IBM Software Group

CICS Web Services Part 2: Deployment

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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

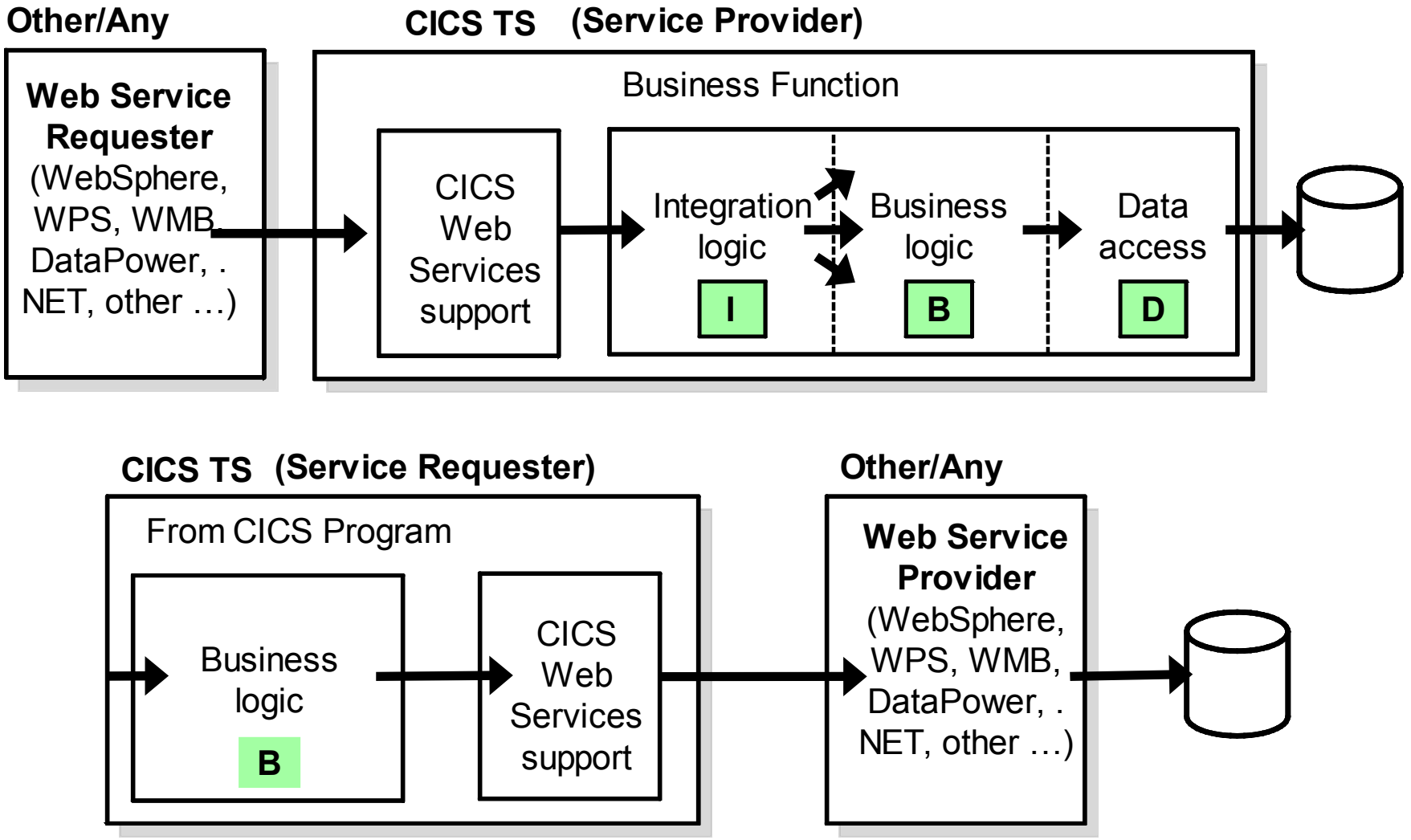
- CICS Information Centers
  TS 3.1 http://publib.boulder.ibm.com/infocenter/cicsts/v3r1/index.jsp
  TS 3.2 http://publib.boulder.ibm.com/infocenter/cicsts/v3r2/index.jsp
  TS 4.1 http://publib.boulder.ibm.com/infocenter/cicsts/v4r1/index.jsp

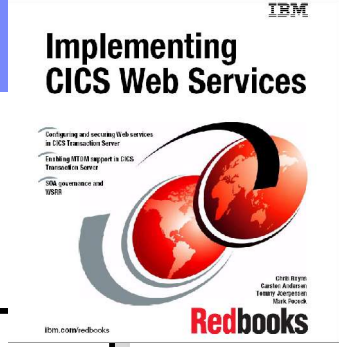
- IBM Web Services Red Books
  Architecture http://www.redbooks.ibm.com/abstracts/sg245466.html?Open
  Implementation http://www.redbooks.ibm.com/abstracts/sg247206.html?Open
  Performance http://www.redbooks.ibm.com/abstracts/sg247687.html?Open
  Security http://www.redbooks.ibm.com/abstracts/sg247658.html?Open
  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

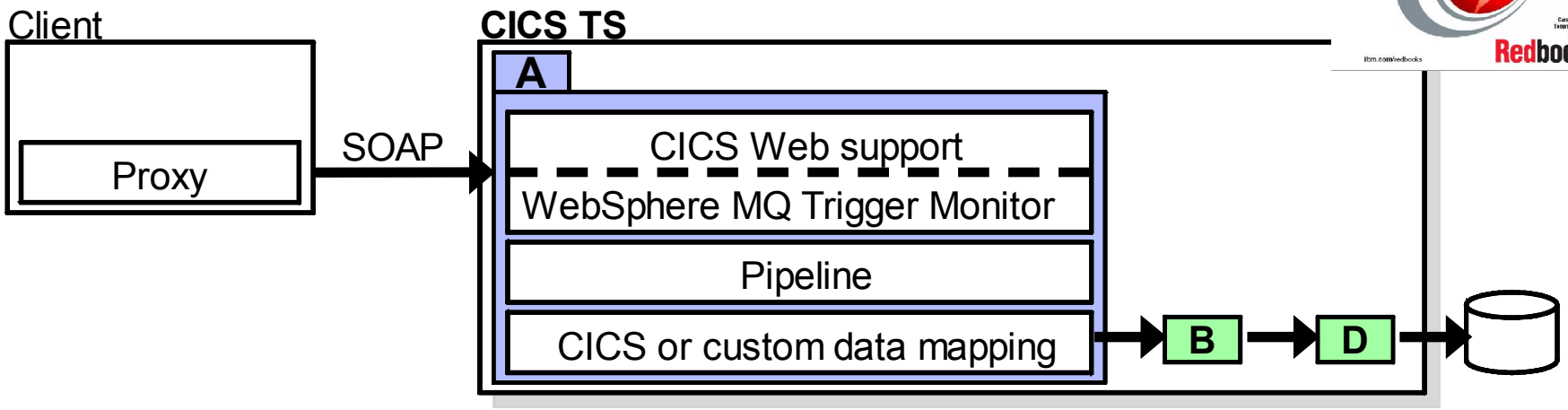
- Knowledge Collection http://www-01.ibm.com/support/docview.wss?uid=swg27010507

Typical CICS Web services scenarios



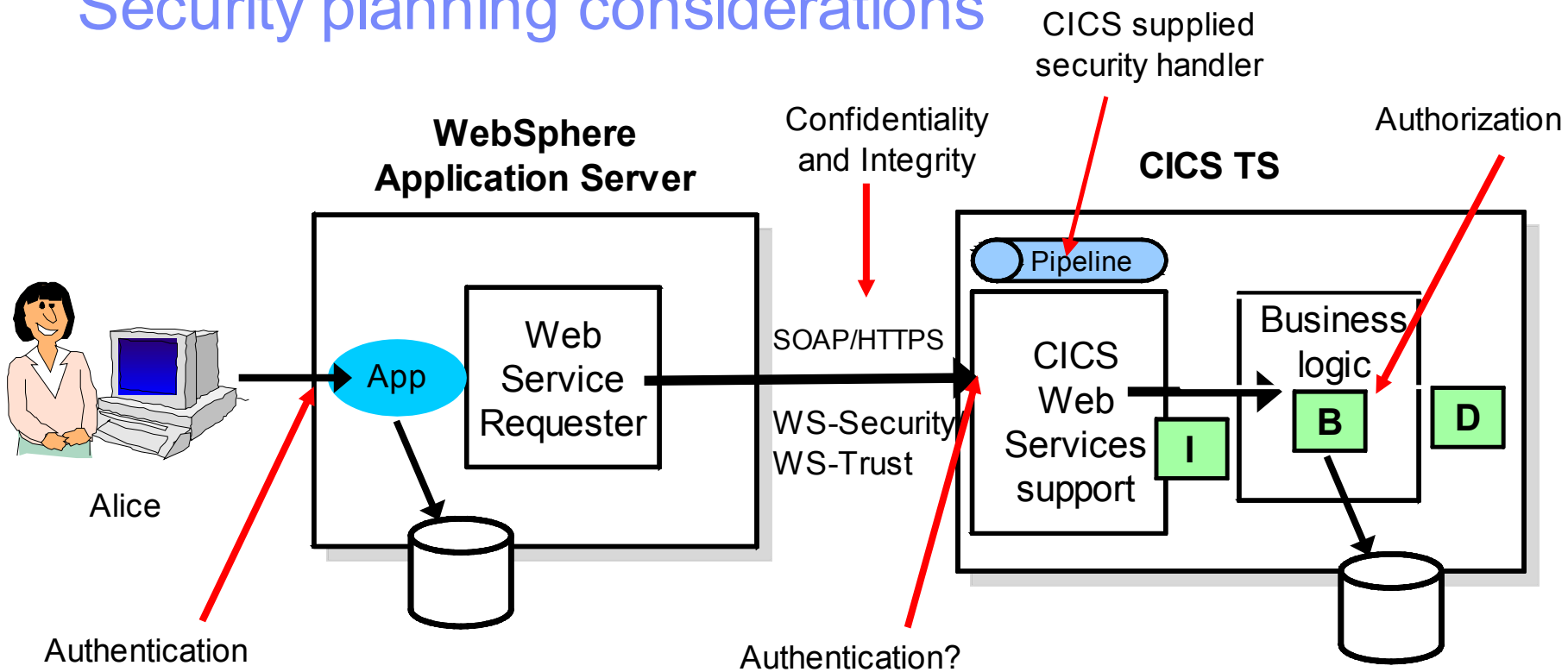


CICS Web services overview



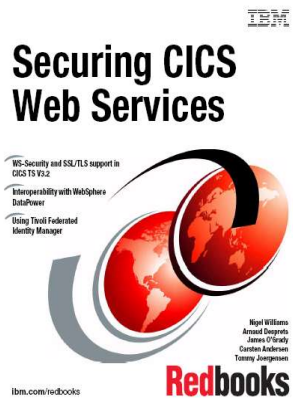
- From CICS TS V3.1 a CICS application can be Web service provider or consumer
  - HTTP or MQ transport
- Runtime
  - SOAP envelope removed by a message handler in the Web services pipeline
  - Commarea or container built by “data mapper”
- Development using CICS supplied utilities or Rational Developer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

