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ORACLE®

Oracle Workloads on Linux on System z



IBM zEnterprise – Freedom by Design

IBM and Oracle commitment to Linux On System z

- **To meet the rapid growth of Linux, server virtualization and IT optimization, IBM and Oracle have increased development and support investments to deliver complete, open and integrated solutions to our customers.**
- **Specifically, IBM and Oracle have:**
 - Expanded porting resources to make Oracle technology infrastructure current and complete for Linux on System z
 - Dedicated resources to engage customers in design, proof-of-concept and benchmark activities.
 - IBM is investing in >40 development and tech staff to bring Linux on System z solutions to market
 - IBM is investing in hardware resources for Oracle development on Linux on System z
 - Aligned our technical support organizations to simplify problem resolution
 - Dedicated Oracle System z team in Oracle Support
 - Delivered 6 consecutive quarters of Parity of Oracle 10gR2 Database Patch Set (PSU) delivery on Linux on System z to other Oracle platforms
 - Published IBM and Oracle customer collateral covering various topics regarding Oracle on Linux on System z, some examples include:
 - Joint FAQ: <http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS4016>
 - Redbooks: <http://www.redbooks.ibm.com/abstracts/sg247634.html>

Complete solutions, collaborative partners

- **Enduring relationship**
 - Oracle 24 years, PeopleSoft 24 years, Siebel 14 years
 - Mission: Provide the strongest combination of solutions to maximize value of client investments
- **Mutual executive commitment**
 - Regular senior executive reviews, development and sales interlocks
 - Dedicated, executive-led IBM Alliance Team
- **Over 30,000 joint applications customers worldwide**
 - Hardware and software support via Applications Unlimited
- **Market Leading Services Practice**
 - ~5,500 successful Joint Services projects
 - >10,000 IBM consultants worldwide dedicated to Oracle Solutions
- **Vibrant technology collaboration**
 - Substantial investment in skills and resources
 - Dedicated International Competency Center
- **Unrivalled joint customer support process**
 - Dedicated on-site resources
 - Significant program investments

Customers running Oracle on Linux on IBM System z

- **Hundreds of customers running Oracle on Linux on IBM System z**
 - Various sizes and deployments
 - Across industries
 - Active volunteer led System z Oracle User Group (www.zseriesoraclesig.org)
- **Small System z customer example**
 - Oil and Gas industry services provider
 - Serves 4,200 companies, 44,000 users, \$80B in transaction detail yearly
 - Was Windows, Dell, Linux
 - Issues – rapid company growth, server sprawl, cost control, hardware outages
 - Solution – z10 BC, 3 IFLs, 24 GB
 - SLES10, Oracle 10g EE
 - Databases: 7 production, 400 GB – 3 TB, 7 virtual servers/database

Customers running Oracle on Linux on IBM System z

- **Medium size System z customer example**
 - Scientific equipment retailer
 - Oracle Database on mostly UNIX (also z890 legacy, was considering ‘move off mainframe’)
 - Issues – Availability on UNIX, growth (without additional footprints), strong UNIX team
 - PoC – Linux on System z, revealed 3X performance increase over UNIX
 - Solution – z10 BC, 7 IFLs, 76GB
 - Global data warehouse, Oracle DB on Linux on System z
 - Migrated two more databases onto Linux on System z
 - COGNOS, home grown applications accessing the databases
 - In process of upgrading for additional Oracle database workloads

Customers running Oracle on Linux on IBM System z

▪ Large System z customer example

- Large government installation
- 100 IFLs, z10 EC Oracle RAC environment across 2 z10 EC servers with Oracle ASM
- 35 TB Database and 45 TB Flash Recovery Area
- Project is getting very high I/O throughput inserting 5.79 billion records in a 7 hour window and updating another 320 million records (exceeds 5 year SLA)

Customers running Oracle on Linux on IBM System z

▪ Large System z customer example

- Leading systems integrator and IT consulting firm
- z990 x 2, z9 EC S54 x 4, z10 EC E64 x 1 (192GB to 256GB per box)
- 32 IFLs per z990, 54 IFLs per z9 EC, 64 IFLs per z10 EC
- All Linux
- 5 LPARs per CEC (4 for Oracle, 1 for management)
 - 16 shared IFLs per LPAR, 45 GB Memory per LPAR
- 4 nodes RAC running on same CEC with HiperSockets interconnect
- 2,000 – 3,000 transactions per second at peak
- Response time less than 1 sec (threshold 5 sec)
- DB Size – >5 TB for online and ~50 TB for data warehouse
- Benefits – TCO, Extreme high availability, scalability
- Planning z196 upgrade

