SOLUTION PARTNER FOR **SMART TECHNOLOGY**

LENA

User Guide

LENA Support

Version 1.3.4.2

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Chapter 1. Overview

1.1. What is LENA?

LENA is a web middleware solution that includes all components necessary for serving JAVA J2EE Web Applications in Enterprise environments.

LENA consists of Server products that provide actual web services and a Web UI-based Manager Console for integrated management. Users can easily perform Server installation, Parameter configuration, and inter-product integration through the Manager Console, and with LENA's user-friendly UX/UI design, even users unfamiliar with web middleware solutions can quickly learn how to use them and acquire web middleware-related knowledge.

LENA provides various convenience features by consolidating years of operational know-how from web middleware operators in data center/cloud environments. Additionally, it provides Clustering with high availability and fault tolerance, and failure diagnostics/response functionality to stably process large-scale transactions and minimize service failures.

The following sections explain LENA's features in more detail.

1.2. LENA Features

Enterprise Requirements Provision

LENA Web Application Server EE (J2EE Edition) supports J2EE specifications such as EJB, JTA/XA, JMS, JAX-WS required for executing Enterprise Web Applications. Additionally, it has achieved improvements in startup performance and Application Deploy performance compared to third-party WAS, and resource usage efficiency such as CPU/Memory has also been improved. For high availability, Session Server is provided by default in Enterprise Edition for essential Session Clustering.

Open Source Compatibility Guarantee

LENA Web Server and LENA WAS are implemented on Open Source Base, ensuring perfect Open Source compatibility. Web Applications written on Open Source basis can be applied to LENA without separate modifications, greatly reducing transition effort. Additionally, using standard technologies for libraries and configuration resolves vendor dependency and strengthens users' IT ownership.

Intelligent Failure Diagnostics/Response and Service Tracing

It can perform diagnostics based on pre-defined rules for representative failure situations such as Thread Pool Full / Hang / Out of memory and take appropriate measures. Based on real-time collected monitoring data, it analyzes and prevents failure situations through Fake Page bypass or forced restart before servers lead to actual failures, or minimizes failure time even if failures occur. Simultaneously, it provides related Dumps and Reports to enable cause analysis.

Multi-Server Management and Centralized Operation

Multiple LENA Web Servers and LENA WAS can be grouped into a single Cluster, allowing control of multiple servers simultaneously through single operation. Stable application is possible through consistent configuration synchronization along with Graceful Restart or Rolling Restart. Additionally, Multi Control is supported for servers not grouped in clusters.

Cloud/Container Specialized Features

It easily responds to Auto Scaling in Cloud environments. To avoid repetitive work of updating Images every time configuration updates occur, LENA provides Server replication and

configuration synchronization functionality for VM Instances that have been scaled out. This greatly reduces the effort required for operators to configure Auto Scaling environments.

To respond to Container environments, LENA provides Base Docker Images, and these Images fully reflect various essential elements required for Container operation. Through template-based dynamic configuration deployment, there's no need to build Images every time, achieving CI/CD simplification. Additionally, various configurations can be applied to integrate with various solutions in MSA environments.

Operational Differentiation Features

Provides various convenience features for easy operation of web middleware solutions. Using template-based simple and fast Server installation and Server replication features, desired configuration sets can be built in a short time. Through Topology View, configuration and integration information between Server modules can be checked at a glance, improving visibility. Through Dashboard, Events and performance status of operating systems can be checked. Additionally, through Multi Account management, menu/resource access permission settings are possible, and operator Action Tracing, configuration update information History tracking, and Restore functionality are provided.

1.3. LENA Components and Key Concepts

LENA is provided through Binary Package and includes all necessary components. Components are broadly divided into two categories.

- Management Module for operating and managing LENA, including LENA Manager Console and LENA Node Agent.
- Server Module responsible for actual Web Service, including LENA Web Server, LENA WAS (Web Application Server), and LENA Session Server.

The following covers detailed descriptions of each component along with key concepts.

1.3.1. Management Module

LENA Manager

LENA Manager is a Web Application designed to configure and control all resources/functions of LENA through Web UI. Installation and start can be performed through scripts prepared in the LENA Package. To perform Server installation/management through LENA Manager, integration with Node Agent and Advertiser must be configured.

The following explains representative functions and concepts provided by LENA Manager. For detailed information not described below, refer to the "Operator Guide".

- **Dashboard**
  Check resource status and Events of LENA Node and Server
- **Server**
  Register LENA Node, install Web Server, WAS, Session Server, manage configuration, and control start/stop
  - **System**
    Minimum unit for managing LENA Node and Server. Multiple Nodes can be registered under one System, but one Node cannot be registered in multiple Systems.
  - **Node**
    Concept corresponding 1:1 with Node Agent. To execute commands on remote Servers from Manager, it must be done through Node Agent.

- **Cluster**
  Multi-Server management. Cluster configuration is only possible for Servers within one System, and one Server cannot belong to multiple Clusters.
  - **Server Cluster**
    Multiple LENA Web Servers and WAS can be managed as one group. Provides various convenience features such as configuration synchronization and integrated restart.
  - **Service Cluster**
    Function for responding to Container environments. Clusters can be created for LENA Web Server, LENA WAS, and LENA Session Server respectively. Through this Cluster, configuration templates can be deployed to Server Containers. The difference from Server Cluster is that while Server Cluster directly performs Server registration in LENA Manager and enables start/stop control, Service Cluster is passively registered by Server Container and start/stop control is not possible.
- **Resource**
  While not a Module provided by LENA, it defines specifications for resources that are closely integrated with LENA Server, using them as Resources. Resources can be set locally for each LENA WAS, but through the Resource menu, they can be set globally and commonly imported by WAS, avoiding duplicate work.
  - **Database**
    Defines physical specifications such as IP, Port, Driver of DBMS. Corresponds 1:1 with one DBMS.
  - **Datasource**
    Specifies JNDI Name, Url, User ID/Password for configuring DB Connection Pool in LENA WAS. Multiple Datasources can be configured under one Database.
  - **Application**
    Specifies the location and Context Path of the Application to be executed through LENA WAS.
- **Topology**
  Expresses the configuration status of LENA Web Server, LENA WAS, LENA Session Server, etc. installed and integrated on LENA Manager in Topology Diagram format. Through this function, simple Server installation and start/stop control are also possible.
- **Diagnostics**
  Equipped with resource monitoring for LENA Node and Server and various related functions.

LENA Node Agent

LENA Node Agent corresponds 1:1 with Node when registering Node in LENA Manager, is installed by default in LENA Package, and can be started through prepared scripts. Main roles are handling commands for Servers under Node when executing commands through LENA Manager, and also performing the function of transmitting monitoring and status data to LENA Manager. One Node Agent per physical server is the default, but multiple Node Agents can be configured as needed. LENA Web Server, LENA WAS, and LENA Session Server are configured under LENA Node, and LENA Node is configured under one System.

1.3.2. Server Module

LENA Web Server

LENA Web Server can transmit static content and interacts with LENA WAS in Reverse Proxy form to perform the front-end role of the Web Application service provided by LENA WAS. In addition to this, various optional additional functions can be used, with Domain/URI-based branching and Load Balancing functionality, and security layer (SSL) being representative.

LENA WAS (Web Application Server)

LENA WAS executes Java Web Application to provide Web Application services. It includes Datasource connection functionality for using DB Connection Pool and Session Server connection functionality for using Session Clustering. The following describes two types of LENA WAS.

- **LENA WAS SE (Standard Edition)**
  It consists only of Servlet Engine and JSP Engine for processing Java Class files and JSP files, and can only run WAR Type Web Applications. It has the advantage of being relatively lightweight and faster than LENA WAS EE.
- **LENA WAS EE (Enterprise Edition)**
  In addition to the Engines provided by LENA WAS SE, it supports J2EE specifications such as EJB Engine, JMS Engine, and can run WAR/EJB/EAR Type Applications. Additionally, it supports XA Datasource for 2 Phase Commit.

LENA WAS is equipped with an Advertiser Module internally, which collects monitoring results from LENA WAS's JVM through JMX and transmits them to LENA Manager.

LENA Session Server

LENA Session Server is provided to ensure high availability through Session Clustering among multiple LENA WAS. It is provided by default when using LENA Enterprise Edition, and two LENA Session Servers can be configured in Active-Active Clustering (Bidirectional Active-Standby) for Session Clustering. It is possible to implement Session Clustering by setting up a separate configuration in the Application, but it can be implemented simply by a simple configuration in LENA Manager.

However, for Session-clustering, all objects stored in HTTP Session must be serialized (Serializable).

1.4. LENA Operation Mechanism

Nodes registered in Manager are equipped with Node Agent, and Application Servers are equipped with Advertiser.

Operators control Server requests (e.g., Start, Stop, Reload, Dump, configuration changes) from Manager's UI to Node Agents, and Node Agents receive these requests and execute control.

Node Agents and Advertisers periodically transmit monitoring data to Managers, and operators can check resource status of each server through Manager's UI, such as Monitoring Dashboard. For Session Server, it directly transmits its own monitoring data to Manager.

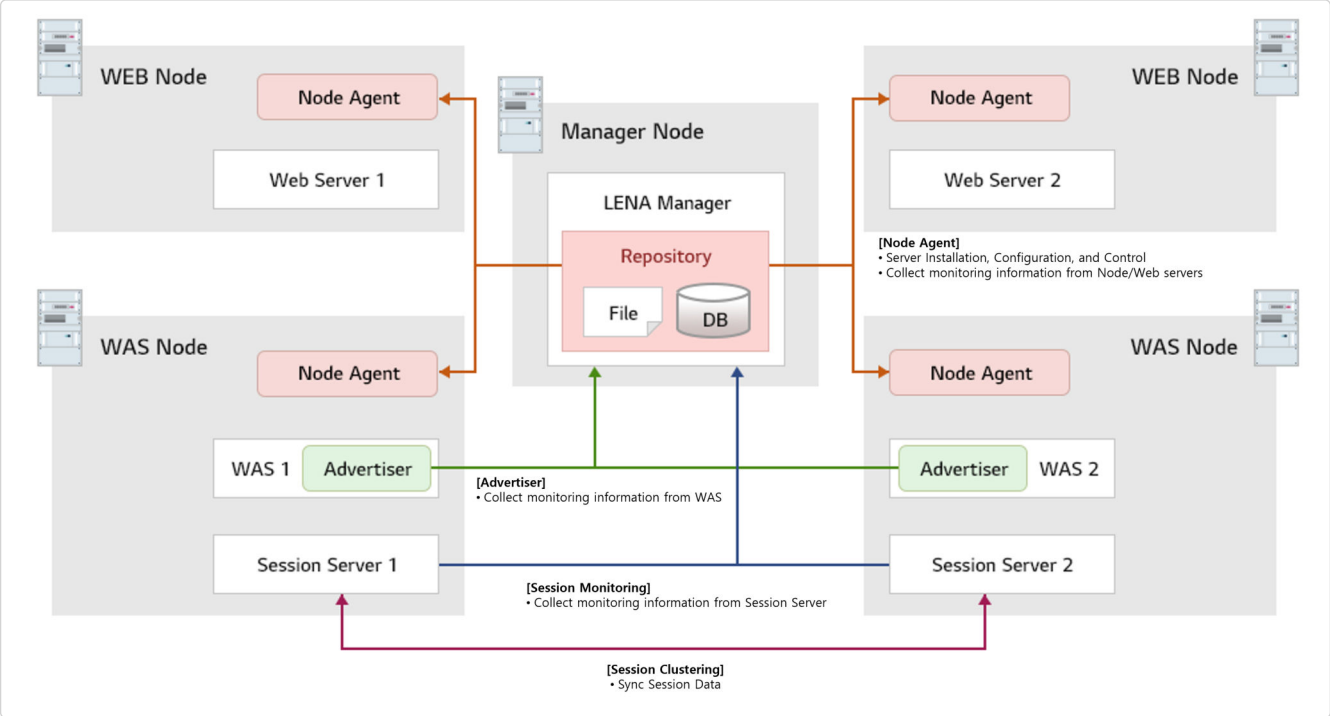


Figure 1. LENA Mechanism

Table 1. Description of LENA Components by Category

Component	Description
Manager	Provides control and monitoring functions through Agent.
Repository	Equipped with File/DB for Manager operation.
Node	Equipped with Node Agent. Server Modules are installed under Node.
Node Agent	- Server installation/replication/patch - Server start/stop control - Server configuration management - Node, Web Server, WAS, Session Server status information - Node, Web Server resource monitoring data provision
Advertiser	Provides WAS resource monitoring data.
WAS	Provides Java Web Application service.
Web Server	Interacts with WAS in Reverse Proxy form to perform the Front-end role of Web services.
Session Server	- Implements Session Clustering with WAS to ensure high availability - Provides Session Server monitoring data.

1.5. Edition-specific Spec

LENA is divided into Standard and Enterprise Editions based on the scope of functions provided by the Application Server, and a Container version is added based on Container requirements. Standard Edition supports Web Application-centric specifications, while Enterprise Edition supports JTA, JMS, EJB, etc. J2EE specifications and provides Session Clustering. The functions or specifications provided for each Edition are as follows.

Table 2. Functions and Specifications by Edition

Function/Spec (LENA-Manager basis)		**Standard**	**Enterprise**	**Container**
Server	Web Server	●	●	●
	WAS (SE)	●	●	●
	WAS (EE)	-	●	●
	Session Server	-	●	●
Resource	Database	●	●	●
	DataSource (General)	●	●	●
	DataSource (XA)	-	●	●
	JTA	-	●	●
	JMS	-	●	●
	Application (WAR)	●	●	●
	Application (EJB, EAR)	-	●	●
Cluster		-	●	●
Topology		●	●	●
Security		●	●	-
Diagnostics	Monitoring	●	●	●
	Diagnostics/Response	-	●	-
Patch		●	●	-

(Legend: ● Provided, - Not provided)

Chapter 2. Log In/Out

Provides functionality for logging in and out of the Manager.

2.1. Log In

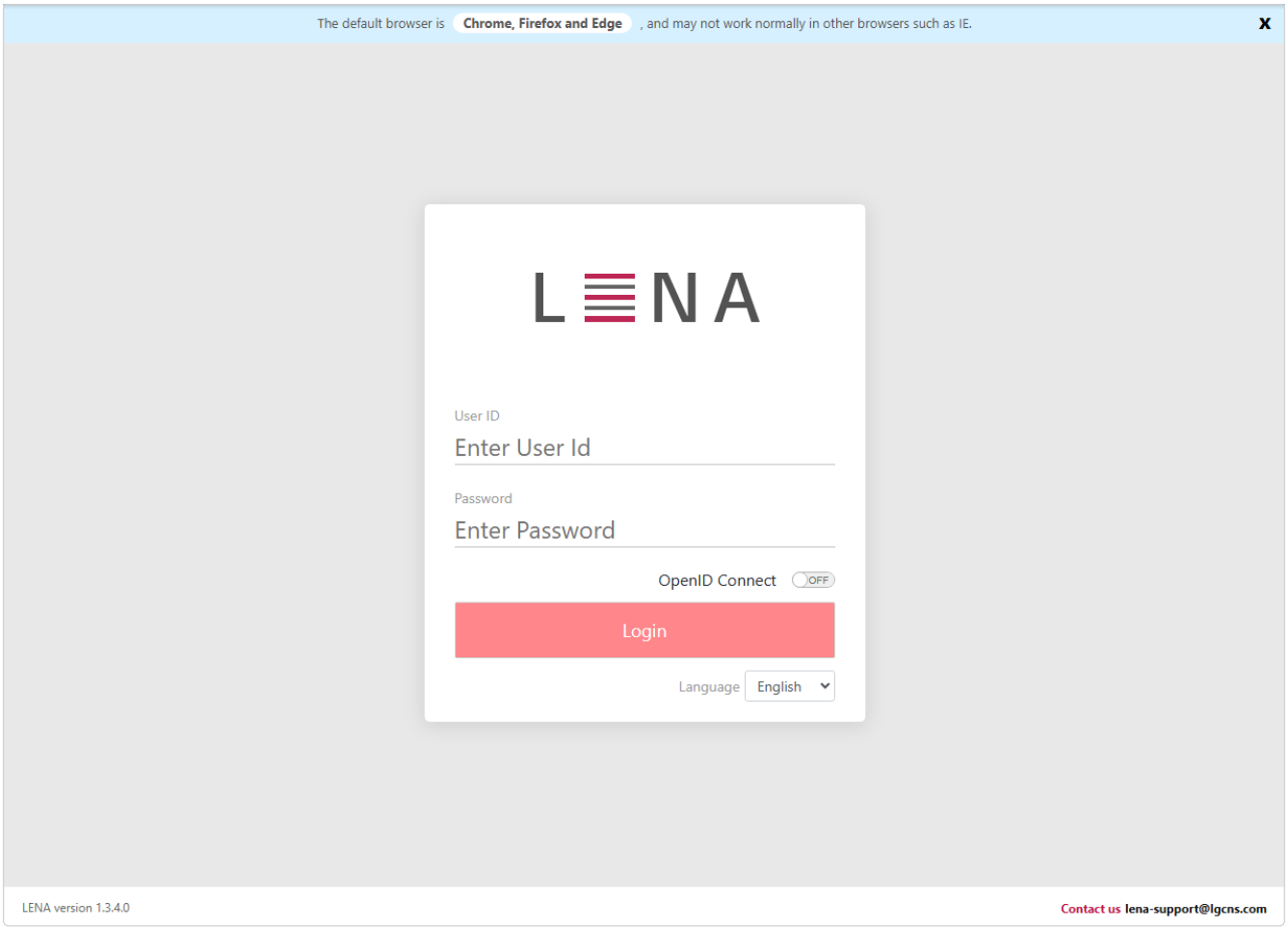


Figure 2. Manager Access Screen

You can log in by entering your user ID and password.

When attempting to log in, if there are 7 or more password errors, you cannot log in with that user. In such cases, the password must be reset through the console. (For detailed information, refer to the 'Manager admin password reset' section in the Appendix.)

2.1.1. OpenID Connect

When OpenID Connect is enabled in the Manager Environment of the Admin menu, the OpenID Connect toggle is activated on the login screen. Through the OpenID Connect toggle, you can log in via authentication providers such as Keycloak.

2.1.2. Language Settings

You can set the language to use in Manager from the Language option. (English, Korean, Chinese)

The installed version is displayed on the bottom left of the login page, and technical support contact information is displayed on the right.

2.2. Log Out

You can log out using the **door icon** on the top right of the Manager.

2.3. Theme Change

You can set the theme through the Dark Theme menu in the **gear icon** menu on the top right of the Manager. You can choose between light mode and dark mode.

Chapter 3. Dashboard

Provides a summary of system configuration information, resource monitoring, events, licenses, and other information managed by the Manager.

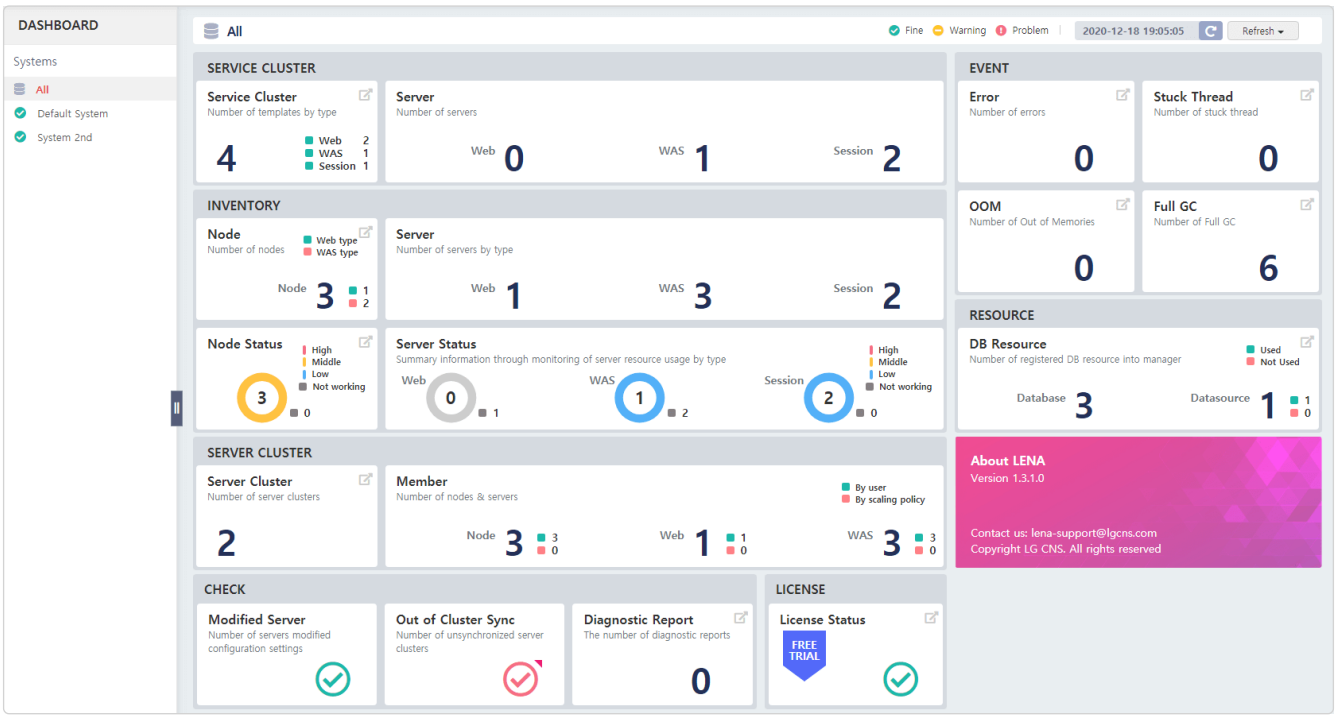


Figure 3. Dashboard

The system list on the left side of the screen provides a list of systems that the logged-in user has permissions for. All shows integrated information from all systems the user has permissions for.

Table 3. Dashboard Items

Item		Description	Notes
SERVICE CLUSTER	Service Cluster	Number of templates by type	
	Server	Total number of servers by type belonging to Service Cluster	

Item		Description	Notes
INVENTORY	Node	Number of Nodes included in the System	Legend: Count by Node type • Web type : Number of nodes where Web Server can be installed • WAS type : Number of nodes where WAS, Session Server can be installed
	Server	Count by Server type included in the System	
	Node Status	Resource usage (CPU, Memory, DISK) status of Nodes included in the System	Legend • High / Middle / Low • Not working : Number of stopped Nodes (Agent)
	Server Status	Resource usage status of Servers included in the System • Web Server : CPU, Memory, Thread check • WAS : Heap Memory, Thread Pool check • Session : Heap Memory check	Legend • High / Middle / Low • Not working : Number of stopped or hung servers
SERVER CLUSTER	Server Cluster	Number of server clusters	
	Member	Total number of servers by type belonging to server clusters	

Item		Description	Notes
CHECK	Modified Server	Whether servers requiring restart exist among Servers included in the System	
	Out of Cluster Sync	Whether Server Clusters requiring sync exist	
	Diagnostic Report	Number of reports issued after diagnostic process execution	EVENT
Exception	Number of Exceptions occurred in Servers included in the System		
Stuck Thread	Number of Stuck Threads occurred in Servers included in the System		
OOM	Number of Out Of Memory occurrences in Servers included in the System		
Full GC	Number of Full GC occurrences in Servers included in the System		RESOURCE
DB Resource	Number of Databases and Datasources registered and managed in the RESOURCE menu	Datasource legend • Used : Number of Datasources currently in use by WAS • Not Used : Number of Datasources not currently in use by WAS	LICENSE

Chapter 4. Server

Provides a screen for managing Node, WAS, Web Server, and Session Server.

You can check the number of Nodes and each Server within a specific System, and manage Node and Server status comprehensively in real-time.

4.1. System

System is a logical group that contains multiple Servers. "DefaultSystem" is provided by default, and users can create, modify, and delete Systems.

4.1.1. List

System list is provided in tree format on the left side of the screen.

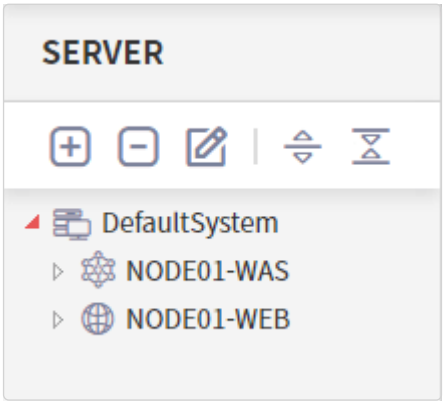


Figure 4. System List

4.1.2. Registration

1. Click the **Register(+) button** to create "Create System" in the list.
2. Enter the name of the system to create and press Enter.
3. Click the **OK button** to save.

The permissions of the currently logged-in user are mapped to that System. That is, only users with the same permissions as the logged-in user can view that System. (Same applies to Node, Server, Resource)

4.1.3. Modification

1. Select the System to modify.
2. Click the **Edit(pencil) button** to change the name of the selected System, then press Enter.
3. Click the **OK button** to save.

4.1.4. Deletion

1. Select the System to delete.
2. Click the **Delete(-) button**.

3. Click the **OK button** to save.

Systems with Nodes underneath cannot be deleted. That is, only empty Systems can be deleted.

4.2. Node

Node is a physical Server that contains multiple WAS, Web Server, and Session Server instances.

4.2.1. List

You can manage each Node through the Node List.

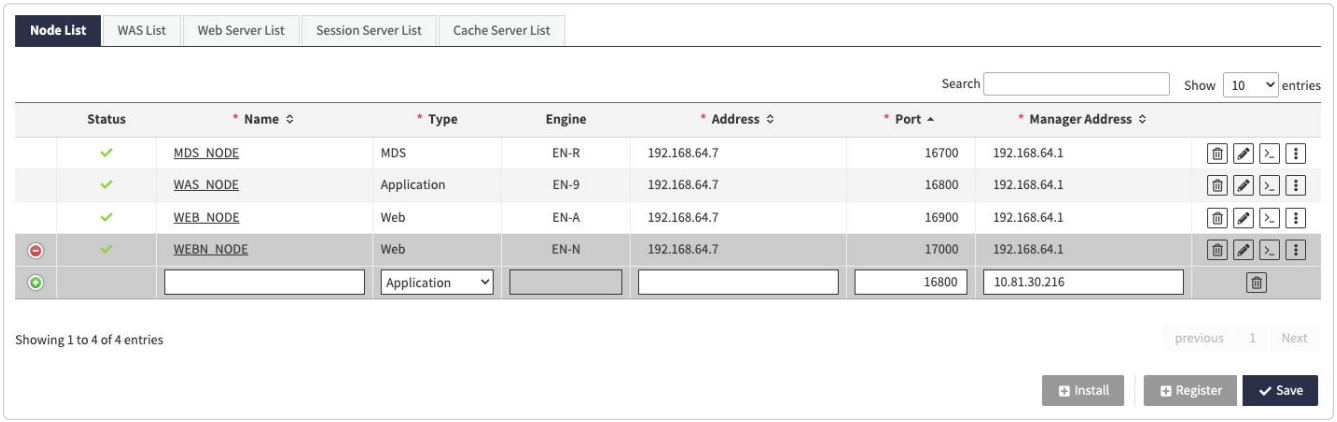


Figure 5. Node List

The properties of Node are as follows.

Table 4. Node Properties

Item (* indicates required value)	Description	Notes
Node information change status	New/Modified/Deleted status of Node data	**+ icon** - Display change status when **Register** / **Edit(pencil)** button is clicked **- icon** - Display deletion pending when **Delete(trash can)** is clicked
Status	Current status of Node	• Started(v) • Stop(□)
Name(*)	Node name	

Item (* indicates required value)	Description	Notes
Type(*)	Node Type	All - Can install all types of Servers Application - Can install WAS and Session Server Web - Can install Web Server MDS - Can install Cache Server
Engine	Engine type according to Node Type	Application - EN-7: Java EE 6 / Servlet 3.0 support - EN-8: Java EE 7 / Servlet 3.1 support - EN-9: Java EE 8 / Servlet 4.0 support - EN-10: Servlet 6.0 support Web - EN-A: JK, Proxy support - EN-N: Proxy, Net-Gateway support MDS - EN-R: Memory Cache support
Address(*)	Node IP address	
Port(*)	Node Agent port number	Default - 16800 (when Node Type is All or Application) - 16900 (when Node Type is Web) - 16700 (when Node Type is MDS)
Manager Address(*)	Manager IP address	
Button area	Displays Node information change and related function buttons	**Trash can icon** - Delete Node information **Pen icon** - Modify Node information **Terminal icon** - Provides SSH terminal functionality to the server where Node is installed **More icon** - Provides menu for JAVA Home setting and Start/Stop

4.2.2. Install

1. Click the **Install button** to prepare Node information registration.
2. Enter Node property values.
3. Click the **Save button** to save.

Table 5. Properties set during Install

Item (* indicates required value)	Description	Notes
Node Type	Node Type	Provides the following types: • Application: Can install WAS and Session Server • Web: Can install Web Server
Node Name(*)	Node name	
Node Address(*)	Node IP address	
Node Port(*)	Node Agent port number	Default : 16800 (when Node Type is All or Application), 16900 (when Node Type is Web)
User(*)	Node execution user account	For Node Type Application, cannot run with root account. For Node Type Web, use root only when Web Server Port must be 1024 or below.
Password(*)	Node execution user account password	
SSH Port	SSH port to access the corresponding Server	
LENA Home	Location where Node Agent will be installed	
JAVA Installation	Whether Java is installed	
JAVA Home	Installed Java path	

Install functionality is only supported in Linux environment.

4.2.3. Register

1. Click the **Register button** to change Node information to registrable state.
2. Enter Node's Name, Type, Address, Port, and Manager Address (default value is provided).

3. Click the **Save button** to save.

- Manager IP is automatically entered as Node's host IP.
- Depending on network configuration, automatically entered IP may differ from actual network IP.
- In this case, you must modify and enter the Manager IP.

4.2.4. Modification

1. Click the **Edit(pencil) button** to change Node information to modifiable state.
2. Modify Node properties.
3. Click the **Save button** to save.

- When Node's Address or Port needs to be changed due to port policy or firewall policy changes, modify agent.conf settings and restart Node Agent.
- At this time, modify and enter Node's Address and Port information so that Manager can also know the changed information.

When saving modified information, if 'Occured Read Timeout' message occurs, check the following cases:

- Port is being used by something other than Node Agent
- Node Agent is hung
- Network problem exists

4.2.5. Deletion

1. Click the **Trash can button** to change Node information to deletable state.
2. Click the **Save button**.

If Servers are registered under a Node, that Node cannot be deleted.

Uninstall is only supported in Linux environment, and is possible only when selecting one node to delete.

4.2.6. Start

Can start nodes that are in stopped state.

1. Select the Start menu provided when selecting the **... button** in the rightmost column of the Node list, then a popup window appears.
2. Enter User, Password, and SSH Port number, then press the **Start button**.

4.2.7. Stop

Can stop nodes that are in running state.

1. Select the Stop menu provided when selecting the **... button** in the rightmost column of the

Node list, then a popup window appears.

2. Enter User, Password, and SSH Port number, then press the **Stop button**.

4.2.8. Change Java Home

Can modify JAVA Home path for Node and Servers installed on Node.

1. Modify JAVA Home Path.
   - Node Java Home Path : Edit Node Java Home Path.
   - Server Java Home Path : Edit JAVA Home path for selected servers. (Not supported in Web Node)
2. Press the **Save button**.

4.2.9. Node Terminal

Can access VM where target Node is installed through LENA Manager and use SSH terminal functionality.

To use this functionality, you must meet the following requirements:

- Node must be running and able to communicate with LENA Manager.
- OS where Node is installed must be Linux-based (Windows-based not supported).
- OS account for Node installation/execution must allow SSH access through password authentication.

This functionality reuses the connection between LENA Manager and Node, so no separate port work is necessary to use this terminal functionality.

Clicking the **terminal icon** in the Node list will show a popup screen for using the functionality, and entering the password of the OS account running Node Agent will execute the SSH terminal.

For detailed settings of Node Terminal functionality, refer to the following Manager Configuration settings.

Table 6. Manager Configuration(manager.conf) Node Terminal functionality setting options

Option key	Default value	Description
ssh.cmdCheck.mode.isWhiteList	true	- When true, controls commands using whitelist method. - When false, controls commands using blacklist method.
ssh.cmdCheck.idleTimeout	600 (second)	Disconnects connection after this time if no action is taken after terminal connection. (Minimum configurable value: 30)
ssh.cmdCheck.whitelist.view	view	Set 'view' or 'vi' commands to allow when using whitelist method, separated by ','
ssh.cmdCheck.whitelist	cd,clear,echo,ll,ls,ps,tail,exit	Set commands to allow when using whitelist method. (view, vi excluded)

Option key	Default value	Description
ssh.cmdCheck.blacklist	alias,chmod,chown,cp,dd,export,rm,mkdir,mv,kill,sed,source,sudo,touch,vi	Set commands to prohibit when using blacklist method, separated by ','

Regardless of Manager Configuration settings, the following expressions cannot be used:

```
'|' cannot be used except for '| grep' case
```

```
'&&' cannot be used
```

```
'>' or '>>' cannot be used
```

```
'()'(sub shell) and $(), and ``(backtick) cannot be used
```

4.3. WAS

Provides screens for managing WAS. Performs registration, modification, and deletion of Servers installed on Nodes, and can also install, remove, and clone Servers.

4.3.1. List

WAS can be managed through the WAS List.

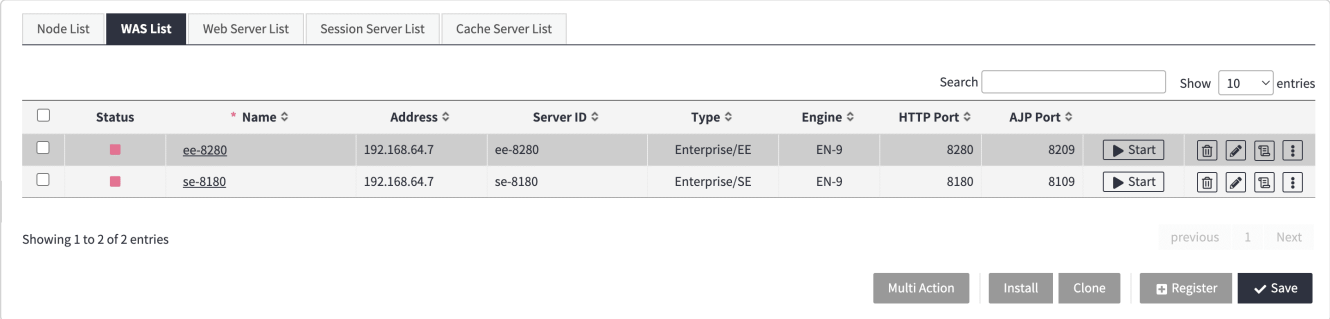


Figure 6. Web Application Server List

WAS attributes are as follows.

Table 7. WAS Attributes

Item (* indicates required values)	Description	Notes
Server information change status	WAS data new/change/delete status and CheckBox for selection	
+ icon - Displays change status when **Register** / **Edit(pencil)** button is clicked	**- icon** - Displays scheduled for deletion when **Delete(trash)** is clicked	Status
Server status	Started (v) Stop (□) Error (!)	Name(*)
Server name		Address
Server IP address		Server ID
Server ID		Type
Server type	Standard Enterprise/EE Enterprise/SE	Engine
Server engine type	Engine refers to LENA's engine type and differs by WAS Java Spec version. - EN-7: Java EE 6 / Servlet 3.0 support - EN-8: Java EE 7 / Servlet 3.1 support - EN-9: Java EE 8 / Servlet 4.0 support - EN-10: Servlet 6.0 support	HTTP Port
HTTP port number		AJP Port
AJP port number		Start/Stop button

Item (* indicates required values)	Description	Notes
Server start and stop		Button area
Displays server information change and related function buttons		**Trash icon** - Delete server information
Pen icon - Edit server information	**Log file icon** - Provides Server Log Viewer functionality	**More icon** - Provides menu for performing Start/Stop

4.3.2. Install

1. Click the **Install button** to prepare for Server installation.
2. Enter Server Type, Server ID, etc.
3. Click the **Save button** to save.

- There may be differences between Servers actually installed on Nodes and Server information managed by Manager. (when installed via console)
- If Server ID duplication error occurs, use Register function to check additional information of installed Servers.

4.3.3. Clone

1. Click the **Clone button** to prepare for Server cloning.
2. Select the Server to clone from Node List. Clone Server ID and Clone Service Port are automatically entered.
3. Modify Clone Server ID and Service Port to desired values.

   (Include External Source is available when cloning servers to other nodes and sets whether to clone application files deployed on the server to be cloned.)

4. Click the **Save button** to save.

- There may be differences between Servers actually installed on Nodes and Server information managed by Manager. (when installed via console)
- If Server ID duplication error occurs, use register function to check additional information of previously installed Servers.
- When remotely cloning WAS servers, Node's Engine No. must be the same to clone WAS servers.

4.3.4. Register

1. Click the **Register button**.
2. Select the Server to register.
3. Click the **Save button** to save.

Installation is also possible from System > Application Server List Tab. However, the Node to install must be selected from Node List.

4.3.5. Modification

1. Click the **Edit(pencil) button** to change Server information to modifiable state.
2. Modify Server attributes.
3. Click the **Save button** to save.

4.3.6. Deletion

1. Click the **Delete(trash) button** to change Server information to deletable state.
2. Click the **Save button**.
3. Press the **OK button** to display a window for selecting deletion type.
   - Deregister : Delete Server information only from Manager DB and maintain physical Server engine (can be re-registered later via **Register button**)
   - Uninstall : Delete Server information from Manager DB and also delete physical Server engine
4. When Uninstall is selected, a window asking about log directory deletion is displayed.

When deleting WAS, the corresponding Server is deleted from the target list of service control (ADMIN > Security > Rule Applying menu).

Servers bound to Server Cluster cannot be deleted.

When use Server Delete Protection value is set to true in Manager Configuration area of ADMIN > Preference > Manager Environment menu, it can prevent servers from being uninstalled from Manager.

4.3.7. Start/Stop

Single Start/Stop

1. Click the **Stop button** to stop the Server.
2. Click the **Start button** to start the Server.

- When stopping Server, WAS stops after all tasks being serviced are completed.
- If tasks are not completed even after Shutdown Timeout time in General tab, it is forcibly stopped.

When Server is started, a popup for viewing log files is executed. You can check whether Server started normally through the popup.

Start button is activated only when in startable state.

Multi Start/Stop

1. Select multiple Servers to start or stop.
2. Click the **Multi Action button** at the bottom of Server list.
3. Select Action Type in popup window and click **Action button** to perform start or stop operations for multiple Servers.

After Start / Stop commands in popup screen, the requested command is not stopped even if popup is closed.

Forced Stop/Restart

1. Click the **Additional function(...) button** at the far right of Server list.
2. Perform forced stop or forced restart.

When performing forced stop or restart, all currently serviced tasks are immediately stopped, so caution is required.

4.3.8. Configuration Information Management

Provides functionality to change Server configuration information. Select the Server name to change from Server list. For Standard Edition, General, Session, Logging, Web Configuration, Environment, Properties, Audit, Configuration Tree, History, TunA tabs are provided, and backup is performed when modifying configuration information for restoration. Enterprise Edition additionally provides Container tab.

When changing Server configuration, Server restart is required to reflect modified items

General

Manages general configuration information of Server. Port information, Connector information, and Stuck Thread related settings can be modified and saved.

Detailed contents of configuration information are as follows.

1. Server Info

Represents main configuration values of Server.

Table 8. Main Configuration

Item (* indicates required values)	Description	Notes
HTTP Port(*)	HTTP port number	
AJP Port	AJP port number	HTTP port number - 71 (auto-calculated)

Item (* indicates required values)	Description	Notes
HTTPS Port	HTTPS port number	HTTP port number + 363 (auto-calculated)
Shutdown Port	Port for receiving Shutdown command string	HTTP port number - 75 (auto-calculated)
Install Path	Server installation path	
Java Home Path	Java Home path	
Minimum Heap Size(MB)(*)	Minimum Heap size to set in WAS (Megabyte)	Default : 2048
Maximum Heap Size(MB)(*)	Maximum Heap size to set in WAS (Megabyte)	Default : 2048
AppBase	Application Base directory	Modification is possible only when Server is in stop state or when no Application is deployed in appBase.
Jvm Route	Server's Unique Identifier	Values set in System Property take priority. If not available, server.xml value is used (Generated by combination of Hostname + Port)
Auto Deploy	Whether to automatically Deploy when application changes	Default : false Detected when war file is re-uploaded to DocBase for each Application
Deploy On Startup	Whether to Deploy Application when WAS starts	Default : true
Shutdown Timeout(s)	Time to wait when tasks are running during Server shutdown (seconds)	Default : 86400

2. Connector

Represents Connector configuration values used by Server.

Table 9. Main Configuration

Item (* indicates required values)	Description	Default Value
Protocol	Protocol type	HTTP/1.1, AJP/1.3

Item (* indicates required values)	Description	Default Value
port	Port number	
Redirect Port	Redirect port	Same as HTTPS Port
Connection Timeout(ms)	Time to wait for Request URI reception after Connector allows connection (ms)	HTTP : 20000, AJP : 60000
URI Encoding	Character Encoding for converting URI bytes	UTF-8
Server	Redefines Server Header for Http Response to prevent Server information exposure	Server
Max Threads	Maximum number of Threads that Connector can create	256
Min Spare Threads	Minimum number of Threads secured when creating Connector	10
Max Queue Size	Maximum length of Request Queue	Integer.MAX_VALUE
Packet Size	AJP packet size	8192
Enable Lookups	Whether to use DNS LookUp. Not using is advantageous for performance	false
Compression	Whether to compress HTTP message Body (off, on:Text only, force:all)	off
Tcp No Delay	Send TCP packets without delay	true

3. Stuck Thread

Represents Stuck Thread configuration values.

Table 10. Main Configuration

Item (* indicates required values)	Description	Notes
Threshold(s)	Minimum time for identifying Stuck Thread (s)	
Interrupt Thread Threshold	Minimum time for interrupting Stuck Thread (s)	To terminate n seconds after Stuck Thread identification, enter "Threshold+n" value

4. Service Endpoint

Represents Endpoint Address configuration values.

Table 11. Main Configuration

Item (* indicates required values)	Description	Notes
Service Endpoint Address	Representative service domain address of WAS	

Session

Sets whether to use Session Cluster functionality.

1. Embedded Session Server mode

   Select when Session Server module is embedded in WAS and operates. When Embedded Mode is selected in Session Server Mode item, it is displayed as Embedded Type in Session Server list in Server management screen.

Table 12. Main Configuration

Item (* indicates required values)	Description	Default Value
Embedded Host	Refers to the WAS	Own IP (cannot be changed)
Embedded Port(*)	Port information for Embedded Session Server to be used in the WAS	
Secondary Server Host(*)	Slave Server host IP	
Secondary Server Port(*)	Slave Server Port	
Multi Login Control	Whether to prevent dual login	false (when true, 3 items below are provided)
Logout Page when Multi Login check(Multi Login)	Screen to provide after terminating session of user who logged in first during dual login	
Logout Message when Multi Login check(Multi Login)	Message to show after terminating session of user who logged in first during dual login	
Excepted Page When Multi Login Check(Multi Login)	Exception URL for dual login check	

2. Standalone mode

   Method of operating by connecting to separate Session Server. Select Standalone in Mode item.

   When setting Primary Server and Secondary Server in Standalone mode, Session Server must be configured in advance.

Table 13. Main Configuration

Item (* indicates required values)	Description	Default Value
Primary Server Host(*)	Primary Session Server host	Enter manually selection allows setting external session server outside system
Primary Server Port(*)	Primary Session Server port	
Secondary Server Host(*)	Secondary Session Server host Used only when connection with PrimaryServer is lost	Enter manually selection allows setting external session server outside system
Secondary Server Port(*)	Secondary Session Server port Used only when connection with PrimaryServer is lost	
External Stored Session	Store Session objects in Session Server instead of local WAS	false
Share session in applications	Share Session objects between Multi Applications Configurable only in Standalone Mode	false
Multi Login Control	Whether to prevent dual login	false (when true, 3 items below are provided)
Logout Page when Multi Login check(Multi Login)	Screen to provide after terminating session of user who logged in first during dual login	
Logout Message when Multi Login check(Multi Login)	Message to show after terminating session of user who logged in first during dual login	
Excepted Page When Multi Login Check(Multi Login)	Exception URL for dual login check	

Session functionality is provided in Enterprise Edition.

Logging

Manages Server's Logging configuration information.

1. Log Home

Table 14. Main Configuration

Item (* indicates required values)	Description	Notes
Log Home(*)	Log Home path	When default is selected, set to logs folder under server installation directory, when Enter manually is selected Log Home Prefix item allows input of log directory home path
Retention Days(*)	Maximum retention days for logs	Default : 0(unlimited)

2. Access Log

Represents configuration values for Access logs for Requests.

Table 15. Main Configuration

Item (* indicates required values)	Description	Notes
Logging Directory	Log directory	Can be specified as absolute path or relative path of
Pattern	Layout of Logging field	
Prefix	Prefix of Log file	
Suffix	Suffix of Log file	

3. Handler List

Detailed contents of Handler configuration information are as follows.

Table 16. Main Configuration

Item (* indicates required values)	Description	Notes
Name(*)	Handler class name	
Type	Handler type	ConsoleHandler and FileHandler can be selected
Level	Handler log level	
Filter	Implementation of java.util.logging.Filter	
Formatter	Implementation of java.util.logging.Formatter	Default : java.util.logging.SimpleFormatter
Encoding	Handler Character Encoding	

Item (* indicates required values)	Description	Notes
Root Handler	Whether Root Logger	

4. Logger List

Detailed contents of Logger configuration information are as follows.

Table 17. Main Configuration

Item (* indicates required values)	Description	Notes
Name(*)	Specify Logger name	
Level(*)	Logger log level	
Handler(*)	Select which Handler Logger will use	ConsoleHandler is selected by default

Server's log configuration file is ()/conf/logging.properties.

Web Configuration

Provides screen for managing Global web.xml configuration. Modify necessary items and click **Save button** at the bottom to save.

Detailed contents of configuration information are as follows.

1. Default Servlet

Table 18. Main Configuration

Item (* indicates required values)	Description	Default Value
Directory Listing	Whether to allow Directory Listing when Welcome file is not present	false
Readonly	Do not allow HTTP methods such as PUT, DELETE	true
Input Buffer Size	Input buffer size (bytes)	2048
Output Buffer Size	Output buffer size (bytes)	2048
File Encoding	File encoding	platform default
Show Server Info	Whether to display Server information when Directory Listing is allowed	true
Load On Startup(*)	Specify Servlet loading order when WAS starts	1 (negative: disable / 0: last)

2. JSP Engine

Table 19. Main Configuration

Item (* indicates required values)	Description	Default Value
Check Interval(s)	When Development is false, cycle for checking jsp changes and recompilation (s)	0 (0: disabled / positive: enabled with that cycle)
Development	Whether Development. When Development is true, changes are checked with modificationTestInterval value as cycle	true
Generate String As Character Array	Whether to generate String as Char Array	false
Modification Test Interval(s)	Cycle for jsp change check when Development is true	4 (when 0: check every access)
Trim Spaces	Remove unnecessary whitespace from response to reduce response bytes	false
Java Encoding	Encoding when generating Java source	UTF8
Load On Startup(*)	Specify Servlet loading order when WAS starts	3

3. JSP Page Encoding

Table 20. Main Configuration

Item (* indicates required values)	Description	Notes
URL Pattern	URL Pattern of JSP Page to apply Page Encoding	
JSP Page Encoding	Specify Page Encoding to apply	

4. Session

Table 21. Main Configuration

Item (* indicates required values)	Description	Notes
Session Timeout(m)	Session timeout time (minutes)	Default : 30

5. Welcome File List

Table 22. Main Configuration

Item (* indicates required values)	Description	Notes
File(*)	Specify files to service in order when Directory index is called	

Environment

Provides screen for managing JVM options, Start Shell configuration, and System Properties (provided only in Enterprise Edition). Modify through file editor and click **Save button** to save.

- JVM Env (/bin/setenv.sh): JVM options for Server execution

- Custom Env (/bin/customenv.sh): User custom environment variable configuration
- Base Env (/env.sh): Shell Script for Server startup

Do not modify JVM_ROUTE value directly here, but use **Load button** in JvmRoute item in Server Info area of General tab to modify. If modified directly here, Manager DB information is not updated, causing DB value mismatch.

- System.properties(/conf/system.properties) (This item can only be checked in Enterprise Edition)
- Catalina.properties (/conf/catalina.properties): Server's Catalina configuration

```
is WAS's default installation directory.
is originally used when creating directories to use multiple
Instances for one WAS and specifying directories for each
Instance, but in LENA, WAS and Instance have 1:1 relationship, so
is used as .
```

By default, configuration cannot be modified as it is Disabled, but if you want to modify, click **Configuration button** in ADMIN > Manager Environment > Manager Configuration item and change the following configuration to false.

```
server.environment.envshell.readonly=false
```

Properties

Provides screen for checking Server's System Properties and System Environments. Key Properties among System Properties are provided separately to check main information such as Server path, JAVA version, etc. Information can only be checked when Server is running.

Container

For Enterprise Edition, provides functionality to change EJB Container configuration. If Server is started without container configuration, EJB required container is created with default configuration. If configuration changes other than default are needed, container must be created to change configuration.

1. Basic Configuration

Table 23. Basic Configuration

Item (* indicates required values)	Description	Notes
ID(*)	Container identifier	
Type(*)	Container type	

2. CMP_ENTITY Configuration

Table 24. CMP_ENTITY Configuration

Item (* indicates required values)	Description	Notes
CmpEngineFactory	Factory class name	Default : org.apache.openejb.core.cmp.jpa.JpaCmpEngineFactory

3. BMP_ENTITY Configuration

Table 25. BMP_ENTITY Configuration

Item (* indicates required values)	Description	Notes
PoolSize	Specify Bean pool size	Default : 10

4. STATELESS Configuration

Table 26. STATELESS Configuration

Item (* indicates required values)	Description	Notes
AccessTimeOut	Wait time between invocations (Specifies the time to wait between invocations)	Default : 0 (means no timeout)
MaxSize	Maximum number of Bean pool	Default : 10
MinSize	Minimum number of Bean pool	Default : 0
StrictPooling	Specify operation method when Pool reaches maximum. StrictPooling waits without increasing pool size	Default : true
MaxAge	Maximum time until removal from Pool (h)	Default : -1
ReplaceAged	Whether to Replace when MaxAge is reached	Default : true
ReplaceFlushed	Whether to Replace when flushed from pool	Default : false
MaxAgeOffset	MaxAge usage	Default : -1
IdleTimeout	Maximum time instance can be in idle state in pool (m)	Default : 0
GarbageCollection	Whether to allow garbage collection as mechanism to reduce pool	Default : false
SweepInterval	Cycle for container to clean pool and remove expired instances (m)	Default : 5
CallbackThreads	Thread Pool size. This value is shared by all Beans deployed in container	Default : 5
CloseTimeout	Maximum time to wait until pool closes and PostConstruct method is called (m)	Default : 5

5. SINGLETON Configuration

Table 27. SINGLETON Configuration

Item (* indicates required values)	Description	Notes
AccessTimeout	Wait time between invocations (Specifies the time to wait between invocations)	Default : 0 (means no timeout)

6. STATEFUL Configuration

Table 28. STATEFUL Configuration

Item (* indicates required values)	Description	Notes
AccessTimeout	Wait time between invocations (Specifies the time to wait between invocations)	Default : 0 (means no timeout)
Cache	Cache to manage Stateful bean instances	
Default : org.apache.openejb.core.stateful.SimpleCache	Passivator	Specify Passivator class
Default : org.apache.openejb.core.stateful.SimplePassivater	TimeOut(m)	Wait time between invocations (Specifies the time to wait between invocations)
Default : 20	Frequency	Cycle for bean cache to check idle beans (s)
Default : 60	Capacity	Bean pool size for Stateful SessionBean container
Default : 1000	BulkPassivate	Number of instances to passivate at once

7. MESSAGE Configuration

Table 29. MESSAGE Configuration

Item (* indicates required values)	Description	Notes
ResourceAdapter	Specify Resource Adapter	Default : Default JMS Resource Adapter
MessageListenerInterface	Specify MessageListener	Default : Javax.jms.MessageListener

Item (* indicates required values)	Description	Notes
ActivationSpecClass	Specify Activation Spec Class	Default : org.apache.activemq.ra.ActiveMQActivationSpec
InstanceLimit	Maximum number of Instances	Default : 10

Audit

Function for collecting/managing events occurring in WAS.

Collected event information can be checked in event dashboard. For event dashboard related content, refer to Event Dashboard.

Four types of Detection Rules can be set to collect events.

Table 30. OOM Detection Rule

Item	Description	Notes
Enable	Detects Out Of Memory Error occurrence	Default : true

Table 31. Stuck Thread Detection Rule

Item	Description	Notes
Enable	Detects Stuck Thread occurrence	Default : false

LenaStuckThreadDetectionValve is basically configured in server.xml, and LenaStuckThreadDetectionValve related configuration can be done in Stuck Thread item of SERVER > Server selection > General tab screen.

When user request processing time exceeds Threshold configuration value, event occurs and is sent to Manager.

Table 32. Full GC Detection Rule

Item	Description	Notes
Enable	Detects Full GC occurrence	Default : false

Table 33. Exception Detection Rule

Item	Description	Notes
Enable	Detects Exception occurrence by pattern	Default : false
Exception Class Pattern	Specify Exception pattern to detect. Exceptions inheriting the pattern are also detected. Maximum 10 can be specified, * pattern cannot be used. ex) abc.dbc.ExampleException	
Exclude Exception Class Pattern	Specify Exception pattern to exclude from detection. Maximum 10 can be specified, * pattern cannot be used. ex) abc.dbc.ExampleException	

Item	Description	Notes
Enable Full Stack	When Exception has multiple Causes, whether to display entire content instead of summary information	Default : true
Max Line of Stack's Cause	Number of Lines to express in Exception Stack Trace. Lines are collected for each Cause by the set number. Setting too large a number can cause load in collection and storage management	Default : 3

Exception classes that can be detected are not Exceptions included in Java's own library, but Exceptions of Application or Framework. Exception patterns must be defined to prevent too many events from occurring.

Audit functionality is provided in Enterprise Edition.

Configuration Tree

Configuration files under /conf folder under WAS installation path can be managed through file editor.

User running Node Agent must have access permission to WAS configuration information files for modification. If access permission is not available, message that file cannot be edited due to no Write permission is displayed.

History

Provides backup and restore functionality for configuration information. When configuration information is modified and saved, History is managed by type. Search by entering modification date and configuration file Type.

Click **View(magnifying glass) button** to view information of selected file, and click **Restore button** to restore to that configuration file.

4.3.9. Resource Management

When Resources menu under Server menu is selected, screen for managing Resource information related to that Server is displayed. By default, information for DataSource, JMS, JTA Resources can be managed. (JMS, JTA Resources are supported only for Enterprise Server)

Methods for setting Resources in WAS are as follows.

- Add : Click **New button** to add Resource. (Datasource, JMS possible)
- Delete : Click **Delete button** to delete Resource. (Datasource, JMS possible)
- Import : Click **Import button** to import Resources registered in RESOURCE menu. (Datasource, JMS, JTA possible)

DataSource

Provides functionality to manage JNDI DataSource that can be used by WAS Applications. JNDI can be set so all Applications running on Server can share and use, or JNDI can be set for each Application for use. For Enterprise Edition, JTA is supported so additional attributes are added.

1. Server DataSource Configuration

Set DataSource shared by all Applications running on Server. List of DataSources available on Server can be queried, and DataSource registration, modification, deletion is possible.

Connection test can also be performed to check DataSource status.

DataSource attributes are as follows. Attributes not visible on initial screen are displayed when **Expand all button** is clicked.

Table 34. DataSource Attributes

Item (* indicates required values)	Description	Notes
Scope	Scope for using DataSource	Provides following scopes • Context: Datasource information is set in common context area so all Applications can share. • Global: Datasource information is set in GlobalNamingResource area, and each application individually sets and uses in DataSource Link List. • Global+ResourceLink: Datasource information is set in GlobalNamingResource area and Datasource link is set in common context area.
JNDI Name(*)	JNDI name of Global DataSource	
Databases(*)	Set information of datasource to be used commonly	
Resource Name(*)	Name of Databases	
Address(Host/Port)(*)	IP and port to be used commonly	
Driver Class Name(*)	JDBC Driver class name	
URL(*)	JDBC URL	
User Name(*)	Connection username	

Item (* indicates required values)	Description	Notes
Password(*)	Connection password	when encryption is checked, password is encrypted and stored. Encryption is recommended for security.
Encryption Level	Specify encryption scope for authentication information	Default : Password only
DefaultAutoCommit	Auto Commit status of Connections created from Pool	Default : JDBC driver default value
Auto Reconnection	Used when setting TestOnBorrow and TestWhileIdle values. When true/false, both values are set the same. When User Defined is selected, both values can be set directly by user	
InitialSize	Initial number of Pool Connections	Default : 10
MaxActive	Maximum number of Pool Connections	Default : 100
MinIdle	Minimum number of Idle Connections	Default : 10
MaxIdle	Maximum number of Idle Connections	Default : 100
MaxWait(ms)	Maximum time to wait when no available Connection in Pool (ms)	Default : 30000
MinEvictableIdleTimeMillis(ms)	Connections existing in Pool in idle state for longer than this time become removal targets (ms)	Default : 60000 (60s) (1800000 (30m) when XaDataSource = true)
ValidationQuery	Connection validity verification query	Default : null
ValidationInterval	Connection validity verification cycle (ms)	Default : 3000
TestOnBorrow	Before taking connection from Pool, perform query set in validationQuery to check connection validity	Default : default
TestOnReturn	Before returning connection to Pool, perform query set in validationQuery to check connection validity	Default : default
TestWhileIdle	For idle connections, perform query set in validationQuery to check connection validity	Default : default
LogValidationErrors	Whether to output errors when errors occur after validation query execution	Default : default(false)

Item (* indicates required values)	Description	Notes
TimeBetweenEvictionRunsMillis(ms)	Thread execution cycle for extracting unused Connections (ms)	Default : 5000
RemoveAbandoned	Whether to detect Connection loss	Default : default
RemoveAbandonedTimeout(s)	Timeout value for determining lost Connection (s)	Default : 60
LogAbandoned	Whether to log when processing Connection loss	Default : default
AbandonWhenPercentageFull	Abandon is performed only when Connection pool exceeds set occupancy rate	Default : 100
JdbcInterceptors	User-defined functionality can be added using flexible and pluggable interceptors	When setting QueryTimeout, enter QueryTimeoutInterceptor(queryTimeout=time(seconds))

When Default value is default instead of true or false, JDBC Driver's default value is used.

Additional attributes for Enterprise Edition are as follows.

Table 35. Enterprise Edition Additional Attributes

Item (* indicates required values)	Description	Notes
JtaManaged	Whether to use JTA	Default : false
XaDataSource	Whether to use XA	Default : false

- XADataSource configuration can only be used when JTA is configured, and when XADataSource is configured, validationInterval, logValidationErrors, abandonWhenPercentageFull attributes cannot be used.
- When DataSource is set to Context scope, all Applications share it.
- In EnterpriseServer, DataSource can also be set to Context scope, but Lookup is not possible in EJB. Setting to Global + ResourceLink scope is recommended for EnterpriseServer.
- Password encryption algorithm uses AES. Key value for encryption is managed as "datasource.key=keyvalue" in Manager LENA Home sub /repository/conf/manager.conf file and each WAS Home sub /conf/advertiser.conf.

2. Databases

When setting URL, register by creating Databases with information to be used commonly.

Click **Add(+) button** to create popup window.

a. Enter Resource Name to distinguish Databases.

b. Check automatically filled DriverClassName. Change if necessary.

c. Enter Address (IP and port) and save.

3. JDBC driver Upload

JDBC Driver library can be uploaded through Manager.

Click **Upload button** under DataSource detailed information to display upload screen as follows.

a. Select file to upload through Search button. File to upload is JDBC Driver library, so only JAR format files can be selected.
b. Click Upload button to upload selected file to target directory.
c. Path where JDBC Driver file is uploaded is ${SERVER_HOME}/lib/datasource.

4. Connection Test

Click **Connection Test button** in DataSource detailed screen to perform connection test for configured DataSource. When connection is successful, "JDBC Connection is successfully tested" message is displayed.

If "Driver Class[class name] does not exist." error message is displayed, check if corresponding driver class is properly uploaded and classpath is configured.

classpath is added in WAS details > Environment > JVM Settings.

Configuration Example

```
CLASSPATH="$\{CLASSPATH}:$\{CATALINA_HOME}/lib/datasource/ojdbc6.
jar"
```

JMS

For Enterprise Edition, JMS related Resources can be defined. Active MQ Resource Adapter, JMS Connection Factory, Queue, Topic configurations can be added, modified, deleted respectively.

Table 36. Main Configuration

Item (* indicates required values)	Description	Notes
ID(*)	Resource identifier	
Type(*)	Resource type	Provides following types • ActiveMQResource Adapter • JMSConnectionFactory • Queue • Topic

2. Active MQ Resource Adapter Configuration

Table 37. Main Configuration

Item (* indicates required values)	Description	Notes
BrokerXmlConfig	Broker configuration	Default : broker:(tcp://localhost:61616)?useJmx=false
ServerUrl	Broker address	Default : vm://localhost?waitForStart=20000&async=true
DataSource	Datasource for persistence messages	
StartupTimeout	Maximum startup wait time (s)	Default : 10

3. JMS Connection Factory Configuration

Table 38. Main Configuration

Item (* indicates required values)	Description	Notes
ResourceAdapter	Specify Resource Adapter to use	
TransactionSupport	Specify Global Transaction	Provides following types • XA • LOCAL • NONE
PoolMaxSize	Maximum number of physical connections to ActiveMQ broker	Default : 10
PoolMinSize	Minimum number of physical connections to ActiveMQ broker	Default : 0
ConnectionMaxWaitTime	Maximum connection wait time	Default : 5 Seconds
ConnectionMaxIdleTime	Maximum idle time before return	Default : 15 Minutes

4. Queue Configuration

Table 39. Main Configuration

Item (* indicates required values)	Description	Notes
Destination	Specify Queue name	

5. Topic Configuration

Table 40. Main Configuration

Item (* indicates required values)	Description	Notes
Destination	Specify Topic name	

JMS functionality is provided in Enterprise Edition and is available when Enterprise version WAS is installed.

JTA

For Enterprise Edition, provides functionality to change Transaction Manager configuration.

To use Transaction Manager configuration with default settings, select Auto for Managed Type. (default during installation)

To change Transaction Manager configuration, select User Defined. (When User Defined is selected, Recovery option is defaulted to "No")

1. Main Configuration

Table 41. Main Configuration

Item (* indicates required values)	Description	Notes
Managed Type	Select whether User Defined Transaction Manager	Default : Auto
ID(*)	Transaction Manager name	
Default TimeOut(min)	Specify Timeout	Default : 10 minutes
Type	JTA Type	
Recovery	Set whether to recover when Transaction error occurs	Logging configuration opens when Yes is selected

2. Transaction Recovery Logging(howl) Option

Table 42. Logging configuration for recovery when Transaction error occurs

Item (* indicates required values)	Description	Notes
Directory	Directory location to create log files	Default : txlog
File Name	Log file name	Default : howl
File Extension	Log file extension	Default : log
Max Log Files	Maximum number of log files to create	Default : 2
Max Block Per File	Maximum number of blocks per file	Default : -1
Buffer Size	Buffer size (kb)	Default : 32
Max Buffers	Maximum buffer value	Default : 0
Min Buffers	Minimum buffer value	Default : 4

Item (* indicates required values)	Description	Notes
Adler32 Checksum	When both Adler32 Checksum and Checksum Enabled settings are "Yes", calculate checksum using Adler32 algorithm	Default : Yes
Checksum Enabled	Check Buffer Contents before recording to Disk	Default : Yes
Threads Waiting	Maximum number of waiting threads	Default : -1
Flush SleepTime	Total sleep time of ForceManager	Default : 50 Milliseconds

JTA functionality is provided in Enterprise Edition and is available when Enterprise version WAS is installed.

4.3.10. Application Deployment

List

Select SERVER menu at top of screen to query Server status. Select Application of Server to deploy from left menu. Provides screen for querying list of deployed Applications.

Application list items are as follows.

Table 43. Application List Items

Item	Description	Notes
Type	Form of Application to deploy	Only Enterprise WAS Type provides following types • EJB • EAR • WAR
Base Name	Base name	
Context Path	Context path	
DocBase	Application location	
Status	Application status	Provides following statuses • Started(v) • Stop(□) • Error(!)

Item	Description	Notes
	Action button	Provides following functionalities • **Undeploy(trash) button** • **Application Start button** • **Application Stop button** • **Application Reload button**
	View button	Provides following functionalities • **web.xml View(document) button**

Deploy

Attributes for deploying Application are as follows.

Table 44. Application Deployment Attributes

Item (* indicates required values)	Description	Notes
Application Type	Form of Application to deploy	Only Enterprise WAS Type provides following types • EJB • EAR • WAR
Context Path(*)	Context path	
unpackWAR	Whether to execute after expanding WAR file. When value is false, deploy without expanding WAR file compression	Default : true
DocBase(*)	Application location	File can be uploaded through **Upload select(file) button**

Application Upload

When there is no separate deployment system, applications can be uploaded through Manager.

1. After selecting server, select Applications to move to Application screen.
2. In Application Deploy area at bottom of Applications screen, click **Upload select(file) button** at right end of DocBase item to display file system screen.
3. Select target directory (Server side Host) to upload.
4. Click **Upload button** to create popup for selecting application files.
5. Select application file to deploy and click **Upload button** to upload selected file to target directory.

Import

Click **Import button** to import and deploy Application information registered in [Resource] menu.

Configuration Information Management

When Application Name is selected from Application list query screen, Application configuration management screen can be queried. Provides configuration and management functionality for Application Descriptor and DataSource.

Application configuration changes are possible only for selected Server.

Application Settings

Manages information configured in Application Descriptor.

Click **Back(←) button** to return to Application list screen. Click **Expand all button** to configure additional Context attributes.

DocBase and ContextPath cannot be modified, and detailed information of attributes is as follows. Attributes not visible on initial screen can be checked by clicking **Expand all button**.

Table 45. Application Setting

Item (* indicates required values)	Description	Notes
DocBase(*)	Application's Document Base	
Context Path(*)	Context path	
unpackWAR	Whether to execute after expanding WAR file. When value is false, WAR file compression is not expanded, and web application is just redeployed in compressed state	Default : true
reloadable	Whether to re-reflect when Application changes (Class File)	
privileged	Whether to use Container Servlet	

Item (* indicates required values)	Description	Notes
cookies	Whether to use cookie for session identifier communication	
useHttpOnly	Whether to block access to session ID using scripts on client side	
session Cookie Domain	When set, overwrites all domains set in web application. When not set, domain distinguished by web application is used	
session Cookie Name	When set, all session cookies are created with that name	Default : JSESSIONID
session Cookie Path	When set, web application uses that path	
useNaming	Set to use JNDI InitialContext for J2EE platform	Default : true

Add Attribute button can be used to add attribute values.

DataSource Link List

Provides functionality to set Global DataSource to be used in Application.

DataSource link management attributes are as follows.

Table 46. DataSource Link Management Attributes

Item (* indicates required values)	Description
Name(*)	JNDI name to use in Application
JNDI Name(*)	JNDI name of Global DataSource
User Name	DataSource connection username
URL	JDBC URL
Description	Description of DataSource
+ icon	Click **New button**, **Edit(pencil) button** to display that selected DataSource information is being changed
- icon	Click **Delete(trash) button** to display that selected DataSource information is deleted

Click **New button** to add new configuration, and click **Save button** to save changed configuration.

Among Datasources configured in WAS, Datasources with Scope of Global or Global + ResourceLink appear as JNDI Name selection items when setting new configuration.

4.3.11. Server Log Viewer

Log Viewer button on right side of server list allows browsing log file contents under target server's Log Home path.

To use this functionality, the following must be satisfied.

- Node to which target server belongs must be running.

Click Log Viewer button in server list to check directories and files in tree structure based on target server's Log Home path.

When file is selected, file contents are queried, and when first selected, file contents from end of file up to predetermined size can be checked.

Use Load More, Load Previous buttons to query and check log file contents by predetermined size.

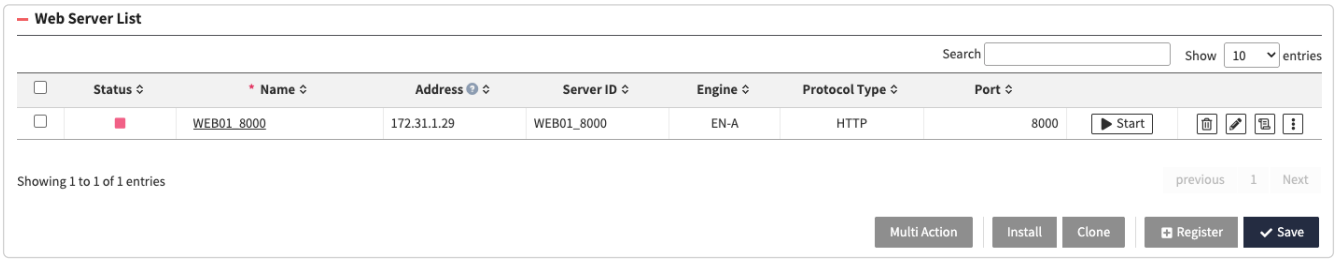
- When using Load Previous button and no more content to query (eg. beginning of file), Alert message that no more data can be read is displayed.
- When using Load More button and no more content to query (eg. end of file), message that no more data can be read is displayed at bottom of screen.

4.4. WEB

Provides screens for managing Web Servers with NODE Engine EN-A and EN-N. Registration, modification, and deletion of Web Servers installed on Nodes is possible, and start and stop operations can be performed.

4.4.1. List

Web Servers can be managed through the Web Server List.



Web Server attributes are as follows.

Table 47. Web Server Attributes

Item (* indicates required values)	Description	Notes
Status	Server status	Provides following statuses • Started(v) • Stop(□) • Error(!)

Item (* indicates required values)	Description	Notes
Name(*)	Server name	
Address	Server IP address	
Server ID	Server ID	
Engine	Node Engine type	• EN-A • EN-N
Protocol Type	Active protocol type	• HTTP • HTTPS
Port	HTTP/HTTPS port number	
Start/Stop button	Server start and stop	
Button area	Displays server information change and related function buttons	
Trash icon - Delete server information	**Pen icon** - Edit server information	**Log file icon** - Provides Server Log Viewer functionality

4.4.2. Install

1. Click the **Install button** to prepare for Server installation.
2. Enter Server ID and Service Port.
3. Click the **Save button** to save.

There may be differences between Servers actually installed on Nodes and Server information managed by Manager. (when installed via console)

If Server ID duplication error occurs, use Register function to check additional information of installed Servers.

4.4.3. Clone

1. Click the **Clone button** to prepare for Web Server cloning.

2. Select Node List to select Server to clone.
3. Enter Clone Server ID and Service Port.

   (Include External Source is available when cloning servers to other nodes and sets whether to clone files in Document Root directory of server to be cloned.)

4. Click the **Save button** to save.

There may be differences between Servers actually installed on Nodes and Server information managed by Manager. (when installed via console)

If Server ID duplication error occurs, use Register function to check additional information of installed Servers.

4.4.4. Register

1. Click the **Register button**.
2. Select the Server to register.
3. Click the **Save button** to save.

4.4.5. Modification

1. Click the **Edit(pencil) button** to change Server information to modifiable state.
2. Modify Server attributes.
3. Click the **Save button** to save.

4.4.6. Deletion

1. Click the **Delete(trash) button** to change Server information to deletable state.
2. Click the **Save button**.
3. Press the **OK button** to display a window for selecting deletion type.
   - Deregister : Delete Server information only from Manager DB and maintain physical Server engine (can be re-registered later via **Register button**)
   - Uninstall : Delete Server information from Manager DB and also delete physical Server engine
4. When Uninstall is selected, a window asking about log directory deletion is displayed.

Servers bound to Server Cluster cannot be deleted.

When use Server Delete Protection value is set to true in Manager Configuration area of ADMIN > Preference > Manager Environment menu, it can prevent servers from being uninstalled from Manager.

4.4.7. Start/Stop

Single Start/Stop

1. Click the **Stop button** to stop the Server.

2. Click the **Start button** to start the Server.

When stopping Server, shutdown method varies according to Stop Mode in General tab.

Stop : Basic shutdown option that does not guarantee currently serviced tasks.
Graceful Stop : Shuts down after completing currently serviced tasks. (Service not guaranteed on Windows)

Start button is activated only when in startable state.

Multi Server Start/Stop

1. Select multiple Servers to start or stop.
2. Click the **Multi Action button** at the bottom of Server list.
3. Select Action Type in popup window and click **Action button** to perform start or stop operations for multiple Servers.

Forced Stop/Restart

1. Click the **... button** at the far right of Server list.
2. Perform forced stop or forced restart.

4.4.8. Configuration Information Management (EN-A)

Provides functionality to change configuration information of Web Server's EN-A engine. When Server is selected from Web Server list, it moves to screen for managing configuration information.

General

General configuration values and Connection, Process information of Web Server can be edited.

Web Server's configuration information performs Validation on configuration files when saving, minimizing Server startup failures due to configuration file errors.

When configuration file error occurs, file is not saved and error message is displayed

Error message example

```
AH00526: Syntax error on line 253  Argument for 'Require all'
must be 'granted' or 'denied'
```

Detailed contents of configuration information are as follows.

