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User Experience: CICS and Web Services at FICO

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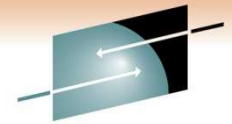


Agenda

- Prerequisites and Purpose of this Session
- FICO Overview for Context
- FICO's Solution Design Strategy
- CICS Web Service Overview
- CICS Web Service Construction at FICO
- CICS Web Service Packaging and Deployment at FICO
- Lessons Learned
- FICO's Future Direction

Prerequisites and Purpose of Session

- Prerequisites
 - Web Services understanding
 - CICS understanding
- Purpose
 - Example of how Web Services can be used in CICS legacy applications
 - Learn what is involved in using Web Services in CICS
 - Avoid some of the pitfalls of Web Services in CICS
 - Real world quick start to CICS Web Services



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You touch FICO technology when you...



Use an ATM



Use a credit/debit card



Buy or use a cell phone



Submit a medical claim



Buy or refinance a home



Make online purchases

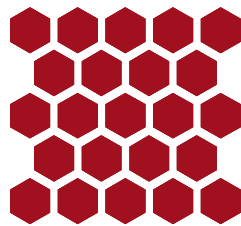


File for workers' comp



Take out auto insurance

Our business analytics put science behind decisions



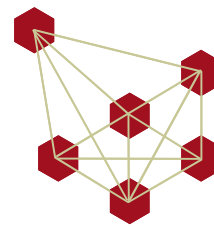
Data

Collect complete past and current information



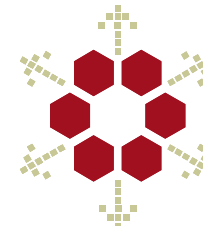
Analysis

Identify patterns that guide decisions



Design

Create strategies that produce better future results



Deploy

Automate strategies and processes to make real-time decisions

We give decisions greater precision, consistency and agility

Solution Design Strategy

Web Services – Open APIs



- FICO has many products on several platforms.
- The Web Service paradigm de-couples platforms and technologies from services
- Gives customers the flexibility to mix and match products and platforms
- Solutions can communicate no matter where they are deployed
- Open APIs let us share functionality and code between platforms and with our customers

Solution Design Strategy

Web Services – Automated Development



- Reduce development cost
- Reduce cost of changes in future releases
- Improve quality
- Time to market

Solution Design Strategy

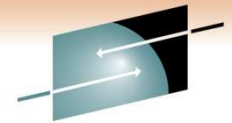
“Open” Technology and Tooling



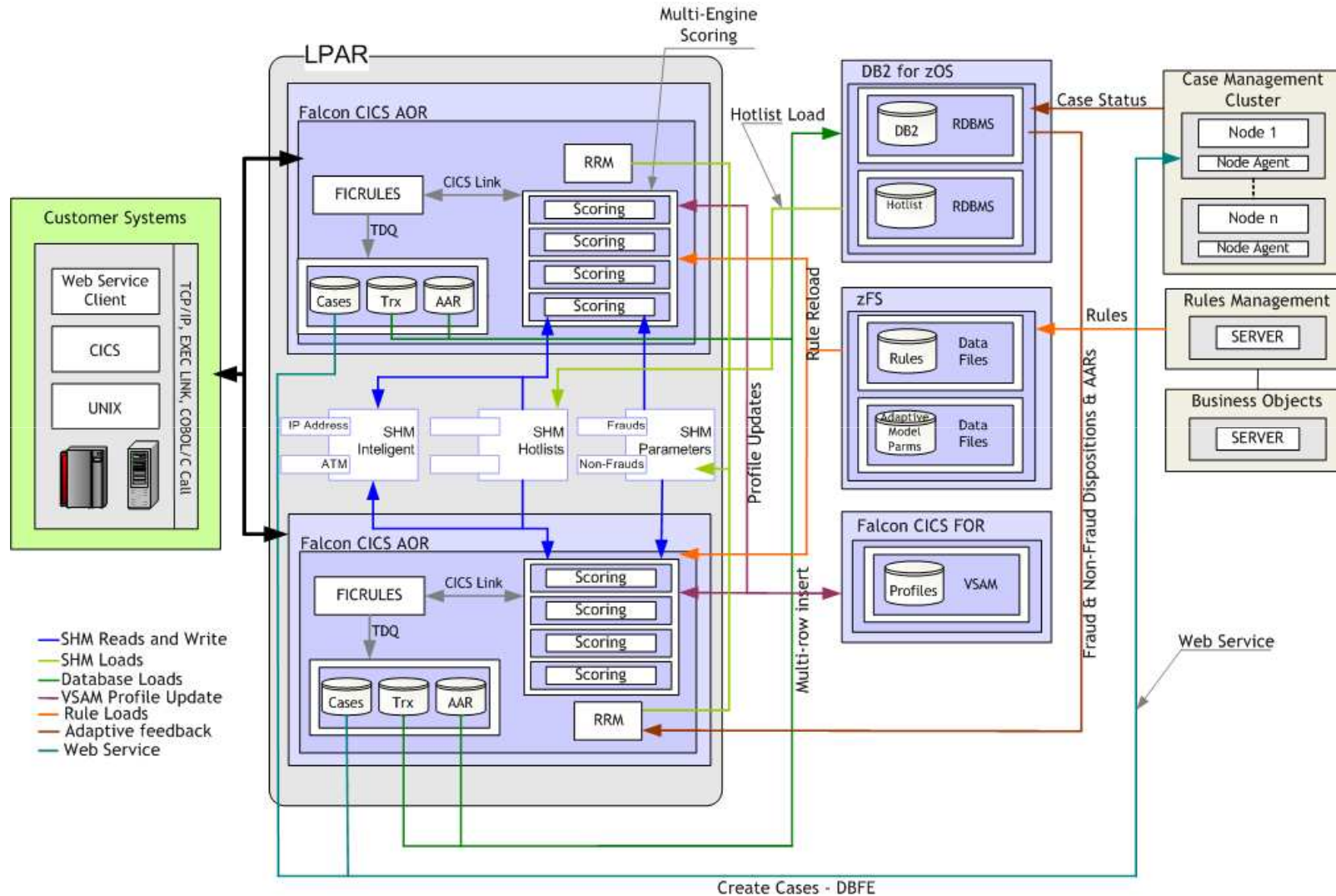
- zFS
- Cross platform source
- Matrixed development team
- RDz

