INTERWORKS 2000

Highly Available OpenView IT/Operations (ITO)

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Configuring OV/ITO 5.0 into a MC/ServiceGuard Package

Purpose: Provide detailed steps that can be used to set-up a MC/ServiceGuard package for OpenView IT/O.

STEP 1: Install HP-UX and other appropriate software. Setup the necessary system resources.

1. The software that was installed for the purposes of this configuration guide is shown below. The selected configuration is the one used for the OV/ITO 2 class taught at HP Education centers. The intention of this list is for comparison purposes only. It is not a list of required or recommended software. You must decide which software to install on you system(s). The first list below shows the software bundles. This is followed by a list of products (mostly patches) that are not part of a bundle. Your actual requirements may differ.

Bundle(s):

APACHE-httpd	1.2.5	Apache httpd 1.2.5
Acrobat-Reader	3.01	Acrobat Reader 3.01
B2491BA	**B.10.20**	**MirrorDisk/UX**
B3693AA_APZ_TRY	B.10.20.140	Trial HP GlancePlus/UX for s800 10.20
B3901BA	B.10.20.07	ANSI-C Dvlpr's Bndl HP-UX 10.20 (S800)
B3919EA_AGS	B.10.20	HP-UX Unlimited-User License
B3929BA	**B.10.20**	**HP OnLine JFS (Advanced VxFS)**
B3935BA	**A.10.10**	**MC / Service Guard**
B5139BA	A.10.11	Enterprise Cluster Master Toolkit
B5458CA	C.01.15.02	HP-UX Virtual Machine for Java* (S800)
H2915S_A00	A.00	OV IT/Operations II (*HP Education*)
HPPD-perl	5.004_04	(perl) perl
HPUXEngCR800	**B.10.20**	**English HP-UX CDE Runtime Environment**
InstInfo	D.03.1.1	HP Instant Information, HP-UX Browser
J1607CA	B.01.01.03	Netscape Fasttrack Server
J2399AA_APZ	B.10.20	VT3K (Virtual Terminal to HP 3000)
J2559C	D.05.15	HP JetAdmin for Unix Utility
J2694BA	B.10.20.04	100VG-AnyLAN/9000 EISA
J2759BA	B.10.20.06	HP-PB 100Base-T/9000
J2780BA	B.10.20.01	100BT/9000 EISA
J3623BA	B.10.20.04	100BT/9000 GSC For D Series
LaserROM	B.02.01	(LROM) HP LaserROM/UX
NS-Nav4	4.07	Netscape Navigator 4.07
Starburst-Client	A.04.04.00	Starburst-UX Client (*HP Education*)

Product(s) not contained in a Bundle:

PHCO_10295	B.10.00.00.AA	Allows umounting a disabled vxfs snapshot FS
PHCO_10848	B.10.00.00.AA	patch to add new /usr/sbin/mc command
PHCO_10947	B.10.00.00.AA	cumulative libHcurses patch
PHCO_11977	B.10.00.00.AA	pax(1) cumulative patch
PHCO_12140	B.10.00.00.AA	patch cleanup utility
PHCO_14214	B.10.00.00.AA	Cumulative vxdump patch.
PHCO_14431	B.10.00.00.AA	lpspool subsystem cumulative patch
PHCO_14518	B.10.00.00.AA	HPDPS cumulative patch
PHCO_14645	B.10.00.00.AA	libc cumulative header file patch
PHCO_14842	B.10.00.00.AA	fsck_vxfs(1M) cumulative patch
PHCO_14888	B.10.00.00.AA	Cumulative SAM/ObAM Patch.
PHCO_14891	B.10.00.00.AA	libc cumulative patch
PHCO_14967	B.10.00.00.AA	sar(1M) cumulative Y2K patch

```
PHCO_16049      B.10.00.00.AA  LVM commands cumulative patch
PHCO_16340      B.10.01.10     HP Disk Array Utilities w/AutoRAID Manager
PHCO_16363      B.10.00.00.AA  ksh(1) cumulative patch
PHCO_16734      B.10.00.00.AA  POSIX shell cumulative patch
PHCO_8788       B.10.00.00.AA  nice(1) patch
PHCO_8934       B.10.00.00.AA  jfs fscat large offset patch
PHCO_8935       B.10.00.00.AA  Fix for vxfs volcopy with LFS disks.
PHKL_12340      B.10.00.00.AA  VxFS fsck fix and mount perf improvement
PHKL_12768      B.10.00.00.AA  Fix for deadlock with JFS snapshot buf
PHKL_12946      B.10.00.00.AA  OnLine JFS (Advanced VxFS) cumulative patch
PHKL_13873      B.10.00.00.AA  diag2 heavy I/O log, prevents diaglogd abort
PHKL_14173      B.10.00.00.AA  kernel header cumulative patch
PHKL_14283      B.10.00.00.AA  missed wakup in select/real_sleep
PHKL_15479      B.10.00.00.AA  JFS hang, JFS files cumulative patch
PHKL_15916      B.10.00.00.AA  fix for alias pdir entries
PHKL_8694       B.10.00.00.AA  sys/time.h fix for select(2)/C++ defects
PHKL_9941       B.10.00.00.AA  VxFS fsadm resize failure when growing >2Gb
PHNE_12141      B.10.00.00.AA  cumulative bootpd/DHCP patch
PHNE_13194      B.10.00.00.AA  gated(1M) cumulative patch
PHNE_13650      B.10.00.00.AA  patch for EISA 100VG-AnyLAN product
PHNE_13721      B.10.00.00.AA  EISA100BT cumulative patch
PHNE_13731      B.10.00.00.AA  NFS/NIS cumulative megapatch
PHNE_14041      B.10.00.00.AA  sendmail(1m) 8.8.6 cumulative patch.
PHNE_14072      B.10.00.00.AA  NFS Kernel Release & Performance Patch
PHNE_14617      B.10.00.00.AA  BIND 4.9.7 components
PHNE_14634      B.10.00.00.AA  LAN products cumulative Patch
PHNE_15203      B.10.00.00.AA  STREAMS cumulative patch (includes XTI/TLI)
PHNE_15582      B.10.00.00.AA  cumulative ARPA Transport patch
PHNE_15781      B.10.00.00.AA  HSC 100BT LAN cumulative patch
PHNE_8421       B.10.00.00.AA  nettune for so_qlimit_max
PHSS_12950      B.10.00.00.AA  Event Monitoring Services(EMS) patch
PHSS_13124      B.10.00.00.AA  cumulative pxdb patch.
PHSS_14003      B.10.00.00.AA  CDE Dev. Env. Mar98 Periodic Patch
PHSS_14040      B.10.00.00.AA  X/Motif1.2 Runtime Feb 98 Periodic Patch
PHSS_14423      B.10.00.00.AA  Ace LIBCL cumulative patch
PHSS_14595      B.10.00.00.AA  CDE Runtime Mar98_A Cumulative Patch
PHSS_15380      B.10.00.00.AA  ld(1) and som tools cumulative patch
PHSS_15389      B.10.00.00.AA  10.01 10.10 10.20 MILLI cumulative patch
PHSS_15391      B.10.00.00.AA  dld.sl(5) cumulative patch
PHSS_15531      B.10.00.00.AA  MC/ServiceGuard A.10.10 Cummulative patch
PHSS_16585      B.10.00.00.AA  HP aC++ runtime libraries (aCC A.01.18)
SharedX         B.10.20.00     HP-UX SharedX Runtime 2.0
Whiteboard      B.10.20.00     HP-UX Whiteboard
```

2. Install additional required patches. The “HP OpenView IT/Operations Software Release Notes” list some additional required patches on page 77. These patches are listed below.

HP-UX Extension Pack → XSW800GR1020
HP-UX Patches → PHSS_15391, PHSS_16585, and PHCO_15453

(Note: patch requirements change over time. You should always check for the latest patch information when setting up a system.)

3. Other system configuration information (provided for comparison purposes not for recommended configuration purposes – see "HP OpenView IT/Operations Installation Guide for the Management Server" for configuration details.)

Swap configuration:

```
               Kb      Kb      Kb   PCT
TYPE       AVAIL    USED    FREE  USED   PRI  NAME
dev       368640    7836  360804    2%    1  /dev/vg00/lvol2
reserve        -   94492  -94492
memory    191028  152972   38056   80%
```

Memory information: Physical: 262144 Kbytes

Kernel parameters must be modified very carefully. The "HP OpenView IT/Operations Installation Guide has recommendations on page 32. The /stand/system file for this configuration is shown below. Only the kernel parameter section is displayed

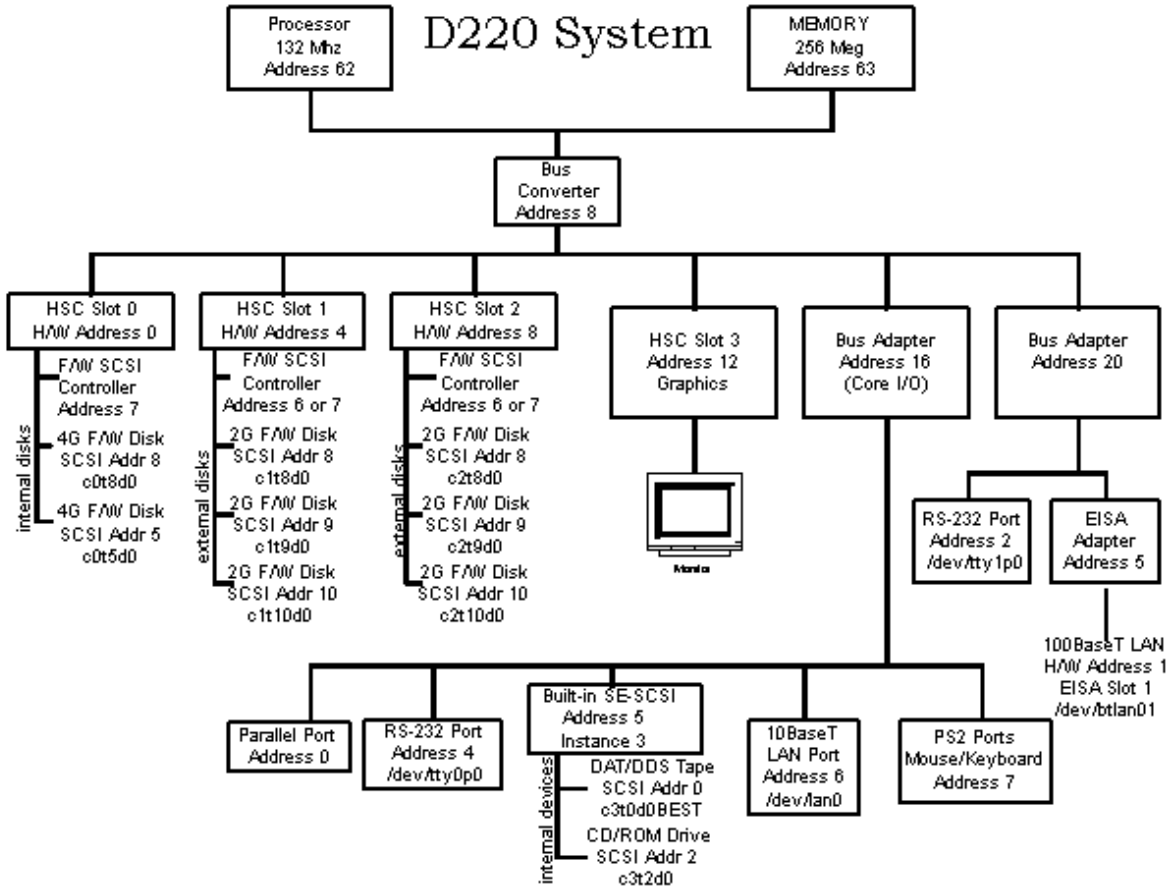
```
*************************************
* Generic system file for new computers
*************************************
*
nstrpty           60
maxdsiz           134217728
maxfiles          120
maxuprc           290
maxusers          64
msgmni            100
nfile             3000
ninode            2000
nproc             700
shmseg            200
```

The file systems, including the shared file systems, are shown below. Refer to the "HP OpenView IT/Operations Installation Guide" for the specifics on calculating file system sizes.

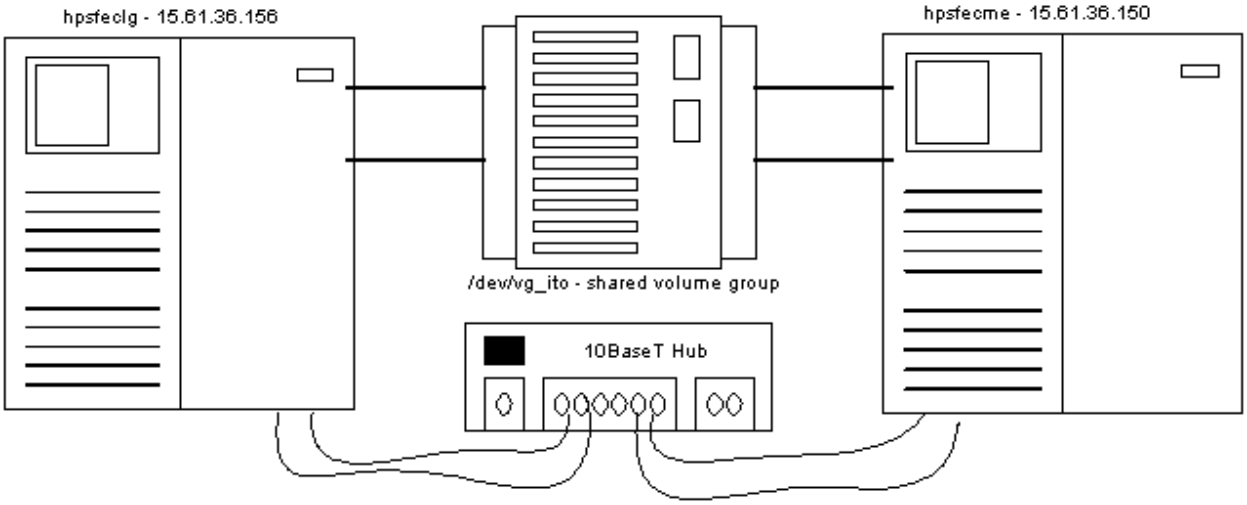
```
Filesystem              kbytes    used   avail %used Mounted on
/dev/vg00/lvol3          86016   19161   62679   23% /
/dev/vg00/lvol1          67733   14899   46060   24% /stand
/dev/vg00/lvol9         614400  359628  238870   60% /var
/dev/vg00/lvol8         512000  304367  194714   61% /usr
/dev/vg00/lvol6         114688   14689   93761   14% /tmp
/dev/vg00/lvol5         774144  524927  233688   69% /opt
/dev/vg00/lvol4          86016    2552   78285    3% /home
/dev/vg_ito/lv_oracle   614400  119816  463736   21% /u01
/dev/vg_ito/lv_ito_var  614400    7844  569085    1% /var/opt/OV/share
/dev/vg_ito/lv_ito_etc  614400    8739  567978    2% /etc/opt/OV/share
```

NOTE: All system configuration data is shown for information purposes only. Do not base your configuration off of this data. Use the data for comparison purposes only!

The physical system layout consisted of two D220 servers with a HASS (High Availability Storage System) disk tower interconnected between the two servers. The figure below shows the internal layout of the D220 servers.



The cluster configuration is shown below. Refer to “Managing MC/ServiceGuard for design requirements.



STEP 2: Prepare the shared disk on the first MC/ServiceGuard cluster node and export the volume group configuration to the other node. Steps 1 and 2 are not directly related to the shared disk but are very important for the rest of the configuration.

1. Create/modify the "$HOME/.rhosts" file for root. Enter the two entries shown below. This needs to be done on both nodes in the cluster. MC/ServiceGuard supports using the /etc/cmcluster/cmclnodelist file instead of the ".rhosts" file, but then you don't have full capabilities of the "r" commands.
   hpsfeclg root
   hpsfecme root

2. Set up the networking information for the ITO ServiceGuard package. The package must use the name "OpC". The name must be defined as a fully qualified domain name (FQDN). The test is to perform a name lookup with "nslookup". Follow these steps to set this up. If this is not set up correctly then you will run into many problems during the rest of the configuration.
   vi /etc/hosts
   Enter the following:
   15.61.36.160 OpC.mayfield.hp.com OpC #ITO ServiceGuard package
   Test the configuration:
   nslookup OpC
   ➔ Using /etc/hosts on: hpsfeclg
   Looking up FILES
   Name: OpC.mayfield.hp.com
   Address: 15.61.36.160
   Alias: OpC

   It does not matter whether you use DNS, NIS, or /etc/hosts for your name resolution, as long as the results are as those shown above.

3. Prepare the disks to become part of the LVM environment:
   pvcreate /dev/rdsk/c1t10d0
   ➔ Physical volume "/dev/rdsk/c1t10d0" has been successfully created.
   pvcreate /dev/rdsk/c2t10d0
   ➔ Physical volume "/dev/rdsk/c2t10d0" has been successfully created.

