IMS Connect:
Proving It's Worth for Web Services

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Disclaimer

Purpose and Agenda

- Proof of Concept Purpose
  - Determine if a combination of IMS 11 and IMS Connect can replace the existing WMQ interface to IMS applications, simplify the environment and continue to meet business SLAs

- Agenda
  - Introduction
  - IMS Connect PoC
  - Findings
  - Potential Benefits
  - References
  - Appendix

Introduction – Background

- In the beginning … an onsite System z Infrastructure Architecture Workshop (zIAW) was executed with customer and IBM SMEs

- Developed and outlined an IMS Connect PoC
  - Subject Applications
    - Online Inquiry System portal integration with mainframe application
    - Online Update System portal integration with mainframe application
    - Outbound Pricing Service

- Established IMS Connect PoC sandbox environment for learning and discovery of IMS SOA capabilities

Introduction – Key Participants

- Customer
  - Enterprise Architects
  - Application Developers
  - System Programmers & DBAs
  - Performance & Tuning / Capacity Planning
  - Application Developers
  - Management

- Ellis Holman, IBM System z Client Architect
- Nancy Stein, IBM Consulting IT Specialist
- Haley Fung, IBM IMS Connect Lead Developer

Introduction – Additional Team Members

- Linda Warfield, IBM Project Manager

- Subra Narayanaswamy, IBM Global Services

- Thomas Garrett, IBM Global Services

- Gerald Waterman, IBM

IMS Connect POC – Customer's Goals

Create a simple sandbox environment to exercise IMS Connect for:

1) inbound calls to an existing IMS application
2) outbound calls from IMS applications to existing web services

This environment is going to be used for discovery and learning relative to the IMS Connect product. We hope to learn how we can leverage IMS Connect in the environment.

- Inbound Transaction Use Case Evaluation
    - Port an existing client application to the mainframe running under a z/Linux LPAR
    - Existing WMQ calls will be modified to utilize the IMS TM Resource Adapter running in Websphere on z and IMS Connect to call existing IMS transactions
    - The modified application will eliminate the need for WMQ

- Outbound Transaction Use Case Evaluation
    - Use an existing CLAIM application to leverage the new IMS DLI call, ICAL, to invoke an existing web service via the IMS SOAP Gateway

IMS Connect POC – What Was Done ?

- On-Site IBM System z Infrastructure Architecture Workshop
  - September 2009
  - Studied two selected Business Use Cases
- Setup Sandbox Environment for PoC
- Application Portals Modifications
  - Migrated from mid-tier AIX platform to Linux on System z platform
  - Replaced WMQ calls with IMS TM Resource Adapter / IMS Connect API
- Inbound Transaction Use Case Evaluation
  - IMS TM Resource Adapter (J2C 1.5 Architecture)
  - IMS Connect API
  - IMS DB Resource Adapter
  - IMS JDBC Universal Drivers
- Outbound Transaction Use Case Evaluation
  - IMS Transactions as web service consumers
  - IMS SOAP Gateway

A project plan was drawn up and teams assembled to provide support for the effort
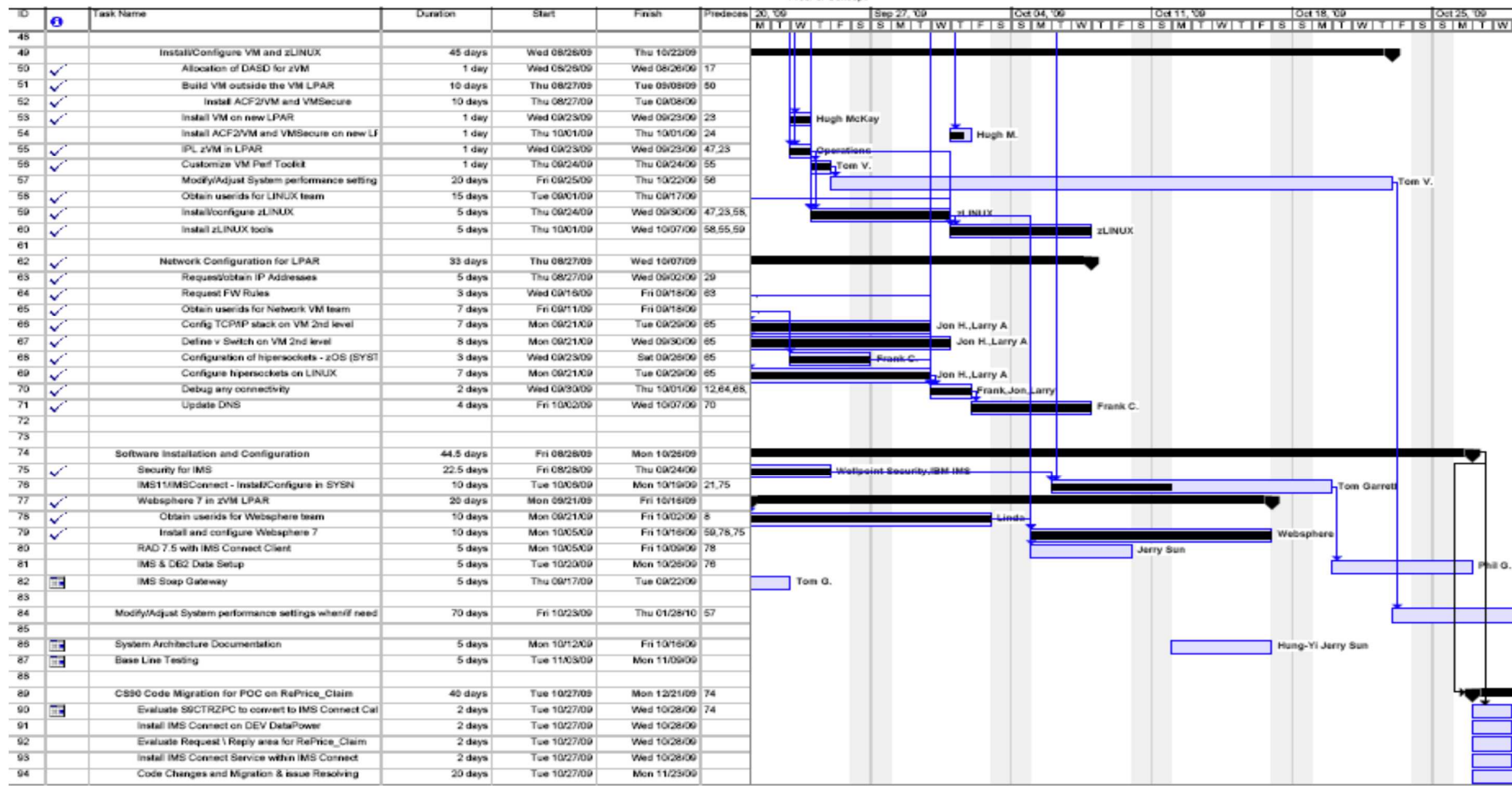
IMS Connect POC– Sandbox Environment

