



IBM System z10 BC

***Enterprise Linux Server:
Saving costs, gaining power
efficiency and optimising
utilisation***

Colin Grocock – IBM UKI

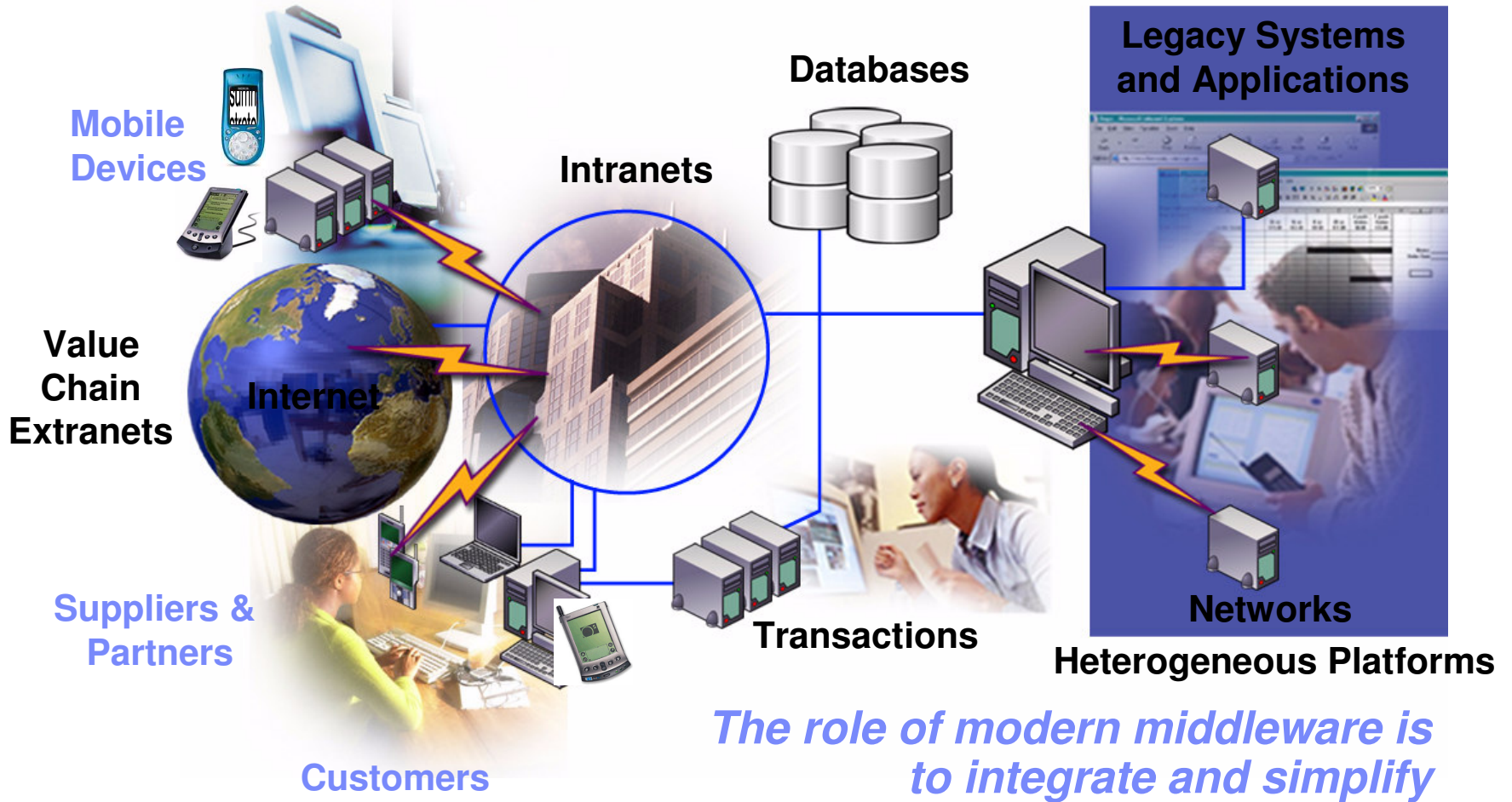
Mainframe Team



Thinking Beyond Today

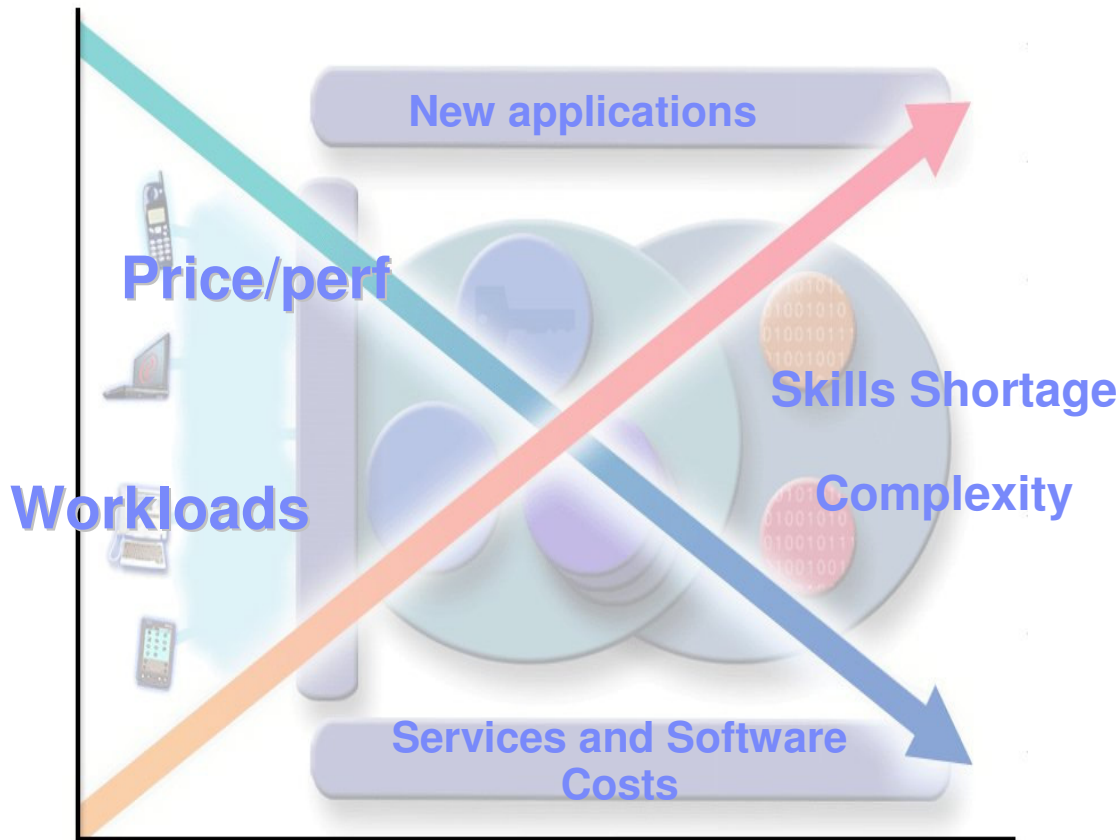
Today's IT Environment

IT environments are increasingly heterogeneous and complex



Key Concerns for IT Executives

price/performance gains in technology
are more than offset
by complexity and increasing costs



► Escalating Cost of IT Infrastructure

- desktop, network, servers, storage
- increasing complexity, higher service costs, more demanding SLAs
- multi-tier applications requiring dozens of servers

► Difficult to link IT to business plans

- need for integrated IT 'vision' (Nice to have...most don't.)
- need incremental and full TCO analysis

► Difficult for IT infrastructure to respond quickly to change in business directions

- need a simpler IT infrastructure that is highly flexible
- need for rapid implementation without the long-term cost and risk

x86 Server Growth has driven IT complexity



- **Demand for IT capacity has continued to grow**
 - New IT Solutions
 - New workloads
 - New applications...and more instances

- **While being perceived as low cost, x86 servers have increased IT complexity**

