

# Oracle Database Data Protection

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# DBA Day – Data Protection AGENDA

- Data Protection Landscape and backup challenges
- Solving Data Protection with Dell EMC Data Domain
- Boost Backup with RMAN
- Long Term Retention
- Addressing future backup challenges
- Summary

# DATA PROTECTION LANDSCAPE AND BACKUP CHALLENGES



CONTROL



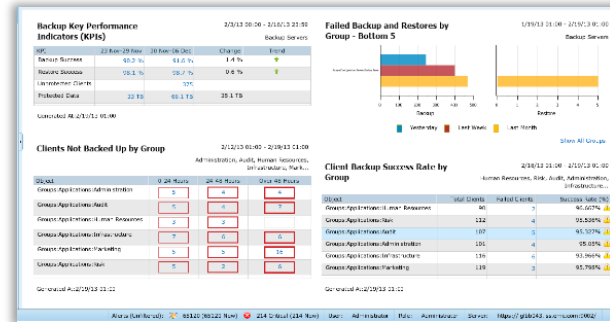
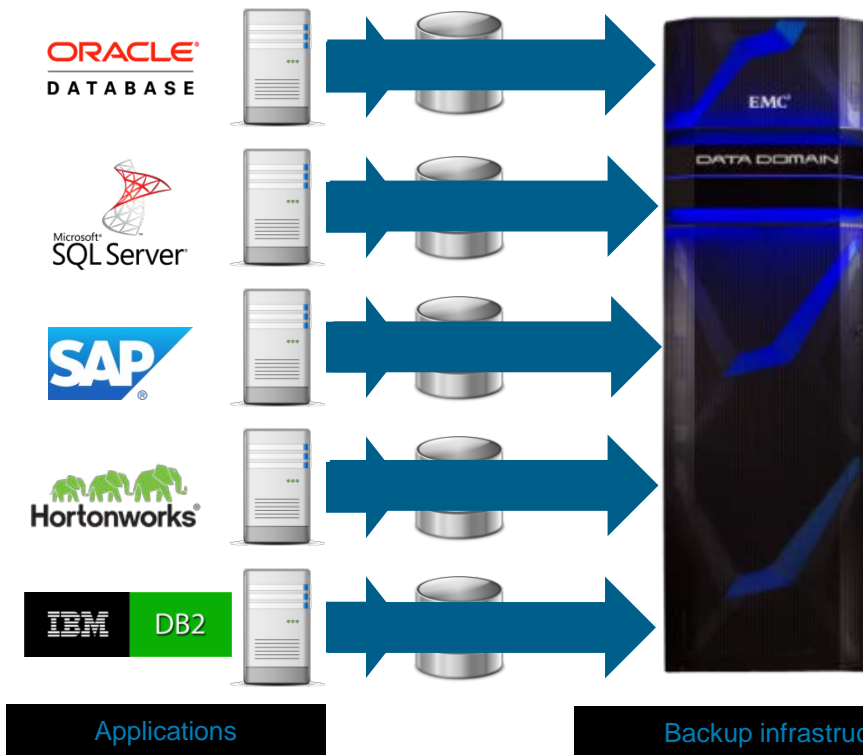
By 2018, 70% of business and application owners will have more self-service control over their data protection services, up from 30% today

Source: 2016 Gartner : Magic Quadrant for Data Center Backup and Recovery

# Backup Challenges



- Difficulty meeting backup windows
- Lack of visibility & control of backup



## IT/Backup team



- Lack of control
- Accidental architecture

# SOLVING DATA PROTECTION WITH DELL EMC DATA DOMAIN

# Dell EMC Data Domain Systems

PROTECTION STORAGE FOR BACKUP AND ARCHIVE DATA



- **Reliable access and recovery**
- **Scale and performance**
- **Efficient resource utilization**
- **Seamless integration**

# Reliability

## DATA INVULNERABILITY ARCHITECTURE

### End-to-end data verification

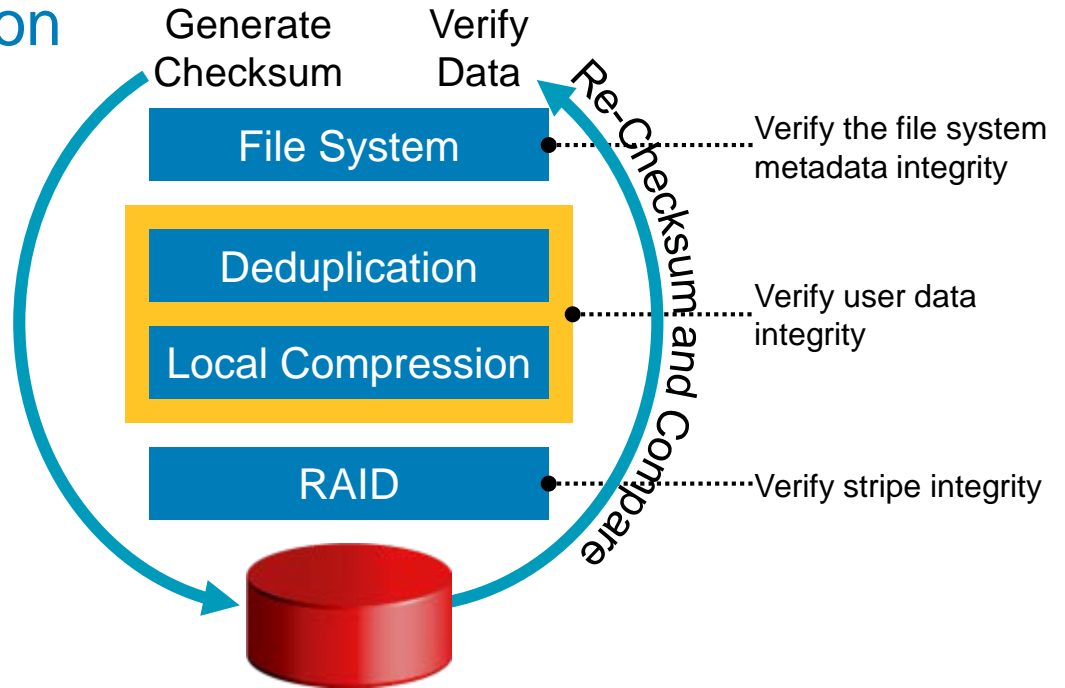
Checksum  
Deduplication, write to disk  
Verify

### Self-healing file system

Cleaning  
Expired data  
Defrag  
Verify

### Other

RAID 6  
NVRAM  
Snapshots





# Scale and Performance



Data Domain  
Virtual Edition

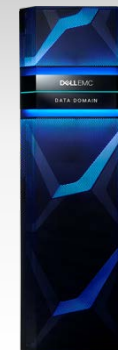
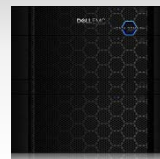
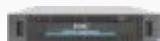
## Small Enterprise/ROBO – Midsize Enterprise

Speed (DD Boost): 5.6 TB/hr (16TB), 11.2 TB/hr (96 TB)  
Usable capacity: .5 TB – 96 TB, Logical capacity: Up to 4.8 PB

## Large Enterprise

### Midsize Enterprise

### Small Enterprise /ROBO



	DD2200	DD6300	DD6800	DD9300	DD9800
Speed (DD Boost)	4.7 TB/hr	24 TB/hr	32 TB/hr	41 TB/hr	68 TB/hr
Speed (other)	3.8 TB/hr	8.5 TB/hr	14 TB/hr	20 TB/hr	31 TB/hr
Logical capacity	40–860 TB	1.8–8.9 PB	2.8–14.4 PB <sup>1</sup> 8.4–43.2 PB <sup>2</sup>	7.2–36 PB <sup>1</sup> 21.6–108 PB <sup>2</sup>	10–50 PB <sup>1</sup> 30–150 PB <sup>2</sup>
Usable capacity	Up to 17.2 TB	Up to 178 TB	Up to 288 TB <sup>1</sup> Up to 864 TB <sup>2</sup>	Up to 720 TB <sup>1</sup> Up to 2.16 PB <sup>2</sup>	Up to 1 PB <sup>1</sup> Up to 3 PB <sup>2</sup>

