Technical Report

Solutions for SAP Development and Test Environments with NetApp Storage

NetApp SAP Competence Center, NetApp
April 2009 | TR-3631

EXECUTIVE SUMMARY

This document describes the best practices for deploying NetApp® storage solutions in support of nonproduction SAP® instances and in situations in which production SAP instances reside on either NetApp or another vendor's storage.

TABLE OF CONTENTS

1 INTRODUCTION

This document addresses the challenges of designing storage solutions based on the SAP NetWeaver® technology platform. It describes the scenario in which the customer utilizes another vendor's storage platform to support production SAP instances while the nonproduction landscapes are supported on NetApp storage systems, it also describes the scenario in which NetApp is the only storage solution.

1.1 SCOPE AND ASSUMPTIONS

It is assumed that the competing vendor's storage platform is either based on a Fibre Channel storage area network (SAN) or is directly attached to the production SAP server or servers. The NetApp solutions presented here take advantage of network-attached storage (NAS) systems utilizing the Network File System (NFS) protocol as well as solutions for pure Fibre Channel SAN environments.

The recommended solutions that follow are generic with respect to most SAP applications as well as to the size and scope of the implementation. This technical report assumes a basic understanding of the technology and operation of NetApp, SAP, and databases.

1.2 BUSINESS CHALLENGES FACING THE SAP CUSTOMER

Corporations deploying SAP software today are under pressure to reduce cost, minimize risk, and control change by accelerating deployments and increasing the availability of their SAP landscapes. Changing market conditions, restructuring activities, and mergers and acquisitions often result in the creation of new SAP landscapes based on the SAP NetWeaver platform. Deployment of these business solutions often exceeds a single production instance of SAP. Business leaders and project managers must coordinate with corporate IT management to optimize the scheduling and availability of systems to support rapid prototyping and development, frequent parallel testing or troubleshooting, and appropriate levels of end-user training. The ability to access these systems as project schedules dictate with current data sets and without affecting production operations is often the difference between SAP projects being delivered on time and within budget or not.

1.3 TECHNOLOGY CHALLENGES OF AN EXPANDING SAP LANDSCAPE

A typical SAP production landscape today consists of several different SAP systems. Just as important to the successful operation and management of these production instances are the many nonproduction instances used to support them. The ability to maintain nonproduction SAP instances is particularly important when the business initiates a new SAP project. In many cases, project development begins through the creation of a new SAP instance from a copy of the current production system.

When an SAP instance is created either from a copy of an existing SAP system or through an SAP installation, additional instances are established based on the needs of the customer and his/her development and integration teams. SAP has long encouraged its customers to maintain separate development and test instances for each production instance. In practice, SAP's standard three-system (development, test, and production) landscapes often expand to include separate instances for technical sandbox, business/development sandbox, development consolidation, and user training. Multiple test systems are also common. Sometimes referred to as quality assurance or staging instances, they are typically the last instance in which changes or modifications to the SAP system reside before being moved into production. Another characteristic of these systems is that they can be exact replicas of the IT infrastructure used to support the production instance. It is possible that for every production instance of SAP, up to 10 copies of that instance could be used to create and support it. Compound this with the many different SAP applications, such as ERP, CRM, BI, SCM, SRM, and Portal, and the number of systems to support can become very large.
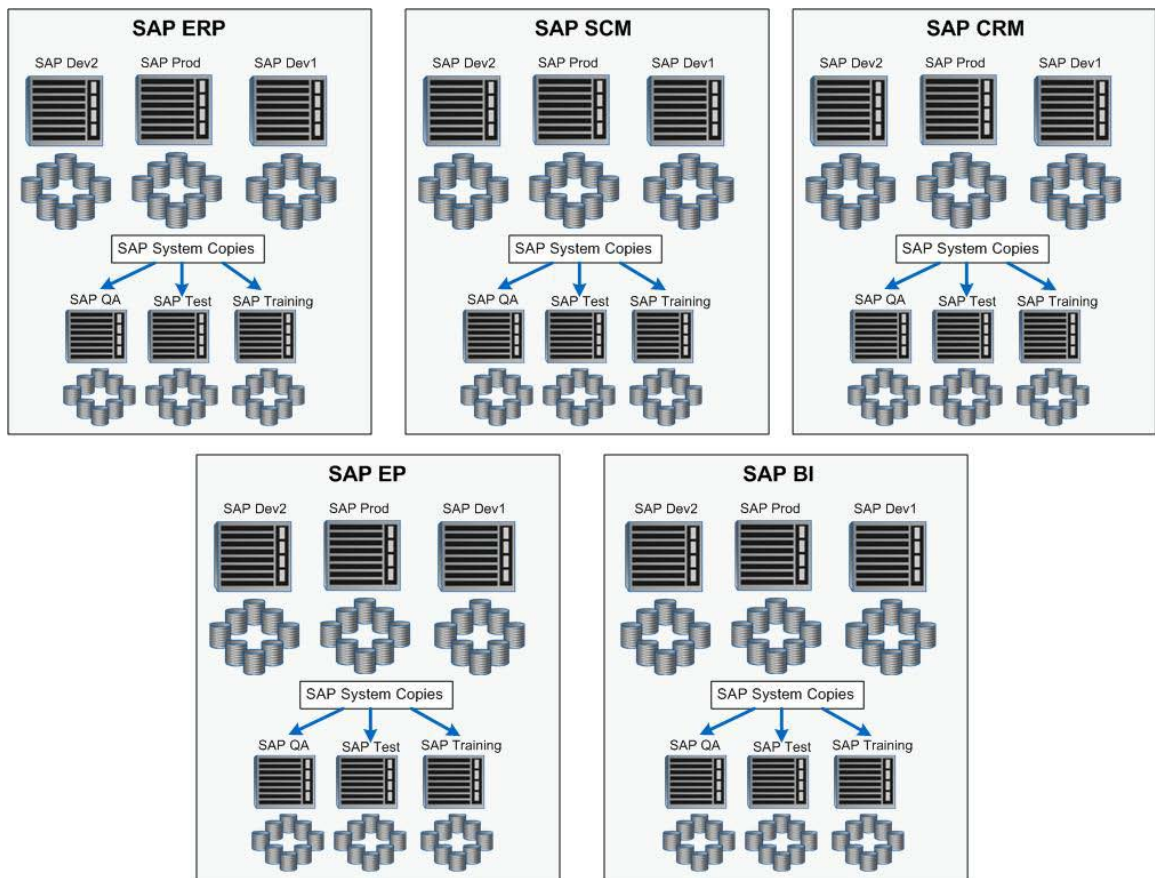
Figure 1) Example of an SAP landscape with many systems.

