z13 Technical Overview

Alessandro Camerra & Carlo Ferrarini
Client Technical Specialists
IBM Systems
**z13 Overview**

**z13**

*Machine Type: 2964*

*Models: N30, N63, N96, NC9, NE1*

- Up to **40+%** Total capacity improvement over zEC12
- Up to **10 TB** 3X more available memory to help z/OS or Linux workloads
- **2 SODs** zKVM and GDPS appliance for Linux on z Systems opens the door for more Linux
- Up to **141** Configurable cores - CP, zIIP, ICFs, SAP
- Up to **30+%** Capacity boost for IFLs and zIIPs

- **Performance, scale, intelligent I/O and security enhancements to support transaction growth in the mobile world**
- **More memory, new cache design, improved I/O bandwidth and compression help to serve up more data for analytics**
- **Enterprise grade Linux, open standards, enhanced sharing and focus on business continuity to support cloud environment**
# IBM z Systems

## z13 Performance Improvements

<table>
<thead>
<tr>
<th><strong>Data Serving</strong></th>
<th><strong>Analytics</strong></th>
<th><strong>Security</strong></th>
<th><strong>Cloud Mobile</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>10% Single Thread Capacity</td>
<td>3X Analytics Performances</td>
<td>2X Secure Access to WAS on z/OS</td>
<td>50% Cloud Cost on z13 Reduction</td>
</tr>
<tr>
<td>Up to 30% SMT Benefit on IFLs and zIIPs</td>
<td>7X SIMD Exploitation for Analytics</td>
<td>2-3X Java Encryption Facilities</td>
<td>55% Software Consolidation Cost Reduction</td>
</tr>
<tr>
<td>Up to 40% SAP on z13 on IFL with SMT</td>
<td>Up to 60% Cognos on z13 with SMT</td>
<td>2X Crypto Performance CPACF</td>
<td>40% Mobile Competitive Play</td>
</tr>
<tr>
<td>Up to 50% Java Workload on z13</td>
<td>2X BI with IDAA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 1.8X Capacity boost for IFL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **5.0 GHz Processors. 1695 MIPS, +12% Perfs**
- **CP Subcapacity up to 30** for any z13 Model. All CP on the same CPC must be of the same capacity
- **zIIP to CP ratio 2:1.** No zAAPs available on z13
- Only 30 CPs can have granular capacity but other PU cores may be characterized as full capacity specialty engines

### Security Features
- **2X** Secure Access to WAS on z/OS
- **2-3X** Java Encryption Facilities
- **2X** Crypto Performance CPACF

### Cloud Mobile Features
- **50%** Cloud Cost on z13 Reduction
- **55%** Software Consolidation Cost Reduction
- **40%** Mobile Competitive Play

---

© 2015 IBM Corporation
Four Drawer with Two physical nodes each:

Each drawer:

- Six PU Chips: 39-42 active cores
- Two SC Chips with 960 MB cache
- Support up to 3,200 GB RAIM
- Water cooling for PU and SC chips
- Ten fanout slots for PCIe I/O drawer fanouts
- Four fanout slots for IFB I/O drawer fanouts

Each logical node:

- Three PU chips
- One SC chip
- Three Memory Controllers
**zEC12 (Per Book)**

- **L1:** 64KI + 96KD
- **L2:** Private 1MB Inclusive of DL1
- **L3:** Shared 48MB Inclusive of L2s
- **L4:** 384MB Inclusive

**384MB Shared eDRAM L4**

**z13 (half of CPC drawer node)**

- **L1:** 96KI + 128KD
- **L2:** Private 2MB Inclusive of DL1
- **L3:** Shared 64MB Inclusive of L2s
- **L4:** 480MB + 224MB NonData

**Intra-node Interface**

- **NIC Directory**
- **480MB Shared eDRAM L4**

**8 L4 Caches**

- **8 L4 Caches**
- **48MB Shr eDRAM L3**
- **6 L3s, 36 L1 / L2s**

**4 L4 Caches**

- **4 L4 Caches**
- **48MB Shr eDRAM L3**
- **6 L3s, 36 L1 / L2s**
Speciality Engines

**zIIP:**
- Optimize Java™ and XML processing
- Workloads can help *connect, manage, extend, and protect* the data
- 2:1 order ratio for zIIP to CP
- Throughput increase with *simultaneous multithreading*

**IFLs and Enterprise Linux Server:**
- *IT optimization and cloud computing* can deliver enhanced economics
- *Predictable throughput increase* for Linux workload with *simultaneous multithreading*

**Coupling Facility:**
- CF uses *Flash Express* for a cost effective, resilient solution for overflow of WebSphere® MQSeries® shared queues in Coupling Facility
- *New PCIe* based short range coupling links
SMT: Simultaneous Multi Threading

- SMT allows instructions from more than one thread to *execute* in any given pipeline stage at a time.
- SMT helps *address memory latency*, resulting in overall throughput gains.
- Increase processing *efficiency and throughput*.
- Currently applies to *Linux (IFL) and zIIPs*.
- *TWO concurrent threads* that can be turned on or off.
- Performance improvements *depend on workload*.
**SIMD: Single Instructions Multiple Data**

