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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

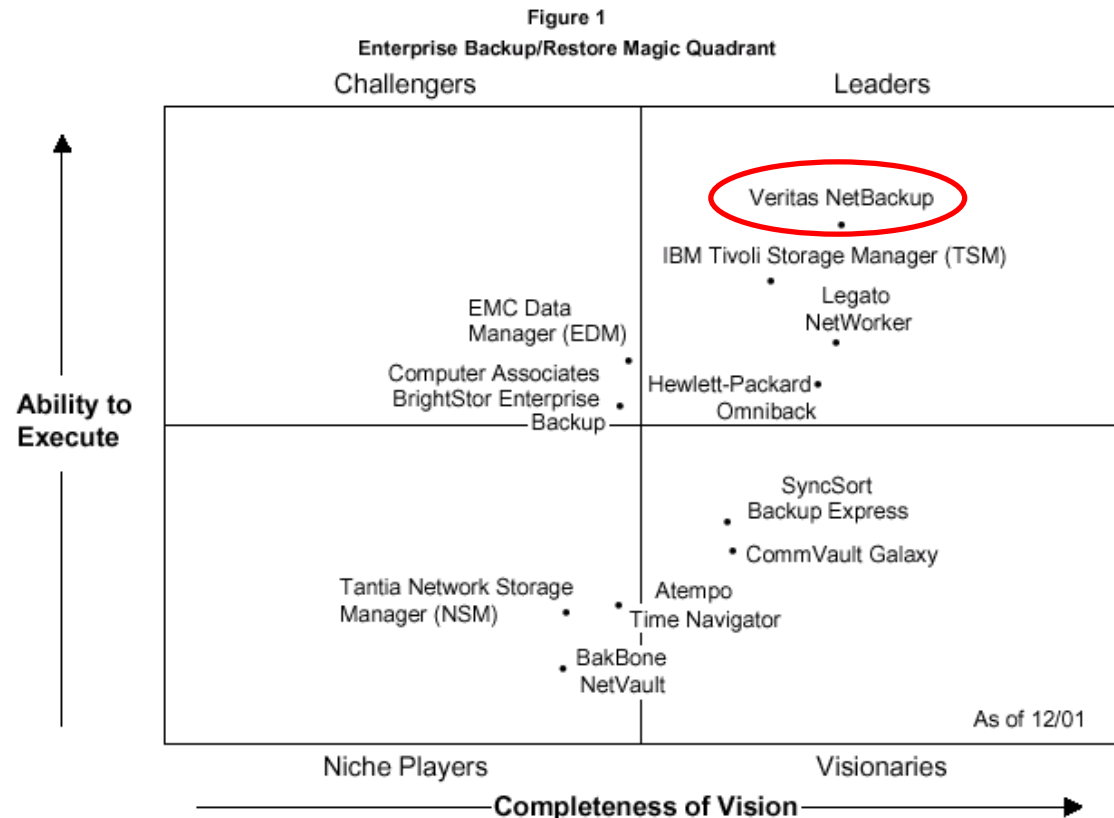
- NetBackup DataCenter
 - Enterprise wide
Windows, UNIX and NetWare data protection
- NetBackup BusinessServer
 - Scalable data protections for smaller heterogeneous workgroup environments & branch offices
- NetBackup Professional
 - Scalable laptop/workstation data protection
- NetBackup Storage Migrator
 - 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



