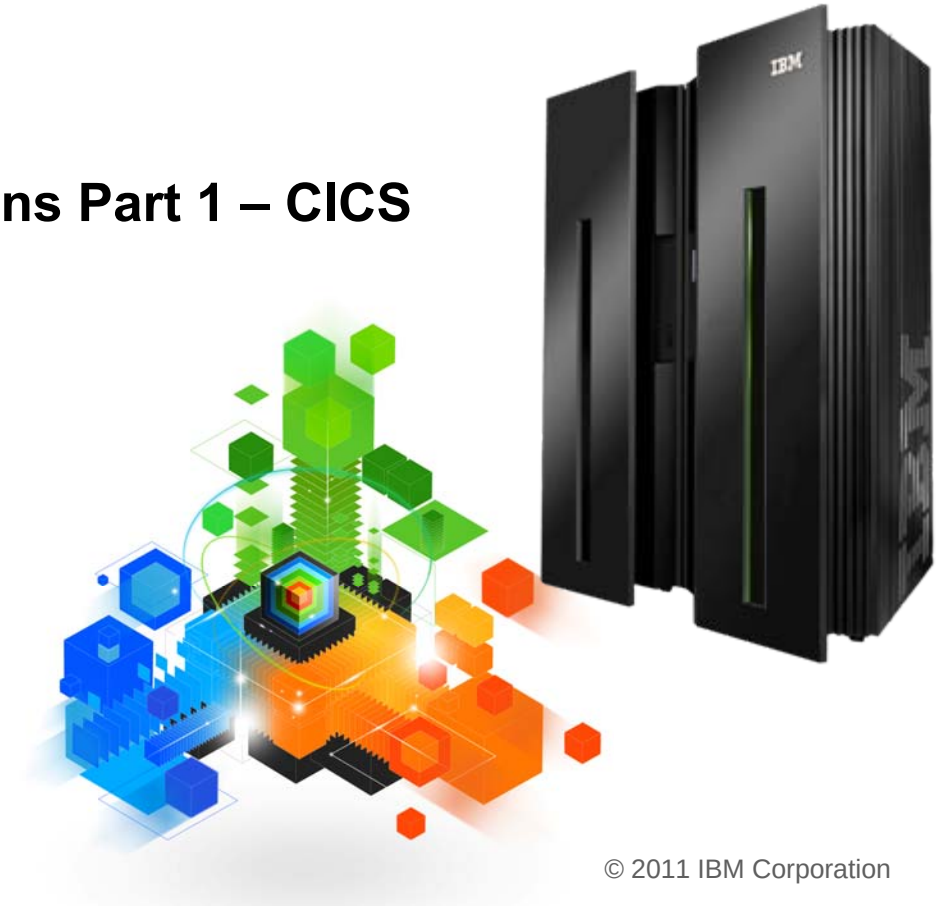
IBM System z Technology Summit

Revitalizing Your (CICS) Applications Part 1 – CICS application development



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Session 2. Abstract

- **Breathe new life into existing applications by extending them into new business processes. Bundles can enable you to identify and package applications in a more flexible way. Learn how CICS and OSGi bundles simplify the process of rapidly assembling and deploying new business applications. Mature SOA support in CICS includes data mapping and Web services addressing, providing faster and enhanced conversion between XML and language structures for all Web services, and APIs to use these services, independent of Web services.**

Agenda

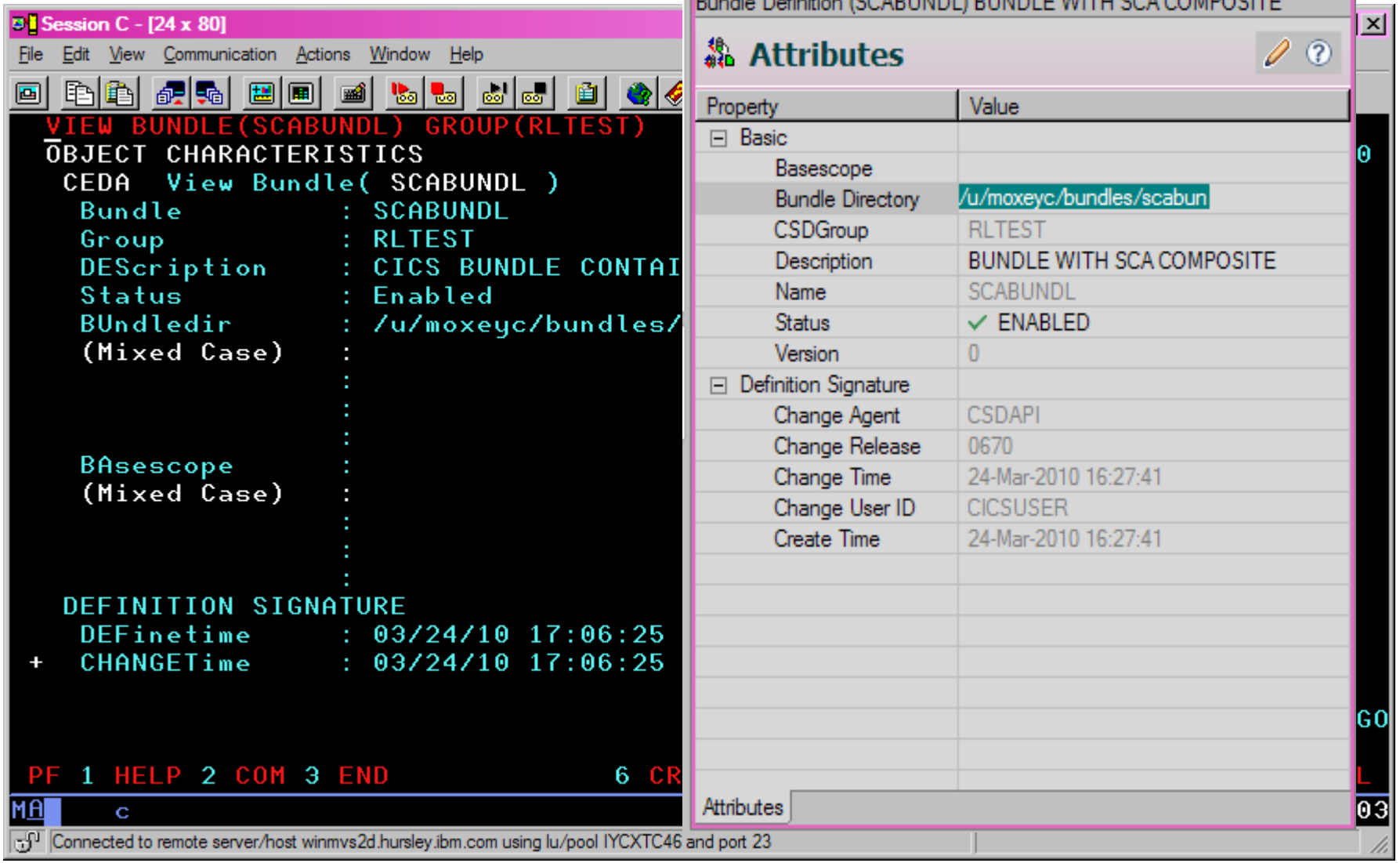
- **Events and CICS Bundles**
- **Java and OSGi Bundles**
- **Service enablement enhancements**
  - Atom
  - WS-Addressing
  - XML Transforms and offload

Events, Atom, and CICS Bundles

What are Bundles?

- **Provide a deployment and life cycle grouping for related application artefacts**
  - Provides a single point of management and control
  - The artefacts can be from a number of resource spaces
- **CICS Bundles are similar in concept to OSGi bundles for Java / Eclipse / WAS**
- **Allow such a grouping to express and police its dependencies**
  - Can express functional or resource related dependencies
- **Extensible**
  - Provide an extension point for Vendor or User artefacts to be deployed and managed alongside CICS Resources
  - Manifest File describes contents - “Imports”, “exports” , “defines”
  - User extensible via Callback program
- **CICS Resources which are “bundle-enabled”:**
  - CICS Bundles: Event Binding, XSD Bindfile, SCA Composite, ATOM feeds
  - OSGi bundles: Java applications for JVM Server deployment