- Hardware:
  - 1 new LPAR
    - 1 IFL
    - 10 Gb Memory
- Software:
  - z/OS LPAR
  - z/VM LPAR
  - IMS 11 Control Region and IMS Connect
  - IMS SOA Integration Suite
  - Rational Application Developer Version 7.5.5
  - Rational Application Developer for System z Version 7.6
  - Websphere Application Server – ND Version 7
  - Redhat Enterprise Linux for z/OS Version 5

IMS Connect POC– Architecture

"Inside the box" virtual networking

WAS Linux Guests

Service Machines (similar to daemons)

IMS ↔ IMS Connect ↔ WAS | WAS

IMS DB

z/OS

CMS | TCP/IP | TSM | VMRM | ACCOUNTING | AUTOLOG1 | MAINT

z/VM Control Program

LPAR | LPAR

CP1 | CP2 | CP3 | IFL4

System z Hardware

11
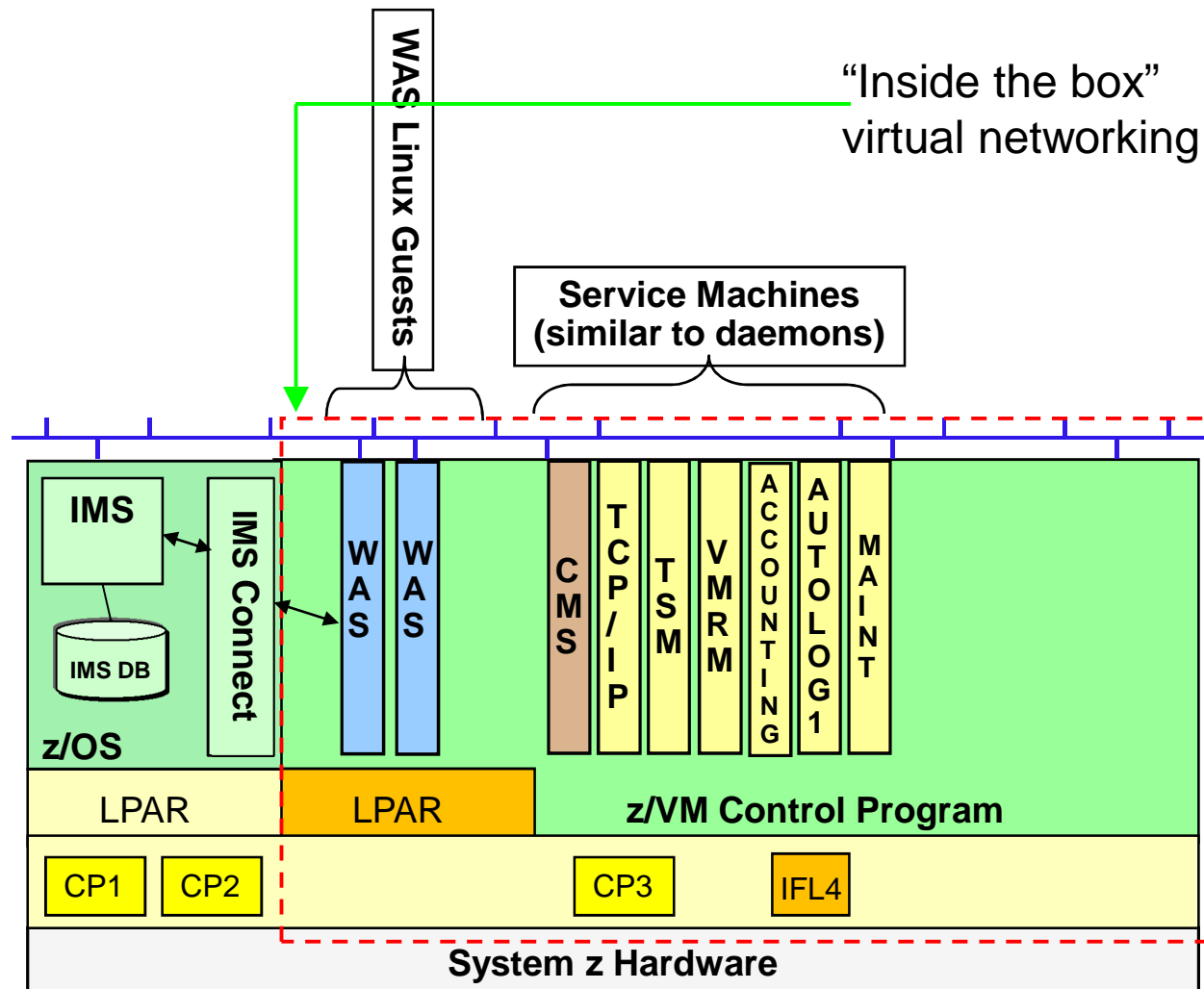
IMS Inbound Service Requests

IMS Connect – IMS's TCP/IP Gateway
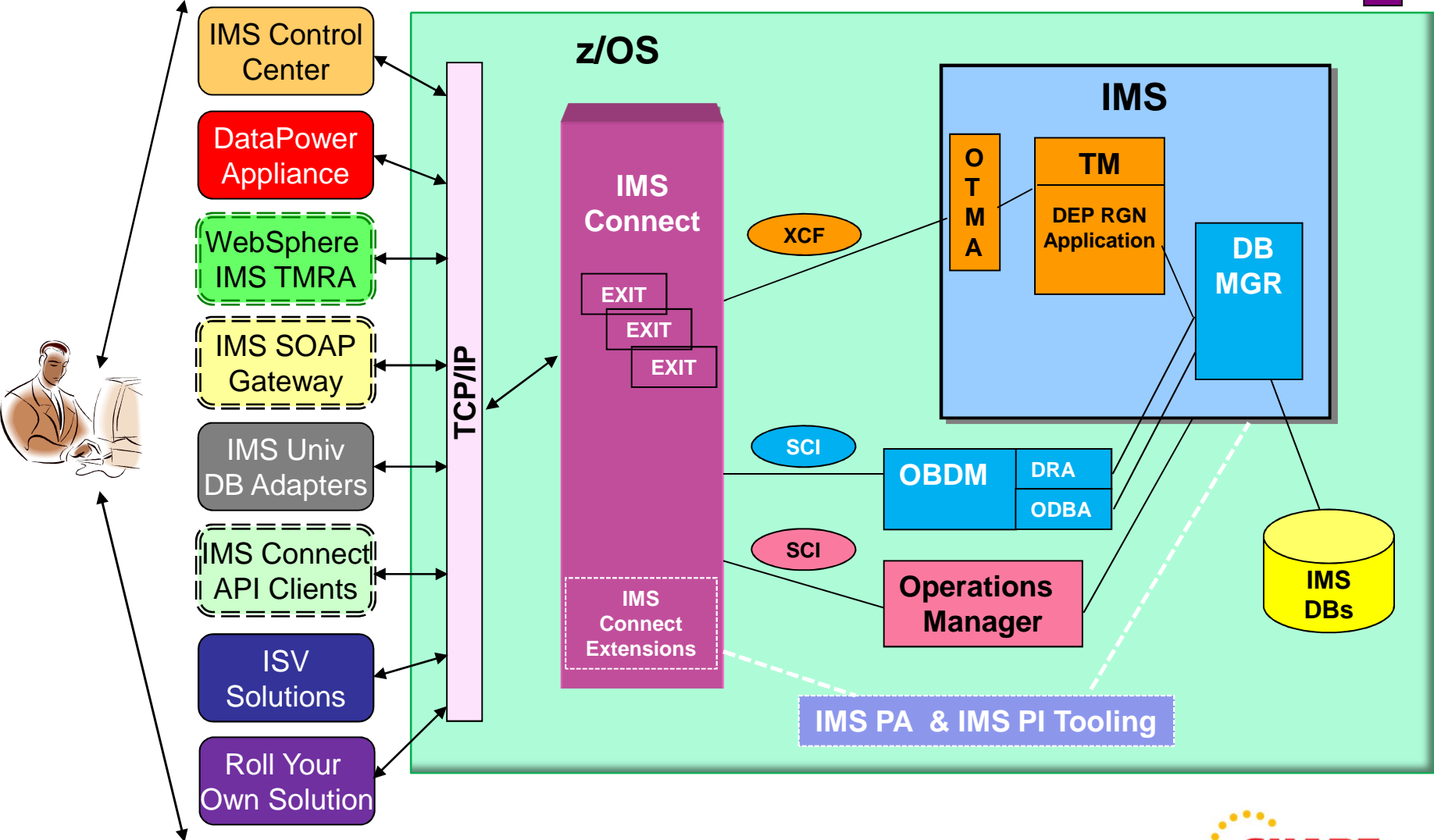
IMS Connect PoC
Use Case #1: Inbound Call to IMS

