IMS Transaction Manager
Your Enterprise Transaction Manager
March 2012
Transaction management – A key z/OS strength!

- A key strength of the z/OS platform is support for high-volume, high-performance transaction management using transaction managers
  - Scalable
  - Optimized for mixed workload
  - Highly available

- IBM’s z/OS-based transaction managers
  - CICS - Customer Information Control System
  - IMS TM - Information Management System Transaction Manager
  - WebSphere Application Server for z/OS
Agenda

- IMS Transaction Manager Positioning
- Robust and efficient product architecture
- Universal Interoperability with network and applications
- IMS Application Support
- External Resource Manager Access
- IMS Operation and System management
Why customers use IMS TM today?

- **Hosting business-critical high-volume transactional or batch-oriented applications**
  - With 24/7 possible availability of application environment
  - With goal-oriented workload management
  - With security

- **Protecting investment in applications and ensuring upward compatibility for over 40 years**
  - Integrated message queuing, transaction processing and database management
  - Business still relies on existing application constantly updated to adapt to new business needs
  - No need to recompile applications when changing middleware, z/OS or HW

- **Running on the most scalable and most robust IT infrastructure**
  - IMS component architecture in conjunction with z/OS features

- **Optimizing CPU and storage consumption when using IMS hierarchical data model**
  - 64 bit Data-In-Memory solution with asynchronous I/Os on physical data on disk (DEDB)
  - Partitioning solution to parallelize I/Os without application changes (DEDB, HALDB)

- **Integrated access to DB2 relational databases and MQ queues on z/OS**
  - Guaranteed integrity (Two Phase Commit)
  - Transactional and batch support (BMP) with dynamic backout capabilities
  - Easy to use batch checkpoint/restart mechanisms
  - Coordinated recovery solution to reduce impact of locked resources after an unplanned outage (FDBR)
The Modern « Application Container » , according Gartner

- **Application Container** requirements
  - Simple programming model
  - Transactional management – ACID properties
  - Optimized management of data and network connection
  - Solution for in-memory data
  - Support application interoperability
  - Support for event-management

- **System Infrastructure** Requirement
  - Elastic scalability
  - Optimized management of system resources (memory, processes, pools, …)
  - Optimized workload management
The Modern « Application Container » , according IMS

- **IMS as « Application Container »**
  - Simple programming model
    - Get message, send message
    - Multi-segment support allowing large messages
    - « Execute » and « forget »
  - Transactional management optimized for over 40 years
  - Universal interoperability with network and applications
  - Solution for in-memory data with DEDB 64 bit addressing
    - Supported by IMS DL/I calls – simple API
  - Support any language including Java (transactional and batch)
  - Support application interoperability between IMS applications
    - Prog-to-prog inside IMSPlex environment
    - MSC between IMS environments
  - Support application interoperability outside of IMS environment
    - SOA standard support
    - IMS as a server or as a client
    - Synchronous and asynchronous capabilities
  - Support for event-management
    - Event could be sent by MQ message or by using IMS API (ISRT ALTPCB)
    - Changed data can be captured and sent using InfoSphere solutions

- **z/OS and System z, the Optimized “System Infrastructure”**
**Strengths**
- Established TM & DB leader, large and loyal installed base
- Running on THE « Best of Breed » OS! Core component of zEnterprise
- Coupling **messaging, TM & DB activities** for reduced MIPS usage
- Integrating **transactional and batch workload**
- Investment protection while supporting new developments
- Support for new strategic IT standards (Java, JavaEE, web 2.0, event, …)
- Very simple programming model enforcing quality in applications and data access
- Centralized administration and system management

**Weaknesses**
- Positioned by IBM in the « Information Brand »; lost attraction from the TM side
- Lack of industry-based solutions
- Expensive Total Cost of Ownership perception of z
  - And IMS has 2 products in one, a database manager and a transaction manager
  - To be compared with CICS + DB2
- Positioned as a High-End TM (large enterprise)

**Opportunities**
- Application modernization with adoption of new development tools and methodology
- Project around mainframe modernization and server consolidation
- Project around IMS connectivity – integration & service enablement – inbound and outbound
- Customer workshop including IMS Business value assessment
- Deployment of new innovative solutions on top of IMS assets (rules, events, processes, master data)

**Threats**
- Skills scarcity
- Losing interest and knowledge from system integrator and ISVs
- Trend of « good enough » versus « best of breed »
- Mainframe offloading initiatives
- Mindset monopoly for so called « modern » applications based on JavaEE or .NET
## IMS TM in Perspective

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### Application Development

| Multi-language AD support | COBOL, PLI, C, … JAVA |
| THE enhanced development platform | Rational Developer for zEnterprise |
| Asset analysis | Using Rational Asset Analyser |

### Access to external resource managers (in addition to IMS Databases) on same z/OS platform

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### Business Integration

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### Decision Support

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Agenda

- z/OS Transaction Management
- IMS Transaction Manager Positioning
- Robust and efficient product architecture
- Universal Interoperability with network and applications
- IMS Application Support
- External Resource Manager Access
- IMS Operation and System management
IMS Architecture – Proven & Innovative Technology

- **Multi-address space architecture with one single point of control**
  - Control region controls up to 1000 « service » address space.
  - DBRC centralizes all backup and recovery information.

