

Implementing a Weblogic Architecture with High Availability

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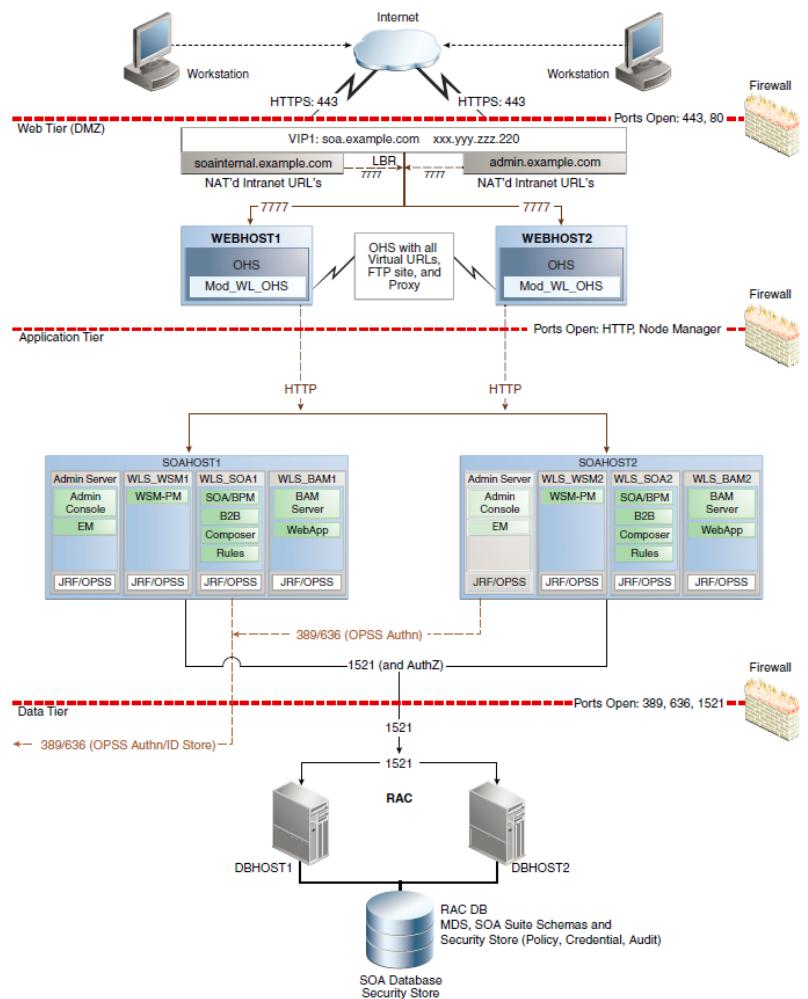
1. Introduction

As a [system administrator](#), I faced the challenge of building several application server architectures with high availability. This kind of work is a challenge because it compromises several layers and professionals. However, one of the most important problems is the lack of documents that allow new system administrators the revision of the whole process. With this in mind, the purpose of this document is to show several of the most important phases to deploy an architecture like this.

2. Topology

2.1. Limitations

Before showing the topology, it is important to remark that this document is based on the design presented in [1]. Thus, the following model is used as a reference.



Architecture designed by Oracle [1]

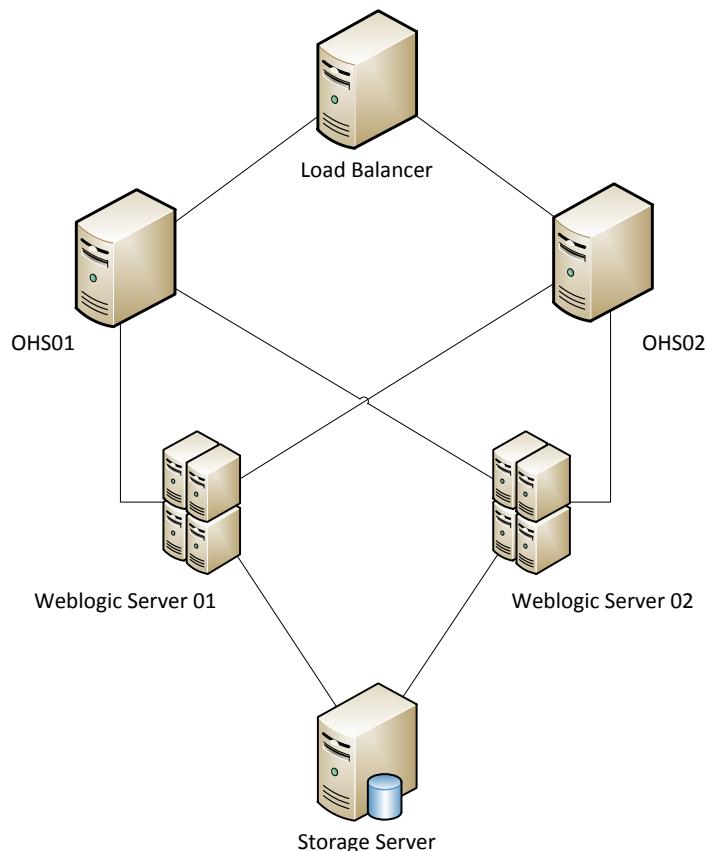
However, because of the resources limitations given by implementing a virtual environment on a laptop. These components will not be used:

- Domain Name Servers
- Firewalls
- The database

In addition, the architecture deployed in this post will not implement Oracle SOA. Thus, this is the topology used in this document.

2.2. Servers diagram

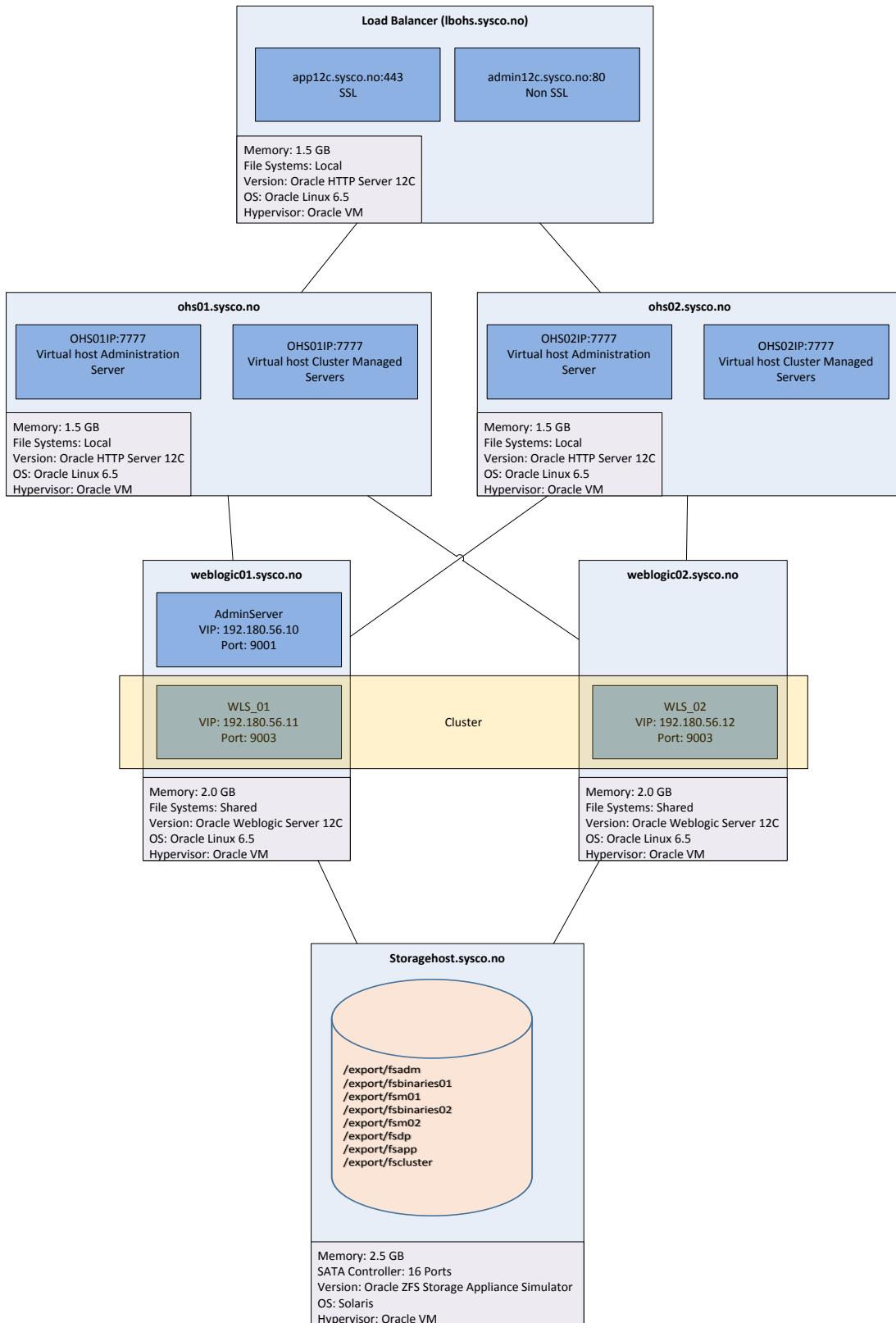
This is a high-level design of the servers used in this document. The load balancer is implemented using Oracle HTTP Server. All the servers shown in the diagram are virtual servers on Oracle VM.



2.3. Weblogic diagram

The following diagram shows more details about the Weblogic architecture implemented in this document. In general, it is composed by

- A load balancer,
- Two web servers,
- An administration server,
- Two managed server conforming a cluster distributed within two machines
- A storage server based on the Oracle ZFS simulator to demonstrate how to configure the architecture using shared storages.



3. Components

This architecture is deployed on a laptop using Oracle Virtual VM and Oracle Linux so these are the components.

3.1. Hardware

Laptop

Memory: 16 GB

Processor: 1 socket, 4 cores and 2 threads so there are 8 VCPUs.

Speed: 2.49 GHz

Virtual servers

SERVER	IP	Description	Memory in GB	OS
lbohs.sysco.no	192.180.56.190	Load balancer	1.5	Oracle Linux 6.5
ohs01.sysco.no	192.180.56.191	Web server	1.5	Oracle Linux 6.5
ohs02.sysco.no	192.180.56.192	Web server	1.5	Oracle Linux 6.5
weblogic01.sysco.no	192.180.56.200	Application server	2.0	Oracle Linux 6.5
weblogic02.sysco.no	192.180.56.201	Application server	2.0	Oracle Linux 6.5
storagehost.sysco.no	192.180.56.100	Storage	2.5	Solaris

File system

It is important to remark that in order to simulate the high availability of the Administration Server the Oracle ZFS simulator is used as a shared storage. In addition binaries and managed servers will be installed on these file systems [2].

3.2. Software

This is the list of products to install.

Product	Version	Installer
Oracle Weblogic Server	12.1.3	V44413-01.zip (fmw_12.1.3.0.0_wls.jar)
Java Development Kit	7u55	jdk-7u55-linux-x64.gz
Oracle HTTP Server	12.1.3	V44417-01.zip (fmw_12.1.3.0.0_ohs_linux64.bin)
Operating System Packages		compat-libcap1-1.10 compat-libstdc++-33-3.2.3 libstdc++-devel gcc-c++ libaio-devel-0.3.107

Before installing review the certification. According to [5] this configuration is supported by Oracle as can be seen in the following screens.

Certified With	Number of Releases / Versions
Operating Systems (9 Items)	
Apple Mac OS X (Intel) (64-bit) (Dev Env Only)	1 Version (10.9)
HP-UX Itanium	1 Version (11.31)
IBM AIX on POWER Systems (64-bit)	2 Versions (7.1, 6.1)
IBM Linux on System z	2 Versions (SLES 11, Red Hat Enterprise Linux 6)
Linux x86-64	7 Versions (SLES 11, Red Hat Enterprise Linux 7, Red Hat Enterprise Linux 6, Red Hat Enterprise Linux 5, Oracle Linux 7, Oracle Linux 6, Oracle Linux 5)
Microsoft Windows x64 (64-bit)	3 Versions (2012 R2, 2012, 2008 R2)
Microsoft Windows x64 (64-bit) (Dev Env Only)	1 Version (7)
Oracle Solaris on SPARC (64-bit)	2 Versions (11, 10)
Oracle Solaris on x86-64 (64-bit)	2 Versions (11, 10)
Application Servers (2 Items)	
Databases (14 Items)	
Desktop Applications, Browsers and Clients (4 Items)	
Directory/LDAP Services (10 Items)	
Enterprise Applications (20 Items)	
Management and Development Tools (7 Items)	
Middleware (35 Items)	
Apache HTTP Server	2 Releases (2.4.4+, 2.2.*)
JD Edwards EnterpriseOne Transaction Server	1 Release (9.1.5.0)
Microsoft Internet Information Services	4 Releases (8.5, 8.0, 7.5, 7.0+)
Oracle API Manager	1 Release (12.1.3.0.0)
Oracle Access Manager	5 Releases (11.1.2.3.0, 11.1.2.2.0, 11.1.2.1.0, 11.1.1.7.0, 11.1.1.5.0)
Oracle Application Integration Architecture Foundation Pack	1 Release (12.1.3.0.0)
Oracle B2B	1 Release (12.1.3.0.0)
Oracle BPM Process Manager	1 Release (12.1.3.0.0)
Oracle Business Activity Monitoring	1 Release (12.1.3.0.0)
Oracle Business Process Management	1 Release (12.1.3.0.0)
Oracle Business Rules	1 Release (12.1.3.0.0)
Oracle Coherence	1 Release (12.1.3.0.0)
Oracle Data Integrator Agent	1 Release (12.1.3.0.0)
Oracle Data Integrator Console	1 Release (12.1.3.0.0)
Oracle Data Service Integrator Console	1 Release (12.1.3.0.0)
Oracle Data Service Integrator IDE	1 Release (12.1.3.0.0)
Oracle Data Service Integrator Server	1 Release (12.1.3.0.0)
Oracle Enterprise Data Quality	1 Release (12.1.3.0.0)
Oracle Enterprise Repository	1 Release (12.1.3.0.0)
Oracle Enterprise Scheduler	1 Release (12.1.3.0.0)
Oracle Event Processing	1 Release (12.1.3.0.0)
Oracle Fusion Middleware	1 Release (12.1.3.0.0)
Oracle Fusion Middleware 12c Infrastructure	1 Release (12.1.3.0.0)
Oracle HTTP Server	3 Releases (12.1.3.6.0, 11.1.1.9.0, 11.1.1.7.0)
Oracle Healthcare Adapter	1 Release (12.1.3.0.0)
Oracle Human Workflow	1 Release (12.1.3.0.0)
Oracle Managed File Transfer	1 Release (12.1.3.0.0)
Oracle MapViewer	1 Release (12.1.3.0.0)
Oracle Mediator	1 Release (12.1.3.0.0)
Oracle JDK 1.7.0_72	
Oracle JDK 1.7.0_71	
Oracle JDK 1.7.0_67	
Oracle JDK 1.7.0_65	
Oracle JDK 1.7.0_60	
Oracle JDK 1.7.0_55	
Apple Mac OS X (Intel) (64-bit) 10.9	Certified
Linux x86-64 SLES 11	Certified
Linux x86-64 Red Hat Enterprise Linux 6	Certified
Linux x86-64 Red Hat Enterprise Linux 5	Certified
Linux x86-64 Oracle Linux 6	Certified
Linux x86-64 Oracle Linux 5	Certified
Microsoft Windows x64 (64-bit) 2012	Certified
Microsoft Windows x64 (64-bit) 7	Certified
Microsoft Windows x64 (64-bit) 2012 R2	Certified
Microsoft Windows x64 (64-bit) 2008 R2	Certified
Oracle Solaris on SPARC (64-bit) 11	Certified

3.3. Domains

The configuration of Oracle HTTP Server 12C is similar to the Weblogic server configuration. In previous versions like 11G Oracle HTTP Server did not need a domain. These domains are defined within this document.

