Today’s economic environment

- business environment: complex, unpredictable, changing fast

- infrastructure environment: challenged to meet the business need for greater agility at lower cost

- business agility: requires a technology infrastructure that adapts to change, optimizes resources and responds immediately to business needs
“It’s not the strongest of the species that survives, nor the most intelligent, but the one that is the most responsive to change”

Charles Darwin
Key elements of the HP adaptive infrastructure

- **Intelligent fault resilience**
- **Built-in security and proactive self-management**
- **Application and data integrity**
- **Optimized for planned and unplanned downtime**

**Continuous operation**

**High availability**

**Fault resilient**

- **Application and data protection**
- **Continuous operation**
- **High availability**
- **Fault resilient**

- **Industry defining technologies**
- **Unifying standards**
- **Collaborative industry partnerships**
- **Scalable to your unique environment, evolving with your business**
- **Integrated with services and solutions**
Unifying standards

- Linux is the fastest growing platform, projected to grow 174% to US$5.9 billion to 2002 (IDC, April, 2002).

- 3,500 Independent software vendors are using Oracle Database on Linux.

- Oracle Database is the leading database on Linux (IDC, 2001).

- Over 650,000 downloads of Oracle on Linux (Oracle).
Linux market forecast.....growth!

CAGR (2002 - 2006)
- Services: 44.4%
- Servers: 34.2%
- Storage: 34.2%
- Clients: 27.8%
- Software: 44.4%
Key elements of the HP adaptive infrastructure

- Continuous operation
- High availability
- Fault resilient

Application and data protection

- Multiple data centers
- Data center/multiple systems
- Single systems

Industry defining technologies
Unifying standards
Collaborative industry partnerships
Scalable to your unique environment, evolving with your business
Integrated with services and solutions
Oracle9i RAC features

- breakthrough ‘scale-out’ cluster performance (2 to 6 parallel processing nodes)
- transparent application scalability and integrated load balancing
- on line recovery from node failure and transparent client migration
- breaks thru the cache/memory/user limits of Windows and Linux
- Red Hat AS and SuSE OS support directly from Oracle
- Oracle delivers own CFS for Windows and Linux
Oracle9i RAC – shared storage architecture

server 1
Oracle 9i RAC instance 1, 2, 3...
DB cache
Oracle clusterware
operating System

server 2
Oracle 9i RAC instance 3, 4, 5...
DB cache
Oracle clusterware
operating system

public network

cluster interconnect

cache to cache

shared storage

more nodes = higher availability

concurrent access from every node = “scale out”

redo log instance 1 ... redo log instance 3 ...
control files
database files
HP is the number 1 in the storage market:

Over 2000PB shipped in 2001*

- #1 in disk storage systems
- #1 in external storage systems
- #1 in tape drives and automation
- #1 in storage area networks
- #1 in virtualization technology

Over 50% of Oracle sites use HP storage

Wide range of Storage solutions

- MSA1000
  - Low cost fibre channel storage
  - Excellent performance – benchmarks
  - Supports redundancy (Secure Path)

- Enterprise Virtual Arrays (EVA)
  - Full featured (virtualized) storage
  - Easy to manage
  - Priced lower than EMC Symmetrix

- VA (IA64)
  - Full featured (virtualized) storage
  - Easy to manage

* Source: UC Berkeley Report – “How Much Information”
1PB = 1000 TB
Storage solutions for Linux and Oracle

• features and benefits:
  – developed and supported by Oracle
  – simplifies storage and Oracle management
    • file level backup
    • no limitation on number of devices
  – minimal performance impact
  – available for Windows and Linux
  – Supported by Oracle

• limitations:
  – Currently, only recommended for database files, not for Oracle Binaries
  – OCFS requires Red Hat Errata 12 or higher
  – Currently OCFS doesn’t support Asynch_IO, will be supported in 1.0-9
OpenSSI project

- **Single System Image for Linux**
- Based on the OpenVMS and TruCluster technology
- Gift from HP to the Linux Community
- Strongly supported and sponsored by HP
- Best Open Source Project 2002 by “LinuxWorld”
- The OpenSSI code is released under the GNU General Public Licence
- Release 0.9.6 available for RedHat 8.0 or kernel 2.4.18
HP contributes to Red Hat performance

