IBM zEnterprise Technology Summit

Next-level solutions with IMS and Java on System z

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Session Objectives and Agenda

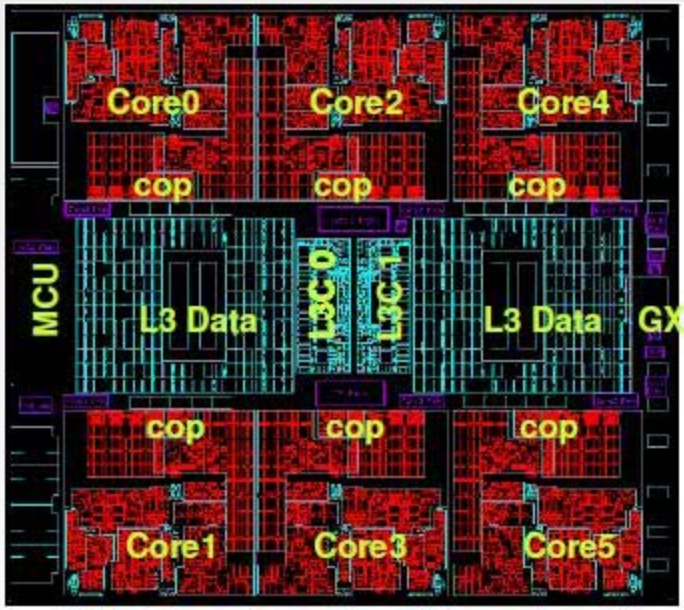
- Java z/OS platform strategy
- Java and IMS strategy and direction
- Futures

zEC12 and Java

New 5.5 GHz 6-Core Processor Chip

Large caches to optimize data serving

Second generation OOO design



Up-to 45% improvement in throughput amongst Java workloads measured with zEC12

Multi-threaded workload shows ~12x aggregate hardware and software improvement comparing Java5SR5 on z9 to Java7SR1 on zEC12

zEC12 – More hardware for Java

Continued aggressive investment in Java on Z

Significant set of new hardware features tailored and co-designed with Java

Hardware Transaction Memory (HTM)

- Better concurrency for multi-threaded applications

Run-time Instrumentation (RI)

- Real-time feedback on program characteristics
- Enables increased optimization by JRE

2GB page frames

- Improved performance targeting 64-bit heaps

Page-able 1MB large pages using flash

- Better versatility of managing memory

New software hints/directives

- Data usage intent improves cache management
- Branch pre-load improves branch prediction

New trap instructions

- Reduce over-head of implicit bounds/null checks

IBM plans for future maintenance roll-ups of IBM 31-bit and 64-bit SDK7 for z/OS Java(TM) Technology Edition, Version 7 (5655-W43 and 5655-W44) (IBM SDK7 for z/OS Java), to provide exploitation of new IBM zEnterprise EC12 features, including: Flash Express and pageable large pages, Transactional Execution Facility, Miscellaneous-Instruction-Extension Facility, and 2 GB pages. In addition, IBM SDK7 for z/OS Java is available for use by IBM middleware products running Java, such as IBM IMS 12 (5635-A03), IBM DB2 10 for z/OS (5605-DB2), and the Liberty profile of IBM WebSphere Application Server for z/OS v8.5 (5655-W65); and is planned for use by a future release of CICS Transaction Server for z/OS.

Java z/OS

z196 and Java6.0.1: Engineered Together

- Up to 2.1x improvement to Java throughput
- Reduced footprint
- Tighter integration with z/OS facilities
- Improved responsiveness in application behavior

J9 R2.6 Virtual Machine

- Significant enhancements to JIT optimization technology
- z196 exploitation of instructions and new pipeline
- New Balanced GC policy to reduce max pause times
- Default GC policy changed to gencon

z/OS Unique Enhancements

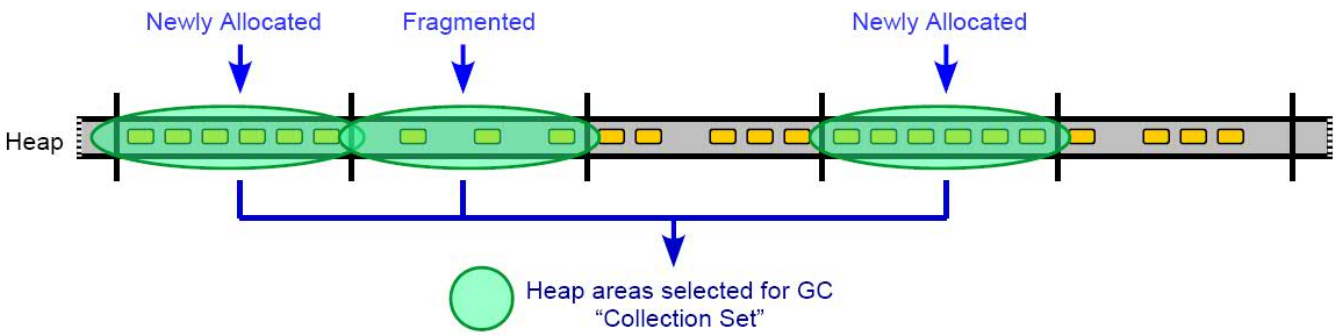
- JZOS 2.4.0
- z/OS Java unique security enhancements