<sup>1</sup> Total capacity on Active Tier only

<sup>2</sup> Total capacity with DD Cloud Tier software for long-term retention

<sup>3</sup> DD Extended Retention is also available for long-term retention

# DE-DUPE EFFICIENCY FIXED BLOCK

4 lines

**Almost heaven, West Virginia**

Blue Ridge Mountains , Shenandoah River

Life is old there

Older than the trees

Younger than the mountains

Growin' like a breeze

4 lines

Country Roads, take me home

To the place I belong

4 lines

West Virginia, mountain momma

Take me home, country roads

All my memories gathered 'round her

Miner's lady, stranger to blue water

4 lines

Dark and dusty, painted on the sky

Misty taste of moonshine

Teardrops in my eye

Country Roads, take me home

4 lines

To the place I belong

West Virginia, mountain momma

Take me home, country roads

# DE-DUPE EFFICIENCY FIXED BLOCK

(SMALLER BLOCK SIZE BETTER)



# DE-DUPE EFFICIENCY VARIABLE BLOCK

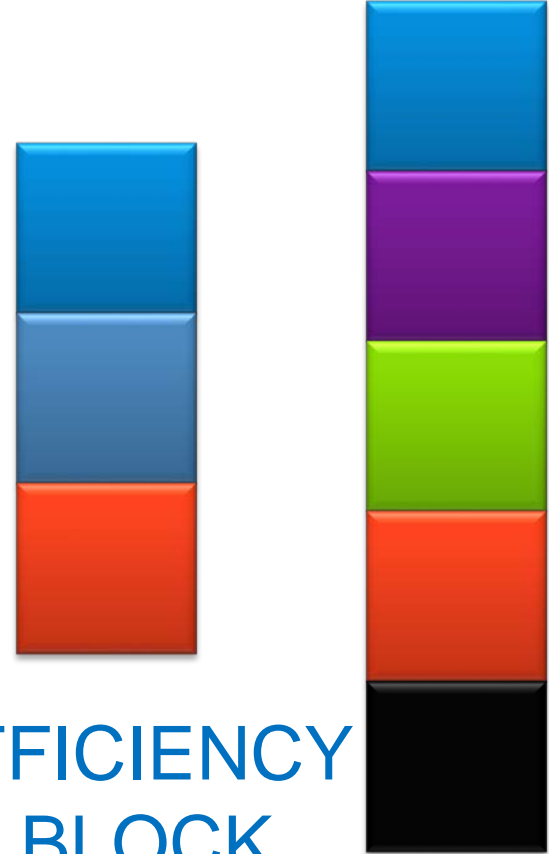
Almost heaven, West Virginia  
Blue Ridge Mountains , Shenandoah River  
Life is old there  
Older than the trees  
Younger than the mountains  
Growin' like a breeze

Country Roads, take me home  
To the place I belong  
West Virginia, mountain momma  
Take me home, country roads  
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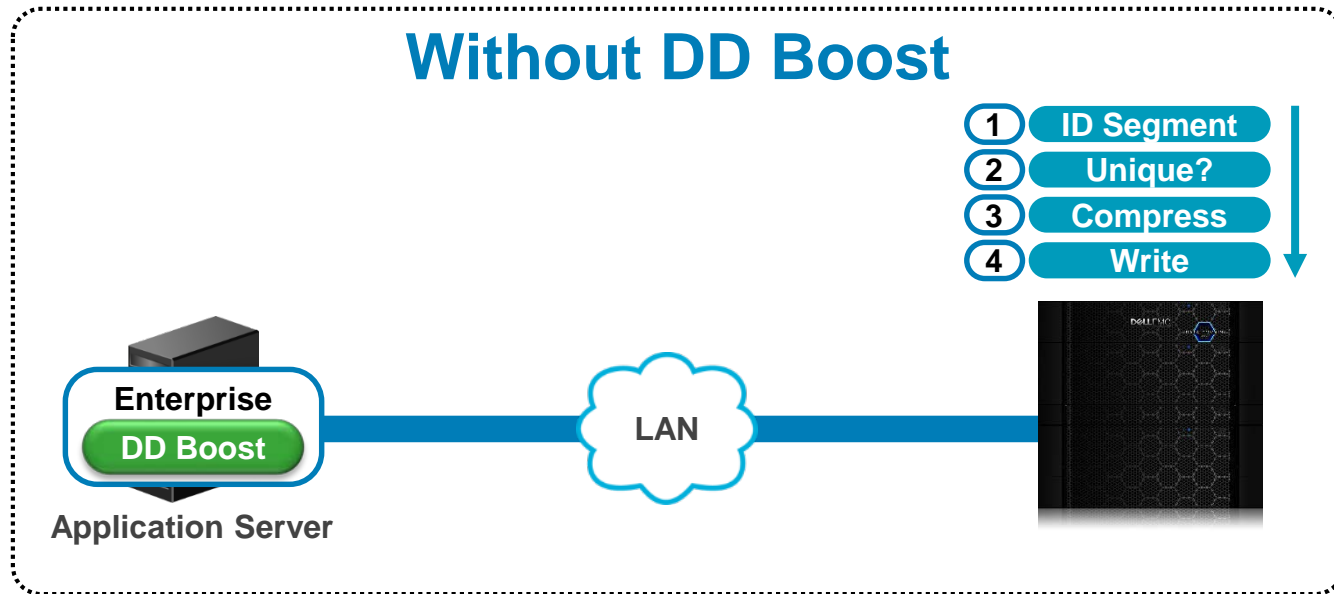
Common

