

## Chapter-9

### CHAPTER 9: STATIC CLUSTER

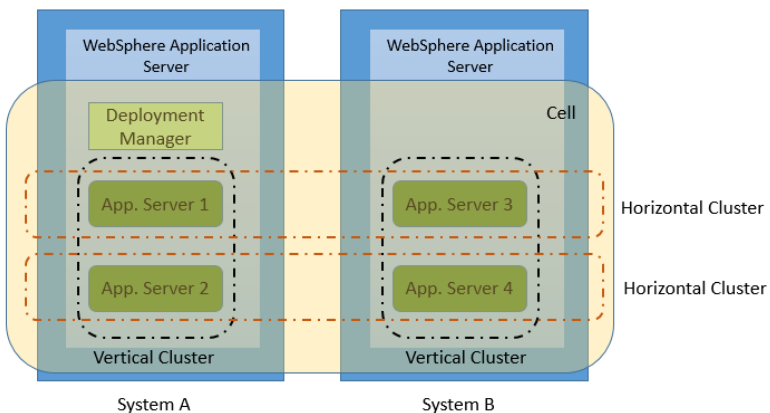
#### Theory

A cluster, generally, referred as a logical grouping of servers or nodes to improve performance and availability. IBM WebSphere Application Server Network Deployment has a built-in clustering function that refers to grouping of application servers that host same enterprise application(s).

In a Network Deployment cell, there can be multiple clusters depending on your needs. You can use an existing application server as a template to create cluster members or you can create and more application servers to the cluster.

Clusters can be configured in different ways to serve your business needs:

**Vertical clustering:** In this type of cluster, all members of an application server cluster reside on the same physical machine or node. You can prefer vertical clustering to use machine's power more efficiently. Although, you can use all the processing power of the machine in a single application server, having a vertical cluster can help when a JVM reaches its limits or fails so that the other member(s) can provide failover.



**Horizontal clustering:** In this type of clustering, cluster members are created on multiple physical machines or nodes. Horizontal clustering allows you to run an enterprise application on several machines to have usage of resources on distributed systems.

Horizontal clustering also provides a prevention against application server process failures, and hardware failures. With this failover capability, workload can be routed

to other cluster members to have better availability of the application. This feature is also helpful for maintenance operations.

WebSphere Application Server can combine both vertical and horizontal clustering to use the benefits of both clustering types.

Clustering application servers provides workload management (WLM) and failover ability. In a typical cluster, following components can be workload managed:

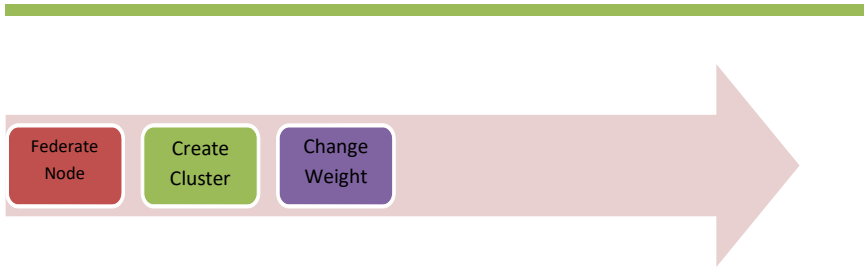
- Http requests and web servers
- Https requests and plug-in
- EJB requests

## AIM

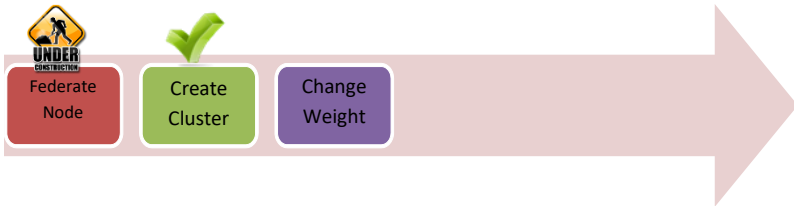
In this lab exercise, you will create a horizontal WebSphere Application Server cluster and then manage the weights of the cluster members. In order to achieve this goal, you need to follow following steps:

- Federate a node to a cell
- Create a static cluster
- Change weight of a cluster member

## Lab Exercise 9: STATIC CLUSTER



1. **Federate a node to a cell**
2. **Create a static cluster**
3. **Change weight of a cluster member**



## Task 1: Federate a node to a cell

**Step 1:** Navigate to “System administration>Deployment manager>Ports” to find out the SOAP port.

PortName	Port	Details
CELL_DISCOVERY_ADDRESS	7277	
BOOTSTRAP_ADDRESS	8809	
SOAP_CONNECTOR_ADDRESS	8879	
ORB_LISTENER_ADDRESS	9100	
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS	9481	
CSVS2_SSL_MUTUALAUTH_LISTENER_ADDRESS	9482	
CSVS2_SSL_SERVERAUTH_LISTENER_ADDRESS	9483	
WC_adminhost	9060	
DCS_UNICAST_ADDRESS	8352	
UAC_outofband_address	8043	

**Step 2:** Use “addNode” command to federate a node.

*addNode.sh wasv90 8879*

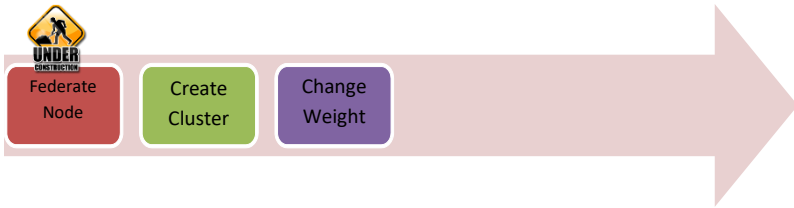
```

root@wasv90:/opt/IBM/WebSphere/AppServer/profiles/Custom01/bin

File Edit View Search Terminal Help

[root@wasv90 profiles]# ls
AppSrv01 Custom01 Dmgr01
[root@wasv90 profiles]#
[root@wasv90 profiles]#
[root@wasv90 profiles]# cd Custom01/bin/
[root@wasv90 bin]# ./addNode.sh wasv90 8879