1. User issues inquiry or update request from Web Browser via HTTP(S)
2. Business Service EJB receives and processes request
3. Business Service EJB invokes IMS TM Resource Adapter
4. IMS TM Resource Adapter sends request to IMS Connect via TCP/IP (uses Hipersocket connection)
5. IMS Connect passes I/P message to OTMA via XCF; OTMA places transaction on IMS Message Queue
6. IMS schedules and processes transaction in dependent region,
7. O/P response message is returned to Business Services EJB
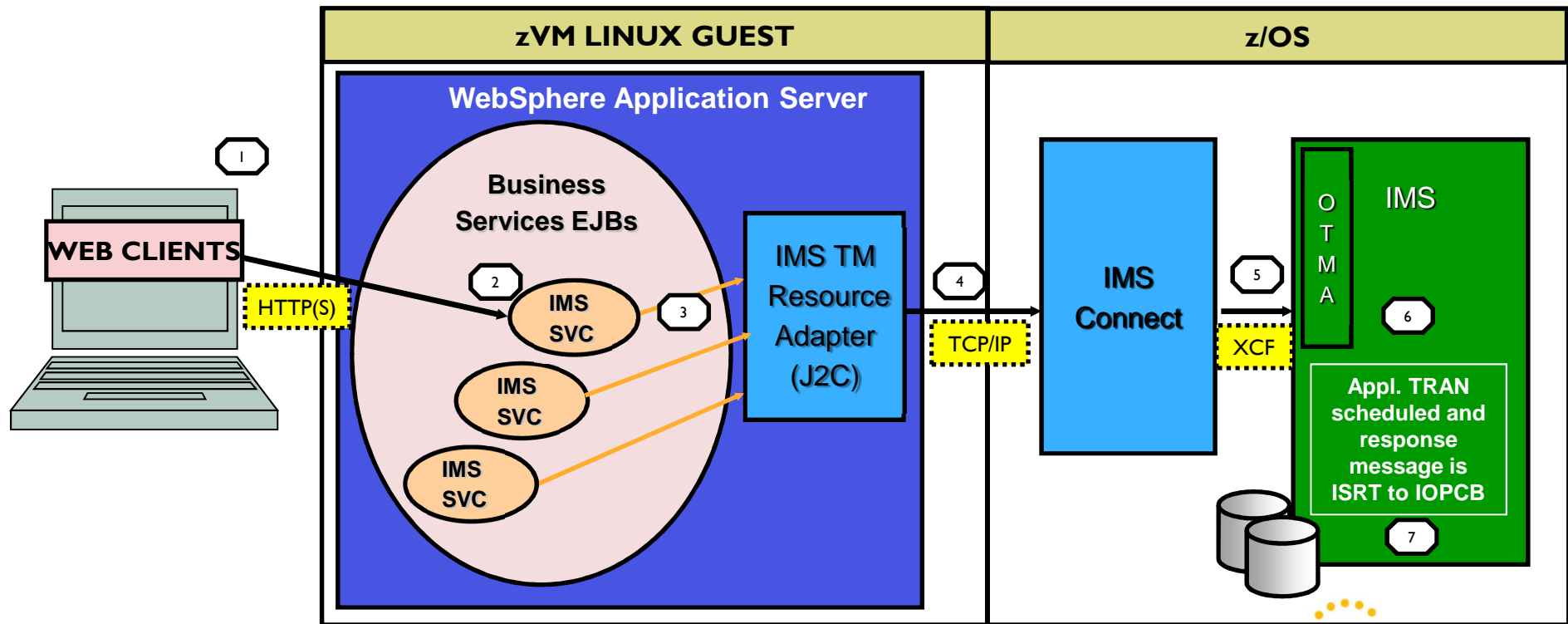
Findings – Inbound Applications

- Positives …
    - Improved performance of inbound IMS transaction
        - application response time reduced by 25%
    - Improved performance of Portals under Linux on System z
        - average 30% improvement in the overall performance
    - Standard and flexible IMS interfaces vs. proprietary WMQ calls
        - JEE, TMRA, JCA 1.5, JDBC and direct API calls
    - Standard, supported IMS SOA vs. proprietary black box solutions of EIS and BSI application frameworks
    - Flexibility of switching backend IMS subsystems via WAS Admin Console
        - no coding changes required when using WAS and IMS TMRA
    - Paradigm shift to a two-tier architecture model
        - resulted in code that is cleaner and easier to maintain
    - IMS 11 supports inbound services calls after enabling IMS Connect
    - Narrowed the knowledge gap between M/F and Distributed personnel