Common



**DE-DUPE EFFICIENCY  
VARIABLE BLOCK**  
DATA DOMAIN USES 4K-12K (AVERAGE 8K)

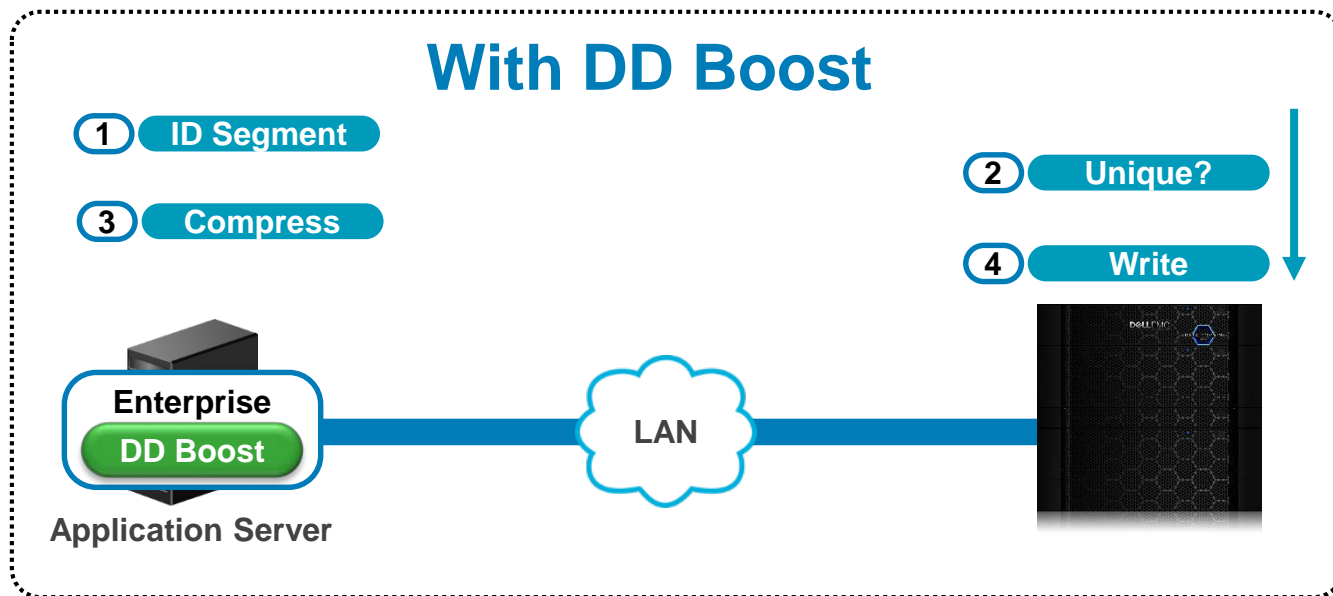
# Efficient Resource Utilisation



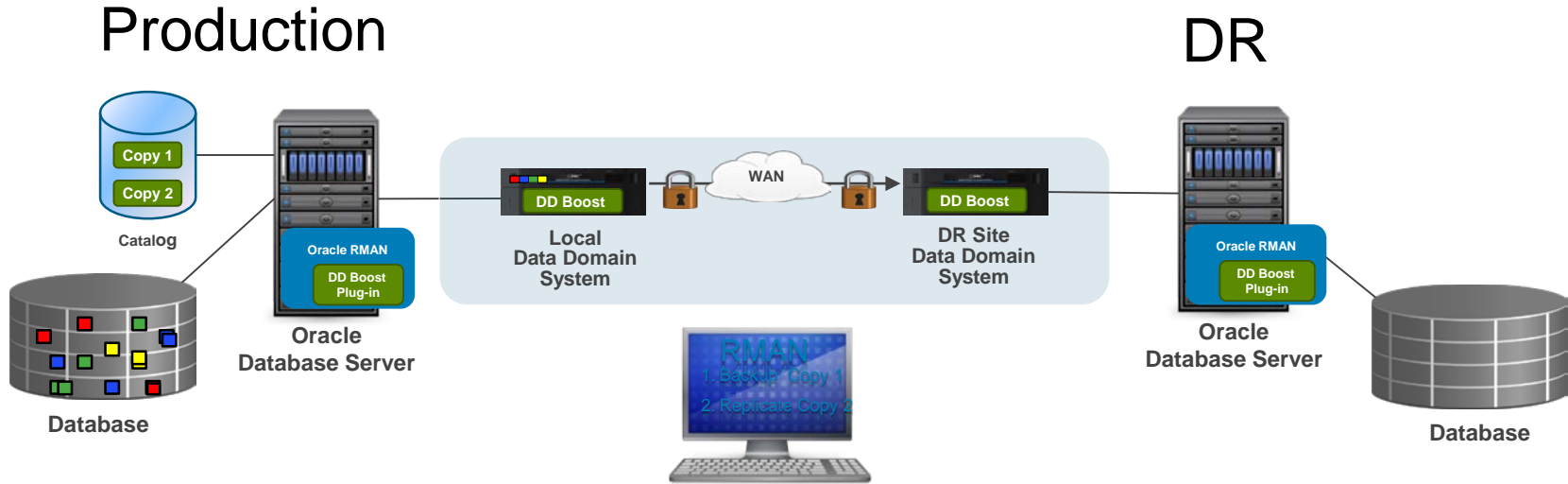
# Efficient Resource Utilisation

- What Gets Distributed?

- ✓ 50% Faster Backups
- ✓ 20 to 40% Lower CPU Utilization
- ✓ 99% Less LAN Bandwidth



# Data Domain Replication Efficiency

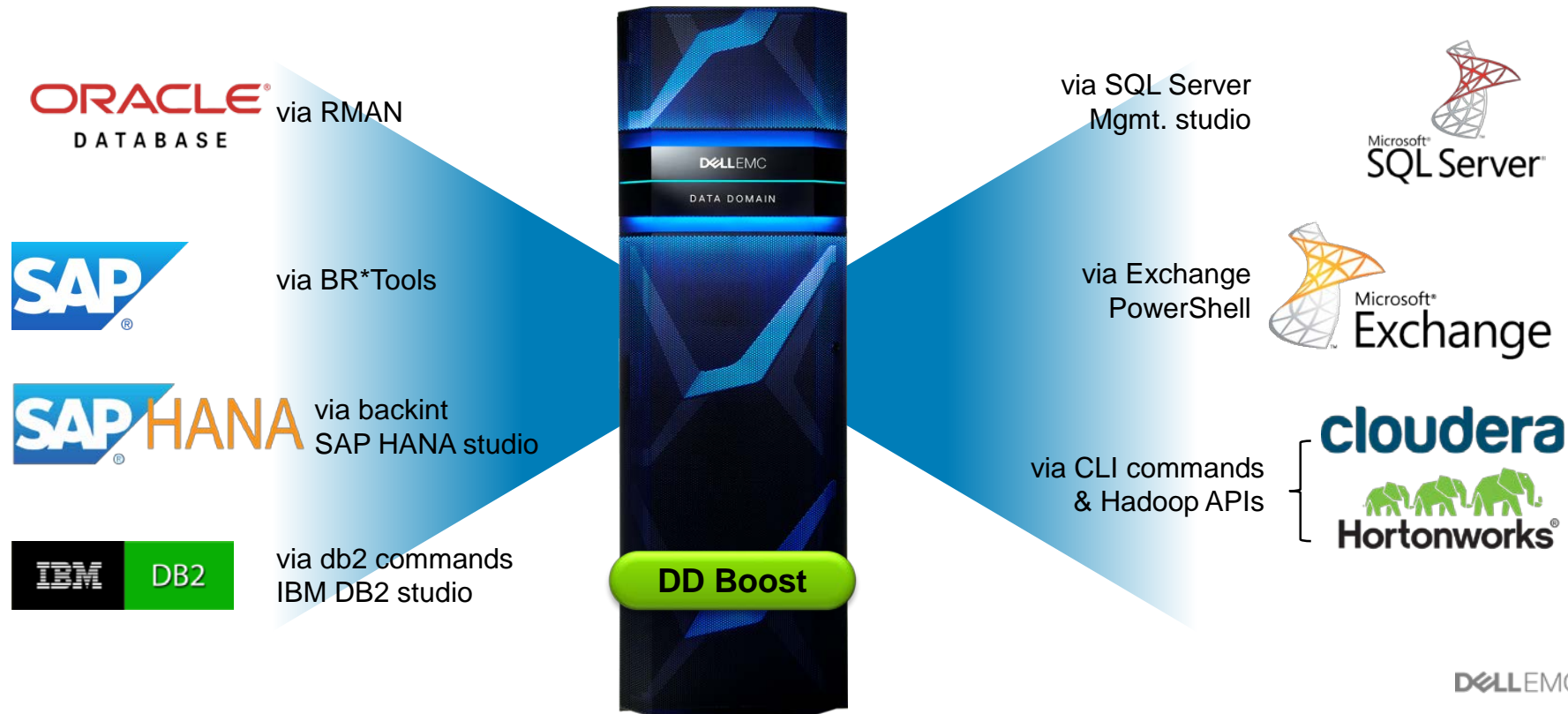


Efficient Local backup and Offsite DR

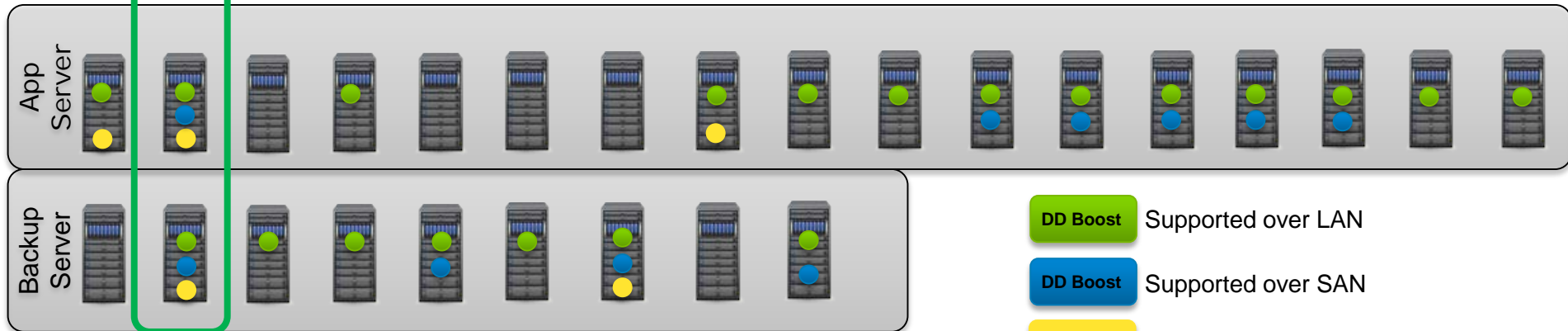
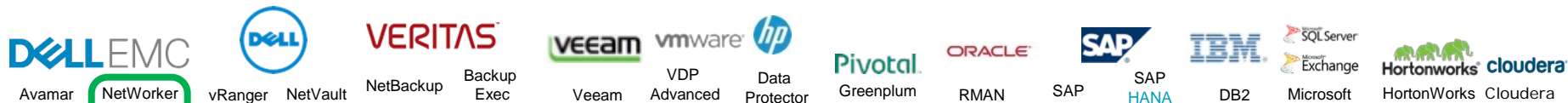


