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# How To Configure Oracle<sup>®</sup> VM Server for SPARC Guest Domains As Oracle Solaris Cluster Nodes

<a href="#">Introduction.....</a>	<a href="#">1</a>
<a href="#">Overview.....</a>	<a href="#">2</a>
<a href="#">Prerequisites, Assumptions, and Defaults.....</a>	<a href="#">3</a>
<a href="#">Configuration Assumptions.....</a>	<a href="#">3</a>
<a href="#">Prerequisites for Each System.....</a>	<a href="#">3</a>
<a href="#">Sample Primary Domain Configuration.....</a>	<a href="#">4</a>
<a href="#">Sample Guest Domain Configuration.....</a>	<a href="#">5</a>
<a href="#">Initial Preparation of Public IP Addresses and Logical Hostnames</a>	<a href="#">8</a>
<a href="#">Defaults.....</a>	<a href="#">8</a>
<a href="#">Installing Oracle Solaris Cluster Software Packages.....</a>	<a href="#">8</a>
<a href="#">Configuring Oracle Solaris Cluster Software.....</a>	<a href="#">15</a>
<a href="#">For More Information.....</a>	<a href="#">18</a>

## Introduction

This Oracle® Solaris Cluster Installation and Configuration white paper is intended to help a new or experienced Oracle Solaris user quickly and easily install and configure Oracle Solaris Cluster software for two nodes that are Oracle VM Server for SPARC (previously called Sun Logical Domains) guest domains. Users are guided step-by-step through the process, with examples and screenshots to simplify the process. This document does not cover the configuration of highly available services; that topic is covered in a separate guide.

For more details about how to install and configure other Oracle Solaris Cluster software configurations, see the Solaris Cluster Software Installation Guide at [docs.sun.com/app/docs/doc/820-4677](https://docs.sun.com/app/docs/doc/820-4677).

## Overview

This white paper on Oracle Solaris Cluster Installation and Configuration uses the interactive `scinstall` utility. This utility enables you to configure all the nodes of your new cluster quickly and easily. The interactive `scinstall` utility is menu driven. These menus help reduce the chance of mistakes and promote best practices by using default values and prompting you for information specific to your cluster. The utility also helps prevent mistakes by identifying invalid entries. Finally, the `scinstall` utility eliminates the need to manually set up a quorum device by automating the configuration of a quorum device for your new cluster. This white paper refers to the Oracle Solaris Cluster 3.2 1/09 release. For more information about the latest Oracle Solaris Cluster release, see [developers.sun.com/solaris/cluster](http://developers.sun.com/solaris/cluster).

The following illustration describes the configuration of the cluster we would be addressing in this document. The configuration uses two servers with one guest domain on each server. The cluster is created with the two guest domains as cluster members. The configuration has two private network adapters between the two servers and a public network adapter on each server.