Findings – Inbound Transactions

- Things to be aware of …

    - Not a full JDBC 3.0 implementation
        - No impact on this PoC, but does not support JDBC Batch accessing databases directly in DLI mode

    - Little Endian and Big Endian conversion between platforms
        - When the client application was migrated to Linux on System z , the order in which bytes were stored in memory required specific parsing of the IMS message returned

    - Need to handle mainframe transaction ABENDs properly

Stress Test Observations

View of performance results for use cases accessing IMS transactions to fetch data
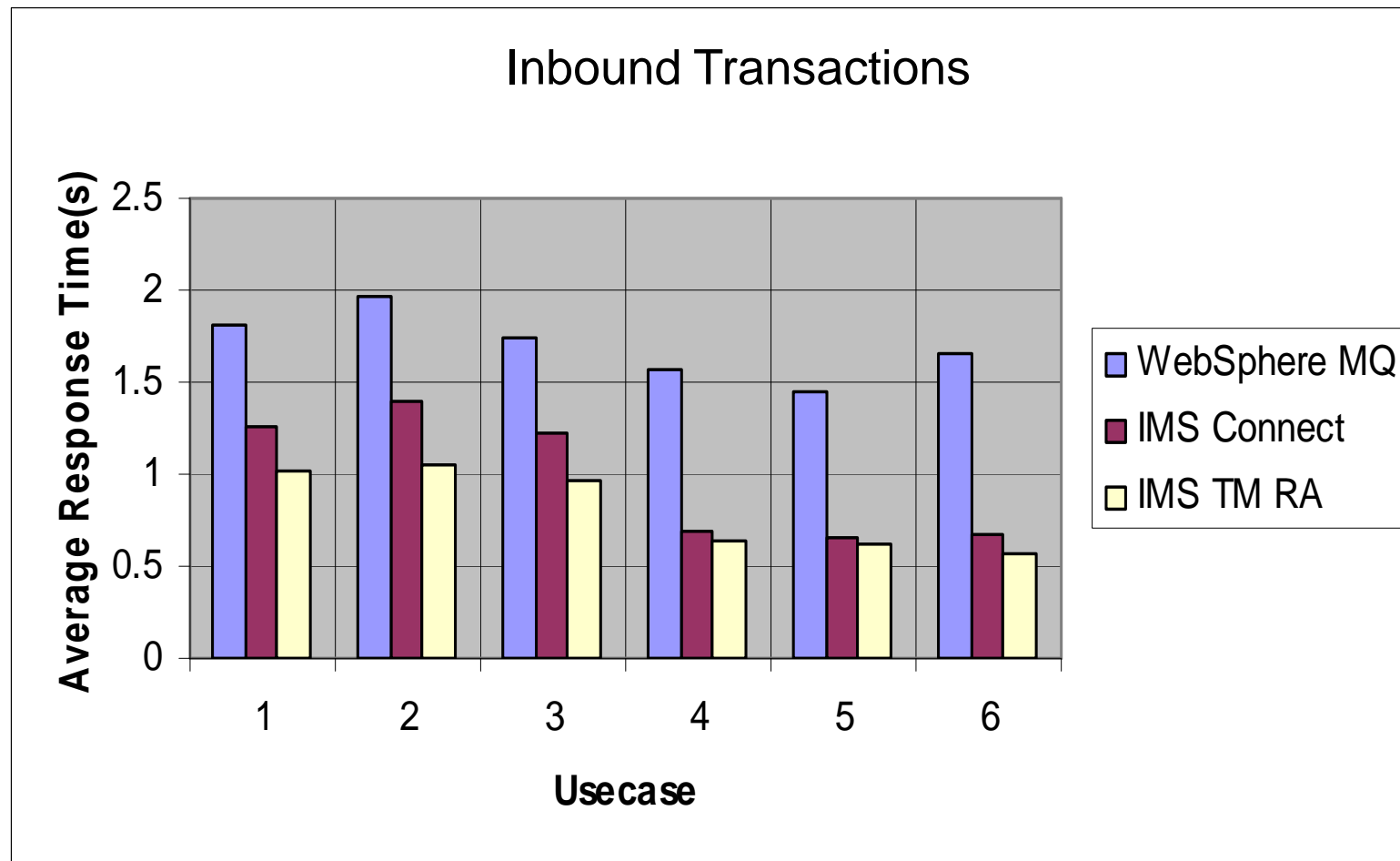
Stress Test Observations

Snap shot of stress test results for use cases - WMQ, IMS Connect API & IMS TMRA

Comparison of usecases

Average 30% improvement using IMS Connect vs WMQ

WebSphere MQ

Name	MeasureType	Unit	Count	Total	Min	Avg	Max	StdDev
1A_ Subscriber_ Search	Response time[s]	Seconds	720	1,297.95	0.578	1.803	10.672	1.306
1C_Select_ Category_and_ click_ lookup	Response time[s]	Seconds	360	708.334	0.625	1.968	9.844	1.468
1F_ Benefit_ Keyword_ Search	Response time[s]	Seconds	180	314.88	0.578	1.749	10.437	1.32
2A_Group_ SubGrp_ Search	Response time[s]	Seconds	720	1,132.43	0.235	1.573	21.97	1.881
2C_Select_ Categoery_ Lookup_for_ Group	Response time[s]	Seconds	360	522.939	0.407	1.453	7.187	1.318
2F_ Benefit_ Keyword_Search_ for_ Group	Response time[s]	Seconds	180	299.365	0.344	1.663	19.453	1.941

