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AMERICAS 2008



Siemens PLM Software

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Teamcenter 2007MP3 on NetApp Storage System over NFS: Reference Architecture with Backup & Recovery Solution

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- ▶ Introducing NetApp
- ▶ NetApp – Siemens PLM Software Partnership
- ▶ Customer Requirements
- ▶ Implementations of Teamcenter 2007MP3
- ▶ Teamcenter Reference Architecture Overview
- ▶ Performance and Scalability Benchmarks
- ▶ NetApp Backup/Restore Solution
- ▶ Q&A



NetApp at a Glance



- ▶ Worldwide, enterprise customers
- ▶ Broad portfolio of innovative storage and data management solutions
- ▶ Industry-leading partners
- ▶ Comprehensive professional services
- ▶ Global support
- ▶ Customer success fuels our growth

~7000+ Employees Offices in over 110 countries
Fortune 1000 NASDAQ 100 S&P 500



Top Product Developers Rely on NetApp



Mechanical Design & Engineering

DAIMLERCHRYSLER

metaldyne



SIEMENS



PSA PEUGEOT CITROËN



BOEING®



Electronics & Chip Design



TEXAS INSTRUMENTS

cadence

XILINX

AMD
Smarter Choice

Software Engineering

SAP



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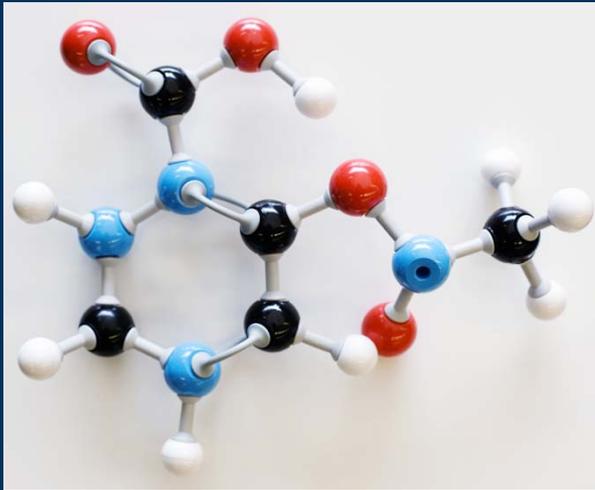


SYNOPSYS®

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Partnership with Siemens PLM Software



- ▶ Partners for over 9 years
- ▶ Snapshot backup integration
 - ▶ TC2007 MP3 “hot backup mode”
 - ▶ SnapManager for Oracle
- ▶ Ongoing technical collaboration
 - ▶ Teamcenter database performance enhancements
 - ▶ Deduplication on primary storage
 - ▶ VMware support
- ▶ Siemens PLM uses NetApp storage

NetApp first NAS storage solution certified for Teamcenter

http://www.netapp.com/us/company/news/news_rel_20070614.html



UGS: Product Lifecycle Management (PLM) Solutions - Microsoft Internet Explorer

Address: http://support.ugs.com/online_library/certification/index.php?interface=external_interop&p=p&v1=9&status=&d=r

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Support

Interoperability with 3rd Party Products
Display Format: Relaxed

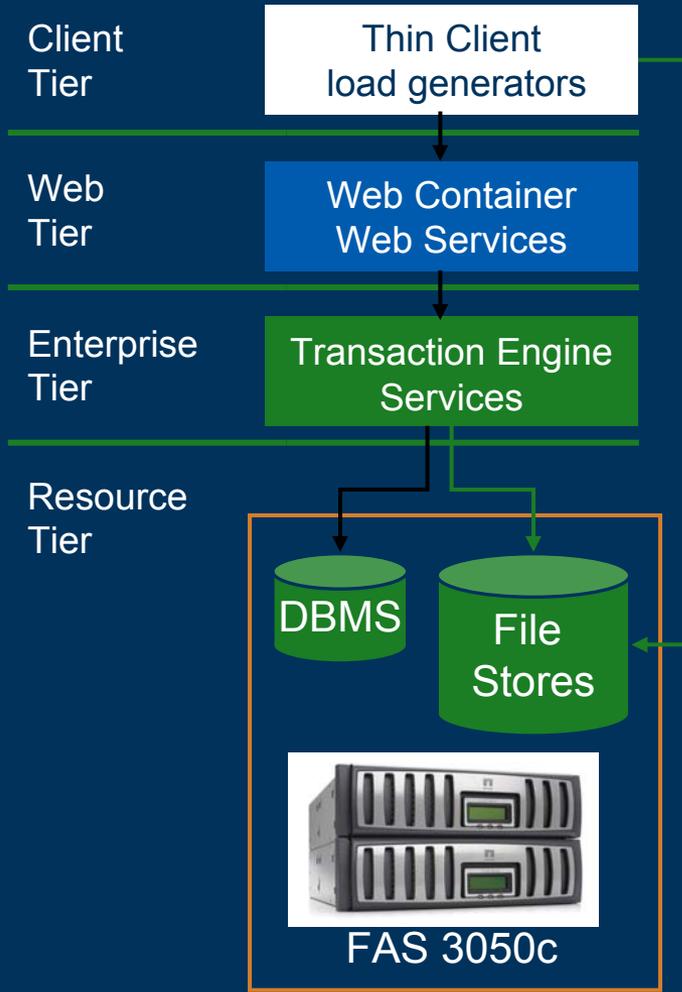
This shows the interoperability between UGS products, and 3rd party products in a version-to-version matrix. The OS details are not into account for this display.

UGS Product	Java Runtime Environment			
	1.4.1	1.4.2	1.4.2_06	1.4.1_05

- ▶ Teamcenter is the most widely used PLM solution
- ▶ NetApp is the first storage vendor to earn certification
- ▶ Joint solution scales to at least 5000 concurrent users, meeting stringent Siemens PLM Teamcenter performance requirements

