

Oracle® Solaris Cluster Data Service for Oracle Solaris Zones Guide

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Preface

Oracle Solaris Cluster Data Service for Oracle Solaris Zones Guide explains how to install and configure Oracle Solaris Cluster data services.

Note – This Oracle Solaris Cluster release supports systems that use the SPARC and x86 families of processor architectures. In this document, “x86” refers to the larger family of x86 compatible products. Information in this document pertains to all platforms unless otherwise specified.

This document is intended for system administrators with extensive knowledge of Oracle software and hardware. Do not use this document as a planning or presales guide. Before reading this document, you should have already determined your system requirements and purchased the appropriate equipment and software.

The instructions in this book assume knowledge of the Oracle Solaris Operating System and expertise with the volume-manager software that is used with Oracle Solaris Cluster software.

Bash is the default shell for Oracle Solaris 11. Machine names shown with the Bash shell prompt are displayed for clarity.

Using UNIX Commands

This document contains information about commands that are specific to installing and configuring Oracle Solaris Cluster data services. The document does *not* contain comprehensive information about basic UNIX commands and procedures, such as shutting down the system, booting the system, and configuring devices. Information about basic UNIX commands and procedures is available from the following sources:

- Online documentation for the Oracle Solaris Operating System
- Oracle Solaris Operating System man pages
- Other software documentation that you received with your system

Typographic Conventions

The following table describes the typographic conventions that are used in this book.

TABLE P-1 Typographic Conventions

Typeface	Description	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name% you have mail.</code>
AaBbCc123	What you type, contrasted with onscreen computer output	<code>machine_name% su</code> Password:
<i>aabbcc123</i>	Placeholder: replace with a real name or value	The command to remove a file is <code>rm filename</code> .
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . <i>A cache</i> is a copy that is stored locally. Do <i>not</i> save the file. Note: Some emphasized items appear bold online.

Shell Prompts in Command Examples

The following table shows the default UNIX system prompt and superuser prompt for shells that are included in the Oracle Solaris OS. Note that the default system prompt that is displayed in command examples varies, depending on the Oracle Solaris release.

TABLE P-2 Shell Prompts

Shell	Prompt
Bash shell, Korn shell, and Bourne shell	\$
Bash shell, Korn shell, and Bourne shell for superuser	#
C shell	machine_name%
C shell for superuser	machine_name#

Related Documentation

Information about related Oracle Solaris Cluster topics is available in the documentation that is listed in the following table. All Oracle Solaris Cluster documentation is available at <http://www.oracle.com/technetwork/indexes/documentation/index.html>.

Topic	Documentation
Hardware installation and administration	<i>Oracle Solaris Cluster Hardware Administration Manual</i> Individual hardware administration guides
Concepts	<i>Oracle Solaris Cluster Concepts Guide</i>
Software installation	<i>Oracle Solaris Cluster Software Installation Guide</i>
Data service installation and administration	<i>Oracle Solaris Cluster Data Services Planning and Administration Guide</i> and individual data service guides
Data service development	<i>Oracle Solaris Cluster Data Services Developer's Guide</i>
System administration	<i>Oracle Solaris Cluster System Administration Guide</i> <i>Oracle Solaris Cluster Quick Reference</i>
Software upgrade	<i>Oracle Solaris Cluster Upgrade Guide</i>
Error messages	<i>Oracle Solaris Cluster Error Messages Guide</i>
Command and function references	<i>Oracle Solaris Cluster Reference Manual</i> <i>Oracle Solaris Cluster Data Services Reference Manual</i> <i>Oracle Solaris Cluster Geographic Edition Reference Manual</i> <i>Oracle Solaris Cluster Quorum Server Reference Manual</i>

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Getting Help

If you have problems installing or using Oracle Solaris Cluster, contact your service provider and provide the following information.

- Your name and email address (if available)
- Your company name, address, and phone number
- The model number and serial number of your systems
- The release number of the operating environment (for example, Oracle Solaris 11)
- The release number of Oracle Solaris Cluster (for example, Oracle Solaris Cluster 4.1)

Use the following commands to gather information about your system for your service provider.

Command	Function
<code>prtconf -v</code>	Displays the size of the system memory and reports information about peripheral devices
<code>psrinfo -v</code>	Displays information about processors
<code>pkg list</code>	Reports which packages are installed
<code>prtdiag -v</code>	Displays system diagnostic information
<code>/usr/cluster/bin/clnode show-rev</code>	Displays Oracle Solaris Cluster release and package version information for each node

Also have available the contents of the `/var/adm/messages` file.

Installing and Configuring HA for Solaris Zones

This chapter explains how to install and configure Oracle Solaris Cluster HA for Solaris Zones (HA for Solaris Zones) for `solaris` and `solaris10` brand zones.

This chapter contains the following sections.

- “HA for Solaris Zones Overview” on page 9
- “Overview of Installing and Configuring HA for Solaris Zones” on page 11
- “Planning the HA for Solaris Zones Installation and Configuration” on page 11
- “Installing and Configuring Zones” on page 15
- “Verifying the Installation and Configuration of a Zone” on page 21
- “Installing the HA for Solaris Zones Package” on page 22
- “Registering and Configuring HA for Solaris Zones” on page 22
- “Verifying the HA for Solaris Zones and Configuration” on page 39
- “Upgrading Non-Global Zones Managed by HA for Oracle Solaris Zones” on page 39
- “Tuning the HA for Solaris Zones Fault Monitors” on page 40
- “Tuning the HA for Solaris Zones `Stop_timeout` property” on page 42
- “Denying Cluster Services for a Non-Global Zone” on page 43
- “Debugging HA for Solaris Zones” on page 43

HA for Solaris Zones Overview

The `solaris` and `solaris10` brands of non-global zones are supported for configuration with the HA for Solaris Zones data service. A `solaris` brand zone is a complete runtime environment for applications that run on the Oracle Solaris 11 Operating System. Solaris 10 Resource Manager and Solaris Zones software partitioning technology are both parts of the `solaris` brand zone. These components address different qualities the zone can deliver and work together to create a complete zone. The zones portion provides a virtual mapping from the application to the platform resources. Zones allow application components to be isolated from one application even though the zones share a single instance of the Solaris Operating System. Resource management features permit you to allocate the quantity of resources that a workload receives.

The Solaris Zones facility in the Solaris Operating System provides an isolated and secure environment in which to run applications on your system. When you create a zone, you produce an application execution environment in which processes are isolated from the rest of the system.

This isolation prevents processes that are running in one zone from monitoring or affecting processes that are running in other zones. Even a process that is running with superuser credentials cannot view or affect activity in other zones. A zone also provides an abstract layer that separates applications from the physical attributes of the machine on which they are deployed. Examples of these attributes include physical device paths.

Every Solaris system contains a global zone. The global zone is both the default zone for the system and the zone that is used for system-wide administrative control. Non-global zones are referred to as zones and are created by the administrator of the global zone.

HA for Solaris Zones enables Oracle Solaris Cluster to manage Solaris Zones by providing components to perform the following operations:

- The orderly booting, shutdown and fault monitoring of a zone through the `sczbt` component.
- The orderly startup, shutdown and fault monitoring of an application within the zone, using scripts or commands through the `sczsh` component.
- The orderly startup, shutdown and fault monitoring of a Solaris Service Management Facility (SMF) service within the zone through the `sczsmf` component.

You can configure HA for Solaris Zones as a failover service or a multiple-masters service. You *cannot* configure HA for Solaris Zones as a scalable service.

When a Solaris Zone is managed by the HA for Solaris Zones data service, the Solaris Zone becomes a Solaris HA zone or a multiple-masters Solaris Zone across the Oracle Solaris Cluster nodes. The failover in case of a Solaris HA zone is managed by the HA for Solaris Zones data service, which runs only within the global zone.

You can also choose to set up non-global zones that do not participate in the cluster. A root user logged into one of these zones is not able to discover or disrupt operation of the cluster. See [“Denying Cluster Services for a Non-Global Zone” on page 43](#) for more information

For conceptual information about failover data services, multiple-masters data services, and scalable data services, see *Oracle Solaris Cluster Concepts Guide*.

Overview of Installing and Configuring HA for Solaris Zones

The following table summarizes the tasks for installing and configuring HA for Solaris Zones and provides cross-references to detailed instructions for performing these tasks. Perform the tasks in the order that they are listed in the table.

TABLE 1-1 Tasks for Installing and Configuring HA for Solaris Zones

Task	Instructions
Plan the installation	“Planning the HA for Solaris Zones Installation and Configuration” on page 11
Install and configure the Solaris Zones	“Installing and Configuring Zones” on page 15
Verify installation and configuration	“How to Verify the Installation and Configuration of a Zone” on page 21
Install HA for Solaris Zones Packages	“Installing the HA for Solaris Zones Package” on page 22
Register and configure HA for Solaris Zones components	“Registering and Configuring HA for Solaris Zones” on page 22
Verify HA for Solaris Zones installation and configuration	“Verifying the HA for Solaris Zones and Configuration” on page 39
Upgrading the non-global zones managed by HA for Solaris Zones	“Upgrading Non-Global Zones Managed by HA for Oracle Solaris Zones” on page 39
Tune the HA for Solaris Zones fault monitors	“Tuning the HA for Solaris Zones Fault Monitors” on page 40
Tune the HA for Solaris Zones Stop_timeout property	“Tuning the HA for Solaris Zones Stop_timeout property” on page 42
Debug HA for Solaris Zones	“How to Activate Debugging for HA for Solaris Zones” on page 43

Planning the HA for Solaris Zones Installation and Configuration

This section contains the information you need to plan your HA for Solaris Zones installation and configuration.