1. Server Info (env.sh and /conf/httpd.conf file management)

Table 48. Server Info

Item (* indicates required values)	Description	Notes
HTTP Port(*)	HTTP Port	

Item (* indicates required values)	Description	Notes
HTTPS Port(*)	HTTPS Port	
Staging HTTP Port	Service port used when starting in Staging mode	Used during Graceful restart LENA uses basic nostage mode
Staging HTTPS Port	HTTPS port used when starting in Staging mode	Used during Graceful restart LENA uses basic nostage mode
Install Path	Server installation path	
Document Root(*)	Basic folder path where documents provided by Web Server are stored	
Welcome Page	Define which file to use as initial page document of website	
Stop Mode	Option referenced when Web Server shuts down	Stop : Basic shutdown option that does not guarantee currently serviced tasks. Graceful Stop : Shuts down after completing currently serviced tasks. (Service not guaranteed on Windows)
Directory/Path	Directory path where web documents are located to set which services and functions to allow/deny	
Directory/Options	Access control settings to apply to all files and directories under specified directory	Indexes : Prevents showing file list under Document Root when welcome page cannot be found FollowSymLinks : Prevents accessing file system other than existing web documents under Document Root via symbolic links

Item (* indicates required values)	Description	Notes
Directory/Allow Override	Set which directives to allow for resource access control configuration files for each subdirectory under Document Root (generally AccessFileName : .htaccess)	Provides following types * None : Do not allow any directives * All : All directives available * AuthConfig : Allow user authentication directives * FileInfo : Allow document type control directives * Indexes : Allow directory indexing control directives * Limit : Allow host access control directives
Directory/Require	Verify whether authenticated users perform allowed Actions	

2. Connection Info (/conf/extra/httpd-default.conf file management)

Table 49. Connection Info

Item (* indicates required values)	Description	Notes
Timeout(s)(*)	Time for Server to wait and disconnect connection when no event occurs for certain time after connection between client and Server (s)	Default : 60
Keep Alive(*)	Whether specific process continues to handle specific user's request tasks	Default : On
Max Keep Alive Requests(*)	Valid value when KeepAlive is On, process handles specific user's requests for specified number of times When this value is exceeded, that process dies and another process handles requests	Default : 100
Keep Alive Timeout(s)(*)	Valid value when KeepAlive is On, timeout to disconnect connection when no request for set time (s)	Default : 5

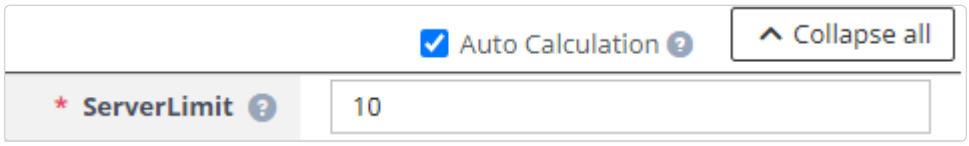
Item (* indicates required values)	Description	Notes
Request Read Timeout(s)(*)	Time to wait for receiving request header and body from user If not received within set time, sends 408 REQUEST TIME OUT error	Default : header=20-40,MinRate=500 body=20,MinRate=500

3. Process Info (/conf/extra/httpd-mpm.conf file management)

Table 50. Process Info

Item (* indicates required values)	Description	Notes
Start Servers(*)	Number of Server processes initialized when Web Server starts	Default : 2
Server Limit(*)	Maximum process value that MaxClients can create	Default : 8
Threads Per Child(*)	Number of Threads created by each child process	Default : 128
Thread Limit(*)	Maximum configurable value for ThreadsPerChild	Default : 128
Min Spare Threads(*)	When number of Idle Threads in Idle state is less than this value, Threads increase to this value and maintain	Default : 128
Max Spare Threads(*)	When number of Idle Threads in Idle state is more than this value, Threads decrease to this value and maintain	Default : 256
Max Request Workers(*)	Maximum number of Threads that all child processes can create	Default : 1024
Max Connection Per Child(*)	Maximum number of requests that child process can service. After processing this many requests, it terminates.	Default : 0 (0: unlimited)

When Web Server can use mpm event method, functionality to easily configure Process Info settings is provided.



When configuring Web Server's Process Info, checking Auto Calculation at top right provides convenient auto-calculation functionality in addition to validation of basic provided configuration values.

Rule	Validation	Auto Calculation
StartServer ServerLimit		-
ThreadsPerChild ThreadLimit		-
ThreadsPerChild + MinSpareThreads MaxSpareTheads		Auto-calculate MinSpareThreads, MaxSpareThreads when ThreadsPerChild changes
ServerLimit ThreadLimit MaxRequestWorkers		Auto-calculate MaxRequestWorkers when ServerLimit, ThreadLimit change

4. Pagespeed Info

Table 51. Pagespeed Info

Item (* indicates required values)	Description	Notes
Enabled(*)	Whether to improve site speed by performing optimization on Resources provided by Web Server by applying mod_pagespeed	Default : off Provides following options • on : Allow optimization for Resources • off : Stop additional optimization but allow access to already optimized Resources • unplugged : Stop optimization and deny access
Rewrite Level(*)	Set Level of filters that module will rewrite	

Item (* indicates required values)	Description	Notes
Default : default(CoreFilters) Provides following options * CoreFilters : Contains filters considered safe for most websites in advance * OptimizeForBandwidth : Enhanced safety, suitable for use on sites that do not recognize Pagespeed * PassThrough : Enter all filters manually	File Cache Path(*)	Path of directory where cached Files are stored
	LogDirPath(*)	Path of directory to record Logs
	Enable Filters	List of filters to use
	Disable Filters	List of filters not to use
	Allow URI	URI including wildcard(*) for Resources to allow rewrite
ex) **/**.js	Disallow URI	URI including wildcard(*) for Resources not to allow rewrite

5. SSL/TLS Security Info (/conf/extra/httpd-ssl.conf file management)

Table 52. SSL/TLS Security Info

Item (* indicates required values)	Description	Notes
Client TLS Protocol(*)	Configuration value defining protocol to use in SSL/TLS connection	Default : all -SSLv3 -TLSv1 -TLSv1.1
Client Cipher Suite(*)	Configuration value defining set of encryption algorithms to use in SSL/TLS connection	Default : HIGH:MEDIUM:!MD5:!RC4:!3DES

Item (* indicates required values)	Description	Notes
Proxy TLS Protocol(*)	Configuration defining protocol for proxy server to use in SSL/TLS connection	Default : all -SSLv3 -TLSv1 -TLSv1.1
Proxy Cipher Suite(*)	Configuration value defining set of encryption algorithms for proxy server to use in SSL/TLS connection	Default : HIGH:MEDIUM:!MD5:!RC4:!3DES

6. Enable Custom

Table 53. Custom Configuration

Item (* indicates required values)	Description	Notes
Custom Configuration	Add configurations that users want to add arbitrarily.	Stored separately in custom-httpd.conf file and managed.

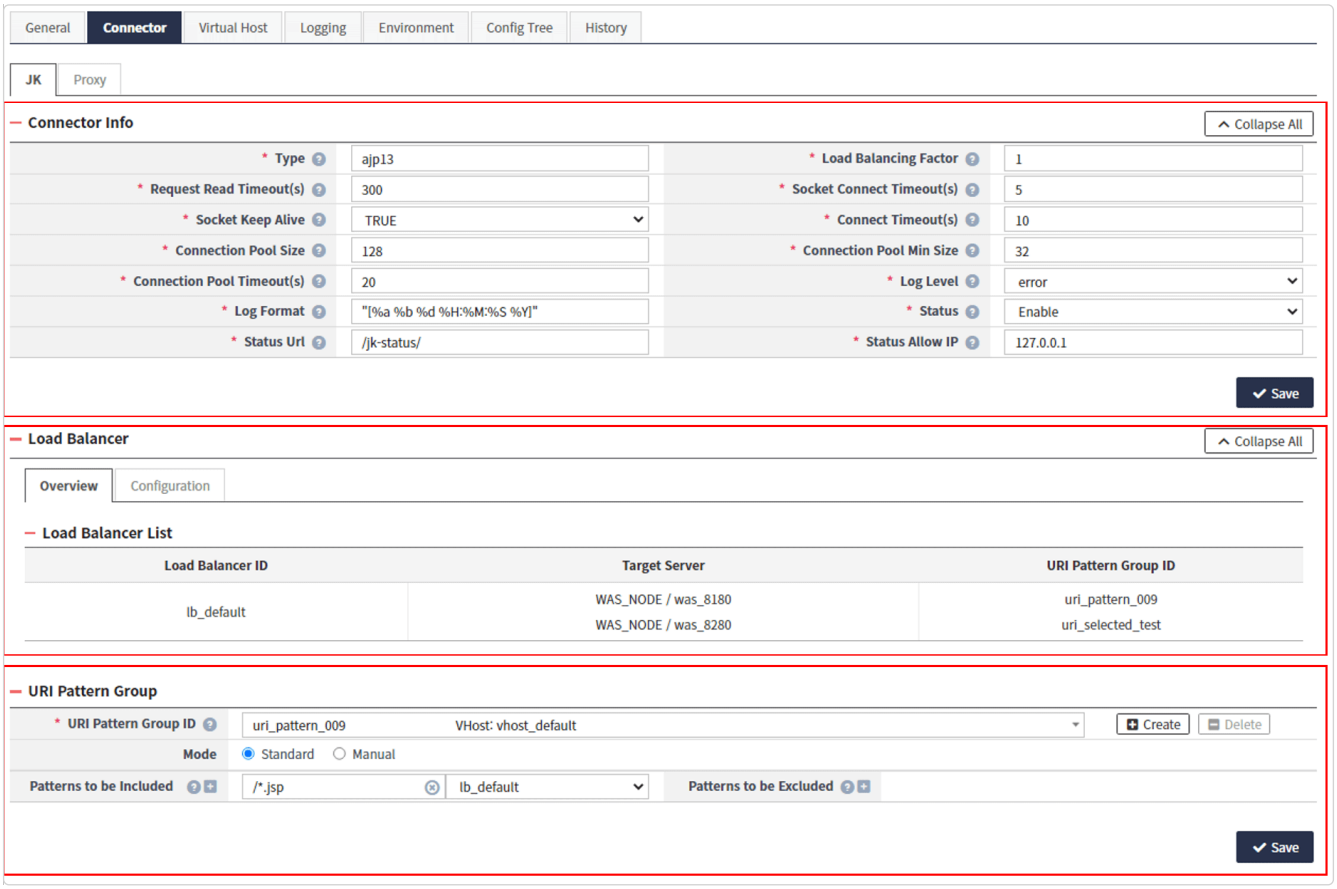
When changing configuration, Server restart is required to reflect modified items.

Connector

Manages information for linking Web Server and WAS.
Connector page is divided into JK and Proxy tabs according to linking method, and Connector configuration information according to module can be edited in each tab.

JK

Edits configuration information when using JK(mod_jk).



JK tab configuration is divided into three areas: Connector Info, Load Balancer, and URI Pattern Group as shown in the above screen.

1. Connector Info
   Manages basic configuration values of JK.

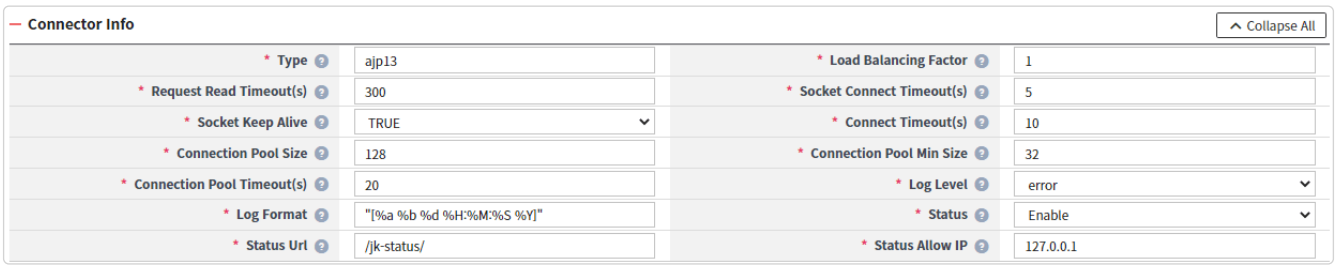


Table 54. Connector Info (JK)

Item (* indicates required values)	Description	Notes
Type(*)	Protocol used when Web Server and WAS communicate. (ajp12, ajp13, ajp14, jni, lb and status can be used, but ajp13, lb, status are recommended.)	Default: ajp13
Load Balancing Factor(*)	Load balancing index of WAS. That is, work allocation ratio.	Default: 1

Item (* indicates required values)	Description	Notes
Request Read Timeout(s)(*)	Timeout(seconds) used for communication channel between JK and remote host. If remote host does not respond within specified timeout, JK generates error and retries. When set to 0(default), JK continues to wait for response in all socket operations.	Default: 300
Socket Connect Timeout(s)(*)	Threshold for time(seconds) taken to configure socket connection between JK and remote host. If socket connection cannot be configured within specified time, JK generates error and attempts reconnection.	Default: 5
Socket Keep Alive(*)	When firewall exists between Web Server and WAS, inactive connections are discarded, but when this attribute is TRUE, sends KEEP_ALIVE message to operating system to prevent firewall from disconnecting inactive connections.	Default: TRUE
Connect Timeout(*)	connectTimeout: Wait time(s) for cpong respond to cping request in ajp13 protocol after connection between JK and WAS is completed.	Default: 10
Connection Pool Size(*)	Number of connections maintained as connection pool between JK and WAS.	Default: 128
Connection Pool Min Size(*)	Minimum number of connections maintained as connection pool between JK and WAS.	Default: 32
Connection Pool Timeout(s)(*)	Specifies time(seconds) that JK must maintain before closing inactive sockets. When set to 0, disables socket closing.	Used together with WAS's connectionTimeout option. Default: 20
Log Level(*)	Specifies log level to be recorded in log file.	Default: error
Log Format(*)	Sets format for recording logs in log file.	Default: "[%a %b %d %H:%M:%S %Y]"
Status(*)	Whether to set Server status monitoring configuration value, Status Url and Allow IP can be configured when Enable is selected.	Default: Enable
Status Url(*)	URL for Server status monitoring.	Default: /jk-status/
Status Allow IP(*)	IP that can access Server status monitoring URL.	Default: 127.0.0.1

2. Load Balancer
   Manages basic configuration and Workers of Load Balancer for load balancing.
   Load Balancer area has Overview tab and Configuration tab. Overview tab can check overall information of currently created Load Balancer, and Configuration tab can configure detailed contents of Load Balancer.

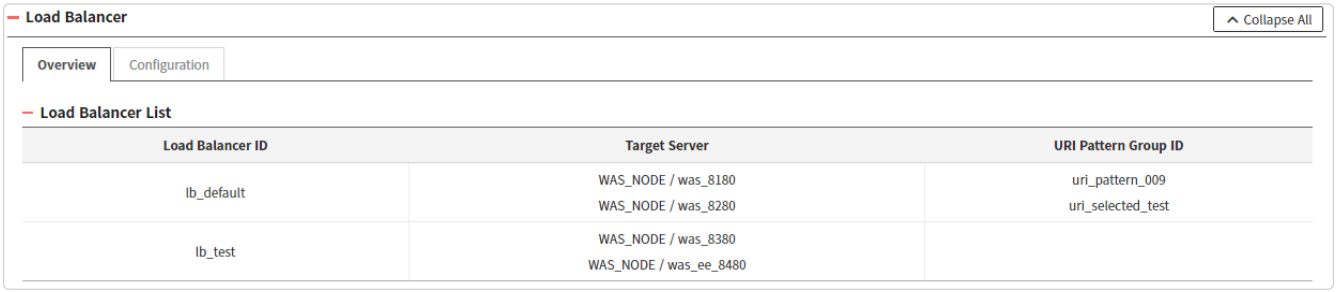


Table 55. Load Balancer Info - Overview (JK)

Item (* indicates required values)	Description	Notes
Load Balancer ID	ID of currently created Load Balancer.	
Target Server	Basic information of Workers registered in Load Balancer. Displayed in 'Node Name/Server Name' format.	
URI Pattern Group ID	When Load Balancer is specified for specific URI Pattern, URI Pattern Group ID that the URI Pattern belongs to is displayed.	

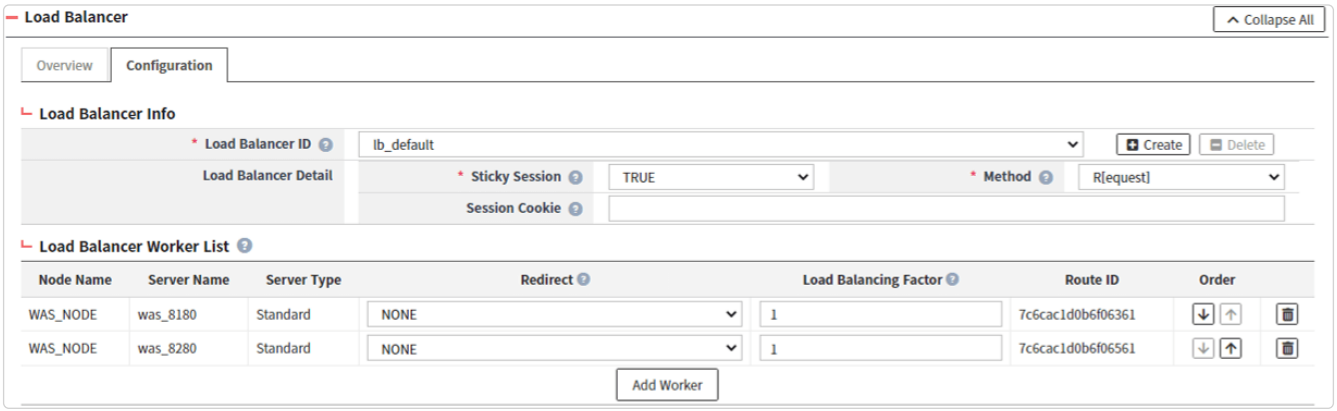


Table 56. Load Balancer Info - Configuration (JK)

Item (* indicates required values)	Description	Notes
Load Balancer ID(*)	Name of Load Balancer.	'lb_' prefix is added.
Sticky Session(*)	Whether to support routing based on Session ID.	
Method(*)	Specifies method used by Load Balancer to determine appropriate Worker for load balancing.	
* R[equest] : Selects Worker with least requests. (Default)	* S[ession] : Selects Worker with least connected sessions.	* N[ext] : Similar to S[ession] but select when fewer Sessions need to be distributed.
* T[raffic] : Selects Worker with least network traffic between JK and AJP connector.	* B[usyness] : Selects Worker with least load based on number of requests.	Session Cookie

Workers are added with Add Worker button in Load Balancer Worker List table.
When Add Worker button is pressed, window for adding Worker is displayed on screen, and users can select servers managed by LENA Manager as Workers in this window. Added Workers are managed through following information.

Table 57. Load Balancer Worker List

Item (* indicates required values)	Description	Notes
Node Name	Node name of server that Worker points to.	
Server Name	Name of server that Worker points to.	
Server Type	Type of server that Worker points to.	Standard or Enterprise is displayed as value.
Redirect	When this Worker is in error state, sets Failover Worker to handle requests received by this Worker.	Default: NONE
Load Balancing Factor	Work allocation ratio, defines how much work this Worker will do compared to other Workers.	Default: 1
Route ID	Route ID of Worker.	
Order	Can change order between Workers.	

3. URI Pattern Group
   Defines URI Mapping to pass requests coming to Web Server to WAS by checking URI patterns.

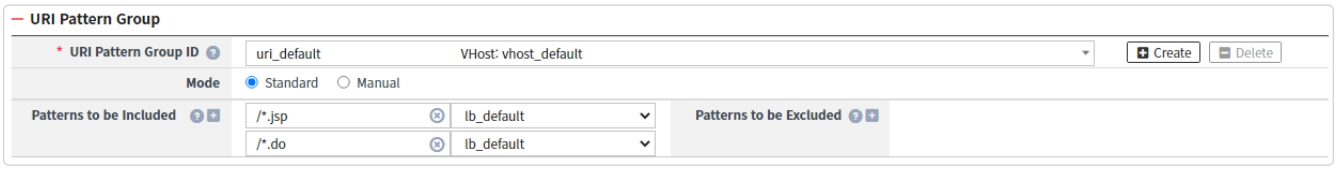


Table 58. URI Pattern Group (JK)

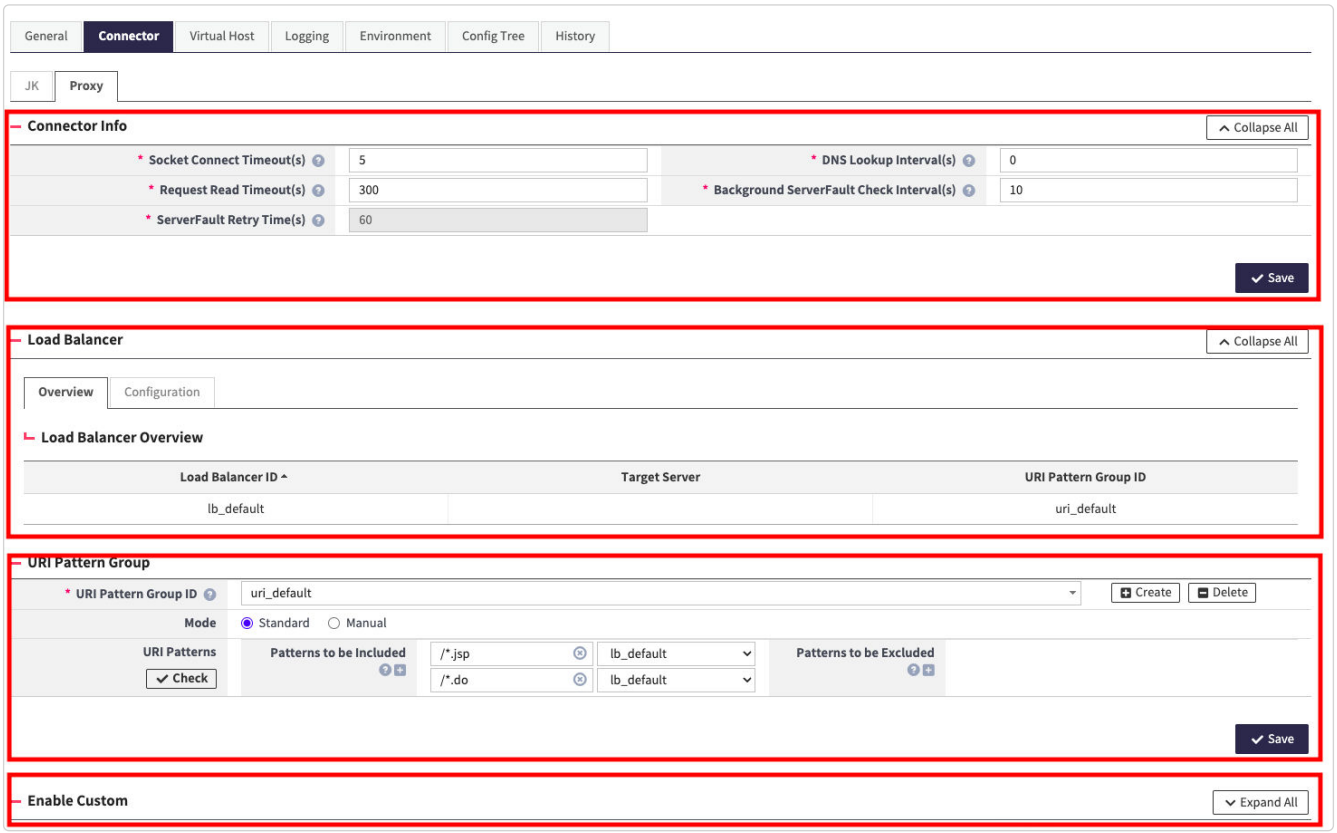
Item (* indicates required values)	Description	Notes
URI Pattern Group ID(*)	Name used for grouping and managing URI patterns. When URI Pattern Group used in Virtual Host, information about which Virtual Host is using it is displayed next to ID.	'uri_' prefix is added when Group is created.
Mode	Specifies whether to input URI patterns in format managed by LENA Manager or in user arbitrary format. Screen for inputting Patterns to be Included/Excluded or URI Patterns is displayed according to this item. If already saved pattern is in format managed by LENA Manager, it is automatically set to Standard, if in user arbitrary format, it is automatically set to Manual.	Standard: Input method according to LENA Manager URI Rule Manual: User arbitrary input method

Item (* indicates required values)	Description	Notes
Patterns to be Included	Input URI patterns to pass to WAS. Must select Load Balancer through right Select box to save. Can delete patterns through button.	Asterisk(*) meaning to allow all characters can be used, Hash(#), Equal(=) are not allowed.
Patterns to be Excluded	Input URI patterns not to pass to WAS. Can delete patterns through button.	Asterisk(*) meaning to allow all characters can be used.
URI Patterns	Used when inputting user arbitrary patterns.	

When changing configuration, Server restart is required to reflect modified items

Proxy

Edits configuration information when using Proxy(mod_proxy).



Proxy tab configuration is divided into four areas: Connector Info, Load Balancer, URI Pattern Group, and Enable Custom.

1. Connector Info
   Manages basic configuration values of Proxy.

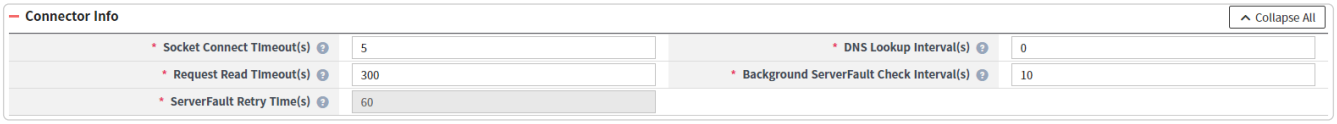


Table 59. Connector Info (Proxy)

Item (* indicates required values)	Description	Notes
Socket Connect Timeout(s)(*)	Time(s) for Apache httpd to wait until connection creation to backend is completed.	Default: 5
DNS Lookup Interval(s)(*)	DNS lookup interval. Set to 0 to disable function.	Default: 10
Request Read Timeout(s)(*)	Time(seconds) for Apache httpd to wait for transmitted data sent and received from backend.	Default: 300
Background ServerFault Check Interval(s)(*)	When Member connected to backend server is in error state, checks server at interval(seconds) set in this item and retransmits requests when server operates normally. Set to 0 to disable function.	Default: 10
ServerFault Retry Time(s)(*)	When Member connected to backend server is in error state, does not transmit any requests to that server until Apache httpd timeout(seconds) expires.	Background ServerFault Check Interval item is modifiable when 0. Default: 60

2. Load Balancer
   Manages basic configuration and Members of Load Balancer for load balancing.
   Load Balancer area has Overview tab and Configuration tab. Overview tab can check overall information of currently created Load Balancer, and Configuration tab can configure detailed contents of Load Balancer.

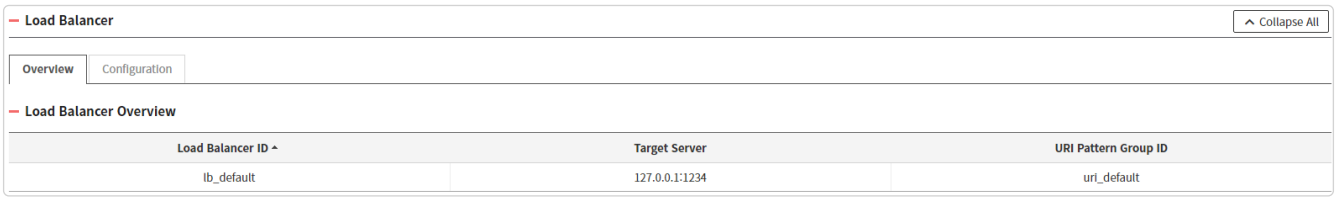


Table 60. Load Balancer Info - Overview (Proxy)

Item (* indicates required values)	Description	Notes
Load Balancer ID	ID of currently created Load Balancer.	
Target Server	Basic information of Members registered in Load Balancer. Displayed in 'Node Name/Server Name' or 'Address:Port' format.	
URI Pattern Group ID	When Load Balancer is specified for specific URI Pattern, URI Pattern Group ID that the URI Pattern belongs to is displayed.	

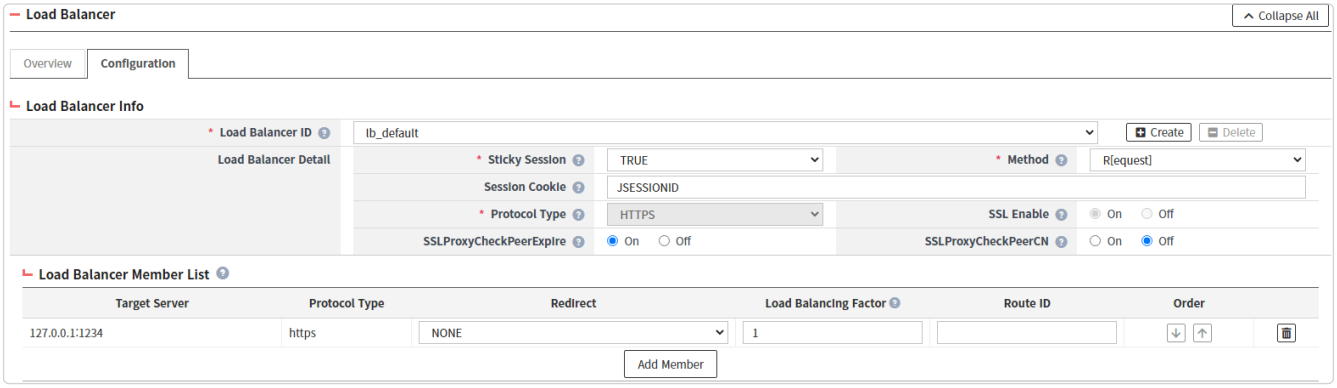


Table 61. Load Balancer Info - Configuration (Proxy)

Item (* indicates required values)	Description	Notes
Load Balancer ID(*)	Name of Load Balancer.	'lb_' prefix is added.
Sticky Session(*)	Whether to support routing based on Session ID.	
Method(*)	Specifies method used by Load Balancer to determine appropriate Member for load balancing.	
* R[equest] : Selects Member with least requests. (Default)	* T[raffic] : Selects Member with least network traffic.	* B[usyness] : Selects Member with least load based on number of requests.
Session Cookie	Set when wanting to change Session Cookie name.	
Protocol Type(*)	Specifies protocol type of Member. Can only be changed when Member is not specified.	Default: HTTP
SSL Enable	Uses SSL/TLS protocol engine for Proxy.	This option cannot be configured and operates only according to Protocol configuration. Default: Off when HTTP, On when HTTPS
SSLProxyCheckPeerExpire	Checks if remote server certificate has expired.	Default: On
SSLProxyCheckPeerCN	Checks CN field of remote server certificate.	Default: Off

Members are added with Add Member button in Load Balancer Member List table.
When Add Member button is pressed, window for adding Member is displayed on screen, and users can select servers managed by LENA Manager as Members in this window or directly input Member information to add.

Added Members are managed through following information.

Table 62. Load Balancer Member List

Item (* indicates required values)	Description	Notes
Target Server	Basic information of server that Member points to. Displayed in Node Name/Server Name format for Members managed by LENA Manager, Address:Port format for Members not managed by LENA Manager.	
Protocol Type	Protocol type used by Member.	
Redirect	When this Member is in error state, sets Failover Member to handle requests received by this Member.	Default: NONE
Load Balancing Factor	Work allocation ratio, defines how much work this Member will do compared to other Members.	Default: 1
Route ID	Route ID of Member.	Must be input when using Sticky Session.
Order	Can change order between Members.	

3. URI Pattern Group
   Defines URI Mapping to pass requests coming to Web Server to WAS by checking URI patterns.

Table 63. URI Pattern Group (Proxy)

Item (* indicates required values)	Description	Notes
URI Pattern Group ID(*)	Name used for grouping and managing URI patterns. When URI Pattern Group used in Virtual Host, information about which Virtual Host is using it is displayed next to ID.	'uri_' prefix is added when Group is created.
Mode	Specifies whether to input URI patterns in format managed by LENA Manager or in user arbitrary format. Screen for inputting Patterns to be Included/Excluded or URI Patterns is displayed according to this item. If already saved pattern is in format managed by LENA Manager, it is automatically set to Standard, if in user arbitrary format, it is automatically set to Manual.	Standard: Input method according to LENA Manager URI Rule Manual: User arbitrary input method
Patterns to be Included	Input URI patterns to pass to WAS. Must select Load Balancer through right Select box to save. Can delete patterns through button.	Asterisk(*) meaning to allow all characters can be used, Hash(#), Equal(=) are not allowed.

Item (* indicates required values)	Description	Notes
Patterns to be Excluded	Input URI patterns not to pass to WAS. Can delete patterns through button.	Asterisk(*) meaning to allow all characters can be used.
URI Patterns	Used when inputting user arbitrary patterns.	

Table 64. Enable Custom (Proxy)

Item (* indicates required values)	Description	Notes
Custom Configuration	Add configurations that users want to add arbitrarily.	Stored separately in custom-proxy.conf file and managed.

When changing configuration, Server restart is required to reflect modified items

Virtual Host

Web Server's Virtual Host information can be registered/modified/cloned/deleted.

Create button, **Delete button** can register/delete Virtual Host, **Clone button** can clone, **Rename button** can change name.

Virtual Hosts with one or more Load Balancers applied cannot be deleted. If you want to delete that Virtual Host, first change Virtual Host ID of Load Balancer to different Virtual Host ID through Connector tab.

When SSL Enabled and Rewrite Enabled are checked, detailed item areas are additionally displayed as follows.

Detailed contents of configuration information are as follows.

Managed files

- /conf/extra/vhost/{Virtual Host ID}.conf
- /conf/extra/rewrite/rewrite_{Virtual Host ID}.conf
- /conf/extra/ssl/ssl_{Virtual Host ID}.conf
- /conf/extra/vhost/custom_{Virtual Host ID}.conf

Table 65. Virtual Host Info Configuration Information

Item (* indicates required values)	Description	Notes
Virtual Host ID(*)	Virtual Host name	
Port(*)	HTTP Port used by that virtual host	

Item (* indicates required values)	Description	Notes
Document Root(*)	Homepage directory location of that virtual host	Can be specified to same or subdirectory using Server's DocumentRoot variable ${DOC_ROOT}
Domain Name(*)	Domain name to identify virtual host	
Server Alias	ServerAlias used by virtual host	Can include wildcard characters (*.example.com)
Custom Log(*)	Web log file location of virtual host	
Directory/Path	Path from DocumentRoot	
Directory/Options	Access control settings to apply to all files and directories under specified directory	-Indexes prevents showing file list under Document Root when welcome page cannot be found -FollowSymLinks prevents accessing file system other than existing web documents under Document Root via symbolic links

Item (* indicates required values)	Description	Notes
Directory/Allow Override	Set which directives to allow for resource access control configuration files for each subdirectory under Document Root (generally AccessFileName : .htaccess)	Provides following types • None : Do not allow any directives • All : All directives available • AuthConfig : Allow user authentication directives • FileInfo : Allow document type control directives • Indexes : Allow directory indexing control directives • Limit : Allow host access control directives
Directory/Require	Verify whether authenticated users perform allowed Actions	
Connector Enable	Whether to configure virtual host Connector	
Connector Type/ID	When configuring virtual host Connector, select according to Jk/Proxy type	Displays Connector list created in Connector Tab.
Rewrite Enable	Whether to use Rewrite	
Rewrite Configuration	Detailed Rewrite configuration. Rewrites according to rules set in Rewrite Rule according to specified Rewrite Condition	
Enable Custom	Add configurations that users want to add to Vhost arbitrarily	Contents are generated and stored in separate file (/conf/http/vhost/custom/custom_default.conf).
SSL Enabled	Whether to use SSL	
SSL Port(*)	HTTPS Port	

Item (* indicates required values)	Description	Notes
SSL Certificate File(*)	SSL certificate path	
SSL Certificate Key File(*)	SSL certificate Key file path	
SSL Certificate Chain File	PEM-encoded server CA certificate file path	
SSL CA Certificate File	ROOT certificate path	
SSL Password	ROOT certificate password	
Https Redirect Enabled	Whether to use Http→Https Redirect	
SSL Log Separation	Whether to use SSL Log configuration separation	
SSL Custom Log(*)	SSL Custom Log configuration	
Enable SSL/TLS Security	SSL security configuration per VirtualHost	Instead of using General SSL/TLS security configuration, SSL/TLS security configuration is applied per VirtualHost.

When changing configuration, Server restart is required to reflect modified items

Logging

Web Server's log configuration information can be edited.

Detailed contents of configuration information are as follows.

1. Log Home

Table 66. Log Home

Item (* indicates required values)	Description	Notes
Log Home(*)	Log Home path	When default is selected, set to logs folder under server installation directory, when custom is selected Log Home Prefix item allows input of log directory home path
Retention Days(*)	Maximum retention days for logs	Default : 0(unlimited)

2. Error Log

Used when Web Server records errors that occur while processing diagnostic information and requests. When problems occur during Server startup or operation, check files at location set here first.

Table 67. Error Log

Item (* indicates required values)	Description	Notes
Location(file/pipe)(*)	Specify Web Server's error log file location	
Log Level(*)	Specify how detailed to record error log file contents	

3. Log Format

Sets format to use for log files.

Table 68. Log Format

Item (* indicates required values)	Description	Notes
Format(*)	Sets format for recording logs in log file	
Nickname(*)	Name of log format to use	

4. Log Format with logio

Table 69. Log Format with logio

Item (* indicates required values)	Description	Notes
Format(*)	Sets format for recording logs in log file	Can measure bytes sent and received including request and head using %I and %O variables

Item (* indicates required values)	Description	Notes
Nickname(*)	Name of log format to use	combinedio requires mod_logio_module to be loaded

5. Log Env

Used when setting environment variables according to Request conditions.

Table 70. Log Env

Item (* indicates required values)	Description	Notes
Attribute(*)	HTTP request header (ex: Host, User-Agent, Referer, Accept-Language), one of request attributes (Remote_Host, Remote_Addr, Server_Addr, Request_Method, Request_Protocol, Request_RUI) or environment variable name associated with request	
Regex(*)	Perl compatible regular expression	
Env-variable name(*)	Variable name and value to set (optional) Varname, !varname or varname=value	
Case	Whether to distinguish case for Env-variable	With case : Distinguish case No case : No case distinction

When changing configuration, Server restart is required to reflect modified items

Environment

Provides screen for managing JVM options, Start Shell configuration, etc. Modify through file editor and click **Save button** to save.

- Custom Env (/bin/customenv.sh): User custom environment variable configuration
- Base Env (/env.sh) - Shell Script for Server startup

By default, configuration cannot be modified. If you want to modify, click **Configuration button** in ADMIN > Manager Environment > Manager Configuration item and change the following configuration to false.

```
server.environment.envshell.readonly=false
```

Configuration Tree

Web Server's ${SERVER_HOME}/conf directory sub configuration files can be managed through file editor.

User running Node Agent must have access permission to Web Server configuration information files for modification. If access permission is not available, message that file cannot be edited due to no Write permission is displayed.

History

Provides backup and restore functionality for configuration information. When configuration information is modified and saved, History is managed. Search by entering modification date.

Click **View(magnifying glass) button** to view information of selected file, and click **Restore button** to restore to that configuration file.

4.4.9. Configuration Information Management (EN-N)

Provides functionality to change engine configuration information of EN-N type Web Server. When Server is selected from Web Server list, it moves to screen for managing configuration information.

General

General configuration values and Connection, Process information of Web Server can be edited.

Web Server's configuration information performs Validation on configuration files when saving, minimizing Server startup failures due to configuration file errors.

When configuration file error occurs, file is not saved and error message is displayed

Error message example

```
AH00526: Syntax error on line 253  Argument for 'Require all'
must be 'granted' or 'denied'
```

Detailed contents of configuration information are as follows.

1. Server Info (/var/common_value.env file management)

Table 71. Server Info

Item (* indicates required values)	Description	Notes
Install Path	Server installation path	
Base Port(*)	Port Type information and Port Number set during installation	Port Type cannot be changed, Port Number can be changed
Welcome Page	Define which file to use as initial page document of website	
Stop Mode	Server stop Mode	• Stop • Graceful Stop
Directory Root Path	Basic folder path where documents provided by Web Server are stored	
Disable Symbolic Links	Whether to not use Symbolic Link	Default : on (not used)
Diasble Auto Index	Enable or disable directory listing output.	Default : on (disabled)

2. Additional Port Info (/var/tcp_port.env, /var/udp_port.env file management)

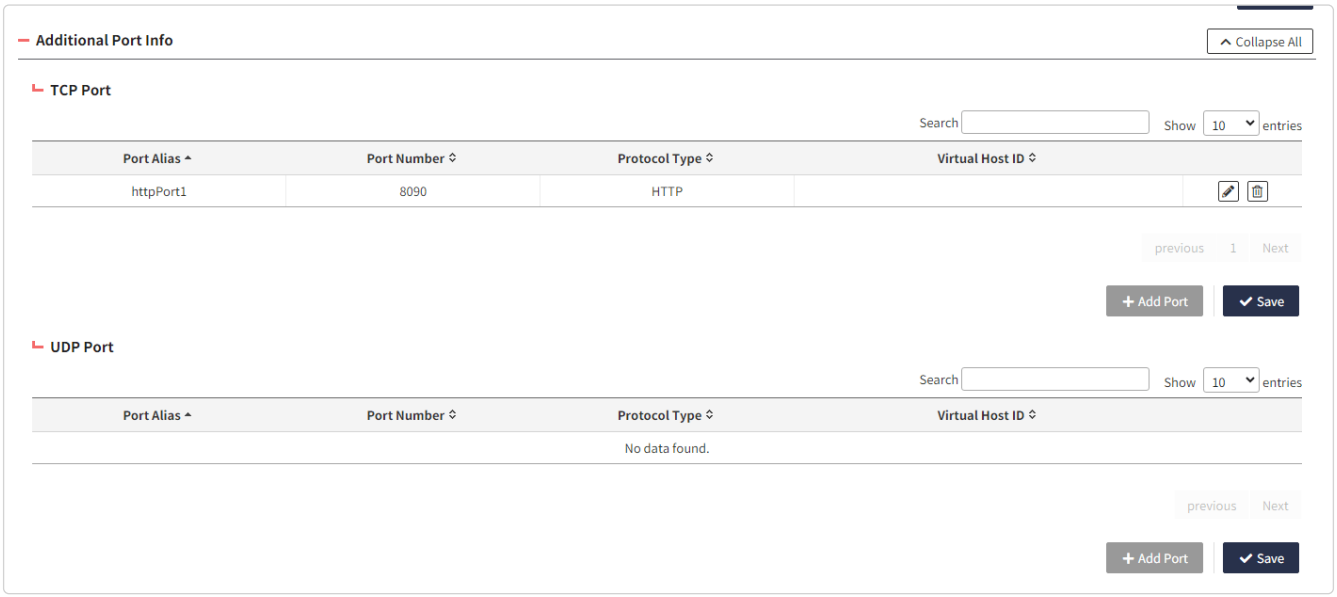


Table 72. TCP Port

Item (* indicates required values)	Description	Notes
Port Alias(*)	Set Alias of port.	
Port Number	Specify port number.	

Item (* indicates required values)	Description	Notes
Protocol Type	Select protocol type.	
Virtual Host ID	Display Virtual Host ID using that Port.	Cannot change Port Alias when specific Virtual Host is using that Port.

TCP Protocol dedicated usage ports (Proxy(HTTP, HTTPS), Net Gateway(TCP))

Table 73. UDP Port

Item (* indicates required values)	Description	Notes
Port Alias(*)	Set Alias of port.	
Port Number	Specify port number.	
Protocol Type	Select protocol type.	
Virtual Host ID	Display Virtual Host ID using that Port.	Cannot change Port Alias when specific Virtual Host is using that Port.

UDP Protocol dedicated usage ports (Net Gateway)

3. Connection Info (/var/common_value.env file management - related file /conf/http/lenan-http.conf)

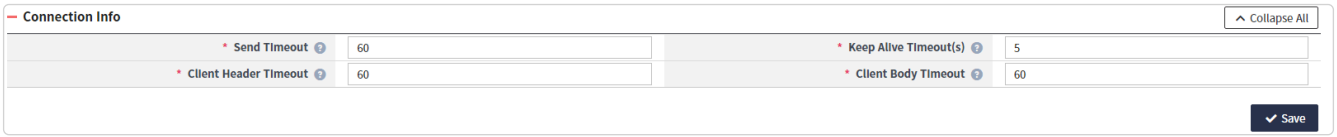


Table 74. Connection Info

Item (* indicates required values)	Description	Notes
Send Timeout(*)	Timeout time set for sending response to client. **This is timeout time between two consecutive write operations, not total response transmission timeout time.** If client receives nothing within time specified in send_timeout, connection is closed.	Default : 60
Keep Alive Timeout(s) (*)	Timeout time set for keeping connection between server and client open.	Default : 5

Item (* indicates required values)	Description	Notes
Client Header Timeout(*)	Time to read request header information, if **client does not send header within specified time**, request ends with 408(Request Time-out).	Default: 60
Client Body Timeout(*)	Time to read request body information, **this is timeout time between two consecutive read operations, not total request body transmission timeout time.** If client sends nothing within time specified in client_body_timeout, request ends with 408(Request Time-out).	Default: 60

4. Process Info (/var/common_value.env file management - related file /conf/lenan.conf)

Table 75. Process Info

Item (* indicates required values)	Description	Notes
Worker Process(*)	Define number of worker processes.	Default : 2
Worker Connection(*)	Set maximum number of simultaneous connections.	Maximum Request allowance: worker_processes * worker_connections

When changing configuration, Server restart is required to reflect modified items.

5. Enable Custom (/conf/custom/custom.conf file management - related file /conf/lenan.conf)

Table 76. Enable Custom

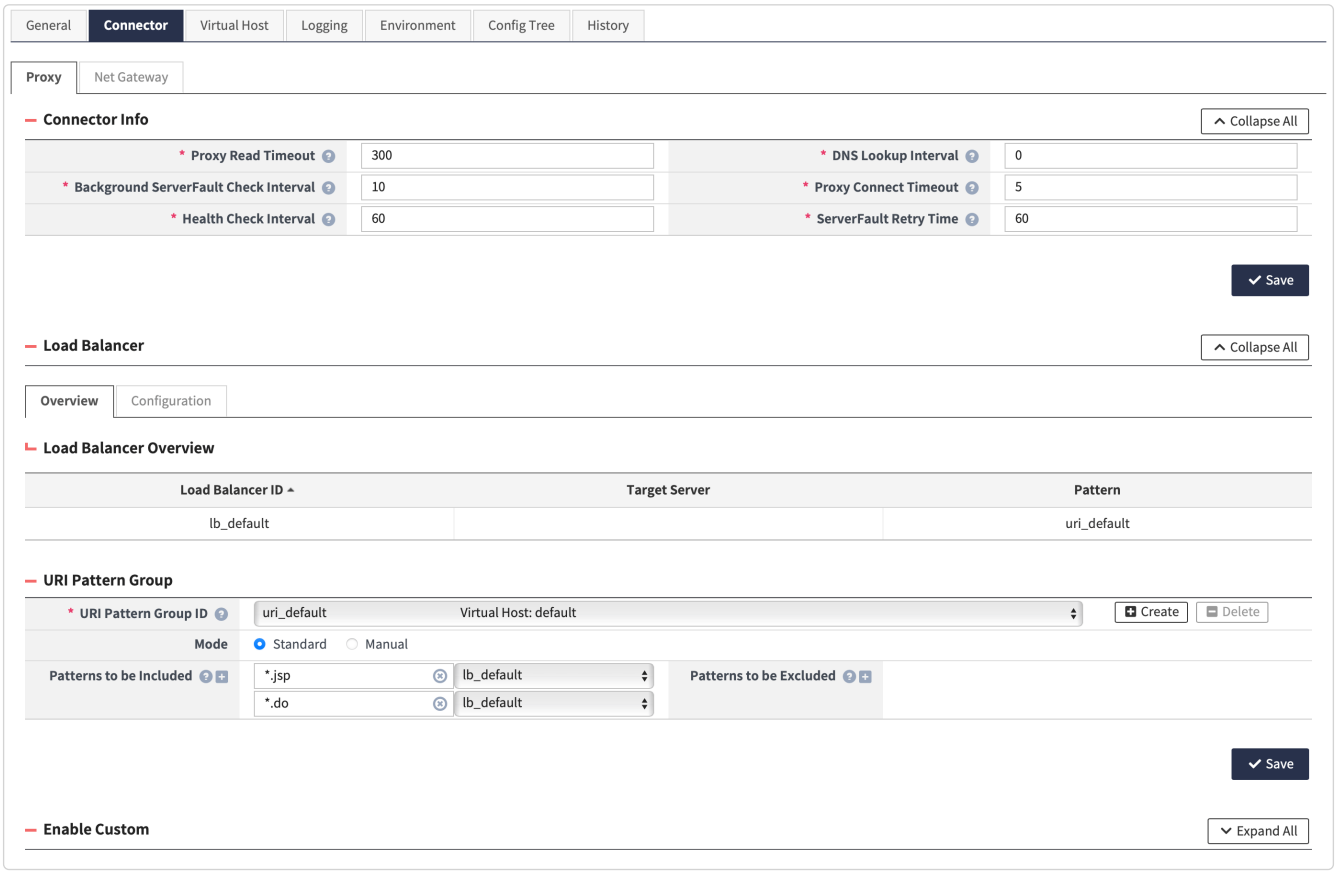
Item (* indicates required values)	Description	Notes
Custom Configuration	Input content that users can freely insert through custom.conf included in lenan.conf.	

Connector

Manages information for linking Web Server and WAS(Backend).
Connector page is divided into Proxy and Net Gateway tabs according to protocol, and Connector configuration information according to module can be edited in each tab.

Proxy

Edits configuration information when using Proxy(ngx_http_upstream_module).



Proxy tab configuration is divided into three areas: Connector Info, Load Balancer, and URI Pattern Group as shown in the above screen.

1. Connector Info
   Manages basic configuration values of Proxy.

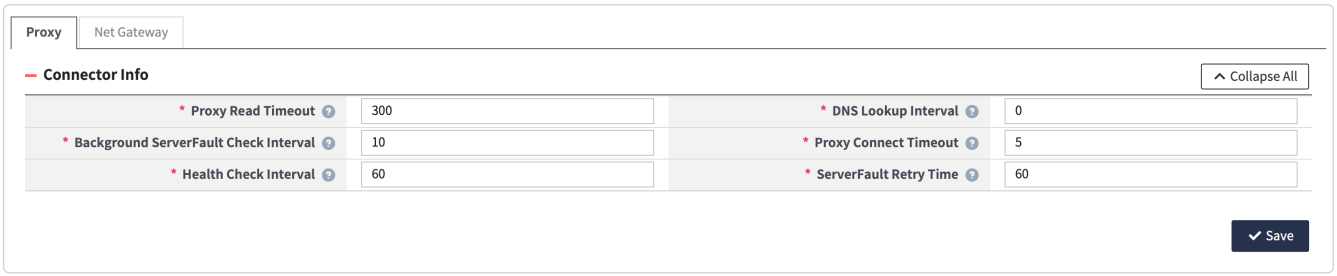


Table 77. Connector Info (Proxy)

Item (* indicates required values)	Description	Notes
Proxy Read Timeout(*)	Timeout time set for reading response from backend server. This is timeout time between two consecutive read operations, not total response transmission timeout time. If backend server sends nothing within time specified in proxy_read_timeout, connection is closed.	Default: 300
Proxy Connect Timeout(*)	Define time limit for establishing connection with backend server. This time limit generally cannot exceed 75 seconds.	Default: 5
Background ServerFault Check Interval(*)	When Member connected to backend server is in error state, checks server at interval(seconds) set in this item and retransmits requests when server operates normally. Set to 0 to disable function.	Default: 10
Server Fault Retry Time(*)	When Member connected to backend server is in error state, does not transmit any requests to that server until timeout(seconds) expires.	Default: 60
Health Check Interval(*)	Checks server at interval(seconds) set for checking backend server status. Set to 0 to disable function.	Default: 60
DNS Lookup Interval(*)	DNS lookup interval. Set to 0 to disable function.	Default: 10

When Background ServerFault Check Interval and Health Check Interval are saved as 0
All LoadBalancer's Auto Server Fault Recovery values change to off, and new creation values are also fixed to off.

2. Load Balancer
   Manages basic configuration and Members of Load Balancer for load balancing.
   Load Balancer area has Overview tab and Configuration tab. Overview tab can check overall information of currently created Load Balancer, and Configuration tab can configure detailed contents of Load Balancer.

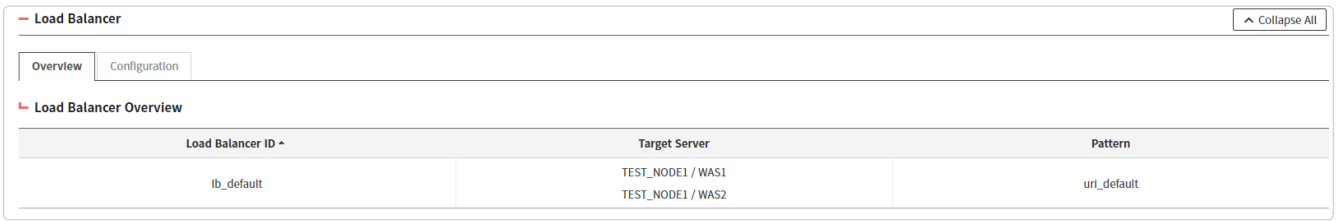


Table 78. Load Balancer Info - Overview (Proxy)

Item (* indicates required values)	Description	Notes
Load Balancer ID	ID of currently created Load Balancer.	
Target Server	Basic information of Workers registered in Load Balancer. Displayed in 'Node Name/Server Name' format.	

Item (* indicates required values)	Description	Notes
Pattern	When Load Balancer is specified for specific URI Pattern, URI Pattern Group ID that the URI Pattern belongs to is displayed.	

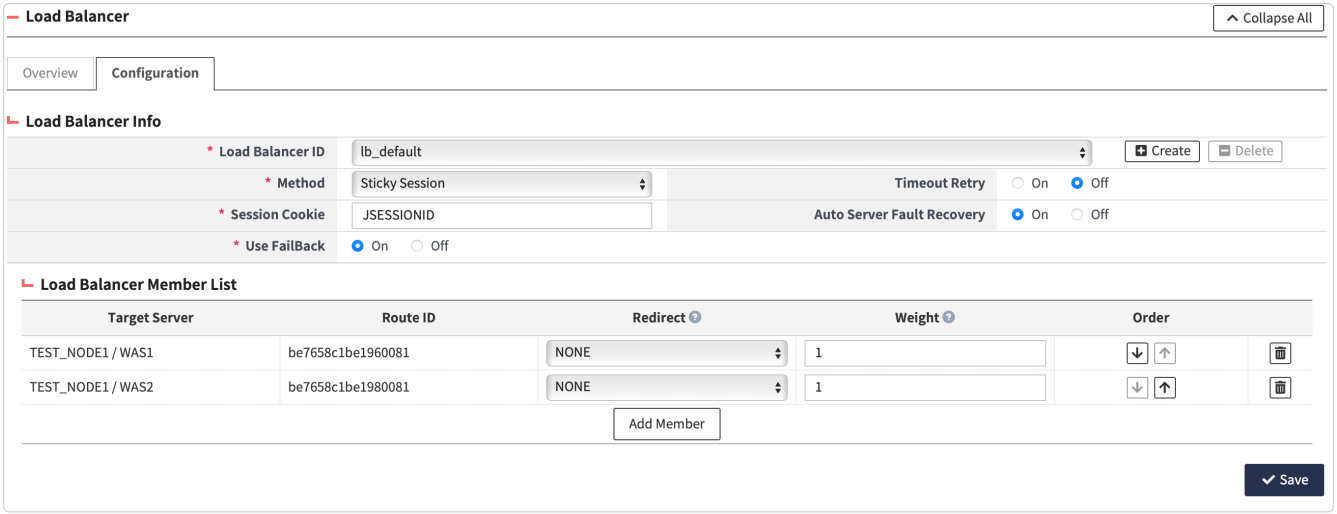


Table 79. Load Balancer Info - Configuration (Proxy)

Item (* indicates required values)	Description	Notes
Load Balancer ID(*)	Name of Load Balancer.	'lb_' prefix is added.
Method(*)	Specifies method used by Load Balancer to determine appropriate Worker for load balancing.	
* Sticky Session : Route based on Session Cookie	* RoundRobin : Route in order of registered members	• IP Hash : Route based on Client's IP
* Least Connection : Route to side with fewer connections	Session Cookie(*)	Set when wanting to change Session Cookie name.
Default: JSESSIONID	Timeout Retry	Set when wanting to change Session Cookie name.
Default:Off When On is set, retransmits when Gateway Timeout occurs.	Auto Server Fault Recovery	Whether to use fox Directive

Members are added with Add Member button in Load Balancer MemberList table.
When Add Member button is pressed, window for adding Member is displayed on screen, and users can select servers managed by LENA Manager as Members in this window. Added Members are managed through following information.

Table 80. Load Balancer Member List

Item (* indicates required values)	Description	Notes
Target Server	Node name and server name of server that Member points to.	
Route ID	Route ID of Member	
Weight	Work allocation ratio, defines how much work this Worker will do compared to other Workers.	Default: 1

3. URI Pattern Group
   Defines URI Mapping to pass requests coming to Web Server to WAS by checking URI patterns.

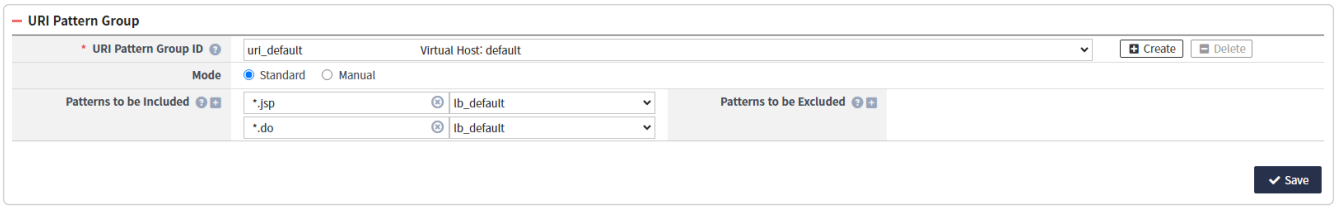


Table 81. URI Pattern Group (Proxy)

Item (* indicates required values)	Description	Notes
URI Pattern Group ID(*)	Name used for grouping and managing URI patterns. When URI Pattern Group used in Virtual Host, information about which Virtual Host is using it is displayed next to ID.	Group creation adds 'uri_' prefix.
Mode	Specifies whether to input URI patterns in format managed by LENA Manager or in user arbitrary format. Screen for inputting Patterns to be Included/Excluded or URI Patterns is displayed according to this item. If already saved pattern is in format managed by LENA Manager, it is automatically set to Standard, if in user arbitrary format, it is automatically set to Manual.	• Standard: Input method according to LENA Manager URI Rule • Manual: User arbitrary input method
Patterns to be Included	Input URI patterns to pass to WAS. Must select Load Balancer through right Select box to save. Can delete patterns through button.	Asterisk(*) meaning to allow all characters can be used, Hash(#), Equal(=) are not allowed.
Patterns to be Excluded	Input URI patterns not to pass to WAS. Can delete patterns through button.	Asterisk(*) meaning to allow all characters can be used.
URI Patterns	Used when inputting user arbitrary patterns.	

4. Enable Custom
   /conf/http/custom/custom_http.conf file management - related file /conf/http/lenan-http.conf)

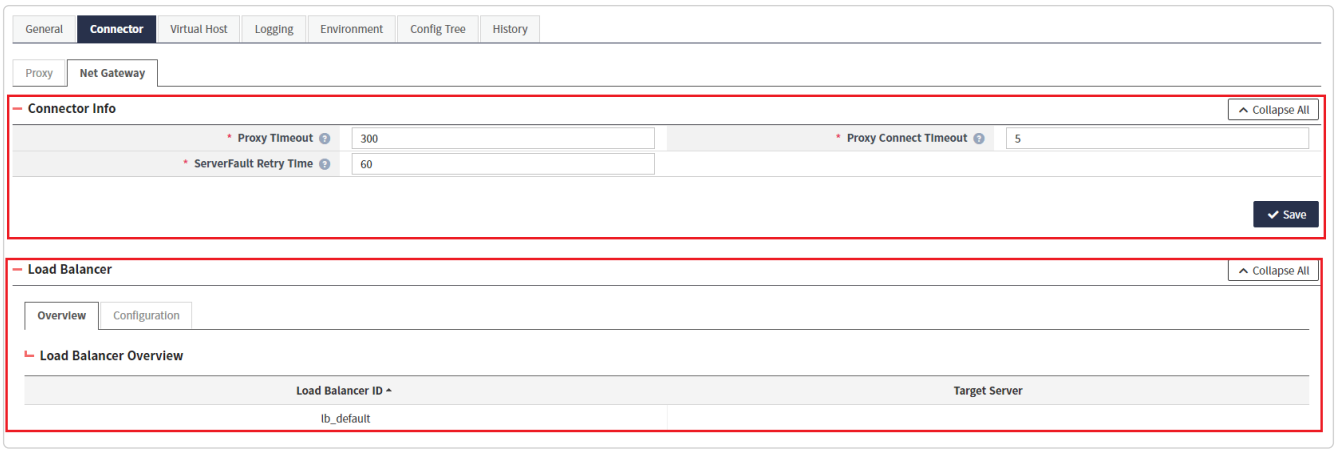
Table 82. Enable Custom (Proxy)

Item (* indicates required values)	Description	Notes
Custom Configuration	Input content that users can freely insert through custom_http.conf included in lenan-http.conf.	

When changing configuration, Server restart is required to reflect modified items

Net Gateway

Edits configuration information when using Net Gateway(ngx_stream_upstream_module).



Net Gateway tab configuration is divided into two areas: Connector Info and Load Balancer.

1. Connector Info
   Manages basic configuration values of Net Gateway.

Table 83. Connector Info (Net Gateway)

Item (* indicates required values)	Description	Notes
Proxy Timeout(s)(*)	Set time limit between two consecutive read or write operations in client or proxy server connection. If data is not transmitted within this time, connection is closed.	Default: 5
Proxy Connect Timeout(s)(*)	Define timeout for establishing connection with proxy server	Default: 10

Item (* indicates required values)	Description	Notes
ServerFault Retry Time(s)(*)	Time period during which server is considered unavailable after specified number of server communication failures occur, period during which server is considered unavailable.	Default: 60

2. Load Balancer
   Manages basic configuration and Members of Load Balancer for load balancing.
   Load Balancer area has Overview tab and Configuration tab. Overview tab can check overall information of currently created Load Balancer, and Configuration tab can configure detailed contents of Load Balancer.

Table 84. Load Balancer Info - Overview (Net Gateway)

Item (* indicates required values)	Description	Notes
Load Balancer ID	ID of currently created Load Balancer.	
Target Server	Basic information of Members registered in Load Balancer. Displayed in 'Address:Port' format.	

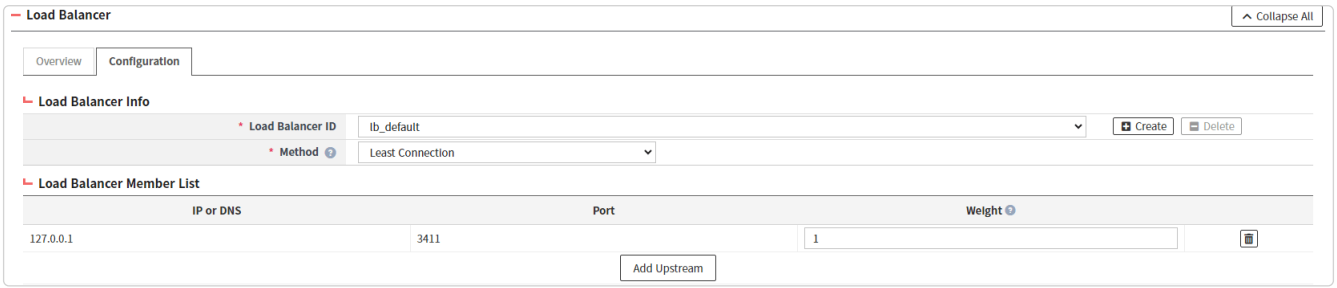


Table 85. Load Balancer Info - Configuration (Net Gateway)

Item (* indicates required values)	Description	Notes
Load Balancer ID(*)	Name of Load Balancer.	'lb_' prefix is added.
Method(*)	Specifies method used by Load Balancer to determine appropriate Member for load balancing.	
* Round Robin : Route sequentially through registered member list	* IP Hash : Route based on Client IP	• Least Connection : Route to side with fewer connections based on Connection

Members are added with Add Upstream button in Load Balancer Member List table.

When Add Upstream button is pressed, window for adding Upstream is displayed on screen, and users can directly input Upstream information to add in this window.

Added Upstreams are managed through following information.

Table 86. Load Balancer Member List

Item (* indicates required values)	Description	Notes
IP or DNS	Basic information of server that Upstream points to. Basically displayed in Address:Port format.	DNS can also be input.
Port	Port information used by Upstream.	
Weight	Work allocation ratio, defines how much work this Upstream will do compared to other Upstreams.	Default: 1 Cannot input 0 for work allocation (changes to default 1)

3. Enable Custom /conf/stream/custom/custom_stream.conf file management - related file /conf/stream/lenan-stream.conf)

Table 87. Enable Custom (Net Gateway)

Item (* indicates required values)	Description	Notes
Custom Configuration	Input content that users can freely insert through custom_stream.conf included in lenan-stream.conf.	

When changing configuration, Server restart is required to reflect modified items

Virtual Host

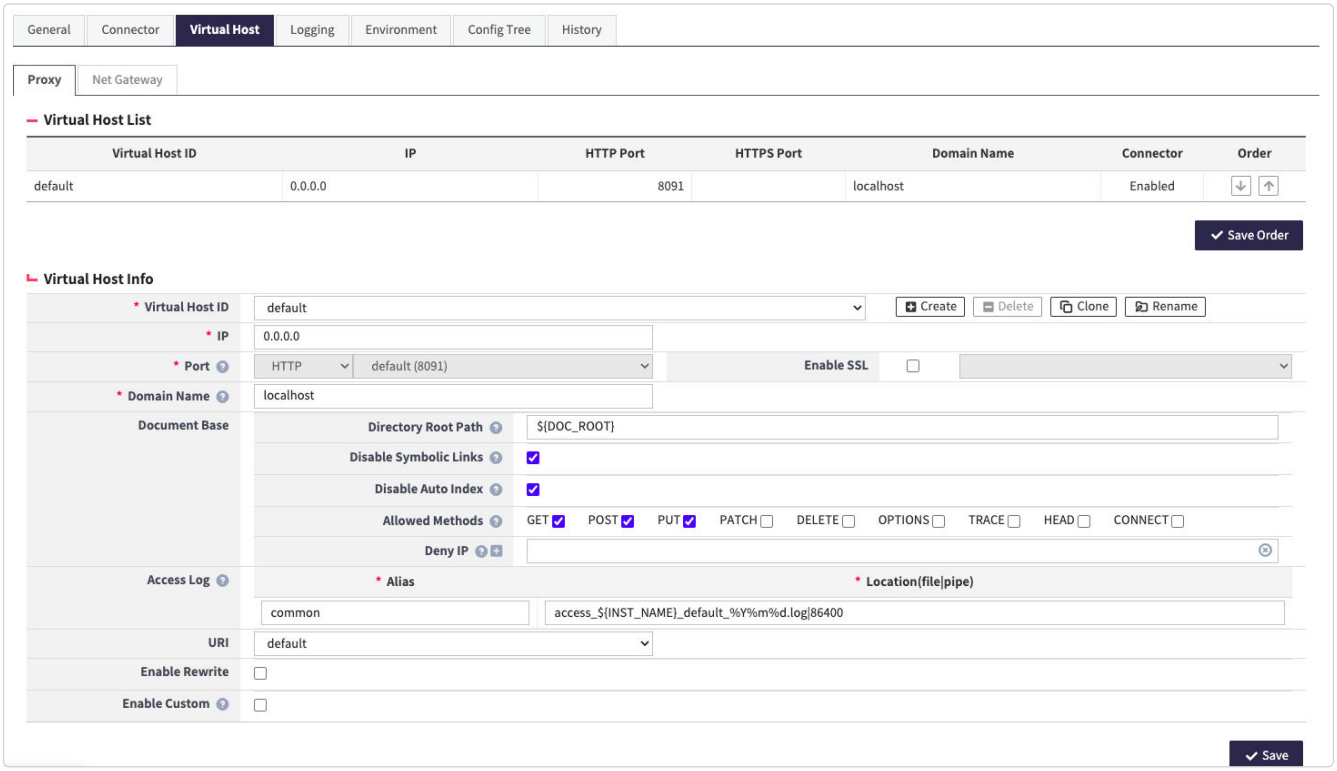
Proxy

Proxy Web Server's Virtual Host information can be registered/modified/cloned/deleted.

Create button, **Delete button** can register/delete Virtual Host, **Clone button** can clone, **Rename button** can change name.

Virtual Hosts with one or more Load Balancers applied cannot be deleted. If you want to delete that Virtual Host, first change Virtual Host ID of Load Balancer to different Virtual Host ID through Connector tab.

When Enable SSL and Enable Rewrite and Enable Custom are checked, detailed item areas are additionally displayed.



Detailed contents of configuration information are as follows.

Managed files

- /conf/http/vhost/vhost_{Virtual Host ID}.conf
- /conf/http/vhost/vhost.list
- /conf/http/vhost/rewrite/rewrite_{Virtual Host ID}.conf
- /conf/http/vhost/custom/custom_{Virtual Host ID}.conf

Table 88. Virtual Host Info Configuration Information

Item (* indicates required values)	Description	Notes
Virtual Host ID(*)	Virtual Host name	
Domain Name	Domain name to identify virtual host	
IP(*)	Select protocol to be used by that virtual host (HTTP, HTTPS) IP used by that virtual host	
Port(*)	Port used by that virtual host	

Item (* indicates required values)	Description	Notes
SSL Enable	Whether to additionally use SSL, HTTPS service port to be used by that virtual host	When checked, need to use port from combo box for HTTPS service port (port information to use must be pre-registered as HTTPS port in General tab's Port Info)
SSL/SSLCertificateFile	SSL certificate path	
SSL/SSLCertificateKeyFile	SSL certificate Key file path	
SSL/SSLPassword	SSL Password	When password is input, managed through AES256 encryption
SSL/Use HTTPS Redirect	Whether to use HttpHttps Redirect	
Document base/Directory Root Path	Homepage directory location of that virtual host	Can be specified to same or subdirectory using Server's DocumentRoot variable ${DOC_ROOT}
Document base/Disable Symbolic Links	Prevent accessing file system other than existing web documents under Document Root via symbolic links	
Document base/Disable Auto Index	Prevent showing file list under Document Root when welcome page cannot be found	
Document base/Allowed Methods	Allow access for specified http methods	
Document base/Deny IP	Deny access for specified networks or addresses	
Access Log/Alias	Set format for recording logs in log file	
Access Log/Location	Set location and name for log files	
URI	Select URI Pattern Group set in Connector Proxy Tab	Not required selection

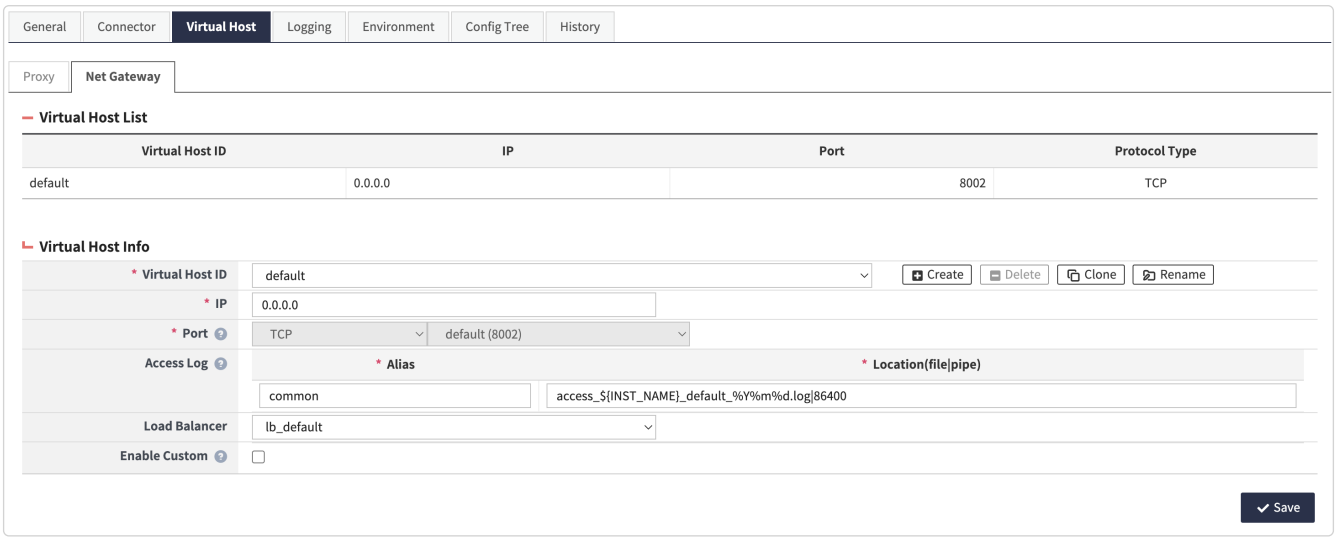
Item (* indicates required values)	Description	Notes
Enable Rewrite	Whether to use Rewrite function, creates input window below when checked	Input content is generated and stored in separate file
Enable Custom	Whether to use Custom Configuration, creates input window below when checked	Input content is generated and stored in separate file (/conf/http/vhost/custom/custom_default.conf)

Net Gateway

Net Gateway Web Server's Virtual Host information can be registered/modified/cloned/deleted.

Create button, **Delete button** can register/delete Virtual Host, **Clone button** can clone, **Rename button** can change name.

Virtual Hosts with one or more Load Balancers applied cannot be deleted. If you want to delete that Virtual Host, first change Virtual Host ID of Load Balancer to different Virtual Host ID through Connector tab.



Detailed contents of configuration information are as follows.

