12

Clusters

Overview, Creation, and Configuration

Objectives

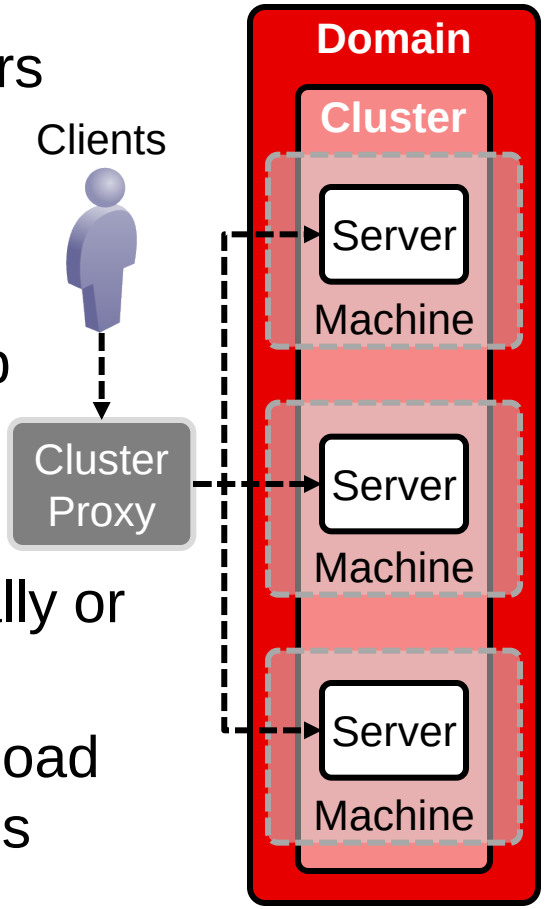
After completing this lesson, you should be able to:

- Describe two cluster architectures: basic and multi-tier
- Create and configure a cluster
- Create and configure a dynamic cluster

Cluster: Review

A cluster:

- Is a logical group of managed servers from the same domain that run cooperatively
- Supports features that provide high availability for web applications, web services, EJBs, and JMS
- Is transparent to its clients
- Can have servers added to it statically or dynamically
- Requires a cluster proxy to provide load balancing, if it hosts web applications

