SAP System Build and Landscape Management Activities

The Cisco Unified Computing System Advantage

White Paper
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1 What You Will Learn

This document describes how the Cisco Unified Computing System™ (UCS) can be used in conjunction with EMC storage to implement SAP Solutions in a way that helps ease overall administration effort and achieve some of the qualitative benefits relating to the availability of the SAP applications. UCS platform with EMC storage can offer significant benefits to customers with diverse SAP implementations to better manage their landscapes by enabling certain practices that simplify the often cumbersome, critical change management activities.

The Cisco Unified Computing System provides the compute, network, and storage access components, deployed as a single cohesive system. The result is an implementation that addresses many of the challenges that SAP Basis administrators and their IT departments face today, including needs for a simplified deployment and operation model, high performance for SAP systems, and lower total cost of ownership (TCO). The document introduces the Cisco Unified Computing System and provides instructions for implementing it; it concludes with an analysis of reliability characteristics. This document will not show SAP performance numbers or sizing suggestions.

This document is written for developers, technical consultants and solution architects. Readers are expected to have administrator level SAP knowledge and a basic knowledge of Windows, storage fundamentals, EMC CLARiiON and Navisphere Manager GUI.

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2 Introduction

Maintenance activities in any application's system landscape in general and SAP in particular involve mandatory version/release upgrades and patch updates on a regular basis. This is to accommodate for all the bug fixes to the constituent software components, add new enhancements relating to features & functionalities and to secure urgent minor code corrections. Such activities directly impact the code and hence are of the severity type 'major'. These downtime inducing activities could be scheduled and performed during a window that would cause minimal to negligible impact on business. The most critical aspect is to ensure a fallback strategy is in place to ensure the system can at any point be restored to its functional state, just before the change was applied. This establishes business continuity during a no-go situation for the change implementation, in shortest possible timeframe. There are other scenarios like system refresh to prepare QA systems, mass deployment of training and demo systems and finally those that demand hardware high availability.

This white paper brings out the advantages that Cisco UCS together with EMC storage can bring into these many perspectives of SAP system landscape management. It also details the procedures and best practices followed while performing these activities.

3 SAP Landscape Management

Challenges

Change management activities in a SAP Landscape like version upgrades, support packages update and SAP Notes implementation are performed on a regular basis to take care of error corrections and that new functionalities provided as part of new release are incorporated.

Be it SAP upgrade or SAP support package implementation, the changes are irreversible. The fact that there are certain risks involved during these change implementations and that it might result in an inconsistent state, calls for a fallback strategy that would ensure the restoration of the system to a point just before the change initiation.

Factors listed below are crucial from the system administration/support standpoint, in such scenarios and have a bearing on the underlying infrastructure platform.

- Simplicity and ease of performing preparation tasks
- Quick, error free restoration of system, in case the changes were to render the system unusable
- Time and effort to perform post-restore follow-up activities that bring up the system to the consistent functional pre-implementation state.

As a preparation for 'major' change implementations, we perform a set of tasks centered on retaining a consistent functional copy of the system. Regular system backups at predetermined intervals actually serve the same purpose, since they would be the last resort if we were not to accept the changes injected into the system and also have problems undoing them.

As an extension to this aspect, we could consider scenarios of certain emergency change requirements like system restoration due to server/hardware crash. During such cases, making available all those critical storage / file-systems that hold the application data becomes crucial.

SAP Upgrades and Support Package Implementation

It has been a standard practice to perform a full database backup with logs, online or offline depending on the affordability of a short scheduled downtime. Full file-system backups are also performed based on the need. The runtimes of these backups depends on many factors like size of the database, throughput of the backup network and the backup device, ranging from as low as an hour to eight hours.

For systems demanding higher uptimes, there has been process of having redundant database file-systems in place which are synchronized just before the start of activity and mounted as contingency file-systems. In the event of Upgrades / Support package update running into issues or not being able to finish the activity within agreed timelines, no-go could be declared and the actual & contingency file-systems could be switched and system started without much delays. This approach provides a quicker alternative than the standard backup-restore method but with a trade-off in storage space utilization. However, the task of managing the storage access- security tasks w.r.t server and mount-unmount of file-systems should be executed with utmost caution since there are risks of running into data corruption and access issues.

System Failover – Hardware/Server Crash Issues

It is becoming a best practice these days that virtualization techniques are being incorporated into the initial system build phases. This allows better managing the systems and also leveraging newer application management tools like Adaptive Computing Controller (ACC) which are available for SAP users on the SAP Service MarketPlace. Virtualization techniques help achieve hardware dependency and make installations hardware agnostic.

Complete system restoration in case of hardware crash has to account for all the aspects like new server hardware preparation, networking configuration and storage file-systems switchover. The crux of this overall movement of system components and making it work is in the access and security re-configuration on the new target hardware w.r.t OS, SAP application and database users & groups.

The high level tasks that are performed during such instances are as listed below:

Pre-checks and preparation:

- Remove the failed hardware out of the network.
- License Key for the SAP system:
    - Maintain New System Data for the system
    - Request new SAP License for system using hardware ID of new server
- Maintain inventory of existing file-systems on source server that need to be moved to the target server and their permissions
- Maintain details of the environment variables of all SAP/DB users at OS level.

Tasks to be performed on new target server:

- Prepare users, their home directory and environment variables.
- Create mount points for file-systems to be moved from source server
- Set ownership on new mount points
- Set permissions on new mount points
- Mount file-systems from source server to target server
- Verify /etc/fstab entries
- Verify the permissions on files and directories
- Set virtual host name resolution for users <sid>adm and sqd<sid>
- Bind virtual IP of Source system on target server
- Add virtual hostname and IP address to /etc/hosts
- Modify /etc/services file, if necessary
- Start database and SAP (in that order). Check for database connectivity and then SAP system availability. Run sanity checks to verify successful failover.

System Builds and Deployment

Certain businesses call for periodic refresh of Production system data into Quality for test purposes. The is performed to make sure more accurate test data is made available in the quality assurance system for the developers and customizing consultants to test their ongoing developments and rollouts. Technically, this would involve a system copy procedure followed by a SAP SID change.

Training needs and demo requirements would call for mass deployment of systems for end-user education purposes. The same may have to be re-deployed for the subsequent use, every time. Since such deployments happen in isolated networks, there may not be any requirement for SAP SID change post the system copy.

4 Conventional approach

Certain old implementations in rack servers including those on obsolete tower servers employed localized installation of SAP systems in terms of disks used for hosting the application and data. The system restoration involved the native database backup-restore with very less scope for switch to another server in case of hardware failure. The restoration tasks tend to be manual and time consuming, in such cases.

For implementations in conventional blade systems, though the very architecture provides the switchover capabilities, adapting a virtual hostname/IP installation method further enhances mobility of applications across blades. As a preparation for SAP Upgrades or Support Package update the standard database backups or depending on the need of higher uptimes, setting up of contingency file-systems (replica having current consistent state snapshot of the database) could be performed. The restoration from a valid backup is comparatively quicker in this case since the storage from which the file-systems have been derived happen to be SAN in most of the cases.

In case of restoration into a new blade in case of hardware failure, manual steps to be performed depends on the degree of virtualization that had been built into the installation like whether OS was installed on the local drive of blade or was SAN bootable, where exactly the application & database files resided and the like.

The steps related to OS preparation, networking configuration and storage switchover have to be performed manually by server admin, network admin and SAN admin respectively in order to make sure new server personalities are affected and applications resume operations now on new server.

In cases needing rapid mass deployment of SAP systems, homogenous DB copies across systems with pre-installed OS and SAP default installation is performed. This however, would depend on factors like network bandwidth and size of the database.

5 The Cisco UCS Advantage

The Cisco Unified Computing System is a next-generation data center platform that unites computing, networking, storage access and virtualization into a single unit. It's a step above the traditional blade server infrastructure that needs each blade to have its own dedicated management module to gain access to chassis' environment and to remotely manage the same.

UCS system comes with its own device management tool, Cisco UCS Manager that provides single point of administration for the entire system.

Also, UCS brings in the concept of statelessness which makes the personality settings of one sever to be applied to another automatically at failover. It makes use of *Service Profiles'* which capture the configuration settings for servers and LAN / SAN network access they require and all those low-level device configuration tasks that are needed to have the system up and running. Service Profile, in turn has a link to the storage parameters like host, storage group for the server in question.

With UCS, the preparation for SAP Upgrades and Support Package update gets reduced to creating a mirror copy or snapshot at the storage level and using this information while creating a service profile. This clone can be used as a fallback productive copy in case, the Upgrade/SP update was to fail. It would then just be a matter of switching the service profiles for that blade in question to have the system functional again.

Also, the disaster recovery in case of server hardware crash is also reduced to task of associating the service profile to a new blade. With this the entire set of components, end-to-end in configured automatically without any further follow-up tasks or post processing.

The service profile association with storage parameters could be leveraged for rapid system deployments. Clones of the LUNs belonging to the system in question could be created. The same could be mapped to service profiles which in turn could be associated to different server hardware and booted independently. SAP system build post processing tasks could be performing the native SAP tools (SAPINST) or custom build tools like Tidal Software's Intelligent Automation for SAP.

6 Comparative Study and Benefits Summary

Conventional Approach Towards Risk Mitigation

- Perform system backups, preferably offline (that would induce additional downtime) after every crucial change application
- Backup on a standby, so as to be able to restore system to previous consistent state, if needed
- Perform install and system copies to set up new systems

Enabling with Cisco UCS and EMC CLARiiON

- Perform snapview snapshot / clone, as required at the SAN level
- Map the snapshot / clones to the Service Profile.
- Associate Service profiles to server; boot server

Conventional Approach	Cisco – EMC Way
• System backup and restore are time consuming • Could also involve lot of manual intervention. • Prone to errors and always run risk of restoration issues. • Dependent on number of factors like system size, backup server processing capabilities and backup network bandwidth. • High administrative effort	• Snapshot creation at a click; clone config comparatively quicker • Minimal manual intervention • Robust procedure and error free copy / restoration. • SAN level procedures and are hence with minimal dependencies. • Minimal administration effort.

Cisco UCS with EMC storage provides comprehensive set of tools to perform system preparation, movement and cloning in a simplified and time saving fashion that help address the challenges discussed earlier w.r.t SAP system landscape management.

Service Profiles of UCS and host/storage group parameters on the storage system are uniquely associated that enables usage of *SnapView Snapshots and Clones* addin to configure identical

configuration systems, contingency systems and system clones that could work as training and demo systems in a customer landscape.

