

SOLUTION PARTNER FOR SMART TECHNOLOGY



# 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 Web Applications.

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.

## 1.2. LENA Features

### High Efficiency

LENA Web Application Server has achieved improvements in startup performance and Application Deploy performance compared to third-party WAS, and resource usage efficiency such as CPU/Memory has been improved.

### 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.

### 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.

### 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, 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 and LENA WAS (Web Application 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 manual content for each menu.

- **Dashboard**  
Check resource status and Events of LENA Node and Server
- **Server**  
Register LENA Node, install servers by type, 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.
- **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 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, 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, and is installed by default in LENA Package, so it can be started through prepared scripts. Main roles are processing commands for Servers under Node commanded through LENA Manager and 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 and LENA WAS 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 integrates with LENA WAS in Reverse Proxy form, performing the front-end role for Web Application services provided by LENA WAS. Additionally, various optional additional functions can be used, with Domain/URI-based branching and Load Balancing functions and security layer (SSL) being representative.

#### LENA WAS (Web Application Server)

LENA WAS executes Java Web Applications to provide Web Application services. It includes Datasource integration functionality for using DB Connection Pool. It consists only of Servlet Engine for processing Java Class files and JSP Engine for processing JSP files, and can only execute WAR Type Web Applications.



LENA WAS internally mounts Advertiser Module, which collects LENA WAS's JVM internal monitoring results through JMX and transmits them to LENA Manager.

## 1.4. LENA Operation Method

Node Agent is installed on Nodes registered in Manager, and Advertiser is installed on Application Server.

Operators send control requests for Server (e.g., Start, Stop, Reload, Dump, configuration changes, etc.) to each Node Agent through Manager's UI, and Node Agent receives and executes the control.

Node Agent and Advertiser periodically transmit monitoring data to Manager, and operators can check resource status of each server through Manager's UI such as Monitoring Dashboard.

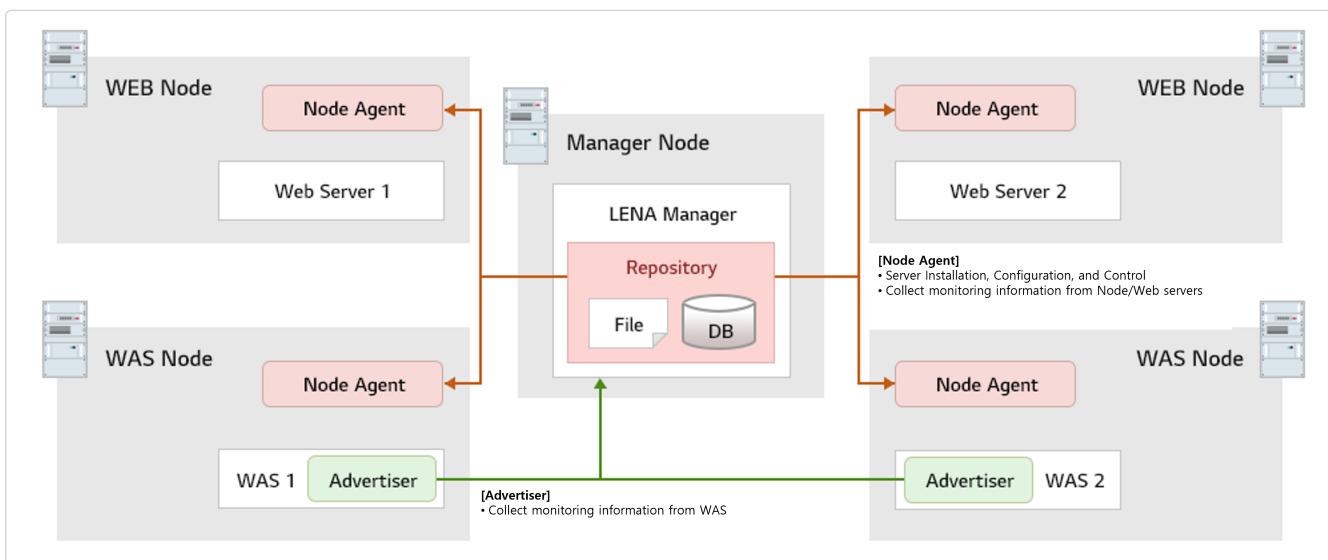


Figure 1. LENA Mechanism

Table 1. LENA Component Descriptions

Component	Description
Manager	Provides Server control through Agent and monitoring functionality

Component	Description
Repository	Mounts File/DB for Manager operation
Node	Mounts Node Agent. Server Module is installed under Node
Node Agent	<ul style="list-style-type: none"><li>- Server installation/replication/patch</li><li>- Server start/stop control</li><li>- Server configuration management</li><li>- Node, Web Server, WAS status information</li><li>- Node, Web Server resource monitoring data provision</li></ul>
Advertiser	Provides WAS resource monitoring data
WAS	Provides Java Web Application services
Web Server	Integrates with WAS in Reverse Proxy form, performing front-end role for Web services

## 1.5. Provided Specifications

Functions or specifications provided by LENA are as follows.

Table 2. Provided Functions and Specifications

Function/Spec (LENA-Manager Standard)		Provision
Server	Web Server	●
	Web Application Server	●
Resource	Database	●
	DataSource (General)	●
	Application (WAR)	●
Topology		●
Security		●
Diagnostics	Monitoring	●
	Diagnostics/Response	-
Patch		●

# Chapter 2. Log In/Out

Provides functionality for logging in and out of the Manager.

## 2.1. Log In

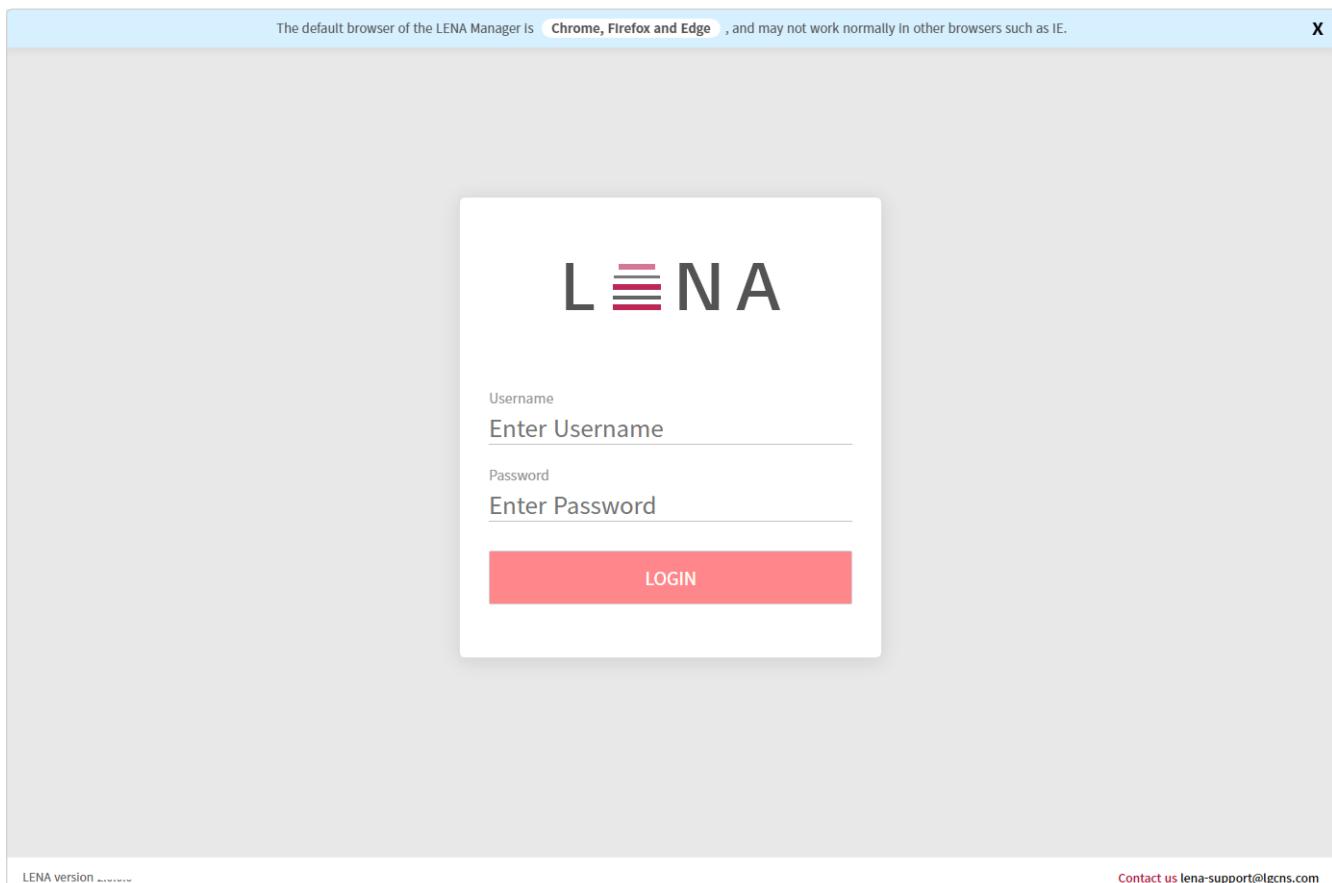


Figure 2. Manager Access Screen

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

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.)

## 2.2. 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.

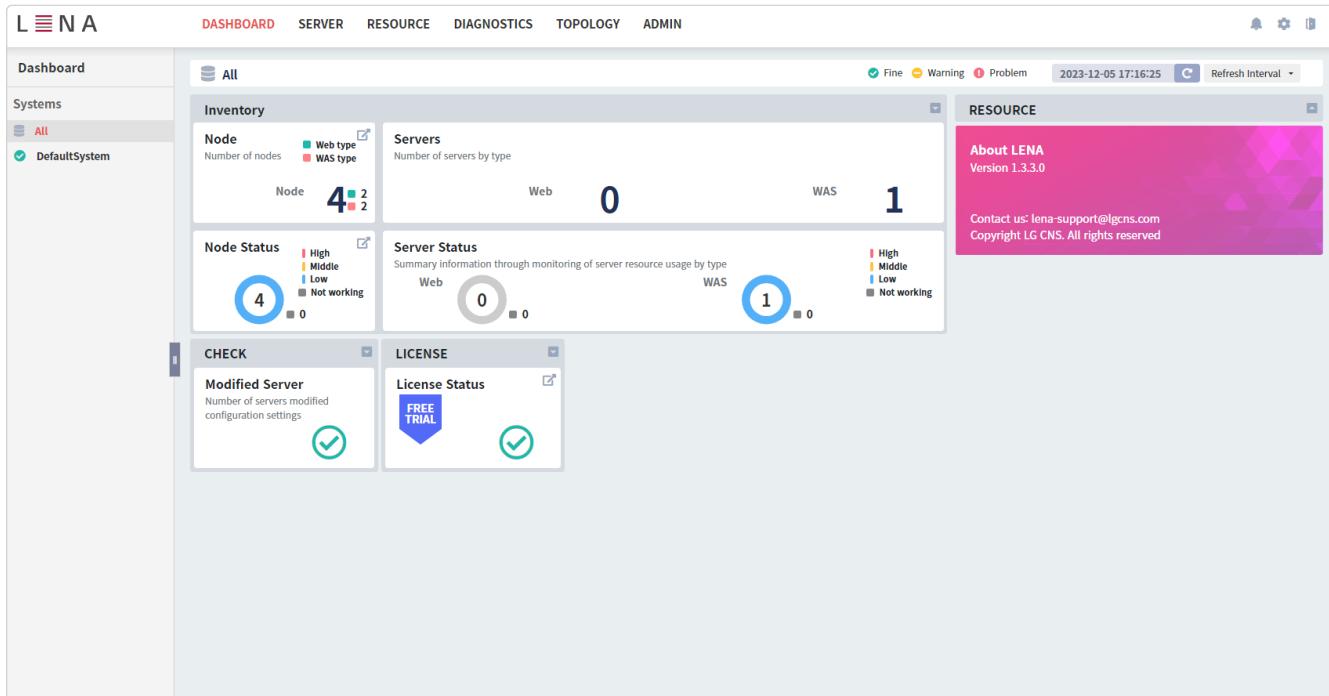


Figure 3. Dashboard

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
INVENTORY	Node	<p>Number of Nodes included in the System</p> <ul style="list-style-type: none"> <li>Web type : Number of nodes where Web Server can be installed</li> <li>WAS type : Number of nodes where WAS can be installed</li> </ul>
	Server	<p>Count by Server type included in the System</p>
	Node Status	<p>Resource usage (CPU, Memory, DISK) status of Nodes included in the System</p>
	Server Status	<p>Resource usage status of Servers included in the System</p> <ul style="list-style-type: none"> <li>Web : CPU, Memory, Thread check</li> <li>WAS : Heap Memory, Thread Pool check</li> </ul>
CHECK	Modified Server	<p>Whether servers requiring restart exist among Servers included in the System</p>

Item	Description	Notes
RESOURCE	DB Resource	<p>Number of Databases and Datasources registered and managed in the RESOURCE menu</p> <ul style="list-style-type: none"> <li>• Used : Number of Datasources currently in use by WAS</li> <li>• Not Used : Number of Datasources not currently in use by WAS</li> </ul>
LICENSE	License Status	<p>License status of nodes (displays valid days for Trial license or valid days for commercial license (from 15 days before expiration date))</p>

# Chapter 4. Server

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

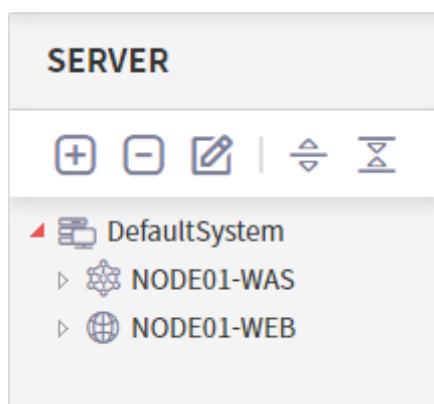


Figure 4. System List

### 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.

Node List							WAS List	Web Server List	Session Server List
							Search <input type="text"/> Show <select>10</select> entries		
Status	* Name	* Type	Engine No.	* Address	* Port	* Manager Address			
	was-node	Application	EN8	10.81.209.117	16800	10.81.209.117			

1 to 1 of 1      Previous 1 Next

**Install**    **Register**    **Save**

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	<b>+ icon</b> - Display change status when <b>Register / Edit(pencil)</b> button is clicked <b>- icon</b> - Display deletion pending when <b>Delete(trash can)</b> is clicked
Status	Current status of Node	<ul style="list-style-type: none"> <li>Started(v)</li> <li>Stop(□)</li> </ul>
Name(*)	Node name	
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

Item (*) indicates required value)	Description	Notes
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	<b>Trash can icon</b> - Delete Node information <b>Pen icon</b> - Modify Node information <b>Terminal icon</b> - Provides SSH terminal functionality to the server where Node is installed <b>More icon</b> - 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: <ul style="list-style-type: none"> <li>• Application: Can install WAS and Session Server</li> <li>• Web: Can install Web Server</li> </ul>
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,exit,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.

WAS List								
<input type="text" value="Search"/> Show 10 entries								
	Status	Name	Address	Server ID	Type	Engine No.	HTTP Port	AJP Port
<input type="checkbox"/>	<span style="color: green;">✓</span>	daf-was-01	10.81.209.171	daf-was-01	Enterprise/SE	EN8	8480	8409 <span style="border: 1px solid red; padding: 2px;">Stop</span>
<input type="checkbox"/>	<span style="color: green;">✓</span>	daf-was-02	10.81.209.171	daf-was-02	Enterprise/SE	EN8	8580	8509 <span style="border: 1px solid red; padding: 2px;">Stop</span>

1 to 2 of 2      Previous 1 Next

Multi Action Install Clone + Register ✓ Save

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	
<b>+ icon</b> - Displays change status when <b>Register / Edit(pencil)</b> button is clicked	<b>- icon</b> - Displays scheduled for deletion when <b>Delete(trash)</b> 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		<b>Trash icon</b> - Delete server information
<b>Pen icon</b> - Edit server information	<b>Log file icon</b> - Provides Server Log Viewer functionality	<b>More icon</b> - 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)

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Default Value</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Default Value</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

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

### 5. Welcome File List

Table 22. Main Configuration

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

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

### 3. BMP\_ENTITY Configuration

Table 25. BMP\_ENTITY Configuration

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

### 4. STATELESS Configuration

Table 26. STATELESS Configuration

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

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

## 6. STATEFUL Configuration

Table 28. STATEFUL Configuration

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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.cor.e.stateful.SimpleCache	Passivator	Specify Passivator class
Default : org.apache.openejb.cor.e.stateful.SimplePassiv ater	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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
ResourceAdapter	Specify Resource Adapter	Default : Default JMS Resource Adapter
MessageListenerInterface	Specify MessageListener	Default : javax.jms.MessageListene r

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) abcdbc.ExampleException	
Exclude Exception Class Pattern	Specify Exception pattern to exclude from detection. Maximum 10 can be specified, * pattern cannot be used. ex) abcdbc.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	<p>Provides following scopes</p> <ul style="list-style-type: none"> <li>• Context: Datasource information is set in common context area so all Applications can share.</li> <li>• Global: Datasource information is set in GlobalNamingResource area, and each application individually sets and uses in DataSource Link List.</li> <li>• Global+ResourceLink: Datasource information is set in GlobalNamingResource area and Datasource link is set in common context area.</li> </ul>
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	<p>Used when setting TestOnBorrow and TestWhileIdle values.</p> <p>When true/false, both values are set the same.</p> <p>When User Defined is selected, both values can be set directly by user</p>	
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
MinEvictableIdleTimeMi llis(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.

- Enter Resource Name to distinguish Databases.
- 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.