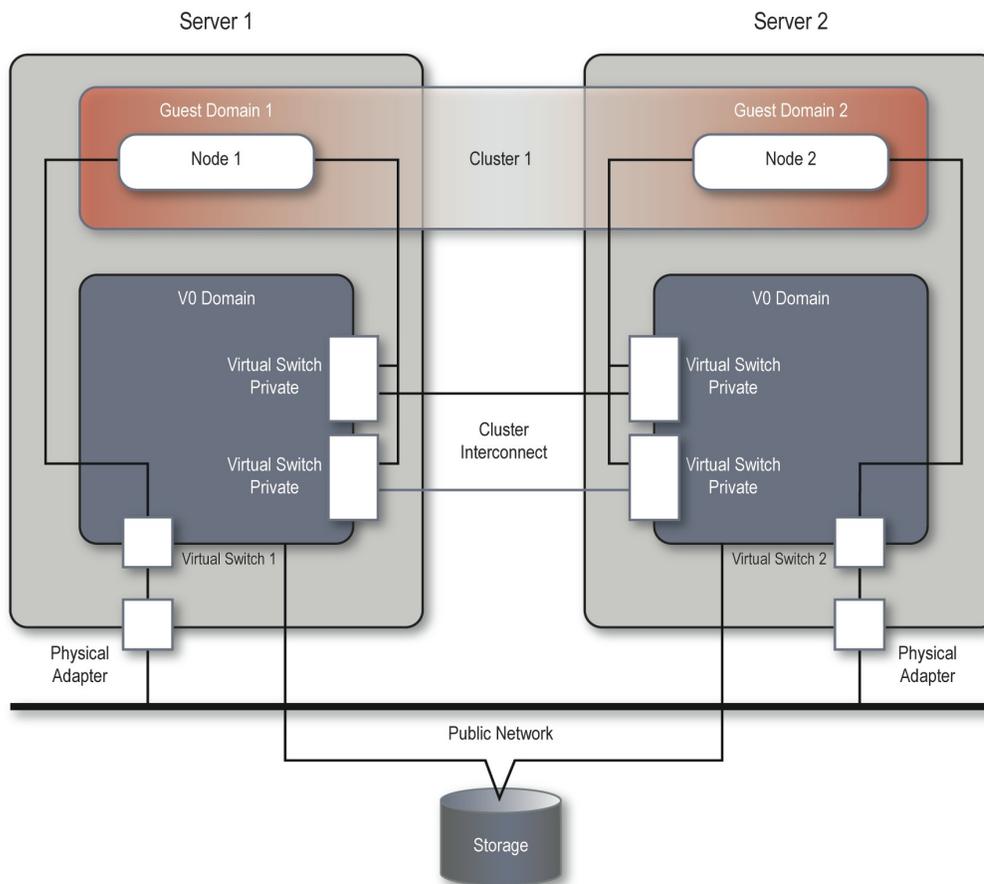


Figure 1— Two-node cluster in Oracle VM Server for SPARC guest domains

## Prerequisites, Assumptions, and Defaults

### Configuration Assumptions

This white paper assumes the following minimum configuration for Oracle VM Server for SPARC

- Basic administration skills.
- Oracle Solaris 10 5/08 OS with minimum patch versions 137042-01, 137111-01, 138042-02, and 138056-01, in both the I/O domain as well as the guest domains.
- Oracle Solaris Cluster 3.2 1/09 software with minimum patch version 126106-15.
- The cluster hardware is a supported configuration for Oracle Solaris Cluster 3.2 1/09 software. If you are not sure about your configuration, see [developers.sun.com/solaris/cluster](http://developers.sun.com/solaris/cluster)
- Cluster software is not installed in the control domain, only in the guest domain.
- Each server has two spare network interfaces to be used as private interconnects by the cluster software running in guest domains.
- SCSI shared storage is connected to the two nodes.
- All of the SCSI devices are supported by Oracle Solaris Cluster software as potential quorum devices. For more information about SCSI devices that are supported for use as quorum device, contact your Oracle Solaris Cluster customer service representative or visit the online documentation at <http://docs.sun.com/app/docs/doc/820-4676/quorum-configurations-requirementssection-1?a=view>.
- Your setup looks similar to the drawing in Figure 1. You might have fewer or more devices, depending on your system or network configuration.

### Prerequisites for Each System

This white paper assumes that the following minimum prerequisites have been met on both systems.

- Oracle Solaris 10 5/08 or later is installed with required patches.
- The Logical Domains Manager software is version 1.0.3 or later on both systems.
- The Oracle Solaris software group is End User.
- The latest patches are installed on your systems. For more information, visit <http://sunsolve.sun.com/show.do?target=patchpage>.

If Oracle Solaris software is preinstalled on the servers that you will configure as cluster nodes, ensure that Oracle Solaris meets the above criteria. If the Oracle Solaris operating system does not meet these requirements, modify the configuration or reinstall Oracle Solaris on each server.

All example console captures used in this document were obtained on a pair of Oracle's Sun SPARC Enterprise® T5240 servers installed with Oracle Solaris 10 10/08 and the latest (at the time of writing) firmware and patches meeting or surpassing the above indicated prerequisites. The servers were installed

with firmware 7.2.0 and were running the Logical Domains 1.1 release, together with consequential required patches.

```
-bash-3.00# ldm list
NAME          STATE      FLAGS     CONS    VCPU MEMORY  UTIL  UPTIME
primary       active    -n-c--   SP      8    4G      0.1%  1h 39m
-bash-3.00#
```

### Sample Primary Domain Configuration

A reasonable, simple configuration of a control domain is used. In the examples shown below the two host control domains have an identical configuration: 8 VCPUs, 4 GB of memory, no cryptographic accelerators, and the required services. The control domains also are equipped with a Fibre Channel HBA and have shared access to a Fibre Channel LUN for use as a quorum device.

Both primary domains can be set up with the following commands repeated on each host.

```
-bash-3.00# ldm set-mau 0 primary
LDom primary is unable to dynamically reconfigure crypto units.
Initiating delayed reconfigure operation on LDom primary. All configuration
changes for other LDom s are disabled until the LDom reboots, at which time
the new configuration for LDom primary will also take effect.
-bash-3.00# ldm set-mem 4g primary
-----
Notice: LDom primary is in the process of a delayed reconfiguration.
Any changes made to this LDom will only take effect after it reboots.
-----
-bash-3.00# ldm set-vcpu 8 primary
-----
Notice: LDom primary is in the process of a delayed reconfiguration.
Any changes made to this LDom will only take effect after it reboots.
-----
-bash-3.00# reboot
```

