NetWorker for OpenVMS

ODS-2 & ODS-5 File Systems
Oracle 8i, 9i, and 10i
Oracle Rdb

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a division of EMC

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Customer Imperatives Today

- Cost Effectiveness/ROI
  - Ability to Backup and Archive data in a heterogeneous environment with a single LAN-free solution
- Deliver on SLA requirements
  - OpenVMS issues
    - Not always feasible to backup across the network
      - Multiple TB's stored
      - Mission Critical Applications
      - OpenVMS Clusters are common
      - Oracle and Oracle RDB are frequently used
- Resources focused on value-added applications
- Improve access and retrieval of corporate data
- Systems and software that are aligned to changes in the business

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What Customers Want *for Data and Applications*

1. Reduce Total Cost of Ownership (TCO)
2. Index Reference Assets
3. Long-term Data Retention
4. Performance
5. Scalability
6. Application Integration
7. Ease of Management

Source: ESG, "Reference Information: The Next Wave"

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Where LEGATO is a Leader Today

- Enterprise Backup and Recovery
- Active Archiving for email, databases and file systems
- Emerging Email Compliance market
- Integrated content and storage management with over 200 Partners
- Customer Satisfaction

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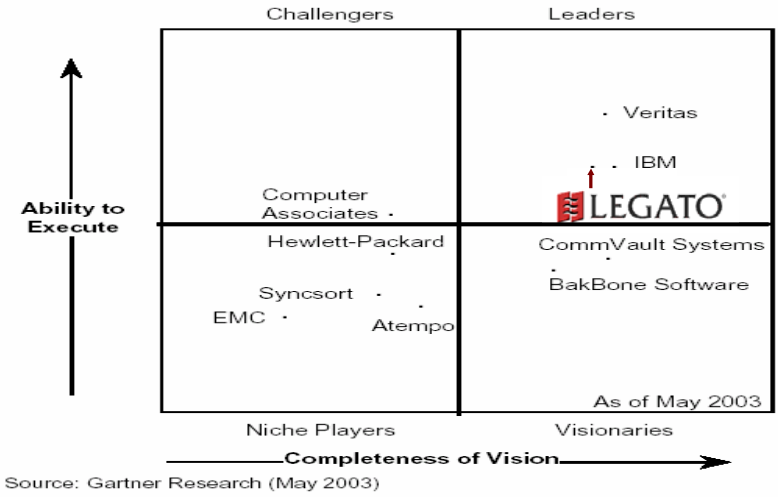
Gartner's view of LEGATO



Source: Gartner Research (May 2003)

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LEGATO's History with HP starts with Digital

- Digital OEM'd NetWorker for Ultrix; later OSF/1 (Digital/Tru64 Unix) and Windows NT on Alpha
- Digital outsourced development of OpenVMS client to Wumpusware
- Digital Outsourcing selected NetWorker as default backup tool
- On acquisition of Digital, Compaq changed software strategy and returned NetWorker source to LEGATO
  - Compaq continued to provide 1st & 2nd Level Technical Support
  - LEGATO NetWorker Single Server ships with Tru64 UNIX
- Outsourcing agreement expanded to include right to resell LEGATO's full product suite
- Consulting and integration services agreement to design and implement Legato solutions
- HP can resell LEGATO products today

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Value Proposition

- NetWorker for OpenVMS
  - Reduces TCO by:
    - Including OpenVMS systems, and clusters, in heterogeneous backup solutions
    - Reducing training needs, and administration costs, by providing a cross-platform GUI and command line
    - Reduce load on valuable staff
      - Move tasks to Operations
      - Consistent policies, no matter the platform
  - Improving ROI by
    - Sharing tape devices, media, and libraries with UNIX and Windows systems
    - Delivers LAN free backup and archiving to direct, or fibre channel, attached tape or disk

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NetWorker Overview

- NetWorker Architecture
- Scaleable Network Topology
- Comparison with ABS
- Cluster and “cluster” Support
- Centralised Management
- Online Application Backup and Recovery
- NetWorker Features
- NetWorker for OpenVMS
- NetWorker Oracle Module for OpenVMS

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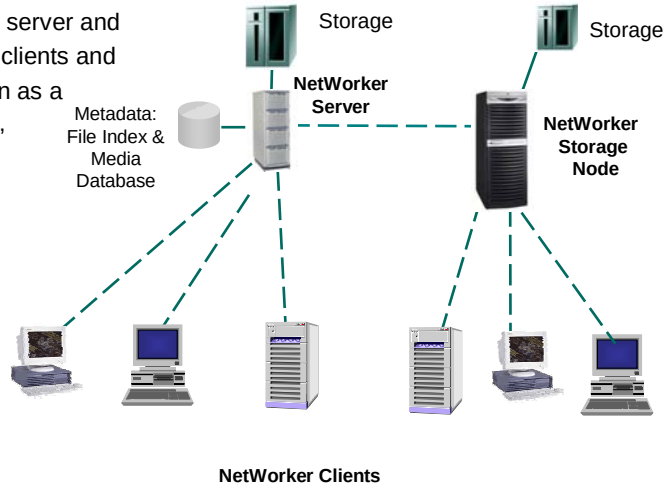
NetWorker architecture

One NetWorker server and all of its related clients and options is known as a "Data Zone"



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Heterogeneous

Server Platforms

HP-UX
Tru64 UNIX
Windows 2000/2003 & NT
LINUX - RedHat, SuSe
Solaris
IBM AIX
SGI IRIX
DYNIX/ptx

Netware

Client & Storage Node Platforms

HP-UX
HP Tru64 UNIX
HP OpenVMS on Alpha
Linux - RedHat, SuSe
Windows NT/2000/2003
Sun Solaris
IBM AIX
DYNIX/ptx
SGI IRIX

Client only Platforms

OpenVMS on VAX
Linux – Caldera, Turbo Linux
Windows 95/98/ME
SCO UNIX Open Server
UnixWare
NetWare
Mac OSX