Adding to the challenge of maintaining these SAP systems is the fact that each of these instances has different performance, scalability, availability, and uptime profiles. These profiles vary depending on the phase of project implementation and whether the project is focused on an existing SAP implementation or a brand new one. Finally, and depending on a number of different factors, is the dependency of the nonproduction instances on the source systems. In the case of an SAP upgrade project, a copy of the production system is used as the basis to execute the upgrade with actual business data. As production continues to run, the upgrade is performed on the instance copy. At various stages of the upgrade, the instance copy is resynchronized with production to make sure that tests are performed on the most current data. The speed and efficiency of this process affects both instances and the upgrade project as a whole. The demand on IT to produce and manage nonproduction instances varies from customer to customer and from project to project.

The fact that more test and training systems are needed to accelerate test cycles by allowing parallel independent operation, and that test and training systems need to be refreshed often to increase the quality of testing and training, increases the demands on the IT infrastructure. If the infrastructure that is supporting SAP systems and related applications is inflexible and difficult to operate or manage, or if high cost-of-ownership barriers develop within IT, the ability of business owners to deploy new and improved business processes can be negatively affected.

2 CREATING SAP SYSTEM COPIES WITH NETAPP STORAGE

With an SAP recommended system landscape consisting of at least a development, test, and production system, the need to have current data available for configuration and testing is a common issue. Most SAP customers solve the test data issue by periodically copying their production system back to their various test instances. This process can be time consuming and expensive because of the size of SAP databases. As described in this section, NetApp has a unique method for addressing the issues of time and storage required for SAP system copies.

2.1 HOMOGENEOUS SAP SYSTEM COPIES

SAP has published recommended procedures for making copies of existing SAP systems. In SAP terms, if a system copy takes place between systems with the same operating system and database platform, it is called a homogeneous system copy. If the system copy takes place between systems with either a different operating system or a different database platform, it is called a heterogeneous system copy. In this discussion, it is assumed that the homogeneous system copy will be used for making copies of SAP systems. SAP has developed documentation and procedures for creating system copies based on online or offline backups of the SAP system as well as import and export tools delivered with the SAP system's underlying RDBMS.

The issues that most customers face when using these tools are that the tools are manually intensive, in most cases require downtime, and can take several hours or even days to create, depending on the size of the source instance and the available resources in the customer's SAP IT landscape. The dependencies are magnified based on the frequency that system copies are needed as well as by the amount of downtime available to complete the copy.

2.2 SAP SYSTEM COPY CAPACITY REQUIREMENTS

When SAP system copies are created with most storage architectures, space must be allocated to accommodate the entire size of the source database. This can drastically increase the amount of storage required to support a single production SAP instance.

For example, suppose a 1TB SAP production system is copied during a project to a quality assurance system, a test system, and a training system. With traditional storage architectures, this requires an additional 3TB of storage. Furthermore, it requires a significant amount of time to first back up the source system and then restore the data to the three target systems.
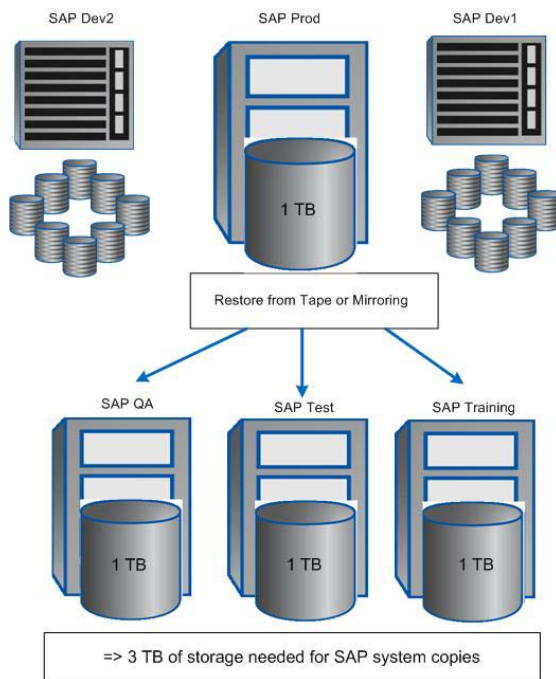

Figure 2) Capacity requirements for SAP system copies on storage other than NetApp.

In contrast, when NetApp FlexClone® technology is used to create SAP system copies, only a fraction of the storage is required. NetApp FlexClone technology uses Snapshot™ copies to create clones of SAP systems. Because data is not copied, but is referenced in place, the amount of storage required is limited to only data that is changed at the source and the target system. As a result, the storage requirements for a system copy in a NetApp storage environment can be kept to around 10% of the size of the source database.
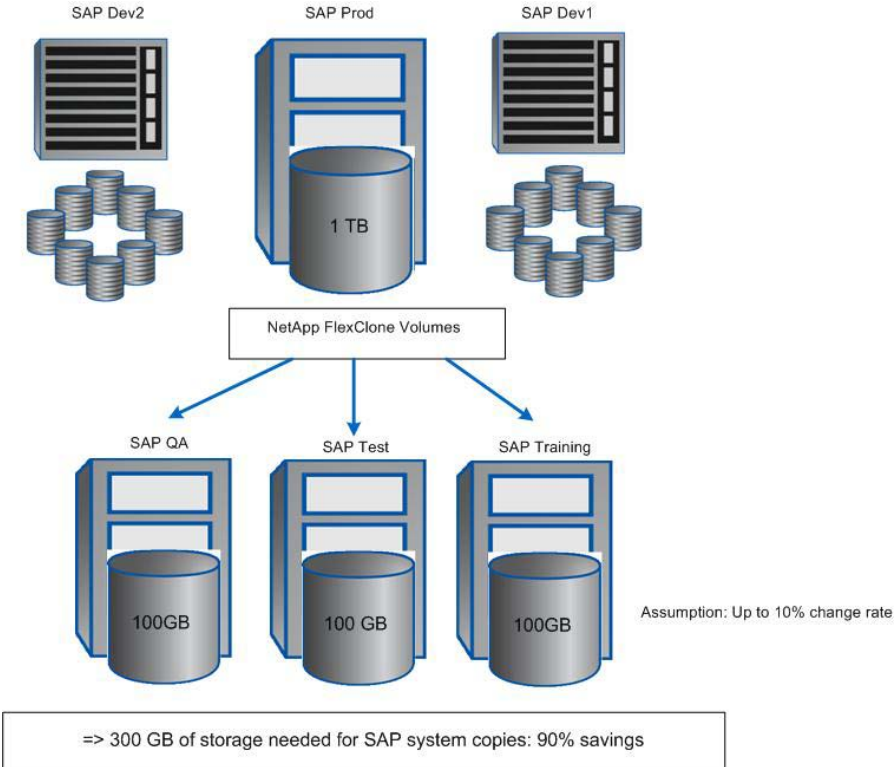