Performance

- 2.1x improvement to multi-threaded workload
- 1.93x improvement to CPU-intensive workload

IBM J9 2.6 Technology Enhancements - Garbage Collection: Balanced Policy

- **Improved responsiveness in application behavior**
  - Reduced maximum pause times to achieve more consistent behavior
  - Incremental result-based heap collection targets best ROI areas of the heap
  - Native memory aware approach reduces non-object heap consumption
- **Next generation technology expands platform exploitation possibilities**
  - Virtualization – Group heap data by frequency of access, direct OS paging decisions
  - Dynamic reorganization of data structures to improve memory hierarchy utilization (performance)
- **Recommended deployment scenarios**
  - Large (>4GB) heaps
  - Frequent global garbage collections
  - Excessive time spent in global compaction
  - Relatively frequent allocation of large (>1MB) arrays
- **Input welcome: Help set directions by telling us your needs**



z/OS Java SDK 7: 16-Way Performance

Aggregate HW and SDK Improvement z9 Java 5 SR5 to zEC12 Java 7

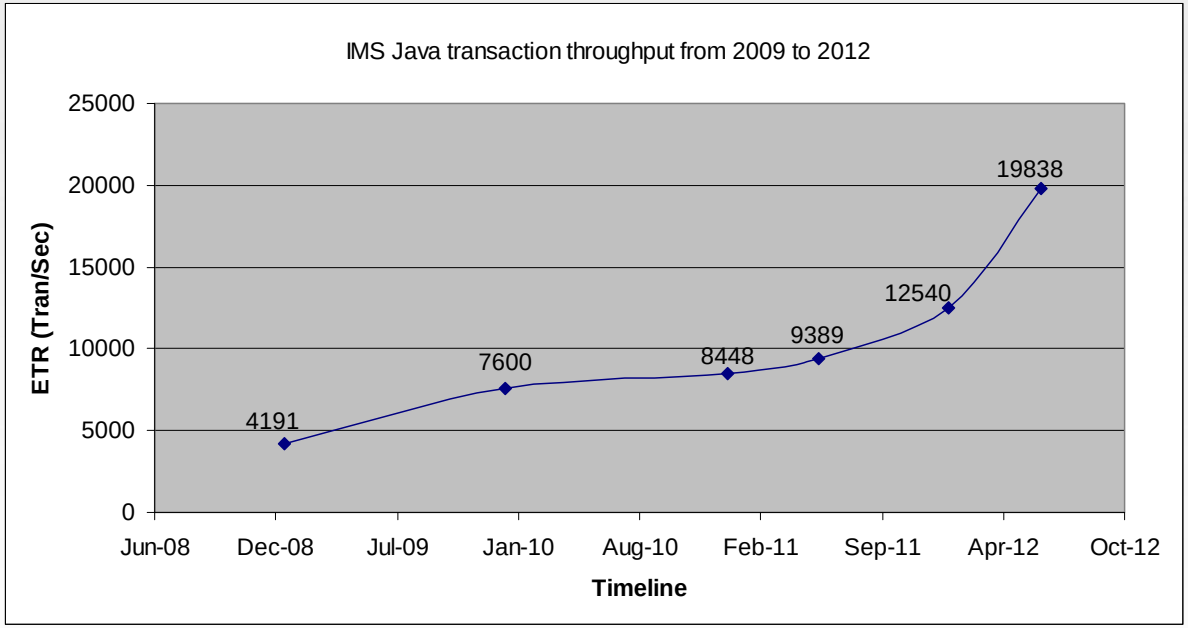
~12x aggregate hardware and software improvement comparing Java5SR5 on z9 to Java7SR3 on zEC12

LP=Large Pages for Java heap CR= Java compressed references

(Controlled measurement environment, results may vary)

