

Chapter-9

CHAPTER 9: STATIC CLUSTER

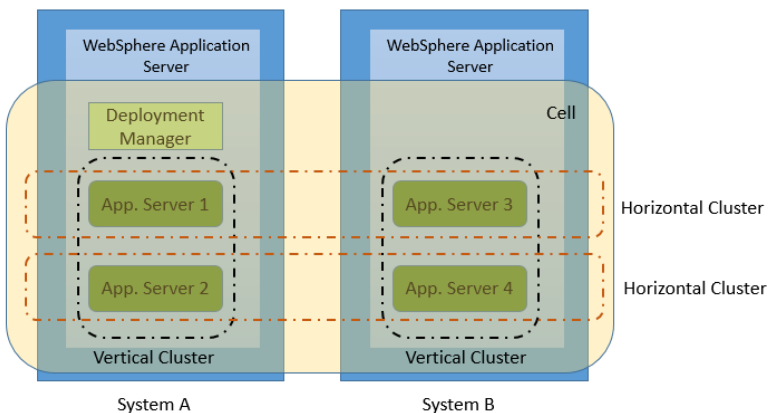
Theory

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:

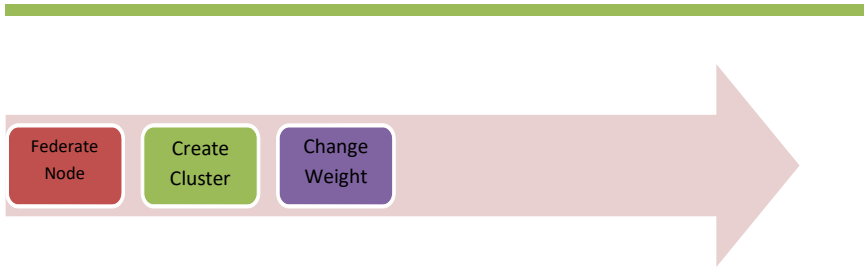
- Http requests and web servers
- Https requests and plug-in
- EJB requests

AIM

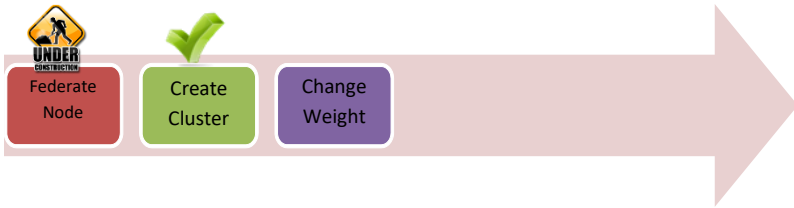
In this lab exercise, you will create a horizontal WebSphere Application Server cluster and then manage the weights of the cluster members. In order to achieve this goal, you need to follow following steps:

- 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

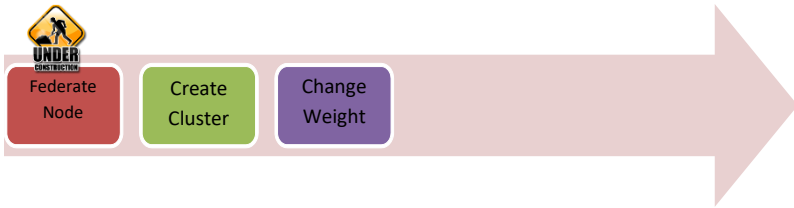
Step 1: Navigate to “System administration>Deployment manager>Ports” to find out the SOAP port.

The screenshot shows the WebSphere Integration console interface. The left sidebar contains a navigation tree with the following structure:

- System administration
 - Job manager
 - Extended Repository Service
 - Application to WebSphere repository
 - Deployment manager
- Deployment manager
 - Ports
- Task Management
 - Notifications
 - Runtime Tasks
 - Console Preferences
 - Job scheduler
 - Validation Data Service
 - Console Identity
- Users and Groups
- Monitoring and Tuning
- Toolbox
- Process Designer

The main content area displays the 'Ports' configuration page. It includes a 'Stop' button, 'General Properties' (Name: dmgr, Start components as needed), 'Server Infrastructure' (Java and Process Management, Administration, Java SDKs), and 'Additional Properties' (Core group service, Job managers). The 'Ports' table is shown with the following data:

PortName	Port	Details
CELL_DISCOVERY_ADDRESS	7277	
BOOTSTRAP_ADDRESS	9809	
SOAP_CONNECTOR_ADDRESS	6879	
ORB_LISTENER_ADDRESS	9100	
SAS_SSL_SERVERAUTH_LISTENER_ADDRESS	9401	
CSV2_SSL_MUTUALAUTH_LISTENER_ADDRESS	9402	
CSV2_SSL_SERVERAUTH_LISTENER_ADDRESS	9403	
WC_adminhost	9560	
DCS_UNICAST_ADDRESS	9352	
IBM_cdsbootstrap_address	8043	