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

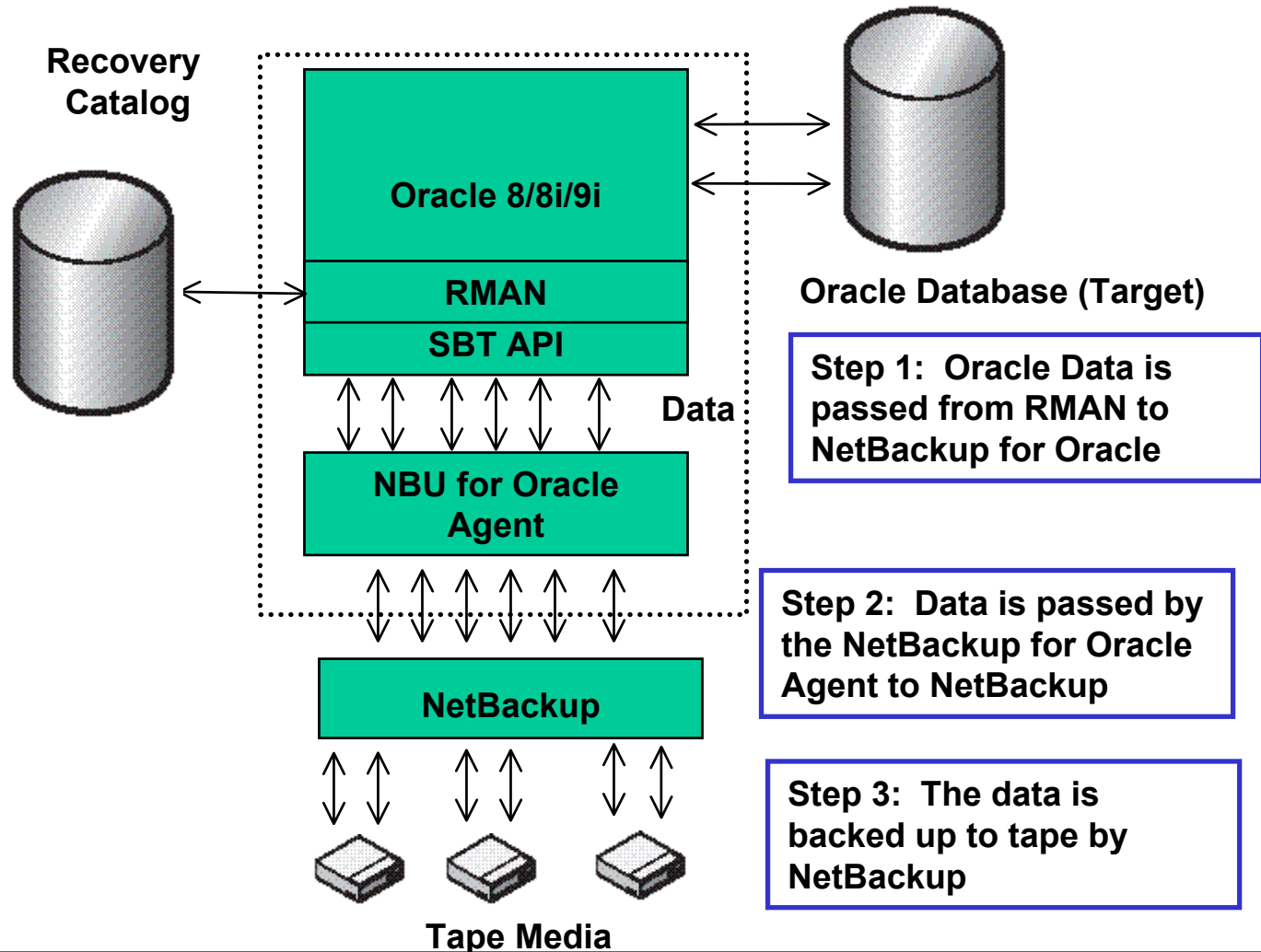
Script Based Oracle Backup

- 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) ? x

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) ? x

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\WA\817\pfile\init.ora Browse

