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Dance with the Penguin: Implementing E-Business Suite on Linux



Agenda



- Oracle and Linux
- Implementation Approaches
- Implementation Architecture
- Benchmarks
- Linux implementation insights
- Steps for planning move to Linux



Oracle – Linux Pioneer



- August 1999 – First commercial database to be released on Linux
- Mid 2001* – Oracle E-Business Suite available on Linux
- June 2002 – Oracle 9i product line certified on Linux
- Mar 2003 – Unbreakable Linux Initiative Launched



A Linux Evangelist



- Oracle, Red Hat, United Linux development teams integrated in a non-exclusive partnership
- Oracle QA now part of Red Hat and United Linux development process
- Oracle now contributes to Linux kernel code
- Linux kernel team making contributions to open-source under GPL - Oracle Cluster File System



Support Initiatives



- Worked with Red Hat and SuSE to develop features into Linux - Improved I/O throughput, Improved memory utilization, Improved SMP scalability, Graceful degradation under load
- Direct support of Linux worldwide - Red Hat Enterprise Linux AS and ES UnitedLinux. No additional Oracle support contract required
- Linux security – Red Hat AS submitted for EAL2 (ISO 15408), Defining the path for EAL4 Certification



“Would not recommend running enterprise applications on Linux” – Larry Ellison, Appsworld 2001 New Orleans Q&A session

“We’ll be running our whole business on Linux” – Larry Ellison, Appsworld 2003 San Diego



Oracle EBS Sites on Linux



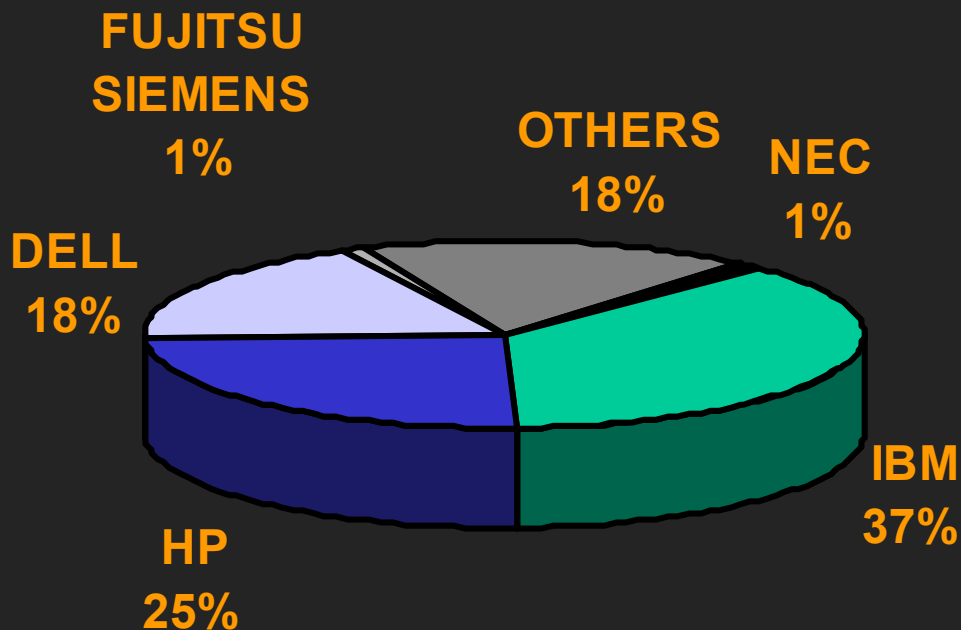
- Covad Communications
- Dana Corporation
- Dell
- Dynamex Inc.
- Electronic Arts
- Emory Riddle University
- Lithonia Lighting
- Luminex Corporation
- Middlesex University
- Omsan Loijistik
- Oracle SGI (single global instance)
- Radicare Sdn Bhd
- Tropicana
- UltraDNS Corporation
- University of San Diego
- Van Shung Chong
- Western Gas
- Zeus Industrial Products

