

Veritas™ Cluster Server One Bundled Agents Reference Guide

AIX, HP-UX, Linux, Solaris, Windows

5.0 Service Pack 1



Veritas Cluster Server One Bundled Agents Reference Guide

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Introduction

Bundled agents are programs that manage resources of predefined resource types according to commands received from the Veritas™ Cluster Server One (VCS One) daemon. These agents are installed when you install the Veritas Cluster Server One by Symantec.

A system in the Policy Master cluster has one agent per resource type that monitors all resources of that type. For example, a single IP agent manages all IP resources.

When the agent starts, it obtains the necessary configuration information from VCS One. The agent then periodically monitors the resources, and updates VCS One with the resource status.

Agents can:

- Bring resources online.
- Take resources offline.
- Monitor resources and report state changes.

About the different kinds of agents

VCS One provides agents that manage applications and resources in a cluster.

VCS One comes packaged (bundled) with a set of agents that enable VCS One to provide high availability. These include agents for mount points, IP addresses, file systems, and virtual environments. These agents are immediately available to you after install VCS One.

For more information about VCS One bundled agents, refer to this guide.

VCS One also provides a set of agents that enable high availability for key enterprise applications and third-party products including:

- Databases
- Replication solutions

- Middleware solutions
- Enterprise applications

These agents are available in the Agent Pack, which is updated quarterly.

For more information about VCS One agents for enterprise applications, refer to the individual agent's guide, the Agent Pack, or contact Symantec consulting services.

For applications not supported by the current set of VCS One agents, Symantec consulting services can create custom agents. You can also develop custom agents for your environment. Creating custom agents requires knowledge of VCS One, scripting skills, and basic programming logic.

For more information about creating VCS One agents, refer to the *Veritas Cluster Server One Agent Developers Guide* or contact Symantec consulting services

Resources and their attributes

Resources are known by their type, such as: a volume, a disk group, or an IP address. VCS One includes a set of resource types. Different attributes define these resource types in the appropriate `types.platform.xml` file. Each type has a corresponding agent that controls the resource.

An attribute's given value configures the resource to function in a specific way. By modifying the value of a resource attribute, you can change the way the VCS One agent manages the resource. For example, the IP agent uses the Address attribute to determine the IP address to monitor.

Modifying agents and their resources

See the *Veritas Cluster Server One User's Guide* for information on how to modify the agent's configuration.

Attributes

Attributes contain data about the cluster, systems, service groups, resources, resource types, and the agent. An attribute has a definition and a value. You change attribute values to configure VCS One resources. Attributes are either optional or required, although sometimes attributes that are optional in one configuration might be required in other configurations. Many optional attributes have predefined or default values, which you should change as required.

A variety of attributes also exist that are . Do not modify these attributes—modifying them can lead to significant problems for your server farms.

Attributes have type and dimension. Some attribute values can accept numbers, others can accept alphanumeric values or groups of alphanumeric values, while others are simple boolean on/off values.

Table 1-1 Attribute data types

Data Type	Description
string	This is the default type.
integer	Signed integer constants are a sequence of digits from 0 to 9. You can precede them with a dash. They are base 10. Integers cannot exceed the value of a 32-bit signed integer: 21471183247.
boolean	A boolean is an integer with the possible values of 0 (false) and 1 (true).

Table 1-2 Attribute dimensions

Dimension	Description
scalar	<p>A scalar is a single element value. It can be a string or an integer data type.</p> <p>Example: string value</p> <pre><attribute name="ConfigFile" type="str" dimension="scalar"> <default><scalar>"conf/file.conf"</scalar></default></pre> <p>Example: integer value</p> <pre><attribute name="PortNum" type="int" dimension="scalar"> <default><scalar>80</scalar></default></pre>
vector	<p>A vector is an ordered list of values.</p> <p>Example: string vector</p> <pre><attribute name="MyStrVector" type="str" dimension="vector"> <default> <val>"myStrVectorValue1"</val> <val>"myStrVectorValue2"</val> </default> <insensitive>1</insensitive> </attribute></pre>
keylist	<p>A keylist is an unordered list of unique strings in that list.</p> <p>Example:</p> <pre><attribute name="MyKeyList" type="str" dimension="keylist"> <default> <val key="val1"></val> <val key="val2"></val> </default> </attribute></pre>

Table 1-2 Attribute dimensions

Dimension	Description
association	<p>An association is an unordered list of name-value pairs.</p> <p>Example: string association</p> <pre><attribute name="MyStrAssoc" type="str" dimension="assoc"> <default> <val key="myStrAssocKey1">"one"</val> <val key="myStrAssocKey2">"two"</val> </default> </insensitive>1</insensitive></pre>

Agent functions

Each agent, depending on its purpose, can perform certain functions on the resources it governs. For example, an agent can bring resources online, take them offline, and monitor them.

Operations

A way to view an agent's behavior is to check its Operations attribute. This static, type-level resource determines the basic functions for an agent. If the agent has no Operations attribute defined in its types definition file, it defaults to an OnOff operation.

Table 1-3 Operations matrix

	Agent functions (entry points)			
	Online	Offline	Clean	Monitor
OnOff Operations	X	X	X	X
OnOnly Operations	X		X	X
None Operations			X	X

Note: An Operation attribute set to None, is also called a persistent resource.

From the command line

If the attribute's value begins with a dash symbol (-) or a percentage symbol (%) symbol, you need to use another preceding percentage symbol (%) symbol to escape it. Any other dash symbols or percentage symbols that appear in the attribute's value does not need to be escaped. The following examples demonstrate this:

- Where the value of the attribute is -foo, and you escape the dash with a percentage symbol.

```
# hares -modify example1 PathName "%-foo"
# hares -display | grep PathName
example1 PathName      global      -foo
```
- Where the value of the attribute is f-oo, you do not have to escape the dash.

```
# hares -modify example1 PathName "f-oo"
# hares -display | grep PathName
example1 PathName      global      f-oo
```
- Where the value of the attribute is %foo, and you do not escape it, the value becomes foo.

```
# hares -modify example1 PathName "%foo"
# hares -display | grep PathName
example1 PathName      global      foo
```
- Where the value of the attribute is %foo, and you do escape it with the percentage symbol, the value becomes %foo.

```
# hares -modify example1 PathName "%%foo"
# hares -display | grep PathName
example1 PathName      global      %foo
```
- Where the value of the attribute is -bd -q30m, you need to escape it with the percentage symbol to get a value of -bd -q30m.

```
# hares -modify example1 PathName "%-bd -q30m"
# hares -display | grep PathName
example1 PathName      global      -bd -q30m
```

Surround strings in attribute values with quotes when working from the command line.

WPAR-aware agents

[Table 1-4](#) lists the ContainerOpts attribute default values for specific resource types. Symantec recommends that you do not modify these values.

Table 1-4 ContainerOpts attribute default values for resource types

Resource Type	RunInContainer	PassCInfo
Application	1	0
IP	0	1
IPMultiNICB	0	1
Mount	0	0
Process	1	0
ProcessOnOnly	1	0
WPAR	0	1

For more information on using WPARs in your VCS environment, refer to the *Veritas Cluster Server User's Guide*.

Zone-aware agents

[Table 1-4](#) lists the ContainerOpts attribute default values for specific resource types. Symantec recommends that you do not modify these values.

Table 1-5 ContainerOpts attribute default values for resource types

Resource Type	RunInContainer	PassCInfo
Application	1	0
IP	0	1
IPMultiNIC	0	1
IPMultiNICB	0	1
Mount	0	0
Process	1	0
ProcessOnOnly	1	0
Zone	0	1

For more information on using WPARs in your VCS environment, refer to the *Veritas Cluster Server User's Guide*.

UNIX agents

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- [Chapter 4, “Program support and testing agents” on page 151](#)
- [Chapter 5, “Virtualization management agents” on page 167](#)
- [Chapter 6, “File service agents” on page 199](#)
- [Chapter 7, “Storage agents” on page 211](#)

Network agents

This chapter contains:

- [“About the network agents”](#) on page 31
- [“IP agent”](#) on page 35
- [“NIC agent”](#) on page 47
- [“IPMultiNIC agent for Linux”](#) on page 60
- [“MultiNICA agent for Linux”](#) on page 64
- [“About the IPMultiNICB and MultiNICB agents”](#) on page 69
- [“IPMultiNICB agent”](#) on page 70
- [“MultiNICB agent”](#) on page 80
- [“DNS agent”](#) on page 100

About the network agents

Use network agents to provide high availability for networking resources.

Note: For Linux distributions, Symantec recommends that you use `ip` commands instead of `ifconfig` and `route` commands.

Network agent comparisons

IP and NIC agents

- Monitor a single IP address and a single NIC
- Support the following link aggregation schemes:
 - AIX EtherChannel
 - Linux bonds
 - HP-UX Auto Port Aggregation (APA)

IPMultiNIC and MultiNICA agents for Linux

- Operates in Performance Mode (PM) for faster failover
- Monitor single or multiple NICs
- Support Linux bonds
- Check the backup NICs at fail over
- Use the original base IP address when failing over
- Have only one active NIC at a time

IPMultiNICB and MultiNICB agents for AIX, HP-UX, and Solaris

- Monitor single or multiple NICs
- Check the backup NICs as soon as it comes up
- Support the following link aggregation schemes:
 - AIX EtherChannel
 - HP-UX Auto Port Aggregation (APA)
 - Sun trunking
 - Sun IP multipathing
- Require a pre-assigned base IP address for each NIC
- Do not fail over the original base IP address
- Have one or more active NIC at a time

802.1Q trunking

The IP/NIC, IPMultiNIC/MultiNICA, and IPMultiNICB/MultiNICB agents support 802.1Q trunking.

For AIX

To use 802.1Q trunking, create 802.1Q trunked interfaces over a physical interface using SMIT. The physical interface is connected to a 802.1Q trunked port on the switch.

The NIC and MultiNICB agents can monitor these trunked interfaces. The IP and IPMultiNICB agents monitor the virtual IP addresses that are configured on these interfaces.

For example, create a 802.1Q interface called en6 over a physical interface called en0. Do not configure an IP address on en0. You connect en0 to a trunked port on the switch. The NIC and IP agents can then monitor en6 and the virtual IP address configured on en6.

For Linux

The underlying utility to manage 802.1Q trunk interfaces is vconfig. For example, you can create a trunk interface on the physical interface:

```
# vconfig add eth2 10
```

This creates a trunk interface called eth2.10 in the default configuration. In this case, the physical NIC eth2 must be connected to a trunk port on the switch. You can now use eth2.10 like a regular physical NIC in a NIC, IP, and MultiNICA resource configuration. You can remove it with the following command.

```
# vconfig rem eth2.10
```

VCS One does not create nor remove trunk interfaces. The administrator should set up the trunking as per the operating system vendor's documentation rather than using vconfig directly.

For Solaris

The IP/NIC and IPMultiNICB/MultiNICB agents support 802.1Q trunking on Solaris 8, 9 and 10. However, on Solaris 8, only "ce" interfaces can be configured as VLAN interfaces. This is a Sun restriction.

On Solaris 9, the IPMultiNICB and MultiNICB agents works only if Sun patch 116670-04 is installed on the system. No patch is required for the IP and NIC agents.

On Solaris 10, IP/NIC and IPMultiNICB/MultiNICB agents require patch 137091 for SPARC and patch 137051 for x86.

On Solaris 9 and 10, VLAN is not supported on the Fast Ethernet interfaces. (for example: hme/qfe interfaces).

You also must make sure that the IP addresses that are assigned to the interfaces of a particular VLAN are in the same subnet.

IP agent

The IP agent manages the process of configuring a virtual IP address and its subnet mask on an interface for IPv4 addresses. The virtual IP address must not be in use. You can use this agent when you want to monitor a single IP address on a single adapter.

AIX, HP-UX, and Linux: The interface must be enabled with a physical (or administrative) base IP address before you can assign it a virtual IP address.

For the IP and NIC agents, VCS One supports EtherChannel, Auto-port Aggregation (APA), and Linux bonds.

This agent is WPAR- and zone-aware. The ContainerOpts resource type attribute for this type has a default value of 0 for RunInContainer and a default value of 1 for PassCInfo. Symantec recommends that you do not change these values. Refer to the *Veritas Cluster Server One User's Guide* for more information.

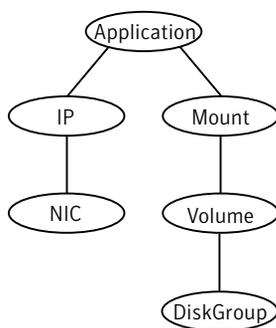
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

IP resources depend on NIC resources.

Figure 2-1 Sample service group that includes an IP resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	<p>AIX: Uses the <code>ifconfig</code> command to set the IP address as an alias on the interface.</p> <p>HP-UX: Configures the IP address to the NIC. Checks if another system is using the IP address. Uses the <code>ifconfig</code> command to set the IP address on a unique alias on the interface.</p> <p>Linux and Solaris: Configures the IP address to the NIC. Checks if another system is using the IP address. Uses the <code>ifconfig</code> command to set the IP address on a unique alias on the interface.</p> <p>Linux and ESX: Sends out a gratuitous ARP.</p>
Offline	Brings down the IP address that is specified in the Address attribute.
Monitor	Monitors the interface to test if the IP address that is associated with the interface is alive.
Clean	Brings down the IP address that is associated with the specified interface.

State definitions

ONLINE	Indicates that the device is up and the specified IP address is assigned to the device.
OFFLINE	Indicates that the device is down or the specified IP address is not assigned to the device.
UNKNOWN	Indicates that the agent could not determine the state of the resource or that the resource attributes are invalid.

Attributes for AIX

Table 2-1 Required attributes for AIX

Required attribute	Description
Address	<p>A virtual IP address that is different from the base IP address, and that is associated with the interface. Note that the address you specify must not be the same as the configured physical IP address, but should be on the same network.</p> <p>Type and dimension: string-scalar Example: 192.203.47.61</p>
Device	<p>The name of the NIC device that is associated with the IP address. Requires the device name without an alias.</p> <p>Type and dimension: string-scalar Example: en0</p>
NetMask	<p>For IPv4 protocol, the subnet mask that is associated with the IP address.</p> <p>Type and dimension: string-scalar Example: 255.255.255.0</p>

Table 2-2 Optional attributes for AIX

Optional attribute	Description
Options	<p>Options for the <code>ifconfig</code> command.</p> <p>Type and dimension: string-scalar Example: mtu 1500</p>

Table 2-2 Optional attributes for AIX

Optional attribute	Description
RouteOptions	<p>Specifies the routing options that are passed to the <code>route add</code> command when the agent configures an interface. The RouteOptions attribute value is generally formed like this: "<i>destination gateway metric</i>".</p> <p>For details about the <code>route</code> command, refer to the man page for your operating system.</p> <p>When the value of this string is null, the agent does not add routes.</p> <p>Type and dimension: string-scalar</p> <p>Example: "192.100.201.0 192.100.13.7"</p> <p>In this example, the agent executes the "<code>route add 192.100.201.0 192.100.13.7</code>" command when it configures an interface.</p>

Attributes for HP-UX

Table 2-3 Required attributes for HP-UX

Required attributes	Description
Address	<p>A virtual IP address, which is different from the base IP address, and which is associated with the interface. Note that the address you specify must not be the same as the configured physical IP address, but should be on the same network.</p> <p>Type and dimension: string-scalar</p> <p>Example: 192.203.47.61</p>
Device	<p>The name of the NIC device that is associated with the IP address. Contains the device name without an alias.</p> <p>Type and dimension: string-scalar</p> <p>Example: lan0</p>

Table 2-4 Optional attributes for HP-UX

Optional attributes	Description
ArpDelay	The number of seconds to sleep between configuring an interface and sending out a broadcast to inform routers about this IP address. Type and dimension: integer-scalar Default: 1
IfconfigTwice	Causes an IP address to be configured twice using an <code>ifconfig up-down-up</code> command sequence. Increases the probability of gratuitous ARP requests (generated by <code>ifconfig up</code>) to reach clients. Type and dimension: integer-scalar
NetMask	The netmask that is associated with the IP address of the resource. Specify the value of the netmask in decimal (base 10) or hexadecimal (base 16). Note: Symantec recommends that you specify a netmask for each virtual interface. Type and dimension: string-scalar Example: 255.255.210.0
Options	Options for the <code>ifconfig</code> command. Type and dimension: string-scalar Example: broadcast 192.203.15.255

Table 2-4 Optional attributes for HP-UX

Optional attributes	Description
RouteOptions	<p>Specifies the routing options that are passed to the <code>route add</code> command when the agent configures an interface. The RouteOptions attribute value is generally formed like this: "<i>destination gateway metric</i>".</p> <p>For details about the <code>route</code> command, refer to the man page for your operating system.</p> <p>When the value of this string is null, the agent does not add routes.</p> <p>Type and dimension: string-scalar</p> <p>Example: "192.100.201.0 192.100.13.7"</p> <p>In this example, the agent executes the "<code>route add 192.100.201.0 192.100.13.7</code>" command when it configures an interface.</p>

Attributes for Linux

Table 2-5 Required attributes for Linux

Required attribute	Description
Address	<p>A virtual IP address that is associated with the interface, and which is different from the base IP address. Note that when the NetMask or PrefixLen attribute is configured, the IP address that you specify must not be the same as the configured physical IP address, the IP address should be on the same network however.</p> <p>Type and dimension: string-scalar Example: 192.203.47.61</p>
Device	<p>The name of the NIC device that is associated with the IP address. Requires the device name without an alias.</p> <p>Type and dimension: string-scalar Example: eth0</p> <p>In above example, eth0 is specified to assign the IP address to the next available alias of eth0. Use the <code>ifconfig -a</code> command to display a list of NICs that are up and the IP addresses assigned to each NIC.</p>

Table 2-6 Optional attributes for Linux

Optional attribute	Description
NetMask	<p>For IPv4 protocol, specify the value of NetMask attribute in decimal (base 10). If you do not specify the Netmask attribute, the agent uses the operating system's default netmask.</p> <p>Symantec recommends that you configure the value for this attribute. The default value for this attribute can cause delays in establishing inter-node connections. The subnet mask that is associated with the IP address.</p> <p>Type and dimension: string-scalar Example: 255.255.255.0</p>

Table 2-6 Optional attributes for Linux

Optional attribute	Description
Options	<p>Options for the <code>ifconfig</code> command.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>mtu 1500</code></p>
IPOptions	<p>Specifies the extra options that are passed to the <code>ip addr add</code> command.</p> <p>The <code>ip addr add</code> command generally resembles:</p> <pre>"ip -4 addr add ipv4addr/prefixlen IPOptions device dev"</pre> <p>Type and dimension: string-scalar</p> <p>Examples:</p> <ul style="list-style-type: none">■ "broadcast 172.20.9.255"■ "scope link"
IPRoute Options	<p>Specifies the extra options that are passed to the <code>ip route add</code> command.</p> <p>The <code>ip route add</code> command resembles:</p> <pre>"ip route add Route IPRouteOptions"</pre> <p>Type and dimension: string-scalar</p> <p>Examples:</p> <ul style="list-style-type: none">■ "default via 172.20.9.1"■ "scope link"

Attributes for Solaris

Table 2-7 Required attributes for Solaris

Required attribute	Description
Address	A virtual IP address that is associated with the interface. Note that the address you specify must not be the same as the configured physical IP address, but should be on the same network. Type and dimension: string-scalar Example: 192.203.47.61
Device	The name of the NIC device that is associated with the IP address. Requires the device name without an alias. Type and dimension: string-scalar Example: bge0

Table 2-8 Optional attributes for Solaris

Optional attribute	Description
ArpDelay	The number of seconds to sleep between configuring an interface and sending out a broadcast to inform routers about this IP address. Type and dimension: integer-scalar Default: 1
IfconfigTwice	Causes an IP address to be configured twice using an ifconfig up-down-up sequence. Increases the probability of gratuitous ARP requests (generated by <code>ifconfig up</code>) to reach clients. Type and dimension: integer-scalar Default: 0

Table 2-8 Optional attributes for Solaris

Optional attribute	Description
NetMask	<p>The subnet mask that is associated with the IP address of the resource. Specify the value of the netmask in decimal (base 10) or hexadecimal (base 16).</p> <p>Symantec recommends that you specify a netmask for each virtual interface.</p> <p>Type and dimension: string-scalar</p> <p>Default: +</p> <p>If you do not specify the netmask in the <code>ifconfig</code> command, the agent uses a default netmask that is based on the contents of the <code>/etc/netmasks</code> path for a given address range.</p> <p>Example: 255.255.248.0</p>
Options	<p>Options for the <code>ifconfig</code> command.</p> <p>Type and dimension: string-scalar</p> <p>Example: trailers</p>
RouteOptions	<p>Specifies the routing options that are passed to the <code>route add</code> command when the agent configures an interface. The <code>RouteOptions</code> attribute value is generally formed like this: <code>"destination gateway metric"</code>.</p> <p>For details about the <code>route</code> command, refer to the man page for your operating system.</p> <p>When the value of this string is null, the agent does not add routes.</p> <p>Type and dimension: string-scalar</p> <p>Example: "192.100.201.0 192.100.13.7"</p> <p>In this example, the agent executes the <code>"route add 192.100.201.0 192.100.13.7"</code> command when it configures an interface.</p>

Sample configurations

NetMask in decimal (base 10) for AIX

```
<resource name="ip_res1" type="IP">
```

```
<attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
<attribute name="Device"><scalar>"en4"</scalar></attribute>
<attribute name="NetMask"><scalar>"255.255.255.0"</scalar>
</attribute>
</resource>
```

NetMask in hexadecimal (base 16) for AIX

```
<resource name="ip_res1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"en4"</scalar></attribute>
  <attribute name="NetMask"><scalar>"0xFFFFFFFF0"</scalar>
</attribute>
</resource>
```

NetMask in decimal (base 10) for HPUX

```
<resource name="ip1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"lan0"</scalar></attribute>
  <attribute name="NetMask"><scalar>"255.255.255.0"</scalar>
</attribute>
</resource>
```

NetMask in hexadecimal (base 16) for HP-UX

```
<resource name="ip1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"lan0"</scalar></attribute>
  <attribute name="NetMask"><scalar>"0xFFFFFFFF0"</scalar>
</attribute>
</resource>
```

Configuration for Linux

```
<resource name="ip_res1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"eth0"</scalar></attribute>
</resource>
```

Configuration using specified NetMask for Linux

```
<resource name="ip_res1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"eth0"</scalar></attribute>
```

```
    <attribute name="NetMask"><scalar>"255.255.255.0"</scalar>
  </attribute>
</resource>
```

Configuration for Solaris

```
<resource name="ip_res1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"bge0"</scalar></attribute>
</resource>
```

NetMask in decimal (base 10) for Solaris

```
<resource name="ip_res1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"bge0"</scalar></attribute>
  <attribute name="NetMask"><scalar>"255.255.255.0"</scalar>
</attribute>
</resource>
```

Configuration of NetMask in hexadecimal (base 16) for Solaris

```
<resource name="ip_res1" type="IP">
  <attribute name="Address"><scalar>"10.10.10.10"</scalar>
</attribute>
  <attribute name="Device"><scalar>"bge0"</scalar></attribute>
  <attribute name="NetMask"><scalar>"0xFFFFFFFF0"</scalar>
</attribute>
</resource>
```

NIC agent

The NIC agent monitors the configured NIC. If a network link fails, or if a problem arises with the NIC, the resource is marked `FAULTED`. You can use the agent to make a single IP address on a single adapter highly available or to monitor it. This resource's Operation value is `OnOnly`.

Linux: Some NICs maintain their connection status in a hardware register. For NICs that maintain their connection status, the agent uses `MII` to determine the status of the NIC resource. For NICs that do not maintain their connection status, the agent uses a ping or a broadcast to determine the status of the resource.

For the NIC and IP agents, VCS One supports EtherChannel, Auto-port Aggregation (APA), and Linux bonds.

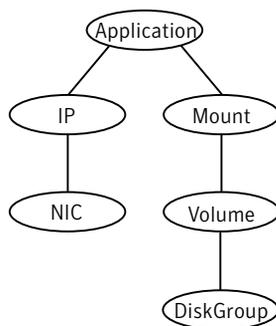
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No child dependencies exist for this resource.

Figure 2-2 Sample service group that includes a NIC resource



AIX, HP-UX, and Solaris

The NIC listed in the Device attribute must have an administrative IP address. The administrative IP address is the default IP address that is assigned to the physical interface of a host on a network. This agent does not configure network routes or administrative IP addresses.

Before you use this agent:

- Verify that the NIC has the correct administrative IP address and subnet mask.
- Verify that the NIC does not have built-in failover support. If it does, disable it.

Bonded network interfaces for Linux

The NIC agent now supports using bonded network interfaces.

See “[Monitoring bonded NICs for Linux](#)” on page 57.

EtherChannel support for AIX

EtherChannel aggregates multiple network interfaces so that they appear as a single interface. For example, you can combine en0 and en1 into an EtherChannel and call the combined interface en2. You then use the NIC agent to monitor this en2 interface. You use the IP agent to configure and monitor an IP address on the en2 interface. Note that you use the en2 interface configured through EtherChannel for the Device attribute.

The IP and NIC agents support EtherChannel use with VCS One. EtherChannel is responsible for providing local adapter swapping, which is outside of VCS One control. EtherChannel Backup and active-active modes are supported.

Auto Port Aggregation (APA) support for HP-UX

HP APA aggregates multiple network interfaces so that they appear as a single interface. For example you can combine lan0 and lan1 and call the combined interface lan9000. You then use the NIC agent to monitor the lan9000 interface. You use the IP agent to configure and monitor an IP address on the lan9000 interface. Note that you use the lan9000 interface configured through APA for the Device attribute.

The IP and NIC agents support APA use with VCS One. APA is responsible for providing local adapter swapping, which is outside of VCS One control.

Agent functions

The value of the Operations attribute for this agent is None.

- Monitor
- AIX, HP-UX, and Solaris
Tests the network card and network link. Pings the network hosts or broadcast address of the interface to generate traffic on the network. Counts the number of packets passing through the device before and after the address is pinged. If the count decreases or remains the same, the resource is marked `FAULTED`.
If the `NetworkHosts` list is empty, or the ping test fails, the agent sends a ping to the device's broadcast address to generate network traffic. The agent checks for any response to the broadcast request. If there is no reply to the broadcast ping, the resource faults.
Note that for AIX, the systems do not respond to broadcast pings by default. Run the `no -o bcastping=1` command to enable response to broadcast pings.
 - Linux
If the NIC maintains its connection status, the agent uses MII to determine the status of the resource.
If the NIC does not maintain its connection status, the agent verifies that the NIC is configured. The agent then sends a ping to all the hosts that are listed in the `NetworkHosts` attribute. If the ping test is successful, it marks the NIC resource `ONLINE`.
If the `NetworkHosts` attribute list is empty, or the ping test fails, the agent counts the number of packets that the NIC received. The agent compares the count with a previously stored value. If the packet count increases, the resource is marked `ONLINE`. If the count remains unchanged, the agent sends a ping to the broadcast address of the device to generate traffic on the network.
The agent counts the number of packets that the NIC receives before and after the broadcast. If the count increases, the resource is marked `ONLINE`. If the count remains the same or decreases over a period of five broadcast cycles, the resource is marked `OFFLINE`.

State definitions

ONLINE	Indicates that the NIC resource is working.
OFFLINE	Linux: The NIC resource can go <code>OFFLINE</code> if the NIC it represents has failed or is unavailable.
FAULTED	Indicates that the NIC has failed.

UNKNOWN Indicates the agent cannot determine the interface state. It may be due to an incorrect configuration.

Attributes for AIX

Table 2-9 Required attributes for AIX

Required attribute	Description
Device	<p>Specifies the name of the NIC that you want to monitor.</p> <p>Use the <code>lsdev</code> command to check for all available network adapters.</p> <p>Type and dimension: string-scalar</p> <p>Example: en0</p>
NetworkHosts	<p>Required for virtual devices.</p> <p>See “NetworkHosts” on page 50.</p>

Table 2-10 Optional attributes for AIX

Optional attribute	Description
NetworkHosts	<p>List of hosts on the network that are pinged to determine if the network connection is alive. Enter the IP address of the host, instead of the host name, to prevent the monitor from timing out. DNS causes the ping to hang. If more than one network host is listed, the monitor returns ONLINE if at least one of the hosts is alive.</p> <p>If you do not specify network hosts, the monitor tests the NIC by sending pings to the broadcast address on the NIC.</p> <p>For a virtual device, you must configure the NetworkHosts attribute. Symantec recommends configuring more than one host to take care of the NetworkHost itself failing.</p> <p>Type and dimension: string-vector</p> <p>Example: 166.96.15.22, 166.97.1.2</p>

Table 2-10 Optional attributes for AIX

Optional attribute	Description
NetworkType	Specifies the type of network. Type and Dimension: string-scalar Example: ether
PingOptimize	Determines whether to ping every monitor cycle. A value of 1 means that the agent pings either the network host or the broadcast address every monitor cycle. It pings each cycle to determine the state of the network interface. A value of 0 means that the agent uses the device statistics from the netstat output to determine the state of the interface. If no activity exists on the interface, the agent then pings the broadcast address to double-check the state of the network interface. Type and dimension: integer-scalar Default: 1

Attributes for HP-UX

Table 2-11 Required attributes for HP-UX

Required attribute	Description
Device	Name of the NIC that you want to monitor. Type and dimension: string-scalar Example: lan0

Table 2-12 Optional attributes for HP-UX

Optional attribute	Description
NetworkHosts	List of hosts on the network that are pinged to determine if the network connection is alive. Enter the IP address of the host, instead of the host name, to prevent the monitor from timing out. DNS causes the ping to hang. If more than one network host is listed, the monitor returns ONLINE if at least one of the hosts is alive. Type and dimension: string-vector Example: 166.96.15.22 , 166.97.1.2
NetworkType	Type of network. VCS One currently only supports Ethernet. Type and dimension: string-scalar Default: ether

Table 2-12 Optional attributes for HP-UX

Optional attribute	Description
PingOptimize	<p>Allows or disallows broadcast pings to control the network traffic that the NIC agent generates.</p> <p>Use the PingOptimize attribute when you have not defined a value for the NetworkHosts attribute.</p> <p>A value of 1 optimizes broadcast pings—it disallows the NIC agent from sending broadcast ping requests.</p> <p>A value of 0 tells the agent to perform a broadcast ping during each monitor cycle and detects the inactive interface.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>

Attributes for Linux

Table 2-13 Required attributes for Linux

Required attribute	Description
Device	<p>Specifies the name of the NIC that you want to monitor.</p> <p>Use the <code>ifconfig - a</code> command to list all network adapters and the IP addresses assigned to each NIC.</p> <p>Type and dimension: string-scalar</p> <p>Example: eth0 or eth1</p>

Table 2-14 Optional attributes for Linux

Optional attribute	Description
Mii	<p>Flag that defines whether the NIC maintains its connection status.</p> <p>If this flag is set to 1, the agent uses MII hardware registers, instead of the ping and packet count method. The agent uses this method to determine the health of the network card.</p> <p>If the flag is set to 0, the agent does not use Mii to monitor the status of the NIC.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>

Table 2-14 Optional attributes for Linux

Optional attribute	Description
NetworkHosts	<p>List of hosts on the network that receive pings to determine the state of the NIC. Specify the IP address of the host—not the host name.</p> <p>The specified hosts must be pingable:</p> <ul style="list-style-type: none">■ from all the AppNodes that are specified in the SystemList attribute for the service group to which the resource belongs■ through all the devices that are specified in the Device attribute <p>The command to ping the host (hostip) via a NIC device (nicdev) is:</p> <pre># ping -I <i>nicdev hostip</i></pre> <p>If more than one network host is listed, the monitor returns ONLINE if the ping test is successful with at least one of the hosts.</p> <p>Type and dimension: string-vector</p>
PingOptimize	<p>Attribute that defines whether the agent sends a broadcast ping before it retrieves the received packet statistics. This attribute is used when Mii is not set and no network hosts are specified.</p> <p>If the value of this attribute is 1, the agent retrieves received packet statistics from the netstat command and compare them with previously stored values. The agent sends a broadcast ping to the network only if the packet count remains unchanged.</p> <p>If the value of this attribute is 0, the agent sends a broadcast ping before it checks the network statistics.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>

Attributes for Solaris

Table 2-15 Required attributes for Solaris

Required attribute	Description
Device	Name of the NIC that you want to monitor. Type and dimension: string-scalar Example: bge0

Table 2-16 Optional attributes for Solaris

Optional attribute	Description
NetworkHosts	List of hosts on the network that are pinged to determine if the network connection is alive. You can use this attribute to help to save network capacity and reduce monitor time. Symantec recommends that you use the outgoing gateway routers for this value. Enter the IP address of the host, instead of the host name, to prevent the monitor from timing out. DNS causes the ping to hang. If more than one network host is listed, the monitor returns ONLINE if at least one of the hosts is alive. If you do not specify network hosts, the monitor tests the NIC by sending pings to the broadcast address on the NIC. Type and dimension: string-vector Example: 166.96.15.22 , 166.97.1.2
NetworkType	Type of network. VCS One supports only Ethernet. Type and dimension: string-scalar Default: ether

Table 2-16 Optional attributes for Solaris

Optional attribute	Description
PingOptimize	<p>Number of monitor cycles to detect if a configured interface is inactive. Use PingOptimize when you have not specified the NetworkHosts attribute.</p> <p>A value of 1 optimizes broadcast pings and requires two monitor cycles.</p> <p>A value of 0 performs a broadcast ping during each monitor cycle and detects the inactive interface within the cycle.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>

Monitoring bonded NICs for Linux

The NIC agent can monitor the network interfaces (bond0, bond1, etc.) that the bonding driver exports. Refer to operating system vendor documentation to set up the bonds and to configure your system to load the bonding driver correctly.

For monitoring a bond interface, the two important settings are:

- The value of the miimon parameter, which you set while loading the bonding driver. miimon is a parameter to the bonding module and has a default setting of 0.
- The value of the Mii attribute (Mii) of the NIC resource, which you set at runtime. Mii is an attribute of the NIC resource and has a default setting of 0.

Setting Mii and miimon

For the following cases, the name of the monitored bond interface is B. If you do not use one of the following cases to set up bonding, the bonding driver can potentially provide incorrect health status. This incorrect health status can result in VCS One failing to fault the resource appropriately.

Case 1

Accept defaults—miimon is 0 and Mii is 1. Each of B's slaves must support the netif_carrier_ok in-kernel call.

Case 2

When you set `miimon` to anything except 0 (`miimon!=0`) and `Mii` to 1, both the hardware and the drivers of each of B's slaves must support the MII-based health monitoring.

Case 3

When you set `Mii` to 0, the NIC agent uses ping, which each card supports. In this case, the `miimon` setting is irrelevant.

Sample configurations

Configuration without network hosts (using default ping mechanism) for AIX

```
<resources>
  <resource name="nic_res1" type="NIC">
    <attribute name="Device"><scalar>en5</scalar></attribute>
  </resource>
</resources>
```

Configuration with network hosts for AIX

```
<resources>
  <resource name="nic_res1" type="NIC">
    <attribute name="Device"><scalar>en5</scalar></attribute>
    <attribute name="NetworkHosts"><val>10.10.10.11</val>
    <val>10.10.10.12</val>
  </attribute>
  </resource>
</resources>
```

Configuration with network hosts for HPUX

```
<resource name="nic" type="NIC">
  <attribute name="Device"><scalar>"lan0"</scalar></attribute>
  <attribute name="NetworkHosts">
    <val>"1.1.1.4"</val>
  </attribute>
</resource>
```

Configuration without network hosts (using broadcast ping mechanism) for HPUX

```
<resource name="nic" type="NIC">
  <attribute name="Device"><scalar>"lan0"</scalar></attribute>
  <attribute name="PingOptimize"><scalar>0</scalar></attribute>
</resource>
```

Configuration for using Mii for Linux

If the NIC does not respond to Mii, the agent uses network statistics to monitor the device.

```
<resources>
  <resource name="nic_res1" type="NIC">
    <attribute name="Device"><scalar>eth0</scalar></attribute>
    <attribute name="Mii"><scalar>1</scalar></attribute>
  </resource>
</resources>
```

Configuration for using network hosts for Linux

```
<resources>
  <resource name="nic_res1" type="NIC">
    <attribute name="Device"><scalar>eth0</scalar></attribute>
    <attribute name="NetworkHosts"><val>10.10.10.11</val>
    <val>10.10.10.12</val>
    </attribute>
  </resource>
</resources>
```

Configuration without network hosts (using default ping mechanism) for Solaris

```
<resources>
  <resource name="nic_res1" type="NIC">
    <attribute name="Device"><scalar>bge0</scalar></attribute>
  </resource>
</resources>
```

Configuration with network hosts for Solaris

```
<resources>
  <resource name="nic_res1" type="NIC">
    <attribute name="Device"><scalar>bge0</scalar></attribute>
    <attribute name="NetworkHosts"><val>10.10.10.11</val>
    <val>10.10.10.12</val>
    </attribute>
  </resource>
</resources>
```

IPMultiNIC agent for Linux

The IPMultiNIC agent manages the virtual IP address that is configured as an alias on one interface of a MultiNICA resource. If the interface faults, the agent works with the MultiNICA resource to fail over to a backup NIC. If multiple service groups have IPMultiNICs associated with the same MultiNICA resource, only one group has the MultiNICA resource. The other groups have Proxy resources pointing to it. You can use this agent for IP addresses on multiple-adapter systems.

For the IPMultiNIC and MultiNICA agents, VCS One supports Linux bonds.

This agent is WPAR- and zone-aware. The ContainerOpts resource type attribute for this type has a default value of 0 for RunInContainer and a default value of 1 for PassCInfo. Symantec recommends that you do not change these values. Refer to the *Veritas Cluster Server One User's Guide* for more information.

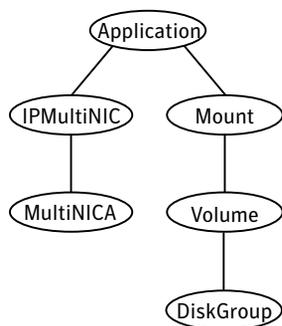
Platforms

Linux

Dependencies

IPMultiNIC resources depend on MultiNICA resources.

Figure 2-3 Sample service group that includes an IPMultiNIC resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Configures a virtual IP address on one interface of the MultiNICA resource.
Offline	Removes the virtual IP address from one interface of the MultiNICA resource.
Monitor	Checks if the virtual IP address is configured on one interface of the MultiNICA resource.
Clean	Solaris: Removes the virtual IP address from one interface of the MultiNICB resource.

State definitions

ONLINE	Indicates that the specified IP address is assigned to the device. Linux: Sends out a gratuitous ARP.
OFFLINE	Indicates that the specified IP address is not assigned to the device.
UNKNOWN	Indicates that the agent can not determine the state of the resource. This state may be due to an incorrect configuration.

Attributes for Linux

Table 2-17 Required attributes for Linux

Required attribute	Description
Address	The virtual IP address that is assigned to the active NIC. Type and dimension: string-scalar Example: 10.128.10.14
MultiNICAResName	Name of the associated MultiNICA resource that determines the active NIC. Type and dimension: string-scalar Example: MultiNICA_grp1

Table 2-18 Optional attributes for Linux

Optional attribute	Description
NetMask	For the IPv4 protocol, specify the value of NetMask attribute in decimal (base 10). If you do not specify the Netmask attribute, the agent uses the operating system's default netmask. Symantec recommends that you configure the value for this attribute. The default value for this attribute can cause delays in establishing inter-node connections. Type and dimension: string-scalar Example: 255.255.255.0
Options	The <code>ifconfig</code> command options for the virtual IP address. Type and dimension: string-scalar Example: mtu 100

Table 2-18 Optional attributes for Linux

Optional attribute	Description
IPOptions	<p>Specifies the extra options that are passed to the <code>ip addr add</code> command. The <code>ip addr add</code> command resembles the following:</p> <ul style="list-style-type: none">■ IPv4 <code>"ip -4 addr add ipv4addr/prefixlen IPOptions device dev"</code> <p>Type and dimension: string-scalar</p> <p>Example:</p> <ul style="list-style-type: none">■ "broadcast 172.20.9.255"■ "scope link"

MultiNICA agent for Linux

The MultiNICA represents a set of network interfaces, and provides failover capabilities between them. You can use the agent to make IP addresses on multiple-adapter systems highly available and to monitor them.

The IPMultiNIC agent depends upon the MultiNICA agent to select the most preferred NIC on the system. IPMultiNIC brings the virtual IP online or offline. However, if the MultiNICA resource changes its active device, the MultiNICA agent handles the shifting of IP addresses.

If a NIC on a system fails, the MultiNICA agent selects another active NIC. The agent then shifts the virtual IP address to the newly selected active NIC. Only in a case where all the NICs that form a MultiNICA agent fail, does the virtual IP address shift to another system.

If you associate an interface with a MultiNICA resource, do not associate it with any other MultiNICA or NIC resource. If the same set of interfaces must be a part of multiple service groups, configure:

- A MultiNICA resource in one of the service groups, and
- The Proxy resources that point to the MultiNICA resource in the other service groups.

The IPMultiNIC and MultiNICA agents support Linux bonds.

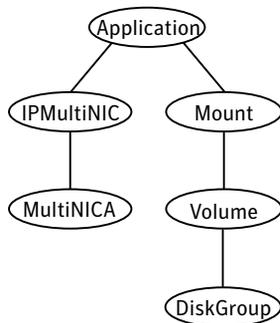
Platform

Linux

Dependencies

The IPMultiNIC resources depend on the MultiNICA resources.

Figure 2-4 Sample service group that includes a MultiNICA resource



Configuration

The MultiNICA agent controls each NIC, and each NIC must have a unique base IP address. The base IP address cannot appear on any other NIC on the same node or any other node.

The base IP addresses have to be enabled on each NIC under MultiNICA control. The addresses need to be enabled before starting VCS One and handing over the management of the NICs to the agent.

Operation

The mode requires that you enable the base IP addresses before starting VCS One. When a NIC goes down, the agent migrates only virtual IP addresses.

In this mode, you can set the Failback attribute to 1 or 0:

- If you set the Failback attribute to 1, in each monitor cycle the agent checks to see if a preferred NIC is up. If the NIC is up, it selects that NIC as the active NIC and moves the virtual IP addresses to the preferred NIC.
- If you set the Failback attribute to 0, the agent selects a new active NIC only if the current active NIC fails. It selects the new active NIC in the order of priority.

Agent function

Monitor	Uses Medium Independent Interface (MII) to request the device status. If the hardware does not respond, the agent sends a ping to the hosts that are listed in the NetworkHosts attribute. If the ping test fails, the agent checks for activity on a configured interface by sampling the input packets that are received on that interface. If the agent does not detect activity, it forces activity by sending out a broadcast ping. If the agent does not receive a network reply, it migrates to the most suitable next interface.
---------	--

Attributes for Linux

Table 2-19 Required attributes for Linux

Required attribute	Description
Device	<p>List of devices and associated base IP addresses. This attribute must be specified separately for each system in the SystemList. You must specify the devices in the list in the order of priority. The first device that the agent determines is “up” becomes the active device, to which the agent assigns a corresponding IP address.</p> <p>Type and dimension: string-association</p> <p>Examples:</p> <pre>Device@vcslinux1={ eth1 = 10.212.100.178, eth2 = 10.212.102.178 } Device@vcslinux2 = { eth2 = 10.212.100.179, eth3 = 10.212.102.179 }</pre>
NetMask	<p>Specifies the netmask that is associated with the base IP address. The value must be specified in decimal (base 10).</p> <p>Type and dimension: string-scalar</p>

Table 2-20 Optional attributes for Linux

Optional attribute	Description
Failback	<p>This attribute determines if the active NIC should be changed to a preferred NIC, even though the current NIC is healthy. If operating in the ICM mode, change the value to 0.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>

Table 2-20 Optional attributes for Linux

Optional attribute	Description
IPv4RouteOptions	<p>The extra options that are passed to the <code>ip route add</code> command.</p> <p>The <code>ip route add</code> command generally resembles: <code>"ip route add Route IPv4RouteOptions"</code></p> <p>Type and dimension: string-scalar</p> <p>Example:</p> <ul style="list-style-type: none"> ■ "default via 172.20.9.1" ■ "scope link"
NetworkHosts	<p>List of hosts on the network that receive pings to determine the state of the NICs. Specify the IP address of the host, not the host name. Include the hosts that all the NICs in the Device list can reach. If more than one network host is listed, monitor returns <code>ONLINE</code> if the ping test is successful with at least one of the hosts.</p> <p>Type and dimension: string-vector</p>
PingOptimize	<p>Determines whether or not a broadcast ping is sent before checking network statistics, which are used to determine the state of the NIC (if MII is not supported and the ping to NetworkHosts does not confirm the NIC is up.) A value of 1 indicates a broadcast ping does not occur, a value of 0 indicates a broadcast ping occurs.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>

Sample configurations

```
<resources>
  <resource name="mna_res1" type="MultiNICA">
    <attribute name="Device" context = "sysA">
      <val key="eth1">11.123.148.47</val>
      <val key="eth2">11.123.148.48</val>
    </attribute>
    <attribute name="Device" context = "sysB">
      <val key="en1">11.123.148.49</val>
      <val key="en2">11.123.148.50</val>
    </attribute>
  </resource>
  <resource name="ipmna_res1" type="IPMultiNIC">
```

```
<attribute name="Address"><scalar>11.123.148.51</scalar>
</attribute>
<attribute name="MultiNICAResName"><scalar>
VR_Group.mna_res1</scalar></attribute>
<attribute name="NetMask"><scalar>255.255.240.0
</scalar></attribute>
</resource>
<link parent="ipmnca_res1" child="mna_res1"/>
</resources>
```

About the IPMultiNICB and MultiNICB agents

The IPMultiNICB and the MultiNICB agents can handle multiple NIC connections.

Checklist to ensure the proper operation of MultiNICB

For the MultiNICB agent to function properly, you must satisfy each item in the following list:

- Each interface must have a unique MAC address.
- All interfaces within one MultiNICB resource must belong to the same IP subnet.
- A MultiNICB resource controls all the interfaces on one IP subnet.
- At boot time, you must configure and connect all the interfaces that are under the MultiNICB resource and give them test IP addresses.
- All test IP addresses for the MultiNICB resource must belong to the same subnet as the virtual IP address.
- Solaris: Reserve the base IP addresses, which the agent uses to test the link status, for use by the agent. These IP addresses do not get failed over.
- Solaris: The IgnoreLinkStatus attribute is set to 1 (default) when using trunked interfaces.
- If you assign IP addresses to the NetworkHosts attribute, then the IP addresses must be on the same subnet as the other IP addresses for the MultiNICB resource.
- Solaris: If in IPMP mode, the group name is recommend at boot time.
- Solaris: /etc/default/mpathd/ has TRACK_INTERFACES_ONLY_WITH_GROUPS=yes.
- Solaris: If you are not using Solaris in.mpathd, all MultiNICB resources on the system have the UseMpathd attribute set to 0 (default). You cannot run in.mpathd on this system.
- Solaris: If you are using Solaris in.mpathd, all MultiNICB resources on the system have the UseMpathd attribute set to 1.
- AIX: If any network host is meant to respond to a broadcast ping, run `no -o bcastping = 1` on the network host.
- AIX: You must use the AIX SMIT configuration tool to configure the test IP addresses and to make them persistent across reboots. If you do not use SMIT is to configure the IP addresses the agent may failover incorrectly.

IPMultiNICB agent

The IPMultiNICB agent works with the MultiNICB agent. The agent configures and manages virtual IP addresses (IP aliases) on an active network device that the MultiNICB resource specifies. When the MultiNICB agent reports a particular interface as failed, the IPMultiNICB agent moves the IP address to the next active interface. You can use this agent for IP addresses on multiple-adapter systems.

If multiple service groups have IPMultiNICB resources associated with the same MultiNICB resource, only one group should have a MultiNICB resource. The other groups should have a proxy resource pointing to the MultiNICB resource. For the MultiNICB and IPMultiNICB agents, VCS One supports EtherChannel, Auto-port Aggregation (APA), and Sun trunking.

This agent is WPAR- and zone-aware. The ContainerOpts resource type attribute for this type has a default value of 0 for RunInContainer and a default value of 1 for PassCInfo. Symantec recommends that you do not change these values. Refer to the *Veritas Cluster Server One User's Guide* for more information.

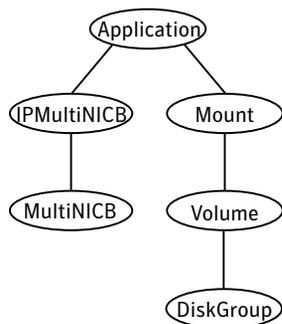
Platforms

AIX, HP-UX, and Solaris

Dependencies

IPMultiNICB resources depend on MultiNICB resources.

Figure 2-5 Sample service group that includes an IPMultiNICB resource



Requirements for IPMultiNICB

The following conditions must exist for the IPMultiNICB agent to function correctly:

- The MultiNICB agent must be running to inform the IPMultiNICB agent of the available interfaces.
- One IPMultiNICB agent can control only one logical IP address.

Minimal configuration for AIX

The minimal configuration for this agent consists of:

- The failover IP address.
- The subnet mask.
- The name of the MultiNICB resource that it depends on.

The haipswitch utility for AIX

You can use the haipswitch utility to switch IP addresses between MultiNICB interfaces on the same system. Running the utility with the `-h` flag gives an example of usage.

Agent functions

The value of the Operations attribute for this agent is OnOff.