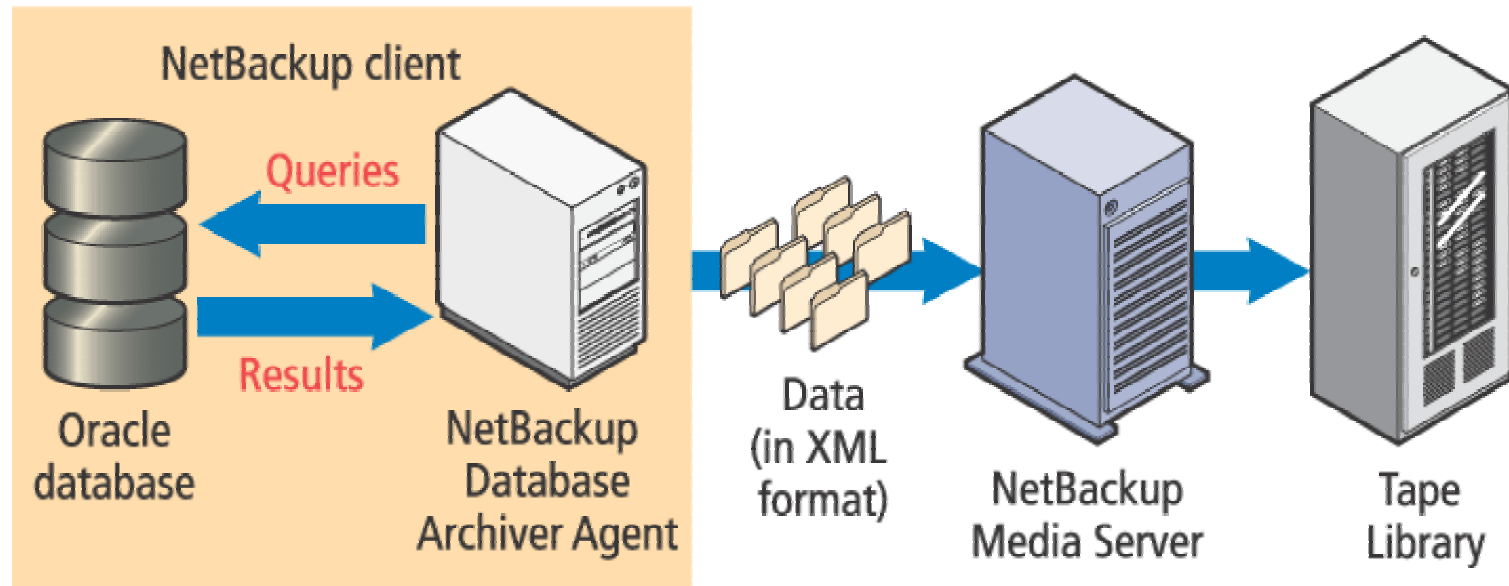
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NetBackup Database Archiver

- 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

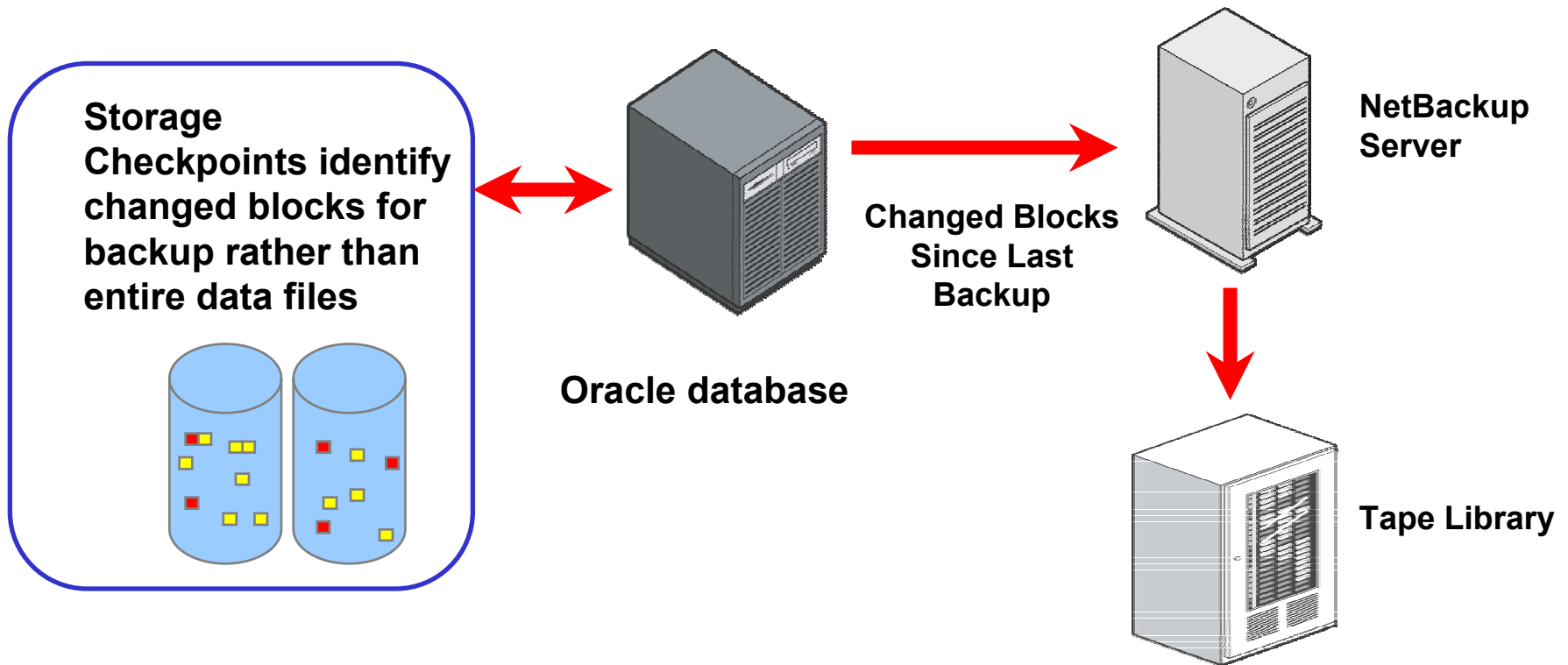
- Software based snapshot backup
 - Backup only the data blocks that have changed
 - Uses File System Storage Checkpoints (VERITAS Database Edition for Oracle)
 - No learning curve (utilizes RMAN and RMAN Proxy Copy)
 - Data is processed from the checkpoints, and not the filesystem
 - Minimal Impact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