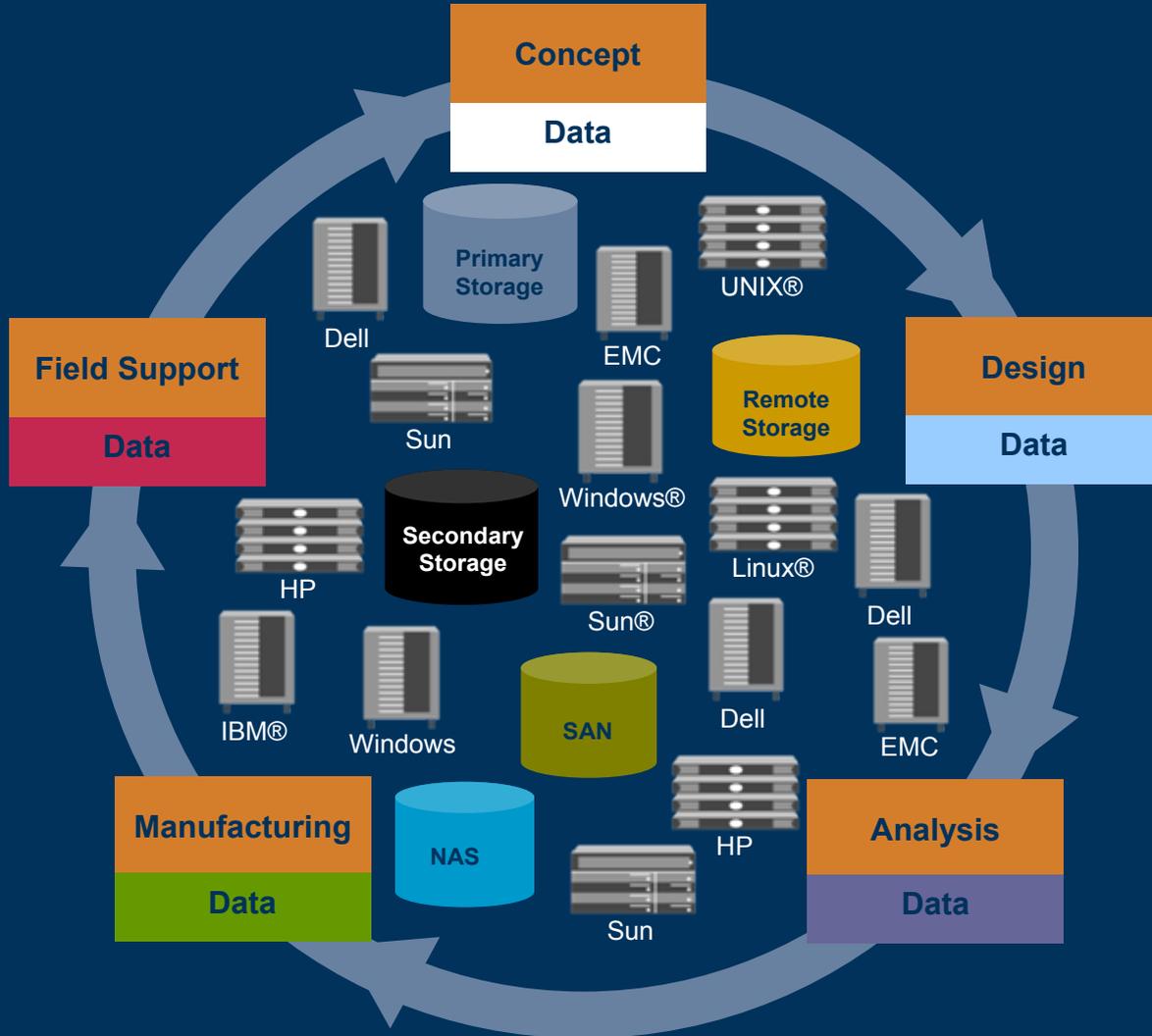


Reference Architecture for Teamcenter



- ▶ Defines reference architecture for Teamcenter on NetApp® over NFS
- ▶ Benchmarks simulate up to 5,000 users accessing Teamcenter simultaneously
- ▶ NAS performance comparable to DAS/SAN
 - ▶ Reduce complexity and cost
 - ▶ Better scalability, availability and data protection

Joint technical report available here: <http://media.netapp.com/documents/tr-3658.pdf>

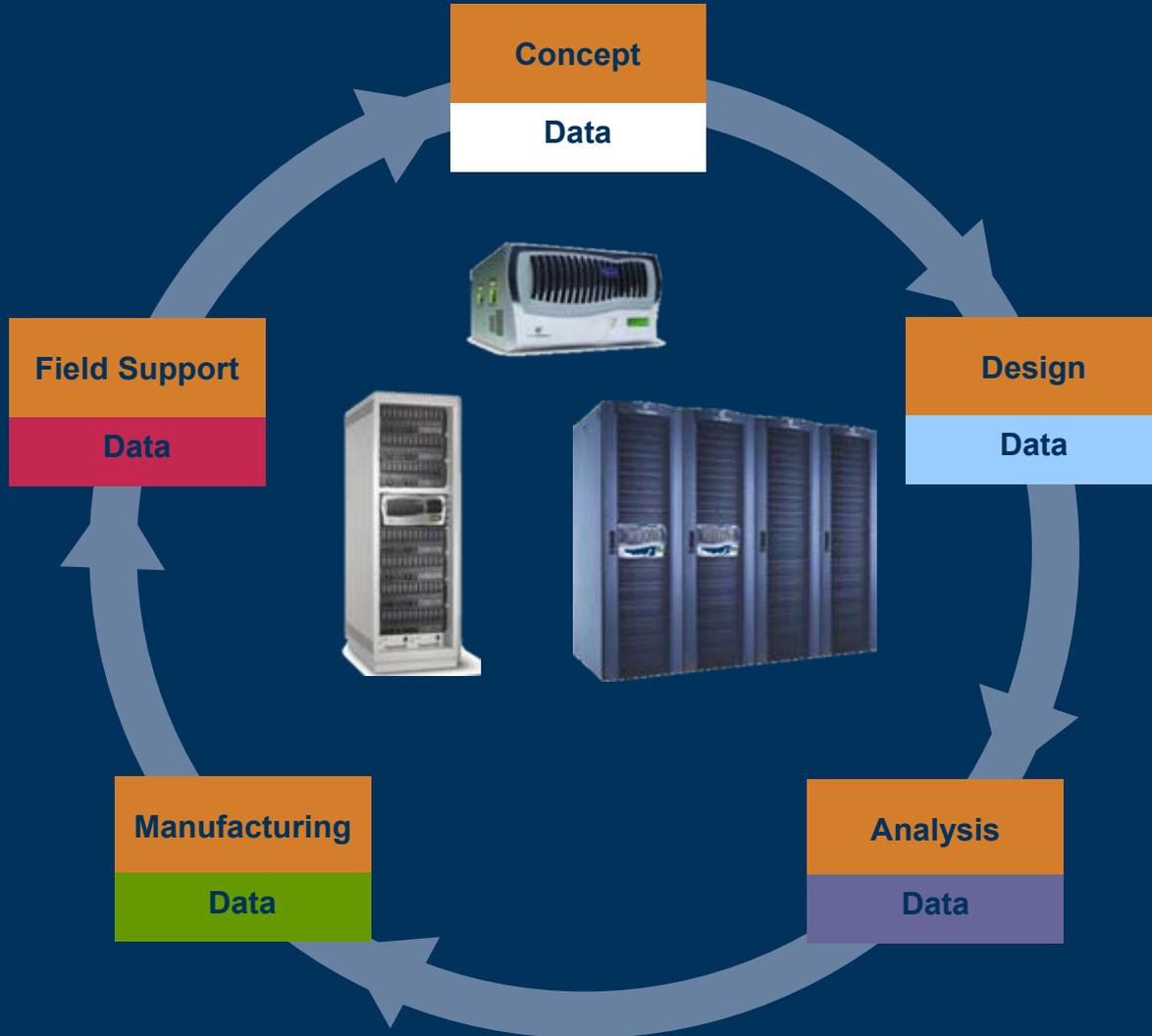


Challenges:

- ▶ Complex Environment
- ▶ Data Availability
- ▶ Data Reuse
- ▶ Less flexible without multi-protocol support
- ▶ Performance and Scalability



The NetApp Advantage

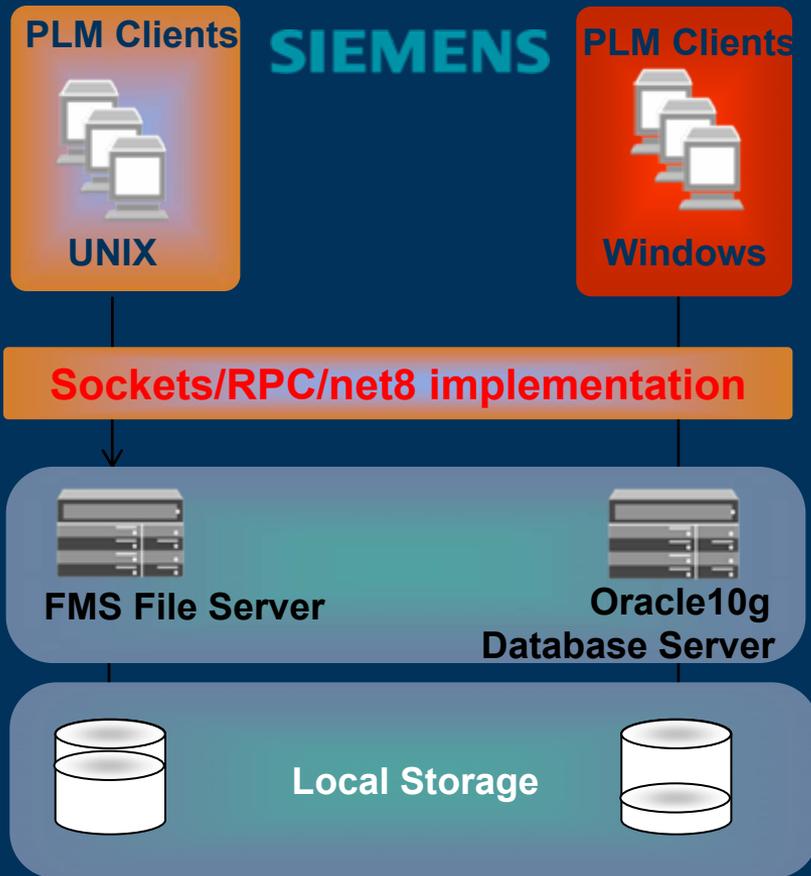


NetApp Solution:

- ▶ Reduces Complexity & Increases Reliability
- ▶ High Data Availability
- ▶ Greater Data Re-usability
- ▶ Multi Protocol Storage Support
- ▶ Greater Performance and Scalability
- ▶ Investment Protection

