Future of Database
- Journey to the Cloud

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Safe Harbor Statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

Database Leadership

- Oracle has been and continues to be the database market and technology leader

- Because Oracle continuously delivers unique innovations that matter

- Oracle 12c has over 700 new enhancements
  - Many improve existing functionality
    - RAC, Data Guard, Analytics, Security, Optimizer, ASM, etc.

- This presentation focuses on transformational innovations
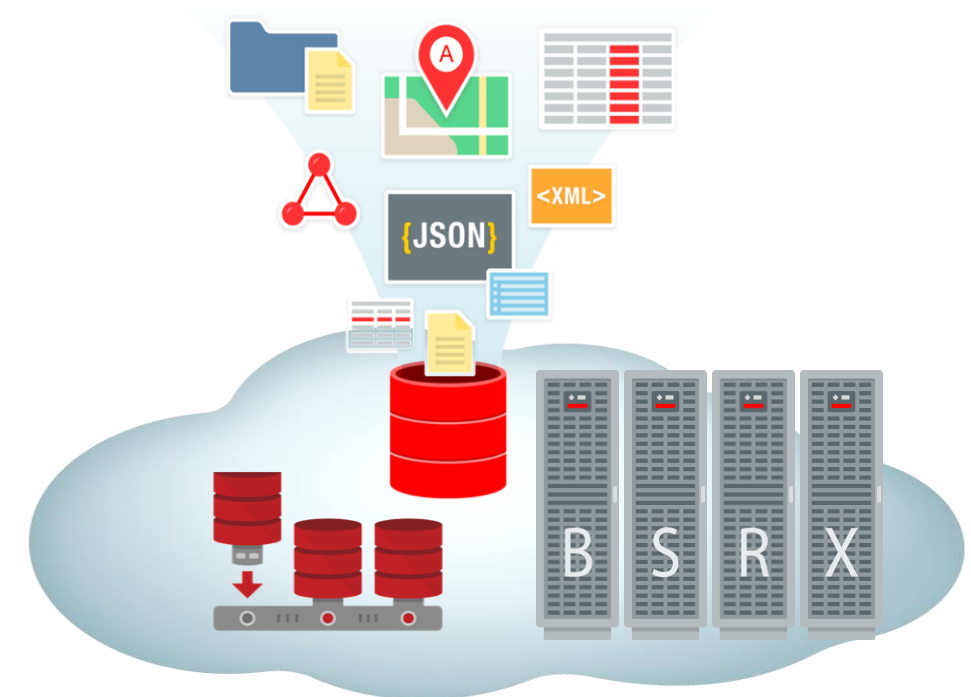
Oracle Continues to Have Largest **RDBMS** Market Share

