

Web Sphere Server 9.0.5.1 Best Practices
Oracle FLEXCUBE Investor Servicing
Release 12.0.4.8.9
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Table of Contents

1.	Introduction.....	1
1.1	Background	1
1.2	Basics of Websphere	1
1.2.1	Profile	2
1.3	References	3
2.	JDBC Tuning	4
3.	JVM Tuning.....	6
3.1	JVM Heap Size.....	6
3.2	Thread Pool Size	7
4.	Logging.....	8
4.1	Diagnostic Trace	8
4.2	JVM Logs.....	9
4.3	Process Logs	10
4.4	IBM Service Logs	10
4.5	Change Log Level Details.....	11
4.6	NCSA Access and HTTP Error Logging	12
5.	Session Management	13
6.	Appendix A: Frequently Encountered Errors.....	15
7.	Appendix A: Frequently Encountered Errors.....	16

1. Introduction

1.1 Background

IBM® WebSphere® Application Server 9.0.5.1 supports a range of applications, each with their own unique set of features, requirements, and services. Just as no two applications will use an application server in exactly the same way, no single set of tuning parameters will likely provide the best performance for any two different applications.

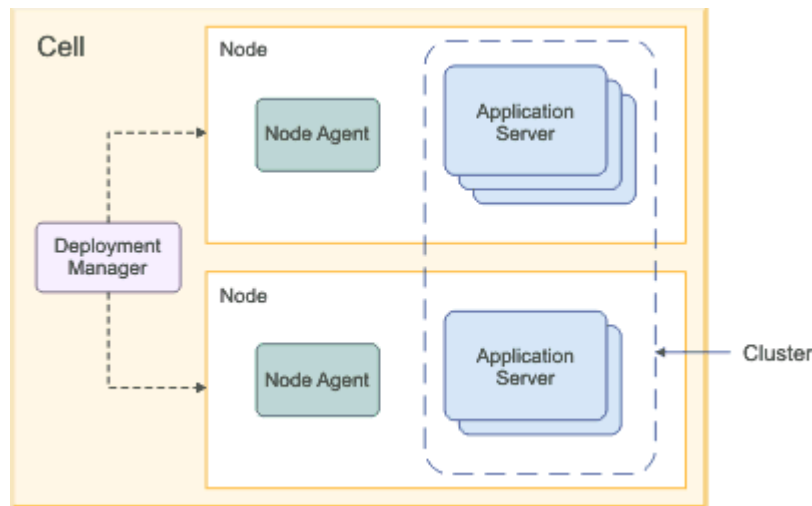
This document explains the best practices followed for Web Sphere application server tuning in the perspective of Oracle FLEXCUBE IS.

1.2 Basics of Websphere

IBM websphere application server cluster deployment contains the below key elements:

- Cell
- Nodes
 - Deployment Manager Node- “DMGR”
 - Node- “NodeXX”
 - Node Agent- “NAXX”
- Profiles
- Cluster
- Cluster Members
- Data Sources

1.2.1 Profile



- Cell: A cell is a grouping of nodes into a single administrative domain. In a Network Deployment environment, a cell can consist of multiple nodes (and node groups), which are all administered from a single point, the deployment manager.
- Node: A node is an administrative grouping of application servers for configuration and operational management within one operating system instance
- Node Agent: In distributed server configurations, each node has a node agent that works with the deployment manager to manage administration processes. A node agent is created automatically when you add (federate) a stand-alone node to a cell.
- Cluster: A cluster is a logical collection of application server processes that provides workload balancing and high availability. Application servers that belong to a cluster are members of that cluster and must all have identical application components deployed on them.
- A profile is a Websphere runtime environment formed by collection of User data and Product files. Product Files are shared application binaries for Websphere. User data is set of user customizations for a specific runtime environment.

Prominent profile types are:

- Stand-alone Application Server: An application server environment runs Enterprise Application. Application server is managed from its own administrative console and functions independently from other application server.
- Deployment Manager: A Deployment Manager manages operations for a logical group or cell of other servers. It is the central administration point of a cell that consists of multiple nodes and node groups in a distributed server configuration. The deployment manager uses the node agent to manage the application servers within one node. A deployment manager provides management capability for multiple federated nodes and can manage nodes that span multiple systems and platforms. A node can only be managed by a single deployment manager and must be federated to the cell of that deployment manager.