Award-Winning Technology





Problems

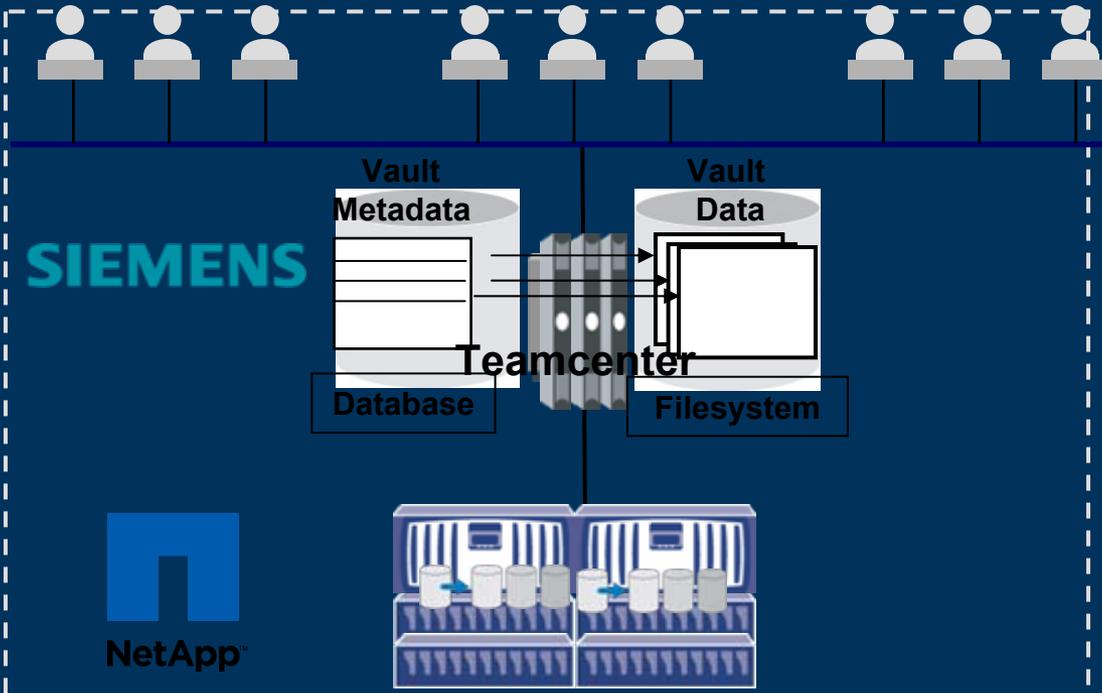
- ▶ **Controlling Growth – Scalability issues**
 - ▶ Cannot grow space on demand
 - ▶ Needs downtime to add more physical disks
 - ▶ Disruptions for users
- ▶ **CPU and Memory Resources**
 - ▶ High CPU utilization on the database servers
 - ▶ Insufficient server memory leads to memory pressure
- ▶ **RAID Configuration**
 - ▶ Less degree of data protection
 - ▶ Performance degradation due to disk bottlenecks
- ▶ **Backup and Recovery – Data Re-usability issues**
 - ▶ Disruptive
 - ▶ Less flexible
 - ▶ Recovery takes a long time
- ▶ **Management and Availability - Complexity issues**
 - ▶ Business information requires high-availability
 - ▶ Seamless integration of network, storage, application and data services



Siemens PLM Teamcenter 2007MP3 – Minimizing Pain Points



Primary Data Center



Solution

▶ Replace current storage solution with NetApp Storage over NFS

Benefits

- ▶ Enhanced throughput and manageability for file level access
- ▶ Multi-protocol support
- ▶ Space provisioning without downtime
- ▶ RAID-DP for better data protection
- ▶ Snapshot technology for backups and fast data recovery
- ▶ High availability in a clustered setup
- ▶ Efficient CPU and memory resource utilization
- ▶ Multiple high speed RAID controllers for parallel and quicker data access
- ▶ Faster access and less disruption

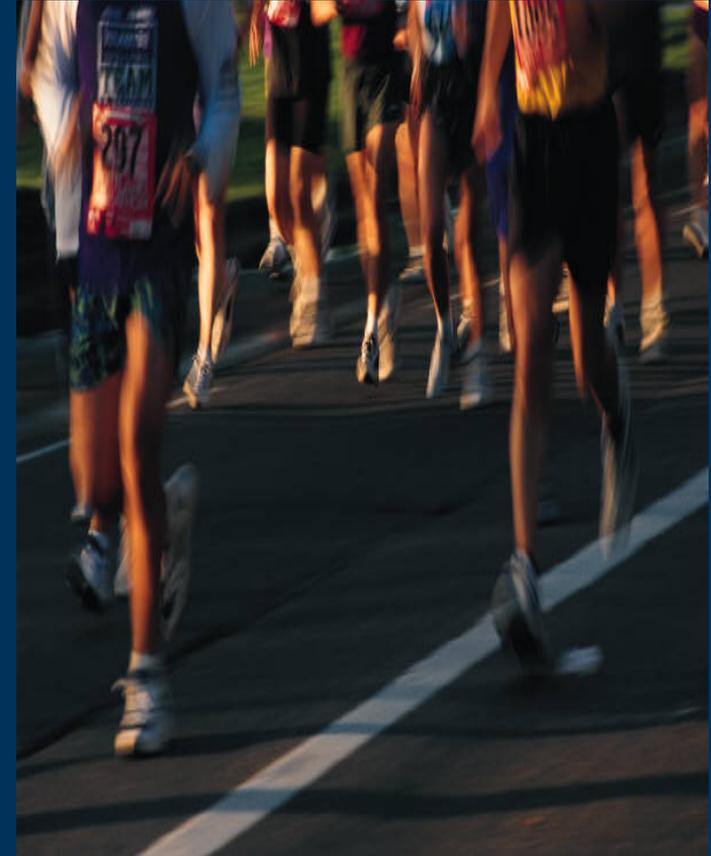
Increase productivity and improve ROI from application deployment



Why NFS for Teamcenter database? — Less Complex and Greater Performance



- ▶ **Reduce the Cost of Storage Provisioning**
 - ▶ Amortize storage costs across many database servers
- ▶ **Simplicity**
 - ▶ Simple storage provisioning
 - ▶ Simple connectivity model
 - ▶ "As easy as Ethernet."
- ▶ **Improved Oracle Administration**
 - ▶ Single repository for all of Oracle's structured and unstructured data
 - ▶ One storage pool to manage, backup/restore and monitor
- ▶ **Better Performance**
 - ▶ Oracle bypasses the OS and generates exactly the request it needs
 - ▶ Data is cached just once, in user space, which saves memory – no second copy in kernel space
 - ▶ Load balances across multiple network interfaces, if they are available
- ▶ **Perfect fit for both Oracle database and Teamcenter Engineering applications**
- ▶ **NetApp drives the standard of NFS in the IETF actively**