4. Create the directory for the volume group.
   mkdir /dev/vg_ito

5. Create the LVM group file for the new volume group. Take special care to use a minor number (0x##0000) that is unique amongst all nodes in the cluster.
   mknod /dev/vg_ito/group c 64 0x010000

6. Verify the creation of the group file and its uniqueness on this node.
   ll /dev/*/group
   ➔ crw-r----- 1 root sys 64 0x000000 Feb 26 09:06 /dev/vg00/group
   crw-r----- 1 root sys 64 0x010000 Feb 26 14:41 /dev/vg_ito/group

7. Create the volume group. The name is vg_ito.
   vgcreate /dev/vg_ito /dev/dsk/c1t10d0 /dev/dsk/c2t10d0
   ➔ Volume group "/dev/vg_ito" has been successfully created.
   Volume Group configuration for /dev/vg_ito has been saved in /etc/lvmconf/vg_ito.conf

8. Create a logical volume for the ITO "share" subdirectory under "/var". Use "lv_ito_var" for its name. Give it a size of 600M and one mirrored copy.

lvcreate –m 1 –L 600 –n lv_ito_var /dev/vg_ito

➔ Logical volume "/dev/vg_ito/lv_ito_var" has been successfully created with character device "/dev/vg_ito/rlv_ito_var".
Logical volume "/dev/vg_ito/rlv_ito_var" has been successfully extended.
Volume Group configuration for /dev/vg_ito has been saved in /etc/lvmconf/vg_ito.conf

9. Create a logical volume for the ITO "share" subdirectory under "/etc". Use "lv_ito_etc" for its name. Give it a size of 600M and one mirrored copy.

lvcreate –m 1 –L 600 –n lv_ito_etc /dev/vg_ito

➔ Logical volume "/dev/vg_ito/lv_ito_etc" has been successfully created with character device "/dev/vg_ito/rlv_ito_etc".
Logical volume "/dev/vg_ito/rlv_ito_etc" has been successfully extended.
Volume Group configuration for /dev/vg_ito has been saved in /etc/lvmconf/vg_ito.conf

10. Create a logical volume for Oracle. Use "lv_oracle" for its name. Give it a size of 600M and one mirrored copy.

lvcreate –m 1 –L 600 –n lv_oracle /dev/vg_ito

➔ Logical volume "/dev/vg_ito/lv_oracle" has been successfully created with character device "/dev/vg_ito/rlv_oracle".
Logical volume "/dev/vg_ito/rlv_oracle" has been successfully extended.
Volume Group configuration for /dev/vg_ito has been saved in /etc/lvmconf/vg_ito.conf

11. Build a journal (vxfs) filesystem in the lv_ito_var logical volume.

newfs –F vxfs /dev/vg_ito/rlv_ito_var

➔ version 3 layout
614400 sectors, 614400 blocks of size 1024, log size 1024 blocks
unlimited inodes, 614400 data blocks, 613160 free data blocks
19 allocation units of 32768 blocks, 32768 data blocks
last allocation unit has 24576 data blocks
first allocation unit starts at block 0
overhead per allocation unit is 0 blocks

12. Build a journal (vxfs) filesystem in the lv_ito_etc logical volume.

newfs –F vxfs /dev/vg_ito/rlv_ito_etc

➔ version 3 layout
614400 sectors, 614400 blocks of size 1024, log size 1024 blocks
unlimited inodes, 614400 data blocks, 613160 free data blocks
19 allocation units of 32768 blocks, 32768 data blocks
last allocation unit has 24576 data blocks
first allocation unit starts at block 0
overhead per allocation unit is 0 blocks

13. Build a journal (vxfs) filesystem in the lv_oracle logical volume.

newfs –F vxfs /dev/vg_ito/rlv_oracle

➔ version 3 layout
614400 sectors, 614400 blocks of size 1024, log size 1024 blocks
unlimited inodes, 614400 data blocks, 613160 free data blocks
19 allocation units of 32768 blocks, 32768 data blocks
last allocation unit has 24576 data blocks
first allocation unit starts at block 0
overhead per allocation unit is 0 blocks

14. Make the mount point directories for the new file systems. These directory names are required.

mkdir –p /var/opt/OV/share
mkdir –p /etc/opt/OV/share
mkdir /u01

15. Change the permissions on the directories.
    chmod –R 777 /var/opt/OV/share
    chmod –R 777 /etc/opt/OV/share

16. Mount the new file systems to their respective mount points.
    mount /dev/vg_ito/lv_ito_var /var/opt/OV/share
    mount /dev/vg_ito/lv_ito_etc /etc/opt/OV/share
    mount /dev/vg_ito/lv_oracle /u01

17. Verify the existence of the new file systems.
    bdf

```
➔Filesystem          kbytes    used   avail %used Mounted on
 /dev/vg00/lvol3      86016   19161   62679  23%  /
 /dev/vg00/lvol1      67733   14899   46060  24%  /stand
 /dev/vg00/lvol9     614400  359628  238870  60%  /var
 /dev/vg00/lvol8     512000  304367  194714  61%  /usr
 /dev/vg00/lvol6     114688   14689   93761  14%  /tmp
 /dev/vg00/lvol5     774144  524927  233688  69%  /opt
 /dev/vg00/lvol4      86016    2552   78285   3%  /home
 /dev/vg_ito/lv_oracle
                     614400    1253  574833   0%  /u01
 /dev/vg_ito/lv_ito_var
                     614400    1253  574833   0%  /var/opt/OV/share
 /dev/vg_ito/lv_ito_etc
                     614400    1253  574833   0%  /etc/opt/OV/share
```

18. Use vgexport to create a volume group map file.
    vgexport –p –s –m /tmp/vg_ito.map /dev/vg_ito
    ➔ Volume group "/dev/vg_ito" is still active

19. Transfer the map file, /tmp/vg_ito.map, to the other node.
    rcp /tmp/vg_ito.map hpsfecme:/tmp/vg_ito.map

20. On the other node, create the volume group directory, /dev/vg_ito.
    mkdir /dev/vg_ito

21. On the other node, make the "group" file for the /dev/vg_ito volume group.
    mknod /dev/vg_ito/group c 64 0x010000

22. Import the volume group configuration information on the other node. On the other node use the vgimport command.
    vgimport –s –m /tmp/vg_ito.map /dev/vg_ito

23. Verify the importation was performed correctly and that the configuration on both nodes is identical. Do a strings command against the /etc/lvmtab file on both nodes. The output should be identical.
    strings /etc/lvmtab

```
➔ /dev/vg00
  /dev/dsk/c0t8d0
  /dev/vg_ito
  /dev/dsk/c1t10d0
  /dev/dsk/c2t10d0
```

STEP 3: Create the MC/ServiceGuard cluster

1. Change to the cluster directory.

cd /etc/cmcluster

2. Generate the cluster configuration template file.

cmquerycl –v –C conf –n hpsfeclg –n hpsfecme

➔

```
Begin checking the nodes...
Looking for other clusters ... Done
Gathering configuration information ..... Done
Warning: The disk at /dev/dsk/c3t2d0 on node hpsfeclg does not have an ID.
Warning: The disk at /dev/dsk/c3t2d0 on node hpsfecme does not have an ID.
Warning: Disks which do not have IDs cannot be included in the topology description.
Use pvcreate(1m) to give a disk an ID.

Node Names:    hpsfeclg
               hpsfecme

Bridged networks:
1      lan0        (hpsfeclg)
       btlan01     (hpsfeclg)
       lan0        (hpsfecme)
       btlan01     (hpsfecme)

IP subnets:
15.61.32.0          lan0  (hpsfeclg)
                    lan0  (hpsfecme)

Possible Heartbeat IPs:
15.61.32.0              15.61.36.156      (hpsfeclg)
                        15.61.36.150      (hpsfecme)

Possible Cluster Lock Devices:
LVM volume groups:
/dev/vg00           hpsfeclg

/dev/vg_ito         hpsfeclg
                    hpsfecme

/dev/vg00           hpsfecme

LVM physical volumes:
/dev/vg00
/dev/dsk/c0t5d0   8/0.5.0      hpsfeclg

/dev/vg_ito
/dev/dsk/c1t10d0  8/4.10.0     hpsfeclg
/dev/dsk/c1t10d0  8/4.10.0     hpsfecme

/dev/dsk/c2t10d0  8/8.10.0     hpsfeclg
/dev/dsk/c2t10d0  8/8.10.0     hpsfecme

/dev/vg00
/dev/dsk/c0t8d0   8/0.8.0      hpsfecme

LVM logical volumes:
Volume groups on hpsfeclg:
/dev/vg00/lvol1       FS MOUNTED   /stand
```

```
/dev/vg00/lvol2
/dev/vg00/lvol3          MOUNTED   /
/dev/vg00/lvol4          MOUNTED   /home
/dev/vg00/lvol5          MOUNTED   /opt
/dev/vg00/lvol6          MOUNTED   /tmp
/dev/vg00/lvol8          MOUNTED   /usr
/dev/vg00/lvol9          MOUNTED   /var
/dev/vg_ito/lv_oracle
/dev/vg_ito/lv_ito_var
/dev/vg_ito/lv_ito_etc

Volume groups on hpsfecme:
/dev/vg00/lvol1        FS MOUNTED   /stand
/dev/vg00/lvol2
/dev/vg00/lvol3          MOUNTED   /
/dev/vg00/lvol4          MOUNTED   /home
/dev/vg00/lvol5          MOUNTED   /opt
/dev/vg00/lvol6          MOUNTED   /tmp
/dev/vg00/lvol8          MOUNTED   /usr
/dev/vg00/lvol9          MOUNTED   /var
/dev/vg_ito/lv_oracle      MOUNTED   /u01
/dev/vg_ito/lv_ito_var     MOUNTED   /var/opt/OV/share
/dev/vg_ito/lv_ito_etc     MOUNTED   /etc/opt/OV/share
```

Writing cluster data to conf.

3. Edit the configuration file, /etc/cmcluster/conf. Minimally change the cluster name and the number of packages that can be configured Change the cluster name to “interworks99” and the maximum number of packages to “2”. The resulting file is shown below.

```
# **********************************************************************
# ********* HIGH AVAILABILITY CLUSTER CONFIGURATION FILE ***************
# ***** For complete details about cluster parameters and how to    ****
# ***** set them, consult the cmquerycl(1m) manpage or your manual. ****
# **********************************************************************
# Enter a name for this cluster.  This name will be used to identify the
# cluster when viewing or manipulating it.

CLUSTER_NAME            interworks99

# Cluster Lock Device Parameters.  This is the volume group that
# holds the cluster lock which is used to break a cluster formation
# tie.  This volume group should not be used by any other cluster
# as cluster lock device.

FIRST_CLUSTER_LOCK_VG                   /dev/vg_ito

# Definition of nodes in the cluster.
# Repeat node definitions as necessary for additional nodes.

NODE_NAME               hpsfeclg
  NETWORK_INTERFACE  lan0
  HEARTBEAT_IP            15.61.36.156
 NETWORK_INTERFACE  btlan01
 FIRST_CLUSTER_LOCK_PV       /dev/dsk/c1t10d0
```

```
# List of serial device file names
# For example:
# SERIAL_DEVICE_FILE    /dev/tty0p0

# Primary Network Interfaces on Bridged Net 1: lan0.
#   Possible standby Network Interfaces on Bridged Net 1: btlan01.

NODE_NAME               hpsfecme
  NETWORK_INTERFACE     lan0
    HEARTBEAT_IP        15.61.36.150
  NETWORK_INTERFACE     btlan01
  FIRST_CLUSTER_LOCK_PV     /dev/dsk/c1t10d0
# List of serial device file names
# For example:
# SERIAL_DEVICE_FILE    /dev/tty0p0

# Primary Network Interfaces on Bridged Net 1: lan0.
#   Possible standby Network Interfaces on Bridged Net 1: btlan01.

# Cluster Timing Parameters (microseconds).

HEARTBEAT_INTERVAL          1000000
NODE_TIMEOUT            2000000

# Configuration/Reconfiguration Timing Parameters (microseconds).

AUTO_START_TIMEOUT  600000000
NETWORK_POLLING_INTERVAL  2000000

# Package Configuration Parameters.
# Enter the maximum number of packages, which will be configured in the cluster.
# You can not add packages beyond this limit.
# This parameter is required.

MAX_CONFIGURED_PACKAGES         2

# List of cluster aware Volume Groups. These volume groups will
# be used by clustered applications via the vgchange -a e command.
# For example:
# VOLUME_GROUP              /dev/vgdatabase.
# VOLUME_GROUP              /dev/vg02.

VOLUME_GROUP            /dev/vg_ito
```

4. Use the configuration checking command to check up on your work.

   cmcheckconf –v –C conf

   ➔

   ```
   Checking cluster file: conf
   Checking nodes ... Done
   Checking existing configuration ... Done
   Gathering configuration information ..... Done
   Warning: The disk at /dev/dsk/c3t2d0 on node hpsfeclg does not have an ID.
   Warning: The disk at /dev/dsk/c3t2d0 on node hpsfecme does not have an ID.
   Warning: Disks which do not have IDs cannot be included in the topology description.
   Use pvcreate(1m) to give a disk an ID.
   ```

```
Cluster interworks99 is an existing cluster
Checking for inconsistencies .. Done
Cluster interworks99 is an existing cluster
Maximum configured packages parameter is 2.
Configuring 1 package(s).
1 package(s) can be added to this cluster.
Modifying configuration on node hpsfeclg
Modifying configuration on node hpsfecme
Modifying the cluster configuration for cluster interworks99.

Verification completed with no errors found.
Use the cmapplyconf command to apply the configuration.
```

5. Compile the configuration file. The "cmapplyconf" command will also distribute the binary configuration to the other node in the cluster.

cmapplyconf –v –C conf

➔

```
Checking cluster file: conf
Checking nodes ... Done
Checking existing configuration ... Done
Gathering configuration information ..... Done
Warning: The disk at /dev/dsk/c3t2d0 on node hpsfeclg does not have an ID.
Warning: The disk at /dev/dsk/c3t2d0 on node hpsfecme does not have an ID.
Warning: Disks which do not have IDs cannot be included in the topology description.
Use pvcreate(1m) to give a disk an ID.
Cluster interworks99 is an existing cluster
Checking for inconsistencies .. Done
Cluster interworks99 is an existing cluster
Maximum configured packages parameter is 2.
2 package(s) can be added to this cluster.
Modifying configuration on node hpsfeclg
Modifying configuration on node hpsfecme
Modify the cluster configuration ([y]/n)?  y
Modifying the cluster configuration for cluster interworks99.
Completed the cluster creation.
```

6. Start the cluster.

cmruncl

```
➔ cmruncl      : waiting for cluster to form…..
  cmruncl      : Cluster successfully formed.
  cmruncl      : Check the syslog file for an warnings found during startup.
```

7. Validate that the cluster is up and running.

cmviewcl

```
➔ CLUSTER          STATUS
  interworks99           up

     NODE          STATUS       STATE
     hpsfeclg      up           running
     hpsfecme      up           running
```

8. Edit /etc/rc.config.d/cmcluster file and change the variable "AUTOSTART_CMCLD" to have a value of 1. Do this on both systems!

vi /etc/rc.config.d/cmcluster

➔

```
#**************************  CMCLUSTER ************************
```

```
# Highly Available Cluster configuration
# @(#) $Revision: 80.1 $
# AUTOSTART_CMCLD:      If set to 1, the node will attempt to
#                       join its CM cluster automatically when
#                       the system boots.
#                       If set to 0, the node will not attempt
#                       to join its CM cluster.
#
AUTOSTART_CMCLD=1
```

STEP 4: Install the Oracle database onto the shared disk. These steps are for Oracle 7.3.4.

1. Unmount the file systems that exist on the shared disk. If they are already unmounted then proceed to the next step.
   umount /u01
   umount /var/opt/OV/share
   umount /etc/opt/OV/share

2. Deactivate the shared volume group, "vg_ito". If it is already deactivated, then proceed to the next step.
   vgchange -a n /dev/vg_ito
   ➔ Volume group "vg_ito" has been successfully changed.

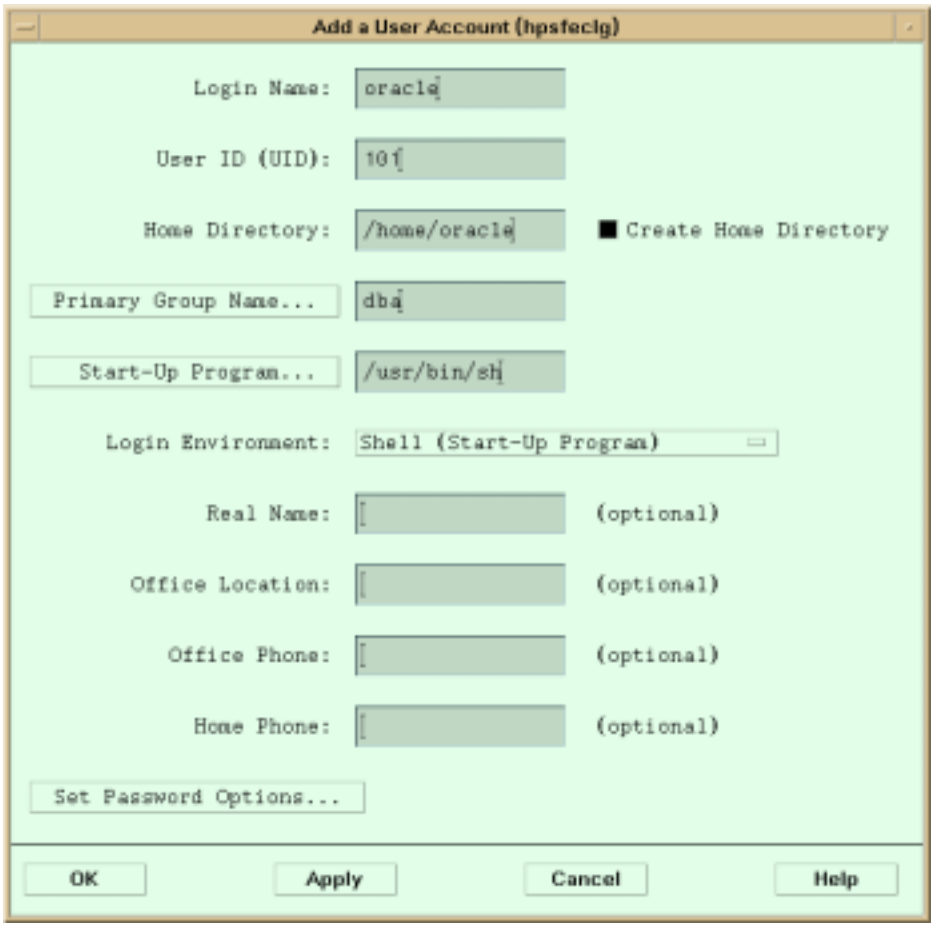
3. Now activate the shared volume group in exclusive mode. The cluster must be up and running for this to be possible.
   vgchange -a e /dev/vg_ito
   ➔ Activated volume group in Exclusive Mode.
   Volume group "vg_ito" has been successfully changed.