IMS Connect API
Average E9 transaction time: 793 ms (12/18/2009)

Name	MeasureType	Unit	Count	Total	Min	Avg	Max	StdDev
1A_ Subscriber_ Search	Response time[s]	Seconds	720	909.542	0.329	1.263	14.204	0.871
1C_Select_ Category_and_ click_ lookup	Response time[s]	Seconds	360	504.113	0.484	1.4	8.563	0.925
1F_ Benefit_ Keyword_ Search	Response time[s]	Seconds	180	219.625	0.422	1.22	5.969	0.779
2A_Group_ SubGrp_ Search	Response time[s]	Seconds	720	494.817	0.078	0.687	8.766	0.546
2C_Select_ Categoery_ Lookup_for_ Group	Response time[s]	Seconds	360	236.378	0.156	0.657	3.235	0.339
2F_ Benefit_ Keyword_Search_ for_ Group	Response time[s]	Seconds	180	120.54	0.141	0.67	2.906	0.337

IMS TM RA
Average E9 transaction time: 681 ms (12/21/2009)

| Name	MeasureType	Unit	Count	Total	Min	Avg	Max	StdDev
1A_ Subscriber_ Search	Response time[s]	Seconds	720	728.017	0.281	1.011	7.75	0.686
1C_Select_ Category_and_ click_ lookup	Response time[s]	Seconds	360	378.439	0.484	1.051	4.61	0.614
1F_ Benefit_ Keyword_ Search	Response time[s]	Seconds	180	172.319	0.468	0.957	4.75	0.574
2A_Group_ SubGrp_ Search	Response time[s]	Seconds	720	456.587	0.11	0.634	8.547	0.506
2C_Select_ Categoery_ Lookup_for_ Group	Response time[s]	Seconds	360	222.155	0.187	0.617	2.328	0.313
2F_ Benefit_ Keyword_Search_ for_ Group	Response time[s]	Seconds	180	102.066	0.109	0.567	1.937	0.247

IMS Outbound Service Requests

IMS Connect PoC
Use Case #2: IMS Outbound to Web Service

1. IMS application transaction issues an "ICAL" request with a SENDRECV to an OTMA Descriptor
2. OTMA passes the request message directly to IMS Connect bypassing the IMS Message Queue
3. IMS Connect converts message into XML and sends it to SOAP Gateway via TCP/IP (uses Hipersocket)
4. SOAP Gateway wraps SOAP envelope around the XML and sends request to the Web Service via HTTP(S)
5. Web Service receives and processes the request from IMS application transaction
6. Web Service sends response back to waiting IMS application transaction via a reverse path
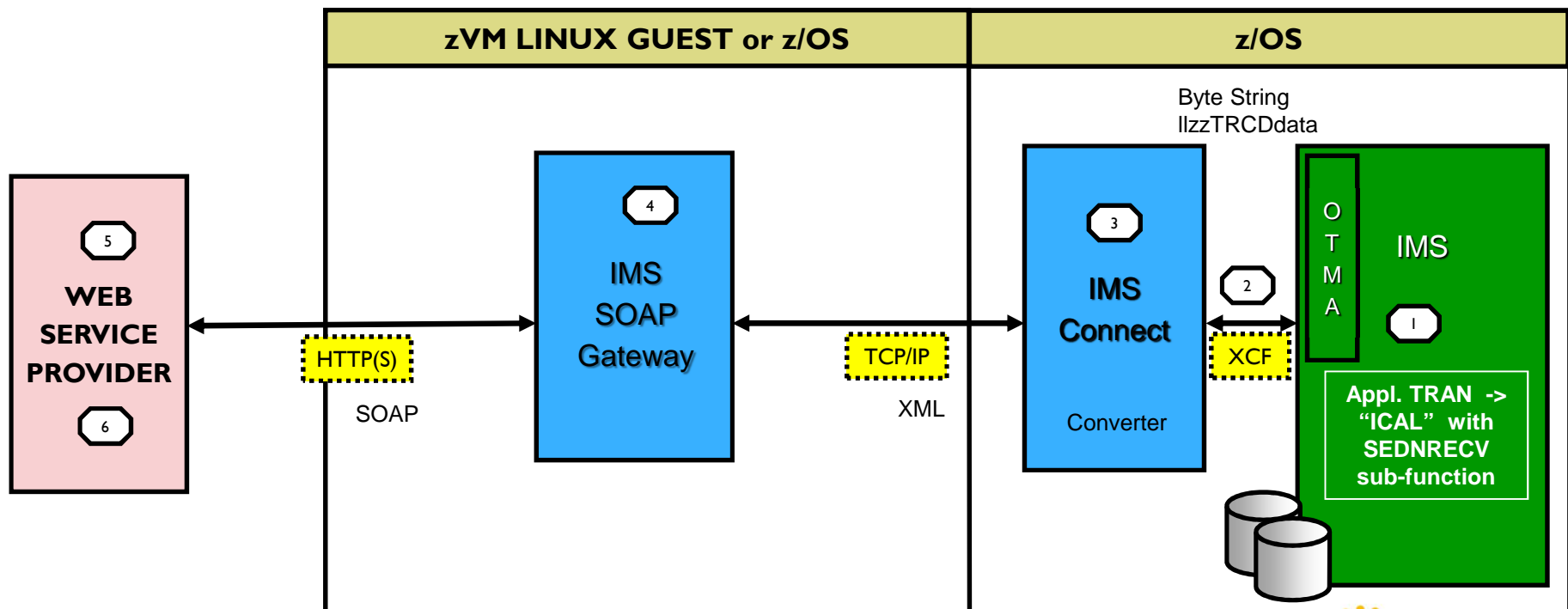
Findings – Outbound Pricing Service