Figure 3) Capacity requirements for system copies on NetApp storage.

In environments in which the source system resides on storage not from NetApp, an additional storage requirement exists. A full copy of the source data must be copied to the NetApp storage before NetApp FlexClone technology can be used to create the SAP system copies. For customers creating only one or two system copies from a source database, the storage savings is significant when compared to customers creating three or more copies.
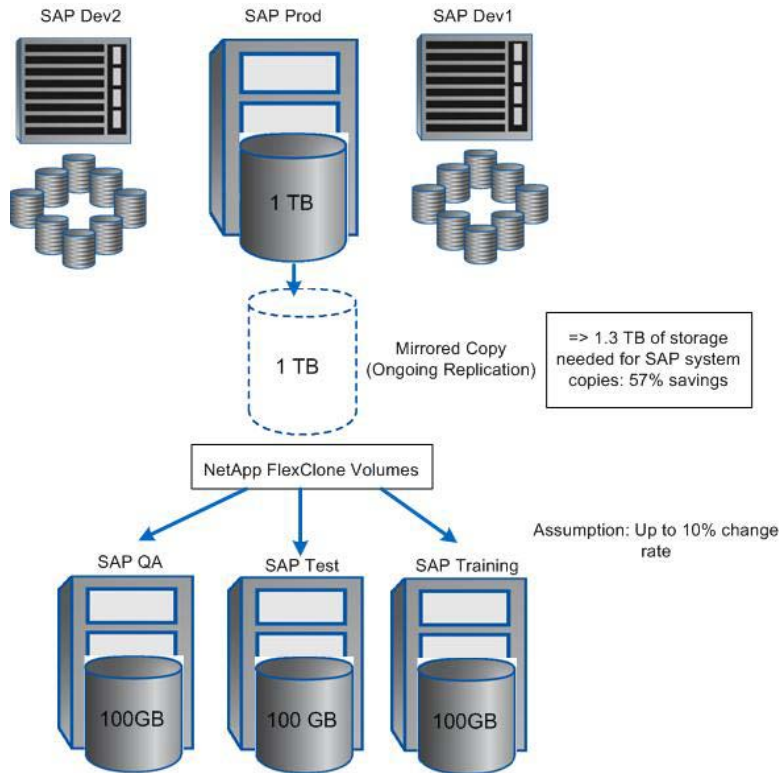
Figure 4) Capacity requirements for SAP system copies in a heterogeneous storage environment.

2.3 SAP SYSTEM COPY TIME REQUIREMENTS

The time required to create a copy of a SAP system can be divided into four parts:

1. Time to create a backup of the source system

2. Time to restore the backup to the target system

3. Time to recover the database and make it consistent

4. Time to perform SAP application postprocessing

In a traditional system copy process, data is backed up to tape and then restored, which takes a great deal of time. If an online backup is used, there is no downtime for the source system; however, the time required to recover the database and make it consistent greatly increases due to the large number of logs that need to be applied. This can add hours to the system copy process. If an offline backup is used, then the source system is shut down, resulting in a loss of productivity.

In contrast, a backup on NetApp storage takes just a few seconds. The database is in hot backup mode very briefly while a Snapshot copy is taken. As a result, only a minimum number of logs needs to be applied to recover the database. Usually only the active database logs are required.

For both processes, the SAP postprocessing time is the same.

Because the backup and restore time is reduced to minutes instead of hours with NetApp storage, additional test cycles can be run in the same amount of time. Figure 5 shows the difference between the amount of time spent testing with NetApp storage versus the time spent testing using a traditional approach. The NetApp approach yields more than twice the amount of testing in the same period of time. The ability to run more test cycles enables customers to correct more issues before going live, reducing risk and increasing end-user satisfaction and productivity.
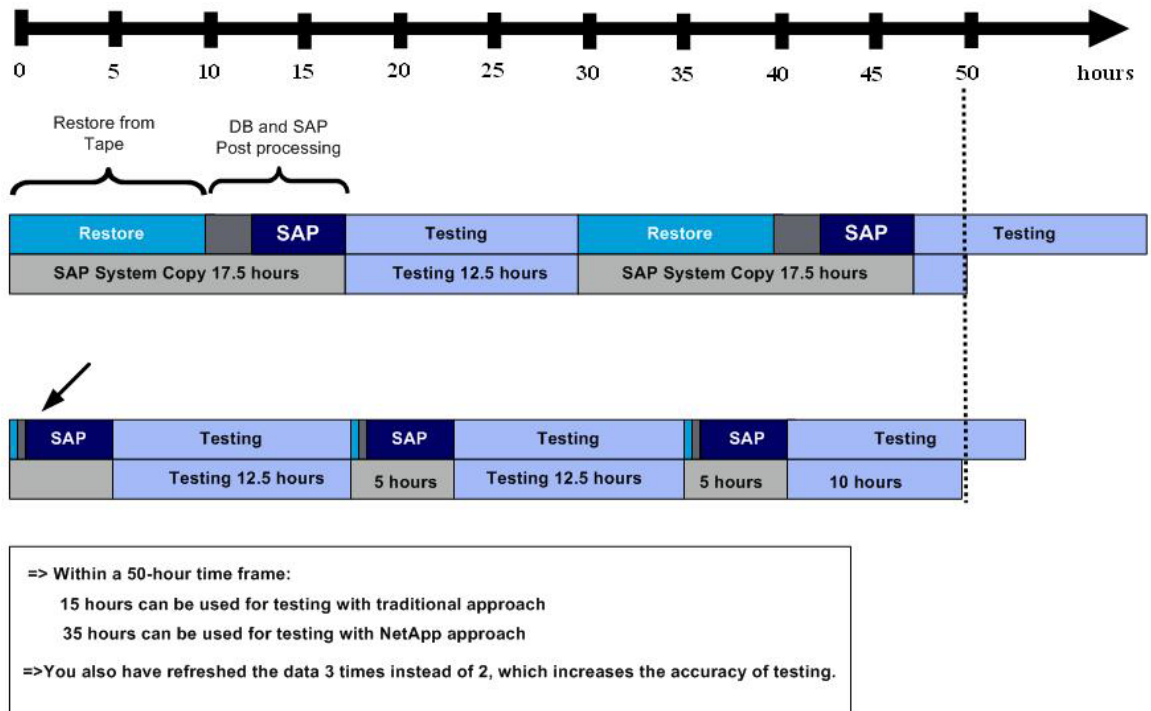
Figure 5) Comparison of test times using traditional and NetApp approaches for SAP system copies.