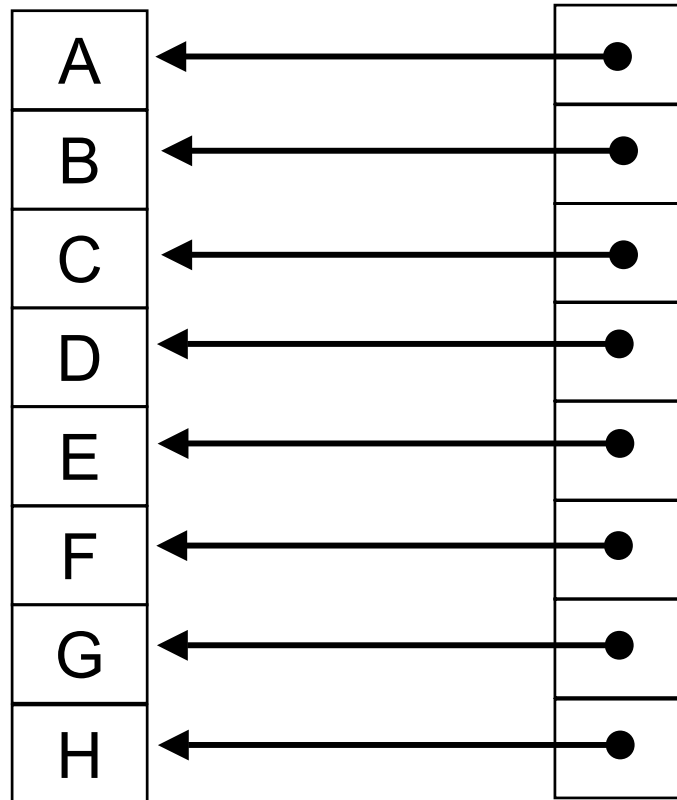


Storage Checkpoint: An Example

When a Storage Checkpoint is first taken:

/oradata

Storage Checkpoint



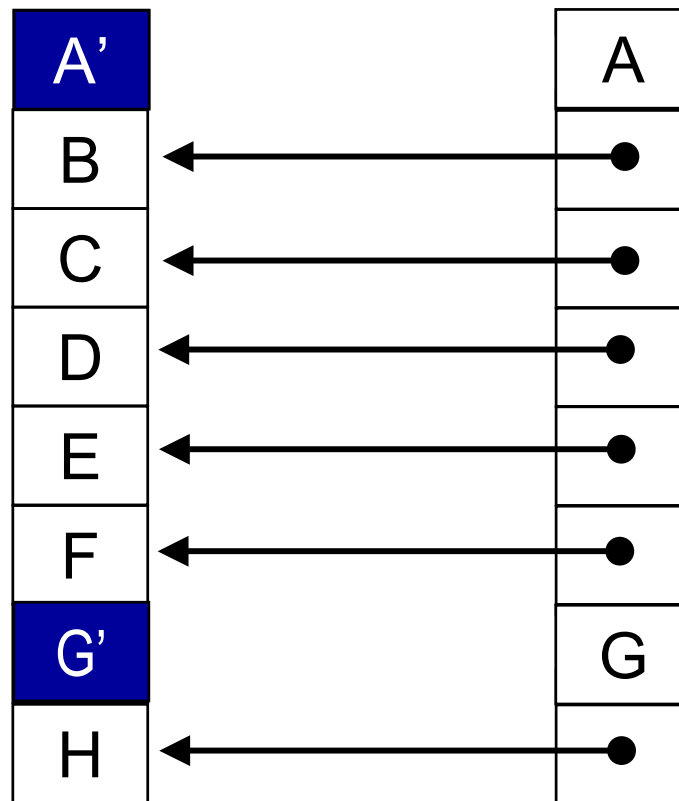
- No data is copied to the Storage Checkpoint
- Takes a couple of seconds
- Presents the point-in-time image of /oradata by finding data from the primary file system, /oradata

