



VERITAS™

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Oracle Backup and Recovery Essentials

Every DBA Should Know

Agenda

- VERITAS Overview
- Storage Trends
- Basic Oracle Backup Methods
- Advanced Oracle Backup Methods
- Oracle Backup Strategies
- Questions and Answers

VERITAS Software

VERITAS Software

- World's Largest Storage Software Company
 - \$1.5BN Revenues
 - 5700 Employees
 - 36 Countries
 - 54% Five Year CAGR
- 86% Of Fortune 500 Run VERITAS Software



Desktop to Data Center

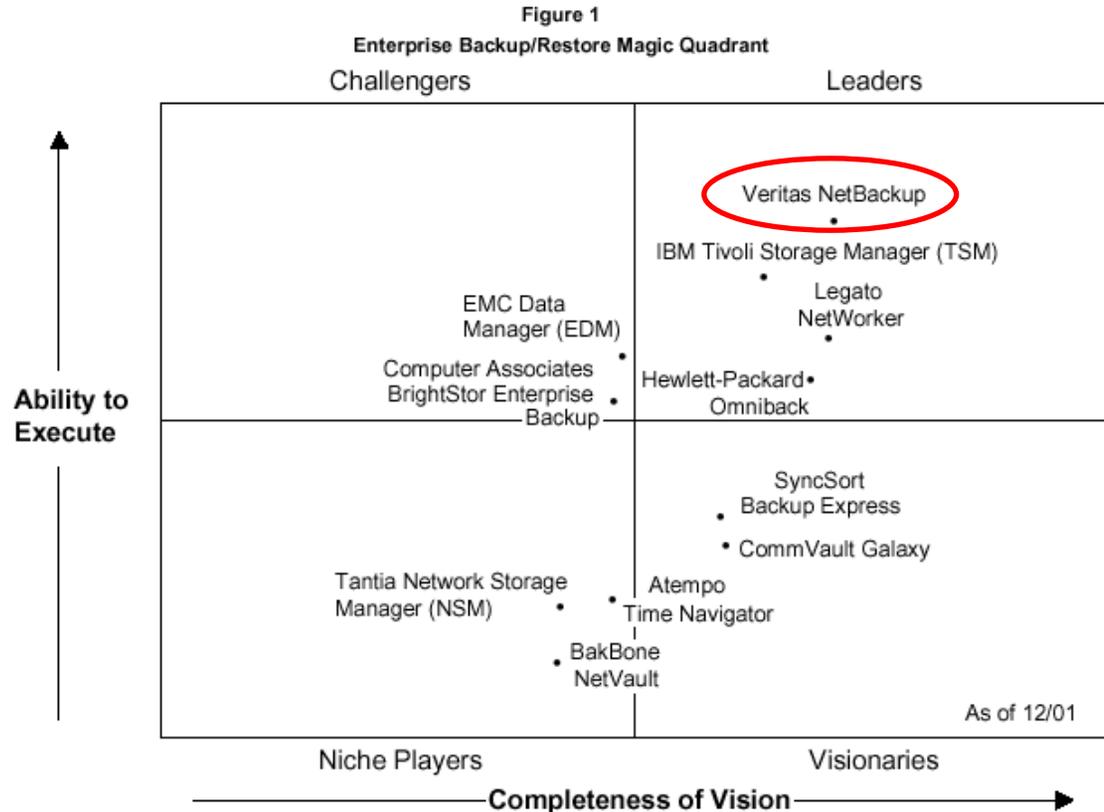
- **NetBackup DataCenter**
 - Enterprise wide
Windows, UNIX and NetWare data protection
- **NetBackup BusinessServer**
 - Scalable data protections for smaller heterogeneous workgroup environments & branch offices
- **NetBackup Professional**
 - Scalable laptop/workstation data protection
- **NetBackup Storage Migrator**
 - Automated migration and recall of infrequently accessed data
 - Reduced backup and recovery times

VERITAS: Listed as an Enterprise Backup Leader

Enterprise Backup/Restore Magic Quadrant

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Source: Gartner Research Note:
"Enterprise Backup/Restore Market: Magic Quadrant,"
S. Zaffos, C. DiCenzo, R. Paquet, 21 December 2001



Source: Gartner Research

Storage Trends

Trends in Data Protection

- Annual data growth is 100-400%
 - Over half of all data resides in databases
 - Not just more data...more *files*
- What backup window?
 - 24 by forever applications
 - Downtime means lost revenue - *or worse*
- Greater emphasis on disaster recovery
 - Need enforceable offsite procedures
- Staffing can't keep up
 - Need centralized control for consistency
 - Interfaces must be intuitive and foolproof

Requirements for Oracle Backup and Recovery

- High Availability of current systems
 - Need for a high-performance solution that supports hot backups and minimizes backup impact on system
- Reliable Results
 - Since Oracle recovery is complex, backup solution needs to be reliable
- Manageability
 - Need for automation so that backups can take place unattended
 - The ability to prioritize which data is backed up first
- Flexibility
 - The ability to recover a single tablespace or table
 - Performing online recoveries
 - Ability to recover to a point in time

Basic Oracle Backup Methods

Backup Types

- Offline (Cold) Backup
 - Closed database backup
 - Backup control files and datafiles
- Online (Hot) Backup
 - Open database backup
 - Must be in archive log mode
 - Backup control files and datafiles
- Logical Backup
 - Export of subsets of Oracle data

Oracle Backup Methods

- Operating System Script Based Backup
- RMAN Based Oracle Backup
- Backup and Recovery Wizards
- Archiving Data for Long-Term Storage