- | | |
|--------------|---|
| Open | AIX: Data structures necessary for monitoring the network interfaces are created. |
| Close | AIX: Data structures that the monitor agent function uses are freed. |
| Attr_Changed | AIX: Updates the data structures that are used for monitoring the NICs. |

State definitions

- | | |
|---------|--|
| ONLINE | <p>AIX: Indicates that an IP address on one of the working network interfaces of the resource is up. The IP address is specified in the Address attribute. The resource is specified in the MultiNICBResName attribute.</p> <p>HP-UX and Solaris: Indicates that an IP address on one of the working network interfaces of the resource is up. The IP address is specified in the Address attribute. The resource is specified in the BaseResName attribute.</p> |
| OFFLINE | <p>AIX: Indicates that an IP address on one of the working network interfaces of the resource is not up. The IP address is specified in the Address attribute. The resource is specified in the MultiNICBResName attribute.</p> <p>HP-UX and Solaris: Indicates that an IP address on one of the working network interfaces of the resource is up. The IP address is specified in the Address attribute. The resource is specified in the BaseResName attribute.</p> |
| UNKNOWN | Indicates that the agent cannot determine the status of the virtual IP address that is specified in the Address attribute. |
| FAULTED | AIX and Solaris: The IP address could not be brought online, usually due to all NICs in the MultiNICB resource faulting. |

Attributes for AIX

Table 2-21 Required attributes for AIX

Required attribute	Description
Address	<p>Defines the dotted decimal failover IP address.</p> <p>This IP address must be different than the base or test IP addresses in the MultiNICB resource.</p> <p>The IPMultiNICB agent automatically assigns the failover IP address. Do not configure this IP address before the IPMultiNICB agent goes online. If the IP address is already configured, the agent returns an error.</p> <p>Type and dimension: string-scalar</p> <p>Example: 10.118.10.15</p>
MultiNICBResName	<p>Contains the name of the MultiNICB resource that the IPMultiNICB resource depends on.</p> <p>Type and dimension: string-scalar</p>
NetMask	<p>The netmask that is associated with the logical IP address.</p> <p>Type and dimension: string-scalar</p> <p>Example: 255.255.255.0</p>

Table 2-22 Optional attributes for AIX

Optional attribute	Description
RouteOptions	<p>Specifies the routing options that are passed to the <code>route add</code> command when the agent configures an interface. The RouteOptions attribute value is generally formed like this: <i>"destination gateway metric"</i>.</p> <p>For details about the <code>route</code> command, refer to the man page for your operating system.</p> <p>When the value of this string is null, the agent does not add routes.</p> <p>Type and dimension: string-scalar</p> <p>Example: "192.100.201.0 192.100.13.7"</p> <p>In this example, the agent executes the <code>"route add 192.100.201.0 192.100.13.7"</code> command when it configures an interface.</p>

Attributes for HP-UX

Table 2-23 Required attributes for HP-UX

Required attribute	Description
Address	The logical IP address that the IPMultiNICB resource must handle. Type and dimension: string-scalar Example: 192.205.10.15
BaseResName	Name of MultiNICB resource from which the IPMultiNICB resource gets a list of working interfaces. The logical IP address is placed on the physical interfaces according to the device number information. Type and dimension: string-scalar Example: gnic_n

Table 2-24 Optional attributes for HP-UX

Optional attribute	Description
DeviceChoice	Indicates the preferred NIC where you want to bring the logical IP address online. Specify the device name or NIC alias as determined in the Device attribute of the MultiNICB resource. Type and dimension: string-scalar Default: 0 Examples: DeviceChoice = lan0 DeviceChoice = 1
NetMask	Netmask for the base IP address. You can specify the value of NetMask in decimal (base 10) or hexadecimal (base 16). Note: Symantec recommends that you specify a netmask for each virtual interface. Type and dimension: string-scalar

Table 2-24 Optional attributes for HP-UX

Optional attribute	Description
RouteOptions	<p>Specifies the routing options that are passed to the <code>route add</code> command when the agent configures an interface. The RouteOptions attribute value is generally formed like this: "<i>destination gateway metric</i>".</p> <p>For details about the <code>route</code> command, refer to the man page for your operating system.</p> <p>When the value of this string is null, the agent does not add routes.</p> <p>Type and dimension: string-scalar</p> <p>Example: "192.100.201.0 192.100.13.7"</p> <p>In this example, the agent executes the "<code>route add 192.100.201.0 192.100.13.7</code>" command when it configures an interface.</p>

Attributes for Solaris

Table 2-25 Required attributes for Solaris

Required attribute	Description
Address	<p>The logical IP address that the IPMultiNICB resource must handle.</p> <p>This IP address must be different than the base or test IP addresses in the MultiNICB resource.</p> <p>Type and dimension: string-scalar</p> <p>Example: 10.112.10.15</p>
BaseResName	<p>Name of MultiNICB resource from which the IPMultiNICB resource gets a list of working interfaces. The logical IP address is placed on the physical interfaces according to the device number information.</p> <p>Create the BaseResName attribute in this format: <i>service_group_name.mnicb_resource_name</i></p> <p>This service group is where the mnicb_resource resides.</p> <p>Type and dimension: string-scalar</p> <p>Example: orasg.gnic_n</p>
NetMask	<p>The netmask that is associated with the logical IP address.</p> <p>Type and dimension: string-scalar</p> <p>Example: 255.255.255.0</p>

Table 2-26 Optional attributes for Solaris

Optional attribute	Description
DeviceChoice	<p>Indicates the preferred NIC where you want to bring the logical IP address online. Specify the device name or NIC alias as determined in the Device attribute of the MultiNICB resource.</p> <p>Type and dimension: string-scalar</p> <p>Default: 0</p> <p>Examples: qfe0 and 1</p>
RouteOptions	<p>Specifies the routing options that are passed to the <code>route add</code> command when the agent configures an interface. The RouteOptions attribute value is generally formed like this: "<i>destination gateway metric</i>".</p> <p>For details about the <code>route</code> command, refer to the man page for your operating system.</p> <p>When the value of this string is null, the agent does not add routes.</p> <p>Type and dimension: string-scalar</p> <p>Example: "192.100.201.0 192.100.13.7"</p> <p>In this example, the agent executes the "<code>route add 192.100.201.0 192.100.13.7</code>" command when it configures an interface.</p>
IgnoreMultiNICBFailure	<p>Set this value to ignore a MultiNICB resource failure when all configured interfaces fail.</p> <p>A value of 1 for this attribute causes the IPMultiNICB agent to ignore the failure that its underlying MultiNICB resource detects.</p> <p>A value of 0 for this attribute causes the IPMultiNICB agent to detect network failure.</p> <p>When the value of this attribute is 1, the value for the MultiNICB LinkTestRatio attribute cannot be 0.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Note: The value of the `ToleranceLimit` static attribute is 1. A value of 1 avoids spurious agent faults in the Multipathing mode while Sun's `mpathd` daemon migrates the IP address from one interface to another.

Due to the change in the `ToleranceLimit` attribute, the value of the `MonitorInterval` static attribute is now 30 seconds. The 30-second value means that the agent tries to online the resource twice a minute. This value ensures that the overall fault detection time is still 60 seconds.

Manually migrating a logical IP address HP-UX and Solaris

Use the `haipswitch` command to migrate the logical IP address from one interface to another.

This command shows the status of the interfaces for the specified MultiNICB resource:

```
# haipswitch -s MultiNICB_resname
```

In the following example, the command checks that both the `from` and `to` interfaces are associated with the specified MultiNICB resource. The command also checks if the `to` interface works. If the interface does not work, the command aborts the operation. It then removes the IP address on the `from` logical interface and configures the IP address on the `to` logical interface. It finally erases any previous failover information that is created by MultiNICB for this logical IP address.

```
# haipswitch MultiNICB_resname IPMultiNICB_resname ip addr \  
netmask from to
```

Sample configurations

Refer to the sample configurations in the MultiNICB agent.

MultiNICB agent

The MultiNICB works with the IPMultiNICB agent. Allows IP addresses to fail over to multiple NICs on the same system before VCS One tries to fail over to another system. You can use the agent to make IP addresses on multiple-adapter systems highly available or to monitor them.

When you use the MultiNICB agent, you must configure the NICs before putting them under the agent's control. You must configure all the NICs in a single MultiNICB resource with the IP addresses that are in the same subnet.

HP-UX and Solaris: If multiple service groups have IPMultiNICB resources associated with the same MultiNICB resource, only one group should have the MultiNICB resource. The other groups can have a proxy resource pointing to it.

For the MultiNICB and IPMultiNICB agents, VCS One supports EtherChannel, Auto-port Aggregation (APA), and Sun trunking.

About the MultiNICB agent for HP-UX

The agent sends packets to other hosts on the network to monitor the interfaces that it controls. It then checks the link status of the interfaces.

If a NIC goes down, the MultiNICB agent notifies the IPMultiNICB agent. The IPMultiNICB agent fails over the virtual IP addresses to a different NIC on the same system. When the original NIC comes up, the agents fail back the virtual IP address.

Each NIC must have its own unique and exclusive base IP address, which the agent uses as the test IP address.

If multiple service groups have IPMultiNICB resources associated with the same MultiNICB resource, only one group should have the MultiNICB resource. The other groups can have a proxy resource pointing to it.

MultiNICB uses the following criteria to determine if an interface works:

- **Interface status:** The interface status as reported by the driver of the interface (assuming that the driver supports this feature). This test is skipped if the attribute `IgnoreLinkStatus = 1`.
- **ICMP echo:** ICMP echo request packets are sent to one of the network hosts (if specified). Otherwise, the agent uses ICMP broadcast and caches the sender of the first reply as a network host. While the agent sends and receives ICMP packets, the IP layer is completely bypassed.

The MultiNICB agent writes the status of each interface to an export information file, which other agents (like IPMultiNICB) or commands (like `haipswitch`) can read.

Failover and failback

During an interface failure, the MultiNICB agent fails over all logical IP addresses to a working interface under the same resource. The agent remembers the first physical interface from which an IP address was failed over. This physical interface becomes the “original” interface for the particular logical IP address. When the original interface is repaired, the logical IP address fails back to it.

Base and Multipathing modes for Solaris

You can use the MultiNICB agent in one of two modes. They are:

- Base mode
- Multipathing mode

See “[Solaris operating modes: Base and Multipathing](#)” on page 95.

Auto Port Aggregation (APA) support for HP-UX

HP APA aggregates multiple network interfaces so that they appear as a single interface. For example you can combine lan0 and lan1 and call the combined interface lan9000. You then use the NIC agent to monitor the lan9000 interface. You use the IP agent to configure and monitor an IP address on the lan9000 interface. Note that you use the lan9000 interface configured through APA for the Device attribute.

The IP and NIC agents support APA use with VCS One. APA is responsible for providing local adapter swapping, which is outside of VCS One control.

EtherChannel support for AIX

EtherChannel aggregates multiple network interfaces so that they appear as a single interface. For example you can combine en0 and en1 into an EtherChannel and call the combined interface en2. You then use the MultiNICB agent to monitor this en2 interface. You use the IPMultiNICB agent to configure and monitor an IPMultiNICB address on the en2 interface. Note that you use the en2 interface configured through EtherChannel for the Device attribute.

The IPMultiNICB and MultiNICB bundled agents support EtherChannel use with VCS One. EtherChannel is responsible for providing local adapter swapping, which is outside of VCS One control. EtherChannel Backup and active-active modes are supported.

The haping utility for AIX

Use the haping utility to test each NIC before you configure the MultiNICB resource. This utility takes the NIC interface as an argument. You can use the utility to perform a link test, a broadcast ping, or to ping a specific remote host. Symantec recommends that the administrator perform a test ping with the remote host before adding it to the NetworkHosts parameter. Some examples of the command syntax are as follows:

Link test only on interface en0:

```
haping -l en0
```

Ping a remote host 10.10.10.10 from interface en0:

```
haping -g 10.10.10.10 en0
```

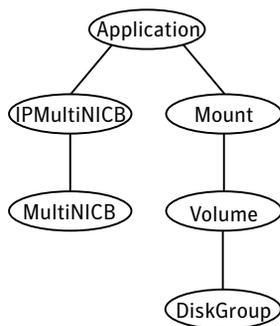
Platforms

AIX, HP-UX, and Solaris

Dependencies

No dependencies exist for the MultiNICB resource.

Figure 2-6 Sample service group that includes a MultiNICB resource



Agent functions

The value of the Operations attribute for this agent is None.

Monitor	Checks the status of each physical interface. Writes the status information to the export information file for IPMultiNICB resources to read it. HP-UX and Solaris: Performs a failover. Performs failback if the value of the Failback attribute is 1.
---------	--

State definitions

ONLINE	Indicates that one or more of the network interfaces listed in the Device attribute of the resource is in working condition.
UNKNOWN	Indicates that the MultiNICB resource is not configured correctly.
FAULTED	Indicates that all of the network interfaces listed in the Device attribute failed.

Attributes for AIX

Table 2-27 Required attributes for AIX

Required attribute	Description
Device	<p>Lists the interfaces that you want the agent to monitor. You can assign a unique test IP address to each interface.</p> <p>Use the AIX SMIT configuration tool to configure the test IP addresses and to make them persistent across reboots.</p> <p>Note: You also must manually configure the default IP route on each NIC in the MultiNICB resource.</p> <p>When you use the IPv6 protocol, you must configure the value for this attribute with base IPv6 addresses. You need to also configure the corresponding IPMultiNICB agent's PrefixLen attribute.</p> <p>Type and dimension: string-association</p> <p>Example: en1=10.182.9.34, en2=10.182.10.34</p>
Gateway	<p>IP address for the default gateway on the local network.</p> <p>Type and dimension: string-scalar</p> <p>Example: 136.22.1.1</p>

Table 2-28 Optional attributes for AIX

Optional attribute	Description
LinkTestRatio	<p>Controls the frequency of the ping test in relation to the link test. The ping test may be run at a lesser frequency to reduce network traffic.</p> <p>If this attribute is set to 1, packets are sent during every monitor cycle.</p> <p>If this attribute is set to 0, packets are never sent during a monitor cycle. Symantec does not recommend setting the value to zero.</p> <p>The agent determines link status without transmitting any ping packets. For other values greater than 1, packets are sent at a lower frequency.</p> <p>For example, if LinkTestRatio=2, then ping packets are sent out during every other monitor cycle. In other words, packets are sent out half as often than if LinkTestRatio were equal to one.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
NetworkHosts	<p>The NetworkHosts attribute is a list of hosts on the local network that are pinged to determine if the network connection is available. These must be IP addresses, and not host names.</p> <p>If you do not specify this attribute, the agent monitors the NIC by pinging the broadcast address on the NIC. If you specify one or more network hosts, and at least one host responds to a ping, the agent reports the MultiNICB resource online. The IP addresses for the NetworkHosts attribute must be on the same subnet as the other IP addresses for the MultiNICB resource.</p> <p>Type and dimension: string-vector</p> <p>Default: 0.0.0.0</p> <p>Example: 10.128.8.10, 10.128.8.45</p>

Table 2-28 Optional attributes for AIX

Optional attribute	Description
NoBroadcast	<p>If the value of this attribute is 1, NoBroadcast prevents the agent from sending broadcast pings. ARP requests may still be generated.</p> <p>Note: If no NetworkHosts are specified and NoBroadcast is set to 1, the agent cannot function properly. Symantec does not recommend setting NoBroadcast to 1.</p> <p>Type and dimension: integer-scalar Default: 0</p>
OfflineTestRepeatCount	<p>Number of times the test is repeated if the interface status changes from up to down. For every repetition of the test, the next NetworkHosts attribute is selected in round-robin manner. At the end of this process, broadcast is performed if NoBroadcast is set to 0. A greater value prevents spurious changes, but increases the response time.</p> <p>Type and dimension: integer-scalar Default: 3</p>
OnlineTestRepeatCount	<p>The number of times that the test is repeated if the interface changes from down to up. This test helps to prevent oscillations in the status of the interface.</p> <p>Type and dimension: integer-scalar Default: 3</p>
NetworkTimeout	<p>Timeout for ARP and ICMP packets in milliseconds. MultiNICB waits for the response to ICMP and ARP packets only during this time period.</p> <p>Assign the NetworkTimeout a value in the order of tens of milliseconds, given that the ICMP and ARP destinations must be on the local network. Increasing this value increases the time for failover.</p> <p>Type and dimension: integer-scalar Default: 100</p>

Attributes for HP-UX

Table 2-29 Required attribute for HP-UX

Required attribute	Description
Device	<p>List of NICs that you want under MultiNICB control, and the aliases of those NICs. The IPMultiNICB agent uses the NIC aliases to configure IP addresses. The IPMultiNICB agent uses these interface aliases to determine the order of the interface on which to bring the IP addresses online.</p> <p>Type and dimension: string-association</p> <p>Example:</p> <p>Device = lan0, lan1</p> <p>Example:</p> <p>Device = lan0 = 0, lan1 = 2, lan2 = 3</p> <p>In this example, the MultiNICB agent uses interfaces lan0, lan1, and lan2. The MultiNICB agent passes on the associated interface aliases 0, 2, and 3 to the IPMultiNICB agent.</p>

Table 2-30 Optional attributes for HP-UX

Optional attribute	Description
DefaultRouter	<p>This attribute is the IP address of the default router on the subnet. If you specify this attribute, the agent removes the default route when the resource goes offline. The agent adds the route back when the group returns online. You must specify this attribute if multiple IP subnets exist on one host. If you do not specify the value, the packets cannot be routed properly when the subnet corresponding to the first default route goes down.</p> <p>Type and dimension: string-scalar</p> <p>Default: 0.0.0.0</p> <p>Example: 192.1.0.1</p>

Table 2-30 Optional attributes for HP-UX

Optional attribute	Description
Failback	<p>If the value of the attribute is 1, the virtual IP addresses are failed back to the original physical interface whenever possible. A value of 0 disables this behavior.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
IgnoreLinkStatus	<p>If the value of the attribute is 1, the agent ignores the driver-reported interface status while testing the interfaces. If the value of the attribute is 0, the agent reports the interface status as down if the driver-reported interface status indicates the down state. Using interface status for link testing may considerably speed up failovers.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>
LinkTestRatio	<p>This attribute is the ratio of total monitor cycles to monitor cycles in which the agent tests the interfaces by sending packets. At all other times, the agent tests the link by checking the "link-status" as reported by the device driver. Checking the "link-status" is a faster way to check the interfaces, but only detects cable disconnection failures.</p> <p>If the value of the attribute is 1, packets are sent during every monitor cycle.</p> <p>If the value of the attribute is 0, packets are never sent during a monitor cycle.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p> <p>Example: 3</p> <p>In this example, if the monitor agent function invokes in a numbered pattern such as 1, 2, 3, 4, 5, 6, ..., the actual packet send test is done at 3, 6, ... monitor agent functions. For LinkTestRatio=4, the packet send test is done at 4, 8, ... monitor agent functions.</p>

Table 2-30 Optional attributes for HP-UX

Optional attribute	Description
NetworkHosts	<p>List of host IP addresses on the IP subnet that are pinged to determine if the interfaces work. NetworkHosts only accepts IP addresses to avoid DNS lookup delays. The IP addresses must be directly present on the IP subnet of interfaces (the hosts must respond to ARP requests).</p> <p>If IP addresses are not provided, the hosts are automatically determined by sending a broadcast ping (unless the NoBroadcast attribute is set to 1). The first host to reply serves as the ping destination.</p> <p>Type and dimension: string-vector</p> <p>Example: 192.1.0.1</p>
NetworkTimeout	<p>Timeout for ARP and ICMP packets in milliseconds. MultiNICB waits for response to ICMP and ARP packets only during this time period.</p> <p>Assign NetworkTimeout a value in the order of tens of milliseconds (given the ICMP and ARP destinations are required to be on the local network). Increasing this value increases the time for failover.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 100</p>
NoBroadcast	<p>If the value of the attribute is 1, NoBroadcast prevents MultiNICB from sending broadcast ICMP packets. (Note: MultiNICB can still send ARP requests.)</p> <p>If NetworkHosts are not specified and NoBroadcast is set to 1, the MultiNICB agent cannot function properly.</p> <p>Note: Symantec does not recommend setting the value of NoBroadcast to 1.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 2-30 Optional attributes for HP-UX

Optional attribute	Description
OfflineTestRepeatCount	<p>Number of times the test is repeated if the interface status changes from UP to DOWN. For every repetition of the test, the next NetworkHost is selected in round-robin manner. At the end of this process, broadcast is performed if NoBroadcast is set to 0. A greater value prevents spurious changes, but also increases the response time.</p> <p>Type and dimension: integer-scalar Default: 3</p>
OnlineTestRepeatCount	<p>Number of times the test is repeated if the interface status changes from DOWN to UP. This test helps to avoid oscillations in the status of the interface.</p> <p>Type and dimension: integer-scalar Default: 3</p>

Attributes for Solaris

Table 2-31 Required attributes for Solaris

Required attribute	Description
Device	<p>List of NICs that you want under MultiNICB control.</p> <p>For IPv4, you must manually configure the test IP addresses on each NIC. This address must be the base IP address (the first address) on that NIC.</p> <p>Type and dimension: string-association Examples: Device = qfe0 , qfe4</p>

Optional attributes for Base and Mpathd modes for Solaris

Table 2-32 Optional attributes for Base and Mpathd modes for Solaris

Optional attribute	Description
DefaultRouter	<p>This attribute is the IP address of the default router on the subnet. If you specify this value, the agent removes the default route when the resource goes offline. The agent adds the route back when the group returns online.</p> <p>You must specify this attribute if multiple IP subnets exist on one host. If you do not specify the value, the packets cannot be routed properly when the subnet corresponding to the first default route goes down.</p> <p>Type and dimension: string-scalar Default: 0.0.0.0 Example: 192.1.0.1</p>
GroupName	<p>The GroupName attribute is the name of the IPMP group that you want to assign to the interfaces under the control of the agent. The name's length should not exceed 31 bytes.</p> <p>Type and dimension: string-scalar Example: IPMPgrp1</p>
MpathdCommand	<p>This value is the path to the mpathd executable. Use MpathdCommand to kill or restart mpathd. See the UseMpathd attribute for details.</p> <p>Type and dimension: string-scalar Default: /usr/lib/inet/in.mpathd</p>

Table 2-32 Optional attributes for Base and Mpathd modes for Solaris

Optional attribute	Description
UseMpathd	<p>The legal values for this attribute are 0 and 1. All the MultiNICB resources on one system must have the same value for this attribute. See “Solaris operating modes: Base and Multipathing” on page 95.</p> <p>If the value of the attribute is 0, in.mpathd is automatically killed on that system. For more information about mpathd, refer to the Sun documentation.</p> <p>If the value of the attribute is 1, MultiNICB assumes that mpathd (in.mpathd) is running. This value restarts mpathd if it is not running already.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Optional attributes for Base mode for Solaris

Table 2-33 Optional attributes for Base mode for Solaris

Optional attribute	Description
Failback	<p>If the value of the attribute is 1, the virtual IP addresses are failed back to the original physical interface whenever possible. A value of 0 disables this behavior.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 2-33 Optional attributes for Base mode for Solaris

Optional attribute	Description
IgnoreLinkStatus	<p>If the value of the attribute is 1, the agent ignores the driver-reported interface status while testing the interfaces. If the value of the attribute is 0, the agent reports the interface status as DOWN if the driver-reported interface status indicates the DOWN state. Using interface status for link testing may considerably speed up failovers.</p> <p>When you use trunked interfaces, you must set the value of this attribute to 1. Otherwise set it to 0.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>
LinkTestRatio	<p>This attribute is the ratio of total monitor cycles to monitor cycles in which the agent tests the interfaces by sending packets. At all other times, the agent tests the link by checking the "link-status" as reported by the device driver. Checking the "link-status" is a faster way to check the interfaces, but only detects cable disconnection failures.</p> <p>If the value of the attribute is 1, packets are sent during every monitor cycle.</p> <p>If the value of the attribute is 0, packets are never sent during a monitor cycle.</p> <p>Do not set the value of this attribute to 0 when its corresponding IPMultiNICB resource's IgnoreMultiNICBFailure attribute has a value of 1.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p> <p>Example: 3</p> <p>In this example, if monitor entry-point invoking is numbered as 1, 2, 3, 4, 5, 6, ..., the actual packet send test is done at 3, 6, etc. monitor agent functions. For LinkTestRatio=4, the packet send test is done at 4, 8, etc., monitor agent functions.</p>

Table 2-33 Optional attributes for Base mode for Solaris

Optional attribute	Description
NetworkHosts	<p>List of host IP addresses on the IP subnet that are pinged to determine if the interfaces work. NetworkHosts only accepts IP addresses to avoid DNS lookup delays. The IP addresses must be directly present on the IP subnet of interfaces (the hosts must respond to ARP requests).</p> <p>If IP addresses are not provided, the hosts are automatically determined by sending a broadcast ping (unless the NoBroadcast attribute is set to 1). The first host to reply serves as the ping destination.</p> <p>Type and dimension: string-vector</p> <p>Example: 192.1.0.1</p>
NetworkTimeout	<p>Timeout for ARP and ICMP packets in milliseconds. MultiNICB waits for response to ICMP and ARP packets only during this time period.</p> <p>Assign NetworkTimeout a value in the order of tens of milliseconds (given the ICMP and ARP destinations are required to be on the local network). Increasing this value increases the time for failover.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 100</p>
NoBroadcast	<p>If the value of the attribute is 1, NoBroadcast prevents MultiNICB from sending broadcast ICMP packets. Note that MultiNICB can still send ARP requests.</p> <p>If NetworkHosts are not specified and NoBroadcast is set to 1, the MultiNICB agent cannot function properly.</p> <p>Note: Symantec does not recommend setting the value of NoBroadcast to 1.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 2-33 Optional attributes for Base mode for Solaris

Optional attribute	Description
OfflineTestRepeatCount	<p>Number of times the test is repeated if the interface status changes from UP to DOWN. For every repetition of the test, the next NetworkHost is selected in round-robin manner. At the end of this process, broadcast is performed if NoBroadcast is set to 0. A greater value prevents spurious changes, but also increases the response time.</p> <p>Type and dimension: integer-scalar Default: 3</p>
OnlineTestRepeatCount	<p>Number of times the test is repeated if the interface status changes from DOWN to UP. This test helps to avoid oscillations in the status of the interface.</p> <p>Type and dimension: integer-scalar Default: 3</p>

Optional attributes for Multipathing mode for Solaris

Table 2-34 Optional attributes for Multipathing mode for Solaris

Optional attribute	Description
ConfigCheck	<p>If the value of the attribute is 1, the MultiNICB agent checks for:</p> <ul style="list-style-type: none"> ■ All specified physical interfaces are in the same IP subnet and group, and have "DEPRECATED" and "NOFAILOVER" flags set on them. ■ No other physical interface has the same subnet as the specified interfaces. <p>Valid values for this attribute are 0 and 1.</p> <p>Type and dimension: integer-scalar Default: 1</p>

Table 2-34 Optional attributes for Multipathing mode for Solaris

Optional attribute	Description
MpathdRestart	<p>If the value of the attribute is 1, MultiNICB tries to restart mpathd.</p> <p>Valid values for this attribute are 0 and 1.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>

Solaris operating modes: Base and Multipathing

The MultiNICB agent has two modes of operation, Base and Multipathing, which you can set with the UseMpathd attribute.

Base mode

The value of the UseMpathd attribute is 0 by default for this mode. In Base mode, to monitor the interfaces that it controls, the agent:

- sends the packets to other hosts on the network for probe-based detection
- tests the link status of the interfaces for link-based detection

The agent logs link failures and failovers when it uses either link- or probe-based detection.

If a NIC goes down, the MultiNICB agent notifies the IPMultiNICB agent. The IPMultiNICB agent fails over the virtual IP addresses to a different NIC on the same system. When the original NIC comes up, the agents fail back the virtual IP address.

Each NIC must have its own unique and exclusive base IP address, which the MultiNICB agent uses as the test IP address.

The MultiNICB agent, in Base mode, uses the following criteria to determine if an interface works:

- Link-based detection of the interface status

The interface driver reports the status of the link. Note that not all drivers support this feature. Set the value of IgnoreLinkStatus to 1 to disable this test.
- Probe-based detection using Internet Control Message Protocol (ICMP) echo

Set the LinkTestRatio attribute to a value greater than 0 to send ICMP echo request packets to a specified network host. You specify the network hosts in the NetworkHosts attribute. You must assign test IP addresses to the interface for probe-based detection. The test IP address is needed to send

the ICMP packets, which determines the link's status. If you set the value of the `LinkTestRatio` attribute to 0, you do not need to assign test IP addresses. If you specify no hosts in the `NetworkHosts` attribute, the agent uses the ICMP broadcast when the value of the `NoBroadcast` attribute is 0. It caches the sender of the first reply for future use as a network host. While the agent sends and receives ICMP packets, the IP layer is completely bypassed.

You can assign addresses and still do only link-based detection by setting the values of the `LinkTestRatio` and `IgnoreLinkStatus` attributes to 0. You can skip link-based detection (link driver tests) and only do ICMP tests if:

- the value of the `IgnoreLinkStatus` attribute is 1, and
- the value of the `LimitTestRation` attribute is greater than 0, and
- the test IP addresses are assigned to the interface

The MultiNICB agent performs both link-based detection and probe-based detection if:

- the value of the `LinkTestRatio` attribute is greater than 0, and
- the value of the `IgnoreLinkStatus` attribute is 0, and
- the test IP addresses are assigned to the interface

The MultiNICB agent writes the status of each interface to an export information file, which other agents (like `IPMultiNICB`) or commands (like `haipswitch`) can read.

Failover and fallback

During an interface failure, the MultiNICB agent fails over all logical IP addresses to a working interface under the same resource. The agent remembers the first physical interface from which an IP address was failed over. This physical interface becomes the “original” interface for the particular logical IP address. When the original interface is repaired, the logical IP address fails back to it.

Multipathing mode

To activate this mode set the value of the `UseMpathd` attribute to 1. The MultiNICB agent, in Multipathing mode, monitors Sun’s IP Multipathing daemon (`mpathd`). The MultiNICB agent specifically monitors the `FAILED` flag on physical interfaces and the `mpathd` process. See the man page: `in.mpathd (1M)` for more information on this daemon.

Sun’s `mpathd` daemon monitors the interfaces that are part of the IPMP group. The daemon:

- sends the packets to other hosts on the network for probe-based detection as long as a test IP address is assigned to the network interface

- checks the link status of the interfaces for link-based detection as long as the interface supports the test for detection

The mpathd daemon can perform both link- and probe-based detection when test IP addresses are assigned to NIC interfaces.

The MultiNICB agent logs errors when the daemon is not running, or if a configuration path error exits. The mpathd daemon logs link failures and IP address failovers in the system log.

Adding and removing a NIC from MultiNICB's device list

If you want to add or remove a NIC from MultiNICB's device list, perform the following actions:

To delete a NIC

- 1 Use the `haipswitch` command to move all the IP addresses from the NIC device that you want to delete to another NIC in the MultiNICB's device list.
- 2 Delete the NIC from MultiNICB's device list. Remove the NIC from the Device attribute for the agent.

To add a NIC

- 1 Set the NIC's IP address, netmask, broadcast address, and groupname values to configure the NIC device.
- 2 Add the NIC to the MultiNICB's device list. Add the NIC to the Device attribute for the agent.

Sample configurations

Interface configuration for Solaris

Set the EPROM variable to assign unique MAC addresses to all ethernet interfaces on the host:

```
# eeprom local-mac-address?=true
```

Reboot the system after setting the eeprom variable to complete the address setup. The base IP addresses must be configured on the interfaces before the MultiNICB agent controls the interfaces. You can configure these addresses at system start up using `/etc/hostname.XXX` initialization files. Refer to the following examples for more information.

Setting up test IP addresses for Base Mode on Solaris

These examples demonstrate setting up test IP addresses for your clustered systems. These IP addresses allow the agent determine if the NIC works. The

agent determines that the NIC works if it receives responses for the ping packets that it sends to other nodes on the network. You do *not* need to perform the following steps for the floating IP addresses. The agent performs these steps.

In the file `/etc/hostname.qfe0`, add the following two lines:

```
north-qfe0 netmask + broadcast + deprecated -failover up \  
    addif north netmask + broadcast + up
```

Where `north-qfe0` is the test IP address that the agent uses to determine the state of the `qfe0` network card.

In the file `/etc/hostname.qfe4`, add the following line:

```
north-qfe4 netmask + broadcast + deprecated -failover up
```

Where `north-qfe4` is the test IP address that the agent uses to determine the state of the `qfe4` network card.

In the example, `north-qfe0` and `north-qfe4` are the host names that correspond to test IP addresses. `north` is the host name that corresponds to the test IP address.

IPMultiNICB and MultiNICB configuration for AIX

```
<resources>  
  <resource name="mnb_res1" type="MultiNICB">  
    <attribute name="Device" context = "sysA">  
      <val key="en1">11.123.148.47</val>  
      <val key="en2">11.123.148.48</val>  
    </attribute>  
    <attribute name="Device" context = "sysB">  
      <val key="en1">11.123.148.49</val>  
      <val key="en2">11.123.148.50</val>  
    </attribute>  
    <attribute name="Gateway"><scalar>11.123.144.1</scalar>  
  </attribute>  
</resource>  
  <resource name="ipmb_res1" type="IPMultiNICB">  
    <attribute name="Address"><scalar>11.123.148.51</scalar>  
  </attribute>  
    <attribute name="MultiNICBResName"><scalar>  
VR_Group.mnb_res1</scalar></attribute>  
    <attribute name="NetMask"><scalar>255.255.252.0  
</scalar></attribute>  
</resource>  
  <link parent="ipmb_res1" child="mnb_res1"/>  
</resources>
```

IPMultiNICB and MultiNICB configuration for HP-UX

The following is an example IPMultiNICB and MultiNICB configuration for HP-UX.

```
<resources>  
  <resource name="mnicb" type="MultiNICB">
```

```

    <attribute name="Device">
      <val key="lan1">"0"</val>
      <val key="lan0">"1"</val>
    </attribute>
    <attribute name="NetworkHosts">
      <val>"1.1.1.1"</val>
    </attribute>
  </resource>
  <resource name="ipmnicb" type="IPMultiNICB">
    <attribute name="Address"><scalar>"1.1.1.4"</scalar>
    </attribute>
    <attribute name="BaseResName"><scalar>"mygrp1.mnicb"
    </scalar></attribute>
    <attribute name="NetMask"><scalar>"255.255.255.0"
    </scalar></attribute>
  </resource>
  <link parent="ipmnicb" child="mnicb"/>

  <resource name="ipmnicb1" type="IPMultiNICB">
    <attribute name="Address"><scalar>"1.1.1.5"</scalar>
    </attribute>
    <attribute name="BaseResName"><scalar>"mygrp1.mnicb"
    </scalar></attribute>
    <attribute name="NetMask"><scalar>"0xFFFFFFFF00"</scalar>
    </attribute>
  </resource>
  <link parent="ipmnicb1" child="mnicb"/>
</resources>

```

IPMultiNICB and MultiNICB configuration for Solaris

```

<resources>
  <resource name="mnb_res1" type="MultiNICB">
    <attribute name="Device" context = "sysA">
      <val key="bge1"></val>
      <val key="bge2"></val>
    </attribute>
    <attribute name="Device" context = "sysB">
      <val key="bge1"></val>
      <val key="bge2"></val>
    </attribute>
  </resource>
  <resource name="ipmb_res1" type="IPMultiNICB">
    <attribute name="Address"><scalar>11.123.15.72</scalar>
    </attribute>
    <attribute name="BaseResName"><scalar>VR_Group.mnb_res1
    </scalar></attribute>
  </resource>
  <link parent="ipmb_res1" child="mnb_res1"/>
</resources>

```

DNS agent

The DNS agent updates and monitors the mapping for the following:

- The host name to IP address (A or PTR record)
- The canonical name (CNAME)

The agent performs these tasks for a DNS zone when failing over nodes across subnets (a wide-area failover). Resource records (RR) can include different types: A, CNAME, NS (name server), SOA, and PTR records.

Use the DNS agent when the failover source and target nodes are on different subnets. The agent updates the name server and allows clients to connect to the failed over instance of the application service.

For important information about this agent, refer to:

[“DNS agent notes”](#) on page 107

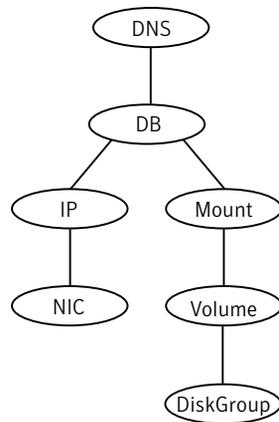
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the DNS resource.

Figure 2-7 Sample service group that includes a DNS resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	<p>Sends a DNS query to retrieve the Start of Authority (SOA) record of the zone that the Domain agent attribute defines. The master server's name is in the SOA field. Unless you define the StealthMasters attribute, it is the only server for the update. When you define the StealthMasters attribute, only the servers that the attribute defines are updated.</p> <p>The agent creates PTR records for each RR of type A if the value of the CreatePTR attribute is true. A prerequisite for this feature is that the same master or stealth servers serve the forward (A) and reverse zones.</p>
Offline	<p>Removes the Online lock file.</p> <p>If attribute OffDelRR is true, offline removes all records that the ResRecord keys define.</p>
Monitor	<p>Returns the ONLINE state if at least one name server reports all mappings that ResRecord defines. The name servers are the master or StealthMaster, and all the servers for which an NS record for the zone exists.</p>
Clean	<p>Removes the Online lock file, if it exists.</p>
Open	<p>Removes the Online lock file if the resource is reported online on another node inside the cluster to prevent concurrency violation. If the lock file exists, at least one name server has to report all the records that the ResRecord attributes define. If one name server cannot report all the records, the agent function removes the Online lock file.</p>
Action	<p>Different action agent functions follow:</p> <ul style="list-style-type: none">■ keyfile.vfd This action entry point checks if the key file as specified in the TSIGKeyFile attribute exists either locally or on shared storage.■ dig.vfd This action entry point checks if dig and nsupdate binaries exist and are executable.■ master.vfd This action entry point checks if stealth masters are pingable from the node.

State definitions

ONLINE	<p>Online lock file exists and servers returning all configured resource records.</p>
--------	---

OFFLINE	Indicates an offline state when either of the following is true: <ul style="list-style-type: none">■ The online lock does not exist.■ At least one server cannot report all of the RRs' mappings.
UNKNOWN	A problem exists with the configuration. Can indicate that the resource record list contains an invalid value as a part of the record key or a record value of the ResRecord attribute.

Attributes

Table 2-35 Required attributes

Required attribute	Description
Domain	<p>A string representing the DNS zone that the agent administers. The domain name can only contain alphanumeric symbols and the dash.</p> <p>Type and dimension: string-scalar</p> <p>Example:</p> <ul style="list-style-type: none">■ Forward mapping demo.example.com■ IPv4 reverse mapping 2.168.192.in-addr.arpa

Table 2-35 Required attributes

Required attribute	Description
ResRecord	<p>ResRecord is an association of DNS resource record values. Each ResRecord attribute consists of two values: <i>DNS record key</i> = <i>DNS record data</i>. Note that the record key must be a unique value.</p> <p>If the resource record list contains any invalid value as a part of the record key or a record value of the ResRecord attribute, the resource enters an UNKNOWN state.</p> <p>Type and dimension: association-scalar</p> <p>Examples:</p> <ul style="list-style-type: none"> ■ For forward mapping, where the zone is demo.example.com: <ul style="list-style-type: none"> - sles901 = "192.168.2.191" - ww2 = sles901 ■ A multi-home DNS record, typically for one host with two network interfaces, different address, but the same DNS name. This results in two-A records, or a single A record with continuation lines. <ul style="list-style-type: none"> sle902 = "192.168.2.102 10.87.13.22" ■ For reverse IPv4 address mapping, where the zone is 2.168.192.in-addr.arpa: <ul style="list-style-type: none"> 191 = "sles901.demo.example.com" <p>Use only partial host names. If you use a fully qualified domain name, append a period "." at the end of the name.</p> <p>For CNAME records, use:</p> <ul style="list-style-type: none"> ■ ResRecord = { www = mydesktop } or ■ ResRecord = { www = "mydesktop.marketing.example.com." } <p>Where the Domain attribute is "marketing.example.com"</p>

Table 2-36 Required attributes

Required attribute	Description
ResRecord (cont.)	<p>The agent uses case-insensitive pattern matching—and a combination of the Domain and ResRecord attribute values—to determine the resource record type. The RR type is as follows:</p> <ul style="list-style-type: none">■ PTR: if the Domain attribute ends with .arpa■ A: if the record data field is four sets of numbers, where a space separates each set. The following details the pattern it tries to match: [1-223].[0-255].[0-255].[0-255] Hexadecimal is not supported.■ CNAME: for any other valid record data. <p>Note: If a name in the ResRecord attribute does not comply with RFC 1035, then a warning is issued to the log file. The ResRecord association is not used.</p>

Table 2-37 Optional attributes

Optional attribute	Description
TTL	<p>A non-zero integer represents the “Time To Live” value, in seconds, for the DNS entries in the zone that you want to update.</p> <p>A lower value means more hits on your DNS server, while a higher value means more time for your clients to learn about changes.</p> <p>The time-in-seconds value may take the value 0, which indicates never caching the record, to a maximum of 2,147,483,647, which is over 68 years! The current best practice recommendation (RFC 1912) proposes a value greater than one day, and on RRs that do not change often, consider multi-week values.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 86400</p> <p>Example: 3600</p>

Table 2-37 Optional attributes

Optional attribute	Description
StealthMasters	<p>The list of primary master name servers in the domain.</p> <p>This attribute is optional since the first name server is retrieved from the zone's SOA (Start of Authority) record.</p> <p>If the primary master name server is a stealth server, define this attribute. A stealth server is a name server that is authoritative for a zone, but does not appear in that zone's SOA record. It is hidden to prevent direct attacks from the Internet.</p> <p>Type and dimension: string-keylist</p> <p>Example: 10.190.112.23</p>
TSIGKeyFile	<p>Required when you configure DNS for secure updates. Specifies the absolute path to the file containing the private TSIG (Transaction Signature) key.</p> <p>Type and dimension: string-scalar</p> <p>Example:</p> <p><code>/var/tsig/example.com.+157+00000.private</code></p>
CreatePTR	<p>Use the CreatePTR attribute to direct the online agent function to create PTR records for each RR of type A. You must set the value of this attribute to true (1) to create the records. Before you can use this attribute, the same master or stealth servers must serve the forward (A) and reverse zones.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p> <p>Example: 1</p>
OffDelRR	<p>Use the OffDelRR attribute to direct the offline agent function to remove all records that the ResRecord key defines. You must set the value of this attribute to true (1) to have the agent remove all the records.</p> <p>The online agent function always adds records if they do not exist.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p> <p>Example: 1</p>

DNS agent notes

The DNS agent has the following notes:

- “[Monitor scenarios](#)” on page 107
- “[Sample Web server configuration](#)” on page 107
- “[Secure DNS update](#)” on page 107
- “[Setting up secure updates using TSIG keys for BIND 9](#)” on page 108

Monitor scenarios

Depending on the existence of the Online lock file and the defined Resource Records (RR), you get different status messages from the Monitor function.

Table 2-38 Monitor scenarios for the Online lock file

Online lock file exists	Expected RR mapping	Monitor returns
NO	N/A	OFFLINE
YES	NO	OFFLINE
YES	YES	ONLINE

Sample Web server configuration

Take the former Veritas corporate web server as an example. A browser requests the URL <http://www.example.com> that maps to the canonical name location1.example.com. The browser retrieves the IP address for the web server by querying a domain name server. If the web server fails over from location one to location two (location2.example.com), the domain name servers need a new canonical name mapping for www.example.com. The www.example.com alias is now updated to point to the canonical name of the standby system in location two.

Secure DNS update

The DNS agent expects that the zone’s allow-update field contains the IP address for the hosts that can dynamically update the DNS records. This functionality is default for the DNS agent. Since a competent black hat can, however, spoof IP addresses, consider TSIG as an alternative.

TSIG (Transaction Signature) as specified in RFC 2845 is a shared key message authentication mechanism that is available in DNS. A TSIG key provides the means to authenticate and verify the validity of exchanged DNS data. It uses a

shared secret key between a resolver and either one or two servers to provide security.

Setting up secure updates using TSIG keys for BIND 9

In the following example, the domain is example.com.

To use secure updates using TSIG keys

- 1 Run the `dnssec-keygen` command with the HMAC-MD5 option to generate a pair of files that contain the TSIG key:

```
# dnssec-keygen -a HMAC-MD5 -b 128 -n ZONE veritas.com.
```

- 2 Open the `example.com.+157+00000.key` file. After you run the `cat` command, the contents of the file resembles:

```
# cat example.com.+157+00000.key
example.com. IN KEY 512 3 157 +Cdjlkef9ZTSeixERZ433Q==
```

- 3 Copy the shared secret (the TSIG key), which looks like:

```
+Cdjlkef9ZTSeixERZ433Q==
```

- 4 Configure the DNS server to only allow TSIG updates using the generated key. Open the `named.conf` file and add these lines.

```
key example.com. {
    algorithm hmac-md5;
    secret "+Cdjlkef9ZTSeixERZ433Q==";
};
```

Where `+Cdjlkef9ZTSeixERZ433Q==` is the key.

- 5 In the `named.conf` file, edit the appropriate zone section and add the `allow-update` sub-statement to reference the key:

```
allow-update { key example.com. ; } ;
```

- 6 Save and restart the `named` process.

- 7 Place the files containing the keys on each of the nodes that is listed in your group's `SystemList`. The DNS agent uses this key to update the name server. Copy both the private and public key files on to the node. A good location is in the `/var/tsig/` directory.

- 8 Set the `TSIGKeyFile` attribute for the DNS resource to specify the file containing the private key.

```
DNS www (
Domain = "example.com"
ResRecord = {www = north}
TSIGKeyFile = "/var/tsig/example.com.+157+00000.private"
)
```

Service and application agents

This chapter contains:

- [“About the service and application agents”](#) on page 109
- [“Apache Web server agent”](#) on page 110
- [“Application agent”](#) on page 119
- [“Process agent”](#) on page 136
- [“ProcessOnOnly agent”](#) on page 144

About the service and application agents

Use service and application agents to provide high availability for application and process-related resources.

Apache Web server agent

The Apache Web server agent brings an Apache Server online, takes it offline, and monitors its processes. The Apache Web server agent consists of resource type declarations and agent scripts. You use the Apache Web server agent, in conjunction with other agents, to make an Apache Web server highly available.

This agent supports the Apache HTTP server 1.3, 2.0, and 2.2. It also supports the IBM HTTP Server 1.3 and 2.0.

This agent can detect when an Apache Web server is brought down gracefully by an administrator. When Apache is brought down gracefully, the agent does not trigger a resource fault even though Apache is down.

Note: The Apache agent requires an IP resource for operation.

For more information regarding this agent:

See [“Apache Web server notes”](#) on page 115.

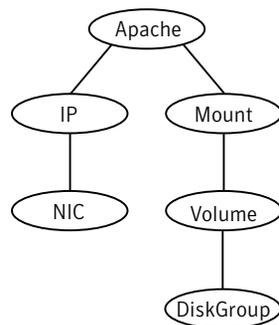
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

This type of resource depends on IP and Mount resources.

Figure 3-1 Sample service group for the Apache Web server agent



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Starts an Apache server by executing the httpdDir/httpd program with the appropriate arguments. When you specify a file with the EnvFile attribute, the file is sourced before the agent executes the httpd command.
Offline	<p>To stop the Apache HTTP server, the agent:</p> <ul style="list-style-type: none">■ Executes the httpdDir/httpd program with the appropriate arguments (Apache v2.0), or■ Sends a TERM signal to the HTTP Server parent process (Apache v1.3). <p>When you specify a file with the EnvFile attribute, the file is sourced before the agent executes the httpd command.</p>
Monitor	Monitors the state of the Apache server. First it checks for the processes, next it can perform an optional state check.
Clean	Removes the Apache HTTP server system resources that might remain after a server fault or after an unsuccessful attempt to online or offline. These resources include the parent httpd daemon and its child daemons.
Action	<p>checkconffile.vfd</p> <p>Checks for the existence of the Apache configuration file and the existence of the directory that contains the httpd binary that is used during start up. For a local installation, if the config file or HttpdDir is not found, make sure that it exists on the failover node.</p>

State definitions

ONLINE	Indicates that the Apache server is running.
OFFLINE	Indicates that the Apache server is not running.
UNKNOWN	Indicates that a problem exists with the configuration.

