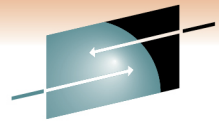

#8557 - Small Programming Enhancements for IMS 10 and 11
Room 211A

Kenny Blackman
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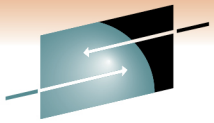
SPE Items

- V11 SPE APPC/OTMA RRS protected conversation processing with ROLB call
- IMS Java Enhancements
  - V10 and V11 SPE Persistent JVM in MPP, BMP, and IFP
  - V10 and V11 SPE Open DB Type 2 Universal Driver
  - V11 Universal JDBC Driver updates for JDBC Connection
  - V11 SPE Fix SQL support for HALDB, DEDB and HDAM databases
  - V11 SPE Universal Driver for XMLDB
- IMS Enterprise Suite Enhancements
  - Connect API for C and Java
  - SOAP Gateway
  - DLIModel Utility
  - Explorer
- IMS SOA Integration Suite Enhancements
  - IMS MFS Web Enablement DBCS support
  - IMS TM RA MFS BPEL for WID
  - IMS 10/11 TM RA Transaction Expiration support
- V10 and V11 SPE Callout Enhancement

V11 SPE APPC/OTMA RRS protected conversation processing with ROLB call

IMS 11 Apar PK84674
PTF UK59654

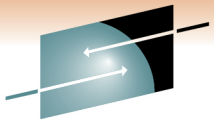
- Remove ABENDU711-20 for ROLB call restriction
  - The ROLB call will not affect the entire RRS protected Unit of Work.
    - The RRS protected input remains in process until a commit point
    - The outbound protected conversation will not be notified to backout
- Migration Consideration
  - IMS Application must now notify outbound protected application to do backout



ADD CCTL TRANCODE AND CCTL TASK ID TO IMS TYPE08 LOG RECORD

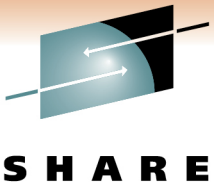
IMS 11 Apar PM24076
PTF UK61382

- Set the CCTL trancode/id or the AER jobname in field LINTSY2 in the TYPE08 log record
- New field LINTCTSK has been added to the end of the TYPE08 log record to contain the CCTL task id.



IMS Java Enhancements

V10 and V11 SPE Persistent JVM in MPP, BMP, and IFP



IMS 10 UK58284
Apar PK82214

IMS 11 UK58285
APAR PM00360

- Provides the ability to use Java in IMS Dependent Regions
  - MPP,BMP,IFP
    - Add ENVIRON= and JVMOPMAS= parms to launch JVM
      - ENVIRON= path to z/OS Java JVM, IMS Java classes
      - JVMOPMAS= path to IMS Java subroutine
      - DFSJVMAP= is not supported
    - Add JAVAOUT and JAVAERR DD statements
    - Add CEE.SCEERUN and SYS1.CSSLIB DD statements
  - DB2 z/OS SPE allows Java code to issue DB2 SQL calls via IMS ESAF
      - RRS is not required
      - DFSDB2AF DD is not supported
        - Use ENVIRON= and JVMOPMAS= to specify DB2 z/OS Java HFS path

V10 and V11 SPE Open DB Type 2 Universal Drivers

Provides type-2 connectivity when accessing IMS in the same LPAR

- IMS Java enabled JMP and JBP Dependent Region runtime
  - New Java Dependent Region Resource Adapter (imsutm.jar)
  - Provides IMS TM services

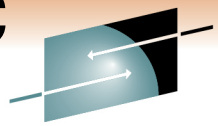
    IMS 10 PM02734 UK57317 IMS 11 PK86498 UK57312
- WAS z/OS and CICS runtimes

  IMS 10 PM13216 IMS 11 PK99686 UK63383
- Restrictions
  - IMS TM Dependent Regions
    - commit/rollback not allowed
    - does not support XA Transactions

IMS Java Dependent Region Resource Adapter

- ApplicationFactory
  - Factory for creating Application objects
- Application
  - Starting point of a TM application.
    - Used to create Transaction, MessageQueue and IOMessage.
- Transaction
  - Represents an IMS TM unit of work. Used to commit, rollback, checkpoint & restart
- IOMessage
  - Class to represent input, output and SPA messages of IMS TM
- MessageQueue
  - Provides services to send and receive messages from an IMS message queue or SPA
- MessageDestinationSpec
  - Used to store information like the LTERM, MFS MOD and alternate PCB names
- SaveArea
  - Used during CHKP/XRST calls to store/retrieve application data
- DLICall Interface
  - Used for IMS System Service calls

V11 Universal JDBC Driver updates for JDBC Connection



V11 APAR PM12893 UK59628

Technology · Connections · Results

- Support DBCS
- Support new optional connection properties for JDBC compliant users
  - `dpsbOnCommit`
    - *Prevents stale connections in a non-managed connection pool*

```
Connection URL interface-
  jdbc://ims://<HOST>:<PORT>/<DATABASE_NAME>:dpsbOnCommit=true;
```

  - `maxRows`
    - *To limit the amount of data that IMS returns - `SELECT * FROM DBPCB.SEGMENT`*
      - *Programming inferface –*

```
Statement.setMaxRows(int fetchSize)
```

      - *Connection URL interface –*

```
jdbc://ims://<HOST>:<PORT>/<DATABASE_NAME>:maxRows=50;
```

  - `fetchSize`
    - *To optimize the amount of data that IMS returns across a network*
      - *Programming interface*

```
Statement.setFetchSize(int fetchSize)
```

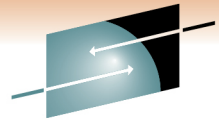
      - *Connection URL interface*

```
jdbc://ims://<HOST>:<PORT>/<DATABASE_NAME>:fetchSize=100;
```

- SQL aggregate function
  - `COUNT(*)`
    - *To provide number of segments returned in a result set*

```
SELECT COUNT(*) FROM DBPCB.SEGMENTA
```

IMS 11 *Fix SQL support for HALDB, DEDB and HDAM databases*



- The A or G command codes can be used to search on a range of keys
  - Return database records that are not in sequence
  - IMS Universal DLI Driver
    - Programmer can use command codes A and G

```
ssaListInstance.addCommandCode("ROOTSEG", SSAList.CC_A);
```

  - IMS Universal JDBC Driver
    - A and G in the JDBC SQL calls for ranged queries on a root key

```
SELECT DBPCB.ROOTSEG.NAME,DBPCB.ROOTSEG.ROOTKEY FROM
 DBPCB.ROOTSEG WHERE ROOTKEY>='R1210010000A' AND
 ROOTKEY<'R1210040000A'
```

```
SELECT DBPCB.ROOTSEG.NAME,DBPCB.ROOTSEG.ROOTKEY FROM
 DBPCB.ROOTSEG WHERE ROOTKEY='R1210010000A' OR
 ROOTKEY='R1210040000A'
```