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

Note: Run “cat /etc/hosts” in terminal to get hostname as shown below:

```

Terminal
File Edit View Terminal Tabs Help
USER ID: 0, GROUP ID: 0
bash-4.2# cat /etc/hosts
# Kubernetes-managed hosts file.
127.0.0.1    localhost
::1         localhost ip6-localhost ip6-loopback
fe00::0     ip6-localhost
fe00::0     ip6-mcastprefix
fe00::1     ip6-allnodes
fe00::2     ip6-allrouters
10.244.224.5 wk-caas-254088d69c0640cb87781272c469424e-5b5371d5e52abdcf41d832
bash-4.2#

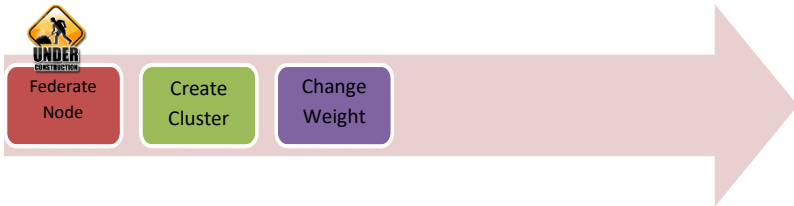
```

addNode.sh <update-hostname> 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]#

```

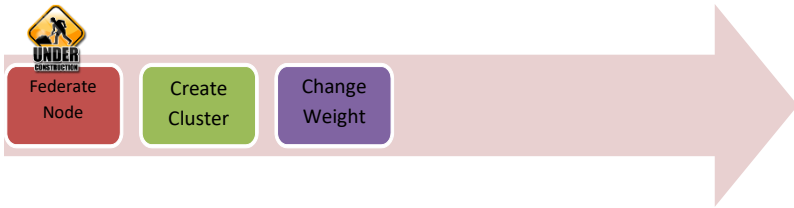
Note: Run “cat /etc/hosts” in terminal to get hostname.

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