- Select file to upload through Search button. File to upload is JDBC Driver library, so only JAR format files can be selected.
- Click Upload button to upload selected file to target directory.
- 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	<p>Provides following types</p> <ul style="list-style-type: none"> <li>• ActiveMQResource Adapter</li> <li>• JMSConnectionFactory</li> <li>• Queue</li> <li>• Topic</li> </ul>

## 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 <ul style="list-style-type: none"> <li>• XA</li> <li>• LOCAL</li> <li>• NONE</li> </ul>
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 <ul style="list-style-type: none"> <li>• EJB</li> <li>• EAR</li> <li>• WAR</li> </ul>
Base Name	Base name	
Context Path	Context path	
DocBase	Application location	
Status	Application status	Provides following statuses <ul style="list-style-type: none"> <li>• Started(v)</li> <li>• Stop(□)</li> <li>• Error(!)</li> </ul>

Item	Description	Notes
	Action button	<p>Provides following functionalities</p> <ul style="list-style-type: none"> <li>• <a href="#">Undeploy(trash) button</a></li> <li>• <a href="#">Application Start button</a></li> <li>• <a href="#">Application Stop button</a></li> <li>• <a href="#">Application Reload button</a></li> </ul>
	View button	<p>Provides following functionalities</p> <ul style="list-style-type: none"> <li>• <a href="#">web.xml View(document) button</a></li> </ul>

## 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	<p>Only Enterprise WAS Type provides following types</p> <ul style="list-style-type: none"> <li>• EJB</li> <li>• EAR</li> <li>• WAR</li> </ul>
Context Path(*)	Context path	
unpackWAR	<p>Whether to execute after expanding WAR file.</p> <p>When value is false, deploy without expanding WAR file compression</p>	<p>Default : true</p>
DocBase(*)	Application location	<p>File can be uploaded through <a href="#">Upload select(file) button</a></p>

### 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 <b>New button</b> , <b>Edit(pencil) button</b> to display that selected DataSource information is being changed
- icon	Click <b>Delete(trash) button</b> 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 List								
	Status	Name	Address	Server ID	Engine	HTTP Port	HTTPS Port	SSL
<input type="checkbox"/>	<input checked="" type="checkbox"/>	WEB01_8000	10.81.209.171	WEB01_8000	EN-A	8000	8363	N
1 to 1 of 1								
Previous 1 Next								
<a href="#">Multi Action</a>   <a href="#">Install</a>   <a href="#">Clone</a>   <a href="#"></a> <a href="#"></a>								

Web Server attributes are as follows.

Table 47. Web Server Attributes

Item (* indicates required values)	Description	Notes
Status	Server status	<p>Provides following statuses</p> <ul style="list-style-type: none"> <li>• Started(v)</li> <li>• Stop(□)</li> <li>• Error(!)</li> </ul>

Item (* indicates required values)	Description	Notes
Name(*)	Server name	
Address	Server IP address	
Server ID	Server ID	
Engine	Node Engine type	<ul style="list-style-type: none"> <li>• EN-A</li> <li>• EN-N</li> </ul>
Protocol Type	Active protocol type	<ul style="list-style-type: none"> <li>• HTTP</li> <li>• HTTPS</li> </ul>
Port	HTTP/HTTPS port number	
Start/Stop button	Server start and stop	
Button area	Displays server information change and related function buttons	
<b>Trash icon</b> - Delete server information	<b>Pen icon</b> - Edit server information	<b>Log file icon</b> - 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)	<p>Provides following types</p> <ul style="list-style-type: none"> <li>* None : Do not allow any directives</li> <li>* All : All directives available</li> <li>* AuthConfig : Allow user authentication directives</li> <li>* FileInfo : Allow document type control directives</li> <li>* Indexes : Allow directory indexing control directives</li> <li>* Limit : Allow host access control directives</li> </ul>
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(*)	<p>Valid value when KeepAlive is On, process handles specific user's requests for specified number of times</p> <p>When this value is exceeded, that process dies and another process handles requests</p>	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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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/extrahttpd-mpm.conf file management)

Table 50. Process Info

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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 ppm event method, functionality to easily configure Process Info settings is provided.

The screenshot shows a configuration panel with a header containing a checked checkbox labeled 'Auto Calculation' and a button labeled 'Collapse all'. Below this, there is a section titled 'ServerLimit' with a value input field containing '10'. A small blue circular icon with a question mark is positioned next to the value field.

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.

**i**

Rule	Validation	Auto Calculation
StartServer ServerLimit	-	
ThreadsPerChild ThreadLimit	-	
ThreadsPerChild + MinSpareThreads MaxSpareThreads		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	<p>Default : off</p> <p>Provides following options</p> <ul style="list-style-type: none"> <li>• on : Allow optimization for Resources</li> <li>• off : Stop additional optimization but allow access to already optimized Resources</li> <li>• unplugged : Stop optimization and deny access</li> </ul>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
Custom Configuration	Add configurations that users want to add arbitrarily.	Stored separately in custom- <code>httpd.conf</code> 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).

The screenshot shows the JK tab configuration interface. It includes three main sections: **Connector Info**, **Load Balancer**, and **URI Pattern Group**.

- Connector Info:** Contains fields for Type (ajp13), Request Read Timeout(s) (300), Socket Keep Alive (TRUE), Connection Pool Size (128), Connection Pool Timeout(s) (20), Log Format ("[%a %b %d %H:%M:%S %Y]"), Status Url (/jk-status/), Load Balancing Factor (1), Socket Connect Timeout(s) (5), Connect Timeout(s) (10), Connection Pool Min Size (32), Log Level (error), Status (Enable), and Status Allow IP (127.0.0.1). A **Save** button is at the bottom.
- Load Balancer:** Overview and Configuration tabs are shown. The Load Balancer List table has one entry: lb\_default, which maps to Target Server WAS\_NODE / was\_8180 and URI Pattern Group ID uri\_pattern\_009. Another entry WAS\_NODE / was\_8280 is listed under Target Server but not assigned to a group.
- URI Pattern Group:** Contains fields for URI Pattern Group ID (uri\_pattern\_009), VHost (vhost\_default), Mode (Standard selected), Patterns to be Included (\*.jsp), and Patterns to be Excluded (lb\_default). A **Save** button is at the bottom.

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.

This is a detailed view of the Connector Info section from the JK tab configuration. It lists various configuration parameters:

* Type	ajp13	* Load Balancing Factor	1
* Request Read Timeout(s)	300	* Socket Connect Timeout(s)	5
* Socket Keep Alive	TRUE	* Connect Timeout(s)	10
* Connection Pool Size	128	* Connection Pool Min Size	32
* Connection Pool Timeout(s)	20	* Log Level	error
* Log Format	"[%a %b %d %H:%M:%S %Y]"	* Status	Enable
* Status Url	/jk-status/	* Status Allow IP	127.0.0.1

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)(*)	<p>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.</p> <p>When set to 0(default), JK continues to wait for response in all socket operations.</p>	Default: 300
Socket Connect Timeout(s)(*)	<p>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.</p>	Default: 5
Socket Keep Alive(*)	<p>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.</p>	Default: TRUE
Connect Timeout(*)	<p>connectTimeout: Wait time(s) for cpong respond to cping request in ajp13 protocol after connection between JK and WAS is completed.</p>	Default: 10
Connection Pool Size(*)	<p>Number of connections maintained as connection pool between JK and WAS.</p>	Default: 128
Connection Pool Min Size(*)	<p>Minimum number of connections maintained as connection pool between JK and WAS.</p>	Default: 32
Connection Pool Timeout(s)(*)	<p>Specifies time(seconds) that JK must maintain before closing inactive sockets. When set to 0, disables socket closing.</p>	<p>Used together with WAS's connectionTimeout option. Default: 20</p>
Log Level(*)	<p>Specifies log level to be recorded in log file.</p>	Default: error
Log Format(*)	<p>Sets format for recording logs in log file.</p>	Default: "[%a %b %d %H:%M:%S %Y]"
Status(*)	<p>Whether to set Server status monitoring configuration value, Status Url and Allow IP can be configured when Enable is selected.</p>	Default: Enable
Status Url(*)	<p>URL for Server status monitoring.</p>	Default: /jk-status/
Status Allow IP(*)	<p>IP that can access Server status monitoring URL.</p>	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.

Load Balancer			<a href="#">Collapse All</a>												
<a href="#">Overview</a>		<a href="#">Configuration</a>													
<b>Load Balancer List</b>															
<table border="1"> <thead> <tr> <th>Load Balancer ID</th><th>Target Server</th><th>URI Pattern Group ID</th><th></th></tr> </thead> <tbody> <tr> <td>lb_default</td><td>WAS_NODE / was_8180 WAS_NODE / was_8280</td><td>uri_pattern_009 uri_selected_test</td><td></td></tr> <tr> <td>lb_test</td><td>WAS_NODE / was_8380 WAS_NODE / was_ee_8480</td><td></td><td></td></tr> </tbody> </table>				Load Balancer ID	Target Server	URI Pattern Group ID		lb_default	WAS_NODE / was_8180 WAS_NODE / was_8280	uri_pattern_009 uri_selected_test		lb_test	WAS_NODE / was_8380 WAS_NODE / was_ee_8480		
Load Balancer ID	Target Server	URI Pattern Group ID													
lb_default	WAS_NODE / was_8180 WAS_NODE / was_8280	uri_pattern_009 uri_selected_test													
lb_test	WAS_NODE / was_8380 WAS_NODE / was_ee_8480														

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.	

Load Balancer			<a href="#">Collapse All</a>								
<a href="#">Overview</a>		<a href="#">Configuration</a>									
<b>Load Balancer Info</b>											
<table border="1"> <tr> <td>* Load Balancer ID</td> <td>lb_default</td> <td><a href="#">Create</a></td> <td><a href="#">Delete</a></td> </tr> <tr> <td>Load Balancer Detail</td> <td>           * Sticky Session : TRUE            Session Cookie :         </td> <td>* Method : R[esponse]</td> <td></td> </tr> </table>				* Load Balancer ID	lb_default	<a href="#">Create</a>	<a href="#">Delete</a>	Load Balancer Detail	* Sticky Session : TRUE Session Cookie :	* Method : R[esponse]	
* Load Balancer ID	lb_default	<a href="#">Create</a>	<a href="#">Delete</a>								
Load Balancer Detail	* Sticky Session : TRUE Session Cookie :	* Method : R[esponse]									
<b>Load Balancer Worker List</b>											
Node Name	Server Name	Server Type	Redirect	Load Balancing Factor	Route ID	Order					
WAS_NODE	was_8180	Standard	NONE	1	7c6cac1d0b6f06361	<a href="#">↑</a> <a href="#">↓</a> <a href="#">Edit</a>					
WAS_NODE	was_8280	Standard	NONE	1	7c6cac1d0b6f06561	<a href="#">↑</a> <a href="#">↓</a> <a href="#">Edit</a>					
<a href="#">Add Worker</a>											

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.

URI Pattern Group					
* URI Pattern Group ID	uri_default				
Mode	<input checked="" type="radio"/> Standard <input type="radio"/> Manual				
Patterns to be Included	<table border="1"> <tr> <td>/*.jsp</td> <td>lb_default</td> </tr> <tr> <td>/*.do</td> <td>lb_default</td> </tr> </table>	/*.jsp	lb_default	/*.do	lb_default
/*.jsp	lb_default				
/*.do	lb_default				
Patterns to be Excluded	<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>				

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.

Load Balancer Overview		
Load Balancer ID	Target Server	URI Pattern Group ID
lb_default	127.0.0.1:1234	url_default

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.	

The screenshot shows the 'Load Balancer' configuration page. In the 'Load Balancer Info' section, there is a table with fields for Load Balancer ID (lb\_default), Sticky Session (TRUE), Session Cookie (JSESSIONID), Protocol Type (HTTPS), Method (R[equest]), SSL Enable (On), and two checkboxes for SSLProxyCheckPeerExpire and SSLProxyCheckPeerCN. In the 'Load Balancer Member List' section, there is a table with columns for Target Server (127.0.0.1:1234), Protocol Type (https), Redirect (NONE), Load Balancing Factor (1), Route ID, and Order. An 'Add Member' button is at the bottom.

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	<p>Basic information of server that Member points to.</p> <p>Displayed in Node Name/Server Name format for Members managed by LENA Manager, Address:Port format for Members not managed by LENA Manager.</p>	
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.

URI Pattern Group					
* URI Pattern Group ID	url_default				
Mode	<input checked="" type="radio"/> Standard <input type="radio"/> Manual				
Patterns to be Included	<table border="1"> <tr> <td>/*.jsp</td> <td><input checked="" type="checkbox"/> lb_default</td> </tr> <tr> <td>/*.do</td> <td><input checked="" type="checkbox"/> lb_default</td> </tr> </table>	/*.jsp	<input checked="" type="checkbox"/> lb_default	/*.do	<input checked="" type="checkbox"/> lb_default
/*.jsp	<input checked="" type="checkbox"/> lb_default				
/*.do	<input checked="" type="checkbox"/> lb_default				
Patterns to be Excluded					

Table 63. URI Pattern Group (Proxy)

Item (* indicates required values)	Description	Notes
URI Pattern Group ID(*)	<p>Name used for grouping and managing URI patterns.</p> <p>When URI Pattern Group used in Virtual Host, information about which Virtual Host is using it is displayed next to ID.</p>	'uri_' prefix is added when Group is created.
Mode	<p>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.</p> <p>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.</p>	<p>Standard: Input method according to LENA Manager URI Rule</p> <p>Manual: User arbitrary input method</p>
Patterns to be Included	<p>Input URI patterns to pass to WAS. Must select Load Balancer through right Select box to save. Can delete patterns through button.</p>	<p>Asterisk(*) meaning to allow all characters can be used, Hash(#), Equal(=) are not allowed.</p>

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	<ul style="list-style-type: none"> <li>-Indexes prevents showing file list under Document Root when welcome page cannot be found</li> <li>-FollowSymLinks prevents accessing file system other than existing web documents under Document Root via symbolic links</li> </ul>

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)	<p>Provides following types</p> <ul style="list-style-type: none"> <li>• None : Do not allow any directives</li> <li>• All : All directives available</li> <li>• AuthConfig : Allow user authentication directives</li> <li>• FileInfo : Allow document type control directives</li> <li>• Indexes : Allow directory indexing control directives</li> <li>• Limit : Allow host access control directives</li> </ul>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
Format(*)	Sets format for recording logs in log file	Can measure bytes sent and received including request and head using %l 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)

Server Info	
Install Path	/engn001/lenaw/1.3.n/servers/WEB01_8010
* Base Port	HTTP 8010
Welcome Page	index.html index.jsp
Stop Mode	Stop
Document Base	Directory Root Path: /engn001/lenaw/1.3.n/servers/WEB01_8010/htdocs Disable Symbolic Links: <input checked="" type="checkbox"/> Disable Auto Index: <input checked="" type="checkbox"/>
<input checked="" type="button"/> Save	

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	<ul style="list-style-type: none"> <li>• Stop</li> <li>• Graceful Stop</li> </ul>
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)
Disable 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)

The screenshot shows a web-based configuration interface for managing ports. It includes a header with a 'Port' link and a 'Collapse All' button. Below this are two main sections: 'TCP Port' and 'UDP Port'. Each section has a table with columns for Port Alias, Port Number, Protocol Type, and Virtual Host ID. In the TCP Port section, there is one entry: httpPort1, 8090, HTTP. In the UDP Port section, it says 'No data found.'

Table 72. TCP Port

Item (* indicates required values)	Description	Notes
Port Alias(*)	Set Alias of port.	
Port Number	Specify port number.	
Protocol Type	Select protocol type.	

Item (* indicates required values)	Description	Notes
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)

The screenshot shows a configuration interface for 'Connection Info'. It includes fields for 'Send Timeout' (60), 'Client Header Timeout' (60), 'Keep Alive Timeout(s)' (5), and 'Client Body Timeout' (60). A 'Save' button is at the bottom right.

Table 74. Connection Info

Item (* indicates required values)	Description	Notes
Send Timeout(*)	Timeout time set for sending response to client. <b>This is timeout time between two consecutive write operations, not total response transmission timeout time.</b> 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 <b>client does not send header within specified time</b> , request ends with 408(Request Time-out).	Default: 60
Client Body Timeout(*)	Time to read request body information, <b>this is timeout time between two consecutive read operations, not total request body transmission timeout time</b> . 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)

The screenshot shows a configuration interface for 'Process Info'. At the top, there's a header bar with tabs for 'Process Info' (selected), 'Collapse All', and a save button. Below the header, there are two main configuration items: 'Worker Process' set to 2 and 'Worker Connection' set to 1024. Both fields have a small info icon next to them.

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)

[server 5 general enableCustom] | manual/server\_5\_general\_enableCustom.png

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).

The screenshot shows the 'Proxy' configuration page with three main sections:

- Connector Info:** Contains fields for Proxy Read Timeout (300), Proxy Connect Timeout (5), Background ServerFault Check Interval (10), and ServerFault Retry Time (60). A 'Save' button is at the bottom right.
- Load Balancer:** Contains tabs for Overview and Configuration. Under Overview, it shows a single entry: Load Balancer ID (lb\_default) with Target Server (lb\_default) and Pattern (url\_default). A 'Save' button is at the bottom right.
- URI Pattern Group:** Contains fields for URI Pattern Group ID (uri\_default), Mode (Standard selected), and Patterns to be Included (\*.jsp, \*.do, both mapped to lb\_default). It also has a 'Create' and 'Delete' button, and a 'Save' button at the bottom right.

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.

This screenshot shows the 'Connector Info' section of the Proxy configuration interface. It includes fields for Proxy Read Timeout (300), Proxy Connect Timeout (5), Background ServerFault Check Interval (10), and ServerFault Retry Time (60). A 'Save' button is located at the bottom right.

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

Item (* indicates required values)	Description	Notes
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.

Load Balancer ID	Target Server	Pattern
lb_default	TEST_NODE1 / WAS1 TEST_NODE1 / WAS2	uri_default

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.	
Pattern	When Load Balancer is specified for specific URI Pattern, URI Pattern Group ID that the URI Pattern belongs to is displayed.	