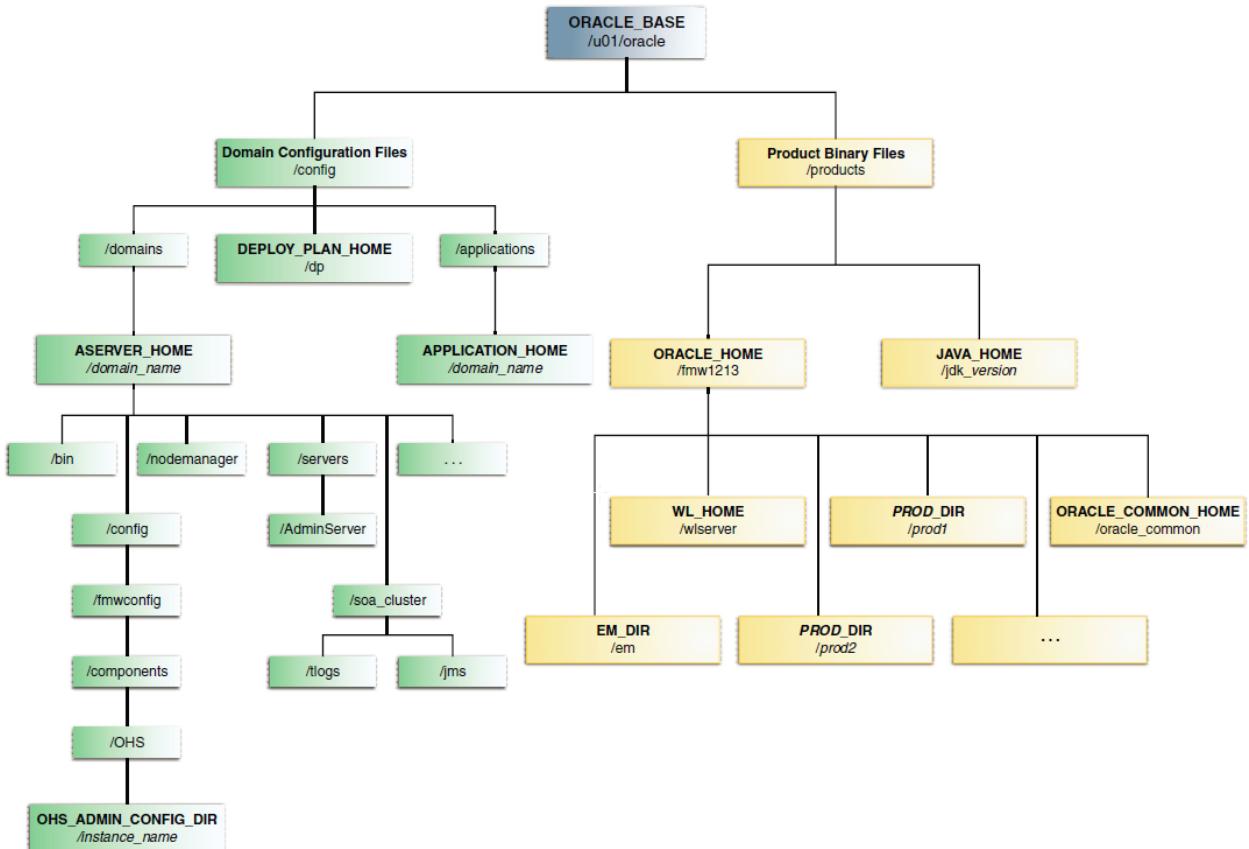
- The load balancer
- The ohs1 as part of the web layer
- The ohs2 as part of the web layer
- The domain for the application layer

All of these domains use the same name “incadomain”

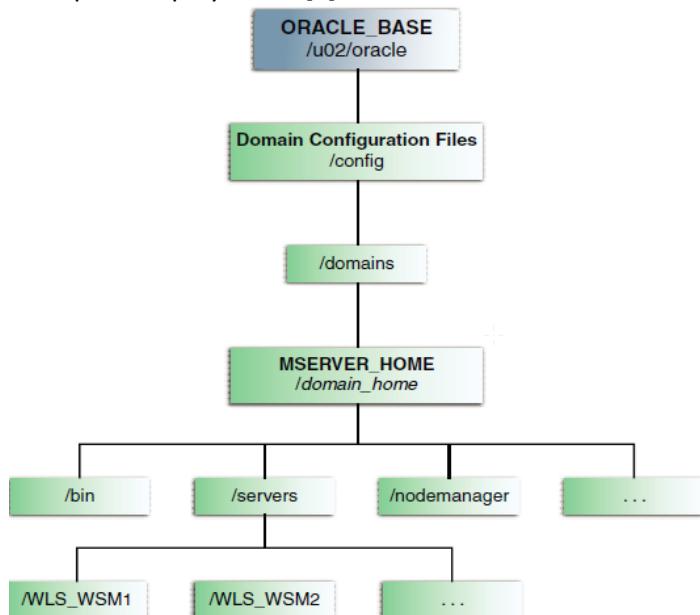
4. File system preparation

According to [1] these is a suitable structure to implement a Weblogic server with high availability.

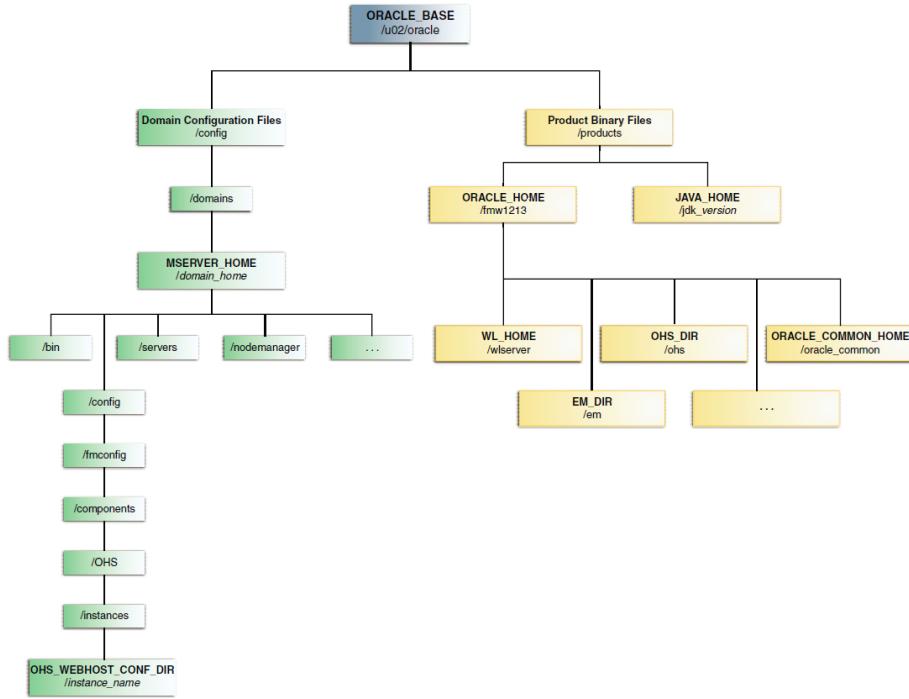
“Recommended Shared Storage Directory Structure for an Enterprise Deployment” [1]



“Recommended Local Storage Directory Structure for an Application Tier Host Computer in an Enterprise Deployment” [1]



"Recommended Local Storage Directory Structure for a Web Tier Host Computer in an Enterprise Deployment" [1]



The difference between the topology developed in this document and that proposed by [1] is that application tier host (managed servers) use shared storages. These are the steps to configure the file systems.

4.1. Oracle ZFS configuration

After analyzing the structures provided by Oracle in [1] and taking into account that managed server will use shared storages. This is the list of file systems created on the Oracle ZFS storage simulator.

File System	MACHINE	DESCRIPTION	U	Comments
fsbinaries01	weblogic01	Products	u01	Products binary files
fsms01	weblogic01	Config	u02	Managed Server
fsbinaries02	weblogic02	Products	u01	Products binary files
fsms02	weblogic02	Config	u02	Managed Server
fsadm	weblogic01 (contingency weblogic02)	Config	u01	Administration Server
fsapp	weblogic01, weblogic02	Applications	u01	Applications developed
fsdp	weblogic01, weblogic02	Deployment plans	u01	Deployment plans
fscluster	weblogic01, weblogic02	JMS, Tlogs	u01	JMS, Tlogs

The recommended protocol to implement this architecture is NFS V4 [2] and the instruction to create these file systems were taken from [3]. Thus, these are the screens related to these tasks.

1. Create a new project

Shares > Projects > Click on Add (+)

The screenshot shows a software interface for managing projects. At the top, there's a navigation bar with tabs: Configuration, Maintenance, Shares (which is selected), Status, and Analytics. Below the navigation bar is a sub-menu with tabs: SHARES, PROJECTS (highlighted with a blue border), ENCRYPTION, and SCHEMA. On the left, there's a sidebar titled 'Projects' with a sub-section 'All Projects'. It shows two items: 'Prueba' and 'default'. In the main content area, there's a table titled 'Projects' with two rows: 'Prueba' and 'default'. To the right of the table, there are columns for 'SIZE', 'CREATION', and 'ENCRYPTED'. At the bottom of the table, there's a 'SHOW ALL : LOCAL : REPLICA' dropdown and a search icon. A mouse cursor is hovering over the 'Add' button in the 'PROJECTS' sub-menu.

In this case the name is middleware100815. Click on Apply



2. Changing the project's properties

Double click on the project that has just created

The screenshot shows a list of projects under the heading 'All Projects'. At the top, it says '+ Projects 3 Total' with a search icon. Below the heading, there's a 'SHOW ALL : LOCAL : REPLICA' dropdown. The main area is a table with columns: NAME, SIZE, CREATION, and ENCRYPTED. It lists three projects: 'Prueba', 'default', and 'middleware100815'. The 'middleware100815' row is highlighted with a blue background. To the right of the table, there are edit and delete icons. A mouse cursor is hovering over the 'middleware100815' row.

Click on Protocols > NFS Exceptions

▶ middleware10... I Shares General Protocols

middleware/local/middleware100815

NFS

192.180.56.100:/export

Share mode	Read/write
Disable setuid/setgid file creation	<input type="checkbox"/>
Prevent clients from mounting subdirectories	<input type="checkbox"/>
Anonymous user mapping	nobody
Character set	default
Security mode	System Authentication

NFS Exceptions

Add item No exceptions defined. Click the + button above to add a new exception.

Adding servers that will access to the storage

NFS

192.180.56.100:/export

Share mode	Read/write
Disable setuid/setgid file creation	<input type="checkbox"/>
Prevent clients from mounting subdirectories	<input type="checkbox"/>
Anonymous user mapping	nobody
Character set	default
Security mode	System Authentication

NFS Exceptions

TYPE	ENTITY	SHARE MODE	CHARSET	ROOT ACCESS
Network	192.180.56.200/24	Read/write	default	<input checked="" type="checkbox"/>
Network	192.180.56.201/24	Read/write	default	<input checked="" type="checkbox"/>

3. Creating file systems

Click on Shares > Filesystems

Configuration Maintenance Shares Status Plugins

SHARES PROJECTS ENCRYPTION SCHEMA

Projects middleware10... I 1 Shares General Protocols Access Snapshots Replication

Usage 0.0% of 29.3G 2 Filesystems LUNs 0 Total

Referenced data 31K
Total space 31K

No filesystems defined. Click the + button above to add a filesystem.

Fill this form in a similar way and click on Apply.

Create Filesystem

CANCEL APPLY

Project	middleware100815
Name	fsbinaries01
Data migration source	None
User	nobody
Group	other
Permissions	<input checked="" type="radio"/> R W X <input type="radio"/> R W X <input type="radio"/> R W X User Group Other <input type="radio"/> Use Windows default permissions
Inherit mountpoint	<input checked="" type="checkbox"/>
Mountpoint	
Reject non UTF-8	<input checked="" type="checkbox"/>
Case sensitivity	Mixed
Normalization	None
Encryption	Off
Inherit key	<input type="checkbox"/>
Key	<input type="radio"/> Local <input type="radio"/> OKM

At the end this the list of file systems created.

Filesystems LUNs 8 Total

SHOW ALL : LOCAL : REPLICA

NAME	SIZE	MOUNTPOINT	ENCRYPTED
middleware100815 /fsadm	31K	/export/fsadm	
middleware100815 /fsapp	31K	/export/fsapp	
middleware100815 /fsbinaries01	31K	/export/fsbinaries01	
middleware100815 /fsbinaries02	31K	/export/fsbinaries02	
middleware100815 /fscluster	31K	/export/fscluster	
middleware100815 /fsdp	31K	/export/fsdp	
middleware100815 /fsm01	31K	/export/fsm01	
middleware100815 /fsm02	31K	/export/fsm02	

In this section, the file systems were created on the shared storage. In further activities they will be mounted on weblogic01.sysco.no and weblogic02.sysco.no.

4.2. Local storage configuration

The load balancer and web layer use Oracle HTTP Server so they are installed on local disks. In order to avoid competition with the Operating System an additional virtual disk is added for each one of the following servers.

- lbohs.sysco.no
- ohs01.sysco.no
- ohs02.sysco.no

These virtual disks has to be formatted and mounted on each one of these machines. For example, lbohs.sysco.no has



In order to format that disk, you have to use the root user to run:

```
fdisk /dev/sdb
```

The same procedure is applied on ohs01.sysco.no and ohs02.sysco.no.

5. Machines preparation

This section includes the activities done on the machines in order to support the installation of configuration of the topology.

5.1. Networking configuration

As was stated in 2.1 there is not a DNS so machine names have to be registered in the hosts files.

SERVER	IP	Description
Ibohs.sysco.no	192.180.56.190	Load balancer
ohs01.sysco.no	192.180.56.191	Web server
ohs02.sysco.no	192.180.56.192	Web server
weblogic01.sysco.no	192.180.56.200	Application server
weblogic02.sysco.no	192.180.56.201	Application server
storagehost.sysco.no	192.180.56.100	Storage

In addition, a set of virtual IPs are used to implement the Administration Server high availability and the possibility of configuring whole server migration. Just to remember “A *virtual IP address is an unused IP Address which belongs to the same subnet as the host's primary IP address. It is assigned to a host manually. Individual Managed Servers within the Oracle WebLogic Server domain are configured to listen on this IP Address.*” [1]. This is the list of virtual IPs.

Machine	Virtual IP	Virtual host name	Weblogic server	Comments
weblogic01.sysco.no	192.180.56.10	admvhost.sysco.no	AdminServer	Administration server
weblogic01.sysco.no	192.180.56.11	ms01vhost.sysco.no	WLS_01	Managed server 01
weblogic02.sysco.no	192.180.56.12	ms02vhost.sysco.no	WLS_02	Managed server 02

Furthermore, two additional virtual IPs are defined to create a load balancer.

Machine	Virtual IP	Virtual host name	Comments
Ibohs.sysco.no	192.180.56.20	admin12c.sysco.no	Administration server requests
Ibohs.sysco.no	192.180.56.21	app12c.sysco.no	Applications requests

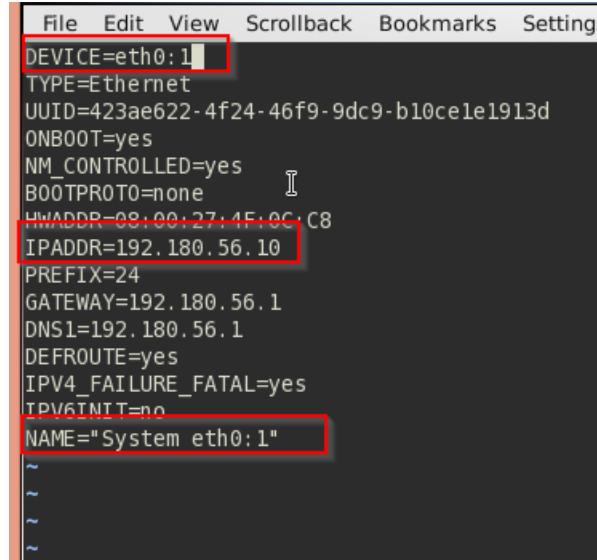
5.1.1. Configuring virtual IPs

According to the previous section, this is the configuration for each server.

For weblogic01.sysco.no

```
cd /etc/sysconfig/network-scripts  
cp ifcfg-eth0 ifcfg-eth0\:1  
vi ifcfg-eth0\:1
```

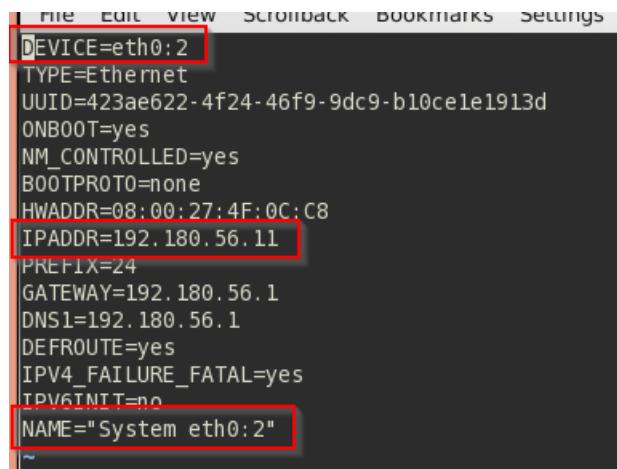
Modify the file according to this picture to set the DEVICE, IPPADDR and NAME.



```
File Edit View Scrollback Bookmarks Settings  
DEVICE=eth0:1  
TYPE=Ethernet  
UUID=423ae622-4f24-46f9-9dc9-b10ce1e1913d  
ONBOOT=yes  
NM_CONTROLLED=yes  
BOOTPROTO=none  
HWADDR=08:00:27:4F:0C:C8  
IPADDR=192.180.56.10  
PREFIX=24  
GATEWAY=192.180.56.1  
DNS1=192.180.56.1  
DEFROUTE=yes  
IPV4_FAILURE_FATAL=yes  
IPV6INIT=no  
NAME="System eth0:1"  
~  
~  
~  
~
```

```
cd /etc/sysconfig/network-scripts  
cp ifcfg-eth0 ifcfg-eth0\:2  
vi ifcfg-eth0\:2
```

Modify the file according to this picture to set the DEVICE, IPPADDR and NAME.



```
File Edit View Scrollback Bookmarks Settings  
DEVICE=eth0:2  
TYPE=Ethernet  
UUID=423ae622-4f24-46f9-9dc9-b10ce1e1913d  
ONBOOT=yes  
NM_CONTROLLED=yes  
BOOTPROTO=none  
HWADDR=08:00:27:4F:0C:C8  
IPADDR=192.180.56.11  
PREFIX=24  
GATEWAY=192.180.56.1  
DNS1=192.180.56.1  
DEFROUTE=yes  
IPV4_FAILURE_FATAL=yes  
IPV6INIT=no  
NAME="System eth0:2"  
~
```

For weblogic02.sysco.no

```
cd /etc/sysconfig/network-scripts  
cp ifcfg-eth0 ifcfg-eth0\:1
```

```
vi ifcfg-eth0:1
```

```
DEVICE=eth0:1
TYPE=Ethernet
UUID=423ae622-4f24-46f9-9dc9-b10ce1e1913d
ONBOOT=yes
NM_CONTROLLED=yes
BOOTPROTO=none
HWADDR=08:00:27:4F:0C:C8
IPADDR=192.180.56.12
PREFIX=24
GATEWAY=192.180.56.1
DNS1=192.180.56.1
DEFROUTE=yes
IPV4_FAILURE_FATAL=yes
IPV6INIT=no
NAME="System eth0:1"
~
```

For lbohs.sysco.no

The same steps are executed, these are the results.

```
File Edit View Scrollback Bookmarks Set
DEVICE=eth0:1
TYPE=Ethernet
UUID=423ae622-4f24-46f9-9dc9-b10ce1e1913d
ONBOOT=yes
NM_CONTROLLED=yes
BOOTPROTO=none
HWADDR=08:00:27:4F:0C:C8
IPADDR=192.180.56.20
PREFIX=24
GATEWAY=192.180.56.1
DNS1=192.180.56.1
DEFROUTE=yes
IPV4_FAILURE_FATAL=yes
IPV6INIT=no
NAME="System eth0:1"
~
```

```
File Edit View Scrollback Bookmarks Set
DEVICE=eth0:2
TYPE=Ethernet
UUID=423ae622-4f24-46f9-9dc9-b10ce1e1913d
ONBOOT=yes
NM_CONTROLLED=yes
BOOTPROTO=none
HWADDR=08:00:27:4F:0C:C8
IPADDR=192.180.56.21
PREFIX=24
GATEWAY=192.180.56.1
DNS1=192.180.56.1
DEFROUTE=yes
IPV4_FAILURE_FATAL=yes
IPV6INIT=no
NAME="System eth0:2"
~
```