4. Mount the logical volume that will contain the Oracle database and binaries. This is the one that gets mounted at /u01.
   mount /dev/vg_ito/lv_oracle /u01

5. Create a user for Oracle. The username must be "oracle". Later on you will be creating this user on the other node, so you should probably determine the correct user id (UID) number to use. We use "sam" to create the user account. Fill in the fields as they are shown in the figure on the next page. Then click on the "OK" button. Enter a password for the user (twice) and the user is created. Exit from "sam".

   Data to enter:

Login name:	**oracle**
User ID:	unique among all nodes in the cluster and greater than 100
Home Directory:	**/home/oracle**
Primary Group Name:	**dba** (if this does not exist, sam will create it for you)
Start-Up Program:	use the default



6. Set the umask to allow users to access the Oracle binaries.
   umask 022

7. Create the Optimal Flexible Architecture (OFA) directory structure recommended by Oracle.
   mkdir -p /u01/home/dba/oracle/product/7.3.4

8. Change the ownership of the directories to be owned by “oracle” and have a group membership of “dba”.
   cd /u01
   chown -R oracle:dba .

9. Add the following Oracle environment variable to the .profile for the user oracle and the user root.
   vi /home/oracle/.profile
   (insert the following lines)
   export ORACLE_BASE=/u01/home/dba/oracle
   export ORACLE_HOME=$ORACLE_BASE/product/7.3.4
   export ORACLE_SID=openview
   export ORACLE_TERM=hp
   export NLS_LANG=american_america.WE8ISO8859P1
   export PATH=$PATH:$ORACLE_HOME/bin

   vi $HOME/.profile (assuming you are logged in as root)
   (insert the following lines)
   export ORACLE_BASE=/u01/home/dba/oracle

```
export ORACLE_HOME=$ORACLE_BASE/product/7.3.4
export ORACLE_SID=openview
export ORACLE_TERM=hp
export NLS_LANG=american_america.WE8ISO8859P1
export PATH=$PATH:$ORACLE_HOME/bin
```

10. Run the PFS mount request server.
    /usr/sbin/pfs_mountd &

11. Run the Portable File System (PFS) Daemon.
    /usr/sbin/pfsd &

12. Edit the /etc/pfs_fstab file and add an entry for the CD-ROM drive where the Oracle CD-ROM will be accessed from.
    vi /etc/pfs_fstab
    (add the following line)
    /dev/dsk/c3t2d0 /cdrom pfs-rrip xlat=unix 0 0

13. Create the mount directory for the Oracle CD-ROM.
    mkdir /cdrom

14. Insert the Oracle CD-ROM into the drive and mount it.
    /usr/sbin/pfs_mount /cdrom

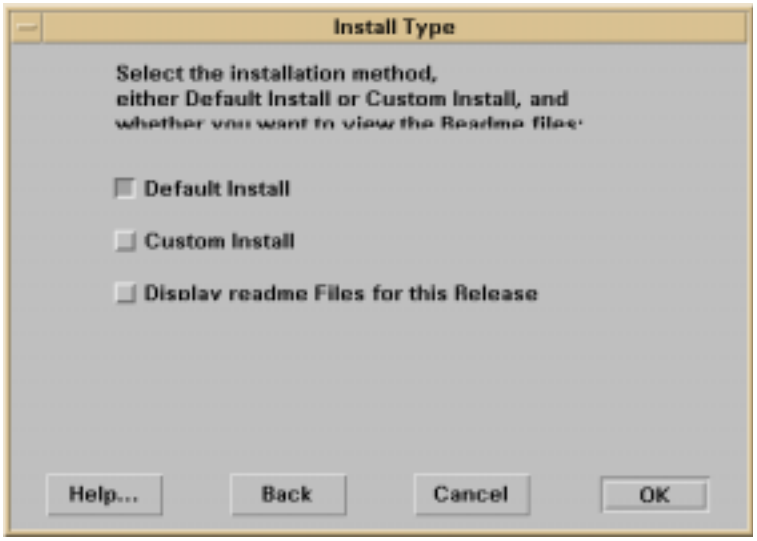
15. Switch to the user oracle.
    su - oracle

16. Change to the orainst directory on the CD-ROM.
    cd /cdrom/orainst

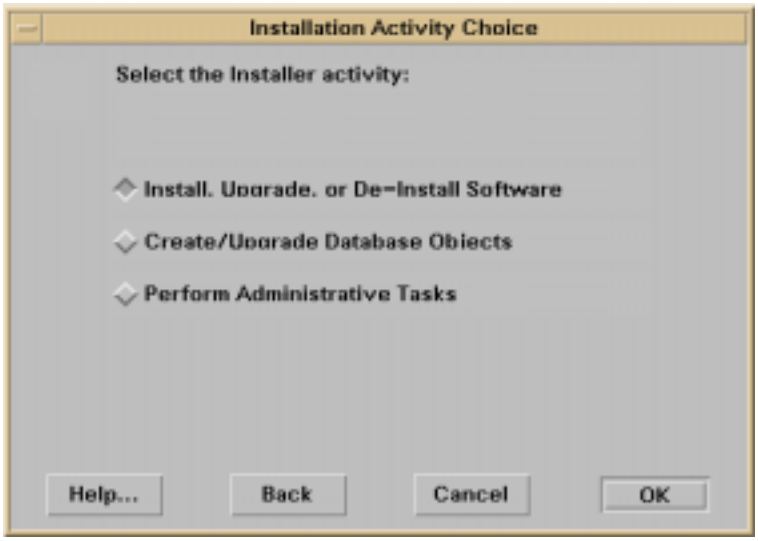
17. Export the display if you are going to run the Motif version of the Oracle Installer.
    export DISPLAY=hpsfeclg:0

18. Start the Oracle Installer in Motif mode.
    ./orainst /m

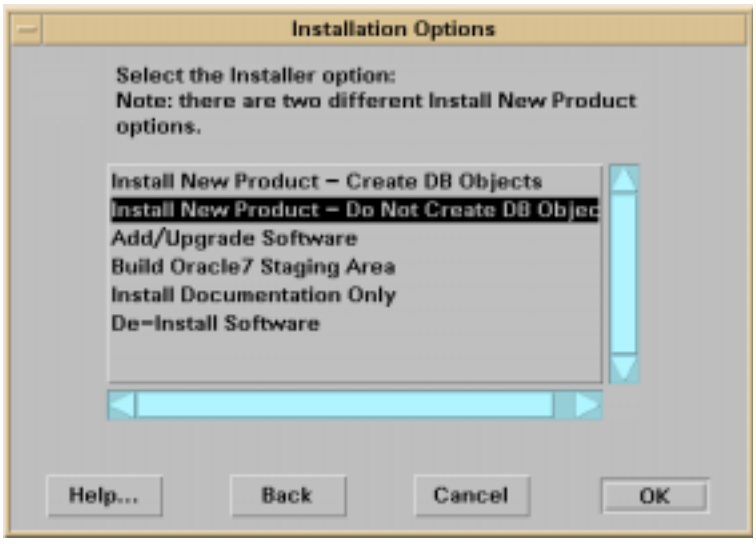
19. When the figure below appears, select “Default Install” and then click “OK”.



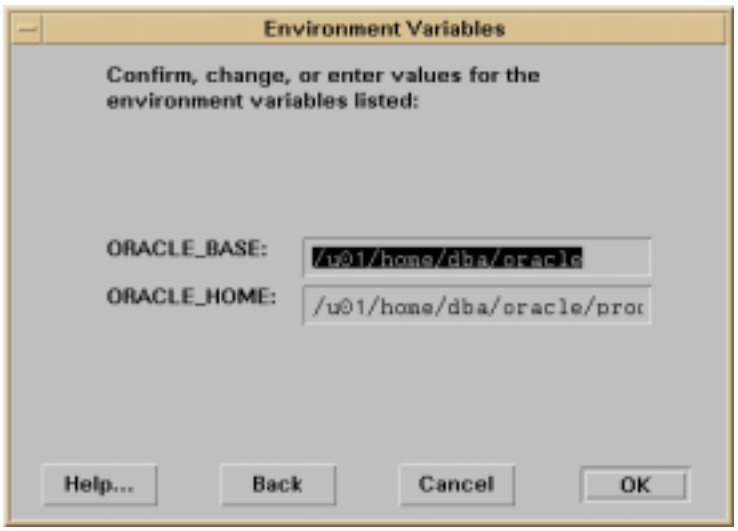
20. The next window appears, shown below, and you should select “Install, Upgrade, or De-Install Software.



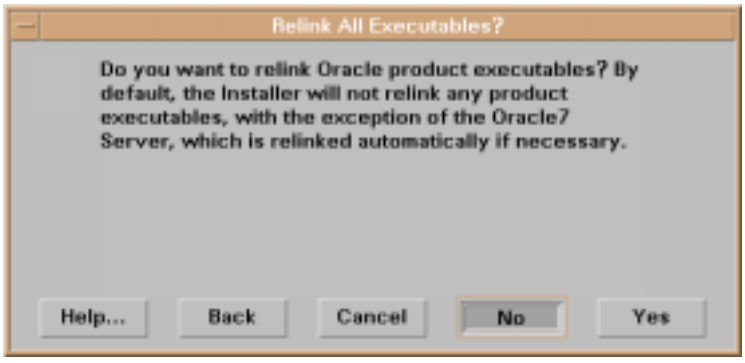
21. The Installation Options window appears. Select “Install New Product – Do Not Create DB Objects.



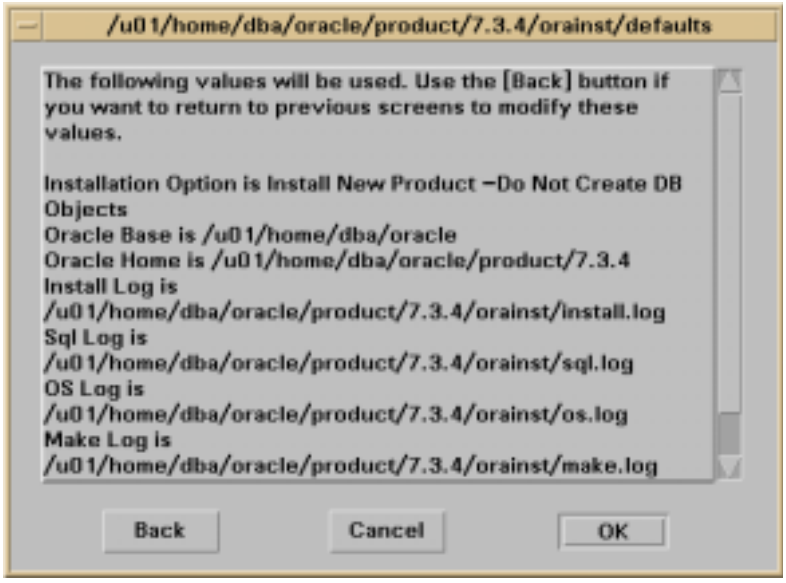
22. Verify the settings of the Oracle variables displayed in the Environment Variables window. These were picked up from the variable definitions you entered into the user oracle’s .profile. If they are not correct, then you must fix them in the window and also in the .profile file. See the figure below.



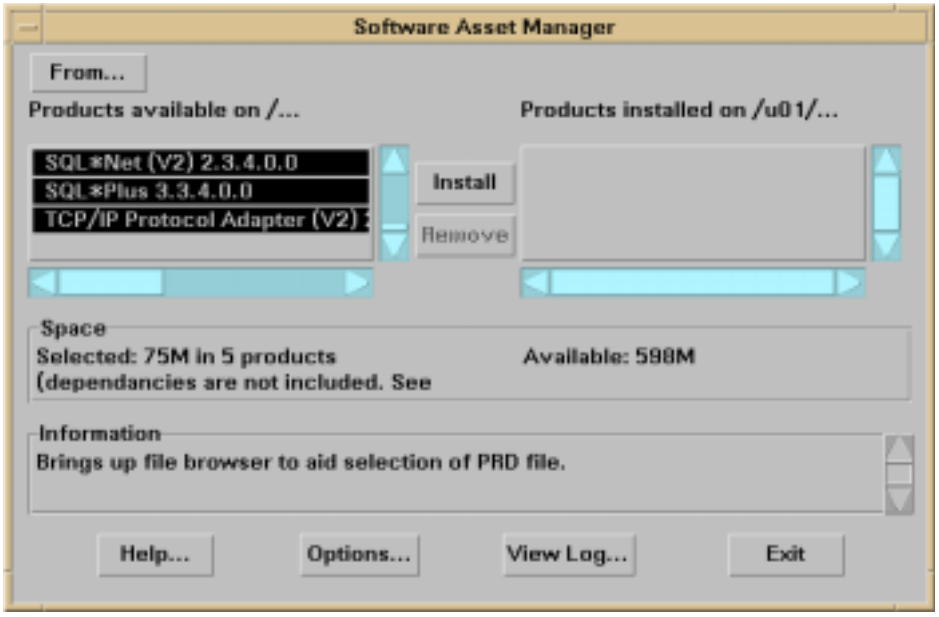
23. Choose whether to relink Oracle product executables. You should select “No”.



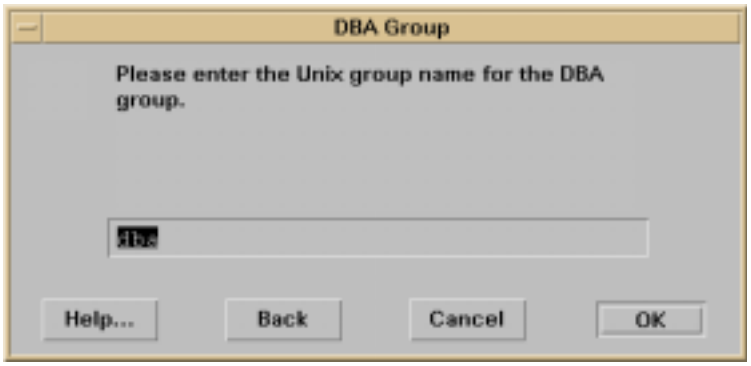
24. The installer displays the values for confirmation. Check them out and select “OK”.



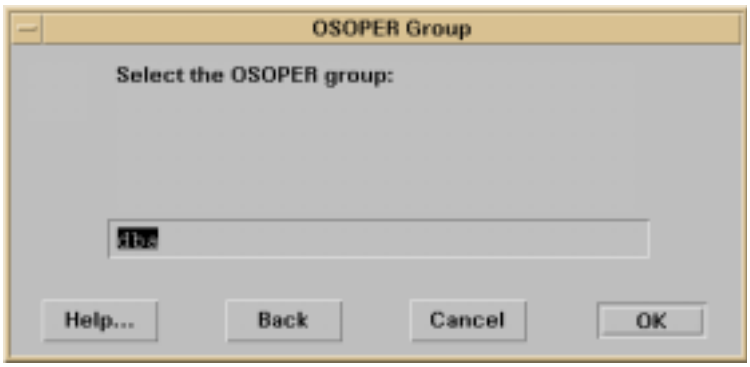
25. The Software Asset Manager window appears. You are now required to choose the Oracle products that you wish to install. To choose a product, just highlight it. When all products are highlighted then click on the “Install” button. The 5 products that we want to install are:
    Oracle7 Server (RDBMS) 7.3.4.0.0
    PL/SQL (V2) 2.3.4.0.0
    SQL*NET (V2) 2.3.4.0.0
    SQL*Plus 3.3.4.0.0
    TCP/IP Protocol Adapter (V2) 2.3.4.0.0



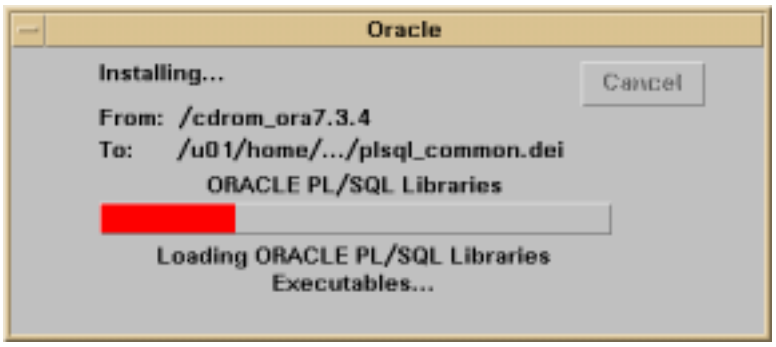
26. Enter the UNIX group name for the DBA group. Enter “dba”.



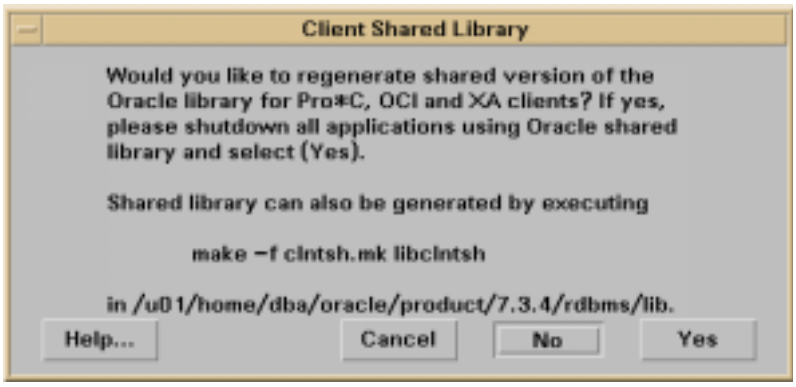
27. Enter the OSOPER group name. Enter “dba”.