Security planning considerations



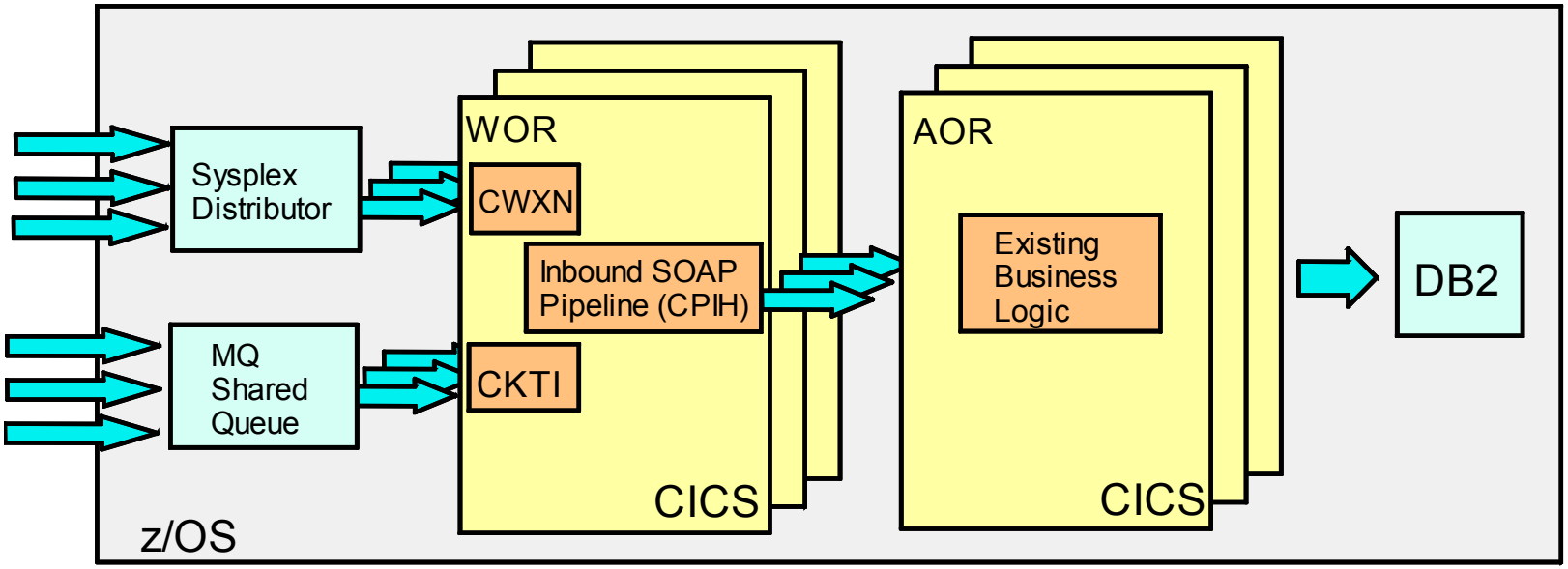
- How to authenticate
- How to pass security credentials (in message or in transport layer)
- Whether identity assertion is required
- How to ensure confidentiality and data integrity

Security best practice



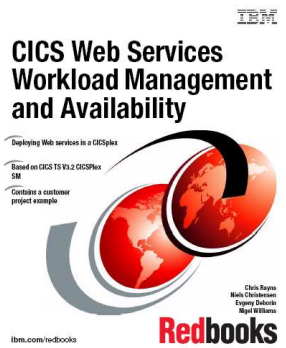
- Transport security alone (e.g SSL/TLS) may be sufficient i simple environments (point to point)
  - Use cryptographic hardware and ICSF (Integrated Cryptographic Hardware Facility) to maximize performance of SSL/TLS
- WS.* standards can be used for more advanced requirements
  - WS-Security enables 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

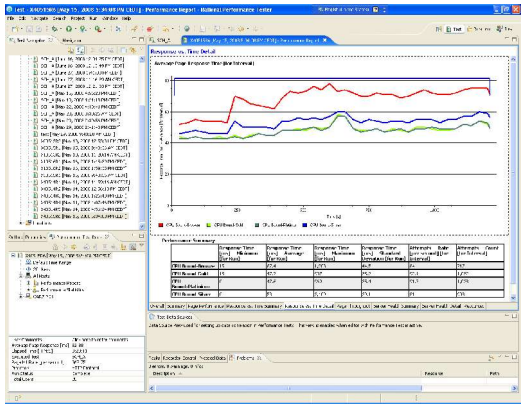


- Use Sysplex Distributor, TCP/IP port sharing and MQ queue sharing to distribute Web service requests across different CICS regions

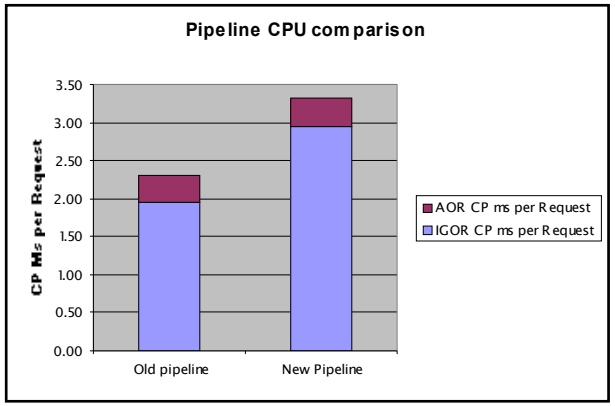
- Use CICSPlex SM to dynamically route requests after the SOAP message has been processed
  - Set a private pipeline transaction id (default CPIH)
  - DPL routing is preferred to transaction routing
    - Cleaner separation between system and application code
    - DPL approach performs better
    - Additional resource definitions required in AOR if routing pipeline

- Use monitoring tools like OMEGAMON XE for CICS for tracking against service response-time goals

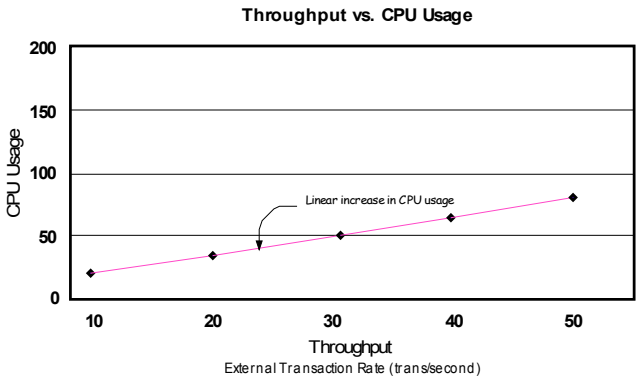
Performance considerations



Workload simulation

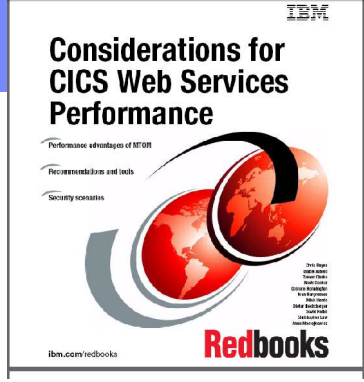


Measure CPU costs



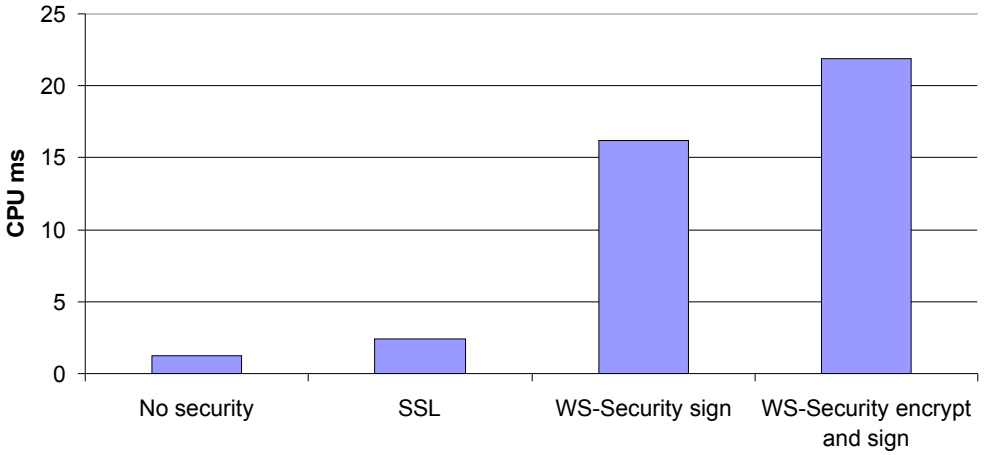
Test for linear scalability

- 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 - UsernameTokens perform better than X.509 certificates



Customer case study

Business….