Note: Deployment Manager is part of Network Deployment Edition of Websphere.

1.3 References

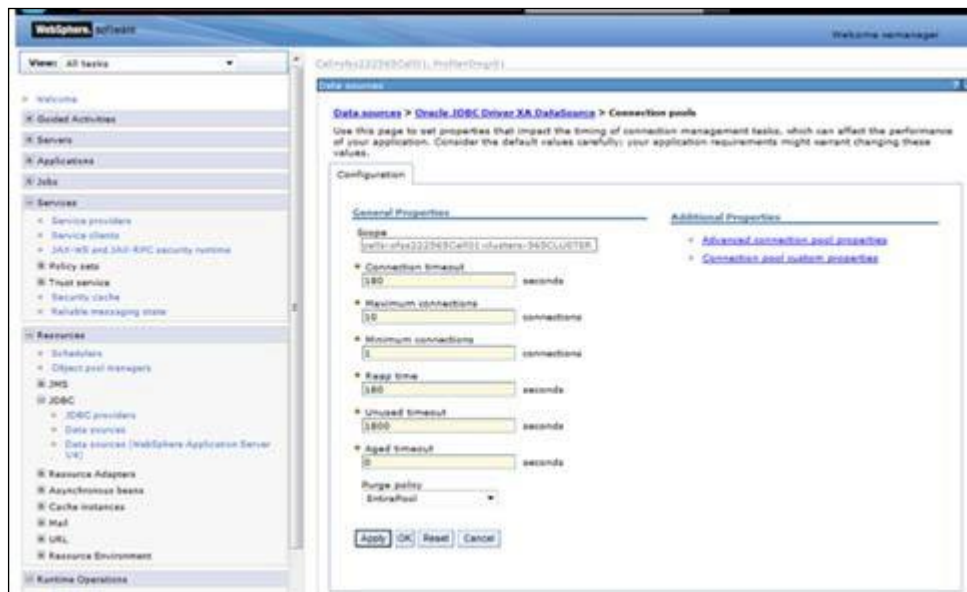
Before proceeding with the document, ensure the below documents are followed for setup

- For resource creation(JDBC Provider, Datasource, Queue connection factory, JMS queue), refer to Resource_Creation_WAS.doc
- For cluster configuration, refer to FCIS_Cluster_Creation_WAS.doc
- For application deployment, refer to FCIS_Application_WAS.doc
- For deployment of Gateway applications, refer to GATEWAY_Applications_WAS.doc
- For SSL configuration in Websphere, refer to SSL_Configuration_WAS.doc

2. JDBC Tuning

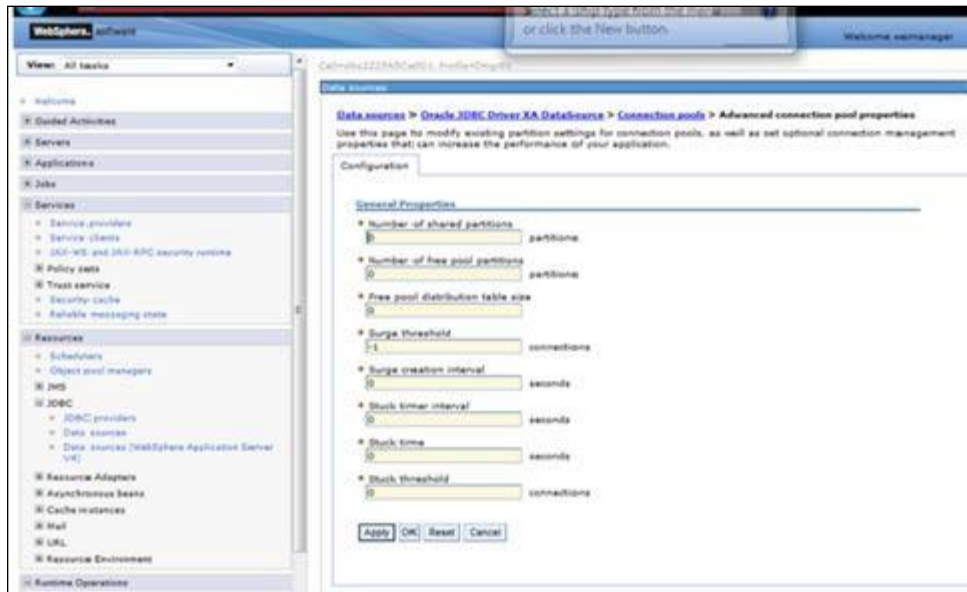
The JDBC provider object encapsulates the specific JDBC driver implementation class for access to the specific vendor database of your environment. The datasource object supplies your application with connections for accessing the database. In a typical production environment database and application needs to use the perfect combination of parameters to achieve higher throughput.