- **Distributed server proliferation is at an all-time high and growing**

Worldwide Server Market – x86 Unit Shipments

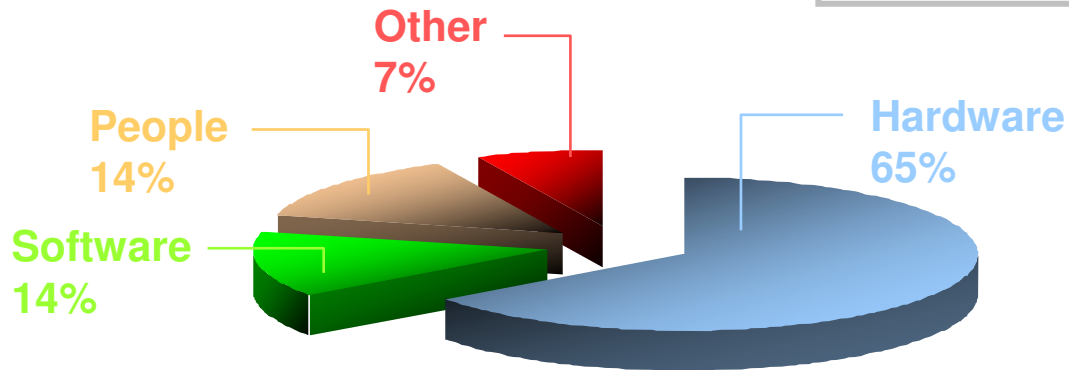
	2003	2004	2005	2006	2007
<i>Total x86 Servers</i>	4,732,564	5,688,198	6,473,502	6,960,226	7,605,512
% Total Server	90%	90%	92%	93%	12.5% CGR

Worldwide Server Market (IDC report, March 2008)

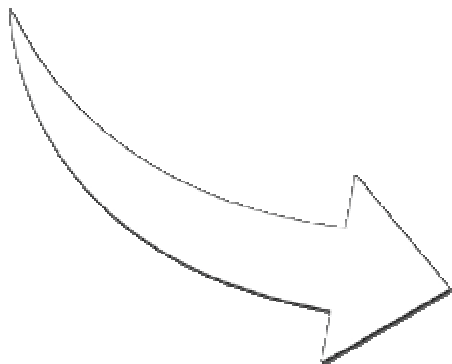
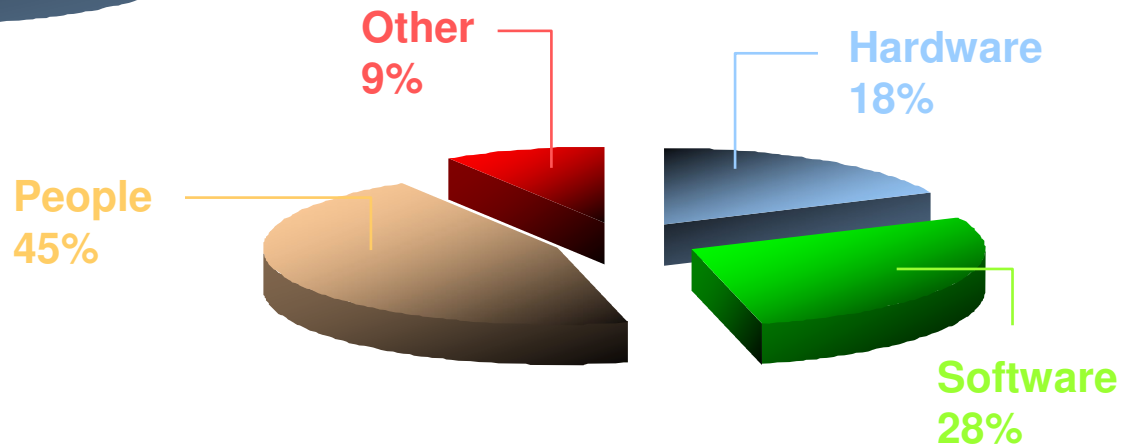
Throughout the past 10 years the cost dynamics of supporting corporate IT infrastructures has changed significantly as has the landscape.

People expense has tripled as a %
Software expense has doubled as a %
Hardware is less than 1/3 of its original %

1995



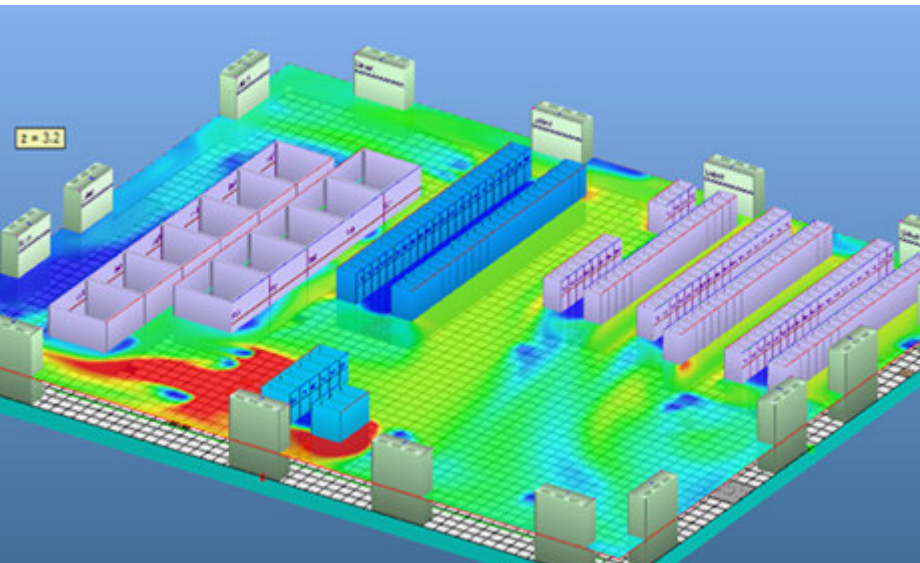
2006



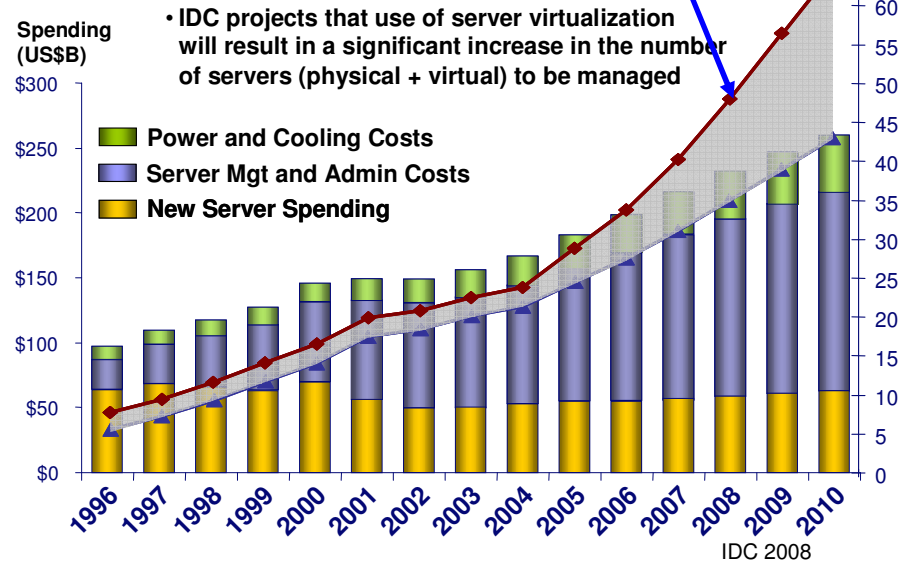
IT Complexity has driven many hidden costs

IT Complexity is continuing to drive business pain and cost to our clients

- People Costs have doubled since 2000
- Energy Costs have doubled since 2000
- Software costs continue to grow linearly as distributed servers grow



Virtualization Management Gap: Higher People Costs



Power & Cooling - #1 concern for Data Centers reported by IDC 2008 poll

- Excessive heat and Insufficient electricity
- Increased technology density will continue to raise energy requirements
- Energy costs will double again by 2012

System z10 BC Mainframe's high utilization capabilities may help to reduce both Power and Facility costs

– when consolidating low utilization Linux on Intel servers

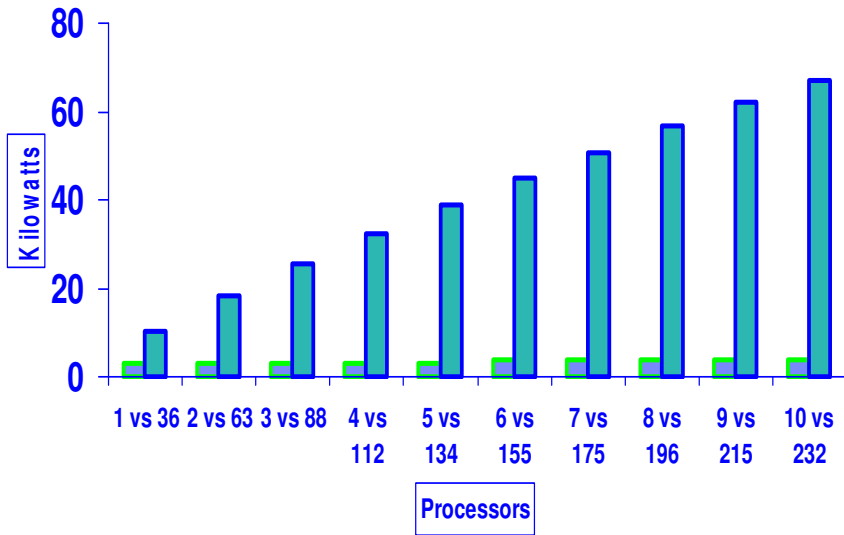
*In a consolidation, the System z10 BC may provide up to 6 times the same work in the same space!
and, may provide up to 16 times the work for the same power consumption!*