```
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]#  
[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
```

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)

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.

Preferences

Add Node Remove Node Force Delete Synchronize Full Resynchronize Stop

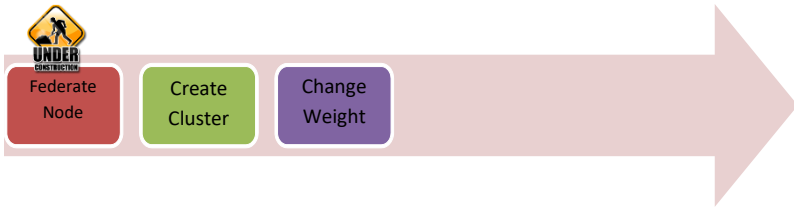
Select	Name	Host Name	Version	Discovery Protocol	Status
<input checked="" type="checkbox"/>	wasv90CellManager01	wasv90	ND 9.0.0.0	TCP	
<input checked="" type="checkbox"/>	wasv90Node01	wasv90	ND 9.0.0.0	TCP	
<input checked="" type="checkbox"/>	wasv90Node02	wasv90	ND 9.0.0.0	TCP	

You can administer the following resources:

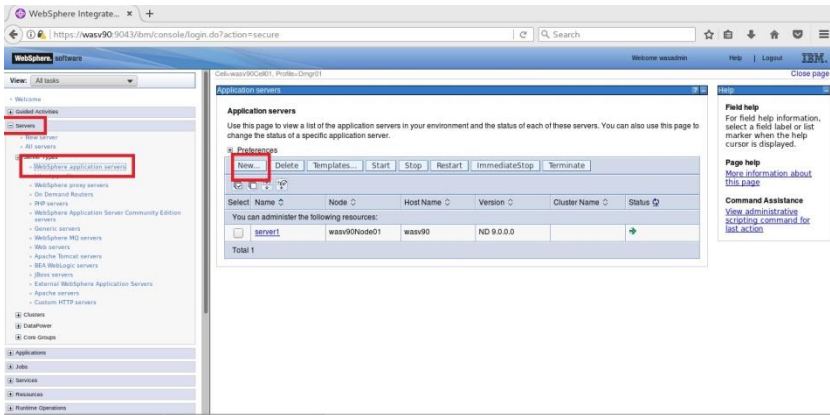
Field help
For field help information, select a field label or list marker when the help cursor is displayed.

Page help
More information about this page

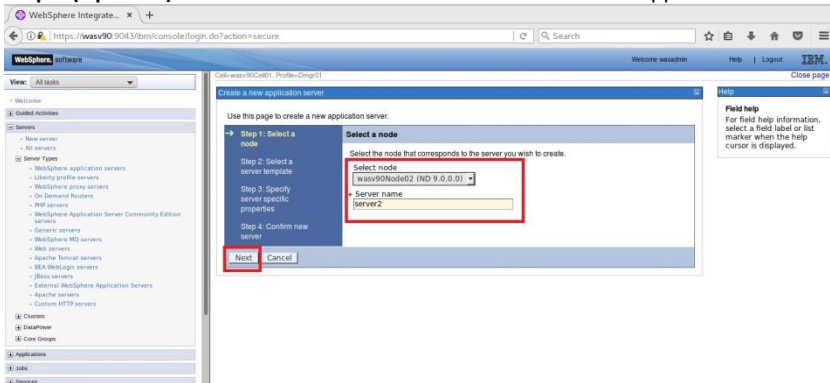
Command Assistance
View administrative scripting command for this action

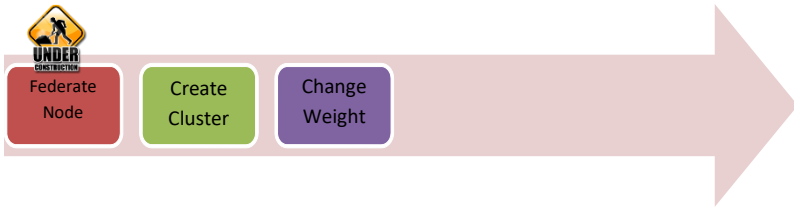


Step 8 (Optional): Rest of the steps are optional to show that you can add new application servers using admin console. Navigate to “Servers>Server Types>WebSphere application servers” and click “New”.

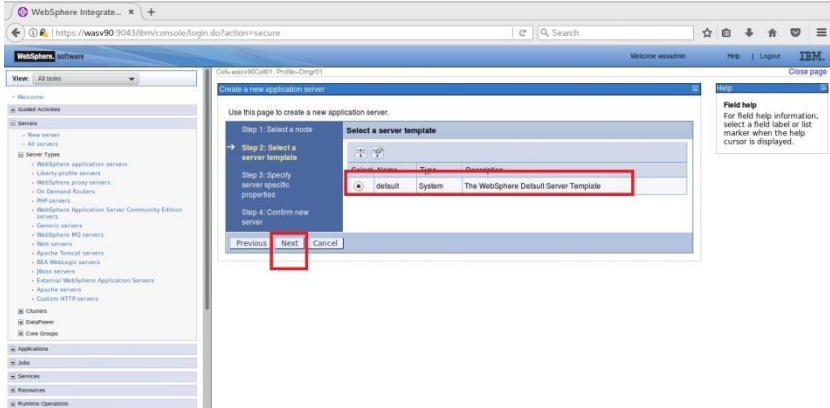


Step 9 (Optional): Select the node and enter a name for the new application server.

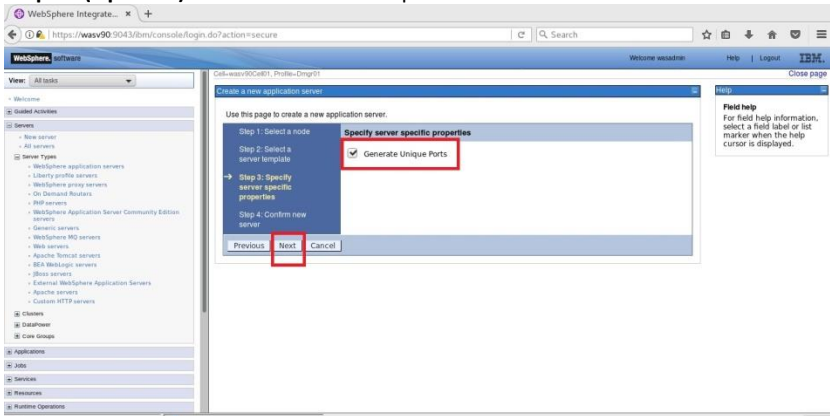


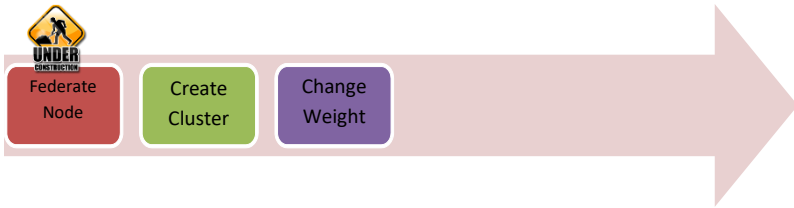


