

Configuring Weblogic Server 12c
Oracle Banking Corporate Lending
Release 14.7.0.0.0
[Nov] [2022]



Table of Contents

1. INTRODUCTION	1-1
1.1 PURPOSE OF THIS DOCUMENT.....	1-1
1.2 WEBLOGIC SERVER OVERVIEW	1-1
1.3 PRE-REQUISITES	1-5
2. DOMAIN CONFIGURATION	2-6
2.1 DOMAIN CREATION	2-6
2.2 PACK AND UNPACK DOMAIN.....	2-16
2.3 START ADMIN SERVER	2-16
2.4 START NODE MANAGER.....	2-16
3. CLUSTER CONFIGURATION.....	3-17
3.1 MACHINES CONFIGURATION	3-18
3.2 DYNAMIC CLUSTER CREATION.....	3-20
3.3 MANAGED SERVER TEMPLATE CONFIGURATION	3-25
3.3.1 <i>Logging</i>	3-25
3.3.2 <i>HTTP Logging</i>	3-27
3.3.3 <i>Stuck Tread Max Time</i>	3-27
4. TUNING	4-28
4.1 GENERAL PARAMETERS	4-28
4.2 JVM TUNING.....	4-28
5. START MANAGED SERVERS.....	5-30
6. DATA SOURCE CREATION AND JDBC CONFIGURATION	6-32
6.1 SETUP REQUIRED FOR OCI DRIVER.....	6-32
6.2 DATA SOURCE CREATION: NON XA	6-33
6.3 XA DATASOURCE.....	6-37
6.4 JDBC PARAMETERS TUNING.....	6-41
7. JMS RESOURCE CREATION.....	7-42
8. ORACLE WEBLOGIC LOAD BALANCING.....	8-43
9. FREQUENTLY ASKED QUESTIONS.....	9-44
9.1 MACHINE STATUS IS UNREACHABLE.	9-44
9.2 HOW TO RESTART NODE MANAGER?	9-44
9.3 SCALING UP DYNAMIC CLUSTER	9-44
9.4 SESSION TIMEOUT	9-46

1. Introduction

1.1 Purpose of this Document

The purpose of this document is to explain the steps required for Configuration and applying best practices in cluster mode for

- FCUBS 14
- Weblogic Version 12.2.1.2.0
- JDK 1.8.0_131

1.2 WebLogic Server Overview

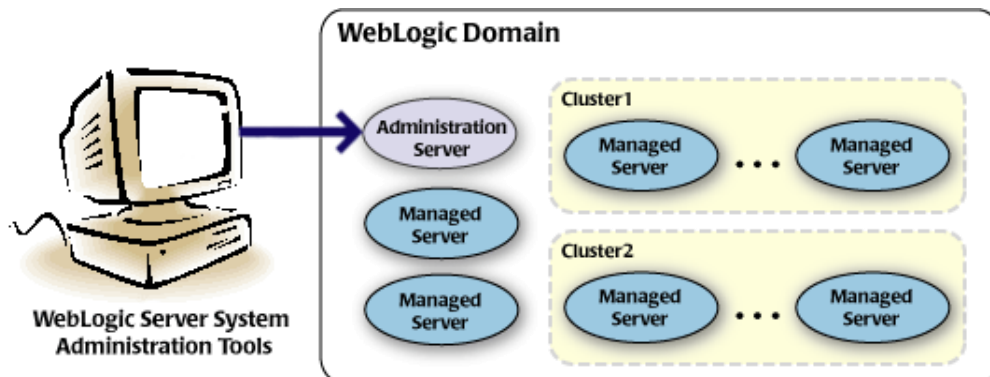
This section of the document provides brief explanation on the main components involved in WebLogic server

Domain

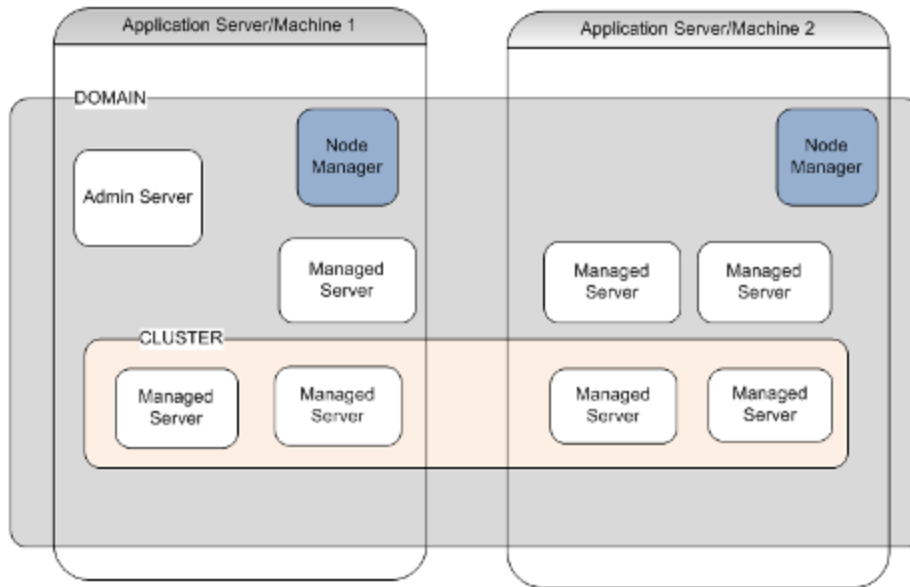
A domain is the basic administration unit for WebLogic Server instances. A domain consists of one or more WebLogic Server instances (and their associated resources) that is managed with a single Administration Server. Multiple domains can be defined based on different system administrators' responsibilities, application boundaries, or geographical locations of servers. Conversely, a single domain can be used to centralize all WebLogic Server administration activities.

Each WebLogic Server domain must have one server instance that acts as the Administration Server. Administration Server can be used via the Administration Console or using the command line for configuring all other server instances and resources in the domain.

WebLogic Domain Structure



Weblogic 12c Domain Overview



Administration Server

A domain includes one WebLogic Server instance that is configured as an Administration Server. All changes to configuration and deployment of applications are done through the Administration Server. The Administration Server provides a central point for managing the domain and providing access to the WebLogic Server administration tools.

These tools include the following:

- WebLogic Server Administration Console: Graphical user interface to the Administration Server.
- WebLogic Server Node Manager: A Java program that lets you start and stop server instances - both Administration Servers and Managed Servers - remotely, and to monitor and automatically restart them after an unexpected failure.

Admin server start mode needs to be configured as Production Mode.

Managed Server

In a domain, server instances other than the Administration Server are referred to as Managed Servers. Managed servers host the components and associated resources that constitute your applications—for example, JSPs and EJBs.

When a Managed Server starts up, it connects to the domain's Administration Server to obtain configuration and deployment settings. In a domain with only a single WebLogic Server instance, that single server works as both the administration server and managed server.

Node Manager

The Managed Servers in a production WebLogic Server environment are often distributed across multiple machines and geographic locations.

Node Manager is a Java utility that runs as separate process from WebLogic Server and allows you to perform common operations tasks for a Managed Server, regardless of its location with respect to its Administration Server. While use of Node Manager is optional, it provides valuable benefits if your WebLogic Server environment hosts applications with high availability requirements.

If you run Node Manager on a machine that hosts Managed Servers, you can start and stop the Managed Servers remotely using the Administration Console or from the command line. Node Manager can also automatically restart a Managed Server after an unexpected failure.

Machine

A machine in the Weblogic Serve context is the logical representation of the computer that hosts one or more Weblogic Server instances(servers). The Admin Server uses the machine definitions to start remote servers through the Node Managers that run on those servers. A machine could be a physical or virtual server that hosts an Admin or Managed Server that belongs to a domain.

Managed Server Cluster

Two or more Managed Servers can be configured as a WebLogic Server cluster to increase application scalability and availability. In a WebLogic Server cluster, most resources and services are deployed to each Managed Server (as opposed to a single Managed Server,) enabling failover and load balancing.

The servers within a cluster can either run on the same machine or reside in different machines. To the client, a cluster appears as a single WebLogic Server instance.

Dynamic Cluster

A dynamic cluster is any cluster that contains one or more dynamic servers. Each server in the cluster will be based upon a single shared server template. The server template allows you to configure each server the same and ensures that servers do not need to be manually configured before being added to the cluster. This allows you to easily scale up or down the number of servers in your cluster without the need for setting up each server manually. Changes made to the server template are rolled out to all servers that use that template.

You cannot configure dynamic servers individually; there are no server instance definitions in the config.xml file when using a dynamic cluster. Therefore, you cannot override the server template with server-specific attributes or target applications to an individual dynamic server instance.

When configuring your cluster you specify the maximum number of servers you expect to need at peak times. The specified number of server instances is then created, each based upon your server template. You can then start up however many you need and scale up or down over time according to your needs. If you need additional server instances on top of the number you originally specified, you can increase the maximum number of servers instances (dynamic) in the dynamic cluster configuration.

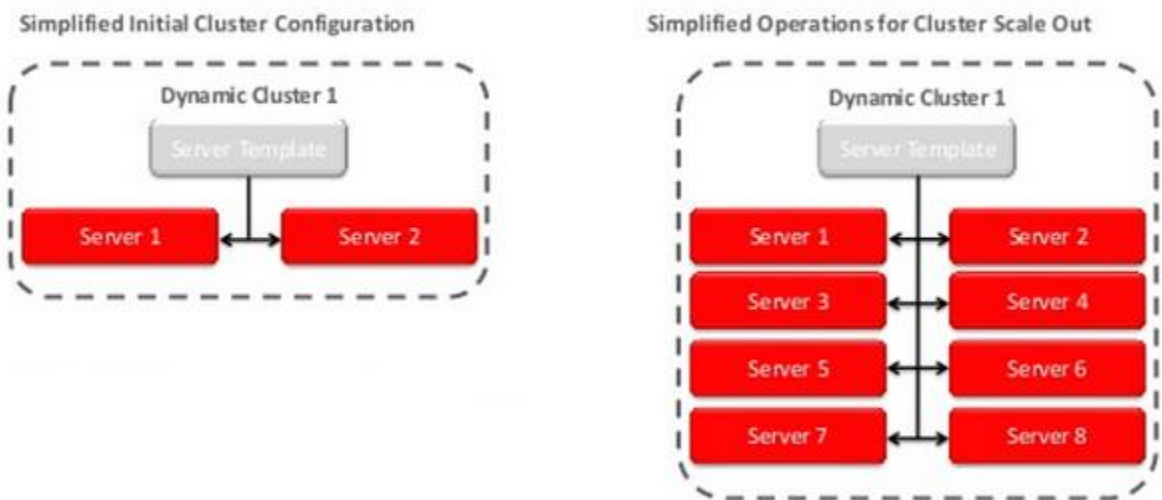
Server Templates

A single server template provides the basis for the creation of the dynamic servers. Using this single template provides the possibility of every member being created with exactly the same attributes. Where some of the server-specific attributes like Servername, listen-ports, machines, etc. can be calculated based upon tokens.

You can pre-create server templates and let Weblogic clone one when a Dynamic Cluster is created.

When none is available a server template is created with the Dynamic Cluster. The name and the listen ports are the only server template attributes that you provide during Dynamic Cluster creation.

Simplified Configuration with Scalability and Elasticity



1.3 Pre-Requisites

In this document, we are going to create a domain with two managed servers. The managed servers are going to be created on two different physical servers (nodes). Note that, this document has been prepared based on a test conducted in Linux servers.

This requires Weblogic Server of same version to be installed on both the machines and services

Environment

2 servers where linux is installed, 1 will be primary where admin console will be running along with managed servers and the other where only managed servers will be.

Softwares

- 1) Oracle Weblogic Server 12.2.1.2 installed on both the machines under same folder structure.
- 2) JDK 1.8 Latest available version installed on both the machines. In this document JDK1.8.0_131 version is used.

Clock Synchronization

The clocks of both the servers participating in the cluster must be synchronized to within one second difference to enable proper functioning of jobs otherwise it will lead to session timeouts.

Enable Graphical User Interface (GUI)

Establish a telnet or SSH connection to primary server. Start X-manager (or any similar tool) in windows desktop. Export DISPLAY environment variable to the machine IP where x-manager is running.

Syntax: export DISPLAY=<ip-address>:<port>

Test using xclock

2. Domain Configuration

2.1 Domain Creation

Weblogic domain creation and configuration will be done from primary server.

From primary server, launch the fusion Middleware configuration wizard using the command **config.sh** available under \$WLS_HOME/common/bin directory.

- 1) In the Welcome screen, select “Create a new domain” option. Enter the domain name and Click on **Next**.

The screenshot shows the 'Configuration Type' window of the Oracle Fusion Middleware Configuration Wizard. The left sidebar contains a tree view with the following items: 'Create Domain' (selected), 'Templates', 'Administrator Account', 'Domain Mode and JDK', 'Advanced Configuration', 'Configuration Summary', 'Configuration Progress', and 'End Of Configuration'. The main area is titled 'What do you want to do?' and has two radio buttons: 'Create a new domain' (selected) and 'Update an existing domain'. Below this, the 'Domain Location' is set to '/scratch/app/wl12c/user_projects/domains/FCUBSDomain', which is highlighted with a red rectangle. A 'Browse' button is to the right of the text field. At the bottom, there are four buttons: 'Help', '< Back', 'Next >' (highlighted with a red rectangle), and 'Finish'. A 'Cancel' button is also present on the far right. The Oracle Fusion Middleware logo is in the top right corner.

- 2) Select the required templates from **Available Templates** and click **Next**.

Templates

ORACLE
FUSION MIDDLEWARE

Create Domain

Templates

Administrator Account

Domain Mode and JDK

Advanced Configuration

Configuration Summary

Configuration Progress

End Of Configuration

Create Domain Using Product Templates:

Template Categories: All Templates

Available Templates

- ☒ Basic WebLogic Server Domain - 12.1.3.0 [wmsvr] *
- ☐ WebLogic Advanced Web Services for JAX-RPC Extension - 12.1.3.0 [oracle_common]
- ☐ WebLogic Advanced Web Services for JAX-WS Extension - 12.1.3.0 [oracle_common]
- ☐ WebLogic Coherence Cluster Extension - 12.1.3.0 [wmsvr]
- ☐ WebLogic JAX-WS SOAP/JMS Extension - 12.1.3.0 [oracle_common]

Create Domain Using Custom Template:

Template location: /scratch/app/wl12c Browse

Help < Back Next > Finish Cancel

- 3) Specify Administrator **User Name** and **Password**.