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NetWorker Modules for 24x7 SLA

Online Protection – Faster Recovery

- **Databases:**
  - Oracle 8i, 9i, 10i
  - Oracle Rdb
  - DB/2
  - Sybase
  - Informix
  - MS SQL Server
- **Messaging:**
  - Microsoft Exchange
  - Lotus
- **ERP:**
  - SAP R/3 on Oracle

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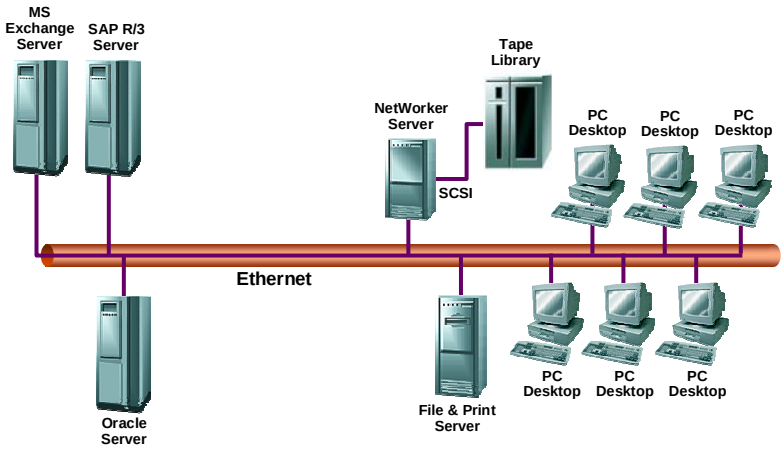
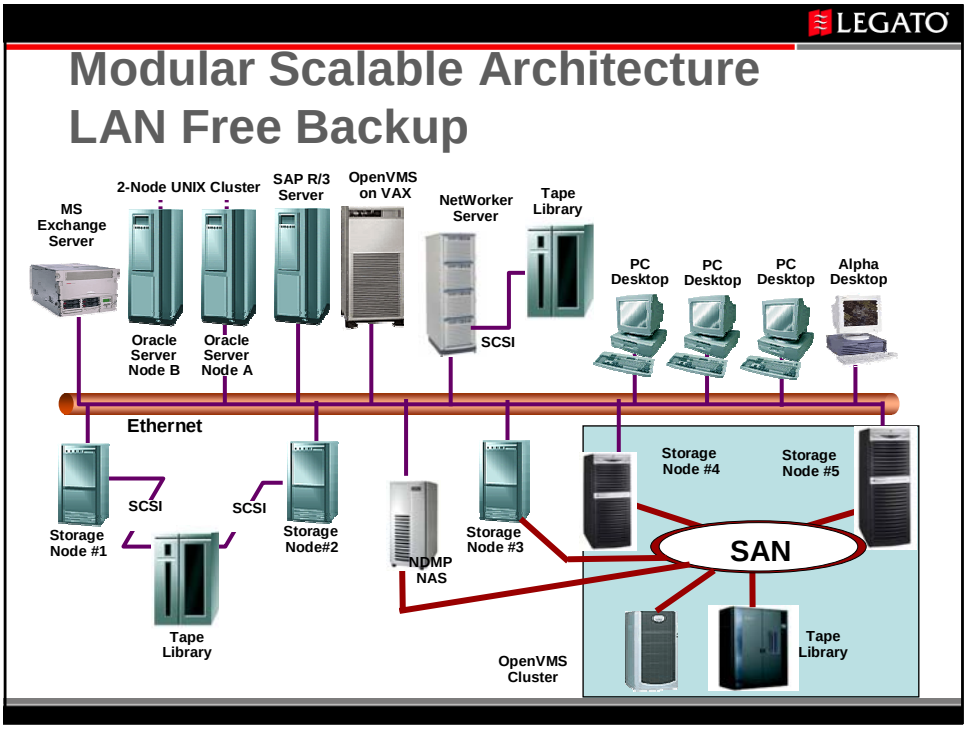
Modular Scalable Architecture LAN/WAN backup

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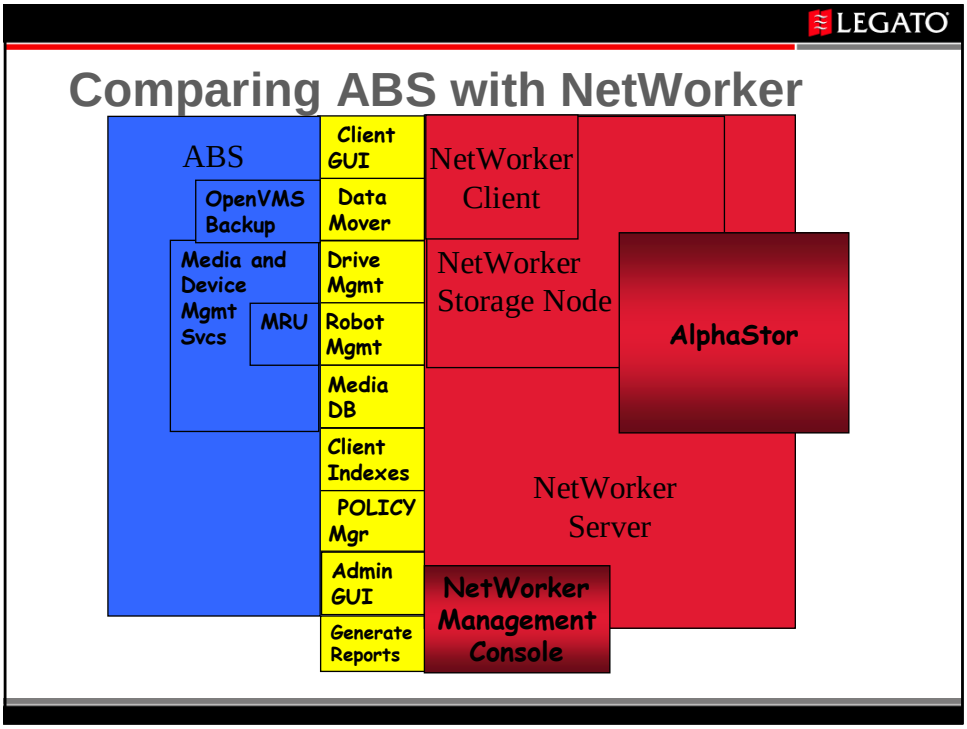
Modular Scalable Architecture
LAN Free Backup
MS Exchange Server
2-Node UNIX Cluster
Oracle Server Node B
Oracle Server Node A
SAP R/3 Server
OpenVMS on VAX
NetWorker Server
Tape Library
SCSI
PC Desktop
PC Desktop
PC Desktop
Alpha Desktop
Ethernet
Storage Node #1
SCSI
SCSI
Storage Node#2
Tape Library
NDMP NAS
Storage Node #3
Storage Node #4
Storage Node #5
SAN
Tape Library
OpenVMS Cluster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Comparing ABS with NetWorker
ABS
OpenVMS Backup
Media and Device Mgmt Svcs
MRU
Client GUI
Data Mover
Drive Mgmt
Robot Mgmt
Media DB
Client Indexes
POLICY Mgr
Admin GUI
Generate Reports
NetWorker Client
NetWorker Storage Node
AlphaStor
NetWorker Server
NetWorker Management Console