Step 10 (Optional): Select a server template and click “Next”.

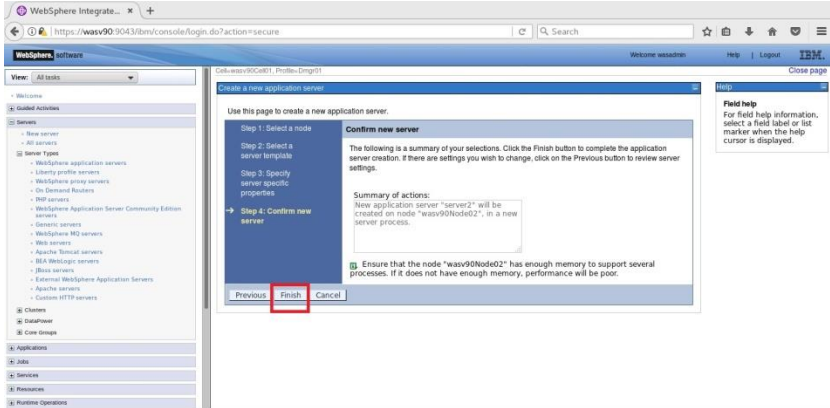


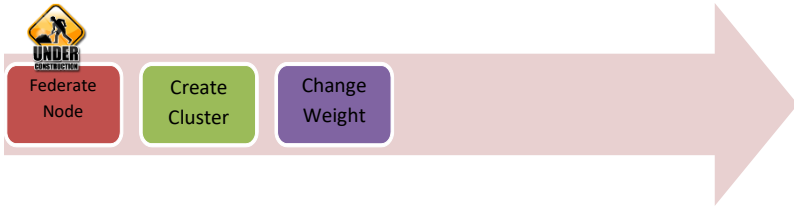
Step 11 (Optional): Mark “Generate Unique Ports” and click “Next”.



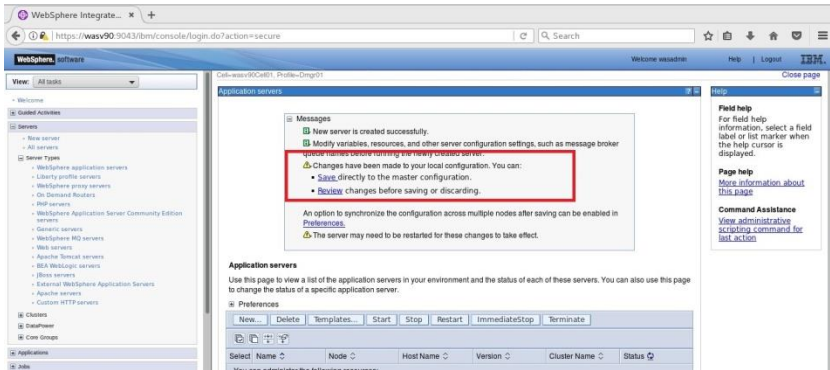


Step 12 (Optional): Review the summary of actions and then click “Finish”.

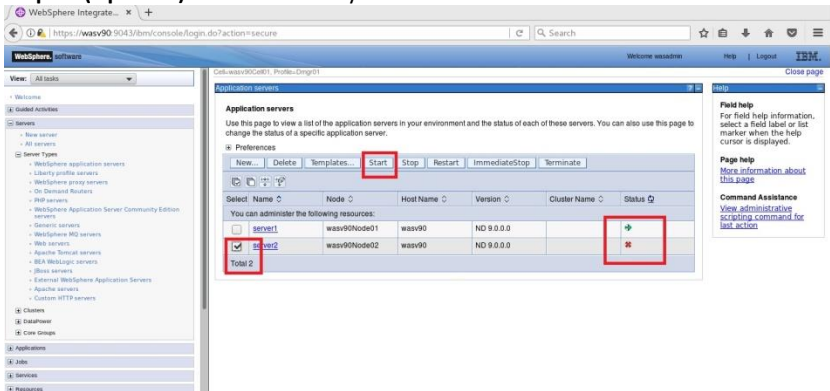


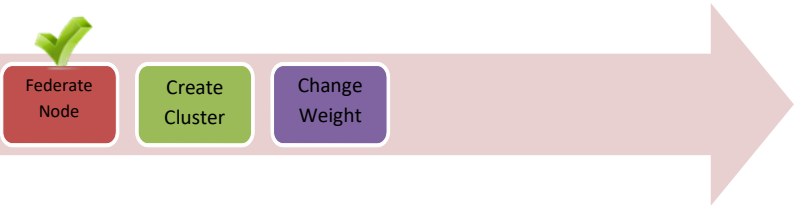


Step 13 (Optional): Click “Save” to write changes to the master file.

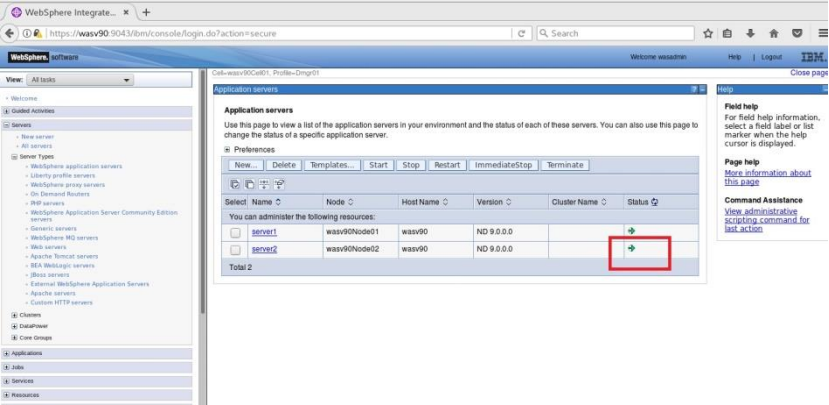


Step 14 (Optional): Select the newly created server and click “Start”.

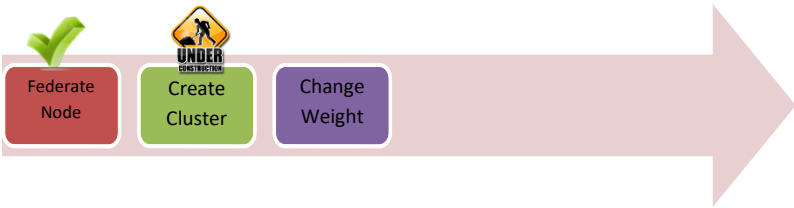




Step 15 (Optional): You should see the application server we just created is started successfully.

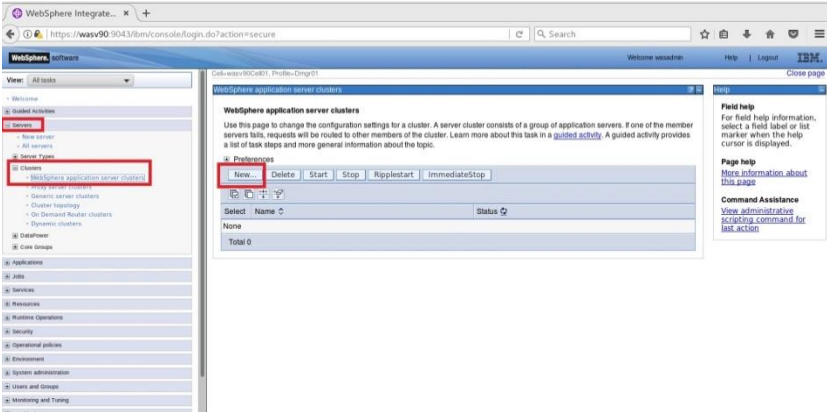


Task 1 is complete!

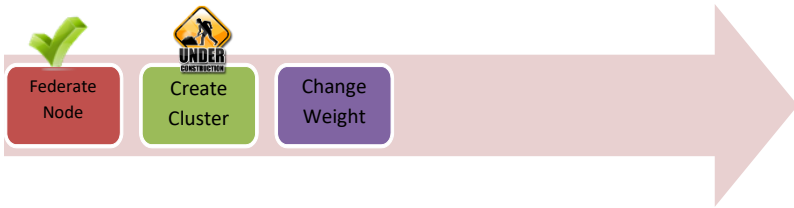


Task 2: Create a static cluster

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



The screenshot shows the IBM WebSphere Enterprise Edition console. The main window displays the 'Create a new cluster' wizard. The wizard is at Step 1: Enter basic cluster information. The cluster name is 'WAS_CLUSTER'. The 'Prefer local' checkbox is checked, and the 'Configure HTTP session memory-to-memory replication' checkbox is unchecked. The 'Next' button is highlighted with a red box.



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 Integrated Solutions console