- Red Hat Advanced Server includes functionality developed with HP and Oracle
  - very large memory support
  - modifiable process map base address
  - 64-bit DMA for HP storage controllers
  - SMP performance improvements
  - Bounce buffer elimination for 64-bit DMA
  - Red Hat async I/O improvements
Leading Price Performance
138,362 tpmC @$17.21/tpmC

• **Hardware**
  – 8 HP ProLiant DL580 Servers
    • each 4P 900Mhz 2MB cache
  – 32 total processors
  – 992 18GB Disks - 17 Terabytes of Storage
  – 128GB of memory
  – 32 HP FCA 2214 Fibre Channel HBA’s
  – 16 HP NC7770 Gigabit NIC’s

• **Software**
  Red Hat Advanced Server 2.1
  Used unmodified Red Hat kernel
  Oracle 9i Enterprise Edition Release 2 with Real Application Clusters and Partitioning Options
  Tuxedo 8.0 transaction monitor
<table>
<thead>
<tr>
<th>Company</th>
<th>System</th>
<th>User Count</th>
<th>Average Response Time (s)</th>
<th>Benchmark Version</th>
<th>Date Submitted</th>
<th>Disclosure Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>HP Proliant DL580 G2</td>
<td>7504</td>
<td>1.19</td>
<td>11.5.6</td>
<td>06-23-03</td>
<td>Detailed Report</td>
</tr>
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<td>Fujitsu Siemens</td>
<td>PRIMEPOWER 850</td>
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<td>1.073</td>
<td>11.5.6</td>
<td>11-07-02</td>
<td>Detailed Report</td>
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<td>IBM</td>
<td>E server xSeries x440</td>
<td>5656</td>
<td>0.49</td>
<td>11.5.6</td>
<td>06-02-03</td>
<td>Detailed Report</td>
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<tr>
<td>Sun Microsystems</td>
<td>Sun Fire V880</td>
<td>5208</td>
<td>1.16</td>
<td>11.5.6</td>
<td>12-13-02</td>
<td>Detailed Report</td>
</tr>
</tbody>
</table>

We don’t just want to tell you, we want to show you! Oracle ETC, Reading UK

4 node 9i RAC cluster on hp Proliant Servers
12 Application Servers
42 Load generator servers simulating up to 8000 Users
• Clear market leadership and industry standard innovation
  – First Oracle9i RAC Linux TPC-C benchmark
  – First Oracle9i RAC W2K TPC-C benchmark
  – First Oracle9i IPF2 TPC-C benchmark
  – First Oracle Applications Standard Benchmark on Intel architecture
  – Greater than 50% market share of Oracle cluster installs
Customer Expectations

• Cost savings

• Complete Linux solutions: recommended, assembled, delivered and supported

• Sage advice – leverage IT provider knowledge and expertise (OS unbiased)

• Linux Services: porting, education, project/transition management, operational and break/fix support

• Ease of acquisition

• Responsiveness

“A UNIX-like experience at less than NT prices”
PDC implementation options

‘do-it-yourself’ PDC cluster kit options

- range of supported servers: 2, 4, and 8 way
- 2 to 6 nodes supported
- MSA1000 or EVA storage in full SAN configurations
- available on Windows and Linux
- available direct from HP or through HP resellers

‘pre-installed’ PDC ready to run solutions

- MSA1000 based solutions
- HP installation options
  - hw rack and cable only
  - OS & Oracle RAC loaded
  - at factory or on-site
- Windows or Linux

New

custom solutions from HP global service

for other RAC options and solutions contact HP service
- ProLiant with EMC RAC
- PDC with PolyServe
- etc.
‘do-it-yourself’ PDC Cluster Kits for Windows or Linux

- The PDC Administrator Guide includes:
  - detailed installation instructions,
  - cluster expansion, nodes and storage
  - PDC customization for end user database
- The PDC Installation Test Tool automates verification of:
  - inter-cluster communication
  - storage view consistency
  - hardware and software version comparison
  - Oracle services and environment variable validation
- The PDC scripted install software (for Linux only) automates:
  - OS installation and configuration
  - Hardware configuration
  - Oracle installation through sample database install
- 2 x Secure Path licenses
- Phone support from PDC Support Specialists
Why Parallel Database Cluster Kits

