

# CICS TS V4.2 - Connectivity

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IBM Hursley

Wednesday August 10<sup>th</sup> 2011  
Session Number 9599

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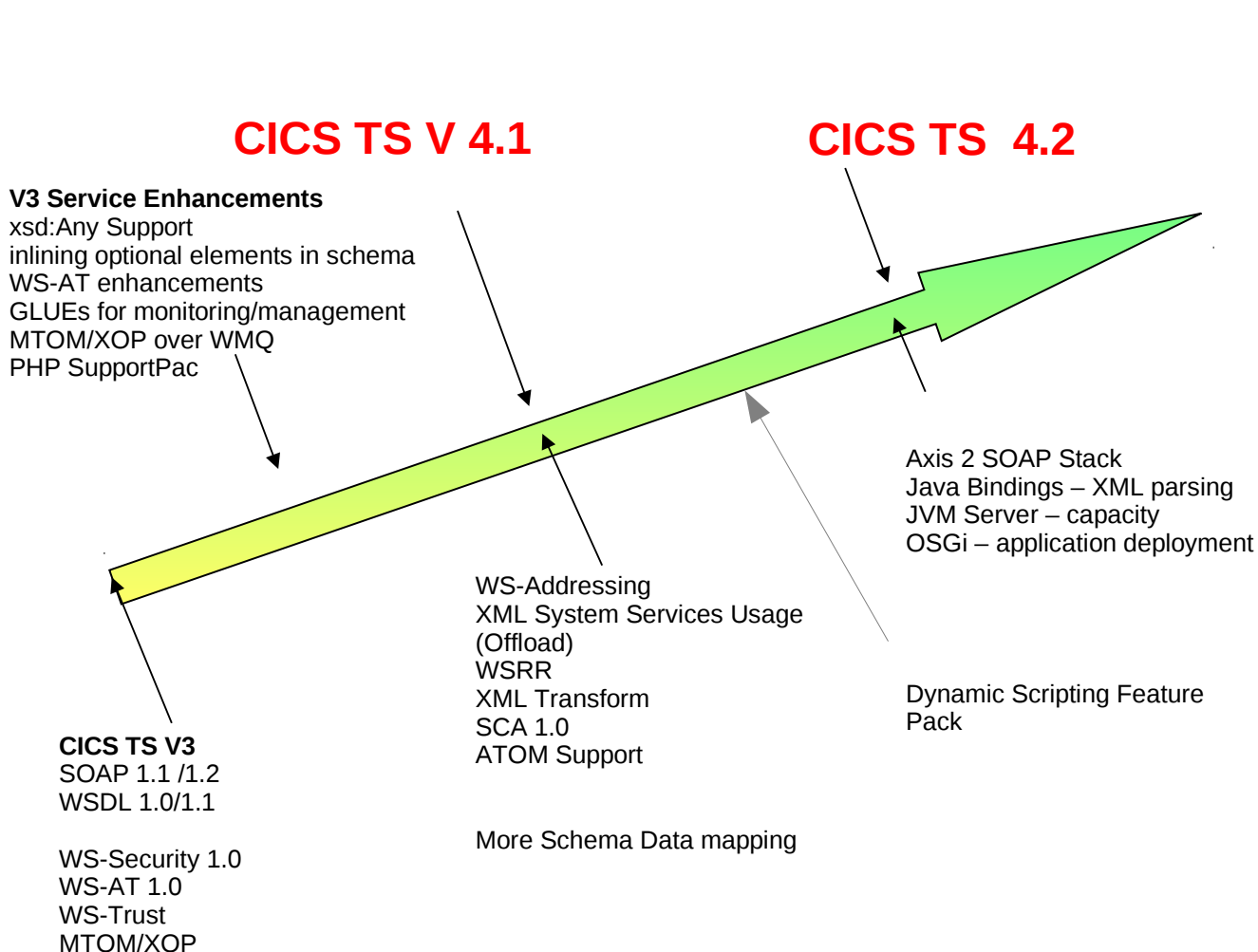
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# Agenda

- Version 4 Connectivity
- IP Interconnectivity between CICS regions extended to function shipping
- Web Services
  - Option to use Axis2 stack for web services
  - Simpler Java applications in web services
- Outbound HTTP connection pooling
- Inbound HTTP connection throttling
- DB2 connection management
- WebSphere MQ support
- Atom Enhancements



# CICS SOA Roadmap



## Web Services Vision

CICS TS continues as a First-Class Web Services endpoint (Provider and Consumer).

The environment of choice for Web Services that interact with CICS assets.

