PayPal: Real-Time OLTP

### Benefits

<table>
<thead>
<tr>
<th>Faster Applications</th>
<th>Reduced Risk Exposure</th>
<th>Maximum Availability</th>
<th>Increased Payment Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>10x Faster Overall</td>
<td>99.99% Analysis</td>
<td>99.99%</td>
<td>200% Increase</td>
</tr>
</tbody>
</table>

“*We chose Oracle Exadata to help keep us nimble by delivering a response time of less than 100ms over petabytes of data.*”
- Sehmuz Bayhan, CTO PayPal

### Objectives

- Analyze 100% of payments for risk in < 100 milliseconds
- 99.999% uptime
- 2x increase in transaction volume

### Solution

- 3 Pods, each with two X2-8’s plus two X2 Storage Expansion Racks, and Active Data Guard to identical standby configuration

### Diagram

- **2x Exadata X2-8**
  - 2x Storage Expansion
  - Production (Primary Data Center)

- **2x Exadata X2-8**
  - 2x Storage Expansion
  - Standby (DR Data Center)

  - **Active Data Guard**
  - **WAN @ 650+ miles (30 ms)**

  - **300,000+ executions per second**
  - **40 ms (avg) response times (99.99%)**

- 24 Exadata Systems in total, across 3 “pods”
- 120 TB database X 3 = 360 TB total
**VocaLink: OLTP Performance**

**Benefits**

- Fast and Scalable Performance
- Zero Unplanned Downtime
- More Capacity
- Zero Data Loss DR Protection

“*Our critical electronic payments service has been live on Exadata since early 2011 with 100% uptime. The service reliably processes the transfer of billions of Euros per week and achieves subsecond response times for online enquires.*” - Martin McGeough, Database Technical Architect

**Objectives**

- Enable real-time enquiries against transaction data
- Process 20 million financial transactions/day
- Sub-second response time
- Zero data loss DR protection

**Solution**

- Two Quarter-rack Exadata V2 systems - Oracle Maximum Availability Architecture

**Pre-Exadata**

- 4 ProdServers, 2 SANs

**Exadata V2**

- Quarter Rack

**Exadata V2**

- Quarter Rack

- Performance boost with no application change using Exadata Smart Flash Cache and Smart Scan

**Benefits**

- Zero Unplanned Downtime
- Zero Data Loss DR Protection

- More Capacity
- Sub-second response time
- Zero data loss DR protection

- Electronic Payment System
- Mixed workload, high volume OLTP and batch processing

**2011**

- Active Data Guard
- Synchronous Zero Data Loss

- Zero RPO, 15 minute RTO
- Auto block repair
- Standby-first maintenance

---

“Electronic Payment System • Mixed workload, high volume OLTP and batch processing” - Martin McGeough, Database Technical Architect
Southwestern Energy: EBS, Hyperion and Consolidation

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Reduced TCO</th>
<th>Reduced Patching Costs</th>
<th>Scality 100% Growth / year</th>
<th>Data Center Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Users recognize the benefits of Exadata’s performance and how it allows faster and more thorough transformational analysis. We’ve consolidated 40 plus databases with requests to consolidate more.” - Brad Salva, Manager Database Team</td>
<td>50%</td>
<td>70% Savings Single Patch Platinum Services</td>
<td></td>
<td>Free up 2/3 of Data Center with 3:1 Consolidation</td>
</tr>
</tbody>
</table>

**Objectives**
- Implement scalable systems
- Streamline and standardize business processes
- Increase the productivity of business analysis
- Enable improved compliance

