HP P2000 REMOTE SNAP TECHNICAL COOKBOOK

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REMOTE SNAP OVERVIEW

REMOTE SNAP INTRODUCTION

- HP's first entry-level controller based replication software
- Remote Snap is an asynchronous, controller-based replication process based on Snapshot. Deployments include:
  - Across geographic distance over Ethernet
  - Across "campuses" over FC
- Builds on existing Volume Copy and Snapshot features
- Copies only changed blocks, extremely efficient operation
- Remote Snap is a pull operation so the remote site will be pulling the information from the local site
- Requires a network connection between two P2000 G3 Arrays
- HP exclusive ease-of-use content with replication setup wizard

CUSTOMER NEEDS ADDRESSED BY REMOTE SNAP AND COMBO CONTROLLER

Need	P2000 G3 Remote Snap solution
Need: Protect data in case of incidents leading to loss of data on local SAN	Software solution enabling snapshots of data to reside on another array at a location distant to primary SAN
Need: Share larger departments' storage resources with smaller groups at low cost	The P2000 Combo controller gives 8Gb FC ports for departments needing high speed access to data. It also provides 1GbE ports to allow smaller departments with tight budgetary restrictions to enjoy shared storage benefits without purchasing their own array – and without the cost of implementing a FC infrastructure.

REPLICATION BENEFITS

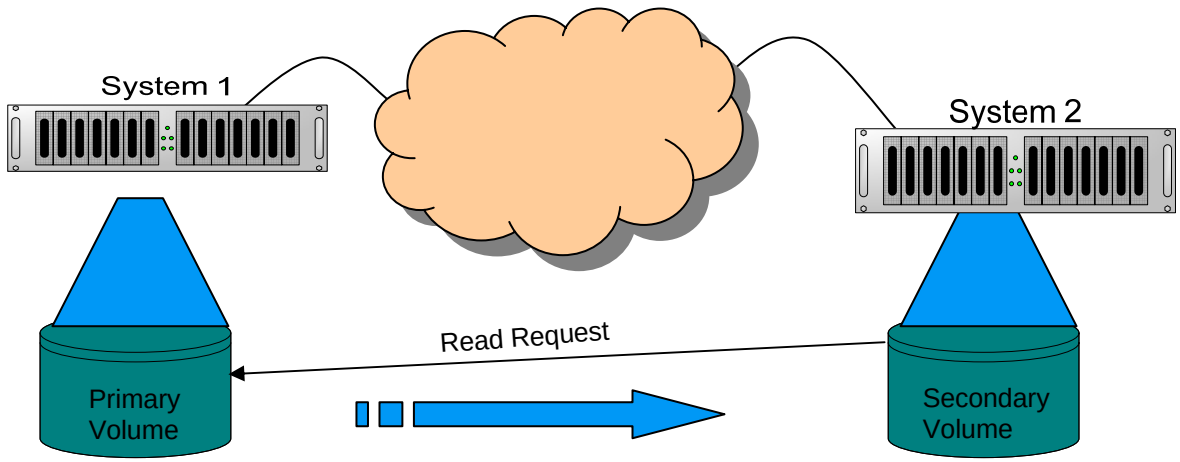
- Business Continuity / Disaster Recovery
  - Improve Data Recoverability
    - Instant restore to any point-in-time snapshot
  - Improve Business Continuity
    - Reduced downtime and data unavailability due to system or human errors
  - Rapid Application Development
    - Use production data without effecting production data or impacting the production application
- Regulatory Compliance
  - Satisfy Regulatory Compliance
    - Data protection is mandatory
- Centralized Backup
  - Reduce Backup Windows
    - From hours to minutes

Significant business impact – Operational & Financial

REPLICATION PROCESS

How does the secondary volume determine what to transfer?