The above query does not use A and G command codes. It is split it into two different queries by the wisdom of the Universal Drivers to return all the data when the target database is direct access

V11 APAR	
Full Function	PM08746
Universal Driver	PM11977
DLIModel Utility	PM11121

V11 SPE Universal Driver for XML-DB

- Support the Universal driver interface introduced in V11
- New JDBC syntax for XML support
  - To define data

```
DLIDatabaseView with XML datatype
    new DLITypeInfo("ASegmentFieldAXML", "ASegmentFieldA.xsd",
      DLITypeInfo.XML)
```

  - To retrieve data

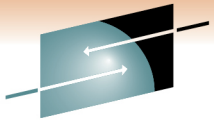
```
ResultSet rs = st.executeQuery("SELECT ASegmentFieldAXML FROM
  DBPCB.SEGMENTA");
```

  - To store data

```
PreparedStatement ps = conn.prepareStatement("INSERT INTO
  DBPCB.SEGMENTA" + " (ASegmentFieldAXML) VALUES (?)");
```

IMS 11 Apar PM17522

- Restrictions
  - The IMS Universal JDBC driver does not support side segments
  - XQuery only supported with the IMS classic JDBC driver



IMS Enterprise Suite Enhancements

IMS Enterprise Suite Enhancements

- Connect API
  - Java — Apar PM05893 UK54997
    - Transaction Expiration
      - *IMS Connect computes STCK format expiration time*
    - SSL keystore and truststore can be specified
      - *FileInputStream or URL object*
    - Support return of MFS Modname
    - Rename samples.jar to ImsESConnectApiForJavaV1R1Samples.jar
      - *Updated to eliminate the need to manually create a logs directory*
  - C and C++ — Apar PM09135
    - Support for C language
      - *SSL connections not supported*
  - Java and C
    - Resume TPIPE support synchronous ICAL

IMS Web 2.0 Solution for WebSphere sMash

- WebSphere sMash
  - lightweight runtime for creating and running RESTful services
    - Groovy, PHP, and Java through the IMS Connect API
  - sMash application is responsible for
    - Preparing input data for IMS application
    - Interpreting output data from IMS application
    - Configuring connection and interaction configuration property files read in by API during execution

IMS Enterprise Suite Enhancements

- SOAP Gateway (SG) V1R1 SPE PM17547 and PM22798
  - Top-Down Web Service generation
  - Security
  - Administration of SOAP Gateway
    - Build scripts for routine configuration and deployment tasks
    - Deployment utility interactive mode is now deprecated
    - SG Management Utility – IOGMGMT
      - *Command-line replaces DU expert mode*
  - Runtime Performance/Availability Enhancements

IMS Enterprise Suite Enhancements

- SOAP Gateway V1R1 SPE…
  - Top-Down Web Service generation
    - Provides the ability to generate language artifacts starting with a WSDL
      - *Only supported for PL/1*
      - *Support multiple operations per service to enable > one operation per WSDL*
      - *Requires RDz 8*
        - *Two copies from IMS web site*
- Benefits
  - Create new or evolve existing IMS PL/I applications for building web services
  - Enable new workload creation on IMS

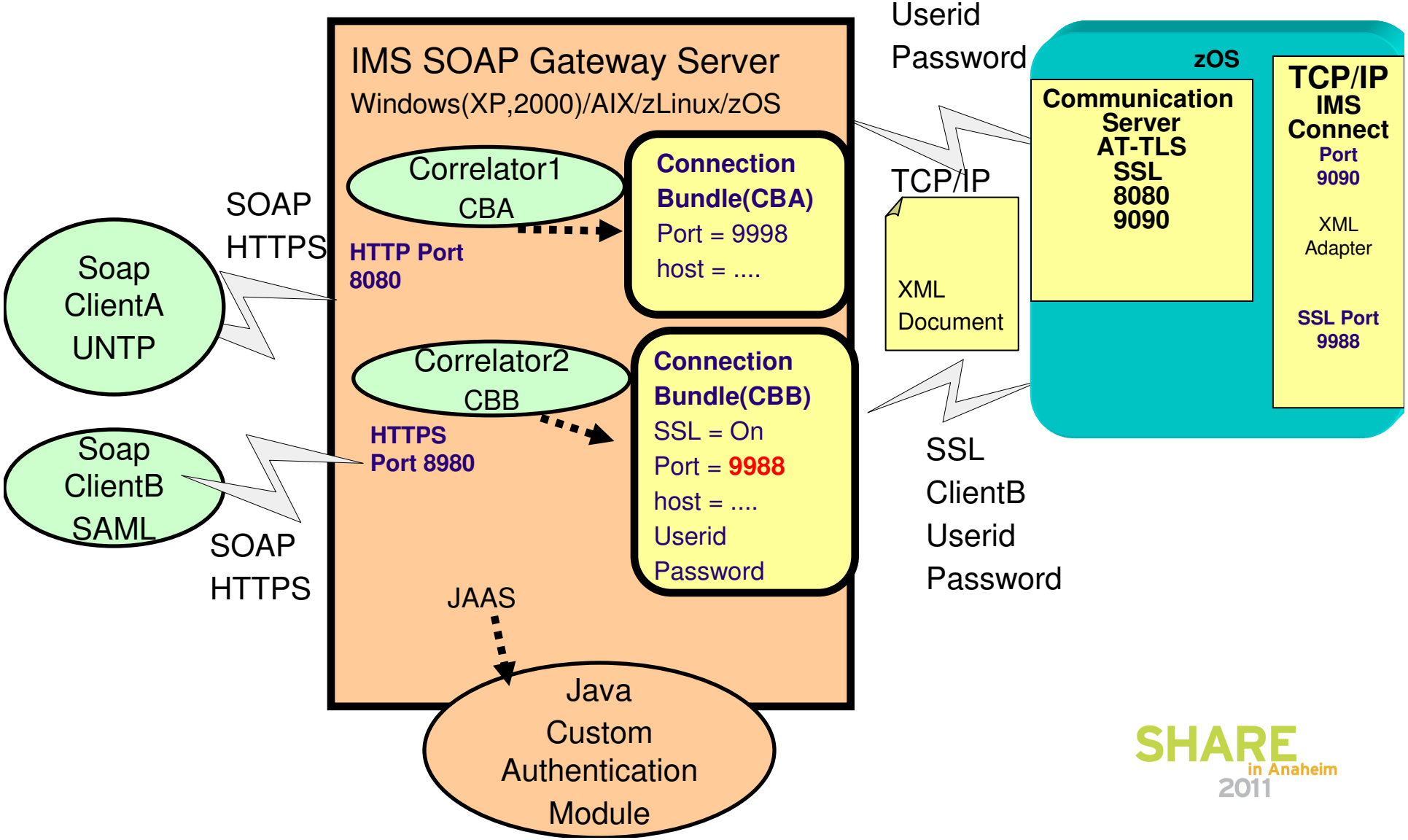
IMS Enterprise Suite Enhancements

- SOAP Gateway V1R1 SPE…
  - Security – all SG supported platforms
    - WS-Security provider scenario
      - *UserName Token Profile (UNTP) 1.1*
      - *Security Assertion Markup Language (SAML) 1.1 security token*
    - Support HTTPS client authentication for provider scenario
      - *SSL session is established using Java KeyStore (JKS)*
        - *authentication of the SG server and the client requestor*
    - Support user-provided Custom Authentication Module
      - *Via JAAS (Java Authentication and Authorization Service)*