Managed files

- /conf/stream/vhost/vhost_{Virtual Host ID}.conf
- /conf/stream/vhost/vhost.list
- /conf/stream/vhost/custom_{Virtual Host ID}.conf

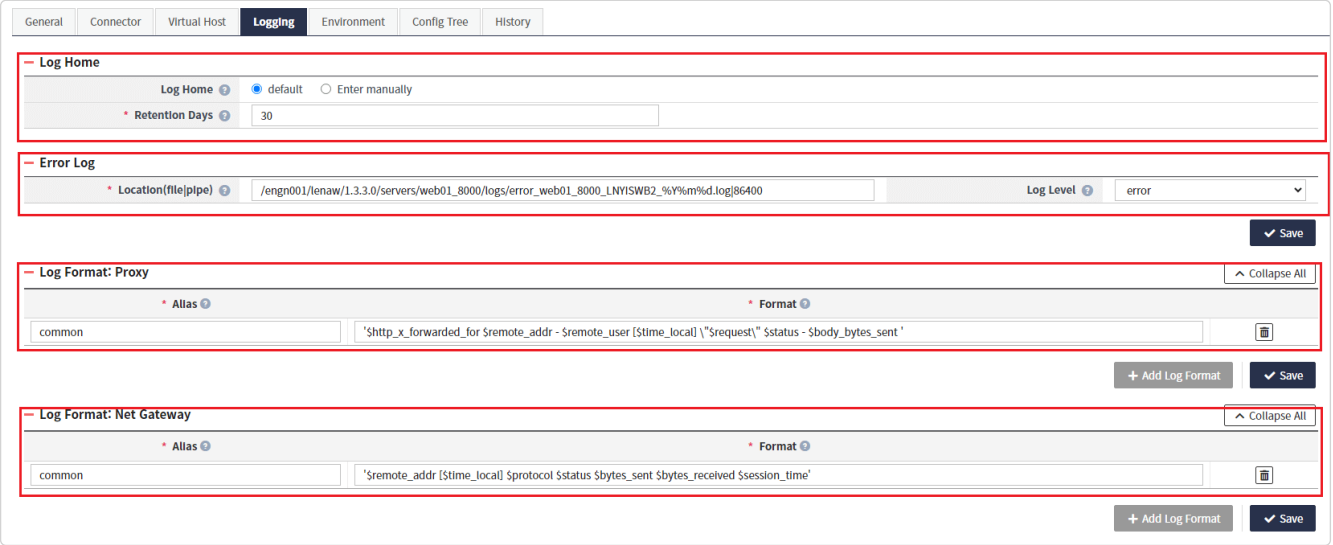
Table 89. Virtual Host Info Configuration Information

Item (* indicates required values)	Description	Notes
Virtual Host ID(*)	Virtual Host name	

Item (* indicates required values)	Description	Notes
IP(*)	Select protocol to be used by that virtual host (HTTP, HTTPS) IP used by that virtual host	
Port(*)	Port used by that virtual host	
Access Log/Alias	Set format for recording logs in log file	
Access Log/Location	Set location and name for log files	
Load Balancer	Select Load Balancer Group set in Connector Net Gateway Tab	
Enable Custom	Whether to use Custom Configuration, creates input window below when checked	Input content is generated and stored in separate file (/conf/stream/vhost/custom/custom_default.conf)

Logging

Web Server's log configuration information can be edited.



Detailed contents of configuration information are as follows.

1. Log Home

Table 90. Log Home

Item (* indicates required values)	Description	Notes
Log Home(*)	Log Home path	When default is selected, set to logs folder under server installation directory, when custom is selected Log Home Prefix item allows input of log directory home path
Retention Days(*)	Maximum retention days for logs	Default : 0(unlimited)

2. Error Log

Used when Web Server records errors that occur while processing diagnostic information and requests. When problems occur during Server startup or operation, check files at location set here first.

Table 91. Error Log

Item (* indicates required values)	Description	Notes
Location(file/pipe)(*)	Specify Web Server's error log file location	
Log Level(*)	Specify how detailed to record error log file contents	

3. Log Format : Proxy

Sets format to use for Proxy log files.

Table 92. Log Format : Proxy

Item (* indicates required values)	Description	Notes
Alias(*)	Name of log format to use	
Format(*)	Sets format for recording logs in log file	

4. Log Format : Net Gateway

Sets format to use for Net Gateway log files.

Table 93. Log Format : Net Gateway

Item (* indicates required values)	Description	Notes
Alias(*)	Name of log format to use	
Format(*)	Sets format for recording logs in log file	

When changing configuration, Server restart is required to reflect modified items

Environment

Provides screen for managing JVM options, Start Shell configuration, etc. Modify through file editor and click **Save button** to save.

- Custom Env (/bin/customenv.sh): User custom environment variable configuration
- Base Env (/env.sh) - Shell Script for Server startup

By default, configuration cannot be modified. If you want to modify, click **Configuration button** in ADMIN > Manager Environment > Manager Configuration item and change the following configuration to false.

```
server.environment.envshell.readonly=false
```

Configuration Tree

Web Server's ${SERVER_HOME}/conf directory sub configuration files can be managed through file editor.

User running Node Agent must have access permission to Web Server configuration information files for modification. If access permission is not available, message that file cannot be edited due to no Write permission is displayed.

History

Provides backup and restore functionality for configuration information. When configuration information is modified and saved, History is managed. Search by entering modification date.

Click **View(magnifying glass) button** to view information of selected file, and click **Restore button** to restore to that configuration file.

4.4.10. Server Log Viewer

Log Viewer button on right side of server list allows browsing log file contents under target server's Log Home path.

To use this functionality, the following must be satisfied.

- Node to which target server belongs must be running.

Click Log Viewer button in server list to check directories and files in tree structure based on target server's Log Home path.

When file is selected, file contents are queried, and when first selected, file contents from end of file up to predetermined size can be checked.

Use Load More, Load Previous buttons to query and check log file contents by predetermined size.

- When using Load Previous button and no more content to query (eg. beginning of file), Alert message that no more data can be read is displayed.
- When using Load More button and no more content to query (eg. end of file), message that no more data can be read is displayed at bottom of screen.

4.5. Session Server

Provides a screen for managing Session Server. You can register, modify, and delete Session Servers installed on Nodes, and execute start and stop shells.

4.5.1. List

You can manage each WAS through the Session Server List.

Figure 7. Session Server List

The properties of Session Server are as follows.

Table 94. Session Server Properties

Item (* indicates required value)	Description	Notes
Status	Session Server status	• Started(v) • Stop(□) • Error(!)
Name(*)	Session Server name	
Address	Session Server IP address	
Server ID	Server ID	
Type	Session Server type	• Standalone • Embedded
Port	Service port number	
Start/Stop button	Server start and stop	

Item (* indicates required value)	Description	Notes
Button area	Displays server information change and related function buttons	**Trash can icon** - Delete server information **Pen icon** - Modify server information **Log file icon** - Provides Server Log Viewer functionality **More icon** - Provides menu for performing Start/Stop

Session Server is a functionality provided by Enterprise Edition and is available when installing Enterprise version WAS.

4.5.2. Install

1. Click the **Install button**.
2. Enter Server ID, Service Port, and Mirror Server IP/Port.
3. Click the **Save button** to save.

There may be differences between the information of Servers actually installed on Nodes and Servers managed by Manager. (When installing via console)

If a Server ID duplication error occurs, use the Register function to check previously installed Server information.

4.5.3. Register

1. Click the **Register button**.
2. Click on the Server to register.
3. Click the **Save button** to save.

4.5.4. Modification

1. Click the **Edit(pencil) button** to change Server information to modifiable state.
2. Modify Server properties.
3. Click the **Save button** to save.

4.5.5. Deletion

1. Click the **Delete(trash can) button** to change Server information to deletable state.
2. Click the **Save button**.
3. Press the **OK button** to display a window for selecting deletion type.
    - Deregister : Delete Server information only from Manager DB and maintain physical Server engine (can be re-registered later via **Register button**)

- Uninstall : Delete Server information from Manager DB and also delete physical Server engine

4. Uninstall selection, a window asking to delete the log directory is displayed.

Servers linked to a Server Cluster cannot be deleted.

When the use Server Delete Protection value in the Manager Environment menu of ADMIN > Preference > Manager Environment is set to true, Manager can prevent the server from being uninstalled.

4.5.6. Start/Stop

1. Click the **Stop button** to stop the Server.
2. Click the **Start button** to start the Server.

Only when the Server is in a state where it can be started, the **Start button** is activated.

4.5.7. Setting Information Management

General

Provides functionality to change Server settings. When you select a Server in the Session Server list, you will be taken to a screen to manage the settings.

The properties that can be changed in the environment settings are as follows.

1. Configuration

Table 95. Configuration

Item (* indicates required value)	Description	Notes
Host(*)	Server's Service Host (IP)	
Port(*)	Server's Service Port	
Mirror Server Host(*)	Pair Server's Host (IP)	
Mirror Serror Port(*)	Pair Server's Service Port	
Share session in applications	Setting for sharing Session between Multi Applications.	You must process this item with the same value in WAS. Only available in standalone.

2. Connected WAS List

Refresh button to refresh the list.

Table 96. Connected WAS List

Item (* indicates required value)	Description	Notes
Server ID	WAS ID	
Host	Host name where WAS is installed	

3. Status (Provides Session Server status information)

Refresh button to refresh the list.

Table 97. Status

Item (* indicates required value)	Description
Session Count	Current number of Sessions
Logout Count	Number of Sessions logged out due to Logout request
Session Max Count	Maximum number of Sessions stored
Session Timeout	Session timeout time (ms)
Request Getnew Logout	Number of Logout responses for GET_FRESH Request received from WAS
Data From Nodes	Number of Sessions received from WAS
Request Getnew Nodata	Number of NODATA responses for GET_FRESH Request received from WAS
Request Getnew	Number of times increased when GET_SESSION Request was made from WAS
Pid	Process ID when Session is standalone
Request Getfresh Data	Number of times increased when GET_FRESH Request was received from WAS and the corresponding Session existed
Request Getfresh Logout	Number of times increased when GET_FRESH Request was received from WAS and the corresponding Session was Logout
Session Recv Lost	Number of Session receive losses
Logout From Nodes	Number of Logouts received from other WASs
Session Expired	Number of Sessions expired due to Session Time Out
Request Getfresh Nodata	Number of times increased when GET_FRESH_SESSION request was made from WAS and no data was found
Data From Secondary	Number of Data received from Slave server
Request Getfresh	Number of GET_FRESH Request requests from WAS

Item (* indicates required value)	Description
Logout From Secondary	Number of Logout requests received from Slave Server
Req Lost	Number of Request losses
Request Getfresh Secondary	Number of GET_FRESH Request requests from Slave Server
Resp Lost	Number of Response losses due to size of Response Queue exceeding
Request Getfresh Not New	Number of NOT_NEW responses for GET_FRESH Request received from WAS
Request Getnew Secondary	Number of times increased when GET_SESSION request was made from Slave Server

Logging

You can edit the Session Server log settings.

The detailed contents of the settings are as follows.

1. Log Home

Table 98. Log Home

Item (* indicates required value)	Description	Notes
Log Home(*)	Log Home path	When default is selected, it is set to the logs folder under the server installation directory, and when manually selected, you can enter the log directory home path in the Log Home Prefix field
Retention Days(*)	Maximum retention days for logs	Default: 0 (unlimited)

Environment

Provides a screen for managing Start Shell settings. Modify using a file editor and click the **Save button** to save.

- Base Env ($CATALINA_HOME/env.sh) - Shell Script for starting Server

By default, settings are disabled for modification, but if you want to modify them, click **Settings button** in ADMIN > Manager Environment > Manager Configuration to change the following settings to false.

```
server.environment.envshell.readonly=false
```

4.5.8. Server Log Viewer

You can search for log file contents under the Log Home path of the target Server via the Log Viewer button on the right side of the Server list.

To use this functionality, you must meet the following requirements.

- The Node to which the target Server belongs must be running.

Clicking the Log Viewer button on the Server list will allow you to check the directory and files based on the Log Home path of the target Server in a tree structure.

Selecting a file will allow you to view the file content, and when you first select it, you can check the file content up to a predetermined size from the end.

You can view and check the content of log files in a predetermined size using Load More and Load Previous buttons.

- When there is no more content to search (e.g., at the beginning of the file), a message "No more data to read" will be displayed in Alert.
- If you use Load More and there is no more content to search (e.g., at the end of the file), a message "No more data to read" will be displayed at the bottom of the screen.

Chapter 5. Cluster

5.1. Server Cluster

A Server Cluster is a group of Application Servers and Web Servers running with the same configuration to provide the same service.

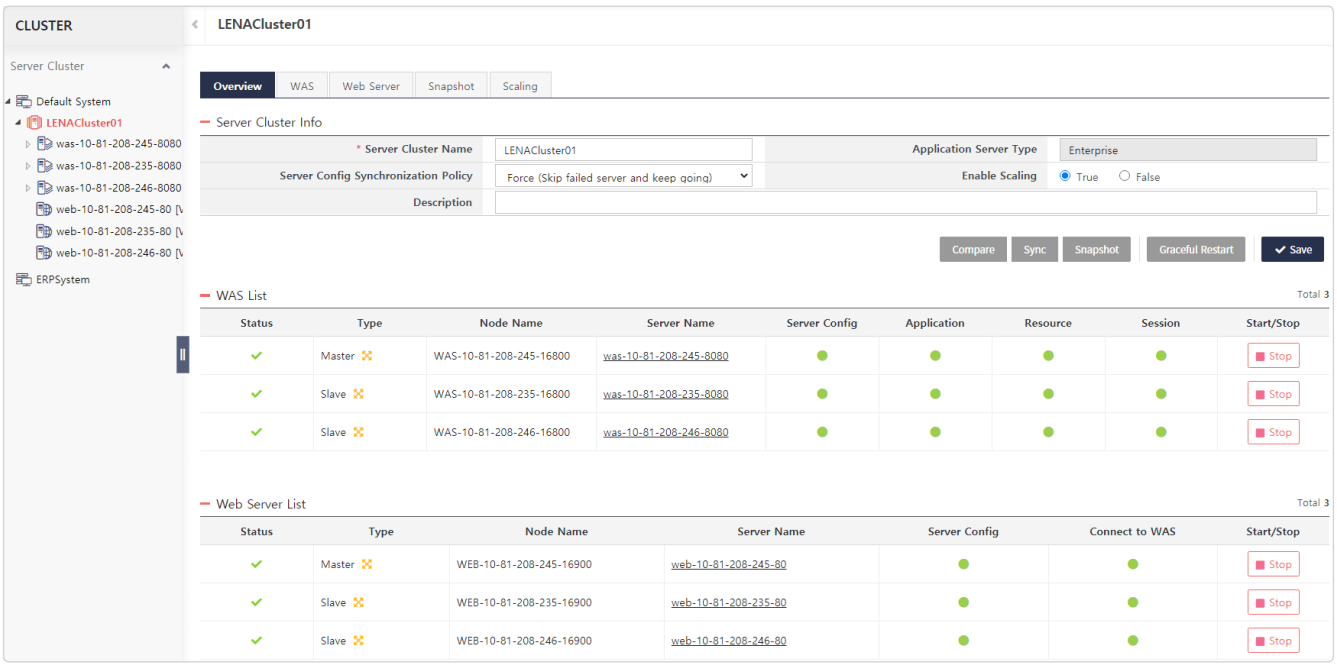


Figure 8. Server Cluster screen

5.1.1. Server Cluster List

You can check the list of Server Clusters registered in Manager by selecting Server Cluster from the left menu.

The properties provided in the Server Cluster List table are as follows.

Table 99. Server Cluster properties

Item	Description	Note
Select	Combo box for deletion	
Server Cluster Name	Cluster name	
Servers	The number of each Server that composes the Server Cluster 1. Application Servers 2. Web Servers	

5.1.2. Create Server Cluster

When creating a Server Cluster, select the list of Application Servers and Web Servers that will

compose the Server Cluster.

1. Select a Server Cluster Group and click the **+New** button at the bottom of the Server Cluster list to open the create screen.
2. Enter the basic information for the Server Cluster.
   - Server Cluster Name: Enter the Server Cluster name.
   - Application Server Type: Select the Application type to be used as a member of the Server Cluster. There are two types: Standard and Enterprise.
   - Enable Scaling: Select whether to use Auto Scaling. This option cannot be changed after the server cluster is created. (This feature is supported only in the Container Edition and requires setting scaling.enable=true in manager.conf.)
   - Description: Enter necessary descriptions related to the Server Cluster.
3. The server list corresponding to the selected Application Server Type appears in the "Application servers in server cluster" area below. From Selectable Servers, click the desired server and then click the **>>** button to move it to the Selected Servers area. Do the same for the "Web Servers in server cluster" area: select servers from Selectable Servers and click the **>>** button to move them to Selected Servers.

Since one Server can only be assigned to a single Server Cluster, only Application Servers and Web Servers that are not mapped to other Server Clusters are listed in Selectable Servers.

4. Click the **V Save** button to save.
5. Verify in the left tree that a menu with the entered server cluster name has been added.

5.1.3. Delete Server Cluster

1. In the left Server Cluster tree menu, select the Server Cluster Group.
2. In the Server Cluster List, select the checkbox in the Select column for the Server Cluster to delete.
3. Click the **- Delete** button to delete.

5.1.4. Server Cluster Details

Overview

Select a Server Cluster from the left menu or from Server Cluster Group details to open the Overview screen for the Server Cluster.

The items and buttons in the Server Cluster details area provide the following functions.

Table 100. Items and buttons in the Server Cluster details area

Item or Button	Function
Server Cluster Name	Server Cluster name
Application Server Type	Application Server type configured in the Server Cluster (not changeable)

Item or Button	Function
Server Config Synchronization Policy	Policy when an error occurs during Server Cluster synchronization (selecting the **Sync** button) The options for Server Config Synchronization Policy are as follows (default: Stop): 1. Stop: Stop immediately when an error occurs during synchronization 2. Rollback: Roll back everything when an error occurs during synchronization 3. Force: Skip the server where the error occurred and continue with the next
Enable Scaling	Whether to use Auto Scaling for this Server Cluster (not changeable)
Description	Description of the Server Cluster
Compare	Compares the synchronization status of Application Servers, Web Servers, and Session Servers in the Server Cluster. The comparison items by Server type are as follows, and they are displayed in the columns of each Server list area below. Server Config, Application, Resource, and Session comparisons are based on the Master Server of each Server type. **Application Server** • Server Config: Whether Application Server configuration information is the same • Application: Whether applications deployed on each Application Server are the same • Resource: Whether resource settings are the same • Session: Whether the Session Server settings for session clustering are the same **Web Server** • Server Config: Whether Web Server configuration information is the same • Connect to WAS: Whether it is linked to all Application Servers in the Server Cluster
Sync	Synchronizes the Server Config, Application, Resource, and Session information of Application Servers in the Server Cluster. Also synchronizes the Server Config and WAS linkage information of Web Servers in the Server Cluster.

Item or Button	Function
Snapshot	Saves the current state as a Snapshot for the synchronized Server Cluster. You can check the created Snapshot in the Snapshot tab. The Snapshot includes Application Sources. Therefore, creating too many Snapshots can consume a lot of system disk space. Create Snapshots only when necessary and delete unnecessary Snapshots via the Snapshot tab.
WAS Scaling Template	Copies files from the WAS Master Server to create a Scaling Template for use in sync mode scaling. The target files are the same as those configured as sync targets in the Config feature of the WAS tab. This button is displayed only when scaling is enabled and the Scaling Mode is sync.
Web Scaling Template	Copies files from the Web Master Server to create a Scaling Template for use in sync mode scaling. The target files are the same as those configured as sync targets in the Config feature of the Web Server tab. This button is displayed only when scaling is enabled and the Scaling Mode is sync.
Graceful Restart	Sequentially restarts Web Servers and Application Servers in the Server Cluster. Since it performs a graceful stop, the server stops after all processing threads finish. The procedure is as follows. Steps in parentheses are optional. 1. Web Server Stop 2. Application Stop 3. (Upload Application Source) 4. Application Server Start 5. (Start Web Server in staging port for testing) 6. Web Server Start
V Save	Saves changes to the Server Cluster details.

Check synchronization status

To check the synchronization status of the Server Cluster, click the **Compare** button and then view the results in the columns below each Server list.

If the state is the same or valid, the status is shown as **green circle icon**.

If server states differ, it is shown as **red circle icon**. Clicking the icon opens a popup window to see detailed information by Server.

You can also click a Server Name in each list to navigate to that server's detail screen.

- Application Server Server Config details

  Comparison results of configuration files are displayed. Click the **magnifier** button in the Detail

column next to the file name to view detailed comparison results (last modified date, config file content) versus the Master server.

- Application Server Application details

  Shows comparison results of application deploy status.

- Application Server Resource details

  Shows comparison results of Application Server resources.

- Application Server Session details

  Shows comparison results of Session settings. The popup provides the session information configured on the Master Server.

- Web Server Server Config

  Shows comparison results of configuration files. Click the **magnifier** button in the Detail column next to the file name to view detailed comparison results (last modified date, config file content) versus the Master server.

- Web Server Connect to WAS

  When the Web Server is linked only to all Application Servers that belong to the Server Cluster, it is displayed as **green circle icon**. Otherwise, it is displayed as **red circle icon**. Click the **red circle icon** to open a popup and check details.

  The popup shows details on whether the Application Servers linked to the Web Server are all registered in the Server Cluster (Web Server Status). It also shows whether all Application Servers registered in the Server Cluster are linked to the Web Server (Application Server Status).

Perform state synchronization

To perform synchronization for the Server Cluster, click the **Sync** button. The results can be checked in the columns below each Server list.

Graceful Restart

The Graceful Restart feature is used to restart all servers in the Server Cluster while ensuring that in-progress tasks complete. It proceeds as follows (applies to all servers in the Server Cluster):

1. Before starting Graceful Restart

   Click the Start Process button to begin the Graceful Restart.

2. Web Server Stop phase

   Stop the Web Server. It stops after all running threads finish.

3. Application Server Stop phase

   Stop the Application Server. This phase starts after all Web Servers have stopped.

4. Source deployment (optional) phase

   Deploy the application source to the Application Server. If you have a separate deployment system, this step is optional.

5. Application Server Start phase

   Start the Application Server. You can also view the startup logs.

6. Start Web Server in Staging mode (optional) phase

   Start the Web Server in Staging mode (optional). This allows testing on a staging port in an environment identical to production before opening to end users.

7. Web Server Start phase

   Start the Web Server in Staging mode (optional). This allows testing on a staging port in an environment identical to production before opening to end users.

8. Complete Graceful Restart

Application Server

This tab manages the list of Application Servers in the Server Cluster and the items targeted for synchronization.

The detailed information for the server list at the top of the tab is the same as in Overview.

Synchronization target items

Manage server configuration files

Click the **Config** button to open a popup where you can select the Master Server for Application Servers, specify the config files to synchronize, and choose whether to synchronize JDBC drivers.

- Master Server

  Specify the Master Server among Application Servers in the Server Cluster.

- Server Configs for Synchronization

  This is the list of files to be kept identical across Application Servers in the Server Cluster. A basic list is registered when the Server Cluster is created, and you can add/remove files as needed for your project. The path is relative to the Application Server home.

- Sync JDBC Drivers

  Choose whether to include all jar files under Manager Repository path /lib/datasource/ in the sync targets.

To prevent runtime errors due to jar changes, JDBC drivers are synchronized only when the driver does not exist on the target server.

Manage Applications

When you select a server from the Application Server list, you can view application details for the selected server via the Application tab at the bottom. The screens and functions provided are the same as described in Application. Therefore, detailed function descriptions are omitted here.

Manage Resources

When you select a server from the Application Server list, you can view details of DataSource, JMS, and JTA for the selected server via the DataSource, JMS, and JTA tabs at the bottom.

The screens and functions provided are the same as described in Datasource, JMS, and JTA. Therefore, detailed descriptions are omitted here.

Manage Session

When you select a server from the Application Server list, you can view session details for the selected server via the Session tab at the bottom.

The screens and functions provided are the same as described in Session. Therefore, detailed descriptions are omitted here.

Manage WAS list

Use the **Clone**, **Join**, or **Unjoin** buttons to include or exclude Application Servers in the Server Cluster.

- Clone

  Click the **Clone** button to install a new server with the same settings as the Master server and register it in the Server Cluster.

Table 101. Clone popup item descriptions

Item	Function
Post Processing Options	• Cloned Server Start: Whether to start the server after clone • All Web Server Sync: Synchronize linkage with Web Servers after clone • All Web Server Graceful Restart: Whether to restart Web Servers after clone
Node List	Node where the cloned server will be installed
Server ID / Clone Service Port	Enter the ID and Service Port for the cloned server
Include External Source	Select Y if the application source is located outside the server and you want to clone that source as well

- Join

  Click the **Join** button to add already created, registrable Application Servers to the Server Cluster.

- Unjoin

  Click the **Unjoin** button to remove servers registered in the Cluster from the Cluster list.

Application Server synchronization and comparison

- Compare

Click the **Compare** button to compare the synchronization status of Application Servers in the Server Cluster.

- Sync

  Click the **Sync** button to synchronize Application Server Server Config, Application, Resource, and Session settings in the Server Cluster.

Scaling Template

Click the **Scaling Template** button to copy files from the WAS Master Server and create a Scaling Template for use in sync mode scaling. The files copied are the same as the sync target files configured in Config. This button is visible only when scaling is enabled and the Scaling Mode is sync.

Rolling Restart

Rolling Restart is used to sequentially restart Application Servers within a Server Cluster.

Since this feature is performed on target servers to be restarted, stopped servers are excluded. Select the target servers from the server list and click the **Rolling Restart** button to open the Rolling Restart popup.

Before starting Rolling Restart, the user can set the interval between server restarts and whether to Force Stop in the Execution option area of the popup. In the Rolling Restart area, you can monitor the sequential restart status of the selected servers.

Table 102. Rolling Restart popup item descriptions

Node	Node name where the server is installed
Server	Server name
Server Status	Current server run status
Stop Status	Server stop task status
Start Status	Server start task status
Action	For a server being restarted, the **Force Restart** and **Next** buttons are provided.
Interval	Remaining wait time for the server. Starts from the value set in Interval in the Execution Option area and counts down to 0, then proceeds to restart the next server.
Elapsed time	Processing time for the restart

Web Server

This tab manages the list of Web Servers in the Server Cluster and the items targeted for synchronization.

The detailed information for the server list at the top of the tab is the same as in Overview.

Synchronization target items

Manage server configuration files

When you click the **Config** button, a popup is provided where you can select the Master Server for Web Servers and set the list of configuration files to synchronize.

- Master Server.

  Specify the Master Server among Web Servers in the Server Cluster.

- Server Configs for Synchronization:

  This is the list of files to be kept identical across Web Servers in the Server Cluster. A basic list is registered when the Server Cluster is created, and you can add/remove files as needed. The path is relative to the Web Server home.

Connector

You can view and modify detailed connector information for the Web Server.

When you select a server from the Web Server list, you can view connector details for the selected server via the Connector tab at the bottom. The screens and functions provided are the same as described in Connector. Therefore, detailed descriptions are omitted here.

Manage Web Server list

Use the **Clone**, **Join**, or **Unjoin** buttons to include or exclude Web Servers in the Server Cluster.

- Clone

  Click the **Clone** button to install a new server with the same settings as the Master server and register it in the Server Cluster.

Table 103. Clone popup item descriptions

Item	Function
Post Processing Options	• Cloned Server Start: Whether to start the server after clone
Node List	Node where the cloned server will be installed
Server ID / Clone Service Port	Enter the ID and Service Port for the cloned server
Include External Source	Select Y if the source is outside the server and you want to clone that source as well

- Join

  Click the **Join** button to add already created, registrable Web Servers to the Server Cluster.

- Unjoin

  Click the **Unjoin** button to remove servers registered in the Cluster from the Cluster list.

Web Server synchronization and comparison

- Compare

  Click the **Compare** button to compare the synchronization status of Web Servers in the Server Cluster.

- Sync

  Click the **Sync** button to synchronize Web Server Server Config and Connect WAS in the Server Cluster.

When you click the Sync button for Web Server, it synchronizes Web Server settings and interconnects all Web Servers and WAS in the Server Cluster in a full-mesh structure. If you want to synchronize only configuration without changing to a full-mesh structure, we recommend composing separate Server Clusters for Web Server and WAS respectively.

Scaling Template

Click the **Scaling Template** button to copy files from the Web Master Server and create a Scaling Template for use in sync mode scaling. The files copied are the same as the sync target files configured in Config. This button is visible only when scaling is enabled and the Scaling Mode is sync.

Rolling Restart

Rolling Restart is used to sequentially restart Web Servers within a Server Cluster.

Since this feature is performed on target servers to be restarted, stopped servers are excluded. Select the target servers from the server list and click the **Rolling Restart** button to open the Rolling Restart popup.

Before starting Rolling Restart, the user can set the interval between server restarts and whether to Force Stop in the Execution option area of the popup. In the Rolling Restart area, you can monitor the sequential restart status of the selected servers.

Table 104. Rolling Restart popup item descriptions

Node	Node name where the server is installed
Server	Server name
Server Status	Current server run status
Stop Status	Server stop task status
Start Status	Server start task status
Action	For a server being restarted, the **Force Restart** and **Skip** buttons are provided.
Interval	Remaining wait time for the server. Starts from the value set in Interval in the Execution Option area and counts down to 0, then proceeds to restart the next server.
Elapsed time	Processing time for the restart

Snapshot

When you click the Snapshot button on the Overview tab, a window for creating a Snapshot appears, and clicking OK creates a Snapshot of the Server Cluster.

Snapshots can be created only when the Server Cluster is in a synchronized state.

The Snapshot tab provides a screen to manage the list of Snapshots. Enter a date to query Snapshot history. You can view details of Snapshot history and restore to a desired point in time.

Click the **list button** in the Detail column of the Snapshot list to view details for that snapshot.

Snapshot information is managed per server, so servers added to the Cluster after a particular Snapshot was created are excluded from restoration to that Snapshot. (In this case, after restoring the Snapshot, perform Sync again so that all servers have the same configuration.) Also, if a specific server is deleted from the Cluster after a Snapshot, all Snapshot information for that server is deleted. When creating a Snapshot, source code is not copied to the Snapshot; the copied configuration files include only basic configuration files, application configuration files, and enterprise.xml.

Creating Snapshots can put a load on disk capacity, so create with care. Also, created Snapshots are not deleted automatically; the user must delete them manually. Therefore, we recommend deleting unnecessary Snapshots at an appropriate time.

5.1.5. Scaling

When creating a Server Cluster, if you set the Enable Scaling option to True, LENA supports service scaling that works with the CSP or cloud platform's Auto Scaling (Infra Scaling). This feature is supported only when the VM OS is Linux and when an Init-Script (e.g., AWS EC2 UserData) is available at VM instance creation.

In a cloud environment, scaling is generally performed as follows:

1. Create a VM image (an image that includes LENA Node, LENA Server, applications, etc.)
2. Write the VM Init-Script
3. Configure the Scaling Policy in LENA Manager
4. When a preconfigured Scaling Trigger condition (resource threshold) occurs, the CSP/cloud platform performs VM Auto Scale-out (CSP/Cloud platform area)
5. On VM Scale-out, according to the cloud Init-Script, register the LENA Node Agent and Servers, synchronize settings, and issue licenses (LENA area)
6. When the resource threshold returns to normal, perform VM Scale-in (CSP/Cloud platform area)
7. After VM Scale-in, if the Node Agent alive check fails as many times as set in LENA Manager, remove the corresponding Node and Servers from LENA Manager (LENA area)

Below describes the LENA scaling area among the steps above: configuring Scaling Policy, VM Init-Script details, and registering LENA Node Agent/Servers.

Scaling is executed by setting the required environment variables within the Init-Script that runs during Infra Scaling and calling the LENA scaling command scale.sh for scale-out. According to rules configured in Manager, when the Node Agent becomes unreachable or when the VM terminates, scale-in is executed either automatically or explicitly by calling stop-agent.sh with options.

- Scale Out

Scale-out is performed by setting environment variables and calling scale.sh. For example, on AWS,

write and run the script in the UserData of the Auto Scaling Group's launch template. A Manager Scaling License must be deployed in advance so that the scaling license can be downloaded and the server can start normally.

- Init-Script Set the required environment variables in the init script and call scale.sh. The environment variables referenced by scale.sh for scale-out are as follows.

Table 105. scale.sh environment variables

Environment Variable	Description
LENA_MANAGER_ADDRESS	• Required. The service address of the LENA Manager that will perform scaling operations for Nodes and Servers. The format is {IP}:{HttpPort}. • You can configure fail-over for a redundant Manager via this variable. If multiple Manager addresses are provided separated by commas (","), it attempts to connect to the second Manager when the first fails. The process repeats until the connection to a Manager succeeds within the specified period (default 10 minutes).
JAVA_HOME	• The Java installation path used by the Node Agent and Servers.
LENA_CLUSTER_NAME	• Server Cluster name. The name of the Server Cluster in which the scaled Server will be registered. Scaling succeeds only when an existing Server Cluster name is provided.
LENA_USER, LENA_GROUP	• OS user and group to run the Node Agent and Servers.
LENA_WAS_SCALING	• Whether to scale the WAS server.
LENA_WAS_HOME	• The install path of the WAS server.
LENA_WAS_AGENT_PORT	• The Node Agent service port of the WAS server.
LENA_WEB_SCALING	• Whether to scale the Web server.
LENA_WEB_HOME	• The install path of the Web server.
LENA_WEB_AGENT_PORT	• The Node Agent service port of the Web server.
LENA_WEB_OPENSSL_VER	• The OpenSSL version installed on the OS, required to start the Web server. • Supported versions are 1.0.1, 1.0.2, 1.1.1. Default is 1.0.2.
LENA_IMAGE_TYPE	• VM image type: 'base' (only LENA packages installed) or 'golden' (servers already installed). 'base' corresponds to Scaling Mode 'clone', and 'golden' corresponds to Scaling Mode 'sync'/'nosync'.

Environment Variable	Description
WAS_CONFIG_DATA	• Per-WAS configuration in JSON format. You can set Session Cluster and DataSource information that will change the installed Server's configuration.

Example: Apply env vars and call scale.sh (Init-Script)

```
export LENA_MANAGER_ADDRESS=10.200.30.213:7700,10.200.30.214:7700
export LENA_CLUSTER_NAME=cust-g3r
export LENA_USER=lena
export LENA_GROUP=lena

export LENA_WAS_SCALING=Y
export LENA_WAS_HOME=/engn001/lena/1.5.0
export LENA_WAS_AGENT_PORT=16800

export LENA_WEB_SCALING=Y
export LENA_WEB_HOME=/engn001/lenaw/1.5.0
export LENA_WEB_AGENT_PORT=16900
export LENA_WEB_OPENSSL_VER=1.0.2

export LENA_IMAGE_TYPE=base

export WAS_CONFIG_DATA='[
     {
         "server_id": "comm_core_was-8980",
         "session_cluster": {
             "primary_port": "5480",
             "secondary_port": "5480"
         },
         "datasource": [
             {
                 "jndi_name": "jdbc/petclinic",
                 "url": "jdbc:mysql://10.200.30.7:63306/petclinic"
             }
         ]
     }
 ]'

if [ "$LENA_WAS_SCALING" = "Y" ]; then $LENA_WAS_HOME/bin/scale.sh; fi
if [ "$LENA_WEB_SCALING" = "Y" ]; then $LENA_WEB_HOME/bin/scale.sh; fi
```

• Scale-in

Scale-in unregisters the Node and Servers that were registered during scale-out. It can be done in two ways: 1) Automatically, when Manager's scheduler detects unresponsive Node Agents and unregisters the Node and Servers on that Node; or 2) Explicitly, by calling stop-agent.sh with options. The options for stop-agent.sh are as follows.

Table 106. stop-agent.sh options

Option	Description
-ur${Manager Address(IP:Port)}	• Required. Unregisters the Node or Server from Manager. • The parameter is the Manager address in the format ${IP}:${HttpPort}. • Supports Manager fail-over. If multiple Manager addresses are provided separated by commas (","), it attempts to connect to the second Manager when the first fails.
-f	• Optional. Force unregister. • When set, the target is unregistered from the Server Cluster as well.
-rt ${time - milliseconds}	• Optional "Retry Time" • Retries for the specified time. The retry interval is 3 seconds. The default retry time is 10 seconds.

Option usage example

```
# Remove Node/Server information from Manager.
# The server's usage is excluded from Manager license usage calculation.
stop-agent.sh -ur 10.80.44.55:78700 -f
```

Scaling Overview

When you select the Scaling tab, the table at the top shows the current scaling status by Node type.

- Initial Node: The number of nodes currently included in the Server Cluster
- Scaled Node: The number of nodes created according to the scaling policy
- Today Event: Number of scaling events that occurred today
- Latest Event: The time the most recent scaling event occurred

Policy

You can define policy information such as naming rules applied during scaling.

Common Policy

- System: System name to apply scaling
- Sync Button Enabled: Whether to enable the Sync button in the Server Cluster feature
- Scaling Mode: Server scaling type
  - nosync: Register Node and Server and add them to the Cluster
  - sync: Register Node and Server, add to Cluster, then perform Cluster-Config-based sync. Sync is performed only on newly scaled Servers.
  - clone: Register Node and add to Cluster, then clone the Master Server to install the Server and add it to the Cluster and perform Web/WAS sync
- Web-WAS Connection Scope: Web-WAS linkage method
  - none (Using Proxy): Do not perform Web-WAS linkage

- JK Mesh - Cluster Servers: Link servers within the same Cluster. For Web, link newly registered Web servers with all servers in the Cluster. For WAS, link newly registered WAS servers with Web servers in the Cluster. In nosync mode, do not synchronize LoadBalancers configured in Web servers; instead, link each LoadBalancer to WASs in the Cluster to support blue-green deployment.
- JK Mesh - Servers on same machine: Link only Web-WAS on the same VM

WAS Node

- Node Naming Rule: Naming rule for WAS nodes
- Server Naming Rule: Naming rule for WAS servers
- Wait For WAS Start Up: Whether to wait for the WAS to start after scale-out. If 'Y', subsequent steps (e.g., WEB server restart) proceed after start.
- Wait Time for WAS Start Up: Maximum wait time for WAS start. Even if 'Wait For WAS Start Up' is 'Y', the next step proceeds after this time elapses.

WEB Node

- Node Naming Rule: Naming rule for WEB nodes
- Server Naming Rule: Naming rule for Web servers

The conventions (reserved words) available in naming rules are:

- #{IP}: Node/Server IP address with each octet separated by '-'
- #{IP[4]}: The 4th octet of the Node/Server IP address
- #{PORT}: Node Agent or Server HTTP service port
- #{MASTER_NAME}: Master Server name
- #{HOSTNAME}: Host name of the VM where the Node/Server is installed
- #{HOSTNAME[R4]}: Rightmost 4 characters of the VM host name

After entering the information for each item, click the **Save** button to save.

WAS Scaling Template / Web Scaling Template

In sync mode scaling, you can view the list and contents of files to be synchronized. The file list shown is created by manually copying from the Master Server of the Server Cluster. Click the **Create** button to create files manually. Click the **magnifier button** to view file details and compare with the current configuration on the Master Server.

History

You can query the history of scaling events by date and time. Select the date the scaling occurred, enter the time, and click the **Search** button to query the scaling events at that time.

The scaling feature is available only in Enterprise Edition.

5.2. Service Cluster

Service Cluster is a logical grouping for managing Containers. It is registered under System and can be created by selecting Standard Application Server, Web Server, or Session Server. You can view information about currently running Containers and history of terminated Containers. Additionally, Standard Application Server and Web Server provide Template management functionality. Through

Templates, you can manage configuration information for Standard Application Server and Web Server, and create and manage Revisions. When creating/starting Container Images, you can download Templates and apply the information configured in Service Cluster to Containers.

Service Cluster functionality can only be used when both Manager and Container Server are running Linux OS.

5.2.1. Service Cluster Creation

1. Select a System and click the **New button** below the Service cluster list to display the new registration screen as shown below.

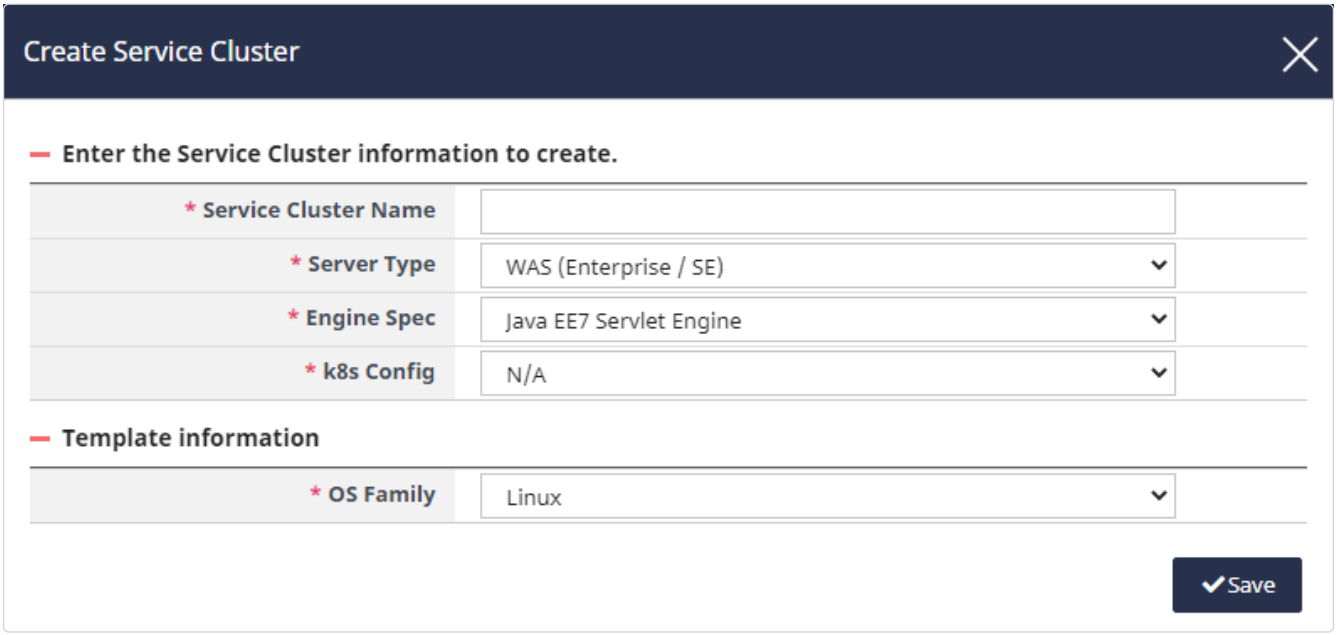


Figure 9. Service Cluster Creation Popup

2. Enter the Service Cluster Name.
3. Select the Server Type. (WEB Server, Application Server, Session Server)
4. Select the k8s Config. You can select k8s Config registered in Resources, or select N/A if no Configuration exists.
5. Select the OS Family. The Server Template type is selected based on your choice, with Linux being the default.

5.2.2. Service Cluster Deletion

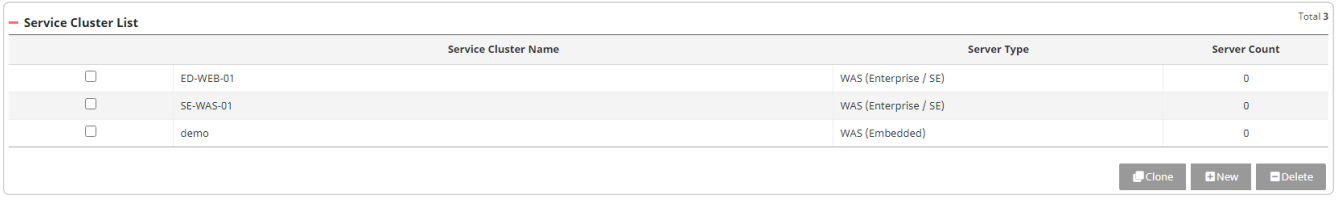


Figure 10. Service Cluster List

1. Check the combo box of the Service Cluster to be deleted from the Service Cluster list.
2. Click the **Delete button** to delete it.

5.2.3. Service Cluster Clone

1. Select a System and click the **Clone button** below the Service cluster list to display the screen as shown below.

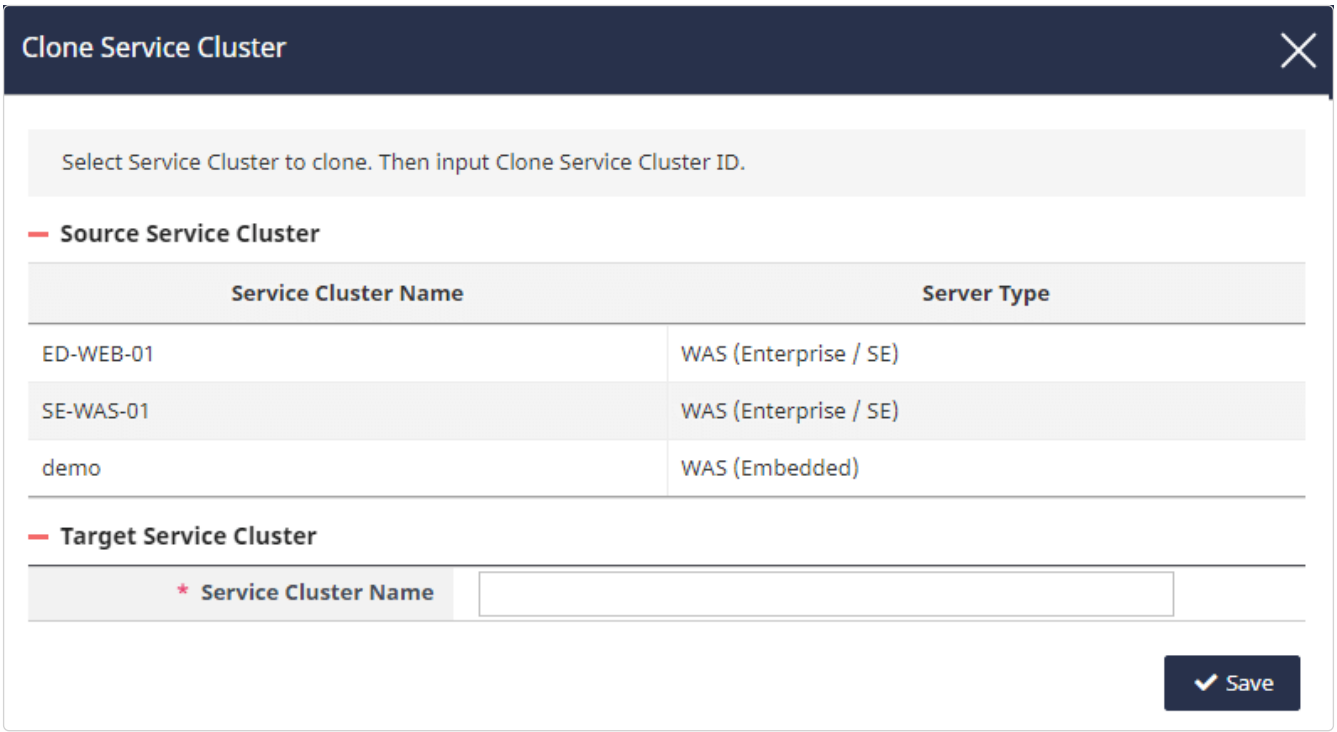


Figure 11. Service Cluster Clone Popup

2. Select the target Service Cluster to clone, enter the name for the newly created Service Cluster, then click the 'Save' button to create a Service Cluster by cloning the Default Revision of the selected Service Cluster.

If the target Service Cluster for cloning has no Default Revision, Configuration files are created using the default Template.

5.2.4. Service Cluster Overview

1. Select a Service Cluster from the left menu or Service Cluster Group details to display the Overview screen for the Service Cluster.

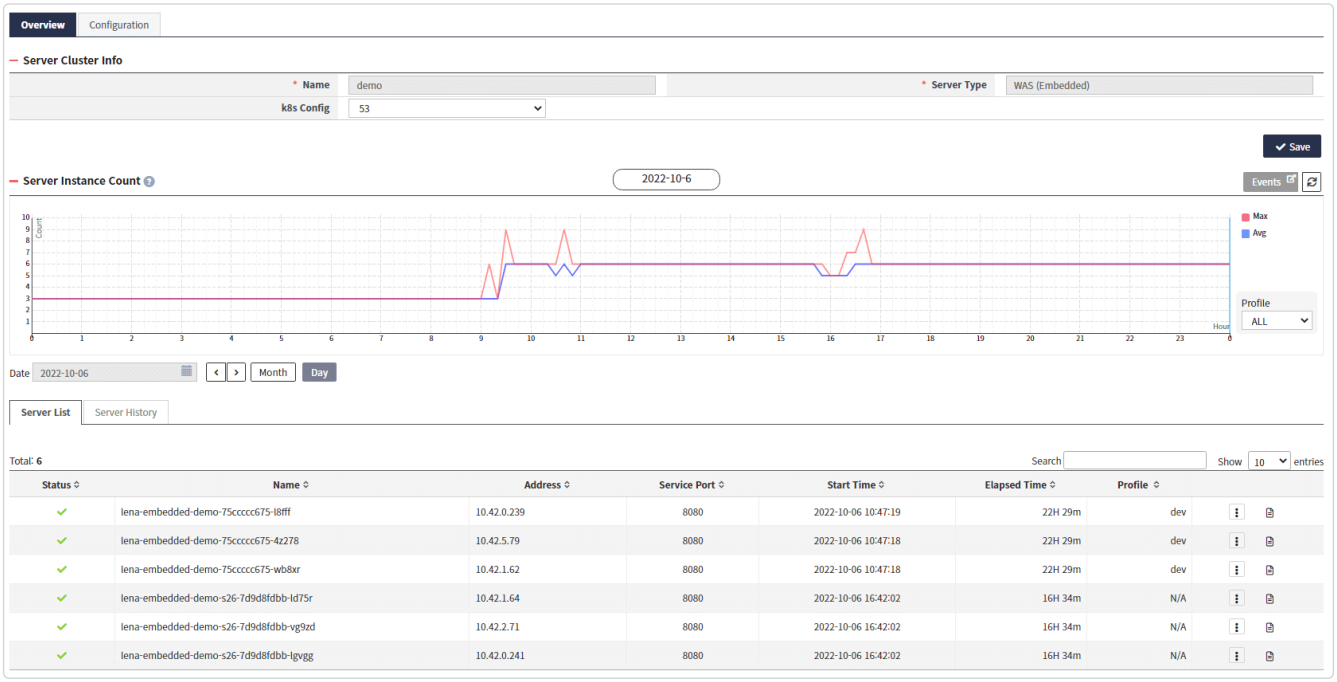


Figure 12. Service Cluster Overview

Service Cluster Info

View and modify basic information of the Service Cluster.

Item	Description
Name	Service Cluster name
Server Type	Type of Server supported by the Service Cluster
Service Endpoint	Service endpoint address. Session servers have 2 endpoints configured as they use redundancy by default.
k8s Config	Kubernetes Config information referenced by the Service Cluster. Used when using Log / Terminal functionality. Kubernetes Config is managed in Resources.

Service Instance Count

Shows the number of running Containers in a graph based on Month/Day. When using Month as the basis, it shows the cumulative number of Servers by date in a graph. When using Day as the basis, it shows the cumulative number of Servers by hour in a graph.

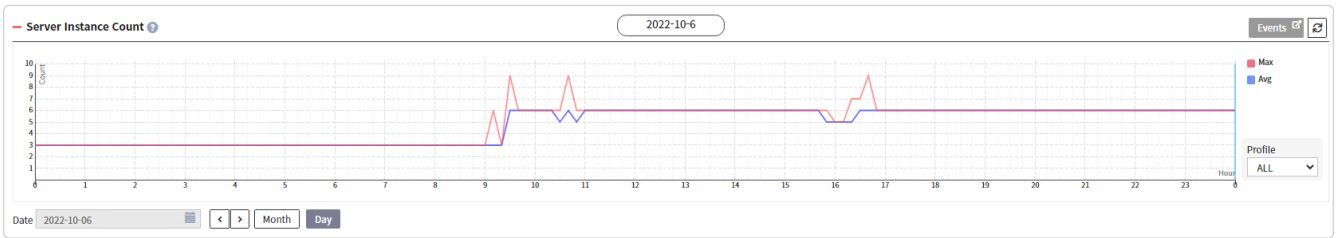


Figure 13. Server Instance Graph

Button Name	Description
Events	Moves to the Event Dashboard screen of the current Server Cluster.

Button Name	Description
Server List	Queries running Containers based on the Server Cluster.
Server History	Queries terminated Containers based on the Server Cluster.

Server List

Shows a list of currently running Servers. Through the ⋮ button, you can view Server logs and connect to Terminal.

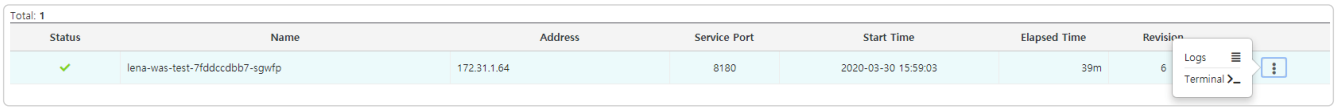


Figure 14. Server List

Log / Terminal functionality can only be used in Service Clusters where k8s Config is configured.

Server History

Shows a list of Server history. Displays start/stop times, address information, and referenced Revision information.

Figure 15. Server History

The Container start time is the Server start time, and the stop time refers to when the monitoring information communication (UDP communication) with the Manager was disconnected.

5.2.5. Application Server Template Management

Modifies the configuration information Template for Application Server and creates Revisions. Once a Revision is created, the Template configuration information can be applied to Containers.

Unlike general VM/HOST-based methods, after Server configuration, the Template must be downloaded during the Container redeployment process for the configuration to be applied.

Server Template Overview

Select a Service Cluster from the left menu or Service Cluster Group details and click the Template tab to display the Service Template Overview screen. Shows OS Family information and current Revision information.

Server Template Configuration Management

Provides functionality to change Web Server configuration information. When you select a Server from the Web Server list, it moves to a screen for managing configuration information.

Summary

Click the Summary tab at the bottom of the Template tab in Service Cluster to display the screen.

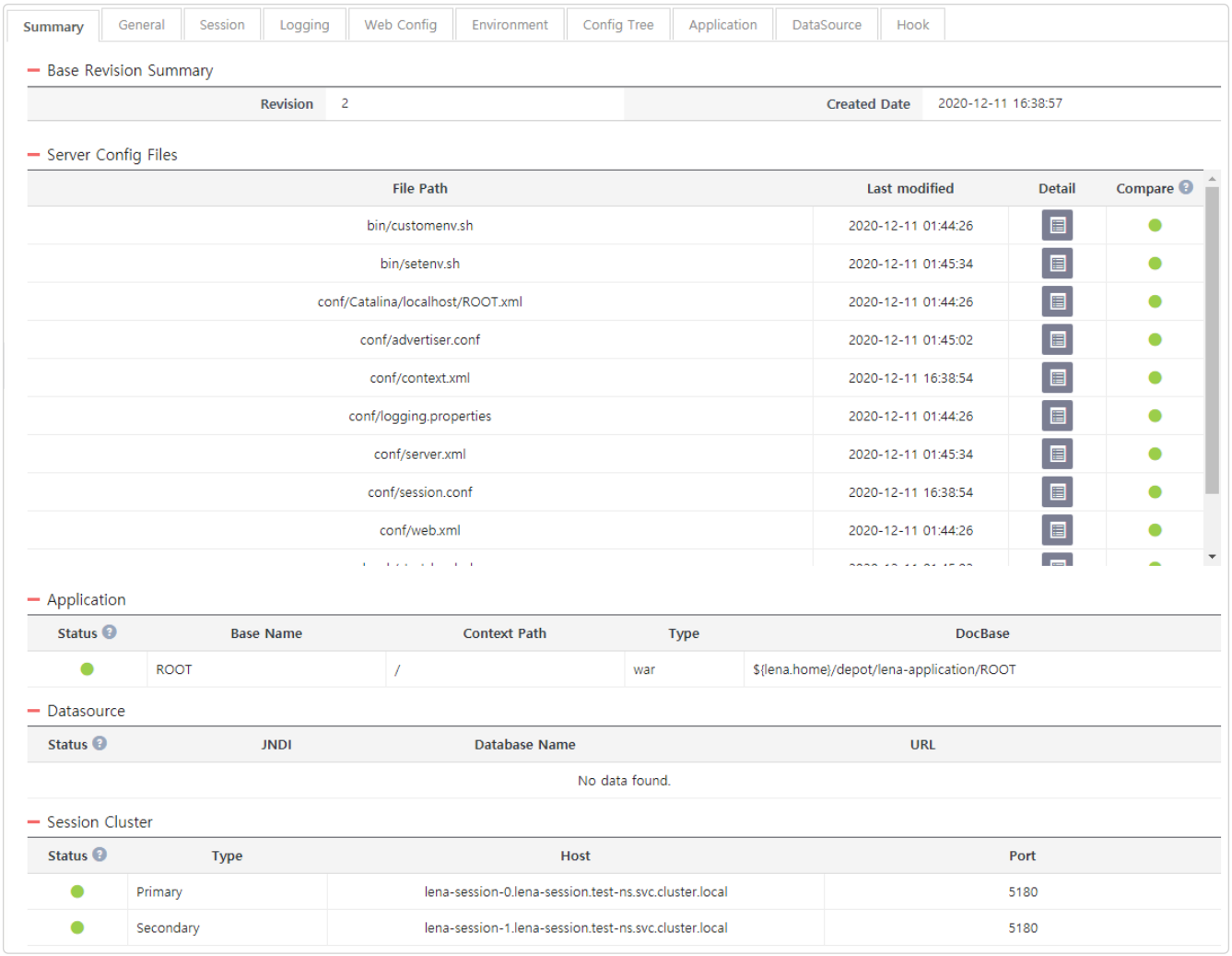


Figure 16. WAS Server Template Summary Tab

1. Base Revision Summary shows the currently loaded Revision number and creation date of the Revision.
2. Server Configuration Files shows a list of Files that make up the currently loaded Revision. Content can be viewed by file, and modified configuration files can be checked and compared through the Compare functionality. If there are no changes, a **green icon** is displayed, and if configuration files are changed, a **red X icon** is displayed. Clicking the **red X icon** shows the differences between the original file and modified file of the loaded Revision in a popup.
3. Application shows Application information configured in the currently loaded Revision. If there are no changes, a **green icon** is displayed, and if Application information is changed, added, or deleted, a **red X icon** is displayed.
4. Database shows Database information configured in the currently loaded Revision. If there are no changes, a **green icon** is displayed, and if Database information is changed, added, or deleted, a **red X icon** is displayed.
5. Session Cluster shows Session Cluster information configured in the currently loaded Revision. If there are no changes, a **green icon** is displayed, and if Session Cluster information is changed, added, or deleted, a **red X icon** is displayed. If the Session Cluster is not running, a **red ! icon** is displayed.

General

Manages general configuration information for the Server. You can modify and save Port information, Connector, Access Log, and Session Cluster related settings.

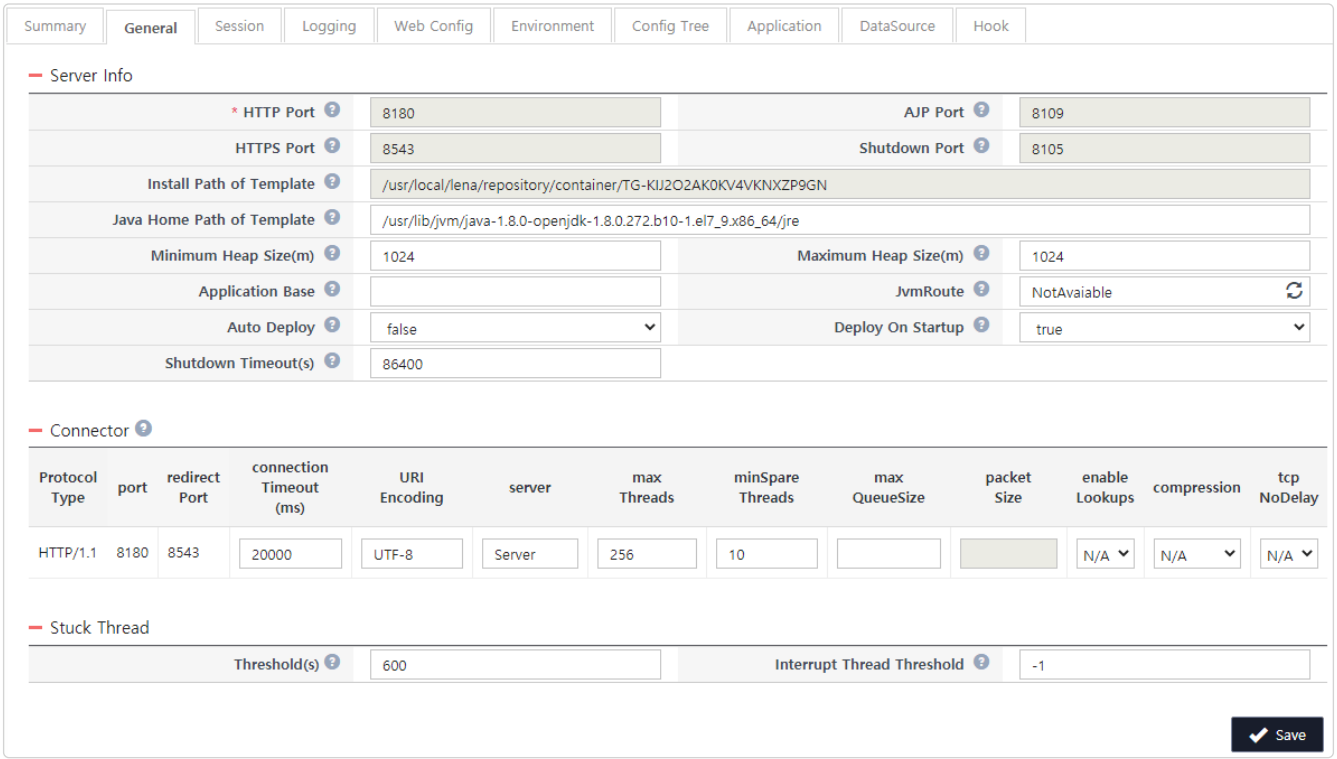


Figure 17. WAS Server Template General Tab

1. Server Info consists of the main attribute values of the Application Server.

Item	Description	Notes
HTTP Port	HTTP port number	Default : 8180
AJP Port	AJP port number	HTTP port number - 71 (auto-calculated)
HTTPS Port	HTTPS port number	HTTP port number + 363 (auto-calculated)
Shutdown Port	Port for receiving shutdown command string	HTTP port number - 75 (auto-calculated)
Application Base	Application's base directory	Can only be modified when the Server is in stop state or when there are no Applications deployed in appBase.
jvmRoute	Server's unique identifier	Prioritizes values set in System Properties. If not available, uses values from server.xml (generated as Hostname + Port combination)
Auto Deploy	Whether to automatically deploy when applications change	Default : false Detected when war files are re-uploaded to Application-specific DocBase

Item	Description	Notes
Deploy On Startup	Whether to deploy Applications when WAS starts	Default : true
Shutdown Timeout	Time to wait (seconds) when running Threads exist during server shutdown	Default : 30

2. Connector represents configuration values for Application Server to communicate with external systems.

Item	Description	Notes
Protocol Type(*)	Protocol type	Default : HTTP/1.1, AJP/1.3
port(*)	Port number	
redirect Port	Redirect port	Same as HTTPS Port
connection Timeout	Connection timeout (ms)	Default : HTTP : 20000, AJP : 60000
URIEncoding	Character encoding for converting URI bytes	Default : UTF-8
server	Redefines Server Header for HTTP Response to prevent server information exposure	Default : Server
maxThreads	Maximum number of Threads that Connector can create	Default : 256
minSpareThreads	Minimum number of Threads to secure when creating Connector	Default : 10
maxQueueSize	Maximum length of Request Queue	Default : Integer.MAX_VALUE
packetSize	AJP packet size	Default : 8192
enableLookups	Whether to use DNS LookUp. Not using it is beneficial for performance	Default : false
compression	HTTP message Body compression (off, on:Text only, force:all)	Default : off
tcpNoDelay	Send TCP packets without delay	Default : true

In Container-based Application Servers, AJP Connector is disabled by default.

3. Stuck Thread is a configuration for identifying tasks that occupy Threads for extended periods.

Item	Description	Notes
Threadshold	Minimum time to identify Stuck Thread	Unit: seconds

Item	Description	Notes
InterruptThreadThreshold	Minimum time to interrupt Stuck Thread	Unit: seconds (To terminate n seconds after Stuck Thread identification, enter "Threshold+n" value)

Session

Provides a screen for managing Session Cluster configuration.

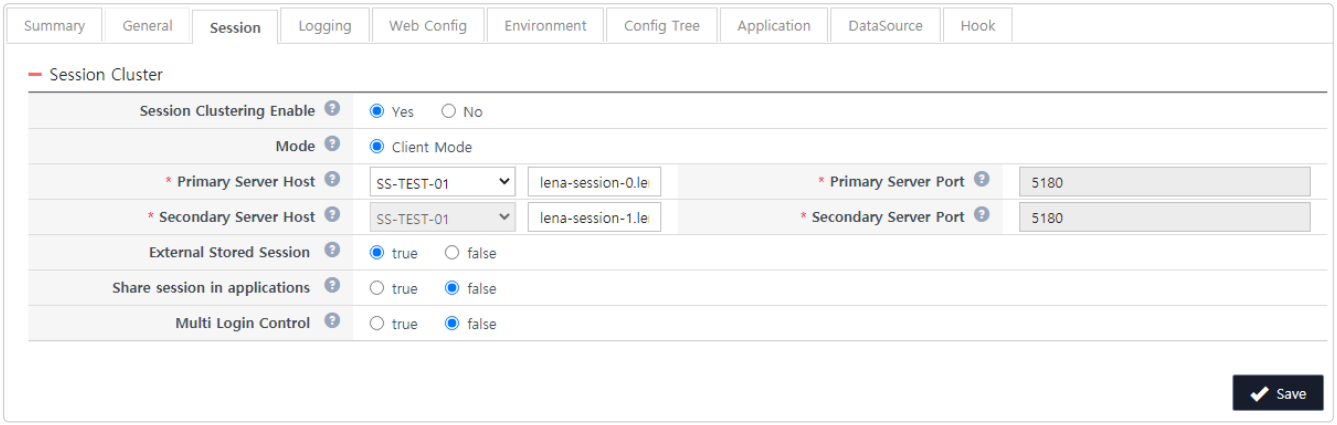


Figure 18. WAS Server Template Session Tab

Item	Description	Default Value
Setting Selection	Whether to use Session Cluster	No
Primary Server Host	Primary Session Server host	
Primary Server Port	Primary Session Server port	
Secondary Server Host	Secondary Session Server host Used only when connection to Primary server is lost	
Secondary Server Port	Secondary Session Server port Used only when connection to Primary server is lost	
External Stored Session	Whether to use External Stored Session When used, Session information is not stored in Application Server.	true
Share session in applications	Share Session objects between Multi Applications Can only be configured in Standalone Mode	false
Multi Login Control	Whether to prevent duplicate login	false

In Container environments, Embedded Mode is not supported due to the environmental characteristics where Server state maintenance is not guaranteed.

Logging

Provides a screen for managing log configuration. You can configure log output types, Handler lists, Handler details, Logger lists, etc. After modifying configuration files, click the **Save button** to update the server's log configuration.

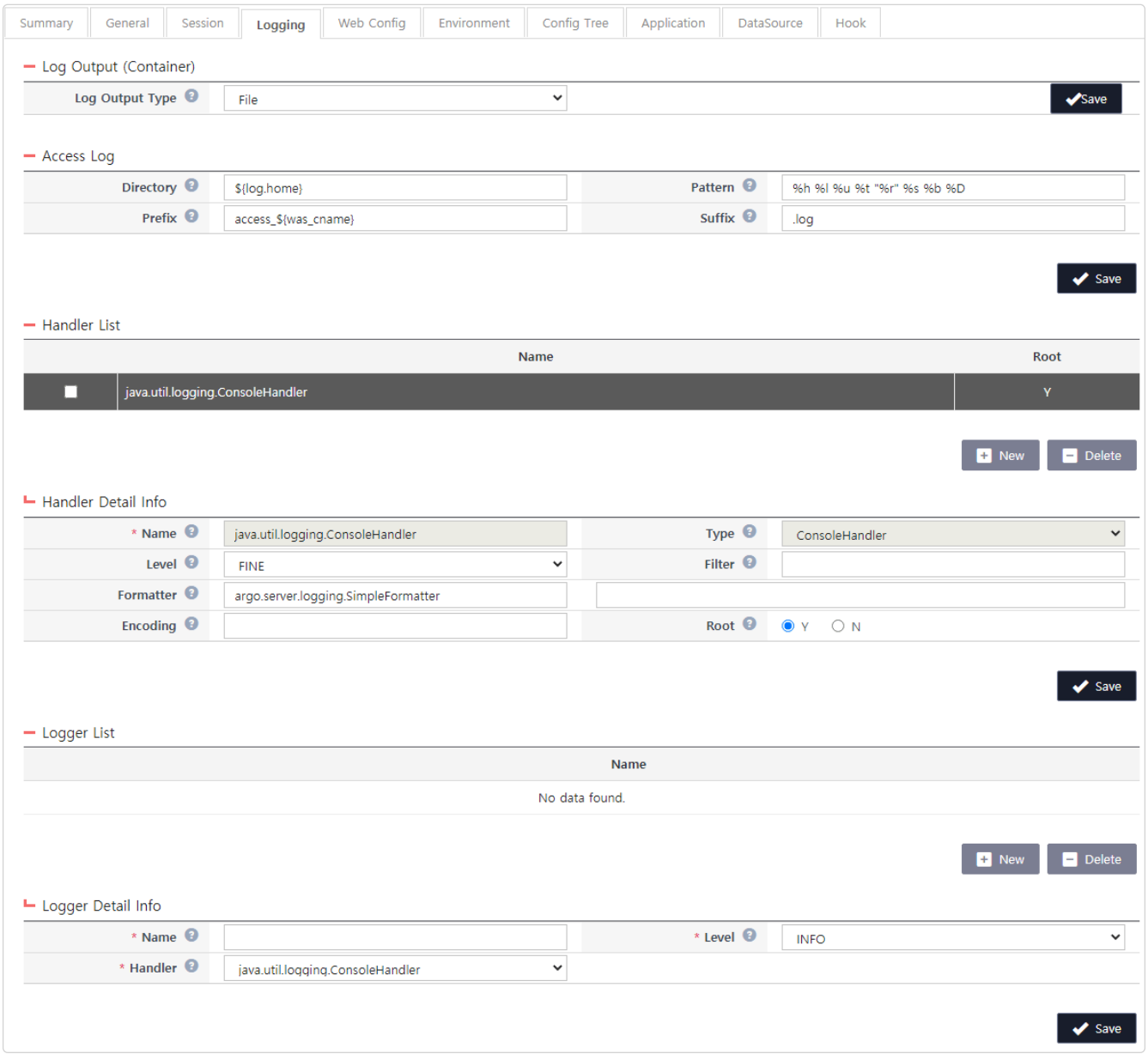


Figure 19. WAS Server Template Logging Tab

1. The details of Log Output (Container) are as follows.

Item	Description	Notes
Log Output Type	Output type of GC log and Engine log	Select from File, Console - File : Single file output and log-rotate execution - Console : Standard out/err output

2. Access Log represents configuration values for Access logs for Requests.

Item	Description	Notes
Output Type	Log output type	File / Console

Item	Description	Notes
Directory	Log directory	Can be specified as absolute path or relative path of
Pattern	Layout of Logging field	
Prefix	Prefix of Log file	
Suffix	Suffix of Log file	

3. Detailed contents of Handler configuration information are as follows.

Item	Description	Notes
Name	Handler class name	
Type	Handler type	ConsoleHandler and FileHandler can be selected.
Level	Handler log level	
Filter	Implementation of java.util.logging.Filter	
Formatter	Implementation of java.util.logging.Formatter	Default value: java.util.logging.SimpleFormatter
Encoding	Handler Character Encoding	
Root	Whether Root Logger	

4. Detailed contents of Logger configuration information are as follows.

Item	Description	Notes
Name	Specify Logger name	
Level	Logger log level	
Handler	Select which Handler Logger will use	ConsoleHandler is selected by default

Server's log configuration file is ()/conf/logging.properties.

Web Configuration

Provides screen for managing Global web.xml configuration. Modify necessary items and click **Save button** to save.

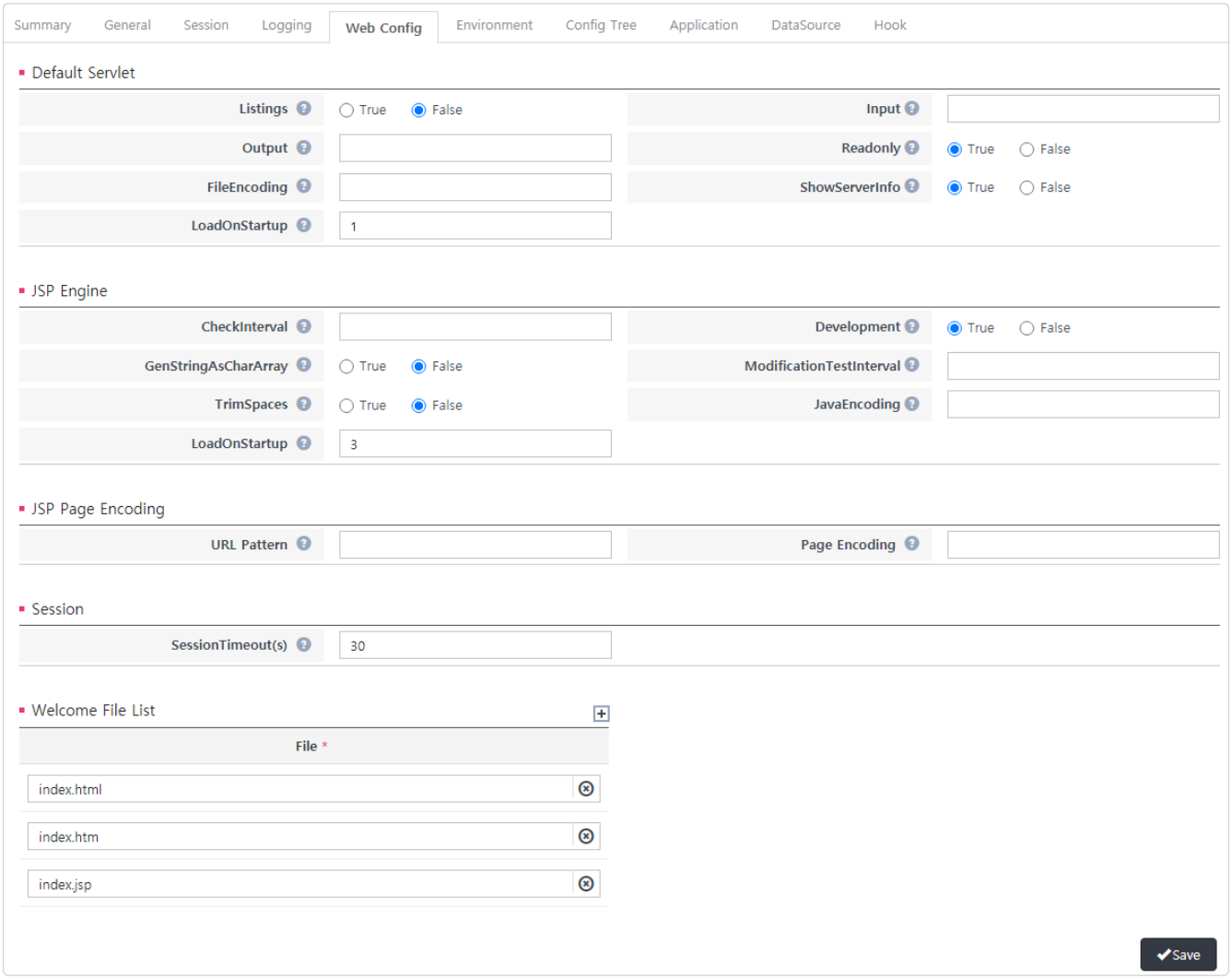


Figure 20. WAS Server Template Web Configuration Tab

1. Default Servlet

Item	Description	Default Value
Listings	Whether to allow Directory Listing when Welcome file is not present	false
Input	Input buffer size (bytes)	2048
Output	Output buffer size (bytes)	2048
Readonly	Do not allow HTTP methods such as PUT, DELETE	true
FileEncoding	File encoding	platform default
ShowServerInfo	Whether to display Server information when Directory Listing is allowed	true
LoadOnStartup	Specify Servlet loading order when WAS starts	1(negative: disable / 0: last)

2. JSP Engine

Item	Description	Default Value
CheckInterval	When Development is false, cycle for checking jsp changes and recompilation (seconds)	0 (0: disabled / positive: enabled with that cycle)
Development	Whether Development. When Development is true, changes are checked with modificationTestInterval value as cycle	true (0: check every access)
GenStringAsCharArray	Whether to generate String as Char Array	false
ModificationTestInterval	Cycle for jsp change check when Development is true	4
TrimSpaces	Remove unnecessary whitespace from response to reduce response bytes	false
JavaEncoding	Encoding when generating Java source	UTF8
LoadOnStartup	Specify Servlet loading order when WAS starts	3

3. Welcome File List

Item	Description	Notes
File	Specify files to service in order when Directory index is called	

4. Session Timeout

Item	Description	Notes
SessionTimeout	Session timeout time (minutes)	Default: 30

Environment

Provides screen for managing JVM options. Modify through editor and click **Save button** to save.