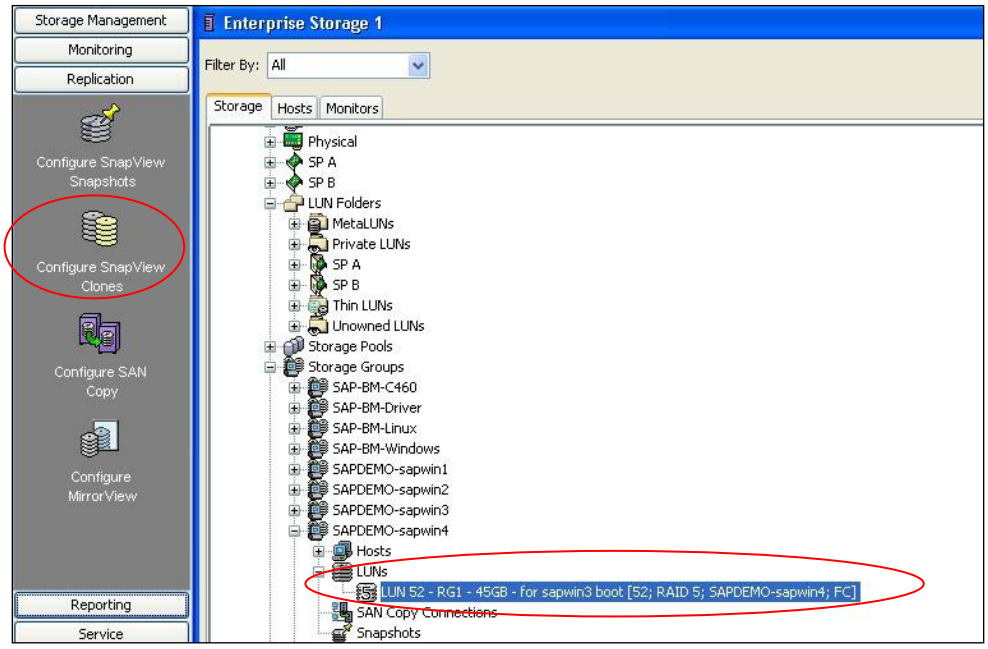
Cloning Procedure for System Preparation

EMC provides “SnapView Clones” snap-in as part of the Navisphere Manager GUI which is used for creating clones.

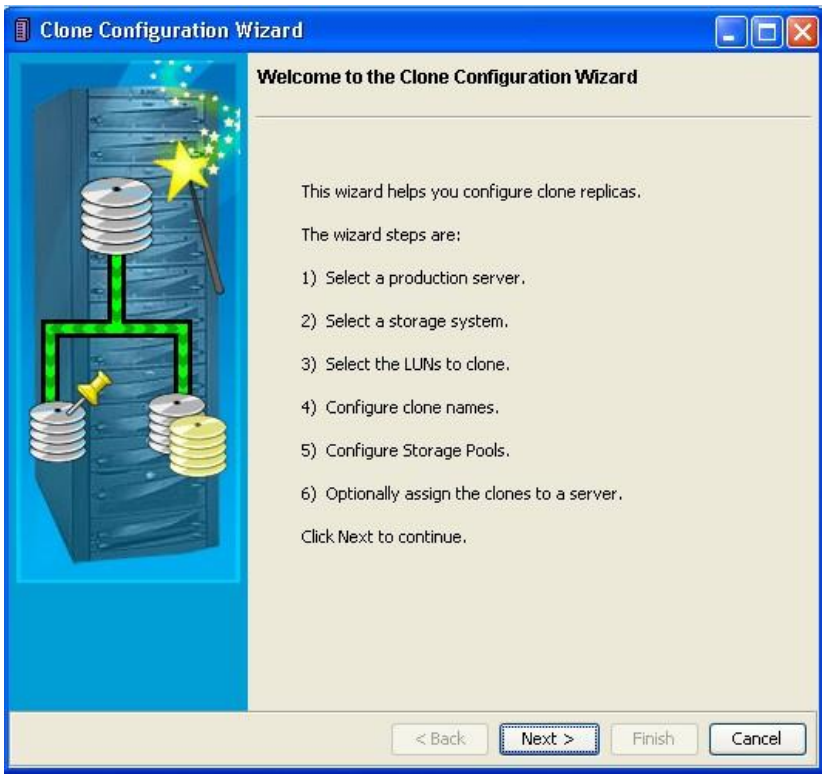
System clone are prepared by performing separate clones of associated LUNs and attaching them into the target host and storage group which are in turn associated service profiles of UCS. Associating these service profiles to new server hardware prepares the clones. These clones could be configured to boot in separate VLANs to avoid IP/host/SID conflict in production network.

The following screenshots provide an example scenario of cloning a Windows server for use on different hardware.

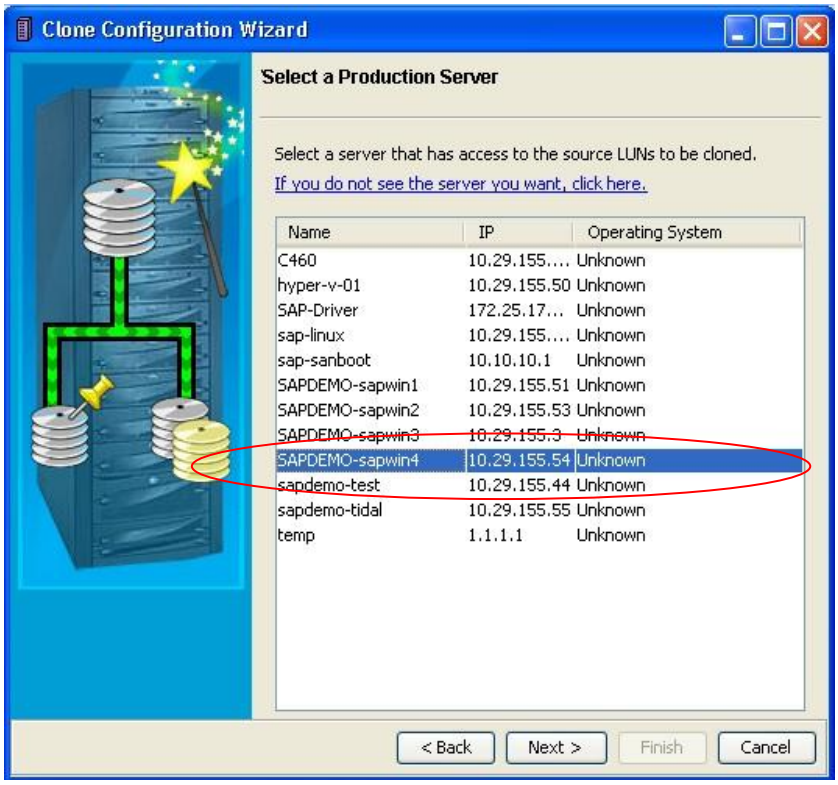
1. Navigate to the Navisphere GUI to the storage group.
2. Select the LUN.
3. Launch the wizard “Configure SnapView Clones” under the Replication tab on the left pane.

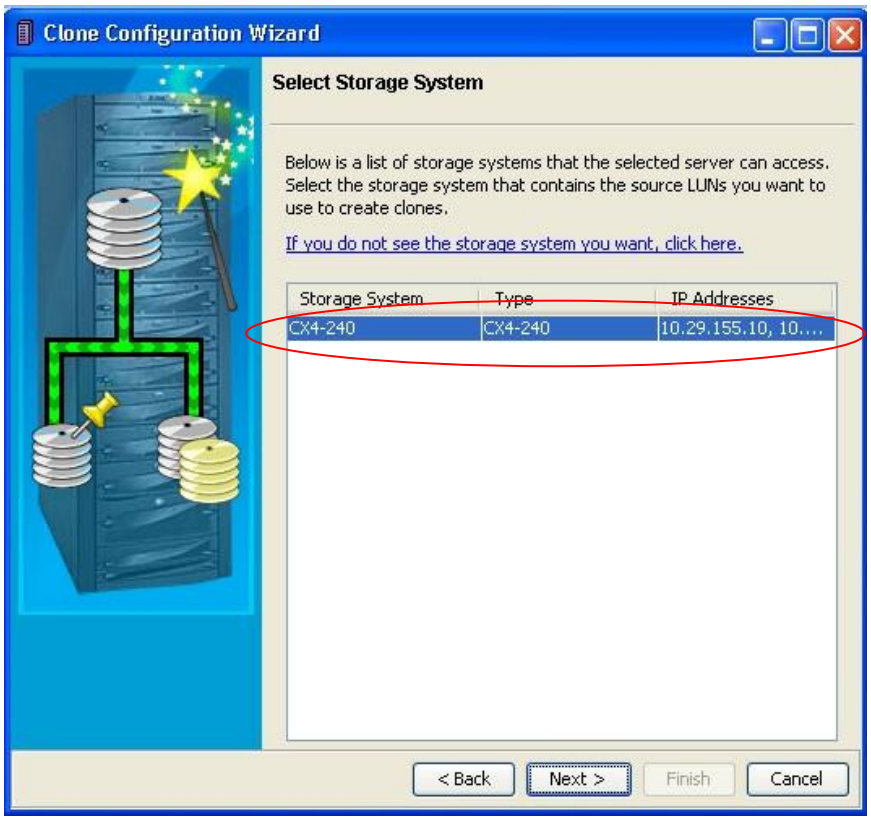


The example scenario shown above has the LUN52 which is a clone and boot LUN of the host sapwin4.