IMS JMP region performance

Aggregate SDK, software and hardware improvements

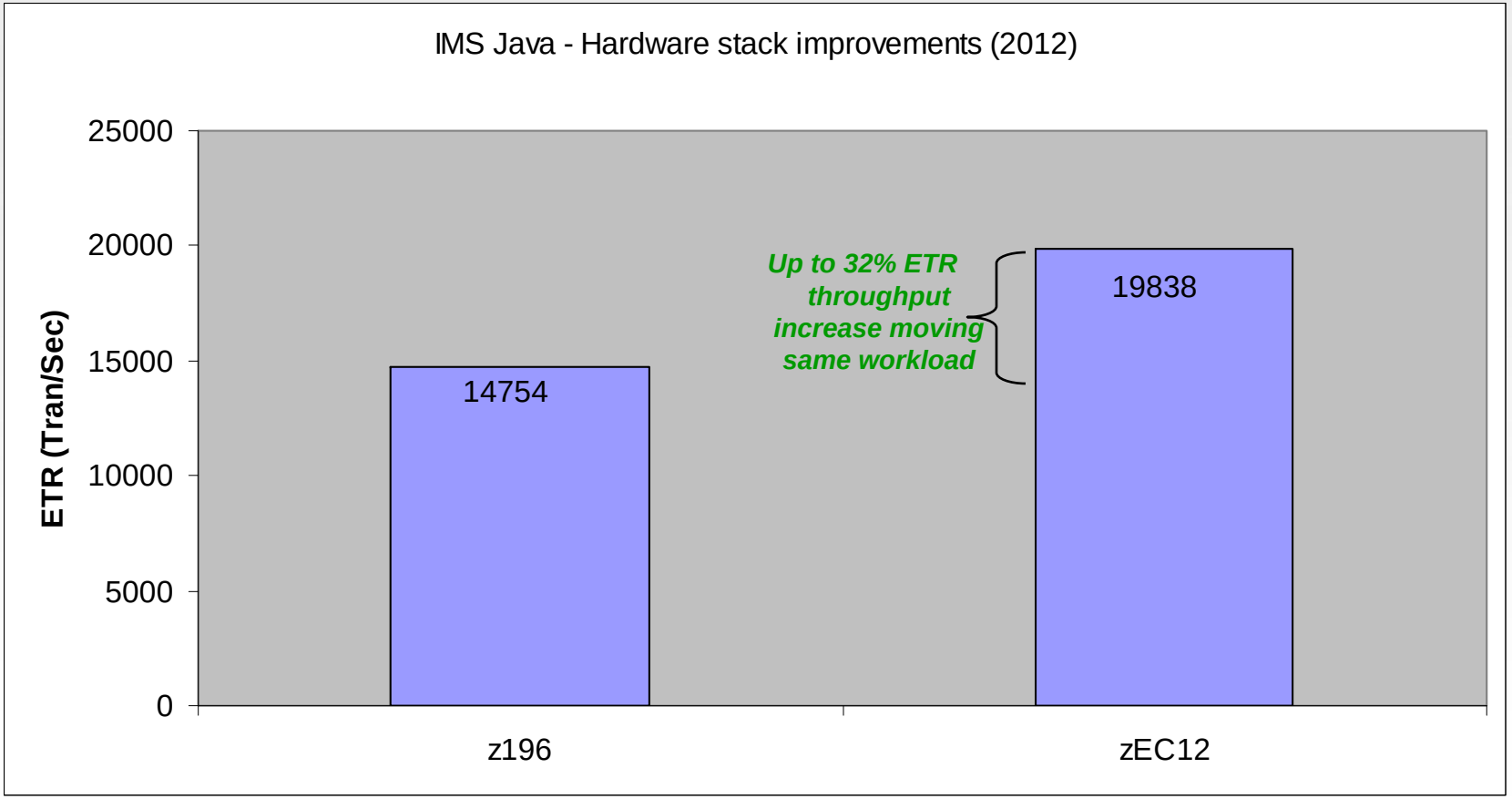


Over 4x aggregate throughput improvement from 2009 to 2012 due to the following enhancements

- Java version to version performance improvements
- IMS improvements
- Hardware improvements
- DASD improvements

IMS JMP region performance

Hardware stack improvements



(Controlled measurement environment, results may vary)