# Web Services Highlights in CICS TS V4.1

- XML Parser Changes
  - Faster
  - ZAAP offload
- WS-Addressing
  - Better support for asynch and stateful message exchange patterns
- ATOM Support
  - Web 2.0 Feeds and Collections
  - From Files and TSQs
- XML TRANSFORM API
  - XML Data mapping without the Web Service
  - SOAP Headers / Custom data mapping

# Dynamic Scripting Feature Pack for CICS TS V4.1

- Script in PHP, Groovy, Java
- Respond to HTTP requests
- Call CICS programs from PHP or Groovy
- Access DB2 databases from PHP, Groovy, ZRM
- Call any JCICS interface from PHP or Groovy
  - Manage units of work (commit/rollback)
- Use event handlers to easily create RESTful Web Services
- Debug PHP scripts with Rational Developer for Z.
- Access any Java class from PHP code using the PHP/Java Bridge

# *IP InterConnectivity (IPIC)*

# IPIC Reminder

- IPIC – IP InterCommunications Protocol
  - Provide CICS communications support over TCP/IP as an alternative to that provided over ISC and MRO
- TCP/IP alternative to SNA for CICS communications, to
  - Enable network convergence and simplification
  - Address SNA skills shortage
  - Reduce cost of infrastructure
  - Take advantage of TCP/IP features on z/OS
  - Exploit high bandwidth OSA connectivity (QDIO)
- Multi-version delivery
  - No plans to remove existing SNA support
  - Migration of infrastructure without modification of CICS applications
  - Provide CICS with IP choice for most of the CICS comms-related programming model
- White paper 'CICS delivers IP interconnectivity' available at:
  - <http://www.ibm.com/software/http/cics/tserver/v32/library/index6.html>



# IPIC functions and releases

- IPIC extensions in CICS TS V4.1
  - Asynchronous processing (STARTs), restricted to function shipping of START, START CHANNEL, and CANCEL commands
  - Supported with or without terminal
  - Transaction routing for 3270 terminals only
  - Simplified CICSplex SM definitions for IPIC (SYSLINKs)
- IPIC extension in CICS TS V4.2
  - **Function shipping** (small bullet point, large value)
  - Enhanced routing for terminal-based STARTs

# IPIC for function shipping

- Function Shipping between CICS TS V4.2 regions (or later) for
  - File Control
  - Transient Data
  - Temporary Storage
    - Including TS MAIN function shipping (which is supported by MRO but not APPC)
- Enhanced routing (i.e. ROUTABLE=YES) of terminal-based START requests (previously only traditional routing supported over IPIC)
- Requests function shipped over IPIC are threadsafe due to mirror program running threadsafe (exception is TD, which is not yet threadsafe)
- New MIRRORLIFE option on IPCONN
  - Can provide efficiency and performance benefits

# *Web Services Enhancements*

# Axis2 engine for Web Services

- **Axis2:** Java-based open source web services engine
- New option to use Java SOAP message handlers that use Axis2 to process SOAP messages
  - Specified via pipeline configuration
  - Add Java SOAP handler to pipeline configuration file, and enable a JVM server for Axis2 processing to run in
  - Optionally, write Axis2 handlers (in Java) to process SOAP headers
  - Same externals as native stack: no need to regenerate bind files etc.
- Axis2 SOAP processing and some of the CICS pipeline processing become eligible for zAAP offload
  - Can reduce processing costs
- Can be used entirely transparently to applications
  - Also opens the opportunity for applications to do data mapping themselves – data mapping by CICS rewritten in Java, and with exit points

# Provider Mode using Java Web Services

- New Java CICS provided SOAP handler

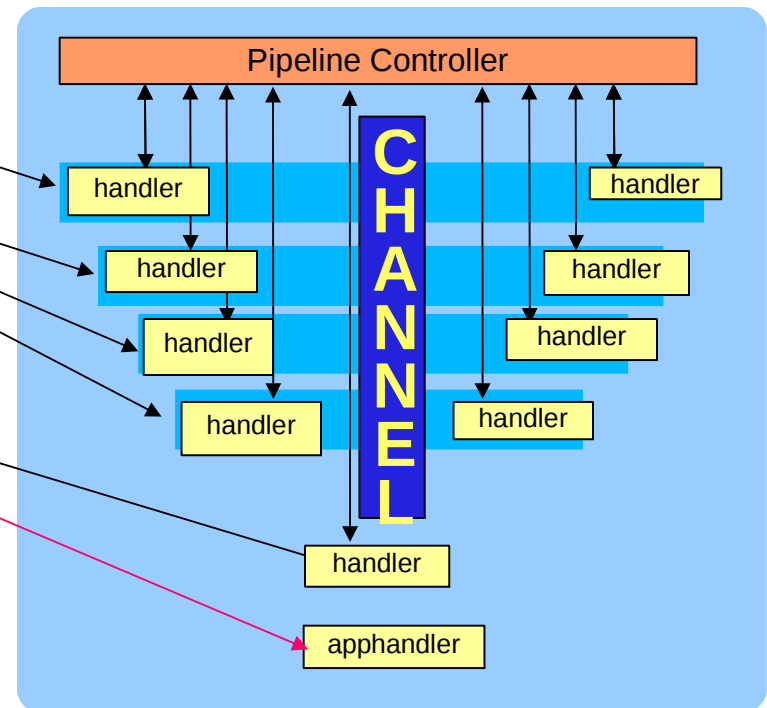
```
<transport>
:
</transport>
```

```
<service>
  <service_handler_list>
  :
  </service_handler_list>
  <terminal_handler>
    <cics_soap_1.1_handler_java/>
  </terminal_handler>
</service>
```

```
<apphandler_class>
com.ibm.cicsts.axis2.CICSAxis2ApplicationHandler
</apphandler_class>
```

```
<service_parameter_list />
```

```
</provider_pipeline>
```



