CubeMOM
Administration Guide

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Contents

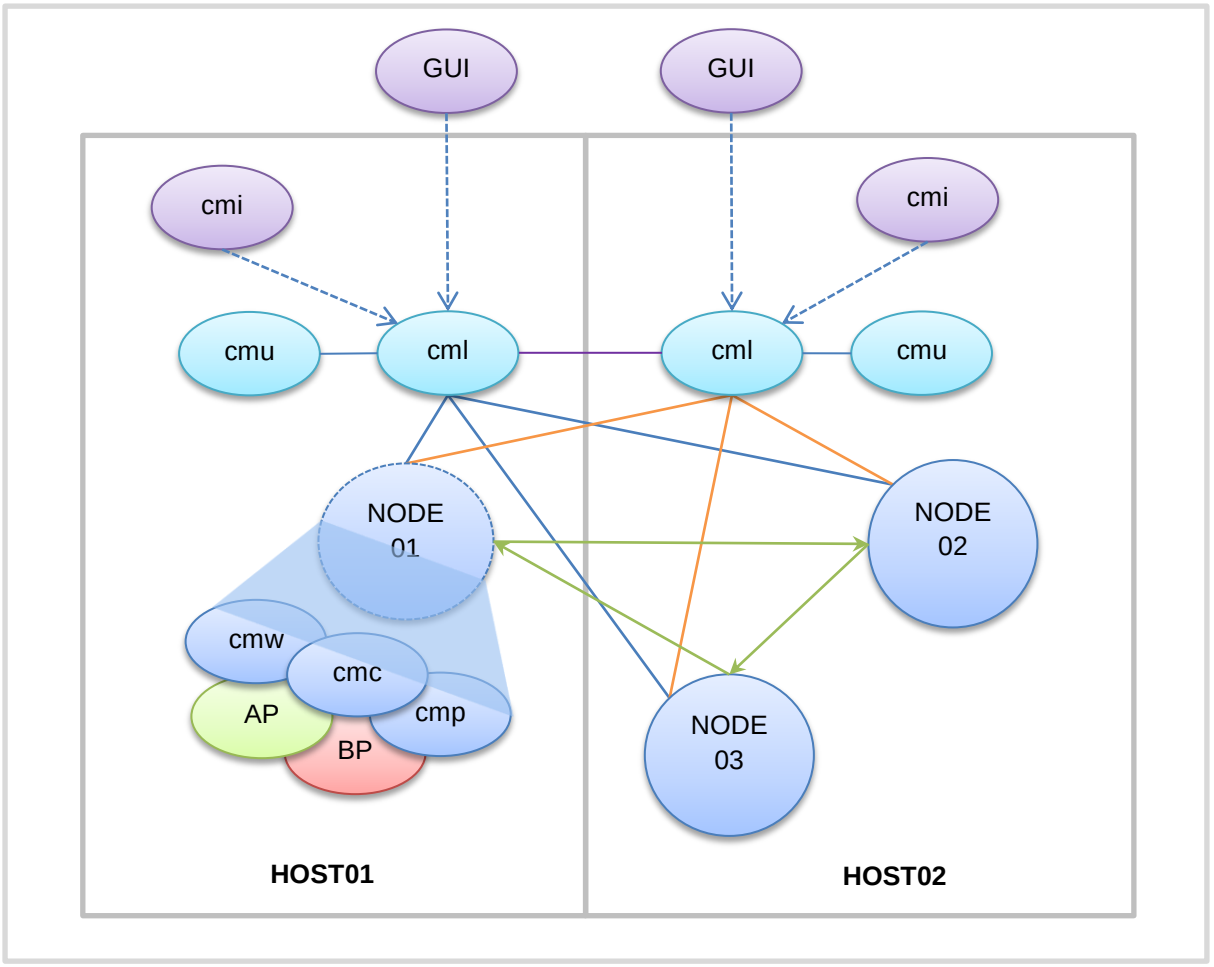
CubeMOM Administration Guide

This document describes the CubeMOM environment and operation method. Readers of this manual should have basic knowledge of UNIX or Linux systems.

The meta characters in this document are listed in the table below.

Character	Description
< >	Mandatory
[ ]	Optional
|	Exclusive selection delimiter among multiple specified values
*****	Zero or more characters
?	One character
-	Number range
.	Separate objects
,	Separate items
…	Repeat item zero or more times

CubeMOM System Diagram



CubeMOM host is a physical computer that consists of one or more logical compute nodes. Different hosts can share node configuration using the same configuration file. A node consists of business and adaptor processes and core processes that manage them.