Configuration Restrictions

The configuration restrictions in the subsections that follow apply only to HA for Solaris Zones.



Caution – Your data service configuration might not be supported if you do not observe these restrictions.

Restrictions for Zone Network Addresses

The configuration of a zone's network addresses depends on the level of high availability (HA) you require for it and the configured `ip-type` option. You can choose between no HA, HA through the use of only IPMP, or HA through the use of IPMP and `SUNW.LogicalHostName` (`ip-type=shared` only).

Your choice of a zone's network addresses configuration affects some configuration parameters for the zone boot resource. For more information, see [“Registering and Configuring HA for Solaris Zones” on page 22](#).

The following restrictions apply if `ip-type` is set to `shared`:

- If HA for the zone's addresses is not required, then configure the zone's addresses by using the `zonecfg` utility.
- If only HA through IPMP protection in the global zone is required, then configure the zone's addresses by using the `zonecfg` utility and place the zone's addresses on an adapter within an IPMP group.
- If HA through IPMP protection in the global zone and protection against the failure of all physical interfaces by triggering a failover is required, choose one option from the following list:
 - If you require the `SUNW.LogicalHostName` resource type to manage one or a subset of the zone's addresses, configure a `SUNW.LogicalHostName` resource for those zone's addresses and not by using the `zonecfg` utility. Use the `zonecfg` utility only to configure the zone's addresses that are not required to be under the control of the `SUNW.LogicalHostName` resource.
 - If you require the `SUNW.LogicalHostName` resource type to manage all the zone's addresses, configure a `SUNW.LogicalHostName` resource with a list of the zone's addresses and do not configure them by using the `zonecfg` utility.
 - Otherwise, configure the zone's addresses by using the `zonecfg` utility and configure a separate redundant IP address in the same subnet for use by a `SUNW.LogicalHostName` resource, which must not be configured using the `zonecfg` utility.

The following restrictions apply if `ip-type` is set to `exclusive`:

- The `SC_NETWORK` variable in the `sczbt_config` file must be set to `false` to successfully register the `sczbt` resource.
- Do not configure a resource dependency on a `SUNW.LogicalHostname` resource from the `sczbt` resource.

- A `linkname` is required for `anet` resources within `zonecfg`. Set the `linkname` value explicitly instead of using the `auto` option.

Restrictions for an HA Zone

The zone path of a zone in an HA zone configuration must reside on a highly available local file system. The zone must be configured on each cluster node where the zone can reside.

The zone is active on only one node at a time, and the zone's address is plumbed on only one node at a time. Application clients can then reach the zone through the zone's address, wherever that zone resides within the cluster.

Ensure that the zone's `autoboot` property is set to `false`. Setting a zone's `autoboot` property to `false` prevents the zone from being booted when the global zone is booted. The HA for Solaris Zones data service can manage a zone only if the zone is booted under the control of the data service.

Ensure that the zone configuration defines a generic attribute with name `osc-ha-zone` of type `boolean` and value `true`. This attribute is used by the `svc:/system/cluster/osc-ha-zone-state-cleanup` SMF service on each node to identify a zone controlled by the `sczbt` component. The `svc:/system/cluster/osc-ha-zone-state-cleanup` SMF service must be enabled.

For a `solaris` brand zone, ensure that the universally unique ID (UUID) of each node's boot-environment (BE) root dataset is the same value.

Restrictions for a Multiple-Masters Zone

The zone path of a zone in a multiple-masters configuration must reside on the local disks of each node. The zone must be configured with the same name on each node that can master the zone.

Each zone that is configured to run within a multiple-masters configuration must also have a zone-specific address. Load balancing for applications in these configurations is typically provided by an external load balancer. You must configure this load balancer for the address of each zone. Application clients can then reach the zone through the load balancer's address.

Ensure that the zone's `autoboot` property is set to `false`. Setting a zone's `autoboot` property to `false` prevents the zone from being booted when the global zone is booted. The HA for Solaris Zones data service can manage a zone only if the zone is booted under the control of the data service.

Restrictions for the Zone Path of a Zone

The zone path of a zone that HA for Solaris Zones manages cannot reside on a global file system.

- If the zone is in a failover configuration, the zone path must reside on a highly available local file system.

- If the zone is in a multiple-masters configuration, the zone path must reside on the local disks of each node.

Restrictions on Major Device Numbers in /etc/name_to_major

For shared devices, Oracle Solaris Cluster requires that the major and minor device numbers are identical on all nodes in the cluster. If the device is required for a zone, ensure that the major device number is the same in /etc/name_to_major on all nodes in the cluster that will host the zone.

Configuration Requirements

The configuration requirements in this section apply only to HA for Solaris Zones.



Caution – If your data service configuration does not conform to these requirements, the data service configuration might not be supported.

Dependencies Between HA for Solaris Zones Components

The dependencies between the HA for Solaris Zones components are described in the following table:

TABLE 1-2 Dependencies Between HA for Solaris Zones Components

Component	Dependency
Zone boot resource (sczbt)	SUNW.HASStoragePlus - In a failover configuration, the zone's zone path must be on a highly available file system managed by a SUNW.HASStoragePlus resource SUNW.LogicalHostName - This dependency is required only if the zone's address is managed by a SUNW.LogicalHostName resource and the ip- type is set to shared
Zone script resource (sczsh)	Zone boot resource
Zone SMF resource (sczsmf)	Zone boot resource

These dependencies are set when you register and configure HA for Solaris Zones. For more information, see [“Registering and Configuring HA for Solaris Zones” on page 22](#).

The zone script resource and SMF resource are optional. If used, multiple instances of the zone script resource and SMF resource can be deployed within the same resource group as the zone boot resource. Furthermore, if more elaborate dependencies are required then refer to the [r_properties\(5\)](#) and [rg_properties\(5\)](#) man pages for further dependencies and affinities settings.

Parameter File Directory for HA for Solaris Zones

The boot component and script component of HA for Solaris Zones require a parameter file to pass configuration information to the data service. You must create a directory for these files. The directory location must be available on the node that is to host the zone and must not be in the zone's zone path. The directory must be accessible *only* from the global zone. The parameter file for each component is created automatically when the resource for the component is registered.

Note – If a multiple-masters zone configuration is being deployed, you must ensure that the parameter directory exists on all nodes that will host the zone. You can either place separate copies of the parameter directory on local storage on each node or place the parameter directory on a cluster file system. The advantage of using a cluster file system ensures that only one copy of the parameter directory exists, whereas if you have separate copies of the parameter directory on local storage you must ensure the contents are kept up to date after registering an `sczbt` or `sczsh` resource and before you enable the resource.

Installing and Configuring Zones

Installing and configuring Solaris Zones involves the following tasks:

1. Enabling a zone to run in your chosen data service configuration, as explained in the following sections:
 - [“How to Enable a Zone to Run in a Failover Configuration”](#) on page 15
 - [“How to Enable a Zone to Run in a Multiple-Masters Configuration”](#) on page 16
2. Installing and configuring a zone, as explained in:
 - [“How to Install a Zone and Perform the Initial Internal Zone Configuration”](#) on page 16

Perform this task for each zone that you are installing and configuring. This section explains only the special requirements for installing Solaris Zones for use with HA for Solaris Zones. For complete information about installing and configuring Solaris Zones, see *Oracle Solaris Administration: Oracle Solaris Zones, Oracle Solaris 10 Zones, and Resource Management*.

▼ How to Enable a Zone to Run in a Failover Configuration

- 1 **Register the `SUNW.HASStoragePlus` resource type.**
`# clresourcetype register SUNW.HASStoragePlus`
- 2 **Create a failover resource group.**
`# clresourcegroup create solaris-zone-resource-group`

3 Create a resource for the zone's disk storage.

This HAStoragePlus resource is for the zonepath. The file system must be a failover file system.

```
# clresource create \  
-g solaris-zone-resource-group \  
-t SUNW.HAStoragePlus \  
-p Zpools=solaris-zone-instance-zpool \  
solaris-zone-has-resource-name
```

4 (Optional) Create a resource for the zone's logical hostname.

```
# clreslogicalhostname create \  
-g solaris-zone-resource-group \  
-h solaris-zone-logical-hostname \  
solaris-zone-logical-hostname-resource-name
```

5 Enable the failover resource group.

```
# clresourcegroup online -M solaris-zone-resource-group
```

▼ How to Enable a Zone to Run in a Multiple-Masters Configuration

1 Create a scalable resource group.

```
# clresourcegroup create \  
-p Maximum primaries=max-number \  
-p Desired primaries=desired-number \  
solaris-zone-resource-group
```

2 Enable the scalable resource group.

```
# clresourcegroup online -M solaris-zone-resource-group
```

▼ How to Install a Zone and Perform the Initial Internal Zone Configuration

Perform this task on each node that is to host the zone.

Note – For complete information about installing a zone, see [Oracle Solaris Administration: Oracle Solaris Zones, Oracle Solaris 10 Zones, and Resource Management](#).

Before You Begin

Consult “[Configuration Restrictions](#)” on page 11 and then determine the following requirements for the deployment of the zone with Oracle Solaris Cluster:

- The number of Solaris Zone instances that are to be deployed.
- The zpool containing the file system that is to be used by each Solaris Zone instance.

Ensure that the zone is configured.

