

Restoring Your Data or Restoring Your Reputation

Paweł Zawadzki
Principal Solution Engineer
Oracle Systems

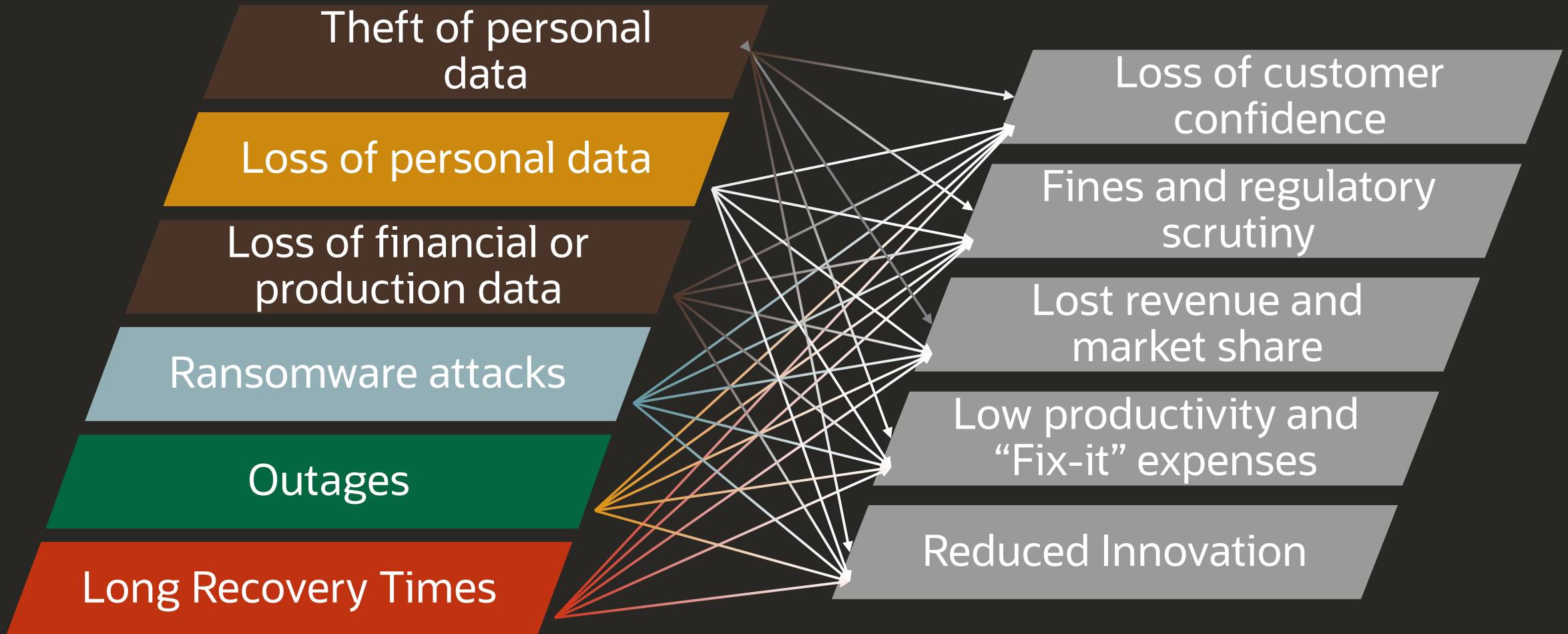


Safe Harbor

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, timing, and pricing of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle Corporation.

Statements in this presentation relating to Oracle's future plans, expectations, beliefs, intentions and prospects are "forward-looking statements" and are subject to material risks and uncertainties. A detailed discussion of these factors and other risks that affect our business is contained in Oracle's Securities and Exchange Commission (SEC) filings, including our most recent reports on Form 10-K and Form 10-Q under the heading "Risk Factors." These filings are available on the SEC's website or on Oracle's website at <http://www.oracle.com/investor>. All information in this presentation is current as of September 2019 and Oracle undertakes no duty to update any statement in light of new information or future events.