Host Process

The host process consists of CML and CMU, which handle node management and user commands. Starting and stopping CubeMOM means starting and stopping the host process.

CML

It manages the nodes in the host and acts as a command interpreter hub. It is connected to the CML process of another host, node processes of the same host and other hosts.

CMU

It is connected to the CML process in the same host as a user command processing server.

Node Process

Node processes include business and adapter processes, processes that manage them, log process, and connection processes between nodes.

CMC

It manages business and adaptor processes and plays a key role as a message carrier. CMW and CMP are processes that assist CMC.

CMW

As a log process, CMW writes to disk the logs stored in shared memory by the CMC and CMP processes. CMC, CMP has improved performance and isolates from disk failures.

CMP

CMP is a process that interconnects nodes, and is connected to CMP processes on other nodes. The CMC sends and receives messages from other nodes through the CMP.

AP

It is a adaptor process that serves to connect business processes with the same or other systems.

BP

It is a business process that developers must implement.

Evironment Variable

Environment variables used by CubeMOM must be registered according to the shell type of the system (UNIX or Linux).

CUBEMOM_HOME

The home directory of CubeMOM, that is, the path to the directory where CubeMOM was installed.

CUBEMOM_HOST

CubeMOM hostname. It must be a unique name that can be distinguished from other hosts. It must start with an alphabetic character, up to 15 characters, and can only contain a combination of alphabetic characters and numbers.

Directory Structure

The structure of the CubeMOM home directory is shown in the table below. The log directory path must be designated separately when installing CubeMOM, and can be changed with a command after installation.

Directory		Description
ap		Adaptor process executable files
bin		Core processes and command interpreter executable files
bp		Business process executable files
cert		Certification files
conf		Configuration files
include		Header files
lib		Library
license		License
path		UNIX domain socket files
sample	**echo**	Business program sample
	link	Link API sample
log	**clog**	Core process log
	plog	Business and Adaptor process log

Config File

CubeMOM configuration file types are shown in the table below. The configuration file is a binary file and is changed by user command.

File Name	Description
cmuser.cmf	User and user's group
cmhost.cmf	Host and node
$NODE.cmf	Process group of node

※ $NODE : Node name.

Shared Memory Structure

CubeMOM uses shared memory to improve processing performance. The host process and node process each maintain and manage separate shared memory. The shared memory size is determined by each section setting (size or max count).

Host shared Memory

It is maintained and managed by a host process and is one per host. The structure is shown in the table below.

Number	Section	Description
1	Object status	Process, Thread status
2	Host	Host attributes (name, address, ...)
3	Node	Node attributes (name, status, ...)
4	Log	Log temporary storage

Node Shared Memory

It is maintained and managed by node processes and is one per node. The structure is shown in the table below.

Number	Section	Description
1	Object status	Process, Thread status
2	Group	Group attributes (name, status, ...)
	Process	Process attributes (status, PID, ...)
	Service	Service attributes (name, status, ...)
	Task/Connection	Task/Connection attributes (status, sessionID, ...)
3	Arguments	Passing on process startup
4	Parameters	Process runtime references
5	Address information	Information about adapter’s addresses and how to delimit messages
6	Command queue	Command message queue
7	Command	Temporary storage for passing command messages
8	Data queue	Data message queue
9	Data	Temporary storage for passing data messages
10	Log	Log temporary storage
11	Save-Drop message queue	Save-Drop Message queue
12	Save-Drop message	Temporary storage for save-drop messages

Log

CubeMOM logs core process logs to a different directory from the logs of business and adaptor processes. Core processes logs to the “clog” directory, and business and adaptor processes log to the “plog” directory. Log files are created by date, and the date format (year, month, day) of the file name is determined by the global attribute **date_format**.

