

# **zOSSEC1 – IBM z/OS Connect Administration**

A dive into Liberty and z/OS Connect  
Administration

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# Disclaimer

- Information in this presentation was derived from product documentation. URLs are provided if more details are desired.
- Additional information included in this presentation was distilled from years of experience as an administrator z/OS products like CICS, IMS, Db2, MQ, etc. as well as Java runtimes environments like WebSphere Application Server and Liberty.
- There will be additional information on slides that will be designated as Tech/Tips. These contain information that the author thinks is perhaps at least interesting and hopefully may prove useful to the reader.
- A z/OS  or Liberty  or z/OS Connect  icon will appear on slides where the information is specific to these products. Don't hesitate to ask questions as to why the icon does or does not appear on certain slides.
- The examples, tips, etc. present in this material are based on firsthand experiences and are not necessarily sanctioned by Liberty or z/OS Connect development.

# Agenda

- Review the basics of OMVS, RACF Liberty and z/OS Connect configuration
- Connecting a z/OS Connect server to other z/OS subsystems and API providers
- Useful Liberty features and MVS commands
- Where do I look when things go wrong?
- Managing and Monitoring Liberty and z/OS Connect environments
- Miscellaneous Odds and Ends
- Appendix - sample administrative JCL

**Let's start by reviewing some of the basic  
Liberty and z/OS Connect  
OMVS, Liberty and RACF  
security/configuration details and options**



# Create a z/OS Connect server by using the `zosconnect` command

To create a server, use the `zosconnect` command:

```
zosconnect create serverName --template=templateName
```

Where *templateName* can be:

- `zosconnect:apiRequester` for an API requester enabled z/OS Connect server
- `zosconnect:default` template for base z/OS Connect servers
  
- `zosconnect:sampleCicsIpicCatalogManager` for a sample CICS enabled z/OS Connect server
- `zosconnect:sampleDb2Project` for a sample Db2 enabled z/OS Connect server
- `zosconnect:sampleDatabase` for a sample IMS database enabled z/OS Connect server
- `zosconnect:samplePhonebook` for a sample IMS transaction enabled z/OS Connect server
- `zosconnect:sampleMQStockManager` for a sample MQ enabled z/OS Connect server
- `zosconnect:sampleWolaCatalogManager` for a sample WOLA enabled z/OS Connect server

```
zosconnect create zceesrvr --template=zosconnect:apiRequester
```

- Where *serverName* is any value you wish, such as `zceesrvr` or `zCEEServer`, and this value will be the name of the server instance. The templates can be found in directory `/usr/lpp/IBM/zosconnect/v3r0/runtime/templates/servers`.
- Environment variable `WLP_USER_DIR` will be used to set the location of the configuration directory and files created by this command, default location is `/var/zosconnect/servers` where `/var/zosconnect` is default value for `WLP_USER_DIR`.

***Issues with permission bits and ownership and group access is a common problem here.***



## Tech/Tip: Verify your OMVS environment\*

- Start an OMVS shell session and verify that Java is fully operational by entering command ***java -version***, you see should results like this:

```
java version "1.8.0_301"
Java(TM) SE Runtime Environment (build 8.0.6.35 - pmz6480sr6fp35-20210714_01(SR6 FP35))
IBM J9 VM (build 2.9, JRE 1.8.0 z/OS s390x-64-Bit Compressed References 20210622_7763 (JIT enabled, AOT
enabled)
OpenJ9   - b1f3adb
OMR      - c2f4a18
IBM      - c24a144)
JCL - 20210625_01 based on Oracle jdk8u301-b09
```

- Verify that RACF identities associated with started tasks have OMVS segments with UIDs and GIDs and valid HOME directories and that the identities can invoke Java commands.
- Prevent out-of-memory or other storage issues:
  - Verify the Java runtime is not being limited by system parameters, e.g., *MAXASSIZE* (2 147 483 647), *MAXTHREADS*, etc., for details see *BPXPRM setting* at URL [https://www.ibm.com/docs/en/sdk-java-technology/8?topic=SSYKE2\\_8.0.0/com.ibm.java.vm.80.doc/docs/j9\\_configure\\_zos\\_bpxprm.html](https://www.ibm.com/docs/en/sdk-java-technology/8?topic=SSYKE2_8.0.0/com.ibm.java.vm.80.doc/docs/j9_configure_zos_bpxprm.html)
  - Check the value of *ASSIZEMAX* in the OMVS segments of the identities involved and ensure it is adequate, see *MAXASSIZE* above.
  - Exclude OMVS from any IEFUSI exit, SUBSYS(OMVS,NOEXITS) in PARMLIB member *SMFRPMxx*.
- Verify the zconsetup script has been executed. My recommendation is to execute this script in the SMP/E target environment, otherwise it will be lost when service is applied and propagated to other images.*

# Tech-Tip: OMVS security - A review Unix file permissions

Owner	Group	Other																																																																					
<table border="1"> <thead> <tr> <th>Bit</th> <th>Read</th> <th>Write</th> <th>Execute</th> </tr> </thead> <tbody> <tr> <td></td> <td><b>1</b></td> <td><b>1</b></td> <td><b>1</b></td> </tr> <tr> <td>Base-2 Value</td> <td>[4]</td> <td>[2]</td> <td>[1]</td> </tr> <tr> <td></td> <td>↓</td> <td>↓</td> <td>↓</td> </tr> <tr> <td></td> <td>4</td> <td>+</td> <td>2</td> <td>+</td> <td>1</td> <td>=</td> </tr> </tbody> </table> <p><b>7</b> The owner has READ, WRITE and EXECUTE</p>  <p>The <b>owner</b> of the file or directory</p> <pre>chmod -R * u+rwx zceesrv1</pre>	Bit	Read	Write	Execute		<b>1</b>	<b>1</b>	<b>1</b>	Base-2 Value	[4]	[2]	[1]		↓	↓	↓		4	+	2	+	1	=	<table border="1"> <thead> <tr> <th>Bit</th> <th>Read</th> <th>Write</th> <th>Execute</th> </tr> </thead> <tbody> <tr> <td></td> <td><b>1</b></td> <td><b>0</b></td> <td><b>1</b></td> </tr> <tr> <td>Base-2 Value</td> <td>[4]</td> <td>[2]</td> <td>[1]</td> </tr> <tr> <td></td> <td>↓</td> <td>↓</td> <td>↓</td> </tr> <tr> <td></td> <td>4</td> <td>+</td> <td>0</td> <td>+</td> <td>1</td> <td>=</td> </tr> </tbody> </table> <p><b>5</b> The group has READ and EXECUTE, but not WRITE</p>  <p>IDs that are part of the <b>group</b> for the file or directory</p> <pre>chmod g+rwx server.xml</pre>	Bit	Read	Write	Execute		<b>1</b>	<b>0</b>	<b>1</b>	Base-2 Value	[4]	[2]	[1]		↓	↓	↓		4	+	0	+	1	=	<table border="1"> <thead> <tr> <th>Bit</th> <th>Read</th> <th>Write</th> <th>Execute</th> </tr> </thead> <tbody> <tr> <td></td> <td><b>0</b></td> <td><b>0</b></td> <td><b>0</b></td> </tr> <tr> <td>Base-2 Value</td> <td>[4]</td> <td>[2]</td> <td>[1]</td> </tr> <tr> <td></td> <td>↓</td> <td>↓</td> <td>↓</td> </tr> <tr> <td></td> <td>0</td> <td>+</td> <td>0</td> <td>+</td> <td>0</td> <td>=</td> </tr> </tbody> </table> <p><b>0</b> Others have nothing</p>  <p>IDs that are not the owner and not part of the group; that is, <b>other</b></p> <pre>chmod -R * o+rx resources chmod -R * o-w resources/security</pre>	Bit	Read	Write	Execute		<b>0</b>	<b>0</b>	<b>0</b>	Base-2 Value	[4]	[2]	[1]		↓	↓	↓		0	+	0	+	0	=
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-R\* indicates recursion



# The default server configuration directories and files



ID=**LIBSERV**  
Group=**LIBGRP**

```
export JAVA_HOME=<path_to_64_bit_Java>
export WLP_USER_DIR=/var/zosconnect
./zosconnect create zceesrvr
--template= zosconnect:apiRequester
```

/var/zosconnect	750	LIBSERV LIBGRP
/servers	750	LIBSERV LIBGRP
/zceesrvr	750	LIBSERV LIBGRP
/logs	777	LIBSERV LIBGRP
messages.log	666	LIBSERV LIBGRP
/resources	750	LIBSERV LIBGRP
/zosconnect	750	LIBSERV LIBGRP
/apis	750	LIBSERV LIBGRP
/apiRequesters	750	LIBSERV LIBGRP
/rules	750	LIBSERV LIBGRP
/services	750	LIBSERV LIBGRP
server.xml	640	LIBSERV LIBGRP
server.env	640	LIBSERV LIBGRP
/workarea	750	LIBSERV LIBGRP

The create command will create the directories and files under the <WLP\_USER\_DIR> and assign ownership based on the ID and Group that created the server

There are a few potential issues with this in a production setting:

- If you have multiple people with a need to change configuration files, do you share the password of LIBSERV?  
(answer: **no**)  
**Sharing passwords is a bad practice. Better to take advantage SAF SURROGAT so permitted users can switch to the owning ID so they can make changes. In fact, LIBSERV should be a PROTECTED identity with no password in the first place.**
- If you have multiple people with a need to read or update configuration files, do you simply connect them to LIBGRP?  
(answer: **no**)  
**The owner group may be granted access to other resources (on z/OS SAF profiles notably: SERVER) and you do not want others inheriting that. Better to make the configuration group be something different from the owner group and grant READ/WRITE through that group.**

# One suggestion for settings of the server configuration permission bits



ID=**LIBSERV**  
Group=**LIBGRP**

```
export JAVA_HOME=<path_to_64_bit_Java>
export WLP_USER_DIR=/var/zosconnect
./server create zceesrvr
```

/var/zosconnect	751	LIBSERV	LIBGRP
/servers	751	LIBSERV	LIBGRP
/zceesrv1	751	LIBSERV	LIBGRP
/logs	771	LIBSERV	LIBGRP
messages.log	644	LIBSERV	LIBGRP
/resources	751	LIBSERV	LIBGRP
/zosconnect	751	LIBSERV	LIBGRP
/apis	761	LIBSERV	LIBGRP
/apiRequesters	761	LIBSERV	LIBGRP
/rules	761	LIBSERV	LIBGRP
/services	761	LIBSERV	LIBGRP
server.xml	460	LIBSERV	ADMGRP
server.env	460	LIBSERV	ADMGRP
/workarea	750	LIBSERV	LIBGRP

```
export WLP_USER_DIR=/var/zosconnect
chmod o+xt $WLP_USER_DIR/servers
chmod o+xt $WLP_USER_DIR/servers/zceesrvr/resources
chmod -R o+xt $WLP_USER_DIR/servers/zceesrvr/resources/*
```

~~Often you may be tempted to use command chmod R 777 \*~~

N.B. Access for Owner, Group, Others depends on the UID and GID as stored with the directory or file, not the actual SAF identity or group. This means when moving entire filesystems from one LPAR to another using utility ADRDSSU ownership, group access may change to another identity and group. Be consistent in UIDs and GIDs across LPARs.

*CWWKB0121I: The server process UMASK value is set to 0000*

- sets permission bit for new files deployed using the RESTful artifacts to rw-rw-rw (666 x'OR 000)

# Tech/Tip: Use SAF SURROGAT Resources



RACF Surrogate access allows a designated administrative identity the ability to invoke commands and perform functions as if they were running under the identity that will be used for the z/OS Connect server started task. This may be useful because identities associated with started task are normally restricted and cannot be used for accessing TSO or OMVS shells,

Use the following examples as guides and create the surrogate resources and permit access. In these examples, ***LIBSERV*** represents the RACF identity under which the z/OS Connect server will be running and ***adminUser*** represent the administrative RACF identity.

*Define a SURROGAT profile for the server's SAF identity*

**RDEFINE SURROGAT BPX.SRV.*LIBSERV***

*Define a SURROGAT submit profile to allow job submission as the server's SAF identity*

**RDEFINE SURROGAT *LIBSERV*.SUBMIT**

*Permit an administrative identity to act as a surrogate of the Liberty task identity*

**PERMIT BPX.SRV.*LIBSERV* CLASS(SURROGAT) ID(*adminGrp*) ACC(READ)**

**PERMIT *LIBSERV*.SUBMIT CLASS(SURROGAT) ID(*adminGrp*) ACC(READ)**

*Refresh the SURROGAT in storage profiles*

**SETROPTS RACLIST(SURROGAT) REFRESH**

Now any identity in group *adminGrp* can submit JCL with the *USER=LIBSERV* parameter on the job card or use the OMVS switch user command (*su -s LIBSERV*) to execute OMVS scripts or commands as LIBSERV.

## Tech/Tip: z/OS : Use SAF UNIXPRIV/FACILITY Resources



An alternative to using a surrogate access is to permit the identity under which the customization will be done to enhanced Unix privileges. Specially, permitting the identity to Unix privileges SUPERUSER.FILESYS, SUPERUSER.FILESYS.CHANGEPERMS and SUPERUSER.FILESYS.CHOWN.

- *Permit an administrative identity to write to any local directory or file*  
**PERMIT SUPERUSER.FILESYS CLASS(UNIXPRIV)**  
    **ID(adminUser) ACC(CONTROL)**
- *Permit an administrative identity to change permission bit of any local directory or file*  
**PERMIT SUPERUSER.FILESYS.CHANGEPERMS CLASS(UNIXPRIV)**  
    **ID(adminUser) ACC(READ)**
- *Permit an administrative identity to change the ownership of any directory or file*  
**PERMIT SUPERUSER.FILESYS.CHOWN CLASS(UNIXPRIV)**  
    **ID(adminUser) ACC(READ)**
- *Permit an administrative identity switch to root (su -s root) or the Enable superuser mode(SU) Setup option in ISHELL*  
**PERMIT BPX.SUPERUSER CLASS(FACILITY) ID(adminUser) ACC(READ)**
- *Refresh the UNIXPRIV and/or FACILITY instorage profiles*  
**SETROPTS RACLIST(UNIXPRIV,FACILITY) REFRESH**

[https://www.ibm.com/support/knowledgecenter/en/SSLTBW\\_2.4.0/com.ibm.zos.v2r4.bpxb200/usspriv.htm](https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.4.0/com.ibm.zos.v2r4.bpxb200/usspriv.htm)

Use these commands only if you understand the implications.

# Tech/Tip: z/OS : A JCL example of using SURROGAT/UNIXPRIV access



```
//ZCEESRVR JOB 'ZCEE',CLASS=A,REGION=0M,NOTIFY=&SYSUID,USER=LIBSERV
//*****
//** SET SYMBOLS
//*****
//EXPORT EXPORT SYMLIST=(*)
// SET JAVAHOME='/usr/lpp/java/J8.0_64'
// SET ZCEEPATH='/usr/lpp/IBM/zosconnect/v3r0'
// SET SERVER='zceesrvr'
// SET TEMPLATE='zosconnect:apiRequester'
// SET WLPUSER='var/zosconnect'
// SET USER='LIBSERV'
// SET GROUP='LIBGRP'
//*****
//** Step ZCEESRVR - Use the zosconnect command to create a server
//*****
//ZCEESRVR EXEC PGM=IKJEFT01,REGION=0M
//SYSTSPRT DD SYSOUT=*
//SYSERR DD SYSOUT=*
//STDOUT DD SYSOUT=*
//SYSTSIN DD *,SYMBOLS=EXECSYS
BPXBATCH SH +
export JAVA_HOME=&JAVAHOME; +
export WLP_USER_DIR=&WLPUSER; +
&ZCEEPATH/bin/zosconnect create &SERVER +
--template=&TEMPLATE
//*****
//** Step CHOWN - Change directory and file ownership
//*****
//CHOWN EXEC PGM=IKJEFT01,REGION=0M
//SYSERR DD SYSOUT=*
//STDOUT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN DD *,SYMBOLS=EXECSYS
BPXBATCH SH +
export WLP_USER_DIR=&WLPUSER; +
chown -R &USER:&GROUP $WLP_USER_DIR/servers/&SERVER
```

Using SURROGAT RACF resources means there is no need provide LIBSERV's password, in fact LIBSERV may be protected and not even have a password. Any files or directories created will be owned by LIBSERV.

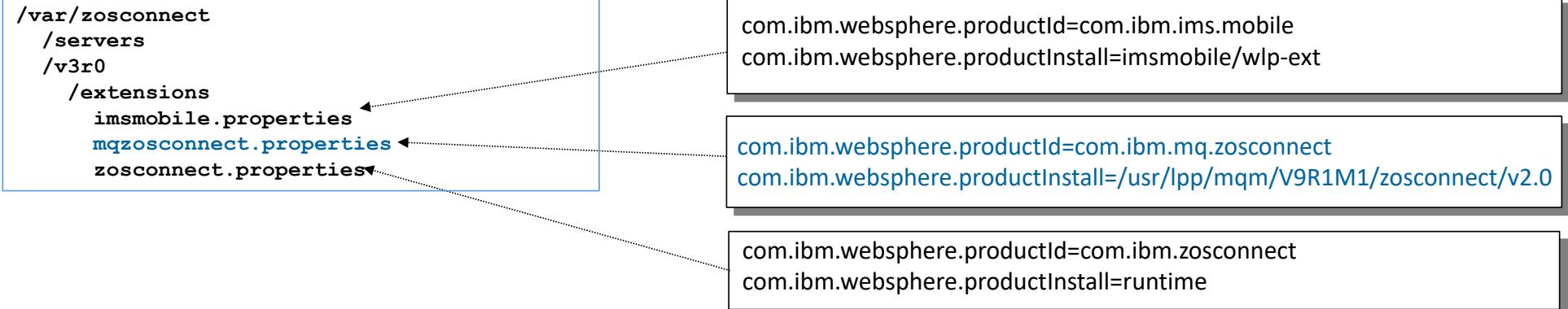
Alternative, use the change ownership command, *chown*, to change the user and group attributes of the user associated with the STARTED task. This requires UNIXPRIV RACF access.

# LPAR specific directories and files created by `zconsetup`



The `zconsetup` script creates a symbolic link from the WLP `etc` directory in `/usr/lpp/IBM/zosconnect/v3r0/wlp` (normally mounted R/O) to a local R/W directory and will create a default configuration directory and a local extension directory.

```
JOHNSON:/usr/lpp/IBM/zosconnect/v3r0/wlp/etc: ls -al
total 32
drwxrwxr-x  2 OMVSKERN 0          8192 Jun 24 10:24 .
drwxrwxr-x 10 OMVSKERN 0          8192 Jun 24 10:24 ..
lrwxrwxrwx  1 990023  0          31 Jul 27 2020 extensions -> /var/zosconnect/v3r0/extensions
```



- This directory structure and contents is created by invoking the `zconsetup` script and **must be created on each LPAR** on which z/OS Connect will execute. This is how the z/OS Connect Liberty server locates service provider executables. Note: the value of the `com.ibm.websphere.productInstall` directive is relative to directory `/usr/lpp/IBM/zosconnect/v3r0`.
- Not creating this link will cause messages `CWWKF0001E: A feature definition could not be found for zosconnect:zosconnect-2.0` or `CWWKE0054E: Unable to open /usr/lpp/IBM/zosconnect/v3r0/wlp/etc/extensions/zosconnect.properties`
- **MQ service provider is not shipped with z/OS Connect so the MQ executables are outside of the z/OS Connect directory structure.**



# A Tour of a server's directories and files

```
/var/zosconnect/v3r0<
  /extensions
  ${WLP_USER_DIR}
    /servers
      /serverName<
        ims-admin-services.xml
        jvm.options
        /logs
        /resources
          /imsmobile-config
          /security
          /zosconnect
        server.env
        server.xml
        /workarea#
        /tranlog #
```

- The extensions subdirectory will always be in /var/zosconnect/v3r0

- Each server (serverName) will have a unique subdirectory in the location specified by WLP\_USER\_DIR, which **defaults to /var/zosconnect**.
- Important, use the same value for starting a server that was used when the server was created.

- The location of the *serverName* directory is based on the concatenation of the value of the *WLP\_USER\_DIR* environment variable with the constant *servers* and does not have to be in directory /var/zosconnect.
- The *serverName* directory structure and its initial contents are created by invoking the *zosconnect create serverName* script.
- The number, size and output location of messages.log and trace files in the *logs* directory can be controlled with the Liberty <logging> configuration element or the output location controlled by using the *com.ibm.ws.logging.log.directory* Java directive as a JVM options override, more on this later.
- #These directories maintain state information and it is a good practice is to add the --clean parameter to the server startup JCL, e.g., PARMS='serverName --clean', especially after service is applied.

# Tech/Tip: Use multiple mount points and multiple ZFS file systems



Create the mount points and mount file systems prior to running zconsetup

```
mkdir -p /var/zosconnect  
mkdir -p /var/zosconnect/servers  
mkdir -p /var/zosconnect/group1  
mkdir -p /var/zosconnect/group2  
mkdir -p /var/zosconnect/group3
```

## SYS1.PARMLIB (BPXPRM##)

```
MOUNT FILESYSTEM('OMVS.ZCEEVAR.ZFS')  
  MOUNTPOINT('/var/zosconnect')  
  TYPE(ZFS) MODE(READ)  
MOUNT FILESYSTEM('OMVS.ZCEE.SERVERS.ZFS')  
  MOUNTPOINT('/var/zosconnect/servers')  
  TYPE(ZFS) PARM('AGGRGROW') MODE(RDWR)  
MOUNT FILESYSTEM('OMVS.ZCEE.GROUP1.ZFS')  
  MOUNTPOINT('/var/zosconnect/group1')  
  TYPE(ZFS) PARM('AGGRGROW') MODE(RDWR)  
MOUNT FILESYSTEM('OMVS.ZCEE.GROUP2.ZFS')  
  MOUNTPOINT('/var/zosconnect/group2')  
  TYPE(ZFS) PARM('AGGRGROW') MODE(RDWR)  
MOUNT FILESYSTEM('OMVS.ZCEE.GROUP.ZFS')  
  MOUNTPOINT('/var/zosconnect/group3')  
  TYPE(ZFS) PARM('AGGRGROW') MODE(RDWR)
```

- Create a dedicated filesystem for the root z/OS Connect `/var/zosconnect` directory, e.g., `/var/zosconnect`. This provides portability for migrations and system upgrades. Note: This means that MODE(READ) will apply to `/var/zosconnect/servers` unless another file system is mounted here.

- Create a dedicated filesystem for each set or groups of servers. These filesystems will contain the server configuration directories for 1 or more servers.
- Each server's `WLP_USER_DIR` environment variable will be set to the mount point, e.g., `WLP_USER_DIR=/var/zosconnect/group1` when the server is created and in the server's startup JCL.

## df -P | grep /var/zosconnect

Filesystem	512-blocks	Used	Available	Capacity	Mounted on
OMVS.ZCEEVAR.ZFS	69120	68658	462	100%	/var/zosconnect
OMVS.ZCEE.SERVERS.ZFS	159120	76455	82665	48%	/var/zosconnect/servers
OMVS.ZCEE.GROUP1.ZFS	135360	1506	133854	2%	/var/zosconnect/group1
OMVS.ZCEE.GROUP2.ZFS	4059360	2591284	1468076	64%	/var/zosconnect/group2
OMVS.ZCEE.GROUP3.ZFS	135360	17858	117502	14%	/var/zosconnect/group3



# A Tour of Server Configuration Directories and Files

A z/OS Connect EE V3.0 server configuration structure looks like this:

```
 ${WLP_USER_DIR}
  /servers
    /zceesrv1
      /logs
        /ffdc
        messages.log
    /resources
      /zosconnect
        /apis
        /apiRequesters
        /rules
        /services
      server.xml
      server.env
    /tranlog
    /workarea
```

The messages.log file is the key output file for messages about Liberty and the processing taking place in the Liberty server. The output written to this file can be written to the SPOOL by including DD statement MSGLOG in the startup JCL, e.g.,  
//MSGLOG DD SYSOUT=\*,FREE=CLOSE,SPIN=(UNALLOC,1M)

The /zosconnect directory is where the deployed APIs, services, and API requester files will be placed.

The server.xml file is the key configuration file. It is here that z/OS Connect EE V3.0 definitions go which define the essential backend connectivity.

The *WLP\_USER\_DIR* environment variable sets the value of the root directory of the server's configuration files and directories, e.g.,  
*WLP\_USER\_DIR*=/var/zosconnect



# Tech/Tip: Liberty environment variables

Environment variables can be set to control which directories are used and the format of output.

- **WLP\_LOGGING\_CONSOLE\_LOGLEVEL<sup>#</sup>** - The logging level used to filter messages written to system streams (STDOUT). The valid values are INFO, AUDIT, WARNING, ERROR, and OFF. By default, the WLP\_LOGGING\_CONSOLE\_LOGLEVEL environment variable is set to AUDIT. Valid options are:

- **AUDIT** - Audit and warning messages will be written to the system output stream (STDOUT). Error messages will be written to the system error stream (STDERR).
- **ERROR** - Error messages will be written to the system error stream (STDERR).
- **INFO** - Info, audit, and warning messages will be written to the system output stream. Error messages will be written to the system error stream (STDERR)
- **OFF** - No server output is written to system streams (STDOUT). Only JVM output is written to system streams(STDOUT).
- **WARNING** - Warning messages will be written to the system output stream (STDOUT). Error messages will be written to the system error stream (STDERR).

STDOUT and STDERR refer to the DD statements in the server JCL, e.g., spool output.

- **WLP\_LOGGING\_CONSOLE\_FORMAT<sup>#</sup>** - The required format for the console. Valid values are DEV, SIMPLE, or JSON format. By default, WLP\_LOGGING\_CONSOLE\_FORMAT is set to DEV. Valid options are:

- **DEV** - Use the dev logging format.
- **JSON** - Use the JSON logging format.
- **SIMPLE** - Use the simple logging format. As of Liberty release 20.0.0.6 (z/OS Connect V3.034), this format writes the messages to STDOUT and STDERR with time stamps included.

- **WLP\_OUTPUT\_DIR<sup>#</sup>** - This environment variable can be used to specify an alternative location for server generated output such as logs, the workarea directory, and generated files.

- **WLP\_USER\_DIR** – This environment variables specifies where the runtime environment looks for shared resources and server definitions.

Environment variables can also be used in the server configuration files. For example, the following environment variables are automatically set in a Liberty server.

- **server.config.dir** – whose value will automatically be set to the value of variable WLP\_USER\_DIR concatenated with the name of the server, e.g. `/var/zosconnect/servers/serverName`
- **server.output.dir** - whose value will automatically be set to the value of variable WLP\_OUTPUT\_DIR concatenated with the name of the server, e.g. `/var/zosconnect/servers/serverName`
- **wlp.server.name** - whose value will automatically be set to the value of the server as provided in the `zosconnect run` command, e.g., PARMS value provided in the JCL procedure.

<sup>#</sup>These environment variables are not available to a z/OS Connect server, use Java directives instead.



# Tech/Tip: Liberty Java Directives for controlling output

**com.ibm.ws.logging.console.format (consoleFormat)** - The required format for the console. Valid values are basic or json format.

**com.ibm.ws.logging.console.log.level (consoleLogLevel)** - This filter controls the granularity of messages that go to the console. The valid values are INFO, AUDIT, WARNING, ERROR, and OFF. By default, the console log level is set to AUDIT.

**com.ibm.ws.logging.hideMessage (hideMessage)** - Use this attribute to configure the messages that you want to hide from the `console.log` and `message.log` files. If the messages are configured to be hidden, then they are redirected to the `trace.log` file.

**com.ibm.ws.logging.log.directory (logDirectory)** - Use this attribute to set a directory for all log files, excluding the `console.log` file, but including FFDC. The default log location path is `WLP_OUTPUT_DIR/serverName/logs`

**com.ibm.ws.logging.max.file.size (maxFileSize)** - The maximum size (in MB) that a log file can reach before it is rolled. The Liberty runtime does only size-based log rolling. To disable this attribute, set the value to 0. The maximum file size is approximate. By default, the value is 20.

**com.ibm.ws.logging.max.files (maxFiles)** - If a maximum file size exists, this setting is used to determine how many of each of the log files are kept. This setting also applies to the number of exception logs that summarize exceptions that occurred on any day. So, if this number is 10, you might have 10 message logs, 10 trace logs, and 10 exception summaries in the `ffdc` directory. The default value is 2.

**com.ibm.ws.logging.message.format (messageFormat)** - The required format for the `messages.log` file. Valid values are basic or json format. By default, `messageFormat` is set to the environment variable `WLP_LOGGING_MESSAGE_FORMAT` (if set) or basic.

## JVM Options example (JCL):

`JVM_OPTIONS=-Dcom.ibm.ws.logging.log.directory=/u/johnson/logs -Dcom.ibm.ws.logging.max.file.size=10`

## bootstrap.properties example:

`com.ibm.ws.logging.message.file.name=basqstrtMessages.log  
com.ibm.ws.logging.log.directory=/u/common/logs`

N.B. `consoleFormat`, `logDirectory`, etc. can be specified in the Liberty `<logging/>` configuration element. Note the recommendation for the attributes in red is for them to be provided in Java directives.

## Tech/Tip: Initial server.xml configuration file



## Default server.xml configuration file

## Modified server.xml configuration file

```
<server description="zCEE Server">
<include location="${server.config.dir}/includes/safSecurity.xml"/>
<include location="${server.config.dir}/includes/ipicIDProp.xml"/>
<include location="${server.config.dir}/includes/keyring.xml"/>
<include location="${server.config.dir}/includes/groupAccess.xml"/>
<include location="${server.config.dir}/includes/shared.xml"/>
<include location="${server.config.dir}/includes/apiRequesterHTTPS.xml"/>
<include location="${server.config.dir}/includes/imsDatabase.xml"/>
<!-- Enable features -->
<featureManager>
    <feature>zosconnect:zosConnect-2.0</feature>
    <feature>zosconnect:zosConnectCommands-1.0</feature>
    <feature>apiDiscovery-1.0</feature>
</featureManager>
<!-- To access this server from a remote client add a host attribute
    <httpEndpoint id="defaultHttpEndpoint"
        host="*"
        httpPort="9090"
        httpsPort="9453" />
```

\*Added in V3.0.48 with no HOLD information provided

Simplify maintenance by :

- Customizing just the ports
  - Using “include” statements to make further changes such as adding additional features and additional XML configuration elements.
  - Review <https://www.ibm.com/docs/en/was-liberty/nd?topic=liberty-configuration-element-merging-rules> to understand merging rules.



## Tech/Tip: Be aware of the default values for updateTrigger and polling attributes

```
<!-- applicationMonitor is not applicable for z/OS Connect EE servers -->
<applicationMonitor updateTrigger="polled" dropinsEnabled="true"/>

<!-- config requires updateTrigger="mbean" for REFRESH command support -->
<config updateTrigger="polled" monitorInterval="500ms"/>

<!-- zosConnect APIs -->
<zosconnect_zosConnectAPIs pollingRate="5s" updateTrigger="disabled"      />

<!-- zosConnect API requesters -->
<zosconnect_apiRequesters updateTrigger="disabled" pollingRate="5s"/>

<!-- zosConnect Services -->
<zosconnect_services pollingRate="5s" updateTrigger="disabled"/>

<!-- zosConnect policies -->
<zosconnect_policy pollingRate="1m" updateTrigger="disabled"/>

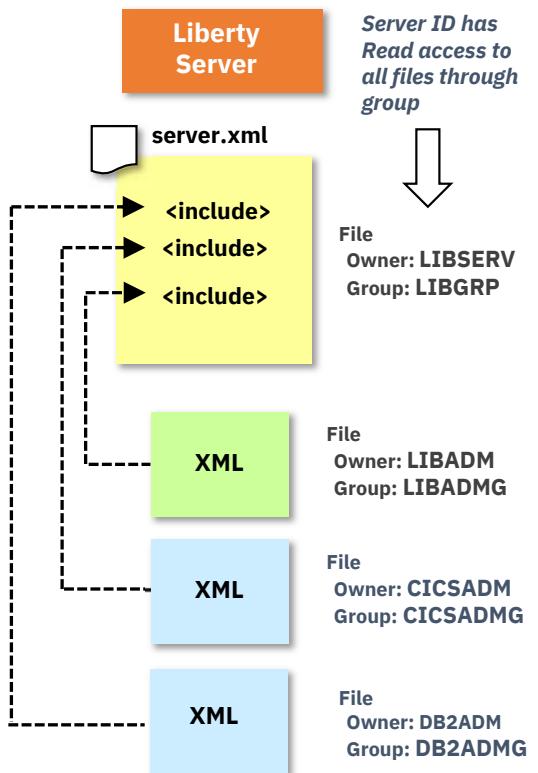
<!-- zosConnect data transformer -->
<zosconnect_zosConnectDataXform pollingrate="2s" updateTrigger="polled"/>

<!--A security certificate repository -->
<keystore pollingrate="500ms" updateTrigger="mbean"/>
```

- **disabled** Disables all update monitoring. Configuration changes will not be applied while the server is running.
- **mbean** Server will only update the configuration when prompted by the FileNotificationMbean. The FileNotificationMbean is typically called by an external program such as an integrated development environment or a management application. (Or an MVS MODIFY command)
- **polled** Server will scan for changes at the polling interval on all the configuration files and update the runtime configuration with the changes detected.



# Take advantage of Liberty's supports server XML “include” file processing



This allows portions of the configuration to be held in files outside the main server.xml file

Two primary uses:

1. Hold sensitive configuration information in file that is READ to select people, but not the read group
2. Allow a user to update their portion of the server configuration, but not other parts of it

For the second use-case it is important to ensure the user can not override configuration in the main XML. Use the "onConflict" tag in the <include> element:

```
<include location="myIncludeFile.xml" onConflict="IGNORE"/>
```

This tells Liberty to ignore XML elements in include file that are also found in the main server.xml. It does not prevent them from injecting configuration elements not found in the main server.xml. If there is a concern about that, don't use include processing.

**Nesting of an include file within a include file is possible**



# Using “administration include” files to manage the server XML

- Setup a server.xml using ‘include’ statements and allow other administrator to manage those included files, but not the server.xml itself.
- Control what configuration can be overridden in included files using the ‘onConflict’ option provided with the include element (see Ignore, Replace, Merge).