- Simple http enabled service was successful
  - The following configuration issues were resolved
    - Tpipe connectivity issue
      - *Analysis to determine why the tpipe which connects IMS Soap Gateway and IMS Connect to OTMA is not processing IMS call to request the simple http enabled service*
      - *Resolved by putting adhoc security in place and applying an APAR*
    - RAD/z was needed to create the WSDL used by IMS Connect
      - *Issues uncovered working with RAD/z:*
        - *The mapping code generated is rejecting the request*
        - *Looking at the Cobol versioning level*
    - Worked with IBM Labs in Germany and in SVL

Findings – Outbound Pricing Service

- Call failed in the timeframe of the PoC
  - Artifact creation issues within the IBM® Rational® Developer for System z® caused a change in direction to create a simple http enabled service to continue with the PoC
    - WSDL RPC support
      - Not all standard WSDL levels were supported
      - IBM confirmed that in the next release this issue would be addressed
    - Three enhancement requests were opened to make the tool useful in a production deployment environment
      - ODC
      - multiple mapping
      - embedded logic
    - Connection issues to the mainframe demon listeners using IBM® Rational® Developer for System z® (RAD/z)
      - Fixed with security

Findings - Non-Technical

- From the Customer
  - IBM as a Technical Partner
    - "IBM supported business associates and addressed the issues quickly and listened to our findings and proposed solutions or integrated our findings into future releases of the software."
  - "Infrastructure support is strongly exploring skipping IMS 10 and migrating directly to IMS 11 and IMS Enterprise Suite Version 11, then deploying the IMS Connect and IMS SOAP Gateway address spaces."
  - "An additional PoC is being proposed by Enterprise Architecture staff to use the IMS 11 sandbox to determine if the technology can be applied to current BSI Frameworks"

Findings – PoC Success

- Proof of Concept Purpose

    - Determine if a combination of IMS 11 and IMS Connect can replace the existing WMQ interface to IMS applications, simplify the environment and continue to meet business SLAs

- IMS V11 and IMS Connect …

    - Can replace the WMQ interface to IMS applications

    - Simplifies the integration environment significantly

    - Able to achieve better results than the business SLAs

Potential Benefits

- **IMS Connect and IMS SOA Integration Suite**
  - Performance, reliabiilty and scalability improvements
  - Reduced configuration and maintenance vs. WMQ setup and maintenance – simplification of interface
  - Assumed significant reduction in production MIPs
    - It was determined that an average Claim took 60 - 100 ms of overhead when going through the WMQ calls
  - Eliminates 32kb payload restriction using "ICAL" / IMS Connect / IMS SOAP Gateway
    - Allowed for request and response payloads of 16mb
  - Eliminates the multiple points of failure inherent in WMQ hops
  - Allows a point to point connection to all web enabled/SOAP/html services from within IMS
  - Brings the IMS environment inline with SOA standards

Potential Benefits

- **Server Virtualization Using Linux on System z**
    - Dynamic computing resource allocations
    - Decreased complexity to improve manageability of systems
    - Automate routine tasks
    - Reduces overall management costs through efficiency
    - Possible Software License cost saving
    - Improves return on infrastructure investment through better utilization of resources
    - Savings on energy and floor space

Potential Benefits

- **Lean Development Process**
  - On demand computing environment and model to test, assemble, retest & deploy applications and maximize hardware utilization
  - Automatically configure OS & software stacks
  - Provides developer self service capabilities
  - Simplifies ongoing operations and reduces technical support burden
  - 11 Servers will be sunset during solution implementation

Post-PoC Steps

- **Total Cost Ownership (TCO) Analysis by IBM**
  - Hardware cost saving model through Linux on System z virtualization
  - License cost saving
  - Maintenance and administration labor cost saving
  - Process efficiency analysis

- **Production Implementation (based on TCO analysis)**
  - IMS 11 and IMS Connect, IMS SOA Integration Suite and z/Linux
  - Application Portal z/Linux Migration
    - consolidate 11 physical boxes
    - software license and administration cost saving
  - DB2 Gateway migration
    - consolidate 2 boxes