More than 700 sites are working on Linux

Source: Oracle Appsnet



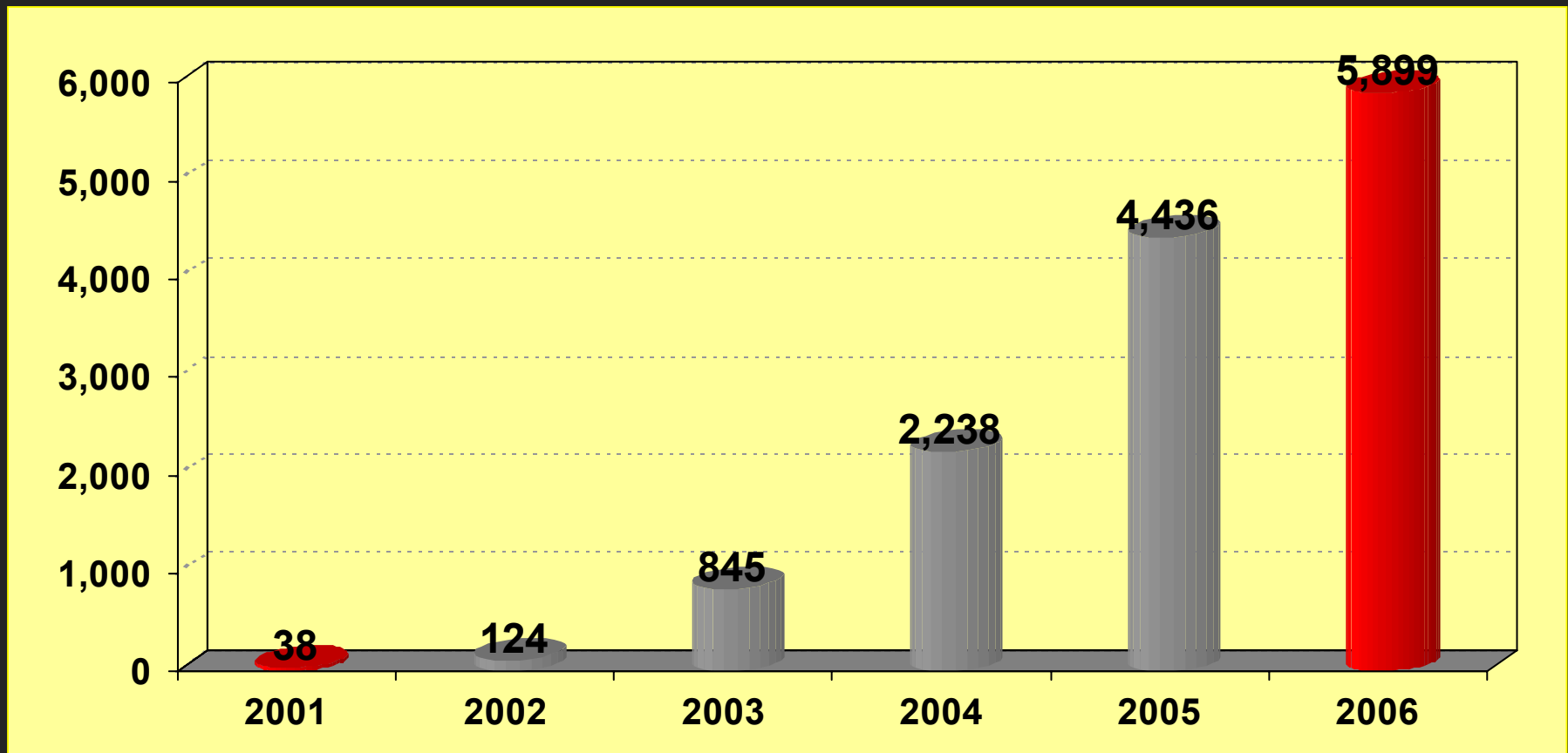
Linux Server Market Share



Source: Gartner Dataquest, May 2003



Linux Market share

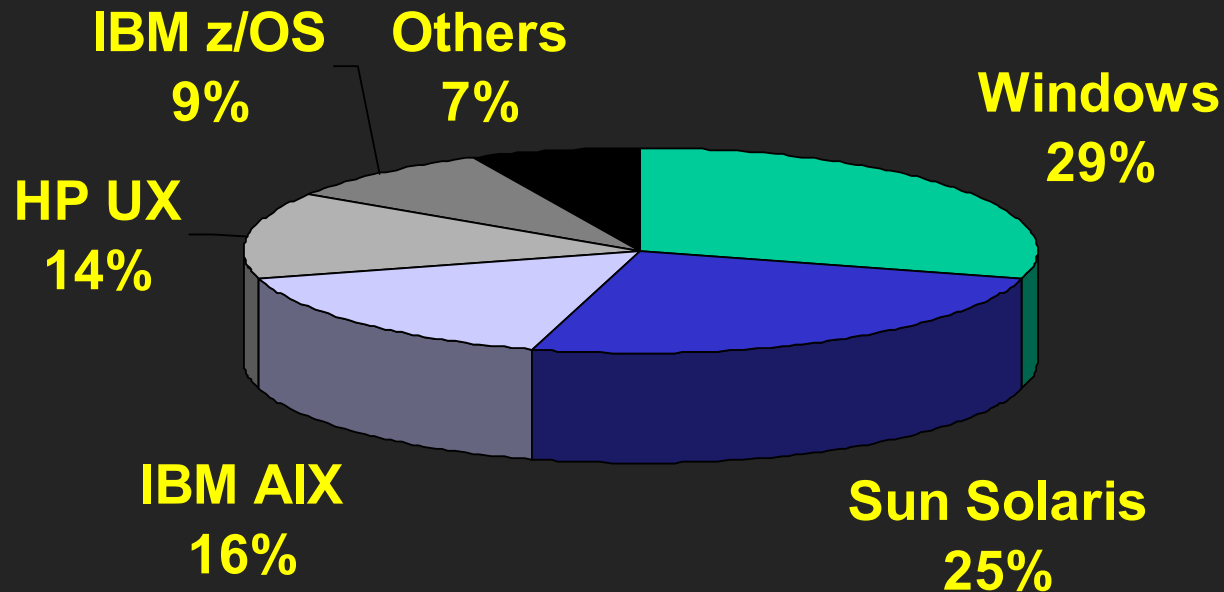


Source: IDC, May 2002

Figures in \$ M for databases on Linux



Source Platforms



- Survey results indicating plan to migrate to Linux

Source: Forrester Research, Linux Tipping Point, 2003



Linux Certification Matrix



- Application Tier Certifications with R11.5.8:
 - SuSE SLES7
 - Red Hat Enterprise Linux AS/ES 2.1
- Database Tier Certifications with 9iAS.R2
 - SuSE SLES7
 - Red Hat Enterprise Linux AS/ES 2.1

Source: Oracle Metalink : only highest level of certification shown



Implementation Approaches



- Planning to implement E-Business Suite
 - All-on-Linux Approach
 - Middle Tier Linux Approach
- Already implemented E-Business Suite

Planning to migrate from RISC to Linux:

- All-on-Linux Approach
- Phased Approach



Implementation Approaches



- All-on-Linux Approach:
 - Database and Application Tier both on Linux