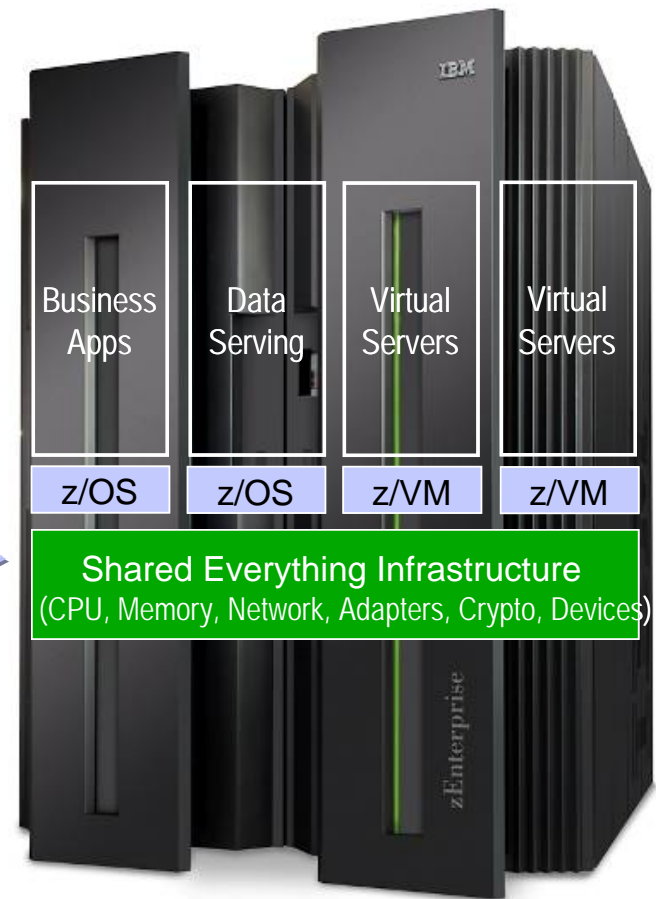
IBM System z IT Optimization and Consolidation

Helping clients save money, reduce complexity, improve service

- Consolidate 3x or more* servers per core than virtualized x86 offerings: spend less on software, energy, floor space and disaster recovery
- Manage more server images with fewer people
- Exploit extensive z/VM facilities for life cycle management: provisioning, automation, monitoring, workload management, capacity planning, security, charge back, patching, backup, recovery, more ...
- Deploy new servers and applications faster – in seconds instead of hours or days

“From every perspective, running applications under Linux on System z makes sense for our organization. Performance, reliability, disaster recovery, server provisioning and cost efficiency have all seen dramatic improvements – helping us deliver better service and value to our members across the state.”

Ted Mansk, Dir. of Infrastructure Engineering and Databases at Blue Cross Blue Shield of Minnesota



* Based on IBM “Friendly Bank” workload scenario

Value of Oracle consolidation with System z

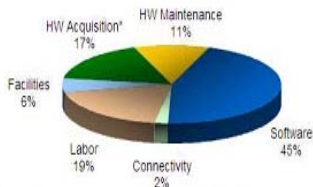


Do more with less

- Consolidate more servers, more networks, more applications, and more data with Linux running on z/VM
- Achieve nearly 100% utilization of system resources nearly 100% of the time
- Enjoy the highest levels of resource sharing, I/O bandwidth, and system availability

Reduce costs on a bigger scale

- Significant savings derived from reductions in server footprints, simplified infrastructure, lower software costs and a flexible and simplified infrastructure which is easy to manage.
- Consume less power and floor space
- Save on software license fees.
 - Consolidating from 86 servers to a single IFL could potentially reduce licensing costs by as much as 97 percent.
- Minimize hardware needed for business continuance and disaster recovery