It is necessary to reboot the host to allow the delayed configurations of the primary domain to take effect. Once rebooted, the remaining services that must be provided for the guest domains can be created and configured.

```

-bash-3.00# ldm list
NAME STATE FLAGS CONS VCPU MEMORY UTIL UPTIME
primary active -n-c-- SP 8 4G 58% 3m
-bash-3.00# ldm add-vdiskserver primary-vds primary
-bash-3.00# ldm add-vswitch net-dev=nxge0 public-vsw primary
-bash-3.00# ldm add-vswitch net-dev=nxge1 mode=sc private-vsw1 primary
-bash-3.00# ldm add-vswitch net-dev=nxge2 mode=sc private-vsw2 primary
-bash-3.00# ldm add-vconscn port-range=5000-5100 primary-vcc primary
-bash-3.00# ldm list-services
VCC
NAME                LDOM                PORT-RANGE
primary-vcc         primary              5000-5100

VSW
NAME                LDOM                MAC                NET-DEV    DEVICE
DEFAULT-VLAN-ID PVID VID                MODE
public-vsw         primary             00:14:4f:f8:62:ec nxge0      switch@0   1    1
private-vsw1       primary             00:14:4f:f9:58:72 nxge1      switch@1   1    1    sc
private-vsw2       primary             00:14:4f:f9:99:1d nxge2      switch@2   1    1    sc

VDS
NAME                LDOM                VOLUME                OPTIONS                MPGROU
DEVICE
primary-vds         primary
-bash-3.00#

```

Note the addition of the `mode=sc` options for the private-vsw devices. These settings are specifically for Oracle Solaris Cluster private interconnect devices and ensure that suitable priority and performance is available for the heartbeat interconnects.

## Sample Guest Domain Configuration

The following set of `ldm` commands is provided as a sample configuration to create guest domains that would run the Oracle Solaris Cluster software. These commands are run in the control domain on each server and assume that the basic configuration of control domain has been completed. Remember to make the changes to suit your environment, such as specific adapter names, boot device, vcpu and memory assignments. It is also advisable to select a different guest-domain name on each different server node.

```
# ldm add-domain sc-dom1
# ldm set-vcpu 16 sc-dom1
# ldm set-memory 4G sc-dom1
# ldm add-vdiskserverdevice /LDMDISKS/disk0/diskimage bootdisk@primary-vds
# ldm add-vdiskserverdevice /dev/dsk/c2t2100001B328FEB94d8s2 quorum@primary-vds
# ldm add-vdisk vdisk0 bootdisk@primary-vds sc-dom1
# ldm add-vdisk vdisk1 quorum@primary-vds sc-dom1
# ldm add-vnet public-net0 public-vsw0 sc-dom1
# ldm add-vnet private-net1 private-vsw1 sc-dom1
# ldm add-vnet private-net2 private-vsw2 sc-dom1
# ldm bind-domain sc-dom1
# ldm start-domain sc-dom1
```

Now connect to the guest domain console by using the following command.

```
# telnet localhost 5000
```

Then install the Oracle Solaris operating system in the guest domains. Normal installation processes can be used such as Oracle Solaris JumpStart or (virtual-) CDROM. For more information, read the Documentation: <http://docs.sun.com/app/docs/prod/ldoms>

The operating system should be installed onto a local virtual disk. The second disk that is provided to the guest domain will be a shared disk for all members of the Oracle Solaris Cluster configuration, to use as a quorum device. The back end for this disk must be capable of multihosting, in order for more than one host to access the device at the same time. For this example, a Fibre Channel disk is used as the back end, though for logical domains, NFS mounted disk images or SCSI disks are all possible alternatives for the back-end disk device. This disk will be mounted on the host as a */globaldevices* partition on both guest domain cluster members.

To mount the shared disk on the */globaldevices* directory, it will be necessary to first create a UFS file system on a partition of the disk and then create a permanent mount of the disk at the correct location.

First, locate the shared disk. If you are using the example configuration illustrated so far, it will be the second disk listed in the output from the `format` command, identified as disk `c0d1`.

```
-bash-3.00# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
    0. c0d0 <SUN-DiskImage-10GB cyl 34950 alt 2 hd 1 sec 600>
        /virtual-devices@100/channel-devices@200/disk@0
    1. c0d1 <SUN-COMSTAR-1.0-20.00GB>
        /virtual-devices@100/channel-devices@200/disk@1
```

```
Specify disk (enter its number): ^C
-bash-3.00#
```

To create a suitable file system on the disk, use the `newfs` command. The following examples use partition `s0`.

```
-bash-3.00# newfs /dev/dsk/c0d1s0
/dev/rdisk/c0d1s0: Unable to find Media type. Proceeding with system determined
parameters.
newfs: construct a new file system /dev/rdisk/c0d1s0: (y/n)? y
Warning: 418 sector(s) in last cylinder unallocated
/dev/rdisk/c0d1s0: 41926238 sectors in 6824 cylinders of 48 tracks, 128
sectors
20471.8MB in 427 cyl groups (16 c/g, 48.00MB/g, 5824 i/g)
super-block backups (for fsck -F ufs -o b=#) at:
32, 98464, 196896, 295328, 393760, 492192, 590624, 689056, 787488, 885920,
Initializing cylinder groups:
.....
super-block backups for last 10 cylinder groups at:
40997024, 41095456, 41193888, 41292320, 41390752, 41489184, 41587616,
41686048, 41784480, 41882912
-bash-3.00#
```

