CICS TS V4.2 - Connectivity

Ian J Mitchell
IBM Hursley

Wednesday August 10th 2011
Session Number 9599
Disclaimer

IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal at IBM's sole discretion. Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision.

The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for our products remains at our sole discretion.
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
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.

4 of 42
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:**
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

```xml
<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:

```xml
<service>
  <terminal_handler>
    <cics_soap_1.1_handler_java>
      <jvmserver>MYJVM</jvmserver>
      <repository>/u/fbohm/wsdll/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>
</service>
```
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

```xml
<transport>
</transport>

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

```xml
<service>
    <terminal_handler>
        <cics_soap_1.1_handler_java>
            <jvmserver>MYJVM</jvmserver>
            <repository>/u/fbohm/wsdI/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 – wsd
- 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
  - Socket will be removed from pool if errors returned, or if any problems are detected
## Socket Close Attribute

![IBM CICS Explorer](image)

### Attributes

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyzer</td>
<td>NO</td>
</tr>
<tr>
<td>Atomservice</td>
<td></td>
</tr>
<tr>
<td>Authenticate</td>
<td>N_A</td>
</tr>
<tr>
<td>Certificate</td>
<td></td>
</tr>
<tr>
<td>Characterset</td>
<td></td>
</tr>
<tr>
<td>Cipher</td>
<td></td>
</tr>
<tr>
<td>Converter</td>
<td></td>
</tr>
<tr>
<td>CSDGroup</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>FEMTEST</td>
</tr>
<tr>
<td>HFS File</td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td></td>
</tr>
<tr>
<td>Hostcodepage</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>Mediatype</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>PASSTHRU</td>
</tr>
<tr>
<td>Path</td>
<td>stock</td>
</tr>
<tr>
<td>Pipeline</td>
<td>PASSTHRU</td>
</tr>
<tr>
<td>Port</td>
<td>NO</td>
</tr>
<tr>
<td>Program</td>
<td></td>
</tr>
<tr>
<td>Redirecttype</td>
<td>NONE</td>
</tr>
<tr>
<td>Scheme</td>
<td>HTTP</td>
</tr>
<tr>
<td>Socketclose</td>
<td>ENABLED</td>
</tr>
<tr>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>Troppservice</td>
<td></td>
</tr>
<tr>
<td>Template Name</td>
<td></td>
</tr>
<tr>
<td>Transaction</td>
<td>API</td>
</tr>
</tbody>
</table>

---

Note: The image shows the IBM CICS Explorer with a URI Mapping Definition (PASSTHRU) and a table of attributes. The attributes include various properties such as Analyzer, Atomservice, Authenticate, Certificate, and more, with their respective values.
HTTP Connection Pooling Diagram

URIMAP

Socket Close > 0

URIMAP

... 

Sockets Domain

Socket Pool

<Timeout>

<Chain>

<Count> 1

Socket Connected
HTTP Connection Pooling Diagram

1. Create a connection

2. Socket owned by task. No longer in pool
HTTP Connection Pooling Diagram

URIMAP

Socket Pool
<Timeout>
<Chain>
<Count> 0

Sockets Domain

URIMAP
...
SocketClose>0

Task

Socket Error

3a. Connection fails.

Close as before
HTTP Connection Pooling Diagram

URIMAP

... SocketClose>0

1

0..1

Socket Pool

<Timeout>

<Chain>

<Count> 1

Socket Connected

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 TCPIPSERVICE
  - 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

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attached</td>
<td>NOTAPPLIC</td>
</tr>
<tr>
<td>Authenticate</td>
<td>NO</td>
</tr>
<tr>
<td>Backlog</td>
<td>10</td>
</tr>
<tr>
<td>Certificate</td>
<td></td>
</tr>
<tr>
<td>Ciphers</td>
<td></td>
</tr>
<tr>
<td>CSGroup</td>
<td>CICSDMO</td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>Dnsgroup</td>
<td>NO</td>
</tr>
<tr>
<td>Grpcritical</td>
<td>ANY</td>
</tr>
<tr>
<td>Host</td>
<td>ANY</td>
</tr>
<tr>
<td>Ipaddress</td>
<td>ANY</td>
</tr>
<tr>
<td>Maxdatalen</td>
<td>32</td>
</tr>
<tr>
<td>Maxpersist</td>
<td>NO</td>
</tr>
<tr>
<td>Name</td>
<td>CICSDMO</td>
</tr>
<tr>
<td>Port Number</td>
<td>8081</td>
</tr>
<tr>
<td>Privacy</td>
<td>NOTAPPLIC</td>
</tr>
<tr>
<td>Protocol</td>
<td>HTTP</td>
</tr>
<tr>
<td>Realm</td>
<td></td>
</tr>
<tr>
<td>Socketclose</td>
<td>NO</td>
</tr>
<tr>
<td>Ssl</td>
<td>NO</td>
</tr>
<tr>
<td>Status</td>
<td>OPEN</td>
</tr>
<tr>
<td>Transaction</td>
<td>CWXN</td>
</tr>
<tr>
<td>Tcprefix</td>
<td></td>
</tr>
<tr>
<td>Urm</td>
<td>DFHWBAAX</td>
</tr>
<tr>
<td>Version</td>
<td></td>
</tr>
</tbody>
</table>

**Attributes**

Maxpersist (MAXPERSIST)
Inbound IP Connection Throttling Diagram

1. New Request Routed to Region C
2. Connections > Maxpersist
3. New request flagged as non-persistent
4. The task responds
5. The connection is closed

TCPIPSERVICE

<MAXPERSIST> 1
<CONNECTIONS> 2
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 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
Copyright and Trademarks

© IBM Corporation 2011. All Rights Reserved.

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at “Copyright and trademark information” at www.ibm.com/legal/copytrade.shtml.