- The specified credentials are used to access Administration console.
- You can use this screen to define the default WebLogic Administrator account for the domain. This account is used to boot and connect to the domain's Administration Server. Click **Next**.

Administrator Account

Create Domain

Templates

Administrator Account

Domain Mode and JDK

Advanced Configuration

Configuration Summary

Configuration Progress

End Of Configuration

ORACLE®
FUSION MIDDLEWARE

Name

weblogic

Password

••••••••

Confirm Password

••••••••

Must be the same as the password. Password must contain at least 8 alphanumeric characters with at least one number or special character.

Help

< Back

Next >

Finish

Cancel

- 4) Select Server Startup as **Production Mode** and the available **JDKs**. Click **Next**.

Domain Mode and JDK

ORACLE
FUSION MIDDLEWARE

[Create Domain](#)
[Templates](#)
[Administrator Account](#)
[Domain Mode and JDK](#)
[Advanced Configuration](#)
[Administration Server](#)
[Node Manager](#)
[Configuration Summary](#)
Configuration Progress
End Of Configuration

Domain Mode

☐ Development
Utilize boot.properties for username and password, and poll for applications to deploy.

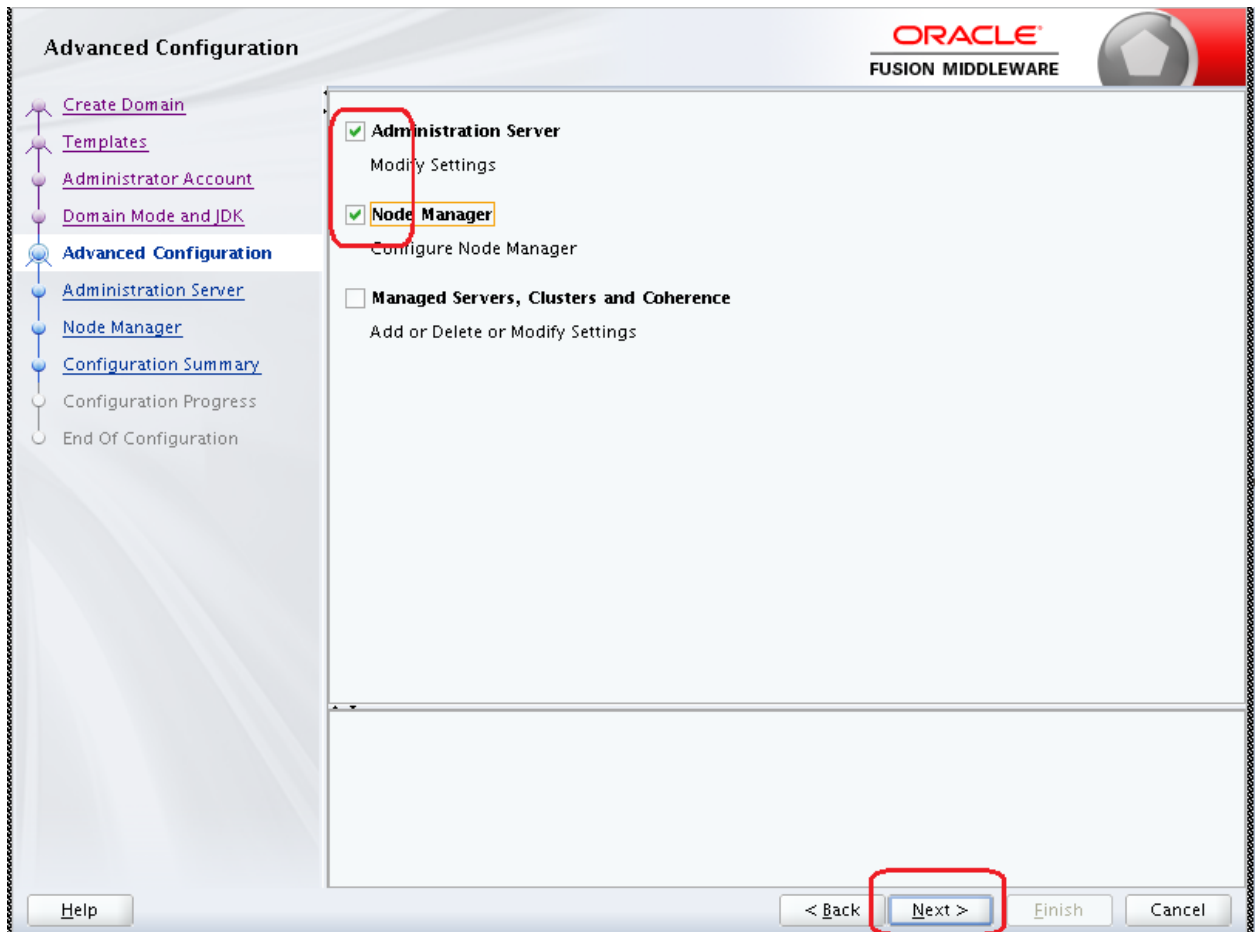
☒ **Production**
Require the entry of a username and password, and do not poll for applications to deploy.

JDK

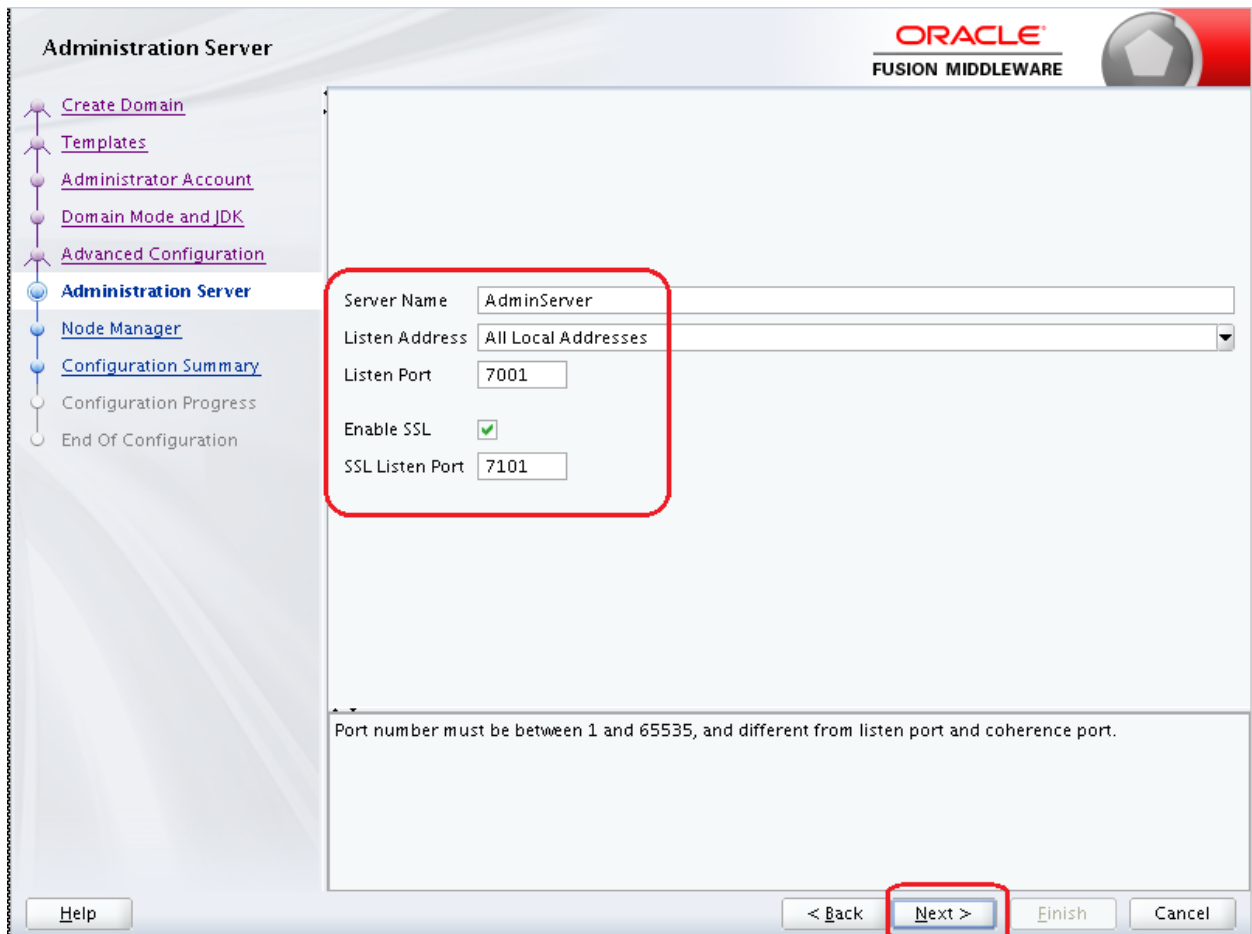
☒ Oracle HotSpot 1.7.0_75 /usr/java/jdk1.7.0_75

☐ Other JDK Location:

5) Select the check box adjacent to **Administration Server** and **Node Manager**. Click **Next**.



6) Specify the Administration server **Listen address** and **Listen port**.



The image shows the 'Administration Server' configuration window in Oracle Fusion Middleware. The left sidebar contains a navigation tree with the following items: 'Create Domain', 'Templates', 'Administrator Account', 'Domain Mode and JDK', 'Advanced Configuration', 'Administration Server' (highlighted), 'Node Manager', 'Configuration Summary', 'Configuration Progress', and 'End Of Configuration'. The main area displays configuration fields for the 'Administration Server'. A red rectangle highlights the 'Server Name' field (containing 'AdminServer'), the 'Listen Address' dropdown (set to 'All Local Addresses'), the 'Listen Port' field (containing '7001'), the 'Enable SSL' checkbox (checked), and the 'SSL Listen Port' field (containing '7101'). Below these fields, a message states: 'Port number must be between 1 and 65535, and different from listen port and coherence port.' At the bottom right, a red rectangle highlights the 'Next >' button, with '< Back' and 'Finish' buttons also visible. A 'Help' button is located at the bottom left.

Server Name	AdminServer
Listen Address	All Local Addresses
Listen Port	7001
Enable SSL	☒
SSL Listen Port	7101

Port number must be between 1 and 65535, and different from listen port and coherence port.

< Back **Next >** Finish Cancel

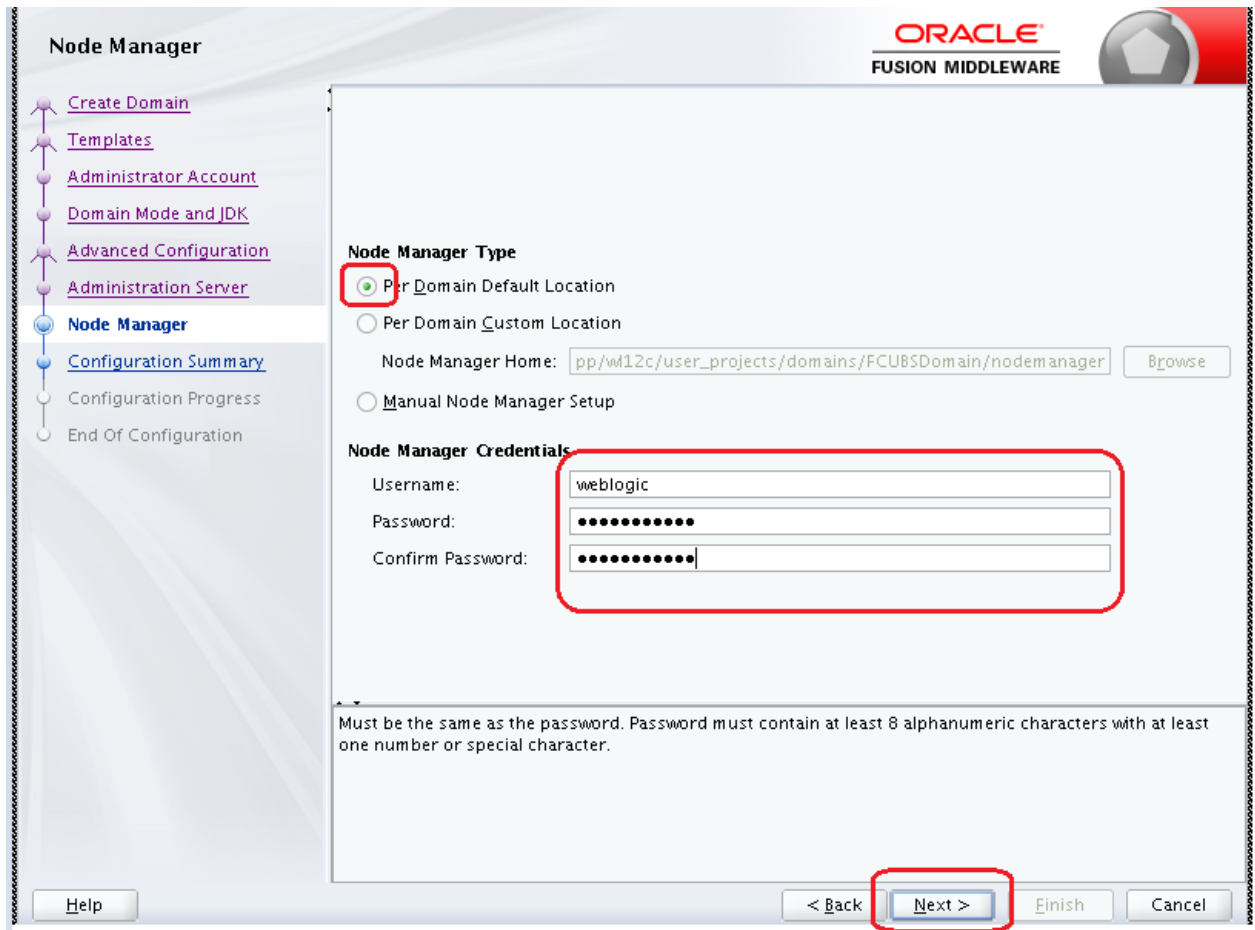
Note: The default Listen port is 7001 and SSL port is 7101. This could be changed to any other available port. Ensure to make a note, of this port since the same is required for launching the Admin console, post domain creation.

Note: Check for the port availability using the command - **netstat -anp |grep <Port no>**

The next screen navigates to **NodeManager configuration**.

7) Configure Node Manager

Select **Per Domain Default Location** option from **Node Manager Type**. And in the **Node Manager Credentials**, provide the username and password for the nodemanager. Click **Next**.