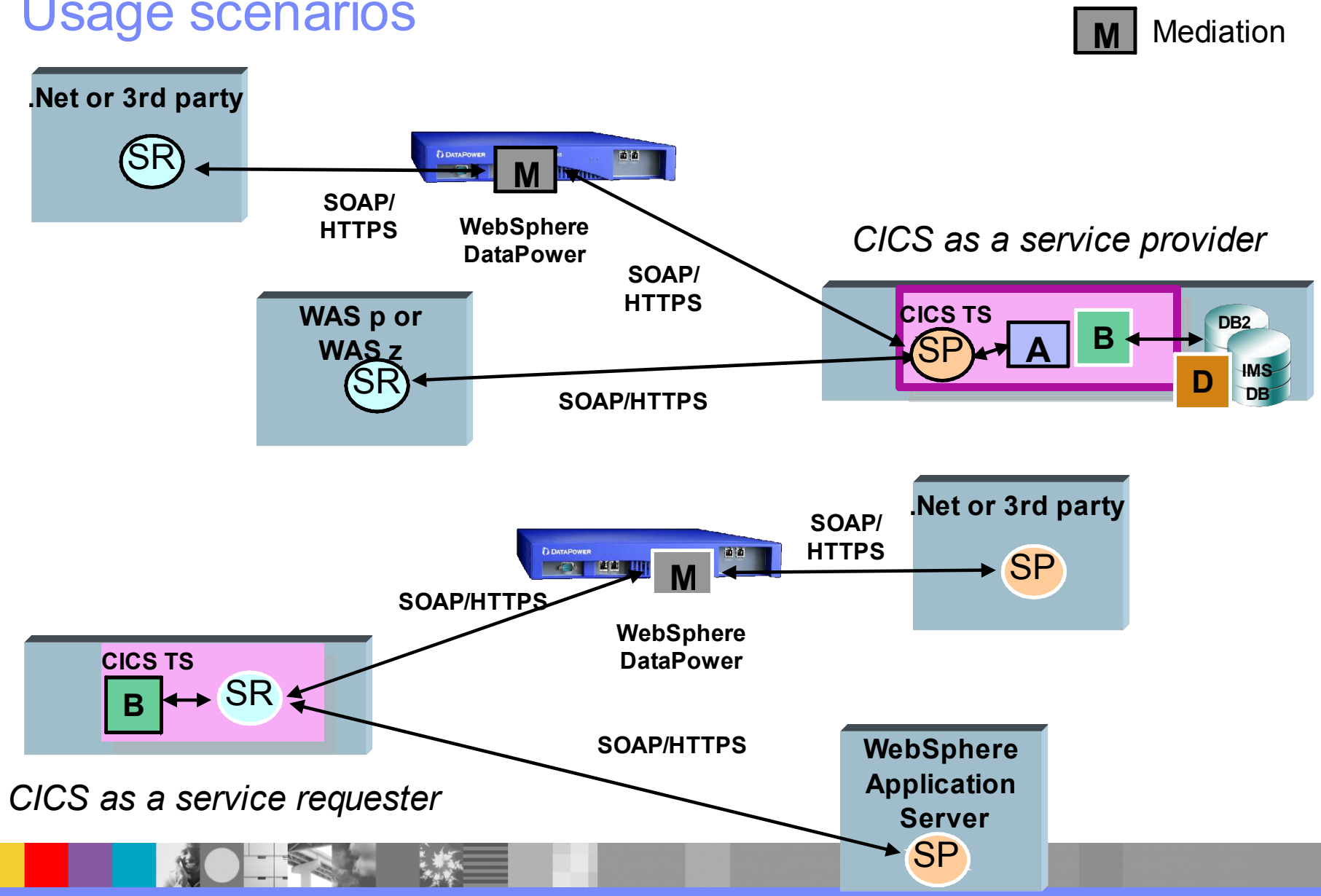
- Very large financial services group
- Retail banking, insurance, mortgages etc…
- 20+ million accounts
- Services large percentage of country ATM payments
- Large car insurer (8+ million policies)
- **Service availability is paramount**

Project scope….

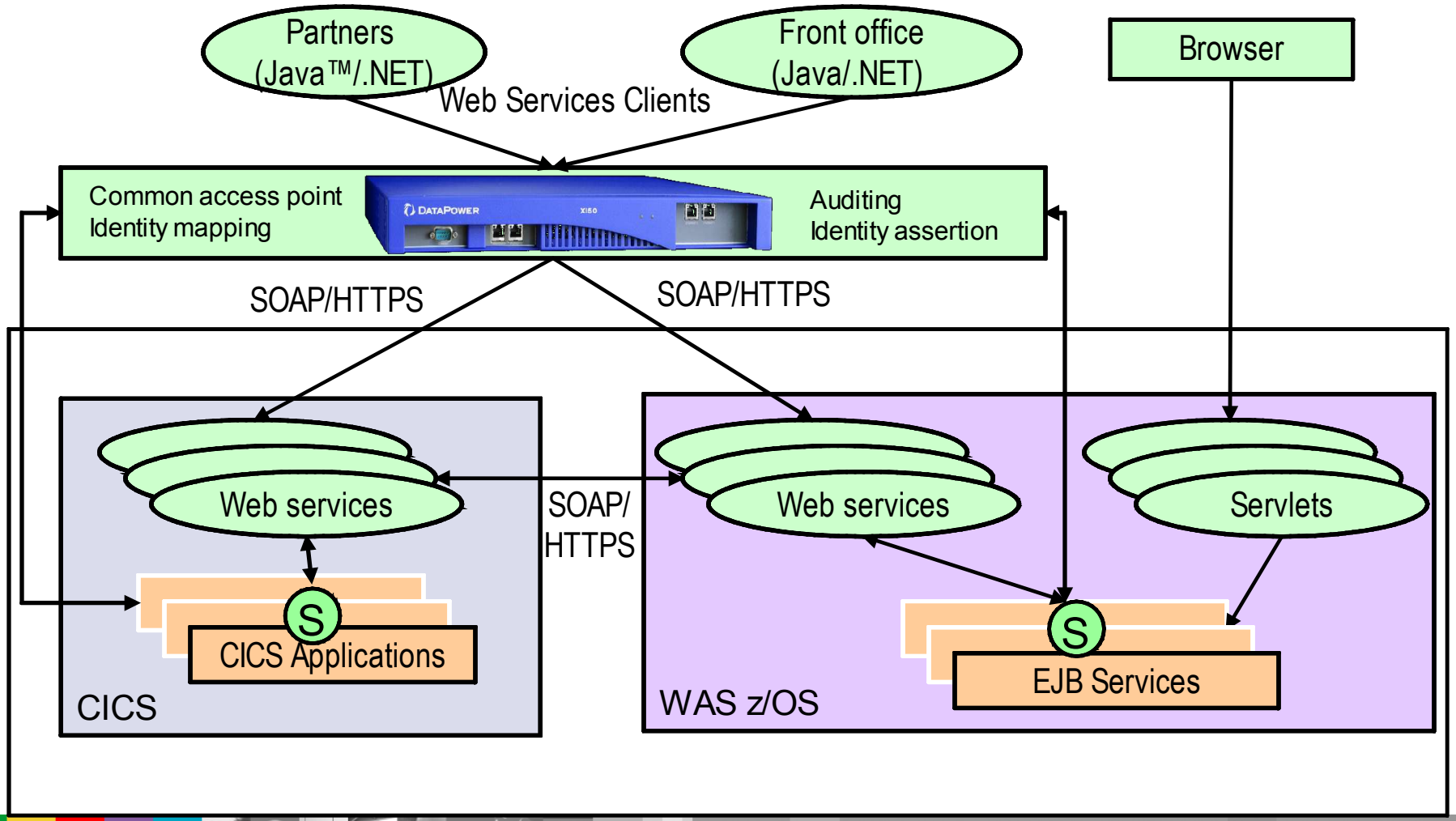
- Determine the best infrastructure bearing in mind the **security**, **workload management** and **scalability** requirements
- Understand the management and monitoring aspects of the solution, and monitoring tool capabilities