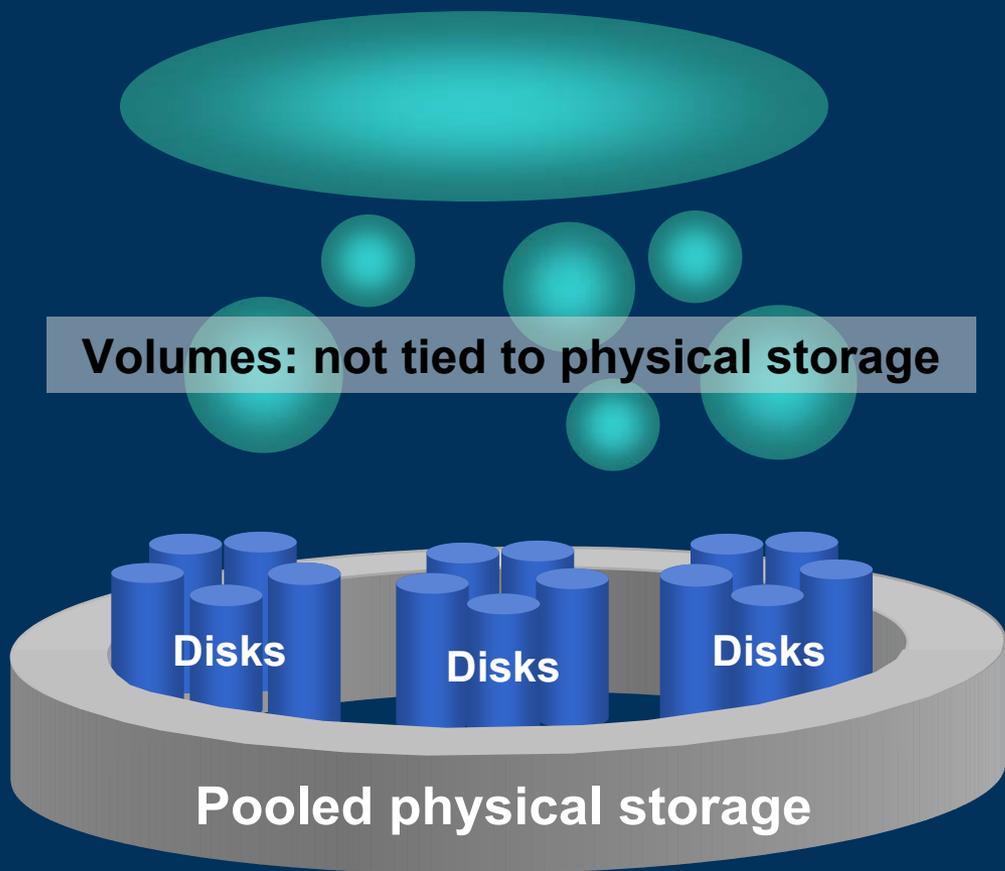




FlexVol: Dynamic Non-disruptive Provisioning — High Scalability

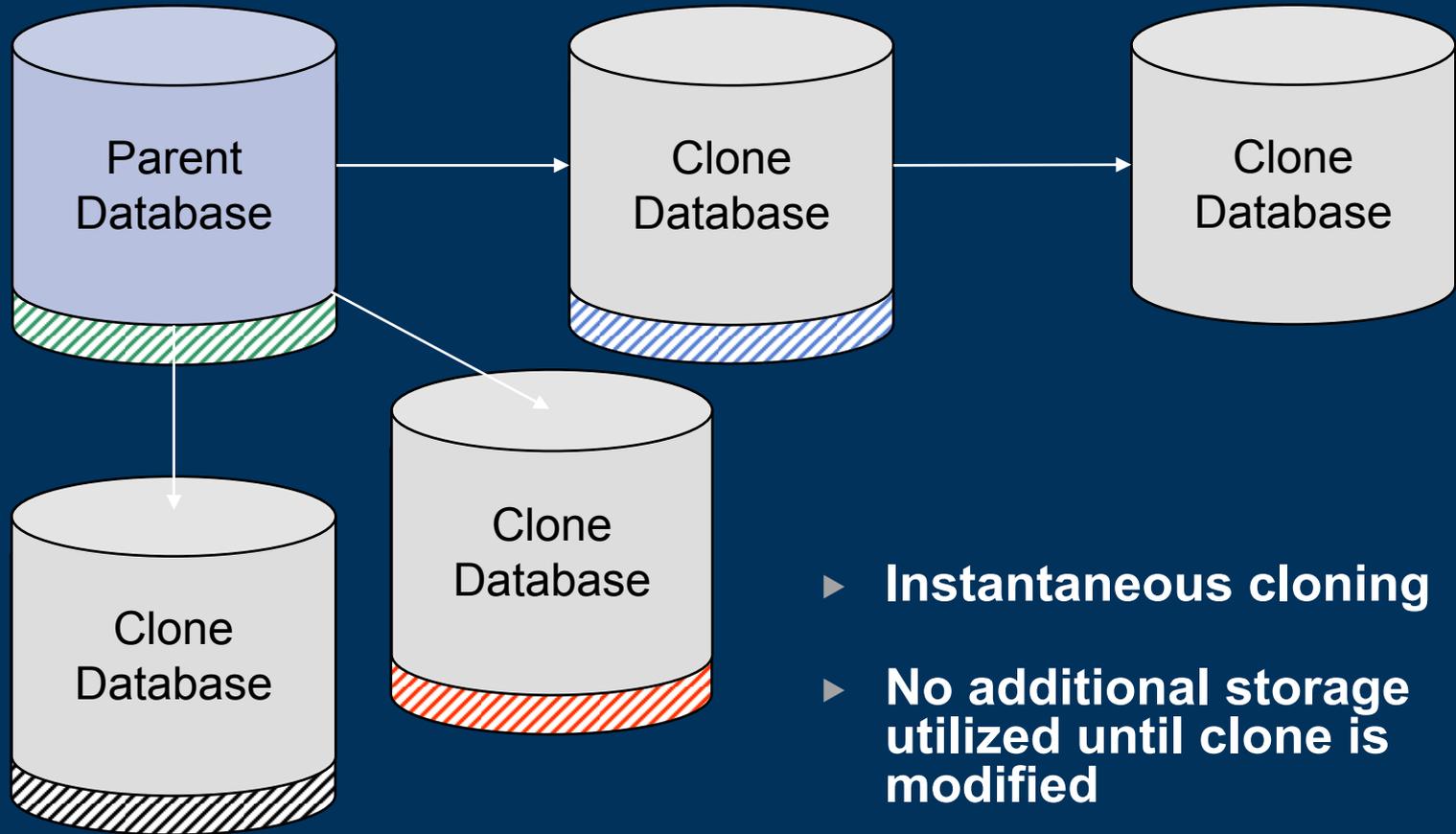


Manage data, not disks



- ▶ Up to 2x storage utilization
- ▶ Responds quickly to changing needs of the enterprise
 - No partitions to manage
 - Ability to over-subscribe free space
 - Reduced implementation and management overhead
- ▶ Uninterrupted service for NFS clients, even with changes in physical storage

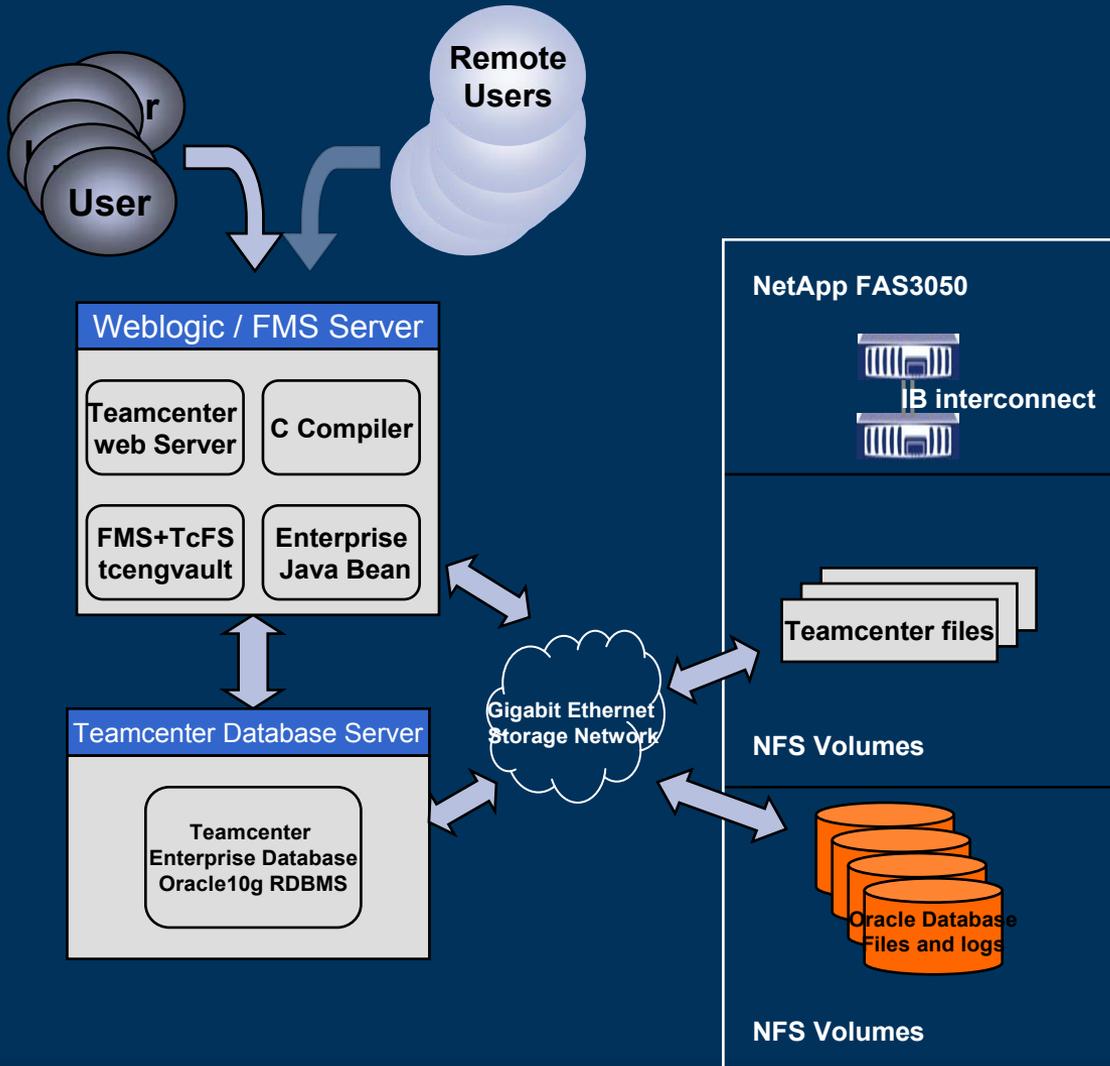
FlexClone™: Improving Productivity — Greater Flexibility