View: All tasks

Step 1: Enter basic cluster information

Step 2: Create first cluster member

Step 3: Create additional cluster members

Step 4: Summary

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.

Cluster:

Select basis for first cluster member:

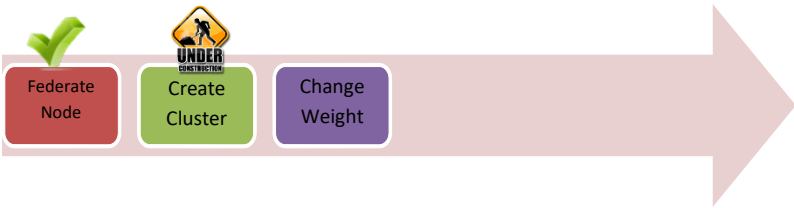
☒ Create the member using an application server template.

☐ 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.

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”.

WebSphere Integrated Solutions console

URL: https://wasv90.9043/bm/console/login.do?action=secure

Navigation: Home | Logout | IBM

View: All tasks

Left sidebar: Servers, Clusters, Applications, Jobs, Services, Resources, Monitoring Operations, Security, Operational policies, Environment, System administration

Center pane: 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

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: App_Server02

Select node: wasv9Node02 (ND 9.0.0.0)

Weight: 2 (0..100)

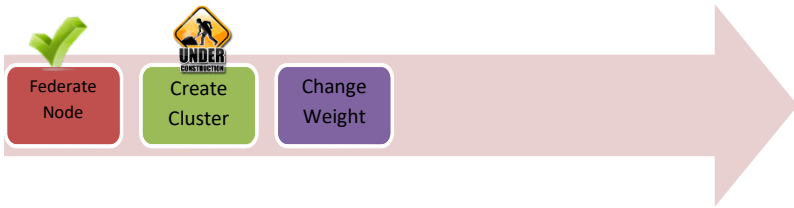
☒ Generate unique HTTP ports

Add Member

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

Right sidebar: Field help, Page help



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

WebSphere Integrated Solutions console

cluster information

Step 2: Create first cluster member

Step 3: Create additional cluster members

Step 4: Summary

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