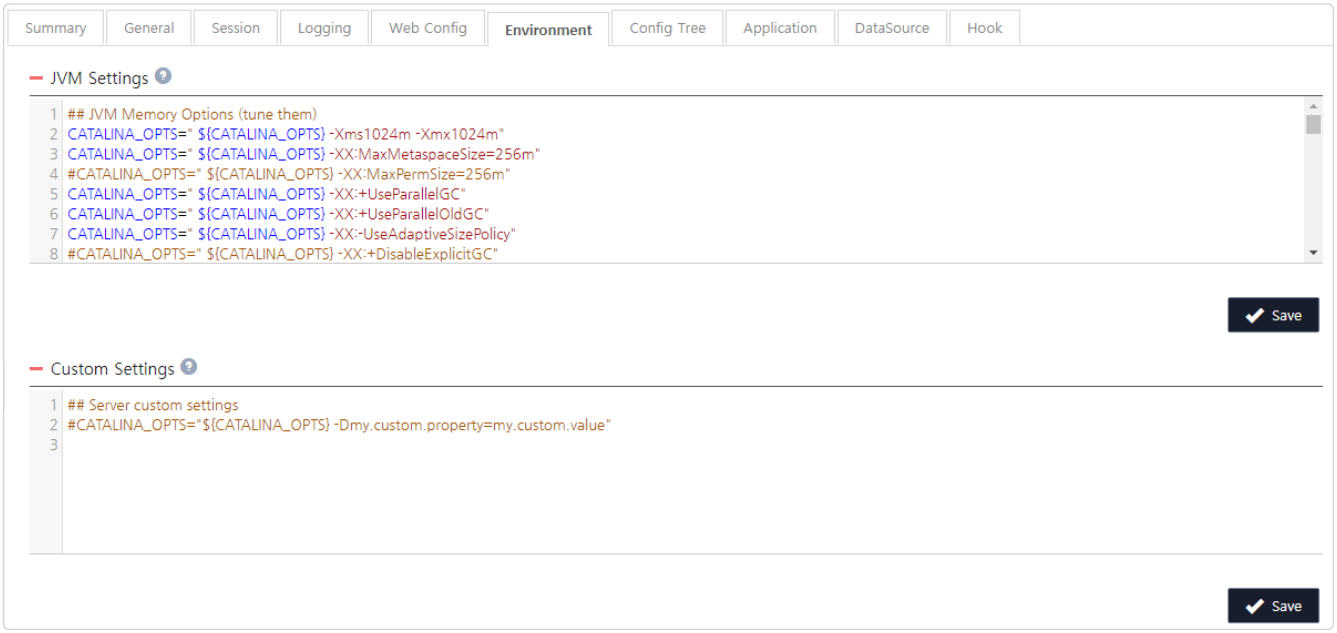


Figure 21. WAS Server Template Environment Tab

Configuration Tree

Application Server's /conf folder sub configuration files under installation path can be managed through file editor.

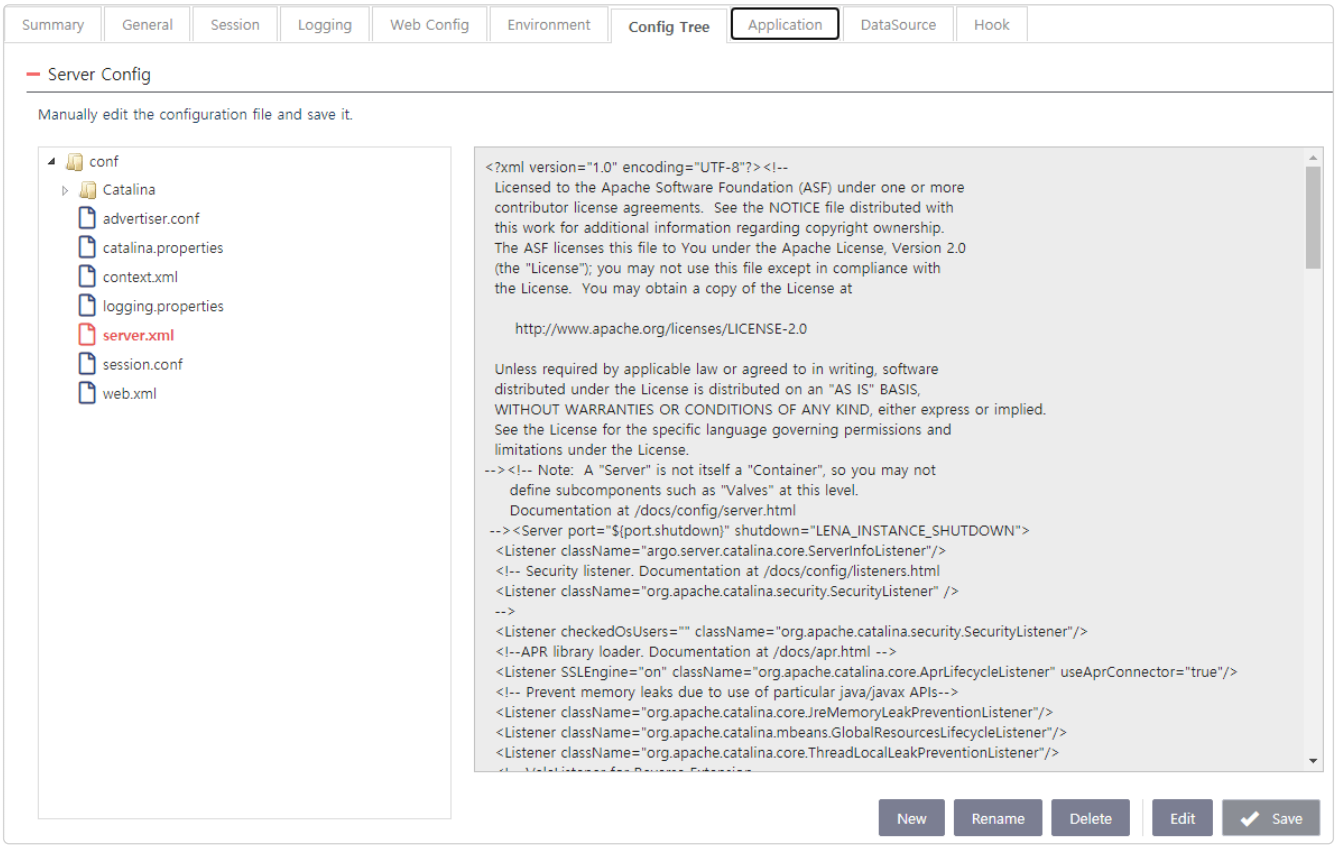


Figure 22. WAS Server Template Configuration Tree Tab

Application

Provides screen for adding/querying Application list.

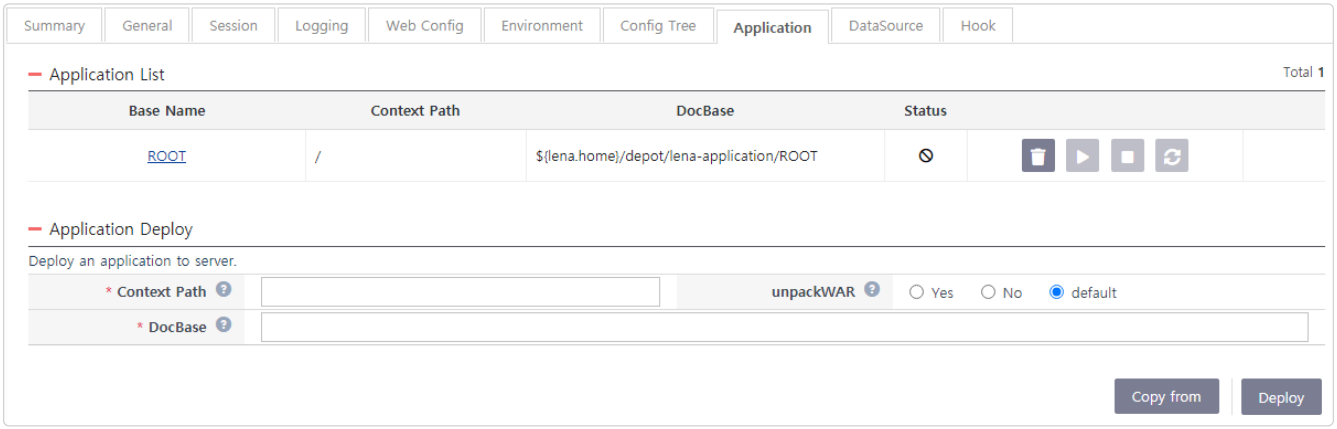


Figure 23. WAS Server Template Application Tab

1. Application List
   Click **trash button** in query screen to Undeploy that Application. When performing Undeploy for WAS, all of the following operations are performed regardless of application's DocBase. Be careful when performing Undeploy if source is located in appBase.
   a. Delete {contextPath}.xml under /conf/Catalina/localhost (basic management method)
   b. Delete {contextPath}.war under appBase
   c. Delete {contextPath} directory under appBase
2. Application Deploy

Item	Description	Notes
Context Path	Context path	Input only when Application Type is selected as WAR
unpackWAR	Whether to execute after expanding WAR file. When value is false, WAR file compression is not expanded, and web application is just redeployed in compressed state	(default: true) Input only when Application Type is selected as WAR
DocBase	Application location	

Two methods can be used to deploy Applications. First is clicking **Copy from button** to import application information registered in resources. Only settings of applications registered in resources are copied, application source is not cloned. Second is directly inputting information. When specifying DocBase, directly input application path or click **Browser button** to get path where that source is located. Then click **Deploy button** to Deploy Application.

When deploying WAS, {contextPath}.xml file is created under /conf/Catalina/localhost.

Even if Application in resources is changed, it is not applied to Service Cluster that cloned that Resource.

DataSource

Provides functionality to manage JNDI DataSource that can be used by Application Server's Applications. JNDI can be set so all Applications running on Server can share and use, or JNDI can be

set for each Application for use. For Enterprise Edition, JTA is supported so additional attributes are added.

1. Server DataSource Configuration Set DataSource shared by all Applications running on Server. List of DataSources available on Server can be queried, and DataSource registration, modification, deletion is possible.

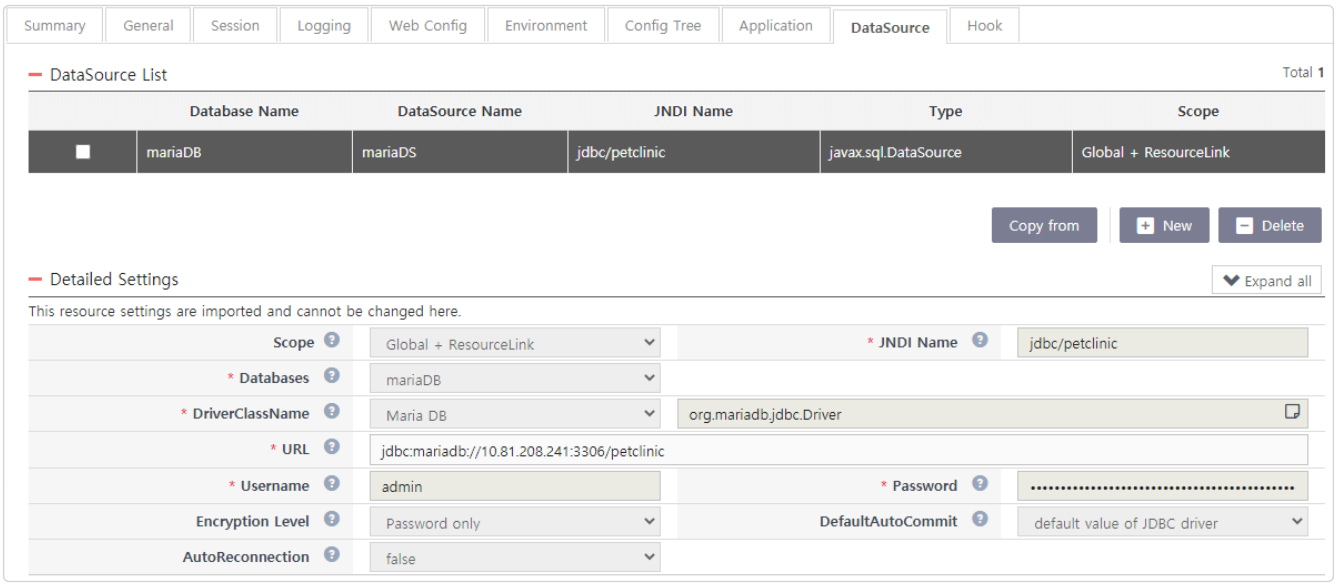


Figure 24. WAS Server Template Datasource Tab

DataSource attributes are as follows. Attributes not visible on initial screen are displayed when **Expand all** button is clicked.

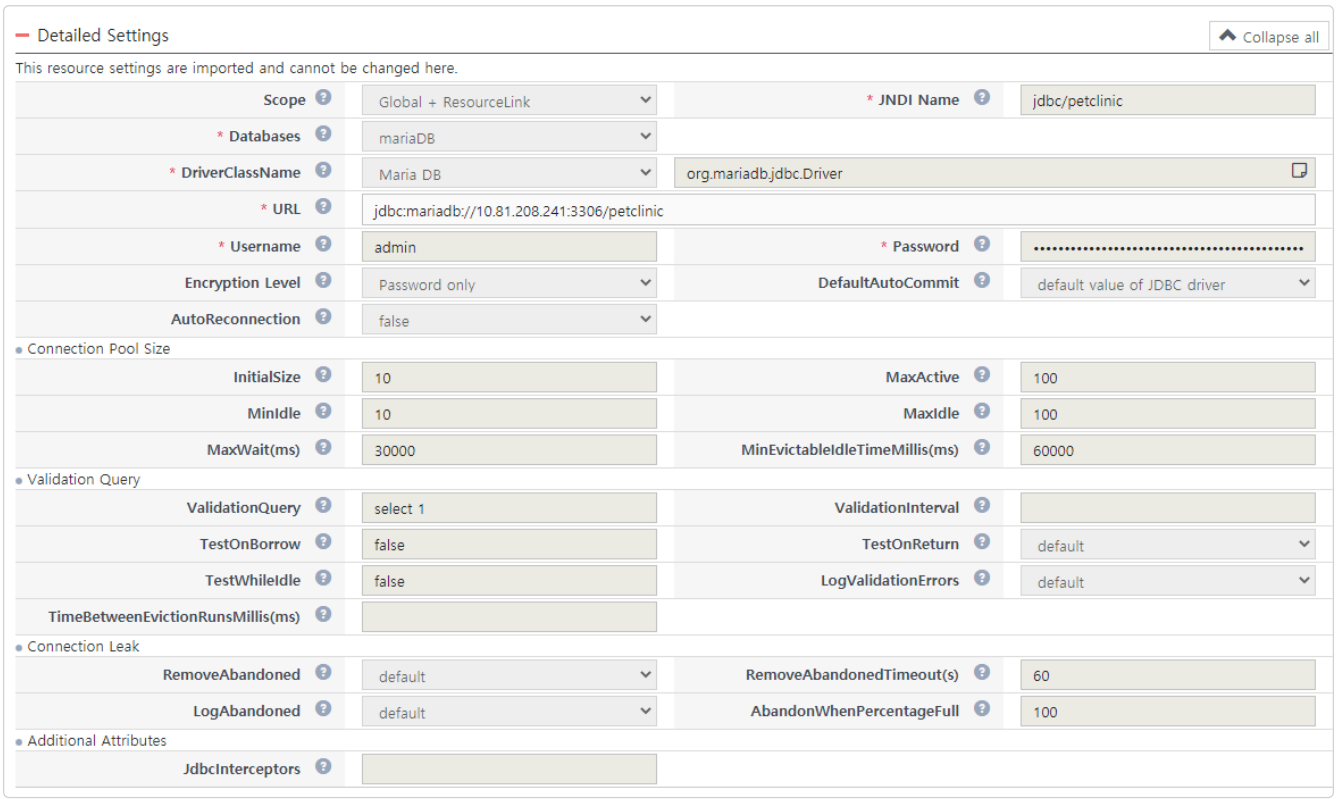


Figure 25. WAS Server Template Datasource Detail

Item	Description	Notes
Scope(*)	Scope for using DataSource	- Context: Datasource information is set in common context area so all Applications can share. - Global: Datasource information is set in GlobalNamingResource area, and each application individually sets and uses in DataSource link management. - Global+ResourceLink: Datasource information is set in GlobalNamingResource area and Datasource link is set in common context area.
JNDI Name(*)	JNDI name of Global DataSource	
Databases	Set information of datasource to be used commonly	
Resource Name	Name of Databases	
Address(Host/Port)	IP and port to be used commonly	
DriverClass Name	JDBC Driver class name	
URL(*)	JDBC URL	
Username(*)	Connection username	
Password(*)	Connection password	when encryption is checked, password is encrypted and stored. Encryption is recommended for security.
Auth(*)	JNDI authority	Default : "Container"
Description	Description of Datasource	
Encryption Level	Specify encryption scope for authentication information	Default : Password only
InitialSize	Initial number of Pool Connections	Default : 10
MaxActive	Maximum number of Pool Connections	Default : 100
MinIdle	Minimum number of Idle Connections	Default : 10
MaxIdle	Maximum number of Idle Connections	Default : 100
MaxWait	Maximum time to wait when no available Connection in Pool (ms)	Default : 30000

Item	Description	Notes
TimeBetweenEvictionRunsMills	Thread execution cycle for extracting unused Connections (ms)	Default : 5000
MinEvictableIdleTimeMillis	Connections existing in Pool in idle state for longer than this time become removal targets (ms)	Default : 60000 (60 seconds) (1800000 (30 minutes) when XaDataSource = true)
DefaultAutoCommit	Auto Commit status of Connections created from Pool	Default : JDBC driver's default value
ValidationQuery	Connection validity verification query	Default : null
ValidationInterval	Connection validity verification cycle (ms)	Default : 3000
TestOnBorrow	Before taking connection from Pool, perform query set in validationQuery to check connection validity	Default : default(false)
TestOnReturn	Before returning connection to Pool, perform query set in validationQuery to check connection validity	Default : default(false)
TestWhileIdle	For idle connections, perform query set in validationQuery to check connection validity	Default : default(false)
LogValidationErrors	Whether to output errors when errors occur after validation query execution	Default : default(false)
RemoveAbandoned	Whether to detect Connection loss	Default : default(false)
RemoveAbandonedTimeout	Timeout value for determining lost Connection (unit: seconds)	Default : 60
LogAbandoned	Whether to log when processing Connection loss	Default : default(false)
AbandonWhenPercentageFull	Connection pool must exceed set occupancy rate to perform abandon	Default : 0
JdbcInterceptors	User-defined functionality can be added using flexible and pluggable interceptors	When setting QueryTimeout, enter QueryTimeoutInterceptor(queryTimeout=time(seconds))

Additional attributes for Enterprise Edition are as follows.

Item	Description	Notes
JtaManaged	Whether to use JTA	Default "false"
XaDataSource	Whether to use XA	Default "false"

XADataSource configuration can only be used when JTA is configured, and when XADataSource is configured, validationInterval, logValidationErrors, abandonWhenPercentageFull attributes cannot be used.

When DataSource is set to Context scope, all Applications share it.

In Enterprise servers, DataSource can also be set to Context scope, but Lookup is not possible in EJB. Setting to Global + ResourceLink scope is recommended for Enterprise servers.

Password encryption algorithm uses AES. Key value for encryption is managed as "datasource.key=keyvalue" in Manager LENA Home sub /conf/manager.conf file and each Application Server Home sub /conf/advertiser.conf.

2. Databases
   When setting URL, register by creating Databases with information to be used commonly. **+ button** creates popup window when clicked.
   a. Enter Resource Name to distinguish Databases.
   b. Check automatically filled DriverClassName. Change if necessary.
   c. Enter Address (IP and port) and save.

3. JDBC driver Upload
   JDBC Driver library can be uploaded through Manager. Click **Upload button** under DataSource detailed information to display upload screen as follows.

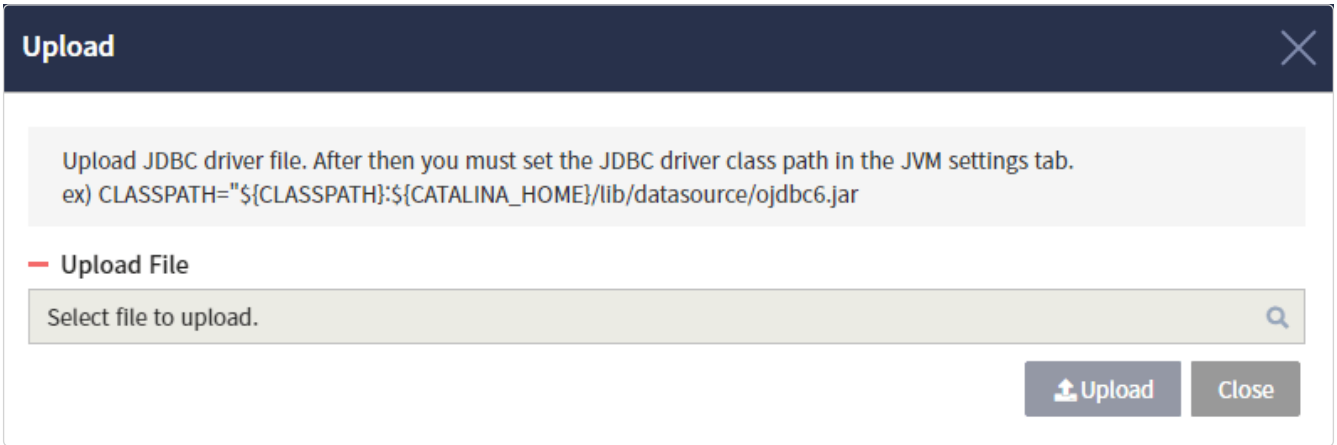


Figure 26. JDBC driver upload popup

a. Select file to upload through Search button. File to upload is JDBC Driver library, so only JAR format files can be selected.
b. Click Upload button to upload selected file to target directory.
c. Path where JDBC Driver file is uploaded is ${SERVER_HOME}/lib/datasource.

4) Connection Test
Click **Connection Test button** in DataSource detailed screen to perform connection test for configured DataSource. When connection is successful, "JDBC Connection is successfully tested" message is displayed as follows. If "Driver Class[class name] does not exist." error message is displayed, check if corresponding driver class is properly uploaded and classpath is configured. classpath is added in Application Server details > JVM Env > JVM Settings. Configuration example is as follows.
ex) CLASSPATH="${CLASSPATH}:${CATALINA_HOME}/lib/datasource/ojdbc6.jar"

When Resources menu under Server menu is selected, screen for managing Resource information related to that Server is displayed. By default, information for DataSource, JMS, JTA Resources can be managed. (JMS, JTA Resources are supported only for Enterprise Server)

5. Resource Configuration Clone

Click **Copy from button** to clone DataSource settings and driver files registered in resources.

Even if DataSource in resources is changed, it is not applied to Service Cluster that cloned that Resource.

Hook

Allows execution of user-defined Shell Script before Application Server startup and after shutdown in Container.

- Start Hook Script : This Script is executed before starting Application Server during Container startup.
- Stop Hook Script : This Script is executed after stopping Application Server during Container shutdown.

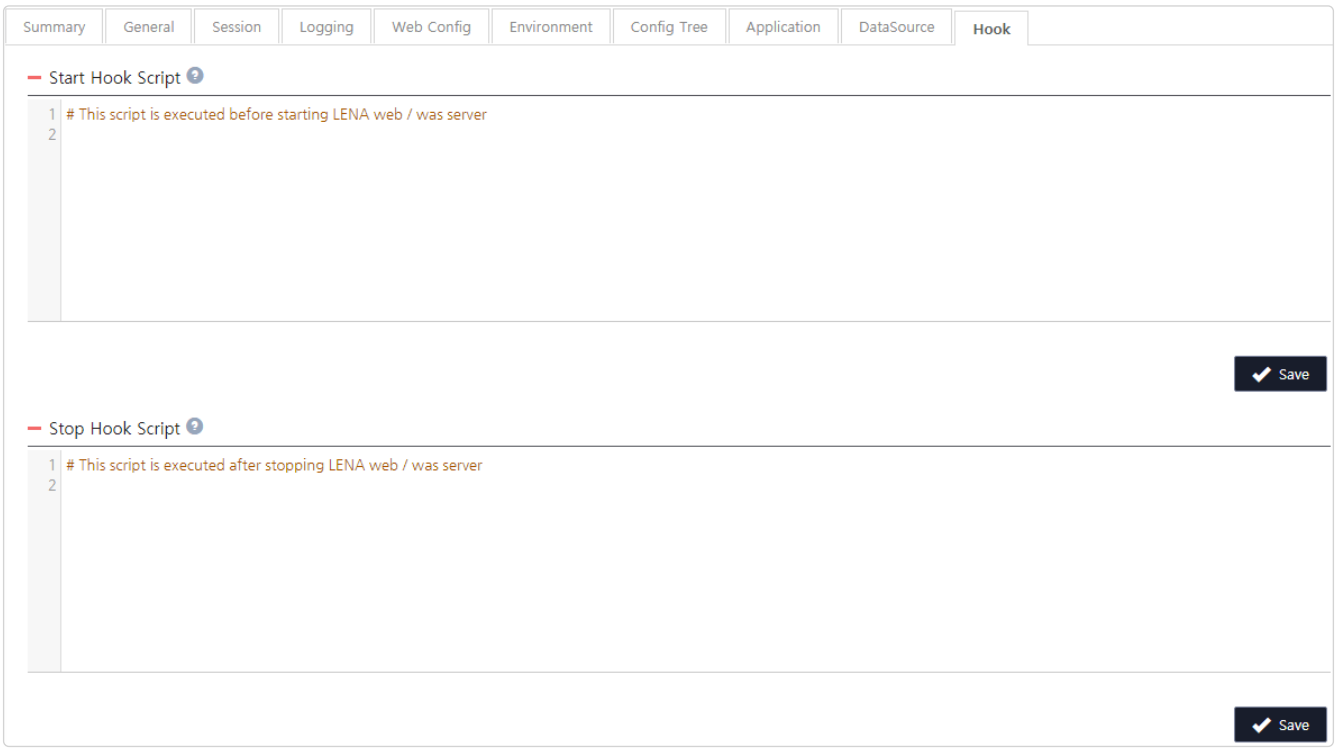


Figure 27. WAS Server Template Hook Tab

TunA

Easily integrates Container environment with TunA APM to conveniently monitor user application performance. TunA Agent file is located under /lib/tuna/ for use. Based on LENA v1.3.4.2, TunA v2.7.0 or higher, can be used on Linux/Unix OS.

- Enable TunA : Whether to use TunA. When checked, System Group and Configuration fields are displayed on screen, when unchecked, those items are not visible on screen.
- System Group : Select TunA System Group that server will belong to.
- Configuration : Provides functionality to check and modify Agent configuration.

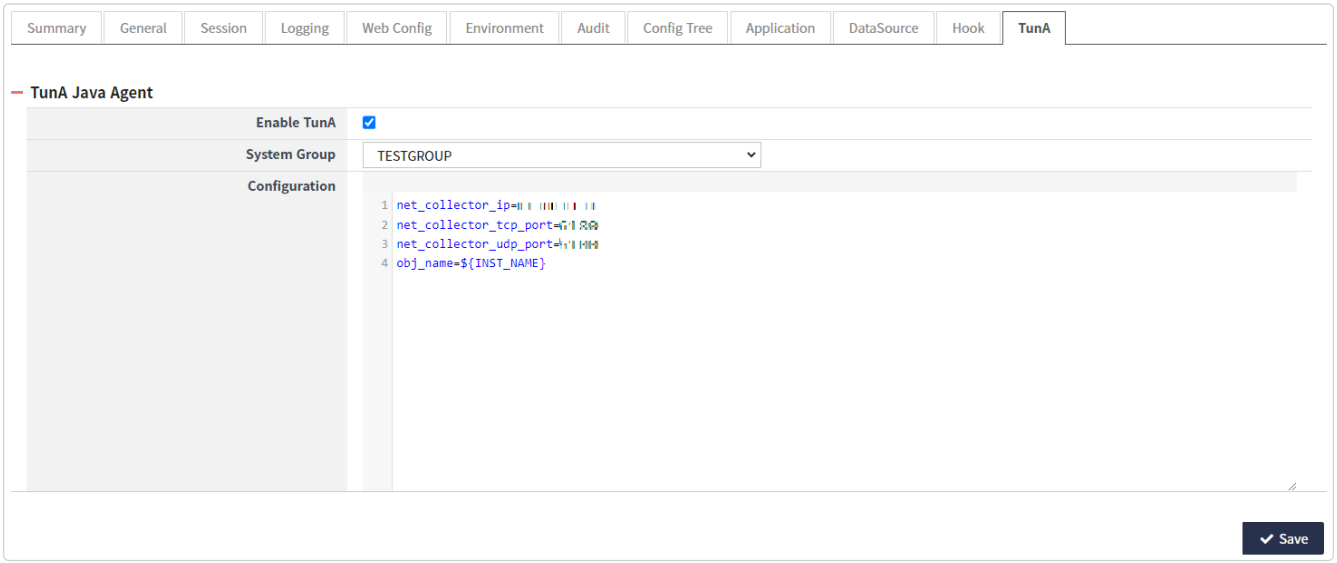


Figure 28. TunA Tab

Revision Creation

Click **New Revision button** in Template tab to create new Revision. Modify WAS, WEB server configuration files through tabs at bottom of System Template Overview and click Save to temporarily save. After all configuration file modifications are complete, click New Revision button to create new Revision and generate Template compressed file. Created Revision can be checked in Revision tab.

Even after modifying and saving WAS, WEB server configuration files, if new Revision is not created, screen returns to Default Revision when re-entering. Configuration

Configuration

Click **Configuration button** in Template tab to display Configuration screen.

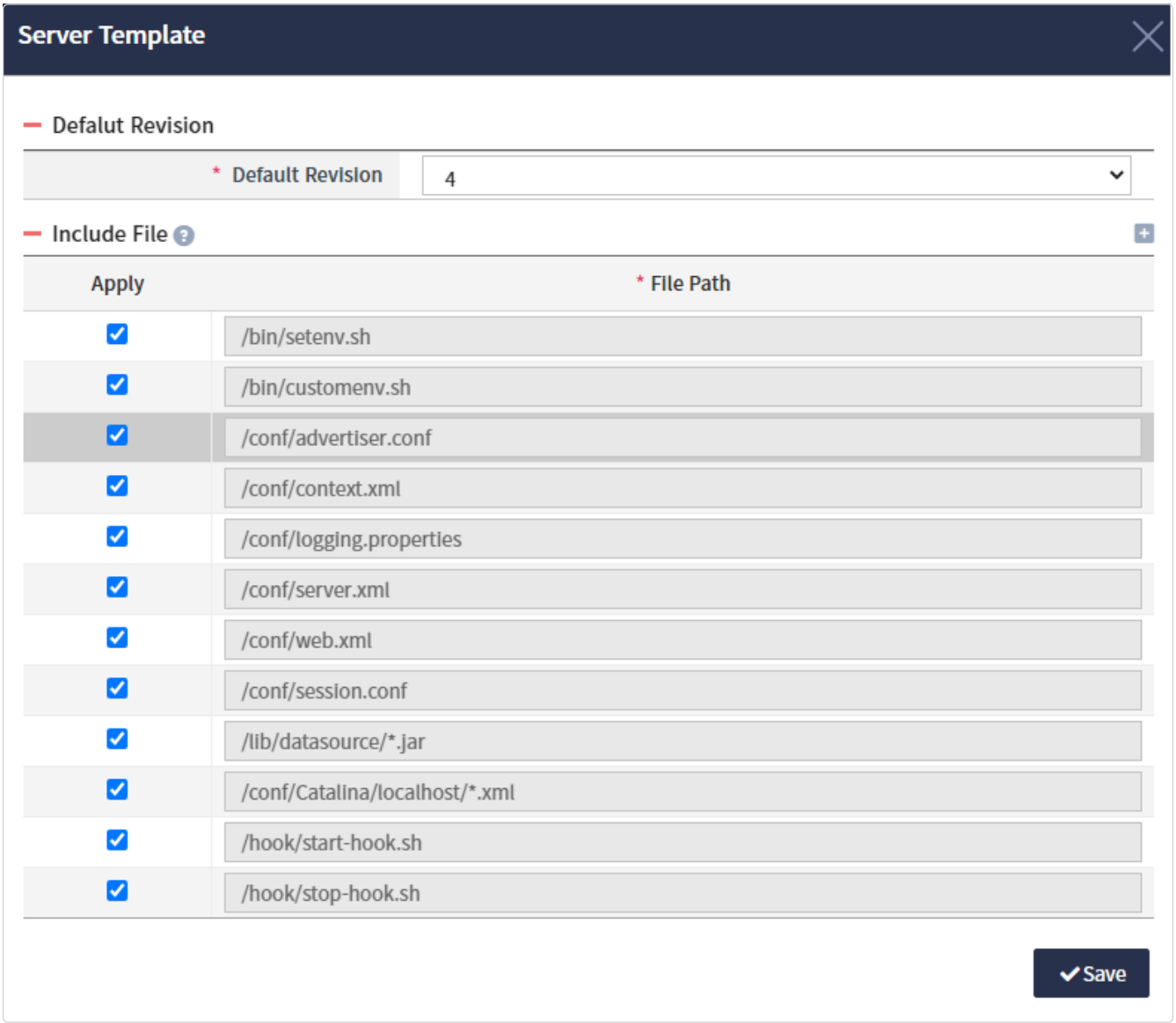


Figure 29. WAS Server Template Configuration Popup

Default Revision and Include Files to be included in Template compressed file can be specified. Basic file list for Template configuration is automatically generated, and users can add desired files. Only files with Apply checkbox activated are included in Template compressed file.

Export

Click **Export button** in Template tab to display Template Export screen. Download Template compressed file to local computer or upload to AWS S3, GCP Storage, Filesystem.

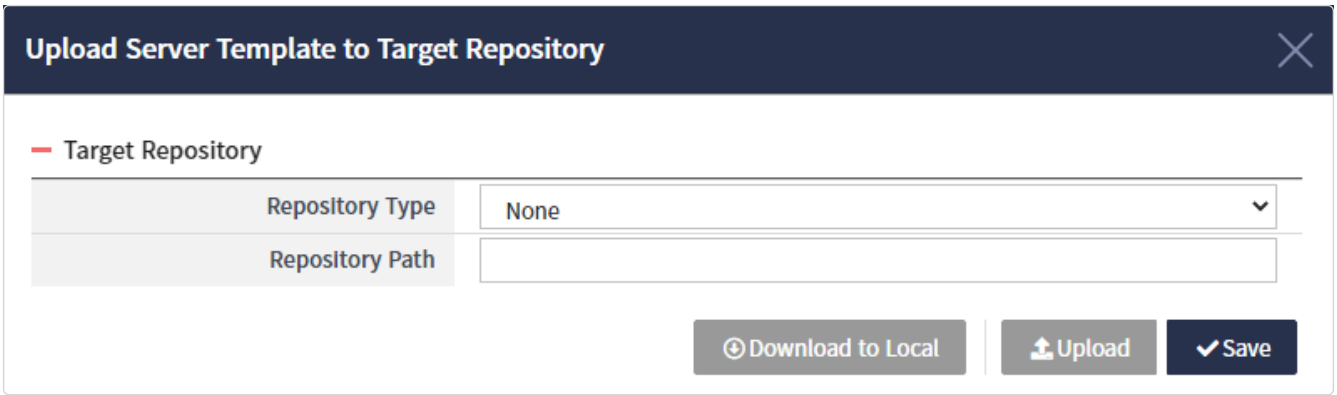


Figure 30. WAS Server Template Export Popup

Copy Configurations

Click **Copy Configurations button** in Template tab to display Copy Configurations screen.

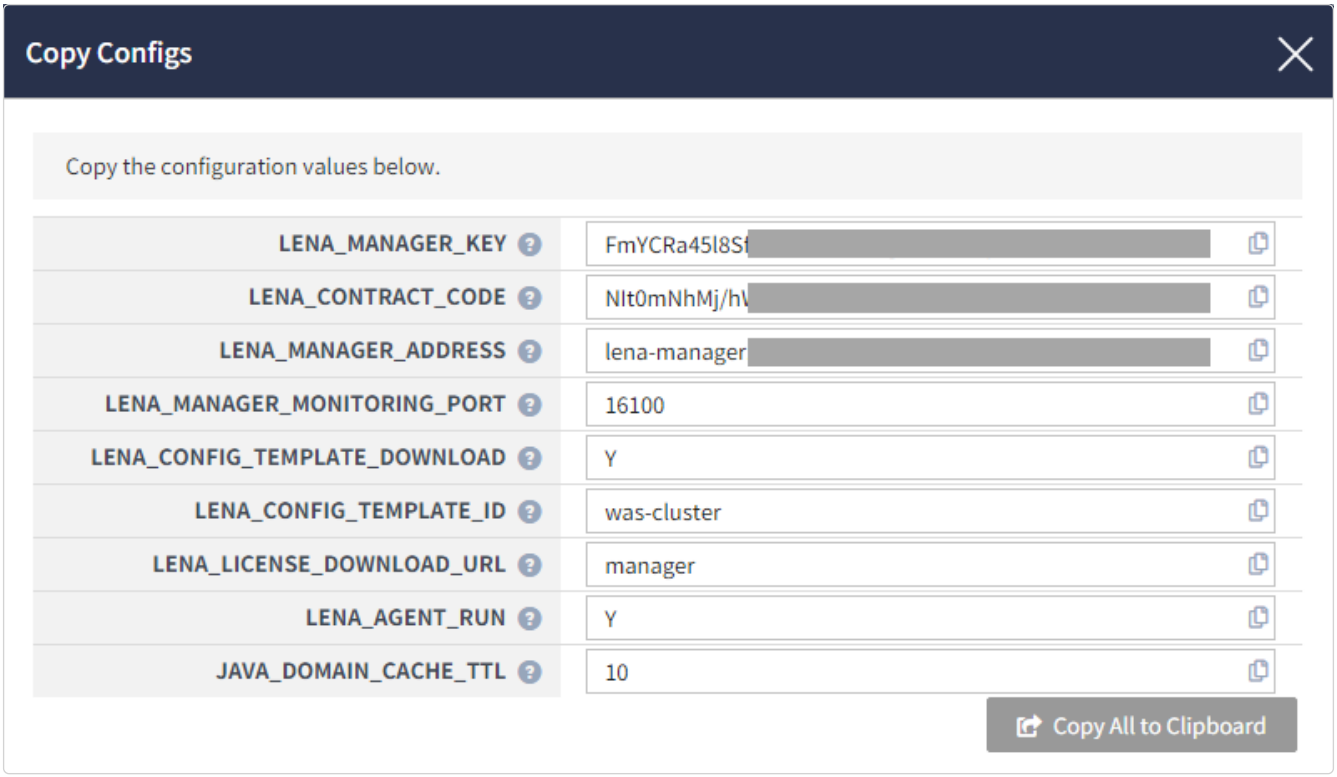


Figure 31. WAS Server Template Copy Configurations Popup

Guides environment variables needed when using Template in Container. 'Key-value' pairs defined on screen are used as container environment variables for Pods. Click right button of each row to copy that value to clipboard, click Copy All to Clipboard button at bottom to copy in 'key-value' format to clipboard.

5.2.6. Web Server Template Management (EN-A)

Server Template Overview

Select Service Cluster from left menu or Service Cluster Group details and click Template tab to display Service Template Overview screen. Shows OS Family information and current Revision information.

Server Template Configuration Management

Provides functionality to change Web Server configuration information. After changing configuration information and clicking New Revision button, new Revision is created. Changed configuration information is managed through created Revision.

Summary

Click Summary tab at bottom of Template tab in Service Cluster to display screen.

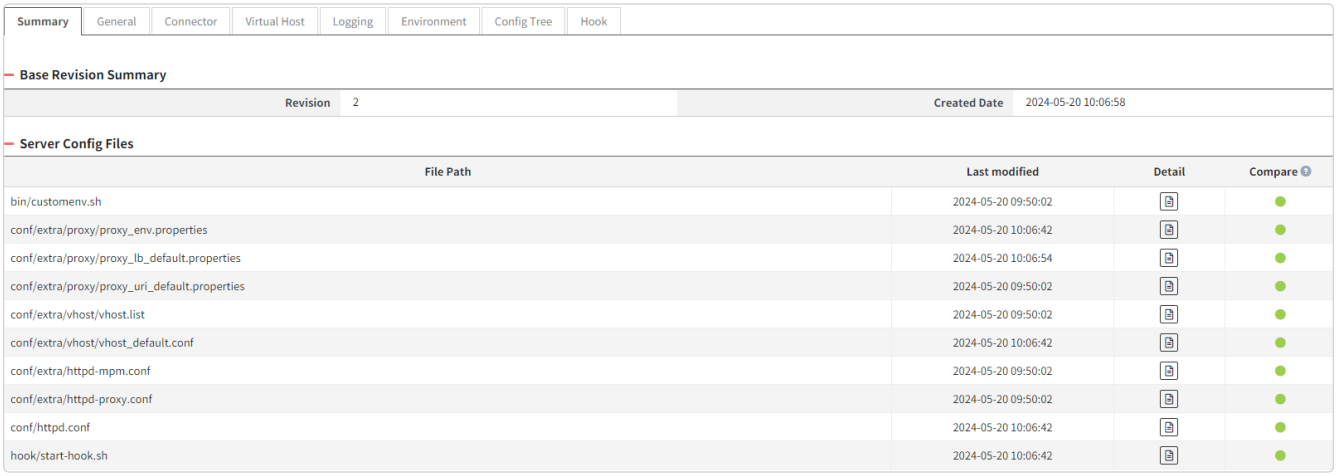


Figure 32. Web Server Template Summary Tab (EN-A)

1. Base Revision Summary shows currently loaded Revision number and Revision creation date.
2. Server Configuration Files shows file list that makes up currently loaded Revision. Content can be checked by file, and modified configuration files can be checked/compared through Compare functionality. If there are no changes, **green icon** is displayed, and if configuration files are modified, **red X icon** is displayed. Click **red X icon** to show differences between original file and modified file of loaded Revision in popup.

General

General configuration values and Connection, Process information of Web Server can be edited. Web Server's configuration information performs Validation on configuration files when saving, minimizing Server startup failures due to configuration file errors.

When configuration file error occurs, file is not saved and error message is displayed ex) AH00526: Syntax error on line 253 Argument for 'Require all' must be 'granted' or 'denied'

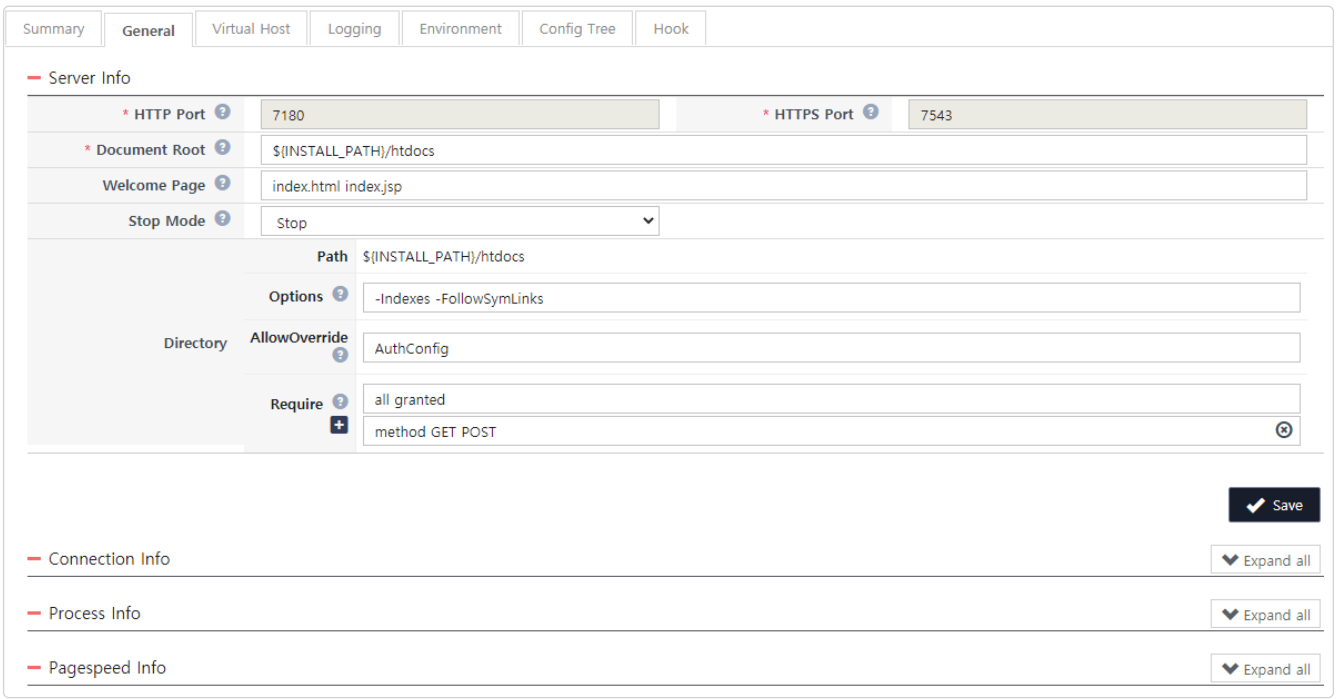


Figure 33. Web Server(EN-A) Template General Tab

1. Server Info (env.sh and /conf/httpd.conf file management)

Item	Description	Notes
Http Port(*)	HTTP Port	Fixed at 7180
Https Port(*)	HTTPS Port	Fixed at 7543
Staging HTTP Port	Service port used when starting in Staging mode	Used during Graceful restart LENA uses basic nostage mode
Staging HTTPS Port	HTTPS port used when starting in Staging mode	Used during Graceful restart LENA uses basic nostage mode
Document Root(*)	Basic folder path where documents provided by Web Server are stored	
Log Home(*)	Folder path containing Web Server's log information	
Welcome Page	Define which file to use as initial page document of website	
Directory/Path	Directory path where web documents are located to set which services and functions to allow/deny	
Directory/Options	Access control settings to apply to all files and directories under specified directory	-Indexes prevents showing file list under Document Root when welcome page cannot be found -FollowSymLinks prevents accessing file system other than existing web documents under Document Root via symbolic links
Directory /AllowOverride	Set which directives to allow for resource access control configuration files for each subdirectory under Document Root (generally AccessFileName : .htaccess)	-None : Do not allow any directives -All : All directives available -AuthConfig : Allow user authentication directives -FileInfo : Allow document type control directives -Indexes : Allow directory indexing control directives -Limit : Allow host access control directives
Directory/Require	Verify whether authenticated users perform allowed Actions	

2. Connection Info (/conf/extra/httpd-default.conf file management)

Item	Description	Notes
Timeout(*)	Time for Server to wait and disconnect connection when no event occurs for certain time after connection between client and server	Default : 60(sec)
KeepAlive(*)	Whether specific process continues to handle specific user's request tasks	Default : On

Item	Description	Notes
MaxKeepAliveRequests(*)	Valid value when KeepAlive is On, process handles specific user's requests for specified number of times When this value is exceeded, that process dies and another process handles requests	Default : 100
KeepAliveTimeout(*)	Valid value when KeepAlive is On, timeout to disconnect connection when no request for set time	Default : 5(sec)
RequestReadTimeout(*)	Time to wait for receiving request header and body from user, if not received within set time, sends 408 REQUEST TIME OUT error	Default : header=20-40,MinRate=500 body=20,MinRate=500

3. Process Info (/conf/extra/httpd-mpm.conf file management)

Item	Description	Notes
StartServers(*)	Number of server processes initialized when Web Server starts	Default : 4
ServerLimit(*)	Maximum process value that MaxClients can create	Default : 32
ThreadLimit(*)	Maximum configurable value for ThreadPerChild	Default : 128
MinSpareThreads(*)	When number of Idle Threads in Idle state is less than this value, Threads increase to this value and maintain	Default : 128
MaxSpareThreads(*)	When number of Idle Threads in Idle state is more than this value, Threads decrease to this value and maintain	Default : 256
ThreadPerChild(*)	Number of Threads created by each child process	Default : 128
MaxRequestWorkers(*)	Maximum number of Threads that all child processes can create	Default : 1024
MaxConnectionPerChild(*)	Maximum number of requests that child process can service After processing this many requests, it terminates.	Default : 0 (0: unlimited)

Virtual Host

Web Server's Virtual Host information can be registered/modified/deleted.

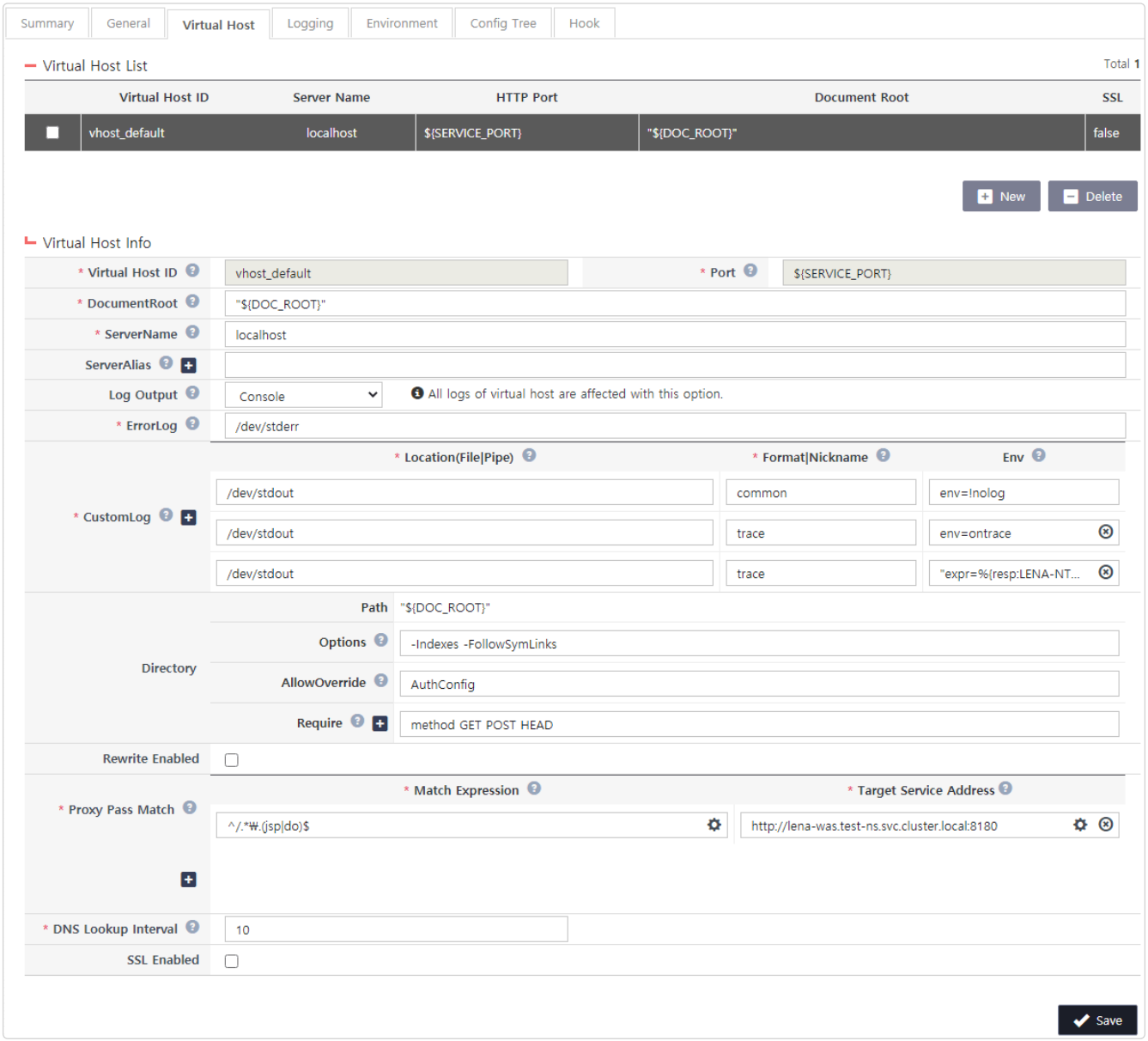


Figure 34. Web Server(EN-A) Template Virtual Host Tab

New / **Delete button** can register/delete Virtual Host. Virtual Hosts with one or more Load Balancers applied cannot be deleted. If you want to delete that Virtual Host, first change Virtual Host ID of Load Balancer to different Virtual Host ID through Connector tab. When SSL Enabled and Rewrite Enabled are checked, detailed item areas are additionally displayed as follows.

Figure 35. Web Server(EN-A) Template Virtual Host Rewrite Detail

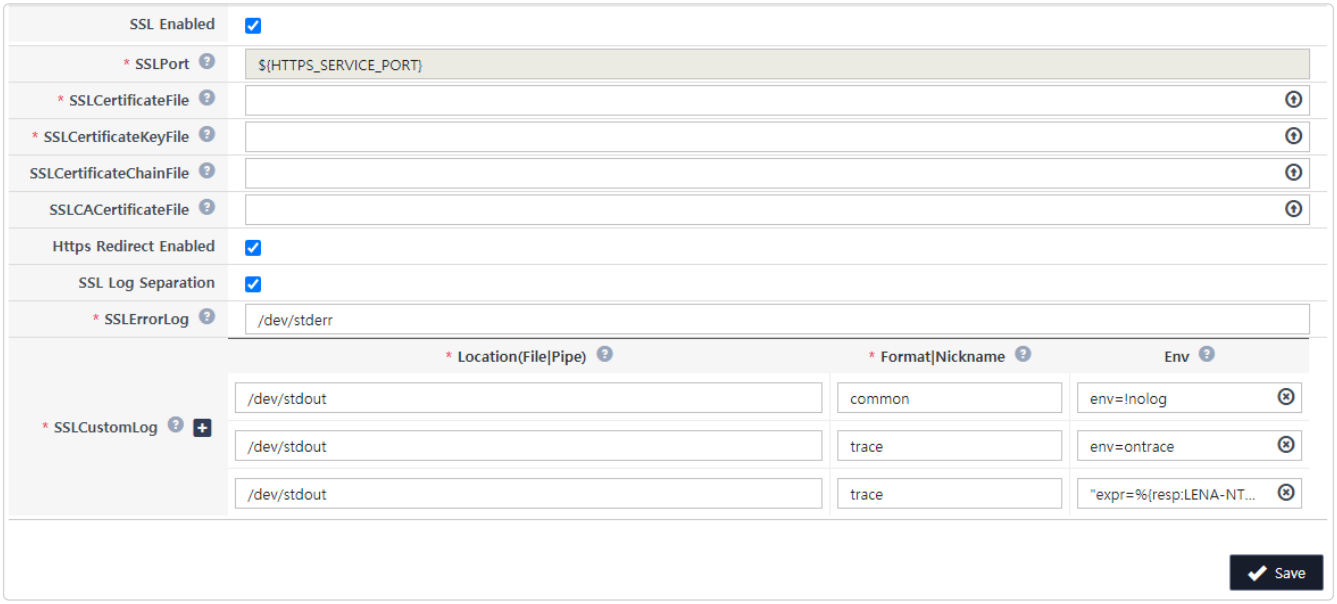


Figure 36. Web Server(EN-A) Template Virtual Host SSL Detail

Detailed contents of configuration information are as follows.

Managed files

- /conf/extra/vhost/{Virtual Host ID}.conf
- /conf/extra/rewrite/rewrite_{Virtual Host ID}.conf
- /conf/extra/ssl/ssl_{Virtual Host ID}.conf
- /conf/extra/vhost/custom_{Virtual Host ID}.conf

Item	Description	Notes
Virtual Host ID(*)	Virtual Host name	
Port(*)	HTTP Port used by that virtual host	
DocumentRoot(*)	Homepage directory location of that virtual host Can be specified to same or subdirectory using Server's DocumentRoot variable ${DOC_ROOT}	
Domain Name(*)	Domain name of that virtual host	
ServerAlias	ServerAlias used by that virtual host Can include wildcard characters (*.example.com)	
Log Output	Set log output type. ErrorLog, CustomLog settings are automatically changed according to selection.	
ErrorLog(*)	Web error log file location of that virtual host	
CustomLog(*)	Web log file location of that virtual host	

Item	Description	Notes
Directory/Path	Path from DocumentRoot	
Directory/Options	Access control settings to apply to all files and directories under specified directory	-Indexes prevents showing file list under Document Root when welcome page cannot be found
-FollowSymLinks prevents accessing file system other than existing web documents under Document Root via symbolic links	Directory/AllowOverride	Set which directives to allow for resource access control configuration files for each subdirectory under Document Root (generally AccessFileName : .htaccess)
-None : Do not allow any directives -All : All directives available -AuthConfig : Allow user authentication directives -FileInfo : Allow document type control directives -Indexes : Allow directory indexing control directives -Limit : Allow host access control directives	Directory/Require	Verify whether authenticated users perform allowed Actions
	SSL Enabled	Whether to use SSL
	SSLPort(*)	HTTPS Port
	SSLCertificateFile(*)	SSL certificate path
	SSLCertificateKeyFile(*)	SSL certificate Key file path

Item	Description	Notes
	SSLCertificateChainFile	File of PEM-encoded Server CA Certificate(optional)
	SSLCACertificateFile	ROOT certificate path(optional)
	Rewirte Enabled	Whether to use Rewrite
	Rewirte Conf	Detailed Rewrite configuration Rewrite according to rules set in Rewrite Rule according to specified Rewrite Condition https://httpd.apache.org/docs/2.4/mod/mod_rewrite.html reference
	Enable Custom	Add configurations that users want to add to Vhost arbitrarily.
Contents are generated and stored in separate file (custom_{Virtual Host ID}.conf).	Proxy Pass Match(*)	Match Expression : Request URL pattern to connect to Proxy Service Target Service Address : Target Proxy Service address to connect
Regular expression	DNS Lookup interval(*)	Domain Address Cache update cycle

Match Expression value of Proxy Pass Match must input URL pattern as regular expression, and can be input directly or by clicking **gear button**.

Figure 37. Web Server Template Virtual Host Proxy Configuration Popup

Match Rules area in above screen shows regular expressions decomposed by '()' units as list. To add unit Rule, click **+ button** at top and input regular expression. To delete unnecessary Rule, click **X button**. Rule Matching Test area is functionality to test whether Match Rules input regular expressions match. Input URL in Path field and click **Test button** to display regular expression matching result at bottom. In above screen, select Service Endpoint and click **Apply button** to close popup window and input value in Target Match Expression field.

Target Service Address of Proxy Pass Match can be input directly or click **gear button** to select Application Server type Service Cluster's Service Endpoint from displayed popup.

Logging

Web Server's log configuration information can be edited.

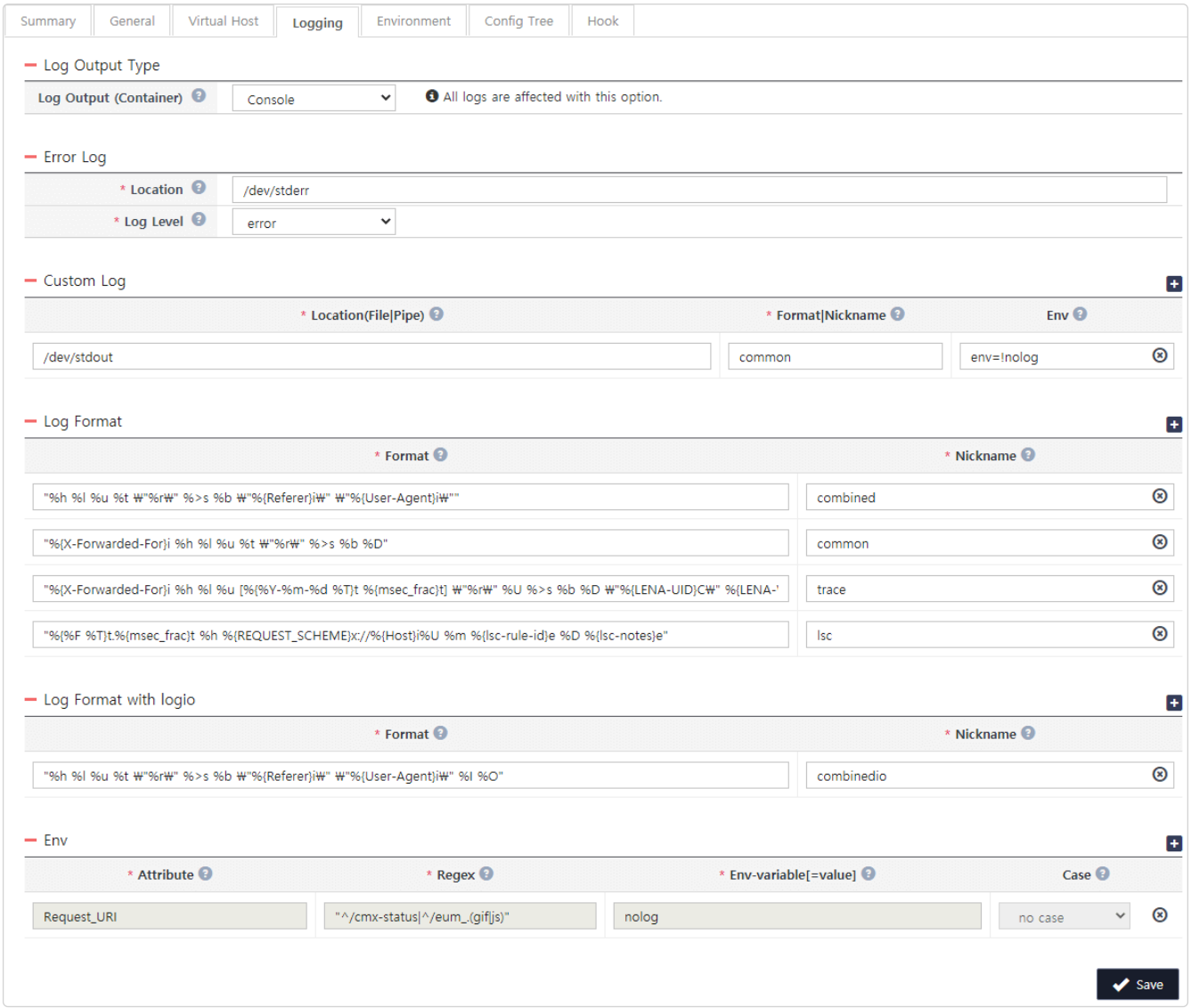


Figure 38. Web Server Template Logging Tab

1. Log Output Type

Select log output type for Web server. Error Log, Custom Log settings are changed according to selection.

Item	Description	Notes
Console	Output Log to standard output / error.	
File	Output Log to single file.	
Rotate pipe	Output Log to file and divide files by date.	
Manually Input	Output Log according to user definition.	

2. Error Log

Used when Web server records errors that occur while processing diagnostic information and requests. When problems occur during Server startup or operation, check files at location set here first.

(*) indicates required values

Item	Description	Notes
Location(*)	Specify Web server's error log file location	
Log Level(*)	Specify how detailed to record error log file contents	

3. Log Format

Sets format to use for log files.

Item	Description	Notes
Format(*)	Sets format for recording logs in log file	
Nickname(*)	Log format name to use in CustomLog	

4. Log Format with logio

Item	Description	Notes
Format(*)	Sets format for recording logs in log file Can measure bytes sent and received including request and head using %I and %O variables	
Nickname(*)	Log format name to use in CustomLog combinedio requires mod_logio_module to be loaded	

5. Custom Log

Sets log file name and format. Can selectively record logs according to request characteristics using environment variables.

Item	Description	Notes
Location(File	Pipe)(*)	File: Error log file location Pipe: Program path to receive log information as standard input after pipe character '
'		Format
Nickname(*)	Content to record in log file Use nickname defined in Log Format or write log format directly	
Env	Write whether to record logs according to server environment variable presence	(optional)

ex) When wanting to record requests from English users and non-English users in different log files
Location Format Env
logs/english_log common english

logs/non_english_log common !english

6. Env

Used when setting environment variables according to Request conditions.

Item	Description	Notes
Attribute(*)	HTTP request header (ex: Host, User-Agent, Referer, Accept-Language), one of request attributes (Remote_Host, Remote_Addr, Server_Addr, Request_Method, Request_Protocol, Request_RUI) or environment variable name associated with request	
Regex(*)	Perl compatible regular expression	
Env-variable[=value]	Variable name and value to set (optional) Varname, !varname or varname=value	
Case	Whether to distinguish case for Env-variable	With case : Distinguish case No case : No case distinction

Configuration Tree

Web Server's ${SERVER_HOME}/conf directory sub configuration files can be managed through file editor.

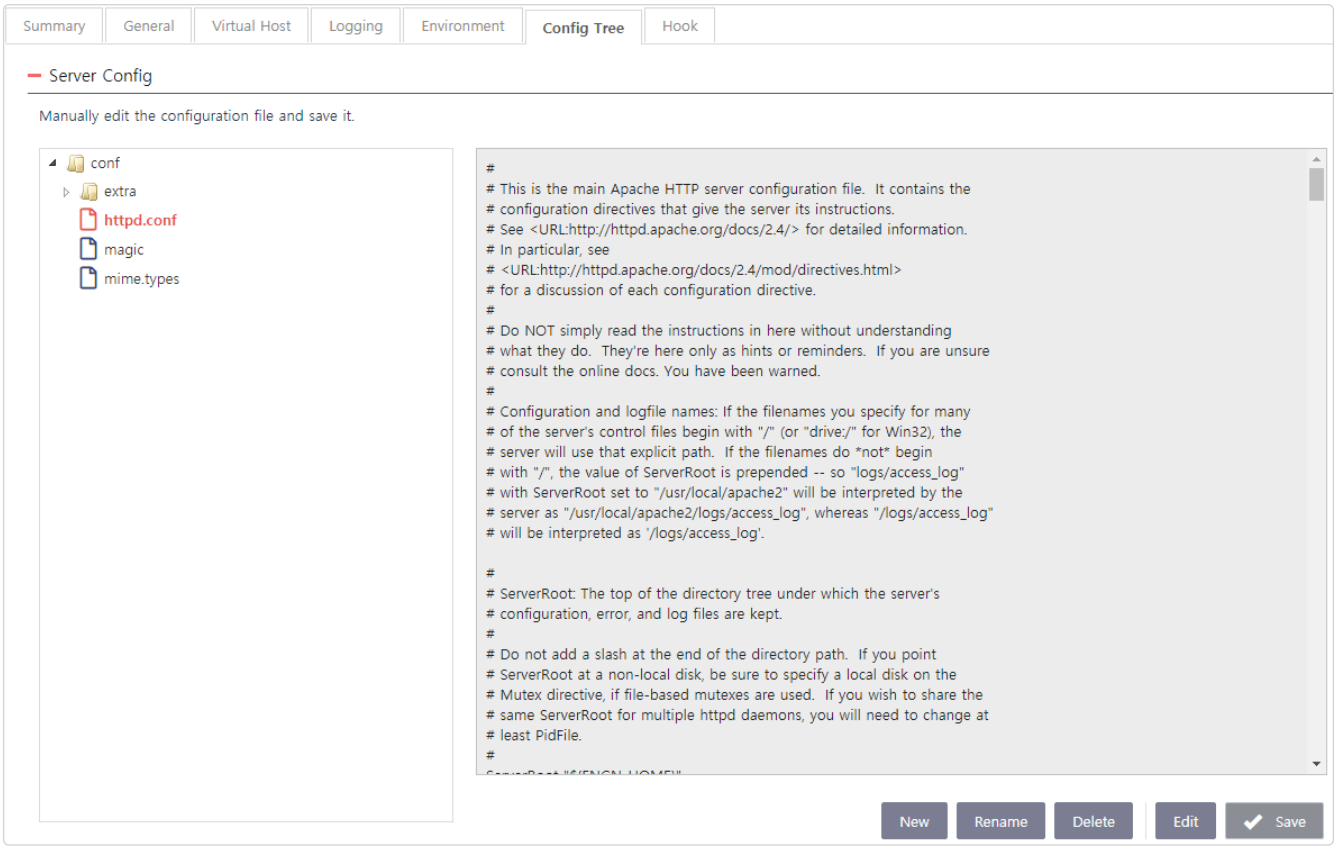


Figure 39. Web Server Template Configuration Tree Tab

Hook

Allows execution of user-defined Shell Script before Application Server startup and after shutdown in Container.

- Start Hook Script : This Script is executed before starting Application Server during Container startup.
- Stop Hook Script : This Script is executed after stopping Application Server during Container shutdown.

Revision Creation

Click **New Revision button** in Template tab to create new Revision. Modify WAS, WEB server configuration files through tabs at bottom of System Template Overview and click Save to temporarily save. After all configuration file modifications are complete, click New Revision button to create new Revision and generate Template compressed file. Created Revision can be checked in Revision tab.

Even after modifying and saving WAS, WEB server configuration files, if new Revision is not created, screen returns to Default Revision when re-entering.

Configuration

Click **Configuration button** in Template tab to display configuration screen.

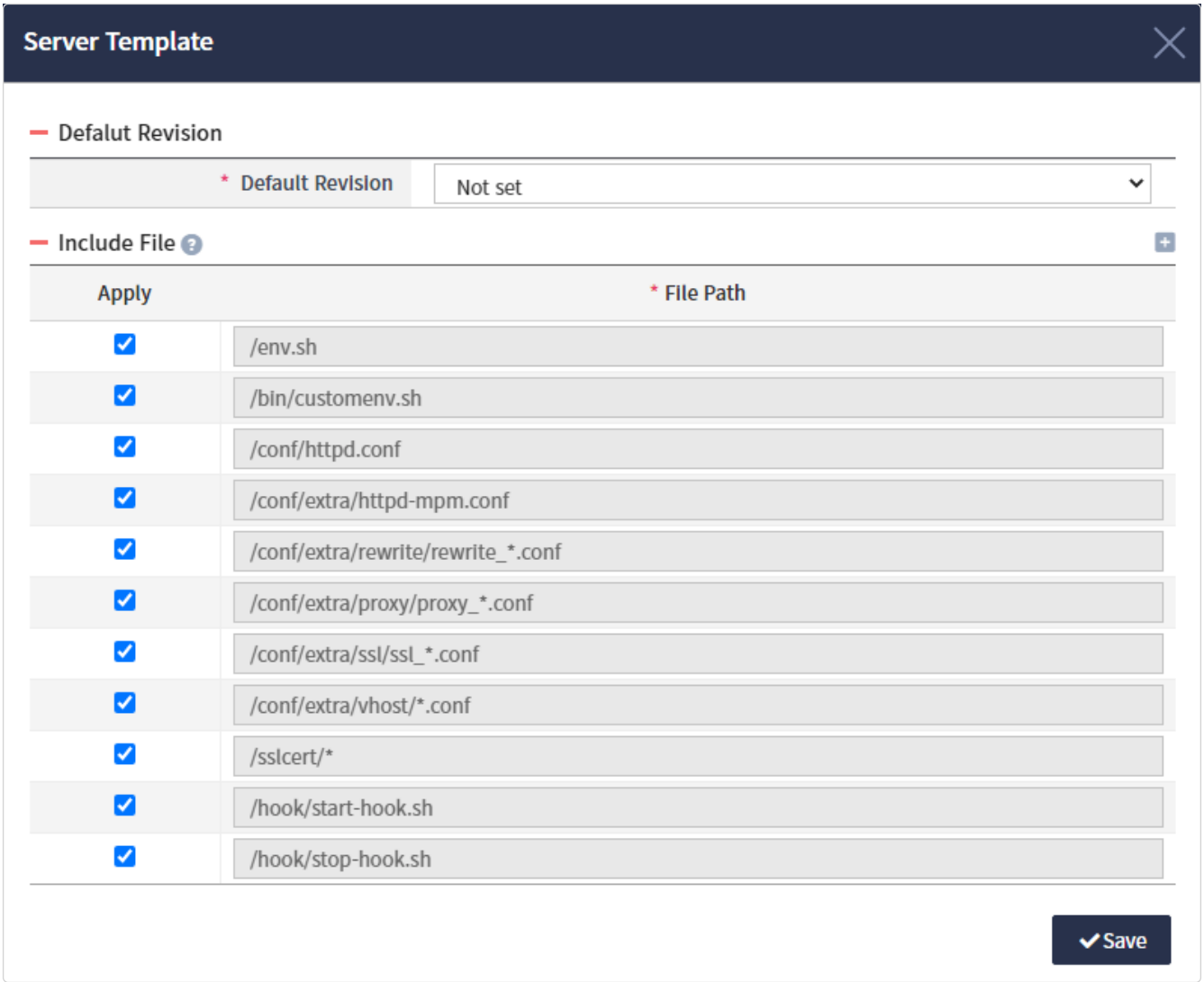


Figure 40. Web Server Template Configuration Popup

Default Revision and Include Files to be included in Template compressed file can be specified. Basic file list for Template configuration is automatically generated, and users can add desired files. Only files with Apply checkbox activated are included in Template compressed file.

