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Getting Started With WebSphere Liberty Profile on z/OS

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IBM
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Session Number 14618

SHARE In Anaheim

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WebSphere Application Server on System Z

Session	Title	Time	Room	Speaker
14618	Getting Started with WebSphere Liberty Profile on z/OS	Monday 9:30	Grand Ballroom Salon C	Loos/Follis
14692	Getting Started with WebSphere Compute Grid	Tuesday 9:30	Grand Ballroom Salon J	Hutchinson/Loos
14693	Using WebSphere Application Server Optimized Local Adapters (WOLA) to Migrate Your COBOL to zAAP-able Java	Wednesday 9:30	Grand Ballroom Salon K	David Follis
14620	WebSphere Liberty Profile on Windows AND z/OS (among other things) Hands-on Lab	Wednesday 1:30	Platinum Ballroom Salon 7	
14949	Tips Learned Implementing Websphere Application Server (WAS) on Linux for IBM System z	Wednesday 3:00	Grand Ballroom Salon G	Eberhard Pasch
14709	Need a Support Assistant? Check Out IBM's! (ISA)	Thursday 8:00	Grand Ballroom Salon A	Mike Stephen
15050	z/OSMF 2.1 Implementation and Configuration	Thursday 8:00	Grand Ballroom Salon G	Greg Daynes
14832	Web Apps using Liberty Profile Technology in CICS	Thursday 11:00	Platinum Ballroom Salon 2	Ian Mitchell
14722	Assimilating WebSphere Application Server into your z/OS WLM Configuration	Thursday 1:30	Orange County Salon 1	David Follis
15017	Using IBM WebSphere Application Server and IBM WebSphere MQ Together [z/OS & Distributed]	Thursday 3:00	Grand Ballroom Salon A	Ralph Bateman

Agenda

- Quick Overview of Liberty Profile
- Installation
- Creating the First Server Instance
- Deploying Applications
- Multiple Server Instances and `server.xml`
- Liberty Profile as z/OS Started Task
- z/OS Extensions and the Angel Process
- z/OS MF!

WP102110 - WebSphere Liberty Profile for z/OS

Liberty Profile z/OS Overview

The new Liberty Profile provides a server model that is:

- **Composable** -- the function is very modular and flexibly decoupled, allowing you to specify just what function you need for the applications you are serving.
- **Lightweight** -- the Liberty Profile uses a number of approaches to optimize the loading of functions, which results in a footprint significantly less than traditional WebSphere Application Server.
- **Dynamic** -- many of the runtime functions may be dynamically updated by simply changing the configuration XML; applications may be added or updated by simply replacing the application file in the file system directory.
- **Fast** -- due to the composable design and other factc the Liberty Profile is able to execute very quickly.

Liberty Profile z/OS Technical Executive Flyer

The following is a two-page color technical executive flyer that provides an overview of the new Liberty Profile:

Liberty Profile z/OS Quick Start Guide

The following is a step-by-step "Quick Start" guide to assist with establishing early success with the Liberty Profile. The document takes the reader from some very simple initial uses of the Liberty Profile up through more sophisticated uses involving z/OS-exclusive functions such as using z/OS for digital certificate keystore/truststore, classifying work using WLM and JDBC using Type 2 and RRS:

The following ZIP file contains two sample applications referenced by the Quick Start guide:

WebSphere Application Server for z/OS Version 8.5

Liberty Profile

Quick Start Guide

Version Date: December 4, 2012

See "Document Change History" on page 37 for a description of the changes in this version of the document

IBM Advanced Technical Skills

Gaithersburg, MD

Step by step guide to creating and using Liberty Profile

Includes focus on running as z/OS started task

Focus on z/OS extensions to Liberty

Overview

What is the Liberty profile?

A lightweight, dynamic, composable runtime

Lightweight

- Server install is only about 55 MB
- Extremely fast server starts – typically well under 5 seconds

Dynamic

- Available features are user selected and can change at runtime
- Restarts are not required for server configuration changes

Composable

- Features are implemented as loosely coupled components with lazily resolved optional and mandatory dependencies
- The availability of features and components determines what Liberty *can* do and what's available to applications

What is the Liberty profile?