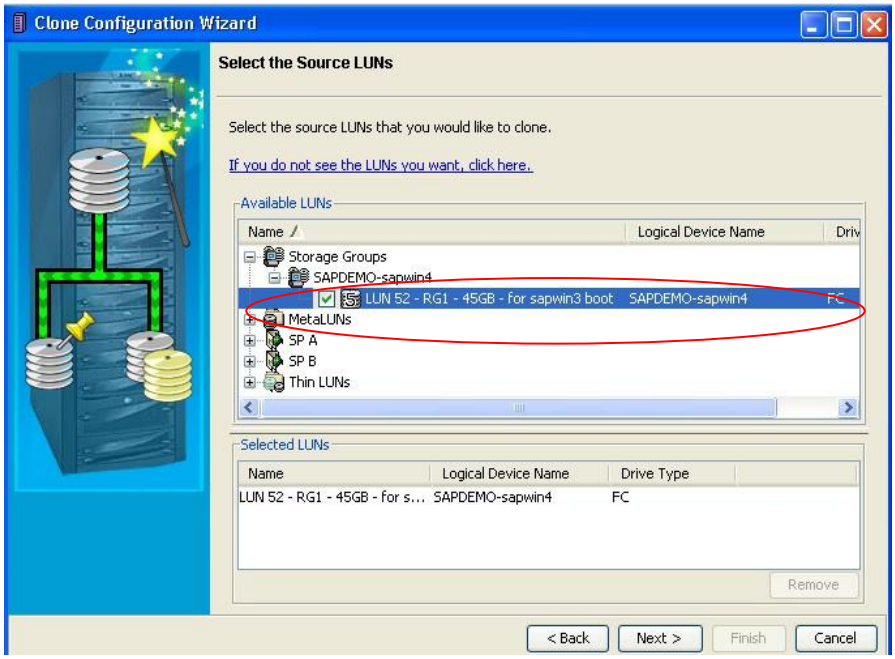


4. Select the server/storage group from the list followed by the storage system.

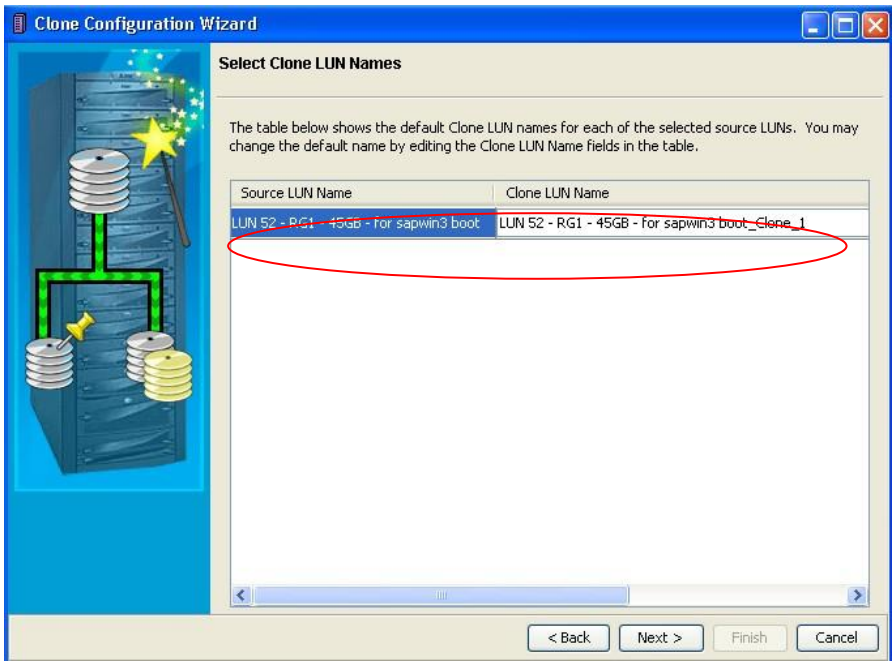




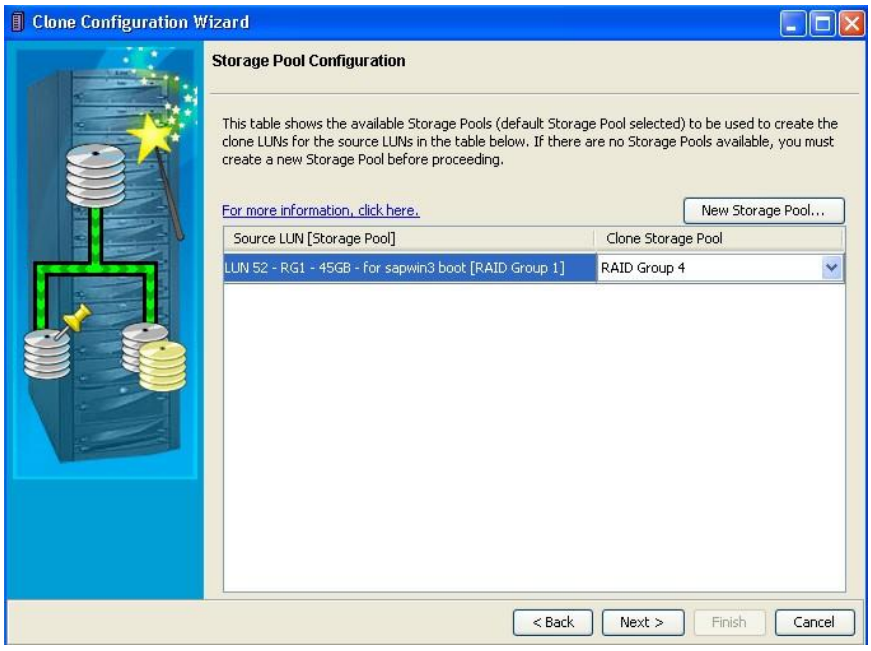
5. Select the LUN under the storage group.



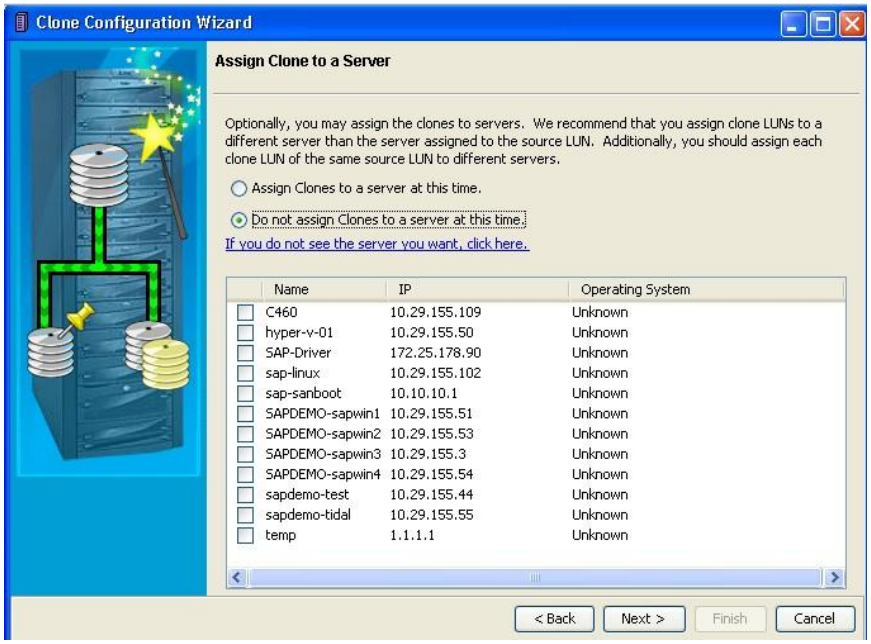
6.



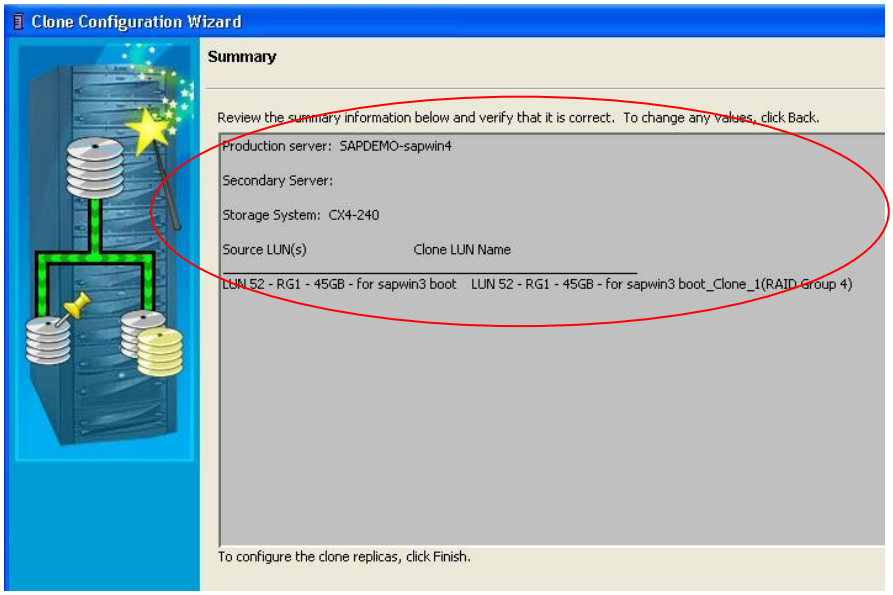
7. Choose the RAID group for clone LUN.



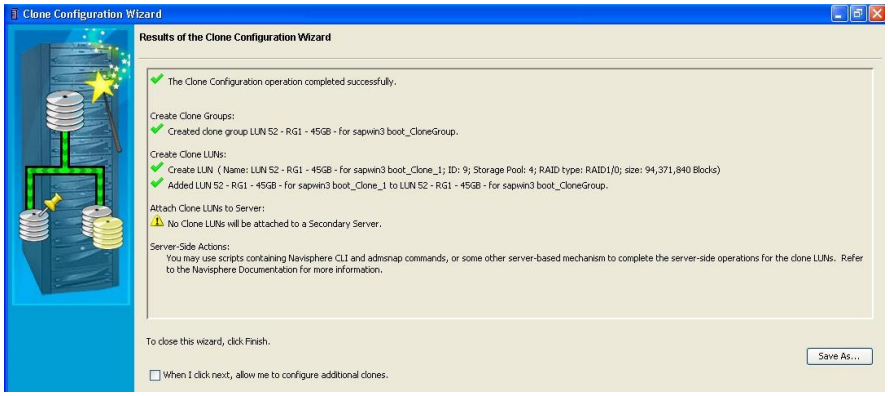
Note: You have an option to map the clone to a storage group or to perform the same at a later point in time.



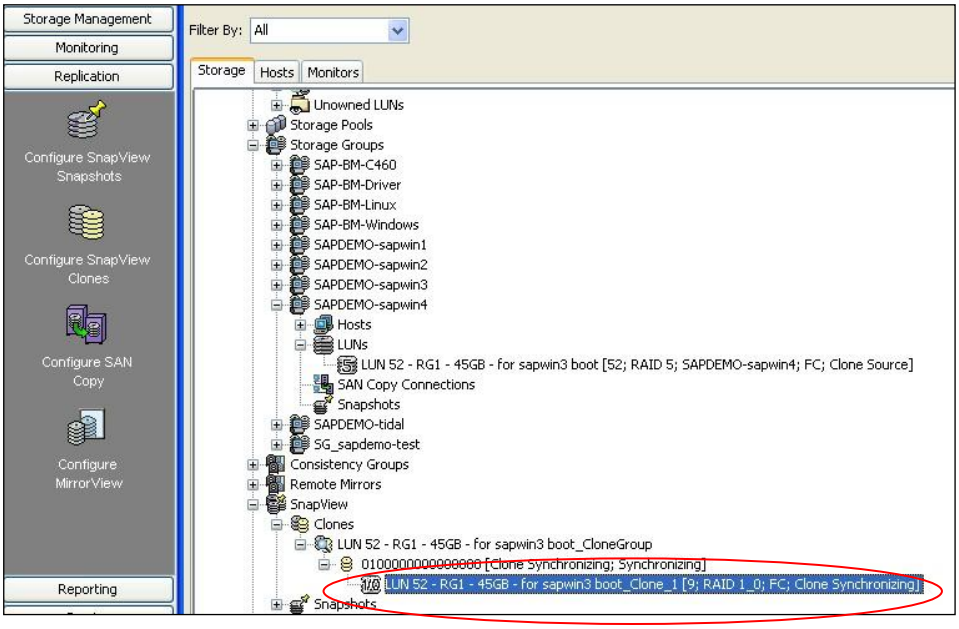
8. This step marks the end of inputs collection for clone creation.