If the zone that you are installing is to run in a failover configuration, configure the zone's zone path to specify a file system on a zpool. The zpool must be managed by the SUNW.HAStoragePlus resource that you created in [“How to Enable a Zone to Run in a Failover Configuration” on page 15](#).

For detailed information about configuring a zone before installation of the zone, see the following documentation:

- Chapter 16, “Non-Global Zone Configuration (Overview),” in *Oracle Solaris Administration: Oracle Solaris Zones, Oracle Solaris 10 Zones, and Resource Management*
- Chapter 17, “Planning and Configuring Non-Global Zones (Tasks),” in *Oracle Solaris Administration: Oracle Solaris Zones, Oracle Solaris 10 Zones, and Resource Management*

Note – This procedure assumes you are performing it on a two-node cluster. If you perform this procedure on a cluster with more than two nodes, perform on all nodes any steps that say to perform them on both nodes.

1 Become superuser on one node of the cluster.

Alternatively, if your user account is assigned the System Administrator profile, issue commands as non-root through a profile shell, or prefix the command with the `pfexec` command.

2 If you will use a solaris10 brand zone, set up the system image.

Follow procedures in [“Creating the Image for Directly Migrating Oracle Solaris 10 Systems Into Zones”](#) in *Oracle Solaris Administration: Oracle Solaris Zones, Oracle Solaris 10 Zones, and Resource Management*.

3 Create an HAStoragePlus resource.

Specify the ZFS storage pool and the resource group that you created.

```
phys-schost-1# clresource create -t SUNW.HAStoragePlus \
-g resourcegroup -p Zpools=pool hasp-resource
```

4 Bring the resource group online.

```
phys-schost-1# clresourcegroup online -eM resourcegroup
```

5 Create a ZFS file-system dataset on the ZFS storage pool that you created.

You will use this file system as the zone root path for the solaris brand zone that you create later in this procedure.

```
phys-schost-1# zfs create pool/filesystem
```

- 6 For a `solaris` brand zone, ensure that the universally unique ID (UUID) of each node's boot-environment (BE) root dataset is the same value.

- a. Determine the UUID of the node where you initially created the zone.

Output is similar to the following.

```
phys-schost-1# beadm list -H
...
b101b-SC;8fe53702-16c3-eb21-ed85-d19af92c6bbd;NR;/;756...
```

In this example output, the UUID is `8fe53702-16c3-eb21-ed85-d19af92c6bbd` and the BE is `b101b-SC`.

- b. Set the same UUID on the second node.

```
phys-schost-2# zfs set org.opensolaris.libbe:uuid=uuid rpool/ROOT/BE
```

Note – If you use a multimaster configuration, you do not need to set the UUID as described in this step.

- 7 On both nodes, configure the `solaris` or `solaris10` brand non-global zone.

Set the zone root path to the file system that you created on the ZFS storage pool.

- a. Configure the zone.

Note – You must define the `osc-ha-zone` attribute in the zone configuration, setting type to `boolean` and value to `true`.

- For a `solaris` brand zone, use the following command.

```
phys-schost# zonecfg -z zonename \
'create ; add attr; set name=osc-ha-zone; set type=boolean; set value=true; end;
set zonepath=/pool/filesystem/zonename ; set autoboot=false'
```

- For a `solaris10` brand zone, use the following command.

```
phys-schost# zonecfg -z zonename \
'create ; set brand=solaris10; set zonepath=/pool/filesystem/zonename ;
add attr; set name=osc-ha-zone; set type=boolean;
set value=true; end; set autoboot=false'
```

- b. Verify the zone configuration.

```
phys-schost# zoneadm list -cv
ID NAME          STATUS      PATH                                BRAND  IP
0 global         running    /                                    solaris shared
- zonename      configured /pool/filesystem/zonename         brand  shared
```

- 8 From the node that masters the HAStoragePlus resource, install the `solaris` or `solaris10` brand non-global zone.

Note – For a multi-master configuration, you do not need an HAStoragePlus resource as described in [Step a](#) and you do not need to perform the switchover described in [Step 9](#).

Output is similar to the following:

a. Determine which node masters the HAStoragePlus resource.

```
phys-schost# clresource status
=== Cluster Resources ===
```

Resource Name	Node Name	Status	Message
<i>hasp-resource</i>	phys-schost-1	Online	Online
	phys-schost-2	Offline	Offline

Perform the remaining tasks in this step from the node that masters the HAStoragePlus resource.

b. Install the zone on the node that masters the HAStoragePlus resource for the ZFS storage pool.

- For a solaris brand zone, use the following command.

```
phys-schost-1# zoneadm -z zonename install
```

- For a solaris10 brand zone, use the following command.

```
phys-schost-2# zoneadm -z zonename install -a flarimage -u
```

c. Verify that the zone is installed.

```
phys-schost-1# zoneadm list -cv
ID NAME          STATUS          PATH          BRAND  IP
0 global         running        /             solaris shared
- zonename      installed     /pool/filesystem/zonename brand  shared
```

d. Boot the zone that you created and verify that the zone is running.

```
phys-schost-1# zoneadm -z zonename boot
phys-schost-1# zoneadm list -cv
ID NAME          STATUS          PATH          BRAND  IP
0 global         running        /             solaris shared
- zonename      running       /pool/filesystem/zonename brand  shared
```

e. Open a new terminal window and log in to the zone console.

Follow the interactive steps to finish the zone configuration.

f. Halt the zone.

The zone's status should return to installed.

```
phys-schost-1# zoneadm -z zonename halt
```

g. Forcibly detach the zone.

```
phys-schost-1# zoneadm -z zonename detach -F
```

The zone state changes from installed to configured.

9 Switch the resource group to the other node and forcibly attach the zone.**a. Switch over the resource group.**

Input is similar to the following, where `phys-schost-1` is the node that currently masters the resource group and `phys-schost-2` is the node to which you switch the resource group.

```
phys-schost-1# clresourcegroup switch -n phys-schost-2 resourcegroup
```

Perform the remaining tasks in this step from the node to which you switch the resource group.

b. Forcibly attach the zone to the node to which you switched the resource group.

```
phys-schost-2# zoneadm -z zonename attach -F
```

c. Verify that the zone is installed on the node.

Output is similar to the following:

```
phys-schost-2# zoneadm list -cv
ID NAME          STATUS  PATH                                BRAND  IP
 0 global        running /                                     solaris shared
- zonename      installed /pool/filesystem/zonename         brand  shared
```

d. Boot the zone.

```
phys-schost-2# zoneadm -z zonename boot
```

e. Open a new terminal window and log in to the zone.

Perform this step to verify that the zone is functional.

```
phys-schost-2# zlogin -C zonename
```

f. Halt the zone.

```
phys-schost-2# zoneadm -z zonename halt
```

g. Forcibly detach the zone.

```
phys-schost-1# zoneadm -z zonename detach -F
```

The zone state changes from installed to configured.

Verifying the Installation and Configuration of a Zone

Before you install the HA for Solaris Zones packages, verify that the zones that you created are correctly configured to run in a cluster. This verification does not verify that the zones are highly available because the HA for Solaris Zones data service is not yet installed.

▼ How to Verify the Installation and Configuration of a Zone

Perform this procedure for each zone that you created in “[Installing and Configuring Zones](#)” on [page 15](#).

1 Start the zone.

```
# zoneadm -z zone boot
```

2 Log in to the zone.

```
# zlogin zone
```

3 Perform the required task depending upon the brand type of the zone.

- For a `solaris` and `solaris10` brand type zone, confirm that the zone has reached the `svc:/milestone/multi-user-server:default` milestone.

```
# svcs -a | grep milestone
online      Apr_10    svc:/milestone/network:default
online      Apr_10    svc:/milestone/devices:default
online      Apr_10    svc:/milestone/single-user:default
online      Apr_10    svc:/milestone/sysconfig:default
online      Apr_10    svc:/milestone/name-services:default
online      Apr_10    svc:/milestone/multi-user:default
online      Apr_10    svc:/milestone/multi-user-server:default
```

4 Stop the zone.

```
# zoneadm -z zone halt
```

Next Steps Go to “[Registering and Configuring HA for Solaris Zones](#)” on [page 22](#).

Installing the HA for Solaris Zones Package

If you did not install the HA for Solaris Zones package during your initial Oracle Solaris Cluster installation, perform this procedure to install the package.

▼ How to Install the HA for Solaris Zones Package

Perform this procedure on each cluster node where you want the HA for Solaris Zones software to run.

- 1 On the cluster node where you are installing the data service package, become superuser.
- 2 Ensure that the `solaris` and `ha-cluster` publishers are valid.

```
# pkg publisher
PUBLISHER                TYPE    STATUS  URI
solaris                  origin  online  solaris-repository
ha-cluster               origin  online  ha-cluster-repository
```

For information about setting the `solaris` publisher, see [“Set the Publisher Origin To the File Repository URI”](#) in *Copying and Creating Oracle Solaris 11 Package Repositories*.

- 3 Install the HA for Solaris Zones software package.
- ```
pkg install ha-cluster/data-service/ha-zones
```

- 4 Verify that the package installed successfully.
- ```
$ pkg info ha-cluster/data-service/ha-zones
```

Installation is successful if output shows that State is Installed.

- 5 Perform any necessary updates to the Oracle Solaris Cluster software.

For instructions on updating single or multiple packages, see [Chapter 11, “Updating Your Software,”](#) in *Oracle Solaris Cluster System Administration Guide*.