File Classification

Div	File Name	Usage	Description
clog	$HOST_cml_$DATE.log	Core	CML process
	$HOST_cmu_$DATE.log	Core	CMU process
	$HOST_aud_$DATE.log	Audit	Record user command execution
	$HOST_err_$DATE.log	Error	Host process errors (with warning)
	$HOST_trc_$DATE.log	Trace	Process sending and receiving time for message
	$HOST_trc_$DATE.idx	Trace	Trace index file
	$HOST_etd_$DATE.log	Delay	Elapsed time delay transaction tracking ID (XID)
	$NODE_cmc_$DATE.log	Core	CMC process
	$NODE_cmw_$DATE.log	Core	CMW process
	$NODE_cmp_$DATE.log	Core	CMP process
	$NODE_ndt_$DATE.msg	message	Save-Drop message when destination not found error
	$NODE_$GROUP_$DATE.log	Group	Process group
	$NODE_$GROUP_$DATE.msg	message	Other than Destination Not Found error, Save-Drop message
	$NODE_err_$DATE.log	Error	Node process errors (with warnings)
plog	$NODE_$GROUP_$DATE.log	Group	Business/Adaptor process log
	$NODE_$GROUP_$DATE.msg	message	Business/Adaptor process message
	$NODE_err_$DATE.log	Error	Business/Adaptor process errors (with warnings)

※ $HOST : Host name, $NODE : Node name, $GROUP : Group name,
$DATE : Date format (year, month, day).

Log Level

CubeMOM categorizes log levels according to severity as shown in the table below.

Log Level	Description
critical	Critical error
error	Common error
warning	Warning - Process normal start and stop, Alert, Notice
info	Information - Sending and Receiving
verbose	Verbose - Miscellaneous information
debug	Debug
trace	Message trace

Log Code

CubeMOM assigns a unique code to every error (including warnings/cautions) for error monitoring or aggregation convenience. The list of log codes is as follows.

Log Code	Description
104	Socket initialize failure
114	Memory allocation failure
118	Shared memory allocation failure
124	Process creation failure
134	File open failure
144	Shared memory creation or attach failure
154	Synchronization object initialize failure
204	Configuration file error
224	Thread creation failure
244	Object creation failure
254	Condition wait failure
1013	Group starting
1014	Group failed to start
1023	Group stopping
1024	Group failed to stop
1033	Group started
1043	Group stopped
1090	Group disabled
1100	Process connecting to core
1101	Process connected to core
1104	Process failed to connect to core
1105	Connection identify failure
1106	Connection identified
1107	Process disconnected to core
1113	Process starting
1114	Process failed to start
1123	Process stopping
1124	Process failed to stop
1133	Process started
1143	Process stopped
1144	Process abnormally stopped
1154	Process stopping by force
1164	Process don't restart request

1190	Process disabled
1213	Service starting
1214	Service failed to start
1223	Service stopping
1224	Service failed to stop
1233	Service started
1243	Service stopped
1273	Listener started
1274	Listener failed to start
1283	Listener stopped
1284	Listener failed to stop
1289	Service abnormal
1290	Service disabled
1304	Connection failed to accept
1313	Connection connecting
1314	Connection failed to connect
1323	Connection disconnecting
1324	Connection failed to disconnect
1333	Connection connected
1343	Connection disconnected
1390	Connection disabled
1413	Task starting
1414	Task failed to start
1423	Task stopping
1424	Task failed to stop
1433	Task started
1443	Task stopped
1490	Task disabled
2113	Thread starting
2114	Thread failed to start
2123	Thread stopping
2124	Thread failed to stop
2133	Thread started
2143	Thread stopped
3104	Polling failure
3113	Sent
3114	Send failure
3123	Rcvd

3124	Recv failure
3144	Message dropped
3234	Message error
3244	Message ack-id error
3254	Message length error
3264	Connection idle
4113	Queuing count alert
4115	Log queuing count alert
4124	Queue waiting timeout
4133	Enqueued
4144	Dequeued
4154	Enqueue failure
4164	Dequeue failure
4165	Queue adjustment
5104	Message destination error
5204	Message source error
5304	Core process error
5471	Message return to source
5473	Message send to path
6113	Shared memory for message usage alert
6114	Shared memory failure for message
6123	Shared memory for log usage alert
6124	Shared memory failure for log
6223	Log write delay
6224	Log write failure
7114	Invalid command
7124	Command waiting timeout
7133	Command enqueued
7143	Command dequeued
7154	Command enqueue failure
7164	Command dequeue failure
7174	Reqeuest command not exist
8001	Login result notification to other host
8002	Login result reflection form other host
8091	Cleansing began
8092	Cleansing timeout
8093	Cleansing finished

CubeMOM Administration

CubeMOM manages middleware resources by using a command interpreter similar to the shell of UNIX or Linux environment. In general, CubeMOM is composed of multiple hosts, and all hosts can be managed using the command interpreter of one host.

Command Interpreter

"cmi" is a command interpreter for managing CubeMOM resources. When the interpreter runs, it login the host process of the host it ran on. Execution options are listed in the following table.