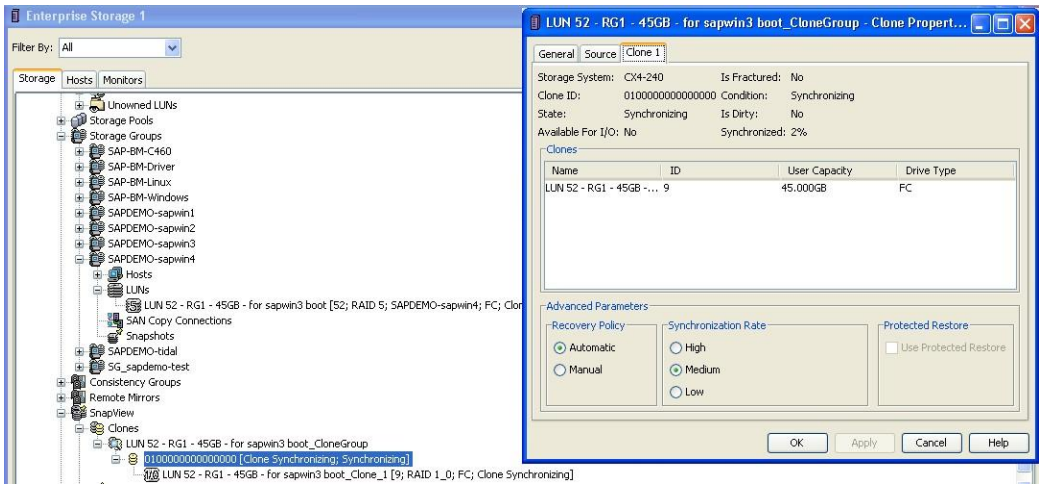
9. Clone creation wizard lists the activities performed and their results.

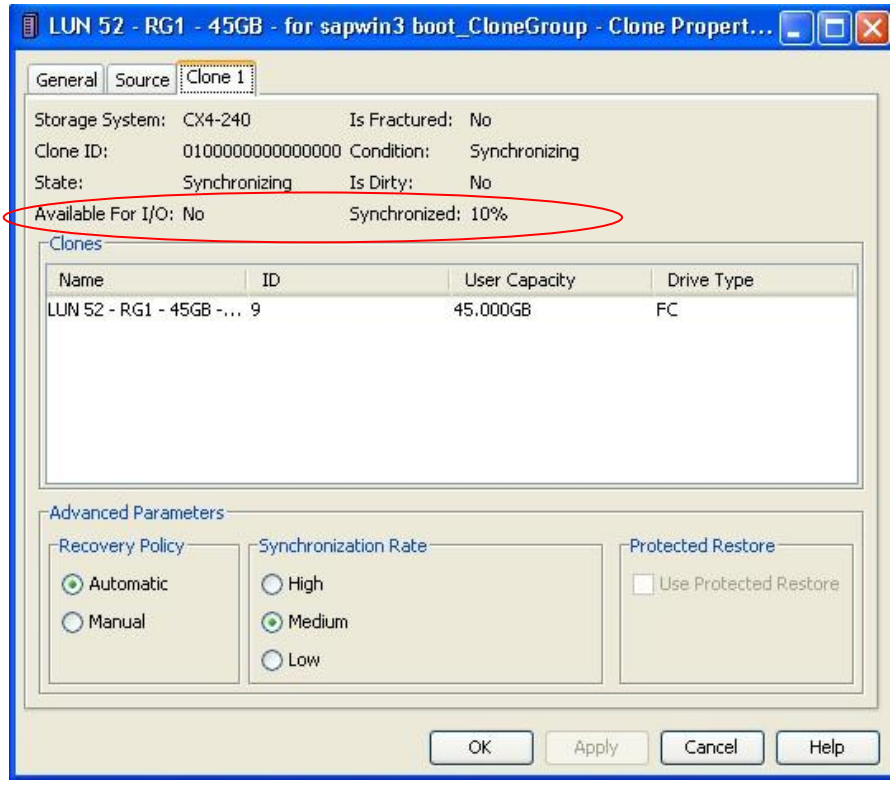


10. Clone creation is initiated and the clone is not part of a new clone-group.

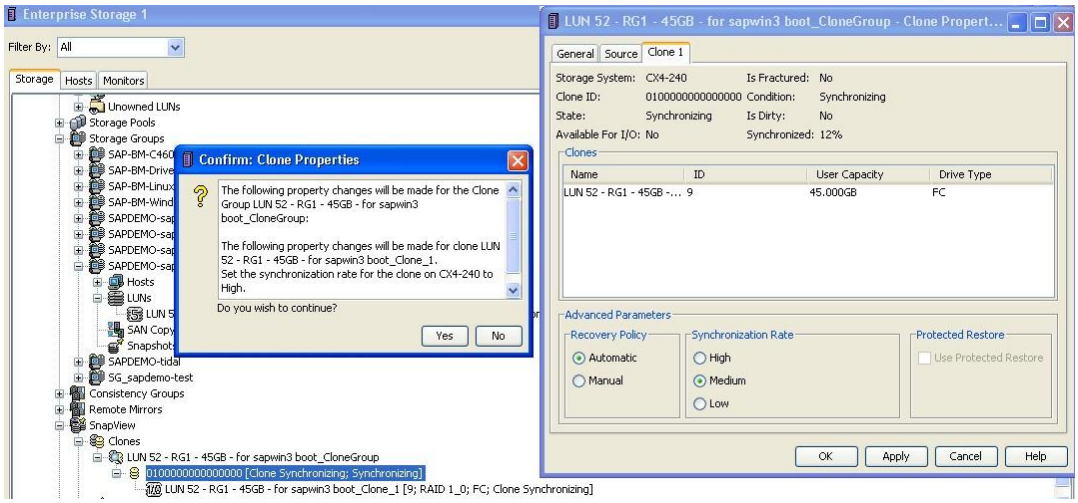


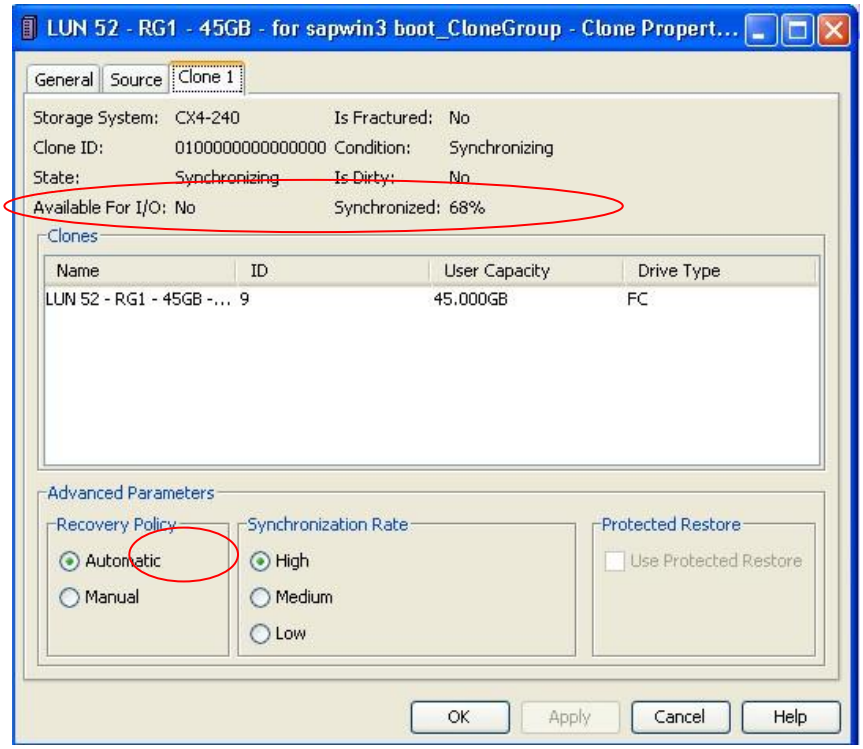
Next is the synchronization process which data on the new clone LUN is synchronized with the source LUN. The process takes several minutes.

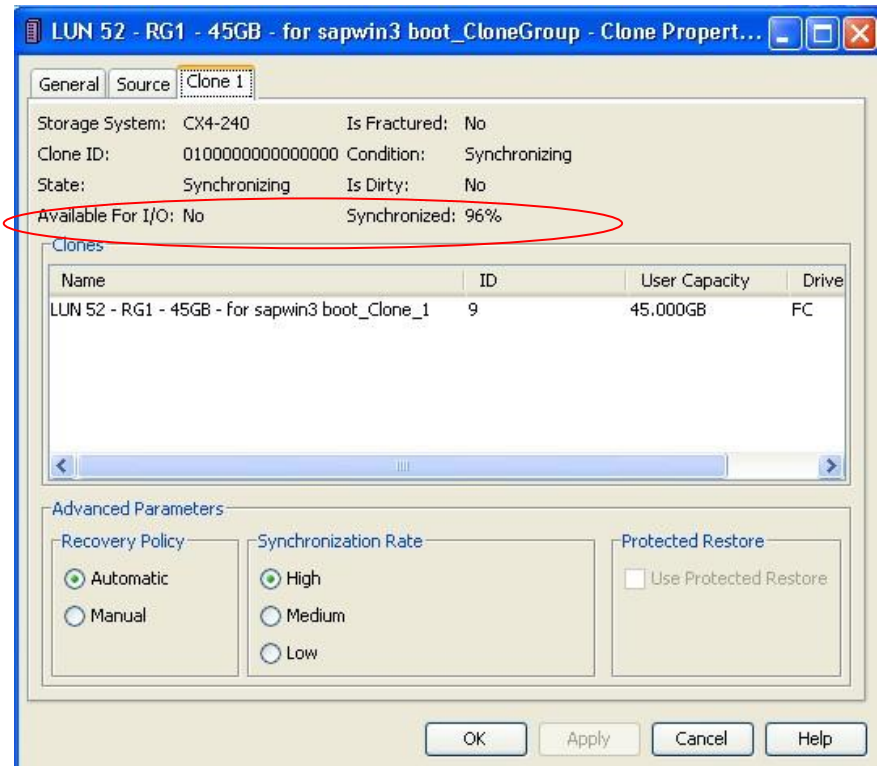




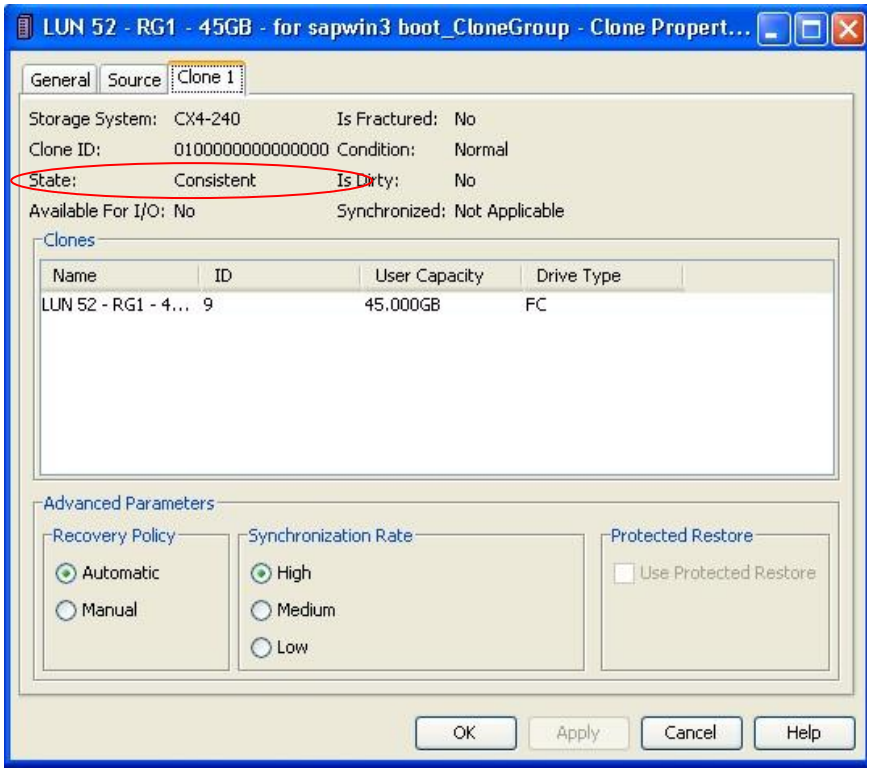
11. Choose the “High” synchronization rate to speed-up the synchronization process.