BUNDLE Resource



Bundle Contents

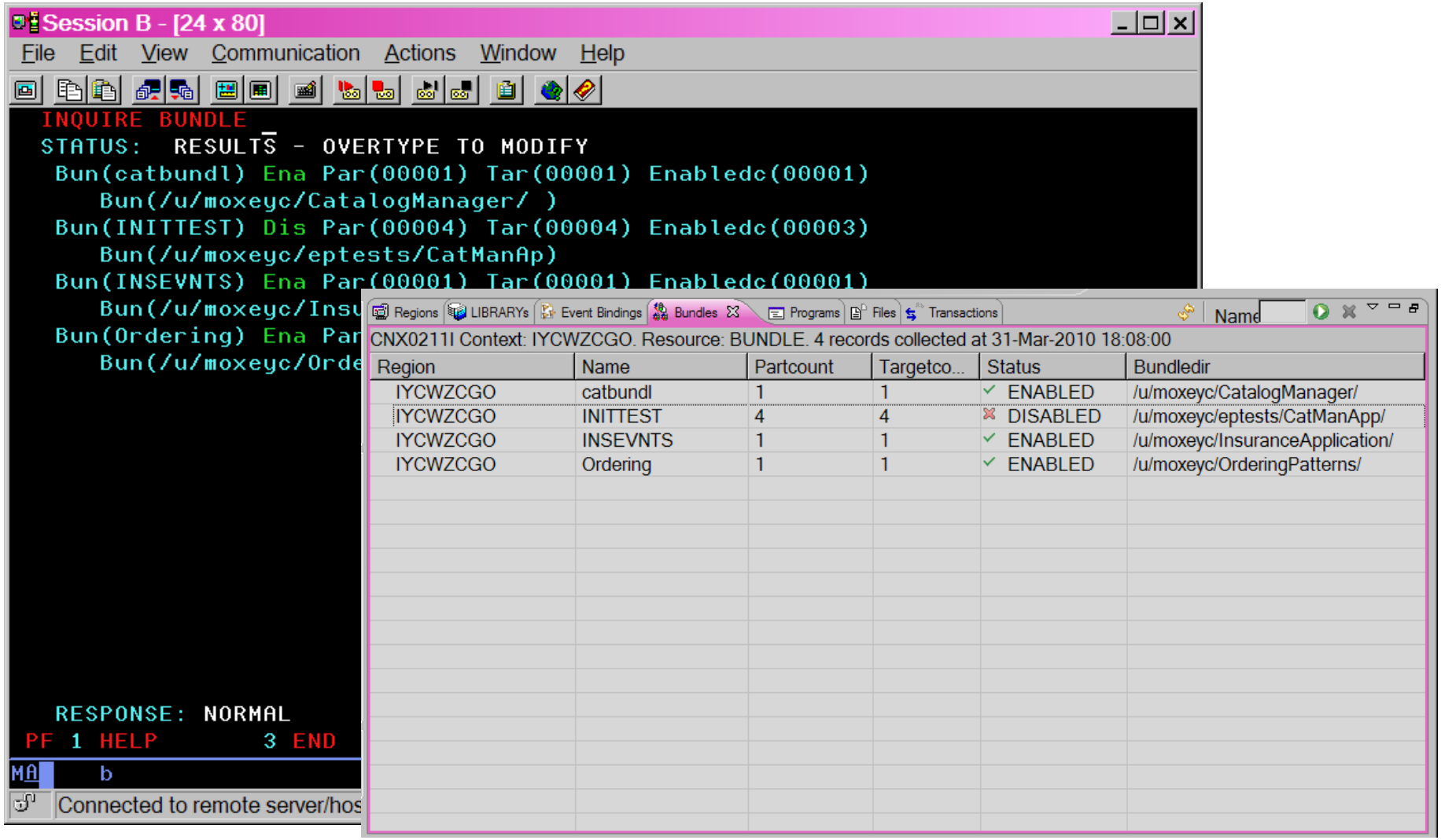
.../scabun
- /META-INF
  - cics.xml ← Bundle manifest
- /scaproject
  - testcomposite.scdl

cics.xml - Notepad

File Edit Format View Help

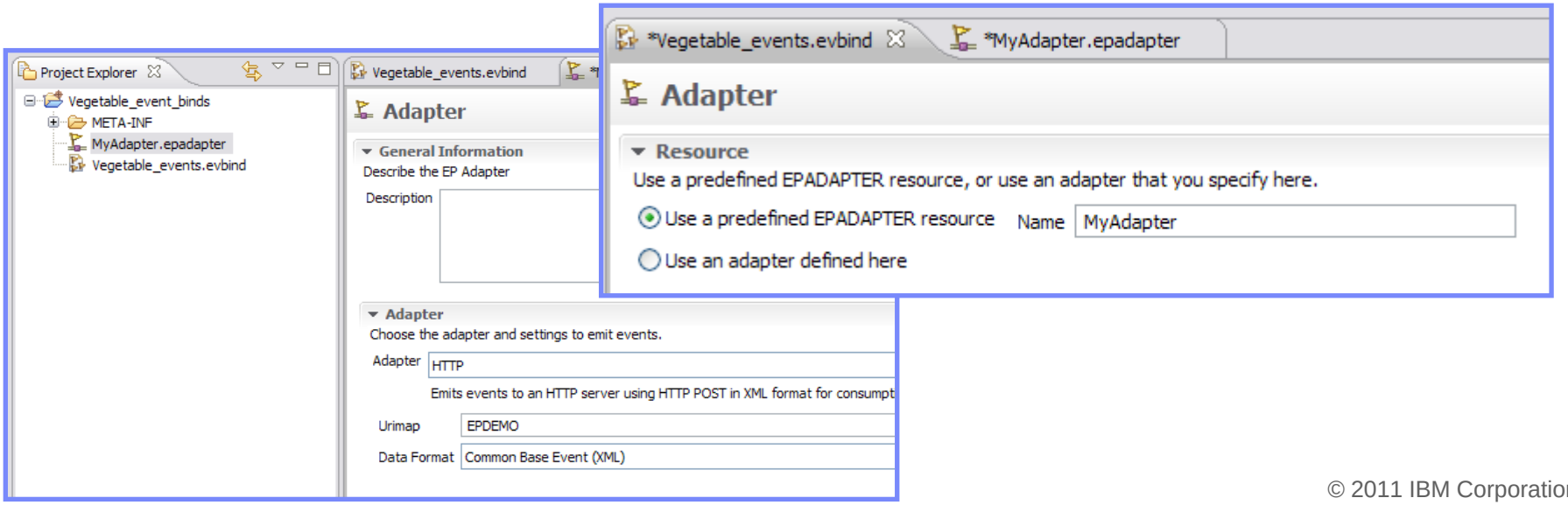
```
<?xml version="1.0"?>
<tns:manifest xmlns:tns="http://www.ibm.com/xmlns/prod/cics/bundle"
        bundleVersion="1" bundleRelease="0">

        <tns:define     name="MyComposite"
                        type="http://www.ibm.com/xmlns/prod/cics/bundle/SCACOMPOSITE"
                        path="scaproject/testcomposite.scdl" />

        <tns:import     name="PAYROLL"
                        type="http://www.ibm.com/xmlns/prod/cics/bundle/PROGRAM" />

        <tns:import     name="TaxQuery"
                        type="http://www.ibm.com/xmlns/prod/cics/bundle/WEBSERVICE" />

</tns:manifest>
```

Bundle Operations

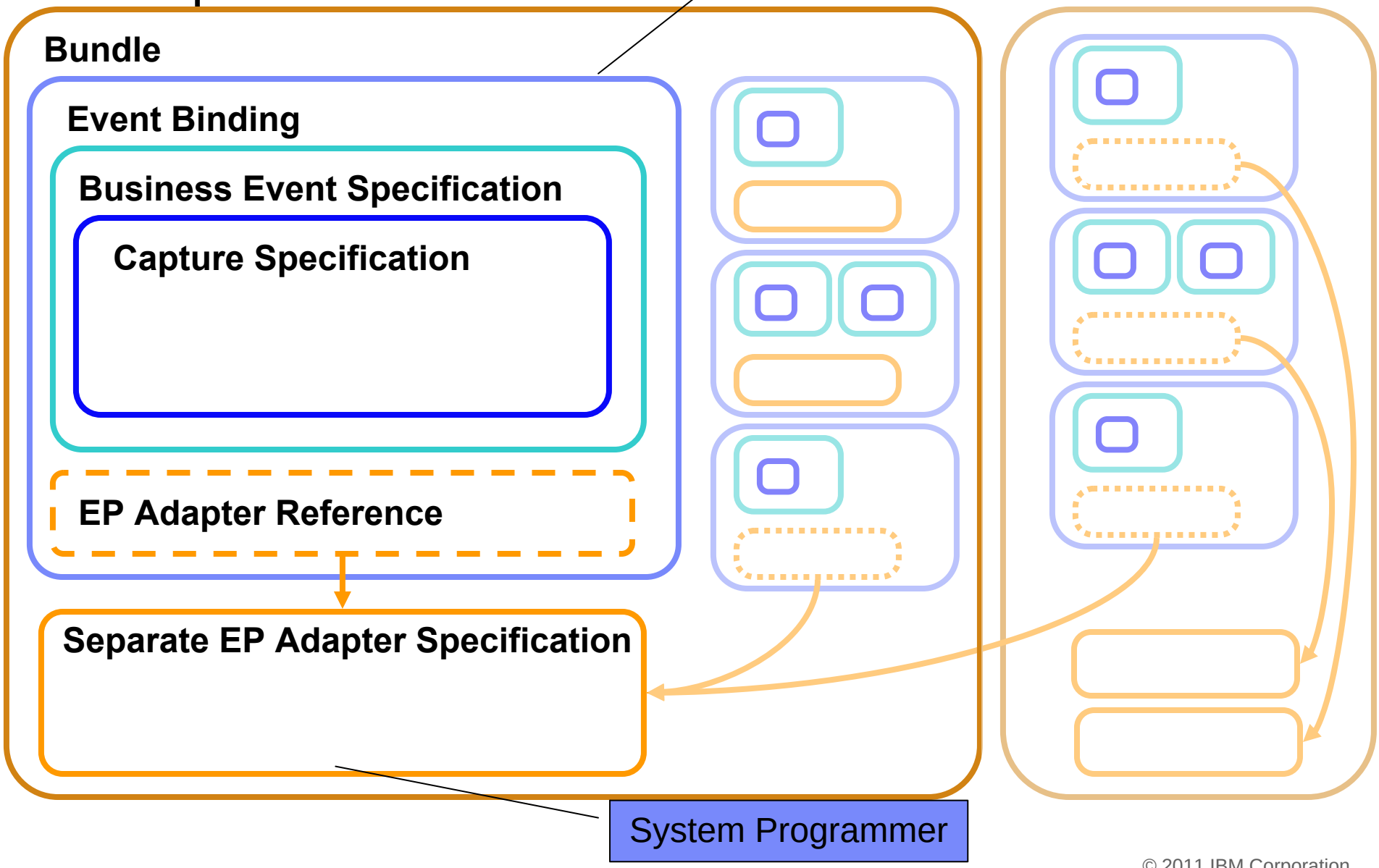


Problem: Customer has many event bindings

- **“We’ve started using events and we have many event bindings. All of our events are emitted using identical EP adapter specifications. What happens if need to change the EP adapter specification? We worry that it would be a lot of work to change it due the number of event bindings we have.”**
- **New in CICS TS V4.2 EP adapter specifications can be defined and managed separately to Event Bindings**
- **Event Bindings can reference these EP adapters by name.**



EP adapters in bundles



Other Event Processing improvements in CICS TS V4.2

- **More data types supported for filter and capture:**
  - Sign leading/trailing Zoned Decimal
  - Hexadecimal floating point
  - Binary floating point
  - Decimal floating point (requires optional hardware facility)
  - Null terminated character
  - Null terminated hex

- **HTTP EP adapter performance improvements if using a URIMAP with SOCKETCLOSE set.**