Program	Option	Description
cmi	-admin	Administrator mode

Administrator mode allows only administrators to login and provides additional commands that are not available in normal user mode.

User and User Group

A user is an account that controls and monitors CubeMOM's resources. Users can only access CubeMOM resources by login using the command interpreter. The login is done on the host that ran the command interpreter, and the result (success or failure) is propagated to other hosts.

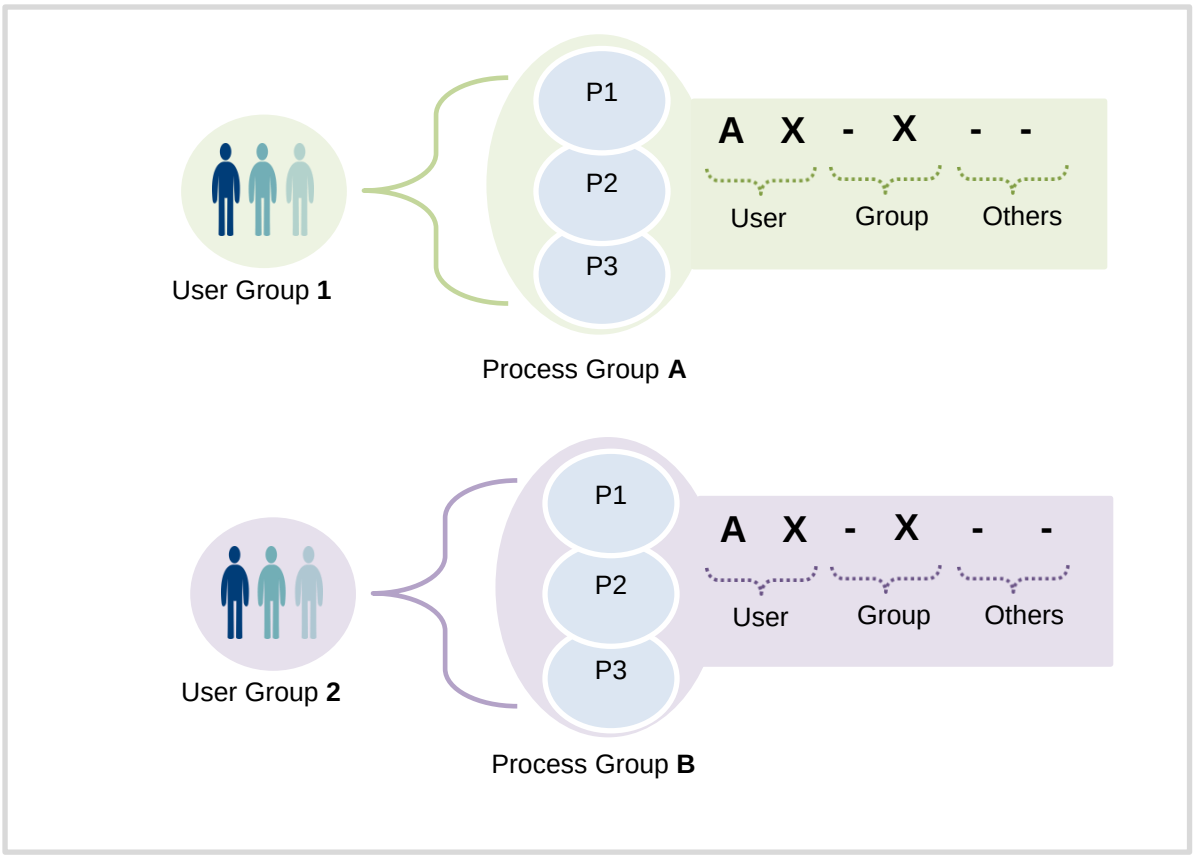
A user group is a collection of users who can share middleware resources. A common use is to extend the access right of a process group to the user group to which the owner belongs. All users must belong to at least one user group.

CubeMOM has default users and user groups. Default users and user groups cannot be deleted. The list is in the following table.

	Account	Description
User	**admin**	Administrator
Group	**ADMINS**	Administrator's Group
	USERS	User's Group – Deault Group

When installing CubeMOM, only one user "admin" exists. If the user does not have a password, it is possible to login without a password. Unless there is a special case, be sure to set a password.

Object Access Permissions



Users need permission to access objects. Object access permissions mean 'Inquiry', 'Add', 'Del', 'Alter', and 'Execute'. For all objects, 'Inquiry' is allowed, and 'Add' and 'Del' are available only to administrators. In the end, the configurable permissions for general users who are not administrators are 'Alter' and 'Execute'.