Export

For detailed content related to Export, refer to Export in this document.

User Guide

For detailed information about the User Guide, please refer to [was-template-userguide].

5.2.7. Embedded WAS Configuration Management

Embedded WAS sets Server configuration in Application internal files. For Spring Boot based Applications, default configuration is done in application.properties file or application.yml file. LENA configuration should also be set in those files.

Embedded WAS requires dependency to be added to Spring Boot Application to be usable. For example, when using maven, declare as follows in pom.xml.

```
<dependency>
    <groupId>lena</groupId>
    <artifactId>spring-boot-starter-lena</artifactId>
    <version>1.3.1.4</version>
</dependency>
```

Embedded WAS Overview

Overview content refers to Service Cluster Overview.

Server List

For Embedded WAS, some items are displayed differently in Server List.

Item	Description	Notes
Profile	Application's Profile	
Note icon	Query Audit configuration, MBean Attributes, System Properties of that Instance	

Embedded WAS Configuration

Basically, Embedded WAS configuration information is inside each Application. Configuration information managed by Manager is not items directly applied to Applications with Embedded WAS. 'Application Properties' can be used when separating configuration information from deployment package, and 'Audit' helps easily apply WAS event collection settings to Applications.

Application Properties

When separating Application's environment configuration information from deployment package,

Spring Cloud Config can be used to read and apply configuration information from remote server. LENA Manager acts as Spring Cloud Config Server to read configuration files uploaded to Git Repository and deliver to Applications. LENA Manager can specify Git Repository by Application&Profile unit.

Item	Description	Notes
Profile	Application's Profile	
Application Name	Application Name. Same as Service Cluster Name. Must input according to {Application Name}-{Profile} pattern since it's retrieved from Git Repository.	
Type	Remote type to receive configuration information.	Currently only Git is supported.
defaultLabel	Git branch name	default: master
URI	Git URI	
username	Username for Git Repository authentication.	Required depending on authentication method.
password	Password for Git Repository authentication.	Required depending on authentication method.
ignoreLocalSshSettings	Whether to set SSH configuration using JAVA properties when accessing Local SSH configuration files is difficult.	default: false
hostKey	Host key of Git repository server, should not include algorithm prefix included in host-key-algorithm.	
hostKeyAlgorithm	Host key algorithm should be ssh-dss, ssh-rsa, ecdsa-sha2-nistp256, ecdsa-sha2-nistp384 or ecdsa-sha2-nistp521 (required only when host-key exists)	
strictHostKeyChecking	Whether Config server instance fails to start when using private host-key.	default: true
privateKey	privateKey for git repository authentication.	
knownHostsFile	Input location of .known_hosts file.	
preferredAuthentications	Override server authentication method order.	

Applications must configure whether to use Spring Cloud Config functionality. (Default setting value is not used.) Must input usage and manager information in boostrap.properties (or yml).

```
server.lena.config.enabled=true
server.lena.config.uri=http://Manager address/lena-embed-manager/config
spring.application.name=
```

spring.application.name, LENA Manager's Application Name, and file pattern stored in Git Repository must match to read configuration files.

Audit

Screen for configuring WAS event collection. Adding configuration information to Application's startup options allows collected event information to be checked in Event Dashboard. For Event Dashboard related content, refer to Event Dashboard.
For event configuration content, refer to Audit. Click **Generate button** to display configuration information script in popup window. Click **Copy to Clipboard button** to easily add to JVM Option. Click **Download oom.sh button** to download execution script file that delivers OOM information to Manager when OOM occurs.

For StuckThread event Valve configuration, refer to Valve Configuration.

oom.sh file can be downloaded as oom.bat file when OS is WINDOWS.
After placing downloaded oom.sh file in specific location, write -XX:OnOutOfMemoryError=.
Refer to [JVM-Option-Setting].

Encryption

Functionality to encrypt information that should not be exposed externally in Application configuration files (application.properties, application.yml, etc.).

Item	Description	Notes
Use Provided Key	Encryption/Decryption Key	TRUE:LENA provided Key
ENcrypt Target String	Plain Text to encrypt	
Key	Encryption/Decryption Key	Activated when Use Provided Key is false
Encrypt Result	Encryption result	Value changes each time Encrypt button is pressed

Configuration method

```
jasypt.encryptor.bean=lenaStringEncryptor
jasypt.encryptor.password=ENC(Os3OQ2CdW0M5xGf9pfdklT2Ce2vj4ti+S1pgI3Rr4B8=)
```

Put Encrypt Result value inside ENC() of jasypt.encryptor.password and start.

Check Configuration

Pre-defines conditional expressions for WAS Configuration Properties values and displays alarm when started WAS does not meet those conditions.

Item	Description	Notes
Name	Name	
Key	Key value to compare	Example) server.lena.stuckThread.threadhold
Value	Reference value	
Condition	Condition	
Description	Description	

```
 When Key value contains dashes, modify to CamelCase and write. +
When started WAS does not meet above conditions, exclamation mark(!) alarm
appears in ETC-INFO item at bottom of Overview tab's ServerList and
clicking exclamation mark allows checking which values did not meet
conditions.
```

Embedded WAS Configuration Items

Spring Boot's Server configuration is as follows.
https://docs.spring.io/spring-boot/docs/current/reference/html/appendix-application-properties.html#common-application-properties-server

Embedded WAS can use Server configuration provided by Spring Boot as is.
However, Spring Boot's tomcat configuration must be changed to lena for use.
ex) Use server.lena.accesslog.enabled= true instead of server.tomcat.accesslog.enabled= true.

Connector Configuration

Additional connector attribute items configurable in LENA are as follows.

Item	Default Value	Description
server.lena.connector.max-cookie-count	200	Maximum number of Cookies allowed in Request
server.lena.connector.max-parameter-count	10000	Maximum number of parameters that can be automatically parsed. Parameter values exceeding this limit are ignored. Negative values mean no limit

Item	Default Value	Description
server.lena.connector.max-post-size	2097152	Maximum size of POST to be processed by Form URL parameter parsing (Byte)
server.lena.connector.uri-encoding	UTF-8	URI Encoding method
server.lena.connector.use-body-encoding-for-uri	false	Whether to use encoding specified in 'content-type' for URI query parameters instead of uriEncoding

Session Clustering Configuration

Session Clustering using LENA Session Server is configured as follows.

Item	Default Value	Description
server.lena.session.enabled	false	Whether to use Session Clustering with LENA Session Server
server.lena.session.config-file		File path when setting session clustering configuration in separate conf file.
server.lena.session.primary-host		LENA Session Server's Host(Primary)
server.lena.session.primary-port		LENA Session Server's Port(Primary)
server.lena.session.secondary-host		LENA Session Server's Host(Secondary)
server.lena.session.secondary-port		LENA Session Server's Port(Secondary)

Valve Configuration

LENA basically has LenaStuckThreadDetectionValve configured. Default configuration is threshold = 600, interruptThreadThreshold = -1. To change, modify as follows.

Item	Default Value	Description
server.lena.stuckThread.threshold	600	Minimum execution time(sec) for Thread to be considered Stuck. Setting to 0 disables.
server.lena.stuckThread.interruptThreadThreshold	-1	Minimum execution time for releasing StuckThread (release not guaranteed). Setting to -1 disables. Must be larger than threshold value to use this functionality.

When additional Valve is needed in LENA, it's possible with following configuration. Valve and Valve's attributes must be declared as arrays.

Item	Default Value	Description
server.lena.valve.className		Valve's ClassName (including package)
server.lena.valve.attribute.name		Valve's attribute name

Item	Default Value	Description
server.lena.valve.attribute.value		Valve's attribute value

Valve configuration example is as follows.

```
server.lena.valve[0].className=org.apache.catalina.valves.StuckThreadDetection
Valve
server.lena.valve[0].attribute[0].name=threshold
server.lena.valve[0].attribute[0].value=100
server.lena.valve[0].attribute[1].name=interruptThreadThreshold
server.lena.valve[0].attribute[1].value=10
```

Existing Application's Port information was defined as server.port.
For management convenience in Embedded LENA, define in startup options.
-Dspring.application.json={"server.port":8080}
In this case, even if server.port is defined in application.properties, priority causes startup with port value defined in startup options.

Startup Configuration

When building and starting Spring Boot Application as jar, following configuration is needed to use Management functionality through LENA Manager.
LENA's Docker Base Image Build method is checked through [Embedded-WAS-Deploy].

- Prepare agent library and conf file
  : Agent library and environment configuration conf file are needed to send monitoring information to LENA Manager.
  Prepare lena-advertiser-1.3.1c.jar file and advertiser.conf file in specific location.
  Basic configuration of advertiser.conf can be modified as follows.

```
# Manager Server address
advertiser.server.addr=127.0.0.1

# Manager Server UDP Port (value entered during Manager Server installation)
advertiser.server.port=16100

# Service Cluster Name.
container.group.name=ApplicationName

# Whether to make TCP connection with Manager (set true if wanting to generate
ThreadDump remotely through Manager)
advertiser.enable.reverse.tcp.connection=true
```

- JVM Option Configuration
  : Library and conf file paths and service port information must be added to JAVA Option during startup.
  To check monitoring information, also change mbean configuration to true by default.
  Following script can be used for easy configuration.

```
#!/bin/sh

# Environment variables for LENA Manager integration
export AGENT_LIB_HOME= # lena-advertiser.jar file path
export AGENT_CONF_HOME= # advertiser.conf file path
export HTTP_PORT= # application service port
export PROFILE=
export
SPRING_OPTION="{\"server.port\":\"\",\"spring.datasource.hikari.register-
mbeans\":true,\"spring.jmx.enabled\":true,\"server.lena.mbeanregistry.enabled\
":true}"
export LENA_VERSION=1.3.1c
export BIN_DIR= # oom.sh file path (oom event option)

# Some options that must be added per project. Must be modified according to
project.
export JVM_HEAP_SIZE=
export JVM_METASPACE_SIZE=
export DUMP_OUTPUT_DIR=
export LOG_OUTPUT_DIR=
export HOSTNAME=LCSKVM06827

# JVM_Option value configuration for LENA Manager integration (required)
JVM_OPTS="-javaagent:/lena-advertiser-.jar"
JVM_OPTS=" -Dport.http="
JVM_OPTS=" -Dlena.config=/advertiser.conf"
JVM_OPTS=" -Dspring.application.json="
JVM_OPTS="
-Dspring.profiles.active=C:\Users\76882\Documents\WindowsPowerShell\Microsoft.
PowerShell_profile.ps1"
JVM_OPTS=" -Dlena.name=LENA_Application"

# Event configuration (value created in Manager)
JVM_OPTS=" -XX:+HeapDumpOnOutOfMemoryError"
JVM_OPTS=" -XX:HeapDumpPath=/hdump"
JVM_OPTS=" -Devent.oom.enable=true"
JVM_OPTS=" -Devent.stuckthread.enable=true"
JVM_OPTS=" -Devent.fullgc.enable=false"
JVM_OPTS=" -Devent.exception.enable=false"
JVM_OPTS=" -Devent.exception.pattern="
JVM_OPTS=" -Devent.exception.exclude.pattern="
JVM_OPTS=" -Devent.exception.fullstack.enable=true"
JVM_OPTS=" -Devent.exception.fullstack.maxline=3"

# Additional configuration (set according to project)
JVM_OPTS=" -Xmsm -Xmxm"
JVM_OPTS=" -XX:MaxMetaspaceSize=m"
JVM_OPTS=" -XX:+UseParallelGC"
```

```
JVM_OPTS=" -XX:+UseParallelOldGC"
JVM_OPTS=" -XX:-UseAdaptiveSizePolicy"
JVM_OPTS=" -XX:+ExplicitGCInvokesConcurrent"
JVM_OPTS=" -Xloggc:/gc_embeddedServer_.log"
JVM_OPTS=" -verbose:gc"
JVM_OPTS=" -XX:+PrintGCDetails"
JVM_OPTS=" -XX:+PrintGCDateStamps"


# Startup method should also be changed according to project.
(XX:OnOutOfMemoryError configuration is needed to collect oom event.)
java -jar  \
-XX:OnOutOfMemoryError="/oom.sh %p /lena-advertiser-.jar /advertiser.conf
/hdump  true" \
application.jar
```

Chapter 6. Resource

6.1. Database

When you select Database from the left menu, the Database Resource list is displayed.

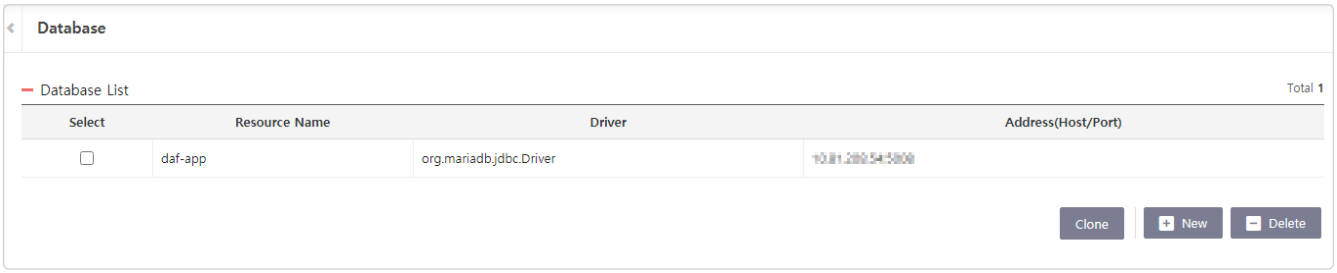


Figure 41. Database List Screen

6.1.1. Database Registration

1. Click the **New button** in the Database Resource list to display the new registration screen.
2. Enter the input fields.
   - Enter the Resource Name.
   - Check the DriverClassName and select the driver for your desired vendor.
   - Enter the Address (host/Port) information.
3. Click the **Save button** to save.

6.1.2. Database Modification

1. Select the checkbox of the Database Resource you want to modify from the Database Resource list.
2. Modify the Database Resource items and save.

When content is modified, it propagates to the DataSource Resource and WAS configuration connected to that Database Resource, so if there are DataSource Resources connected under that Database Resource, the input fields are disabled by default. Click the **Edit button** to enable modification.

6.2. DataSource

When you select DataSource from the left menu, the DataSource Resource list is displayed.

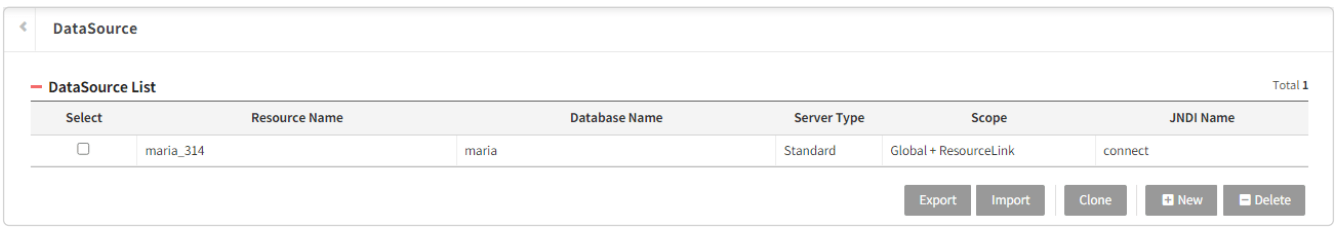


Figure 42. DataSource List Screen

6.2.1. DataSource Registration

1. Click the **New button** in the DataSource Resource list to display the new registration screen.
2. Enter a logical name in the Resource Name field.
3. Set the Server Type. Server Type must be selected from Standard or Enterprise, and thereafter it can only be imported and used on servers of the same type.
4. Configure the detailed settings for DataSource (refer to the detailed item descriptions in [Server DataSource Settings])
5. Click the **Upload button** to register the Driver for that DataSource on the Manager server. Pre-registered Drivers are transmitted to the corresponding server when operators import them to the server.
6. Click the **Save button** to save.

JDBC Drivers uploaded to the Manager are transmitted to the corresponding server when operators import that DataSource Resource to the server. Transmitted JDBC Drivers are located in the {server home path}/lib/datasource directory and are automatically registered in the Classpath.

6.2.2. DataSource Modification

1. When you select a row you want to modify from the DataSource Resource list, the DataSource Resource modification screen is displayed.
2. Change the configuration you want to modify.
3. Click the **Save button** to save.

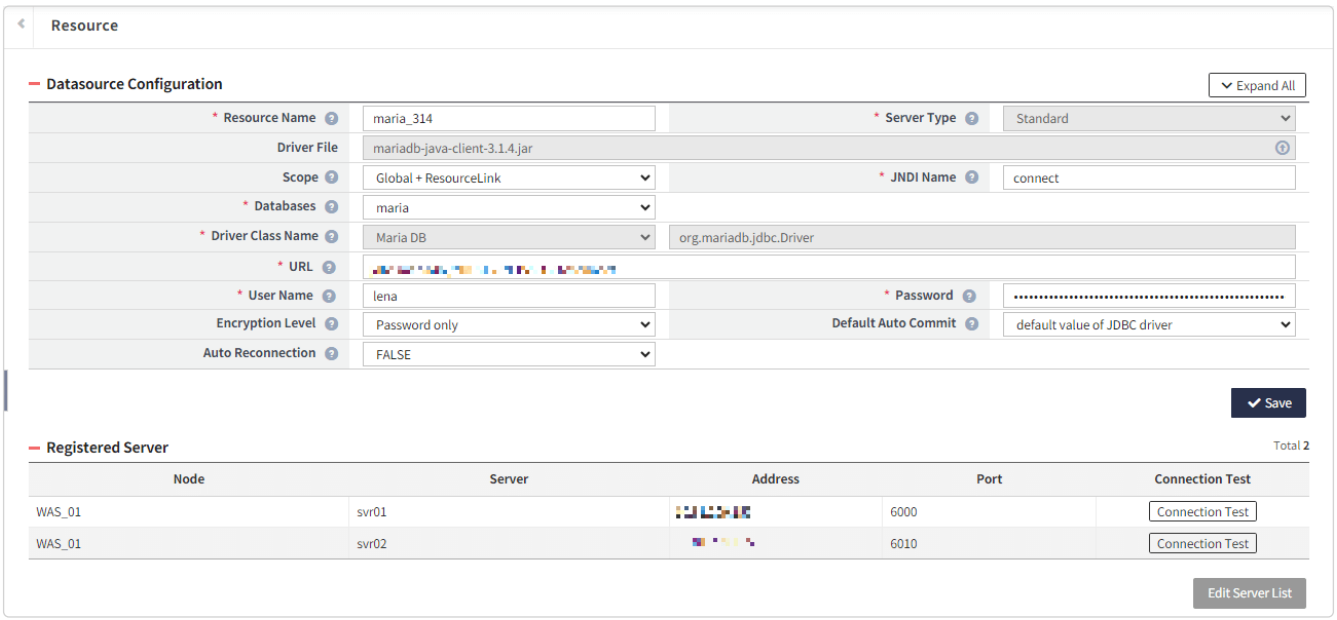


Figure 43. DataSource Detail Information Screen

When you save after modifying DataSource Resource information, the changed configuration propagates to the server where that DataSource Resource is used. When you restart the server where the configuration has propagated, that configuration is applied.

After importing a DataSource Resource set to Standard Type to a Standard server, the Server Type cannot be changed to Enterprise.

Note that when deleting a DataSource Resource after Classpath registration, the Classpath is not deleted.

6.2.3. DataSource Deletion

1. Select the checkbox of the DataSource Resource you want to delete from the DataSource Resource list.
2. Click the **Delete button** to delete.

If there are Registered Servers or Registered Applications that have imported from the Server or Application, that DataSource Resource cannot be deleted.

6.2.4. JDBC Driver Upload

1. Click the **Upload button** in the DataSource Resource registration or edit screen to display a screen where you can upload Driver Files.
2. Click the **File Selection button** to select the Driver File you want to upload from your local PC.
3. Click the **Upload button** to upload the Driver File to the Manager.

6.2.5. DataSource Import

The list of Servers using the created DataSource Resource by importing it (when Scope is Context, Global, Global + Link) or the list of Applications (when Scope is Application) is displayed in the lower area when viewing DataSource Resource details.

Importing DataSource from DataSource Detail Screen

DataSource Resources with Scope Context, Global, or Global + Link can register servers that import them.

1. In the DataSource management screen, select a specific DataSource Resource to navigate to the detail information screen.
2. Click the **Edit Server List button** to display a window where you can register and manage servers.
3. Specify the server to import that DataSource and move it to the right area.
4. Click the **Save button** to import the DataSource Resource to that server.

To delete an imported DataSource Resource from a server, move the target server to the left area and click the **Save button**.

Importing DataSource from Individual Server

1. Select the Servers menu from the top of LENA Manager.
2. Click on the left side: Individual Web Application Server > Resources > DataSource tab to display a screen where you can view the DataSource Resource list for that server and add DataSource Resources.
3. Click the **Import button** to display a list of predefined DataSource Resources in a popup window.
4. Select the DataSource Resource you want to import.
5. Click the **OK button** to import that DataSource Resource.

When you import a DataSource Resource, connection information between that DataSource Resource and the server is internally created. Based on this connection information, configuration updates are delivered to that server when the DataSource Resource is modified.

Standard Servers cannot import Enterprise Type DataSource Resources. (They are not displayed in the list)

Imported DataSource Resource settings cannot be edited in Server settings. (Configuration information can be viewed but not modified) To change the configuration, go to the Resource > DataSource screen to make changes.

6.3. JTA

When you select JTA from the left menu, the JTA Resource list is displayed.

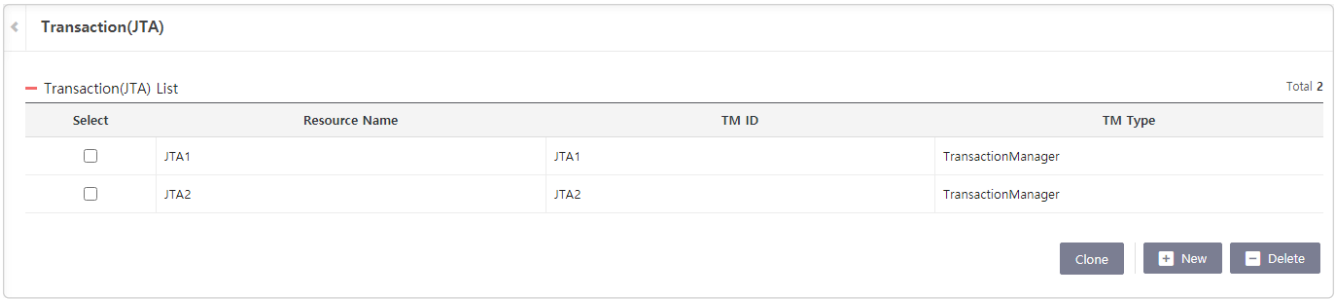


Figure 44. JTA List Screen

6.3.1. JTA Registration

1. Click the **New button** in the JTA list to display the new registration screen.
2. Enter the values you want to configure. (For detailed settings, refer to "4.3.7 Server Configuration Information Management")
3. Click the **Save button** to save.

6.3.2. JTA Modification

1. When you select a row you want to modify from the JTA Resource list, the modification screen is displayed.
2. Enter the configuration you want to change.
3. Click the **Save button** to save.

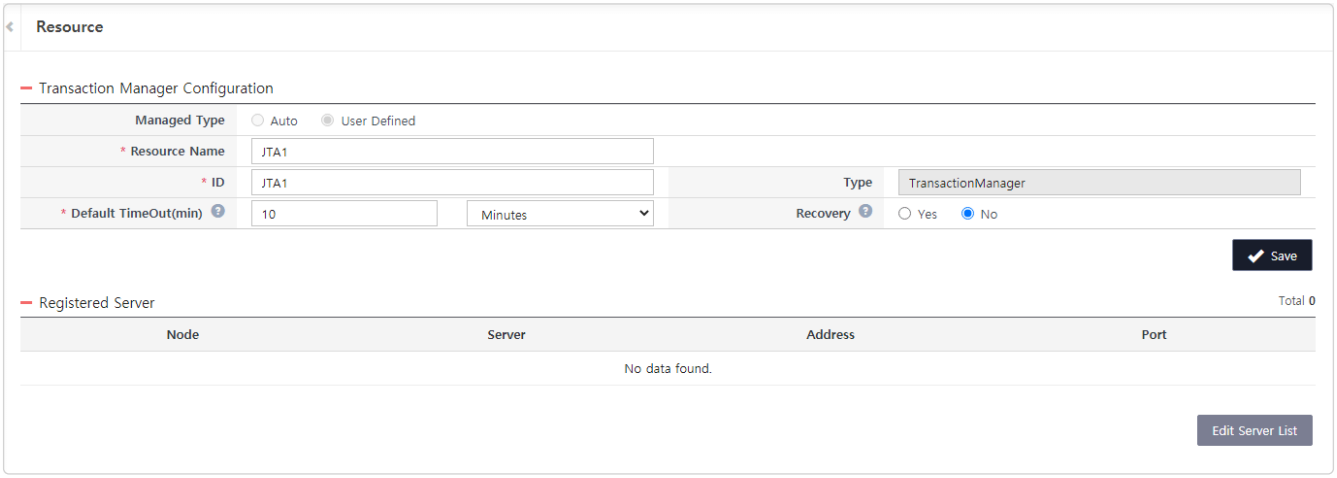


Figure 45. JTA Detail Information Screen

When you save after modifying JTA Resource information, the changed configuration propagates to the server where that JTA Resource is used. When you restart the server where the configuration has propagated, that configuration is applied.

6.3.3. JTA Deletion

1. Select the checkbox of the JTA Resource you want to delete from the JTA list.
2. Click the **Delete button** to delete.

If there are Registered Servers that have imported from the server, that JTA Resource cannot be deleted.

6.3.4. JTA Import

The list of servers using the created JTA Resource by importing it is displayed in the lower area when viewing JTA Resource details.

Importing JTA from JTA Detail Screen

In the JTA detail screen, you can modify the list of servers that are importing and using it.

1. In the JTA management screen, select a specific JTA Resource to navigate to the detail information screen.
2. Click the **Edit Server List button** to display a window where you can register and manage servers.
3. Specify the server to import that JTA Resource and move it to the right area.
4. Click the **Save button** to import the JTA Resource to that server.

To delete an imported JTA Resource from a server, move the target server to the left area and click the **Save button**.

Importing JTA from Individual Server

1. Select the Servers menu from the top of LENA Manager.
2. Click on the left side: Individual Web Application Server > Resources > JTA tab to display a screen where you can view the JTA Resource list for that server and add JTA Resources.
3. Click the **Import button** to display a list of predefined JTA Resources in a popup window.

4. Select the JTA Resource you want to import.
5. Click the **OK button** to import that JTA Resource.

When you import a JTA Resource, connection information between that JTA Resource and the server is internally created. Based on this connection information, configuration updates are delivered to that server when the JTA Resource is modified. Connection information can be viewed in the Resource > JTA screen.

Imported JTA Resource settings cannot be edited in server settings. (Configuration information can be viewed but not modified) To change the configuration, go to the Resource > JTA screen to make changes.

6.4. JMS

When you select JMS from the left menu, the JMS Resource list is displayed.

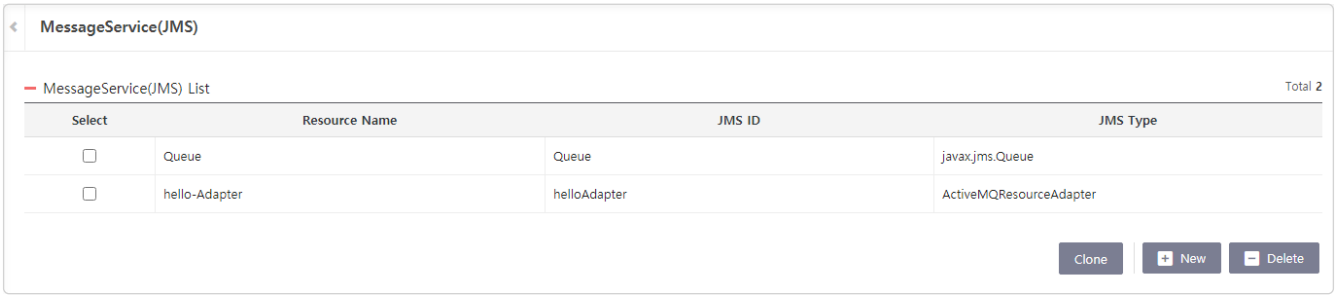


Figure 46. JMS List Screen

6.4.1. JMS Registration

1. Click the **New button** in the JMS list to display the new registration screen.
2. When you select the type of JMS Resource to register, configuration information appropriate for the selected type is displayed below.
3. Enter the values you want to configure. (For detailed settings, refer to "4.3.7 Server Configuration Information Management")
4. Click the **Save button** to save.

6.4.2. JMS Modification

1. When you select a row you want to modify from the JMS Resource list, the modification screen is displayed.
2. Enter the configuration you want to change.
3. Click the **Save button** to save.

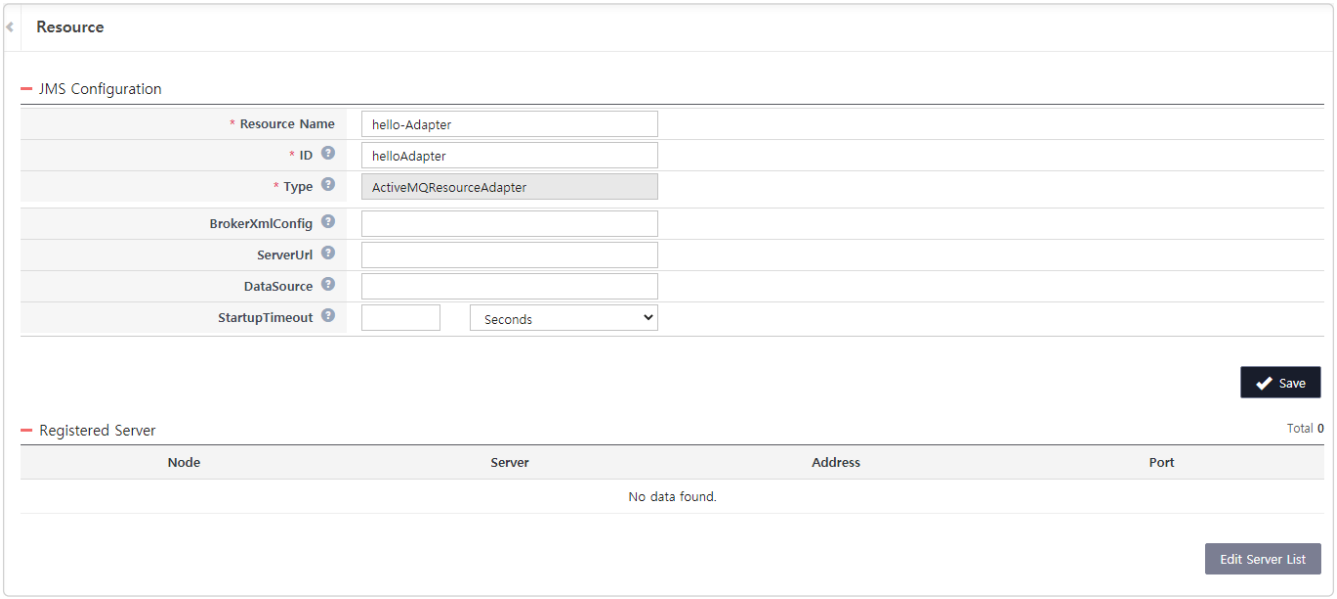


Figure 47. JMS Detail Information Screen

When you save after modifying JMS Resource information, the changed configuration propagates to the server where that JMS Resource is used. When you restart the server where the configuration has propagated, that configuration is applied.

6.4.3. JMS Deletion

1. Select the checkbox of the JMS Resource you want to delete from the JMS list.
2. Click the **Delete button** to delete.

If there are Registered Servers that have imported from the server, that JMS Resource cannot be deleted.

6.4.4. JMS Import

The list of servers using the created JMS Resource by importing it is displayed in the lower area when viewing JMS Resource details.

Importing JMS from JMS Detail Screen

In the JMS detail screen, you can modify the list of servers that are importing and using it.

1. In the JMS management screen, select a specific JMS Resource to navigate to the detail information screen.
2. Click the **Edit Server List button** to display a window where you can register and manage servers.
3. Specify the server to import that JMS and move it to the right area.
4. Click the **Save button** to import the JMS Resource to that server.

To delete an imported JMS Resource from a server, move the target server to the left area and click the **Save button**.

Importing JMS from Individual Server

1. Select the Servers menu from the top of LENA Manager.
2. Click on the left side: Individual Web Application Server > Resources > JMS tab to display a screen where you can view the JMS Resource list for that server and add JMS Resources.
3. Click the **Import button** to display a list of predefined JMS Resources in a popup window.
4. Select the JMS Resource you want to import.
5. Click the **OK button** to import that JMS Resource.

When you import a JMS Resource, connection information between that JMS Resource and the server is internally created. Based on this connection information, configuration updates are delivered to that server when the JMS Resource is modified. Connection information can be viewed in the Resource > JMS screen.

Imported JMS Resource settings cannot be edited in server settings. (Configuration information can be viewed but not modified) To change the configuration, go to the Resource > JMS screen to make changes.

6.5. Application

When you select Application from the left menu, the Application Resource list is displayed.

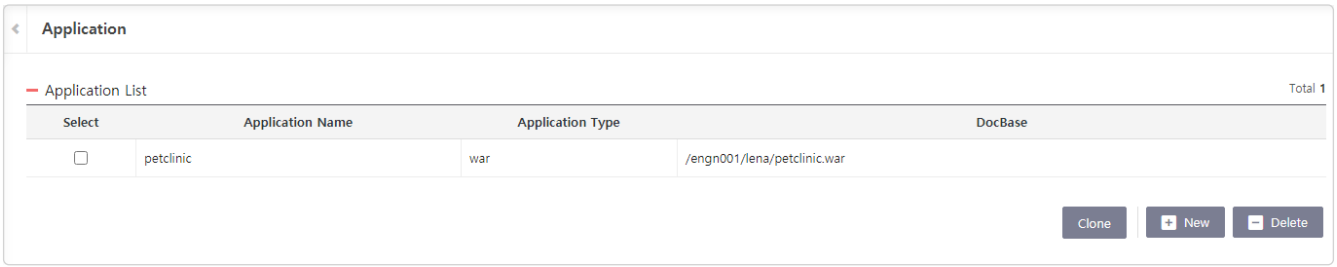


Figure 48. Application List Screen

6.5.1. Application Registration

1. Click the **New button** in the Application list to display the new registration screen.
2. Enter the values you want to configure.
   - If Application Type is WAR, additional configurable items are displayed. (For detailed settings, refer to Application Settings)
3. Click the **Save button** to save.

6.5.2. Application Modification

1. When you select a row you want to modify from the Application Resource list, the modification screen is displayed.
2. Enter the configuration you want to change.
3. Click the **Save button** to save.

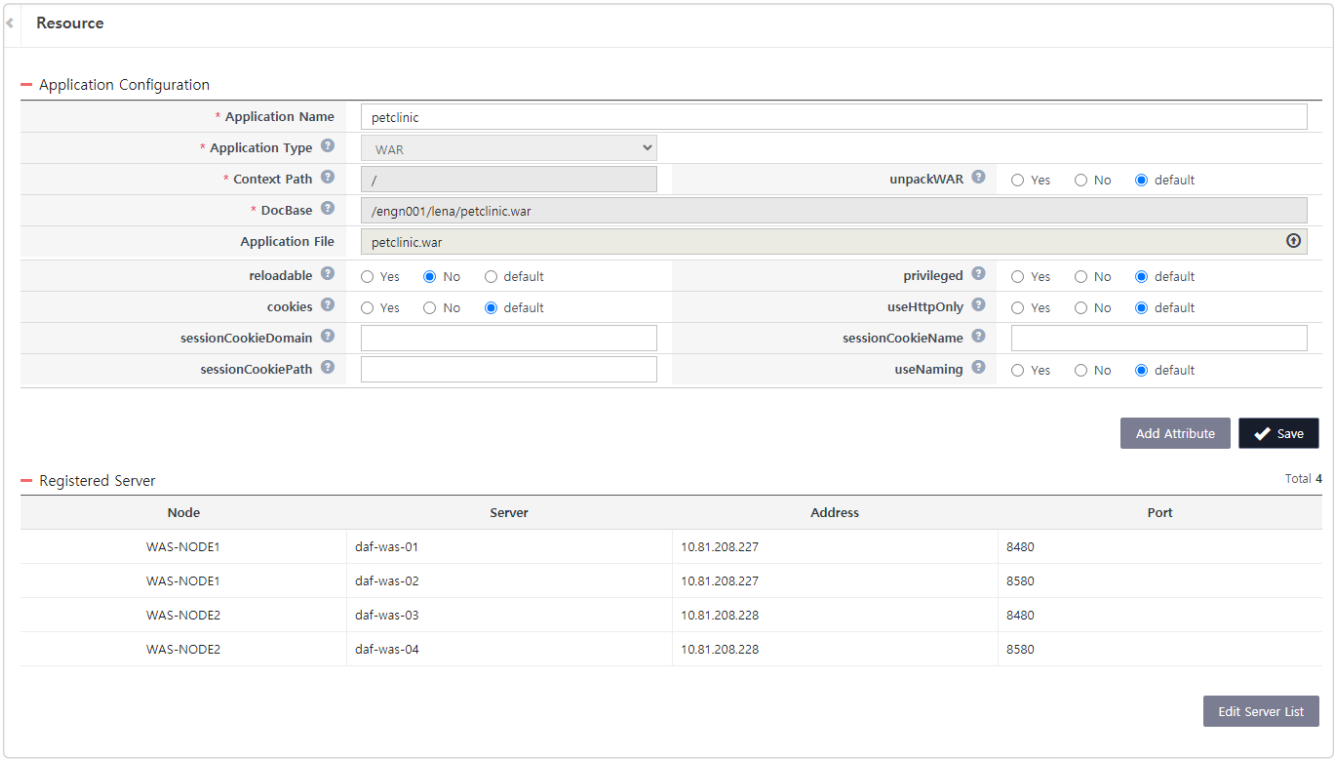


Figure 49. Application Detail Information Screen

When you save after modifying Application Resource information, the changed configuration propagates to the Server where that Resource is used. The Server where the configuration has propagated will apply that configuration when restarted.

6.5.3. Application Deletion

1. Select the checkbox of the Application Resource you want to delete from the Application list.
2. Click the **Delete button** to delete.

If there are Registered Servers that have imported from the Server, that Application Resource cannot be deleted.

6.5.4. Application Upload

1. Click the **Upload button** in the Application Resource registration or edit screen to display a screen where you can upload Application Files.
2. Click the **File Selection button** to select the Application File you want to upload from your local PC.
3. Click the **Upload button** to upload the Application File to the Manager.

Application Import

The list of Servers that are using the created Application Resource by importing it is displayed in the lower area of the Application Resource detail view.

Importing Application from Application Detail Screen

In the Application detail screen, you can modify the list of Servers that are importing and using it.

1. In the Application management screen, select a specific Application Resource to navigate to the

detail information screen.

2. Click the **Edit Server List button** to display a window where you can register and manage Servers.
3. Specify the Server to import that Application and move it to the right area.
4. Click the **Save button** to import the Application Resource to that Server.

To delete an imported Application Resource from a Server, move the target Server to the left area and click the **Save button**.

Importing Application from Individual Server

1. Select the Servers menu from the top of LENA Manager.
2. Click on the left side: Individual Web Application Server > Applications menu to display a screen where you can view the Application Resource list for that Server and add Application Resources.
3. Click the **Import button** to display a list of predefined Application Resources in a popup window.
4. Select the Application Resource you want to import.
5. Click the **OK button** to import that Application Resource.

When you import an Application Resource, connection information between that Application Resource and the Server is internally created. Based on this connection information, configuration updates are delivered to that Server when the Application Resource is modified. Connection information can be viewed in the Resource > Application screen.

Imported Application Resource settings cannot be edited in Server settings. (Configuration information can be viewed but not modified) To change the configuration, go to the Resource > Application screen to make changes.

6.6. k8s Config

6.6.1. k8s Config Registration

1. Click on k8s Config and click the **New button** to display the new registration screen as shown below.

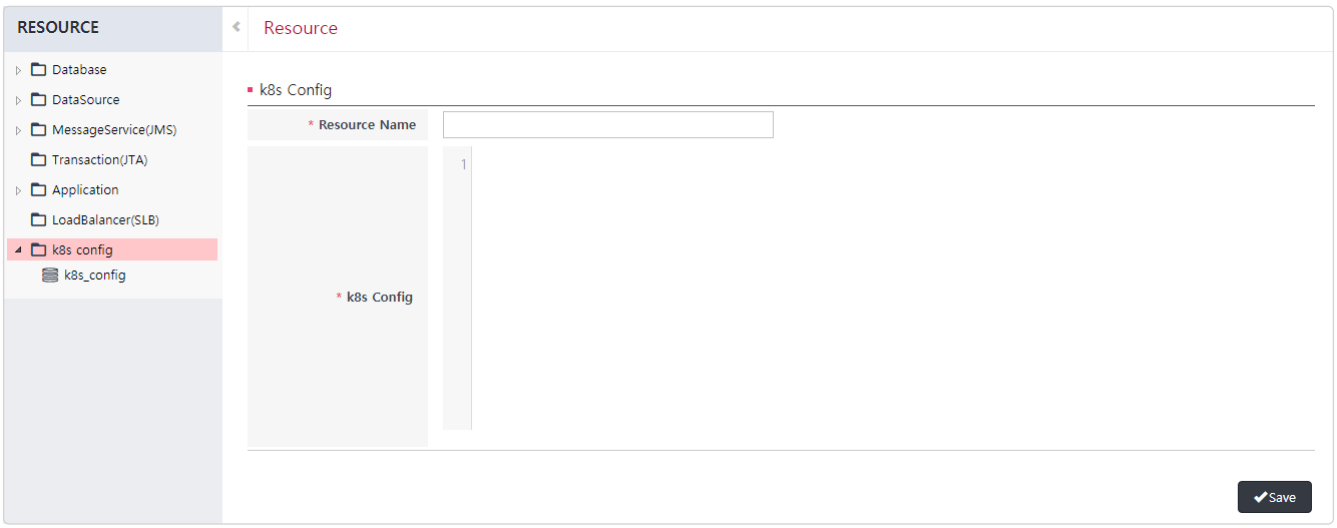


Figure 50. k8s Config Registration Screen

2. Enter the Resource Name.
3. Copy the kubernetes cluster config file content to k8s Config and save.

After setting up k8s Config, each Service Cluster can share and use it. When using Log / Terminal functionality in Service Cluster, the API is called by referencing the information entered above.

6.6.2. k8s Config Modification

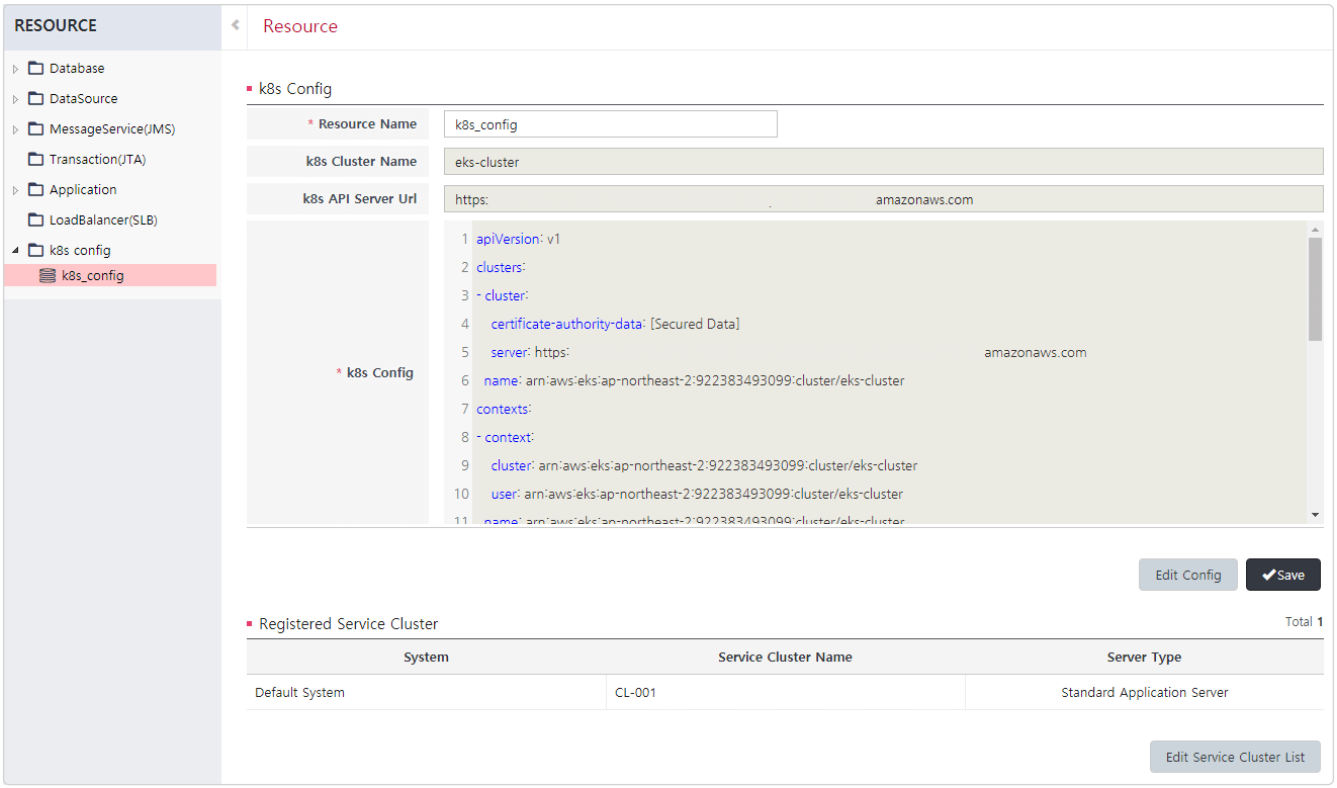


Figure 51. k8s Config Modification Screen

1. Modify the Resource Name and k8s Config content and save.
2. Click the **Edit Configuration button** to modify the k8s Config content.
3. Click the **Edit Service Cluster List button** in Registered Service Cluster to modify the list of Service Clusters mapped to k8s Config.

6.6.3. k8s Config Deletion

1. Click on k8s Config and check the Resource List.
2. Check the k8s Config you want to delete in Select, then click the **Delete button** to delete. If there are Service Clusters mapped to k8s Config, deletion is not possible.

6.6.4. k8s Config Clone

1. Click on k8s Config and check the Resource List. Select the item and click the **Clone button** to clone the k8s Config.
2. Enter values to register a new k8s Config.

Chapter 7. Diagnostics

7.1. Monitoring Dashboard

7.1.1. Status Summary

The Monitoring Dashboard provides three tabs at the bottom, and the summary information shown at the top changes depending on the selected tab.

Information by tab is as follows.

Node tab

Provides server monitoring information by registered Node

Server Cluster tab

Provides server monitoring information by Server Cluster group

Service Cluster tab

Provides container monitoring information by Service Cluster group

You can set the refresh interval for each view. For WAS, click the **popup button** in the Function column to move to the detailed monitoring view.

The Monitoring Dashboard screens are as follows.

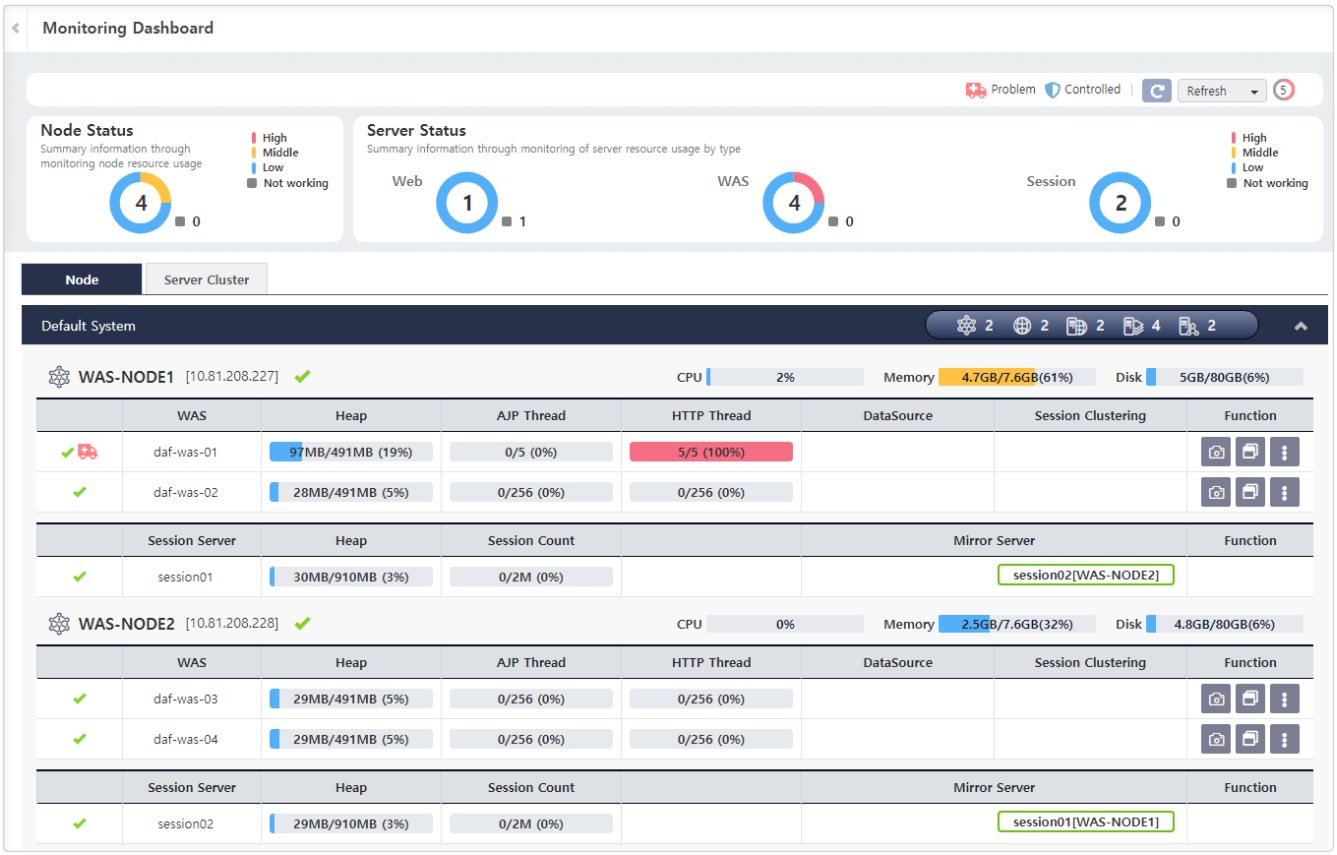


Figure 52. Monitoring Dashboard - Node tab

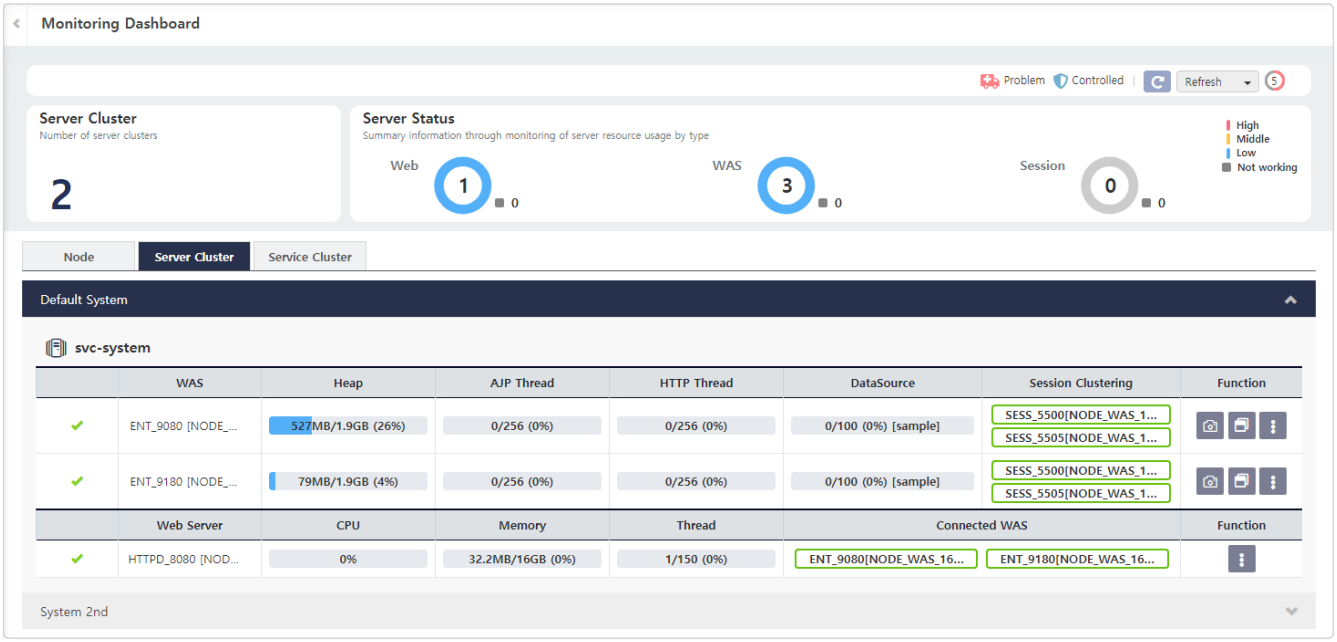


Figure 53. Monitoring Dashboard - Server Cluster tab

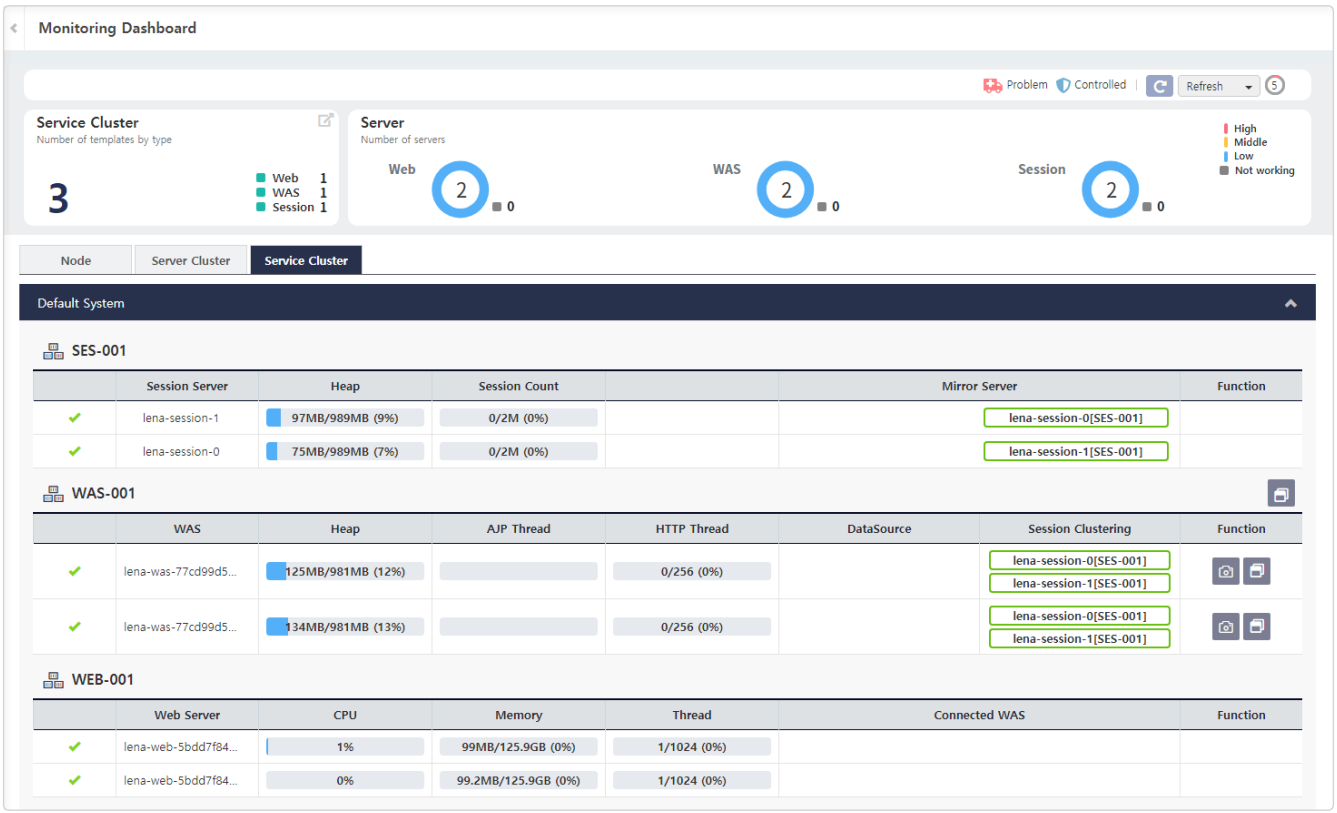


Figure 54. Monitoring Dashboard - Service Cluster tab

The Service Cluster tab is available in the Container Edition.

The properties used in the Monitoring Dashboard are as follows. For utilization values, you can change the color thresholds using the Status Range property. (See the Monitoring Settings subsection in this chapter.)

Table 107. Node status

Field	Description	Note
CPU	Node CPU usage rate	Default thresholds: Low if below 60%, High if 80% or above
Memory	Node memory usage rate	Default thresholds: Low if below 60%, High if 80% or above
Disk	Node disk usage rate	Usage of the disk where the Engine is installed. Default thresholds: Low if below 60%, High if 80% or above

Table 108. Application Server status

Field	Description	Note
Status	Server running status, whether diagnostics results are being published (**ambulance icon**), and whether auto-actions are enabled (**shield icon**)	Unknown is shown when the server state cannot be retrieved via the Node Agent
Server Name	Server name	
Heap Memory	Heap memory usage rate used by the Application Server	
Thread Pool	Usage of the Request Thread pool managed by the Application Server, shown per Connector (Ajp, Http)	
DataSource	Usage of the DataSource Connections managed by the Application Server	
Session Clustering	Information and running status of the Session Server configured for the Application Server	Red: stopped, Green: running, Black: servers outside the system

Table 109. Web Server status

Field	Description	Note
Status	Server running status	Unknown is shown when the server state cannot be retrieved via the Node Agent
Server Name	Server name	
CPU	CPU usage rate of the Web Server process	
Memory	Memory usage rate of the Web Server process	
Thread	Number of Web Server threads (Active / Max)	

Field	Description	Note
Connected WAS	Information and running status of WAS connected to the Web Server	Red: stopped, Green: running, Black: servers outside the system

Table 110. Session Server status

Field	Description	Note
Status	Server running status	Unknown is shown when the server state cannot be retrieved via the Node Agent
Server Name	Server name	
Heap	Heap memory usage rate of the Session Server	
Session Count	Ratio of Active sessions	
Mirror Server	Information and running status of the Mirror Server	Red: stopped, Green: running, Black: servers outside the system

The following actions are provided to immediately control each server.

Table 111. Application Server control actions

Field	Description	Note
Thread Dump	Generate a Thread Dump	Click **left button (Server Snapshot(dump))** > Dump List to download the dump file
Active Service Dump	Generate an Active Service Dump	Click **left button (Server Snapshot(dump))** > Dump List to download the dump file
Heap Dump	Generate a Heap Dump	Click **left button (Server Snapshot(dump))** > Dump List to download the dump file
Forced Stop	Force stop the server	Immediate termination without wait time
Forced Restart	Force restart the server	Immediate restart without wait time
All Diagnostics Disable	Disable all diagnostics/actions applied to the server	

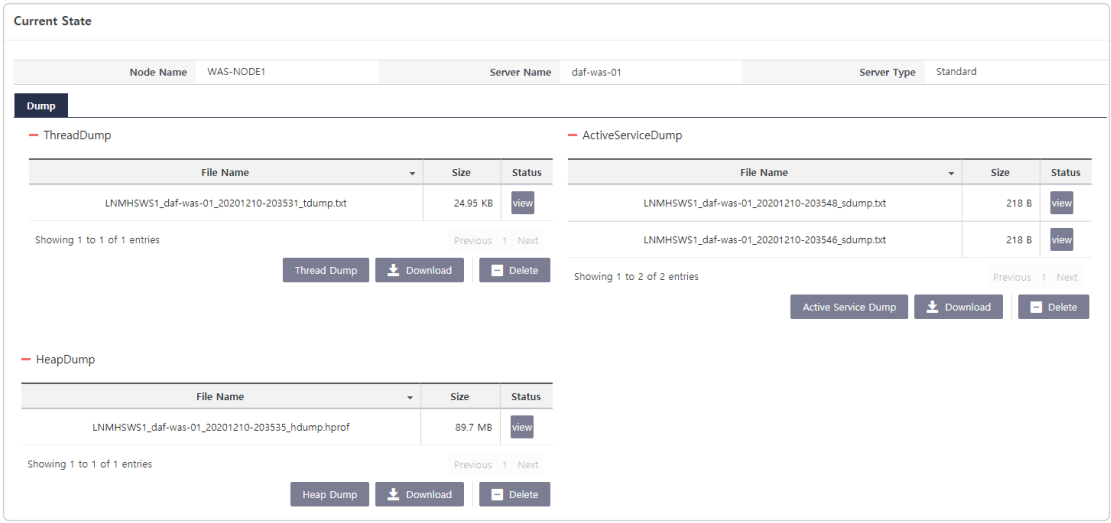


Figure 55. Dump window

You can generate and download Heap Dump, Thread Dump, and Active Service Dump. In general, dumps are created to investigate root causes when errors such as Out Of Memory, excessive Thread Pool usage, or service delays occur on a server.

Depending on the dump type you want to generate, click **Thread Dump button**, **Active Service Dump button**, or **Heap Dump button** to create the dump. Generated dumps are stored on the Host where the Web Application Server runs: Thread Dump at {log_home}/logs/tdump, Active Service Dump at {log_home}/logs/sdump, and Heap Dump at {log_home}/logs/hdump.

Click the **Delete button** to delete dump files. Click the **Download button** to download dump files. When downloading, the dump file is downloaded as a zip along with the system status dump file.

The items in the dump management screen are as follows.

Table 112. Dump screen items

Field	Description	Note
File Name	Name of the generated file	Automatically generated string including the date
Size	Size of the generated file	
Status	System and Server status at the time of dump creation	CPU and Memory information of the system at the time of dump creation and key resource usage of the Web Application Server are also captured together when generating the dump. Click the **View button** to check the captured Status values

Table 113. Web Server control actions

Field	Description	Note
Forced Stop	Force stop the server	Immediate termination without wait time
Graceful Stop	Gracefully stop the server	

If monitoring information is not displayed, check whether the registered Node/Server actually exists and whether communication with the Node/Server is working properly.

7.1.2. Detailed Status Monitoring

In the Monitoring Dashboard, select the **middle button (View Detail Chart)** in the Function column to monitor detailed Thread, Memory, and service information.

System tab

You can check the Web Application Server's Memory, Thread, and Service information.

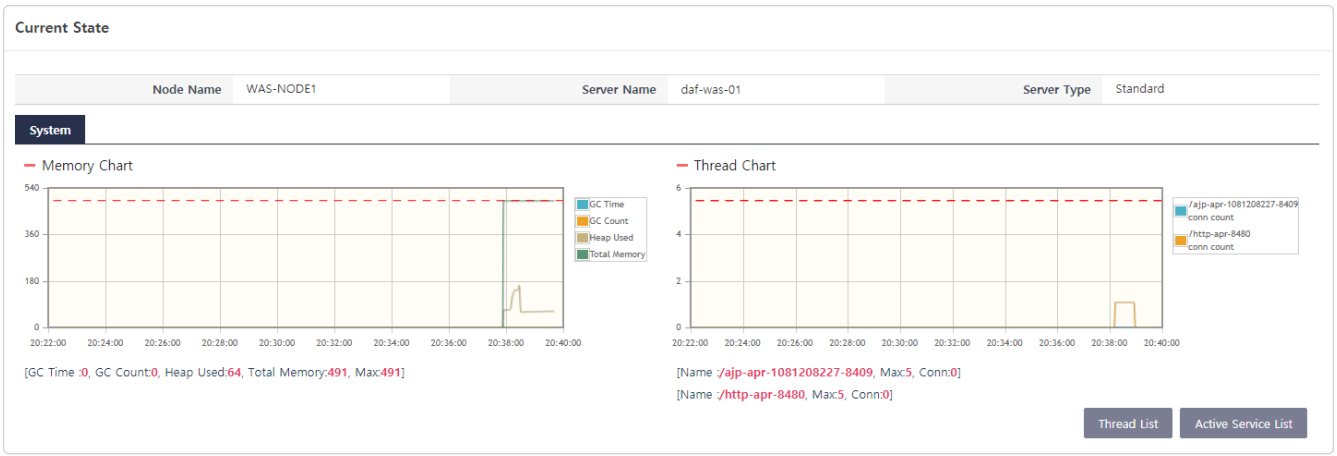


Figure 56. System tab

Memory Chart

Real-time memory usage is displayed. The provided metrics are GC Time (time spent in Garbage Collection), GC Count, Heap Used (Total Memory - Free Memory), and Total Memory (total memory used by the server). The red dashed line on the chart indicates the maximum available Heap Memory. Therefore, pay attention if Heap Memory usage stays near the red dashed line for a long time without a normal GC pattern.

The maximum number of Request Threads can be changed from the Server menu via the maxThreads property of the Web Application Server.

Thread Chart

This line chart shows the usage of Request Threads that the Web Application Server manages as a pool to handle user requests. The red dashed line indicates the maximum number of Request Threads available. Pay attention if the number of Request Threads approaches the red dashed line.

The maximum number of Request Threads can be changed from the Server menu via the maxThreads property of the Web Application Server.

Thread List

You can view all Threads in the Web Application Server. You can filter by the printed Thread name or Thread state. The Thread List fields are as follows.

Table 114. Thread List fields

Field	Description	Note
Thread ID	Unique Thread ID	
Name	Thread name	
Stat	Thread state	There are three states: • RUNNABLE: runnable thread • WAITING: waiting for a specific action of another thread • TIMED_WAITING: waiting with a specified timeout
CPU	CPU time used by the specified Thread	
Elapsed	Elapsed time the Thread has been running	
Service Name	Name of the service executed by the Thread	

Click the **+ button** to view the following detailed information.

Table 115. Thread detail fields

Field	Description	Note
threadId	Unique Thread ID	
threadName	Thread name	
state	Thread state	There are three states: • RUNNABLE: runnable thread • WAITING: waiting for a specific action of another thread • TIMED_WAITING: waiting with a specified timeout
threadCpuTime	CPU time of all Threads including the current Thread	
threadUserTime	CPU time of the current Thread	
blockedCount	Total number of times blocked	

Field	Description	Note
blockedTime	Cumulative blocked elapsed time	
waitedCount	Total number of waits	
waitedTime	Cumulative waited elapsed time	
lockOwnerId	ID of the Thread owning the locked object	
lockName	Name of the locked object	
lockOwnerName	Name of the Thread owning the locked object	
stackTrace	stackTrace	

Active Service List

You can view service information and the Thread processing the service. The fields are similar to the Thread List, with the following additional field.

Table 116. Active Service List fields

Field	Description	Note
Sql	SQL statement currently being executed	

DataSource tab

You can view the DataSource information configured on the Application Server.

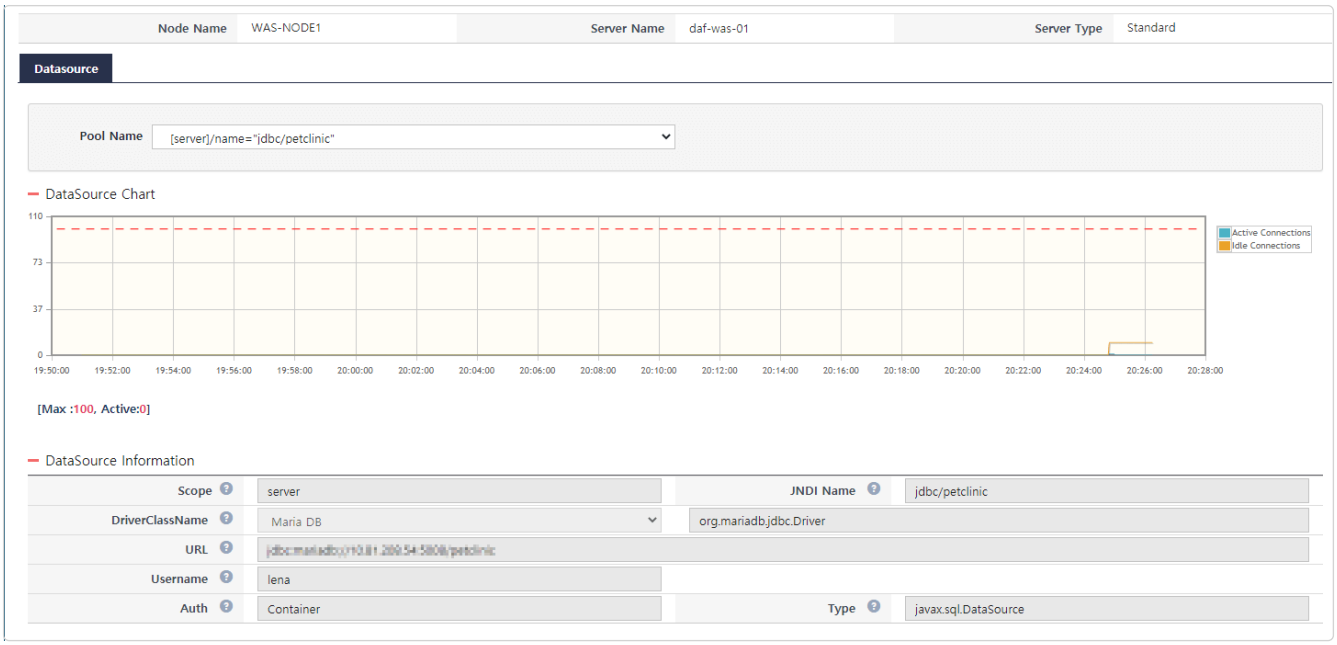


Figure 57. DataSource tab

DataSource Chart

The numbers of Active Connections and Idle Connections are displayed on the chart in real time. The red dashed line indicates the configured maximum number of connections. Be careful when Active Connections approach the red dashed line. Use the combo box to select and monitor other DataSources.

The maximum number of connections can be changed via the maxConnection property on the DataSource registration screen.

DataSource Information

You can check the configuration information for the selected DataSource.

7.1.3. Monitoring Settings

You can set basic monitoring configurations in DIAGNOSTICS > Policy > Common Rule Setting. The settings are as follows.

Table 117. Monitoring-related default settings

Field	Description	Default
Status Range	Configure thresholds for Resource Low, Middle, and High in the Monitoring Dashboard.	Low if below 60%, Middle if 60% or above, High if 80% or above
Diagnostics Interval	Set the diagnostics interval.	10000 (ms)
Dump Limit	Per-server dump count limit for each dump directory (Thread/ActiveService/Heap). 0 means unlimited.	200 (files)

7.2. Analysis Dashboard

The Analysis Dashboard provides real-time failure analysis information at the system level. The provided information types are as follows.

- Performance Map
- Analysis Summary
- Instance Map

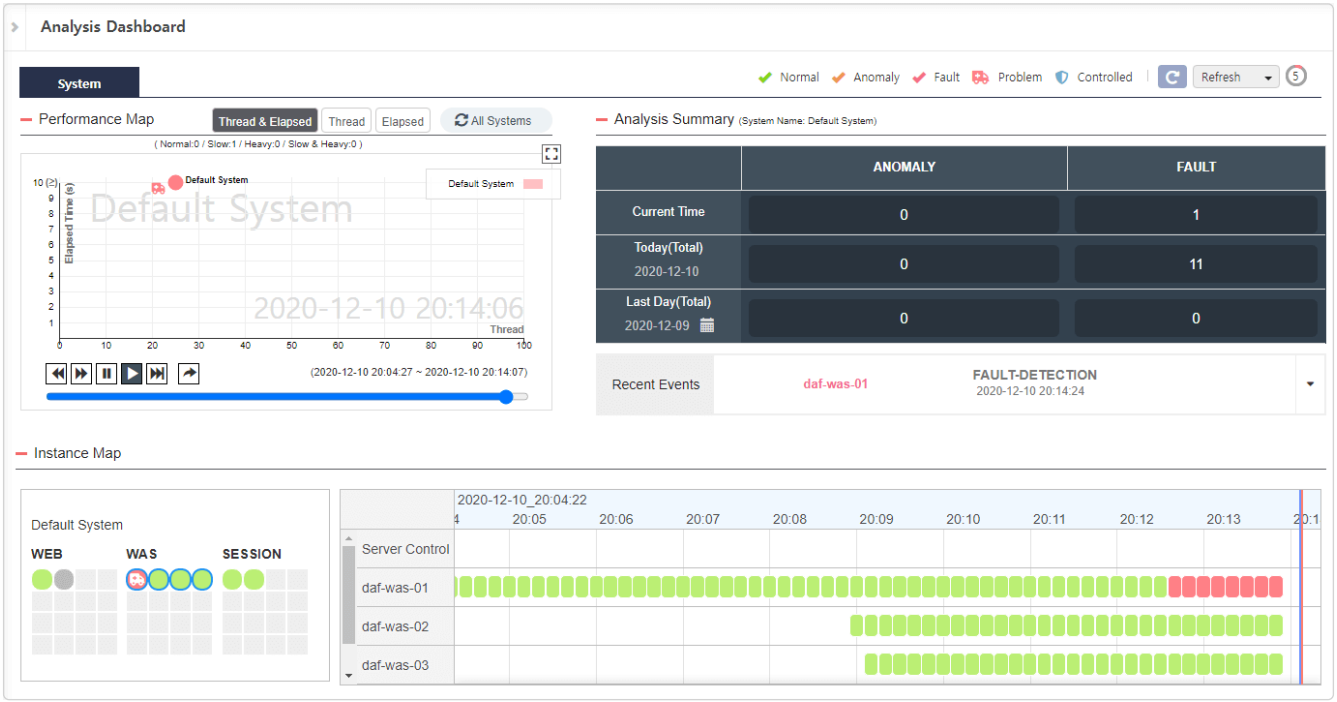


Figure 58. Analysis Dashboard

7.2.1. Performance Map

The Performance Map in the top-left of the Analysis Dashboard provides system state information based on each of "Thread & Elapsed", "Thread", and "Elapsed". Each system is represented as a colored circle on the chart. The colors by system state are as follows.