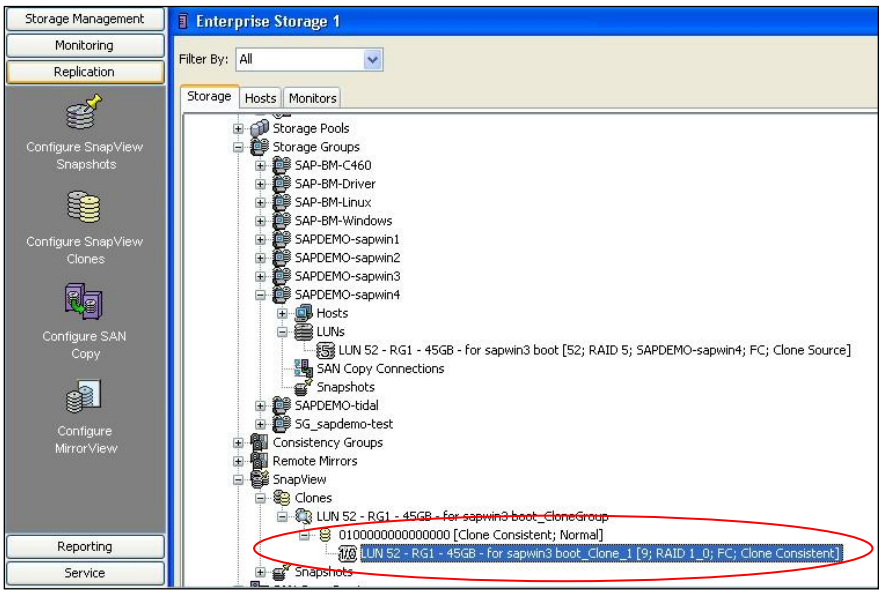

Enterprise Storage 1
Filter By: All
Storage
Hosts
Monitors
Unowned LUNs
Storage Pools
Storage Groups
Confirm: Clone Properties
The following property changes will be made for the Clone Group LUN 52 - RG1 - 45GB - for sapwin3 boot_CloneGroup:
The following property changes will be made for clone LUN 52 - RG1 - 45GB - for sapwin3 boot_Clone_1.
Set the synchronization rate for the clone on CX4-240 to High.
Do you wish to continue?
Yes
No
Consistency Groups
Remote Mirrors
SnapView
Clones
LUN 52 - RG1 - 45GB - for sapwin3 boot_CloneGroup
LUN 52 - RG1 - 45GB - for sapwin3 boot_Clone_1 [9; RAID 1_0; FC; Clone Synchronizing]
LUN 52 - RG1 - 45GB - for sapwin3 boot_CloneGroup - Clone Propert...
General
Source
Clone 1
Storage System: CX4-240
Is Fractured: No
Clone ID: 0100000000000000
Condition: Synchronizing
State: Synchronizing
Is Dirty: No
Available For I/O: No
Synchronized: 12%
Clones
Name
ID
User Capacity
Drive Type
LUN 52 - RG1 - 45GB -... 9
45.000GB
FC
Advanced Parameters
Recovery Policy
Automatic
Manual
Synchronization Rate
High
Medium
Low
Protected Restore
Use Protected Restore
OK
Apply
Cancel
Help


LUN 52 - RG1 - 45GB - for sapwin3 boot_CloneGroup - Clone Propert...
General
Source
Clone 1
Storage System: CX4-240
Is Fractured: No
Clone ID: 0100000000000000
Condition: Synchronizing
State: Synchronizing
Is Dirty: No
Available For I/O: No
Synchronized: 68%
Clones
Name
ID
User Capacity
Drive Type
LUN 52 - RG1 - 45GB -... 9
45.000GB
FC
Advanced Parameters
Recovery Policy
Automatic
Manual
Synchronization Rate
High
Medium
Low
Protected Restore
Use Protected Restore
OK
Apply
Cancel
Help

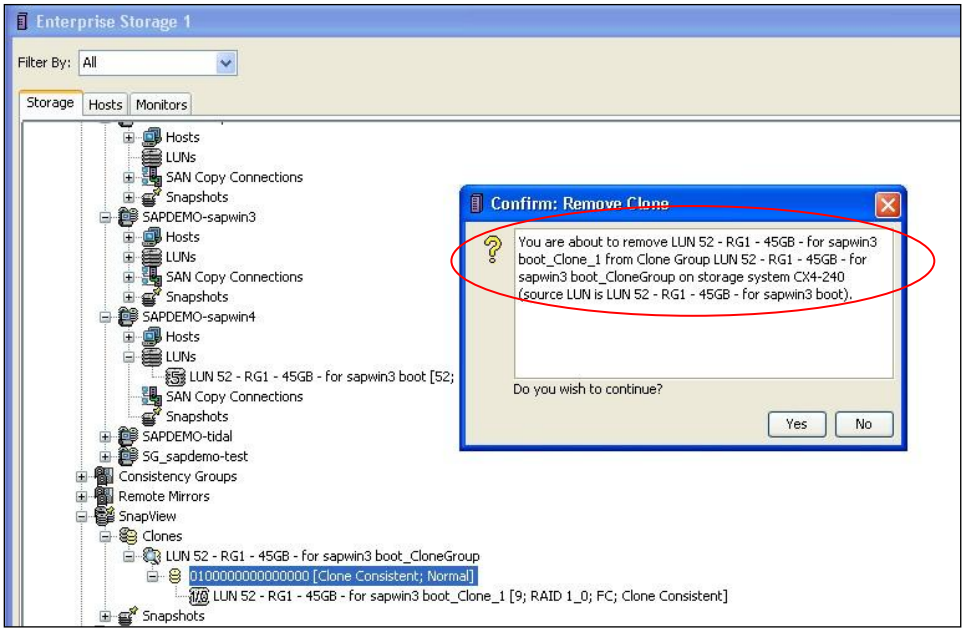


The result is a “Consistent” clone.

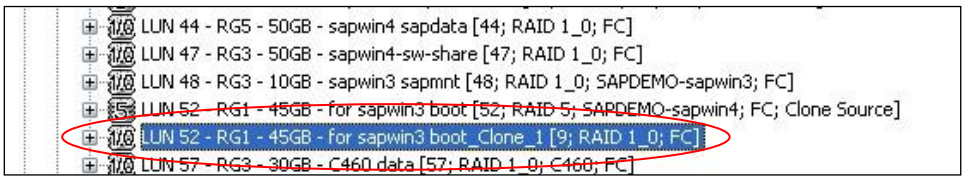


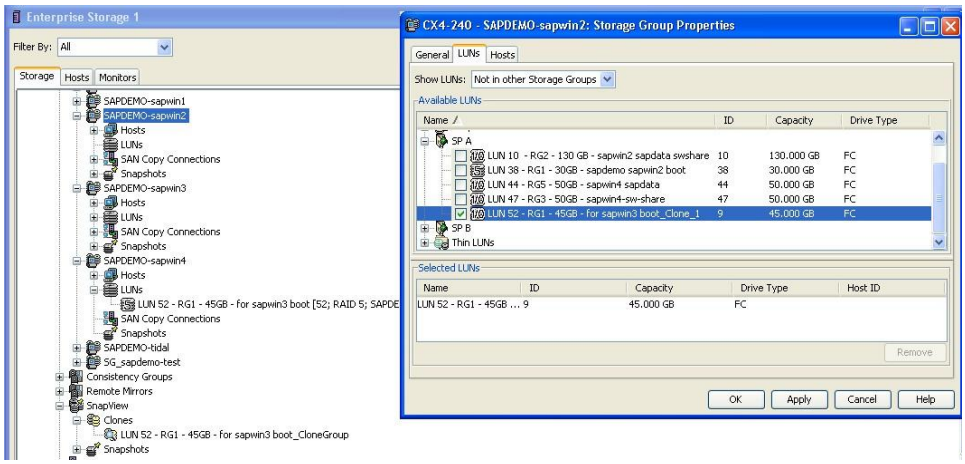


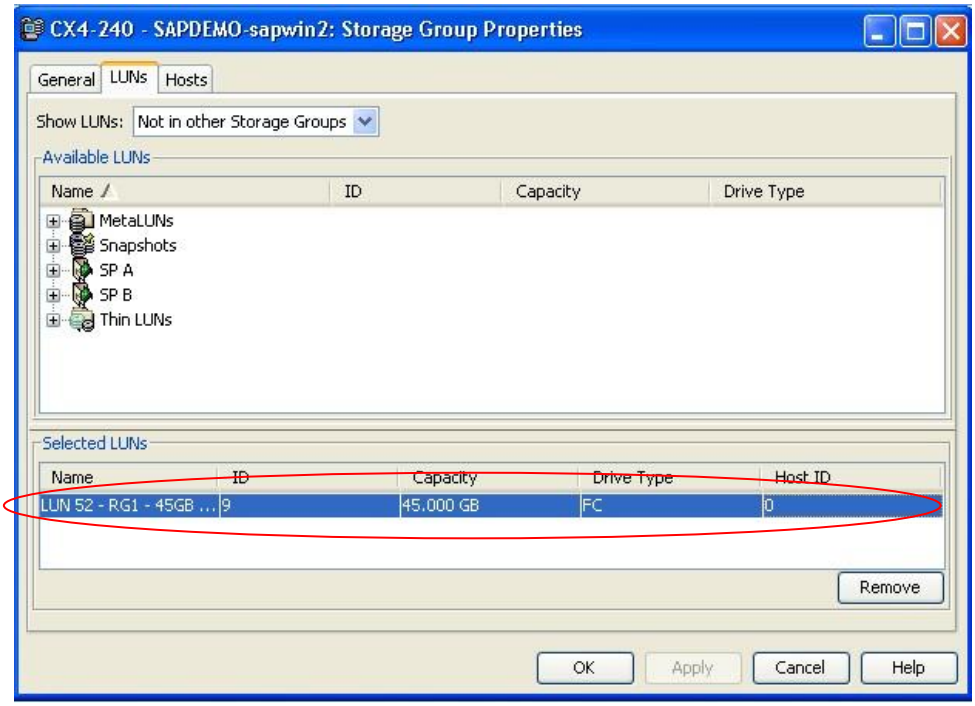
You could have this clone LUN administratively fractured or removed from the clone group to be able to independently deploy as the boot LUN, now on a different hardware. The screenshot below shows the removal steps.