The screenshot shows a web-based configuration interface for a load balancer. At the top, there's a navigation bar with 'Load Balancer' and a 'Collapse All' button. Below it, tabs for 'Overview' and 'Configuration' are visible, with 'Configuration' being active. The main area is divided into two sections: 'Load Balancer Info' and 'Load Balancer Member List'. In 'Load Balancer Info', fields include 'Load Balancer ID' (set to 'lb\_default'), 'Method' (set to 'Sticky Session'), 'Session Cookie' (set to 'JSESSIONID'), 'Timeout Retry' (set to 'Off'), and 'Auto Server Fault Recovery' (set to 'On'). Buttons for 'Create' and 'Delete' are also present. In 'Load Balancer Member List', a table lists a single member: 'WAS\_NODE\_01 / SE01\_8080' with 'Route ID' '2a713d37421d06161' and 'Weight' '1'. An 'Add Member' button is available, and a 'Save' button is at the bottom right.

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	

Item (* indicates required values)	Description	Notes
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.

The screenshot shows a configuration interface for a 'URI Pattern Group'. At the top, it displays the group ID 'uri\_default' and the virtual host 'default'. Below this, there are two radio buttons for 'Mode': 'Standard' (selected) and 'Manual'. Under 'Patterns to be Included', there are two entries: '\*.jsp' and '\*.do', each associated with a 'lb\_default' entry in a dropdown menu. There is also a section for 'Patterns to be Excluded' with a single entry 'lb\_default'. At the bottom right is a large blue 'Save' button with a checkmark icon.

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.	<ul style="list-style-type: none"> <li>• Standard: Input method according to LENA Manager URI Rule</li> <li>• Manual: User arbitrary input method</li> </ul>
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)

[server 5 web server proxy enable custom] | manual/server\_5\_web\_server\_proxy\_enable\_custom.png

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).

The screenshot shows the configuration interface for the Net Gateway. At the top, there are tabs for General, Connector, Virtual Host, Logging, Environment, Config Tree, History, Proxy, and Net Gateway. The Net Gateway tab is selected. Below the tabs, there are two main configuration areas: 'Connector Info' and 'Load Balancer'. The 'Connector Info' section contains fields for 'Proxy Timeout' (set to 300) and 'ServerFault Retry Time' (set to 60). The 'Load Balancer' section has an 'Overview' tab selected, showing a table with columns for 'Load Balancer ID' (ib\_default) and 'Target Server'.

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

### 1. Connector Info

Manages basic configuration values of Net Gateway.

This screenshot shows the 'Connector Info' configuration area. It includes fields for 'Proxy Timeout' (300), 'Proxy Connect Timeout' (5), and 'ServerFault Retry Time' (60). A 'Save' button is located at the bottom right.

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
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.

The screenshot shows a web-based interface for managing a load balancer. At the top, there's a navigation bar with 'Load Balancer' and tabs for 'Overview' and 'Configuration'. Below this is a section titled 'Load Balancer Overview' with two main fields: 'Load Balancer ID ~' containing 'lb\_default' and 'Target Server'.

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.	

The screenshot shows the configuration page for a load balancer. It includes sections for 'Load Balancer Info' (with fields for Load Balancer ID set to 'lb\_default' and Method set to 'Least Connection') and 'Load Balancer Member List' (which lists a single member with IP 127.0.0.1, port 3411, and weight 1). There are also 'Create' and 'Delete' buttons for managing members.

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	<ul style="list-style-type: none"> <li>Least Connection : Route to side with fewer connections based on Connection</li> </ul>

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.

<b>Item (* indicates required values)</b>	<b>Description</b>	<b>Notes</b>
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)

[server 5 web server stream enable custom] |

## manual/server\_5\_web\_server\_stream\_enable\_custom.png

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.

Virtual Host List						
Virtual Host ID	IP	HTTP Port	HTTPS Port	Server Name	Connector	Order
default	0.0.0.0	8010		localhost	Enabled	

**Virtual Host Info**

* Virtual Host ID	default					
* IP	0.0.0.0					
* Port	HTTP base_http_default_port (8010)	Enable SSL <input checked="" type="checkbox"/>				
* Server Name	localhost					
Document Base	Directory Root Path <input type="text" value="\${DOC_ROOT}"/>					
	Disable Symbolic Links <input checked="" type="checkbox"/>					
	Disable Auto Index <input checked="" type="checkbox"/>					
Access Log	Alias common <input type="text" value="access_\${INST_NAME}_default_%Y%m%d.log 86400"/>	* Location(file pipe)				
URI	default					
Enable Rewrite	<input type="checkbox"/>					
SSL	* SSLCertificateFile <input type="text"/>					
	* SSLCertificateKeyFile <input type="text"/>					
	SSLPASSWORD <input type="text"/>					
	Use HTTPS Redirect <input type="checkbox"/>					
Enable Custom	<input type="checkbox"/>					

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	
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	

Item (* indicates required values)	Description	Notes
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
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.

The screenshot shows the Net Gateway configuration interface. At the top, there are tabs for 'Proxy' and 'Net Gateway', with 'Net Gateway' being active. Below the tabs, there is a red link labeled 'Virtual Host List'. The main area displays a table with columns: 'Virtual Host ID', 'IP', 'Port', and 'Protocol Type'. A message 'No data found.' is centered in the table. Below this, there is a section titled 'Virtual Host Info' with a 'Cancel' button. This section contains several input fields: 'Virtual Host ID' (with a red asterisk), 'IP' (0.0.0.0), 'Port' (TCP), 'Access Log' (common), 'Alias' (empty), 'Location(file|pipe)' (empty), and 'Load Balancer' (lb\_default).

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	
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.

The screenshot shows the 'Logging' tab selected in a navigation bar. Below it are four configuration sections:

- Log Home:** Contains fields for 'Log Home' (radio buttons for 'default' or 'Enter manually'), 'Retention Days' (set to 30), and a 'Save' button.
- Error Log:** Contains fields for 'Location(file|pipe)' (set to /engn001/lenaw/1.3.3.0/servers/web01\_8000/logs/error\_web01\_8000\_LNYISWB2\_%Y%m%d.log|86400) and 'Log Level' (set to error), followed by a 'Save' button.
- Log Format: Proxy:** Contains fields for 'Alias' (common) and 'Format' (\$http\_x\_forwarded\_for \$remote\_addr \$remote\_user [\$time\_local] \$"\$request" \$status - \$body\_bytes\_sent'), with a 'Save' button.
- Log Format: Net Gateway:** Contains fields for 'Alias' (common) and 'Format' (\$remote\_addr [\$time\_local] \$protocol \$status \$bytes\_sent \$bytes\_received \$session\_time), with a 'Save' button.

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.

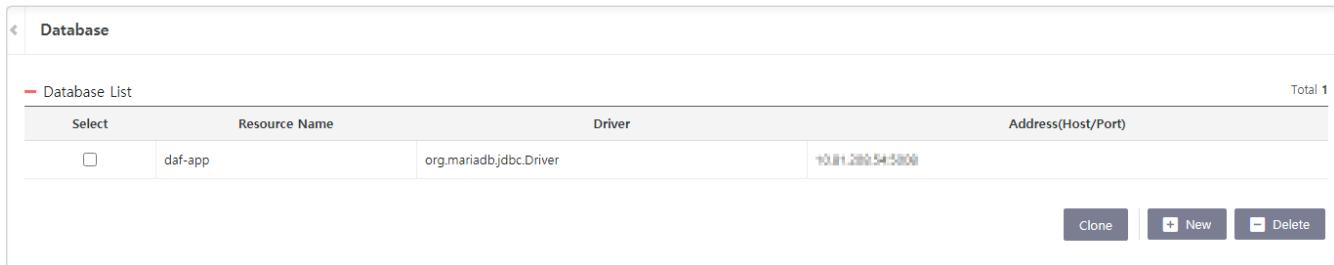
- When using Load Previous button and no more content to query (eg. beginning of file), Alert message that no more data can be read is displayed.

- 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.

# Chapter 5. Resource

## 5.1. Database

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



Database				Total 1
Database List				
Select	Resource Name	Driver	Address(Host/Port)	
<input type="checkbox"/>	daf-app	org.mariadb.jdbc.Driver	10.81.200.54:5808	
				<a href="#">Clone</a>   <a href="#">New</a>   <a href="#">Delete</a>

Figure 7. Database List Screen

### 5.1.1. Database Registration

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

### 5.1.2. Database Modification

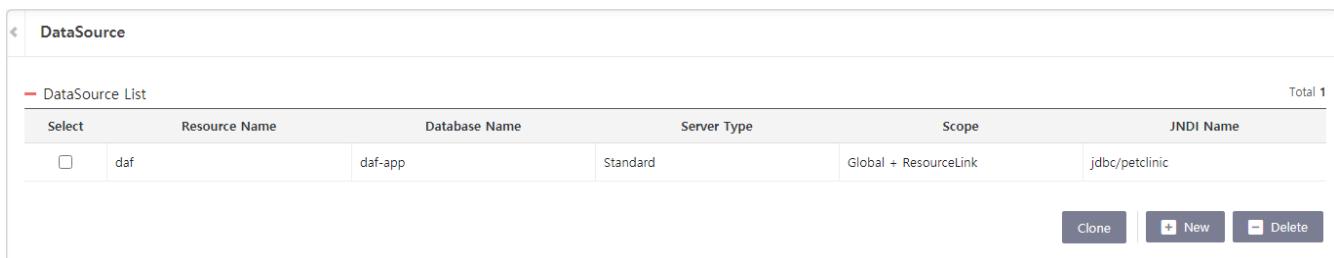
1. Select the checkbox of the Database Resource you want to modify from the Database Resource list.
2. Modify the Database Resource items and save.



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.

## 5.2. DataSource

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



DataSource						Total 1
DataSource List						
Select	Resource Name	Database Name	Server Type	Scope	JNDI Name	
<input type="checkbox"/>	daf	daf-app	Standard	Global + ResourceLink	jdbc/petclinic	
						<a href="#">Clone</a>   <a href="#">New</a>   <a href="#">Delete</a>

Figure 8. DataSource List Screen

## 5.2.1. DataSource Export

The Export function is a feature to download information of previously registered DataSources to the Local Server. DataSource information exported through this function can be reloaded to LENA Manager using the Import function when needed.

### Performing DataSource Export

1. In the DataSource list screen, select one or more DataSources to export through the Checkbox in the Select column.
2. Click the Export button.
3. A compressed file is downloaded.

## 5.2.2. DataSource Import

The Import function is a feature to re-register exported DataSource information to LENA Manager.

### Performing DataSource Import

1. Click the Import button to display the DataSource Dialog on screen.
2. Click the magnifying glass button in the Upload File Input field to load the exported compressed file.
3. Click the Scan button to read the information from the compressed file.
4. Verify that DataSource information is displayed in the table below.
5. Select the DataSource information to perform Import function with Checkbox, then click the Import button below.
6. Verify that the selected DataSource has been added to the DataSource list.

[resource datasource import] | manual/resource\_datasource\_import.png

Figure 9. Import DataSource Dialog Screen

### Understanding Import Status

- When re-importing an already registered DataSource, the Import operation is performed normally.
- When the Database information managed by LENA Manager differs from the Database information the DataSource had at Export time (or if the information doesn't exist), the Import operation is not performed and the Checkbox is in a disabled state.



This is a different function from DataSource Import in the DataSource detail information screen.

## 5.2.3. 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. Configure the detailed settings for DataSource (refer to the detailed item descriptions in [Server DataSource Settings])
4. 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.

- 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.

## 5.2.4. DataSource Modification

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

The screenshot shows the 'Resource' tab of the DataSource configuration interface. It includes a 'DataSource Configuration' section with fields for Resource Name (daf), Server Type (Standard), Driver File (mariadb-java-client-2.2.1-for-java-8-9.jar), Scope (Global + ResourceLink), JNDI Name (jdbc/petclinic), Databases (daf-app), DriverClassName (Maria DB), URL (jdbc:mariadb://10.0.1.208:34308/petclinic), Username (lena), Password (hidden), Encryption Level (Password only), DefaultAutoCommit (selected), and AutoReconnection (false). A 'Save' button is at the bottom right. Below this is a 'Registered Server' section with four entries: WAS-NODE1 (daf-was-01, 10.0.1.208:227, 8480), WAS-NODE1 (daf-was-02, 10.0.1.208:227, 8580), WAS-NODE2 (daf-was-03, 10.0.1.208:228, 8480), and WAS-NODE2 (daf-was-04, 10.0.1.208:228, 8580). Each entry has a 'Connection Test' button. At the bottom right of the 'Registered Server' section is an 'Edit Server List' button.

Figure 10. 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.



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

## 5.2.5. DataSource Deletion

- Select the checkbox of the DataSource Resource you want to delete from the DataSource Resource list.
- 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.

## 5.2.6. 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.

## 5.2.7. 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. Connection information can be viewed in the Resource > DataSource screen.



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.

## 5.3. Application

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

Application			
Application List			
Select	Application Name	Application Type	DocBase
<input type="checkbox"/>	petclinic	war	/engn001/lena/petclinic.war
		<a href="#">Clone</a>	<a href="#">New</a> <a href="#">Delete</a>

Figure 11. Application List Screen

### 5.3.1. 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.
  - o If Application Type is WAR, additional configurable items are displayed. (For detailed settings, refer to [Application Settings](#))
3. Click the **Save button** to save.

### 5.3.2. 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.

Resource			
Application Configuration			
* Application Name	petclinic		
* Application Type	WAR	unpackWAR	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> default
* Context Path	/	privileged	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> default
* DocBase	/engn001/lena/petclinic.war	useHttpOnly	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> default
Application File	petclinic.war	sessionCookieName	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> default
reloadable	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> default	sessionCookieDomain	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> default
cookies	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> default	useNaming	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> default
sessionCookiePath			
<a href="#">Add Attribute</a> <a href="#">Save</a>			
Registered Server			
Node	Server	Address	Port
WAS-NODE1	daf-was-01	10.81.208.227	8480
WAS-NODE1	daf-was-02	10.81.208.227	8580
WAS-NODE2	daf-was-03	10.81.208.228	8480
WAS-NODE2	daf-was-04	10.81.208.228	8580
<a href="#">Edit Server List</a>			

Figure 12. 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.

### 5.3.3. 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.

### 5.3.4. 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.

# Chapter 6. Diagnostics

## 6.1. Monitoring Dashboard

### 6.1.1. Status Summary

The Monitoring Dashboard screen provides 3 tabs at the bottom, and the summary information provided at the top changes according to the selected tab.

The information provided by each tab is as follows.

#### Node Tab

Provides server monitoring information for each registered node

You can set the query cycle for each piece of information, and for WAS, you can move to the detailed monitoring screen by clicking the **popup button** in the Function column.

The Monitoring Dashboard screen is as follows.

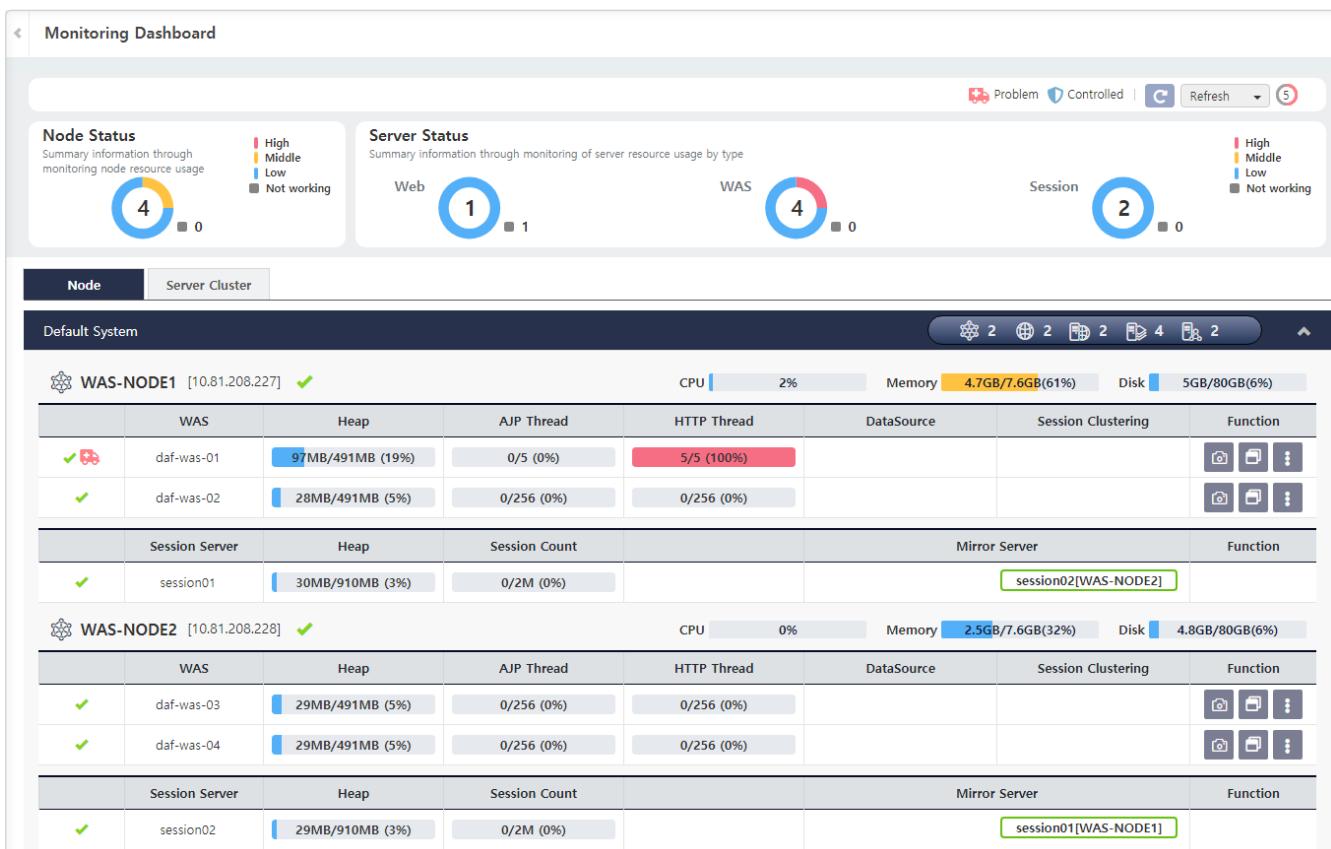


Figure 13. Monitoring Dashboard Node Tab Screen

The attributes used in the Monitoring Dashboard screen are as follows. The colors of information provided in usage rate format can be changed using the Status Range attribute. (Refer to the monitoring basic settings subsection of this chapter)

Table 94. Node Status

Item	Description	Remarks
CPU	Node CPU usage rate	Default setting value is Low when below 60%, High when 80% or above.
Memory	Node Memory usage rate	Default setting value is Low when below 60%, High when 80% or above.
Disk	Node Disk usage rate	Disk usage rate where Engine is installed. Default setting value is Low when below 60%, High when 80% or above.