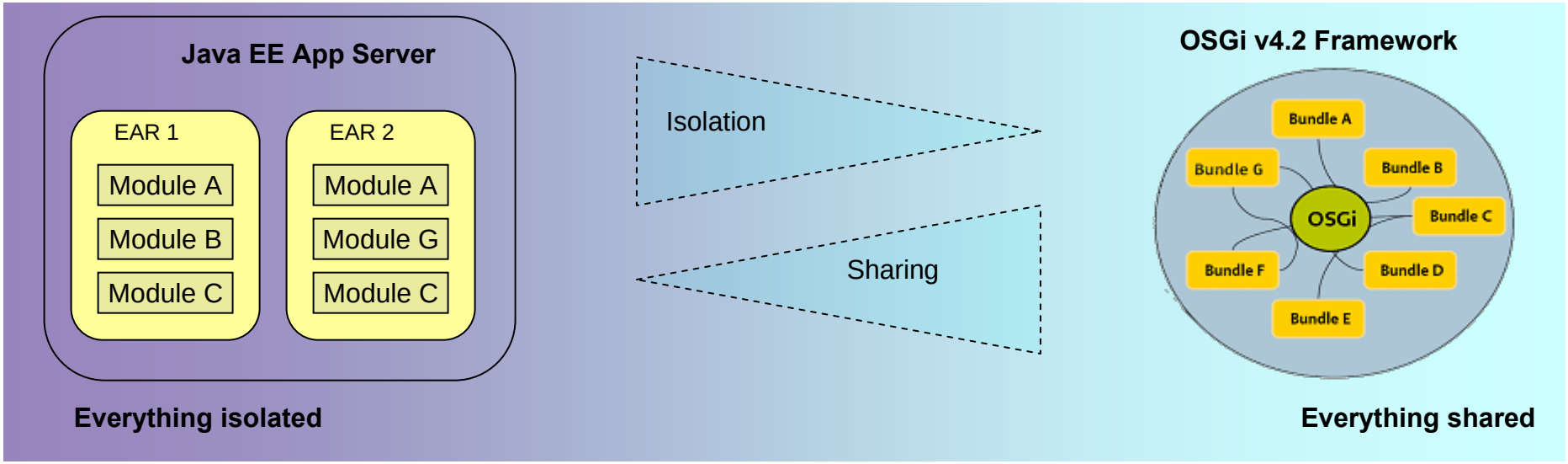
Java and OSGi Bundles

CICS OSGi Support Overview

- **OSGi**
  - OSGi development and packaging now required to deploy CICS applications to a JVM server
  - Existing CICS Java applications using main() method linkage can run unchanged if wrapped in an OSGi bundle
  - All JVM server applications must be thread-safe and can't use stabilised CICS EJB or CORBA functions
  - Equinox used as OSGi implementation
- **CICS Explorer SDK**
  - Provides CICS Java development toolkit for use in any Eclipse 3.6.2 IDE (i.e RAD 8.0 or vanilla Eclipse SDK)
  - Can be used to develop and deploy applications for any release of CICS (CICS TS 3.2 onwards)
  - Java projects are developed as Plug-in Projects and then packaged in a CICS bundle and exported to zFS
  - CICS TS V3.2/V4.1 Pooled JVM applications classes/JARs can be wrapped and deployed to OSGi JVM servers

OSGi - Isolated and Shared Bundles

- **In Java EE, modules are isolated within an application and applications are isolated from one another.**
  - Makes sharing modules difficult
- **OSGi 4.2 all bundles have shared visibility to the externals of all others bundles within an OSGi framework (JVM)**



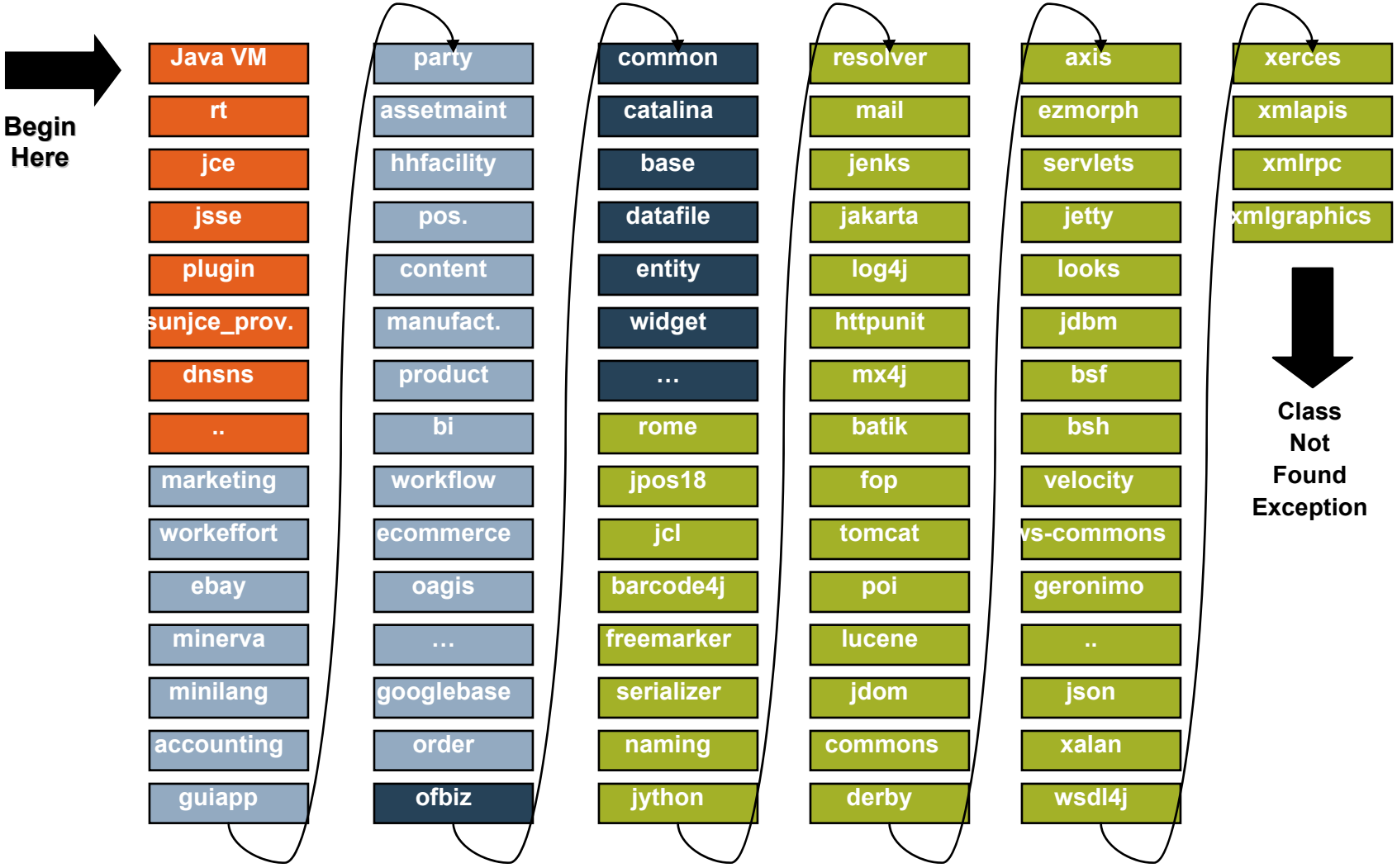
OSGI Bundle types in CICS

- **OSGi Bundles**
  - Just a jar with a few extra lines in the jar manifest file
- **Application Bundles**
  - Provide one or more entry points which can be LINKed too by CICS.
  - This is done by using the CICS-MainClass directive
  - Can import packages from other bundles, i.e. JCICS
- **Library Bundles**
  - Provide no entry points but simply export code to be used by other bundles
  - Shared library services

Manifest.mf

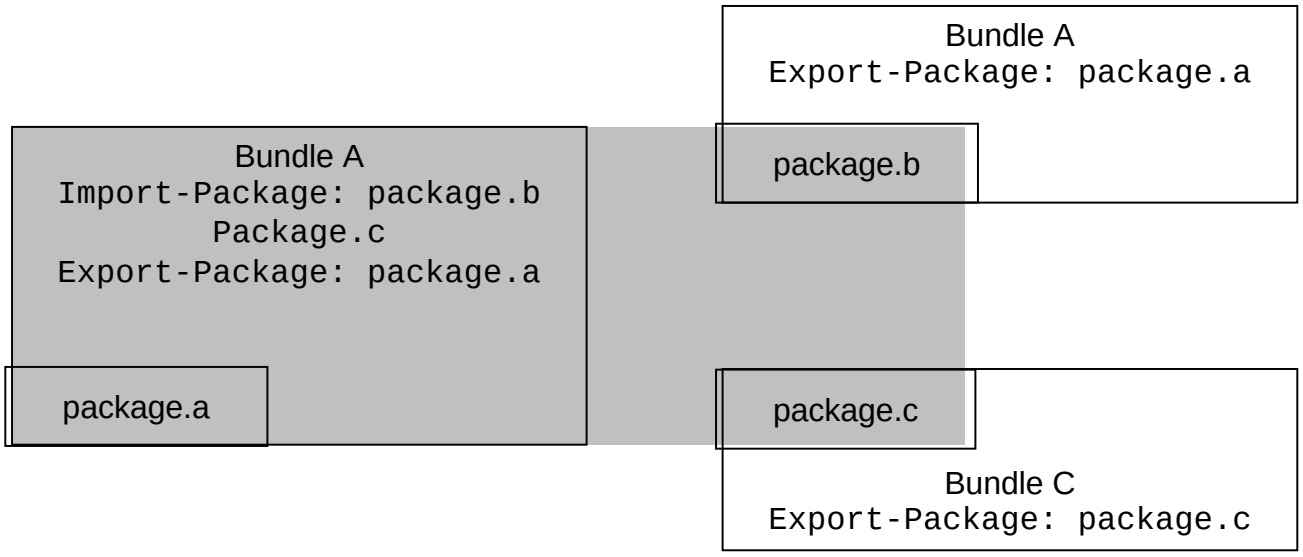
```
Bundle-SymbolicName: com.ibm.cics.server.examples.hello
Bundle-Version: 1.0.0
...
CICS-MainClass: examples.hello.HelloCICSWorld
Export-Package: my.library.classes 1.0.0
```