- Snapshot taken on primary volume – seen/referred to as a replication snapshot
- The primary volume sends notification that an replication operation has been started
- The secondary volume requests a “difference list”
- The secondary volume replicates the changed blocks, based on the information retrieved in the difference list



P2000 SOFTWARE PRODUCT SKUS

SKUs Being Introduced:

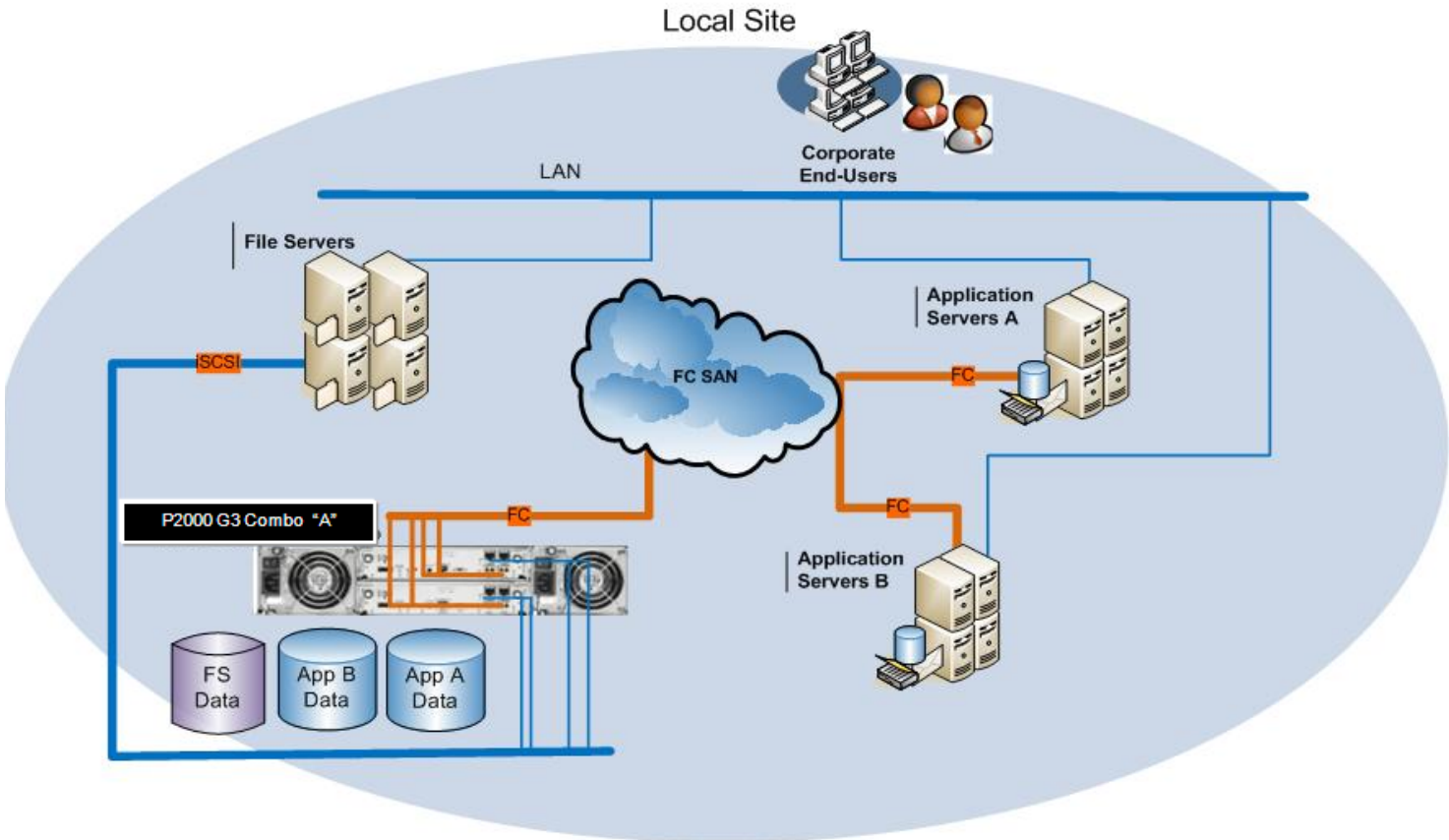
512 – Snapshot LTU	
HP P2000 Snapshot 512 Software LTU	TA806A
HP P2000 Snapshot 512 Software E-LTU	TA806AAE
Remote Snap LTU	
HP P2000 Remote Snap Software LTU	TA808A
HP P2000 Remote Snap Software E-LTU	TA808AAE

