



IBM Software Group

CICS Web Services Part 2: Deployment

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WebSphere® Support Technical Exchange



Agenda

- Overview of CICS Web services runtime
- Major deployment considerations and best practice
 - Security
 - Workload Management and Availability
 - Performance
- Customer case study
- CICS version differences

Note: this WSTE Webcast is a follow-on from the Webcast of 22nd August 'CICS Web Services Part 1: Development':

<http://www.ibm.com/support/docview.wss?uid=swg27016658>



Useful Resources

- CICS Information Centers

TS 3.1 <http://publib.boulder.ibm.com/infocenter/cicsts/v3r1/index.jsp>

TS 3.2 <http://publib.boulder.ibm.com/infocenter/cicsts/v3r2/index.jsp>

TS 4.1 <http://publib.boulder.ibm.com/infocenter/cicsts/v4r1/index.jsp>

- IBM Web Services Red Books

Architecture <http://www.redbooks.ibm.com/abstracts/sg245466.html?Open>

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

Performance <http://www.redbooks.ibm.com/abstracts/sg247687.html?Open>

Security <http://www.redbooks.ibm.com/abstracts/sg247658.html?Open>

WLM <http://www.redbooks.ibm.com/abstracts/sg247144.html?Open>

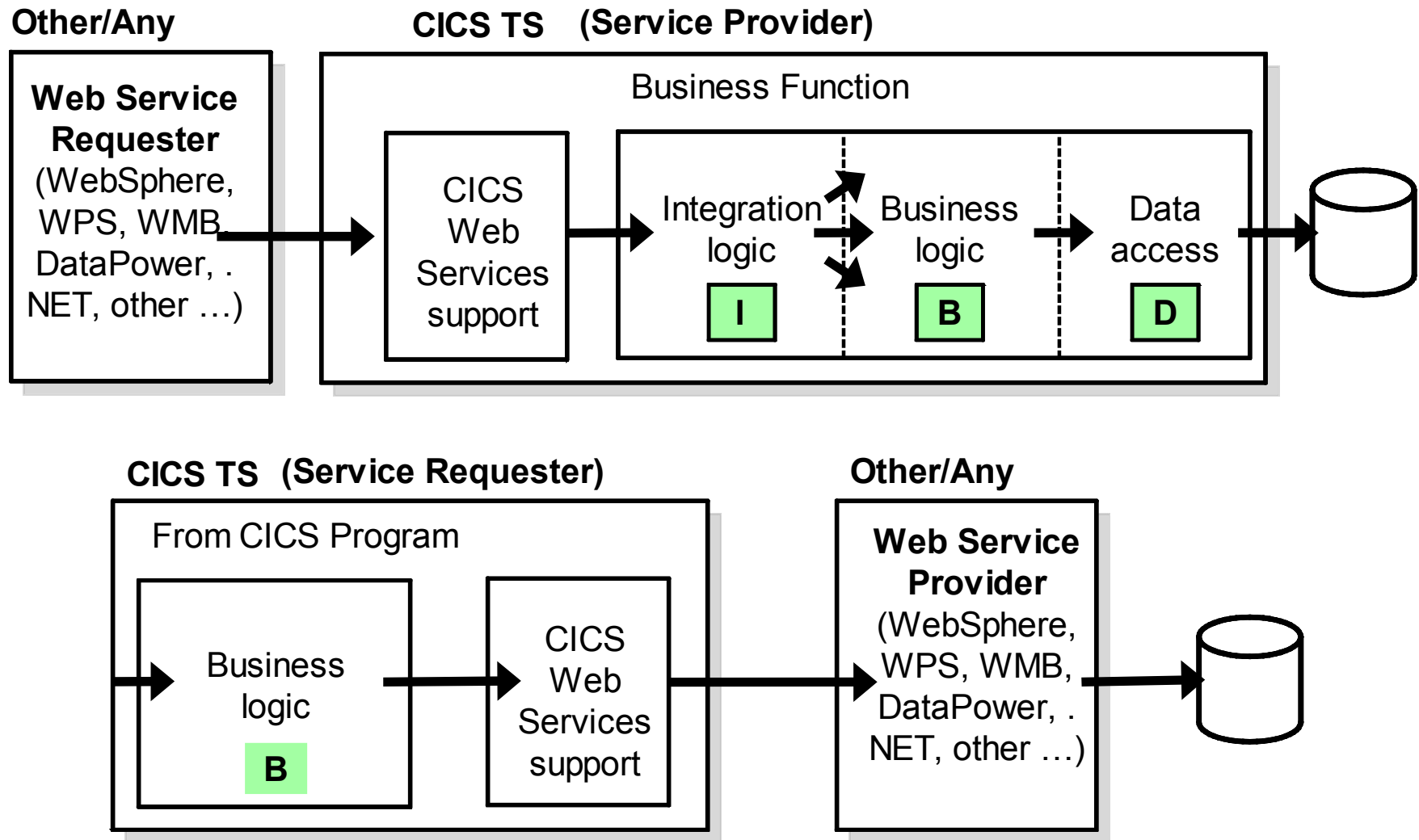
Development <http://www.redbooks.ibm.com/abstracts/sg247126.html?Open>

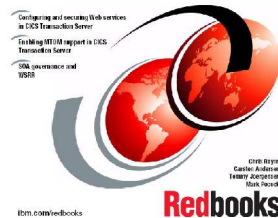
- Examples <http://www-01.ibm.com/support/docview.wss?uid=swg24020774>

- Knowledge Collection <http://www-01.ibm.com/support/docview.wss?uid=swg27010507>

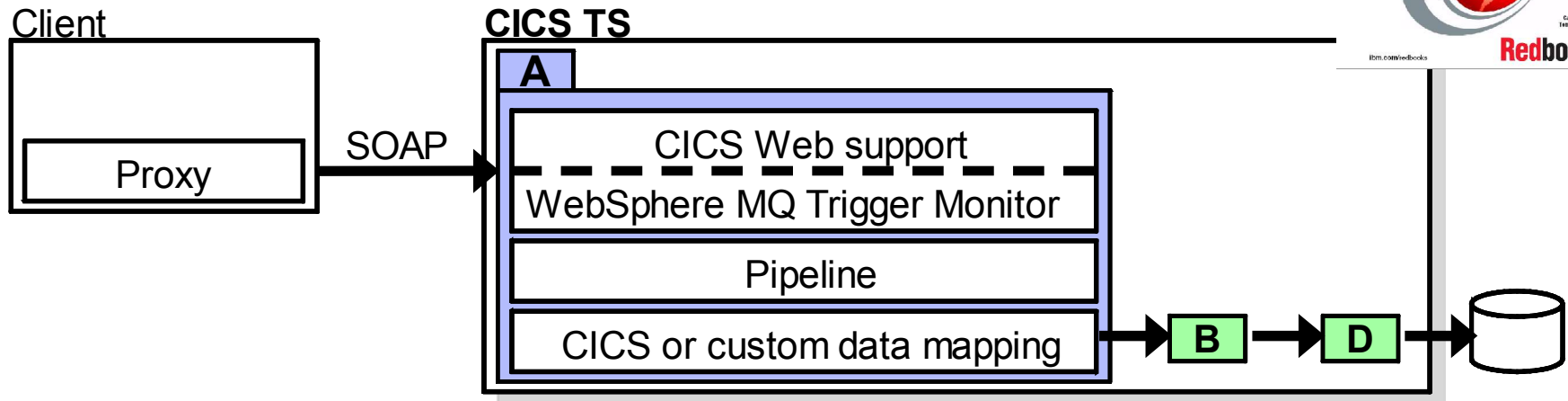


Typical CICS Web services scenarios



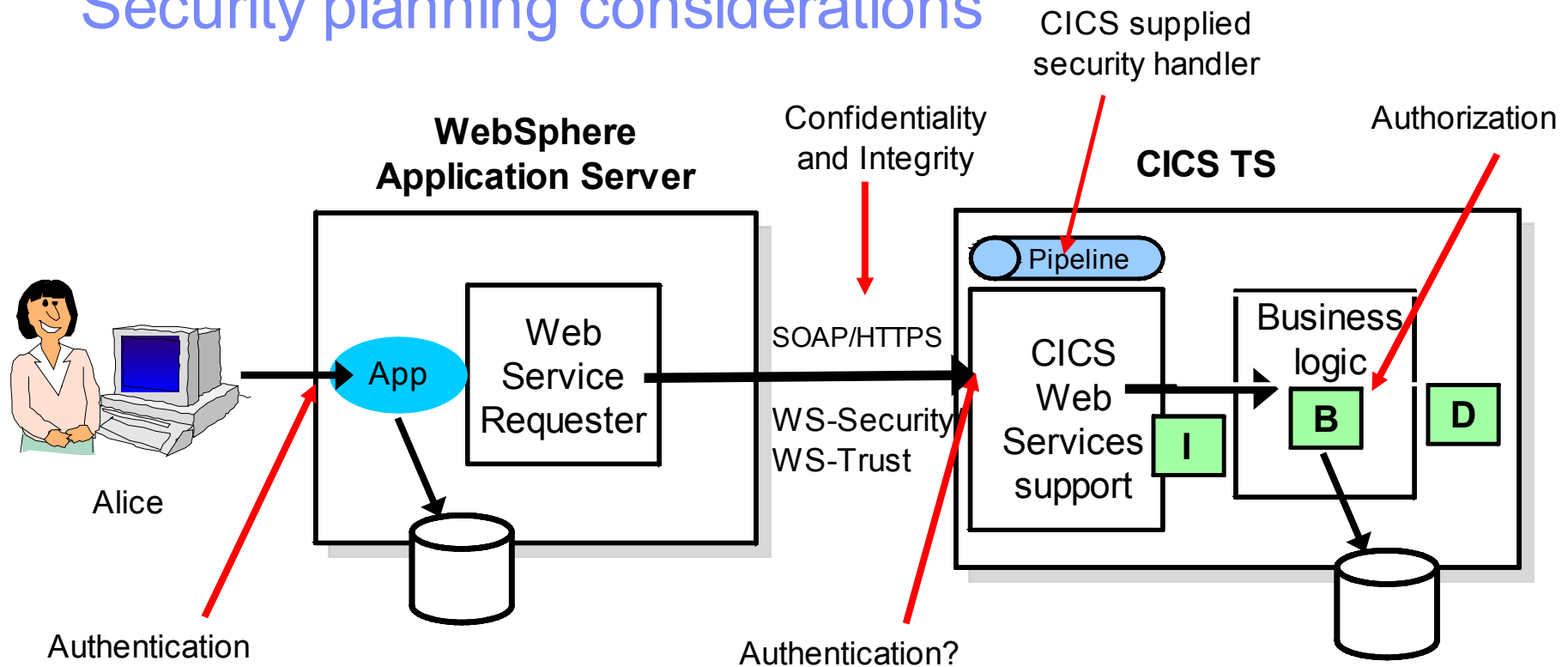


CICS Web services overview

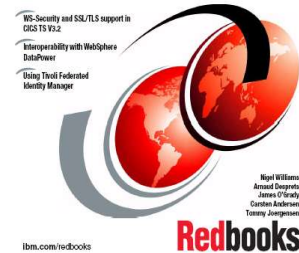


- From CICS TS V3.1 a CICS application can be Web service provider or consumer
 - HTTP or MQ transport
- Runtime
 - SOAP envelope removed by a message handler in the Web services pipeline
 - Commarea or container built by “data mapper”
- Development using CICS supplied utilities or Rational Developer for System z (RDz)
 - Used to generate the data mapping
- EXEC CICS INVOKE WEBSERVICE api for outbound support