More than Double Sales of Nearest Competitor

Oracle 45.6%

Microsoft, 19.1%

IBM, 15.7%

SAP, 9.6%

Teradata, 3.2%

Others, 6.8%

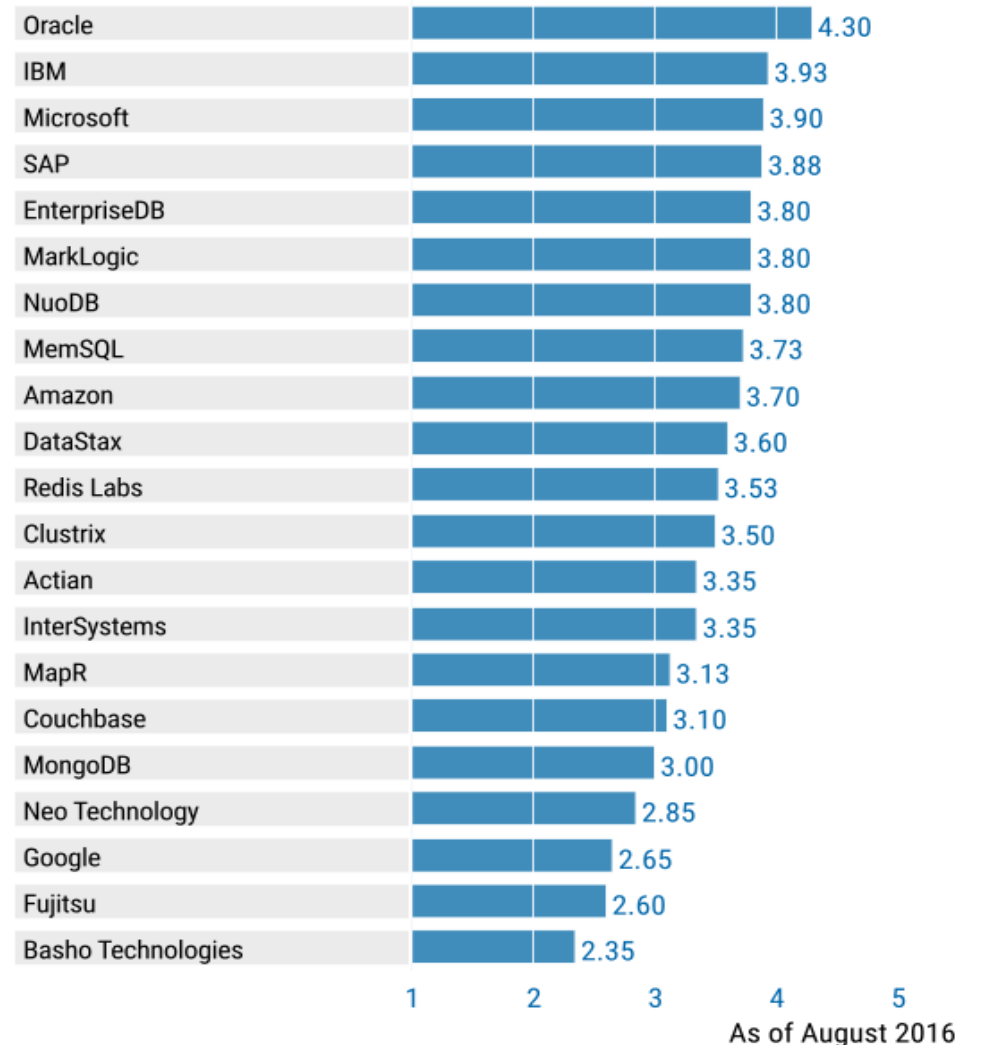Source: Gartner "Market Share: All Software Markets, Worldwide 2015", March 31, 2016
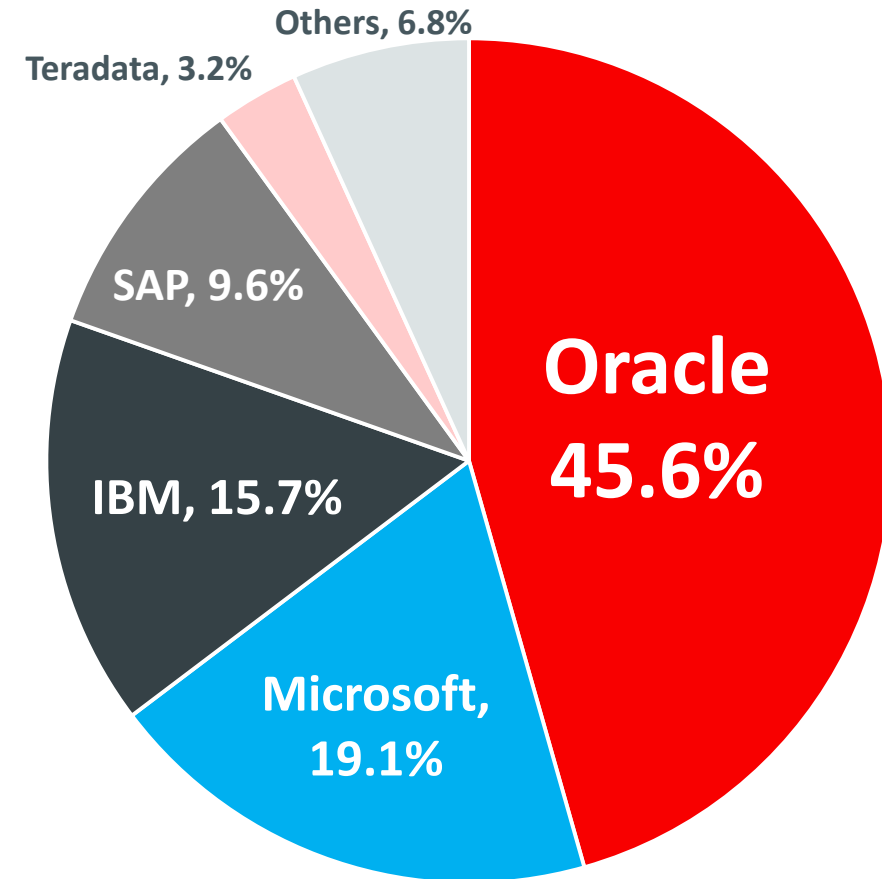
Korea is a Global Leader in Adopting Innovative Technologies

- Highest concentration of Exadata deployments worldwide

- Early adapters of Zero Data Loss Recovery Appliance

- Ten of the top 10 Korean corporations run Exadata

Oracle Database Scores Highest On Gartner Evaluation of Critical Capabilities for Traditional Transactions Use Case
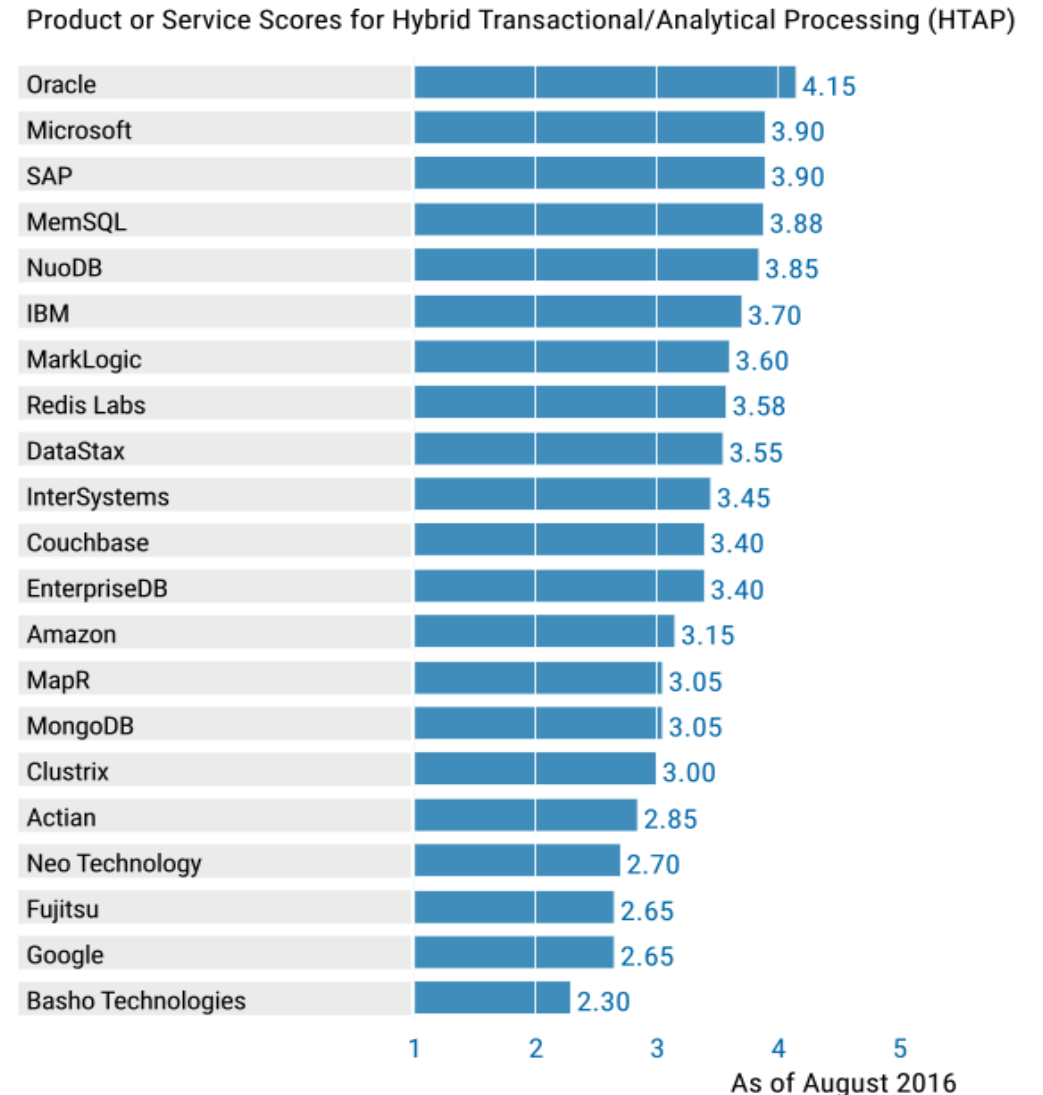