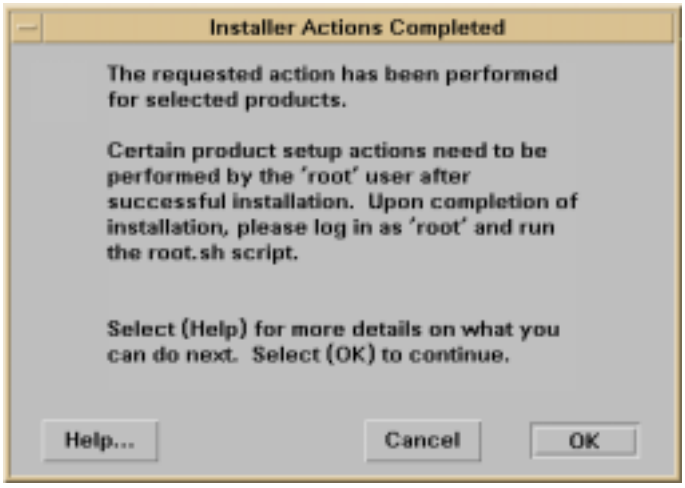
28. The Oracle installation window appears. This is a good time to take a short break.



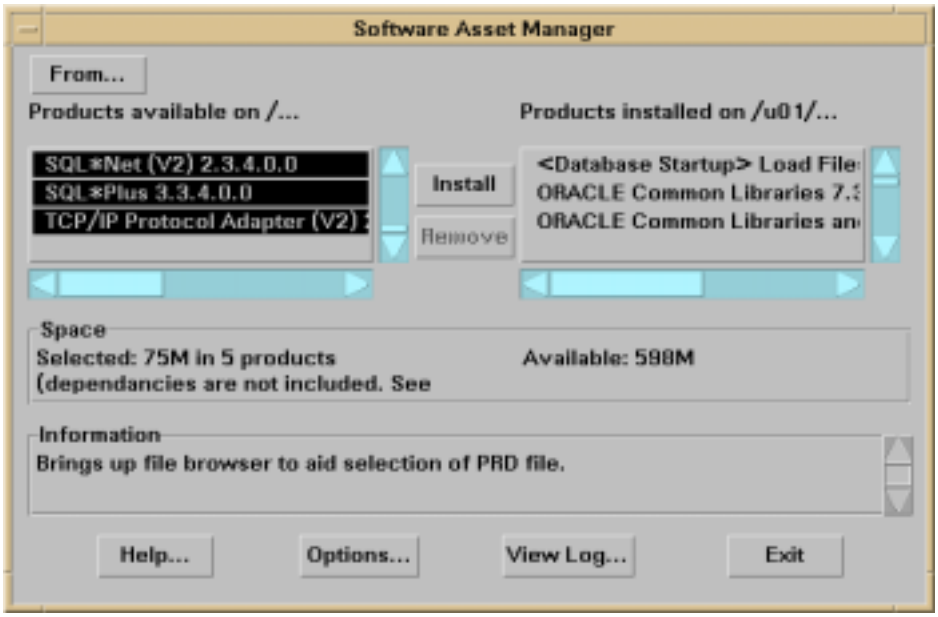
29. Just before the install has completed, you are asked: “Would you like to regenerate shared version of the Oracle Library …”. Select the “No” button.



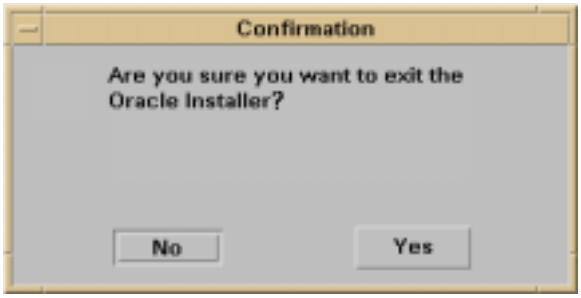
30. When the Installer has finished, you will see the window below. This is the Installer Actions Completed window. Select “OK”.



31. You are returned to the Software Asset Manager window. Select "Exit".



32. Like all user-friendly software, we end with the Confirmation window. Select "Yes".



33. Exit from the oracle user session.
    exit

34. Now you are back as user root. You need to set the Oracle environmental variables. The quickest way to do this is to source the .profile you modified earlier.
    . $HOME/.profile

35. Verify that the variables exist and that the values are correct.
    env | grep ORA
    ➔
    ORACLE_BASE=/u01/home/dba/oracle
    ORACLE_HOME=/u01/home/dba/oracle/product/7.3.4
    ORACLE_SID=openview
    ORACLE_TERM=hp

36. Change to the "orainst" directory.
    cd $ORACLE_HOME/orainst

37. Run the program "root.sh" which will set up the /etc/oratab file.
    ./root.sh
    ➔
    Running ORACLE7 root.sh script…

    The following environment variables are set as:
        ORACLE_OWNER= oracle
        ORACLE_HOME= /u01/home/dba/oracle/product/7.3.4
        ORACLE_SID= openview
    Are these settings correct (Y/N)? [Y]: **Y**

    Enter the full pathname of the local bin directory [/usr/local/bin]: **<ENTER>**

    Checking for "oracle" user id…
    ORACLE_HOME does not match the home directory for oracle.
    Okay to continue? [N] : **Y**

    Creating /etc/oratab file…
    Updating /etc/oratab file…

    Leaving common section of ORACLE7 root.sh.

    Please shutdown oracle before continuing.
    Press enter when you are ready to continue. **<ENTER>**

    /u01/home/dba/oracle/product/7.3.4/bin/oracle:
        current values:

    (40 to 50 lines of value information is displayed to the screen)

38. Unmount the CD_ROM drive.
    /usr/sbin/pfs_umount /cdrom

39. Terminate the background Portable File System daemons. Go to the window where you started the daemons and enter the following commands. The idea is to pull the command out of the background and then use <CNTL C> to terminate its existence.
    fg
    <ctrl-c>
    fg
    <ctrl-c>

This completes the Oracle installation.

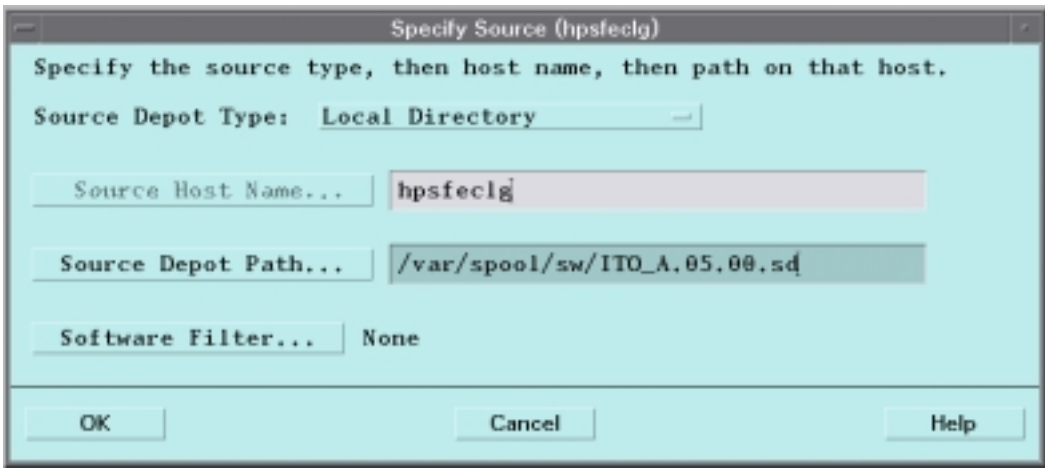
STEP 5: Install OpenView IT/Operations 5.0 on the first node in the cluster.

1. Mount the shared logical volumes for the ITO MC/ServiceGuard package on the node to which you intend to install the software.
   mount /dev/vg_ito/lv_ito_var /var/opt/OV/share
   mount /dev/vg_ito/lv_ito_etc /etc/opt/OV/share

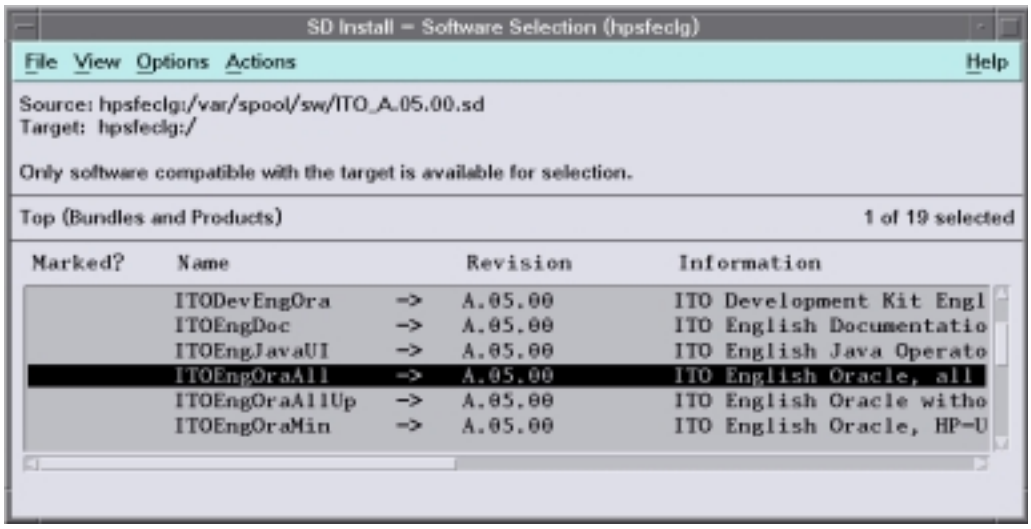
2. Use the "swinstall" program to install IT/O 5.0. You must determine the software source. If it is from CD-ROM, then you must mount the disk. If it is from a network install server, then you must know its hostname and which depot the software is located in. The following example will install from a local depot. The depot is located at the default location - /var/spool/sw.

3. Start up the "swinstall" program.
   /usr/sbin/swinstall

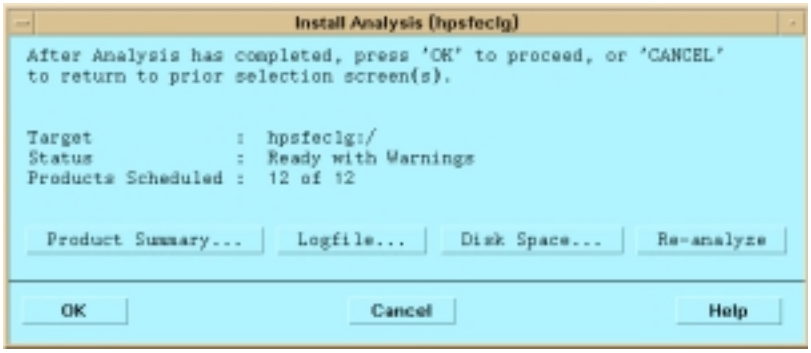
4. The Specify Source (hpsfeclg) window appears. If necessary, change the name of the Source Host Name. Enter in the Source Depot Path or click on the Source Depot Path button and select from the listed depots. The depot for our configuration appears below. Click on the "OK" button when ready.



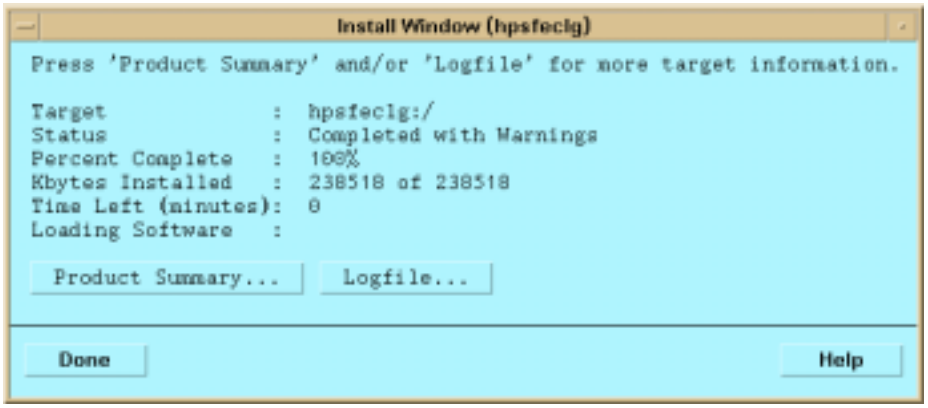
5. The next window to appear is the SD Install – Software Selection (hpsfeclg) window. Your listing may differ, but you need to select "ITOEngOraAll" by highlighting it. This is shown in the figure below. Then select "Actions" → "Install (analysis)…".



6. The install process now enters the analysis phase. The window shown below appears. Its purpose is to determine whether the install of selected software will be successful or not. When the status field informs you that swinstall is ready, then click on the “OK” button.



7. Now the install begins. The status of the install is displayed in the Install Window (hpsfeclg). Once the Status field contains the word “Ready” then you can click on the “Done” button. This is another good place to take a break.



8. You are returned to the Software Selection window. Select "File" → "Exit"

This concludes the installation of OpenView IT/Operations 5.0.

STEP 6: Configure OpenView IT/Operations 5.0 on the first node in the cluster.

1. Disable the automatic startup of the NNM/ITO processes. Edit the file, /etc/rc.config.d/ov500 and set the variable to a value of 0 (zero).
   vi /etc/rc.config.d/ov500
   (change the existing line to match the one below)
   START_OV500=0

2. Verify that the Oracle environment variables are set correctly.
   env | grep ORA
   →
   ORACLE_BASE=/u01/home/dba/oracle
   ORACLE_HOME=/u01/home/dba/oracle/product/7.3.4
   ORACLE_SID=openview
   ORACLE_TERM=hp

3. Configure ITO using "opcconfig" command. Follow the output displayed below and answer the questions appropriately.
   /opt/OV/bin/OpC/install/opcconfig
   →

```
# /opt/OV/bin/OpC/install/opcconfig
    ------------------------------------------------------------
    This script configures HP OpenView IT/Operations on Management Server
    ------------------------------------------------------------
NOTE:    Umask is set from 022 to 027
WARNING: After ending this script the umask will be set back to 022
Lockfile /var/opt/OV/share/tmp/OpC/mgmt_sv/opcsw.lock checked
Using database codeset WE8ISO8859P1
and NLS_LANG american_america.WE8ISO8859P1 for the database setup
NOTE:    LANG variable checked, currently set to 'C'
QUERY:   MC/ServiceGuard is installed on this system. Do you want to
         setup an ITO ServiceGuard installation (y/n) ? y
To setup an ITO ServiceGuard installation you have to specify several
attributes. You should have a good understanding of ServiceGuard
installation and read the 'Managing MC/ServiceGuard' manual:
QUERY:   Full qualified hostname of the ITO ServiceGuard package: ? OpC.mayfield.hp.com
QUERY:   IP address of the ITO ServiceGuard package: ? 15.61.36.160
NOTE:    You have selected the following values for the ITO MC/ServiceGuard installation:
NOTE:    Hostname of the ITO ServiceGuard package:   OpC.mayfield.hp.com
NOTE:    IP address of the ITO ServiceGuard package:   15.61.36.160
NOTE:    Version of the ITO ServiceGuard package:      A.05.00
QUERY:   Do you want to change any of these values (y/n) ? n
-------> Do you want to continue the configuration (y/n) y
NOTE:    Starting the ITO MC/ServiceGuard configuration...
 Updating opcsvinfo file.
Creating shared opcsginfo file.
QUERY:   Do you want to configure the database automatically (y/n) ? y
NOTE:    Stopping HP OpenView Platform services, if they are running ...
ovstop: ovspmd is not running
NOTE:    Starting opcdbsetup. Please wait...
ITO database configuration script opcdbsetup.
```

```
Called on Tue Mar  2 19:12:19 PST 1999.

If you want to use an existing database, please enter the password
for the Oracle user 'system'. For a new database creation you can accept the default.
Password of Oracle user 'system' [manager]: manager
This script will create two new Oracle users, opc_op and opc_report.
Please enter the password of Oracle user 'opc_op':   hp
Please confirm the password of Oracle user 'opc_op':    hp
Please enter the password of Oracle user 'opc_report':   hp
Please confirm the password of Oracle user 'opc_report':  hp

Do you want to enable automatic database startup at system boot time (y/n) [y] ? y
Checking, if SQL*Net is already configured ..
        SQL*Net not yet configured.
Please enter the data directory [/u01/oradata/openview]:  <ENTER>
Please enter the index directory [/u01/oradata/openview]:  <ENTER>
Entering Phase 1 (ovdbsetupo1.sh)
ovdbsetup for Oracle
Please enter the value for ORACLE_SID [openview]:  <ENTER>
Please enter the value for ORACLE_BASE [/u01/home/dba/oracle]:  <ENTER>
Please enter the value for ORACLE_HOME [/u01/home/dba/oracle/product/7.3.4]:  <ENTER>

Oracle release is 7.3.4 (from svrmgrl)
Please enter the Oracle DBA user [oracle]: <ENTER>

Creating the database. This may take some time ...
spool file is: /u01/home/dba/oracle/admin/openview/create/crdbov1.lst
Entering Phase 2 (ovdbsetupo2.sh)

Configuring openview instance
spool file is: /u01/home/dba/oracle/admin/openview/create/crdbov2.lst

Checking connection to DB openview...
Connected to openview database.

 Checking connection to DB openview..
 Can connect to database openview.
 Creating the ITO tablespaces and users. This may take some time ...

Creating the ITO tables ...
Installation of ITO tables in database successful. (OpC55-3)
Created public synonyms and granted read access to report role. (OpC55-41)
 Loading the initial configuration into the database ...
 Initialization of ITO tables in database successful.
 WARNING: Entry in /etc/oratab for ORACLE_SID openview
       is not enabled for startup. Modifying /etc/oratab.
 Changing the password of DB user opc_op.
 Configuring SQL*Net.
  ITO SQL*Net configuration script opcsqlnetconf.

 (Re-)starting the SQL*Net listener ...

LSNRCTL for HPUX: Version 2.3.4.0.0 - Production on 02-MAR-99 19:24:11

Copyright (c) Oracle Corporation 1994.  All rights reserved.
```

```
Starting /u01/home/dba/oracle/product/7.3.4/bin/tnslsnr: please wait...

TNSLSNR for HPUX: Version 2.3.4.0.0 - Production
System parameter file is /etc/listener.ora
Log messages written to /u01/home/dba/oracle/product/7.3.4/network/log/listener.log
Listening on: (ADDRESS=(PROTOCOL=ipc)(DEV=10)(KEY=openview))
Listening on: (ADDRESS=(PROTOCOL=tcp)(DEV=13)(HOST=15.61.36.156)(PORT=1521))

Connecting to (ADDRESS=(PROTOCOL=IPC)(KEY=openview))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for HPUX: Version 2.3.4.0.0 - Production
Start Date                02-MAR-99 19:24:17
Uptime                    0 days 0 hr. 0 min. 0 sec
Trace Level               off
Security                  OFF
SNMP                      OFF
Listener Parameter File   /etc/listener.ora
Listener Log File         /u01/home/dba/oracle/product/7.3.4/network/log/listener.log
Services Summary...
  openview                has 1 service handler(s)
The command completed successfully
        ITO SQL*Net configuration script opcsqlnetconf finished.
        Verifying SQL*Net connection ..

      opcdbsetup succeeded with Warnings.
NOTE:    The Oracle database was successfully configured
NOTE:    Integrate ITO in the HP OpenView ovstart/ovstop sequence. Please wait
        ...
NOTE:    Added Local Registration File for ITO to enable 'ovstart/ovstop opc'.
         One or more HP OpenView Platform services are not running
NOTE:    Starting HP OpenView Platform. Please wait...

WARNING: Following services are not running:
          netmon
NOTE:    HP OpenView Platform couldn't start correctly. Stopping all HP
        OpenView processes and try to start HP OpenView Platform again.
        Please wait...
NOTE:   Starting HP OpenView Platform. Please wait…
NOTE:    HP OpenView Platform was successfully started.
NOTE:    Loading the new OV Windows field definitions for ITO
NOTE:    Review /tmp/opc_tmp/opc.log to see whether errors have occurred while
        OV Windows was loaded. The lines starting with
        /etc/opt/OV/share/fields/C/opc are of special interest. Remove the
        /tmp/opc_tmp/opc.log file after reviewing
QUERY:   Do you want to read the /tmp/opc_tmp/opc.log (y/n) ?  n
NOTE:     All ITO processes are up and running
            ------------------------------------------------------------------------
           Check the /var/opt/OV/log/OpC/mgmt_sv/opcsw_inst.log and
           /var/opt/OV/log/OpC/mgmt_sv/opcsw_inst_err.log for problems that
           might have occurred. These logfiles were updated by this
           installation script
```