Security planning considerations



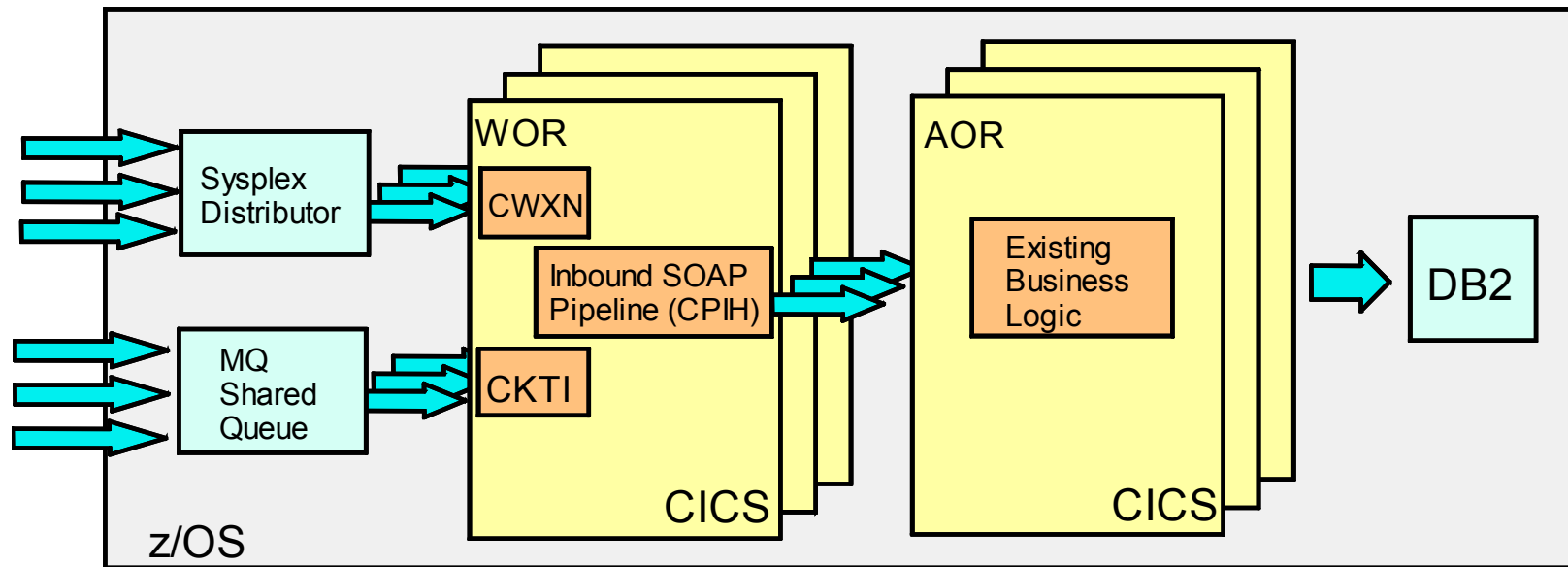
- How to authenticate
- How to pass security credentials (in message or in transport layer)
- Whether identity assertion is required
- How to ensure confidentiality and data integrity



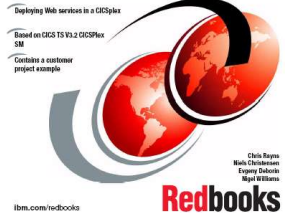
Security best practice

- Transport security alone (e.g SSL/TLS) may be sufficient i simple environments (point to point)
 - Use cryptographic hardware and ICSF (Integrated Cryptographic Hardware Facility) to maximize performance of SSL/TLS
- WS.* standards can be used for more advanced requirements
 - WS-Security enables message-level authentication, data integrity and encryption
 - CICS supports WS-Security UsernameTokens and X.509 certificates natively
 - WS-Trust support (CICS TS V3.2) enables indirect support of other token types (Kerberos, SAML ...) by interoperating with a Security Token Service (STS) such as Tivoli Federated Identity Manager (TFIM)
- Consider using WebSphere DataPower for internet solutions:
 - XML validation
 - Protection against XML DNS attacks
 - Offload of expensive operations (e.g XML digital signature processing)

WLM and Availability considerations



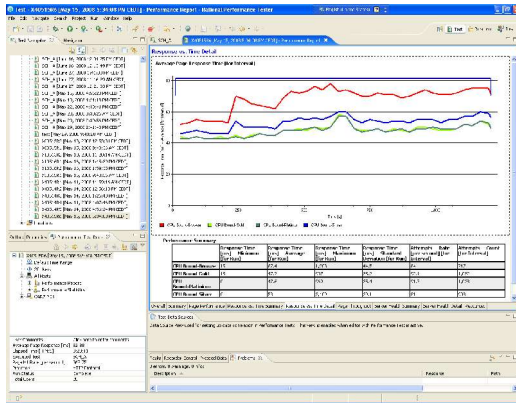
- How to workload manage service requests
- How to set the pipeline transaction id
- How to process Web service requests across a CICSplex
- How to ensure service availability



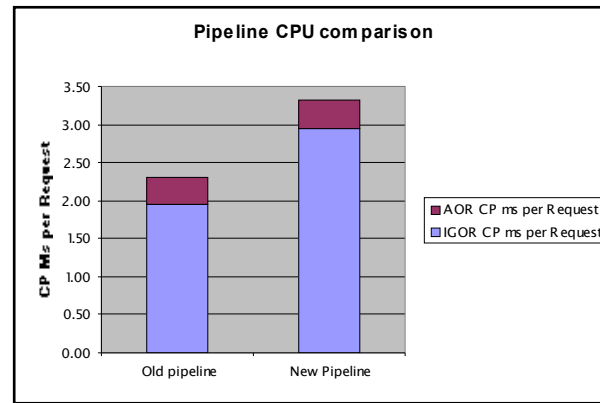
WLM and availability best practice

- Use Sysplex Distributor, TCP/IP port sharing and MQ queue sharing to distribute Web service requests across different CICS regions
- Use CICSplex SM to dynamically route requests after the SOAP message has been processed
 - Set a private pipeline transaction id (default CPIH)
 - DPL routing is preferred to transaction routing
 - Cleaner separation between system and application code
 - DPL approach performs better
 - Additional resource definitions required in AOR if routing pipeline
- Use monitoring tools like OMEGAMON XE for CICS for tracking against service response-time goals

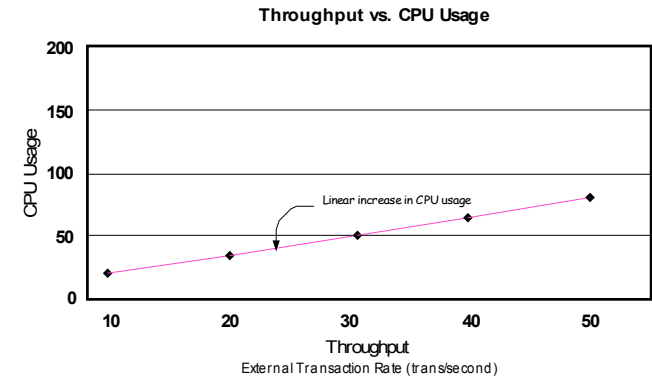
Performance considerations



Workload simulation

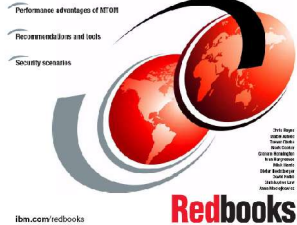


Measure CPU costs



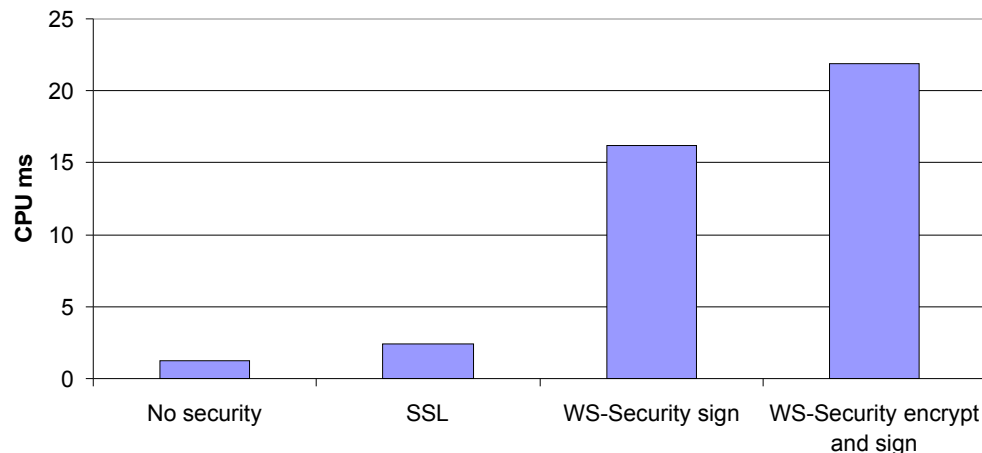
Test for linear scalability

- What response times can be achieved
- How many processors do I need
- How to optimize performance



Performance best practice

- Reducing the size of inbound and outbound SOAP messages will improve performance
 - Using short tag names
 - Removing redundant data elements from the SOAP message
- CPU consumption is significantly affected by the complexity of the messages
 - In the design phase, try to keep the number of elements, and depth of the XML message structure, to a minimum
- Security impact can be large
 - Optimise SSL using persistent connections or SSL session id reuse
 - When using WS-Security - Username Tokens perform better than X.509 certificates



Customer case study

Business....

- Very large financial services group
- Retail banking, insurance, mortgages etc...
- 20+ million accounts
- Services large percentage of country ATM payments
- Large car insurer (8+ million policies)
- **Service availability is paramount**

Project scope....

- Determine the best infrastructure bearing in mind the **security, workload management** and **scalability** requirements
- Understand the management and monitoring aspects of the solution, and monitoring tool capabilities



Deploying CICS Web services to preserve IT investments in the banking industry.