- Normal: Green
- Anomaly: Orange (An anomaly situation was detected by diagnostics)
- Fault: Red (A fault situation was detected by diagnostics)

The meanings of the X and Y axes in the chart are as follows.

Table 118. Meanings of the X and Y axes in the Performance Map chart

Item	Description	Note
Thread & Elapsed Chart	X-axis: Average Thread usage rate of Web Application Servers in the system Y-axis: Average response time of services executed in the Web Application Servers in the system	
Thread Chart	X-axis: Time line over 10 minutes Y-axis: Average Thread usage rate of Web Application Servers in the system	

Item	Description	Note
Elapsed Chart	X-axis: Time line over 10 minutes Y-axis: Average response time of services executed in the Web Application Servers in the system	

The System status summary information displayed at the top of the chart is as follows.

Table 119. System status summary fields

Item	Description	Note
Normal	Number of normal systems	
Slow	Number of systems with long response times	
Heavy	Number of systems with high Thread pool usage	
Slow & Heavy	Number of systems that are both Slow and Heavy	

You can use the slider at the bottom of the chart to browse previous states, and click the **Previous 10 minutes icon**, **Next 10 minutes icon**, **Pause icon**, **Play icon**, and **Move to current time icon** to move through time. When first entering the dashboard, all systems are displayed. You can click systems or legends in the chart to select and view specific systems. To view all systems again, click the **All System icon** at the top right.

Right-clicking on a system icon provides the following features.

Table 120. Available features on right-clicking a system icon

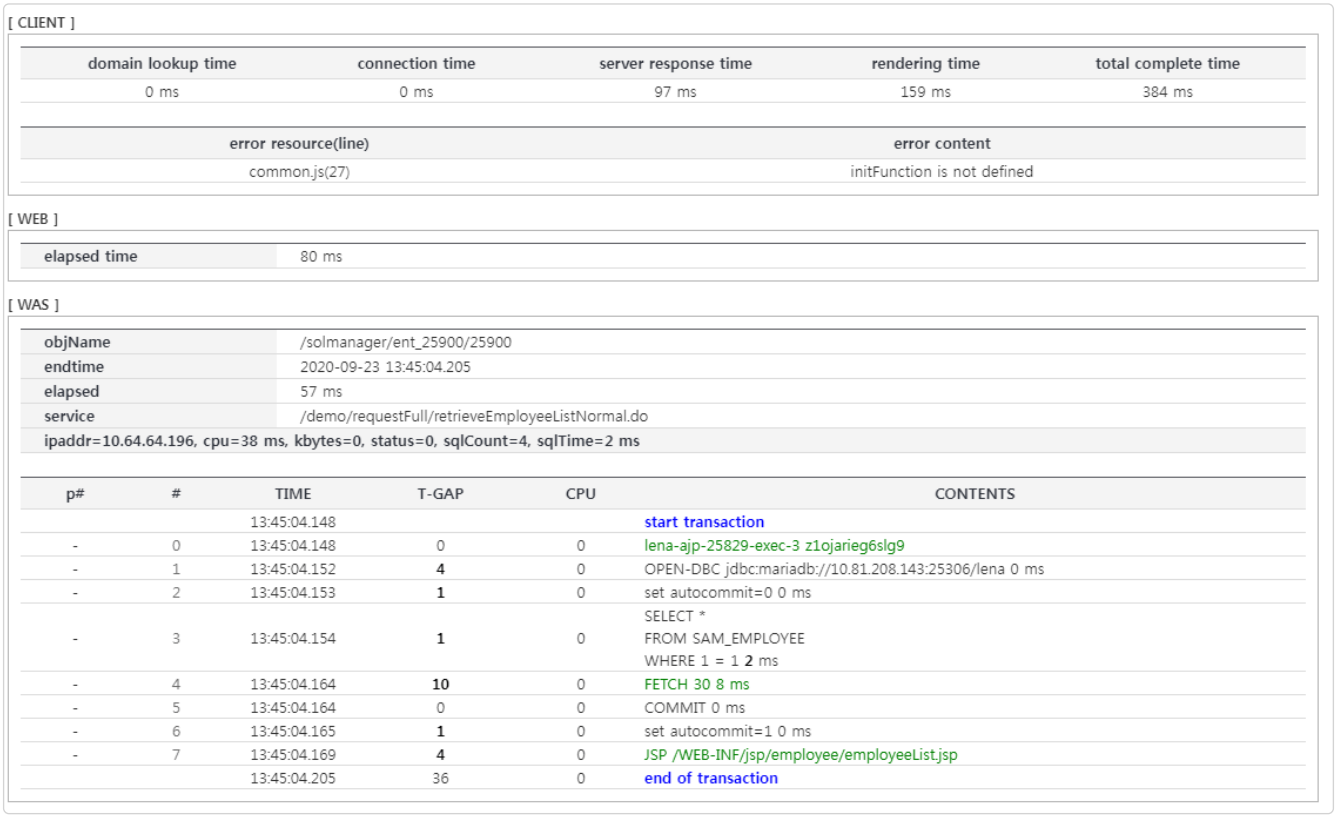
Item	Description	Note
Topology View	Move to the Topology View screen	
Service Analysis	Display the System Detail popup	
Monitoring	Move to the Monitoring Dashboard	
Statistics	Move to the Statistics screen	

When clicking Service Analysis among the right-click menu, the following popup is displayed. The current statuses of Web Server, WAS, and Session Server are displayed on the left. On the right, you can see a Transaction Heat Map Chart, and by dragging an area you can view detailed information.

Figure 59. System Detail screen

Transaction information is retained only if it was collected via the Service Trace feature in LENA Dashboard.

Below is the detail screen that you can see when selecting a specific transaction from the Transaction list displayed after dragging the desired area in the Transaction Heat Map Chart.



[CLIENT]

domain lookup time	connection time	server response time	rendering time	total complete time
0 ms	0 ms	97 ms	159 ms	384 ms

error resource(line)	error content
common.js(27)	initFunction is not defined

[WEB]

elapsed time	80 ms

[WAS]

objName	/solmanager/ent_25900/25900
endtime	2020-09-23 13:45:04.205
elapsed	57 ms
service	/demo/requestFull/retrieveEmployeeListNormal.do
ipaddr=10.64.64.196, cpu=38 ms, kbytes=0, status=0, sqlCount=4, sqlTime=2 ms	

p#	#	TIME	T-GAP	CPU	CONTENTS
		13:45:04.148			start transaction
-	0	13:45:04.148	0	0	lena-ajp-25829-exec-3 z1ojarieg6slg9
-	1	13:45:04.152	4	0	OPEN-DBC jdbc:mariadb://10.81.208.143:25306/lena 0 ms
-	2	13:45:04.153	1	0	set autocommit=0 0 ms
-	3	13:45:04.154	1	0	SELECT * FROM SAM_EMPLOYEE WHERE 1 = 1 2 ms
-	4	13:45:04.164	10	0	FETCH 30 8 ms
-	5	13:45:04.164	0	0	COMMIT 0 ms
-	6	13:45:04.165	1	0	set autocommit=1 0 ms
-	7	13:45:04.169	4	0	JSP /WEB-INF/jsp/employee/employeeList.jsp
		13:45:04.205	36	0	end of transaction

Figure 60. Transaction detail screen

The details consist of data related to CLIENT (user browser), WEB (LENA Web Server), and WAS (LENA Web Application Server). The items visible in each type of information are as follows.

Table 121. CLIENT-related data items

Item	Description	Note
domain lookup time	Time for the browser to perform domain lookup to connect to the server	
connection time	Time for the browser to establish a connection with the server	

Item	Description	Note
server response time	Total time from the browser requesting to receiving a response from the server	
rendering time	Browser screen rendering time	
total complete time	Total time processed by the browser	
error resource(line)	Line number where a script error occurred	
error content	Error content when a script error occurred	

Table 122. WEB-related data items

Item	Description	Note
elapsed time	Processing time in WEB	

WAS-related data items

- Basic info

Table 123. Basic info

Item	Description	Note
objName	Name of the server that processed the request	
endtime	Time the request processing was completed	
elapsed	Processing time for the request	
service	Name of the requested service	
ipaddr	IP address of the caller	
cpu	CPU usage time	
sqlCount	Number of executed queries	
sqlTime	Query execution time	

- Profile info

Table 124. Profile info

Item	Description	Note
#	Index indicating the sequence of profile steps	
p#	Parent index for internal steps	
TIME	Time at which the step started	
T-GAP	Difference between the start time of the current step and the start time of the previous step	
CPU	CPU time	
CONTENTS	Contents of each step	

CLIENT and WEB-related information is collected only when the E2E feature is ON. It is OFF by default to minimize load.

Profile information is collected only when profiling is ON in WAS. It is OFF by default to minimize load.

7.2.2. Analysis Summary

Displays the summary information of the number of diagnostic results currently detected, the total number of diagnostic results that occurred today, and the total number of diagnostic results that occurred on the previous day (Default: 1 day ago).

Table 125. Analysis summary fields

Item	Description	Note
Anomaly	Number of diagnostic results that are not Fault but require attention	
Fault	Number of results diagnosed as Fault	

Recent Events shows the most recently occurred diagnostic results; click an item to view Report information.

7.2.3. Instance Map

When you select a specific system in the Performance Map, you can view a Time Line Chart showing server information and diagnostic results within the system at the bottom of the screen. Servers are displayed in different colors depending on their status, and you can toggle specific servers to show/hide them in the Time Line Chart on the right. When Anomaly or Fault situations are detected after diagnostics, they are displayed in orange (Anomaly) or red (Fault) on the Time Line; double-click the area to view the Report.

7.3. Event Dashboard

The Event Dashboard provides information on events that occurred in WAS.

Event information is generated in WAS and delivered to Manager via UDP. Events sent by WAS are stored in the Manager DB for a certain period (3 months), while detailed SQL and Exception Trace information for those events is stored for 7 days only due to their large data size.

7.3.1. Event Types

There are four types of events as follows:

- Out Of Memory Error event in WAS
- Full GC event in WAS
- Stuck Thread event in WAS
- Exception event in WAS

WAS Exception events are generated and sent to Manager in the following two cases:

- When an Exception is thrown outside the service method of a Servlet for a user request
- When an Exception of a type configured by the user occurs

7.3.2. Managing Events via the Event Dashboard

You can manage collected events in the Event Dashboard of LENA Manager.

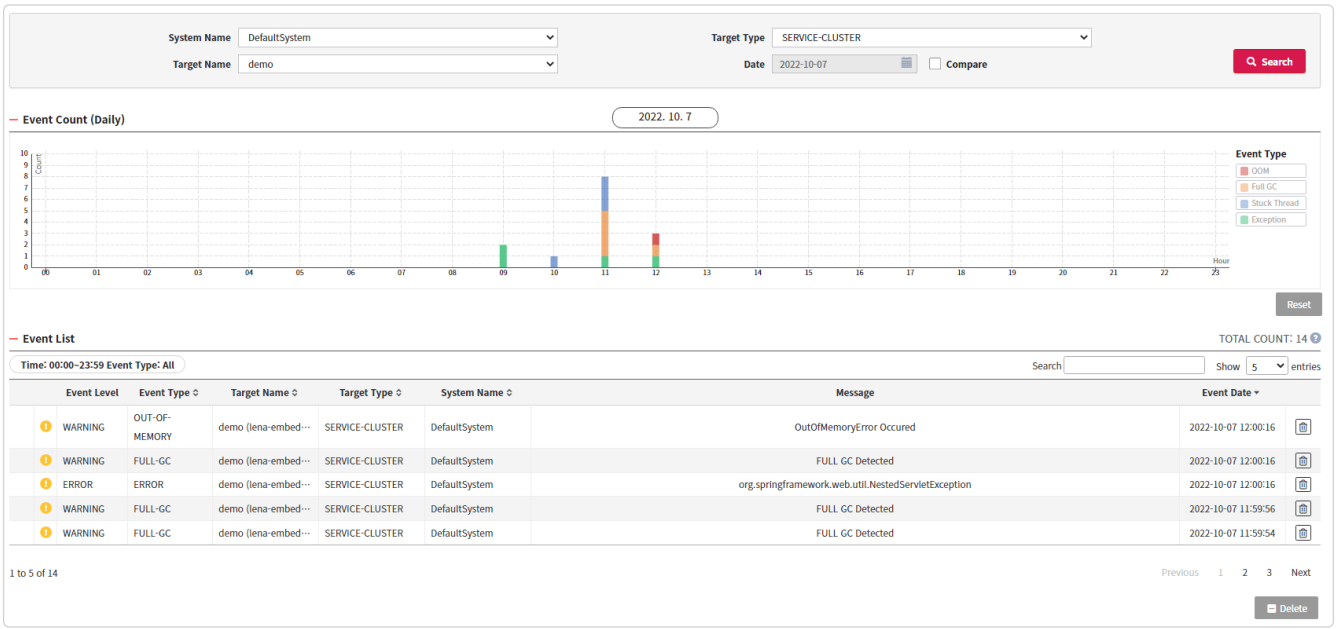


Figure 61. Event Dashboard

You can check the trend of event occurrences by date using a bar chart. You can view all Systems or specify a particular System or Server to query. Click the **calendar button** to change the date.

The Event list fields are as follows.

Table 126. Event List fields

Field	Description	Note
Event Level	Event level	The following types exist. The four event types are WARNING by default and can be changed. • INFO • WARNING(DEFAULT) • ERROR • CRITICAL

Field	Description	Note
Event Type	Event type	The following types exist • OUT-OF-MEMORY • FULL-GC • STUCK-THREAD • ERROR
Target Name	Name of the target server	WAS name or Service Cluster name
System Name	System name	
Message	Event message	For Error events, the Exception name; for Stuck Thread events, a message indicating that a Stuck Thread occurred
Event Date	Time the event occurred	
(**Delete button**)	Button to select when deleting events	

Click an individual event row to view the Event details as shown below.

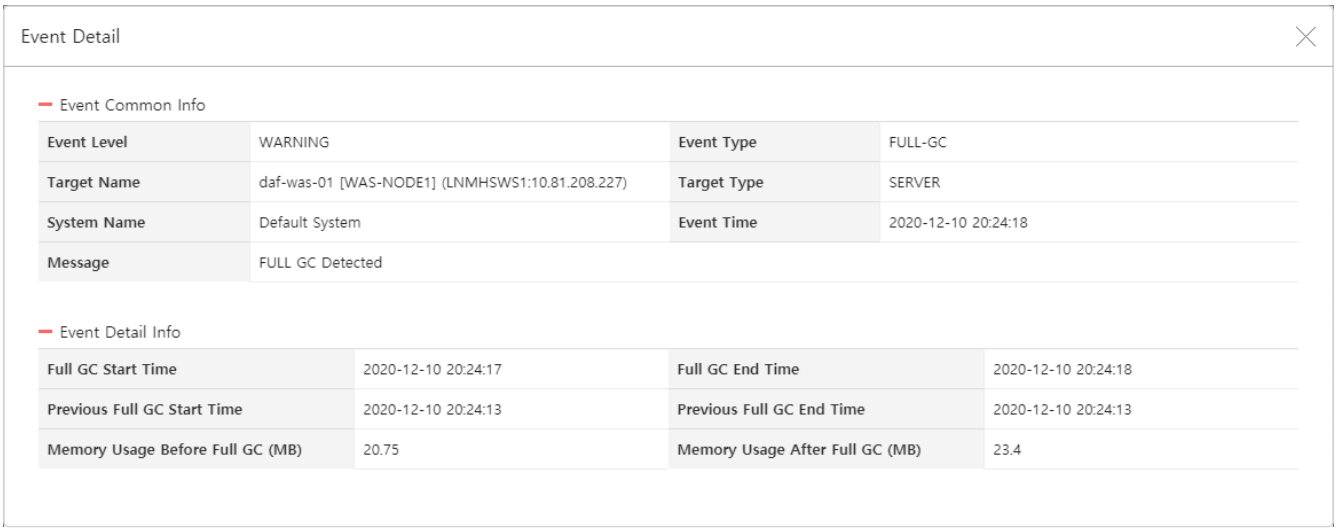


Figure 62. Event detail screen

The common fields in Event details are as follows.

Table 127. Event Common Info

Field	Description	Note
Event Level	Event level	The following types exist. • WARNING • INFO • ERROR • CRITICAL
Event Type	Event type	The following types exist • OUT-OF-MEMORY • FULL-GC • STUCK-THREAD • ERROR
Target Name	Name of the target server	WAS name or Service Cluster name
Target Type	Type of the target server	The following types exist • WAS • SERVICE-CLUSTER
System Name	System name	
Event Date	Time the event occurred	

The detailed fields differ by event type as follows.

Table 128. Out Of Memory Event Detail Info

Field	Description	Note
Heap Dump File Name	Name of the Heap Dump file automatically generated when an Out Of Memory Error occurred	

Table 129. Full GC Event Detail Info

Field	Description	Note
Full GC Start Time	Start time of the Full GC	
Full GC End Time	End time of the Full GC	
Previous Full GC Start Time	Start time of the immediately preceding Full GC	
Previous Full GC End Time	End time of the immediately preceding Full GC	

Field	Description	Note
Memory Usage Before Full GC (MB)	Memory usage before performing the Full GC	
Memory Usage After Full GC (MB)	Memory usage after performing the Full GC	

Table 130. Stuck Thread Event Detail Info

Field	Description	Note
Service	Service URL	
Http Query	GET parameters of the service URL	POST data is not shown The GET parameter keys are shown but the values are masked
Threshold(ms)	Threshold configured in LenaStuckThreadDetectionValve	
Active Time(ms)	Processing time of the service at the moment the Stuck Thread was detected	
Stack Trace	Stack Trace at the moment the Stuck Thread was detected	

Table 131. Error Event Detail Info

Field	Description	Note
Service	Service URL	
Http Query	GET parameters of the service URL	POST data is not shown The GET parameter keys are shown but the values are masked
Remote Addr	Client remote address	
Custom Info	User-defined code information	Key/Value specified via a custom Servlet Filter used by the user
Exception Trace	Trace of the occurred Exception	

7.4. Statistics

7.4.1. Yearly Diagnostics/Action Statistics

From DIAGNOSTICS > Analysis > Diagnostics Trend, yearly diagnostic results per server are provided via charts.

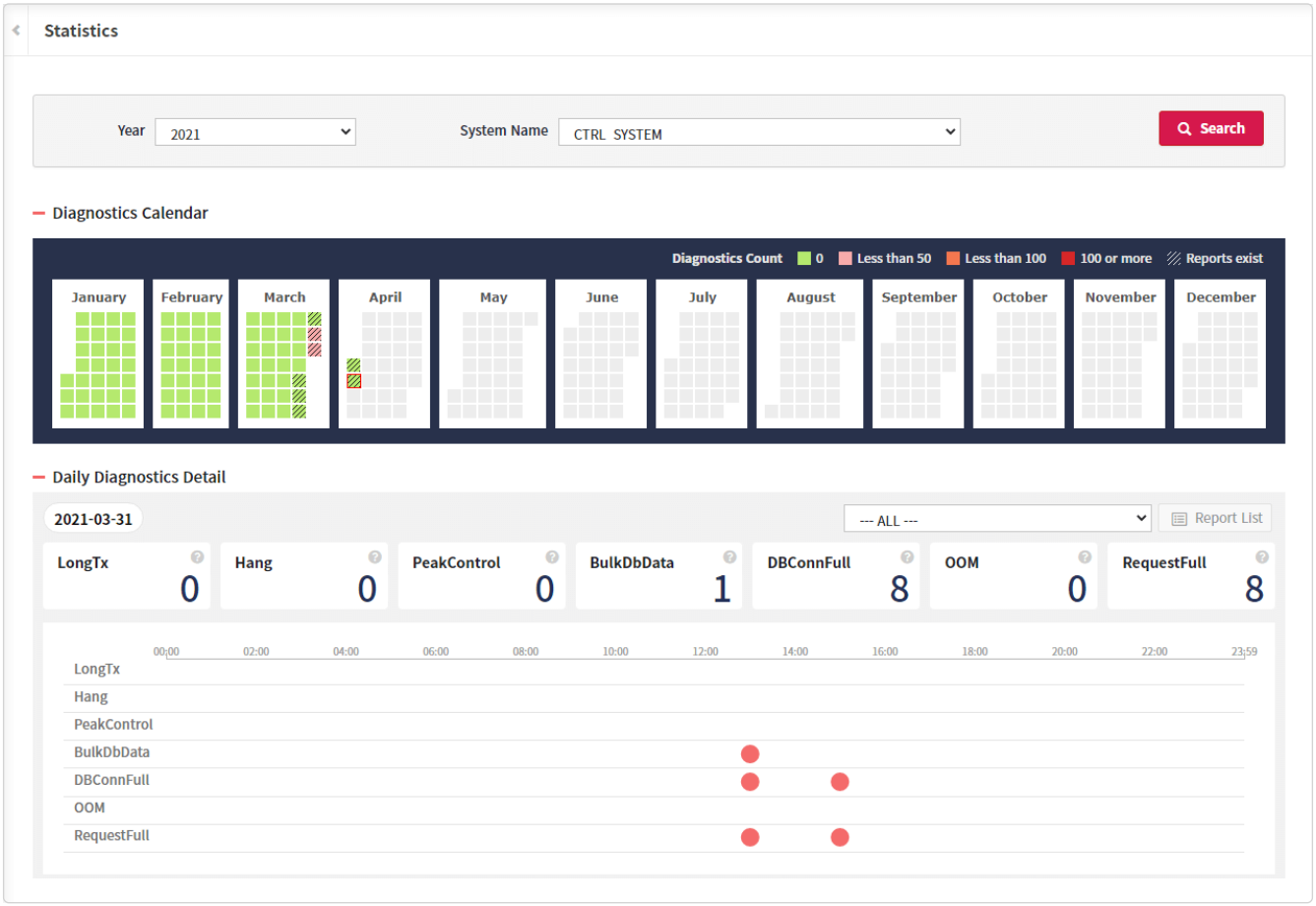


Figure 63. Statistics screen

On this screen you can check the following:

- Diagnostics Calendar
  - Each cell represents a day. When you mouse over a date in the yearly statistics chart, you can see how many diagnostics occurred on that date.
- Daily Diagnostics Detail
  - When you click a specific date in the Diagnostics Calendar, a graph showing the number of diagnostics by hour for the selected date is displayed at the bottom of the screen.

7.4.2. Report

When diagnostics and actions run, a Report is automatically generated. Reports are retained for 7 days, and older Reports are automatically deleted.

Diagnostics/Action Report List

In DAIGNOSTICS > Analysis > Diagnostics Trend, after selecting a specific server, click the **Report List button** to see the Diagnostics/Action Report list screen. The list screen looks as follows.

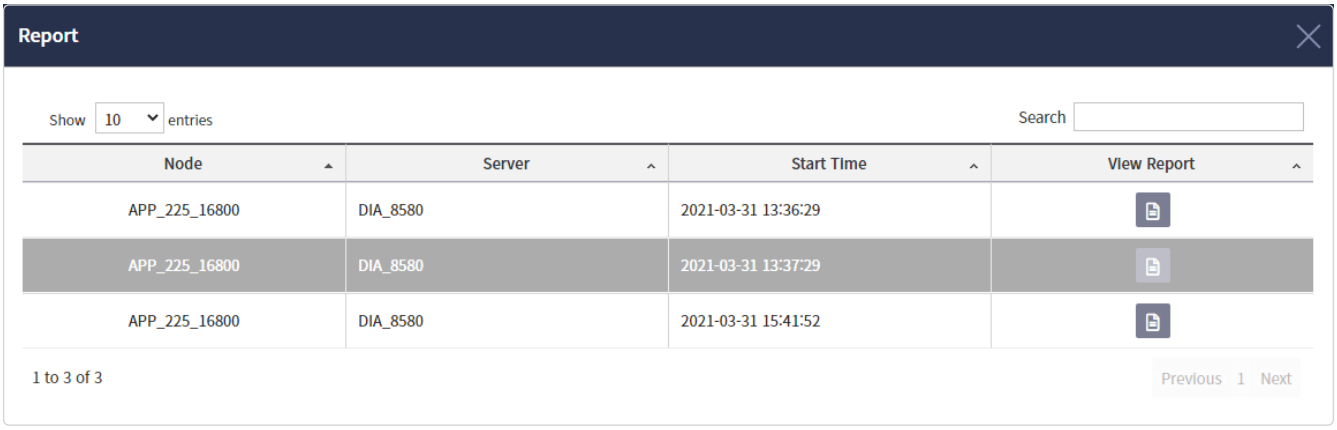


Figure 64. Diagnostics/Action Report list screen

You can click the **View button** to open a Report.

Common Information in Report

While the Report contents vary depending on the diagnostic results, they share the following common information.

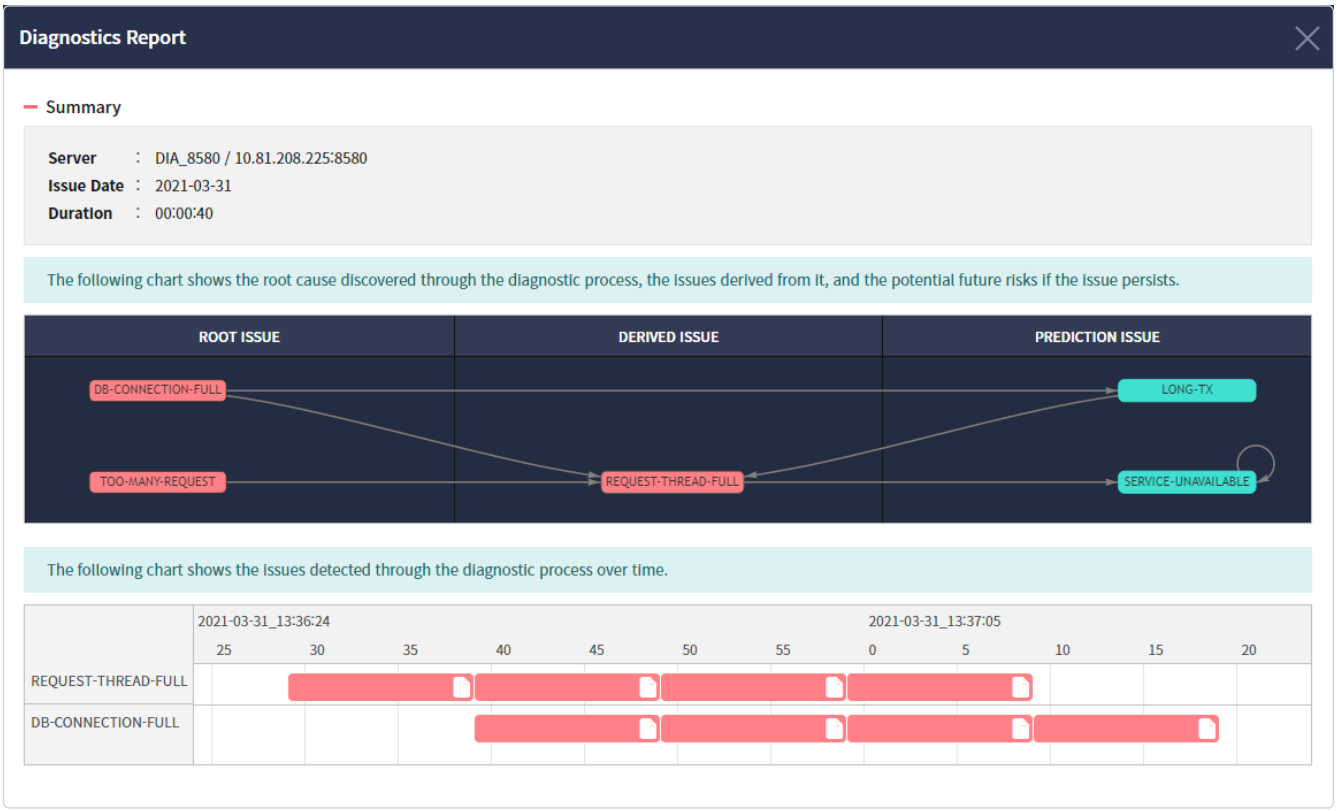


Figure 65. Diagnostics/Action Report screen

It visualizes the causal relationships among diagnostic results detected during the period when the abnormal symptom persisted, and at the bottom of the screen shows the time slots when each diagnostic result was generated.

An Anomaly indicates that only part of the conditions configured in the Diagnostics/Action Rule were met and is displayed in orange, whereas a Fault indicates that all conditions configured in the Diagnostics/Action Rule were met and is displayed in red.

Report Details

From the Time Line at the bottom of the Report, click a specific diagnostic type at a specific time to view details as follows.

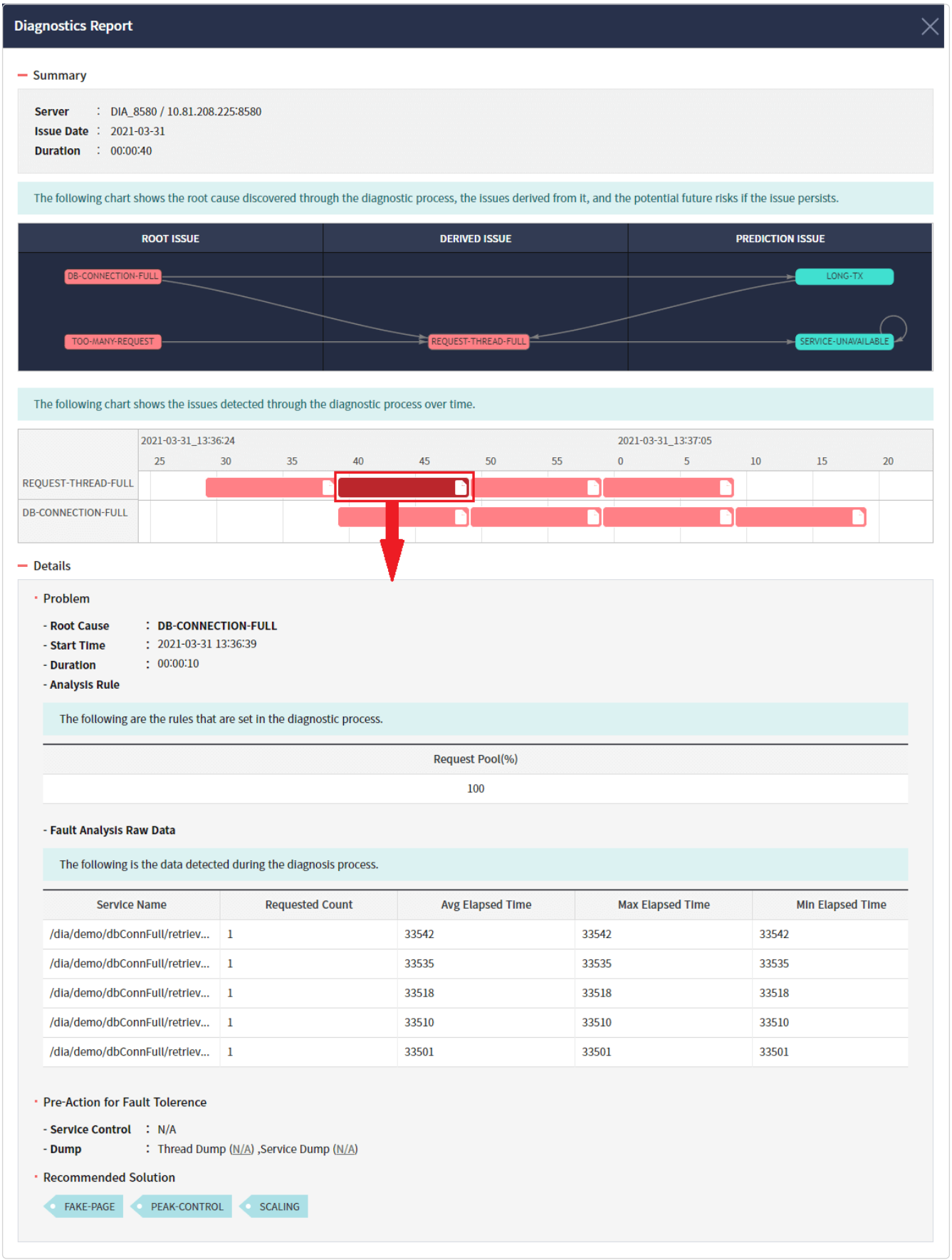


Figure 66. Diagnostics/Action Report Details

The detailed fields are as follows.

Table 132. Report detail fields

Field	Description	Note
Root Cause	The diagnostic item that is the cause	Indicates the diagnostic item that caused this diagnostic result. If another diagnostic item exists as the cause, that other diagnostic item is shown
Analysis Rule	Thresholds configured in the Diagnostics/Action Rule	
Fault Analysis Raw Data	Back data that serves as the basis for the diagnosis	
Pre-Action for Fault Tolerance	Performed Action(s) and dump file name(s)	
Recommended Solution	Actionable remedy	

The Back Data fields vary by diagnostics/action type as follows.

The Back Data for a Request Full diagnostic Report is the top 5 most frequently called services.

Table 133. Back Data fields for Request Full diagnostic Report

Field	Description	Note
Service Name	Service name	
Requested Count	Number of requests for the service	
Avg. Elapsed Time	Average response time of the service	
Max Elapsed Time	Response time of the slowest invocation among the service calls	
Min Elapsed Time	Response time of the fastest invocation among the service calls	

The Back Data for a Bulk DB Data Request diagnostic Report is the top 5 services that made the largest number of bulk DB data requests.

Table 134. Back Data fields for Bulk DB Data Request diagnostic Report

Field	Description	Note
Service Name	Service name	
Count	Number of requests for the service	
Blocked Count	Number of blocked DB data retrievals	

The Back Data for a DB Conn Full diagnostic Report is the information on the overly occupied DataSource Connection Pool.

Table 135. Back Data fields for DB Conn Full diagnostic Report

Field	Description	Note
DataSource Name	DataSource name	
DB Connection Pool Usage Rate	DB Connection Pool usage rate	

The Back Data for a Long Transaction diagnostic Report is the top 5 longest services among the diagnostic targets.

Table 136. Back Data fields for Long Transaction diagnostic Report

Field	Description	Note
Service Name	Service name	
Requested Count	Number of requests for the service	
Avg. Elapsed Time	Average response time of the service	
Max Elapsed Time	Response time of the slowest invocation among the service calls	
Min Elapsed Time	Response time of the fastest invocation among the service calls	

The Back Data for a Peak Control diagnostic Report is the top 5 longest services among the diagnostic targets.

Table 137. Back Data fields for Peak Control diagnostic Report

Field	Description	Note
Service Name	Service name	
Requested Count	Number of requests for the service	
Avg. Elapsed Time	Average response time of the service	
Max Elapsed Time	Response time of the slowest invocation among the service calls	
Min Elapsed Time	Response time of the fastest invocation among the service calls	

The Back Data for an OOM diagnostic Report is whether an OOM occurred and memory usage information.

Table 138. Back Data fields for OOM diagnostic Report

Field	Description	Note
OOM Occurred	Whether an OOM occurred	
Heap Usage Rate	Heap memory usage rate	
Full GC Count	Number of Full GCs	
Memory Leak	Whether a memory leak occurred	

Field	Description	Note
Heap Dump	File name if a Heap Dump was generated	

The Back Data for a Hang diagnostic Report is the server status and system resource information.

Table 139. Back Data fields for Hang diagnostic Report

Field	Description	Note
Node CPU Rate	CPU usage measured by the Node Agent	
Node Memory Rate	Memory usage measured by the Node Agent	
Process CPU Rate	Server process CPU usage	
Full GC Count	Number of Full GCs in the server	

7.4.3. Notifications

When a Report is generated via diagnostics/actions, you can check it via the **bell icon** at the top-right of LENA Manager.

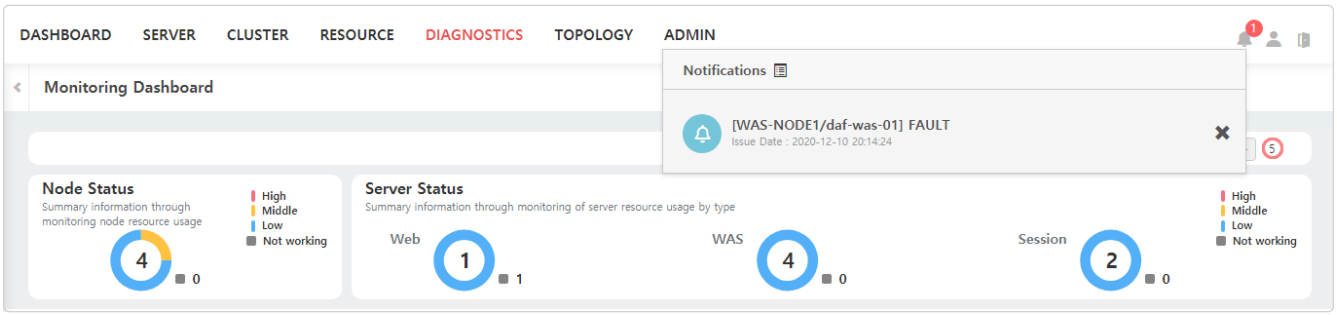


Figure 67. Diagnostics/Action result notification

Selecting a notification opens the generated Report immediately. If you want to acknowledge and hide it, click the **x button**. If there are many notifications, click the **bell icon** at the top-right of Manager to open the Notifications screen and review them in bulk.

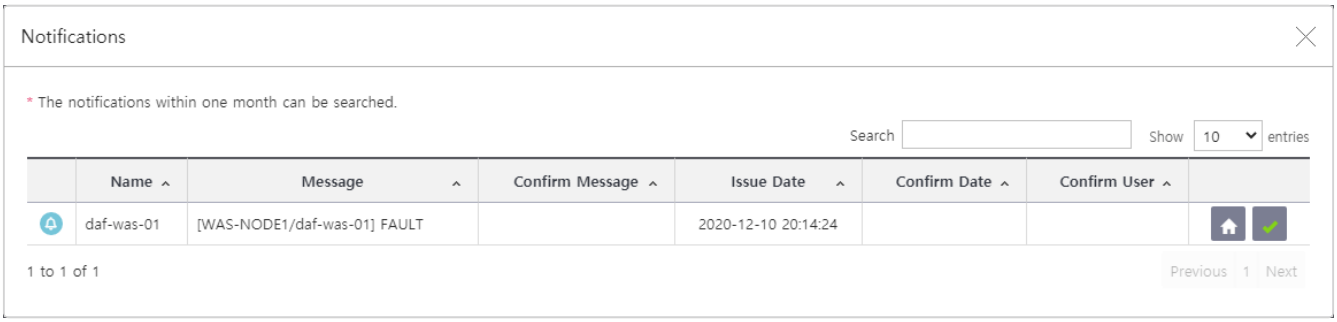


Figure 68. Bulk acknowledgement of Diagnostics/Action result notifications

Clicking the **Home icon** navigates to the diagnostics history screen for the selected notification. Clicking the **V icon** marks the selected notification as acknowledged; acknowledged notifications no longer appear in the **bell icon** list at the top-right.

In the Notifications screen you can review notifications from within the last month. Data older than one month is automatically deleted.

7.4.4. Thread Dump Analysis

Analyzes Thread Dumps generated via LENA Manager and presents the results in an easy-to-understand way.

As a prerequisite, Thread Dump files must exist in the Server or Service-Cluster.

Create Report

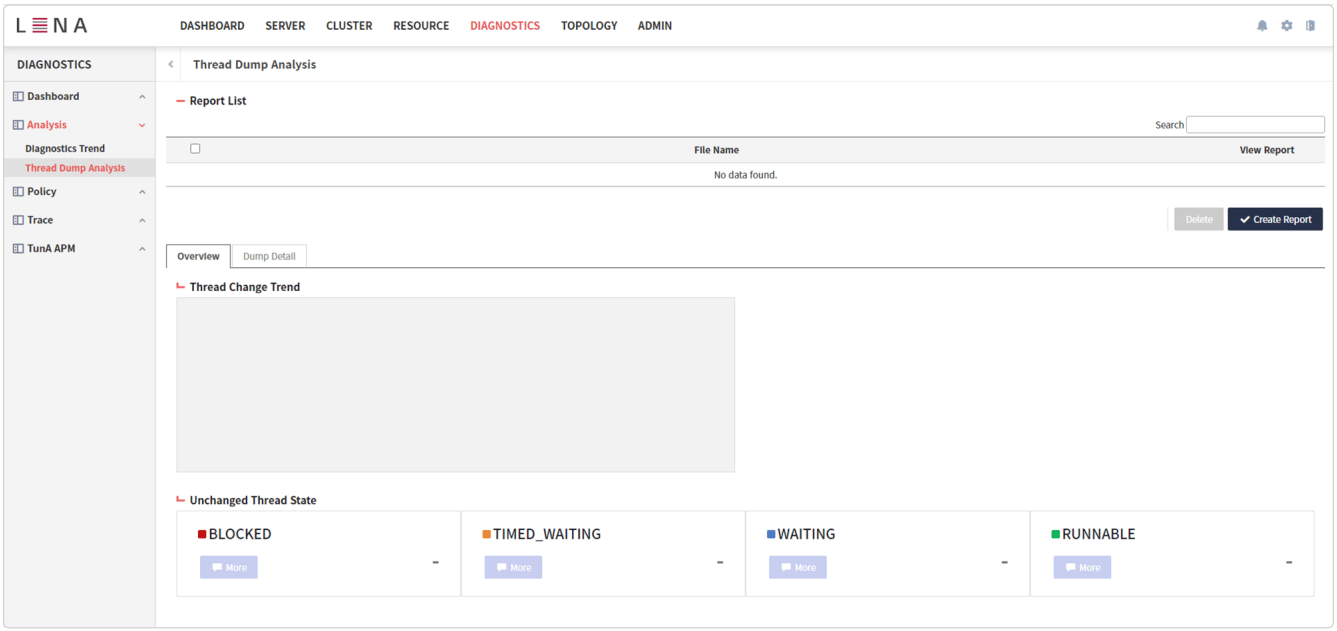


Figure 69. Initial Thread Dump Analysis screen

Select the 'DIAGNOSTICS' menu at the top of LENA Manager and click Thread Dump Analysis under Analysis.

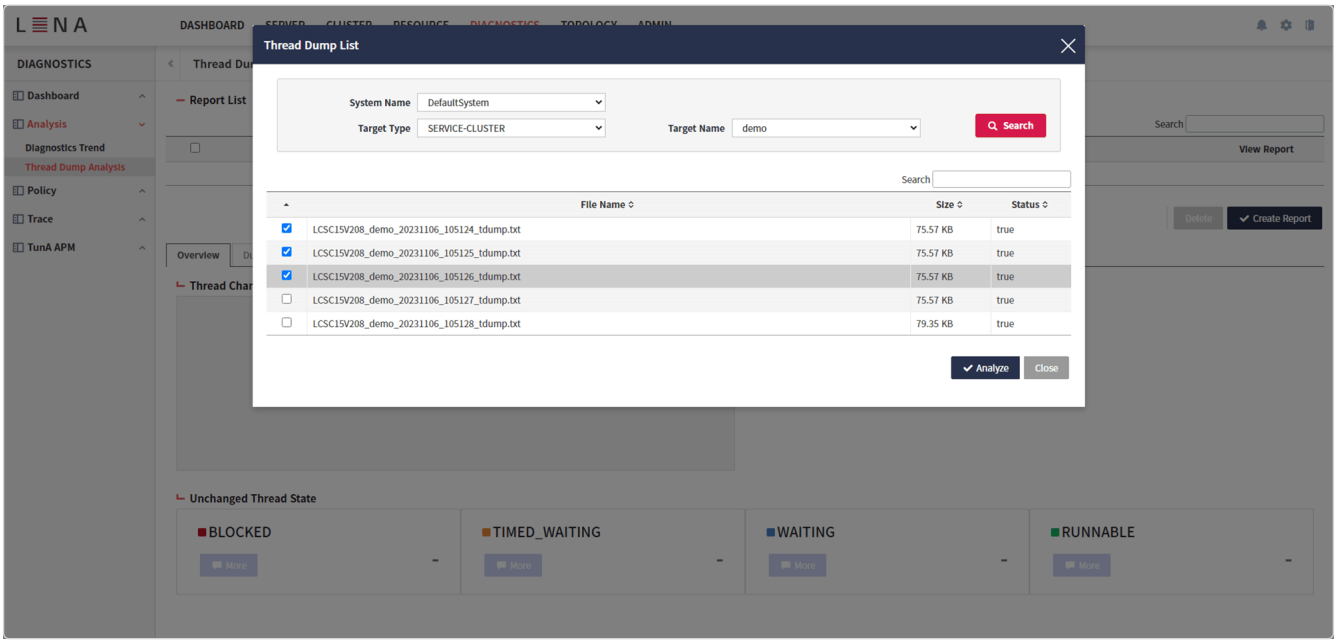


Figure 70. Modal window to select Thread Dump(s) to analyze and create a Report

Click the Create Report button to open the modal.

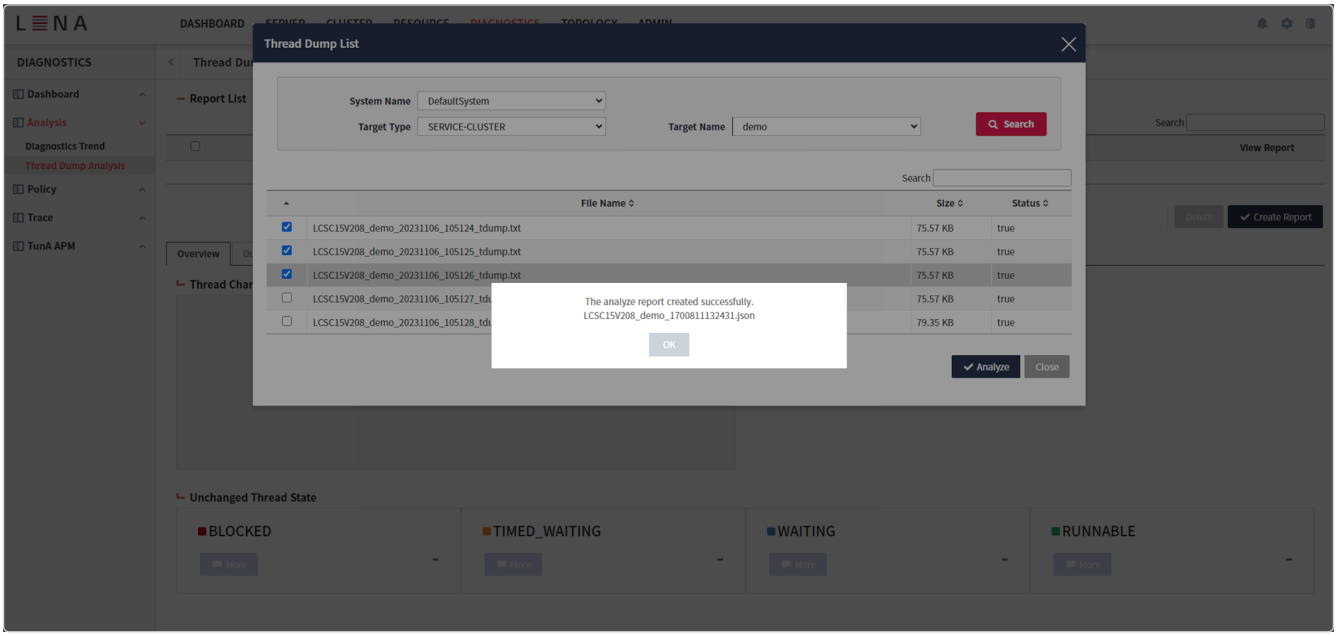


Figure 71. Screen showing successful Report creation after analyzing Thread Dump files

Select System Name, Target Type, and Target Name in order, then click the Search button to list available Thread Dump files.
Select the Thread Dump files to analyze and click the Analyze button to create a Report.
The path of the created Report is as follows:

- (LENA-Manager installation path)/repository/monitoringDB/report

(Select 3–5 Thread Dump files for analysis.)

Overview

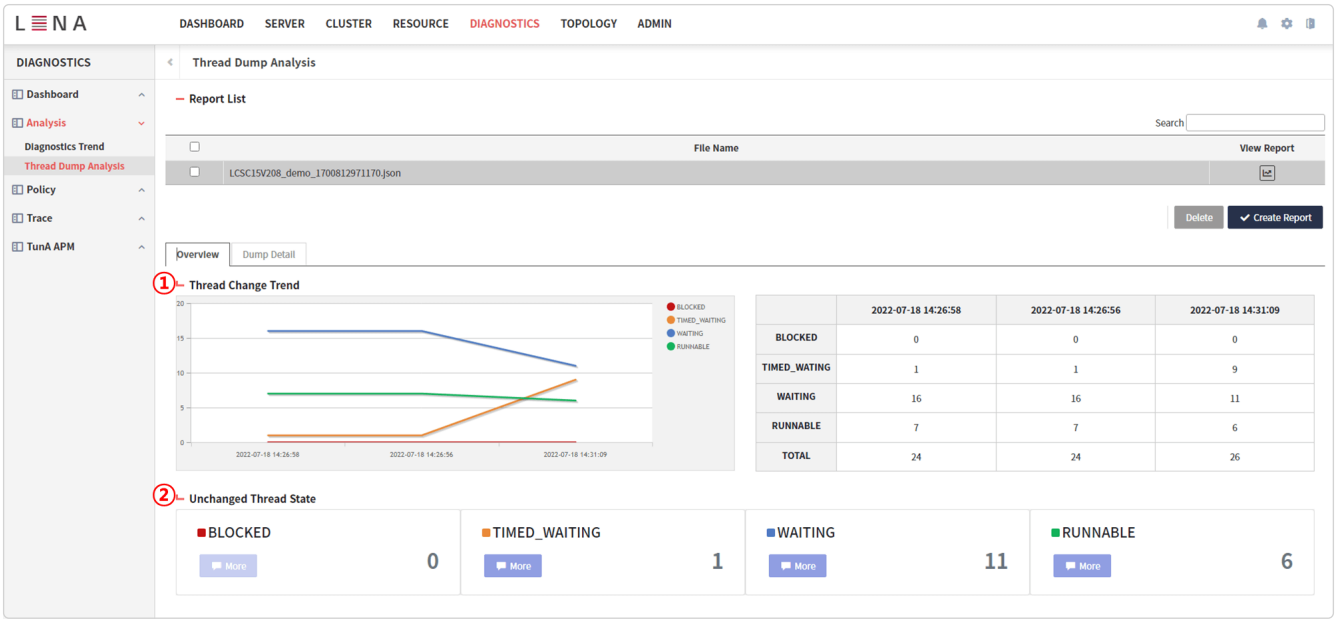


Figure 72. Screen showing the analyzed Report files

1. Thread Change Trend
   You can view a graph of Thread state changes per Thread Dump file and check exact counts in a table.
2. Unchanged Thread State
   You can check the number of Threads whose state does not change across all analyzed Thread Dump files and click the 'More' button to view details.

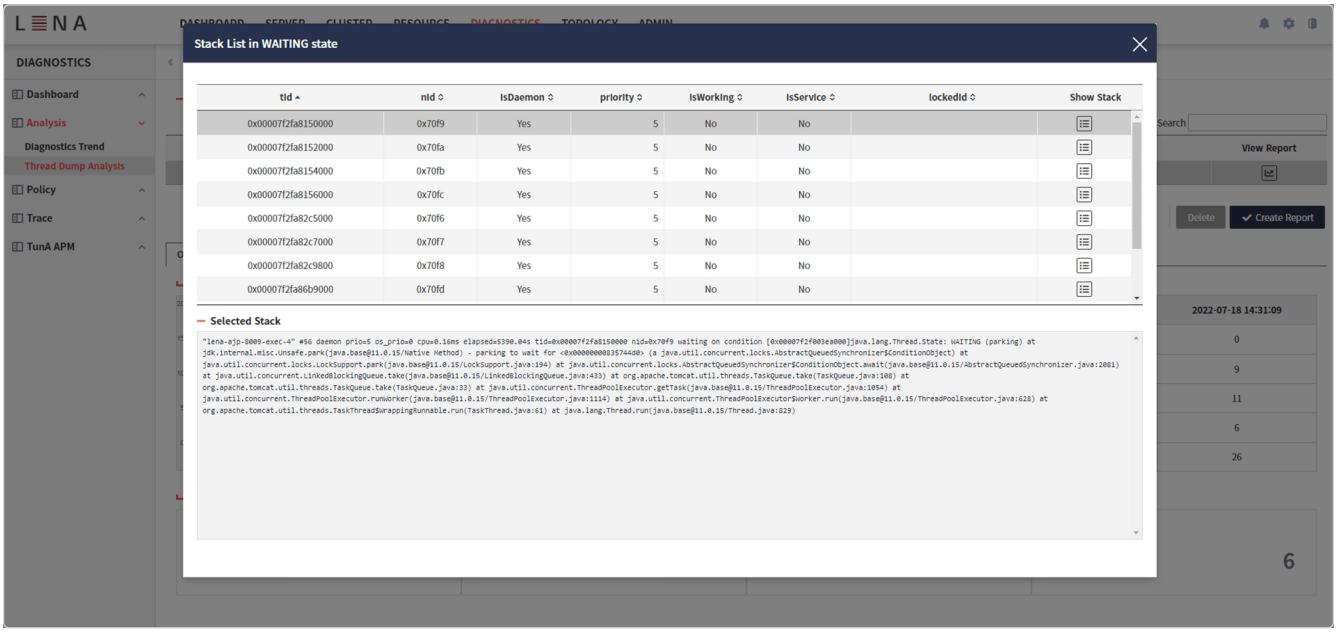


Figure 73. Thread information by state

Dump Detail

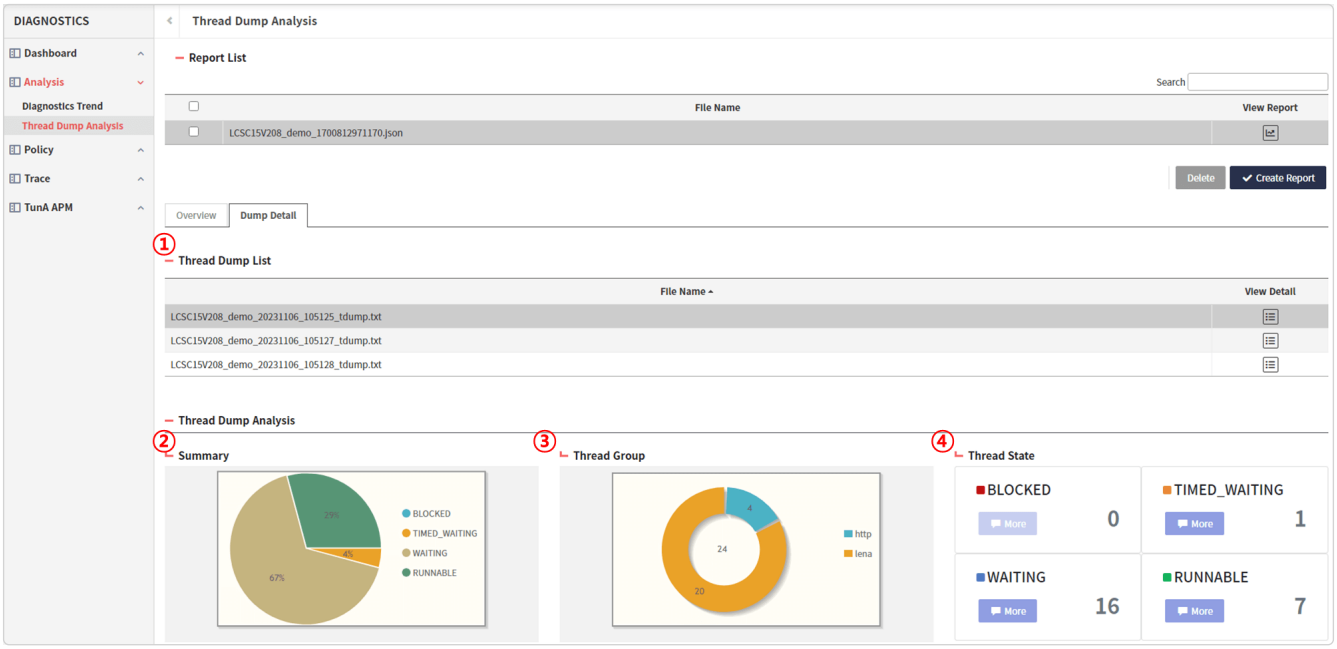


Figure 74. Screen showing Thread information per analyzed Dump file

1. Thread Dump List
   List of analyzed Thread Dumps
2. Summary
   Distribution of Thread states for the Thread Dump
3. Thread Group
   Number of Threads grouped as workerThread as defined in the rule file
   - Rule file path: (LENA-Manager installation path)/repository/conf/diagnostics/basic-parser.json
4. Thread State
   Counts of Thread states for the Thread Dump; click the 'More' button to view details.

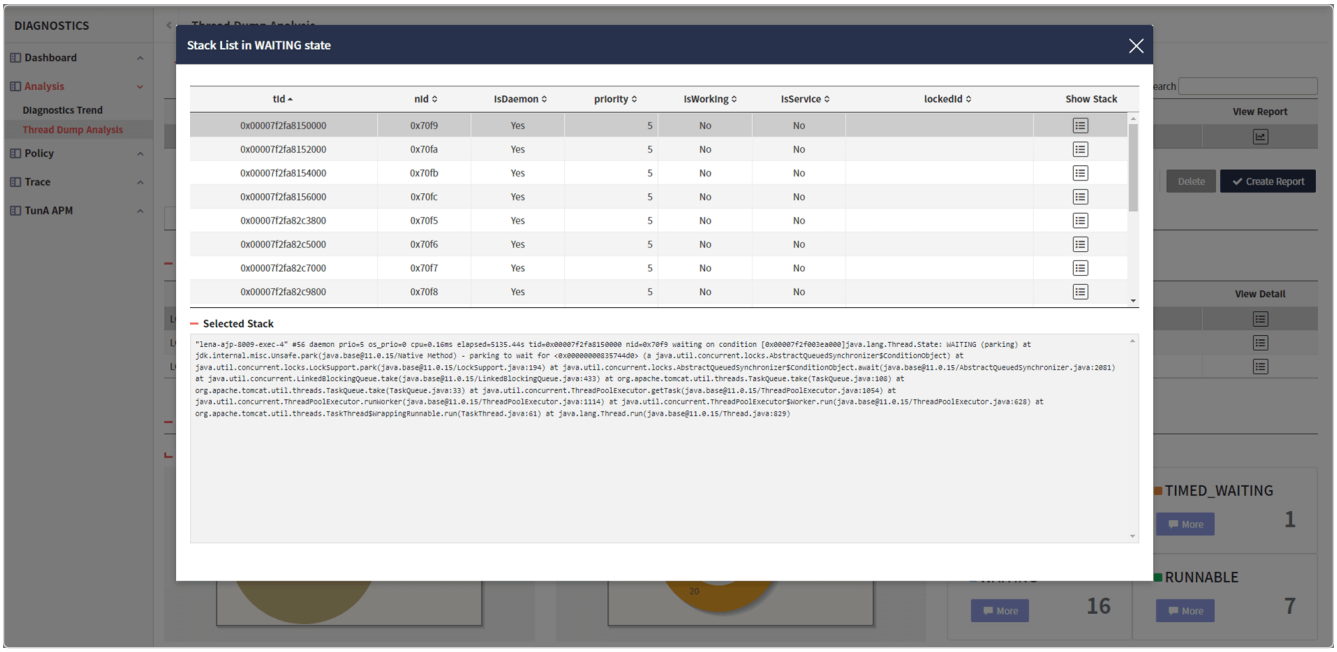


Figure 75. Thread information by state in the selected Thread Dump file

7.5. Diagnostics and Actions

By using Diagnostics and Actions, you can proactively diagnose potential failures and automatically perform appropriate actions to improve server stability.

- The diagnostics feature automatically determines the possibility of server failure (or a failure state) based on rules.
- The action feature helps maintain stable service by automatically performing appropriate server controls based on diagnostic results to withstand failure situations.

The target diagnostic types are as follows.

- Excessive use of the Request Pool (Request Full)
  - When service requests are excessive and all available Request Threads on the server are exhausted, service requests may be delayed or result in an unavailable state. Based on Request Thread usage, determine whether service requests are excessive, and automatically redirect such requests to a temporary page to keep the server stable.
- Bulk DB Data Request
  - When a service processes large amounts of DB data, it may consume excessive memory, leading to OOM, frequent Full GCs, and server hang. Determine whether a service is making bulk DB data requests, and forcibly terminate the service to keep the server stable.
- Excessive use of the DB Connection Pool (DB Conn Full)
  - When DB connections are overly occupied due to DB processing delays, WAS-DB network latency, or DB locks, services are delayed until they can obtain an available DB connection. If services waiting for DB connection allocation accumulate and overly occupy the Request Thread Pool, it may lead to service unavailability. When all DB connections in a specific DataSource are exhausted, shorten the allocation wait time to isolate the failure and keep the server stable.
- Long-running services (Long Transaction)
  - If services are delayed due to transient network or inter-system issues, or if there are inherently long-running services, those services can excessively occupy available Request Threads, hindering other services. Limit Request Thread usage for long-running services to

guarantee QoS for other services.

- Server hang (Hang)
  - When the server enters a hang state where it cannot operate, not only are all tasks stopped, but it may also affect the entire system where the server is installed. When a hang is detected, restart immediately to resolve the server failure and prevent system-wide failures.
- Out of Memory error (OOM)
  - OOM errors can occur due to service logic errors or excessive memory usage. Because normal server operation cannot be guaranteed when OOM occurs, quickly detect OOM and automatically restart to overcome the server failure.
- User surge (Peak Control)
  - When the number of user requests exceeds server capacity, services may be delayed or unavailable. If user requests concentrate on a specific service, control requests to enter sequentially to provide stable service while preventing user churn. This also guarantees QoS for other services.

7.5.1. Diagnostics/Action Rule Setting

You can configure Diagnostics/Action Rules from DIAGNOSTICS > Policy > Diagnostics Rule Setting.

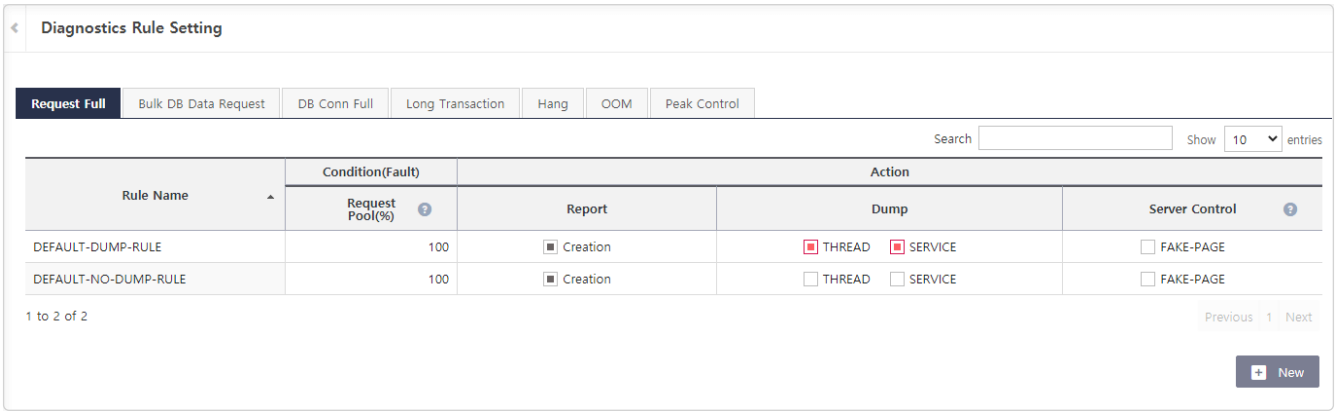


Figure 76. Diagnostics Rule Setting screen

Rules are organized by tab for each diagnostic type, and basic Default Rules are provided. Click the **New button** to create a new Rule, or select an existing Rule to edit or delete it.

Two Default Rules are provided for each diagnostic item as follows:

- A rule that only generates a Report after diagnosis
- A rule that generates a Report and Dump after diagnosis (Action is provided as Disabled)

Rule settings by diagnostic type are as follows.

Table 140. Request Full diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
Request Pool(%)	Threshold for Request Pool usage	100
Report	Whether to generate a Report (always Enabled)	Enable

Field	Description	Default
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump • SERVICE: Active Service Dump	Enable
Server Control	Action to perform when judged as abnormal • NONE: Do not perform • FAKE-PAGE: Reroute requests to a temporary page (reroute page can be specified)	NONE

Table 141. Bulk DB Data Request diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
RS Count	Threshold for the number of DB data rows requested within a service	10000
Exceptional URI	Service URIs to exclude from diagnostics	
Report	Whether to generate a Report (always Enabled)	Enable
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump • SERVICE: Active Service Dump	Enable
Server Control	Action to perform when judged as abnormal • NONE: Do not perform • THROW-EXCEPTION: Throw an Exception to forcibly terminate the service	NONE

Table 142. DB Conn Full diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
DB Connection Pool(%)	Threshold for DB Connection Pool usage	100
Report	Whether to generate a Report (always Enabled)	Enable

Field	Description	Default
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump • SERVICE: Active Service Dump	Enable
Server Control	Action to perform when judged as abnormal • NONE: Do not perform • DB-CONN-CONTROL: Dynamically change the DataSource connection allocation wait time (wait time can be set)	NONE

Table 143. Long Transaction diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
Elapsed Time(s)	Threshold for execution time of target services	300
Service Allow Rate(%)	Threshold for Request Thread usage allowed for target services	50
Target URI	Target service URI	
Report	Whether to generate a Report (always Enabled)	Enable
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump • SERVICE: Active Service Dump	Enable
Server Control	Action to perform when judged as abnormal • NONE: Do not perform • SERVICE-CONTROL: Reroute requests to a temporary page (reroute page can be specified)	NONE

Table 144. Hang diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
Timeout(ms)	Response wait time threshold after attempting a server Health Check	3000 (ms)
Retry Count	Number of retries when a server Health Check fails	3

Field	Description	Default
FullGC Duration(s)	Time interval for checking Full GC count	60
FullGC Count	Number of Full GCs	2
Report	Whether to generate a Report (always Enabled)	Enable
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump	Enable
Server Control	Action to perform when judged as abnormal • NONE: Do not perform • SHUTDOWN: Shut down the server • RESTART: Restart the server	NONE

The relationships among Hang diagnostic settings are as follows:

- Fault condition: If, due to a server hang, there is no response for Timeout(s) after attempting a Health Check and this repeats for Retry Count times, it is considered a Fault and an Action is performed.
- Anomaly condition: If the number of Full GCs within FullGC Duration(s) reaches FullGC Count, it is considered an Anomaly and only a Warning report is generated without any Action.

Table 145. OOM diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
OUT OF MEMORY	Whether OOM occurred (considered a Fault)	Detected without additional settings
Memory Leak	Whether a Memory Leak occurred (considered an Anomaly)	Detected without additional settings
Report	Whether to generate a Report (always Enabled)	Enable
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump • SERVICE: Active Service Dump	Enable

Field	Description	Default
Server Control	Action to perform when judged as abnormal • NONE: Do not perform • SHUTDOWN: Shut down the server • RESTART: Restart the server	NONE

Table 146. Peak Control diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
Target URI	Target service URI for Peak Control	
Service Allow Rate(%)	Threshold for Request Thread usage allowed for target services	50
Release Rate(%)	Request Thread usage threshold to clear the abnormal state	10
Report	Whether to generate a Report (always Enabled)	Enable
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump • SERVICE: Active Service Dump	Enable
Server Control	Action to perform when judged as abnormal • NONE: Do not perform • PEAK-CONTROL: Reroute requests to a temporary page (reroute page can be specified)	NONE

7.5.2. Server Rule Setting

From DIAGNOSTICS > Policy > Server Rule Setting, you can map Diagnostics/Action Rules to servers and enable/disable them.

Initially, no diagnostic Rules are mapped. Before you can enable/disable Rules, you must first map Diagnostics/Action Rules. Click the row for each server to map Diagnostics/Action Rules to the server as follows.

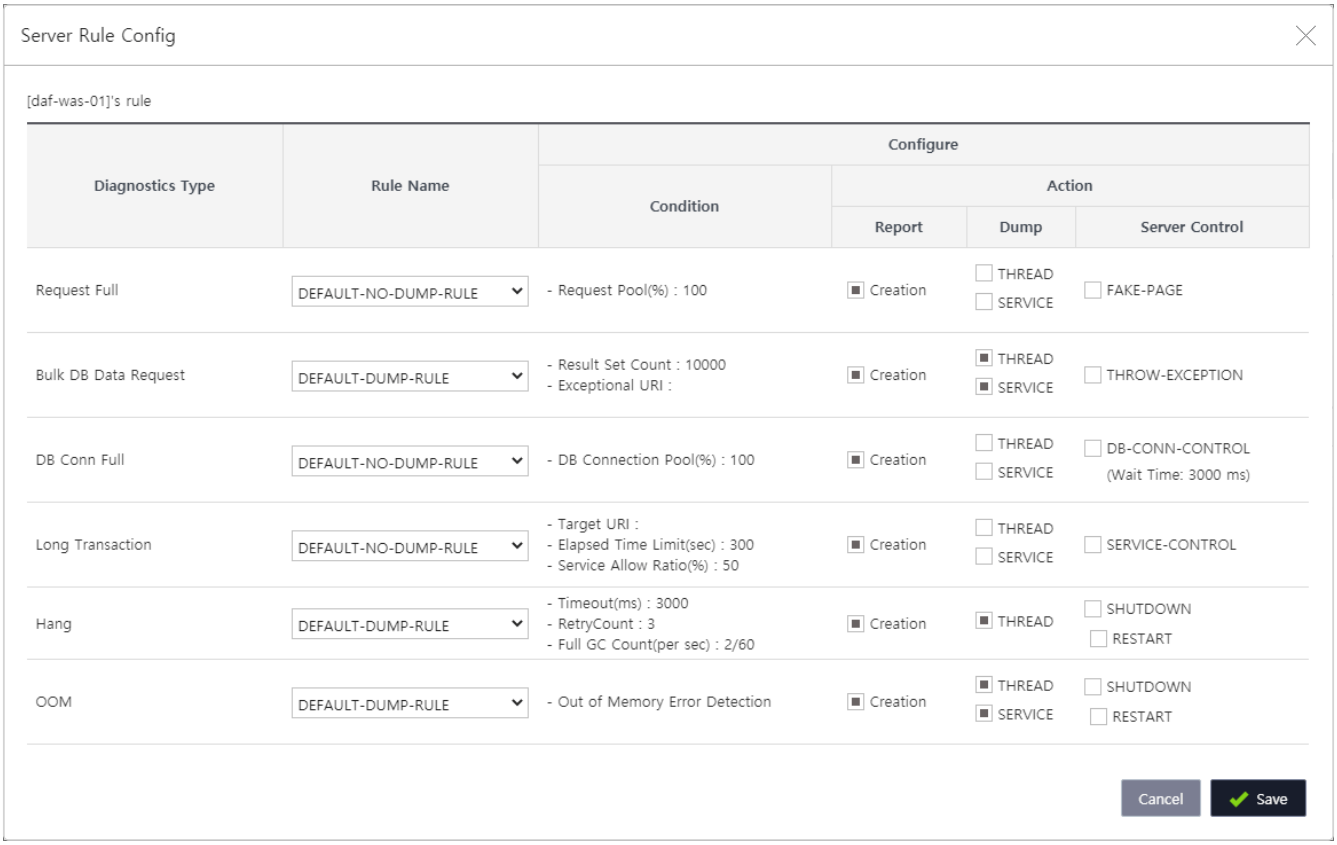


Figure 77. Diagnostics Rule Mapping screen

After Rules are mapped, you can enable/disable them from the Server Rule Setting screen as follows.

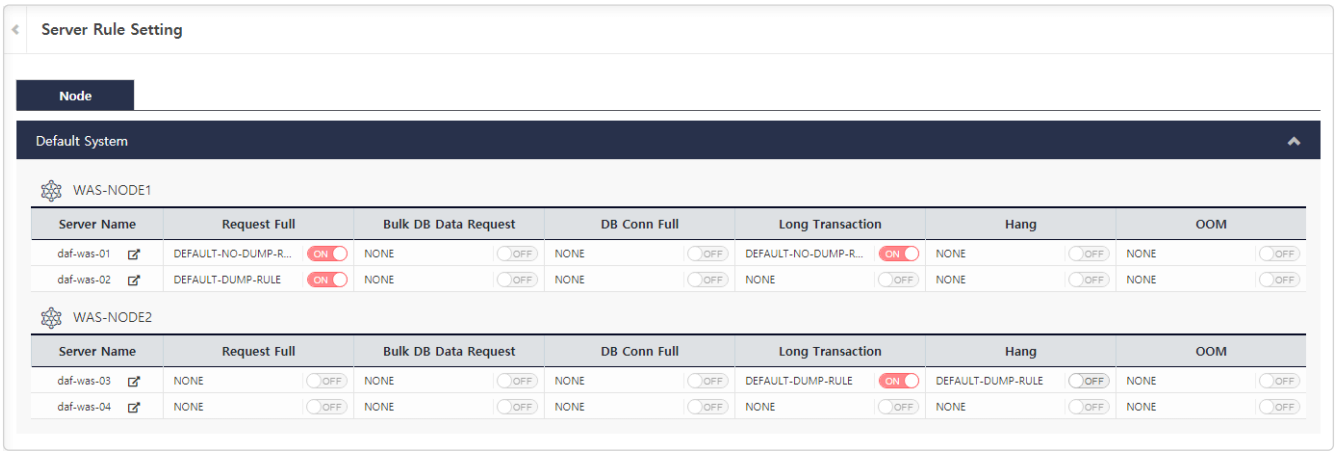


Figure 78. Server Rule Setting screen

Only the Peak Control diagnostic Rule is configured from DIAGNOSTICS > Policy > Peak Control Rule Setting.