Your Business and Reputation Can be Damaged in Many Ways

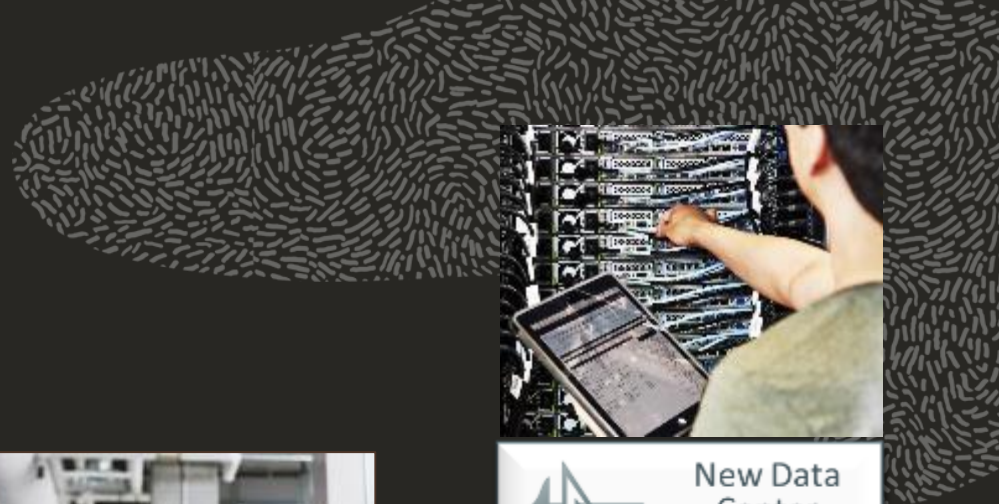


IT Technology Has Progressed, But Storage and Data Protection Has Not

Current Industry Norms:

- “One-size-fits-all” backup approach independent of data type and usage
- Varying performance and capacity by using different media types and deduplication
- Long recovery times and data loss
- Backup and restore failure is common






New Data
Center
Architectures



Enterprise
Databases &
Applications



Cloud
Storage
Extensions



Era of Storage as a Standalone Technology has Ended

Oracle's Unique Storage Integration Strategy

STORAGE AND DATA PROTECTION SOLUTIONS

Storage Engineered with Databases and Applications

- Increased efficiency
- Simplified management
- Reduced costs

Storage Engineered In New Data Center Architectures

- Higher performance
- Unsurpassed protection for Oracle Database
- Greater value

Storage Engineered with Public and Private Cloud Models

- Automated data placement
- Easier access
- Lower cost

The Zero Data Loss Recovery Appliance

The Focus on ZDLRA was to automate logging and recovery – take human error out of it... and never lose any of your data.”

Larry Ellison
Executive Chairman & CTO, Oracle



Recovery Appliance

Continuously protects
Oracle Databases

Validates each backup

Minimizes
performance impact
on production servers

Reduces data loss
exposure

Reduces downtime
with rapid, automated
database recovery

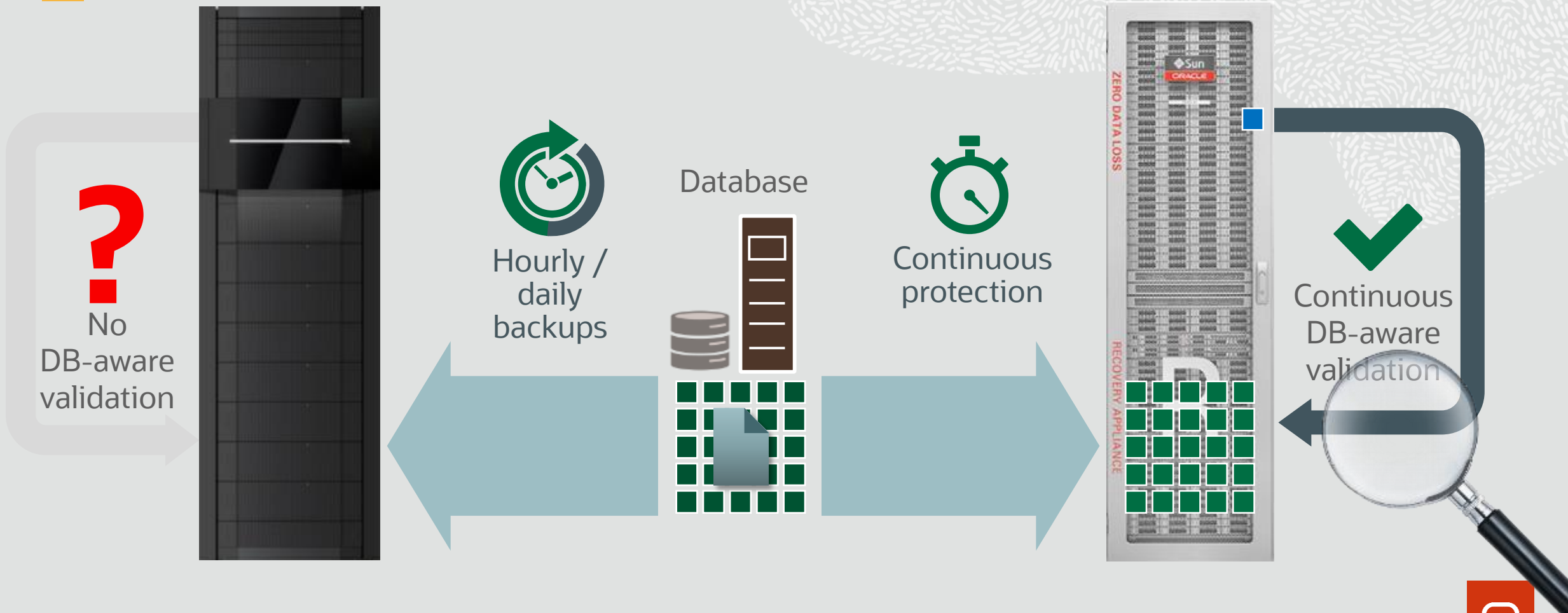
Provides clear
indication of
time to restore