# Provider Mode Java Web Services...

- Configuration for the Java application handler
  - Apphandler Class `com.ibm.cicsts.axis2.CICSAxis2ApplicationHandler`
  - JVMSERVER
    - Define a JVMSERVER for execution
  - JVM profile updates
    - Add `JAVA_PIPELINE=YES` to the profile used
  - Pipeline configuration file changes
    - `jvmserver`
    - `Repository`
    - `addressing`

# Provider Mode Java Application Handler...

- Example pipeline configuration file:

```
<service>
  <terminal_handler>
    <cics_soap_1.1_handler_java>
      <jvmserver>MYJVM</jvmserver>
      <repository>/u/fboh/wsdl/axis2</repository>

      <headerprogram>
        <program_name>MYPROG</program_name>
        <namespace>http://www.example.org/headerNamespace</namespace>
        <localname>*</localname>
        <mandatory>true</mandatory>
      </headerprogram>

    </cics_soap_1.1_handler_java>
  </terminal_handler>
</service>

<apphandler_class>com.ibm.cicsts.axis2.CICSAxis2ApplicationHandler
</apphandler_class>
```

# Java applications as Web Services

- Deploy Axis2-style webservices: POJO as provider web services
- Java interfaces for Web services
  - Use Java (zAAP offloadable) for data mapping of Web services
- Improve integration of CICS and Java applications for in-bound Web services
  - Pipeline can call directly to CICS service provider applications written in Java
- Improve price performance of existing Web Services by allowing the data mapping (bind file processing) to be executed in a JVM server (and thus be eligible for zAAP offload).
- Suitably written Java applications/components can interact directly with the Java object model of incoming messages, rather than containers used by traditional languages
  - Avoids cost of serializing to XML and parsing the XML



# Java Web Services with Axis2

- New Java application handler for provider mode
  - Configuration
- New support for provider mode Java application
  - Configuration
  - Application preparation

# Provider Mode User Java Application Handlers

- New application handler user written in Java
  - Use is optional
  - Executes in a JVMSERVER
  - Eligible for zAAP off-load processing
    - XML data conversion can be off-loaded
- Based on Axis2 technology
  - An Open Source project from the Apache organization
    - <http://ws.apache.org/axis2/>

# Provider Mode Java Application Handler...

- New Java CICS provided application handler

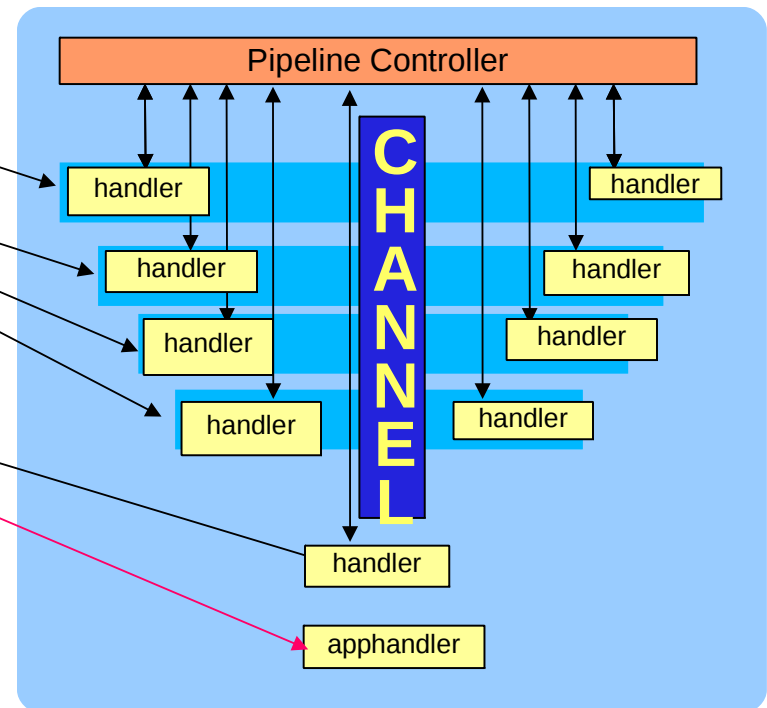
```
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:
</transport>
```

```
<service>
  <service_handler_list>
  :
  </service_handler_list>
  <terminal_handler>
    <cics_soap_1.1_handler_java/>
  </terminal_handler>
</service>
```

```
<apphandler_class>...</apphandler_class>
```

```
<service_parameter_list />
```

```
</provider_pipeline>
```



# Provider Mode Java Application Handler...

- Configuration for the Java application handler
  - Apphandler Class
    - Replace IBM supplied class with your own
  - JVMSERVER
    - Define a JVMSERVER for execution
  - JVM profile updates
    - Add JAVA\_PIPELINE=YES to the profile used
  - Pipeline configuration file changes
    - jvmserver
    - Repository
    - addressing

# Provider Mode Java Application Handler...

- Example pipeline configuration file:

```
<service>
  <terminal_handler>
    <cics_soap_1.1_handler_java>
      <jvmserver>MYJVM</jvmserver>
      <repository>/u/fboh/wsdl/axis2</repository>

    </cics_soap_1.1_handler_java>
  </terminal_handler>
</service>
<apphandler_class>my.company.AppHandler
</apphandler_class>
```

# Provider Mode Axis2 Web Service

- Start with an existing Java application
  - POJO using JAX-WS
- Compile the Java application
  - `javac TestAxis2.java`
- Generate the WSDL and Bindings
  - `wsgen -cp TestAxis2 - wsdl`
- Package the application
  - `Jar -cvf TestAxis2.jar *`