4. Stop all NNM/ITO processes.

/opt/OV/bin/ovstop

5. Stop the Oracle database.
   /sbin/init.d/ovoracle stop force

6. SQL*Net must now be configured with the virtual node name (IP address of the MC/SG package). Configure SQL*Net.
   /opt/OV/bin/OpC/opcsqlnetconf
   ➔
   # /opt/OV/bin/OpC/opcsqlnetconf
   ITO SQL*Net configuration script opcsqlnetconf.
   /etc/listener.ora
   /etc/sqlnet.ora
   /etc/tnsnames.ora
   /etc/tnsnav.ora
   WARNING: Above SQL*Net files already exist.
   Do you want to replace them (y/n) [y] ? **y**
   Verify/Set Variables:
   Please enter ORACLE_SID [openview]: **<ENTER>**

   Enter ORACLE_HOME [/u01/home/dba/oracle/product/7.3.4]: **<ENTER>**

   Please enter the name of the database server node
   (normally management server) [hpsfeclg]: **OpC.mayfield.hp.com**
   Do you want to enable automatic startup of the SQL*Net listener
   at system boot (y/n) [y] ? **y**
   Do you want to start the SQL*Net listener now (y/n) [y] ? **n**
   ITO SQL*Net configuration script opcsqlnetconf finished.

7. Unmount all the shared file systems.
   umount /u01
   umount /var/opt/OV/share
   umount /etc/opt/OV/share

8. Deactivate the shared volume group.
   vgchange -a n /dev/vg_ito
   ➔ Volume group "/dev/vg_ito" successfully changed.

That concludes the configuration of IT/Operations 5.0 on the first MC/ServiceGuard cluster node.

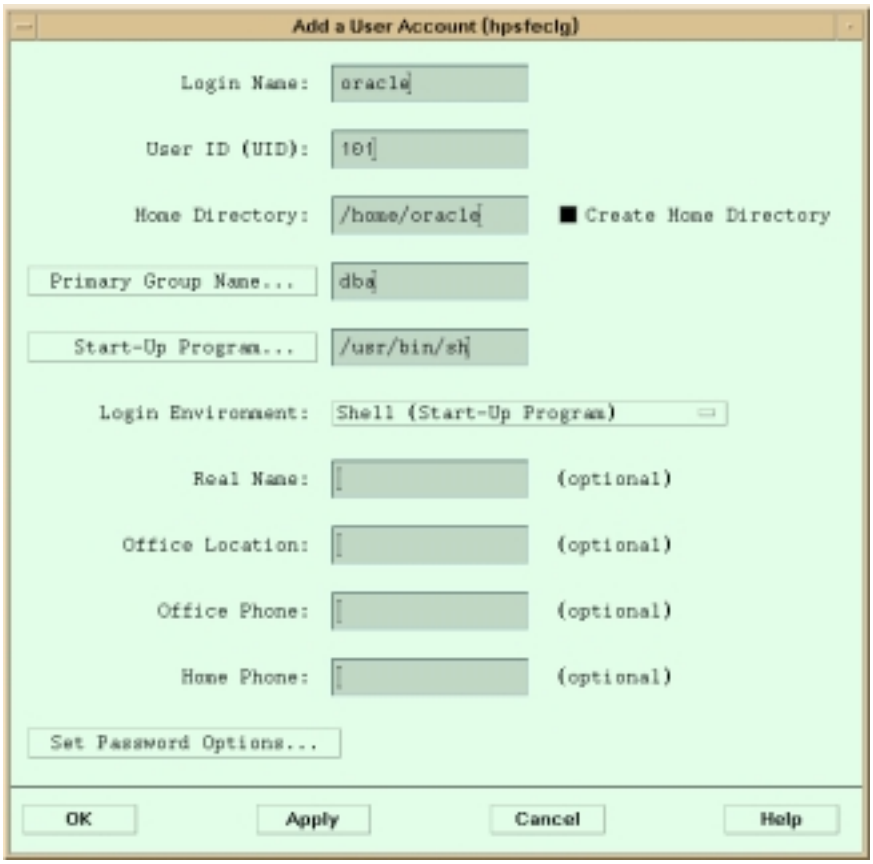
STEP 7: Installing ITO on additional MC/SG cluster nodes. In our case one additional node needs to be installed.

1. Login to the other node, hpsfecme. Prepare the node for the ITO install process. Create the user opc_op and the group opcgrp.
   vi /etc/passwd
   (add the entry shown below)
   opc_op:*:777:77:OpC default operator:/home/opc_op:/usr/bin/ksh

   vi /etc/group
   (add the entry shown below)
   opcgrp::77:opc_op

2. Create the home directory structure for the "opc_op" user.
   mkdir /home/opc_op
   rcp hpsfeclg:/home/opc_op/.[!.]* /home/opc_op
   chown -R opc_op:opcgrp /home/opc_op

3. Create a user for Oracle. The username must be “oracle”. This is to match the account created on the first node. Fill in the fields like those shown below.



4. Add the following Oracle environment variables to the .profile for the user oracle and the user root.

vi /home/oracle.profile
(add the following lines)
export ORACLE_BASE=/u01/home/dba/oracle
export ORACLE_HOME=$ORACLE_BASE/product/7.3.4
export ORACLE_SID=openview
export ORACLE_TERM=hp
export NLS_LANG=american_america.WE8ISO8859P1
export PATH=$PATH:$ORACLE_HOME/bin
vi $HOME/.profile
(add the following lines)
export ORACLE_BASE=/u01/home/dba/oracle
export ORACLE_HOME=$ORACLE_BASE/product/7.3.4
export ORACLE_SID=openview
export ORACLE_TERM=hp
export NLS_LANG=american_america.WE8ISO8859P1
export PATH=$PATH:$ORACLE_HOME/bin

5. Create the mount points for the shared file systems.
mkdir /u01
mkdir -p /var/opt/OV/share

mkdir –p /etc/opt/OV/share

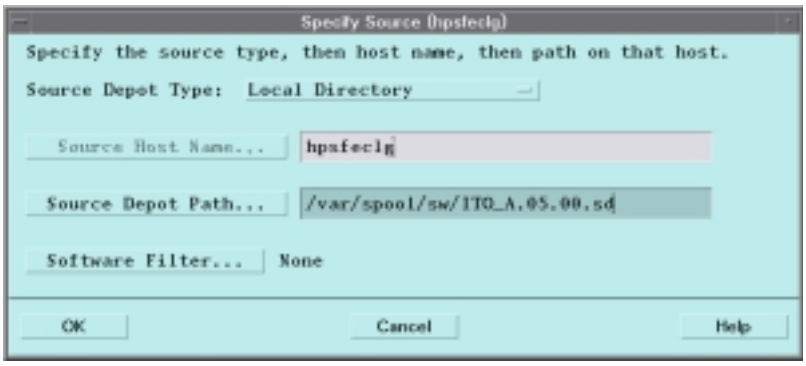
6. Copy the following files from the configured node. Adjust the ownership and permissions accordingly. They must match the configured node.
   rcp hpsfeclg:/etc/oratab /etc/oratab
   rcp hpsfeclg:/etc/listener.ora /etc/listener.ora
   rcp hpsfeclg:/etc/sqlnet.ora /etc/sqlnet.ora
   rcp hpsfeclg:/etc/tnsnames.ora /etc/tnsnames.ora
   rcp hpsfeclg:/etc/tnsnav.ora /etc/tnsnav.ora
   chown oracle /etc/oratab

7. Activate the shared volume group.
   vgchange -a e /dev/vg_ito
   ➔ Activated volume group in Exclusive Mode
   Volume group "vg_ito" has been successfully changed.

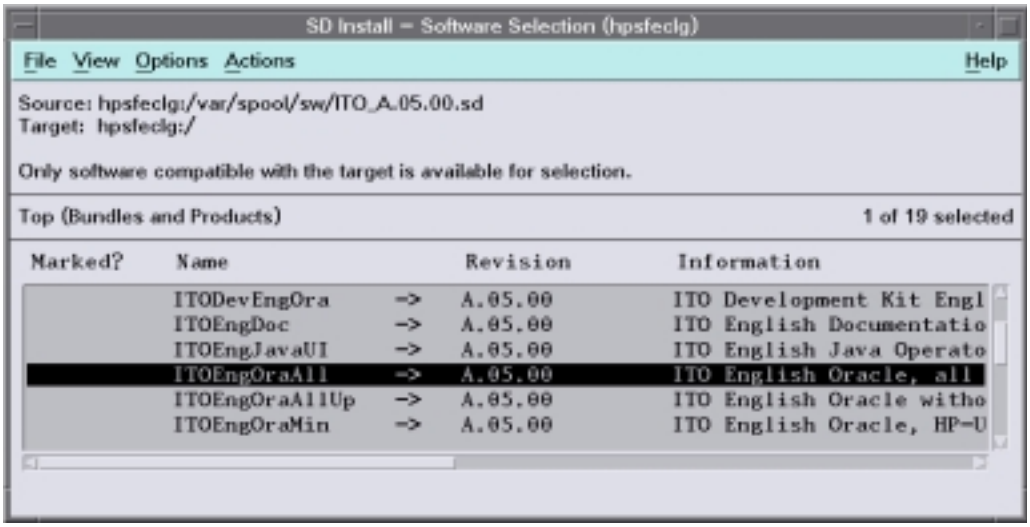
8. Mount the Oracle logical volume. DO NOT mount the other shared logical volumes!
   mount /dev/vg_ito/lv_oracle /u01

9. Install the ITO software using swinstall as was performed earlier.
   /usr/sbin/swinstall

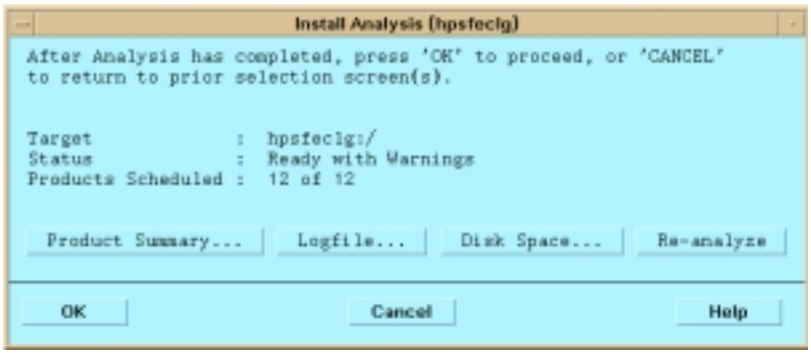
10. Specify the source of the OpenView IT/Operations 5.0 software. Click on the "OK" button.



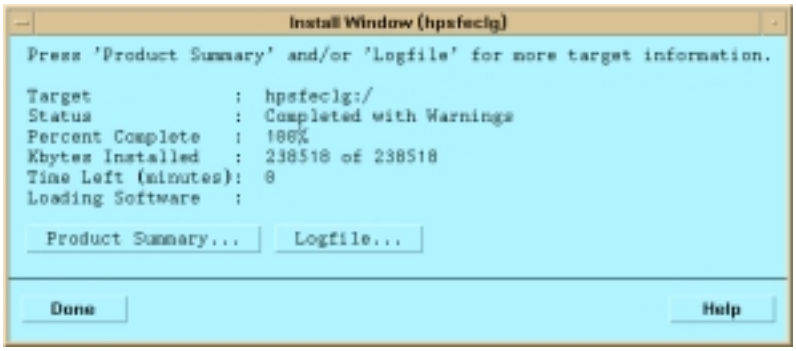
11. Highlight the software to be installed. Select "ITOEngOraAll" and then select "Actions" ➔ "Install (analysis)".



12. When the analysis is done, click on the “OK” button.



13. Time for another break. When the install has completed, then click on the “Done” button.



14. Exit from the swinstall utility. Select “File” → “Exit”.

15. Remove the contents of both “/var/opt/OV/share” and “/etc/opt/OV/share”.
    rm -rf /var/opt/OV/share/* /etc/opt/OV/share/*

16. Disable automatic startup of the NNM/ITO processes. Edit the /etc/rc.config.d/ov500 and change the variable’s value to 0 (zero).
    vi /etc/rc.config.d/ov500
    (change the variable to match the line below)
    START_OV500=0

17. Enable the auto-startup of Oracle and the Oracle listener. Edit /etc/rc.config.d/ovoracle and change the value of “OVORACLE” and “OVORALISTENER” to 1 (one).
    vi /etc/rc.config.d/ovoracle
    (change the two variables to match the lines below)
    OVORACLE=1
    OVORALISTENER=1

18. Mount the two ITO shared file systems.
    mount /dev/vg_ito_var /var/opt/OV/share
    mount /dev/vg_ito_etc /etc/opt/OV/share

19. Configure ITO using “opcconfig” as before. This time “opcconfig” will read its information from a file. The file is /etc/opt/OV/share/conf/OpC/mgmt_sv/opcsginfo and was created during the configuration of the first node.

/opt/OV/bin/OpC/install/opcconfig
➔

```
# /opt/OV/bin/OpC/install/opcconfig
-------------------------------------------------------
This script configures OpenView IT/Operations on Management Server
-------------------------------------------------------
NOTE:    Umask is set from 022 to 027
WARNING: After ending this script the umask will be set back to 022
         Lockfile /var/opt/OV/share/tmp/OpC/mgmt_sv/opcsw.lock checked
         Using database codeset WE8ISO8859P1
         and NLS_LANG american_america.WE8ISO8859P1 for the database setup
NOTE:    LANG variable not set, setting to 'C'
NOTE:    This an installation of an additional node in an ITO MC/SG cluster.
NOTE:    The shared disk is already installed as ITO MC/ServiceGuard. The
         current values of installation are:
         Hostname of the ITO ServiceGuard package:   OpC.mayfield.hp.com
         IP address of the ITO ServiceGuard package: 15.61.36.160
         Version of the ITO ServiceGuard package:    A.05.00
-------> Do you want to continue the configuration (y/n) y
         -------------------------------------------------------
         The additional cluster node is prepared. Don't start any OV/ITO
         processes before the MC/SG package is configured.
         -------------------------------------------------------
NOTE:    While running this script, there occurred no errors or warnings
         -------------------------------------------------------
         For further information see the logfile
         /var/opt/OV/log/OpC/mgmt_sv/opcsw_inst.log. All essential steps are
         also described in the HP OpenView IT/Operations Installation Guide
```

20. Unmount the shared file systems.
    umount /u01
    umount /var/opt/OV/share
    umount /etc/opt/OV/share

21. Deactivate the shared volume group.
    vgchange -a n /dev/vg_ito
    ➔ Volume group “vg_ito” has been successfully changed.

Now both nodes are configured with Oracle and OpenView IT/Operations 5.0.

STEP 8: Configure NNM to run under MC/ServiceGuard. Appendix B contains a white paper that has more information on the details of this configuration.

1. Return to the first node. Activate the shared volume group.
   vgchange -a e /dev/vg_ito
   ➔ Activated volume group in Exclusive Mode.
   Volume group “vg_ito” has been successfully changed.