5.1.2. Modifying host files

In this section host files are modified because of the lack of a DNS server. These are the results.

lbohs.sysco.no

```
[root@lbohs ~]# cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6
192.180.56.190 lbohs.sysco.no
192.180.56.191 ohs01.sysco.no
192.180.56.192 ohs02.sysco.no
192.180.56.20 admin12c.sysco.no
192.180.56.21 appl12c.sysco.no
[root@lbohs ~]#
```

ohs01.sysco.no

```
[root@ohs01 network-scripts]# cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6
192.180.56.191 ohs01.sysco.no
192.180.56.190 lbohs.sysco.no
192.180.56.192 ohs02.sysco.no
192.180.56.200 weblogic01.sysco.no
192.180.56.201 weblogic02.sysco.no
192.180.56.10 admvhost.sysco.no
192.180.56.11 ms01vhost.sysco.no
192.180.56.12 ms02vhost.sysco.no
192.180.56.20 admin12c.sysco.no
192.180.56.21 appl12c.sysco.no
```

ohs02.sysco.no

```
[root@ohs02 ~]# cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6
192.180.56.192 ohs02.sysco.no
192.180.56.190 lbohs.sysco.no
192.180.56.191 ohs01.sysco.no
192.180.56.200 weblogic01.sysco.no
192.180.56.201 weblogic02.sysco.no
192.180.56.10 admvhost.sysco.no
192.180.56.11 ms01vhost.sysco.no
192.180.56.12 ms02vhost.sysco.no
192.180.56.20 admin12c.sysco.no
192.180.56.21 appl12c.sysco.no
```

weblogic01.sysco.no

```
[root@weblogic01 network-scripts]# cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6
192.180.56.201 weblogic02.sysco.no
192.180.56.200 weblogic01.sysco.no
192.180.56.191 ohs01.sysco.no
192.180.56.192 ohs02.sysco.no
192.180.56.100 storagehost.sysco.no
192.180.56.10 admvhost.sysco.no
192.180.56.11 ms01vhost.sysco.no
192.180.56.12 ms02vhost.sysco.no
192.180.56.20 admin12c.sysco.no
192.180.56.21 appl2c.sysco.no
```

weblogic02.sysco.no

```
[root@weblogic02 network-scripts]# cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6
192.180.56.201 weblogic02.sysco.no
192.180.56.200 weblogic01.sysco.no
192.180.56.191 ohs01.sysco.no
192.180.56.192 ohs02.sysco.no
192.180.56.100 storagehost.sysco.no
192.180.56.10 admvhost.sysco.no
192.180.56.11 ms01vhost.sysco.no
192.180.56.12 ms02vhost.sysco.no
192.180.56.20 admin12c.sysco.no
192.180.56.21 appl2c.sysco.no
```

5.2. Creating directories

In section 4, a distribution of directories is shown. These directories are implemented locally for web servers and on shared storages for application servers. These are the directories created in this document using the root user.

For weblogic01.sysco.no

```
/u01/oracle/config
/u01/oracle/products
/u02/oracle/config
/u01/oracle/config/dp
/u01/oracle/config/applications/incadomain
```

For weblogic02.sysco.no

```
/u02/oracle/config
/u01/oracle/products
/u01/oracle/config/dp
/u01/oracle/config/applications/incadomain
/u01/oracle/config/domains/incadomain/incacluster
```

For lbohs.sysco.no, ohs01.sysco.no and ohs02.sysco.no

```
/u02/oracle/config  
/u02/oracle/products  
/u02/oracle/config/domains  
/u02/oracle/config/domains/incadomain
```

5.3. Mounting file systems

In this section, the process of mounting file systems is show for each one of the machines. These activities are executed using the root user.

For weblogic01.sysco.no

Modify the /etc/fstab file to include these lines

```
#  
# /etc/fstab  
# Created by anaconda on Mon Aug 3 09:42:37 2015  
#  
# Accessible filesystems, by reference, are maintained under '/dev/disk'  
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info  
#  
/dev/mapper/vg_weblogic01-lv_root / ext4 defaults 1 1  
UUID=ad237def-badd-44a8-a182-a6c30d029db9 /boot ext4 defaults 1 2  
/dev/mapper/vg_weblogic01-lv_swap swap swap defaults 0 0  
tmpfs /dev/shm tmpfs defaults 0 0  
devpts /dev/pts devpts gid=5,mode=620 0 0  
sysfs /sys sysfs defaults 0 0  
proc /proc proc defaults 0 0  
storagehost.sysco.no:/export/fsadm /u01/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp  
storagehost.sysco.no:/export/fsbinaries01 /u01/oracle/products nfs4 rw,bg,hard,nointr,proto=tcp  
storagehost.sysco.no:/export/fsm01 /u02/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp  
storagehost.sysco.no:/export/fsdp /u01/oracle/config/dp nfs4 rw,bg,hard,nointr,proto=tcp  
storagehost.sysco.no:/export/fsapp /u01/oracle/config/applications/incadomain nfs4 rw,bg,hard,nointr,proto=tcp
```

**IMPORTANT: For weblogic01.sysco.no the folder
/u01/oracle/config/domains/incadomain/incipcluster will be created after creating the
Domain. For that reason, in the previous picture, there is not any reference to the cluster
folder**

Execute this command

```
mount -a
```

For weblogic02.sysco.no

Modify the /etc/fstab file to include these lines

```

#
# /etc/fstab
# Created by anaconda on Mon Aug  3 09:42:37 2015
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/vg_weblogic01-lv_root /           ext4  defaults      1 1
UUID=ad237def-badd-44a8-a182-a6c30d029db9 /boot   ext4  defaults      1 2
/dev/mapper/vg_weblogic01-lv_swap swap     swap   defaults      0 0
tmpfs          /dev/shm        tmpfs  defaults      0 0
devpts         /dev/pts        devpts  gid=5,mode=620  0 0
sysfs          /sys           sysfs   defaults      0 0
proc            /proc          proc    defaults      0 0
storagehost.sysco.no:/export/fsbinaries02 /u01/oracle/products nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsm02 /u02/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsdp /u01/oracle/config/dp nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsapp /u01/oracle/config/applications/incadomain nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fscluster /u01/oracle/config/domains/incadomain incacluster nfs4 rw,bg,hard,nointr,proto=tcp

```

IMPORTANT: For weblogic02.sysco.no the cluster folder can be mounted without any problem as is shown in the previous picture. That is because in that machine the domain will be unpacked on /u02/oracle/config

Execute this command

```
mount -a
```

For ohs01.sysco.no, ohs02.sysco.no and lbohs.sysco.no

Modify the /etc/fstab file to include the remarked line.

```

#
# /etc/fstab
# Created by anaconda on Mon Aug  3 09:42:37 2015
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/vg_weblogic01-lv_root /           ext4  defaults      1 1
UUID=ad237def-badd-44a8-a182-a6c30d029db9 /boot   ext4  defaults      1 2
/dev/mapper/vg_weblogic01-lv_swap swap     swap   defaults      0 0
tmpfs          /dev/shm        tmpfs  defaults      0 0
devpts         /dev/pts        devpts  gid=5,mode=620  0 0
sysfs          /sys           sysfs   defaults      0 0
proc            /proc          proc    defaults      0 0
/dev/sdb1       /u02/oracle    ext4  defaults      0 0
~
```

Execute this command

```
mount -a
```

5.4. Creating users, groups and giving privileges

In this section the oracle user and groups dba and oinstall are created. In addition, privileges for users and groups are given.

5.4.1. Creating operating system users and groups

According to [1] the oracle user and the groups called dba and oinstall must be created on each node. In addition, these users and groups must have the same ID in each machine.

This table shows users and groups:

Name	Type	ID
oracle	User	501
oinstall	Group	502
dba	Group	503

Oracle will be member of oinstall and dba groups where oinstall is the main group.

Execute these commands on all the nodes: ohs01.sysco.no, ohs02.sysco.no, weblogic01.sysco.no, weblogic02.sysco.no, lbohs.sysco.no to create the user and groups [4].

```
groupadd -g 502 oinstall
groupadd -g 503 dba
useradd -c "Oracle software owner" -g oinstall -G dba oracle -u 501
passwd oracle
```

5.4.2. **Setting privileges**

In this section privileges are set for each server

lbohs.sysco.no

```
chown -R oracle:oinstall /u02/oracle
chmod -R 775 /u02/oracle
ls -ld /u02/oracle
```

ohs1.sysco.no

```
chown -R oracle:oinstall /u02/oracle
chmod -R 775 /u02/oracle
ls -ld /u02/oracle
```

ohs2.sysco.no

```
chown -R oracle:oinstall /u01/oracle
chmod -R 775 /u01/oracle
ls -ld /u01/oracle
```

weblogic01.sysco.no

```
chown -R oracle:oinstall /u01/oracle
chmod -R 775 /u01/oracle
ls -ld /u01/oracle
```

```
chown -R oracle:oinstall /u02/oracle
chmod -R 775 /u02/oracle
ls -ld /u02/oracle
```

weblogic02.sysco.no

```
chown -R oracle:oinstall /u01/oracle
chmod -R 775 /u01/oracle
ls -ld /u01/oracle
```

```
chown -R oracle:oinstall /u02/oracle
chmod -R 775 /u02/oracle
ls -ld /u02/oracle
```

6. Products Installation

6.1. JDKs

Previously 2 file systems (fsbinaries01 and fsbinaries02) were defined in order to install products. In this case we will work on this part of the file system. In addition, three local systems were defined for the web layer and balancer.

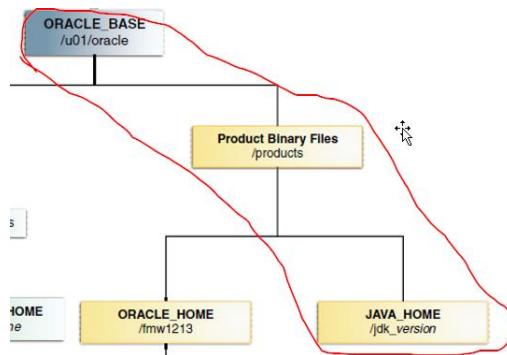


Figure that shows the path where JDK is installed

Machine	Mount Point	NFS
weblogic01.sysco.no	/u01/oracle/products	/export/fsbinaries01
weblogic02.sysco.no	/u01/oracle/products	/export/fsbinaries02
lbohs.sysco.no	/u02/oracle/products	Local file system
ohs01.sysco.no		
ohs02.sysco.no		

Table of file systems where products will be installed

In order to install the JDK execute these steps on weblogic01.sysco.no, weblogic02.sysco.no, lbohs.sysco.no, ohs01.sysco.no and ohs02.sysco.no.

- Login with the Oracle user
- Go to the directory where the product will be installed

```
cd /u0[1|2]/oracle/products/
```

- Unpack the installer

```
tar zxvf [Installer path]/jdk-7u55-linux-x64.gz
```

6.2. Weblogic

This product is installed on weblogic01 and weblogic02. Execute the following steps in both machines.

Important: Take into account each server uses different storages to store products. Thus, copying inventories between servers is not necessary.

- a. Create the ORACLE_HOME directory

```
mkdir /u01/oracle/products/fml213
```

- b. Set the JDK variables

```
export JAVA_HOME=/u01/oracle/products/jdk1.7.0_55  
export PATH=$JAVA_HOME/bin:$PATH
```

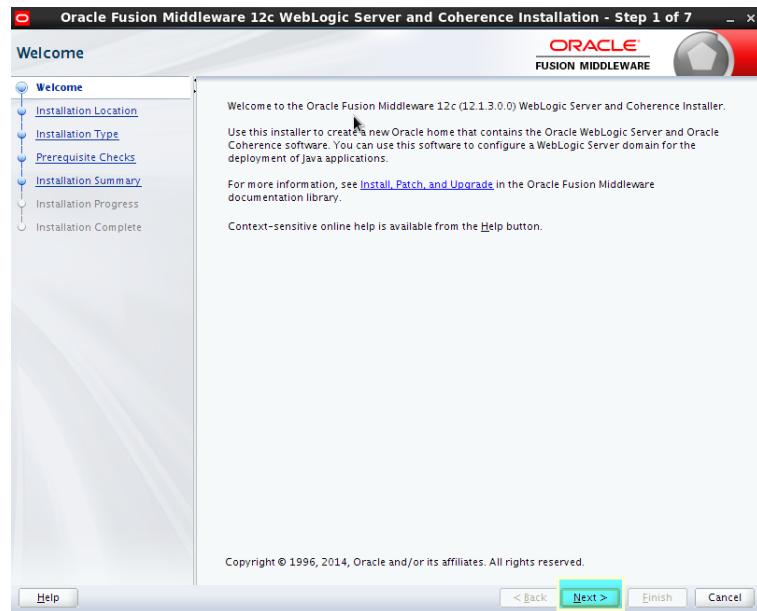
- c. Run the weblogic installer.

```
java -d64 -jar [Installer path]/fmw_12.1.3.0.0_wls.jar
```

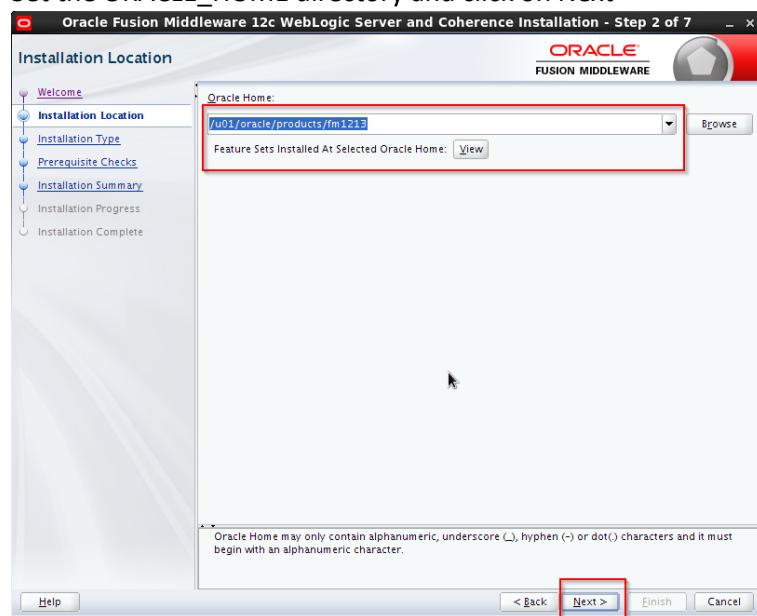
- d. Select the inventory directory, the OS group and click on Ok



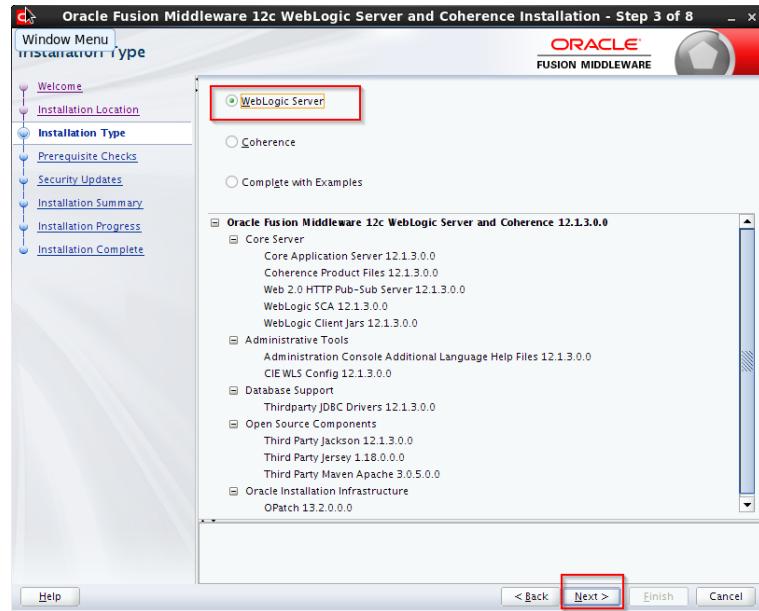
- e. Click on Next



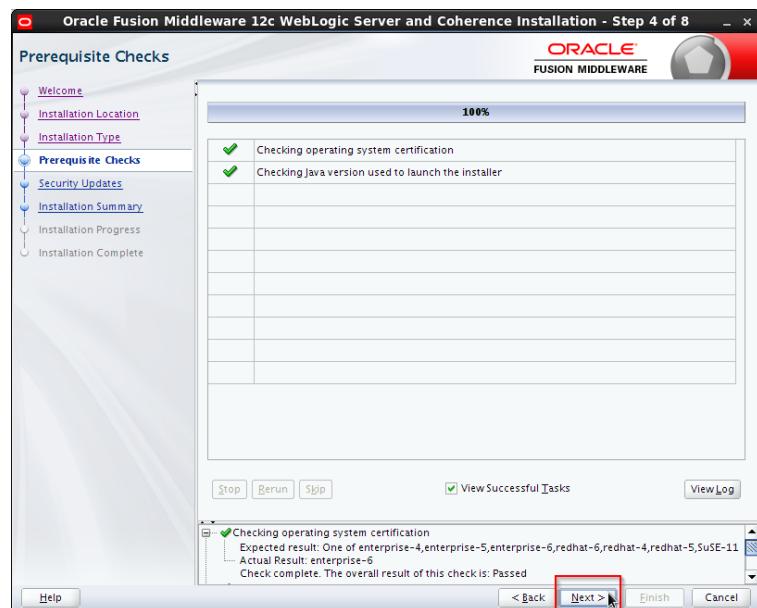
- f. Set the ORACLE_HOME directory and click on Next