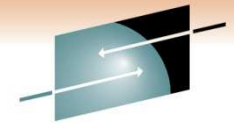
Design Strategy

Falcon 6.0+ Architecture



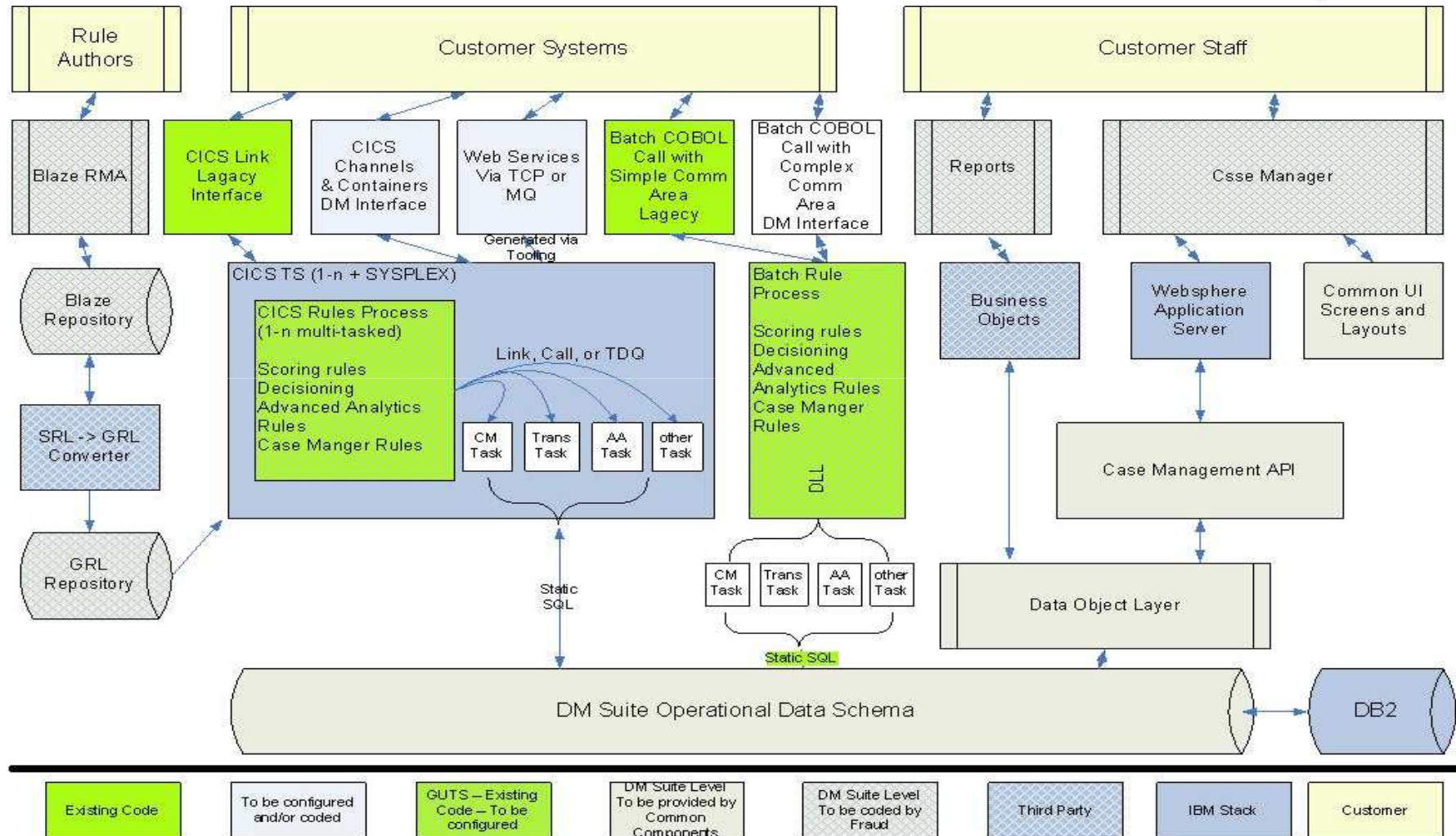
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Solution Design Strategy Falcon 6.0's Use Technology