Table 95. Application Server Status

Item	Description	Remarks
Status	Server start status, diagnostic result issuance ( and automatic response execution ())	Unknown status is displayed when server status cannot be retrieved through Node Agent
Server Name	Server name	
Heap Memory	Heap Memory usage rate used in Application Server	
Thread Pool	Request Thread usage rate managed by Application Server as Pool, displayed by Connector (Ajp, Http)	
DataSource	Datasource Connection usage rate managed by Application Server as Pool	

Table 96. Web Server Status

Item	Description	Remarks
Status	Server start status	Unknown status is displayed when server status cannot be retrieved through Node Agent
Server Name	Server name	
CPU	Web Server process CPU usage rate	
Memory	Web Server process Memory usage rate	
Thread	Web Server Thread count (Active / Max)	

Item	Description	Remarks
Connected WAS	WAS information connected to Web Server and start status	Red indicates stopped state, green indicates running state, black indicates server existing outside the system

Functions to immediately control each server are provided together as follows.

Table 97. Application Server Control Functions

Item	Description	Remarks
Thread Dump	Generate Thread Dump	<b>Left button (Server Snapshot(dump)) &gt;</b> Select Dump List menu > Dump file can be downloaded
Active Service Dump	Generate Active Service Dump	<b>Left button (Server Snapshot(dump)) &gt;</b> Select Dump List menu > Dump file can be downloaded
Heap Dump	Generate Heap Dump	<b>Left button (Server Snapshot(dump)) &gt;</b> Select Dump List menu > Dump file can be downloaded
Forced Stop	Force server shutdown	Immediate forced shutdown without wait time
Forced Restart	Force server restart	Immediate forced restart without wait time

The screenshot shows a 'Current State' section with three main dump types:

- Thread Dump:** Shows one entry: LNMHSWS1\_daf-was-01\_20201210-203531\_tdump.txt (24.95 KB). Buttons: Thread Dump, Download, Delete.
- Active Service Dump:** Shows two entries: LNMHSWS1\_daf-was-01\_20201210-203548\_sdump.txt (218 B) and LNMHSWS1\_daf-was-01\_20201210-203546\_sdump.txt (218 B). Buttons: Active Service Dump, Download, Delete.
- Heap Dump:** Shows one entry: LNMHSWS1\_daf-was-01\_20201210-203535\_hdump.hprof (89.7 MB). Buttons: Heap Dump, Download, Delete.

Figure 14. Dump Window

You can generate and download Heap Dump, Thread Dump, and Active Service Dump. Generally, Dumps are generated to identify causes when errors such as Out Of Memory, excessive Thread Pool usage, service delays, etc. occur on the server.

Click **Thread Dump button**, **Active Service Dump button**, **Heap Dump button** according to the Dump type you want to generate to create the Dump. Generated Dumps are stored within the Host where the Web Application Server exists, Thread Dump is stored in {log\_home}/logs/tdump, Active Service Dump is stored in {log\_home}/logs/sdump, and HeapDump files are stored in {log\_home}/logs/hdump path.



You can delete Dump files by clicking the **Delete button**. You can download Dump files by clicking the **Download button**, and when downloading, the Dump file is downloaded in zip format along with the system status Dump file.

The items in the Dump management screen are as follows.

Table 98. Dump Screen Items

Item	Description	Remarks
File Name	Generated file name	Automatically generated as a string including date
Size	Size of generated file	
Status	System and Server status at the time of Dump execution	CPU and Memory information of the system at the time of Dump generation and main resource usage information of Web Application Server are also generated together when creating the Dump.  You can check the generated Status value by clicking the <b>View button</b>

Table 99. Web Server Control Functions

Item	Description	Remarks
Forced Stop	Force server shutdown	Immediate forced shutdown without wait time
Graceful Stop	Server graceful shutdown	



If monitoring information is not displayed, check whether the registered Node/Server actually exists and whether communication with Node/Server is working properly.

## 6.1.2. Detailed Status Monitoring

You can monitor detailed Thread, Memory, and service information by selecting **middle button (View Detail Chart)** in the Function column of the Monitoring Dashboard.

### System Window

You can check Memory, Thread, and Service information of the Web Application Server.

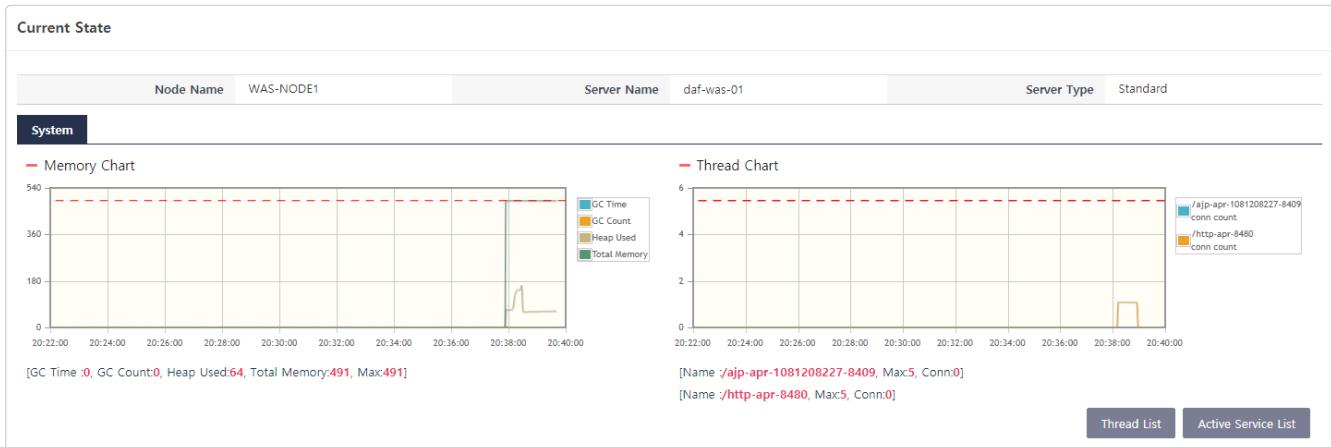


Figure 15. System Tab

### Memory Chart

Real-time Memory usage information is displayed. The provided information includes GC Time (Garbage Collection time), GC Count, Heap Used (Total Memory - Free Memory), and Total Memory (total memory used by the server). The red dotted line in the chart represents the maximum available Heap Memory. Therefore, you should be careful when Heap Memory usage continuously approaches the red dotted line for a long time in a pattern that is not typical GC.



The maximum value of Request Thread can be changed through the `maxThreads` attribute of the corresponding Web Application Server in the Server menu.

### Thread Chart

This is a Line Chart that shows the usage status of Request Threads managed by the Web Application Server as a Pool to process user requests. The red dotted line in the chart represents the maximum available Request Thread. Therefore, you should be careful when the Request Thread count approaches the red dotted line in the chart.



The maximum value of Request Thread can be changed through the maxThreads attribute of the corresponding Web Application Server in the Server menu.

## Thread List

You can check all Threads of the Web Application Server. You can filter based on the output Thread name or Thread status. The Thread List items are as follows.

Table 100. Thread List Items

Item	Description	Remarks
Thread ID	Unique Thread ID	
Name	Thread name	
Stat	Thread status	<p>Three states exist in total</p> <ul style="list-style-type: none"> <li>• RUNNABLE: Available Thread</li> <li>• WAITING: Thread waiting to perform a specific Action of another Thread</li> <li>• TIMED_WAITING: Thread with specified wait time</li> </ul>
CPU	CPU usage time for specified Thread	
Tx Id	Transaction ID	
Elapsed	Time taken for Thread execution	
Service Name	Service name performed by Thread	

You can check the following detailed information by pressing the **+ button**.

Table 101. Thread Detailed Information Items

Item	Description	Remarks
threadId	Unique Thread ID	
threadName	Thread name	

Item	Description	Remarks
State	Thread status	<p>Three states exist in total</p> <ul style="list-style-type: none"> <li>• RUNNABLE: Available Thread</li> <li>• WAITING: Thread waiting to perform a specific Action of another Thread</li> <li>• TIMED_WAITING: Thread with specified wait time</li> </ul>
threadCpuTime	CPU time of all Threads including current Thread	
threadUserTime	CPU time of current Thread	
blockedCount	Total blocked count	
blockedTime	Cumulative elapsed time blocked	
waitedCount	Total count of waiting Threads	
waitedTime	Cumulative elapsed time of waiting Threads	
lockOwnerId	ID of Thread owning locked Object	
lockName	Name of locked Object	
lockOwnerName	Name of Thread owning locked Object	
stackTrace	stackTrace	

## Active Service List

You can check service information and Thread information processing that service. The items within that information are similar to Thread List items, and the following additional items exist.

Table 102. Active Service List Items

Item	Description	Remarks
Sql	Currently executing SQL statement	

## DataSource Window

You can check DataSource information configured in the Application Server.

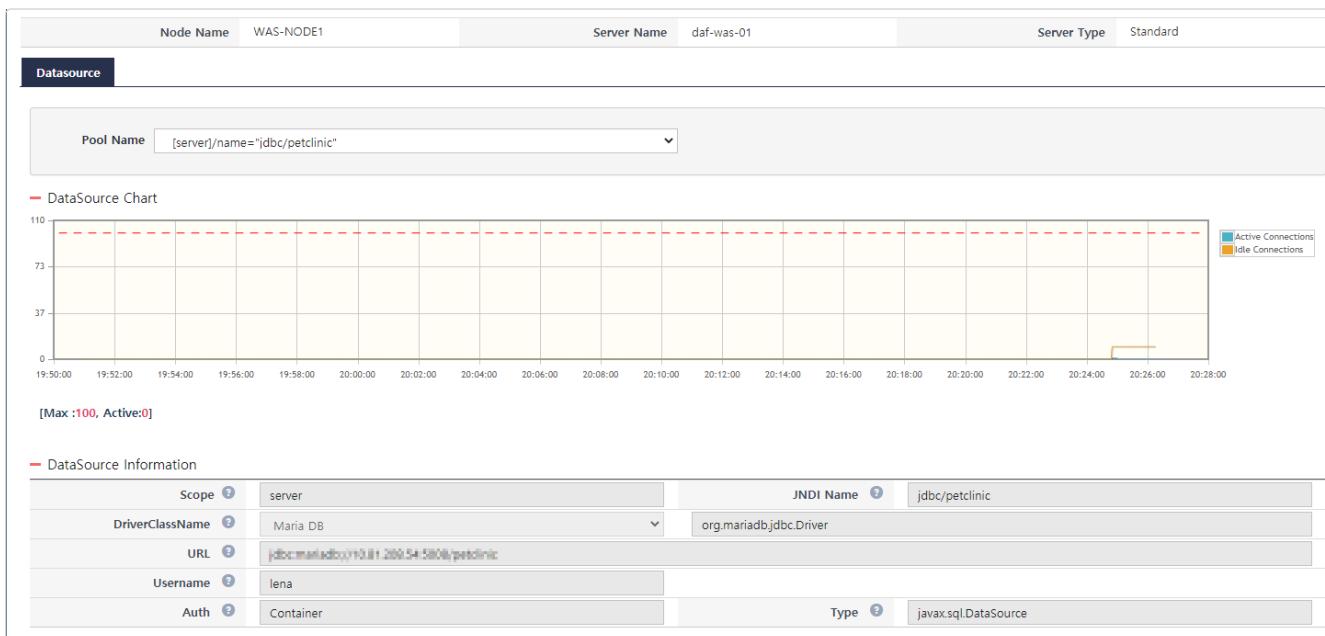


Figure 16. DataSource Tab Screen

## DataSource Chart

Active Connection count and Idle Connection count are displayed in real-time on the Chart. The red dotted line in the chart represents the configured maximum Connection count. You should be careful when Active Connections approach the red dotted line. You can select DataSource from the combo box to monitor other DataSources.



The maximum Connection count can be changed through the maxConnection attribute in the DataSource information registration screen.

## DataSource Information

You can check the configuration information of the specified Datasource.

### 6.1.3. Monitoring Settings

You can set basic monitoring settings in the DIAGNOSTICS > Policy > Common Rule Setting menu. The setting items are as follows.

Table 103. Basic Setting Items Related to Monitoring

Item	Description	Default Value
Status Range	Sets Low, Middle, High criteria for Resources in Monitoring Dashboard.	Less than 60% means Low, 60% or above means Middle, 80% or above means High
Diagnostics Interval	Sets the diagnosis cycle.	10000(ms)
Dump Limit	Dump count limit per Dump (Thread/ActiveService/Heap) directory for each server (0 means unlimited)	200(count)

# Chapter 7. 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.

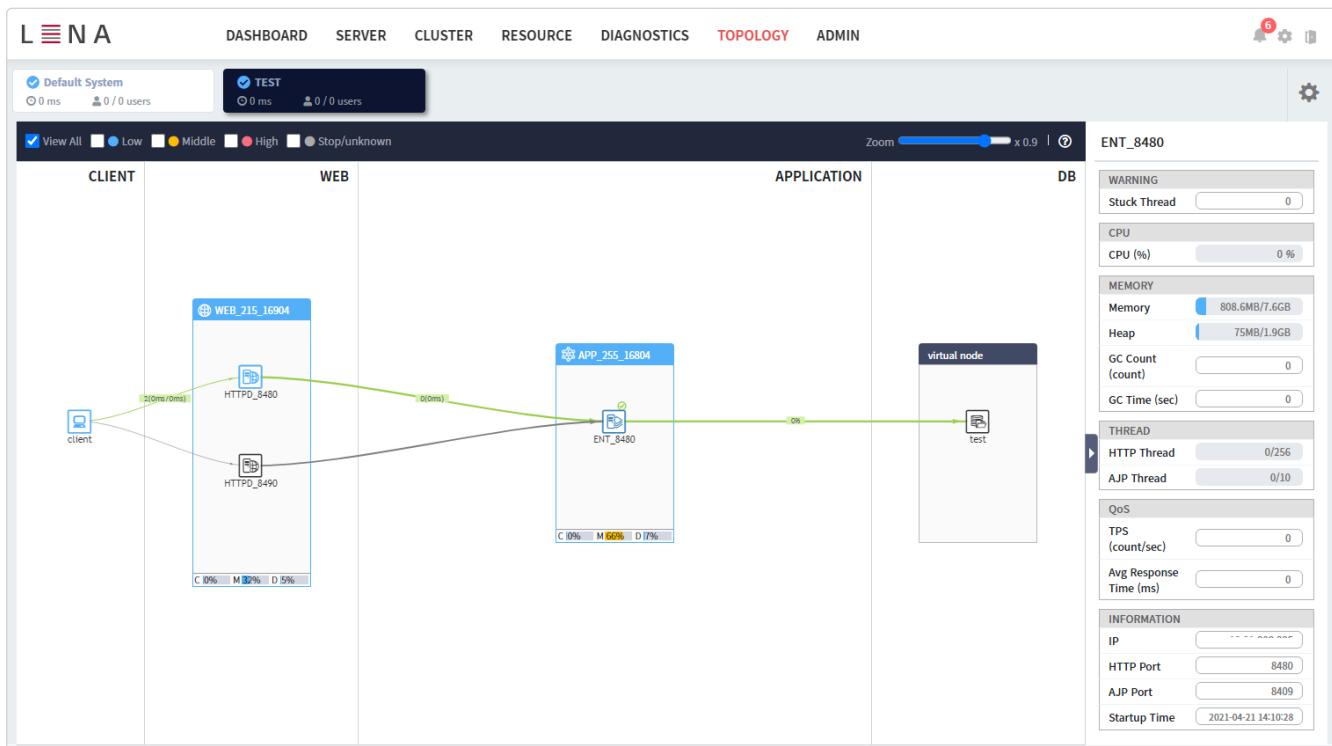


Figure 17. Topology Screen

## 7.1. Screen Configuration

It is divided into System area, Topology area, and Resource monitoring 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
- **Orange circle icon** : When all servers constituting the system have Middle resource usage
- **Red circle icon** : When some servers constituting the system have High resource usage

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 run WEB Server and WAS installed on each Node, and check server status information.

- Resource Monitoring Area

Provides detailed resource monitoring information such as CPU and Memory of Nodes and Servers.

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

## 7.2. 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.

### 7.2.1. Control

Provides detailed monitoring information and control functions from Client to Database from an E2E (End to End) perspective.