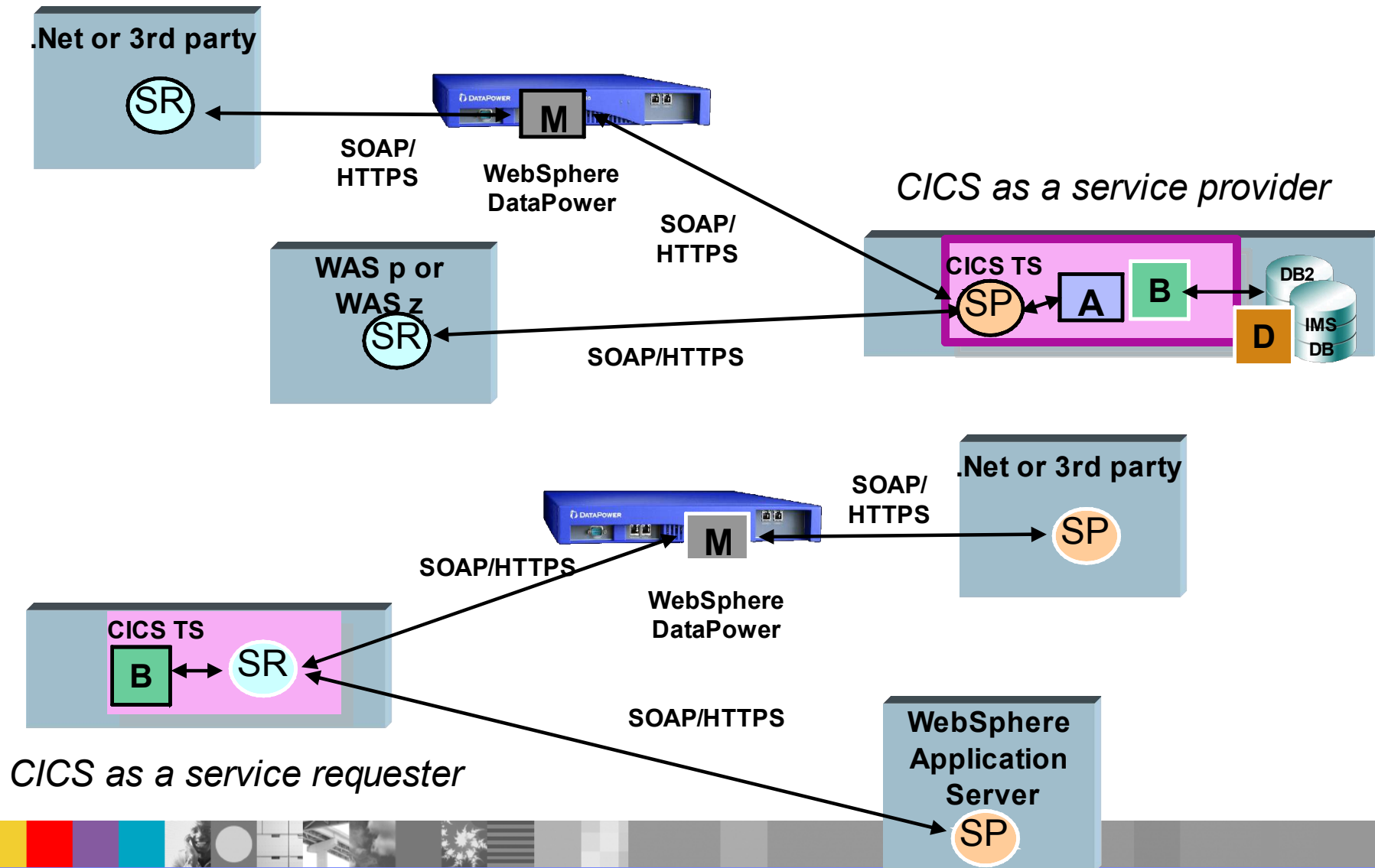
<http://www.ibm.com/software/http/cics/tserver/v32/library/index.html>



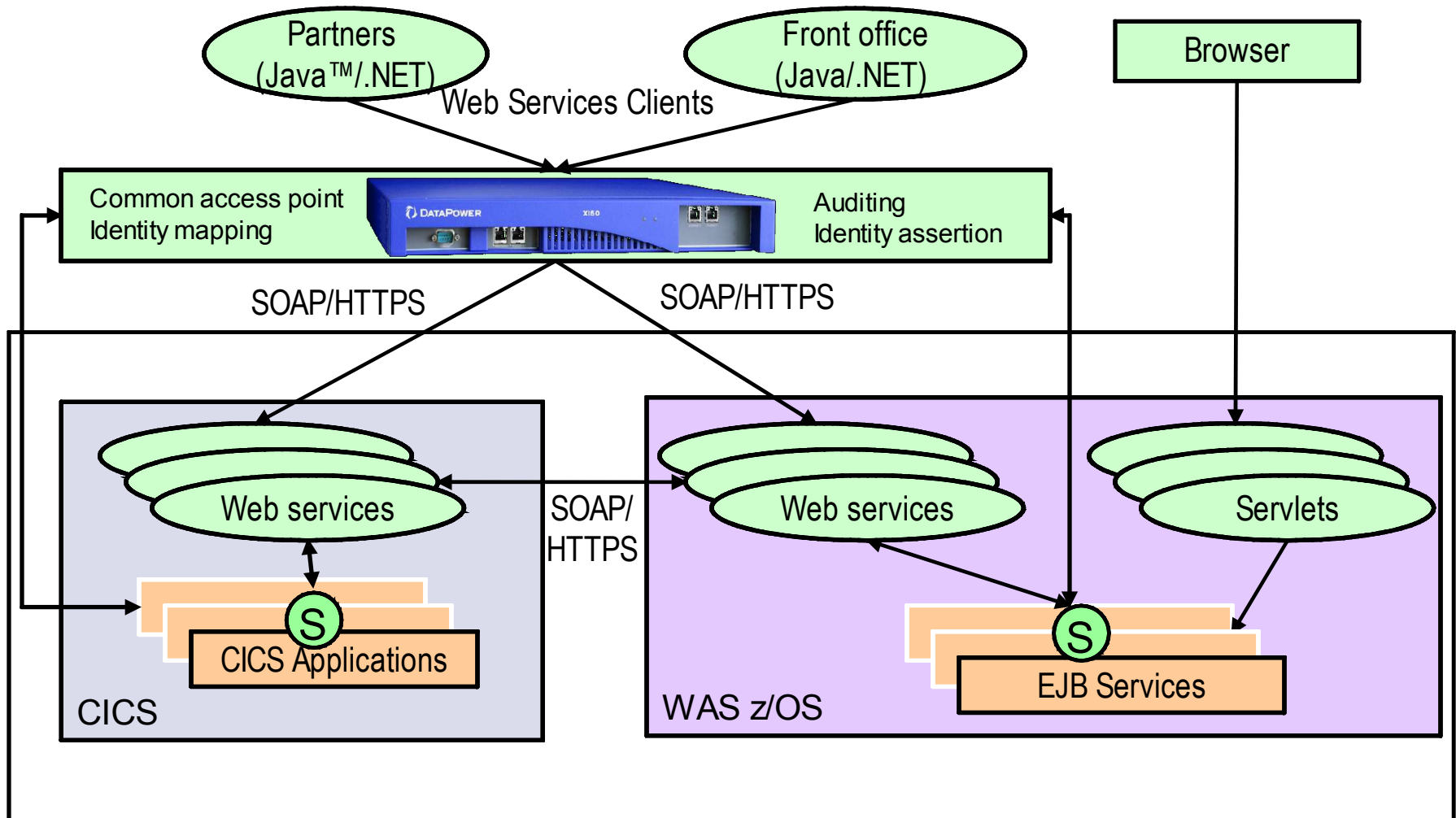
By Nigel Williams, Certified IT Specialist, IBM Design Center, Montpellier, France and Steve Wall, IT Specialist, System z Benchmark Center, Montpellier, France