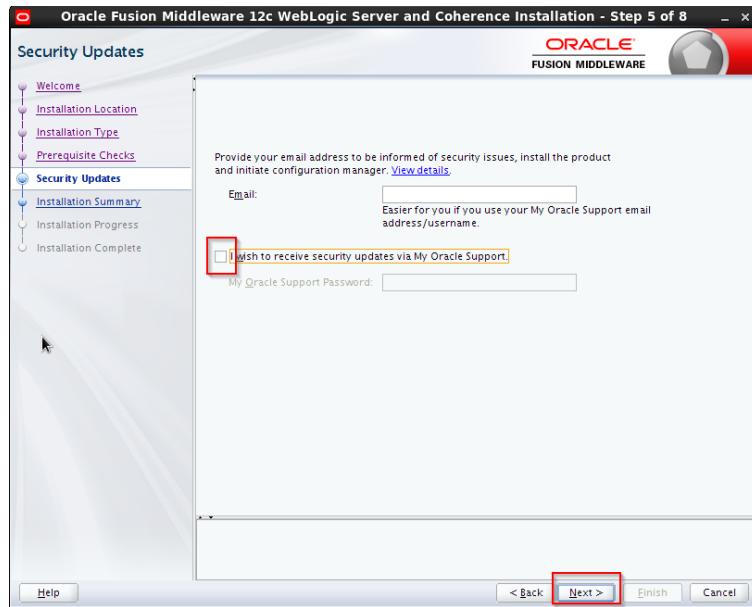
- g. Select Weblogic Server and click on Next



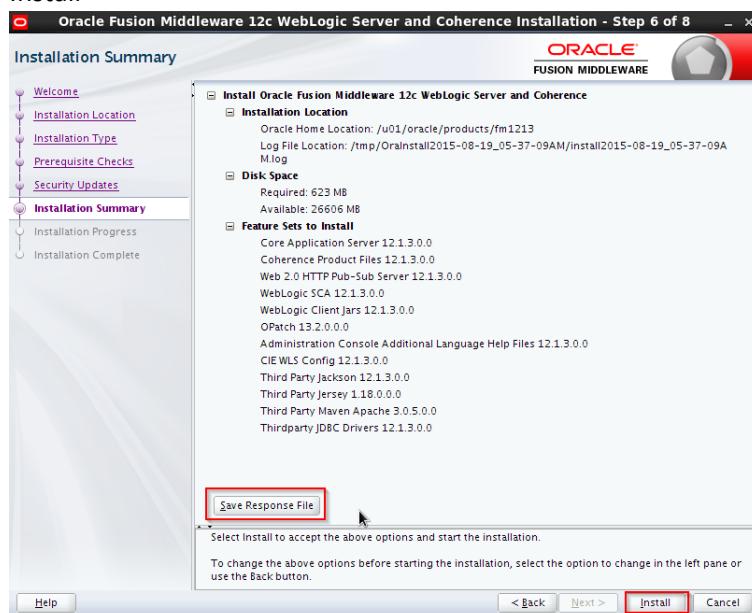
h. Click on Next



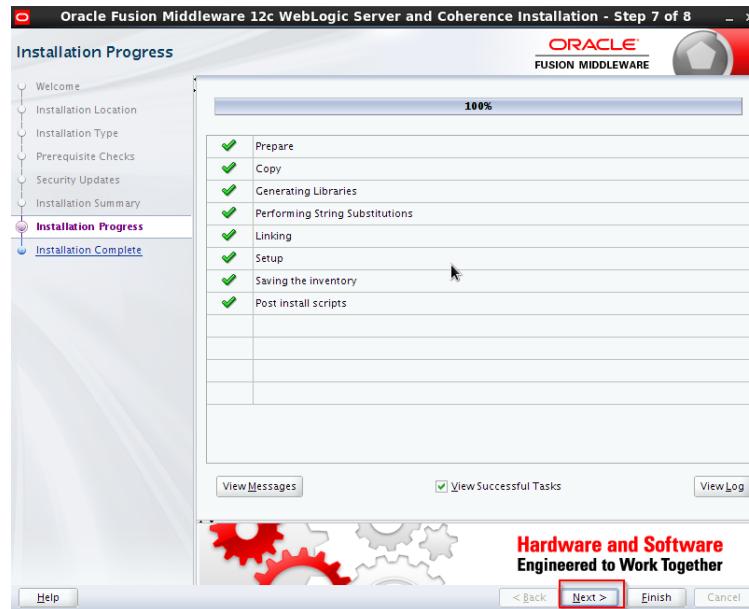
i. Uncheck the checkbox and click on Next



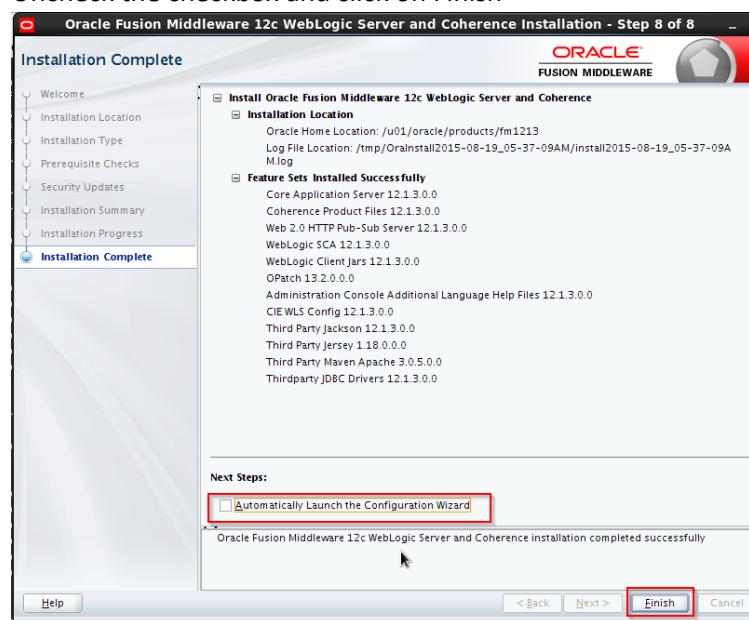
- j. Click on Save Response File (it will be useful to automate future installations) and click on Install



- k. Click on Next



I. Uncheck the checkbox and click on Finish



m. Make a backup of the installation

6.3. Oracle Http Server

This product is installed on ohs01.sysco.no, ohs02.sysco.no and lbohs.sysco.no. Execute the following steps in these machines.

a. Use the root user account to install operating system packages.

```

yum install compat-libcap1-1.10
yum install compat-libstdc++-33-3.2.3
yum install libstdc++-devel
yum install gcc-c++

```

```
yum install libaio-devel-0.3.107
```

- b. After installing operating system packages, use the oracle user account to create the ORACLE_HOME.

```
mkdir /u02/oracle/products/fm1213
```

- c. Execute the installer

```
./fmw_12.1.3.0.0_ohs_linux64.bin
```

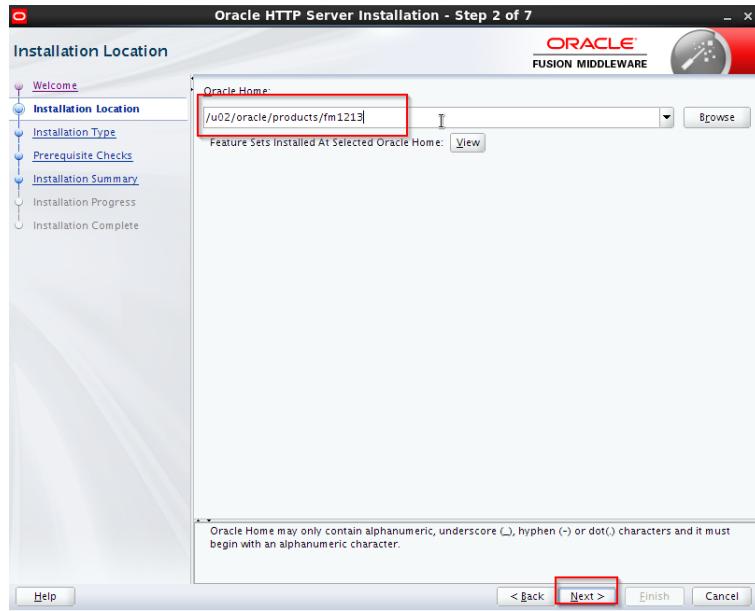
- d. Click on Ok



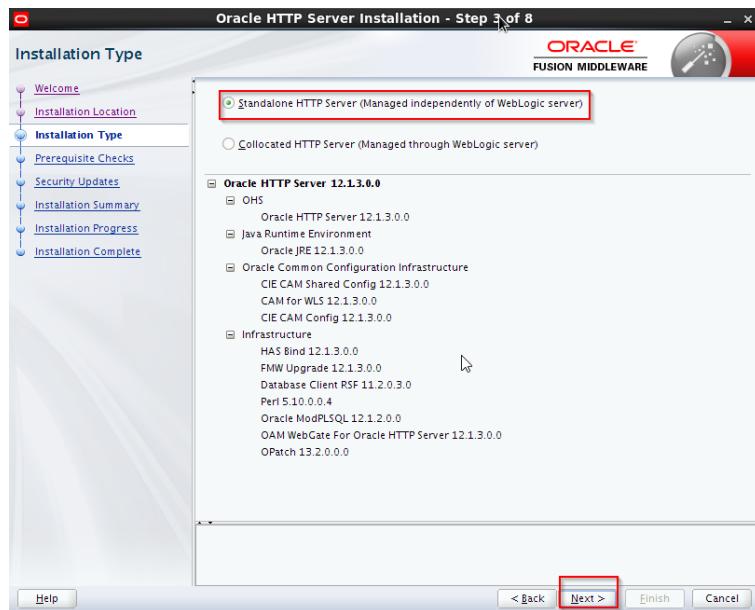
- e. Click on Next



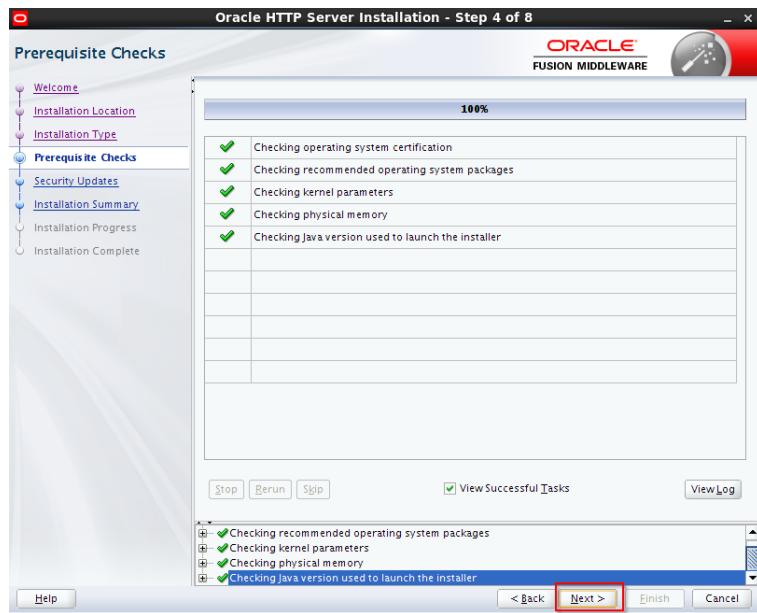
- f. Set the ORACLE_HOME path and click on Next



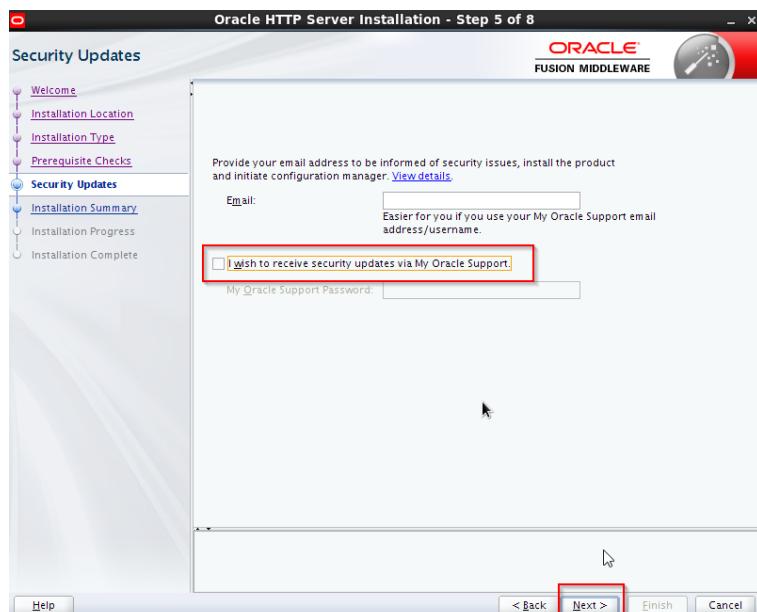
g. Select Standalone HTTP Server and click on Next



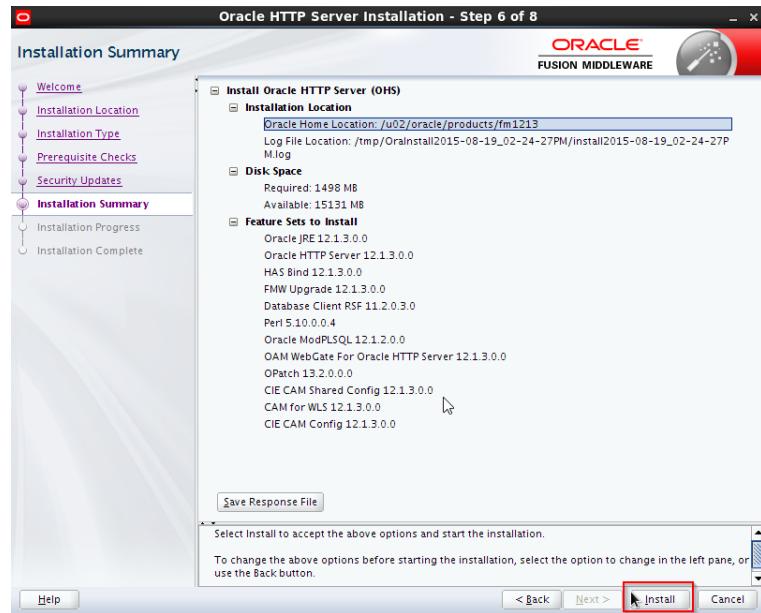
h. Click on Next



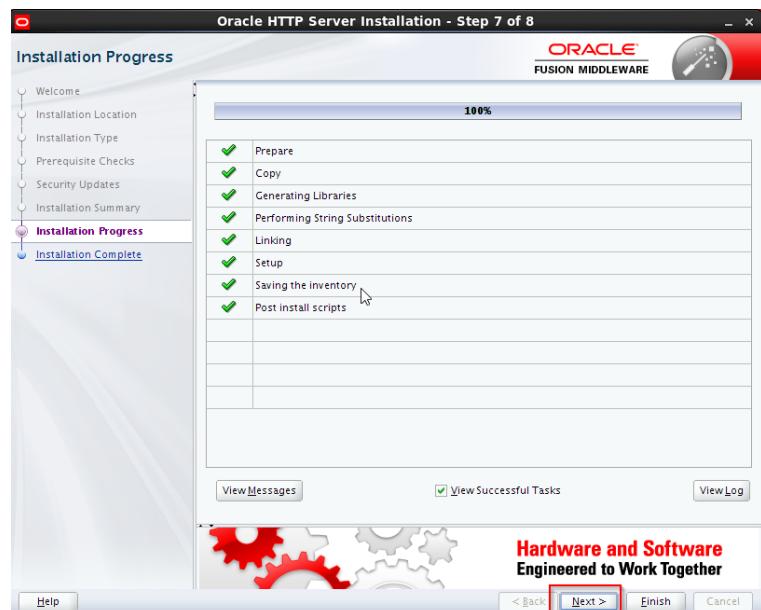
- i. Uncheck the checkbox and click on Next



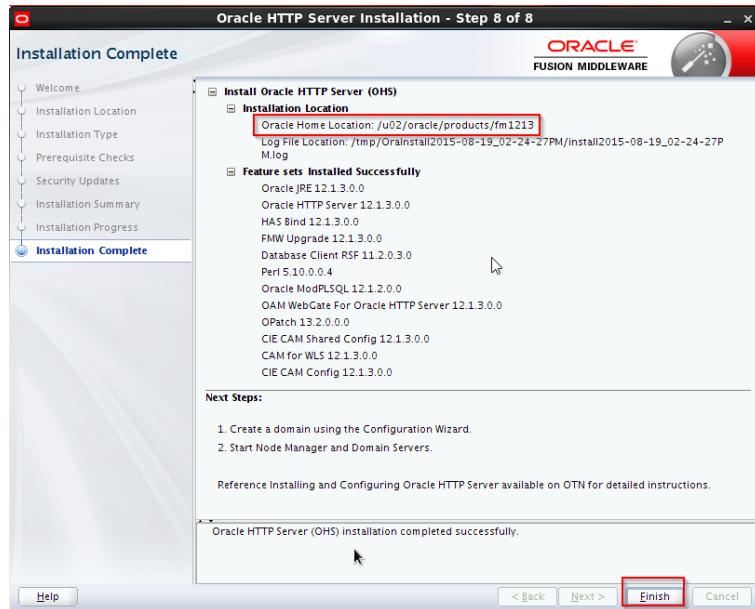
- j. Click on Install



k. Click on Next



l. Click on Finish



- m. Make a backup of the installation

7. Creating domains

7.1. Creating the load balancer domain

In this section a machine will be configured as a load balancer. The machine is **Ibohs.sysco.no** and the OHS was installed in the previous section. In addition, a JVM was also installed because the Oracle HTTP Server 12C is configured to use an Oracle Weblogic Domain, which is different from previous versions like 11G.

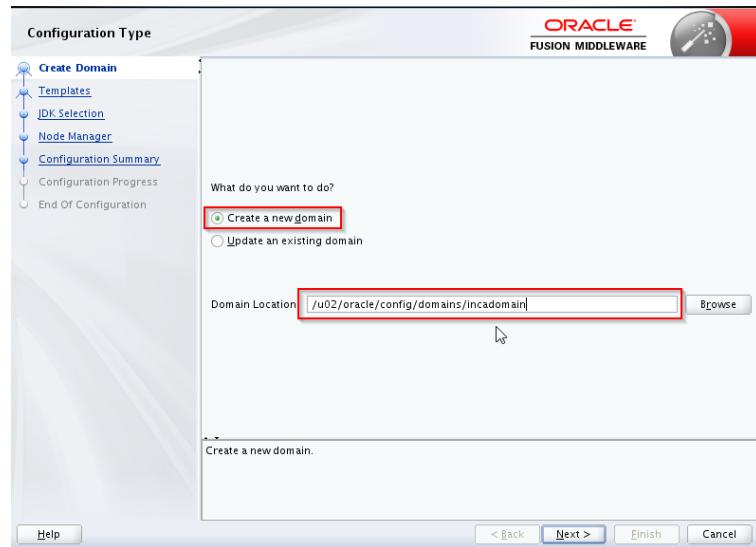
In order to configure the domain follow these steps.