IMS Enterprise Suite Enhancements

- SOAP Gateway V1R1 SPE…
  - Security - z/OS only
    - z/OS Application Transparent Transport Layer Security feature (AT-TLS)
      - Provide System Authorization Facility (SAF) support of truststore and keystore for RACF-equivalent External Security Manager Services
      - Provide a way to select a certificate when the SAF keyring contains multiple certificates
      - Provide Client authentication via SAF based Keyring
      - CRL (Certificate Revocation List)
        - configure an LDAP directory that contains your CRLs
        - z/OS AT-TLS passes the list to System SSL for handshake validation
      - Configurable security connection refresh
        - Provide an interval setting for SSL renegotiation
        - Provide a timeout setting for SSL sessions in the cache
        - Provide a threshold to limit maximum number of TCP/IP connections

IMS Enterprise Suite SOAP Gateway Security Enhancements



SOAP Gateway V1R1 SPE Administration Sample .bat command

```
C:\IBM\IMS Enterprise Suite V1.1\SOAP Gateway\deploy
@echo off
rem -----create connection bundled file  --------------------------
iogmgmt -conn -c -n MyBundle -h www.ibm.com -p 9999 -d IMS1
rem -----create IMS correlator bundled file  ---------------------------
iogmgmt -corr -c -w MyWSDL.wsdl -p MyOperation -i MyService -n bundle1 -t TRAN1
iogmgmt -corr -U -r Mycorrelator.xml -p MyOperation  -n MyBundle -l LTERM1
rem -----deploy web service wsdl and correlator file  --------------------------
   -
iogmgmt -deploy -w IMSPHBK.wsdl -r IMSPHBK.xml
iogmgmt -deploy -w TSTPHBK.wsdl -r TSTPHBK.xml
iogmgmt -deploy -w MyWSDL.wsdl -r MyWSDL.xml
```

- Benefits
  - Single consistent Deployment Utility mode
  - Automate configuration definitions

IMS Enterprise Suite Enhancements

- SOAP Gateway V1R1 SPE
  - Performance/Availability Enhancements
    - Built-in cache for runtime to speed up performance for both provider and callout scenarios virtually eliminating any/all I/O bottlenecks
      - *cache is loaded at SG startup time*
        - *WSDLs, correlators, connection bundles, SG properties …*
    - SG Management Utility changes are immediately reflected in the cache without having to restart the server
      - *Some changes i.e. HTTP port number require restart SG*
    - Cache and physical artifacts are maintained in sync all the time
- Benefits
  - Improves response times
  - Reduces outage for obtaining configuration changes

IMS Enterprise Suite Enhancements

- **APAR PM07229 (UK55284)**
  - When SOAP Gateway is set with stopOnError=true, the callout thread does not stop until the worker thread receives the error twice.
  - When SOAP Gateway is set with pollInterval=0, stopOnError=true, and OneThreadPerTpipe=true, SOAP Gateway issues many messages when a communication error occurs with IMS Connect.
  - A callout worker thread is deemed nonexistent and is replaced with a new worker thread when a Web service timeout occurs.
- **APAR PM09532 (UK55289)**
  - The SOAP Gateway deployment utility issues a FileNotFound exception in the log file imssoap_DU.log when, after the installation, SOAP Gateway and the deployment utility are manually copied to a different directory and run from the new directory.
  - The SOAP Gateway deployment utility restricts the WSDL filename to uppercase letters, issuing an error message when the WSDL filename that users specify is not uppercase.

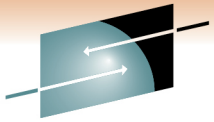
IMS Enterprise Suite Enhancements

- DLIModel Utility

  Apar PM05637

  - Support COBOL DBCS PIC G(n)
  - Support CCSID for national language processing and interchange
  - Remove OVFL error message for HISAM DBD
    - root segment only DBD and no OVFL statement

- Benefits
  - Improve usability of the DLIModel Utility



IMS SOA Integration Suite Enhancements

IMS SOA Integration Suite Enhancements

APAR IMS 10 PM23985

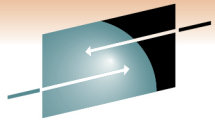
- IMS V10 SPE MFS Web Enablement DBCS support
  - Provides Double Byte Character Set keyword support in MFS source
  - Web Enablement tooling utility and runtime support DBCS for the Web
  - MFS Web Enablement
    - MFS Parser
      - *Generate XMI files with both DBCS and ASCII data*
  - MFS Stylesheet
    - New stylesheets supporting DBCS

IMS SOA Integration Suite Enhancements

APAR IMS 10 PM13664 / IMS 11 PM23831

- IMS V10 SPE TM RA MFS BPEL for WID
  - Provides Service Oriented Architecture (SOA) support in WebSphere Integration Developer for IMS Message Format Service (MFS)
    - Transform existing conversational and non-conversational MFS-based IMS applications into components (services)
  - WebSphere Integration Developer (WID)
    - visual tool to create business processes
  - Business Process Execution Language (BPEL)
    - industry-standard executable language for specifying interactions with services

IMS TM RA Transaction Expiration Support



Apar IMS 10 PM01727

IMS 11 PM01822

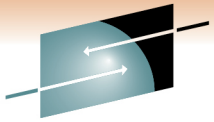
- IMS Transaction Expiration support from IMS TM Resource Adapter
  - Transaction expiration time can be set
    - message or transaction level
  - IMS Connect sets expiration time for message, based on message specified or IMS connect default values
  - IMS TM RA adds boolean property (transExpiration) to IMSInteractionSpec to tell IMS Connect whether or not to invoke message level transaction expiration
    - New IMSInteractionSpec boolean property added along with getter and setter

      `transExpiration`

      `getTransExpiration()`

      `setTransExpiration()`

    - TMRA populates flag in OTMA state data segment based on transExpiration setting
    - IMS Connect populates the offset in OTMA state data segment and STCK value in OTMA user data segment with its TIMEOUT value according to TMRA flag setting



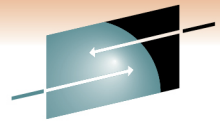
Callout Enhancements

V10 and V11 SPE Callout Enhancements

APAR IMS 10 PM20292 / IMS 11 PM20293

- New ICAL AIB AIBERRXT for why ICAL failed
  - For example, the new AIBERRXT helps identify whether or not the ICAL request data was sent to the client when the time-out occurs.
- New DFS4688E for ICAL internal processing error
  - ICAL times out with an extended reason code
  - IMS writes a 67D0 log record to show the error information
- IMS Connect logon token copied to the OTMA user data prefix for asynchronous callout
  - If input message is from IMS Connect and the OTMA destination descriptor is used to set the destination, the logon token from the input message is copied into the OTMA user data prefix of the ALT-PCB output message so that IMS Connect can later cut an event x'42' with the event key.