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

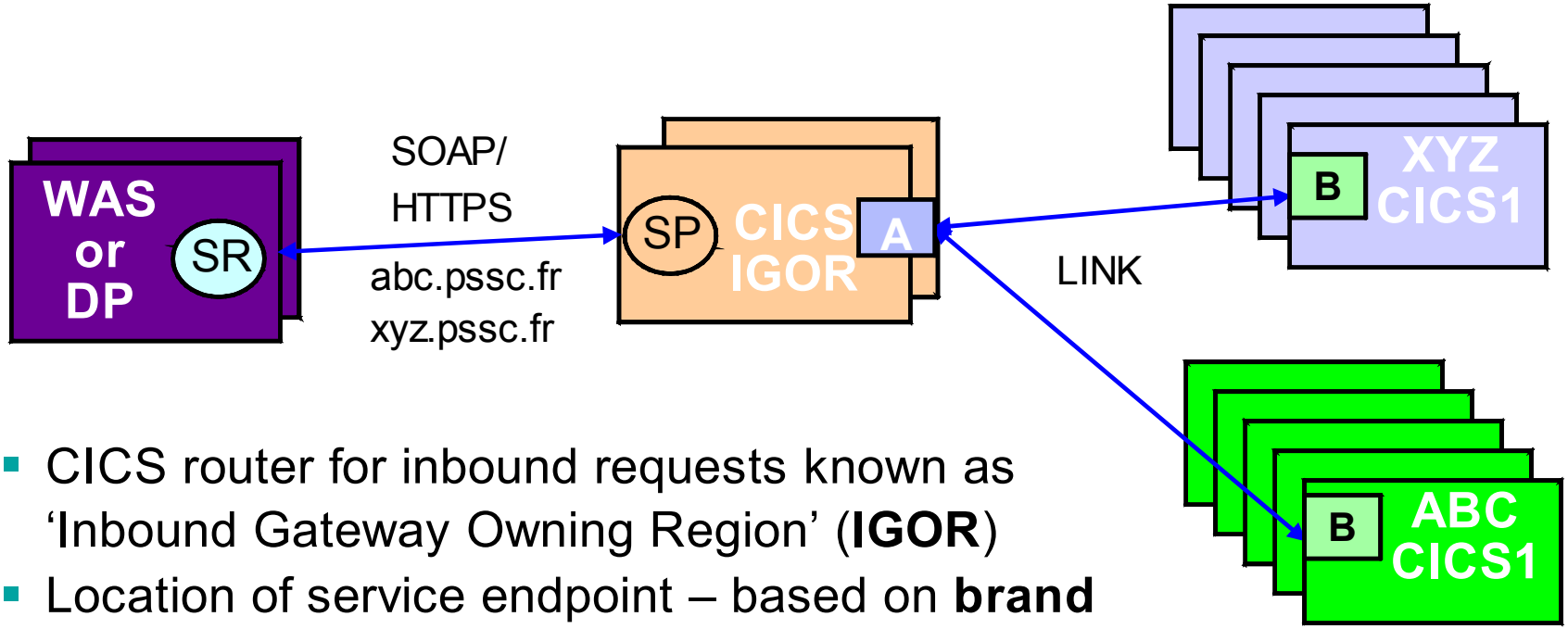
Usage scenarios



Tested configuration

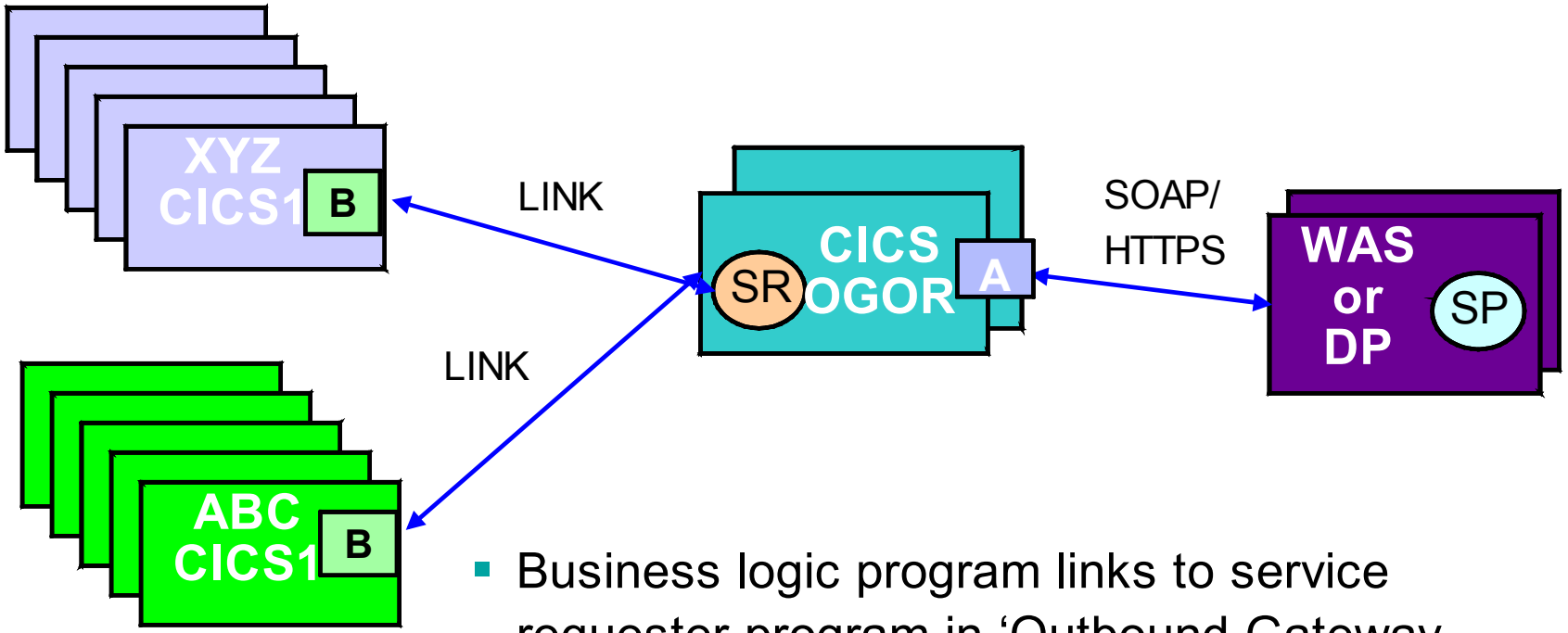


Workload management of inbound service requests



- 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)

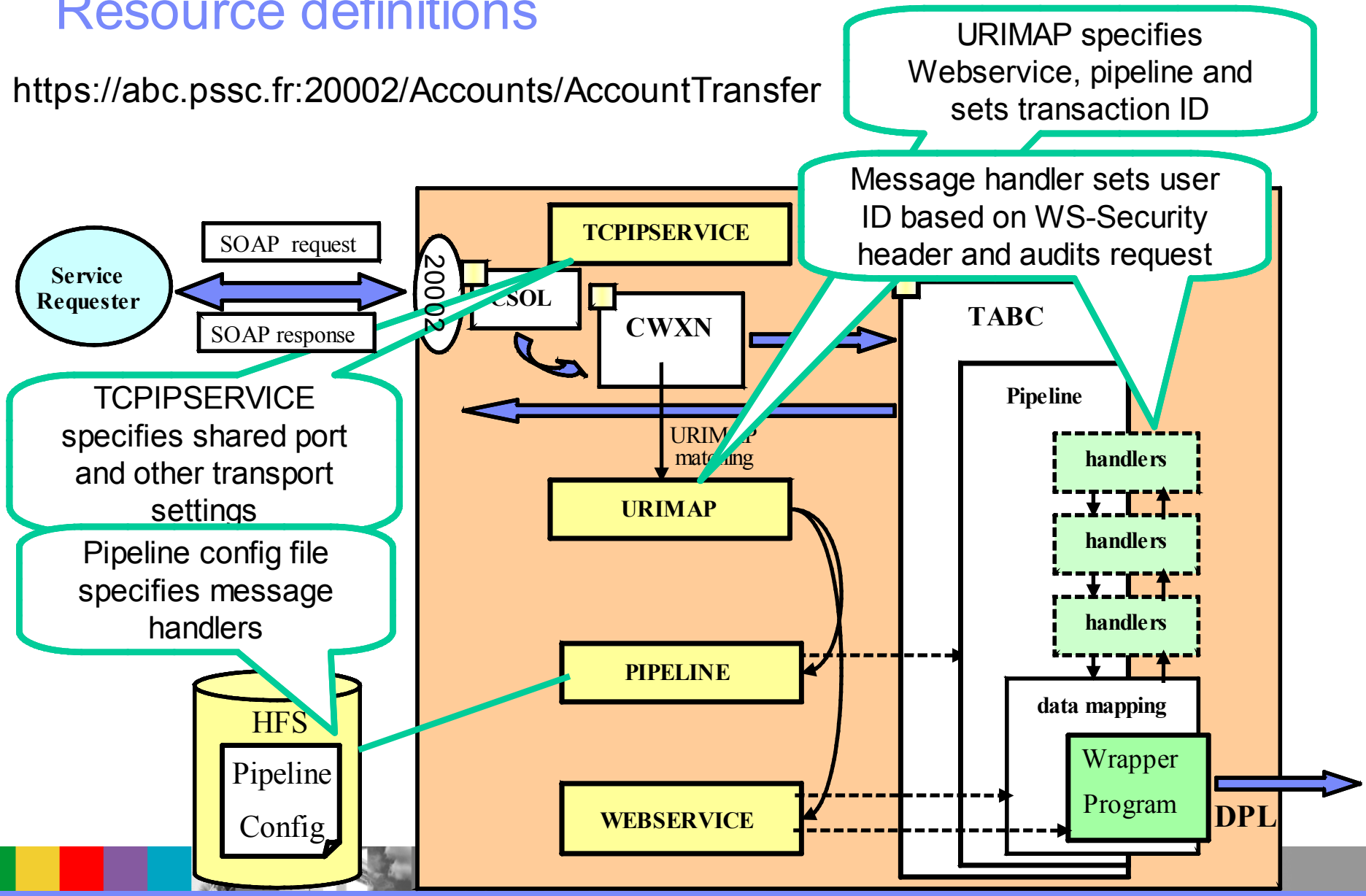
Workload management of outbound service requests