- Smaller amount of code helps **improve execution efficiency**
- Process elements in parallel **enabling more iterations**
- Supports **analytics, compression, cryptography, video/imaging processing**

**Scalar**

**SINGLE INSTRUCTION, SINGLE DATA**

Instruction is performed for **every data element**

**SIMD**

**SINGLE INSTRUCTION, MULTIPLE DATA**

Perform instructions on **every element at once**
Synergy Matters: z System and DS8870

- High Unique Synergy with System z
  Extreme Performance with new I/O Infrastructure and Flash Enclosure

- Continuous Availability
  24/7 Availability with HyperSwap & a wide range of replication options

- Accelerated Data Insight
  Extreme Performance with High Performance Flash Enclosure

- 3X z System Database Performance
- Six 9’s Proven Availability and Security
- 4X Performance in 50% of the physical footprint
**FICON Dynamic Routing**  
Reduce costs with improved and persistent performance for supporting I/O devices

**16Gb host adapters**  
Improve network performance with 2x faster FC and FICON adapters; minimize latency for DB2 log writes with zHyperWrite

**Forward Error Correction**  
Preserve data integrity with more redundancy on the information transmitted via 16Gb adapters

**zHPF Extended Distance II**  
Increase remote data speed with 50% better IO performance for remote mirror

**Fabric Priority**  
Improve resiliency capabilities and enhance the value of FICON Dynamic Routing
IBM z Systems

z13 Business Values

Superior Efficiency
68% of the world's production workload capacity, only 6.2% of total server spend

Virtually Limitless Scale
Processing 56,582 transactions a second on VisaNet

Enterprise Data Serving
Over 80% of all corporate data is managed on the mainframe

Trusted, Secure Computing
the Highest level of security certification for commercial server and 5 9s application availability

Transaction Processing Hub
55% of all enterprise applications need mainframe to complete transactions
Private Cloud: the most secure, scalable private cloud infrastructure

Hybrid Cloud: Leveraging BlueMix and interoperability with SoftLayer

Public Cloud: Enable MSPs/CSPs to deliver mainframe-based services

Bridging system of record to system of engagement to support the mobile and social generation

Mobile friendly z/OS subsystems and Mobile First Platform to support mobile world

The greatest value is achieved when analytics are run where the transactions and data originate

Deliver real-time insights at the point of impact:

- Improve customer experience
- Increase revenue opportunities
- Improve response time
IBM z Systems is a Total IBM Stack Story

Protecting critical data, delivering insight, integrating next generation applications... at enterprise scale
Compilers & languages: unprecedented performance

New language versions ready to exploit z13 features and enhancements

Enterprise COBOL for z/OS v5.2
Up to **14%** reduction in CPU time*

Enterprise PL/I for z/OS v4.5
Up to **17%** reduction in CPU time*

z/OS XL C/C++ V2R1M1
Up to **17%** increase in throughput*

*The performance improvements are based on internal IBM lab measurements. All benchmarks were optimized and executed on zEC12 and z13, and built using the highest optimization level. Performance results for specific applications will vary, depending on the source code, the compiler options specified, and other factors.
• Immediately exploit improvements z13 with Java benefiting from SMT, SIMD, CPACF and more

• Gain further improvement in throughput from IBM Java 8

• Up to 60X improvement with Java 8 exploiting z13 new SIMD vector hardware instructions for specific Java libraries and functions
Cloud-Enabling z Systems software delivery

Simplify service delivery with IBM Custom Patterns for Linux on z Systems

Ability to provision z Systems environments in an IBM SoftLayer data center through IBM Rational managed services for System z

Automated deployment and release management across heterogeneous environments leveraging IBM UrbanCode solutions

Integrate easily and securely with cloud based applications with IBM Bluemix Services for z Systems
The winners are those that manage the data deluge and turn it into value-generating insights ahead of the competition.

- Recent DB2 for z/OS developments **provide more opportunities to use z13 memory advantageously**

- **Compress more data helping to save disk space and cut data transfer time** with improved on chip hardware compression

- **Improved performance** exploiting SMT on zIIP and enhanced cryptographic features on CPACF
<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2 with Blu Acceleration</td>
<td>In-memory database acceleration for Linux on z Systems</td>
</tr>
<tr>
<td>IBM DB2 Analytics Accelerator</td>
<td>Analytical query acceleration for z/OS on z Systems</td>
</tr>
<tr>
<td>IBM InfoSphere System z Connector for Hadoop</td>
<td>Fast and seamless data connectivity</td>
</tr>
<tr>
<td>IBM CPLEX Optimizer for z/OS</td>
<td>Delivers mathematical optimization on z Systems</td>
</tr>
</tbody>
</table>

Enabling real-time, in-transaction analytics

IBM z Systems
Mobile & z Systems: disruptive synergies

- End-to-end reference architectures for mobile on System z from MobileFirst Platform to CICS and IMS, underpinning Security
- Sample MobileFirst applications for CICS, IMS, z/OS Connect
- IBM Mobile Center of Competencies worldwide
- Apple iOS apps package with GBS implementation services for z Systems
Thank you!

Alessandro Camerra & Carlo Ferrarini
Client Technical Specialists
IBM Systems