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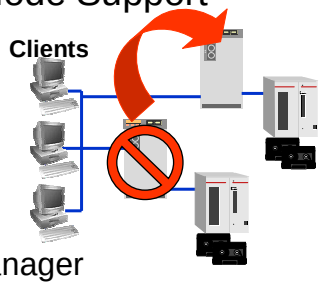
NetWorker Differentiation – HA support

- "Clustered" Client & Storage Node Support
  - HP OpenVMS Clusters
  - HP TruCluster
  - HP MC-ServiceGuard
  - Microsoft Cluster Services
  - Legato Application Availability Manager
  - Veritas Cluster Services (Client only)
  - Sun Clusters
  - IBM HACMP



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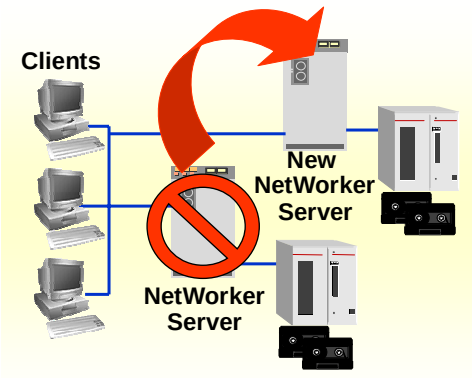
Highly Available NetWorker Server



Preserves NetWorker Server by:

- **NIC2NIC IP address failover, when NIC's fail**
- **Restarts NW services on a secondary server when the first server fails**
- **Between servers, transfers any in-progress Save Sets**

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Centralised Management & Control

- Single Point of Control
  - Administer multiple servers simultaneously
  - Control all group schedules and policies
  - GUI
    - Motif:
      - OpenVMS, UNIX & Linux
    - Windows
    - Java – via NetWorker Management Console
- Firewall Support
  - Back up NetWorker clients through firewall
  - User specified TCP/UDP ports
  - Supports OpenVMS, Unix & Windows

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Centralised Management & Control

- Advanced Client and Media Indexes
  - Supports “unlimited” number of client backups & media tapes
  - ‘Write-once, Read-many’ architecture eliminates corruption completely.
  - Supports Saveset up to 4TB in size
  - Client File & Media Index can be transferred to a Server with different OS file systems
- Browse Policy
  - Defined per NetWorker Saveset, group of savesets or client
  - Allows for point in time recovery
  - Data is visible via User Administration interface
- Retention Policy
  - Defined per backup media
  - Used for grooming and recycling media
  - Data is visible via System Administration interface

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Administration and Reporting

NetWorker Management Console

- LEGATO's web enabled management application allows central monitoring, administration, and reporting on NetWorker.
  - Easy to install and deploy
  - Immediate Web-enabled management of NetWorker
  - Enterprise Hierarchy
  - Centralised Administration
  - Centralised Reporting
  - Centralised Event Monitoring

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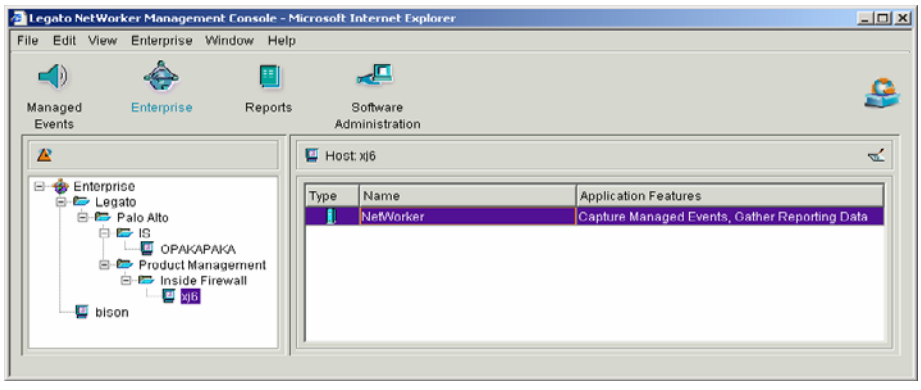
Enterprise Hierarchy