Attributes

Table 3-1 Required attributes

Required attribute	Description
ConfigFile	<p>Full path and file name of the main configuration file for the Apache server.</p> <p>Type and dimension: string-scalar</p> <p>Example: /apache/server1/conf/httpd.conf</p>
httpdDir	<p>Full path of the directory to the httpd binary file</p> <p>Type and dimension: string-scalar</p> <p>Example: /apache/server1/bin</p>
SecondLevelMonitor	<p>Enables second-level monitoring for the resource. Second-level monitoring is a deeper, more thorough state check of the Apache HTTP server. Valid attribute values are 1 (true) and 0 (false). Specifying this attribute is required.</p> <p>For information on using the ab utility to enable this functionality on SLES 10, see “Using the SecondLevelMonitor” on page 117.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p> <p>Example: 1</p>
ResLogLevel	<p>Controls the agent’s logging detail for a specific instance of a resource. Values are:</p> <ul style="list-style-type: none"> ■ ERROR: Logs error messages. ■ WARN: Logs error and warning messages. ■ INFO: Logs error, warning, and informational messages. ■ TRACE: Logs error, warning, informational, and trace messages. Trace logging is verbose. Use for initial configuration or troubleshooting. <p>Type and dimension: string-scalar</p> <p>Default: INFO</p> <p>Example: TRACE</p>

Table 3-2 Optional attributes

Optional attribute	Description
DirectiveAfter	<p>A list of directives that httpd processes after reading the configuration file.</p> <p>Type and dimension: string-association</p> <p>Example: KeepAlive=On</p>
DirectiveBefore	<p>A list of directives that httpd processes before it reads the configuration file.</p> <p>Type and dimension: string-association</p> <p>Example: User=nobody, Group=nobody</p>
User	<p>Account name the agent uses to execute the httpd program. If you do not specify this value, the agent executes httpd as the root user.</p> <p>Type and dimension: string-scalar</p> <p>Example: apache1</p>
EnableSSL	<p>Set to 1 (true) to have the online agent function add support for SSL by including the option <code>-DSSL</code> in the start command. For example: <code>/usr/sbin/httpd -f path_to_httpd.conf -k start -DSSL</code></p> <p>Where <code>path_to_httpd.conf</code> file is the path to the <code>httpd.conf</code> file.</p> <p>Set to 0 (false) it excludes the <code>-DSSL</code> option from the command.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p> <p>Example: 1</p>

Table 3-2 Optional attributes

Optional attribute	Description
HostName	<p>The virtual host name that is assigned to the Apache server instance. The host name is used in second-level monitoring for benchmarking the Apache HTTP server.</p> <p>Note: The HostName attribute is only required when the value of SecondLevelMonitor is 1 (true).</p> <p>Type and dimension: string-scalar</p> <p>Example: web1.example.com</p>
Port	<p>Port number where the Apache HTTP server instance listens. The port number is used in second-level monitoring for benchmarking the Apache HTTP server. Specify this attribute only if SecondLevelMonitor is set to 1 (true).</p> <p>Type and dimension: integer-scalar</p> <p>Default: 80</p> <p>Example: 80</p>
EnvFile	<p>Full path and file name of the file that is sourced before executing httpdDir/httpd. With Apache 2.0, the file <i>ServerRoot/bin/envvars</i>, which is supplied in most Apache 2.0 distributions, is commonly used to set the environment before executing httpd. Specifying this attribute is optional. If EnvFile is specified, the shell for user root must be Bourne, Korn, or C shell.</p> <p>Type and dimension: string-scalar</p> <p>Example: /apache/server1/bin/envvars</p>
PidFile	<p>The PidFile attribute sets the file to which the server records the process ID of the daemon. The value of PidFile attribute must be the absolute path where the Apache instance records the pid.</p> <p>This attribute is required when you want the agent to detect the graceful shutdown of the Web server. For the agent to detect the graceful shutdown of the Web server, the value of the IntentionalOffline resource type attribute must be 1 (true).</p> <p>Type and dimension: string-scalar</p> <p>Example: /var/run/httpd.pid</p>

Table 3-2 Optional attributes

Optional attribute	Description
SharedObjDir	<p>Full path of the directory in which the Apache HTTP shared object files are located. Specifying this attribute is optional. It is used when the HTTP Server is compiled using the SHARED_CORE rule. If you specify this attribute, the directory is passed to the <code>-R</code> option when executing the <code>httpd</code> program. Refer to the <code>httpd</code> man pages for more information about the <code>-R</code> option.</p> <p>Type and dimension: boolean-scalar</p> <p>Example: <code>/apache/server1/libexec</code></p>
SecondLevelTimeout	<p>The number of seconds that the monitor agent function waits on the execution of second-level monitor. If the second-level monitor program does not return to calling the monitor agent function before the <code>SecondLevelTimeout</code> window expires, the monitor agent function no longer blocks on the program sub-process. It does, however, report that the resource is offline. The value should be high enough to allow the second level monitor enough time to complete. The value should be less than the value of the agent's <code>MonitorTimeout</code>.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 30</p>

Apache Web server notes

The Apache Web server has the following notes:

- [“Tasks to perform before you use the Apache Web server agent”](#) on page 115
- [“About detecting application failure”](#) on page 116
- [“About bringing an Apache Web server online outside of VCS One control”](#) on page 117
- [“About SUSE-specific tasks for SLES 10 and SLES 11”](#) on page 117

Tasks to perform before you use the Apache Web server agent

Before you use this agent, perform the following tasks:

- Install the Apache server on shared or local disks.
- Ensure that you are able to start the Apache Web server outside of VCS control, with the specified parameters in the Apache configuration file (for example: `/etc/apache/httpd.conf`). For more information on how to start the server:
See [“About bringing an Apache Web server online outside of VCS One control”](#) on page 117.
- Specify the location of the error log file in the Apache configuration file for your convenience (for example: `ErrorLog /var/apache/logs/error_log`).
- Verify that the floating IP has the same subnet as the cluster systems.
- If you use a port other than the default 80, assign an exclusive port for the Apache server.
- Verify that the Apache server configuration files are identical on all cluster systems.
- Verify that the Apache server does not autostart on system startup.
- Verify that `Inetd` does not invoke the Apache server.
- Remove previous versions of this agent.
- The service group has disk and network resources to support the Apache server resource.
- Assign virtual host name and port to Apache Server.

About detecting application failure

The agent provides two methods to evaluate the state of an Apache HTTP server instance. The first state check is mandatory and the second is optional.

The first check determines the state of the Apache HTTP server. The check determines the state by searching for the existence of the parent `httpd` daemon. It also searches for at least one child `httpd` daemon. If the parent process and at least one child do not exist, VCS One reports the resource as offline. If they do exist, and if the agent attribute `SecondLevelMonitor` is set to `true`, then a socket connection is established with the Apache HTTP server using the values specified by the `Host` and `Port` agent attributes. When connected, the agent issues an HTTP request to the server to test its ability to respond. If the HTTP Server responds with a return code between 0 and 408, the agent considers the server online. If the server fails to respond or returns any other code, the agent considers the server offline.

About bringing an Apache Web server online outside of VCS One control

When you bring an Apache Web server online outside of VCS One control, first source its environment file. Start the server with the `-f` option so the server knows which instance to start. You can then specify additional options (such as `EnableSSL` or `SharedObjDir`) that you want the server to use at start.

To start an Apache Web server outside of VCS One control

- 1 Source the environment file if required.
- 2 Start the Apache Web server. You must use the `-f` option so that the agent can distinguish different instances of the server.

```
httpdDir/httpd -f ConfigFile -k start
```

Where *httpdDir* is `/apache/v2.2/bin` *ConfigFile* is `/apache/v2.2/conf/httpd.conf`. When fully formed, the start example looks like:

```
/apache/v2.2/bin/httpd -f /apache/v2.2/conf/httpd.conf -k start
```

- 3 Specify additional options such as `EnableSSL` or `SharedObjDir` that you want to use when you start server. When you add `EnableSSL` to the command, it resembles:

```
httpdDir/httpd -f ConfigFile -k start -DSSL
```

About SUSE-specific tasks for SLES 10 and SLES 11

The following procedures are specific for SUSE.

Symbolic linking required for the Apache Web server agent to work correctly

The Apache Web server agent does not work correctly with the default `httpd` RPM package available.

To create a symbolic link to enable the Apache Web server agent to function

- ◆ Create a symbolic link from `/usr/sbin/httpd` to the `/usr/sbin/httpd2` executable.

```
# ln -s /usr/sbin/httpd /usr/sbin/httpd2
```

Using the SecondLevelMonitor

The Apache Web server agent uses the Apache Benchmarking “ab” utility for its `SecondLevelMonitor`. The agent searches for the `ab` utility in the following locations:

- `$HttpDir/bin/ab`
- `/usr/bin/ab`

In some situations the ab utility may be in another location. If it is in another location, create a symbolic link from /usr/bin/ab to the location of the ab utility.

For example:

```
# ln -s /usr/bin/ab /usr/sbin/ab2
```

Creating this link allows SecondLevelMonitor to perform properly.

While the name of the utility was ab in this environment, the name can be different in different environments.

Application agent

The Application agent brings applications online, takes them offline, and monitors their status. Use it to specify different executables for the online, offline, and monitor routines for different programs. The executables must exist locally on each node. You can use this agent to provide high availability for applications that do not have bundled, enterprise, or custom agents.

An application runs in the default context of root. Specify the user name to run an application in a user context.

You can monitor the application in the following ways:

- Use the monitor program
- Specify a list of processes
- Specify a list of process ID files
- Any combination of the above

This agent is WPAR- and zone-aware. The ContainerOpts resource type attribute for this type has a default value of 1 for RunInContainer and a default value of 0 for PassCInfo. Symantec recommends that you do not change these values. Refer to the *Veritas Cluster Server One User's Guide* for more information.

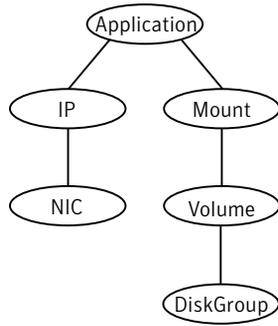
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

Depending on how you plan to use it, this type of resource can depend on IP, IPMultiNIC, and Mount resources.

Figure 3-2 Sample service group that includes an Application resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

- | | |
|---------|---|
| Online | Runs the command or script that you specify in the value of the StartProgram attribute. Runs the command with the specified parameters in the context of the specified user. |
| Offline | Runs the command or script that you specify in the value of the StopProgram attribute. Runs the command with the specified parameters in the context of the specified user. |
| Monitor | <p>If you specify the MonitorProgram attribute, the agent executes the user-defined MonitorProgram in the user-specified context. If you specify the PidFiles attribute, the routine verifies that the process ID that is found in each listed file is running. If you specify the MonitorProcesses attribute, the routine verifies that each listed process is running in the context you specify.</p> <p>Use any combination among these attributes (MonitorProgram, PidFiles, or MonitorProcesses) to monitor the application.</p> <p>If any of the processes that are specified in either PidFiles or MonitorProcesses is determined not to be running, the monitor returns OFFLINE. If the process terminates ungracefully, the monitor returns OFFLINE and failover occurs.</p> |
| Clean | Terminates processes specified in PidFiles or MonitorProcesses. Ensures that only those processes (that are specified in the MonitorProcesses attribute) running with the user ID specified in the User attribute are killed. If the CleanProgram is defined, the agent executes the CleanProgram. |

State definitions

- | | |
|---------|--|
| ONLINE | Indicates that all processes that are specified in the PidFiles and the MonitorProcesses attribute are running and that the MonitorProgram returns ONLINE. |
| OFFLINE | Indicates that at least one process that are specified in the PidFiles attribute or MonitorProcesses is not running, or that the MonitorProgram returns OFFLINE. |
| UNKNOWN | Indicates an indeterminable application state or invalid configuration. |

Attributes for AIX

Table 3-3 Required attributes for AIX

Required attribute	Description
StartProgram	<p>The executable, created locally on each node, which starts the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>In some situations, the Online agent function of an Application resource does not start the StartProgram attribute's program as a background process. It instead executes the application in the foreground. If your application start program blocks the application, append an ampersand symbol to the value of the StartProgram attribute.</p> <p>For example, if the attribute for StartProgram is <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log</code> (and vxnotify is blocking command) set it like: <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log &</code></p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/samba start</code></p>
StopProgram	<p>The executable, created locally on each node, which stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/samba stop</code></p>
At least one of the following attributes: <ul style="list-style-type: none"> ■ MonitorProcesses ■ MonitorProgram ■ PidFiles 	See " Optional attributes for AIX " on page 123.

Table 3-4 Optional attributes for AIX

Optional attribute	Description
CleanProgram	<p>The executable, created locally on each node, which forcibly stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>Type and dimension: string-scalar</p>
MonitorProcesses	<p>A list of processes that you want monitored and cleaned. Each process name is the name of an executable. Qualify the executable name with its complete path if the path starts the executable.</p> <p>The process name must be the full command line argument that the <code>ps -u user -eo pid,comm</code> command displays for the process.</p> <p>Type and dimension: string-vector</p>
MonitorProgram	<p>The executable, created locally on each node, which monitors the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>MonitorProgram can return the following states: OFFLINE value is 100; ONLINE values range from 101 to 110 (depending on the confidence level); 110 equals confidence level of 100%. Any other value = UNKNOWN.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/sample_app_monitor all</code></p>

Table 3-4 Optional attributes for AIX

Optional attribute	Description
PidFiles	<p>A list of PID (process ID) files that contain the PID of the processes that you want monitored and cleaned. These are application generated files. Each PID file contains one monitored PID. Specify the complete path of each PID file in the list.</p> <p>The process ID can change when the process restarts. If the application takes time to update the PID file, the agent's Monitor function may return an incorrect result. If incorrect results occur, increase the ToleranceLimit in the resource definition.</p> <p>Type and dimension: string-vector</p>
User	<p>The user ID for running StartProgram, StopProgram, MonitorProgram, and CleanProgram. The processes that are specified in the MonitorProcesses list must run in the context of the specified user. Monitor checks the processes to make sure they run in this context.</p> <p>Note: The User attribute is required when the value of the ContainerOpts resource type attribute is true for the RunInContainter key.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p>

Attributes for HP-UX

Table 3-5 Required attributes for HP-UX

Required attribute	Description
StartProgram	<p>The executable, created locally on each node, which starts the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>In some situations, the Online agent function of an Application resource does not start the StartProgram attribute's program as a background process. It instead executes the application in the foreground. If your application start program blocks the application, append an ampersand symbol to the value of the StartProgram attribute.</p> <p>For example, if the attribute for StartProgram is <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log</code> (and vxnotify is blocking command) set it like: <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log &</code></p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/sample_app start</code></p>
StopProgram	<p>The executable, created locally on each node, which stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/sample_app stop</code></p>
<p>At least one of the following attributes:</p> <ul style="list-style-type: none"> ■ MonitorProcesses ■ MonitorProgram ■ PidFiles 	<p>See "Optional attributes for HP-UX" on page 126.</p>

Table 3-6 Optional attributes for HP-UX

Optional attribute	Description
CleanProgram	<p>The executable, created locally on each node, which forcibly stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/sbin/sample_app force stop</p>
MonitorProcesses	<p>A list of processes that you want monitored and cleaned. Each process name is the name of an executable. Qualify the executable name with its complete path if the path starts the executable.</p> <p>The process name must be the full command line argument that the <code>ps -u user -o args more</code> command displays for the process.</p> <p>Type and dimension: string-vector</p> <p>Example: sample_app_process</p>
MonitorProgram	<p>The executable, created locally on each node, which monitors the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>MonitorProgram can return the following VCSAgResState values: OFFLINE value is 100; online values range from 101 to 110 (depending on the confidence level); 110 equals confidence level of 100%. Any other value = UNKNOWN.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/sbin/sample_app_monitor all</p>

Table 3-6 Optional attributes for HP-UX

Optional attribute	Description
PidFiles	<p>A list of PID (process ID) files that contain the PID of the processes that you want monitored and cleaned. These are application generated files. Each PID file contains one monitored PID. Specify the complete path of each PID file in the list.</p> <p>The process ID can change when the process restarts. If the application takes time to update the PID file, the agent's Monitor function may return an incorrect result. If incorrect results occur, increase the ToleranceLimit in the resource definition.</p> <p>Type and dimension: string-vector Example: /etc/sample/sample_app.pid</p>
User	<p>The user ID for running StartProgram, StopProgram, MonitorProgram, and CleanProgram. The processes that are specified in the MonitorProcesses list must run in the context of the specified user. Monitor checks the processes to make sure they run in this context.</p> <p>Type and dimension: string-scalar Default: root</p>

Attributes for Linux

Table 3-7 Required attributes for Linux

Required attribute	Description
StartProgram	<p>The executable, created locally on each node, which starts the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>In some situations, the Online agent function of an Application resource does not start the StartProgram attribute's program as a background process. It instead executes the application in the foreground. If your application start program blocks the application, append an ampersand symbol to the value of the StartProgram attribute.</p> <p>For example, if the attribute for StartProgram is <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log</code> (and vxnotify is blocking command) set it like: <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log &</code></p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/samba start</code></p>
StopProgram	<p>The executable, created locally on each node, which stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/sample_app stop</code></p>
<p>At least one of the following attributes:</p> <ul style="list-style-type: none"> ■ MonitorProcesses ■ MonitorProgram ■ PidFiles 	<p>See "Optional attributes for Linux" on page 129.</p>

Table 3-8 Optional attributes for Linux

Optional attribute	Description
CleanProgram	<p>The executable, created locally on each node, which forcibly stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>Type and dimension: string-scalar</p>
MonitorProcesses	<p>A list of processes that you want monitored and cleaned. Each process name is the name of an executable. Qualify the executable name with its complete path if the path starts the executable.</p> <p>The process name must be the name that the <code>ps -ef</code> command displays for the process.</p> <p>Type and dimension: string-vector</p> <p>Example: nmbd</p>
MonitorProgram	<p>The executable, created locally on each node, which monitors the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>MonitorProgram can return the following VCSAgResState values: OFFLINE value is 100; ONLINE values range from 101 to 110 (depending on the confidence level); 110 equals confidence level of 100%. Any other value = UNKNOWN.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p>

Table 3-8 Optional attributes for Linux

Optional attribute	Description
PidFiles	<p>A list of PID (process ID) files that contain the PID of the processes that you want monitored and cleaned. These are application generated files. Each PID file contains one monitored PID. Specify the complete path of each PID file in the list.</p> <p>The process ID can change when the process restarts. If the application takes time to update the PID file, the agent's Monitor function may return an incorrect result. If incorrect results occur, increase the ToleranceLimit in the resource definition.</p> <p>Type and dimension: string-vector</p>
User	<p>The user ID for running StartProgram, StopProgram, MonitorProgram, and CleanProgram. The processes that are specified in the MonitorProcesses list must run in the context of the specified user. Monitor checks the processes to make sure they run in this context.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p>

Attributes for Solaris

Table 3-9 Required attributes for Solaris

Required attribute	Description
StartProgram	<p>The executable, created locally on each node, which starts the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>In some situations, the Online agent function of an Application resource does not start the StartProgram attribute's program as a background process. It instead executes the application in the foreground. If your application start program blocks the application, append an ampersand symbol to the value of the StartProgram attribute.</p> <p>For example, if the attribute for StartProgram is <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log</code> (and vxnotify is blocking command) set it like: <code>/usr/sbin/vxnotify -g dg00 -m >> /var/log/vxnotify.log &</code></p> <p>For applications running in Solaris 10 zones, use the path as seen from the non-global zone.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/samba start</code></p>
StopProgram	<p>The executable, created locally on each node, which stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>For applications running in Solaris 10 zones, use the path as seen from the non-global zone.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/usr/sbin/samba stop</code></p>

Table 3-9 Required attributes for Solaris

Required attribute	Description
<p>At least one of the following attributes:</p> <ul style="list-style-type: none"> ■ MonitorProcesses ■ MonitorProgram ■ PidFiles 	<p>See “Optional attributes for Solaris” on page 132.</p>

Table 3-10 Optional attributes for Solaris

Optional attribute	Description
CleanProgram	<p>The executable, created locally on each node, which forcibly stops the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>For applications running in Solaris 10 zones, use the path as seen from the non-global zone.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/sbin/samba force stop</p>
MonitorProcesses	<p>A list of processes that you want monitored and cleaned. Each process name is the name of an executable.</p> <p>Provide the full path name of the executable if the agent uses that path to start the executable.</p> <p>The process name must be the full command line argument that the <code>ps -u user -o args</code> command displays for the process.</p> <p>Type and dimension: string-vector</p> <p>Example: nmbd</p>

Table 3-10 Optional attributes for Solaris

Optional attribute	Description
MonitorProgram	<p>The executable, created locally on each node, which monitors the application. Specify the complete path of the executable. Applicable command line arguments follow the name of the executable and have spaces separating them.</p> <p>For applications running in Solaris 10 zones, use the path as seen from the non-global zone.</p> <p>MonitorProgram can return the following VCSAgResState values: OFFLINE value is 100; ONLINE values range from 101 to 110 (depending on the confidence level); 110 equals confidence level of 100%. Any other value = UNKNOWN.</p> <p>Note: Do not use the opening and closing ({}) brace symbols in this string.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/local/bin/sambaMonitor all</p>

Table 3-10 Optional attributes for Solaris

Optional attribute	Description
PidFiles	<p>A list of PID (process ID) files that contain the PID of the processes that you want monitored and cleaned. These are application generated files. Each PID file contains one monitored PID. Specify the complete path of each PID file in the list.</p> <p>For applications running in Solaris 10 non-global zones, include the zone root path in the PID file's path—the global zone's absolute path.</p> <p>The process ID can change when the process restarts. If the application takes time to update the PID file, the agent's monitor function may return an incorrect result. If incorrect results occur, increase the ToleranceLimit in the resource definition.</p> <p>Type and dimension: string-vector</p> <p>Example:</p> <p><code>/var/lock/samba/smbd.pid</code></p> <p>Example in a global zone for Solaris 10: <code>/var/lock/samba/smbd.pid</code></p> <p>Example in a non-global zone for Solaris 10: <code>\$zoneroot/var/lock/samba/smbd.pid</code></p> <p>Where the <i>\$zoneroot</i> is the root directory of the non-global zone, as seen from the global zone.</p>
User	<p>The user ID for running StartProgram, StopProgram, MonitorProgram, and CleanProgram. The processes that are specified in the MonitorProcesses list must run in the context of the specified user. Monitor checks the processes to make sure they run in this context.</p> <p>Note: The User attribute is required when the value of the ContainerOpts resource type attribute is true for the RunInContainer key.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p>

Sample configurations

Configuration 1 for Linux

In this example, the executable samba is configured as StartProgram and StopProgram, with start and stop specified as command-line arguments respectively. Configure the agent to monitor two processes: a process that the `smbd.pid` specifies and the process `nmbd`.

```
<resource name="samba_app" type="Application">
  <attribute name="MonitorProcesses">
    <val>"nmbd"</val>
  </attribute>
  <attribute name="PidFiles">
    <val>"/var/lock/samba/smbd.pid"</val>
  </attribute>
  <attribute name="StartProgram"><scalar>"/usr/sbin/samba
start"</scalar></attribute>
  <attribute name="StopProgram"><scalar>"/usr/sbin/samba stop"
</scalar></attribute>
  <attribute name="User"><scalar>"root"</scalar></attribute>
</resource>
```

Configuration 2 for Linux

In this example, no user is specified, so the root user is used. The executable `samba` is used to start and stop the application, with start and stop as the command-line arguments respectively. The executable `sambaMonitor` monitors the application and uses "all" as its command-line argument. In addition, the processes `smbd` and `nmbd` are monitored.

```
<resource name="samba_app2" type="Application">
  <attribute name="CleanProgram"><scalar>"/usr/sbin/samba
force stop"</scalar></attribute>
  <attribute name="MonitorProcesses">
    <val>"smbd"</val>
    <val>"nmbd"</val>
  </attribute>
  <attribute name="MonitorProgram"><scalar>"/usr/local/bin/
sambaMonitor all"</scalar></attribute>
  <attribute name="StartProgram"><scalar>"/usr/sbin/samba
start"</scalar></attribute>
  <attribute name="StopProgram"><scalar>"/usr/sbin/samba stop"
</scalar></attribute>
</resource>
```

Process agent

The Process agent starts, stops, and monitors a process that you specify. You can use the agent to make a process highly available or to monitor it.

This agent is WPAR- and zone-aware. The ContainerOpts resource type attribute for this type has a default value of 1 for RunInContainer and a default value of 0 for PassCInfo. Symantec recommends that you do not change these values. Refer to the *Veritas Cluster Server One User's Guide* for more information.

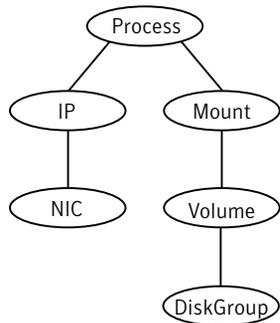
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

Depending on the context, this type of resource can depend on IP, IPMultiNIC, and Mount resources.

Figure 3-3 Sample service group for a Process resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	AIX and Solaris: Starts the process with optional arguments. HP-UX and Linux: Starts a process in the background with optional arguments and priority in the specified user context.
Offline	Terminates the process with a SIGTERM. If the process does not exit, a SIGKILL is sent.

Monitor	Checks to see if the process is running by scanning the process table for the name of the executable pathname and argument list.
Clean	Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.

State definitions

ONLINE	Indicates that the specified process is running in the specified user context. The agent only reports the process as online if the value configured for PathName attribute exactly matches the process listing from the ps output.
OFFLINE	Indicates that the specified process is not running in the specified user context.
FAULTED	Indicates that the process has terminated unexpectedly.
UNKNOWN	Indicates that the agent can not determine the state of the process.

Attributes for AIX

Table 3-11 Required attribute for AIX

Required attribute	Description
PathName	<p>Complete pathname to access an executable program. This path includes the program name. If a script controls the process, the PathName defines the complete path to the shell.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/sbin/sendmail</p>

Table 3-12 Optional attributes for AIX

Optional attribute	Description
Arguments	<p>Passes arguments to the process. If a script controls the process, the script is passed as an argument. Separate multiple arguments with a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters.</p> <p>Type and dimension: string-scalar</p> <p>Example: bd -q1h</p>

Attributes for HP-UX

Table 3-13 Required attribute for HP-UX

Required attribute	Description
PathName	<p>Complete pathname to access an executable program. This path includes the program name. If a script controls the process, the PathName defines the complete path to the shell.</p> <p>Type and dimension: string-scalar Example: /usr/sbin/sendmail</p>

Table 3-14 Optional attributes for HP-UX

Optional attribute	Description
Arguments	<p>Passes arguments to the process. If a script controls the process, the script is passed as an argument. Separate multiple arguments with a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters.</p> <p>Type and dimension: string-scalar Example: bd -q30m</p>
PidFile	<p>File containing the process ID.</p> <p>Type and dimension: string-scalar Example: /etc/mail/sendmail.pid</p>
Priority	<p>Priority with which the process runs. Effective only when the user is root. Range is 0 to 39 where a process with a priority 0 is the highest.</p> <p>Type and dimension: string-scalar Default: 20 Example: 35</p>

Table 3-14 Optional attributes for HP-UX

Optional attribute	Description
UserName	<p>The user whose ID is used to run the process. The process along with the arguments must run the context of the specified user.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p> <p>Example: user1</p>

Attributes for Linux

Table 3-15 Required attribute for Linux

Required attribute	Description
PathName	<p>Complete pathname to access an executable program. This path includes the program name. If a script controls the process, the PathName defines the complete path to the shell.</p> <p>This attribute must not exceed 256 characters.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/sbin/proc1</p>

Table 3-16 Optional attributes for Linux

Optional attribute	Description
Arguments	<p>Passes arguments to the process. If a script controls the process, the script is passed as an argument. Separate multiple arguments with a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters.</p> <p>Type and dimension: string-scalar</p>

Table 3-16 Optional attributes for Linux

Optional attribute	Description
PidFile	<p>The file that contains the process ID for the monitoring process. Specify the PidFile attribute for the monitoring process to use the Pid. Otherwise, to complete the monitoring process the agent uses the ps output.</p> <p>Note that when you use scripts, or other indirect mechanisms, to start processes, you must set the PidFile attribute if the ps output is different from the configured values for the PathName or Arguments attributes.</p> <p>Type and dimension: string-scalar</p> <p>Example: /var/lock/sendmail.pid</p>
Priority	<p>Priority that the process runs. Priority values range between -20 (highest) to +19 (lowest).</p> <p>Type and dimension: string-scalar</p> <p>Default: 10</p>
UserName	<p>This attribute is the owner of the process. The process runs with this user ID.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p>

Attributes for Solaris

Table 3-17 Required attribute for Solaris

Required attribute	Description
PathName	<p>Complete pathname to access an executable program. This path includes the program name. If a script controls the process, the PathName defines the complete path to the shell.</p> <p>This attribute must not exceed 80 characters.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/lib/sendmail</p>

Table 3-18 Optional attributes for Solaris

Optional attribute	Description
Arguments	<p>Passes arguments to the process. If a script controls the process, the script is passed as an argument. Separate multiple arguments with a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters.</p> <p>This attribute must not exceed 80 characters.</p> <p>Type and dimension: string-scalar</p> <p>Example: bd -q1h</p>

Sample configurations

Configuration for Linux

In this example, the Process agent starts, stops, and monitors sendmail. This process is started with two arguments as determined in the Arguments attribute. The pid stored in the PidFile attribute is used to monitor the sendmail process.

```
<resource name="sendmail" type="Process">
  <attribute name="Arguments"><scalar>"-bd -q30m"
</scalar></attribute>
```

```
<attribute name="PathName"><scalar>"/usr/sbin/sendmail"  
</scalar></attribute>  
<attribute name="PidFile"><scalar>"/var/run/sendmail.pid"  
</scalar></attribute>  
</resource>
```

ProcessOnOnly agent

The ProcessOnOnly agent starts and monitors a process that you specify. You can use the agent to make a process highly available or to monitor it. This resource's Operation value is OnOnly.

Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No child dependencies exist for this resource.

Agent functions

The value of the Operations attribute for this agent is OnOnly.

Online	Starts the process with optional arguments.
Monitor	Checks to see if the process is alive by scanning the process table for the name of the executable pathname and argument list.
Clean	Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.

State definitions

ONLINE	Indicates that the specified process is running. The agent only reports the process as ONLINE if the value configured for PathName attribute exactly matches the process listing from the ps output.
FAULTED	Indicates that the process has unexpectedly terminated.
UNKNOWN	Indicates that the agent can not determine the state of the process.

Attributes for AIX

Table 3-19 Required attributes for AIX

Required attribute	Description
PathName	<p>Defines complete pathname to access an executable program. This path includes the program name. If a process is controlled by a script, the PathName defines the complete path to the shell.</p> <p>The value configured for this attribute needs to match the process listing from the ps output for the agent to display as ONLINE.</p> <p>Type and dimension: string-scalar</p>

Table 3-20 Optional attributes for AIX

Optional attribute	Description
Arguments	<p>Passes arguments to the process. If a process is controlled by a script, the script is passed as an argument. Multiple arguments must be separated by a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters.</p> <p>Arguments must not exceed 80 characters (total).</p> <p>Type and dimension: string-scalar</p>
IgnoreArgs	<p>A flag that indicates whether monitor ignores the argument list.</p> <ul style="list-style-type: none">■ If the value is 0, it checks the process pathname and argument list.■ If the value is 1, it only checks for the executable pathname and ignores the rest of the argument list. <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Attributes for HP-UX

Table 3-21 Required attributes for HP-UX

Required attribute	Description
PathName	<p>Defines complete pathname to access an executable program. This path includes the program name. If a process is controlled by a script, the PathName defines the complete path to the shell. Pathname must not exceed 80 characters.</p> <p>The value configured for this attribute needs to match the process listing from the ps output for the agent to display as ONLINE.</p> <p>Type and dimension: string-scalar</p> <p>Example: /usr/sbin/sendmail</p>

Table 3-22 Optional attributes for HP-UX

Optional attribute	Description
IgnoreArgs	<p>A flag that indicates whether monitor ignores the argument list.</p> <ul style="list-style-type: none"> ■ If the value is 0, it checks the process pathname and argument list. ■ If the value is 1, it only checks for the executable pathname and ignores the rest of the argument list. <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>
Arguments	<p>Passes arguments to the process. If a process is controlled by a script, the script is passed as an argument. Multiple arguments must be separated by a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters. Arguments must not exceed a total of 80 characters.</p> <p>Type and dimension: string-scalar</p> <p>Example: -bd -q30m</p>

Attributes for Linux

Table 3-23 Required attributes for Linux

Required attribute	Description
PathName	<p>Defines complete pathname to access an executable program. This path includes the program name. If a process is controlled by a script, the PathName defines the complete path to the shell. The PathName attribute must not exceed 256 characters.</p> <p>The value configured for this attribute needs to match the process listing from the ps output for the agent to display as ONLINE.</p> <p>Type and dimension: string-scalar</p>

Table 3-24 Optional attributes for Linux

Optional attribute	Description
Arguments	<p>Passes arguments to the process. If a process is controlled by a script, the script is passed as an argument. Multiple arguments must be separated by a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters.</p> <p>Type and dimension: string-scalar</p> <p>Example: -bd -q30m</p>
IgnoreArgs	<p>A flag that indicates whether monitor ignores the argument list.</p> <ul style="list-style-type: none">■ If the value is 0, it checks the process pathname and argument list.■ If the value is 1, it only checks for the executable pathname and ignores the rest of the argument list. <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Table 3-24 Optional attributes for Linux

Optional attribute	Description
PidFile	<p>The file that contains the process ID for the monitoring process. Specify the PidFile attribute for the monitoring process to use the Pid. Otherwise, to complete the monitoring process the agent uses the ps output.</p> <p>Note that when you use scripts, or other indirect mechanisms, to start processes, you must set the PidFile attribute when the ps output is different from the configured values for the PathName or Arguments attributes.</p> <p>Type and dimension: string-scalar</p> <p>Example: /var/lock/sendmail.pid</p>
Priority	<p>Priority with which the process will run. Priority values range between -20 (highest) to +19 (lowest).</p> <p>Type and dimension: string-scalar</p> <p>Default: 10</p>
UserName	<p>Owner of the process. The process runs with the user ID.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p>

Attributes for Solaris

Table 3-25 Required attributes for Solaris

Required attribute	Description
PathName	<p>Defines complete pathname to access an executable program. This path includes the program name. If a process is controlled by a script, the PathName defines the complete path to the shell. Pathname must not exceed 80 characters.</p> <p>The value configured for this attribute needs to match the process listing from the ps output for the agent to display as ONLINE.</p> <p>Type and dimension: string-scalar</p> <p>Example:</p> <p>Solaris 8 and 9: /usr/lib/nfs/nfsd</p> <p>Example:</p> <p>"/usr/lib/nfs/nfsd"</p>

Table 3-26 Optional attributes for Solaris

Optional attribute	Description
Arguments	<p>Passes arguments to the process. If a process is controlled by a script, the script is passed as an argument. Multiple arguments must be separated by a single space. A string cannot accommodate more than one space between arguments, nor allow for leading or trailing whitespace characters. Arguments must not exceed 80 characters (total).</p> <p>Type and dimension: string-scalar</p>

Table 3-26 Optional attributes for Solaris

Optional attribute	Description
IgnoreArgs	<p>A flag that indicates whether monitor ignores the argument list.</p> <ul style="list-style-type: none"> ■ If the value is 0, it checks the process pathname and argument list. ■ If the value is 1, it only checks for the executable pathname and ignores the rest of the argument list. <p>Type and dimension: boolean-scalar Default: 0</p>

Sample configurations

Configuration for Linux

```
<resource name="sendmail" type="ProcessOnOnly">
  <attribute name="Arguments"><scalar>"-bd -q30m"
</scalar></attribute>
  <attribute name="PathName"><scalar>"/usr/sbin/sendmail"
</scalar></attribute>
  <attribute name="PidFile"><scalar>"/var/run/sendmail.pid"
</scalar></attribute>
</resource>
```

Program support and testing agents

This chapter contains:

- [“About the program support and testing agents”](#) on page 151
- [“ElifNone agent”](#) on page 152
- [“FileNone agent”](#) on page 154
- [“FileOnOff agent”](#) on page 156
- [“FileOnOnly agent”](#) on page 158
- [“Phantom agent”](#) on page 160
- [“Proxy agent”](#) on page 161

About the program support and testing agents

Use these agents to provide high availability for program support resources. The ElifNone, FileNone, FileOnOff, and FileOnOnly agents are useful for testing clusters.

ElifNone agent

The ElifNone agent monitors a file. It checks for the file's absence.

You can use the ElifNone agent to test service group behavior. You can also use it as an impostor resource, where it takes the place of a resource for testing.

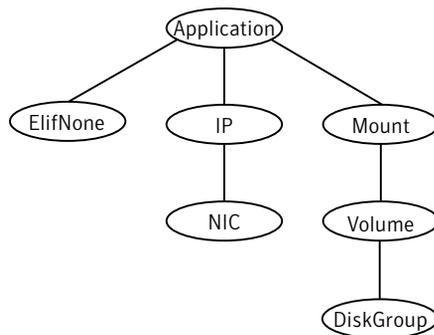
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the ElifNone resource.

Figure 4-1 Sample service group that includes an ElifNone resource



Agent function

The value of the Operations attribute for this agent is None.

Monitor	Checks for the specified file. If it exists, the resource faults. If it does not exist, the agent reports as ONLINE.
---------	--

State definitions

UNKNOWN	Indicates that the value of the PathName attribute does not contain a file name.
---------	--

Attributes

Table 4-1 Required attribute

Required attribute	Description
PathName	<p>Specifies the complete pathname. Starts with a slash (/) preceding the file name.</p> <p>Type and dimension: string-scalar</p> <p>Example: /tmp/file01</p>

Sample configuration

```
<resource name="elifnone" type="ElifNone">
  <attribute name="PathName"><scalar>/tmp/elifnone"
  </scalar></attribute>
</resource>
```

FileNone agent

Monitors a file—checks for the file’s existence.

You can use the FileNone agent to test service group behavior. You can also use it as an “impostor” resource, where it takes the place of a resource for testing.

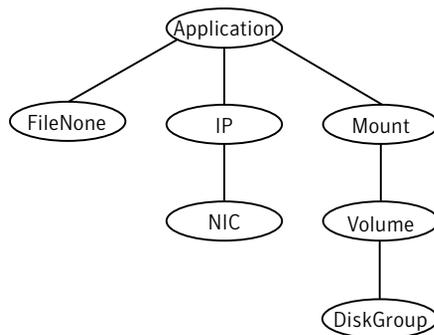
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the FileNone resource.

Figure 4-2 Sample service group that includes an FileNone resource



Agent functions

The value of the Operations attribute for this agent is None.

Monitor	Checks for the specified file. If it exists, the agent reports as ONLINE. If it does not exist, the resource faults.
---------	--

State definitions

UNKNOWN	Indicates that the value of the PathName attribute does not contain a file name.
---------	--

Attribute

Table 4-2 Required attribute

Required attribute	Description
PathName	<p>Specifies the complete pathname. Starts with a slash (/) preceding the file name.</p> <p>Type and dimension: string-scalar</p> <p>Example: /tmp/file01</p>

Sample configuration

```
<resource name="fnone" type="FileNone">
  <attribute name="PathName"><scalar>"/tmp/fnone"
  </scalar></attribute>
</resource>
```

FileOnOff agent

The FileOnOff agent creates, removes, and monitors files.

You can use this agent to test service group behavior. You can also use it as an “impostor” resource, where it takes the place of a resource for testing.

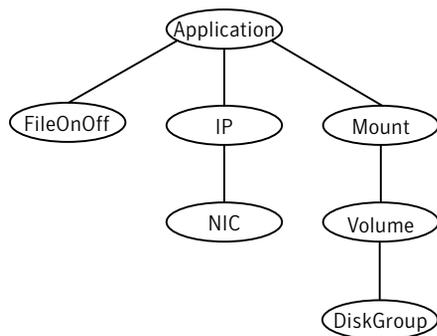
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the FileOnOff resource.

Figure 4-3 Sample service group that includes a FileOnOff resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Creates an empty file with the specified name if the file does not already exist.
Offline	Removes the specified file.
Monitor	Checks for the specified file. If it exists, the agent reports as ONLINE. If it does not exist, the agent reports as OFFLINE.
Clean	Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.

State definitions

UNKNOWN Indicates that the value of the PathName attribute does not contain a file name.

Attribute

Table 4-3 Required attribute

Required attribute	Description
PathName	<p>Specifies the complete pathname. Starts with a slash (/) preceding the file name.</p> <p>Type and dimension: string-scalar</p> <p>Example: /tmp/file01</p>

Sample configuration

```
<resource name="fonoff" type="FileOnOff">
  <attribute name="PathName"><scalar>"/tmp/fonoff"
  </scalar></attribute>
</resource>
```

FileOnOnly agent

The FileOnOnly agent creates and monitors files.

You can use this agent to test service group behavior. You can also use it as an “impostor” resource, where it takes the place of a resource for testing.

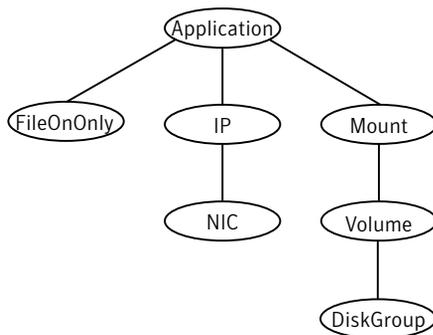
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the FileOnOnly resource.

Figure 4-4 Sample service group that includes a FileOnOnly resource



Agent functions

The value of the Operations attribute for this agent is OnOnly.

Online	Creates an empty file with the specified name, unless one already exists.
Monitor	Checks for the specified file. If it exists, the agent reports as ONLINE. If it does not exist, the resource faults.
Clean	Linux: Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.

State definitions

UNKNOWN Indicates that the value of the PathName attribute does not contain a file name.

Attribute

Table 4-4 Required attributes

Required attribute	Description
PathName	Specifies the complete pathname. Starts with a slash (/) preceding the file name. Type and dimension: string-scalar Example: /tmp/file02

Sample configuration

```
<resource name="fononly" type="FileOnOnly">
  <attribute name="PathName"><scalar>"/tmp/fononly"
  </scalar></attribute>
</resource>
```

Phantom agent

The Phantom agent enables VCS One to determine the state of parallel service groups that do not include OnOff resources.

Do not use the Phantom resource in failover service groups.

Note: Do not attempt manual online or offline operations on the Phantom resource at the resource level. Do not use `hares` commands on the Phantom resource at the resource level. Unpredictable behavior results when you try a manual online or offline procedure or an `hares` command on a Phantom resource. You can perform commands on the service group that contains the Phantom resource.

Platforms

AIX, ESX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the Phantom resource.

Figure 4-5 Sample service group that includes a Phantom resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Monitor Determines status based on the status of the service group.

Proxy agent

The Proxy agent mirrors the state of another resource on a local or remote system. It provides a means to specify and modify one resource and have its state reflected by its proxies. You can use the agent when you need to replicate the status of a resource.

A Proxy resource can only point to None or OnOnly type of resources, and can reside in a failover/parallel group. A target resource and its proxy cannot be in the same group.

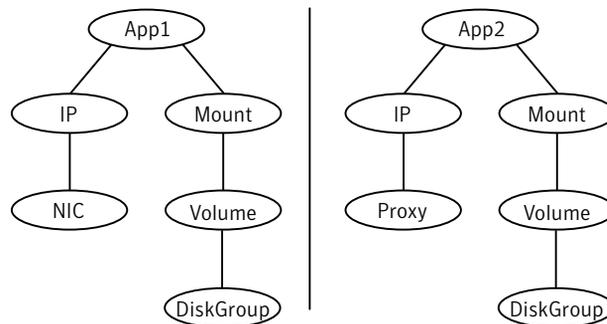
Platforms

AIX, ESX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the Proxy resource.

Figure 4-6 Sample service group that includes a Proxy resource



Agent functions

The value of the Operations attribute for this agent is None.

Monitor Determines status based on the target resource status.

Attributes

Table 4-5 Required attribute

Required attribute	Description
TargetResName	<p>Fully qualified name of the target resource that the Proxy resource mirrors.</p> <p>The target resource must be in a different resource group than the Proxy resource.</p> <p>Type and dimension: string-scalar</p> <p>Example: SG1.mp_VRTSvcstone_file1</p>

Table 4-6 Optional attribute

Optional attribute	Description
TargetSysName	<p>Mirrors the status of the TargetResName attribute on systems that the TargetSysName variable specifies. If this attribute is not specified, the Proxy resource assumes the system is local.</p> <p>Type and dimension: string-scalar</p> <p>Example: sysa</p>

Sample configurations

Configuration 1 for AIX, ESX, HP-UX, Linux, and Solaris

Sample configuration for a proxy mirroring state on local system. Where SG1 is the service group where the resource mp_vcsone_file1 belongs.

```
<resource name="proxyres" type="Proxy">
  <attribute name="TargetResName"><scalar>"SG1.mp_vcsone_file1"
  </scalar></attribute>
</resource>
```

Configuration 2 for AIX, ESX, HP-UX, Linux, and Solaris

Sample configuration for proxy mirroring state on sysa. Where SG2 is the service group to which resource tmp_vcsone_file1 belongs.

```
<resource name="proxyres" type="Proxy">  
  <attribute name="TargetResName">"SG2.tmp_vcsone_file1"  
  <scalar></scalar></attribute>  
  <attribute name="TargetSysName"><scalar>"sysa"  
  </scalar></attribute>  
</resource>
```

Configuration for Linux

The proxy resource mirrors the state of the resource `mnica` on the local system; note that target resource is in `grp1`, and the proxy is in `grp2`; a target resource and its proxy cannot be in the same group.

```
<group name="grp1">
  <attributes>
    <attribute name="SystemList">
      <val key="sys1">0</val>
      <val key="sys2">1</val>
    </attribute>
  </attributes>
  <resources>
    <resource name="mnica" type="MultiNIC">
      <attribute name="Device" context = "sys1">
        <val key="eth4">"10.212.89.51"</val>
        <val key="eth3">"10.212.89.51"</val>
      </attribute>
      <attribute name="Device" context = "sys2">
        <val key="eth2">"10.212.89.99"</val>
        <val key="eth3">"10.212.89.99"</val>
      </attribute>
      <attribute name="NetMask"><scalar>"255.255.254.0"
      </scalar></attribute>
      <attribute name="NetworkHosts">
        <val>"10.212.108.10"</val>
      </attribute>
    </resource>
    <resource name="ip1" type="IPMultiNIC">
      <attribute name="Address"><scalar>"10.212.89.148"
      </scalar></attribute>
      <attribute name="MultiNICResName"><scalar>"grp1.mnica"
      </scalar></attribute>
      <attribute name="NetMask"><scalar>"255.255.254.0"
      </scalar></attribute>
    </resource>
    <link parent="ip1" child="mnica"/>
  </resources>
</group>
<group name="grp2">
  <attributes>
    <attribute name="SystemList">
      <val key="sys1">0</val>
      <val key="sys2">1</val>
    </attribute>
  </attributes>
  <resources>
    <resource name="ip2" type="IPMultiNIC">
      <attribute name="Address"><scalar>"10.212.89.52"
      </scalar></attribute>
      <attribute name="MultiNICResName"><scalar>"grp1.mnica"
      </scalar></attribute>
    </resource>
  </resources>
</group>
```

```
        <attribute name="NetMask"><scalar>"255.255.254.0"  
        </scalar></attribute>  
    </resource>  
    <resource name="proxy" type="Proxy">  
        <attribute name="TargetResName"><scalar>"grpl.mnic"  
        </scalar></attribute>  
    </resource>  
    <link parent="ip2" child="proxy"/>  
    </resources>  
</group>
```


Virtualization management agents

This chapter contains:

- [“About the virtualization management agents”](#) on page 167
- [“Project agent”](#) on page 168
- [“Zone agent”](#) on page 170
- [“LDom agent”](#) on page 175
- [“WPAR agent”](#) on page 182
- [“ESXVM agent”](#) on page 185
- [“ESXVSwitch agent”](#) on page 192
- [“ESXDatastore agent”](#) on page 196

About the virtualization management agents

Virtualization management agents allow you to manage certain virtualized environments and maintain their high availability.

Project agent

The Project agent adds, deletes, and monitors Solaris 10 projects. You can use the agent to make projects highly available or to monitor them.

The Project agent sets the CPU load value as:

```
project.cpu-shares=" (priv, <cpu_load_value>, none) "
```

VCSONE, by default, uses the priv and none values.

If you use Pool, the Project agent sets the pool value as:

```
project.pool="pool_name"
```

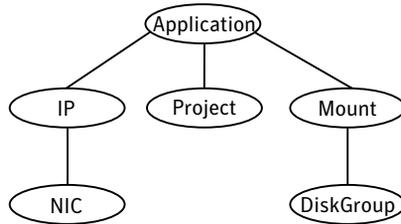
This agent is compatible with Solaris zones. Refer to the *Veritas Cluster Server One User's Guide* for more information on using this agent with zones.

Platforms

Solaris

Dependencies

Figure 5-1 Sample service group that includes a Project resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Creates a Solaris 10 project, if one is not present. Modifies a Solaris 10 project, if one present.
Offline	Deletes a Solaris 10 project.
Monitor	Checks if the specified project is up and running.
Clean	Deletes a Solaris 10 project.

Attributes

Table 5-1 Optional attributes

Optional attribute	Description
User	Comma separated list of existing users that are part of the project. Type and dimension: string-scalar
Pool	This is the existing resource pool name that is associated with the project. Type and dimension: string-scalar

Sample configuration

Sample configuration for a Project resource

```
<resource name="MyProject" type="Project">
  <attribute name="Pool">
    <scalar>"pool_default"</scalar>
  </attribute>
  <attribute name="User">
    <scalar>"tjones"</scalar>
  </attribute>
</resource>
```

Zone agent

The Zone agent brings online, takes offline, monitors, and cleans Solaris 10 zones. You can use the agent to make zones highly available and to monitor them.

This agent is zone-aware. The ContainerOpts resource type attribute for this type has a default value of 0 for RunInContainer and a default value of 1 for PassCInfo. Symantec recommends that you do not change the values for these keys. Refer to the *Veritas Cluster Server User's Guide* for more information.

For important information about this agent, refer to:

[“Zone agent notes”](#) on page 173

Platforms

Solaris

Dependencies

Typically no dependencies are required for the Zone resource, however if the zone root is on shared storage the resource may require the Mount and DiskGroup resources.

Figure 5-2 Sample service group that includes a Zone resource when the zone root is on shared storage with a loopback file system

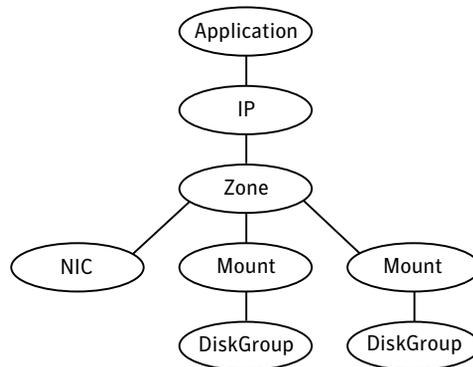


Figure 5-3 Sample service group that includes a Zone resource for the zone root on shared storage with a loopback file system when VCS manages the loopback file system as a Mount resource

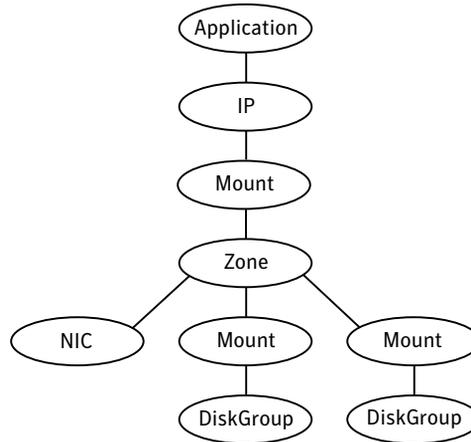
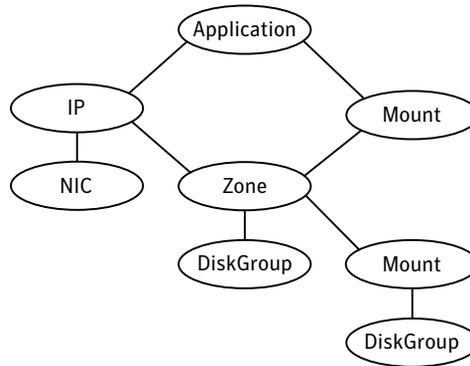


Figure 5-4 Sample service group that includes a Zone resource with the zone root on shared storage a direct mounted file system



Agent functions

The value of the Operations attribute for this agent is OnOff.