The Global Classpath

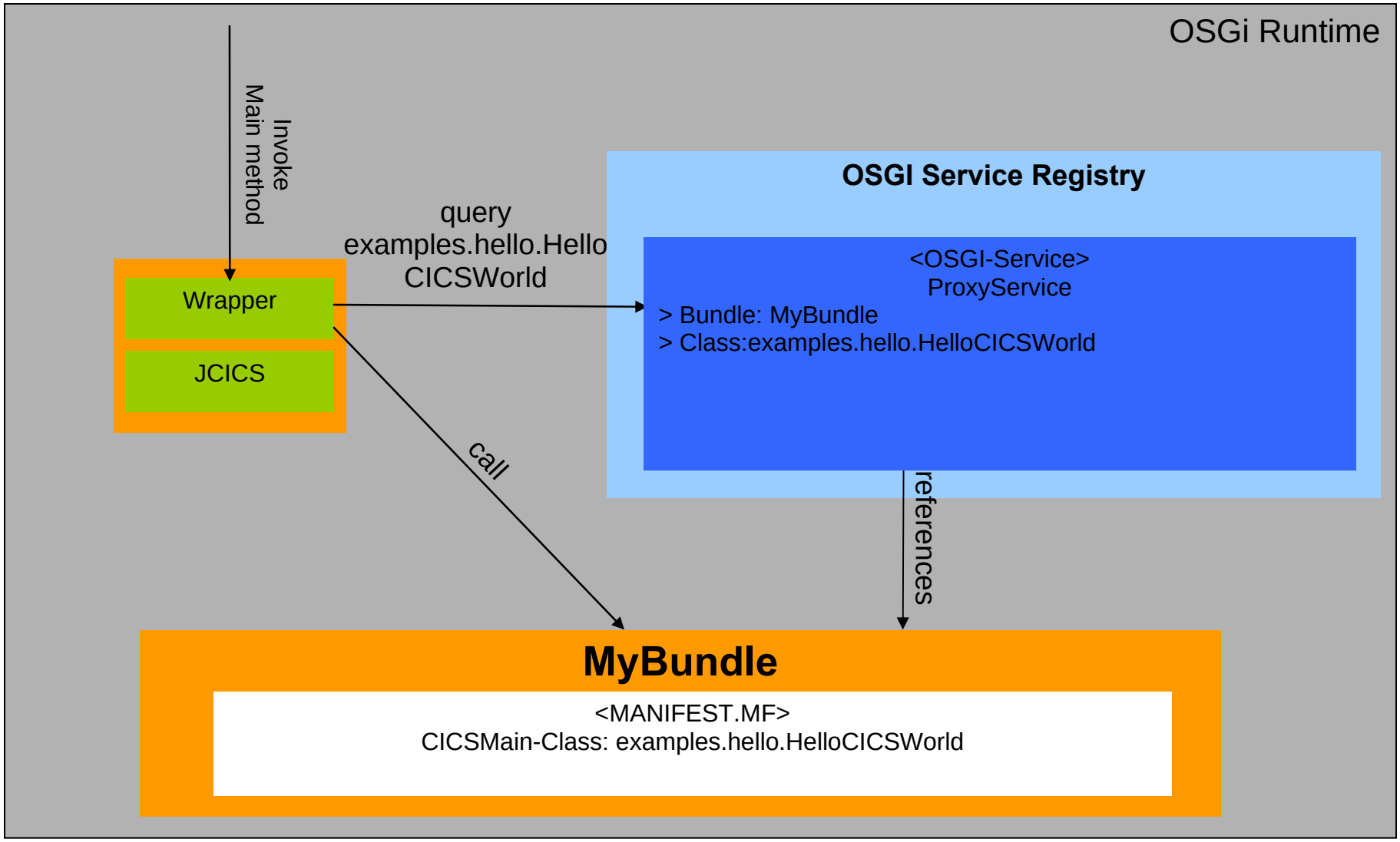


Class loading with OSGi

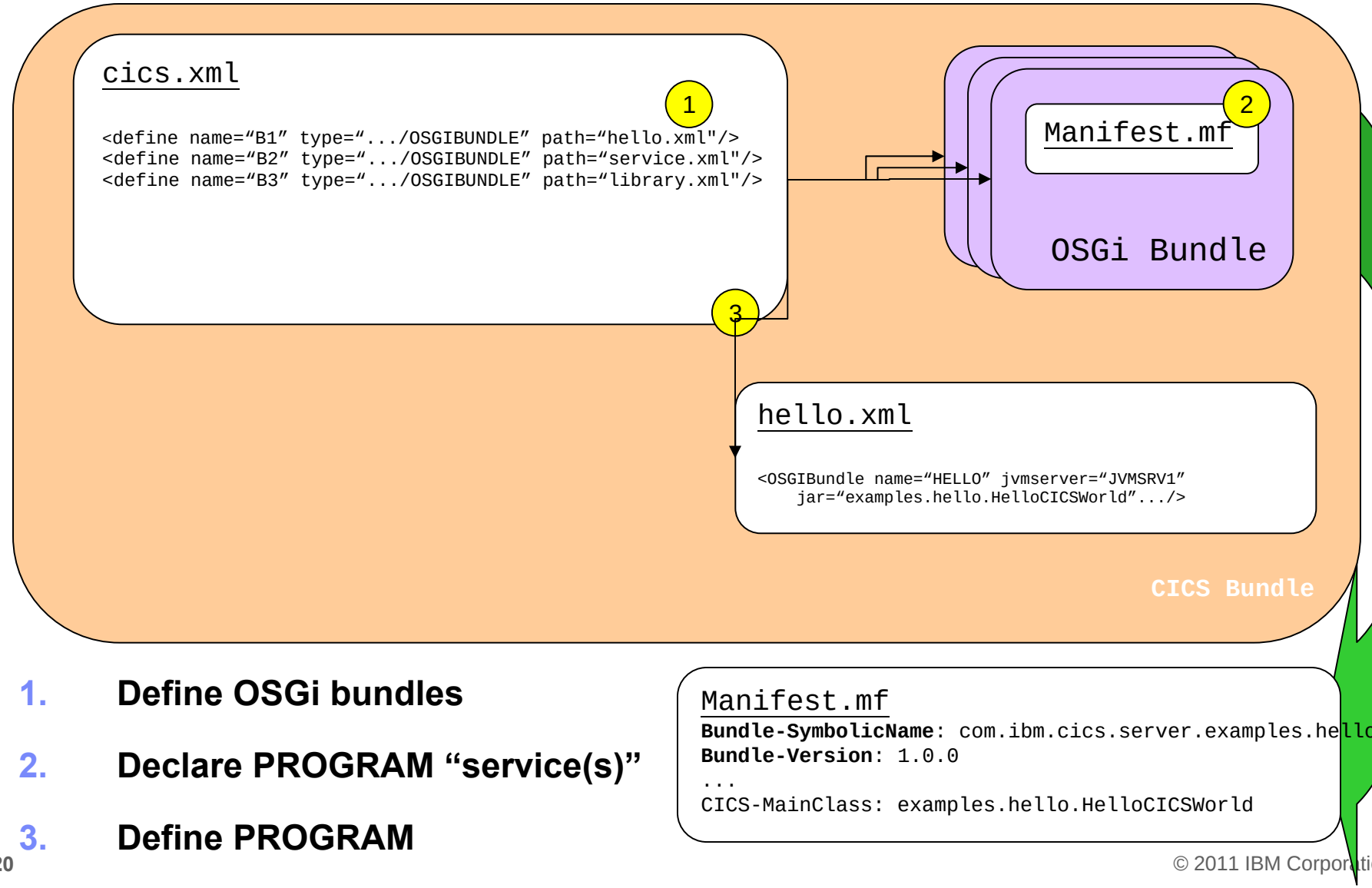
- **No more CLASSPATH**
  - Each bundle has its own class loader
- Class space is the classes required for the bundle
- Smallest unit is a package



JVMSERVER OSGi Details



Deployment with CICS Bundles



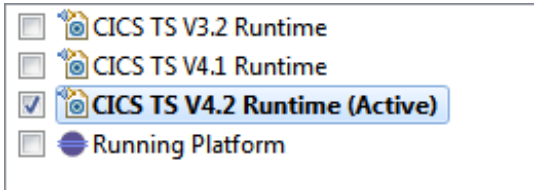
1. **Define OSGi bundles**
2. **Declare PROGRAM "service(s)"**
3. **Define PROGRAM**

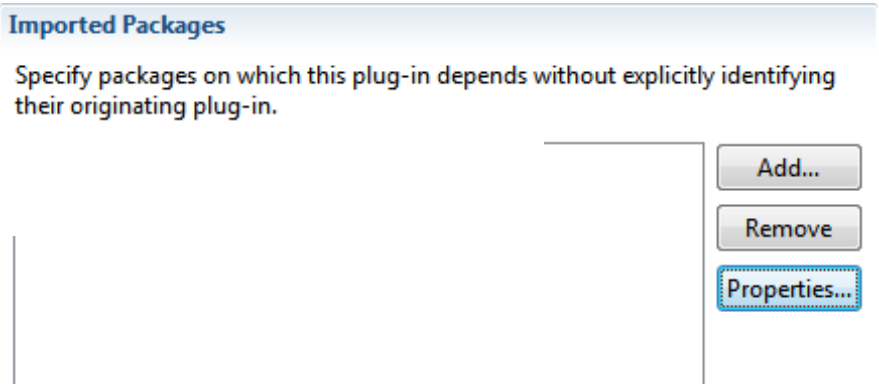
Manifest.mf

```
Bundle-SymbolicName: com.ibm.cics.server.examples.hello
Bundle-Version: 1.0.0
...
CICS-MainClass: examples.hello.HelloCICSWorld
```