Navigation Path >> Resources->JDBC->Data Sources ->DATA_SOURCE_NAME->Connection Pools ->



PARAMETER	VALUE
Connection Time out	180
Maximum Connection	10
Minimum Connections	1
Reap Time	180
Unused Time	180
Aged Timeout	0
Purge Policy	Entire Pool

Navigation Path >> Resources-> JDBC->Data Sources ->DATA_SOURCE_NAME->Connection Pools ->Advanced Connection Pool Properties



PARAMETER	VALUE
Number of shared pool partitions	0
Number of free pool partitions	0
Free pool distribution table size	0
Surge threshold	-1
Surge creation interval	0
Stuck timer interval	0
Stuck time interval	0
Stuck threshold	0

3. JVM Tuning

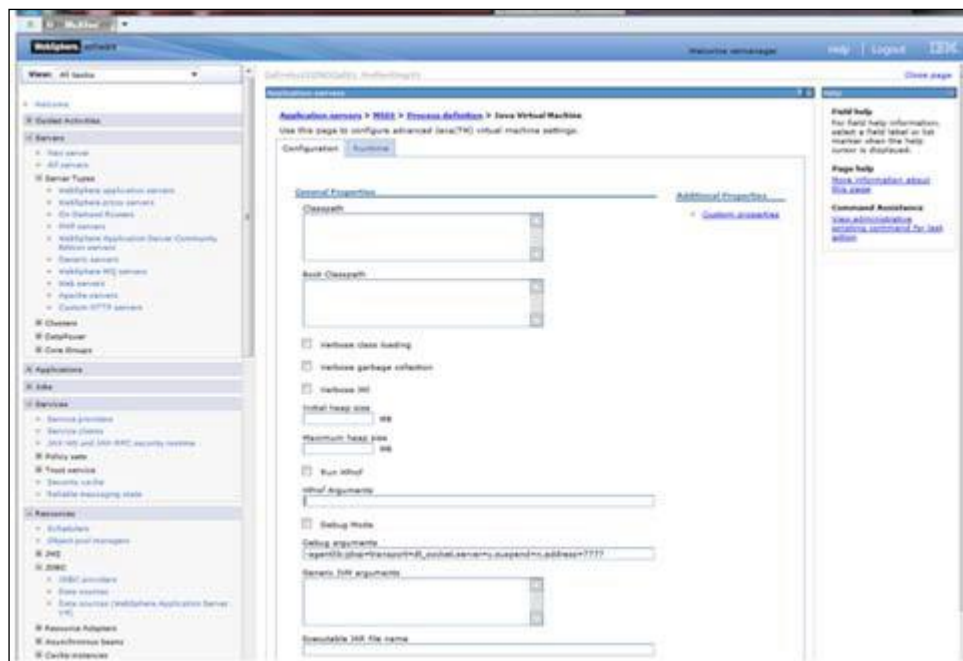
3.1 JVM Heap Size

When a Java Virtual Machine (JVM) is started, it obtains a large area of memory from the underlying operating system. This area is called the heap, and Java performs its own memory management by allocating areas of the heap as memory is needed by the process. Performance tuning generally starts with the Java Virtual Machine (JVM), which serves as the foundation for the application server. From that point forward, tuning is primarily driven by the application server components that are used by the application.

Every 75 concurrent Oracle FLEXCUBE users require one websphere application server of size 4GB. I.e. for 300 concurrent Oracle FLEXCUBE IS users, it is recommended to have 4 websphere application servers.