**Solution**
- 2010: qtr rack V2
- 2010: qtr rack X2-2
- 2011: qtr rack X2-2 upgrade
- 2013: half rack X3-2 upgrade

<table>
<thead>
<tr>
<th>Exadata Competition</th>
<th>Exadata X3-2/X2-2 Production / Dev/Test</th>
<th>Exadata X2-2/V2 Disaster Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ rack X3-2 2013</td>
<td>¼ rack X2-2 2011</td>
<td>¼ rack X2-2 2010</td>
</tr>
<tr>
<td>Storage Arrays</td>
<td>40+ Databases consolidated</td>
<td>DR: ½ rack V2 + X2-2</td>
</tr>
<tr>
<td>X64 &amp; storage arrays</td>
<td>E-Business Suite</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OBIEE, Hyperion, P2Es Energy Upstream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Guard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WAN @ 450 miles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automatic Service Requests</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oracle Platinum Services</td>
<td></td>
</tr>
</tbody>
</table>
Objectives

- Real-time processing and monitoring of all cargo and every passenger crossing the US border
- Shrink data center costs

Solution

- 2010: Implement V2, X2-2
- 2011: Add X2-2, X2-8
- 2012: Add X2-8, Exalogic

Benefits

- Faster Applications
  - 10X speedup
- Storage Savings
  - 1 Petabyte
- Maximum Availability
  - 99.95%
- Cost Savings
  - 75% Cost Reduction

“Oracle Exadata has changed our strategic IT focus from building systems to developing and supporting services.”
- Ken Ritchhart, Deputy Assistant Commissioner

Exadata V2
Primary/Standby

Exadata X2-2
Primary /Standby

Exadata X2-8
Primary/Standby

Automated Targeting Systems

Automated Export Systems

Passenger & Cargo Systems

Enterprise Data Warehouse

Storage Savings
32 billion queries/day

Replaced $$ SAN

Data Guard

2010

2010 - 2011

2011 - 2012
Oracle Beehive: Collaboration

**Objectives**
- Company-wide collaboration for > 100K users
- CPU/ storage growth 3+ years
- Improved response times
- Guarantee uptime

**Solution**
- 2009: Move Beehive storage to Exadata V1 storage
- 2011: Migrate to Exadata X2-2

**Benefits**
- Faster Response: 5x – 60x
- 100% Uptime

"Beehive is our largest application in-house. It is Oracle's largest backend database."
- Campbell Webb, Vice-President IT, Oracle

**Exadata V1 Storage Servers**
- 96 V1 storage servers
- Post-Sun acquisition, CPU and disk oversubscribed

**Exadata X2-2 Production**
- Austin (Texas) Data Center
- 9 full-rack X2-2
- 2.3 Petabytes raw disk
- 48 TB flash
- > 5,000 peak TPS

**Exadata X2-2 Standby**
- Utah Data Center
- 9 full-rack X2-2
- Triple mirroring
- Disk backups/flashback enabled
- 100% uptime since go-live
Turkcell: DW and DB Consolidation

Objectives

- Speed up BI
- Lean, green data center
- Prepare for big data growth

Solution

- 2010: Replace 11 racks with 1 full-rack Exadata V2 for DW
- 2011: Add 2 full-rack Exadata X2-2s for DB consolidation

Benefits

- Faster Reports: 10X
  - 27 min to 3 min (avg for 50k rpts)

- Storage Savings: 900 TB
  - 1,000 TB to 100 TB

- Reduced Admin: 20%

Data Center Cost Savings

- 80% Less Power
- 30 m² Less Space

“In a word, Oracle Exadata is fantastic. Almost no report takes more than 10 minutes to run, versus hours before. It sounds unreal, but it’s real.”