Registering and Configuring HA for Solaris Zones

Before you perform this procedure, ensure that the HA for Solaris Zones data service packages are installed.

Use the configuration and registration files in the following directories to register the HA for Solaris Zones resources:

- `/opt/SUNWsczone/sczbt/util`
- `/opt/SUNWsczone/sczsh/util`
- `/opt/SUNWsczone/sczsmf/util`

The files define the dependencies that are required between the HA for Solaris Zones components. For information about these dependencies, see [“Dependencies Between HA for Solaris Zones Components”](#) on page 14.

Registering and configuring HA for Solaris Zones involves the tasks that are explained in the following sections:

1. [“Specifying Configuration Parameters for the Zone Boot Resource”](#) on page 23
2. [“Writing Scripts for the Zone Script Resource”](#) on page 28
3. [“Specifying Configuration Parameters for the Zone Script Resource”](#) on page 29
4. [“Writing a Service Probe for the Zone SMF Resource”](#) on page 30
5. [“Specifying Configuration Parameters for the Zone SMF Resource”](#) on page 31
6. [“How to Create and Enable Resources for the Zone Boot Component”](#) on page 33
7. [“How to Create and Enable Resources for the Zone Script Component”](#) on page 38
8. [“How to Create and Enable Resources for the Zone SMF Component”](#) on page 38

Specifying Configuration Parameters for the Zone Boot Resource

HA for Solaris Zones provides the script `sczbt_register`, which automates the process of configuring the zone boot resource. By default this script obtains configuration parameters from the `sczbt_config` file in the `/opt/SUNWsczone/sczbt/util` directory. To specify configuration parameters for the zone boot resource, copy the `sczbt_config` file to a different filename and amend it as described below. It is recommended to keep this file as a future reference. The register script provides option `-f` to specify the fully qualified filename to the copied configuration file.

The directory you specify for the `PARAMETERDIR` can exist on the local file system of all nodes, the global file system, or the failover file system.

Each configuration parameter in the `sczbt_config` file is defined as a keyword-value pair. The `sczbt_config` file already contains the required keywords and equals signs. For more information, see [“Listing of sczbt_config”](#) on page 45. When you edit the `sczbt_config` file, add the required value to each keyword.

For more information, see [“How to Create and Enable Resources for the Zone Boot Component”](#) on page 33.

The keyword-value pairs in the `sczbt_config` file are as follows:

```
RS=sczbt-rs
RG=sczbt-rg
PARAMETERDIR=sczbt-parameter-directory
SC_NETWORK=true|false
SC_LH=sczbt-lh-rs
FAILOVER=true|false
```

```

HAS_RS=sczbt-has-rs
Zonename=zone-name
Zonebrand=zone-brand-type
Zonebootopt=zone-boot-options
Milestone=zone-boot-milestone
LXrunlevel=linux-runlevel
SLrunlevel=solaris-legacy-runlevel
Mounts=list-of-mountpoints

```

The meaning and permitted values of the keywords in the `sczbt_config` file are as follows:

`RS=sczbt-rs`

Specifies the name that you are assigning to the zone boot resource. You must specify a value for this keyword.

`RG=sczbt-rg`

Specifies the name of the resource group the zone boot resource will reside in. You must specify a value for this keyword.

`PARAMETERDIR=sczbt parameter directory`

Specifies the directory name that you are assigning to the parameter directory where some variables and their values will be stored. You must specify a value for this keyword. This directory can exist on the local file system of all nodes, the global file system, or on a failover file system.

`SC_NETWORK=true|false`

Specifies whether the zone boot resource is network aware with a `SUNW.LogicalHostName` resource. You must specify a value for this keyword.

- If HA for the zone's addresses is not required, then configure the zone's addresses by using the `zonecfg` utility.

```

SC_NETWORK=false
SC_LH=

```

- If only HA through IPMP protection is required, then configure the zone's addresses by using the `zonecfg` utility and then place the zone's addresses on an adapter within an IPMP group.

```

SC_NETWORK=false
SC_LH=

```

- If HA through IPMP protection and protection against the failure of all physical interfaces by triggering a failover is required, choose one option from the following list:

- If you require the `SUNW.LogicalHostName` resource type to manage one or a subset of the zone's addresses, configure a `SUNW.LogicalHostName` resource for those zone's addresses and not by using the `zonecfg` utility. Use the `zonecfg` utility to configure only the zones's addresses that are not to be under the control of the `SUNW.LogicalHostName` resource.

```

SC_NETWORK=true
SC_LH=Name of the SUNW.LogicalHostName resource

```

- If you require the `SUNW.LogicalHostName` resource type to manage all the zone's addresses, configure a `SUNW.LogicalHostName` resource with a list of the zone's addresses and do not configure them by using the `zonecfg` utility.

```
SC_NETWORK=true
SC_LH=Name of the SUNW.LogicalHostName resources
```

- Otherwise, configure the zone's addresses by using the `zonecfg` utility and configure a separate redundant IP address for use by a `SUNW.LogicalHostName` resource, which must not be configured using the `zonecfg` utility.

```
SC_NETWORK=false
SC_LH=Name of the SUNW.LogicalHostName resource
```

`SC_LH=sczbt-lh-rs`

Specifies the name of the `SUNW.LogicalHostName` resource for the zone boot resource. Refer to [“Restrictions for Zone Network Addresses” on page 12](#) for a description of when to set this variable. This name must be the `SUNW.LogicalHostName` resource name you assigned when you created the resource in [Step 4](#).

`FAILOVER=true|false`

Specifies whether the zone's zone path is on a highly available file system.

`HAS_RS=sczbt-has-rs`

Specifies the name of the `SUNW.HASStoragePlus` resource for the zone boot resource. This name must be the `SUNW.HASStoragePlus` resource name you assigned when you created the resource in [“How to Enable a Zone to Run in a Failover Configuration” on page 15](#). You must specify a value for this keyword if `FAILOVER=true` is set. This will cause the `sczbt_register` script to define a `Resource_dependencies_offline_restart` resource dependency from the zone boot resource to the specified `SUNW.HASStoragePlus` resource.

For a multi-master configuration, the `HAS_RS=` parameter must be empty because there is no `SUNW.HASStoragePlus` resource. All the zone paths are local to each node in that configuration.

`Zonename=zone-name`

Specifies the zone name. You must specify a value for this keyword.

`Zonebrand=zone-brand-type`

Specifies the brand type of the zone. The options that are currently supported are `solaris` or `solaris10`. You must specify a value for this keyword.

`Zonebootopt=zone-boot-options`

Specifies the zone boot option to use. Only `-s` is supported. Leaving this variable blank will cause the zone to boot to the `multi-user-server` milestone.

`Milestone=zone-boot-milestone`

Specifies the milestone the zone must reach to be considered successfully booted. This option is used for the `solaris` or `solaris 10` brand type. You must specify a value for this keyword if you set the `Zonebrand` option to `solaris` or `solaris 10`.

`LXrunlevel=linux-runlevel`

This option was used on Oracle Solaris 10 and is now deprecated. Any value for this keyword is ignored.

`SLrunlevel=solaris-legacy-runlevel`

This option was used on Oracle Solaris 10 and is now deprecated. Any value for this keyword is ignored.

`MOUNTS=list-of-mountpoints`

Specifies a space separated list of directories with their mount options, which will automatically get `lofs` mounted from the global zone into the booted zone. The mount point used in the global zone can be different to the mount point in the booted zone. Specifying a value for this keyword is optional.

The `MOUNTS` keyword format is as follows:

```
MOUNTS="/global-zone-dir:/local-zone-dir:mount-options <next entry>"
```

While `mount-options` can be a comma separated list of file system mount options.

The only required entry when setting this keyword is the `/global-zone-dir` part of the colon separated variable. The `/local-zone-dir` and `mount-options` part can be omitted.

Omitting the `/local-zone-dir` part will make the zone's mount point the same as the global zone directory.

Omitting the `mount-options` part will not provide any mount options except the default options from the mount command.

Note – If you are omitting the `/local-zone-dir` or the `mount-options`, you must also omit the “:” as delimiter.

Note – You must manually create any mount point directories within the booted zone that will be used within the `MOUNTS` keyword, before registering this resource within Oracle Solaris Cluster.

Note – If the file system of the source mount point in the global zone is mounted by a `SUNW.HASStoragePlus` resource, you must specify a strong resource dependency from the `sczbt` resource to this `SUNW.HASStoragePlus` resource.

EXAMPLE 1-1 Sample sczbt_config File

This example shows an sczbt_config file in which configuration parameters are set as follows:

- The name of the zone boot resource is zone1-rs.
- The name of the resource group for the zone boot resource is zone1-rg.
- The name of the parameter file directory for the zone boot resource is/global/zones/pfiles.
- Indicates that the zone's address is managed by a SUNW.LogicalHostName resource and is true.
- The name of the SUNW.LogicalHostName resource name for the zone boot resource is zone1-lh.
- Indicates that the zone boot resource's zone path is managed by a SUNW.LogicalHostName resource and is true.
- The name of the SUNW.HASStoragePlus resource name for the zone boot resource is zone1-has.
- The name of the zone is zone1.
- The brand type of the zone is solaris.
- Indicates that the zone boot resource's boot option is null.
- Indicates that the zone boot resource's milestone is multi-user-server.
- Defines that /global/app/bin from the global zone gets mounted read-only within zone zone1 under mount point /app/bin.
- Defines that /app/data from the global zone gets mounted read-write within zone zone1 under mount point /app/data.
- Defines that /logs from the global zone gets mounted with default mount options within zone zone1 under mount point /logs.

```
RS=zone1-rs
RG=zone1-rg
PARAMETERDIR=/global/zones/pfiles
SC_NETWORK=true
SC_LH=zone1-lh
FAILOVER=true
HAS_RS=zone1-has
Zonename=zone1
Zonebrand=solaris
Zonebootopt=
Milestone=multi-user-server
Mounts="/global/app/bin:/app/bin:ro /app/data:rw /logs"
```

Writing Scripts for the Zone Script Resource

The zone script resource provides the ability to run commands or scripts to start, stop and probe an application within a zone. The zone script resource depends on the zone boot resource. The command or script names are passed to the zone script resource when the resource is registered and must meet with the following requirements.