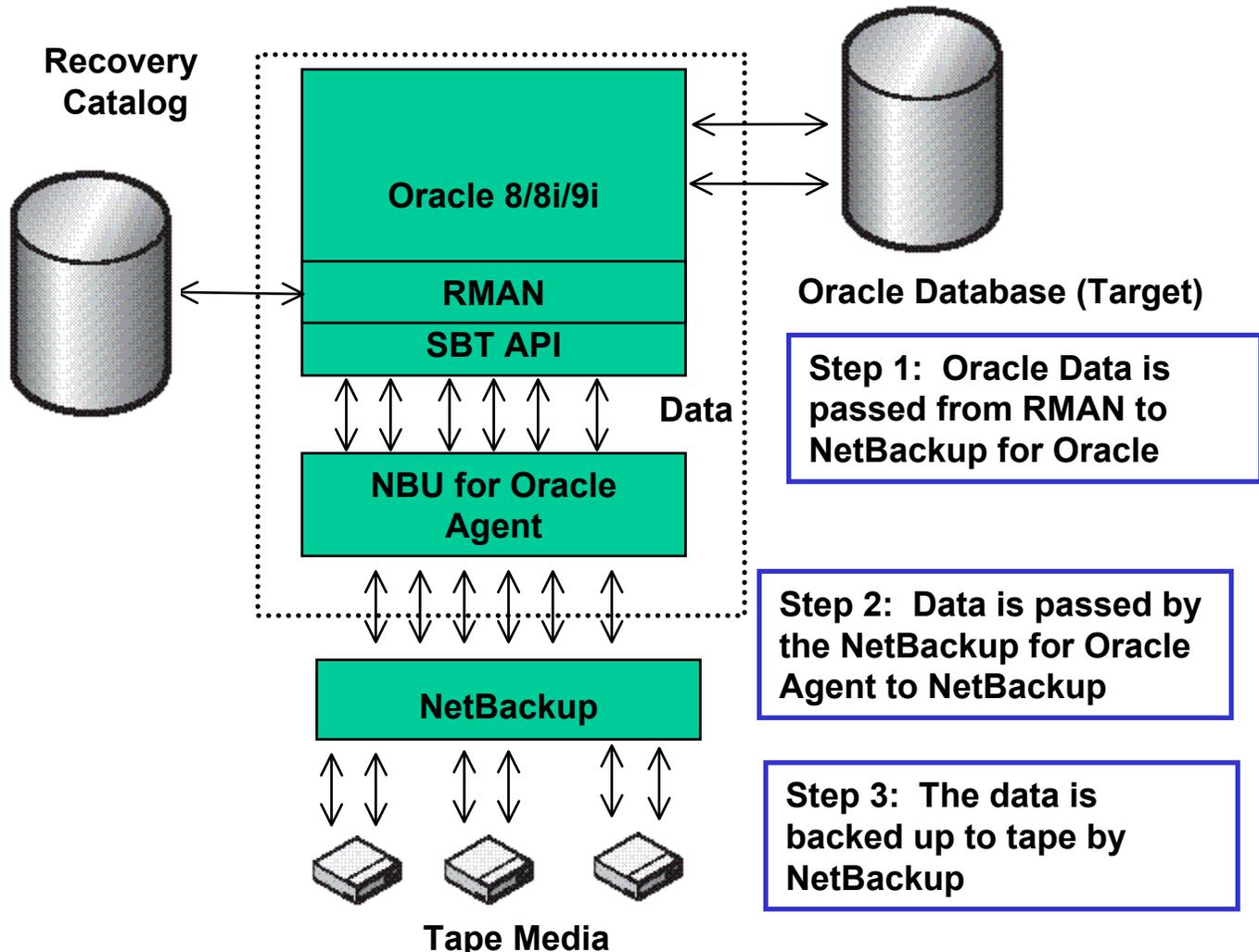
Script Based Oracle Backup

- User creates custom made Oracle scripts
- Can perform cold or hot database backups
- Disadvantages: Very Manual Process
 - Complicated scripts must be manually maintained
 - Constantly updating file lists, class definitions
 - Archived logs and control files must be done separately
 - Recovery process is difficult
 - Crisis-driven, may result in errors

NetBackup for Oracle

- Greatly simplifies recovery
- Leverages RMAN Features
- Automates Oracle data protection process
- Supported by Oracle Corporation
- Uses NetBackup for Media Management and RMAN Script Generation (via Wizard)

NetBackup for Oracle Architecture



NetBackup for Oracle

- Features
 - Incremental backups
 - Differential and Cumulative
 - Corrupt block detection
 - Null block compression
 - Archived redo logs and control files can be automatically included in the backup
 - Tight integration with NetBackup via the NetBackup for Oracle Agent

NetBackup for Oracle

- Features
 - Restartable backup and restore (Oracle9i)
 - Backup optimization (Oracle9i)
 - Ideal for archived redo logs
 - RMAN determines what is needed during restore and recovery
 - Reports
 - REPORT and LIST commands help determine what has been backed up and what needs to be backed up
 - Extremely helpful in developing an effective backup strategy

Backup and Recovery Wizards

- Backup and Recovery RMAN Wizards
 - GUI driven, reducing training costs
 - Dramatically simplifies the Oracle backup and recovery process
 - Makes backup and recovery script creation straightforward
 - Available with the following VERITAS Products
 - NetBackup for Oracle
 - NetBackup for Oracle Advanced BLI Agent
 - NetBackup for Oracle ServerFree Agent

Backup and Recovery Wizards

New Wizards make script creation easy

RMAN Template Generation (Backup)

Archived Redo Logs
Specify archived redo log options.