- Power User, Finance Department, Turkcell

Pre-Exadata Data Warehouse

- Hitachi USP-V 5 Racks
- EMC DMX-4 5 Racks
- 250 TB Raw Data

Exadata V2 Data Warehouse

- 25 TB Compressed

2 Exadata X2-2 Prod

- 2 Prod Databases
  - 600 TB Raw / 60 TB Compressed
  - 16-node RAC Cluster

Original V2 Prod/DR/Dev

- 4 Prod, 2 Test Databases
  - 400 TB Raw / 40 TB Compressed
  - 2 RAC Clusters

Backup

Restore

Raw Data

Compressed

2010

2011

2011

2010

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SK Telecom: Revenue Assurance DW

**Benefits**

- Oracle Exadata Database Machine has overwhelmingly superior performance, with average data processing rates 8 to 20 times greater than other SK Telecom in-house systems.”
- Jin-hyung Lee, Manager, Network Engineering Department, SK Telecom

**Business Objectives**

- Ensure billing accuracy
- Enhance customer service
- Predict data traffic trends

**Solution**

- 2009: Create new DW on Exadata
- 2010: Move to full-rack Exadata V2
- 2011: Add full-rack Exadata X2-2
- 2012: Clustered 3 full racks

**Extreme Capacity**

- 18+ TB/day

**Storage Savings**

- 1620 TB

**Capture Lost Revenue**

- $ Millions

- 1800 TB to 180 TB

---

**Exadata V1 Data Warehouse (2009)**

- Billing Analysis System

**Exadata V2 Data Warehouse**

- Billing Analysis System
- Usage & Roaming Inquiries

**Exadata V2+ two X2-2 Data Warehouse**

- Raw Data 1800 TB
- Compressed to 180 TB
- DB size: 350 TB with indices
- 24-node RAC, 42 Exadata Cells

**Exadata X2-2 Qtr Rack (2010)**

- Spam Filtering
Organic Food Retailer: OLTP Consolidation

**Benefits**

- Faster Applications: Up to 20X
- Uniform HA/DR
- Simplified Support
- Data Center Cost Savings

“One number for me to call; no more forwarding phone calls and email between vendors when we are digging into an issue.”
- DBA Team Leader

**Objectives**

- Consolidate all OLTP databases to simplify and standardize management and reduce costs
- One vendor to call for support

**Solution**

- 2011: Consolidate 14 servers onto two Qtr-rack Exadata X2-2

**Pre-Exadata**

- 14 Legacy Servers
- 3 O/S Versions
- 18 Oracle Databases
- 5 Oracle DB Versions
- 12 Application Teams

**Exadata X2-2 DB Consolidation**

- PeopleSoft HR
- Ordering
- Timekeeping
- Decision Support
- Many other applications

**Exadata X2-2 Dev/Test**

- Data Guard
- Data Guard
P&G: DW and Mixed Workload

### Objectives
- Improve stability and supportability
- Lower costs
- Boost performance

### Solution
- 2010: Implement 1st DW on V2
- 2011: Move 2nd DW to X2-2, Move OLTP/Analytics to X2-2
- 2012: Move 3rd DW to X2-8
- 2013: Add X3-2

### Benefits

<table>
<thead>
<tr>
<th>Faster Applications</th>
<th>Storage Savings</th>
<th>Simplified Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 30X</td>
<td>3x – 10x</td>
<td>Compression</td>
</tr>
</tbody>
</table>

“Performance with Exadata is much better, and getting an out-of-the-box solution dramatically reduced the time and money to build and maintain our DW platform.”

- Brian Beckman, DW Platform Manager, Procter & Gamble

### Exadata V2
- Data Warehouse
  - Prod
  - Non-Prod

### Exadata X2-2
- Data Warehouse
  - Prod
  - DR
  - Dev
  - UAT

### Exadata X2-8
- Data Warehouse
  - Prod
  - Non-Prod

### Exadata X2-2
- OLTP/Analytics
  - Prod
  - Non-Prod

- Trade/Mkt/POS Data
- Shipments Data
- Fin’l/Planning Data
- Trade Fund Management
**Alpha Natural Resources: OLTP**

### Objectives
- Reduce cost and complexity
- Deploy Oracle E-Business Suite quickly
- Dramatically improve performance and availability