- Online Brings a Solaris 10 zone up and running.
 For information on SRM functionality:
 See [“SRM functionality”](#) on page 174.

Offline	Takes a Solaris 10 zone down gracefully.
Monitor	Checks if the specified zone is up and running.
Clean	A more forceful method for halting a Solaris 10 zone.

Attributes

Table 5-2 Optional attributes for Solaris

Optional attribute	Description
Pool	This is the resource pool name that is associated with the zone. Type and dimension: string-scalar
BootState	The value for the milestone service. Acceptable values follow: <ul style="list-style-type: none"> ■ single-user ■ multi-user ■ multi-user-server <p>Note: Symantec recommends that you use the multi-user-server value for the BootState attribute.</p> Type and dimension: string-scalar Default: multi-user-server
ShutDownGracePeriod	Specifies the interval in seconds from the Offline action to the execution of the shutdown within the zone. Type and dimension: integer-scalar Default: 0 Example: 10
LastCredRenewal	Timestamp of the last time the Zone credential was successfully renewed. The Zone agent attempts to renew the zone credential every 180 days. The Zone must be online for the renewal to occur. Type and dimension: integer-scalar Default: ""

Table 5-2 Optional attributes for Solaris

Optional attribute	Description
ZUserPassword	<p>Specifies the password used to create the local-zone container.</p> <p>The value of this attribute must be a string that is at least six characters long and has been encrypted using the <code>haencrypt -agent</code> command.</p> <p>Type and dimension: string-scalar</p> <p>Default: ""</p>
DROpts	<p>The value of this attribute consists of the following keys that define the disaster recovery (DR) options for the Zone.</p> <ul style="list-style-type: none"> ■ DNSDomain The domain name to use within the Zone at this site. ■ DNSSearchPath The domain search path used by this Zone at this site. ■ DNSServers The list of DNS servers used by this Zone at this site. ■ Gateway The default Gateway used by this Zone at this site. <p>In a DR configuration, if one or more of these keys are set, the resource is considered to be DR-enabled. If all the keys stay at their default value (""), then the resource is not DR-enabled even if it is in a disaster recovery configuration.</p> <p>Type and dimension: string-association</p> <p>Default: ""</p>

Zone agent notes

The Mount agent has the following notes:

- [“Uninstalling a local zone”](#) on page 173
- [“SRM functionality”](#) on page 174

Uninstalling a local zone

When the Zone agent takes a zone offline it detaches the zone. Since the zone must be in the installed state before you uninstall, you need to reattach it before you can uninstall it. Before you reattach the zone, make sure that the zone root

file system is available if it is configured. Once you have reattached the zone, then you can perform the zone uninstall command, and the zonecfg delete command to completely remove the zone.

SRM functionality

If the Load attribute is specified at the group level, the Zone agent sets the CPU shares when the Online agent function is invoked. If you want to change this Load attribute, you must bring down the service group that contains this Zone resource. Note that the Zone agent only works if the value of server farm PrecedenceOrder attribute contains the key "CPU".

For more information see the *Veritas Cluster Server One User's Guide*.

LDom agent

The LDom agent brings logical domains (LDoms) online, takes them offline, and monitors them. You can use this agent to monitor LDoms, and to make them highly available.

For more information about LDom attributes, see *Veritas Cluster Server One User's Guide*.

Configuring primary and guest domain dependencies and failure policy

For all the guest domains that are configured in the cluster, the agent performs the following commands to set:

- The dependency between the primary and guest domains.
ldm set-domain master=primary guestldom
- The failure-policy of the primary domain to stop.
ldm set-domain failure-policy=stop primary

Platform

Solaris

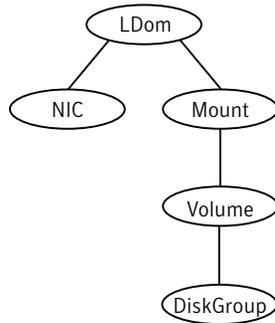
The VCS One 2.0 RU1 LDom agent is not compatible with the VCS One 5.0 LDom type definition.

Dependencies

The LDom resource depends on the NIC resource. It also depends on a storage resource, such as Mount, Volume, Zpool, or Disk.

See “Managing objects in an LDom environment” in the *Veritas Cluster Server One User's Guide*.

Figure 5-5 Sample service group for an LDom resource that monitors an image file



Network resources

Use the NIC agent to monitor the network adapter for the LDom, whether it is virtual or physical.

Storage resources

- Veritas Volume Manager (VxVM) exposed volumes
Use the Volume and DiskGroup agents to monitor a VxVM volume.
- ZFS volumes
Use the Zpool agent to monitor a ZFS volume.
- Image file
 - Image file in a volume that is managed by Veritas Volume Manager (VxVM)
Use the Mount, Volume, and DiskGroup agents to monitor the image file.
 - Image file in an NFS share
Use the Mount agent to monitor the image file.
 - Image file in a ZFS volume
Use the Mount and Zpool agents to monitor the image file.
 - Image file in a partition of a physical disk
Use the Mount and Disk agents to monitor the image file.

Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Starts the LDom.
Offline	Stops the LDom.
Monitor	Monitors the status of the LDom.
Clean	Stops the LDom forcefully.
Action	<ul style="list-style-type: none">■ vmreservation The action entry point reserves CPU and Memory for the LDom. This entry point is used by the Policy Master for AWM when a Load value is configured for the LDomsvM VFrame object. Before the LDom is brought online, the Policy Master invokes this entry point to reserve CPU and Memory for the LDom. If this operation fails, the online operation will not execute. Internal use only.

State definitions

ONLINE	Indicates that the LDom is up and running.
OFFLINE	Indicates that the LDom is down.
FAULTED	Indicates that the LDOM is down when the Policy Master expects it to be up and running. If the MonitorCPU attribute is set to true (1), CPU usage of either 0% or 100% is interpreted as a fault.
UNKNOWN	Indicates the agent cannot determine the LDom's state. A configuration problem likely exists in the resource or the LDom.

Attributes for Solaris

Table 5-3 Required attributes for Solaris

Required attribute	Description
LDomName	<p>The name of the LDom that you want to monitor.</p> <p>Type-dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: "ldom1"</p>

Table 5-4 Optional attributes for Solaris

Optional attribute	Description
CfgFile	<p>The absolute location of the XML file that contains the LDom configuration. The online agent function uses this file to create LDoms as necessary.</p> <p>Refer to the <code>ldm(1M)</code> man page for information on this file.</p> <p>To create the configuration file for an LDom, run the following command:</p> <pre>\$ ldm list-constraints -x ldom_name > ldom_name.xml</pre> <p>The configuration file must be present locally on all of the systems or on a shared disk where it is accessible by all of the systems</p> <p>Type-dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: "/root/ldom-cfg/ldom1.xml"</p>

Table 5-4 Optional attributes for Solaris

Optional attribute	Description
MonitorCPU	<p>Specifies whether the LDom agent monitors the CPU usage of the LDom.</p> <p>If the CPU usage of all of the VCPUs attached to the LDom is equal to either 0% or 100%, then the resource is declared <code>FAULTED</code>.</p> <p>For an LDom with one VCPU, set this attribute to 0. This setting is to work around an LDom limitation where an LDom with one VCPU always reports CPU usage of 100%.</p> <p>Type-dimension: boolean-scalar</p> <p>Default: 1</p>

You cannot modify the following internal attributes. You can modify the values at the pframe or vframe levels depending on the attribute. For more information, refer to the *Veritas Cluster Server One User's Guide* in the Virtualization chapter.

Table 5-5 Internal attributes

Internal attribute	Description
ConfigureNetwork	<p>Determines whether (1) or not (0) the LDom agent configures the <code>network-boot-arguments PROM</code> variable of the guest domain. Only valid if the <code>LDomsVM:NetworkDetails</code> attribute of the vframe object is properly configured.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.FirstLocalOnline}</code></p>

Table 5-5 Internal attributes

Internal attribute	Description
DNS	<p>The agent sets the value of this attribute to the <code>name-servers</code> key of the <code>network-boot-arguments</code> PROM variable of the LDom during online operation.</p> <p>Use the LDom's VM vframe object's <code>NetworkDetails</code> attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.LDomsVM:NetworkDetails%DNS}</code></p>
Gateway	<p>The agent sets the value of this attribute to the <code>router-ip</code> key of the <code>network-boot-arguments</code> PROM variable of the LDom during online operation.</p> <p>Use the LDom's VM VFrame object's <code>NetworkDetails</code> attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.LDomsVM:NetworkDetails%Gateway}</code></p>
IPAddress	<p>The agent sets the value of this attribute to the <code>host-ip</code> key of the <code>network-boot-arguments</code> PROM variable of the LDom during online operation.</p> <p>Use the LDom's VM VFrame object's <code>NetworkDetails</code> attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.LDomsVM:NetworkDetails%IPAddress}</code></p>

Table 5-5 Internal attributes

Internal attribute	Description
Netmask	<p>The agent sets the value of this attribute to the <code>subnet-mask</code> key of the <code>network-boot-arguments</code> PROM variable of the LDom during online operation.</p> <p>Use the LDom's VM VFrame object's <code>NetworkDetails</code> attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar Default: <code>@{vframe.LDomsVM:NetworkDetails%Netmask}</code></p>
UpdatePMDetails	<p>Determines whether (1) or not (0) the agent updates the Policy Master configuration after a disaster recovery failover.</p> <p>The update consists of the values in the LDom's VM vframe object's <code>NetworkDetails</code> attribute.</p> <p>Use the LDom's VM vframe object's <code>PropagatePMDetails</code> attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar Default: <code>@{vframe.LDomsVM:PropagatePMDetails}</code></p>

WPAR agent

The WPAR agent brings online, takes offline, and monitors workload partitions. You can use the agent to make WPARs highly available and to monitor them.

This agent is WPAR-aware. The ContainerOpts resource type attribute for this type has a default value of 0 for RunInContainer and a default value of 1 for PassCInfo. Symantec recommends that you do not change the values for these keys. Refer to the *Veritas Cluster Server One User's Guide* for more information.

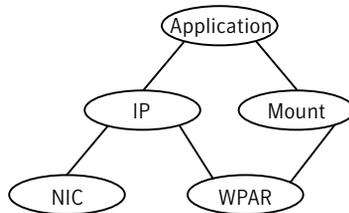
Platforms

AIX

Dependencies

No dependencies exist for the WPAR resource.

Figure 5-6 Sample service group that includes a WPAR resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Brings a WPAR up and running.
Offline	Takes a WPAR down gracefully.
Monitor	Checks if the specified WPAR is up and running.
Clean	Another attempt to bring down a WPAR forcefully.

Attributes

Table 5-6 Optional attributes for AIX

Optional attribute	Description
ShutdownGracePeriod	<p>Allows the root user to set the number of seconds before the shut down of a WPAR.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 90</p> <p>Note: Offline fails if the value of this attribute is 0 as the WPAR takes some time to shut down fully.</p> <p>Example: 10</p>
ResourceSet	<p>A resource set is used to define a subset of processors in the system. If a resource set is specified for a workload partition, it can use the processors within the specified resource set only. The value of the ResourceSet attribute is the name of the resource set created using the <code>mkrset</code> command. If set, the agent configures the WPAR to use only the resource set specified by this attribute.</p> <p>Type and dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: ResourceSet = myrset</p>

Table 5-6 Optional attributes for AIX

Optional attribute	Description
DROpts	<p>The value of this attribute consists of the following keys that define the disaster recovery (DR) options for the WPAR.</p> <ul style="list-style-type: none"> ■ DNSDomain The domain name to use within the WPAR at this site. ■ DNSSearchPath The domain search path used by this WPAR at this site. ■ DNSServers The list of DNS servers used by this WPAR at this site. ■ Gateway The default Gateway used by this WPAR at this site. <p>In a DR configuration, if one or more of these keys are set, the resource is considered to be DR-enabled. If all the keys stay at their default value (""), then the resource is not DR-enabled even if it is in a disaster recovery configuration.</p> <p>Type and dimension: string-association</p> <p>Default: ""</p>

Sample configuration

```
<attribute name="ContainerInfo">
  <val key="Name">"wp1"</val>
  <val key="Type">"WPAR"</val>
  <val key="Enabled">"1"</val>
</attribute>
```

For more information about configuring WPARs, refer to *Veritas Cluster Server Administrator's Guide*.

ESXVM agent

The ESXVM agent brings online, takes offline, and monitors virtual machines that are configured on the ESX/ESXi Server host.

For more information about the ESXVM attribute, see *Veritas Cluster Server One User's Guide*.

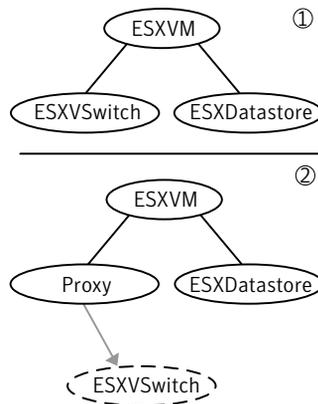
Platforms

ESX

Dependencies

The ESXVM resource can directly depend on the ESXVSwitch resource and the ESXDatastore resource. The ESXVM resource can alternatively depend on Proxy resources that are configured for the ESXVSwitch resource, the ESXDatastore resource, or both. When the ESXVM resource depends on the Proxy resources, the actual resources are configured as resources in another service group or in another VFrame.

Figure 5-7 Sample service group for an ESXVM resource. In (1) a direct dependency exists. In (2), the ESXVM resource depends on Proxy resources that proxy for the ESXVSwitch resource and ESXDatastore resource respectively



Agent functions

The value of the Operations attribute for this agent is OnOff. The ESXVM agent has the following agent functions:

Online	Registers the virtual machine on the system if it is not already registered. Powers on the virtual machine.
Offline	If VMware Tools is running, the agent attempts a graceful shutdown of the virtual machine's operating system. If VMware Tools is not running, the agent powers off the virtual machine.
Clean	Forcefully powers off the virtual machine.
Monitor	Monitors the virtual machine's state. It can also monitor the guest operating system's state if the value of the MonitorHB attribute is 1.

State definitions

The ESXVM agent has the following state definitions:

ONLINE	<p>Indicates that the virtual machine is powered on. Can also indicate that VMware Tools has a heartbeat when the value of the MonitorHB attribute is 1 and VMware Tools is running.</p> <p>The resource can remain online with a low confidence level when the value of the MonitorHB attribute is 1 in the following situations:</p> <ul style="list-style-type: none">■ VMware Tools has intermittent heartbeat■ VMware Tools has never run
OFFLINE	Indicates that the virtual machine is powered off or suspended.
UNKNOWN	Indicates that the agent cannot determine the virtual machine's state. This can be due to a problem with the configuration of the resource's required attributes or the agent is unable to connect to ESX web services.
FAULTED	<p>Indicates a FAULTED state when the resource moved from an ONLINE state in the following situations:</p> <ul style="list-style-type: none">■ The virtual machine is powered off or suspended.■ The value of the MonitorHB attribute is 1; the virtual machine is powered on; and VMware Tools does not have a heartbeat or VMware Tools is stopped.

Attributes

The ESXVM agent has the following attributes:

Table 5-7 Required attribute

Required attribute	Description
PathName	<p>The PathName attribute is the datastore path to the virtual machine. The format of the path is "[datastore] vm-folder/vmx-file". Note that a space comes after the closing bracket of the datastore name. This value must be same as summary.config.vmPathName property of the virtual machine.</p> <p>Type and dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: "[shared1] vm1/vm1.vmx"</p>

Table 5-8 Optional attributes

Optional attributes	Description
MonitorHB	<p>The MonitorHB attribute enables heartbeat monitoring for a virtual machine. When the value of this attribute is 1, the agent detects a heartbeat failures of the virtual machine and flags it as a fault.</p> <p>The virtual machine must have VMware Tools configured and running inside of the virtual machine when the value of this attribute is 1.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>

Table 5-8 Optional attributes

Optional attributes	Description
VMName	<p>The VMName attribute is the name assigned to the virtual machine while registering the virtual machine. If you do not set this attribute, the display name of the virtual machine does not change.</p> <p>Type and dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: vm1</p>

You cannot modify the following internal attributes. You can modify the values at the pframe or vframe levels depending on the attribute. For more information, refer to the *Veritas Cluster Server One User's Guide* in the Virtualization chapter.

Table 5-9 Internal attributes

Internal attributes	Description
DNS	<p>A comma-separated list of the domain name services of the virtual machine.</p> <p>Use the ESXVM VFrame object's NetworkDetails attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.ESXVM:NetworkDetails%DNS}</code></p>
ESXHostName	<p>The ESXHostName attribute is the name of the ESX Server that the virtual machine belongs to.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{pframe.ESXServer:HealthCheckIPs%IP1}</code></p>

Table 5-9 Internal attributes

Internal attributes	Description
ESXUser	<p>The name of the user who logs in to the Web service that runs on the ESX/ESXi Server. While the default value of the User attribute is root, Symantec recommends to set this value to a non-root user who has the Administrator role.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{pframe.ESXServer:User}</code></p>
ESXPassword	<p>The encrypted password for user who you have specified in the User attribute. When you specify this value in the VCS One console, it automatically encrypts.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{pframe.ESXServer>Password}</code></p>
OtherNetDetails	<p>Network details of the secondary networks of the virtual machine. Use the ESXVM VFrame object's OtherNetDetails attribute to edit the value of this attribute.</p> <p>Do not edit this attribute directly.</p> <p>Each attribute takes its string value with the following format.</p> <p><i>NIC, IP Address, Netmask, Gateway</i></p> <p>For example:</p> <pre>eth1,192.168.2.190,255.255.255.0,10.182.144.1</pre> <p>You can leave the gateway unspecified.</p> <p>For example:</p> <pre>eth2,192.168.2.191,255.255.240.0</pre> <p>Type and dimension: string-scalar</p> <p>Default:</p> <pre>@{vframe.ESXVM:OtherNetDetails%VMNetwork2} @{vframe.ESXVM:OtherNetDetails%VMNetwork3} @{vframe.ESXVM:OtherNetDetails%VMNetwork4}</pre>

Table 5-9 Internal attributes

Internal attributes	Description
Gateway	<p>The gateway of the virtual machine.</p> <p>Use the ESXVM VFrame object's NetworkDetails attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.ESXVM:NetworkDetails%Gateway}</code></p>
IPAddress	<p>The IP address of the virtual machine</p> <p>Use the ESXVM VFrame object's NetworkDetails attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.ESXVM:NetworkDetails%IPAddress}</code></p>
Netmask	<p>The netmask of the virtual machine.</p> <p>Use the ESXVM VFrame object's NetworkDetails attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.ESXVM:NetworkDetails%Netmask}</code></p>
NIC	<p>Linux: The name of the virtual machine.</p> <p>Windows: The MAC address.</p> <p>Use the ESXVM VFrame object's NetworkDetails attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.ESXVM:NetworkDetails%NIC}</code></p>

Table 5-9 Internal attributes

Internal attributes	Description
UpdatePMDetails	<p>Determines whether (1) or not (0) the agent updates the Policy Master configuration after a disaster recovery failover.</p> <p>The update consists of the values in the ESXVM vframe object's NetworkDetails attribute.</p> <p>Use the ESXVM vframe object's PropagatePMDetails attribute to edit the value of this attribute. You may not edit this attribute directly.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.ESXVM:PropagatePMDetails}</code></p>
ConfigureNetwork	<p>Determines whether (1) or not (0) the ESXVM agent configures the VM network guestinfo variables.</p> <p>Only valid if the ESXVM:NetworkDetails attribute of the vframe is properly configured.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>@{vframe.FirstLocalOnline}</code></p>

ESXVSwitch agent

The ESXVSwitch agent monitors a virtual switch on an ESX/ESXi Server.

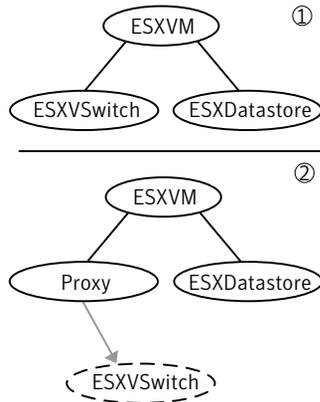
Platforms

ESX

Dependencies

The ESXVSwitch resource has no dependencies.

Figure 5-8 Sample service group for an ESXVSwitch resource. In (1) a direct dependency exists. In (2), the ESXVM resource depends on Proxy resources that proxy for the ESXDatastore resource and ESXVSwitch resources respectively



Agent functions

The value of the Operations attribute for this agent is None. The ESXVSwitch agent has the following agent functions:

Monitor	The agent performs a hardware link test. It returns online if any of the switch's links are up.
---------	---

State definitions

The ESXVSwitch agent has the following state definitions:

ONLINE	Indicates that the virtual switch is working.
UNKNOWN	Indicates the agent cannot determine the virtual switch's interface states. This state may be due to an incorrect configuration.
FAULTED	Indicates that all the links for the virtual switch are down or no physical NIC is connected to the virtual switch.

Attributes

The ESXVSwitch agent has the following attributes:

Table 5-10 Required attribute

Required attribute	Description
VSName	<p>The VSName attribute is the name of the virtual switch that you want to monitor. The agent returns an ONLINE state if any one of the switch's links are up.</p> <p>Type and dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: vSwitch0</p>

Table 5-11 Optional attribute

Optional attribute	Description
IsDistributed	<p>Enable this attribute only if you have configured a distributed virtual switch.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

You cannot modify the following internal attributes. You can modify the values at the pframe or vframe levels depending on the attribute. For more information, refer to the *Veritas Cluster Server One User's Guide* in the Virtualization chapter.

Table 5-12 Internal attribute

Internal attribute	Description
ESXHostName	<p>The ESXHostName attribute is the name of the ESX Server that the virtual switch belongs to.</p> <p>Type and dimension: string-scalar</p> <p>Default: @ {pframe . ESXServer : HealthCheckIPs%IP1}</p>
ESXUser	<p>The name of the user who logs in to the Web service that runs on the ESX/ESXi Server. While the default value of the User attribute is root, Symantec recommends to set this value to a non-root user who has the Administrator role.</p> <p>Type and dimension: string-scalar</p> <p>Default: @ {pframe . ESXServer : User}</p>
ESXPassword	<p>The encrypted password for user who you have specified in the User attribute. When you specify this value in the VCS One console, it automatically encrypts.</p> <p>Type and dimension: string-scalar</p> <p>Default: @ {pframe . ESXServer : Password}</p>

ESXDatastore agent

The ESXDataStore agent brings online, takes offline, and monitors datastores that are configured on the ESX/ESXi Servers.

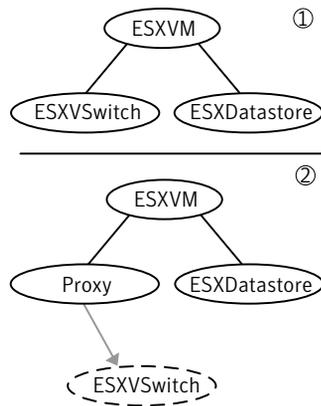
Platforms

ESX

Dependencies

The ESXDatastore resource has no dependencies.

Figure 5-9 Sample service group for an ESXDatastore resource. In (1) a direct dependency exists. In (2), the ESXVM resource depends on a Proxy resource that proxies for the ESXVSwitch resource and the ESXDatastore resource



Agent functions

The value of the Operations attribute for this agent is OnOff. The ESXDatastore agent has the following agent functions:

- Monitor** The agent monitors the datastore to see if it is accessible when the resource is brought online.
- Online** The agent refreshes the storage and rescans the VMFS and all HBAs if the datastore is not accessible.

Offline The offline agent function serves as a dummy function, and performs no action.

State definitions

The ESXDatastore agent has the following state definitions:

ONLINE Indicates that a refresh on the datastore succeeds and the value of the `summary.accessible` property is true after the agent's online function has run.

OFFLINE Indicates that the resource is supposed to be in OFFLINE state.

UNKNOWN Indicates the agent cannot determine the datastore's state. This state may be due to an incorrect configuration.

FAULTED Indicates the datastore is not visible or is not accessible.

Attributes

The ESXDatastore agent has the following attributes:

Table 5-13 Required attribute

Required attribute	Description
DSName	The DSName attribute is the name of the datastore that you want to monitor. Type and dimension: string-scalar Default: n/a Example: storage1

You cannot modify the following internal attributes. You can modify the values at the vframe or vframe levels depending on the attribute. For more

information, refer to the *Veritas Cluster Server One User's Guide* in the Virtualization chapter.

Table 5-14 Internal attribute

Internal attribute	Description
ESXHostName	<p>The ESXHostName attribute is the name of the ESX Server that the datastore belongs to.</p> <p>Type and dimension: string-scalar</p> <p>Default: @ {pframe . ESXServer : HealthCheckIPs%IP1}</p>
ESXUser	<p>The name of the user who logs in to the Web service that runs on the ESX/ESXi Server. While the default value of the User attribute is root, Symantec recommends to set this value to a non-root user who has the Administrator role.</p> <p>Type and dimension: string-scalar</p> <p>Default: @ {pframe . ESXServer : User}</p>
ESXPassword	<p>The encrypted password for user who you have specified in the User attribute. When you specify this value in the VCS One console, it automatically encrypts.</p> <p>Type and dimension: string-scalar</p> <p>Default: @ {pframe . ESXServer : Password}</p>

File service agents

This chapter contains:

- [“About the file service agents”](#) on page 199
- [“About the Samba agents”](#) on page 200
- [“NetBIOS agent”](#) on page 202
- [“SambaServer agent”](#) on page 205
- [“SambaShare agent”](#) on page 209

About the file service agents

Use the file service agents to provide high availability for file share resources.

About the Samba agents

Samba is a suite of programs that allows a system running a UNIX or UNIX-like operating system to provide services using the Microsoft network protocol. Samba supports the following services:

- Filespace
- Printer
- WINS
- Domain Master

Configure these services in the Samba configuration file (`smb.conf`). Samba uses two processes: `smbd` and `nmbd` to provide these services.

VCS One provides Samba failover using three agents: `SambaServer`, `NetBios`, and `SambaShare`.

Platforms

AIX, Linux, Solaris

The Samba agents

- The `NetBios` agent
- The `SambaServer` agent
- The `SambaShare` agent

Before using the Samba agents

- Verify that `smbd` and `nmbd` always run as daemons. Verify that they cannot be started using the meta-daemon `inetd`.
- Verify that the `smbd` and `nmbd` daemons are in the path environment variable.
- If they are not, verify that they run from the default directory `/usr/bin` /`usr/sbin`.
 - AIX: The path of `smbd` and `nmbd` is `/usr/local/samba/sbin`.
 - Linux: The path of `smbd` and `nmbd` is `/usr/sbin`.
 - Solaris: The path of `smbd` and `nmbd` is `/usr/sfw/sbin`.
- Verify that Samba is configured properly and that the Samba configuration file is identical on all cluster systems. The user can replicate the file or store it on a shared disk accessible from all cluster systems.

- If configuring Samba as a WINS server or Domain Master, verify that the Samba lock directory is on the shared disk. This ensures that the WINS server database and Domain Master are created on the shared disk.

Supported versions

VCS supports most versions of Samba that are bundled with supported operating systems. For operating systems that do not come bundled with Samba, VCS supports most versions that are compatible with the operating system.

Note: If you install Samba on AIX 6.1, the AIX 5.3 version is binary compatible.

Configuring the Samba agents

If Samba is configured properly, and the configuration file is identical on all cluster systems, configure resources of type SambaServer and NetBios only. This ensures that all shares in the Samba configuration file are failed over when the SambaServer resource fails over. Note that the Samba shares are not monitored. To monitor the Samba shares, configure the agents with the following dependencies:

```
SambaShare requires NetBios
SambaShare requires SambaServer
NetBios requies IP
```

For example, use the following configuration to monitor Samba shares SambaShare1 and SambaShare2. Use multiple resources of type SambaShare (if necessary), but only one resource each of type NetBios and SambaServer.

```
SambaShare1 requires NetBios1
SambaShare1 requires SambaServer1
SambaShare2 requires NetBios1
SambaShare2 requires SambaServer1
NetBios1 requies IP_1
```

NetBIOS agent

The NetBIOS agent starts, stops, and monitors the nmbd daemon. Only one resource of this type is permitted. You can use the agent to make the nmbd daemon highly available or to monitor it.

The agent sets, monitors, and resets the names and network interfaces by which the Samba server is known. The agent also sets, monitors and resets Samba to act as a WINS server or domain master or both.

Note that nmbd broadcasts the NetBIOS name, or the name by which the Samba server is known in the network.

Before using this agent:

- Set the NetBIOS name.
- Set the NetBIOS interface.

Platforms

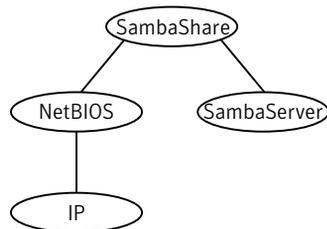
AIX, Linux, Solaris

Dependencies

The NetBios resource depends on the IP or the IPMultiNICB resource.

Note: You can configure only one NetBios resource on a system.

Figure 6-1 Sample service group that includes a NetBIOS resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

State definitions

ONLINE	Indicates that the specified NetBIOS aliases are advertised and that Samba is handling requests for all specified network interfaces. Indicates that WINS and Domain support services are running, if configured.
OFFLINE	Indicates one or more of the following: <ul style="list-style-type: none"> ■ NetBIOS name is not advertised. ■ A NetBIOS alias is not advertised. ■ Samba is not handling requests on one of the specified interfaces. ■ If WINS support is configured, Samba is not providing WINS service. ■ If domain support is set, Samba is not providing Domain Master service.
UNKNOWN	Indicates that the agent could not determine the state of the resource.

Attributes

Table 6-1 Required attributes

Required attribute	Description
NetBiosName	Name by which the Samba server is known in the network. Type and dimension: string-scalar

Table 6-2 Optional attributes

Optional attribute	Description
Interfaces	List of network interfaces on which Samba handles browsing. Type and dimension: string-vector Example: 172.29.9.24/16

Table 6-2 Optional attributes

Optional attribute	Description
NetBiosAliases	<p>List of additional names by which the Samba server is known in the network.</p> <p>Type and dimension: string-vector</p> <p>Example: host1_samba, myname</p>
WinsSupport	<p>If set to 1, this flag causes the agent to configure Samba as a WINS server.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Sample configuration

```

<resources>
  <resource name="samba_netbios" type="NetBios">
    <attribute name="DomainMaster"><scalar>1</scalar>
    </attribute>
    <attribute name="Interfaces">
      <val>"172.16.7.53/24"</val>
      <val>"172.16.7.54/255.255.255.0"</val>
    </attribute>
    <attribute name="NetBiosAliases">
      <val>"samba1"</val>
      <val>"samba2"</val>
    </attribute>
    <attribute name="NetBiosName"><scalar>"sambaX"</scalar>
    </attribute>
    <attribute name="SambaServerRes"><scalar>"SG.samba_server"
    </scalar></attribute>
  </resource>
</resources>

```

SambaServer agent

The SambaServer agent starts, stops, and monitors the `smbd` process as a daemon. Only one resource of this type is permitted. You can use the agent to make a `smbd` daemon highly available or to monitor it.

The `smbd` daemon provides Samba share services. The agent makes a copy of `smbd` for each client and verifies that Samba is running by reading the `pid` of this daemon. The agent can perform in-depth monitoring by establishing a socket connection to Samba at ports where the daemon is listening and sending it a NetBIOS session request.

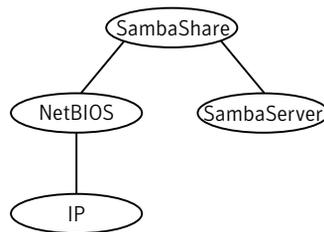
Platforms

AIX, Linux, Solaris

Dependencies

No dependencies exist for the SambaServer resource. You can configure only one SambaServer resource on a node.

Figure 6-2 Sample service group that includes a SambaServer resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Starts the <code>smbd</code> daemon at specified or default ports.
Offline	Stops the <code>smbd</code> daemon.
Monitor	Verifies that the <code>smbd</code> daemon is running by reading its <code>pid</code> file. Does in-depth monitoring periodically, if configured, by establishing a socket connection to Samba and sending it a NetBIOS session request.
Clean	Stops the <code>smbd</code> daemon.

State definitions

ONLINE	Indicates that the smbd daemon is running. If in-depth monitoring is configured, it indicates that a positive session response packet was received through a socket connection to the Samba server.
OFFLINE	Indicates that smbd is not running. If in-depth monitoring is enabled, it indicates that the agent could not establish a socket connection with the server, or that it received an incorrect response packet header, or the session response packet connection timed out.
UNKNOWN	Indicates that the agent could not determine the state of the resource.

Attributes

Table 6-3 Required attributes

Required attribute	Description
ConfFile	Complete path of the configuration file that Samba uses. Type and dimension: string-scalar Example: /etc/samba/smb.conf Example: "/etc/sfw/smb.conf" Example: "/etc/opt/samba/smb.conf" Example: "/etc/samba/smb.conf"
LockDir	Lock directory of Samba. Samba stores the files smbd.pid, nmbd.pid, wins.dat (WINS database), and browse.dat (master browser database) in this directory. Type and dimension: string-scalar Example: /var/run

Table 6-4 Optional attributes

Optional attribute	Description
IndepthMonitorCyclePeriod	Number of monitor cycles after which the in-depth monitoring is performed. For example, the value 5 indicates that the agent monitors the resource in-depth every five monitor cycles. The value 0 indicates that the agent will not perform in-depth monitoring for the resource. Type and dimension: integer-scalar Default: 5

Table 6-4 Optional attributes

Optional attribute	Description
Ports	<p>Ports where Samba accepts connections.</p> <p>To run Samba over NBT (NetBios over TCP/IP), set this attribute to 139. To run Samba directly over TCP/IP, set this attribute to 445.</p> <p>For Samba version less than 3.0, exactly one value must be provided.</p> <p>Type and dimension: integer-vector</p> <p>Default: 139, 445</p>
ResponseTimeout	<p>Number of seconds the agent waits to receive the session response packet after sending the session request packet. For example, the value 5 indicates that the agent waits for five seconds before receiving the session response packet. Configure this attribute if in-depth monitoring is enabled.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 10</p>

Sample configurations

```

<resources>
  <resource name="smb_res1" type="SambaServer">
    <attribute name="ConfFile"><scalar>"/etc/samba/smb.conf"
    </scalar></attribute>
    <attribute name="LockDir"><scalar>"/var/run"</scalar>
    </attribute>
  </resource>
</resources>

```

SambaShare agent

The SambaShare agent adds, removes, and monitors a share by modifying the specified Samba configuration file. You can use the agent to make a Samba Share highly available or to monitor it.

Each filesystem or printer service provided by Samba is a shared resource and is defined as a section in the Samba configuration file. The section name is the name of the shared resource and the section parameters define the share attributes.

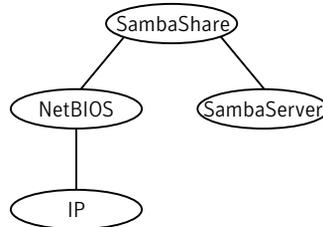
Platforms

AIX, Linux, Solaris

Dependencies

SambaShare resources depend on SambaServer, NetBios and Mount resources.

Figure 6-3 Sample service group for a SambaShare resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Edits the samba configuration file and adds the shares.
Offline	Removes the shares from the configuration file.
Monitor	Issues the command <code>smbclient</code> to check if the specified shares exist.
Clean	Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.

State definitions

ONLINE	Indicates that the share is available and that the share path exists.
OFFLINE	Indicates that the share is not available, or that the share has a non-existent path.
UNKNOWN	Indicates that the agent could not determine the state of the resource.

Attributes

Table 6-5 Required attributes

Required attribute	Description
SambaServerRes	Name of the SambaServer resource. Type and dimension: string-scalar Example: SG.smb_res1 Where SG is the service group to which the resource smb_res1 belongs.
ShareName	Name of the share resource. Type and dimension: string-scalar Example: share1
ShareOptions	List of parameters for the share attributes. These parameters are specified as name=value pairs, with each pair separated by a semicolon (;). Type and dimension: string-scalar Example: path=/shared; public=yes; writable=yes

Storage agents

This chapter contains:

- [“About the storage agents”](#) on page 211
- [“DiskGroup agent”](#) on page 212
- [“Volume agent”](#) on page 229
- [“Disk agent”](#) on page 233
- [“LVMVG agent”](#) on page 235
- [“LVMCombo agent”](#) on page 245
- [“LVMLogicalVolume agent”](#) on page 248
- [“LVMVolumeGroup agent”](#) on page 253
- [“NetAppFiler agent”](#) on page 257
- [“NetAppExport agent”](#) on page 262
- [“Mount agent”](#) on page 281
- [“Zpool agent”](#) on page 312

About the storage agents

Use storage agents to provide high availability for storage resources.

DiskGroup agent

The DiskGroup agent brings online, takes offline, and monitors Veritas Volume Manager (VxVM) disk groups. This agent uses VxVM commands. You can use this agent to monitor or make disk groups highly available.

When the value of the StartVolumes and StopVolumes attribute is 1, the DiskGroup agent brings the volumes online and takes them offline during the import and deport operations of the disk group.

For important information on this agent, refer to:

“[DiskGroup agent notes](#)” on page 227

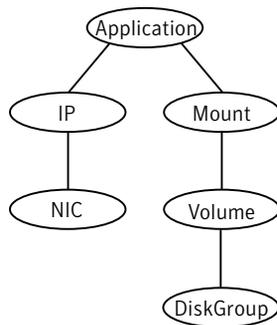
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

The DiskGroup resource has no required resources.

Figure 7-1 Sample service group that includes a DiskGroup resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online Imports the disk group using the `vxchg` command.

Offline Deports the disk group using the `vxchg` command.

Monitor	<p>Determines if the disk group is online or offline using the <code>vxdg</code> command. The Monitor function changes the value of the VxVM <code>noautoimport</code> flag from off to on. This action allows VCS One to maintain control of importing the disk group. The following command changes the <code>autoimport</code> flag back to on:</p> <pre># vxdg -g disk_group set autoimport=yes</pre>
Clean	<p>Terminates all ongoing resource actions and takes the resource offline—forcibly when necessary.</p>
Info	<p>The DiskGroup info agent function gets information from the Volume Manager and displays the type and free size for the DiskGroup resource.</p> <p>Initiate the info agent function by setting the <code>InfoInterval</code> timing to a value greater than 0.</p> <p>In the following example, the info agent function executes every 60 seconds:</p> <pre># hatype -modify DiskGroup InfoInterval 60</pre> <p>The command to retrieve information about the <code>DiskType</code> and <code>FreeSize</code> of the DiskGroup resource is:</p> <pre># hares -value diskgroupres ResourceInfo</pre> <p>Output includes for AIX, Linux, and Solaris:</p> <pre>DiskType sliced FreeSize 35354136</pre> <p>Output includes HP-UX:</p> <pre>DiskType auto:cdsdisk FreeSize 12765712</pre>

State definitions

ONLINE	Indicates that the disk group is imported.
OFFLINE	Indicates that the disk group is not imported.
FAULTED	Indicates that the disk group has unexpectedly deported or become disabled.
UNKNOWN	Indicates that a problem exists either with the configuration or the ability to determine the status of the resource.

Attributes for AIX

Table 7-1 Required attributes for AIX

Required attribute	Description
DiskGroup	Name of the disk group that is configured with Veritas Volume Manager. Type and dimension: string-scalar Example: diskgroup1

Table 7-2 Optional attributes for AIX

Optional attributes	Description
StartVolumes	If the value of this attribute is 1, the DiskGroup online function starts all volumes belonging to that disk group after importing the group. Type and dimension: string-scalar Default: 1
StopVolumes	If the value of this attribute is 1, the DiskGroup offline function stops all volumes belonging to that disk group before it deports the group. Type and dimension: string-scalar Default: 1

Table 7-2 Optional attributes for AIX

Optional attributes	Description
UmountVolumes	<p>This attribute enables the DiskGroup resource to forcefully go offline even if open volumes are mounted outside of VCS One control. When the value of this attribute is 1 and the disk group has open volumes, the following occurs:</p> <ul style="list-style-type: none">■ The agent attempts to unmount the file systems on open volumes. If required, the agent attempts to kill all VCS One managed and un-managed applications using the file systems on those open volumes.■ The agent attempts to forcefully unmount the file systems to close the volumes. <p>Type and dimension: integer-scalar Default: 0</p>
Reservation	<p>If the value of the attribute is set to SCSI-3, the disk group is imported with a SCSI-3 reservation. This action requires that the disks support SCSI-3. SCSI-3 reservations ensure that I/O happens only from the node that holds the SCSI-3 reservation. If the value of the attribute is set to NONE, the disk group is imported without reservation.</p> <p>Do not modify the value of this attribute when the resource is ONLINE.</p> <p>Type and dimension: string-scalar Default: NONE Examples: NONE orSCSI3</p>
MonitorReservation	<p>If the value of this attribute is 1, and SCSI-3 fencing is used, the agent monitors the SCSI reservation on the disk group. If the reservation is missing, the Monitor agent function takes the resource offline.</p> <p>Type and dimension: boolean-scalar Default: 0</p>

Table 7-2 Optional attributes for AIX

Optional attributes	Description
NumThreads	<p>The number of threads that are used within the agent process for managing resources. This number does not include the number of threads that are used for other internal purposes.</p> <p>Symantec recommends that you set the value of the NumThreads attribute to 1. Setting this attribute to a higher value may result in agent function timeouts due to serialization of underlying commands.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>

Table 7-2 Optional attributes for AIX

Optional attributes	Description
PanicSystemOnDGLoss	<p>Determines whether to panic the node if the disk group becomes disabled. A loss of storage connectivity can cause the disk group to become disabled.</p> <p>If the value of this attribute is 1 and the disk group becomes disabled, the node panics.</p> <p>If PanicSystemOnDGLoss is set to 1, and the Monitor agent function (entry point) hangs a consecutive number of times per the value of the FaultOnMonitorTimeouts attribute, then the node panics.</p> <p>Note: System administrators may want to set a high value for FaultOnMonitorTimeout to increase system tolerance.</p> <p>If the value of the attribute is 0 and the disk group becomes disabled, the following occurs:</p> <ul style="list-style-type: none"> ■ If the cluster has I/O fencing enabled, the DiskGroup resource is marked <code>FAULTED</code>. This state results in the agent attempting to take the service group offline. As part of bringing the DiskGroup resource offline, the agent attempts to deport the disabled disk group. Even if disabled disk group fails to deport, the DiskGroup resource enters a <code>FAULTED</code> state. This state enables the failover of the service group that contains the resource. To fail back the DiskGroup resource, manually deport the disk group after restoring storage connectivity. ■ If the cluster does not use I/O fencing, a message is logged and the resource is reported <code>ONLINE</code>. The resource is reported <code>ONLINE</code> so that it does not fail over, which ensures data integrity. <p>Note: The PanicSystemOnDGLoss attribute does not depend on the MonitorReservation attribute.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>
MonitorOnly	Do not use. For internal use only.

Attributes for HP-UX

Table 7-3 Required attributes for HP-UX

Required attribute	Description
DiskGroup	<p>Name of the disk group that is configured with Veritas Volume Manager.</p> <p>Type and dimension: string-scalar</p> <p>Example: "diskgroup1"</p>

Table 7-4 Optional attributes for HP-UX

Optional attributes	Description
MonitorReservation	<p>If the value is 1, and SCSI-3 fencing is used, the agent monitors the SCSI reservation on the disk group. If the reservation is missing, the Monitor agent function takes the resource offline.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Table 7-4 Optional attributes for HP-UX

Optional attributes	Description
PanicSystemOnDGLoss	<p>Determines whether to panic the node if the disk group becomes disabled. A loss of storage connectivity can cause the disk group to become disabled.</p> <p>If the value of this attribute is 1 and the disk group becomes disabled, the node panics.</p> <p>If PanicSystemOnDGLoss is set to 1, and the Monitor agent function (entry point) hangs a consecutive number of times per the value of the FaultOnMonitorTimeouts attribute, then the node panics.</p> <p>Note: System administrators may want to set a high value for FaultOnMonitorTimeout to increase system tolerance.</p> <p>If the value of the attribute is 0 and the disk group becomes disabled, the following occurs:</p> <ul style="list-style-type: none"> ■ If the cluster has I/O fencing enabled, the DiskGroup resource is marked <code>FAULTED</code>. This state results in the agent attempting to take the service group offline. As part of bringing the DiskGroup resource offline, the agent attempts to deport the disabled disk group. Even if disabled disk group fails to deport, the DiskGroup resource enters a <code>FAULTED</code> state. This state enables the failover of the service group that contains the resource. To fail back the DiskGroup resource, manually deport the disk group after restoring storage connectivity. ■ If the cluster does not use I/O fencing, a message is logged and the resource is reported <code>ONLINE</code>. The resource is reported <code>ONLINE</code> so that it does not fail over, which ensures data integrity. <p>Note: The PanicSystemOnDGLoss attribute does not depend on the MonitorReservation attribute.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>
StartVolumes	<p>If value is 1, the DiskGroup online function starts all volumes belonging to that disk group after importing the group.</p> <p>Type and dimension: string-scalar</p> <p>Default: 1</p>

Table 7-4 Optional attributes for HP-UX

Optional attributes	Description
StopVolumes	<p>If value is 1, the DiskGroup offline function stops all volumes belonging to that disk group before it deports the group.</p> <p>Type and dimension: string-scalar</p> <p>Default: 1</p>
UmountVolumes	<p>This attribute enables the DiskGroup resource to forcefully go offline even if open volumes are mounted outside of VCS One control. When the value of this attribute is 1 and the disk group has open volumes, the following occurs:</p> <ul style="list-style-type: none"> ■ The agent attempts to unmount the file systems on open volumes. If required, the agent attempts to kill all VCS One managed and un-managed applications using the file systems on those open volumes. ■ The agent attempts to forcefully unmount the file systems to close the volumes. <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>
Reservation	<p>If the value of the attribute is set to SCSI-3, the disk group is imported with a SCSI-3 reservation. This action requires that the disks support SCSI-3. SCSI-3 reservations ensure that I/O happens only from the node that holds the SCSI-3 reservation. If the value of the attribute is set to NONE, the disk group is imported without reservation.</p> <p>Do not modify the value of this attribute when the resource is ONLINE.</p> <p>Type and dimension: string-scalar</p> <p>Default: NONE</p> <p>Examples: NONE orSCSI3</p>
MonitorOnly	<p>Do not use. For internal use only.</p>

Attributes for Linux

Table 7-5 Required attributes for Linux

Required attribute	Description
DiskGroup	Name of the disk group that is configured with Veritas Volume Manager. Type and dimension: string-scalar Example: diskgroup1

Table 7-6 Optional attributes for Linux

Optional attributes	Description
MonitorReservation	If the value is 1, and SCSI-3 fencing is used, the agent monitors the SCSI reservation on the disk group. If the reservation is missing, the monitor agent function takes the resource offline. Type and dimension: boolean-scalar Default: 0

Table 7-6 Optional attributes for Linux

Optional attributes	Description
PanicSystemOnDGLoss	<p>Determines whether to panic the node if the disk group becomes disabled. A loss of storage connectivity can cause the disk group to become disabled.</p> <p>If the value of this attribute is 1 and the disk group becomes disabled, the node panics.</p> <p>If PanicSystemOnDGLoss is set to 1, and the Monitor agent function (entry point) hangs a consecutive number of times per the value of the FaultOnMonitorTimeouts attribute, then the node panics.</p> <p>Note: System administrators may want to set a high value for FaultOnMonitorTimeout to increase system tolerance.</p> <p>If the value of the attribute is 0 and the disk group becomes disabled, the following occurs:</p> <ul style="list-style-type: none"> ■ If the cluster has I/O fencing enabled, the DiskGroup resource is marked <code>FAULTED</code>. This state results in the agent attempting to take the service group offline. As part of bringing the DiskGroup resource offline, the agent attempts to deport the disabled disk group. Even if disabled disk group fails to deport, the DiskGroup resource enters a <code>FAULTED</code> state. This state enables the failover of the service group that contains the resource. To fail back the DiskGroup resource, manually deport the disk group after restoring storage connectivity. ■ If the cluster does not use I/O fencing, a message is logged and the resource is reported <code>ONLINE</code>. The resource is reported <code>ONLINE</code> so that it does not fail over, which ensures data integrity. <p>Note: The PanicSystemOnDGLoss attribute does not depend on the MonitorReservation attribute.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>
StartVolumes	<p>If value is 1, the DiskGroup online function starts all volumes belonging to that disk group after importing the group.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>

Table 7-6 Optional attributes for Linux

Optional attributes	Description
StopVolumes	<p>If value is 1, the DiskGroup offline function stops all volumes belonging to that disk group before it deports the group.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>
UmountVolumes	<p>This attribute enables the DiskGroup resource to forcefully go offline even if open volumes are mounted outside of VCS One control. When the value of this attribute is 1 and the disk group has open volumes, the following occurs:</p> <ul style="list-style-type: none"> ■ The agent attempts to unmount the file systems on open volumes. If required, the agent attempts to kill all VCS One managed and un-managed applications using the file systems on those open volumes. ■ The agent attempts to forcefully unmount the file systems to close the volumes. <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
Reservation	<p>If the value of the attribute is set to SCSI-3, the disk group is imported with a SCSI-3 reservation. This action requires that the disks support SCSI-3. SCSI-3 reservations ensure that I/O happens only from the node that holds the SCSI-3 reservation. If the value of the attribute is set to NONE, the disk group is imported without reservation.</p> <p>Do not modify the value of this attribute when the resource is ONLINE.</p> <p>Type and dimension: string-scalar</p> <p>Default: NONE</p> <p>Examples: NONE orSCSI3</p>
DiskGroupType	Do not use. For internal use only.
MonitorOnly	Do not use. For internal use only.