The image shows the Oracle Fusion Middleware Node Manager configuration window. The left sidebar contains a navigation tree with the following items: [Create Domain](#), [Templates](#), [Administrator Account](#), [Domain Mode and JDK](#), [Advanced Configuration](#), [Administration Server](#), **Node Manager** (highlighted), [Configuration Summary](#), [Configuration Progress](#), and [End Of Configuration](#). The main content area is titled "Node Manager" and features the Oracle Fusion Middleware logo in the top right corner. Under the "Node Manager Type" section, the "Per Domain Default Location" radio button is selected and highlighted with a red box. Below it, the "Node Manager Home" field contains the path "pp/wl12c/user_projects/domains/FCUBSDomain/nodemanager" with a "Browse" button to its right. The "Manual Node Manager Setup" radio button is unselected. Under the "Node Manager Credentials" section, the "Username" field contains "weblogic", and both the "Password" and "Confirm Password" fields are filled with masked characters (dots). This entire credentials section is highlighted with a red box. At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted with a red box), "Finish", and "Cancel". A note at the bottom of the main content area states: "Must be the same as the password. Password must contain at least 8 alphanumeric characters with at least one number or special character."

Node Manager

ORACLE
FUSION MIDDLEWARE

[Create Domain](#)
[Templates](#)
[Administrator Account](#)
[Domain Mode and JDK](#)
[Advanced Configuration](#)
[Administration Server](#)
Node Manager
[Configuration Summary](#)
[Configuration Progress](#)
[End Of Configuration](#)

Node Manager Type

☒ Per Domain Default Location
☐ Per Domain Custom Location

Node Manager Home: [Browse](#)

☐ Manual Node Manager Setup

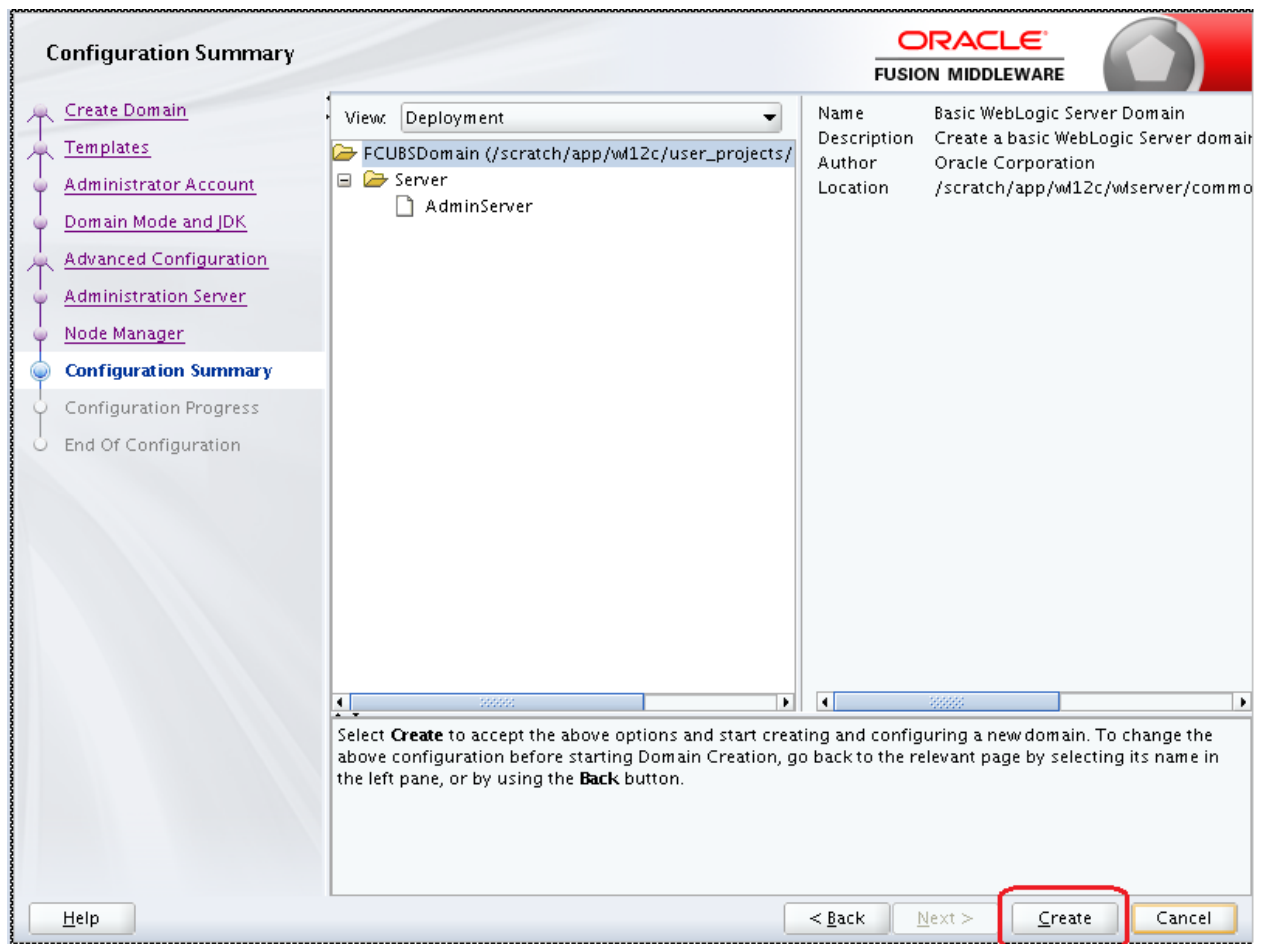
Node Manager Credentials

Username:
Password:
Confirm Password:

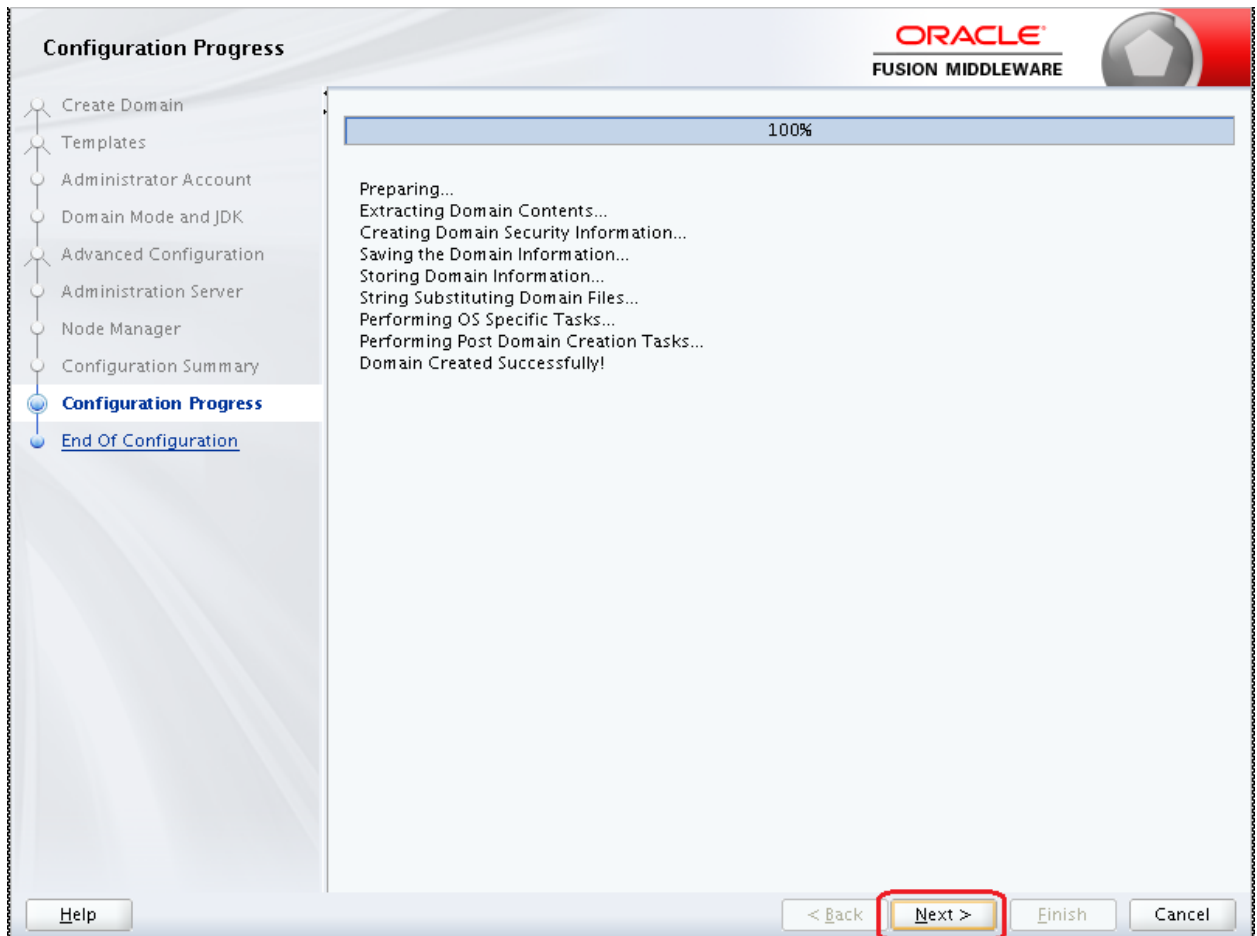
Must be the same as the password. Password must contain at least 8 alphanumeric characters with at least one number or special character.

[Help](#) [< Back](#) [Next >](#) [Finish](#) [Cancel](#)

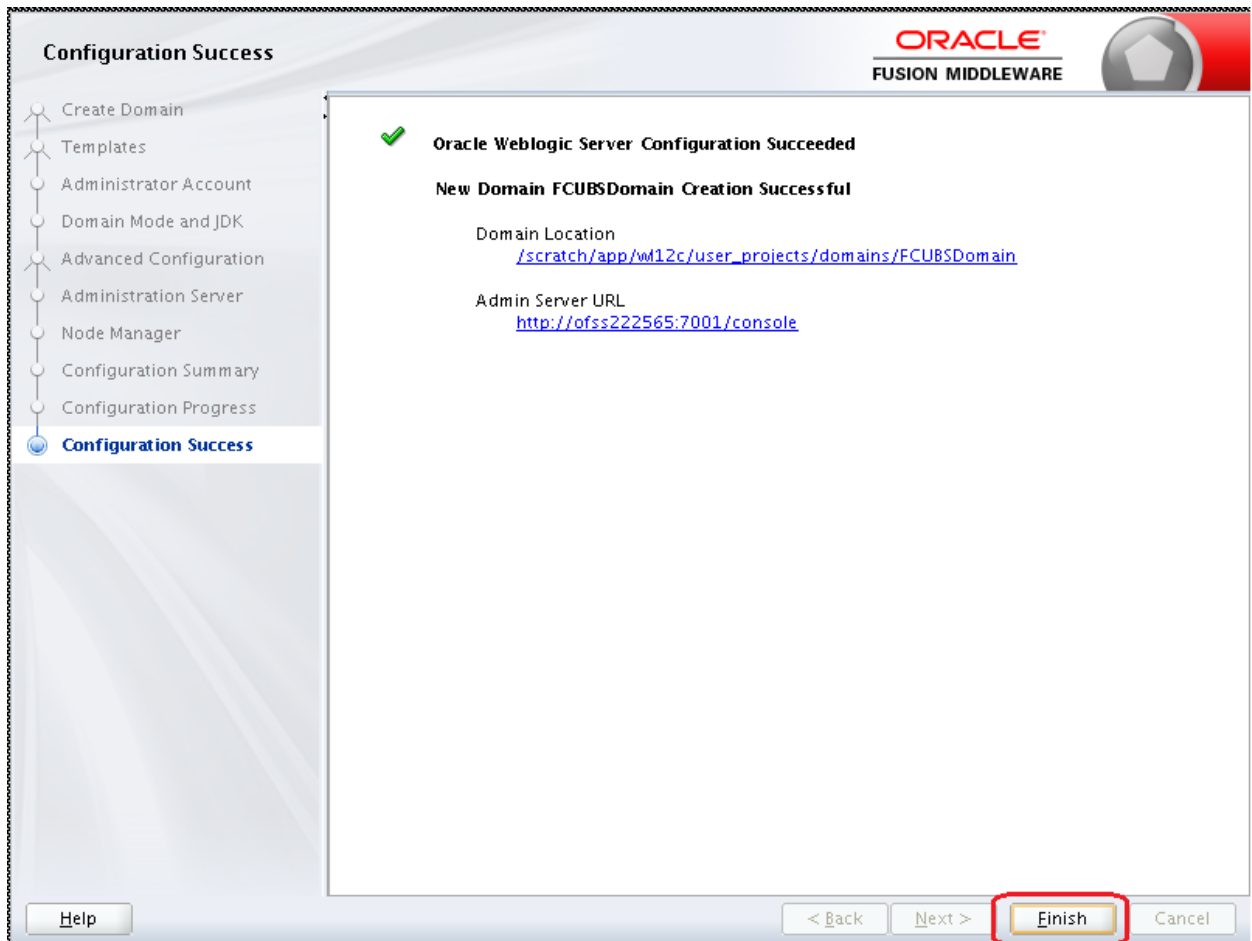
- 8) Verify the details and click **Create**. The domain creation process is initiated and the progress of completion is indicated.



9) Click **Next**.



10) The **Configuration Success** message will be displayed as follows:



The Admin Server console URL is as indicated below:

http://<IP address>:<admin console port>/console

- <IP address >: Host on which domain was created.
- <admin console port> : Port specified in Administration Server configuration page.

In this case the Admin Console URL is: <http://ofss222565:7001/console>

2.2 Pack and Unpack Domain

The domain structure is expected to be copied to the second server during domain creation. To copy the same, you can use pack and unpack utility provided under \$WLSHOME/common/bin.

Pack

Pack domain in primary server:

```
./pack.sh -managed=true -domain=/scratch/app/wl12c/user_projects/domains/FCUBSDomain -  
template=/tmp/FCUBSDomain.jar -template_name="FCUBSDomain"
```

Unpack

Unpack FTP FCBUSDomain.jar in binary mode to secondary server under /tmp area and unpack the domain using unpack utility provided under \$WLSHOME/common/bin

```
./unpack.sh -domain=/scratch/app/wl12c/user_projects/domains/FCUBSDomain -  
template=/tmp/FCUBSDomain.jar
```

2.3 Start Admin server

Admin server is started on the primary server. Login to primary server and navigate to folder \$DOMAIN_HOME/bin and execute **startWeblogic.sh**.

