zWAS-IRL
(WebSphere Application Server on z/OS - In Real Life)

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## WebSphere Application Server on z/OS Sessions

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Day</th>
<th>Time</th>
<th>Location</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>12182</td>
<td>What’s New?</td>
<td>Monday</td>
<td>11:00</td>
<td>Golden Gate 1</td>
<td>Stephen / Hutchinson</td>
</tr>
<tr>
<td>12185</td>
<td>WAS on z/OS - In Real Life</td>
<td>Monday</td>
<td>1:30</td>
<td>Golden Gate 1</td>
<td>Rod Feak / Follis</td>
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<tr>
<td>12184</td>
<td>Lab</td>
<td>Tuesday</td>
<td>12:15</td>
<td>Union Square 23-24</td>
<td>Follis / Hutchinson / Loos / Stephen</td>
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<tr>
<td>12183</td>
<td>Liberty Server</td>
<td>Wednesday</td>
<td>11:00</td>
<td>Plaza B</td>
<td>Follis</td>
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<tr>
<td>12186</td>
<td>Spelunking the Admin Console</td>
<td>Wednesday</td>
<td>1:30</td>
<td>Plaza B</td>
<td>Hutchinson</td>
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<td>12188</td>
<td>Being the Backup Administrator</td>
<td>Friday</td>
<td>9:30</td>
<td>Franciscan B</td>
<td>Loos</td>
</tr>
</tbody>
</table>
Objective of Session

To offer some background on key functions of WAS z/OS and then discuss how customers use those functions

Request and Application Designs

Data Access Approaches

Availability Designs
Overview and Considerations:

- Direct to CR okay for internal, but not for external access
- Typically have some “front-end” device between users and CR
  Examples: IBM HTTP Server, Apache webserver, OEM load balancing devices
- Target is most often a JSP or servlet (essentially same thing to WAS)
- Applications often involve more beyond servlet/JSP (ex: EJBs)
  “Tiered application” design – presentation, business logic, data
- HTTP often implies HTTP sessions, which implies affinity routing
  Whether sessions exist is a function of the application
  Affinity implies follow-up requests come back to same server
  Front-end devices provide routing affinity; WAS has ability to replicate sessions
Who is MIB?

- Formerly “Medical Information Bureau”, now “MIB Group, Inc.”
- A membership corporation owned by approximately 470 member insurance companies in the US and Canada.
- Organized in 1902 to provide core fraud protection services to all aspects of the insurance industry, including, life, health, critical illness, long-term care and disability-income insurance.
- Provide members with shared, searchable databases to support the underwriting process. (Think “insurance credit bureau”)
- Adhere to all privacy and disclosure regulations, including FCRA (15 U.S.C. § 1681 et seq.) HIPAA (Public Law 104-191, 1996) and HITECH Act (H.R.1/P.L.-111-5, 2009)
Physical Environment

- Datapower Front-end
  - XSL Transforms
  - Certificate Security

- System to System Accord XML

- Web Browser Access

- z114
  - Business Logic
  - Database
Processing Overview

User Agent

Gateway (DataPower)

Service Layer

Business Logic Layer

Data

Web-Direct (Computer – Computer)

Web-Direct

Web-Direct

Web-Direct

Web-Direct

Web-Direct

Batch/Transaction Processing

Transaction Controller

Update Processor

MIB Search

Web-Term

Web-Term

Web-Term

Web-Term

Web-Term

zWebSphere

DB2 V9

IDS

ODS

OUTDS

Complete your sessions evaluation online at SHARE.org/SanFranciscoEval
Customer Usage Examples

**Federal Government Agency**

40+ application servers clustered across 3 z/OS LPARs.

IBM HTTP Server deployed on z/OS LPARs with WAS plugin providing affinity routing. Sysplex Distributor routing to HTTP Servers.
Message Driven Beans (MDBs)

**Overview and Considerations:**

- Provides a very efficient *asynchronous* request interface
- MDB listens for arrival on queue, then reacts and processes
- Which region picks up message depends on how things configured:
  - *Message Listener Ports if not Activation Spec*
  - *If Activation Spec then Adjunct region*
- MDB applications are a form of Enterprise Java Bean (EJB)
MIB - Processing Example

NOTE: There are 2 deployments for transaction controller. One to handle online processing. One to handle batch, follow-up and purge processing. Each has its own queues and listeners.
A Large U.S. Bank

Trade Processing System - Context

Mainframe - Z/OS

<table>
<thead>
<tr>
<th>CICS</th>
<th>VSAM File (Trade Activity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade Figuration System</td>
<td>OLA</td>
</tr>
</tbody>
</table>

TPS Request Queue

Pre-Standard Message

Websphere Application Server

JMS/JCA

JMS: Request MDB

TPSProcessBean

PreStandard Bean

TPSDataBeans
- PROMDataBean
- AccountDataBean
- TRAMUpdateBean

TPSVSAMBean

TPSCICSBean

MQ

DB2

JCA Connector

JDBC

JRO
Overview and Considerations:

• Program-to-program communications

• Target must be an EJB; requester may be EJB or Servlet

• Requester in same server as target very common
  Tiered application with servlet calling EJB in same server

• Requester in other servers, or outside WAS z/OS cell, does exist
  Where separation of application tiers done for capacity and availability purposes
Customer Usage Examples

Canadian Bank and use of IBM Portal Server:

WebSphere Application Server z/OS

Portal Server

- Portlet
- Portlet
- Portlet

EJB Container

- EJB
- EJB
- EJB

HTTP

Fetch static content, make JDBC calls

IIOP

DB2, CICS and IMS calls
Asynchronous Beans

Overview and Considerations:

- Designed for long-running tasks not subject to normal OLTP timing
- Involves use of “Work Manager” function in application server

*Requesting application requests thread and invocation from work manager*
IBM’s z/OS Management Facility has an HTTP interface but dispatches long running management tasks to asynchronous threads:
Customer Usage Examples

IBM WebSphere Compute Grid (function now included in WAS V8.5)

By the way, integration with enterprise schedulers is accomplished with a utility that places messages on a queue, and an MDB interface in scheduler processes jobs.