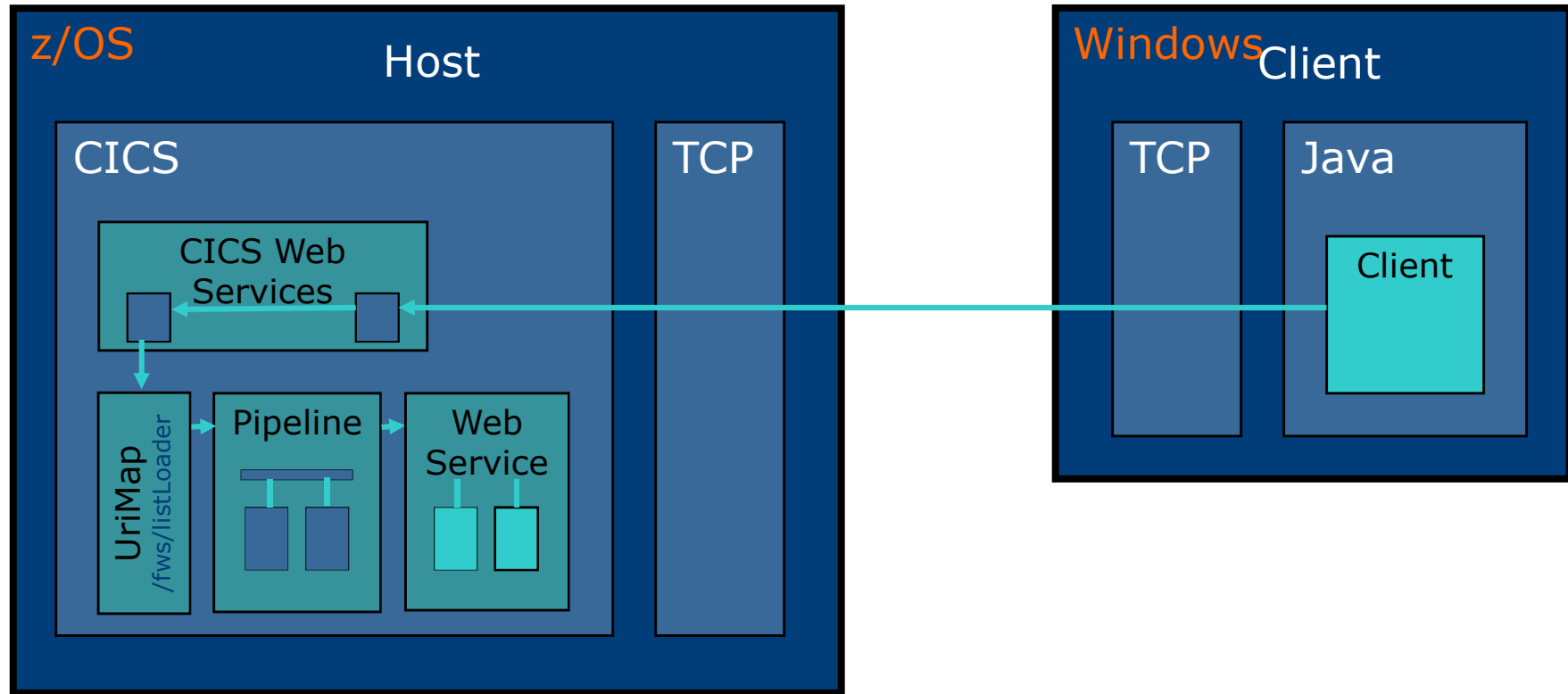
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Design Requirements

- CICS Web Services
 - Web service components in CICS
 - Batch uses EXCI for outbound CICS web service call
- Customers can opt-out
 - Alternatives for Web Services and POSIX are available

CICS Web Service Overview

Web Services – Execution Flow

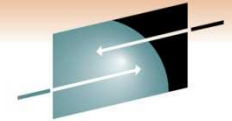


<http://www.ibm.com:8296/fws/listLoader>

CICS Web Service Overview

Important CICS Table Entries

- PIPeline: Requester and Provider
 - Config file
 - Shelf
 - WSDIR directory
- TCPIPService:
 - Port
 - Transaction
- WEBSservice:
 - Wsbind location
 - Service to program
- URimap:
 - URI to service