Manage growth and complexity

- Exploit extensive z/VM facilities for life cycle management: provisioning, monitoring, workload mgmt, capacity planning, security, charge back, patching, backup, recovery, more...
- Add hardware resources to an already-running system without disruption – the epitome of Smarter Infrastructure
- Consolidation on a “scale up” machine like the Enterprise Linux Server means fewer cables, fewer components to impede growth



More flexibility, minimize lead time for new projects

- Consolidating Oracle and Linux environments to a single Enterprise Linux Server offers significant advantages in terms of flexibility
- Rapid provisioning reduces lead time for new IT projects, helping to increase business agility

Questions for Oracle Database consolidation

General questions:

- Are you using more than 10 Oracle DB x86 servers?
- Is your department considering or complying with mandates to use open source software to help lower software licensing costs?
- Are you having difficulty meeting peak time demand and SLAs?
- Do you need higher levels of uptime for your customers?
- Would you like to increase the productivity of your IT staff and enable them to manage even more server images?
- Would you like to take advantage of many reliability and systems management best practices that do not exist on distributed systems platforms?

CIOs:

- What are you planning to do to reduce rising Oracle licensing costs?
- Are you aware that server consolidation can significantly reduce both hardware and software licensing costs?
- Can you support business needs for rapid change?
- How much cost and time does your organization spend on manual processes?
- Are you concerned about data centre growth in terms of space and power consumption?
- Are you currently able to leverage a single source of data and the business insight derived from that data?

Questions for Oracle Database consolidation

Architects:

- **Would you like to eliminate some network communication handoffs between systems, which can allow to transaction performance improvements, simplified integration, and ease of system support and administration?**
- **Do you need a stable and reliable infrastructure that gives developers the creativity to explore new ideas?**
- **Are you being asked to explore open source computing models to reduce costs, yet are concerned about security, availability and reliability?**
- **Do you need an economical, reliable platform to deliver the ability to meet unpredictable peaks or growth within the business without required elongated procurement cycles?**
- **Would you like a more simplified and efficient hardware solution deployment, one that delivers on and off capacity on demand over the web?**

Developers / IT Managers:

- **Are you able to deliver everything the business asks for on time & in budget?**
- **Do you have to write custom code to connect processes internally or externally?**