Product or Service Scores for Traditional Transactions

Vendor	Score
Oracle	4.30
IBM	3.93
Microsoft	3.90
SAP	3.88
EnterpriseDB	3.80
MarkLogic	3.80
NuoDB	3.80
MemSQL	3.73
Amazon	3.70
DataStax	3.60
Redis Labs	3.53
Clustrix	3.50
Actian	3.35
InterSystems	3.35
MapR	3.13
Couchbase	3.10
MongoDB	3.00
Neo Technology	2.85
Google	2.65
Fujitsu	2.60
Basho Technologies	2.35

As of August 2016

Source: Gartner (October 2016)

Gartner, Critical Capabilities for Operational Database Management Systems, Merv Adrian, Donald Feinberg, Nick Heudecker, Adam M. Ronthal, Terilyn Palanca,09 December 2015This graphic was published by Gartner, Inc. as part of a larger research document and should be evaluated in the context of the entire document. The Gartner document is available upon request from Oracle. Gartner does not endorse any vendor, product or service depicted in its research publications, and does not advise technology users to select only those vendors with the highest ratings or other designation. Gartner research publications consist of the opinions of Gartner's research organization and should not be construed as statements of fact. Gartner disclaims all warranties, expressed or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.

Oracle Database Scores Highest On Gartner Evaluation of Critical Capabilities for **Hybrid Transactions/Analytic** Processing (HTAP) Use Case

Product or Service Scores for Hybrid Transactional/Analytical Processing (HTAP)

Vendor	Score
Oracle	4.15
Microsoft	3.90
SAP	3.90
MemSQL	3.88
NuoDB	3.85
IBM	3.70
MarkLogic	3.60
Redis Labs	3.58
DataStax	3.55
InterSystems	3.45
Couchbase	3.40
EnterpriseDB	3.40
Amazon	3.15
MapR	3.05
MongoDB	3.05
Clustrix	3.00
Actian	2.85
Neo Technology	2.70
Fujitsu	2.65
Google	2.65
Basho Technologies	2.30

As of August 2016

Source: Gartner (October 2016)

Oracle Positioned Highest
for Ability to Execute
On Gartner Magic Quadrant
for Data Management Solutions
for Analytics