### Solution
- X2-2 for production E-Bus Suite
- X2-2 for Standby DR and test/QA
- Database Appliance for testing

### Benefits

<table>
<thead>
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<th>Faster Applications</th>
<th>Reduced TCO</th>
<th>Maximum Availability</th>
<th>Data Center Cost Savings</th>
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</thead>
<tbody>
<tr>
<td>5X+ Speedup</td>
<td>50%</td>
<td>99.95%</td>
<td></td>
</tr>
</tbody>
</table>

"Oracle Exadata has enabled us to deliver exceptional service to our business users while reducing the cost involved. Exadata has been a big win for our business and for IT."
- Saul Hernandez, CIO

---

Pre-Exadata (Hosted)  
- IBM x86 Servers  
- 3 O/S Versions  

Exadata X2-2 DB Consolidation  
- Production  
- E-Business Suite  

Oracle Database Appliance Dev/Test  
- Disaster Protection  
- Test and QA  

---

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Garmin: OLTP Consolidation

**Objectives**
- Support 400% growth in customer facing applications
- Eliminate bottlenecks in Manufacturing and Planning
- Consolidate to reduce costs

**Solution**
- 2012: Consolidate 12 servers onto two Half-rack Exadata V2
- 2012: Add two Half-rack X2-2 systems, two Qtr-rack storage expansion

**Benefits**
- Up to 11X Faster Month End Reports
- 99.95% Uptime
- 4x Growth
- Data Center Cost Savings

“Consolidation on Exadata reduced costs and eliminated critical performance bottlenecks in our Manufacturing and Planning systems”
- Ed Link, Vice-President IT, Garmin

**Pre-Exadata 12 Prod Servers**
- Oracle E-Business Suite
- Advanced Supply-Chain Planning
- Hyperion Reporting
- Garmin Connect custom app

**Exadata X2-2 2012**
- Garmin Connect
- Half-rack Exadata
- Qtr-rack Storage Expansion

**Exadata X2-2 2012**
- Dev/Test/Local Standby
- EBS, ASCP, Hyperion DB Consolidation

**Data Guard**
- Exadata V2 DB Consolidation
- Data Guard
- High-Capacity Exadata Storage Servers
- Archived Data
- Exadata V2 Dev/Test/Local Standby
**Lion: SAP on Exadata and Consolidation**

### Benefits

<table>
<thead>
<tr>
<th>Faster Application</th>
<th>Storage Savings</th>
<th>Operation Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. up to 100x</td>
<td>SAP FI: 2x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teradata: Over 5x</td>
<td></td>
</tr>
<tr>
<td>Avg. up to 20x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

“Exadata has always high performance. Data Compression is also wonderful result. It is best consolidation database platform. Also, thanks to careful planning and verification, it was smooth without any major problems as a project.”

- Masatoshi Utsunomiya, Director, Integration system department, Lion

### Business Objectives

- Reduce TCO
- Improve Operation and Maintenance Cost
  - Standardize the environment

### Solution

- **2010: Project start Exadata V2 Quarter Rack**
- **2012: Software Upgrade X2-2**
  - SAP DB Consolidation

#### Mainframe Migration
- Sales/Logistics, Master Data Cost Mgmt, Sales Analytics
- Migrated Aug 2012

#### SAP Database Migration
- SAP FI (from Linux)
- Consolidate 3 systems
- Compress 1400 GB to 700 GB
- Migrated May 2012

#### Teradata DWH Migration
- Compress 320GB to 60GB
- Migrated Mar 2013

- Oracle Exadata Quarter Rack
- DWH used HCC, SAP used Advanced Compression
- Delete useless index of Teradata

---

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Univ. of Minnesota: DBaaS

Business Objectives

- Eliminate server proliferation
- Provide consistent service levels
- Free up redundant administrators
- Standardize roles and permissions

Solution

- Consolidate 40 DB servers onto 2 Exadata X2-2 Half-Racks
- Create a standard Schema-as-a-Service with 150+ schemas in 8 databases, serving all departments