Tight integration delivers better protection throughout the data life-cycle



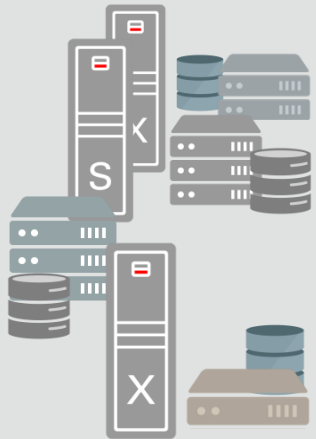
General Purpose Backup vs. Recovery Appliance

Continuous protection and built-in integrity checking



Centralized Data Protection for Oracle Databases

Protected Databases



Delta Push

- DBs access and send only changes
 - Minimal impact on production
- Real-time redo transport instantly protects ongoing transactions

Recovery Appliance



Offloads to
Oracle Cloud



Offloads
Tape
Backup



Replicates to Remote
Recovery Appliance

Protects all DBs in Data Center

- Petabytes of data
- Oracle 11g-19c, any platform
- No expensive DB backup agents

Delta Store

- Stores validated, compressed DB changes on disk
- Fast restores to any point-in-time using deltas
- Built on Exadata scaling and resilience
- Enterprise Manager end-to-end control

Real-Time Database Recoverability Status

Enterprise Manager-Integrated Monitoring, Alerting, and Reporting

Real-time recoverability status for all databases at your finger tips:

Target Name	Database Size (GB)	Recovery Window			Unprotected Data Window		Errors/Warnings	Redo Shipping	Copy-to-Tape	Replication	Last Complete Backup
		Goal (days)	Current (days)	Needed Space (GB)	Threshold	Current					
store32	573.0	2.0	6.2	465.4	24.0 hrs	5.7 hrs			✓		Sep 4, 11:12 PM PDT
store33	473.0	2.0	6.4	449.0	24.0 hrs	< 1 sec		✓	✓		Sep 4, 11:16 PM PDT
store34	463.0	2.0	6.4	444.5	24.0 hrs	< 1 sec		✓	✓		Sep 4, 11:19 PM PDT

Current point-in-time-recovery window

Current amount of unprotected data



Alerts and warnings issued if a database is not meeting user-defined recovery goals or thresholds