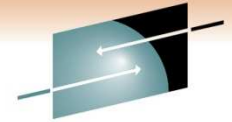
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CICS Web Service Overview Pipeline(s)

```
I PI
STATUS: RESULTS - OVERTYPE TO MODIFY
Pip(FWSPIPE1) Ena Pro
    Soa(1.1      )          Con(/u/fia/cc/CFIADEV3/FAL/fws)
Pip(FWSPIPE2) Dis Req
    Soa(1.1      )          Con(/u/fia/cc/CFIADEV3/FAL/fws)
```

```
I PI
RESULT - OVERTYPE TO MODIFY
Pipeline(FWSPIPE1)
Enablestatus( Enabled )
Mode(Provider)
Mtomst(Nomtom)
Sendmtomst(Nosendmtom)
Mtomnoxopst(Nomtomnoxop)
Xopsupportst(Noxopsupport)
Xopdirectst(Noxopdirect)
Soaplevel(1.1)
Respwait(      )
Configfile(/u/fia/cc/CFIADEV3/FAL/fws/defs/pipeline/fwspipe1.xml)
Shelf(/u/fia/cc/CFIADEV3/FAL/fws/shelf/)
Wsdiref(/u/fia/cc/CFIADEV3/FAL/fws/defs/wsdiref/provider/)
Ciddomain(cicsts)
Installtime(02/22/11 12:15:52)
Installuserid(CFIADEV3)
Installagent(Grplst)
Definesource(FALCON)
```

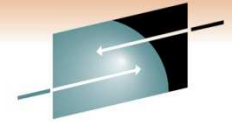
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CICS Web Service Overview Pipeline(s)

```
I PI  
RESULT - OVERTYPE TO MODIFY  
Pipeline(FWSPPIPE2)  
Enablestatus( Disabled )  
Mode(Requester)  
Mtomst(Nomtom)  
Sendmtomst(Nosendmtom)  
Mtomnoxopst(Nomtomnoxop)  
Xopsupportst(Noxopsupport)  
Xopdirectst(Noxopdirect)  
Soaplevel(1.1)  
Respwait( )  
Configfile(/u/fia/cc/CFIADEV3/FAL/fws/defs/pipeline/fwspipe2.xml)  
Shelf(/u/fia/cc/CFIADEV3/FAL/fws/shelf/)  
Wsdire(/u/fia/cc/CFIADEV3/FAL/fws/defs/wsdire/requester/)  
Ciddomain(cicsts)  
Installtime(02/22/11 12:15:52)  
Installuserid(CFIADEV3)  
Installagent(Grplst)  
Definesource(FALCON)
```



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CICS Web Service Overview

TCPIPService

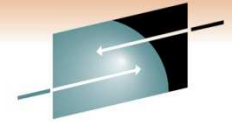
```
I TCPIPS
RESULT - OVERTYPE TO MODIFY
  Tcpiptime(FWSHTTP1)
  Openstatus( Open )
  Port(08085)
  Protocol(Http)
  Ssltype(Nossl)
  Transid(CWXN)
  Authenticate(Noauthentic)
  Connections(00000)
  Backlog( 00001 )
  Maxdatalen( 524288 )
  Urm( NONE )
  Privacy(Notsupported)
  Ciphers()
  Ippaddress(168.230.158.11)
  Socketclose(Wait)
  Closetimeout(000000)
  Realm()
+ Dnsgroup()
```


CICS Web Service Overview

WEBSERVICE



```
I WEBS
RESULT - OVERTYPE TO MODIFY
  Webservice(LSTLOAD)
  Pipeline(FWSPPIPE1)
  Validationst( Novalidation )
  State(Inservice)
  Ccsid(00000)
  Urimap($548302)
  Program(FICCLL)
  Pgminterface(Channel)
  Xopsupportst(Xopsupport)
  Xopdirectst(Xopdirect)
  Mappinglevel(1.2)
  Minrunlevel(1.2)
  Datestamp(20110128)
  Timestamp(05:48:30)
  Container(DFHWS-DATA)
  Wsdlfile()
  Wsbind(/u/fia/cc/CFIADEV5/FAL/fws/defs/wmdir/provider/LSTLOAD.wsbind)
  Endpoint(http://localhost:9080/fws/listLoader)
```



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CICS Web Service Overview

URimap

```
I UR  
RESULT - OVERTYPE TO MODIFY  
Urimap($548302)  
Usage(Pipe)  
Enablestatus( Enabled )  
Analyzerstat(Noanalyzer)  
Scheme(Http)  
Redirecttype( None )  
Tcpipservice()  
Host(*)  
Path(/fws/listLoader)  
Transaction(FIWS)  
Converter()  
Program()  
Pipeline(FWSPPIPE1)  
Webservice(LSTLOAD)  
Userid()  
Certificate()  
Ciphers()  
Templatename()
```

CICS Web Service Construction at FICO

Cross Platform URI

- FICO's URL syntax
<http://www.ibm.com:8296/fws/listLoader>
- fws: FICO product namespace
 - Falcon Web Service (fws)
 - Triad Web Service (tws)
- listLoader: service name
 - rulesLoad
 - Info
 - ...
 - ...