7.6. Diagnostics and Actions (Container & Embedded LENA)

By using Diagnostics and Actions, you can proactively diagnose potential failures and automatically perform appropriate actions to improve server stability.

- The diagnostics feature automatically determines the possibility of server failure (or a failure state) based on rules.
- The action feature helps maintain stable service by automatically performing appropriate server

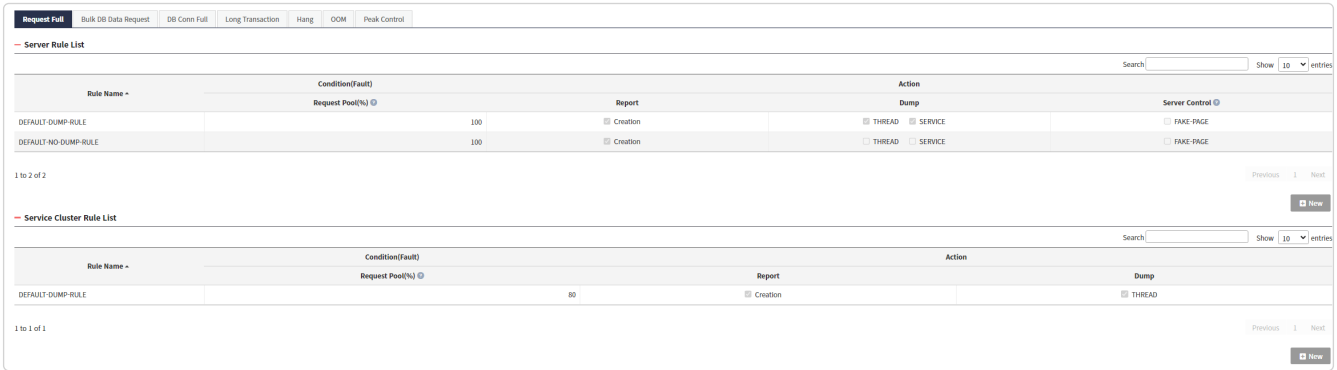
controls based on diagnostic results to withstand failure situations.

The target diagnostic types are as follows.

- Excessive use of the Request Pool (Request Full)
  - When service requests are excessive and all available Request Threads on the server are exhausted, service requests may be delayed or result in an unavailable state.
    Determine whether service requests are excessive based on Request Thread usage, and manage history based on Reports.
- Bulk DB Data Request
  - When a service processes large amounts of DB data, it may consume excessive memory, leading to OOM, frequent Full GCs, and server hang. Determine whether a service is making bulk DB data requests, and manage history based on Reports.
- Excessive use of the DB Connection Pool (DB Conn Full)
  - When DB connections are overly occupied due to DB processing delays, WAS-DB network latency, or DB locks, services are delayed until they can obtain an available DB connection. If services waiting for DB connection allocation accumulate and overly occupy the Request Thread Pool, it may lead to service unavailability. If all DB connections of a specific DataSource are exhausted, manage history based on Reports.
- Out of Memory error (OOM)
  - OOM errors can occur due to service logic errors or excessive memory usage. Because normal server operation cannot be guaranteed when OOM occurs, quickly detect OOM and manage history based on Reports.

7.6.1. Diagnostics/Action Rule Setting

From DIAGNOSTICS > Policy > Diagnostics Rule Setting, in the Service Cluster Rule List, you can configure Diagnostics/Action Rules to be used by Embedded LENA and Container Servers.



Rules are organized by tab for each diagnostic type, and basic Default Rules are provided. Click the New button to create a new Rule, or select an existing Rule to edit or delete it.

Table 147. Request Full diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
Request Pool(%)	Threshold for Request Pool usage	100
Report	Whether to generate a Report (always Enabled)	Enable

Field	Description	Default
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump • SERVICE: Active Service Dump	Enable

Table 148. Bulk DB Data Request diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
RS Count	Threshold for the number of DB data rows requested within a service	10000
Report	Whether to generate a Report (always Enabled)	Enable
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump	Enable

Table 149. DB Conn Full diagnostic Rule

Field	Description	Default
Rule Name	Rule name	
DB Connection Pool(%)	Threshold for DB Connection Pool usage	100
Report	Whether to generate a Report (always Enabled)	Enable
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump	Enable

Table 150. OOM diagnostic Rule

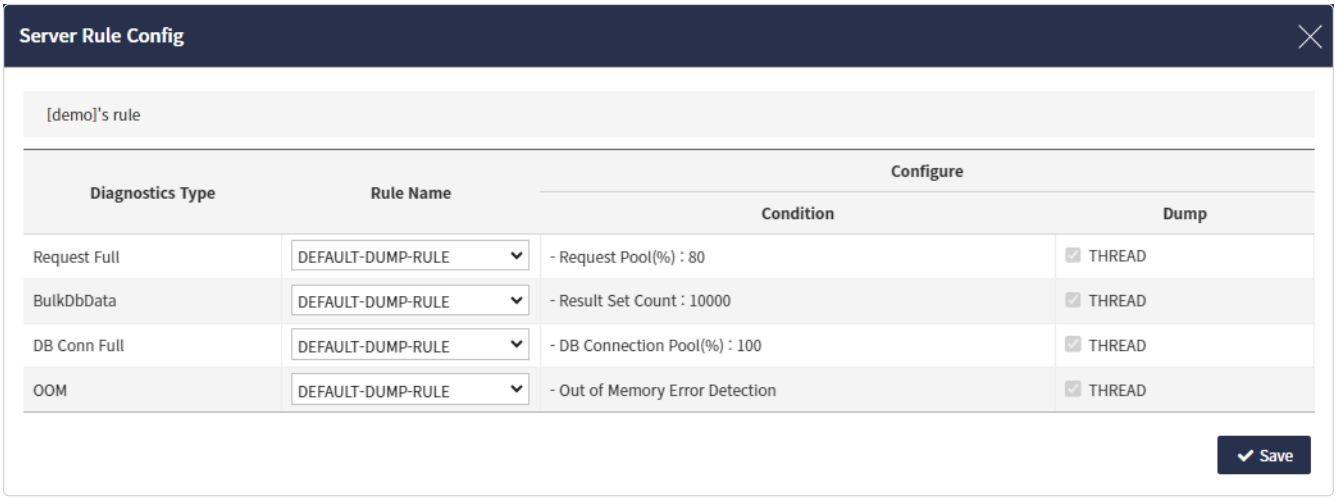
Field	Description	Default
Rule Name	Rule name	
OUT OF MEMORY	Whether OOM occurred (considered a Fault)	Detected without additional settings
Memory Leak	Whether a Memory Leak occurred (considered an Anomaly)	Detected without additional settings
Report	Whether to generate a Report (always Enabled)	Enable

Field	Description	Default
Dump	Dump type to generate when judged as abnormal • THREAD: Thread Dump	Enable

7.6.2. Server Rule Setting

From DIAGNOSTICS > Policy > Server Rule Setting, you can map Diagnostics/Action Rules to Service Clusters and enable/disable them.

Initially, no diagnostic Rules are mapped. Before you can enable/disable Rules, you must first map Diagnostics/Action Rules. Click the row for each Service Cluster to map Diagnostics/Action Rules to the servers as follows.



After Rules are mapped, you can enable/disable them from the Server Rule Setting screen as follows.

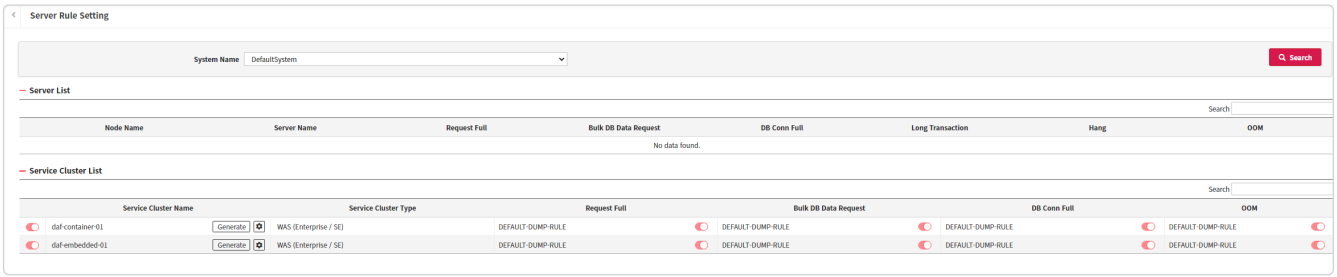


Figure 79. Server Rule Setting screen

7.7. Trace

Trace records the movement path and time of the corresponding request across LENA Servers for failure diagnosis so that the cause can be identified. The Trace types provided by LENA are as follows.

- Session Trace
- Event Trace

You can access various functions from the submenus under DIAGNOSTICS > Trace.

7.7.1. Session ID Search

You can check the Session Trace information (which server holds the session). To search for a session, the clustered Session Server must be running.

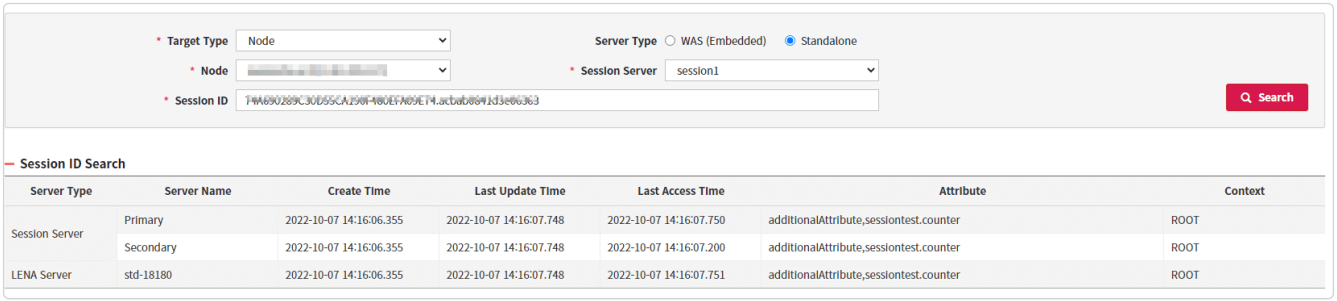


Figure 80. Session Trace screen

The result fields are as follows.

Table 151. Session Trace result fields

Field	Description	Note
Server Type	Server type	Session Server: LENA Session Server LENA Server: LENA Application Server
Server Name	Server name	For a Session Server, the searched server is Primary and its Slave Server is Secondary
Create Time	Session creation time	
Last Update Time	Last time the session was modified	
Last Access Time	Last time the server accessed the session	
Attribute	Session attributes	
Context	Application context of the session	

7.7.2. Event Trace

When an event considered a failure occurs, you can view the Trace information for that request.

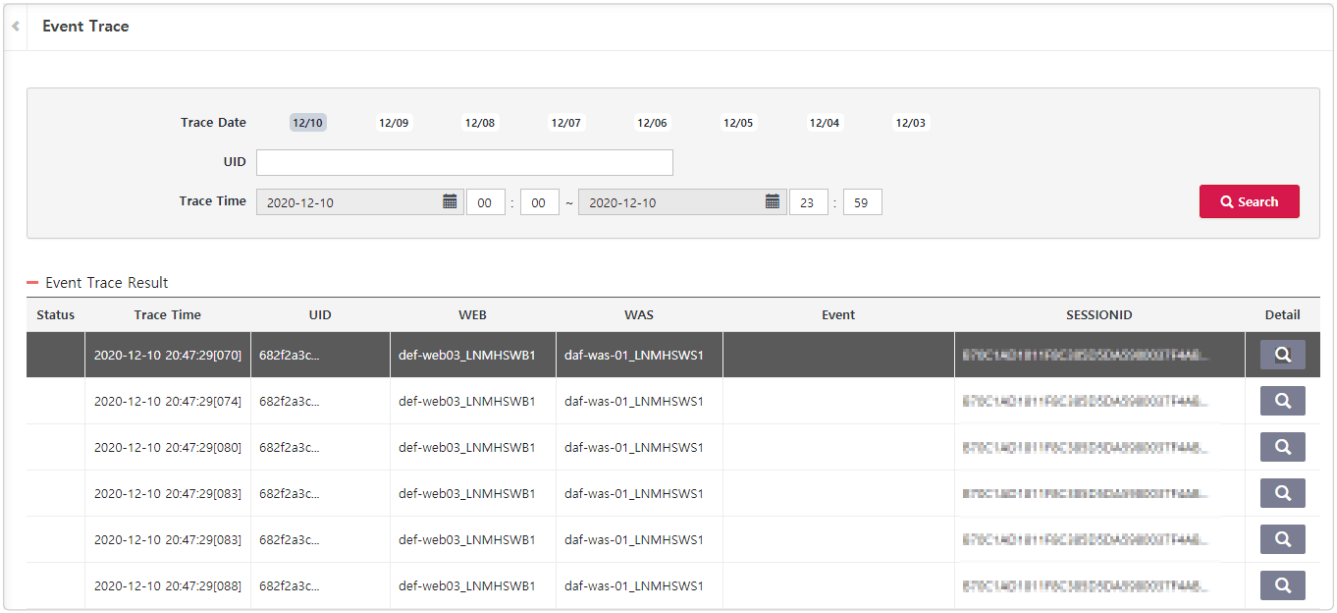


Figure 81. Event Trace screen

Trace information is retained for one week only. The date on which the event occurred is shown in the Trace Date search condition. In the search results, the Status field indicates the severity of the event.

Table 152. Event Trace search result fields

Field	Description	Note
Trace Time	Completion time of processing the request where the event occurred	End time at the Web Server
UID	User ID that made the request. If one user uses different browsers, the UID is treated differently for each.	
WEB	Web Server that processed the request	
WAS	WAS that processed the request	
Event	Event that occurred	
SESSION ID	Session ID of the request	
Detail	Button to view details	

Click the **Detail button** in the search results to view details. The fields are as follows.

Table 153. Detailed fields in Event Trace information

Field	Description	Note
Trace Time	Completion time of processing the request where the event occurred	End time at the Web Server
UID	User ID that made the request. If one user uses different browsers, the UID is treated differently for each.	
WEB	Web Server that processed the request	
WAS	WAS that processed the request	

Field	Description	Note
Event	Event that occurred	
JVMRoute	JVMRoute value of the WAS that processed the request	
SESSION ID	SESSION ID of the request	
Session Server	Session Server that processed the request	Labeled as the Primary/Secondary Session Server connected to the WAS
URL	URL of the request	

The traceable events are as follows (you can see the event codes in log files; the screen shows descriptive sentences instead of codes).

Table 154. Traceable event codes and descriptions

Event Code	Description	Note
sywz	Session ID and JVMRoute information differ. (Can occur when failover happens due to a WAS failure.)	Session ID does not match with JVMRoute.
wxso	No session information in WAS but session information exists in the Session Server. (Can occur when failover happens due to a WAS failure.)	Session does not exist in Application Server.
wosx	Session information exists in WAS but not in the Session Server. (Can occur if both Session Servers were restarted.)	Session does not exist in Session Server.
wxsx	No session information in both WAS and Session Server. (Can occur if both Session Servers are stopped.)	Session does not exist in any Server.
woxx	Session information exists in WAS, but the connection to both Primary & Secondary Session Servers is lost. (Can occur if both Session Servers are stopped.)	Session Server does not respond.
wxxx	No session information in WAS and the connection to both Primary & Secondary Session Servers is lost. (Can occur if the session timed out in WAS and both Session Servers are stopped.)	Session Server does not respond.

If the sywz and wxso events occur repeatedly for a single request, both events are shown in one search result.

7.7.3. Trace Setting

The following screen is for configuring Event/Time Trace settings.

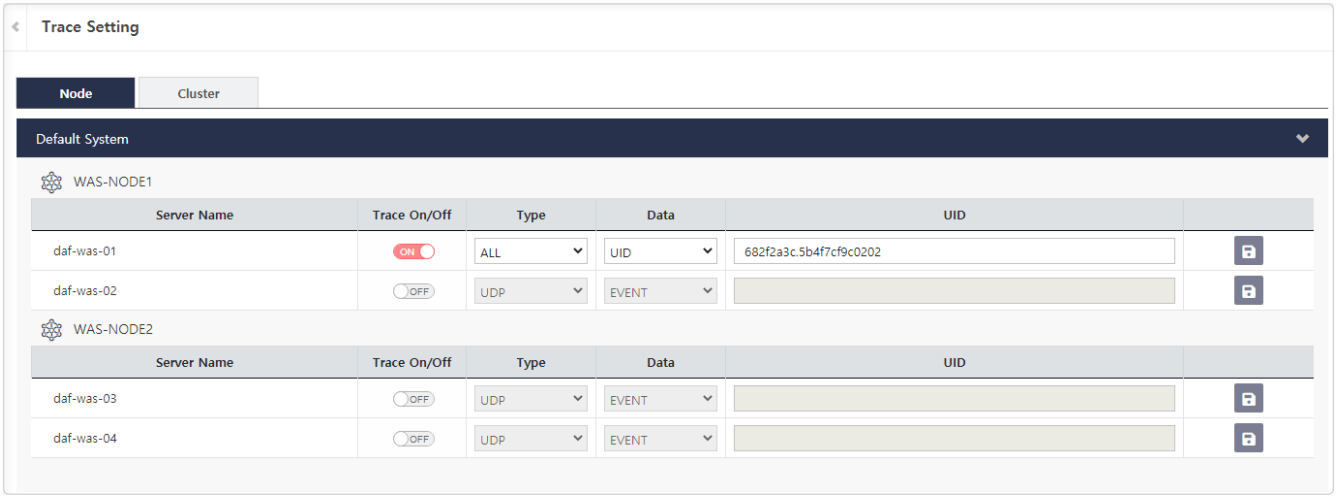


Figure 82. Trace Setting screen

The Trace settings are as follows.

Table 155. Trace Setting fields

Field	Description	Note
Trace On/Off	Whether to enable Trace	Applied without restart
Type	UDP: When the Trace condition is met, send Trace information to Manager via UDP LOG: When the Trace condition is met, save Trace information to logs ALL: When the Trace condition is met, use both UDP and LOG	
Data	EVENT: Record traces when events occur UID: Record traces only for requests with the specified UID	
UID	Record traces only for requests with the entered UID	

Chapter 8. Topology

You can see the configuration status of each system at a glance, and it provides installation and configuration functions, as well as resource monitoring and start/stop control.

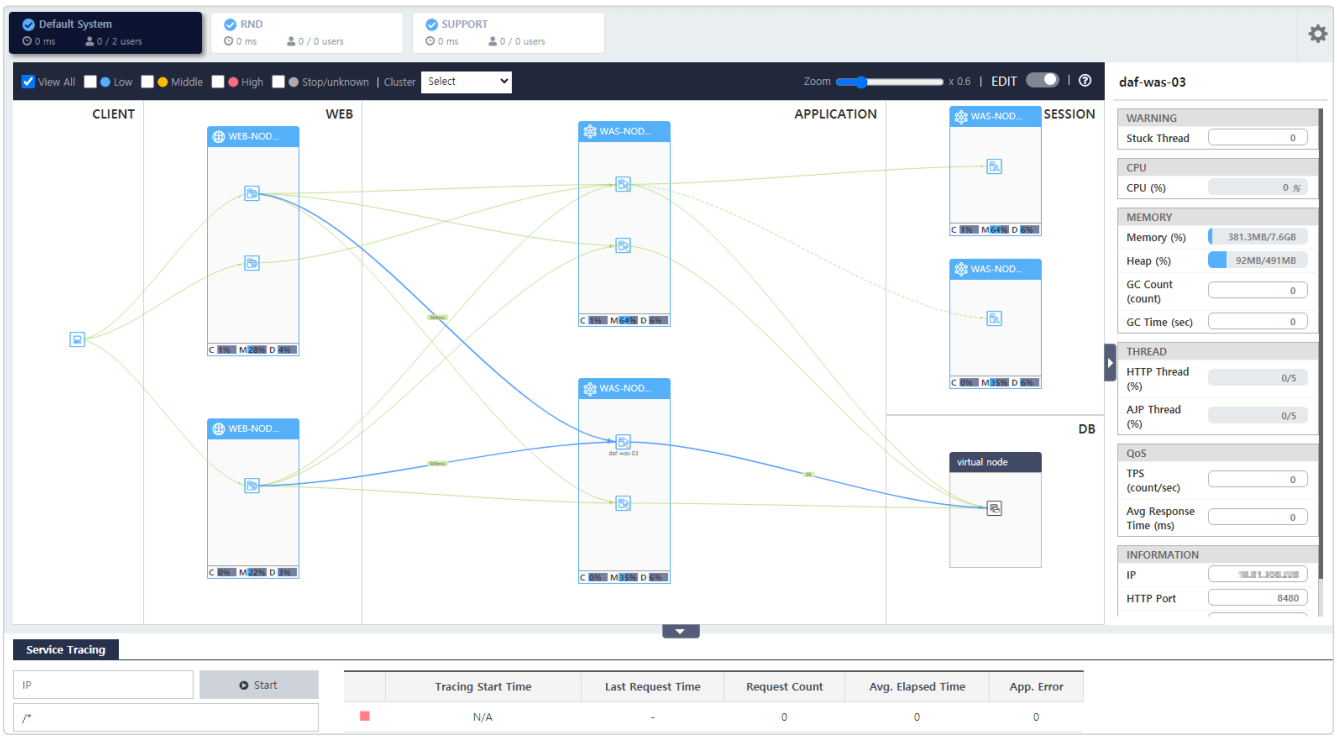


Figure 83. Topology Screen

8.1. Screen Configuration

It is divided into System area, Topology area, Resource monitoring area, and Service tracing area.

- System Area

  Provides a list of registered Systems in card format.

  The icon to the left of the system name in the card represents the system status, which is displayed in 3 levels based on the Resources constituting the system and diagnostic results.

  - **Blue circle icon** : When all servers constituting the system have Low resource usage and diagnostic processes are not performed
  - **Orange circle icon** : When all servers constituting the system have Middle or lower resource usage, or diagnostic process results are in Abnormal status
  - **Red circle icon** : When some servers constituting the system have High resource usage, or diagnostic process results are in Fault status

  The **clock icon** below the system name represents the average response time of WASs within the system, and the **user icon** represents the current number of users (in the last 5 minutes) / total users today.

  > The criteria for Low, Middle, and High resource usage can be changed in DIAGNOSTICS > Policy > Common Rule Setting > Dashboard items.

- Topology Area

Shows the configuration status of nodes and server instances by system in topology chart format. You can install and run Web Server, WAS, and Session Server installed on each Node, perform clustering, and check server status information. Additionally, you can configure integration between Web Server-WAS, WAS-Session Server, and WAS-Datasource.

- Resource Monitoring Area

  Provides detailed resource monitoring information such as CPU and Memory of Nodes and Servers.

- Service Tracing Area

  You can trace services based on specific Client IP and requested Service Pattern to check the number of requests, average response time, and number of service response errors.

Through the **Settings button** on the right side of the system list, you can change the following items:

Chart

- Refresh Interval : Data retrieval cycle for the topology area
- Refresh Topology Chart : Metadata consistency verification and restoration for drawing charts in the topology area

System List

- Selection of Systems to display in the System list and order change

Elements

- Show Endpoint : Setting for displaying the Endpoint area
- Show Edge Info : Setting for displaying detailed information on Edges
- Show Server Name : Setting for displaying server names

Transparency

- Node : Setting transparency for Nodes in the topology area
- Edge : Setting transparency for Edges in the topology area

8.2. Topology Area Details

In topology, information is displayed differently according to the view mode.

- View All : Shows all information.
- Low : Shows only instances with Low resource usage on servers.
- Middle : Shows only instances with Middle resource usage on servers.
- High : Shows only instances with High resource usage on servers.
- Stop/unknown : Shows only stopped instances.

Also, instances are activated and displayed by Cluster unit.

For WAS with diagnostic functionality configured, the diagnostic results of server status (Abnormal or Fault) are checked first before checking resource usage. If the status is determined to be in that state, it is displayed as High status.

8.2.1. Control [Edit: OFF]

Provides detailed monitoring information and control functions from Client to Database from an E2E (End to End) perspective.

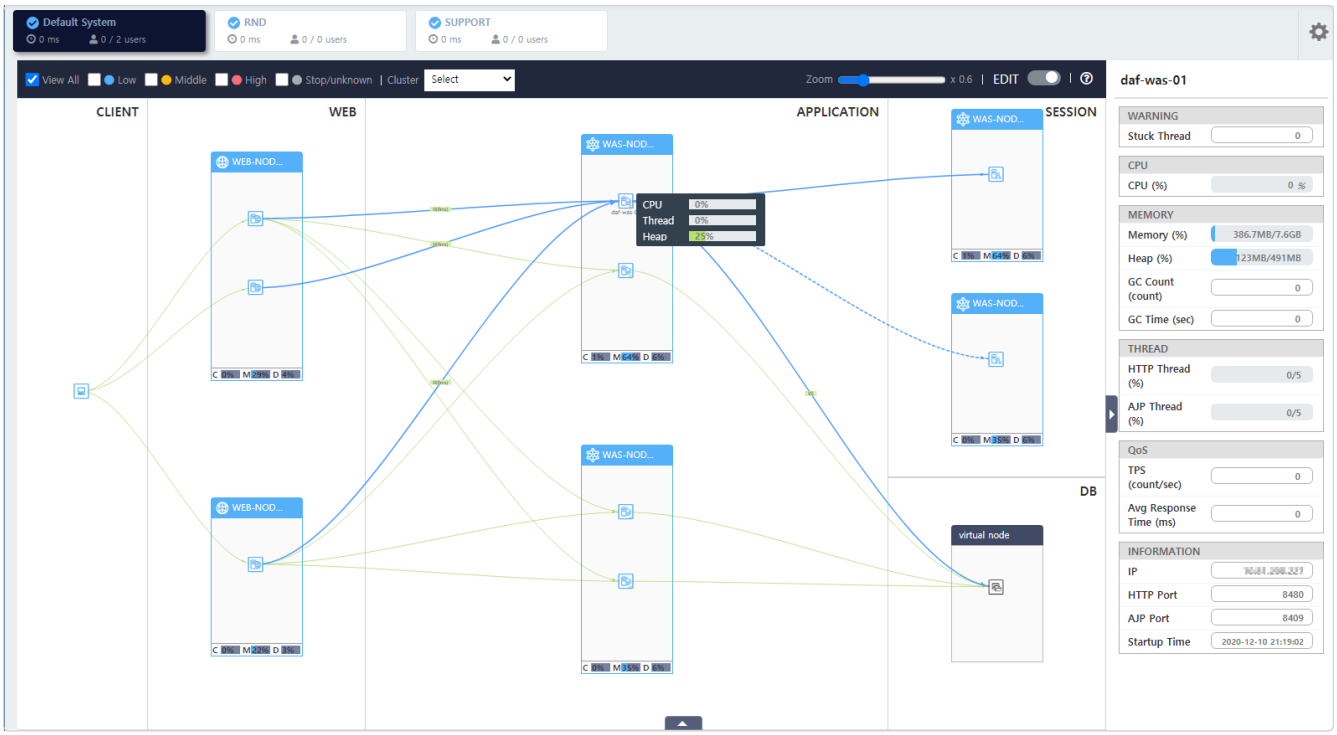


Figure 84. Topology Control [Edit: OFF]

CLIENT Area

Client refers to users, and you can check the browser screen rendering time when users make requests to the Web Server and the content of script errors.

WEB Area

The WEB area provides information about installed Web Nodes and Web servers and allows server control.

- Configuration Information

  Web Node is the area where Web servers are installed, and you can check the server installation status by node.

- Monitoring Information

  Web Node provides basic CPU, Memory, Disk status information by default.

  When you hover over a Web Server, it provides CPU, Memory, Thread status information in a popup form.

  When you select a Web Node and a Server, you can get real-time detailed monitoring information for each in the Resource Monitoring Area on the right side of the Topology Area.

  - Node : CPU, Memory, Disc, Network and basic information
  - Server : CPU, Memory, Thread, QoS and basic information

- Control Functions

Server provides three main control functions.

1. Server Control : Start, Stop, Service Control

Service Control provides uninterrupted deployment functionality. This is a method in which the source corrected for an error service is immediately deployed to the WAS and then the Web Server (timely server) that calls this WAS is configured to forward the error service to the timely server, thereby ensuring normal service provision.

To use this function, the LSC module must be enabled in the Web Server (httpd-lsc.conf file, change LscEnable to On, and restart the server).

After defining the control time, control conditions (Header, Cookie, URL) and the server to forward (http://IP:Port) to save, it connects incoming requests in real-time to the corresponding server according to the defined content, thereby providing service without server restart.

2. Move to : Configuration
3. Cluster : Compare, Sync, Snapshot, Graceful Restart

APPLICATION Area

APPLICATION Area provides information about installed WAS Nodes and WAS servers and allows server control.

- Configuration Information

  WAS Node is the area where WAS servers are installed, and you can check the server installation status by node.

- Monitoring Information

  WAS Node provides basic CPU, Memory, Disk status information by default.

  When you hover over a WAS Server, it provides CPU, Thread, Heap status information in a popup form.

  When you select a WAS Node and a Server, you can get real-time detailed monitoring information for each in the Resource Monitoring Area on the right side of the Topology Area.

  - Node : CPU, Memory, Disc, Network and basic information
  - Server : Warning, CPU, Memory, Thread, QoS and basic information

- Control Functions

  Server provides four main control functions.

  1. Server Control : Start, Stop, Forced Stop
  2. Dump : Thread Dump, Active Service Dump, Heap Dump
  3. Move to : Configuration, Monitoring
  4. Cluster : Compare, Sync, Snapshot, Graceful Restart

SESSION Area

SESSION Area provides information about installed Session Nodes and Session servers and allows server control.

- Configuration Information

  Session Node is the area where Session servers are installed, and you can check the server installation status by node.

- Monitoring Information

  Session Node provides basic CPU, Memory, Disk status information by default.

  When you hover over a Session Server, it provides CPU, Session Count, Heap status information in a popup form.

  When you select a Session Node and a Server, you can get real-time detailed monitoring information for each in the Resource Monitoring Area on the right side of the Topology Area.

  - Node : CPU, Memory, Disc, Network and basic information
  - Server : CPU, Memory, Session Count and basic information

- Control Functions

  Server provides two main control functions.

  1. Server Control : Start, Stop
  2. Move to : Configuration

DB Area

DB Area provides information about the Database connected to WAS. The Database must be registered in the RESOURCE menu. Nodes are represented as virtual nodes to be consistent with other areas. Monitoring and control functions for each DB are not provided.

Edge Information

The connection line means the connection between instances, or between an instance and a Database, and represents the average response time of the server and the number of connected connections.

- Client-WEB : Connection count (Average browser rendering completion time (ms)/Average Web Server response time (ms))
- WEB-APPLICATION : Active Connection count (Average WAS response time (ms))
- APPLICATION-DB : Active Datasource usage rate (%)

End to End monitoring functionality is set to off by default.

Therefore, to view the average browser rendering response time between Client-WEB or the average response time of the server, you must set it in the following order.

1. manager.conf file, set diagnostics.e2e.enable=true
2. In the httpd.conf file of the Web Server, uncomment httpd-eum.conf

```
<IfDefine MOD_EUM>
  #LENA E2E Monitoring Extension settings
  Include ${INSTALL_PATH}/conf/extra/httpd-eum.conf <--
Uncomment this line
</IfDefine>
```

3. Web Server's eum/eum.properties file, modify agent_enable value to true

However, this function is not supported on window OS.

8.2.2. Control [Edit: ON]

When you select the **Edit button** in the upper right corner of the Topology Area, it switches to the editing mode. Here, you can provide node and instance installation functions within the system.

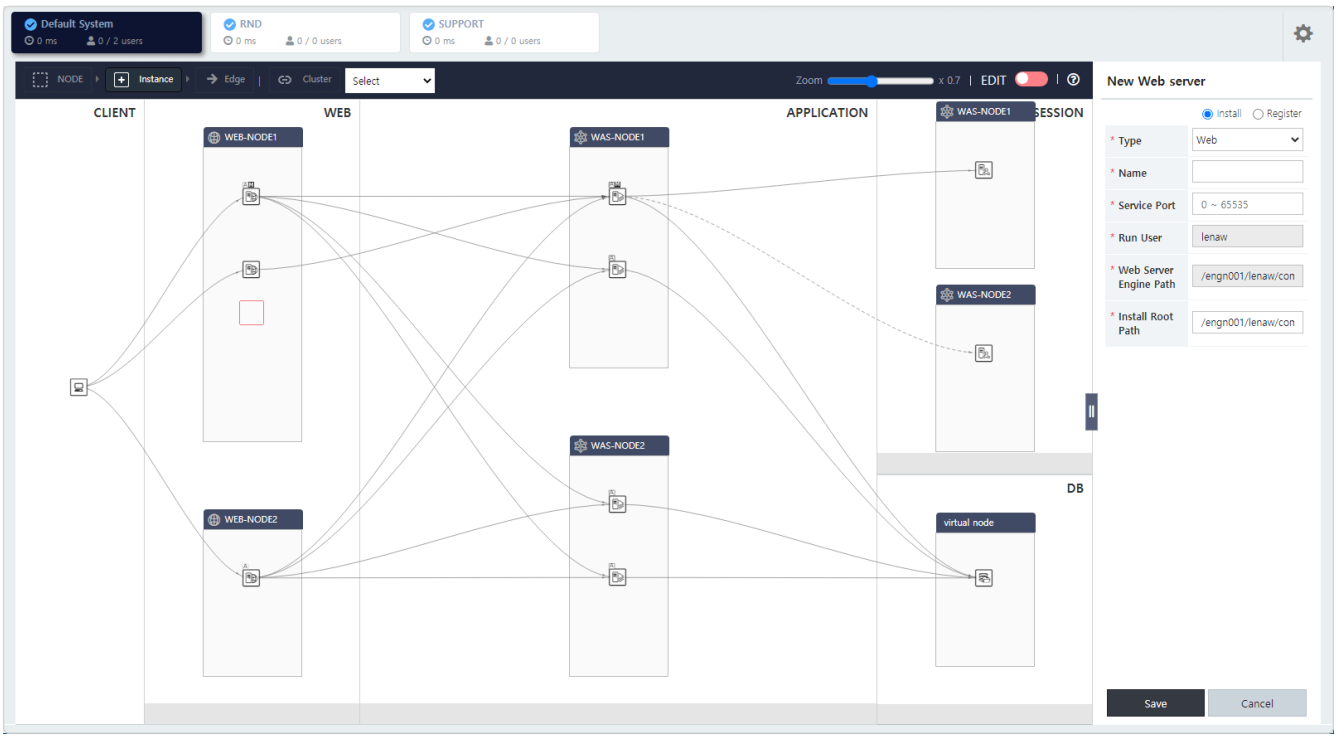


Figure 85. Topology Control [Edit: ON]

Node

The installation/modification/deletion operation of the Node is the same as Node, so only the usage method is described here.

- Installation

1. Select the **Node button** and click on the area you want to install above.
2. Enter the corresponding information in the detailed information area on the right side of the screen.
3. Select the **Save button** .

- Modification
  1. Select the node you want to change.
  2. Change the corresponding information in the detailed information area on the right side of the screen.
  3. Select the **Save button** .
- Deletion
  1. Select the node you want to delete.
  2. Right-click and select Hide, Unregister, Uninstall from the menu.

When deleting a Node, there must be no servers installed in the Node.

Instance

The installation/modification/deletion operation of the Server is the same as server, so only the usage method is described here.

- Installation
  1. Select the **Instance button** and click on the Node above the area you want to install.
  2. Enter the corresponding information in the detailed information area on the right side of the screen.
  3. Select the **Save button** .

The list of Nodes with no servers installed in each area is provided in the gray background below the area, as a square button. If you want to install a server in an empty node, double-click the node button.

- Modification
  1. Select the server you want to change.
  2. Change the corresponding information in the detailed information area on the right side of the screen.
  3. Select the **Save button** .
- Deletion
  1. Select the server you want to delete.
  2. Right-click and select Unregister, Delete from the menu.

Edge

Edge means the connection between servers, and you can connect servers within the WEB-APPLICATION, APPLICATION-SESSION, APPLICATION-DB areas.

- Connection
  1. Select the **Edge button** and drag from the starting server you want to connect to the destination server.

2. Enter the corresponding information in the detailed information area on the right side of the screen.
3. Select the **Save button** .

When connecting between APPLICATION-SESSION, the solid line means the Primary Server, and the dotted line means the Secondary Server.

- Change Connection Information
  1. Select the edge you want to change.
  2. Change the corresponding information in the detailed information area on the right side of the screen.
  3. Select the **Save button** .
- Disconnection
  1. Select the edge you want to delete.
  2. Select the Delete button in the menu of the right-click button.

Cluster

You can set up Server Cluster functionality provided by the CLUSTER menu.

- Creation
  1. Select the **Cluster button** .
  2. Enter the corresponding information in the detailed information area on the right side of the screen.
  3. Select the **Save button** .
- Change
  1. Select the server cluster you want to change in the select box next to the **Cluster button** .
  2. Change the corresponding information in the detailed information area on the right side of the screen.
  3. Select the **Save button** .
- Deletion
  1. Select the server cluster you want to change in the select box next to the **Cluster button** .
  2. Select the **Delete button** in the detailed information area on the right side of the screen.

Chapter 9. Admin

9.1. IAM

Provides user management and per-user menu permission management for Manager.

9.1.1. Users (User Management)

User List

From ADMIN > Users, you can create, edit, and delete Manager users.

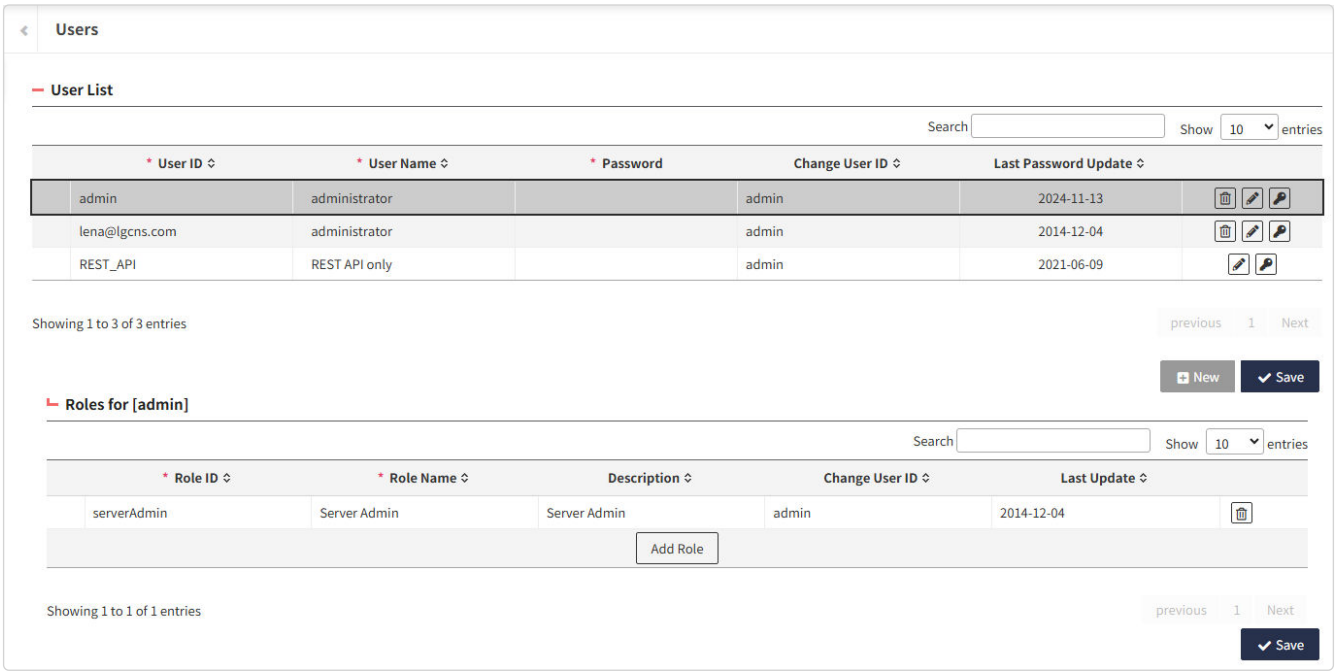


Figure 86. Users screen

The user management fields are as follows.

Table 156. User management fields

Field (* = required)	Description	Note
Use ID(*)	User identifier	
User Name(*)	User name	
Password(*)	User password	Must be at least 8 characters with a mix of special characters, numbers, and letters
Change User ID	Who created/updated the user data	
Last Update	When the user data was created/updated	
+ icon	Indicates that the selected permission info is being changed when clicking **New** or **Edit**	

Field (* = required)	Description	Note
- icon	Indicates that the selected permission info is marked for deletion when clicking **Delete**	

Two administrator accounts are provided by default (for emergency use). We recommend adding additional users besides the provided accounts.

Create User

1. Click the **New** button to prepare to register a new user.
2. Enter user ID, user name, and user password.
   - The user password is stored in encrypted form.
   - Password must be 8–20 characters and include upper/lowercase letters, numbers, and special characters (!@#$%^*+=-).
3. Click **Save** to store the user information.

- Password encryption uses the SHA-512 hash algorithm.

Edit User

1. Select the user to edit.
2. Click **Edit** to change the user name and user password.
   - The user password is stored in encrypted form.
3. Click **Save** to store the user information.

- If login fails 7 or more times, the account is locked and cannot be used.
- To unlock, change the password for the account from the user management screen.
- If there is no account currently logged in to Manager to change the password, run $LENA_HOME/bin/reset-manager-pw.sh to change it.

Delete User

1. Select the user to delete.
2. Click **Delete** to mark the user as deletable.
3. Click **Save** to store the changes.

If only one user remains, that user cannot be deleted.

9.1.2. Auths (Permission Management)

To manage permissions per menu, you must create permission groups. From ADMIN > Auths you can create, edit, and delete permission groups.

Permission List

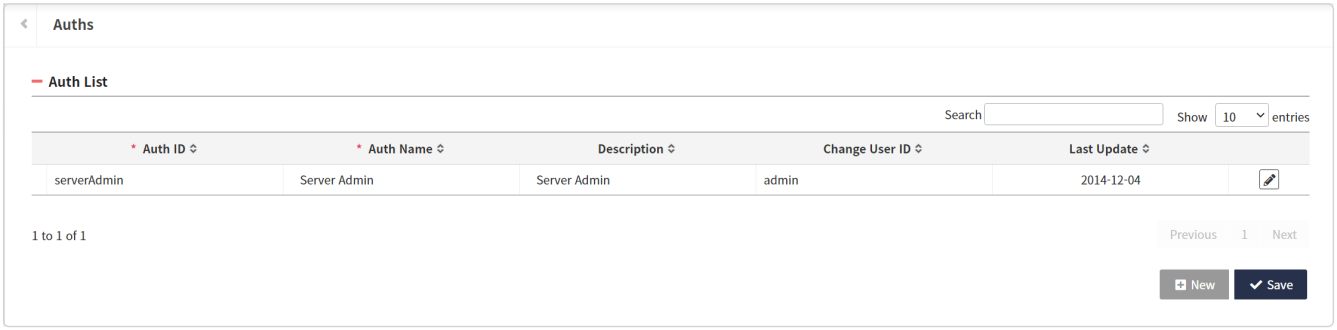


Figure 87. Auths screen

The permission management fields are as follows.

Table 157. Permission management fields

Field (* = required)	Description	Note
Auth ID(*)	Permission identifier	
Auth Name(*)	Permission name	
Description	Description of the registered permission	
Change User ID	Who created/updated the permission data	
Last Update	When the permission data was created/updated	
+ icon	Indicates that the selected permission info is being changed when clicking **New** or **Edit**	
- icon	Indicates that the selected permission info is marked for deletion when clicking **Delete**	

Create Permission

1. Click the **New** button to prepare to register a new permission.
2. Enter permission ID, permission name, and description.
3. Click **Save** to store the permission information.

Edit Permission

1. Select the permission to edit.
2. Click **Edit** to change the permission name and description.
3. Click **Save** to store the permission information.

Delete Permission

1. Select the permission to delete.
2. Click **Delete** to mark the permission as deletable.
3. Click **Save** to store the changes.

9.1.3. User-Auth Mapping (User Permission Management)

Manager users must belong to at least one group to gain menu usage permissions. Administrators can select permission groups and assign users. Select one of the registered permissions from the

"Permission Management" screen and use the shuffle buttons to control user permissions.

View User Permissions

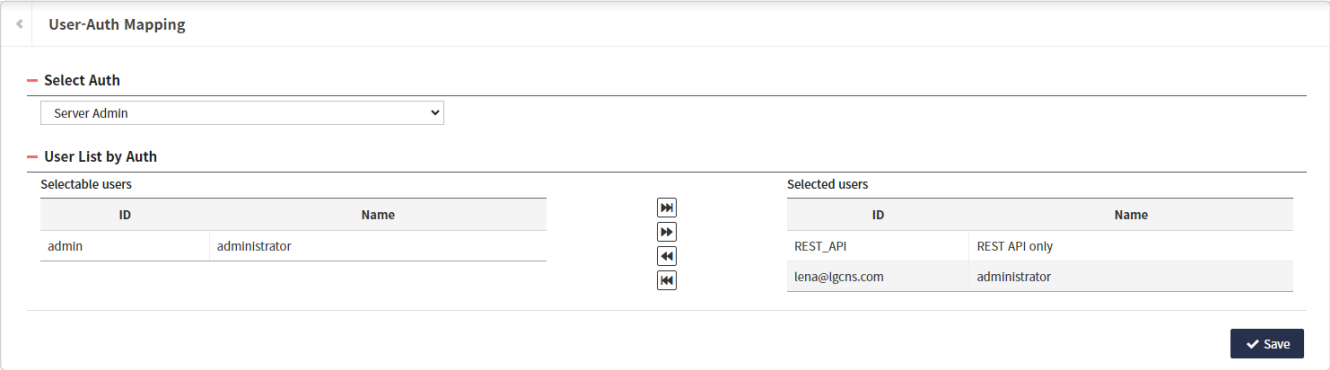


Figure 88. User-Auth Mapping screen

The fields for user permission management are as follows.

Table 158. Fields for user permission management

Field	Description	Note
Select Permission Name	Combo box listing permissions registered via the "Permission Management" screen	
ID	User identifier	
Name	User name	

Map User Permissions

1. Select the permission to which users will be assigned.
    - When you select a permission, both selectable users and currently selected users are displayed.
2. Select the selectable users.
3. Assign or remove users.
    - Click the **Single right shuffle** to assign the selected users.
    - Click the **All right shuffle** to assign all users.
    - Click the **Single left shuffle** to remove the selected users.
    - Click the **All left shuffle** to remove all users.
4. Click **Save** to store user-permission mapping information.

9.1.4. Menu-Auth Mapping (Menu Permission Management)

You can configure accessible menus for each permission created in LENA Manager. Select one permission to configure menus for from the created permissions. From the list of all menus registered in LENA Manager, select the menus to control access for and set the menu permissions.

View Menu Permissions

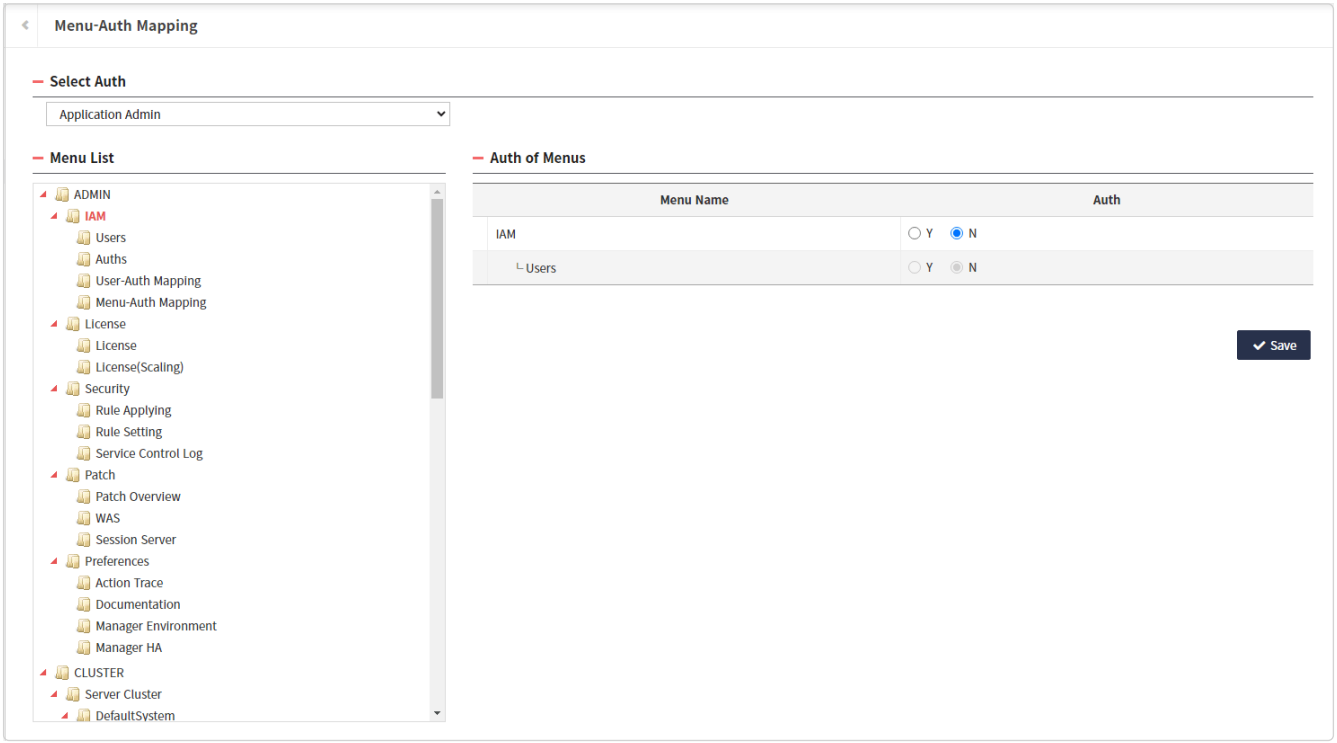


Figure 89. Menu-Auth Mapping screen

The fields for menu permission management are as follows.

Table 159. Fields for menu permission management

Field	Description	Note
Select Permission Name	Combo box listing permissions registered via the "Permission Management" screen	
Menu Name	Name of the menu selected from the left menu list registered in LENA Manager	
Auth	Whether the selected permission can access the menu	Default "N"

When Node, Server, or Resource items are added from the submenus of "SERVER", "CLUSTER", "RESOURCE", those items are automatically added and shown in the menu list of the "Menu Permission Management" screen.

Therefore, to add a new menu, register and create each item from the submenus under "SERVER", "CLUSTER", and "RESOURCE".

When changing permissions for a Server, reflect the same permissions in the menus below.

- The Server under "SERVER"
- The Server under "CLUSTER"

Consider the case where, contrary to the recommendation, you configure permissions differently for some Server menus under a Server Cluster.

- Server under "SERVER": permission granted
- Server under "CLUSTER": permission not granted

In this case, menu/Server Cluster/Server permissions are represented as follows.

- Number of Servers composing the Server Cluster: count of Servers with permission based on the "CLUSTER" submenus
- Submenus under the Server Cluster: only Servers with permission based on the "CLUSTER" submenus are shown
- Server list in the Server Cluster's Overview, Application Server, and Web Server tabs: shows all Servers regardless of "CLUSTER" submenu permissions, since it must reflect the composition of the Server Cluster
- Server detail links in the Server Cluster's Overview, Application Server, and Web Server tabs: since this is access to individual Servers, access is blocked for Servers without permission under the "SERVER" menu

Map Menu Permissions

1. Select the menu for which to configure permissions.
   - When a permission is selected, permissions for the menu are also retrieved.
2. Select the menu to configure from the menu list.
   - When a menu is selected, menu permissions are displayed in the permissions list.
3. Select Y or N to change permissions if needed.
4. Click **Save** to store the menu permission information.

9.2. License

Provides functions to view and update the currently applied license per Node via Manager.

9.2.1. License List

When you open the License screen, you can view the list of currently applied Licenses per Node.

You can check the license status in the Status field.

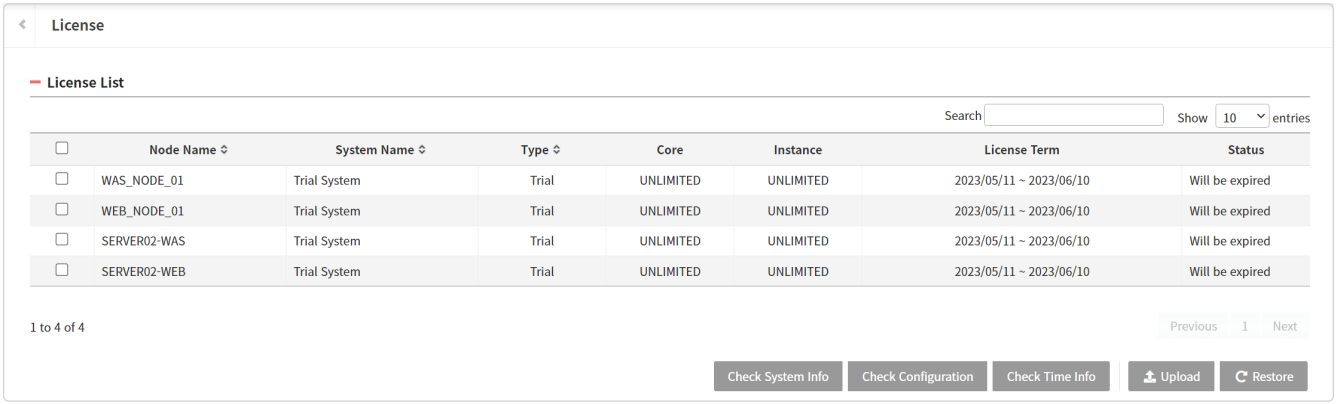


Figure 90. License list screen

9.2.2. License Details

Click a License in the list to view its details.

The detail fields are as follows.

Table 160. License detail fields

Field	Description	Note
Node Name	Node name	
Type	License type	Trial, Standard
Customer Name	Name of the purchasing customer	
System Name	Name of the installed system	
Issue No	License issue number	
Issue Date	License issue date	
License Term	License validity period	
Lena Home	Lena Home path	
IP Address	IP address of the Node	
Hardware ID	ID identifying the H/W	MAC Address or Host name
Contract CPU Core Limit	Maximum number of contracted cores	
CPU Core Limit	Actual measured number of cores	
Contract Instance Limit	Maximum number of contracted instances	
Instance Limit	Actual measured number of instances	
Status	Whether the license is valid	

A notification is provided starting 15 days before license expiration. You can check notifications from the **bell icon** at the top-right of the Manager.

9.2.3. Upload/Restore License

Upload

Select the node(s) to which you want to apply a new License from the node list and click the **Upload** button at the bottom. Clicking the button opens the License Upload popup. Select the issued License file and upload it to apply the License to the selected nodes.

Restore

Select the node(s) whose License you want to restore from the node list and click the **Restore** button at the bottom. Clicking the button restores the License from the backed-up file.

9.2.4. Check System Information related to License

In the License list screen, select a Node and click the **Check System Info** button to view system information required for issuing a License.

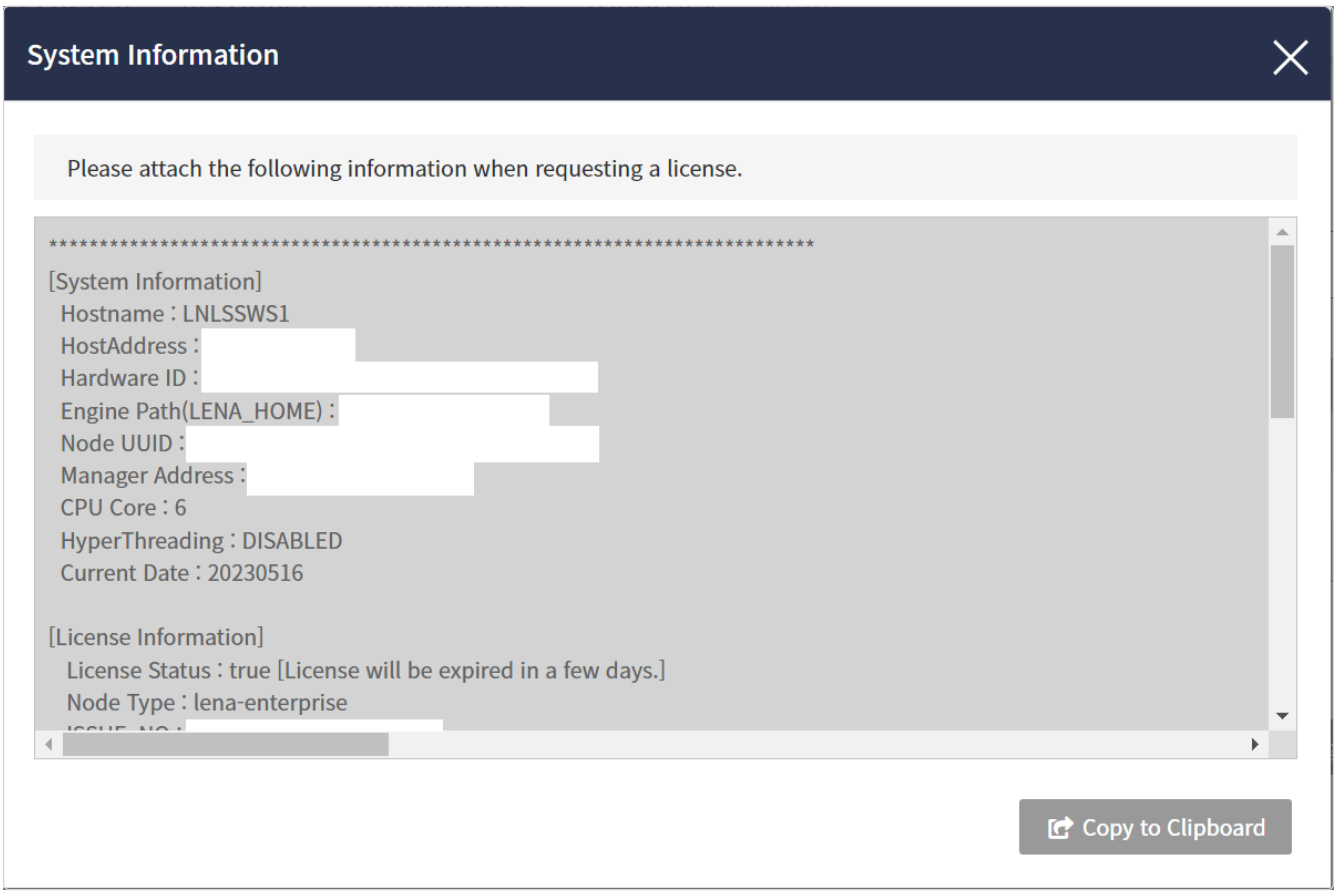


Figure 91. System Information

A shell script is also provided in the CLI environment to view License status per Node. The shell file is ${LENA_HOME}/bin/check-license.sh. An example result from running this script is shown below.

check-license.sh example

```
[bin]$ ./check-license.sh
*************************************************************************
[System Information]
  Hostname : solweb2
  HostAddress : 127.0.0.1
  Hardware ID : 52:54:00:E9:AC:A1 ( 52:54:00:E9:AC:A1 )
  Engine Path(LENA_HOME) : /engn001/lena/dev
  Node UUID : e46da220-db50-3854-84a0-7b61e1b6e7cd
  Manager Address : 127.0.0.1:7700
  CPU Core : 4
  HyperThreading : DISABLED
  Current Date : 20180705

[License Information]
  License Status : true [License is valid.]
  Node Type : lena-enterprise
  ISSUE_NO : 201807041532438300001
  TYPE : Standard
  CUSTOMER_NAME : LG
  SYSTEM_NAME : CNS
  SYSTEM_TYPE : PROD
  HARDWARE_ID : 52:54:00:E9:AC:A1
  LENA_HOME : /engn001/lena/dev
  CONTRACT_CPU_CORE_LIMIT : 8
  CPU_CORE_LIMIT : 8
  CONTRACT_INSTANCE_LIMIT : 8
  INSTANCE_LIMIT : 8
  MANAGER_ADDRESS : UNLIMITED
  WEB_CONTRACT_CPUCOREDAY_LIMIT :
  WEB_CPUCOREDAY_LIMIT : N
  WAS_CONTRACT_CPUCOREDAY_LIMIT :
  WAS_CPUCOREDAY_LIMIT : N
  RE_ISSUEANCE :
  USE_POSTPAID :
  START_DATE : 20180501
  END_DATE : 20190531
  LICENSE_KEY :
H2VaDEE9fjFlvHBRsQeGXasYT5l4tBc6ebayNIdtVZ5/lj4/EM0mYf38karMTKgcLLmPMMFa8BOEFt
5zRfBc/IiOxlmDgy
j0+iq30ABfJoyAhY3nWBVJhBy7h0U3hzJWr1hyCuZMFAHquL4dinwWAqmJeL+jntJKFufD38vdF2Yw
KEoRNH9dGQnqXZHO
U8wQZmN4UHk5YB5/O6YIUfFNGU3wyzjfKCfF9Golu9zQAsSZ358ptjC/TBUy+ccvLa75H32XPxiNSS
xytn0hGFbcVc61kv
zi7YMNUgnuEyDEQ/dhFKxJ17ijUQBZj5xbFQ9qUTzL1QKGLl+cbYVsr6kvZg==
*************************************************************************
```

The fields printed are the same as described above and provide basic information required for license issuance, which can be used when requesting a license.

Among the output fields, "HyperThreading" checks whether HyperThreading is used. If HyperThreading is enabled, the number of cores is counted as double the number of physical cores.

9.2.5. Host-based License Check Setting

Depending on the contract, the License checks the target H/W by MAC Address or Host name. The default setting is based on MAC Address. To perform license checks based on Host name (on Linux/Unix OS), open the following files located under ${LENA_HOME}/bin and in each Application Server's setenv.sh and modify as below.

start-agent.sh settings (add to $JAVA_OPTS)

```
JAVA_OPTS="${JAVA_OPTS} -Dlicense.check-type=hostname"
```

check-license.sh settings (uncomment the following)

```
_JAVA_OPTS="${_JAVA_OPTS} -Dlicense.check-type=hostname"
```

Each Application Server's setenv.sh settings (uncomment the following)

```
CATALINA_OPTS=" ${CATALINA_OPTS} -Dlicense.check-type=hostname"
```

9.2.6. Time Information

In the license list, select the node(s) for which you want to check time information and click the **Check Time Info** button to view time and timezone information for the selected nodes.

9.3. License(Scaling)

Provides functions to view and update the currently applied Manager License via Manager.

9.3.1. Manager License

You can check the status, usage, and validity period of the Manager License. You can upload a License file via the **Upload Manager License** button. The uploaded License is sent to VMs during scale-out and serves as authentication when servers start.

9.3.2. License List

You can view the list of currently applied Licenses per Node. You can check the license status in the Status field.

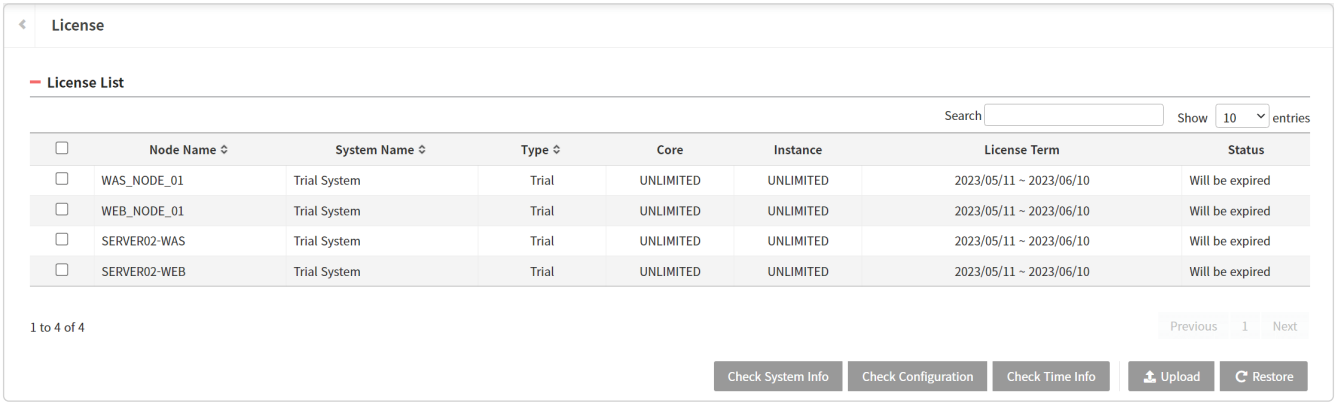


Figure 92. License list screen

9.3.3. License Details

Click a License in the list to view its details.

The detail fields are as follows.

Table 161. License detail fields

Field	Description	Note
Node Name	Node name	
Type	License type	Trial, Enterprise, Standard, Developer
Customer Name	Name of the purchasing customer	
System Name	Name of the installed system	
Issue No	License issue number	
Issue Date	License issue date	
License Term	License validity period	
Engine Path	LENA Engine installation path	
IP Address	IP address of the Node	
Hardware ID	ID identifying the H/W	MAC Address or Host name
Contract CPU Core Limit	Maximum number of contracted cores	
CPU Core Limit	Actual measured number of cores	
Contract Instance Limit	Maximum number of contracted instances	
Instance Limit	Actual measured number of instances	
Status	Whether the license is valid	

9.3.4. Upload/Restore License

Upload

Select the node(s) to which you want to apply a new License from the node list and click the **Upload** button at the bottom. Clicking the button opens the License Upload popup. Select the issued License file and upload it to apply the License to the selected nodes.

Restore

Select the node(s) whose License you want to restore from the node list and click the **Restore** button at the bottom. Clicking the button restores the License from the backed-up file.

9.3.5. Check System Information related to License

In the License list screen, select a Node and click the **Check System Info** button to view system information required for issuing a License.

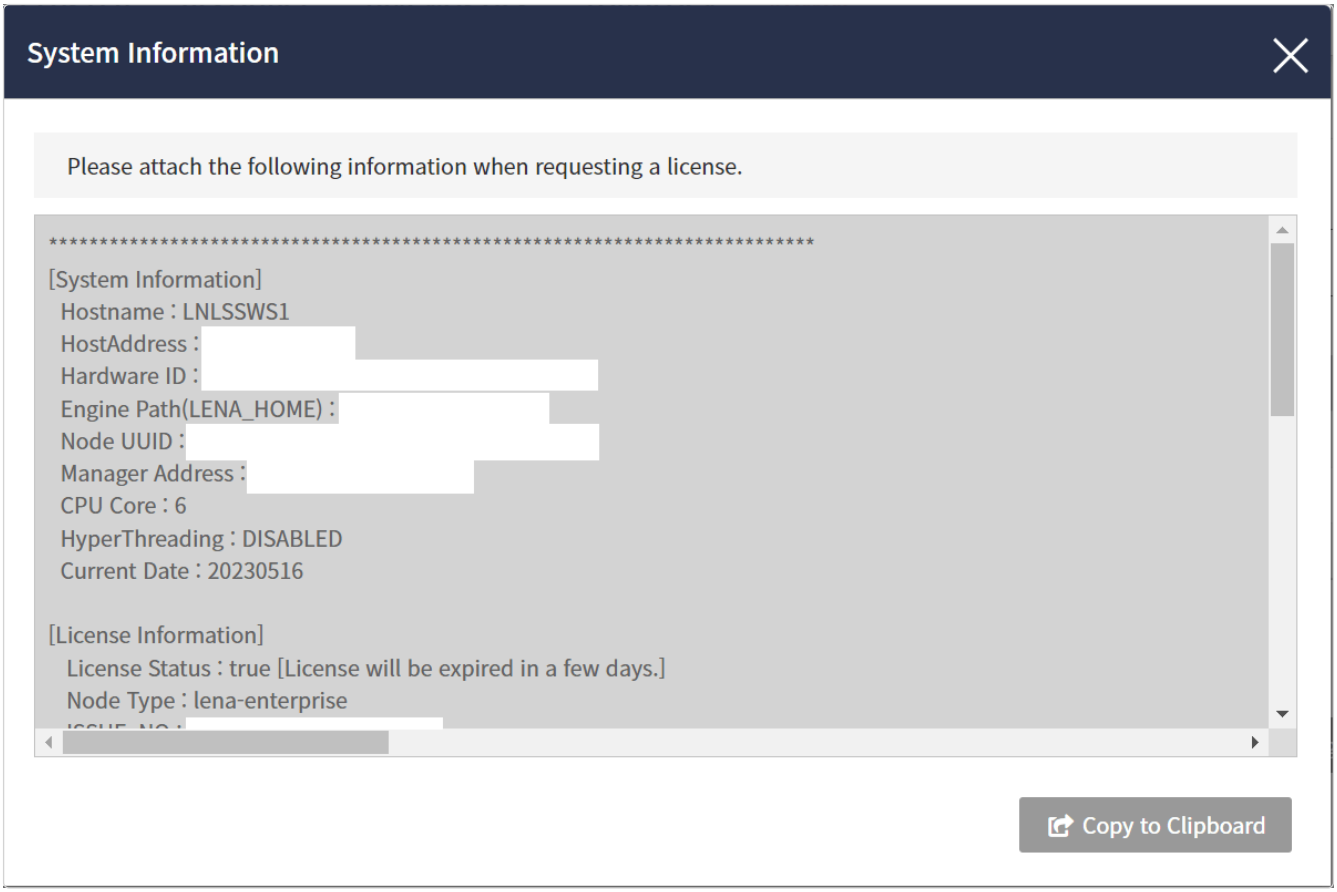


Figure 93. System Information

A shell script is also provided in the CLI environment to view License status per Node. The shell file is ${LENA_HOME}/bin/check-license.sh (check-license.bat for Windows). An example result from running this script is shown below.

check-license.sh example

```
[bin]$ ./check-license.sh
*************************************************************************
[System Information]
  Hostname : solweb2
  HostAddress : 127.0.0.1
  Hardware ID : 52:54:00:E9:AC:A1 ( 52:54:00:E9:AC:A1 )
  Engine Path(LENA_HOME) : /engn001/lena/1.3
  Node UUID : e46da220-db50-3854-84a0-7b61e1b6e7cd
  CPU Core : 4
  HyperThreading : DISABLED
  Current Date : 20180705

[License Information]
  License Status : true [License is valid.]
  ISSUE_NO : 201807041532438300001
  TYPE : Enterprise
  CUSTOMER_NAME : LG
  SYSTEM_NAME : CNS
  SYSTEM_TYPE : PROD
  HARDWARE_ID : 52:54:00:E9:AC:A1
  LENA_HOME : /engn001/lena/1.3
  CONTRACT_CPU_CORE_LIMIT : 8
  CPU_CORE_LIMIT : 8
  CONTRACT_INSTANCE_LIMIT : 8
  INSTANCE_LIMIT : 8
  START_DATE : 20180501
  END_DATE : 20190531
  LICENSE_KEY :
H2VaDEE9fjFlvHBRsQeGXasYT5l4tBc6ebayNIdtVZ5/lj4/EM0mYf38karMTKgcLLmPMMFa8BOEFt
5zRfBc/IiOxlmDgy
j0+iq30ABfJoyAhY3nWBVJhBy7h0U3hzJWr1hyCuZMFAHquL4dinwWAqmJeL+jntJKFufD38vdF2Yw
KEoRNH9dGQnqXZHO
U8wQZmN4UHk5YB5/O6YIUfFNGU3wyzjfKCfF9Golu9zQAsSZ358ptjC/TBUy+ccvLa75H32XPxiNSS
xytn0hGFbcVc61kv
zi7YMNUgnuEyDEQ/dhFKxJ17ijUQBZj5xbFQ9qUTzL1QKGLl+cbYVsr6kvZg==
*************************************************************************
```

The fields printed are the same as described above and provide basic information required for license issuance, which can be used when requesting a license.

Among the output fields, "HyperThreading" checks whether HyperThreading is used. If HyperThreading is enabled, the number of cores is counted as double the number of physical cores.

9.3.6. Host-based License Check Setting

Depending on the contract, the License checks the target H/W by MAC Address or Host name. The default setting is based on MAC Address. To perform license checks based on Host name (on Linux/Unix OS), open the following files located under ${LENA_HOME}/bin and in each Application Server's setenv.sh and modify as below.

start-agent.sh settings (add to $JAVA_OPT)

```
JAVA_OPTS="${JAVA_OPTS} -Dlicense.check-type=hostname"
```

check-license.sh settings (uncomment the following)

```
_JAVA_OPTS="${_JAVA_OPTS} -Dlicense.check-type=hostname"
```

Each Application Server's setenv.sh settings (uncomment the following)

```
CATALINA_OPTS=" ${CATALINA_OPTS} -Dlicense.check-type=hostname"
```

9.3.7. Time Information

In the license list, select the node(s) for which you want to check time information and click the **Check Time Info** button to view time and timezone information for the selected nodes.

9.4. License(Container)

View the license applied to the Container via Manager and display the current status/list of servers in service.

9.4.1. Container License

Shows the status, usage, and validity period of the Container License. Click the **Check System Info** button to view system information such as the Manager UUID.

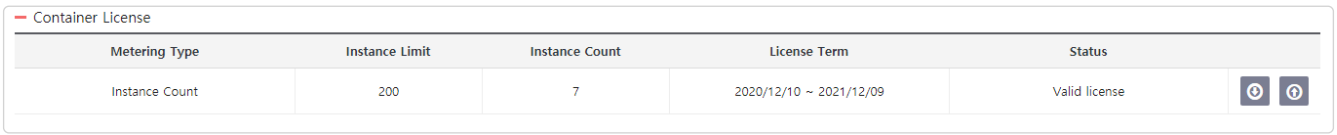


Figure 94. Container License

9.4.2. Server Instance Count

Shows the number of started Containers as a graph based on Month/Day. For Month, shows a graph of the cumulative number of servers per day; for Day, shows a graph of the cumulative number of servers per hour.