[https://www.ibm.com/support/knowledgecenter/en/SSAW57/liberty/com.ibm.websphere.wlp.nd.multiplatform.doc/ae/cwlp\\_config\\_include.html](https://www.ibm.com/support/knowledgecenter/en/SSAW57/liberty/com.ibm.websphere.wlp.nd.multiplatform.doc/ae/cwlp_config_include.html)

## server.xml (owned by ID ADMIN1)

```
<featureManager>
  <feature>appSecurity-1.0</feature>
<featureManager>
<include location="${server.config.dir}/includes/db2.xml onConflict="IGNORE"/>
<include location="${server.config.dir}/includes/cics.xml onConflict="IGNORE"/>
<include location="${server.config.dir}/includes/imsDb.xml onConflict="IGNORE"/>
```

## db2.xml (owned and managed by a DBA)

```
<server description="Db2 REST">
  <zosconnect_zosConnectServiceRestClientConnection
    id="Db2Conn" host="wg31.washington.ibm.com" port="2446" basicAuthRef="dsn2Auth" />
  <zosconnect_zosConnectServiceRestClientBasicAuth id="dsn2Auth"
    applName=DSN2APPL"/>
</server>
```

## cics.xml (owned and managed by a CICS administrator)

```
<server description="CICS">
  <featureManager> <feature>zosconnect:cicsService-1.0</feature> </featureManager>
  <zosconnect_cicsIpicConnection id="catalog" host="wg31" port="1491"/>
</server>
```

## imsDB.xml (owned and managed by a IMS administrator)

```
<server description="IMS DATABASE">
  <featureManager> <feature>zosconnect:dbService-1.0</feature> </featureManager>
  <connectionFactory id="DFSIVPAConn"> <properties.imsudbJLocal
    databaseName="DFSIVPA" datastoreName="IVP1" driverType="4" portNumber="5555"
    datastoreServer="wg31" user="USER1" password="USER1"
    flattenTables="True"/> </connectionFactory>
</server>
```



## Tech-Tip: Review configuration conflicts

```
ÝAUDIT  " CWWKG0102I: Found conflicting settings for cscvincAPI instance of zosconnect_endpointConnection
configuration.

Property port has conflicting values:
  Value 9443 is set in file:/var/zosconnect/servers/myServer/includes/apiRequesterHTTPS.xml.
  Value 9443 is set in file:/var/zosconnect/servers/myServer/includes/apiRequesterHTTPS.xml.
  Value 9463 is set in file:/var/zosconnect/servers/myServer/includes/oauth.xml.

Property port will be set to 9463.

Property host has conflicting values:
  Value https://dvipa.washington.ibm.com is set in
file:/var/zosconnect/servers/myServer/includes/apiRequesterHTTPS.xml.
  Value https://dvipa.washington.ibm.com is set in
file:/var/zosconnect/servers/myServer/includes/apiRequesterHTTPS.xml.
  Value https://mpz3.washington.ibm.com is set in file:/var/zosconnect/servers/myServer/includes/oauth.xml.

Property host will be set to https://mpz3.washington.ibm.com.

Property authenticationConfigRef has conflicting values:
  Value mySAFAuth is set in file:/var/zosconnect/servers/myServer/includes/apiRequesterHTTPS.xml.
  Value myoAuthConfig is set in file:/var/zosconnect/servers/myServer/includes/oauth.xml.

Property authenticationConfigRef will be set to myoAuthConfig.
```

onConflict="MERGE" Conflicting elements will be merged, and the last value encountered will be used.

onConflict="REPLACE" When elements conflict, the element in the included file will be ignored

onConflict="IGNORE" Conflicting elements in the included file are ignored.

# Using a bootstrap.properties file to customize the server's configuration XML<sup>#</sup>



```
zceesrv1's bootstrap.properties
httpPort=9080
httpsPort=9443
ipicPort=1491
cicsHost=wg31.washington.ibm.com
network=ZOSCONN1
applid=ZOSCONN1
```

```
zceesrv2's bootstrap.properties
httpPort=9090
httpsPort=9453
ipicPort=1492
cicsHost=wg31.washington.ibm.com
network=ZOSCONN2
applid=ZOSCONN2
```

## **server.xml**

```
<!-- To access this server from a remote client, add a host attribute to the following
element, e.g. host="*" -->
<httpEndpoint id="defaultHttpEndpoint"
    host="*"
    httpPort="${httpPort}"
    httpsPort="${httpsPort}" />
```

## **ipicIDProp.xml**

```
<zosconnect_cicsIpicConnection id="catalog"
    host="${cicsHost}" port="${ipicPort}"
    zosConnectNetworkid="${network}" zosConnectApplid="${applid}"/>

<zosconnect_cicsIpicConnection id="cscvinc"
    host="${cicsHost}" port="${ipicPort}"
    zosConnectNetworkid="${network}" zosConnectApplid="${applid}"/>

<zosconnect_cicsIpicConnection id="miniloan"
    host="${cicsHost}" port="${ipicPort}"
    zosConnectNetworkid="${network}" zosConnectApplid="${applid}"/>
```

#Located in directory \${server.config.dir}



## Sharing XML configuration files between servers

You could start by adding an “includes” directory to each server’s configuration directory and then add “include” statements to this local directory to each server’s server.xml file

```
<include location="${server.config.dir}/includes/basicSecurity.xml"/>
<include location="${server.config.dir}/includes/ipic.xml"/>
<include location="${server.config.dir}/includes/keyringInbound.xml"/>
<include location="${server.config.dir}/includes/groupAccess.xml"/>
<include location="${server.config.dir}/includes/shared.xml"/>
<include location="${server.config.dir}/includes/oauth.xml"/>
```

- /var/zosconnect/servers/zceesrv1/includes
- /var/zosconnect/servers/zceesrv2/includes
- /var/zosconnect/servers/zceesrv3/includes

Then change the include file in each server’s XML file as needed

```
<include location="${server.config.dir}/includes/safSecurity.xml"/>
<include location="${server.config.dir}/includes/ipicIDProp.xml"/>
<include location="${server.config.dir}/includes/keyringOutboundMutual.xml"/>
<include location="${server.config.dir}/includes/groupAccess.xml"/>
<include location="${server.config.dir}/includes/shared.xml"/>
<include location="${server.config.dir}/includes/oauth.xml"/>
```

**F ZCEESRV1,REFRESH,CONFIG  
F ZCEESRV2,REFRESH,CONFIG  
F ZCEESRV3,REFRESH,CONFIG**

### Contents of the three “includes” directory

basicSecurity.xml  
db2.xml  
db2TLS.xml  
groupAccess.xml  
ipic.xml  
**ipicIDProp.xml**  
keyringInbound.xml  
keystore.xml  
keyringMutual.xml  
keyringOutboundMutual.xml  
**safSecurity.xml**

The issue here is that each of the included files must be maintained in 3 locations

**So, let’s take this a step further**



# Sharing XML configuration files between servers

Replace the *includes* subdirectories with symbolic links. Now the included files can be in a shared location which then can be accessed from multiple servers on a single or from multiple LPARs. Updates to the “include” files are made in one administrative directory.

## OMVS commands

### *Symbolic links to a shared local LPAR directory*

```
ln -s /var/shared/zosconnect/includes /var/zosconnect/servers/zceesrv1/includes  
ln -s /var/shared/zosconnect/includes /var/zosconnect/servers/zceesrv2/includes  
ln -s /var/shared/zosconnect/includes /var/zosconnect/servers/zceesrv3/includes
```

### *Symbolic links to a shared Sysplex directory*

```
ln -s /global/zosconnect/includes /var/zosconnect/servers/zceesrv1/includes  
ln -s /global/zosconnect/includes /var/zosconnect/servers/zceesrv2/includes  
ln -s /global/zosconnect/includes /var/zosconnect/servers/zceesrv3/includes
```

The server.xml file contains these “include” statements

```
<include location="${server.config.dir}/includes/safSecurity.xml"/>  
<include location="${server.config.dir}/includes/ipicIDProp.xml"/>  
<include location="${server.config.dir}/includes/keyringOutboundMutual.xml"/>  
<include location="${server.config.dir}/includes/groupAccess.xml"/>  
<include location="${server.config.dir}/includes/shared.xml"/>  
<include location="${server.config.dir}/includes/oauth.xml"/>
```



/var/shared/zosconnect/includes

### Contents of the common “includes” directory

*basicSecurity.xml*  
*db2.xml*  
*db2TLS.xml*  
*groupAccess.xml*  
*ipic.xml*  
*ipicIDProp.xml*  
*keyringInbound.xml*  
*keystore.xml*  
*keyringMutual.xml*  
*keyringOutboundMutual.xml*  
*safSecurity.xml*

F ZCEESRV1,REFRESH,CONFIG

F ZCEESRV2,REFRESH,CONFIG

F ZCEESRV3,REFRESH,CONFIG

Consider creating an “include” file with just the include statements and then include this file in each server’s server.xml file.



# Tech-TIP: A practical example-PTF V3.0.35 included a CORS update

**July 2020**

V3.0.35 (APAR PH26291)  
Server code update

**Enhancements**

- The text of messages BAQR0417W and BAQR0418W has been updated. For more information, see z/OS Connect EE [Runtime Messages](#).

**Fixes**

- PH21761 A CICS region reports **SOS DFHSM0133 WBSETBUF** when z/OS Connect EE requester is in use.
- PH25345 Passing user credentials in the request body to the authentication server to obtain a JWT causes a NPE in z/OS Connect EE.
- PH21819 z/OS Connect EE sets some CORS headers automatically.

**Attention**

When this fix is applied, additional CORS configuration is required in `server.xml` to enable connections from the z/OS Connect EE API toolkit and JavaScript clients. For more information, see [Configuring Cross-Origin Resource Sharing on a z/OS Connect Enterprise Edition Server](#)

`cors.xml`

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="CORS entries">

    <!-- add cors to allow cross origin access, e.g. when using swagger doc from zOS Connect Enterprise
        Edition -->
    <cors id="defaultCORSConfig"
        domain="/"
        allowedOrigins="*"
        allowedMethods="GET, POST, PUT, DELETE, OPTIONS"
        allowedHeaders="Origin, Content-Type, Authorization, Cache-Control, Expires, Pragma"
        allowCredentials="true"
        maxAge="3600"/>

</server>
```

`server.xml`

```
<include location="${server.config.dir}/includes/cors.xml"/>
```



# Sharing XML configuration files – using *variable* files

## myServer.xml

```
<variable name= "unauthenticatedUser" value= "WSGUEST" />
<variable name="profilePrefix" value= "BBGZDFLT" />
```

## zceeopid.xml

```
<variable name= "unauthenticatedUser" value="ZCGUEST" />
<variable name="profilePrefix" value="EMJZDFLT" />
```

### server.xml

```
<server description="new server">
<include location="${server.config.dir}/includes/safSecurity.xml"/>
<include location="${server.config.dir}/includes/${wlp.server.name}.xml"/>

    <!-- Enable features -->
    <featureManager>
        <feature>zosconnect:zosConnect-2.0</feature>
        <feature>zosconnect:zosConnectCommands-1.0</feature>
    </featureManager>
```

### safSecurity.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="SAF security">

    <!-- Enable features -->
    <featureManager>
        <feature>appSecurity-2.0</feature>
        <feature>zosSecurity-1.0</feature>
    </featureManager>

    <webAppSecurity allowFailOverToBasicAuth="true" />
    <safRegistry id="saf" />
    <safAuthorization racRouteLog="ASIS" />
    <safCredentials unauthenticatedUser="${unauthenticatedUser}"
        profilePrefix="${profilePrefix}" />
</server>
```



## Tech/Tip: Administrative – Use symbolic links for an administrative shortcut

- Create an “administration” subdirectory, e.g., `zcee` in directory `/var`
- Then create a symbolic link in the “administration” directory to each Liberty server’s configuration directory and other frequently accessed directories.

```
ls -al /var/zcee
drwxrwxrwx  4 JOHNSON  SYS1      8192 Aug 16 12:23 .
drwxrwxrwt 25 OMVSKERN SYS1      8192 Aug 16 11:56 ..
lrwxrwxrwx  1 JOHNSON  SYS1      57 Aug 16 12:22 CSCWLP -> /var/wlp/cics/CICS53Z/CSCWLP/wlp/usr/servers/defaultServer
lrwxrwxrwx  1 JOHNSON  SYS1      57 Aug 16 12:22 CICSWLP -> /var/wlp/cics/CICS53Z/CICSWLP/wlp/usr/servers/cicswlp
drwxrwxrwx  2 JOHNSON  SYS1      8192 Aug 16 15:30 hcd
lrwxrwxrwx  1 JOHNSON  SYS1      27 Jun 10 15:55 includes -> /global/zosconnect/includes
lrwxrwxrwx  1 JOHNSON  SYS1      28 Aug 16 10:12 mqweb -> /var/mqm/mqweb/servers/mqweb
lrwxrwxrwx  1 JOHNSON  SYS1      32 Jun  4 12:49 myServer -> /var/zosconnect/servers/myServer
drwxr-xr-x  2 JOHNSON  SYS1      8192 Aug 16 13:14 properties
lrwxrwxrwx  1 JOHNSON  SYS1      18 Aug 17 12:47 shared -> /var/shared/zosconnect/resources/zosconnect
lrwxrwxrwx  1 JOHNSON  SYS1      24 May 13 2020 walop3a -> /var/wlp/servers/walop3a
lrwxrwxrwx  1 JOHNSON  SYS1      24 May 13 2020 walrp3a -> /var/wlp/servers/walrp3a
lrwxrwxrwx  1 JOHNSON  SYS1      31 May 14 2020 wazs34a -> /var/zosconnect/servers/wazs34a
lrwxrwxrwx  1 JOHNSON  SYS1      24 Aug 16 10:32 wlphats -> /var/wlp/servers/wlphats
lrwxrwxrwx  1 JOHNSON  SYS1      36 Aug 16 10:31 zceeadm -> /var/ats/zosconnect/servers/zceeadm
lrwxrwxrwx  1 JOHNSON  SYS1      39 Aug 16 10:18 zceecics -> /var/cicsts/zosconnect/servers/zceecics
lrwxrwxrwx  1 JOHNSON  SYS1      35 Aug 16 10:31 zceedvm -> /var/ats/zosconnect/servers/zceedvm
lrwxrwxrwx  1 JOHNSON  SYS1      32 Jun 10 15:54 zceepid -> /var/zosconnect/servers/zceepid
lrwxrwxrwx  1 JOHNSON  SYS1      36 Aug 16 10:14 zceesrvr -> /var/ats/zosconnect/servers/zceesrvr
lrwxrwxrwx  1 JOHNSON  SYS1      44 Aug 16 11:57 zosmfServer -> /var/zosmf/configuration/servers/zosmfServer
```



## Tech/Tip: Administrative – Use dedicated ZFS filesystem at the mount points

- Create mount points in the “administrative” directory for shared r/w directories
- Avoid creating directories and files in the root file system.
- Use a common or shared mount point
  - Use /var mount point for local read/write file systems
  - Use /global for sharing a mount point across multiple LPARs
- Use ZFS filesystems and use AGGRGROW to allow R/W ZFS filesystems to automatically go into extents (>16).

```
SYS1.PARMLIB(BPXPRM##)
MOUNT FILESYSTEM('OMVS.ZCEE.ZFS')
  MOUNTPOINT('/var/zcee')
  TYPE(ZFS) PARM('AGGRGROW') MODE(RDWR)
MOUNT FILESYSTEM('OMVS.ZCEEHCD.ZFS')
  MOUNTPOINT('/var/zcee/hcd')
  TYPE(ZFS) PARM('AGGRGROW') MODE(RDWR)
MOUNT FILESYSTEM('OMVS.ZCEE.SHARED.ZFS')
  MOUNTPOINT('/var/shared/zosconnect')
  TYPE(ZFS) PARM('AGGRGROW') MODE(RDWR)
```



## Tech/Tip: Symbolic links can simplify commands in command shells and JCL

```
Performing commands:  
ln -s /global/zosconnect/includes /var/zcee/includes  
ln -s /var/zosconnect/servers/zceesrv1 /var/zcee/zceesrv1  
ln -s /var/zosconnect/servers/zceesrv2 /var/zcee/zceesrv2  
  
Changes the ln command from:  
ln -s /global/zosconnect/includes /var/zosconnect/servers/zceesrv1/includes  
ln -s /global/zosconnect/includes /var/zosconnect/servers/zceesrv2/includes  
  
To:  
ln -s /var/zcee/includes /var/zcee/zceesrv1/includes  
ln -s /var/zcee/includes /var/zcee/zceesrv2/includes
```

Directory Shortcuts

Which leads to shorter OMVS commands:

```
//EXPORT EXPORT SYMLIST=(*  
// SET SERVER='defaultServer'  
// SET SHARED='/var/zcee/shared'  
// SET WLPUSER='/var/zosconnect'  
//ZCEELN EXEC PGM=IKJEFT01,REGION=0M  
//SYSTSPRT DD SYSOUT=*  
//SYSERR DD SYSOUT=*  
//STDOUT DD SYSOUT=*  
//SYSTSIN DD *,SYMBOLS=EXEC SYS  
BPXBATCH SH +  
export serverName=&SERVER; +  
export sharedDir=&SHARED; +  
export WLP_USER_DIR=&WLPUSER; +  
ln -s $WLP_USER_DIR/servers/$serverName /var/zcee/$serverName; +  
ln -s $sharedDir/includes /var/zcee/$serverName/includes
```

OR

```
/u/johnson/.profile  
export serverName=defaultServer  
export sharedDir=/var/zcee/shared  
export WLP_USER_DIR=/var/zosconnect
```

```
//ZCEELN EXEC PGM=IKJEFT01,REGION=0M  
//SYSTSPRT DD SYSOUT=*  
//SYSERR DD SYSOUT=*  
//STDOUT DD SYSOUT=*  
//SYSTSIN DD *,SYMBOLS=EXEC SYS  
BPXBATCH SH +  
ln -s $WLP_USER_DIR/servers/$serverName /var/zcee/$serverName; +  
ln -s $sharedDir/includes /var/zcee/$serverName/includes
```



# Also use symbolic links to share z/OS Connect artifacts in default locations

By default, each server has their own dedicated resources/zosconnect subdirectory

-  /var/zosconnect/servers/zceesrv1/resources/zosconnect
-  /var/zosconnect/servers/zceesrv2/resources/zosconnect
-  /var/zosconnect/servers/zceesrv3/resources/zosconnect

**Contents of each of the "resources/zosconnect" directory**

```
/apis  
/apiRequesters  
/rules  
/services
```

Specify a shared alternative location for these artifacts using symbolic links.

## OMVS commands

### **Symbolic links to a local file system**

```
ln -s /var/shared/zosconnect/resources/zosconnect /var/zcee/shared
```

### **Or a symbolic links to a shared file system**

```
ln -s /global/zosconnect/resources/zosconnect /var/zcee/shared
```

 /var/shared/zosconnect/resources/zosconnect/.....

 /global/zosconnect/resources/....

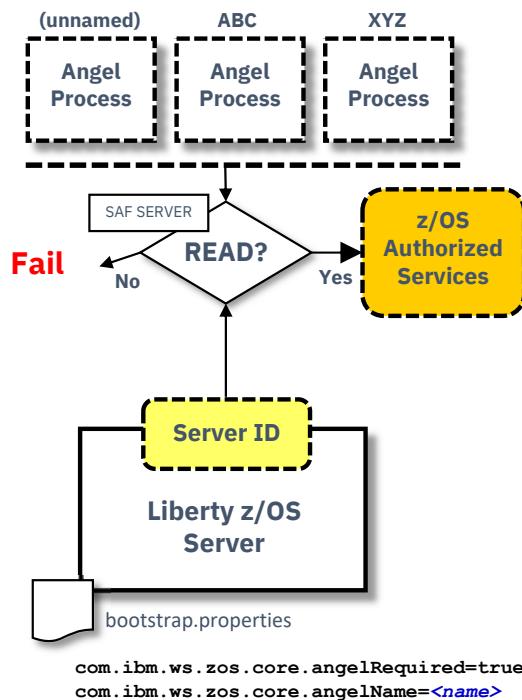
Then use the *location* attribute to override the default directories

```
shared.xml  
<zosconnect_apiRequesters location="/var/zcee/shared/apiRequesters">  
</zosconnect_apiRequesters>  
<zosconnect_zosConnectAPIs location="/var/zcee/shared/apis">  
</zosconnect_zosConnectAPIs>  
<zosconnect_services location="/var/zcee/shared/services">  
</zosconnect_services>
```

One directory for all APIs, API Requesters, Rules, and Services

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Slide 32

# z/OS : The Angel process – what is this about?



**The Angel Process is a started task that is used to protect access to z/OS privileged or authorized services. This is done with SAF SERVER profiles.**

- Authorized services include: WOLA, SAF, WLM, RRS, DUMP
- The ability to start multiple Angel processes on an LPAR was introduced in 16.0.0.4. This is called "Named Angels". It provides a way to separate Angel usage between Liberty servers:
  - An Angel process can be started with a NAME='<name>' parameter (or it can be started as a "default" without a name). The name may be up to 54 characters.
  - Liberty servers can be pointed at a specific Angel with a bootstrap property

## Best practice:

- You may create separate named Angels for isolation of Test and Production, but do not take this practice too far. A few Angels, yes; dozens, no.
- Establish automation routines to start the Angels at IPL
- Grant SAF GROUP access to the SERVER profiles, then connect server IDs as needed

List of current Liberty Features

[https://www.ibm.com/support/knowledgecenter/SSEQTP\\_liberty/com.ibm.websphere.wlp.doc/ae/rwlp\\_feat.html](https://www.ibm.com/support/knowledgecenter/SSEQTP_liberty/com.ibm.websphere.wlp.doc/ae/rwlp_feat.html)

# z/OS : SAF SERVER profiles related to the Angel



## Best practice:

- Establish all the SERVER profiles ahead of time. Existence of profile does not grant access; READ to it does.
- Determine what access a server needs and grant only that; check "is available" messages in messages.log to verify

Tech/Tip: The SAFLOG parameter was added in a recent Liberty drop. If this parameter is set to Y, additional security related messages will be written to the JES messages and console if a Liberty server does not have authorization to use an angel-controlled privileged function. See URL

[https://www.ibm.com/support/knowledgecenter/SS7K4U\\_liberty/com.ibm.websphere.wlp.zseries.doc/ae/rwlp\\_newinrelease.html](https://www.ibm.com/support/knowledgecenter/SS7K4U_liberty/com.ibm.websphere.wlp.zseries.doc/ae/rwlp_newinrelease.html)

Liberty 21.0.6 add a new property to identify required services, com.ibm.ws.zos.core.angelRequiredServices, for more details see URL

<https://www.ibm.com/docs/en/was-liberty/zos?topic=overview-process-types-zos>



# SAF APPL and EJBRole Resources

*Connect z/OS Connect users to a common group*

**CONNECT (FRED,USER1,JOHNSON) GROUP(ZCEEUSR)**

*Define a APPL profile for the server's SAF profilePrefix and permit access*

**RDEFINE APPL BBGZDFLT UACC(NONE) OWNER(SYS1)**

**PERMIT BBGZDFLT CLASS(APPL) ACCESS(READ) ID(WSGUEST#, ZCEEUSR)**

**SETROPTS RACLIST(APPL) REFRESH**

*Define an EJBROLE profile for the server's SAF profilePrefix and permit access*

**RDEFINE EJBROLE BBGZDFLT.zos.connect.access.roles.zosConnectAccess +  
OWNER(SYS1) UACC(NONE)**

**PERMIT BBGZDFLT.zos.connect.access.roles.zosConnectAccess +  
CLASS(EJBROLE) ID(ZCEEUSR) ACCESS(READ)**

*Refresh the EJBROLE in storage profiles*

**SETROPTS RACLIST(EJBROLE) REFRESH**

```
<safCredentials unauthenticatedUser="WSGUEST" profilePrefix="BBGZDFLT" />
```

- # [https://www.ibm.com/support/knowledgecenter/SS7K4U/liberty/com.ibm.websphere.wlp.zseries.doc/ae/twlp\\_config\\_security\\_saf.html](https://www.ibm.com/support/knowledgecenter/SS7K4U/liberty/com.ibm.websphere.wlp.zseries.doc/ae/twlp_config_security_saf.html)  
[https://www.ibm.com/support/knowledgecenter/SS4SVW/beta/securing/saf\\_unauthenticated\\_id.html#concept\\_saf\\_unauthenticated\\_id](https://www.ibm.com/support/knowledgecenter/SS4SVW/beta/securing/saf_unauthenticated_id.html#concept_saf_unauthenticated_id)

## Tech/Tip: z/OS : ISPF/OMVS examples of using SURROGAT access



The image displays two side-by-side terminal windows from the ISPF/OMVS environment.

**Top Window (Left):** This window shows the ISPF Shell interface. The menu bar includes File, Edit, Settings, View, Communication, Actions, Window, Help, File, Directory, Special\_file, Tools, File\_systems, Options, and Setup (which is circled in red). Below the menu is the text "UNIX System Services ISPF Shell". It prompts the user to "Enter a pathname and do one of these:" followed by three options: "Press Enter.", "Select an action bar choice.", and "Specify an action code or command on the command line.". It also says "Return to this panel to work with a different pathname." At the bottom, it shows the path "/var/zcee". A message "EUID=200042" is highlighted with a red oval.

**Bottom Window (Right):** This window shows the OMVS shell interface. The menu bar includes File, Edit, Settings, View, Communication, Actions, Window, Help, IBM, Licensed Material - Property of IBM, 5650-ZOS Copyright IBM Corp. 1993, 2017, (C) Copyright Mortice Kern Systems, Inc., 1985, 1996, (C) Copyright Software Development Group, University of Waterloo, 1989. It displays U.S. Government Users Restricted Rights - Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp. It shows "IBM is a registered trademark of the IBM Corp.". The user has run the command "su libserv" (highlighted with a red oval), and the output shows the user switching to the "libserv" user. The prompt changes to "\$" and the user runs "id", which shows they are now user 200042 (LIBSERV). The bottom of the window shows a function key legend: ESC=< 1=Help 2=SubCmd 3=HlpRetrn 4=Top 5=Bottom 6=TSO  
7=BackScr 8=Scroll 9=NextSess 10=Refresh 11=FwdRetrn 12=Retrieve. The status bar at the bottom indicates "Connected to remote server/host wg31a using lu/pool TCP00117 and port 23".

Super user is required to set some extended attributes and to use the *ps -ef* command to display all processes.

# **Connecting z/OS Connect servers to to z/OS subsystems**



## Tech-Tip: Liberty's “adminCenter” Feature

- Provides a web browser interface to the server's configuration files

The screenshot shows two side-by-side views of the IBM Liberty adminCenter interface for editing the `server.xml` configuration file.

**Left View (Design Tab):**

- Title Bar:** Server Config
- File Bar:** server.xml
- Buttons:** Save
- Tab:** Design (highlighted with a red circle)
- Content Area:**
  - Server Section:** Includes a tree view of configuration elements like `Include /var/zosconnect/servers/myServer...`, a "Server" section with "Add child" and "Remove" buttons, and a "Description" input field containing "new server".
  - Save Buttons:** Save, Close

**Right View (Source Tab):**

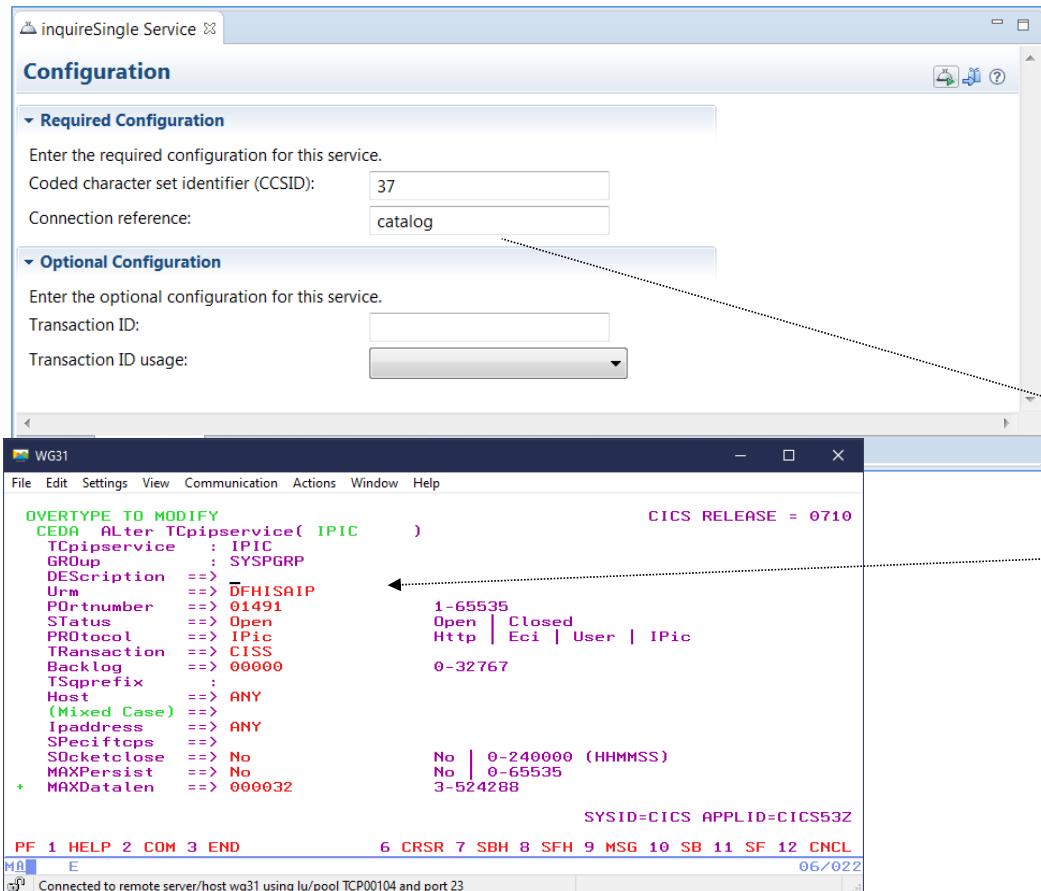
- Title Bar:** Server Config
- File Bar:** server.xml
- Buttons:** Save, Close
- Tab:** Source (highlighted with a red circle)
- Content Area:** Displays the XML code for the `server.xml` file, showing the configuration for a new server and various included resources.

```
1<server description="new server">
2<include location="/var/zosconnect/servers/myServer/resources/imsmobile-config/services/ims-services.xml" optional="true"/>
3<include location="/var/zosconnect/servers/myServer/resources/imsmobile-config/interactions/ims-interactions.xml" optional="true"/>
4<include location="/var/zosconnect/servers/myServer/resources/imsmobile-config/connections/ims-connections.xml" optional="true"/>
5<include location="${server.config.dir}/includes/safSecurity.xml"/>
6<include location="${server.config.dir}/includes/safTrace.xml"/>
7<include location="${server.config.dir}/includes/ipic.xml"/>
8<include location="${server.config.dir}/includes/keyring.xml"/>
9<include location="${server.config.dir}/includes/shared.xml"/>
10<include location="${server.config.dir}/includes/apiRequesterHTTPS.xml"/>
11<include location="${server.config.dir}/includes/oauth.xml"/>
12<include location="${server.config.dir}/includes/audit.xml"/>
13<include location="${server.config.dir}/includes/audit.xml"/>
14<include location="${server.config.dir}/includes/mq.xml"/>
15<include location="${server.config.dir}/includes/db2.xml"/>
16<include location="${server.config.dir}/includes/wlm.xml"/>
17<include location="${server.config.dir}/includes/restConnector.xml"/>
18<include location="${server.config.dir}/includes/smf.xml"/>
19<include location="${server.config.dir}/includes/adminCenter.xml" />
20
21<!-- Enable features -->
22<featureManager>
23    <feature>apiDiscovery-1.0</feature>
24    <feature>zosconnect:zosConnect-2.0</feature>
25    <feature>zosconnect:zosConnectCommands-1.0</feature>
26    <feature>imsmobile:imsmobile-2.0</feature>
27</featureManager>
28
29<!-- To access this server from a remote client add a host attribute to the following element, e.g. host="" -->
30<httpEndpoint host="" httpPort="9080" httpsPort="9443" id="defaultHttpEndpoint"/>
31
32<
```

# Server XML - Accessing a CICS program using IPIC



The server.xml file is the key configuration file:



```
catalog.xml
Design Source
1 <server description="CICS IPIC - catalog">
2
3 <!-- Enable features -->
4 <featureManager>
5   <feature>zosconnect:cicsService-1.0</feature>
6 </featureManager>
7
8 <zosconnect_cicsIpicConnection id="catalog">
9   host="wg31.washington.ibm.com"
10  port="1491"
11  transid="CSMI"
12  transidUsage="EIB_AND_MIRROR"/>
13
14 </server>
15
```

# Server XML – Accessing an IMS Transaction using OTMA



ivtnoService Service Configuration

**Required Configuration**

Enter the required configuration for this service.

Connection profile: **IMSCONN**

Interaction profile: **IMSINTER**

**Optional Configuration**

Enter the optional configuration for this service.

IMS destination override:

Program name:

Overview Configuration

## IMS Connect HWSCFG

```
HWS= (ID=IMS14HWS, XIBAREA=100, RACF=Y, RRS=N)
TCPIP= (HOSTNAME=TCPIP, PORTID= (4000, LOCAL) , RACFID=JOHNSON, TIMEOUT=
5000)
DATASTORE= (GROUP=OTMAGRP, ID=IVP1, MEMBER=HWSMEM, T MEMBER=OTMAMEM)
IMSPLEX= (MEMBER=IMS14HWS, T MEMBER=PLEX1)
ODACCESS= (ODBMAUTOCONN=Y,
DRDAPORT= (ID=5555, PORTTMOT=6000) , ODBMTMOT=6000)
```

## Connection

```
<server>
<imsmobile_imsConnection comment="" connectionFactoryRef="CF1" connectionTimeout="-1" connectionType="IMSCONNECT" id="IMSCONN"/>
<connectionFactory containerAuthDataRef="Connection1_Auth" id="CF1">
    <properties.gmoa hostName="wg31.washington.ibm.com" portNumber="4000"/>
</connectionFactory>

<authData id="Connection1_Auth" password="encryptedPassword1" user="userName1"/>
</server>
```

## Interaction

```
<server>
<imsmobile_interaction comment="" commitMode="1" id="IMSINTER" imsConnectCodepage="Cp1047" imsConnectTimeout="0"
    imsDatastoreName="IVP1" interactionTimeout="-1" ltermOverrideName="" syncLevel="0"/>
</server>
```

# Server XML – Accessing an IMS Database using ODBA



## Service Project Editor: Configuration



### Required Configuration

Enter the required configuration for this service.

Connection profile:

DFSIVPACConn

### ConnectionFactory

```
<connectionFactory id="DFSIVPACConn">
<properties.imsudbJLocal
  databaseName="DFSIVPA"
  datastoreName="IVP1"
  datastoreServer="wg31.washington.ibm.com"
  driverType="4"
  portNumber="5555"
  user="USER1"
  password="password"
  flattenTables="True"/>
</connectionFactory>
```

### IMS Connect HWSCFG

```
HWS=(ID=IMS14HWS,XIBAREA=100,RACE=N,RRS=N)
TCPIP=(HOSTNAME=TCPIP,PORTID=(4000,LOCAL),RACFID=JOHNSON,TIMEOUT=5000)
DATASTORE=(GROUP=OTMAGRP,ID=IVP1, MEMBER=HWSMEM,TMEMBER=OTMAMEM)
IMSPLEX=(MEMBER=IMS14HWS,TMEMBER=PLEX1)
ODACCESS=(ODBMAUTOCONN=Y,
DRDAPORT=(ID=5555,PORTTMOT=6000),ODBMTMOT=6000)
```

# Server XML - Accessing a Db2 REST service



Service Project Editor: Configuration

Required Configuration

Enter the required configuration for this service.

Connection reference: db2conn

Definition Configuration

DSNL004I -DSN2 DDF START  
COMPLETE  
LOCATION DSN2LOC  
LU  
USIBMWZ.DSN2APPL  
GENERICLU -NONE  
DOMAIN  
WG31.WASHINGTON.IBM.COM  
TCPPORT 2446  
SECPORT 2445  
RESPORT 2447

db2pass.xml

Design Source

```
1 <server description="DB2 REST">
2
3   <zosconnect_zosConnectServiceRestClientConnection id="db2conn"
4     host="wg31.washington.ibm.com"
5     port="2446"
6     basicAuthRef="dsn2Auth" />
7
8   <zosconnect_zosConnectServiceRestClientBasicAuth id="dsn2Auth"
9     applName="DSN2APPL"/>
10
11</server>
12
```

# Server XML - Using JMS to access MQ



\*twoWay Service X

## Service Project Editor: Configuration

**Required Configuration**

Enter the required configuration for this service.