An easy to configure runtime environment

- Simple, extensible, and sparse configuration model
  - Configuration can live in a single XML document
  - Configuration is by exception
    - Defaults are provided by contributing feature
    - Only modifications to the defaults are required
- Flexible configuration structure
  - Include mechanism allows for shared configuration elements
  - Variable indirection mechanism allows for customization when distributed across multiple JVMs
  - Easily managed by version control systems if desired

What is the Liberty profile?

A transportable runtime for your applications

Use “server package” to generate an archive that contains a tested, self-contained, pre-configured server instance that includes your application
- Enables an application-centric deployment model that allows for easy scale-out
- Light-touch admin builds on the ND job manager infrastructure to manage Liberty server instances

A runtime environment with fidelity to full WAS

- Liberty *is* WebSphere
- Applications that are developed and tested on Liberty will run on the full profile

Why Liberty on z/OS?

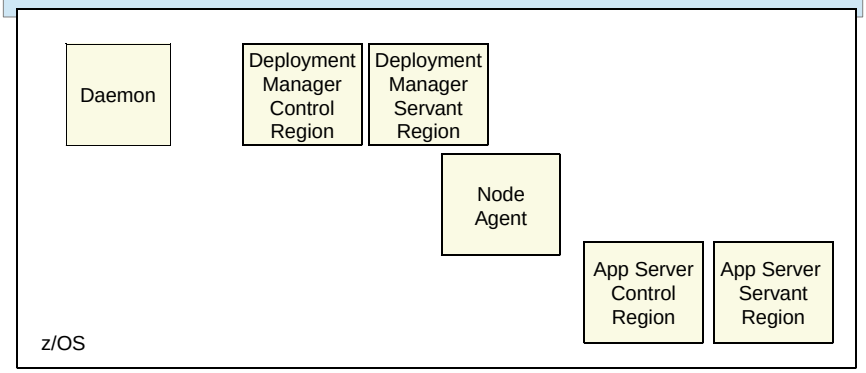
- ***Simplification***
- Liberty environments don't need significant z/OS configuration and customization
  - RRS, WLM, and SAF exploitation and configuration is optional
  - No authorized code is ***required*** to host applications
- Liberty runs in a single process instead of 3+ started tasks
  - Significantly reduced resource consumption
  - No started task definitions are ***required***
  - No need to create users and groups for controllers, servants
- Server instances can be quickly created or cloned
  - `server create serverName [options]`
  - `server package serverName [options]`

Why Liberty on z/OS?

- ***Application portability and stack consistency***
- Liberty behaves *exactly the same* on all platforms out of the box
  - z/OS specific behaviour must configured if desired
- Administration is the same for all platforms out of the box
  - Server operations are controlled by the same `server` script
  - Logs, trace, and configuration live in the hierarchical file system and are tagged with the appropriate code page for easy viewing and editing
  - Existing server configurations can be brought to z/OS from distributed without modification
- An extremely light-weight, single process runtime
  - Removes deployment and runtime complications introduced by the split process, multi-JVM runtime of traditional WAS for z/OS

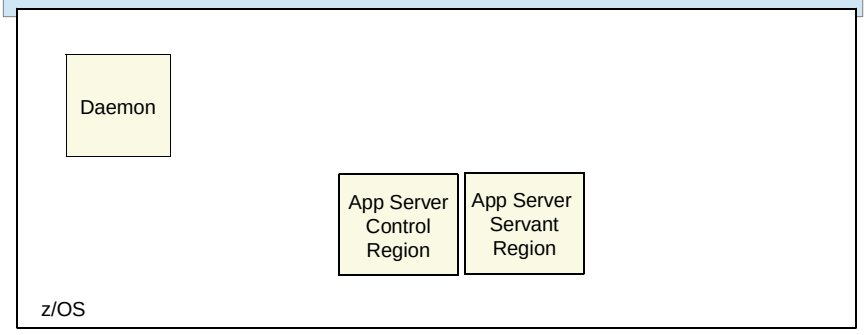
“Traditional” WebSphere for z/OS

- Example: a Network Deployment cell with one application server.