```



**Step 3:** Enter credentials for the DMGR administrative user to perform the operation.

```

root@wasv90:/opt/IBM/WebSphere/AppServer/profiles/Custom01/bin
File Edit View Search Terminal Help
[root@wasv90 profiles]#
[root@wasv90 profiles]#
[root@wasv90 profiles]# cd Custom01/bin/
[root@wasv90 bin]# ./addNode.sh wasv90 8879
ADMU0116I: Tool information is being logged in file
/opt/IBM/WebSphere/AppServer/profiles/Custom01/logs/addNode.log
ADMU0128I: Starting tool with the Custom01 profile
CWPKI0308I: Adding signer alias "CN=wasv90, OU=Root Certificate," to local
keystore "ClientDefaultTrustStore" with the following SHA digest:
FE:57:E8:1F:7C:22:FF:C1:A8:FB:57:2D:F3:98:C2:B1:9C:D7:69:CA
Realm/Cell Name: <default>
Username: wasadmin
Password:

```

**Step 4:** You should see a success message as below.

```

File Edit View Search Terminal Help
ADMU0024I: Deleting the old backup directory.
ADMU0015I: Backing up the original cell repository.
ADMU0012I: Creating Node Agent configuration for node: wasv90Node02
ADMU0014I: Adding node wasv90Node02 configuration to cell: wasv90Cell01
ADMU0016I: Synchronizing configuration between node and cell.
ADMU0018I: Launching Node Agent process for node: wasv90Node02
ADMU0020I: Reading configuration for Node Agent process: nodeagent
ADMU0022I: Node Agent launched. Waiting for initialization status.
ADMU0030I: Node Agent initialization completed successfully. Process id is:
8214

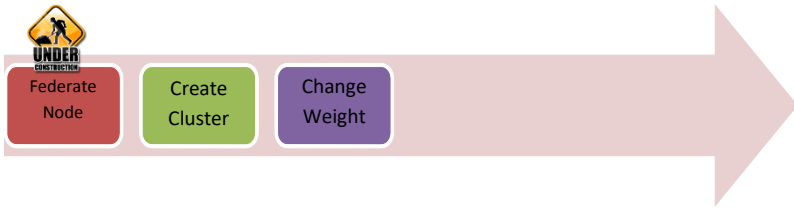
ADMU0300I: The node wasv90Node02 was successfully added to the wasv90Cell01
cell.

ADMU0306I: Note:
ADMU0302I: Any cell-level documents from the standalone wasv90Cell01
configuration have not been migrated to the new cell.
ADMU0307I: You might want to:
ADMU0303I: Update the configuration on the wasv90Cell01 Deployment Manager with
values from the old cell-level documents.

ADMU0306I: Note:
ADMU0304I: Because -includeapps was not specified, applications installed on
the standalone node were not installed on the new cell.
ADMU0307I: You might want to:
ADMU0305I: Install applications onto the wasv90Cell01 cell using wsadmin
$AdminApp or the Administrative Console.

ADMU0003I: Node wasv90Node02 has been successfully federated.
[root@wasv90 bin]#

```

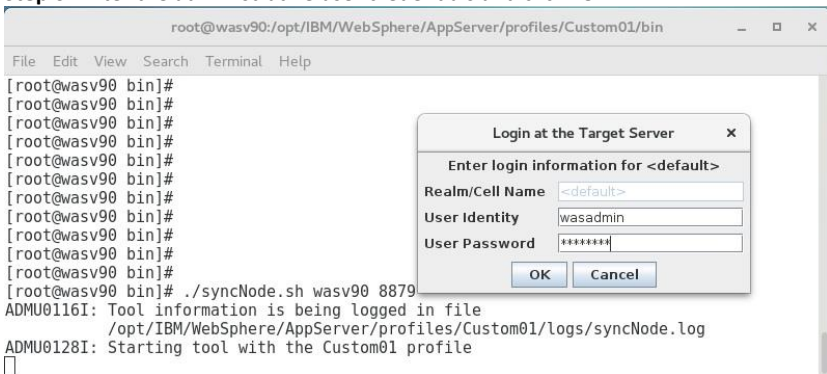


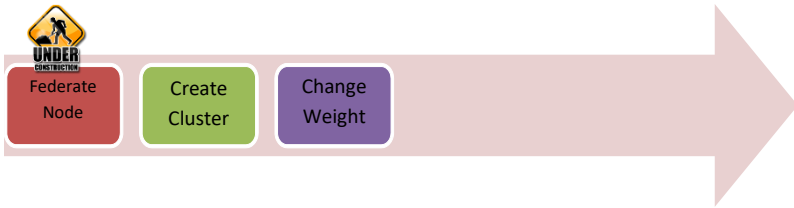
**Step 5:** You have to synchronize the nodes manually. To do that, stop the node agent and issue the following command

*syncNode.sh wasv90 8879*

```
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]# ./syncNode.sh wasv90 8879
```

**Step 6:** Enter the administrative user credentials and click “OK”.





**Step 7:** You should see the success message as below.

```

root@wasv90:/opt/IBM/WebSphere/AppServer/profiles/Custom01/bin

File Edit View Search Terminal Help

[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]#
[root@wasv90 bin]# ./syncNode.sh wasv90 8879
ADMU0116I: Tool information is being logged in file
/opt/IBM/WebSphere/AppServer/profiles/Custom01/logs/syncNode.log
ADMU0128I: Starting tool with the Custom01 profile
ADMU0401I: Begin syncNode operation for node wasv90Node02 with Deployment
Manager wasv90: 8879
ADMU0016I: Synchronizing configuration between node and cell.
ADMU0402I: The configuration for node wasv90Node02 has been synchronized with
Deployment Manager wasv90: 8879
root@wasv90 bin]#

```

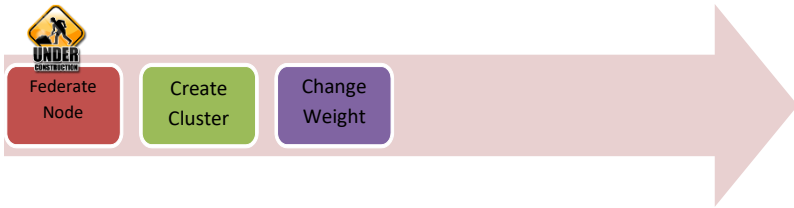
**Step 8:** Now, you can check and synchronize the nodes using the admin console.  
(System administration>Nodes)