Navigation Path >> Application Server->APPLICATION_SERVER_NAME-> Server

Infrastructure->Java And Process Management->Process Definition-> Java Virtual machine



PARAMETER	VALUE
Initial Heap Size	1024
Maximum Heap Size	4096

3.2 Thread Pool Size

Each task performed by the server runs on a thread obtained from one of WebSphere Application Server's many thread pools. A thread pool enables components of the server to reuse threads, eliminating the need to create new threads at run time to service each new request. Three of the most commonly used (and tuned) thread pools within the application server are:

Web container: Used when requests come in over HTTP

Default: Used when requests come in for a message driven bean or if a particular transport chain has not been defined to a specific thread pool.

ORB: Used when remote requests come in over RMI/IIOP for an enterprise bean from an EJB application client, remote EJB interface, or another application server.

Navigation Path >> Application Server->APPLICATION_SERVER_NAME->Additional Properties->Thread Pools->

The screenshot shows the 'Thread Pools' configuration page in the WebSphere Application Server Administration console. The left-hand navigation pane is expanded to 'Servers' > 'Server Types' > 'WebSphere application servers' > 'On Demand Routers' > 'WebSphere MQ servers' > 'Web servers' > 'Apache servers' > 'Custom HTTP servers'. The main content area is titled 'Custom HTTP servers (http://localhost:9070)' and shows the 'Thread Pools' configuration for the 'Application servers'.

Application servers > Thread pools

Use this page to specify a thread pool for the server to use. A thread pool enables server components to reuse threads instead of creating new threads at run time. Creating new threads is typically a time and resource intensive operation.

Preferences

Buttons: [New...](#) [Delete](#)

Icons: [Refresh](#) [Add](#) [Remove](#)

Select	Name	Description	Minimum Size	Maximum Size
<input type="checkbox"/>	Default		20	20
<input type="checkbox"/>	ORAThreadLocal		10	50
<input type="checkbox"/>	SOAPInboundThreadPoo	Service integration bus SOAP inbound channel thread pool	4	50
<input type="checkbox"/>	SOAPThreadPoo	Service integration bus SOAP outbound channel thread pool	4	50
<input type="checkbox"/>	SOAPMTAThreadPoo	Service Integration Bus MTA Resource Adapter thread pool	20	41
<input type="checkbox"/>	TCPCChannelLOC		20	20
<input type="checkbox"/>	WMQCMResourceAdapte	WebSphere MQ Resource Adapter thread pool	10	50
<input type="checkbox"/>	WebGetAccor		10	50
<input type="checkbox"/>	WebGetAccor	This pool is used by WebSphere during server startup.	1	3

Total: 9

PARAMETER	Minimum Size	Maximum Size	Thread Inactive
Default	20	20	5000
ORB.thread.pool	10	50	3500
Web Container	50	50	60000

4. Logging

When working with IBM to debug request processing problems, there might be occasions where low-level tracing components must be enabled to capture details for how the request is processed. These low-level Application server trace components do not have knowledge of the request intent or the potential data within. Therefore, when enabled, it is possible that these tracing components might potentially include sensitive information, in plain text, in the trace file.

It is recommended whenever possible to not enable these types of tracing components on a production system and attempt to simulate the problem on a quality assurance environment to capture the appropriate information.

Navigation Path >> Application Server->APPLICATION_SERVER_NAME->Process Definition-> Logging and Tracing

4.1 Diagnostic Trace

The screenshot shows the 'Diagnostic trace service' configuration page. The breadcrumb trail is 'Middleware servers > MS01 > Process definition > MS01 > Diagnostic trace service'. Below the breadcrumb, there is a description: 'Use this page to view and modify the properties of the diagnostic trace service. Diagnostic trace provides detailed information about how the application server components run within this managed process. Changes on the Configuration panel apply when the server is restarted. Changes on the Runtime panel apply immediately.' There are two tabs: 'Configuration' (selected) and 'Runtime'. The 'General Properties' section has two sub-sections: 'Trace Output' and 'Additional Properties'. Under 'Trace Output', there are three radio buttons: 'None', 'Memory Buffer', and 'File' (selected). Below 'File', there are three text boxes: 'Maximum Buffer Size' (8 thousand entries), 'Maximum File Size' (20 MB), and 'Maximum Number of Historical Files' (5). Below these, there is a text box for 'File Name' with the value '\$(SERVER_LOG_ROOT)/trace.log'. Under 'Additional Properties', there is a link 'Change log detail levels'. At the bottom, there is a 'Trace Output Format' dropdown menu set to 'Basic (Compatible)' and four buttons: 'Apply', 'OK', 'Reset', and 'Cancel'.