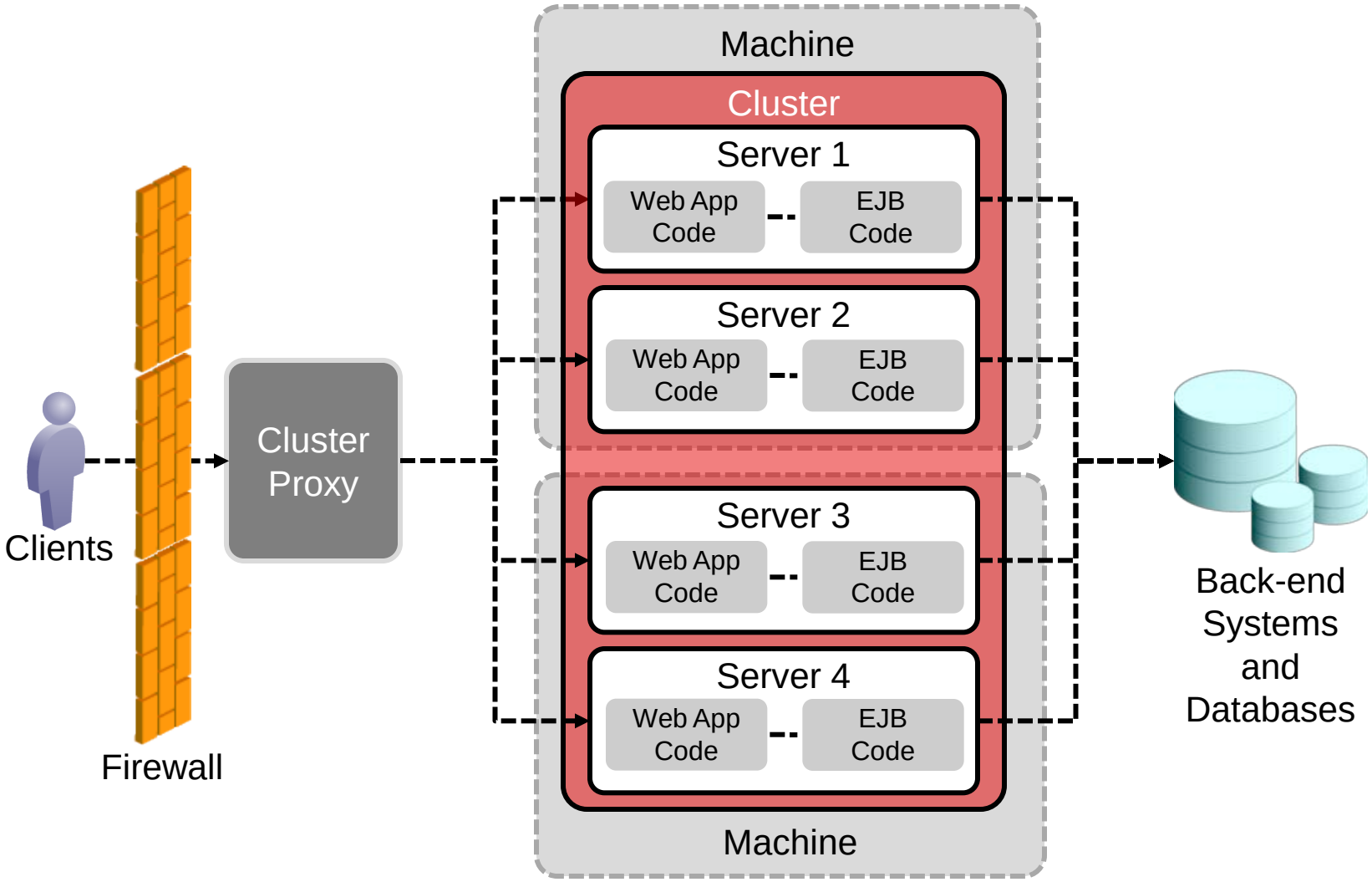


Benefits of Clustering

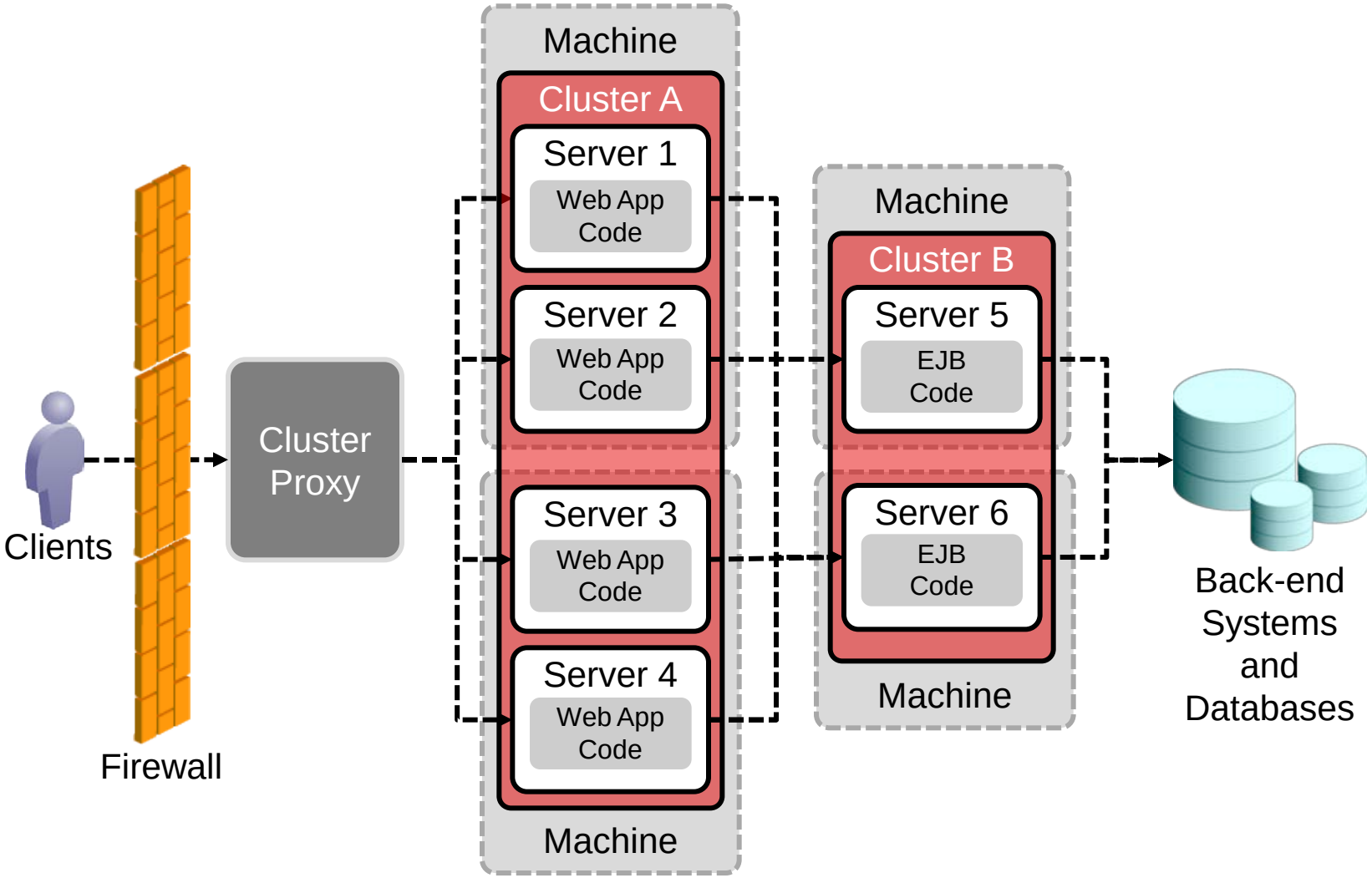
Concept	Description
Scalability	More capacity for applications can be provided by adding servers, without interruption of service or making architectural changes.
Load balancing	Work (for example, client requests) is distributed across the members of a cluster.
Failover	When a server fails, another one can automatically take its place. Information on the failed server is replicated (or stored), so that the new server has access to it.
Migration	When a server fails, its “pinned” services can continue by moving them to another server in the cluster, or by moving the entire failed server to a new hardware.

A “pinned” service is a service that must run only on a single instance of WebLogic Server at any given time.

Basic (Single-Tier) Cluster Architecture



Multi-Tier Cluster Architecture



Architecture Advantages and Disadvantages

Cluster Architecture	Advantages	Disadvantages
Basic (single-tier)	• Easier to administer • Less network traffic • EJB calls are local (and therefore faster)	• Cannot load balance EJB calls
Multi-tier	• EJB calls are load balanced • Scaling options (for example, you can shift (or add) hardware and WebLogic server instances to whichever tier is busier) • More security options (for example, you could place a firewall in between the web application tier and the EJB tier)	• Harder to administer • Perhaps more hardware and licensing costs • EJB calls are remote (and therefore slower) • More network traffic

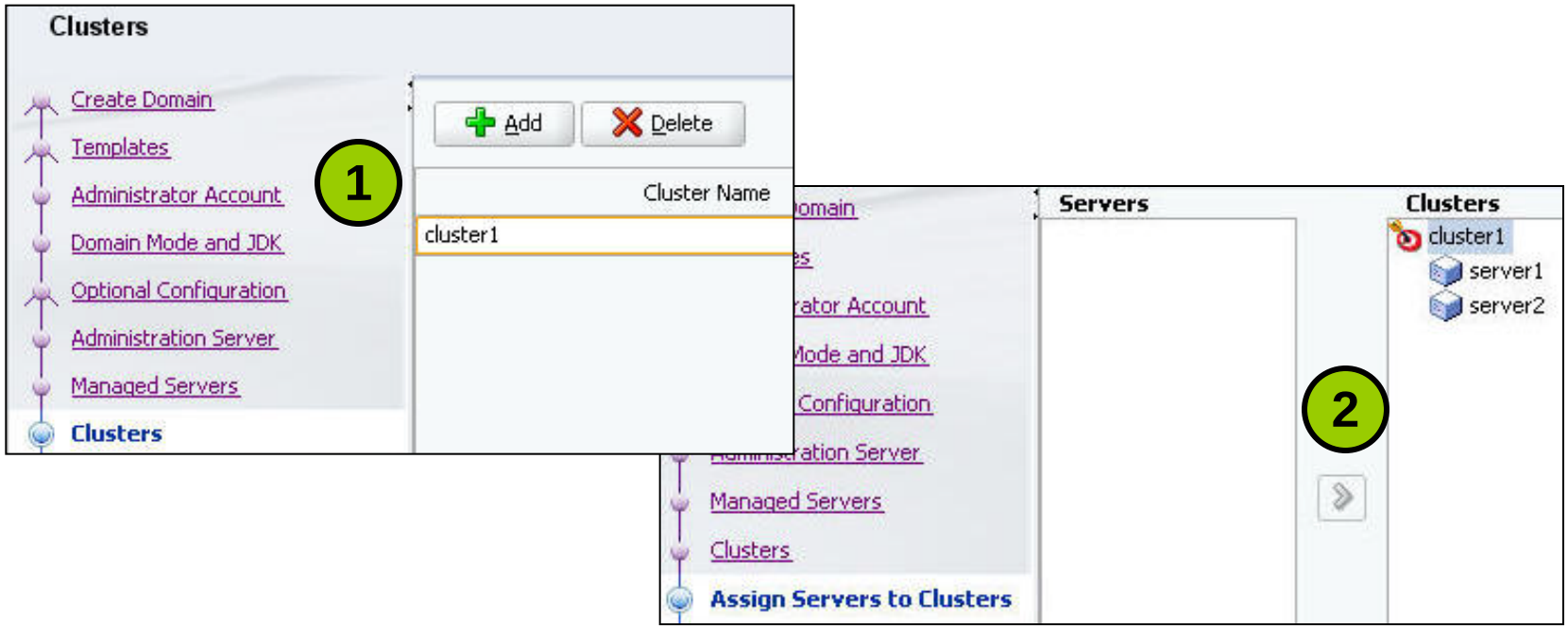
Cluster Communication

- Cluster members communicate with each other in two ways:
  - One-to-many messages:
    - For periodic “heartbeats” to indicate continued availability
    - To announce the availability of clustered services
    - **Note:** This communication can use either:
      - IP unicast (recommended): No additional configuration is required.
      - IP multicast: A multicast host and port must be configured.
  - Peer-to-peer messages:
    - For replicating HTTP session and stateful session EJB state
    - To access clustered objects that reside on a remote server (multi-tier architecture)
    - **Note:** This communication uses sockets.