- Middle Tier Linux – Database Tier RISC based (some have even implemented the opposite combination too!)
- Phased Approach
 - First phase: Middle-tier Linux
 - Database Tier on Linux



Migration Path Case Study



- Upgrade from R11.0.2 to R11i
- Sun Solaris 2.6 migration to Red Hat Linux AS 2.1
- Steps :
 - Category 1: Completed on Sun Solaris.
 - Category 2:
 - Laid down upgrade environment on Linux Server with rapid install.
 - Included new APPL_TOP and Oracle HOME.
 - Apply rapid install patches and pre-upgrade patches for the Linux APPL_TOP (Note 112659.1)
 - Did export and import to migrate the database and also reorg it. (Note 204015.1)
 - Category 3-6:
 - When database was imported, completed upgrade process – Cat 3 onwards.



Some illustrations



- Phased approach:
 - Middle tier: APPL_TOP/Forms Server/Report Server/Web Server on Sun Solaris
 - Database tier on SuSE Linux.
 - For the database using a Dell 6650, SuSE SLES8, and 9i Release 2(9.2.0.2).
 - Was Running on SLES7 and 8.1.7.4
 - Upgraded to SLES8/9iRel2
 - Presently deploying 9i RAC.
 - Waiting for 11.5.9 to replace Sun Solaris with SuSE Linux on middle tier.