Storage Checkpoint: An Example

Storage Checkpoint as /oradata changes

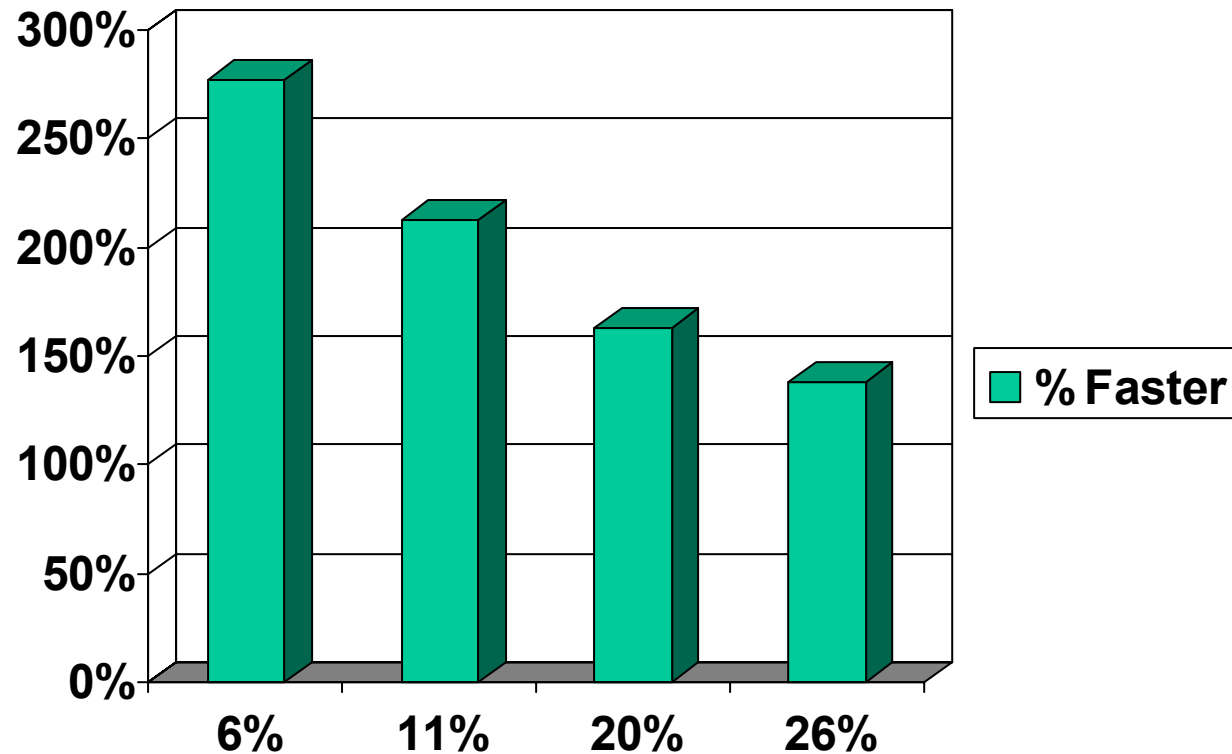
/oradata

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