WebSphere Admin Console - Nodes

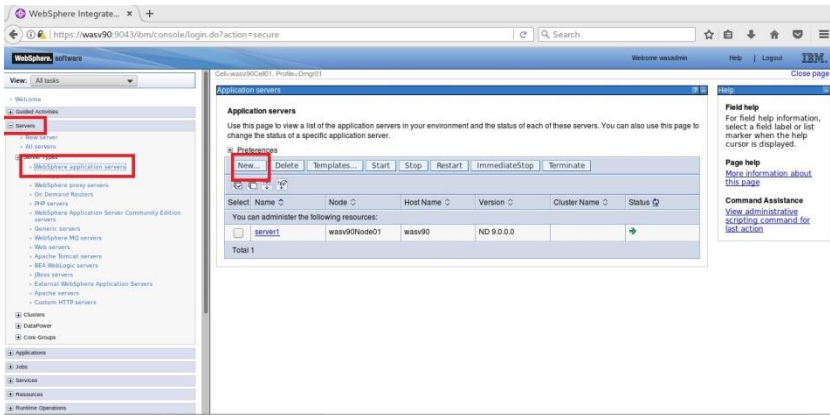
Use this page to manage nodes in the application server environment. A node corresponds to a physical computer system with a distinct IP host address. The following table lists the managed and unmanaged nodes in this cell. The first node is the deployment manager. Add new nodes to the cell and to this list by clicking Add Node.

Select	Name	Host Name	Version	Discovery Protocol	Status
<input checked="" type="checkbox"/>	wasv90CellManager01	wasv90	ND 9.0.0.0	TCP	
<input type="checkbox"/>	wasv90Node01	wasv90	ND 9.0.0.0	TCP	
<input type="checkbox"/>	wasv90Node02	wasv90	ND 9.0.0.0	TCP	

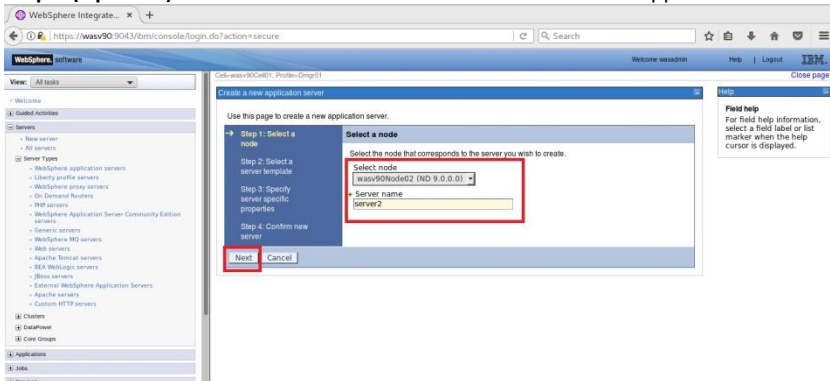


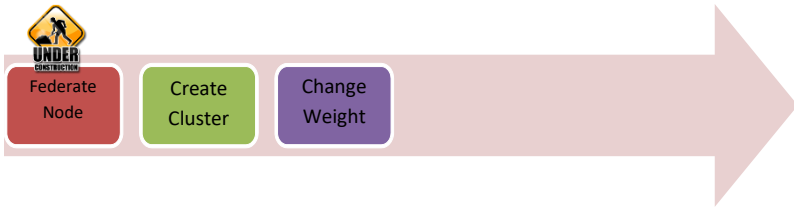


**Step 8 (Optional):** Rest of the steps are optional to show that you can add new application servers using admin console. Navigate to “Servers>Server Types>WebSphere application servers” and click “New”.