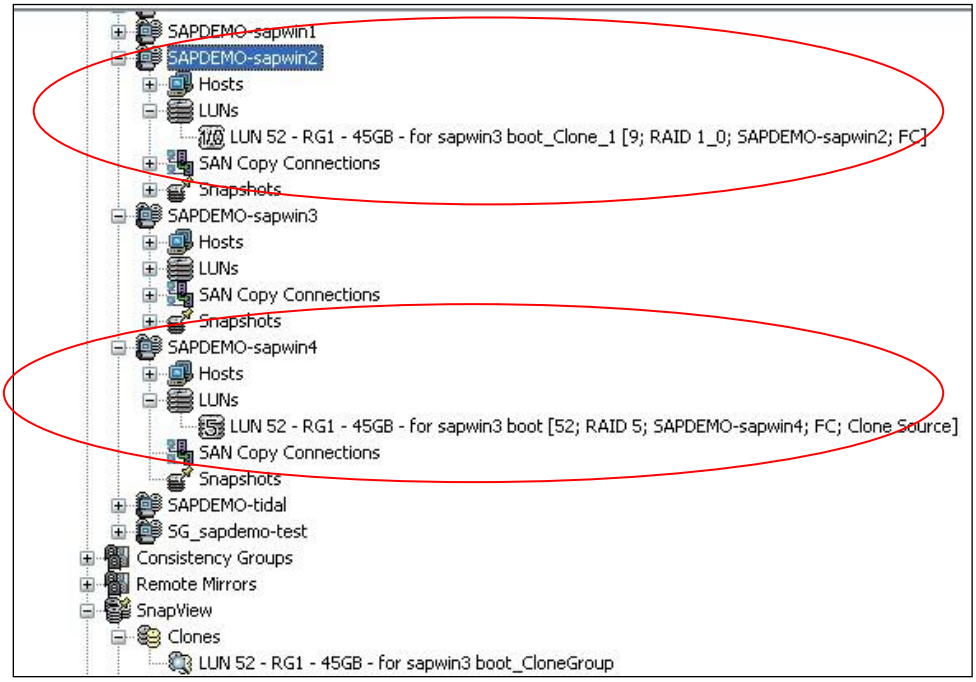


The example scenario has a different host sapwin2, to which the clone LUN would be mapped for test purposes. Since there are no LUNs which already part of sapwin2 , the clone LUN gets allocated with a Host ID 0.

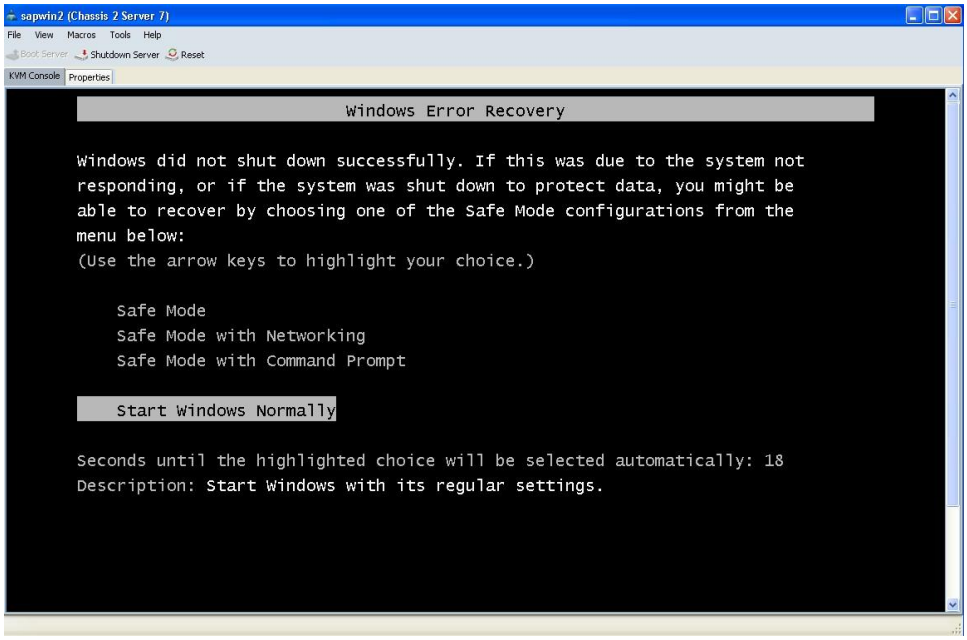

LUN 44 - RG5 - 50GB - sapwin4 sapdata [44; RAID 1_0; FC]
LUN 47 - RG3 - 50GB - sapwin4-sw-share [47; RAID 1_0; FC]
LUN 48 - RG3 - 10GB - sapwin3 sapmnt [48; RAID 1_0; SAPDEMO-sapwin3; FC]
LUN 52 - RG1 - 45GB - for sapwin3 boot [52; RAID 5; SAPDEMO-sapwin4; FC; Clone Source]
LUN 52 - RG1 - 45GB - for sapwin3 boot_Clone_1 [9; RAID 1_0; FC]
LUN 57 - RG3 - 30GB - C460 data [57; RAID 1_0; C460; FC]

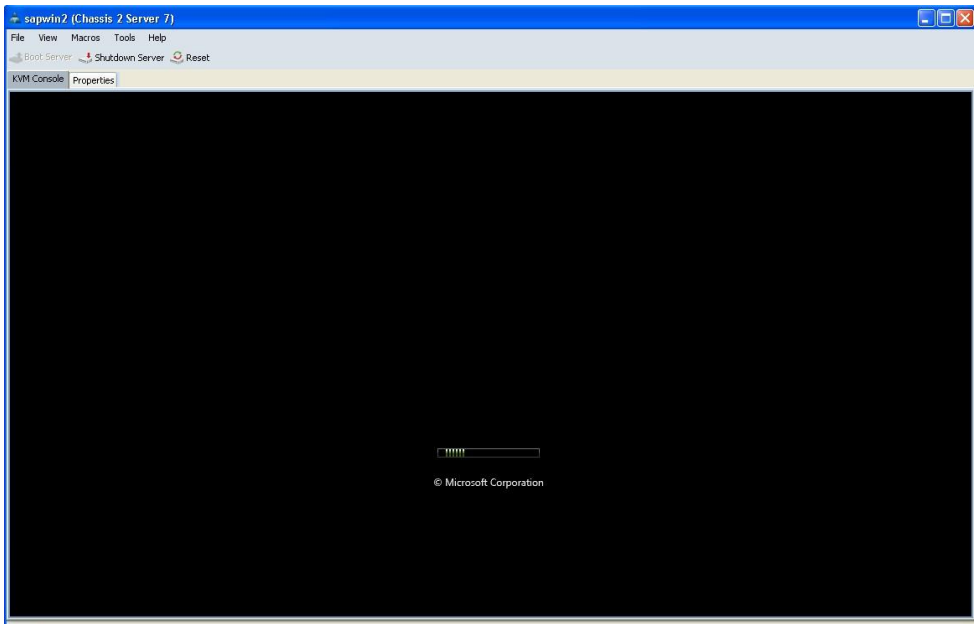

Enterprise Storage 1
CX4-240 - SAPDEMO-sapwin2: Storage Group Properties
General
LUNs
Hosts
Show LUNs:
Not in other Storage Groups
Available LUNs
Selected LUNs
OK
Apply
Cancel
Help

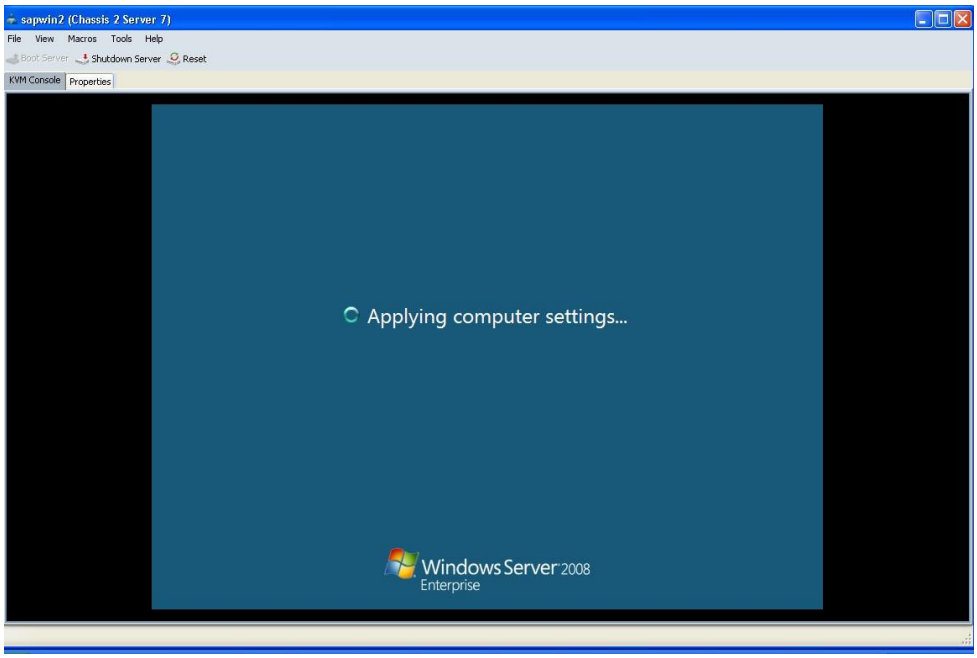

CX4-240 - SAPDEMO-sapwin2: Storage Group Properties
General
LUNs
Hosts
Show LUNs:
Not in other Storage Groups
Available LUNs
Name
ID
Capacity
Drive Type
MetaLUNs
Snapshots
SP A
SP B
Thin LUNs
Selected LUNs
Name
ID
Capacity
Drive Type
Host ID
LUN 52 - RG1 - 45GB ...
9
45.000 GB
FC
0
Remove
OK
Apply
Cancel
Help

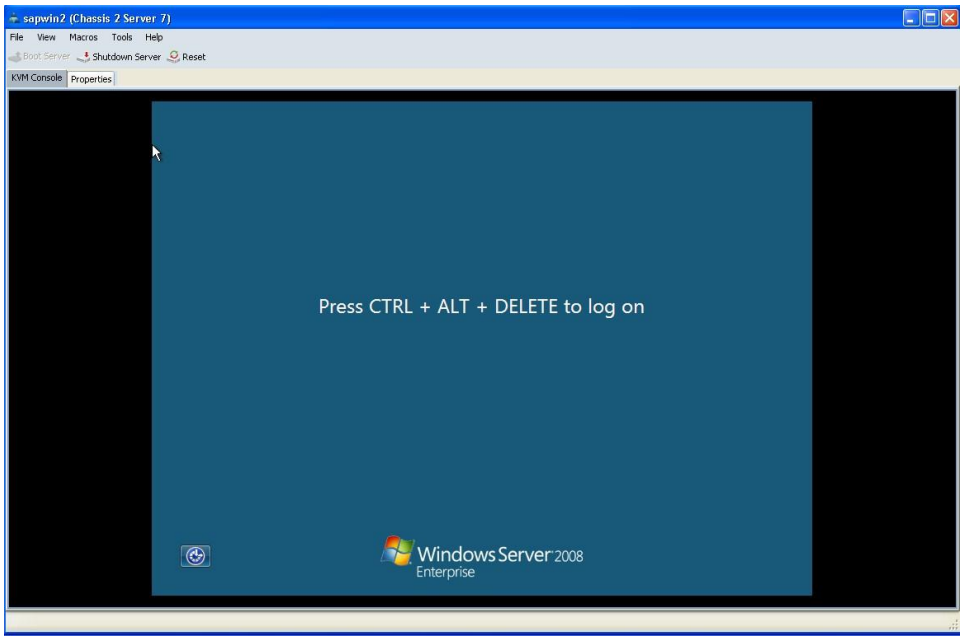


Note: Sapwin2 host now has a clone of boot LUN of sapwin3, as its boot LUN. Reboot the host and check for its issueless booting.




sapwin2 (Chassis 2 Server 7)
File View Macros Tools Help
Boot Server Shutdown Server Reset
KVM Console Properties
© Microsoft Corporation


sapwin2 (Chassis 2 Server 7)
File View Macros Tools Help
Boot Server Shutdown Server Reset
KVM Console Properties
Applying computer settings...
Windows Server 2008
Enterprise



Note: Host boots up with clone of boot LUN and the Window server is available also on a new server.