- ▶ **Instantaneous cloning**
- ▶ **No additional storage utilized until clone is modified**



Storage Resiliency — High Availability



Solution

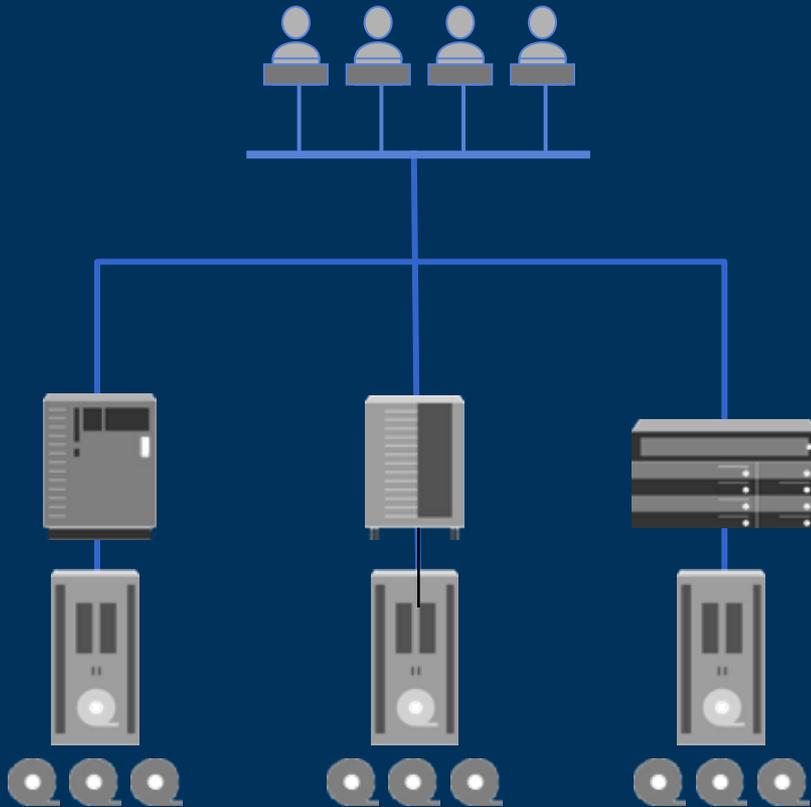
- ▶ High Availability
 - ▶ The business requires high availability of data in a rapidly expanding env.

Benefits

- ▶ Clustered Failover in the event of hardware failure
- ▶ Less cluster failover/giveback times
- ▶ Transparent to NFS clients
- ▶ Non-disruptive DATA ONTAP upgrades without any user downtime
- ▶ Less systems + less multiple-system dependencies = less ways to fail
- ▶ Reduced TCO and maximized Storage ROI



Teamcenter Database Backup and Recovery



Challenges

- ▶ Performance degrades during hot backup windows
- ▶ Cold backups lead to lower SLAs
- ▶ Separate backups on each platform
- ▶ Time-to-recover from tape becomes prohibitive
- ▶ DBA/Administrator's time spent on non-value-add backup/restore tasks
- ▶ Backups not performed often

- ▶ Step 1: The third-party backup software requests that TCEng to freeze all operations on TCFS volumes and sends a cautionary message to the user to save all files.
 - ▶ TCEng is placed in read-only mode once there are no open TC files in the system.
- ▶ Step 2: The third-party backup software is now ready to take a snapshot of the TCFS and the Oracle database.
- ▶ Step 3: The backup of the Oracle database starts in hot mode allowing Teamcenter to available 24/7
 - ▶ Optionally, during the backup, the third-party software can request that Teamcenter Engineering operate in blobby volume mode.
- ▶ Step 4: The third-party backup software completes the backup operation.
- ▶ Step 5: The third-party backup software requests that TCEng resume normal mode and thereby TCFS volume resumes normal mode.



Teamcenter Backup Strategy — The NetApp Way



- ▶ Step 1: The third-party backup software requests that TCEng to freeze all operations on TCFS volumes and sends a cautionary message to the user to save all files.
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- ▶ Step 2: The third-party backup software is now ready to take a snapshot of the TCFS and the Oracle database.
- ▶ Step 3: The backup of the Oracle database starts in hot mode allowing Teamcenter to available 24/7
- ▶ Step 4: The third-party backup software requests that TCEng resume normal mode and thereby TCFS volume resumes normal mode.
- ▶ Step 5: The backup from the snapshot resumes in the background without any IO disruption