Power and Space Consumption

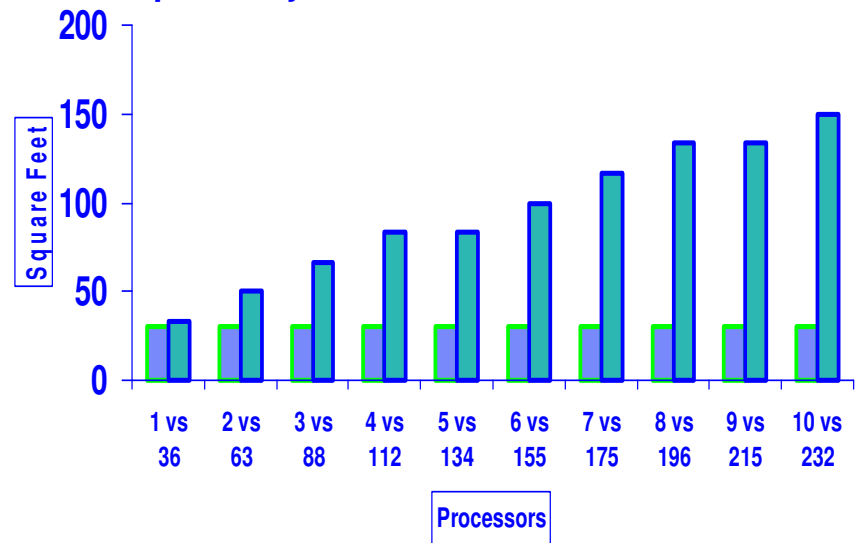
■ Power IBM z10
■ Power x86

■ Space IBM z10
■ Space x86

Power : System z10 BC vs Linux on Intel



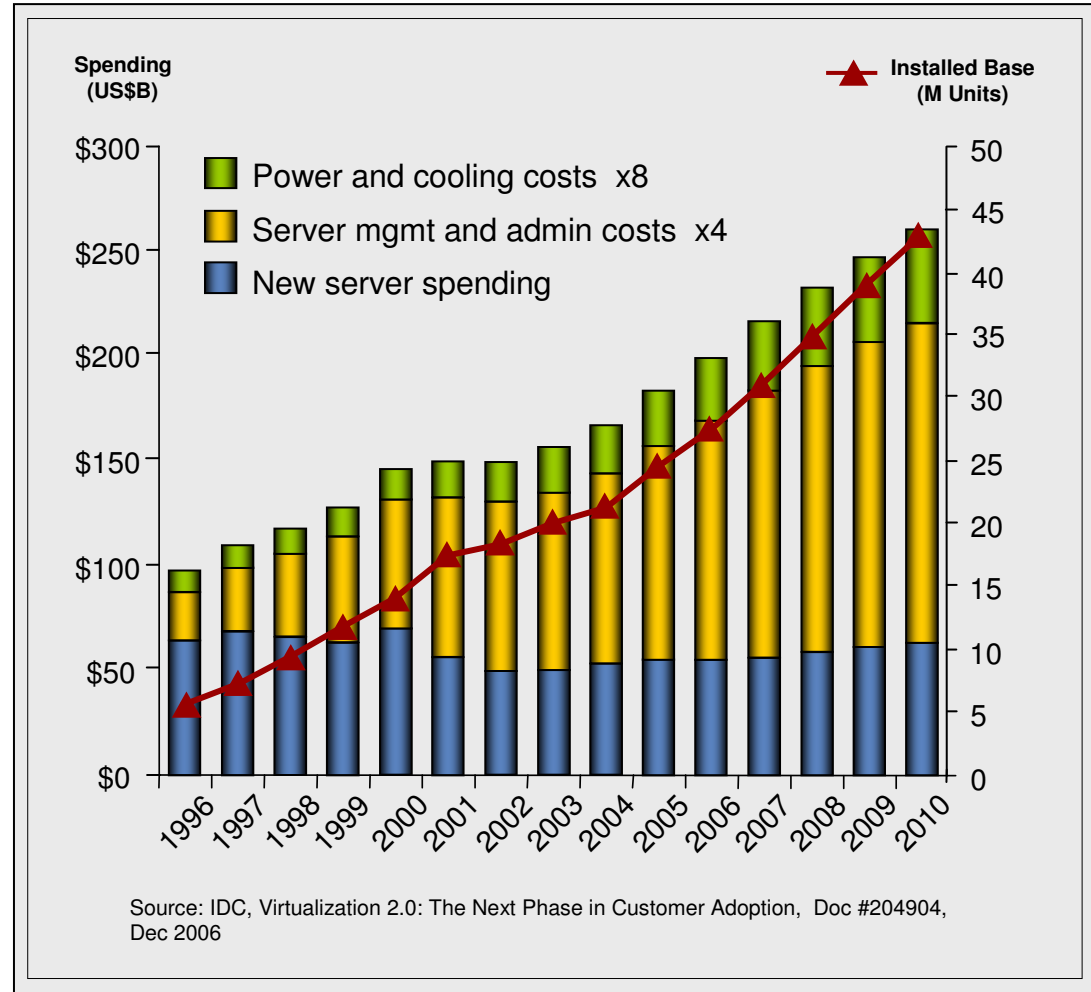
Space : System z10 BC vs Linux on Intel



The Linux on Intel servers selected in this example are functionally eligible servers considered for consolidation to a System z running at low utilization such that the composite utilization is approximately 10%. The utilization rate assumed for System z10 BC is 90%. This is for illustration only, actual power and space reductions, if any, will vary according to the actual servers selected for consolidation.

Today's reality . . .

- IDC reports that IT operational labor spend is growing at 10% CAGR 2003 – 2008
- 70% of IT budget goes toward operational overhead
- 85-95% of server capacity is excess – nearly \$140B in over expenditure
- Typical company IT energy costs have been rising 15% per year over the last 5 years
- Today, each dollar of new servers cost \$0.52 to power and cool and is forecast to increase to \$0.71 in the next four years

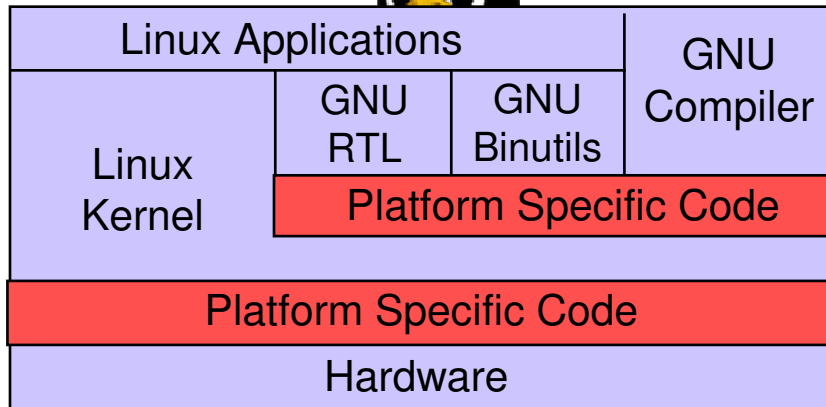


What is Linux?