- **Tight integration of messaging, TM and DB activities**
  - Sharing IMS system components (logging, pool management, …)
  - Transactional workload as well as batch workload
  - Optimized access to IMS DEDBs – high volume – high performance – low CPU

- **Optimized parallel processing inside an IMS environment**
  - Multi-threading and multi-tasking
  - Based on IMS workload classes and priority in conjunction with z/OS WLM for resource allocation
    - Transaction / Processing Class / MPP
  - Serial, Standard, Pseudo-WFI, WFI

- **Optimized workload balancing in an IMS Shared Queue environment**
  - « Pull » instead of « Push »
  - Routing at different level: network entry (see VGR or sysplex distributor), IMS connect, or IMS Shared Q

- **Transparent connectivity between IMS systems geographically dispersed**
  - MSC (Multiple Systems Coupling) using VTAM or TCP/IP networks
  - Asynchronous IMS-IMS TCP/IP support
IMS Architecture – Proven & Innovative Technology …

- **Tight Integration with z/OS**
  - Continuous application availability, thanks to a robust inter-system coupling solution, aka parallel sysplex
  - Continuous IT operations for system or maintenance upgrades
  - Elastic scalability thanks to adequate resource allocation of computing resources based on workload priority
  - Mixed workload support (transactional, batch, java, …) and best of breed workload management
  - “Bulletproof” system recoverability without data loss (exceptions could occur …)
  - Focus on outage prevention
  - Optimized parallel computing with efficient latch/lock management
  - Exploitation of z/OS capabilities e.g., the use of extended format data sets and striping to improve logging bandwidth
  - 64-bit support

- **Security**
  - Based on z/OS Security Server
  - User authentication
  - User authorization at transaction / program / database level
IMS Architecture – Proven & Innovative Technology …

- **System Updates - easy to skip releases of IMS**
  - Supported migration paths from 9 to 11, 10 to 12
  - Customer could also make more important jump without fallback capabilities and without official support
    - From 5 to 10, or 6 to 12, …

- **System Updates – without impacting investment in business logic**
  - Application is not required to be modified or even re-compiled or re-bound
    - Even when the physical structure of a database is changed, e.g., from Full Function to HALDB
    - Or when new capabilities are leveraged, e.g. Shared Queues or Data Sharing
    - Or even when the communications interface changes

- **Numerous continuous availability features**
  - On one site, on 2 sites, on 3 sites geographically dispersed
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Universal Interoperability with network and applications

- **Support for routinely large number of concurrent accesses from terminals and/or applications**

- **Evolution from terminal to « client/server » to « browser / processes & services » without application change**
  - Presentation layer outside of IMS application
  - Application interface based on input and output message descriptions
  - OTMA as universal protocol to access IMS TM – many OTMA clients
    - IBM: IMS Connect, MQ bridge, DB2 Stored procedure
    - Non IBM: TIBCO, …
  - High performance TCP/IP access thru IMS Connect
    - Enhanced by IMS Connect Extension functionalities
    - Parallel processing of incoming requests – multiple ICON Address space
    - Highly available configuration
    - The basis for many integration solutions

- **Integration between IMS applications**
  - “Prog to Prog” inside a single IMS, or inside an IMS Shared Queue environment, or across a TCP/IP link with IMS Connect
  - MSC between any IMS environment (locally or geographically dispersed)
Universal Interoperability with network and applications …

- **Integration of IMS applications with other service providers**
  - SOA Integration
  - WOLA IMS Support
  - Support for lightweight web application with mashups

- **Flexible and high performance connectivity**
  - VTAM generic resource capability
    - Across the different LU types
  - TCP/IP IP spraying and load balancing support, e.g., with Sysplex Distributor
    - IMS Connect can be configured to access multiple IMS systems in the same or different LPARs
    - or multiple IMS Connects can access a single IMS
SOA Connectivity with IMS TM - Inbound to IMS

WebSphere Servers
WAS, WESB, WTX, WMB, BPM

IMS TM Resource Adapter

IMS SOAP Gateway

WebSphere DataPower

IBM Mashup Center / WebSphere sMash

Connect API (Java, C)