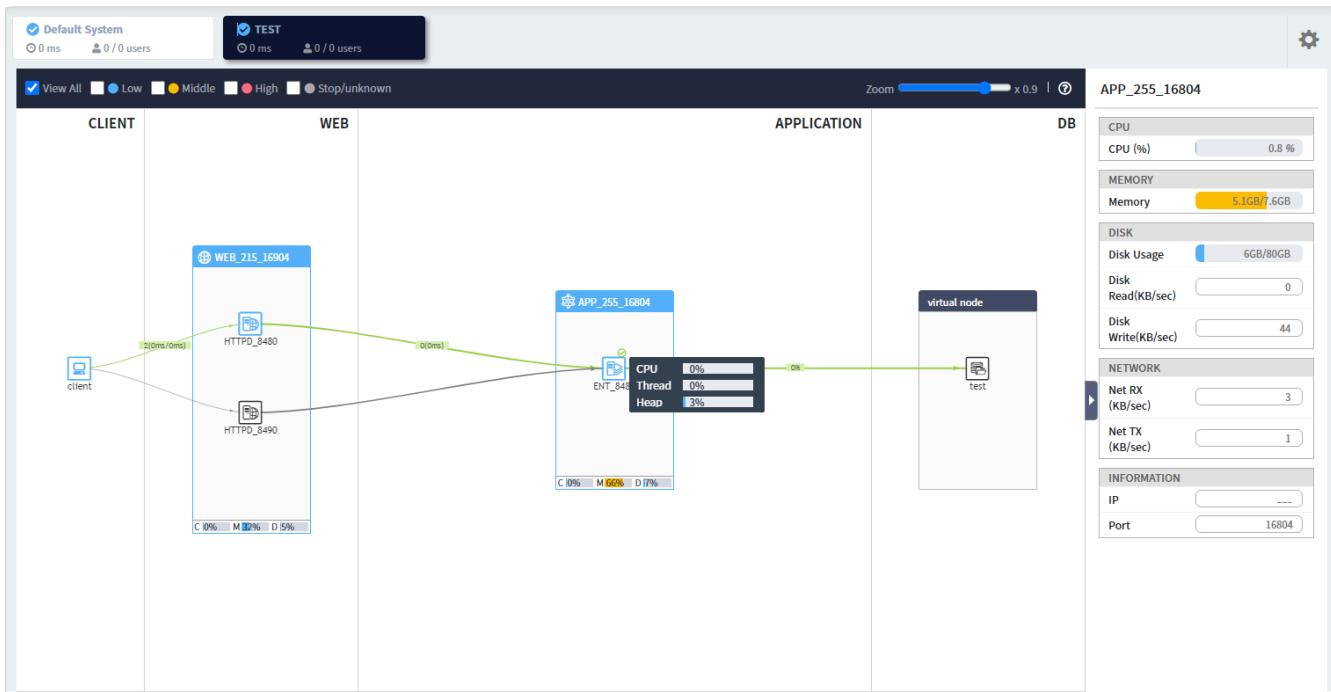


Figure 18. Topology Control

## 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 basically provides CPU, Memory, and Disk status information.

When you hover over a Web Server, it provides server CPU, Memory, and Thread status information in popup format.

When you select a Web Node and Server, real-time detailed monitoring information is provided in the resource monitoring area on the right side of the topology area.

- Node : CPU, Memory, Disk, Network and basic information
- Server : CPU, Memory, Thread, QoS and basic information



The background color of the title area at the top of the node (area where the node name is displayed) appears in the most critical color among the statuses of servers within the node.

- Control Functions

Provides three main control functions for Servers.

## 1. Server Control : Start, Stop, Service Control



Service Control provides zero-downtime timely deployment functionality. This is a method where when an error service occurs, the corrected source is urgently deployed to WAS, and a Web server (timely server) to call this WAS is configured, then Web servers that received requests for the error service forward the service to the timely server to ensure the service is provided normally.

After defining the control time, control conditions (Header, Cookie, URL), and the server to forward requests to, and saving, according to the defined content, incoming requests in real-time are connected to the corresponding server to provide service without server restart.

## 2. Move to : Configuration

### APPLICATION Area

The APPLICATION area provides information about installed WAS Nodes and WAS and allows server control.

- Configuration Information

WAS Node is the area where WAS is installed, and you can check the server installation status by node.

- Monitoring Information

WAS Node basically provides CPU, Memory, and Disk status information.

When you hover over a WAS Server, it provides server CPU, Thread, and Heap status information in popup format.

When you select a WAS Node and Server, real-time detailed monitoring information is provided in the resource monitoring area on the right side of the topology area.

- Node : CPU, Memory, Disk, Network and basic information
- Server : Warning, CPU, Memory, Thread, QoS and basic information



The background color of the title area at the top of the node (area where the node name is displayed) appears in the most critical color among the statuses of servers within the node. For example, if there are 3 servers in a node and one of them is in High status (other servers are in Middle or Low status), the node's title background color is displayed in the color representing High.

- Control Functions

Provides four main control functions for Servers.

1. Server Control : Start, Stop, Forced Stop
2. Manual Check : Thread Dump, Active Service Dump, Heap Dump, Dump List
3. Move to : Configuration, System, Datasource

## DB Area

The DB area provides Database information connected to WAS. Database must be registered in the RESOURCE menu. Nodes are represented as virtual nodes to maintain consistency with other areas. No monitoring information or control functions are provided for each DB.

### Edge Information

Connection lines represent connections between each instance, or between instances and Database, and show the number of connected Connections.

- Client-WEB : Number of Connections
- WEB-APPLICATION : Number of Active Connections
- APPLICATION-DB : Active Datasource usage rate (%)

The End to End monitoring functionality is set to off by default.

Therefore, to view the browser rendering average response time between Client-WEB, WEB-APPLICATION, or the server's average response time, you must configure the following in order:

1. Set diagnostics.e2e.enable=true in the manager.conf file
2. Uncomment the httpd-eum.conf file in the web server's httpd.conf file

 `<IfDefine MOD_EUM>  
 #LENA E2E Monitoring Extension settings  
 Include ${INSTALL_PATH}/conf/extra/httpd-eum.conf <--  
 Uncomment this part  
</IfDefine>`

3. Modify the agent\_enable value to true in the web server's eum/eum.properties file

After enabling E2E settings, the information provided on connection lines is as follows:

- Client-WEB : Number of Connections (Client browser rendering average completion time (ms) / Web Server average response time (ms))
- WEB-APPLICATION : Number of Active Connections (WAS average response time (ms))
- APPLICATION-DB : Active Datasource usage rate (%)

## 7.3. TunA APM

TunA APM is a function that allows easy integration with LENA and TunA APM Tool to conveniently monitor user application performance. It can be used in Linux/Unix OS and VM installation versions based on LENA 1.3.2 version.

Integration and environment configuration can be performed through the sub-menus of the DIAGNOSTICS > TunA APM menu. The TunA APM menu configuration is as follows.

- Connection Management
- Module Management
- Install Management
- Host Management

### 7.3.1. Connection Management

Manages IP Address and Port information of TunA collection server and Web Server. Performs tests to check if connection to TunA collection server is possible based on the IP Address and Port information entered by the user.

#### TunA Connection Information Input

Figure 19. TunA Connection Information Input Screen

#	Item	Description
①	TunA Address	Enter the IP Address of the TunA collection server.
②	TCP Port	Enter the TCP Port of the TunA collection server.
③	TunA Web Address	Enter the TunA Web Server IP Address.
④	HTTP Port	Enter the TunA Web Server HTTP Port.
⑤	<b>Save button</b>	Performs connection test for items ① ~ ④ entered by the user and saves the information to LENA Manager.

When TunA connection is successfully completed, it is displayed on the screen instead of the Save button, and you can modify and delete the previously entered TunA connection information through each button.



Figure 20. TunA Connection Information Input After Action Column

#	Item	Description
①	<b>Edit button</b>	Modifies TunA connection information.

#	Item	Description
②	<b>Delete button</b>	Deletes TunA connection information.

## TunA User Information Input

Figure 21. TunA User Information Input Screen

#	Item	Description
①	User ID	<p>Enter the user to be created in TunA. The prefix 'LENA_' is added to the entered user.</p> <ul style="list-style-type: none"> <li>User name rules: User names can be composed using English letters, numbers, Dash(-), and Underscore(_).</li> </ul>
②	<b>Check button</b>	<p>Validates whether the entered user is correct and whether it is already registered in TunA. If it is a newly registered user in TunA, Owner is displayed in the User Type column, and if it is already registered in TunA, Guest is displayed. After completing this validation, you can enter or specify System Group. System Group is a concept used from TunA v2.6.0 to manage monitoring targets as groups. System Group is the basic unit of monitoring.</p>

Figure 22. New User TunA System Group Input Screen

#	Item	Description
①	User ID	ID entered in user information.

#	Item	Description
②	User Type	User types are divided into Owner and Guest, and new users are displayed as Owner. Owner type users are given permissions to create, delete, and modify System Group lists.
③	Default	Sets the System Group to be used by default. The System Group set here is set as the default System Group when installing the Agent.
④	Name	Enter the System Group name you want to use. <ul style="list-style-type: none"> <li>System Group name rules: System Group names can be composed using English letters, numbers, Dash(-), and Underscore(_).</li> </ul>
⑤	Add System Group	Adds System Group.
⑥	Save	Saves the specified System Group and Default System Group information.
⑦	Cancel	Cancels current unsaved information and returns to the previous state.



The screenshot shows a user interface for managing system groups. At the top, there's a header 'TunA User Information'. Below it, a table has columns: 'User ID' (containing 'LENA\_TESTUSER'), 'User Type' (containing 'Guest'), 'System Group' (with sub-columns 'Default' and 'Name', where 'Default' is 'TESTGROUP' and 'Name' is 'TESTGROUP'), 'Last Update' (containing '2023-06-02 15:29:53'), and 'Action' (containing 'Save' and a cancel icon). Red boxes and numbers are overlaid on the interface to identify specific fields:

- ① is over the 'User ID' field.
- ② is over the 'User Type' field.
- ③ is over the 'Default' column in the 'System Group' section.
- ④ is over the 'Name' column in the 'System Group' section.
- ⑤ is over the 'Save' button.
- ⑥ is over the cancel icon.

Figure 23. Existing User TunA System Group Input Screen

#	Item	Description
①	User ID	ID entered in user information.
②	User Type	User types are divided into Owner and Guest, and existing registered users are displayed as Guest. Guest type users, unlike Owner type users, are not given permissions to create, delete, and modify System Group lists and only have the right to select Default System Group.
③	Default	Sets the System Group to be used by default. The System Group set here is set as the default System Group when installing the Agent.
④	Name	System Group linked to existing registered users.

#	Item	Description
⑤	Save	Saves the specified Default System Group information.
⑥	Cancel	Cancels current unsaved information and returns to the previous state.

## TunA Connection Confirmation

The screenshot shows the LENA Manager interface with the 'DIAGNOSTICS' tab selected. On the left, there's a sidebar with 'TunA APM' expanded, showing 'Connection Management', 'Module Management', 'Install Management', and 'Host Management'. The main area has two tables: 'TunA Connection Information' and 'TunA User Information'. At the bottom right of the main area, there is a red-bordered button labeled 'Open TunA' with a checkmark icon.

Figure 24. Open TunA Button Activated

When all necessary information is entered through TunA Connection Information and TunA User Information, you can use the button that connects to TunA as shown in the attached screen above. When you press the button, the TunA screen is displayed in a new browser window.

### 7.3.2. Module Management

Uploads TunA Agent files to LENA Manager and manages environment settings for TunA Agent. The Agent files provided by TunA consist of TunA Host Agent and TunA Java Agent, and each is provided in tar compressed file format.

The screenshot shows the LENA Manager interface with the 'DIAGNOSTICS' tab selected. On the left, there's a sidebar with 'TunA APM' expanded, showing 'Connection Management', 'Module Management', 'Install Management', and 'Host Management'. The main area has two sections: 'Host Agent Module Information' and 'Java Agent Module Information'. Each section contains an 'Upload' button (marked with a red circle and number) and a 'Save' button (marked with a red box). There are also checkboxes for 'TunA Host Agent' and 'TunA JAVA Agent' respectively, and a 'Use Additional Config' checkbox.

Figure 25. Agent Module Upload Button

#	Item	Description
①	<b>Host Agent Upload button</b>	Opens Upload File dialog to upload TunA Host Agent file. If uploading the file again, it overwrites the previously uploaded file.

#	Item	Description
②	<b>Java Agent Upload button</b>	Opens Upload File dialog to upload TunA Java Agent file. If uploading the file again, it overwrites the previously uploaded file.

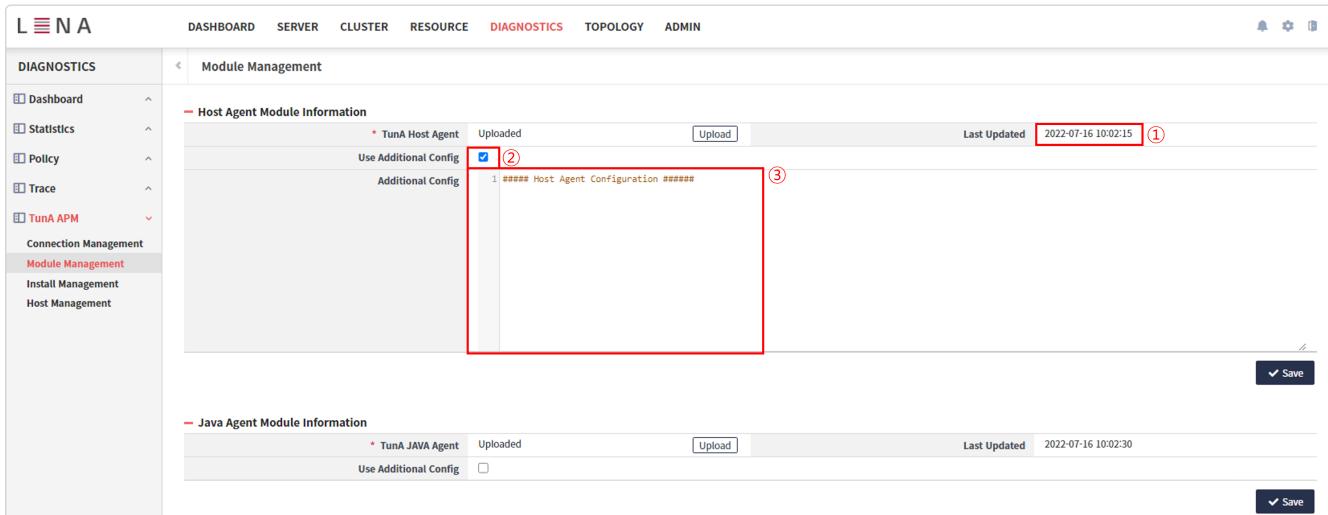


Figure 26. Agent Module Upload After Screen

#	Item	Description
①	Last Updated	Displays the time when the Agent file was uploaded.
②	Use Additional Configuration	Check if there are setting items to be commonly specified for each Agent. When the checkbox is checked, Additional Configuration items are displayed below this item, and when the checkbox is unchecked, Additional Configuration items are not displayed.
③	Additional Configuration	Text box that is activated when Use Additional Configuration is checked, where you write setting items to be commonly specified for each Agent. When installing the Agent in the Install Management step, the content written in this text box is included in the environment configuration file and installed.

### 7.3.3. Install Management

Manages target servers to install TunA Host Agent and TunA Java Agent and installs Agent files on servers.

Figure 27. Install Management Screen

#	Item	Description
①	Host List	List that manages TunA Host Agent installation. Lists of Hosts where Host Agent can be installed and lists of Hosts where Host Agent is installed are displayed.
②	<b>Add Host button</b>	Opens dialog to query and specify lists to be managed by Host List.
③	WAS List	List that manages TunA Java Agent installation. Lists of WAS where Java Agent can be installed and lists of WAS where Java Agent is installed are displayed.
④	<b>Add WAS button</b>	Opens dialog to query and specify lists to be managed by WAS List.

In Install Management, first select the Host or WAS to install TunA Agent and add it to the list (Host List, WAS List).

### Host List Addition / Deletion / Modification

TunA Host Agent can install one Agent per Host. Therefore, in multi-node environments, one specific Node is selected for installation.

Add Host to Host List for installation. Proceed by clicking the Add Host button at the bottom of the Host List Table.

**Adding host**

Please select Node. You can select one Node per Host.

Available host list for TunA

①	Host Name	Host Ip	OS	Node Name	Port	LENA Home	Act. Status
<input type="checkbox"/>	LNLYEWS1	10.81.209.155	Linux	WASNODE_11	▼		
<input type="checkbox"/>	LNLYEWS2	10.81.209.156	Linux	WASNODE_12	▼		

Save Close

**Adding host**

Please select Node. You can select one Node per Host.

Available host list for TunA

②	Host Name	Host Ip	OS	Node Name	Port	LENA Home	Act. Status
<input checked="" type="checkbox"/>	LNLYEWS1	10.81.209.155	Linux	③ WASNODE_11	④ 16800	/engn001/lena/1.3.2.0	Add
<input type="checkbox"/>	LNLYEWS2	10.81.209.156	Linux	WASNODE_12	▼		

⑤ Save Close

Figure 28. Host Addition Dialog Screen

#	Item	Description
①	Available host list for TunA	Refers to the list of Hosts where Host Agent can be installed. Only Hosts containing Nodes registered or installed in LENA Manager can be checked.
②	Action Checkbox	Checkbox for selecting Host.
③	Node Selectbox	Selects Node to perform addition / deletion / modification operations.
④	Action Status	Displays what function will be performed on the Node selected by Node Selectbox. The displayed functions are as follows. <ul style="list-style-type: none"> <li>• Add: Specifies Host's Node and adds it to Host List.</li> <li>• Modify: Changes the specified Node to another Node.</li> <li>• Delete: Deletes the Node from the list.</li> </ul>
⑤	Save button	Performs the specified Action on the selected Node.

## WAS List Addition / Deletion

TunA Java Agent can install one Agent per WAS. Add WAS to WAS List for installation. This operation is performed by pressing the Add WAS button at the bottom of the WAS List table.

① OS	Node Name	Server Name	Port	Path	Act. Status
<input type="checkbox"/> Linux	WASNODE_12	WAS12_8180	8180	/engn001/lena/1.3.2.0/servers/WAS12_8180	
<input type="checkbox"/> Linux	WASNODE_11	WAS11_8180	8180	/engn001/lena/1.3.2.0/servers/WAS11_8180	

② OS	Node Name	Server Name	Port	Path	Act. Status
<input checked="" type="checkbox"/> Linux	WASNODE_12	WAS12_8180	8180	/engn001/lena/1.3.2.0/servers/WAS12_8180	③ Add
<input type="checkbox"/> Linux	WASNODE_11	WAS11_8180	8180	/engn001/lena/1.3.2.0/servers/WAS11_8180	

Figure 29. WAS Addition Dialog Screen

#	Item	Description
①	Available WAS list for TunA	Refers to the list of WAS where WAS Agent can be installed. Only WAS registered or installed in LENA Manager can be checked.
②	Action Checkbox	Checkbox for selecting WAS.
③	Action Status	Displays what function will be performed on the selected WAS. The displayed functions are as follows. <ul style="list-style-type: none"> <li>• Add: Adds WAS to WAS List.</li> <li>• Delete: Deletes the WAS from the list.</li> </ul>
④	Save button	Performs the specified Action on the selected WAS.