Connection factory JNDI name: jms/qmgrCf

Request destination JNDI name: jms/requestQueue

Reply destination JNDI name: jms/replyQueue

Wait interval: 3000

MQMD format: MQSTR

Coded character set identifier (CCSID): 37

Is message persistent:

Reply selection: msgIDToCorrelID

Expiry: -1

Definition Configuration

mq.xml

Read only Close

Design Source

```
2 <featureManager>
3   <feature>zosconnect:mqService-1.0</feature>
4 </featureManager>
5
6 <variable name="wmqJmsClient.rar.location"
7   value="/usr/lpp/mqm/V9R1M1/java/lib/jca/wmq.jmsra.rar"/>
8 <wmqJmsClient nativeLibraryPath="/usr/lpp/mqm/V9R1M1/java/lib"/>
9
10 <connectionManager id="ConMgr1" maxPoolSize="5"/>
11
12 <jmsConnectionFactory id="qmgrCf" jndiName="jms/qmgrCf">
13   connectionManagerRef="ConMgr1">
14   <properties.wmqJMS transportType="BINDINGS"
15     queueManager="QMZ1" />
16 </jmsConnectionFactory>
17
18 <jmsConnectionFactory id="qmgrCf2" jndiName="jms/qmgrCf2">
19   connectionManagerRef="ConMgr1">
20   <properties.wmqJMS transportType="CLIENT"
21     queueManager="ZMQ1"
22     channel="LIBERTY.DEF.SVRCONN"
23     hostName="wg31.washington.ibm.com"
24     port="1422" />
25 </jmsConnectionFactory>
26
27 <jmsQueue id="q1" jndiName="jms/default">
28   <properties.wmqJms
29     baseQueueName="ZCONN2.DEFAULT.MQZCEE.QUEUE"
30     CCSID="37"/>
31 </jmsQueue>
32
33 <jmsQueue id="requestQueue" jndiName="jms/request">
34   <properties.wmqJms
35     baseQueueName="ZCONN2.TRIGGER.REQUEST"
36     targetClient="MQ"
37     CCSID="37"/>
38 </jmsQueue>
39
40 <jmsQueue id="replyQueue" jndiName="jms/replyQueue">
41   <properties.wmqJms
42     baseQueueName="ZCONN2.TRIGGER.RESPONSE"
43     targetClient="MQ"
44     CCSID="37"/>
45 </jmsQueue>
46
47
```

# Server XML – Accessing a HATS REST service



```
getCompany.properties - Notepad
File Edit Format View Help
provider=rest
name=getCompany
version=1.0
description=Obtain a list of companies
requestSchemaFile=getCompanyRequest.json
responseSchemaFile=getCompanyResponse.json
verb=POST
uri=/Trader/rest/GetCompany
connectionRef=HatsConn
```

Server Config

hats.xml

Read only Close

Design Source

```
<server description="HATS">
  <zosconnect_zosConnectServiceRestClientConnection id="HatsConn"
    host="wg31.washington.ibm.com"
    port="29080" />
</server>
```

## HATS Liberty server.xml

```
<!-- To access this server from a remote client, add a host attribute to the following element, e.g. host="*" -->
<httpEndpoint id="defaultHttpEndpoint"
  httpPort="29080"
  host="*"
  httpsPort="29443" />
```



# Server XML- Accessing an MVS application using WOLA

```
filea.properties - Notepad
File Edit Format View Help
name=Filea
version=1.0
provider=wola
description=Test COBOL batch program
language=COBOL
program=ATSFIL
register=FILEAZCON
connectionRef=wolaCF
requestStructure=./fileareq.cpy
responseStructure=./filearsp.cpy
```

Server Config

wola.xml

Design    Source

```
<server description="WOLA">
  <featureManager>
    <feature>zosLocalAdapters-1.0</feature>
  </featureManager>
  <zosLocalAdapters wolaGroup="ZCEESRVR"
    wolaName2="ZCEESRVR"
    wolaName3="ZCEESRVR"/>
  <connectionFactory id="wolaCF"
    jndiName="eis/ola">
    <properties.ola/>
  </connectionFactory>
</server>
```

```
* SET THE VALUES FOR USE WITH WOLA REGISTRATION
MOVE 'FILEAZCON'          TO REG-REGNAME.
MOVE 'ZCEESRVR'            TO REG-DAEMONGRP.
MOVE 'ZCEESRVR'            TO REG-NODE.
MOVE 'ZCEESRVR'            TO REG-SVRNAME.
MOVE 'ATSFIL'              TO SVC-SERVICE-NAME.
INSPECT REG-DAEMONGRP CONVERTING ' ' to LOW-VALUES.
* Register to a Local Liberty server
CALL 'BBOA1REG' USING
  REG-DAEMONGRP,REG-NODE,REG-SVRNAME,REG-REGNAME,REG-MINCONN,REG-MAXCONN,REG-FLAGS,RSP-RC,RSP-RSN.
```

# Server XML – Accessing a DVM server using WOLA



Server Config

dvs.xml

Read only Close

Design Source

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="new server">
  <!-- Enable features -->
  <featureManager>
    <feature>usr:dvsProvider</feature>
    <feature>zosLocalAdapters-1.0</feature>
  </featureManager>
  <!-- Adapter Details with WOLA Group Name (ZCEEDVM) -->
  <zosLocalAdapters wolaName3="NAME3"
    wolaName2="NAME2"
    wolaGroup="ZCEEDVM"/>
  <!-- DVS Service Details with Register Name (ZCEEDVM) -->
  <zosconnect_zosConnectService invokeURI="/dvs"
    serviceDescription=""
    serviceRef="dvsService"
    serviceName="dvsService"
    id="zosConnectDvsService"/>
  <usr_dvsService invokeURI="/dvs"
    serviceName="DVSS1"
    registerName="ZCEEDVM"
    connectionFactoryRef="wolaCF"
    id="dvsService"/>
  <connectionFactory jndiName="eis/ola" id="wolaCF">
    <properties.ola/>
  </connectionFactory>
  <zosconnect_zosConnectService serviceRef="svc1"
    serviceAsyncRequestTimeout="600s"
    serviceName="dvs1" id="sdef1"/>
  <zosconnect_localAdaptersConnectService
    connectionWaitTimeout="7200"
    connectionFactoryRef="wolaCF"
    serviceName="DVSS1"
    registerName="ZCEEDVM"
    id="svc1"/>
</server>
```

## DVS.AVZS.SAVZEXEC (AVZSIN00)

```
/*
 * Enable z/OS Connect interface facility
 */
if DoThis then
  do
    /*
     * The following parameter enables the z/OS Connect interface
     * facility.
    */
    "MODIFY PARM NAME(ZCONNECT)           VALUE(YES)"
    "MODIFY PARM NAME(NETWORKBUFFERSIZE)  VALUE(96K)"
  /*
   * The "DEFINE ZCPATH" command(s) can be used to define
   * paths to z/OS Connect regions to handle requests.
   * Use a separate "'DEFINE ZCPATH" command to define each
   * path required (Note that a single path can handle
   * several different requests)
   * refer to the documentation for details about the parameters,
   * and information about optional parameters.
  */
  "DEFINE ZCPATH",
    "  NAME(ZCEE)          '',
    "  RNAME(ZCEEDVM)      '',
    "  WNAME(ZCEEDVM)      '',
    ""
end
```

# Server XML – Accessing a File Manager server



```
filea.properties - Notepad
File Edit Format View Help
name=filea
provider=filemanager
host=wg31.washington.ibm.com
version=1.0
port=2800
file=USER1.ZCEE.FILEA
template=USER1.ZCEE.TEMPLATE(FILEA)
connid=default
userid=USER1
passwd=USER1
```

Server Config

filemgr.xml

Read only Close

Design Source

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="new server">
  <!-- Enable features -->
  <featureManager>
    <feature>filemanager:fmProvider-2.0</feature>
  </featureManager>
  <FileManager_Connection id="default">
    <runport>2800</runport>
    <max_timeout>1800</max_timeout>
  </FileManager_Connection>
</server>
```

SYS1.PROCLIB(IPVSRV1)

```
//IPVSRV1 PROC PORT=2800,FAMILY='AF_INET',TRACE=N
//      SET ENV=''
//RUN      EXEC PGM=IPVSRV,REGION=40M,
//          PARM='(&ENV/&PORT &FAMILY &TRACE')
// SET IPV=SYSP.ADFZ.JCL           <== Update HLQ
//STEPLIB  DD DISP=SHR,DSN=ADFZ.SIPVMODA      <== ADFzCC APF LIBRARY
//SYSPRINT DD SYSOUT=*
//IPVTRACE DD SYSOUT=*
//STDOUT   DD SYSOUT=*
///* Server wide, then participating product configurations
//CONFIG   DD DISP=SHR,DSN=&IPV.(IPVCFG)
```

# Server XML – Accessing a z/OS Connect API Provider



```
cscvinc.properties - Notepad
File Edit Format View Help
apiDescriptionFile=./cscvinc.json
dataStructuresLocation=./syslib
apiInfoFileLocation=./syslib
logFileDirectory=./logs
language=COBOL
connectionRef=cscvincAPI
requesterPrefix=csc

Ln 1, Col 1 100% Unix (LF) UTF-8
```

Server Config

apiRequesterHTTPS.xml

Read only Close

Design Source

```
<server description="API Requester">
  <!-- Enable features -->
  <featureManager>
    <feature>zosconnect:apiRequester-1.0</feature>
  </featureManager>
  <zosconnect_apiRequesters location="/global/zosconnect/resources/apiRequesters"
    idAssertion="ASSERT_ONLY">
    <apiRequester name="cscvinc_1.0.0" requireSecure="false"/>
  </zosconnect_apiRequesters>
  <zosconnect_endpointConnection id="mqapi"
    host="http://dvipa.washington.ibm.com"
    port="9443"
    authenticationConfigRef="mySAFAuth"
    connectionTimeout="10s"
    receiveTimeout="40s" />
  <zosconnect_endpointConnection id="cscvincAPI"
    host="https://dvipa.washington.ibm.com"
    port="9443"
    connectionTimeout="10s"
    receiveTimeout="40s" />
  <zosconnect_endpointConnection id="miniloancicsAPI"
    host="https://dvipa.washington.ibm.com"
    port="9443"
    authenticationConfigRef="mySAFAuth"
    connectionTimeout="10s"
    receiveTimeout="40s" />
  <zsoauth_data id="mySAFAuth"
    user="USER1"
    password="user1" />
</server>
```

Server Config

server.xml

Save Close

Design Source

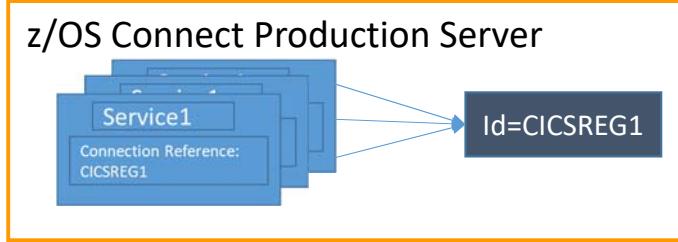
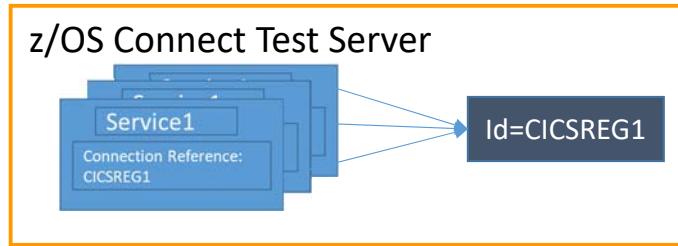
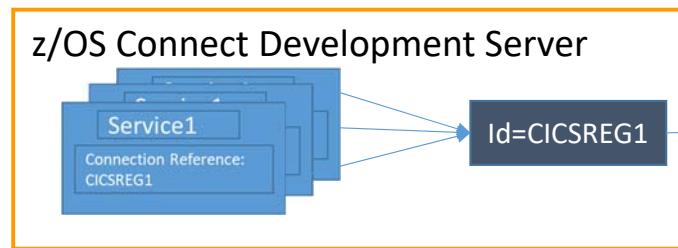
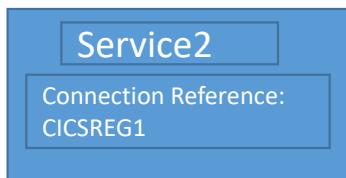
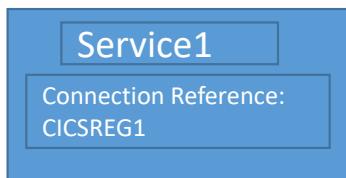
Press Ctrl+space for content assist.

```
<!-- To access this server from a remote client add a host attribute to the following
element, e.g. host="*" -->
<httpEndpoint host="*"
  httpPort="9080"
  httpsPort="9443"<!--&lt;!--&gt; id="defaultHttpEndpoint"/&gt;</pre>
```

# Use naming conventions for service connection references



Don't couple connection names to specific systems



CICS region CICSREG1

CICS region CICSTST1

CICS region CICSTST2

?

CICS region CICSPRD1

CICS region CICSPRD2

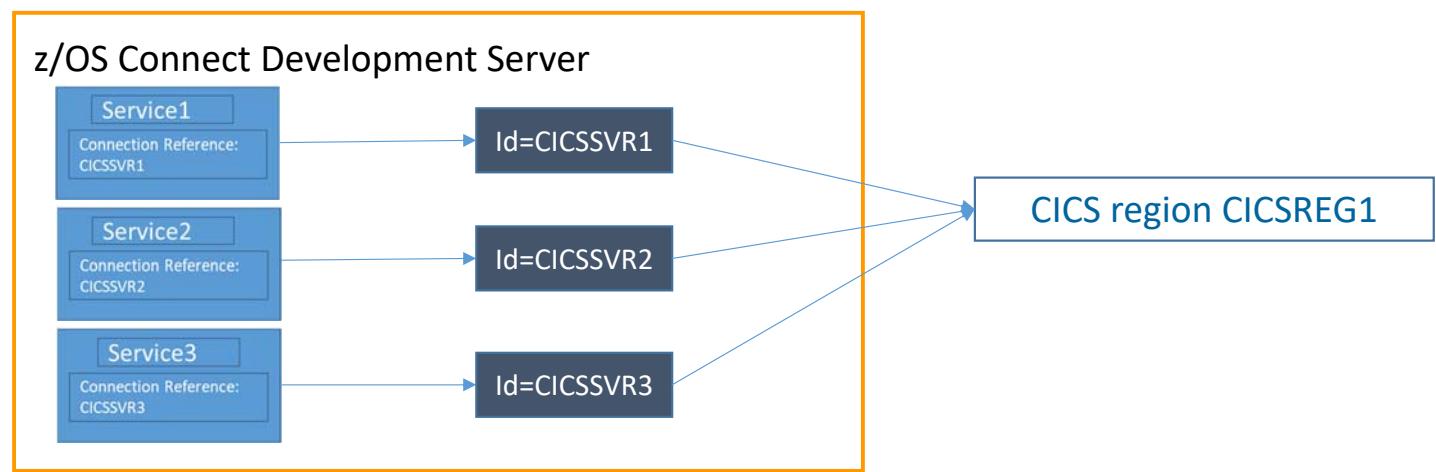
CICS region CICSPRD3

?

# Use naming conventions for service connection references



Use application meaningful names for connection references



# **Useful Liberty features and MVS commands**

# Use the adminCenter-1.0 feature to update the server XML from a browser



Administrators can use a web interface to maintain the server XML configuration.



```
1<server description="Admin Center">
2
3  <!-- Enable features -->
4  <featureManager>
5    <feature>adminCenter-1.0</feature>
6  </featureManager>
7
8  <remoteFileAccess>
9    <writeDir>${server.config.dir}</writeDir>
10 </remoteFileAccess>
11
12</server>
13
```

```
RDEFINE EJBROLE BBGZDFLT.com.ibm.ws.management.security.resource.Administrator OWNER(SYS1) UACC(NONE)

PERMIT BBGZDFLT.com.ibm.ws.management.security.resource.Administrator CLASS(EJBROLE) ID(FRED) ACCESS(READ)

SETR RACLIST(EJBROLE) REFRESH
```



# Tech-Tip: Liberty's “adminCenter” Feature to update server XML

- Web browser interface to the server's configuration files

The screenshot shows the IBM Liberty adminCenter interface for managing server configuration files. The main window title is "Server Config" and the file being edited is "server.xml". The interface has two tabs: "Design" and "Source". The "Source" tab is currently active, showing the XML code for the configuration.

A content assist dropdown is open over the "zosconnect\_apiRequester" element in the XML. The dropdown lists several options, with "zosconnect\_zosConnectServiceRestClientBasicAuth" highlighted. The content assist trigger "Press Ctrl+space for content assist" is circled in red in the top right corner of the source editor.

The XML code shown in the "Source" tab is as follows:

```
<server description="new server">
<include location="/var/zosconnect/servers/myServer/resources/imsmobile-config/services/ims-services.xml" optional="true"/>
<include location="/var/zosconnect/servers/myServer/resources/imsmobile-config/interactions/ims-interactions.xml" optional="true"/>
<include location="/var/zosconnect/servers/myServer/resources/imsmobile-config/connections/ims-connections.xml" optional="true"/>
<include location="${server.config.dir}/includes/safSecurity.xml"/>
<include location="${server.config.dir}/includes/safTrace.xml"/>
<include location="${server.config.dir}/includes/ipic.xml"/>
<include location="${server.config.dir}/includes/keyring.xml"/>
<include location="${server.config.dir}/includes/apiRequesterHTTPS.xml"/>
<include location="${server.config.dir}/includes/shared.xml"/>
<include location="${server.config.dir}/includes/oauth.xml"/>
<include location="${server.config.dir}/includes/audit.xml"/>
<include location="${server.config.dir}/includes/mq.xml"/>
<include location="${server.config.dir}/includes/db2.xml"/>
<include location="${server.config.dir}/includes/wlm.xml"/>
<include location="${server.config.dir}/includes/restConnector.xml"/>
<wsSecurityProvider>
<zosconnect_apiRequester>
<zosconnect_apiRequesters>
Required z/OS Connect API Requester.
<zosconnect_auditInterceptor>
<zosconnect_authData>
<zosconnect_authorizationInterceptor>
<zosconnect_authorizationServer>
<zosconnect_authToken>
<zosconnect_zosConnectServiceRestClientBasicAuth />

<cors allowCredentials="true" allowedHeaders="Origin, Content-Type, Authorization, Cache-Control, Expires, Pragma" allowedMethods="GET, POST, PUT, PATCH, DELETE, HEAD, OPTIONS" maxAge="1728000" />
```

# Use the restConnector-2.0 feature to see real time configuration details



A secure, REST administrative connector that enables remote access from a Java client or Web browser (GET only) or directly through an HTTPS call to the current runtime configuration.

Server Config

restConnector.xml

Read only Close

Design Source

```
1<?xml version="1.0" encoding="UTF-8"?>
2
3<server description="REST Connector">
4  <featureManager>
5    <feature>restConnector-2.0</feature>
6  </featureManager>
7
8</server>
9
```

URI Path is the concatenation of the path /ibm/api/config with the server XML configuration element and any optional query strings.

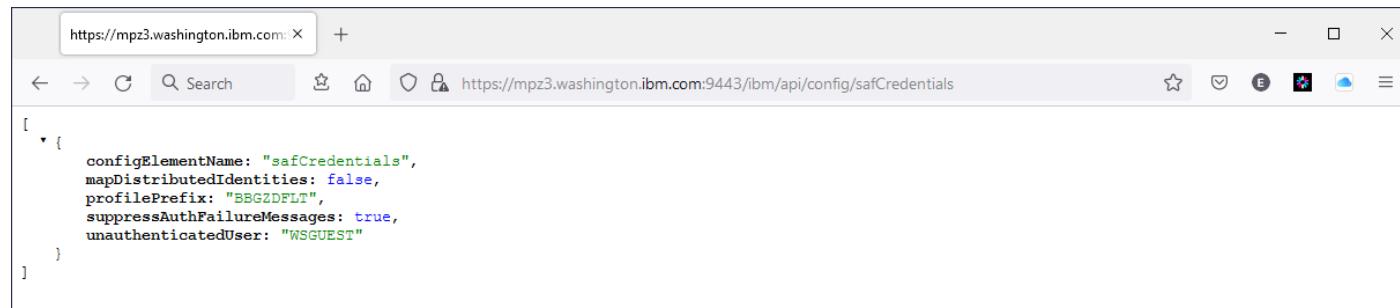
<https://mpz3.washington.ibm.com:9443/ibm/api/config/jmsQueue>  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_cicsIpicConnection?port=1491](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_cicsIpicConnection?port=1491)  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_zosConnectServiceRestClientConnection](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_zosConnectServiceRestClientConnection)  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_cicsIpicConnection?id=miniloan](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_cicsIpicConnection?id=miniloan)  
<https://mpz3.washington.ibm.com:9443/ibm/api/config/safCredentials>  
<https://mpz3.washington.ibm.com:9443/ibm/api/config/connectionFactory>  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_zosConnectManager](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_zosConnectManager)  
<https://mpz3.washington.ibm.com:9443/ibm/api/config/keyStore>  
<https://mpz3.washington.ibm.com:9443/ibm/api/config/ssl>  
<https://mpz3.washington.ibm.com:9443/ibm/api/config/sslDefault>  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_zosConnectManager](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_zosConnectManager)  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_zosConnectAPIs](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_zosConnectAPIs)  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_services](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_services)  
[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_apiRequesters](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_apiRequesters)

```
RDEFINE EJBROLE BBGZDFLT.com.ibm.ws.management.security.resource.Administrator OWNER(SYS1) UACC(NONE)
RDEFINE EJBROLE BBGZDFLT.com.ibm.ws.management.security.resource.Reader OWNER(SYS1) UACC(NONE)
RDEFINE EJBROLE BBGZDFLT.com.ibm.ws.management.security.resource.allAuthenticatedUsers OWNER(SYS1) UACC(NONE)
PERMIT BBGZDFLT.com.ibm.ws.management.security.resource.Administrator CLASS(EJBROLE) ID(USER1) ACCESS(READ)
PERMIT BBGZDFLT.com.ibm.ws.management.security.resource.Reader CLASS(EJBROLE) ID(ZCEEUSRS) ACCESS(READ)
SETR RACLIST(EJBROLE) REFRESH
```



# restConnector-2.0 feature examples

<https://mpz3.washington.ibm.com:9443/ibm/api/config/safCredentials>



```
[{"configElementName": "safCredentials", "mapDistributedIdentities": false, "profilePrefix": "BBGZDFLT", "suppressAuthFailureMessages": true, "unauthenticatedUser": "WSGUEST"}]
```

[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_zosConnectServiceRestClientConnection?port=2446](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_zosConnectServiceRestClientConnection?port=2446)

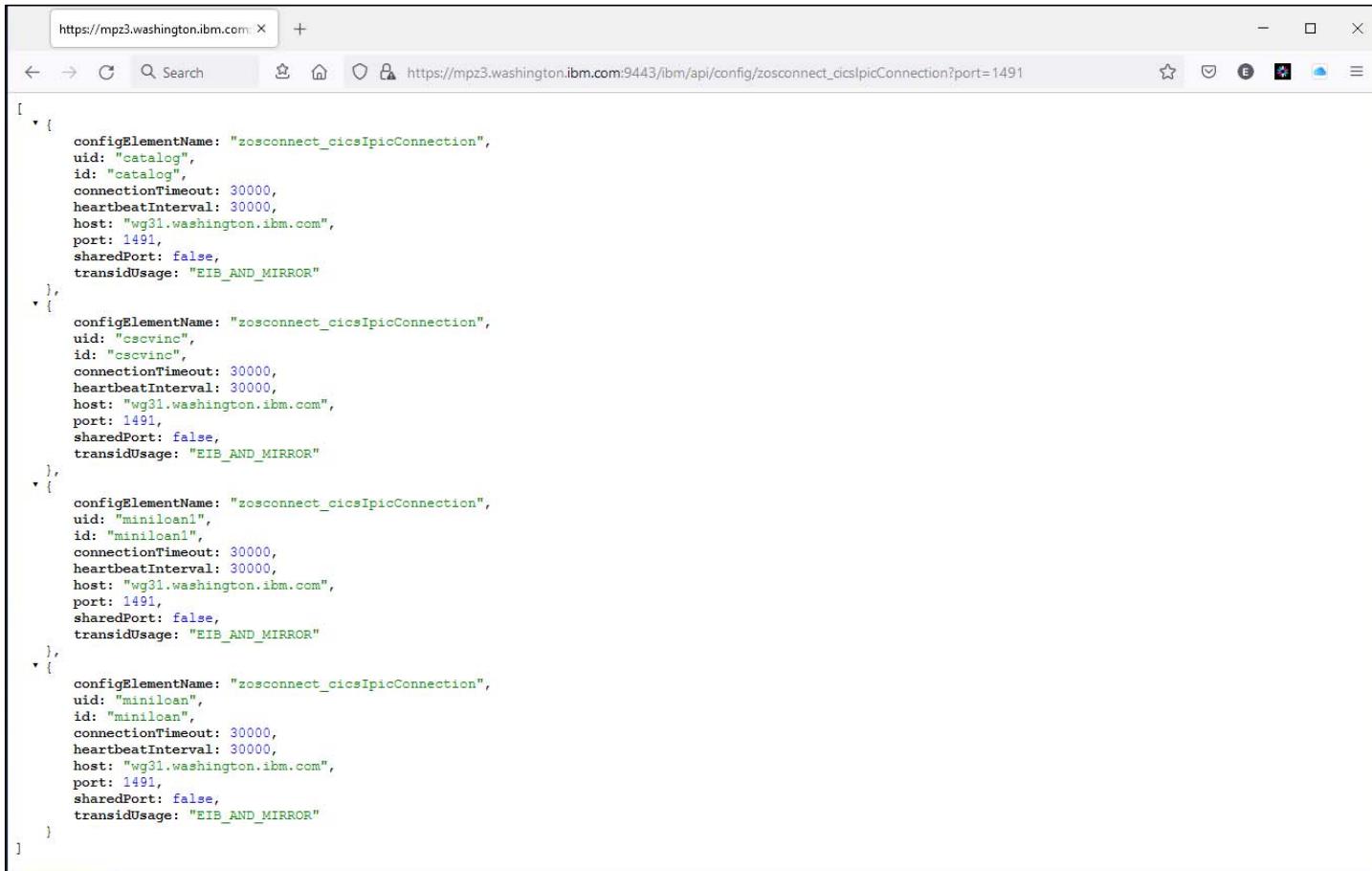


```
[{"configElementName": "zosconnect_zosConnectServiceRestClientConnection", "uid": "Db2Conn", "id": "Db2Conn", "allowChunking": true, "basicAuthRef": {"configElementName": "zosconnect_zosConnectServiceRestClientBasicAuth", "uid": "dns2Auth", "id": "dns2Auth", "password": "*****", "userName": "USER1"}, "connectionTimeout": 30000, "host": "sg31.washington.ibm.com", "port": "2446", "receiveTimeout": 60000} ]
```



# restConnector-2.0 feature

[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_cicsIpicConnection?port=1491](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_cicsIpicConnection?port=1491)



The screenshot shows a web browser window displaying a JSON array of configuration elements. The URL in the address bar is [https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_cicsIpicConnection?port=1491](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_cicsIpicConnection?port=1491). The JSON data lists four connection configurations:

```
[{"configElementName": "zosconnect_cicsIpicConnection", "uid": "catalog", "id": "catalog", "connectionTimeout:": 30000, "heartbeatInterval": 30000, "host": "wg31.washington.ibm.com", "port": 1491, "sharedPort": false, "transidUsage": "EIB_AND_MIRROR"}, {"configElementName": "zosconnect_cicsIpicConnection", "uid": "cscvinc", "id": "cscvinc", "connectionTimeout": 30000, "heartbeatInterval": 30000, "host": "wg31.washington.ibm.com", "port": 1491, "sharedPort": false, "transidUsage": "EIB_AND_MIRROR"}, {"configElementName": "zosconnect_cicsIpicConnection", "uid": "miniloan1", "id": "miniloan1", "connectionTimeout": 30000, "heartbeatInterval": 30000, "host": "wg31.washington.ibm.com", "port": 1491, "sharedPort": false, "transidUsage": "EIB_AND_MIRROR"}, {"configElementName": "zosconnect_cicsIpicConnection", "uid": "miniloan", "id": "miniloan", "connectionTimeout": 30000, "heartbeatInterval": 30000, "host": "wg31.washington.ibm.com", "port": 1491, "sharedPort": false, "transidUsage": "EIB_AND_MIRROR"}]
```

## **restConnector-2.0 feature**



[https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect\\_services](https://mpz3.washington.ibm.com:9443/ibm/api/config/zosconnect_services)

```
File Edit View History Bookmarks Tools Help
https://mpz3.washington.ibm.com: X + 
← → ⌂ 🔍 https://mpz3.washington.ibm.com:9443/ibm/api/cor ⌂ > ⌂
[ {
    configElementName: "zosconnect_services",
    location: "/global/zosconnect/resources/services",
    pollingRate: 5000,
    * service: [
        * {
            configElementName: "service",
            uid: "zosconnect_services/service[default-0]",
            name: "mqPutService",
            * property: [
                * {
                    configElementName: "property",
                    uid: "zosconnect_services/service[default-0]/property[default-0]",
                    name: "useCallerPrincipal",
                    value: "*****"
                }
            ],
            runGlobalInterceptors: true
        }
    ],
    updateTrigger: "disabled"
}
]
```

<https://mpz3.washington.ibm.com:9443/ibm/api/config/featureManager>

## **Use the apiDiscovery-1.0 feature to execute RESTful APIs directly\***



File Edit View History Bookmarks Tools Help

IBM REST API Documentation x +

Search https://mpz3.washington.ibm.com:9443/api/explorer/#/cscvinc

IBM all Filter

## Liberty REST APIs

Discover REST APIs available within Liberty

<b>cscvinc</b>	Show/Hide   List Operations   Expand Operations
<b>POST</b> /cscvinc/employee	
<b>DELETE</b> /cscvinc/employee/{employee}	
<b>GET</b> /cscvinc/employee/{employee}	
<b>PUT</b> /cscvinc/employee/{employee}	
<b>db2employee</b>	Show/Hide   List Operations   Expand Operations
<b>filemgr</b>	Show/Hide   List Operations   Expand Operations
<b>imsPhoneBook</b>	Show/Hide   List Operations   Expand Operations
<b>jwtlvpDemoApi</b>	Show/Hide   List Operations   Expand Operations
<b>miniloancics</b>	Show/Hide   List Operations   Expand Operations
<b>mqapi</b>	Show/Hide   List Operations   Expand Operations
<b>phonebook</b>	Show/Hide   List Operations   Expand Operations

\*V3.0.48



# Liberty MVS Commands

## F BAQSTRT,REFRESH,CONFIG

Process pending configuration updates. Configuration processing applies to the server.xml file, any files it includes

## F BAQSTRT,REFRESH,KEYSTORE

Use the command to refresh the keystore instorage profiles for the server.

## F BAQSTRT,REFRESH,KEYSTORE, ID=*OutboundKeyRing*

To refresh a specific keystore defined in the server XML with ID=OutboundKeyRing.

## F BAQSTRT,CACHE,CLEAR,AUTH

Clears all users that are cached in the Liberty authentication cache.

## F BAQZANGL,DISPLAY,SERVERS

Displays a list of servers currently connected to the angel

## F BAQZANGL,DISPLAY,SERVERS,PID

Displays a list of servers currently connected to the angel code along with the server's PIDs.

```
CWWKB0067I ANGEL DISPLAY OF ACTIVE SERVERS
CWWKB0080I ACTIVE SERVER ASID 4d JOBNAM ZCEEAPIR PID 16777398
CWWKB0080I ACTIVE SERVER ASID 4b JOBNAM ZCEEDVM PID 50331780
CWWKB0080I ACTIVE SERVER ASID 4f JOBNAM WLPRPSRV PID 138
CWWKB0080I ACTIVE SERVER ASID 4a JOBNAM ZCEESRVR PID 50331815
CWWKB0080I ACTIVE SERVER ASID 50 JOBNAM ZCEEOPID PID 33554605
CWWKB0080I ACTIVE SERVER ASID 4c JOBNAM ZCEEHATS PID 143
CWWKB0080I ACTIVE SERVER ASID 4e JOBNAM WLPOPSRV PID 33554565
CWWKB0080I ACTIVE SERVER ASID 58 JOBNAM MQWEBS PID 152
```

## F BAQZANGL,VERSION

Displays the version level of the angel

# **z/OS Connect MVS Commands**



## **F BAQSTRT,ZCON,REFRESH**

All updated z/OS Connect artifacts (APIs, services, and API Requesters) are reloaded.

## **F BAQSTRT,ZCON,CLEARTOKENCACHE**

Clears all OAuth 2.0 access tokens and JWTs from the cache. The token cache is only applicable for OAuth 2.0 access tokens and JWTs that were generated either locally or by an external authentication server, when invoking API requesters.