- a. Login with the oracle user account on **Ibohs.sysco.no**.

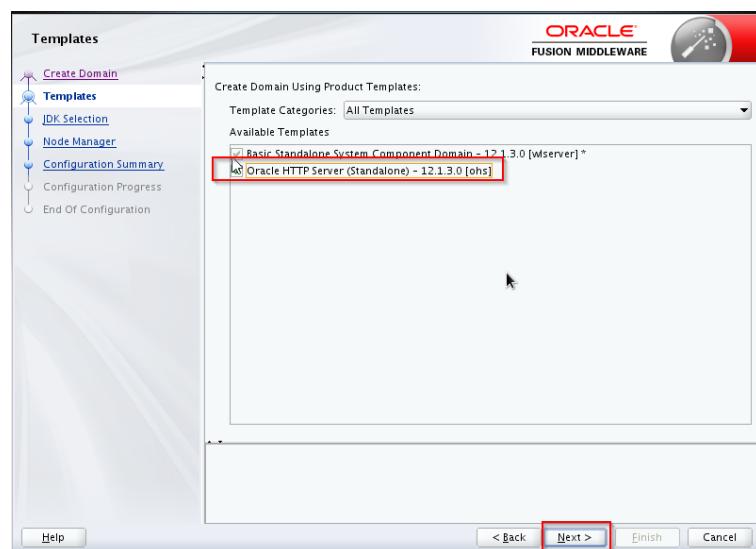
- b. Run the configuration wizard

```
/u02/oracle/products/fm1213/oracle_common/common/bin./config.sh
```

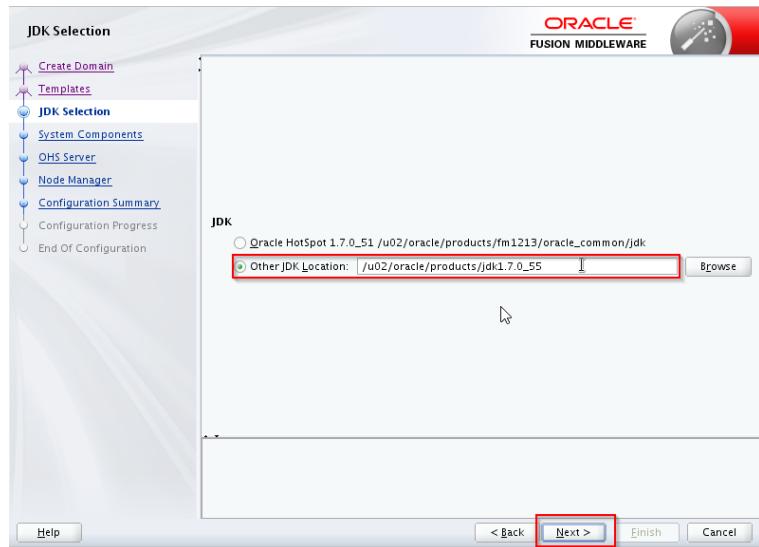
- c. Select the option Create a new domain, set the domain location and click on Next.



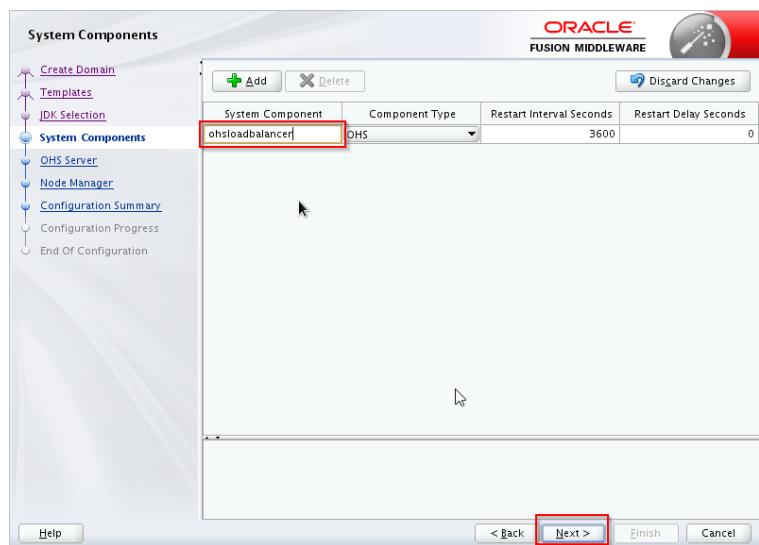
d. Mark the checkbox and click on Next



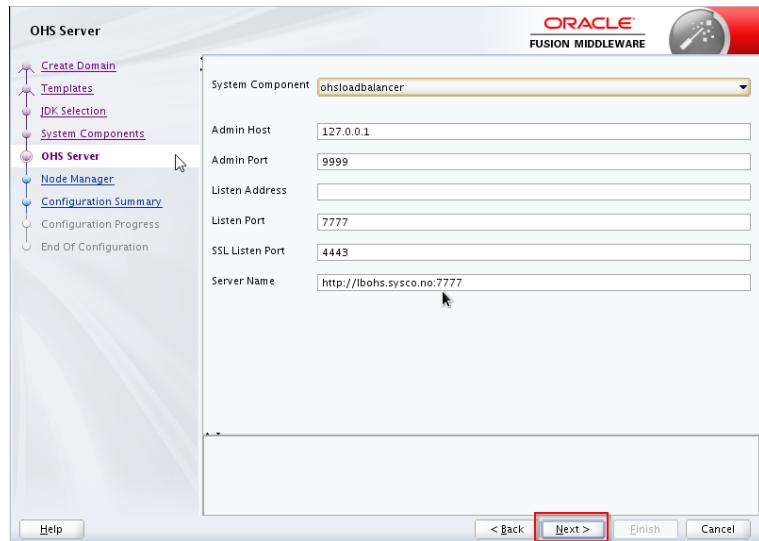
e. Specify the JDK location and click on Next



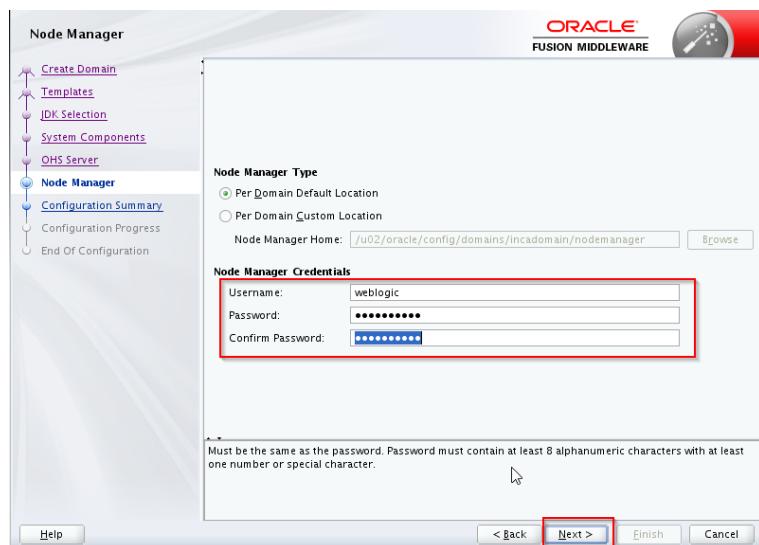
f. Specify a system component name and click on Next.



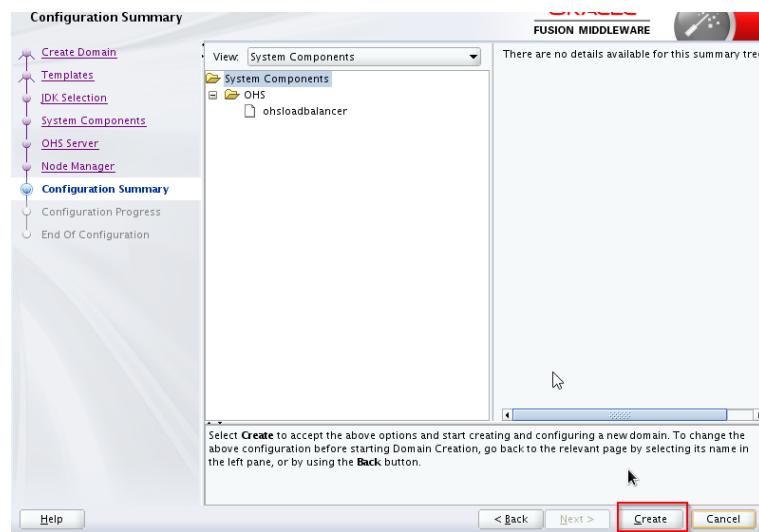
g. Modify values according to your needs and click on Next



- h. Set the node manager user and password and click on Next.



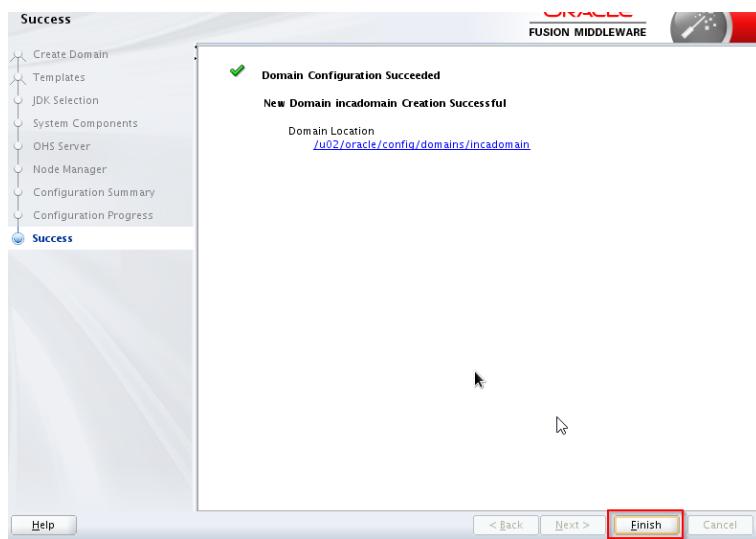
- i. Click on Create



j. Click on Next



k. Click on Finish



I. Startup the node manager

```
cd /u02/oracle/config/domains/incadomain/bin
nohup ./startNodeManager.sh > nm.out&
```

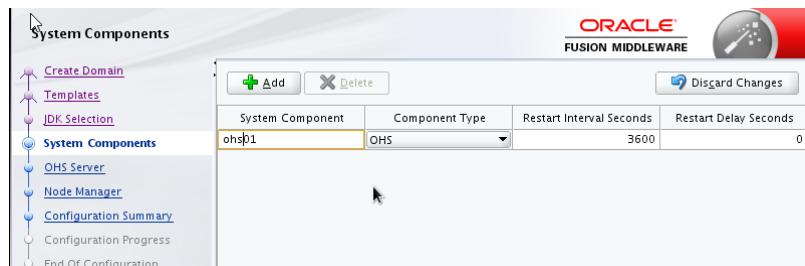
m. Startup the Oracle HTTP Server

```
cd /u02/oracle/config/domains/incadomain/bin
./startComponent.sh ohsloadbalancer
```

7.2. Creating the web layer domain

In order to create the web layer domain apply the same steps shown in the previous case (load balancer domain) on these machines **ohs01.sysco.no** and **ohs02.sysco.no**. The following screen shows two relevant screens for each configuration where system component names and port are set.

ohs01.sysco.no



The screenshot shows the Oracle Fusion Middleware Configuration Wizard interface. On the left, a sidebar lists options: Create Domain, Templates, IDK Selection, System Components (which is selected), OHS Server, Node Manager, Configuration Summary, Configuration Progress, and End Of Configuration. The main panel is titled 'System Component' and contains fields for Admin Host (127.0.0.1), Admin Port (9999), Listen Address (empty), Listen Port (7777), SSL Listen Port (4443), and Server Name (http://ohs01.sysco.no:7777). A progress bar at the bottom indicates 100% completion.

ohs02.sysco.no

This screenshot shows the configuration for System Component ohs02. It includes a table with columns: System Component (ohs02), Component Type (OHS), Restart Interval Seconds (3600), and Restart Delay Seconds (0). Below the table are detailed configuration fields: Admin Host (127.0.0.1), Admin Port (9999), Listen Address (empty), Listen Port (7777), SSL Listen Port (4443), and Server Name (http://ohs02.sysco.no:7777).

7.3. Applications domain

The aim of this section is to create a domain composed by an administration server and two managed servers that are part of a cluster. This section is based on the information available in [1]. In this case, the process starts in the machine weblogic01.sysco.no and these are the steps.

7.3.1. Domain creation

a. Login with the oracle user account on **weblogic01.sysco.no**

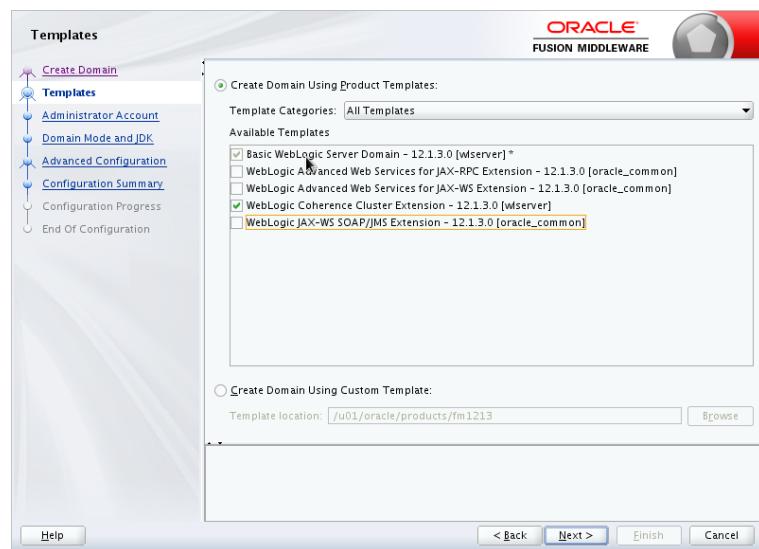
b. Run the configuration wizard

```
/u01/oracle/products/fm1213/oracle_common/common/bin./config.sh
```

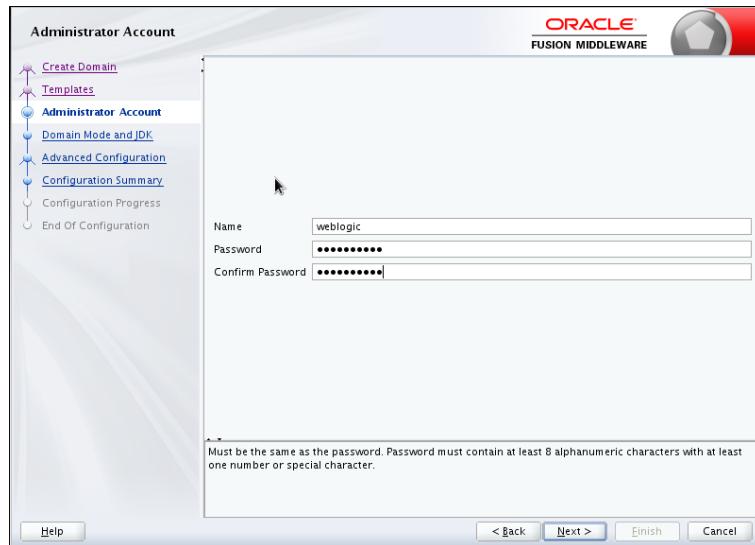
c. Select the option Create a new domain, give the domain location and click on Next.



- d. Select the checkbox Weblogic Coherence Cluster Extension and click on Next



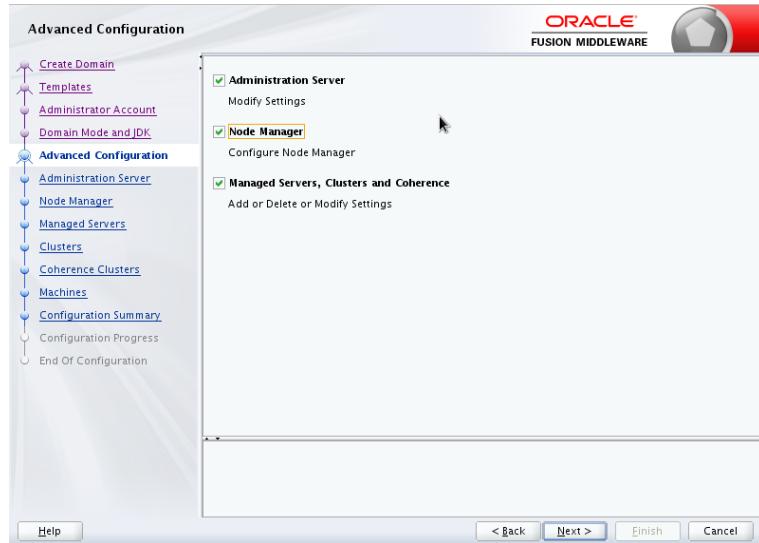
- e. Select a username and password for the Administrator Account and click on Next.



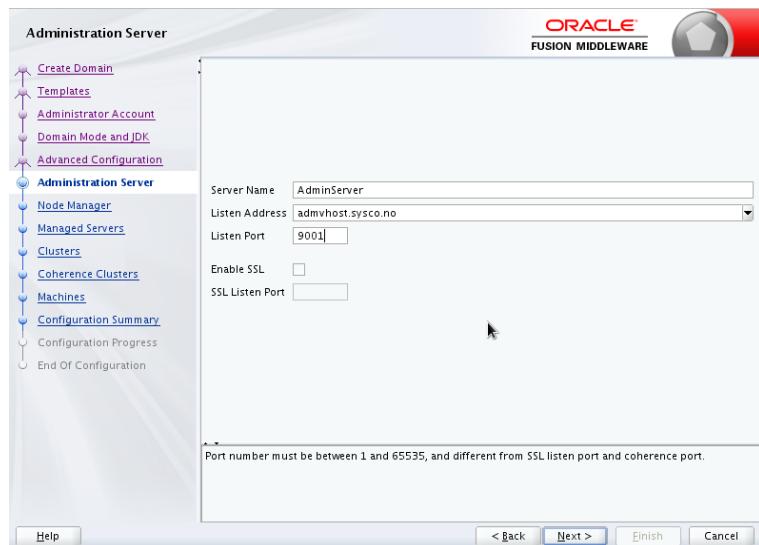
- f. Select the Domain Mode (in this case is Production), set the JDK path and click on Next.