## Agent Installation

To install TunA Agent, targets where Agent will be installed must be added to Host List and WAS List as shown in the attached screen below.

The screenshot shows the 'Install Management' section of the LENA interface. On the left, a sidebar lists 'DIAGNOSTICS' sub-sections: Dashboard, Statistics, Policy, Trace, TunA APM, Connection Management, Module Management, and **Install Management**. The 'Install Management' section is currently selected. The main area displays two tables: 'Host List' and 'WAS List'. The 'Host List' table has columns: Host IP, Node Name, Path, and Installed Date. It contains two rows: one for host 10.81.209.133 (Node Name: WASNODE\_11, Path: /engn001/lena/1.32c0) and one for host 10.81.209.134 (Node Name: WASNODE\_21, Path: /engn001/lena/1.32c0). Each row has an 'Install' button. The 'WAS List' table has columns: Node Name, Server Name, Port, Path, and Installed Date. It contains two rows: one for node WASNODE\_11 (Server Name: WAS11\_8180, Port: 8180, Path: /engn001/lena/1.32c0/servers/WAS11\_8180) and one for node WASNODE\_12 (Server Name: WAS11\_8180, Port: 8180, Path: /engn001/lena/1.32c0/servers/WAS11\_8180). Each row has an 'Install' button. Buttons for 'Add Host' and 'Add WAS' are located at the bottom right of each table.

Figure 30. Install Management Screen with Host and WAS Added to Installation Target List

#	Item	Description
①	Host List	List that manages TunA Host Agent installation. Lists of Hosts where Host Agent can be installed and lists of Hosts where Host Agent is installed are displayed.
②	<b>Install button</b>	Installs TunA Host Agent on Host. When installation is completed normally, the time when Agent was installed is displayed.
③	WAS List	List that manages TunA Java Agent installation. Lists of WAS where Java Agent can be installed and lists of WAS where Java Agent is installed are displayed.
④	<b>Install button</b>	Installs TunA Java Agent on WAS. When installation is completed normally, the time when Agent was installed is displayed.

### 7.3.4. Host Management

Control and individual environment setting management of TunA Host Agent that performed installation work in Install Management is performed in Host Management.

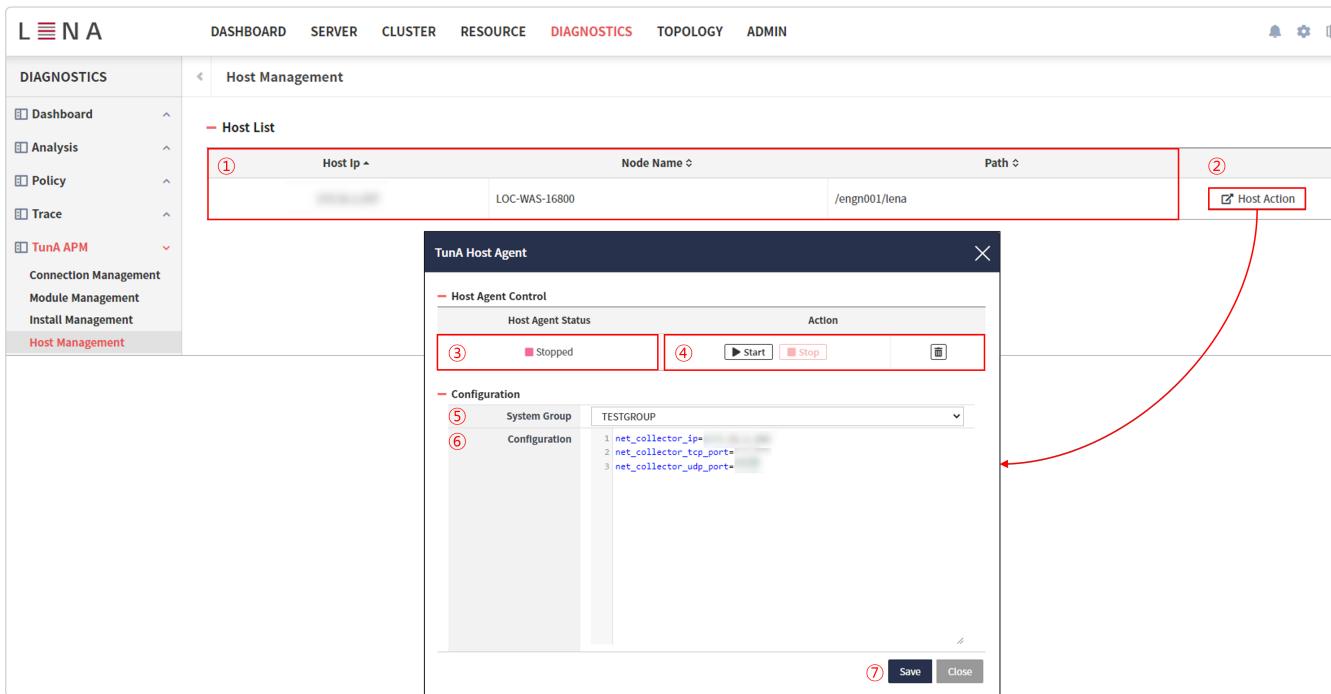


Figure 31. Host Management Screen

#	Item	Description
①	Host List	Displays list of Hosts where TunA Host Agent is installed.
②	<b>Host Action button</b>	Opens dialog to check status and perform control of TunA Host Agent.
③	Host Agent Status	Displays status of TunA Host Agent. The statuses that can be displayed are as follows. <ul style="list-style-type: none"> <li>Started: TunA Host Agent is in running state.</li> <li>Stopped: TunA Host Agent is in stopped state.</li> </ul>
④	<b>Action button</b>	Starts, stops, or deletes TunA Host Agent. Deletion is only activated when TunA Host Agent is in stopped state.
⑤	System Group	Selects System Group to which Host Agent belongs.
⑥	Configuration	Modifies Host Agent settings.
⑦	<b>Save button</b>	Saves modified Host Agent settings.

### 7.3.5. TunA Settings in WAS

Control and individual environment setting management of TunA Java Agent that performed installation work in Install Management is performed in the TunA tab of the WAS setting management screen.

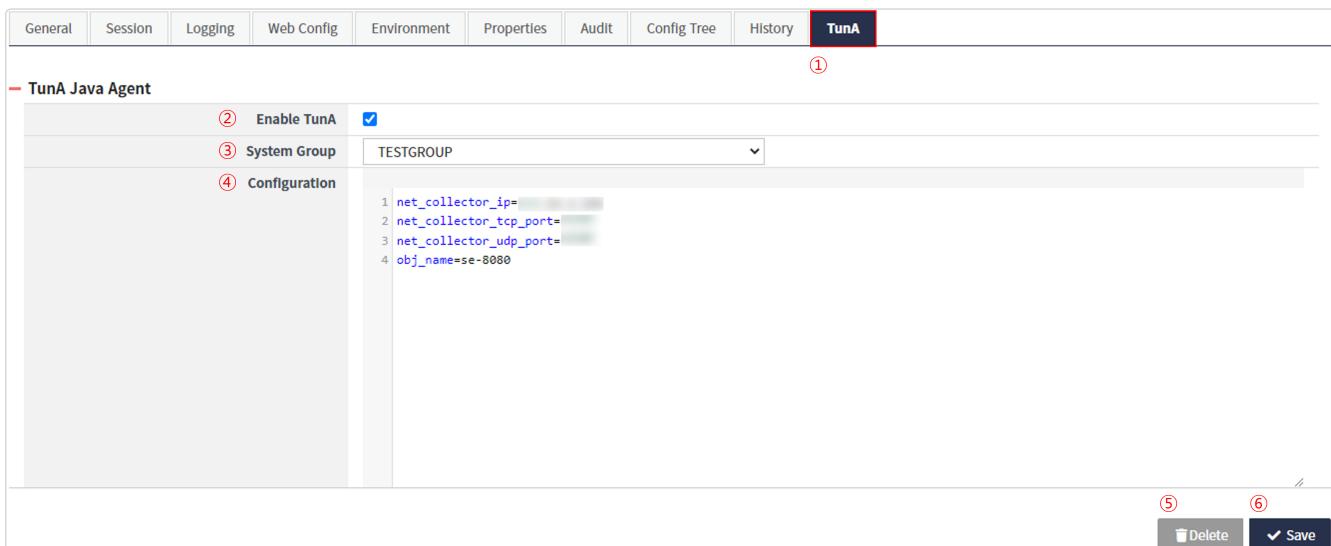


Figure 32. WAS - TunA Tab Screen

#	Item	Description
①	TunA Tab	Manages TunA Java Agent in the TunA Tab screen. When the TunA Tab is pressed, if the user is not registered or TunA Java Agent is not installed on WAS, a message requesting user registration and Agent installation is displayed on the screen.
②	Enable TunA Checkbox	Checks whether to use TunA Java Agent. This item is reflected when WAS starts.
③	System Group	Selects System Group to which Java Agent belongs.
④	Java Agent Configuration	Provides function to check and modify TunA Java Agent settings.
⑤	<b>Delete button</b>	Deletes TunA Java Agent. Only activated when WAS is in stopped state.
⑥	<b>Save button</b>	Saves TunA Java Agent settings.

# Chapter 8. Admin

## 8.1. IAM

Manager provides user management and menu permission management functionality for each user.

### 8.1.1. Users (User Management)

#### User List

The ADMIN > Users menu provides functionality to create, modify, and delete Manager users.

The screenshot shows a table with columns: \* User ID, \* User Name, \* Password, Change User ID, and Last Update. The table contains three rows of data:

* User ID	* User Name	* Password	Change User ID	Last Update
REST_API	REST API only	admin		2021-06-09
admin	administrator	admin		2014-12-04
lena@lgcns.com	administrator	admin		2014-12-04

At the bottom, there are buttons for New, Save, Previous, Next, and a search bar.

Figure 33. Users Screen

The properties of user management are as follows.

Table 104. User Management Properties

Item (* indicates required)	Description	Remarks
User ID(*)	User identifier	
User Name(*)	User name	
Password(*)	User password	Password must be at least 8 characters combining special characters, numbers, and letters
Updater	User who modified and created the user data	
Last Update	Date when user data was modified and created	
+ Icon	Click <b>New button</b> , <b>Edit button</b> to indicate that selected permission information is being changed	
- Icon	Click <b>Delete button</b> to indicate that selected permission information has been deleted	



By default, two users with administrator privileges are provided. (For emergency use) It is recommended to add users beyond the provided users for use.

## User Registration

1. Click **New button** to prepare for new user registration.
2. Enter User ID, User Name, and User Password.
  - User passwords are encrypted and stored.
  - Passwords should be 8-20 characters combining uppercase/lowercase letters, numbers, and special characters (!@#\$%^\*+=-).
3. Click **Save button** to save user information.



- Password encryption uses hash algorithm (SHA-512).

## User Modification

1. Select the user to modify.
2. Click **Edit button** to change the user name and user password.
  - User passwords are encrypted and stored.
3. Click **Save button** to save user information.
  - If login to Manager fails 7 times or more, the corresponding ID becomes locked and cannot be used.
  - To unlock the locked status, the password for that ID must be modified in the user management screen.
  - If there is no user logged into Manager to modify the password, you can run \$LENA\_HOME/bin/reset-manager-pw.sh to modify the password.



## User Deletion

1. Select the user to delete.
2. Click **Delete button** to change the user to deletable status.
3. Click **Save button** to save user information.



Users cannot be deleted when only one user remains.

### 8.1.2. Auths (Permission Management)

Manager must create permission groups for menu-specific permission management. You can create, modify, and delete permission groups through the ADMIN > Auths menu.

#### Permission List

Auths					
Auth List					
* Auth ID	* Auth Name	Description	Change User ID	Last Update	
serverAdmin	Server Admin	Server Admin	admin	2014-12-04	
1 to 1 of 1					
Previous		1	Next		

Figure 34. Auths Screen

The properties of permission management are as follows.

Table 105. Permission Management Properties

Item (* indicates required)	Description	Remarks
Auth ID(*)	Permission identifier	
Auth Name(*)	Permission name	
Description	Description of the registered permission	
Updater	User who modified and created the permission data	
Last Update	Date when permission data was modified and created	
<b>+ Icon</b>	Click <b>New button</b> , <b>Edit button</b> to indicate that selected permission information is being changed	
<b>- Icon</b>	Click <b>Delete button</b> to indicate that selected permission information has been deleted	

## Permission Creation

1. Click **New button** to prepare for new permission registration.
2. Enter Auth ID, Auth Name, and Auth Description.
3. Click **Save button** to save permission information.

## Permission Modification

1. Select the permission to modify.
2. Click **Edit button** to change the permission name and permission description.
3. Click **Save button** to save permission information.

## Permission Deletion

1. Select the permission to delete.
2. Click **Delete button** to change the permission to deletable status.
3. Click **Save button** to save permission information.

### 8.1.3. User-Auth Mapping (User Permission Management)

Manager users must belong to at least one group to acquire menu usage permissions. Administrators can select permission groups to assign users. Select one of the permissions registered through the "Permission Management" screen and use various shuffle buttons to control user permissions.

#### User Permission Inquiry

The screenshot shows the 'User-Auth Mapping' interface. At the top, there's a dropdown menu labeled 'Select Auth' with 'Server Admin' selected. Below it is a section titled 'User List by Auth' with two tables: 'Selectable users' and 'Selected users'. The 'Selectable users' table has one row: 'admin' (ID) and 'administrator' (Name). The 'Selected users' table has two rows: 'REST\_API' (ID) and 'REST API only' (Name), and 'lena@lgcns.com' (ID) and 'administrator' (Name). Between the two tables are four shuffle buttons: 'Single Right' (top-left), 'All Right' (top-right), 'Single Left' (bottom-left), and 'All Left' (bottom-right). A 'Save' button is located at the bottom right of the screen.

Figure 35. User-Auth Mapping Screen

The properties of user permission management are as follows.

Table 106. User Permission Management Properties

Item	Description	Remarks
Permission Name Selection	Combo box composed of permission lists registered through the "Permission Management" screen	
ID	User identifier	
Name	User name	

#### User Permission Mapping

1. Select the permission to assign the user to.
  - o When selecting permissions, selectable users and selected users are displayed on the screen.
2. Select selectable users.
3. Assign or exclude users.
  - o Click **Single Right Shuffle Button** to assign the selected user.
  - o Click **All Right Shuffle Button** to assign all users.
  - o Click **Single Left Shuffle Button** to exclude the selected user.
  - o Click **All Left Shuffle Button** to exclude all users.
4. Click **Save button** to save user permission management information.

### 8.1.4. Menu-Auth Mapping (Menu Permission Management)

You can configure accessible menus for each permission created in LENA Manager. Select one permission among the permissions created through permission selection to configure menus. Select the menu to configure access control from the menu list showing all menus registered in LENA Manager and configure menu permissions.

## Menu Permission Inquiry

The screenshot shows the 'Menu-Auth Mapping' screen. On the left, there is a navigation tree with categories like ADMIN, IAM, License, Security, Patch, Preferences, CLUSTER, and sub-items such as IAM, Users, Auths, User-Auth Mapping, etc. A dropdown menu at the top left is set to 'Application Admin'. On the right, there are two panels: 'Select Auth' which contains a dropdown for 'Auth' with 'Y' and 'N' options, and 'Auth of Menus' which lists 'IAM' and 'Users' with their respective 'Auth' status (Y or N). A 'Save' button is located at the bottom right.

Figure 36. Menu-Auth Mapping Screen

The properties of menu permission management are as follows.

Table 107. Menu Permission Management Properties

Item	Description	Remarks
Permission Name Selection	Combo box composed of permission lists registered through the "Permission Management" screen	
Menu Name	Menu name selected from the left menu list among menus registered in LENA Manager	
Auth	Indicates whether the selected permission can access the menu	Default "N"



When adding Node, Server, Resource in the sub-screens of "SERVER", "RESOURCE" menus, the added items are automatically displayed in the menu list of the "Menu Permission Management" screen.

Therefore, to add new menus, register and create each item in the "SERVER", "RESOURCE" sub-screens.

## Menu Permission Mapping

1. Select the menu to configure permissions.
  - o When selecting permissions, permissions for menus are also displayed.
2. Select the menu to configure permissions from the menu list.
  - o When selecting a menu, menu permissions are displayed in the menu permission list.
3. If permission changes are needed, select Y or N.

4. Click **Save button** to save menu permission information.

## 8.2. License

Manager provides functionality to view and renew currently applied licenses for each node.

### 8.2.1. License List

When you open the License screen, you can view the list of currently applied licenses by node.

You can verify the license status by checking the Status item.

	Node Name	System Name	Type	Core	Instance	License Term	Status
<input type="checkbox"/>	WAS_NODE_01	Trial System	Trial	UNLIMITED	UNLIMITED	2023/05/11 ~ 2023/06/10	Will be expired
<input type="checkbox"/>	WEB_NODE_01	Trial System	Trial	UNLIMITED	UNLIMITED	2023/05/11 ~ 2023/06/10	Will be expired
<input type="checkbox"/>	SERVER02-WAS	Trial System	Trial	UNLIMITED	UNLIMITED	2023/05/11 ~ 2023/06/10	Will be expired
<input type="checkbox"/>	SERVER02-WEB	Trial System	Trial	UNLIMITED	UNLIMITED	2023/05/11 ~ 2023/06/10	Will be expired

1 to 4 of 4      Previous 1 Next

[Check System Info](#) [Check Configuration](#) [Check Time Info](#)  [Upload](#)  [Restore](#)

Figure 37. License List Screen

### 8.2.2. License Details

When you click on a license in the license list, you can verify the detailed information of the license.

The detailed information items are as follows.

Table 108. License Detail Information Items

Item	Description	Remarks
Node Name	Node name	
Type	License classification	Trial, Standard
Customer Name	Purchasing customer company name	
System Name	Installed system name	
Issue No	License issue number	
Issue Date	License issue date	
License Term	License allowed period	
Lena Home	Lena Home path	
IP Address	Node's IP address	
Hardware ID	ID that recognizes H/W	MAC Address or Host name

Item	Description	Remarks
Contract CPU Core Limit	Maximum core count under contract	
CPU Core Limit	Actually measured core count	
Contract Instance Limit	Maximum instance count under contract	
Instance Limit	Actually measured instance count	
Contract Type	Contract type	Subscription, Perpetual
Node Type	Node type	WEB, WAS, MDS
LENA Version	LENA version	
Status	License validity status	



Notification messages are provided 15 days before the license expiration date. You can verify notification messages from the **bell icon** in the upper right corner of Manager.