**Linux Kit:**
- Installation scripts eliminate human errors
  - Installs OS
  - Sets up shared memory parameters
  - Sets up NICs and HBAs
  - Sets up high availability features
  - Sets up shared storage
  - Sets up OCFS or raw devices
  - Verifies cluster connectivity
  - Installs Oracle 9i RAC
  - Installs Oracle patches
  - Database creation
  - Validation or functional cluster
- Kit owners entitled to PDC Support escalation

**Windows Kit:**
- Detailed Administrator Guide includes add-a-node and add-storage processes
- Includes two Secure Path licenses
- Includes PDC Installation Test Tool that validates:
  - key hardware and software versions and compatibility
  - OS configuration for networking etc
  - Oracle cluster configuration
  - consistent inter-cluster communication
  - common storage view across all nodes of the cluster
  - final cluster validation scripts ensure proper RAC functionality
- Kit owners entitled to PDC Support escalation
‘pre-installed’ PDC for Linux or Windows

- MSA1000 based solutions on Windows or Linux (not available in all areas)

- choose the level of integration right for you
  - factory direct hardware bundles
    - simplified configuration and ordering
    - all options installed, hardware racked and cabled
  - fully installed solutions thru HP integration partner
    - complete hardware installation and burn in
    - OS and Oracle RAC loaded and ready to run
  - on-site custom integration by HP Consulting and integration
    - customized hw sw and integration services plus:
      - optional custom database configuration and tuning
      - optional RAC training

- backed by PDC Support specialists
‘custom’ solutions for RAC

- optional RAC solutions for customers with specific requirements beyond the PDC offerings
  - HP components backed by HP Support
  - Cooperative Support Agreement with Oracle
  - implemented by HP Consulting and Integration Services

- ProLiant with EMC
- PDC with PolyServe cluster file system
- ProLiant with United Linux

- For more information see HP.com or e-mail RAC_Contact@HP.com
Investing in Linux skills ....

- HP trains its consulting team, Oracle people and partners to 9iRAC and Linux

- Training covering:
  - Hardware setup
  - Linux Installation and setting
  - Oracle 9.2 RAC installation
  - Database creation
  - OEM installation
  - Linux tuning

- 160 trained people this year. Goal > 500.
Joint HP/Oracle Support

Simpler, faster problem resolution keeps your business on-line and your staff on-schedule

**Reactive**

CTSA - Call either HP or Oracle for any interoperability problem

**Proactive**

JSS - HP and Oracle provide coordinated assessments and optimization

Together, we solve customers problems.
These customers chose HP ProLiant Server Solutions for Oracle Database and Real Application Clusters.
Key elements of the HP adaptive infrastructure

- Intelligent fault resilience
- Built-in security and proactive self-management
- Application and data integrity
- Optimized for planned and unplanned downtime

Industry defining technologies
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Intel® Itanium® architecture

- Leader in RISC and UNIX systems
- Advanced PA-RISC designs and compilers

- Creator of the world's most pervasive computing technology
- Leadership in high volume semiconductor process

• Breakthrough performance
  - Next generation beyond RISC
  - Advanced compiler technology

• Tens of thousands of applications
  - Fully binary compatible with Intel x86 and PA-RISC
  - Supports applications for the next century

• Enterprise Systems
  - Handhelds to supercomputers
  - Extensive middleware
#1 4-way performance!
HP Server rx5670 with next generation Itanium 2 processors and 64-bit Windows tops all other 4-way and 8-way servers!

<table>
<thead>
<tr>
<th>OLTP tpmC with Windows</th>
<th>OLTP tpmC with Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4-way</strong></td>
<td><strong>4-way</strong></td>
</tr>
<tr>
<td>HP rx5670 Itanium 2 1.5GHZ</td>
<td>80,494 $5.30/tpmc</td>
</tr>
<tr>
<td>IBM x440 Xeon MP 2GHz</td>
<td>SUN</td>
</tr>
<tr>
<td>Unisys ES700 Xeon MP 2GHz</td>
<td>Dell</td>
</tr>
<tr>
<td>RackSaver QX-64 Opteron 1.8GHz</td>
<td>IBM</td>
</tr>
<tr>
<td>Dell PE6600 Xeon MP 2GHz</td>
<td><strong>82,226 $2.76/tpmc with SQL</strong></td>
</tr>
<tr>
<td><strong>119,115 $6.56/tpmc</strong></td>
<td><strong>118,381 $5.56/tpmc</strong></td>
</tr>
<tr>
<td><strong>1.47x</strong></td>
<td><strong>1.55x</strong></td>
</tr>
<tr>
<td><strong>101,065 $4.97/tpmc</strong></td>
<td></td>
</tr>
<tr>
<td><strong>with SQL</strong></td>
<td></td>
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<tr>
<td><strong>82,226 $2.76/tpmc with SQL</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>with Linux</strong></td>
<td></td>
</tr>
</tbody>
</table>