Benefits

“"We consolidated dozens of database servers onto Exadata and freed up many of our admins for more strategic tasks. Standardizing our database services and configurations has yielded benefits across many dimensions."”
- Andy Wattenhofer, Database Administration Manager, University of Minnesota

Server Consolidation

- 40 servers → 2 Exadata

Reduced Administration

- 235 databases → 29
- 5 DBAs → 3

Standardized Configurations

- Security, Backup, HA/DR

Exadata X2-2 Half-Rack Prod

Exadata X2-2 Half-Rack Standby/Test

Data Guard

Data Center A1

Data Center B

NAS Storage
- Backups of DB
- Export dumps

Data Center A2
**CBA: DBaaS**

**Business Objectives**
- Cost Savings
- Rapid Provisioning
- Extreme Standardization

**Solution**
- Exadata for
  - Rapid, reliable deployments
  - Standardized environments

**Benefits**

<table>
<thead>
<tr>
<th>Benefits</th>
<th>OPEX</th>
<th>ROI</th>
<th>Rapid Provisioning</th>
<th>Simplified Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>“As the business seeks more services on demand, we needed to provide that resilient platform and Exadata provides us a consolidated platform for database services that can meet all those needs”</td>
<td>50~60% reduction</td>
<td>150% in 5 years</td>
<td>Months to Minutes</td>
<td>Two Oracle Homes</td>
</tr>
</tbody>
</table>

- Nicolas Tan, Head, Infrastructure and Platform Services

**ROI**

- 150% in 5 years

**Rapid Provisioning**

- Months to Minutes

**Simplified Management**

- Two Oracle Homes

**Enterprise servers configured by CBA**

**Commodity clusters configured by CBA**

**Commodity clusters configured by Oracle**
### Business Objectives

- Improve yield management by correlating data across fabs
- Reliability, availability, scalability
- Reduce support costs and improve serviceability
- Lower data center costs

### Solution

- **2013**: 2 x X3-8 Full Rack; X3-2 Half Rack; 2 x ZFS Storage

### Benefits

<table>
<thead>
<tr>
<th>Faster Applications</th>
<th>Data Center Cost Savings</th>
<th>Storage Savings</th>
<th>Reduced Admin Serviceability</th>
</tr>
</thead>
</table>
| • 10-15 x Faster Data Load  
• 5-50x Faster Queries | 5x Less Hardware  
80% Less Power | ~ 9 x Data Compression | 40% Savings  
Single Patch Platinum Services |

---

"Exadata transformed production data analysis. Exadata improved performance better than 5x and reduced costs by more that 50."
Deutsche Bank: Financial DW

**Business Objectives**
- Disclosure
- RWA (Basel I / II)
- EC / EL / GVA
- Daily Derivatives
- Many more

**Solution**
- Establish real-time credit risk, regulatory law, and internal management reporting to optimize credit risk analysis, as the ability to perform daily analyses of risk ratios is increasingly important

---

**Benefits**

- Extreme Usage: 1000s of users
- Storage Savings: 75% reduced electrical usage and costs

---

"With the implementation of Oracle Exadata Database Machine, data processing performance improved significantly, and the bank acquired the ability to analyze increasing data volume in much shorter cycles. In addition, compressing the data volume by 75% reduced electrical usage and costs."

- Marcus Prätzas, Head FDW, Deutsche Bank

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- Marcus Prätzas, Head FDW, Deutsche Bank
Starwood: DW and Mixed Workload

Business Objectives

- Improve application response time
- More current reports
- More responsive marketing

Solution

- 2011: X2-2 full rack for prod and DR
- 2013: full Storage Expansion Rack; 2 x ZFS Backup Appliance

Benefits

"14x performance improvements enable our field managers to take proactive actions not possible before. Reporting with ‘real time’ data is rapidly becoming the expectation at Starwood."