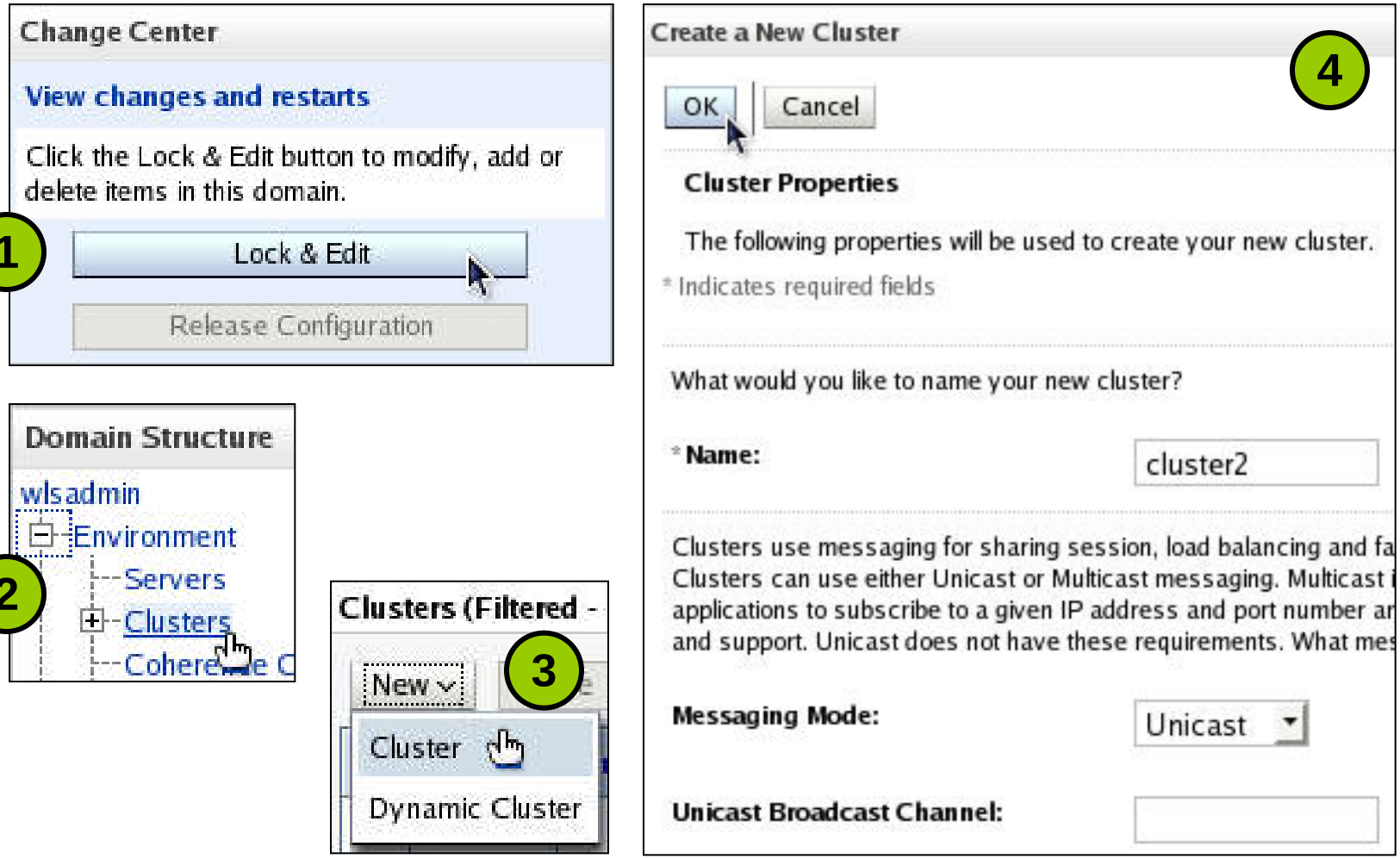
Creating a Cluster: Configuration Wizard

In the Configuration Wizard:

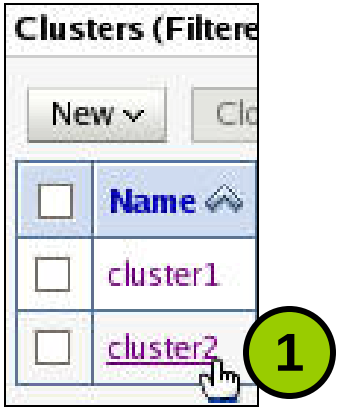
1. Add clusters.
2. Assign managed servers to them.

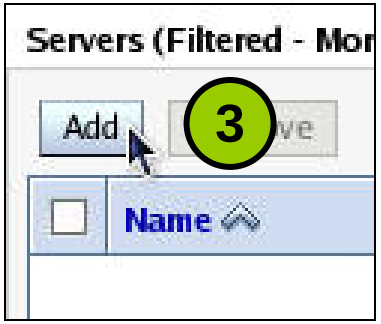


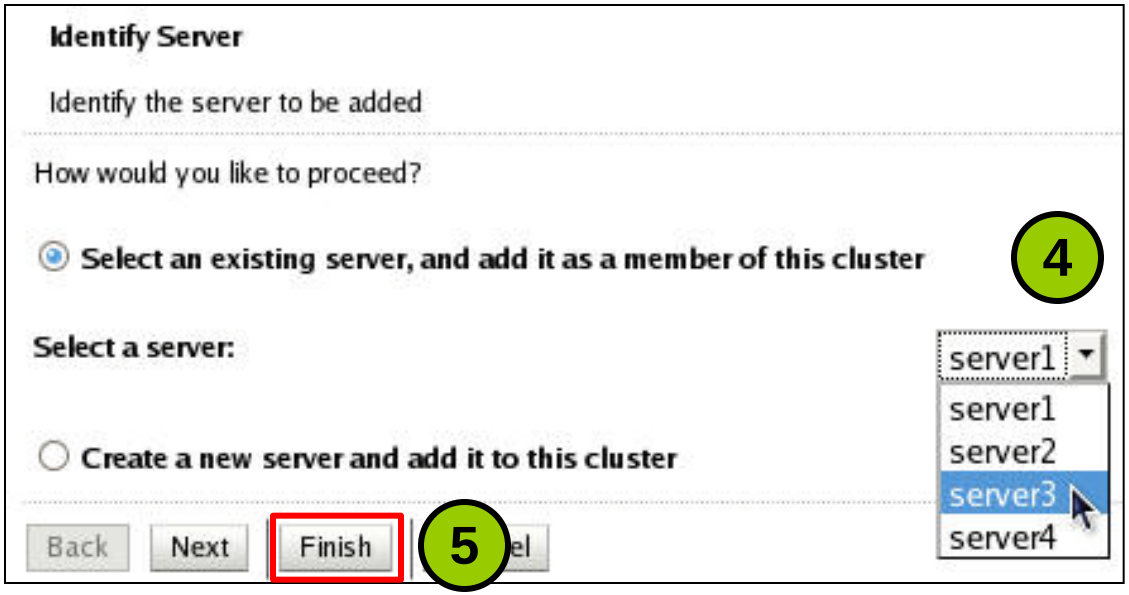
Creating a Cluster: Administration Console