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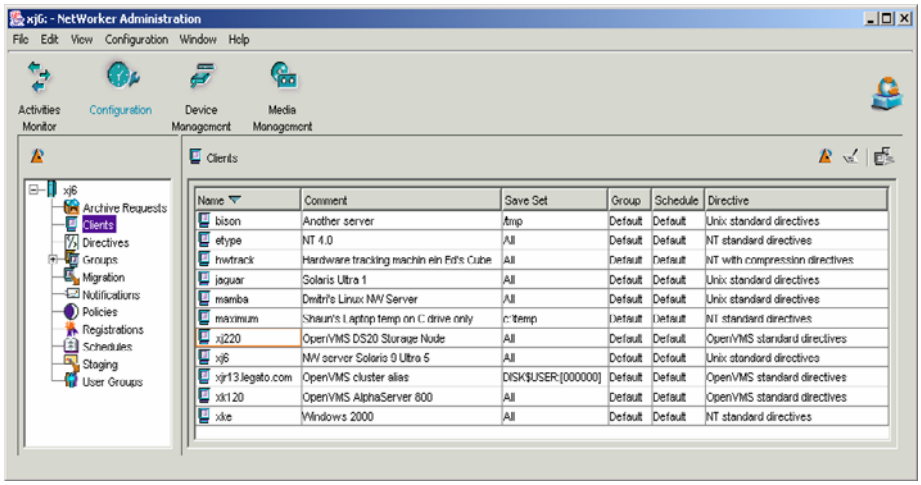
Centralised Administration



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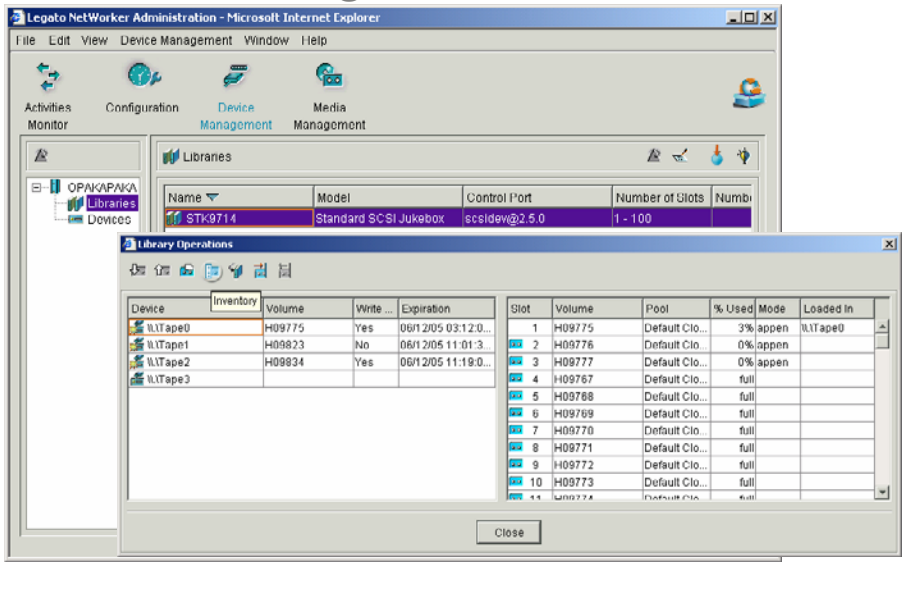
Device Management



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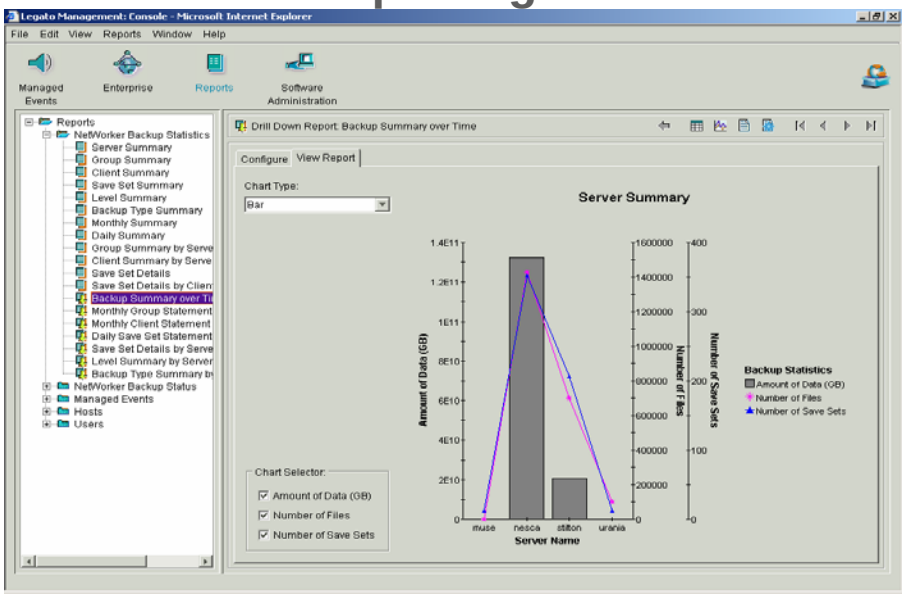
NetWorker Reporting



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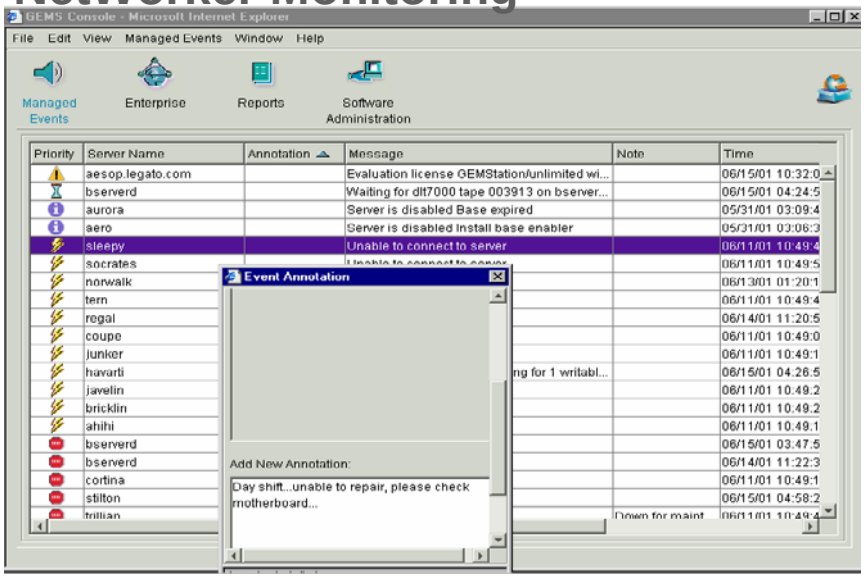
NetWorker Monitoring