Utilization of “distributed” servers

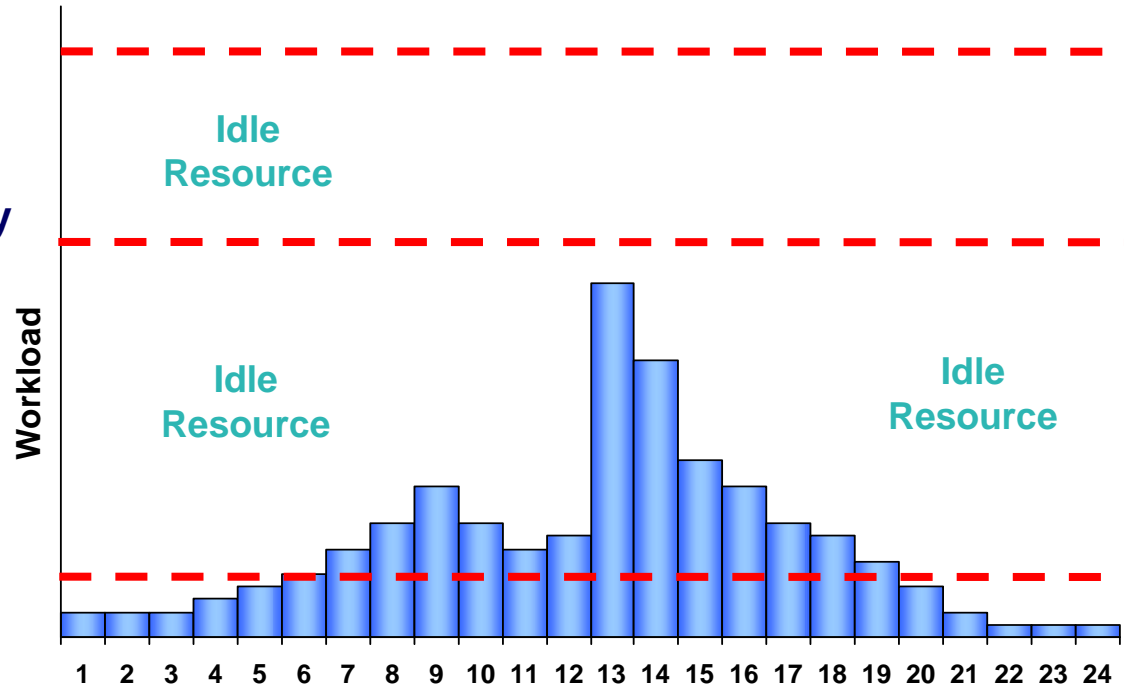
Provision for expected growth

Provision capacity for peak workload

Average utilization



Server dedicated to one application



- Typical utilization of Microsoft Windows servers 5 – 10%
- Typical utilization of UNIX servers 10 – 20%
- Typical utilization of System z servers 85 – 100%

Oracle solutions delivered in 2008 and 2009

- **2008Q2**
 - Oracle Data Vault 10.2.0.3
 - PeopleSoft 9 PeopleTools 8.49 on Oracle DB 10g
- **2008Q3**
 - Siebel CRM 8.1 on Oracle DB 10g
 - Oracle E-Business Suite 12 split-tier on Oracle DB 10g
- **2008Q4**
 - Enterprise Manager Grid Control Agent 10.2.0.4
 - Oracle DB 10g 10.2.0.4 RHEL 5
- **2009Q1**
 - Oracle AS 10g 10.1.3.4 PS
- **2009Q3**
 - PeopleSoft PeopleTools 8.50 on Oracle DB 10gR2 RHEL 5 & SLES 10
 - Enterprise Manager Grid Control Agent 10.2.0.5
 - E-Business Suite 12.1.1 split-tier on Oracle DB 10gR2 RHEL 4,5 & SLES 9,10
 - Oracle AS 10gR2 10.1.2.3 PS
 - Oracle DB 10gR2 10.2.0.4 PSU 1
 - WebLogic Server 10.3.1
- **2009Q4**
 - Oracle DB 10gR2 10.2.0.4 PSU 2
 - Oracle AS 10gR3 10.1.3.5 PS

Oracle solutions delivered in 2010

■ 2010Q1

- Oracle DB 10gR2 10.2.0.4 PSU 3
- WebLogic Server 10.3.2
- WebLogic Portal 10.3.2

■ 2010Q2

- WebLogic Server 10.3.3
- Oracle DB 10gR2 10.2.0.4 PSU 4

■ 2010Q3

- Oracle DB 10gR2 10.2.0.4 PSU 5
- E-Business Suite 12.1.2 native on Oracle DB 10gR2

■ 2010Q4

- Oracle DB 10.2.0.4 PSU 6
- E-Business Suite 12.1.3 native on Oracle DB 10gR2

Oracle solutions delivered and planned in 2011

■ 2011Q1

- Oracle DB 10gR2 10.2.0.5 SLES 11
- Oracle Tuxedo 11g R1
- Oracle DB 10gR2 10.2.0.4 PSU 7
- WebLogic Server 11gR1 PS3
- SOA and WebCenter 11gR1 PS3
- E-Business Suite native on Oracle DB 10gR2 10.2.0.5
- Oracle DB 11gR2 11.2.0.2

■ 2011Q2

- WebLogic Server, SOA and WebCenter 11gR1 PS4
- Oracle DB 10gR2 10.2.0.4 PSU 8
- E-Business Suite native on Oracle DB 11gR2 11.2.0.2
- Oracle DB 10gR2 10.2.0.5 PSU 3
- Oracle DB 11gR2 11.2.0.2 PSU 2

■ 2011Q3

- Oracle DB 11gR2 PSU 3
- Oracle DB 10gR2 10.2.0.5 PSU 4

■ Planned

- PeopleSoft V9 PT 8.51 on Oracle DB 11gR2

IBM zEnterprise for Oracle Database 11g Release 2

- **The zEnterprise is binary compatible with previous generations of System z**
- **Oracle certifies OS level only – not to hardware or hardware virtualization**
 - Any hardware running certified OS level implicitly supported
- **Oracle Database 11g Release 2 Linux supported distributions minimum levels certified, later service levels are also supported:**
 - SUSE SLES10 SP3 and SLES11 SP1
 - Red Hat RHEL 5.4

Oracle E-Business Suite on Linux for System z

Another workload for System z

- Enterprise Resource Planning
- Financials, HR, Project Management
- Supply Chain Management
- Manufacturing
- Technology (Oracle)
- CRM
- Procurement
- Asset Lifecycle Management
- Product Lifecycle Management



Cross industry solution with highest traction in:

- Financials Services
- Mfg (auto parts, packaging, electrical controls, engines, materials, mining)
- High Tech (both products and design companies , semiconductors)
- Asset Based Industries (like E&C, Utilities, Oil and Gas services)
- Telecommunications
- Travel and Transport
- Public Sector, etc.