# DD BOOST FOR ENTERPRISE APPLICATIONS

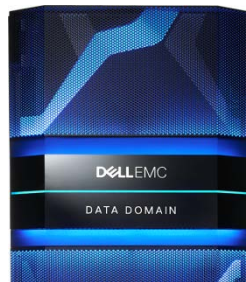
NATIVE APPLICATION INTEGRATION, THROUGH WHICH DATA PROTECTION CONTROLLED BY APPLICATION OWNERS



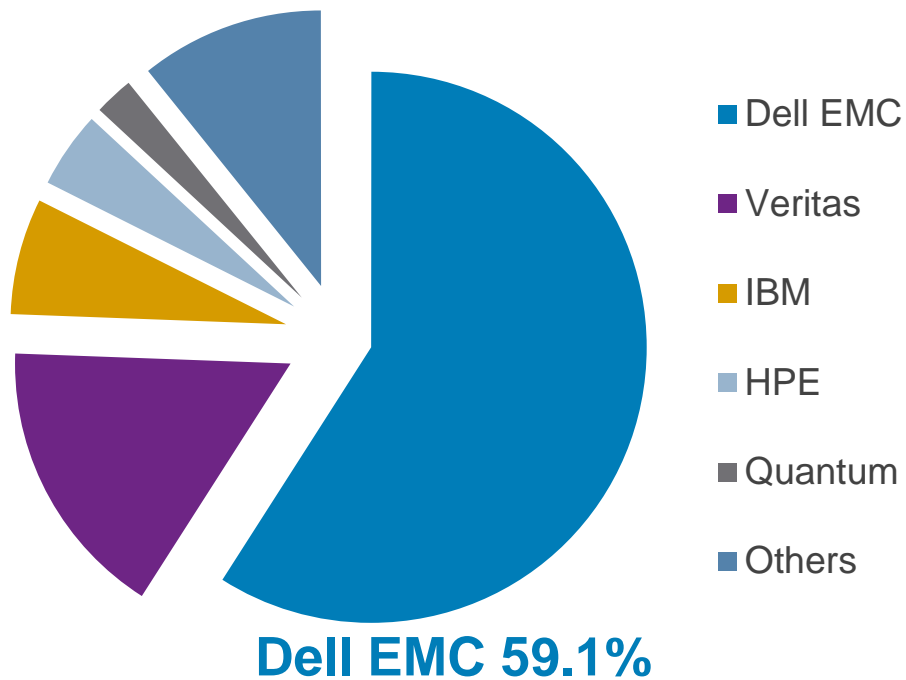
# DD Boost Seamless Integration



- DD Boost Supported over LAN
- DD Boost Supported over SAN
- DD Boost Supported over WAN



# DATA DOMAIN – MARKET SHARE (PBBA)



Source: IDC Worldwide Quarterly Purpose Built Backup Appliance Tracker – Q4 2016

Source: Gartner

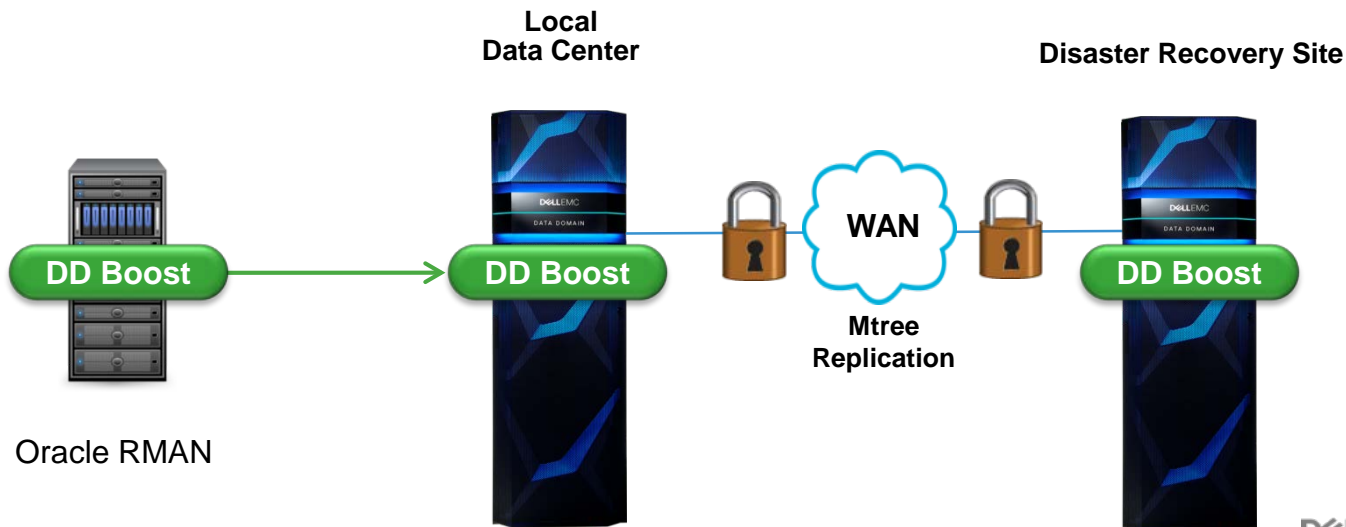
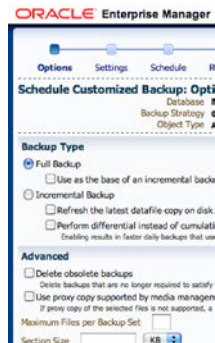
# BOOST BACKUP VIA RMAN

# DD BOOST WITH ORACLE RMAN AGENT

- App Owner control of backup using **Oracle RMAN**
- Faster backup and recovery using native utilities
- Supports IP or Fibre Channel



Database Admin



# BOOST BACKUP VIA RMAN DEMO

Get your free Data Domain at

<https://www.emc.com/products-solutions/trial-software-download/data-domain-virtual-edition.htm>

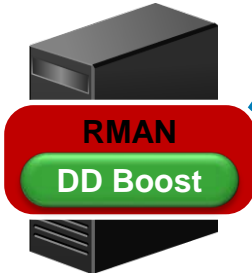
# ORACLE INTEGRATION



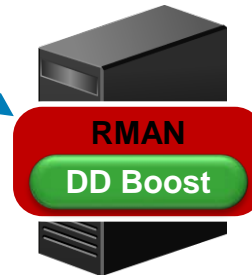
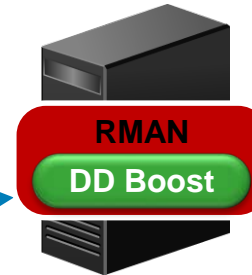
✓ Oracle Exadata Supported

# USING DATA DOMAIN TO CLONE/REFRESH

Production Server



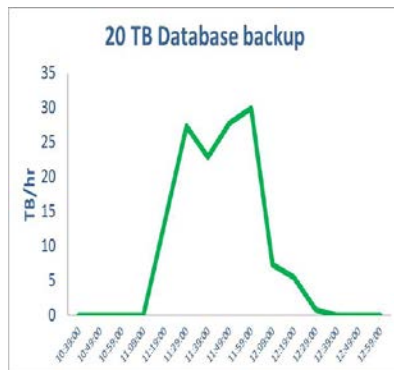
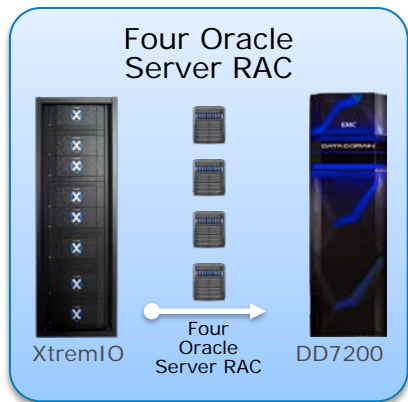
Test Server





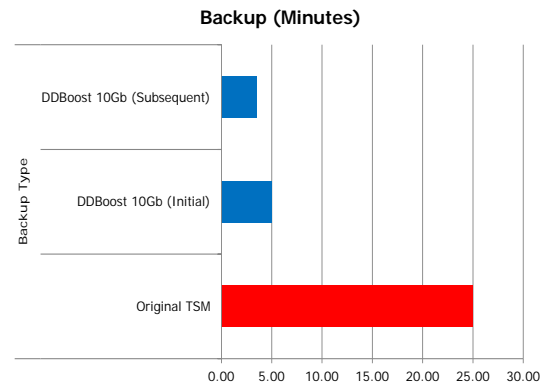
# ORACLE DD BOOST - BACKUP PERFORMANCE

## Customer Use Case



Peak throughput: 30 TB/hr  
Average throughput: 20 TB/hr

## UU634 – Backup Performance



- Database backup time (existing) --- **25 hours**
- Database backup time using DD Boost – **4 hours (5hrs initial)**