- The command or script must contain the fully qualified path within the zone.
- The command or script must be executable by root.
- The command or script must return one of the following return codes.

TABLE 1-3 Return codes

0	Successful completion
>0	An error has occurred
201	(Probe only) – An error has occurred that requires an immediate failover of the resource group
>0 & !=201	(Probe only) – An error has occurred that requires a resource restart

Note – For an immediate failover of the zone script resource, you must configure the resource properties `Failover_mode` and `Failover_enabled` to meet the required behavior. Refer to the [r_properties\(5\)](#) man page when setting the `Failover_mode` property and the [SUNW.gds\(5\)](#) man page when setting the `Failover_enabled` property.

EXAMPLE 1-2 Zone Probe Script for Apache2

This example shows a simple script to test that the Apache2 service is running, beyond the process tree existing. The script `/var/tmp/probe-apache2` must exist and being executable within the zone.

```
# <userinput>cat /var/tmp/probe-apache2</userinput>
#!/usr/bin/ksh
if echo "GET; exit" | mconnect -p 80 > /dev/null 2>&1
then
    exit 0
else
    exit 100
fi

# <userinput>chmod 755 /var/tmp/probe-apache2</userinput></screen>
```

Specifying Configuration Parameters for the Zone Script Resource

HA for Solaris Zones provides the script `sczsh_register`, which automates the process of configuring zone script resource. By default this script obtains configuration parameters from the `sczsh_config` file in the `/opt/SUNWsczone/sczsh/util` directory. To specify configuration parameters for the zone script resource, copy the `sczsh_config` file to a different filename and amend it as described below. It is recommended to keep this file as a future reference. The `register` script provides option `-f` to specify the fully qualified filename to the copied configuration file.

Each configuration parameter in the `sczsh_config` file is defined as a keyword-value pair. The `sczsh_config` file already contains the required keywords and equals signs. For more information, see [“Listing of `sczsh_config`” on page 48](#). When you edit the `sczsh_config` file, add the required value to each keyword.

The keyword-value pairs in the `sczsh_config` file are as follows:

```
RS=sczsh-rs
RG=sczbt-rg
SCZBT_RS=sczbt-rs
PARAMETERDIR=sczsh-parameter-directory
Zonename=sczbt-zone-name
ServiceStartCommand=sczsh-start-command
ServiceStopCommand=sczsh-stop-command
ServiceProbeCommand=sczsh-probe-command
```

The meaning and permitted values of the keywords in the `sczsh_config` file are as follows:

`RS=sczsh-rs`

Specifies the name that you are assigning to the zone script resource. You must specify a value for this keyword.

`RG=sczbt-rg`

Specifies the name of the resource group the zone boot resource resides in. You must specify a value for this keyword.

`SCZBT_RS=sczbt-rs`

Specifies the name of the zone boot resource. You must specify a value for this keyword.

`PARAMETERDIR=sczsh parameter directory`

Specifies the directory name that you are assigning to the parameter directory where the following variables and their values will be stored. You must specify a value for this keyword.

`Zonename=sczbt-zone-name`

Specifies the zone name. You must specify a value for this keyword.

`ServiceStartCommand=sczsh-start-command`

Specifies the zone start command or script to run. You must specify a value for this keyword.

`ServiceStopCommand=sczsh-stop-command`

Specifies the zone stop command or script to run. You must specify a value for this keyword

`ServiceProbeCommand=sczsh-probe-command`

Specifies the zone probe command or script to run. You must specify a value for this keyword

EXAMPLE 1-3 Sample `sczsh_config` File

In this example the zone script resource uses the scripts that are available with the `pkg:/web/server/apache-22` package on Oracle Solaris 11. Before this example can be used the Apache2 configuration file `http.conf` needs to be configured. For the purpose of this example, the delivered `/etc/apache2/2.2/http.conf` can be used. Amend the file so that you can successfully start and stop the Apache httpd server.

This example shows an `sczsh_config` file in which configuration parameters are set as follows:

- The name of the zone script resource is `zone1-script-rs`.
- The name of the resource group for the zone script resource is `zone1-rg`.
- The name of the zone boot resource is `zone1-rs`.
- The name of the parameter file directory for the zone script resource is `/global/zones/pfiles`.
- The name of the zone is `zone1`.
- The name of the zone script resource start command and its parameter is `"/lib/svc/method/http-apache22 start"`.
- The name of the zone script resource stop command and its parameter is `"/lib/svc/method/http-apache22 stop"`.
- The name of the zone script resource probe command is `"/var/tmp/probe-apache2"`. This script is shown in [Example 1-4](#) and must exist in `zone1`.

```
RS="zone1-script-rs"
RG="zone1-rg"
SCZBT_RS="zone1-rs"
PARAMETERDIR="/global/zones/pfiles"
Zonename="zone1"
ServiceStartCommand="/lib/svc/method/http-apache22 start"
ServiceStopCommand="/lib/svc/method/http-apache22 stop"
ServiceProbeCommand="/var/tmp/probe-apache2"
```

Writing a Service Probe for the Zone SMF Resource

The zone SMF resource provides the ability to enable, disable, and probe an SMF service within a zone that is of brand type `solaris` or `solaris10`. The zone SMF resource depends on the zone boot resource. Probing the SMF service is performed by running a command or script against

the SMF service. The SMF service and probe command or script names are passed to the zone SMF resource when the resource is registered. The probe command or script must meet the following requirements.

- The probe command or script must contain the fully qualified path within the zone.
- The probe command or script must be executable by root.
- The probe command or script must return one of the following return codes.

TABLE 1-4 Return codes

0	Successful completion
100	An error occurred that requires a resource restart
201	An error has occurred that requires an immediate failover of the resource group

Note – For an immediate failover of the zone SMF resource, you must configure the resource properties `Failover_mode` and `Failover_enabled` to meet the required behavior. Refer to the [r_properties\(5\)](#) man page when setting the `Failover_mode` property and the [SUNW.gds\(5\)](#) man page when setting the `Failover_enabled` property.

EXAMPLE 1-4 Zone SMF Probe Script for Apache2

This example shows a simple script to test that the SMF Apache2 service is running, beyond the process tree existing. The script `/var/tmp/probe-apache2` must exist and being executable within the zone.

```
# <userinput>cat /var/tmp/probe-apache2</userinput>
#!/usr/bin/ksh
if echo "GET; exit" | mconnect -p 80 > /dev/null 2>&1
then
    exit 0
else
    exit 100
fi

# <userinput>chmod 755 /var/tmp/probe-apache2</userinput></screen>
```

Specifying Configuration Parameters for the Zone SMF Resource

HA for Solaris Zones provides the script `sczsmf_register`, which automates the process of configuring the zone SMF resource. By default this script obtains configuration parameters from the `sczsmf_config` file in the `/opt/SUNWsczone/sczsmf/util` directory. To specify configuration parameters for the zone SMF resource, copy the `sczsmf_config` file to a different

filename and amend it as described below. It is recommended to keep this file as a future reference. The register script provides option `-f` to specify the fully qualified filename to the copied configuration file.

Each configuration parameter in the `sczsmf_config` file is defined as a keyword-value pair. The `sczsmf_config` file already contains the required keywords and equals signs. For more information, see “[Listing of `sczsmf_config`](#)” on page 48. When you edit the `sczsmf_config` file, add the required value to each keyword.

The keyword-value pairs in the `sczsmf_config` file are as follows:

```
RS=sczsmf-rs
RG=sczbt-rg
SCZBT_RS=sczbt-rs
ZONE=sczbt-zone-name
SERVICE=smf-service
RECURSIVE=true|false
STATE=true|false
SERVICE_PROBE=sczsmf-service-probe
```

The meaning and permitted values of the keywords in the `sczsmf_config` file are as follows:

`RS=sczsmf-rs`

Specifies the name that you are assigning to the zone SMF resource. This must be defined.

`RG=sczbt-rg`

Specifies the name of the resource group the zone boot resource resides in. This must be defined.

`SCZBT_RS=sczbt-rs`

Specifies the name of the zone boot resource. You must specify a value for this keyword.

`ZONE=sczbt-zone-name`

Specifies the zone name. This must be defined.

`SERVICE=smf-service`

Specifies the SMF service to enable/disable. This must be defined.

`RECURSIVE=true|false`

Specifies `true` to enable the service recursively or `false` to just enable the service and no dependents. This must be defined.

`STATE=true|false`

Specifies `true` to wait until the service state is reached or `false` to not wait until the service state is reached. This must be defined.

`SERVICE_PROBE=sczsmf-service-probe`

Specify the script to check the SMF service. Specifying a value for this keyword is optional.