3 ACCELERATING TEST AND TRAINING CYCLES

When the amount of time required to perform system copies and database restores is reduced, the amount of time left to test is increased. As a result, more test cycles can be performed. By using the NetApp system copy process, it's also possible to create multiple test systems with the same data and to run parallel test processes in the same test system at the same time. Because the NetApp system copy requires a fraction of the time and storage of a traditional method, there is just minor impact to the infrastructure. Any problems encountered can be corrected quickly in the source system. Because the NetApp Snapshot copy process takes only a few seconds and does not affect the source system, a new source image for the test systems can be created quickly and easily. The parallel tests can then be rerun against the adjusted system. This process can be repeated until all tests are successful or until the testing period ends. The end result is that more and higher-quality test cycles can be performed in the same amount of time.

The same concepts also apply to training systems. Because of the ability to rapidly restore system backups from a NetApp Snapshot copy by using SnapRestore® or to create system copies by using FlexClone volumes, training system refreshes take only minutes. This allows more training courses to be run in a shorter period of time because it quickly restores the training system to its original state. Also, if a change is required in the training system, the change can be made and the training systems refreshed quickly. With NetApp FlexClone volumes, it's possible to eliminate the process of making time-consuming and storage-intensive client copies for training. Multiple training systems can be created from a single source system. Individuals can perform training on their own systems, using the same data for every user. This reduces the amount of time required to generate client-specific data for every user. It also requires less work to create training materials. Finally, the training systems can be refreshed in a few minutes from the master source system, and IT staff members are not required to work long nights and weekends to support training schedules.
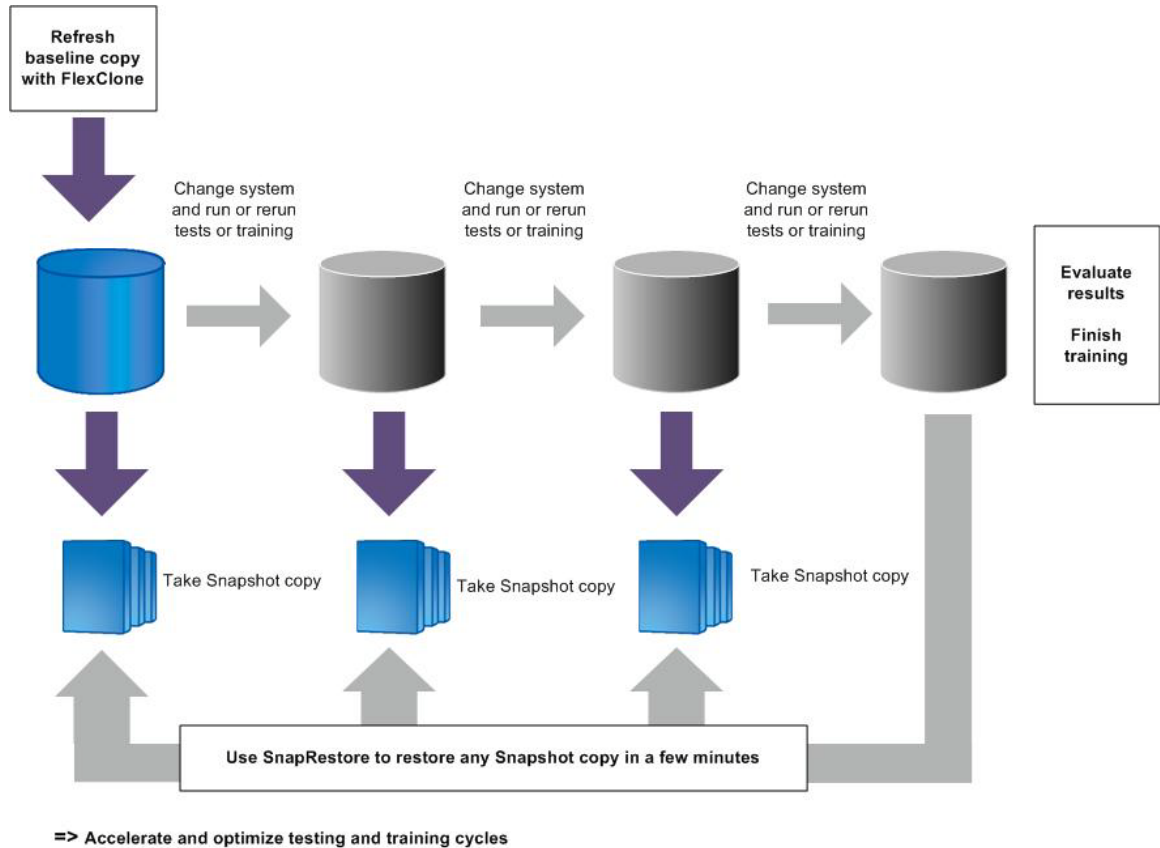
Figure 6) Accelerated test and training with NetApp SnapRestore and FlexClone.