REMOTE SNAP & P2000 G3 COMBO ARRAY USE CASES

P2000 G3 COMBO CONTROLLER

TWO 8GB FC PORTS / TWO 1G ISCSI PORTS

- Extend reach of SAN to servers that don't have FC HBA's or FC SAN access
- Provide IP-based centralized backup of FC SAN
- Snap Replication over IP or FC

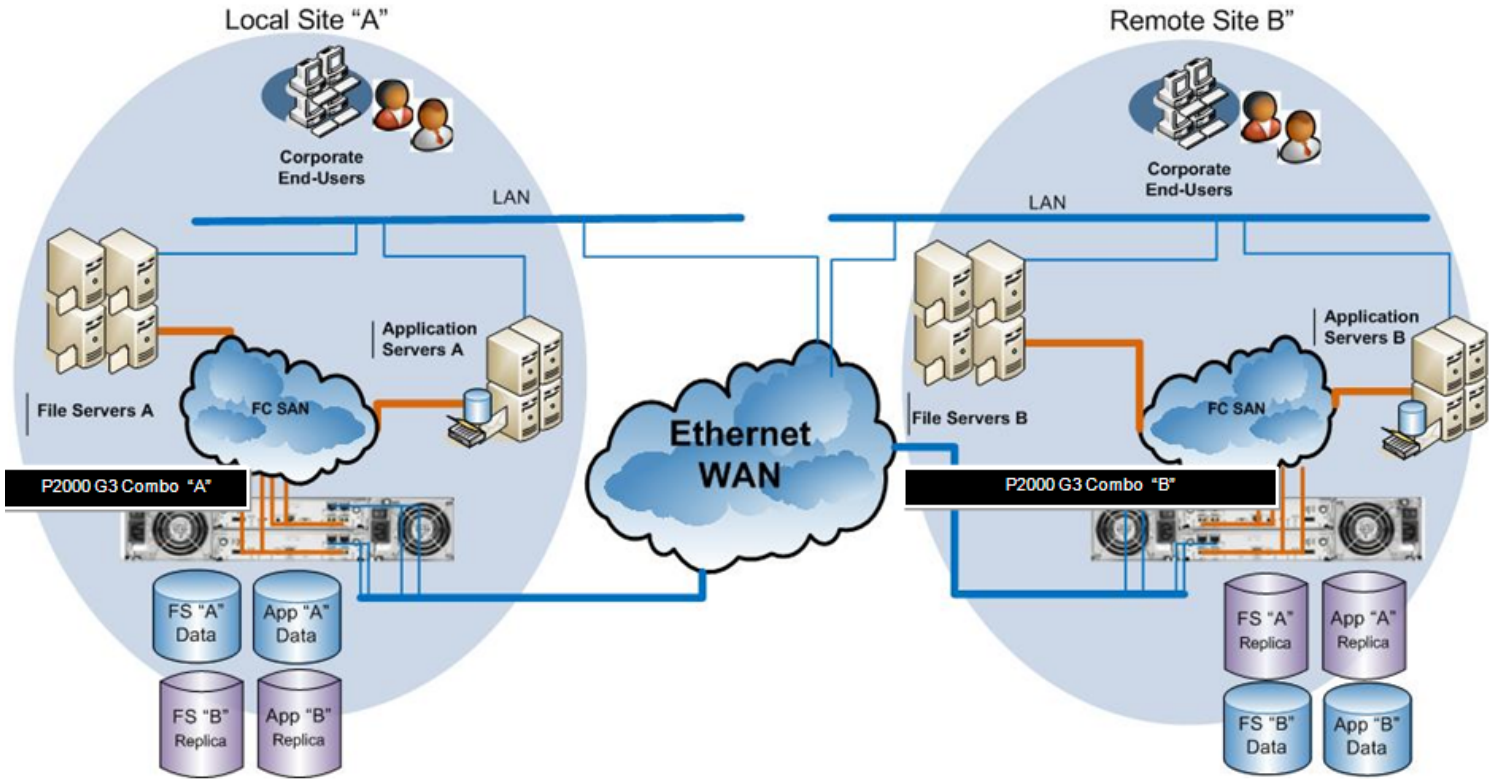


P2000 G3 REMOTE SNAP

DISASTER RECOVERY FOR REMOTE SITES OVER IP (WAN)

Snapshot-based replication over Ethernet to enable Disaster Recovery.