# Provider Mode Axis2 Web Service...

- Deploy the jar file to the Axis2 repository
  - Must be deployed to a **servicejars** directory in the repository
  - Repository is specified in the pipeline configuration file
- Define and install a URIMAP
  - Automatic install of a URIMAP cannot be used
  - Path name must follow Axis2 conventions
    - **/name\_of\_serviceService.name\_of\_portPort/suffix**
- A WEBSERVICE definition is not used

# Provider Mode Axis2 Web Service...

- Restrictions
  - Axis2 applications interact with CICS with the Axis2 programming model
  - Some CICS services are not available
    - SOAPFAULT CREATE
    - WSACONTEXT GET
    - DFHWS-OPERATION container
    - DFHWS-MEP container
    - DFHWS-USERID container
    - DFHWS-TRANID container
    - Web services security

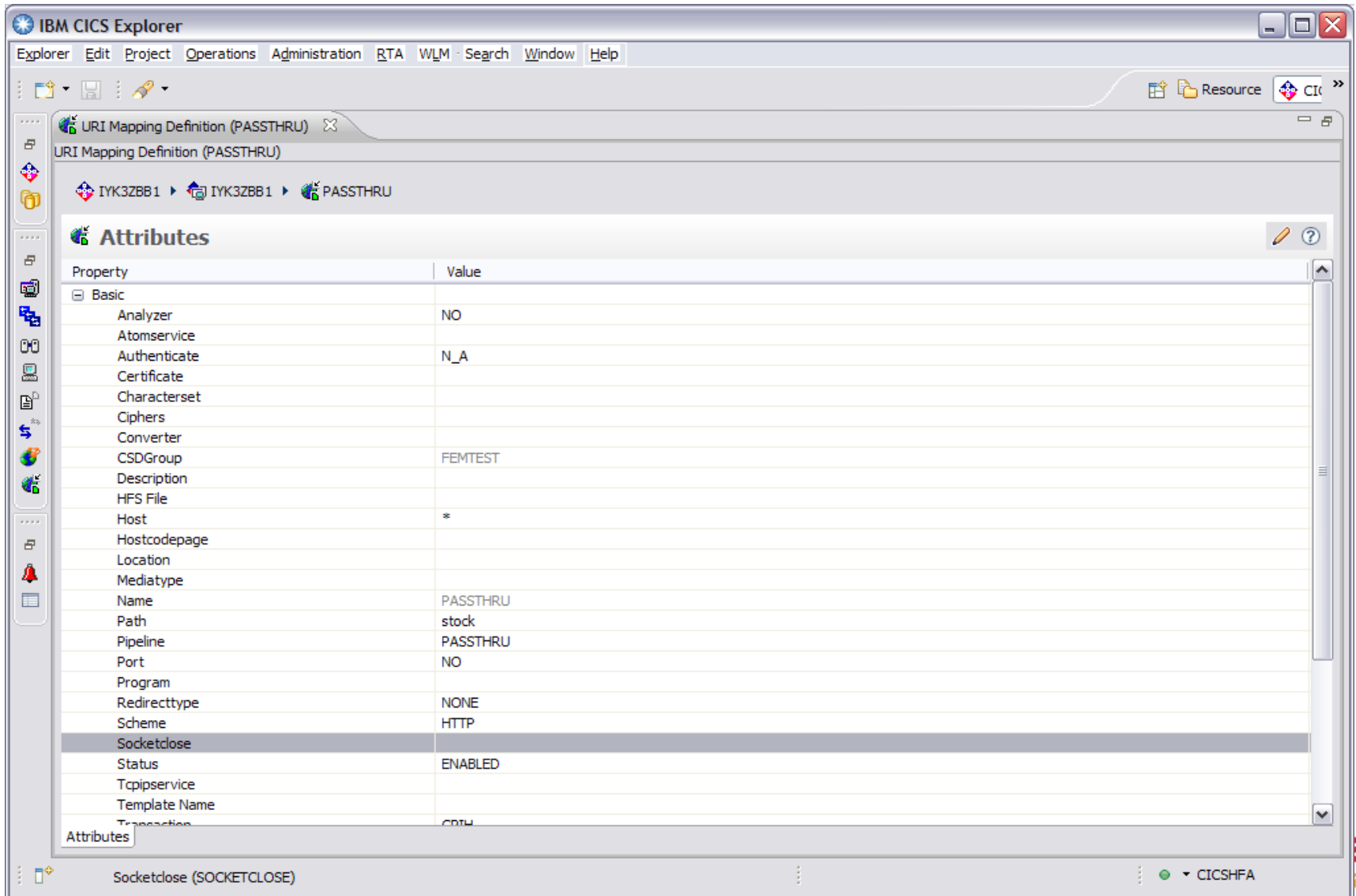


# *Connection Management*

# HTTP Outbound Connection Pooling

- Reuse of connections for outbound HTTP requests in *or across* tasks
  - Re-use connections which have the same properties, as defined by URIMAP
  - SOCKETCLOSE timeout option on client URIMAP
    - Non-zero value means HTTP requests using that URIMAP can use connections (sockets) from a pool
      - Applies to any HTTP requests using the same client URIMAP
      - No code changes needed to benefit, except when using CICS WEB interface
      - Benefits HTTP EP adapter
    - SOCKETCLOSE is timeout time for length of time socket remains available for reuse from the pool
- 26 of 42 Socket will be removed from pool if errors returned, or if any problems are detected