IBM withdrew their x440 4-way results
Intel Itanium 2–based systems address the growing customer application demand to run applications faster than IA-32 and more cost effectively than RISC through more than just 64-bits and fast floating point.

<table>
<thead>
<tr>
<th></th>
<th>typical IA-32 system</th>
<th>typical RISC system</th>
<th>Itanium 2–based hp system</th>
</tr>
</thead>
<tbody>
<tr>
<td>system bandwidth</td>
<td>1–3 GB/s</td>
<td>2–4 GB/s</td>
<td>6.4 GB/s</td>
</tr>
<tr>
<td>I/O bandwidth</td>
<td>1 GB/s</td>
<td>2–GB/s</td>
<td>4 GB/s</td>
</tr>
<tr>
<td>on-chip resources</td>
<td>8 general registers</td>
<td>32 general registers</td>
<td>128 general registers</td>
</tr>
<tr>
<td>parallel execution</td>
<td>1 instruction per cycle</td>
<td>2–4 instructions per cycle</td>
<td>6 instructions per cycle</td>
</tr>
</tbody>
</table>

benefits:
- faster OLTP
- quicker Web serving
- faster secure transactions
- better Java object code performance
Oracle DB on Itanium2 – status

- HP-UX
  - Developer release Oracle8i R2 available since Feb 2001
  - Developer release Oracle9i R1 available since Feb 2002
    - Oracle 9i R2 production released for HP-UX February 2003

- Linux - RedHat Advanced Server 2.1
  - Second developer release available since mid Jan 2003
    - Oracle 9i R2 production released for Linux March 2003

- Windows 2003 (64bit)
  - Oracle 9i R2 developer release available since Oct 2002
  - Oracle 9i R2 production April 28th 2003
Migration to Oracle 9i on Itanium®2 Processor

• Migration from HP PA-RISC (check the release notes)
  – no export and import required

• Migrating from a 32-Bit System Linux
  – no export and import required

• Migrating from a 32-Bit System Windows
  – no export and import required

• Migrating from a Proprietary RISC Based System
  – export – import
How to migrate Oracle DB from Linux IA-32 to Itanium®2 on Linux

- Only migrations from Oracle 9.2.0.2 on Linux IA-32 will be supported. Pre Oracle 9i versions have to be migrated before to Oracle 9i.

- Simple migration steps:
  - Shutdown database
  - Install new binaries on Itanium server
  - Copy your existing configuration files to the new ORACLE_HOME
  - Copy database files from IA-32 server to the Itanium2 server or plug your external storage on the new Itanium server
  - Re-create control file (a single SQL statement)
    SQL> ALTER DATABASE BACKUP CONTROLFILE TO TRACE;
  - Startup database on the Itanium2 server
  - Re-compile existing PL/SQL and change the word size
    SQL> @utlirp.sql;
  - Re-compile Java (a single SQL script)
    SQL > create or replace java system;
  - Done!
Our commitment to you

• HP is committed to open standard solutions, increasing your Return on IT
  – IA-32 and IPF platforms
  – Comprehensive storage, management and service solutions

• HP and Oracle are committed to your success with Linux
  – HP is the only platform partner to certify every Oracle cluster version since ’97 (beginning with OPS)
  – consistently broadest offering with 2, 4 & 8 way server options and SAN storage
  – extensive documentation and specialized installation tools
  – experienced field support personnel and specialized installation services
  – one call cluster support for a complete hp solution
  – Supporting benchmarks and customer wins
Call to Action

• For more information on the hp & Oracle Alliance: http://www.hp.com/solutions1/oracle/

• For more details on ETC including booking details http://etc.oracle.com/

• For more technical information email : OracleCTC@hp.com

• For general information email : OracleEMEA@hp.com
Questions & Answers