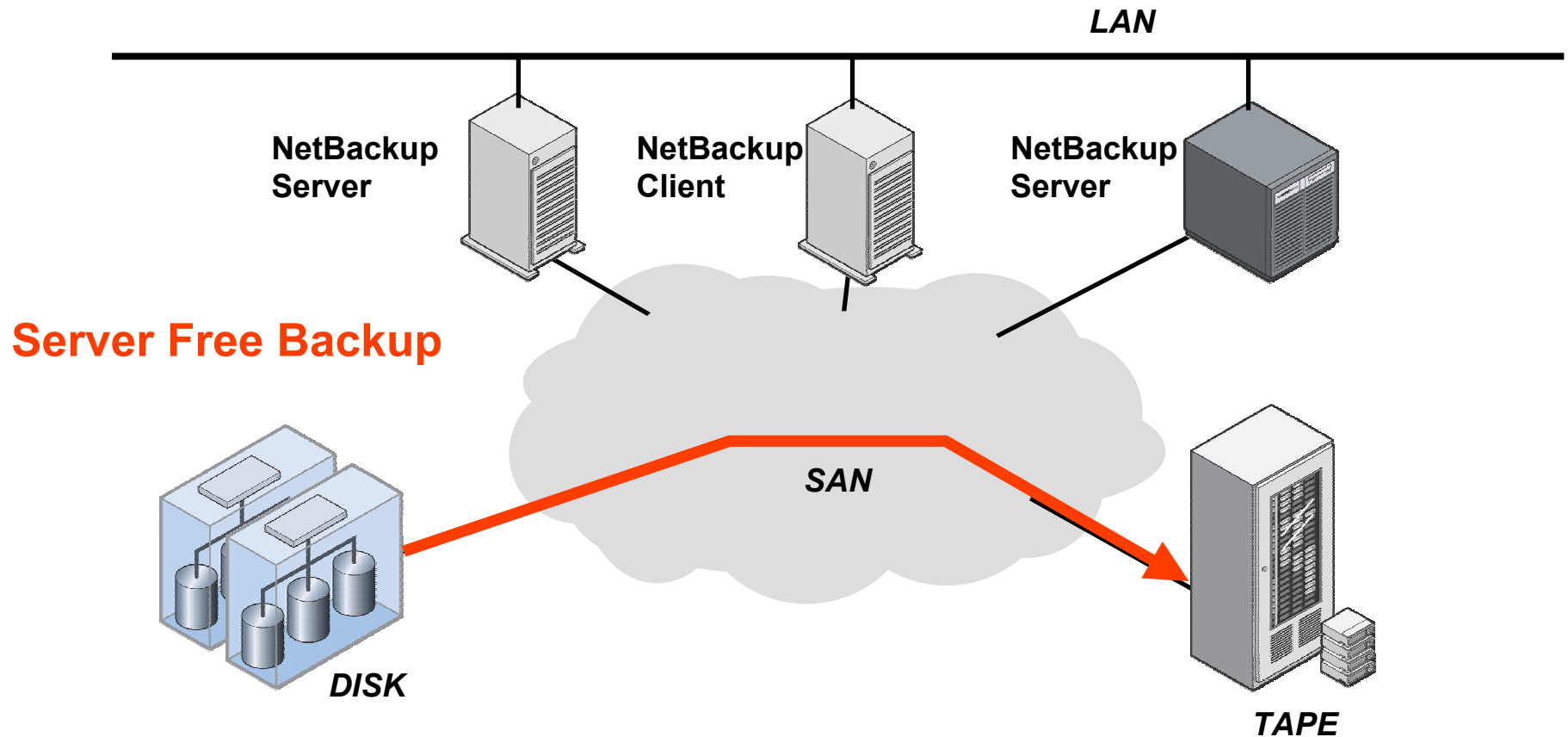
NetBackup for Oracle ServerFree Agent

- 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

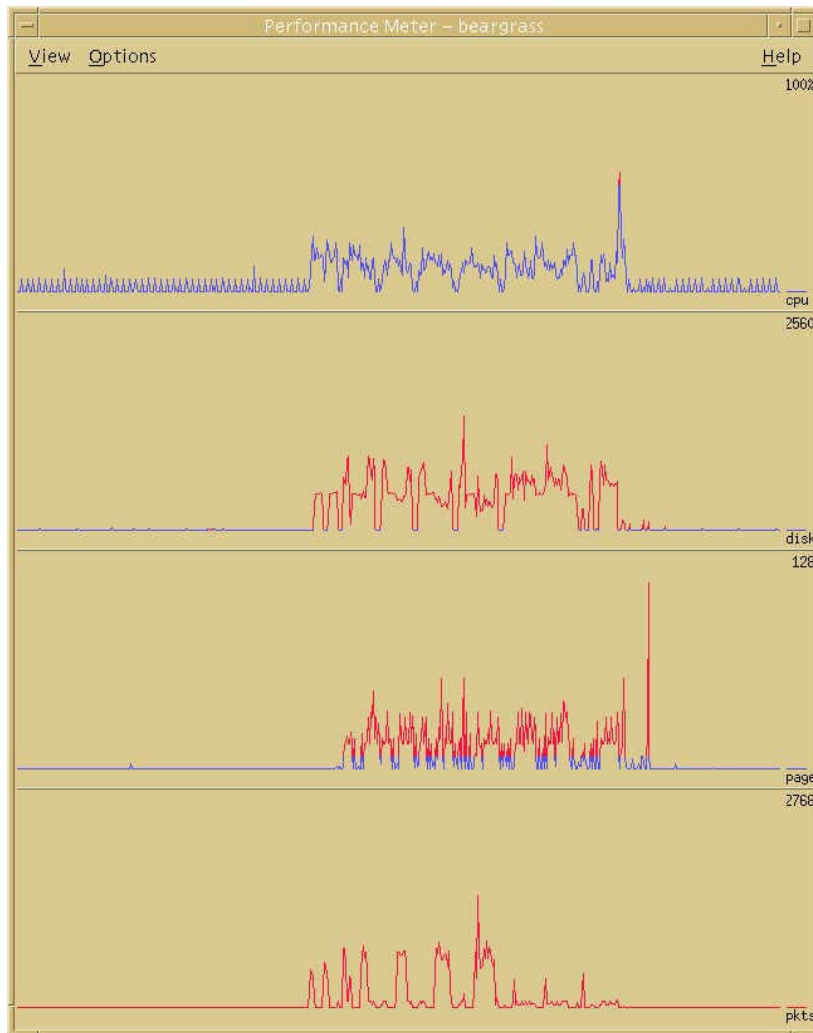