Usage scenarios

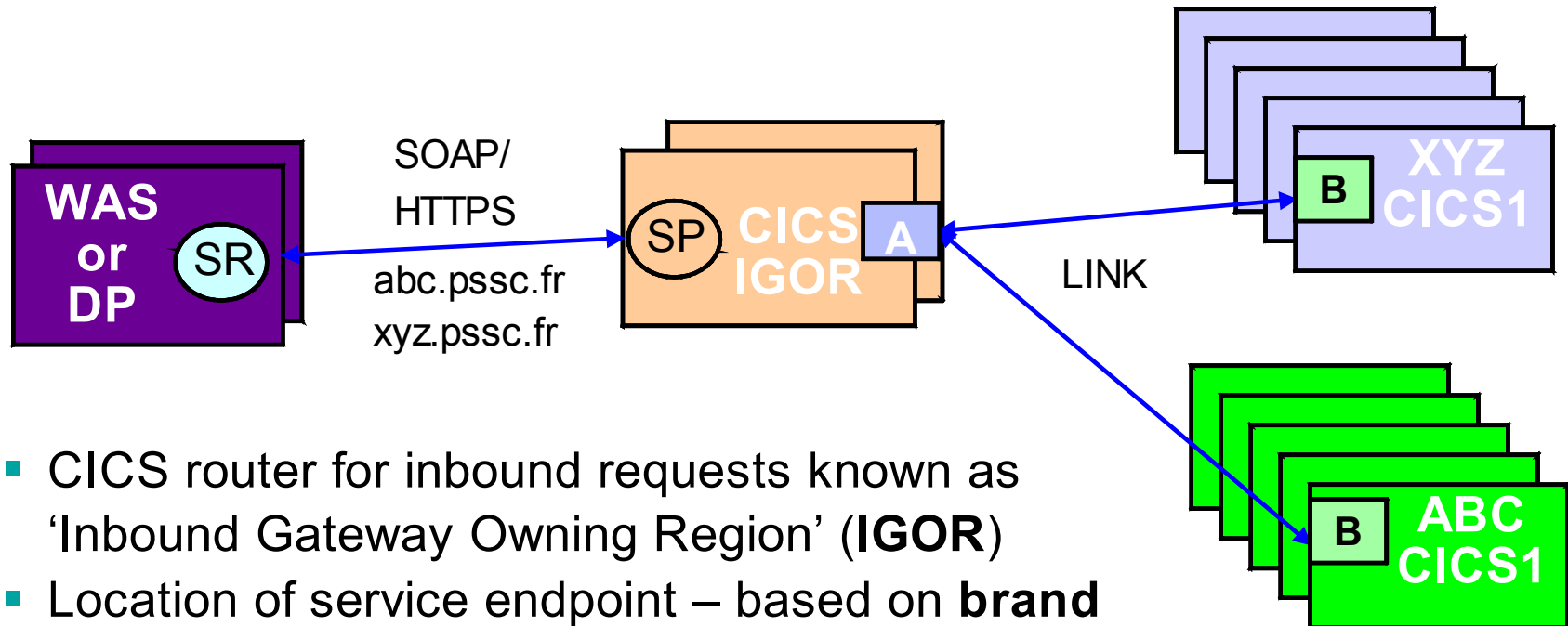
M Mediation



Tested configuration

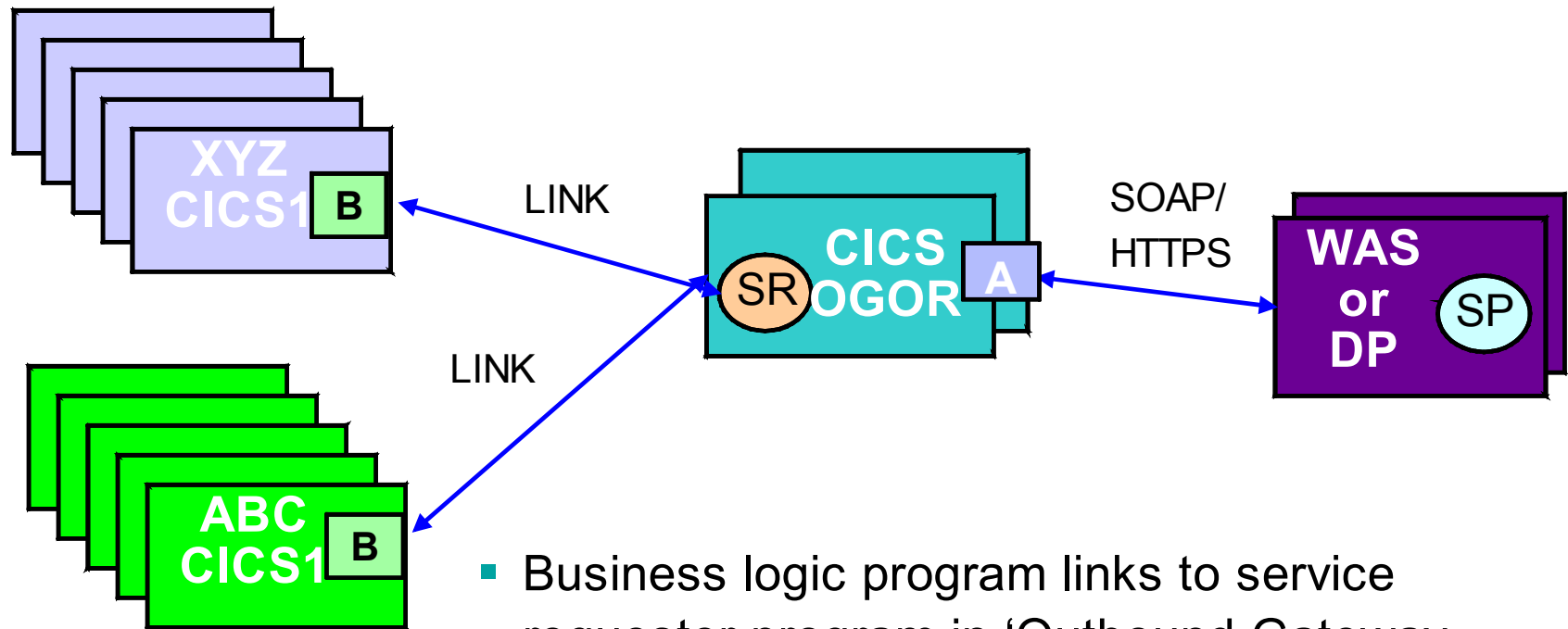


Workload management of inbound service requests



- CICS router for inbound requests known as 'Inbound Gateway Owning Region' (**IGOR**)
- Location of service endpoint – based on **brand** host names
- IGOR runs CICS **wrapper** program ('meet in the middle' approach)
- Establishes transaction context (brand specific transaction id and user identity)

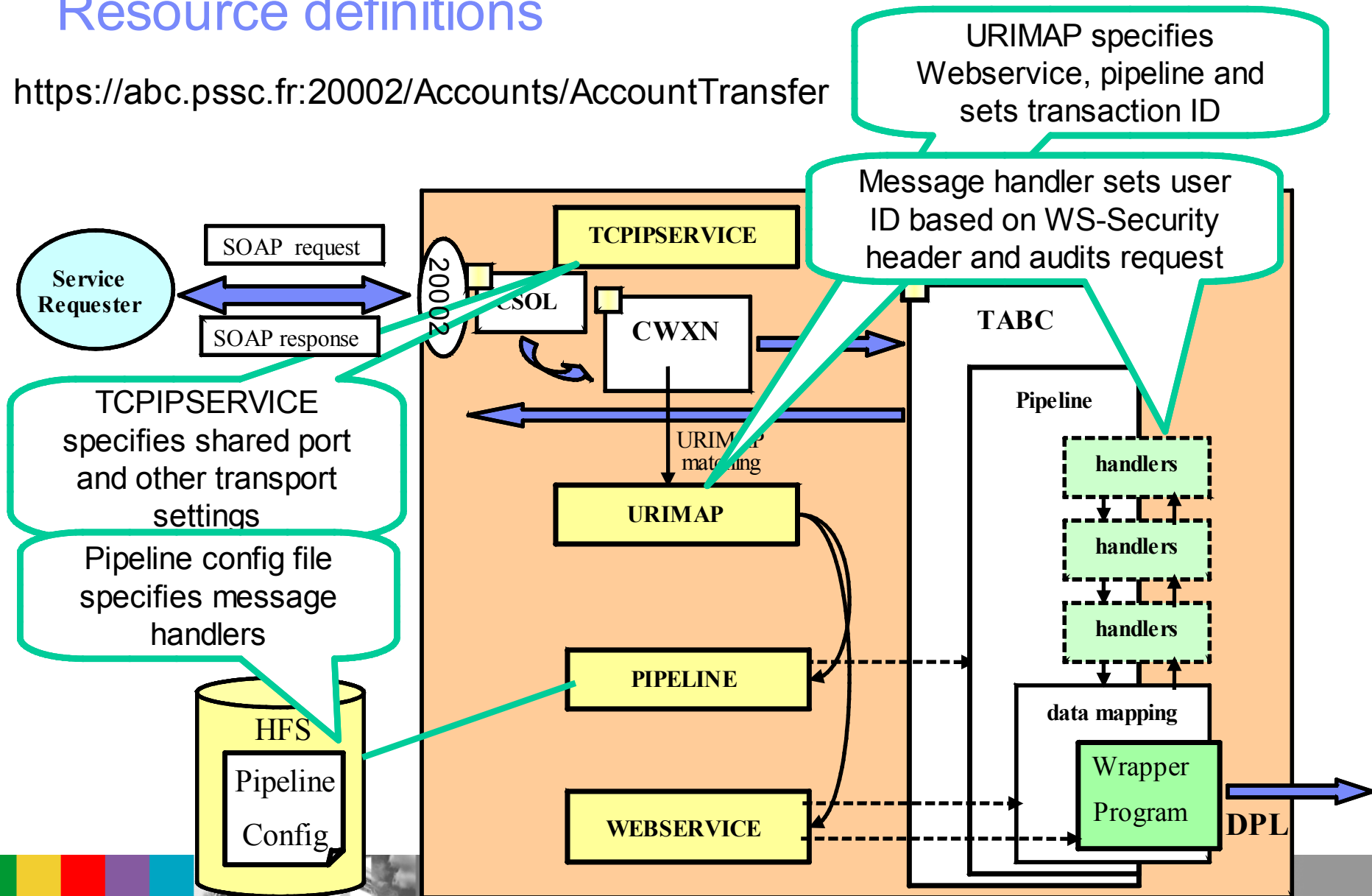
Workload management of outbound service requests



- Business logic program links to service requester program in 'Outbound Gateway Owning Region' (**OGOR**)
- Runs CICS Web service requester program which uses EXEC CICS INVOKE WEBSERVICE API to call service provider

Resource definitions

<https://abc.pssc.fr:20002/Accounts/AccountTransfer>



SOAP request message

```
- <soapenv:Envelope
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding"
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope"
  xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
- <soapenv:Header>
- <wsse:Security soapenv:mustUnderstand="1"
  xmlns:wsse="http://docs.oasis-
  open.org/wss/2004/01/oasis-200401-wss-
  wssecurity-secext-1.0.xsd">
- <wsse:UsernameToken>
  <wsse:Username>ABCUSR1</wsse:Username>
  </wsse:UsernameToken>
  </wsse:Security>
</soapenv:Header>
- <soapenv:Body>
- <p23:RequestComplexRequestPart
  xmlns:p23="http://localhost/CICSWSTestHarness/">
  <count>10</count>
  <delay>100</delay>
</p23:RequestComplexRequestPart>
</soapenv:Body>
</soapenv:Envelope>
```

SOAP response message

```
- <soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <soapenv:Header />
  <soapenv:Body>
    <p23:RequestComplexResponsePart
      xmlns:p23="http://localhost/CICSWSTestHarness/">
      <customer>
        <firstname>Nigel</firstname>
        <surname>Williams</surname>
        <address>
          <line1>Rue de la Vieille Poste</line1>
          <line2>Montpellier</line2>
          <line3 />
          <line4 xsi:nil="true" />
          <postcode>34160</postcode>
        </address>
        <balance>0.99</balance>
        <overdraftLimit>100</overdraftLimit>
      </customer>
      <customer>
        <firstname>Steve</firstname>
        <surname>Wall</surname>
        <address>
          <line1>Some Street</line1>
          <line2>Somewhere</line2>
          <line3 />
          <line4 xsi:nil="true" />
          <postcode>ABC 2XX</postcode>
```

TCPIPSERVICE definition

```

CEDA  DEFine TCpipservice( TCPIPABC )
    TCpipservice      : TCPIPABC
    GROup             : WSIGOR
    DEscription       ==> TCPIPSERVICE FOR BRAND ABC
    Urm               ==> DFHWBADX
    PORTnumber        ==> 20002                1-65535
    Status            ==> Open                  Open ! Closed
    PROtocol          ==> Http                  Iiop ! Http ! Eci !
User
    TRansaction       ==> CWXN
    Backlog           ==> 00005                0-32767
    TSqprefix         ==>
    Ipaddress         ==>
    SOcketclose        ==> 000030              No ! 0-240000 (HHMMSS)
    Maxdatalen        ==> 000032              3-524288
SECURITY
    SSL               ==> Clientauth          Yes ! No ! Clientauth
    Authenticate      ==> Certificate

```

PORTNUMBER is set to **20002**, the shared port

SOCKETCLOSE to **30** so that connections persist but that an idle connection is timed out after 30 seconds

SSL is set to **Clientauth** and Authenticate is set to **Certificate**



URIMAP definition

```

CEDA  DEfINE Urimap(AcntTABC )
    Urimap          : AcntTABC
    Group           : WSIGOR
    Description      ==> URIMAP for brand ABC Account Transfer
service
    Status           ==> Enabled                Enabled | Disabled
    USAge            ==> Pipeline                Server | Client |
Pipeline
    UNIVERSAL RESOURCE IDENTIFIER
    SCHEME           ==> HTTPS                HTTP | HTTPS
    HOST             ==> abc.pssc.fr
    (Lower Case)     ==>
    PAth             ==> /Accounts/AccountTransfer

    ASSOCIATED CICS RESOURCES
    TCpipservice     ==> TCPIPABC
    TRansaction      ==> TABC
    PIpipeline       ==> PIPEHIGH
    Webservice       ==> AcntTrn

```

Host **abc.pssc.fr** specifies the host component of the URI to which the URIMAP definition applies

Transaction **TABC** (Transfer for brand **ABC**) is name of the transaction id to be used for pipeline transaction

Pipeline **PIPEHIGH** specifies name of pipeline

Service part of high value pipeline configuration file

```
<service>
  <terminal_handler>
    <cics_soap_1.1_handler>
      <headerprogram>
        <program_name>SRSETUID</program_name>
        <namespace>http://docs.oasis-open.org/wss/2004/01/oasis-
          200401-wss-wssecurity-secext-1.0.xsd</namespace>
        <localname>Security</localname>
        <mandatory>true</mandatory>
      </headerprogram>
    </cics_soap_1.1_handler>
  </terminal_handler>
</service>
```

Note: In this PoC we used a custom-written security handler. From CICS TS V3.2 we recommend to use the CICS supplied security handler.