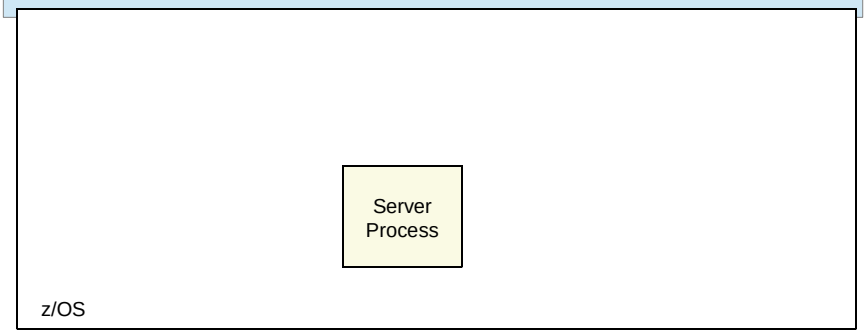
“Traditional” WebSphere for z/OS

- Example: a Standalone Cell.



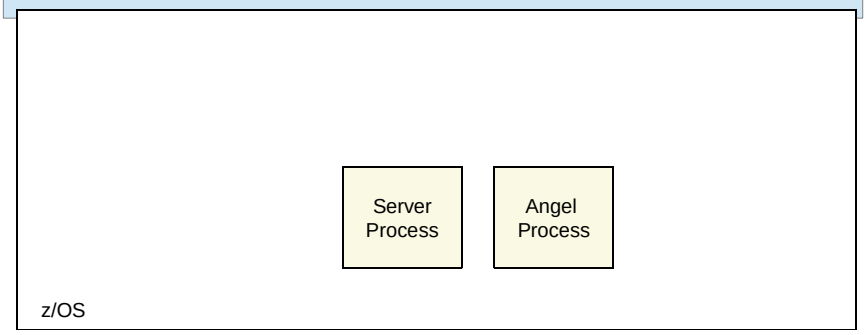
Liberty Profile on z/OS

- Example: a simple Liberty Profile server environment.



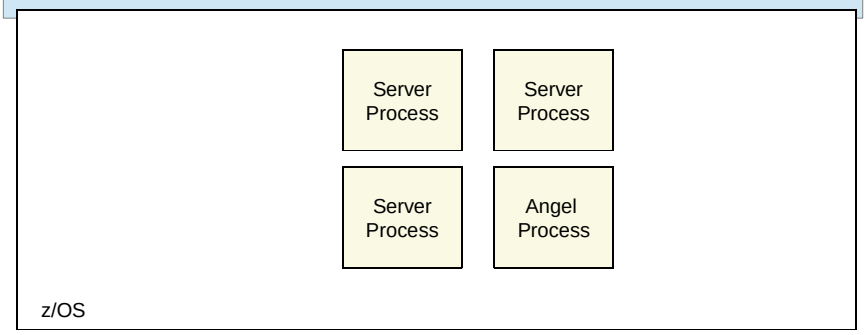
Liberty Profile on z/OS

Example: a complete Liberty Profile server environment.



Liberty Profile on z/OS

- Example: multiple (3) complete Liberty Profile server environments.



The Liberty Server Process

- Runs Servlets and JSPs, supports JDBC, JNDI, WLM.
- Different libraries than traditional WebSphere.
- No authorized code.
- No UID 0, no TRUSTED/PRIVILEDGED, no SPECIAL.
- Supports http, SSL/TLS, SAF Keyrings and certificates.
- Supports Java EE Security:
  - Using LDAP or SAF as the Registry.
  - Basic, Form, and Client Cert Authentication.
  - EJBROLE checks (with the help of an Angel Process).