2.4 Start Node Manager

Node Manager needs to be started on both the servers. Before starting the node manager update ListenAddress to the Hostname/IP Address of the machine in nodemanager.properties located in folder \$DOMAIN_HOME/nodemanager

To start the node manager login to the servers and navigate to folder \$DOMAIN_HOME/bin and execute **NodeManager.sh**

3. Cluster Configuration

Dynamic Cluster configuration involves below steps

- 1) Machine Configuration
- 2) Dynamic Cluster Creation: In a normal WebLogic Cluster you define Managed Server and add them to Cluster. In Dynamic Cluster, you select number of Servers you want in Cluster and Server Template you wish to assign to Servers in this WebLogic Dynamic Cluster.
- 3) Server template modification: Servers (or Managed Server) that are part of WebLogic Dynamic Cluster will have properties taken from Server Template.

Modify server template for best practices parameters for Dynamic Servers (part of Dynamic Cluster), you modify Server Template that is applicable to Dynamic Cluster. These settings are applicable to all the managed servers.

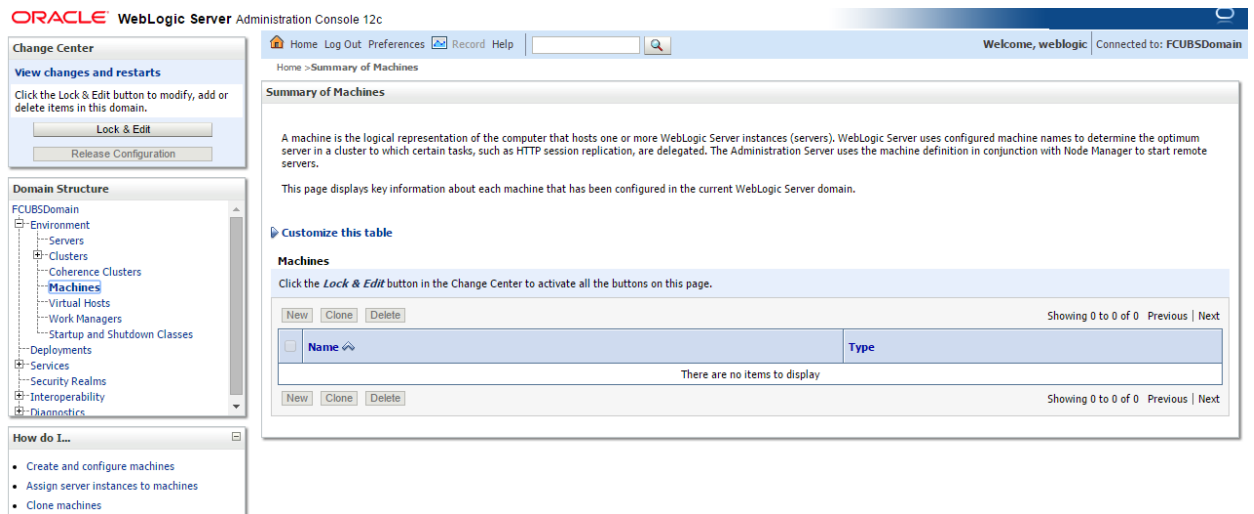
- 4) Activate Changes which would automatically create the managed servers(as mentioned in the number of servers required parameter).

Calculate Number of Servers Required:

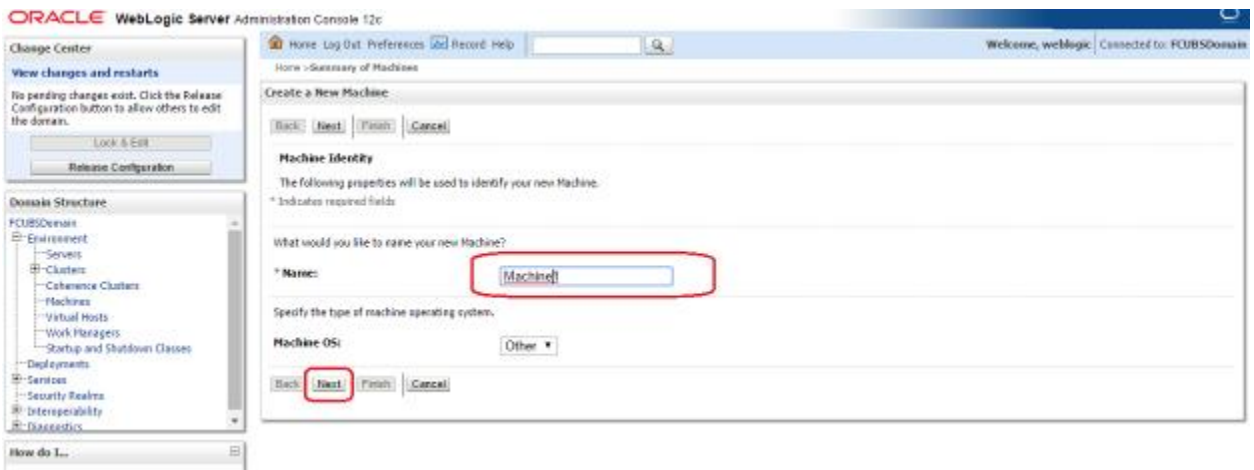
For every 50 logged in FLEXCUBE users require one managed server of size 8GB. i.e. for 300 logged in FLEXCUBE users, it is recommended to have 6 managed servers. Based on the logged in users that needs to be supported decide on the number of the managed servers required. This parameter is required later in the dynamic cluster creation.

3.1 Machines Configuration

- 1) Login into Admin Console and Navigate to FCUBSDomain → Environment → Machine and Click **New**



- 2) Enter the **machine name** and click **Next**



- 3) Enter the **Listen Address** and **Listen Port**(this is the port mentioned in nodemanager.properties file) and click **Finish**

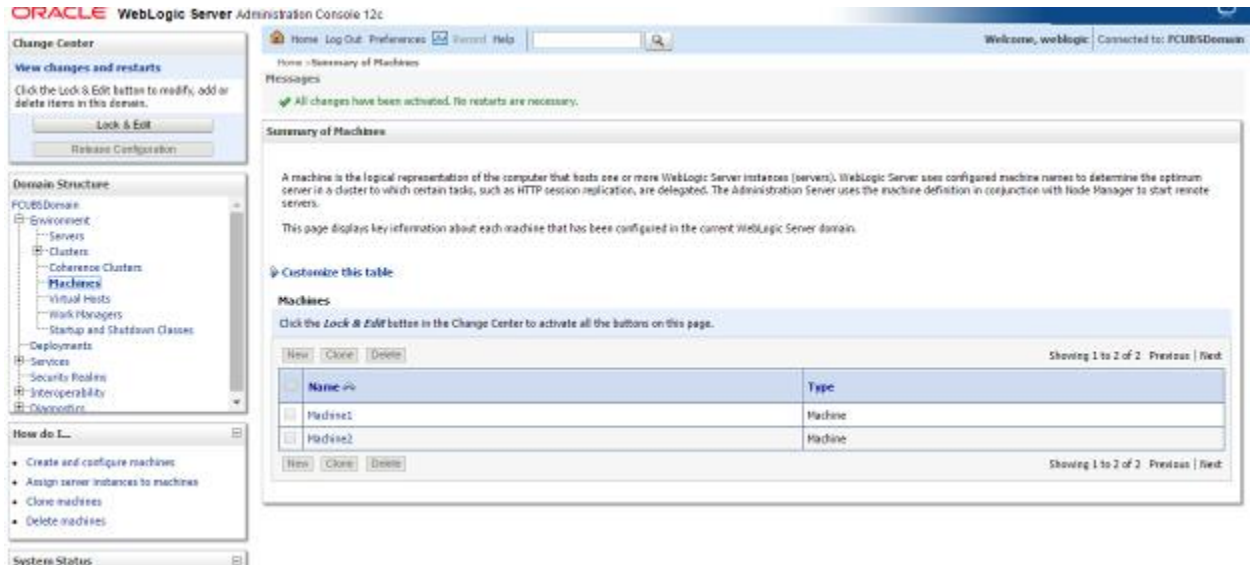
The screenshot shows the 'Create a New Machine' dialog in the Oracle WebLogic Server Administration Console. The 'Node Manager Properties' section is active. The 'Type' is set to 'SSL'. The 'Listen Address' is 'localhost' and the 'Listen Port' is '5556'. The 'Finish' button is highlighted with a red box.

- 4) Machine is created

The screenshot shows the 'Summary of Machines' page in the Oracle WebLogic Server Administration Console. A message states: 'All changes have been activated. No restarts are necessary.' Below this, a table lists the created machine.

Name	Type
Machine1	Machine

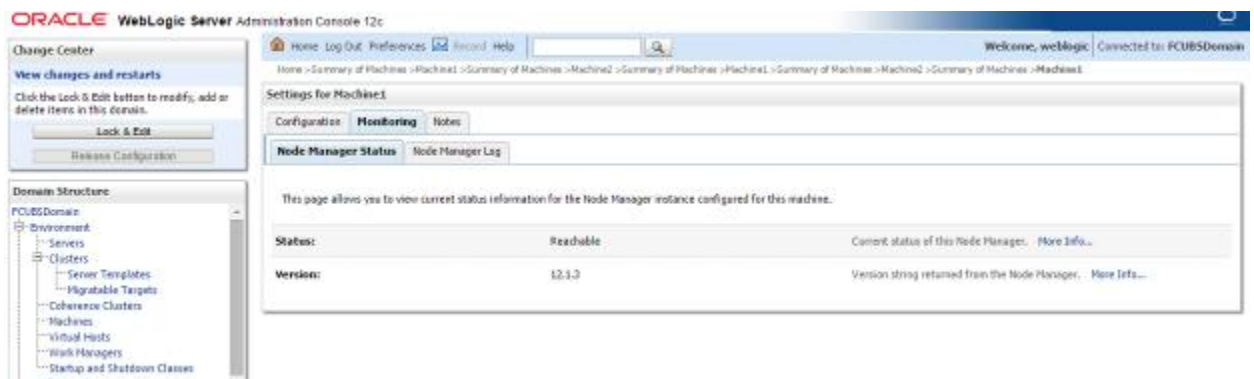
5) Similarly create a new **machine** entry for the other server



Verifying machine status

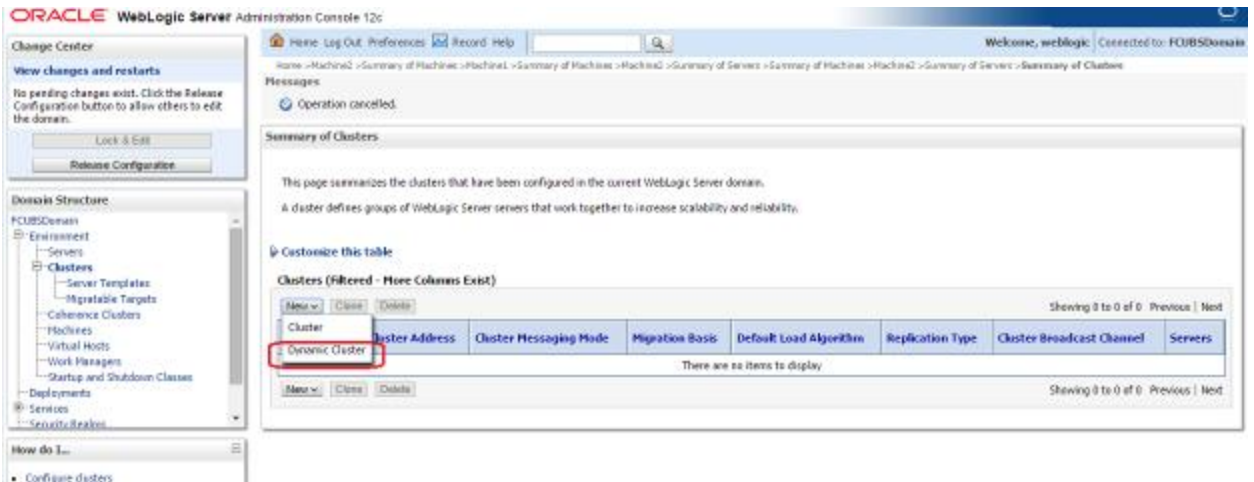
Before starting the managed servers, ensure that the Node manager Status of all the machines are "Reachable".

In the console, navigate through Domain structure → Machines → machine1 → Monitoring → Node Manager Status. Status should be **Reachable**.

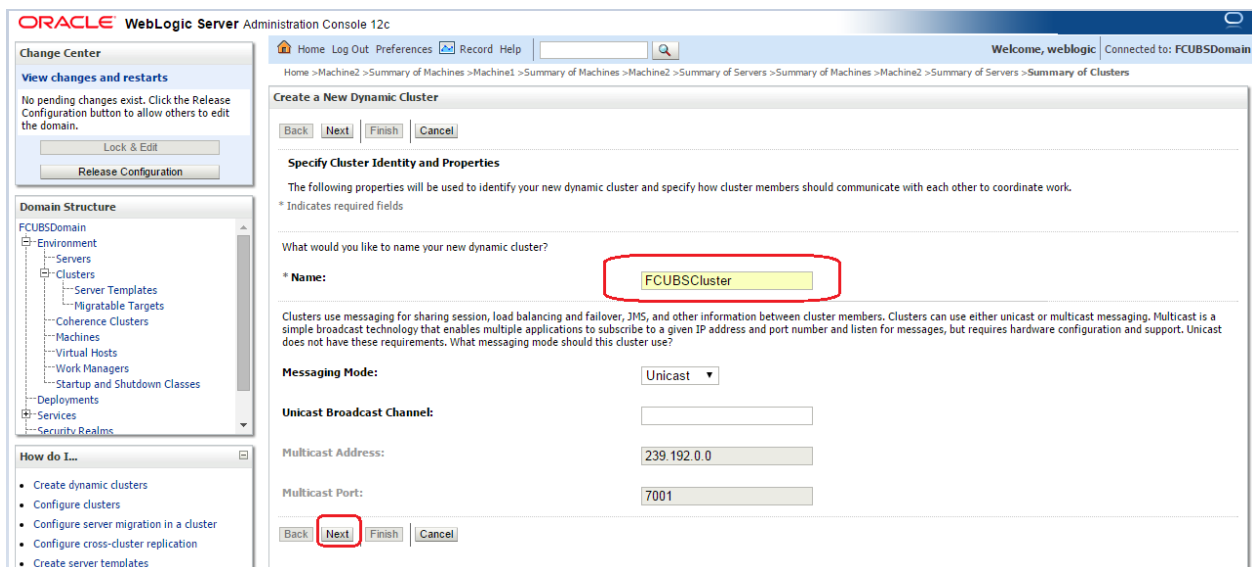


3.2 Dynamic Cluster Creation

1) Login into Admin Console and Navigate to FCUBSDomain → Environment → Clusters → New → select **Dynamic Cluster**



2) Enter the **Cluster Name** and Click on **Next**



- 3) Enter the **number of dynamic servers** you want to configure, enter the **server name prefix** and click on **Next**

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Record Help

Welcome, weblogic Connected to: FCUBSDomain

Home > Machine2 > Summary of Machines > Machine1 > Summary of Machines > Machine2 > Summary of Servers > Summary of Machines > Machine2 > Summary of Servers > Summary of Clusters

Create a New Dynamic Cluster

Back Next Finish Cancel

Specify Dynamic Server Properties

The following properties will be used to specify the size and characteristics of your new dynamic cluster.