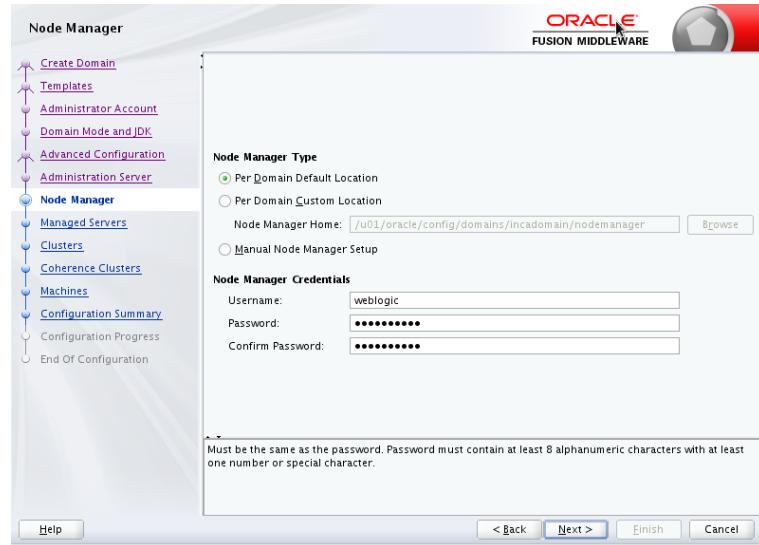
- g. Mark the three checkboxes and click on Next.



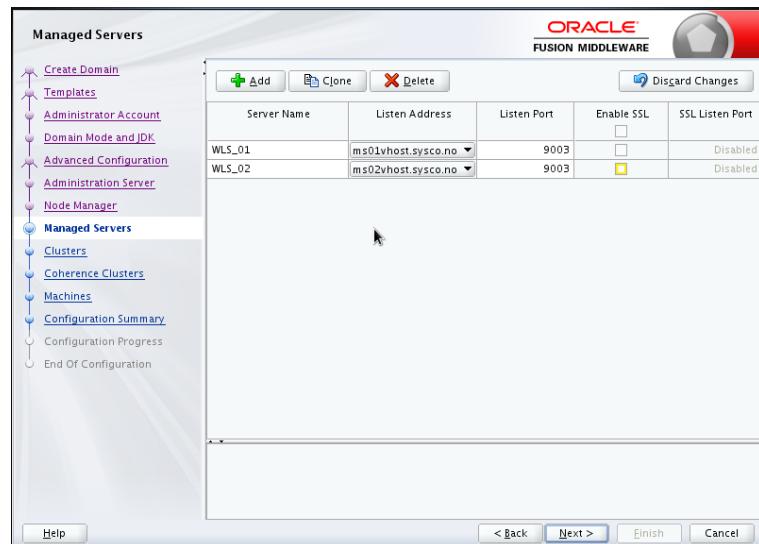
- h. Set the Administration Server Listen Address and its Listen Port. It is important to remark that in this case that hostname (admvhhost.sysco.no) represents a virtual IP in order to configure the AdminServer high availability in future steps.



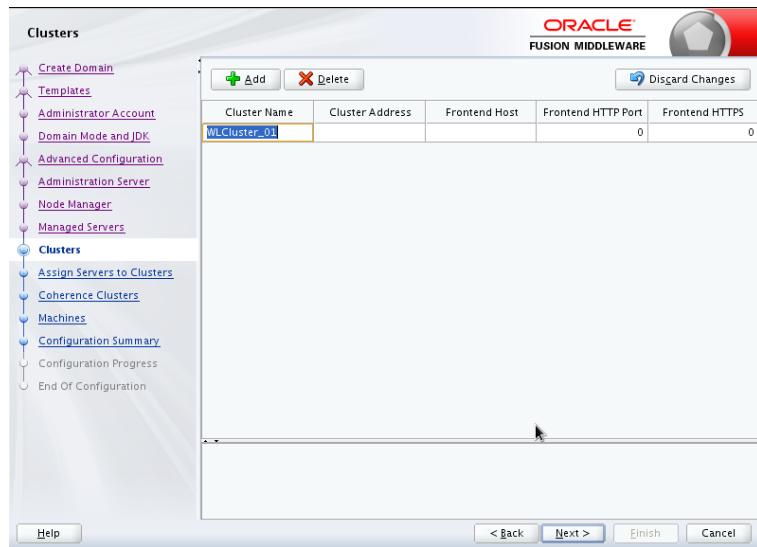
- i. Choose a node manager type (in this case Per Domain Default Location), set the node manager credentials and click on Next.



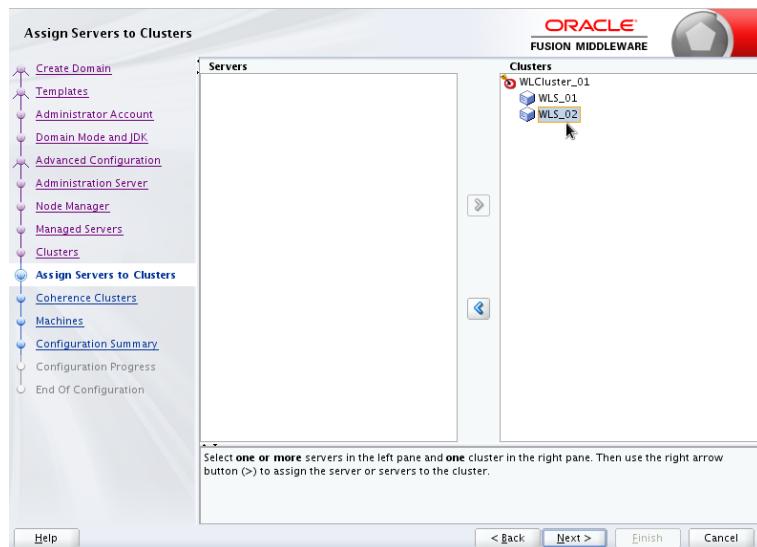
- j. Add two managed server, these server are configured to use virtual IPs in order to configure the whole server migration further.



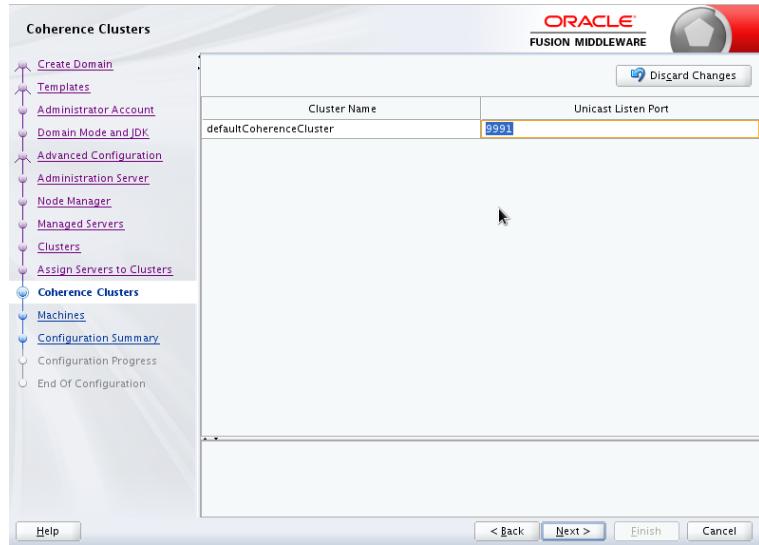
- k. Set a name for the cluster and click on Next.



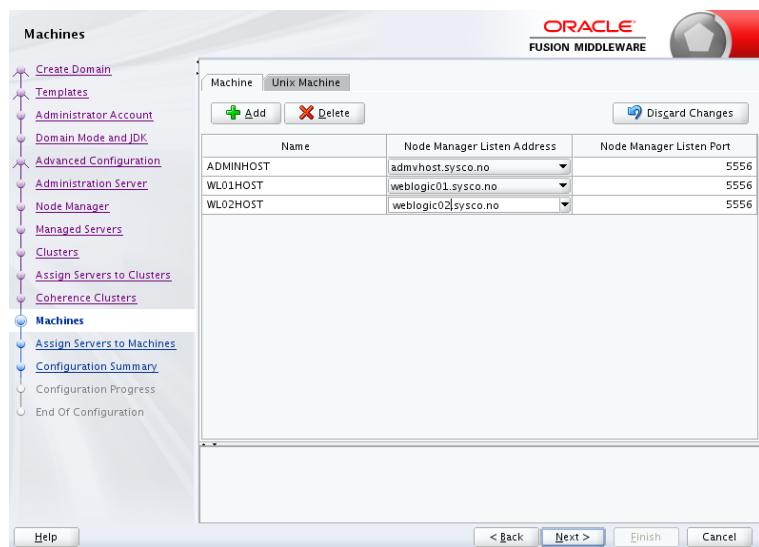
- I. Assign managed servers to the cluster and click on Next.



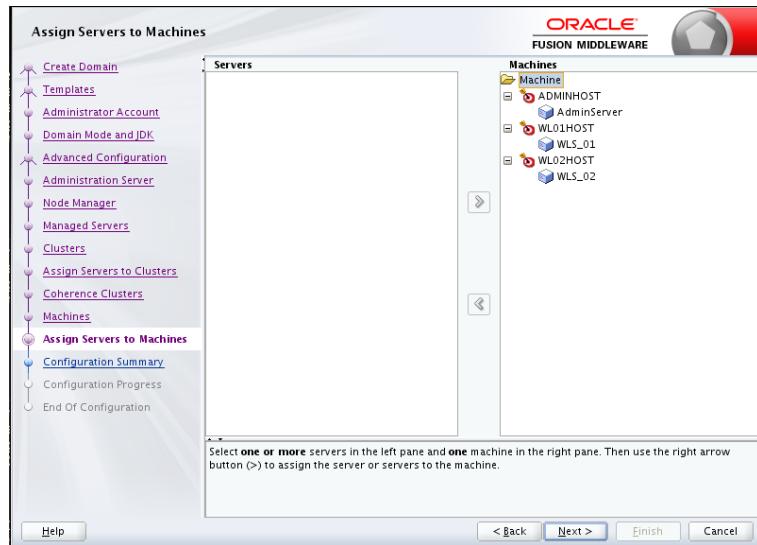
- m. Set the value for the coherence cluster port and click on Next.



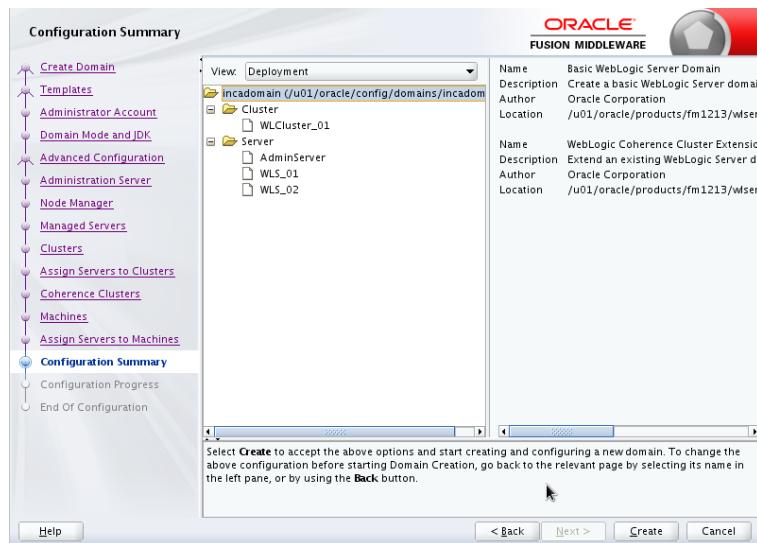
- n. Define three machines, the first one is the Administration Server machine and is tied to the virtual IP. In addition, there are two machines for each managed server.



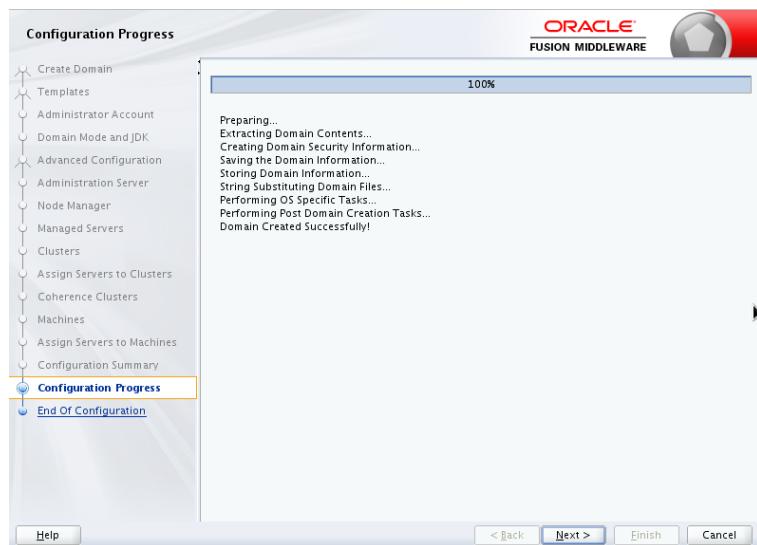
- o. Assign servers to machines and click on Next



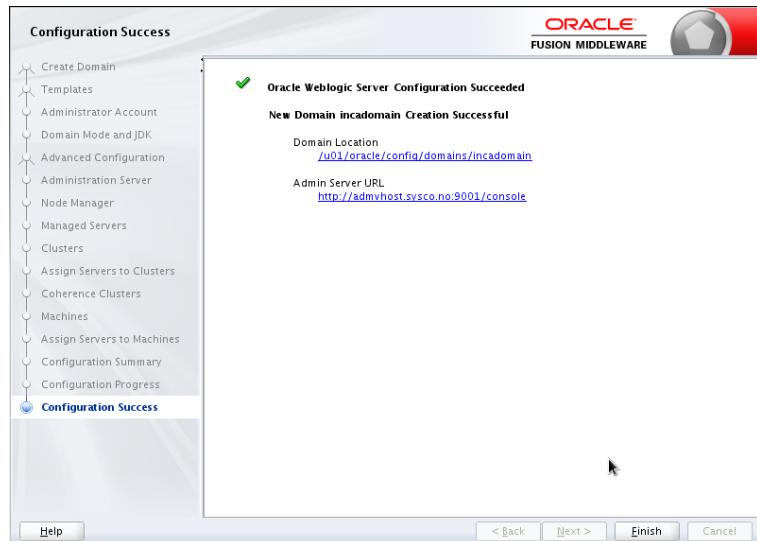
p. Review the configuration and click on Create.



q. Click on Next



r. Click on Finish



7.3.2. Extending the domain to create the managed server WLS_01 on weblogic01.sysco.no

Even though the domain was created on this server, it is necessary to extend the domain (using commands pack and unpack) to create the managed server (WLS_01) in a different domain directory on the same host.

Just to remember

Domain path **ASERVER_HOME**

/u01/oracle/config/domains/incadomain -> it was configured during the domain creation

Domain path **MSERVER_HOME**

/u02/oracle/config/domains/incadomain -> it is configured in this section

These are the steps to create the WLS_01 managed server

- Login with the oracle user account on **weblogic01.sysco.no**

- Create the domain directory

```
mkdir -p /u02/oracle/config/domains/incadomain
```

- Run the pack command to create a template

```
cd ORACLE_COMMON_HOME/common/bin
```

In this installation is:

```
cd /u01/oracle/products/fm1213/oracle_common/common/bin
```

According to [1] this the pack command

```
./pack.sh -managed=true  
-domain=ASERVER_HOME  
-template=soadomaintemplate.jar  
-template_name=soa_domain_template
```

In this installation is:

```
./pack.sh -managed=true -domain=/u01/oracle/config/domains/incadomain -  
template=incadomaintemplate01.jar -template_name=inca_domain_template
```

```
[oracle@weblogic01 bin]$ ./pack.sh -managed=true -domain=/u01/oracle/config/domains/incadomain -template=incadomaintemplate01.jar -template_name=inca_domain_template  
<< read domain from "/u01/oracle/config/domains/incadomain"  
>> succeed: read domain from "/u01/oracle/config/domains/incadomain"  
<< set config option Managed to "true"  
>> succeed: set config option Managed to "true"  
<< write template to "/u01/oracle/products/fm1213/oracle_common/common/bin/incadomaintemplate01.jar"  
>> succeeded: write template to "/u01/oracle/products/fm1213/oracle_common/common/bin/incadomaintemplate01.jar"  
<< close template  
>> succeed: close template  
[oracle@weblogic01 bin]$
```

- Run the unpack command

```
cd /u01/oracle/products/fm1213/oracle_common/common/bin
```

```
./unpack.sh -domain=/u02/oracle/config/domains/incadomain -  
overwrite_domain=true -template=incadomaintemplate01.jar -  
log_priority=DEBUG -log=unpack01.log -  
app_dir=/u01/oracle/config/applications/incadomain
```

In this case -domain means the directory of managed servers (/u02/oracle/...) and app_dir means the common directory applications that is shared between two machines.

```
[oracle@weblogic01 bin]$ ./unpack.sh -domain=/u02/oracle/config/domains/incadomain -overwrite_domain=true -template=incadomaintemplate01.jar -log_  
priority=DEBUG -log=unpack01.log -app_dir=/u01/oracle/config/applications/incadomain  
<< read template from "/u01/oracle/products/fm1213/oracle_common/common/bin/incadomaintemplate01.jar"  
>> succeed: read template from "/u01/oracle/products/fm1213/oracle_common/common/bin/incadomaintemplate01.jar"  
<< set config option OverwriteDomain to "true"  
>> succeed: set config option OverwriteDomain to "true"  
<< set config option AppDir to "/u01/oracle/config/applications/incadomain"  
>> succeed: set config option AppDir to "/u01/oracle/config/applications/incadomain"  
<< set config option DomainName to "incadomain"  
>> succeed: set config option DomainName to "incadomain"  
<< write Domain to "/u02/oracle/config/domains/incadomain"  
>> succeeded: write Domain to "/u02/oracle/config/domains/incadomain"  
<< close template  
>> succeed: close template  
[oracle@weblogic01 bin]$
```

e. Creating the boot properties file

```
mkdir -p ASERVER_HOME/servers/AdminServer/security
```

Create the boot.properties file with the Administration Server Credentials

```
username=weblogic
password=password
```

f. Starting up the AdminServer

```
cd /u01/oracle/config/domains/incadomain/bin
nohup ./startWeblogic.sh > wlAdminServer.out&
```

g. Test the console: <http://admvhhost.sysco.no:9001/console>

h. Start the node manager related to the managed server (WLS_01) on weblogic01.sysco.no

```
cd /u02/oracle/config/domains/incadomain/bin
nohup ./startNodeManager.sh > nodeManager.out&
```

It is possible to review the node manager status using the admin console.

i. Use the admin console to startup the managed server WLS_01

<input type="checkbox"/> Server ↗	Machine	State	Status of Last Action
<input type="checkbox"/> AdminServer(admin)	ADMINHOST	RUNNING	None
<input checked="" type="checkbox"/> WLS_01	WL01HOST	SHUTDOWN	None
<input type="checkbox"/> WLS_02	WL02HOST	SHUTDOWN	None

The server is running!