Now the file system can be mounted under the directory `/globaldevices`, which must also be created.

```
-bash-3.00# mkdir /globaldevices
-bash-3.00#
```

To make the mounting of `/globaldevices` persistent across system reboots, add a mount descriptor line to the `/etc/vfstab` file.

```
-bash-3.00# echo "/dev/dsk/c0d1s0 /dev/rdisk/c0d1s0 /globaldevices ufs 1 no -
">>/etc/vfstab
-bash-3.00# mountall
mount: /tmp is already mounted or swap is busy
-bash-3.00#
```

### Initial Preparation of Public IP Addresses and Logical Hostnames

You have to add the logical names (hostnames) and IP addresses of the guest domains to each node's `/etc/inet/hosts` file and, if used, to a naming service such as DNS or NIS+ maps.

This configuration example uses the following values for the node names and IP addresses.

**TABLE 1. NODE NAMES AND IP ADDRESSES**

COMPONENT	NAME	IP ADDRESS
Node 1	mynode1	192.168.1.10
Node 2	mynode2	192.168.1.11

## Defaults

The `scinstall` interactive utility in *Typical* mode installs Oracle Solaris Cluster software with the following defaults.

- Private-network address 172.16.0.0. If another cluster configuration (potentially in a different guest domain) is using the same physical adapters for the private network, they must use a different private network address. This white paper assumes that this is the only cluster that is currently using the private adapters and hence the default is acceptable.
- Private-network netmask 255.255.248.0.
- Cluster-transport switches switch1 and switch2.
- Installation security (DES) level *Limited*.

The example in this guide has no cluster-transport switches. Instead, the private networking is resolved by using cross-over cables. More information about the cluster interconnect can be found at <http://docs.sun.com/app/docs/doc/820-2554/bagcced?l=en&a=view&q=cluster+interconnect>.

In this example, the interfaces of the private interconnects are `vnet1` and `vnet2` on both cluster nodes. To find more information about how to identify your hardware, see the Oracle Solaris 10 Hardware Platform Guide at [docs.sun.com/source/817-6337/chapterH1PG.html](http://docs.sun.com/source/817-6337/chapterH1PG.html).

## Installing Oracle Solaris Cluster Software Packages

1. Become superuser on the guest domain on which you are installing Oracle Solaris Cluster software. Use the `telnet` command to `mynode1`, then log in with the `root` login and password.

```
myconsole# ssh mynode1 -l root
password: *****
```

2. To use the GUI form of the installer program, set the display environment on your administrative console. In this example, we are using `csh`.

```
myconsole# xhost +
myconsole# setenv display myconsole:0.0
```

Continue using the administrative console for the next steps, and remember to perform them on both nodes, one at a time.

3. Insert the Oracle Solaris Cluster installation media into the appropriate media drive of the cluster node. If you are installing from a network, navigate to the appropriate media image.
4. Change to the directory that contains the installer program (in this case the network server named media-server) and use the appropriate directory.

```
mynode1# cd /net/media-server/sc-dvd/solaris_sparc
```

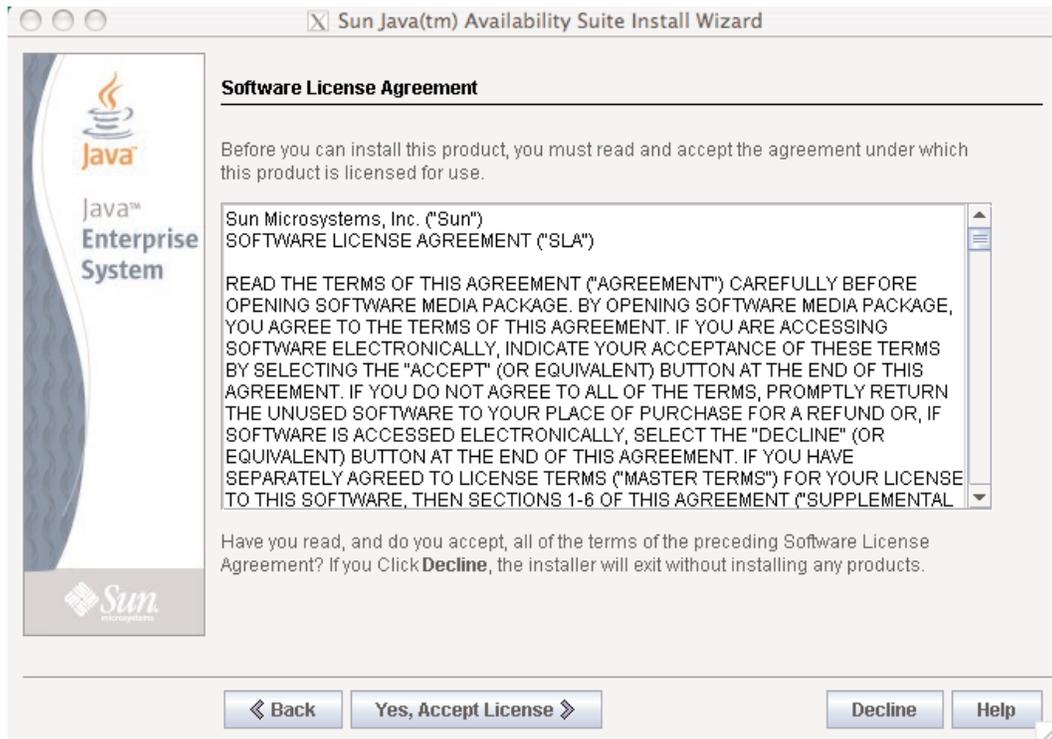
5. Start the installer program. It might take up to a minute for the installer GUI to display.

```
mynode1# ./installer
```