- Snapshots replicated from Site "A" to Site "B".
- Initial replication can be done with a physical disk move.
- Site "B" can mount the latest Snapshots to begin running as the primary online source.
- Replication moves only new data across the wire.
- Can be replicated over LAN/WAN using iSCSI ports, or over FC using FC ports.
- Can hold 512 Snaps per array

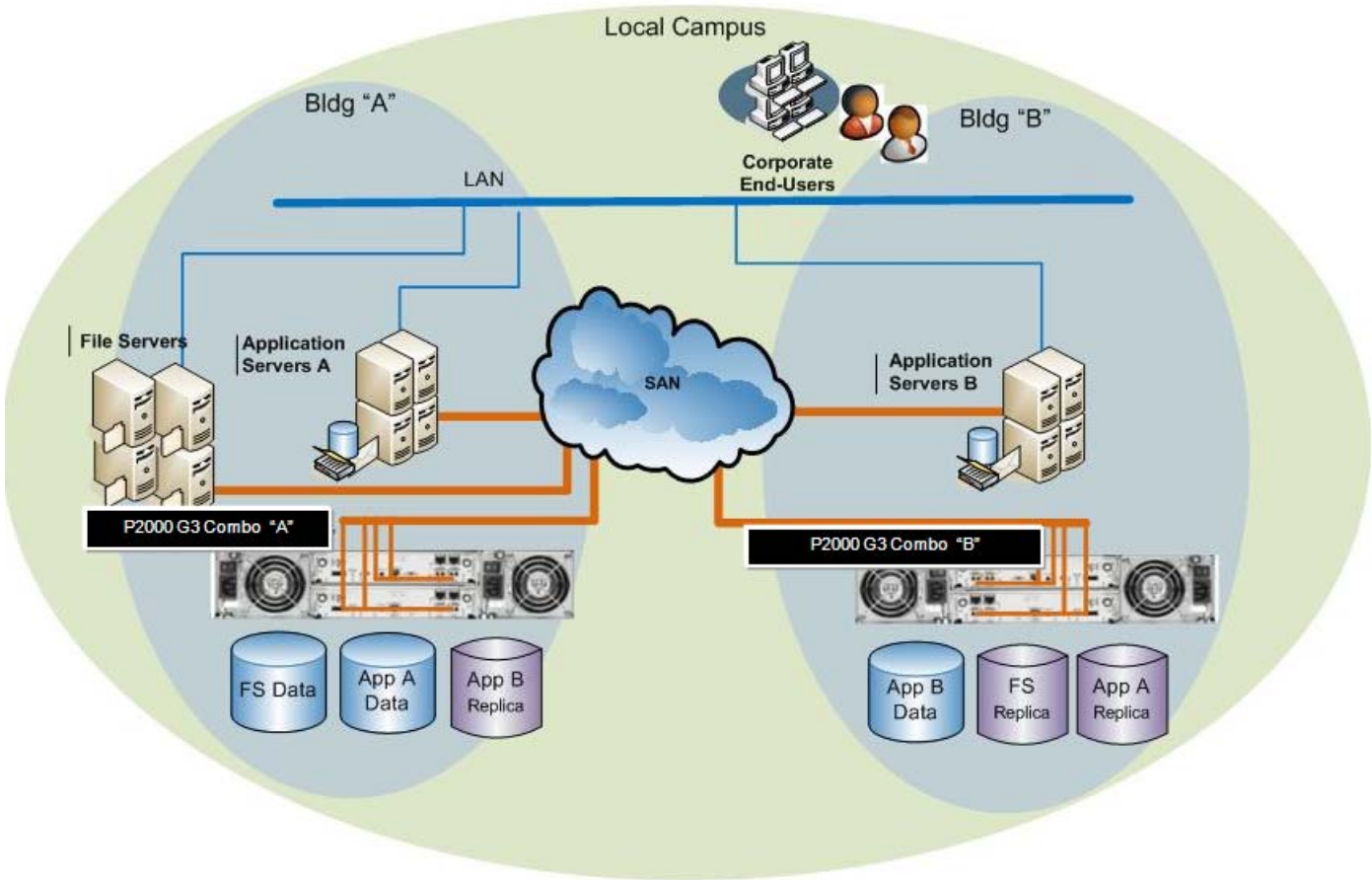


P2000 G3 REMOTE SNAP

DISASTER RECOVERY FOR LOCAL CAMPUS OVER FC

Snapshot-based replication over FC to enable Disaster Recovery.