Include Archived Redo Logs in Backup

All

Range

From: 12/31/1969 6:00:00 PM

Until: 12/31/1969 6:00:00 PM

Delete archived redo logs after they are backed up

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RMAN Template Generation (Backup)

Database State
Choose to stop and start the database before and after the backup.

A cold backup requires that the database be offline. The database can be automatically taken offline prior to the start of the backup.

Take the database OFFLINE BEFORE the backup starts

Bring the database ONLINE AFTER the backup completes.

Oracle database initialization parameter file:
E:\oracle\admin\WA1817\pfile\init.ora Browse

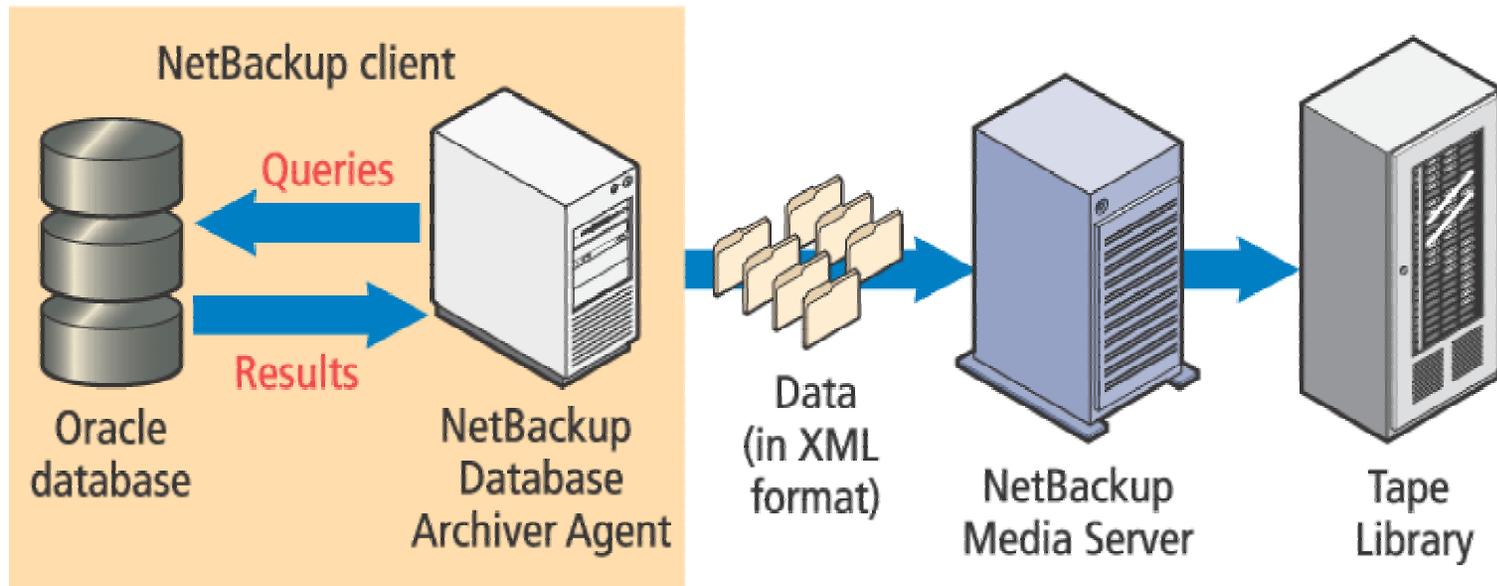
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NetBackup Database Archiver

- Features
 - Uses XML format for Oracle database archiving
 - Provides two utilities for data movement
 - Export
 - Import
- Benefits
 - Oracle release independent archive
 - Table, row, column and partition level archiving
 - Useful for long-term archival of Oracle data
 - Allows for easy recovery of data even if the original environment is no longer available
 - Increased database performance and reduced online backup times by archiving and deleting historical data

Database Archiver Agent

NetBackup Database Archiver Export Process



Advanced Oracle Backup Methods

Advanced Oracle Backup Methods

- Why consider advanced methods?
 - Large terabyte databases
 - High availability databases
 - Reduce the backup window
 - Reduce the recovery time
 - Reduce the impact on the Oracle database server
 - Reduce the impact on the network
- Block Level Incremental Backup
- Frozen Image/Snapshot Backup