# Socket Close Attribute

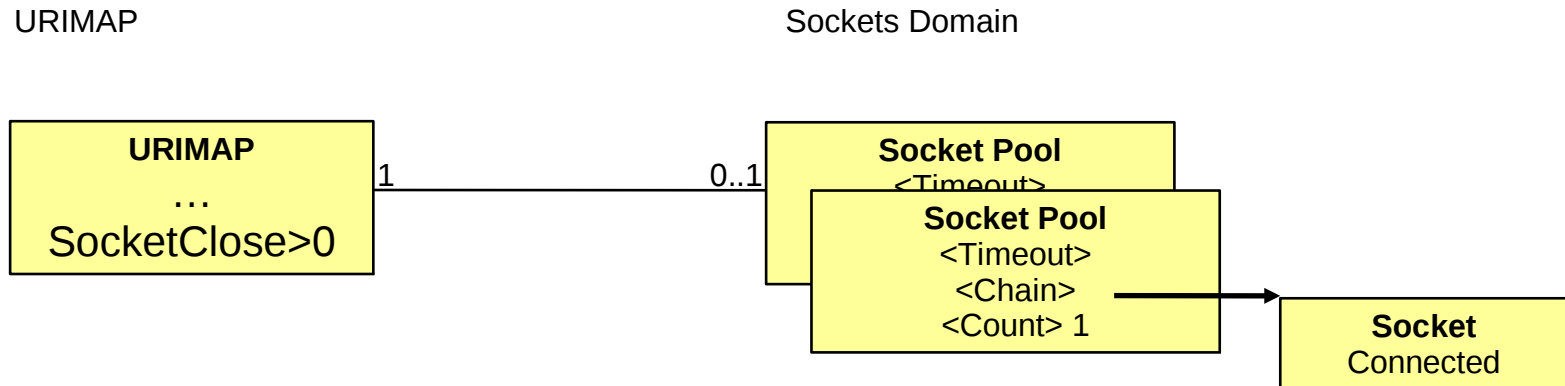


The screenshot shows the IBM CICS Explorer interface. The main window displays the 'URI Mapping Definition (PASSTHRU)' configuration. The 'Attributes' tab is active, showing a table of properties and their values. The 'Socketclose' attribute is highlighted in the table.

Property	Value
Analyzer	NO
Atomservice	
Authenticate	N_A
Certificate	
Characteraset	
Ciphers	
Converter	
CSDGroup	FEMTEST
Description	
HFS File	
Host	*
Hostcodepage	
Location	
Mediatype	
Name	PASSTHRU
Path	stock
Pipeline	PASSTHRU
Port	NO
Program	
Redirecttype	NONE
Scheme	HTTP
Socketclose	
Status	ENABLED
Tcpipservice	
Template Name	
Transaction	COTM

The status bar at the bottom indicates the current selection is 'Socketclose (SOCKETCLOSE)' and the CICS region is 'CICSHFA'.