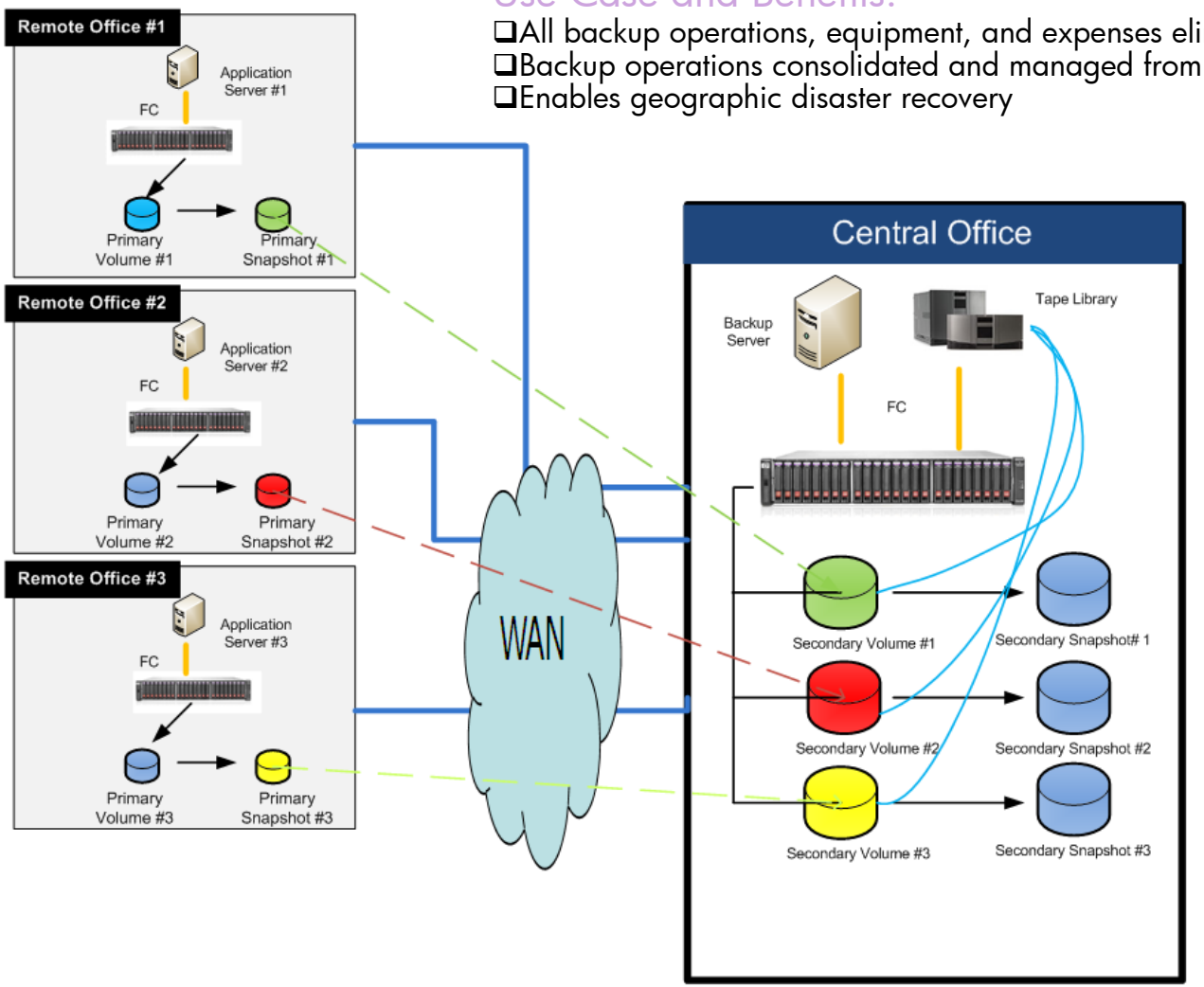
- Snapshots can be replicated between arrays w/out servers in the replication path
- Initial replication can be done with a physical disk move.
- Replication moves only new data across the FC link.
- Up to 512 Snaps per array