Oracle Solutions available on IBM System z

		DB2 on z/OS or Linux	Oracle DB on Linux
ERP & CRM Solutions	PeopleSoft Enterprise	PS 9.0, 9.1 / PT 8.50, 8.51 on DB2 8, 9, 10 for z/OS* (Batch server supported on z/OS and Linux)	PS 9.0, 9.1 / PT 8.5-, 8.51 on Oracle DB 10gR2*
	Siebel Enterprise	Version 8.0 & 8.1.1 on DB2 v8, v9 for z/OS* and DB2 9.1, 9.7 for Linux*	Siebel 8.0, 8.1.1 on Oracle DB 10gR2*
	E-Business Suite		EBS 12.1.2, 12.1.3 on Oracle 10gR2, 11gR2 (10.2.0.5, 11.2.0.2)
Insurance	Insurance	Documaker 11.4, 11.5 on DB2 8, 9 for z/OS	
	Cross-Industry		Oracle Policy Automation 10.2 on Oracle 10gR2 on SLES10

* Note: Multi-Platform “Split Tier” Configuration – Only the database runs on System z servers unless otherwise noted

Oracle Solutions available on IBM System z

		DB2 on z/OS or Linux	Oracle DB on Linux
Public Sector Solutions	Enterprise Tax Management	2.2 on DB2 9 for z/OS, WAS 6.1 for z/OS (web Server only)	
BIEE Solutions	Oracle Business Intelligence Enterprise Edition	11gR1 11.1.1.3 with DB2 9.1, 9.5 as Data Source *DB2 9.7 supported as Data Source and Repository on Linux	11gR1 11.1.1.3 Oracle 10gR2 (10.2.0.4, 10.2.0.5) and 11gR2 (11.2.0.2) as Data Source and Repository
		10.1.3.4.1 with DB2 8, 9.1 as Data Source on z/OS *DB2 9.1, 9.5 supported as Data Source on Linux	10.1.3.4.1 Oracle 10gR2 (10.2.0.4, 10.2.0.5) and 11gR2 (11.2.0.2) as Data Source and Repository

* Note: Multi-Platform “Split Tier” Configuration – Only the database runs on System z servers unless otherwise noted

Oracle technology available on IBM System z

	Oracle Solution	Version Available
Database	Oracle Database 10gR2	Oracle DB 10gR2 10.2.0.4, 10.2.0.5
	Oracle Data Vault 10gR2	Oracle Data Vault 10gR2 10.2.0.4
	Oracle Database 11gR2	Oracle DB 11gR2 11.2.0.2
Fusion Middleware	Oracle FMW 10gR2/10gR3 Application Server	Oracle AS 10gR2 10.1.2.3 10gR3 10.1.3.5
	Oracle FMW 11gR1	WebLogic Server 10.3.2, 10.3.3 WebLogic Portal 10.3.2 SOA 11gR1 WebCenter 11gR1 Tuxedo 11gR1
Enterprise Manager	Oracle Enterprise Manager Agent	Oracle Enterprise Grid Control Agent 10.2.0.5