NetBackup for Oracle ServerFree Agent

- 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

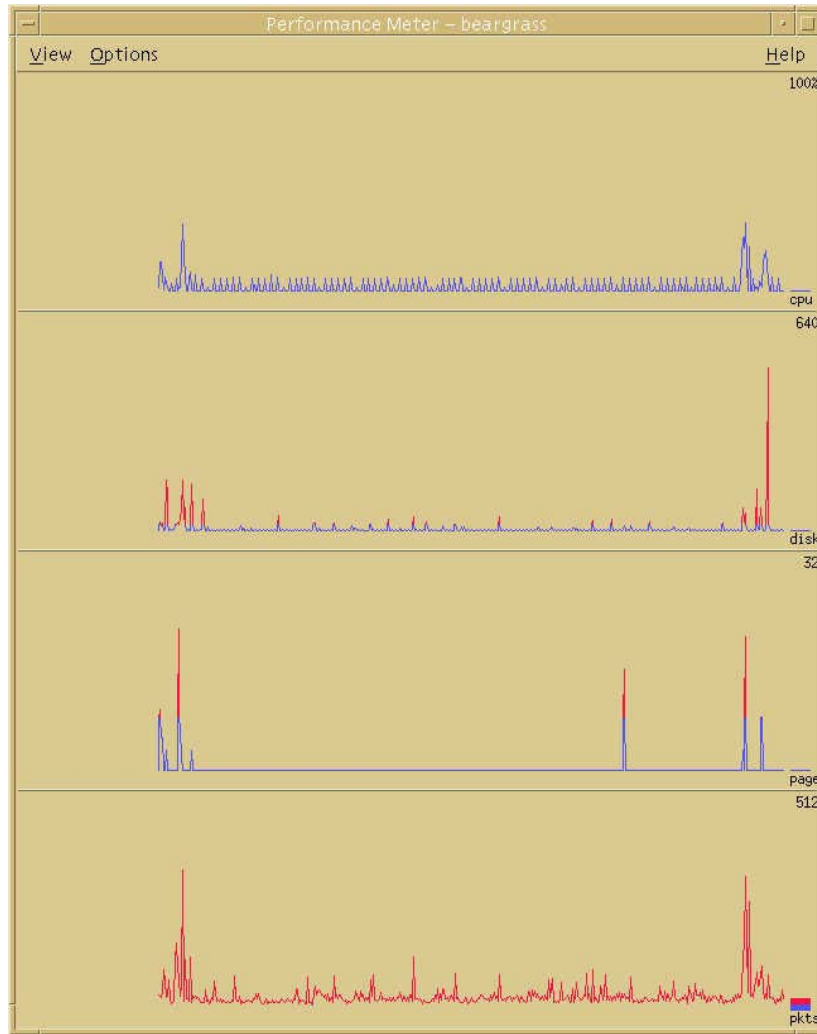


Customer Impact Without ServerFree Agent