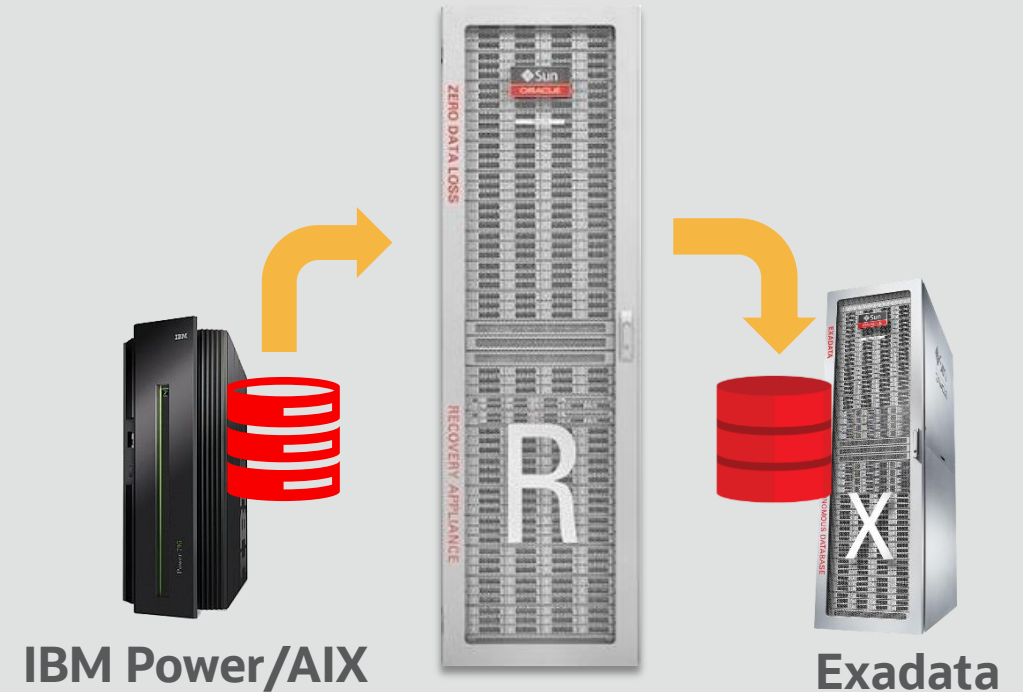
Data Protection-as-a-Service: Policy-based management to meet Recovery SLAs throughout the enterprise



Recoverability Status & System Utilization Reports

Simplify Database Migration with Recovery Appliance

- Recovery Appliance migration automation tool **simplifies** platform migration steps
 - Especially useful for large databases
- Significant **reduction in downtime** – less than 2 hour read-only downtime, regardless of DB size.
- Supports **same and cross-endian platform** migration activities



Global Chip Design Leader Improves Protection SLAs and Accelerates Move to Cloud

- **Up to 6X**
faster backup and recovery
- **50TB**
production DB with point-in-time recovery
- **Eliminated**
speed and connectivity issues with 3rd party solution on NetApp NAS



Requirement to modernize backup/recovery solution for SLAs:

- Could no longer meet Recovery Time Objective (RTO) with existing solution
- Too much overhead on production servers due to backup operations
- Address current data growth challenges and longer-term expectations
- Product roadmap align with strategic direction of moving to Oracle Public Cloud

Recovery Appliance delivered key advantages:

- Incremental forever backup strategy –
 - Faster backups, less overhead on network and DB server
- Reduced RPO an important business objective
 - Very beneficial feature during decision phase
- Operational efficiencies managing Oracle Database backup/recovery
- Oracle wall-to-wall responsibility instead of multiple different vendors

[Watch the Video](#)

Global Food Distributor and Retailer Enables Rapid Recovery

- 30X
faster backup
- 4PB
of critical data rapidly protected
- Point-in-time
recovery of business-critical data



CUSTOMER PERSPECTIVE



The Recovery Appliance helps us migrate databases, especially when you have to do cross-platform migrations. And what we want to do in the next couple of years is to migrate from IBM to Oracle Cloud at Customer.