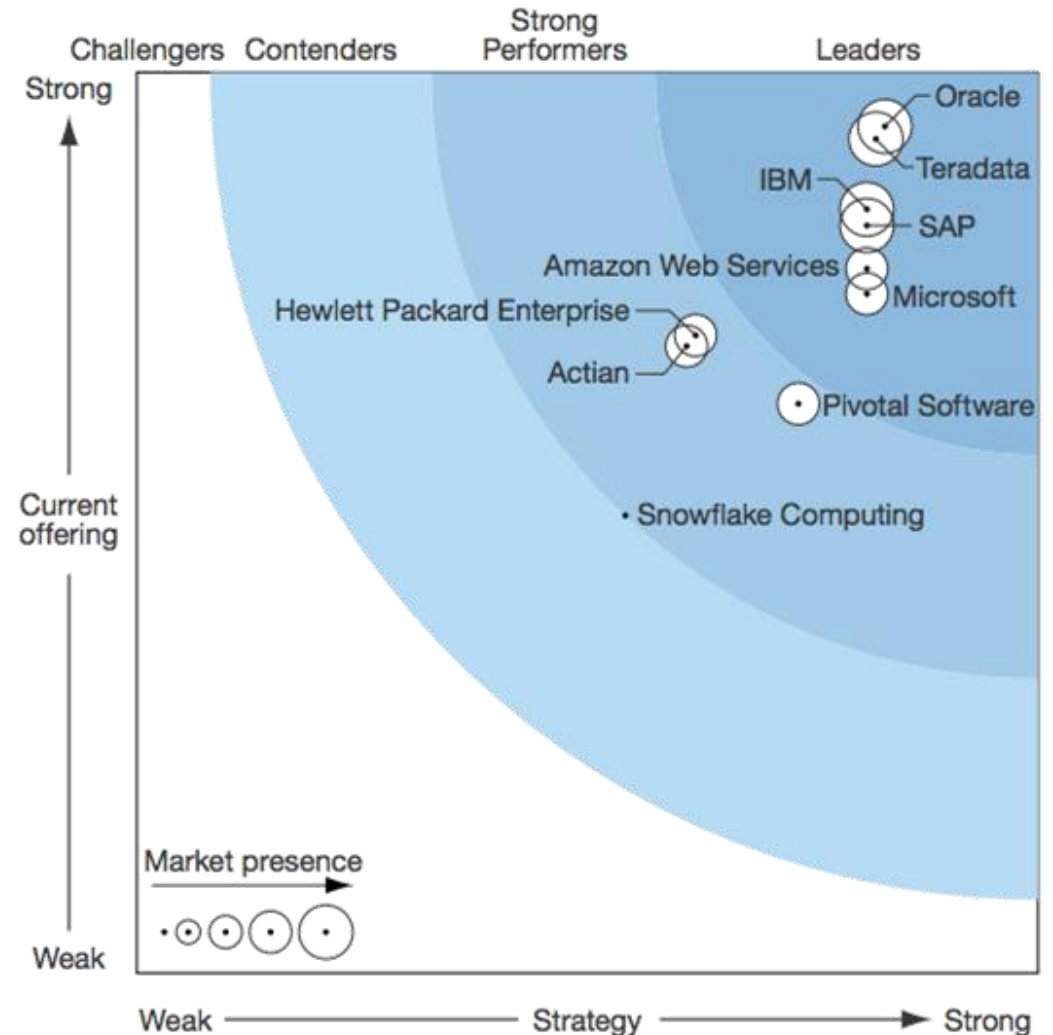Figure 1. Magic Quadrant for Data Management Solutions for Analytics

The Forrester Wave™: Enterprise Data Warehouse, Q4 2015

Forrester Scores Oracle Highest on both Current Offering and Strategy **for Enterprise Data Warehouse**

http://www.oracle.com/us/corporate/analystreports/forrester-enterprise-data-warehouse-2811129.pdf
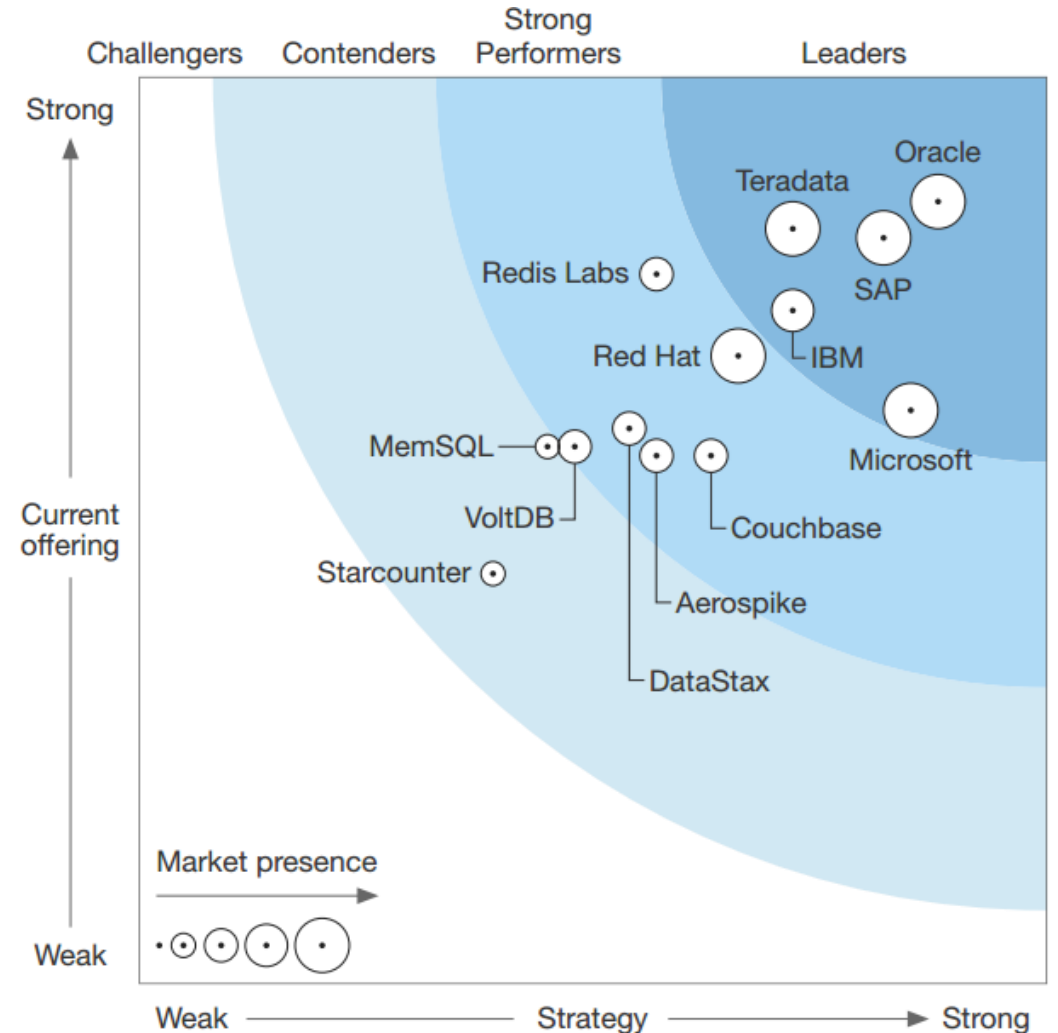
The Forrester Wave™: In-Memory Databases, Q1 2017