PARAMETER	VALUE
Trace Output	File

4.2 JVM Logs

Middleware servers

Middleware servers > MS01 > Process definition > MS01 > JVM Logs

Use this page to view and modify the settings for the Java virtual machine (JVM) System.out and System.err logs for a managed process. The JVM logs are created by redirecting the System.out and System.err streams of the JVM to independent log files. The System.out log is used to monitor the health of the running application server. The System.err log contains exception stack trace information that is used to perform problem analysis. One set of JVM logs exists for each application server and all of its applications. JVM logs are also created for the deployment manager and each node manager. Changes on the Configuration panel apply when the server is restarted. Changes on the Runtime panel apply immediately.

Configuration Runtime

General Properties

System.out

* File Name:

File Formatting

Log File Rotation

☒ File Size ☐ Time

Maximum Size
 MB

Start Time

Repeat Time
 hours

Maximum Number of Historical Log Files. Number in range 1 through 200.

Installed Application Output

☒ Show application print statements
☒ Format print statements

System.err

* File Name:

Log File Rotation

☒ File Size ☐ Time

Maximum Size
 MB

Start Time

Repeat Time
 hours

PARAMETER	VALUE	Remarks
System.out	\${SERVER_LOG_ROOT}/SystemOut.log	File Name and File
System.err	\${SERVER_LOG_ROOT}/SystemErr.log	File Name and File

4.3 Process Logs

Middleware servers > MS01 > Process definition > MS01 > Process Logs

Use this page to view or modify settings to specify the files to which standard out and standard error streams write. The process logs are created by redirecting the standard out and standard error streams of a process to independent log files. Native code writes to the process logs. These logs can also contain information that relates to problems in native code or diagnostic information written by the JVM. One set of process logs is created for each application server and all of its applications. Process logs are also created for the deployment manager and each node manager. Changes on the Configuration panel apply when the server is restarted. Changes on the Runtime panel apply immediately.

Configuration Runtime

General Properties

* Stdout File Name
\${SERVER_LOG_ROOT}/native_stdout.log

* Stderr File Name
\${SERVER_LOG_ROOT}/native_stderr.log

Apply OK Reset Cancel

PARAMETER	VALUE
Stdout File	\${SERVER_LOG_ROOT}/native_stdout.log
Stderr file name	\${SERVER_LOG_ROOT}/native_stderr.log

4.4 IBM Service Logs

Middleware servers > MS01 > Process definition > MS01 > IBM Service Logs

Use this page to configure the IBM service log, also known as the activity log. The IBM service log contains both the application server messages that are written to the System.out stream and special messages that contain extended service information that you can use to analyze problems. One service log exists for all Java virtual machines (JVMs) on a node, including all application servers and their node agent, if present. A separate activity log is created for a deployment manager in its own logs directory. The IBM Service log is maintained in a binary format. Use the Log Analyzer or Showlog tool to view the IBM service log.

Configuration Runtime

General Properties

☐ Enable service log

* File Name:
\${LOG_ROOT}/activity.log

* Maximum File Size
2 MB

☒ Enable Correlation ID

Apply OK Reset Cancel

PARAMETER	VALUE
Enable Service Log	False
Maximum File Size	2
File Name	\$(LOG_ROOT)/activity.log
Enable Correlation Id	True

4.5 Change Log Level Details

Middleware servers

Middleware servers > MS01 > Process definition > MS01 > Change log detail levels

Use log levels to control which events are processed by Java logging. Click Components to specify a log detail level for individual components, or click Groups to specify a log detail level for a predefined group of components. Click a component or group name to select a log detail level. Log detail levels are cumulative; a level near the top of the list includes all the subsequent levels.

Configuration Runtime

General Properties

Change log detail levels

☐ Disable logging and tracing of potentially sensitive data (WARNING: This might cause the log detail level setting to be modified when it is applied on the server.)

Select components and specify a log detail level. Log detail levels specified here will apply to the entire server. Expand Components and Groups and click Components to specify a log detail level for individual components, or click Groups to specify a log detail level for a predefined group of components. Click a component or group name to select a log detail level. Log detail levels are cumulative.

*=info

☐ Components and Groups

Correlation

Enable log and trace correlation so entries that are serviced by more than one thread, process, or server will be identified as belonging to the same unit of work.