Adding Servers to the Cluster: Administration Console

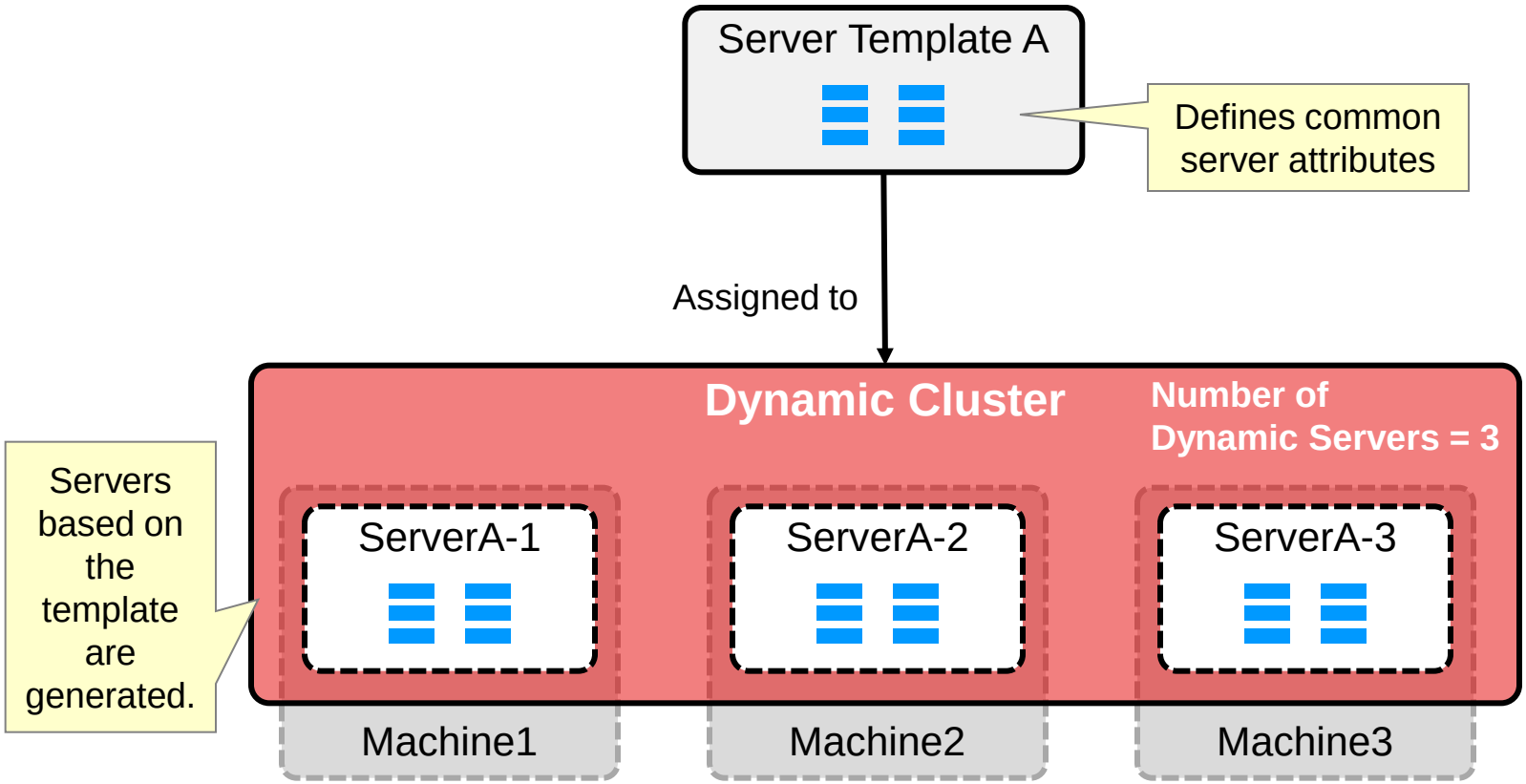






Server Templates and Dynamic Clusters

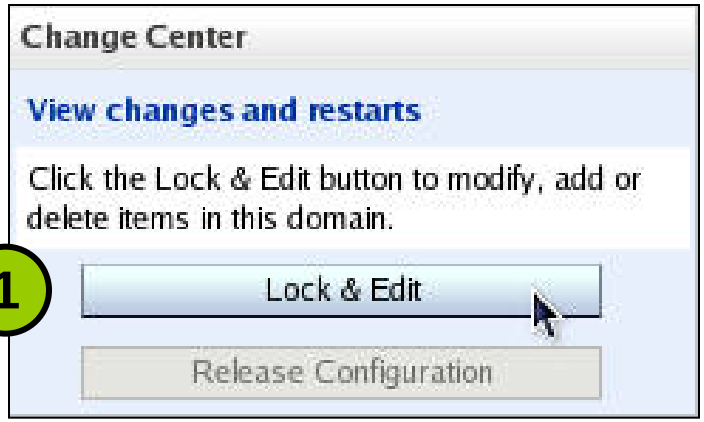
A dynamic cluster is based on a server template.

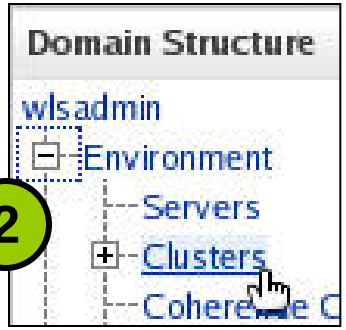


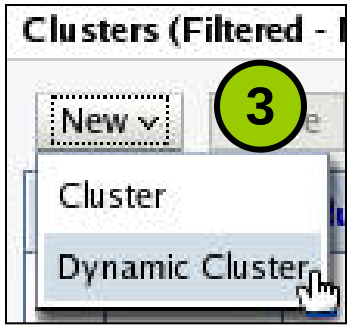
Server Templates and Dynamic Clusters

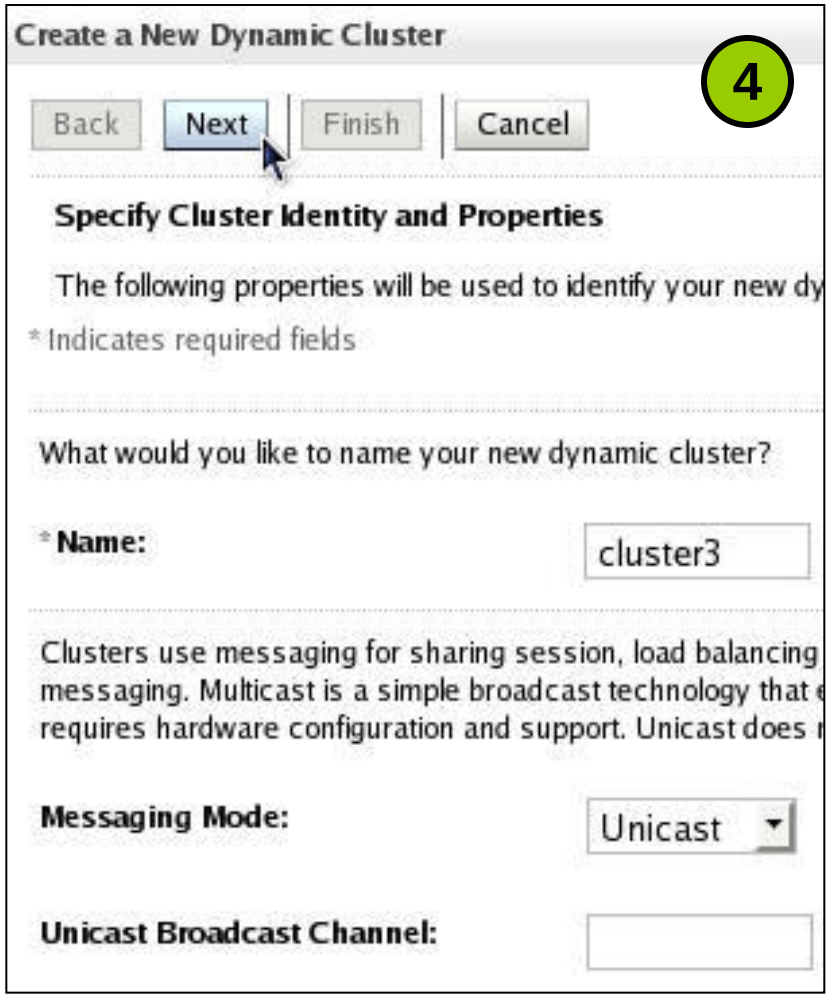
- A server template defines server attributes.
  - Servers based on that template share those attributes.
    - If you change an attribute in the template, all of the servers based on that template change.
- A cluster can be associated with one server template. The cluster sets the number of dynamic servers needed.
  - That number of servers is generated and assigned to the cluster.
  - These servers show in the Servers table with the Type “Dynamic” (as opposed to “Configured”).
  - Attributes of dynamic servers that are server-specific are calculated when the servers are generated (for example, the server names).