CICS Web Service Construction at FICO

A Falcon Web Service in Detail



- Deploy Rules
 1. Customer writes rules in a Web Based Java application
 2. When they are done they deploy the rules
 3. This creates a SOAP request to a CICS region *
 - The request contains user information and the actual rule code
 4. CICS parses the request and calls the business application
 5. The business application
 - Looks up configuration for the request
 - Copy the rules, located in the payload of the SOAP envelope, to the zFS

* Not to be confused with “SOAP for CICS”

CICS Web Service Construction at FICO Automated Build Process(es)



Use CICS Web services assistant

- DFHWS2LS
 - For Web Services shared with other platforms
 - Input: The common WSDL is input
 - Output:
 - A COBOL COPYBOOK or C structure
 - wsbind file
- DFHLS2WS
 - Used for Falcon for mainframe only Web Services
 - Input: COBOL COPYBOOK or C Structure
 - Output:
 - WSDL
 - wsbind file

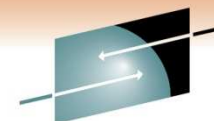
CICS Web Service Construction at FICO Automated Build Process(es)



- Configuration for DFHxx2xx utilities

```
LOGFILE=/u/fia/cc/d060/CWCCT24.log
PDSLIB=//FIACCN.D060.SOURCE.WS
REQMEM=CT24
RESPMEM=SRV3
LANG=C
PGMNAME=FICCRUL
PGMINT=CHANNEL
URI=fws/scoringServiceCreditTransaction_V24
TRANSACTION=FIWS
WSBIND=/u/fia/cc/d060/wssrc/cics/fws/defs/wsdir*
/provider/scoringServiceCreditTran_V24.wsbind
WSDL=/u/fia/cc/d060/wssrc/cics/fws/defs/wsd1*
/scoringServiceCreditTransaction_V24.wsd1
```

CICS Web Service Construction at FICO Automated Build Process(es)



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JCL example //LSTLOAD EXEC DFHWS2LS,COND=&STEPCOND,CNF='CWCLL'

```
//*-----*
/** Copy input parameters to ZFS. Note - the util deletes afterward.
/**-----*
//COPYCNF EXEC PGM=IKJEFT01,COND=(4,LT)
//INDD1 DD DSN=FIACCN.D060.DEVLPARM(&CNF),DISP=SHR
//OUTDD1 DD PATH=&QT./u/fia/cc/d060/&CNF..wscnf&QT,
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),PATHMODE=SIRWXU
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN DD DSN=FIACCN.D060.DEVLPARM(OCOPY),DISP=SHR
//*-----*
/** chmod the file so that is can be used by others
/**-----*
//CHMOD EXEC BPXBATCH,COND=(4,LT),
// USSPARM=&QT.SH&SP.chmod&SP.777&SP./u/fia/cc/d060/&CNF..wscnf&QT
//*-----*
/** Execute script using batch shell
/**-----*
//GENSERV EXEC BPXBATCH,COND=(4,LT),
// USSPARM=&QT.SH&SP./u/fia/cc/d060/DFHLS2WS&SP.&CNF..wscnf&QT
//*-----*
/** Copy log to sysout
/**-----*
```

CICS Web Service Construction at FICO

Batch Support

- Falcon runs in both batch and CICS
 - Business logic for web service outbound calls need to be handled in a common way for both batch and CICS
- Open source web service solution, such as gsoap, not robust and had code page conversion issues
- Falcon already uses EXCI interface for other functionality
- Common exci interface for batch web service calls was developed
 - Handles open, execute and close of EXCI pipe
 - Common functions for invoking web service were created
 - Batch version of invoke web service will execute the EXCI functions to call a CICS program to send the web service request

CICS Web Service Construction at FICO Packaging

- What gets delivered to a customer?
 - WSDL
 - wsbind
 - CSD
 - documentation
- How we deliver it?
 - Send and receive and a system to replace tags as needed
 - Self extracting tar

CICS Web Service Deployment at FICO Prerequisite Checks



1. Verify that the TCPIP region is running

- From SDSF, DA, type: prefix tcp*
- You should see the TCPIP region running

```
Display Filter View Print Options Help
-----
SDSF DA DPIO DPIO PAG 0 SIO 201 CPU 100
COMMAND INPUT ===> █
NP JOBNAME StepName ProcStep JobID Owner
TCPIP TCPIP TCPIP STC02970 NETWORK
```