V10 and V11 SPE Callout Enhancements



APAR IMS 10 PM20541 / IMS 11 PM20543

Requires IMS 10 PM20292 / IMS 11 PM20293

- IMS Connect Adapter response data error for ICAL
  - Previous to APAR support
    - HWSA0345E ADAPTER HWSXMLA0 ENCOUNTERED AN ERROR: R=132, M=SDRC
    - The client socket connection is disconnected
    - OTMA is not informed and IMS application waits for ICAL timer to pop
  - APAR support
    - HWSA0345E ADAPTER HWSXMLA0 ENCOUNTERED AN ERROR: R=132, M=SDRC
    - The client socket connection is disconnected
    - OTMA is informed and IMS application receives AIB return code reason code
      - NAK to OTMA for sync callout response XML adapter errors
      - New ICAL AIB return code/reason code
        - rc X'108' rsn X'588' with partial data returned to IMS application program response area
        - rc X'108' rsn X'58C' with no data returned to IMS application program response area

V10 and V11 SPE Callout Enhancements

APAR IMS 10 PK80756 UK50877 / IMS 11 PK91373 UK55186

- Queue multiple Resume TPIPEs for a given TMEMBER/TPIPE
- Resume Tpipe will be informed when there is no message
  - Only for NOAUTO or SINGLE-NO-WAIT options
  - IMS Connect will immediately timeout the client's Resume Tpipe request
- /DISPLAY TMEMBER TPIPE SYNC has been enhanced
  - show the number of queued resume tpipe request
  - POSTREQ PM11143
  - POSTREQ PM20008
  - POSTREQ PM31931
  - POSTREQ PM31939

V10 and V11 SPE Callout Enhancements…

APAR IMS 10 PK80756/PM09695
IMS 11 PK91373/PM12142

- Before APAR /DIS TMEMBER TPIPE SYNC command

```
ENQCT DEQCT QCT INPCT OPT MODE SYNCOT NO-RSP STATUS SMEM
```

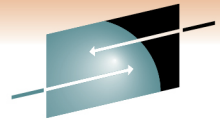
  - NO-RSP
    - The number of messages waiting for response, including WAIT_S status.
  - SYNCOT
    - The number of active synchronous callout messages waiting to be completed.

- Enhancement to /DIS TMEMBER TPIPE SYNC command

```
ENQCT DEQCT QCT INPCT OPT MODE SYNCOT NO-COT RTQ STATUS SMEM
```

  - RTQ provides the # of queued resume tpipe requests
  - replace the NO-RSP with NO-COT to show the accumulated ICAL counts
  - SYNCOT provides NO-RSP information
  - NO-COT
    - The current number of ICAL messages received for this tpipe.

V10 and V11 SPE Callout Enhancements



APAR IMS 10 PK80758 / IMS 11 PK91374
Requires IMS 10 PK80756 / IMS 11 PK91373

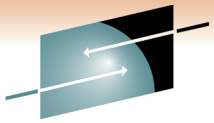
- Resume TPIPE Failover
  - Token to differentiate requests for same Tpipe
  - Delete Resume Tpipe request after timeout
- OTMA Log Record Diagnostics
  - IMS Connect adds LCRE or CORTKN to ACK and NAK responses
- This APAR also fixes two other problems:
  - NAK for Resume TPIPE using Alternate Clientid
  - Resume TPIPE Single receiving more than one response

- Benefit
  - Improves Resume TPIPE management
  - Enhances diagnostics information

V10 and V11 SPE Callout Enhancements

Apar IMS 10 PM09696/PM09695/PM14872
IMS 11 PM12172/PM12142

- Delayed ACK/NAK support
  - Prevent Client TPIPE hang when ICAL timeout occurs before ACK
  - new OTMA NAK message with sense code x'2B'
- Tpipe cleanup function extended to support tpipe with ICAL messages
  - TPIPE will be deleted after 3 checkpoints
- Benefits
  - Client does not need to wait for timeout
  - TPIPE cleanup reduces storage utilization



Reference Information

New ICAL AIB Return Codes and Reason Codes

Apar IMS 10 PM20292 IMS 11 PM20293

- ICAL add the following new return and reason codes:

  Return Code - x'0108'
  Reason Code - x'0588'
  Extended reason code - non-zero, prepared by IMS Connect
  Description - IMS Connect fails to process the response and the response data is not returned.

  Return Code - x'0108'
  Reason Code - x'058C'
  Extended reason code - non-zero, prepared by IMS Connect
  Description - IMS Connect fails to process the response and the complete or partial raw data from the external client application is returned.

DFS4688E ERROR PROCESSING ICAL

Apar IMS 10 PM20292 IMS 11 PM20293

Explanation: An error occurred in the synchronous callout processing for DL/I ICAL.

System Action:

IMS timer routine will later try to timeout this ICAL.

System Programmer Response:

Prepare the 6701 and 67D0 log records and contact the IBM Support Center

Synchronous callout error scenarios and recovery

- When ICAL cannot be sent out, ICAL detects AIB RCX'108'264/RSNX'580'1408 immediately with new extended reason codes:
  - 4 - IMS is in the process of shutting down
  - 8 - IMS callout function is disabled
  - 12 - OTMA member is not found or inactive
  - 16 - OTMA TPIPE is not found or stopped
  - 20 - IMS fails to obtain the storage to queue a request
  - 24 - IMS fails to obtain LUMP storage to process message
  - 28 - IMS fails to inform OTMA to process ICAL
- V10 APAR PM20292