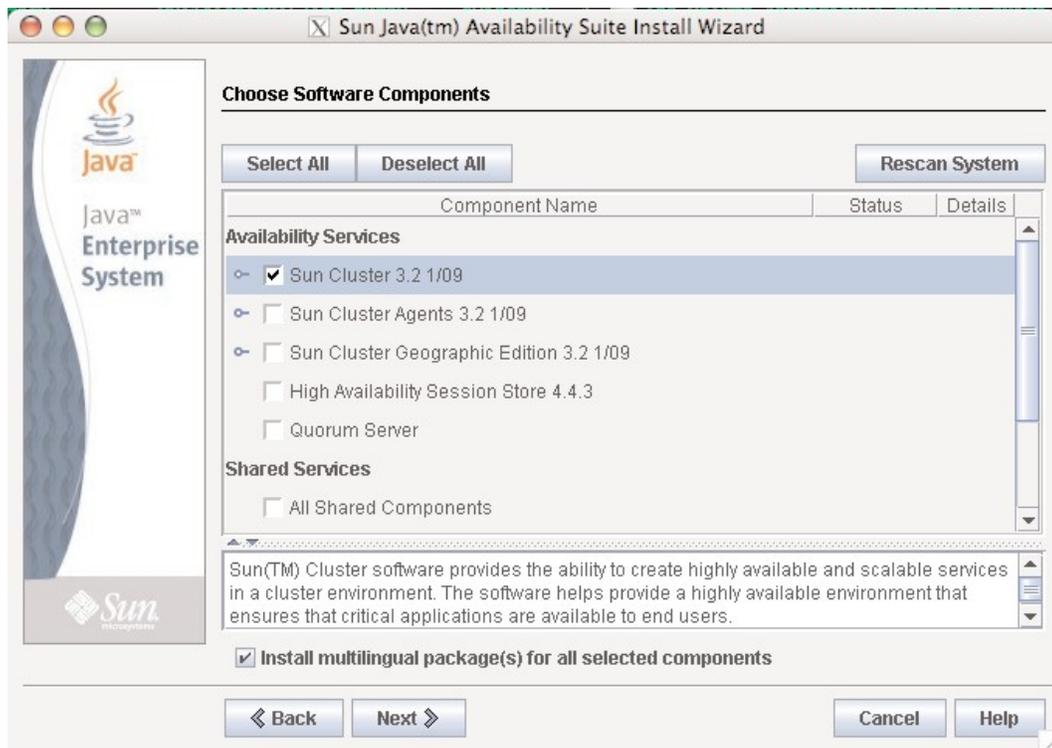
6. Follow the instructions on the screen to install the Oracle Solaris Cluster software.



On the welcome opening screen, click Next.



Click Yes, Accept License to accept the license agreement.