CICS Web Service Deployment at FICO Prerequisite Checks



```
Display Filter View Print Options Help
-----
SDSF OUTPUT DISPLAY CFIADDEV2 JOB08935 DSID 2
COMMAND INPUT ==>
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XUSER=NO,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XEJB=NO,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XDCT=NO,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XFCT=NO,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XPPT=NO,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XPCT=NO,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XTST=NO,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 TCPIP=YES,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 XTRAN=ESN,
12.45.46 JOB08935 DFHPA1927 FICCDEV2 DFLTUSER=FIA
12.45.46 JOB08935 DFHPA1927 FICCDEV2 .END
12.45.46 JOB08935 DFHPA1103 FICCDEV2 END OF FILE
12.45.46 JOB08935 DFHPA1930 FICCDEV2 CSDFRLOG=01 H
12.45.46 JOB08935 +DFHTR0103 TRACE TABLE SIZE IS 6
12.45.46 JOB08935 +DFHSM0122I FICCDEV2 Limit of DS
12.45.46 JOB08935 +DFHSM0123I FICCDEV2 Limit of DS
12.45.46 JOB08935 +DFHSM0113I FICCDEV2 Storage pro
12.45.46 JOB08935 +DFHSM0126I FICCDEV2 Transaction
12.45.47 JOB08935 +DFHDM0101I FICCDEV2 CICS is ini
```

2. Verify that CICS has enabled TCPIP

- Check the SIT override parameters in the CICS start job
- You should see this statement: TCPIP=YES

CICS Web Service Deployment at FICO Prerequisite Checks



3. Verify that the TCPIP SERVICE is open

```
I TCPIPS(FWSHTTP1) █  
STATUS: RESULTS - OVERTYPE TO MODIFY  
TcpiPs(FWSHTTP1) Ope Por(08284) Http Nos Tra(CWXN)  
Con(00000) Bac( 00001 ) Max( 000032 ) Urm( NONE )
```

CICS Web Service Deployment at FICO Prerequisite Checks



4. Verify that the Language Environment is high enough
 - ceda ex l(*) g(cee2) [group cee2 should be in the CSD]

```
EX L(*) G(CEE2)
ENTER COMMANDS
NAME      TYPE      LIST
CEE2     GROUP    FIALIST2
```

CICS Web Service Deployment at FICO Prerequisite Checks



4. Verify that the Language Environment is high enough
- ceda ex I(*) g(cee2) [group cee2 should be in the CSD]
 - GRPLIST=() [this SIT override parm should include the list cee2 belongs to]

```
Display Filter View Print Options Help
-----
SDSF OUTPUT DISPLAY CFIADDEV2 JOB08958 DSID 2 LINE 13
COMMAND INPUT ==>
13.14.19 JOB08958 DFHPA1927 FICCDEV2 DB2CONN=YES,
13.14.19 JOB08958 DFHPA1927 FICCDEV2 GMTEXT='
13.14.19 JOB08958 DFHPA1927 FICCDEV2
13.14.19 JOB08958 DFHPA1927 FICCDEV2
13.14.19 JOB08958 DFHPA1927 FICCDEV2
13.14.19 JOB08958 DFHPA1927 FICCDEV2 GRPLIST=(FIALIST2 _DEV2),
13.14.19 JOB08958 DFHPA1927 FICCDEV2 EDSALIM=5SM
13.14.19 JOB08958 DFHPA1927 FICCDEV2 CICSSVC=226,
13.14.19 JOB08958 DFHPA1927 FICCDEV2 MAXOPENTCBS=25,
13.14.19 JOB08958 DFHPA1927 FICCDEV2 MCT=OM,
13.14.19 JOB08958 DFHPA1927 FICCDEV2 PGAIPGM=ACTIVE,
13.14.19 JOB08958 DFHPA1927 FICCDEV2 PLTPI=D2,
13.14.19 JOB08958 DFHPA1927 FICCDEV2 PLTSD=DB,
```

CICS Web Service Deployment at FICO

Problem / Solution

1. TCPIP SERVICE closed because of port conflict
 - Port numbers must be unique for each machine [e.g. for each TCPIP region]
 - Create a port assignment convention to keep ports unique
2. Outbound or Inbound firewall prevents connection
 - The request to open a port can be blocked by firewalls on either side
 - To verify our suspicion, we put our TCPIP SERVICE on port 80 and had success
 - Then we made request to the firewall owners to open our port
3. UTF-8 to EBCDIC z/OS Conversion Services