- 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
    PIpieline    ==> PIPEHIGH
    Webservice   ==> AcntTrn
```

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

Transaction **TABC** (**T**ransfer 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)

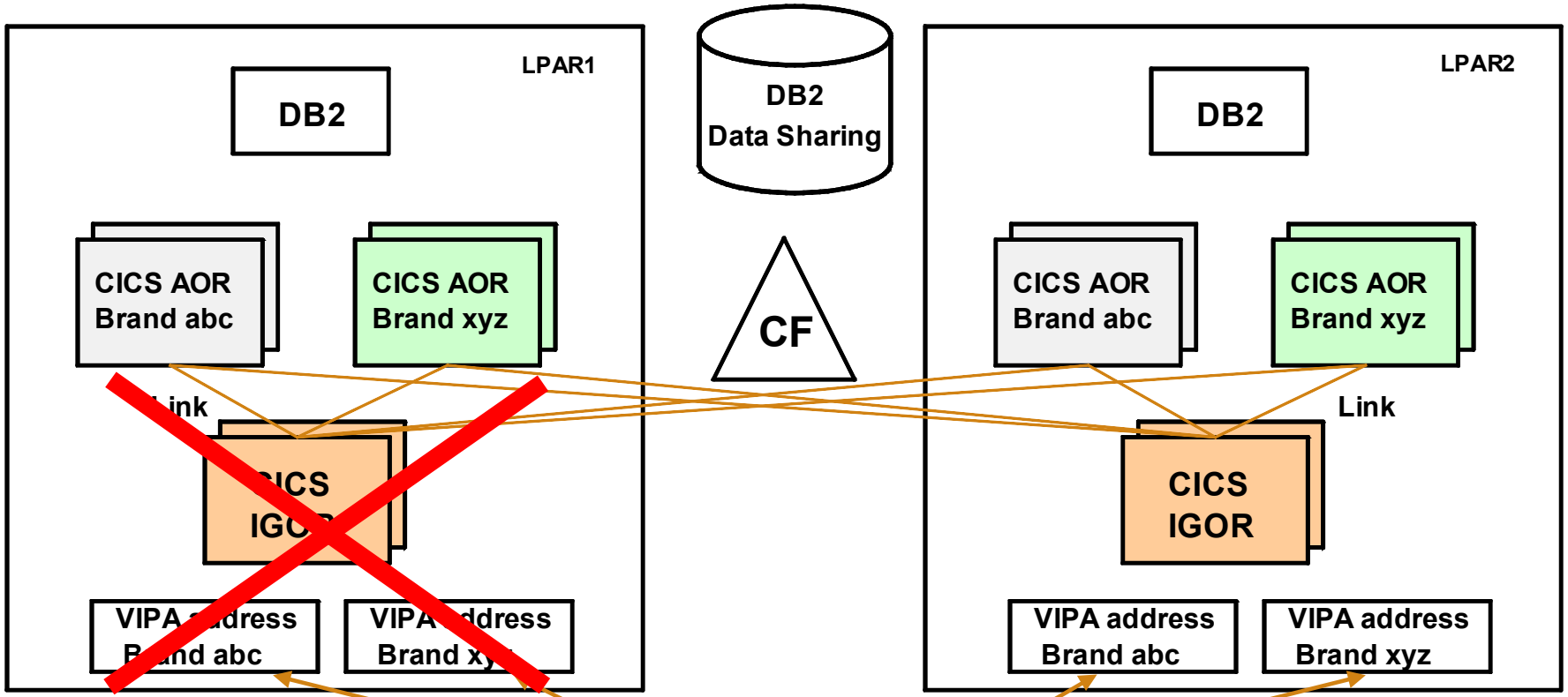
```
<wsse_handler>
    <dfhwsse_configuration version="1">
        <authentication trust="blind" mode="basic">
        </authentication>
    </dfhwsse_configuration>
</wsse_handler>
```

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**)

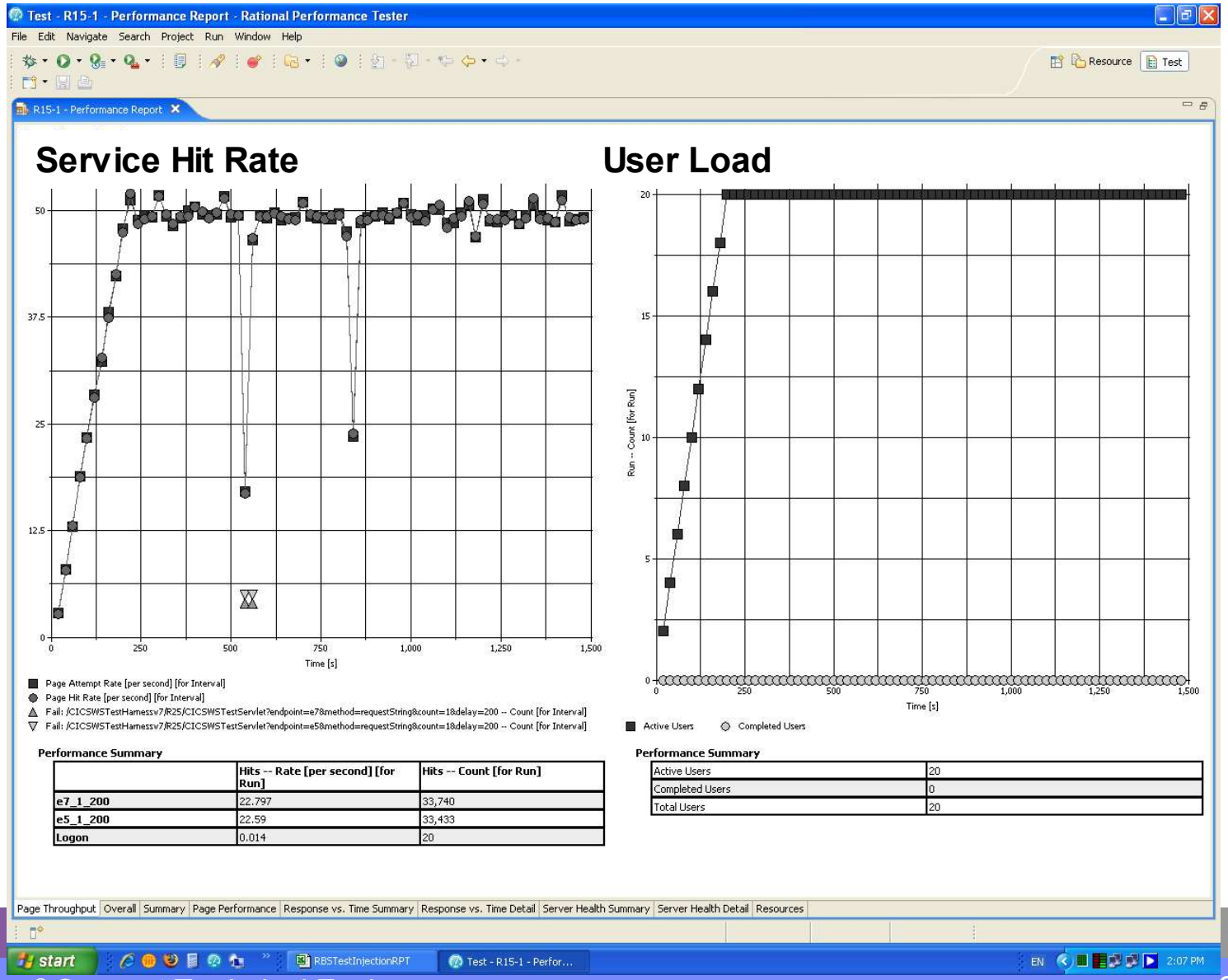
