Debugging Web Services for the CICS System Programmer

Charlie Wiese, CICS Early Programs
IBM Corporation

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Agenda

• Avoiding Problems and Dodging Pitfalls
  • Testing your Web services with Eclipse

• Identifying Problems and Getting Documentation

• Diagnosis Techniques
  • Verbexit displays
  • Working with Traces

• Sample Problems
CICS WEB SERVICES

Avoiding Problems and Dodging Pitfalls
Avoid Common Problems

- See WSTE presentation, “Web Services Problems and Pitfalls” for further details – Technote #7012643
  http://www.ibm.com/support/docview.wss?rs=1083&uid=swg27012643
- Check your maintenance levels
  - This includes both CICS modules, as well as the “mapping-level” parameter in Web Services Assistant utilities
- Ensure you have sufficient HFS dataset access
  - WSBIND, Pipeline CONFIGFILE, WSDIR
- **Install and test the supplied sample Web service application**
- Search the CICS Support pages to see if you’ve encountered a ‘known problem’
  http://www.ibm.com/cics/tserver/support/
Recommendations: Web services Assistant (WSA)

- Use the latest MAPPING-LEVEL to ensure the most recent WSA support

<table>
<thead>
<tr>
<th>MAPPING-LEVEL</th>
<th>PTF/Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>CICS/TS 3.1 base</td>
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<td>PK15904</td>
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<td>1.2</td>
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<td>2.2</td>
<td>PK69738</td>
</tr>
<tr>
<td>3.0</td>
<td>CICS/TS 4.1 base and later</td>
</tr>
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</table>

- Unlike other CICS maintenance, WSA support enhancements are NOT automatically incorporated into WSAs
- Caution is advised, as this may result in unintended changes to the generated artifacts (WSBind, Copybook, and WSDL files)
- Refer to CICS InfoCenter, “Mapping levels for the CICS assistants” for more details

- Verify you’re using the correct input parameters
  - For example, it’s invalid to specify PGMNAME for a Web service requester
  - Be aware of the case-sensitive parameters
Common Problems: Deployment/Tooling

• Performance problems with the CICS WSA
  • Check your LE configuration
  • Additional details available in Technote #1249544
    http://www.ibm.com/support/docview.wss?rs=1083&uid=swg21249544

• WSDL or WSBind errors (“deployment errors”)
  • Unusable WSDL
  • Unsupported features
  • Unable to install PIPELINE or WEBSERVICE resource
    • Use CEMT to inquire against the status of the appropriate resources
    • Diagnosis: Messages in Logs, and Trace of the install with PI=1-2
Common Problems: Runtime

• Access from a Browser
  • (not appropriate for Web Services)

• Response time is longer than expected
  • Can be caused by the TCP/IP “DELAYACKS” parameter
  • Code NODELAYACKS on the TCPCONFIG statement
    • DELAYACKS can still override this setting for specific PORT, PORTRANGE, BEGINROUTES, or GATEWAY statements
  • Refer to Technote #1250026 for further details
Common Problems: CICS and HFS

- Insufficient HFS dataset access
  - Example showing an error accessing the Pickup shelf in a PIPELINE resource definition:
    DFHPI0705 E 13/01/2006 23:10:54 DBDCCICS CICSUSER PIPELINE EXPIPE02 encountered an error writing the configuration to the derived shelf /var/cicsts/DBDCCICS/PIPELINE/EXPIPE02/. The response code from the HFS write was X'00000081' and the reason code was 'X'0594003D'.

- Corrupt WSBIND file
  - Symptom: DFHPI0914 WEBSERVICE webservice is unusable because the WSBIND file is corrupt
  - If you generated your WSBIND file on a distributed platform -- for example, Rational Developer for z (RD/z) -- make sure you transferred the file to z/OS in BIN (binary) mode
Testing A Web Service Provider with Eclipse

• Eclipse provides a native method for testing a Web Services application. This can be used to exercise your application, and to observe the data flow between your distributed workstation and CICS.