How many dynamic servers will you need at peak load?

Number of Dynamic Servers: 4

What naming convention would you like to use for new dynamic servers in this cluster?

Server Name Prefix: FCUBSMS

Server templates are used to configure the characteristics that are common to all dynamic servers in this cluster. Server templates are unique to a cluster and cannot be shared across clusters, so a new server template will be created to support this new cluster.

Back Next Finish Cancel

- 4) Select Machines that participate in domain, in this case all machines will be part of the domain, select **Use any machine configured in this domain** and click on **Next**

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Record Help

Welcome, weblogic Connected to: FCUBSDomain

Home > Machine2 > Summary of Machines > Machine1 > Summary of Machines > Machine2 > Summary of Servers > Summary of Machines > Machine2 > Summary of Servers > Summary of Clusters

Create a New Dynamic Cluster

Back Next Finish Cancel

Specify Machine Bindings

Associating dynamic servers with machines is essential if you intend to use Node Manager and the Administration Console (or WLST) to start server instances.

How do you want to distribute dynamic servers across machines?

☒ Use any machine configured in this domain

☐ Use a single machine for all dynamic servers

Selected Machines: Machine1

☐ Use a subset of machines in this domain

Machine Name Match Expression:

Back Next Finish Cancel

- 5) Select the **listen port for the first server** in the dynamic cluster and then the **SSL listener port** for the first server in the dynamic cluster. The subsequent servers will be assigned with an incremental port number. Click **Next**

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Recent Help

Welcome, weblogic Connected to: FCUBSDomain

Home > Machines2 > Summary of Machines > Machine2 > Summary of Machines > Machine2 > Summary of Servers > Summary of Machines > Machine2 > Summary of Servers > Summary of Clusters

Create a New Dynamic Cluster

Back Next Finish Cancel

Specify Listen Port Bindings

Select how these dynamic servers should be bound to listen ports.

Listen ports for dynamic servers can be specified in a server template or can be dynamically generated to be unique.

☒ Assign each dynamic server unique listen ports

Listen Port for First Server: 7002

SSL Listen Port for First Server: 7102

☐ Assign each dynamic server fixed listen ports

Listen Port: 7100

SSL Listen Port: 8100

Back Next Finish Cancel

- 6) Summary of new Dynamic Cluster configuration is presented. Click **Finish** to create

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Recent Help

Welcome, weblogic Connected to: FCUBSDomain

Home > Machines2 > Summary of Machines > Machine2 > Summary of Machines > Machine2 > Summary of Servers > Summary of Machines > Machine2 > Summary of Servers > Summary of Clusters

Create a New Dynamic Cluster

Back Next Finish Cancel

Review Your Dynamic Cluster Configuration

You have elected to create a new dynamic cluster with the following configuration.

Configuration details for new dynamic cluster:

Name of New Dynamic Cluster:	FCUBSCluster
Maximum Number of Dynamic Servers:	4
Server Name Prefix:	FCUBSHS
Enable Calculated Listen Ports:	true
Enable Calculated Machine Associations:	true

Configuration details for new server template:

Name of New Server Template:	FCUBSHSTemplate
Listen Port:	7002
SSL Listen Port:	7102

Back Next Finish Cancel

7) The **Summary of Clusters** screens should show the recently created Dynamic Cluster.

Summary of Clusters

This page summarizes the clusters that have been configured in the current WebLogic Server domain.

A cluster defines groups of WebLogic Server servers that work together to increase scalability and reliability.

Customize this table

Clusters (Filtered - More Columns Exist)

Name	Cluster Address	Cluster Messaging Mode	Migration Basis	Default Load Algorithm	Replication Type	Cluster Broadcast Channel	Servers
FCUBSHSTemplate		Unicast	Database	Round Robin	(None)		

8) Upon **Activate Changes** would automatically create 4 managed servers.

Summary of Clusters

This page summarizes the clusters that have been configured in the current WebLogic Server domain.

A cluster defines groups of WebLogic Server servers that work together to increase scalability and reliability.

Customize this table

Clusters (Filtered - More Columns Exist)

Click the **Lock & Edit** button in the Change Center to activate all the buttons on this page.

Name	Cluster Address	Cluster Messaging Mode	Migration Basis	Default Load Algorithm	Replication Type	Cluster Broadcast Channel	Servers
FCUBSHSTemplate		Unicast	Database	Round Robin	(None)		FCUBSHS1, FCUBSHS2, FCUBSHS3, FCUBSHS4

9) Navigate to FCUBSDomain → Environment → Servers tab and 4 new servers are created

Summary of Servers

A server is an instance of WebLogic Server that runs in its own Java Virtual Machine (JVM) and has its own configuration.

This page summarizes each server that has been configured in the current WebLogic Server domain.

Customize this table

Servers (Filtered - More Columns Exist)

Click the **Lock & Edit** button in the Change Center to activate all the buttons on this page.

Name	Type	Cluster	Machine	State	Health	Listen Port
AdminServer(admin)	Configured			RUNNING	OK	7001
FCUBSHS1	Dynamic	FCUBSHSTemplate	Machine1	SHUTDOWN	Not reachable	7002
FCUBSHS2	Dynamic	FCUBSHSTemplate	Machine2	SHUTDOWN	Not reachable	7004
FCUBSHS3	Dynamic	FCUBSHSTemplate	Machine1	SHUTDOWN	Not reachable	7005
FCUBSHS4	Dynamic	FCUBSHSTemplate	Machine2	SHUTDOWN	Not reachable	7006

3.3 Managed Server Template configuration

The server template created is modified to apply the below parameters

3.3.1 Logging

The process of log file writing in a Weblogic server can impact the performance. Hence, you need to keep the logging to minimum in a production environment.

Update below parameters by in Logging Screen

Minimum Severity to log	Warning
Log file Severity level	Warning
Standard Out Severity level	Critical
Domain broadcaster Severity level	Critical

1) Navigate to FCUBSDomain → Environment → Clusters

The screenshot shows the Oracle WebLogic Server Administration Console. On the left, the 'Domain Structure' tree is expanded to 'Server Templates'. The main panel displays the 'Summary of Server Templates' page. It includes a table with columns: Name, Cluster, Machine, Listen Port, and Listen Address. The table contains one entry: 'FCUBSMSTemplate' under the 'FCUBSCLUSTER' cluster, with a listen port of 7002. The 'FCUBSMSTemplate' row is highlighted with a red box. Navigation links like 'New', 'Clone', and 'Delete' are present for the table.

2) Select FCUBSTemplate and naviage to Logging → General

The screenshot shows the 'Settings for FCUBSMSTemplate' page in the Oracle WebLogic Server Administration Console. The 'Logging' tab is selected. Under the 'General' sub-tab, the 'Log file name' is set to 'logs/FCUBSMSTemplate.log'. A note explains that the log file name is typically a computed value based on the parent of the MBean. The 'Rotation' section is partially visible at the bottom.

3) Under Advanced Tab, update the below parameters and Click on **Save**

Advanced

 **Date Format Pattern:**

MMM d, yyyy h:mm:ss a z

The date format pattern used for rendering dates in the log. The DateFormatPattern string conforms to the specification of the java.text.SimpleDateFormat class. [More Info...](#)

Minimum severity to log:

Warning

The minimum severity of log messages going to all log destinations. By default all messages are published. [More Info...](#)

 **Logger severity properties:**

The configuration of the different logger severities keyed by name. The values are one of the predefined Severity strings namely Emergency, Alert, Critical, Error, Warning, Notice, Info, Debug, Trace. [More Info...](#)

Log file :

Severity level:

Warning

The minimum severity of log messages going to the server log file. By default all messages go to the log file. [More Info...](#)

Filter:

None

The filter configuration for the server log file. [More Info...](#)

 **Log File Buffer:**

8

Gets the underlying log buffer size in kilobytes [More Info...](#)

Standard out :

Severity level:

Critical

The minimum severity of log messages going to the standard out. Messages with a lower severity than the specified value will not be published to standard out. [More Info...](#)

Filter:

None

The filter configuration for log events being sent to the standard out. [More Info...](#)

Domain log broadcaster :

Severity level:

Critical

The minimum severity of log messages going to the domain log from this server's log broadcaster. Messages with a lower severity than the specified value will not be published to the domain log. [More Info...](#)

Filter:

None

The filter configuration for log events being sent to the domain log. [More Info...](#)

Buffer Size:

10

Broadcasts log messages to the domain log in batch mode. [More Info...](#)

☒ **Stack Traces to stdout**

Specifies whether to dump stack traces to the console when included in logged message. [More Info...](#)

stdout Stack Trace Depth:

5

Determines the no of stacktrace frames to display on standard out. All frames are displayed in the log file. * -1 means all frames are displayed. [More Info...](#)

 **stdout Format:**

standard

The output format to use when logging to the console. [More Info...](#)

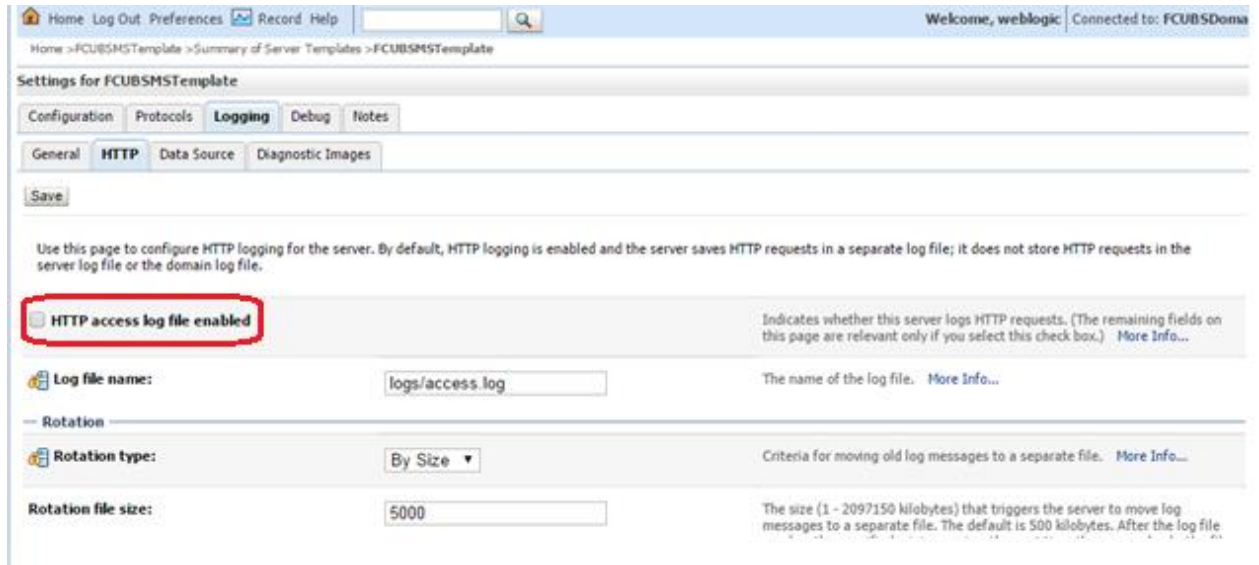
Save

3-26

ORACLE

3.3.2 HTTP Logging

- 1) FCUBSDomain → Environment → Clusters → FCUBSTemplate → Logging → HTTP →
Uncheck the **Access Logs** Flag



Home Log Out Preferences Record Help Welcome, weblogic Connected to: FCUBSDoma

Home > FCUBSMSTemplate > Summary of Server Templates > FCUBSMSTemplate

Settings for FCUBSMSTemplate

Configuration Protocols **Logging** Debug Notes

General **HTTP** Data Source Diagnostic Images

Save

Use this page to configure HTTP logging for the server. By default, HTTP logging is enabled and the server saves HTTP requests in a separate log file; it does not store HTTP requests in the server log file or the domain log file.