NetBackup for Oracle Advanced BLI

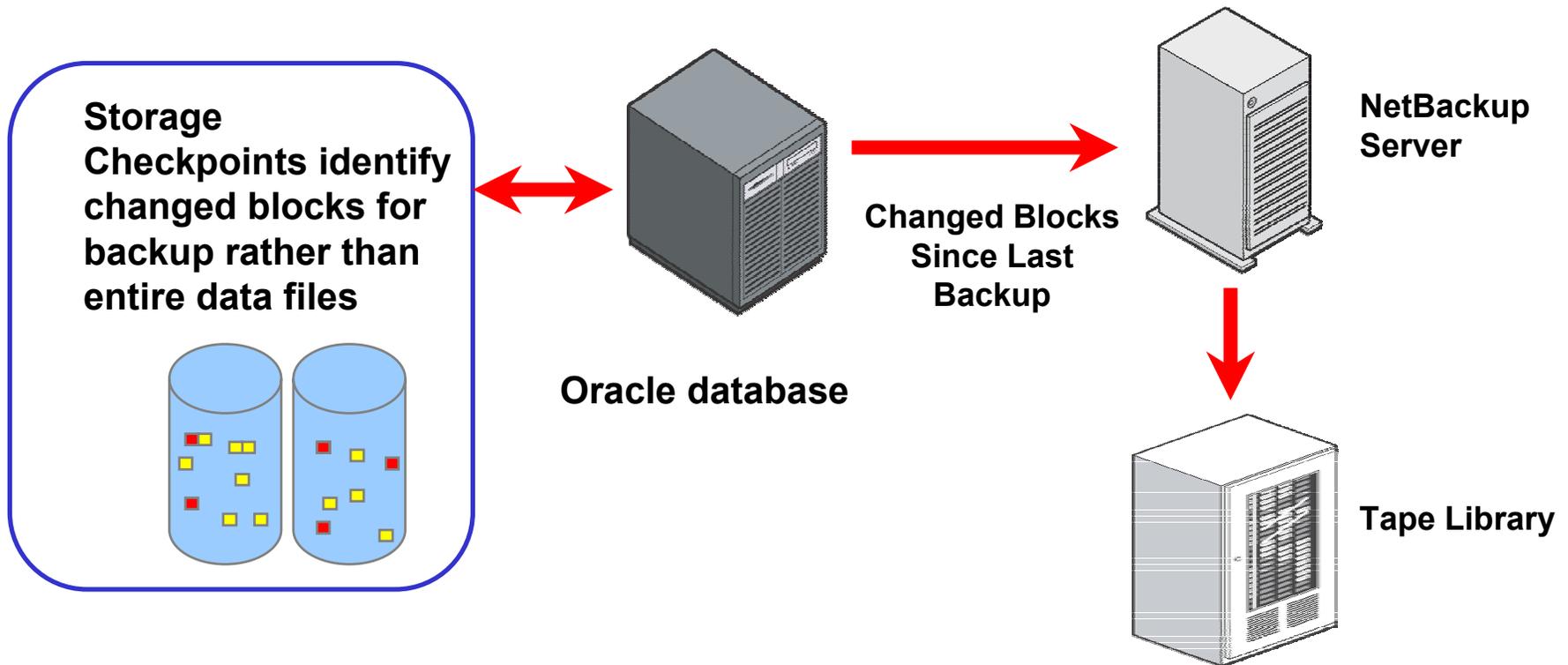
- Software based snapshot backup
 - Backup only the data blocks that have changed
 - Uses File System Storage Checkpoints (VERITAS Database Edition for Oracle)
 - No learning curve (utilizes RMAN and RMAN Proxy Copy)
 - Data is processed from the checkpoints, and not the filesystem
 - Minimal Impact on Oracle
 - Removes the backup workload from Oracle
 - Removes the I/O overhead from Oracle

NetBackup for Oracle Advanced BLI

- How it works
 - Create the snapshot
 - File system storage checkpoints created
 - Blockmap created
 - Keeps track of the changed File System blocks
 - Storage Checkpoints are kept on disk
 - Block Level Incremental Backup
 - Backs up the blocks from the Storage Checkpoint
 - Overhead taken off the file system (file system is only offline for seconds)
 - Using RMAN Proxy Copy, the data is read and written to tape, taking the overhead off of Oracle
 - Block level recovery is quicker and more efficient than traditional methods

NetBackup for Oracle Advanced BLI Agent

- Online Snapshot Block-Level Incremental Backup
- Backup of only changed Oracle blocks from the storage checkpoints reduces elapsed time for backup
- Oracle database remains online and backup impact is minimal

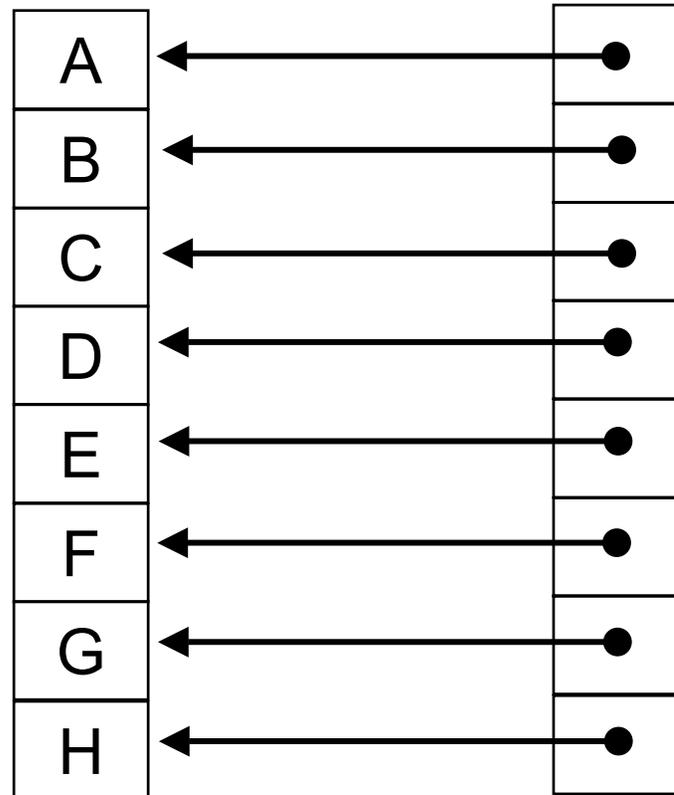


Storage Checkpoint: An Example

When a Storage Checkpoint is first taken:

/oradata

Storage Checkpoint



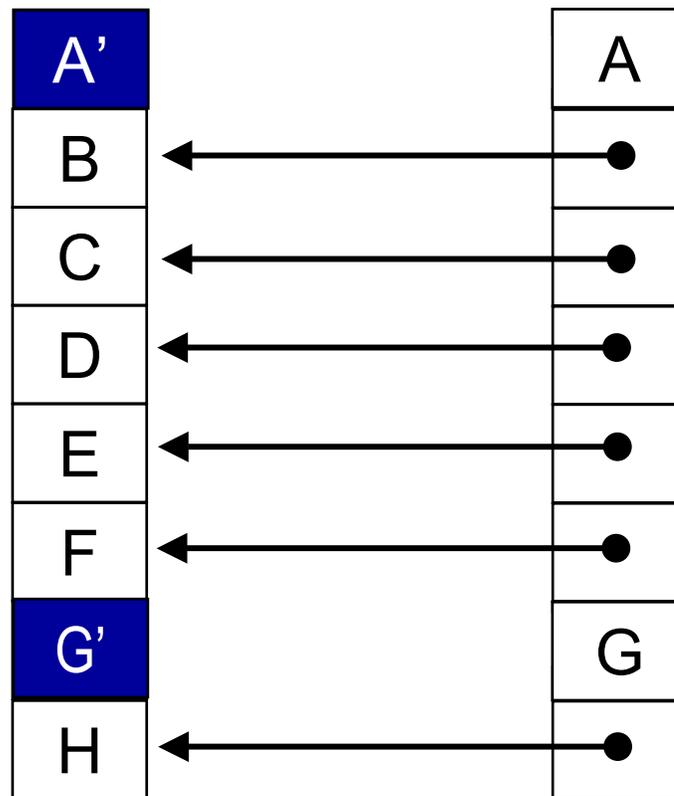
- No data is copied to the Storage Checkpoint
- Takes a couple of seconds
- Presents the point-in-time image of /oradata by finding data from the primary file system, /oradata

Storage Checkpoint: An Example

Storage Checkpoint as /oradata changes

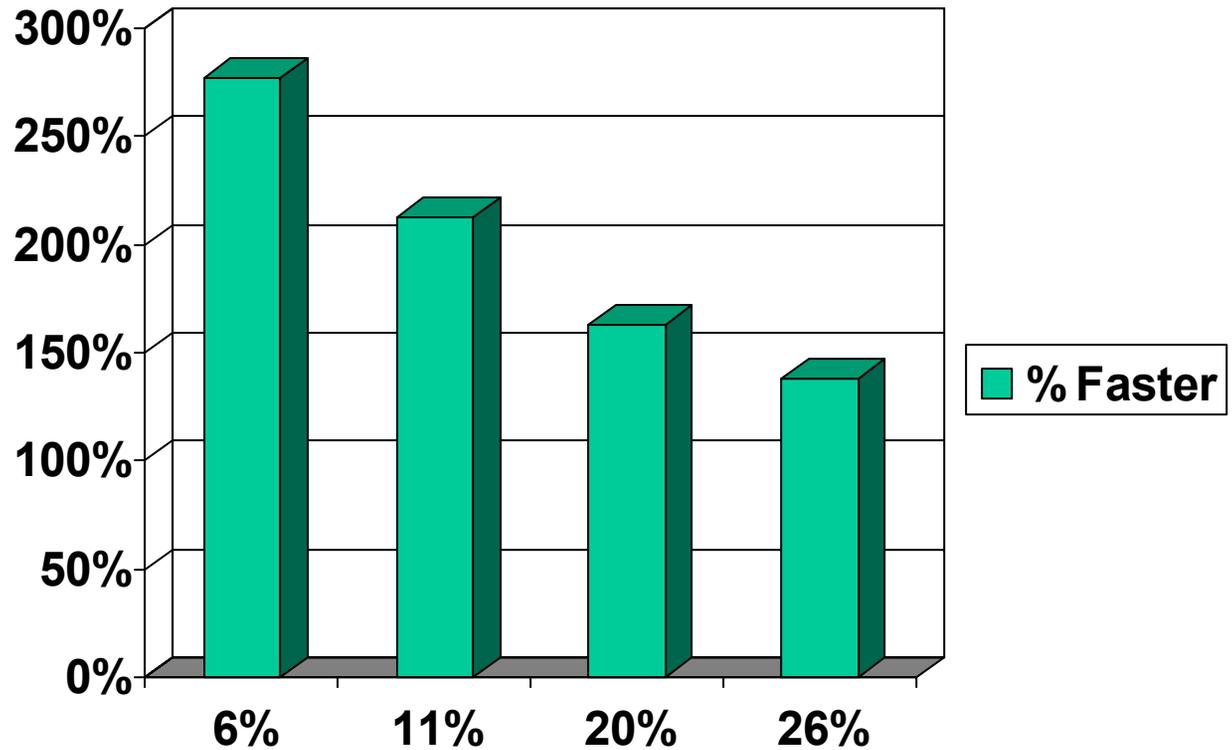
/oradata

Storage Checkpoint



- Copy-on-write mechanism first copies the before-image to the Storage Checkpoint and then updates the data block in the primary file system
- Mountable and writable
- Copy-on-write in place until the next Storage Checkpoint created or the Checkpoint is removed

BLI Agent- Customer Impact



Oracle Database Change

Frozen Image Backup

- Backup a stable, consistent copy of the data (snapshot)
- Data movement can be shifted to a SAN device or a separate host
 - ServerFree Oracle Backup
- Three Step Process:
 - Data Snapshot
 - Logical Disk Object Mapping
 - Data Movement