Some illustrations



- All-in-One Approach:
 - In production with 11i on SuSE Linux since the 11.5.5 release.
 - Live on Financials, HR and PO since October 2001
 - Currently running 11.5.7 on SLES7 with 8.1.7.3
 - Upgrading to SLES 8/9i RAC later this year.
 - Also going live with Order Management, Quoting, Telesales, Work in Process, BOM, full inventory, etc.
 - Dell 8450 Server with the DB/Concurrent Manager and the Form/App/Web on a Dell 6450 Server.
 - Storage consist of a NetApp Filer 840
 - Multiple development environments share two Dell 2550 Servers



Some illustrations



- All-in-One with 9iRAC
 - Leading Electronics Games Company
 - More than 300 GB database
 - Implementing Linux Red Hat Enterprise Linux ES 2.1 middle tier
 - Database tier on Red Hat Enterprise Linux
 - Implementing 9iRAC
 - Upgrading to R11i from RISC platform



Some illustrations



- All-in-One with 9iRAC with Desktops too
 - Global conglomerate with businesses from transportation system to cellphone
 - More than 400 GB database
 - Implemented Linux Red Hat Enterprise Linux
 - Implementing 9iRAC, database 9iR2
 - Replaced Windows on Desktops with Linux
(note: Wine, an open-source Windows API enables Linux users to run many applications developed for Windows environment)



Sizing Benchmark



Sizing Benchmark:

- 70 users per CPU
- 8MB memory is required for each user
- Hence for a base of 300 named users, using Finance, Manufacturing and HR modules – new install one needed 8 processors of 900 MHZ and 16 GB of memory
- Swap space could be created and single time of physical memory because the physical memory is huge
- Upgrade option has to be taken care in near future requirement



Sizing Benchmark



Sizing Benchmark (continued):

- Legacy systems if any needs to be considered separately
- For greater reliability it is preferred to use a a SCSI hard disk, preferably with Disk Mirroring.
- SCSI hard drives of 18 GB capacity , 3 drives without mirroring and 6 drives with mirroring (RAID-5).
- Rapid Install install files for all products regardless of licensing status. In a single node installation – Oracle applications top directory would take around a 8.2 GB and 2.5 GB each for various oracle homes.



Sizing Benchmark



- For about 300 concurrent users
 - Single-tier system to run an OLTP application, a single four processor Linux database server
- For 300-1000 users
 - Use multi-tier architecture with a single four processor Linux/Intel database server



Scalability



- Load balancing and Function shipping
- Allow adding more servers for high resource requirement
- Middle tier comprising of single large server would be incur higher cost to scale
- Meet demand incrementally at incremental cost



Load Balancing



- Traffic routing based on type of service being requested using load balancer switches
- Better load distribution
- Load balancer switches equipped with SSL accelerator cards.



Functional Shipping



- Similar business functions based on specific server/s. E.g. for high payroll volume have middle tier server dedicated for payroll concurrent managers
- Resource consumption less difficult to predict and manage
- Easy transition of a server to handle different set of business functions instead of the original
- All middle tier servers installed and configured identically