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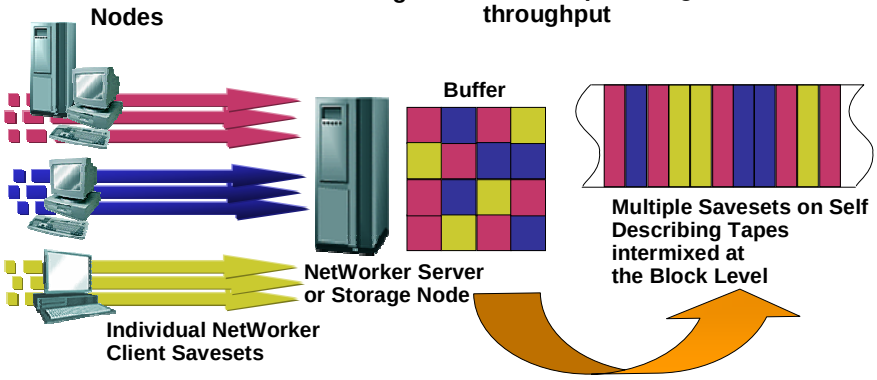
Parallelism and Interleaving

- **Parallelism**
  Multiple Data Streams from Multiple Clients to a NetWorker Server or Storage Nodes
- **Interleaving**
  Multiple Data Streams buffered in memory written to multiple tape devices, providing maximum throughput



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Multiple Backup Levels

- Full Backup - all files regardless if changed or not
- Incremental - Back up files that have changed since last full backup
- Level 1-9 - Back up files that have changed since the last lower numbered backup.
- Directives – Backup ‘all’ but ‘skip’ /…/…
- Consolidated - Backup all data changed since last full backup and merges with last full backup
- Skip - Skip a backup if not needed
- Volume & Saveset Cloning
- Staging

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Directives

- Examples:
  - Nobackup = /ignore=nobackup
  - nolock = /ignore=interlock
  - Record = /record
  - Skip = /exclude

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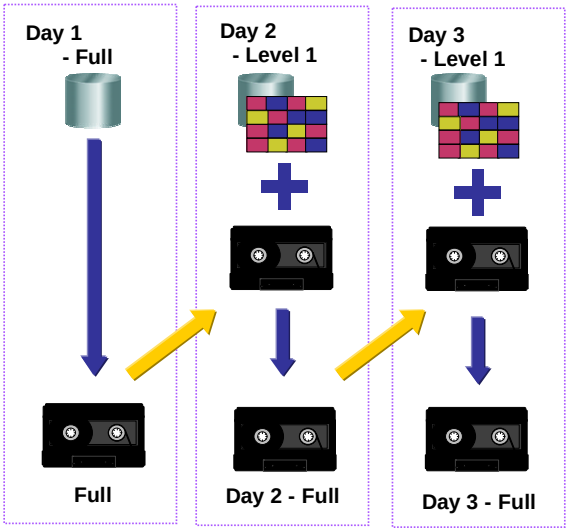
Saveset Consolidation



Backups

Merges Level 1 backup with full back up Saveset to create a new full backup

.....

Single set of tapes to recover!
Faster Recovery Time !

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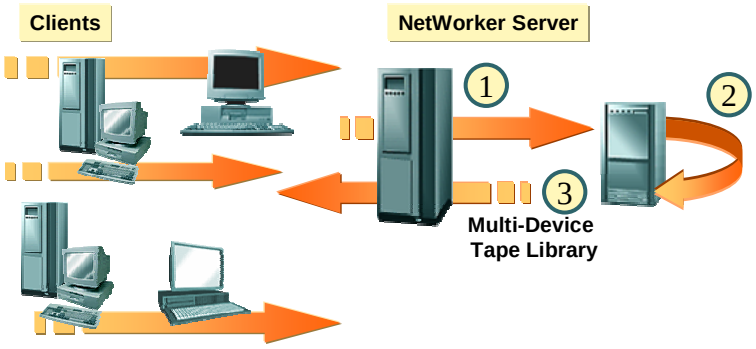
Saveset and Volume Cloning



1. Backup operations read file systems once
2. Automatic or manual cloning duplicates save sets or volumes
3. Recover can use original or clone
4. Cloning creates contiguous backup savesets
5. Ideal for off-site vaulting or high speed recover tapes

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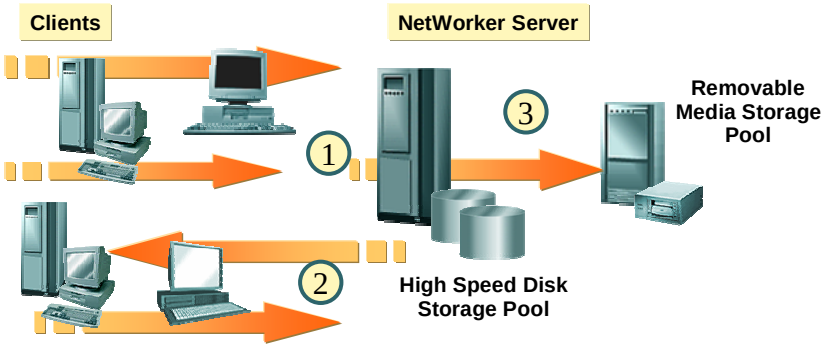
Disk-to-Disk Backup, and staging