2. Mount the shared file systems.
   mount /dev/vg_ito/lv_ito_var /var/opt/OV/share
   mount /dev/vg_ito/lv_ito_etc /etc/opt/OV/share
   mount /dev/vg_ito/lv_oracle /u01

3. Edit the file “/etc/opt/OV/share/conf/ov.conf” and set the following values. Remove the comments from the appropriate lines and modify values accordingly.

vi /etc/opt/OV/share/conf/ov.conf
(uncomment/modify the lines that match those below)
USE_LOOPBACK=ON
HOSTNAME=hpsfeclg.mayfield.hp.com
NNM_INTERFACE=15.61.36.160

4. Now comes the sneaky part. Create an ov.conf for each node. NNM uses this file when it runs on that specific node.
   cp /etc/opt/OV/share/conf/ov.conf /etc/opt/OV/share/conf/ov.conf.hpsfeclg
   cp /etc/opt/OV/share/conf/ov.conf /etc/opt/OV/share/conf/ov.conf.hpsfecme

5. Change the "HOSTNAME" variable in the "conf.hpsfecme" file.
   vi /etc/opt/OV/share/conf/ov.conf.hpsfecme
   (change the appropriate line to match below)
   HOSTNAME=hpsfecme.mayfield.hp.com

6. Edit the three authorization files to include approval for both nodes as well as the MC/SG package.

   vi /etc/opt/OV/share/conf/ovw.auth
   (add these lines)
   hpsfecme +
   hpsfeclg +
   OpC +

   vi /etc/opt/OV/share/conf/ovwdb.auth
   (add these lines)
   hpsfecme +
   hpsfeclg +
   OpC +

   vi /etc/opt/OV/share/conf/ovspmd.auth
   (add these lines)
   hpsfecme +
   hpsfeclg +
   OpC +

7. Unmount the shared file systems.
   umount /u01
   umount /var/opt/OV/share
   umount /etc/opt/OV/share

8. Deactivate the shared volume group.
   vgchange -a n /dev/vg_ito
   ➔ Volume group "vg_ito" has been successfully changed.

You have finished the NNM configuration.

STEP 9: Configure the ITO ServiceGuard package.

1. Create the ITO package directory. This name is hard coded into the control scripts.
   mkdir /etc/cmcluster/OpC

2. Go to the ITO package directory.
   cd /etc/cmcluster/OpC

3. Copy the ITO/ServiceGuard package template files into the ITO package directory.

cp /opt/OV/OpC/examples/sg/* .

4. Edit the ITO package ASCII configuration file, "OpC.conf". Enter the values for the environment that this ITO package is running in. The two fields to modify are: NODE_NAME and SUBNET.
   vi /etc/cmcluster/OpC/OpC.conf

```
##############################################################################
#
# File:         OpC.conf
# Description:  HIGH AVAILABILITY PACKAGE CONTROL SCRIPT
#               Template for NNM/ITO package
# Language:     Bourne Shell
# Package:      HP OpenView IT/Operations
#
# (c) Copyright Hewlett-Packard Co. 1993 - 1999
#
##############################################################################
#
# Note: This file MUST be edited before it can be used.
#
# UNCOMMENT the variables as you set them.
#
# *********************************************************************
# ****** HIGH AVAILABILITY PACKAGE CONFIGURATION FILE (template) *******
# *********************************************************************
# ******* Note: This file MUST be edited before it can be used. ********
# * For complete details about package parameters and how to set them, *
# * consult the MC/ServiceGuard or MC/LockManager manpages or manuals. *
# *********************************************************************

# Enter a name for this package.  This name will be used to identify the
# package when viewing or manipulating it.  It must be different from
# the other configured package names.

PACKAGE_NAME                    OpC

# Enter the names of the nodes configured for this package.  Repeat
# this line as necessary for additional adoptive nodes.
# Order IS relevant.  Put the second Adoptive Node AFTER the first
# one.
# Example : NODE_NAME  original_node
#           NODE_NAME  adoptive_node

NODE_NAME hpsfeclg
NODE_NAME hpsfecme

# Enter the complete path for the run and halt scripts.  In most cases
# the run script and halt script specified here will be the same script,
# the package control script generated by the cmmakepkg command.  This
# control script handles the run(ning) and halt(ing) of the package.
# If the script has not completed by the specified timeout value,
# it will be terminated.  The default for each script timeout is
# NO_TIMEOUT.  Adjust the timeouts as necessary to permit full
# execution of each script.
# Note: The HALT_SCRIPT_TIMEOUT should be greater than the sum of
# all SERVICE_HALT_TIMEOUT specified for all services.
```

```
RUN_SCRIPT                      /etc/cmcluster/OpC/OpC.cntl
RUN_SCRIPT_TIMEOUT              NO_TIMEOUT
HALT_SCRIPT                     /etc/cmcluster/OpC/OpC.cntl
HALT_SCRIPT_TIMEOUT             NO_TIMEOUT

# Enter the SERVICE_NAME, the SERVICE_FAIL_FAST_ENABLED and the
# SERVICE_HALT_TIMEOUT values for this package.  Repeat these
# three lines as necessary for additional service names.  All
# service names MUST correspond to the service names used by
# cmrunserv and cmhaltserv commands in the run and halt scripts.
#
# The value for SERVICE_FAIL_FAST_ENABLED can be either YES or
# NO.  If set to YES, in the event of a service failure, the
# cluster software will halt the node on which the service is
# running.  If SERVICE_FAIL_FAST_ENABLED is not specified, the
# default will be NO.
#
# SERVICE_HALT_TIMEOUT is represented in the number of seconds.
# This timeout is used to determine the length of time (in
# seconds) the cluster software will wait for the service to
# halt before a SIGKILL signal is sent to force the termination
# of the service.  In the event of a service halt, the cluster
# software will first send a SIGTERM signal to terminate the
# service.  If the service does not halt, after waiting for the
# specified SERVICE_HALT_TIMEOUT, the cluster software will send
# out the SIGKILL signal to the service to force its termination.
# This timeout value should be large enough to allow all cleanup
# processes associated with the service to complete.  If the
# SERVICE_HALT_TIMEOUT is not specified, a zero timeout will be
# assumed, meaning the cluster software will not wait at all
# before sending the SIGKILL signal to halt the service.
#
# Example: SERVICE_NAME                   DB_SERVICE
#          SERVICE_FAIL_FAST_ENABLED      NO
#          SERVICE_HALT_TIMEOUT           300
#
# To configure a service, uncomment the following lines and
# fill in the values for all of the keywords.
#
#SERVICE_NAME                    <service name>
#SERVICE_FAIL_FAST_ENABLED       <YES/NO>
#SERVICE_HALT_TIMEOUT            <number of seconds>

SERVICE_NAME                    OpC
SERVICE_FAIL_FAST_ENABLED       NO
SERVICE_HALT_TIMEOUT            300

SERVICE_NAME                    NNM
SERVICE_FAIL_FAST_ENABLED       NO
SERVICE_HALT_TIMEOUT            300

# Enter the network subnet name that is to be monitored for this package.
# Repeat this line as necessary for additional subnet names.  If any of
# the subnets defined goes down, the package will be switched to another
# node that is configured for this package and has all the defined subnets
# available.
```

SUBNET 15.61.32.0
All EMS – Resource information have been removed from this example.

```
# The default for PKG_SWITCHING_ENABLED is YES. In the event of a
# failure, this permits the cluster software to transfer the package
# to an adoptive node.  Adjust as necessary.

PKG_SWITCHING_ENABLED         YES

# The default for NET_SWITCHING_ENABLED is YES.  In the event of a
# failure, this permits the cluster software to switch LANs locally
# (transfer to a standby LAN card).  Adjust as necessary.

NET_SWITCHING_ENABLED         YES

# The default for NODE_FAIL_FAST_ENABLED is NO.  If set to YES,
# in the event of a failure, the cluster software will halt the node
# on which the package is running.  Adjust as necessary.

NODE_FAIL_FAST_ENABLED  NO
```

5. Next edit the ITO package control script, OpC.cntl. The only changes that are need are those that are environment specific. Look for the entries that have been boldfaced.

   vi /etc/cmcluster/OpC/OpC.cntl

   ➔

```
##########################################################################
#
# File:         OpC.cntl
# Description:  HIGH AVAILABILITY PACKAGE CONTROL SCRIPT
#               Template for NNM/ITO package
# Language:     Bourne Shell
# Package:      HP OpenView IT/Operations
#
# (c) Copyright Hewlett-Packard Co. 1993 - 1999
#
##########################################################################

#
# Note: This file MUST be edited before it can be used.
#
# UNCOMMENT the variables as you set them.

# Set PATH to reference the appropriate directories.
PATH=/sbin:/usr/bin:/usr/sbin:/etc:/bin

# VOLUME GROUP ACTIVATION:
# Specify the method of activation for volume groups.
# Leave the default ("VGCHANGE="vgchange -a e") if you want volume
# groups activated in exclusive mode. This assumes the volume groups have
# been initialized with 'vgchange -c y' at the time of creation.
#
# Uncomment the first line (VGCHANGE="vgchange -a e -q n"), and comment
# out the default, if your disks are mirrored on separate physical paths,
#
# Uncomment the second line (VGCHANGE="vgchange -a y") if you wish to
# use non-exclusive activation mode. Single node cluster configurations
```

```
# must use non-exclusive activation.
#
# VGCHANGE="vgchange -a e -q n"
# VGCHANGE="vgchange -a y"
VGCHANGE="vgchange -a e"            # Default

# VOLUME GROUPS
# Specify which volume groups are used by this package. Uncomment VG[0]=""
# and fill in the name of your first volume group. You must begin with
# VG[0], and increment the list in sequence.
#
# For example, if this package uses your volume groups vg01 and vg02, enter:
#         VG[0]=vg01
#         VG[1]=vg02
#
# The volume group activation method is defined above. The filesystems
# associated with these volume groups are specified below.
#

#
# NNM/ITO package example - uncomment and change
#
VG[0]="vg_ito"

# FILESYSTEMS
# Specify the filesystems which are used by this package. Uncomment
# LV[0]=""; FS[0]=""; FS_MOUNT_OPT[0]="" and fill in the name of your first
# logical volume, filesystem and mount option for the file system. You must
# begin with LV[0], FS[0] and FS_MOUNT_OPT[0] and increment the list in
# sequence.
#
# For example, if this package uses the file systems pkg1a and pkg1b,
# which are mounted on the logical volumes lvol1 and lvol2 with read and
# write options enter:
#          LV[0]=/dev/vg01/lvol1; FS[0]=/pkg1a; FS_MOUNT_OPT[0]="-o rw"
#          LV[1]=/dev/vg01/lvol2; FS[1]=/pkg1b; FS_MOUNT_OPT[1]="-o rw"
#
# The filesystems are defined as triplets of entries specifying the logical
# volume, the mount point and the mount options for the file system. Each
# filesystem will be fsck'd prior to being mounted. The filesystems will be
# mounted in the order specified during package startup and will be unmounted
# in reverse order during package shutdown. Ensure that volume groups
# referenced by the logical volume definitions below are included in
# volume group definitions above.
#
#LV[0]=""; FS[0]=""; FS_MOUNT_OPT[0]=""

#
# NNM/ITO package example - uncomment and change
#
LV[0]="/dev/vg_ito/lv_oracle"; FS[0]="/u01"; FS_MOUNT_OPT[0]="-o rw"
LV[1]="/dev/vg_ito/lv_ito_etc"; FS[1]="/etc/opt/OV/share"; FS_MOUNT_OPT[1]="-
o rw"
LV[2]="/dev/vg_ito/lv_ito_var"; FS[2]="/var/opt/OV/share"; FS_MOUNT_OPT[2]="-
o rw"

# IP ADDRESSES
```

```
# Specify the IP and Subnet address pairs which are used by this package.
# Uncomment IP[0]="" and SUBNET[0]="" and fill in the name of your first
# IP and subnet address. You must begin with IP[0] and SUBNET[0] and
# increment the list in sequence.
#
# For example, if this package uses an IP of 192.10.25.12 and a subnet of
# 192.10.25.0 enter:
#          IP[0]=192.10.25.12
#          SUBNET[0]=192.10.25.0 # (netmask=255.255.255.0)
#
# Hint: Run "netstat -i" to see the available subnets in the Network field.
#
# IP/Subnet address pairs for each IP address you want to add to a subnet
# interface card.  Must be set in pairs, even for IP addresses on the same
# subnet.
#
IP[0]="15.61.36.160"
SUBNET[0]="15.61.32.0"

#
# NNM/ITO package example - uncomment and change
#
#IP[0]="15.136.123.211"
#SUBNET[0]="15.136.120.0"

# SERVICE NAMES AND COMMANDS.
# Specify the service name, command, and restart parameters which are
# used by this package. Uncomment SERVICE_NAME[0]="", SERVICE_CMD[0]="",
# SERVICE_RESTART[0]="" and fill in the name of the first service, command,
# and restart parameters. You must begin with SERVICE_NAME[0],
SERVICE_CMD[0],
# and SERVICE_RESTART[0] and increment the list in sequence.
#
# For example:
#          SERVICE_NAME[0]=pkg1a
#          SERVICE_CMD[0]="/usr/bin/X11/xclock -display 192.10.25.54:0"
#          SERVICE_RESTART[0]=""  # Will not restart the service.
#
#          SERVICE_NAME[1]=pkg1b
#          SERVICE_CMD[1]="/usr/bin/X11/xload -display 192.10.25.54:0"
#          SERVICE_RESTART[1]="-r 2"   # Will restart the service twice.
#
#          SERVICE_NAME[2]=pkg1c
#          SERVICE_CMD[2]="/usr/sbin/ping"
#          SERVICE_RESTART[2]="-R" # Will restart the service an infinite
#                                  number of times.
#
# Note: No environmental variables will be passed to the command, this
# includes the PATH variable. Absolute path names are required for the
# service command definition.  Default shell is /usr/bin/sh.
#
#SERVICE_NAME[0]=""
#SERVICE_CMD[0]=""
#SERVICE_RESTART[0]=""

SERVICE_NAME[0]="OpC"
SERVICE_CMD[0]="/etc/cmcluster/OpC/ito.mon"
```

```
SERVICE_RESTART[0]="-r 1"

SERVICE_NAME[1]="NNM"
SERVICE_CMD[1]="/etc/cmcluster/OpC/nnm.mon"
SERVICE_RESTART[1]="-r 1"

# DTC manager information for each DTC.
# Example: DTC[0]=dtc_20
#DTC_NAME[0]=

# START OF CUSTOMER DEFINED FUNCTIONS

# This function is a place holder for customer define functions.
# You should define all actions you want to happen here, before the service
is
# started.  You can create as many functions as you need.

function customer_defined_run_cmds
{
        cp /etc/opt/OV/share/conf/ov.conf.`hostname`
/etc/opt/OV/share/conf/ov.conf
        if [ -f /var/opt/OV/tmp/ovpause.lock ]
        then
        rm /var/opt/OV/tmp/ovpause.lock
        fi
        /sbin/init.d/ovoracle start force
        /opt/OV/bin/ovstart -v
        /opt/OV/bin/OpC/ito_start_sgtrapi.sh

        if [ -f  /var/opt/OV/share/tmp/OpC/mgmt_sv/opcprevsgnode ]
        then
          /opt/OV/bin/OpC/opcragt -start `cat
/var/opt/OV/share/tmp/OpC/mgmt_sv/opcprevsgnode`
        fi
}

# This function is a place holder for customer define functions.
# You should define all actions you want to happen here, before the service
is
# halted.

function customer_defined_halt_cmds
{
        /opt/OV/bin/OpC/ito_stop_sgtrapi.sh
        /opt/OV/bin/ovstop -v

        if [ -f /opt/OV/bin/OpC/opcagt ]
        then
          echo "`hostname`" > /var/opt/OV/share/tmp/OpC/mgmt_sv/opcprevsgnode
        else
          if [ -f /var/opt/OV/share/tmp/OpC/mgmt_sv/opcprevsgnode ]
          then
            rm -f /var/opt/OV/share/tmp/OpC/mgmt_sv/opcprevsgnode
          fi
        fi

        /sbin/init.d/ovoracle stop force
```

```
        rm /etc/opt/OV/share/conf/ov.conf
        rm /var/opt/OV/share/databases/openview/ovwdb/ovserver
        if [ -f /var/opt/OV/tmp/ovpause.lock ]
        then
        rm /var/opt/OV/tmp/ovpause.lock
        fi
}

# END OF CUSTOMER DEFINED FUNCTIONS
```
The remainder of this script has been removed to save space.