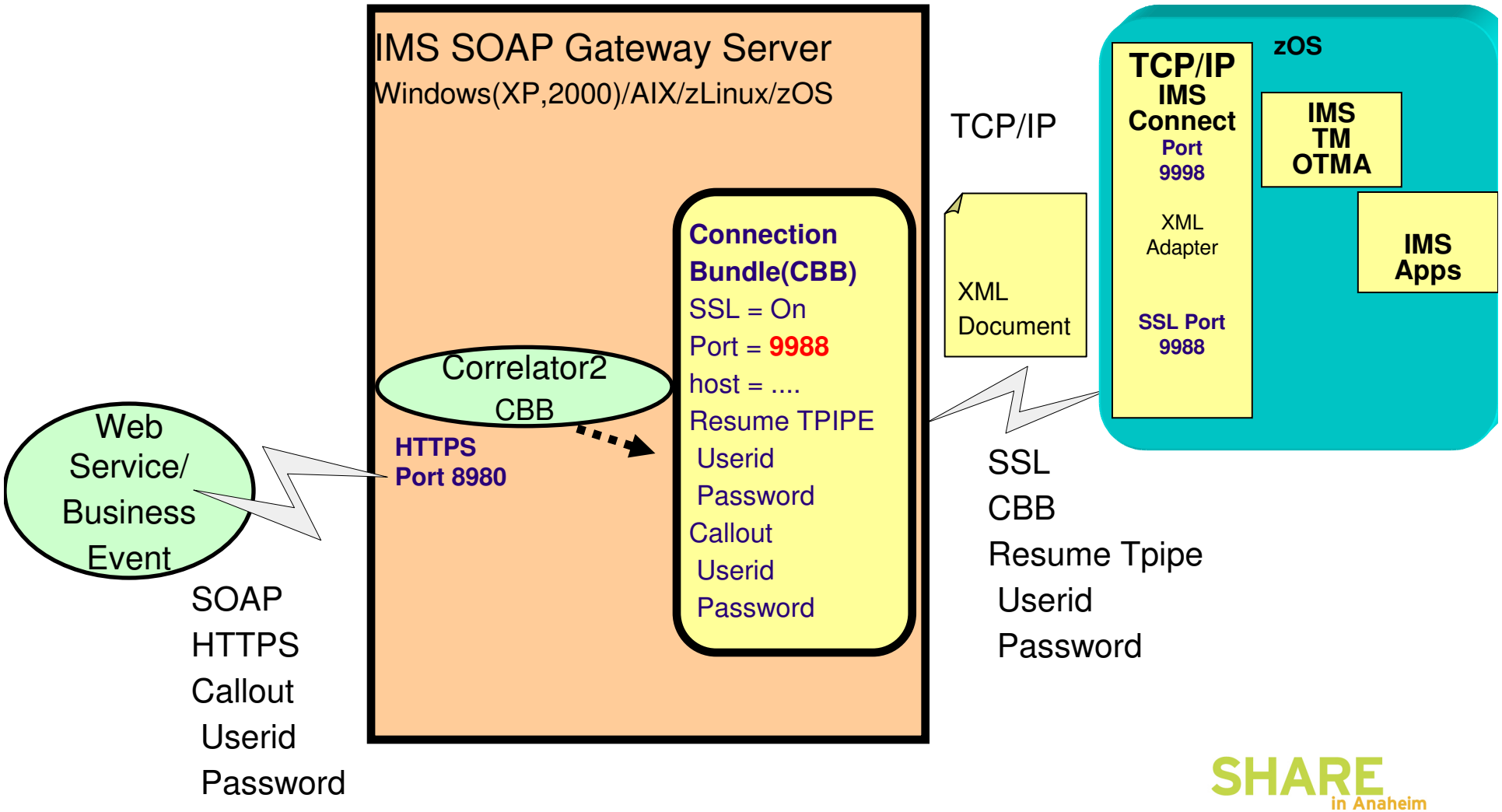
Synchronous callout error scenarios and recovery…

- When ICAL times out, ICAL detects AIB RCX'100'256/RSNX'104'260 immediately with new extended reason codes:
  - 4 - ICAL was not sent to the external application yet
  - 8 - ICAL was sent, but ACK was not received
  - 12 - ICAL was sent, but response was not received yet
  - 16 - ICAL was sent, failed to process response
- V10 APAR PM20292

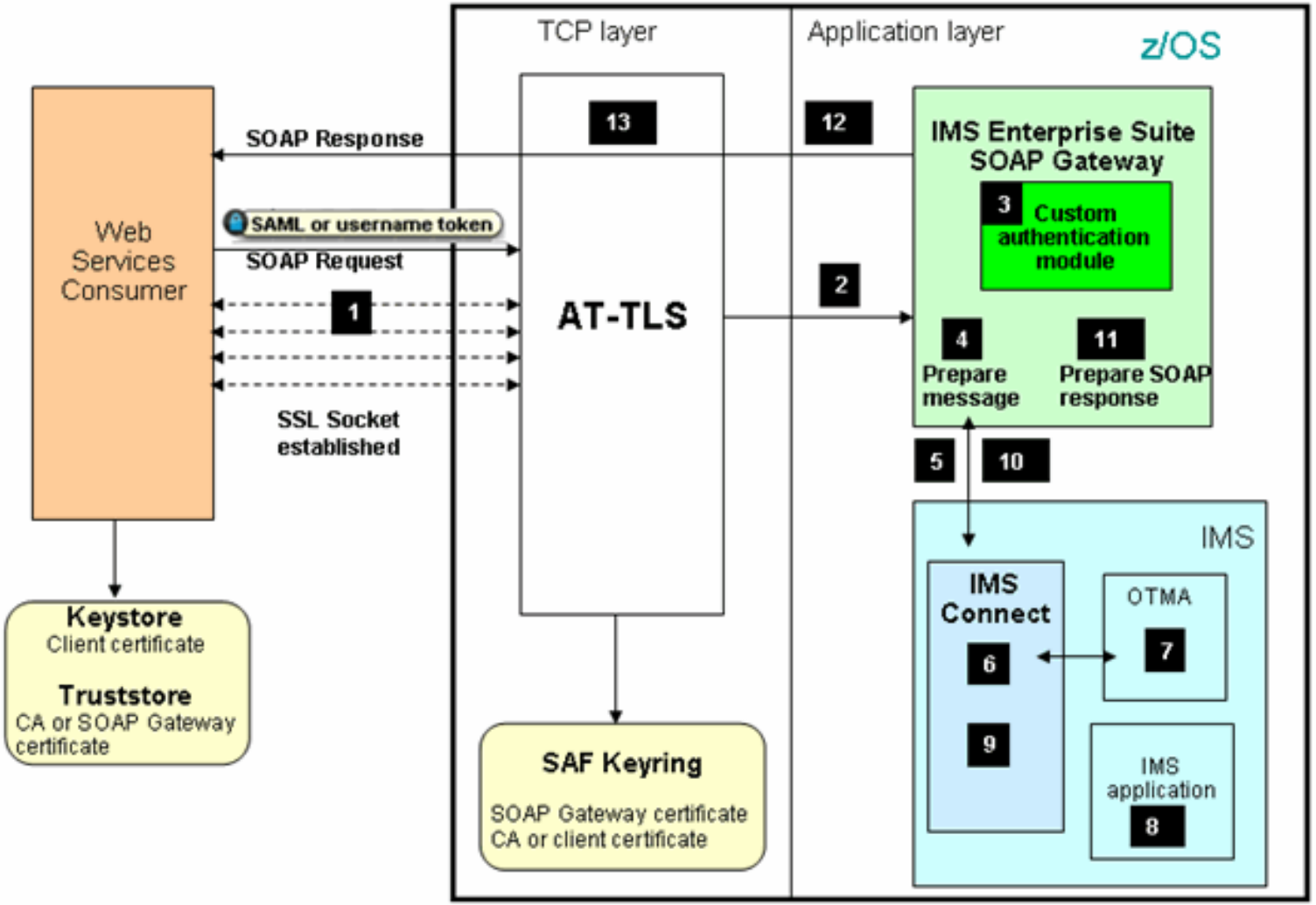
Synchronous callout error scenarios and recovery…