Object access permissions ('**A**lter', 'E**x**ecute') are granted to the process group, and sub-objects follow the permissions of the group to which they belong. Process group permissions ('**A**lter', 'E**x**ecute') can be granted to the owner, the owner's group, and other users respectively. General users who are not administrators can only 'Inquiry' about hosts and nodes.

Object Start and Stop

Starting/stopping CubeMOM starts/stops the top-level object of CubeMOM, that is, the host. When the parent object starts/stops, the child object starts/stops automatically. The object start/stop permission and commands are listed in the table below.

Object	Permission	start/stop command	Description
Host	Admin mode	**cmstart/cmstop**	Host start/stop
Node	Admin	**start/stop**	Object start/stop
Group	User		
Process	User		

Service	User
Task/Connection	User

Host start/stop targets the host that ran the command interpreter.

Add host

The new host must have the same system (hardware and operating system) specifications as the existing host. How to add a new host is as follows.

1. Add new hosts to existing hosts.
   • ‘add’ command
2. Copy files from the existing host to the new host. The CubeMOM home directory path of the new host is the same as that of the existing host for management convenience.
   • Copy entire CubeMOM home directory
3. Set environment variables for the new host.
   • CUBEMOM_HOME, CUBEMOM_HOST
4. Create a log directory for the new host and grant permission.
   • Same path and structure as existing host
5. Start CubeMOM of the new host.
   • ‘cmstart’ command
6. Restart CubeMOM of the existing host.
   • ‘cmstop’/’cmstart’ command
7. Check the host, node, and core process connection status. Please refer to the CubeMOM System Diagram.
   • ‘status’ command

Add Node

How to add a new node is as follows.

1. Add a new node.
   • ‘add’ command
2. Restart CubeMOM on all hosts.
   • ‘cmstop’/’cmstart’ command
3. Check the host, node, and core process connection status. Please refer to the CubeMOM System Diagram.
   • ‘status’ command

Add Process Group

A process group must contain at least one service. How to add a new process group is as follows.

1. Add a process group.
   • ‘add’ command
2. add service.
   •’ add’ command
3. Check the status after process group startup.
   • ‘start’, ‘status’ command

Add Service

How to add a new service is as follows.

1. Stop a process group.
   • ‘stop’ command
2. Add a service.
   • ‘add’ command
3. Check the status after process group startup.
   • ‘start’,’ status’ command

Number of Process

The number of processes is managed as a minimum and maximum number as a process group attribute. The minimum number is the number of processes to keep regardless of the transaction volume, and the maximum number is the maximum number of processes to automatically increase according to the transaction volume. If the number of processes is insufficient, messages may be queue up and response time may be delayed. Set an appropriate number of processes considering the message processing time and transaction volume.

The number of processes can be changed with the ‘alter’ command. Changes in the minimum number of processes are applied immediately, and changes in the maximum number of processes are reflected only when the process group is restarted.

Number of Task or Connection

The number of tasks or connections is managed as a minimum and maximum number as a service attribute. Depending on the process type, the minimum and maximum number of tasks and connections have different meanings. The table below summarizes their meaning.

Process Type	Service	Minimum Number	Maximum Number

Business		Number of concurrently process messages	No meaning
Adaptor	Client	Stay connected count	No meaning
	Server	No meaning	Max number of connections

A business process can simultaneously send or receive as many messages as the minimum number of tasks. If the service of the adaptor process is a client, it tries to maintain the connection for the minimum number of connections. That is, if the connection is not connected, it tries to connect at the set number of times and intervals. If the service of the adaptor process is a server, connections are allowed as many as the maximum number of connections.

The number of tasks or connections can be changed with the ‘alter’ command. Both minimun and maximum number changes will not take effect until the group is restarted.

Message Queue Size

The message queue size is a process group attribute, managed by a minimum and maximum number of (items). The minimum number is the number of queue items to statically reserved and the maximum number is the maximum number of queue items to reserved statically and dynamically. Items that exceed the minimum number are dynamically reserved. Statically reserved items are guaranteed to be enqueued, while dynamically reserved items are determined to be enqueued based on queue storage usage. To summarize, it is shown in the the table below.

Queue Size	Description
Minimum number	Queuing guaranteed length
Maximum number	Guaranteed queuing length + Non-guaranteed queuing length

The size of the message queue can be changed with the ‘alter’ command. minimum and maximum (items) number changes are reflected immediately on command.