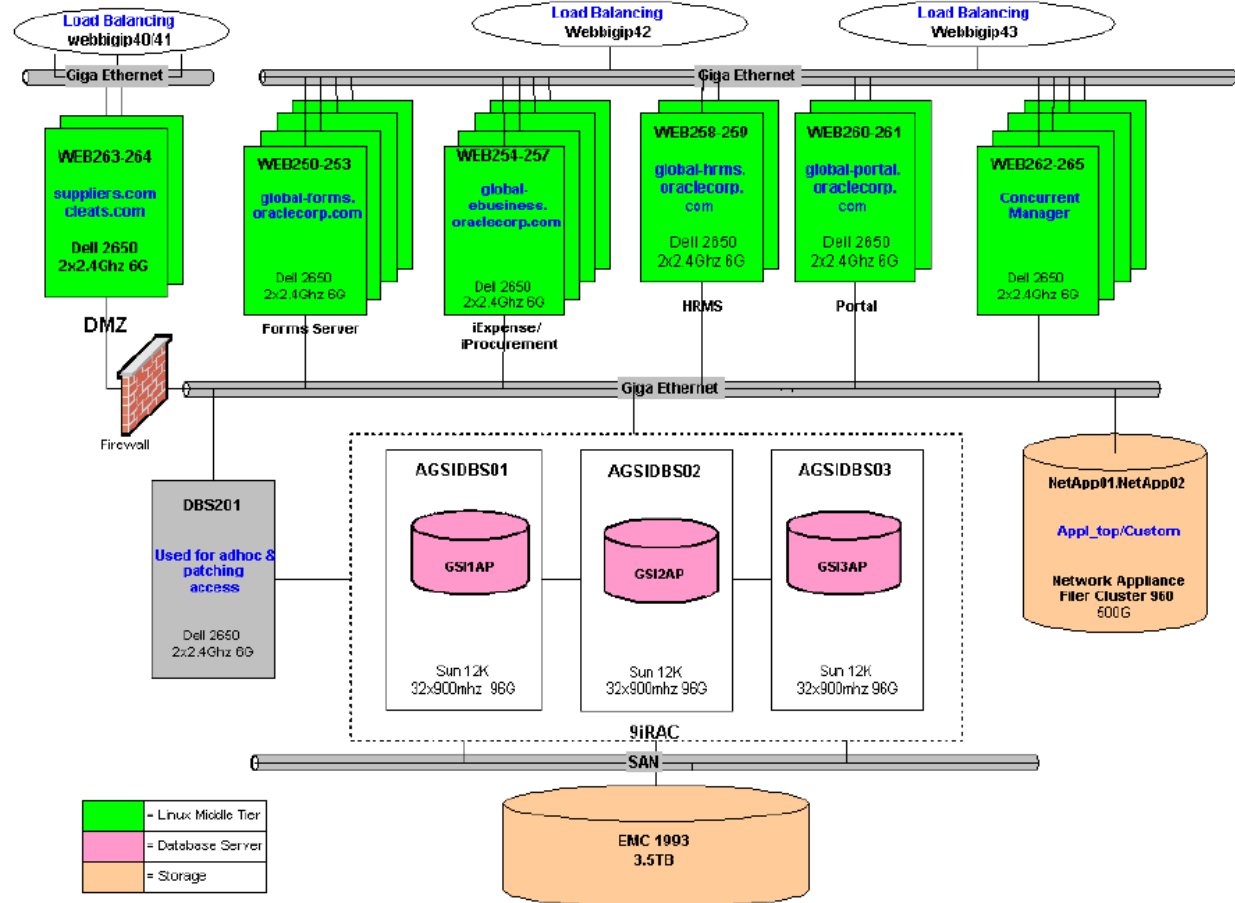
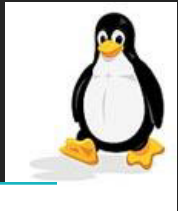
Higher Availability



- Automatic re-routing in case of server failure
- Easy replacement due to centralized storage for APPL_TOP and 9iAS server code tree
- Impact of server failure is less than a single large middle tier server



Implementation Architectures





Red Hat Benchmark



User Count	Average Response Time	90th Percentile Response Time
3472 users	1.17 s	1.27 s

Application Tier	Database Tier	Database Storage
1 x IBM @server pSeries 680 Each with: CPU: 24 x PowerPC_RS64III at 600 MHz, L1 Data Cache = 128 KB/CPU L1 Instruction Cache = 128 KB/CPU L2 Cache = 16 MB/CPU Memory: 96GB OS: AIX 4.3.3 Disk Controllers: 4 Wide/Ultra-3 SCSI I/O Controllers Disks: 4 18G SSA Disks in IBM 7133 Disk System Network Type: 2 100 base T Ethernet	1 x IBM @server xSeries 440 With: CPU: 5 x Intel Xeon MP at 1.6GHz, L1 Cache: 8 KB/CPU L2 Cache: 256 KB/CPU, L3 Cache: 1MB/CPU, L4 Cache: 64 MB system total Memory: 32GB OS: RedHat Linux Advanced Server 2.1 Disk Controllers: 1 x ServeRAID controller with 4 Ultra160 SCSI channels + 2 integrated Ultra160 SCSI controllers Disks: 2 x 18G Ultra160 SCSI Internal Disks	4 IBM EXP300 External Disk Enclosures With: 48 x 18G Ultra160 SCSI Disks



SuSE Linux Benchmark



User Count	Average Response Time	90th Percentile Response Time
2072 users	0.79 s	1.42 s