- IMS fails to process the response from the Soap Gateway. IMS could time out the ICAL with AIB RCX'100'256/RSNX'104'260 or returns the AIB RC X'108'264/RSNX'584'1412 with the following extended RSN:
  - 4 - No data is found in the response message
  - 8 - XCF buffer length is incorrect for the response message
  - 12 - IMS fails to allocate storage to process response
  - 16 - A null segment is found in the multi-segment response
- However, the external client application using the Soap Gateway has no idea about this failure. Potential solution is to implement the WS-Atomic Transaction with IMS Connect "Send-Only with ACK" support to inform the client.

IMS Enterprise Suite SOAP Gateway Consumer Security

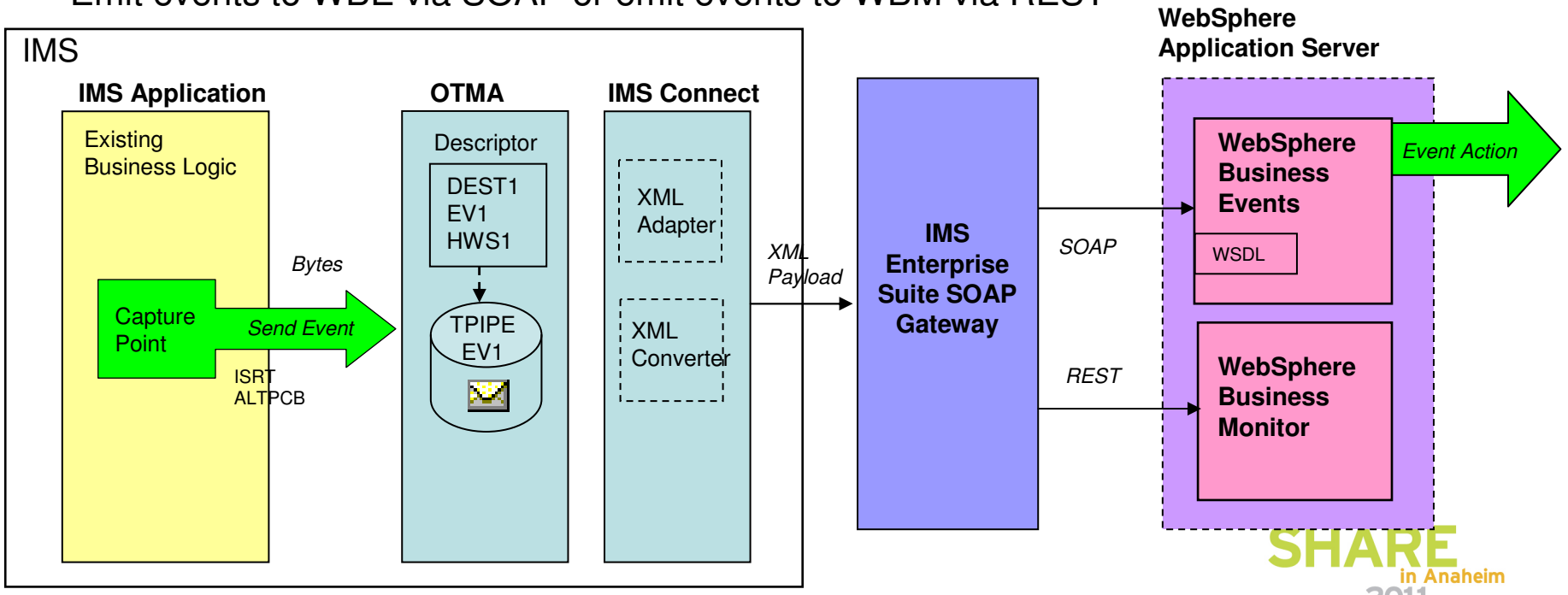


Security process flow with AT-TLS for the provider scenario



IMS Enterprise Suite 1.1 SOAP Gateway Business Events

- IMS application send out business event data using ISRT ALTPCB call
  - RDz 7.6 drag-and-drop code snippet function allows user to easily make changes to IMS application
- RDz generates artifacts to convert IMS business events data to WBE/WBM formats
  - Takes IMS application source and generates XSD for WBE/WBM tooling
  - Generates converters to handle COBOL/mainframe data to WBE/WBM format (XML). IMS customer does not need to worry about data format requires by WBE/WBM
- SOAP Gateway emits business events data asynchronously to WBM and WBE
  - Emit events to WBE via SOAP or emit events to WBM via REST



IMS Enterprise Suite Enhancements sample command for client authentication

- SOAP Gateway V1R1 SPE…
  - Client authentication details
    - Deployment Utility server authentication expert mode command:

```
iogdeploy –u –prop –serverauth true –s <HTTPS portnumber>
–k <keystorename> –w <keystorepassword>
```

    - Deployment Utility client authentication expert mode

```
iogdeploy –u –prop –clientauth true –s <HTTPS portnumber>
    –k <keystorename> –w <keystorepassword>
    –t <truststorename> –u <truststorepassword>
```

IMS Enterprise Suite Enhancements

- SOAP Gateway V1R1 SPE sample command for user auth module
  - User provided Custom Authentication Module written in Java

```
‘<SOAP Gateway install dir>/server/webapps/imssoap/WEB-INF: wsjaas.conf
```