<https://www.emc.com/collateral/white-papers/h14026-xtremio-dd-rman-wp.pdf>

**ORACLE**  
DATABASE

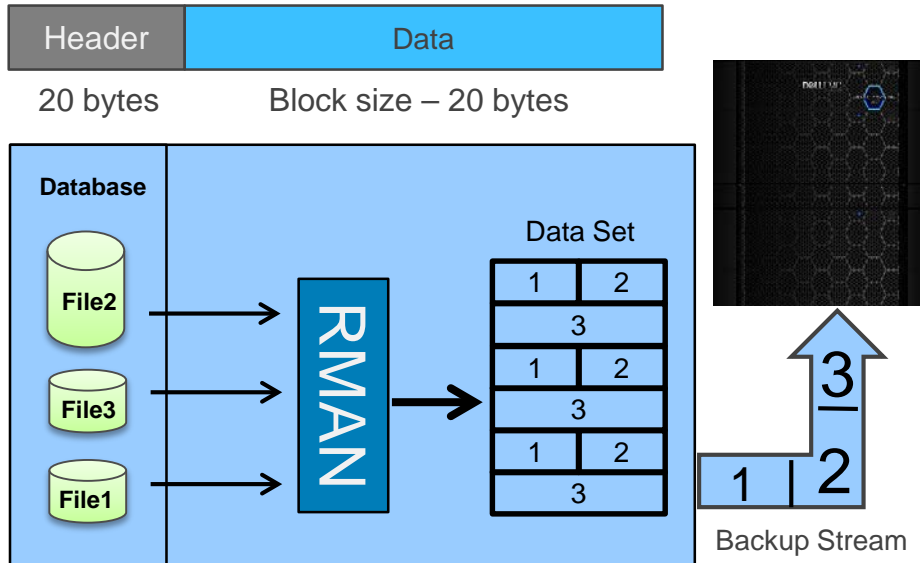
DELL EMC

# ACHIEVE HIGHER DE-DUPE

Using Data Domain's Oracle optimization parameter

Block header changes when

- Block data changes
- Multiplexing is enabled



- Oracle multiplexing **reduces effectiveness** of other deduplication appliances **except Data Domain**
- Understands Oracle's backupset data structure
- Result: **30% increase in deduplication**
- **Highest dedupe rates** of any dedupe appliance.

# SIMPLE RMAN DD BOOST BACKUP

Minimal changes to RMAN scripts

## #Complete DDBoost for RMAN Configuration

```
CONFIGURE DEFAULT DEVICE TYPE TO SBT_TAPE;  
CONFIGURE DEVICE TYPE SBT_TAPE Backup TYPE to BACKUPSET PARALLELISM 8 ;  
CONFIGURE CHANNEL DEVICE TYPE 'SBT_TAPE' PARMS 'BLKSIZE=1048576,  
SBT_LIBRARY=/app/oracle/product/12.1.0/dbhome_1/lib/libddobk.so,  
ENV=(STORAGE_UNIT=orabackups, BACKUP_HOST=datadomain.emc.com,  
ORACLE_HOME=/app/oracle/product/12.1.0/dbhome_1)';
```

## #Authentication one-time only

```
run  
{  
ALLOCATE CHANNEL c1 TYPE SBT_TAPE Trace 5 PARMS 'BLKSIZE=1048576,  
SBT_LIBRARY=/app/oracle/product/12.1.0/dbhome_1/lib/libddobk.so, ENV=(STORAGE_UNIT=orabackups,  
BACKUP_HOST=datadomain.emc.com, ORACLE_HOME=/app/oracle/product/12.1.0/dbhome_1)';  
send 'set username ddbboost password abc123 servername datadomain.emc.com';  
RELEASE CHANNEL c1;  
}
```

# RMAN SCRIPT SAMPLE







```
run {
configure controlfile autobackup on;
set controlfile autobackup format for device type sbt to "CONTROLFILE.%F";

allocate channel dd0 type 'sbt_tape'
parms='BLKSIZE=1048576,SBT_LIBRARY=/u01/app/oracle/product/11.2.0/db_1/lib/libddobk.so,ENV=(STORAGE_UNIT=
orabackups, BACKUP_HOST=datadomain.emc.com,ORACLE_HOME=/u01/app/oracle/product/11.2.0/db_1)';

allocate channel dd1 type 'sbt_tape'
parms='BLKSIZE=1048576,SBT_LIBRARY=/u01/app/oracle/product/11.2.0/db_1/lib/libddobk.so,ENV=(STORAGE_UNIT=
orabackups, BACKUP_HOST=datadomain.emc.com, ORACLE_HOME=/u01/app/oracle/product/11.2.0/db_1)';

backup filesperset 4 database format '%d_set%s_piece%p_%T_%U';
backup archivelog all format '%d_set%s_piece%p_%T_%U';
release channel dd0;
release channel dd1;
```

# RMAN BACKUP OPTIONS FOR DATA DOMAIN

Application Data	Backup without RMAN compression and Encryption	Backup with <b>RMAN compression</b> (disk backup)
Not Encrypted		
Encrypted with TDE column encryption		
Encrypted with TDE tablespace encryption		

Recommendation: no RMAN compression and no RMAN encryption

# ORACLE TDE TEST RESULT – SMALL DB

#disk uncompressed backup

real 1m15.304s

user 0m3.960s

sys 0m0.299s

#disk compressed backup

real 3m17.607s

user 0m3.699s

sys 0m0.198s

#ddboost uncompressed backup

real 0m35.591s

user 0m3.947s

sys 0m0.237s

- Disk uncompressed backup is 2.1 times longer than DDboost
- Disk compressed backup is 5.6 times longer than DDboost.

# Tuning Summary for Device Type SBT

RMAN Parameters	
FILESERSET	Tunable based on customer environment with Oracle Optimization
Section Size	Break large file to multiple channel
Number of Channels	As many as the Oracle server can bear
Backup type	Full and/or cumulative incremental
Format	%d_set%s_piece%p_%T_%U
Block Change Tracking	enable
RMAN Compression	No
RMAN Encryption	No (Oracle database can be encrypted)



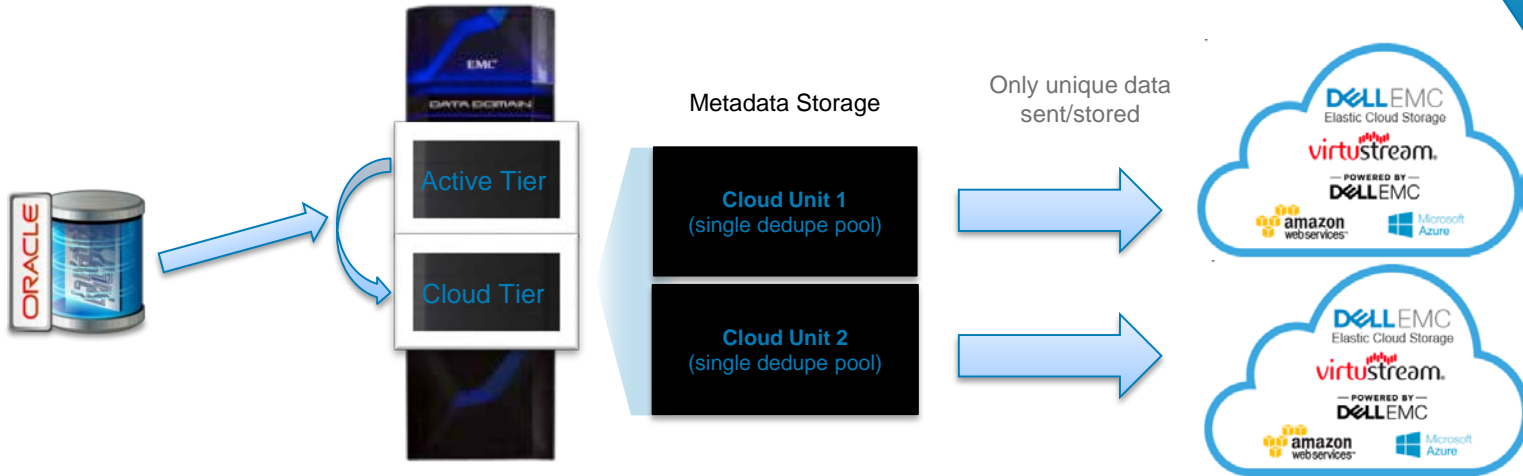
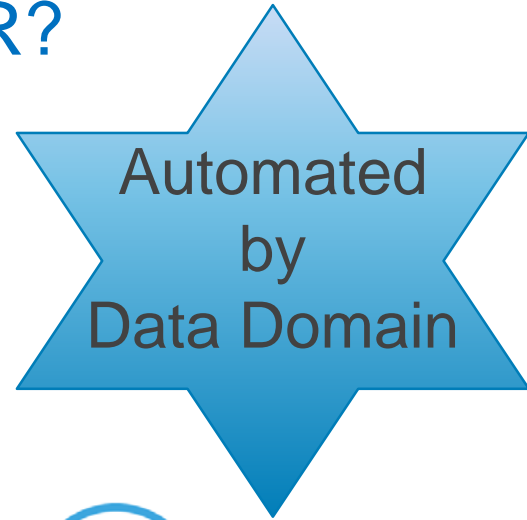
# LONG TERM RETENTION