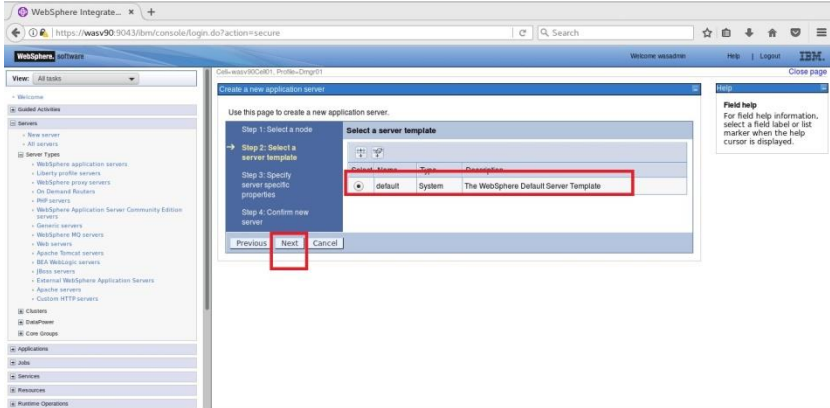


**Step 9 (Optional):** Select the node and enter a name for the new application server.

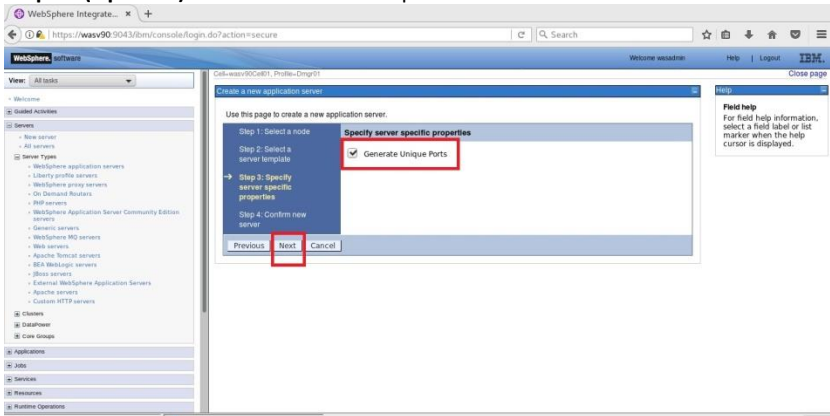


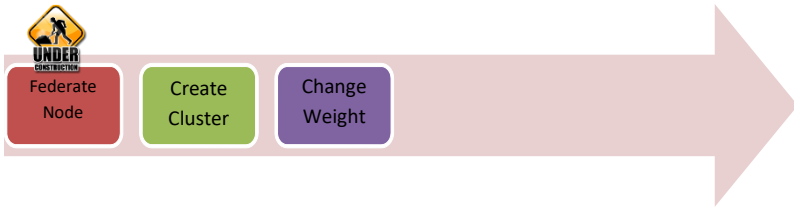


**Step 10 (Optional):** Select a server template and click “Next”.

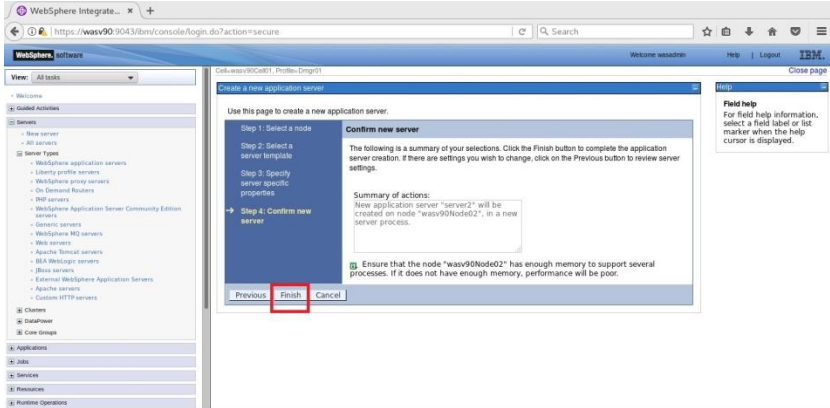


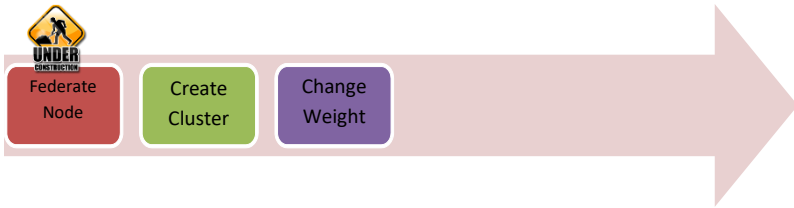
**Step 11 (Optional):** Mark “Generate Unique Ports” and click “Next”.