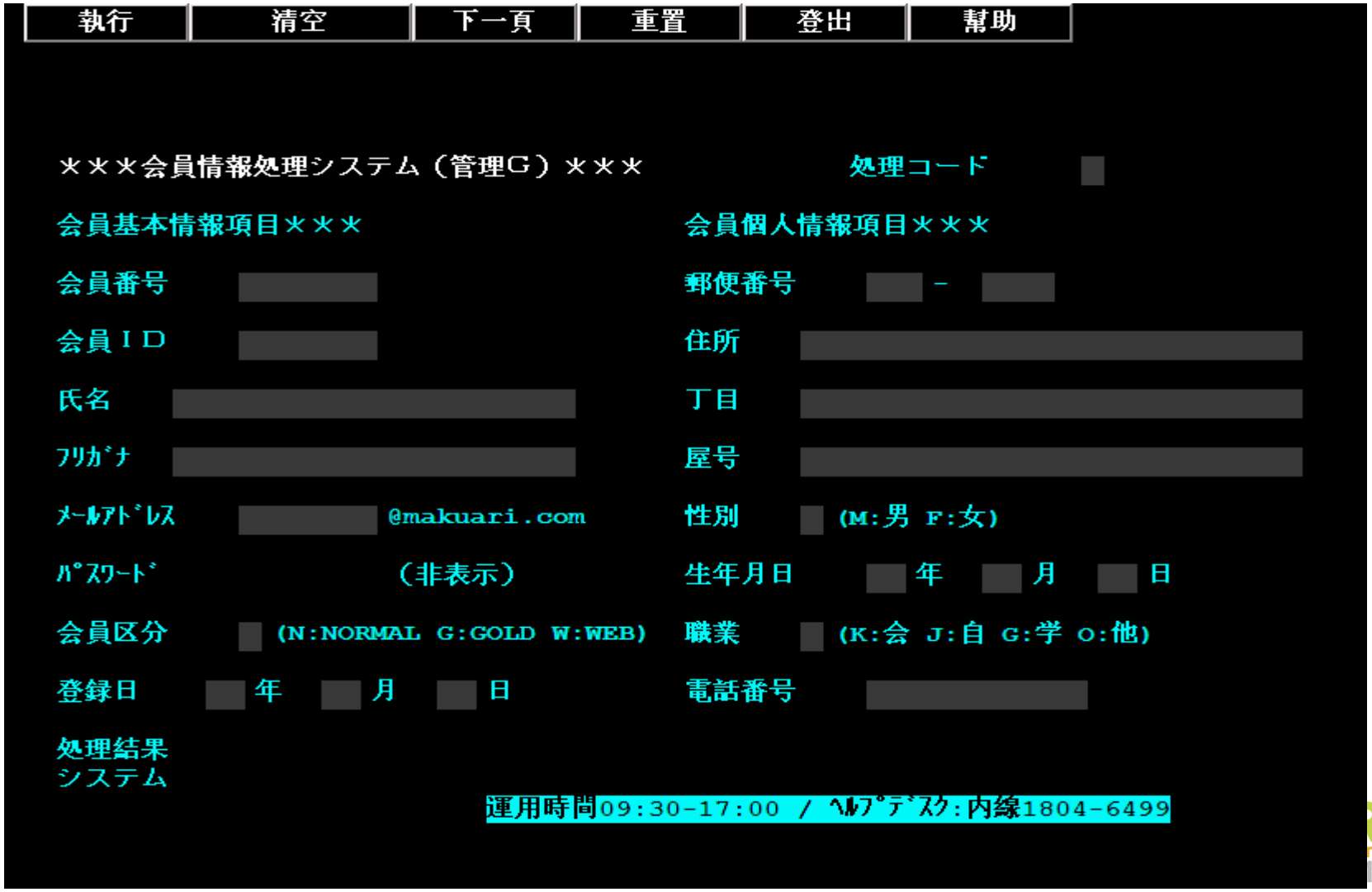
SAML Wsjaa.conf entry intercept SAML V1.1 requests

```
system.wss.consume.saml11 {
    com.ibm.ims.soap.server.module.SAMLConsumeLoginModule required;
    com.yourCompany.security.server.YourCompanyConsumeLoginModule required;
};
```

intercept UserNameTokenProfile(UNTP)

```
system.ims.soap.soapunt  {
    com.ibm.ims.soap.server.module.soapConsumeLoginModule required;
};
```

IMS MFS Web Enablement DBCS samples



IMS MFS Web Enablement DBCS samples

V10 and V11 SPE Open DB Type 2 Universal Drivers

JMP Sample Application

```
try {
    Application app = ApplicationFactory.createApplication();
    MessageQueue messageQueue = app.getMessageQueue();
    IOMessage input = app.getIOMessage("class://InputMessage");
    IOMessage spa = app.getIOMessage("class://SPAMessage");
    IOMessage output = app.getIOMessage("class://OutputMessage");

    String query = "SELECT * FROM Phonebook.Person WHERE Lastname=?";
    IMSDataSource ds = new IMSDataSource();
    ds.setDatastoreName("SYS3");
    ds.setDriverType(IMSDataSource.DRIVER_TYPE_2);
    ds.setMetadataURL("class://DFSIVP37DatabaseView");
    Connection conn = ds.getConnection();
    PreparedStatement pStmt = conn.prepareStatement(query);
    if (messageQueue.getUnique(spa)) {
        while (messageQueue.getNext(input)) {
            String lastName = input.getString("LastName");
            pStmt.setString(1, lastName);
            ResultSet results = pStmt.executeQuery();
            while (results.next()) {
                output.setString("LastName", results.getString("LastName"));
                output.setString("FirstName", results.getString("FirstName"));
                output.setString("Extension", results.getString("Extension"));
                output.setString("ZipCode", results.getString("ZipCode"));
                messageQueue.insert(spa, MessageQueue.DEFAULT_DESTINATION);
                messageQueue.insert(output, MessageQueue.DEFAULT_DESTINATION);
            }
        }
    }
} catch (Exception e) {
    e.printStackTrace();
}
```

V10 and V11 SPE Persistent JVM in MPP, BMP, and IFP
IMS MPP JVM sample

- ENVIRON=DFSJVMEV

```
LIBPATH=/usr/lpp/java/J5.0/bin/j9vm:/usr/lpp/java/J5.0/
  bin: >
/usr/lpp/ims/imsjava10/ :  >
/usr/lpp/db2910_jdbc/lib
```