- **A fully-networked 32/64-bit UNIX-like operating system developed by Linus Torvalds**
- **Multi-user, multitask, multiprocessor**
- **Compilers like C, C++, Fortran, Smalltalk, Ada, java**
- **GNU development tools, runtime, and utilities**
- **apache- web server, samba- file and print server, nfs file server, ldap, database**
- **X Windows Graphical User Interface - gnome, kde**
- **Coexists with other operating systems**
- **Runs on multiple platforms**
- **Includes the source code**



Linux + z/VM + z10 BC = ELS



Linux

- Reliable, stable, secure
- Large selection of applications middleware and tooling from IBM, ISV's and Open Source
- Available from multiple distributors
- Evolves rapidly to meet business challenges
- Plentiful availability of skilled administrators and developers



Enterprise Linux Server

- Legendary dependability
- Designed for multiple diverse workloads executing concurrently
- Highly scalable – up or out
- Rich security features
- Proven high volume data acquisition and management
- Advanced virtualization capabilities

Open Standards for Deployment/Development

**Common
Application
Development**



```
int from;
char *y_t *p;
assigned int num, const cha
if (iotable[i].f
break;
< IOTABLE_SIZE; i++)
if (iotable[i].num == 0)
break;
printk("warning: ioport table is full\n");
else {
P = find_gap(&iolist, from, num);
return;
iotable[i].name = name;
iotable[i].from = from;
iotable[i].num = num;
iotable[i].next = p->next;
return;
printk("warning:
else {
return;
iotable[i].name
iotable[i].from
iotable[i].num
iotable[i].next
p->next = sic
return;
```



zSeries



risc



x86



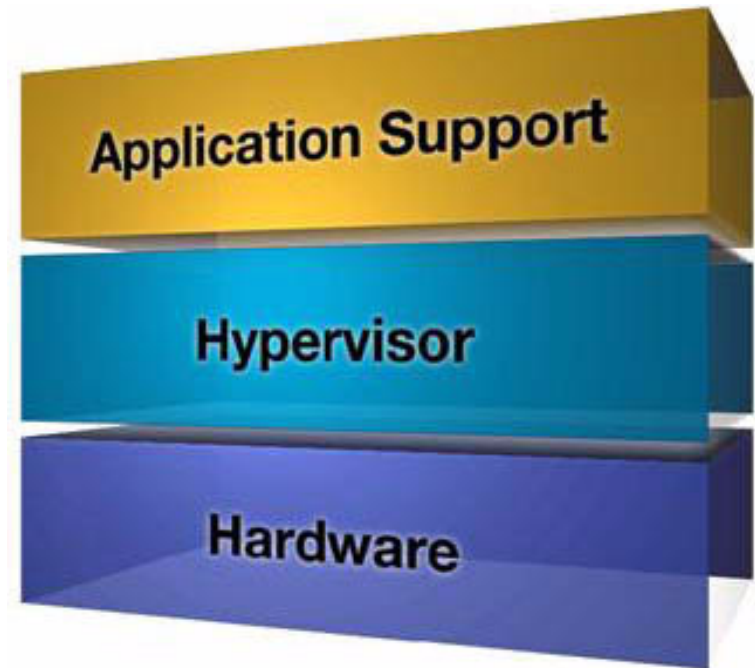
**Embedded
Appliances**

zSeries Virtualization: a Multidimensional Solution

Virtualization is built in, not added on

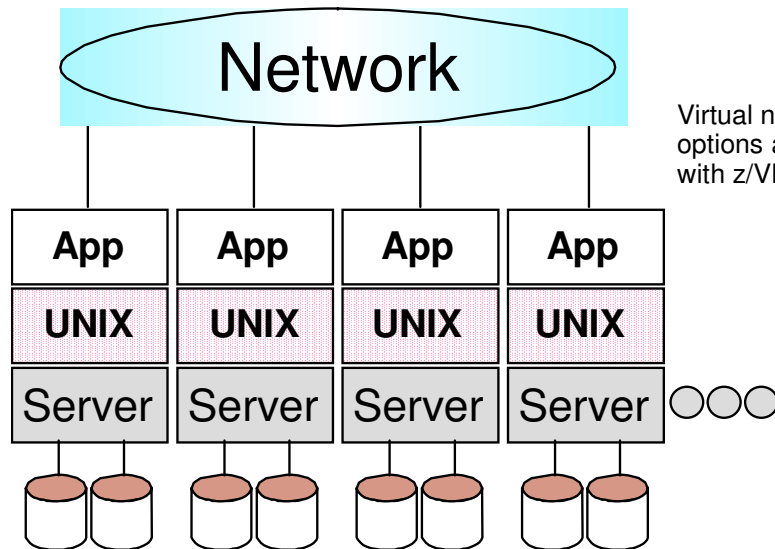
On demand scale out solutions are composed of multiple dimensions of function:

- **Application Support Dimension (open, stable)**
 - Open, stable operating system
 - Virtual server awareness infrastructure
 - Enterprise applications
- **Hypervisor Dimension (powerful, flexible)**
 - Shared-memory based virtualization model
 - Granular resource sharing and simulation
 - Flexible virtual networking
 - Resource control and accounting
 - Server operation continuity (failover)
 - Server maintenance tools and utilities
- **Hardware Dimension (robust, reliable)**
 - Legendary reliability, scalability, availability, security
 - Logical partitioning (LPAR)
 - Processor and peripheral sharing
 - Inter-partition communication
 - Virtualization support at the hardware instruction level (e.g., SIE)



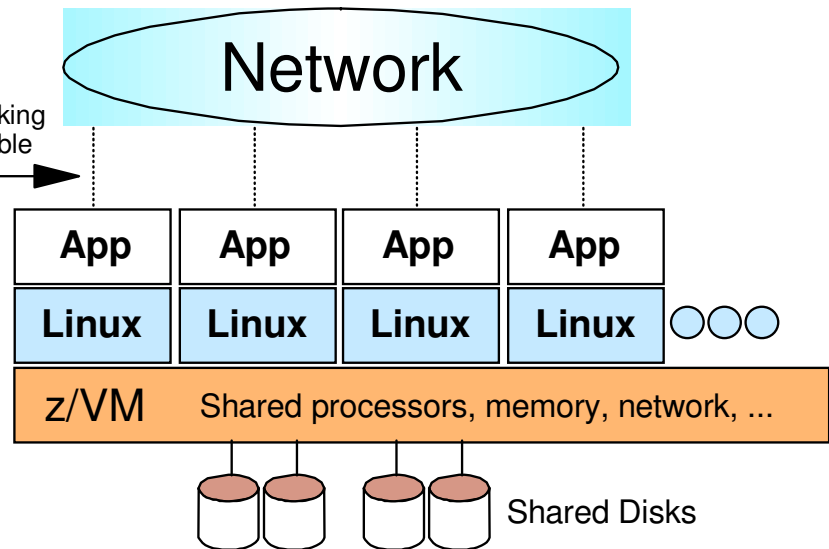
Achieve Rapid Horizontal Growth with Linux on z/VM

Typical UNIX® environment



- Dedicated processors, disks, adapters, ...
 - Resources wasted when idle
- Complex system management
 - Networking and software products required for command and control
- New servers available in hours / days

Linux on z/VM

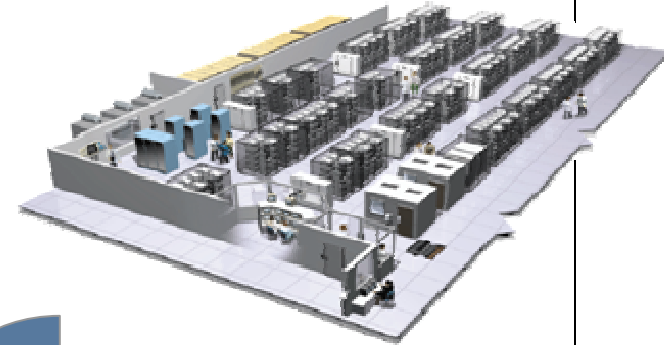


- Shared resources
 - Idle capacity given to servers that need it
- Simplified system management
 - Everything in one box
 - Automation tools included in z/VM
- New servers online in minutes / seconds
- On/Off Capacity on Demand available

Take back control of your IT infrastructure

An Enterprise Linux Server – not a server farm

- **Central point of management**
- **Increased resource utilization**
- **Potentially lower cost of operations**
 - Less servers
 - Fewer software licenses
 - Fewer resources to manage
 - Less energy, cooling and space
- **Fewer intrusion points**
 - Tighter security
- **Fewer points of failure**
 - Greater availability



Leverage the strengths of the Ultimate Virtualization Platform

Use z10 BC to rein in Linear Costs driven by Server Growth and Complexity

- *Virtualize* everything with up to 100% utilization rates
- *Scale* applications to surprisingly massive levels on one server
- *Consolidate* your distributed workload on a z10 BC at a up to 28 to 1 IFL ratio
- *Secure* everything on the server with the highest security classification (EAL5) of any publicly available server
- *Non-disruptively add* resources with proper planning
- *Optimize and integrate* it all with the IBM software portfolio

Consolidate all types
of workloads

Energize your
productivity

Smart economics: Virtualize,
Consolidate, and Save

Make your virtual
servers more secure to reduce
business risk

Rapidly respond to
workload spikes

Increase staff productivity
with customization of
images no longer required

System z Virtualization can dramatically reduce Software costs.