Creating a Dynamic Cluster

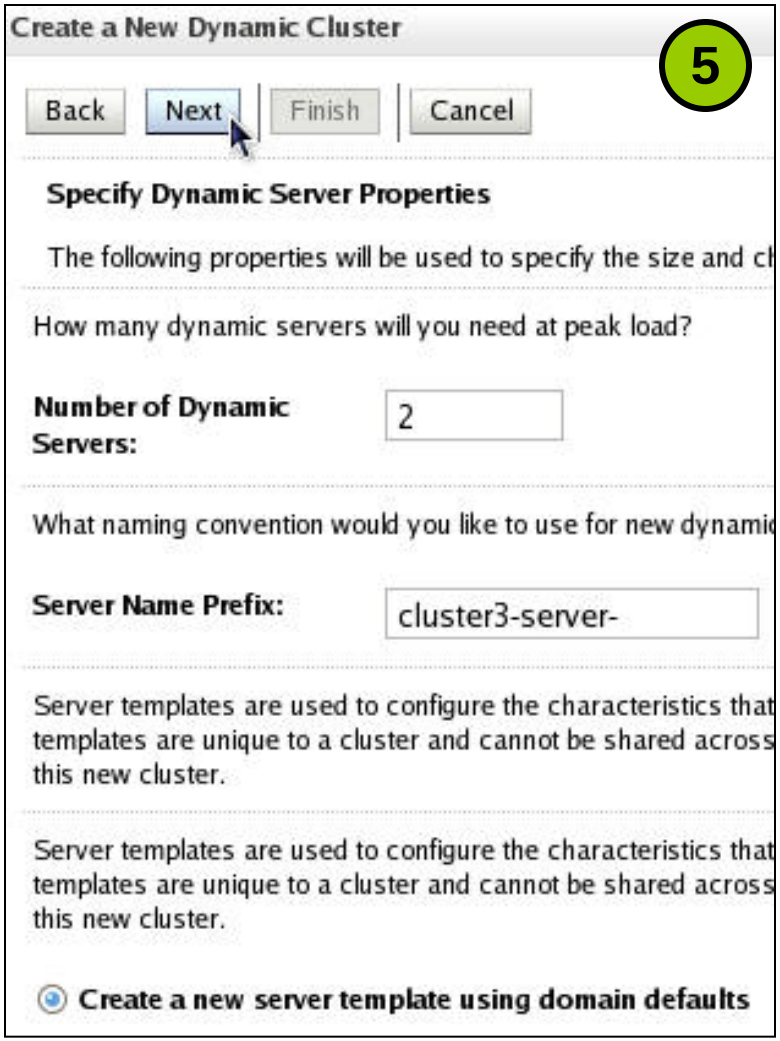


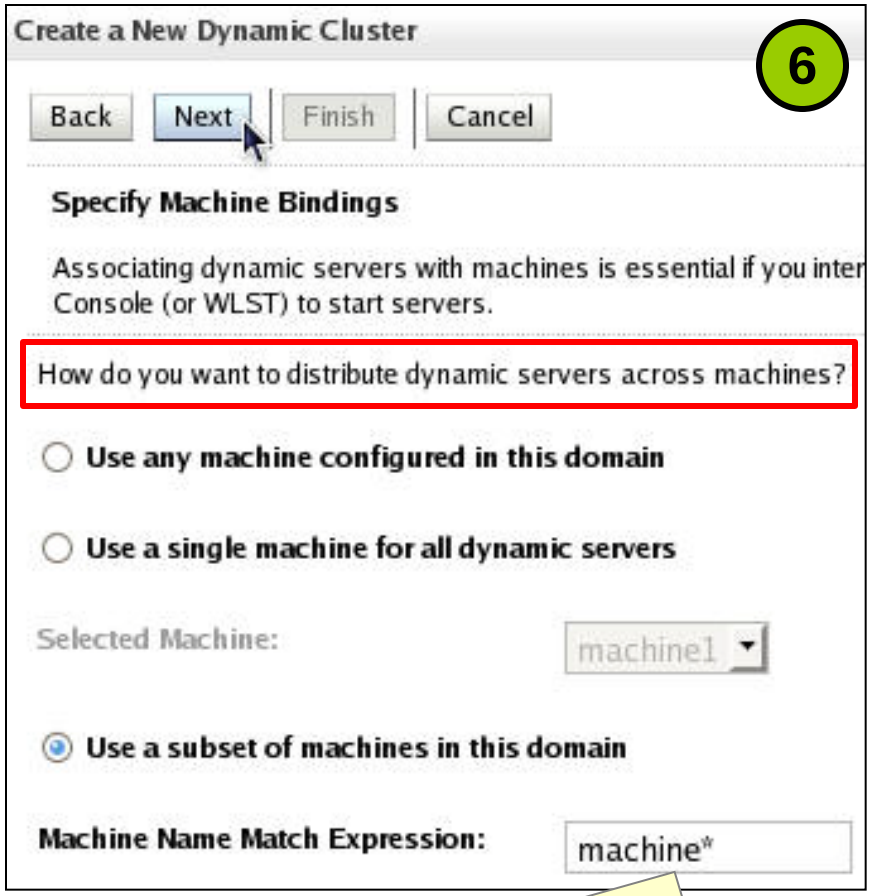






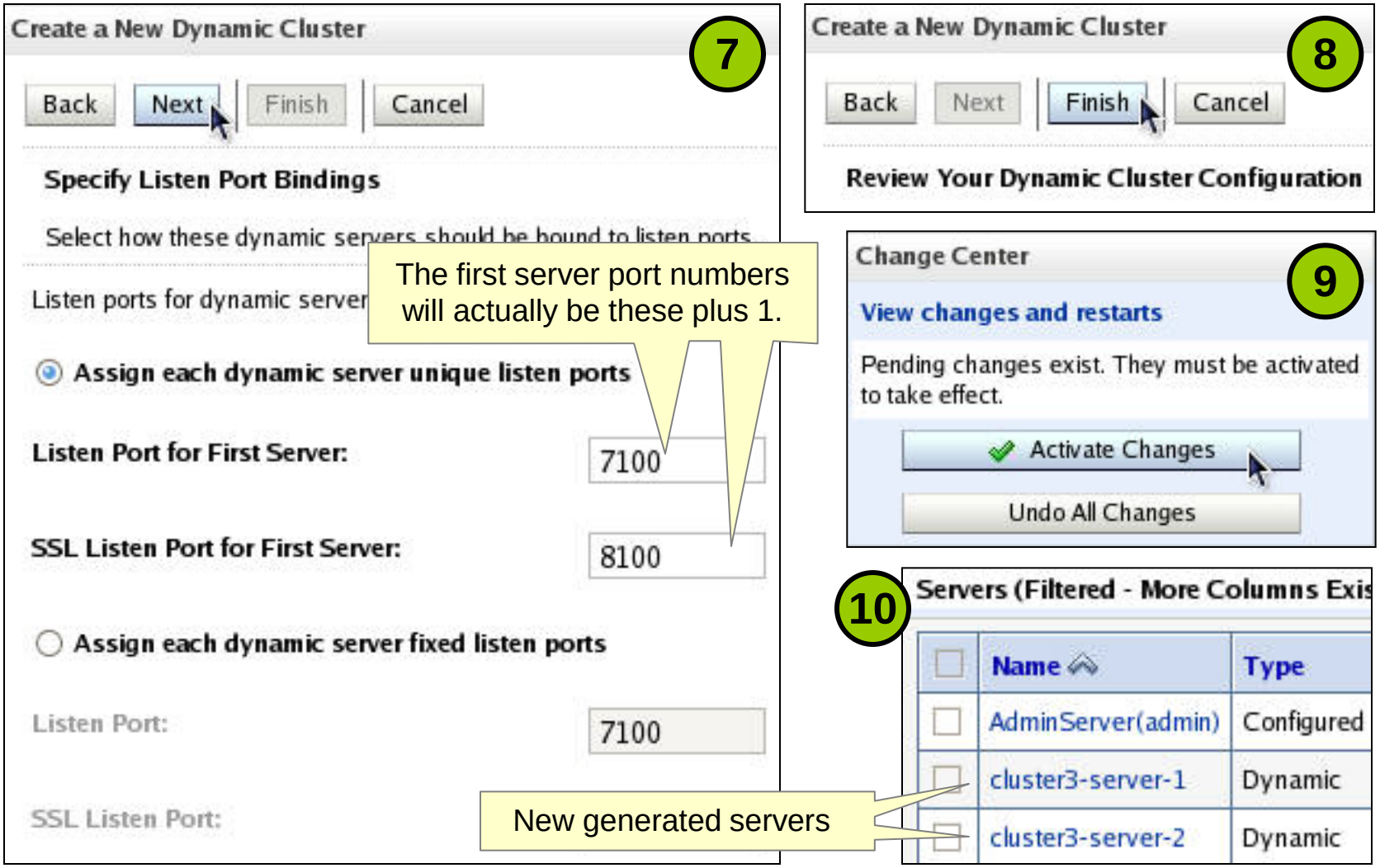
Creating a Dynamic Cluster



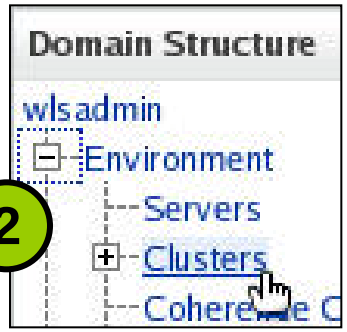


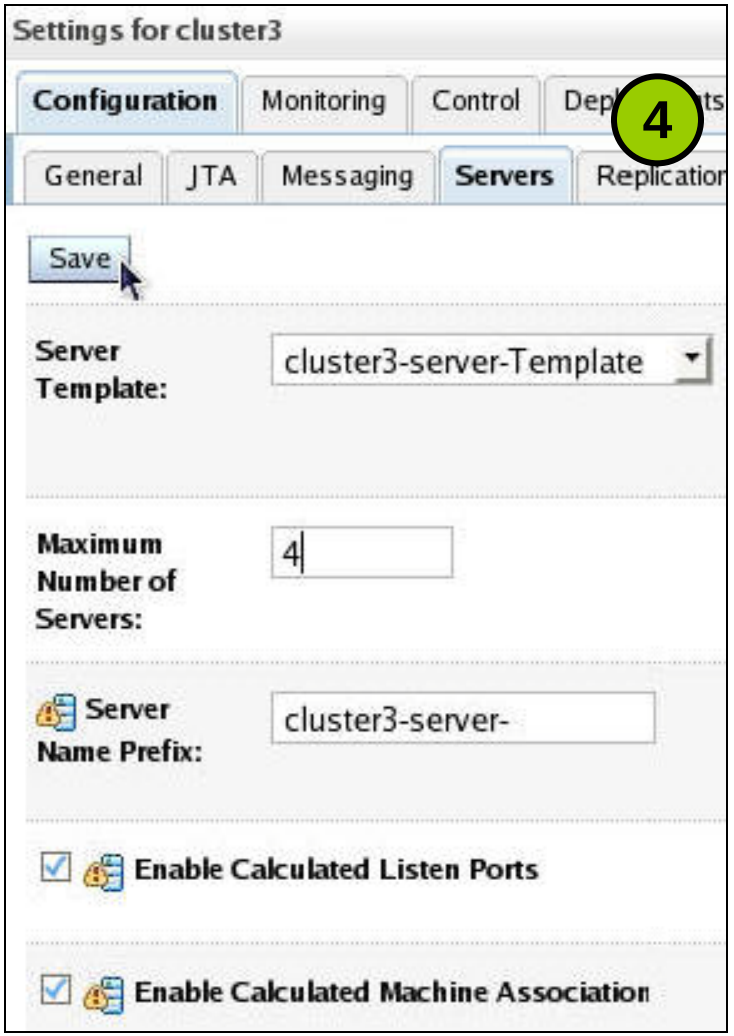
Use machines that have a name that starts with the string "`machine`."