1. Initial backup operations use intermediate high speed disk devices
2. Interim recovery operations occur at disk speeds -- no manual intervention
3. When devices reach customer specified thresholds, NetWorker can automatically stage backup data to removable tape media or libraries (freeing up disk capacity)
4. Single Step recovery

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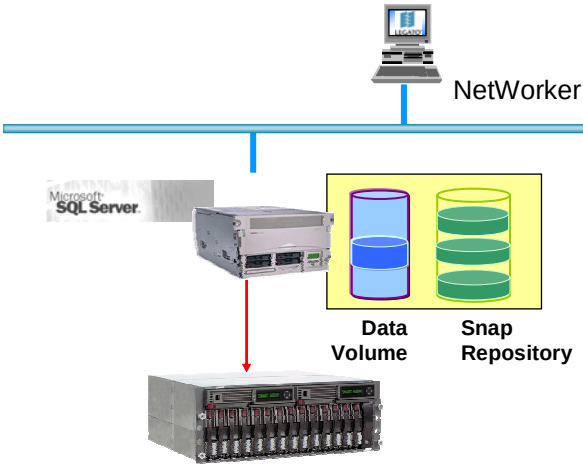
Snap Shot management PowerSnap Application Integration



- Freeze Application
- Sync File System
- Create Snapshot
- Thaw Application

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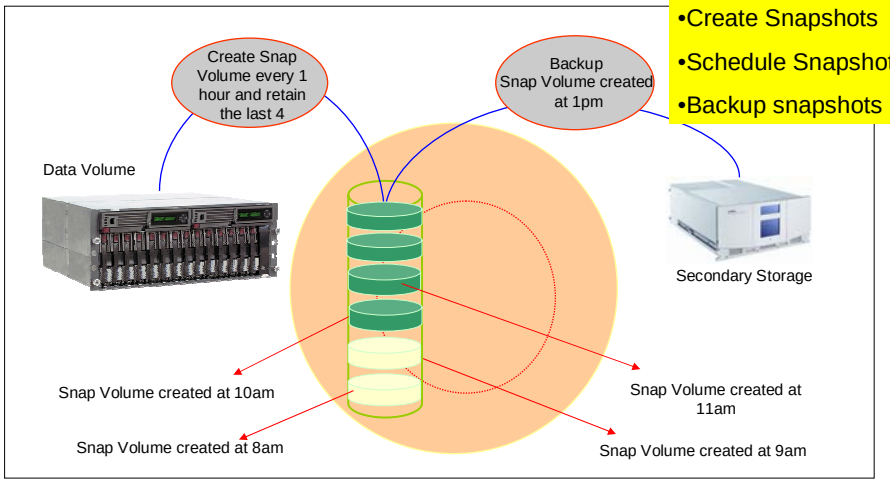
PowerSnap Snapshot Management



- Create Snapshots
- Schedule Snapshots
- Backup snapshots

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PowerSnap Value Proposition

- ***LEGATO seamlessly integrates instant backup and rapid restores with traditional backup operations***
  - **Scheduling, browsing, retention policies, etc. of snapshots**

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Key Features of NetWorker for OpenVMS

- Supports OpenVMS data being stored in heterogeneous fibre-based SAN environments, including library sharing and tape drive sharing – *an industry first!*
- Protects OpenVMS servers to locally attached tape libraries reducing network traffic and improving backup and recovery performance (storage node only)
- Allows for a centrally managed backup and recovery solution for OpenVMS systems that exist within a mixed UNIX, Windows, Netware and Linux environment
- Supports OpenVMS clients running in an OpenVMS cluster
- At least match OpenVMS Backup performance

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Compatibility

- Client
  - ODS-2 File System, ODS-5 in Beta
  - OpenVMS clusters
  - VAX 5.5-2 and above
  - Alpha 7.0 and above
  - HP's TCP/IP Services (UCX), Multinet, TCPware
  - Archiving (OpenVMS for Alpha 7.0 and above)
  - Co-exists with OpenVMS Shelving (HSM)
- Storage Node – Alpha V7 and above
  - Tape devices and Libraries supported by the OpenVMS SCSI driver
  - Library Sharing
  - Dynamic Drive Sharing
    - NW V6.1 and above server and library controlled by NW 6.1 server or Storage Node.
    - Fibre Channel Requires OpenVMS V7.2-2 and above
  - Disk to Disk Backup

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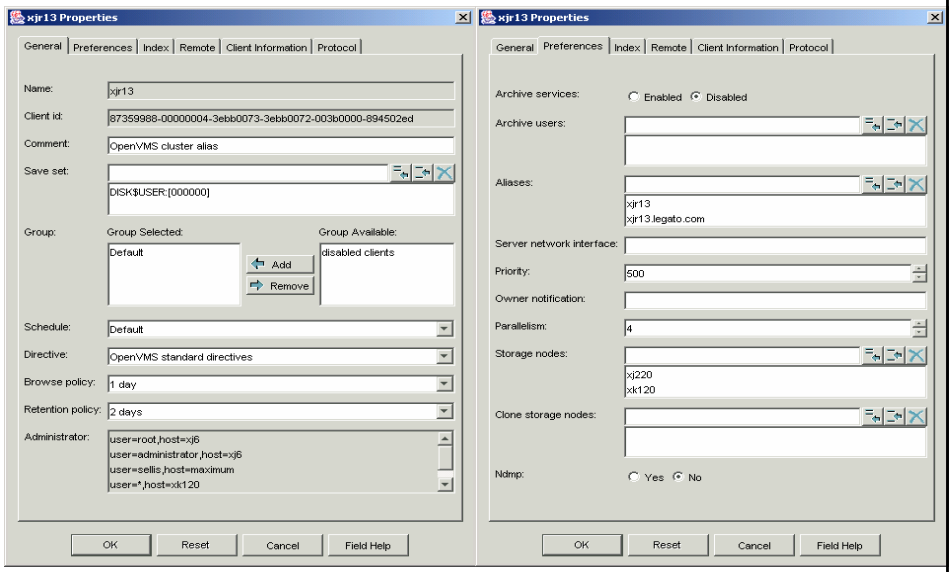
Defining an OpenVMS Cluster Client