EXAMPLE 1-5 Sample `sczsmf_config` File

In this example the zone SMF resource uses the Apache2 SMF service that is available in Solaris 11. Before this example can be used the Apache2 configuration file `http.conf` needs to be configured. For the purpose of this example, the delivered `/etc/apache2/2.2/http.conf` can be used. Amend the `http.conf` file so that you can successfully start and stop the apache http server.

This example shows an `sczsmf_config` file in which configuration parameters are set as follows:

- The name of the zone SMF resource is `zone1-smf-rs`.
- The name of the resource group for the zone SMF resource is `zone1-rg`.
- The name of the zone boot resource is `zone1-rs`.
- The name of the zone name is `zone1`.
- The name of the zone SMF service is `apache2`.
- Indicates that the zone SMF service Recursive option is `true`.
- Indicates that the zone SMF service State option is `true`.
- Indicates that the zone SMF service probe name is `/var/tmp/probe-apache2`. This script is shown in [Example 1-2](#) and must exist in `zone1`.

```
RS=zone1-smf-rs
RG=zone1-rg
SCZBT_RS=zone1-rs
ZONE=zone1
SERVICE=apache2
RECURSIVE=true
STATE=true
SERVICE_PROBE=/var/tmp/probe-apache2
```

▼ How to Create and Enable Resources for the Zone Boot Component

Before You Begin Ensure you have edited the `sczbt_config` file or a copy of it to specify configuration parameters for the HA for Solaris Zones zone boot component. For more information, see [“Specifying Configuration Parameters for the Zone Boot Resource”](#) on page 23.

- 1 **Become superuser on one of the nodes in the cluster that will host the zone.**
- 2 **On both nodes, configure the zone-boot (`sczbt`) resource.**
 - a. **Register the `SUNW.gds` resource type.**

```
phys-schost# clresource-type register SUNW.gds
```

b. Create a directory on the ZFS file system that you created.

You will specify this directory to store the parameter values that you set for the zone-boot resource.

```
phys-schost# mkdir /pool/filesystem/parameterdir
```

c. Install and configure the HA for Zones agent.

```
phys-schost# pkg install ha-cluster/data-service/ha-zones
phys-schost# cd /opt/SUNWsczone/sczbt/util
phys-schost# cp -p sczbt_config sczbt_config.zoneboot-resource
phys-schost# vi sczbt_config.zoneboot-resource
```

Add or modify the following entries in the file.

```
RS="zoneboot-resource"
RG="resourcegroup"
PARAMETERDIR="/pool/filesystem/parameterdir"
SC_NETWORK="false"
SC_LH=""
FAILOVER="true"
HAS_RS="hasp-resource"
Zonename="zonename"
Zonebrand="brand"
Zonebootopt=""
Milestone="multi-user-server"
LXrunlevel="3"
SLrunlevel="3"
Mounts=""
```

Save and exit the file.

d. Configure the zone-boot resource.

The resource is configured with the parameters that you set in the zone-boot configuration file.

```
phys-schost# ./sczbt_register -f ./sczbt_config.zoneboot-resource
```

Note – If you are using a multi master configuration and a local parameter directory, copy the files from the node where you ran the register command to all other nodes in the resource group nodelist.

e. Verify that the zone-boot resource is enabled.

```
phys-schost# clresource enable zoneboot-resource
```

3 Verify that the resource group can switch to another node and the ZFS storage pool successfully starts there after the switchover.**a. Switch the resource group to another node.**

```
phys-schost-2# clresourcegroup switch -n phys-schost-1 resourcegroup
```

b. Verify that the resource group is now online on the new node.

Output is similar to the following:

```
phys-schost-1# clresourcegroup status
=== Cluster Resource Groups ===
```

Group Name	Node Name	Suspended	Status
-----	-----	-----	-----
resourcegroup	phys-schost-1	No	Online
	phys-schost-2	No	Offline

c. Verify that the zone is running on the new node.

```
phys-schost-1# zoneadm list -cv
```

ID	NAME	STATUS	PATH	BRAND	IP
0	global	running	/	solaris	shared
1	zonename	running	/pool/filesystem/zonename	brand	shared

Example 1-6 Configuring the HA for Zones Zone Boot Component for solaris Brand Zones

This example creates the HAStoragePlus resource `hasp-rs`, which uses a mirrored ZFS storage pool `hapool` in the resource group `zone-rg`. The storage pool is mounted on the `/hapool/solaris` file system. The `hasp-rs` resource runs on the `solaris` brand non-global zone `solariszone1`, which is configured on both `phys-schost-1` and `phys-schost-2`. The `zone-boot` resource `solariszone1-rs` is based on the `SUNW.gds` resource type.

Create a resource group.

```
phys-schost-1# clresourcegroup create zone-rg
```

Create a mirrored ZFS storage pool to be used for the HA zone root path.

```
phys-schost-1# zpool create -m /ha-zones hapool mirror /dev/rdisk/c4t6d0 \
/dev/rdisk/c5t6d0
phys-schost-1# zpool export hapool
```

Create an HAStoragePlus resource that uses the resource group and mirrored ZFS storage pool that you created.

```
phys-schost-1# clresourcetype register SUNW.HAStoragePlus
phys-schost-1# clresource create -t SUNW.HAStoragePlus \
-g zone-rg -p Zpools=hapool hasp-rs
```

Bring the resource group online.

```
phys-schost-1# clresourcegroup online -eM zone-rg
```

Create a ZFS file-system dataset on the ZFS storage pool that you created.

```
phys-schost-1# zfs create hapool/solaris
```

Ensure that the universally unique ID (UUID) of each node's boot-environment (BE) root dataset is the same value on both nodes.

```
phys-schost-1# beadm list -H
...
zfsbe;8fe53702-16c3-eb21-ed85-d19af92c6bbd;NR;/;7565844992;static;1229439064
```

```
...
phys-schost-2# zfs set org.opensolaris.libbe:uuid=8fe53702-16c3-eb21-ed85-d19af92c6bbd \
rpool/ROOT/zfsbe
```

Configure the solaris brand non-global zone.

```
phys-schost-1# zonecfg -z solariszone1 'create -b ;\
set zonepath=/hapool/solaris/solariszone1 ; add attr; set name=osc-ha-zone; set type=boolean;
set value=true; end; set autoboot=false; set ip-type=shared'
```

```
phys-schost-1# zoneadm list -cv
ID NAME          STATUS      PATH                               BRAND  IP
0 global         running    /                                  solaris shared
- solariszone1   configured /hapool/solaris/solariszone1     solaris shared
```

Repeat on phys-schost-2.

Identify the node that masters the HAStoragePlus resource, and from that node install solariszone1.

```
phys-schost-1# clresource status
=== Cluster Resources ===
```

Resource Name	Node Name	Status	Message
hasp-rs	phys-schost-1	Online	Online
	phys-schost-2	Offline	Offline

```
phys-schost-1# zoneadm -z solariszone1 install
```

```
phys-schost-1# zoneadm list -cv
ID NAME          STATUS      PATH                               BRAND  IP
0 global         running    /                                  solaris shared
- solariszone1   installed  /hapool/solaris/solariszone1     solaris shared
```

```
phys-schost-1# zoneadm -z solariszone1 boot
```

```
phys-schost-1# zoneadm list -cv
ID NAME          STATUS      PATH                               BRAND  IP
0 global         running    /                                  solaris shared
- solariszone1   running   /hapool/solaris/solariszone1     solaris shared
```

Open a new terminal window and log in to solariszone1.

```
phys-schost-1# zoneadm -z solariszone1 halt
```

Forcibly detach the zone.

```
phys-schost-1# zoneadm -z solariszone1 detach -F
```

Switch zone-rg to phys-schost-2 and forcibly attach the zone.

```
phys-schost-1# clresourcegroup switch -n phys-schost-2 zone-rg
```

```
phys-schost-2# zoneadm -z solariszone1 attach -F
```

```
phys-schost-2# zoneadm list -cv
ID NAME          STATUS      PATH                               BRAND  IP
0 global         running    /                                  solaris shared
- solariszone1   installed  /hapool/solaris/solariszone1     solaris shared
```

```
phys-schost-2# zoneadm -z solariszone1 boot
```

Open a new terminal window and log in to solariszone1.

```
phys-schost-2# zlogin -C solariszone1
phys-schost-2# zoneadm -z solariszone1 halt
```

Forcibly detach the zone.

```
phys-schost-1# zoneadm -z solariszone1 detach -F
```

On both nodes, configure the zone-boot (sczbt) resource.

```
phys-schost# clresourcetype register SUNW.gds
phys-schost# mkdir /hapool/solaris/params
```

On both nodes, install and configure the HA for Zones agent.

```
phys-schost# pkg install ha-cluster/data-service/ha-zones
phys-schost# cd /opt/SUNWsczone/sczbt/util
phys-schost# cp -p sczbt_config sczbt_config.solariszone1-rs
phys-schost# vi sczbt_config.solariszone1-rs
```

On both nodes, add or modify the following entries in the sczbt_config.solariszone1-rs file.

```
RS="solariszone1-rs"
RG="zone-rg"
PARAMETERDIR="/hapool/solaris/params"
SC_NETWORK="false"
SC_LH=""
FAILOVER="true"
HAS_RS="hasp-rs"
```

```
Zonename="solariszone1"
Zonebrand="solaris"
Zonebootopt=""
Milestone="multi-user-server"
LXrunlevel="3"
SLrunlevel="3"
Mounts=""
```

Save and exit the file.