CICS pipeline configuration for ID assertion (CICS TS V3.2)

```
<wsse_handler>  
  <dfhwsse_configuration version="1">  
    <authentication trust="blind" mode="basic">  
    </authentication>  
  </dfhwsse_configuration>  
</wsse_handler>
```

Authorization checking for Account Transfer service

CEMT INQUIRE TASK

Tas(0000311) Tra(CEMT) Fac(C5TN) Run Ter Pri(255)
Sta(TO) Use(NIGEL2) Uow(C070F226FD3AEAA0)

Tas(0000330) Tra(**TABC**) Sus Tas Pri(001)
Sta(U) Use(**ABCBRAND**) Uow(C070F385DFACC098) Hty
(RZCBNOTI)

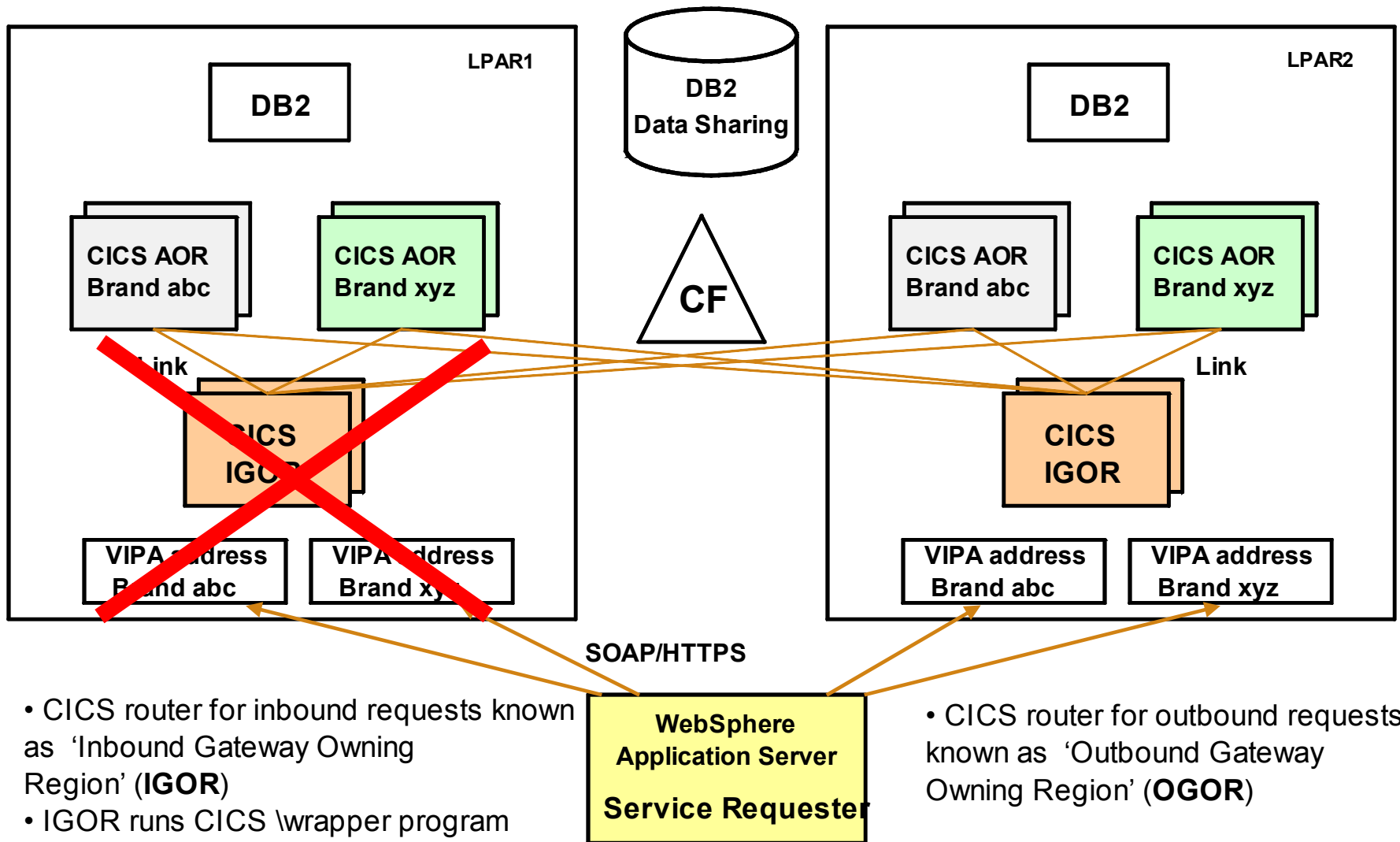
Tas(0000331) Tra(**TABC**) Sus Tas Pri(001)
Sta(U) Use(**ABCUSR1**) Uow(C070F385E02A7FD8) Hty
(IRLINK)

TASK 330 runs with user ID ABCBRAND (**transport id**)

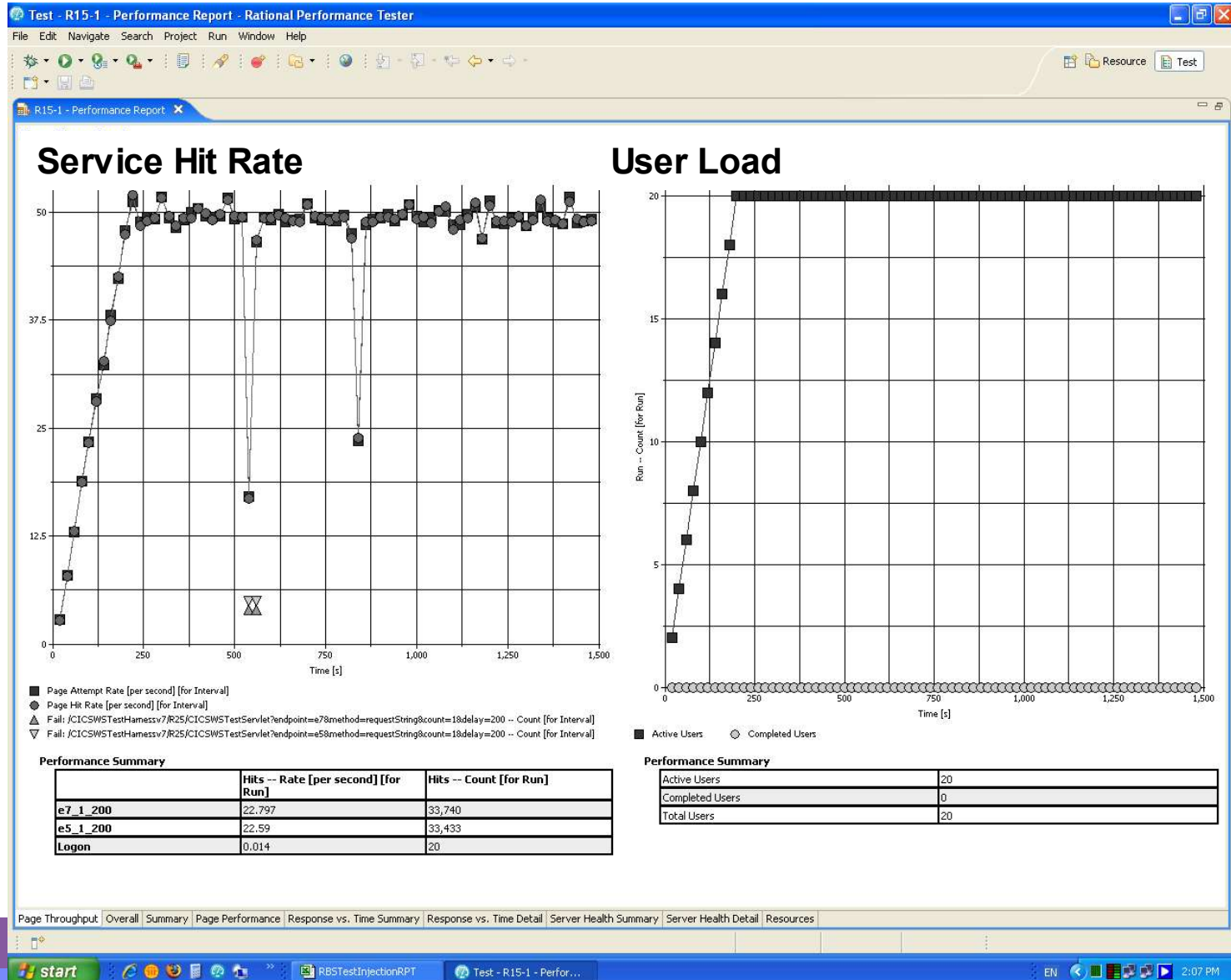
TASK 331 runs with user ID ABCUSR1 (**asserted id**)



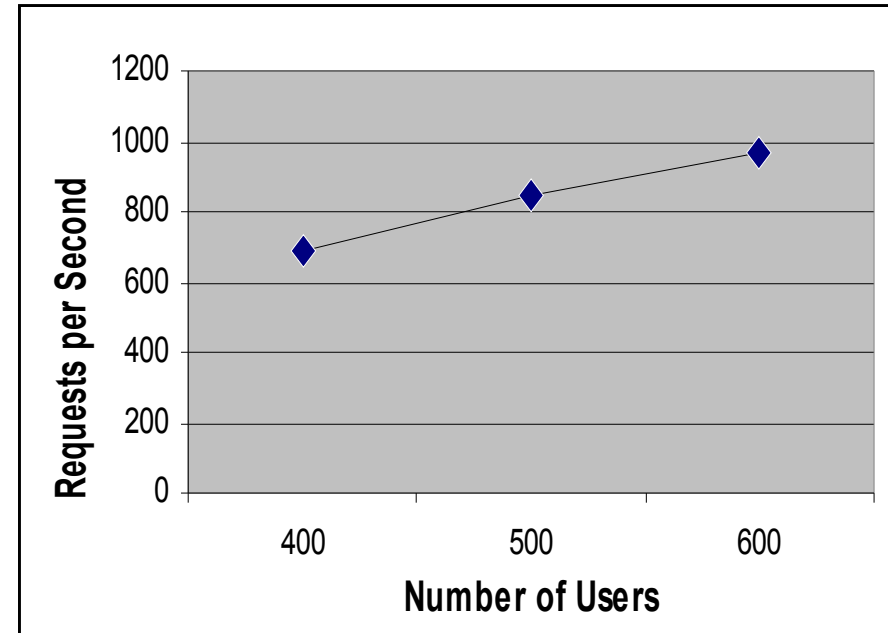
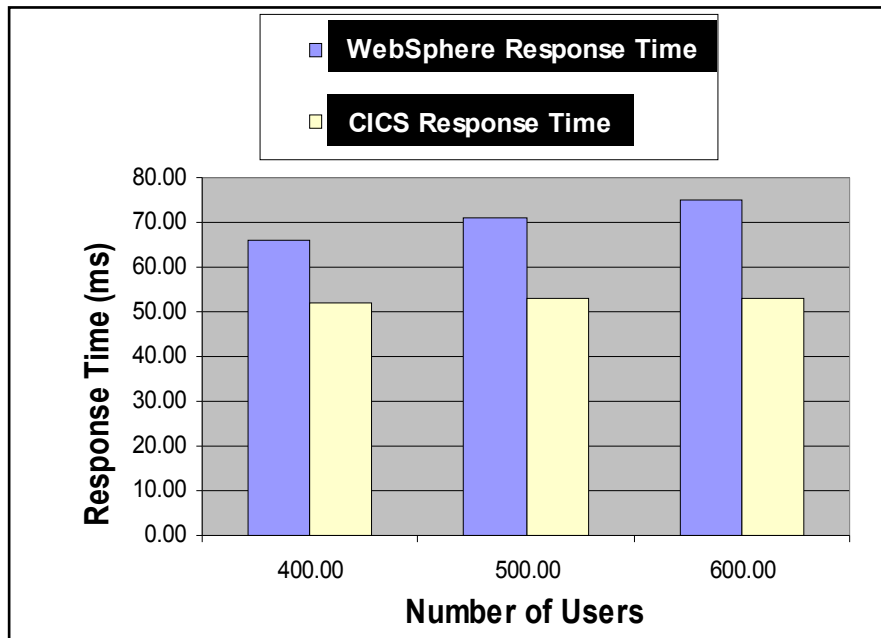
High availability configuration