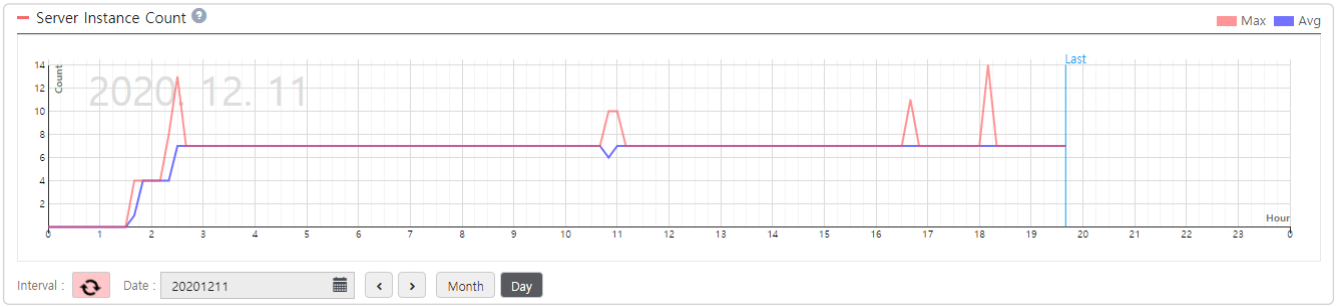


Figure 95. Server Instance Count

9.4.3. Server List

Shows the list of Containers currently in service.

Server List

Search Show 10 entries

Status	Start Time	Elapsed Time	Name	Address	Service Port
✓	2020-12-11 18:14:48	1H 16m	lena-session-1	10.42.157.151	5180
✓	2020-12-11 18:14:48	1H 16m	lena-session-0	10.42.157.163	5180
✓	2020-12-11 18:15:07	1H 16m	lena-was-5758c76996-cbhq7	10.42.157.190	8180
✓	2020-12-11 18:15:07	1H 16m	lena-was-5758c76996-plxsv	10.42.157.164	8180
✓	2020-12-11 18:15:28	1H 16m	lena-web-585f64fc4-gbx99	10.42.157.167	7180
✓	2020-12-11 18:15:28	1H 16m	lena-web-585f64fc4-lb9w9	10.42.157.160	7180
✓	2020-12-11 18:15:27	1H 16m	lena-web-585f64fc4-dmphf	10.42.157.168	7180

1 to 7 of 7 Previous 1 Next

Figure 96. Server List

9.5. Security (Service Control)

This feature restricts user requests to Application Servers based on IP or URL.

9.5.1. Rule Setting

If you want to control requests from specific IPs or URLs, configure a new Rule via the screen. For convenience in adding and deleting Rules, a search function is provided. Server-wide properties that apply to all Applications can be handled via an error page.

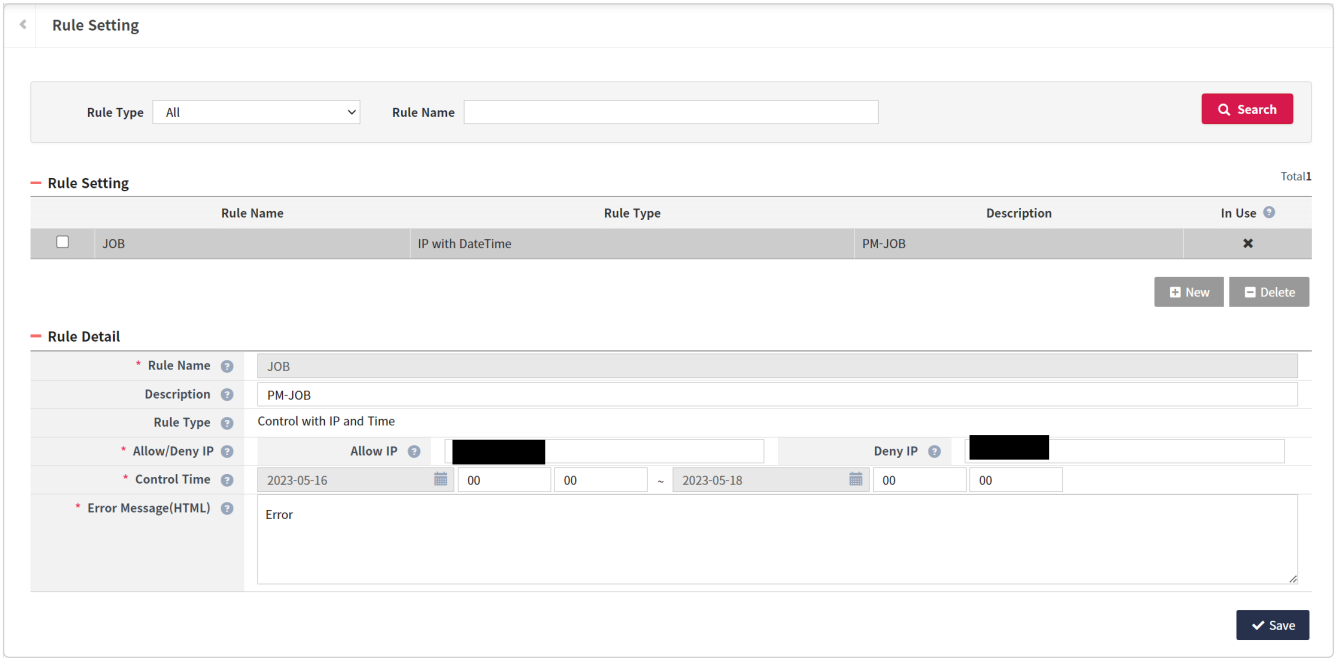


Figure 97. Rule Setting screen

The Use column in the Rule list indicates whether the Rule is applied to the Application Server.

When adding a Rule, the configurable fields are as follows.

Table 162. Configurable fields when adding a Rule

Field (* = required)	Description	Note
Rule Name(*)	Name of the Rule to add	
Description	Description of the Rule to add	
Rule Type	Unit to control	IP, URL
Allow IP(*)	Request IPs to allow	Regular expressions supported
Deny IP(*)	Request IPs to deny	Regular expressions supported
Control Time(*)	Time unit to apply the Rule	
Error Message(HTML)(*)	Error page to output for requests filtered by control	

If you apply a Rule of type "IP with DateTime" to an Application Server behind a Proxy Server, Rule application may fail because, due to the security characteristics of the Proxy Server, the user's IP may not be obtainable.

Applied Rules cannot be deleted.

9.5.2. Rule Applying

Select one of the added Rules to apply it to an Application Server. For convenience, search is provided by Rule type, application unit, and Rule name.

Select a Rule from the list, then in Rule Applying use the **shuffle buttons** to choose targets, then click the **On/Off** button to apply and save. To exclude a target, use the **shuffle buttons** to remove it from the applied list.

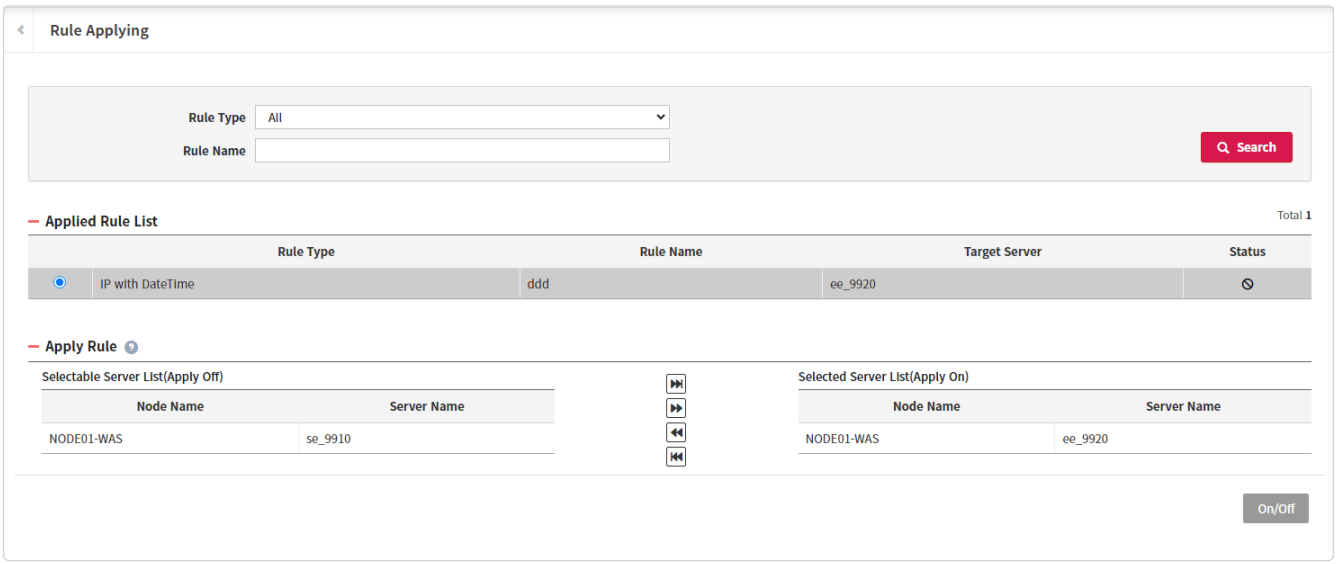


Figure 98. Rule Applying screen

The fields used in the Rule status and application screen are similar to those in the Rule Setting screen, with the following additional fields.

Table 163. Additional fields

Field	Description	Note
Node Name	Name of the Node under the registered System	
Server Name	Name of the Server under the registered Node	

When a new target is added to the selected Rule, depending on the application unit, entries are added to server.xml or context.xml. When a target is excluded, the Rule settings added to the above configuration files are removed.

9.5.3. Service Control Log (View Rule Application Results)

Processing results for items to which Rules have been applied are displayed as a list. For convenience, search is provided by Rule type, application unit, Rule name, and log time.

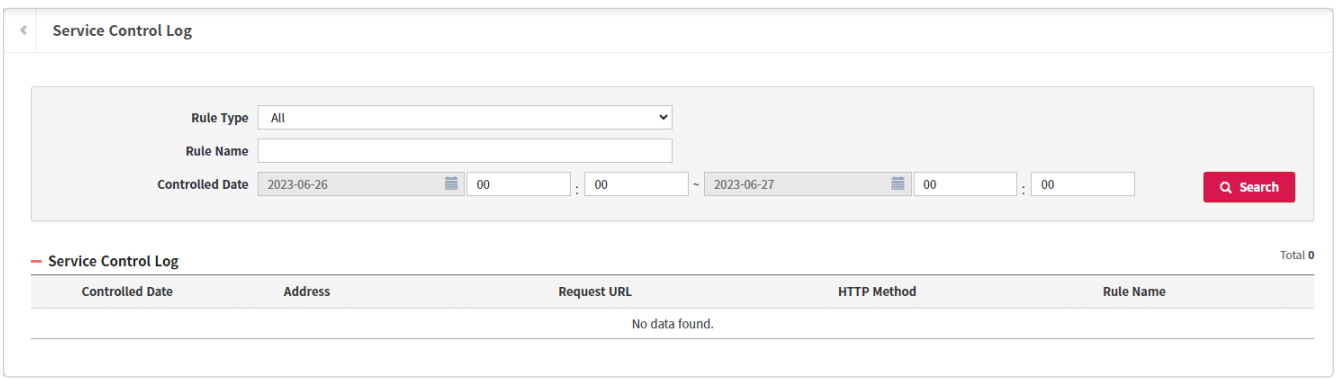


Figure 99. Service Control Log screen

The fields used in the processing list are as follows.

Table 164. Log information fields

Field	Description	Note
Controlled Date	Processing time of the request to which the Rule setting was applied	
Address	Processed remote address	
Request URL	URL of the processed request	
HTTP Method	HTTP method of the processed request	
Rule Name	Name of the Rule applied to process the request	

For Rule history, set the access filter log aggregation listener to true in Manager's /conf/manager.conf. Logs are written to access_filter.log."date".txt in each server's logs folder, and Manager periodically aggregates each server's logs into the Database. (At this time, the aggregated logs are backed up to access_filter_log."date".txt.gathered.) Logs aggregated into the Database can be viewed in the processing list screen.

An example of the settings in the manager.conf file is shown below.

```
# Whether to use the access filter log aggregation listener and
its interval (seconds). Defaults: false, 60
accessfilter.listener=false
accessfilter.interval=60
```

9.6. Notification Settings

You can configure the Notifications shown in Manager and the SNS information to integrate those Notifications.

9.6.1. Manager Notification

When you open the Manager Notification menu, you can see which Notifications are currently enabled. Levels are categorized as Critical, Warning, and Info.

If you uncheck a Notification and click Save, that Notification will not be shown in the bell icon even when it occurs.

Notifications not shown in the icon can still be viewed by clicking the bell icon and then clicking the Notification Detail button at the top-right of the popup.

9.6.2. SNS Notification

You can manage SNS integration information for Notifications generated by the Manager.

It works based on WebHook, and integration can be configured per System.

Table 165. Details for the SNS integration target

Item	Description
Name	A name specified by the user
System	Name of the System to integrate with
DuplicateTime(s)	If the same Notification occurs repeatedly within DuplicateTime(s), it will not be sent to SNS.
Request	HTTP method to send
Encoding	Encoding of the request
Header	Headers to include in the request. If multiple headers are used, separate them with new lines.
Body	Body of the request. Substitution parameters are as follows: ${alarmLevel} - level of the occurred alarm, ${message} - message content
Webhook URL	URL to send the request to
SSL	Whether to use SSL verification

Table 166. Types of Notifications to integrate to SNS

Item	Description
AUDIT	When a Notification occurs for the items specified in the server's Audit settings
DIAGNOSTICS	When a Notification occurs that violates a DIAGNOSTICS Rule configured on the server
LICENSE	When a license-related Notification occurs
INFO	When an information-related Notification occurs for the server

After entering the configuration fields, you can use the Test button to check whether the request works correctly.

If the test succeeds, save the configuration and toggle the on/off switch to on to enable the integration.

9.7. Patch

Provides patches for feature improvements and bug fixes for installed LENA.

Patches are provided as compressed files and run as an independent Java process.

Patch operations can be executed via CLI and Management UI. If any service issues occur during patching, you can restore the previous state via the Restore function.

The patch order is as follows.

1. Upload patch file
2. Apply Manager patch

3. Apply Node patch
4. Apply Server (Application Server, Session Server) patch
5. Commit patch

The restore order is as follows.

1. Restore Server patch
2. Restore Node patch
3. Restore Manager patch
4. Commit restore

For CLI-based patching, see the Appendix.

9.7.1. Overview

Provides patch file upload and shows the patch reflection status for Manager and each Node's Node Agent.

Upload Patch File

The Patch Info area displays details of the highest version among the patch files uploaded to the Manager.

Table 167. Patch Info fields

Field	Description	Note
Patch File Ver.	Version of the patch file	
Release Date	Distribution date of the patch file	
Patch Note	Click the **Detail(Note)** button to view the detailed patch notes.	Shows patch note popup

The process to upload a patch file is as follows.

1. Click the **Upload** button.
2. After checking whether patching is possible, if normal, a popup for uploading the patch file is displayed

Patch-possible conditions

1. All Nodes registered in Manager must be running.
2. patch must be in the committed state.
3. Node and server versions must match the manager version.
4. No servers unregistered from Manager must exist.
    a. If there are unregistered servers, register them to Manager
    b. If servers exist under the servers folder in the node engine, delete the corresponding folders

3. Select the patch file to upload; the upload will start automatically.

Uploadable files are zip and tar.gz. Uploading other file types will display an error message.

Manager Patch

The Manager Info area shows the Manager's patch status and allows you to execute patching and restoring of the Manager.

The fields shown are as follows.

Table 168. Manager Info fields

Field	Description	Note
Patch Status	Patch application status of the Manager • **sun icon** : Manager is up to date • **cloud icon** : A patch is available for the Manager	
Current Ver.	Current version of the Manager	
Patch Ver.	Patch version	
History	Button to view patch history	When handwork is required, the **Detail(Note)** button is shown in red.

Clicking the **Detail(Note)** button in the History item of the Manager Info screen opens a popup to check the patch execution history.

The fields shown are as follows.

Table 169. History fields

Field	Description	Note
Action	Shows patch/restore history	
Patch Version	Version of the patch file used for patch/restore	
Pervious Version	Server version prior to applying patch/restore	
Timestamp	Time when patch/restore was applied	
Log/Handwork	Clicking the **Detail(Note)** button shows execution logs. Clicking the **Handwork (wrench)** button shows required manual steps (Handwork). When Handwork is required, the button is displayed in red.	

Patch

Click the **Patch** button at the bottom of the Manager Info area to apply the latest patch.

Items described in Handwork are manual steps required after patch execution, so you must execute and reflect them. After completing Handwork, uncheck the checkbox at the bottom of the popup, and the **Handwork** button in the Manager Patch Info screen will change to white.

After applying the Manager patch, until you click **Commit** after applying patches to Nodes and Servers, you cannot perform operations such as installing/registering Nodes or installing/registering/duplicating Servers.

After patching, be sure to clear the browser cache to use the Manager of the patched version.

Restore

Click the **Restore** button at the bottom of the Manager Info area to revert to the previous version before the patch.

Restoring is performed when the patch status of all nodes registered with Manager is Patch Available.

Commit

After applying all patches for Manager, Nodes, and Servers, click the **Commit** button to finalize. After confirmation, you cannot revert to the previous version.

Node Patch

The Node Patch Status area summarizes, for nodes registered to the manager, the number of servers with the latest patch applied and the number of servers without the patch.

The fields shown are as follows

Table 170. Node Patch Status fields

Field	Description	Note
Status	Patch application status of the node • **sun icon** : All servers are up to date • **cloud icon** : The Node Agent is not up to date • **hemisphere icon** : The Node Agent is up to date, but Servers installed on the Node are not • **exclamation icon** : The Node agent is incompatible with lena-manager.	
Node name	Node name	
Address	Node IP	

Field	Description	Note
Node Ver.	Current version of the Node	
Node Hotfix.	Hotfix version of the Node	
History	Button to view patch history	When handwork is required, the **Detail(Note)** button is shown in red.
WAS	Patch status information for Web Application Servers • Up To Date: number of servers with the latest patch applied • Patch Available: number of servers without the latest patch	
Session Server	Patch status information for Session Servers • Up To Date: number of servers with the latest patch applied • Patch Available: number of servers without the latest patch	

Click the **Node Patch** button to open a popup where you can choose Nodes and perform patch or restore for the selected Node(s).

Nodes installed on Windows OS perform patching via CLI, not via Manager.

Server Cluster Patch Status

Displays patch status per Server Cluster.

The fields shown are as follows.

Table 171. Server Cluster Patch Status fields

Field	Description	Note
Status	Patch application status of the cluster • **sun icon** : All servers are up to date • **cloud icon** : Some servers are not up to date	
Cluster Group	Cluster group name	
Cluster Name	Cluster name	

Field	Description	Note
LENA Patch	Patch status information for Application Servers • Up To Date: number of servers with the latest patch applied • Patch Available: number of servers without the latest patch	

9.7.2. WAS

For Application Servers included in a Node/Cluster, patching is performed with the latest patch file uploaded to the manager, and a function is provided to restore to the state immediately before the patch in case of problems.

List

Search for servers to patch by group conditions (node or cluster unit).

Table 172. Application Server Patch Status fields

Field	Description	Note
Patch Status	Patch application status of the Application Server • **sun icon** : Up to date • **cloud icon** : Patch available	
Node	Name of the Node where the Application Server is installed	
Name	Application Server name	
Type	Application Server type • Standard: Application Server Standard Edition • Enterprise: Application Server Enterprise Edition	
Address	IP of the Node where the Application Server is installed	
HTTP Port	HTTP Connector port of the Application Server	
AJP Port	AJP Connector port of the Application Server	
Start/Stop	Start/Stop operations for the Application Server	

Field	Description	Note
Current Version	Currently installed version of the Application Server	
Hotfix	Hotfix version information	
Patch Version	Version to apply patch to. If up to date, shows 'N/A'.	Latest patch version uploaded to manager
History	View patch/restore history applied to the Server	

If the Node Agent process is killed or otherwise not functioning normally, Server information for that node will not be retrieved.

Patch

1. Before applying the patch, ensure the server is stopped (**Start** button enabled). If not stopped, click the **Stop** button to stop the server.
2. Check the checkbox(es) for the server(s) to patch (multiple selection allowed).
3. Click the **Patch** button to proceed. A log popup appears. If manual steps are required after patch completion, the **Handwork (wrench)** button in the Handwork column is shown in red.
4. After closing the log popup, the server's patch status icon changes to **sun icon**, and current ver. and patch ver. display the applied patch version and N/A respectively.
5. Validation
    a. Cannot apply a patch when the server is running
    b. Cannot re-apply a patch to a server that already has the latest patch

When applying a patch to a server for the first time for that Node, the Node patch is performed internally first, followed by the server patch.

Restore

1. Before restoring, ensure the server is stopped (**Start** button enabled). If not stopped, click the **Stop** button to stop the server.
2. Check the checkbox(es) for the server(s) to restore (multiple selection allowed).
3. Click the **Restore** button to proceed. A log popup appears.
4. After closing the log popup, the server's patch status icon changes to **cloud icon**, and current ver. and patch ver. display the previous version and the patch file version respectively.
5. Validation
    a. Cannot apply restore when the server is running
    b. After a restore, you cannot restore again (only one-stage restore is supported via Manager)

If, after restoring on servers, no servers on the Node have the patch applied, the Node restore is also performed internally.

History

Click the **Detail(Note)** button to view the 5 most recent patch/restore histories.

Table 173. History fields

Field	Description	Note
Action	Shows patch/restore history	
Patch Version	Version of the patch file used for patch/restore	
Previous Version	Server version prior to applying patch/restore	
Timestamp	Time when patch/restore was applied	
Log/Handwork	Clicking the **Detail(Note)** button shows execution logs. Clicking the **Handwork (wrench)** button shows required manual steps (Handwork). When Handwork is required, the button is displayed in red.	

9.7.3. Session Server

For Session Servers, patching is performed with the latest patch file uploaded to the manager, and a function is provided to restore to the state immediately before the patch in case of problems.

List

Search for servers to patch by group conditions (node unit).

Table 174. Session Server Patch Status fields

Field	Description	Note
Patch Status	Patch application status of the Session Server • **sun icon** : Up to date • **cloud icon** : Patch available	
Node	Name of the Node where the Session Server is installed	
Name	Session Server name	
Type	Session Server type	
Address	Address of the Session Server	

Field	Description	Note
Port	Port of the Session Server	
Start/Stop	Start/Stop operations for the Session Server	
Current Version	Currently installed version of the Session Server	
Hotfix	Hotfix version information	
Patch Version	Version to apply patch to. If up to date, shows 'N/A'.	Latest patch version uploaded to manager
History	View patch/restore history applied to the Server	

If the Node Agent process is killed or otherwise not functioning normally, Server information for that node will not be retrieved.

Patch

1. Before applying the patch, ensure the server is stopped (**Start** button enabled). If not stopped, click the **Stop** button to stop the server.
2. Check the checkbox(es) for the server(s) to patch (multiple selection allowed).
3. Click the **Patch** button to proceed. A log popup appears. If manual steps are required after patch completion, the **Handwork (wrench)** button in the Handwork column is shown in red.
4. After closing the log popup, the server's patch status icon changes to **sun icon**, and current ver. and patch ver. display the applied patch version and N/A respectively.
5. Validation
    a. Cannot apply a patch when the server is running
    b. Cannot re-apply a patch to a server that already has the latest patch

When applying a patch to a server for the first time for that Node, the Node patch is performed internally first, followed by the server patch.

Restore

1. Before restoring, ensure the server is stopped (**Start** button enabled). If not stopped, click the **Stop** button to stop the server.
2. Check the checkbox(es) for the server(s) to restore (multiple selection allowed).
3. Click the **Restore** button to proceed. A log popup appears.
4. After closing the log popup, the server's patch status icon changes to **cloud icon**, and current ver. and patch ver. display the previous version and the patch file version respectively.
5. Validation
    a. Cannot apply restore when the server is running
    b. After a restore, you cannot restore again (only one-stage restore is supported via Manager)

If, after restoring on servers, no servers on the Node have the patch applied, the Node restore is also performed internally.

History

Click the **Detail(Note)** button to view the 5 most recent patch/restore histories.

Table 175. History fields

Field	Description	Note
Action	Shows patch/restore history	
Patch Version	Version of the patch file used for patch/restore	
Previous Version	Server version prior to applying patch/restore	
Timestamp	Time when patch/restore was applied	
Log/Handwork	Clicking the **Detail(Note)** button shows execution logs. Clicking the **Handwork (wrench)** button shows required manual steps (Handwork). When Handwork is required, the button is displayed in red.	

9.8. Preferences

9.8.1. Action Trace

The history of add/modify/delete operations performed by each user through Manager is recorded in logs. Action Trace provides functions to query/trace these histories.

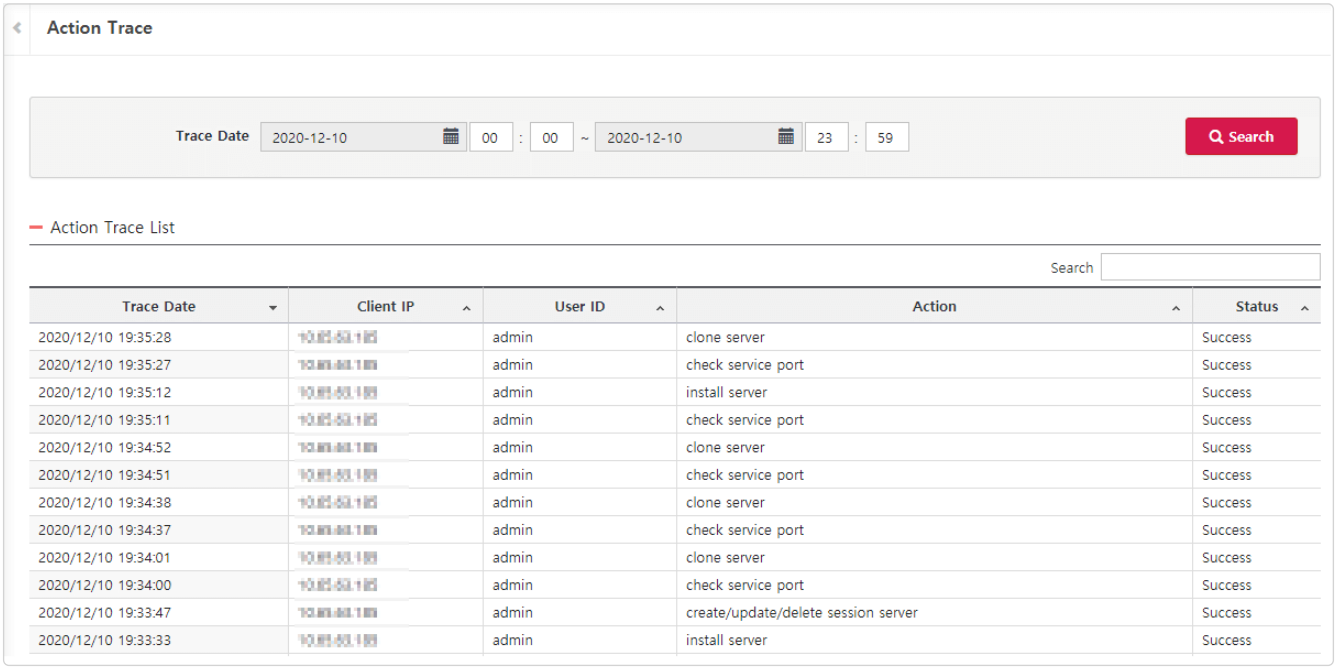


Figure 100. Action Trace screen

History Search

Enter the search conditions and click to retrieve the history. Select a row in the list to view its details.

The fields shown in the search screen are as follows.

Table 176. History detail fields

Field	Description	Note
Trace Date	Time when the Action was performed	
Status	Result of the Action	Success / Fail
Client IP	IP address of the user who performed the Action	
User ID	ID of the user who performed the Action	
Action	Name of the action performed	
Method	Name of the method used for the Action	
Request	LENA Manager HTTP Request URL	
Input	HTTP request input parameters	

Among the above, "Input" stores the request parameters as-is, so Server ID, Node ID, and Server Cluster ID appear as data-management key values (serial numbers, e.g., "serverID=31" in the screenshot). To view details of the corresponding Server/Node/Cluster, use the "Search ID" function at the bottom of the "Action Trace Detail" information. The I/O fields for this function are as follows.

Table 177. I/O fields for the Search ID function

Field	Description	Note
ID	• Left combo: choose one of serverId / nodeId / serverClusterId • Right: enter the ID value from Input	Input field
Data	Retrieved Server/Node/Cluster information	Output field

9.8.2. Documentation

You can download LENA introduction material and manuals.

9.8.3. Manager Environment

Provides information for Manager environment settings.

Manager Environment

Among Manager environment settings, provides information saved to env-manager.sh/bat.

- Manager Allow IPs: Set IPs allowed to access Manager.
- Java Home Path: Set the java home path used by Manager.

Manager Configuration

Among Manager environment settings, provides information saved to manager.conf.

Two items are provided by default:

- use JMX for Server Status: Whether to retrieve server status via JMX (default: false)

Table 178. When JMX for Server Status is true, WAS Status is displayed

Status	Status name	Description
image::manual/server_3_application_server_status_green.png[]	Started	WAS and Application are both running normally
image::manual/server_3_application_server_status_yellow.png[]	Started(Warning)	WAS is running, but some (or all) Applications are not started
image::manual/server_3_application_server_status_stopped.png[]	Stopped	WAS is stopped
image::manual/server_3_application_server_status_error.png[]	Error	WAS status cannot be determined

- use Server Delete Protection: Whether to disable server deletion in Manager (default: false)

Click the **Settings button** on the right of the screen to view and modify details.

Metadata Refresh

Performs verification and restoration of metadata consistency used to draw the topology chart of each system in the Topology menu.

Reset manager address of all registered nodes

Provides a function to batch update the Manager Address for nodes registered with Manager.

Start Hook Script

This script runs before Manager starts when starting the Manager Container.

Stop Hook Script

This script runs after Manager stops when stopping the Manager Container.

9.8.4. Manager HA

Manage settings for Manager high availability (HA) and view the current HA status.

Manager HA synchronizes the database and key files between LENA Managers started as Primary and Secondary so that when the Primary Manager is down, the Secondary Manager can temporarily act as the Primary's service.

The services the Secondary Manager can act on are the following two:

- Server Cluster - Scaling service
- Service Cluster - Server Template and License download

For Manager HA, modify the following part of the environment configuration file 'env-manager.sh' according to each Manager's role, then start.

LENA Manager environment variables file (env-manager.sh) settings

```
CATALINA_OPTS=" ${CATALINA_OPTS} -Dspring.profiles.active=ha-none"
```

The spring.profiles property set in the above file can take the following three values. If entered incorrectly, the Manager will not start properly.

- ha-none: Default value; standalone Manager without HA
- ha-primary: Acts as the Primary Manager in HA
- ha-secondary: Acts as the Secondary Manager in HA

Local Manager

Provides information about the current Manager. Regardless of the Manager's role, the Manager providing the current admin screen is the Local Manager, and the remote Manager is called the Remote Manager.

Table 179. Local Manager info fields

Field	Description	Note
Status	Server status; always Active.	
Start Time	Start time of the Local Manager	
HA Mode	Whether Primary or Secondary	
HA Pairing Config	• Indicates whether the Remote Manager connection info configured in the Local Manager matches the actual Remote Manager info. Compared fields are address, Http/Udp service ports, and DB service port. • When pairing settings are normal, **green ○ icon** is shown; when abnormal, **red X icon**; when Remote is unreachable, **red ! icon**.	

Remote Manager

Provides information about the remote Manager.

Table 180. Remote Manager info fields

Field	Description	Note
Status	Server status: Active if connected normally; InActive if not connected.	
Start Time	Start time of the Remote Manager	
HA Mode	Whether Primary or Secondary	
HA Pairing Config	• Indicates whether the Remote Manager's configured Remote Manager connection info matches the actual Local Manager info. Compared fields are address, Http/Udp service ports, and DB service port. • When pairing settings are normal, **green ○ icon** is shown; when abnormal, **red X icon**; when Remote is unreachable, **red ! icon**.	
Address	Address of the Remote Manager, used when configuring connection info.	
Http Port	Http service port of the Remote Manager, used when configuring connection info.	

Click the **Connection Test** button to test whether a real connection is possible using the Address and Http Port of the Remote Manager.

Primary Manager and Secondary Manager can set information for mutual synchronization via pairing. Click the **Sync Settings** button to perform pairing to synchronize settings with the Remote Manager.

Latest Sync Status

View the latest history of database and file synchronization between HA Managers.

Table 181. Latest Sync Status fields

Field	Description	Note
Type	Database or File	
Status	**green ○ icon** when normal; **red X icon** on error, **red ! icon** when Remote is unreachable.	
Time	Time of synchronization attempt	
Result	Whether synchronization succeeded	
Message	Result message generated during synchronization	
List	Click the **List** button to view previous synchronization history. Up to 10 histories are shown; only histories after Manager startup are shown, and sync info from the Remote Manager is shown only when connected normally.	

Chapter 10. Appendix

10.1. LENA System Requirements

The minimum requirements to install and use LENA are as follows.

Category	JVM	CPU	Memory	Disk	Support OS	Note
Base installation package	JDK 1.8 or higher	2 cores or more	4 GB or more	10 GB or more excluding root	Linux (CentOS 7 or higher) or Windows 7 or higher	Installation files for each component provided

10.2. Supported Browsers for Manager

Browsers that can be used with Manager features are Chrome/Edge (version 70 or higher) and Firefox (version 62 or higher). Some features may not work properly in IE, so other browsers are recommended. The recommended minimum browser size is 1680×900.

10.3. Supported Specification Versions

Specification	Version	Note
Java Development Kit (JDK)	1.8~	
Java Servlet	3.1	
Java Server Pages (JSP)	2.3	
Expression Language (EL)	2.2	
JavaServer Pages Standard Tag Library (JSTL)	1.2	
Enterprise JavaBeans (EJB)	3.2	
Java Message Service (JMS)	1.1	
Java Transaction API (JTA)	1.2	
Java API for RESTful Services (JAX-RS)	2.0	
Java API for XML Web Services (JAX-WS)	2.2	

10.4. Manager DB File Backup

HSQL DB files for managing Manager's internal data are backed up periodically (daily). The backup location is ${LENA_HOME}/repository/backup/database.

By default, backup information older than 30 days is deleted. If you want to change the retention period, open the manager.conf file under ${LENA_HOME}/repository/conf and set

dbbackup.size=<retention_days>, then restart Manager to apply.

10.5. Deleting Manager Internal History

Manager periodically deletes internal histories via scheduling. The data deleted are Action Trace history and Server History.

By default, Action Trace history is retained for 30 days and Server History for 90 days. If you want to change these retention periods, open the manager.conf file under ${LENA_HOME}/repository/conf and set actiontrace.size=<retention_days>, serverhistory.size=<retention_days>, then restart Manager to apply.

10.6. Initialize Manager admin Password

If the Manager admin user password is lost or the number of failed password attempts is exceeded, you need to initialize the password via console.

1. Access the machine where Manager is installed via console (telnet or ssh).
2. Run $LENA_HOME/bin/reset_manager_pw.sh.
3. Enter admin as the user whose password will be reset.
4. Enter the new password. The password must be at least 8 characters and be a combination of letters/numbers/special characters. For security, the password is not displayed on the console.

```
[bin]$ ./reset-manager-pw.sh

 ******************************
* LENA Server Install ! *
 ******************************

+-------------------------------------------------------------------------------
--
| 1. USER_ID is the user id to reset
| ex : admin
| 2. NEW_PASSWORD is the password to change
| - password rule #1 : more than 8 length
| - password rule #2 : inclusion of one or more alphabet characters
| - password rule #3 : inclusion of one or more numerical digits
| - password rule #4 : inclusion of one or more special characters
+-------------------------------------------------------------------------------
--

Input USER_ID for installation. (q:quit)
administrator

Input NEW_PASSWORD for installation. (q:quit)

The password has been changed successfully.

Execution is completed.!!
```

10.7. Recommended OS Parameters for LENA Installation (CentOS)

When installing LENA, it is recommended to set the OS parameter max user processes to 8192 or more.

parameter	Recommended	Default
max user processes	8192	1024
open files	8192	1024

On CentOS, you can check the max user processes setting by running the command 'ulimit -a' as follows.

```
$ ulimit -a
core file size          (blocks, -c) 0
data seg size           (kbytes, -d) unlimited
scheduling priority             (-e) 0
file size               (blocks, -f) 8192
pending signals                 (-i) 14891
max locked memory       (kbytes, -l) 64
max memory size         (kbytes, -m) unlimited
open files                      (-n) 1024
pipe size            (512 bytes, -p) 8
POSIX message queues     (bytes, -q) 819200
real-time priority              (-r) 0
stack size              (kbytes, -s) 10240
cpu time               (seconds, -t) unlimited
*max user processes             (-u) 1024*
virtual memory          (kbytes, -v) unlimited
file locks                      (-x) unlimited
```

On CentOS, you can set the number of processes and open files with 'ulimit -u' and 'ulimit -n'. To persist these changes, add the ulimit commands to each user's profile (.profile, .bash_profile), or enforce via system configuration (CentOS).

```
*$ cat $HOME/.bash_profile

*.. (omitted)*

*ulimit -u 8192

*ulimit -n 8192
```

Another way is to open /etc/security/limits.conf (CentOS) and set the maximum number of processes (nproc) and open files (nofile).

```
*$ cat /etc/security/limits.conf

*.. (omitted)*

** soft nproc 8192

** hard nproc 8192

** soft nofile 8192

** hard nofile 8192
```

10.8. Files That Grow Periodically in LENA

Item	Path	Deletion Cycle	Expected Monthly Growth	Note
Manager maintenance logging	LENA_HOME/repository/monitoringDB/maintenance	6 months	10 MB	Estimated for 6 servers Auto-delete
Manager monitoring, diagnostic reports	LENA_HOME/repository/monitoringDB/{yyyyMMdd}	7 days	N/A	Auto-delete
Manager diagnostics statistics	LENA_HOME/repository/monitoringDB/statistics	Permanent	≤ 1 MB	
Manager DB backup files	LENA_HOME/repository/backup/database	30 days	≤ 100 MB	Auto-delete
Manager logs	LENA_HOME/logs/lena-manager	30 days	≤ 100 MB	Auto-delete
Agent logs	LENA_HOME/logs/lena-agent	30 days	N/A	Auto-delete
Installer logs	LENA_HOME/logs/lena-installer	Permanent	≤ 1 MB	
Patch applied files	LENA_HOME/etc/patch	Permanent	N/A	Created only during patching Can be deleted after patch completes
Patch backup files	LENA_HOME/etc/backup/lena-patcher	Permanent	N/A	Created during patching Can be deleted after patch completes
Patch logs	LENA_HOME/logs/lena-patcher	Permanent	N/A	Created during patching Can be deleted after patch completes
Server instance logs	Server instance install path LENA_HOME/servers/server_id/logs	Permanent	Depends on load	Path can be changed

Item	Path	Deletion Cycle	Expected Monthly Growth	Note
Server instance history	Server instance install path LENA_HOME/servers/server_id/history	Permanent	N/A	Only diffs of config files are generated when changing server settings via Manager
Server instance snapshot	Server instance install path LENA_HOME/servers/server_id/snapshot	Permanent	N/A	Generated only when creating Cluster Snapshots via Manager
WAS dump files	LENA_HOME/repository/monitoringDB/dump	Permanent	N/A	Generated only when performing WAS dumps via Manager

10.9. Patch CLI (Command Line Interface)

Patch is provided to deliver feature improvements and bug fixes for installed LENA. It is provided as a compressed file and runs as an independent Java process.

For the UI-based method, see patch. This section describes how to patch and restore via the CLI.

10.9.1. Upload and Extract Patch Files

Upload the delivered patch files individually to the server where LENA is installed (e.g., via FTP).

Extract the uploaded file at the following locations and rename the directory to the patch version. When uploaded via Manager, extraction to these paths is performed automatically.

```
Node/Server patch file path: /engn001/lena/1.3/etc/patch/{patch-version}
Manager patch file path: /engn001/lena/1.3/repository/patch/{patch-version}
```

10.9.2. Patch

Node Patch

Run patch.sh to patch the Node.

```
<extracted_patch_path>/bin/patch.sh lena-node
```

During the Node patch process, the Node is restarted.

```
[bin]$ ./patch.sh lena-node

*****************************
* LENA Server Patch ! *
*****************************

2018-05-28 14:06:43:915 [INFO] Patch started to lena-node
2018-05-28 14:06:47:075 [INFO] Stopping node-agent
...
2018-05-28 14:06:52:595 [INFO] Starting node-agent
2018-05-28 14:06:52:748 [INFO] Patch completed to lena-node

 ======================== Execution Result ========================
MESSAGE : Patch succeeded
RESULT : Success
PATCH_HISTORY_ID : patch-20180528140643905
PATCH_TARGET : lena-node
PATCH_VERSION : 1.3.1.1
 ==================================================================
patch is completed.!!
```

Manager Patch

Run patch.sh to patch Manager.

manager patch

```
<extracted_patch_path>/bin/patch.sh lena-manager
```

During the Manager patch process, Manager is restarted.

```
[bin]$ ./patch.sh lena-manager

*****************************
* LENA Server Patch ! *
*****************************

2018-05-28 14:05:32:752 [INFO] Patch started to manager
2018-05-28 14:05:36:032 [INFO] Stopping manager
...
2018-05-28 14:05:46:062 [INFO] Starting manager
2018-05-28 14:05:47:066 [INFO] Patch completed to manager

 ======================== Execution Result ========================
MESSAGE : Patch succeeded
RESULT : Success
PATCH_HISTORY_ID : patch-20180528140532668
PATCH_TARGET : lena-manager
PATCH_VERSION : 1.3.1.1
 ==================================================================

patch is completed.!!
```

Server Patch

Run patch.sh to patch an individual server.

Run on the machine where the node is installed, and execute separately for each LENA server installation type. Node patch must be applied before server patch.

WAS standard type patch

```
<extracted_patch_path>/bin/patch.sh lena-se
```

Session Server patch

```
<extracted_patch_path>/bin/patch.sh lena-session
```

Table 182. patch.sh input arguments and fields

Field	Description	Note
PATCH_TARGET	Patch target (input as an argument to patch.sh)	lena-node lena-manager lena-se lena-ee lena-session

Field	Description	Note
SERVER_ID	Server ID corresponding to the patch target	Not required for lena-node, lena-manager

```
[bin]$ ./patch.sh lena-ee

******************************
* LENA Server Patch ! *
******************************

2018-05-28 14:17:18:840 [INFO] Patch started to lena-se

Input SERVER_ID for execution. (q:quit)
wasEE_9100
...
2018-05-28 14:17:26:820 [INFO] Saving patch history
2018-05-28 14:17:26:842 [INFO] Patch completed to lena-se

 ======================== Execution Result ========================
MESSAGE : Patch succeeded
RESULT : Success
PATCH_HISTORY_ID : patch-20180528141639064
PATCH_TARGET : lena-ee
PATCH_VERSION : 1.3.1.1
 ==================================================================

patch is completed.!!
```

10.9.3. History

Run history.sh to check patch history. The default history excludes restored entries, while the full history shows all entries.

Default history

```
<extracted_patch_path>/bin/history.sh
```

Full history

```
<extracted_patch_path>/bin/history.sh all
```

```
[bin]$ ./history.sh

******************************
* LENA Server Patch ! *
******************************
```

```
LENA Patch History
1 lena-node / patch-20180528140643905
- action : PATCH
- id : patch-20180528140643905
- target : lena-node
- serverId : lena-node
- oldVersion : 1.3.1.0
- patchVersion : 1.3.1.1
- backupRoot:
/engn001/lena/1.2/etc/backup/lena-patcher/backup-20180528140643903
- timestamp : 20180528140643905
- restored : false
- handwork-status : NO_WORK

2 lena-manager / patch-20180528140532668
- action : PATCH
- id : patch-20180528140532668
- target : lena-manager
- serverId : lena-manager
- oldVersion : 1.3.1.0
- patchVersion : 1.3.1.1
- backupRoot:
/engn001/lena/1.2/etc/backup/lena-patcher/backup-20180528140532666
- timestamp : 20180528140532668
- restored : false
- handwork-status : NEED_WORK
- start of handwork-detail
...
- end of handwork-detail

3 lena-ee / patch-20180528141639064
- action : PATCH
- id : patch-20180528141639064
- target : lena-ee
- serverId : wasEE_9100
- oldVersion : 1.3.1.0
- patchVersion : 1.3.1.1
- backupRoot:
/engn001/lena/1.2/etc/backup/lena-patcher/backup-20180528141639062
- timestamp : 20180528141639064
- restored : false
- handwork-status : NO_WORK

history is completed.!!
```

10.9.4. Restore

Run restore.sh to rollback an applied patch (when patch issues occur).

When executing restore, files changed at the time of patch are restored to the pre-change state.

```
<extracted_patch_path>/bin/restore.sh <PATCH_HISTORY_ID>

(PATCH_HISTORY_ID is the id value shown by ./history.sh.)
```

```
[bin]$ ./restore.sh patch-20180423130610713

*****************************
* LENA Server Patch ! *
*****************************

2018-05-28 14:40:05:404 [INFO] Restore started to lena-ee
...
2018-05-28 14:40:05:532 [INFO] Restore completed to lena-ee

 ======================== Execution Result ========================
MESSAGE : Restore succeeded
RESULT : Success
 =================================================================

restore is completed.!!
```

10.9.5. Check Version

Run version.sh to check the patch status of currently installed servers.

```
<extracted_patch_path>/bin/version.sh
```

```
[bin]$ ./version.sh

*****************************
* LENA Server Patch ! *
*****************************

LENA Patch Information
1. Base Information
- Version : 1.3.1.1 (Up to date)
- LENA_HOME : /engn001/lena/1.3.1

2. lena-manager
2.1 - id : lena-manager / version : 1.3.1.1 (Up to date)

3. lena-se
3.1 - id : wasSE_9100 / version : 1.3.1.1 (Up to date)
3.2 - id : wasSE_9200 / version : 1.3.1.1 (Up to date)

4. lena-ee
4.1 - id : wasEE_9300 / version : 1.3.1.0 (Patch available to 1.3.1.1)
4.2 - id : wasEE_9400 / version : 1.3.1.0 (Patch available to 1.3.1.1)

5. lena-session
5.1 - id : session_5000 / version : 1.3.1.0 (Patch available to 1.3.1.1)
5.2 - id : session_5500 / version : 1.3.1.0 (Patch available to 1.3.1.1)

version is completed.!!
```

10.10. DBCP Add-on Features

Control the Application Server via database connection tests, or generate logs of tasks performed by DBCP.

Configure via environment variables or JVM options; JVM options take precedence. (If the same option is set in both, the JVM option value is used.)

When the Application Server is registered as a Windows service, configuration is only possible via JVM options.

10.10.1. Application Server Control

When an abnormal state is detected at Application Server startup, such as database connection failure, pool creation failure, or validation query failure, the server is shut down.

Table 183. DBCP add-on, Application Server control

Environment Variable	JVM Option	Description	Default
SHUTDOWN_IF_DBCONN_FAIL	lena.shutdownIfDbConnFail	If true, shut down the server on Database connection / Pool creation failure / validation query failure	false

10.10.2. DBCP Logging

Logging for Datasource creation, Connection creation, Validation query execution, Borrow Connection, Return Connection / Detailed Stack Trace logging

Environment Variable	JVM Option	Description	Default
DBCPLOG_ON	lena.dbcplogOn	If true, log when Datasource/Connection are created	false
DBCPLOG_ON_DETAIL	lena.dbcplogOnDetail	If true, log Validation query, Borrow/Return Connection (does not work if DBCPLOG_ON is false)	false
DBCPLOG_ON_STACKTRACE	lena.dbcplogOnStacktrace	If true, add Stack Trace information to logs	false
DBCPLOG_MAX_TRACE	lena.dbcplogMaxTrace	Maximum number of Stack Trace lines to print in logs	5
DBCPLOG_EXC_DBCP_PACKAGE	lena.dbcplogExcDbcpPackage	Whether to exclude dbcp-related packages from Stack Trace logging	true

10.11. Change Manager Language Setting

You can change the language setting of LENA Manager.

Table 184. LENA Manager available languages

Language	Default
English (US)	O
Korean (KR)	

10.11.1. How to Change Language Setting

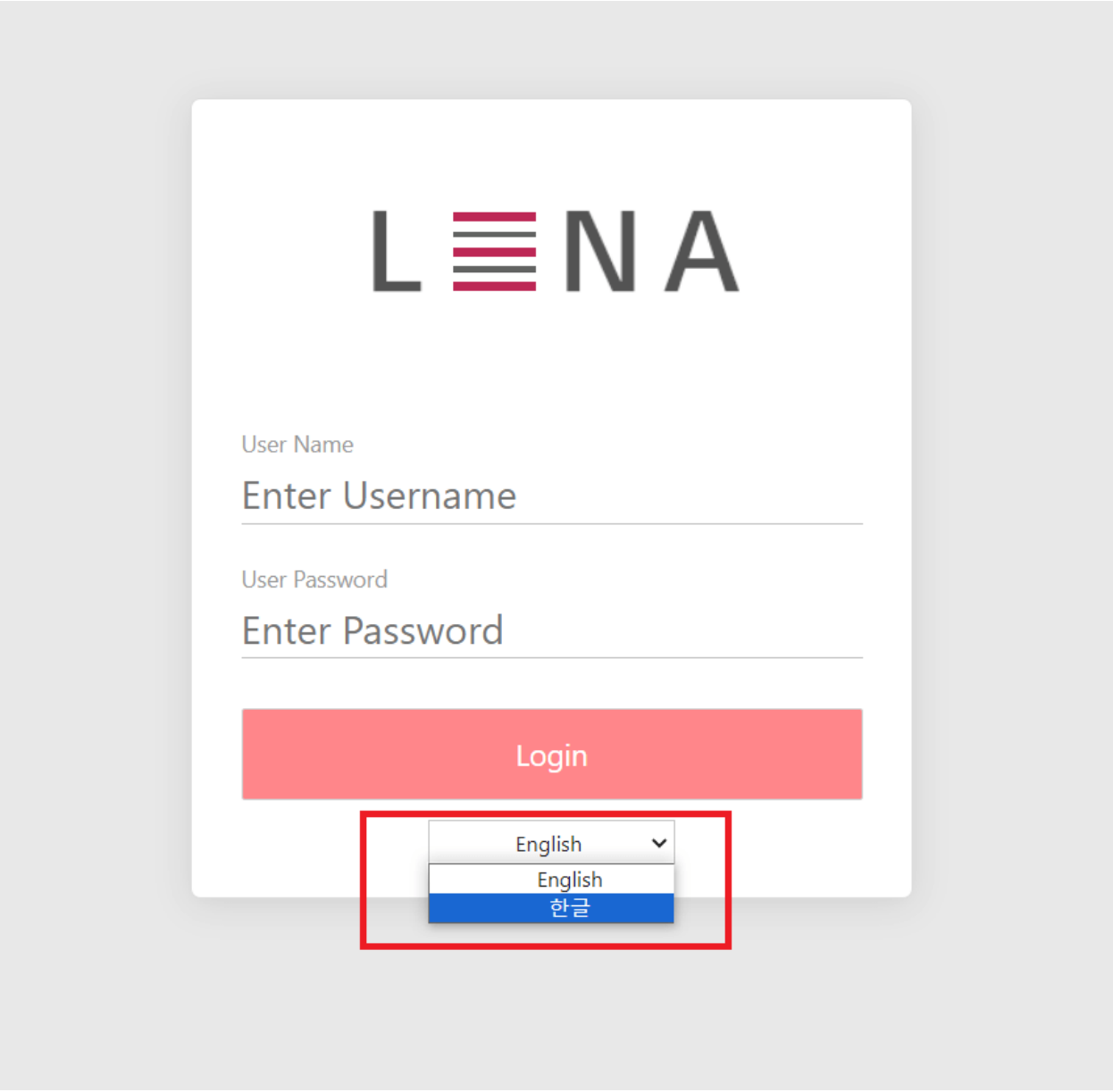
To enable language setting changes, first navigate to:

ADMIN > Preference > Manager Environment
(based on default English setting)

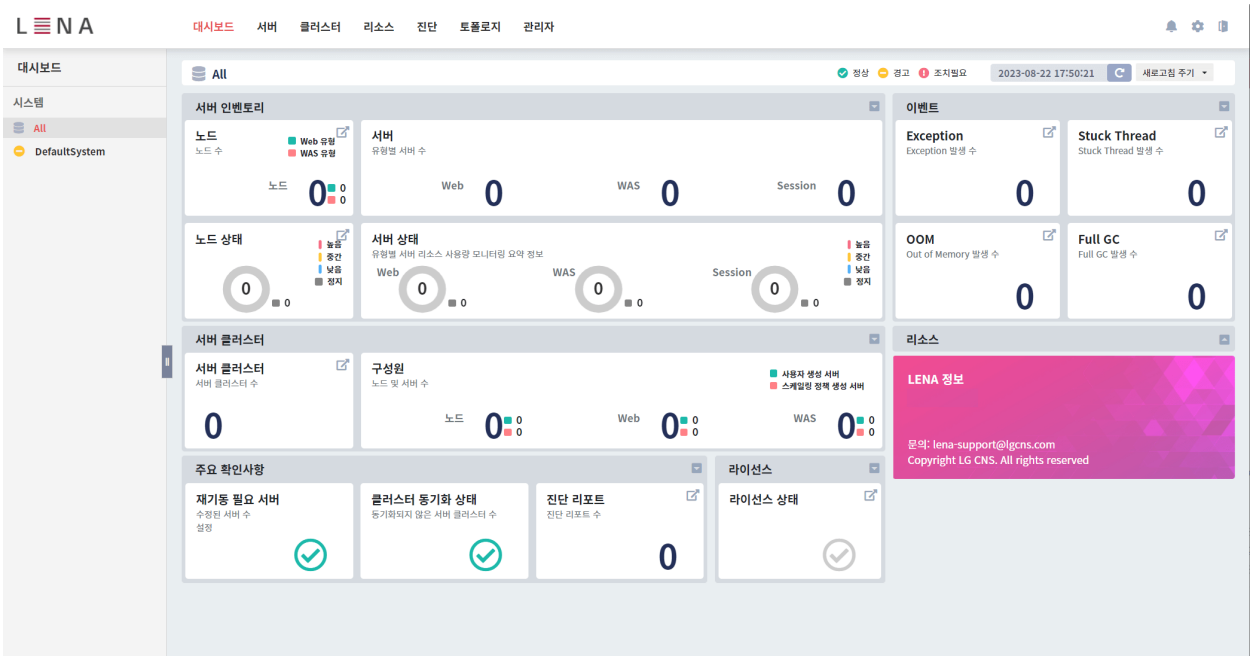
Click the gear button under Manager Configuration to open the details and modify as follows.

```
...
 9  # i18n On/off
10  lena.i18n.enable=true # false -> true
...
```

Now you can change the language on the Login page. If you are logged in, log out to go to the Login page.



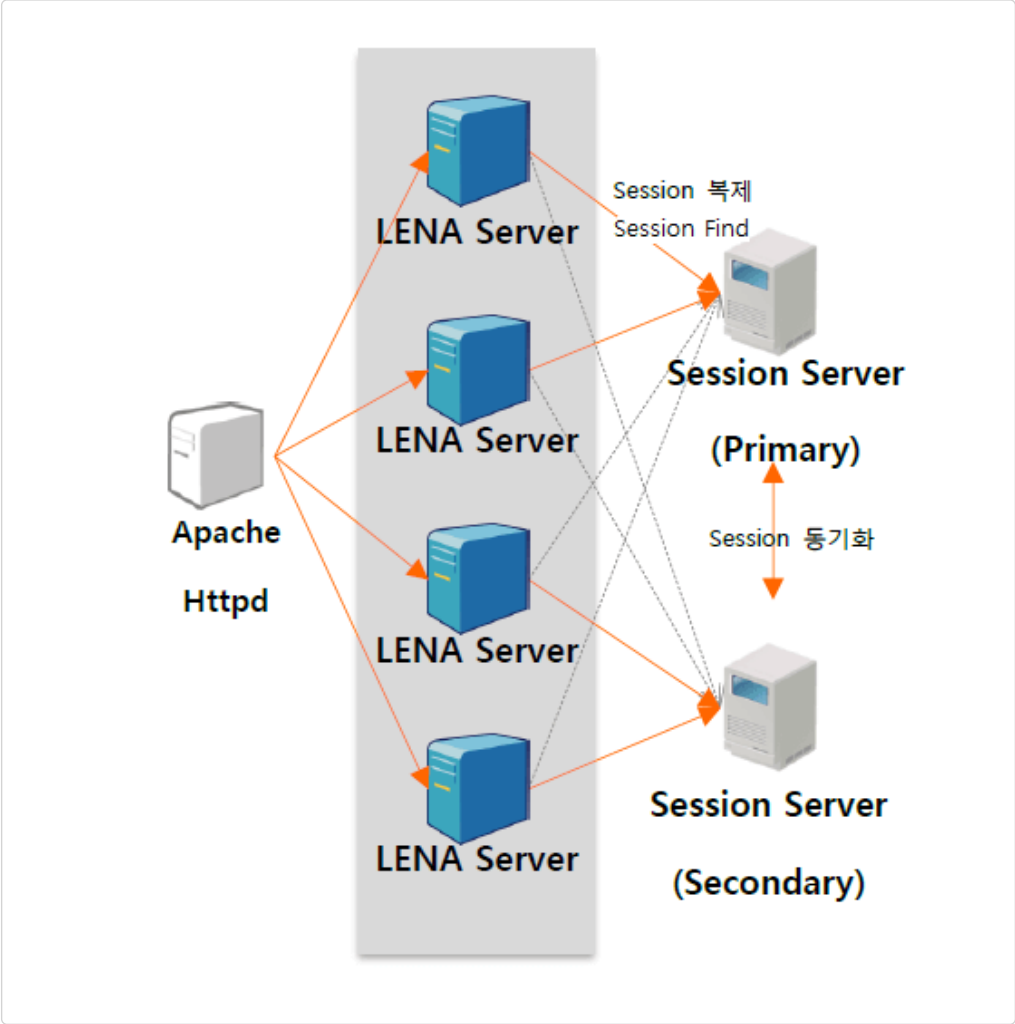
After selecting the language and logging in, you can use LENA Manager in the changed language.



10.12. Session Server Details

Application Server session clustering shares sessions by installing a separate Session Server. The Session Server has a Standalone mode that runs on a separate VM and an Embedded mode where the Session Server module is embedded in the Application Server.

10.12.1. Session Server Standalone Mode



Installation

For installation, refer to Install.

Start/Stop and Status Check

For start/stop and status checks, see Start/Stop.

Configuration

The location where the Session Server is installed is referred to as ${ZODIAC_HOME}. The Session Server is located under the LENA home /servers folder.

Configuration information is managed in ${ZODIAC_HOME}/session.conf. The configuration items that can be changed are as follows.

Item	Description
server_id	server ID
server_name	server Name
primary_port	TCP listening port of the Session Server
session_max_count	Maximum number of HTTP sessions

Item	Description
server_recv_queue_size	Queue size for processing requests for session information (update to latest/new registration, logout) received from the Secondary Server or Application Server
server_req_queue_size	Queue size that holds requests for session information received from other servers (session info requests, latest info checks, etc.)
resp_queue_size	Queue size that holds responses to session information requested by other servers
send_queue_size	Queue size that holds session information to be sent to other servers
keep_alive_time	Interval at which dummy messages are sent to maintain the TCP connection between Application Server and Session Server. Must be less than so_timeout. It is recommended to match each Application Server setting.
so_timeout	read timeout in the connection with Application Server
thread_request_handler	Number of threads that process data accumulated in the request Queue.
thread_data_handler	Number of threads that process data accumulated in the receive Queue.
debug_clustering	Whether to leave debug logs
enable_auto_was_sync	When set to true, sends a Sync request to the reconnected WAS (due to failure, etc.) to sync the WAS session data.
enable_auto_peer_sync	Whether to send a Sync request to the reconnected Secondary Session Server (due to failure, etc.) to sync the Slave Session Server's session data
server_expire_sec	Time to expire HTTP session information on the server (Session Timeout) If 0, use the session timeout set by the Application
server_expire_check_sec	Session Timeout check interval (seconds)
secondary_host	Address of the Secondary session server
secondary_port	Address of the Secondary session server
enable_ready_after_sync	Whether to send the Ready state (available to provide clustering service) to connected WAS after performing session data synchronization with the Secondary Server (true sends Ready after synchronization)
wait_server_ready_timeout	If the Ready state (available to provide Session Clustering service) is not reached by this time, it will automatically be set to Ready.
server_ready_time	Wait time to connect to the Secondary Server at startup (this value * 100 ms).
max_logoutset	Maximum number of logged-out HTTP sessions
enable_auto_logout_sync	If true, sync logout information together when syncing session entry information (needed for round-robin when not sticky)

Logs

Logs are stored at ${LENA_HOME}/logs/session-server/lena-[Session Server Name]_[YYYYMMDD].log. You can also check logs by running the ${ZODIAC_HOME}/log.sh file.

```
[session_5002]$ ./log.sh

May 09, 2018 02:55:50 PM [ZODIAC] TCP listen 5002
May 09, 2018 02:55:54 PM [ZODIAC] ACCEPT NODE(Tomcat) /127.0.0.1:33138
May 09, 2018 02:55:55 PM [ZODIAC] SERVER_READY, no peer, time=5000
May 09, 2018 02:59:57 PM [ZODIAC] Zodiac Stop
May 09, 2018 03:00:00 PM [ZODIAC] Zodiac Session Server 1.3.0 20160420
May 09, 2018 03:00:01 PM [ZODIAC] TCP listen 5002
May 09, 2018 03:00:01 PM [ZODIAC] ACCEPT NODE(Tomcat) /127.0.0.1:33359
May 09, 2018 03:00:03 PM [ZODIAC] ACCEPT SERVER /127.0.0.1:46818
May 09, 2018 03:00:04 PM [ZODIAC] SYNC[session_5002] recv bulk
sessions : #0 recv bulk logout sessions : #0 recv bulk dupInfo : #0 2ms
May 09, 2018 03:00:04 PM [ZODIAC] SERVER_READY sync is done
May 09, 2018 03:00:05 PM [ZODIAC] TCP Primary name=session_5002
/127.0.0.1:5002
May 09, 2018 03:00:05 PM [ZODIAC] SYNC start 127.0.0.1:5002
May 09, 2018 03:00:05 PM [ZODIAC] SYNC Send bulk sessions send to
127.0.0.1:5002 #0 and logout session send : 0 and dupInfo send : 0
```

Console

Zodiac Session Server provides APIs via JMX to query Session Server information and to execute Application Server sync commands. Run the console.sh file under ${ZODIAC_HOME} to use the Zodiac Session Server's JMX features.

```
[session_5002]$ ./console.sh

 =====zodiac session server JMX Console=====

 ------------------------------------------------------------

- Usage: ./console.sh <COMMAND> -
- <COMMAND> is one of the following: -
- 1. was_list -
- 2. status -
- 3. was_serverq -
- 4. was_sync -
-    It needs WAS ID -
-    example: ./console.sh was_sync <was id> -
- 5. search -
-    It needs SESSION ID. -
-    example: ./console.sh search <session id> -

 ------------------------------------------------------------
```

The following are descriptions of console.sh commands.

- Application Server List

  Shows the list of Application Servers connected to the current Session Server.

  Run the shell command console.sh was_list.

  ```
  [session_5002]$ ./console.sh was_list

   =====zodiac session server JMX Console=====

  RUN OPERATION: getServerInfo

  RESULT:server={addr:/127.0.0.1:54001,name:wasEE7_29100,
  info:{server_name=wasEE7_29100,pid=24915,hostname=solwas4,jvmName=bde0fbb29e
  8100285,context=/jpetstoreJTA;ROOT;/lena;/EPS;/HelloWorldWeb,type=INSTANCE}}
  server=
  {addr:/127.0.0.1:33912,name:wasEE3_29100,
  info:{server_name=wasEE3_29100,pid=10607,hostname=solmanager,jvmName=2b2451d
  d049f00285,context=/jpetstoreJDBC;ROOT;/jpetstore3,type=INSTANCE}}
  ```

- Session Server Status

  Shows the current Session Server status values.

  Run the shell command console.sh status.

```
[session_5002]$ ./console.sh status

 =====zodiac session server JMX Console=====

RUN OPERATION:

getStatusString{request_getfresh_logout:0,session_count:0,req_lost:0,request
_
getfresh_not_new:0,request_getfresh_nodata:0,request_getnew_secondary:0,sess
ion_expired:0,request_getnew_logout:0,session_timeout:1800,request_getnew_no
data:0,session_max_count:2000000
,logout_from_nodes:0,pid:32705,session_recv_lost:0,logout_from_secondary:0,r
equest_getfresh_secondary:0,request_getfresh:0,request_getnew:0,logout_count
:0,data_from_nodes:0,resp_lost:0,request_getfresh_data:0,data_from_secondary
:0}
```

- Session Server ServerQ Status

  Shows the ServerQ status of Zodiac Session Server. ServerQ is a module that manages connections of Application Servers connected to the Session Server. The data shown here are Queue information containing session data and request data sent by the Application Server.

  Run the shell command console.sh was_serverq.

```
[session_5002]$ ./console.sh was_serverq

=====zodiac session server JMX Console=====

PRINT ATTRIBUTEdataQ.size: 0requestQ.size: 0dataQ.overCnt:
0requestQ.overCnt: 0
```

- Session Id Search

  Shows the list of Application Servers that have a session matching the entered Session ID.

  Run the shell command console.sh search [Session ID].


```
[session_5002]$ ./console.sh search
B38E30BDE5223BAA0221B9479AF3DDAF.6ef7931859a200285
 =====zodiac session server JMX Console=====

RUN OPERATION: search

RESULT:{'AE4_29100'={lastAccessTime='2018-05-24
15:55:48.503',context='ROOT',attributeNames=[sessiontest.counter,
ARGO_DUPLICATION_STATUS],lastUpdateTime='2018-05-24
15:55:48.501',addr='/127.0.0.1:44568',id=B38E30BDE5223BAA0221B9479AF3DDAF.6e
f7931859a200285,createTime='2018-05-24
15:55:43.241'}}
```

- Application Server Session Sync

  Execute when syncing Application Server session information to the Session Server.

  Run the shell command console.sh was_sync [Application Server jvmName (value printed as jvmName in was_list)].

```
[session_5002]$ ./console.sh was_list

 =====zodiac session server JMX Console=====

RUN OPERATION: getServerInfo

RESULT:server={addr:/127.0.0.1:54001,name:wasEE7_29100,
info:{server_name=wasEE7_29100,pid=24915,hostname=solwas4,jvmName=bde0fbb29e
8100285,context=/jpetstoreJTA;ROOT;/lena;/EPS;/HelloWorldWeb,type=INSTANCE}}
server=
{addr:/127.0.0.1:33912,name:wasEE3_29100,
info:{server_name=wasEE3_29100,pid=10607,hostname=solmanager,jvmName=2b2451d
d049f00285,context=/jpetstoreJDBC;ROOT;/jpetstore3,type=INSTANCE}}}
```

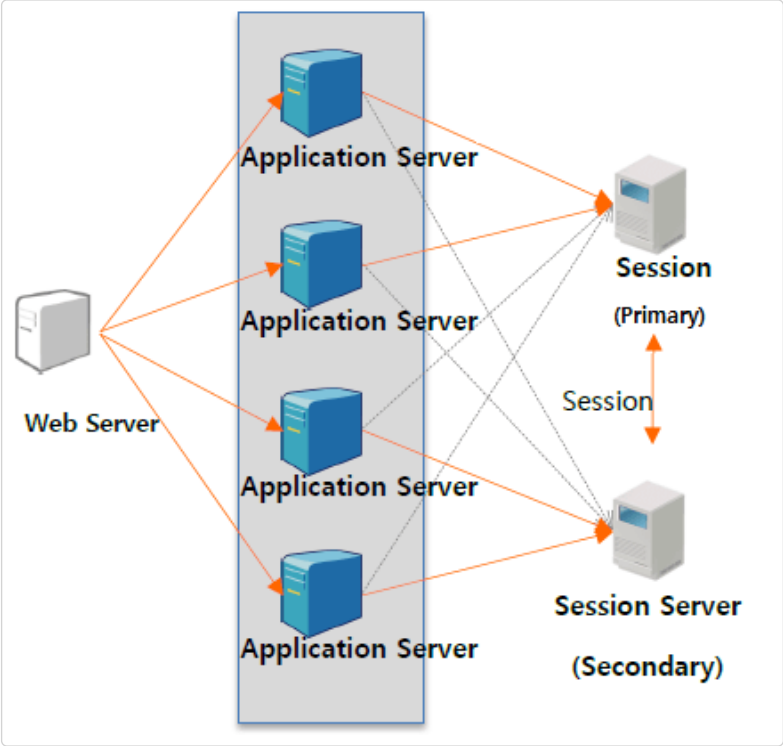
```
[session_5002]$ ./console.sh was_sync bde0fbb29e8100285

 =====zodiac session server JMX Console=====

RUN OPERATION: serverSyncsync complete
```

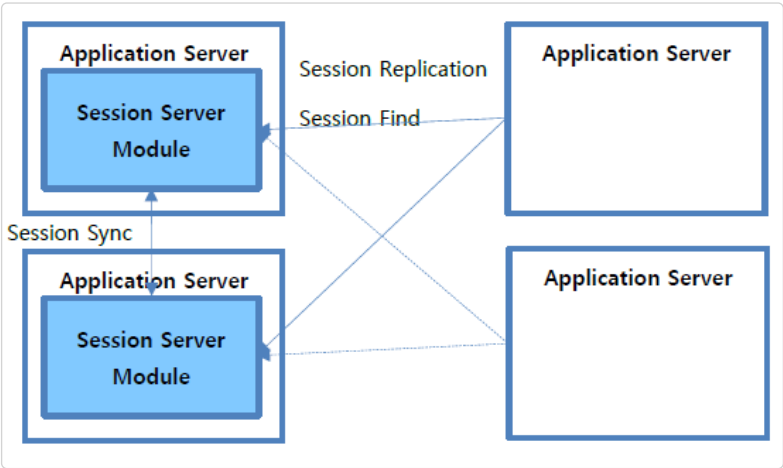
Session Server failover

The Session Server is configured as Primary/Secondary and synchronizes session information in real time. Since the Application Server maintains connections to both Primary/Secondary Session Servers, when a failure occurs in the Primary Session Server, failover to the Secondary Session Server occurs from the time the failure is detected.



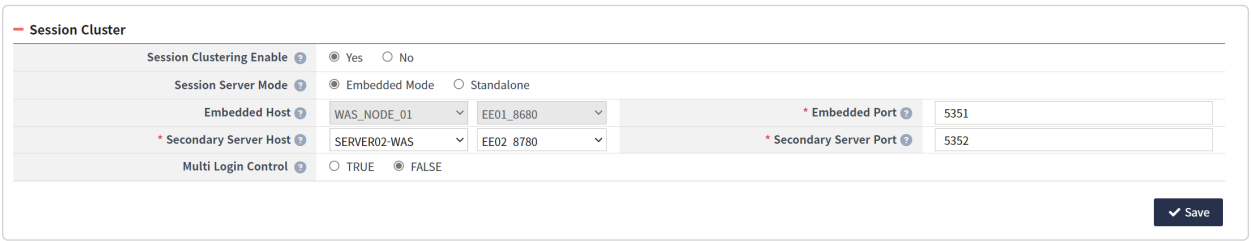
10.12.2. Session Server Embedded Mode

In Embedded mode, the Session Server module is embedded within the Application Server.



Configuration

To configure the Session Server in Embedded mode, configure it from Manager's Application Server settings screen, or edit ${LENA_HOME}/servers/[ApplicationServerName]/conf/session.conf.



Descriptions of the items displayed on the screen are as follows.

Item	Description	Note
Session Server Mode	Select Embedded or Client mode of Standalone Session Server	
Embedded Host	Node name and server name of the Primary server in the Session Cluster	
Embedded Port	Service port of the Primary server in the Session Cluster	
Secondary Server Host	Node name and server name of the Secondary server in the Session Cluster	
Secondary Server Port	Service port of the Secondary server in the Session Cluster	
Multi Login Control	Whether to check multiple logins	false
Logout Page when Multi Login check (Multi Login)	Logout result page shown to the user who logged in first in case of multiple logins	
Logout Message when Multi Login check (Multi Login)	Logout result message in case of multiple logins, provided to ajax client as JSON	
Expected Page When Multi Login Check (Multi Login)		

In Manager, the configurable settings are predefined. By default, follow the default configuration.

Below are the configuration values that can be changed via the session.conf file.

Item	Description	Default
enable_clustering	Whether to perform session clustering. If false, the session is not searched in the Session Server.	TRUE
debug_clustering	Whether to enable debug	FALSE
primary_host	Address of the Primary Session Server In Embedded mode, this is the Embedded Host value	127.0.0.1
primary_port	Port of the Primary Session Server In Embedded mode, this is the Embedded Port value	5005

Item	Description	Default
secondary_host	Address of the Secondary Session Server, Used only when the connection between the Application Server and the Primary Session Server is lost. In Embedded mode, this is the Slave Server Host value	127.0.0.1
secondary_port	Port of the Secondary Session Server, Used only when the connection between the Application Server and the Primary Session Server is lost In Embedded mode, this is the Slave Server Port value	5006
recv_queue_size	Queue size for processing requests for session information (update to latest/new registration, logout) received from other servers	512
req_queue_size	Queue size that holds requests for session information (session info requests, latest info checks, etc.) received from other servers	512
resp_queue_size	Queue size that holds responses to session information requested by other servers	512
send_queue_size	Queue size that holds session information to be sent to other servers	512
keep_alive_time	Interval at which dummy messages are sent to maintain the TCP connection between Application Server and Session Server. Must be less than so_timeout.	3000
so_timeout	read timeout in the connection with Session Server	8000
tcp_open_try_interval	Interval for retrying connection when connection to Session Server is lost	5000
find_timeout	When a transaction on the Application Server searches for a session, the time to wait for a server response. If the server does not respond within this time, the Application Server considers that the server does not have the session.	500
wait_server_ready_cnt	If communication is connected to the Server but the Server state is not ready, wait up to the configured seconds. If -1, wait indefinitely.	-1
server_embedded	Whether to embed the session server module. If true, embed the session server module.	false

Item	Description	Default
max_logoutset	Size of the set that stores logged-out HTTP sessions	20000
check.duplication.login	Whether to check for duplicate logins	false

Note 1) Other Server. The connected Session Server or clustered Application Server