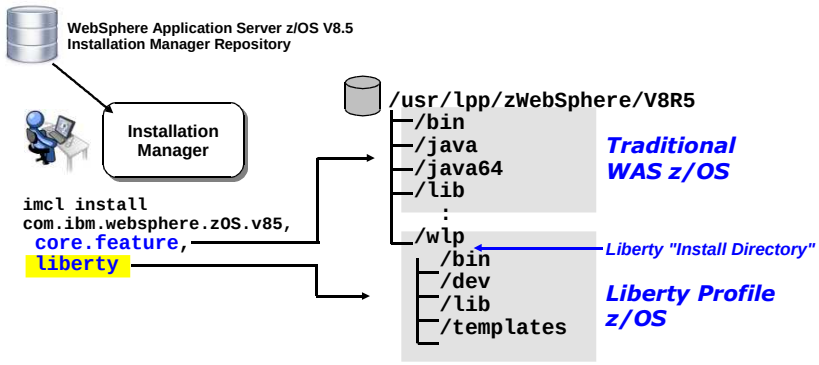
The Liberty Angel Process

- The Angel Process runs in an authorized key and provides facilities to Liberty Server Processes to load and access z/OS system services in a way that protects the integrity of the operating system.
- No UID 0, no TRUSTED/PRIVILEDGED, no SPECIAL.
- The Angel Process is required for the Server to support:
  - SAF Authorization (EJBROLE) checks.
  - JDBC type 2 (local) calls.
  - WLM services.
  - Dump services.

Installation

IM and Liberty Profile (pre 8.5.5)

Liberty Profile comes with WAS z/OS, but it requires you specify it to have the binaries installed when WAS z/OS itself is installed



Liberty doesn't take much space ... recommend installing it

This populates the `/wlp` directory with Liberty binaries

Server configurations are held in a separate "user directory" ...

What 8.5.5 Liberty Looks Like in File System

With 8.5.5 the installation of Liberty changes a bit:

Separate package name

```
imcl install com.ibm.websphere.liberty.zOS.v85,
liberty,embeddablecontainer,extprogmodels +
-installationDirectory /usr/lpp/zWebSphere/Liberty
```

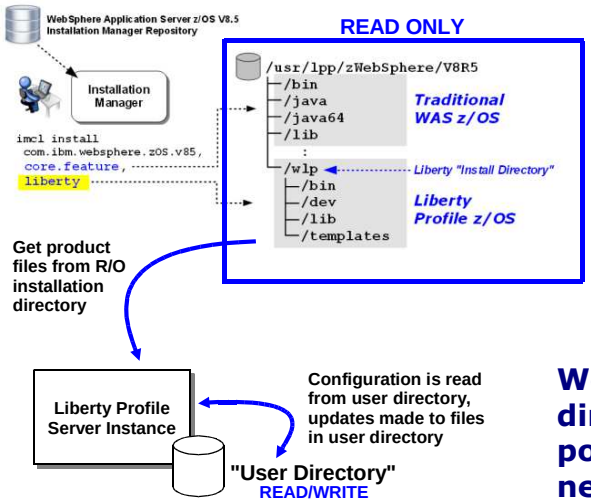
Separate install directory from WAS itself

```
<dir>
 ├ /bin
 ├ /clients
 ├ /dev
 ├ /lib
 │
 └ /templates
```

Then the structure is essentially the same as the prior chart, with 8.5.5 delivering additional function

Install vs. User Directory

Your install directory will very likely be mounted READ only ... which means the Liberty Profile configuration files are held in a different location:



Get product files from R/O installation directory

Liberty Profile Server Instance

Configuration is read from user directory, updates made to files in user directory

"User Directory"
READ/WRITE

We'll see how this directory is populated in the next section

First Server

UNIX Environment Requirements

The following UNIX environment variables are needed or recommended:

`JAVA_HOME=` ← Liberty requires a 64-bit Java at level Java 6 or Java 7.
The Java that comes with traditional WAS z/OS works very well

`WLP_USER_DIR=` ← This variable tells the shell script where the user directory is located

`_BPXK_AUTOCVT=ON` ← This variable enables auto conversion in z/OS USS for tagged files

Set variables at command prompt or in .profile

Liberty Profile file are tagged ASCII which is what tells z/OS editors (OEDIT) to auto-convert. The variable above is what enables this.