Post-PoC Steps

- **Identify Additional Applications Within Scope**

  - Begin reengineering of another IMS application

  - Frameworks integration using DataPower

  - PoC completed in 2010

- **Phase II PoC**

  - Centralize Benefit Services running on Websphere 7 / z/OS

  - DataPower integration

References for PoC

- **IMS SOA Integration Suite**

  http://www-01.ibm.com/software/data/ims/soa-integration-suite/

- **IMS Enterprise Suite**

  http://www-01.ibm.com/software/data/ims/soa-integration-suite/enterprise-suite/

- **IBM Websphere Application Server**

  IBM - WebSphere Application Server - Software

- **Programming with the IMS Universal JDBC drivers**

  http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/topic/com.ibm.ims11.doc.apr/ims_odbjavareference.htm

References for PoC

- **Bringing IMS and SOA Together With IMS Connect**

  Bringing IMS and SOA Together With IMS Connect | Mainframe | IBM Systems Magazine

- **IBM IMS TM Resource Adapter**

  http://www-01.ibm.com/software/data/ims/ims/components/tm-resource-adapter.html

- **IBM Enterprise Modernization Sandbox - Demos**

  http://www.ibm.com/developerworks/downloads/emsandbox_systemz/index.html

Information and Analytics Communities

- **On-line communities, User Groups, Technical Forums, Blogs, Social networks, and more**
  - Find a community that interests you …
    - **ibm.com**/software/data/community

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  - Recognizing individuals who have made the most outstanding contributions to Information Management communities
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IMS Information and Education
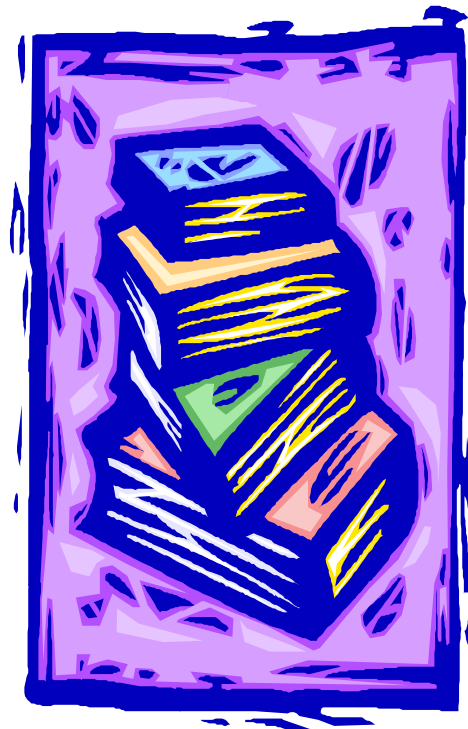
- "*An Introduction to IMS*" book
  - Update coming for IMS 11
- IMS Redbook
  - IMS Version 11 Technical Overview
- IMS Family Website: www.ibm.com/ims
  - Presentations, papers, newsletters, fact sheets, announce letters, Redbooks
  - Schedule of seminars, webcasts and conferences
  - IMS education schedule
- Information Center - enables search across IMS, DB2 and Tools documentation
- Migration, skills transfer, customized offerings at *ibmdds@us.ibm.com*

IMS 11 Information

- ***IMS 11 Announcement Letter 208-258***

   www.ibm.com/common/ssi/index.wss

- ***IMS 11 Fact Sheet - GC19-2451***

   http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/index.jsp?topic=/com.ibm.ims11.doc.fact/factsheet_v11.htm

- ***IMS 11 Release Planning* - GC19-2442**

   http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/topic/com.ibm.ims11.doc.rpg/rpg.htm

- ***IMS 11 Publications***

   - *All of the IMS 11 publications are available from the Information Management Software for z/OS® Solutions Information Center*

      http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/topic/com.ibm.ims11.doc/imshome_v11.htm

- ***IMS Version 11 Technical Overview – Redbook* SG24-7807-00**

   http://www.redbooks.ibm.com/abstracts/sg247807.html?Open

- ***IMS 11 Open Database – Redbook* SG24-7856-00**

   http://publib-b.boulder.ibm.com/abstracts/sg247856.html?Open/

Data Management Communities for IMS

- **Data Management Community** – share and interact on all Data Management topics with peers around the world
    - www.ibm.com/software/data/management/community.html
- **IMS Community** – share and interact with IMS peers around the world
    - http://www-01.ibm.com/software/data/ims/community/
- **IMS Regional User Groups** – find a meeting near you
    - www.ibm.com/software/data/ims/usergroups.html
- **IMS Application Development Forum**
    - www.ibm.com/developerworks/forums/forum.jspa?forumID=1632
- **Information Champions** – recognized individuals who have made the most outstanding contributions to the Information Management community
    - www.ibm.com/software/data/champion
- **Rational Cafes** – for host application programming languages
    - www.ibm.com/software/rational/cafe/index.jspa
- **COBOL Cafe** – IMS Hub for application programmers
    - www.ibm.com/software/rational/cafe/community/cobol/ims?view=overview

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ibm.com/vrm/newsletter/11069

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