Servers (Filtered - More Columns Exist)				
	Server	Machine	State	Status of Last Action
<input type="checkbox"/>	AdminServer(admin)	ADMINHOST	RUNNING	None
<input type="checkbox"/>	WLS_01	WL01HOST	RUNNING	TASK COMPLETED
<input type="checkbox"/>	WLS_02	WL02HOST	SHUTDOWN	None

- j. Shutdown all the services and make a backup of the installation before extending the domain to the server weblogic02.sysco.no

7.3.3. Creating the cluster directory

In section 5.2 was not possible to create the folder `/u01/oracle/config/domains/incadomain/incacluster` because the configuration wizard requires an empty directory. In this section, this directory is created and mounted within the shared storage.

- a. Stop all the weblogic services running on weblogic01.sysco.no

- b. Login into weblogic01.sysco.no with the root user account.

- c. Create the directory

```
mkdir /u01/oracle/config/domains/incadomain/incacluster
```

- d. Take a backup of the file /etc/fstab

- e. Modify the file /etc/fstab to include the cluster shared storage (with the root user account)

```
# /etc/fstab
# Created by anaconda on Mon Aug  3 09:42:37 2015
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/vg_weblogic01-lv_root /           ext4    defaults      1 1
UUID=ad237def-badd-44a8-a182-a6c30d029db9 /boot   ext4    defaults      1 2
/dev/mapper/vg_weblogic01-lv_swap swap      swap    defaults      0 0
tmpfs      /dev/shm        tmpfs   defaults      0 0
devpts     /dev/pts        devpts  gid=5,mode=620  0 0
sysfs     /sys            sysfs   defaults      0 0
proc       /proc           proc    defaults      0 0
storagehost.sysco.no:/export/fsadm /u01/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsbinaries01 /u01/oracle/products nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsm01 /u02/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsdp /u01/oracle/config/dp nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsapp /u01/oracle/config/applications/incadomain nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fscluster /u01/oracle/config/domains/incadomain/incacluster nfs4 rw,bg,hard,nointr,proto=tcp
```

- f. Run this command (with the root user account)

```
mount -a
```

- g. After running the `df` command, it is possible to see the new shared storage

```
[root@weblogic01 incacluster]# df
Filesystem      1K-blocks   Used Available Use% Mounted on
/dev/mapper/vg_weblogic01-lv_root     10508540  4843720  5124356  49% /
tmpfs             1025376      8  1025368  1% /dev/shm
/dev/sdal          487652   56025  406027  13% /boot
storagehost.sysco.no:/export/fsadm    25209856   22528  25187328  1% /u01/oracle/config
storagehost.sysco.no:/export/fsbinaries01 26347520 1160192  25187328  5% /u01/oracle/products
storagehost.sysco.no:/export/fsm01     25191424   4096  25187328  1% /u02/oracle/config
storagehost.sysco.no:/export/fsdp      28421120 3233792  25187328 12% /u01/oracle/config/dp
storagehost.sysco.no:/export/fsapp     25187328      0  25187328  0% /u01/oracle/config/applications/incadomain
storagehost.sysco.no:/export/fscluster 25187328      0  25187328  0% /u01/oracle/config/domains/incadomain/incacluster
[root@weblogic01 incactuster]#
```

7.3.4. Extending the domain to create the managed server WLS_02 on weblogic02.sysco.no

It is necessary to extend the domain (using commands pack and unpack) to create the managed server (WLS_02) in a different host.

Just to remember

Domain path **ASERVER_HOME** in this case is:

/u01/oracle/config/domains/incadomain -> **it was configured during the domain creation on weblogic01.sysco.no**

Domain path **MSERVER_HOME** in this case is

/u02/oracle/config/domains/incadomain -> **it is configured in this section on weblogic02.sysco.no**

These are the steps to create the WLS_02 managed server

- Login with the **oracle** user account on **weblogic02.sysco.no**
- Create the domain directory

```
mkdir -p /u02/oracle/config/domains/incadomain
```

- Run the pack command on **weblogic01.sysco.no**

```
./pack.sh -managed=true -domain=/u01/oracle/config/domains/incadomain -template=incadomaintemplate02.jar -template_name=incadomain_template
```

- Copy **incadomaintemplate02.jar** into **weblogic02.sysco.no**

- Run the unpack command

```
cd /u01/oracle/products/fm1213/oracle_common/common/bin
```

```
./unpack.sh -domain=/u02/oracle/config/domains/incadomain -overwrite_domain=true -template=incadomaintemplate02.jar -log_priority=DEBUG -log=unpack02.log -app_dir=/u01/oracle/config/applications/incadomain
```

```
[oracle@elboglio02 bin]$ ./unpack.sh -d /u02/oracle/config/domains/incadomain -overwrite_domainName -template=incadomain
template02.jar -log_priority=DEBUB -log_level=INFO -app_dir=/u01/oracle/config/application/incadomain
<> Read template From "/u01/oracle/products/fmw123/oracle_common/common/bin/incadomainTemplate02.jar"
<> succeed: read template From "/u01/oracle/products/fmw123/oracle_common/common/bin/incadomainTemplate02.jar"
<> set config option OverwriteDomainName to "true"
<> succeed: set config option OverwriteDomainName to "true"
<> set config option AppDir to "/u01/oracle/config/application/incadomain"
<> succeed: set config option AppDir to "/u01/oracle/config/application/incadomain"
<> set config option DomainName to "incadomain"
<> succeed: set config option DomainName to "incadomain"
<> write Domain to "/u02/oracle/config/domains/incadomain"
.....  
<> succeed: write Domain to "/u02/oracle/config/domains/incadomain"
<> close template
<> succeed: close template
```

- f. Start the node manager related to the managed server on weblogic02.sysco.no

```
cd /u02/oracle/config/domains/incadomain/bin  
nohup ./startNodeManager.sh > nodeManager.out&
```

It is possible to review the node manager status using the admin console.

Settings for WL02HOST	
Configuration Monitoring Notes	
Node Manager Status Node Manager Log	
This page allows you to view current status information for the Node Manager instance configured for this machine.	
Status:	Reachable
Current status of this Node Manager. More Info...	
Version:	12.1.3
Version string returned from the Node Manager. More Info...	

- g. Use the admin console to startup the managed server WLS_02

Servers (Filtered - More Columns Exist)				
	Start	Resume	Suspend ▾	Shutdown ▾
	Restart SSL			Showing 1 to 3 of 3 Previous Next
<input type="checkbox"/>	Server ↗	Machine	State	Status of Last Action
<input type="checkbox"/>	AdminServer(admin)	ADMINHOST	RUNNING	None
<input type="checkbox"/>	WLS_01	WL01HOST	RUNNING	TASK COMPLETED
<input type="checkbox"/>	WLS_02	WL02HOST	RUNNING	TASK COMPLETED

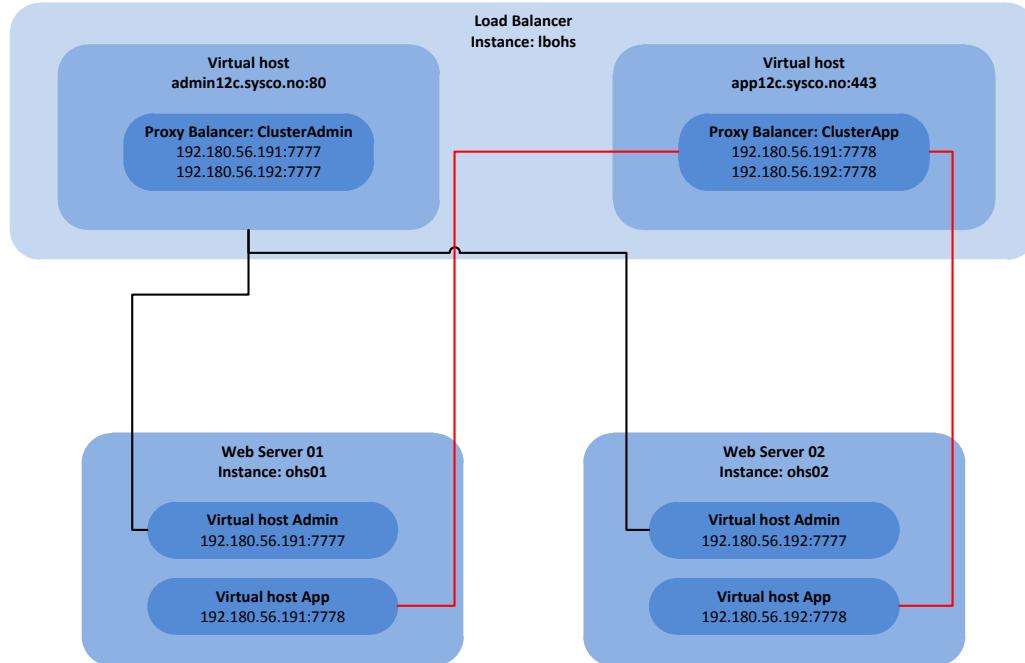
- h. Shutdown all the services and make a backup of the installation

8. Configuring the load balancer

In this section, one of the Oracle HTTP Server installations (lbohs.sysco.no) is configured as a load balancer. Two virtual addresses have been created to use the load balancer. these are:

Machine	Virtual IP	Virtual host name	Comments
lbohs.sysco.no	192.180.56.20	admin12c.sysco.no	Administration server requests
lbohs.sysco.no	192.180.56.21	app12c.sysco.no	Applications requests

These addresses will be configured as virtual hosts in the Oracle HTTP Server installed in lbohs.sysco.no. In addition, each virtual host will have a cluster to redirect requests towards instances ohs01 and ohs02. Furthermore, virtual hosts to direct the traffic from instances osh01 and oh02 to the AdminServer and managed server will be created. The following graph depicts the configuration.



In order to create the configuration shown in the previous picture, follow these steps.

- Login into the server lbohs.sysco.no with the oracle user.
- Create this file

```
cd
/u02/oracle/config/domains/incadomain/config/fmwconfig/components/OHS/instances/ohsloadba
lancer/moduleconf

touch loadbalancer.conf
```

- Add this configuration to the file

```
<VirtualHost app12c.sysco.no:443>
    ProxyRequests off

    ServerName app12cLBOHS

    <IfModule ssl_module>
        SSLEngine on
        SSLProtocol nzos_Version_1_0 nzos_Version_3_0_With_2_0_Hello
        nzos_Version_3_0
        SSLCipherSuite
        SSL_RSA_WITH_RC4_128_MD5,SSL_RSA_WITH_RC4_128_SHA,SSL_RSA_WITH_3DES_EDE_CBC
        SHA,SSL_RSA_WITH_DES_CBC_SHA,TLS_RSA_WITH_AES_128_CBC_SHA,TLS_RSA_WITH_AES
        _256_CBC_SHA
        SSLVerifyClient none
        SSLWallet
        "${ORACLE_INSTANCE}/config/fmwconfig/components/${COMPONENT_TYPE}/instances
        /${COMPONENT_NAME}/keystores/default"
        SSLCRLCheck Off
    </IfModule>

<Proxy balancer://ClusterApp>
```

```
# WebHead1
BalancerMember http://ohs01.sysco.no:7778
BalancerMember http://ohs02.sysco.no:7778

# Security "technically we aren't blocking
# anyone but this the place to make those
# changes
Order Deny,Allow
Deny from none
Allow from all

# Load Balancer Settings
# We will be configuring a simple Round
# Robin style load balancer. This means
# that all webheads take an equal share of
# of the load.
ProxySet lbmethod=byrequests

</Proxy>

# balancer-manager
# This tool is built into the mod_proxy_balancer
# module and will allow you to do some simple
# modifications to the balanced group via a gui
# web interface.
<Location /balancer-manager>
  SetHandler balancer-manager

  # I recommend locking this one down to your
  # your office
  Order deny,allow
  Allow from all
</Location>

# Point of Balance
# This setting will allow to explicitly name the
# the location in the site that we want to be
# balanced, in this example we will balance "/"
# or everything in the site.
ProxyPass /balancer-manager !
ProxyPass / balancer://ClusterApp/

</VirtualHost>

<VirtualHost admin12c.sysco.no:80>
  ProxyRequests off

  ServerName Admin12cLBOHS

<Proxy balancer://ClusterAdmin>
  # WebHead1
  BalancerMember http://ohs01.sysco.no:7777
  BalancerMember http://ohs01.sysco.no:7777

  # Security "technically we aren't blocking
  # anyone but this the place to make those
```

```
# chages
Order Deny,Allow
Deny from none
Allow from all

# Load Balancer Settings
# We will be configuring a simple Round
# Robin style load balancer. This means
# that all webheads take an equal share of
# of the load.
ProxySet lbmethod=byrequests

</Proxy>

# balancer-manager
# This tool is built into the mod_proxy_balancer
# module and will allow you to do some simple
# modifications to the balanced group via a gui
# web interface.
<Location /balancer-manager>
  SetHandler balancer-manager

  # I recommend locking this one down to your
  # your office
  Order deny,allow
  Allow from all
</Location>

# Point of Balance
# This setting will allow to explicitly name the
# the location in the site that we want to be
# balanced, in this example we will balance "/"
# or everything in the site.
ProxyPass /balancer-manager !
ProxyPass / balancer://ClusterAdmin/

<IfModule ossl_module>
  SSLEngine off
</IfModule>

</VirtualHost>
```

- d. The previous configuration uses ports 80 and 443 so we have to activate these ports. Before changing ports, use these articles to apply a patch and to set privileges to start the service in privileged ports.

IMPORTANT:

OHS 12c Fails to Start With the Error "Permission denied: make_sock: could not bind to address" on Linux6 (Doc ID 1599750.1)

[http://docs.oracle.com/middleware/1213/webtier/HSADM/getstart.htm#HSADM848 \[Starting Oracle HTTP Server Instances on a Privileged Port \(UNIX Only\)\]](http://docs.oracle.com/middleware/1213/webtier/HSADM/getstart.htm#HSADM848)

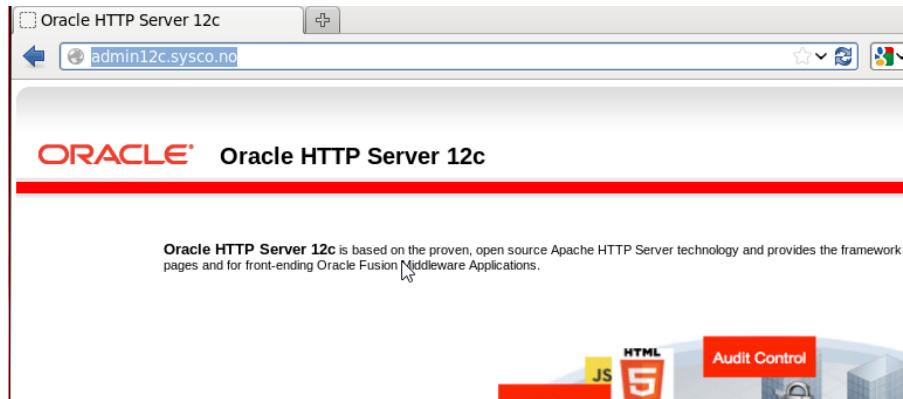
e. Changing ports

```
cd  
/u02/oracle/config/domains/incadomain/config/fmwconfig/components/OHS/instances/ohsloadbalancer/moduleconf  
  
vi httpd.conf  
  
#  
# Listen: Allows you to bind Apache to specific IP addresses and/or  
# ports, instead of the default. See also the <VirtualHost>  
# directive.  
#  
# Change this to Listen on specific IP addresses as shown below to  
# prevent Apache from glomming onto all bound IP addresses (0.0.0.0)  
#  
# Listen 12.34.56.78:80  
# The Listen directive below has a comment following it that is used at OHS provisioning time.  
# The below comment can be deleted from the file in an OHS instance, but *DO NOT* delete the comment at $PRODUCT_HOME/templates/conf/httpd.conf  
#Listen 7777 #$IS_LISTEN_PORT  
Listen 80  
Listen 443  
#
```

f. Start the Oracle Http Server on lbohs.sysco.no with these commands.

```
cd /u02/oracle/config/domains/incadomain/bin  
nohup ./startNodeManager.sh > nm.out&  
  
cd /u02/oracle/config/domains/incadomain/bin  
. ./startComponent.sh [INSTANCE_NAME] (For example ohsloadbalancer or ohs01)
```

g. Test the port 80



Obviously, the OHS services on ohs01.sysco.no and ohs02.sysco.no are up and listening to requests on port 7777.

9. Configuring virtual hosts on ohs01 and ohs02 instance

In the section two virtual hosts are configured, they will use the same IP (physical IP) and different port according to this table.