4 INFRASTRUCTURE OPTIONS FOR DEVELOPMENT AND TEST SYSTEMS ON NETAPP

The key value to having development and test systems running on NetApp storage is the ability to create fast, efficient copies. In an environment in which the source system is also on NetApp storage, doing this is very straightforward. FlexClone copies can be created quickly and easily from a Snapshot copy of the data. However, when the source system resides on a storage platform other than NetApp, the challenge is getting the data to the NetApp storage system to be able to create those fast and efficient copies.

This section reviews a storage infrastructure completely from NetApp as well as several options that address the challenge of moving data from a different vendor to NetApp storage to leverage NetApp's development and test efficiencies.

4.1 NETAPP STORAGE INFRASTRUCTURE SOLUTIONS

The NetApp solution for SAP system cloning addresses these issues by providing a fully automated process to create an SAP system copy on demand, in a few minutes, and without any impact to the source system. In addition, NetApp cloning functionality enables storage to be managed very efficiently by storing only data changes between the parent and the clone.

4.1.1 SYSTEM COPY ON THE LOCAL STORAGE SYSTEM

SAP system copies are created by using the NetApp FlexClone feature. A FlexClone volume is a writable point-in-time image of a NetApp FlexVol® volume. A FlexClone volume is based on a Snapshot copy of the source FlexVol volume. It is created in a few seconds, without interrupting the operation on the source system. FlexClone volumes

store only changed blocks between the source FlexVol volume and the FlexClone volume, significantly decreasing the amount of disk space needed for SAP system copies.

On the source system, a database-consistent Snapshot copy of the data files is taken. This is done during online operation and has no performance impact on the source system. This step can therefore be carried out at any time.

On the target system, this Snapshot copy is the base for the FlexClone volume. The creation of the FlexClone volume takes only a few seconds. This volume is then connected at the target system. The subsequent steps at the target system are necessary to change the database and the SAP SID. In addition, SAP-specific postprocessing tasks must be accomplished.

All of these steps are fully automated and do not need any manual interaction. A SAP system copy can be accomplished in a few minutes by using the NetApp solution. Figure 7 is a high-level representation of this infrastructure.
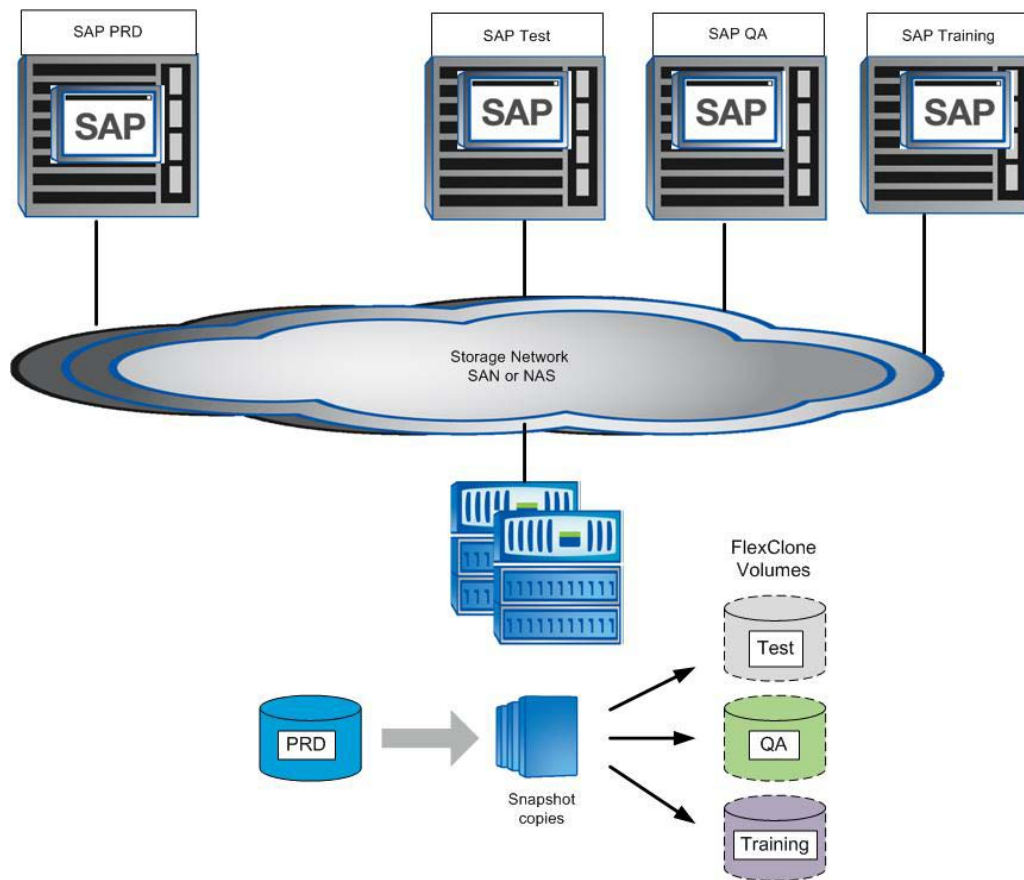

Figure 7) SAP system copies with NetApp infrastructure

4.1.2 SYSTEM COPIES ON A REMOTE STORAGE SYSTEM

System copies can also be created at a remote location by using NetApp storage. The source system data can be replicated to a secondary location by using NetApp SnapMirror® or SnapVault® software.