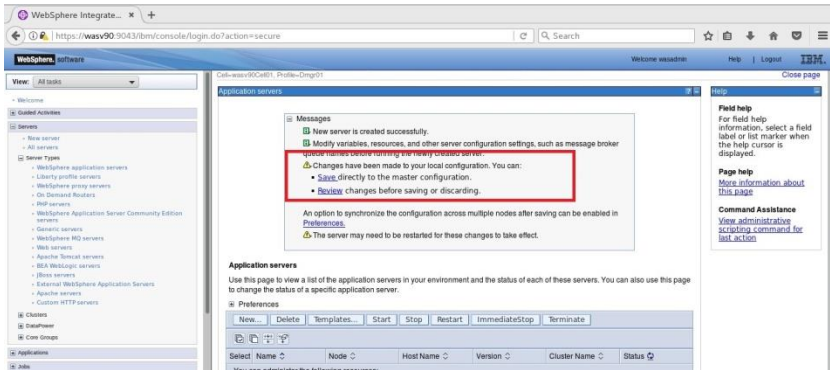


**Step 12 (Optional):** Review the summary of actions and then click “Finish”.

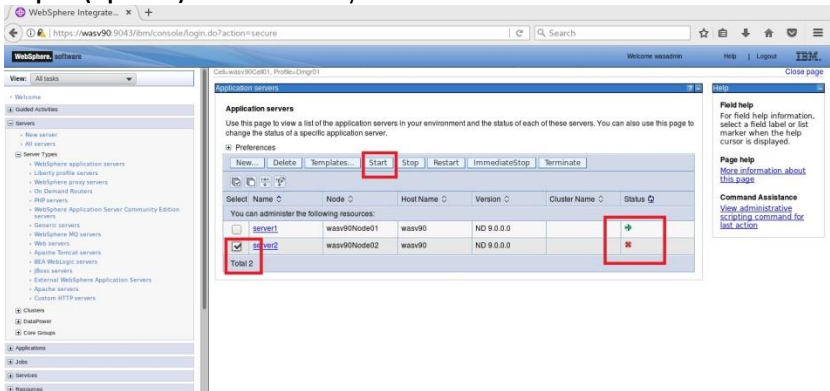


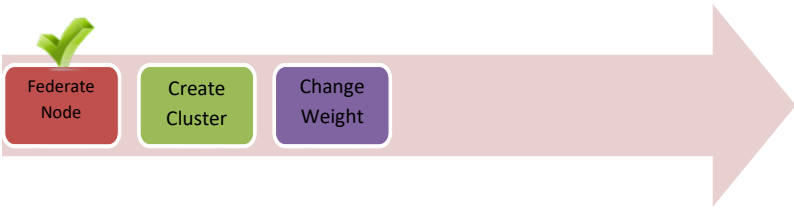


**Step 13 (Optional):** Click “Save” to write changes to the master file.

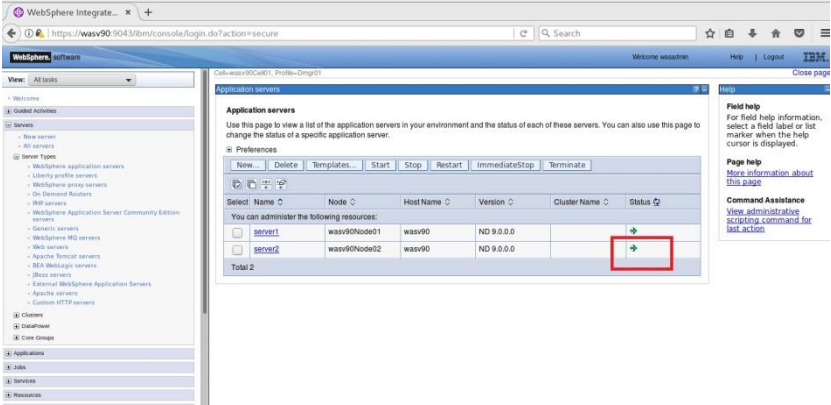


**Step 14 (Optional):** Select the newly created server and click “Start”.

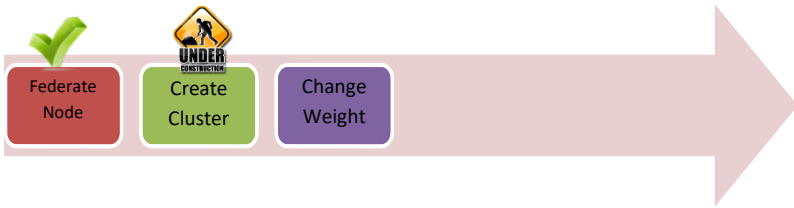




**Step 15 (Optional):** You should see the application server we just created is started successfully.

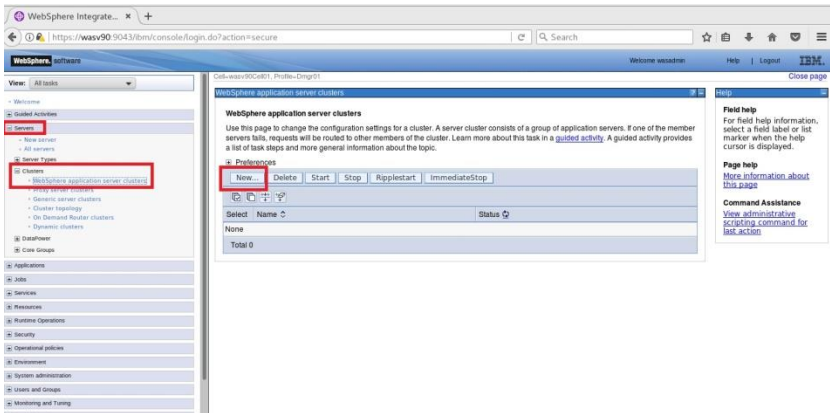


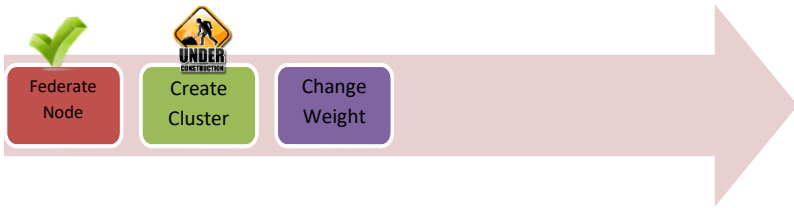
**Task 1 is complete!**



## Task 2: Create a static cluster

**Step 1:** Navigate to “Servers>Clusters>WebSphere application server clusters” and click “New”.





**Step 2:** Enter a cluster name and click “Next”.

WebSphere Integrated Solutions console

URL: https://wasy90.9043/bmv/console/login.do?action=secure

WebSphere software

View: All tasks

Cell: was90Cell1, Profile: Dmgr01

Welcome wasadm | Help | Logout | IBM

Close page

Create a new cluster

Step 1: Enter basic cluster information

Step 2: Create first cluster member

Step 3: Create additional cluster members

Step 4: Summary

Enter basic cluster information

Cluster name: WAS\_CLUSTER

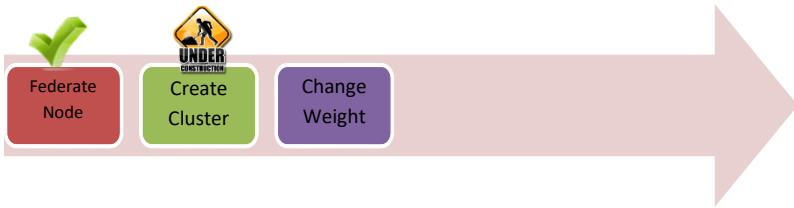
☒ Prefer local. Specifies whether enterprise bean requests will be routed to the node on which the client resides when possible.

☐ Configure HTTP session memory-to-memory replication

Next Cancel

Field help: For field help information, select a field label or list marker when the help cursor is displayed.

Page help: More information about this page.



**Step 3:** Enter a name for the new cluster member to be created and select the target node. You can define also the weight of the cluster member. Then select basis for the first cluster member and click “Next”.

WebSphere Integration Developer console screenshot showing the "Create first cluster member" step. The interface includes a left sidebar with navigation links, a central content area with a progress bar and form fields, and a right sidebar with help links.

**Step 3: Create first cluster member**

The first cluster member determines the server settings for the cluster members. A server configuration template is created from the first member and stored as part of the cluster data. Additional cluster members are copied from this template.

Member name:

Select node:

Weight:  (0..100)

☒ Generate unique HTTP ports

Select how the server resources are promoted in the cluster:

Select basis for first cluster member:

☒ Create the member using an application server template.

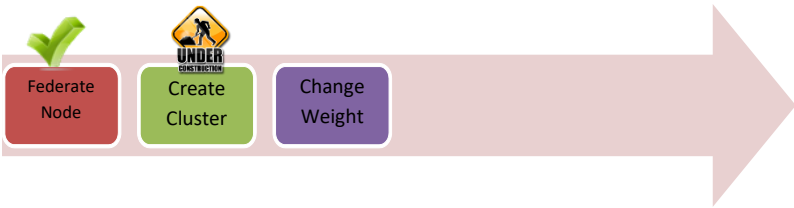
☐ Create the member using an existing application server as a template.

☐ Create the member by converting an existing application server.

☐ None. Create an empty cluster.

Navigation buttons: Previous, **Next**, Cancel





**Step 4:** In this step, we will create additional cluster members. For this example, we will add a member to be created on the second node and click “Add Member”.

**Create additional cluster members**

Enter information about this new cluster member, and click Add Member to add this cluster member to the member list. A server configuration template is created from the first member, and stored as part of the cluster data. Additional cluster members are copied from this template.