• For an excellent narrative of this technique, see “Testing CICS Web services (Technote #1268824)”
Testing your Provider with Eclipse: A look at the SOAP Response envelope

```xml
                   xmlns:x0="http://www.DFH0XCMN.DFH0XCP4.Request.com"
                   xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
                   xmlns:xsd="http://www.w3.org/2001/XMLSchema"
                   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <SOAP-ENV:Body>
    <DFH0XCMNOperationResponse
        xmlns="http://www.DFH0XCMN.DFH0XCP4.Response.com">
      <ca_request_id>01INQS</ca_request_id>
      <ca_return_code>20</ca_return_code>
      <ca_response_message>ITEM NOT FOUND</ca_response_message>
      <ca_inquire_single>
        <ca_item_ref_req>41</ca_item_ref_req>
        <filler1>0</filler1>
        <filler2>0</filler2>
      </ca_inquire_single>
      <ca_single_item>
        <ca_sngl_item_ref>0</ca_sngl_item_ref>
        <ca_sngl_description/>
        <ca_sngl_department>0</ca_sngl_department>
        <ca_sngl_cost/>
        <in_sngl_stock>0</in_sngl_stock>
        <on_sngl_order>0</on_sngl_order>
      </ca_single_item>
    </DFH0XCMNOperationResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```
CICS WEB SERVICES

Identifying Problems and Getting Documentation
Identifying Problems (Runtime)

- Abends

- MSGUSR log
  - CICS-supplied messages: Use these to learn about errors you’re receiving, and to assist with problem determination
  - Messages here may also give you the opportunity to capture documentation at a key point in Web Services processing

- SOAPFAULT message
  - Useful for both Requesters and Providers
Identifying Problems (Tooling)

- Batch Job
  - Joblog
  - SYSPRINT
  - HFS error log (specified by the LOGFILE parameter)
- Did you validate your WSDL with Eclipse?
  - If your WSDL isn’t valid from Eclipse’s viewpoint, the CICS tooling isn’t going to have any better luck with it!
Getting Documentation

- CICS dumps
  - System dumps can be triggered by using System Dump table:
    \[ \text{CEMT SET SYD(\text{ddnnnn}) MAX(1) ADD} \]
    (for example, use “WB0723” when message DFHWB0723 is most closely related to the observed problem)
  - As an alternative, you can set a SLIP trap to capture an SVCDUMP on a specific message
  - Or manually request a dump with a console command similar to:
    \[ \text{DUMP COMM=} (\text{dumpname}) \]
    \[ \text{R yy, JOBNAME=} (\text{cicsjob}), \text{CONT} \]
    \[ \text{R yy, SDATA=} (\text{RGN}, \text{CSA}, \text{SQA}, \text{LPA}, \text{LSQA}, \text{SWA}, \text{PSA}, \text{ALLNUC}, \text{TRT}, \text{GRSZ}, \text{SUM}), \text{END} \]
Getting Documentation cont’d

• CICS Internal or Auxiliary Trace
  • Trace should be active (“Started”), sized to at least 4000K
  • Use Standard Level=1-2 tracing for EI, PG, PI, SO, WB components
    • Use Standard Level=ALL tracing for PG at CICS TS 3.1
  • Use Standard Level=1 tracing for all other components

• MustGather publications
  • General overview CICS “MustGather” is located at
    http://www.ibm.com/support/docview.wss?rs=1083&uid=swg21208053
  • Specific MustGather articles are linked from this document, such as
    • Web Services (#1220283)
    • SOAP for CICS (#1197886)
CICS WEB SERVICES

Diagnosis Techniques
Diagnosis Techniques: Non-standard methods

• WSDL validation tools
  • WD/z or RD/z
  • Eclipse

• WSDL Formatting
  • Web Browser (Firefox)

• CEDX (CEDF) transaction
  • HTTP transport: Tran(CPIH)
  • WMQ transport: Tran(CPIQ)
Diagnosis Techniques – VERBEXIT displays

- Use DFHPDvrr to format release-specific information
  - DFHPD640 CICS TS 3.1
  - DFHPD650 CICS TS 3.2
  - DFHPD660 CICS TS 4.1
  - DFHPD670 CICS TS 4.2

- KE=3 for Kernel-related data
  - Display tasks present in dumped region
  - Show STACK for each task, to determine what point in processing
  - KERR display will reveal if your dump symptom cascaded from an earlier error (remember to keep focused on the ROOT CAUSE!)

- DS=3 for Dispatch information
  - Helpful for observing and diagnosing HANG and Performance-related problems

- WB=3 for Web Interface data
  - SO=3 for Sockets
  - PI=3 for Pipelines
  - PG=3 for Program Manager (includes Container information)
Diagnosis: Trace techniques

- Trace listings can be formatted with various utilities, depending on where the trace data resides
  - Sample Trace request using IPCS Verbexit:
    DFHPD670 ‘tr=2,trs=<typetr=(so0201-0202,xm1101,ds0002)>’
  - Sample Trace request using CICS Trace Utility program DFHTUunnn:
    //DFHAXPRM DD *
    FULL
    TYPETR=(SO0201-0202)
    TYPETR=(XM1101,DS0002)

- Internal Trace is typically associated with a particular abend or identifying situation such as an error message that can trigger a dump
- Auxiliary Trace can be used for problems that produce no (known) external symptoms
- Trace space (datasets and the internal table) fill quickly