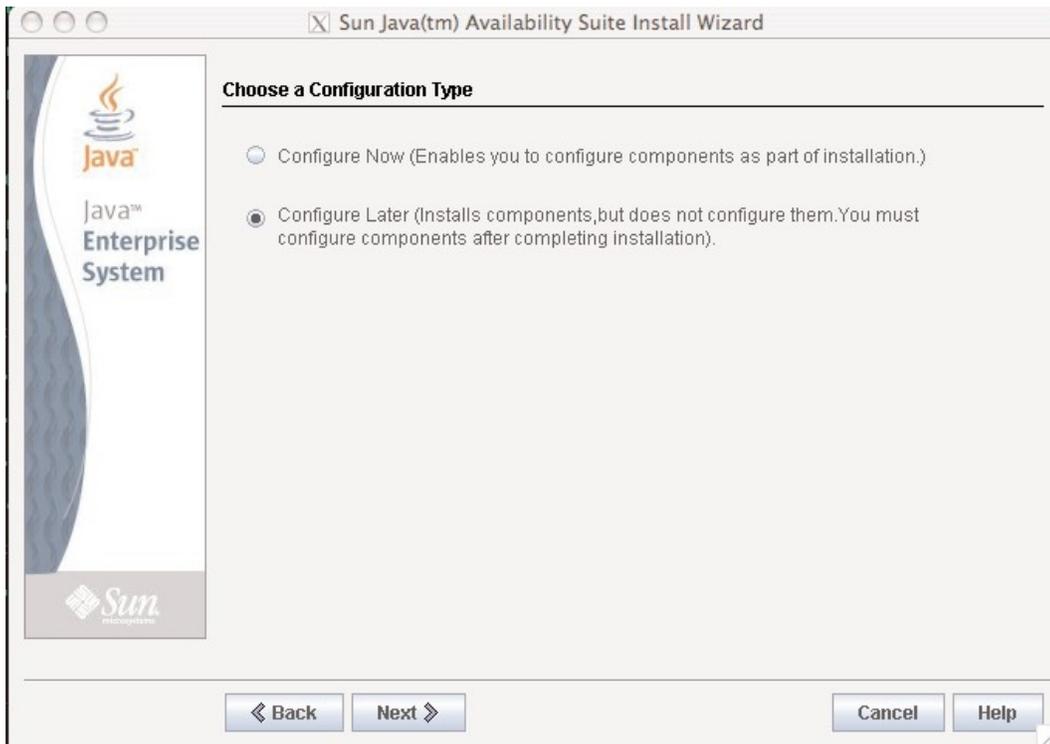


From the list of software to install, under Availability Services, select Solaris Cluster 3.2 1/09.

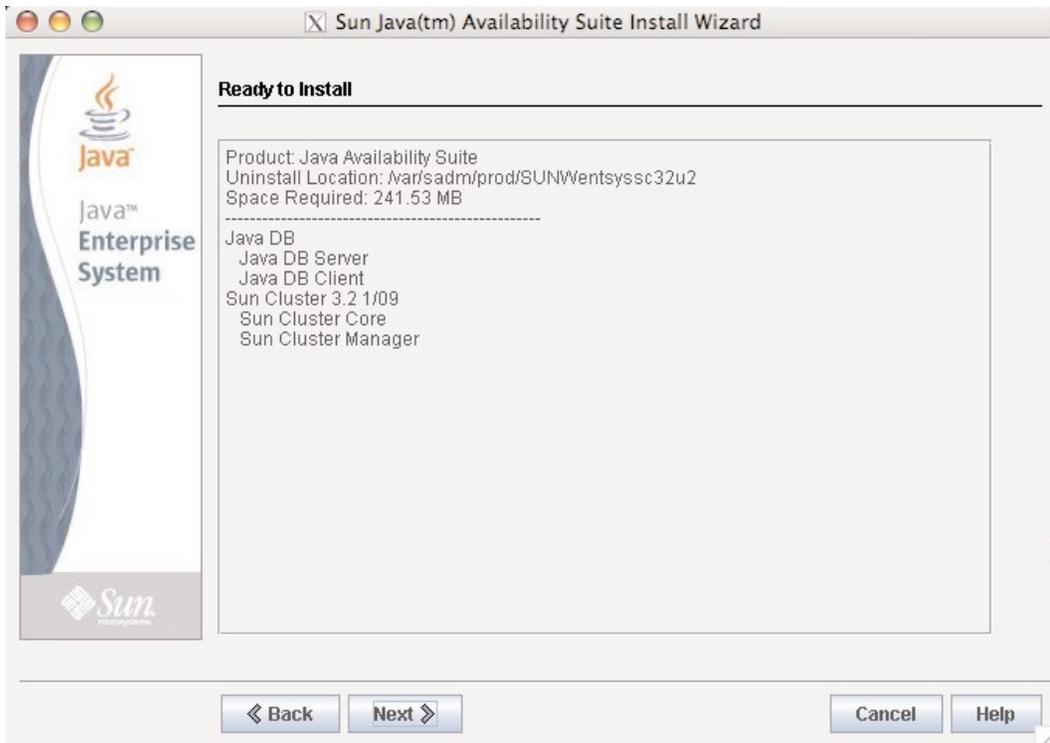
The Multilingual packages checkbox is selected by default. Deselect the checkbox if you want only English components. You cannot add multilanguage support later.