Member name:

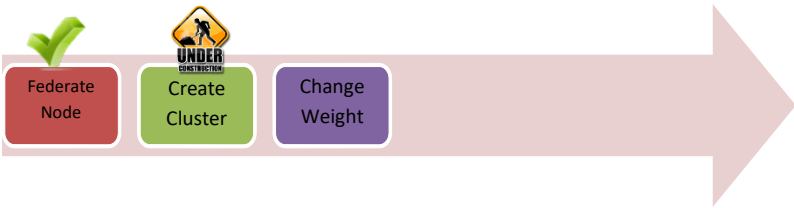
Select node:

Weight:  (0..100)

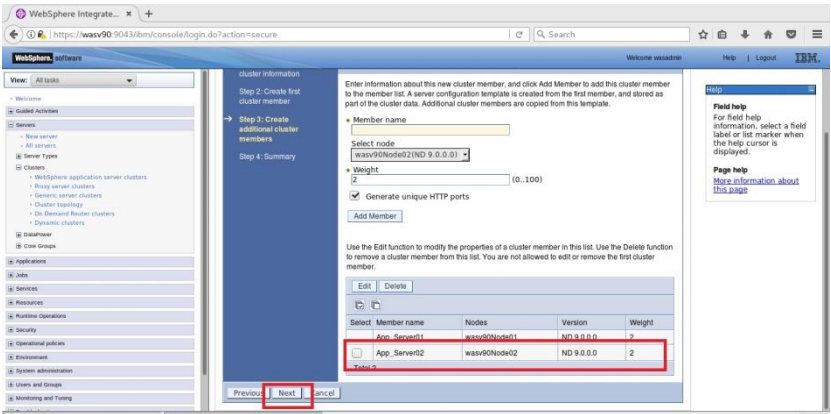
☒ Generate unique HTTP ports

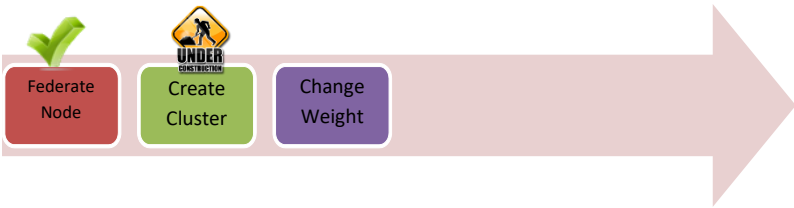
Use the Edit function to modify the properties of a cluster member in this list. Use the Delete function to remove a cluster member from this list. You are not allowed to edit or remove the first cluster member.

Select	Member name	Nodes	Version	Weight
<input type="checkbox"/>	App_Server01	wasv9Node01	ND 9.0.0.0	2

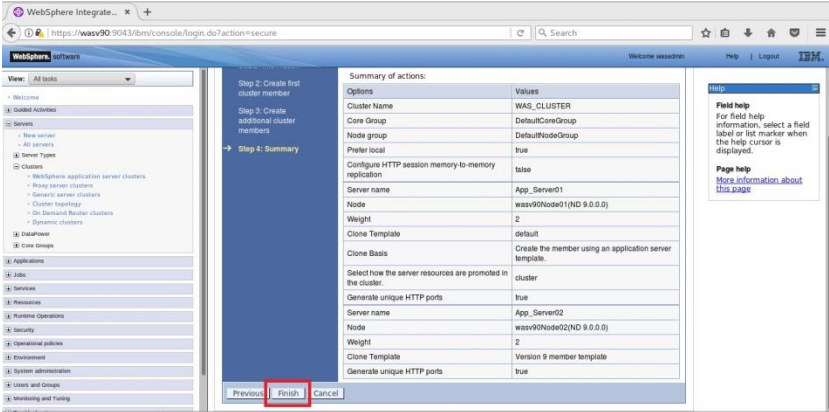


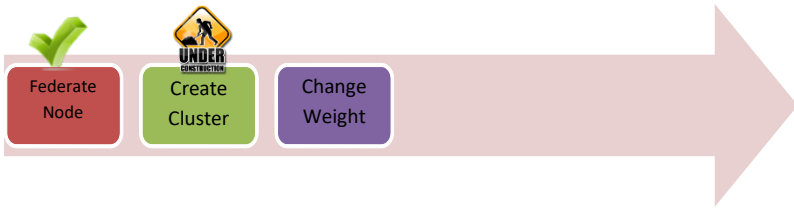
**Step 5:** Click “Next” when you finish adding the cluster members.





**Step 6:** Review the configuration and click “Finish”.





**Step 7:** Click “Save” to write changes directly to the master file.

WebSphere application server clusters

Messages

- Changes have been made to your local configuration. You can:
  - Save directly to the master configuration.
  - Revert changes before saving or discarding.

An option to synchronize the configuration across multiple nodes after saving can be enabled in [Preferences](#).

The server may need to be restarted for these changes to take effect.

WebSphere application server clusters

Use this page to change the configuration settings for a cluster. A server cluster consists of a group of application servers. If one of the member servers fails, requests will be routed to other members of the cluster. Learn more about this task in a [guided activity](#). A guided activity provides a list of task steps and more general information about the topic.

Preferences

New... Delete Start Stop Ripplestart ImmediateStop

Select Name C Status

You can administer the following resources:

Selected	Name	Status
<input type="checkbox"/>	WAS_CLUSTER	OK

Total 1

**Step 8:** Select the newly created cluster and click “Start”.

WebSphere application server clusters

WebSphere application server clusters

Use this page to change the configuration settings for a cluster. A server cluster consists of a group of application servers. If one of the member servers fails, requests will be routed to other members of the cluster. Learn more about this task in a [guided activity](#). A guided activity provides a list of task steps and more general information about the topic.

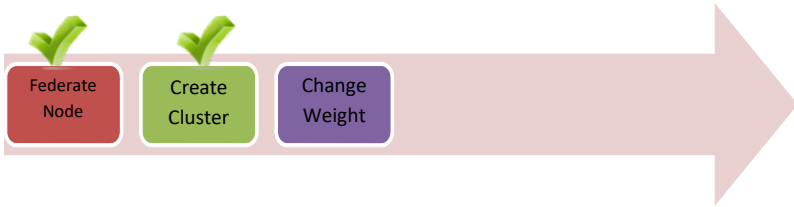
Preferences

New... Delete Start Stop Ripplestart ImmediateStop

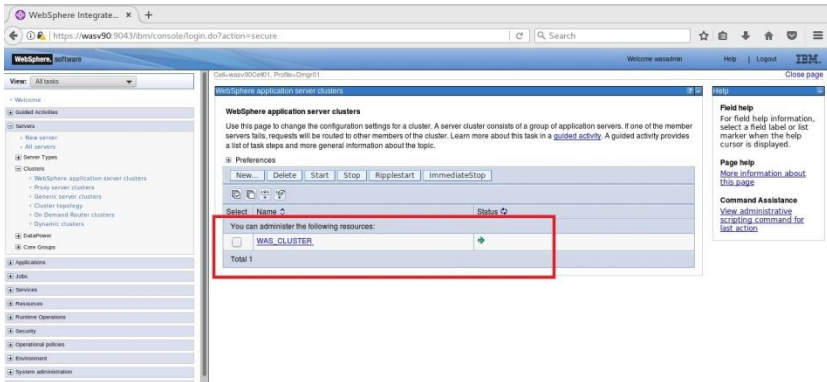
Select Name C Status

You can administer the following resources:

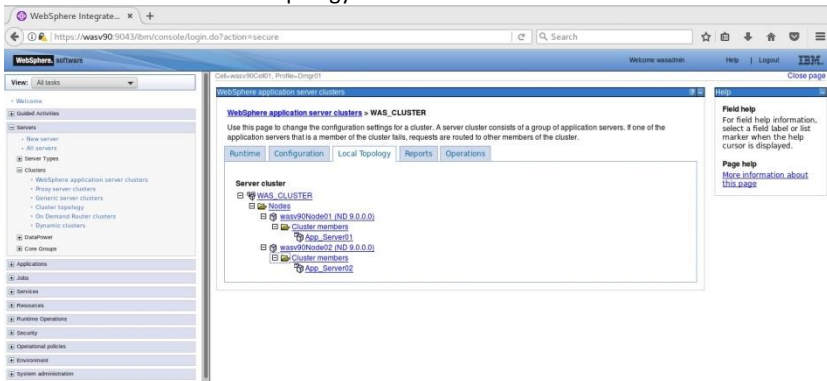
Selected	Name	Status
<input type="checkbox"/>	WAS_CLUSTER	OK



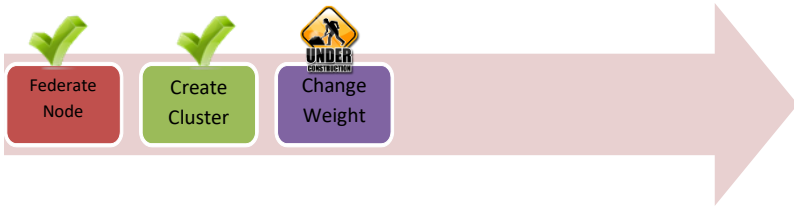
**Step 9:** You should see the cluster as started as below.



**Step 10:** You can check the topology of clusters by navigating “Servers>Clusters>Cluster Topology”.



**Task 2 is complete!**



### Task 3: Change weight of a cluster member

**Step 1:** Navigate to “Servers>Clusters>WebSphere application server clusters” and click on the name of the cluster.

The screenshot shows the WebSphere Integrated Solutions console. The left sidebar displays the navigation tree with 'WebSphere application server clusters' selected. The main content area shows the 'WebSphere application server clusters' page. The page includes a title bar, a description, and a table of clusters. The 'WAS\_CLUSTER' cluster is highlighted in the table.

**WebSphere application server clusters**

Use this page to change the configuration settings for a cluster. A server cluster consists of a group of application servers. If one of the member servers fails, requests will be routed to other members of the cluster. Learn more about this task in a [guided activity](#). A guided activity provides a list of task steps and more general information about the topic.

**Preferences**

New Delete Start Stop Rpplestart ImmediateStop

Select Name Status

You can administer the following resources:

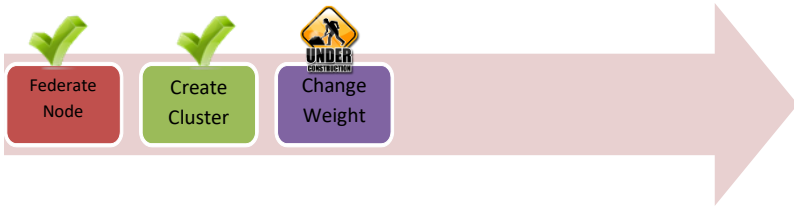
Name	Status
WAS_CLUSTER	

Total 1

**Field help**  
For field help information, select a field label or list marker when the help cursor is displayed.

**Page help**  
More information about this page

**Command Assistance**  
View administrative scripting command for task action



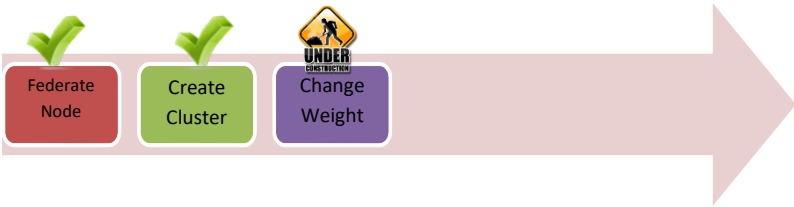
## Step 2: Click on “Cluster members”.

The screenshot shows the WebSphere Integration Developer console interface. The browser address bar displays `https://wasv90.9043/bm/console/login.do?action=secure`. The console title is "WebSphere Integration Developer". The left sidebar shows a navigation tree with categories like "Welcome", "Toolset Activities", "Servers", "Server Types", "Clusters", "Deployment", "Core Groups", "Applications", "Jobs", "Services", "Runtime Operations", "Security", "Operational policies", "Environment", "System administration", "Users and Groups", and "Monitoring and Events".