Attributes for Solaris

Table 7-7 Required attributes for Solaris

Required attribute	Description
DiskGroup	<p>Name of the disk group that is configured with Veritas Volume Manager.</p> <p>Type and dimension: string-scalar</p> <p>Example: diskgroup1</p>

Table 7-8 Optional attributes for Solaris

Optional attributes	Description
MonitorReservation	<p>If the value is 1, and SCSI-3 fencing is used, the agent monitors the SCSI reservation on the disk group. If the reservation is missing, the monitor agent function takes the resource offline.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Table 7-8 Optional attributes for Solaris

Optional attributes	Description
PanicSystemOnDGLoss	<p>Determines whether to panic the node if the disk group becomes disabled. A loss of storage connectivity can cause the disk group to become disabled.</p> <p>If the value of this attribute is 1 and the disk group becomes disabled, the node panics.</p> <p>If PanicSystemOnDGLoss is set to 1, and the Monitor agent function (entry point) hangs a consecutive number of times per the value of the FaultOnMonitorTimeouts attribute, then the node panics.</p> <p>Note: System administrators may want to set a high value for FaultOnMonitorTimeout to increase system tolerance.</p> <p>If the value of the attribute is 0 and the disk group becomes disabled, the following occurs:</p> <ul style="list-style-type: none"> ■ If the cluster has I/O fencing enabled, the DiskGroup resource is marked <code>FAULTED</code>. This state results in the agent attempting to take the service group offline. As part of bringing the DiskGroup resource offline, the agent attempts to deport the disabled disk group. Even if disabled disk group fails to deport, the DiskGroup resource enters a <code>FAULTED</code> state. This state enables the failover of the service group that contains the resource. To fail back the DiskGroup resource, manually deport the disk group after restoring storage connectivity. ■ If the cluster does not use I/O fencing, a message is logged and the resource is reported <code>ONLINE</code>. The resource is reported <code>ONLINE</code> so that it does not fail over, which ensures data integrity. <p>Note: The PanicSystemOnDGLoss attribute does not depend on the MonitorReservation attribute.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>
StartVolumes	<p>If value is 1, the DiskGroup online function starts all volumes belonging to that disk group after importing the group.</p> <p>Type and dimension: string-scalar</p> <p>Default: 1</p>

Table 7-8 Optional attributes for Solaris

Optional attributes	Description
StopVolumes	<p>If value is 1, the DiskGroup offline function stops all volumes belonging to that disk group before it deports the group.</p> <p>Type and dimension: string-scalar</p> <p>Default: 1</p>
UmountVolumes	<p>This attribute enables the DiskGroup resource to forcefully go offline even if open volumes are mounted outside of VCS One control. When the value of this attribute is 1 and the disk group has open volumes, the following occurs:</p> <ul style="list-style-type: none"> ■ The agent attempts to unmount the file systems on open volumes. If required, the agent attempts to kill all VCS One managed and un-managed applications using the file systems on those open volumes. ■ The agent attempts to forcefully unmount the file systems to close the volumes. <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
Reservation	<p>If the value of the attribute is set to SCSI-3, the disk group is imported with a SCSI-3 reservation. This action requires that the disks support SCSI-3. SCSI-3 reservations ensure that I/O happens only from the node that holds the SCSI-3 reservation. If the value of the attribute is set to NONE, the disk group is imported without reservation.</p> <p>Do not modify the value of this attribute when the resource is ONLINE.</p> <p>Type and dimension: string-scalar</p> <p>Default: NONE</p> <p>Examples: NONE orSCSI3</p>
DiskGroupType	Do not use. For internal use only.
MonitorOnly	Do not use. For internal use only.

DiskGroup agent notes

The DiskGroup agent has the following notes:

- [“Setting the noautoimport flag for a disk group for AIX and Solaris”](#) on page 227
- [“Configuring the Fiber Channel adapter for AIX and Solaris”](#) on page 228

Setting the noautoimport flag for a disk group for AIX and Solaris

VCS One requires that the noautoimport flag of an imported disk group be explicitly set to true. This value enables VCS One to control the importation and deportation of disk groups as needed when bringing disk groups online and taking them offline.

To check the status of the noautoimport flag for an imported disk group

```
◆ # vxprint -l disk_group | grep noautoimport
```

If the output from this command is blank, the noautoimport flag is set to false and VCS One lacks the necessary control.

For VxVM version 5.0 or later on AIX and VxVM versions 4.1 and 5.0 or later for Solaris

The Monitor function changes the value of the VxVM noautoimport flag from off to on. It changes the value instead of taking the service group offline. This action allows VCS One to maintain control of importing the disk group.

The following command changes the autoimport flag to false:

```
# vxdg -g disk_group set autoimport=no
```

For VxVM version 4.0

When you enable a disk group that is configured as a DiskGroup resource that does not have the noautoimport flag set to true, VCS One forcibly deports the disk group. This forcible deportation may disrupt applications running on the disk group.

To explicitly set the noautoimport flag to true, deport the disk group and import it with the -t option as follows:

To deport the disk group, enter:

```
# vxdg deport disk_group
```

To import the disk group, specifying the noautoimport flag be set to true to ensure that the disk group is not automatically imported, enter:

```
# vxdg -t import disk_group
```

Configuring the Fiber Channel adapter for AIX and Solaris

Solaris: Most Fiber Channel (FC) drivers have a configurable parameter called “failover.” This configurable parameter is in the FC driver’s configuration file. This parameter is the number of seconds that the driver waits before it transitions a disk target from OFFLINE to FAILED. After the state becomes FAILED, the driver flushes all pending fiber channel commands back to the application with an error code. Symantec recommends that you use a non-zero value that is smaller than any of the MonitorTimeout values of the Disk Group resources. Use this value to avoid excessive waits for monitor timeouts.

AIX: You must set FC adapter tunables appropriately to avoid excessive waits for monitor timeouts. One FS adapter tunable is FC error recovery policy.

Refer to the Fiber Channel adapter's configuration guide for further information.

Sample configurations

DiskGroup resource configuration

Example of a disk group resource in the Share Out mode.

```
<resources>
  <resource name="dg_res1" type="DiskGroup">
    <attribute name="DiskGroup"><scalar>"myvcsone_dg"</scalar>
  </attribute>
</resource>
</resources>
```

Volume agent

The Volume agent brings online, takes offline, and monitors a Veritas Volume Manager (VxVM) volume. Use the agent to make a volume highly available.

Note: Do not use the Volume agent for volumes created for replication.

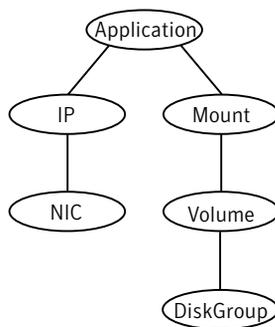
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

Volume resources depend on DiskGroup resources.

Figure 7-2 Sample service group that include a Volume resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Uses the <code>vxrecover</code> command to start the volume.
Offline	Uses the <code>vxvol</code> command to stop the volume.
Monitor	Attempts to read a block from the raw device interface to the volume to determine if the volume is online, offline, or unknown.
Clean	Terminates all ongoing resource actions and takes the resource offline—forcibly when necessary.

State definitions

ONLINE	Indicates that the specified volume is started and that I/O is permitted.
OFFLINE	Indicates that the specified volume is not started and that I/O is not permitted.
FAULTED	Indicates the volume stopped unexpectedly and that I/O is not permitted.
UNKNOWN	Indicates that the agent could not determine the state of the resource or that the resource attributes are configured incorrectly.

Attributes

Table 7-9 Required attributes

Required attribute	Description
DiskGroup	Name of the disk group that contains the volume. Type and dimension: string-scalar Example: DG1
Volume	Name of the volume from disk group specified in DiskGroup attribute. Type and dimension: string-scalar Example: DG1Vol1

Table 7-10 Internal attribute

Internal attribute	Description
NumThreads	Number of threads used within the agent process for managing resources. This number does not include threads used for other internal purposes. Do not modify this attribute. Setting this attribute to a higher value may result in agent function timeouts due to serialization of underlying commands. Default: 1

Sample configuration

```
<resources>
  <resource name="dg_res1" type="DiskGroup">
    <attribute name="DiskGroup"><scalar>"myvcsone_dg"</scalar>
    </attribute>
  </resource>
  <resource name="vol_res1" type="volume">
    <attribute name="DiskGroup"><scalar>"myvcsone_dg"</scalar>
    </attribute>
```

```
        <attribute name="Volume"><scalar>"myvol"</scalar>
        </attribute>
    </resource>
    <link parent="vol_res1" child="dg_res1"/>
</resources>
```

Disk agent

Monitors a physical disk or a partition.

Platforms

ESX and Solaris

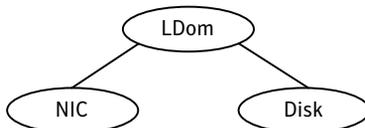
Dependencies

Disk resources have no dependencies.

Figure 7-3 Sample service group or vframe that includes a Disk resource on ESX



Figure 7-4 Sample service group that includes a Disk resource on Solaris



Agent functions

Monitor Performs read I/O operations on the raw device to determine if a physical disk or a partition is accessible.

State definitions

ONLINE Indicates that the disk is working normally.

FAULTED Indicates that the disk has stopped working or is inaccessible.

UNKNOWN Indicates that a problem exists either with the configuration or the ability to determine the status of the resource.

Attributes

Table 7-11 Required attributes

Required attribute	Description
Partition	<p>Indicates which partition to monitor. Specify the partition with the full path beginning with a slash (/).</p> <p>For ESX, if this path is not specified, the name is assumed to reside in /dev/.</p> <p>Example: "/dev/sdc"</p> <p>For Solaris, if this path is not specified, the name is assumed to reside in /dev/rdisk/.</p> <p>Example: "/dev/rdisk/c2t0d0s2"</p> <p>Type and dimension: string-scalar</p>

LVMVG agent

The LVMVG agent activates, deactivates, and monitors a Logical Volume Manager (LVM) volume group. The LVMVG agent supports JFS or JFS2. It does not support VxFS. This agent ensures that the ODM is in sync with changes to the volume group. Specifically from the last time that the volume group was imported on the system.

For important information on this agent, refer to:

“[LVMVG agent notes](#)” on page 238

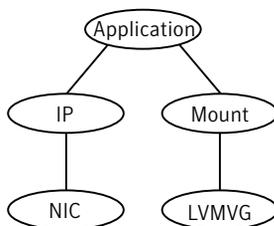
Platform

AIX

Dependencies

No dependencies exist for the LVMVG resource.

Figure 7-5 Sample service group for an LVMVG resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Activates the volume group. The Online agent function expects that the volume group is already imported on the system. If the volume group had been modified on a system where it was previously active, the online agent function detects the modification. It then syncs up the ODM on the system where you want to bring the volume group resource online.
Offline	Deactivates the volume group.
Monitor	Determines the volume group's state (activated or deactivated) and availability for read/write operations.

Clean Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.

State definitions

ONLINE Indicates that the volume group is activated.

OFFLINE Indicates that the volume group is deactivated.

Attributes for AIX

Table 7-12 Required attributes for AIX

Required attribute	Description
MajorNumber	<p>Integer that represents the major number of the volume group. To ensure NFS functions properly, assign the same major number to the volume group on each system in the cluster.</p> <p>Type and dimension: integer-scalar</p>
NumThreads	<p>The number of threads that are used within the agent process for managing resources. This number does not include the threads that are used for other internal purposes.</p> <p>This resource type attribute is for internal use only. This value of this attribute must be set to 1.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>
VolumeGroup	<p>Name of the volume group that is configured with LVM.</p> <p>Type and dimension: string-scalar</p> <p>Example: testvg1</p>

Table 7-13 Optional attributes for AIX

Optional attribute	Description
GroupName	<p>Attribute used to specify the volume's group.</p> <p>If set, the group's name is applied to the volume group and all of its logical volumes.</p> <p>Type and dimension: string-scalar</p> <p>Default: system</p>
ImportvgOpt	<p>Attribute used to specify options for the importvg command.</p> <p>The default option, "n", indicates the volume group is not automatically activated when imported.</p> <p>Type and dimension: string-scalar</p> <p>Default: n</p>
Mode	<p>Attribute used to specify permissions for a volume group and its logical volumes.</p> <p>If set, these permissions are applied to the volume group and all of its logical volumes.</p> <p>Type and dimension: string-scalar</p> <p>Default: 640</p>
OwnerName	<p>Attribute used to specify the volume owner's name.</p> <p>If set, the owner's name is applied to the volume group and all of its logical volumes.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p>

Table 7-13 Optional attributes for AIX

Optional attribute	Description
SyncODM	<p>Integer that specifies whether or not the agent ensures that the ODM is in sync with any changes to the volume group.</p> <p>If the value of this attribute is 1, the agent ensures that the ODM is in sync with the changes to the volume group. In situations where the volume group was modified on another system in the cluster. The sync operation occurs on the system where the agent brings the volume group online.</p> <p>If the value of this attribute is 0, the changes to the volume group are independent of the ODM.</p> <p>See “SyncODM Attribute” on page 240.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>
VaryonvgOpt	<p>Attribute used to specify options for the varyonvg command.</p> <p>Type and dimension: string-scalar</p>

LVMVG agent notes

The LVMVG agent for AIX has the following notes:

- [“Deactivation failure using the varyoffvg command on losing storage connectivity”](#) on page 239
- [“LVMVG Agent Supports JFS or JFS2”](#) on page 239
- [“Volume group needs to be imported”](#) on page 239
- [“Varyonvg options”](#) on page 240
- [“SyncODM Attribute”](#) on page 240
- [“Major Numbers”](#) on page 240
- [“Autoactivate Options”](#) on page 241
- [“LVMVG agent support for the Subsystem Device Driver \(SDD\)”](#) on page 242
- [“LVMVG agent support for the Hitachi’s HiCommand Dynamic Link Manager \(HDLM\)”](#) on page 242
- [“LVMVG agent support for the EMC PowerPath”](#) on page 242

- [“The hadevice utility”](#) on page 242

Deactivation failure using the varyoffvg command on losing storage connectivity

In certain circumstances, the varyoffvg command does not deactivate all the volume groups on a node. This failure can prevent the failback of the LVMVG resource.

In situations where storage connectivity is lost, the LVMVG resources fails over. Failback for the LVMVG resource requires the deactivation of the volume groups on the node that lost its connectivity to storage. VCS One uses the varyoffvg command to deactivate the volume groups. The LVMVG resource cannot fail back, however, when deactivation is unsuccessful.

When the volume group loses its storage connectivity, the clean function executes the varyoffvg command. Deactivation using the varyoffvg command can fail, however, if the volume group is busy. Criteria that can cause this failure can include:

- when the volume group has pending I/O operations, or
- when an application or upper-level resources in the resource dependency tree uses the volume group.

After the restoration of storage connectivity, you must ensure that the volume groups are deactivated on the node. You can then clear the fault on the resources. If you find active volume groups, deactivate them using the varyoffvg command.

The LVMVG resource must be the bottom-most resource in the resource dependency tree in the service group. A resource under the LVMVG resource can potentially fail to go offline if the volume group’s deactivation fails.

LVMVG Agent Supports JFS or JFS2

The LVMVG agent supports these file systems: JFS or JFS2. It does not support VxFS.

Volume group needs to be imported

The LVMVG agent relies on the ODM to find out the names of the disk devices that a volume group is created on. Unless a volume group is imported on the system, the ODM on that system does not contain any information about that volume group. Therefore, you must import the volume group on all the systems in the group’s SystemList for the LVMVG agent to function properly.

For example, the volume groups (vg1 and vg2) must be imported on the specified systems (sysA and sysB).

See “[LVMVG agent notes](#)” on page 238.

Varyonvg options

By default, the agent checks the state of the disk devices underneath the volume group. If the disk device is in a defined state, the agent resets it to an available state. You can use the `VaryonvgOpt` attribute to change this default behavior.

You can tell the agent not to check for the state of the disk devices. Set the value of "u" in the `VaryonvgOpt` attribute of the LVMVG resource. This option to the `varyonvg` command ensures that the disks underneath the volume group are not reserved when the volume group is activated.

Note: When you activate a volume group with the "u" option, ghost disks are not created. Therefore, you do not have to reset disks for these volume groups.

SyncODM Attribute

The LVMVG agent ensures that the ODM is in sync with any changes to the volume group since it was last imported on the system. This sync happens only if this attribute is set to 1. The agent maintains a time stamp file, `/var/VRTSvcstone/log/tmp/volume_group_name.ts`, which records the time when the volume group was last imported on the system. When the agent initially brings a volume group online, the agent exports and reimports the group while initializing the time stamp file for that group. During the export and re-import processes, the agent preserves the ownership and mode information for the volume group and all its logical volumes.

The sync operation occurs when the time stamp value in the volume group's time stamp file is older than the time stamp value in the volume group's descriptor area. The timestamp value in the VGDA area of a volume group is updated after creating or deleting logical volumes, and adding or removing physical volumes.

Major Numbers

If a file system on a volume group is shared for NFS, make sure that the volume group is imported with the same major number. The volume group is imported on all of the nodes in the cluster.

To view a list of available major numbers on the system, enter the `lvlstmajor` command. For example:

```
# lvlstmajor
49, 60 ...
```

To import volume group `vg00` with major number 60, enter:

```
# importvg -V 60 -y vg00 hdisk3
```

To view the major number that is assigned to a volume group, use the `ls` command with the `-l` option. For example:

```
# ls -l /dev/vg00
crw-r----- 1 root      system    60,  0 Apr  2 16:05 /dev/vg00
```

Assign the same major number to the volume group on each system in the cluster. Specify this major number in the `MajorNumber` attribute of the LVMVG configuration.

Note: Do not specify the `V` option in the `ImportvgOpt` attribute string, the agent specifies this option.

Autoactivate Options

The "Concurrent Capable" options for the `importvg` and `mkvg` commands that are used with HACMP are not required for VCS One. If an LVM volume group is placed under VCS One control, the autoactivate options should be turned off. Do this using SMIT or through the command line.

From SMIT, set the following field values when creating or altering the volume group:

```
Activate volume group AUTOMATICALLY          no
  at system restart?
Create VG Concurrent Capable?                 no
Auto-varyon in Concurrent Mode?              no
```

From the command line, to view the current value for these fields, use the `lsattr` command.

For example:

```
# lsattr -El vg00
vgserial_id 0001632f00004c00000000ee092b3bd8 N/A False
auto_on      y                               N/A True
conc_capable n                               N/A True
conc_auto_on n                               N/A True
timestamp    3ceff3390a8b1379                  N/A True
```

From the command line, to change the value for these fields, use the `chvg` command.

To change the value of `auto_on` to `n`:

- 1 Activate the volume group `vg00` (if the volume group is not already activated):
varyonvg vg00
- 2 Run the `chvg` command:
chvg -a 'n' vg00
- 3 Verify the changes:

```
# lsattr -El vg00
vgserial_id 0001632f00004c00000000ee092b3bd8 N/A False
auto_on     n                                     N/A True
conc_capable n                             N/A True
conc_auto_on n                             N/A True
timestamp   3ceff3390a8b1379                       N/A True
```

LVMVG agent support for the Subsystem Device Driver (SDD)

The LVMVG agent supports the IBM Multipathing SDD version 1.4.0.0 and later. If disks are under SDD control, create a volume group with vpath devices. Refer to the SDD Documentation for configuration and migration of volume groups.

SDD support requires the `/usr/sbin/lquerypr` command, which provides a set of persistent reserve functions. The `lquerypr` command tool comes with the SDD installation package.

LVMVG agent support for the Hitachi's HiCommand Dynamic Link Manager (HDLM)

The LVMVG agent supports the Hitachi's HiCommand Dynamic Link Manager. For the details of the array and HDLM versions supported, refer to the HCL.

Note that if disks are under HDLM control, create a volume group with HDLM devices (`dlnfdrvn`). Refer to the HDLM documentation for configuration and migration of volume groups.

LVMVG agent support for the EMC PowerPath

The LVMVG agent supports the EMC PowerPath. For the details of the array and PowerPath versions supported, refer to the HCL.

Note that if disks are under PowerPath control, create a volume group with PowerPath devices (`hdiskpower`). Refer to the EMC PowerPath documentation for configuration and migration of volume groups.

The hadevice utility

The LVMVG agent provides the `hadevice` utility. This utility checks the status of a disk device and resets a disk device to an available state. The utility then breaks any SCSI reservations on a disk device. Its syntax is:

```
hadevice -c | -r | -b -p device_name
```

The five possible states of a disk device are: AVAILABLE, DEFINED AND RESERVED, DEFINED AND UNRESERVED, PERSISTENT RESERVATION, and AVAILABLE AND OPEN.

To check the state of a disk device, enter:

```
# hadevice -c device_name
```

The following commands locate and remove ghost disks for a disk device and break any SCSI reservation on the disk device. When the `-p` flag follows the `-b` flag, it breaks any previous SCSI reservation on the device. It then obtains and retains a new reservation on the device. For SDD (vpath) disks, ghost disks are not created. Both the `-b` and `-r` flags remove any persistent reservation and clear all reservation key registration on the device. The `-p` flag (retain reservation) is not applicable for SDD disks.

To break any SCSI reservations on the disk device, enter:

```
# hadevice -b device_name
```

To break any SCSI reservations on the disk device, and obtain and retain a new reservation on the device, enter:

```
# hadevice -b -p device_name
```

To locate and remove ghost disks, reset a disk device that is in a `DEFINED` state and put it into an `AVAILABLE` state, enter:

```
# hadevice -r device_name
```

Removing a ghost disk from VxVM control

If VxVM 5.0 is installed, you may need to remove a ghost disk from VxVM control before using `hadevice` utility (except `-r` option).

If you check the ghost disk's status using the `hadevice -c hdisk#` command, you get an error. The error reads: `V-16-10011-10237 Error opening the device /dev/hdisk# (The file access permissions do not allow the specified action.)` Check if the ghost disk is under VxVM control. You can do this using the `vxdisk -eq list` command. If the disk is under VxVM control, remove it using the `vxdisk rm vxvm_disk_name`.

In this example, `hdisk4` is a ghost disk.

```
sysA# vxdisk -eq list
Disk_0          auto      -      -      LVM      disk0
HDS9500-ALUA0_0 auto      -      -      error    hdisk4
HDS9500-ALUA0_1 auto      -      -      online   hdisk2
HDS9500-ALUA0_2 auto      -      -      online   hdisk3

sysA# vxdisk rm HDS9500-ALUA0_0
```

Sample configuration

```
<resources>
  <resource name="lvg_res1" type="LVMVG">
    <attribute
name="VolumeGroup"><scalar>"myvcsone_vg"</scalar>
    </attribute>
    <attribute name="MajorNumber">
    <scalar>50</scalar>
    </attribute>
```

```
</resource>  
</resources>
```

LVMCombo agent

The LVMCombo agent controls the activation and deactivation of the logical volumes and the Logical Volume group. You can use this agent to make volume groups and logical volumes highly available.

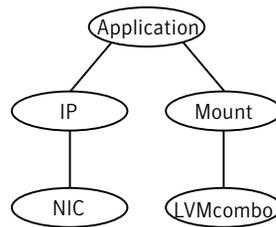
Platform

HP-UX

Dependencies

No dependencies exist for the LVMCombo resource.

Figure 7-6 Sample service group that includes an LVMcombo resource



Agent functions

Online	Activates the volume group and any of the logical volumes that are not available. While each system in the cluster must import the volume group, each system should not activate it. This agent does not import volume groups because of the way LVM stores configuration information. Use the HP-UX SMH tool to import a volume group.
Offline	Deactivates the volume group, but does not deactivate the logical volumes. The logical volumes are automatically deactivated when the volume group is deactivated.
Monitor	If the volume group and all of the logical volumes are activated, the resource is online. Otherwise, the resource is reported offline.

Note: The monitor agent function does not perform any I/O on disk. If a disk that makes up a logical volume is powered off, the agent is not aware of this situation until LVM marks the logical volume unavailable. This situation may occur if the file system or the application using the logical volume attempts an I/O operation and fails. LVM can then set the logical volume as unavailable.

State definitions

ONLINE	Indicates that the Volume Group and Logical Volumes are active.
OFFLINE	Indicates that the Volume Group and Logical Volumes are not active.
UNKNOWN	Indicates that a problem exists either with the configuration or the ability to determine the status of the resource.

Attributes for HP-UX

Table 7-14 Required attributes for HP-UX

Required Attribute	Description
LogicalVolumes	List of logical volumes in a volume group. Type and dimension: string-vector Example: lvol1 , lvol2
VolumeGroup	Name of a volume group. Type and dimension: string-scalar Example: vg01

Table 7-15 Optional attributes for HP-UX

Optional Attribute	Description
VolumeIOTimeout	<p>The time for which the agent waits before it returns an OFFLINE state when I/Os to the volume hangs.</p> <p>Default: "15"</p> <p>Minimum value: 3 seconds</p> <p>Maximum value: No maximum value, but the higher the value the higher the failover time required.</p>

Physical volumes associated with volume groups

For all the Physical Volumes (PV) that are associated with a Volume Group, set the timeout to a smaller value than specified in the VolumeIOTimeout attribute of the resource. For example, if you specify an IOTimeout to equal 15 seconds, update the PV Timeout to a value that is less than 15 seconds.

Use the following command to change the timeout:

```
# pvchange -t time /dev/dsk/PV Used
# pvchange -t time Physical Volume
```

For example:

```
# pvchange -t 10 /dev/dsk/c2t4d4
```

Basic configuration

```
<resources>
  <resource name="lvmcombo1" type="LVMCombo">
    <attribute name="VolumeGroup"><scalar>"vg01"</scalar>
    </attribute>
    <attribute name="LogicalVolumes"><scalar>"lvm1"</scalar>
    </attribute>
  </resource>
</resources>
```

LVMLogicalVolume agent

HP-UX: The LVMLogicalVolume agent brings online, takes offline, and monitors Logical Volume Manager (LVM) logical volumes. You can use this agent to make volume groups and logical volumes highly available and to monitor them.

Linux: The LVMLogicalVolume agent brings online, takes offline, and monitors a Logical Volume Manager (LVM2) volume. This agent uses LVM2 commands. You can use this agent to make volume groups and logical volumes highly available and to monitor them.

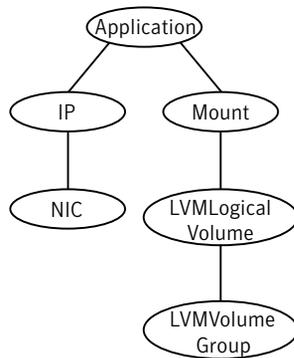
Platforms

HP-UX and Linux

Dependencies

LVMLogicalVolume resources depend on LVMVolumeGroup resources.

Figure 7-7 Sample service group that includes a LVMLogicalVolume resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

- | | |
|---------|--|
| Online | HP-UX: Activates the logical volume.
Linux: Starts the volume using the <code>lvchange</code> command. |
| Offline | HP-UX: Deactivates the logical volume.
Linux: Stops the volume using the <code>lvchange</code> command. |

Monitor	<p>HP-UX: Determines if the logical volume is accessible by performing read I/O on the raw logical volume.</p> <p>Linux: Determines if the volume is online or offline by reading a block from the raw device interface to the volume.</p>
Clean	<p>Linux: Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.</p>

State definitions

ONLINE	<p>HP-UX: Indicates that the Logical Volume is active.</p> <p>Linux: Indicates that the specified volume is started and that I/O is permitted.</p>
OFFLINE	<p>HP-UX: Indicates that the Logical Volume is not active.</p> <p>Linux: Indicates that the specified volume is not started—and I/O is not permitted.</p>
UNKNOWN	<p>HP-UX: Indicates that a problem exists either with the configuration or the ability to determine the status of the resource.</p> <p>Linux: Indicates that the agent could not determine the state of the resource or that the resource attributes are invalid.</p>

Attributes for HP-UX

Table 7-16 Required attributes for HP-UX

Required attribute	Description
LogicalVolume	Name of the logical volume. Type and dimension: string-scalar Example: lv01
VolumeGroup	Name of the volume group containing the logical volume. Type and dimension: string-scalar Example: vg1

Table 7-17 Optional attributes for HP-UX

Optional attribute	Description
VolumeIOTimeout	The time for which the agent should wait before it returns an OFFLINE state when IO to the volume hangs. Default: 15 Minimum value: 3 seconds Maximum value: No maximum value, but the higher the value the higher the failover time required.

Attributes for Linux

Table 7-18 Required attributes for Linux

Required attribute	Description
LogicalVolume	Name of the volume that is configured with Logical Volume Manager (LVM2). Type and dimension: string-scalar Example: volume1
VolumeGroup	Name of the volume group that is configured with Logical Volume Manager (LVM2), which contains the volume. Type and dimension: string-scalar Example: volumegroup1

Physical volumes associated with volume groups for HP-UX

For all the Physical Volumes (PV) that are associated with a volume group, set the timeout to a smaller value than specified in the VolumeIOTimeout attribute of the resource.

For example, if you specify an IOTimeout to equal 15 seconds, update the PV Timeout to a value that is less than 15 seconds.

Use the following command to change the timeout:

```
# pvchange -t time /dev/dsk/PV Used
# pvchange -t time Physical Volume
```

For example:

```
# pvchange -t 10 /dev/dsk/c2t4d4
```

Basic configuration

```
<resources>
  <resource name="lvml" type="LVMLogicalVolume">
    <attribute name="VolumeGroup"><scalar>"vg01"</scalar>
    </attribute>
    <attribute name="LogicalVolume"><scalar>"lv01"</scalar>
    </attribute>
  </resource>
  <resource name="vg1" type="LVMVolumeGroup">
    <attribute name="VolumeGroup"><scalar>"vg01"</scalar>
    </attribute>
```

```
    </resource>  
<link parent="lvm1" child="vg1"/>  
</resources>
```

LVMVolumeGroup agent

HP-UX: The LVMVolumeGroup agent activates, deactivates, and monitors LVM volume groups. You can use this agent to make volume groups and logical volumes highly available and to monitor them.

Linux: The LVMVolumeGroup agent brings online, takes offline, and monitors a Logical Volume Manager (LVM2) volume group. This agent uses LVM2 commands. You can use this agent to make volume groups and logical volumes highly available and to monitor them.

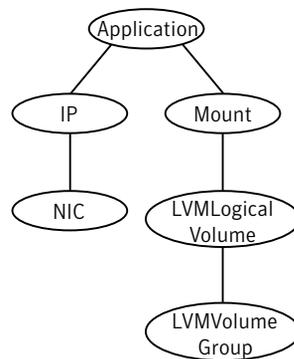
Platforms

HP-UX and Linux

Dependencies

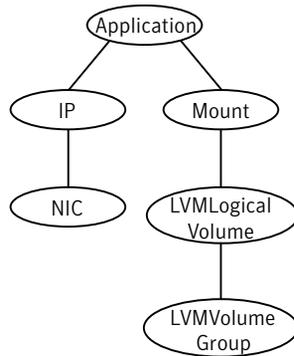
HP-UX: The LVMVolumeGroup resource has no dependencies.

Figure 7-8 Sample service group that includes a LVMVolumeGroup resource



Linux: LVMVolumeGroup resources do not depend on other resources.

Figure 7-9 Sample service group for a LVMVolumeGroup resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	<p>HP-UX: Activates a volume group. While each system in the cluster must import the volume group, each system does not need to activate it.</p> <p>This agent does not import volume groups because of the way LVM stores configuration information. Use the HP-UX SMH to import a volume group.</p> <p>Linux: Imports the volume group using the <code>vgimport</code> command.</p>
Offline	<p>HP-UX: Deactivates a volume group with the <code>vgchange</code> command.</p> <p>Linux: Exports the volume group using the <code>vgexport</code> command.</p>
Monitor	<p>HP-UX: Determines whether the volume group is available.</p> <p>Linux: Determines if the volume group is online or offline using the <code>vgdisplay</code> command.</p>
Clean	<p>Terminates all ongoing resource actions and takes the resource offline, forcibly when necessary.</p>

State definitions

ONLINE	<p>HP-UX: Indicates that the volume group is active.</p> <p>Linux: Indicates that the volume group is imported.</p>
--------	---

OFFLINE	HP-UX: Indicates that the volume group is not active. Linux: Indicates that the volume group is not imported.
UNKNOWN	HP-UX: Indicates that a problem exists either with the configuration or the ability to determine the status of the resource. Linux: Indicates that a problem exists either with the configuration or the ability to determine the status of the resource.

Attributes for HP-UX

Table 7-19 Required attributes for HP-UX

Required attribute	Description
VolumeGroup	The name of the volume group that is configured with Logical Volume Manager. Type and dimension: string-scalar Example: sharevg

Attributes for Linux

Table 7-20 Required attributes for Linux

Required attribute	Description
VolumeGroup	The name of the volume group that is configured with Logical Volume Manager (LVM2) that contains the volume. Type and dimension: string-scalar Example: volumegroup1

Table 7-21 Optional attributes for Linux

Optional attribute	Description
StartVolumes	If the value of this attribute is 1, the LVMVolumeGroup online function imports the group. It then starts all the volumes that belong to that volume group. Type and dimension: boolean-scalar Default: 0

Basic configuration

```
<resources>
  <resource name="vg1" type="LVMVolumeGroup">
    <attribute name="VolumeGroup"><scalar>"vg01"</scalar>
    </attribute>
  </resource>
</resources>
```

NetAppFiler agent

The NetAppFiler agent monitors connectivity to a NetApp Filer from a VCS One system. This agent uses ICMP pings to determine if a specified VCS One system has TCP/IP connectivity to the filer.

Platforms

AIX, HP-UX, Linux, Solaris

The following versions and operating systems are supported:

- AIX 5.3 and 6.1
- RHEL and SUSE
- Solaris 10 SPARC and x86 architectures
- HPUX 11.23 and 11.31 on PA RISC architectures only

Dependencies

The NetAppFiler resource can depend on the NIC, MultiNICA, or MultiNICB resources.

See the NetAppExport agent for more information.

Agent functions

The value of the Operations attribute for this agent is None.

Monitor	Monitors the connectivity to the NetApp Filer using ICMP ping.
---------	--

State definitions

ONLINE	Indicates that the specified VCS One system can reach the NetApp Filer.
FAULTED	Indicates that the specified VCS One system cannot reach the NetApp Filer. This lack of connectivity may be due to loss of network connectivity to the filer or because the filer is powered off.
UNKNOWN	Indicates that the user did not specify a required attribute for the resource.

Attributes

Table 7-22 Required attributes

Required attribute	Description
FilerName	Specifies the IP address or the DNS name of a NetApp Filer. Type and dimension: string-scalar
FilerPingTimeout	The number of seconds after which the NetApp Filer times out and is declared <code>FAULTED</code> . It is declared <code>FAULTED</code> because the ICMP ping cannot reach it. Note: Symantec recommends a value larger than two minutes, which is the approximate time required by most NetApp Filers to restart. Type and dimension: integer-scalar Default: 240 seconds (recommended minimum: 120 seconds, recommended maximum: 360 seconds)

Table 7-23 Optional attributes

Optional attribute	Description
UseAPI	If the value of this attribute is 1, the agent uses the NetApp API to send commands to the filer. Type and dimension: boolean-scalar Default: 1

Table 7-23 Optional attributes

Optional attribute	Description
UseSSH	<p>If the value of this attribute is 1, the agent uses SSH-based access to communicate with the filer.</p> <p>If the value of this attribute is 0, and if the value of the UseAPI attribute is also 0, then the NetApp Filer uses RSH-based access to communicate with the filer.</p> <p>For both SSH- and RSH-based access, you must set up password-less access between the NetApp Filer and the VCS One system that communicates with the filer.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>
UserName	<p>The user name to communicate with the filer using SSH, RSH, or the NetApp API.</p> <p>In zone environments, the UserName attribute needs to have the same value as a user in the zone where the NetAppFiler resource is configured.</p> <p>Type and dimension: string-scalar</p> <p>Default: root</p>
Password	<p>This attribute specifies the encrypted password for communication with the filer.</p> <p>Password is a required attribute if you set the value of the UseAPI attribute to 1.</p> <p>Type and dimension: string-scalar</p>
Persist	<p>Specifies if export entry modifications for the NetAppExport resources that access this filer are persistent on the filer. In other words, whether the export entry modifications are written to /etc/exports.</p> <p>Type and dimension: string-integer</p> <p>Default: 1</p>

Table 7-23 Optional attributes

Optional attribute	Description
HostingFilerName	<p>Specifies the HostName or the IP Address of the actual filer. Use this attribute only if the FilerName attribute is a vfiler.</p> <p>The NetAppFiler resource supports vfiler access when the values of UseAPI and UseSSH are 0. That is to say, when RSH access is in use to communicate with the vfiler.</p> <p>Type and dimension: string-scalar</p>

Sample configurations

The following section presents sample configurations for the NetAppFiler agent.

Creating a NetAppFiler resource in a service group

Create the resource.

To create the NetAppFiler resource

- 1 At the command line, enter the following to add the filer resource to the “sg” service group:

```
# hares -add filer NetAppFiler sg
```

- 2 Enter the following for the filer’s IP address or host name.

```
# hares -modify filer FilerName filename
```

Where filename is the IP address or the host name of the filer.

You now must decide the kind of access that you want the filer to have.

To give SSH access

- ◆ Enter the following commands:

```
# hares -modify filer UseAPI 0
# hares -modify filer UseSSH 1
```

To give RSH access

- ◆ Enter the following commands:

```
# hares -modify UseAPI 0
# hares -modify UseSSH 0
```

To give API access

- 1 Verify the default user name of root to access the filer. If you cannot verify root's user name, modify the `UserName` attribute of filer resource with the user name that you want to use.
- 2 Specify the encrypted password for the `Password` attribute of the filer resource.
- 3 Run the `haencrypt` command. When the system prompts you for the password, enter the password that corresponds to the `UserName` attribute of the filer resource on the NetApp Filer.

```
# haencrypt -agent
```

The command displays the encrypted value of the password.

- 4 Modify the `Password` attribute with this encrypted value.

```
# hares -modify filer Password encryptedvalue
```
- 5 Issue a `hares -display` command on the filer resource and after you verify that the desired attributes have been set.
- 6 Enable the resource.

```
# hares -modify filer Enabled 1
```

Creating an off-host resource with a NetApp Filer

The following sample configuration uses API access to communicate with the `netapp3` NetAppFiler resource. Note that value of `Password` attribute is the encrypted password.

See [“Creating a NetAppFiler resource in a service group”](#) on page 260.

```
<resource name="filer" type="NetAppFiler">  
  <attribute name="FilerName"><scalar>"netapp3"</scalar>  
  </attribute>  
  <attribute name="Password"><scalar>"aoaMboDodOhmPocMet "  
  </scalar></attribute>  
<attribute name="UseAPI"><scalar>1</scalar></attribute>  
</resource>
```

NetAppExport agent

The NetAppExport agent monitors export options on the NetApp Filer from a VCS One System. This agent supports the export and deport of NFS volumes (file systems) and qtrees. You can configure this agent to use SSH, RSH, or the NetApp API to:

- Communicate with the filer
- Export or deport a file system (volume) on the NetApp Filer

The following limitations apply to the NetAppExport agent:

- The NetAppExport agent only manipulates export options on the NetApp Filer. To mount or unmount the exported file system, you must use the Mount agent.
- NetAppExport resources are supported only in failover service groups.
- The NetAppExport agent requires that NetApp Filers run Data ONTAP 7.0.1.1 or later.

The ToleranceLimit static resource type attribute for the NetAppExport resource is 1. For more information on this attribute, refer to the *Veritas Cluster Server One User's Guide*.

You can configure the NetAppExport type as an off-host resource.

See “[Creating an off-host resource with a NetApp Filer](#)” on page 276.

Note: The NetAppExport agent does not support off-host reporting in a zone environment.

You can use Zones with the NetAppExport agent. For required installation and configuration information, refer to the:

- *Veritas Cluster Server One Installation Guide*
- *Veritas Cluster Server One User's Guide*

Platforms

AIX, HP-UX, Linux, Solaris

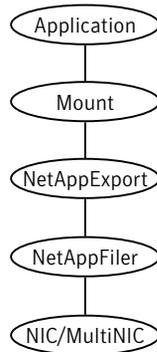
Refer to the *Veritas Cluster Server One Release Notes* for specific supported operating systems. Note that on HP-UX, IA64 is not supported.

Dependencies

The NetAppExport resource depends on the NetAppFiler resource. You must configure a NetAppFiler resource before you configure a NetAppExport resource.

Figure 7-10 shows the resource dependencies for the NetAppExport resource.

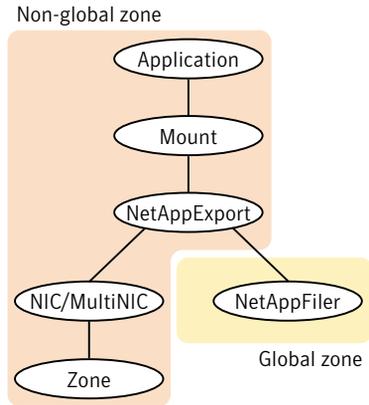
Figure 7-10 Resource dependency graph that includes the NetAppExport resource



In a Zone environment, the target application and its resources reside in a non-global zone, while the NetAppFiler resource resides in the global zone. The NetAppExport agent depends on the NetAppFiler resource and the NIC or MultiNIC resource. You must configure a NetAppFiler resource before you configure a NetAppExport resource.

Figure 7-10 shows the resource dependencies for the NetAppExport resource.

Figure 7-11 In a Zone environment, the resource dependency graph for the NetAppExport resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	Exports a file system on the NetApp Filer to the VCS One system.
Offline	Deports an exported file system on the NetApp Filer from the VCS One system.
Monitor	Monitors a file system on the NetApp Filer.
Clean	Deports the exported file system from all of the nodes in the resource's SystemList to prevent data corruption.

State definitions

ONLINE	Indicates that the file system on the NetApp Filer is exported with the desired options to the VCS One system.
FAULTED	Indicates that the file system is not exported to the VCS One system as expected.
OFFLINE	Indicates that the file system is not exported to the VCS One system.
UNKNOWN	Indicates that a required attribute for the resource is not specified. The resource state is also UNKNOWN when the NetAppExport agent cannot communicate with the filer.

Attributes

Table 7-24 Required attributes

Required attribute	Description
FilerPathName	Specifies the file system (volume in NetApp terminology) or the qtree on the NetApp Filer. Type and dimension: string-scalar
FilerResName	This attribute is the name of the NetAppFiler resource. Use this value to determine the filer where export entries are to be manipulated. For more information on dependent attributes, refer to the <i>Veritas Cluster Server One User's Guide</i> . Type and dimension: string-scalar

Table 7-24 Required attributes

Required attribute	Description
ExportACL	<p>Specifies the host name or the IP address for the NIC that communicates with the filer. The NetAppExport agent does not support manipulation of export entries for netgroups and network subnets.</p> <p>An example is SysA = 172.30.40.10. This value indicates that on the VCS One system SysA, the base IP address for the NIC that communicates with the filer is 172.30.40.10. For each VCS One system where the NetAppExport resource is configured, you must specify this attribute.</p> <p>In a zone environment, the ExportACL attribute specifies the zone's host name or the zone's base IP address. Note that each node can have a different name for the same zone. Where each node uses the same name for a different zone, you need take no action. For each unique zone where the NetAppExport resource is configured to run, use a name-value pair that applies to the zone.</p> <p>Type and dimension: string-association</p> <p>Example:</p> <p style="padding-left: 40px;">SysA = 172.30.40.10, SysB = 172.30.40.11</p> <p>Example in a zone environment:</p> <p style="padding-left: 40px;">ZoneA = 172.30.40.10, ZoneB = 172.30.40.11</p> <p style="padding-left: 40px;">Where ZoneA and ZoneB are actually the same zone, but are named differently for each host.</p>

Table 7-25 Optional attributes

Optional attribute	Description
ExportOptions	<p>Specifies the permissions that you want for the file system when it is exported to a VCS One system. Your choices are rw (read-write) or ro (read-only).</p> <p>Type and dimension: string-scalar</p> <p>Default: rw</p>

Table 7-25 Optional attributes

Optional attribute	Description
FilerOptions	<p>Specifies the various options (actual, anon, nosuid, root, sec, etc.) while exporting or deporting the file system on the NetApp Filer.</p> <p>The options are name-value pairs. The options are comma delimited. The value in a name-value pair may be colon delimited if a given name has multiple values.</p> <p>For more details, refer to the NetApp documentation (the <code>na_options</code> man page).</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>sec=sys</code></p> <p>Examples:</p> <ul style="list-style-type: none">■ Comma-delimited name-value pair <code>sec=sys,root=AdminHostName,nosuid</code>■ Colon-delimited name-value pair <code>sec=sys,root=AdminHostName1:AdminHostName2</code>
OtherOptions	<p>Controls the access of the VCS One system to the exported file system when the resource comes online or goes offline. Allowed values are <code>ro</code> (read-only) and <code>none</code>.</p> <p>A value of <code>ro</code> indicates that the VCS One systems where the resource is <code>OFFLINE</code> get read-only access to the specified file system. This file system is specified in the <code>FilerPathName</code> attribute.</p> <p>A value of <code>none</code> indicates that VCS One systems where the resource is <code>OFFLINE</code> are removed from the export list. The export list is on the NetApp Filer for the specified file system. The file system is specified in the <code>FilerPathName</code> attribute.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>none</code></p>

Table 7-25 Optional attributes

Optional attribute	Description
ClearNFSLocks	<p>Set the value of this attribute to 1 to clear node-specific NFS v3 locks on the filer when the resource comes online. This action clears locks system-wide. If multiple application on a system uses NFS v3 locks, the agent clears the locks for all the applications on the filer for that system.</p> <p>Note: Note that this option is supported only with NFS v3.0 clients.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Selecting how to communicate with the filer

You have four options to use for communication between the filer and the agent. They are: SSH, RSH, SSL using the API, or the NetApp API. You need to specify the access method in the NetAppFiler resource definition. The following information should help you select the best method for your environment.

Symantec recommends that you use the NetApp API if you want to configure a large number (greater than 30) of NetAppExport resources.

The SSH- or RSH-based access methods do have concurrency limitations. You cannot set the type-level NumThreads attribute for the NetAppExport type to a value greater than 1. The NumThreads value of 1 serializes all operations by the NetAppExport Agent across all resources.

SSH is not part of the standard AIX operating system distribution. Refer to the appropriate IBM documentation for details on setting up SSH for your AIX client.

Note: The NetAppExport agent on AIX expects that SSH is available by default in /usr/bin. If SSH is installed in a different location, create a soft link to the SSH executable in /usr/bin.

Figure 7-12 Access selection flow chart

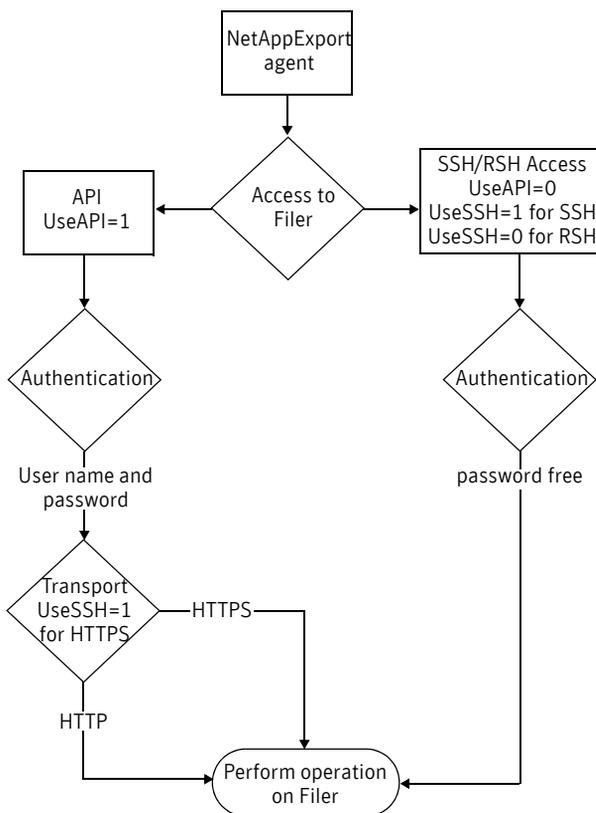


Table 7-26 shows use of different access methods attribute toggles:

Table 7-26 NetApp Filer attributes their values, and the desired access effect

UseAPI	UseSSH	Effect	NumThreads for NetAppExport
0	0	RSH	1
0	1	SSH	1
1	0	API with HTTP	1 - 30
1	1	API with HTTPS	1 - 30

Using HTTPS requires appropriate support on the following platforms:

- On Solaris, the following SSL libraries must be resolvable:
 - /usr/lib/libssl.so
 - /usr/lib/libcrypt.so
- On Linux, the following SSL and Kerberos libraries must be resolvable:
 - /usr/lib/libcrypto.so
 - /usr/lib/libkr5.so
 - /usr/lib/libgssapi_krb5.so
 - /usr/lib/libcom_err.so
 - /usr/lib/libk5crypto.so
 - /usr/lib/libssl.so
- On AIX, the following SSL library must be resolvable: /usr/lib/libcrypt.so

When the SSL libraries cannot be resolved, perform the following procedure.

To make the SSL libraries resolvable

- 1 Set the NAE_SSL_LIBRARY_PATH environment variable to the path for the SSL libraries.
- 2 Set this environment variable in /opt/VRTSvcsonone/bin/vcsonenv for it to take effect.
- 3 Restart the VCS One client on systems where the NetAppExport agent runs. Symantec recommends SSL libraries be resolved from a locally mounted file system.

Performance considerations

If you want to have the agent manage a large number of NetAppExport resources, set the following attributes:

- The type-level attribute NumThreads to 20
- The agent attribute UseAPI to 1.

When you set the NumThreads attribute to a value greater than 1, you need to perform some tuning. The tuning is to determine an ideal value for the capacity of a system. For instance, a NumThreads value of 20 may be optimal for a quad-CPU system. A value of 10 may be optimal for a dual-CPU system.