☐ **HTTP access log file enabled** Indicates whether this server logs HTTP requests. (The remaining fields on this page are relevant only if you select this check box.) [More Info...](#)

Log file name: logs/access.log The name of the log file. [More Info...](#)

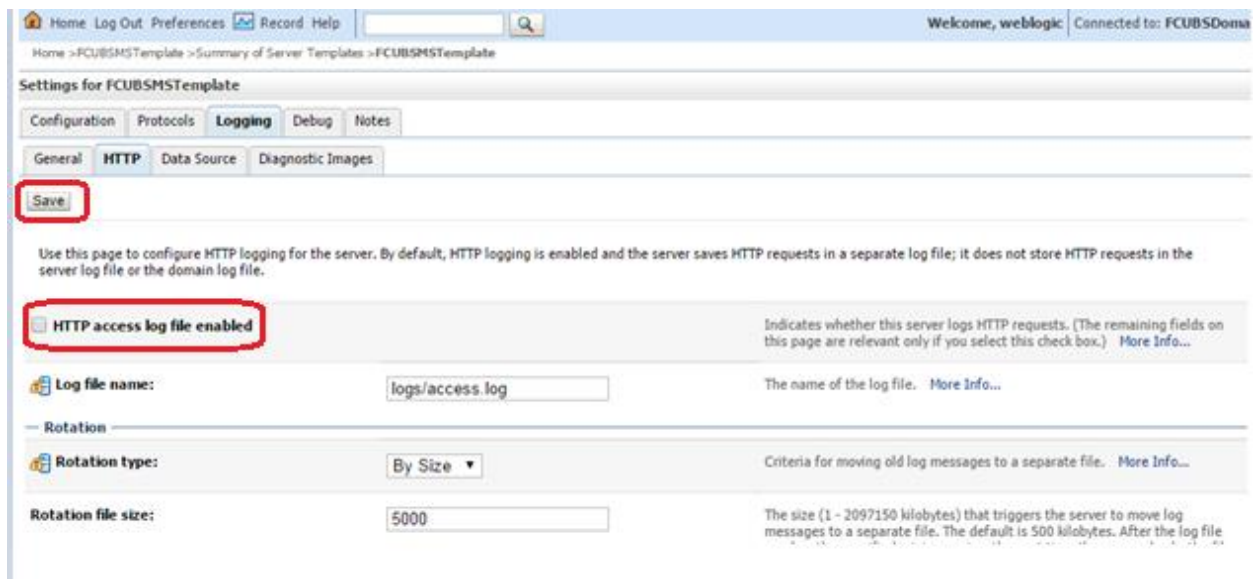
Rotation

Rotation type: By Size Criteria for moving old log messages to a separate file. [More Info...](#)

Rotation file size: 5000 The size (1 - 2097150 kilobytes) that triggers the server to move log messages to a separate file. The default is 500 kilobytes. After the log file

3.3.3 Stuck Tread Max Time

- 1) FCUBSDomain → Environment → Clusters → FCUBSTemplate → Tuning, update the stuck thread max time to **18000** and Click on **Save**



Home Log Out Preferences Record Help Welcome, weblogic Connected to: FCUBSDoma

Home > FCUBSMSTemplate > Summary of Server Templates > FCUBSMSTemplate

Settings for FCUBSMSTemplate

Configuration Protocols **Logging** Debug Notes

General **HTTP** Data Source Diagnostic Images

Save

Use this page to configure HTTP logging for the server. By default, HTTP logging is enabled and the server saves HTTP requests in a separate log file; it does not store HTTP requests in the server log file or the domain log file.

☐ **HTTP access log file enabled** Indicates whether this server logs HTTP requests. (The remaining fields on this page are relevant only if you select this check box.) [More Info...](#)

Log file name: logs/access.log The name of the log file. [More Info...](#)

Rotation

Rotation type: By Size Criteria for moving old log messages to a separate file. [More Info...](#)

Rotation file size: 5000 The size (1 - 2097150 kilobytes) that triggers the server to move log messages to a separate file. The default is 500 kilobytes. After the log file

4. Tuning

4.1 General Parameters

PARAMETER	VALUE	Navigate To
JTA Time out seconds	18000	Login to Weblogic Server console. Click on the domain name (ex: FCUBSDomain) which is under 'Domain Structure'. Go to Configuration > JTA, parameter and values is found on the right side panel of console.
Session Timeout	900	Login to Weblogic Server console Click on Deployments which is under 'Domain Structure'. Click on the deployed FCJ application from right side panel. Click on FCJNeoWeb from 'Modules and components' Go to Configuration General, the parameter values can be found here.

4.2 JVM Tuning

This section of the document provides JVM optimization for Oracle FLEXCUBE Universal Banking Solution.

Basically the JAVA minimum and maximum heap size needs to be reset for 32 and 64 bit environments. Both the minimum and maximum heap size is set to 1.5GB and 4GB in case of 32 bit and 64 bit environments respectively.

How to find whether the JVM is 32bit or 64bit?

Go to \$JAVA_HOME/bin directory. Check java version using command `./java -d64 -version`
64 bit JVM shows the version details where as 32bit throws an error.

How to modify the JVM heap parameters?

To change the JVM heap parameters modify `setDomainEnv.sh` under domain FCUBSCL in both servers. This file is located at “`$WL_HOME/user_projects/domains/$WLS_DOMAIN/bin`” in both the servers.

Use below `USER_MEM_ARGS` variable to override the standard memory arguments passed to java for **SUN JDK**.

32 bit JDK

```
USER_MEM_ARGS="-  
Dorg.apache.xml.dtm.DTMManager=org.apache.xml.dtm.ref.DTMManagerDefault  
-  
Dorg.apache.xerces.xni.parser.XMLParserConfiguration=org.apache.xerces.  
parsers.XML11Configuration -Dweblogic.threadpool.MinPoolSize=100 -  
Dweblogic.threadpool.MaxPoolSize=100 -Xms1536M -Xmx1536M -  
XX:MaxPermSize=256m -server -XX:+UseParallelOldGC -  
XX:ParallelGCThreads=4"  
export USER_MEM_ARGS
```

64 bit JDK

```
USER_MEM_ARGS="-  
Dorg.apache.xml.dtm.DTMManager=org.apache.xml.dtm.ref.DTMManagerDefault  
-Dorg.a  
pache.xerces.xni.parser.XMLParserConfiguration=org.apache.xerces.parser  
s.XML11Configuration -Dweblogic.threadpool.MinPoolSize=100 -  
Dweblogic.threadpool.MaxPoolSize=100 -Xms8g -Xmx8g -Xmn4g -server  
-XX:+UseParallelOldGC -XX:ParallelGCThreads=4"  
export USER_MEM_ARGS
```

Note: Take a backup of the files before modifying the same.

5. Start Managed Servers

Starting using scripts

Managed Servers can be started by executing startManagedWebLogic.sh script present in folder **\$DOMAIN_HOME/bin**

Usage: ./startManagedWebLogic.sh SERVER_NAME {ADMIN_URL}

Eg: ./startManagedWebLogic.sh FCUBSMS1 https://<hostname1>/console

Starting using console

Alternatively, login to admin console, navigate to FCUBSDomain → Environment → Servers → Control, select the managed servers to be started and click on **Start**

The screenshot shows the Oracle WebLogic Server Administration Console. The left sidebar contains a 'Domain Structure' tree with 'FCUBSDomain' expanded, showing 'Environment' and 'Servers'. The 'Servers' folder is selected. The main area displays the 'Summary of Servers' page with the 'Control' tab active. A table lists servers with columns: 'Server', 'Machine', 'State', and 'Status of Last Action'. The table shows four servers: 'AdminServer(admin)' (RUNNING), 'FCUBSMS1' (SHUTDOWN), 'FCUBSMS2' (SHUTDOWN), and 'FCUBSMS3' (SHUTDOWN). The 'Start' button is highlighted with a red box. Below the table, there are buttons for 'Start', 'Resume', 'Suspend', 'Shutdown', and 'Restart SSL'.

Server	Machine	State	Status of Last Action
AdminServer(admin)		RUNNING	None
FCUBSMS1	Machine1	SHUTDOWN	None
FCUBSMS2	Machine2	SHUTDOWN	None
FCUBSMS3	Machine1	SHUTDOWN	None

Upon successful startup, the status of Managed servers is changed to **"RUNNING"**.

Change Center

View changes and restarts

Click the Lock & Edit button to modify, add or delete items in this domain.

Lock & Edit

Release Configuration

Domain Structure

FCUBSDomain

- Environment
 - Servers**
 - Clusters
 - Server Templates
 - Migratable Targets
 - Coherence Clusters
 - Machines
 - Virtual Hosts
 - Work Managers
 - Startup and Shutdown Classes
 - Deployments
 - Services
 - Security Realms

How do I...

- Create Managed Servers
- Clone servers
- Delete Managed Servers
- Delete the Administration Server

Summary of Servers

Configuration Control

A server is an instance of WebLogic Server that runs in its own Java Virtual Machine (JVM) and has its own configuration. This page summarizes each server that has been configured in the current WebLogic Server domain.

Last Refreshed: Jun 11, 2015 2:57:19 PM

Customize this table

Servers (Filtered - More Columns Exist)

Click the **Lock & Edit** button in the Change Center to activate all the buttons on this page.

New Clone Delete Showing 1 to 5 of 5 Previous Next

	Name vs	Type	Cluster	Machine	State	Health	Listen Port
☐	AdminServer(admin)	Configured			RUNNING	OK	7001
☐	FCUBSHS1	Dynamic	FCUBSCluster	Machine1	RUNNING	OK	7003
☐	FCUBSHS2	Dynamic	FCUBSCluster	Machine2	RUNNING	OK	7004
☐	FCUBSHS3	Dynamic	FCUBSCluster	Machine1	RUNNING	OK	7005
☐	FCUBSHS4	Dynamic	FCUBSCluster	Machine2	RUNNING	OK	7006

New Clone Delete Showing 1 to 5 of 5 Previous Next

6. Data Source creation and JDBC Configuration

Following are the JNDI names of those data sources used by FLEXCUBE application.

- jdbc/fcjdevDS - This datasource is used by FLEXCUBE online screen excluding branch screens.
- jdbc/fcjdevDSBranch - This datasource is used by Branch screens.
- jdbc/fcjSchedulerDS - This datasource is used by Quartz scheduler.

Note:

- jdbc/fcjdevDS should be **NonXA** and make use of **OCI** driver.
- jdbc/fcjdevDSBranch and jdbc/fcjSchedulerDS should be **XA**

6.1 Setup Required for OCI Driver

Data sources are created with OCI enabled. For this, Oracle Instant Client is required, below steps needs to be followed

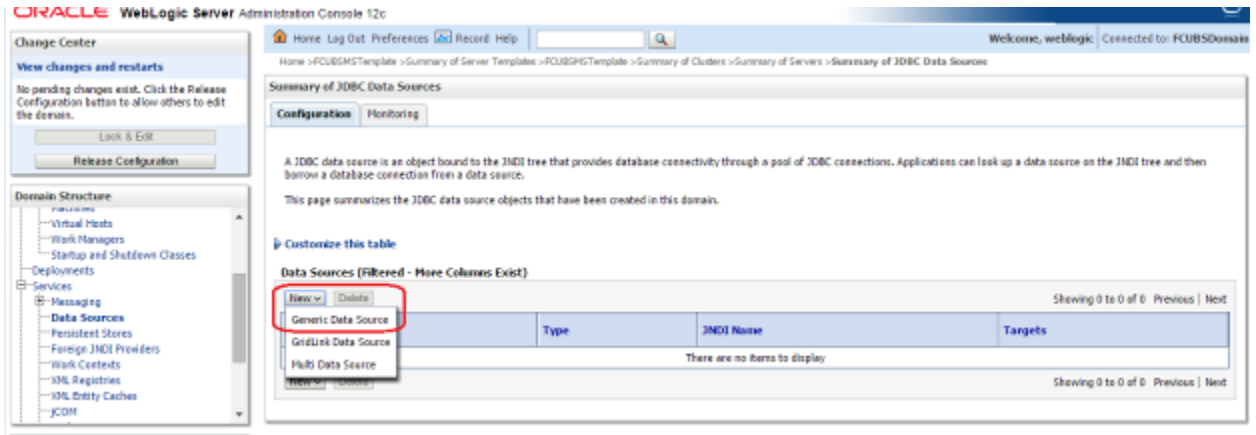
- Download Oracle Instant Client corresponding to the used Oracle DB and java (x64 or x32):

<http://www.oracle.com/technetwork/database/features/instant-client/index-097480.html>

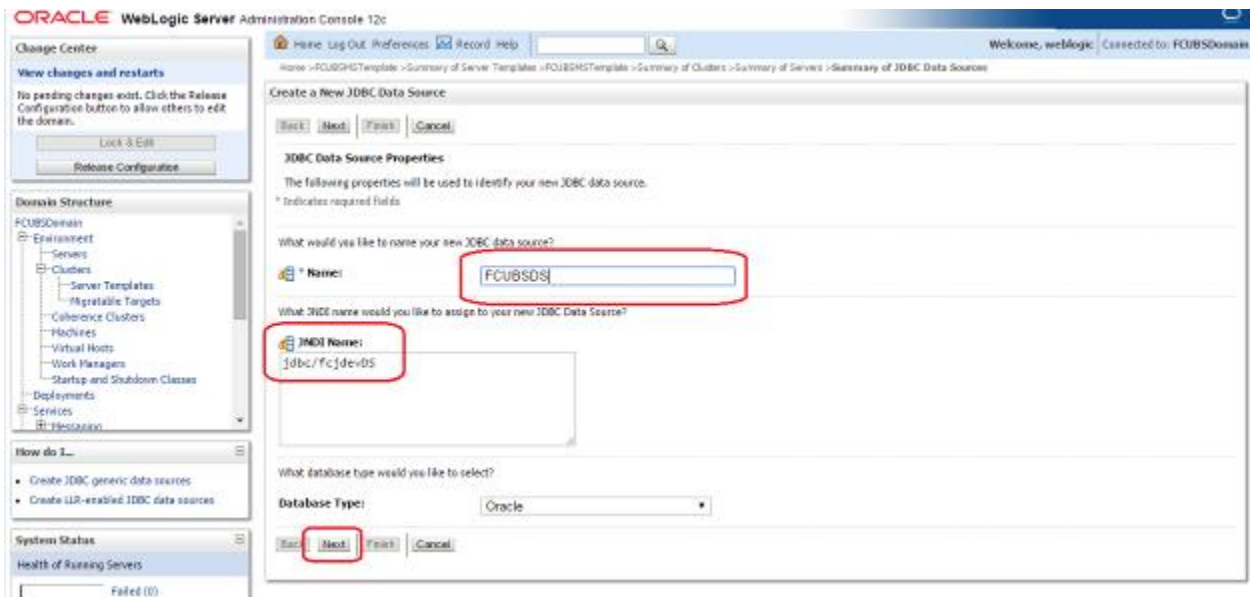
- Set {ORACLE_HOME} in the environment variable.
- Update the environment variable LD_LIBRARY_PATH as {ORACLE_HOME}/lib. This is to load all the .so files.
- Ensure that the ojdbc*.jar file in {WL_HOME}/server/lib/ojdbc*.jar is the same as the file {ORACLE_HOME}/jdbc/lib/ojdbc*.jar. This is to ensure compatibility.
- Update LD_LIBRARY_PATH in StartWebLogic.sh or in setDomainEnv.sh. This must be the path of directory where Oracle Instant Client is installed.
- If you are still not able to load the .so files, then you need to update the EXTRA_JAVA_PROPERTIES by setting Djava.library.path as {ORACLE_HOME}/lib in StartWebLogic.sh or in setDomainEnv.sh.