wasv90Node02 (ND 9.0.0.0)

Weight

2 (0..100)

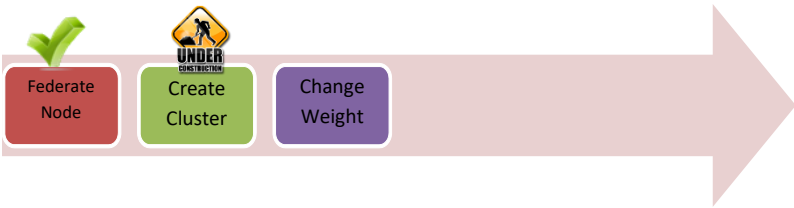
☒ Generate unique HTTP ports

Add Member

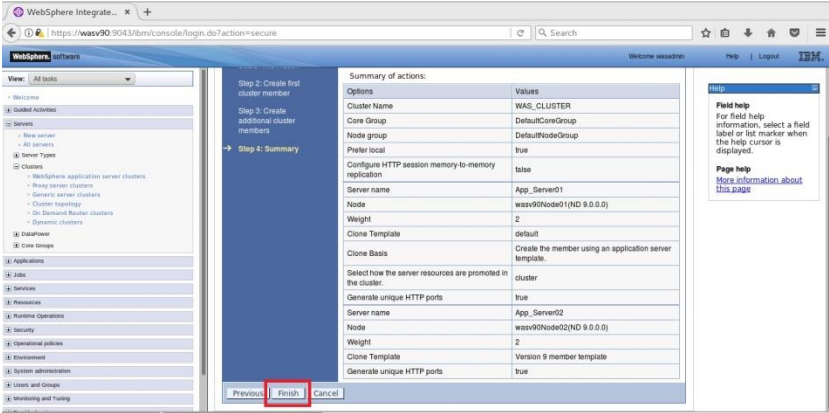
Use the Edit function to modify the properties of a cluster member in this list. Use the Delete function to remove a cluster member from this list. You are not allowed to edit or remove the first cluster member.

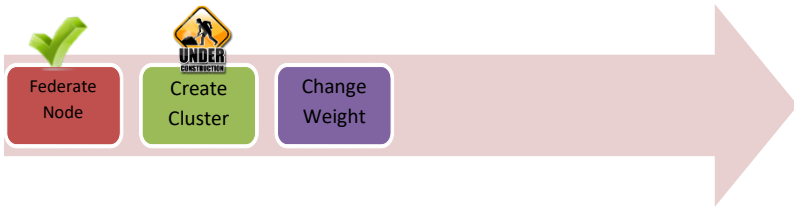
Selected	Member name	Nodes	Version	Weight
<input type="checkbox"/>	App_Server01	wasv90Node01	ND 9.0.0.0	2
<input type="checkbox"/>	App_Server02	wasv90Node02	ND 9.0.0.0	2

Previous Next Cancel



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



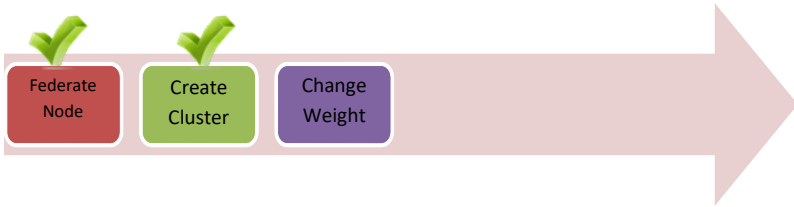


Step 7: Click “Save” to write changes directly to the master file.

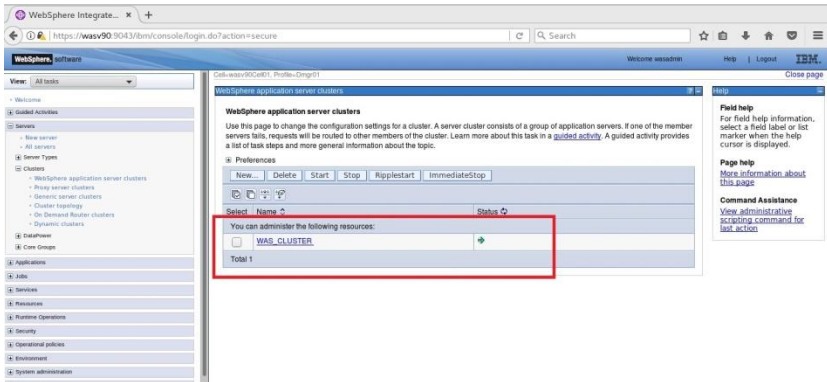
WebSphere Integrated Solutions console screenshot showing the 'WebSphere application server clusters' page. A red box highlights a message indicating that changes have been made to the local configuration and can be saved directly to the master configuration or reverted. The page also shows a table of resources, including 'WAS_CLUSTER'.

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

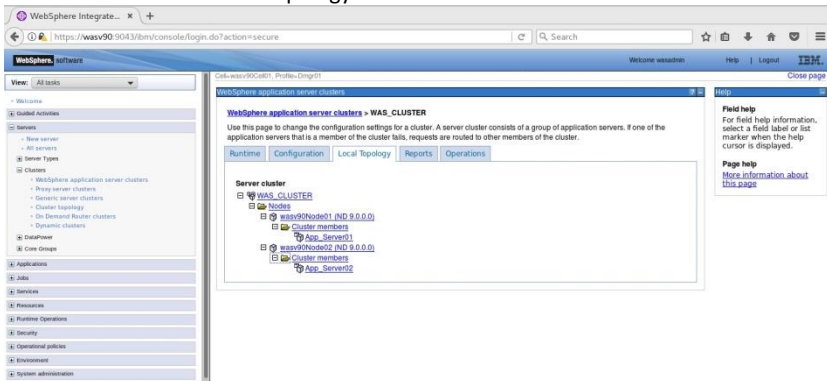
WebSphere Integrated Solutions console screenshot showing the 'WebSphere application server clusters' page. A red box highlights the 'WAS_CLUSTER' resource in the table, which has a status of 'OK'. The 'Start' button is visible next to the cluster name.