High availability configuration



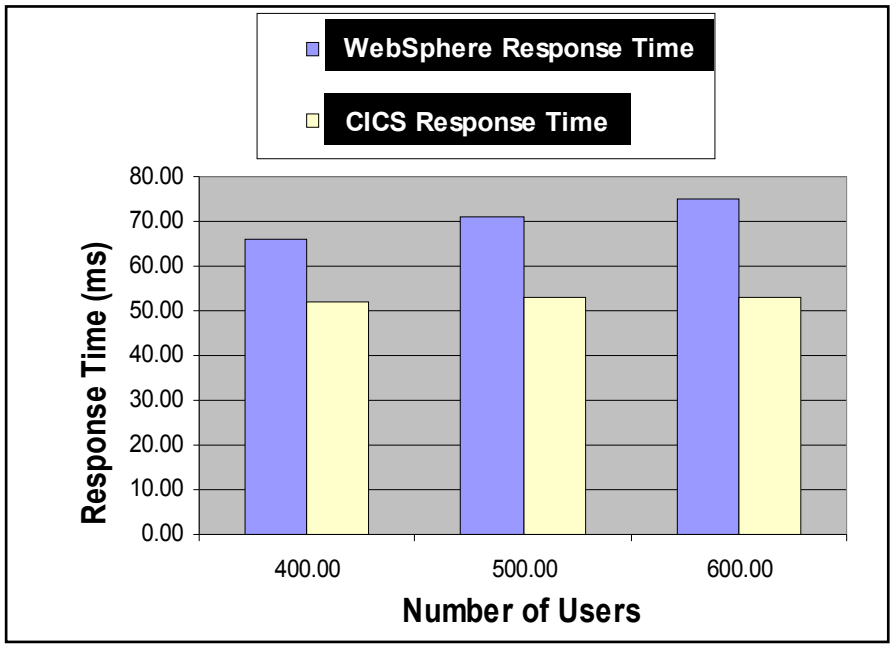
- CICS router for inbound requests known as 'Inbound Gateway Owning Region' (**IGOR**)
- IGOR runs CICS \wrapper program

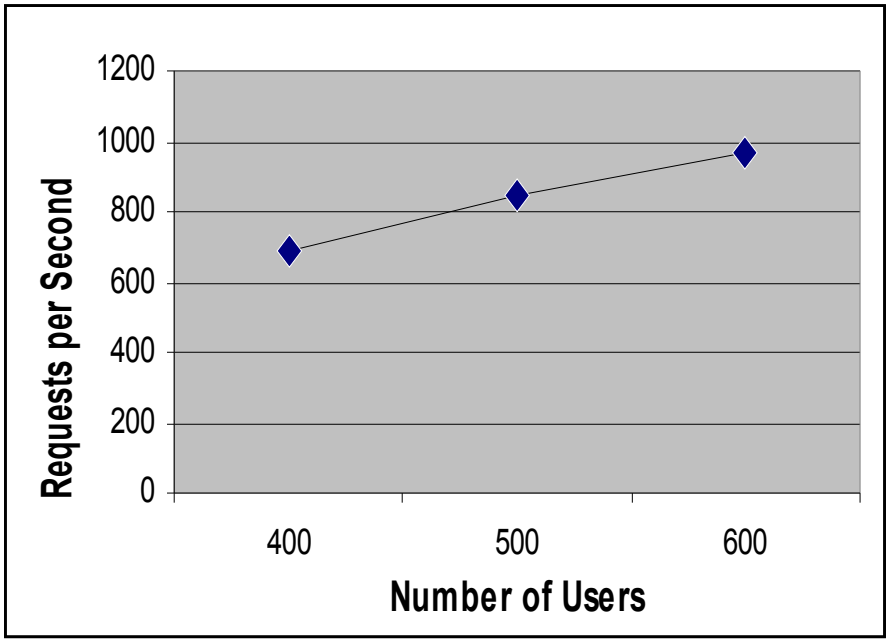
- CICS router for outbound requests known as 'Outbound Gateway Owning Region' (**OGOR**)

High availability test scenario



Scalability tests





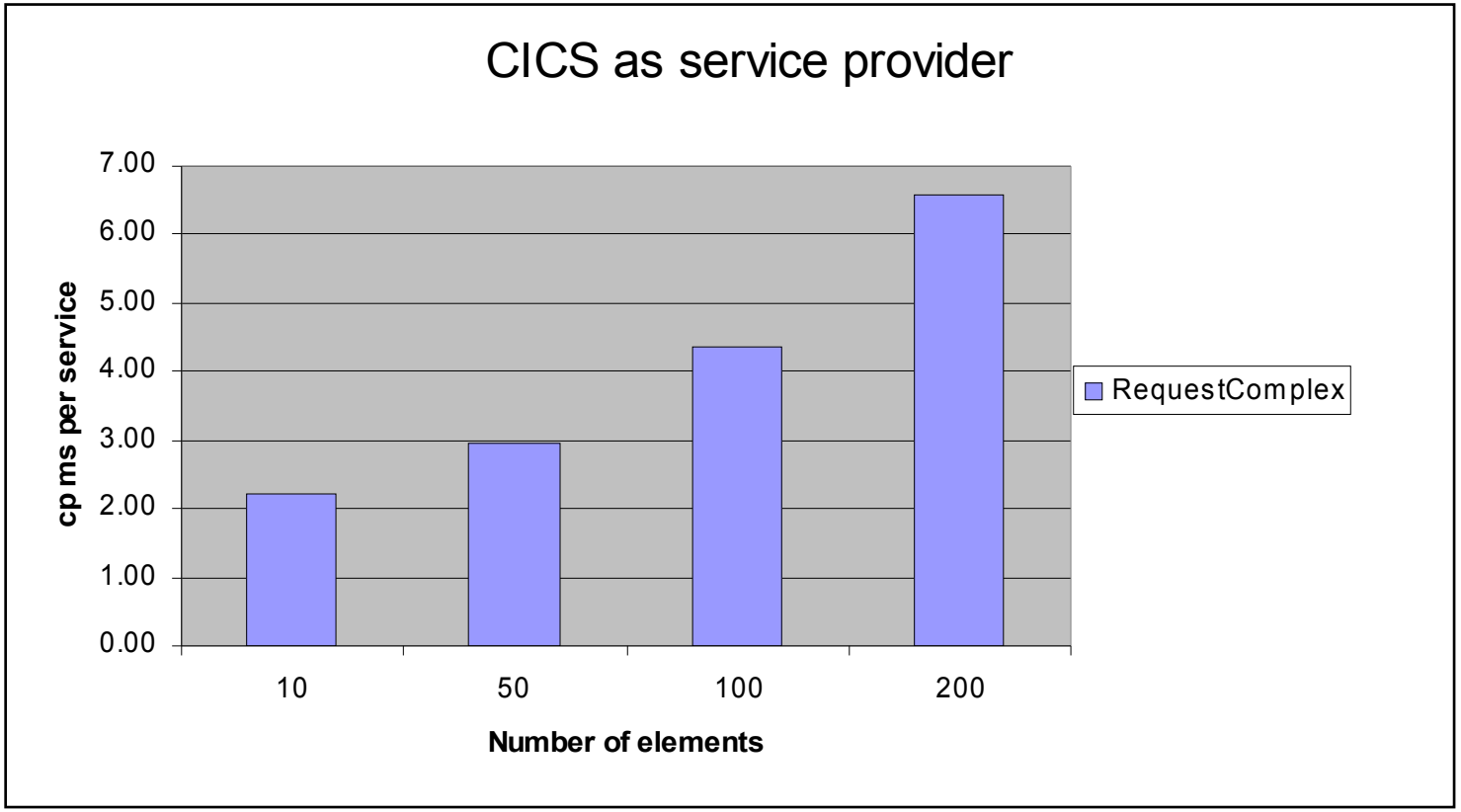
These tests were performed with service requester application deployed in WebSphere Application Server for z/OS and service provider application deployed in CICS