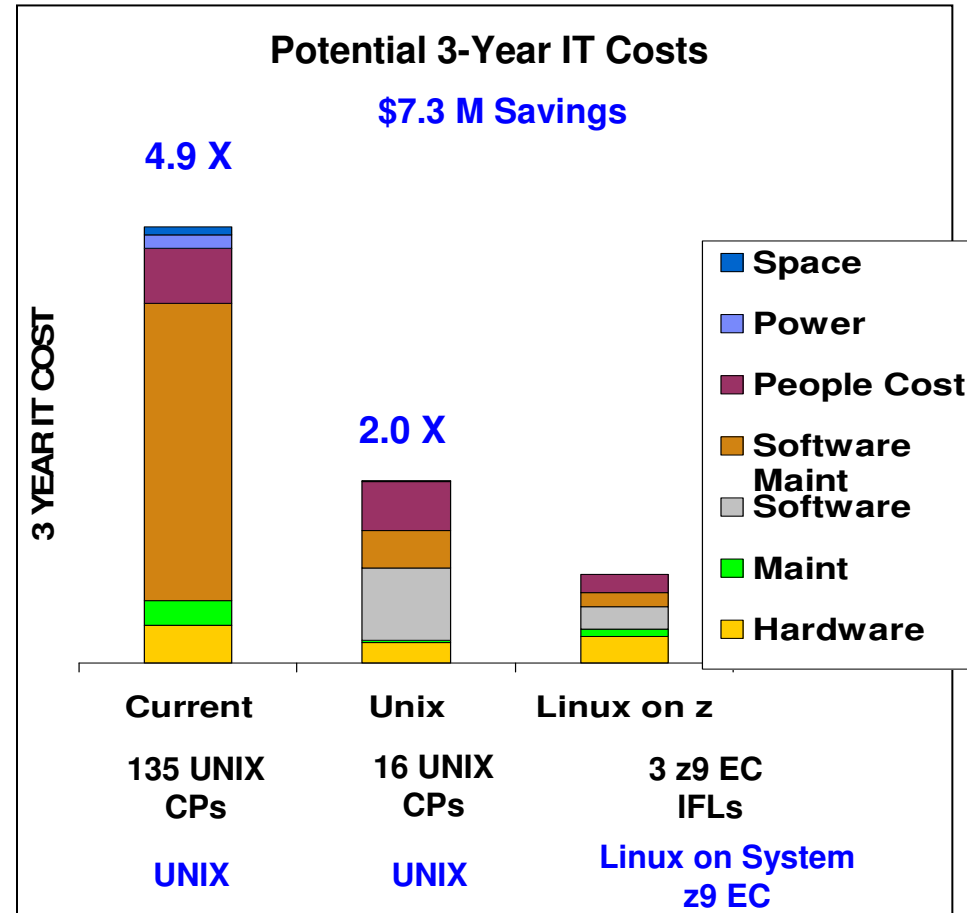
Do you want to save, or do you want to save BIG

Your IT Cost may vary:

- Save BIG in annual IT costs
 - Reduced by 82%
- Save BIG on energy
 - Reduced by 94%
- Save BIG on Floor space
 - Reduced by 100%
 - z solution added 0 space
- Save BIG on Labor costs
 - Reduced by 66%
- Save BIG on software licenses and SW service and support
 - Reduced by 87%

**Want to save BIG
z10 can do IT.**

Information and Delivery Service Company IT Costs
Varied UNIX Workloads
3-Year Total IT Cost



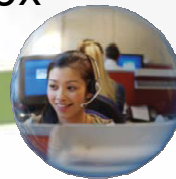
IBM Scorpion Study 2008

* All performance information was determined in a controlled environment. Actual results may vary.

ELS - Economics

Leverage the ability of Linux on System z on z10 BC to run many distributed workloads and to consolidate x86 core processors at up to a 28:1 ratio to unleash significant IT Cost savings opportunities

- People Cost – reduced administration
- Software Cost – reduced ISV licence costs
- Maintenance – 3 years included
- Energy Cost – dramatic reduction
- Facilities Cost – fraction of the space and cooling
- Networking Cost – virtualised within the box



Enterprise Linux Server

- Standard z10BC
- 2 processors enabled for Linux
- 64 GB of memory
- ficon and ethernet comms
- z/VM + support 3 years included
- HW maintenance – 3 years included
- Special rate on SUSE support
- Storage – DS8000 option

- Linear price on remaining capacity



Enterprise Linux Server

- Contact
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 - 0208 818 4372



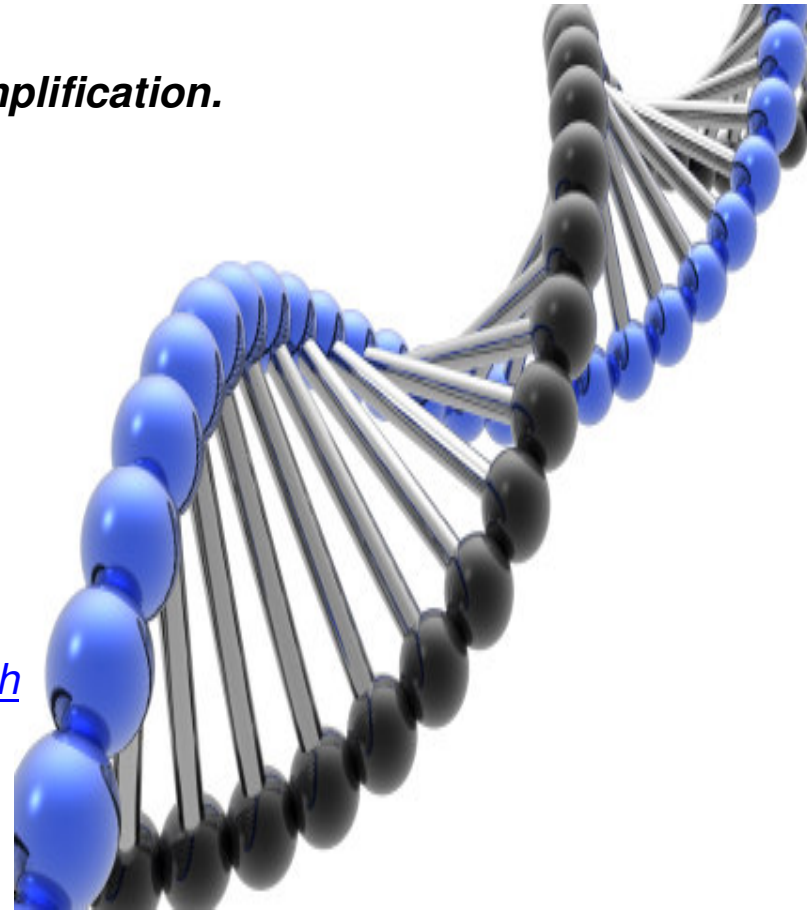
Backup Charts

Server Architecture Genetics

Consider the Heritage of the Server Platform that you use to simplify your IT

System z servers are often the right tools for IT Simplification.

- **x86 systems**
 - Key value proposition: end-user autonomy
 - “Ctl-Alt-Del” not a problem for a single-user system
- **UNIX systems**
 - Key value proposition: processor speed
 - Sweet spot: engineering/scientific computing
- **Mainframe systems**
 - Key value proposition: mixed workloads and high I/O workloads
 - Highest degrees of efficiency, availability, workload management, security