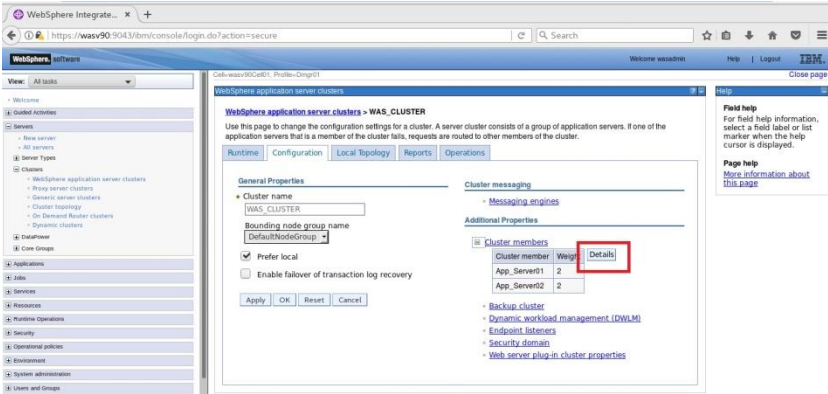
The main content area is titled "WebSphere application server clusters - WAS\_CLUSTER". It includes a description: "Use this page to change the configuration settings for a cluster. A server cluster consists of a group of application servers. If one of the application servers that is a member of the cluster fails, requests are routed to other members of the cluster." Below this are tabs for "Runtime", "Configuration", "Local Topology", "Reports", and "Operations".

The "Configuration" tab is active, showing "General Properties" and "Cluster messaging". Under "General Properties", the "Cluster name" is "WAS\_CLUSTER" and the "Bounding node group name" is "DefaultNodeGroup". There are checkboxes for "Prefer local" (checked) and "Enable failover of transaction log recovery". Under "Cluster messaging", there is a link for "Cluster members" which is highlighted with a red box. Other links include "Messaging engines", "Additional Properties", "Binding profiles", "Dynamic workload management (DWM)", "Endpoint listeners", "Security domain", and "Web server plug-in cluster properties".

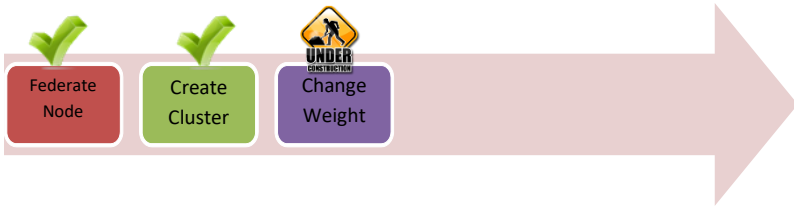
At the bottom of the configuration section are buttons for "Apply", "OK", "Reset", and "Cancel". On the right side of the console, there are links for "Field help" and "Page help".



**Step 3:** Click on “Details” to continue.







**Step 4:** Change the “Configure weight” value of “App-Server02” to “4” and click “Update”.

WebSphere Integrated Solutions console - WebSphere application server clusters - WAS\_CLUSTER - Cluster members

Use this page to view and manage the application servers (cluster members) that belong to the cluster. You can also use this page to change the weight of any of the cluster members. Learn more about this task in a [guided activity](#). A guided activity provides a list of task steps and more general information about the topic. The configuration of new cluster members is based on a server configuration template that is stored as part of the cluster data. This template is based on the first cluster member and is used to create all subsequent cluster members. Modifications to the configuration of an individual cluster member has no effect on the cluster member template.

**Preferences**

New... Delete Templates... Start Stop Restart ImmediateStop Terminate Make Idle

Select Member name Node Host Name Version Configured weight Runtime weight Status

You can administer the following resources:

Member name	Node	Host Name	Version	Configured weight	Runtime weight	Status
App_Server01	wasv9Node01	wasv90	ND 9.0.0.0	2	2	+
App_Server02	wasv9Node02	wasv90	ND 9.0.0.0	4	2	+

Total 2

**Step 5:** Click “Save” to save the changes to master file.

WebSphere Integrated Solutions console - WebSphere application server clusters - WAS\_CLUSTER - Cluster members

Use this page to view and manage the application servers (cluster members) that belong to the cluster. You can also use this page to change the weight of any of the cluster members. Learn more about this task in a [guided activity](#). A guided activity provides a list of task steps and more general information about the topic. The configuration of new cluster members is based on a server configuration template that is stored as part of the cluster data. This template is based on the first cluster member and is used to create all subsequent cluster members. Modifications to the configuration of an individual cluster member has no effect on the cluster member template.

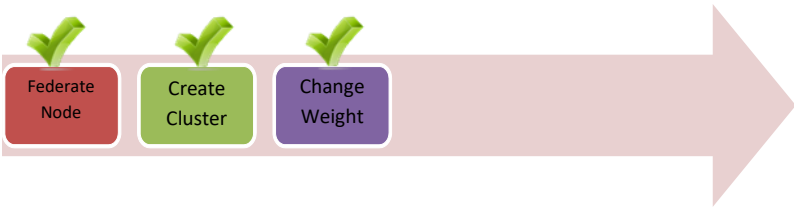
**Preferences**

New... Delete Templates... Start Stop Restart ImmediateStop Terminate Make Idle

Select Member name Node Host Name Version Configured weight Runtime weight Status

You can administer the following resources:

Member name	Node	Host Name	Version	Configured weight	Runtime weight	Status
App_Server01	wasv9Node01	wasv90	ND 9.0.0.0	2	2	+



**Step 6:** You should see newly configured weight of cluster members.

WebSphere Integrated Solutions console

WebSphere application server clusters > WAS\_CLUSTER > Cluster members

Use this page to view and manage the application servers (cluster members) that belong to the cluster. You can also use this page to change the weight of any of the cluster members. Learn more about this task in a [guided activity](#). A guided activity provides a list of task steps and more general information about the topic. The configuration of new cluster members is based on a server configuration template that is stored as part of the cluster data. This template is based on the first cluster member and is used to create all subsequent cluster members. Modifications to the configuration of an individual cluster member has no effect on the cluster member template.

Preferences

Select	Member name	Node	Host Name	Version	Configured weight	Runtime weight	Status
<input type="checkbox"/>	App_Server01	wasv0Node01	wasv0	ND 9.0.0.0	2	2	+
<input type="checkbox"/>	App_Server02	wasv0Node02	wasv0	ND 9.0.0.0	4	4	+

Total 2

**Task 3 is complete!**

## **SUMMARY**

IBM WebSphere Application Server Network Deployment has a built-in clustering function that refers to grouping of application servers that host same enterprise application(s). There are two types of clustering that are vertical clustering and horizontal clustering. In IBM WebSphere Application Server, you can use vertical, horizontal or hybrid of vertical and horizontal clustering. Horizontal clustering provides failover feature that gives higher availability of your applications. Different components can be workload managed to have scalability and failover for applications that run on an application server cluster.

## REFERENCES

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