High availability test scenario



Scalability tests



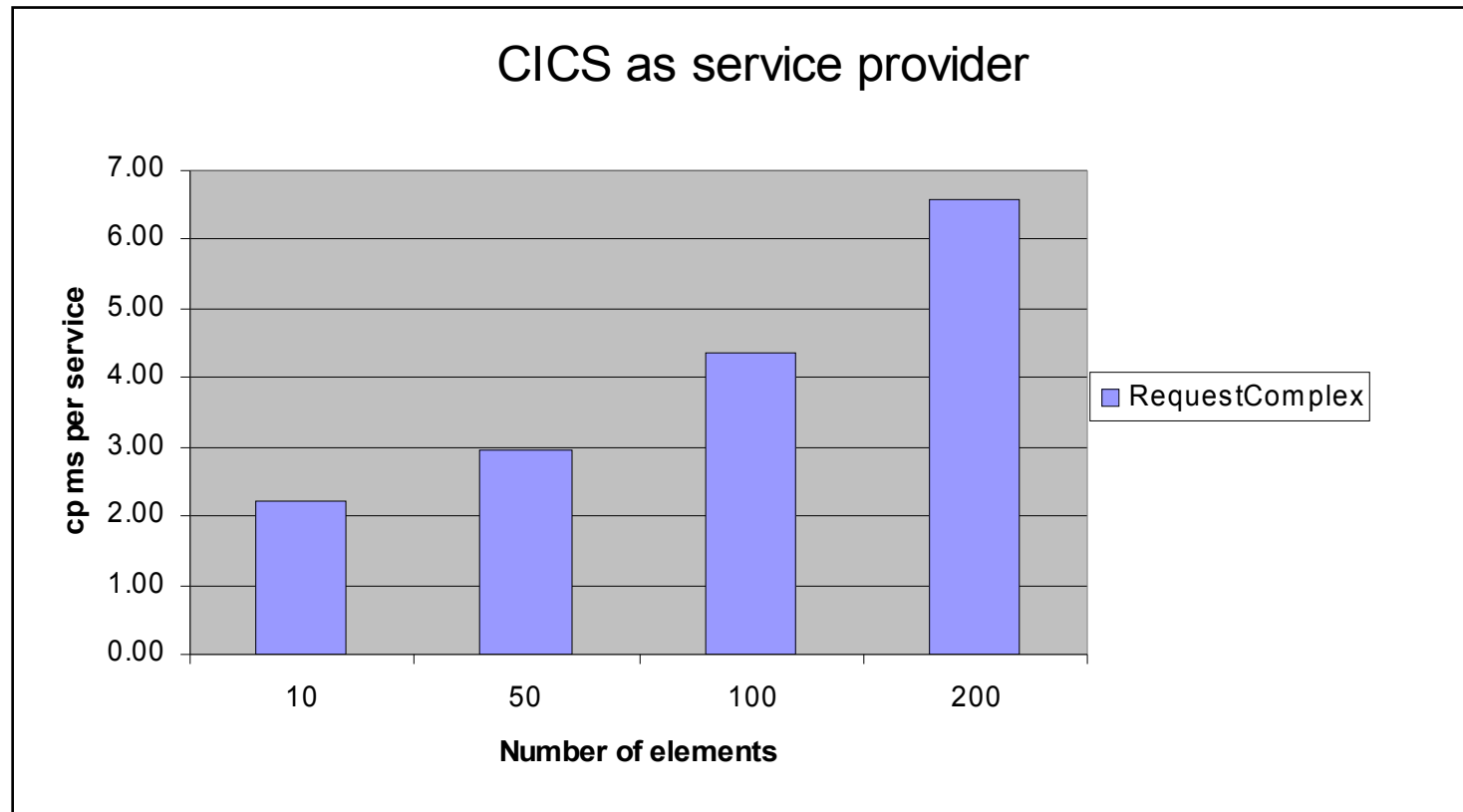
These tests were performed with service requester application deployed in WebSphere Application Server for z/OS and service provider application deployed in CICS

Delay of 50 ms coded in CICS business logic program

Short messages: Request <1K , Response 3.3K

Note: these tests performed with CICS TS V3.1 on a System z9

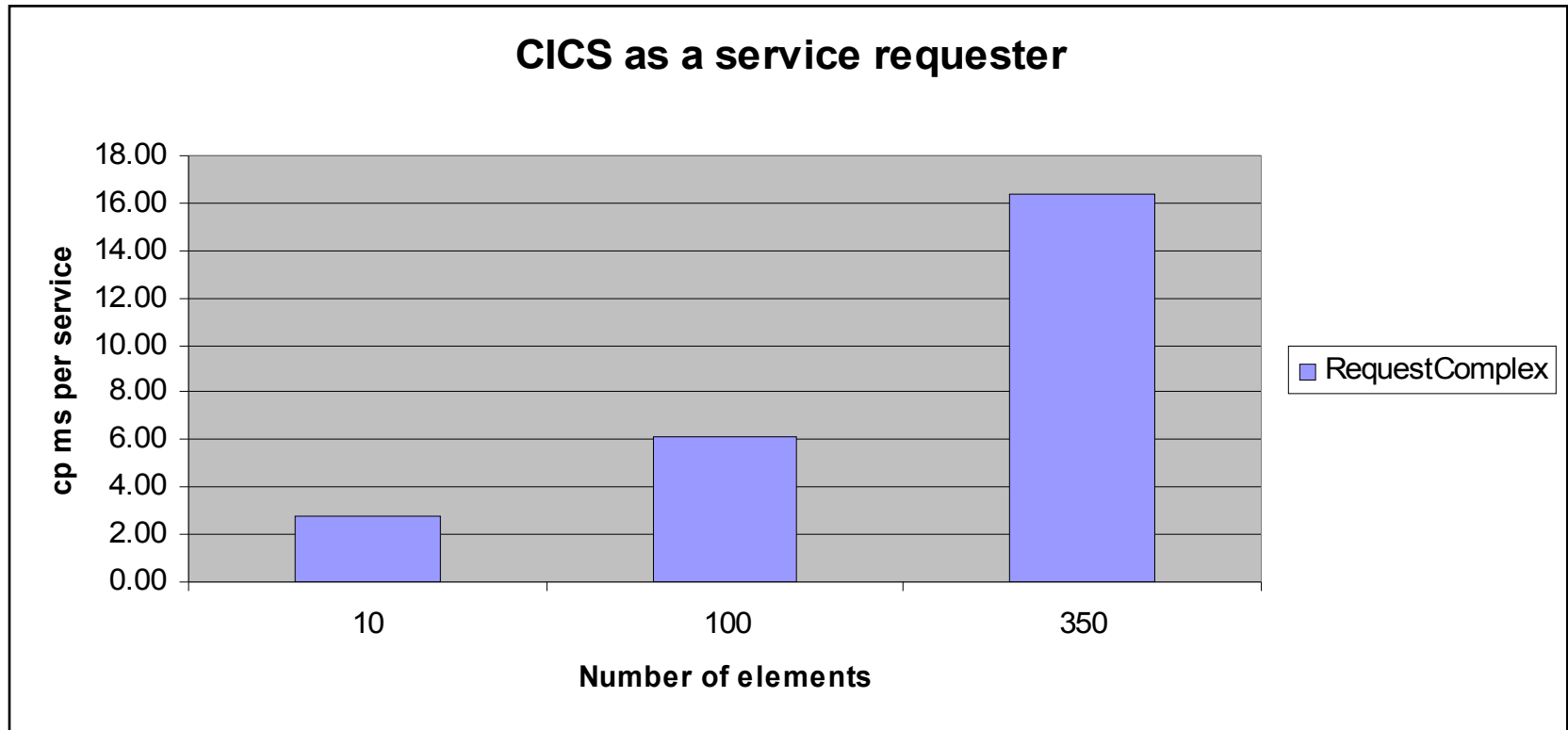
Changing the number of elements (inbound)



Web service performance depends on the length and complexity of the message
Each element (customer record) in this test contains 10 sub-elements
Total length of the 10 element message is 3.3K
Total length of 200 element message is 68K

20 x Msg Size → 3 x CPU

Changing number of elements (outbound)



CICS has to parse response message

Total length of the 10 element (customer record) message is 3.3K

Total length of 350 element message is 102K

35 x Msg Size → 6 x CPU

Using CICSplex SM Web User Interface

Web service

EYUVC12801 3 records collected at 10/21/08 15:30:10.

Context: WSPLEX
Scope: WSPLEX

How many services

Which CICS regions are running services

Record	CICS system name	Web service name	Web service status	Number of times web service used
1	CICSIGO1	AcntTrn	Inservice	154263
2	CICSIGO2	AcntTrn	Inservice	173805
3	CICSIGO3	AcntTrn	Inservice	233910

Local or dynamic transaction

EYUVC12801 12 records collected at 10/21/08 15:31:13

Context: WSPLEX
Scope: WSPLEX
Transaction ID: = T* Aa
Enabled status: =

Record	CICS system name	Transaction ID	Enabled status	Number of times transaction used
1	CICSABC1	TABC	Enabled	91605
2	CICSABC2	TABC	Enabled	102445
3	CICSABC3	TABC	Enabled	127310
4	CICSIGO1	TABC	Enabled	181980
5	CICSIGO1	TXYZ	Enabled	179253
6	CICSIGO2	TABC	Enabled	202737
7	CICSIGO2	TXYZ	Enabled	199904
8	CICSIGO3	TABC	Enabled	258013
9	CICSIGO3	TXYZ	Enabled	256594
10	CICSXYZ1	TXYZ	Enabled	91800
11	CICSXYZ2	TXYZ	Enabled	99018
12	CICSXYZ3	TXYZ	Enabled	127055

Where are transactions running

How many transactions

CICS Explorer

IBM CICS Explorer

Explorer Operations Administration Window Help

Server: CICSWUI1

Scope: WSPLEX, Resource: WEBSERV, 3 records collected at 10/24/08 9:32 AM

Region	Name	Status	Usage Counter	Pipeline	URI Map
CICSIGO1	AcntTrn	✓ INSERVICE	42679	PIPEHIGH	
CICSIGO2	AcntTrn	✓ INSERVICE	53892	PIPEHIGH	
CICSIGO3	AcntTrn	✓ INSERVICE	62304	PIPEHIGH	