Creating a Dynamic Cluster

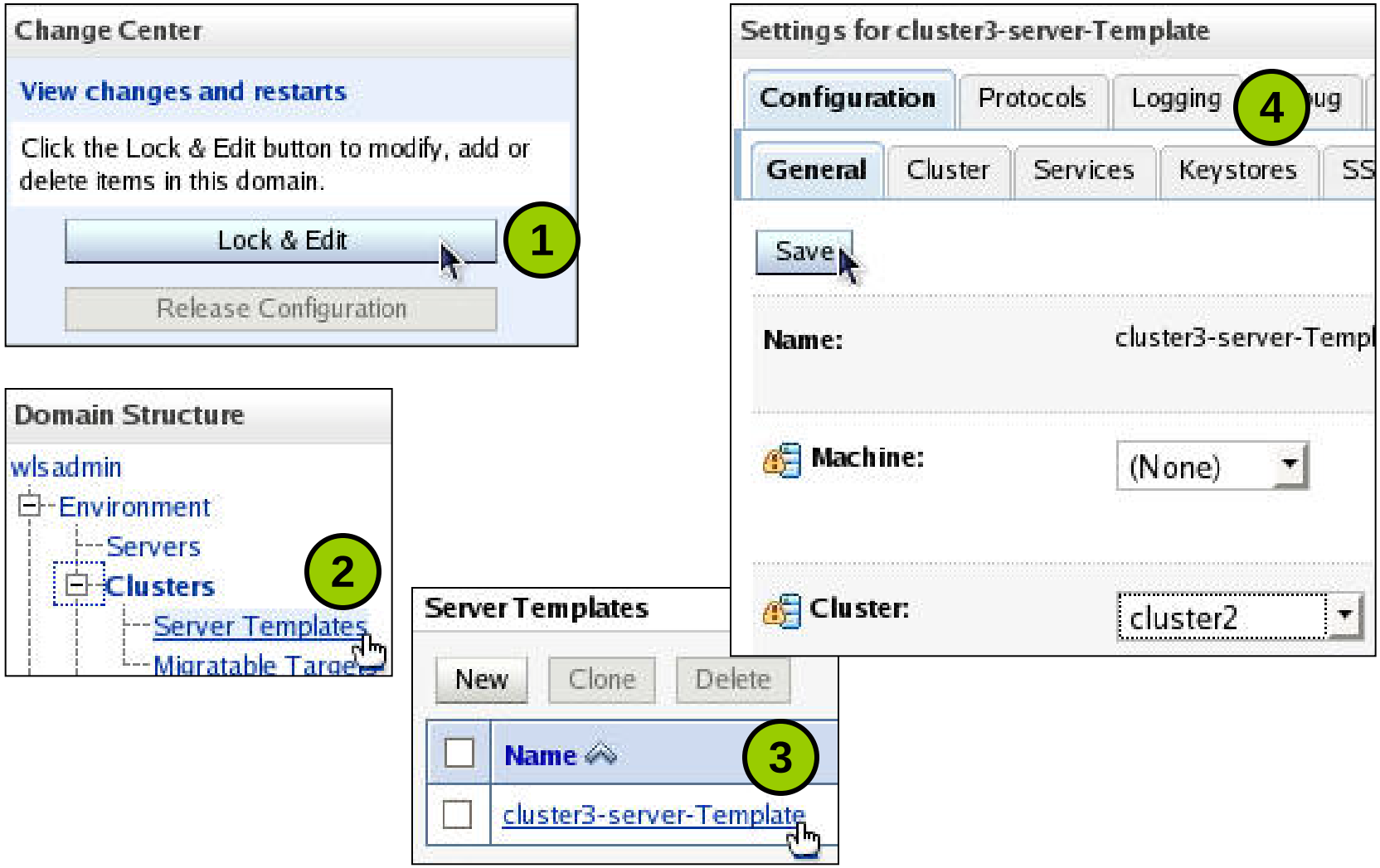


Editing the New Dynamic Cluster





Editing the New Server Template



Dynamic Server Calculated Attributes

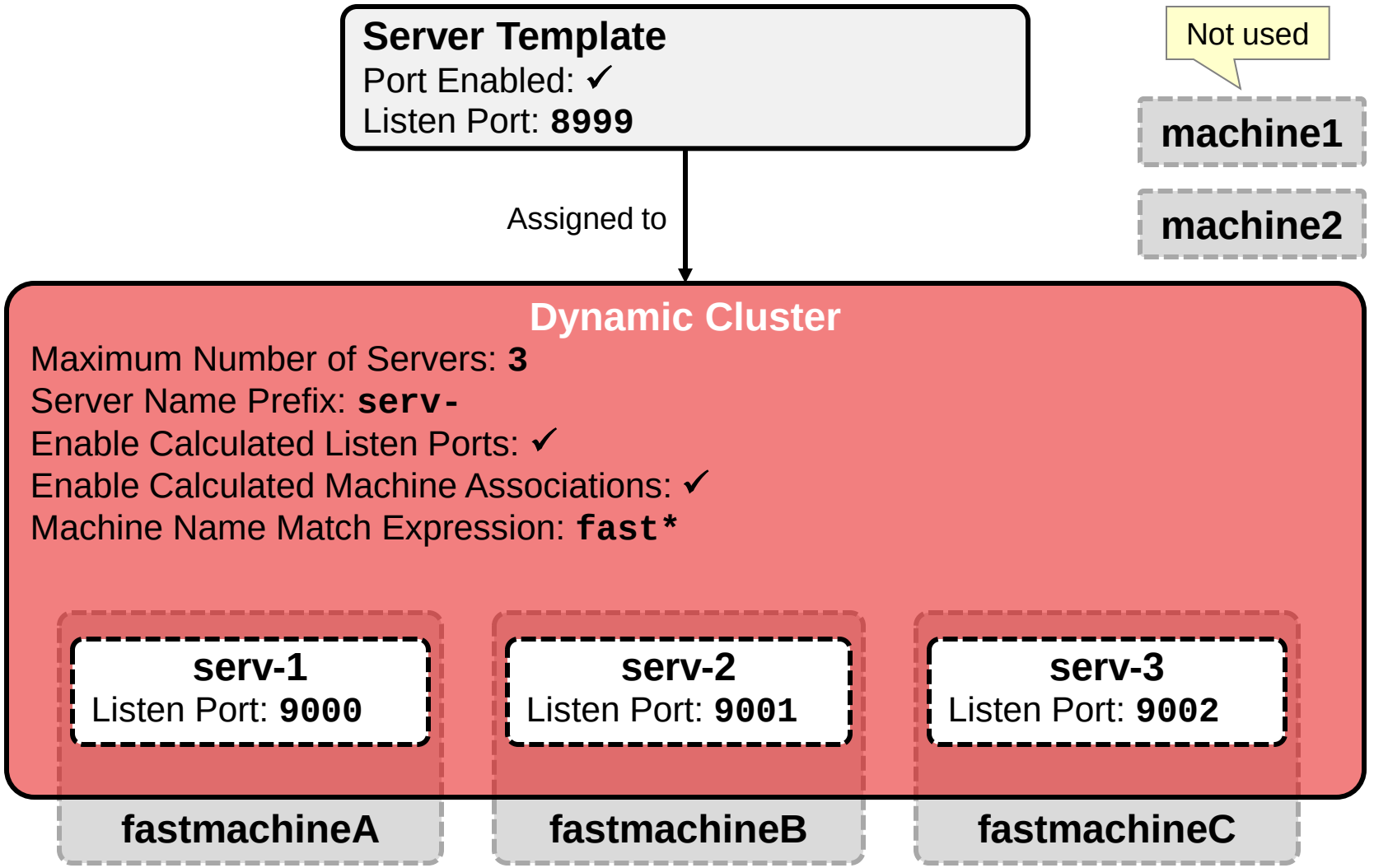
Dynamic servers are generated for a dynamic cluster based on the server template. Server-specific attributes are calculated:

- Server name: The Server Name Prefix followed by indexes in order, starting with 1.
- Listen ports:
  - Dynamic: The port values entered in the template +1 for the first server, +2 for the second, and so on.
  - Static: Each server gets the same template port values
- Machine names:
  - No machine name match expression: All machines are rotated through as the servers are generated.
  - Machine name match expression: Only matching machines are rotated through as the servers are generated.

Cluster has Enable Calculated Listen Ports selected

Cluster has Enable Calculated Machine Associations selected