Testing – Invoking a Web Service

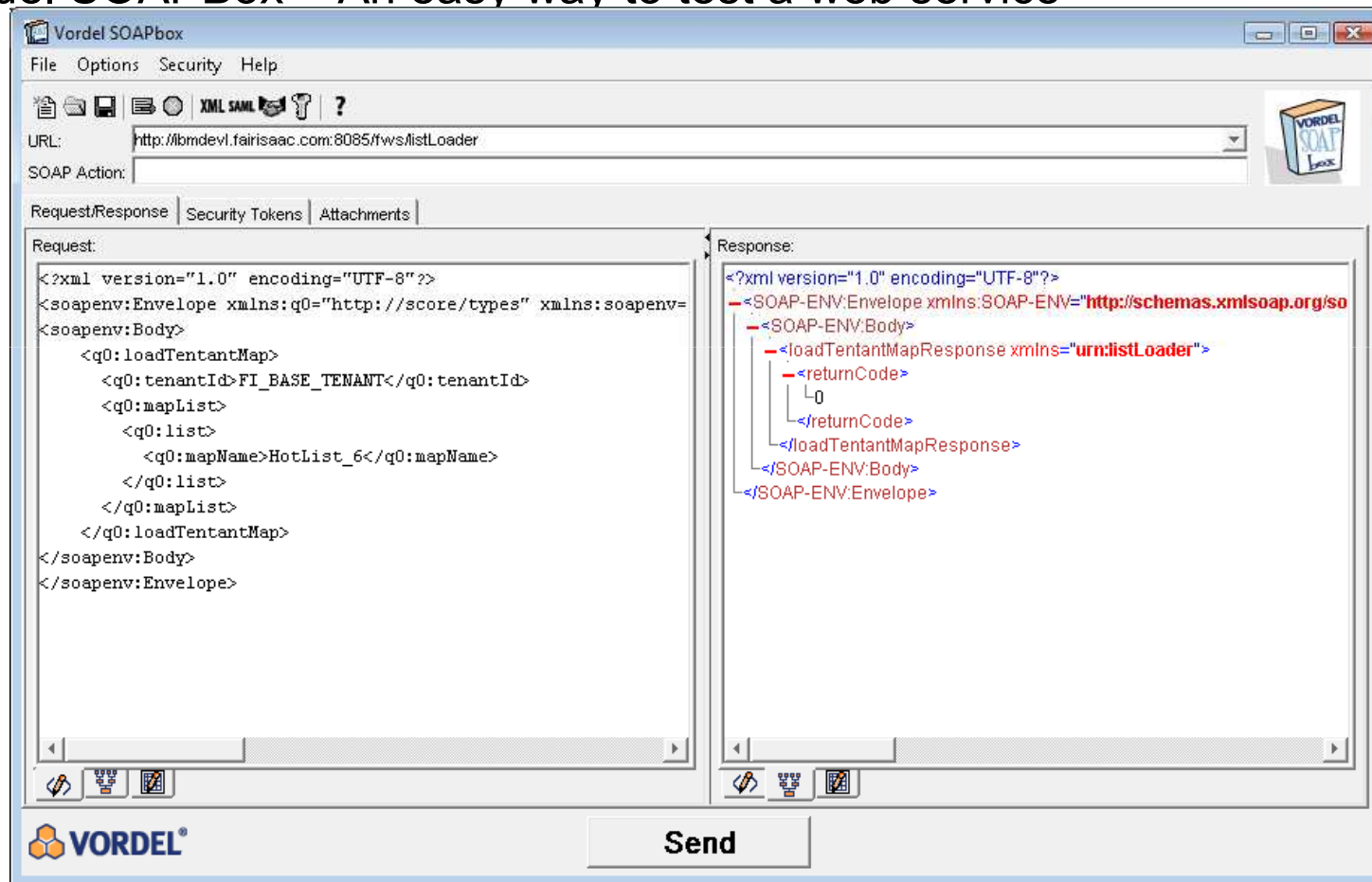


Request Soap Envelope

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:q0="http://score/types" 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">
<soapenv:Body>
  <q0:loadTenantMap>
    <q0:tenantId>FI_BASE_TENANT</q0:tenantId>
    <q0:mapList>
      <q0:list>
        <q0:mapName>HotList_6</q0:mapName>
      </q0:list>
    </q0:mapList>
  </q0:loadTenantMap>
</soapenv:Body>
</soapenv:Envelope>
```


Testing – Invoking a Web Service

Vordel SOAPBox – An easy way to test a web service



The screenshot shows the Vordel SOAPBox application window. The URL is set to `http://lbmdevl.fairisaac.com:8085/fws/listLoader`. The SOAP Action field is empty. The interface has tabs for Request/Response, Security Tokens, and Attachments. The Request/Response tab is active, showing the following XML request and response:

```

Request:
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:q0="http://score/types" xmlns:soapenv=
<soapenv:Body>
  <q0:loadTenantMap>
    <q0:tenantId>FI_BASE_TENANT</q0:tenantId>
    <q0:mapList>
      <q0:list>
        <q0:mapName>HotList_6</q0:mapName>
      </q0:list>
    </q0:mapList>
  </q0:loadTenantMap>
</soapenv:Body>
</soapenv:Envelope>