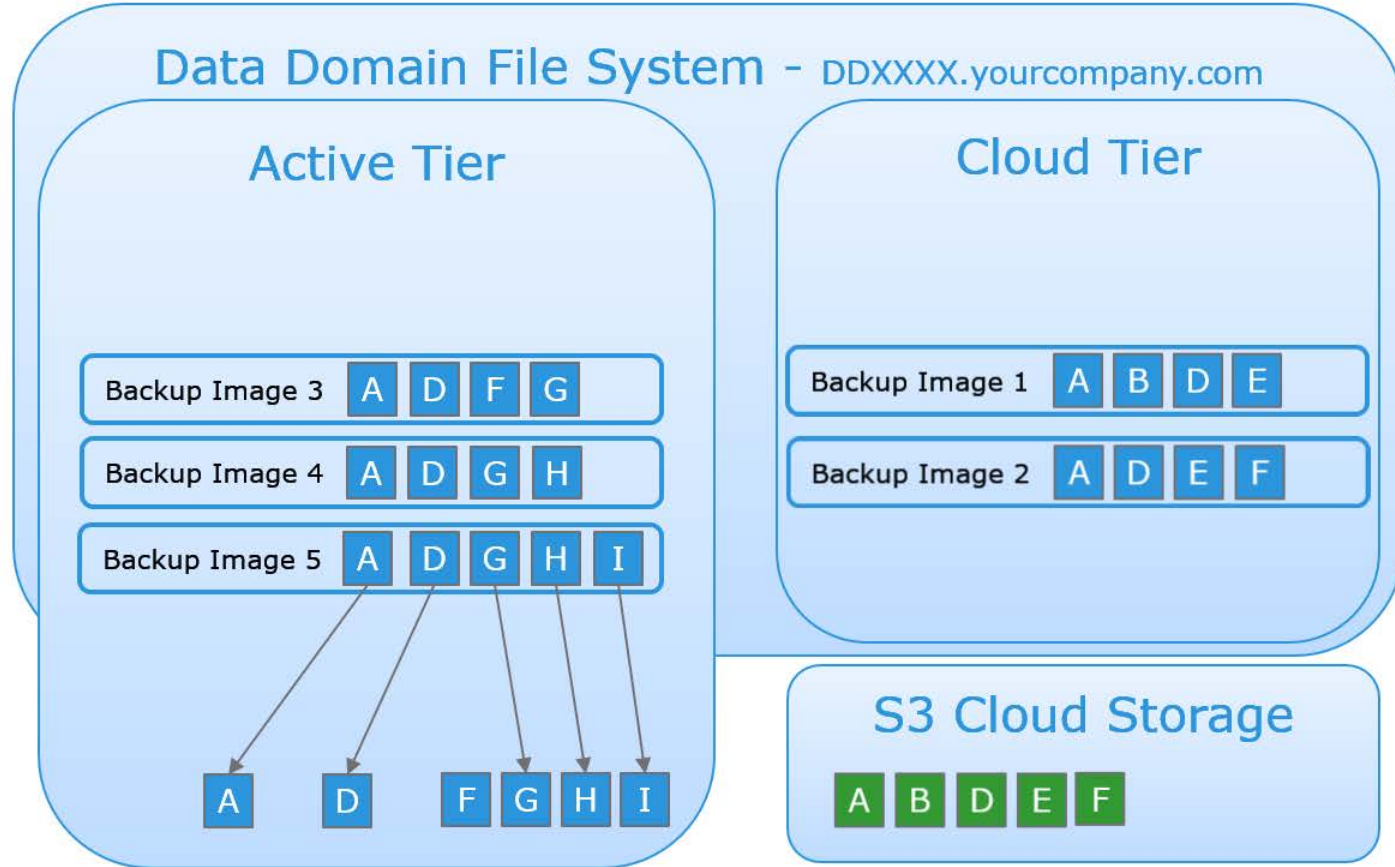
# WHAT IS DATA DOMAIN CLOUD TIER?

## AUTOMATED LONG TERM RETENTION

- Send only unique data to the Private or Public cloud
- Data lands in the cloud already de-duplicated
- Reduce storage requirements up to 10 – 30x



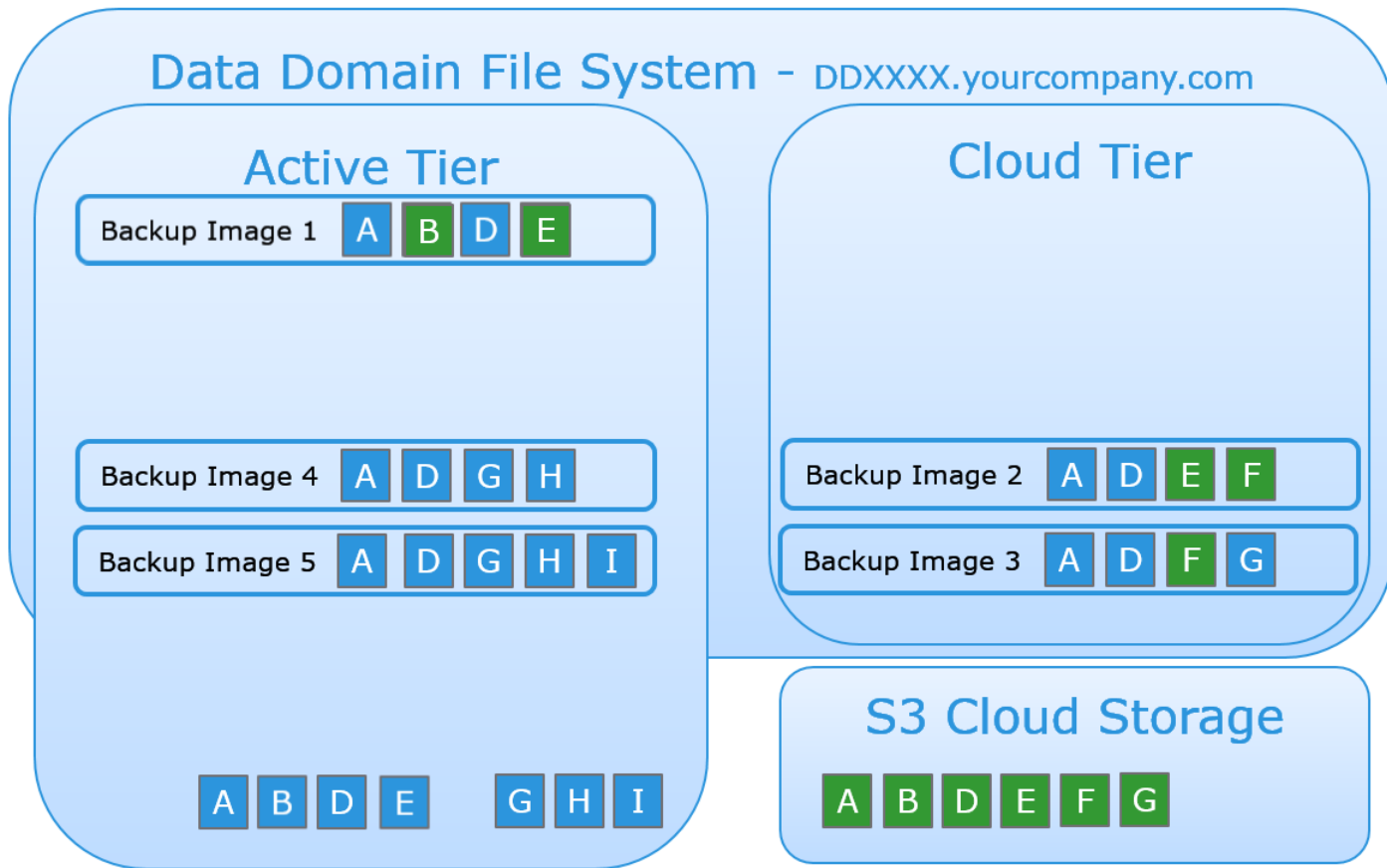
# DATA DOMAIN CLOUD TIER DATA MOVEMENT EXAMPLE