  - Sizing considerations: Better “too big”, than “not big enough”
Dissecting a Trace: Getting your bearings

- Specify limited trace entry types
  **ABBREV or TR=1, TYPETR=(XM1101,DS0002,PG0901-0902,PG1101-1102)**
  to display the transactions, task numbers, and linked-to programs

<table>
<thead>
<tr>
<th>Code</th>
<th>Action</th>
<th>Program Type</th>
<th>Entry/Exit</th>
<th>Initial/Link</th>
<th>Priority</th>
<th>Remarks</th>
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<tr>
<td>00004</td>
<td>SL</td>
<td>XM 1101 XMAT</td>
<td>ENTRY ATTACH</td>
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<td></td>
<td>CWXN, C, NO, YES, SOCKET, 1565E000, 00000038</td>
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<td>14509B00, 0, 1, NON_SYSTEM, 14509B00, 0000428C</td>
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<tr>
<td>00428</td>
<td>QR</td>
<td>DS 0002 DSAT</td>
<td>ENTRY ATTACH</td>
<td></td>
<td></td>
<td>CPHI, NONE, C, YES, YES, WEB, 15644030, 00000428</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENTRY SET_PRIORITY</td>
<td></td>
<td>1</td>
<td>15671100, 0, 1, NON_SYSTEM, 15671100, 000429C</td>
</tr>
</tbody>
</table>

Abbreviations and remarks:
- `CWXN`: (00004) 1st transactions, task numbers, and linked-to programs
- `CPHI`: (00428) 1st transactions, task numbers, and linked-to programs
- `DFHWBXN`: (00428) 1st transactions, task numbers, and linked-to programs
- `DFHPIDS`: (00428) 1st transactions, task numbers, and linked-to programs
- `DFHPISN1`: (00428) 1st transactions, task numbers, and linked-to programs
Dissecting a Web Services Trace: Sockets Domain

- SO (Sockets Domain) entries display capture inbound and outbound datastreams. This can be useful for
  - Pinpointing the task(s) that need further investigation,
  - Identifying Performance characteristics of Web Services processing, and
  - Displaying the SOAPFAULT information associated with both Providers and Requesters

- Datastream focus: Consider requesting both SO 0201 and SO 0202 entries
  - Outgoing Socket data (SEND) is visible in SO 0201 ENTRY records
  - Incoming Socket data (RECEIVE) is visible in SO 0202 EXIT records
SOCKET Domain Trace entries sample

00428 SO  SO 0D01 SOSO ENTRY INQUIRE_CONNECTION
00428 SO  SO 0D02 SOSO EXIT INQUIRE_CONNECTION
00428 QR  SO 0D02 SOSO EXIT INQUIRE/OK
00428 QR  SO 0D0B SOSO ENTRY RECEIVE
00428 SO  SO 0D23 SOSO ENTRY TAKE_SOCKET
00428 SO  SO 0E0A SOSO EVENT TAKESOCKET_ENTRY
00428 SO  SO 0D0C SOSO EXIT INQUIRE/OK
00428 QR  SO 0D0C SOSO EXIT RECEIVE
00428 QR  SO 0D09 SOSO ENTRY SEND
00428 L8000 SO 0D09 SOSO EVENT CONNECTIONS_DECREMENTED EXMPORT,0

Complete your sessions evaluation online at SHARE.org/AnaheimEval

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SHARE in Anaheim
SOCKET Domain Trace entries sample
ABBREV SO0201 and SO0202 entries

- Specify trace entry types
  ABBREV,TYPETR=(SO0201-0202)
  to display the Socket SEND and RECEIVE data (along with CONNECT, etc.)
Sample SO 0202 (RECEIVE) Trace entry

SO 0202 SOCK EXIT - FUNCTION(RECEIVE) RESPONSE(OK) RECEIVE_BUFFER(16310000 , 00000140 , 00001000)
TASK-00428 KE_NUM-0049 TCB-QR   /007D5328 RET-9499F866 TIME-23:03:03.0753144592 INTERVAL-00.000325156
=052169=
1-0000  01000000 0000019B 00000000 00000000 B3008004 04000000 03001000 00000000

... 2-0000  00000000 0000019B 00000000 00000000 B3008004 00000000 03000100 00000000

SO 0202 SOCK EXIT - FUNCTION(RECEIVE) RESPONSE(OK) RECEIVE_BUFFER(151F3500 , 000003D2 , 000003D2)
TASK-00428 KE_NUM-0049 TCB-QR   /007D5328 RET-9499F866 TIME-23:03:03.3942695976 INTERVAL-00.0000065000
=052185=
1-0000  01000000 0000019B 00000000 00000000 B3008004 00000000 03001000 00000000

... 2-0000  00000000 0000019B 00000000 00000000 B3008004 00000000 03000100 00000000

Complete your sessions evaluation online at SHARE.org/AnaheimEval

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Sample SO 0201 (SEND) Trace entry

SO 0201 SOCK ENTRY - FUNCTION(SEND) BUFFER_LIST(152FA544 , 00000002)

TASK-00429 KE_NUM-0047 TCB-L8000/007ABE88 TIME-23:03:03.4295566447 INTERVAL-00.0000038750

=001597=

1-0000 00000000 00000000 00000000 00000000 =001597=

2-0000 15661000 000000E1 151F38E0 0000041A

3-0000 48545450 2F312E31 20323030 204F4B20

4-0000 3C534F41 502D454E 563A4546 76656C6F

5-0000 30000001 01000000 0000019B 00000000 00000000 B0000000 00180000 01000000 00000000

........\... HTTP/1.1 200 OK

*Date: Fri, 06 Feb*

*S..Content-Type: text/xml; char*

*set=UTF-8..Content-Length: 0000*

*0000001050..Connection: Close....*

<SOAP-ENV:Envelope xmlns:q0="http://www.DFH0XCMN.DFH0XCMP4.Request"

*..SOAP-ENV:Body><DFH0XCMNOperation*

*Response xmlns="http://www.DFH0XCMN.DFH0XCMP4.Response.com"<ca_r*

*Response_message>RETURNED *

=item: REF =0080

*...*/

Complete your sessions evaluation online at SHARE.Org/AnaheimEval
Working with Trace: Revealing Container contents

- **TYPETR**=(WBFF60, PG1900, PG1910, PG1912)