The source database is copied over a WAN or LAN connection to the NetApp storage system at the remote location. SnapVault and SnapMirror replicate the Snapshot copies of the database taken at the source location. These Snapshot copies become the basis for FlexClone copies of the SAP systems. The target systems become full read and write copies of the source system and can be used for development and test purposes. Figure 8 is a high-level representation of this infrastructure.
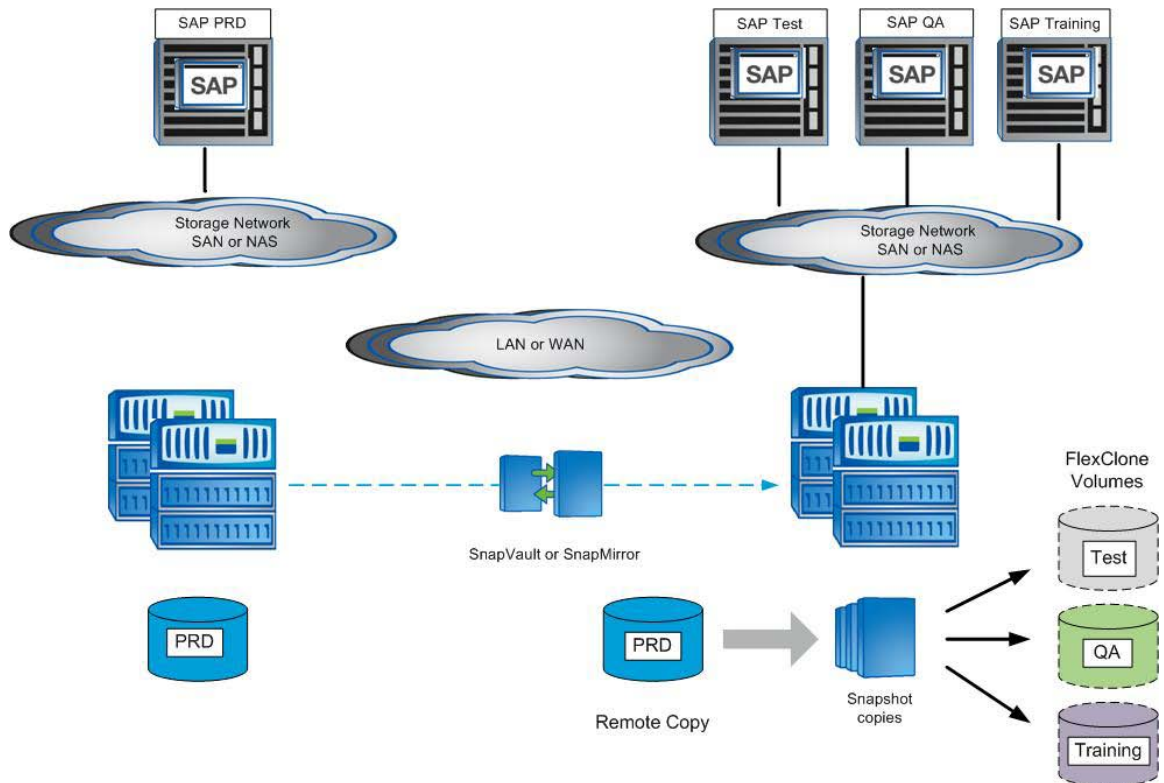

Figure 8) SAP system copy with NetApp infrastructure at a remote location.

4.2 SOLUTIONS FOR HETEROGENEOUS STORAGE INFRASTRUCTURE

If the source system runs on storage other than NetApp, the system data required for testing and development must be migrated before advantage can be taken of the unique system-copy capabilities of NetApp.

4.2.1 DATA MIGRATION

A variety of solutions can be used to migrate data in a heterogeneous storage environment. Some of these tools work at the server level and some are installed directly in the SAN infrastructure. After these tools are used to create a copy of a production database on the NetApp storage system, a copy of this database can be used to create development and test systems. First, the replication process must be suspended to allow the target volumes to become consistent. Then, a Snapshot copy can be taken of the NetApp storage that contains the replicated volumes. Once the Snapshot copy is created, the replication processes can be restarted and the replication continues. A FlexClone copy based on the Snapshot copy of the replicated volumes can then be created and mounted to a server. This entire process can be scripted for a consistent and repeatable process to create development and test systems in a matter of minutes, including changing the target database system identifier and performing postprocessing. Figure 9 is a high-level representation of this process.
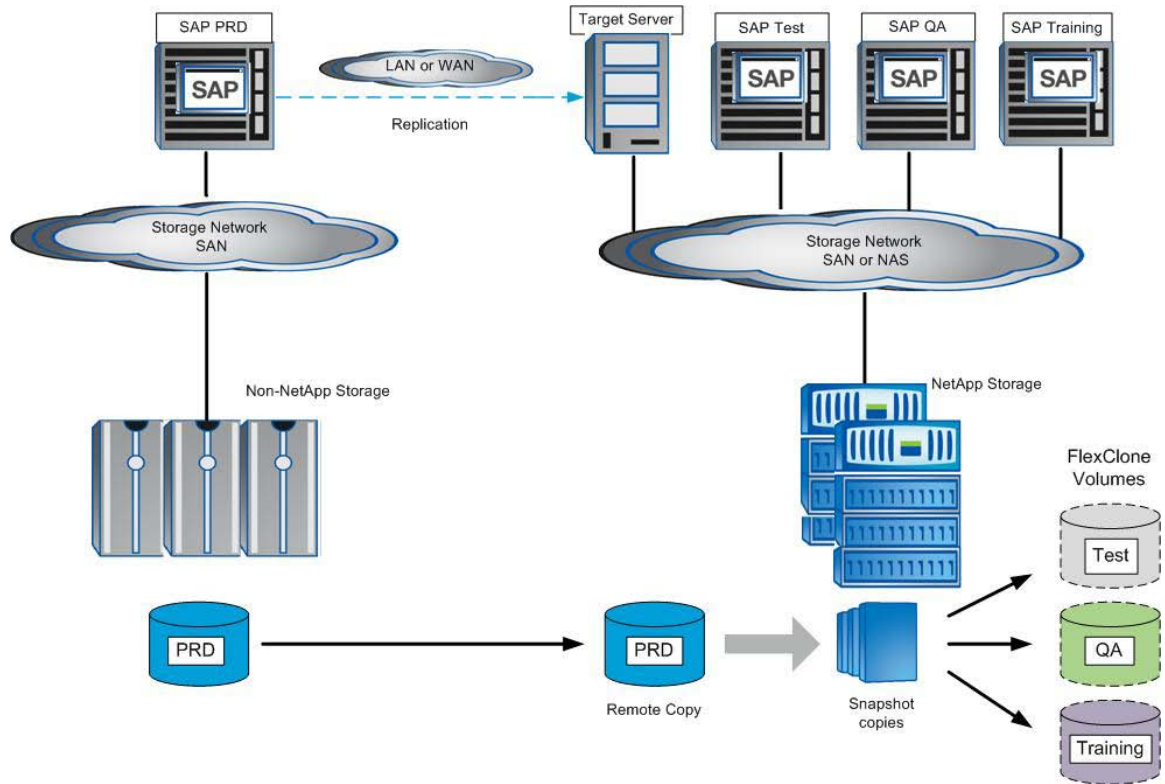
Figure 9) SAP system copy with data migration.