## **F BAQSTRT,ZCON,CLEARSAFCACHE**

Clears the SAF cache. The SAF cache contains SAF user IDs and any associated RACF groups in which the user ID resides. The SAF cache is only applicable to API requester, and only when ID assertion is enabled.

```
<feature>zosconnect:zosConnectCommands-1.0</feature>
```

# **Where do I look when things go wrong?**

# Where to find information when a problem occurs.



## messages.log

```
mpz3
File Edit Settings View Communication Actions Window Help
File Edit Edit... Settings Menu Utilities Compilers Test Help
VIEW /MPZ3/var/zosconnect/servers/myServer/logs/messages.log Columns 00100 00223
SCROLL ==> PAGE
000222 SYSTEM:Property com.ibm.zos.jdbenvironment set to 'WAS'
000223 JZCA7081I: Resource adapter insudsLocal installed in 5.685 seconds,
000224 The application serverConfig has been started as it could not be found at location /var/zosconnect/servers/myServer
000231 CMKXZ0618I: Starting application serverConfig.
000232 SRVE0165I: The server configuration file is using the expanded directory at the /var/zosconnect/servers/myServer location.
000233 SRVE0165I: Web Module myServer has been loaded.
000234 SRVE0250I: Web Module myServer has been bound to defaultHost.
000235 SESN0176I: A new session context will be created for application key defaultHost/server/config.
000236 CMKXZ0618I: The session context has been created for application key defaultHost/server/config.
000237 SRVE0165I: The session context has been bound to defaultHost.
000238 SESN0176I: A new session context will be created for application key defaultHost/server/config.
000239 CMKXZ0618I: Application serverConfig started in 0.636 seconds.
000240 CMKXZ0219I: TCP Channel defaultHTTPEndpoint has been started and is now listening for requests on host * (IPv6) port 9080.
000241 CMKXZ0219I: TCP Channel defaultHTTPEndpoint has been started and is now listening for requests on host * (IPv6) port 9080.
000242 CMKXZ0618I: The server installed the following features: AdminCenter-1.0, appDiscovery-v2.0, distributedRedis
000243 CMKXZ0608I: Feature update completed in 17.917 seconds.
000244 CMKXZ0608I: Feature update completed in 17.917 seconds.
000245 CMKXZ0608I: Feature update completed in 17.917 seconds.
000246 CMKXZ0608I: The authorized version of the SAF user registry is activated. Authentication will proceed using authorized native
000247 CMKXZ1100I: Authentication did not succeed for user ID user1. An invalid user ID or password was specified.
000248 CMKXZ1100I: Authentication did not succeed for user ID user1. An invalid user ID or password was specified.
***** Bottom of Data *****
```

Connected to remote server/host mpz3 using lu/pool MPZ30030 and port 23

## First Failure Data Collection (FFDC) dumps

```
mpz3
File Edit Settings View Communication Actions Window Help
File Edit Edit... Settings Menu Utilities Compilers Test Help
VIEW /MPZ3/var/zosconnect/servers/myServer/logs/ffdc/ffdc.21.08-36.15.05.55.0.109 Columns 00001 00124
SCROLL ==> PAGE
Command **** Top of Data *****
====MSG01==== Warning: The UNDO command is not available until you Change your edit Profile using the command RECOVERY ON
====MSG02==== Start Date: 2021-08-36 15:05:55.000000000 GMT
====MSG03==== Exception = javax.net.ssl.SSLHandshakeException
====MSG04==== ProbId = 799
====MSG05==== Stack Dump = javax.net.ssl.SSLHandshakeException Received fatal alert: unknown_ca
====MSG06==== at com.ibm.jsse2.a.b.(Unknown Source)
====MSG07==== at com.ibm.jsse2.b.b.(Unknown Source)
====MSG08==== at com.ibm.jsse2.b.b.a.(Unknown Source)
====MSG09==== at com.ibm.jsse2.b.b.c.(Unknown Source)
====MSG10==== at com.ibm.jsse2.b.b.d.(Unknown Source)
====MSG11==== at com.ibm.jsse2.b.b.g.(Unknown Source)
====MSG12==== at com.ibm.jsse2.b.b.h.(Unknown Source)
====MSG13==== at com.ibm.jsse2.b.b.i.(Unknown Source)
====MSG14==== at com.ibm.jsse2.b.b.l.(Unknown Source)
====MSG15==== at com.ibm.jsse2.b.b.m.(Unknown Source)
====MSG16==== at com.ibm.jsse2.b.b.o.(Unknown Source)
====MSG17==== at com.ibm.ws.channel.ssl.internal.SSLReadServiceContext.decryptMessage(SSLReadServiceContext.java:121)
====MSG18==== at com.ibm.ws.channel.ssl.internal.SSLReadServiceContext.decrypt(SSLReadServiceContext.java:100)
====MSG19==== at com.ibm.ws.channel.ssl.internal.SSLReadServiceContext.decrypt(SSLReadServiceContext.java:100)
***** Bottom of Data *****
```

Connected to remote server/host mpz3 using lu/pool MPZ30030 and port 23

## trace.out

```
mpz3
File Edit Settings View Communication Actions Window Help
File Edit Edit... Settings Menu Utilities Compilers Test Help
VIEW /MPZ3/var/zosconnect/servers/myServer/logs/trace.log Columns 00001 00124
SCROLL ==> PAGE
Command **** Top of Data *****
====MSG01==== Warning: The UNDO command is not available until you Change your edit Profile using the command RECOVERY ON
====MSG02==== Start Date: 2021-08-36 15:05:55.000000000 GMT
====MSG03==== PRINTER IS FOR ZOSCONNECT/IBM/zosconnect/v3d-wip
====MSG04==== server.config.dir = /var/zosconnect/servers/myServer/
====MSG05==== Java.version = 1.8.0_311
====MSG06==== Java.runtime = Java(TM) SE Runtime Environment (8.0_65-b14-1624-2020-08-30-16:48 ((#P-1.8.0_311-b14-2020-08-30-16:48))
====MSG07==== process = 168439936P23
====MSG08==== spec.CCFCSTL = 1
====MSG09==== process = 168439936P23
====MSG10==== spec.CCFCSTL = 1
====MSG11==== **** Bottom of Data *****
000011 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection > setVersion Entry
000012 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection < setVersion Exit
000013 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection > getHeader Entry
000014 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection < getHeader Exit
000015 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection > initEntry
000016 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection < initExit
000017 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection > finiEntry
000018 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection < finiExit
000019 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection > destroyEntry
000020 [8/30/21 15:34:58]201 QHT 00000064 id=8994258 com.ibm.zosconnect.service.cics.internal.com.isc.Connection < destroyExit
***** Bottom of Data *****
```

Connected to remote server/host mpz3 using lu/pool MPZ30030 and port 23

## SYSLOG/STC JESMSGLG DD

```
mpz3
File Edit Settings View Communication Actions Window Help
File Edit Display Filter View Print Options Search Help
SDF$ OPERLOG_MPZ3 08/30/2021 04 COLUMNS 02* 133
COMMAND INPUT ==> SCROLL ==> CSB
00000000 MPZ3 21242 13:20:25.35 STC10771 000000290 +GMLIB0194I: Resource manager RRSI DEFAULT,DA930CE1985D9C11,IBM with 307
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 the corresponding token ID of 81000001023805780000000000000007 has
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 successfully restarted with Resource Recovery Services (RRS). Number
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 ATR169I: RRS HAS UNSET EXITS FOR RESOURCE MANAGER 338
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 DB010000I: Resource manager RRSI DEFAULT,DA930CE1985D9C11,IBM with the corresponding token ID of
00000000 MPZ3 21242 13:20:25.41 STC04167 000000990 +GMLIB0194I: Recovery Processing for resource manager 339
00000000 MPZ3 21242 13:20:25.41 STC04167 000000990 DSNU133I: DSNE DSNMVSMF - TRACE DATA LOST, SMF NOT ACCESSIBLE RC=24
00000000 MPZ3 21242 13:20:25.41 STC04167 000000990 DSNU123I: DSNE DSNMVSMF - TRACE RECORDING HAS BEEN RESUMED ON SMF
00000000 MPZ3 21242 13:20:25.92 STC10771 000000990 +GMLIB0194I: The myServer server is ready to run a smarter Planet. The
00000000 MPZ3 21242 13:20:25.92 STC10771 000000990 myServer server started in 17.991 seconds.
00000000 MPZ3 21242 13:20:30.98 STC10771 000000990 #Server server started in 17.991 seconds.
00000000 MPZ3 21242 13:20:30.98 STC10771 000000990 IC4980I: USERUSER1 ) GROUP(SYS) NAME( ) VALID ) 342
00000000 MPZ3 21242 13:20:30.98 STC10771 000000990 IC4980I: USERUSER1 ) GROUP(SYS) NAME( ) 343
00000000 MPZ3 21242 13:20:35.53 STC04169 000000990 LOGON/JOB INITIATION - PASS PHRASE IS NOT VALID
00000000 MPZ3 21242 13:21:00.19 STC04167 000000990 DSNU133I: DSNE DSNMVSMF - TRACE DATA LOST, SMF NOT ACCESSIBLE RC=24
00000000 MPZ3 21242 13:21:00.19 STC04169 000000990 DSNU123I: DSNE DSNMVSMF - TRACE RECORDING HAS BEEN RESUMED ON SMF
00000000 MPZ3 21242 13:21:00.19 STC04169 000000990 +GSDX251I: ZMQ CXS03T Listener started, TRPTYPETCP INDISPQMR
00000000 MPZ3 21242 13:21:00.19 STC04169 000000990 +GSDX251I: ZMQ CXS03T Listener not started, unable to bind, 245
***** Bottom of Data *****
```

Connected to remote server/host mpz3 using lu/pool MPZ30030 and port 23

## STC STDOUT DD

```
mpz3
File Edit Settings View Communication Actions Window Help
File Edit Display Filter View Print Options Search Help
SDF$ OUTPUT DISPLAY BA00171 DSID 103 LINE 84 COLS 02* 133
COMMAND INPUT ==> SCROLL ==> CSB
00000000 MPZ3 21242 13:20:25.35 STC10771 000000290 +GMLIB0194I: Resource manager RRSI DEFAULT,DA930CE1985D9C11,IBM with 307
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 the corresponding token ID of 81000001023805780000000000000007 has
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 successfully restarted with Resource Recovery Services (RRS). Number
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 ATR169I: RRS HAS UNSET EXITS FOR RESOURCE MANAGER 338
00000000 MPZ3 21242 13:20:25.36 STC10771 000000290 DB010000I: Resource manager RRSI DEFAULT,DA930CE1985D9C11,IBM with the corresponding token ID of
00000000 MPZ3 21242 13:20:25.41 STC04167 000000990 +GMLIB0194I: Recovery Processing for resource manager 339
00000000 MPZ3 21242 13:20:25.41 STC04167 000000990 DSNU133I: DSNE DSNMVSMF - TRACE DATA LOST, SMF NOT ACCESSIBLE RC=24
00000000 MPZ3 21242 13:20:25.41 STC04167 000000990 DSNU123I: DSNE DSNMVSMF - TRACE RECORDING HAS BEEN RESUMED ON SMF
00000000 MPZ3 21242 13:20:25.92 STC10771 000000990 +GMLIB0194I: The myServer server is ready to run a smarter Planet. The
00000000 MPZ3 21242 13:20:25.92 STC10771 000000990 myServer server started in 17.991 seconds.
00000000 MPZ3 21242 13:20:30.98 STC10771 000000990 #Server server started in 17.991 seconds.
00000000 MPZ3 21242 13:20:30.98 STC10771 000000990 IC4980I: USERUSER1 ) GROUP(SYS) NAME( ) VALID ) 342
00000000 MPZ3 21242 13:20:30.98 STC10771 000000990 IC4980I: USERUSER1 ) GROUP(SYS) NAME( ) 343
00000000 MPZ3 21242 13:20:35.53 STC04169 000000990 LOGON/JOB INITIATION - PASS PHRASE IS NOT VALID
00000000 MPZ3 21242 13:21:00.19 STC04167 000000990 DSNU133I: DSNE DSNMVSMF - TRACE DATA LOST, SMF NOT ACCESSIBLE RC=24
00000000 MPZ3 21242 13:21:00.19 STC04169 000000990 DSNU123I: DSNE DSNMVSMF - TRACE RECORDING HAS BEEN RESUMED ON SMF
00000000 MPZ3 21242 13:21:00.19 STC04169 000000990 +GSDX251I: ZMQ CXS03T Listener started, TRPTYPETCP INDISPQMR
00000000 MPZ3 21242 13:21:00.19 STC04169 000000990 +GSDX251I: ZMQ CXS03T Listener not started, unable to bind, 245
***** Bottom of Data *****
```

Connected to remote server/host mpz3 using lu/pool MPZ30030 and port 23

# Issues and problems can be categorized

First realize that actual products problems do occur, but they are rare. In my experience most problems and issues can be resolved with a little investigation and some analysis. I have found that most problems and issues will fall in this these categories.

- **Basic Security issues**
  - Insufficient access to local SAF resources, e.g., APPL, EJBROLE, SERVER resources
  - Security issues related to XML configuration elements, safCredentials, sslDefault, keystore, etc.
- **Advanced Security issues**
  - Key ring access, e.g., FACILITY resources IRR.DIGTCERT or RDATALIB or IDIDMAP resources.
  - Key ring contents, e.g., missing certificates, key usage, personal and certificate authorities, private keys versus public keys.
  - Incorrect use of certificates in a TLS handshakes versus certificates used for token validation.
- **z/OS Connect XML Configuration issues**
  - Missing or misspelled configuration attributes (remember the Liberty XML parser is too forgiving)
- **External resource Issues**
  - Service provider configuration issues.
  - Timeouts
  - Network Firewalls
  - Resource Security
  - Other resource errors

Remember external symptoms will overlap. But the use of rigor in setting configuration standards and following a process in problem isolation/determination process will help reduce the impact of problems and issues.

# messages.log - The anatomy of a message in the messages.log



```
*****
product = WAS FOR Z/OS 21.0.0.6, z/OS Connect 03.00.48 (wlp-1.0.53.c1210620210527-1900)
wlp.install.dir = /shared/IBM/zosconnect/v3r0/wlp/
server.config.dir = /var/zosconnect/servers/zceepid/
java.home = /MA4RS1/usr/lpp/java/J8.0_64
java.version = 1.8.0_301
java.runtime = Java(TM) SE Runtime Environment (8.0.6.35 - pmz6480sr6fp35-20210714_01(SR6 FP35))
os = z/OS (02.04.00; s390x) (en_US)
process = 16843186@MPZ3
*****
[9/3/21 13:38:02:831 GMT] 00000013 com.ibm.ws.kernel.launch.internal.FrameworkManager
[9/3/21 13:38:04:439 GMT] 0000001f com.ibm.ws.config.xml.internal.XMLConfigParser
[9/3/21 13:38:04:466 GMT] 0000001f com.ibm.ws.config.xml.internal.XMLConfigParser
[9/3/21 13:38:04:470 GMT] 0000001f com.ibm.ws.config.xml.internal.XMLConfigParser
[9/3/21 13:38:04:473 GMT] 0000001f com.ibm.ws.config.xml.internal.XMLConfigParser
[9/3/21 13:38:04:476 GMT] 0000001f com.ibm.ws.config.xml.internal.XMLConfigParser
[9/3/21 13:38:04:481 GMT] 0000001f com.ibm.ws.config.xml.internal.XMLConfigParser
[9/3/21 13:38:04:610 GMT] 00000021 com.ibm.ws.zos.core.internal.NativeServiceTracker
[9/3/21 13:38:04:612 GMT] 00000021 com.ibm.ws.zos.core.internal.NativeServiceTracker
[9/3/21 13:38:04:628 GMT] 00000021 com.ibm.ws.zos.core.internal.NativeServiceTracker
[9/3/21 13:38:04:679 GMT] 00000021 com.ibm.ws.zos.core.internal.NativeServiceTracker
[9/3/21 13:38:04:680 GMT] 00000021 com.ibm.ws.zos.core.internal.NativeServiceTracker
[9/3/21 13:38:04:680 GMT] 00000021 com.ibm.ws.zos.core.internal.NativeServiceTracker
-----
[9/3/21 13:38:42:347 GMT] 00000040 om.ibm.ws.app.manager.rar.internal.RARApplicationHandlerImpl
[9/3/21 13:38:42:419 GMT] 0000003e com.ibm.ws.jmx.connector.server.rest.RESTAppListener
[9/3/21 13:38:42:422 GMT] 0000003e com.ibm.ws.jmx.connector.server.rest.RESTAppListener
[9/3/21 13:38:42:428 GMT] 0000002c com.ibm.ws.tcpchannel.internal.TCPEndpoint
[9/3/21 13:38:42:431 GMT] 0000002c com.ibm.ws.tcpchannel.internal.TCPEndpoint
[9/3/21 13:38:42:437 GMT] 00000042 com.ibm.ws.webcontainer.osgi.mbeans.PluginGenerator
[9/3/21 13:38:42:489 GMT] 0000002c com.ibm.ws.kernel.feature.internal.FeatureManager
[9/3/21 13:38:42:490 GMT] 0000002c com.ibm.ws.kernel.feature.internal.FeatureManager
[9/3/21 13:38:42:490 GMT] 0000002c com.ibm.ws.kernel.feature.internal.FeatureManager
[9/3/21 13:41:31:640 GMT] 00000045 .securityopenidconnect.client.internal.OidcClientConfigImpl
[9/3/21 13:41:31:691 GMT] 00000045 rity.authentication.filter.internal.AuthenticationFilterImpl
[9/3/21 13:41:32:824 GMT] 00000053 com.ibm.zosconnect.service.cics.internal.conn.isc.Connection
```

A CWWKE0001I: The server zceepid has been launched.  
A CWWKG0028A: Processing included configuration resource  
I CWWKB0125I: This server requested a REGION size of 0KB  
I CWWKB0126I: MEMLIMIT=2000. MEMLIMIT CONFIGURATION SOUR  
I CWWKB0122I: This server is connected to the default an  
I CWWKB0103I: Authorized service group KERNEL is availab  
I CWWKB0103I: Authorized service group LOCALCOM is avail  
I CWWKB0103I: Authorized service group PRODMGR is availa  
----- 148 Line(s) not Displayed  
A J2CA7001I: Resource adapter imsudbJLocal installed in  
I CWWKX0103I: The JMX REST connector is running and is a  
I CWWKX0103I: The JMX REST connector is running and is a  
I CWWKO0219I: TCP Channel defaultHttpEndpoint has been s  
I CWWKO0219I: TCP Channel defaultHttpEndpoint-ssl has be  
I SRVE9103I: A configuration file for a web server plugi  
A CWWKF0012I: The server installed the following feature  
I CWWKF0008I: Feature update completed in 37.484 seconds  
A CWWKF0011I: The zceepid server is ready to run a smar  
I CWWKS1700I: OpenID Connect client ATS configuration su  
I CWWKS4358I: The authentication filter ATSAuthFilter co  
I BAQR0680I: CICS connection cscvinc established with 10

- **WLP\_LOGGING\_CONSOLE\_FORMAT - SIMPLE** - Use the simple logging format. As of Liberty release 20.0.0.6 (z/OS Connect V3.034), this format writes the messages to STDOUT and STDERR with time stamps included.



# Basic security issues – Sometimes you are lucky

The STDOUT may show:

```
ÝAUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified  
ÝAUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified
```

And the messages.log displays:

```
CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
```

But the JESMSGGLG and SYSLOG displays:

```
WG31
File Edit Settings View Communication Actions Window Help
Display Filter View Print Options Search Help

SDSF OUTPUT DISPLAY BAQSTRT STC12856 DSID 2 LINE 17 COLS 02- 133
COMMAND INPUT ==> SCROLL ==> PAGE
15.27.30 STC12856 +CWWKZ0001I: Application resources started in 0.086 seconds.
15.27.30 STC12856 +CWWKZ0001I: Application serverConfig started in 0.085 seconds.
15.27.31 STC12856 +CWWKF0011I: The myServer server is ready to run a smarter planet. The 001
001 myServer server started in 36.923 seconds.
15.27.32 STC12856 ICH408I USER(FRED ) GROUP(ATSGRP ) NAME(USER FRED ) 002
002 LOGON/JOB INITIATION - INVALID PASSWORD
15.27.32 STC12856 IRR013I VERIFICATION FAILED. INVALID PASSWORD GIVEN.
15.27.32 STC12856 ICH408I USER(FRED ) GROUP(ATSGRP ) NAME(USER FRED ) 004
004 LOGON/JOB INITIATION - INVALID PASSWORD
15.27.32 STC12856 IRR013I VERIFICATION FAILED. INVALID PASSWORD GIVEN.
1 //BAQSTRT JOB MSGLEVEL=1 STC12856
2 //STARTING EXEC BAQSTRT
3 XXBAQSTRT PROC PARMs='myServer --clean'
XX*
4 XX SET ZCONHOME='/usr/lpp/IBM/zosconnect/v3r0'
XX*
5 XXZCON EXEC PGM=BPXBATSL,REGION=0M,MEMLIMIT=8G,
XX PARM='PGM &ZCONHOME./bin/zosconnect run &PARMS.'
IEFC653I SUBSTITUTION JCL - PGM=BPXBATSL,REGION=0M,MEMLIMIT=8G,PARM='PGM
/usr/lpp/IBM/zosconnect/v3r0/bin/zosconnect run myServer --clean'
6 XXSTEPLIB DD DISP=SHR,DSN=MQ91#.SCSQAUTH
7 XX DD DISP=SHR,DSN=MQ91#.SCSQANL
8 XXSTDERR DD SYSOUT=*,FREE=CLOSE,SPIN=(UNALLOC,1M)

MA B 16/074
Connected to remote server/host mpz3 using lu/pool MPZ30023 and port 23
```



# Basic security issues – Some times you have to dig a little more

The STDOUT may show:

```
ÝAUDIT  .. CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified  
ÝAUDIT  .. CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified
```

But there are no SAF messages in the SYSLOG:

While the messages.log displays a SAF return code and reason code:

```
VIEW      /MPZ3/var/zosconnect/servers/myServer/logs/messages.log          Columns 00100 00223  
Command ==> -  
000256  SAF return code 0x00000008. RACF return code 0x00000008. RACF reason code 0x00000020.  
000257  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000258  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000259  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000260  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000261  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000262  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000263  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000264  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000265  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000266  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000267  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000268  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000269  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000270  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000271  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000272  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000273  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000274  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000275  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
000276  CWWKS2907E: SAF Service IRRSIA00_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZD  
000277  CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.  
***** ***** Bottom of Data *****  
Name: B  
Connected to remote server/host mpz3 using lu/pool MPZ30023 and port 23  
04/015
```

CWWKS2907E: SAF Service IRRSIA00\_CREATE did not succeed because user FRED has insufficient authority to access APPL-ID BBGZDFLT. SAF return code 0x00000008. RACF return code 0x00000008. RACF reason code 0x00000020.

# Tech-Tip: And be aware of hex v decimal return and reason codes



RACF return code 0x00000008. RACF reason code 0x00000020.

Table 1. initACEE create return codes

SAF return code	RACF® return code	RACF reason code	Explanation
0	0	0	The service was successful.
4	0	0	RACF is not installed.
8	8	4	Parameter list error occurred.
8	8	8	An internal error occurred during RACF processing.
8	8	12	Recovery environment could not be established.
8	8	16	User ID is not defined to RACF.
8	8	20	Password, Password Phrase or Pass Ticket is not valid.
8	8	24	Password or Password Phrase is expired.
8	8	28	User ID is revoked or user access to group is revoked.
8	8	32	The user does not have appropriate RACF access to either the SECLABEL, SERVAUTH profile, or APPL specified in the parmlist.
8	8	36	Certificate is not valid.
8	8	40	< No user ID is defined for this certificate. See Usage Note number 37. >
8	8	44	The client security label is not equivalent to the server's security label.
8	8	48	A managed ACEE is requested with a nested RACO in the Envir_In parameter.
8	12	InitUSP reason code	initUSP failed. See initUSP reason codes in <a href="#">Return and reason codes</a> .

Hex '20' = Dec '32'

Root cause – No READ access to APPL resource BBGZDFLT

From URL <https://www.ibm.com/docs/en/zos/2.4.0?topic=acee-return-reason-codes>

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Slide 67



# Basic security issues – Sometimes there is misdirection

The STDOUT may show:

WG31

File Edit Settings View Communication Actions Window Help

Display Filter View Print Options Search Help

```
SDSF OUTPUT DISPLAY BAQSTRT STC12844 DSID 103 LINE 98      COLS 02- 133
COMMAND INPUT ==> SCROLL ==> PAGE
AUDIT  " CWWKZ0001I: Application serverConfig started in 4.006 seconds.
AUDIT  " CWWKZ0001I: Application resources started in 4.007 seconds.
AUDIT  " CWWKT0016I: Web application available (default_host): http://dvipa.washington.ibm.com:9080/zosConnect/apiRequesters/
AUDIT  " CWWKT0016I: Web application available (default_host): http://dvipa.washington.ibm.com:9080/
AUDIT  " CWWKF0012I: The server installed the following features: YadminCenter-1.0, apiDiscovery-1.0, appSecurity-2.0, distributed
AUDIT  " CWWKF0011I: The myServer server is ready to run a smarter planet. The myServer server started in 66.646 seconds.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
AUDIT  " CWWKS1100A: Authentication did not succeed for user ID FRED. An invalid user ID or password was specified.
***** BOTTOM OF DATA *****
```

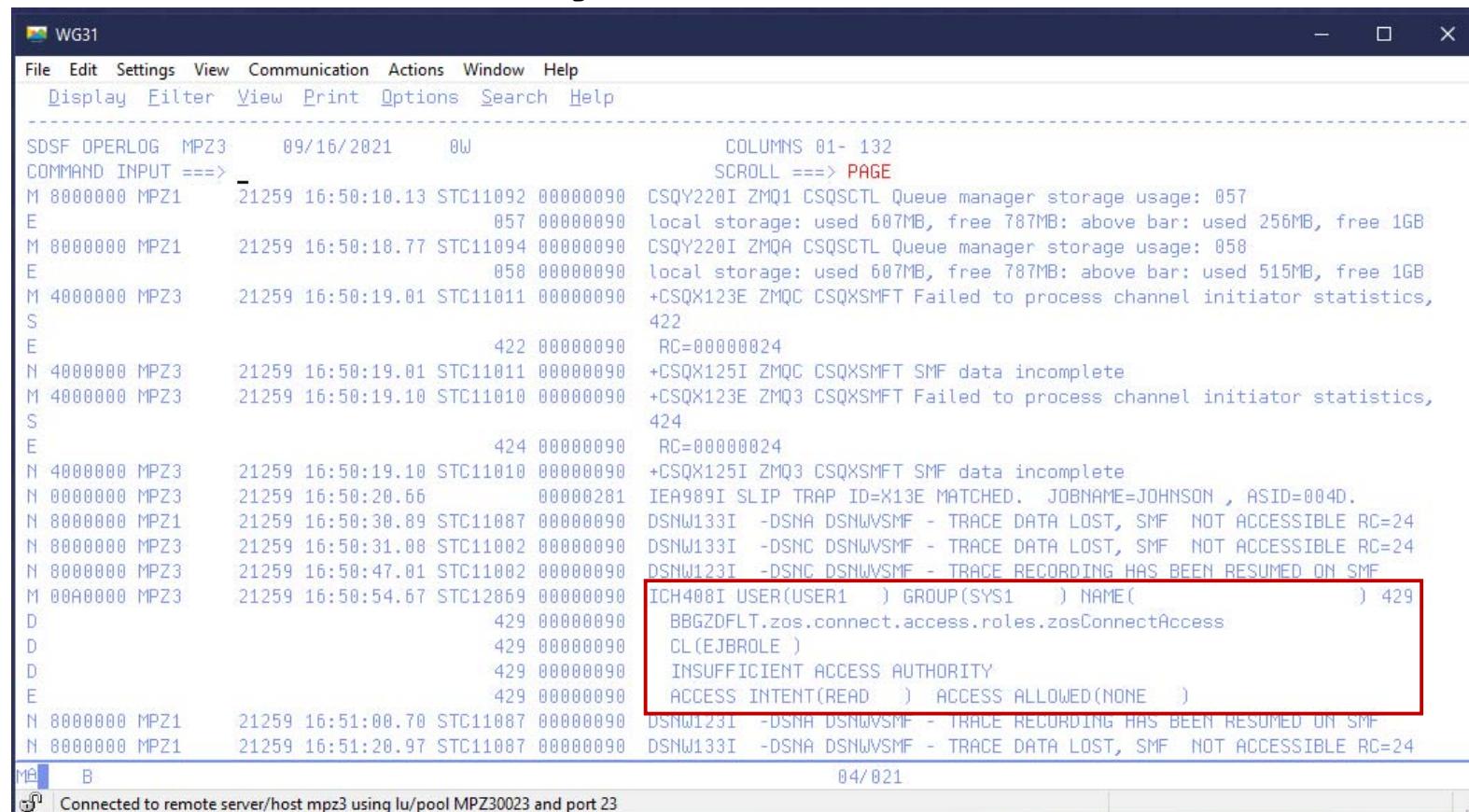
M A B 04/021

Connected to remote server/host mpz3 using lu/pool MPZ30019 and port 23

Symptom: client see HTTP 403 – Authorization Failed. There were no useful messages in STDOUT or messages.log locations.

# Basis security issues - Use the SYSLOG/JESMSGGLG output

The SYSLOG shows a ICH408I message:



```

WG31
File Edit Settings View Communication Actions Window Help
Display Filter View Print Options Search Help
SDSF OPERLOG MPZ3 09/16/2021 0W
COMMAND INPUT ===> -
M 8000000 MPZ1 21259 16:50:10.13 STC11092 00000090 CSQY220I ZMQ1 CSQSCTL Queue manager storage usage: 057
E 000000000000 local storage: used 607MB, free 787MB: above bar: used 256MB, free 1GB
M 8000000 MPZ1 21259 16:50:18.77 STC11094 00000090 CSQY220I ZMQA CSQSCTL Queue manager storage usage: 058
E 000000000000 local storage: used 607MB, free 787MB: above bar: used 515MB, free 1GB
M 4000000 MPZ3 21259 16:50:19.01 STC11011 00000090 +CSQX123E ZMQC CSQXSMFT Failed to process channel initiator statistics,
S 422
E 000000000000 RC=00000024
N 4000000 MPZ3 21259 16:50:19.01 STC11011 00000090 +CSQX125I ZMQC CSQXSMFT SMF data incomplete
M 4000000 MPZ3 21259 16:50:19.10 STC11010 00000090 +CSQX123E ZMQ3 CSQXSMFT Failed to process channel initiator statistics,
S 424
E 000000000000 RC=00000024
N 4000000 MPZ3 21259 16:50:19.10 STC11010 00000090 +CSQX125I ZMQ3 CSQXSMFT SMF data incomplete
N 0000000 MPZ3 21259 16:50:20.66 000000281 IEA989I SLIP TRAP ID=X13E MATCHED. JOBNAME=JOHNSON , ASID=004D.
N 8000000 MPZ1 21259 16:50:30.89 STC11087 00000090 DSNW133I -DSNA DSNWVSMF - TRACE DATA LOST, SMF NOT ACCESSIBLE RC=24
N 8000000 MPZ3 21259 16:50:31.08 STC11002 00000090 DSNW133I -DSNC DSNWVSMF - TRACE DATA LOST, SMF NOT ACCESSIBLE RC=24
N 8000000 MPZ3 21259 16:50:47.01 STC11002 00000090 DSNW123T -DSNC DSNWVSMF - TRACE RECORDING HAS BEEN RESUMED ON SMF
M 00A0000 MPZ3 21259 16:50:54.67 STC12869 00000090 ICH408I USER(USER1 ) GROUP(SYS1 ) NAME( ) 429
D 000000000000 BBGZDFLT.zos.connect.access.roles.zosConnectAccess
D 000000000000 CL(EJBROLE )
D 000000000000 INSUFFICIENT ACCESS AUTHORITY
E 000000000000 ACCESS INTENT(READ ) ACCESS ALLOWED(NONE )
N 8000000 MPZ1 21259 16:51:00.70 STC11087 00000090 DSNW123I -DSNA DSNWVSMF - TRACE RECORDING HAS BEEN RESUMED ON SMF
N 8000000 MPZ1 21259 16:51:20.97 STC11087 00000090 DSNW133I -DSNA DSNWVSMF - TRACE DATA LOST, SMF NOT ACCESSIBLE RC=24

```

Connected to remote server/host mpz3 using lu/pool MPZ30023 and port 23

Root cause – No READ access to EJBROLE BBGZDFLT.zos.connect.access.roles.zosConnectAccess.

## Basic security issues - SYSLOG/JESMSGGLG output (even more misdirection)



```
WG31
File Edit Settings View Communication Actions Window Help
Display Filter View Print Options Search Help
-----
SDSF OUTPUT DISPLAY BAQSTRT STC12862 DSID      2 LINE 0      COLS 02- 133
COMMAND INPUT ==>                                     SCROLL ==> PAGE
*****TOP OF DATA *****
J E S 2 J O B L O G -- S Y S T E M M P Z 3 -- N O D E W S C 1 0

16.31.55 STC12862 ---- THURSDAY, 16 SEP 2021 ----
16.31.55 STC12862 IEF695I START BAQSTRT WITH JOBNAME BAQSTRT IS ASSIGNED TO USER LIBSERV , GROUP LIBGRP
16.31.55 STC12862 $HASP373 BAQSTRT STARTED
16.32.03 STC12862 +CLWJKE0001I: The server myServer has been launched.
16.32.20 STC12862 BPXMF023I (LIBSERV) 282
    282          GMDIG7777I: IMS service provider (20210816-0926) for z/OS Connect
    282          Enterprise Edition initialized successfully.
16.32.50 STC12862 +CLWJKZ0001I: Application resources started in 14.912 seconds.
16.32.50 STC12862 +CLWJKZ0001I: Application serverConfig started in 14.910 seconds.
16.32.55 STC12862 +CLWJKF0011I: The myServer server is ready to run a smarter planet. The 285
    285          myServer server started in 51.809 seconds
16.43.25 STC12862 BPXP015I HFS PROGRAM /usr/lib/java_runtime/libifaedjreg64.so IS NOT MARKED PROGRAM CONTROLLED.
16.43.25 STC12862 BPXP014I ENVIRONMENT MUST BE CONTROLLED FOR DAEMON (BPX.DAEMON) PROCESSING.
16.43.25 STC12862 BPXP015I HFS PROGRAM /usr/lib/java_runtime/libifaedjreg64.so IS NOT MARKED PROGRAM CONTROLLED.
16.43.25 STC12862 BPXP014I ENVIRONMENT MUST BE CONTROLLED FOR DAEMON (BPX.DAEMON) PROCESSING.
16.43.26 STC12862 BPXP015I HFS PROGRAM /usr/lib/java_runtime/libifaedjreg64.so IS NOT MARKED PROGRAM CONTROLLED.
16.43.26 STC12862 BPXP014I ENVIRONMENT MUST BE CONTROLLED FOR DAEMON (BPX.DAEMON) PROCESSING.
16.43.26 STC12862 BPXP015I HFS PROGRAM /usr/lib/java_runtime/libifaedjreg64.so IS NOT MARKED PROGRAM CONTROLLED.
16.43.26 STC12862 BPXP014I ENVIRONMENT MUST BE CONTROLLED FOR DAEMON (BPX.DAEMON) PROCESSING.
16.43.26 STC12862 BPXP015I HFS PROGRAM /usr/lib/java_runtime/libifaedjreg64.so IS NOT MARKED PROGRAM CONTROLLED.

MA B                               04/021
Connected to remote server/host mpz3 using lu/pool MPZ30023 and port 23
```

Symptom: Client unable to connect. STDOUT contains message *CWWKS1100A: Authentication did not succeed for user ID user1. An invalid user ID or password was specified.*

# Basic security issues - SYSLOG/JESMSGGLG output (even more misdirection)

There is no need to set the extended protection attribute for this Java shared object executable.