Focusing on currency and parity

Delivered 2010 – Linux on System z Certifications and Product Currency

- Oracle Database 10.2.0.4.3 PSU (1Q10)
- Oracle FMW 11 WebLogic Server 10.3.2 (1Q10)
- Oracle FMW 11 WebLogic Portal 10.3.2 (1Q10)
- Oracle Database 10.2.0.4.4 PSU, parity (2Q10)
- Oracle FMW 11 WebLogic Server 10.3.3 (2Q10)
- Oracle Haley Systems Policy Automation v10.1
 - On SLES10, (Complex Modeling)
- Oracle Database 10.2.0.4.5 PSU, parity (3Q10)
- E-Business Suite Full Port Native 12.1.2 (3Q10 – July 30th)
- E-Business Suite FMW 10gR3 10.1.2.3 External Certifications
 - 12.1.2 OCC: Internet Directory (OID) (3Q10 – Aug 30)
 - 12.1.2 OCC Single Sign On (SSO) (3Q10 – Aug 30)
 - 12.1.2 Portal 10g (10.1.4.2) (4Q10 – Oct 5)
 - 12.1.2 Containers for J2EE (OC4J) (4Q10 - Oct 14)
 - 10.1.3.5 BPEL Process Manager (4Q10 - Nov 8 2010)
 - 10.2.1.3 Web Cache 10g (4Q10 – Dec 13 2010)
- E-Business Suite 12.1.3 RUP (4Q10 – Oct 28)

Delivered 2011 – Linux on System z Certifications and Product Currency

- 10g 10.2.0.5 Database (1Q11- Jan 3)
- 10g 10.2.0.4 PSU 7 (1Q11- Jan 25)
- 11g Release 2 11.2.0.2 (1Q11 – March 30)
- 10g 10.2.0.4 PSU 8 (2Q11- April 26)
- 10g 10.2.0.5 Database PSU 3 (2Q11- May 27)
- 11g Release 2 11.2.0.2 PSU 2(1Q11 – June 3)
- E-Business Suite FMW 10gR3 External Certifications:
 - Oracle Discoverer (1Q11 - Jan 20)
- EBS 12.1.x on 10g 10.2.0.5 (1Q11 – March 22)
- EBS 12.1.x on 11g Release 2 (11.2.0.2) 1Q11 – May 2)
- Siebel 8.1 and 8.1 on Oracle DB 11gR2 (2Q11)
- FMW 11gR1: WebLogic Server PS3 (1Q11 - Jan 24)
- FMW 11gR1: SOA PS3 (1Q11 - Jan 24)
- FMW 11gR1: WebCenter PS3 (1Q11 - Jan 24)
- FMW 11gR1: WebLogic Server PS4 (2Q1 – May 12)
- FMW 11gR1: SOA PS4 (2Q11 – May 12)
- FMW 11gR1: WebCenter PS4 (2Q11 – May 12)
- Tuxedo 11gR1 (1Q11 – Jan 13)

Delivered 2011 DB2 and z/OS Certifications

- PeopleTools v8.49, 8.50 & 8.51 with DB2 v9 and DB2 v8 certified on z/OS 1.12 (2Q11 – April 6)
- PeopleSoft Version 9.0 & 9.1 /PeopleTools 8.50 & 8.51 certified on DB2 V10 for z/OS (2Q11 – April 29)

Migration of Oracle E-Business Suite to Linux on System z

- **Customers first implemented in mixed architecture mode with the database on Linux on System z**
- **To implement the middle tier on Linux on System z, you must have the source platform on the same level as the target platform**
 - Oracle E-Business Suite 12.1.3
 - Oracle DB 11.2.0.2, 10.2.0.4, 10.2.0.5 or 11.2.0.2
 - Use the migration utility to move to Linux on System z
- **Oracle Fusion Middleware is the base infrastructure for Oracle E-Business Suite and can be used with other software**
 - AS 10g 10.1.2 and 10.1.3
 - Workaround needed on RHEL 5.5
 - WebLogic Server, WebCenter, WebPortal
- **Key document is Oracle E-Business Suite Installation and Upgrade Notes Release 12 (12.1.2) for IBM: Linux on System z [ID 1116895.1] (search IUN and zseries on My Oracle Support)**
- **Key contact is david.simpson@us.ibm.com**