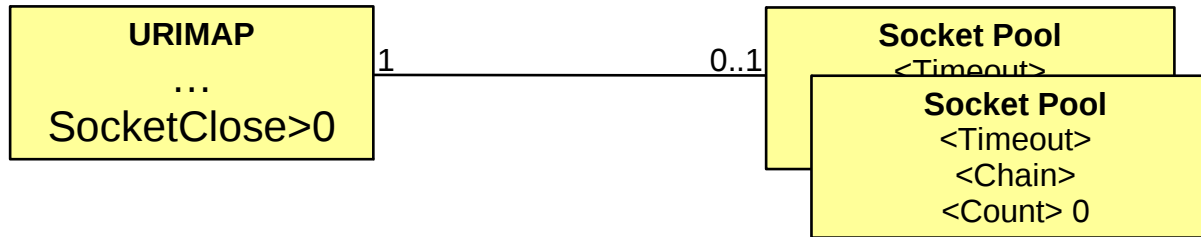
# HTTP Connection Pooling Diagram



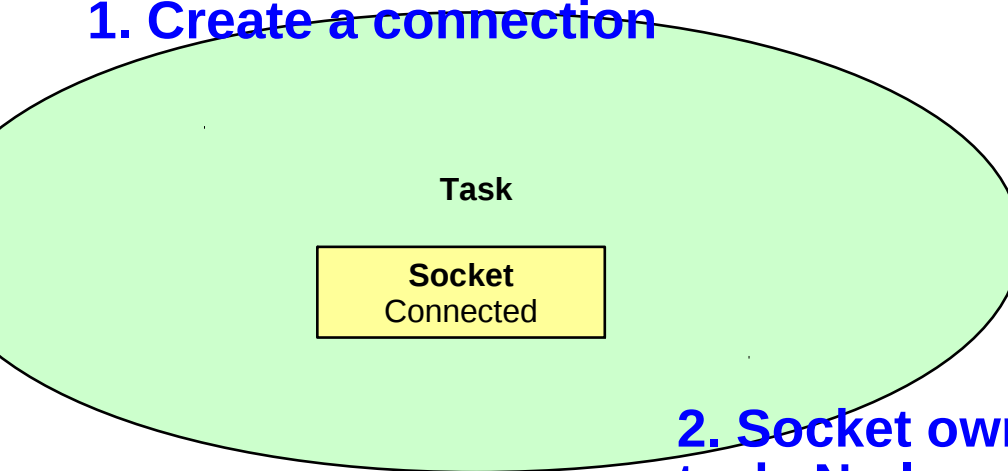
# HTTP Connection Pooling Diagram

URIMAP

Sockets Domain



**1. Create a connection**

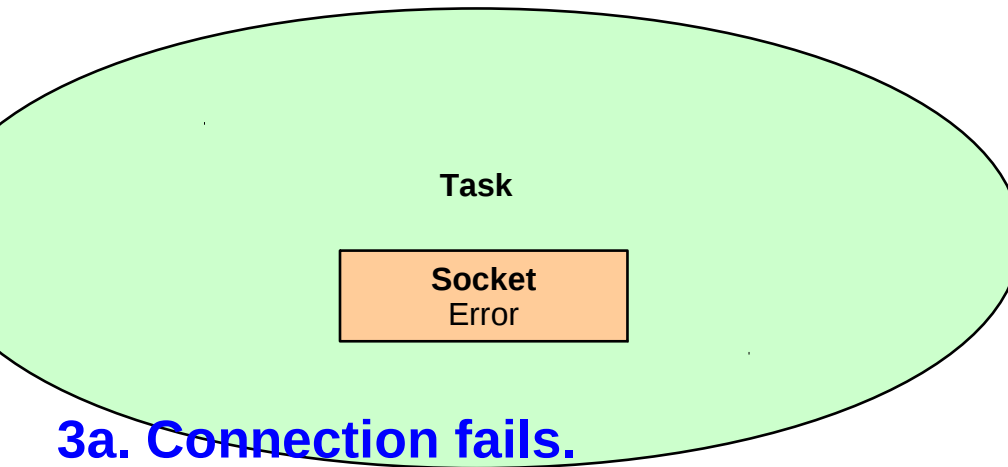
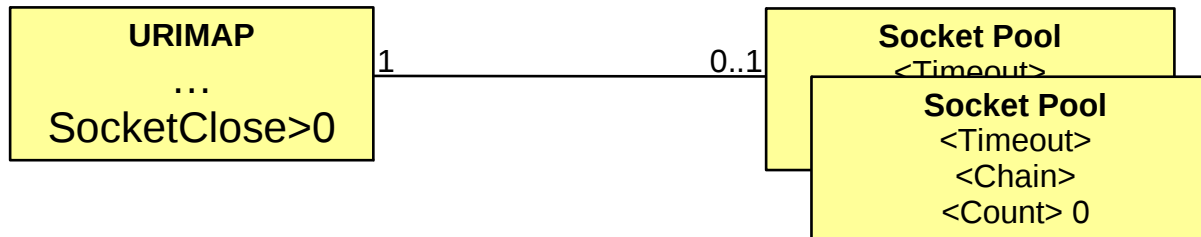