The root cause was that the angel was not active and Liberty is failing over to trying to use OMVS security.

```
VIEW      /MPZ3/var/zosconnect/servers/myServer/logs/messages.log          Columns 00100 00223
Command ==>
000021 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/shared.xml
000022 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/oauth.xml
000023 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/audit.xml
000024 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/mq.xml
000025 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/db2.xml
000026 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/uIm.xml
000027 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/restConnector.xml
000028 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/smf.xml
000029 CWWKG0028A: Processing included configuration resource: /var/zosconnect/servers/myServer/includes/adminCenter.xml
000030 CWWKB0125I: This server requested a REGION size of 0KB. The below-the-line storage limit is 8MB and the above-the-line stor
000031 CWWKB0126I: MEMLIMIT=2000. MEMLIMIT CONFIGURATION SOURCE=JCL.
000032 CWWKB0101I: The angel process is not available. No authorized services will be loaded. The reason code is 4.
000033 CWWKB0104I: Authorized service group KERNEL is not available.
000034 CWWKB0104I: Authorized service group LOCALCOM is not available.
000035 CWWKB0104I: Authorized service group PRODMGR is not available.
000036 CWWKB0104I: Authorized service group SAFCREDS is not available.
000037 CWWKB0104I: Authorized service group TXRRS is not available.
000038 CWWKB0104I: Authorized service group WOLA is not available.
000039 CWWKB0104I: Authorized service group ZOSAIO is not available.
000040 CWWKB0104I: Authorized service group ZOSDUMP is not available.
000041 CWWKB0104I: Authorized service group ZOSWLM is not available.
000042 CWWKB0104I: Authorized service group CLIENT.WOLA is not available.
000043 CWWKB0108I: IBM Corp product z/OS Connect version 03.00 successfully registered with z/OS.
```

MA 14/009

Connected to remote server/host mpz3 using lu/pool MPZ30023 and port 23



# External resource issues (HTTP 500) - CICS

The client sees:

```
HTTP/1.1 500 Internal Server Error
```

The STDOUT may show:

```
ÝWARNING `` BAQR0429W: API db2employee encountered an error while processing a request under URL  
https://mpz3.washington.ibm.com:9443/cscvinc/employee/948478.
```

While the messages.log display

```
[9/16/21 21:00:55:811 GMT] 00000051 com.ibm.zosconnect.service.cics.internal.conn.ISCECIRequest E BAQR0657E: Transaction  
abend MIJO occurred in CICS while using CICS connection cscvinc and service cscvincDeleteService.  
[9/16/21 21:00:55:815 GMT] 00000051 com.ibm.zosconnect.internal.web.ServiceProxyServlet W BAQR0429W: API cscvinc  
encountered an error while processing a request under URL https://mpz3.washington.ibm.com:9443/cscvinc/employee/948478.
```



# External resource issues (HTTP 500) – Db2

The client sees:

```
HTTP/1.1 500 Internal Server Error
```

The STDOUT may show:

```
ÝWARNING `` BAQR0429W: API db2employee encountered an error while processing a request under URL  
https://mpz3.washington.ibm.com:9443/db2/employee/948478.
```

The messages.log displays:

```
[9/14/21 20:04:59:776 GMT] 00000048 zosconnect.service.client.rest.internal.RestClientServiceImpl E BAQR0558E: The remote  
service invocation failed with [9/14/21 20:04:59:776 GMT] 00000048  
zosconnect.service.client.rest.internal.RestClientServiceImpl E BAQR0558E: The remote service invocation failed with failed  
due to SQLCODE=-204 SQLSTATE=42704, USER1.EMPLOYEE IS AN UNDEFINED NAME. Error Location:DSNLJACC:35"}
```

```
[9/14/21 20:04:59:821 GMT] 00000048 com.ibm.ws.logging.internal.impl.IncidentImpl I FFDC1015I: An FFDC  
Incident has been created: "javax. ws.rs.InternalServerErrorException: HTTP 500 Internal Server Error  
com.ibm.zosconnect.service.client.rest.internal.SarRestClientServiceImpl 528" at ffdc_21.09.14_20.04.59.0.log
```

```
[9/14/21 20:04:59:826 GMT] 00000048 com.ibm.zosconnect.internal.web.ServiceProxyServlet W BAQR0429W: API db2employee  
encountered an error while processing a request under URL https://mpz3.washington.ibm.com:9443/db2/employee/details/000050.  
[9/14/21 20:05:00:045 GMT] 00000046 osconnect.service.client.rest.internal.RestClientServiceImpl E BAQR0558E: The remote  
service invocation failed with response message: HTTP 500 Internal Server Error and response body:  
{"StatusCode":500,"StatusDescription":"Service zCEEService.selectEmployee execution failed due to SQLCODE=-204  
SQLSTATE=42704, USER1.EMPLOYEE IS AN UNDEFINED NAME. Error Location:DSNLJACC:35"}
```

## Tech-Tip: An HTTP 500 shortcut

A HTTP status code 500 occurs when a failure occurred at an external endpoint. It does not matter if the endpoint is a z/OS resources or a REST API provider, or an external authorization server, etc.

The details of the failure are not provided **directly** to z/OS Connect, just the fact that a failure has occurred. The failure could be a security issue, an abend or something entirely. z/OS Connect may or may not have directly access to any details of the failure (it depends on the service provider and/or middleware). It does not mean the details do not exist; the details are just readily available.

The shortcut to identify the issue is review the messages in the messages.log and check to see if there is corresponding FFDC (first failure data collection) dump.

# Before continuing, let's step back - what is a Java stack trace?



```
[9/6/21 22:51:19:981 GMT] 00000039 com.ibm.ejs.j2c.ConnectionEventListener
A J2CA0056I: The Connection Manager received
a fatal connection error from the Resource Adapter for resource null. The exception is: javax.resource.spi.EISSystemException: ICO0001E:
com.ibm.connector2.ims.ico.IMSTCPIPManagedConnection@c341a0aa.processOutputOTMAMsg(Connection, InteractionSpec, Record, Record) error. IMS
Connect returned an error: RETCODE=[4], REASONCODE=[NFNDDST] [Datastore not found.]
at com.ibm.connector2.ims.ico.IMSManagedConnection.processOutputOTMAMsg(IMSManagedConnection.java:4042)
at com.ibm.connector2.ims.ico.IMSTCPIPManagedConnection.callSendRecv(IMSTCPIPManagedConnection.java:241)
at com.ibm.connector2.ims.ico.IMSManagedConnection.call(IMSManagedConnection.java:1625)
at com.ibm.connector2.ims.ico.IMSConnection.call(IMSConnection.java:213)
at com.ibm.connector2.ims.ico.IMSInteraction.execute(IMSInteraction.java:586)
at com.ibm.ims.gateway.services.IMSGatewayServiceImpl.executeTranServiceInputTMRA(Unknown Source)
at com.ibm.ims.gateway.services.IMSGatewayServiceImpl.invokeTransactionService(Unknown Source)
at com.ibm.ims.gateway.services.IMSGatewayServiceImpl.invoke(Unknown Source)
at com.ibm.ims.zconnect.provider.clients.GatewayServiceClient.doPost(Unknown Source)
at com.ibm.ims.zconnect.provider.clients.IMSClient.doInvoke(Unknown Source)
at com.ibm.ims.gateway.config.services.IMSZServiceHandlerImpl.invoke(Unknown Source)
at com.ibm.ims.gateway.config.services.IMSZServiceImpl.invoke(Unknown Source)
at com.ibm.zosconnect.internal.ZosConnectServiceImpl.apiInvoke(Unknown Source)
at com.ibm.zosconnect.internal.ServiceManagerImpl.invoke(Unknown Source)
at com.ibm.zosconnect.internal.ApiManagerImpl.invokeApi(Unknown Source)
at com.ibm.zosconnect.internal.web.ServiceProxyServlet$3.run(Unknown Source)
at com.ibm.ws.webcontainer.async.ServiceWrapper.wrapAndRun(ServiceWrapper.java:236)
at com.ibm.ws.webcontainer.async.ContextWrapper.run(ContextWrapper.java:28)
at com.ibm.ws.webcontainer.async.WrapperRunnableImpl.run(WrapperRunnableImpl.java:89)
at com.ibm.ws.threading.internal.ExecutorServiceImpl$RunnableWrapper.run(ExecutorServiceImpl.java:238)
at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1160)
at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:635)
at java.lang.Thread.run(Thread.java:825)
```

IMS service provider classes  
z/OS Connect Java classes

A Google search of ICO0001E returned an explanation at URL: <https://www.ibm.com/docs/en/ims/13.1.0?topic=exceptions-ico0001e>

Root cause – Datastore mistyped in the interaction configuration



# First Failure Data Collection (FFDC)

```
-----Start of DE processing----- = [9/7/21 14:19:29:291 GMT]
Exception = com.ibm.msg.client.jms.DetailedIllegalStateException
Source = com.ibm.zosconnect.service.mq.OneWayMQServiceInvocation
probeid = 0004
Stack Dump = com.ibm.msg.client.jms.DetailedIllegalStateException: JMSWMQ2002: Failed to get a message from destination 'ZCONN2.DEFAULT.MQZCEE.QUEUE'.
IBM MQ classes for JMS attempted to perform an MQGET; however IBM MQ reported an error.
Use the linked exception to determine the cause of this error.
at com.ibm.msg.client.wmq.common.internal.Reason.reasonToException(Reason.java:489)
at com.ibm.msg.client.wmq.common.internal.Reason.createException(Reason.java:215)
.
.
.
at com.ibm.zosconnect.service.mq.MQService.invoke(Unknown Source)
at com.ibm.zosconnect.internal.ZosConnectServiceImpl.apiInvoke(Unknown Source)
at com.ibm.zosconnect.internal.ServiceManagerImpl.invoke(Unknown Source)
at com.ibm.zosconnect.internal.ApiManagerImpl.invokeApi(Unknown Source)
at com.ibm.zosconnect.internal.web.ServiceProxyServlet$3.run(Unknown Source)
at com.ibm.ws.webcontainer.async.ServiceWrapper.wrapAndRun(ServiceWrapper.java:236)
at com.ibm.ws.webcontainer.async.ContextWrapper.run(ContextWrapper.java:28)
at com.ibm.ws.webcontainer.async.WrapperRunnableImpl.run(WrapperRunnableImpl.java:89)
at com.ibm.ws.threading.internal.ExecutorServiceImpl$RunnableWrapper.run(ExecutorServiceImpl.java:238)
at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1160)
at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:635)
at java.lang.Thread.run(Thread.java:825)
Caused by: com.ibm.mq.MQException: JMSCMQ0001: IBM MQ call failed with compcode '2' ('MQCC_FAILED') reason '2016' ('MQRC_GET_INHIBITED').
at com.ibm.msg.client.wmq.common.internal.Reason.createException(Reason.java:203)
... 25 more
```

MQ service provider classes

Root cause – Queue was configured to disable the MQPUT request

# The FFDC dump is more than a Java stack trace



z/OS Connect Java classes

```
-----Start of DE processing----- = [9/7/21 20:26:12:394 GMT]
Exception = com.ibm.zosconnect.endpoint.connection.TokenConfigException
Source = com.ibm.zosconnect.endpoint.connection.internal.OAuthConfigImpl
probeid = 265
Stack Dump = com.ibm.zosconnect.endpoint.connection.TokenConfigException: BAQR1006E: An error occurred when z/OS Connect EE attempted to
access the authentication/authorization server. Error: javax.net.ssl.SSLHandshakeException: SSLHandshakeException invoking
https://wg31.washington.ibm.com:26213/oidc/endpoint/OP/token: com.ibm.jsse2.util.j: PKIX path building failed:
com.ibm.security.cert.IBMCertPathBuilderException: unable to find valid certification path to requested target
at com.ibm.zosconnect.endpoint.connection.internal.OAuthConfigImpl.requestAuthorizationServer(Unknown Source)
at com.ibm.zosconnect.endpoint.connection.internal.OAuthConfigImpl.getAuthData(Unknown Source)
at com.ibm.zosconnect.apirequester.internal.restclient.RestClientImpl.handleAuthConfig(Unknown Source)
at com.ibm.zosconnect.apirequester.internal.restclient.RestClientImpl.invoke(Unknown Source)
at com.ibm.zosconnect.apirequester.internal.ARInvokeHandler.handle(Unknown Source)
at com.ibm.zosconnect.apirequester.internal.ApiRequesterManagerImpl.invoke(Unknown Source)
at com.ibm.zosconnect.apirequester.internal.proxy.ApiRequesterManagerProxyImpl$1.run(Unknown Source)
.
.
.
Dump of callerThis
Object type = com.ibm.zosconnect.endpoint.connection.internal.OAuthConfigImpl
copyright_notice = "Licensed Materials - Property of IBM 5655-CE3 (c) Copyright IBM Corp. 2017, 2021 All Rights Reserved
tc = class com.ibm.websphere.ras.TraceComponent@2d85bcc
strings[0] = "TraceComponent[com.ibm.zosconnect.endpoint.connection.internal.OAuthConfigImpl,class
com.ibm.zosconnect.endpoint.connection.internal.OAuthConfigImpl,[zosConnectApiRequesterToken],com.ibm.zosconnect.endpoint
.connection.internal.resources.ZosConnectEndpointConnection,null]"
CFG_ELEMENT_ID = "id"
CFG_GRANTTYPE = "grantType"
id = "myoAuthConfig"
grantType = "password"
authServer = class com.ibm.zosconnect.endpoint.connection.internal.AuthorizationServerImpl@ed6c1e8c
.
.
.
sslCertsRef = "OutboundSSLSettings"
connectionTimeout = 30000
receiveTimeout = 60000
id = "myoAuthServer"
```



# The FFDC dump for a network issue

```
-----Start of DE processing----- = [6/6/21 14:56:01:242 GMT]
Exception = java.net.UnknownHostException
Source = com.ibm.zosconnect.service.cics.internal.conn.isc.ConnectionManager
probeid = 131
Stack Dump = java.net.UnknownHostException: wg31.washington.ibm.com
at java.net.InetAddress.getAllByName0 (InetAddress.java:1419)
at java.net.InetAddress.getAllByName (InetAddress.java:1323)
at java.net.InetAddress.getAllByName (InetAddress.java:1246)
at java.net.InetAddress.getByName (InetAddress.java:1196)
at com.ibm.zosconnect.service.cics.internal.conn.isc.ConnectionManager.createConnection (Unknown Source)
at com.ibm.zosconnect.service.cics.internal.conn.isc.ConnectionManager.getConnection (Unknown Source)
at com.ibm.zosconnect.service.cics.internal.conn.isc.SessionManager.getNewConversation (Unknown Source)
at com.ibm.zosconnect.service.cics.ServerECIRequest.executeISC (Unknown Source)
at com.ibm.zosconnect.service.cics.ServerECIRequest.execute (Unknown Source)
at com.ibm.zosconnect.service.cics.internal.CicsIpicConnection.flow (Unknown Source)
at com.ibm.zosconnect.service.cics.internal.CicsServiceImpl.flowRequest (Unknown Source)
at com.ibm.zosconnect.service.cics.internal.CicsServiceImpl.invoke (Unknown Source)
at com.ibm.zosconnect.internal.ZosConnectServiceImpl.apiInvoke (Unknown Source)
at com.ibm.zosconnect.internal.ServiceManagerImpl.invoke (Unknown Source)
at com.ibm.zosconnect.internal.ApiManagerImpl.invokeApi (Unknown Source)
```

Base Java classes  
z/OS Connect Java classes

Root cause – Host wg31.washington.ibm.com was not configured in the DNS server



## Tech/Tip: Use the TCPIP resolver trace to display name resolution information

```
ALLOC FILE(SYSTCPD) DA(*)
ping wg31.washington.ibm.com
Resolver Trace Initialization Complete -> 2021/09/12 12:54:37.36

res_init Resolver values:
Setup file warning messages = No
CTRACE TRACERES option = No
Global Tcp/Ip Dataset = SYS1.TCPIP.TCPPARMS(TCPDAT3)
Default Tcp/Ip Dataset = SYS1.TCPIP.TCPPARMS(TCPDAT3)
Local Tcp/Ip Dataset = //DD:SYSTCPD
                      ==> SYS1.TCPIP.TCPPARMS(TCPDAT3)
Translation Table = SYS1.TCPIP.STANDARD.TCPXLBIN
UserId/JobName = JOHNSON
Caller API = TCP/IP Sockets Extended
Caller Mode = EBCDIC
System Name = WSC13 (from VMCF)
UnresponsiveThreshold = 25
(G) DataSetPrefix = SYS1.TCPIP
(G) HostName = MPZ3
. . .
res_query Failed: RetVal = -1, RC = 1, Reason = 0x78981005
res_querydomain Failed: RetVal = -1, RC = 1, Reason = 0x78981005
res_search Failed: RetVal = -1, RC = 1, Reason = 0x78981005
GetAddrInfo Closing IOCTL Socket 0x00000000
BPX1CL0: RetVal = 0, RC = 0, Reason = 0x00000000
GetAddrInfo Failed: RetVal = -1, RC = 1, Reason = 0x78AE1004
GetAddrInfo Ended: 2021/09/12 12:55:32.364732
*****
EZ3111I Unknown host 'WG31.WASHINGTON.IBM.COM'
```

Root cause – Host wg31.washington.ibm.com was missing from SYS1.TCPIP.TCPPARMS(IPNODES)



# Use the messages.log and FFDC log together

## messages.log

```
[9/12/21 14:56:45:613 GMT] 00000045 com.ibm.ws.logging.internal.impl.IncidentImpl           I FFDC1015I: An FFDC Incident has been  
created: "com.ibm.mq.connector.DetailedResourceException: MQJCA1011: Failed to allocate a JMS connection., error code: MQJCA1011 An internal  
error caused an attempt to allocate a connection to fail. See the linked exception for details of the failure.  
com.ibm.ejs.j2c.poolmanager.FreePool.createManagedConnectionWithMCWrapper 199" at ffdc_21.09.12_14.56.45.0.log  
  
[9/12/21 14:56:45:652 GMT] 00000045 com.ibm.ws.logging.internal.impl.IncidentImpl           I FFDC1015I: An FFDC Incident has been  
created: "com.ibm.msg.client.jms.DetailedJMSEException: MQJCA1011: Failed to allocate a JMS connection.  
  
An internal error caused an attempt to allocate a connection to fail.  
  
See the linked exception for details of the failure. com.ibm.zosconnect.service.mq.OneWayMQServiceInvocation 0004" at  
ffdc_21.09.12_14.56.45.1.log  
  
[9/12/21 14:56:45:652 GMT] 00000045 com.ibm.zosconnect.service.mq.MQServiceInvocation          E BAQM0056E: An unexpectedJMSEException  
occurred while processing a request for service 'mqGetService'. The exception message was 'MQJCA1011: Failed to allocate a JMS connection.'.
```

Spacing added between lines to improve readability

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# The FFDC dump showing additional JMS information



```
-----Start of DE processing----- = [9/12/21 14:56:45:567 GMT]
Exception = com.ibm.mq.connector.DetailedResourceException
Source = com.ibm.ejs.j2c.poolmanager.FreePool.createManagedConnectionWithMCWrapper
probeid = 004
Stack Dump = com.ibm.mq.connector.DetailedResourceException: MQJCA1011: Failed to allocate a JMS connection., error code: MQJCA1011 An
internal error caused an attempt to allocate a connection to fail. See the linked exception for details of the failure.
at com.ibm.mq.connector.services.JCAExceptionBuilder.buildException(JCAExceptionBuilder.java:169)
at com.ibm.mq.connector.services.JCAExceptionBuilder.buildException(JCAExceptionBuilder.java:135)
at com.ibm.mq.connector.ConnectionBuilder.createConnection(ConnectionBuilder.java:162)
at com.ibm.mq.connector.outbound.ManagedConnectionFactoryImpl.createConnection(ManagedConnectionFactoryImpl.java:655)
at com.ibm.mq.connector.outbound.ManagedConnectionImpl.<init>(ManagedConnectionImpl.java:200)
at com.ibm.mq.connector.outbound.ManagedConnectionFactoryImpl.createManagedConnection(ManagedConnectionFactoryImpl.java:248
at com.ibm.ejs.j2c.FreePool.createManagedConnectionWithMCWrapper(FreePool.java:1376)
at com.ibm.ejs.j2c.FreePool.createOrWaitForConnection(FreePool.java:1246)
at com.ibm.ejs.j2c.PoolManager.reserve(PoolManager.java:1438)
at com.ibm.ejs.j2c.ConnectionManager.allocateMCWrapper(ConnectionManager.java:574)
at com.ibm.ejs.j2c.ConnectionManager.allocateConnection(ConnectionManager.java:306)
at com.ibm.mq.connector.outbound.ConnectionFactoryImpl.createManagedJMSConnection(ConnectionFactoryImpl.java:309)
at com.ibm.mq.connector.outbound.ConnectionFactoryImpl.createConnectionInternal(ConnectionFactoryImpl.java:252)
at com.ibm.mq.connector.outbound.ConnectionFactoryImpl.createConnection(ConnectionFactoryImpl.java:225)
...
at java.lang.Thread.run(Thread.java:818)
Caused by: com.ibm.msg.client.jms.DetailedJMSEException: JMSFMQ6312: An exception occurred in the Java(tm) MQI.
The Java(tm) MQI has thrown an exception describing the problem.
See the linked exception for further information.
at sun.reflect.NativeConstructorAccessorImpl.newInstance0(Native Method)
...
... 27 more
Caused by: com.ibm.mq.jmqi.JmqiException: CC=2;RC=2495;AMQ8568: The native JNI library 'mqjrrs64' was not found. For a client installation
this is expected. [3=mqjrrs64]
at com.ibm.mq.jmqi.local.LocalMQ.loadLib(LocalMQ.java:1178)
Caused by: java.lang.UnsatisfiedLinkError: /usr/lpp/mqm/V9R1M0/java/lib/libmqjrrs64.so (EDC5205S DLL module not found.)
```

Root cause – configuration issue in the MQ resource adapter configuration, e.g., nativeLibraryPath.

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# A FFDC dump showing a SSL Handshake issue



```
. . . -----Start of DE processing----- = [6/16/21 17:59:45:534 GMT]
Exception = java.security.cert.CertPathValidatorException
Source = com.ibm.ws.ssl.core.WSX509TrustManager
probeid = checkServerTrusted
Stack Dump = java.security.cert.CertPathValidatorException: The certificate issued by CN=OpenIdProv, OU=CertAuth is not trusted; internal cause is: java.security.cert.CertPathValidatorException: Certificate chaining error
at com.ibm.security.cert.BasicChecker.<init>(BasicChecker.java:111)
at com.ibm.security.cert.PKIXCertPathValidatorImpl.engineValidate(PKIXCertPathValidatorImpl.java:220)
at java.security.cert.CertPathValidator.validate(CertPathValidator.java:278)
at com.ibm.jsse2.util.f.a(f.java:40)
at com.ibm.jsse2.util.f.b(f.java:143)
. . .
e = class com.ibm.jsse2.util.f@5728f8dd
f = null
z = class java.lang.String[37]
tsCfgAlias = "OutboundKeyRing"
tsFile = "safkeyring:///zCEE.KeyRing"
extendedInfo = class java.util.HashMap@5ebd51b
serialVersionUID = 362498820763181265
```

Root cause – CA used to sign server certificate was not present in outbound key ring.

# Other common TLS handshake issues



- ***Error occurred during a read, exception:javax.net.ssl.SSLHandshakeException: null cert chain***

This exception occurs when the server configuration set to require client certificates (`clientAuthentication="true"`) and the client had no certificate to provide and no alternative authentication method was available.

- ***Error occurred during a read, exception:javax.net.ssl.SSLEException: Received fatal alert: bad\_certificate error (handshake), vc=1083934466  
Caught exception during unwrap, javax.net.ssl.SSLEException: Received fatal alert: bad\_certificate***

This is usually caused when the client certificate presented to the server did not have a valid CA certificate for the client's personal certificate in the server's trust store key ring.

- ***CWWKO0801E: Unable to initialize SSL connection. Unauthorized access was denied or security settings have expired. Exception is javax.net.ssl.SSLHandshakeException: no cipher suites in common***

There may be many causes for this issue but first confirm the RACF identity under which the server is running has either READ access to FACILITY resources IRR.DIGTCERT.LISTRING and IRR.DIGTCERT.LIST or access to RDATALIB resources if virtual keyrings are being used.

The first FACILITY resource gives the identity access to their own key ring and the second allows access to the certificates. Of if virtual keyrings are in use, then the identity needs READ or UPDATE authority to the <ringOwner>.<ringName>.LST resource in the RDATALIB class. READ access enables retrieving one's own private key, UPDATE access enables retrieving another's private key.

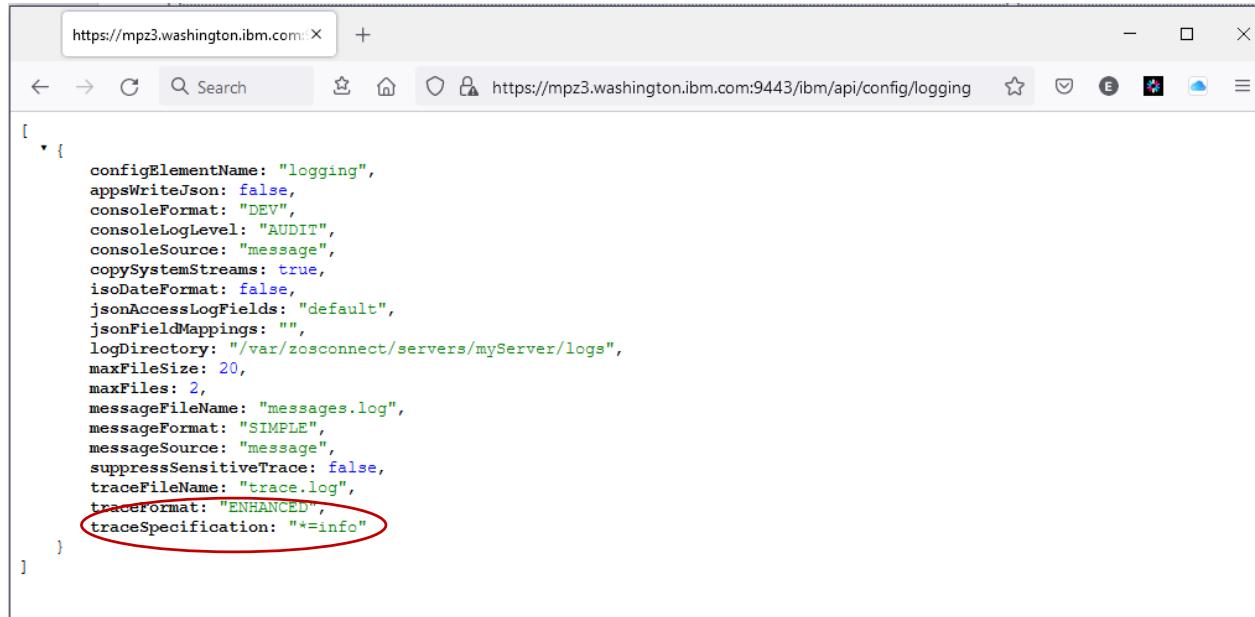
An alternative cause: For a TLS handshake to occur, the server must first have access to a private or site certificate that has a private key and the server must have access to that certificate's private key and no certificate with a private key is available.



# trace.out – use as a last resort or at the request of Level 2

First, the current active trace specification settings can be display using the *restConnector* feature.

`https://mpz3.washington.ibm.com:9443/ibm/api/config/logging`



```
[{"configElementName": "logging", "appsWriteJson": false, "consoleFormat": "DEV", "consoleLogLevel": "AUDIT", "consoleSource": "message", "copySystemStreams": true, "isoDateFormat": false, "jsonAccessLogFields": "default", "jsonFieldMappings": "", "logDirectory": "/var/zosconnect/servers/myServer/logs", "maxFileSize": 20, "maxFiles": 2, "messageFileName": "messages.log", "messageFormat": "SIMPLE", "messageSource": "message", "suppressSensitiveTrace": false, "traceFileName": "trace.log", "tracerFormat": "ENHANCED", "traceSpecification": "*=info"}]
```

## Enabling trace in z/OS Connect EE server

<https://www.ibm.com/docs/en/zosconnect/3.0?topic=problems-enabling-trace-in-zos-connect-ee>



# Managing trace specification

- Use “include” file to save commonly used trace specifications.
- Add the “include” after the sever has started to avoid tracing the startup activity.

## **server.xml**

```
<include location="${server.config.dir}/includes/safTrace.xml"/>
```

## **safTrace.xml**

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="security trace">
<logging traceSpecification="com.ibm.ws.security.*=all:
    SSLChannel=all:SSL=all:zosConnectSaf=all:zosConnect=all"/>
</server>
```

## **cicsTrace.xml**

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="CICS trace">
<logging traceSpecification="zosConnectServiceCics=all:
    com.ibm.zosconnect.wv*=FINEST:zosConnect=all"/>
</server>
```

## **imsTrace.xml**

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="IMS trace">
<logging traceSpecification="com.ibm.ims.*=all:
    com.ibm.j2ca.RAIMSTM=all:com.ibm.zosconnect.wv*=FINEST:
    zosConnect=all"/>
</server>
```

## **Enables enhanced tracing**

(after adding an “include” file)  
F BAQSTRT, REFRESH, CONFIG

## **Disable enhanced tracing**

F BAQSTRT, LOGGING='\*=INFO'  
**Or**  
F BAQSTRT, REFRESH, CONFIG  
(after removing the “include” file)

# trace.out file



mpz3

File Edit Settings View Communication Actions Window Help

File Edit Edit\_Settings Menu Utilities Compilers Test Help

EDIT /MPZ3/usr/zosconnect/servers/myServer/logs/trace.log

Command ==>

```
003637      > getSSLConfig: DefaultSSLSettings Entry
003638      < getSSLConfig Exit
003639          SSLConfig.toString() {
003640
003643      > determineIfCSIV2SettingsApply Entry
003644          (com.ibm.ssl.remoteHost=*, com.ibm.ssl.direction=inbound, com.ibm.ssl.remotePort=9443, com.ibm.ssl.endPointName=defaultHttpEndpoint-ssl)
003645      < determineIfCSIV2SettingsApply (original settings) Exit
003646
003647      3 keyStoreType: JCERACFKS
003648      3 trustStoreType: JCERACFKS
003649
003650      3 keyStore: safkeuring:///Liberty.KeyRing
003651      3 keyStoreName: CellDefaultKeyStore
003652      3 keyStorePassword: *****
003653      3 trustStore: safkeuring:///Liberty.KeyRing
003654      3 trustStoreName: CellDefaultKeyStore
003655      3 trustStorePassword: *****
003656
003657          (com.ibm.ssl.remoteHost=*, com.ibm.ssl.direction=inbound, com.ibm.ssl.remotePort=9443, com.ibm.ssl.endPointName=defaultHttpEndpoint-ssl)
003658
004117 K      3 Error occurred during a read, exception:javax.net.ssl.SSLHandshakeException: Empty server certificate chain
004119
004120      3 Caught exception during unwrap, javax.net.ssl.SSLHandshakeException: Empty server certificate chain
004142
004143      (com.ibm.ssl.remoteHost=*, com.ibm.ssl.direction=inbound, com.ibm.ssl.remotePort=9443, com.ibm.ssl.endPointName=defaultHttpEndpoint-ssl)
004144
004145      > isTransportSecurityEnabled Entry
004146      < isTransportSecurityEnabled true Exit
004150
004151
004152
004156
004196      > determineIfCSIV2SettingsApply Entry
004197          (com.ibm.ssl.remoteHost=*, com.ibm.ssl.direction=inbound, com.ibm.ssl.remotePort=9443, com.ibm.ssl.endPointName=defaultHttpEndpoint-ssl)
004198      < determineIfCSIV2SettingsApply (original settings) Exit
004243
004244      3 keyStoreType: JCERACFKS
004245      3 trustStoreType: JCERACFKS
004246
004247      3 keyStore: safkeuring:///Liberty.KeyRing
004248      3 keyStoreName: CellDefaultKeyStore
004249      3 keyStorePassword: *****
004250      3 trustStore: safkeuring:///Liberty.KeyRing
004251      3 trustStoreName: CellDefaultKeyStore
004252      3 trustStorePassword: *****
004253
004254          (com.ibm.ssl.remoteHost=*, com.ibm.ssl.direction=inbound, com.ibm.ssl.remotePort=9443, com.ibm.ssl.endPointName=defaultHttpEndpoint-ssl)
004630 K      3 Error occurred during a read, exception:javax.net.ssl.SSLHandshakeException: Empty server certificate chain
004632
004633      3 Caught exception during unwrap, javax.net.ssl.SSLHandshakeException: Empty server certificate chain
004655
004656      (com.ibm.ssl.remoteHost=*, com.ibm.ssl.direction=inbound, com.ibm.ssl.remotePort=9443, com.ibm.ssl.endPointName=defaultHttpEndpoint-ssl)
004657
004658      > isTransportSecurityEnabled Entry
004659      < isTransportSecurityEnabled true Exit
```

Columns 00101 00252  
Scroll ==> PAGE

MA A 03/019

Connected to remote server/host mpz3 using lu/pool MPZ30006 and port 23

Use thread number and/or package name to control which trace records are displayed

# **Monitoring Java, Liberty and z/OS Connect**

# Java Health Center – HEAP analysis example



The screenshot shows the IBM Java Health Center interface, specifically the Garbage Collection perspective. The main window displays a graph of heap usage, pause times, and object allocations over time.

**Graph View:**

- Y-axis: Size (MB) and time (ms).
- X-axis: elapsed time (minutes).
- Legend: Used heap (after collection), Heap size, Pause time.
- The graph shows a step-like increase in heap size over time, with several sharp vertical spikes representing pause times.

**Summary View:**

Metric	Value
Concurrent collection count	10
GC Mode	Default (gencon)
Global collections - Mean garbage collection pause	6.29 ms
Global collections - Mean interval between collections	2110 ms
Global collections - Number of collections	12
Largest memory request	199 KB
Mean garbage collection pause	3.5 ms
Mean interval between collections	129 ms
Minor collections - Mean garbage collection pause	3.39 ms
Minor collections - Mean interval between collections	134 ms
Minor collections - Number of collections	310
Minor collections - Total amount flipped	338073 KB
Minor collections - Total amount tenured	52.64 MB
Number of collections	322
Number of collections triggered by allocation failure	312
Proportion of time spent in garbage collection pauses (%)	2.71%
Proportion of time spent unpause (%)	97.29%
Rate of garbage collection	2643 MB/minute
Total amount flipped	338073 KB

**Help and Documentation:**

- Help: Eclipse
- Scope: All topics
- Contents:
  - Introduction
  - What's new
  - Platform requirements
  - Monitoring a running application
    - Saving data
    - Loading saved data
  - Viewing the data collected
    - Classes perspective (Java applications only)
      - CPU perspective
      - Environment perspective
      - Events perspective
    - I/O perspective (Java applications only)
    - Locking perspective (Java applications only)
    - Method trace perspective (Java applications only)
    - Native memory perspective
    - Network perspective (Java applications only)
    - Threads perspective (Java applications only)
  - Garbage collection perspective
    - Using the garbage collection perspective** (selected)
    - Java applications only
- Tool: IBM Monitoring and Diagnostic Tools - Health Center > IBM Monitoring and Diagnostic Tools - Health Center > Viewing the data collected > Garbage collection perspective

**Using the garbage collection perspective**

View data such as heap usage, pause times, summary table, object allocations, and tuning recommendation sections in the Health Center garbage collection perspective. Some data is not available for non-Java™ applications.

The Health Center garbage collection perspective has the following views:

**Views for basic garbage collection information**

These views are available for all application types:

- Heap and pause times: A graph of [heap usage](#) and [pause times](#).
- Summary: A [summary table](#) of important garbage collection metrics.

**Views for detailed garbage collection information**

These views are available only for Java applications, and only if you enable detailed garbage collection information (Java applications only):

- Object allocations: A table that shows the [allocation of objects](#) within a specified size range.
- Samples by request site: A profile of sampled object allocations, grouped by the call site of the allocation request.
- Samples by object: A profile of sampled object allocations, grouped by the type of object allocated.
- Call hierarchy: This view shows data when you select a row in the Object allocations, Samples by request site, or Samples by object views. For example, if you select a row in the Samples by object view, this view shows the hierarchy of calls to allocations of that object.
- Timeline: A visual indication of when object allocations were requested. This view shows data when you select a row in the Object allocations or Samples by request site views.

# Java Health Center – Monitors the Java environment



Configuring the Monitoring Agent using JVM directives

## Java Directives

- Xhealthcenter:level=headless
  - Dcom.ibm.java.diagnostics.healthcenter.headless.output.directory=/var/zcee/hcd
  - Dcom.ibm.java.diagnostics.healthcenter.socket.readwrite=on
  - Dcom.ibm.java.diagnostics.healthcenter.headless.files.to.keep=2
  - Dcom.ibm.java.diagnostics.healthcenter.headless.delay.start=value=0
  - Dcom.ibm.java.diagnostics.healthcenter.headless.run.pause.duration=0
  - Dcom.ibm.java.diagnostics.healthcenter.headless.run.duration=0
  - Dcom.ibm.java.diagnostics.healthcenter.headless.run.number.of.runs=0
  - Dcom.ibm.diagnostics.healthcenter.readonly=on
- run without a client  
directory where HCD will be stored  
collect socket sent/receive data  
number of HCD files to retain  
delay start value in minutes  
pause between runs, in minutes  
run duration, in minutes  
number of runs  
no client connections allowed*

**Add directives to bootstrap.properties or a JVM properties file, e.g.,  
`/var/zcee/properties/zceeHCD.properties`**