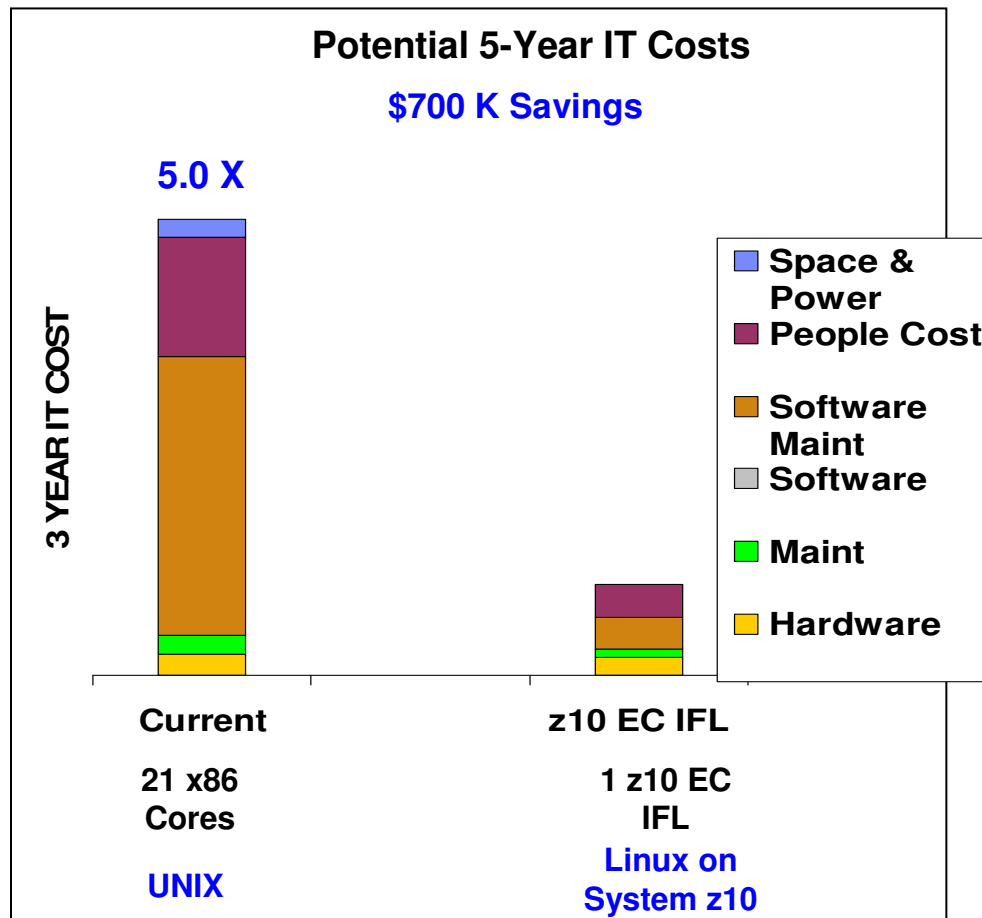


Virtualization technology can be significantly constrained or compromised by the underlying system architecture.

Do you want to begin to save Big? Begin with 1 IFL

- Save in annual IT costs
 - Reduced by 80%
- Save on Labor costs
 - Reduced by 72%
- Save on Software service and support costs
 - Reduced by 88%
- Increased Utilization
 - Improved from 5.5% to 72%
- Plenty of room to grow savings
 - Only 25% of 1 IFL required

Insurance Company IT Costs
 Combination Wintel and Netware™
 File & Print Servers
 5-Year Total IT Cost Analysis



Tap into the BIG
Savings potential of z10.

* All performance information was determined in a controlled environment. Actual results may vary.
 IBM Scorpion Study 2008.

Virtualization and Security

Should IT Managers Be Concerned?

Virtualization security risks being overlooked, Gartner warns.

Gartner raises warning on virtualization and security.

Companies in a rush to deploy virtualization technologies for server consolidation efforts **could wind up overlooking many security issues and exposing themselves to risks**, warns research firm Gartner.

“Virtualization, as with any emerging technology, will be the target of new security threats,” said Neil MacDonald, a vice president at Gartner, in a published statement.

– NetworkWorld.com, April 6, 2007

Be wary of “Sea Level” Security



“When it comes to business continuity, sometimes the biggest threat is not necessarily the impending natural disaster but a man-made disaster that is lurking nearby.”¹



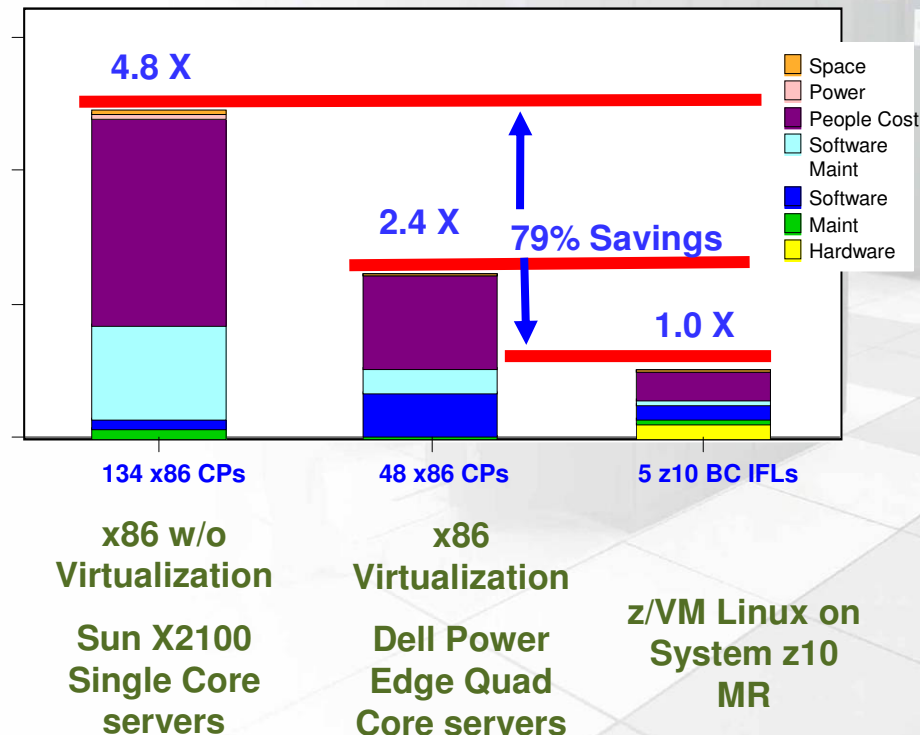
1 Disaster Recovery Journal, “Beware of Sea-Level Executives,” 2008, Ron Faucet

IT Cost Savings powered by z/VM Virtualization on z10 MR

Your IT Cost may vary:

- Up to 79% Saving in IT Cost vs unVirtualized CPs
- Up to 58% Saving in IT Cost vs Virtualized CPs
- Up to 96% Less Hardware
 - 134 x86 Processor Cores vs 5 IFLs
- Potential for dramatic reductions in software expense for processor based licenses
- Potential reductions in power and cooling
 - Up to 92% Savings in KWatts and Energy Costs in this scenario
- Up to 87% People savings
- Increased processor utilization
- Industry leading Security

Consolidating 134 Linux servers
z/VM Virtualization versus x86
Oracle DB Workload
3-Year Total IT Cost
\$12.3 M Savings versus x86 without Virtualization



Energize your IT savings with z10 MR

All performance information was determined in a controlled environment. Actual results may vary.



zDAAS

or

Do something different with your z!

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IBM System z

What is DAAS and why is it relevant to you?

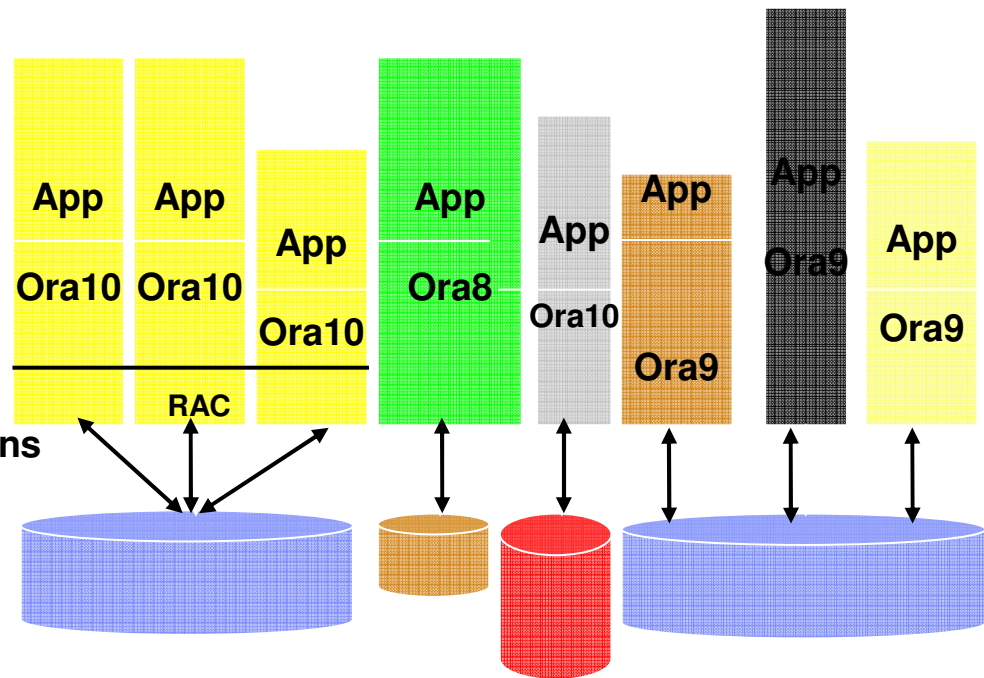
- **DAAS – Data As A Service.**
 - ▶ The running of the Oracle database as a separate tier to support business critical data.
 - ▶ This is referred to by Oracle as MAA (Maximum Availability Architecture)

- **zDAAS**
 - ▶ The deployment of DAAS on System z to provide a highly reliable solution for the massive centralisation of Oracle data and operations.
 - ▶ zDAAS provides, by design, the lowest cost, lowest risk, most secure and most flexible deployment of DAAS.
 - ▶ zDAAS includes tools to allow repeatable deployment of new Oracle databases ready for production use in less than 15 minutes to support agile deployment
 - ▶ Transition from legacy mid range sprawl to massive centralisation is achieved using a formal, standardised and well understood process to allow for rapid return on investment.