CICS Explorer SDK - Development

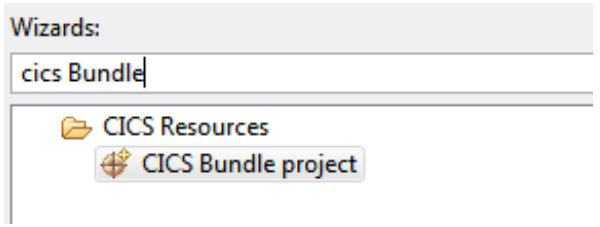
- **1. Install CICS Explorer SDK into Eclipse**
- **2. Set Target Platform (sets JCICS and JVM levels)**
  - Window -> Preferences… -> Target Platform- > Add…- > Template”
- **3. Create New OSGi Project**
  - New -> Plug-in Project
- **4. Provided access to JCICS package**
  - MANIFEST.MF -> Dependencies -> Imported Packages -> com.ibm.cics.server
  - Add other bundle imports if require
- **5. Import/Create Java class**

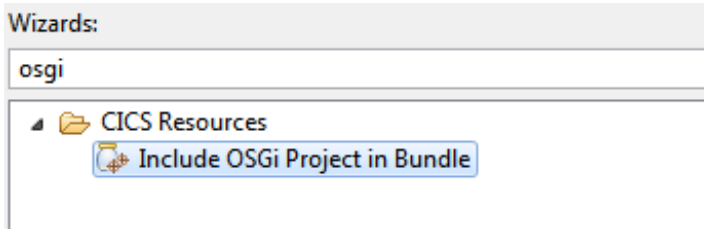


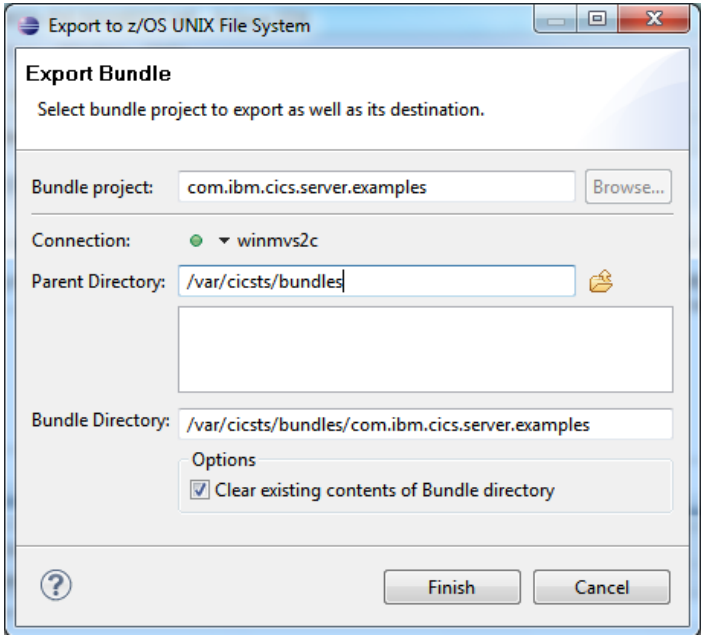


CICS Explorer SDK - Deployment

- **6. Create CICS Bundle**
  - New -> CICS Bundle Project
- **7. Add OSGi bundle meta data file to CICS Bundle**
  - New -> Include OSGi Project in Bundle
- **8. Provide CICS region userid read access to bundledir**
  - mkdir /var/cicsts/bundles
  - chmod 750 /var/cicsts/bundles 1
- **9. Connect CICS Explorer to USS FTP daemon**
  - Windows -> Open Perspective –> z/OS
- **10. Export CICS Bundle to CICS**
  - -> CICS to z/OS UNIX File System