Application Tier	Database Tier	Database Storage
5 x ProLiant DL580 Each with: CPU: 4 x Intel Pentium III Xeon at 700MHz, 2MB cache Memory: 16GB OS: SuSE Linux 7.0 Disks: 4 x Ultra3 SCSI 18.2GB	1 x ProLiant DL580 with: CPU: 4 x Intel Pentium III Xeon at 900MHz, 2MB cache Memory: 16GB OS: SuSE Linux 7.2 Disks: 4 x 9.1 GB Ultra2 SCSI	Smart Array Cluster Storage (data) with: Disks: 14 x Ultra3 SCSI 15K 18.2GB StorageWorks 4314R (logs) with: Disks: 14 x Ultra3 SCSI 15K 18.2GB



Oracle 9iRAC Features



9iRAC features that enhance database scalability:

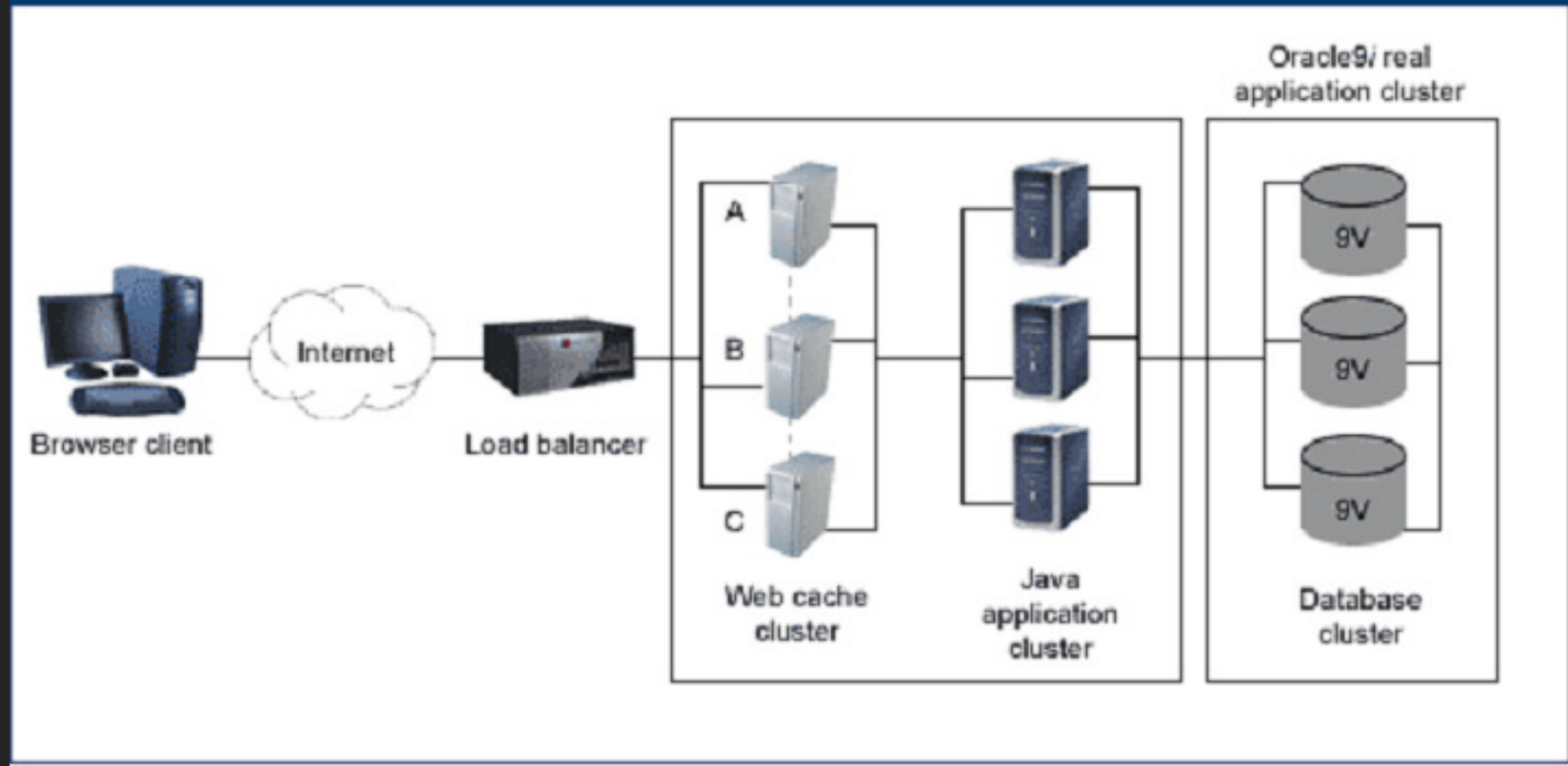
- Dynamic Cluster configuration
- Transparent Application Failover
- Linear scalability when adding nodes by enabling cache fusion.
- Oracle Cluster File System