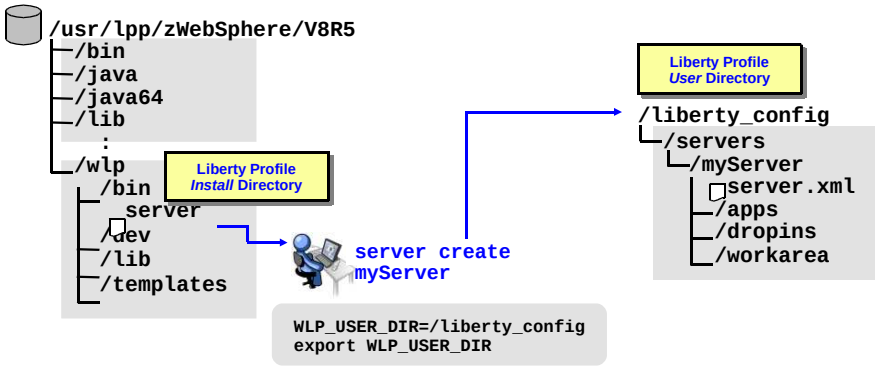
Do not use conversion tools like "a2e" or "viascii" to work on tagged files. You could harm the tagging, which Liberty Profile relies on.

You can tag a file with: `chtag -t -c iso8859-1 <filename>`

Command `ls -lT` on a directory will show what files are tagged

Using "server" Shell Script to Create Server:

The "server" shell script will populate the user directory with the key files and directories needed by Liberty Profile:



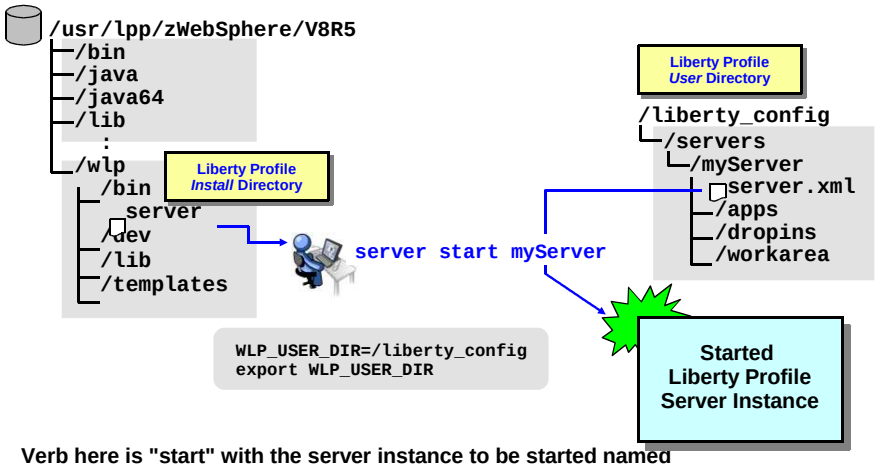
This is done in UNIX shell ... Telnet or OMVS

UNIX environment variable WLP_USER_DIR tells script where to put files

In this example "create" is the verb and "myServer" names the server instance

Starting The Server

The "server" shell script is used to start the server as well:



Verb here is "start" with the server instance to be started named

To stop a server the verb is "stop" with the server instance name provided

Shell script has other verbs as well

First Server Somewhat Unusable at First

Two things make your initial server unusable at first:

The default `server.xml` has `host=` defaulting to "localhost," which works fine on platform where a browser may run locally, but not well on z/OS where browsers are all remote.

- This is a security design ... not opened to outside unless you tell it to
- Simple update -- edit `server.xml` and change `host="localhost"` to `host="*"`
- Liberty Profile will detect change and dynamically implement
- By the way, default HTTP port is 9080 so you may see port conflicts if that port is already in use on your system. That value may be changed dynamically as well.