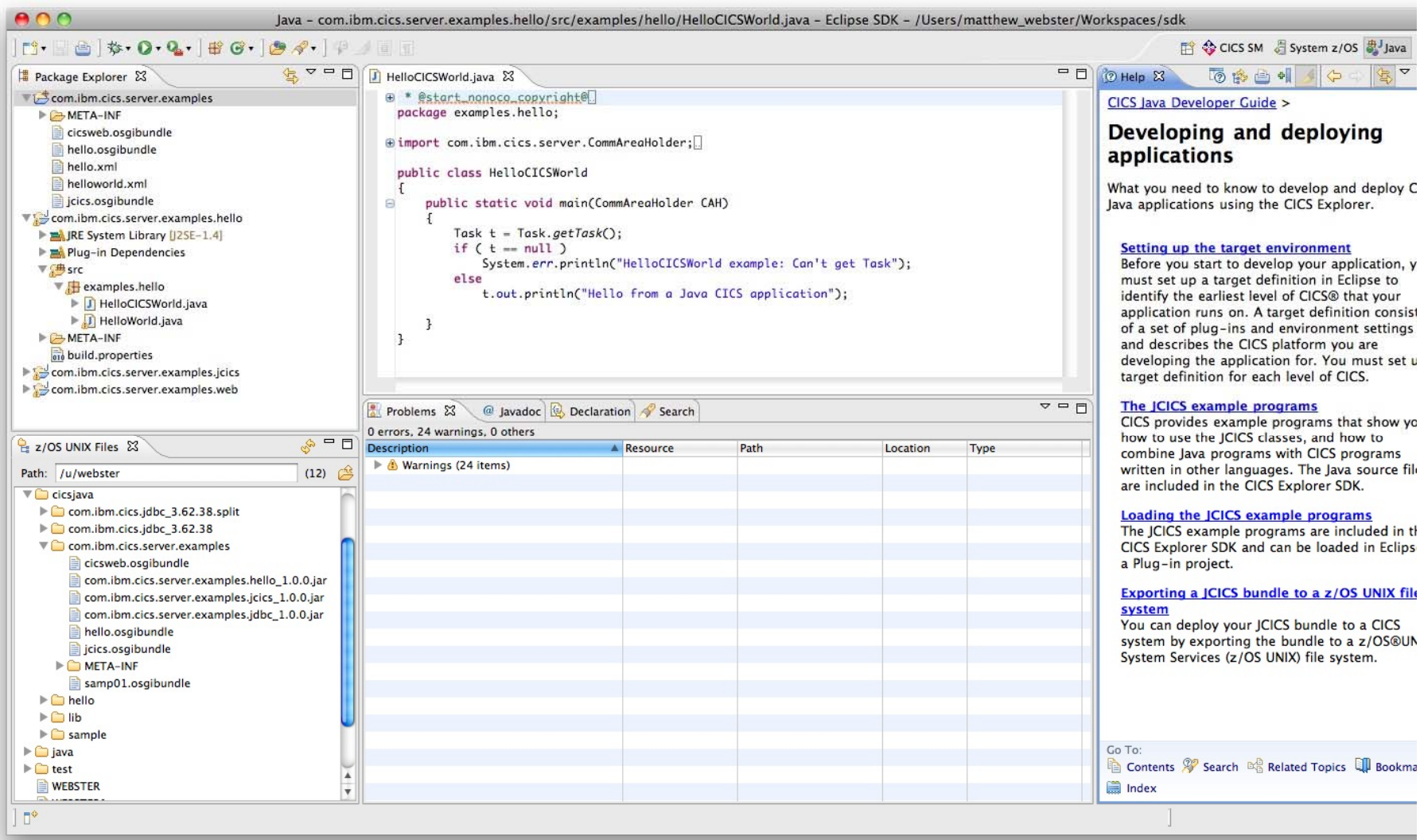




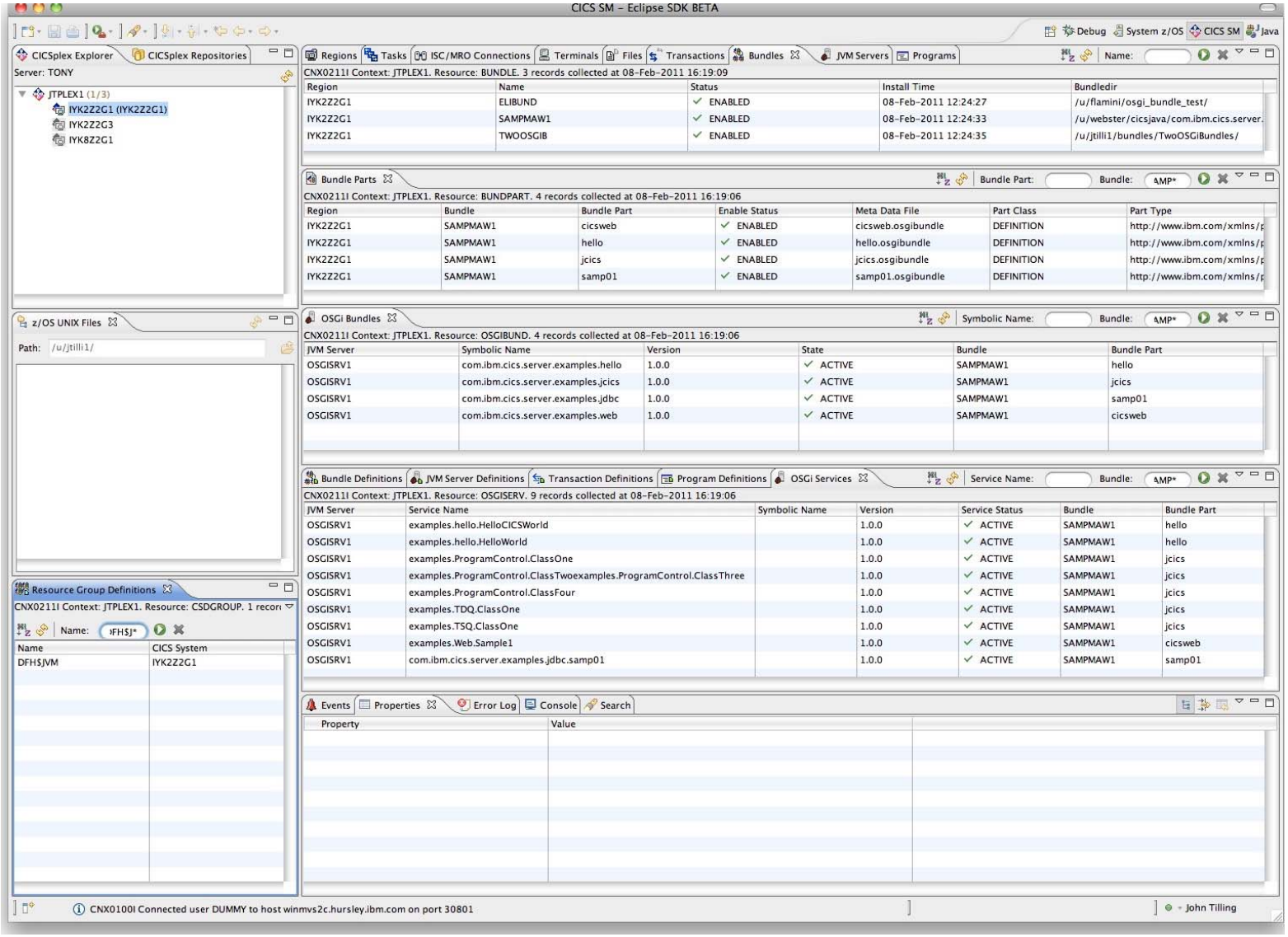


[1] **Note:** CICS region userid and FTP user must be in same USS group

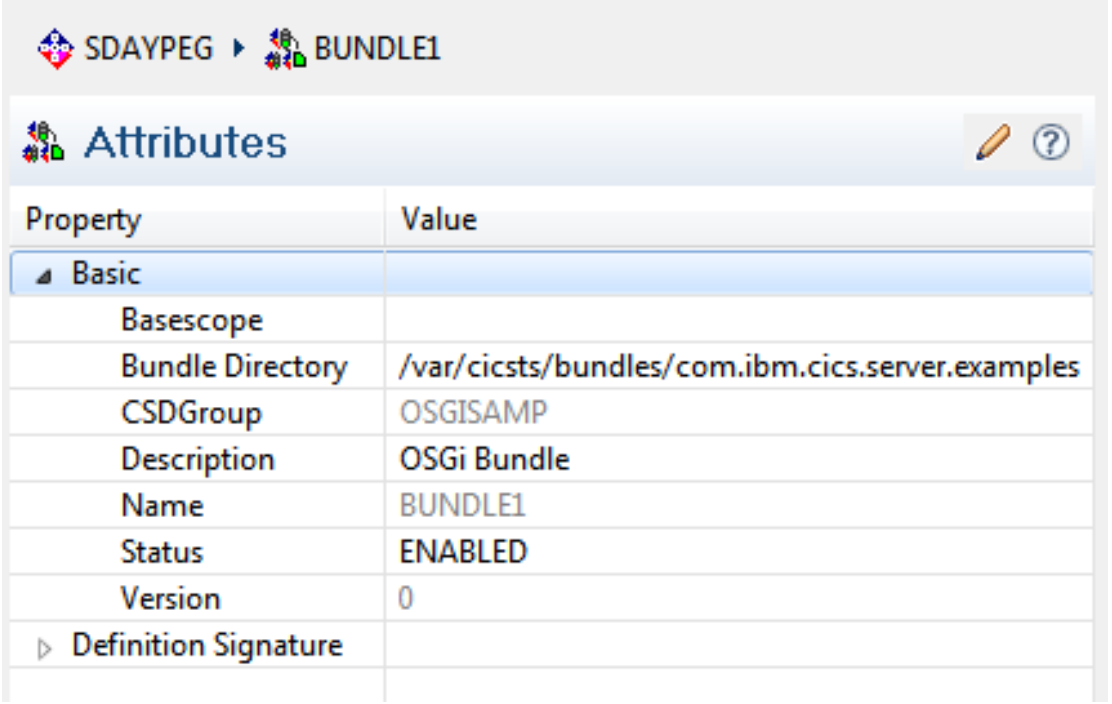
Developing Java applications with the CICS Explorer SDK



Bundles in CICS Explorer

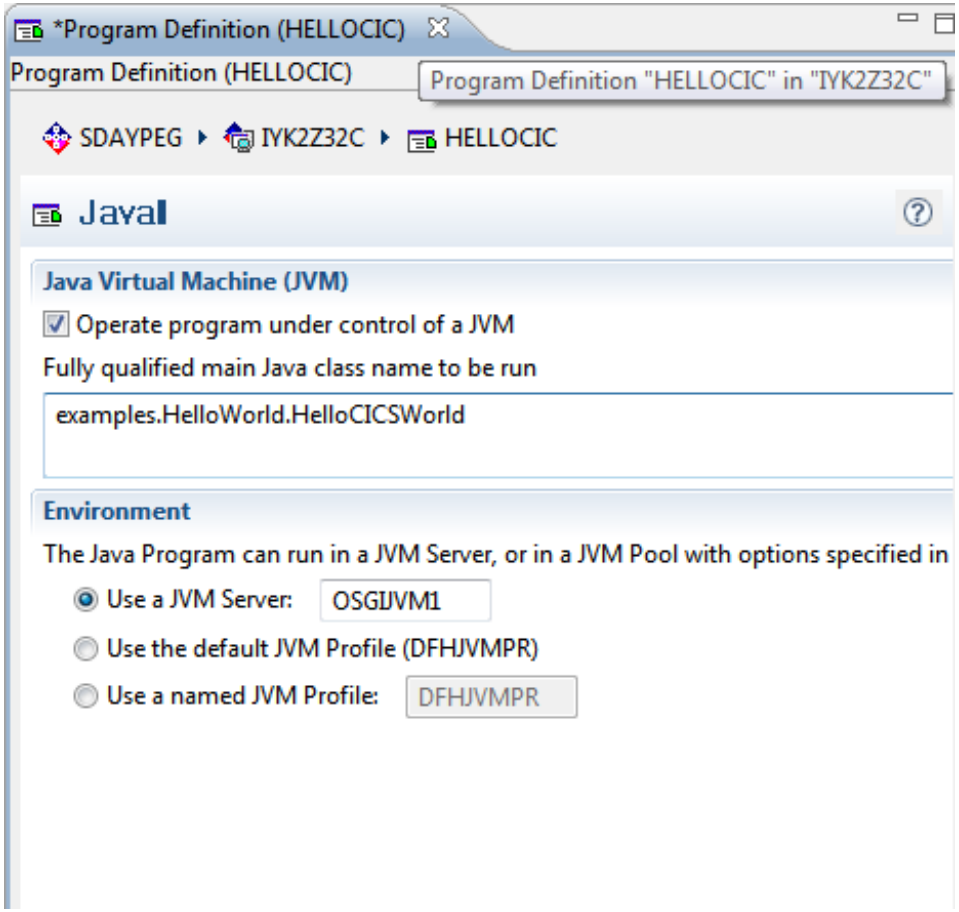


Defining a CICS BUNDLE



- Bundle Directory
  - Name of directory containing deployed JAR and bundle meta data files
- Status
  - ENABLED -> Activate on install of resource

Defining a Program to run in JVMSERVER



- JVMServer
  - Name of JVM server resource
- Main Java class
  - OSGIService defined in the OSGi bundle manifest
  - Either an alias or the full package.class name
- Also required
  - CONCURRENCY(THREADSAFE)
  - EXECKEY(CICS)

CICS Bundle Operations

BUNDLE
BUNDLEDIR=/var/cicsts/bundledir
com.ibm.cics.bundle

INSTALL
ENABLE
DISABLE
DISCARD

BUNDLEPART – B1
PARTYPE=OSGIBUNDLE

BUNDLEPART – B1
PARTYPE=OSGIBUNDLE

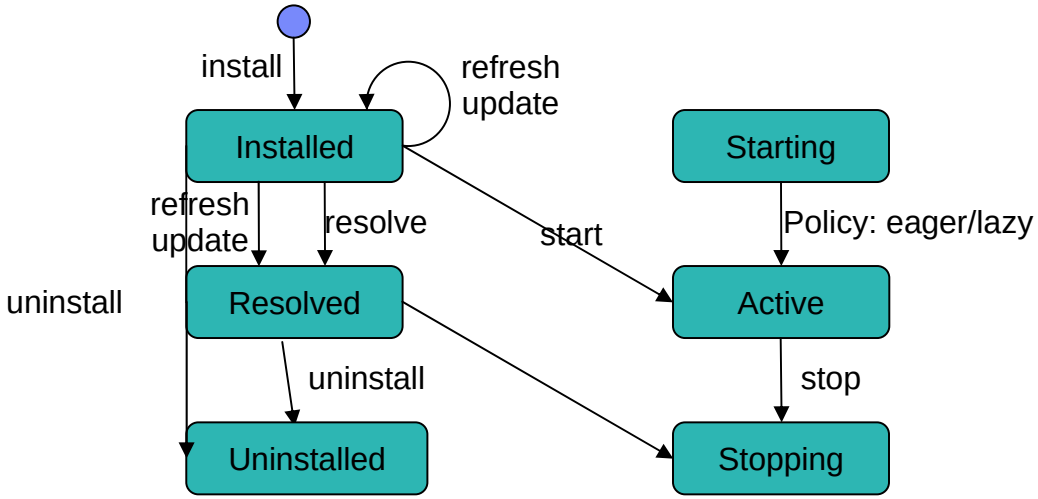
PROGRAM
Java Class = mypkg.ClassB1
JVMSERVER=MYJVM