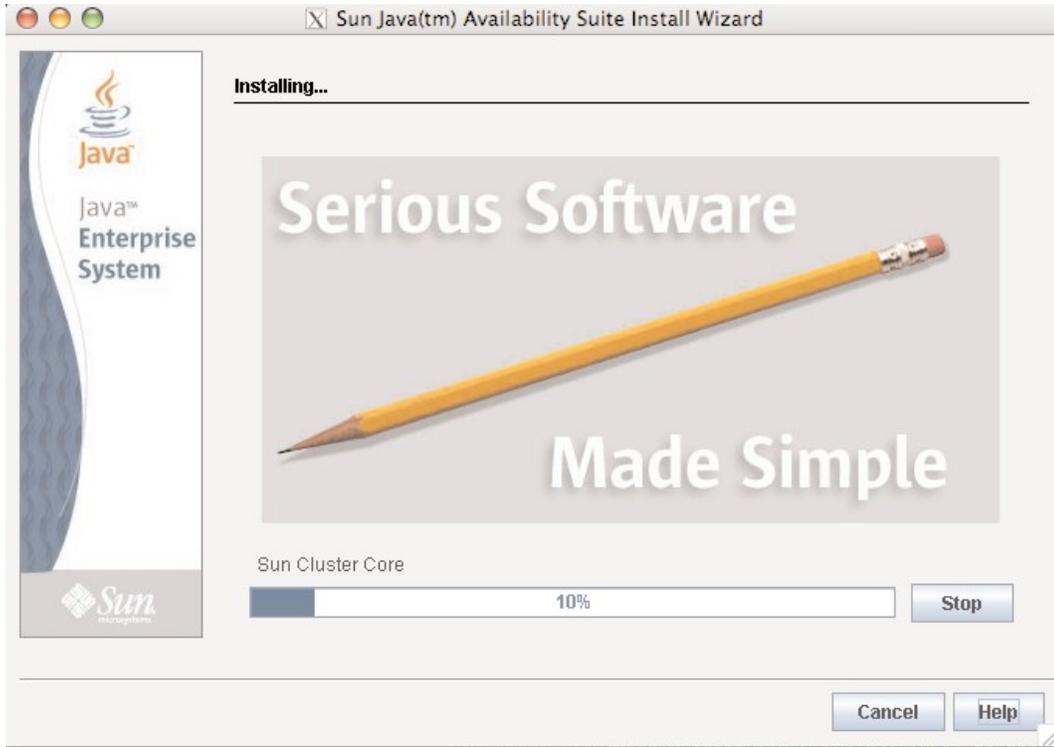
In the Shared Component Upgrades Required screen, click Next to automatically upgrade.



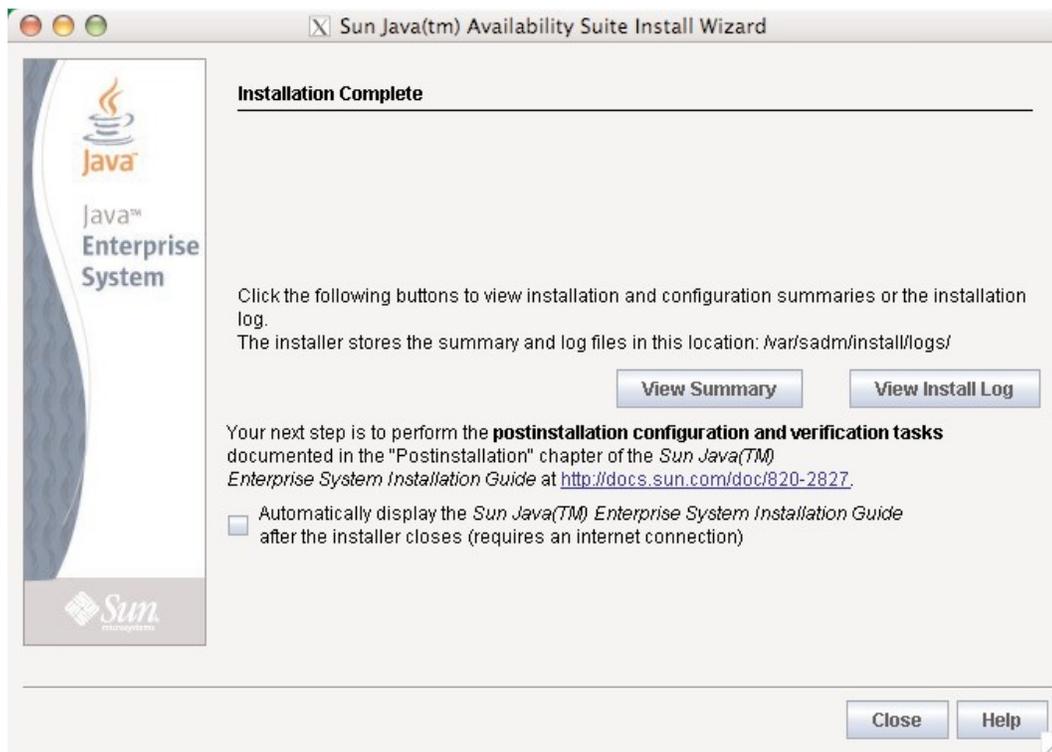
When prompted, choose Configure Later.



When you receive confirmation that the system is ready to install, click Next.



Installation takes a few minutes.