Gordon Light, Sr. Dir., Datawarehouse, Starwood

Pre-Exadata (2011)

- 2 servers @128 cpu each
- DR: RMAN to disk, NetBackup to tape
- 45 TB on 2 frames
- DB 10.2
- HA: RAC; DR SRDF

Exadata X2-2 Full Rack Production Dev/Test

- Apps: Loyalty program; marketing & revenue analytics
- DB 11.2

Exadata X2-2 Full Rack Disaster Recovery

- Offsite reporting
- RMAN to ZFS; ZFS-ZFS

Faster Reports

14X

Faster ETL

16 hours to 3

Simplified Support

Single Vendor

> 25% cost reduction

14x performance improvements enable our field managers to take proactive actions not possible before. Reporting with ‘real time’ data is rapidly becoming the expectation at Starwood.”

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Faster Reports

14X

Faster ETL

16 hours to 3

Simplified Support

Single Vendor

> 25% cost reduction
WestJet: Siebel on Exadata

Business Objectives

- Consolidate DBs
- Consistency of performance
- Availability, especially during rolling upgrades
- Time to market
- Lower data center costs

Solution

- 2013: 3 x X2-2s ¼ Rack

Benefits

- Faster Response: 19x – 260x
- Data Center Cost Savings: 18 servers → 2 Exadata
- Reduced Admin Serviceability: 70% Savings Single Patch Platinum Services
- Zero Unplanned Downtime

Pre-Exadata (2012)

- HP Unix (2) + 23+ x64 servers
- HP EVA Storage
- DB 11g R1

Exadata X2-2 DB Consolidation

- Siebel, OBIEE, Booking & Notification, + other
- DB 11g R2
- Consolidated 16 DBs
- 1/2 rack: ¼ staging and ¼ prod’n

Exadata X2-2 Active Data Guard

- DR: ¼ rack

Benefits

- "WestJet consolidated 16 databases while delivering exceptional and consistent performance to our online ticketing, customer rewards and loyalty programs. Performance is at least 19 times faster."
  - Kris Trzesicki, DBA, WestJet

Oracle Platinum Services

- Reduced Admin Serviceability: 70% Savings Single Patch Platinum Services
- Faster Response: 19x – 260x
- Data Center Cost Savings: 18 servers → 2 Exadata
- Zero Unplanned Downtime

HP EVA Storage

- HP Unix Servers
- 2012/13
- Dev/Test
- HP EVA Storage

Oracle Platinum Services

- Faster Response: 19x – 260x
- Data Center Cost Savings: 18 servers → 2 Exadata
- Zero Unplanned Downtime

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Ziraatbank: Core Banking System

Benefits

- Oracle Exadata enabled us to support more users with much better response time while at the same time improving uptime for our core banking OLTP system.” - Serdar Mutlu, Manager, Database Systems

Objectives

- Meet OLTP SLAs (99.95% availability, disk response time under 3ms, 25,000 users, 3,000 TPS)
- Zero Data Loss HA configuration
- Reduce overnight batch window from 8 hours to 3 hours
- Stable, available mixed workloads

Solution

- 2013 Q2: 2 x Half Racks, and 1 x Quarter Rack X3-2 for production
- 2013 Q3: 1 x Eighth Rack for test/dev

Smaller Batch Window

- 60% less time

Consolidation of Databases

- 40% fewer Admin tasks

System Utilization

- 70% to 30%

Zero Data Loss HA Protection

- Exadata X3-2 Half Rack
  - Finart Core Banking DB
  - 1,500 Branches
  - 5,000 ATMs
  - Internet Banking

- Asynchronous Active Data Guard

- Exadata X3-2 Half Rack
  - Finart ADG
  - T-1 Reporting
  - Disaster Recovery DBs

- Synchronous Active Data Guard

- X3-2 Quarter Rack
  - Finart ADG
  - Archive DBs, 8x compression
  - DWH Summary
  - Document Mgmt

- X3-2 Eighth Rack
  - Test
  - Development

Summary

- Document Mgmt

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