INSTALL
ENABLE
DISABLE
DISCARD

OSGISERVICE

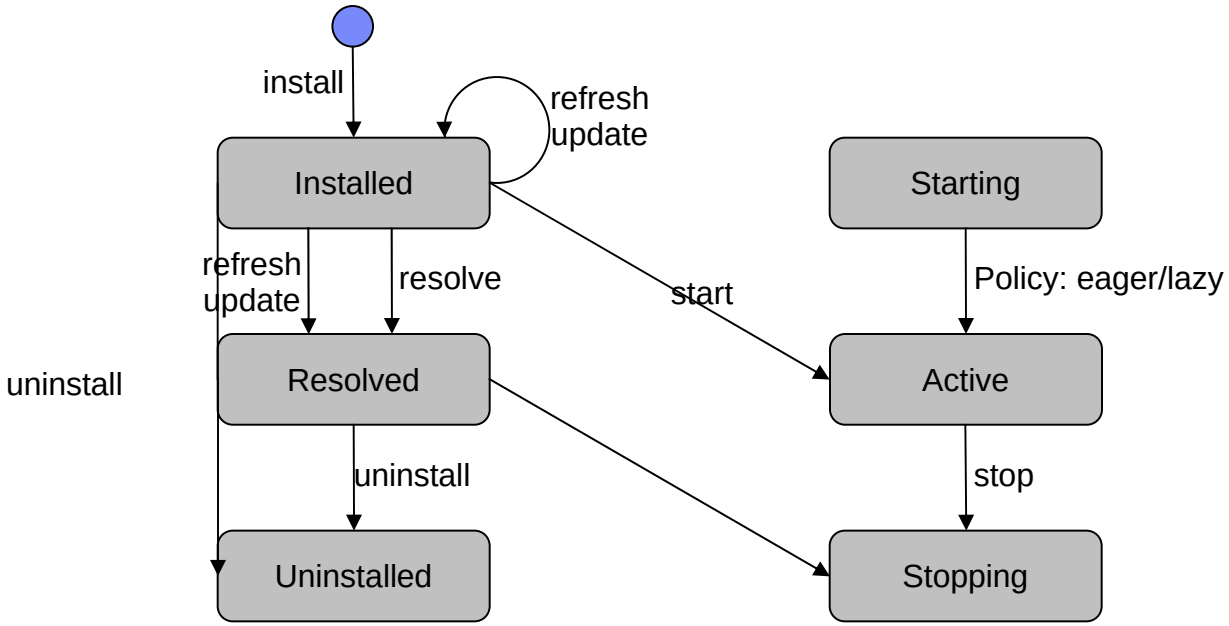
CICS-MainClass: mypkg.ClassB1

OSGIBUNDLE



Note: BUNDLEPART, OSGISERVICE and OSGIBUNDLE dynamically created based on BUNDLE lifecycle

OSGi Bundle Lifecycle



OSGi bundle state displayed in CICS Explorer OSGi bundle view

Tasks | Programs | JVM Serve | Bundles | Bundle Par | OSGi Bund | OSGi Servi | JVM Serve | Bundle De | Program D | Transactio

CNX0211I Context: IYK2Z32C. Resource: OSGIBUND. 4 records collected at 24-Mar-2011 09:41:29 — Symbolic Name:

Region	Symbolic Name	State	Bundle Part	Bundle	JVM Server	Install Time	Version	Bundle ID
IYK2Z32C	com.ibm.cics.server.examples.hello	✓ ACTIVE	hello	SAMPLES	OSGIJVM1	24-Mar-2011 09:41:11	1.0.0	13
IYK2Z32C	com.ibm.cics.server.examples.jcics	✓ ACTIVE	jcics	SAMPLES	OSGIJVM1	24-Mar-2011 09:41:11	1.0.0	14
IYK2Z32C	com.ibm.cics.server.examples.web	✓ ACTIVE	cicsweb	SAMPLES	OSGIJVM1	24-Mar-2011 09:41:11	1.0.0	15
IYK2Z32C	sleep	✓ ACTIVE	sleep	SLEEP	OSGIJVM1	23-Mar-2011 21:49:46	1.1.0	12

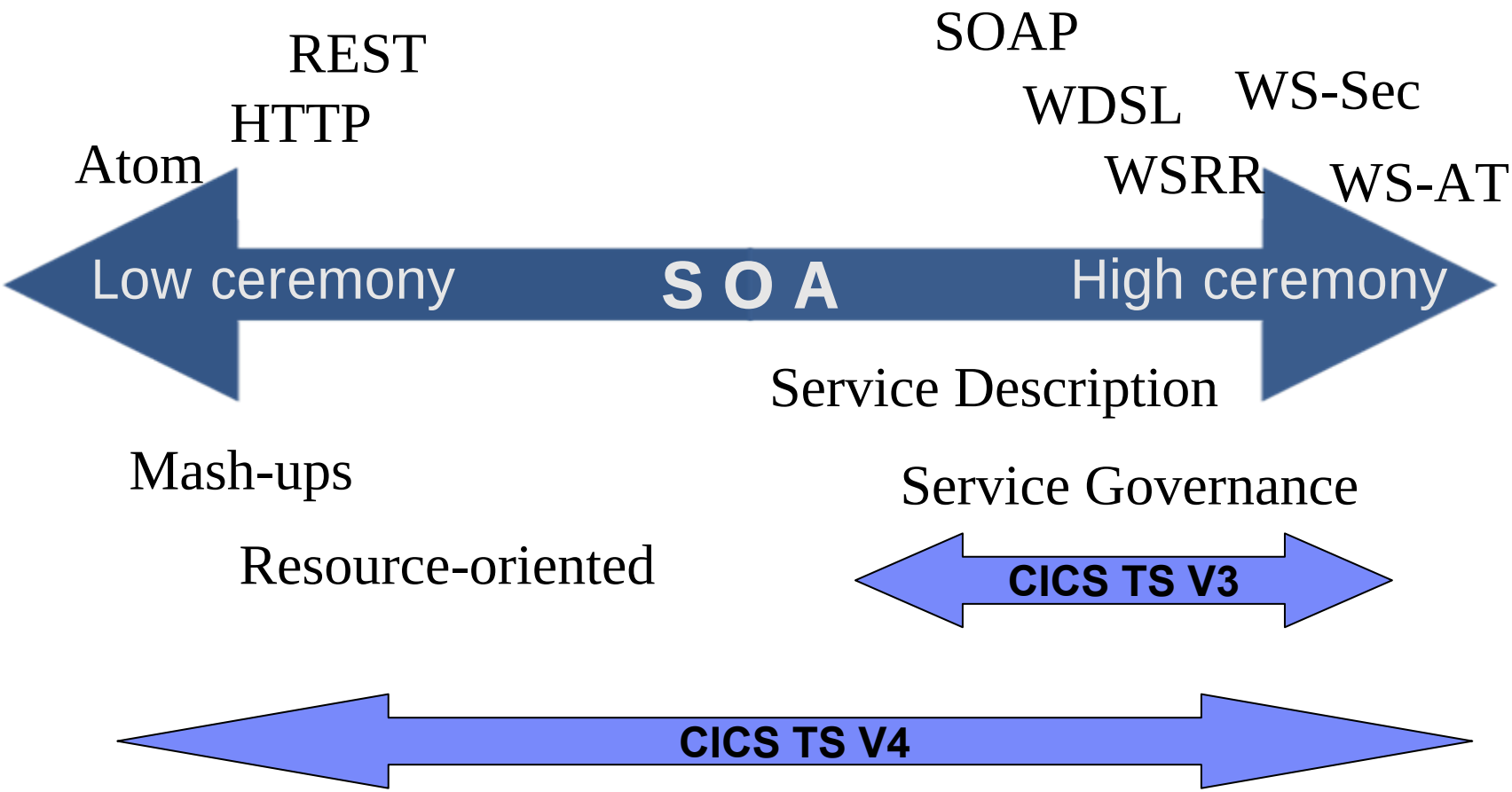
CICS OSGi bundle resource states

BUNDLE	BUNDLEPART	OSGIBUNDLE	OSGISERVICE
DISABLING	**DISABLING**	**STOPPING**	***n/a***
DISABLED	**DISABLED**	**INSTALLED** **RESOLVED** **UNINSTALLED** [2]	***n/a***
	UNUSABLE	***n/a***	***n/a***
ENABLING	**ENABLING**	***n/a***	***n/a***
ENABLED	**ENABLED**	**STARTING** [1]	***n/a***
		ACTIVE	**ACTIVE** **INACTIVE** [3]

1 – Bundle activation policy = lazy
2 – Transitory state during termination
3 - Inactive OSGIService if duplicates existing active OSGI service or Main class invalid

Service Enablement

A Spectrum of Service Enablement



RESTful web services

- **REST**
  - REpresentational State Transfer - See http://en.wikipedia.org/wiki/Representational_State_Transfer
  - How the Web has always worked...
    - HTTP methods POST | GET | PUT | DELETE
      … all the verbs you'll ever need
    - Everything else is a *resource* – with a representation of its state

- **“Clean and meaningful URLs”**
  - For everything!
  - e.g. a file, a database, a TSqueue....
    - or a single record within each resource

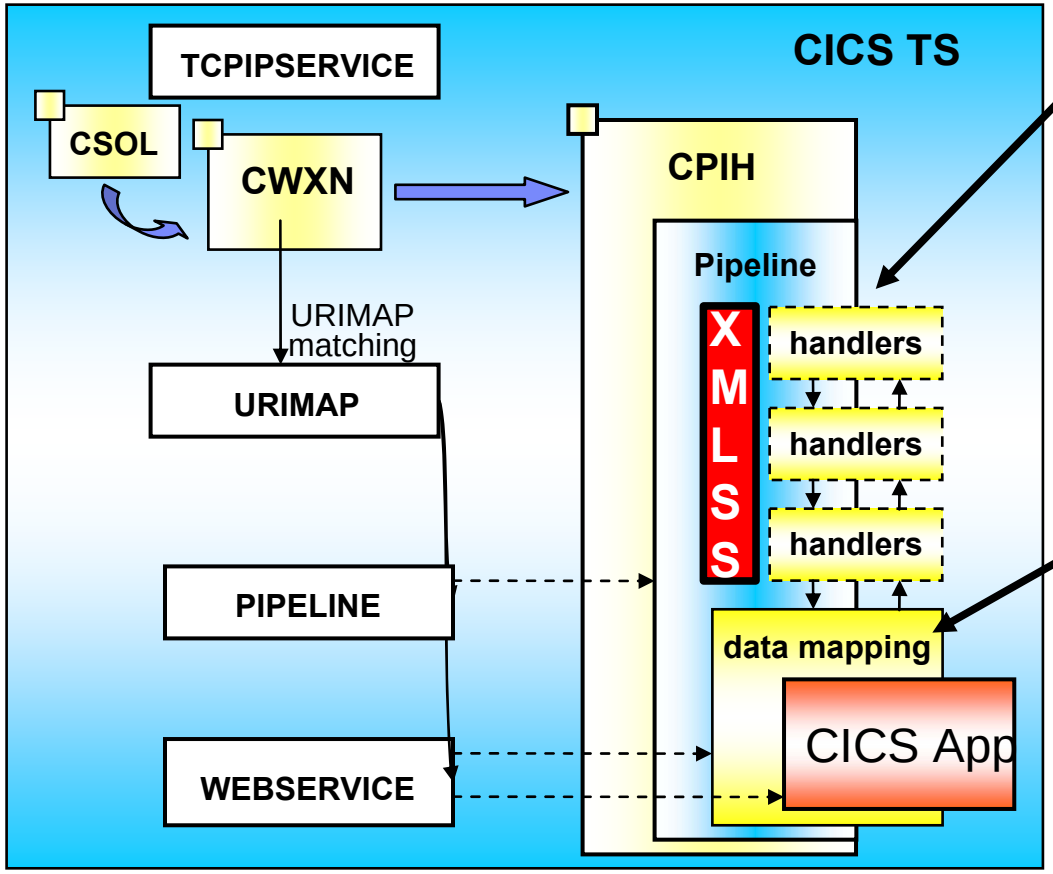
Atom Consumability enhancements in CICS TS V4.2