Java and IMS

Java is an integral component of the IMS modernization strategy

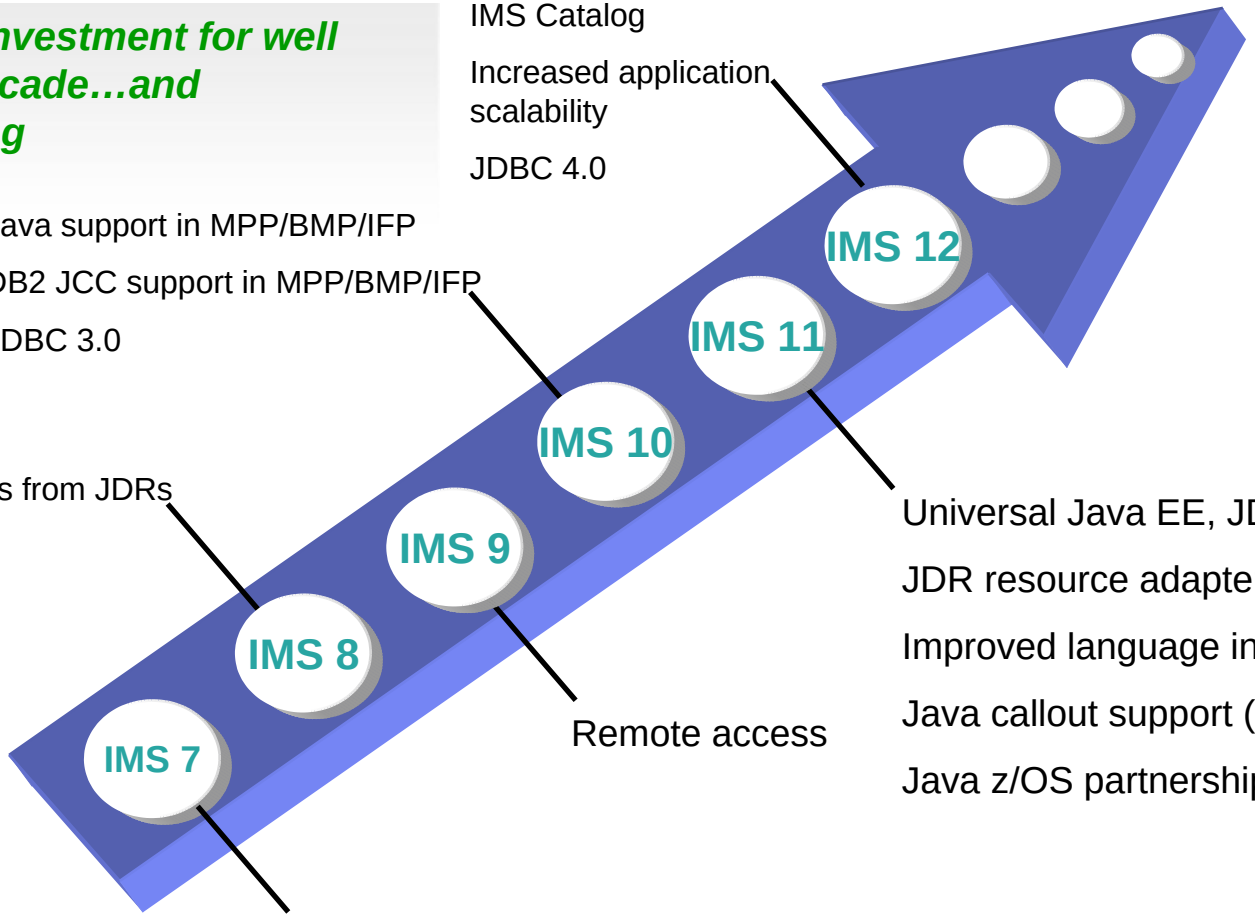
- Enable customers to quickly achieve IMS value while significantly reducing development costs and improving productivity
- IMS leverages the IBM JVM for System z and integrates it into the IMS runtime containers

IMS family has a long-term commitment to Java

- Investing over 50 FTEs (full-time equivalents) in Java technology moving forward
  - IMS dependent region types (JMP, JBP, MPP, BMP, IFP)
  - Java EE platform (WebSphere Application Server)
  - z/OS and open systems access to IMS assets

Java and IMS – IMS 7 to IMS 12 highlights

Dedicated investment for well over a decade…and continuing



Java dependent region deployment

Java dependent region resource adapter

- **Allows new IMS transactions (JMP, JBP) to be written in Java and managed by the IMS transaction manager**
- **Complete Java framework for applications operating in an IMS container**
  - Message queue processing
  - Program switching
    - Deferred and immediate
  - Transaction demarcation
  - GSAM support
  - Additional IMS call support necessary for IMS transactions
    - INQY
    - INIT
    - LOG
    - Etc
- **Shipped with type 2 Universal drivers**

IMS Open Database

Solution statement

- **Extend the reach of IMS data**
  - Offer scalable, distributed, and high-speed local access to IMS database resources

Value

- **Business growth**
  - Allow more flexibility in accessing IMS data to meet growth challenges
- **Market positioning**
  - Allow IMS databases to be processed as a standards-based data server