4.2.2   SAP SYSTEM COPIES WITH A STANDBY DATABASE

Another option for moving data between different vendors' storage systems is to create a standby copy of the source database on the NetApp storage. This can be done by using traditional tape backup and restore methods. Once the database is restored onto the NetApp storage, it can be started in standby mode and logs applied to keep it current.

The standby database is used as a source for system copies. This database must be shut down for a short time to create a Snapshot copy. These Snapshot copies are used as the basis for the FlexClone copies. System copies of any development system can be accomplished directly by using the NetApp system copy solution.

The method for moving logs between the source system and the target system can be database vendor specific or even scripts used to copy the logs from one location to another. In this case, the database on the target system is continuously kept up to date with current data from the source system. Figure 10 is a high-level representation of this solution.
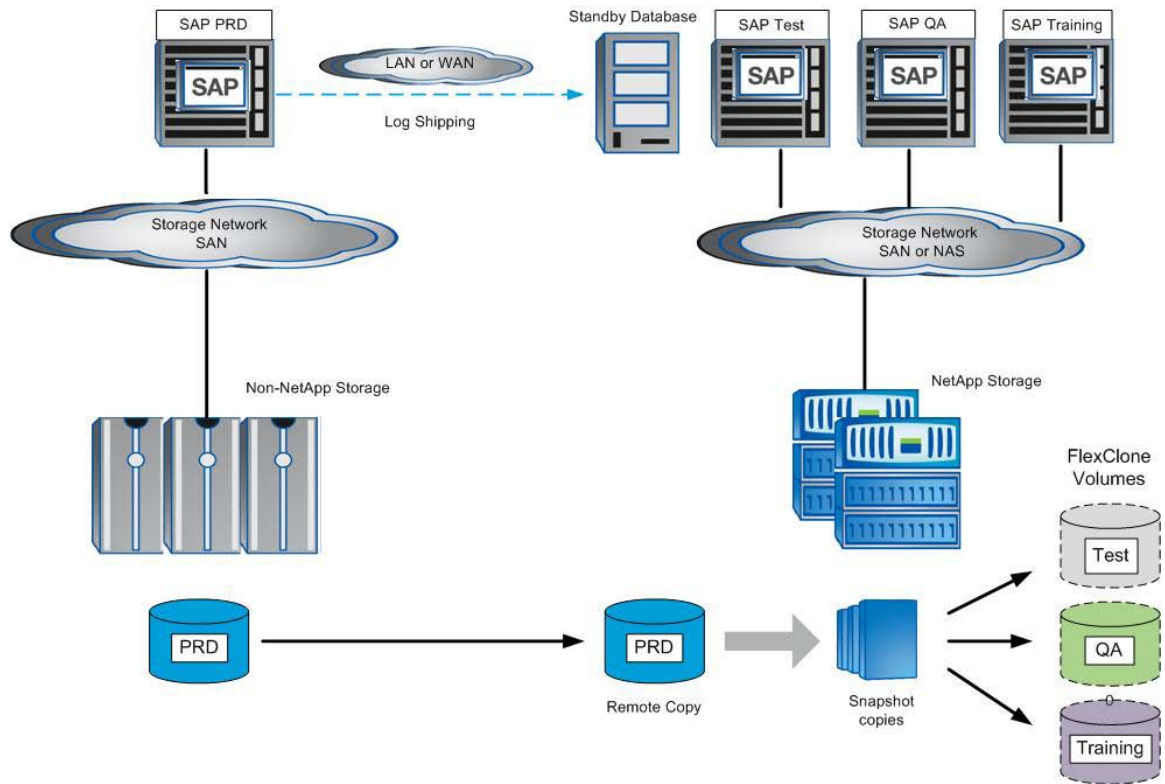
Figure 10) SAP system copy with data migration using log shipping.

5 NETAPP STORAGE IN AN SAP TEST DATA MIGRATION SERVER ENVIRONMENT

SAP customers are constantly looking for ways to simplify and streamline their IT operations. As databases supporting SAP applications grow in size, there is a desire to reduce the amount of data that is replicated in development and test environments. However, for proper testing to occur, a representative group of data must be present in the development and test systems. With the highly integrated nature of SAP modules, it's not possible to simply eliminate some tables and keep others. As a result, SAP has developed a solution called SAP Test Data Migration Server (TDMS), which extracts data from a source system, based on criteria set by the customer, and imports it into a test or development system. TDMS can significantly reduce the amount of data that is duplicated in SAP development and test systems.