MQ

MQ IMS Bridge

MQ Trigger Monitor

IMS

IMS Connect

IMS DB & XML DB

DB2

WOLA

IMS

WAS – WebSphere Application Server
WOLA - WebSphere z/OS Optimized Local Adapters
WESB – WebSphere Enterprise Service Bus
WTX – WebSphere Transformation Extender
WMB – WebSphere Message Broker
BPM - IBM Business Process Manager (BPM) Advanced

WOLA - WebSphere z/OS Optimized Local Adapters

IMS TM – IBM IMS Transaction Manager

DB2

MQ

WebSphere DataPower

Connect API (Java, C)

MQ IMS Bridge

MQ Trigger Monitor

IMS

IMS Connect

IMS DB & XML DB

DB2

WOLA

IMS

WAS – WebSphere Application Server
WOLA - WebSphere z/OS Optimized Local Adapters
WESB – WebSphere Enterprise Service Bus
WTX – WebSphere Transformation Extender
WMB – WebSphere Message Broker
BPM - IBM Business Process Manager (BPM) Advanced
SOA Connectivity with IMS TM - Outbound from IMS

- Asynchronous and synchronous capabilities

WAS – WebSphere Application Server
WOLA - WebSphere z/OS Optimized Local Adapters
WBE – WebSphere Business Events
WBM – WebSphere Business Monitor
WMB – WebSphere Message Broker
RYO Server - .Net, BizTalk, Oracle SP, SAP, PayPal services, and any application server, etc.
## Integration and Connectivity Features Summary

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- Universal Interoperability with network and applications

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- External Resource Manager Access

- IMS Operation and System management
IMS Application Support – Design & Development

- Supports many languages including Java
  - Assembler (yes, still used), Cobol, PL/I, C/C++, REXX and Java
  - Allows interoperability between Cobol or PL/I and Java in MPP/BMP/IFP regions
    - e.g., Cobol calling Java or Java calling Cobol
  - Specific processing regions for Java transaction (JMP) and Java Batch (JMP) based on z/OS optimized JVM

- Support for a simple programming model for IMS application
  - No presentation layer imbedded in IMS logic
  - Very simple design
    - Get Input Message
    - Access resource Managers
    - ISRT Output Message
    - “Execute” and “Forget” - No affinity with the middleware or OS (as best practice)
    - IMS call for application logging service inside the centralized IMS log

- Based on a simple IMS API for IMS TM
  - GU IOPCB call to get input message and ISRT IOPCB call to send output message
  - ISRT ALTPCB call to send a message to an alternate destination ie other IMS transaction, terminal, remote program, EJB, web service, …
  - Additional API for IMS DB Access
    - GHU, GU, GHN, GN, GNP, ISRT, REPL, DLET calls
  - Other supported API
    - JDBC to access IMS databases
    - Exec SQL or JDBC to access DB2 databases
    - MQI to access MQ queues
    - WOLA API to access EJB or web service
IMS Application Support – Design & Development

- **Supported by enhanced IBM Enterprise Modernization tools**
  - Collaborative design and lifecycle management with Rational Team Concert (RTCz)
  - Development with Rational Developer for zEnterprise (RDz)
    - Tools provide code snippets to assist programmers in coding the IMS calls
  - Application asset understanding with Rational Asset Analyzer

- **Solutions for IMS Application Development Environment on z/OS**
  - Running development and unit test on x86 workstation with Rational Developer for System z Unit Test (RDz UT)
    - Running z/OS on a x86 PC running Linux
  - Virtualization of multiple IMS environments into one IMS on z/OS
    - The Standardware COPE solution allows IMS development teams to virtualize their IMS test environments for potential savings in test resources, process time and set-up systems skills without associated application program changes
IMS Application Support – Design & Development …

- Support from testing and problem determination tools
  - IMS based: BTS
  - z/OS based: Debug tool, File Manager, Fault analyzer
  - Look at “IMS Explorer for Dev” extension for IMS TM in the future

- Easily integrated into the Services and Processes Oriented world
  - IMS as service provider – IMS Inbound solutions
  - IMS as service requestor - Able to call out to a service using native DLI calls – IMS Outbound solutions
  - Generation of business events

- Supports integration into SOA development models
  - Bottom up: reuse business logic already implemented in existing IT application systems
  - Meet-in-the-middle: create an integration layer to accommodate new business needs with existing services – support for all IBM ESBs: Datapower, WESB, WMB
  - Top-down: write new services based on IMS transactions – Tooling to be provided to facilitate IMS application development from WSDL definition

- IMS application modernization scenarios
  - Modify or add COBOL or PL/I logic
  - Add JAVA classes to existing CÔBOL or PL/I programs
  - Take advantage of a Business Rules management system
    - Business Rules mining using Rational Asset Analyzer
  - Take advantage of Business Event management system
  - Study all Call in/Callout capabilities
  - …
IMS Application Support - Deployment / Maintenance