P2000 G3 REMOTE SNAP

CENTRALIZED BACK UP OVER WAN

Remote Snap Many-to-1 Replication (Centralization)



Use Case and Benefits:

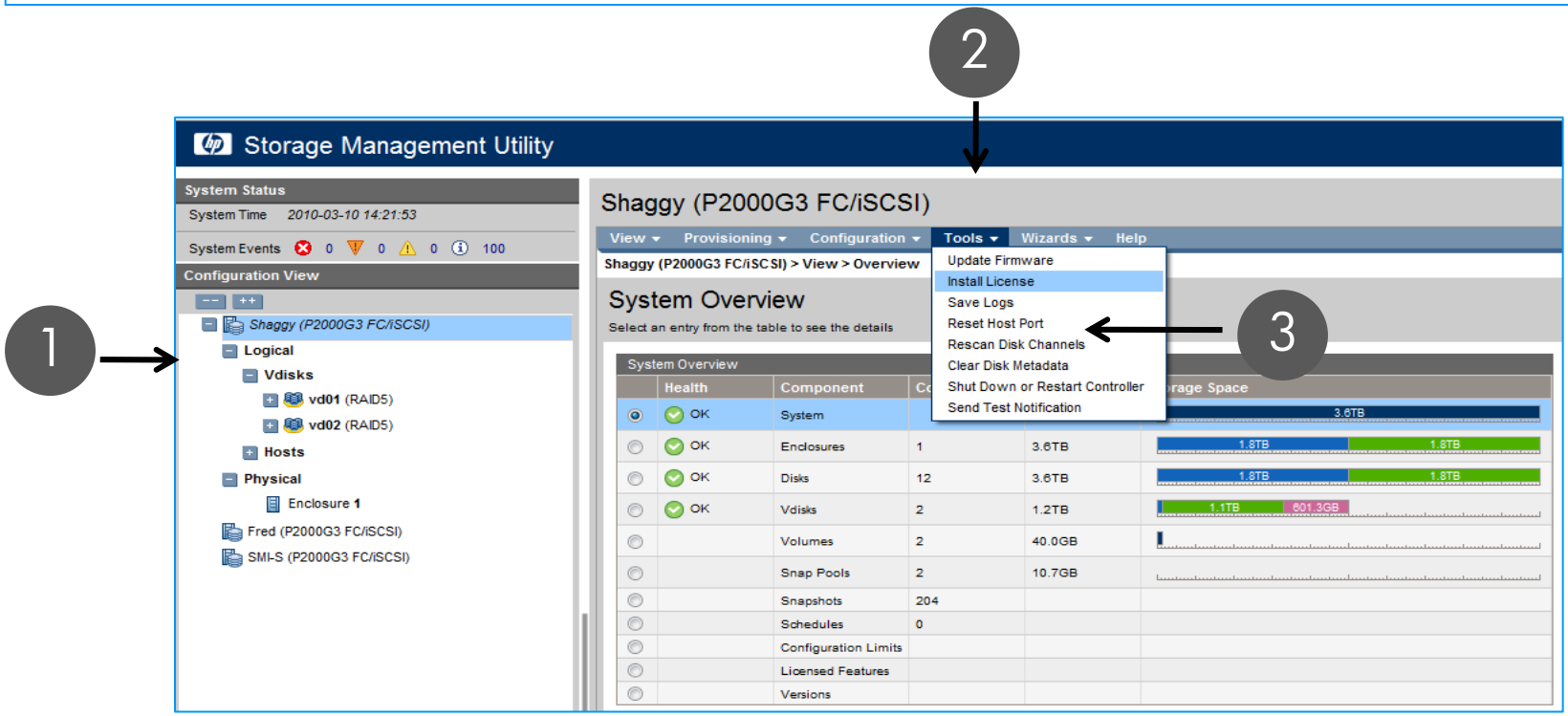
- ❑All backup operations, equipment, and expenses eliminated from remote offices
- ❑Backup operations consolidated and managed from a centralized location
- ❑Enables geographic disaster recovery