NetApp Backup solution is quick and easy to manage

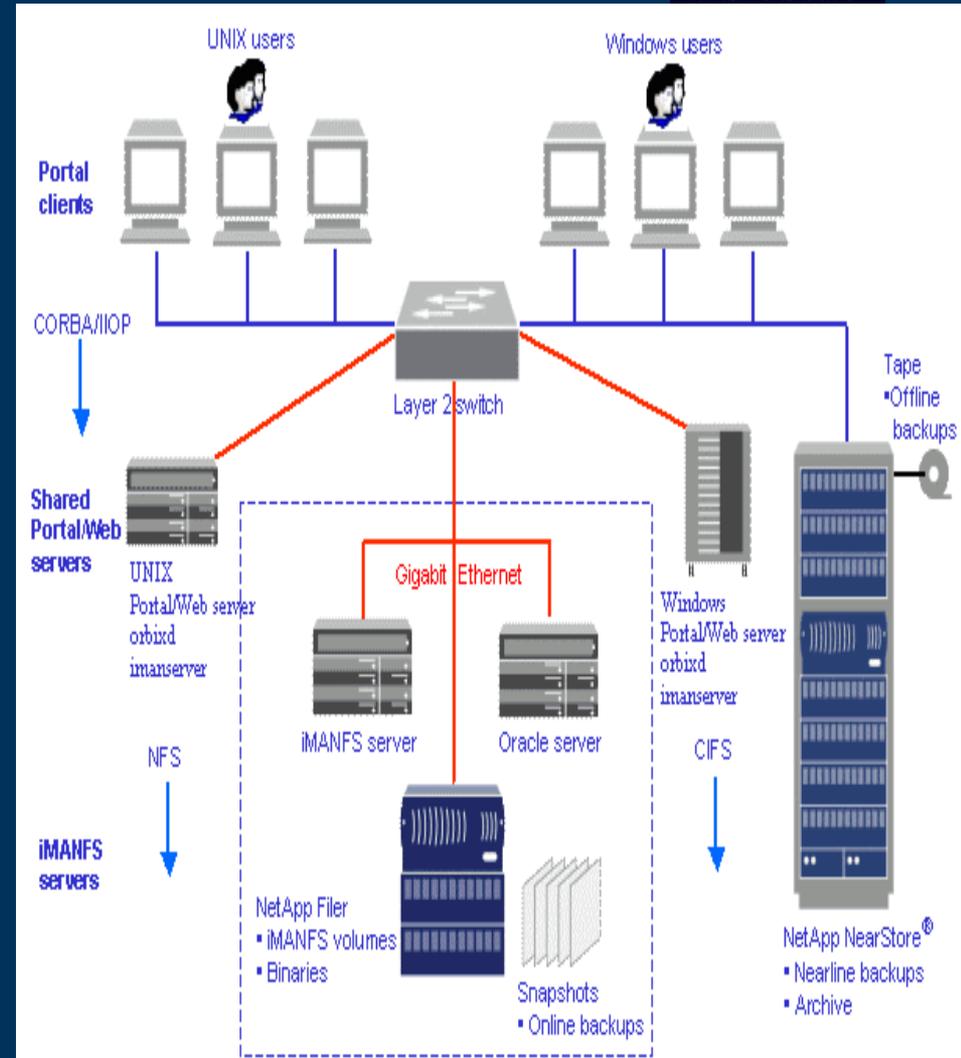


Teamcenter Backup Leveraged — NetApp Solution for Data Reuse



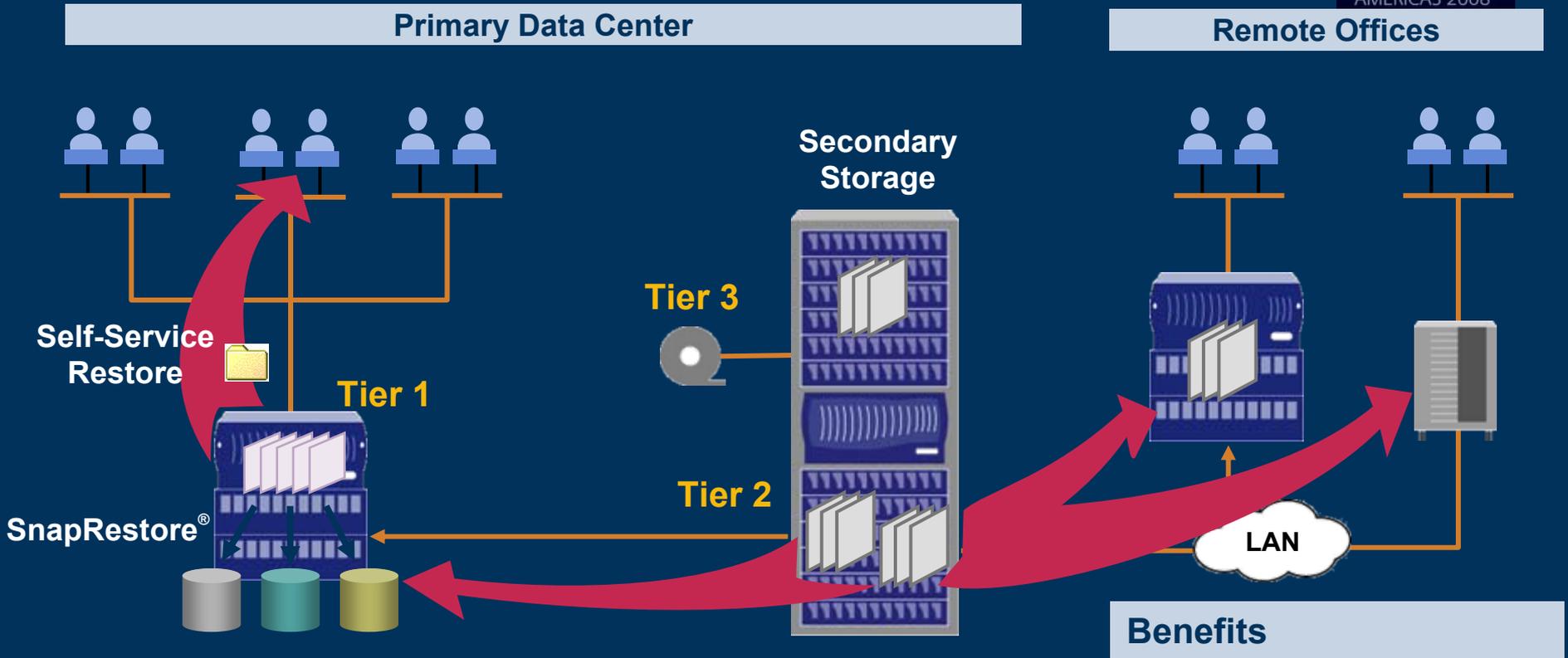
Benefits

- ▶ Snapshot provides multiple point-in-time recovery points for Oracle® data files
- ▶ Replace tape backups with disk-to-disk backups
- ▶ Time to restore is improved with online backups and SnapRestore
- ▶ Consolidated storage means consolidated backups
- ▶ Rapid failover supported—when a server fails, you can remount the database volumes to another server





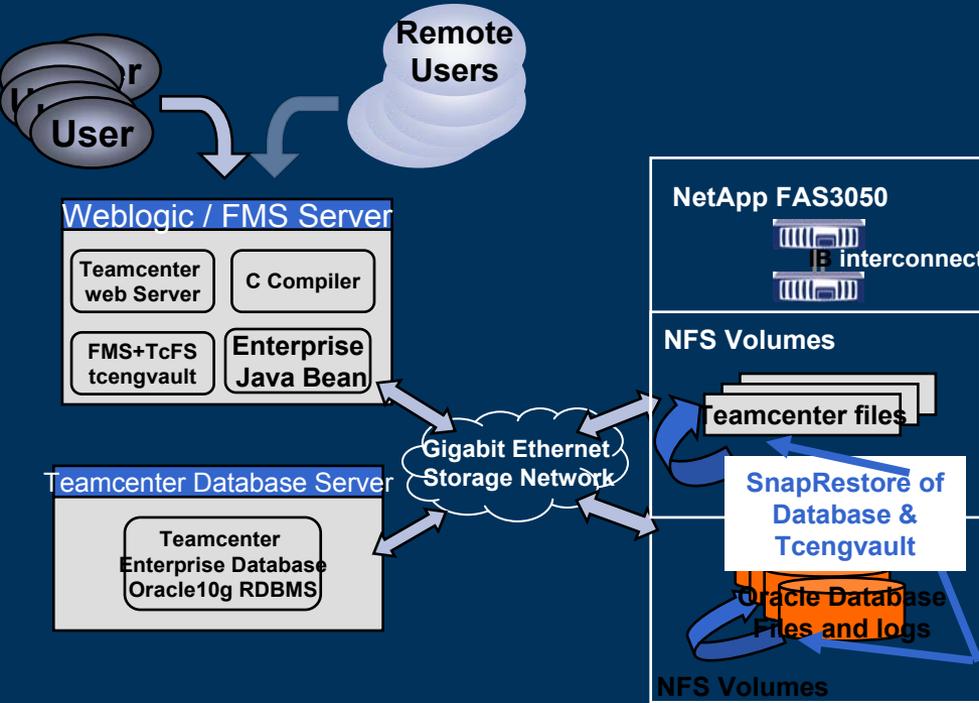
Improved Business Continuity: Rapid Restore Process



- ▶ Users can restore their own files in seconds
- ▶ Administrators can rapidly recover volumes and single files with SnapRestore
- ▶ Administrators can quickly recover local and remote systems from disk-based backup archives

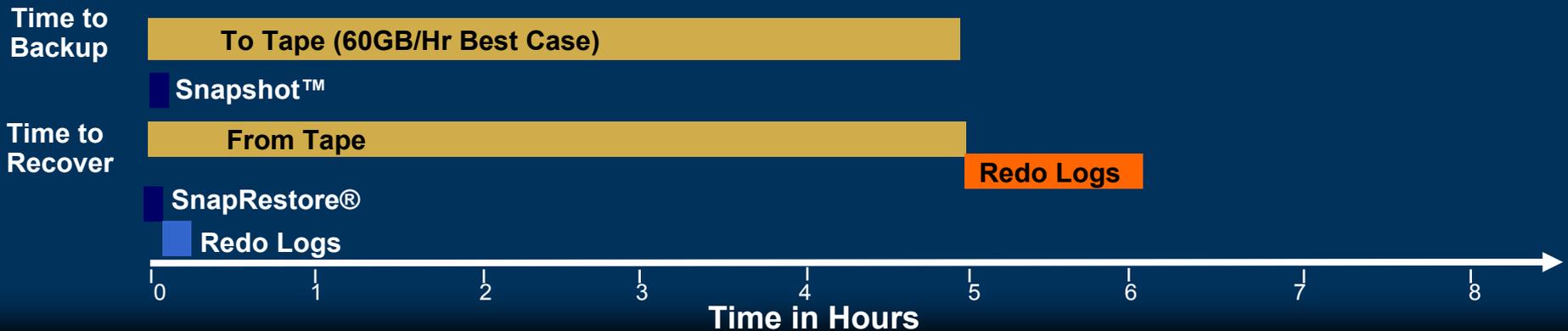
Benefits

- ▶ Flexible solution to ensure business continuance
- ▶ No user disruption and fast recovery to maintain productivity