☐ Enable log and trace correlation

- ☒ Include request IDs in log and trace records
- ☐ Include request IDs in log and trace records and create correlation log records
- ☐ Include request IDs in log and trace records, create correlation log records, and capture data snapshots

PARAMETER	VALUE
Disable logging	False
Enable Log and Trace	False

4.6 NCSA Access and HTTP Error Logging

Middleware servers

Middleware servers > MS01 > Process definition > MS01 > NCSA access and HTTP error logging

Use this page to configure HTTP error logs and National Center for Supercomputing Applications (NCSA) access logs.

Configuration

General Properties

☐ Enable logging service at server start-up

NCSA Access logging

☒ Enable access logging

* Access log file path
\${SERVER_LOG_ROOT}/http_access.log

Access log maximum size
500 MB

Maximum number of historical files
1

* NCSA access log format
Common

Error logging

☒ Enable error logging

* Error log file path
\${SERVER_LOG_ROOT}/http_error.log

Error log maximum size
500 MB

Maximum number of historical files
1

* Error logging level
Warning

PARAMETER	VALUE
NCSA Access logging	True
Error logging Enable	True

5. Session Management

Web browsers and applications use HTTP to communicate. Since HTTP is a stateless protocol (meaning that each command is executed independently without any knowledge of the commands that came before it), there must be a way to manage sessions between the browser side and the server side. Session management is used to configure session manager properties to control the behaviour of Hypertext Transfer Protocol (HTTP) session support.

Navigation Path >> Enterprise Application->APPLICATION_NAME->Web Module Properties->Session Management

The screenshot shows the 'Session management' configuration window. The 'General Properties' tab is active. The 'Override session management' checkbox is checked. Under 'Session tracking mechanism:', 'Enable cookies' is checked, while 'Enable SSL ID tracking', 'Enable URL rewriting', and 'Enable protocol switch rewriting' are unchecked. The 'Maximum in-memory session count' is set to 1000 sessions. The 'Allow overflow' checkbox is checked. Under 'Session timeout:', 'Set timeout' is selected with a value of 30 minutes. The 'Security integration' checkbox is unchecked. Under 'Serialize session access:', 'Allow serial access' is unchecked, and 'Allow access on timeout' is checked. The 'Additional Properties' tab is also visible, showing 'Custom properties' and 'Distributed environment settings'.

PARAMETER	VALUE
Enable SSL ID Tracking	False
Enable Cookies	True
Enable URL rewriting	False
Maximum in-memory session count	1000
Session timeout	30 Minutes
Security Integration	False

Serialization Session access	True
------------------------------	------

6. Appendix A: Frequently Encountered Errors

Error 1: Websphere is causing too many database locks.

Solution: In order to avoid problems with database locks issue, change the custom property "webSphereDefaultIsolationLevel=2". By default Webpsphere uses Repeatable Read isolation level(4) for transactions. Before proceeding with the isolation level change make sure these locks are not caused by the application.

Possible values	JDBC isolation level	Isolation level
8	TRANSACTION_SERIALIZABLE	Repeatable Read (RR)
4 (default)	TRANSACTION_REPEATABLE_READ	Read Stability (RS)
2	TRANSACTION_READ_COMMITTED	Cursor Stability (CS)
1	TRANSACTION_READ_UNCOMMITTED	Uncommitted Read (UR)
0	TRANSACTION_NONE	No Commit (NC)

Navigation Path >> Resources-> JDBC->Data Sources ->DATA_SOURCE_NAME-> Custom Properties

If this property is found then update the value to 4 and Save, else create a new property

- Click New.
- Enter webSphereDefaultIsolationLevel for the name field.
- Enter 2 for the value field.

7. Appendix A: Frequently Encountered Errors

Data sources

[Data sources](#) > [Default Datasource](#) > [Custom properties](#) > [New...](#)

Use this page to specify custom properties that your enterprise information system (EIS) requires for the resource providers and resource factories that you configure. For example, most database vendors require additional custom properties for data sources that access the database.

Configuration

General Properties

* Scope
cells:ofss222565Node01Cell:nodes:ofss222565Node01:servers:server1

* Name
webSphereDefaultIsolationLevel

Value
2 x

Description

Type
java.lang.String



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