Oracle In-Memory Databases Scored Highest by Forrester on both Current Offering and Strategy

http://www.oracle.com/us/corporate/analystreports/forrester-imdb-wave-2017-3616348.pdf

Transformational Innovations

Oracle is **Revolutionizing** database

- Performance
- Cost
- Availability
- Big Data
- Cloud

With **Transformational Innovations** in software and systems

Far Ahead of ALL Alternatives and Competitors

Does Performance Matter to You?
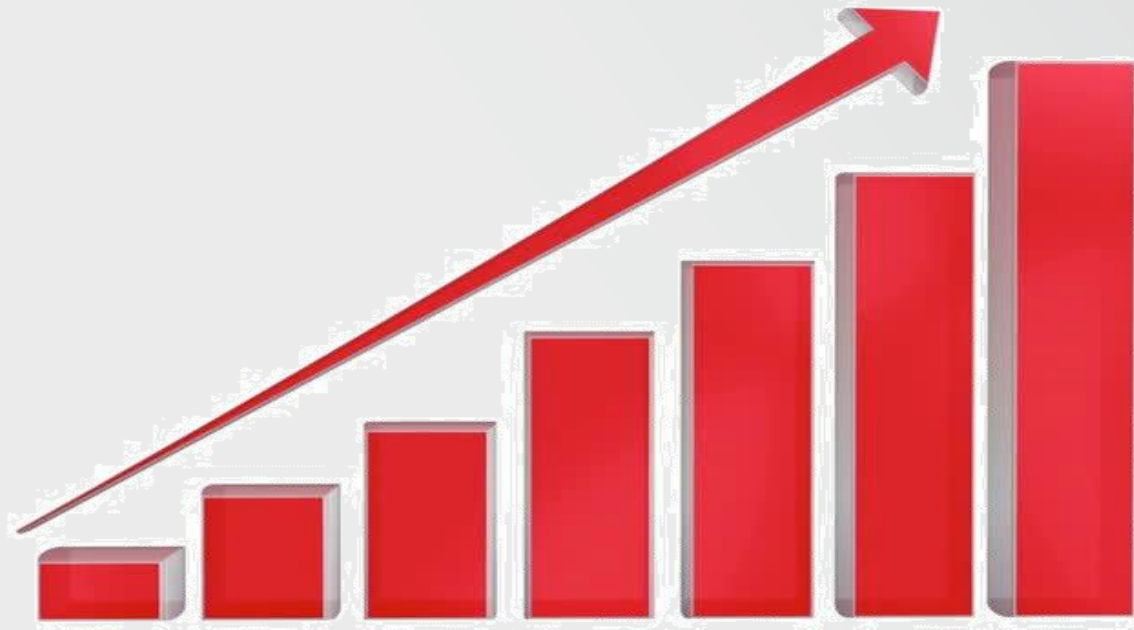
Hint: Better Performance = Better Price/Performance

Transformational Performance
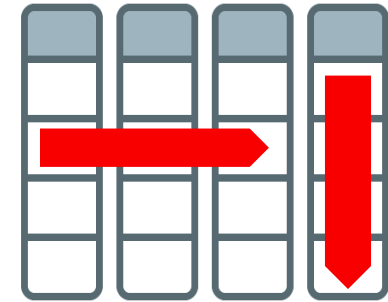
From Disk Based to In-Memory Database

Oracle DB In-Memory Delivers Best Analytics **AND** Best OLTP

- Analytics & reporting run 100x faster using in-memory Column format
  - Optimized for vector processing
  - Pure in-memory, so changes are fast enabling mixed OLTP and analytics
- Table data kept in BOTH row and column format with full consistency
  - OLTP uses proven Oracle row format
- No app changes, trivial to deploy
  - Full Scale-Out, Scale-Up, HA, etc.
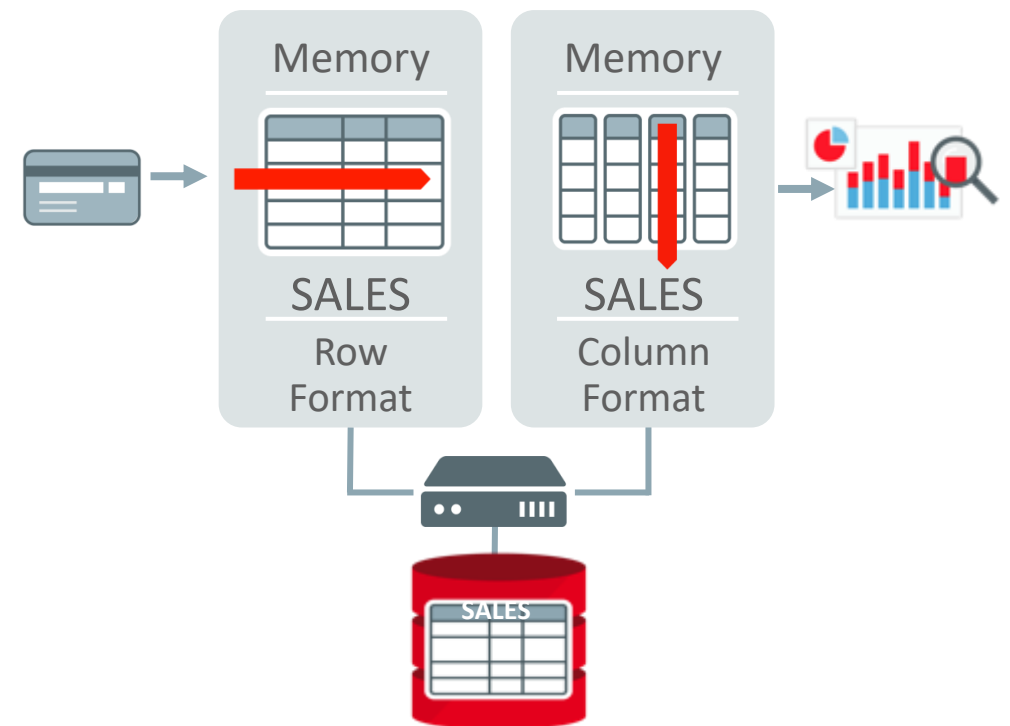
Transformational Performance