Set the value of the type-level attribute NumThreads to 1 for SSH- or RSH-based access for communication with the filer.

For sizing and capacity planning information about off-hosts resources refer to the *Veritas Cluster Server One User's Guide*.

Troubleshooting

Turning on debug logs for NetAppExport agent

Update the LogDbg resource type attribute for the NetAppExport agent to turn on debug log messages from the agent. Debug logging introduces additional overhead; limit its use to a temporary basis to troubleshoot agent operation. Some information for using debug logs with the NetAppExport agent follows:

- When the LogDbg attribute includes DBG_AGINFO, general agent framework-related debug messages appear in the agent's log file.
- The LogDbg attribute can include the debug tags 1, 2, or 3. If you use these values, the debug log messages appear on the system where the agent runs in the VCS One Client log file (vcsoneclientd_A.log).
- Agent functions from the NetAppExport agents appear in the VCS One client log file (vcsoneclientd_A.log) on the system where the agent runs.
- For off-host resources, the relevant debug log messages are logged on the system where the control group for the off-host resource is online/partial.

Turning on debug log messages for tag 1

This command turns on debug log messages with tag 1 from the agent functions. It also turns on debug log messages from the agent framework for NetAppExport agents running on the Linux platform. If the platform is omitted, LogDbg is updated for the NetAppExport type for the default platform if one is configured.

```
hatype -modify NetAppExport LogDbg -add 1 DBG_AGINFO -platform linux
```

Disabling debug log messages from the agent framework

This command disables debug log messages from the agent framework for the NetAppExport agent on the linux platform.

```
hatype -modify NetAppExport LogDbg -delete DBG_AGINFO -platform linux
```

Selecting the tags to turn on

To troubleshoot agent functions in the NetAppExport agent, review the following list to select the tags that you want:

- Use 1 to trace entry to and exit from the agent functions.
- Use 2 to identify the arguments that are passed to agent functions. This selection allows validation of the ArgListValues as seen by the agent. For instance, turn on the 2 tag to obtain the encrypted password that passes to the agent function.

- Use 3 to obtain a more verbose debug log messages from the agent.

Log errors

The VCS One system (vcsonclientd_A.log) log indicates errors like:

```
ssh_askpass: exec(/usr/lib/ssh/ssh-askpass): No such file or directory. Host key verification failed.
```

This error indicates that password free SSH-based access between a VCS One system and the filer is not set up correctly. After you set up password free SSH-based access, log in to the filer from the VCS One system where you have configured the NetAppExport resource. You log in so that the filer gets added to the list of known systems for SSH access on the VCS One system.

The NetAppExport resource name is qualified as *resname@SysA when the resource is an off-host resource on SysA. For details on configuring NetAppExport as an off-host resource:

See “[Configuring NetAppExport as an off-host resource](#)” on page 273.

UseAPI for Filer communication

If you set the value of the UseAPI attribute to 1, ensure that HTTP access is enabled on the NetApp Filer.

Issue the command `options trusted.hosts` on the NetApp Filer. The output must indicate * or a list of trusted hosts.

The VCS One system where the NetAppExport resource is configured must be a trusted host on the filer. For off-host resources, systems in the control group for the off-host NetAppExport resource must be in the trusted hosts list on the NetApp Filer.

Verifying configuration of password free SSH- or RSH-based access

You can verify if password free SSH- or RSH-based access or API access is set up correctly.

- To verify password free SSH or RSH access, issue the following command from the VCS One System trying to access the filer. For off-host resources, use one of the systems in the SystemList of the control group of the NetAppExport resource.

```
rsh/ssh filename version
```

The command should not prompt for a password. If it does then password free access has not been configured correctly.

- To verify if API-based access is configured, issue the following command from the VCS One system.

```
/opt/VRTSvcsone/bin/NetAppExport/ontapi filename user password  
system-get-version
```

The ONTAP version on the filer displays.

Mount resources in a NetApp Filer environment need a higher MonitorTimeout than other local file systems

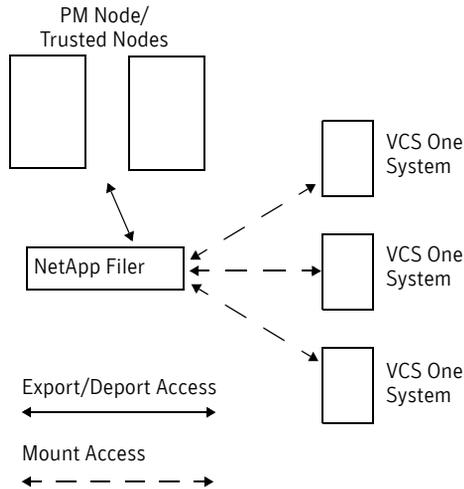
Mount resources in a NetApp Filer environment usually need a higher MonitorTimeout value than other local file systems. NetApp Filers typically take 120 seconds to restart. Symantec recommends that you increase the MonitorTimeout value for the Mount agent to 130 seconds. The higher value allows local file systems to ignore NetApp Filer restarts. It also gives the Mount agent time to handle a Mount resource monitor agent function that could occur when the filer restarts.

Configuring NetAppExport as an off-host resource

You can configure the NetAppExport type as an off-host resource. This configuration enables file systems on the NetApp Filer to be exported or deported from a trusted node. The Policy Master system or another VCS One client system. This configuration eliminates the need for management access to the filer from the VCS One client systems that need to mount the exported file system from the filer. It also helps to ensure the security of the NetApp Filer.

Ensure that password free SSH-, RSH-, or API-based is configured correctly from each VCS One system that appears in the SystemList of the control group. This SystemList is specified for the NetAppExport resource.

Figure 7-13 The NetApp Filer that allows mount, export, and deport access



To configure resources of NetAppExport type as off-host resources, modify the ControlGroup attribute for the resource to specify the control group service group name. Configure the control group service group on the VCS One systems that have management access to the NetApp Filer. For more information about configuring an off-host resource refer to the *Veritas Cluster Server One User's Guide*.

Sample Configurations

The following section presents sample configurations for the NetAppExport agent. Before you can use the NetAppExport resource for the filer, review the following pre-configuration procedures.

Preparing the filer before the NetAppExport resource configuration

Before you configure the NetAppExport resource, review the following information and perform the appropriate tasks. If you use password free RSH- or SSH-based access to communicate with the filer, you must enable access to it. Refer to the appropriate NetApp Filer documentation for more information.

For password free access to the filer, you need to append the public key of the client that accesses the filer to the filer's authorized_keys. The following procedure describes the set up of password free access for the root user on the client system SysA. If NetAppExport is configured as an off-host resource, perform these steps from the candidate control systems where the control group is configured.

To set up password free access for the root user on client system SysA

- 1 Ensure that SysA has read-write access to the /vol/vol0 volume. For read-write access to SysA, type the following command on the filer console:

```
# exportfs -i -o sec=sys,rw=SysA:ExistingRWHosts,\
ro=ExistingROHosts,anon=0 /vol/vol0
```

Where *ExistingRWHosts* and *ExistingROHosts* are the hosts with read-write and read-only access respectively in the existing export entry on the filer for the /vol/vol0 volume.

Refer to the NetApp Filer documentation for more details on the exportfs command and its options.

- 2 Mount /vol/vol0 on SysA.

```
# mount filename:/vol/vol0 /admin
```

Where the *filename* is the name of the filer from which you mount the volume.

- 3 Change directory to /admin/etc/sshd.

```
# cd /admin/etc/sshd
```

- 4 If a directory for root—or for the user for whom you set up password free access—is not present, create it.

- 5 In zone environments, you must be a valid user for the non-global zone.

- 6 Change directory to root/.ssh.

```
# cd root/.ssh
```

Your current working directory is now: /admin/etc/sshd/root/.ssh

- 7 Append SysA's public key to the authorized_keys file on the filer.

```
# cat public_key_for_SysA >> authorized_keys
```

Where *public_key_for_SysA* is the public key for the SysA client.

- 8 Make sure that permissions are set for the following directories and files, where the root directory contains the .ssh directory, and where the .ssh directory contains the authorized_keys file:

- root directory

```
drw----- 3 root other 4096 Dec 3 03:27 root/
```

- .ssh directory

```
drw----- 2 root other 4096 Dec 3 03:31 .ssh/
```

- authorized_keys file

```
-rw-r--r-- 1 root other 1204 Apr 14 08:14
```

```
authorized_keys
```

```
lrwxrwxrwx 1 root root 15 Dec 3 03:31
```

```
authorized_keys2
```

```
-> authorized_keys
```

- 9 For information on setting up SSL or SSH on the filer, refer to the appropriate NetApp Filer documentation.

Using the NetApp API to access the filer

When the NetAppExport agent uses the NetApp API to communicate with the filer, make sure that the filer can use HTTP- or HTTPS-based communication.

Perform the following tasks to ensure that the filer has HTTP-based access:

- Verify that HTTP access exists.
Type the following command on the NetApp console prompt:

```
# options httpd
```

The console displays HTTP options.
- Verify that the correct HTTP options are activated.
Ensure that the following options are "on" as shown in the following lines:

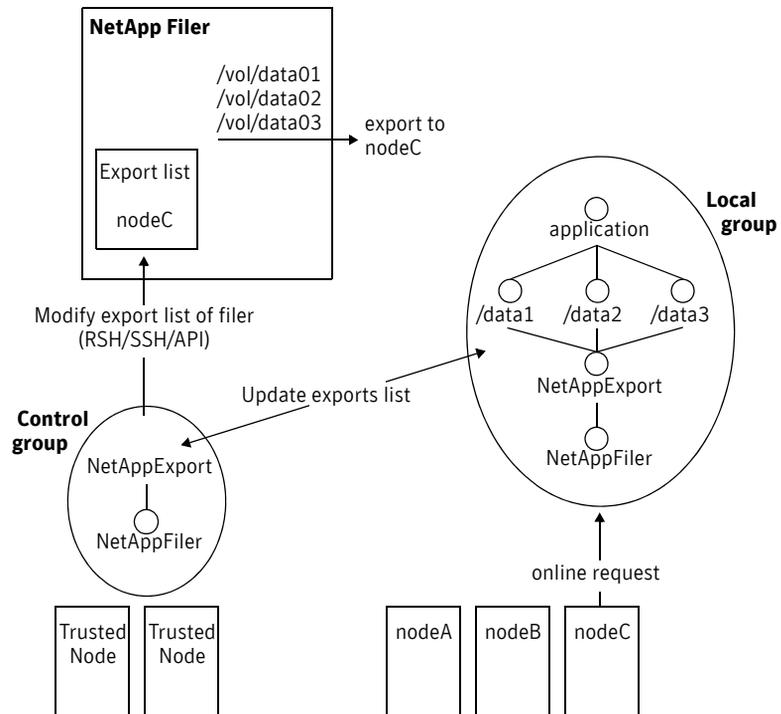
```
httpd.admin.enable on
httpd.admin.hostsequiv.enable on
httpd.admin.ssl.enable on
httpd.autoindex.enable on
httpd.enable on
```
- Verify that the UserName attribute (for a non-root user) in the NetApp Filer's resource has the appropriate user group assigned to it.
For role-based access control of the NetAppFiler resource, assign the appropriate user groups on the filer to this non-root user on the filer.
- Ensure that the UserName attribute of the NetAppFiler resource that can access the filer has access to the following API and CLI on the filer. Where the asterisk is the wild-card symbol in the following list:
 - api-nfs-exportfs-*
For example: api-nfs-exportfs-append-rules, api-nfs-exportfs-list-rules, etc.
 - api-system-*
 - cli-exportfsFor details on user management and setting up restrictive administrative access for non-root users, see the appropriate NetApp Filer documentation.

Creating an off-host resource with a NetApp Filer

The following example presents how to create and configure a VCS One off-host resource for use with a NetApp Filer. In this example, we use a password free SSH to access and update the NetApp Filer.

Note: You can also set up off-host resources using API access. For API access, it is not necessary to setup password free SSH access to the filer.

Figure 7-14 Off-host resource with a NetApp Filer



Preparing the NetApp Filer

Perform the following tasks on the NetApp Filer to prepare it.

To prepare the filer

- 1 Create the shared volumes.
- 2 Add the SSH keys for all the nodes in the control group's SystemList to the `/etc/sshd/root/.ssh/authorized_keys` file on the filer.
- 3 Add entries for base IP addresses for the systems in the control group's SystemList attribute list to the `/etc/hosts` file on the NetApp Filer. This action enables the VCS One clients to SSH into the filer and to update the exports list.

Creating the control group

Perform the following tasks to create the control group.

To create the control group

- 1 Create a control group. The SystemList for the control group includes the VCS One clients with password free SSH access to the NetApp Filer.
- 2 Perform the following command once from each system in the control group's SystemList.

```
# ssh netappfilername exportfs
```

Where *netappfilername* is the name of the filer. This command verifies password free SSH access from the systems in the control group's SystemList. It also creates entries for the filer in the list of known hosts in the SSH configuration. It creates these entries on the VCS One systems in the SystemList of the control group.
- 3 You next create the following resources in the control group:
 - NetAppFiler—This resource verifies the node hosting the control group has connectivity to the NetAppFiler.
 - NetAppExport—This resource is a stub resource that you create to notify the VCS One client to start the NetAppExport Agent on the host. Set the value of the ControlMode attribute for this off-host resource definition to 1. Setting the Enabled attribute to a value of 1 to enable the resource. Enabling the resource ensures that VCS One manages the off-host resources from only from one system, wherever the control group is online.

Creating the local group

Perform the following tasks to create the local group.

To create the local group

- 1 Add entries for base IP addresses for the systems in the local group's SystemList attribute list to the `/etc/hosts` file on the NetApp Filer. This action ensures that the clients that mount the exported file systems have their base IP addresses listed in the correct location on the filer.
- 2 Create a local service group with “nodeA”, “nodeB”, and “nodeC” in the system list.

- 3 Configure all the resource attributes like a normal service group. At a minimum, the local service group consists of the following resources:
 - NetAppFiler—This resource verifies that the application node has connectivity to the NetAppFiler. The application node needs connectivity to mount the NFS shares.
 - NetAppExport—This resource defines the parameters that update the exports list on the NetApp Filer.
 - Mount—This resource mounts the NFS file systems. Each NFS file system that is exported on the NetApp Filer has its own corresponding Mount resource.

Link the local service group to the control service group

Link the NetAppExport resource in the local service group to be an off-host resource that points to the NetApp resource in the control group.

To link the local service group to the control service group

- ◆ At the command line, enter the following:

```
# hares -modify NetAppExport ControlGroup ControlGroup
```

NetAppExport is the name of the NetAppExport type resource in the local service group. *ControlGroup* is the name of your control group.

Bring the local group online

Before you perform any operations on the local group, you must bring the control group online.

When the NetAppExport resource is brought online the VCS One Policy Master relays the online command to the control node. The control node then reaches into the NetApp Filer to update the exports list with the appropriate VCS One client name. It then returns control back to the VCS One client where the rest of the local service group is brought online.

Off-host resource sample configuration

The following sample configuration describes an off-host NetAppExport resource that is configured for a service group called sg. The SystemList has SysA and SysB. The resource specifies sg.filer for the FilerResName attribute. All communication with the filer uses API-access for updating the export option for /vol/agentvol/p5 on the filer.

If the attribute ControlGroup is omitted, the resource definition changes to a non-off-host or a local resource definition.

```
<resource name="hgexport" type="NetAppExport">  
  <attribute name="ControlGroup"><scalar>"cg"</scalar>  
</attribute>
```

```
<attribute name="FilerPathName"><scalar>"/vol/agentvol/p5"  
</scalar></attribute>  
<attribute name="FilerResName"><scalar>"sg.filer"</scalar>  
</attribute>  
<attribute name="ExportACL">  
  <val key="SysA">"SysA"</val>  
  <val key="SysB">"SysB"</val>  
</attribute>  
</resource>
```

Mount agent

The Mount agent brings online, takes offline, and monitors a file system or an NFS client mount point. You can use the agent to make file systems or NFS client mount points highly available or to monitor them. You can now configure the agent to monitor individual resources or all configured resources of type Mount.

This agent also supports high availability fire drills.

This agent is WPAR- and zone-aware. The ContainerOpts resource type attribute for this type has a default value of 0 for RunInContainer and a default value of 0 for PassCInfo. Symantec recommends that you do not change these values. Refer to the *Veritas Cluster Server One User's Guide* for more information.

For important information about this agent, refer to:

[“Mount agent notes”](#) on page 307

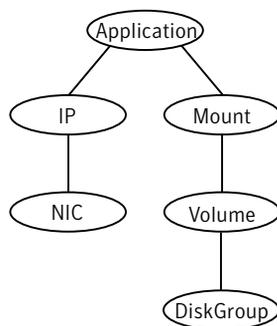
Platforms

AIX, HP-UX, Linux, and Solaris

Dependencies

No dependencies exist for the Mount resource.

Figure 7-15 Sample service group that includes a Mount resource



Agent functions

The value of the Operations attribute for this agent is OnOff.

Online	<p>Mounts a block device on the directory. If the mount process fails for non-NFS mounts, the agent attempts to run the <code>fscck</code> command on the device before attempting to mount the file system again.</p> <p>If file system type is NFS, agent mounts the remote file system to a specified directory. The remote NFS file system is specified in the BlockDevice attribute.</p>
Offline	<p>Unmounts the mounted file system gracefully.</p>
Monitor	<p>Determines if the file system is mounted. The agent can monitor resources in the following ways:</p> <ul style="list-style-type: none"> ■ Monitor individual resources at specific monitoring intervals. ■ Collectively monitor a set of mount resources, also known as type-level monitoring. <p>For more information on type-level monitoring, see the <i>Veritas Cluster Server One User's Guide</i>.</p>
Clean	<p>Unmounts the mounted file system forcefully.</p>
Info	<p>The Mount info agent function executes the command:</p> <p>AIX and Solaris:</p> <pre>df -k mount_point</pre> <p>HP-UX:</p> <pre>bdf mount_point</pre> <p>Linux:</p> <pre>df -h mount_point</pre> <p>The output displays Mount resource information:</p> <pre>Size Used Avail Use%</pre> <p>To initiate the info agent function, set the InfoInterval timing to a value greater than 0. In this example, the info agent function executes every 60 seconds:</p> <pre>hatype -modify Mount InfoInterval 60</pre> <p>The command to retrieve information about the Mount resource is:</p> <pre>hares -value mountres ResourceInfo</pre> <p>Output includes:</p> <pre>Size 2097152 Used 139484 Available 1835332 Used% 8%</pre>

State definitions

ONLINE	<p>AIX, HP-UX, and Solaris: For the local file system, indicates that the block device is mounted on the specified mount point.</p> <p>For an NFS client, indicates that the NFS remote client is mounted on the specified mount directory.</p> <p>Linux: Indicates that the file system is properly mounted on the given mount point.</p>
OFFLINE	<p>AIX, HP-UX, and Solaris: For the local file system, indicates that the block device is not mounted on the specified mount point.</p> <p>For an NFS client, indicates that the NFS remote client is not mounted on the specified mount directory.</p> <p>Linux: Indicates that the file system is not mounted properly on the mount point.</p>
FAULTED	<p>AIX, HP-UX, and Solaris: For the local file system, indicates that the block device has unexpectedly unmounted.</p> <p>For the NFS client, indicates that the NFS remote client has unexpectedly unmounted.</p> <p>Linux: Indicates that the file system unexpectedly unmounted.</p>
UNKNOWN	<p>Indicates that a problem exists either with the configuration or the ability to determine the status of the resource.</p>

Attributes for AIX

Table 7-27 Required attributes for AIX

Required attribute	Description
BlockDevice	<p>Block device for mount point.</p> <p>Type and dimension: string-scalar</p> <p>Example: /dev/vx/dsk/my_dg/myvol</p>
FscOpt	<p>Mandatory for the following file systems types:</p> <ul style="list-style-type: none"> ■ jfs ■ jfs2 ■ vxfs <p>Use this attribute to specify options for the <code>fsck</code> command. You must correctly set this attribute for local mounts. If the mount process fails, the <code>fsck</code> command is executed with the specified options before it attempts to remount the block device. Its value must include either <code>-y</code>, <code>-n</code>, or <code>-p</code>. The <code>-p</code> option is only for jfs or jfs2 file systems on AIX. Refer to the <code>fsck</code> manual page for more information.</p> <p>For NFS mounts, the value of this attribute is not applicable and is ignored.</p> <p>Type and dimension: string-scalar</p> <p>Default: -n</p>
FSType	<p>Type of file system.</p> <p>Supports jfs, jfs2, nfs, namefs, or vxfs.</p> <p>Type and dimension: string-scalar</p> <p>Example: vxfs</p>
MountPoint	<p>Directory for mount point</p> <p>Type and dimension: string-scalar</p> <p>Example: /tmp/mnt</p>

Table 7-28 Optional attributes for AIX

Optional attribute	Description
MountOpt	<p>Options for the mount command. Refer to the mount manual page for more information.</p> <p>Type and dimension: string-scalar</p> <p>Example: rw</p>
SnapUmount	<p>If the value of this attribute is 1, this attribute automatically unmounts VxFS snapshots when the file system is unmounted.</p> <p>If the value of this attribute is 0, and snapshots are mounted, the resource cannot be brought offline. In this case, failover does not occur.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
CkptUmount	<p>If the value of this attribute is 1, this attribute automatically unmounts VxFS checkpoints when file system is unmounted.</p> <p>If the value of this attribute is 0, and checkpoints are mounted, then failover does not occur.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>
SecondLevelMonitor	<p>This attribute is only applicable for an NFS client mount.</p> <p>If the value of this attribute is 1, this attribute enables detailed monitoring of an NFS mounted file system. The agent executes the <code>df -k</code> command for the NFS mounted file system to detect network outage.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Table 7-28 Optional attributes for AIX

Optional attribute	Description
SecondLevelTimeout	<p>This attribute is only applicable for an NFS client mount.</p> <p>This attribute is the timeout (in seconds) for the SecondLevelMonitor attribute. This attribute is only functional when the value of the SecondLevelMonitor attribute is 1. The actual timeout value can be much smaller. This setting depends on how much time remains before it exceeds the MonitorTimeout interval.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 30</p>
AccessPermissionChk	<p>If the value of this attribute is 1 or 2, the monitor verifies that the values of the MntPtPermission, MntPtOwner, and MntPtGroup attributes are the same as the actual mounted file system values.</p> <p>If any of these do not match the values that you have defined, a message is logged.</p> <p>If the value of this attribute is 2, and if the mounted file system permissions do not match the attribute values, the Monitor agent function returns the state as OFFLINE.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 7-28 Optional attributes for AIX

Optional attribute	Description
CreateMntPt	<p>If the value of this attribute is 0, no mount point is created. The mount can fail if the mount point does not exist with suitable permissions.</p> <p>If the value of this attribute is 1 or 2, and a mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions for the mount point are less than 555, a warning message is logged.</p> <p>If the value of this attribute is 2, and the mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions for the mount point are less than 555, a warning message is logged. In addition, VCS deletes the mount point and any recursively created directories when the resource is brought offline. The mount point gets deleted only if it is empty, which is also true for recursive mount points.</p> <p>Type and dimension: integer-scalar Default: 0</p>
MntPtGroup	<p>This attribute specifies the group ownership of the mounted file system. The agent verifies the group ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar Example: grp1</p>
MntPtOwner	<p>This attribute specifies the user ownership of the mounted file system. The agent verifies the user ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar Example: usr1</p>

Table 7-28 Optional attributes for AIX

Optional attribute	Description
MntPtPermission	<p>This attribute specifies the permissions of the mounted file system in an absolute format of a four-digit octal. The agent verifies the mode of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar</p> <p>Example: 0755</p>
OptCheck	<p>The value of this attribute determines if VCS One should verify the mount options. The state of the resource is determined based on the result of the verification.</p> <p>If the value of this attribute is 0 (default), the mount options are not checked.</p> <p>If the value of the OptCheck attribute is 1, 2 or 3, a check is performed to see if the mount command options that you have specified for VCS One are set in the MountOpt attribute. The MountOpt attributes should be the same as the actual mount command options. If the actual mount options differ from the MountOpt attribute, a message is logged. The state of the resource depends on the value of this attribute.</p> <p>If the value of the attribute is 1, the state of the resource is unaffected.</p> <p>If the value is 2, the state of the resource is set to offline.</p> <p>If the value is 3, state of the resource is set to unknown.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
RecursiveMnt	<p>If the value of this attribute is 1, VCS One creates all the parent directories of the mount point if necessary.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Table 7-28 Optional attributes for AIX

Optional attribute	Description
ReuseMntPt	<p>If the same mount point needs to be specified in more than one mount resource, set the value of this attribute to 1. Note that this attribute only accepts a value of 1 or 0.</p> <p>To use this attribute, the cluster administrator needs to add this attribute to the ArgList resource type attribute of the agent. Set the appropriate group and resource dependencies such that only one resource can come online on a system at a time.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Attributes for HP-UX

Table 7-29 Required attributes for HP-UX

Required attribute	Description
BlockDevice	<p>Block device for mount point.</p> <p>For LVM2, use the actual path to the volume.</p> <p>Type and dimension: string-scalar</p> <p>Examples:</p> <ul style="list-style-type: none"> ■ VxVM example /dev/vx/dsk/my_dg/myvol ■ LVM2 example # ls -la /dev/ora_vg/ora_vol lrwxrwxrwx 1 root root 26 Apr 17 04:48 /dev/ora_vg/ora_vol -> /dev/mapper/ora_vg-ora_vol <p>Use the path /dev/mapper/ora_vg-ora_vol for the BlockDevice attribute.</p>
FsckOpt	<p>Mandatory for non-NFS mounts.</p> <p>Use this attribute to specify options for the <code>fsck</code> command. You must correctly set this attribute for local mounts. If the mount process fails, the <code>fsck</code> command is executed with the specified options before it attempts to remount the block device. Its value must include either <code>-y</code> or <code>-n</code>. Refer to the <code>fsck</code> manual page for more information.</p> <p>The <code>-y</code> argument enables the VxFS file systems to perform a log replay before a full <code>fsck</code> operation.</p> <p>For NFS mounts, the value of this attribute is not applicable and is ignored.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>-n</code></p> <p>VxFS example: <code>-y</code></p>

Table 7-29 Required attributes for HP-UX

Required attribute	Description
FSType	Type of file system. Supports vxfs, hfs, or nfs. Type and dimension: string-scalar Example: nfs
MountPoint	Directory for mount point. Type and dimension: string-scalar Example: /campus1

Table 7-30 Optional attributes for HP-UX

Optional attribute	Description
CkptUmount	If the value of this attribute is 1, this attribute automatically unmounts VxFS checkpoints when the file system is unmounted. If the value of this attribute is 0, and checkpoints are mounted, then failover does not occur. Type and dimension: integer-scalar Default: 1
MountOpt	Options for the <code>mount</code> command. Refer to the <code>mount</code> manual page for more information. Type and dimension: string-scalar Example: rw

Table 7-30 Optional attributes for HP-UX

Optional attribute	Description
CreateMntPt	<p>If the value of this attribute is 0, no mount point is created. The mount can fail if the mount point does not exist with suitable permissions.</p> <p>If the value of this attribute is 1 or 2, and a mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions of the mount point are less than 555, a warning message is logged.</p> <p>If the value of this attribute is 2, and the mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions for the mount point are less than 555, a warning message is logged. In addition, VCS deletes the mount point and any recursively created directories when the resource is brought offline. The mount point gets deleted only if it is empty, which is also true for recursive mount points.</p> <p>Type and dimension: integer-scalar Default: 0</p>
MntPtGroup	<p>This attribute specifies the group ownership of the mounted file system. The agent verifies the group ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar Example: grp1</p>
MntPtOwner	<p>This attribute specifies the user ownership of the mounted file system. The agent verifies the user ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar Example: usr1</p>

Table 7-30 Optional attributes for HP-UX

Optional attribute	Description
MntPtPermission	<p>This attribute specifies the permissions of the mounted file system in absolute format of a four-digit octal. The agent verifies the mode of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar</p> <p>Example: 0755</p>
AccessPermissionChk	<p>If the value of this attribute is 1 or 2, the monitor verifies that the values of the MntPtPermission, MntPtOwner, and MntPtGroup attributes are the same as the actual mounted file system values. If any of these do not match the values that you have defined, a message is logged.</p> <p>If the value of this attribute is 2, and if the mounted file system permissions do not match the attribute values, the Monitor agent function returns the state as OFFLINE.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 7-30 Optional attributes for HP-UX

Optional attribute	Description
OptCheck	<p>The value of this attribute determines if VCS One should verify the mount options. The state of the resource is determined based on the result of the verification.</p> <p>If the value of this attribute is 0 (default), the mount options are not checked.</p> <p>If the value of the OptCheck attribute is 1, 2 or 3, a check is performed to see if the mount command options that you have specified for VCS One are set in the MountOpt attribute. The MountOpt attributes should be the same as the actual mount command options. If the actual mount options differ from the MountOpt attribute, a message is logged. The state of the resource depends on the value of this attribute.</p> <p>If the value of the attribute is 1, the state of the resource is unaffected.</p> <p>If the value is 2, the state of the resource is set to offline.</p> <p>If the value is 3, state of the resource is set to unknown.</p> <p>Type and dimension: integer-scalar Default: 0</p>
RecursiveMnt	<p>If the value of this attribute is 1, VCS One creates all the parent directories of the mount point if necessary.</p> <p>Type and dimension: boolean-scalar Default: 0</p>
SecondLevelMonitor	<p>This attribute is only applicable to NFS client mounts.</p> <p>If the value of this attribute is 1, this attribute enables detailed monitoring of an NFS mounted file system. The agent executes the <code>df -k</code> command for the NFS mounted file system to detect network outage.</p> <p>Type and dimension: boolean-scalar Default: 0</p>

Table 7-30 Optional attributes for HP-UX

Optional attribute	Description
SecondLevelTimeout	<p>This attribute is only applicable to NFS client mounts.</p> <p>This attribute is the timeout (in seconds) for the SecondLevelMonitor attribute. This attribute is only functional when the value of the SecondLevelMonitor attribute is 1. The actual timeout value can be much smaller. This setting depends on how much time remains before it exceeds the MonitorTimeout interval.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 30</p>
SnapUmount	<p>If the value of this attribute is 1, this attribute automatically unmounts VxFS snapshots when the file system is unmounted.</p> <p>If the value of this attribute is 0 and snapshots are mounted, then failover does not occur.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
ReuseMntPt	<p>If the same mount point needs to be specified in more than one mount resource, set the value of this attribute to 1. Note that this attribute only accepts a value of 1 or 0.</p> <p>To use this attribute, the cluster administrator needs to add this attribute to the arglist of the agent. Set the appropriate group and resource dependencies such that only one resource can come online on a system at a time.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Attributes for Linux

Table 7-31 Required attributes for Linux

Required attribute	Description
BlockDevice	<p>Block device for mount point.</p> <p>For LVM2, use the actual mapper path to the volume.</p> <p>Type and dimension: string-scalar</p> <p>Examples:</p> <ul style="list-style-type: none"> ■ Raw disk /dev/sdc1 ■ VxVM example /dev/vx/dsk/my_dg/myvol ■ LVM2 example # ls -la /dev/ora_vg/ora_vol lrwxrwxrwx 1 root root 26 Apr 17 04:48 /dev/ora_vg/ora_vol -> /dev/mapper/ora_vg-ora_vol Use the path /dev/mapper/ora_vg-ora_vol for the BlockDevice attribute. ■ NFS example If the file system type is NFS, then specify the BlockDevice as: server:/path/to/share vcsonelnx1.symantec.com:/usr/share1
FckOpt	<p>Mandatory for non-NFS mounts.</p> <p>Use this attribute to specify options for the <code>fck</code> command. You must correctly set this attribute for local mounts. If the mount process fails, the <code>fck</code> command is executed with the specified options before it attempts to remount the block device. Its value must include either <code>-y</code> or <code>-n</code>. Refer to the <code>fck</code> manual page for more information.</p> <p>The <code>-y</code> argument enables the VxFS file systems to perform a log replay before a full <code>fck</code> operation.</p> <p>For NFS mounts, the value of this attribute is not applicable and is ignored.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>-n</code></p> <p>VxFS example: <code>-y</code></p>

Table 7-31 Required attributes for Linux

Required attribute	Description
FSType	Type of file system. Supports vxfs, ext2, ext3, nfs, or reiserfs. Type and dimension: string-scalar
MountPoint	Directory for mount point. Type and dimension: string-scalar Example: /mnt/apache1

Table 7-32 Optional attributes for Linux

Optional attribute	Description
CkptUmount	If the value of this attribute is 1, this attribute automatically unmounts VxFS checkpoints when the file system is unmounted. If the value of this attribute is 0, and checkpoints are mounted, then failover does not occur. Type and dimension: boolean-scalar Default: 1
MountOpt	Options for the <code>mount</code> command. Refer to the <code>mount</code> manual page for more information. Do not specify <code>-o</code> in the <code>MountOpt</code> field. Type and dimension: string-scalar Example: <code>rw</code>

Table 7-32 Optional attributes for Linux

Optional attribute	Description
SecondLevelMonitor	<p>This attribute is only applicable to NFS client mounts.</p> <p>If the value of this attribute is 1, this attribute enables detailed monitoring of an NFS mounted file system. The agent executes the <code>df -k</code> command for the NFS mounted file system to detect network outage.</p> <p>Type and dimension: boolean-scalar Default: 0</p>
SecondLevelTimeout	<p>This attribute is only applicable for an NFS client mount.</p> <p>This attribute is the timeout (in seconds) for the SecondLevelMonitor attribute. This attribute is only functional when the value of the SecondLevelMonitor attribute is 1. The actual timeout value can be much smaller. This setting depends on how much time remains before it exceeds the MonitorTimeout interval.</p> <p>Type and dimension: integer-scalar Default: 30</p>
SnapUmount	<p>If the value of this attribute is 1, this attribute automatically unmounts VxFS snapshots when the file system is unmounted.</p> <p>If the value of this attribute is 0, and snapshots are mounted, the resource cannot be brought offline. In this case, failover does not occur.</p> <p>Type and dimension: boolean-scalar Default: 0</p>

Table 7-32 Optional attributes for Linux

Optional attribute	Description
AccessPermissionChk	<p>If the value of this attribute is set to 1 or 2, the monitor verifies that the values of the MntPtPermission, MntPtOwner, and MntPtGroup attributes are the same as the actual mounted file system values. If any of these do not match the values that you have defined, a message is logged.</p> <p>If the value of this attribute is 2, and if the mounted file system permissions do not match the attribute values, the Monitor agent function returns the state as OFFLINE.</p> <p>Type and dimension: integer-scalar Default: 0</p>
CreateMntPt	<p>If the value of this attribute is 0, no mount point is created. The mount can fail if the mount point does not exist with suitable permissions.</p> <p>If the value of this attribute is 1 or 2, and a mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions of the mount point is less than 555, a warning message is logged.</p> <p>If the value of this attribute is 2, and the mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions for the mount point are less than 555, a warning message is logged. In addition, VCS deletes the mount point and any recursively created directories when the resource is brought offline. The mount point gets deleted only if it is empty, which is also true for recursive mount points.</p> <p>Type and dimension: integer-scalar Default: 0</p>
MntPtGroup	<p>This attribute specifies the group ownership of the mounted file system. The agent verifies the group ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar Example: grp1</p>

Table 7-32 Optional attributes for Linux

Optional attribute	Description
MntPtOwner	<p>This attribute specifies the user ownership of the mounted file system. The agent verifies the user ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar</p> <p>Example: usr1</p>
MntPtPermission	<p>This attribute specifies the permissions of the mounted file system in absolute format of a four-digit octal. The agent verifies the mode of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar</p> <p>Example: 0755</p>
OptCheck	<p>The value of this attribute determines if VCS One should verify the mount options. The state of the resource is determined based on the result of the verification.</p> <p>If set to 0 (default), the mount options are not checked.</p> <p>If the value of the OptCheck attribute is 1, 2 or 3, a check is performed to see if the mount command options that you have specified for VCS One are set in the MountOpt attribute. The MountOpt attributes should be the same as the actual mount command options. If the actual mount options differ from the MountOpt attribute, a message is logged. The state of the resource depends on the value of this attribute.</p> <p>If the value of the attribute is 1, the state of the resource is unaffected.</p> <p>If the value is 2, the state of the resource is set to offline.</p> <p>If the value is 3, state of the resource is set to unknown.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 7-32 Optional attributes for Linux

Optional attribute	Description
RecursiveMnt	<p>If the value of this attribute is 1, VCS One creates all the parent directories of the mount point if necessary.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>
ReuseMntPt	<p>If the same mount point needs to be specified in more than one mount resource, set the value of this attribute to 1. Note that this attribute only accepts a value of 1 or 0.</p> <p>To use this attribute, the cluster administrator needs to add this attribute to the arglist of the agent. Set the appropriate group and resource dependencies such that only one resource can come online on a system at a time.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Attributes for Solaris

Table 7-33 Required attributes for Solaris

Required attribute	Description
BlockDevice	<p>Block device for mount point.</p> <p>Type and dimension: string-scalar</p> <p>Example: /dev/vx/dsk/my_dg/myvol</p>
FsckOpt	<p>Mandatory for the following file system types:</p> <ul style="list-style-type: none"> ■ ufs ■ vxfs <p>Use this attribute to specify options for the <code>fsck</code> command. You must correctly set this attribute for local mounts. If the mount process fails, the <code>fsck</code> command is executed with the specified options before it attempts to remount the block device. Its value must include either <code>-y</code> or <code>-n</code>. Refer to the <code>fsck</code> manual page for more information.</p> <p>For NFS mounts, the value of this attribute is not applicable and is ignored.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>-n</code></p> <p>VxFS example: <code>-y</code></p>
FSType	<p>Type of file system.</p> <p>Supports <code>ufs</code>, <code>nfs</code>, <code>zfs</code>, <code>lofs</code>, or <code>vxfs</code>.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>vxfs</code></p>
MountPoint	<p>Directory for mount point</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>/tmp/mnt</code></p>

Table 7-34 Optional attributes for Solaris

Optional attribute	Description
MountOpt	<p>Options for the <code>mount</code> command. Refer to the <code>mount</code> manual page for more information.</p> <p>Type and dimension: string-scalar</p> <p>Example: <code>rw</code></p>
SnapUmount	<p>If the value of this attribute is 1, this attribute automatically unmounts VxFS snapshots when the file system is unmounted.</p> <p>If the value of this attribute is 0, and snapshots are mounted, the resource cannot be brought offline. In this case, failover does not occur.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>
CkptUmount	<p>If the value of this attribute is 1, this attribute automatically unmounts VxFS checkpoints when file system is unmounted.</p> <p>If the value of this attribute is 0, and checkpoints are mounted, then failover does not occur.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1</p>
SecondLevelMonitor	<p>This attribute is only applicable for an NFS client mount.</p> <p>If the value of this attribute is 1, this attribute enables detailed monitoring of an NFS mounted file system. The agent executes the <code>df -k</code> command for the NFS mounted file system to detect network outage.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Table 7-34 Optional attributes for Solaris

Optional attribute	Description
SecondLevelTimeout	<p>This attribute is only applicable for an NFS client mount.</p> <p>This attribute is the timeout (in seconds) for the SecondLevelMonitor attribute. This attribute is only functional when the value of the SecondLevelMonitor attribute is 1. The actual timeout value can be much smaller. This setting depends on how much time remains before it exceeds the MonitorTimeout interval.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 30</p>
AccessPermissionChk	<p>If the value of this attribute is 1 or 2, the monitor verifies that the values of the MntPtPermission, MntPtOwner, and MntPtGroup attributes are the same as the actual mounted file system values.</p> <p>If any of these do not match the values that you have defined, a message is logged.</p> <p>If the value of this attribute is 2, and if the mounted file system permissions do not match the attribute values, the Monitor agent function returns the state as OFFLINE.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 7-34 Optional attributes for Solaris

Optional attribute	Description
CreateMntPt	<p>If the value of this attribute is 0, no mount point is created. The mount can fail if the mount point does not exist with suitable permissions.</p> <p>If the value of this attribute is 1 or 2, and a mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions for the mount point are less than 555, a warning message is logged.</p> <p>If the value of this attribute is 2, and the mount point does not exist, the agent creates a mount point with system default permissions when the resource is brought online. If the permissions for the mount point are less than 555, a warning message is logged. In addition, VCS deletes the mount point and any recursively created directories when the resource is brought offline. The mount point gets deleted only if it is empty, which is also true for recursive mount points.</p> <p>Type and dimension: integer-scalar Default: 0</p>
MntPtGroup	<p>This attribute specifies the group ownership of the mounted file system. The agent verifies the group ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar Example: grp1</p>
MntPtOwner	<p>This attribute specifies the user ownership of the mounted file system. The agent verifies the user ownership of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar Example: usr1</p>

Table 7-34 Optional attributes for Solaris

Optional attribute	Description
MntPtPermission	<p>This attribute specifies the permissions of the mounted file system in an absolute format of a four-digit octal. The agent verifies the mode of the mounted file system every monitor cycle if the value of the AccessPermissionChk attribute is not 0.</p> <p>Type and dimension: string-scalar</p> <p>Example: 0755</p>
OptCheck	<p>The value of this attribute determines if VCS One should verify the mount options. The state of the resource is determined based on the result of the verification.</p> <p>If the value of this attribute is 0 (default), the mount options are not checked.</p> <p>If the value of the OptCheck attribute is 1, 2 or 3, a check is performed to see if the mount command options that you have specified for VCS One are set in the MountOpt attribute. The MountOpt attributes should be the same as the actual mount command options. If the actual mount options differ from the MountOpt attribute, a message is logged. The state of the resource depends on the value of this attribute.</p> <p>If the value of the attribute is 1, the state of the resource is unaffected.</p> <p>If the value is 2, the state of the resource is set to offline.</p> <p>If the value is 3, state of the resource is set to unknown.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 0</p>

Table 7-34 Optional attributes for Solaris

Optional attribute	Description
RecursiveMnt	<p>If the value of this attribute is 1, VCS One creates all the parent directories of the mount point if necessary. All directories in the path are created with system default permissions.</p> <p>Note: Permissions on mount points must be a minimum of 555 for the operating system commands to work correctly.</p> <p>Type and dimension: boolean-scalar Default: 0</p>
ReuseMntPt	<p>If the same mount point needs to be specified in more than one mount resource, set the value of this attribute to 1. Note that this attribute only accepts a value of 1 or 0.</p> <p>To use this attribute, the cluster administrator needs to add this attribute to the arglist of the agent. Set the appropriate group and resource dependencies such that only one resource can come online on a system at a time.</p> <p>Type and dimension: integer-scalar Default: 0</p>

Mount agent notes

- [“Bringing a Mount resource online in the WPAR”](#) on page 307
- [“Selecting the attribute values for a Mount resource for the WPAR’s root file system for NFS mounts”](#) on page 308
- [“Taking a group with the Mount resource offline can take several minutes if the file system is busy”](#) on page 308
- [“Example 1”](#) on page 309
- [“Example 2”](#) on page 309
- [“Example 3”](#) on page 309

Bringing a Mount resource online in the WPAR

The Mount resource is brought online in the global environment by default (`RunInContainer = 0`). If you want to bring a mount resource online inside the WPAR, perform the following:

- Make sure the resource is in a service group that has the ContainerInfo attribute configured.
- Override this attribute at the resource level.
- Set the value of the RunInContainer key to 1.

Selecting the attribute values for a Mount resource for the WPAR's root file system for NFS mounts

For NFS mounts, you can run the SecondLevelMonitor in a container if you configure the following:

- RunInContainer = 0
- PassCInfo = 1
- Use the absolute path for the value of the MountPoint attribute for the Mount resource. The MountPoint attribute should not have the path relative to the WPAR root with this combination.
- Use a value of 1 for the SecondLevelMonitor attribute for the Mount resource.

The following are examples of relative and absolute paths:

- The file system is mounted on: /wpar/p1/mnt
- The MountPoint attribute's value absolute path: /wpar/p1/mnt
- The MountPoint attribute's value relative path to WPAR root: /mnt

For more information on the ContainerOpts resource attribute, and is RunInContainer and PassCInfo keys, refer to the *Veritas Cluster Server Administrator's Guide*.

Taking a group with the Mount resource offline can take several minutes if the file system is busy

When a file system has heavy I/O, the `umount` command can take several minutes to respond. However, the `umount` command temporarily deletes the mount point from mount command output while processing. Per IBM, this is the expected and supported behavior on AIX. The `umount` command's processing later puts the mount point back if the mount point is found busy. Meanwhile, the default `OfflineTimeout` value of the Mount agent can get exceeded, which in turn invokes the Clean agent function. The Clean function can find the mount point's entry absent from the mount command output and exit with success.

The unmounting, however, may not have happened yet. If unmounting did not occur, offlining resources below the Mount resource (for example the LVMVG or DiskGroup resources) can fail.

The Mount resource's Offline agent function then proceeds to unmount the mount point. After several attempts, the Clean scripts that clean the resources below the Mount resource succeed and the group goes offline.

See the *Veritas Cluster Server Administrator's Guide* for more information about the OfflineTimeout attribute.

Example 1

In this `/etc/filesystems` entry for a VxFS file system created on a VxVM volume, `/mount_point` is the mount point for the file system, `/dev/vx/dsk/Diskgroup_name/Volume_name` is the block device on which the file system is created, and `vxfs` is the file system type.

```
/etc/filesystems:
/mount_point:
    dev      = /dev/vx/dsk/Diskgroup_name/Volume_name
    vfs      = vxfs      mount    = false
    check    = false
```

Example 2

In this `/etc/filesystems` entry for a JFS file system created on an LVM logical volume, `/mount_point2` is the mount point for the file system, `/dev/LVMlogical_volume` is the block device on which the file system is created, `/dev/LVMlogical_volumelog` is the log device for the file system automatically created by the `crfs` command, and `jfs` is the file system type.

```
/etc/filesystems:
/mount_point2:
    dev      = /dev/LVMlogical_volume
    vfs      = jfs
    log      = /dev/LVMlogical_volumelog
    mount    = false
    check    = false
```

Example 3

Use the `crfs` and `mkfs` commands to create file systems. VCS One supports the following configurations for the Mount agent:

- LVM volume group with a JFS or JFS2 file system.
- VxVM volume with a VxFS file system.

Sample configurations

Configuration 1 for AIX

In the following configuration, vol1 is a volume in VxVM diskgroup. The Mnt_dg resource requires the dg resource.

```
<resource name="Mnt_dg" type="Mount">
  <attribute name="BlockDevice"><scalar>"/dev/vx/dsk/dg/vol1"
  </scalar></attribute>
  <attribute name="FSType"><scalar>"vxfs"</scalar></attribute>
  <attribute name="MountOpt"><scalar>"rw"</scalar></attribute>
  <attribute name="MountPoint"><scalar>"/data"</scalar>
  </attribute>
  <attribute name="FsckOpt"><scalar>"-y"</scalar></attribute>
</resource>
```

Configuration 2 for AIX

In the following configuration, lv01 is a volume in LVM volume group. The Mnt_vg resource requires the LVM volume group resource.

```
<resource name="Mnt_vg" type="Mount">
  <attribute name="BlockDevice"><scalar>"/dev/lv01"
  </scalar></attribute>
  <attribute name="FSType"><scalar>"jfs"</scalar></attribute>
  <attribute name="MountOpt"><scalar>"rw"</scalar></attribute>
  <attribute name="MountPoint"><scalar>"/testmnt"</scalar>
  </attribute>
  <attribute name="FsckOpt"><scalar>"-y"</scalar></attribute>
</resource>
```

Configuration 3 for AIX

```
<resource name="MountNFS" type="Mount">
  <attribute name="BlockDevice"><scalar>"10.212.100.101:/mnt/
  share"</scalar></attribute>
  <attribute name="FSType"><scalar>"nfs"</scalar></attribute>
  <attribute name="MountOpt"><scalar>"rw"</scalar>
  </attribute>
  <attribute name="MountPoint"><scalar>"/data"</scalar>
  </attribute>
  <attribute name="SecondLevelMonitor"><scalar>1</scalar>
  </attribute>
  <attribute name="SecondLevelTimeout"><scalar>20</scalar>
  </attribute>
</resource>
```

Configuration 1 for Linux and Solaris

```
<resource name="MountSCSI1" type="Mount">
```

```

    <attribute name="BlockDevice"><scalar>"/dev/vx/dsk/dg/vol1"
    </scalar></attribute>
    <attribute name="FSType"><scalar>"vxfs"</scalar></attribute>
    <attribute name="MountOpt"><scalar>"rw"</scalar></attribute>
    <attribute name="MountPoint"><scalar>"/data"</scalar>
    </attribute>
    <attribute name="FsckOpt"><scalar>"-y"</scalar></attribute>
</resource>

```

Configuration 2 for Linux and Solaris

```

<resource name="MountNFS" type="Mount">
  <attribute name="BlockDevice"><scalar>"10.212.100.101:
  /mnt/share"</scalar></attribute>
  <attribute name="FSType"><scalar>"nfs"</scalar></attribute>
  <attribute name="MountOpt"><scalar>"rw"</scalar></attribute>
  <attribute name="MountPoint"><scalar>"/data"</scalar>
  </attribute>
  <attribute name="SecondLevelMonitor"><scalar>1</scalar>
  </attribute>
  <attribute name="SecondLevelTimeout"><scalar>20</scalar>
  </attribute>
</resource>

```

Configuration 3 for AIX, Linux, and Solaris

In the following configuration, vol1 is a volume in VxVM diskgroup. The Mnt_dg resource requires the dg resource.

```

<resource name="Mnt_dg" type="Mount">
  <attribute name="BlockDevice"><scalar>"/dev/vx/dsk/dg/vol1"
  </scalar></attribute>
  <attribute name="FSType"><scalar>"vxfs"</scalar></attribute>
  <attribute name="MountOpt"><scalar>"rw"</scalar></attribute>
  <attribute name="MountPoint"><scalar>"/data1/data2"</scalar>
  </attribute>
  <attribute name="AccessPermissionChk"><scalar>1</scalar>
  </attribute>
  <attribute name="CreateMntPt"><scalar>1</scalar></attribute>
  <attribute name="MntPtGroup"><scalar>"grp1"</scalar>
  </attribute>
  <attribute name="MntPtOwner"><scalar>"usr1"</scalar>
  </attribute>
  <attribute name="MntPtPermission"><scalar>"0755"</scalar>
  </attribute>
  <attribute name="OptCheck"><scalar>1</scalar></attribute>
  <attribute name="RecursiveMnt"><scalar>1</scalar></attribute>
</resource>

```

for Linux for Linux

Zpool agent

The Zpool agent monitors ZFS storage pools. It exports ZFS storage pools (which reside on shared storage) from one node. It then imports the pool onto another node as required.