6. Copy the ITO package control script and the monitor files to the other node in the cluster. You must also make the ITO package directory.
   remsh hpsfecme "mkdir /etc/cmcluster/OpC"
   rcp /etc/cmcluster/OpC/* hpsfecme:/etc/cmcluster/OpC

7. Check the configuration of the ITO package configuration file.
   cmcheckconf -v -P /etc/cmcluster/OpC/OpC.conf

8. Compile the ITO package configuration file.
   cmapplyconf -v –P /etc/cmcluster/OpC/OpC.conf

9. Start the package for the first time. There is sample output from the "OpC.cntl.log" file shown below. This is included for your reference, so that you can see the steps in a clean start of the ITO package.
   cmmodpkg -e OpC

The sample ITO package control script log file:

```
      ############ Node "hpsfecme": Starting package at Thu Mar  4 21:08:25
PST 1999 ############
Mar  4 21:08:25 - "hpsfecme": Activating volume group vg_ito with exclusive
option.
Activated volume group in Exclusive Mode.
Volume group "vg_ito" has been successfully changed.
Mar  4 21:08:26 - Node "hpsfecme": Checking filesystems:
   /dev/vg_ito/lv_oracle
   /dev/vg_ito/lv_ito_etc
   /dev/vg_ito/lv_ito_var
file system is clean - log replay is not required
file system is clean - log replay is not required
file system is clean - log replay is not required
Mar  4 21:08:28 - Node "hpsfecme": Mounting /dev/vg_ito/lv_oracle at /u01
Mar  4 21:08:29 - Node "hpsfecme": Mounting /dev/vg_ito/lv_ito_etc at
/etc/opt/OV/share
Mar  4 21:08:29 - Node "hpsfecme": Mounting /dev/vg_ito/lv_ito_var at
/var/opt/OV/share
Mar  4 21:08:29 - Node "hpsfecme": Adding IP address 15.61.36.160 to subnet
15.61.32.0

LSNRCTL for HPUX: Version 2.3.4.0.0 - Production on 04-MAR-99 21:08:31

Copyright (c) Oracle Corporation 1994.  All rights reserved.

Starting /u01/home/dba/oracle/product/7.3.4/bin/tnslsnr: please wait...
```

```
TNSLSNR for HPUX: Version 2.3.4.0.0 - Production
System parameter file is /etc/listener.ora
Log messages written to
/u01/home/dba/oracle/product/7.3.4/network/log/listener.log
Listening on: (ADDRESS=(PROTOCOL=ipc)(DEV=10)(KEY=openview))
Listening on: (ADDRESS=(PROTOCOL=tcp)(DEV=13)(HOST=15.61.36.160)(PORT=1521))

Connecting to (ADDRESS=(PROTOCOL=IPC)(KEY=openview))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for HPUX: Version 2.3.4.0.0 - Production
Start Date                04-MAR-99 21:08:38
Uptime                    0 days 0 hr. 0 min. 0 sec
Trace Level               off
Security                  OFF
SNMP                      OFF
Listener Parameter File   /etc/listener.ora
Listener Log File
/u01/home/dba/oracle/product/7.3.4/network/log/listener.log
Services Summary...
  openview        has 1 service handler(s)
The command completed successfully
         Oracle database is not running.
         Starting Oracle database ...
         Oracle database started.
 object manager name: OVsPMD
 state:               RUNNING
 PID:                 423
 last message:        -
 exit status:         -

 object manager name: ovsessionmgr
 state:               RUNNING
 PID:                 426
 last message:        Initialization complete.
 exit status:         -

 object manager name: pmd
 state:               RUNNING
 PID:                 428
 last message:        Initialization complete.
 exit status:         -

 object manager name: ovtrapd
 state:               RUNNING
 PID:                 448
 last message:        Initialization complete.
 exit status:         -

 object manager name: ovactiond
 state:               RUNNING
 PID:                 449
 last message:        Initialization complete.
 exit status:         -

 object manager name: ovalarmsrv
```

```
state:               RUNNING
PID:                 450
last message:        Loading alarms from database
exit status:         -

object manager name: ovwdb
state:               RUNNING
PID:                 427
last message:        Initialization complete.
exit status:         -

object manager name: ovdbcheck
state:               RUNNING
PID:                 429
last message:        Connected to embedded database.
exit status:         -

object manager name: ovtopmd
state:               RUNNING
PID:                 451
last message:        Connected to native database "openview".
exit status:         -

object manager name: ovuispmd
state:               RUNNING
PID:                 456
last message:        Initialized. 0 ovw clients registered.
exit status:         -

object manager name: snmpCollect
state:               RUNNING
PID:                 458
last message:        Initialization complete.
exit status:         -

object manager name: netmon
state:               RUNNING
PID:                 457
last message:        Loading databases...
exit status:         -

object manager name: ovalarmsrv
state:               RUNNING
PID:                 450
last message:        Initialization complete.
exit status:         -

object manager name: httpd
state:               unknown
PID:                 -
last message:        (Does not communicate with ovspmd.)
exit status:         -

object manager name: ovoacomm
state:               RUNNING
PID:                 459
last message:        Open Agent Service Server Initialization Complete.
```

```
                     For details about Open Agent Service use 'opcsv'.
 exit status:        -

 object manager name: opc
 state:              RUNNING
 PID:                500
 last message:       ITO Server Initialization Complete.
                     For details about ITO Manager Processes use 'opcsv'.
 exit status:        -

Node hpsfeclg:
Starting OpC services...Done.

Mar  4 21:09:49 - Node "hpsfecme": Starting service OpC using
   "/etc/cmcluster/OpC/ito.mon"
Mar  4 21:09:50 - Node "hpsfecme": Starting service NNM using
   "/etc/cmcluster/OpC/nnm.mon"

      ########### Node "hpsfecme": Package start completed  at Thu Mar  4
21:09:50 PST 1999 ###########
```

APPENDIX A

INSTALLING THE ITO AGENT AND ASSIGNING THE TRAP TEMPLATE IN MC/SERVICEGUARD

INSTALLING THE ITO AGENT AND ASSIGNING THE TRAP TEMPLATE IN SG

At the first startup of the system, the virtual ITO management server is the only configured node to which the trap template: **SNMP 6.0 Traps** is automatically "assigned". For more information, see "Running ITO Agents on SG Cluster Nodes" in the ITO Installation Guide.

Install the ITO agent on SG cluster nodes as follows:

1. Add all physical cluster nodes that are able to run the virtual ITO package to the Node Bank window and assign the template group MC/SG Physical Management Server to these nodes.

NOTE: *Do not assign the trap template directly to the physical SG cluster nodes.*

2. Install the ITO agent software on all physical cluster nodes.

3. Distribute the template group MC/SG Physical Management Server to the physical SG cluster nodes.

4. Ensure that the agents are running on the physical SG cluster nodes.

5. Distribute the pre-configured trap template to the virtual ITO node.

NOTE: *Running the opctrapi event interceptor remotely on a SG cluster node that is not the ITO management server is not supported.*

Change the agent-registration file on all physical SG cluster nodes:

1. Copy the SG agent registration file, enter:

   cp /opt/OV/newconfig/OpC/opt/OV/bin/OpC/install/itoagt_sg.reg /opt/OV/bin/OpC/install/itoagt.reg

2. Replace the agent registration file for SG:

   opcagtreg –add /opt/OV/bin/OpC/install/itoagt.reg

3. Start the agent:

   opcagt –start

If the agents on the cluster nodes are ever upgraded to a higher patch level, you will need to change the agent-registration file again.

Running ITO Agents on SG Cluster Nodes

The concept behind the operation of ITO agents on SG cluster nodes differs slightly from the concept behind the operation of agents in a stand-alone ITO installation. In a SG cluster installation, the ITO management server is not a dedicated physical system. It should be seen more as a virtual node that can be switched from on physical cluster node to another together with the ITO SG package. In addition, each SG cluster node also functions as a normal ITO managed node, which has the following implications:

1. It is not possible to install or de-install the ITO agent on the virtual ITO management server (the SG cluster node on which the ITO package is active). The agent software must instead be installed on all physical SG cluster nodes. As soon as the ITO package is switched to any one of the physical SG cluster nodes, the ITO agent on that node assumes the role of the ITO-management server and holds this special role for as long as the ITO SG package is active on that node.

2. The switch-over of the virtual ITO management server from one SG cluster node to another requires that all templates assigned to the virtual ITO management server's agent also be switched at the same time. However, since the current ITO agents do not support this template switch, it is not possible to assign directly to the virtual ITO management server agent any templates other than the trap template. Rather, all templates except the trap template must be assigned and distributed to all the agents in the SG cluster. ITO provides a dedicated template group for this purpose.

3. The trap template has to be "assigned" to the agent on the virtual ITO management server, which is the SG cluster node on which the ITO package is active. (If the ITO event interceptor ran on all SG cluster nodes, ITO would receive identical SNMP traps from multiple sources, that is; one time from each SG cluster node). The virtual ITO management server and the ITO agents in an ITO SG installation handle the trap template in a special way:
   a. the trap template must be copied to the following directory on the shared disk:

      /etc/opt/OV/share/conf/OpC/mgmt_sv/opcsgtemplates

      After a package switch, the ITO agent running on the SG cluster node where the ITO package is active reads the trap template from this directory rather than from the standard ITO agent configuration. A symbolic link is made from the SG cluster node to the directory on the shared disk during the ITO-package startup.

   b. When the ITO management server starts, it instructs the ITO agent to start the event interceptor.

   c. When the ITO management server stops, it instructs the ITO agent to stop the event interceptor.

APPENDIX B

WHITE PAPER: NETWORK NODE MANAGER AND MC/SERVICEGUARD

The purpose of this document is to present the issues and methodology for improving the availability of network management using Hewlett-Packard's OpenView Network Node Manager (NNM) together with MC/ServiceGuard.

It is important to first understand that the fundamental architecture and databases of NNM have not changed. The conditions under which it was possible to have a corrupted NNM database will exist in the new configuration with MC/ServiceGuard. While a system crash will force the migration of the NNM processes to the surviving system, the crash can still potentially corrupt an NNM database. User precautions and backup techniques previously employed to recover from a corrupt database are still applicable in an NNM configuration with MC/ServiceGuard.

MC/ServiceGuard is only available on HP9000 Series 800 Servers. The configuration information is only applicable to those systems. MC/ServiceGuard information is not applicable to NNM on Series 700 Workstations, SUN Solaris and NT.

In addition, these notes do not address the issue of combining a MC/ServiceGuard configuration of NNM with a MC/ServiceGuard configuration of IT/Operations.

Note: The NNM MC/ServiceGuard enhancements are supported by both the NNM product team and the ITO product teams.

NNM distributed consoles are supported as part of the NNM MC/ServiceGuard enhancements. They are implemented using a combination of MC/ServiceGuard NFS package configuration and a new version of ovw, run on the client, called ovwrs. The details of implementing management consoles are discussed later in the 'Implementation Notes for Network Node Manager and MC/ServiceGuard'.

Users must work with their OpenView Solution Partners to determine whether their NNM applications will function with NNM in a MC/ServiceGuard configuration and whether their NNM applications can also be configured with MC/ServiceGuard.

The changes to NNM to run under MC/ServiceGuard are provided through a consolidated patch. There is no new release number associated with this new functionality.

To ensure a common understanding a brief discussion of the concepts of High Availability and the features and functions of MC/ServiceGuard is provided below. The paper continues with a description of implementing Network Node Manager with MC/ServiceGuard. The description is only provided as a guideline. Special customization is left to the user. The methodology can be applied to either a new installation or an existing configuration. A current implementation of Network Node Manager with all its user and map customizations can be migrated to a MC/ServiceGuard configuration. As always, the user is advised to backup their system and NNM configuration before proceeding with any upgrade.

An Overview of High Availability

Hewlett-Packard's High Availability (HA) solutions seek to reduce the number and length of business application downtime by providing redundant hardware and rapid failover capabilities. HP's HA solutions address the issue of single points of failure (SPOFs) of the system and environment where the failure of any item may cause the entire system to become unavailable. Availability typically does not take into account planned downtime.

Examples of SPOFs include SPU (system processing unit), disks and disk controllers, LAN interface cards and cables, and power connection. These potential SPOFs are removed by clustering SPUs, mirroring and/or using RAID technology, providing redundant LAN interface cards, and attaching UPSs to the system. Clustering also facilitates rolling OS and application upgrades. HA solutions cannot protect against some failures such as bugs in applications and OS panics.

It should be noted that HP's HA solution MC/ServiceGuard does not provide customers with a continuously available system. For further discussion on levels of availability please see Clusters for High Availability: a Primer of HP-UX Solutions by Peter Weygant, Prentice-Hall, 1996.

Goals of High Availability

The primary goal from a HP perspective is to increase the availability of mission critical applications when compared to standard availability, but to do so at a reasonable cost.

An Overview of Network Node Manager and MC/ServiceGuard

The following description is only provided as a brief outline of the features, functions and capabilities of MC/ServiceGuard. MC/ServiceGuard should only be implemented after thorough training. MC/ServiceGuard is a high availability solution that monitors system, process and LAN failures. MC/ServiceGuard supports a configuration of up to 8 systems. However, for the purposes of this paper only a configuration of two systems is considered. The solution is designed around the concept of moving the service point from one system to another. In the event of a failure on one system, the designated processes and LAN connection are moved to a standby (failover) system. To provide access to the applications/processes regardless of the system on which they are running a relocatable IP address is assigned to each set of application resources grouped into a MC/ServiceGuard package. In this case, Network Node Manager processes and volatile data are the package. NNM will use the relocatable IP address to monitor the network and interact with NNM Collection Stations. If the primary system fails, the backup system acquires the relocatable IP address of NNM, activates the shared disks and starts the NNM processes. The shared disks are only accessed by one system at a time (primary or standby system), even though the disks are connected to both systems.

MC/ServiceGuard ensures that the NNM package will run on only one system at a time. The cluster will automatically reconfigure itself when it detects that a system has gone down. Heartbeat messages are exchanged between the primary and failover systems to monitor each other's health. If the two systems cannot communicate with each other via heartbeat messages, the cluster will reform automatically. Each system will attempt to obtain the lock on the designated cluster lock disk (see the MC/ServiceGuard manual for more information on the definition and use of a cluster lock disk). Whichever system gains control of the cluster lock disk will reform itself as a one-system cluster. The other system will crash immediately to prevent two servers from running NNM concurrently.

Package switching occurs when a failure (an interruption of the execution of the NNM package and services, regardless of whether the system continues running) is detected. It is a feature of MC/ServiceGuard that no more than one minute will pass between the detection of a failure and the start of the NNM package's startup scripts on another available system. The time for all the NNM services to be running is dependent on the condition of the NNM database and the normal startup associated with NNM. The NNM package can fail over from either the designated primary system to the designated standby system or vice versa. Refer to the MC/ServiceGuard manual for the details and conditions for automated failover. As stated earlier, if the primary system fails NNM will restart on the standby system. The NNM package will not automatically fail back to the primary system when that system is repaired. Fail back is the responsibility of the administrator of the cluster. Fail back is usually performed during off-hours to minimize interruption of NNM monitoring. Alternatively, NNM can be left running on the standby system. This will effectively reverse the roles of the systems.

When the NNM package is started on either system or is restarted on either system after a failure, NNM daemons are started as they would at boot time on servers not running NNM under MC/ServiceGuard.

Neither MC/ServiceGuard nor NNM require that the two systems have similar values for date and time. However, different time settings may increase the difficulty of debugging the MC/ServiceGuard log files. In addition, NNM puts time stamps into its database files. Different time settings may negatively impact NNM synchronization. For these reasons the use of Network Time Protocol is highly recommended.

MC/ServiceGuard provides a Cluster Manager SNMP subagent. Whenever a cluster is monitored by NNM (whether or not NNM is running on that cluster), this subagent should be enabled on each node in the cluster. This subagent provides NNM with additional information to handle the floating IP address. The subagent is enabled by editing the file /etc/rc.config.d/cmsnmpagt and started by /sbin/init.d/cmsnmpagt. Start the SNMP master agent (/usr/sbin/snmpdm) before the subagent.

Implementation notes for Network Node Manager and MC/ServiceGuard

These implementation notes assume the reader is familiar with HP-UX system administration, Logical Volume Manager, MC/ServiceGuard and Network Node Manager. The configuration of the test cluster is provided in Appendix A of this paper.

Install NNM on both systems in the cluster. It may be possible to maintain a single set of NNM executables in /opt/OV that is shared between the two systems. However, that configuration was not tested and is currently not supported. A single license is required when network licensing is employed. It is beyond the scope of this paper to describe the implementation of a license server in a MC/ServiceGuard configuration. Two licenses are required when nodelock licensing is employed. In this case the second license is purchased at a nominal cost. When configuring NNM with MC/ServiceGuard nodelock licensing is recommended.

NNM should be started and tested on both of the systems at this time. This will ensure that NNM is properly installed on each system. Any NNM discovery or map customization can be done on one system at this time without compromising moving the configuration under MC/ServiceGuard. This also implies that a current implementation of Network Node Manager can be upgraded to a MC/ServiceGuard configuration. Alternatively, the customization can be done after moving to a MC/ServiceGuard configuration. Before proceeding stop the NNM daemons on both systems. NNM operators defined or planned for on one system must be defined on both systems with the same user and group IDs.

The data in /etc/opt/OV/share and /var/opt/OV/share must be available to both systems in the cluster. A volume group and two logical volumes must be created on a shared disk. This disk can also serve as the cluster lock disk. The sizes of these two file systems depend on the your configuration. Refer to the “NNM Performance and Tuning Document” for assistance in this area. These new file systems can be HFS or JFS. JFS file systems are recommended for High Availability configurations, but are not required. It is beyond the scope of this paper to describe the performance differences between these two file system types when used for the NNM data files.

The following procedure is done on the primary system unless otherwise noted. After creating the volume group and file systems and stopping the NNM daemons copy the contents of the two file systems noted earlier to the shared file systems. This copy is done on only one system. Retain file ownership and permissions when doing the copy. The original contents of /etc/opt/OV/share and /var/opt/OV/share can now be deleted. (Note: Had these shared file systems been mounted, NNM could have been installed directly into these shared file systems.) Unmount the shared file systems and remount them on /etc/opt/OV/share and var/opt/OV/share. Restart the NNM daemons to ensure that NNM is still properly functioning. Unmount the shared file systems and deactivate the shared volume group. The original contents of /etc/opt/OV/share and /var/opt/OV/share on the second system can now be deleted. Import the volume group information onto the second system in the cluster. Do NOT attempt to manually activate the shared volume group, mount the shared file systems and try to run NNM on the second system at this time.

A new configuration file (ov.conf) has been added to NNM. This file is applicable to MC/SG and non-MC/SG configurations. This paper only addresses the use of this file in an MC/SG environment. Copy the sample file provided in the patch from /opt/OV/newconfig/OVNNM-RUN/conf /ov.conf to /etc/opt/OV/share/conf/ov.conf. Sample configurations of this file are provided in the Appendix.

There are three fields to be configured in the $OV_CONF/ov.conf file: HOSTNAME, NNM_INTERFACE, USE_LOOPBACK.

HOSTNAME=<>: The value for this field is the actual hostname of the machine currently running NNM. This entry must reflect the hostname, which resolves to the static IP Address of the system on which NNM is currently running.

NNM_INTERFACE=<>: The value for this field is the network IP name or IP address through which NNM discovers and manages the network. In a MC/ServiceGuard configuration, the value for this field is the relocatable IP name or address associated with the NNM package.

USE_LOOPBACK=<>: The value for this field determines whether loopback is enabled (ON or OFF). To maintain backward compatibility the default value for this field is OFF). The recommended value for this field is ON. When set to ON, NNM processes will continue even if all LAN interfaces are down. The entries are position/line independent.