Which CICS regions are running services

How many services

Number of active tasks

CPU time

IBM CICS Explorer

Explorer Operations Administration Window Help

Server: CICSWUI1

Scope: WSPLEX, Resource: CICSRG, 9 records collected at 10/24/08 9:33 AM

Region	System	Tasks	Max...	CICS Status	CPU	Actopentcbs	Maxopentcbs	Actssltcbs	Maxssltcbs
CICSABC1	TR01	3	120	✓ ACTIVE	0000:00:20...	0	50	0	8
CICSABC2	TR02	3	120	✓ ACTIVE	0000:00:21...	0	50	0	8
CICSABC3	TR03	3	120	✓ ACTIVE	0000:00:23...	0	50	0	8
CICSIGO1	TR01	38	240	✓ ACTIVE	0000:02:55...	30	100	0	50
CICSIGO2	TR02	38	240	✓ ACTIVE	0000:02:43...	30	100	0	50
CICSIGO3	TR03	37	240	✓ ACTIVE	0000:03:14...	30	100	0	50
CICSXYZ1	TR01	19	120	✓ ACTIVE	0000:00:01...	15	50	0	8
CICSXYZ2	TR02	18	120	✓ ACTIVE	0000:00:01...	14	50	0	8
CICSXYZ3	TR03	18	120	✓ ACTIVE	0000:00:01...	14	50	0	8

CICS Explorer V4.1

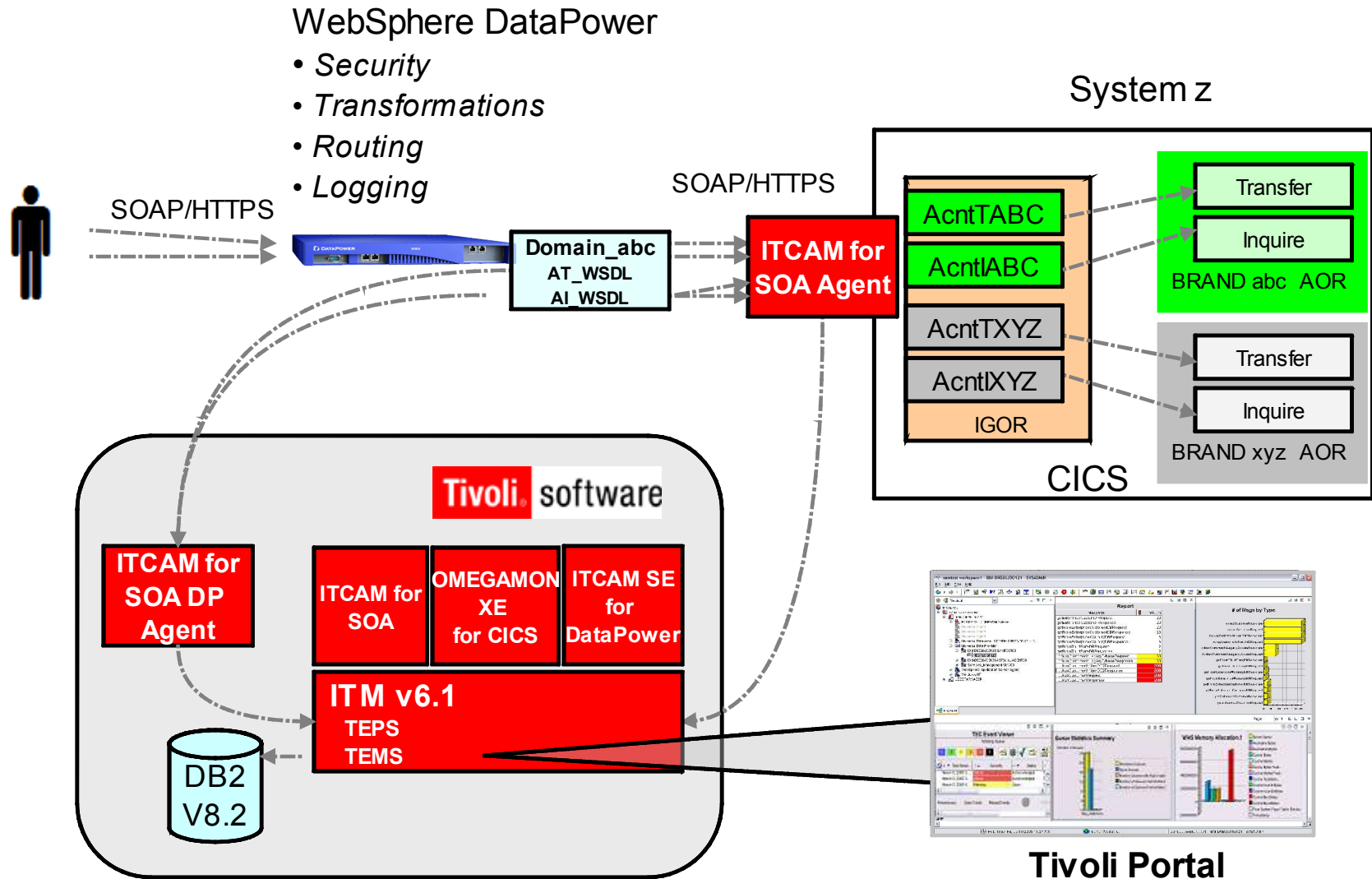
The screenshot displays the IBM CICS Explorer V4.1 interface. The main window shows a list of resource definitions for the CICSPLX1 (2/35) server. The table lists resources with columns for Region, Name, State, Use Count, Pipeline, and URI Map. A context menu is open over the 'placeOrder' resource, showing options: Open, Open Related (selected), and Discard. The 'Open Related' option is further expanded, showing 'Pipeline' and 'URI Map' as related resources. A green callout box with the text 'Make links between resource definitions' points to the 'Open Related' option.

On the right side, the 'URI Map (\$558513)' window is open, displaying the 'Attributes' tab. The attributes are listed in a table with columns for Property and Value. A green callout box with the text 'Take actions' points to the 'Status' attribute, which is set to 'ENABLED'.

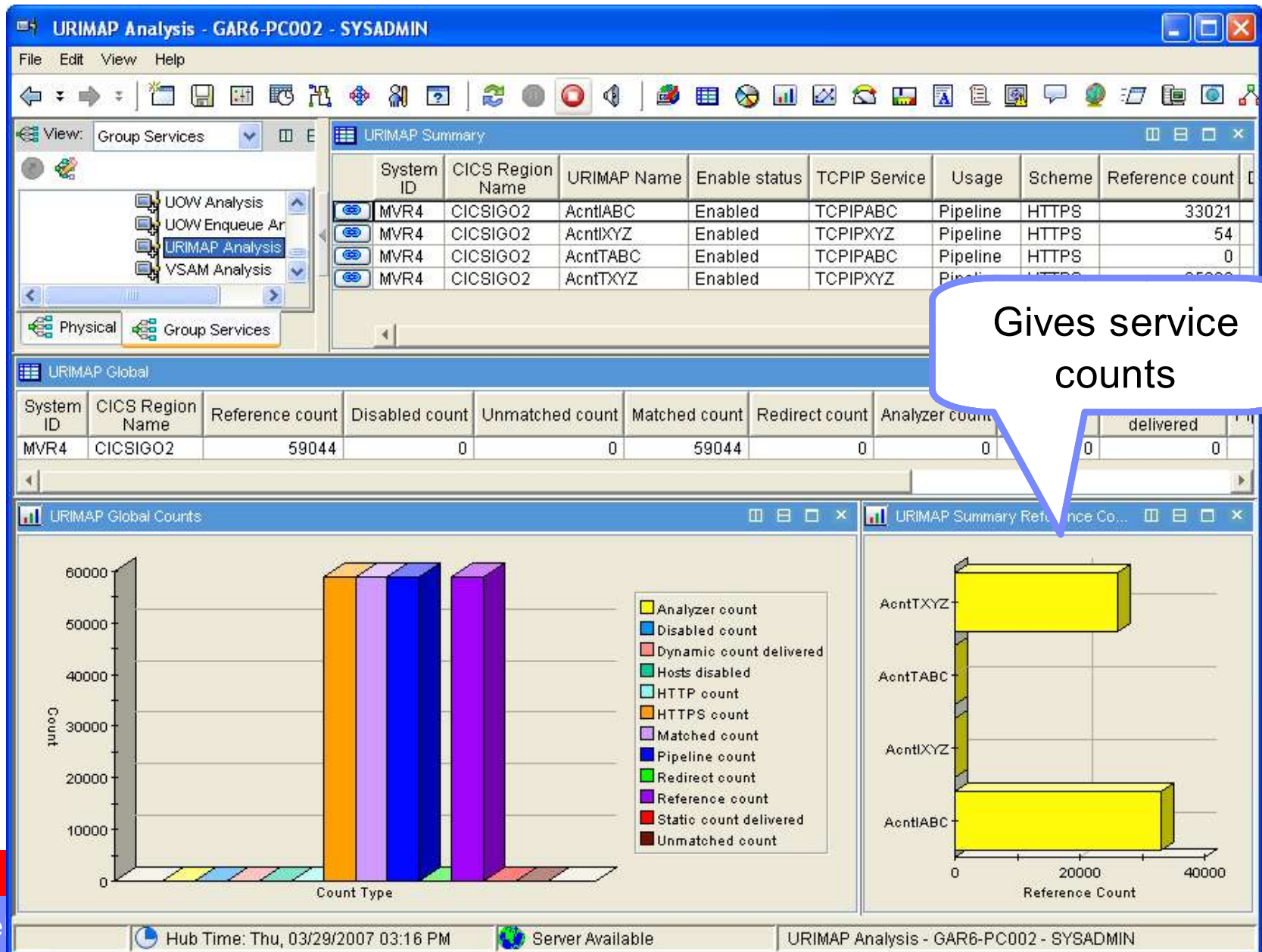
Region	Name	State	Use Count	Pipeline	URI Map
CICSDM01	dispatchOr...	✓ IN SERV...	0	S101PIP2	
CICSDM01	dispatchOr...	✓ IN SERV...	0	S101PIP1	\$558510
CICSDM01	inquireCata...	✓ IN SERV...	0	S101PIP1	\$558511
CICSDM01	inquireCata...	✓ IN SERV...	0	S101PIP2	\$558514
CICSDM01	inquireSingle	✓ IN SERV...	0	S101PIP1	\$558512
CICSDM01	inquireSingl...	✓ IN SERV...	0	S101PIP2	\$558515
CICSDM01	inquireSingl...	✓ IN SERV...	0	S101PIP1	\$558513
CICSDM01	placeOrder...	✓ IN SERV...	0		
CICSDM01	placeOrder...	✓ IN SERV...	0		
CICSDM01	ADNCRDR	✓ IN SERV...	0		

Property	Value
Analyzerstat	NOANALYZER
Certificate	
Characteraset	
CICS Release	E650
Ciphers	
Converter	
Hfsfile	
Host	*
Hostcodepage	
Location	
Matchdisabl	0
Matchredirec	0
Mediatype	
Name	\$558513
Numciphers	0
Path	/exampleApp/pl...
Pipeline	S101PIP1
Program	
Redirecttype	NONE
Reference Cou	0
Region	CICSDM01
Scheme	HTTP
Status	✓ ENABLED
TCP/IP Service	
Templatename	
Transaction	CPIH
Usage	PIPELINE
Userid	
Web Service	placeOrder