ZFS's automount feature mounts all its file systems by setting the mountpoint property to something other than legacy. To find the value of the mountpoint property, use the `zfs get` command. For example, from the command line for the tank mountpoint, enter:

```
# zfs get mountpoint tank
NAME          PROPERTY      VALUE          SOURCE
tank          mountpoint    /tank          default
```

As another example, to find the value of the mountpoint property for the legacypool storage pool, enter:

```
# zfs get mountpoint legacypool
NAME          PROPERTY      VALUE          SOURCE
tank          mountpoint    legacy         default
```

The Zpool agent checks this property, and checks the `ChkZFSMounts` attribute to decide whether the mounted file system should be checked in the Zpool agent or not.

When the value of the mountpoint property is one of the following:

- If the value of the mountpoint property is something other than legacy, the agent checks the mount status of the ZFS file systems.
- If the value of the mountpoint property is legacy, then it does not check the file system mount status. The agent assumes that you plan to use Mount resources to manage and monitor the ZFS file systems.

Limitations

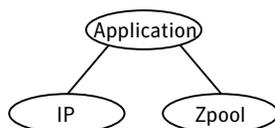
The agent does not support the use of logical volumes in ZFS. If ZFS logical volumes are in use in the pool, the pool cannot be exported, even with the `-f` option. Sun does not recommend the use of logical volumes in ZFS due to performance and reliability issues.

Platform

Solaris

Dependencies

No dependencies exist for the Zpool resource for a pool that has a non-legacy value for its mountpoint property.

Figure 7-16 Sample service group for a Zpool resource

Agent functions

The value of the Operations attribute for this agent is OnOff.

Online Imports the ZFS storage pool.

Offline Exports the ZFS storage pool.

Monitor Check the online status of the ZFS pool.

If the mountpoint property of the ZFS file system is set and its value is not legacy, and the attribute ChkZFSMounts is enabled, then the agent checks if all the ZFS file systems under the same ZFS storage pool are mounted.

If the ZFS pool contains a ZFS file system that a non-global zone uses, then you need to import the pool before the zone boots up. After the zone boots up, if the mountpoint property for this ZFS file system that the non-global zone uses is not set to legacy, it mounts after the zone boots up.

If you have enabled the ChkZFSMounts in the Zpool resource, delay the check inside the Monitor agent function because the zone resource is not up yet, and the file systems are not mounted until the zone boots up.

The Zone resource depends on the Zpool resource for the non-global zone scenario. In this case, you need to provide the ZoneResName attribute, which indicates the name of the Zone resource. When the Zone resource is in an ONLINE state, then ChkZFSMounts starts to check the mount status of the ZFS file system pool that the non-global zone uses.

Clean Exports the ZFS storage pool forcefully.

State definitions

ONLINE Reports an ONLINE state when the ZFS file systems that share a common storage pool are mounted, and the zpool command `zpool list -H -o health $Poolname` indicates if the pool is online or not.

- OFFLINE Reports an OFFLINE state when all of the ZFS file systems that share a common storage pool are unmounted. It also reports an OFFLINE state when the `zpool list -H -o health $Poolname` command's status indicates that the pool is offline.
- UNKNOWN Reports an UNKNOWN state in the following situations:
- If the status of the storage pool is unavailable or faulted.
 - If the storage pool is online but the path of the mounted file system does not match the path that is specified in the `AltRootPath` attribute of this agent.

Attributes for Solaris

Table 7-35 Required attributes for Solaris

Required attribute	Description
PoolName	<p>The name of the ZFS storage pool name.</p> <p>Type and dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: tank</p>
AltRootPath	<p>Provides the alternate root path that is necessary to prevent the <code>/etc/zfs/zpool.cache</code> file from being populated.</p> <p>Supplying this value keeps a node from importing the ZFS storage pool automatically when it restarts after a crash. Not importing the ZFS storage prevents concurrency violations and file system corruption.</p> <p>If you do not provide a value for the <code>AltRootPath</code> attribute, VCS One sets the <code>\$AltRootPath</code> to <code>/</code> as a workaround. This workaround makes sure that the ZFS command <code>zpool import -R \$AltRootPath \$PoolName</code> does not populate the <code>zpool.cache</code> file.</p> <p>Type and dimension: string-scalar</p> <p>Default: /</p> <p>Example: /mnt</p>

Table 7-35 Required attributes for Solaris

Required attribute	Description
ChkZFSMounts	<p>The ChkZFSMounts attribute enables the check to determine whether all the file systems are properly mounted for that ZFS storage pool when the mountpoint property is not set to legacy. The default value is enabled (set to 1).</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 1</p>
ZoneResName	<p>Use the ZoneResName attribute when a non-global zone needs the Zpool resource. In this case, supply the ZoneResName attribute with the name of the Zone resource.</p> <p>Type and dimension: string-scalar</p> <p>Default: n/a</p> <p>Example: zone1</p>



Windows agents

- [Chapter 8, “Network agents” on page 319](#)
- [Chapter 9, “Services and applications agents” on page 337](#)
- [Chapter 10, “FileShare agent” on page 351](#)
- [Chapter 11, “PrintShare agents” on page 361](#)
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Network agents

This chapter contains:

- [“About the network agents”](#) on page 319
- [“NIC agent”](#) on page 320
- [“IP agent”](#) on page 323
- [“IPMonitor agent”](#) on page 325
- [“Lanman agent”](#) on page 326

About the network agents

Network agents make IP addresses and computer names highly available.

The network agents include the following:

- The NIC and IP agents work together to make a virtual IP address highly available.
- The IPMonitor agent monitors the configured IP addresses.
- The Lanman agent makes a virtual computer name highly available. The Lanman agent requires the IP agent for operation.

NIC agent

The NIC (Network Interface Card) agent monitors the configured NIC. Some NICs maintain their connection status in a system-defined variable. The NIC agent uses this variable to determine the status of the NIC resource. If the NIC does not maintain its connection status, the agent uses a 'ping' or a User Datagram Protocol (UDP) echo broadcast to determine the status of the resource. The agent does not support fault-tolerant NICs.

The NIC resource is a persistent resource and cannot be made dependent on other resources.

Note: Symantec recommends two public NICs, one as a communication channel with the Policy Master and one to configure service groups for applications.

Agent function

Monitor If the NIC maintains its connection status, the agent reads the system-defined variable to determine the status of the resource.

If the NIC does not maintain its connection status, the agent verifies that the NIC has been assigned an IP address, and sends a ping to all the hosts listed in the attribute `PingHostList`. The agent counts the number of packets received by the NIC before and after the ping. If the count increases, the resource is marked `ONLINE`. If the count remains unchanged, the agent broadcasts a UDP echo request to the address derived from the administrative IP address and the associated subnet mask. The agent counts the number of packets received by the NIC before and after the broadcast. If the count increases, the resource is marked `ONLINE`. If the count remains the same or decreases, the resource is marked `FAULTED`.

The NIC agent also calculates the percentage of erroneous packets transmitted during each monitor interval. If this percentage exceeds the value in the `MaxTxErrorPercentage` attribute for the number of consecutive monitor intervals specified by the value in the `MaxTxErrInterval` attribute, the NIC resource is marked `FAULTED`.

State definitions

ONLINE	Indicates the NIC resource is online.
FAULTED	Indicates a problem with the NIC or that a network link failed.
UNKNOWN	Indicates the agent encountered errors while monitoring the NIC resource.

Attributes

Table 8-1 NIC agent required attributes

Required Attribute	Description
MACAddress	<p>The physical address of the NIC to be monitored. Note that this attribute is always local, that is, it is different for each system.</p> <p>Note: You can use the <code>ipconfig -all</code> command to retrieve the physical address of a NIC.</p> <p>Type and dimension: string-scalar</p>

Table 8-2 NIC agent optional attributes

Optional Attributes	Description
MaxTxErrInterval	<p>The number of consecutive monitor intervals for which the percentage of erroneous packets should not exceed the value specified in MaxTxErrorPercentage. When this occurs, the NIC is declared FAULTED.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 10</p>
MaxTxErrorPercentage	<p>The threshold error percentage for the total packets sent between two consecutive monitor intervals.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 50</p>
PingHostList	<p>A list of hosts that are always reachable from the NIC. You must specify the IP addresses of the systems that you add as hosts.</p> <p>If the UseConnectionStatus attribute is set to False, make sure the attribute PingHostList is not empty.</p> <p>Type and dimension: string-vector</p>

Table 8-2 NIC agent optional attributes

Optional Attributes	Description
PingTimeoutMseconds	<p>The timeout interval, in milliseconds, for a ping.</p> <p>Type and dimension: integer-scalar</p> <p>Default: 1000 milliseconds</p>
UseConnectionStatus	<p>A flag that defines whether the NIC maintains its connection status. The value True indicates the NIC maintains its status. The value False indicates it does not. If this attribute is set to False, you must specify a value for the attribute PingHostList.</p> <p>VCS One provides a utility, "NICTest," which determines whether a NIC maintains its connection status. You can use the NICTest utility to determine whether or not this attribute is required.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: True</p>

IP agent

The IP agent assigns a virtual IP address to the NIC, monitors the IP address, and removes it. The agent also monitors the associated subnet mask on a network interface card (NIC).

Dependency

The IP resource depends on the NIC resource.

Agent functions

Online	Assigns a unique virtual IP address to an empty slot on the NIC after verifying that the IP address is not being used by another system.
Offline	Removes the virtual IP address assigned to the NIC.
Monitor	Verifies that the specified virtual IP address is assigned to the NIC.

State definitions

ONLINE	Indicates the specified virtual IP address is assigned to the NIC.
OFFLINE	Indicates the specified virtual IP address is not assigned to the NIC.
UNKNOWN	Indicates the agent encountered errors while monitoring the IP resource.

Attributes

Table 8-3 IP agent required attributes

Required Attributes	Description
Address	A unique virtual IP address to be assigned to the NIC. Type and dimension: string-scalar
SubNetMask	The subnet mask associated with the IP address. Type and dimension: string-scalar

Table 8-3 IP agent required attributes

Required Attributes	Description
MACAddress	<p>The physical address of the NIC to which the virtual IP address is assigned. Note that this attribute is always local, that is, it is different for each system.</p> <p>Note: Use the <code>ipconfig -all</code> command to retrieve the physical address of a NIC.</p> <p>Type and dimension: string-scalar</p>

IPMonitor agent

The IPMonitor agent monitors the specified IP addresses. The agent also monitors the associated subnet mask on a network interface card (NIC).

Agent functions

Monitor Verifies that the specified IP address is available on the local system.

State definitions

ONLINE Indicates the specified IP address is assigned and is available on the specified network adapter.

FAULTED Indicates a problem with the network adapter or that a network link failed.

UNKNOWN Indicates the agent encountered errors while monitoring the IPMonitor resource.

Attributes

Table 8-4 IPMonitor agent required attributes

Required Attributes	Description
Address	The IP address to be monitored. Type and dimension: string-scalar
SubNetMask	The subnet mask associated with the IP address. Type and dimension: string-scalar
MACAddress	The physical address of the NIC to which the IP address is assigned. Note that this attribute is always local, that is, it is different for each system. Note: Use the <code>ipconfig -all</code> command to retrieve the physical address of a NIC. Type and dimension: string-scalar

Lanman agent

The Lanman agent enables clients to access data and applications on a cluster node by associating the virtual IP address with the virtual computer name in the WINS database. The agent provides the option of associating multiple IP addresses from different subnets with the virtual computer name. The agent also provides the option of creating the virtual computer object in any organizational unit in the Active Directory and enhances the DNS updating capabilities of VCS One.

The Lanman agent registers the following services with the WINS server:

- Server (20h)
- Workstation (00h)
- Messenger (03h)

The agent supports Kerberos authentication by providing the option of adding the virtual computer name to the Active Directory and adding the virtual IP address to the DNS. The agent uses the VCS One Remoting Service user context for AD and DNS updates.

The Lanman agent updates and monitors the canonical name (CNAME) mapping in the domain name server when failing over applications across subnets (performing a wide-area failover.) The Lanman agent also supports creating DNS records in different DNS zones.

DNS scavenging affects virtual servers configured in VCS One because the Lanman agent uses Dynamic DNS (DDNS) to map virtual names with IP addresses. If you use scavenging, then you must enable the `DNSRefreshRequired` attribute. This will enable the Lanman agent to refresh the resource records on the DNS servers. See the `DNSRefreshRequired` attribute description for more information.

If security policies are enabled on Windows Server 2008, ensure that the startup type of the VCS One Remoting Service is set to Automatic.

Dependency

The Lanman resource depends on the IP resource.

If you change your Lanman resource dependency to a new IP resource and bring the Lanman resource online, a ping to the virtual name might respond from the IP address of the previous IP resource until the next WINS broadcast. The WINS broadcast updates the WINS database with the changed association.

For example, if you took the Lanman resource offline, changed the Lanman resource dependency from IP_A to IP_B, and brought the Lanman resource online, a ping to the virtual name might still respond from IP_A. Note that the

IP_A resource is kept online during this process. The ping will respond from IP_B after the next WINS broadcast updates the WINS database.

Agent functions

Online	Binds the IP addresses with the specified virtual computer name. The agent also queries the name server of the domain for Host (A), PTR, and CNAME records and adds or updates the records on the name server.
Offline	Removes the IP address binding from the virtual computer name.
Monitor	Verifies the IP addresses are bound to the virtual computer name. If DNSUpdateRequired and DNSRefreshRequired is enabled and the resource is ONLINE, then the Lanman agent refreshes the resource records on the DNS servers. The agent queries the name servers for DNS records. It reports back ONLINE if the response from all the name servers contains the Host (A), PTR, and CNAME records. If no servers return the appropriate records, the monitor reports the resource as OFFLINE.

State definitions

ONLINE	Indicates the IP addresses are bound to the virtual computer name and the DNS records are as expected.
OFFLINE	Indicates the IP addresses are not bound to the virtual computer name or the agent failed to create the DNS records or the expected DNS records were not found.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Attributes

Table 8-5 Lanman agent required attributes

Required Attributes	Description
IPResName	<p>The name of the IP resource on which the Lanman resource depends. Do not define a value for this attribute if the MultiNet attribute is set to 1.</p> <p>Type and dimension: string-scalar</p>
VirtualName	<p>The virtual computer name to be assigned to the server. The virtual name must be fewer than 16 characters. Note that if you specify a virtual computer name in lowercase letters, the agent converts it to uppercase. For example, the name VCSONEServer is converted to VCSONESERVER.</p> <p>Type and dimension: string-scalar</p>

Table 8-6 Lanman agent optional attributes

Optional Attributes	Description
ADContainer	<p>Specifies the distinguished name of the Active Directory container or the organizational unit (OU) for the newly created computer object. If no value is specified for this attribute, the Lanman resource creates the computer object in the default container “Computers.”</p> <p>Note that the user account for VCS One Remoting Service must have adequate privileges on the specified container to create and update computer accounts. Refer to Microsoft documentation for information on assigning user privileges for a container.</p> <p>By default, the attribute contains no value.</p> <p>Type and dimension: string-scalar</p> <p>Note: Value specified for this attribute will be effective only if ADUpdateRequired is set to 1.</p>
ADCriticalForOnline	<p>Defines whether the Lanman resource faults if the agent fails to update the Active Directory. The value 1 indicates that the resource faults in case of a failure to update the Active Directory. The value 0 indicates that it does not.</p> <p>Default: 0</p> <p>Type and dimension: boolean-scalar</p>

Table 8-6 Lanman agent optional attributes

Optional Attributes	Description
AdditionalDNSServers	<p>An array that specifies the IP addresses of the additional DNS servers that the Lanman resource will update. For all the Windows DNS servers, the forward and reverse lookup zones must be configured. For all the Berkeley Internet Name Domain (BIND) servers, only the forward lookup zones are required.</p> <p>All additional DNS servers are considered as Windows DNS servers by default. If any additional DNS server is BIND server, you must specify it in the attribute value.</p> <p>Example:</p> <pre>{“10.212.108.9” = ““,”10.212.108.10” = “BIND”}</pre> <p>Where 10.212.108.9 is the IP address of a Windows DNS server, and 10.10.212.108.10 is the IP address of a BIND DNS server.</p> <p>The Lanman agent creates only CNAME records on BIND servers. You must also specify the AliasName attribute in case of BIND server updates.</p> <p>Note: The Lanman agent supports BIND version 8 and above.</p> <p>By default, the attribute contains no value. Values specified for this attribute will be effective only if DNSUpdateRequired is set to 1.</p> <p>Note: In cases where the default DNS is a BIND DNS server, set the value of the DNSOptions attribute to IgnoreDefault, and specify the BIND DNS server details in this attribute.</p> <p>Note: If the BIND DNS servers are configured for secure updates, then you must configure the TSIG keys either in the DNSZones attribute or the TSIGKeyFile attribute.</p> <p>Type and dimension: string-association</p>
ADUpdateRequired	<p>Defines whether the Lanman resource updates the Active Directory with the virtual name. The value 1 indicates that the agent updates the Active Directory. The value 0 indicates it does not.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p>

Table 8-6 Lanman agent optional attributes

Optional Attributes	Description
DNSCriticalForOnline	<p>Defines whether the Lanman resource faults if the agent fails to update the DNS. The value 1 indicates that the resource faults in case of a failure to update the DNS. The value 0 indicates that it does not.</p> <p>Default: 0</p> <p>Type and dimension: boolean-scalar</p>
DNSOptions	<p>An array that specifies the way in which the Lanman resource updates the DNS servers.</p> <p>This attribute can take one or all of the following values:</p> <ul style="list-style-type: none"> ■ UpdateAll: Updates all the default DNS servers specified in the TCP/IP properties for the client system, and the additional DNS servers specified in the AdditionalDNSServers attribute. ■ IgnoreDefault: Ignores the default DNS servers and updates only the additional DNS servers. ■ PurgeDuplicate: Removes duplicate DNS entries from the DNS servers. Symantec recommends you to set this value for service groups configured for wide area failover. ■ SkipPtrRecords: The Lanman resource excludes the PTR records while updating the resource records on the specified DNS servers. <p>Any combination of these values can be specified for the attribute. This attribute takes effect only when the Lanman resource comes online.</p> <p>By default, the attribute contains no value. Values specified for this attribute will be effective only if DNSUpdateRequired is set to 1 and DNS servers are specified in the AdditionalDNSServers attribute.</p> <p>Note: In cases where the default DNS is a BIND DNS server, set this attribute value to IgnoreDefault and specify the BIND DNS server details in the AdditionalDNSServers attribute.</p> <p>Type and dimension: string-vector</p>

Table 8-6 Lanman agent optional attributes

Optional Attributes	Description
DNSUpdateRequired	<p>Defines whether the Lanman resource updates the DNS with the virtual IP address. The value 1 indicates that the resource updates the DNS. The value 0 indicates it does not.</p> <p>Default: 0</p> <p>If you set this attribute but there are no DNS serves specified in the TCP/IP properties, then you must specify the DNS servers that you wish to update, in the AdditionalDNSServers attribute.</p> <p>If NetBIOS is disabled over TCP, set this attribute value to 1.</p> <p>Type and dimension: boolean-scalar</p> <p>Note: The Lanman resource does not update the DNS for manual DNS entries.</p>
DNSRefreshInterval	<p>This attribute represents the time interval, in seconds, after which the Lanman agent attempts to refresh the resource records (RRs) on the DNS servers. You must set a value for this attribute if you want the Lanman agent to refresh the records on the DNS servers.</p> <p>The default value zero indicates that the Lanman agent does not attempt to refresh the records on the DNS servers.</p> <p>The Lanman agent logs warning messages if it is not able to refresh the DNS records. After three failed attempts, the Lanman agent logs error messages for subsequent failures.</p> <p>If the Lanman agent is unable to refresh the DNS records, and the records are removed as a result of a scavenging operation or by the DNS administrator, the Lanman resource will fault.</p> <p>Type and dimension: integer-scalar</p>

Table 8-6 Lanman agent optional attributes

Optional Attributes	Description
DNSZones	<p>An array that specifies a list of DNS zones (in case of multi-domain environments with parent-child configurations) for which the Lanman resource should create and update Address (A) records and canonical name (CNAME) records in the DNS server of the parent domain.</p> <p>Example: {"child1.company.com", "child2.company.com"}</p> <p>Where child1.company.com and child2.company.com are DNS zones representing different child domains.</p> <p>By default, the attribute contains no value. This means that the Lanman resource will create and update resource records only in the DNS name servers for the zones in which the nodes exist.</p> <p>If multiple zones are being updated on BIND DNS servers that are configured for secure updates, then each zone may require a different TSIG key. In such a case, you must specify the absolute path of the TSIG key file in this attribute value.</p> <p>Example:</p> <pre>{ "child1.company.com" = "C:\TSIGKey1.key", "child2.company.com" = "C:\TSIGKey2.key" }</pre> <p>Where TSIGKey1.key is the TSIG key for the DNS zone child1.company.com, and TSIGKey2.key is the TSIG key for the DNS zone child2.company.com.</p> <p>Note: The Lanman agent supports BIND version 8 and above.</p> <p>Type and dimension: string-association</p>
AliasName	<p>A string representing the alias to the canonical name. The Lanman resource creates a CNAME record using the value specified in this attribute.</p> <p>Example: "www"</p> <p>Where www is the alias to the canonical name mtv.veritas.com.</p> <p>By default, the attribute contains no value.</p> <p>Note: This attribute is required if a BIND DNS server is specified in the AdditionalDNSServers attribute.</p> <p>Type and dimension: string-scalar</p>

Table 8-6 Lanman agent optional attributes

Optional Attributes	Description
TSIGKeyFile	<p>Required when you configure BIND DNS for secure updates. Specify the absolute path to the file that contains the private Transaction Signature (TSIG) key. This key is used by the nsupdate utility to perform secure BIND DNS updates.</p> <p>See the BIND man pages for more information about secure DNS updates.</p> <p>You must copy the files containing the keys (typically the .key and the .private file) on each of the client systems that are part of the service group.</p> <p>Example: C:\TSIG\Kveritas.com.+157+00000.key</p> <p>By default, the attribute contains no value.</p> <p>Note: The Lanman agent supports BIND version 8 and above.</p> <p>Type and dimension: string-scalar</p>
TTL	<p>This attribute defines the Time To Live (TTL) value (in seconds) that gets stored in the DNS records created by the agent.</p> <p>Example: TTL = 7200</p> <p>Default: 0</p> <p>Type and dimension: integer-scalar</p>
MultiNet	<p>Defines whether the Lanman resource binds multiple IP addresses with the virtual name. The value 1 indicates the resource binds multiple IP addresses specified in MultiNetInfo with the virtual computer name. The value 0 indicates the resource binds a single IP address specified in IPResName.</p> <p>Default: 0</p> <p>Type and dimension: boolean-scalar</p>

Table 8-6 Lanman agent optional attributes

Optional Attributes	Description
MultiNetInfo	<p>An array that specifies details of the IP addresses to be bound to the virtual computer name. If MultiNet is set to 1, configure this attribute in the following format:</p> <pre>MultiNetInfo = { "IP=<i>ip_address1</i> Mask=<i>subnetmask1</i> WINS=<i>wins_ip_address1</i> MAC=<i>mac_address1</i>" , "IP=<i>ip_address2</i> Mask=<i>subnetmask2</i> WINS=<i>wins_ip_address2</i> MAC=<i>mac_address2</i>" }</pre> <p>Note: Specifying Mask and MAC address is optional. If not specified, the Lanman agent discovers the subnet mask from the current configuration.</p> <p>Note: On Windows Server 2008, MAC address is required if NetBIOS is disabled for the IP address.</p> <p>Type and dimension: string-vector</p>

Updating manual DNS entries

Perform the following steps to update the DNS for manual DNS entries.

To update the DNS for manual DNS entries

- 1 For the manually added DNS entry, add the user in whose context the VCS One Remoting Service is running.
- 2 Assign “Full Control” privilege to the newly added user.

Refer to Microsoft documentation for information about adding users and assigning privileges.

Updating DNS servers

The table below presents possible combinations of values for the DNSOptions attribute and the updates effected by the Lanman resource corresponding to each value set.

Table 8-7 DNSOptions attribute and Lanman agent behavior

UpdateAll	Ignore Default	Purge Duplicate	Effect
-	-	-	Updates any “one” default DNS server.
-	-	✓	Updates any “one” default DNS server and removes duplicate entries, if any.
-	✓	-	Updates any “one” additional DNS server.
-	✓	✓	Updates any “one” additional DNS server and removes duplicate entries, if any.
✓	-	-	Updates all the default and additional DNS servers.
✓	-	✓	Updates all the default and additional DNS servers and removes duplicate entries, if any.
✓	✓	-	Updates all the additional DNS servers.
✓	✓	✓	Updates all additional DNS servers and removes duplicate entries, if any.

Services and applications agents

This chapter contains:

- [“About the services and applications agents”](#) on page 337
- [“MSDTC agent”](#) on page 338
- [“GenericService agent”](#) on page 341
- [“ServiceMonitor agent”](#) on page 344
- [“Process agent”](#) on page 347

About the services and applications agents

Services and applications agents make generic services and other applications highly available.

- The MSDTC agent brings the MSDTC Server service online, monitors its status, and takes it offline. The agent provides high availability for the MSDTC service in a clustered environment.
- The GenericService agent brings services online, monitors their status, and takes them offline.
- The ServiceMonitor agent *only* monitors a service or starts a user-defined script and interprets the exit code of the script.
- The Process agent brings processes online, monitors their status, and takes them offline.

MSDTC agent

Microsoft Data Transaction Coordinator (MSDTC) service enables you to perform distributed transactions. A distributed transaction updates data one or more computers in a network. The MSDTC service ensures that a transaction is successfully committed on each computer. A failure to commit on a single system aborts the transaction on all systems in the network.

If a transaction spans across more than one computer in the network, you must ensure that the MSDTC service is running on all the computers. Also, all the computers must be able to communicate with each other.

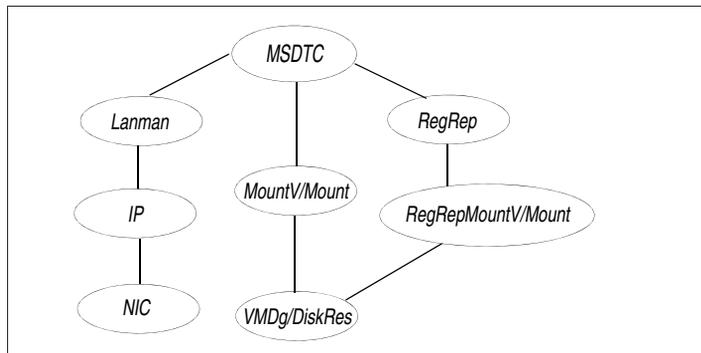
The MSDTC agent brings the MSDTC service online, monitors its status, and takes it offline. The agent provides high availability for the MSDTC service in a clustered environment. The agent detects an MSDTC failure if the MSDTC service is not running.

Dependencies

For a failover service group, the MSDTC resource depends on the Mount (MountV in case of SFW) and the Registry Replication resources. It also requires a Lanman resource that is dependent on the IP resource.

The following figure illustrates the MSDTC agent's resource dependency graph for a failover service group:

Figure 9-1 Dependency: MSDTC in a failover service group

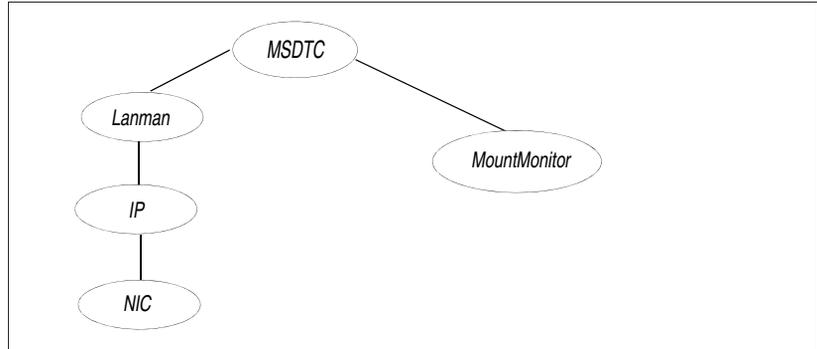


In a Veritas Storage Foundation for Windows environment, use the MountV and the Volume Manager Diskgroup (VMDg) agents instead of the Mount and Disk Reservation (DiskRes) agents, respectively.

For a start/stop service group configured in the virtual server context, the MSDTC resource depends on the MountMonitor resource. It also requires a Lanman resource that is dependent on the IP resource.

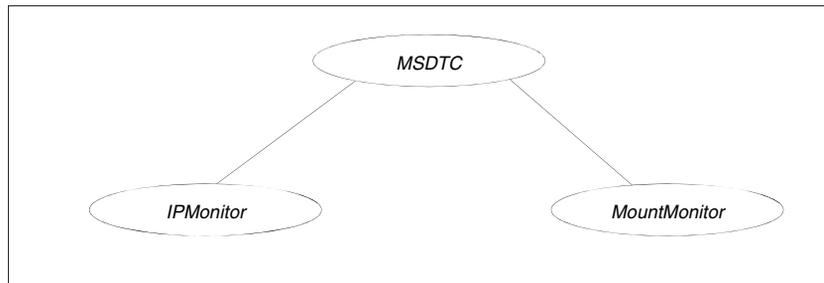
The following figure illustrates the MSDTC agent’s resource dependency graph for a start/stop service group configured in the virtual server context:

Figure 9-2 Dependency: MSDTC in a virtual server start/stop service group



For a start/stop service group configured in the local system context, the MSDTC resource depends on the IPMonitor and the MountMonitor resources. The following figure illustrates the MSDTC agent’s resource dependency graph for a start/stop service group configured in the local system context:

Figure 9-3 Dependency: MSDTC in a local system start/stop service group



Agent functions

Online	Brings the MSDTC service online.
Offline	Takes the MSDTC service offline.
Monitor	Monitors the MSDTC service.
Clean	Forcibly stops the MSDTC service.

State Definitions

ONLINE	Indicates the MSDTC service is running.
OFFLINE	Indicates the MSDTC service is not running.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Attribute definitions

[Table 9-1](#) on page 340 describes the attributes associated with the VCS One agent for MSDTC. The required attributes must be configured for the agent to function properly.

Table 9-1 MSDTC agent required attributes

Required Attribute	Description
LanmanResName	<p>Name of the Lanman resource on which the MSDTC resource depends.</p> <p>For service groups configured in the virtual server context, the MSDTC service is started in the Lanman name context.</p> <p>For start/stop service groups configured in the local system context, this attribute is not set and the agent starts the MSDTC service in the localhost context.</p> <p>Type and dimension: string-scalar</p>
MountResName	<p>For a failover service group, this is the name of the MountV (in case of SFW) or Mount (in case of LDM) resource name on which the MSDTC resource depends.</p> <p>For a start/stop service group this is the name of the MountMonitor resource.</p> <p>Type and dimension: string-scalar</p>
LogPath	<p>The path for the MSDTC logs directory. For a failover service group, this directory must reside on a shared disk.</p> <p>This attribute value must be relative to the drive letter specified in the the MountResName attribute.</p> <p>This attribute can take localized values.</p> <p>Type and dimension: string-scalar</p>

GenericService agent

The GenericService agent brings services online, takes them offline, and monitors their status. Note that a service is an application type that is supported by Windows, and conforms to the interface rules of the Service Control Manager (SCM).

Services are configured as resources of type GenericService. You can configure the GenericService agent to monitor multiple services by defining a resource for each service to be monitored. You can monitor a service in a user-context by specifying the user name, password, and domain. You can start and monitor services in the virtual computer context by enabling the UseVirtualName attribute.

Note: The service to be configured using the GenericService agent must have the status as “Stopped” and the startup type as “Manual.”

Agent functions

Online	Starts the configured service.
Offline	Stops the configured service.
Monitor	Retrieves the current state of the configured service. It also verifies the user context, if applicable.

State definitions

ONLINE	Indicates the service being monitored is online.
OFFLINE	Indicates the service being monitored is offline.
UNKNOWN	Indicates the service operation is in a pending state, or that the agent could not determine the state of the resource.

Attributes

Table 9-2 GenericService agent required attributes

Required Attribute	Description
ServiceName	Name of the service to be monitored. The service name can be the Service Display Name or the Service Key Name. Type and dimension: string-scalar

Table 9-3 GenericService agent optional attributes

Optional Attributes	Description
DelayAfterOffline	Number of seconds the offline routine waits for the service to go offline. Default is 10 seconds. Type and dimension: integer-scalar
DelayAfterOnline	Number of seconds the online routine waits for the service to go online. Default is 10 seconds. Type and dimension: integer-scalar
Domain	The domain name to which the user specified in the UserAccount attribute belongs. If the UserAccount attribute is empty or contains a built-in service account, this attribute is ignored. Type and dimension: string-scalar
Password	The password of the user, in whose context, the service would be started. Encrypt the password using the VCS One Encrypt utility. If the UserAccount attribute is empty or contains a built-in service account, this attribute is ignored. Type and dimension: string-scalar
service_arg	An array of arguments passed to the service. Type and dimension: string-vector

Table 9-3 GenericService agent optional attributes

Optional Attributes	Description
UserAccount	<p>A valid user account in whose context the service will be monitored. Username can be of the form <i>username@domain.com</i> or <i>domain.com\username</i>.</p> <p>If you do not specify a value for this attribute, then the user account of the service in the SCM is ignored. To monitor service under built-in accounts, you must provide explicit values. For example:</p> <ul style="list-style-type: none"> ■ On Windows 2003: UserAccount='LocalSystem', 'Local Service', or 'Network Service'. Domain='NT Authority'. The 'NT Authority' domain is not applicable for the 'LocalSystem' account. <p>Type and dimension: string-scalar</p>
UseVirtualName	<p>Set this value to enable the service specified by the ServiceName attribute to inherit the Virtual Server context of Lanman resource specified in LanmanResName attribute. If this attribute is set, the LanmanResName becomes a mandatory attribute.</p> <p>Type and dimension: boolean-scalar</p> <p>Note: It is recommended that you do not set this attribute for system services. If you configure system services using the GenericService agent, then this attribute is not supported.</p>
LanmanResName	<p>The name of the Lanman resource on which the GenericService resource depends.</p> <p>Type and dimension: string-scalar</p> <p>Note: It is recommended that you do not set this attribute for system services. If you configure system services using the GenericService agent, then this attribute is not supported.</p>

ServiceMonitor agent

The ServiceMonitor agent monitors a service or starts a user-defined script and interprets the exit code of the script. A service is an application type that is supported by Windows, and conforms to the interface rules of the Service Control Manager (SCM). The agent can be configured to monitor a service using the SCM or through a user-defined script.

When configured to monitor using the SCM, the agent queries the SCM database for the status of the service. When configured to monitor using a script or an executable, the agent executes the script on *each system* in the cluster, once every monitor cycle. The agent returns `ONLINE`, `OFFLINE`, or `UNKNOWN` depending on the exit code of the script. The exit code must conform to VCS One standards. You can monitor a service or run a script in a user-context by specifying the user name, password, and domain.

Note: The ServiceMonitor resource is a persistent resource and cannot be made dependent on other resources.

Agent function

Monitor	If the agent is configured to monitor a service, the agent queries the SCM for the status of the service. If the agent is configured to start a script, the agent spawns the specified script and interprets the exit code of the script.
---------	---

State definitions

ONLINE	Indicates the specified service is running, or that the configured script returned an online exit code.
FAULTED	Indicates the specified service is not running, or that the configured script returned an offline exit code.
UNKNOWN	Indicates the agent could not determine the state of the resource.

Attributes

Table 9-4 ServiceMonitor agent required attributes

Required Attribute	Description
ServiceOrScriptName	<p>The name of the service to be monitored or script to be spawned for monitoring the service. You must specify the complete path of the script, including any command-line arguments.</p> <p>Type and dimension: string-scalar</p> <p>Note: The exit code of the script must conform to VCS One conventions: 110 for ONLINE and 100 for OFFLINE. For exit values outside the range 100-110, the status is considered UNKNOWN.</p>

Table 9-5 ServiceMonitor agent optional attributes

Optional Attributes	Description
Domain	<p>The domain to which the user belongs, as specified by the attribute UserAccount. If the domain name is not specified, the agent assumes that the user account belongs to the local machine.</p> <p>If the UserAccount attribute is empty or contains a built-in service account, this attribute is ignored.</p> <p>Type and dimension: string-scalar</p>
MonitorProgTimeout	<p>The maximum wait time, in seconds, for the agent to receive a return value from the monitor script. This attribute is ignored if the MonitorService flag is set to 1.</p> <p>Default is 30 seconds.</p> <p>Type and dimension: integer-scalar</p>
MonitorService	<p>A flag that defines whether the agent monitors a service or starts a script. If the flag is set to 1, the agent monitors a service specified by the attribute ServiceOrScriptName. If the flag is set to 0 the agent starts a script specified by the attribute ServiceOrScriptName.</p> <p>Default is 1.</p> <p>Type and dimension: boolean-scalar</p>

Table 9-5 ServiceMonitor agent optional attributes

Optional Attributes	Description
Password	<p>The password for the user account, encrypted using the VCS One Encrypt utility. This attribute is valid only if the MonitorService is set to 0 and UserAccount is not empty.</p> <p>Type and dimension: string-scalar</p>
UserAccount	<p>A valid user account in whose context the service will be monitored. Username can be of the form <i>username@domain.com</i> or <i>domain.com\username</i>.</p> <p>If you do not specify a value for this attribute, then the user account of the service in the SCM is ignored. To monitor service under built-in accounts, you must provide explicit values. For example:</p> <ul style="list-style-type: none"> ■ On Windows 2003: User Account="LocalSystem", "Local Service", or "Network Service". Domain="NT Authority". The 'NT Authority' domain is not applicable for the 'LocalSystem' account. <p>Type and dimension: string-scalar</p>

Process agent

The Process agent brings processes online, takes them offline, and monitors their status. You can specify different executables for each process routine. You can configure the Process agent to monitor processes in a virtual server context. By default, processes are monitored in the context of the LocalSystem account. You can run a process with user privileges by specifying the user name, password, and domain.

Agent functions

Online	Starts the process configured as the start program.
Offline	Terminates the process, or starts the process configured as the stop program.
Monitor	Verifies the status of the process, or starts the process configured as the monitor program.

State definitions

ONLINE	Indicates the process being monitored is running properly.
OFFLINE	Indicates the process being monitored is not running properly.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Attributes

Table 9-6 Process agent required attributes

Required Attribute	Description
StartProgram	<p>The process to be monitored by the agent. You must specify the complete path of the executable, its file extension, and command-line arguments, if any. If you define the start program as a batch file or a script to launch another program, you must specify the monitor program in the configuration file.</p> <p>If you define the start program as a script (a batch file, a perl script, or a vbs script), the start program should be the program that interprets the script (cmd.exe, or perl.exe, or cscript.exe) and the script itself should be passed as an argument.</p> <p>Type and dimension: string-scalar</p>

Table 9-7 Process agent optional attributes

Optional Attributes	Description
CleanProgram	<p>The full path of the clean process that is launched when the resource needs a forceful offline. If no value is specified for this attribute, for a clean operation the agent kills the process indicated by the StartProgram attribute.</p> <p>Type and dimension: string-scalar</p>
CleanProgramTimeout	<p>The maximum time, in seconds, that the agent must wait before killing the process specified in the CleanProgram attribute.</p> <p>This attribute is ignored if the clean program is not specified.</p> <p>The default value is 30 seconds.Type and dimension: integer-scalar</p>
Domain	<p>The domain in which the user specified by the attribute UserName exists. This attribute is ignored if the user name is not specified.</p> <p>Type and dimension: string-scalar</p>

Table 9-7 Process agent optional attributes

Optional Attributes	Description
InteractWithDesktop	<p>A flag that defines whether the configured process interacts with the desktop. Enabling desktop interaction enables user intervention for the process. The value 1 indicates the process will interact with the desktop. The value 0 indicates it will not. Default is 0.</p> <p>Type and dimension: boolean-scalar</p>
MonitorProgram	<p>A program that monitors the process specified as the start program. You must specify the complete path of the executable, its file extension, and command-line arguments, if any. If you do not specify a value for this attribute, VCS One monitors the start program. However, if the start program is a batch file or a script to launch another program, you must specify a monitor program.</p> <p>Type and dimension: string-scalar</p> <p>Note: The monitor program is spawned every monitor cycle and must return before the program specified in MonitorProgram times out. The return values for the monitor program must conform to VCS One conventions: 110 for ONLINE and 100 for OFFLINE. For exit values outside the range 100-110, the status is considered UNKNOWN.</p>
MonitorProgramTimeout	<p>The maximum wait time, in seconds, for the agent to receive a return value from the monitor routine. This attribute is ignored if the monitor program is not specified.</p> <p>Default is 30 seconds.</p> <p>Type and dimension: integer-scalar</p>
Password	<p>The encrypted password of the user specified by the UserName. Note that the password must be encrypted using the VCS One Encrypt utility.</p> <p>This attribute is ignored if the user name is not specified.</p> <p>Type and dimension: string-scalar</p>
StartupDirectory	<p>The startup directory for the process indicated by the StartProgram attribute.</p> <p>Type and dimension: string-scalar</p>

Table 9-7 Process agent optional attributes

Optional Attributes	Description
StopProgram	<p>A program that stops the process specified as the start program. You must specify the complete path of the program, its file extension, and command-line arguments, if any. If you do not specify a value for this attribute, VCS One stops the start program.</p> <p>Type and dimension: string-scalar</p> <p>Note: If successful, the StopProgram returns a positive value. The agent framework calls the Monitor routine after those many seconds, as returned by StopProgram. Also, while writing a stop program, make sure to stop all the processes launched by the start program.</p>
StopProgramTimeout	<p>The maximum time, in seconds, that the agent must wait before killing the process specified in the StopProgram attribute.</p> <p>The default value is 30 seconds.</p> <p>Type and dimension: integer-scalar</p>
UserName	<p>The user name with whose privileges the configured process executes. Username can be of the form <i>username@domain.com</i> or <i>domain.com\username</i>.</p> <p>If a user name is not specified, the configured process runs in the context of the user account used by VCS One Client Daemon service.</p> <p>Type and dimension: string-scalar</p>
LanmanResName	<p>The name of the Lanman resource.</p> <p>The Process agent monitors the configured process in the context of the virtual name specified in the Lanman resource.</p> <p>Type and dimension: string-scalar</p>

Note: When defining the StartProgram, StopProgram, or MonitorProgram attributes, enclose the path of the executable file and its arguments in double quotes.

FileShare agent

This chapter contains:

- [“About the FileShare agent”](#) on page 351
- [“FileShare agent”](#) on page 352

About the FileShare agent

Fileshare agent makes file shares highly available. The FileShare agent ensures high availability for multiple shared folders including their subfolders.

FileShare agent

The FileShare agent enables systems to share multiple folders including their subfolders, making the shared folders highly available. For a failover service group, the folders to be shared are stored on a shared disk.

Using the FileShare agent, you can also do the following:

- Create hidden shares for a specific share or subfolders
- Dynamically share subfolders created after the resource is brought online
- Configure and control existing shares

The FileShare agent enables sharing folders shared outside VCS One. However, you cannot add special shares (shares created by the operating system for administrative and system use) to the VCS One configuration. For example, you cannot add the shares ADMIN\$, print\$, IPC\$, and *DriveLetter\$* to the VCS One configuration.

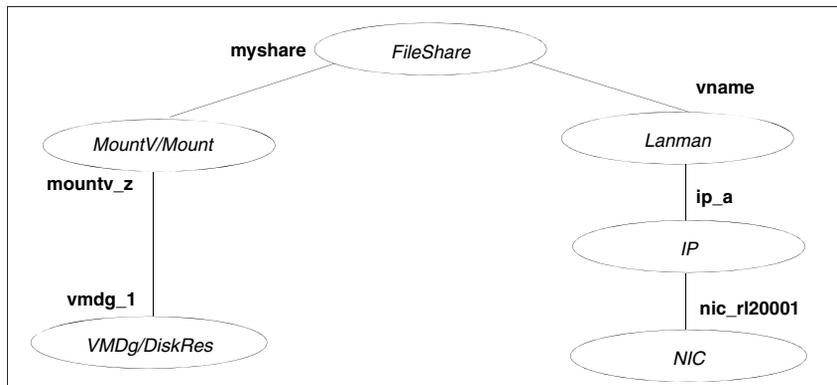
The agent simplifies the process of configuring multiple file shares. It defines file shares in an array, thereby eliminating the need to specify dependencies for each FileShare resource. Each FileShare resource can be configured for a maximum of 50 file shares.

You can configure a file share service group using the File Share Configuration Wizard. For information on configuring a file share service group, see the *Veritas Cluster Server One User's Guide*.

Dependencies

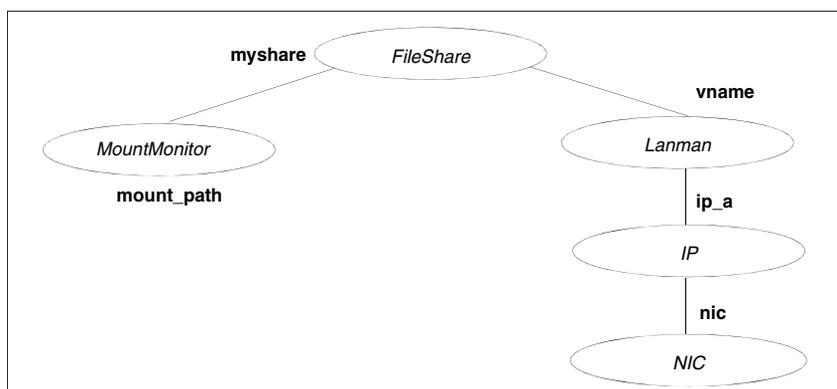
For a failover service group, the FileShare resource depends on the MountV (in case of SFW) or Mount (in case of LDM) resource. A file share service group also requires a Lanman resource that is dependent on the IP resource.

The following figure illustrates the FileShare resource dependency graph for a failover service group:

Figure 10-1 Dependency: FileShare in a failover service group

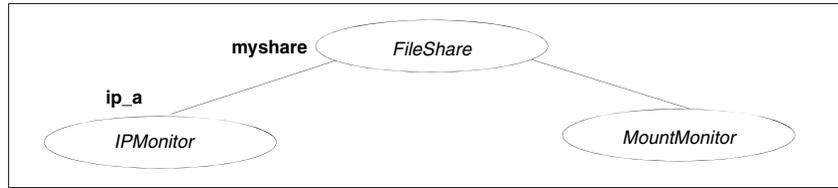
When using Veritas Storage Foundation for Windows, use the MountV agent instead of the Mount agent and the Volume Manager Diskgroup (VMDg) agent instead of the DiskReservation agent.

For a start/stop service group configured in the virtual server context, the FileShare resource depends on the MountMonitor resource. A FileShare resource also requires a Lanman resource that is dependent on the IP resource. The following figure illustrates the FileShare resource dependency graph for a start/stop service group configured in the virtual server context:

Figure 10-2 Dependency: FileShare in a virtual server start/stop service group

For a start/stop service group configured in the local system context, the FileShare resource depends on the MountMonitor and the IPMonitor resources. The following figure illustrates the FileShare resource dependency graph for a start/stop service group configured in the local system context:

Figure 10-3 Dependency: FileShare in a local system start/stop service group



Agent functions

Online	Shares the specified folders with designated permissions.
Offline	Removes the shares for the specified folders.
Monitor	Verifies that the specified folders are shared with the designated permissions.

State definitions

ONLINE	Indicates at least one specified folder is shared.
OFFLINE	Indicates no specified folder is shared.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Note: Sharing a folder with a large number of subfolders and enabling the ShareSubdirectories attribute could cause increased failover time and high CPU and memory utilization.

About ForceControl function

ForceControl is a FileShare agent function that allows you to reset the file share properties as per what is defined in the service group configuration. The agent overwrites all modifications made to the file share properties, either externally or from within VCS One, and sets the properties as per what you had defined while configuring the file shares in VCS One. This function overrides the FileShare agent's AutoControl attribute settings.

You can run the ForceControl function from the command line.

To run the ForceControl function on a fileshare resource, type the following command:

```
hares -action <fileshare_resource_name> ForceControl  
-sys <system_name>
```

Here, *<fileshare_resource_name>* is the name of the file share resource for which you want to reset the properties and *<system_name>* is the name of the cluster node on which that file share resource is online.

For example, to run the ForceControl function on a FileShare resource *A_fileshare* that is currently online on a cluster system *System1*, type the following:

```
hares -action A_fileshare ForceControl -sys System1
```

The changes take effect on the next agent monitor function.

Attributes

Table 10-1 lists the required attributes of the FileShare agent.

Table 10-1 FileShare agent required attributes

Required Attributes	Description
LanmanResName	<p>The name of the Lanman resource on which the FileShare resource depends.</p> <p>If you do not specify a value for this attribute, the agent uses localhost.</p> <p>Type and dimension: string-scalar</p>
MountResName	<p>For a failover service group, this is the name of the MountV (in case of SFW) or Mount (in case of LDM) resource on which the FileShare resource depends.</p> <p>For a start/stop service group, this is the name of the MountMonitor resource.</p> <p>Type and dimension: string-scalar</p>
ShareAndPathName	<p>A list of share names and paths of the shared folders.</p> <p>If the path of a shared folder is \Documents, and the share name is UserDocs, the attribute is defined in the configuration file as {"UserDocs" = "\Documents"}.</p> <p>Type and dimension: string-association</p>
ShareFaultPolicy	<p>Defines whether the agent faults the FileShare resource when either one or all the shares configured in the FileShare resource become unavailable.</p> <p>This attribute can take the following values:</p> <p>ALL: Indicates that the agent will fault the FileShare resource only if all the shares configured in that resource become unavailable.</p> <p>ANY: Indicates that the agent will fault the FileShare resource even if one of the shares configured in that resource become unavailable.</p> <p>Default is ANY.</p> <p>Type and dimension: string-scalar</p>

Table 10-2 lists the optional attributes of the FileShare agent.