6.2 Data source creation: non XA

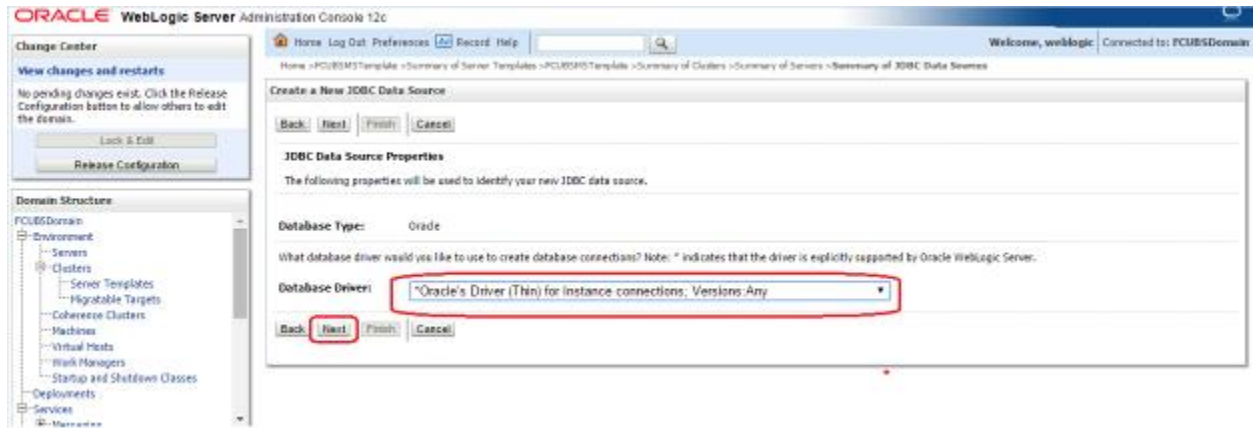
- 1) Navigate to FCUBSDomain → Services → Data Sources → select New > **Generic data source**



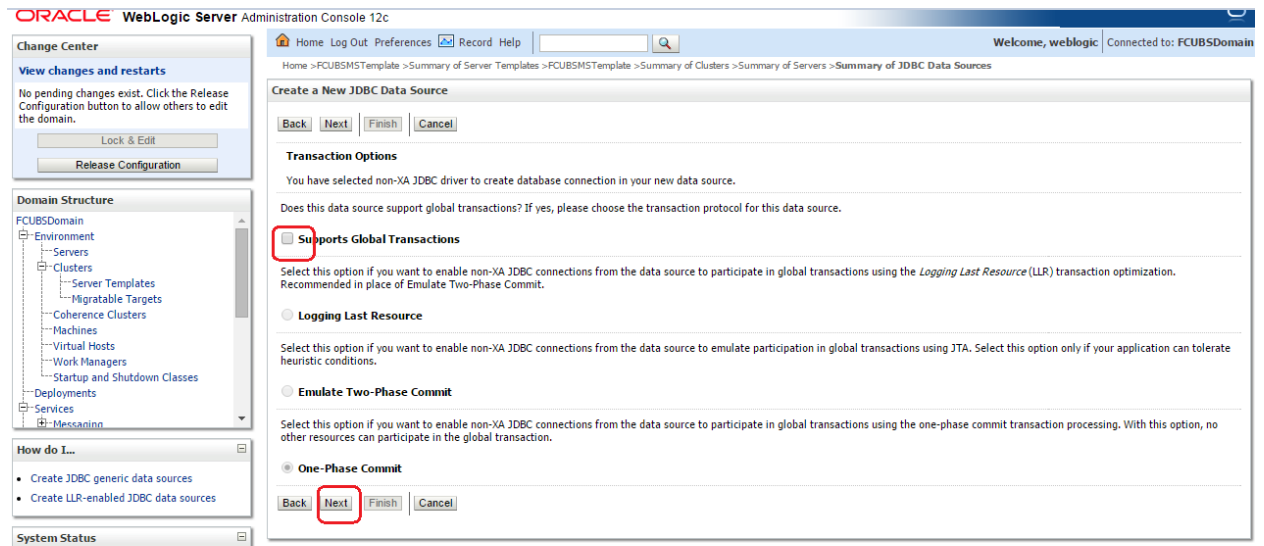
- 2) Enter the **Name** and **JNDI Name** and Click on **Next**



- 3) Select the Driver as **“Oracle’s Driver(thin) for Instance connection: Versions: Any”** and Click on **Next**



- 4) Uncheck the **“Supports Global Transactions”** and click on **Next**



- 5) Enter the Database Name, Host Name, Port, User Name, Password, Confirm Password and Click on **Next**

The screenshot displays the Oracle WebLogic Server Administration Console. The main window is titled 'Create a New JDBC Data Source'. It features a 'Connection Properties' section with the following fields: 'Database Name', 'Host Name', 'Port' (set to 1521), 'Database User Name', 'Password', and 'Confirm Password'. A red rectangular box highlights the 'Database Name', 'Host Name', 'Port', 'Database User Name', 'Password', and 'Confirm Password' fields. The left sidebar shows the 'Domain Structure' tree with 'PCUBSDomain' selected, and the 'System Status' section showing 'Health of Running Servers' with a green bar indicating 'OK (5)'.

- 6) Replace the **JDBC URL** in the below format and click on **Next**

Default URL: jdbc:oracle:thin:@<IP_Address>:<Port>:<INSTANCE_NAME>.

Change the default URL to:

jdbc:oracle:oci:@(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=TCP)(HOST=xxxxxx.com)(PORT=1521)))(CONNECT_DATA=(SERVICE_NAME=fcubs)))

Where,

Scan IP = xxxxxx.com

Service Name = fcubs

Port = 1521

Make sure that in URL, we make the changes to reflect oci.

Then Click on Test Configuration. The connection test should be successful.

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Record Help

Welcome, weblogic Connected to: FCUBSDomain

Create a New JDBC Data Source

Test Configuration Back Next Finish Cancel

Test Database Connection

Test the database availability and the connection properties you provided.

What is the full package name of JDBC driver class used to create database connections in the connection pool?
(Note that this driver class must be in the classpath of any server to which it is deployed.)

Driver Class Name: oracle.jdbc.OracleDriver

What is the URL of the database to connect to? The format of the URL varies by JDBC driver.

URL: jdbc:oracle:oci:@(DESCRIPTION)

What database account user name do you want to use to create database connections?

Database User Name: FCUBS12IDB

What is the database account password to use to create database connections?
(Note: For secure password management, enter the password in the Password field instead of the Properties field below)

Password:

Confirm Password:

What are the properties to pass to the JDBC driver when creating database connections?

Properties: user=FCUBS12USER

7) Select Target as **FCUBSCluster** and click on **Finish**

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Record Help

Welcome, weblogic Connected to: FCUBSDomain

Create a New JDBC Data Source

Back Next Finish Cancel

Select Targets

You can select one or more targets to deploy your new JDBC data source. If you don't select a target, the data source will be created but not deployed. You will need to deploy the data source at a later time.

Servers

☐ AdminServer

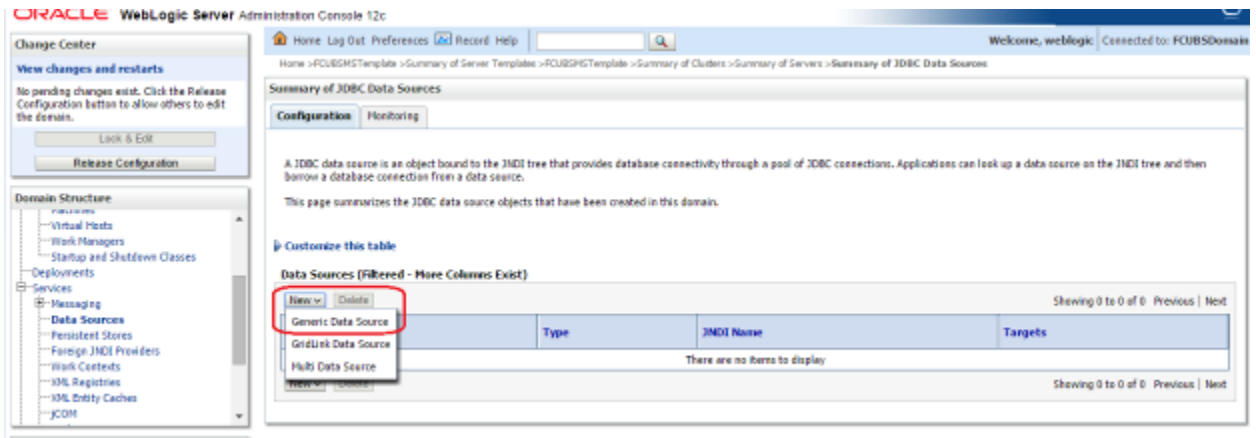
Clusters

☒ FCUBSCluster
All servers in the cluster

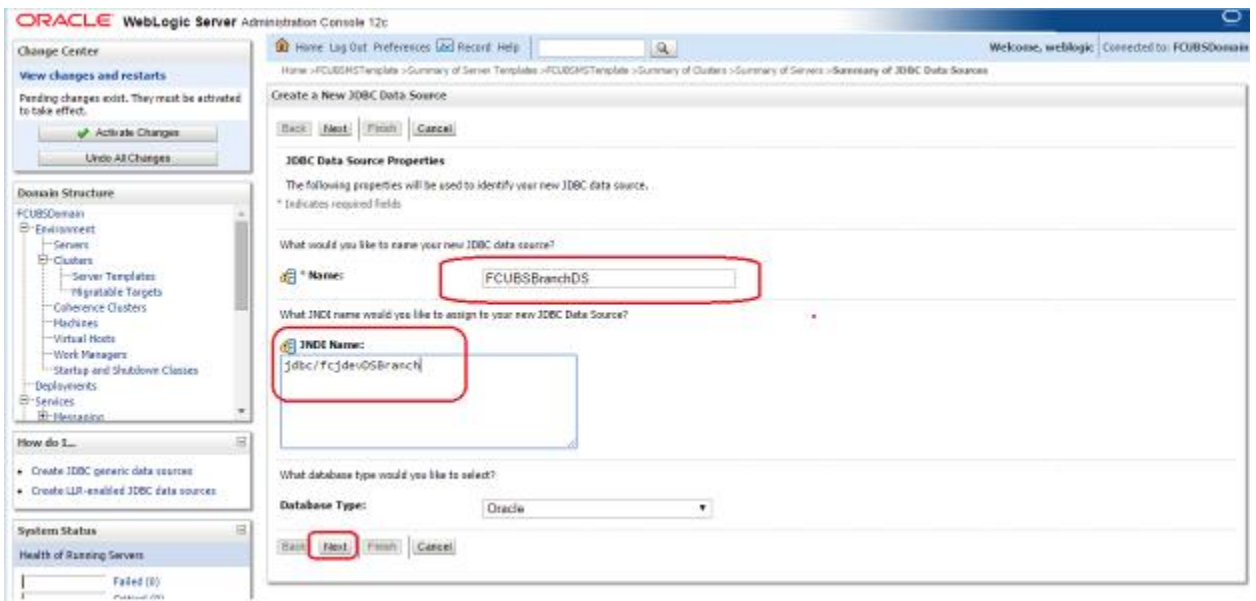
Back Next Finish Cancel

6.3 XA Datasource

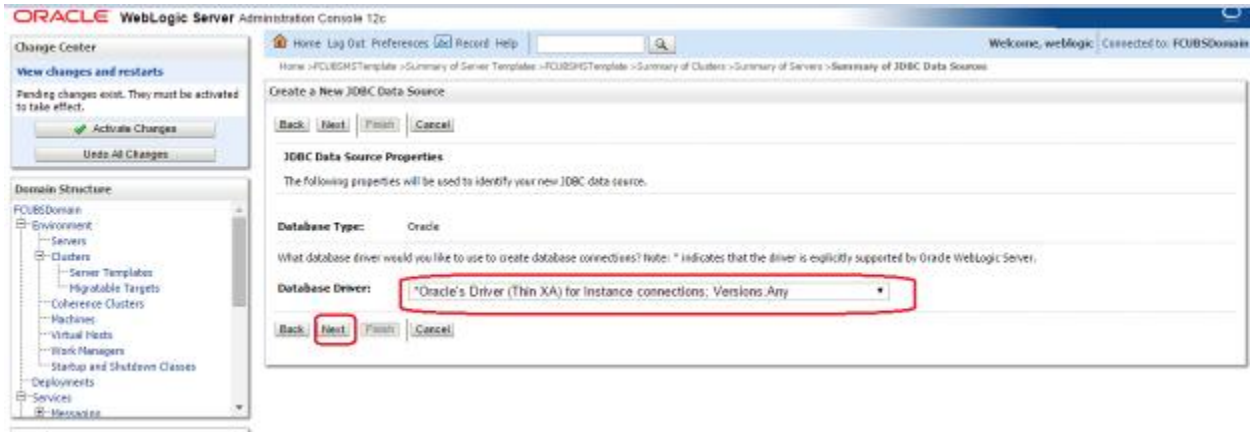
- 1) Navigate to FCUBSDomain → Services → Data Sources → select New > **Generic data source**



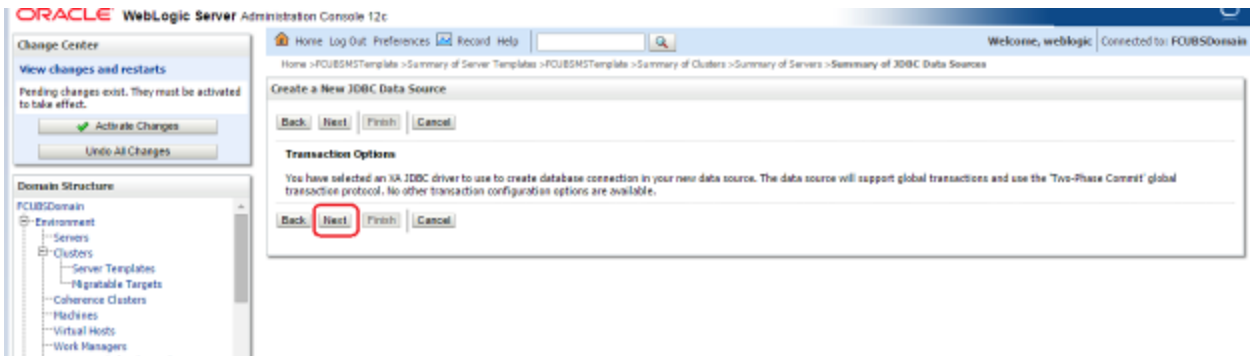
- 2) Enter the **Name** and **JNDI Name** and Click on **Next**



- 3) Select the Driver as **“Oracle’s Driver(thin XA) for Instance connection: Versions: Any”** and Click on **Next**



- 4) Click on **Next**



5) From this step to target setting step follow as mentioned in non-xa

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Record Help

Welcome, weblogic Connected to: FCUBSDomain

Home > FCUBSGHTemplate > Summary of Server Templates > FCUBSGHTemplate > Summary of Clusters > Summary of Servers > Summary of JDBC Data Sources

Create a New JDBC Data Source

Back Next Finish Cancel

Connection Properties

Define Connection Properties.