Day 28 – Next Backup

\*14 day movement policy

# DATA DOMAIN CLOUD TIER DATA RECALL EXAMPLE



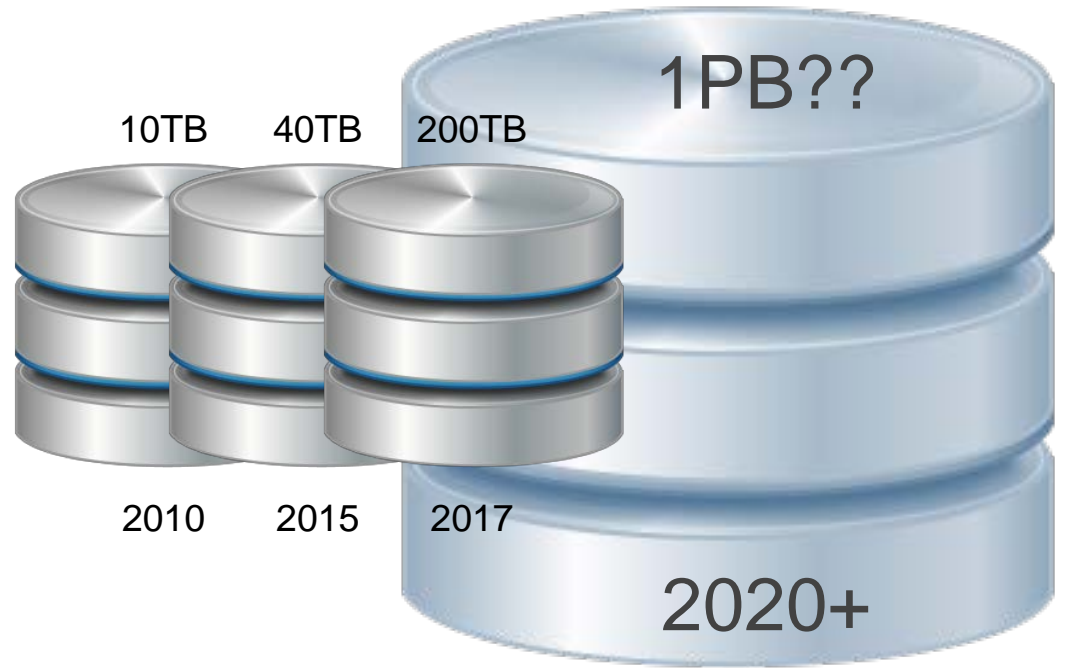
Blocks B and E recalled from the cloud

\*14 day movement policy

# ADDRESSING FUTURE BACKUP CHALLENGES



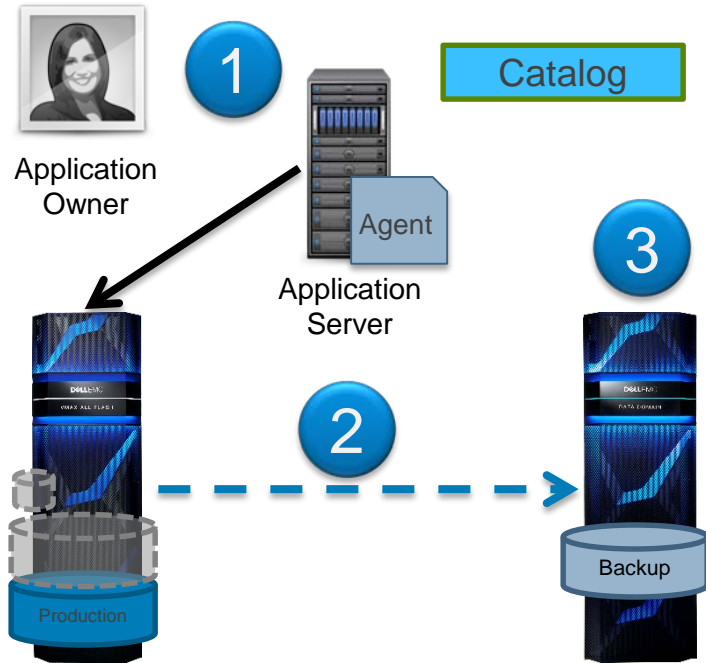
# CHALLENGE 1: DATABASE SIZES KEEP GROWING



**How can your backup architecture keep you protected as your data grows?**

# BACKUP WITH PROTECTPOINT TECHNOLOGY

Storage-integrated data protection: support VMAX3, VMAX Flash, and XtremIO



- App owner triggers backup at an application consistent checkpoint
  - RMAN proxy option
  - DB2 snapshot option
  - SQL via SSMS
- Primary storage sends changed blocks directly to Data Domain
- Data Domain uses the changed blocks to create full backups in native format

**20X faster backup**  
**No Application Impact**

**ORACLE®**  
DATABASE

**IBM**

**DB2**



Microsoft®  
**SQL Server®**

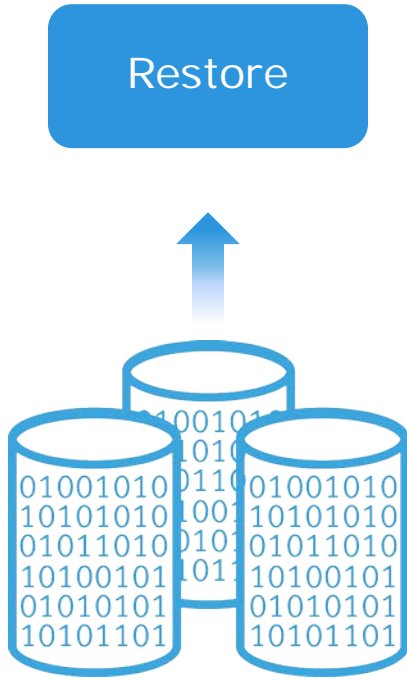
Microsoft®  
**Exchange**

**SAP®**

File System

# PROTECTPOINT ACCELERATED RESTORES

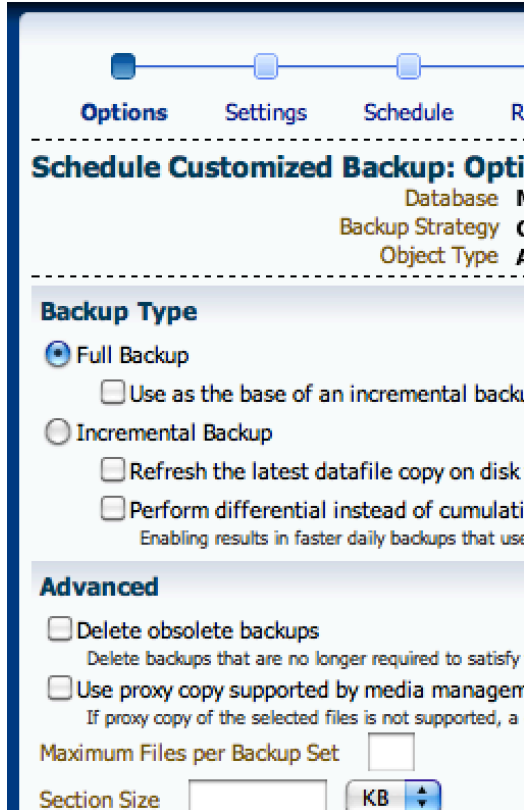
RESTORE IN FULL OR AT AN OBJECT LEVEL



- Use Array change Block tracking for full restore
- Granular/Object restore carried out by instantly accessing a full backup
  - Either direct from the Data Domain (VMAX3/XtremIO)
  - Or via VMAX3
- Controlled via RMAN