Soner Toraman, Product Owner – Relational Databases
METRONOM

[Watch the Video](#)

Oracle Solution



RA X6 - 5 cells (180 TB)

Backup Rate – 11.84 Gbs

Backup Size – 8.5 TB

Backup Time – 67 Min

Restore Rate – 9.33 Gbs

Virtual Restore Time – 124 Min

of channels: 16

+ Stores Real-Time Redo &
Eliminates Archived Log Backup Time



Recovery Appliance IS JUST FASTER



3X Faster Backup vs. Dedupe Device

2X Faster Restore vs. Dedupe Device

4X Faster Restore vs. Legacy Backup

Storage Team Solution



Leading Deduplication Device

Backup Rate – 7.26 Gbs

Backup Size – 12.64 TB

Backup Time* – 237 Min

Restore Rate – 7.03 Gbs

Restore Time** – 245 Min

of channels: 48

* Dedupe Device requires additional archived log backup time

** Dedupe Device requires additional incremental restore + apply time



Backup vs Recovery Solution

Backup Solution (Status Quo)

Many Backup Silos

Diverse scripts, multiple backup methodologies and overhead



NOT Recovery-Aware

Assume backups can be restored and recovered



90% at Risk

Most companies only test about 10% of backups for validity



Slow Restore Times

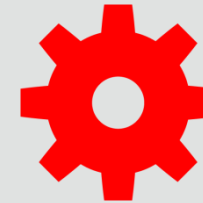
Only promotes and publishes backup performance rates



Recovery Appliance

1 Strategy

Incremental Forever with Full Restore, consistent results with minimal impact



Known Recovery Status

Real-time recovery status, alerts monitoring and reporting for all databases under management



100% Backups Tested

Oracle-aware validation at every touch-point and periodically at rest



Predictable and Fast

Same backup and restore rates, linear performance with scale-out and results published so customers can plan accordingly



Recovery Appliance Delivers IT Advantages

Demonstrated business value with “Database Protection-as-a-Service”

Status Quo: Managing Backup Tasks

- Backup management unrewarding (necessary) task
- NO ONE gets a “thank you” for performing backups
- Only feedback is generally complaints
- Periodically test/validation a sampling of backups

Recovery Appliance: Managing Recovery SLAs

- Provide regular recovery status reports to business owners / management
- Virtually eliminate data loss exposure for all databases
- Chargeback business owners using out-of-the-box reports
- 100% of backups validated with NO overhead of personnel or database servers

Oracle Helps Protect Your Entire Enterprise

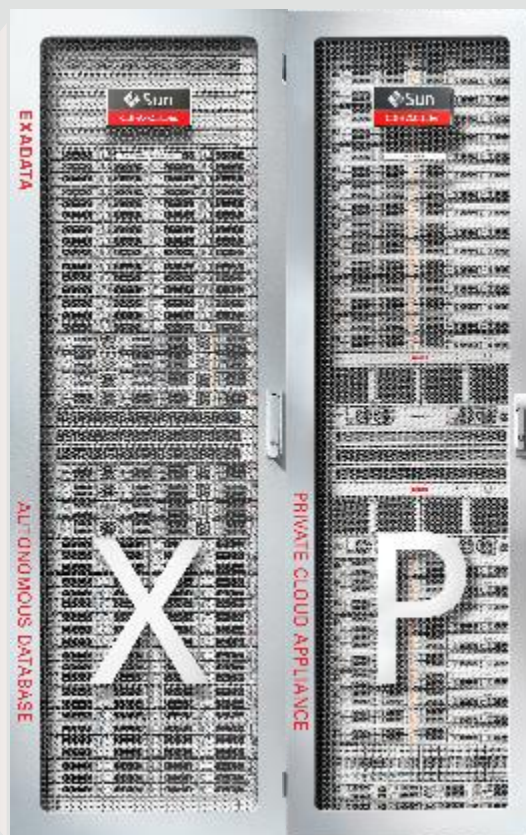
Oracle Database
20% of Data with
80% of Enterprise Value