```
-Dcom.ibm.tools.attach.enable=yes  
-Xhealthcenter:level=headless -Dcom.ibm.java.diagnostics.healthcenter.headless.output.directory=/var/zcee/hcd  
    -Dcom.ibm.java.diagnostics.healthcenter.socket.readwrite=on -Dcom.ibm.diagnostics.healthcenter.readonly=on  
    -Dcom.ibm.java.diagnostics.healthcenter.headless.run.duration=5  
    -Dcom.ibm.java.diagnostics.healthcenter.headless.run.number.of.runs=1 #
```

# All the health center directives should be on one line.

For details on these and other Health Center configuration properties, see URL

<https://www.ibm.com/docs/en/mon-diag-tools?topic=agent-health-center-configuration-properties>

# Java Health Center – Monitoring Agent Configuration



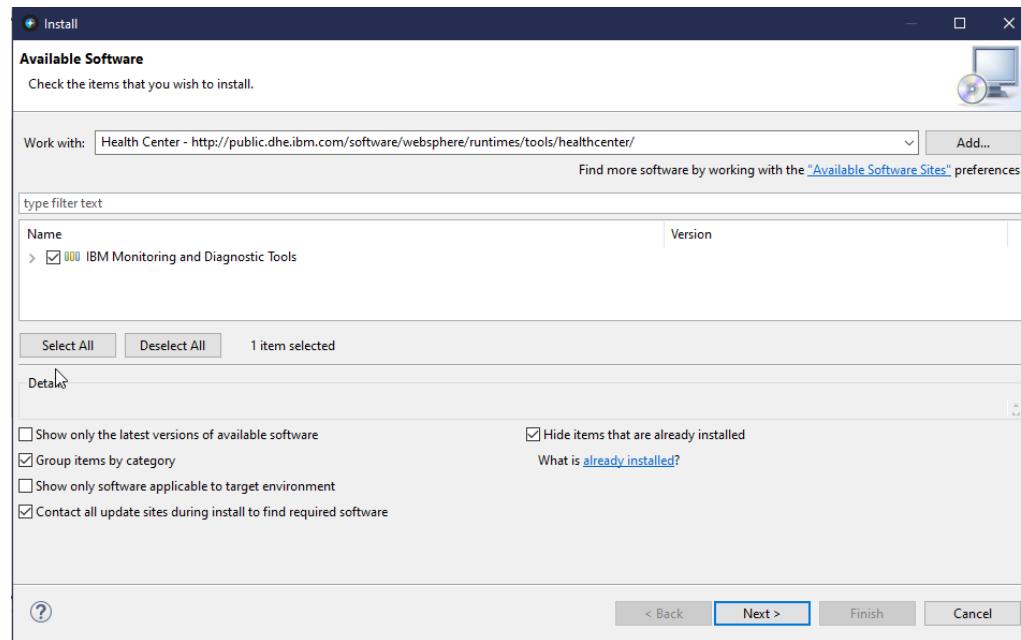
Set the JVM\_OPTIONS environment variable to the properties file containing the health center directives

```
SYS1.PROCLIB(BAQSTRT)
//BAQSTRT PROC PARM='myServer --clean'
/*
// SET ZCONHOME='/usr/lpp/IBM/zosconnect/v3r0'
/*
//ZCON      EXEC PGM=BPXBATSL,REGION=0M,MEMLIMIT=8G,
//              PARM='PGM &ZCONHOME./bin/zosconnect run &PARMS.'
//STEPLIB  DD DISP=SHR,DSN=MQ91#.SCSQAUTH
//          DD DISP=SHR,DSN=MQ91#.SCSQANLE
//STDERR   DD SYSOUT=*,FREE=CLOSE,SPIN=(UNALLOC,1M)
//STDOUT   DD SYSOUT=*
//STDIN    DD DUMMY
//STDENV   DD *
_BPX_SHAREAS=YES
JAVA_HOME=/usr/lpp/java/J8.0_64/
WLP_USER_DIR=/var/zosconnect
JVM_OPTIONS=-Xoptionsfile=/var/zcee/properties/zceeHCD.properties
```

# Java Health Center – Client Configuration



The Java health center client can be installed in most Eclipse workspace, e.g., IBM z/OS Explorer, etc.



The plug-in is available for download from <http://public.dhe.ibm.com/software/websphere/runtimes/tools/healthcenter/>

# Java Health Center – Network analysis example



smf - Eclipse

File Edit Navigate Search Project Data Run Monitored System Window Help

Status Connection

CPU Classes Environment Events Garbage Collection I/O Locking Method Profiling Method Trace Native Memory Network Threads WebSphere Real Time

Analysis and Recommendations

- Your application has made 1,270 open socket requests and 820 close socket requests.
- Your application has 17 open sockets.
- No problems detected

Sockets

Socket ID filter:

ID	Type	IP Address	Port	Data sent	Data received	State	Thread [ID] Name
102	Client	0:0:0:ffff:c0a8:11c9	1491	116043 bytes	42284 bytes	Closed	[0x29d2fa00] Equino...
103	Client	0:0:0:ffff:c0a8:11c9	65470	32953 bytes	38334 bytes	Open	[0x2a00aa00] Default...
112	Server	0:0:0:ffff:c0a8:3c	59411			Open	[0x2a253d00] Shared...
127	Server	0:0:0:ffff:c0a8:3c	2446	87343 bytes	98768 bytes	Closed	[0x2a019f00] Default...
136	Server	0:0:0:ffff:c0a8:11c9	9080			Open	[0x2b38c800] Default...
138	ServerS...	0:0:0:0:0	59412	4248 bytes	8818 bytes	Open	[0x2a253d00] Shared...
144	Server	0:0:0:ffff:c0a8:3c	9443			Open	[0x2a019f00] Default...
164	ServerS...	0:0:0:0:0	176			Open	[0x2a253d00] Shared...
183	Client	0:0:0:ffff:c0a8:11c9	4000	182558 bytes	186691 bytes	Closed	[0x2a00aa00] Default...
186	Server	0:0:0:ffff:c0a8:11f3	7883			Open	[0x2a14f400] Default...
196	Server	0:0:0:ffff:c0a8:3c	61723			Closed	[0x29fcbb00] Default...
204	Server	0:0:0:ffff:c0a8:11f3	7880	1428 bytes	602 bytes	Open	[0x2a253d00] Shared...
215	Client	0:0:0:ffff:c0a8:11c9	1491	116825 bytes	62048 bytes	Open	[0x2b38c800] Default...
226	Server	0:0:0:ffff:c0a8:11f3	7863	2447 bytes	1059 bytes	Closed	[0x2a00aa00] Default...
227	Server	0:0:0:ffff:c0a8:11f3	9463	9892 bytes	8675 bytes	Open	[0x2aa3c100] Default...
228	Server	0:0:0:ffff:c0a8:11f3	7849			Closed	[0x29fcbb00] Default...
230	Server	0:0:0:ffff:c0a8:11f3	7850	39936 bytes	54048 bytes	Open	[0x2a00aa00] Default...
231	Server	0:0:0:ffff:c0a8:11f3	9463	10868 bytes	7460 bytes	Open	[0x2a14f400] Default...
233	Server	0:0:0:ffff:c0a8:11f3	7810	22059 bytes	11436 bytes	Open	[0x2a00aa00] Default...
234	Server	0:0:0:ffff:c0a8:11f3				Closed	[0x2a14f400] Default...

Sockets open Network I/O

mitchj@us.ibm.com

c0a8:11c9 = 192.168.17.201



# Java Health Center – Method Profiling

The Java Health Center interface for method profiling is shown. It includes a left sidebar with monitoring categories like CPU, Classes, Environment, Garbage Collection, I/O, Locking, Method Profiling (which is selected), Method Trace, Native Memory, Network, Threads, and WebSphere Real Time. The main area has three tabs: Sample based profile, Samples over time, and Method trace summary.

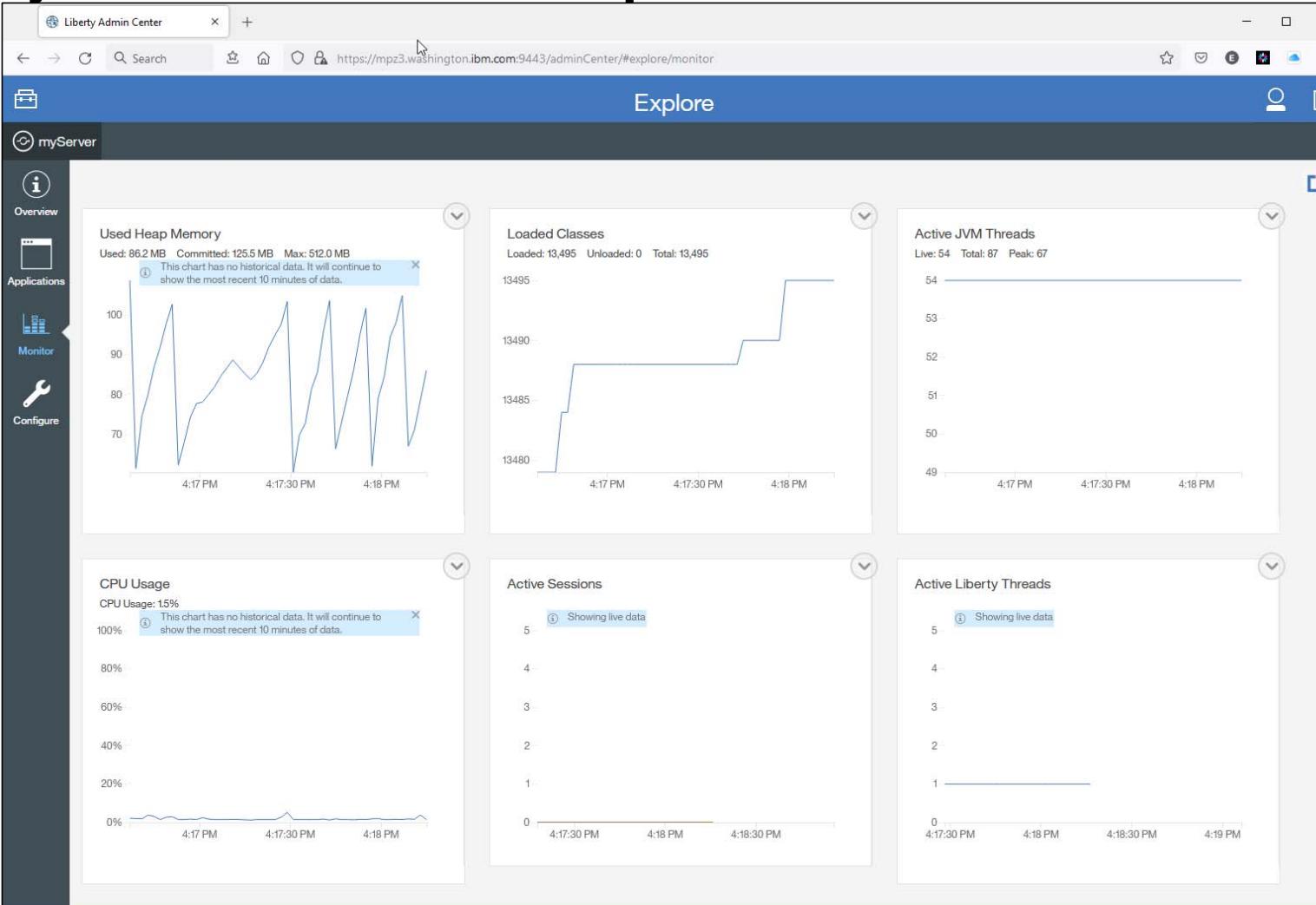
**Sample based profile:** This tab displays a table of sampled methods. The columns are Samples, Self (%), Self, Tree (%), Tree, and Method. A red bar indicates the self percentage for the top method, com.ibm.crypto.provider.MD5.a().

Samples	Self (%)	Self	Tree (%)	Tree	Method
2806	27.17	■	27.28	■	com.ibm.crypto.provider.MD5.a(byte[], int, int, byte[], int)
562	5.44	■	7.26	■	com.ibm.ws.logging.utils.FileLogHolder.writeRecord(java.lang.String)
440	4.26	■	21.36	■	com.ibm.ws.logging.internal.impl.BaseTraceService.publishTraceLogRecord(com.ibm.ws.loggii
264	2.56	■	2.56	■	java.math.Division.monReduction(int[], java.math.BigInteger, int)
183	1.77		1.79		java.math.Multiplication.square(int[], int, int)
172	1.67		2.32	■	javax.security.auth.Subject.toString(boolean)
150	1.45		1.47		java.math.Division.long.monReduceSqr(long[], long[], long, int, long[])
130	1.26		1.83		com.ibm.crypto.provider.P256PrimeField.a(int[])
128	1.24		1.55		com.ibm.crypto.provider.x.add(com.ibm.crypto.provider.EllipticPoint)
115	1.11		1.14		java.math.Division.long.monReduceSqr(long[], long[], long, int, long[])
102	0.99		5.32	■	com.ibm.ws.logging.utils.FileLogHolder.writeRecord(java.lang.String)
97	0.94		1.91		com.ibm.ws.logging.internal.impl.BaseTraceService.publishTraceLogRecord(com.ibm.ws.loggii
92	0.89		1.21		nra.eclipse.ocni.interpreter.OCNIInterpreter

**Samples over time:** This tab shows a line graph of samples over time. A red circle highlights a peak in samples around 2:30. A blue arrow points from this peak to the Method trace summary tab.

**Method trace summary:** This tab shows a line graph of samples over time, mirroring the trend seen in the Samples over time tab.

# Liberty Admin Center feature provides real time monitoring



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Slide 94





# Workload Manager - Definitions

## WLM Service Classes

```

Service-Class Xref Notes Options Help
Modify a Service Class Row 1 to 2 of 2
Command ==>_

Service Class Name . . . . . : OPS_HIGH
Description . . . . . : System Tasks Velocity 70
Workload Name . . . . . : STC_WKL (name or ?)
Base Resource Group . . . . . : (name or ?)
Cpu Critical . . . . . : NO (YES or NO)
I/O Priority Group . . . . . : NORMAL (NORMAL or HIGH)
Honor Priority . . . . . : DEFAULT (DEFAULT or NO)

Specify BASE GOAL information. Action Codes: I=Insert new period,
E>Edit period, D>Delete period.

-- Period -- ----- Goal -----
Action # Duration Imp. Description
1 Execution velocity of 70
***** Bottom of data *****
  
```

MP A 19/004  
Connected to remote server/host mpz3 using lu/pool MPZ30008 and port 23

## WLM Report Classes

```

Report-Class View Notes Options Help
Report Class Selection List Row 1 to 12 of 12
Command ==>_

Action Codes: I=Create, 2=Copy, 3=Modify, 4=Browse, 5=Print, 6=Delete,
/=Menu Bar

Action Name Description
BAQSTC
WMQFTE
WMQFTIER
WMQFTIE2
ZCEEADM
ZCEEAIR
ZCEECICS
ZCEEDB2
ZCEEIMS
ZCEEMQ
ZCEEOTHR
ZCEESTC

-- Last Change --
User Date
JOHNSON 2021/09/04
JOHNSON 2011/08/31
JOHNSON 2011/08/31
JOHNSON 2011/08/31
JOHNSON 2021/08/02
JOHNSON 2021/08/05
JOHNSON 2021/08/05
JOHNSON 2021/08/05
JOHNSON 2021/08/05
JOHNSON 2021/08/02
JOHNSON 2021/09/02
***** Bottom of data *****

  
```

MP A 10/004  
Connected to remote server/host mpz3 using lu/pool MPZ30008 and port 23  
mitchj@us.ibm.com

## WLM "CB" Classification Rules

```

Subsystem-Type Xref Notes Options Help
Modify Rules for the Subsystem Type Row 1 to 8 of 16
Command ==>_
Scroll ==> PAGE

Subsystem Type . . . . . : CB Fold qualifier names? N Y or N
Description . . . . . : WLP/zCEE Transactions

Action codes: A=After C=Copy M=Move I=Insert rule
B=Before D=Delete row R=Repeat IS=Insert Sub-rule
More ==>

-----Qualifier-----
Action Type Name Start
1 CN myServer
2 TC TCHUM
2 TC TCAPIR
2 TC TCCICS
2 TC TCDB2
2 TC TCIMS
2 TC TCMQ
2 TC TCOTHR

-----Class-----
Service Report
OPS_HIGH ZCEEOTHR
OPS_HIGH BAQSTC
OPS_HIGH ZCEEADM
OPS_HIGH ZCEEAIR
OPS_HIGH ZCEECICS
OPS_HIGH ZCEEDB2
OPS_HILO ZCEEIMS
OPS_MED ZCEEMQ
OPS_LOW ZCEEOTHR

  
```

MP A 07/021  
Connected to remote server/host mpz3 using lu/pool MPZ30008 and port 23

```

Subsystem-Type Xref Notes Options Help
Modify Rules for the Subsystem Type Row 9 to 16 of 16
Command ==>_
Scroll ==> PAGE

Subsystem Type . . . . . : CB Fold qualifier names? N Y or N
Description . . . . . : WLP/zCEE Transactions

Action codes: A=After C=Copy M=Move I=Insert rule
B=Before D=Delete row R=Repeat IS=Insert Sub-rule
More ==>

-----Qualifier-----
Action Type Name Start
1 CN zceex
2 TC TCADM
2 TC TCAPIR
2 TC TCDB2
2 TC TCCICS
2 TC TCIMS
2 TC TCMQ
2 TC TCOTHR

-----Class-----
Service Report
OPS_HIGH ZCEEOTHR
OPS_HIGH ZCEESTC
OPS_HIGH ZCEEADM
OPS_HIGH ZCEEAIR
OPS_HIGH ZCEEDB2
OPS_HILO ZCEEIMS
OPS_MED ZCEEMQ
OPS_HILO ZCEEOTHR

  
```

MP A 07/021  
Connected to remote server/host mpz3 using lu/pool MPZ30008 and port 23

# Workload Manager – WLM Classification server XML



## The corresponding required sever XML configuration

- Based on HTTP path matching (port and/or method can also be specified)
- The default value for the `wlmClassification` name is the name of the server
- See URL <https://www.ibm.com/docs/en/was-liberty/zos?topic=zos-wlm-classification> for more information

Server Config

wlm.xml

Design   Source

1 <?xml version="1.0" encoding="UTF-8"?>  
2 <server description="wlm">  
3  
4 <featureManager>  
5 <feature>zosWlm-1.0</feature>  
6 </featureManager>  
7  
8 <wlmClassification>  
9 <httpClassification transactionClass="TCCICS"  
10 resource="/cscvinc/employee/\*" method="GET"/>  
11 <httpClassification transactionClass="TCDB2"  
12 resource="/db2/employee/\*" method="GET"/>  
13 <httpClassification transactionClass="TCIMS"  
14 resource="/phonebook/contacts/\*"/>  
15 <httpClassification transactionClass="TCIMS"  
16 resource="/phonebook/contacts" METHOD="POST"/>  
17 <httpClassification transactionClass="TCMQ"  
18 resource="/mqapi/\*" METHOD="POST"/>  
19 <httpClassification transactionClass="TCMQ"  
20 resource="/mqapi/\*" METHOD="GET"/>  
21 <httpClassification transactionClass="TCAPIR" resource="/zosConnect/apiRequesters/\*"/>  
22 <httpClassification transactionClass="TCADM" resource="/zosConnect/\*\*/\*"/>  
23 <httpClassification transactionClass="TCOTHR" />  
24 </wlmClassification>  
25  
26 <osWorkloadManager collectionName="\${wlp.server.name}" />  
27  
28 <zosWlmHealth interval="30" increment="15"/>  
29  
30 </server>  
31

Related to WLM CN name.



# Workload Manager – Active HTTP Classification

<https://mpz3.washington.ibm.com:9443/ibm/api/config/httpClassification>

The screenshot shows a web browser window with the URL <https://mpz3.washington.ibm.com:9443/ibm/api/config/httpClassification>. The page displays a JSON array of configuration elements for HTTP classification. Each element has properties such as configElementName, uid, host, method, port, resource, and transactionClass. The transactionClass values include TCMQ, TCMQ, TCAPIR, TCADM, and TCOTHR.

```
[{"configElementName": "httpClassification", "uid": "wlmClassification[default-0]/httpClassification[default-4]", "host": "*", "method": "POST", "port": "*", "resource": "/mqapi/*", "transactionClass": "TCMQ"}, {"configElementName": "httpClassification", "uid": "wlmClassification[default-0]/httpClassification[default-5]", "host": "*", "method": "GET", "port": "*", "resource": "/mqapi/*", "transactionClass": "TCMQ"}, {"configElementName": "httpClassification", "uid": "wlmClassification[default-0]/httpClassification[default-6]", "host": "*", "method": "*", "port": "*", "resource": "/zosConnect/apiRequesters/*", "transactionClass": "TCAPIR"}, {"configElementName": "httpClassification", "uid": "wlmClassification[default-0]/httpClassification[default-7]", "host": "*", "method": "*", "port": "*", "resource": "/zosConnect/**/*", "transactionClass": "TCADM"}, {"configElementName": "httpClassification", "uid": "wlmClassification[default-0]/httpClassification[default-8]", "host": "*", "method": "*", "port": "*", "resource": "*", "transactionClass": "TCOTHR"}]
```

# RMF SMF Type 72 Service Class Reports



mpz3

File Edit Settings View Communication Actions Window Help

Display Filter View Print Options Search Help

SDSF OUTPUT DISPLAY JOHNSONR JOB12740 DSID 112 LINE CHARS 'CICS' FOUND

COMMAND INPUT ==>

POLICY=WSCPOL

REPORT CLAS

-TRANSACTIONS--		TRANS-TIME	HHH.MM.SS.FFFFFF	TRA
Avg	0.02	ACTUAL	108891	TOT
MPL	0.02	EXECUTION	108856	MOB
ENDED	96	QUEUED	34	CAT
END/S	0.16	R/S AFFIN	0	CAT
#SWAPS	0	INELIGIBLE	0	
EXCTD	0	CONVERSION	0	
		STD DEV	762583	

----SERVICE----

SERVICE TIME		---APPL %---	--P			
IOC	0	CPU	1.967	CP	0.02	BLK
CPU	1739K	SRB	0.000	IIPCP	0.02	ENQ
MSO	0	RCT	0.000	IIP	0.31	CRM
SRB	0	IIT	0.000	AAPCP	0.00	LCK
TOT	1739K	HST	0.000	AAP	N/A	SUP
/SEC	2898	IIP	1.844			
ABSRPTN	166K	AAP				
TRX SERV	166K					

MA A

Connected to remote server/host mpz3 using lu/pool MPZ30008 and port 23

mpz3

File Edit Settings View Communication Actions Window Help

Display Filter View Print Options Search Help

SDSF OUTPUT DISPLAY JOHNSONR JOB12740 DSID 112 LINE CHARS 'APIR' FOUND

COMMAND INPUT ==>

POLICY=WSCPOL

REPORT CLASS=ZCEEAPIR

PERIOD=1

-TRANSACTIONS--		TRANS-TIME	HHH.MM.SS.FFFFFF	TRANS-APPL%----CP-IIPCP/AAPCP-IIP/AAP	---ENCLAVES---				
Avg	0.14	ACTUAL	424835	TOTAL	0.12	0.12	0.73	Avg ENC	0.14
MPL	0.14	EXECUTION	424707	MOBILE	0.00	0.00	0.00	REM ENC	0.00
ENDED	200	QUEUED	126	CATEGORYA	0.00	0.00	0.00	MS ENC	0.00
END/S	0.33	R/S AFFIN	0	CATEGORYB	0.00	0.00	0.00		
#SWAPS	0	INELIGIBLE	0						
EXCTD	0	CONVERSION	0						
		STD DEV	1.381943						

----SERVICE----

SERVICE TIME		---APPL %---	--PROMOTED--	--DASD I/O--	----STORAGE----	-PAGE-IN RATES-							
IOC	0	CPU	5.073	CP	0.12	BLK	0.000	SSCHRT	2.4	Avg	0.00	SINGLE	0.0
CPU	4485K	SRB	0.000	IIPCP	0.12	ENQ	0.000	RESP	0.4	TOTAL	0.00	BLOCK	0.0
MSO	0	RCT	0.000	IIP	0.73	CRM	0.000	CONN	0.3	SHARED	0.00	SHARED	0.0
SRB	0	IIT	0.000	AAPCP	0.00	LCK	0.000	DISC	0.0			HSP	0.0
TOT	4485K	HST	0.000	AAP	N/A	SUP	0.000	Q+PEND	0.0				
/SEC	7474	IIP	4.363					IOSQ	0.0				
ABSRPTN	53K	AAP											
TRX SERV	53K												

MA A

05/057

Connected to remote server/host mpz3 using lu/pool MPZ30008 and port 23

# Liberty SMF 120 Subtype 11



WebSphere Liberty Profile (WLP) can generate various types of SMF 120 records. Support for a SMF 120 record relevant for z/OS Connect was added in WLP V16.0.0.2. This record, a SMF 130 Subtype 11, is generated for each HTTP request received by the Liberty server. For more details and a description of the contents of this record, see URL <https://www.ibm.com/support/pages/liberty-zos-smf-120-11-version-2>

The screenshot shows the 'Server Config' interface with a blue header bar. On the left is a navigation icon, in the center is the title 'Server Config', and on the right are search and refresh icons. Below the header is a dark grey toolbar with the text 'smf.xml' on the left and 'Read only' and 'Close' buttons on the right. Underneath the toolbar is a tab bar with 'Design' and 'Source' tabs; the 'Source' tab is selected and underlined. To the right of the tabs is a gear icon. The main area contains the XML code for the smf.xml file:

```
1<?xml version="1.0" encoding="UTF-8"?>
2
3<server description="SMF">
4    <featureManager>
5        <feature>monitor-1.0</feature>
6        <feature>zosRequestLogging-1.0</feature>
7    </featureManager>
8
9</server>
10
```

Useful Plug-ins for WAS z/OS SMF 120.9 Browser

<https://www.ibm.com/support/pages/node/6355403>

# Liberty SMF 120 Subtype 11 – WP102312 Plugin

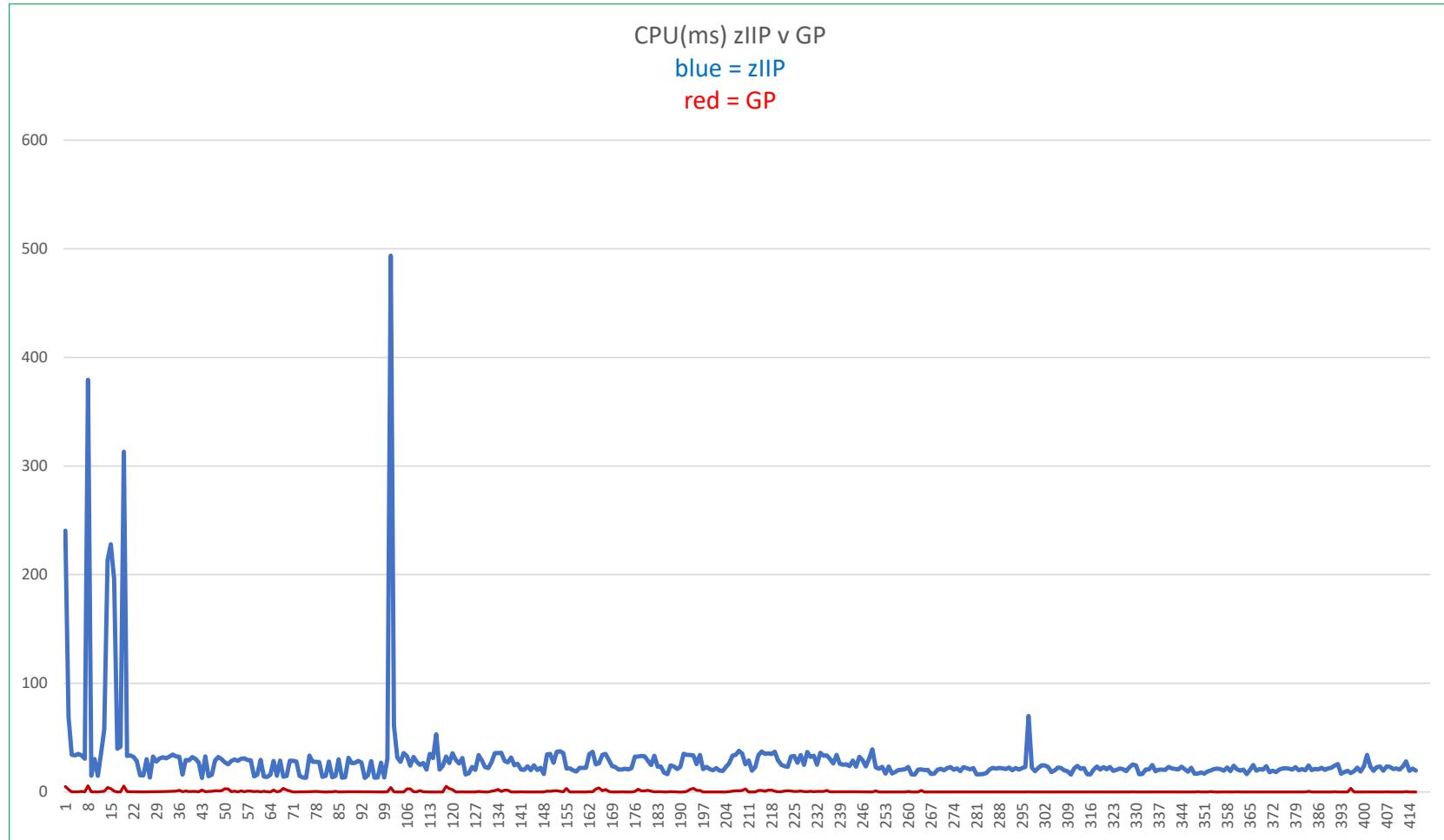


LibertyExport.csv

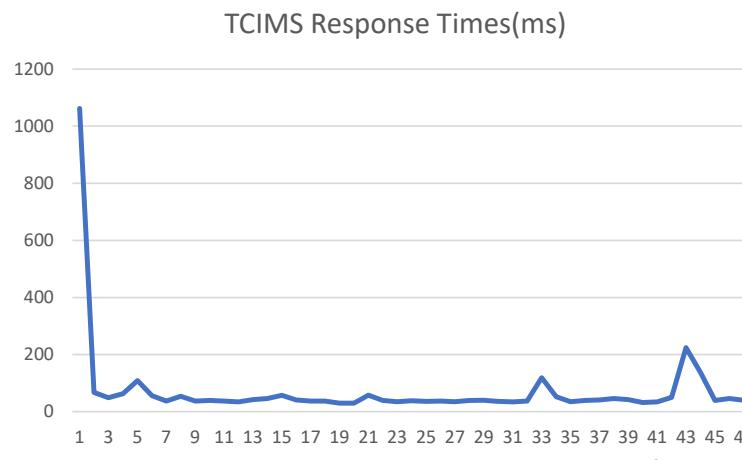
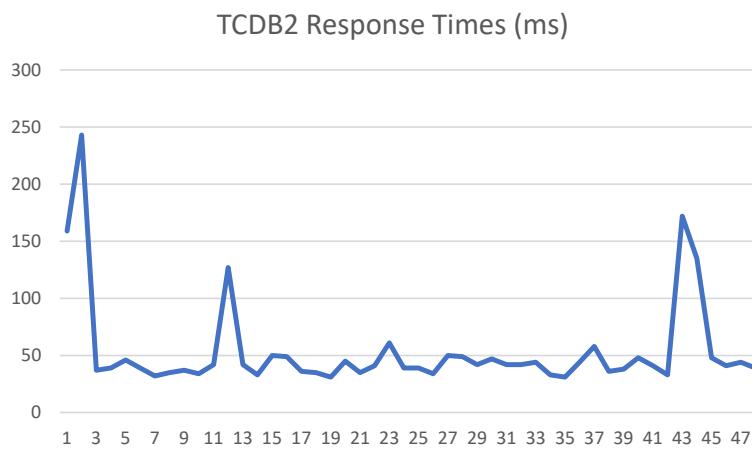
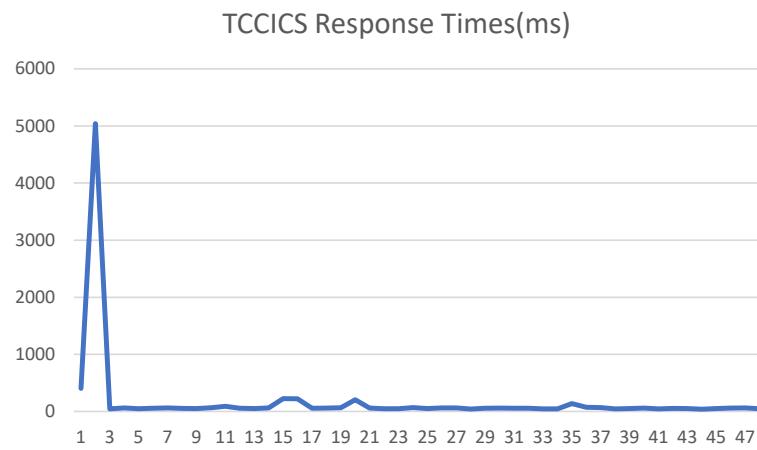
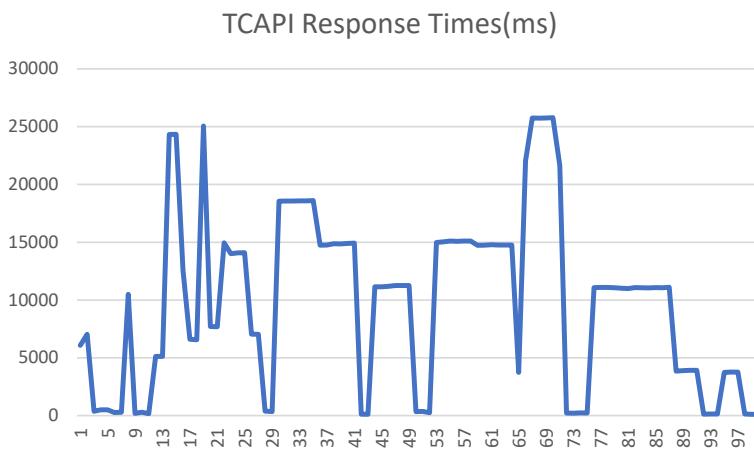
Some fields have been hidden

AS	B	C	E	P	Q	R	S	T	U	V	W	Z	AA	AB	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW
1	SystemName	Sysplex	JobName	StartTime	StartTime	EndTime	(EndTime)-(StartTime)	Respon	TranClass	Total CPU	Start	Total CPU	ETotalCPU	TotalGPP(ms)	TotalOffload(ms)	userid	mappedUser	requestUser	host	port	uri	responseTargetPort	targetPort	remotePort	remoteAddr
2	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	6080	TCAPIR	3314772936	4.32E+09	245.5195	5.0110927	240.50838	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4283	192.168.17.243	
3	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	7030	TCAPIR	178821759	471750165	71.51572	2.334169	69.18156	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4286	192.168.17.243	
4	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	374	TCAPIR	4327455460	4.469E+09	34.44008	0.10757129	34.332504	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4301	192.168.17.243	
5	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	495	TCAPIR	2762287407	2.9E+09	33.65053	0.057430662	33.5931	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4304	192.168.17.243	
6	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	500	TCAPIR	4484655211	4.629E+09	35.15451	0.12540185	35.020004	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4303	192.168.17.243	
7	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	262	TCAPIR	4637789017	4.777E+09	34.10283	0.42818993	33.680042	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4305	192.168.17.243	
8	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	293	TCAPIR	542458283	668050357	30.66213	0.053870115	30.608257	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4306	192.168.17.243	
9	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	10493	TCAPIR	3802597962	5.38E+09	385.0374	5.576213	379.46115	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4285	192.168.17.243	
10	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	185	TCAPIR	5384541333	5.446E+09	15.04486	0.15656103	14.888303	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4308	192.168.17.243	
11	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	282	TCAPIR	1028119195	1.153E+09	30.38298	0.04661279	30.336363	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4309	192.168.17.243	
12	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	163	TCAPIR	901260513	962209631	14.88016	0	14.880165	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4310	192.168.17.243	
13	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	5126	TCAPIR	3137255105	3.284E+09	35.92899	0.33009765	35.598892	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4313	192.168.17.243	
14	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	5122	TCAPIR	4890213483	5.128E+09	58.01673	0.61064285	57.40609	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4314	192.168.17.243	
15	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	24315	TCAPIR	13036032356	1.393E+09	217.4406	4.0119	213.4287	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4282	192.168.17.243	
16	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	24338	TCAPIR	1463812131	2.41E+09	290.9845	3.1036336	277.8809	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4284	192.168.17.243	
17	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	12587	TCAPIR	1160912461	1.967E+09	196.8579	0.7669092	196.09096	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4315	192.168.17.243	
18	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	6599	TCAPIR	5303866625	5.467E+09	39.79177	0.020269532	39.761494	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4316	192.168.17.243	
19	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	6565	TCAPIR	6143860672	6.315E+09	41.86705	0.16208105	41.704967	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4317	192.168.17.243	
20	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	25052	TCAPIR	2627290027	3.928E+09	318.7149	5.498493	313.22546	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4281	192.168.17.243	
21	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	7709	TCAPIR	4477460136	4.615E+09	33.52233	0.35891944	33.163406	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4322	192.168.17.243	
22	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	7682	TCAPIR	1973032107	2.112E+09	33.81701	0.19548193	33.621525	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4321	192.168.17.243	
23	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	14950	TCAPIR	458083506	590213570	32.25832	0.0489917	32.209324	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4323	192.168.17.243	
24	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	14016	TCAPIR	61401222	178390269	28.56178	0.2347461	28.327032	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4325	192.168.17.243	
25	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	14088	TCAPIR	860696286	148846164	15.32625	0.0541626	15.272091	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4326	192.168.17.243	
26	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	14097	TCAPIR	5471350509	5.535E+09	15.43587	0.21740967	15.218459	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4324	192.168.17.243	
27	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	7051	TCAPIR	5358173556	5.482E+09	30.16547	0.001757324	30.163715	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4328	192.168.17.243	
28	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	7029	TCAPIR	2281578411	2.336E+09	13.27289	0	13.272889	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4327	192.168.17.243	
29	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	379	TCAPIR	1054429318	1.188E+09	32.66632	0.067269534	32.599052	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4329	192.168.17.243	
30	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	347	TCAPIR	644045567	759168227	28.10612	0.16462207	27.941496	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4330	192.168.17.243	
31	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	18550	TCAPIR	764059849	891747729	31.1738	0.4028291	30.770971	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4336	192.168.17.243	
32	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	18551	TCAPIR	5678912186	5.811E+09	32.35731	0.39294335	31.964365	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4332	192.168.17.243	
33	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	18557	TCAPIR	260836676	390012335	31.53703	0.6369346	30.900091	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4331	192.168.17.243	
34	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	18568	TCAPIR	252264630	387487083	33.01329	0.4126411	32.600655	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4333	192.168.17.243	
35	MPZ3	MPZPLEX	BAQSTRT	Friday	Au	3.84E+12	Friday	Au	3.84E+12	18571	TCAPIR	6167008451	6.311E+09	35.09796	0.69125974	34.406696	USER1	/zosConn/mpz3.was	9080	/zosConnect/apiRequeste	166	9080	4334	192.168.17.243	

# Liberty SMF 120 type 11 – GP v zIPP comparison example



# Liberty SMF 120 type 11 – Response times comparisons example



# z/OS Connect SMF 123 server XML configuration



**SMF 123 records have two subtypes, and each subtype can have different versions.**

- SMF type 123 subtype 1 records - Version 1 contains some basic information about both API provider and API requester requests. Version 2 supersedes version 1 and contains more detailed information about each API provider request, including information about to which system of record (SOR) the request was sent
- *SMF type 123 subtype 2 records - Version 2 supersedes subtype 1 version 1 and contains more detailed information about each API requester request, including information about to what HTTP endpoint the request was sent.*

**Server Config**

audit.xml

Read only Close

Design Source

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="SMF reporting">
  <zosconnect_zosConnectManager>
    globalInterceptorsRef="interceptorList_g"/>
  <zosconnect_authorizationInterceptor id="auth">
    safCacheTimeout="600"/>
  <zosconnect_auditInterceptor id="audit">
    apiRequesterSmfVersion="2"
    apiProviderSmfVersion="2"/>
  <zosconnect_zosConnectInterceptors id="interceptorList_g">
    interceptorRef="audit"/>
</server>
```