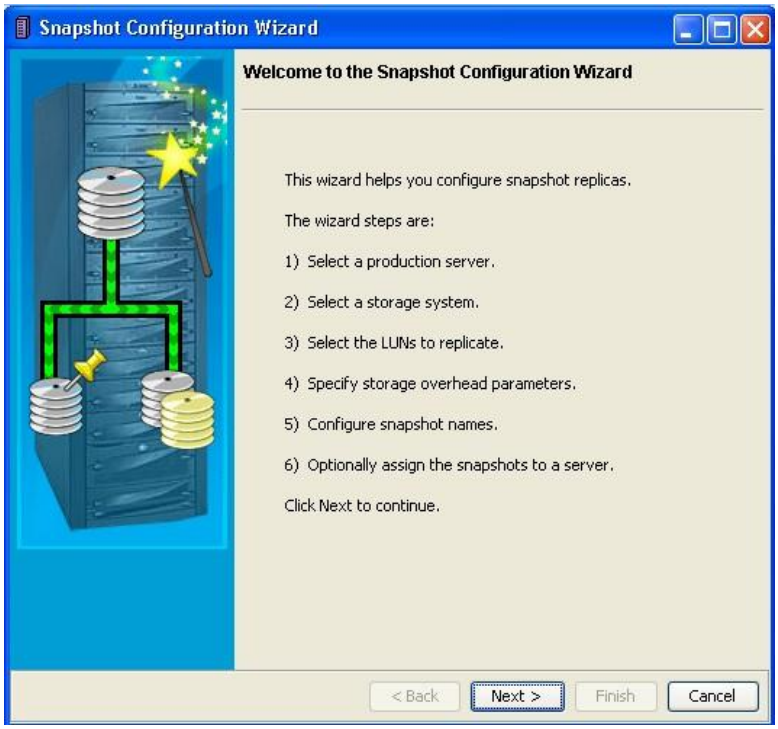
Snapshot Procedure for System Preparation

EMC provides “SnapView Snapshots” snap-in as part of the Navisphere Manager GUI which is used for creating snapshots.

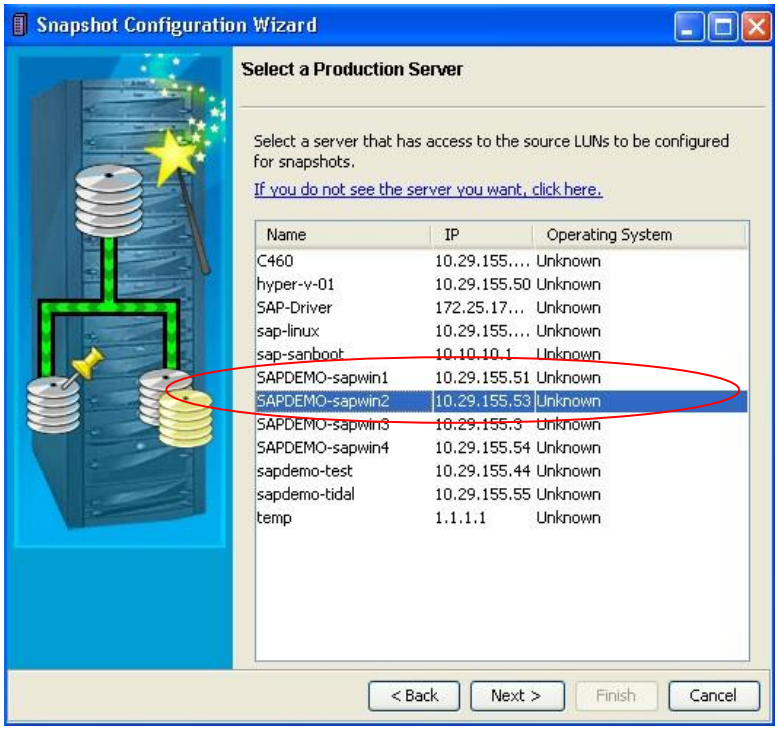
System clone could be prepared by taking a snapshot of associated LUNs and activating their sessions the target host / storage group which are in turn associated service profiles of UCS. Associating these service profiles to new server hardware prepares the clones. These snapshots could be configured to boot in separate VLANs to avoid IP/host/SID conflict in production network.

The following screenshots provide an example scenario of using a snapshot of an existing boot LUN to simultaneously boot other server hardware.

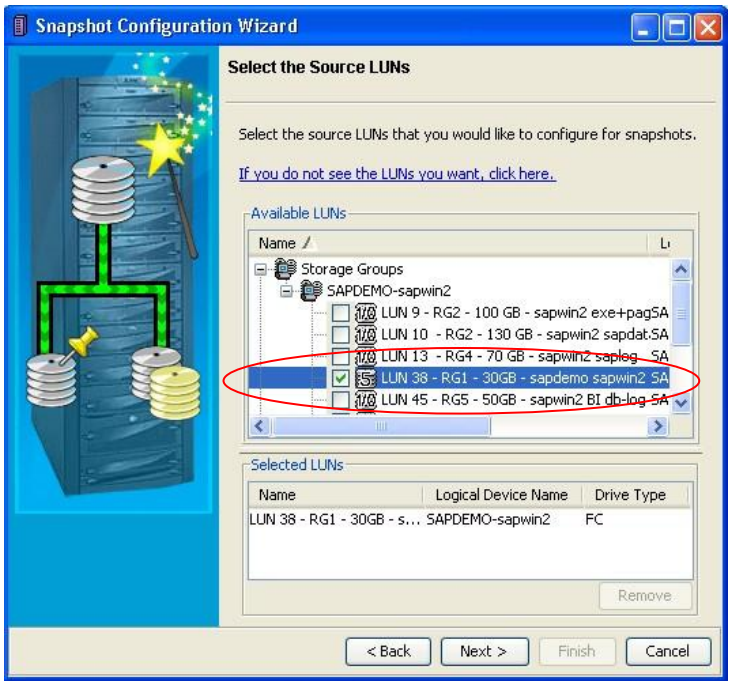
1. Navigate to the Navisphere GUI to the storage group.
2. Select the LUN.
3. Launch the wizard “Configure SnapView Snapshots” under the Replication tab on the left pane.



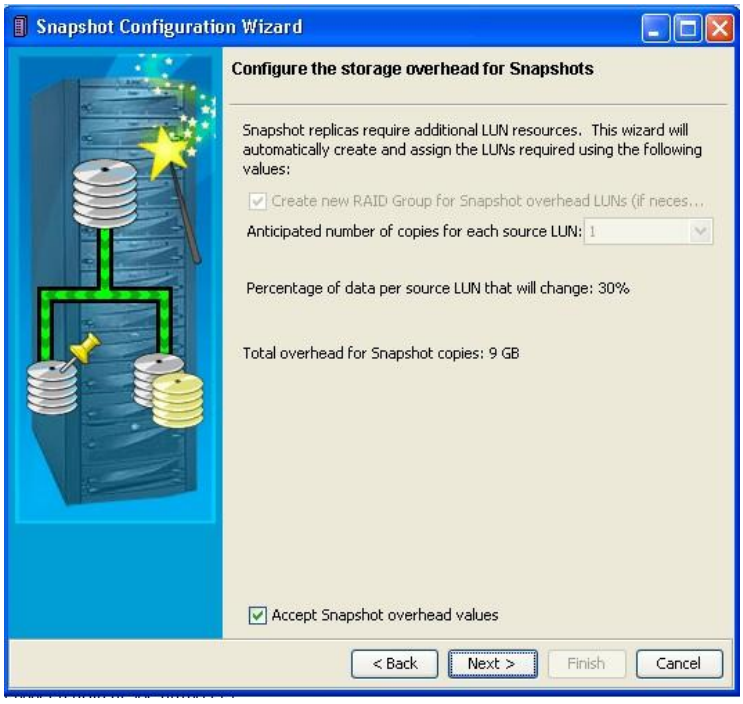
4. Select a host having the LUN whose snapshot is to be created.



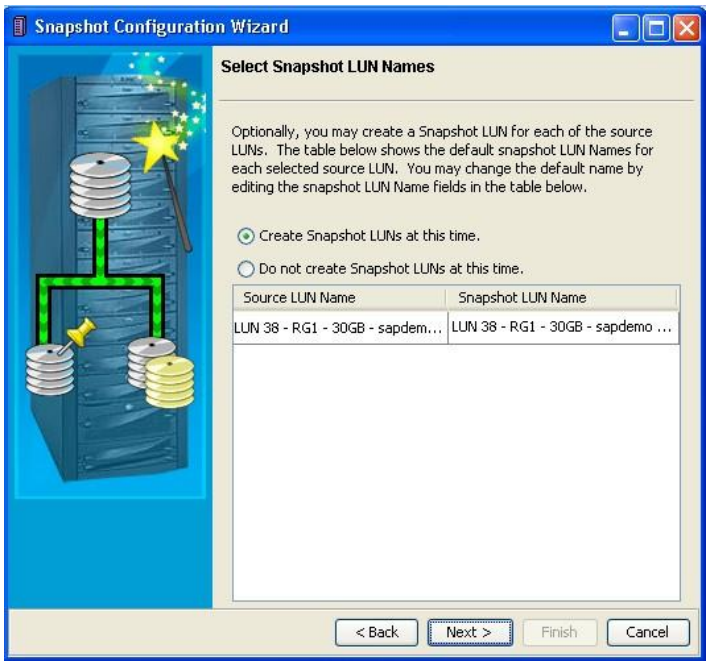
5. Select the source LUN(s).