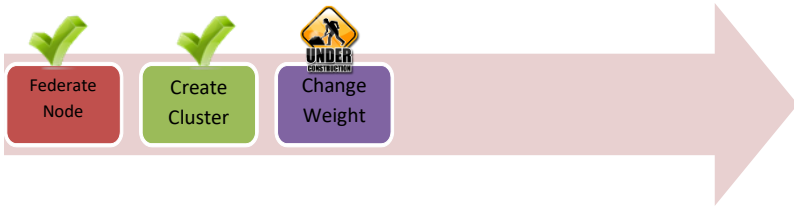
Step 9: You should see the cluster as started as below.



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

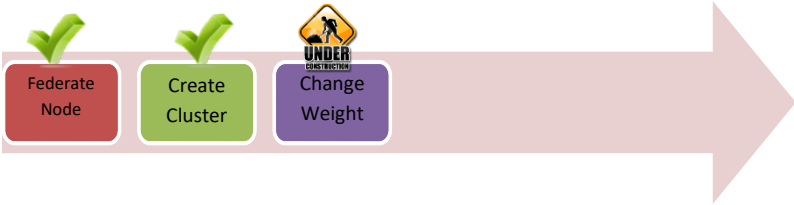
Step 1: Navigate to “Servers>Clusters>WebSphere application server clusters” and click on the name of the cluster.

The screenshot shows the WebSphere Integrated Solutions console interface. The left sidebar displays a navigation tree with the following structure:

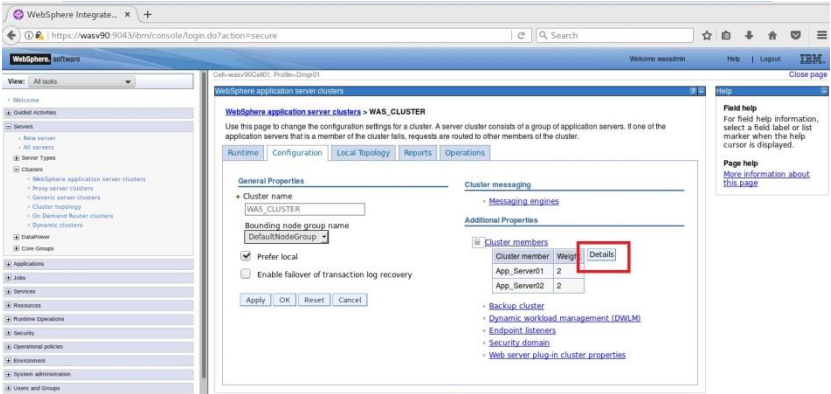
- Home
- Guided Activities
- Servers
 - Base server
 - All servers
 - Server Types
 - WebSphere application server clusters (highlighted)
 - Generic server clusters
 - Cluster topology
 - On Demand Router clusters
 - Dynamic clusters
- Enterprise
- Core Groups
- Applications
- Jobs
- Services
- Resources
- Platform Operations
- Security
- Operational policies
- Eventstreams
- System administration
- License and license

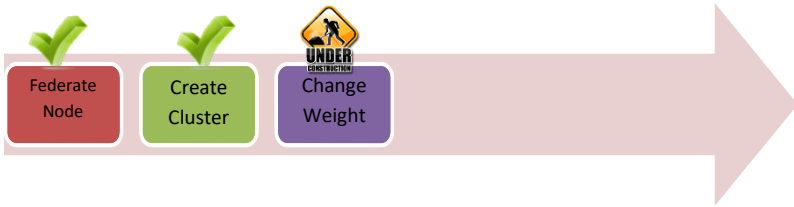
The main content area displays the 'WebSphere application server clusters' page. It includes a header with 'WebSphere application server clusters' and a sub-header 'WebSphere application server clusters'. Below the header, there is a table with columns 'Select', 'Name', and 'Status'. The table contains one entry: 'WAS_CLUSTER'. The 'WAS_CLUSTER' entry is highlighted in the table. To the right of the table, there is a 'Total 1' label. On the far right, there is a 'Help' section with links for 'Field help', 'Page help', and 'Command Assistance'.