What is the name of the database you would like to connect to?

Database Name:

What is the name or IP address of the database server?

Host Name:

What is the port on the database server used to connect to the database?

Port:

What database account user name do you want to use to create database connections?

Database User Name:

What is the database account password to use to create database connections?

Password:

Confirm Password:

Add Global Connection Properties:

oracle.jdbc.OracleConnectionClass:

Back Next Finish Cancel

ORACLE WebLogic Server Administration Console 12c

Home Log Out Preferences Record Help

Welcome, weblogic Connected to: FCUBSDomain

Home > FCUBSGHTemplate > Summary of Server Templates > FCUBSGHTemplate > Summary of Clusters > Summary of Servers > Summary of JDBC Data Sources

Create a New JDBC Data Source

Test Configuration Back Next Finish Cancel

Test Database Connection

Test the database availability and the connection properties you provided.

What is the full package name of JDBC driver class used to create database connections in the connection pool?

(Note that this driver class must be in the classpath of an server to which it is deployed.)

Driver Class Name:

What is the URL of the database to connect to? The format of the URL varies by JDBC driver.

URL:

What database account user name do you want to use to create database connections?

Database User Name:

What is the database account password to use to create database connections?

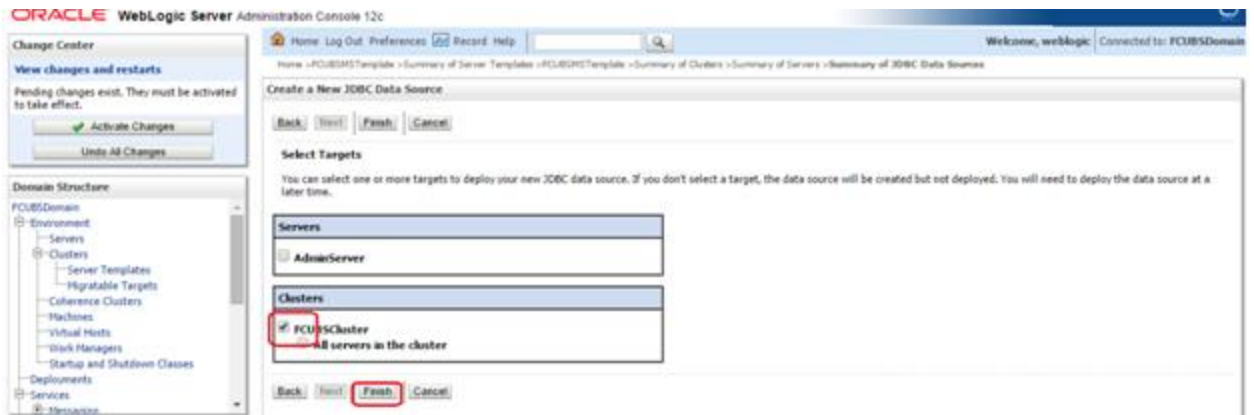
(Note: for secure password management, enter the password in the Password field instead of the Properties field below)

Password:

Confirm Password:

What are the properties to pass to the JDBC driver when creating database connections?

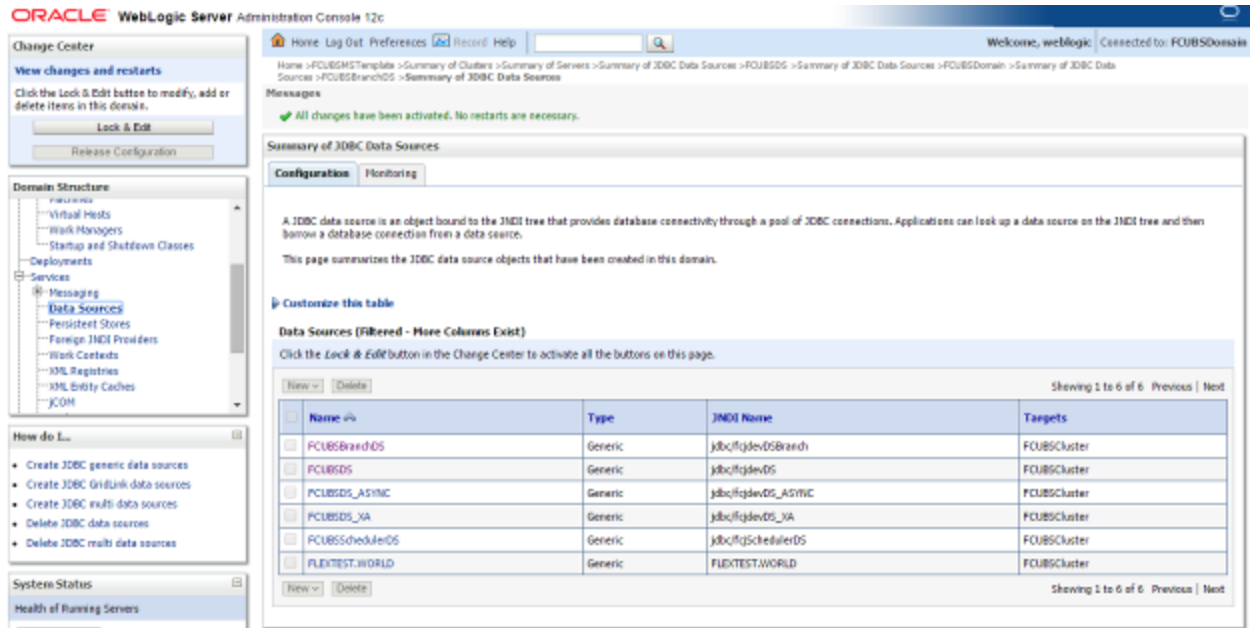
Properties:



6) Upon Activate Changes would create the XA Datasource



7) Similarly create all the other Datasource required for the FCUBS Application and Gateway Deployments



6.4 JDBC Parameters Tuning

Below JDBC parameters needs to updated for all the Datasources

PARAMETER	VALUE	Navigate To
Connection Reserve time out	30	Connection Pool->Advance
Test Frequency	60	Connection Pool->Advance
Inactive connection time out	30	Connection Pool->Advance
Initial Capacity	1	Connection Pool
Max capacity	Based on Site Requirement	Connection Pool
Capacity Increment	5	Connection Pool
Shrink Frequency	900	Connection Pool->Advance
Test Connection on Reserve	Checked	Connection Pool->Advance

7. JMS Resource Creation

JMS Resource Creation involves various steps

- Persistence Store Creation
- JMS Server Creation
- JMS Module Creation
- Resource Creation: Connection Factory and Queue's

Refer to the [Configuring JMS on Weblogic Server](#) for further details on JMS setup.

8. Oracle WebLogic Load Balancing

For Weblogic Load balancing, use

- 1) Oracle HTTP Server: Refer to Configuration for Oracle HTTP Server for setup.
- 2) Apache: Refer to Configuration for Apache for setup.

9. Frequently Asked Questions

9.1 Machine status is Unreachable.

If the machine status is unreachable, means that machine is not reachable and from console you cannot start/stop the managed servers.

In the console, navigate through Domain structure → Machines → machine1 → Monitoring → Node Manager Status will be **Unreachable**

To change the status, you need to start the nodemanager on that server. Refer to start nodemanager section on steps to start the nodemanager.

9.2 How to restart node manager?

- 1) Locate node manager pid using `ps -ef|grep weblogic.nodemanager.javaHome`
- 2) Change directory to `$DOMAIN_HOME/bin`
- 3) Kill the unix process using `kill -9 <pid>`
- 4) Verify that the node manager is killed by `tail -f nohup.out`
- 5) Start node manager using `nohup ./startNodeManager.sh &`
- 6) Verify nodemanager is started using `tail -f nohup.out`

9.3 Scaling Up Dynamic Cluster

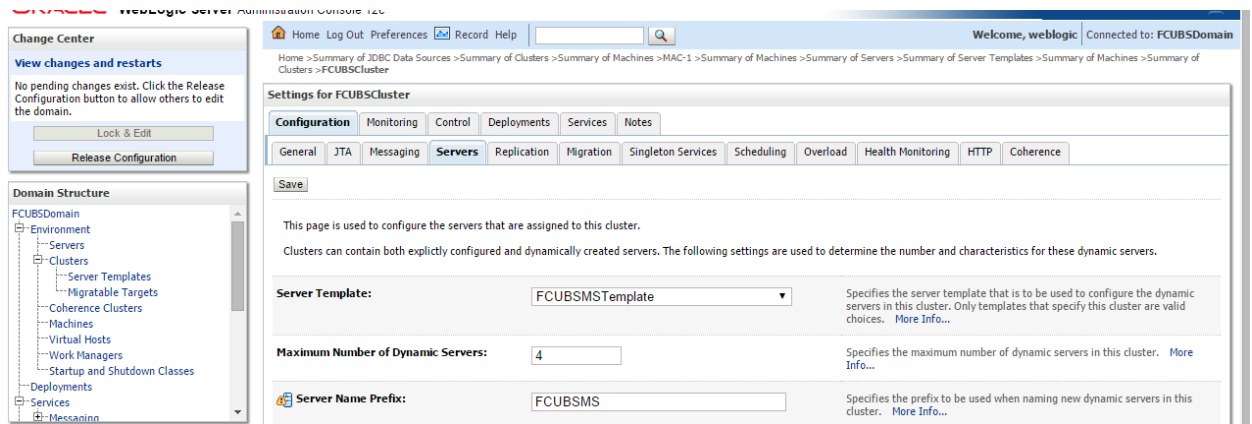
When the capacity is insufficient and you need to scale-up, you can add dynamic servers on demand. It requires only a few clicks.

- 1) Navigate to FCUBSDomain → Environment → Clusters

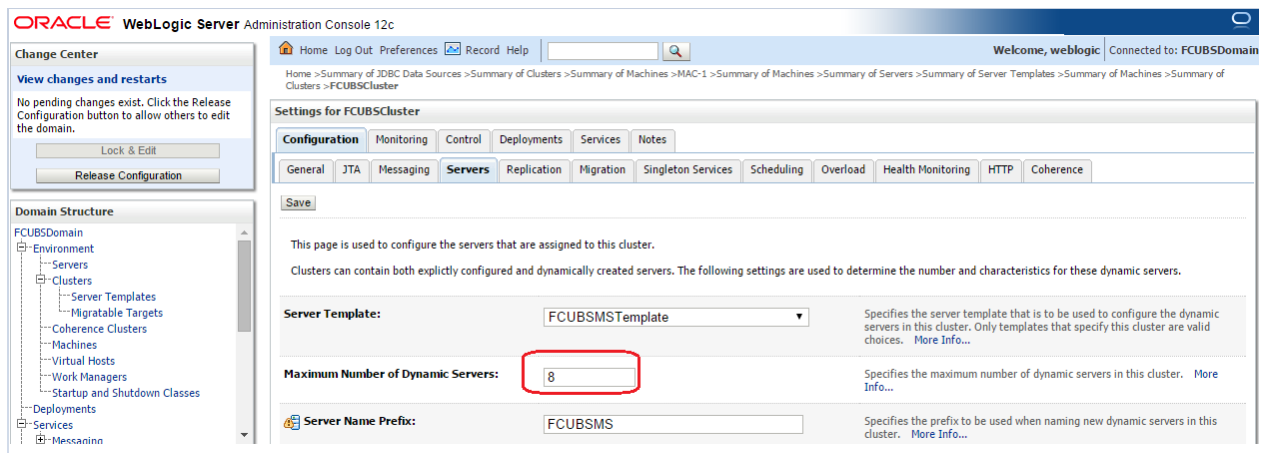
The screenshot displays the WebLogic Server Administration Console. On the left, the 'Domain Structure' tree shows 'FCUBSDomain' expanded, with 'Environment' selected, and 'Clusters' highlighted. The main area shows the 'Summary of Clusters' page. It includes a 'Change Center' on the left with 'Lock & Edit' and 'Release Configuration' buttons. The 'Summary of Clusters' page contains a table with the following data:

Name	%	Cluster Address	Cluster Messaging Mode	Migration Basis	Default Load Algorithm	Replication Type	Cluster Broadcast Channel	Servers
FCUBSCluster			Unicast	Database	Round Robin	[None]		FCUBSHG1, FCUBSHG2, FCUBSHG3, FCUBSHG4

2) Click FCUBScluster → Configuration→ Servers tab



3) Change the Maximum Number of Dynamic Servers to: 8 and Click Save



4) Activate changes in the Change Center of the Weblogic Console. After activation 4 new Dynamic Servers are added to the Dynamic Cluster

	Name	Type	Machine	Listen Port
☐	FCUBSMS1	Dynamic	MAC-1	7101
☐	FCUBSMS2	Dynamic	MAC-2	7102
☐	FCUBSMS3	Dynamic	MAC-1	7103
☐	FCUBSMS4	Dynamic	MAC-2	7104
☐	FCUBSMS5	Dynamic	MAC-1	7105
☐	FCUBSMS6	Dynamic	MAC-2	7106
☐	FCUBSMS7	Dynamic	MAC-1	7107
☐	FCUBSMS8	Dynamic	MAC-2	7108

5) Start the 4 new Dynamic Servers and you have doubled you capacity.

9.4 **Session Timeout**

Session timeouts occur intermittently during load condition. Verify the following

1. Clock Synchronization: Time across the nodes/machines is same.
2. Session Stickiness in load balancer: Persistence Type in load balancer should be set to SOURCE IP and should not be cookie.



FCUBS Weblogic 12c Middleware Practices
[Nov] [2022]
Version 14.7.0.0.0

Oracle Financial Services Software Limited
Oracle Park
Off Western Express Highway
Goregaon (East)
Mumbai, Maharashtra 400 063
India

Worldwide Inquiries:
Phone: +91 22 6718 3000
Fax: +91 22 6718 3001
<https://www.oracle.com/industries/financial-services/index.html>

Copyright © [2007], [2022], Oracle and/or its affiliates. All rights reserved.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

U.S. GOVERNMENT END USERS: Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate failsafe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

This software or hardware and documentation may provide access to or information on content, products and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.