The installer program installs Oracle Solaris Cluster software packages plus additional software that is required to run certain Oracle Solaris Cluster functionality. When finished, the installer program can provide an installation summary.

7. Now that you have finished the installation on mynode1, go back to step 2 and start the installation process, this time for mynode2.
8. Install any necessary Oracle Solaris Cluster patches. Go to <http://sunsolve.sun.com/show.do?target=patchpage> and download the recommended patches for Java ES Component Patch Solaris 10 on Oracle SPARC or x86 accordingly and install on each node.

## Configuring Oracle Solaris Cluster Software

1. Log on to one of the two nodes. Start the `scinstall` utility in interactive mode as superuser. This procedure configures the Oracle Solaris Cluster software on both nodes.

```
# /usr/cluster/bin/scinstall
```

2. From the Main Menu, type 1 to choose the menu item, Install a cluster or cluster node.

```
*** Main Menu ***
Please select from one of the following (*) options:
* 1) Install a cluster or cluster node
2) Configure a cluster to be JumpStarted from this install server
3) Add support for new data services to this cluster node
4) Upgrade this cluster node
* 5) Print release information for this cluster node
* ?) Help with menu options
* q) Quit
Option: 1
```

3. From the Install Menu that appears, type 1 to choose the menu item, Install all nodes of a new cluster. Then confirm your choice by answering y when prompted.

```
*** Install Menu ***
Please select from any one of the following options:
1) Install all nodes of a new cluster
2) Install just this machine as the first node of a new cluster
3) Add this machine as a node in an existing cluster
?) Help with menu options
q) Return to the Main Menu
Option: 1
...
*** Installing all Nodes of a New Cluster ***
...
Do you want to continue (yes/no)? y
```

4. From the Type of Installation menu, type 1 to choose *Typical* mode.

```
>>> Type of Installation <<<
...
Please select from one of the following options:
1) Typical
2) Custom
?) Help
q) Return to the Main Menu
Option [1]: 1
```

5. When prompted, supply the following information.
  - Name to give the cluster: `virtualcluster`
  - Name of the other node (if started from `mynode1`): `mynode2`
  - Type `yes` if correct and press `Return` to continue
  - The first private adapter name (interface name): `vnet1`
  - The second private adapter name (interface name): `vnet2`
  - Type `no` to disable automatic quorum device selection
  - Type `yes` and press `Return` to continue
  - Type `no` to interrupt cluster creation for `sccheck` errors

At this point, the `scinstall` utility configures all cluster nodes and reboots the nodes into cluster mode. This might take several minutes. The cluster is established when all nodes have successfully booted into the cluster. Oracle Solaris Cluster installation output is logged in a `/var/cluster/logs/install/scinstall.log,N` file.

6. Verify on each node that multi-user services for the Service Management Facility (SMF) are online.

```
# svcs multi-user-server
STATE          STIME          FMRI
online         17:52:55      svc:/milestone/multi-user-server:default
```

If services are not yet online for a node, wait until the state becomes online before you proceed to the next step.

7. From one of the nodes, verify that both nodes have joined the cluster.

```
# clnode status
```

Output resembles the following.

```

-- Cluster Nodes --

                Node name                Status
                -----                -
Cluster node:   mynode1                  Online
Cluster node:   mynode2                  Online

```

The cluster is now ready to configure the components you will use to support highly available applications. These cluster components can include device groups, cluster file systems, highly available local file systems, and individual data services. To configure these components, consult the installation documentation detailed below.

## For More Information

**TABLE 1. INFORMATION RESOURCES**

<b>MANUALS</b>	
Oracle Solaris Manuals	<a href="https://docs.sun.com/app/docs/prod/solaris.10#hic">docs.sun.com/app/docs/prod/solaris.10#hic</a>
Oracle VM Server for SPARC Manuals	<a href="https://docs.sun.com/app/docs/prod/ldoms">docs.sun.com/app/docs/prod/ldoms</a>
System Administration Guide: Oracle Solaris Containers Resource Management and Oracle Solaris Zones	<a href="https://docs.sun.com/app/docs/doc/817-1592">docs.sun.com/app/docs/doc/817-1592</a>
System Administration Guide: Security Services	<a href="https://docs.sun.com/app/docs/doc/816-4557">docs.sun.com/app/docs/doc/816-4557</a>
Oracle Solaris Administration Guide: Basic Administration	<a href="https://docs.sun.com/app/docs/doc/817-1985">docs.sun.com/app/docs/doc/817-1985</a>
<b>TRAINING COURSES</b>	
Configuring Security on the Oracle Solaris 10 OS	<a href="http://education.oracle.com/pls/web_prod-plq-dad/db_pages.getcoursedes?dc=D61816GC10">http://education.oracle.com/pls/web_prod-plq-dad/db_pages.getcoursedes?dc=D61816GC10</a>



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Guest Domains As Oracle Solaris Cluster  
Nodes  
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