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

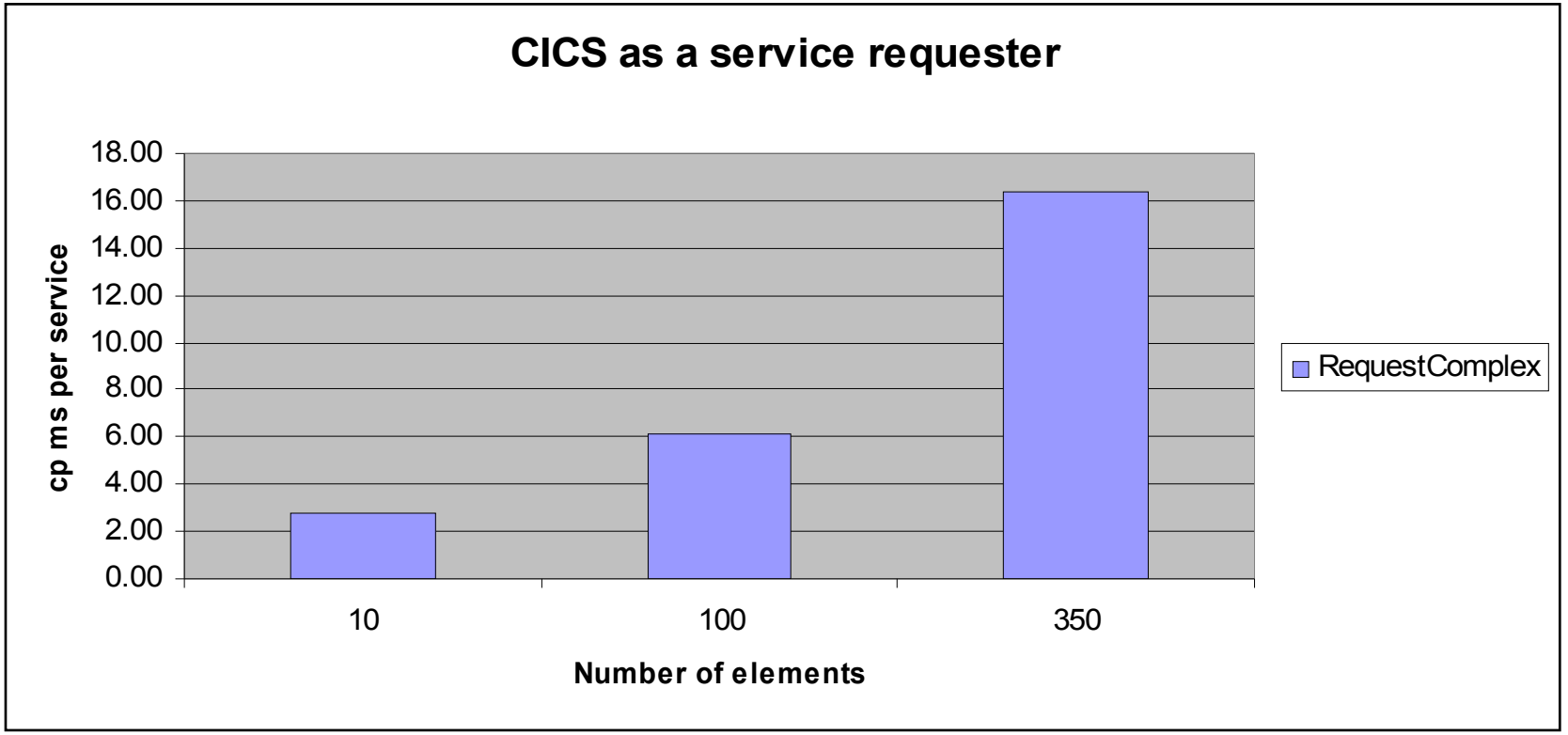
Changing the number of elements (inbound)



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

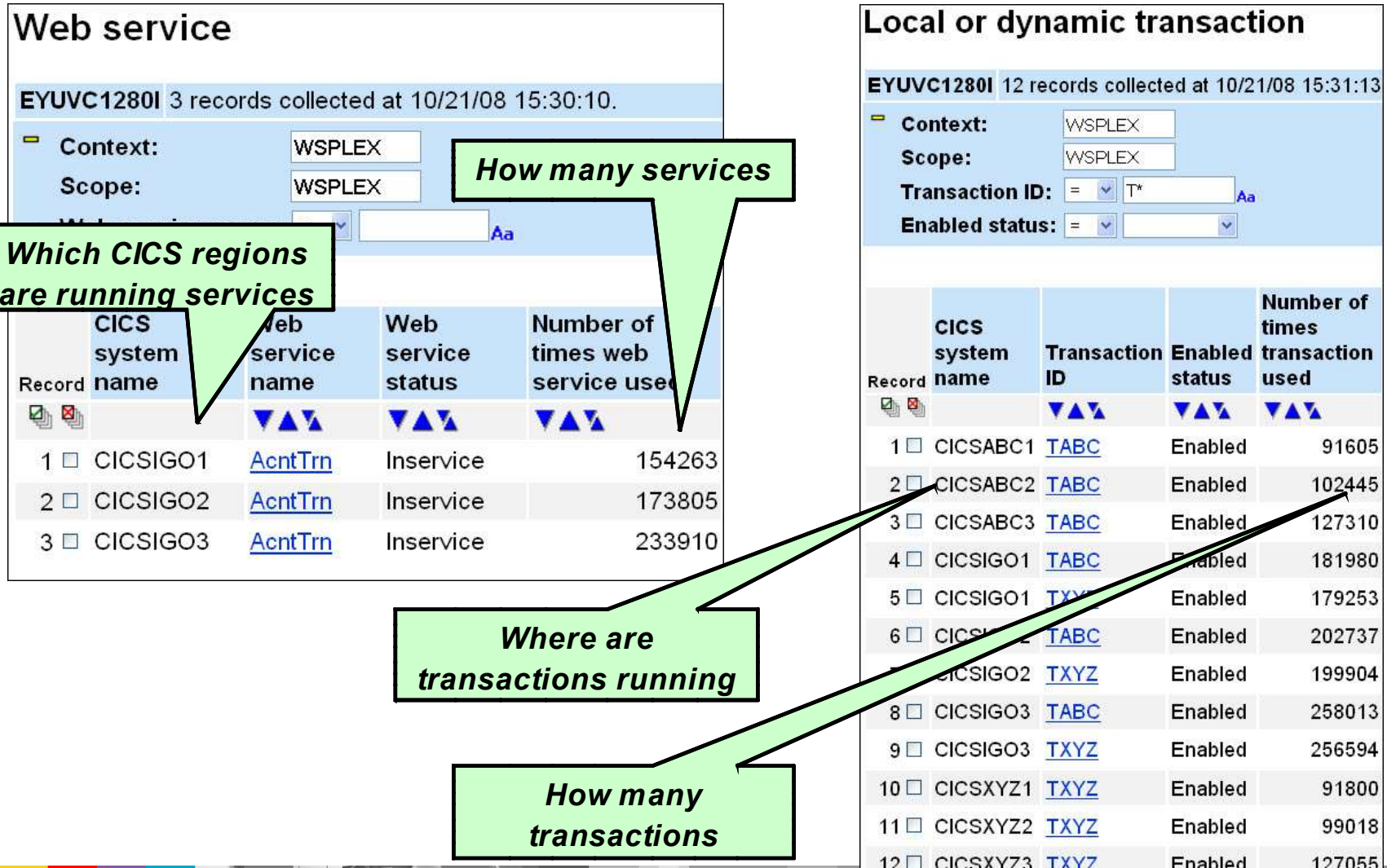
Changing number of elements (outbound)



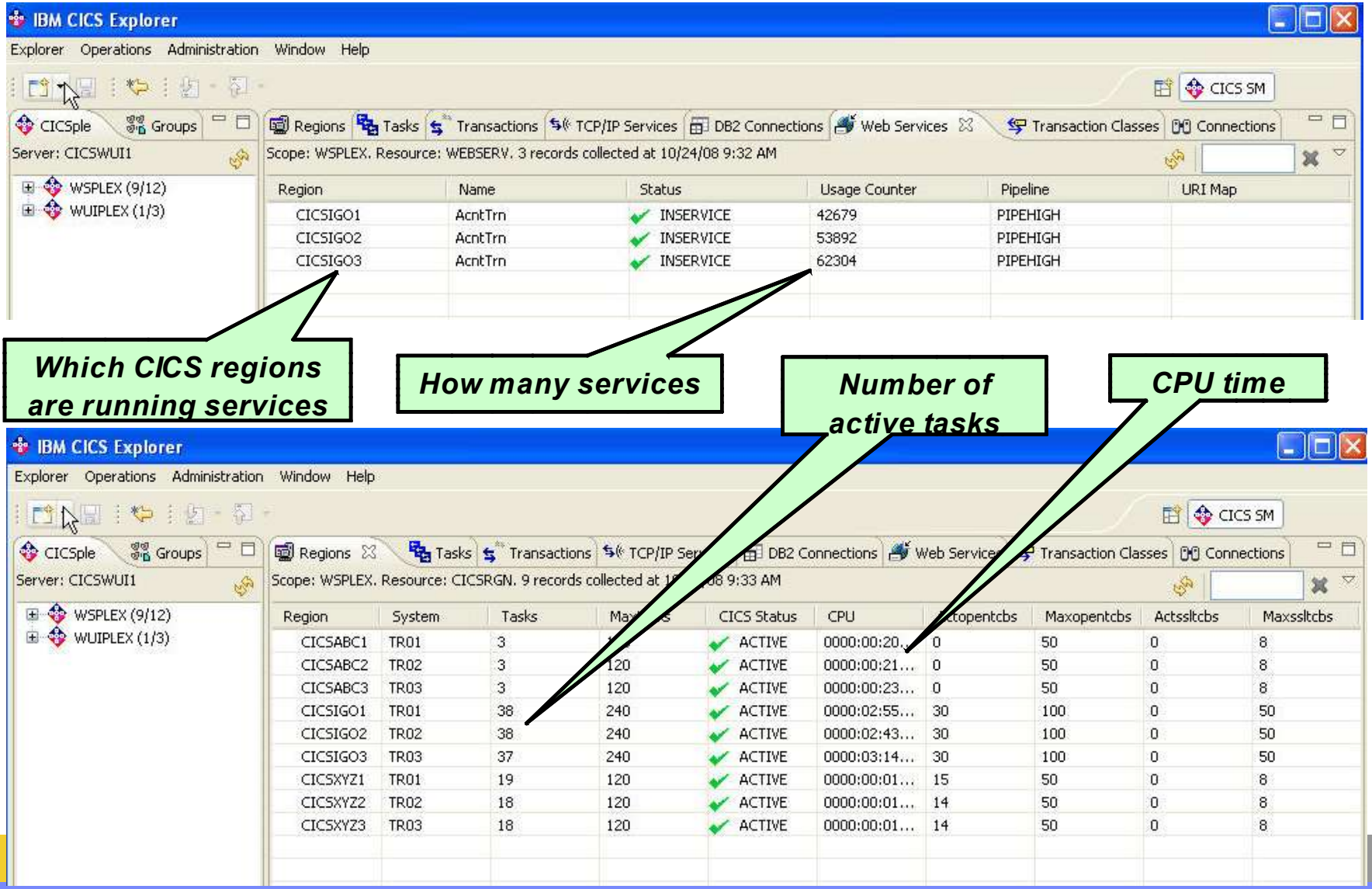
CICS has to parse response message
Total length of the 10 element (customer record) message is 3.3K
Total length of 350 element message is 102K

35 x Msg Size ➔ 6 x CPU

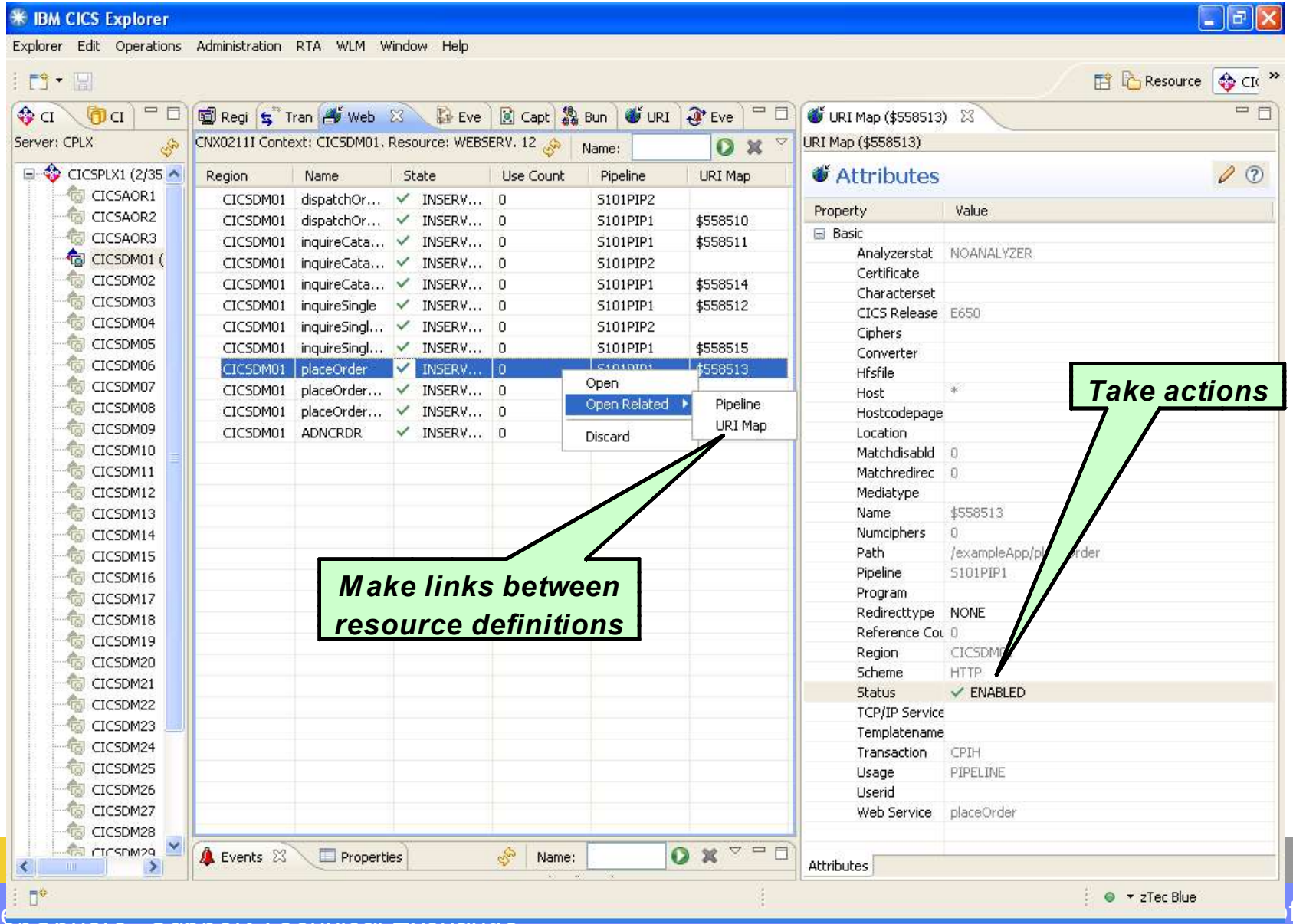
Using CICSPlex SM Web User Interface



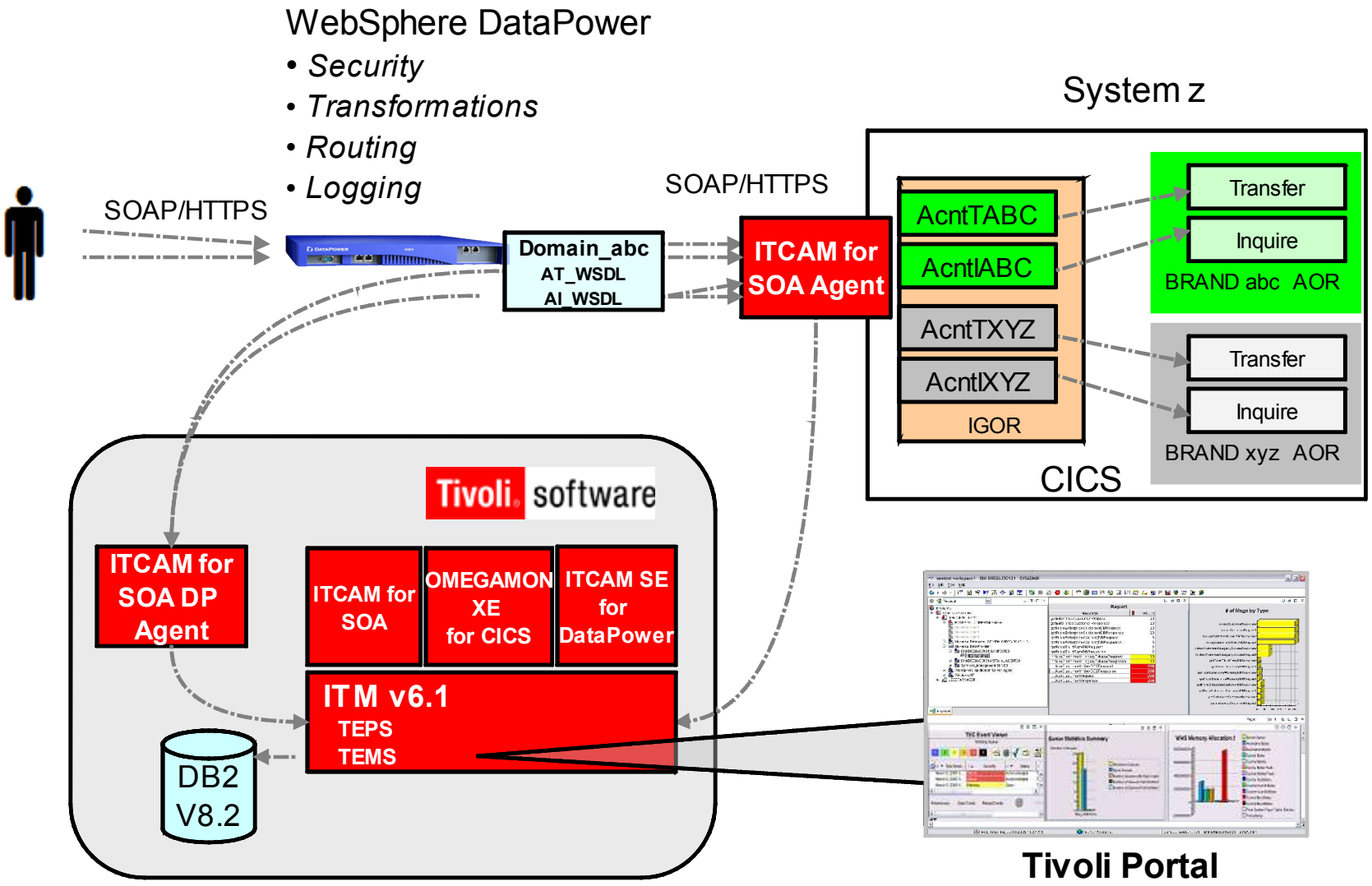
CICS Explorer