Table 10-2 FileShare agent optional attributes

Optional Attributes	Description
AutoControl	<p>Defines the agent behavior when share properties are modified (either from within or outside VCS One) when the FileShare resource is online.</p> <p>The value 1 indicates that the agent synchronizes the changes made to the share properties with those that were defined while configuring the file share service group.</p> <p>The value 0 indicates that the agent does not synchronize the share properties as per what is defined in the service group configuration.</p> <p>If this attribute is set to 0 and the share properties are modified (either from within or outside VCS One), the FileShare resource goes into the UNKNOWN state. The changes made to the share properties remain in effect until the resource is in the UNKNOWN state.</p> <p>To restore the state of the FileShare resource, you must either restore the share properties manually or set this attribute value to 1. The agent restores the share properties that are defined in the service group configuration in its next monitor cycle.</p> <p>Default is 1.</p> <p>To make an existing share highly available, the share name and the share permissions in the configuration file must be the same as those for the file share.</p> <p>Type and dimension: boolean-scalar</p>
AutoShare	<p>Defines the agent behavior when a folder with shared subdirectories is added to a VCS One file share. The value 1 indicates the agent automatically shares the newly added subfolder in its next monitor cycle. The value 0 indicates the agent does not.</p> <p>Default is 1.</p> <p>This attribute is considered only if the attribute ShareSubdirectories is set to 1.</p> <p>Type and dimension: boolean-scalar</p>

Table 10-2 FileShare agent optional attributes

Optional Attributes	Description
ClientCacheType	<p>A string that specifies whether the documents or programs in the shared directory are cached locally on the client system when accessed by users. It also specifies how the files are cached. The cached files are then available offline even if users are not connected to the share.</p> <p>Note: The agent does not cache the files or directories itself. It sets the value so that the server and client interfaces do the needful.</p> <p>This attribute can have the following values:</p> <ul style="list-style-type: none"> ■ MANUAL: Indicates that only the files and programs specified by the users are cached. ■ NONE: Indicates that the files and programs from the share are not cached. ■ DOCS: Indicates that all files and programs that the users open from the share are automatically cached. Files and programs that are not accessed are not available offline. ■ PROGRAMS: Indicates that all files and programs that the users open from the share are automatically cached and are optimized for performance. The next time the user accesses the executable files, they are launched from the local cache. Files and programs that are not accessed are not available offline. <p>Default is MANUAL.</p> <p>Type and dimension: string-scalar</p>
HiddenShare	<p>Defines whether the agent hides the file share. The value 1 indicates the agent hides the file share. The value 0 indicates it does not.</p> <p>Default is 0.</p> <p>Type and dimension: boolean-scalar</p> <p>Note: To create a hidden share, set the HiddenShare attribute to 1. Do not append the share name with a \$ (dollar) sign.</p>

Table 10-2 FileShare agent optional attributes

Optional Attributes	Description
HideChildShares	<p>Defines whether the agent hides the subfolder shares. The value 1 indicates the agent hides the subfolder shares. The value 0 indicates it does not.</p> <p>Default is 0.</p> <p>This attribute is considered only if the attribute ShareSubdirectories is set to 1.</p> <p>Type and dimension: boolean-scalar</p>
IgnorePermissions	<p>This attribute has been deprecated.</p> <p>Please use the AutoControl attribute instead.</p>
MaxUsers	<p>The maximum number of users that can access the file share. Default is null, which indicates access is granted to maximum users allowed on Windows.</p> <p>If this attribute is set to zero or greater than the maximum users allowed on Windows, access is granted to the maximum users allowed on Windows.</p> <p>Type and dimension: string-scalar</p>
ShareSubdirectories	<p>Defines whether the agent shares the subfolders of the file shares defined in the attribute PathAndShareName. Subfolders are shared with their own names, that is, the share name of a subfolder is the same as the subfolder name. If a share with the same name exists, the subfolder will not be shared. However, this does not effect the state of the resource.</p> <p>The value 1 indicates the agent shares the subfolders. The value 0 indicates it does not.</p> <p>Default is 0.</p> <p>Note: Sharing a folder with a large number of subfolders and enabling the ShareSubdirectories attribute may cause increased failover time and high CPU and memory utilization.</p> <p>Type and dimension: boolean-scalar</p>

Table 10-2 FileShare agent optional attributes

Optional Attributes	Description
UserPermissions	<p>The permissions with which the directories are shared for users.</p> <p>The following permissions are associated with the FileShare resource:</p> <ul style="list-style-type: none"> ■ FULL_CONTROL: Permission to read, write, create, execute, and delete the resource, and to modify its attributes and permissions. ■ READ_ACCESS: Permission to read, and execute the resource. ■ CHANGE_ACCESS: Permission to read, write, execute, and delete the resource. ■ NO_ACCESS: No access to the resource. <p>The UserPermissions are specified in the format <i>'Domain_Name\Username'=Permission</i>.</p> <p>For example, to give full control to user John who belongs to the domain VCSONE_cluster, the syntax is <code>'VCSONE_cluster\John'=FULL_CONTROL</code>.</p> <p>Note that the domain name and the user name must be enclosed in quotation marks.</p> <p>Default is {'Everyone' = READ_ACCESS}.</p> <p>A maximum of 50 users can be configured for each file share. To configure more than 50 users for a file share, configure user groups.</p> <p>The agent monitors only the users and permissions that are defined in the service group configuration.</p> <p>Type and dimension: string-association</p>
AccessBasedEnumeration	<p>Defines whether the agent enables the Windows Access-based Enumeration option for the specified file share.</p> <p>The value 1 indicates that the agent enables it and the value 0 indicates that the agent does not.</p> <p>Default is 0.</p> <p>Type and dimension: boolean-scalar</p>

PrintShare agents

This chapter contains:

- [“About the PrintShare agents”](#) on page 361
- [“PrintSpool agent”](#) on page 362
- [“PrintShare agent”](#) on page 366

About the PrintShare agents

The PrintShare agents work together to make a shared network printer highly available. The PrintSpool agent provides high availability for a print spooler and the PrintShare agent makes a network printer highly available.

PrintSpool agent

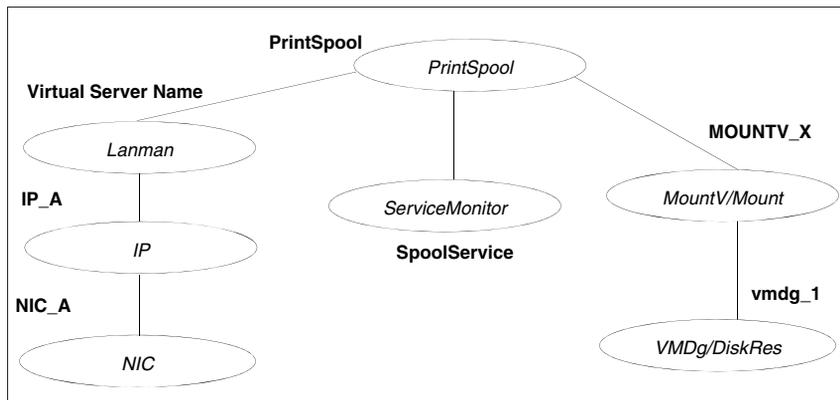
The PrintSpool agent makes a print spooler highly available and binds it to the virtual server. It ensures that spooling does not occur locally. The PrintSpool agent is used in conjunction with the PrintShare agent to make a print server highly available. You can configure only one PrintSpool resource for one virtual server.

Dependencies

For a failover service group, the PrintSpool resource depends on the Mount (MountV in case of SFW) and Lanman resources for operation. It also requires the Print Spooler service configured as a ServiceMonitor resource.

The following figure illustrates the PrintSpool agent's resource dependency graph for a failover service group:

Figure 11-1 Dependency: PrintSpool in a failover service group

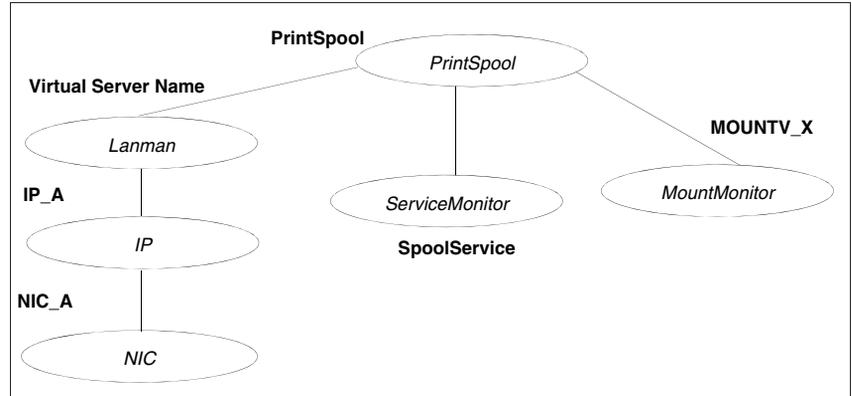


In a Veritas Storage Foundation for Windows environment, use the MountV and the Volume Manager Diskgroup (VMDg) agents instead of the Mount and Disk Reservation (DiskRes) agents, respectively.

For a start/stop service group configured in the virtual server context, the PrintSpool resource depends on the MountMonitor and Lanman resources for operation. It also requires the Print Spooler service configured as a ServiceMonitor resource.

The following figure illustrates the PrintSpool agent's resource dependency graph for a start/stop service group configured in the virtual server context:

Figure 11-2 Dependency: PrintSpool in a virtual server start/stop service group



Note: The PrintSpool agent is not used in start/stop type of print share service groups configured in the local system context.

Agent functions

Online	Creates a virtual spooler and binds it with the virtual server. The agent also loads the printspool registry hive.
Offline	Stops the virtual spooler and unloads the printspool registry hive.
Monitor	Verifies the spooler is bound to the virtual server.

State definitions

ONLINE	Indicates the virtual spooler is active on the virtual server.
OFFLINE	Indicates the virtual spooler is not active on the virtual server.
UNKNOWN	Indicates the agent could not determine the status of the virtual spooler.

Attributes

Table 11-1 PrintSpool agent required attributes

Required Attributes	Description
IPResName	<p>The name of the IP resource on which the Lanman resource specified by the attribute LanmanResName depends.</p> <p>Type and dimension: string-scalar</p>
LanmanResName	<p>The name of the Lanman resource on which the PrintSpool resource depends. The print spooler is bound to the virtual server associated with this Lanman resource.</p> <p>Type and dimension: string-scalar</p>
MountResName	<p>For a failover service group, this is the name of the MountV (in case of SFW) or Mount (in case of LDM) resource on which the PrintSpool resource depends. This resource must point to the drive on the shared disk where the spooler directory will reside.</p> <p>For a start/stop service group configured in the virtual server context, this is the name of the MountMonitor resource.</p> <p>Type and dimension: string-scalar</p>
SpoolDir	<p>A directory to be used for spooling. For a failover service group, this directory must reside on a shared disk.</p> <p>The value for SpoolDir attribute must be relative to the drive letter specified in the MountResName attribute.</p> <p>Type and dimension: string-scalar</p>
RegMountResName	<p>For a failover service group, this is the name of the MountV (in case of SFW) or Mount (in case of LDM) resource on which the PrintSpool resource depends. This resource must point to the drive on the shared disk where the registry replication directory will reside.</p> <p>For a start/stop service group configured in the virtual server context, this is the name of the MountMonitor resource.</p> <p>You can configure only one MountV or Mount or MountMonitor resource for the spooler and regrep; in that case the value of this attribute will be the same as that of the MountResName attribute.</p> <p>Type and dimension: string-scalar</p>

Table 11-1 PrintSpool agent required attributes

Required Attributes	Description
RegDir	<p>A directory that is used by the virtual spooler to store the registry information. For a failover service group, this directory must reside on a shared disk.</p> <p>The value for RegDir attribute must be relative to the drive letter specified in the RegMountResName attribute.</p> <p>Type and dimension: string-scalar</p>

PrintShare agent

The PrintShare agent enables systems to share a network printer from a cluster so that the clients can access it. The agent adds, monitors, and removes a share to the network printer from the virtual server. You can configure a print share service group using the Print Share Configuration Wizard.

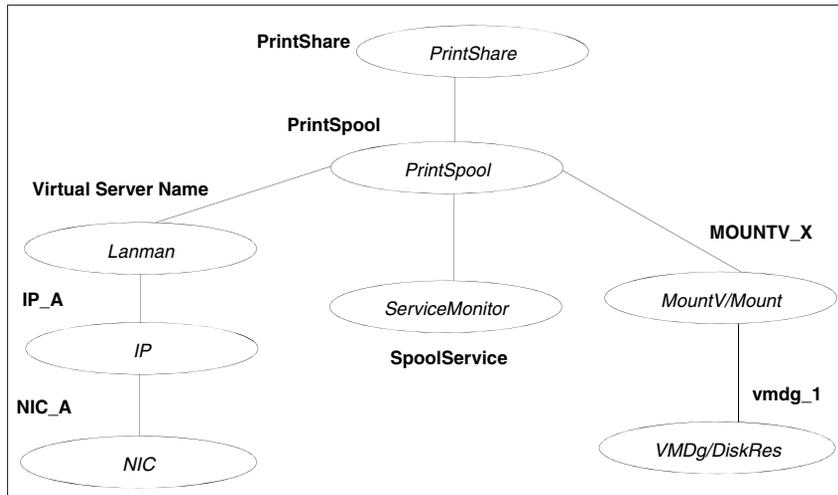
For information on configuring a print share service group using the Print Share Configuration Wizard, see the *Veritas Cluster Server One User's Guide*.

Dependency

For a failover service group, the PrintShare resource depends on the PrintSpool resource.

The following figure illustrates the PrintShare agent's resource dependency graph for a failover service group:

Figure 11-3 Dependency: PrintShare in a failover service group

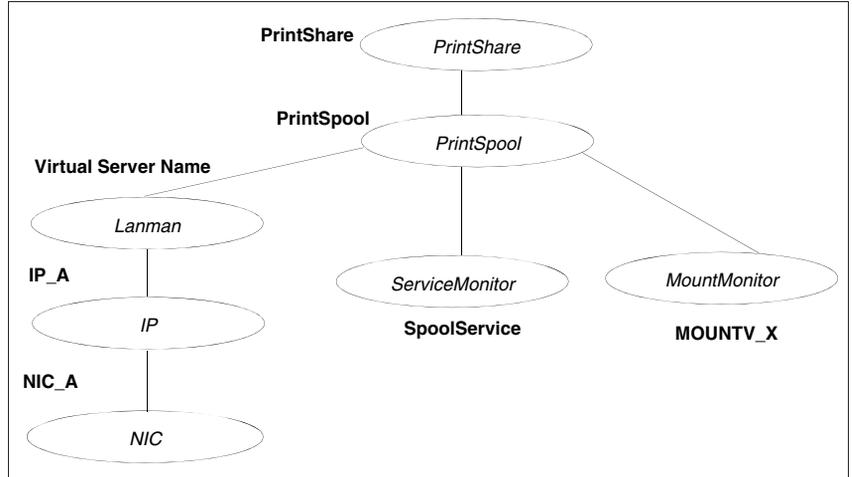


In a Veritas Storage Foundation for Windows environment, you can use the MountV and the Volume Manager Diskgroup (VMDg) agents instead of the Mount and Disk Reservation (DiskRes) agents, respectively.

For a start/stop service group configured in the virtual server context, the PrintShare resource depends on the PrintSpool resource.

The following figure illustrates the PrintShare agent's resource dependency graph for a start/stop service group configured in the virtual server context:

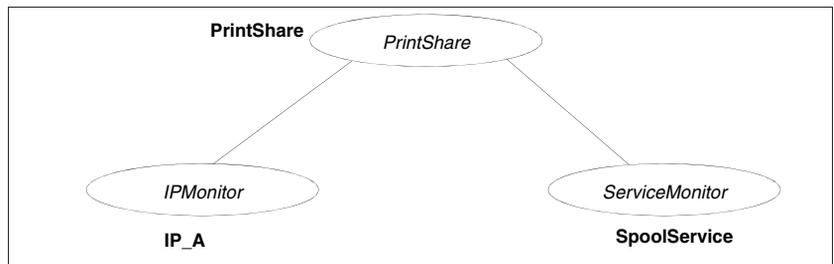
Figure 11-4 Dependency: PrintShare in virtual server start/stop service group



For a start/stop service group configured in the local system context, the PrintShare resource depends on the IPMonitor resource. It also requires the Print Spooler service configured as a ServiceMonitor resource.

The following figure illustrates the PrintShare agent’s resource dependency graph for a start/stop service group configured in the local system context:

Figure 11-5 Dependency: PrintShare in a local system start/stop service group



Agent functions

- | | |
|---------|---|
| Online | Adds a share to the network printer on the virtual server. |
| Offline | Deletes the share to the network printer from the virtual server. |
| Monitor | Verifies that the share to the network printer exists. |

State definitions

ONLINE	Indicates the network printer is shared from the virtual server.
OFFLINE	Indicates the network printer is not shared from the virtual server.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Attributes

Table 11-2 PrintShare agent required attributes

Required Attributes	Description
LanmanResName	The name of the Lanman resource configured for the virtual server. For a start/stop service group configured in the local system context, if this attribute is not specified, the agent uses localhost. Type and dimension: string-scalar
PrinterName	The name of the network printer to be shared. This attribute can take localized values. Type and dimension: string-scalar
ShareName	The name by which the network printer is shared. This attribute can take localized values. Type and dimension: string-scalar

Storage agents

This chapter contains:

- [“About the storage agents”](#) on page 369
- [“DiskReservation \(DiskRes\) agent”](#) on page 370
- [“Mount agent”](#) on page 371
- [“VMDg agent”](#) on page 374
- [“MountV agent”](#) on page 378
- [“MountMonitor agent”](#) on page 384

About the storage agents

Storage agents make your shared storage highly available.

- Use the Disk Reservation and Mount agents to provide high availability for shared disks and volumes managed using Windows Disk Management (LDM).
- Use the Volume Manager Diskgroup (VMDg) and MountV agents to provide high availability for shared disks and volumes managed using Veritas Storage Foundation for Windows (SFW).
- Use the MountMonitor agent to monitor the mount path of the configured storage.

DiskReservation (DiskRes) agent

The DiskReservation agent monitors shared disks. The agent makes the disks highly available. The DiskReservation agent supports SCSI-3 persistent reservations; SCSI-2 is not supported. The agent is represented by the DiskRes resource type.

The DiskReservation agent supports basic disks only. VCS One supports dynamic disks configured and controlled by Veritas Storage Foundation for Windows.

Agent functions

Online	Reserves the shared disk.
Offline	Releases the reservation to the shared disk.
Monitor	Verifies the system holds the reservation to the shared disk.

State definitions

ONLINE	Indicates the system holds the reservation to the shared disk.
OFFLINE	Indicates the system does not hold the reservation to the shared disk.
UNKNOWN	Indicates the agent could not determine the status of the shared disk.

Attributes

Table 12-1 DiskRes agent required attributes

Required Attribute	Description
Signature	A system-specified disk identifier. To retrieve the disk signature, use the VCS One havol utility with the -getdrive option. Type and dimension: string-scalar

Mount agent

The Mount agent brings a basic disk mount point online, monitors it, and takes it offline. When a shared disk fails over to another system, the Mount agent ensures that the new system accesses the volume in the same way it was accessed before failover. The Mount agent ensures a consistent device path by mounting the volume with the same mount path (drive letter) on the new system. The agent also ensures proper dismounting from a failed system when a resource or group is taken offline. When a disk partition is mounted, VCS One creates an administrative share to enable remote administration of the disk. Note that the volume to be monitored using the Mount agent must not be mounted multiple times.

The Mount agent supports basic disks only. VCS One supports dynamic disks configured and controlled by Veritas Storage Foundation for Windows.

Dependency

The Mount resource depends on the DiskRes resource.

Agent functions

Online	Mounts the partition (assigns a drive letter or a folder) at the specified mount path.
Offline	Unassigns the drive letter or a folder and unmounts the partition.
Monitor	Verifies that the partition is accessible from the specified mount path.

State definitions

ONLINE	Indicates the system can access the configured partition at the specified mount path.
OFFLINE	Indicates the system cannot access the configured partition at the specified path.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Attribute definitions

Table 12-2 Mount agent required attributes

Required Attributes	Description
MountPath	<p>The drive letter or path to an empty NTFS folder, that will be assigned to the partition being mounted.</p> <p>The attribute can be specified as <i>X</i>, <i>X:</i>, <i>X:\</i>, <i>X:\Directory</i>, or <i>X:\Directory\</i>.</p> <p>When configuring a directory to host the mount, verify the following conditions:</p> <ul style="list-style-type: none"> ■ The configured path exists. ■ The directory is empty. ■ The volume on which the directory resides is NTFS-formatted. ■ The directory is not a system directory. <p>Type and dimension: string-scalar</p>
PartitionNo	<p>The partition on the disk configured for mounting. Note that the base index for the partition number is 1. To retrieve the partition number use the VCS One utility <code>havol</code> with the <code>-getdrive</code> option.</p> <p>Default: 0</p> <p>Type and dimension: integer-scalar</p>
DiskResName	<p>The name of the DiskRes resource on which the Mount resource depends. The Mount agent retrieves the disk signature from the DiskRes resource.</p> <p>Type and dimension: string-scalar</p>

Table 12-3 Mount agent optional attributes

Optional Attributes	Description
AutoFSClean	<p>If the agent detects corruption, this attribute defines whether the agent automatically cleans the file system by running <code>Chkdsk /X</code> on the volume being brought online. The value 1 indicates the agent cleans the file system. The value 0 indicates it does not.</p> <p>The output of the <code>Chkdsk /x</code> command is stored at <code>%vcsone_home%\log\Chkdsk_<MountVresname>.txt</code></p> <p>Here, <code>%vcsone_home%</code> is the default product installation directory, typically <code>C:\Program Files\Veritas\Cluster Server One</code>.</p> <p>Type and dimension: boolean-scalar Default: 1</p>
ForceUnmount	<p>Defines whether the agent unmounts the volume (gracefully or forcibly) when it is being used by other applications.</p> <p>The attribute takes the following values:</p> <ul style="list-style-type: none">■ NONE: The agent does not unmount the volume if an application is accessing it.■ READ-ONLY: The agent gracefully unmounts the volume even if applications are accessing it.■ ALL: The agent forcefully unmounts the volume irrespective of the type of access an application has to the volume. <p>Type and dimension: string-scalar Default: READ-ONLY</p>
ListApplications	<p>Defines whether the agent lists the applications accessing the volume while unmounting. The value 1 indicates that the agent lists the applications; the value 0 indicates that it does not.</p> <p>Type and dimension: boolean-scalar Default: 1</p>
MountResName	<p>This attribute is not used by the agent.</p>

VMDg agent

The Volume Manager Diskgroup (VMDg) agent imports, monitors, and deports a cluster disk group configured using Veritas Storage Foundation for Windows. The agent makes the cluster disk group highly available. The VMDg agent supports dynamic multi-pathing (DMP) and works in a SAN environment. The agent is represented by the VMDg resource type.

Note: Use this agent to manage cluster disk groups configured using Veritas Storage Foundation for Windows. Do not use this agent if you use other software to manage shared storage.

Agent functions

Online	Imports the configured cluster disk group.
Offline	Deports the configured cluster disk group.
Monitor	Verifies that the configured cluster disk group is imported.

State definitions

ONLINE	Indicates the configured cluster disk group is imported.
OFFLINE	Indicates the configured cluster disk group is not imported.
UNKNOWN	Indicates the agent could not detect the cluster disk group.

Attributes

Table 12-4 VMDg agent required attributes

Required Attribute	Description
DiskGroupName	The name of the cluster disk group configured using Veritas Storage Foundation. The disk group name may be retrieved from the SFW console by running the command <code>vxdg list</code> , or by using the VMGetDrive utility. Type and dimension: string-scalar

Table 12-5 VMDg agent optional attributes

Optional Attributes	Description
DetailMonitorFreq	The number of monitor cycles after which the agent monitors the resource in detail. Setting this value to 0 disables detail monitoring. Type and dimension: integer-scalar Default: 10
DGGuid	The GUID of the cluster disk group configured using Veritas Storage Foundation. The GUID may be retrieved by using the VMGetDrive utility or <code>vxdg list</code> . Type and dimension: string-scalar
ForceImport	A flag that defines whether the agent forcibly imports the cluster disk group when exactly half the disks are available. The value 1 indicates the agent imports the configured disk group when half the disks are available. The value 0 indicates it does not. This means that the disk group will be imported only when SFW acquires control over majority of the disks. Type and dimension: boolean-scalar Default: 0 Note: Set this attribute to 1 only after verifying the integrity of your data. If due caution is not exercised before setting this attribute to 1, you risk a split-brain condition, leading to potential data loss.

Table 12-5 VMDg agent optional attributes

Optional Attributes	Description
ForceDeport	<p>A flag that defines whether the agent forcibly deports the cluster disk group even if the disks within the disk group are being used. The value 1 indicates the agent forcibly deports cluster disk groups. The value 0 indicates it does not.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p> <p>Note: Set this attribute to 1 only after verifying the integrity of your data. If due caution is not exercised before setting this attribute to 1, you risk a potential data loss.</p>
ListApplications	<p>A flag that defines whether the agent lists the applications accessing the cluster disk group while deporting. The value 1 indicates the agent lists the applications. The value 0 indicates it does not.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p> <p>Note: The list of applications can be seen in the agent's log.</p>
ListMountedVolumes	<p>A flag that defines whether the agent lists all mounted volumes in the cluster disk group. The value 1 indicates the agent lists the mounted volumes. The value 0 indicates it does not.</p> <p>Type and dimension: boolean-scalar</p> <p>Default: 0</p> <p>Note: The list of mounted volumes can be seen in the agent's log.</p>
VxVMFailAction	<p>Defines the agent behavior when the Veritas Storage Agent service (VxVM) fails. The value <code>RESTART_VXVM</code> indicates the agent attempts to restart the VxVM service every monitor cycle. The value <code>SHUTDOWN</code> indicates the agent attempts to restart the VxVM service the number of times defined in the attribute <code>VxVMRestartAttempts</code>. If it fails in restarting VxVM, the agent shuts down the system. When this occurs, all service groups online on the system fail over to another system in the cluster. For example, if <code>VxVMRestartAttempts</code> is set to 5, the agent attempts to start the service five times before shutting down the system.</p> <p>Type and dimension: string-scalar</p> <p>Default: <code>RESTART_VXVM</code></p>

Table 12-5 VMDg agent optional attributes

Optional Attributes	Description
VxVMRestartAttempts	The number of times the agent attempts to restart the failed VxVM service before shutting down the system. This attribute is considered only when VxVMFailAction is set to SHUTDOWN. Type and dimension: integer-scalar Default: 10

MountV agent

The MountV agent mounts, monitors, and unmounts volumes on cluster disk groups imported using Veritas Storage Foundation for Windows. The agent supports volumes formatted using the NTFS, FAT, and FAT32 file systems.

When a cluster disk group fails over to another system, the MountV agent ensures the new system accesses the volume in the same way it was accessed before failover. The MountV agent ensures a consistent device path by mounting the cluster disk group with the same mount point (drive letter) on the new system. The agent also mounts a disk group as an NTFS folder. The agent ensures proper dismounting from a failed system when a resource or a group is taken offline. When a disk partition is mounted, VCS One creates an administrative share to enable remote administration of the disk.

The agent performs a file system check when it brings the resource online. If a drive letter is already assigned to the volume, the agent skips the file system check, and declares the resource online. Note that the volume to be monitored using the MountV agent must not be mounted multiple times.

Note: Use this agent to manage cluster disk groups configured using Storage Foundation for Windows. Do not use this agent if you use other software to manage shared storage.

Dependency

The MountV resource depends on the VMDg resource.

Agent functions

Online	Mounts the volume as a drive letter or as an NTFS folder.
Offline	Unmounts the configured volume.
Monitor	Verifies the volume is mounted as per the configuration.
Action: CheckFSAccess	The CheckFSAccess function allows you to enable or disable MountV agent's file system access monitoring on volumes mounted using SFW. CheckFSAccess is enabled by default. See " About CheckFSAccess function " on page 379.

About CheckFSAccess function

CheckFSAccess is a MountV agent function that allows you to enable or disable MountV agent's file system access monitoring on volumes mounted using SFW. You can enable or disable the CheckFSAccess function from the command line. CheckFSAccess is enabled by default.

You can also add custom actions for the agent. Refer to the *VCS One Agent Developer's Guide* for more information.

To enable or disable file system access monitoring for a MountV resource using the command line

- Type the following command

```
hares -action <MountV_resource_name> CheckFSAccess  
-actionargs <arg1> [<arg2>] -sys <system_name>
```

Use the following information to replace the appropriate variables:

MountV_resource_name	The name of the MountV resource.
arg1	This can take a value of 1 or 0. Setting this to 1 will enable file system check; setting this to 0 will disable it. The default value is 1 (enabled).
arg2	This can take a value of 1 or 0, and is optional. Setting this value to 1 indicates that the <arg1> setting is persistent in the cluster. The <arg1> setting will remain in effect even if you restart the VCS One daemon. Setting this value to 0 indicates that the <arg1> setting is non-persistent and will get reset to the default value of 1 whenever the VCS One daemon is restarted.
system_name	This is the name of the cluster node on which the MountV resource is configured to fail over.

For example, to disable file system access for a MountV resource A_mountv that is currently online on a cluster node Node1, enter the following:

```
hares -action A_mountv CheckFSAccess -actionargs 0 1  
-sys Node1
```

The changes take effect on the next agent monitor function.

Repeat this command for each node that the specified MountV resource is configured to fail over. You can run the command from the same node;

replace <system_name> with the cluster node name. The change takes effect when the MountV resource is brought online on those nodes.

To enable or disable file system access monitoring for all MountV resources on a cluster node simultaneously

Perform the following steps on each cluster node, one node at a time.

Note: In a case where file system access monitoring is disabled for all MountV resources using the following procedure, but is enabled for a MountV resource individually, then the setting for the MountV resource takes precedence. The agent will perform file system access monitoring for the volume configured in that MountV resource.

- 1 Make a backup copy of the registry.
- 2 To open the Registry Editor, click **Start > Run**, type **regedit**, and then click **OK**.
- 3 In the registry tree (on the left), navigate to HKEY_LOCAL_MACHINE > SOFTWARE > Veritas > VCS > BundledAgents.
- 4 Click **Edit > New > Key** and create a key by the name MountV, if it does not exist already.
- 5 Select MountV and then click **Edit > New > Key** and create a key by the name **__GLOBAL__**. (underscore-underscore-GLOBAL-underscore-underscore)
- 6 Select **__GLOBAL__** and add a DWORD type of value.
- 7 Specify Value name as **CheckFSAccess** and Value data as follows:
 - Set this value to 0 to disable file system access monitoring.
 - Set this value to 1 to enable file system access monitoring.The specified setting will apply to all the MountV resources on the cluster node.
- 8 Save the changes and exit the Registry Editor.

State definitions

ONLINE	Indicates the configured volume is mounted and accessible.
OFFLINE	Indicates the mounted drive is inaccessible.
UNKNOWN	Indicates the agent could not determine the state of the configured volume.

Attributes

Table 12-6 MountV agent required attributes

Required Attributes	Description
MountPath	<p>The drive letter or path to an empty NTFS folder that will be assigned to the volume being mounted.</p> <p>When configuring a directory to host the mount, verify the following conditions:</p> <ul style="list-style-type: none">■ The configured path exists.■ The directory is empty.■ The volume on which the directory resides is NTFS-formatted.■ The directory is not a system directory. <p>The attribute can be specified as <i>X</i>, <i>X:</i>, <i>X:\</i>, <i>X:\Directory</i>, or <i>X:\Directory\</i>.</p> <p>Type and dimension: string-scalar</p>
VolumeName	<p>The name of the volume to be mounted. For example, the name could be Raid1, Stripe2, Volume01, etc. Use the VMGetDrive utility to retrieve the volume name.</p> <p>Type and dimension: string-scalar</p>
VMDGResName	<p>The name of the Volume Manager Diskgroup (VMDg) resource on which the MountV resource depends.</p> <p>Type and dimension: string-scalar</p>

Table 12-7 MountV agent optional attributes

Optional Attributes	Description
AutoFSClean	<p>If the agent detects corruption, this attribute defines whether the agent automatically cleans the file system by running Chkdsk /X on the volume being brought online. The value 1 indicates the agent cleans the file system. The value 0 indicates it does not.</p> <p>The output of the Chkdsk /x command is stored at %vcsone_home%\log\Chkdsk_<MountVresname>.txt</p> <p>Here, %vcsone_home% is the default product installation directory, typically C:\Program Files\Veritas\Cluster Server One.</p> <p>Type and dimension: boolean-scalar Default: 1</p>
ForceUnmount	<p>Defines whether the agent unmounts the volume (gracefully or forcibly) when it is being used by other applications.</p> <p>The attribute takes the following values:</p> <ul style="list-style-type: none"> ■ NONE: The agent does not unmount the volume if an application is accessing it. ■ READ-ONLY: The agent gracefully unmounts the volume even if applications are accessing it. ■ ALL: The agent forcefully unmounts the volume irrespective of the type of access an application has to the volume. <p>Type and dimension: string-scalar Default: READ-ONLY</p>
ListApplications	<p>Defines whether the agent lists the applications accessing the volume while unmounting. The value 1 indicates that the agent lists the applications; the value 0 indicates that it does not.</p> <p>Type and dimension: boolean-scalar Default: 1</p>
MountResName	<p>This attribute is not used by the agent.</p>

Table 12-7 MountV agent optional attributes

Optional Attributes	Description
PurgeStaleMountPoints	<p>This attribute is applicable to a global cluster configuration. In case of a global fail over, this attribute defines whether the agent purges volume mount point (NTFS folder mounts) properties before bringing the folder mount points online on the remote cluster.</p> <p>The default value is 0, which means that the agent does not purge the volume mount point properties.</p> <p>For folder mounts, set this attribute to 1 to clean the MountPath of any stale mount points.</p> <p>Type and dimension: boolean-scalar</p>

MountMonitor agent

The MountMonitor agent monitors the mount path of the configured storage. It is independent of how the underlying storage is managed (whether SFW disk groups or LDM disks). The mount path can be a drive letter or a folder mount.

When configuring a directory to host the mount, verify the following conditions:

- The configured path exists.
- The directory is empty.
- The volume on which the directory resides is NTFS-formatted.
- The directory is not a system directory.

This agent is used in start/stop type of service groups. The agent is represented by the MountMonitor resource type.

Agent functions

Monitor	Verifies that the specified mount path is accessible.
---------	---

State definitions

ONLINE	Indicates the system can access the configured mount path.
FAULTED	Indicates the system cannot access the configured mount path.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Attribute definitions

Table 12-8 MountMonitor agent required attributes

Required Attributes	Description
MountPath	<p>The drive letter or path to an empty NTFS folder where a partition is mounted. The attribute can be specified as <i>X</i>, <i>X:</i>, <i>X:\</i>, <i>X:\Directory</i>, <i>X:\Directory\</i>.</p> <p>When configuring a directory to host the mount, verify the following conditions:</p> <ul style="list-style-type: none">■ The configured path exists.■ The directory is empty.■ The volume on which the directory resides is NTFS-formatted.■ The directory is not a system directory. <p>Type and dimension: string-scalar</p>

Infrastructure and support agents

This chapter contains:

- [“About the infrastructure and support agents”](#) on page 388
- [“RegRep agent”](#) on page 389
- [“Proxy agent”](#) on page 395
- [“Phantom agent”](#) on page 397
- [“FileNone agent”](#) on page 397
- [“ElifNone agent”](#) on page 398
- [“FileOnOff agent”](#) on page 399
- [“FileOnOnly agent”](#) on page 400

About the infrastructure and support agents

The VCS One infrastructure and support agents provide high availability for VCS One-related operations.

You can use the following agents to test VCS One functionality:

RegRep Agent	Replicates the system registry.
Proxy Agent	Monitors the state of a resource on a local or remote system.
Phantom Agent	Enables VCS One to determine the status of parallel service groups that do not include OnOff resources.
FileNone Agent	Monitors a file.
ElifNone Agent	Monitors a file.
FileOnOff Agent	Monitors a file.
FileOnOnly Agent	Monitors a file.

RegRep agent

To ensure efficient failover of an application, the registry of the node on which the application was taken offline and the registry of the node on which the application is brought online must be synchronized.

The Registry Replication (RegRep) agent synchronizes the registry of both the nodes by monitoring the designated registry keys. When an application changes the registry keys on the active cluster node, the agent logs these changes to the shared disk. When failover occurs, the agent updates the registry of the system on which the application is brought online using the logs on the shared disk.

The RegRep agent provides you the option to:

- exclude certain subkeys from being replicated
- mark keys for replication or exclusion, even though they do not exist when the agent is configured
- mark keys for replication or exclusion dynamically, even when the resource is online

When the RegRep agent is started, it forks an independent process to monitor registry changes. Even if the VCS One client dies, the process continues logging registry changes to the shared disk.

If you wish to replicate the registry of an application running on a node outside VCS One, run the utility VCSRegUtil on that particular node.

Refer to the *Veritas Cluster Server One User's Guide* for more information about the VCSRegUtil utility.

Note: The RegRep agent runs in the context of the local system user while the HKEY_CURRENT_USER (HKCU) hive has values in the context of the current user. Because the local system user account does not map to a current user account, the RegRep agent does not replicate the keys under the HKCU hive.

Dependency

The RegRep resource depends on the MountV or Mount resource.

In case of a NetApp storage environment, the NetAppSnapDrive resource is used instead of the MountV or Mount resource.

Agent functions

Online	Starts logging changes to specified registry keys to the shared disk.
Offline	Stops logging changes to specified registry keys to the shared disk.
Monitor	Verifies that the process that logs changes to registry keys is running.

State definitions

ONLINE	Indicates the agent is logging changes to specified registry keys to the shared disk.
OFFLINE	Indicates the agent is not logging changes to specified registry keys to the shared disk.
UNKNOWN	Indicates the agent could not determine the status of the resource.

Note: The Registry Replication agent is for failover service groups only. Do not use the agent for parallel applications or service groups.

Attributes

Table 13-1 RegRep agent required attributes

Required Attributes	Description
Keys	<p>The list of registry keys to be monitored. From the 'Key-Value' pair of a registry key, you must provide the name of the registry keys to be synchronized in the Key field. The Value field is optional.</p> <p>You can use the Value field to specify the name for the file in which the agent replicates the registry keys specified in the Key field. Specify the file name in the format SaveRestoreFile:<filename>.reg</p> <p>For example, SaveRestoreFile:Myregistrykeys.reg</p> <p>If the Value field is empty or if ignore subkey strings are specified, the agent creates a registry file with a default name.</p> <p>Setting up replication of a key automatically sets up replication of its subkeys. For example, to replicate the keys HKEY_LOCAL_MACHINE\\Software\\VERITAS\\ and HKEY_LOCAL_MACHINE\\Software\\VERITAS\\VCSONE, define only HKEY_LOCAL_MACHINE\\Software\\VERITAS\\ in the keys attribute.</p> <p>When defining the keys, you can also use the abbreviations listed. See "Configuring registry keys" on page 394.</p> <p>The agent also enables you to replicate a registry key without replicating the subkeys. Specify IgnoreSubKeys or IgnoreSubKeys=Yes in the Value field. The agent replicates the registry key and ignores the subkeys for the registry. See "Ignoring subkeys" on page 394.</p> <p>Caution: Do not configure more than 63 keys for a single RegRep resource; otherwise the resource will go in an UNKNOWN state.</p> <p>Type and dimension: string-association</p>
MountResName	<p>The name of the MountV or Mount resource on which the Registry Replication resource depends. The MountV or Mount resource specifies the mount drive on the shared disk where the registry log file is created.</p> <p>Type and dimension: string-scalar</p>

Table 13-1 RegRep agent required attributes

Required Attributes	Description
ReplicationDirectory	<p>The directory on the shared disk in which the registry changes are logged. The agent creates a directory with the specified name if one does not exist.</p> <p>Default: "\\REGREP\DEFAULT"</p> <p>Type and dimension: string-scalar</p>

Table 13-2 RegRep agent optional attributes

Optional Attributes	Description
DebugMonitor	<p>A flag that defines whether debug logging is to be enabled for the executable (RegRepMonitor.exe) that monitors the registry keys. The value 0 indicates that the logging is enabled. The value 1 indicates that it is not.</p> <p>Default is 1.</p> <p>Type and dimension: integer-scalar</p>
ExcludeKeys	<p>A list of the subkeys to be excluded from replication.</p> <p>For more information on how the agent excludes keys, see “Excluding keys” on page 393.</p> <p>When defining the keys, you can also use the abbreviations listed.</p> <p>See “Configuring registry keys” on page 394.</p> <p>Type and dimension: string-vector</p>
ForceRestore	<p>A flag that defines the agent behavior when the registry update fails on a node where the resource is being brought online. A registry update may fail if any of the keys being updated are open.</p> <p>If the flag is set to 1, the agent tries to forcibly update the registry.</p> <p>If the flag is set to 0, the agent does not try to forcibly update the registry when an update fails.</p> <p>Default is 0.</p> <p>Type and dimension: boolean-scalar</p>

Table 13-2 RegRep agent optional attributes

Optional Attributes	Description
ListOpenKeys	A flag that defines whether the agent lists a set of registry keys, including keys having open handles, when a registry update fails. The list is logged to the agent log. The value 1 indicates the agent lists the registry key set. The value 0 indicates the agent does not. Default is 1. Type and dimension: boolean-scalar
RestoreLocally	A flag that defines whether the agent restores the keys on the node if it was taken offline from the same node. For example, if the agent was taken offline from SystemA and brought online again on SystemA, the flag determines whether the registry keys would be restored on SystemA. The value 1 indicates the agent restores the keys on the system. The value 0 indicates it does not. Default is 0. Type and dimension: boolean-scalar

Excluding keys

This section describes the algorithm the Registry Replication agent uses while excluding keys. For example, assume a registry key KEY_X has a subkey of KEY_Y, which has a subkey KEY_Z. This key would appear as KEY_X\KEY_Y\KEY_Z in the Registry Editor.

[Table 13-3](#) describes various scenarios of keys marked for replication and for exclusion. The Result column describes the agent behavior in these scenarios.

Table 13-3 RegRep agent exclude keys and behavior

Keys for Replication	Exclude Keys	Result
KEY_X	KEY_Y\KEY_Z	KEY_Y is excluded. So is KEY_Z.
KEY_X	KEY_Y	KEY_Y is excluded. So is KEY_Z.
KEY_X	KEY_X	KEY_X is <i>not</i> excluded and an error message is logged.
KEY_X\KEY_Y	KEY_X	KEY_X is <i>not</i> excluded and an error message is logged.

Configuring registry keys

To configure a registry key to be replicated or excluded, use the abbreviation corresponding to the registry hive.

[Table 13-4](#) lists the abbreviations.

Table 13-4 RegRep agent registry hive

Registry Hive	Abbreviation
HKEY_LOCAL_MACHINE	HKLM
HKEY_USERS	HKU
HKEY_CURRENT_CONFIG	HKCC
HKEY_CLASSES_ROOT	HKCR

Ignoring subkeys

Use the IgnoreSubKeys option for the Keys attribute to prevent the Registry Replication agent from replicating the subkeys.

[Table 13-5](#) describes possible combination of values for the Keys attribute and the agent behavior in these scenarios.

Table 13-5 RegRep agent IgnoreSubKeys and behavior

Keys attribute value (Key field)	Keys attribute value (Value field)	Agent behavior
HKLM\SOFTWARE\VERITAS\VCSONE	-	Replicates the subkeys
HKLM\SOFTWARE\VERITAS\VCSONE	IgnoreSubKeys	Does not replicate the subkeys
HKLM\SOFTWARE\VERITAS\VCSONE	IgnoreSubKeys:Yes	Does not replicate the subkeys
HKLM\SOFTWARE\VERITAS\VCSONE	IgnoreSubKeys:No	Replicates the subkeys
HKLM\SOFTWARE\VERITAS\VCSONE	<any other value>	Replicates the subkeys

Additional considerations for using IgnoreSubKeys

Symantec recommends not to set the "IgnoreSubKeys" value when the RegRep resource is online. If the value is set with the resource online, the changes will be applicable only after the next agent online function.

Proxy agent

The Proxy agent monitors and mirrors the state of a resource on a local or a remote system. The agent is used to reduce monitoring overheads in configurations where multiple resources point at the same physical device. For example, if multiple service groups use the same NIC, configure one service group to monitor the NIC and have Proxy resources in the each of the other service groups to mirror the state of the NIC resource. The agent can also determine the status of an OnOff resource in a different service group.

Symantec recommends the use of Proxy agent to monitor persistent resources, for example NIC, and ServiceMonitor, ElifNone, and FileNone.

Agent function

Monitor	Determines the status of the target resource.
---------	---

State definitions

ONLINE	Indicates the target resource is online.
FAULTED	Indicates the target resource is offline.
UNKNOWN	Indicates the proxy resource is not able to detect the state of the target resource.

Attributes

Table 13-6 Proxy agent required attributes

Required Attribute	Description
TargetResName	The name of the target resource whose status is monitored and mirrored by the Proxy resource. Type and dimension: string-scalar

Table 13-7 Proxy agent optional attributes

Optional Attribute	Description
TargetSysName	The name of the system associated with the target resource. If this attribute is not specified, the Proxy resource assumes the system is local. Type and dimension: string-scalar

Phantom agent

The Phantom agent enables VCS One to determine the status of parallel service groups that do not include OnOff resources (resources that VCS One starts and stops as required.) The Phantom agent provides a “dummy” resource that can be brought online and taken offline. Without such a dummy resource, VCS One cannot assess the status of service groups containing only None (Persistent) and OnOnly resources because the state of these resources is not considered in the process of determining whether a group is online.

Agent function

Monitor	Determines status based on the status of its service group.
---------	---

State definitions

ONLINE	Indicates the service group is online.
OFFLINE	Indicates the service group is offline.

FileNone agent

The FileNone agent monitors a file. The monitor routine returns ONLINE if the specified file exists.

Agent functions

Monitor	Verifies that the specified file exists.
---------	--

State definitions

ONLINE	Indicates the specified file exists.
FAULTED	Indicates the specified file does not exist.
UNKNOWN	Indicates that the value of the PathName attribute does not contain a valid file name.

Attributes

Table 13-8 FileNone agent required attributes

Required Attributes	Description
PathName	The complete path of the file to be monitored. Type and dimension: string-scalar

ElifNone agent

The ElifNone agent monitors a file. The monitor routine returns ONLINE if the specified file does not exist.

Agent functions

Monitor Verifies that the specified file exists.

State definitions

ONLINE Indicates the specified file does not exist.
FAULTED Indicates the specified file exists.
UNKNOWN Indicates that the value of the PathName attribute does not contain a valid file name.

Attributes

Table 13-9 ElifNone agent required attributes

Required Attributes	Description
PathName	The complete path of the file to be monitored. Type and dimension: string-scalar

FileOnOff agent

The FileOnOff agent creates, removes, and monitors files.

Agent functions

Online	Creates an empty file with the specified name, if the file does not already exist.
Offline	Removes the specified file.
Monitor	Verifies that the specified file exists.

State definitions

ONLINE	Indicates the specified file exists.
OFFLINE	Indicates the specified file does not exist.
UNKNOWN	Indicates that the value of the PathName attribute does not contain a valid file name.

Attributes

Table 13-10 FileOnOff agent required attributes

Required Attributes	Description
PathName	The complete path of the file to be monitored. Type and dimension: string-scalar

FileOnOnly agent

The FileOnOnly agent creates and monitors a file.

Agent functions

- Online Creates the specified file.
- Monitor Verifies that the specified file exists.

State definitions

- ONLINE Indicates the specified file exists.
- FAULTED Indicates the specified file does not exist.
- UNKNOWN Indicates that the value of the PathName attribute does not contain a valid file name.

Attributes

Table 13-11 FileOnOnly agent required attributes

Required Attributes	Description
PathName	The complete path of the file to be monitored. Type and dimension: string-scalar

Glossary

administrative IP address

The operating system controls these IP addresses and brings them up even before VCS One brings applications online. Use them to access a specific system over the network for doing administrative tasks, for example: examining logs to troubleshoot issues, cleaning up temp files to free space, etc. Typically, you have one administrative IP address per node.

agent function

Agent functions start, stop, fault, forcibly stop, and monitor resources using scripts. Sometimes called an entry point.

base IP address

The first logical IP address, can be used as an administrative IP address.

entry point

See [agent function](#).

floating IP address

See [virtual IP address](#).

logical IP address

Any IP address assigned to a NIC.

NIC bonding

Combining two or more NICs to form a single logical NIC, which creates a fatter pipe.

operation

All agents have scripts that turn the resource on and off. Operations determine the action that the agent passes to the resource. See None operation, OnOff operation, and OnOnly operation.

None operation

For example the NIC resource. Also called persistent resource, this resource is always on. This kind of resource has no online and offline scripts, and only monitors a resource.

OnOff operation

For example the IP and Share agents--in fact most agents are OnOff. This resource has online and offline scripts. Often this type of resource does not appear in the types file because by default when a resource does not have this resource type defined, it is OnOff.

OnOnly operation

For example the NFS, FileOnOnly resources. This kind of resource has an online script, but not an offline one.

plumb

Term for enabling an IP address—used across all platforms in this guide.

test IP address

IP addresses to help determine the state of a link by sending out a ping probe to another NIC (on another system.) Requires a return ping to complete the test. Test IP addresses can be the same as base IP addresses.

virtual IP address

IP addresses that can move from one NIC to another or from one node to another. VCS One fails over these IP address with your application. Sometimes called a floating IP address.

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