Oracle Engineered Systems powered by Intel Xeon
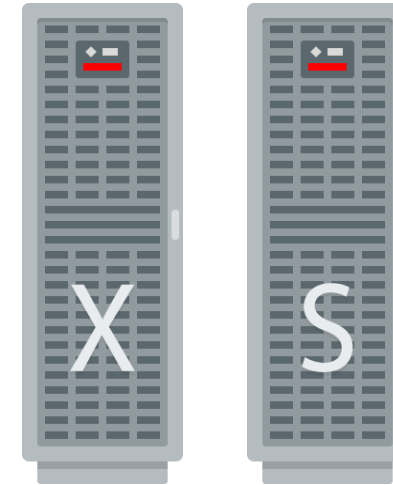
From Generic to Engineered Systems

Exadata & Supercluster

Thousands of Production Deployments – ½ OLTP, ½ Analytics

- Fastest and Most Cost-Effective Hardware
  - **Best Compute:** Scale-out Database and Storage Servers
  - **Best Network:** Ultra-Fast Unified InfiniBand Fabric
  - **Best Storage:** Fastest PCIe Flash, Largest Helium Disks

- Unique Database Optimizations Across Entire System:
  - **Fastest Analytics:** Offload DB queries to storage
  - **Fastest OLTP:** Special InfinBand and PCIe flash algorithms
  - **Most Cost Effective:** 10X Hybrid Col Compression, Best Consolidation
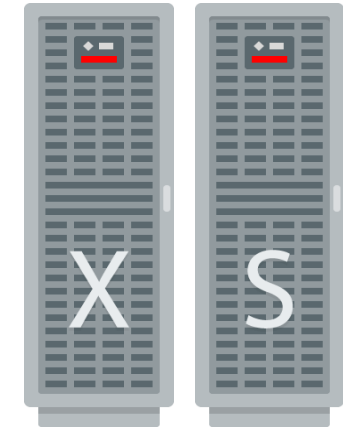
4 of the Top 5
- Banks
- Telecoms
- Retailers

Run Exadata

Exadata Getting Faster with In-Memory Technology

- With Exadata Flash throughput approaching memory throughput, SQL bottleneck moves from I/O to CPU

- Exadata will automatically transform table data into In-Memory DB columnar formats in Exadata Flash cache
  - Enables fast vector processing for storage server queries

- Uniquely optimizes next generation Flash as memory

In-Memory Columnar scans

In-Flash Columnar scans
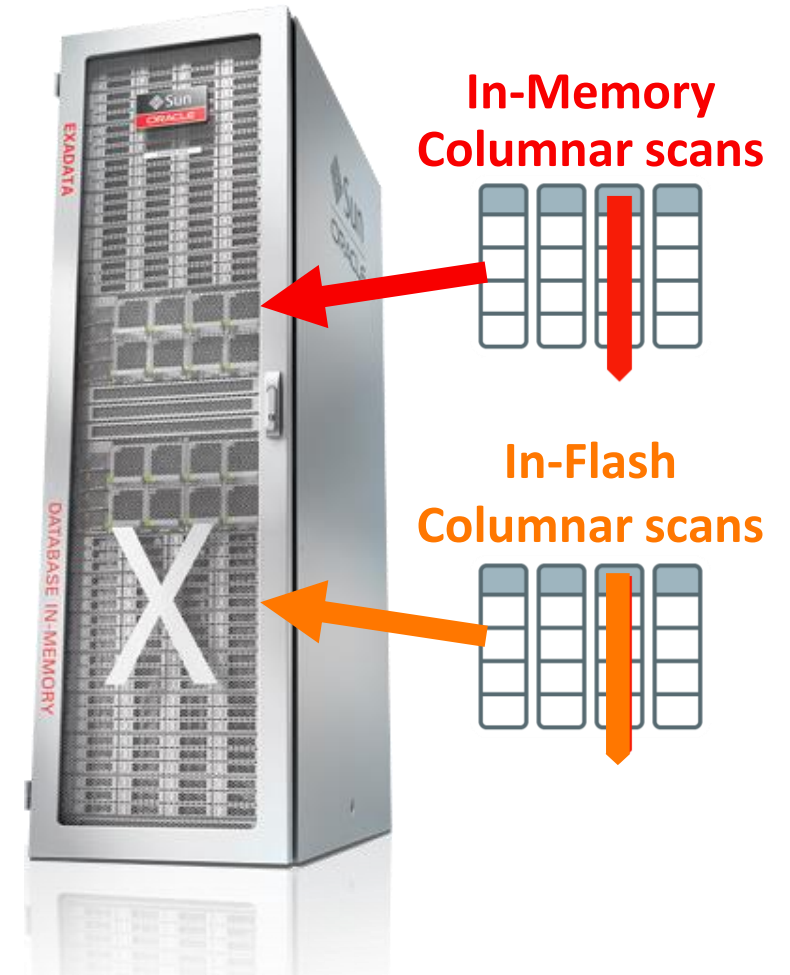
Does Cost Matter to You?