On both nodes, configure the solariszone1-rs resource and verify that it is enabled.

```
phys-schost# ./sczbt_register -f ./sczbt_config.solariszone1-rs
phys-schost# clresource enable solariszone1-rs
```

Verify that zone-rg can switch to another node and that solariszone1 successfully starts there after the switchover.

```
phys-schost-2# clresourcegroup switch -n phys-schost-1 zone-rg
phys-schost-1# clresourcegroup status
=== Cluster Resource Groups ===
```

Group Name	Node Name	Suspended	Status
-----	-----	-----	-----
zone-rg	phys-schost-1	No	Online

phys-schost-2 No Offline

phys-schost-1# zoneadm list -cv

ID	NAME	STATUS	PATH	BRAND	IP
0	global	running	/	solaris	shared
1	solariszone1	running	/hapool/solaris/solariszone1	solaris	shared

Next Steps Go to “[Verifying the HA for Solaris Zones and Configuration](#)” on page 39.

▼ How to Create and Enable Resources for the Zone Script Component

Before You Begin Ensure you have edited the `sczsh_config` file or a copy of it to specify configuration parameters for the HA for Solaris Zones zone script component. For more information, see “[Specifying Configuration Parameters for the Zone Script Resource](#)” on page 29.

- 1 Go to the directory that contains the script for creating the HA for Solaris Zones script resource.

```
# cd /opt/SUNWsczone/sczsh/util
```

- 2 Run the script that creates the zone script resource.

```
# ./sczsh_register -f /mypath/sczsh_config
```

- 3 Bring online the zone script resource.

```
# clresource enable sczsh-rs
```

Next Steps Go to “[Verifying the HA for Solaris Zones and Configuration](#)” on page 39.

▼ How to Create and Enable Resources for the Zone SMF Component

Before You Begin Ensure you have edited the `sczsmf_config` file or a copy of it to specify configuration parameters for the HA for Solaris Zones zone SMF component. For more information, see “[Specifying Configuration Parameters for the Zone SMF Resource](#)” on page 31.

- 1 Go to the directory that contains the script for creating the HA for Solaris Zones SMF resource.

```
# cd /opt/SUNWsczone/sczsmf/util
```

- 2 Run the script that creates the zone SMF resource.

```
# ./sczsmf_register -f /mypath/sczsmf_config
```

- 3 Bring online the zone SMF resource.

```
# clresource enable sczsmf-rs
```

Next Steps Go to “[Verifying the HA for Solaris Zones and Configuration](#)” on page 39.

Verifying the HA for Solaris Zones and Configuration

After you install, register, and configure HA for Solaris Zones, verify the HA for Solaris Zones installation and configuration. Verifying the HA for Solaris Zones installation and configuration determines if the HA for Solaris Zones data service makes your zones highly available.

▼ How to Verify the HA for Solaris Zones Installation and Configuration

- 1 **Become superuser on a cluster node that is to host the Solaris Zones component.**
- 2 **Ensure all the Solaris Zone resources are online.**
For each resource, perform the following steps.
 - a. **Determine whether the resource is online.**

```
# cluster status -t rg,rs
```
 - b. **If the resource is not online, bring online the resource.**

```
# clresource enable solaris-zone-resource
```
- 3 **For a failover service configuration, switch the zone resource group to another cluster node, such as *node2*.**

```
# clresourcegroup switch -n node2 solaris-zone-resource-group
```
- 4 **Confirm that the resource is now online on *node2*.**

```
# cluster status -t rg,rs
```

Upgrading Non-Global Zones Managed by HA for Oracle Solaris Zones

You can upgrade Oracle Solaris non-global zones that are managed by the Oracle Solaris Cluster software. For instructions, see [Chapter 2, “Upgrading Zones Managed by HA for Oracle Solaris Zones,”](#) in *Oracle Solaris Cluster Upgrade Guide*.

Tuning the HA for Solaris Zones Fault Monitors

The HA for Solaris Zones fault monitors verify that the following components are running correctly:

- Zone boot resource
- Zone script resource
- Zone SMF resource

Each HA for Solaris Zones fault monitor is contained in the resource that represents Solaris Zones component. You create these resources when you register and configure HA for Solaris Zones. For more information, see [“Registering and Configuring HA for Solaris Zones”](#) on [page 22](#).

System properties and extension properties of these resources control the behavior of the fault monitor. The default values of these properties determine the preset behavior of the fault monitor. The preset behavior should be suitable for most Oracle Solaris Cluster installations. Therefore, you should tune the HA for Solaris Zones fault monitor *only* if you need to modify this preset behavior.

Tuning the HA for Solaris Zones fault monitors involves the following tasks:

- Setting the interval between fault monitor probes
- Setting the time-out for fault monitor probes
- Defining the criteria for persistent faults
- Specifying the failover behavior of a resource

For more information, see [“Tuning Fault Monitors for Oracle Solaris Cluster Data Services”](#) in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

Operation of the HA for Solaris Zones Parameter File

The HA for Solaris Zones zone boot and script resources uses a parameter file to pass parameters to the start, stop and probe commands. Changes to these parameters take effect at every restart or enabling, disabling of the resource.

Operation of the Fault Monitor for the Zone Boot Component

The fault monitor for the zone boot component ensures that the all requirements for the zone boot component to run are met:

- The corresponding zsched process for the zone is running.

If this process is not running, the fault monitor restarts the zone. If this fault persists, the fault monitor fails over the resource group that contains resource for the zone boot component.

- Every logical hostname that is managed by a `SUNW.LogicalHostname` resource is operational.

If the logical hostname is not operational, the fault monitor fails over the resource group that contains resource for the zone boot component.

- The specified milestone for the `solaris` or `solaris10` zone brand type is either online or degraded.

If the milestone is not online or degraded, the fault monitor restarts the zone. If this fault persists, the fault monitor fails over the resource group that contains resource for the zone boot component.

To verify the state of the milestone, the fault monitor connects to the zone. If the fault monitor cannot connect to the zone, the fault monitor retries every five seconds for approximately 60% of the probe time-out. If the attempt to connect still fails, then the fault monitor restarts the resource for the zone boot component.



Caution – The `Probe_timeout` defaults to 30 seconds. If you configure multiple Solaris HA zones on the same cluster or in combination with additional workloads, ensure that 60% of the `Probe_timeout` is enough (even under high system load) to successfully run the probe. Increase the `Probe_timeout` if the default is too sensitive in your actual deployment.

Operation of the Fault Monitor for the Zone Script Component

The fault monitor for the zone script component runs the script that you specify for the component. The value that this script returns to the fault monitor determines the action that the fault monitor performs. For more information, see [Table 1-3](#).

Operation of the Fault Monitor for the Zone SMF Component

The fault monitor for the zone SMF component verifies that the SMF service is not disabled. If the service is disabled, the fault monitor restarts the SMF service. If this fault persists, the fault monitor fails over the resource group that contains the resource for the zone SMF component.

If the service is not disabled, the fault monitor runs the SMF service probe that you can specify for the component. The value that this probe returns to the fault monitor determines the action that the fault monitor performs. For more information, see [Table 1-4](#).

Tuning the HA for Solaris Zones Stop_timeout property

The HA for Solaris Zones components consist all of the resource type `SUNW.gds(5)`. As described in “[Stop_command Property](#)” in *Oracle Solaris Cluster Data Services Developer’s Guide*, the value for the `Stop_timeout` should be chosen so that the `Stop_command` can successfully return within 80% of its value.

Choosing the Stop_timeout value for the Zone Boot Component

The stop method for the zone boot component spends 60% of the value for the `Stop_timeout` performing a complete “`zoneadm -z zonename shutdown`” for the zone. If that failed, the next 20% of the value for the `Stop_timeout` will be spent halting the zone performing a “`zoneadm -z zonename halt`” and perform some additional cleanup steps in order to force the zone into the state installed. Therefore the `Stop_timeout` value for the zone boot component should be computed so that 60% is enough to successfully shutdown the zone.

Choosing the Stop_timeout value for the Zone Script Component

The stop method for the zone script component calls the command or script configured for the `ServiceStopCommand` keyword. Therefore the `Stop_timeout` value for the zone script component should be computed so that 80% is enough for the configured `ServiceStopCommand` to succeed.

Choosing the Stop_timeout value for the Zone SMF Component

The stop method for the zone SMF component spends 60% of the value for the `Stop_timeout` using `svcadm` to disable the configured SMF service in the zone. If that failed, the next 20% of the value for the `Stop_timeout` will be spent to first send `SIGTERM` then `SIGKILL` to the processes associated with this SMF service. Therefore the `Stop_timeout` value for the zone SMF component should be computed so that 60% is enough to successfully disable the configured SMF service in the zone.

Denying Cluster Services for a Non-Global Zone

You can choose to set up non-global zones that do not participate in the cluster. A root user logged into one of these zones will not be able to discover or disrupt operation of the cluster.

To implement this feature, create the file `/etc/cluster/cluster.zone.deny` in the global zone of each node and add the names of the non-global zones on that node that should not be part of the cluster. If the zone name appears in the file, all cluster commands and daemons are disabled in that zone. Ensure that the zone is not running when you add or remove a zone name from this file.

Debugging HA for Solaris Zones

The `config` file in the `/opt/SUNWsczone/zone component/etc` directory enables you to activate debugging for Solaris Zone resources. Where *zone component* represents `sczbt` for the boot component, `sczsh` for the script component and `sczsmf` for the SMF component.