**Server Config**

audit.xml

Read only Close

Design Source

Server

z/OS Connect Manager

z/OS Connect Authorization Interceptor **auth**

**z/OS Connect EE SMF Audit Interceptor **audit****

z/OS Connect Interceptors **interceptorList\_g**

Sequence  
0 (default)

The sequence in which this interceptor should be processed with respect to other configured interceptors implementing z/OS Connect's com.ibm.wsspi.zos.connect.Interceptor Service Provider Interface (SPI).

**API provider SMF Version**  
2

The version of SMF 123 subtype 1 records to be written.

**auditApiProviderRequestHeaders.name**  
(no value)

**auditApiProviderRequestHeaders.desc**

**auditApiProviderResponseHeaders.name**  
(no value)

**auditApiProviderResponseHeaders.desc**

**API requester SMF Version**  
2

The version of SMF 123 subtype 1 or subtype 2 records to be written.

**z/OS Connect SMF 123 subtype 1 version 2 \***

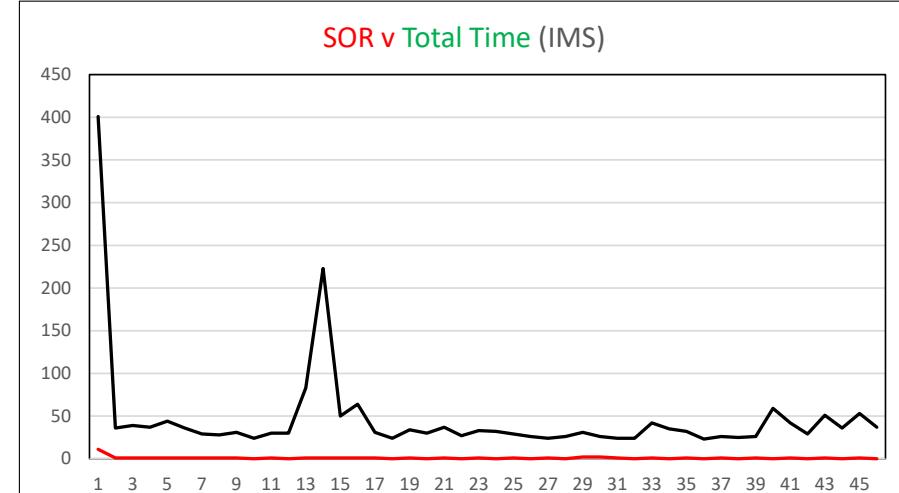
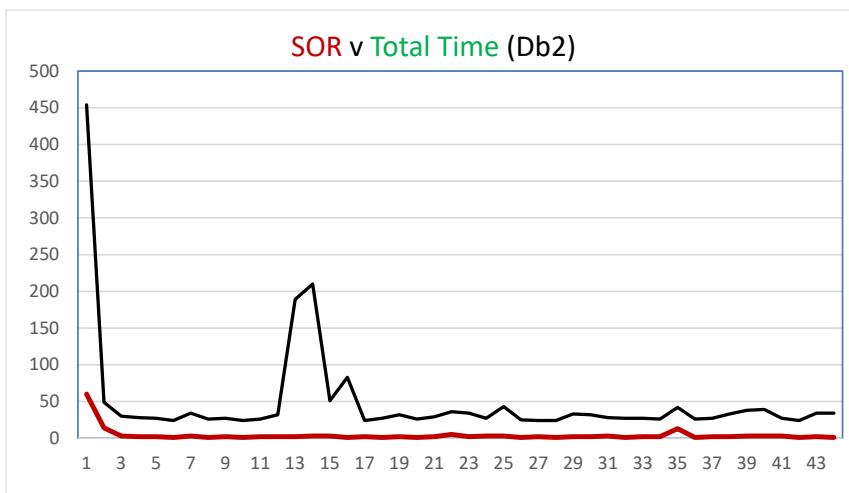
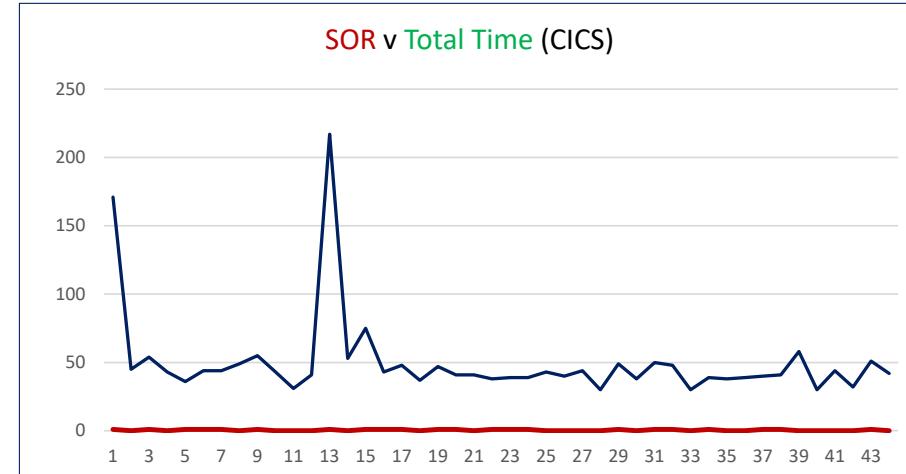
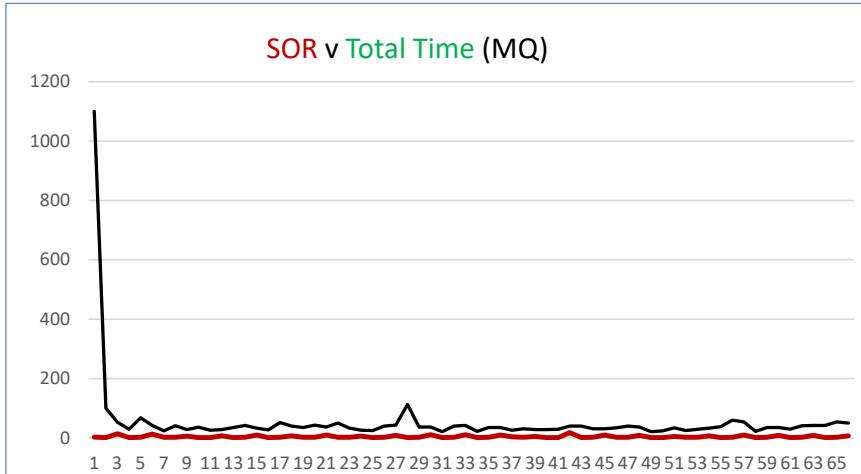


Some fields have been hidden

\* Generated by using a modified version  
of the BAQSMFX sample program.

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# **z/OS Connect SMF 123 subtype 1 version 2 graph examples**



# z/OS Connect SMF 123 subtype 2 version 2 \*



smfout.csv

2021/08/23 18:16:02.725340 UTC

SMF123_RSMF123_SMF123_SUBTYPE_VERSION																											
AP31																											
27	SMF123_RSMF123_SMF123_SUBTYPE_VERSION																										
28	123	2	2																								
29																											
30	SID	SSI	TRIPLET_C	TRIPLET_U	HTTP_REQ_STAT	REQ_RET	REQ_PAYL	RESP_PA1	USER_NA	USER_NA	ENDPOINT_I	ENDPOINT_T	TIME_ST	TIME_TIME_I	TII	TIME_ENPOI	StubTime	ZCInboun	TokenTim	EndPointTime	ZCOutbou	TotalTime(us)	TotalTime(s)	MYS_JOB	MYS_JOB		
31	MPZ3	ZCON	2	40	200	200	NO	0	272	USER1	GET		2021/08/2021/0220202:2021/08/2318:	95384	108577	6734453	131423	25653	7103301	7,103301	7,103301	7,103301	7,103301	7,103301	7,103301	7,103301	
32	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	114313	7767	318	40583	2105	166276	166276	0.1663	0.1663	0.1663	0.1663	0.1663	0.1663	0.1663
33	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	112903	7193	130	51158	1905	175644	175644	0.1756	0.1756	0.1756	0.1756	0.1756	0.1756	0.1756
34	MPZ3	ZCON	2	40	200	200	NO	0	271	USER1	GET		2021/08/2021/0220202:2021/08/2318:	103999	102634	8843582	110850	3497	9166156	9,166156	9,166156	9,166156	9,166156	9,166156	9,166156	9,166156	
35	MPZ3	ZCON	2	40	200	200	NO	0	271	USER1	GET		2021/08/2021/0220202:2021/08/2318:	82840	4956	128	65685	1900	156097	156097	0.1561	0.1561	0.1561	0.1561	0.1561	0.1561	0.1561
36	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	116458	10778	288	58698	1778	189030	189030	0.189	0.189	0.189	0.189	0.189	0.189	0.189
37	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	149159	20483	614	102698	1760	277114	277114	0.2771	0.2771	0.2771	0.2771	0.2771	0.2771	0.2771
38	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	153803	23181	285	101022	1775	281176	281176	0.281176	0.281176	0.281176	0.281176	0.281176	0.281176	0.281176
39	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	140685	70595	11275606	113382	1920	11603168	11,603168	11,603168	11,603168	11,603168	11,603168	11,603168	11,603168	
40	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	108088	7624	222	65726	1746	184303	184303	0.1843	0.1843	0.1843	0.1843	0.1843	0.1843	0.1843
41	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	119784	9945	282	76225	1773	209052	209052	0.2091	0.2091	0.2091	0.2091	0.2091	0.2091	0.2091
42	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	94511	5061	132	44576	2427	147407	147407	0.1474	0.1474	0.1474	0.1474	0.1474	0.1474	0.1474
43	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	56951	10497	126	118293	1703	189186	189186	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892
44	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	55110	7646	210	122479	1616	187974	187974	0.188	0.188	0.188	0.188	0.188	0.188	0.188
45	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	119104	10588	354	109467	1604	242675	242675	0.2427	0.2427	0.2427	0.2427	0.2427	0.2427	0.2427
46	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	3051028	17103	9999318	222997	1770	13292831	13,292831	13,292831	13,292831	13,292831	13,292831	13,292831	13,292831	
47	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	129965	20381	121	212563	1870	366316	366316	0.3663	0.3663	0.3663	0.3663	0.3663	0.3663	0.3663
48	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	117036	17792	768	221666	1796	360790	360790	0.3608	0.3608	0.3608	0.3608	0.3608	0.3608	0.3608
49	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	121667	23095	468	217285	1673	366393	366393	0.3664	0.3664	0.3664	0.3664	0.3664	0.3664	0.3664
50	MPZ3	ZCON	2	40	200	200	NO	0	269	USER1	GET		2021/08/2021/0220202:2021/08/2318:	115629	13252	685	146376	1659	279825	279825	0.2798	0.2798	0.2798	0.2798	0.2798	0.2798	0.2798
51																											
52	REC_TYPE	SUBTYPE	SUBTYPE	SUBTYPE	VERSION																						

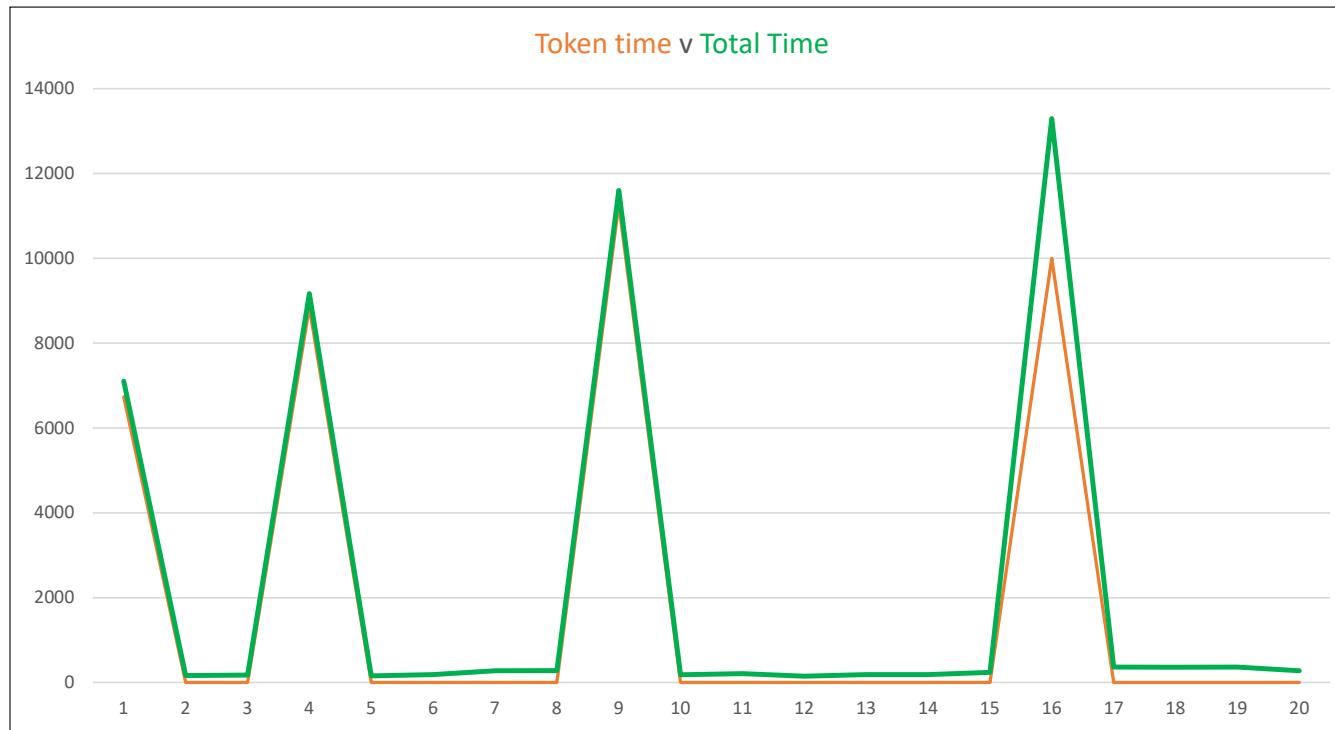
Some fields have been hidden

\* Generated by using a modified version of the BAQSMFX sample program.

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# **z/OS Connect SMF 123 subtype 2 version 2 graph example**



# BAQSMFP output



```
*****  
* SMF123.1 V2 Request Data Section *  
*****
```

```
SMF123S1_REQ_TYPE = API (1)
```

```
SMF123S1_HTTP_RESP_CODE = 500  
SMF123S1_REQ_TIMED_OUT = NO  
SMF123S1_USER_NAME = FRED  
SMF123S1_USER_NAME_MAPPED =  
SMF123S1_CLIENT_IP_ADDR = 192.168.0.60  
SMF123S1_API_NAME = db2employee  
SMF123S1_API_VERSION = 1.0.0  
SMF123S1_SERVICE_NAME = selectEmployee  
SMF123S1_SERVICE_VERSION = 1.0.0  
SMF123S1_REQ_METHOD = GET  
SMF123S1_REQ_QUERY_STR =  
SMF123S1_REQ_TARGET_URI = /db2/employee/000010  
SMF123S1_REQ_PAYLOAD_LEN = 0  
SMF123S1_RESP_PAYLOAD_LEN = 0
```

```
SMF123S1_TIME_ZC_ENTRY = 0x00DA2FB8 38ED5494 04000000 08880001  
UTC_CONV_TIME_ZC_ENTRY = 2021/08/19 15:30:24.905545 UTC  
SMF123S1_TIME_ZC_EXIT = 0x00DA2FB8 38F3883F A8000000 08880001  
UTC_CONV_TIME_ZC_EXIT = 2021/08/19 15:30:24.930947 UTC  
SMF123S1_TIME_SOR_SENT = 0x00DA2FB8 38F232A9 76000000 08A00001  
UTC_CONV_TIME_SOR_SENT = 2021/08/19 15:30:24.925482 UTC  
SMF123S1_TIME_SOR_RECV = 0x00DA2FB8 38F300A4 AA000000 08880001  
UTC_CONV_TIME_SOR_RECV = 2021/08/19 15:30:24.928778 UTC
```

```
SMF123S1_SP_NAME = restclient-1.0  
SMF123S1_SOR_REFERENCE = Db2Conn  
SMF123S1_SOR_IDENTIFIER = Db2:DSN2LOC,wg31.washington.ibm.com:2446  
SMF123S1_SOR_RESOURCE = services/zCEEService/selectEmployee  
SMF123S1_REQ_ID = 302  
SMF123S1_TRACKING_TOKEN = 0x42415131 77734859 41514159 314E6670 31395046  
35304455 312B6E7A 51454241  
514E6F76 75446A74 564A5145 41413D3D 40404040 40404040 40404040  
SMF123S1_REQ_HDR1 =  
SMF123S1_REQ_HDR2 =  
SMF123S1_REQ_HDR3 =  
SMF123S1_REQ_HDR4 =  
SMF123S1_RESP_HDR1 =  
SMF123S1_RESP_HDR2 =  
SMF123S1_RESP_HDR3 =
```

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```
*****  
* SMF123.2 V2 Request Data Section *  
*****
```

```
SMF123S2_REQ_APP_TYPE = ZOS (3)
```

```
SMF123S2_HTTP_RESP_CODE = 200  
SMF123S2_REQ_STATUS_CODE = 200  
SMF123S2_REQ_RETRY = NO  
SMF123S2_REQ_PAYLOAD_LEN = 0  
SMF123S2_RESP_PAYLOAD_LEN = 269  
SMF123S2_USER_NAME = USER1  
SMF123S2_USER_NAME_MAPPED =  
SMF123S2_USER_NAME_ASSERTED = USER1  
SMF123S2_API_REQ_NAME = cscvinc_1.0.0  
SMF123S2_API_REQ_VERSION = 1.0.0  
SMF123S2_ENDPOINT_REFERENCE = cscvincAPI  
SMF123S2_ENDPOINT_HOST = https://mpz3.washington.ibm.com  
SMF123S2_ENDPOINT_PORT = 9463  
SMF123S2_ENDPOINT_FULL_PATH = /cscvinc/employee/111111  
SMF123S2_ENDPOINT_METHOD = GET
```

```
SMF123S2_ENDPOINT_COUNT_STR  
SMF123S2_TIME_STUB_SENT = 0x00DA2FC1 7D34CE8B 4A000000 084C0001  
UTC_CONV_TIME_STUB_SENT = 2021/08/19 16:11:52.420584 UTC  
SMF123S2_TIME_ZC_ENTRY = 0x00DA2FC1 7D58AE00 0E000000 08A00001  
UTC_CONV_TIME_ZC_ENTRY = 2021/08/19 16:11:52.567534 UTC  
SMF123S2_TIME_ZC_EXIT = 0x00DA2FC1 87DCB806 E6000000 08880001  
UTC_CONV_TIME_ZC_EXIT = 2021/08/19 16:12:03.594112 UTC  
SMF123S2_TIME_TOKEN_GET_START = 0x00DA2FC1 7D59D3A6 E6000000 08A00001  
UTC_CONV_TIME_TOKEN_GET_START = 2021/08/19 16:11:52.572218 UTC  
SMF123S2_TIME_TOKEN_GET_FINISH = 0x00DA2FC1 7D59DF85 CC000000 088C0001  
UTC_CONV_TIME_TOKEN_GET_FINISH = 2021/08/19 16:11:52.572408 UTC  
SMF123S2_TIME_ENDPOINT_SENT = 0x00DA2FC1 7D5A0328 04000000 088C0001  
UTC_CONV_TIME_ENDPOINT_SENT = 2021/08/19 16:11:52.572978 UTC  
SMF123S2_TIME_ENDPOINT_RECEIVED = 0x00DA2FC1 87DCB816 58000000 08880001  
UTC_CONV_TIME_ENDPOINT_RECEIVED = 2021/08/19 16:12:03.593249 UTC
```

```
SMF123S2_MVS_JOBNAME = USER1GE2  
SMF123S2_MVS_JOBID = JOB09543  
SMF123S2_MVS_SYSNAME = MPZ3  
SMF123S2_MVS_ASID = 54  
SMF123S2_MVS_SID = MPZ3
```

```
SMF123S2_REQ_ID = 732  
SMF123S2_TRACKING_TOKEN = 0x42415131 77734859 41514159 314E6670 31395046 35304455 312B6E7A 51454241  
514E6F76 77583159 7275414F 40404040 40404040 40404040 40404040  
SMF123S2_REQ_HDR1 =  
SMF123S2_REQ_HDR2 =  
SMF123S2_REQ_HDR3 =
```

# CICS Performance Analyzer

V5R4M0		CICS Performance Analyzer z/OS Connect Summary					
ZCEE0001 Printed at 13:35:01 8/21/2021		Data from 11:30:24 8/19/2021 to 12:11:24 8/19/2021				Page 1	
Initial CICS PA report							
JOBNAME : BAQSTRT SPNAME : imsmobile-2.0							
Request: 49 Fail: 0 Timed out: 0 Get: 49 Post: 0 Put: 0 Delete: 0							
----- Maximum value Request details -----							
SOR Sent Latency	Avg .0326	Max .3781	Req ID 551	ZC Entry 19/08/2021 12:09:45.036778			
SOR Response	.0016	.0183	551	19/08/2021 12:09:45.036778			
ZC Exit Latency	.0025	.0048	504	19/08/2021 12:09:36.823661			
ZC Response	.0367	.3982	551	19/08/2021 12:09:45.036778			
ZC Time	.0351	.3799	551	19/08/2021 12:09:45.036778			
JOBNAME : BAQSTRT SPNAME : restclient-1.0							
Request: 50 Fail: 50 Timed out: 0 Get: 50 Post: 0 Put: 0 Delete: 0							
----- Maximum value Request details -----							
SOR Sent Latency	Avg .0478	Max .5953	Req ID 488	ZC Entry 19/08/2021 12:09:33.386614			
SOR Response	.0027	.0127	594	19/08/2021 12:09:52.016624			
ZC Exit Latency	.0014	.0029	524	19/08/2021 12:09:40.369997			
ZC Response	.0519	.6004	488	19/08/2021 12:09:33.386614			
ZC Time	.0492	.5972	488	19/08/2021 12:09:33.386614			
JOBNAME : BAQSTRT SPNAME : CICS-1.0							
Request: 49 Fail: 0 Timed out: 0 Get: 49 Post: 0 Put: 0 Delete: 0							
----- Maximum value Request details -----							
SOR Sent Latency	Avg .0300	Max .0589	Req ID 450	ZC Entry 19/08/2021 12:09:26.478282			
SOR Response	.0011	.0049	517	19/08/2021 12:09:39.019456			
ZC Exit Latency	.0077	.0138	450	19/08/2021 12:09:26.478282			
ZC Response	.0387	.0741	450	19/08/2021 12:09:26.478282			
ZC Time	.0376	.0727	450	19/08/2021 12:09:26.478282			

# IBM z Omegamon for JVM

The image displays three windows from the IBM z Omegamon for JVM software:

- WG31 - 3270**: A main window titled "z/OS Connect Request Summary". It shows a table of requests with columns: APIName, Service, SoR ID, Reference, Resource. The table includes rows for "Last 30 Minute(s)", "Last 1 Hour(s)", and "Date/Time Range". Below the table are sections for "Columns" and "API Name".
- WG31 - 3270**: Another window titled "Requests by Service Name". It shows a table with columns: APIName, Service, SoR ID, Reference, Resource. It lists requests for "inquireSingle", "cscvincService", and "selectEmployee".
- WG31 - 3270**: A window titled "z/OS Connect Request Detail". It displays detailed information for a specific request, including event time, request type, API name, and various performance metrics like total request time, service response time, and so on.

# IBM z Omegamon for JVM

WG31 - 3270

File Edit View Communication Actions Window Help

File Edit View Tools Navigate Help 04/02/2019 18:59:29  
Auto Update : Off  
SMF ID : WG31  
Coll ID : KJJ1

Command ==> z/OS Connect Request Detail

```

Event time..... 04/02/19 18:49:14.525
Request Type... API
API name..... filequeue
Request URI.... /filequeue/mq
Query String...
Method..... GET
Port..... 9453
HTTP code.... 200 (OK)
Timeout..... No
Service Name... FileaQueue
Total Req Time. 0.016206s
z/OS Conn Time. 0.016206s
SoR Resp Time. 0.000000s
SoR ID..... NONE
SoR Ref..... NONE
SoR Resource... NONE
Remote Address.. 192.168.0.141
Request Length.. 0
Response Length. 191
Correlator.... e6e2d3d7d3c5e7400011000010d5ea51
Operation.... getFilea
Provider..... IBM MQ for z/OS
User ID..... Fred

```

VERIFY | BACK | HOME Hub WG31:CMS on platform WG31(z/OS) 01/002

Connected to remote server/host wg31a using lu/pool TCP00109 and port 23

Event time..... 04/02/19 18:48:34.790
Request Type... API
API name..... db2employee
Request URI.... /db2/employee/000020
Query String...
Method..... GET
Port..... 9453
HTTP code.... 200 (OK)
Timeout..... No
Service Name... selectEmployee
Total Req Time. 0.022592s
z/OS Conn Time. 0.022592s
SoR Resp Time. 0.000000s
SoR ID..... NONE
SoR Ref..... NONE
SoR Resource... NONE
Remote Address.. 192.168.0.141
Request Length.. 0
Response Length. 326
Correlator.... e6e2d3d7d3c5e7400011000010d5ea50
Operation.... getSelectEmployee
Provider..... restclient-1.0
User ID..... Fred

VERIFY | BACK | HOME Hub WG31:CMS on platform WG31(z/OS) 01/002

Connected to remote server/host wg31a using lu/pool TCP00109 and port 23

WG31 - 3270

File Edit View Communication Actions Window Help

File Edit View Tools Navigate Help 04/02/2019 19:00:52  
Auto Update : Off  
SMF ID : WG31  
Coll ID : KJJ1

Command ==> z/OS Connect Request Detail

```

Event time..... 04/02/19 18:47:54.267
Request Type... API
API name..... cscvinc
Request URI.... /cscvinc/employee/444444
Query String...
Method..... GET
Port..... 9453
HTTP code.... 200 (OK)
Timeout..... No
Service Name... cscvincService
Total Req Time. 0.000006s
z/OS Conn Time. 0.005515s
SoR Resp Time. 0.002491s
SoR ID..... USIBMWZ.CICS53Z
SoR Ref... cscvinc
SoR Resource... CSM1,CSCVINC
Remote Address.. 192.168.0.141
Request Length.. 0
Response Length. 302
Correlator.... e6e2d3d7d3c5e7400011000010d5ea50
Operation.... getGscvincService
Provider..... CICS-1.0
User ID..... Fred

```

VERIFY | BACK | HOME Hub WG31:CMS on platform WG31(z/OS) 01/002

Connected to remote server/host wg31a using lu/pool TCP00109 and port 23

Request Type... API
API name..... phonebook
Request URI.... /phonebook/contacts/LAST1
Query String...
Method..... GET
Port..... 9453
HTTP code.... 200 (OK)
Timeout..... No
Service Name... ivtnoService
Total Req Time. 0.345265s
z/OS Conn Time. 0.163460s
SoR Resp Time. 0.181805s
SoR ID..... IVP1
SoR Ref..... IMSCONN
SoR Resource... IVTNO
Remote Address.. 192.168.0.141
Request Length.. 0
Response Length. 158
Correlator.... e6e2d3d7d3c5e7400011000010d5ea55
Operation.... getPhoneBookService1
Provider..... imsmobile-2.0
User ID..... Fred

VERIFY | BACK | HOME Hub WG31:CMS on platform WG31(z/OS) 01/002

Connected to remote server/host wg31a using lu/pool TCP00109 and port 23

## Miscellaneous Odds and Ends



## **z/OS Connect administration API**

Interface providing meta-data and life-cycle operations for z/OS Connect services, APIs and API requesters.

### **APIs : Operations for working with APIs**

Show/Hide | List Operations | Expand Operations

<b>GET</b>	/apis	Returns a list of all the deployed z/OS Connect APIs
<b>POST</b>	/apis	Deploys a new API into z/OS Connect
<b>DELETE</b>	/apis/{apiName}	Undeploys an API from z/OS Connect
<b>GET</b>	/apis/{apiName}	Returns detailed information about a z/OS Connect API
<b>PUT</b>	/apis/{apiName}	Updates an existing z/OS Connect API

### **Services : Operations for working with services**

Show/Hide | List Operations | Expand Operations

<b>GET</b>	/services	Returns a list of all the deployed z/OS Connect services
<b>POST</b>	/services	Deploys a new service into z/OS Connect
<b>DELETE</b>	/services/{serviceName}	Undeploys a service from z/OS Connect
<b>GET</b>	/services/{serviceName}	Returns detailed information about a z/OS Connect service
<b>PUT</b>	/services/{serviceName}	Updates an existing z/OS Connect service
<b>GET</b>	/services/{serviceName}/schema/{schemaType}	Returns the request or response schema for a z/OS Connect service

### **API Requesters : Operations that work with API Requesters.**

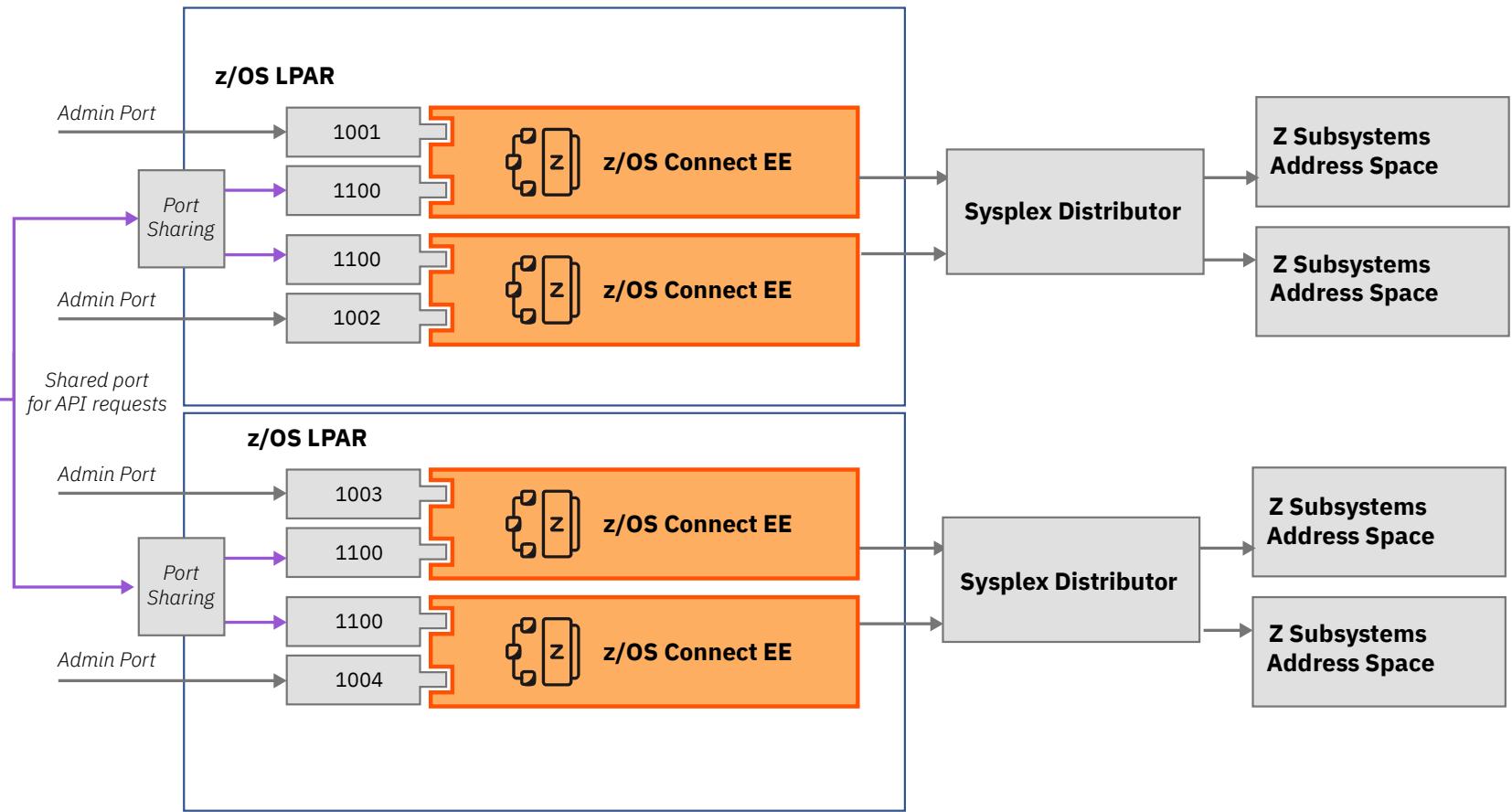
Show/Hide | List Operations | Expand Operations

<b>GET</b>	/apiRequesters	Returns a list of all the deployed z/OS Connect API Requesters
<b>POST</b>	/apiRequesters	Deploys a new API Requester into z/OS Connect and invoke an API Requester call
<b>DELETE</b>	/apiRequesters/{apiRequesterName}	Undeploys an API Requester from z/OS Connect
<b>GET</b>	/apiRequesters/{apiRequesterName}	Returns the detailed information about a z/OS Connect API Requester
<b>PUT</b>	/apiRequesters/{apiRequesterName}	Updates an existing z/OS Connect API Requester

# High Availability



## Topology



[ibm.biz/zosconnect-ha-concepts](http://ibm.biz/zosconnect-ha-concepts)

[ibm.biz/zosconnect-scenarios](http://ibm.biz/zosconnect-scenarios)



# Sysplex DVIPAs

## SYS1.TCPIP.TCPPARMS (IPNODES)