REMOTE SNAP
PREREQUISITE

PREREQUISITES

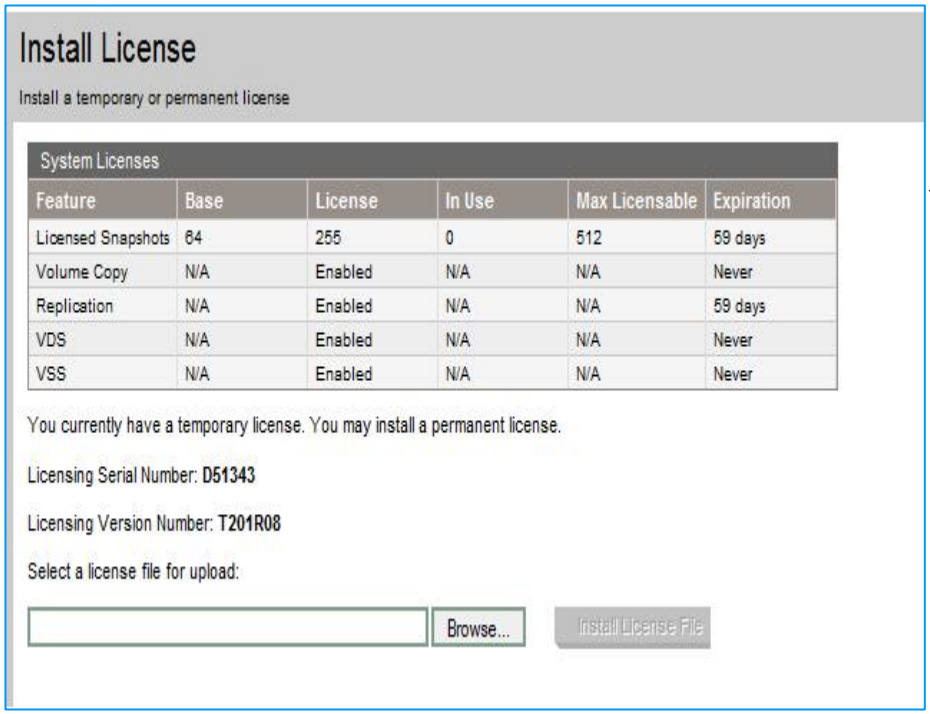
- Both Systems (local and remote) must have Remote Snap license installed
  - A permanent license can be obtained by accessing the HP licensing server at http://www.webware.hp.com
  - If you do not have a permanent license you can use the built in 60-day trial license
- This cookbook is for HP P2000 G3 Arrays
  - If desired you can upgrade the controllers in a MSA2000G1 or G2 array to a G3 array to get this functionality without having to migrate any data

ENABLING A TRY-N-BUY LICENSE

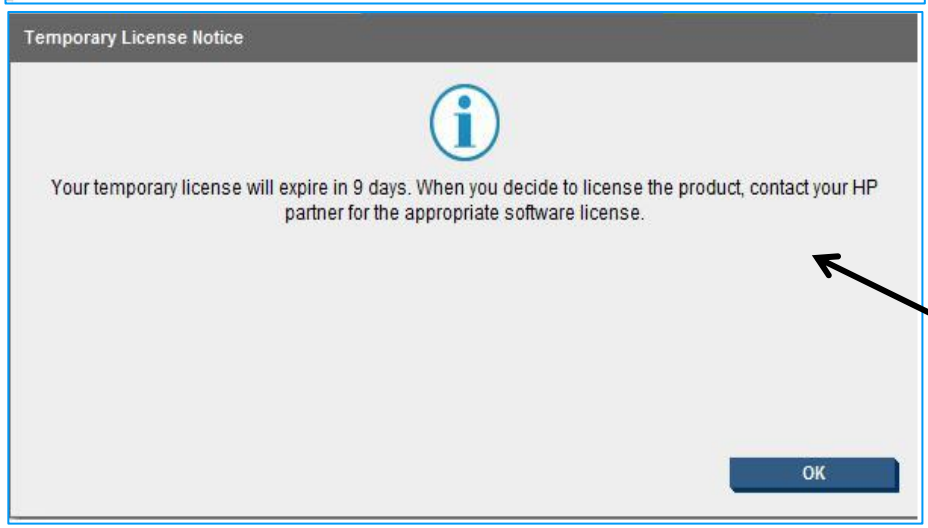


1. Select the Storage Array in the left panel
2. Select “Tools”
3. Select “Install License”

INSTALLING THE 60-DAY TRIAL LICENSE



- On the Install License screen
  - First scroll down and accept the End User License Agreement
  - Second confirm operation by clicking the Yes button
- Your 60 trial period has now started



When the trial license is close to expiration, each login to the Storage Array will display a pop-up message with the number of days left in the trial period.