Dynamic Server Calculated Attributes: Example

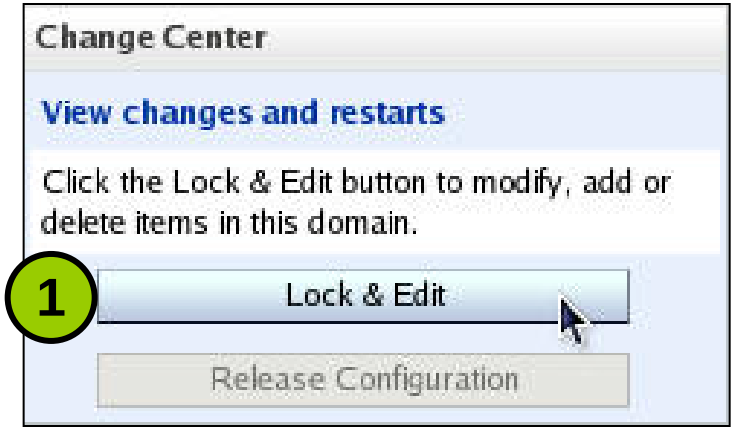


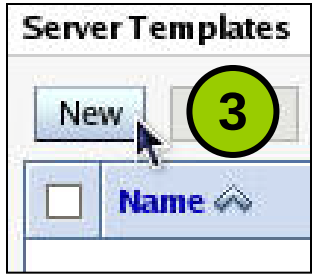
Comparing Configured and Dynamic Clusters

Feature	Configured Cluster	Dynamic Cluster
Create with the Admin Console / WLST	Yes	Yes
Create with the Configuration Wizard	Yes	No
Edit individual server attributes	Yes	No
Servers generated automatically	No	Yes
Can contain configured servers	Yes	Yes
Can contain dynamic servers	No	Yes
Supports service-level migration	Yes	No
Supports whole-server migration	Yes	No

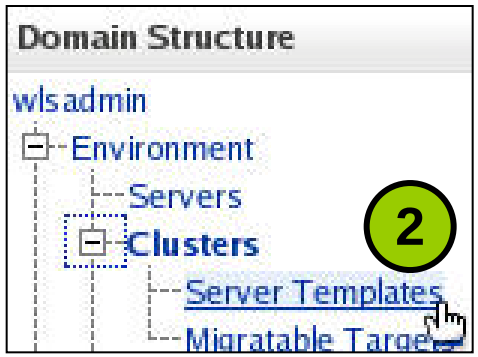
Creating a Server Template

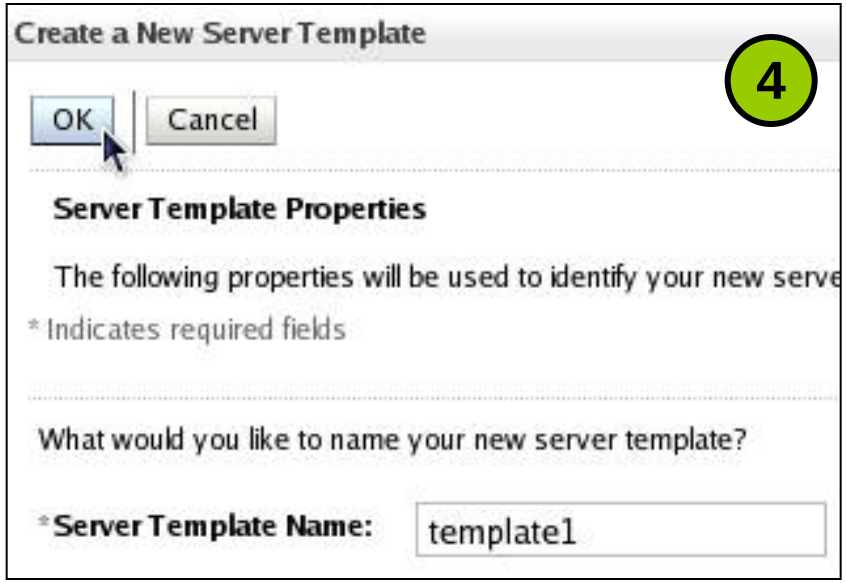
You can create a server template independently from creating a dynamic cluster:



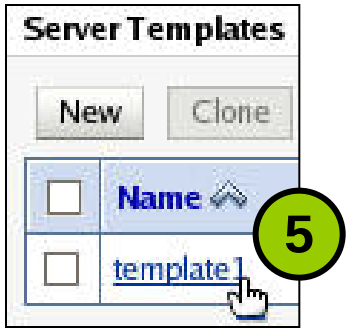


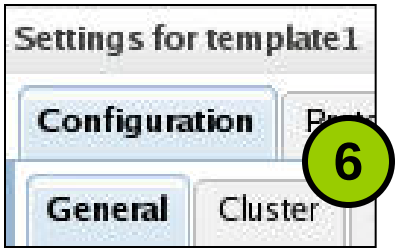
This template can be cloned when creating a dynamic cluster, or assigned to a cluster to make it dynamic.