**2. Socket owned by task. No longer in pool**

# HTTP Connection Pooling Diagram

URIMAP

Sockets Domain



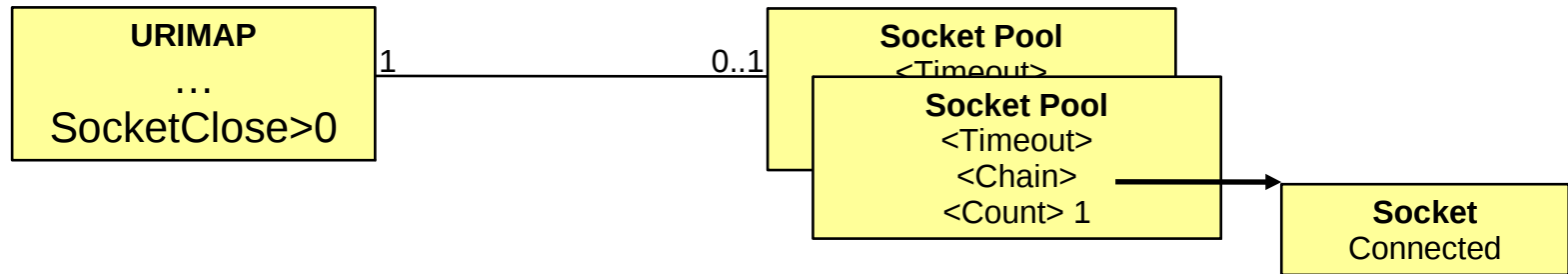
**3a. Connection fails.**

**Close as before**

# HTTP Connection Pooling Diagram

URIMAP

Sockets Domain



Task

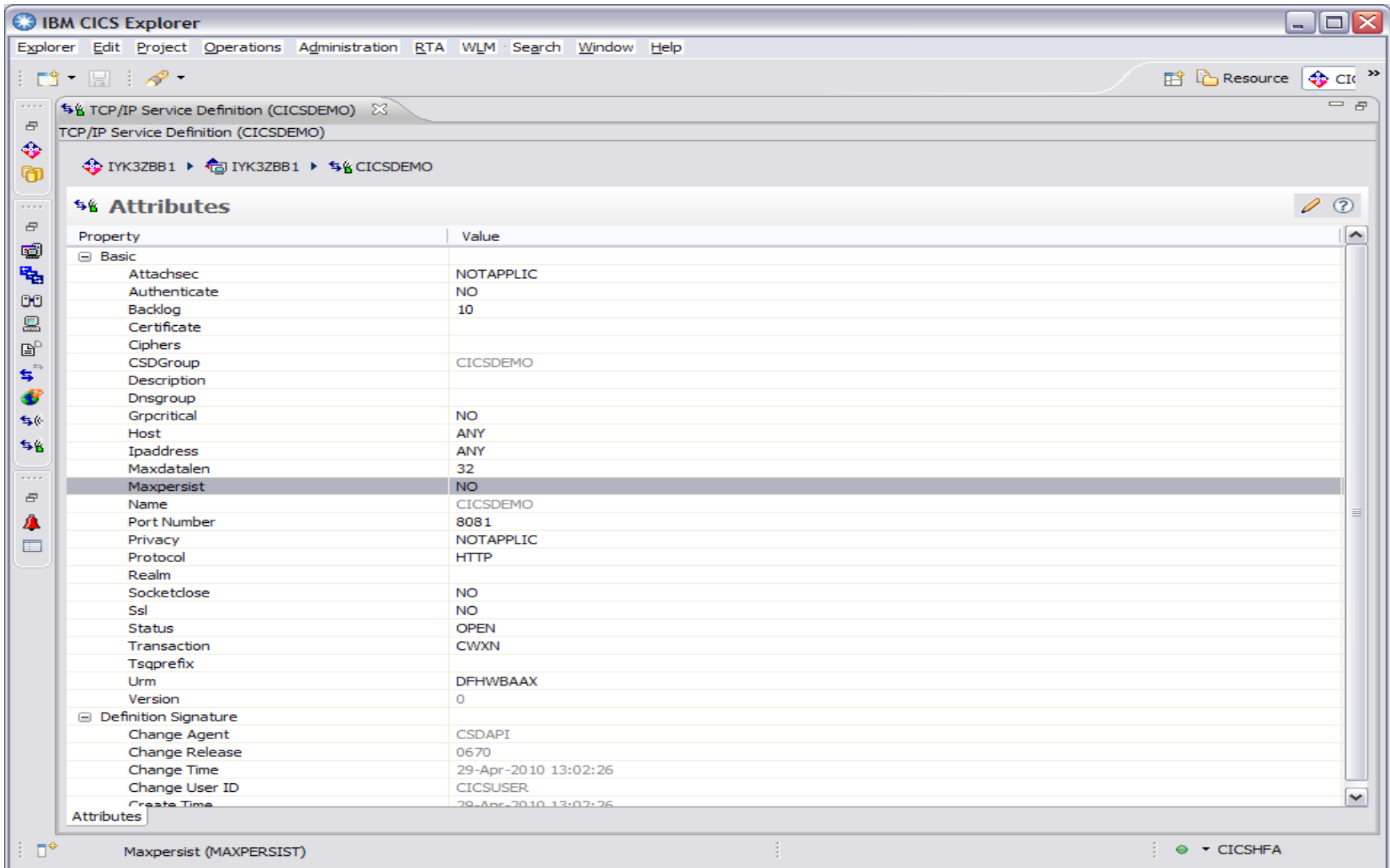
**3b. Task completes ok**  
**Return socket to pool**

# HTTP Inbound Connection Throttling

- Option to limit the number of persistent connections from web clients that are allowed on a port (at any one time)
- MAXPERSIST option on TCPIP SERVICE
  - Number of persistent connections
  - Socket 'closed' if number exceeded
  - Default is NO
- Provides a way to “throttle” incoming requests without leaving them queueing



# Max Persist Attribute



IBM CICS Explorer

Explorer Edit Project Operations Administration RTA WLM Search Window Help

TCP/IP Service Definition (CICSDEMO)

TCP/IP Service Definition (CICSDEMO)