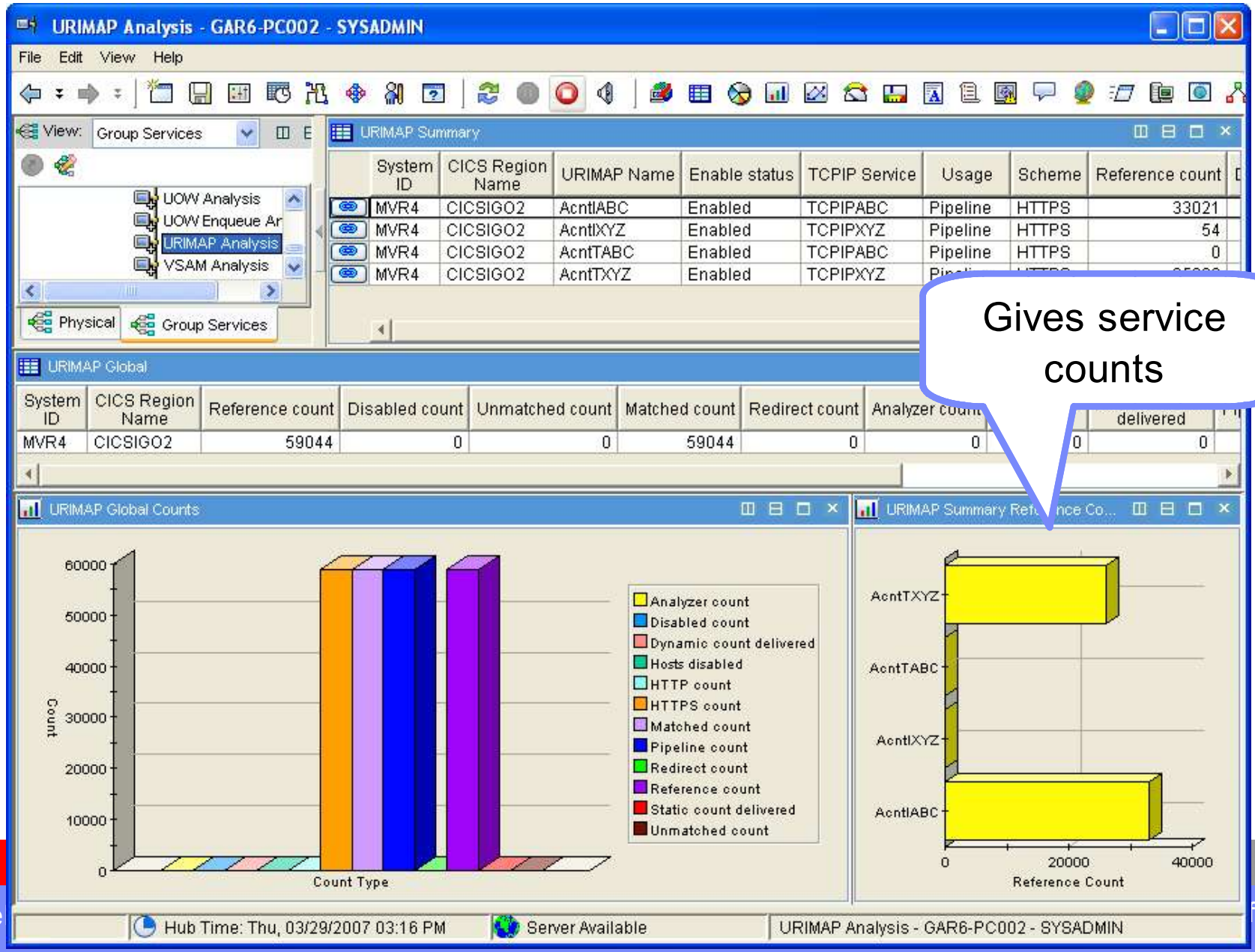
CICS Explorer V4.1



Tivoli monitoring



OMEGAMON XE for CICS



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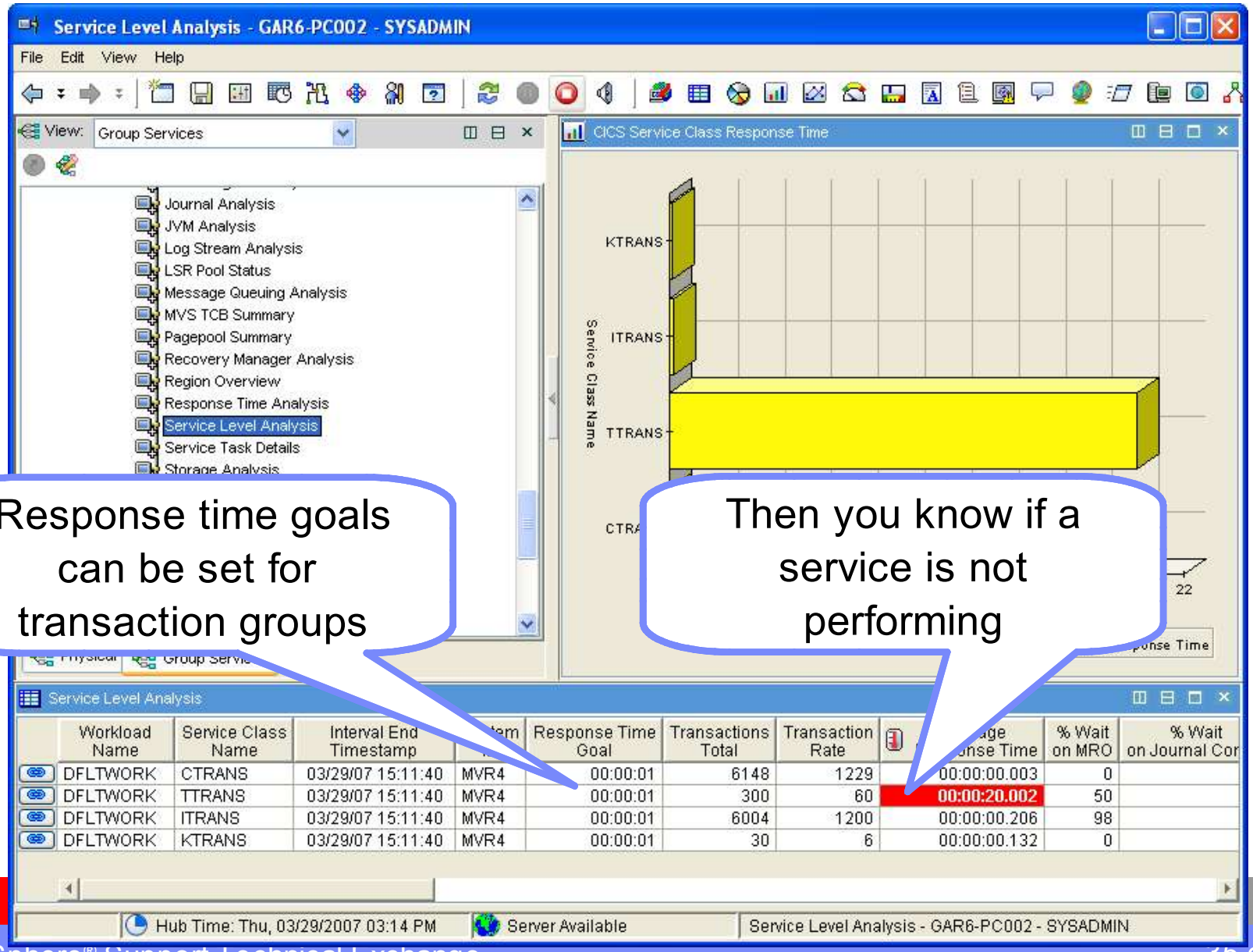
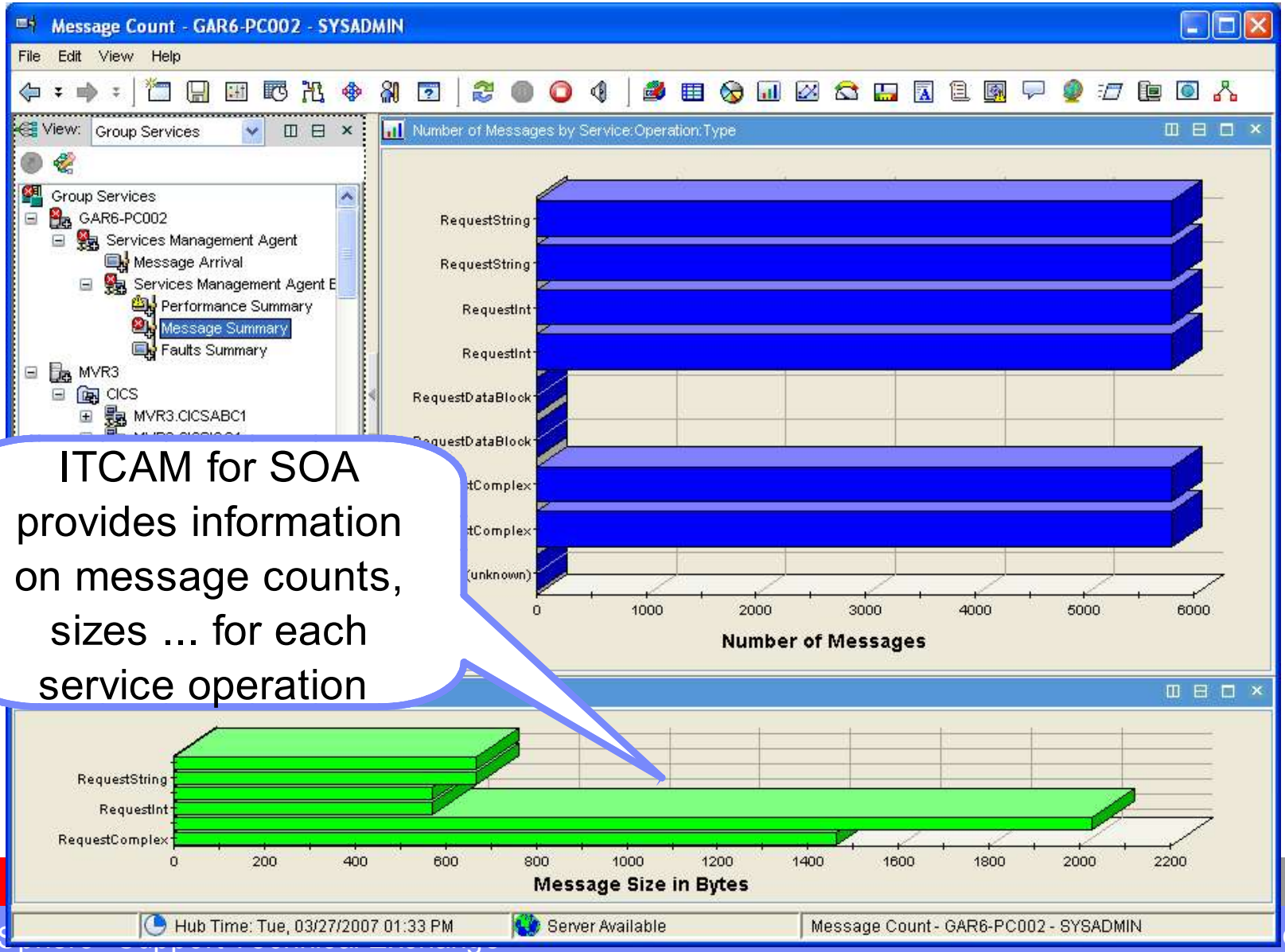


ITCAM for SOA



ITCAM for SOA provides information on message counts, sizes ... for each service operation

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 IBMs 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/htp/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

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Questions and Answers