SERVER	Instance	IP	Virtual Host	Port Virtual Host	Redirect to
ohs01.sysco.no	ohs01	192.180.56.191	Admin	7777	admvhost.sysco.no:9001
ohs01.sysco.no	ohs01	192.180.56.191	App	7778	ms01vhost.sysco.no:9003, ms02vhost.sysco.no:9003
ohs02.sysco.no	ohs02	192.180.56.192	Admin	7777	admvhost.sysco.no:9001
ohs02.sysco.no	ohs02	192.180.56.192	App	7778	ms01vhost.sysco.no:9003, ms02vhost.sysco.no:9003

These are the steps to create these virtual hosts.

- Login into the server ohs01.sysco.no with the oracle user.
- Create these files

```
cd
/u02/oracle/config/domains/incadomain/config/fmwconfig/components/OHS/instances/ohs01/mod
uleconf

touch admVhost.conf
touch appVhost.conf
```

- Configure these files as is shown in the following pictures

admVhost.conf

```
<VirtualHost ohs01.sysco.no:7777>
    ServerName admin12cVirtualHost
    ServerAdmin example@example.com
    RewriteEngine On
    RewriteOptions inherit

    <Location /console>
        SetHandler weblogic-handler
        WeblogicHost admvhost.sysco.no
        WeblogicPort 9001
    </Location>

    <Location /consolehelp>
        SetHandler weblogic-handler
        WeblogicHost admvhost.sysco.no
        WeblogicPort 9001
    </Location>

</VirtualHost>
```

appVhost.conf

```
<VirtualHost ohs01.sysco.no:7778>
    ServerName app12cVirtualHost
    ServerAdmin example@example.com
    RewriteEngine On
    RewriteOptions inherit
    ~

</VirtualHost>
~
```

- Modify the httpd.conf to add the port 7778

```
Listen 7777 #OHS_LISTEN_PORT
Listen 7778

#
# Dynamic Shared Object (DSO) Support
#
# To be able to use the functionality of the DSOs you have to place corresponding `LoadModule` directives contained in it are actual DSOs. Statically compiled modules (those listed below) are always loaded.
#
# Example:
# LoadModule foo_module "${PRODUCT_HOME}/lib/mod_foo.so"
```

- h. Start the Oracle Http Server on ohs01.sysco.no with these commands.

```
cd /u02/oracle/config/domains/incadomain/bin
nohup ./startNodeManager.sh > nm.out&

cd /u02/oracle/config/domains/incadomain/bin
./startComponent.sh [INSTANCE_NAME] (For example ohsloadbalancer or ohs01)
```

- i. Test the applications URL from the load balancer



- j. Copy the following files from ohs01.sysco.no to ohs02.sysco.no and modify the remarked values

admVhost.conf

```
<VirtualHost ohs02.sysco.no:7777>
ServerName admin12cVirtualHost02
ServerAdmin example@example.com
RewriteEngine On
RewriteOptions inherit

<Location /console>
SetHandler weblogic-handler
WeblogicHost admvhost.sysco.no
WeblogicPort 9001
</Location>

<Location /consolehelp>
SetHandler weblogic-handler
WeblogicHost admvhost.sysco.no
WeblogicPort 9001
</Location>

</VirtualHost>
```

appVhost.conf

```
<VirtualHost ohs02.sysco.no:7778>
ServerName app12cVirtualHost02
ServerAdmin example@example.com
RewriteEngine On
RewriteOptions inherit

</VirtualHost>
~
```

- k. Modify the httpd.conf (on the server ohs02.sysco.no) to add the port 7778

```
Listen 7777 #OHS_LISTEN_PORT
Listen 7778

#
# Dynamic Shared Object (DSO) Support
#
# To be able to use the functionality of
# have to place corresponding `LoadModule'
# directives contained in it are actual
# Statically compiled modules (those listed
# to be loaded here).
#
# Example:
# LoadModule foo_module "${PRODUCT_HOME}
```

- l. Start the Oracle Http Server on ohs02.sysco.no with these commands.

```
cd /u02/oracle/config/domains/incadomain/bin
nohup ./startNodeManager.sh > nm.out&

cd /u02/oracle/config/domains/incadomain/bin
./startComponent.sh [INSTANCE_NAME] (For example ohsloadbalancer or ohs01)
```

m. Shutdown the server ohs01.sysco.no and test URLs from the load balancer. In this case it works.

10. Configuring the frontend host and the frontend http port

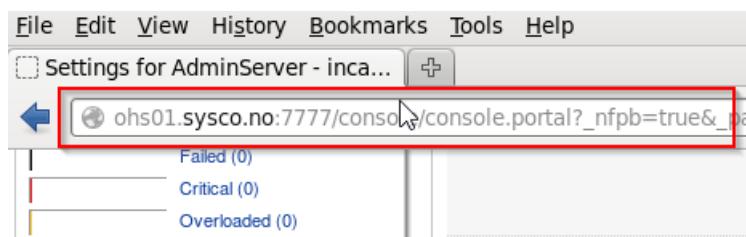
Configure the frontend host and the frontend http port the cluster and for the AdminServer in order to use those ports configured in the load balancer.

10.1. Configuring the cluster WLCluster_01

Follow these steps

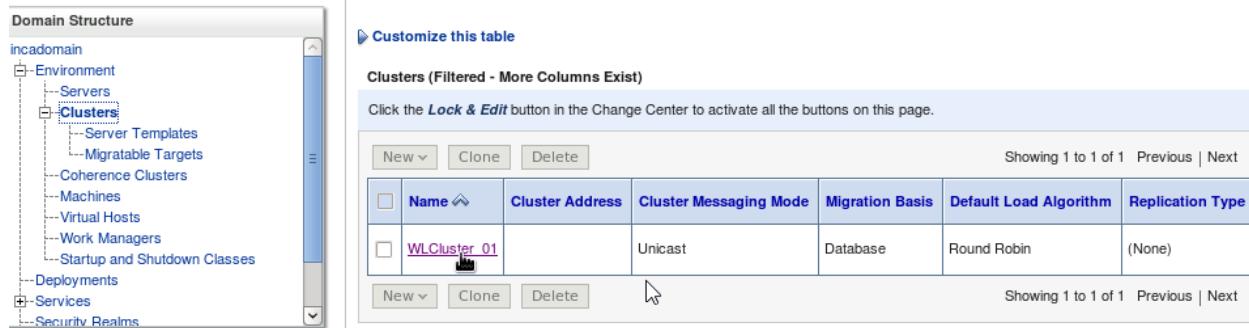
a. Login into the AdminServer with this URL: <http://admin12c.sysco.no/console>

b. The system will redirect the request towards one of the Oracle HTTP Servers.



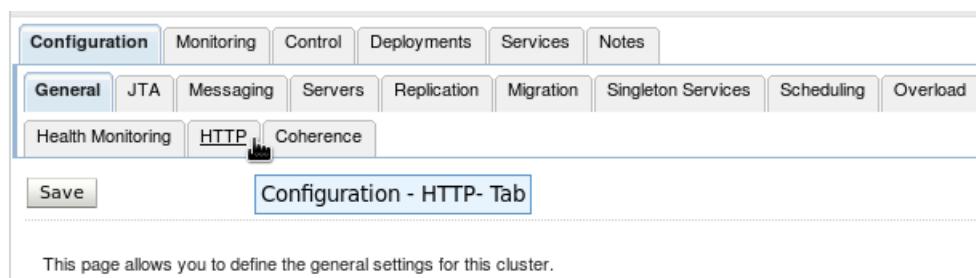
The following steps will avoid this kind of redirection

c. Click on WLCluster_01 as can be seen in the picture



Name	Cluster Address	Cluster Messaging Mode	Migration Basis	Default Load Algorithm	Replication Type
WLCluster_01		Unicast	Database	Round Robin	(None)

d. Click on HTTP tab



This page allows you to define the general settings for this cluster.

e. Set the following values and click on save

Frontend Host:	<input type="text" value="app12c.sysco.no"/>	The HTTP frontendHost is set when the Host information coming from the URL may be inaccurate due to the presence of a firewall or proxy. If this parameter is set, the HOST header is ignored and this value is always used. More Info...
Frontend HTTP Port:	<input type="text" value="80"/>	The frontend HTTP Port is set when the Port information coming from the URL may be inaccurate due to the presence of a firewall or proxy. If this parameter is set, the HOST header is ignored and this value is always used. More Info...
Frontend HTTPS Port:	<input type="text" value="443"/>	The frontend HTTPS Port is set when the Port information coming from the URL may be inaccurate due to the presence of a firewall or proxy. If this parameter is set, the HOST header is ignored and this value is always used. More Info...
<input type="button" value="Save"/>		

10.2. Configuring the AdminServer

Follow these steps

a. Click on AdminServer

Name	Type	Cluster	Machine	State	Health
AdminServer(admin)	Configured	ADMINHOST	ADMINHOST	RUNNING	OK

b. Click on Protocols

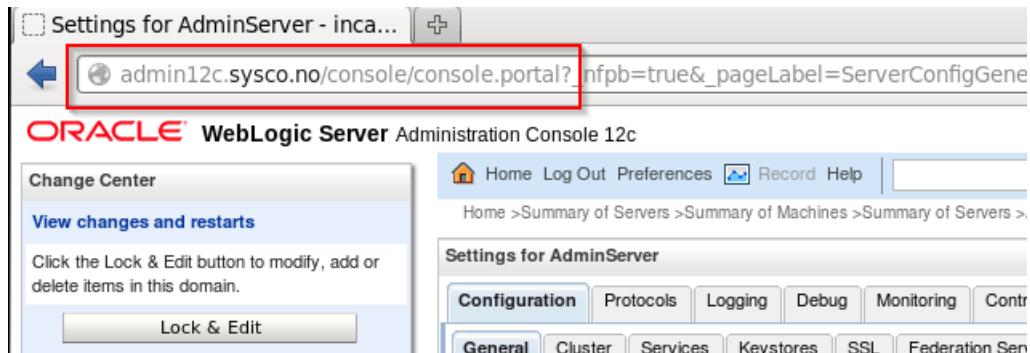
7

c. Click on HTTP

d. Set the following values and click on Save

Frontend Host:	<input type="text" value="admin12c.sysco.no"/>	The name of the host to which the requests will be sent. If specified, this value rather than the host header. More Info...
Frontend HTTP Port:	<input type="text" value="80"/>	The name of the HTTP port to which the URLs will be sent. If specified, use this value rather than the port header. More Info...

- e. Log out of the Admin Console and log in again. Now the address used by the Admin Console is that defined on the load balancer.



11. Testing the Administration Server high availability

With the previous a high available architecture was create according to the Oracle recommendations. Therefore, this architecture can be used to show how to start the admin serve in another machine. In this way, a contingency server is used in case the Admin Server machine has problems. It is important to remark that this work is possible because the Admin Server domain was created on a shared storage and it is using virtual IPs.

This is the relevant information for this testing:

Virtual IPs

Machine	Virtual IP	Virtual host name	Weblogic server	Comments
weblogic01.sysco.no	192.180.56.10	admvhhost.sysco.no	AdminServer	Administration server
weblogic01.sysco.no	192.180.56.11	ms01vhhost.sysco.no	WLS_01	Managed server 01
weblogic02.sysco.no	192.180.56.12	ms02vhhost.sysco.no	WLS_02	Managed server 02

File system

File System	MACHINE	DESCRIPTION	Comments
fsbinaries01	weblogic01	Products	Products binary files
fsms01	weblogic01	Config	Managed Server
fsbinaries02	weblogic02	Products	Products binary files

fsms02	weblogic02	Config	Managed Server
fsadm	weblogic01 (contingency weblogic02)	Config	Administration Server
fsapp	weblogic01, weblogic02	Applications	Applications developed
fsdp	weblogic01, weblogic02	Deployment plans	Deployment plans
fscluster	weblogic01, weblogic02	JMS, Tlogs	JMS, Tlogs

Fstab weblogic01.sysco.no

```

proc          /proc           proc defaults    0 0
storagehost.sysco.no:/export/fsadm /u01/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/tsbinaries01 /u01/oracle/products nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsm01 /u02/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsdp /u01/oracle/config/dp nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsapp /u01/oracle/config/applications/incadomain nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fscluster /u01/oracle/config/domains/incadomain/incacluster nfs4 rw,bg,hard,nointr,proto=tcp
~
~
```

The following steps show how to do this configuration

- Review that the Weblogic Admin server is running

As can be seen the server is running on weblogic01.sysco.no

- Shutdown the virtual machine weblogic01.sysco.no

- Test the Admin Server, the following picture shows that now it is not working.

Weblogic Bridge Message

admin12c.sysco.no/console/console.portal?_nfpb=true&_pageLabel=HomePage1

Failure of Web Server bridge:

No backend server available for connection: timed out after 10 seconds or idempotent set idempotent.

- d. Configure the virtual IP **192.180.56.10** on the server weblogic02.sysco.no using the root user account

```
File Edit View Scrollback Bookmarks Settings Help
[root@weblogic02 ~]# ifconfig eth0:2 192.180.56.10
[root@weblogic02 ~]# ifconfig
eth0      Link encap:Ethernet HWaddr 08:00:27:4F:0C:C8
          inet addr:192.180.56.201 Bcast:192.180.56.255 Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe4f:cc8/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
          RX packets:915302 errors:0 dropped:0 overruns:0 frame:0
          TX packets:128414 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1240898323 (1.1 GiB) TX bytes:19223845 (18.3 MiB)

eth0:1    Link encap:Ethernet HWaddr 08:00:27:4F:0C:C8
          inet addr:192.180.56.12 Bcast:192.180.56.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1

eth0:2    Link encap:Ethernet HWaddr 08:00:27:4F:0C:C8
          inet addr:192.180.56.10 Bcast:192.180.56.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
```

- e. Make a backup of the file /etc/fstab
- f. Add the following line in the file /etc/fstab using the root user account

```
root@weblogic02:~# cat /etc/fstab
proc            /proc           sysfs defaults        0 0
storagehost.sysco.no:/export/fsbinaries02 /u01/oracle/products nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsadm /u01/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/rsm02 /u02/oracle/config nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsdp /u01/oracle/config/d nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fsapp /u01/oracle/config/applications/incadomain nfs4 rw,bg,hard,nointr,proto=tcp
storagehost.sysco.no:/export/fscluster /u01/oracle/config/domains/incadomain nfs4 rw,bg,hard,nointr,proto=tcp
-
```

- g. Run the following command using the root user account

```
mount -a
```

- h. Start the Admin Server using the oracle user account

```
[oracle@weblogic02 etc]$ cd /u01/oracle/config/domains/incadomain/bin
[oracle@weblogic02 bin]$ nohup ./startWebLogic.sh > wlAdminLog.out &
[2] 4604
[oracle@weblogic02 bin]$ nohup: ignoring input and redirecting stderr to stdout
[oracle@weblogic02 bin]$ tail -f wlAdminLog.out
```

- i. The log file shows the server is running

```

ion with the Domain level Diagnostic Service >
<Sep 25, 2015 2:04:13 PM GMT-02:00> <Notice> <WebLogicServer> <BEA-000365> <Server state changed to ADMIN.>
<Sep 25, 2015 2:04:13 PM GMT-02:00> <Notice> <WebLogicServer> <BEA-000365> <Server state changed to RESUMING.>
<Sep 25, 2015 2:04:13 PM GMT-02:00> <Notice> <server> <BEA-002613> <Channel "Default" is now listening on 192.160.56.10:8001>
for protocols iop, t3, ldap, snmp, http.>
<Sep 25, 2015 2:04:13 PM GMT-02:00> <Notice> <WebLogicServer> <BEA-000329> <Started the WebLogic Server Administration Server "AdminServer" for domain "incadomain" running in production mode.>
<Sep 25, 2015 2:04:13 PM GMT-02:00> <Notice> <WebLogicServer> <BEA-000360> <The server started in RUNNING mode.>
<Sep 25, 2015 2:04:13 PM GMT-02:00> <Notice> <WebLogicServer> <BEA-000365> <Server state changed to RUNNING.>
    
```

j. Test the Admin Console again

As can be seen in the previous picture, the Admin Console is working again, but on other server.

12. Conclusions

This document shows a comprehensive process to construct an architecture with high availability that demonstrates how useful is in order to do tasks such as the recovery of the Administration Server in other machine. Even though, the whole server migration of managed servers is not configured in this guide, the architecture is ready to apply this configuration because of the use of virtual IPs and shared storages. In fact the directories that allow this work are also create. For example, the path `/u01/oracle/config/domains/incadomain/incacluster` is created to store the JMS and TLOG files. This document can be used to learn how to do this configuration and to apply this knowledge to other cases such SOA and OSB.

13. References list

[1] Oracle (2015) Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite [Online document] Available from:

https://docs.oracle.com/middleware/1213/soasuite/SOEDG/edg_storage.htm#SOEDG2179

(Accessed: 07 August 2015)

[2] Oracle (2013) Oracle WebLogic on Shared Storage: Best Practices [Online document] Available from: <http://www.oracle.com/technetwork/database/availability/maa-fmwsharedstoragebestpractices-402094.pdf> (Accessed: 10 August 2015)

[3] Oracle (2010) Oracle® E-Business Suite 11i Deployment Guide Using Oracle's Sun Storage 7000 Unified Storage Systems [Online document] Available from:

<http://www.oracle.com/technetwork/articles/systems-hardware-architecture/ebusinesssuiteandss7k-163843.pdf> (Accessed: 07 August 2015)

[4] RedHat (n.d) Chapter 23. Creating Oracle User Accounts [Online document] Available from: https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/5/html/Tuning_and_Optimizing_Red_Hat_Enterprise_Linux_for_Oracl_9i_and_10g_Databases/chap-Oracle_9i_and_10g_Tuning_Guide-Creating_Oracle_User_Accounts.html (Accessed: 13 August 2015)

[5] Oracle (2015) Certifications>Search Results: Oracle Weblogic Server 12.1.3.0.0 [Online document] Available from: <https://support.oracle.com/> (Accessed: 17 August 2015)

[6] Oracle (2014) JDK 7 Installation for Linux Platforms [Online document] Available from: <https://docs.oracle.com/javase/7/docs/webnotes/install/linux/linux-jdk.html> (Accessed: 18 August 2015)