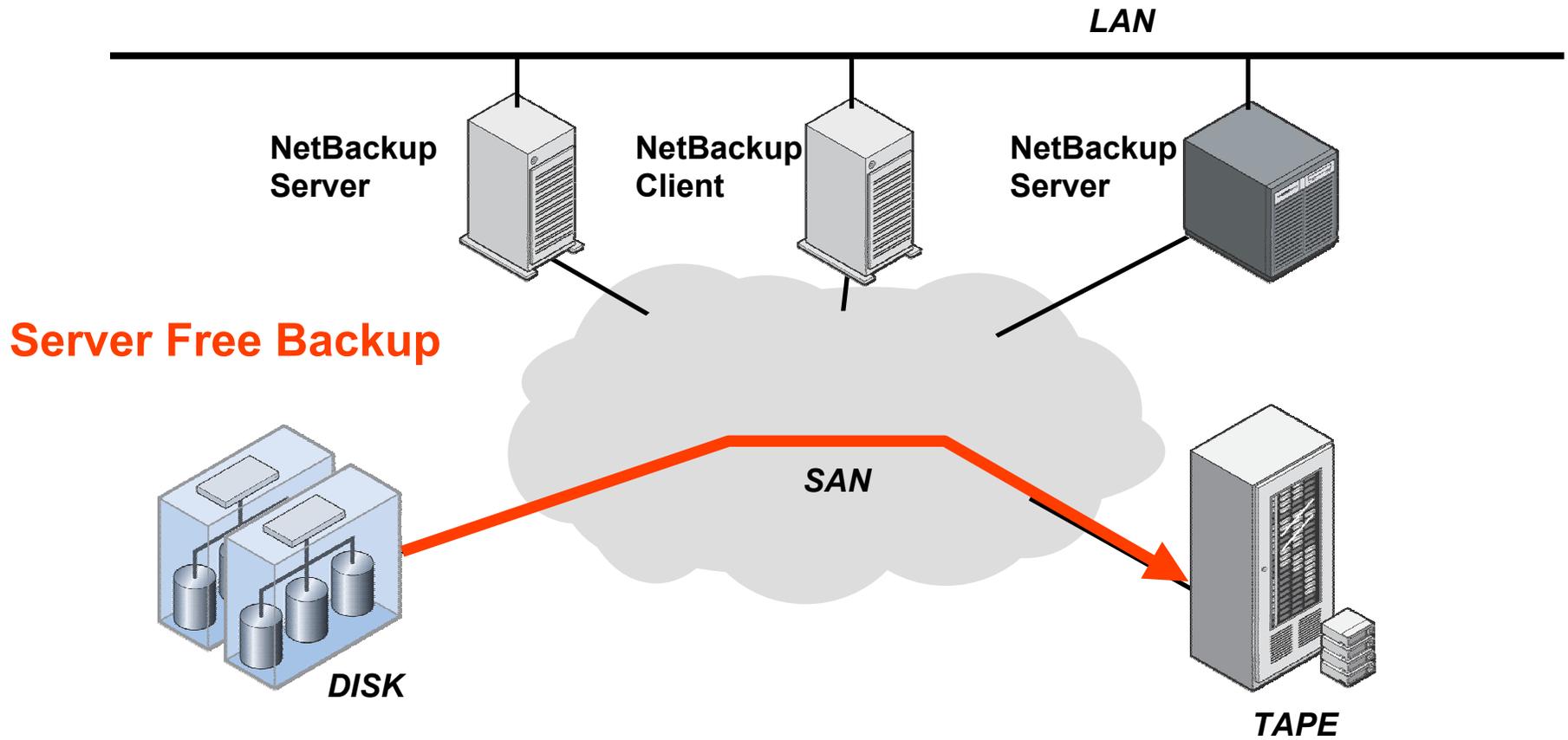
NetBackup for Oracle ServerFree Agent

- Step 1: Data Snapshot
 - RMAN puts the datafiles into backup mode
 - Create frozen image
 - Software Based
 - NetBackup for Oracle ServerFree Agent
 - Hardware Based (Split Mirror)
 - EMC TimeFinder
 - Hitachi ShadowImage
 - HP BusinessCopy
 - RMAN takes the datafiles out of backup mode