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

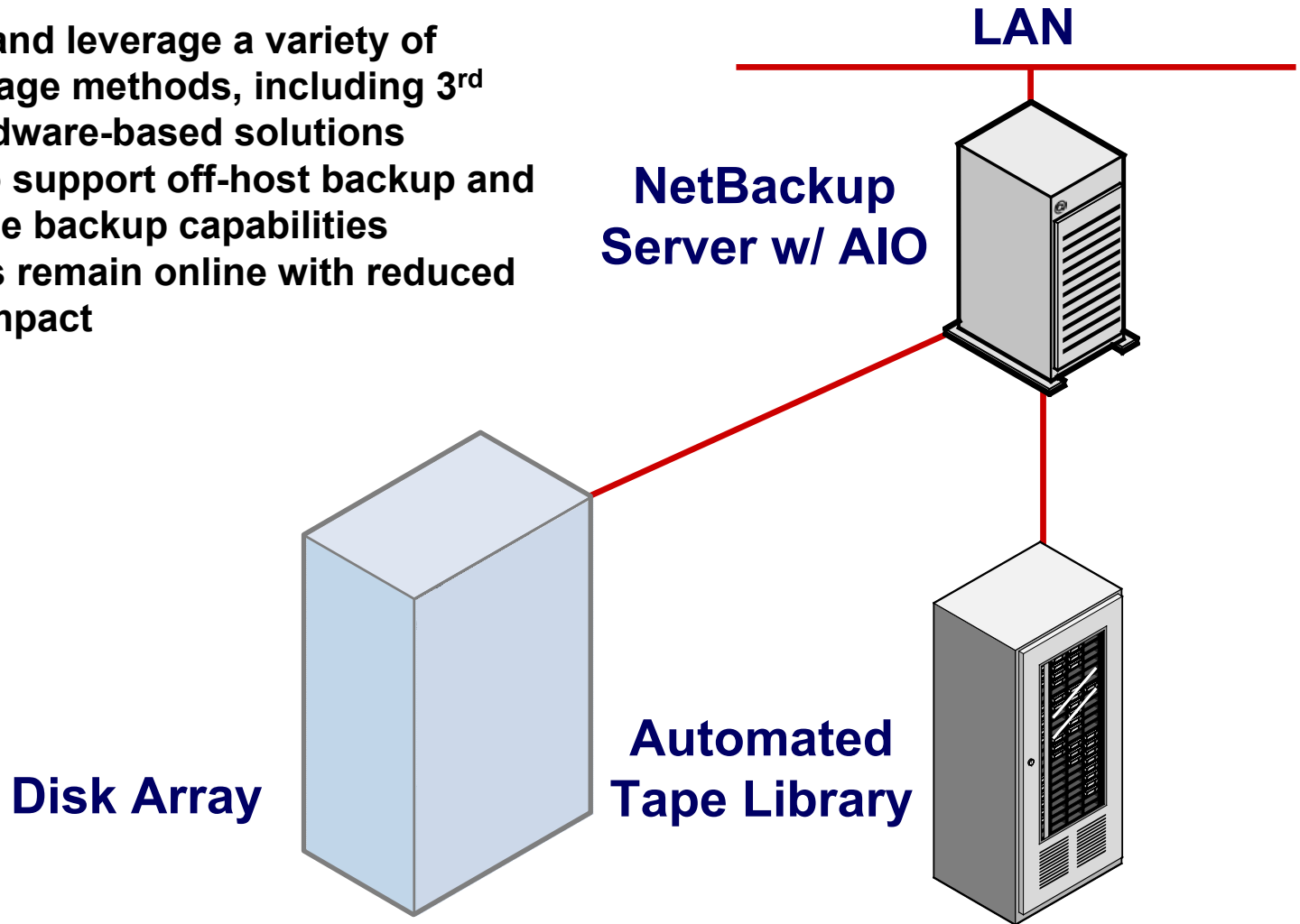
Customer Impact With ServerFree Agent



- 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