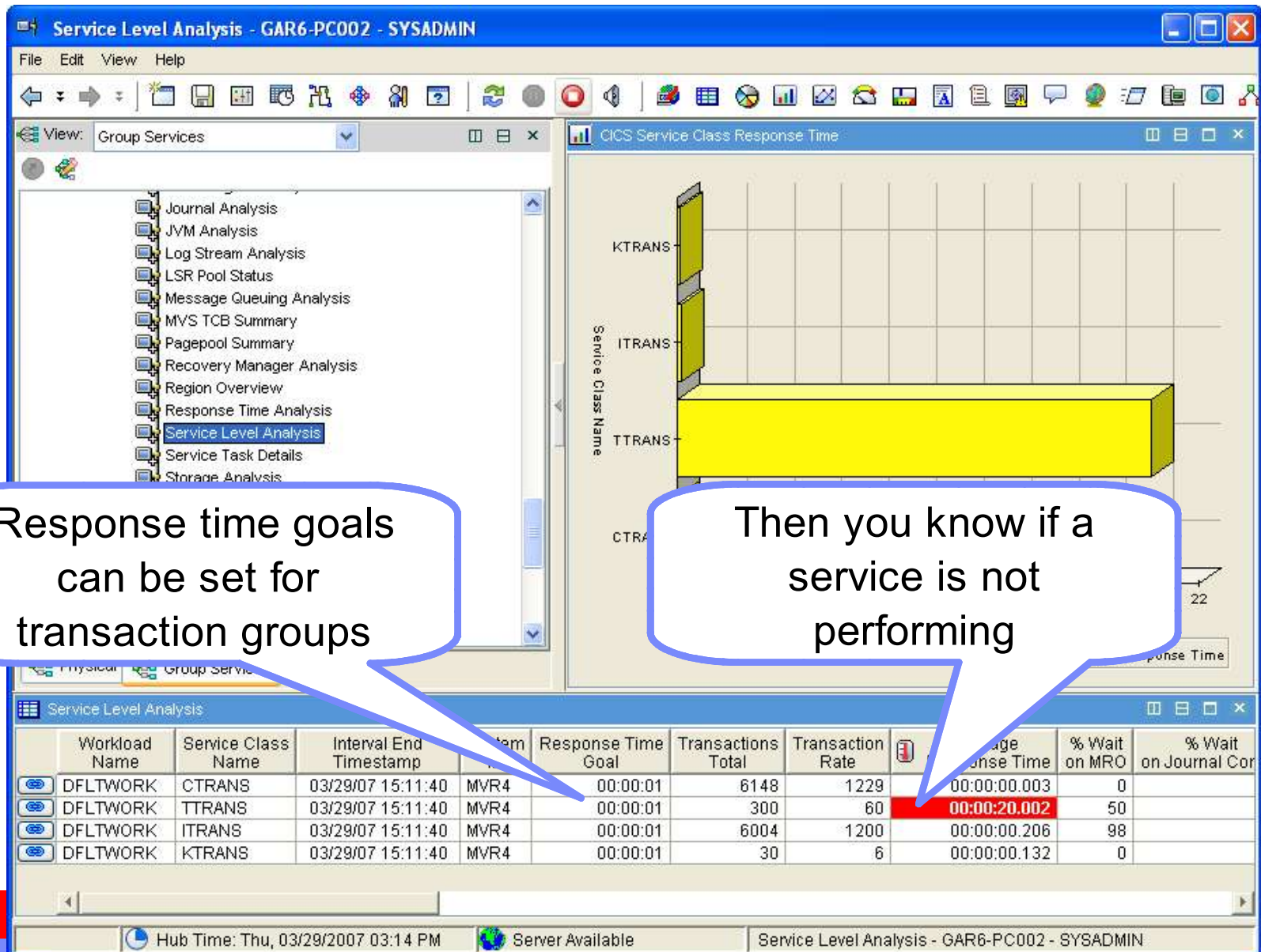
Tivoli monitoring



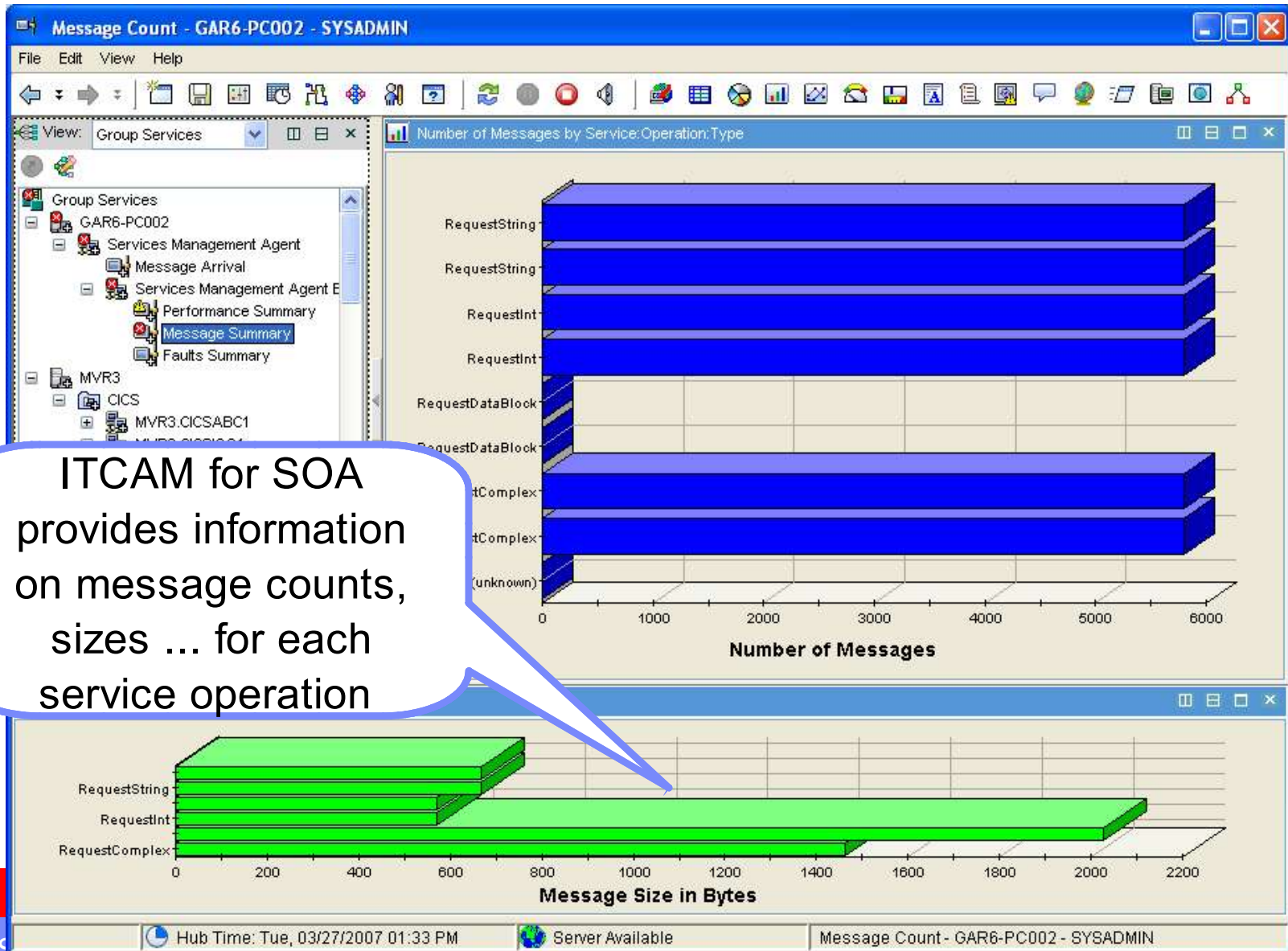
OMEGAMON XE for CICS



OMEGAMON XE for CICS



ITCAM for SOA



CICS TS 3.2 vs CICS TS 3.1

■ **More specifications**

- MTOM/XOP, WSDL 2.0, WS-Trust

■ **Workload management and availability**

- PIPELINE resource has a new RESPWAIT attribute that determines how many seconds CICS service requester should wait

■ **Security**

- Performance of CICS supplied security handler is much improved when using UsernameTokens
- WS-Trust support (can be used with IBM Tivoli Federated Identity Manager)

■ **Performance**

- General performance improvements from optimizations to HTTP processing, codepage conversion and use of 64-bit containers
- Use of MTOM/XOP (internal test): 94% less CPU for a 1 meg binary element



CICS TS 4.1 vs CICS TS 3.2

- **More specifications**

- WS-Addressing

- **Workload management and availability**

- Web services workloads can benefit from improvements in CICSplex SM dynamic workload management

- **Security**

- A client mode URIMAP may be named on INVOKE WEBSERVICE (can be used to specify client certificate or HTTP basic authentication for outbound Web service call)

- **Performance**

- Parsing performance improved with the introduction of the IBM z/OS XML System Services (XMLSS) parser
- Internal test: 15% of CPU offloaded to zAAP



Summary

- CICS provides a robust and scalable Web services infrastructure
- Web services enable secure interoperability with internal systems and external business partners
- Many of IBM's largest customers are using CICS Web services today
- Check out the CICS Information Center and the many ITSO Redbooks for more information on deploying CICS Web services



Additional Product Resources

- CICS Transaction Server Support Web page:
<http://www.ibm.com/software/http/cics/tserver/support/>
- CICS Featured documents:
<http://www.ibm.com/support/docview.wss?rs=1083&uid=swg27006900>
- Sign up to receive technical support emails:
<http://www.ibm.com/software/support/einfo.html>
- Follow IBM_CICS support news on Twitter:
<http://www.ibm.com/support/docview.wss?rs=1083&uid=swg21384915>
- Webcasts for CICS and OMEGAMON:
<http://www.ibm.com/support/docview.wss?rs=1083&uid=swg27007244>
- IBM Education Assistant modules:
<http://publib.boulder.ibm.com/infocenter/ieduasst/stgv1r0/index.jsp>



Join WebSphere Support Technical Exchange on Facebook!

The screenshot shows the Facebook page for 'WebSphere Support Technical Exchange'. The page has a blue header with the Facebook logo and navigation links. The main content area displays a list of posts from the page. The first post is titled 'Using IBM Tooling to improve your self-help abilities for WebSphere Commerce' and is scheduled for August 20th. The second post is titled 'Response Time Analysis for Databases and Web Services in WebSphere Application Server' and is scheduled for August 19th. The third post is titled 'Do-It-Yourself: WebSphere Commerce Problem Determination' and is scheduled for August 13th. The fourth post is titled 'WebSphere Application Server - Message Store Overview' and is scheduled for August 12th. The fifth post is titled 'Introduction to the Java Consumability Tools and Java Guided Troubleshooting' and is scheduled for August 11th. The page also shows a list of fans and a photo album.

- Stay up-to-date on upcoming webcast sessions
- Suggest future topics
- Suggest program improvements
- Network with other product users
- And More...

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<http://www.facebook.com/pages/WebSphere-Support-Technical-Exchange/121293581419>

Questions and Answers