Recovery Appliance

High-Performance
Oracle Database
Recovery

Unstructured Data
80% of Data with
20% of Enterprise Value



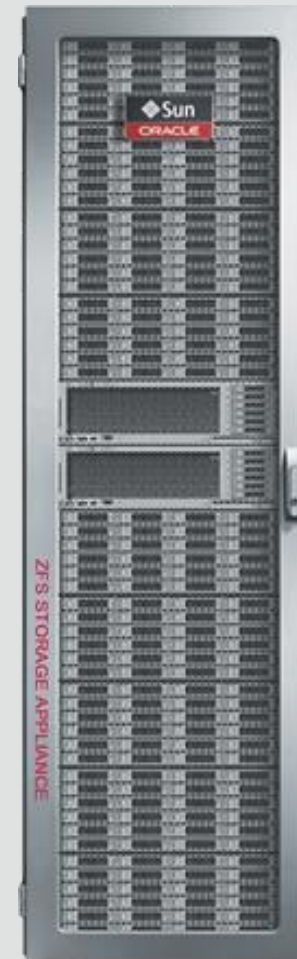
ZFS Storage Appliance

High-Performance
General-Purpose
Backup



Oracle ZFS Storage Appliance

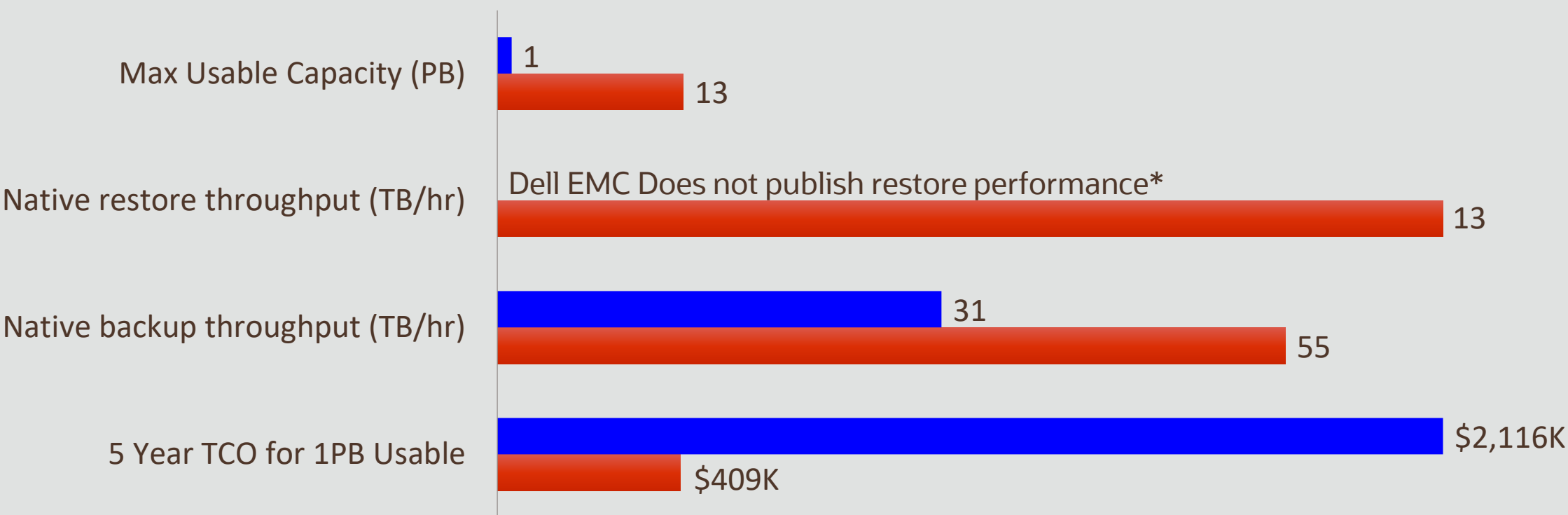
- High performance for all data
 - 55+ Tbytes/Hour backup
 - 60+ Tbytes/Hour restore
- High capacity with 13+ PBytes usable
- Native compression and deduplication
- Unique Oracle Database integration
- Flexible usage models – not just backup
- Low-cost – up to 80% lower TCO than Dell EMC Data Domain at 1PB capacity



13X More Scalable, Significantly Faster, 80% Less Expensive

Oracle versus Dell EMC

■ Data Domain 9800 ■ ZFS Backup Appliance ZS7-2



Native performance achieved without additional add-on license fees or agents, no deduplication or compression applied.

- Estimates of DD9800 restore performance based on POC data and other third party validation are between 5TB/hour and 10TB/hour
- 5 Year TCO based on Oracle Value Navigator tool, Jun 20, 2019