Compute Grid is used by several large customers.
Overview and Considerations:

• WAS z/OS exclusive … exploits z/OS cross-memory services
  *Very fast with a minimum of latency and overhead*

• Non-WAS address space: CICS, IMS, Batch Program
  *Must be on same z/OS LPAR as target WAS z/OS application server*

• Target application in WAS is a stateless EJB
  *That implements interfaces using supplied WOLA class libraries*

• Requester program uses supplied APIs to invoke target and get response
Customer Usage Examples

U.S. Telecommunications Company

Advanced inbound APIs with asynchronous control
Asynchronous because COBOL is single-threaded and web service call to external tax package is the slowest link. Asynchronous APIs allows COBOL to get program control immediately.

150 connections kept loaded with work and busy
Maximum connections over WOLA to EJB. All 150 loaded up with work requests. COBOL then loops through array to see if response received. If so, then process back results and load that connection with another request. Connections kept fully busy in this manner.

Multi-threaded Java then parallelized web service calls
WAS z/OS and WAS distributed are multi-threaded. Given sufficient processing capacity, the work requests from COBOL may then be handled in a parallel execution fashion.
Data Access -- JDBC

Overview and Considerations:

• JDBC Driver code is provided by vendor of relational database
  *Provider and data source information configured into WAS by administrator*

• Transaction: RRS if Type 2; XA if Type 4

• T2/T4 zIIP/zAAP offload comparison: WP101476 on Techdocs
  *http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101476*
  *Type 2 overall CPU slightly lower; GP equivalent (based on specific test run)*

• Very common data access pattern with WAS z/OS
  *Nearly every WAS z/OS customer has at least some JDBC in their architecture*
zWebSphere Processing Flow – System Diagram

Provides intranet web based access to customer data at a large insurance company.
Data Access – JCA CTG to CICS

Overview and Considerations:

• CTG = “CICS Transaction Gateway”
  *IBM product that provides the JCA resource adapter and connectivity code*

• CTG JCA Resource Adapter installed into WAS z/OS
  *Connection Factory (CF) configuration then provides information about region to connect to*

• Accessing CICS also very common for WAS z/OS customers
  *A great deal of business logic has been developed / deployed on CICS over the years*
  *JCA CTG to CICS provides relatively easy access to those assets from Java front-end*
  *Also used to access VSAM data managed by CICS applications*
A Large Power Company

- **1800** unique users per day
- **400** concurrent peak on average day
- **2200** concurrent peak every fortnight

**Internal Users**

**Purchased Vendor Application**

*Materials management, purchasing, and work management*

**WebSphere Application Server z/OS**

**CICS**
Overview and Considerations:

- WOLA Adapter is JCA with Common Client Interface (CCI) implemented
  \textit{Methods the same as CTG JCA adapter; values supplied to methods based on WOLA, not CTG}

- Task Related User Exit (TRUE) in CICS implements WOLA code
  \textit{Provides the low-level cross-memory connectivity function}

- WOLA Link Server in CICS (not shown) invokes the named CICS program
  \textit{WOLA link server task handles WOLA call, then turns and does DPL to program
  CICS program unchanged ... unaware of WOLA}

- Supports 2PC and WAS user thread identity assertion into CICS
Customer Usage Examples

A Large U.S. Bank

TPSCICSBean uses WOLA JCA adapter to access local CICS region

Another financial company using WOLA to access multiple CICS gateway regions using round-robin function introduced in 8.0.0.1
Overview and Considerations:

- Provides multiple application JVM instances behind CR
  *Vertical scalability as well as protection against outage of any given application JVM instance*
  *WLM will automatically restart failed servant region*
  *Several work distribution methodologies available (favor first, stateful balance, stateless dist.)*
  *Affinities understood and maintained by WLM*

- HTTP Session replication between servant regions supported
  *Configure a “replication domain” or “session persistence” just like other WAS cluster*

- Loss of CR implies loss of all SRs (so this is not complete HA picture)
  *Use of other WAS cluster provides multiple CR/SR structures across LPARs*
MIB- zWebSphere Configuration
Clustering – Multiple Application Servers

Overview and Considerations:

• WAS “horizontal” cluster – multiple CR/SR structures
  
  Provides protection against outage of CR or LPAR
  
  Picture shows multiple SR each … not necessary, but is another level of HA

• HTTP Session replication between application servers supported
  
  Configure a “replication domain” or “session persistence”

• Parallel Sysplex provides data sharing across LPARs
  
  Key IBM data facilities Sysplex-aware and data-sharing enabled (DB2, CICS, IMS and MQ)

• Inbound request distribution must be considered (HTTP, MDB)

• Transaction failure and recovery another consideration for HA
A Large U.S. Health Insurance Company

The design for maximum availability of System z, z/OS, Software, Storage and Network

Why WAS on z/OS was selected?

- The design for maximum availability of System z, z/OS, Software, Storage and Network
- The capability of WAS on z/OS that supports high transactional volume for mission-critical applications
- High QoS (Quality of Services)
- Minimized physical tiers by using local connection from WAS to DB2
- Removes of any N/W latency and overhead by using single tier of WAS and DB2

A customer-owned health benefits company in US

Serving more than 12 million members
Summary

Many approaches ... many uses

How do you use WAS z/OS?
Questions?
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