**WB FF60 WBQM**

`ENTRY - FUNCTION(PUT_CONTAINER) RECORD_BUFFER(16310000, 00000000, 00000140) CONTAINER_POOL_TOKEN(15645030) CONTAINER_NAME(SERVER_HDR_IN) APPEND(NO)`

**TASK-00428 KE_NUM-0049 TCB-QR /007D5328 RET-949A40DA TIME-23:03:03.3947961132 INTERVAL-00.0000016562 -000379-

- `1-0000 00700000 000001B0 00000000 00000000 B5606000 00000000 05000000 00000000`...`
- `0020 00000000 16310000 00000000 00000000 CONTAINER_NAME(SERVER_HDR_IN) TYPE(CI CS) DATATYPE(BIT) CONVERT(NO)`

**PUT_TYPE(REPLACE) ITEM_DATA(16310000, 00000140)**

**PG 1900 PGCR**

`ENTRY - FUNCTION(PUT_CONTAINER) POOL_TOKEN(15645030) CONTAINER_NAME(SERVER_HDR_IN) TYPE(CICS) DATATYPE(BIT) CONVERT(NO)`

**TASK-00428 KE_NUM-0049 TCB-QR /007D5328 RET-949A2B96 TIME-23:03:03.3947983230 INTERVAL-00.0000022187 -000380-

- `1-0000 00000000 0000022E 00000000 00000000 B68E4000 00000000 01000000 00000000`...`
- `0020 15645030 E2C5D9E5 6DC9D540 6DC8C4D9 54000000 00010000 00000000 02020010`...`

**PG 1910 PGCR EVENT - PUT_CONTAINER_DATA**

**TASK-00428 KE_NUM-0049 TCB-QR /007D5328 RET-949A2B96 TIME-23:03:03.3948129882 INTERVAL-00.0000005625 -000386-

- `1-0000 D7D6E2E3 406185A7 81949793 81949797 85C19797 61949798 85999985 8299587 938540C0`...`
- `0020 03E3D761 F14BF10D 25C896A2 4BF2F04B 5F1F2F24 6F1F17AF 7F070701`...`

- `0040 0D25C396 95A38595 A360E3A8 97857A40 A385A7A3 6179493 5E408388`...`

- `0060 A37EA4A3 860F08O0 25C39695 A38599A3 87A3887A 40F9F7F8 0025C183`...`

- `0080 8385979A 7A00B197 9739897A 81A29989 9561A296 81974EA7 94936B40`...`

- `00A0 898381A3 89969561 84899485 684094A4 93A38997 8199A361 99859381`...`

- `00C0 40A385A7 A3615C0D 25E4A285 9960C187 8595A37A 40BC9CD4 40E68582`...`

- `00E0 A5898385 A240C5A7 97939699 85990D25 C3818388 8560C396 95A39996`...`
Working with Trace: Other Important Entries

- **TYPETR=(AP4800)**
  - Data conversion information
- **TYPETR=(PI0000-PIFFFF)**
  - Pipeline details: Nodes, execution, parsing
- **TYPETR=(WB0410)**
  - HTTP Data
CICS WEB SERVICES

Sample Problems
Sample Problems

- Web Services failure
- Data conversion error
- Real-world example
Problem 1: Web Services failure Background and Symptoms

- Attempting to configure and use a **new** Web Service
- Web Service isn’t functional, requester receives “500 Internal Server Error”
- CICS MSGUSR log reports this message after a user tries to call the Web Service:
  
  DFHWEB0725 30/01/2011 16:58:08 IYNX32 CWXN CICS Web attach processing detected an error linking to the analyzer user replaceable module NONE. Host IP address: 9.20.122.71. Client IP address: 9.37.248.135. TCPIPSERVICE: EXMPPORT

- WEBSERVICE(*) and URIMAP(*) definitions weren’t automatically generated with CEDA INSTALL PIPELINE request.
Problem 1: Web Service failure Diagnosis

• Check CICS System Log

  • No messages in Console Log, but MSGUSR contained the following information when the PIPELINE install was requested:

    DFHPI0701 I 29/01/2011 15:36:53 IYNX32 CICSUSER PIPELINE EXPIPE01 has been created.
    DFHRD0124 I 29/01/2011 15:36:53 IYNX32 IYCNTC57 CICSUSER CEDA INSTALL PIPELINE(EXPIPE01)
    TC57 CEDA CICSUSER 29/01/11 15:36:53 INSTALL PIPELINE(EXPIPE01) GROUP(WEBSVCS)
    DFHPI0705 E 29/01/2011 15:36:53 IYNX32 CICSUSER PIPELINE EXPIPE01 encountered an error writing the configuration to the derived shelf /var/cicsts/IYNX32/PIPELINE/EXPIPE01/. The response code from the HFS write was X'0000006F' and the reason code was 'X'EF086015'.
    DFHPI0709 E 29/01/2011 15:36:53 IYNX32 CICSUSER PIPELINE EXPIPE01 resolution failed because the XML configuration file cannot be copied to the derived shelf.

  • The z/OS UNIX System Services Messages and Codes manual shows the uss-response code in message DFHPI0705: X'0000006F' = Permission is denied
Digging Deeper:
CICS Trace is most helpful in this instance, for identifying the specific problem we’ve encountered:

DH 0E00 DHFS ENTRY - FUNCTION(MAKE_HFS_DIRECTORY) PATHNAME(1454FBE0 , 00000025)
  TASK-00052 KE_NUM-001A TCB-L8003/007AB358 RET-9464F82E TIME-15:36:53.5902507788 INTERVAL-00.0007807881 =069504=
    2-0000  61A58199 61838983 A2A3A261 C9EBD5E7 F3F261D7 C9D7C5D3 C9D5C561 C5E7D7C9 */var/cicsts/IYNX32/PIPELINE/EXPI*
       0020 D7C5F0F1 61

DH 0E01 DHFS EXIT - FUNCTION(MAKE_HFS_DIRECTORY) RESPONSE(EXCEPTION) REASON(NOTAUTH)
  TASK-00052 KE_NUM-001A TCB-L8003/007AB358 RET-9464F82E TIME-15:36:53.5906541381 INTERVAL-00.004033593 =069505=

DH 0E01 DHFS EXIT - FUNCTION(WRITE_HFS_FILE) RESPONSE(EXCEPTION) REASON(NOTAUTH) USS_RESPONSE(0000006F)
  USS_REASON(EF086015) CONTENT(155FF890 , 0000116 , 00000000)
  TASK-00052 KE_NUM-001A TCB-QR /007D5328 RET-948C7A4C TIME-15:36:53.5929455881 INTERVAL-00.0022908874 =069507=
Problem 1: Web Service failure Diagnosis (cont’d)

• More about Diagnosis Approach:
  • The MSGUSR log entries show that the original error was recognized by CICS, when the Pipeline was initially Installed – even though the Install itself ‘worked’