Copy this file to /etc/opt/OV/share/conf/ov.conf.<hostname1> and /etc/opt/OV/share/conf/ov.conf.<hostname2>, where <hostname1> and <hostname2> are the hostnames of the two systems in the cluster. Edit the HOSTNAME field in each of these files to reflect the respective hostname. Two files are necessary since each system has a different hostname. Two files are used to simplify NNM package switching between the systems in the cluster, but automating an edit of a single ov.conf before NNM starts on each system is also acceptable. See the ov.conf(4) man page for a more detailed description of these fields.

Note: if the ov.conf file does not exist, then NNM reverts to its default behavior.

Edit the authorization files /etc/opt/OV/share/conf/ovw.auth, /etc/opt/OV/share/conf/ovwdb.auth and /etc/opt/OV/share/conf/ovspmd.auth (NNM 5.X only) to contain entries for both systems in the cluster and the relocatable IP address name. If LOOPBACK is enabled in ov.conf, then entries for localhost, loopback and loghost must also appear in the authorization files.

Note: The patch installation process, will attempt to update the .auth files to add: localhost, loopback, and loghost. Post-installation; as a precautionary measure, check these files post-installation to ensure that they were properly updated.

Create the MC/ServiceGuard cluster configuration file. A sample cluster configuration file is provided in the Appendix. The cluster configuration file must contain a minimum of two (three are recommended) LAN definitions. Edit the other parameters in the file as normally done for a MC/ServiceGuard configuration.

Create the NNM package configuration file. At this time NNM does not require any special naming convention for the package name or package services. A sample package configuration file is provided in the Appendix. The sample file contains a single service definition. This service is used to monitor the NNM daemons. While a service is recommended it is not a requirement for a successful implementation. The sample file also defines a network for MC/ServiceGuard to monitor. While monitoring the health of the network is recommended it is not a requirement. If this network is unavailable to the system running NNM, the NNM package will gracefully fail over (an ovstop is executed to halt the NNM processes) to the other system (provided it has current access to that network). If neither system has access to the network, the NNM package will gracefully shut down. When a system regains access to the network, the NNM package will restart automatically.

Note: if NNM management consoles are used, an NFS service definition should be added to this file as well.

For example:

```
SERVICE_NAME                    NFS
SERVICE_FAIL_FAST_ENABLED       NO
SERVICE_HALT_TIMEOUT            300
```

Create the NNM run/halt script. A sample script is provided in the Appendix. Use the volume group and file systems described earlier in this paper. Define the relocatable IP address. This must be on the same network defined in the NNM package definition file and must resolve to the same DNS name used in the /etc/opt/OV/share/conf/ov.conf file described earlier. Add the commands:

```
cp /etc/opt/OV/share/conf/ov.conf.`hostname` /etc/opt/OV/share/conf/ov.conf
/opt/OV/bin/ovstart –v
```

to the customer_defined_run_cmds function. The verbose option of ovstart is recommended for debug and troubleshooting but is not required. Add the commands

```
/opt/OV/bin/ovstop –v
```

```
rm /etc/opt/OV/share/conf/ov.conf
rm /var/opt/OV/share/databases/openview/ovwdb/ovserver
```

to the customer_defined_halt_cmds function. The verbose option of ovstop is recommended for debug and troubleshooting but is not required. The removal of the two files is not required, but may facilitate running NNM outside of MC/ServiceGuard. It is recommended that ovwsessions be executed to determine if there are any ovw sessions running. If any sessions are running they should be killed before the ovstop command is issued. Complete the service definition if a service was defined in the package configuration file.

Note: ovwsessions lists all sessions running both locally and on attached ovw management consoles. If the kill option of ovwsessions is used to terminate all ovw sessions and there are attached remote consoles, the ovw sessions running on the remote management consoles will also be gracefully terminated.

A sample service monitor script is provided in the Appendix. Defining one restart of the service is recommended but is not required. The service monitor script checks for the presence of a maintenance file. This is helpful for troubleshooting or making modifications to files in the shared file system. When /tmp/maint_NNM exists, NNM can be safely stopped and restarted without MC/ServiceGuard attempting to restart stopped processes. If a maintenance file is created be sure to delete the file after the modifications are made.

The sample service monitor script checks all the major NNM background daemons. If a daemon is not running the script will attempt to restart it. The ovstart command in this case will only start daemons that are not running; this will not affect running daemons. After the restart, if there are NNM daemons that still are not running, the script will exit. MC/ServiceGuard will either restart the service monitor or gracefully fail over the NNM package to the other system depending on the service definition. Remember to copy this file to both systems in the cluster. Also ensure that the executable properties of the file are retained.

Note: If management consoles are to be used, then the Package script should contain the appropriate NFS directives for exporting the server-shared file systems to the appropriate client machines.

Important Note: If management consoles are implemented the purchase of the MC/ServiceGuard NFS Toolkit is highly recommended. This toolkit contains all the necessary scripts for implementing HA NFS within the cluster. In addition, only a single package in a cluster may be configured with NFS. The processes rpc.statd and rpc.lockd are killed and restarted when the package configured with NFS halts. This will impact any other applications or packages using NFS processes. See the MC/ServiceGuard manual for more details.

For example:

```
# NFS: Specifies all exported NFS directories with export options. The
# directories must be defined in the above mounted file system FS list.
# These variables are used by the command "exportfs -i" to export
# the file systems and the command "exportfs -u" to unexport the file
# systems.
# Example: XFS[0]="-o ro /pkg1"
# Example: XFS[1]="/pkg2"
#
XFS[0]="-o root=robot /etc/opt/OV/share"
XFS[1]="-o root=robot /var/opt/OV/share"
```

The service must also be defined in the Package script.

For example:

```
# NFS MONITOR : If you wish to monitor NFS services,
# uncomment the following three lines, and define
# SERVICE_NAME[1] identically to SERVICE_NAME in the Package configuration file.
#
```

SERVICE_NAME[1]="NFS"
SERVICE_CMD[1]="/etc/cmcluster/nnm/nfs.mon"
SERVICE_RESTART[1]=

Note: When management consoles are used, ovwrs instead of ovw should be run on the client. ovwrs will detect a loss of connection to the server, as would be the case if the package failed between cluster nodes. When the connection to the server is restored ovwrs will restart the ovw session, including the original map if one were used in the first call of ovwrs. The ovw session will restart with the applicable home submap and not the open submap at the time of the failure. For more information see the ovwrs(1) man page.

The run/halt script should also contain scripting for the start and stop of the NFS processes.

When configuring the NNM management consoles, outside of the special considerations for MC/ServiceGuard, all other management console configuration procedures should be followed.

Lastly, when mounting the NFS exported directories, use the floating IP address and/or hostname associated with this address, rather than the hostname associated with the static IP address. When ovw -server is run on the client, it should return the name of the floating IP address.

Use cmcheckconf and cmapplyconf to check and create the cluster configuration binary file and distribute it to the two systems in the cluster. If there are no errors, execute cmruncl to start the cluster.

Maintenance Notes for Network Node Manager and MC/ServiceGuard:

Rolling upgrades of the Operating System, Network Node Manager and MC/ServiceGuard are supported. As always be sure a backup is done before the upgrade. Most NNM patches do not directly affect the files in the shared file systems. However, when applying NNM patches check the log files for errors and warnings. If possible, each system should be patched when the shared file systems are mounted and the NNM daemons are not running (i.e., the NNM package is running in maintenance mode, but the NNM processes are stopped). The following sequence may be used when patching NNM:

Touch /tmp/maint_NNM
Stop all ovw sessions
Stop NNM daemon processes
Remove the ov.conf file
Remove the ovserver file
Install the patch
Restore the applicable ov.conf file for that server
Retstart the NNM daemon process
Remove /tmp/maint_NNM

Third Party Applications integrated with NNM 4.1x for MC/ServiceGuard

No HP integrated applications -- with the exception of ITO – or third party applications such as Bay Networks Optivity were tested with the NNM enhancements for MC/ServiceGuard. Every effort was made to provide backward compatibility for these applications.

NNM and an Oracle Database

Use of Oracle for the NNM topology database is supported in the NNM and MC/ServiceGuard configuration. The Oracle database must be started before running the ovstart command and must be stopped after running the ovstop command. If distributed consoles are connected to the NNM server and the Oracle database; the database must be shut down using either “shutdown immediate” or “shutdown abort”. If a process has the database open, the database will not be shut down using the standard “shutdown” provided in the Oracle dbshut command.

Migration to NNM 6.00

The modifications that affect MC/ServiceGuard in migrating to 6.00 are:

New daemons: ovuispmd, ovalarmsrv, httpd
The file ovpause.lock
Elimination of ovwsessions and ovwlistsessions
Web access

If using the monitor script, the new daemons should be added. See the MUSTRUN variable in the monitor example below.

With the advent of ovpause and ovresume, a file, /var/opt/OV/tmp/ovpause.lock, will be created when a pause (ovpause command) is done. It is possible that in the event of a system failure, the file might still exist, which would bring up the NNM daemons in a paused state the next time that they are started on that system. To eliminate this possibility, there should be a check for this file when the package is run and the halting of the package should remove the file. See the example template for the halt and run commands below.

In the past, the mechanism to stop ovw sessions was to use ovwlistsessions and ovwsessions. This was recommended as part of the halt script for the package. With NNM 6.00, these are not needed as the shutting down of the ovw sessions is controlled by ovuispmd.

For web access, there is a configuration file, /opt/OV/httpd/conf/httpd.conf, which will specify the server name as the physical nodename when the installation is done. For MC/ServiceGuard, the physical nodename should be changed to the fully-qualified logical nodename for the following lines:

ServerAdmin root@spike.cnd.hp.com
Server Name spike.cnd.hp.com

(spike.cnd.hp.com is the fully-qualified logical nodename). For client applications, web access should be done using the logical nodename for all operations.

Appendix

Sample Cluster Configuration File (comments have been removed from the typical configuration file):

```
# **********************************************************************
# ********* HIGH AVAILABILITY CLUSTER CONFIGURATION FILE **********
# **********************************************************************
CLUSTER_NAME                    sg_nnm

FIRST_CLUSTER_LOCK_VG           /dev/vg02

NODE_NAME                       sgtest1
NETWORK_INTERFACE               lan0
HEARTBEAT_IP                    15.2.114.156
NETWORK_INTERFACE               lan1
HEARTBEAT_IP                    192.168.0.2
NETWORK_INTERFACE               lan2
FIRST_CLUSTER_LOCK_PV           /dev/dsk/c0t2d0

NODE_NAME                       sgtest2
NETWORK_INTERFACE               lan0
```

```
HEARTBEAT_IP                    15.2.114.157
NETWORK_INTERFACE               lan1
HEARTBEAT_IP                    192.168.0.1
NETWORK_INTERFACE               lan2
FIRST_CLUSTER_LOCK_PV           /dev/dsk/c0t2d0

HEARTBEAT_INTERVAL3000000
NODE_TIMEOUT                    9000000
AUTO_START_TIMEOUT              600000000
NETWORK_POLLING_INTERVAL        2000000
VOLUME_GROUP                    /dev/vg02
```

Sample NNM Package Configuration File (comments have been removed from the file):

```
# *********************************************************************
# ****** HIGH AVAILABILITY NNM PACKAGE CONFIGURATION FILE   ******
# *********************************************************************

PACKAGE_NAME                    nnm

NODE_NAME                       sgtest1
NODE_NAME                       sgtest2

RUN_SCRIPT                      /etc/cmcluster/nnm/nnm.sh
RUN_SCRIPT_TIMEOUT              NO_TIMEOUT
HALT_SCRIPT                     /etc/cmcluster/nnm/nnm.sh
HALT_SCRIPT_TIMEOUT             NO_TIMEOUT

SERVICE_NAME                    NNM
SERVICE_FAIL_FAST_ENABLED       NO
SERVICE_HALT_TIMEOUT            300

SUBNET                          15.2.112.0
PKG_SWITCHING_ENABLED           YES
NET_SWITCHING_ENABLED           YES
NODE_FAIL_FAST_ENABLED          NO
```

Sample NNM Run/Halt Script (This is only an extract of the areas in the script requiring editing and comments have been removed. This extract does not include the entries for NFS that would be required to support distributed/management consoles.):

```
#!/usr/bin/sh
# *********************************************************************
# ********HA NNM MC/ServiceGuard PACKAGE CONTROL SCRIPT************
# *********************************************************************

# Set PATH to reference the appropriate directories.
PATH=/sbin:/usr/bin:/usr/sbin:/etc:/bin

# VOLUME GROUP ACTIVATION:
VGCHANGE="vgchange -a e"

# VOLUME GROUPS
VG[0]=vg02
```

```
# FILE SYSTEMS
LV[0]="/dev/vg02/etcopt"; FS[0]="/etc/opt/OV/share"
LV[1]="/dev/vg02/varopt"; FS[1]="/var/opt/OV/share"

# IP/Subnet address pairs
IP[0]=15.2.117.182
SUBNET[0]=15.2.112.0

# Service names and commands.
SERVICE_NAME[0]=NNM
SERVICE_CMD[0]="/etc/cmcluster/nnm/nnm.mon"
SERVICE_RESTART[0]="-r 1"

# START OF CUSTOMER DEFINED FUNCTIONS
function customer_defined_run_cmds
{
# ADD customer defined run commands.
        cp /etc/opt/OV/share/conf/ov.conf.`hostname` \
        /etc/opt/OV/share/conf/ov.conf
        if [ -f /var/opt/OV/tmp/ovpause.lock ]
        then
                rm /var/opt/OV/tmp/ovpause.lock
        fi
        /opt/OV/bin/ovstart -v
}

function customer_defined_halt_cmds
{
# ADD customer defined halt commands.
        /opt/OV/bin/ovstop –v
        rm /etc/opt/OV/share/conf/ov.conf
        rm /var/opt/OV/share/databases/openview/ovdb/ovserver
        if [ -f /var/opt/OV/tmp/ovpause.lock ]
        then
                rm /var/opt/OV/tmp/ovpause.lock
        fi
}
```

Sample NNM Monitor Script:

```
#!/usr/bin/sh
# ******************************************************************************
# ************ NNM SERVICE GUARD Monitor Daemon Script *****************
# ******************************************************************************
#
#               MONITOR Shell Script for NNM &
#                   MC/ServiceGuard
#
# This shell script monitors NNM by making sure that the necessary
# NNM background processes are up and running.
#
PATH=/opt/OV/bin:/bin:/usr/bin:$PATH
# Set MUSTRUN to contain names of NNM processes that should be monitored.
MUSTRUN="netmon ovspmd ovtrapd ovwdb ovtopmd ovlmd ovactiond ovrepld ovuispmd ovalarmsrv httpd"
trap "exit " 15
```

```
###############################################################################
# Monitor the NNM processes by making sure that all required processes are running.

while true
do
# Test for the existence of a maintenance file.  If the maintenance
# file exists, the script will not check for NNM processes.
  if [ ! -f /tmp/maint_NNM ]
  then
      for i in $MUSTRUN
      do
            # Check that MUSTRUN processes are running
            ps -ef | grep $i | grep -v grep > /dev/null 2>&1
            if [ $? -eq 1 ]
            then
            # If a process is not running, then rerun ovstart to restart
            # the failed processes.  ovstart will only restart failed
            # processes.
                  /opt/OV/bin/ovstart
                  sleep 5   # wait ovspmd execution of daemon to fail
                  for j in $MUSTRUN
                  do
                        ps -ef | grep $j | grep -v grep > /dev/null 2>&1
                        if [ $? -eq 1 ]
                        # If a process won't run, then exit
                        then
                        echo "Process $j won't run exiting service"
                        exit 1
                        fi
                  done
            fi
      done
  fi
  sleep 30
done

exit 0
```

Sample NNM Configuration Files (/etc/opt/OV/share/conf/ov.conf):

```
#/etc/opt/OV/share/conf/ov.conf.sgtest1
HOSTNAME=sgtest1.cnd.hp.com
NNM_INTERFACE=spike.cnd.hp.com
USE_LOOPBACK=ON

#/etc/opt/OV/share/conf/ov.conf.sgtest2
HOSTNAME=sgtest2.cnd.hp.com
NNM_INTERFACE=spike.cnd.hp.com
USE_LOOPBACK=ON
```

Sample file in /opt/OV/newconfig/OVNNM-RUN/conf:

```
###############################################################################
# For more information on the configuration of the ov.conf file see the  #
# ov.conf(4) man page.                                                    #
```

```
###############################################################################

# uncomment this line to enable loopback communications between NNM server
# processes.
#USE_LOOPBACK=ON

# uncomment this line to specify the system name that NNM is running on
# in a MC/ServiceGuard cluster. The system name on a SG cluster is the
# hostname associated with the static IP Address bound to the LAN interface.
# This option is ONLY for use in a MC/ServiceGuard environment. When NNM
# is not implemented in a SG cluster, this option should NEVER be used.
#HOSTNAME=<hostname>

###############################################################################
# IMPORTANT: uncomment only one of the following two examples.  You can  #
#            specify NNM_INTERFACE as a DNS name OR an IP Address but    #
#            NOT both.  If you uncomment both lines only the first line  #
#            will be used.                                               #
###############################################################################

# uncomment this line and change <DNS name> to the DNS name (or hostname or
NIS
# name) of the interface you want NNM to use for communications.
# Note: if you are in a MC/ServiceGuard environment, this option can be used
# to indicate the <DNS name> of the floating IP Address.
#NNM_INTERFACE=<DNS name>

# uncomment this line and change <nnn.nnn.nnn.nnn> to the IP Address of
# the interface you want NNM to use for communications.
# Note: if you are in a MC/ServiceGuard environment, the IP Address can
# be used to indicate the IP Address of a MC/ServiceGuard floating IP
Address.
#NNM_INTERFACE=<nnn.nnn.nnn.nnn>
```