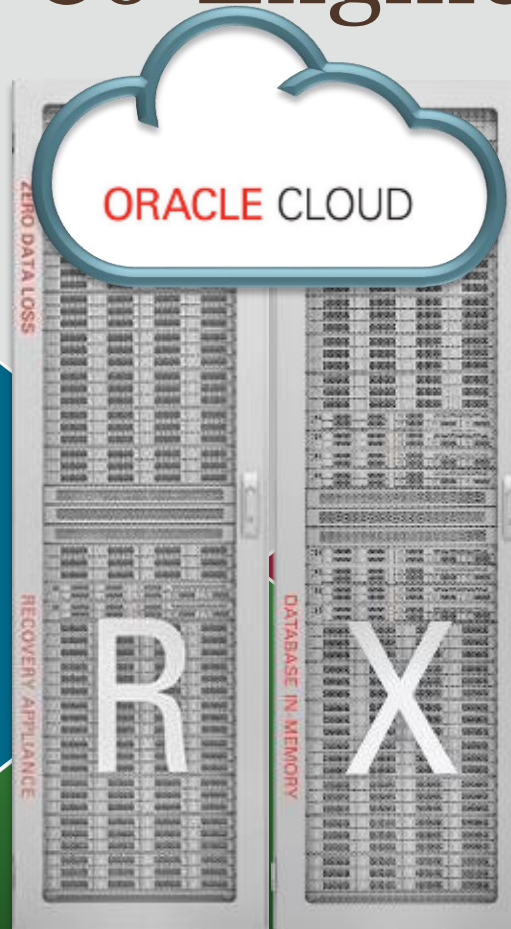


Full Suite of Unique Co-Engineered Capabilities

	Multitenant
	In-Memory DB
	Real Application Clusters
	Active Data Guard
	Partitioning
	Advanced Compression
	Advanced Security, Label Security, DB Vault
	Real Application Testing
	Advanced Analytics, Spatial and Graph
	Automatic Storage Manager

**Oracle
Database
Innovations**

Recovery Appliance Innovations



**Oracle
Exadata
Database
Machine
Innovations**

Offload SQL to Storage	
InfiniBand Fabric	
Smart Flash Cache, Log	
Storage Indexes	
Columnar Flash Cache	
Hybrid Columnar Compression	
I/O Resource Management	
Network Resource Management	
In-Memory Fault Tolerance	
Exafusion Direct-to-Wire Protocol	

Validation Offload	Zero Data Loss	Incremental Forever Backup	Virtual Full Backups	Recoverability Monitoring & Alerts
--------------------	----------------	----------------------------	----------------------	------------------------------------

Thank You





ORACLE

Announcing: Recovery Appliance X8M



- RA X8M leverages new 100 Gb/s RDMA over Converged Ethernet (RoCE) for high throughput internal data transfers between compute and storage
 - Backup/restore network same as RA X8 (25 Gb/s): 24 TB/Hr
- Rack usable capacity configurations same as RA X8
 - Base rack: 155 TB, Full rack: 949 TB, Per storage server: 53 TB
- RA X8 (Infiniband) continues to ship for customers expanding existing Recovery Appliances

Brazilian Justice Tribunal of Santa Catarina

Backup/Recovery Benefits **with Recovery Appliance**

Reduce RTO and RPO

High Protection and Zero Data Loss

High Deduplication Factor

Incremental Forever

New level 0 (virtual full) after only
23 minutes incremental backup time

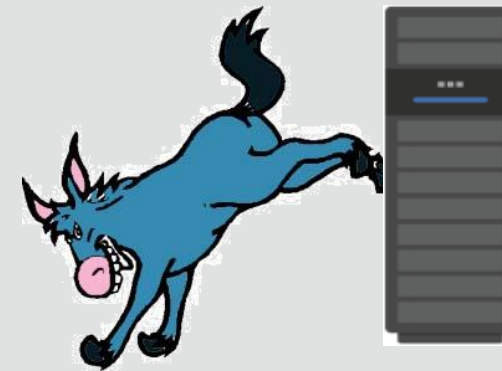
Nearly **200X improvement** in backup performance

Fast 10 Gbps Network

Facilitated DB Migration from Exadata X4 to X5

2 Recovery Appliances less expensive than
expanding Data Domain to support same
backup requirements

*The major benefit for us was
Incremental Forever and Virtual Full*



Presentation on OTN:

<http://www.oracle.com/technetwork/database/availability/con8830-tjsc-2811110.pdf>

World Leader in Aircraft Engine Manufacturing Eliminates Data Loss Exposure

5X to 10X
faster restore time

Gained
validated backup
confidence

Up to the moment
recovery possible



<https://www.youtube.com/watch?v=Wq2H2un84EA>