# PROTECTPOINT FOR ORACLE

## ORACLE® Enterprise Manager

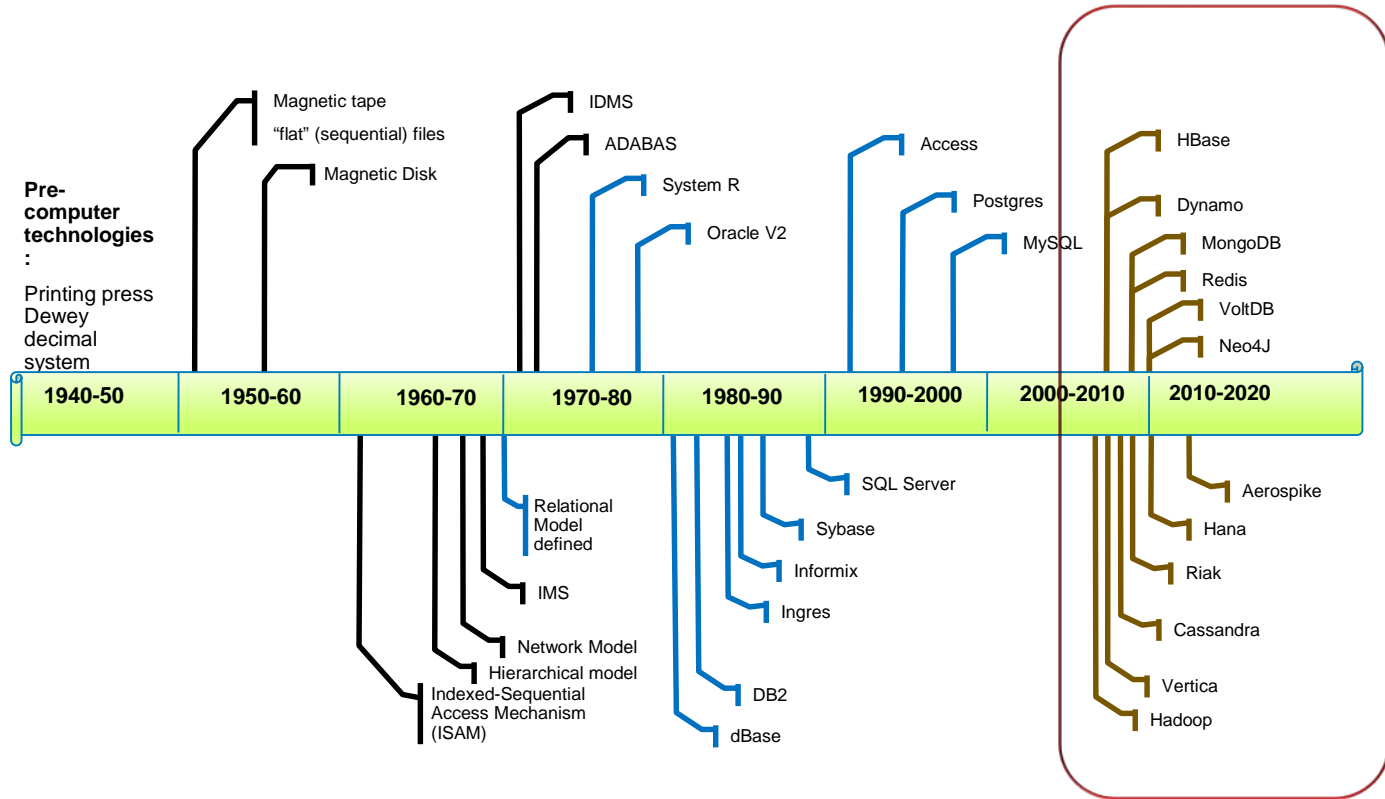


The screenshot shows the Oracle Enterprise Manager configuration page for a customized backup. At the top, there are tabs for 'Options', 'Settings', 'Schedule', and 'R...'. Below the tabs, the page title is 'Schedule Customized Backup: Opti...'. Underneath, there are dropdown menus for 'Database', 'Backup Strategy', and 'Object Type'. The 'Backup Type' section has three radio buttons: 'Full Backup' (selected), 'Incremental Backup', and 'Differential Backup'. Below 'Full Backup' are two checkboxes: 'Use as the base of an incremental backup' and 'Refresh the latest datafile copy on disk'. Below 'Incremental Backup' are two checkboxes: 'Perform differential instead of cumulative' and 'Enabling results in faster daily backups that use...'. The 'Advanced' section has two checkboxes: 'Delete obsolete backups' and 'Use proxy copy supported by media management'. At the bottom, there are input fields for 'Maximum Files per Backup Set' and 'Section Size' with a unit dropdown set to 'KB'.

- DBA Control of Backup
  - via **Oracle RMAN**
- Supports Oracle 11g, 12c
  - Oracle RAC Support
  - OS: Windows, Linux
  - OS: Unix (Solaris, AIX, HP-UX)
  - VMAX<sup>3</sup> and XtremIO
  - VMware: RDM Support in guest agent

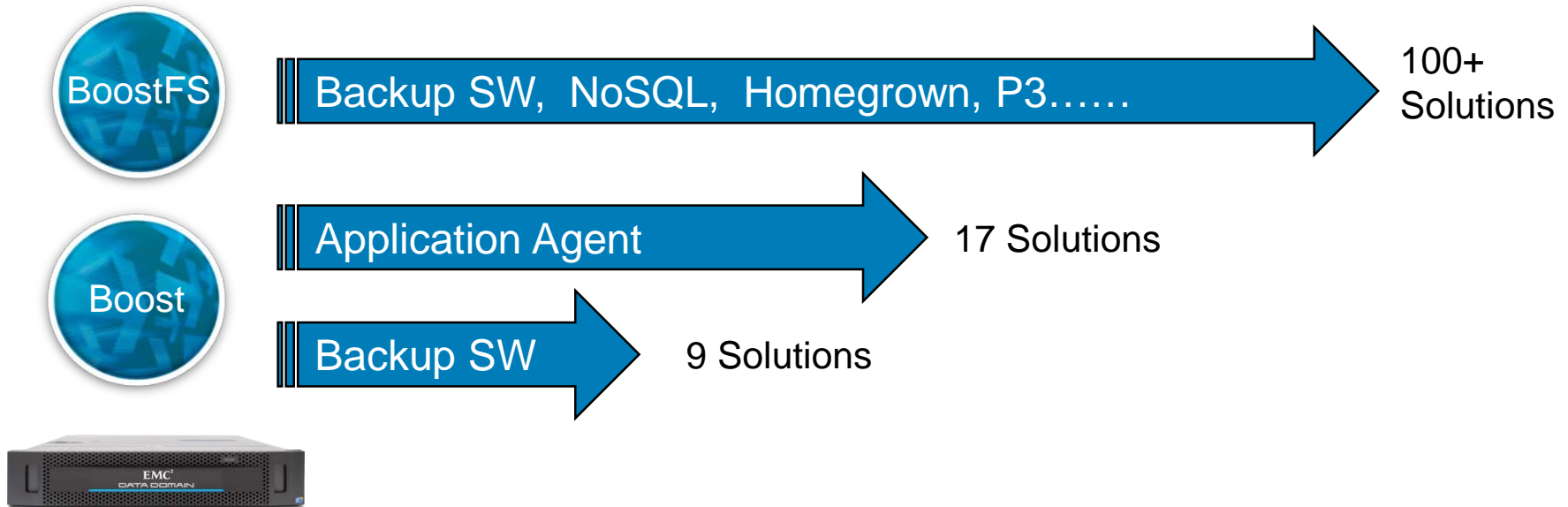


# Evolution of Databases



# CHALLENGE 2: MODERN DATABASE BACKUP

MARKET ACCELERATION WITH BOOSTFS



# BOOSTFS DEMO

# Dell EMC Oracle Backup Solution for Oracle

## USING DATA DOMAIN BOOST



- Unsurpassed efficiency
  - Efficiently identify what to backup
    - Use DD Boost to do source side de-dupe
    - Small variable length blocks for highest efficiency
    - Direct backup from Client – No dump and sweep
  - Efficiently & securely send backup data
    - Send unique blocks only using Compression and/or Encryption
  - Efficiently store data
    - Variable Length De-dupe for highest dedupe
    - Data at Rest Encryption
    - Retention Lock to secure backups
    - Expand to Object Storage for Long Term Retention
    - Seamless and automated remote replication for DR
- Controlled via backup software or via native tool
- Industry leading and ready for future

**D**  **LEMC**