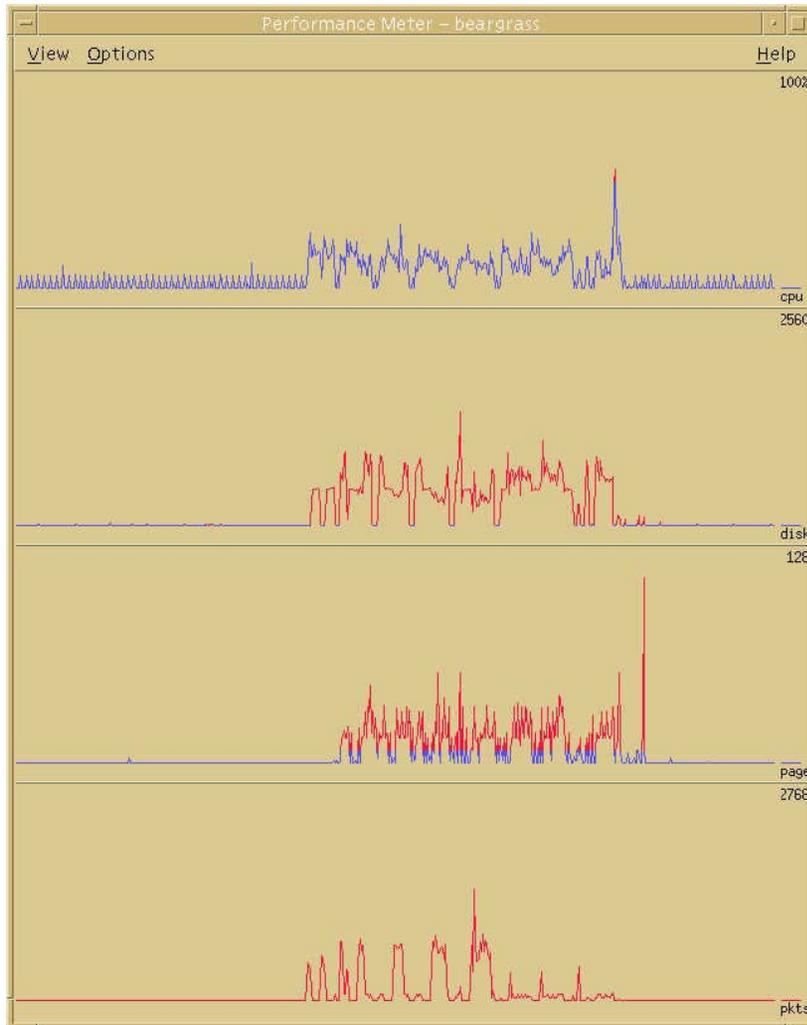
NetBackup for Oracle ServerFree Agent

- Step 2: Logical Disk Object Mapping
 - Blockmap is created
 - Mapping logical (files) to physical (SCSI blocks)
 - Device relative mapping of files -> file system -> volume -> partition -> SCSI-blocks
- Step 3: Data Movement
 - Off host backup
 - Third-party copy device with Extended SCSI Command
 - NetBackup Media Server

NetBackup ServerFree Agent

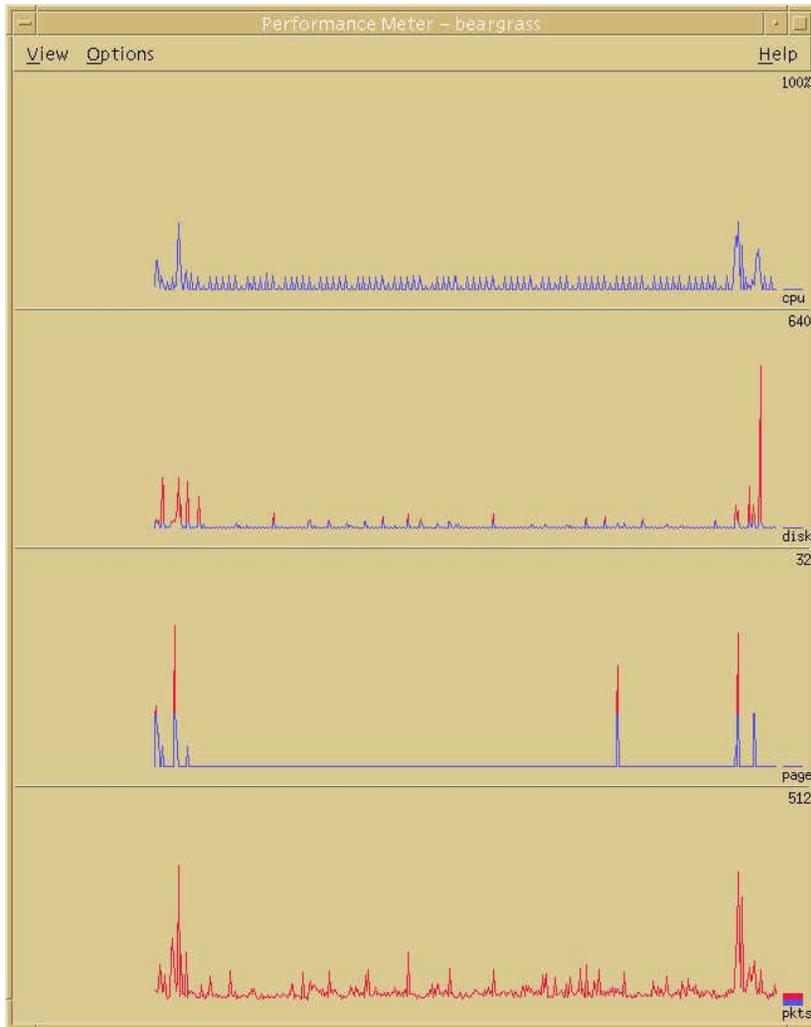


Customer Impact Without ServerFree Agent



- Standard Oracle RMAN Proxy Copy
 - Full backup
 - 2 GB database
 - Ten 2 MB data files
 - 35% full
 - Not snapped