Each component of HA for Solaris Zones has a `config` that enables you to activate debugging for Solaris Zone resources. The location of this file for each component is as follows:

- For the zone boot component, this file is contained in the `/opt/SUNWsczone/sczbt/etc` directory.
- For the zone script component, this file is contained in the `/opt/SUNWsczone/sczsh/etc` directory.
- For the zone SMF component, this file is contained in the `/opt/SUNWsczone/sczsmf/etc` directory.

▼ How to Activate Debugging for HA for Solaris Zones

1 Determine whether debugging for HA for Solaris Zones is active.

If debugging is inactive, `daemon.notice` is set in the file `/etc/syslog.conf`.

```
# grep daemon /etc/syslog.conf
*.err;kern.debug;daemon.notice;mail.crit      /var/adm/messages
*.alert;kern.err;daemon.err                    operator
#
```

2 If debugging is inactive, edit the `/etc/syslog.conf` file to change `daemon.notice` to `daemon.debug`.

3 Confirm that debugging for HA for Solaris Zones is active.

If debugging is active, `daemon.debug` is set in the file `/etc/syslog.conf`.

```
# grep daemon /etc/syslog.conf
*.err;kern.debug;daemon.debug;mail.crit      /var/adm/messages
```

```
*.alert;kern.err;daemon.err          operator
#
```

4 Restart the syslogd daemon.

```
# svcadm restart system-log
```

5 Edit the /opt/SUNWsczone/sczbt/etc/config file to change DEBUG= to DEBUG=ALL or DEBUG=sczbt-rs.

```
# cat /opt/SUNWsczone/sczbt/etc/config
#
# Copyright 2012 Oracle Corporation. All rights reserved.
# Use is subject to license terms.
#
# ident "@(#)config    1.1    06/02/12"
#
# Usage:
#     DEBUG=<RESOURCE_NAME> or ALL
#
DEBUG=ALL
#
```

Note – To deactivate debugging, reverse the preceding steps.

Files for Configuring HA for Solaris Zones Resources

The /opt/SUNWsczone/zone component/util directory contains files that automate the process of configuring HA for Solaris Zones resources. Listings of these files are provided in the following sections:

- “Listing of sczbt_config” on page 45
- “Listing of sczsh_config” on page 48
- “Listing of sczsmf_config” on page 48

Listing of sczbt_config

```
#
# Copyright 2012 Oracle Corporation. All rights reserved.
# Use is subject to license terms.
#
# ident "@(#)sczbt_config 1.5 08/04/17"
#
# This file will be sourced in by sczbt_register and the parameters
# listed below will be used.
#
# These parameters can be customized in (key=value) form
#
# RS - Name of the resource
# RG - Name of the resource group containing RS
# PARAMETERDIR - Name of the parameter file directory
# SC_NETWORK - Identifies if SUNW.LogicalHostname will be used
# true = zone will use SUNW.LogicalHostname
# false = zone will use it's own configuration
#
# NOTE: If the ip-type keyword for the non-global zone is set
# to "exclusive", only "false" is allowed for SC_NETWORK
#
# The configuration of a zone's network addresses depends on
# whether you require IPMP protection or protection against
# the failure of all physical interfaces.
#
# If you require only IPMP protection, configure the zone's
```

```

# addresses by using the zonecfg utility and then place the
# zone's address in an IPMP group.
#
# To configure this option set
# SC_NETWORK=false
# SC_LH=Name of the SC Logical Hostname resource
#
# If IPMP protection is not required, just configure the
# zone's addresses by using the zonecfg utility.
#
# To configure this option set
# SC_NETWORK=false
# SC_LH=Name of the SC Logical Hostname resource
#
# If you require protection against the failure of all physical
# interfaces, choose one option from the following list.
#
# - If you want the SUNW.LogicalHostName resource type to manage
# the zone's addresses, configure a SUNW.LogicalHostName
# resource with at least one of the zone's addresses.
#
# To configure this option set
# SC_NETWORK=true
# SC_LH=Name of the SC Logical Hostname resource
#
# - Otherwise, configure the zone's addresses by using the
# zonecfg utility and configure a redundant IP address
# for use by a SUNW.LogicalHostName resource.
#
# To configure this option set
# SC_NETWORK=false
# SC_LH=Name of the SC Logical Hostname resource
#
# Whichever option is chosen, multiple zone addresses can be
# used either in the zone's configuration or using several
# SUNW.LogicalHostname resources.
#
# e.g. SC_NETWORK=true
# SC_LH=zone1-lh1,zone1-lh2
#
# SC_LH - Name of the SC Logical Hostname resource
# FAILOVER - Identifies if the zone's zone path is on a
# highly available local file system
#
# e.g. FAILOVER=true - highly available local file system
# FAILOVER=false - local file system
#
# HAS_RS - Name of the HAStoragePlus SC resource
#
RS=
RG=
PARAMETERDIR=
SC_NETWORK=
SC_LH=
FAILOVER=
HAS_RS=
#

```

```

# The following variable will be placed in the parameter file
#
# Parameters for sczbt (Zone Boot)
#
# Zonename      Name of the zone
# Zonebrand     Brand of the zone. Current supported options are
#               "solaris" (default) or "solaris10"
# Zonebootopt   Zone boot options ("-s" requires that Milestone=single-user)
# Milestone     SMF Milestone which needs to be online before the zone is
#               considered booted. This option is only used for the
#               "solaris" Zonebrand.
# LXrunlevel    Runlevel which needs to get reached before the zone is
#               considered booted. This option is only used for the "lx"
#               Zonebrand.
# SLrunlevel    Solaris legacy runlevel which needs to get reached before the
#               zone is considered booted. This option is only used for the
#               "solaris8" or "solaris9" Zonebrand.
# Mounts        Mounts is a list of directories and their mount options,
#               which are loopback mounted from the global zone into the
#               newly booted zone. The mountpoint in the local zone can
#               be different to the mountpoint from the global zone.
#
#               The Mounts parameter format is as follows,
#
#               Mounts="/global zone directory:/local zone directory:mount options"
#
#               The following are valid examples for the "Mounts" variable
#
#               Mounts="/globalzone-dir1:/localzone-dir1:rw"
#               Mounts="/globalzone-dir1:/localzone-dir1:rw /globalzone-dir2:rw"
#
#               The only required entry is the /global zone directory, the
#               /local zone directory and mount options can be omitted.
#
#               Omitting /local zone directory will make the local zone
#               mountpoint the same as the global zone directory.
#
#               Omitting mount options will not provide any mount options
#               except the default options from the mount command.
#
#               Note: You must manually create any local zone mountpoint
#               directories that will be used within the Mounts variable,
#               before registering this resource within Solaris Cluster.
#
#
Zonename=""
Zonebrand="solaris"
Zonebootopt=""
Milestone="multi-user-server"
LXrunlevel="3"
SLrunlevel="3"
Mounts=""

```

Listing of sczsh_config

```

#
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#
# ident "@(#)sczsh_config 1.1 06/02/12"
#
# This file will be sourced by sczsh_register and the parameters
# listed below will be used.
#
# These parameters can be customized in (key=value) form
#
#           RS - Name of the resource
#           RG - Name of the resource group containing RS
#           SCZBT RS - Name of the SC Zone boot resource
#           PARAMETERDIR - Name of the parameter file directory
#           Zonename - Name of the zone
# ServiceStartCommand - Command including all options to start
#                       the service in the configured zone
# ServiceStopCommand - Command including all options to stop
#                       the service in the configured zone
# ServiceProbeCommand - Command including all options to probe
#                       the service in the configured zone
#
RS=""
RG=""
SCZBT_RS=""
PARAMETERDIR=""
#
# The following parameters will be put in the agents parameterfile:
#
Zonename=""
ServiceStartCommand=""
ServiceStopCommand=""
ServiceProbeCommand=""

```

Listing of sczsmf_config

```

#
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#
# ident "@(#)sczsmf_config 1.1 06/02/12"
#
# This file will be sourced in by sczsmf_register and the parameters
# listed below will be used.
#
# These parameters can be customized in (key=value) form
#
#           RS - Name of the resource
#           RG - Name of the resource group containing RS
#           SCZBT RS - Name of the SC Zone boot resource
#           ZONE - Name of the Zone
#

```

```

# For SERVICE, RECURSIVE and STATE, refer to the svcadm(1M)
# man page
#
# SERVICE - {FMRI | pattern}
# FMRI - Fault management resource identifier
# pattern - Pattern matching a service
#
# RECURSIVE - {false | true} Default: true
# False - Just enable the service and no dependents
# True - Enable the service and recursively enable
# its dependents
#
# RECURSIVE=true equates to svcadm enable "-r"
#
# STATE - {false | true} Default: true
# False - Do not wait until service state is reached
# True - Wait until service state is reached
#
# STATE=true equates to svcadm enable/disable "-s"
#
# SERVICE_PROBE - Script to check the SMF service
#
# The optional parameter, SERVICE_PROBE, provides the
# ability to check that the SMF service is working.
# This must be a script within the zone and must
# adhere to these return codes,
#
# 0 - The SMF service is working
# 100 - The SMF service should be restarted
# 201 - The SMF service should initiate a failover of
# the Resource Group
#
# Note: That return code 201, requires that this resource
# has an appropriate extension property value for
# FAILOVER_MODE and FAILOVER_ENABLED=TRUE
#
# For FAILOVER_MODE refer to the r_properties(5) man page.
#

RS=
RG=
SCZBT_RS=
ZONE=
SERVICE=
RECURSIVE=true
STATE=true
SERVICE_PROBE=""

```


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