IYK3ZBB1 IYK3ZBB1 CICSDEMO

### Attributes

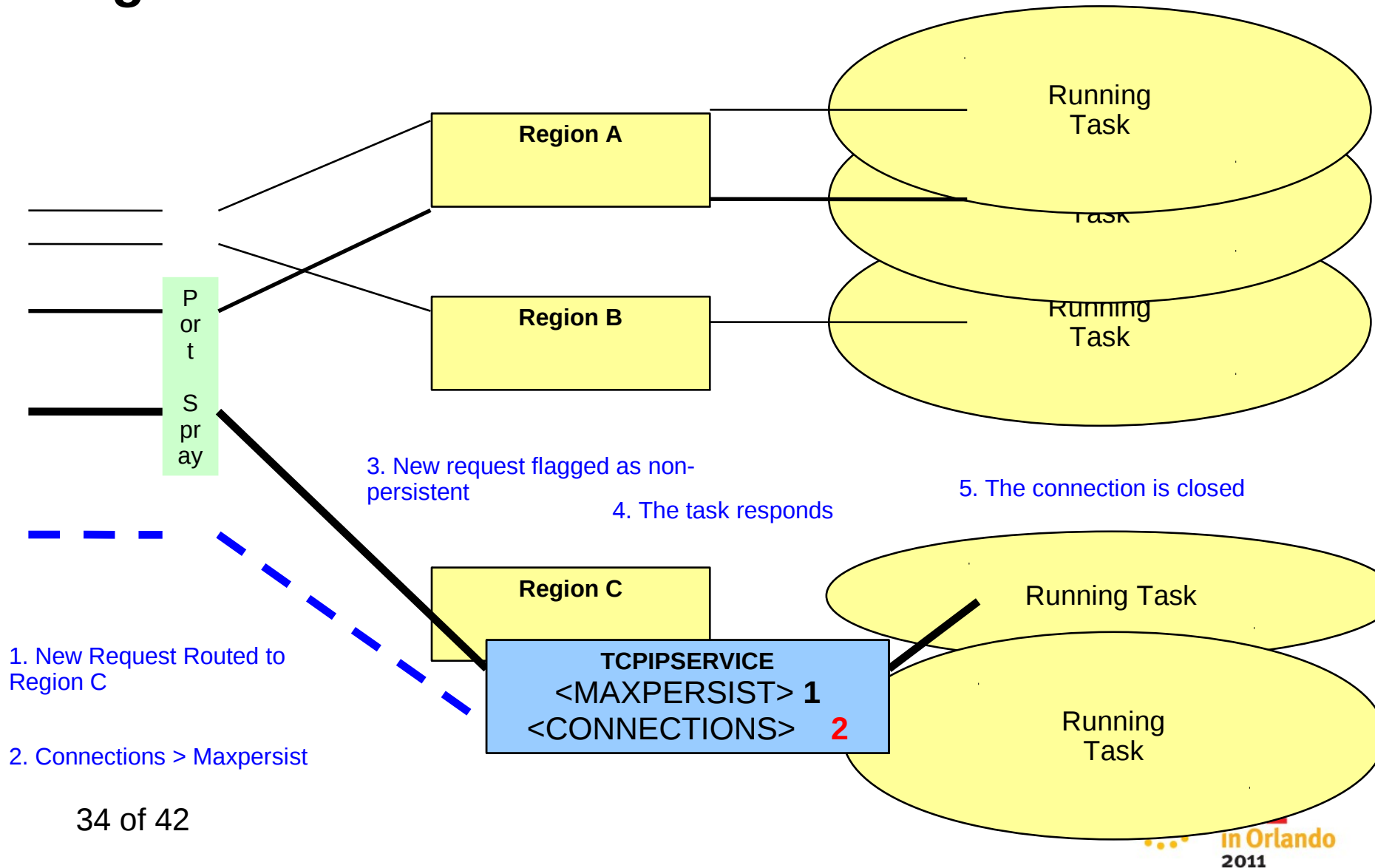
Property	Value
Basic	
Attachsec	NOTAPPLIC
Authenticate	NO
Backlog	10
Certificate	
Ciphers	
CSDGroup	CICSDEMO
Description	
Dnsgroup	
Grpcritical	NO
Host	ANY
Ipaddress	ANY
Maxdatalen	32
<b>Maxpersist</b>	<b>NO</b>
Name	CICSDEMO
Port Number	8081
Privacy	NOTAPPLIC
Protocol	HTTP
Realm	
Socketclose	NO
Ssl	NO
Status	OPEN
Transaction	CWXXN
Tsqprefix	
Urm	DFHWBAAX
Version	0
Definition Signature	
Change Agent	CSDAPI
Change Release	0670
Change Time	29-Apr-2010 13:02:26
Change User ID	CICSUSER
Create Time	29-Apr-2010 13:02:26

Attributes

Maxpersist (MAXPERSIST)

CICSHFA

# Inbound IP Connection Throttling Diagram



# *DB2 Connection Management*

# DB2 Connection Management

- Enhancements to DB2 thread reuse
- REUSELIMIT on DB2CONN to control number of times a thread can be reused
  - Default is 1000
  - 0 means no limit on thread reuse (same as before)
- Address problems where long-running CICS DB2 threads can cause resource issues in DB2

# *WebSphere MQ Enhancements*

# WebSphere MQ support

- Updated CICS-WebSphere MQ Adapter to support WebSphere MQ V7
  - Supports 12 new MQ V7 API commands for message properties, publish subscribe, and asynchronous consume
  - Also available via APARs PK89844 and PK66866 for CICS TS V3.2 and V4.1
- Support for WebSphere MQ Group units of work recovery
  - CICS TS V4.1 introduced support for WMQ group attach
    - If CICS has any outstanding UOWs with the WMQ server, need to reconnect to that specific WMQ server to resolve them
  - With CICS TS V4.2, will be able to attach to any local WMQ server in the queue sharing group and have it resolve outstanding UOWs
- This option can be used only when running a release of WebSphere MQ that supports group unit of work recovery for CICS and when the GROUPUR attribute has been enabled in the WebSphere MQ queue managers

## *Other Connectivity Items*

# Atom Consumability enhancements

- 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



# Summary

- IP Interconnectivity between CICS regions extended to function shipping
- Web Services
  - Option to use Axis2 stack for web services
  - Simpler Java applications in web services
- Outbound HTTP connection pooling
- Inbound HTTP connection throttling
- DB2 connection management
- WebSphere MQ support
- Atom Enhancements

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