- **Unchanged application when changing system infrastructure and middleware – application investment protection**
  - No need to recompile IMS application to move from one IMS Version to another
    - But recompiling may take better advantage of HW & z/OS enhancements

- **Online change for application components**
  - Dynamic resource definition

- **Easy implementation of new version or maintenance of application**
  - Could be isolated in some processing region
  - No need to stop IMS processing
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External Resource Manager Access – On same z/OS

- **Access to the 2 z/OS DBMS, IMS DB and DB2**
  - Efficient data management capabilities
  - Support for “Data Sharing” in a z/OS sysplex environment
    - CF cache structure can be used to store data and reducing the need for read disk I/Os.
    - *Available for IMS DEDBs, IMS OSAM FF, DB2*
  - Support for “Data-In-Memory” - 64 bit support for IMS DEDB and DB2

- **Access to “Master Data” thru the MDM Server “Query” Connect**
  - InfoSphere MDM Server offers a high performance, high scalability foundation to access master data with several options (server and/or data can be distributed or z/OS).
  - When data is in DB2 for z/OS, a COBOL Adapter enables COBOL programs to access Master Data Management Server services thru the MDM Server Central Transaction server (for Update request) and thru the MDM Server “Query” Connect (for Read-only requests)

- **Access to Messaging Systems**
  - IMS has a imbedded queuing mechanism based on IMS API.
  - IMS applications can also use MQ API to access the MQ local manager. Queues can be defined local or remote inside this QM.

- **Access to services with WOLA - WebSphere z/OS Optimized Local Adapters**
  - IMS applications can use WOLA API to call WAS on z/OS-based applications using cross-memory
  - Available for transactional workload and batch workload

- **Access to local “Business Rules” with WebSphere Operational Decision Management (WODM)**
  - ILOG Rules for COBOL can be used to develop rules as COBOL subroutine to be included in the IMS transaction UOW
  - ILOG zRules will be able to call java-based rules from a COBOL IMS application without complicated development
# IMS DB in Perspective

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External Resource Manager Access – On a different environment (z/OS or distributed)

- **Access to DB2 LUW via DB2 z/OS as a gateway**
  - Transactionality preserved

- **Access to Services**
  - IMS provides numerous solutions for accessing services from IMS applications
  - Asynchronously or synchronously using SOAP, JCA or JMS
    - Asynch: IMS API (ISRT ALTPCB), MQ API and also APPC API or TCP/IP calls with IMS Connect
    - Synch (not in 2PC scope): IMS API (ICAL), MQ API and also APPC/IMS (2PC scope)

- **Access to remote “Business Rules”**
  - ILOG Rules Execution Server provides services that can be called by IMS application as described above.

- **Access to Messaging Systems**
  - IMS applications can use MQ API to access the MQ local manager that will then communicate with any MQ manager.
  - Remote queue managers can communicate with IMS TM using either the MQ OTMA bridge or the MQ Trigger Monitor mechanism.

- **Access to Event Manager**
  - Event message can be created by the IMS application based on data included in IOPCB, based on database content or based on application logic
  - Event message is sent based on IMS Callout solutions using IMS API & IMS SOAP Gateway Business Event Support or using MQ API
Agenda

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IMS Operation and System Management

- Centralization of messages for the whole IMS environment
  - One log for IMS system, TM and DB activity
  - Tool to simplify log visualization for analysis and debugging purposes

- Automated operator interface based on simple IMS calls to submit commands, receive command output and monitor messages
  - AO application programs and exit routines

- Capability to implement a SPOC (Single Point of Control) for several IMS environments
  - Provides a simple front-end interface for an IMSPlex
  - Allows commands to be routed to one or more IMS systems and retrieves results
  - Based on the IMS Common Service Layer (CSL)
    - Keeps track of resources and provides an efficient mechanism for inter-address space communications

- Dynamic resource definition
  - For VTAM terminals, applications and databases

- Enhanced solutions from different vendors – IBM & ASG, BMC, CA
  - IMS monitoring, IMS system management, …
Agenda

- IMS Transaction Manager Positioning
- Robust and efficient product architecture
- Universal Interoperability with network and applications
- IMS Application Support
- External Resource Manager Access
- IMS Operation and System management

Conclusion
The Message

- **IMS continues to be a premier server with architected standard interfaces**
  - New products and tools from a variety of vendors provide access to IMS transactions and data

- **Our goal is to leverage IMS as an integral part of the enterprise in the evolving business world through**
  - Addition of support for complementary standards surrounding IMS connectivity, data representation, and application development

- **And to allow you to realize the promise of building the IT for the Future**
  - Simplify the business environment
  - Respond to market changes quicker and at less cost
References

- Ibm.com/ims

- Redbooks
  - IMS 12 – SG24-7972
  - Powering SOA Solutions with IMS - SG24-7662
  - Enabling z/OS Applications for SOA - SG24-7669