Oracle 9i RAC Architecture

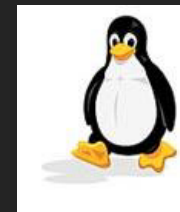


The Oracle9i RAC architecture





Implementation Insights



- Installation of Oracle Applications release 11*i* requires 1.3 GB of temporary disk space for Linux Intel.
- An additional RDBMS patch for bug # 1763407 also needs to be applied to the 8.1.7 ORACLE_HOME directory for Linux Intel.
- If the existing implementation contains modification to Oracle Forms or the Oracle Forms6i executables contains user-exits, port the executables, and regenerate the .fmb files. The Oracle Forms6i executable will need to be relinked on Linux.



Implementation Insights



- For SuSE 7.0 sites, upgrade the kernel to 2.2.19
- Oracle Applications release 11i for Linux Intel requires the installation of Open Motif Version 2.1.
- Open Motif 2.1 is required on the nodes where concurrent processing server, forms server and HTTP server are installed.



Implementation Insights



- Linux operating system uses dynamic libraries as part of the relinking and execution process. To ensure that your system's dynamic linker is able to find the proper Oracle Server dynamic libraries when relinking or running Oracle Applications executables, the value for LD_LIBRARY_PATH should be set appropriately in the \$APPL_TOP/admin/adovars.env file, and the 8.0.6 \$ORACLE_HOME/<sid>.env file
- The Java 2 Software Development Kit (J2SDK) version 1.3.1 must be installed on the HTTP server node before starting the Rapid Install. For Red Hat Linux, then when the Rapid Install Wizard prompts you for the "External JDK" location, you must change the default value to /usr/local/java/jdk1.3.1.



Implementation Insights



- CyberCash MCK is currently not supported on Linux Intel SuSE 7.0 for Oracle iPayment implementations
- ERROR: APP-FND-01372: Please register system printer 'lp' with application object library Cause: Some Linux distributions set the PRINTER environment variable to a value such as lp for all users by default.
- Apart from the Linux OS Patches to be applied, OS compatibility patches and gcc compiler patches among others.
- Korn-Shell has to be installed as an add-on rpm.
- For Linux Graphics environment (X Windows) has to be configured in order to get proper generation of graphs for Oracle BIS 11i modules.



Planning Steps



- Benchmark your installation with other sites
- Hardware architecture and sizing is important
- Decide on number of middle-tier servers
- Estimate for load balancing by module
- Customizations would influence migration approach
- Check all customizations and executables work
- Test the system for performance and functionality



Price - Performance



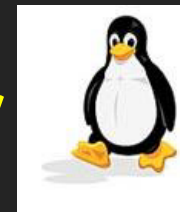
Platform	Number of CPU per box	CPU Speed	Physical memory	Average Response Time (sec)	List price
Linux/Intel	2	2.4 GHz	6 GB	1.3	\$8,860
RISC	2	750 MHz	8 GB	1.7	\$53,330

3 Times CPU, Faster performance and nearly 6 times cheaper

Source: Josie De Marco, Oracle Corporation



Savings with Linux Middle Tier



Hardware	#CPU	RAM	Qty	List Price
UNIX/RISC	20	20GB	3	\$2,400,000
Linux/Intel	2	6GB	18	\$210,700

Faster performance and nearly 11 times cheaper

Source: Oracle Single Global Instance data



For more information



- E-Business Suite on Linux:
<http://www.oracle.com/appsnet/technology/Linux.html>
- Oracle Makes Linux Unbreakable:
<http://www.oracle.com/events/unbreakablelinux/index.html>
- Unbreakable Linux Initiative:
http://partnercontent.oracle.com/home/product_ini/americas/english/linux/member_ini/index.html
- Linux Migration Center:
<http://www.redhat.com/solutions/migration>



Contact Information



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E-Mail Your Questions and we would try to
Address them at the earliest.

Our Best Wishes to you
For migrating to Linux!



Q & A

QUESTIONS
ANSWERS



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