Response:
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/so
<SOAP-ENV:Body>
  <loadTenantMapResponse xmlns="urn:listLoader">
    <returnCode>
      0
    </returnCode>
  </loadTenantMapResponse>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
  
```

At the bottom of the window, there is a "Send" button and the Vordel logo.

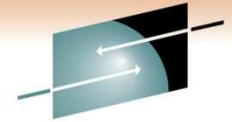
Debugging – Soap Fault

- `<SOAP-ENV:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">`
- `<SOAP-ENV:Body>`
- `<SOAP-ENV:Fault xmlns="">`
 - `<faultcode>SOAP-ENV:Client</faultcode>`
 - `<faultstring>IGZ0282S XML to data structure conversion could not complete in program "inqprmI" because no element names in the XML document were recognized by the converter.</faultstring>`
- `</SOAP-ENV:Fault>`
- `</SOAP-ENV:Body>`
- `</SOAP-ENV:Envelope>`

Debugging – CICS Start Job

```

Display Filter View Print Options Help
-----
SDSF JOB DATA SET DISPLAY - JOB CFIADEV2 (JOB08935) LINE 1-12 (12)
COMMAND INPUT ==> SCROLL ==> CSR
NP DDNAME StepName ProcStep DSID Owner C Dest Rec-Cnt Page
  → JESMSG LG JES2 2 CFIADEV2 X 2
  JESJCL JES2 3 CFIADEV2 X 158
  JESYSMSG JES2 4 CFIADEV2 X 2
  DFHLP JS10 CICS 101 CFIADEV2 X 0
  DFHCXRF JS10 CICS 102 CFIADEV2 X 0
  → MSGUSR JS10 CICS 104 CFIADEV2 X 2,899
  PLIMSG JS10 CICS 106 CFIADEV2 X 0
  COUT JS10 CICS 107 CFIADEV2 X 0
  CEEOUT JS10 CICS 108 CFIADEV2 X 0
  CEEMSG JS10 CICS 109 CFIADEV2 X 0
  CAFF JS10 CICS 115 CFIADEV2 X 0
  CRPO JS10 CICS 116 CFIADEV2 X 0
  
```



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Debugging – Checking Program Counts

```
I PROG (DFHWBGB,DFHWBXN,FICCLL) ■
STATUS:  RESULTS - OVERTYPE TO MODIFY
Prog(DFHWBGB ) Leng(0000001056) Ass Pro Ena Pri
  Res(000) Use(0000000002) Any Cex Ful Qua Cic          Nat
Prog(DFHWBXN ) Leng(0000024640) Ass Pro Ena Pri
  Res(000) Use(0000000004) Any Cex Ful Qua Cic          Nat
Prog(FICCLL  ) Leng(0000368376) C   Pro Ena Pri          Ced
  Res(000) Use(0000000004) Any Cex Ful Thr Ope         Len
```

Web Services – References

- Redbook – Implementing Web Services

<http://www.redbooks.ibm.com/abstracts/sg247206.html>

- How CICS supports Web services

http://publib.boulder.ibm.com/infocenter/cicsts/v3r1/index.jsp?topic=/com.ibm.cics.ts31.doc/dfhws/concepts/dfhws_support.htm

- z/OS Unix command reference

<http://publibz.boulder.ibm.com/epubs/pdf/bpxza5a0.pdf>

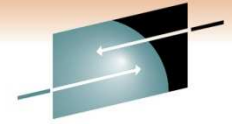
Lessons Learned

- Sharing WSDLs and WS tools
 - Not all WSDLs compatible with CICS
- Matrix Development hurdles
 - Falcon z/OS compiles in batch, not make files
 - Other cross platform tool issues
- Develop and support one ‘flavor’
 - Original deployment with ‘SOAP for CICS’
 - problems to try to support two flavors
 - Future IBM changes for tooling?
- Customer challenges – security & user authentication

The Future

- More components of the Falcon system exposed as WS
 - Profile IO
 - Case Management (create, update, status)
 - Scoring
- Blaze Interfaces, Java
- More ported functionality
- Remote monitoring
- Fast and cheap interfaces to other applications (Blaze, Java)

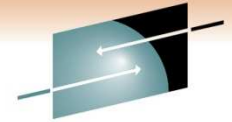




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Additional Information



Web Services Glossary

- Service Oriented Architecture (SOA)
- Web Service (WS) is part of SOA
 - Described via a Web Services Description Language (WSDL)
 - Universal Description, Discovery and Integration (UDDI)
 - Simple Object Access Protocol (SOAP)
 - Extensible Markup Language (XML) Based
- HyperText Transmission Protocol (HTTP)
- Portable Operating System Interface (POSIX)
- The POSIX standard is UNIX centric
 - Of particular interest to FIC:
 - Shared Memory Functions
 - Locking mechanisms

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