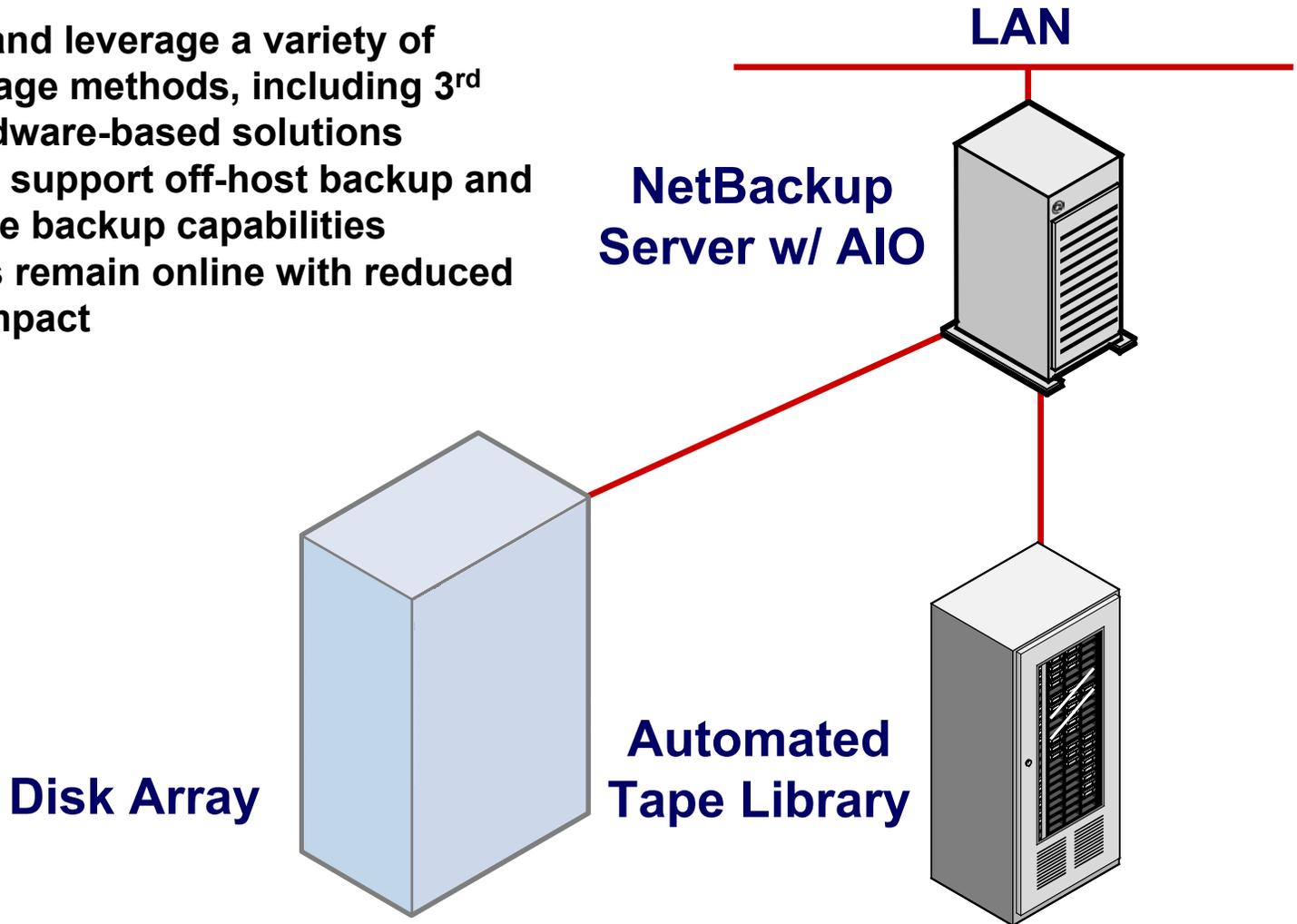
Customer Impact With ServerFree Agent



- Oracle RMAN Proxy Copy
 - Full backup
 - Same data files hosted on VxVM mirror and third party copy
 - Larger, fuller data files will see better performance
 - Keys: Lowered CPU and disk I/O

Array Integration Option

- Extend and leverage a variety of frozen image methods, including 3rd party hardware-based solutions
- Ability to support off-host backup and server-free backup capabilities
- Systems remain online with reduced backup impact



Oracle Backup Strategies

Oracle Backup Strategies

- Cold vs Hot (or mixed?)
 - Does the database need to be available at all times?
 - Is there a backup window available to do a complete cold database backup?
 - Is there a backup window available to do a complete hot database backup?
 - Is there a subset of frequently updated tablespaces that can be backed up separately?
 - What is an acceptable amount of downtime to do a recovery?
 - Example of a mixed backup strategy:
 - Cold database backup once a month
 - Hot database backup once a week
 - Selected highly updated tablespaces backed up hot nightly

Oracle Backup Strategies

- NetBackup for Oracle Agent/RMAN Based vs. OS Script Based
 - Do you need to take advantage of the many RMAN specific features (e.g. incremental backups, compression, restartable backup and restore, administrative tools and reports)?
 - Do you want your experienced DBAs spending their time maintaining scripts?
 - Do you want to use the backup method supported by Oracle Corporation?

Oracle Backup Strategies

- NetBackup Database Archiver
 - Are you required by law to archive corporate data for long periods of time?
 - FDA 7-year requirements
 - Internal and external audits
 - Does your database contain time dependent data with older data less frequently accessed?
 - Sales data warehouse
 - Oracle partitions based on financial quarters
 - Solution: Archive old partitions on a quarterly basis

Oracle Backup Strategies

- NetBackup Database Archiver
 - Is database growth negatively impacting application performance?
 - Too much DBA time spent tuning Oracle
 - Slow end user response times
 - Solution: Archive and delete historical data
 - Do you want to provide extra protection for certain data that would allow system and database independent recovery?

Oracle Backup Strategies

- Advanced Backup Methods
 - Are you having issues with backup windows that are impacting your Oracle servers?
 - Enterprise Applications
 - Large Data Warehouses
 - E-Commerce
 - Do you need to further reduce Oracle recovery time beyond what is possible with the basic backup methods?

Oracle Recovery Strategies

- Test backup and recovery strategy
- Validate backups and restores using RMAN
 - Backup
 - Confirms that all database files exist and are in the correct location
 - Restore
 - Executes a restore test run without actually restoring the files
- Plan responses to failure
 - Media failures
 - Datafile block corruption
 - Non-Media failures
 - User errors
 - Instance failure

Conclusion

- Some Factors to Consider When Planning Backup and Recovery Strategies
 - Recovery Time
 - Backup Windows
 - Performance Requirements
 - Availability Requirements
 - Acceptable data loss
 - Risk of user error
 - Database size
 - Amount of data changing
 - Growth plans/Knowledge and turnover of administrators
 - Archiving requirements
 - Oracle versions

QUESTIONS & ANSWERS



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