- **Simplified deployment and administration of ATOM services**
- **ATOMSERVICE and XMLTRANSFORM resources can be deployed via CICS BUNDLEs**
  - Appropriate URIMAP will be dynamically generated
- **CICS Explorer enhancements to generate and deploy the BUNDLE**
- **Sample BUNDLEs provided with general-purpose XMLTRANSFORM resources for use in creating ATOM Feeds**

XML to language structure mapping services

- **API to convert between XML and application data**
  - Map between XML and language structure
- **EXEC CICS TRANSFORM TRANSFORMTYPE(XMLTODATA ¦ DATATOXML)**
- **Command options depend on the direction of the transformation**
  - XMLTRANSFORM resource provides XML binding and schema used for the transformation
    - Required for DATATOXML, optional for XMLTODATA (depending on whether transforming or querying XML)
  - XMLTRANSFORM resource installed via Bundle support
- **CICS XML Assistant**
  - Batch utilities that transform XML into high-level language structures and vice versa
  - Generate metadata in XML bind file, stored on z/OS UNIX

CICS and z/OS XML System Services Parser (XMLSS)

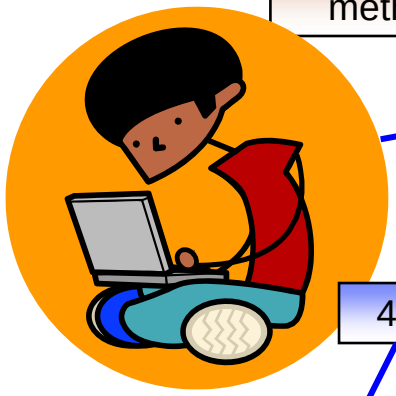


- **First parse of message now uses XMLSS**
  - Locates the SOAP headers
  - Handler execution is outside of XMLSS
- **XMLSS is zAAP eligible**
  - Offloads MIPS for this element of the processing
- **"Shredding" of body into Containers or Commareas is *NOT* XMLSS**
  - and so ***NOT*** zAAP eligible.

WS-Addressing goals

- **Defines transport-neutral mechanisms to address Web services and support message transmission through networks**
- **Improves interoperability with other Web Services implementations such as .NET**
- **XML elements to identify Endpoints: EndpointReferences (EPRs)**
  - More than just a URI
  - Can have Reference Parameters and metadata
  - Allows for Psuedo-Conversational style web service requesters in CICS
- **WS-Addressing Message Addressing Properties (MAPs)**
  - Standard placeholders in the SOAP header for WS-Addressing information
  - Plus reference parameters in target EPR

Example of a WS-Addressing Resource Access Pattern



1. New shopper invokes a factory method to get a shopping cart

2. Service creates new EPR

3. Add Reference Parameter containing cart ID. Eg. Cart A

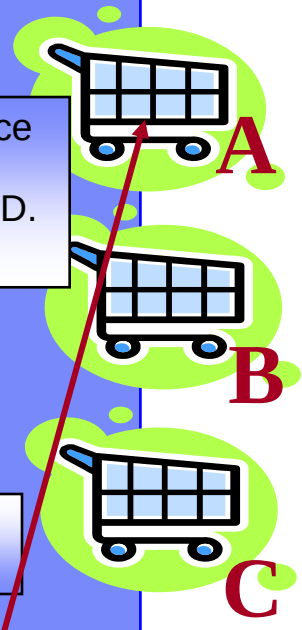
4. Return EPR in SOAP Body

5. This EPR is then used for subsequent invocations

6. IWS op=update

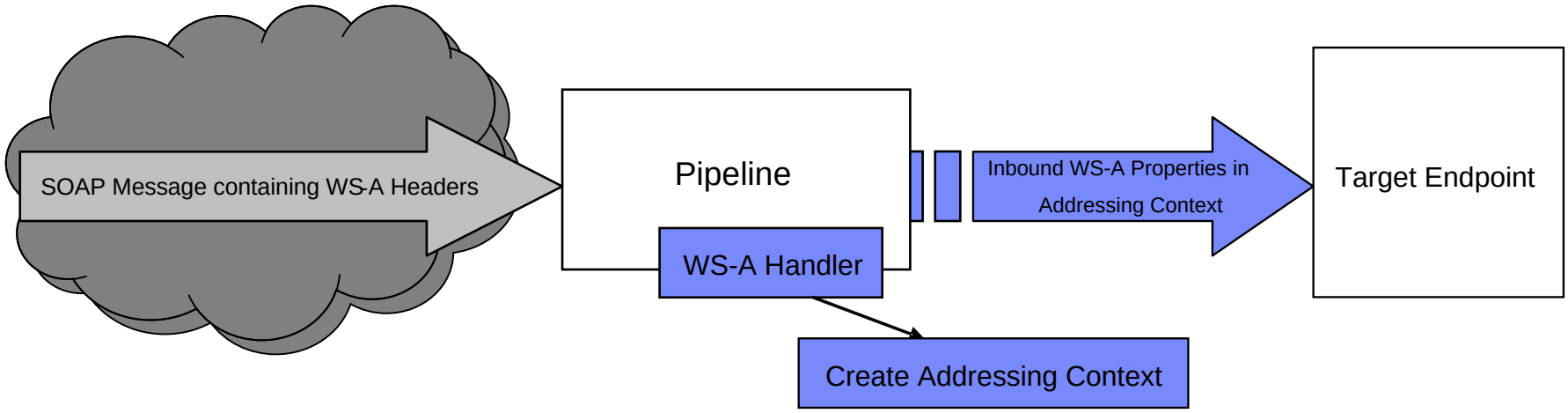
7. Service gets Reference Parameter From Addressing Context

8. Service knows which cart to update




```
<wsa:EndpointReference>
  <wsa:Address>www.market.com</>
  <wsa:ReferenceParameters>A</>
</wsa:EndpointReference>
```

WS-Addressing in CICS



WS-Addressing in CICS

- **Pipeline configuration**
  - Configure Requester pipeline to use WS-Addressing handler giving specification version
  - Configure Provider pipeline to use WS-Addressing handler
- **Requester**
  - Requester application is not aware requests are WS-Addressed
    - CICS handles the required addressing responses
  - Requester is WS-A aware
    - Uses EXEC CICS API to create an addressing context and set Message Addressing Properties (MAPs)
- **Provider**
  - Provider application is not aware request/response is WS-Addressed
    - CICS handles the required addressing responses and routing
  - Provider is WS-A aware
    - Uses EXEC CICS API to interrogate Addressing Context and set MAPs (e.g. Get EPR to extract Reference parameters)
    - ReplyTo or FaultTo EPR used for reply endpoint (default is anonymous address to reply back to the requester)

Summary

- **Revitalize your applications using modern practices**
  - Exploit new CICS capabilities with Bundles
  - Develop, package and deploy java applications in standard way with OSGi and CICS JVM Servers
  - Easy to use XML Transforms
    - and reduce licence fees with zAAP offload
  - Improve interoperability with WS-Addressing

Resources

For more information

CICS Development Technical Services

Engage the IBM Hursley CICS development team to ensure that you get the maximum value from your CICS investments.

Consultants are now available via a funded services engagement directly from CICS development providing a complete range of CICS services - no one has more experience!

- **For more information please contact: CICSDTS@uk.ibm.com**

CICS On Demand Seminars

Free customised technical agenda of CICS TS and CICS tools products

- Web Services, Events, Web 2.0, version upgrades, tooling etc.

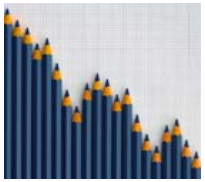
Targeted at AD, System Programmers and Architects at customers' own location

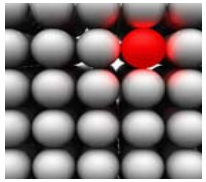
Demonstrates how to use the new features in the latest releases to leverage existing solutions

Can be tailored to customers interests

- **For more information please contact: cicssem@uk.ibm.com**






CICS Communities and Information

- **CICS Transaction Server V4.2**
  - http://ibm.com/cics/tserver/v42
- **CICS Explorer**
  - Home page ibm.com/cics/explorer
- **Twitter**
  - Subscribe to the IBM_System_z channel & CICSfluff channel to get CICS news flashes
- **Facebook I ♥ CICS group**
  - News and views
- **YouTube channels**
  - CICS Explorer - Videos, demos and other cool stuff
  - CICSFluff - Other CICS videos
- **CICS Blog - Comment and opinion**
  - TheMasterTerminal.com
- **CICS eNews**
  - Subscribe for news about CICS and related products
- **CICS Links regular updates all in a single presentation deck**

Thank You !