```
EX G(WEBSVCS)
ENTER COMMANDS
NAME     TYPE         GROUP                    DATE    TIME
EXPIPE01 PIPELINE     WEBSVCS  *n INSTALL SUCCESSFUL
```

• And, as you can see from the Master Terminal (CEMT) inquiry, the Pipeline was in fact installed, but the status was set to Disabled due to the errors encountered during the Pipeline Scan:

```
I PIPE
STATUS:  RESULTS - OVERTYPE TO MODIFY
Pip(EXPIPE01) Dis Unk
Soa(NOTSOAP )    Con(/MV23/cicsts/cics650/sampl)
```
Problem 1: Web Service failure Resolution and Lessons Learned

• Resolving the error:
  • Address the problem identified in the error messages and trace
  • Request a new “Scan” of the Pipeline resource, either by
    • Re-installing the PIPELINE: CEDA INSTALL GROUP(groupname)
    • Scan the existing PIPELINE: CEMT PERFORM PIPELINE(pipeline) SCAN

• Lessons Learned:
  • Just because CEDA reports a Pipeline “INSTALL SUCCESSFUL”,
    doesn’t mean it was complete!
  • MSGUSR can be a valuable source of diagnostic information, but
    you may still need TRACE to learn important details
Problem 2: Data Conversion Error
Background and Symptoms

- CICS Message Log contains message
  DFHPI1009 02/02/2011 20:50:48 IYNX32 00166 SOAP message processing failed. A conversion error (INVALID_CHARACTER) occurred when converting field ca_item_ref_req.
**Problem 2: Data Conversion Error Diagnosis**

- Stack for the CPIH task attempting to provide the Web Service:

<table>
<thead>
<tr>
<th>KE_NUM</th>
<th>@STACK</th>
<th>LEN</th>
<th>TYPE</th>
<th>ADDRESS</th>
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<th>REG</th>
<th>OFFSET</th>
<th>ERR</th>
<th>NAME</th>
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- PICC_PARSE_XML
- DFHMEME
- SEND
- CONTINUE_SEND
- TAKE_A_DUMP_FOR_CALLER
- DFHDUDU
- SYSTEM_DUMP
- TAKE_SYSTEM_DUMP
Problem 2: Data Conversion Error Diagnosis (cont’d)

• SOAPFAULT container returned by CICS:

```xml
xmlns:q0="http://www.DFH0XCMN.DFH0XCP4.Request.com"
xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <SOAP-ENV:Body>
    <SOAP-ENV:Fault xmlns="">
      <faultcode>SOAP-ENV:Server</faultcode>
      <faultstring>Conversion from SOAP failed</faultstring>
      <detail>
        <CICSFault xmlns="http://www.ibm.com/software/htp/cics/WSFault">
          DFHPI1009 30/01/2011 19:17:46 IYNX32 00059 SOAP message processing failed. A conversion error (INVALID_CHARACTER) occurred when converting field ca_item_ref_req.</CICSFault>
      </detail>
    </SOAP-ENV:Fault>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```
## Problem 2: Data Conversion Error

Aside: IPCS EBCDIC and ASCII feature

<table>
<thead>
<tr>
<th>Raw Data</th>
<th>EBCDIC format</th>
<th>ASCII format</th>
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<tr>
<td>D7D6E2E3 4061B5A7 81949793 85C19797</td>
<td>POST /exampleApp</td>
<td>.@a.</td>
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<tr>
<td>61899958 A4899985 E2899587 938540C8</td>
<td>/inquireSingle H</td>
<td>a.</td>
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<tr>
<td>E3E3D761 F14BF10D 25C896A2 A37A40F9</td>
<td>TTP/1.1..Host: 9</td>
<td>a.K%¢.@.</td>
</tr>
<tr>
<td>4BF2F04B F1F2F248 F7F17AF3 F0F7F0F1</td>
<td>.20.12.71:30701</td>
<td>K.K%z.</td>
</tr>
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<td>0D25C396 95A38595 A360E3A8 97857A40</td>
<td>.Content-Type:</td>
<td>.%z.</td>
</tr>
<tr>
<td>A385A7A3 61A79493 5E408388 8199A285</td>
<td>text/xml; charset=</td>
<td>....a..%..¢.z@.</td>
</tr>
</tbody>
</table>
| A37EA4A3 8660F80D 25C39695 A38595A3 | ...utf-8..Content | ....a..%..%
| 60D38595 87A3887A 40F9F8F3 0D25C183 | -Length: 983..Ac | ....z@..%
| 838597A3 7A408197 97938983 81A38996 | cept: application/ | ....z@
| 9561A296 81974EA7 9436B40 81979793 | n/soap+xml,appli | a%N%k@
| 898381A3 89965961 84899485 6B4094A4 | cation/dime,muti | a..%k@
| 93A38997 8199A361 99859381 A385846B | ...ttipart/related, | ....a..%k@
| 40A385A7 A361C0D 25E4A285 9600C187 | text/*..User-Agent | @...a%.
| 8595A37A 40C9C2D4 40E68582 40E28599 | ent: IBM Web Serv | z@
| A5898385 A240C5A7 97939699 85990D25 | ices Explorer.. | %
| C3813888 8560C396 95A38996 937A4095 | vache-Control: n | ....z@
| 96608381 838850D 25D79981 8794817A | o-cache..Pragma: | %..%...z
| 40959660 83818388 850D25E2 D6C1D7C1 | no-cache..SOAPA | @....%....
| 83A38996 957A40F9 7F0D25C3 96959585 | ction: ""..Conne | z@
| 83A38996 957A40F3 9396A285 0D250D25 | ction: close.... | ....z@
| 3C736F61 70656E76 3A456E76 656C6F70 | .%/..>%..%.% | <soapenv:Envelope
| 652078E6 6C6733A 71303222 68747470 | ....%>%..%.% | e xmlns:q0="http
| 3A2F2F77 77772E44 46483058 434D4E2E | ://www.DFH0XCMN. | DFH0XCP4.Request
| 44464830 58435034 2E526571 75657374 | .%&...%...%/.. | .com" xmlns:soap
| 2E636F6D 2220786D 6C6733A 736F6170 | .%...%>%..%/.. | .
Problem 2: Data Conversion Error Resolution (cont’d)

The PG domain includes information about the Channels and Containers associated with a task, as well as the program link levels.

The data within a container is located at the address specified +x’30’ into the CRCB.

To display the contents of container DFHWS-BODY (length = x’2D9’), use the IPCS command L 15649818+30? Length(x’2D9’)

==PG: PTA SUMMARY FOR TRAN NUM : 00166, PTA ADDRESS : 145FC510
LOG-LVL : 3 SYS-LVL : 0 TASK-LLE : 00000000 PLCB : 152F3B90
=PG: TASK PLCB SUMMARY
PROG DFHPITP LVL 3 PLCB 152F3B90 LD 15077100 ENT 95077128 LEN 000FC8 FPTE 155007C0 ENV EXEC INV DFHPISN1 EXIT
PROGRAM: DFHPITP CPE: 15501370 LIB: DFHRPL CONCAT: 00
CHANNEL DFHAHC-V1 *CURRENT* CHCB 15643030 LEN 00000802 CCSID 000025 GN 0018 CPCB 15645060
CON wranener DFHWS-MEP TYPE USER CRCB 15649660 LEN 00000000 DTYPE (BIT) GN 0018 CSCB 1564A300
CON wranener DFHWS-OPERATION TYPE USER CRCB 15649450 LEN 00000011 CCSID 000025 GN 0017 CSCB 1564A2D8
CON wranener DFHWS-BODY TYPE USER CRCB 15649818 LEN 000002D9 CCSID 0004B8 GN 0014 CSCB 1564A198
CON wranener DFHWS-XMLNS TYPE USER CRCB 15649608 LEN 000000D1 CCSID 0004B8 GN 0016 CSCB 1564A288
CON wranener DFHWS-SOAPLEVEL TYPE R/O CRCB 15649710 LEN 00000004 DTYPE (BIT) GN 0013 CSCB 1564A260
CON wranener DFH-HANDLERPLIST TYPE USER CRCB 156494A8 LEN 00000000 DTYPE (BIT) GN 0015 CSCB 1564A260
CON wranener DFHRESPONSE TYPE R/O CRCB 15649558 LEN 00000000 DTYPE (BIT) GN 0011 CSCB 1564A260
CON wranener DFHFUNCTION TYPE R/O CRCB 156493F8 LEN 00000010 CCSID 000025 GN 0015 CSCB 1564A378
CON wranener DFHWS-SOAPACTION TYPE USER CRCB 156493A0 LEN 00000002 CCSID 000025 GN 000A CSCB 1564A350
CON wranener DFHWS-URI TYPE USER CRCB 15649348 LEN 00000019 CCSID 000025 GN 0009 CSCB 1564A1E8
CON wranener DFHREQUEST TYPE R/O CRCB 15649500 LEN 000000D7 CCSID 0004B8 GN 0010 CSCB 1564A210
CON wranener DFHWS-RESPWAIT TYPE R/O CRCB 15649298 LEN 00000004 DTYPE (BIT) GN 0007 CSCB 1564A120
CON wranener DFH-SERVICEPLIST TYPE R/O CRCB 15649240 LEN 00000000 DTYPE (BIT) GN 0006 CSCB 1564A0F8
CON wranener DFHWS-PIPELINE TYPE R/O CRCB 156491E8 LEN 00000008 CCSID 000025 GN 0005 CSCB 1564A0F8