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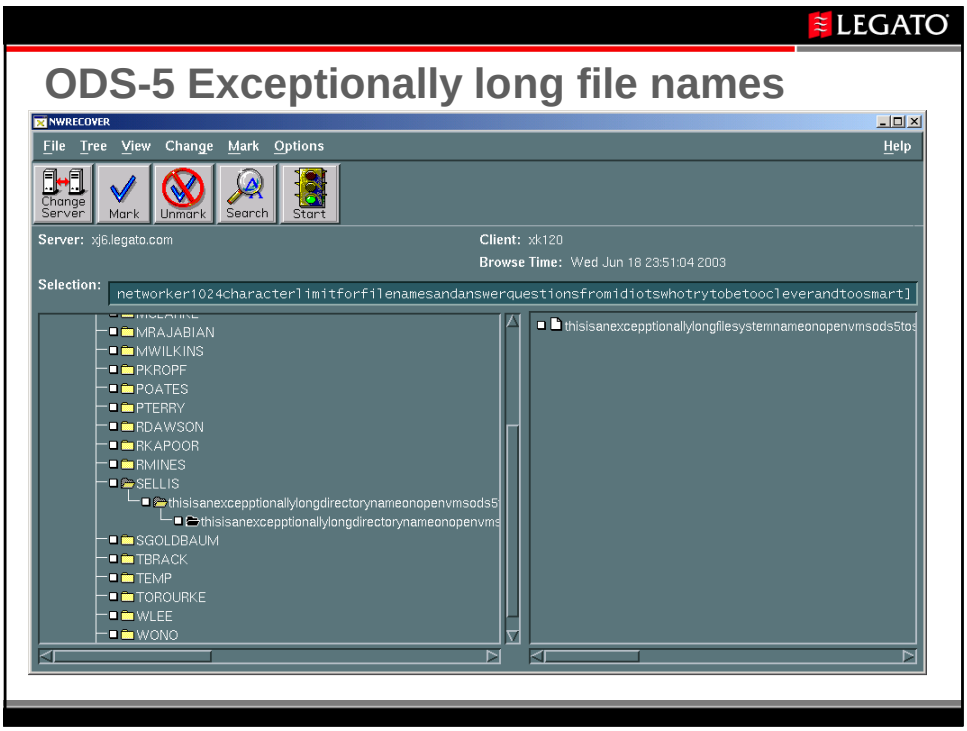
Recover to an ODS-5 volume
NWRECOVER
File Tree View Change Mark Options Help
Change Server
Mark
Unmark
Search
Start
Server: xj6.legato.com
Client: xk120
Browse Time: Wed Jun 18 22:06:48 2003
Selection: DISK$USER:[SELLIS]
KITS
MCLARKE
MRAJABIAN
MWILKINS
PKROPF
POATES
PTERRY
RDAWSON
RKAPOOR
RMINES
SELLIS
SGOLDBAUM
TBRACK
TEMP
TOROURKE
WLEE
WONO
YBODECHON
FRED.TXT;1
fred.txt;1
fred.txt;2
FRED1.TXT;1
Recover Status
Recovering 1 file into its original location
Volumes needed (all on-line):
000011 at Adic Scalar 100
Requesting 1 file(s), this may take a while...
DISK$USER:[SELLIS]fred.txt;1
Filename Conflict for DISK$USER:[SELLIS]fred.txt;1
Do you want to?
Rename the recover file
Discard the recover file
Overwrite the existing file
Do you want to be prompted if further conflicts occur?
Yes No
Ok
Help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ODS-5 Exceptionally long file names
NWRECOVER
File Tree View Change Mark Options Help
Change Server
Mark
Unmark
Search
Start
Server: xj6.legato.com
Client: xk120
Browse Time: Wed Jun 18 23:51:04 2003
Selection: networker1024characterlimitforfilenamesandanswerquestionsfromidiotswhotrytobetoocleverandtoosmart]
MRAJABIAN
MWILKINS
PKROPF
POATES
PTERRY
RDAWSON
RKAPOOR
RMINES
SELLIS
thisisanexcepptionallylongdirectorynameonopenvmsods5
thisisanexcepptionallylongdirectorynameonopenvms
SGOLDBAUM
TBRACK
TEMP
TOROURKE
WLEE
WONO
thisisanexcepptionallylongfilesystemnameonopenvmsods5tos

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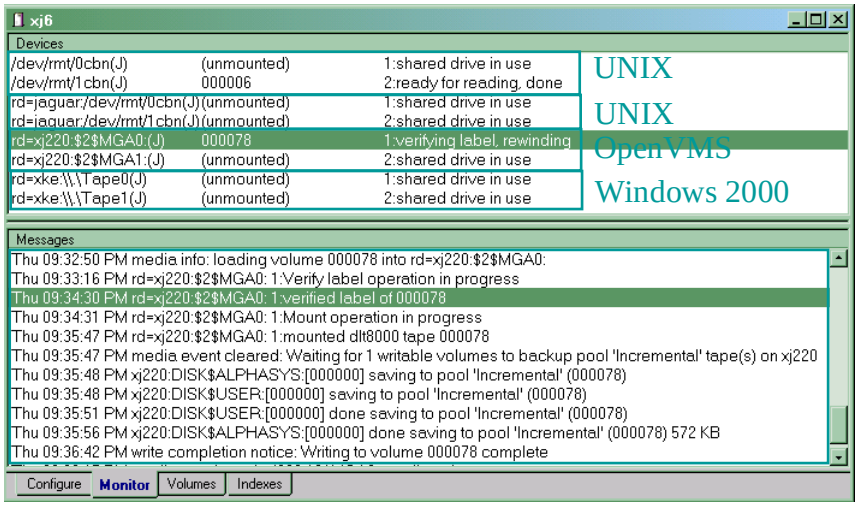
OpenVMS Storage Node in a DDS environment



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Oracle Support on OpenVMS

- In Beta now, Release in December
- Supports SBT (RMAN) API V2.0
  - Oracle 8i, 9i and 10i
  - Rdb 7.1.2.1.0
    - Worked closely with Rdb engineering team
    - LIBRARIAN qualifier supported
      - Database backup and restore
      - Journal backup and recovery
    - requires a patch from Rdb.