The screenshot shows the WebSphere Application Server Administration console. The left-hand navigation pane is expanded to 'Servers', and the 'Server Types' sub-menu is selected. The main content area displays the 'WebSphere application server clusters' configuration page for the 'WAS_CLUSTER'. The 'Runtime' tab is active, showing the 'General Properties' section. In this section, the 'Cluster name' is 'WAS_CLUSTER' and the 'Bundling node group name' is 'DefaultNodeGroup'. The 'Prefer local' checkbox is checked, and the 'Enable failover of transaction log recovery' checkbox is unchecked. The 'Cluster members' link in the 'Additional Properties' section is highlighted with a red rectangle. The top of the console shows the URL 'https://wasv90:9043/blm/console/ogn.do?action=secure' and the user 'Cell=wasv90Cell01, Profile=Eng001'.



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.

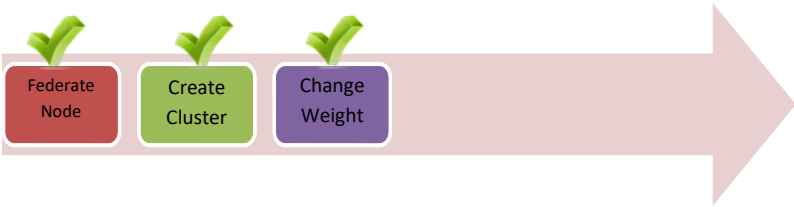
Preferences

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

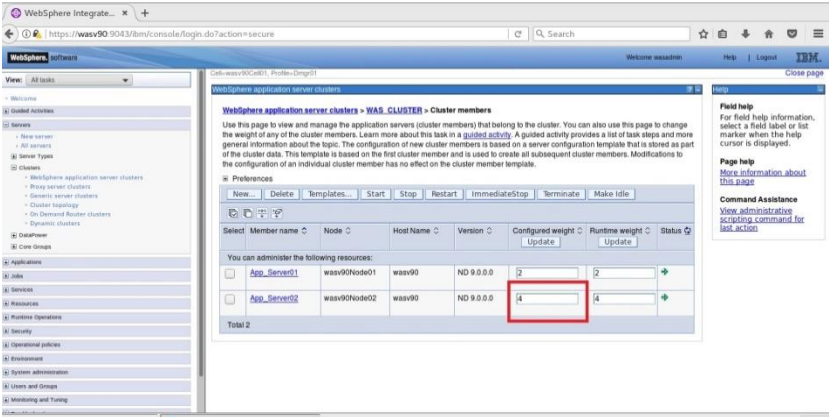
Select Member name Node Host Name Version Configured weight Runtime weight Status

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.



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.

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