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2012
Problem 2: Data Conversion Error Resolution (cont’d)

- Displaying the DFHWS-BODY container:

```
LIST 15435A98. ASID(X'003B') LENGTH(X'03E7') AREA
ASID(X'003B') ADDRESS(15435A98.) KEY(90) ABSOLUTE(EB446A98.)
15435A98.
15435AA0. 7AC29684  A86E0D25  40404040  4C98F07A  C4C6C8F0  E7C3D4D5  D6978599  81A38996
15435AC0. 956E0D25  40404040  40404C98  F07A8381  6D998598  A485A2A3  6D89846E  F0F1C9D5
15435AE0. D8E24C61  98F07A83  81699985  98A485A2  A3688984  6E0D2540  40404040  404C98F0
15435BB0. 7A83816D  9985A3A4  99956D83  9684856E  F04C6198  F07A8381  6D998598  A499956D
15435B20. 83968485  6E0D2540  40404040  404C98F0  7A83816D  9985A297  9695A285  6D9485A2
15435B40. A2817885  616E0D25  40404040  40404C98  F07A8381  6D999598  A4999985  6DA28995
15435B60. 8793856E  0D254040  40404040  404C98F0  F07A8381  6D9A385  9669D985  8669D985
15435B80. 886EC289  93934C61  98F07A83  8169D985  85946D99  8586D989  8598E6ED  25404040
15435BA0. 40404040  404C98F0  7A868993  938599F1  616E0D25  40404040  40404040  4C98F07A
15435BC0. 86899939  8599F261  6E0D2540  40404040  40404040  40404C98  F07A8381  816DA289  95879385
15435BE0. 6D9A385  946E0D25  40404040  40404040  40404C98  F07A8381  6DA29587  936987A5
15435C00. 85946D99  8586E6F0  F01F04C6  6198F07A6  83816D2A  95829660  89A35894  6DH99856
15435C20. 6E0D2540  40404040  40404040  404C98F0  7A83816D  29587936  6D8485A2  83998997
15435C40. A3899695  616E0D25  40404040  40404040  40404C98  F07A8381  6DA29587  936D8485
15435C60. 978199A9  94859A53  46F04C61  98F07A83  616A2958  9587936  8485996E  0D254040
15435C80. A366E0D25  40404040  40404040  40404C98  F07A8381  6DA29587  936D9999  6DA29587
15435CA0. 6D254040  40404040  40404040  404C98F0  89956DA2  9587936  6A39683  6D89F04C
15435CC0. 6198F07A  89956D2A  9587936  6A39683  926E0D25  40404040  40404040  40404C98
15435CED. F07A9695  6DA29587  93699999  8485996E  F04C6198  F07A9695  6DA29587  936D9999
15435D00. 8485996E  0D254040  40404040  40404C61  98F07A83  816DA289  95879385  6D89A385
```
Problem 2: Data Conversion Error Resolution (cont’d)

• A quick review of the WSDL that describes this element reveals the inconsistency that triggered this error:

```xml
<xsd:element name="ca_item_ref_req" nillable="false">
  <xsd:simpleType>
    <xsd:annotation>
      <xsd:appinfo source="http://www.ibm.com/software
      /htp/cics/annotations">#Wed Sep 14 08:27:41 BST 2005
      com.ibm.cics.wsdl.properties.synchronized=false</xsd:appinfo>
    </xsd:annotation>
    <xsd:restriction base="xsd:unsignedShort">
      <xsd:maxInclusive value="9999"/>
      <xsd:minInclusive value="0"/>
    </xsd:restriction>
  </xsd:simpleType>
</xsd:element>
```
Real-World Example: DFHPI1008
Background and Symptoms

- Customer attempting to upgrade CICS TS 3.1 => 3.2
- Nearly all Web Services functions migrated without error
- A single Web Service PROVIDER application encountered consistent failures, identified by message DFHPI1008:
  DFHPI1008 03/10/2009 11:27:04 CICSABCD 00077 SOAP message generation failed because of incorrect input (INPUT_STRUCTURE_TOO_SMALL).
- Customer provided system dump triggered by this message, requesting assistance with problem analysis
Real-World Example: DFHPI1008 Diagnosis

• “Getting my bearings” with Trace: Which task? TR=2, then search for symptom code PI1008:

DU 0600 DUTM ENTRY - FUNCTION(LOCATE_SYSTEM_DUMP_CODE) SYSTEM_DUMP_CODE(PI1008)

TASK-00350 KE_NUM-003C TCB-L8002/009ACD70 RET-9682E18C TIME-12:42:13.5301526250

• Now let’s take a closer look at this task

00350 L8002 PI 0F00 PIII ENTRY PARSE_ICM
00350 L8002 PI 0F06 PIII DATA OUTBOUND_COMMAREA_DATA
00350 L8002 PI 0F0B PIII *EXC* INPUT_ERROR INPUT_STRUCTURE_TOO_SMALL

• Description of INPUT_STRUCTURE_TOO_SMALL:

The container passed to CICS does not hold sufficient data given the length of the language structure.