Benefits

- ▶ Faster and more reliable backup and recovery to increase productivity and TTM
- ▶ Reduce system and storage overhead
- ▶ Simplifies backup and recovery to improve operational efficiency and TCO
- ▶ CLI Script to create Snapshot based backups of Teamcenter on NetApp
- ▶ Uses backup_modes utility to change state of Teamcenter





▶ **Ensure User Productivity over NAS**

- ▶ Maintain high data availability
- ▶ Native NT/UNIX support
- ▶ Eliminates cost and complexity caused by emulation layers
- ▶ Supports the security models of UNIX© and Windows© file systems
- ▶ Unified NAS and SAN in one platform



▶ **Remote Collaboration**

- ▶ Reduced response time accessing data improves remote user productivity
- ▶ Reduced bandwidth requirement



▶ **Fast and scalable**

- ▶ Speeds I/O performance and access to data
- ▶ Same OS across entire product line ensures seamless upgrades

▶ **Simplicity**

- ▶ No administrator required at remote site
- ▶ Thin client remote footprint reduces administrative workload



▶ **Reduce Costs**

- ▶ Consolidate and simplify storage environment
- ▶ Reduce administrative workload

 ROI

 Capacity

 Utilization

 Complexity

 TCO

Q&A

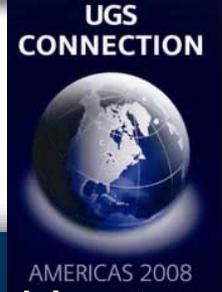
E-mail: bikash@netapp.com

jkim@netapp.com

BACKUP SLIDES



Customer Requirements



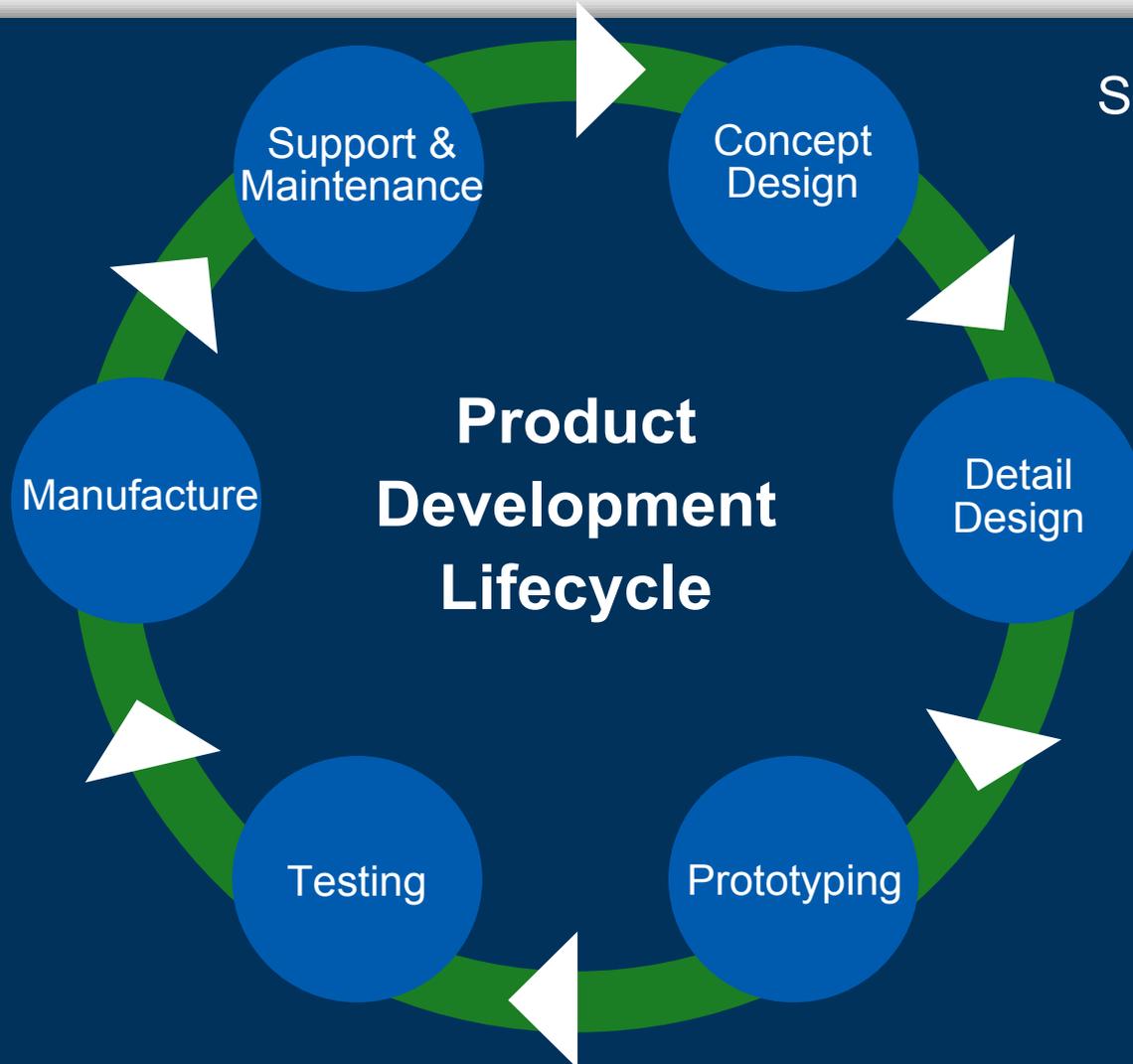
Data retention and archival

Scalable storage for central repository and user workspace

Reliable, secure data sharing

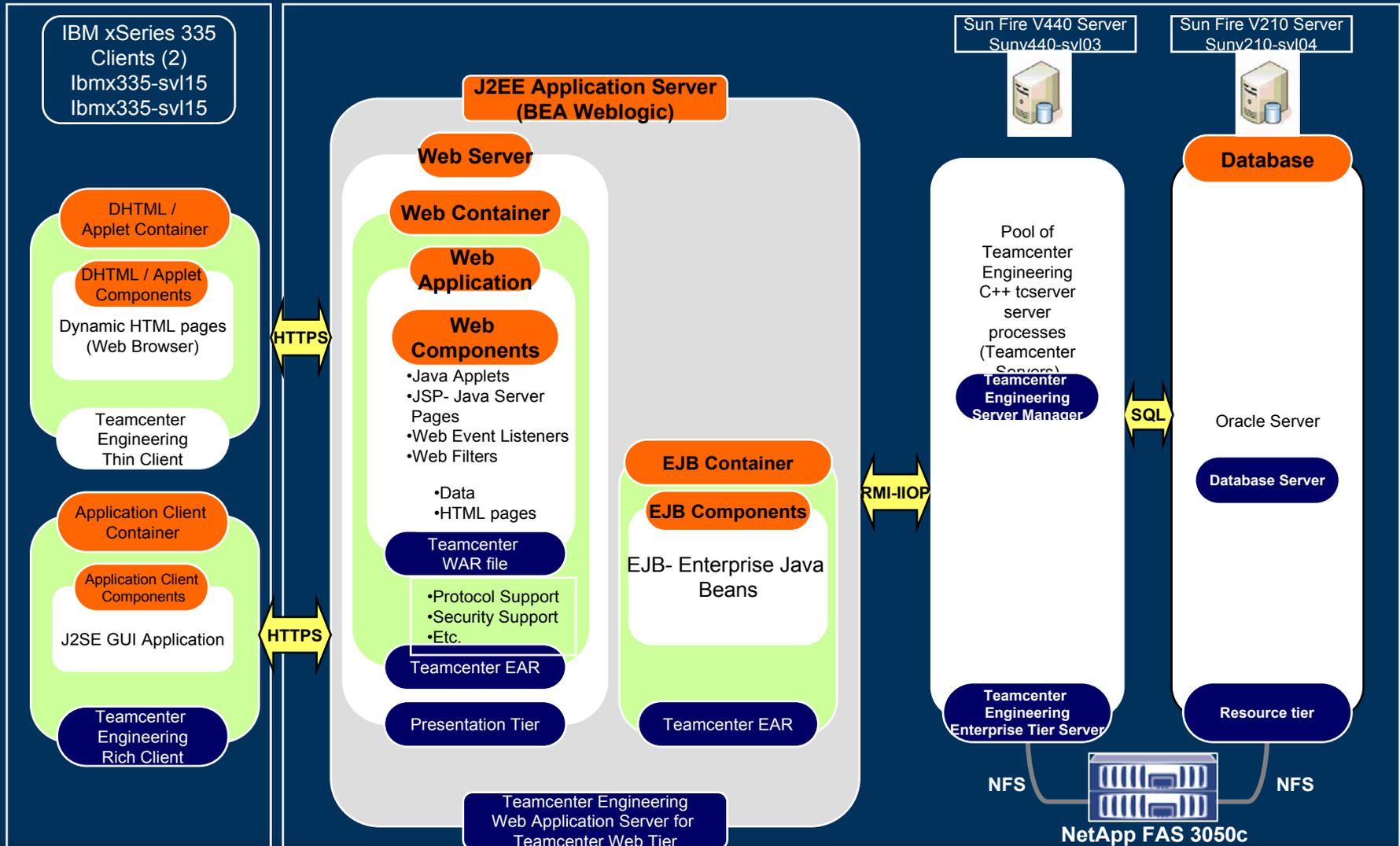
Fast, reliable, backup and recovery

Storage for high performance computing





Reference Architecture — NetApp Best Practice





FMS throughput Benchmark Overview



Item	Description
Business Process	Multiple processes are executed mimicking thousands of of users and they are doing upload, download, and delete in parallel.
Users	Simulated users execute file operations continuously for a period of 60 minutes. The test runs for 1000-5000 users.
Timescale	The results of the tests were gathered from a 60 min period

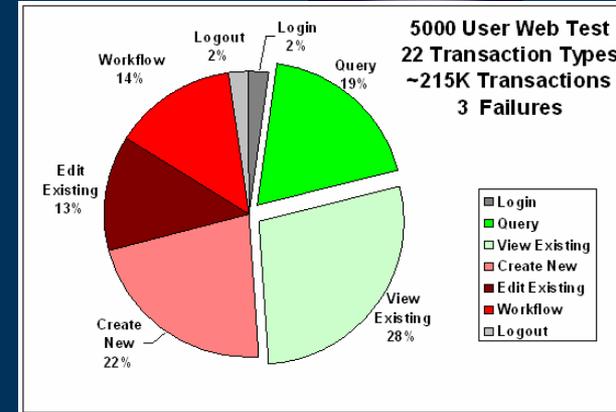
- ▶ The FMS files and the Oracle database resides on a clustered FAS3050 NetApp Storage on separate volumes over NFS
- ▶ The LOGIN activities during peak periods for the 1000 to 5000 users thin client benchmark.