### 8.2.3. License Upload / Recovery

#### Upload

Select the node to apply a new license from the node list and use the **Upload button** at the bottom of the list. When you click this button, a license upload popup window opens where you can find and upload the issued license file, and the license will be applied to the selected nodes.

#### Recovery

Select the node to recover the license from the node list and use the **Restore button** at the bottom of the list. When you click this button, the license is recovered from the backup file.

### 8.2.4. License-related System Status Check

In the license list view screen, select a Node and click **Check System Info button**, you can verify the system status required for license issuance.

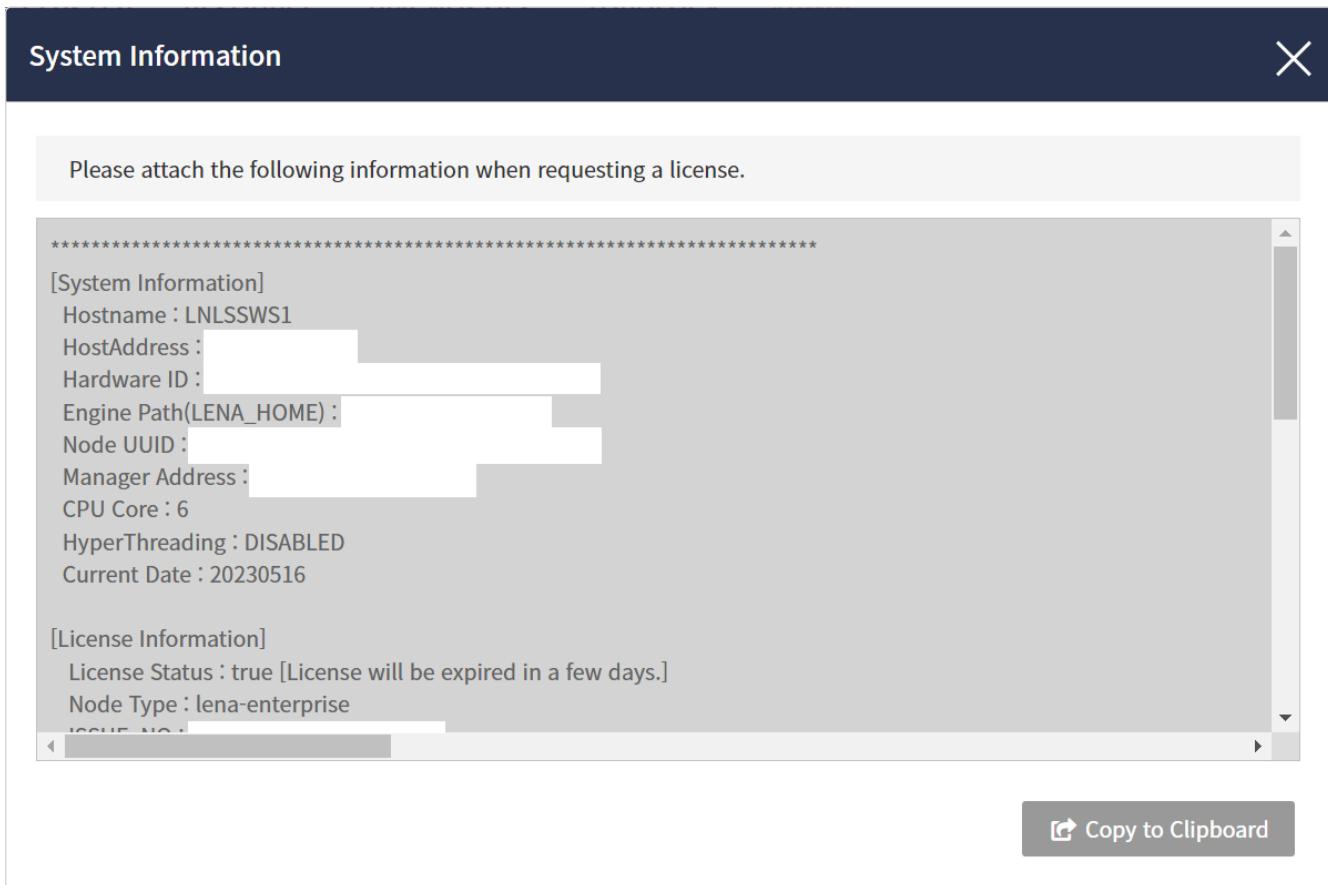


Figure 38. System Information

Shell Scripts are also provided in CLI environment to check license status for each node. The shell file is \${LENA\_HOME}/bin/check-license.sh. An example of the result of running this script is as follows.

## check-license.sh Execution 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 :
H2VaDEE9fjF1vHBRsQeGXasYT514tBc6ebayNIdtVZ5/1j4/EM0mYf38karMTKgcLLmPMMFa8BOEft
5zRfBc/Ii0x1mDgy
j0+iq30ABfJoyAhY3nWBVJhBy7h0U3hzJWr1hyCuZMFAHquL4dinwWAqmJeL+jntJKFufD38vdF2Yw
KEoRNH9dGQnqXZHO
U8wQZmN4UHk5YB5/06YIUffNGU3wyzjfKCFF9Golu9zQAsSZ358ptjC/TBuY+ccvLa75H32XPxiNSS
xytn0hGFbcVc61kv
zi7YMNUnuEyDEQ/dhFKxJ17ijUQBZj5xbFQ9qUTzL1QKGLl+cbYVs6kvZg==
*****
```

The output items are the same as described in the previous section, and since they output basic information required for license issuance, they are utilized when requesting license issuance.



Among the output items, "HyperThreading" checks whether HyperThreading is used, and when HyperThreading is used, the core count is calculated as 2 times the physical core count.

### 8.2.5. Host-based License Check Configuration

License checks the target H/W according to the contract using Mac Address or Host name. Since the default configuration is based on Mac Address, to execute license check based on Host name, for Linux/Unix OS, open the start-agent.sh, check-license.sh files located in \${LENA\_HOME}/bin and each Application Server's setenv.sh file and modify them as follows.

start-agent.sh File Configuration (Add to variable \$JAVA\_OPTS)

```
JAVA_OPTS="$\{JAVA_OPTS\} -Dlicense.check-type=hostname"
```

check-license.sh File Configuration (Uncomment the following item)

```
_JAVA_OPTS="$\{_JAVA_OPTS\} -Dlicense.check-type=hostname"
```

Each Application Server's setenv.sh File Configuration (Uncomment the following item)

```
CATALINA_OPTS=" \$\{CATALINA_OPTS\} -Dlicense.check-type=hostname"
```

### 8.2.6. Time Information Inquiry

In the license list, select the node for which you want to check time information, then click **Check Time Info button**, you can verify the time and timezone information for the selected nodes.

## 8.3. Security (Service Control)

This is a functionality to restrict user requests to Application Server based on IP or URL.

### 8.3.1. Rule Setting (Rule Configuration)

When you want to control requests from specific IPs or URLs, configure new rules through the screen. Provides search functionality for convenience in new rule configuration and rule deletion. Server attributes applied to all applications can be processed as error pages.

The screenshot shows the 'Rule Setting' interface. At the top, there's a search bar with 'Rule Type' set to 'All' and a 'Search' button. Below it is a table titled 'Rule Setting' with one row listed. The table columns are 'Rule Name', 'Rule Type', 'Description', and 'In Use'. The row shows 'JOB', 'IP with DateTime', 'PM-JOB', and a checked 'In Use' box. Below the table are two buttons: '+ New' and 'Delete'. Underneath the table is a 'Rule Detail' section with fields for 'Rule Name' (JOB), 'Description' (PM-JOB), 'Rule Type' (Control with IP and Time), 'Allow/Deny IP' (Allow IP [redacted] Deny IP [redacted]), 'Control Time' (2023-05-16 ~ 2023-05-18), and 'Error Message(HTML)' (Error). A 'Save' button is at the bottom right.

Figure 39. Rule Setting Screen



The Use column in the Rule list indicates whether the corresponding rule is applied to the Application Server.

The configurable properties when adding rules are as follows.

Table 109. Configurable Properties When Adding Rules

Item (* indicates required)	Description	Remarks
Rule Name(*)	Name of the rule to add	
Description	Description of the rule to add	
Rule Type	Unit to control	IP, URL
Allow IP(*)	IP addresses to allow requests from	Can be entered in regex format
Deny IP(*)	IP addresses to deny requests from	Can be entered in regex format
Control Time(*)	Time unit to apply the rule	
Error Message(HTML)(*)	Error page to display for requests filtered by control	



If you apply a rule with control type "IP with DateTime" to an Application Server that is relayed through a Proxy Server, you may not be able to apply the rule because User IP cannot be obtained due to the Proxy Server's security characteristics.



Applied rules among created rules cannot be deleted.

### 8.3.2. Rule Applying (Rule Application)

Select one of the added rules to apply to the Application Server. Provides search functionality for rule

type, application unit, and rule name for convenience in application.

Select one from the rule list and use **shuffle buttons** in rule application to select the target to apply, then click **On/Off button** to apply and save. To exclude from the application target, also use **shuffle buttons** to exclude.

The screenshot shows the 'Rule Applying' interface. At the top, there are filters for 'Rule Type' (set to 'All') and 'Rule Name', followed by a 'Search' button. Below this is a table titled 'Applied Rule List' with one entry: 'IP with DateTime' (Rule Type), 'ddd' (Rule Name), 'ee\_9920' (Target Server), and a status icon. Underneath is a section titled 'Apply Rule' with two tables: 'Selectable Server List (Apply Off)' and 'Selected Server List (Apply On)'. Both tables show a single row for 'NODE01-WAS' with 'se\_9910' as the server name. Between the tables are four shuffle buttons (two up, two down). At the bottom right is an 'On/Off' button.

Figure 40. Rule Applying Screen

The properties used in the rule status and application screen are similar to the rule configuration screen, and the following properties are additional properties.

Table 110. Additional Properties

Item	Description	Remarks
Node Name	Node name under the registered system	
Server Name	Server name under the registered node	



When new targets are added to the selected rule, they are added to server.xml or context.xml according to the application unit, and when excluding from the applied targets, the rule configuration added to the above configuration files is deleted.

### 8.3.3. Service Control Log (Rule Application Result Inquiry)

The processing results for items with applied rules are output as a list. Provides search functionality for rule type, application unit, rule name, and log time for convenience in processing result verification.

The screenshot shows the 'Service Control Log' interface. At the top, there are filters for 'Rule Type' (set to 'All'), 'Rule Name', and a date range ('Controlled Date' from 2023-06-26 to 2023-06-27), followed by a 'Search' button. Below this is a table titled 'Service Control Log' with columns: 'Controlled Date', 'Address', 'Request URL', 'HTTP Method', and 'Rule Name'. A message at the bottom states 'No data found.' Total 0 is indicated at the top right.

Figure 41. Service Control Log Screen

The properties used in the processing list are as follows.

Table 111. Log Information Items

Item	Description	Remarks
Controlled Date	Processing time of the request with applied rule configuration	
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, you must configure the access filter log aggregation listener usage in the Manager's /conf/manager.conf configuration file to true. Logs are recorded in the access\_filter.log."date".txt file in each server's logs folder, and Manager periodically aggregates logs from each server and stores them in the database. (At this time, aggregated logs are backed up in access\_filter\_log."date".txt.gathered file) Aggregated logs in the database can be verified in the processing list screen.



The configuration example for the configuration file item in manager.conf is as follows.