```
192.168.17.241 MPZ1.DMZ MPZ1 mpz1.washington.ibm.com  
192.168.17.242 MPZ2.DMZ MPZ2 mpz2.washington.ibm.com  
192.168.17.243 MPZ3.DMZ MPZ3 mpz3.washington.ibm.com  
192.168.17.240 dvipa dvipa.washington.ibm.com
```

## SYS1.TCPIP.TCPPARMS (PROFMPZ3)

```
IPCONFIG SYSPLEXROUTING  
    DYNAMICXCF 172.1.1.243 255.255.255.0 3  
VIPADYNAMIC  
VIPADEFINE 255.255.255.0 192.168.17.240  
VIPADISTRIBUTE DEFINE DISTM ROUNDROBIN|BASEWLM 192.168.17.240  
PORT 23 1416 1491 2446 9443 9453 9463  
DESTIP  
    172.1.1.241  
    172.1.1.242  
    172.1.1.243  
ENDVIPADYNAMIC
```

## HOMETEST

```
EZA0619I Running IBM MVS TCP/IP CS V2R4 TCP/IP Configuration Tester  
EZA0602I TCP Host Name is: MPZ3  
  
EZA0605I Using Name Server to Resolve MPZ3  
EZA0611I The following IP addresses correspond to TCP Host Name: MPZ3  
EZA0612I 192.168.17.243  
EZA0614I The following IP addresses are the HOME IP addresses defined in PROFILE.TCPIP:  
EZA0615I 192.168.17.243  
EZA0615I 172.1.1.243  
EZA0615I 192.168.17.240  
EZA0615I 127.0.0.1  
  
EZA0618I All IP addresses for MPZ3 are in the HOME list!  
EZA0622I Hometest was successful - all Tests Passed!
```

```
<zosconnect_cicsIpicConnection id="cscvinc"  
host="dvipa.washington.ibm.com"  
port="1491"/>  
<zosconnect_endpointConnection id="mqapi"  
host="http://dvipa.washington.ibm.com"  
port="9453"  
basicAuthRef="myBasicAuth"  
connectionTimeout="10s"  
receiveTimeout="20s" />
```

The screenshot shows a browser window displaying the REST API Documentation for Liberty. The URL in the address bar is <https://dvipa.washington.ibm.com:9443/api/explorer/>. The page title is "IBM". Below the title, it says "Liberty REST APIs" and "Discover REST APIs available within Liberty". There is a table listing several APIs:

		Show/Hide	List Operations	Expand Operations
<b>cscvinc</b>	<b>POST</b> /cscvinc/employee			
	<b>DELETE</b> /cscvinc/employee/{employee}			
	<b>GET</b> /cscvinc/employee/{employee}			
	<b>PUT</b> /cscvinc/employee/{employee}			
<b>db2employee</b>		Show/Hide	List Operations	Expand Operations
<b>filemgr</b>		Show/Hide	List Operations	Expand Operations
<b>imsPhoneBook</b>		Show/Hide	List Operations	Expand Operations
<b>jwtvpDemoApi</b>		Show/Hide	List Operations	Expand Operations
<b>miniloancics</b>		Show/Hide	List Operations	Expand Operations
<b>mqapi</b>		Show/Hide	List Operations	Expand Operations
<b>phonebook</b>		Show/Hide	List Operations	Expand Operations



# Displaying zCEE messages on the console and/or STDERR spool

## server.xml

```
<zosLogging wtoMessage=
  "BAQR0657E,BAQR0658E,BAQR0660E,BAQR0686E,BAQR0687E"
  hardCopyMessage=
  "BAQR0657E,BAQR0658E,BAQR0660E,BAQR0686E,BAQR0687E"/>
```

## MVS Console

```
18.12.02 STC00137 +BAQR0686E: Program CSCVINC is not available in the CICS region with
  811           connection ID cscvinc; service cscvincService failed.
18.12.02 STC00137 +BAQR0686E: Program CSCVINC is not available in the CICS region with
  812           connection ID cscvinc; service cscvincService failed.
19.07.12 STC00137 +BAQR0657E: Transaction abend MIJO occurred in CICS while using
  745           connection cscvinc and service cscvincService.
```

## STDERR

```
ÝERROR   " BAQR0686E: Program CSCVINC is not available in the CICS region with connection cscvinc and service cscvincService.
ÝERROR   " BAQR0686E: Program CSCVINC is not available in the CICS region with connection cscvinc and service cscvincService.
ÝERROR   " BAQR0657E: Transaction abend MIJO occurred in CICS while using CICS connection cscvinc and service cscvincService.
```

**Provide remote access to configuration/log information**



This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<server description="new server">
<include location="${server.config.dir}/includes/safSecurity.xml"/>
<include location="${server.config.dir}/includes/ipicSSLIDProp.xml"/>
<include location="${server.config.dir}/includes/keyringOutbound.xml"/>
<include location="${server.config.dir}/includes/groupAccess.xml"/>
<include location="${server.config.dir}/includes/shared.xml"/>
<include location="${server.config.dir}/includes/oauth.xml"/>
<include location="${server.config.dir}/includes/adminCenter.xml"/>
<include location="${server.config.dir}/includes/sslConfig.xml"/>
<include location="${server.config.dir}/includes/sslKeyring.xml"/>
<!-- Enable features -->
<featureManager>
<feature>zosconnect:zosConnect</feature>
<feature>zosconnect:zosConnect</feature>
</featureManager>
<!--
   To access this server from
-->
<httpEndpoint id="defaultHttpEndpoint">
<!--
   add cors to allow cross origin
-->
```

product = WAS FOR Z/OS 20.0.0.6, z/OS Connect 03.00.41 (Wlp-1.0.41.c1200620200528-0414)  
wlp.install.dir = /shared/IBM/zosconnect/wlp20/wlp/  
server.config.dir = /var/zosconnect/servers/myServer/  
java.home = /shared/java/J8\_0\_44  
java.version = 1.8.0\_261  
java.vendor = IBM Corporation SE Runtime Environment (8.0.6.15 - pmz6480sr6fp15-20200724\_01(SR6)  
process = 16778879@qsg1  
\*\*\*\*\*  
[2/19/21 15:48:15:901 GMT] 00000000 com.ibm.ws.kernel  
[2/19/21 15:48:19:069 GMT] 000000017 com.ibm.ws.config  
/var/zosconnect/servers/myServer/includes/safSecurity  
[2/19/21 15:48:19:899 GMT] 000000017 com.ibm.ws.config  
\*\*\*\*\*

```
<webApplication id="serverConfig-location" name="serverConfig"
    location="${server.config.dir}">
    <web-ext context-root="/server/config"
        enable-file-serving="true" enable-directory-browsing="true">
        <file-serving-attribute name="extendedDocumentRoot"
            value="${server.config.dir}" />
    </web-ext>
</webApplication>
```

The screenshot shows a browser window with two tabs. The top tab displays the log file 'messages.log' from port 9443, showing entries like 'product = WAS FOR Z/OS 21.0.0.1, z/OS Connect 03.00.42 (wlp-1.0.48.c12010210113-1459)' and 'java.home = /shared/java/J8\_0\_64'. The bottom tab displays the log file 'trace.log' from the same port, showing trace states being changed. A red oval highlights the first few lines of the 'trace.state' section, which include 'I INFO[Credentials]all:SSLChannel=all:Security.Authorization=all:UserRegistry=all:com.ibm.ws.security.\*=all:com.ibm.ws.webcontainer.\*=all:com.ibm.ws.WIN.\*=all:org.apache.http.client.\*=all:zosConnect=all:zosConnectSaf=all'. The log also shows thread identity bundle file wrappers and dependency manager entries. The bottom of the log includes INF and OSGI entries for com.ibm.ws.zos.logging.config.xml.

```
*****  
product = WAS FOR Z/OS 21.0.0.1, z/OS Connect 03.00.42 (wlp-1.0.48.c12010210113-1459)  
vip.install.dir = /shared/IBM/zosconnect/vip0/wlp/  
server.config.dir = /var/zosconnect/servers/myServer/  
java.home = /shared/java/J8_0_64  
java.version = 1.8_0_261  
java.runtime = Java(TM) SE Runtime Environment (8.0.6.15 - pmz480sr6fp15-20200724_01(SR6 FP15))  
os.name = z/OS 21.0.0.00-2990X (en_US)  
process.id = 16779823901  
TRACE_SPECIFIC  
*****  
I INFO[Credentials]all:SSLChannel=all:Security.Authorization=all:UserRegistry=all:com.ibm.ws.security.*=all:com.ibm.ws.webcontainer.*=all:com.ibm.ws.WIN.*=all:org.apache.http.client.*=all:zosConnect=all:zosConnectSaf=all  
*****  
[2/25/21 17:27:54:482 GMT] 00000000 com.ibm.ws.logging.internal.TraceSpecification I TRAS0018I: The trace state has been changed. The new trace state is  
+INFO[Credentials]all:SSLChannel=all:Security.Authorization=all:UserRegistry=all:com.ibm.ws.security.*=all:com.ibm.ws.webcontainer.*=all:com.ibm.ws.WIN.*=all:org.apache.http.client.*=zosConnect=all:zosConnectSaf=all.  
[2/25/21 17:27:54:482 GMT] 00000000 id=07sec277 ty.thread.zos.hooks.internal.ThreadIdentityBundleFileWrapper > getEntry Entry  
org/apache/felix/scr/impl/manager  
/DependencyManager$SingleDynamicCustomizer.class  
[2/25/21 17:27:54:490 GMT] 00000000 id=07sec277 ty.thread.zos.hooks.internal.ThreadIdentityBundleFileWrapper < getEntry Exit  
org/apache/felix/scr/impl/manager  
/DependencyManager$SingleDynamicCustomizer.class  
[2/25/21 17:27:54:491 GMT] 00000017 id=00000000 com.ibm.ws.zos.core.internal.CoreBundleActivator I CWWKDD011I: The server process UNASK value is set to 0000.  
[2/25/21 17:27:54:494 GMT] 00000017 id=32c3d2ff ty.thread.zos.hooks.internal.ThreadIdentityBundleFileWrapper > getEntry Entry  
OSGI-  
INF/com.ibm.ws.zos.logging.config.xml  
[2/25/21 17:27:54:494 GMT] 00000017 id=32c3d2ff ty.thread.zos.hooks.internal.ThreadIdentityBundleFileWrapper < getEntry Exit  
OSGI-  
INF/com.ibm.ws.zos.logging.config.xml  
[2/25/21 17:27:54:494 GMT] 0000001b id=489954a0 ty.thread.zos.hooks.internal.ThreadIdentityBundleFileWrapper > getEntry Entry  
OSGI-  
INF/com.ibm.ws.zos.logging.config.xml  
[2/25/21 17:27:54:494 GMT] 0000001b id=489954a0 ty.thread.zos.hooks.internal.ThreadIdentityBundleFileWrapper < getEntry Exit  
OSGI-
```



# Provide remote access to z/OS Connect archives files

The image shows two browser windows and a code snippet. The left browser window displays the index of /resources/zosConnect, showing four directory entries: apis, services, apiRequesters, and rules. The right browser window displays the index of /resources/zosConnect/services, showing three file entries: cscvincDeleteService.sar, cscvincInsertService.sar, and cscvincSelectService.sar. A modal dialog box is open over the right window, titled "Opening cscvincSelectService.sar", asking what Firefox should do with the file. The code snippet at the bottom left shows an Apache configuration snippet for a web application named "resources-location".

Name	Last Modified	Size	Description
apis	Fri Feb 19 13:46:13 GMT 2021	-	Directory
services	Sat Feb 20 20:54:41 GMT 2021	-	Directory
apiRequesters	Wed Feb 07 17:59:04 GMT 2018	-	Directory
rules	Tue Jan 26 20:34:05 GMT 2021	-	Directory

Name	Last Modified	Size	Description
cscvincDeleteService.sar	Thu Feb 18 18:02:19 GMT 2021	4362	File
cscvincInsertService.sar	Thu Feb 18 18:02:19 GMT 2021	4491	File
cscvincSelectService.sar	Thu Feb 18 18:02:19 GMT 2021	4590	File

```
<webApplication  
    id="resources-location" name="resources"  
    location="${server.config.dir}/resources/zosconnect">  
    <web-ext context-root="/resources/zosConnect"  
        enable-file-serving="true"  
        enable-directory-browsing="true">  
        <file-serving-attribute name="extendedDocumentRoot"  
            value="${server.config.dir}/resources/zosconnect"/>  
    </web-ext>  
</webApplication>
```

## **Today we covered**

- **A Review OMVS, Liberty and RACF security/configuration**
- **Connecting z/OS Connect servers to other z/OS subsystems**
- **Useful Liberty features and MVS commands**
- **Where do look when things go wrong**
- **Managing and Monitoring Liberty and z/OS Connect**
- **Miscellaneous Odds and Ends**
- **Additional Material - sample administrative JCL**

# z/OS Connect Wildfire Github Site

<https://ibm.biz/Bdf8BZ>

A screenshot of two separate browser windows side-by-side, both displaying GitHub interfaces. The left window shows the repository 'ibm-wsc/zCONNEE-Wildfire-Workshop' with a single commit from 'emitchj' adding files via upload. The right window shows the repository 'ibm-wsc/zCONNEE-Wildfire-Workshop' with a list of XML configuration files in the 'xml' directory, all added via upload by 'emitchj'.

The left window displays the repository `ibm-wsc/zCONNEE-Wildfire-Workshop` with 1 issue and 0 pull requests. The right window displays the same repository with 12 issues, 13 stars, and 8 forks. Both windows show a list of XML files in the `xml` directory, all added via upload by 'emitchj'.

File	Action	Added By	Time Ago
adminCenter.xml	Add files via upload	emitchj	14 months ago
apiRequester.xml	Add files via upload	emitchj	14 months ago
apiRequesterHTTPS.xml	Add files via upload	emitchj	14 months ago
apiRequesterTrace.xml	Add files via upload	emitchj	14 months ago
atssaf.xml	Add files via upload	emitchj	4 months ago
basicSecurity.xml	Add files via upload	emitchj	14 months ago
cicsTrace.xml	Add files via upload	emitchj	14 months ago
cors.xml	Add files via upload	emitchj	11 months ago
db2.xml	Add files via upload	emitchj	14 months ago
db2TLS.xml	Add files via upload	emitchj	14 months ago

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Thank you for listening and your questions.

## **Additional Material**

### **Sample Administrative JCL**

# Sample JCL - Check Java installation by display Java version information

```
//JOHNSONS JOB (ACCOUNT),JOHNSON,NOTIFY=JOHNSON,REGION=0M,  
// CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1),USER=LIBSERV  
//*****  
//* SET SYMBOLS  
//*****  
//EXPORT EXPORT SYMLIST=(*)  
// SET JAVAHOME='/usr/lpp/java/J8.0_64'  
//*****  
/* STEP JAVA - INVOKE THE java -version COMMAND  
//*****  
/JAVA EXEC PGM=IKJEFT01,REGION=0M  
/SYSTSPRT DD SYSOUT=*  
/SYSERR DD SYSOUT=*  
/STDOUT DD SYSOUT=*  
/STDENV DD DUMMY  
/SYSTSIN DD *,SYMBOLS=EXECSYS  
BPXBATCH SH +  
export JAVA_HOME=&JAVAHOME; +  
$JAVA_HOME/bin/java -version
```

# Sample JCL - Executing the z/OS Connect zconsetup script using JCL

```
//JOHNONS JOB (ACCOUNT), JOHNSON, NOTIFY=JOHNSON, REGION=0M,  
// CLASS=A, MSGCLASS=H, MSGLEVEL=(1,1)  
//*****  
/* Step IEBCOPY - Set common environment variables  
//*****  
//IEBGENER EXEC PGM=IEBGENER  
//SYSPRINT DD SYSOUT=*  
//SYSUT1 DD *  
JAVA_HOME=/usr/lpp/java/J8.0_64  
ZCEEPATH=/usr/lpp/IBM/zosconnect/v3r0  
//SYSUT2 DD DSN=&&STDENV,DISP=(,PASS),  
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=80),SPACE=(TRK,(1,1))  
//SYSIN DD DUMMY  
//*****  
/* Step ZCSETUP - Invoke the zconsetup script  
//*****  
//ZCSETUP EXEC PGM=IKJEFT01,REGION=0M  
//SYSERR DD SYSOUT=*  
//STDOUT DD SYSOUT=*  
//STDENV DD DSN=&&STDENV,DISP=(OLD,DELETE)  
//SYSTSPRT DD SYSOUT=*  
//SYSTSIN DD *  
BPXBATCH SH $ZCEEPATH/bin/zconsetup install
```

# Sample JCL - Executing the z/OS Connect Build Toolkit on z/OS

```
//JOHNSONS JOB (ACCOUNT),JOHNSON,NOTIFY=&SYSUID,REGION=0M,  
// CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1)  
//*****  
///* SET SYMBOLS  
//*****  
//EXPORT EXPORT SYMLIST=(*)  
// SET WORKDIR='u/johnson/zconbt'  
// SET ZCONDIR='/usr/lpp/IBM/zosconnect/v3r0/zconbt/bin'  
//ZCONBT EXEC PGM=IKJEFT01,REGION=0M,MEMLIMIT=4G  
//SYSTSPRT DD SYSOUT=*  
//SYSERR DD SYSOUT=*  
//STDOUT DD SYSOUT=*  
//SYSTSIN DD *,SYMBOLS=EXECSYS  
BPXBATCH SH +  
  export WORKDIR=&WORKDIR; +  
  export ZCONDIR=&ZCONDIR; +  
  cd $WORKDIR; +  
  $ZCONDIR/zconbt.zos -p cscvinc.properties -f=cscvinc.ara; +  
  cp -v $WORKDIR/syslib/* "///JOHNSON.ZCONBT.COPYLIB"
```

## cscvinc.properties

```
apiDescriptionFile=./cscvinc.json  
dataStructuresLocation=./syslib  
apiInfoFileLocation=./syslib  
logFileDirectory=./logs  
language=COBOL  
connectionRef=cscvincAPI  
requesterPrefix=csc
```

This assumes the zconbt.zip files was expanded into directory /usr/lpp/IBM/zosconnect/v3r0/zconbt using command *jar -tf zconbt.zip* and that the property file and Swagger JSON document are encoded in ASCII in directory /u/johnson/zconbt.

# Sample JCL - Executing multiple OMVS commands in one step

```
//*****  
//* SET SYMBOLS  
//*****  
//EXPORT EXPORT SYMLIST=(*)  
// SET CURL= '/usr/lpp/rocket/curl'  
//*****  
//* CURL Procedure  
//*****  
//CURL PROC  
//CURL EXEC PGM=IKJEFT01,REGION=0M  
//SYSTSPRT DD SYSOUT=*  
//SYSERR DD SYSOUT=*  
//STDOUT DD SYSOUT=*  
// PEND  
//*****  
//* STEP CURL - use cURL to deploy API cscvinc  
//*****  
//DEPLOY EXEC CURL  
BPXBATCH SH export CURL=&CURL; +  
$CURL/bin/curl -X PUT -s +  
--cacert /u/johnson/CERTAUTH.PEM --user FRED:FRED +  
https://wg31.washington.ibm.com:9445/zosConnect/apis/cscvinc?status=sto+  
pped > null; +  
$CURL/bin/curl -X DELETE -s +  
--cacert /u/johnson/CERTAUTH.PEM --user FRED:FRED +  
https://wg31.washington.ibm.com:9445/zosConnect/apis/cscvinc > null; +  
$CURL/bin/curl -X POST -s +  
--cacert /u/johnson/CERTAUTH.PEM --user FRED:FRED +  
--data-binary @/u/johnson/cscvinc.aar +  
--header "Content-Type: application/zip" +  
https://wg31.washington.ibm.com:9445/zosConnect/apis  
//*****  
//* STEP CURL - use cURL to invoke the API cscvinc  
//*****  
//INVOKE EXEC CURL  
//SYSTSIN DD *,SYMBOLS=EXECSYS  
BPXBATCH SH export CURL=&CURL; $CURL/bin/curl -X GET -s +  
--cacert /u/johnson/CERTAUTH.PEM --user FRED:FRED +  
https://wg31.washington.ibm.com:9445/cscvinc/employee/000100
```

Always be aware of the beginning and trailing spaces.

[https://www.rocketsoftware.com/  
platforms/ibm-z/curl-for-zos](https://www.rocketsoftware.com/platforms/ibm-z/curl-for-zos)

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# Sample JCL - Executing the Liberty *productInfo* command

```
//*****  
//** SET SYMBOLS  
//*****  
//EXPORT EXPORT SYMLIST=(*)  
// SET WLPDIR='/usr/lpp/IBM/zosconnect/v3r0/wlp'  
//PRODINFO EXEC PGM=IKJEFT01,REGION=0M,MEMLIMIT=4G  
//SYSTSPRT DD SYSOUT=*  
//SYSERR DD SYSOUT=*  
//STDOUT DD SYSOUT=*  
//SYSTSIN DD *,SYMBOLS=EXECSYS  
BPXBATCH SH +  
$WLPDIR/bin/productInfo version; +  
$WLPDIR/bin/productInfo featureInfo | grep cics; +  
$WLPDIR/bin/productInfo featureInfo | grep mq; +  
$WLPDIR/bin/productInfo featureInfo | grep ims; +  
$WLPDIR/bin/productInfo validate | grep 'Product validation'
```

```
productInfo featureInfo  
productInfo version  
productInfo validate
```

```
Product name: z/OS Connect  
Product version: 03.00.48  
Product edition: z/OS Connect Enterprise Edition
```

```
cicsService-1.0 "1.0.0"  
wmqJmsClient-1.1 "1.0.0"  
wmqJmsClient-2.0 "1.0.0"  
Product Extension: mqzosconnect  
mqService-1.0 "1.0.0"  
Product Extension: imsmobile  
imsmobile-2.0 "2.0.0.202108160933"  
Product validation completed successfully.
```

# Sample JCL - Copy WOLA executables from OMVS to a PDSE

```
//JOHNSONS JOB (ACCOUNT),JOHNSON,NOTIFY=JOHNSON,REGION=0M,  
// CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1)  
//*****  
/* SET SYMBOLS  
//*****  
//EXPORT EXPORT SYMLIST=(*  
// SET DSNAME='USER1.WOLA2106.LOADLIB'  
// SET ZCEEPATH='/usr/lpp/IBM/zosconnect/v3r0'  
// SET JAVAHOME='/usr/lpp/java/J8.0_64'  
//*****  
/* Step ALLOC - Allocate a PDSE load library  
//*****  
//ALLOC EXEC PGM=IDCAMS  
//SYSPRINT DD SYSOUT=*  
//SYSIN DD *,SYMBOLS=EXECSYS  
DELETE '&DSNAME'  
SET MAXCC=0  
ALLOC DSNAME('&DSNAME') -  
    NEW CATALOG SPACE(2,1) DSORG(PO) CYLINDERS -  
    RECFM(U) DSNTYPE(LIBRARY)  
//*****  
/* Step WOLACOPY - copy the WOLA executables to the PDSE  
//*****  
//WOLACOPY EXEC PGM=IKJEFT01,REGION=0M  
//SYSTSPRT DD SYSOUT=*  
//SYSERR DD SYSOUT=*  
//STDOUT DD SYSOUT=*  
//SYSTSIN DD *,SYMBOLS=EXECSYS  
BPXBATCH SH +  
  export JAVA_HOME=&JAVAHOME; +  
  export DSNAME=&DSNAME; +  
  cp -Xv &ZCEEPATH/wlp/clients/zos/* "//$DSNAME"
```

# Sample JCL - BBOSMFV (Extract Liberty SMF 120 Subtype 11 records)

```
//JOHNSONS JOB (ACCOUNT),JOHNSON,NOTIFY=JOHNSON,REGION=0M,  
// CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1)  
//EXPORT EXPORT SYMLIST=(*)  
// SET REPORT='LibertyExport'  
//JAVA EXEC PROC=JVMPRC86,  
// JAVACLS='com.ibm.ws390.sm.smfview.JclSmf'  
//STDENV DD DISP=SHR,DSN=JOHNSON.JCLLIB.CNTL(STDENV)  
//SMFDATA DD DISP=SHR,DSN=MPZ3.DUMPSMF  
//SMFENV DD *,SYMBOLS=EXECSYS  
# Specify the plugin to use  
plugin=&REPORT  
# Specify where the output goes  
output=/u/johnson/&REPORT..csv  
# Uncomment (and change the value as appropriate) to filter  
#matchServer=BAQSTRT
```

```
JOHNSON.JCLLIB.CNTL(STDENV)  
. /etc/profile  
export JAVA_HOME=/usr/lpp/java/J8.0_64  
export PATH=/bin:"${JAVA_HOME}"/bin  
  
LIBPATH=/lib:/usr/lib:"${JAVA_HOME}"/bin  
LIBPATH="$LIBPATH":${JAVA_HOME}/lib/s390x  
LIBPATH="$LIBPATH":${JAVA_HOME}/lib/s390x/j9vm  
LIBPATH="$LIBPATH":${JAVA_HOME}/bin/classic  
export LIBPATH="$LIBPATH":  
  
# Customize your CLASSPATH here  
APP_HOME=${JAVA_HOME}  
CLASSPATH=$APP_HOME:${JAVA_HOME}/lib:${JAVA_HOME}/lib/ext  
CLASSPATH=/u/johnson/lib/bbomsmfv.jar:$CLASSPATH  
CLASSPATH=/u/johnson/lib/WP102312_Plugins.jar:$CLASSPATH  
  
# Add Application required jars to end of CLASSPATH  
for i in "${APP_HOME}/*.jar; do  
    CLASSPATH="$CLASSPATH":$i"  
done  
export CLASSPATH="$CLASSPATH":  
  
# Configure JVM options  
IJO="-Xms16m -Xmx128m"  
export IBM_JAVA_OPTIONS="$IJO "
```

# Sample JCL – Using ADRDSSU to dump/restore MVS data sets



```
ZCEEDUMP
//EXPORT EXEC PGM=IDCAMS
// SET ZCEELVL=349
//DELETE EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *,SYMBOLS=EXECSYS
    DELETE IBM.ZCEE30.BKUP&ZCEELVL.
    SET MAXCC=0
//DUMP EXEC PGM=ADRDSU,REGION=2048K
//SYSPRINT DD SYSOUT=*
//DUMPDD DD DSN=IBM.ZCEE30.BKUP&ZCEELVL.,
//          DISP=(NEW,CATLG),
//          UNIT=SYSDA,SPACE=(CYL,(3000,2000,0),RLSE)
//SYSIN DD *,SYMBOLS=EXECSYS
    DUMP DATASET(INCLUDE(
        ZCEE30.SBAQ* -
        ZCEE30.WOLA*.* -
        OMVS.ZCEE*.* -
    )) OPTIMIZE(4) OUTDDNAME(DUMPDD) TOLERATE(ENQF)
```

```
ZCEERSTR
//RESTORE EXEC PGM=ADRDSU,REGION=2048K
//SYSPRINT DD SYSOUT=*
//DUMPDD DD DISP=SHR,DSN=JOHNSON.ZCEE30.BKUP349
//SYSIN DD *
    RESTORE DATASET(INCLUDE(**)) -
    INDDNAME(DUMPDD) OUTDYNAM(WAS004) -
    NULLSTORCLAS -
    REPLACE CATALOG TOLERATE(ENQF)
```



# Sample JCL – Define and format a ZFS data set using IOEAGFMT

```
ZFS
//DEFINE EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//AMSDUMP DD SYSOUT=*
//SYSIN DD *
      SET MAXCC=0
      DEFINE CLUSTER (NAME(OMVS.ZCEE.GROUP1.ZFS) -
                      LINEAR CYLINDERS(100 100) SHAREOPTIONS(3))
//CREATE EXEC PGM=IOEAGFMT,REGION=0M,
// PARM=(-aggregate OMVS.ZCEE.GROUP1.ZFS -compat')
//SYSPRINT DD SYSOUT=*
//STDOUT DD SYSOUT=*
//STDERR DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//CEEDUMP DD SYSOUT=*
```

# Sample JCL – Generate WLM Workload Activity Reports

```
//JOHNSONS JOB (ACCOUNT),NOTIFY=&SYSUID,REGION=0M,  
// CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1)  
//DELETE EXEC PGM=IDCAMS  
//SYSPRINT DD SYSOUT=*  
//SYSIN DD *  
    DELETE JOHNSON.DUMPSSMF.SORT  
//RMFSORT EXEC PGM=SORT,REGION=0M  
//SORTIN DD DISP=SHR,DSN=MPZ3.DUMPSSMF  
//SORTOUT DD DISP=(,CATLG),DSN=JOHNSON.DUMPSSMF.SORT,  
//           SPACE=(CYL,(100,50),RLSE),UNIT=SYSDA  
//SORTWK01 DD DISP=(NEW,DELETE),UNIT=SYSDA,SPACE=(CYL,(100))  
//SORTWK02 DD DISP=(NEW,DELETE),UNIT=SYSDA,SPACE=(CYL,(100))  
//SORTWK03 DD DISP=(NEW,DELETE),UNIT=SYSDA,SPACE=(CYL,(100))  
//SORTWK04 DD DISP=(NEW,DELETE),UNIT=SYSDA,SPACE=(CYL,(100))  
//SORTWK05 DD DISP=(NEW,DELETE),UNIT=SYSDA,SPACE=(CYL,(100))  
//SORTWK06 DD DISP=(NEW,DELETE),UNIT=SYSDA,SPACE=(CYL,(100))  
//SORTWK07 DD DISP=(NEW,DELETE),UNIT=SYSDA,SPACE=(CYL,(100))  
//SYSPRINT DD SYSOUT=(,)  
//SYSOUT DD SYSOUT=(,)  
//SYSIN DD *  
    SORT FIELDS=(11,4,CH,A,7,4,CH,A),EQUALS  
    MODS E15=(ERBPPE15,36000,,N),E35=(ERBPPE35,3000,,N)  
//RMFPP EXEC PGM=ERBRMFPP,REGION=0M  
//SYSUDUMP DD SYSOUT=*  
//STEPLIB DD DSN=SYS1.COMBINED.LINKLIB,DISP=SHR  
//MFPIINPUT DD DISP=SHR,DSN=JOHNSON.DUMPSSMF.SORT  
//MFPMMSGDS DD SYSOUT=*  
//SYSIN DD *  
    SYSOUT(O)  
    SYSRPTS(WLMGL(RCPER)) /*WORKLOAD ACTIVITY REPORT */
```

# Sample JCL - Restarting the Java Health Center collection

SDSF PROCESS DISPLAY MPZ3 ALL		LINE 1-5 (5) SCROLL ===> CSR									
NP	JOBNAME	tatus	Owner	State	CPU-Time	PID	PPID	ASID	ASIDX	LatchWaitPID	Command
	BAQSTRT	AITING FOR CHILD	LIBSERV	1W	40.01	69050	83955129	42	002A		/bin/sh /usr/l
	BAQSTRT	THER KERNEL WAIT	<b>LIBSERV</b>	HK	40.01	<b>16846267</b>	69050	42	002A		/usr/lpp/java/
	BAQZANGL	WAPPED, RUNNING	LIBANGE	1RI	0.01	50399398	83953829	77	004D		/usr/lpp/IBM/z
	BAQZANGL	WAPPED, FILE SYS KERNEL WAIT	LIBANGE	1FI	0.01	83953829		1	77	004D	BPXBATA2
	BAQSTRT	ILE SYS KERNEL WAIT	LIBSERV	1F	40.01	83955129		1	42	002A	BPXBATSL

```
//JOHNSONS JOB (ACCOUNT),NOTIFY=&SYSUID,REGION=0M,  
// CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1),USER=LIBSERV  
//JAVA      EXEC PGM=IKJEFT01,REGION=0M  
//SYSERR   DD  SYSOUT=*<br/>  
//STDOUT    DD  SYSOUT=*<br/>  
//SYSTSPRT  DD  SYSOUT=*<br/>  
//SYSTSIN   DD  *<br/>  
BPXBATCH SH +  
java -jar /usr/lpp/java/J8.0_64/lib/ext/healthcenter.jar +  
ID=16846267 level=headless +  
-Dcom.ibm.java.diagnostics.healthcenter.headless.run.number.of.runs=1
```

The job must be executed under the same identity under which the server is running.