Hint: It Certainly Matters to Your Business

ORACLE®

Transformational Cost
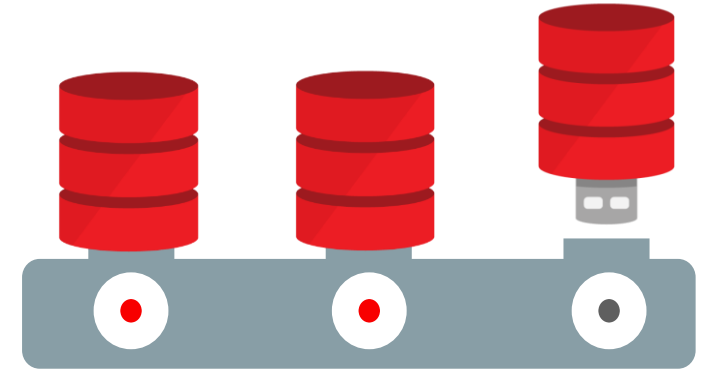
From Dedicated to **Multitenant Databases**

Oracle Multitenant

Virtualizes Databases Into Pluggable Databases (PDB) in a Single Container Database

PDB

PDB

PDB

Pluggable

Single Container DB (CDB)
centralizes and shares operations and services
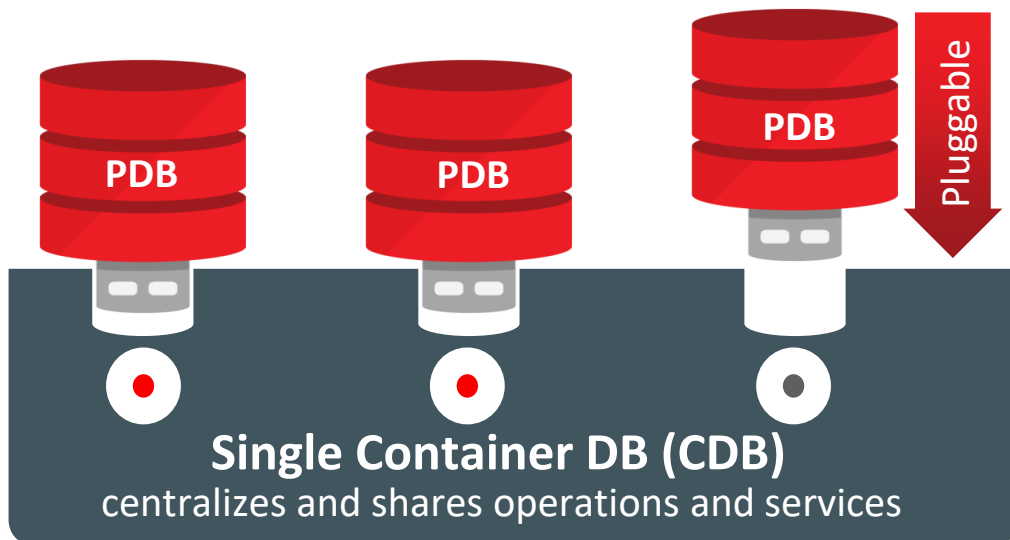
Lower OPEX
- Manage many PDBs as one
- Patch, upgrade, backup, standby at Container DB

Lower CAPEX
- More PDBs per server – PDBs share memory and processes

More Agile
- Easy and fast to provision, move, clone PDBs

Multitenant Greatly Decreases Software Administration
Virtualization Increases it

Does Availability Matter to You?

24/7

Hint: It Matters a Lot to Your Users

Transformational Availability
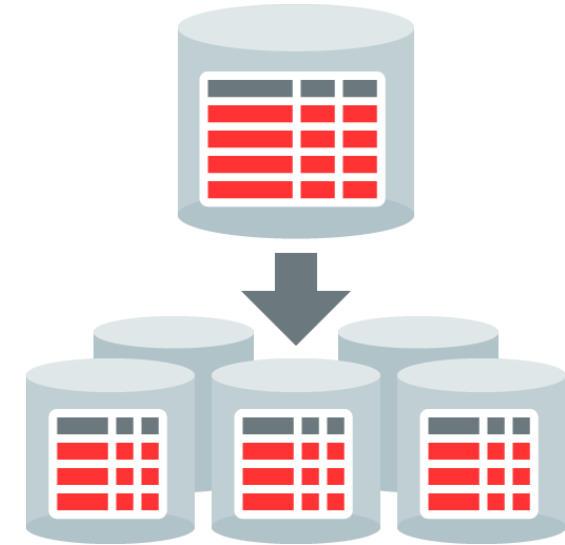
From Massive Database to Sharded Databases

Native Oracle Database Sharding

- Some Global-Scale OLTP applications prefer to shard massive databases into a farm of smaller databases

- Sharding is easy on NoSQL due to restricted data model, **Native Sharding** makes it easy on Oracle
  - Benefits of sharding with benefits of mature SQL Database