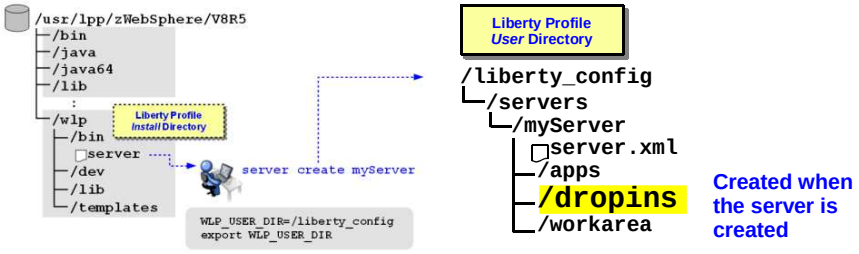
By default no applications are deployed initially

- Simple update -- Liberty Profile allows application files to be "dropped" into a directory where it will be detected and auto-loaded and auto-started.
- We'll look at deploying applications in the next section.

Deploying Applications

"Dropins" Directory for Application Files

The first way to deploy an application is to simply drop the file into the folder:



The `/dropins` directory is monitored by the server instance

Application WAR files placed in this directory are read in and app started

Remove the WAR file and the app is stopped and removed

Coding Applications in server.xml

The other way is to explicitly code the application in the XML:

```
<server description="server1">

  <!-- Enable features -->

  <featureManager>
    <feature>jsp-2.2</feature>
  </featureManager>

  <application location="/path/ATS_servlet.war" />

  <httpEndpoint id="defaultHttpEndpoint"
    host="*"
    httpPort="9080"
    httpsPort="9443" />

</server>
```

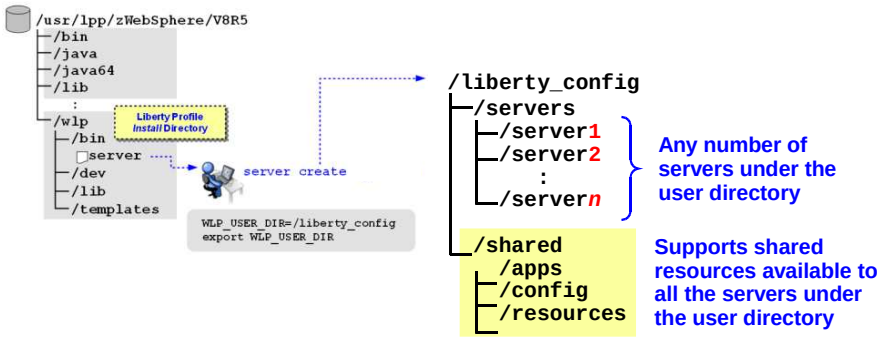
Any location provided server instance ID has READ to the location

There is a way to code a substitution variable to have multiple server instances share the same application files

Multiple Servers

Multiple Servers under User Directory

You can use `server create` to create multiple server instances:



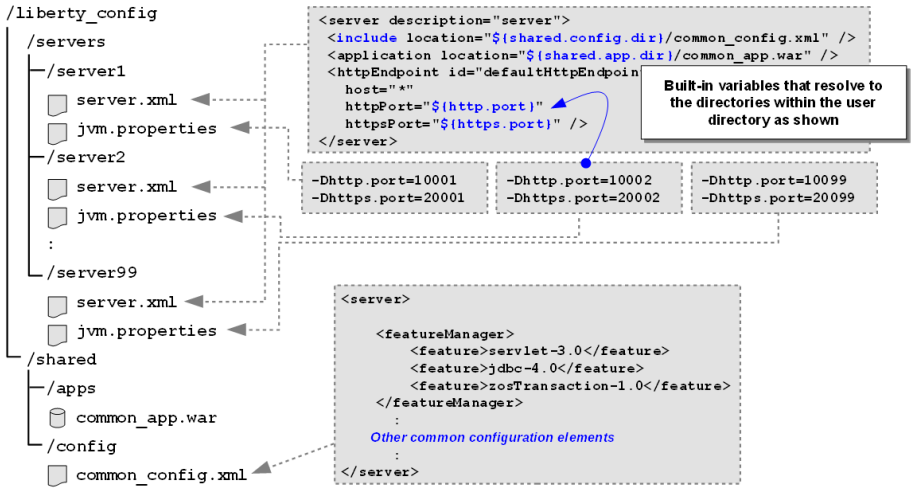
Any given WLP_USER_DIR may have multiple server instances within it

(In addition you may have multiple user directories)

Liberty Profile provides built-in substitution variables to access the shared resource directories. This allows several servers to have common configuration, each pointing to the shared resource directories.