Linux on System z and Oracle licensing

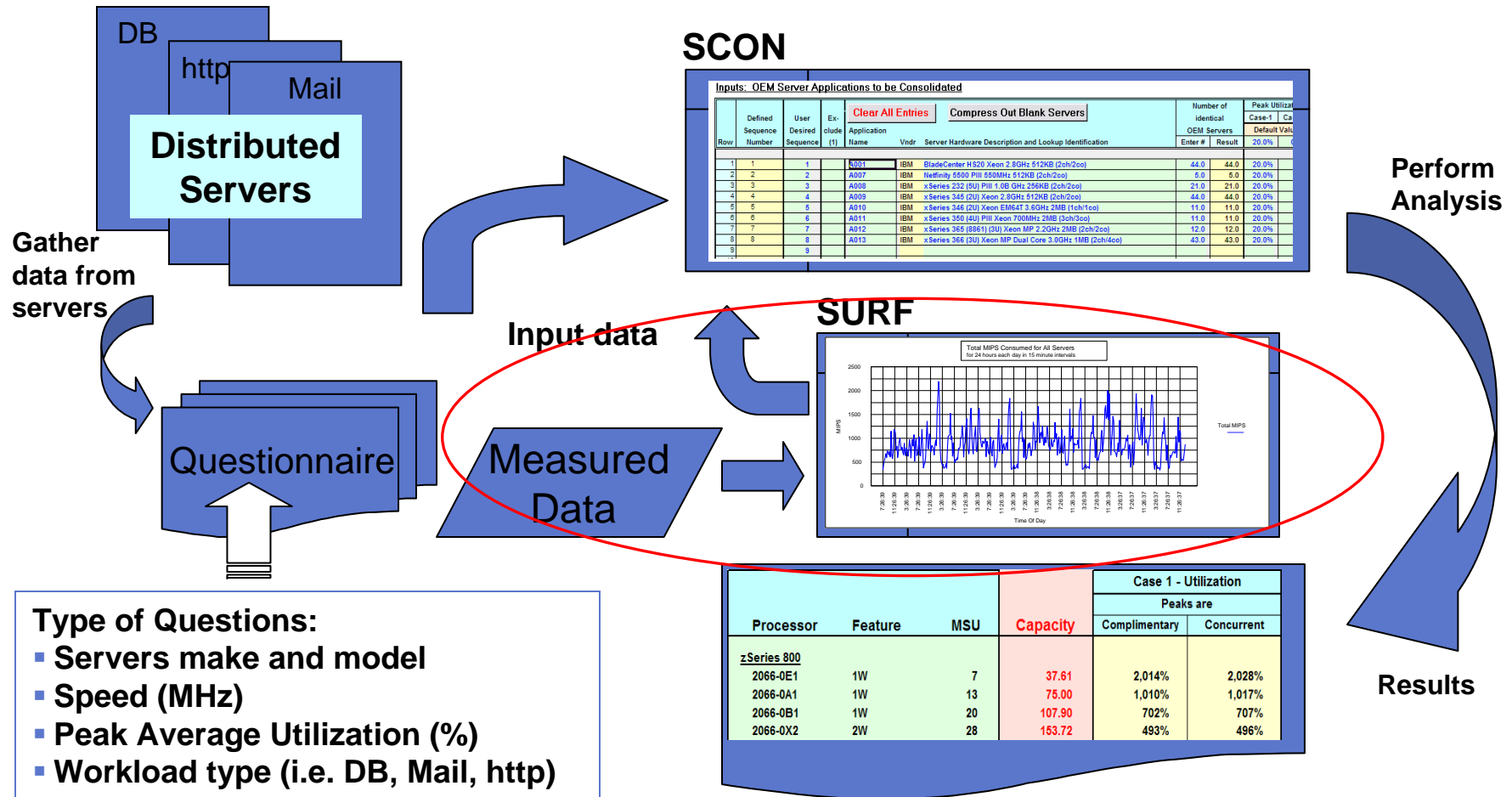
- **An IFL is a specialty engine on a System z**
- **Oracle uses the term core for purposes of pricing**
- **From an Oracle licensing perspective an IFL = one core**
- **The System z10 and zEnterprise 196 have quad core processors but an IFL represents one core**

High Availability with Oracle on Linux for System z

- **System z – highly available platform**
 - Attention to detail over decades of engineering
 - Fault tolerant (HA) design
 - Elimination of single points of failure
 - Driving to 100 years MTBF
- **Oracle Maximum Availability Architecture**
 - Best practices based on Oracle database technology
 - Best HA/DR in distributed database technology (Forrester, Oct 2006)
 - Constantly evolves with new releases
- **Synergistic**
 - Continue on your path with Grid using System z
 - Develop a Grid strategy for Oracle on Linux for System z
 - Take advantages of the HA/DR features of IBM and Oracle technologies