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Rdb Support

- Use the /LIBRARIAN qualifier with RMU
  - Device, directory, file type are ignored
- Specify reader and writer threads in commands, like:

```
$ RMU /BACKUP /LIBRARIAN /LOG -
_$ rdb-root-file  rmu-backup-file
```

- Backup save set managed by NetWorker
- Restore is just as you would expect

```
$ RMU /RESTORE /NOCDD /LIBRARIAN /LOG rmu-backup-file
```

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Multi-threaded Backup Supported

- Specify reader and writer threads in commands, like:

```
$ RMU /BACKUP /LIBRARIAN = (WRITER_THREADS = 3)/LOG -
_$ rdb-root-file  rmu-backup-file
```

- Results in three backup files (managed by NetWorker)

```
RMU-BACKUP-FILE.RBF
RMU-BACKUP-FILE02.RBF
RMU-BACKUP-FILE03.RBF
```

- On restore, if reader threads don't match writer threads use /VOLUMES

```
$ RMU /RESTORE /LIBRARIAN=(READER_THREADS = 2)  -
_$ /VOLUMES=3  rmu-backup-file
```

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Parallel Process Backups with Rdb

- Multiple processes distribute backup processing across SMP processors, cluster nodes
- Can use both parallel processes and threads

```
$ RMU /BACKUP /PARALLEL = EXECUTOR = 3 -
_$ /LIBRARIAN = WRITER_THREADS = 3 -
_$ /LOG -
_$ rdb-root-file  rmu-backup-file
```

- These commands write to 9 save sessions
- SQL/Services required for parallel backups

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Backup Plans Supported

- Generate a backup plan then edit, execute:

```
$ RMU /BACKUP /PARALLEL = EXECUTOR = 3
_$ /LIBRARIAN = WRITER_THREADS = 3 -
_$ /LIST_PLAN = parallel_backup.plan -
_$ /NOEXECUTE /LOG -
_$ rdb-root-file  rmu-backup-file
$
$ EDIT parallel_backup.plan
$
$ RMU /BACKUP /PLAN parallel_backup.plan
```

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Restoring using Rdb

- Use the same plan file to restore the database
- Parallel restore still not supported
- Limit restore threads like this:

```
$ RMU /RESTORE
_$ /LIBRARIAN = (READER_THREADS = 3, -
_$ PLAN_FILE = parallel_backup.plan) -
_$ /LOG -
_$ rmu-backup-file
```

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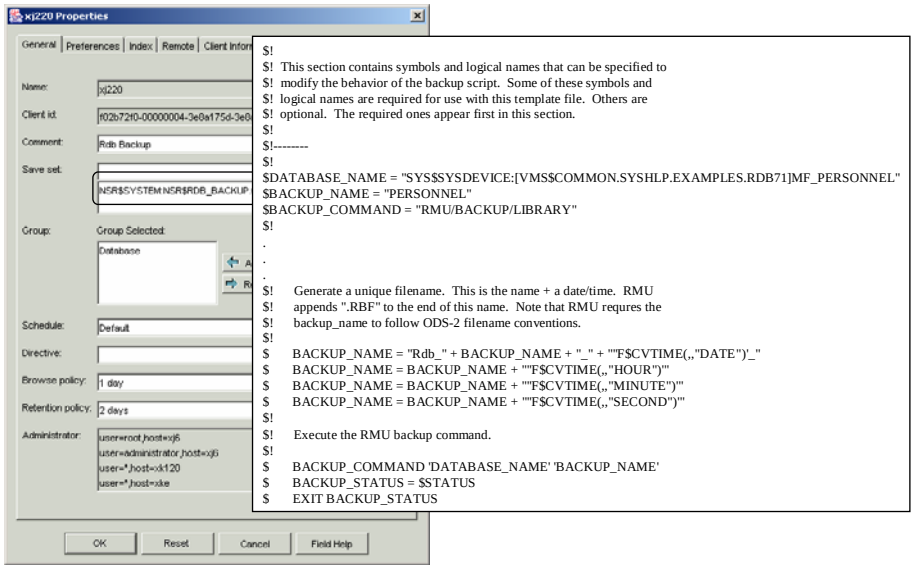
Rdb Client in NetWorker



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Delivering Operational Efficiency and Business Continuance…

- ONE, a leading Austrian telecom provider protects more than **54 terabytes** on NAS/SAN
  - reduced resources and personnel required for data protection
  - better able to leverage SAN environment
  - **cut Oracle backup times by 50%**

…To Help Customers Change *Their* Rules

LEGATO

Coming to a Release Near You Soon

We need your feedback to define priorities:

- Q4 CY2003
  - In Beta from October 2003, support for:
    - ODS-5
    - RDB 7.1.2 and above
    - Oracle 8i, 9i, 10i
  - Itanium Port for OpenVMS 8.0
- CY2004
  - AlphaStor client
  - NetWorker server
- ?

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HP & LEGATO Support

- **Technical Support**
  - **1st and 2nd line support offered by HP and LEGATO (customer choice)**
  - **3rd line support offered by LEGATO**
- **LEGATO technical field sales support**
  - **LEGATO OpenVMS "Consuls"**
  - **Specialists who have background in OpenVMS and will assist in answering technical questions/pre-sales support**

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Legato Information & Contacts

openvms@legato.com

the leader in open software solutions for Information Management™
LEGATO