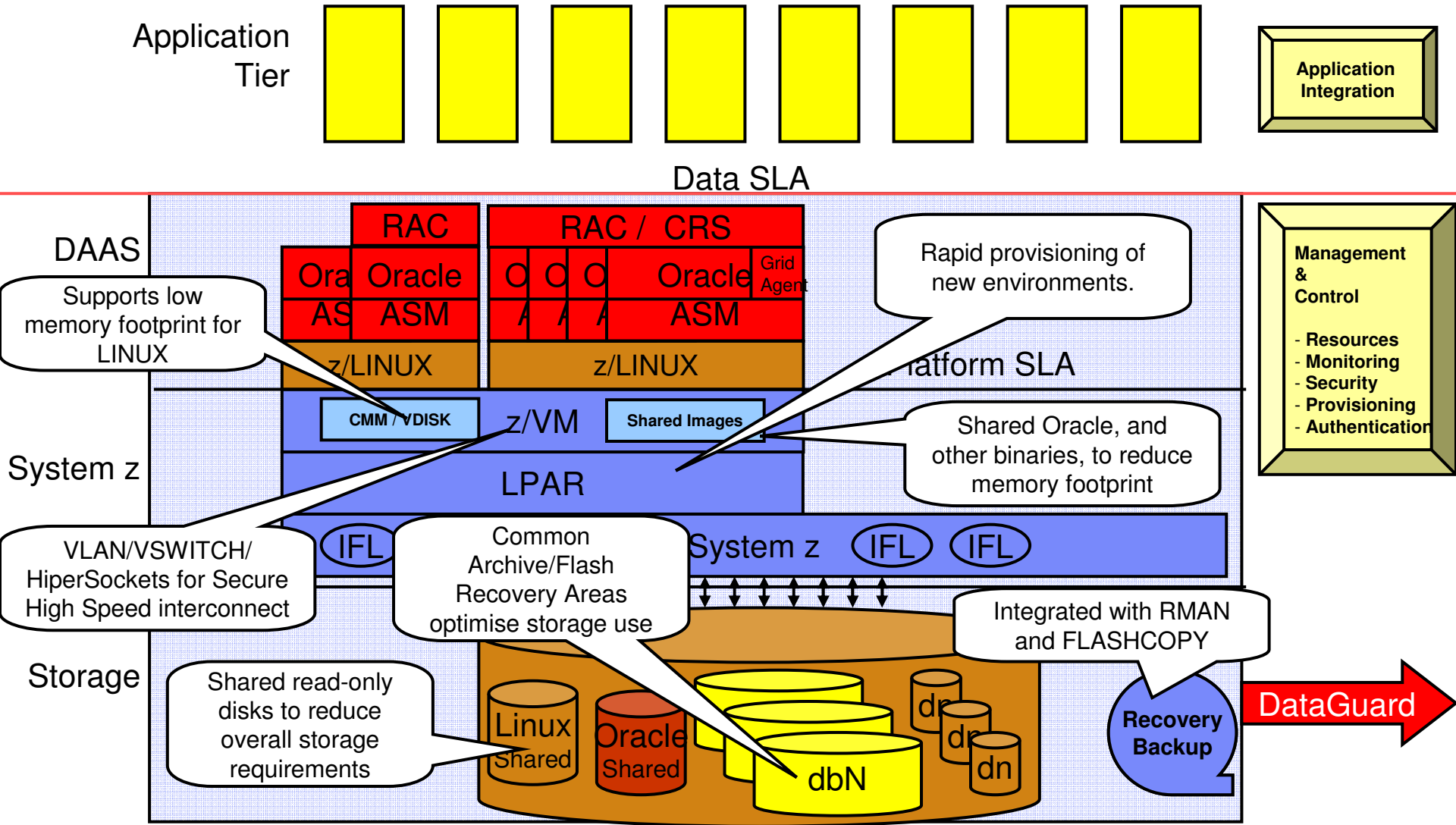
zDAAS ⇒ Oracle MAA for System z

Typical Distributed Estate

- **Utilisation less than 30% across estate**
 - ▶ Biggest overall consumer of cycles
 - Database
- **For most customers DB of choice is Oracle**
 - ▶ 40% of used cycles spent in Oracle
- **Deployed applications running on many versions of Oracle**
 - ▶ 7, 8, 9i, 10g and now 11g
 - ▶ Older databases tend to be smaller BUT run on older hotter servers
 - ▶ Extended Support charges if < 10g
 - ▶ 60% of databases < 10GB (80% < 50GB)
- **Storage ranges from DAS, NAS, SAN**
 - ▶ Large space/energy footprint for older drives
- **Backups done over network**
 - ▶ Reliability of backup is a big issue



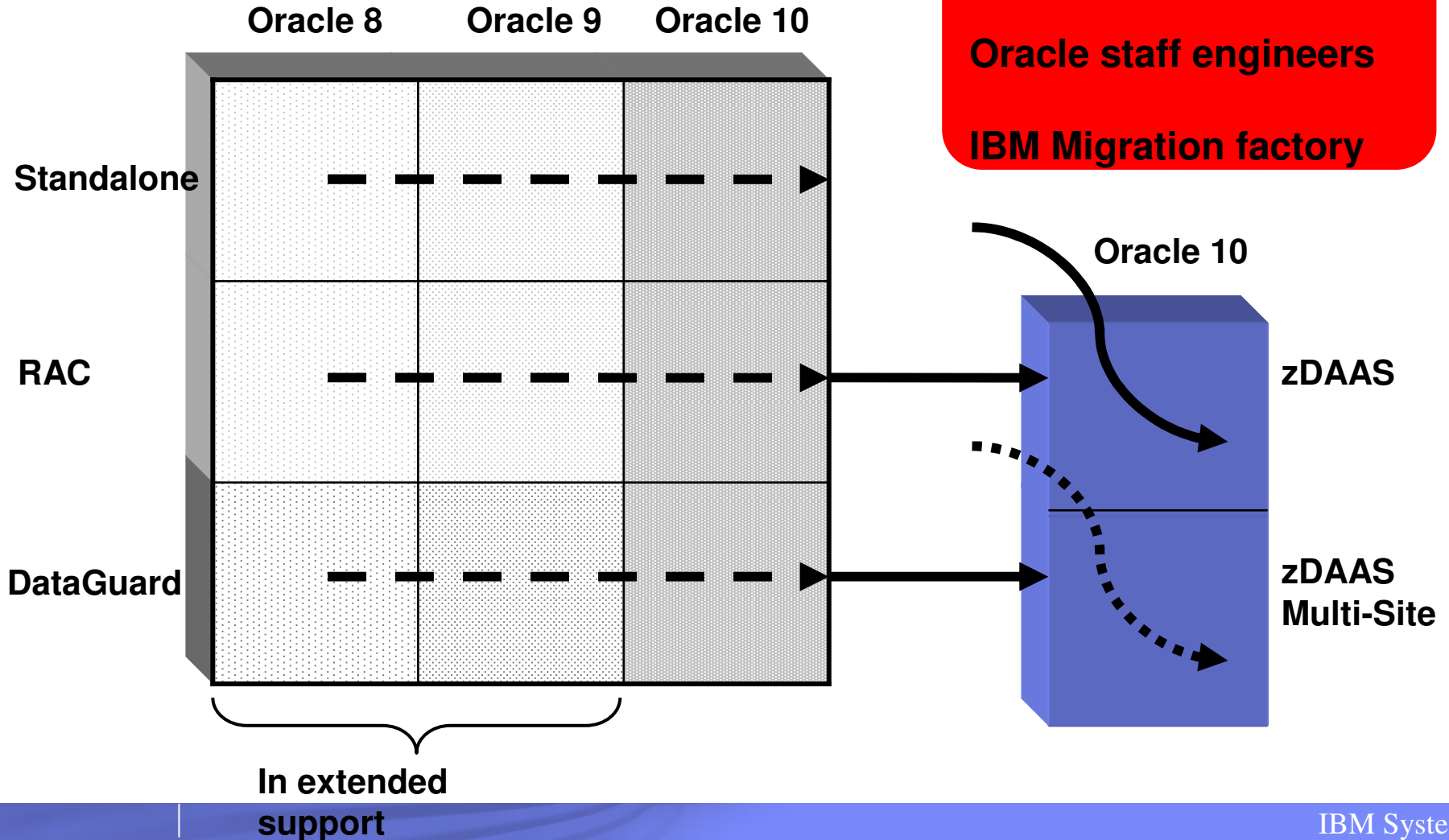
High Level zDAAS Oracle MAA Technical Solution