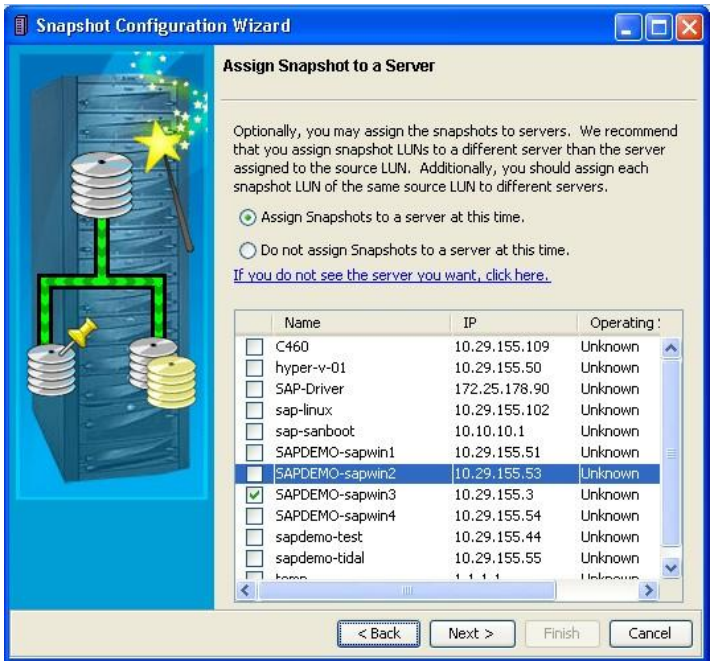
Information collection for Metaluns creation displays.



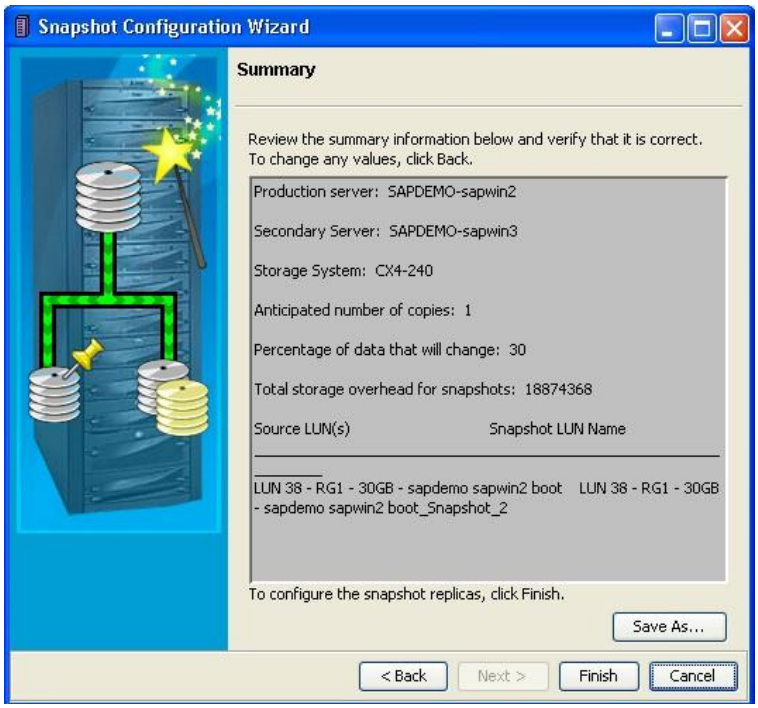
6. Optionally, set the default snapshot name or change for a meaningful interpretation.



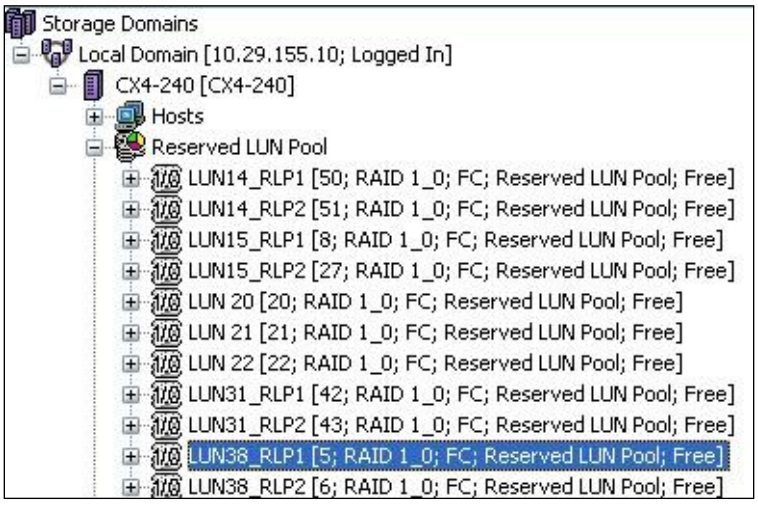
7. Specify the host to which the snapshot has to be assigned.



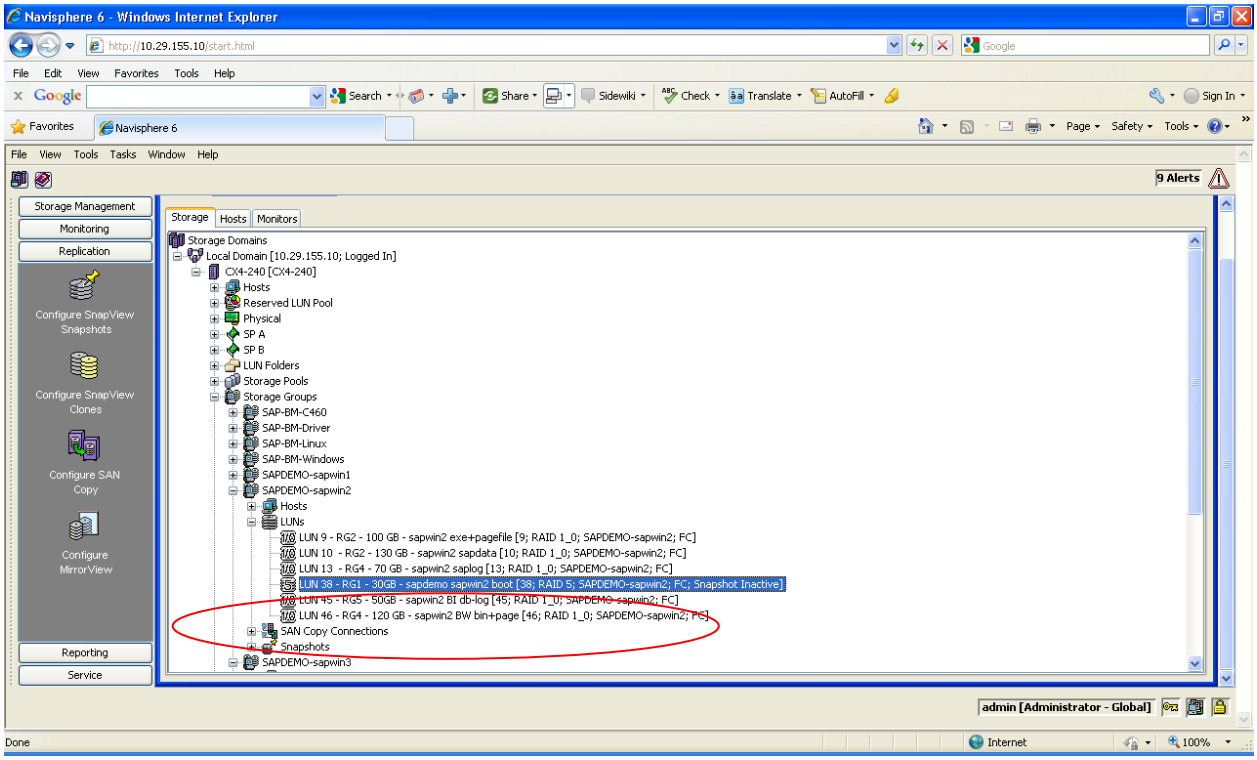
Inputs collection complete.



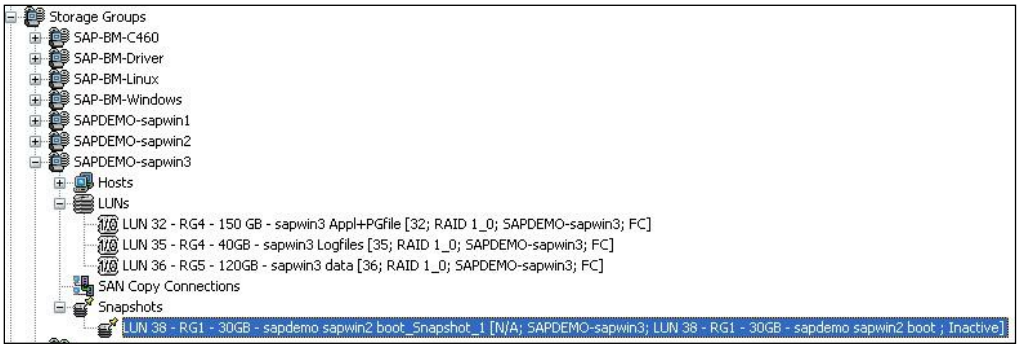
As storage overheads pair of reserved LUNs get created that hold the dirty data blocks.



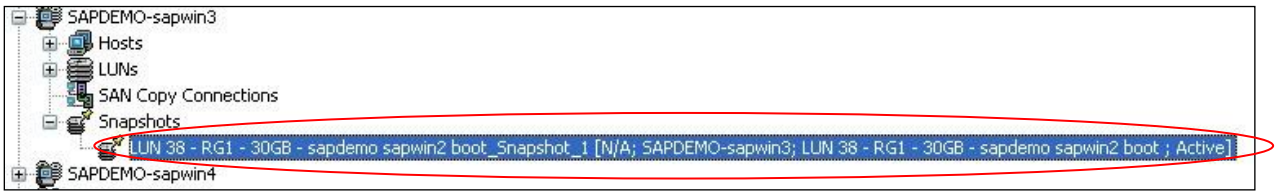
At this time you will see that source LUN is marked as inactive snapshot.



You will find the snapshot attached to a different host under the snapshots section under the storage group.



8. Activite the snapshot.



The next step is to start the SnapView session for this LUN. Once the snapshot is made active and start the SnapView session to the host, the same LUN which is a source is available in the destination host.

This approach could be used to perform production system backups without exposing the actual system for the same but its snapshot to the backup server. It could be used to boot servers with same pre-configured OS partition.

7 Conclusion

Designed using a new and innovative approach to improve data center infrastructure, the Cisco Unified Computing System unites compute, network, storage access, and virtualization resources into a scalable, modular architecture that is managed as a single system. Together with EMC storage, UCS offers many advantages for system administrators to ensure easy mass system deployments, contigency system preparation, and a process that ensures hardware high availablity.

8 For More Information

CISCO:

http://www.cisco.com/go/sap

EMC:

http://www.emc.com/products/family/clariion-family.htm