Sizing – the most important step

Sizing process – SCON with SURF, use RACE for TCO analysis



Projected Utilization on Mainframe

Oracle Database memory sizing

- **Obtain Oracle SGA and PGA sizes from all database instances**
 - Prefer Advisory sizes from multiple AWR reports
- **Calculate guest(s) virtual storage size (assume MB):**
(SGA + PGA) + 256 MB for ASM + 512 MB for Linux*
- **Assume the sum all of the guest virtual sizes for production equals p and the sum of all guest virtual sizes for dev/qa/training equals t**
Real memory for guests = $p/.66 + t/(.33)$ for z/VM memory over commit
 - Assumes multiple guests are involved. Not correct for a one guest
- **System z memory = real memory for guests + memory for z/VM and expanded storage (2GB or 4 GB).**

* Increase estimate when Oracle SGA is large and there are expected to be hundreds of dedicated server connections or use hugepages with Oracle 11gR2. A large overall virtual storage requirement may result in larger Page Tables in Linux which require extra guest storage. Consider hugepages but no AMM.

Obvious comments about sizing

- **Garbage in, garbage out**
- **Choose appropriate time frames that represent reasonable capacity usage**
- **Do not make guesses about the sizing input**
- **Get the IFL capacity, I/O subsystem setup, and the memory at the correct levels before any starting any testing**
- **Engage an IBM System z – Oracle specialist to assist with sizing**

Oracle Database 11g Release 2 documentation

▪ Oracle Documentation

- Database Client Quick Installation Guide for IBM: Linux on System z - E18190
- Database Quick Installation Guide for IBM: Linux on System z - E18182
- Oracle Database Release Notes 11g Release 2 (11.2) for Linux - E16778-09
- Grid Infrastructure for Linux - E17212- 11
- Oracle Real Application Clusters Installation Guide – E17214

▪ My Oracle Support Notes

- 1306465.1 - Getting Started - 11gR2 Grid Infrastructure, ASM and DB (IBM: Linux on System z)
- 1290644.1 - Requirements for Installing Oracle 11gR2 on SLES11 on IBM: Linux on System z (s390x)
- 1306889.1 - Requirements for Installing Oracle 11gR2 on RHEL 5 on IBM: Linux on System z (s390x)
- 1308859.1 - Requirements for Installing Oracle 11gR2 RDBMS on SLES 10 SP3 on IBM: Linux on System z (s390x)
- 1086769.1 - Ensure you have prerequisite rpms to install Oracle Database and AS10g (midtier) on IBM: Linux on System z (s390x)
- 169706.1 - Oracle Database on UNIX AIX,HP-UX, Linux, Mac OS X,Solaris,Tru64 UNIX Operating Systems Installation and Configuration Requirements Quick Reference (8.0.5 to 11.2)

IBM Resources

- **IBM Redbooks at <http://ibm.com/redbooks>**
 - SG24-7191-00 Experiences with Oracle 10gR2 Solutions on Linux for System z
 - SG24-7573-00 Using Oracle Solutions on Linux on System z
 - SG24-7634-00 Experiences with Oracle Solutions on Linux for IBM System z
- **IBM Oracle on System z portal**
 - http://ibm.com/systems/z/os/linux/solutions/zlo_gs.html

International zSeries Oracle SIG

- **Independent User Organization**
 - President, Mike Zechman
 - Worldwide user participation
 - No cost to be a member
 - Oracle and IBM Participation
- **Annual Conference**
 - Next is April 2012, Las Vegas
- **Communicates requirements and priorities to Oracle and IBM**
- **Longest running still active Oracle User Group**
- **Website www.zseriesoraclesig.org**
 - Presentations, Links, Bulletin Board



System z education on the Web

ibm.com/vm/devpages/jelliott/educate.html

- **On my education page, there are lots of links to education materials on System z**
 - IBM Training
 - IBM Webcasts
 - Non-IBM System z Training
 - Internet Discussion Lists
 - System z Academic Initiative
 - Information Centers and the Education Assistant
 - ABCs of z/OS System Programming
 - z/OS Communications Server
- **This web page is frequently updated and you can subscribe to change notifications**

Thanks!



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