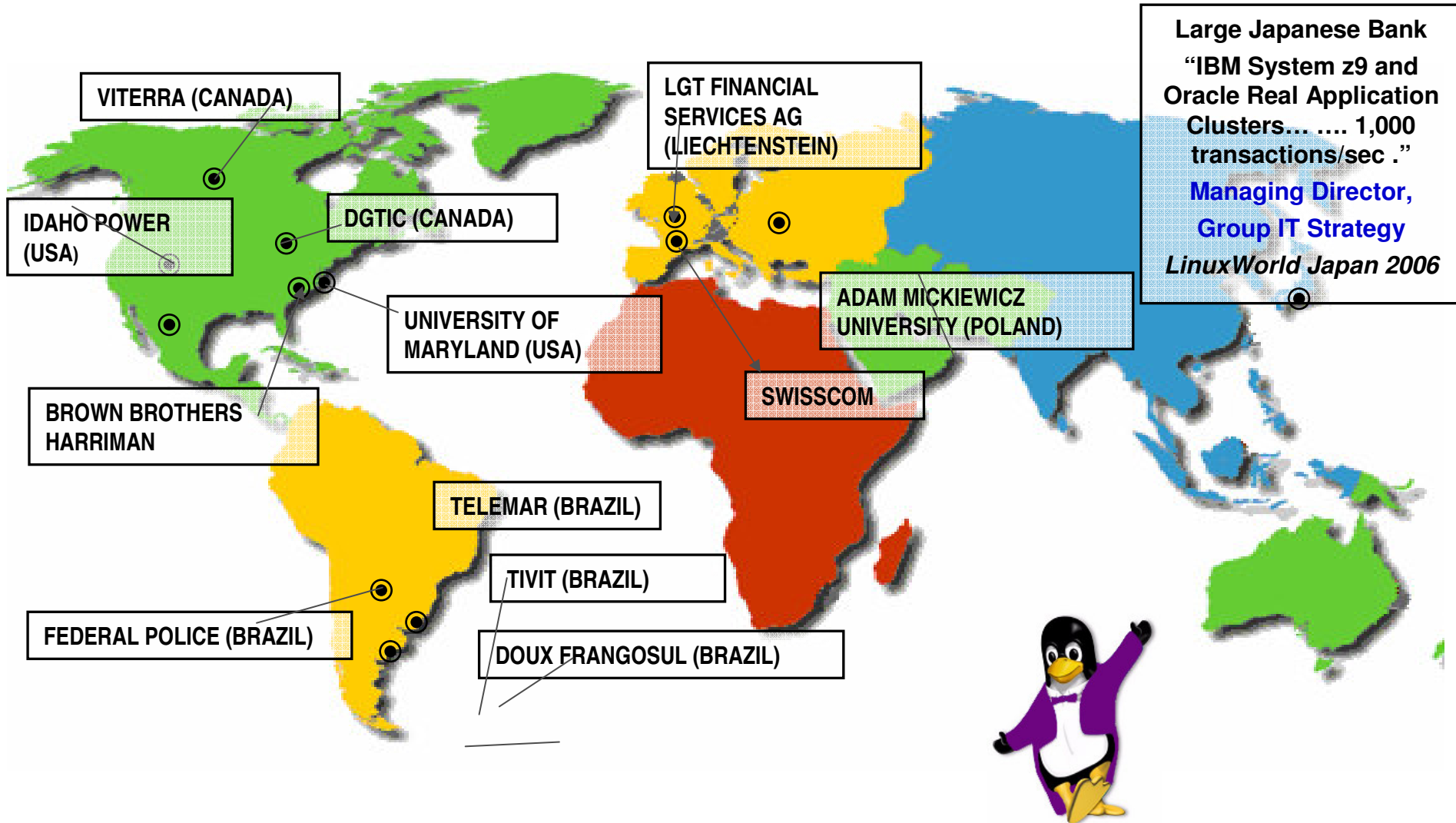
Typical Savings

- **Based on 100 server estate**
 - ▶ **IT Footprint**
 - c. 40 servers can be removed
 - £30K pa less electricity for server & air conditioning => 3,800 tonnes less CO₂ pa.
 - c. 30% saving in storage utilisation, c. 20% less backup capacity required
 - 240 fewer network ports (8 x 32 port switches), 80 fewer SAN ports (4 switches)
 - £24K pa switch, £20K pa. SAN port savings
- **Software**
 - ▶ Fewer tools required (in one customer from 20+ per server to < 5 => 8,000 licences)!
 - ▶ Reduction in extended support charges through up-revving Oracle 8/9 to 10
 - ▶ Potential Oracle licence savings (z10 core = 0.75 Oracle licence)
- **Operations**
 - ▶ 80% reduction in out of hours DBA call outs!
 - ▶ Simplified storage management reduces number of storage allocation requests
 - ▶ 99.99+% availability of data can improve end service level
- **Deployment**
 - ▶ Faster provisioning (< 15 minutes) reduces project timescales
 - ▶ Pre designed Oracle building block allows design teams to focus on higher level business problems

Making the journey



Sample of Customers Who Have Chosen *IBM System z running Linux with Oracle Database*



Sizing Questions

- **What we need to get some sizing sorted is an indication of:**
 1. **How many production/test/development Oracle instances you have?**
 2. **Any database size information to match (not critical as we can make assumptions)?**
 3. **Which hardware vendor(s) have you used to host these instances?**
 4. **Any specific details on server types (this is not critical as we can make some assumptions)?**
 5. **Any idea of split between Oracle 8, 9, 10 and 11?**
 6. **Do you use any Oracle E-Business suite applications?**
 7. **Do you tend to run Oracle on the same server as the application or have you already implemented some form of database farm?**
 8. **Are the databases held on an existing SAN? If so, which vendor(s)?**
 9. **How do you back these databases up? Network or direct attach tape?**
 10. **How many DBAs do you have?**
 11. **How many servers do you have running the applications/databases as described above?**

- **Answer what questions you can. For any gaps we have a set of tables/rules which we can use to make assumptions. For example, if you said "they have 3,000 servers mostly from Sun", we can make some accurate predictions around sizing.**

- **Above ALL do not get bogged down in detail – averages are good!**

..... how about BI?

Cognos 8 for Linux on System z providing a centralized environment to enhance your business

New version - Cognos 8.4

Designed to...

- Deliver a customized “informational” view of your business from across the entire enterprise
- Provide business insights to a broader set of employees, decision makers and influencers into the thousands
- Deliver the security and availability associated with System z
- Put decision making information into the hands of the front lines of business
- Work with DB2, Oracle, etc



Want to know more?

■ IBM Redbooks

▶ Using Oracle Solutions on Linux for System z

- <http://www.redbooks.ibm.com/abstracts/sg247573.html?Open>

■ LINUX

▶ Redhat

- <https://www.redhat.com/apps/download/>

▶ SuSe

- <http://www.novell.com/products/server/eval.html>

■ Oracle

▶ Oracle 10G

- <http://www.oracle.com/technology/software/products/database/oracle10g/htdocs/10202zlinuxsoft.htm>

■ Interesting tools

- ▶ <http://www.dovetail.com> § zOS to LINUX integration tools
- ▶ <http://www-03.ibm.com/servers/eserver/zseries/zos/unix/bpxa1toy.html>

§ not an endorsement but discussed in LINUX390 mailing list

```
//BACKUP EXEC PROC=COZPROC,
// ARGS='userid@linux.server'
//STDIN DD *
cd /sub/directory/to/back/up
tar cjv * |\
todsn -b '//DD:TAROUT'
/*
//TAROUT DD DSN=output.file,
//
RECFM=FB,LRECL=1,BLKSIZE=0,DSORG=PS,
// UNIT=(SYSDA,10),
// SPACE=(CYL,(200,10))
//
```

Summary of Oracle MAA on System z

- **Available today**
 - ▶ You could be running a trial tomorrow!
- **Can drive significant cost reductions**
 - ▶ Opex savings
 - ▶ Capacity on Demand / Financing
- **No additional training required**
 - ▶ LINUX, Oracle
 - ▶ z/VM
- **Does not incur any zOS MLC**
- **To a**
 - ▶ DBA it is just Oracle
 - ▶ Sys Admin it is just LINUX



Where else would you put your business critical data?