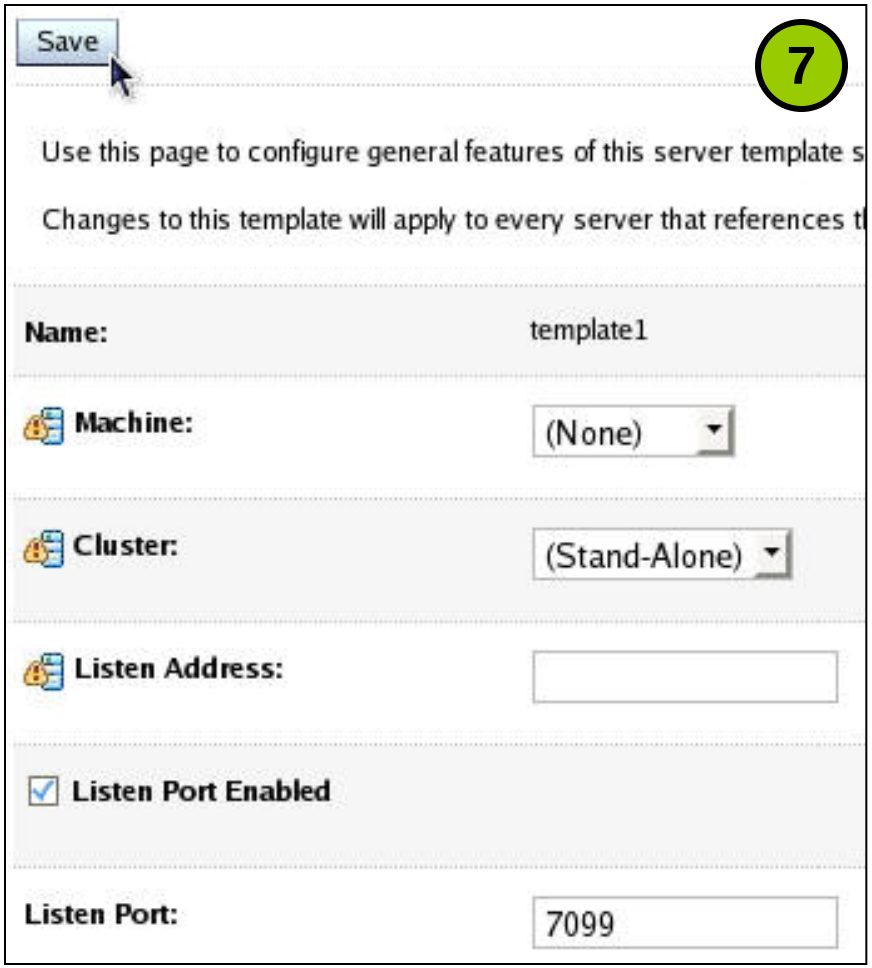




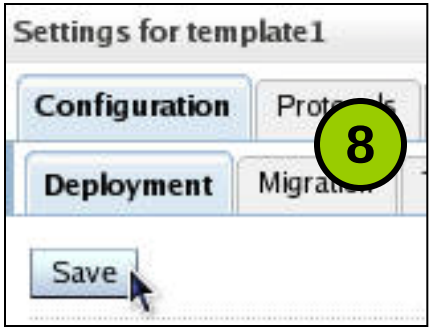
Creating a Server Template







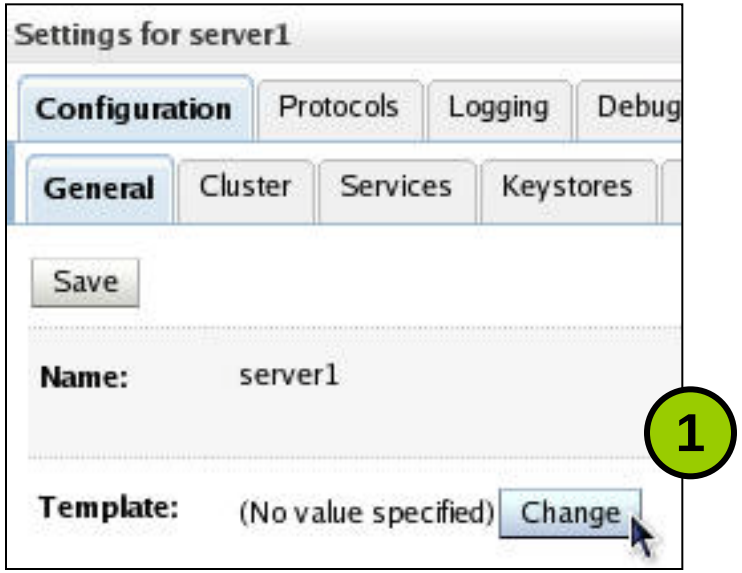
Choose other tabs and edit server attributes

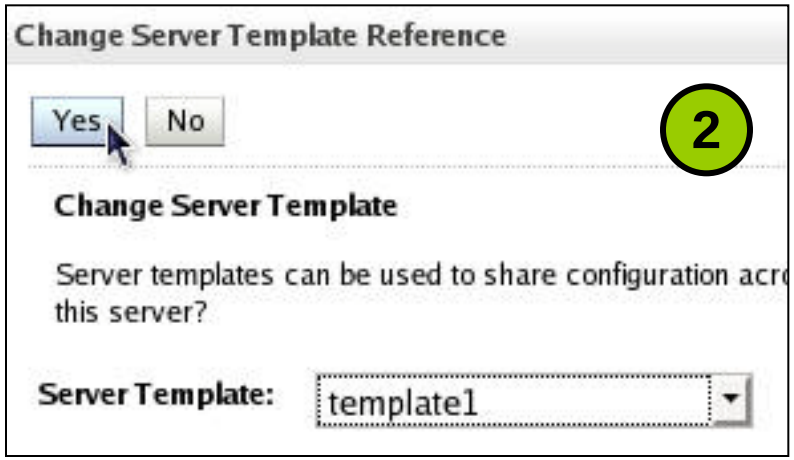


Server Templates and Configured Servers

In addition to using server templates to define the servers in a dynamic cluster, a server template can be assigned to any number of configured servers, so those servers can share common, nondefault attributes.

- The attributes can be overridden by the individual servers.





Quiz

The multi-tier cluster architecture allows you to load balance EJB calls. But, the basic (single-tier) architecture has an EJB-related advantage over multi-tier. The advantage is:

a. It cannot use EJBs, which makes development simpler
b. This is a trick question, because the single-tier architecture has no EJB-related advantages
c. All EJB calls are local and, therefore, faster

Quiz

A dynamic cluster is based on:

a. One server template
b. Multiple server templates
c. A cluster proxy
d. A domain template

Summary

In this lesson, you should have learned how to:

- Describe two cluster architectures: basic and multi-tier
- Create and configure a cluster
- Create and configure a dynamic cluster

Practice 12-1 Overview: Configuring a Cluster

This practice covers creating a cluster by using the administration console.

Practice 12-2 Overview: Configuring a Dynamic Cluster

This practice covers creating a dynamic cluster by using the administration console.