- Native SQL for sharding tables across up to 1000 Shards
  - Isolation of Shards with Linear scalability of data and users
  - Online addition and reorganization of shards
  - Routing of SQL based on shard key, Cross Shard Queries
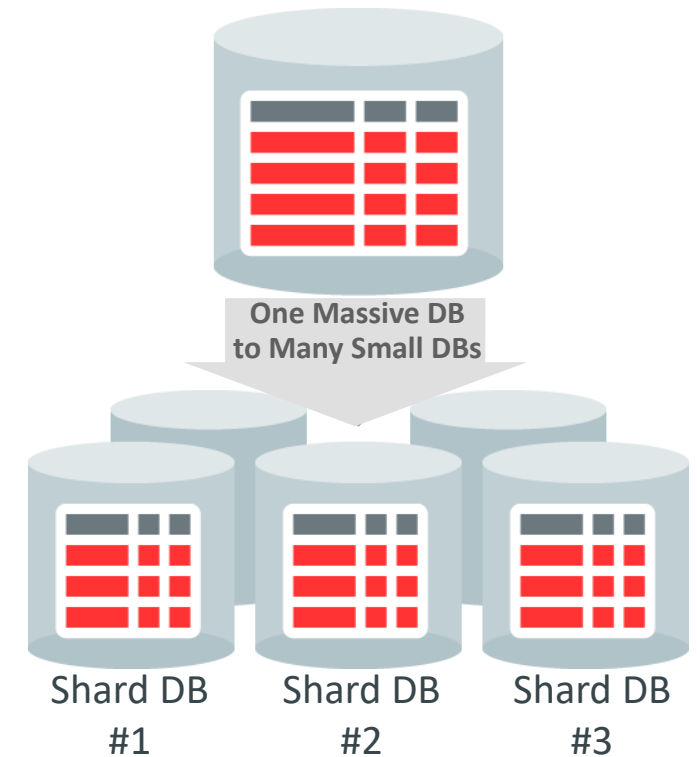
One Massive DB to Many Small DBs

Shard DB #1 Shard DB #2 Shard DB #3

Transformational Availability

From Loss-Prone to Complete Data Protection

Oracle Engineered Systems powered by Intel Xeon

Zero Data Loss Recovery Appliance (ZDLRA)

- Major outages and data loss occur regularly with current solutions
  - Recent headline outages: Airline, SaaS vendor, Government department

- ZDLRA provides dramatically better database protection
  - **Zero Data Loss** – real-time redo shipping instantly protects new transactions
  - **Minimal Impact to Production** - production databases only send changes
  - **Cloud-Scale Protection** – scales to protect all databases in data center
  - **Deep Data Validation** – appliance understands and validates database formats
  - **Fastest Recovery Time** – others optimize backup at the expense of recovery

Oracle Engineered Systems powered by Intel Xeon

Transformational Availability
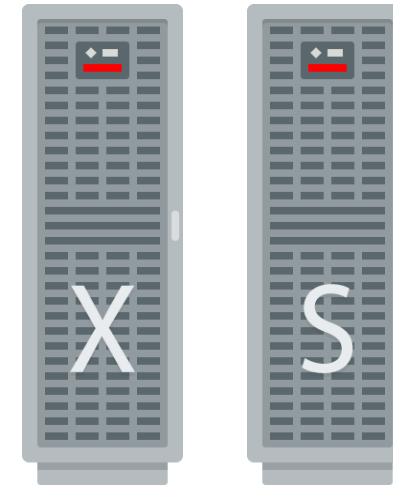
From Generic to Engineered Systems

Fault Tolerant Availability

IDC

"**Exadata** and **SuperCluster** both achieve AL4 fault tolerance in a **Maximum Availability Architecture*** configuration"

*Gold or Platinum reference architecture

FIVE NINES
5X9
99.999%

A New Gold Standard

Only other AL4 Systems
- IBM - z Systems
- HPE - Integrity NonStop & Superdome
- Fujitsu – GS & BS2000
- NEC – FT Server/320 Series
- Stratus ftServer & V Series
- Unisys – Dorado

Does Cloud Matter to You?

Hint: It is the Future of I.T.

Transformational Cloud

From Generic to Database Optimized Cloud

Oracle Database Exadata Cloud Service

- **Best Database:** Oracle with **all advanced options**
  - **100% compatible** with on-premises DBs for easy migration

- **Fastest and most available** DB cloud platform: **Exadata**
  - Scale-Out Compute, Scale-Out Intelligent Storage, InfiniBand, PCIe flash, DB Optimized Protocols
  - **Complete Isolation** of tenants with no overprovisioning

- All Benefits of Public Cloud
  - **Fast, Elastic, Web Driven** Provisioning
  - **Oracle Experts Deploy and Manage** Infrastructure
  - Monthly or yearly Subscription with **online capacity bursting**

Oracle Big Data Cloud Service

- **All features and capabilities** of Oracle Big Data Appliance
  – Secure SparK and Hadoop and clusters out-of-the-box

- **Fastest and most available** Big Data platform:
  – Dedicated instances deliver high-performance
  – Infiniband connectivity with Exadata Cloud Service
  – Unify Oracle Database and Big Data access with Oracle Big Data SQL

- All Benefits of Public Cloud

Transformational Cloud

From Public Cloud to Cloud Where You Want It

Oracle Public Cloud Services @ Customer

- **Same** Exadata Cloud and Oracle IaaS **software** and **hardware** as Oracle Public Cloud

- Managed by Oracle and delivered as a service in your datacenter behind your firewall

- Same cost-effective subscription pricing model as Oracle Cloud

- Helps conform to business and government security requirements

- Connect via fast LAN to existing systems

Database

IaaS

Complete Choice, Complete Compatibility

On-Premises	Cloud @ Customer	Public Cloud
Exadata Database Machine	**Exadata Database Machine**	**Exadata Cloud Service**
Customer Data Center	Customer Data Center	Oracle Cloud
Purchased	Subscription	Subscription
Customer Managed	Oracle Managed	Oracle Managed

Conclusion

- Oracle has been and continues to be the database market and technology leader

- With **Transformational Innovations** in software and systems, Oracle is **Revolutionizing** database
  - Performance
  - Cost
  - Availability
  - Cloud

Far Ahead of ALL Alternatives and Competitors

Integrated Cloud
Applications & Platform Services