- JVMOPAS=DFSJVMMS

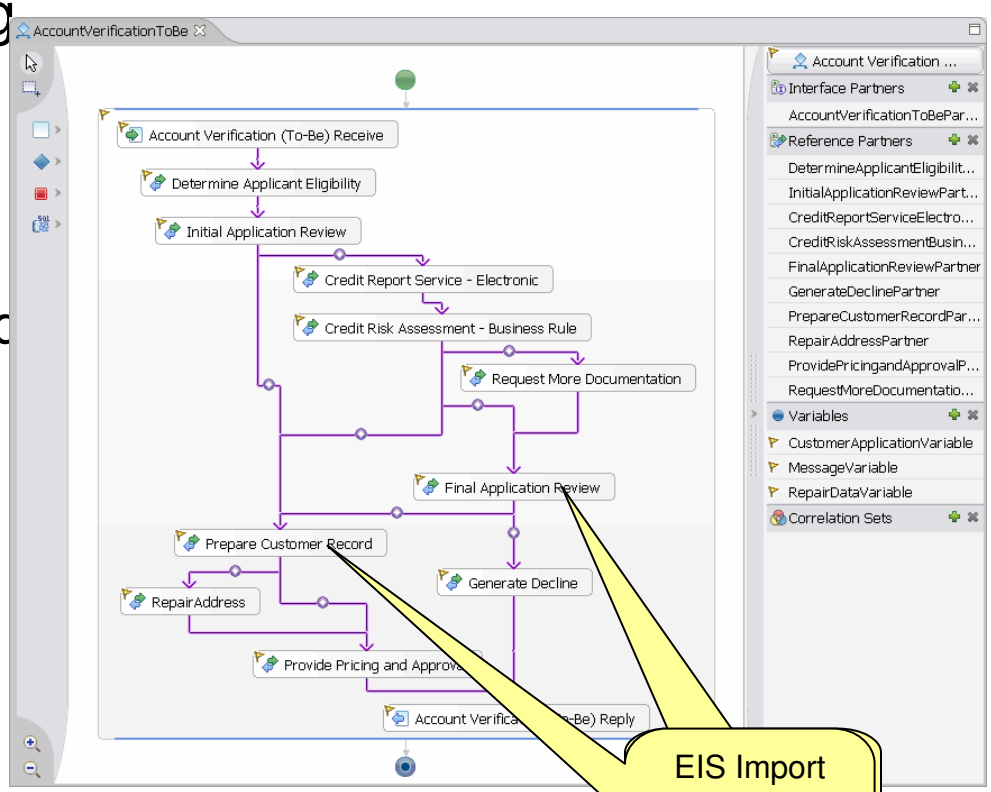
```
-Djava.class.path=/usr/lpp/ims/imsjava10/samples.jar:>
/usr/lpp/ims/imsjava10/imsjavaBase.jar:>
/usr/lpp/ims/imsjava10/imsjavaTM.jar:>
/usr/lpp/ims/imsjava10/imsJDBC.jar:>
/usr/lpp/db2910_jdbc/classes/db2jcc.jar:>
/usr/lpp/db2910_jdbc/classes/db2jcc_javax.jar:>
/usr/lpp/db2910_jdbc/classes/db2jcc_license_cisuz.jar:>
/usr/lpp/db2910_jdbc/classes/sqlj.zip
```

V10 and V11 SPE Persistent JVM in MPP, BMP, and IFP
MPP JCL sample


```
//REGION EXEC PGM=DFSRRC00,
// REGION=0M,TIME=1438,DPRTY=(13,10),
//PARM=(MSG,001,002,003,004,
// ...
// ENVIRON=DFSJVMEV,JVMOPMAS=DFSJVMMS
//PROCLIB DD DSN=IMS.PROCLIB,DISP=SHR
//STEPLIB DD DSN=IMS.PGMLIB,DISP=SHR
// DD DSN=IMS.PGMLIB.PDSE,DISP=SHR
// DD DISP=SHR,DSN=SYS1.SCEERUN
// DD DISP=SHR,DSN=SYS1.CSSLIB
//* HFS PATH FOR JAVA STDOUT SYSTEM.OUT.PRINT()
//JAVAOUT DD PATH='/IMS/JAVA.OUT'
//* HFS PATH FOR JAVA STDERR SYSTEM.ERR.PRINT()
//JAVAERR DD PATH='/IMS/JAVA.ERR'
```

Tooling: WebSphere Integration Developer (WID)
Runtime: WebSphere Process Server (WPS)

- Component based Programming Model
  - Service Components & Modules
- Intuitive drag-and-drop tools
  - Visually define the sequence and flow of business processes
- **WS-BPEL** specification
  - Human interaction
  - Partner links, e.g. EIS Import
  - Compensation support
  - etc…
- Modular Development
  - Change Implementations without disrupting Modul consumers



EIS Import support: IMS, CICS, SAP, Siebel, Flatfile, FTP, Email, JDBC, Oracle, and PeopleSoft

EIS Import for IMS PL/I, COBOL, C or MFS source

IMS Web 2.0 Solution for WebSphere sMash

- Prerequisites
  - IMS Enterprise Suite V1R1 Connect API for Java
  - WebSphere sMash V1.1+
  - IMS V11

- Restrictions (no support)
  - Synchronous Callout
  - Two-Phase Commit (2PC)
  - Unicode
  - XML

IMS Web 2.0 Solution for WebSphere sMash Sample Application for Groovy

- Parse the URI for the input arguments
  - http://server:port/resources/appName/arg1/arg2/...
- Set the connection properties to the IMS System

```
myCF.setHostName("zserveros.demos.ibm.com")
myCF.setPortNumber(9999)
myCF.setUseSslConnection(false)
myCF.setClientId("client01")
```

- Set the transaction interaction properties

```
myTMInteraction.setImsDatastoreName("IMSC")
myTMInteraction.setImsConnectTimeout(ApiProperties.TIMEOUT_5_SECONDS)
myTMInteraction.setTrancode("IVTNO     ")
```

- Set the input data

```
inMsg.setInputMessageData(arg1 + arg 2 + arg3);
```

- Process the output

IMS Web 2.0 Solution for WebSphere sMash Sample Application for Java

- Application Implementation similar to Groovy
- Need to write own handler in zero.config

```
# Event handler
/config/handlers += [{
  "events" : "GET",
  "handler" : "com.ibm.ims.smash.example.imsphonebookjava.class",
  "conditions" : "/request/path =~ /resources/imsphonebookjava(/.*)?"
}]
```

IMS Web 2.0 Solution for WebSphere sMash Sample Application for PHP

- Parse the URI for the input arguments
  - http://server:port/resources/appName/arg1/arg2/...
- Set the connection properties to the IMS System

```
$myCF->setHostName("zserveros.demos.ibm.com");
$myCF->setPortNumber(9999);
$myCF->setClientId("client01");
$apiProperties = new JavaClass("com.ibm.ims.connect.ApiProperties");
$myCF->setUseSslConnection(false);
```

- Set the transaction interaction properties

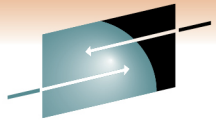
```
$myTMInteraction->setImsDatastoreName($datastore);
$myTMInteraction->setImsConnectTimeout($apiProperties->TIMEOUT_5_SECONDS);
$myTMInteraction->setTrancode($trancode);
```

- Set the input data

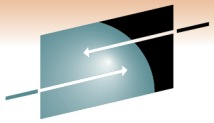
```
$signature = new JavaSignature(JAVA_STRING);
$inMsg->setInputMessageData($signature, $indata);
```

- Process the output

WebSphere sMash Considerations



- Behavior of IMS Transactions are application specific and do not fit the CRUD model
  - Recommended use of HTTP GET method for all transactions
- Groovy implementation was the simplest as it could use the IMS Connect Java API directly
- PHP implementation required understanding of how to call Java
  - Calling Static classes and methods is not intuitive
  - Calling Overloaded methods
- PHP has no byte representation
  - User needs to use the overloaded functions that takes Strings
- Java implementation required writing an event handler
  - This was not transparent based on the sMash online documentation
- Finished RESTful service was easily portable due to lightweight architecture of sMash



The End