5.1 NETAPP STORAGE AND TDMS

TDMS is a solution for migrating data from production environments to test environments. SAP has found that 10% to 20% of tables in an SAP system contain 80% to 90% of the data. As a result, the amount of data in a test system can be greatly reduced by setting parameters to migrate only a subset of the data in the production system. Customizing data and customer "Z" tables are migrated entirely. A limitation of the TDMS solution is the requirement that the source system be inactive while the TDMS processes are reading the data. If the system is active, data corruption at the target system is possible. NetApp storage works in conjunction with TDMS to allow data integrity without downtime at the production server. A clone of the production system can be created on the NetApp storage by using the FlexClone functionality. That system can then be used as the source for the TDMS processing. Because the FlexClone copy is created based on a Snapshot copy of the source production system, very little storage is used. Also, the clone can be deleted after the TDMS process is complete, eliminating the need for a complete copy of the production database to be maintained. Regular FlexClone copies can be created to make sure that the latest data from the production system is migrated to the test system by using the TDMS process.
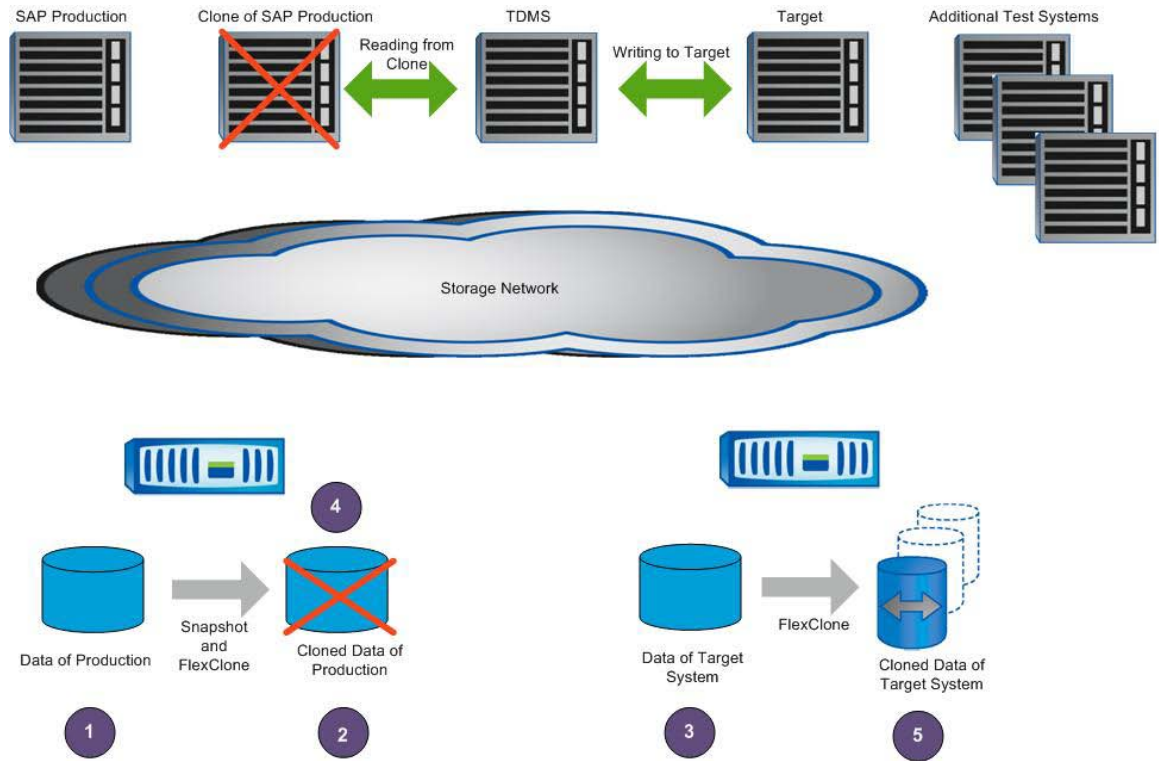
Figure 11) NetApp storage in an SAP TDMS environment.

Figure 11 illustrates the process of using NetApp storage in an SAP TDMS environment. Several steps are performed to allow the migration of data between the source production system and the target test systems. The steps in the figure correspond to the following activities:

1. A copy of the data in the production system is requested.

2. A clone of the production data is created by creating a FlexClone copy based on a Snapshot copy. There is no impact on the production system.

3. TDMS reads data from the FlexClone copy of the source system and writes to the target system.

4. The clone of the source system is no longer required and can be deleted.

5. Additional target systems can be created as FlexClone copies, so that the data in the target system is not changed and can be reused for multiple test cycles.

6 CONCLUSION

A key requirement for successfully managing an SAP environment is the ability to create copies of production data for use as test, development, training, and sandbox systems. NetApp Snapshot and FlexClone technologies allow the fast and efficient creation of SAP systems. The NetApp system copy solution significantly improves the process of creating SAP system copies by reducing the impact on the production system during the backup process. It also allows a complete system copy to be created in a few minutes, with 50–90% less storage required depending on the number of nonproduction instances used and the type of storage you have in production.

However, the NetApp system copy process can be used only when a copy of the source system resides on NetApp storage. When the source production system resides on storage other than NetApp, it is necessary to migrate a copy of that data to the NetApp storage system. There are several software and hardware solutions for performing this migration, including standby databases with log shipping.

If using TDMS to reduce the amount of data being copied, NetApp FlexClone copies allow the production system to remain active while the TDMS server extracts data. After the target system is loaded with the desired data, FlexClone

copies can be made of that system, allowing multiple parallel testing processes to be run and extending storage savings even further.

NetApp storage is the perfect solution for SAP development and test environments. NetApp storage enables customers to reduce their infrastructure costs by using less storage. It also simplifies administration and reduces risk by allowing more testing with high-quality data in a short period of time.

7 REFERENCES

DATA ONTAP 7G: FLEXVOL AND FLEXCLONE

TR-3348—Block Management with Data ONTAP 7G: FlexVol, FlexClone, and Space Guarantees

TR-3347—A Thorough Introduction to FlexClone Volumes

TUNING DATABASES AND OPERATING SYSTEM

TR-3373—Data ONTAP 7G—The Ideal Platform for Database Applications

TR-3411—Database Layout with Data ONTAP 7G

TR-3369—Network Appliance Best Practices for Oracle

TR-3408—AIX Performance with NFS, iSCSI, and FCP Using an Oracle Database on NetApp Storage

Oracle Development and Test Solution Brief

SAP ON NETAPP

Enterprise Application Development and Test

NetApp and SAP Partnership

TR-3533—SAP on UNIX/Oracle/FCP

TR-3540—SAP System Copy with NetApp Storage

TR-3520—SAP Backup and Recovery with NetApp Storage: UNIX/Oracle/FCP

TR-3444—SAP on Windows/Oracle

TR-3585—SAP on Windows/SQL Server Best Practices

TR-3586—SAP on Windows/SQL Server System Copy

TR-3682—SnapManager for SAP Best Practices

SAP

Global SAP Homepage

SAP Service Marketplace

SAP Developer Network

SAP Help Portal