• What is the data being passed for Parsing?

PI 0F06 PIII DATA - OUTBOUND_COMMAREA_DATA

*Unique UserData1 *
Real-World Example: DFHPI1008 Diagnosis (cont’d)

- What’s the overall task flow?
  
  TR=1, TRS=<TASKID=350, TYPETR=(XM1101, DS0002, PG0901-0902, PG1101-1102)>
  
  00350 QR PG 0901 PGPG ENTRY INITIAL_LINK DFHPIDSH
  00350 QR PG 1101 PGLE ENTRY LINK_EXEC DFHPISN1, YES, DFHNODE
  00350 L8002 PG 1101 PGLE ENTRY LINK_EXEC DFHPIEP, 177A3A18, 00000010, YES
  00350 L8002 PG 1102 PGLE EXIT LINK_EXEC/OK ,,,
  00350 L8002 PG 1101 PGLE ENTRY LINK_EXEC DFHPITP, YES, DFHAHC-V1
  00350 L8002 PG 1101 PGLE ENTRY LINK_EXEC PEBCAK01, NO, DFHAHC-V1
  00350 QR PG 1101 PGLE ENTRY LINK_EXEC PEBCAK02, NO, NO, PULL-CHANNEL
  00350 QR PG 1102 PGLE EXIT LINK_EXEC/EXCEPTION REMOTE_PROGRAM, PEBZ, PEBCAK02, PEB1,
  00350 QR PG 1102 PGLE EXIT LINK_EXEC/OK ,,,

- What data was passed TO the program that had a Link failure?
  *Unique User Data1*

- A theory emerges:
  
  PG 1102 PGLE EXIT - FUNCTION(LINK_EXEC) RESPONSE (EXCEPTION)
  REASON(REMOTE_PROGRAM) REMOTE_SYSID (PEBZ)
  REMOTE_PROGRAM_NAME (PEBCAK02)
  REMOTE_TRANID (PEB1) ABEND_CODE()
  TASK-00350 KE_NUM-003C TCB-QR /009C3D98 RET-96FF3E98
  TIME-12:42:04.8614592187 INTERVAL-00.0000004687 =048740=
Real-World Example: DFHPI1008 Diagnosis (cont’d)

- **What is Program Autoinstall status?**
  
  ==PG: GLOBAL STATE SUMMARY

  PG domain status:  **Initialised**

  Autoinstall status:  **Inactive**

- **Is the PEBCAK02 program already defined?**

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<th>ADDRESS</th>
<th>TYPE</th>
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<th>CEDF</th>
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<th>REMOTE</th>
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</table>
Real-World Example: DFHPI1008 Resolution and Lessons Learned

- Called customer to ask about remote program PEBCAK02
- Explained what the dump’s internal trace showed us, our working theory, and requirements for new doc if analysis to this point didn’t identify the error
- Customer reported a missing resource Group was discovered, which included the program in question
- Lessons Learned:
  - Worthwhile to get the lay of the land (overview-type trace listings)
  - ASK Questions!
CICS WEB SERVICES DEBUGGING

References
Reference:
Handy Tracing Tricks for Web Services

- XM1101  Attached Transids
- DS0002  Attached Taskids
- PG0901-0902  Attached Taskids
  PG1101-1102  Program linkage
- SO0201  Socket Send
- SO0202  Socket Receive
- PG1900
  PG1910  Show CONTAINER
  PG1912  contents
  WBFF60
- AP4800  Data conversion information
- WB0410  HTTP Data
References: CICS Support Page and Technotes

- CICS Support Web Page
  - Helpful references and links to CICS Info Center, Technotes, Flashes, “Must Gather” documents for defect support, SupportPacs, Redbooks, and more!

- Technote Highlights
  - Knowledge Collection: Web services for CICS (#7010507)
  - Support for white space and variable length values (#1248612)
  - How to read WSDL – A bottom-up approach (#1199529)
  - Testing CICS Web services (#1268824)
  - Diagnosing DFHPI0602 error messages (#1264885)
  - Diagnosing data conversion errors with CICS Web Services (#1211424)

- Related Technotes
  - Answer common questions
  - Describe known problems and limitations
  - Warn of migration issues and requirements
  - Describe performance recommendations
  - Provide how-to and example implementation instructions
References: Web Services related Redbooks and Redpapers

- Implementing CICS Web Services
  http://www.redbooks.ibm.com/abstracts/sg247657.html
- Application Development for CICS Web Services
  http://www.redbooks.ibm.com/abstracts/sg247126.html
- Securing CICS Web Services
  http://www.redbooks.ibm.com/redpieces/abstracts/sg247658.html
- CICS Web Services Workload Management and Availability
  http://www.redbooks.ibm.com/abstracts/sg247144.html
- SOAP Message Size Performance Considerations
- Developing Web Services Using CICS, WMQ, and WMB
  http://www.redbooks.ibm.com/abstracts/sg247425.html
References: Additional Publications

- Sockets Domain – AIOCB embedded in the Sockets Listener Table Entry
  
z/OS V1R12.0 UNIX System Services Programming: Assembler Callable Services Reference (SA22-7803)

- HFS File activity – return codes
  
z/OS V1R12.0 UNIX System Services Messages and Codes (SA22-7807)
Numerous Technical presentations are cataloged online, and available for on-demand viewing:

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