```
#Whether to use access filter log aggregation listener and
operation cycle (seconds) default is false, 60
accessfilter.listener=false
accessfilter.interval=60
```

## 8.4. Notification configuration

You can configure notifications to be displayed in Manager and SNS information to be linked with notifications.

### 8.4.1. Manager Notification

When you open the Manager Notification menu, you can verify currently active notifications, and levels are classified as Critical, Warning, and Info.

If you uncheck the notification checkbox and save, even if a notification occurs, it will not be displayed on the bell icon.

Notifications that are not displayed on the icon can be verified by clicking the Notification Detail button in the upper right corner of the popup that appears when you click the bell icon.

### 8.4.2. SNS Notification

You can manage SNS information to be linked with notifications generated in Manager.

It operates based on WebHook and can be linked with SNS at the system level.

Table 112. Detailed Information Items for SNS to be Linked

Item	Description
Name	Name specified by the user
System	Name of the system to be linked
DuplicateTime(s)	If the same notification occurs consecutively within DuplicateTime(s), it is not linked to SNS.
Request	Method to send the request
Encoding	Encoding of the request
Header	You can input the request header, and if using multiple headers, separate them with line breaks.
Body	You can input the request body, and the replaceable parameters are as follows: \${alarmLevel} - Level of the generated alarm, \${message} - Message content
Webhook URL	URL to send the request to
SSL	Whether SSL authentication is required

Table 113. Types of Notifications to be Linked with SNS

Item	Description
AUDIT	When a notification occurs from items specified in the server's Audit configuration
DIAGNOSTICS	When a notification occurs that violates the DIAGNOSTICS Rule configured on the server
LICENSE	When a LICENSE-related notification occurs
INFO	When a notification related to server information occurs

After entering the configuration items, you can verify whether the request works normally through the Test button.

If the test is successful, save it through Save, then configure the item's on/off toggle to on to enable the linkage.

## 8.5. Patch

Provides patches for functional improvements and bug fixes of installed LENA.

Patches are provided in compressed file format and operate as independently running Java processes.

Patch functionality can be executed through CLI and Management UI, and in case of service issues during patching, you can restore to the original state through the Restore functionality.

The patch sequence is as follows.

1. Patch file upload

2. Manager patch application
3. Node patch application
4. Server (Application Server, Session Server) patch application
5. Patch commit

The recovery sequence is as follows.

1. Server patch recovery
2. Node patch recovery
3. Manager patch recovery
4. Recovery commit

Refer to the Appendix for CLI patching methods.

### 8.5.1. Overview

Provides patch file upload functionality and displays patch reflection status information for Manager and each Node's Node Agent.

#### Patch File Upload

The Patch Info area displays detailed information of the highest version among patch files uploaded to the manager.

Table 114. Patch Info Items

Item	Description	Remarks
Patch File Ver.	Version information of the patch file	
Release Date	Release date of the patch file	
Patch Note	Click <b>Detail (Note) button</b> to view detailed patch note content.	Patch note popup display

The process of uploading patch files is as follows.

1. Click **Upload button**.
2. Verify if it's in patchable status, and if normal, display a popup for patch file upload



#### Patchable Status Conditions

1. All nodes registered in Manager must be in start status.
2. Patch must be in commit status.
3. Manager, node, and server must all be the same version.
4. No unregistered servers exist in manager.
  - a. If unregistered servers exist, register them in manager
  - b. If servers exist in the node engine's servers folder, delete that folder

3. When you select the patch file to upload, upload is automatically executed.



Uploadable files are zip and tar.gz, and if you try to upload other files, error messages will be displayed.

## Manager Patch

The Manager Info area displays the Manager's patch status and you can execute Manager patching and recovery.

The description of each item displayed on the screen is as follows.

Table 115. Manager Info Items

Item	Description	Remarks
Patch Status	Manager's patch application status <ul style="list-style-type: none"> <li>• <b>Sun icon</b> : Manager has applied the latest patch (up to date) status</li> <li>• <b>Cloud icon</b> : Manager has not applied the latest patch (patch available) status</li> </ul>	
Current Ver.	Manager's current version	
Patch Ver.	Patch version	
History	Button to view patch history	When handwork is required, <b>Detail (Note) button</b> is displayed in red.

When you click the **Detail (Note) button** displayed in the History item of the Manager Info screen, you can verify patch execution history through a popup window.

The description of each item displayed on the screen is as follows.

Table 116. History Items

Item	Description	Remarks
Action	Displays patch/restore history	
Patch Ver.	Version of the patch file that performed patch/restore	
Previous Ver.	Server version before applying patch/restore	
Timestamp	Time when patch/restore was applied	
Log/Handwork	<p><b>Detail (Note) button</b> provides execution result logs when selected.</p> <p><b>Handwork (Wrench) button</b> provides Handwork (additional manual work required) content when selected. When handwork is required, this button is displayed in red.</p>	

## Patch

Click the **Patch button** at the bottom of Manager Info to apply the latest patch.

The content described in Handwork is manual work required after patch execution, so you must execute and reflect the described content. After handwork, uncheck the checkbox at the bottom of the popup window, then the **Handwork button** in the Manager Patch Info screen changes to white.

When Manager patch is applied, you cannot perform functions such as Node installation/registration, Server installation/registration/cloning until you press the **Commit button** after applying patches to Node and Server.



After patching, you must clear the browser cache to use the patched version of Manager.

## Restore

Click the **Restore button** at the bottom of Manager Info to recover to the version before patching.

Recovery is performed when all nodes registered in Manager have patch status as Patch Available.

## Commit

After applying all patches to Manager, Node, and Server, press the Commit button to confirm. After confirmation, you cannot revert to the previous version.

## Node Patch

The Node Patch Status area shows the total count of servers with the latest patch applied and servers without patches applied, comprehensively for nodes registered in the manager.

The description of each item displayed on the screen is as follows

Table 117. Node Patch Status Items

Item	Description	Remarks
Status	Node's patch application status <ul style="list-style-type: none"> <li>• <b>Sun icon</b> : All servers have applied the latest patch (up to date) status</li> <li>• <b>Cloud icon</b> : Node Agent has not applied the latest patch (patch available) status</li> <li>• <b>Half circle icon</b> : Node Agent has applied the latest patch, but the latest patch has not been applied to servers installed on the Node status</li> <li>• <b>Exclamation icon</b> : Node agent is incompatible with lena-manager status.</li> </ul>	
Node name	Node name	
Address	Node's IP	

Item	Description	Remarks
Node Version	Node's current version	
History	Button to view patch history	When handwork is required, <b>Detail (Note) button</b> is displayed in red.
WAS	Web Application Server's patch status information <ul style="list-style-type: none"> <li>• Up To Date : Count of servers with latest patch applied</li> <li>• Patch Available : Count of servers without latest patch applied</li> </ul>	

Click **Node Patch button** to select a Node in the provided popup window, then proceed with patching or recovery for that Node.



Nodes installed in Windows OS environment perform patching through CLI, not Manager.

## 8.5.2. Application Server

For Application Servers included in Nodes, provides functionality to proceed with patching using the latest patch file uploaded to the manager, and in case of problems, restore to the status immediately before patch application.

### List

Search for servers to apply patches by group conditions (node unit).

Table 118. Application Server Patch Status Items

Item	Description	Remarks
Patch Status	Application Server's patch application status <ul style="list-style-type: none"> <li>• <b>Sun icon</b> : Latest patch applied (up to date) status</li> <li>• <b>Cloud icon</b> : Can apply latest patch (patch available) status</li> </ul>	
Node	Node name where Application Server is installed	
Name	Application Server name	
Type	Application server type	

Item	Description	Remarks
IP	IP of the Node where Application Server is installed	
HTTP Port	Application Server's HTTP Connector port	
AJP Port	Application Server's AJP Connector port	
Start/Stop	Application Server's start and stop execution	
Current Ver.	Application Server's currently installed version information	
Patch Ver.	Version information to apply patch. When latest patch is applied, it displays 'N/A'.	Latest patch version uploaded to manager
History	View patch/restore history information applied to the server	



If Node Agent process kill or other reasons cause abnormal operation, server information for that node will not be displayed.

## Patch

1. Verify the server's stop status before applying patch (**Start button** activated status), and if not in stop status, click **Stop button** to stop the server.
2. Check the checkbox of the server to apply patch to. (Multiple checks possible)
3. Click **Patch button** to proceed with patching. A log popup will appear, and if there are items requiring manual work after patch completion, **Handwork (Wrench) button** is displayed in red in the Handwork column.
4. When you close the log popup, the server's patch status changes to **Sun icon**, and current ver, patch ver. display the currently applied patch version and N/A respectively.
5. Validation
  - a. Cannot apply patch when server is in start status
  - b. Cannot apply patch again to servers that already have the latest patch applied



When applying patches to servers, if it's the first time applying patches to that Node, internally the Node's patch is performed first, then server patching proceeds.

## Restore

1. Verify the server's stop status before applying recovery (**Start button** activated status), and if not in stop status, click **Stop button** to stop the server.
2. Check the checkbox of the server to apply recovery to. (Multiple checks possible)
3. Click **Restore button** to proceed with recovery. A log popup will appear.

4. When you close the log popup, the server's patch status changes to **Cloud icon**, and current ver., patch ver. display the previous version and patch file version respectively.
5. Validation
  - a. Cannot apply recovery when server is in start status
  - b. Cannot recover again after recovery (Manager recovery supports only 1 step)



After proceeding with server recovery, if no servers with patches applied exist on the Node, internally the Node's recovery is also performed together.

## History Inquiry

Click **Detail (Note) button** to view the most recent 5 patch/restore histories.

Table 119. History Items

Item	Description	Remarks
Action	Displays patch/restore history	
Patch Ver.	Version of the patch file that performed patch/restore	
Previous Ver.	Server version before applying patch/restore	
Timestamp	Time when patch/restore was applied	
Log/Handwork	<p><b>Detail (Note) button</b> provides execution result logs when selected.</p> <p><b>Handwork (Wrench) button</b> provides Handwork (additional manual work required) content when selected. When handwork is required, this button is displayed in red.</p>	

## 8.6. Preferences

### 8.6.1. Action Trace

Through Manager, logs are kept of the execution history of add/modify/delete operations performed by each user. Action Trace provides functionality to view/track these execution histories.

Action Trace													
Trace Date		2020-12-10	<input type="button" value="Calendar"/>	00	:	00	~	2020-12-10	<input type="button" value="Calendar"/>	23	:	59	<input type="button" value="Search"/>
<b>- Action Trace List</b>													
Search <input type="text"/>													
Trace Date	Client IP	User ID	Action	Status									
2020/12/10 19:35:28	10.0.5.51.100	admin	clone server	Success									
2020/12/10 19:35:27	10.0.5.51.100	admin	check service port	Success									
2020/12/10 19:35:12	10.0.5.51.100	admin	install server	Success									
2020/12/10 19:35:11	10.0.5.51.100	admin	check service port	Success									
2020/12/10 19:34:52	10.0.5.51.100	admin	clone server	Success									
2020/12/10 19:34:51	10.0.5.51.100	admin	check service port	Success									
2020/12/10 19:34:38	10.0.5.51.100	admin	clone server	Success									
2020/12/10 19:34:37	10.0.5.51.100	admin	check service port	Success									
2020/12/10 19:34:01	10.0.5.51.100	admin	clone server	Success									
2020/12/10 19:34:00	10.0.5.51.100	admin	check service port	Success									
2020/12/10 19:33:47	10.0.5.51.100	admin	create/update/delete session server	Success									
2020/12/10 19:33:33	10.0.5.51.100	admin	install server	Success									

Figure 42. Action Trace Screen

## History Inquiry

After entering search conditions and clicking, you can view the history. When you select one from the list, you can also verify detailed information.

The items displayed on the inquiry screen are as follows.

Table 120. History Detail Information Items

Item	Description	Remarks
Trace Date	Time when the Action was performed	
Status	Action execution result	Success : Success, Failure : Fail
Client IP	IP address of the user who performed the Action	
User ID	User ID who performed the Action	
Action	Name of the performed activity (Action)	
Method	Method name used for the Action	
Request	LENA Manager Http Request URL	
Input	Http Request Input parameters	

Among the above items, "Input" stores Request parameters as-is, so Server ID, Node ID, Server Cluster ID are displayed as data management Key values (serial numbers, "serverID=31" as shown in the capture screen). To view detailed information of the corresponding Server/Node/Cluster, utilize the "Search ID" functionality located at the bottom of the "Action Trace Detail" information. The input/output items of this functionality are as follows.

Table 121. Search ID Functionality Input/Output Items

Item	Description	Remarks
ID	<ul style="list-style-type: none"> <li>Left Combo : Choose between serverId / nodeld</li> <li>Right : Enter the ID value from Input</li> </ul>	Input item
Data	Retrieved Server/Node information	Output item

## 8.6.2. Documentation

You can download LENA introduction materials and manuals.

## 8.6.3. Manager Environment

Provides information for Manager environment configuration.

### Manager Environment

Provides information stored in env-manager.sh/bat among Manager environment configuration information.

- Manager Allow IPs : Configures IP items that can access the Manager.
- Java Home Path : Configures the java home path used by the Manager.

### Manager Configuration

Provides information stored in manager.conf among Manager environment configuration information.

Provides 2 items by default.

- use Server Delete Protection : Whether to disable server deletion functionality in Manager (default : false)
- use JMX for Server Status : Whether to retrieve server status information through JMX (default : false)

Click the **configuration button** on the right side of the screen to verify and change detailed information.

Table 122. When using JMX for Server Status: true, WAS Status display



Status	Status name	Description
	Started	Both WAS and Application are normally started
	Started(Warning)	WAS normally started, Application partially (or entirely) not started
	Stopped	WAS stopped
	Error	WAS Status verification impossible

## Metadata Refresh

Performs metadata consistency verification and restoration functionality used to draw system-specific configuration information as topology charts in the Topology menu.

## Reset manager address of all registered nodes

Provides functionality to collectively change the changed Manager Address to all nodes registered in the Manager.

# Chapter 9. Appendix

## 9.1. LENA System Requirements

The minimum requirements for installing and using LENA are as follows.

Categor y	JVM	CPU	Memory	Disk	Support OS	Remarks
Basic Installation Package	JDK 1.8 or higher	2 Core or higher	4 GB or higher	10GB or higher (excluding root)	Linux (CentOS 7 or higher)	Installation files provided for each component

## 9.2. Manager Supported Browsers

The types of browsers that can use Manager functions are as follows.

For IE, some functions may not work properly, so it is recommended to use other browsers.

Type	Version	Remarks
Chrome	81	

## 9.3. Manager DB File Backup

HSQL DB files for internal data management of Manager generate backup files periodically (daily). The generation location is \${LENA\_HOME}/etc./backup/lena-manager/script.

By default, backup information older than 30 days is deleted. If you want to change the retention period, open the manager.conf file in the \${LENA\_HOME}/repository/conf folder and enter dbbackup.size=retention\_period, then restart Manager to change the retention period.

## 9.4. Manager Internal History Deletion

The history that Manager leaves internally is scheduled to be deleted periodically. The information being deleted is Action Trace history and Server History history.

By default, Action Trace history is retained for up to 30 days, and Server History history is retained for up to 90 days. If you want to change this retention period, open the manager.conf file in the \${LENA\_HOME}/repository/conf folder and enter actiontrace.size=retention\_period, serverhistory.size=retention\_period, then restart Manager to change the retention period.

## 9.5. Manager Admin Password Reset

If you lose the Manager admin user password or exceed the password error count, you must reset the password through the console.

1. Connect to the equipment where Manager is installed via console (telnet or ssh).
2. Execute the \$LENA\_HOME/bin/reset\_manager\_pw.sh file.
3. Enter admin as the user to reset the password.
4. Enter the password to reset. Note that the password must be 8 characters or more, a combination of alphabet/numbers/special characters. The password is not displayed on the console for security reasons.

```
[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.!!
```

## 9.6. LENA Installation Recommended OS Parameters (CentOS Standard)

When installing LENA, it is recommended to set the max user processes value to 8192 or higher.

parameter	Recommended Value	Default Value
max user processes	8192	1024
open files	8192	1024

For CentOS, you can check the max user processes setting by running the 'ulimit -a' command 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
```

For CentOS, you can set the number of processes and open files using the commands 'ulimit -u' and 'ulimit -n'. To permanently reflect the above changes, add the ulimit execution command to each user's profile (.profile, .bash\_profile), or you can force the setting (CentOS standard).

```
*$ cat $HOME/.bash_profile*
*.. (omitted)*
*ulimit -u 8192*
*ulimit -n 8192*
```

Another configuration method is to open the /etc/security/limits.conf (CentOS standard) file and set the maximum number of processes (nproc) and maximum number of open files (nofile).

```
*$ cat /etc/security/limits.conf*
*.. (omitted)*
** soft nproc 8192*
** hard nproc 8192*
** soft nofile 8192*
** hard nofile 8192*
```

## 9.7. LENA Periodically Increasing Files

Item	Path	Deletion Cycle	Monthly Expected Increase	Remarks
Manager Regular Maintenance Logging	LENA_HOME/repository/monitoringDB/maintenance	6 months	10MB	Expected increase based on 6 servers Auto deletion
Manager Monitoring, Diagnostic Reports	LENA_HOME/repository/monitoringDB/{yyyyMMdd}	7 days	N/A	Auto deletion
Manager Diagnostic Statistics	LENA_HOME/repository/monitoringDB/statistics	Permanent	1MB or less	
Manager DB Backup Files	LENA_HOME/repository/backup/database	30 days	100MB or less	Auto deletion
Manager Logs	LENA_HOME/logs/lena-manager	30 days	100MB or less	Auto deletion
Agent Logs	LENA_HOME/logs/lena-agent	30 days	N/A	Auto deletion
Installer Logs	LENA_HOME/logs/lena-installer	Permanent	1MB or less	
Patch Applied Files	LENA_HOME/etc/patch	Permanent	N/A	Only generated during patching Can be deleted after patch completion
Patch Backup Files	LENA_HOME/etc/backup/lena-patcher	Permanent	N/A	Only generated during patching Can be deleted after patch completion
Patch Logs	LENA_HOME/logs/lena-patcher	Permanent	N/A	Only generated during patching Can be deleted after patch completion

Item	Path	Deletion Cycle	Monthly Expected Increase	Remarks
Server Instance Logs	Server instance installation path LENA_HOME/servers/server_id/logs	Permanent	Judged based on load	Path changeable
Server Instance History	Server instance installation path LENA_HOME/servers/server_id/history	Permanent	N/A	Only configuration file updates are generated when server settings are modified through Manager

## 9.8. Manager Language Setting Change

You can change the language setting of LENA Manager.

Table 123. LENA Manager Configurable Languages

Language	Default
English(US)	0
Korean(KR)	

### 9.8.1. Language Setting Change Method

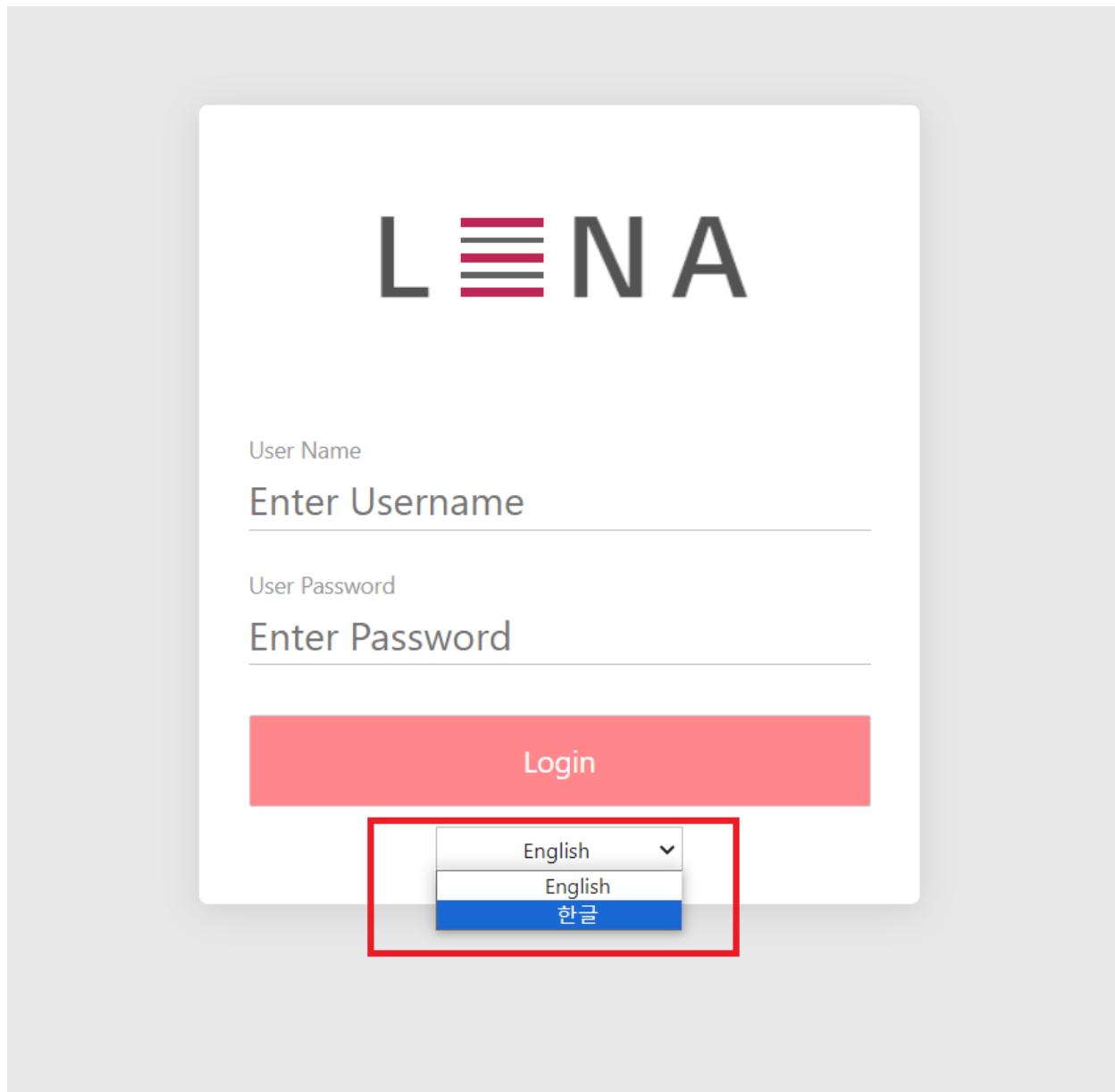
To turn on the language setting change function, first enter the following menu.

ADMIN > Preference > Manager Environment  
(Based on default English setting)

Click the gear button of Manager Configuration to open detailed settings and modify as follows.

```
...
9 # i18n On/off
10 lena.i18n.enable=true # false -> true
...
```

Now you can change the language setting on the Login Page. If you are logged in, log out and go to the Login page.



After selecting the language to use and logging in, you can use LENA Manager in the changed language.

The image shows the LENA Manager dashboard after logging in. The interface is now displayed in Korean. The top navigation bar includes '대시보드' (Dashboard), '서버' (Server), '클러스터' (Cluster), '리소스' (Resources), '진단' (Diagnosis), '토풀로지' (Topology), and '관리자' (Administrator). The left sidebar shows '시스템' (System) and 'DefaultSystem'. The main dashboard area contains several cards: '서버 인벤토리' (Server Inventory) showing 0 nodes, '노드 상태' (Node Status) showing 0 nodes, '서버 클러스터' (Server Cluster) showing 0 clusters, '주요 확인사항' (Main Check Items) showing '재기동 필요 서버' (Reboot Required Server) with a green checkmark, '클러스터 동기화 상태' (Cluster Sync Status) with a green checkmark, and '진단 리포트' (Diagnosis Report) showing 0 reports. On the right side, there are sections for '이벤트' (Events) showing 0 events for 'Exception', 'OOM', and 'Full GC', and a '리소스' (Resources) section with a pink banner for 'LENA 정보' (LENA Information) containing the text '문의: lena-support@gcns.com Copyright LG CNS. All rights reserved'.

## 9.9. About LENA

For questions related to LENA products, please contact us through the following channels.

- Email: [lena-support@lgcns.com](mailto:lena-support@lgcns.com)
- Website: <https://soltech.lgcns.com/>
- Location: 71 Magokjungang 8-ro, Gangseo-gu, Seoul, LG Science Park E13, E14