Build-in Vars ... Multiple Servers, Common Artifacts

Illustration of 99 servers sharing common artifacts:

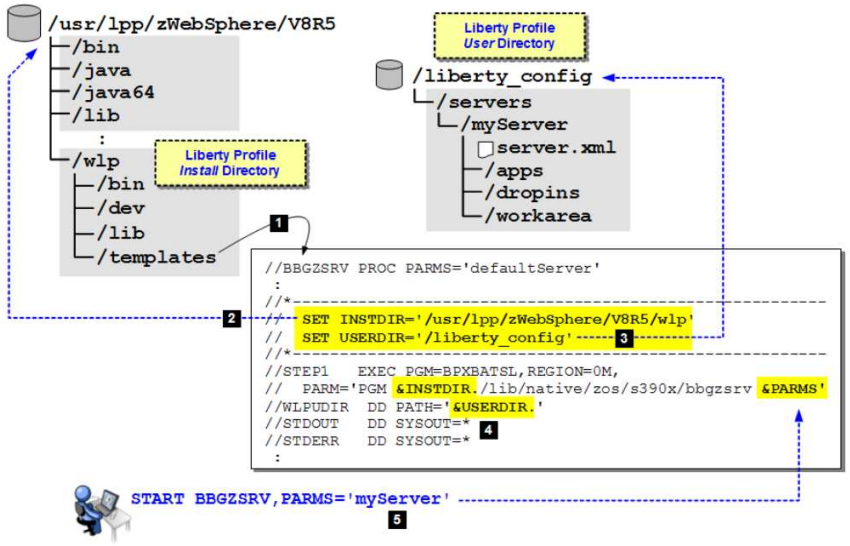


Changes to shared artifacts dynamically picked up by all server instances

z/OS Started Tasks

Run as z/OS Started Task with Supplied JCL

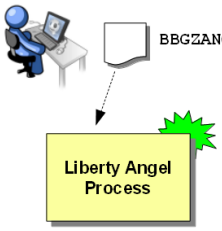
Copy out the sample JCL, simple updates, then start as z/OS started task



z/OS Extensions

Liberty "Angel" Process

The "Angel" process provides access to z/OS authorized services



- **Not strictly required**
  Only required if there's a Liberty server instance on the LPAR that requires access to z/OS authorized services
- **If needed, then only one per LPAR**
  Whether one Liberty server instance or a thousand
- **Very lightweight**
  Very little memory, almost no CPU once started, no TCP ports, no configuration files
- **Access to authorized through `SERVER` profiles**
  Small handful of `SERVER` profiles to set up ... you grant `READ` to server ID
- **Services: SAF, WLM, RRS, z/OS DUMP**
  Of those, only RRS and z/OS DUMP *require* Angel process; SAF and WLM will work without but not as efficient as authority check then done for every call rather than once

z/OS Extensions for Liberty Profile

Four areas of platform exploitation:

SAF

- Use SAF for authentication repository (userid and passwords)
- Use SAF for trust and key store (digital certificates)
- If Angel, then SERVER profile: `BBG.AUTHMOD.BBGZSAFM.SAFCRED`

WLM

- Provide transaction classification (TC) to work requests
- Elements in `server.xml` provide classification rules *(not separate XML file like trad. WAS z/OS)*
- Common use-case: provide separate reporting classes for work
- If Angel, then SERVER profile: `BBG.AUTHMOD.BBGZSAFM.ZOSWLM`

RRS

- Use for JDBC Type 2 with RRS for transaction management
- Angel process required for this
- SERVER profile: `BBG.AUTHMOD.BBGZSAFM.TXRRS`

DUMP

- Provides ability MODIFY request for SVCDUMP or Java Transaction (TDUMP)
- Angel process required for this
- SERVER profile: `BBG.AUTHMOD.BBGZSAFM.ZOSDUMP`