Key differentiators

- **Standards-based approach (Java Connector Architecture, JDBC, SQL, DRDA)**
- **Solution packaged with IMS**

Enables new application design frameworks and patterns

- **JCA 1.5 (Java EE)**
- **JDBC**

Java and IMS moving forward

Java z/OS stakeholder

- **Continued partnership to maximize synergy between IMS and Java z/OS**

Performance

- Aggressive performance analysis and cooperative approach to continue h/w and s/w exploitation

Enterprise modernization

- Language interoperability
- Universal drivers/JDR resource adapter

Integration

- Aggressive approach to horizontal integration across IBM portfolio
  - Rational
  - Cognos
  - Data Studio
  - InfoSphere

Language interoperability (Java and COBOL)

- **Significant collaboration over the past year to enrich language interoperability in IMS dependent regions**
  - IMS, Language Environment (LE), Java z/OS, COBOL organizations have all worked together
    - Including a major European customer (Fiducia)
- **Specific areas of focus in order to ensure a robust offering**
  - Exception handling and percolation
  - Real-time debugging (stepping through the stack across language boundaries)
  - Cleaning out (optionally) COBOL working storage areas across application schedules
  - Performance
  - Several others
- **Continued collaboration**
  - Want to start a working group with direct focus in this space between IBM and interested parties
    - Direct IBM assistance to propel your organization forward
    - Interested? Let me know.
- **What about Java and PL/I?**
  - Would like to start investing in this space
  - Interested? Let me know.

Java and IMS moving forward

Continued modernization of the core system

- IMS catalog
- Database versioning
- Dynamic database
- Native SQL
- Programming models

Who

- Caterpillar
  - Core manufacturing system managed by IMS

Business Challenge

- Required open systems access to IMS database assets
- Error-prone process to accomplish task
  - Unloaded databases and did manual entry into open system database

Solution

- Leverage IMS Open Database technology and the Universal JDBC driver

Benefits

- Real-time access to data
- Confident decision making
- Trusted information

CATERPILLAR®

Who

- Northwest Airlines/Delta
  - Largest airline in the world
  - Technical operations managed by IMS

Business Challenge

- Integrate critical applications after merger with Delta
- Implement a distributed application front-end using SOA on top of existing z/OS

Solution

- Implement IMS/JDBC on z/OS to integrate technical operations data via ESB and WebSphere Application Server

Benefits

- Technical infrastructure is much more open and primed for integration across the enterprise
- Smooth integration of all critical applications running on z/OS after merger with Delta

Who

- Worldwide bank
  - Core banking system managed by IMS TM/DB and written mostly in COBOL

Business Challenge

- Modernize existing core services
- Offer new services framework to business partners

Impaired ability to deliver new function

Solution

- Leverage the JDR resource adapter and Universal JDBC and Universal DLI drivers for IMS
- Integration of existing assembler modules common to the application framework
- Deployment in JMP regions
- Initially no language interoperability (pure Java)
  - Future direction

Benefits

- Leverage abundant Java domain knowledge in industry
- Dramatically increased time to market
- IMS API consistency with relational databases

Who

- Bank in US
  - Several banking channels managed by IMS and written mostly in COBOL

Business Challenge

- Introduce additional core services to support new banking channels
- Impaired ability to deliver new function

Solution

- Introduce a new banking channel implemented in Java using the Universal JDBC and Universal DLI drivers for IMS
- Deployment in CICS JCICS regions
- Initially no language interoperability (pure Java)
  - Future potential

Benefits

- Leverage abundant Java domain knowledge in industry
- Dramatically increased time to market
- IMS API consistency with relational databases

Who

- German bank
  - Framework mainly PL/I with conversational transactions

Business Challenge

- Integration of 3rd party credit checking technology that was part of a Java package

Solution

- Leverage the deferred program switching support in Java class libraries to switch conversation iterations from MPP to JMP regions and back

Benefits

- Ability to leverage decades of existing assets and add in new Java-based services into the architecture transparently
- Just another service
- In production within a month with this solution

Summary

IMS is committed to enterprise modernization

- Deep synergy across many organizations within IBM
- Portfolio integration is very important
- Constantly validating the enterprise roadmap with customers

The partnership of IMS and Java technology is capable of handling mission-critical workload

- IMS is an important stakeholder in the IBM Java on System z strategy
- Java running in IMS regions has been benchmarked at over 19,000 transactions per second

Many customers are modernizing their IMS application development patterns and access paradigms around Java as the primary language of choice

- Over 40 proof of concepts in the last year alone

WRAP UP