- ▶ The CPU and memory utilization on the FMS and the database servers were monitored as the load keeps growing
- ▶ CPU utilization, NFS OPS and latency on the NetApp Storage.



APA Scalability Benchmark Overview



- ▶ 5,000 concurrent users with 50,000 user database
- ▶ Full 4-tier environment with 250GB volume data
- ▶ 3 user types in 10 Tc Eng groups
- ▶ LoadRunner 8.1 with standard APA scripts
 - ▶ ~ 50% query/view, 50% create/update/workflow
- ▶ Aggressive login/logout ramps, 6 hour duration, ≥ 1hr steady state



For each benchmark:

- ▶ Reset the environment
- ▶ Activate system utilization capture with PerfMon
 - ▶ CPU, RAM, processes, syscalls, cpu queue, swap
- ▶ Start / monitor the run
- ▶ Collect system utilization metrics
- ▶ Generate Windows system utilization graphs
- ▶ Generate LR HTML report
- ▶ Post the run

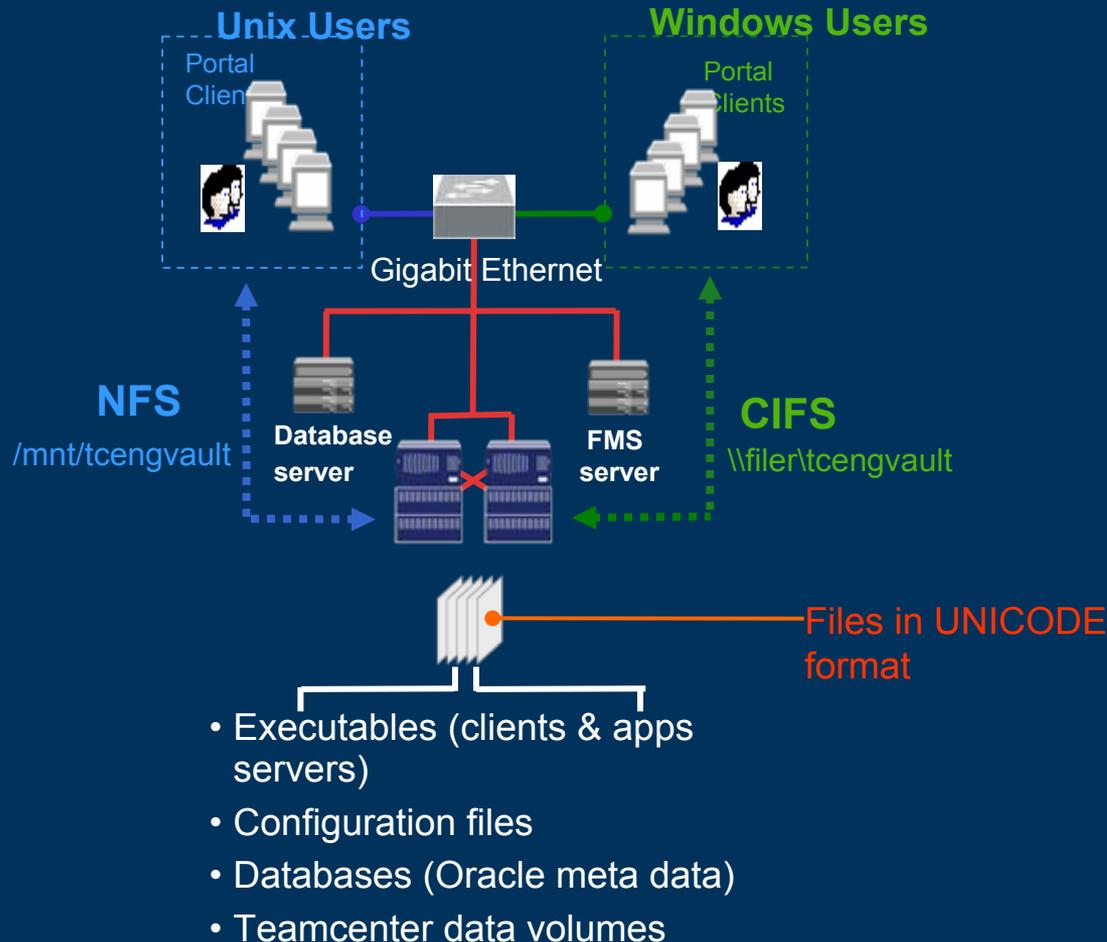


NetApp Key Features and Benefits



- ▶ **Versatile Storage** – *Flexible, multi-use, multi-tier storage systems*
- ▶ **Multi-Protocol Support** - *Simplifies data consolidation and sharing*
- ▶ **Enhanced Data Availability** - *Provides high data availability, replication, and disaster recovery*
- ▶ **RAID-DP™** – *High Performance RAID 6*
- ▶ **FlexVol™** – *Simple and flexible storage provisioning*
- ▶ **Snapshot™/SnapRestore®** – *Data in-place backup and recovery*
- ▶ **SnapMirror®** – *Easy-to-use and efficient data replication*
- ▶ **SnapVault®** – *Incremental block-level disk-to-disk backup*
- ▶ **FlexClone™** – *Instantaneous cloning of volumes and LUNs*
- ▶ **FlexCache™** – *Speed up client and remote access with caching*
- ▶ **SnapManager®** – *Integrated application-level data management*
- ▶ **SnapLock™/LockVault™** – *Volume-level WORM disk storage*

Multi-Protocol Support — More Transparency for Users



Solution

- ▶ Standardized support for growing Mixed (UNIX/Windows) environment
 - ▶ “Native” implementation provides safe, consistent access to files

Benefits

- ▶ Minimized time and cost associated with customized solutions
- ▶ Increased system performance and efficiency
- ▶ Supports the security models of UNIX[®] and Windows[®] file systems
- ▶ Non-disruptive Data ONTAP upgrades without any disruptions
- ▶ Emulation of any kind is no longer a requirement