FIRST REPLICATION CHECK LIST

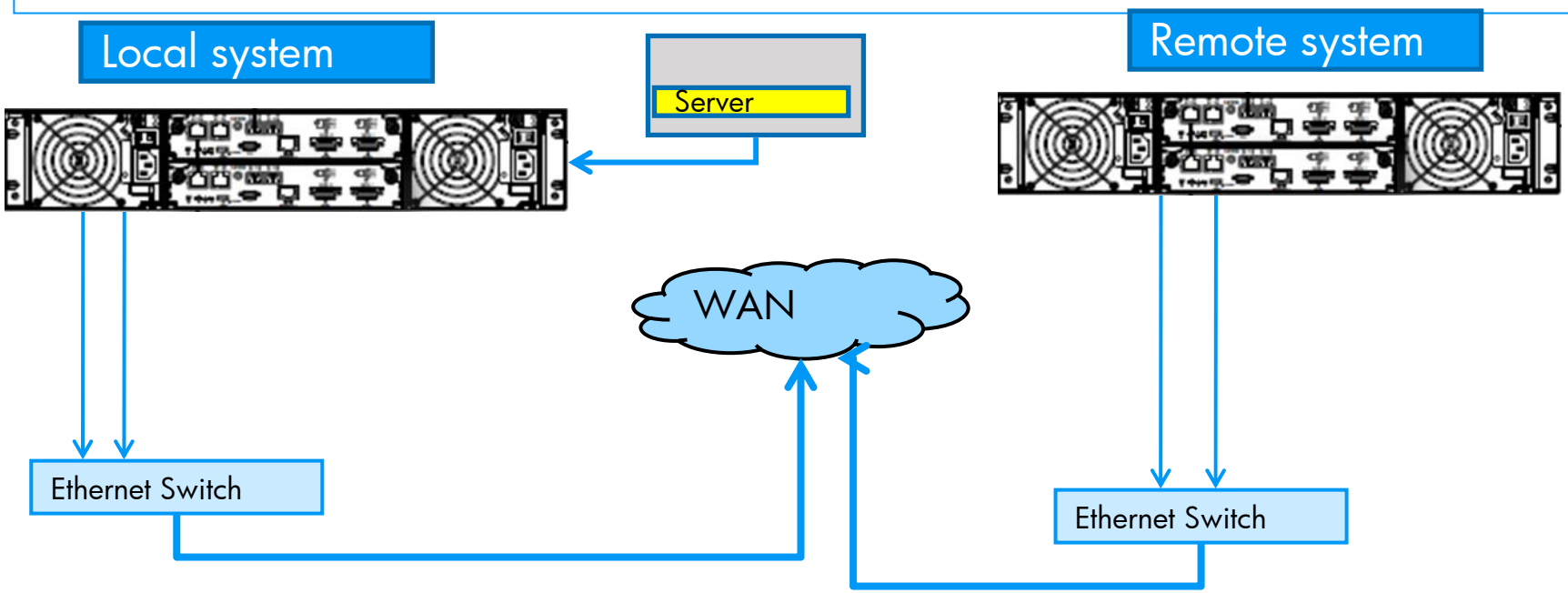
- Prerequisites
  - License
  - Network configuration
  - Create vdisks on both systems
  - iSCSI addresses
- Create first replication
  - Follow wizard steps
- Case Scenarios
  - Local replication
  - Backup
  - DR

PRE-REPLICATION CHECK LIST

- Network Configuration
  - Though not required the best practice is to replicate between two sites which have a VPN connection
  - Use network gear that can manage the network bandwidth
- Local System Configuration
  - Add Remote System
  - Configure iSCSI addresses (only required if iSCSI ports are used for replication)
- Remote Site Configuration
  - Configure iSCSI addresses
  - Create a vdisk to replicate to

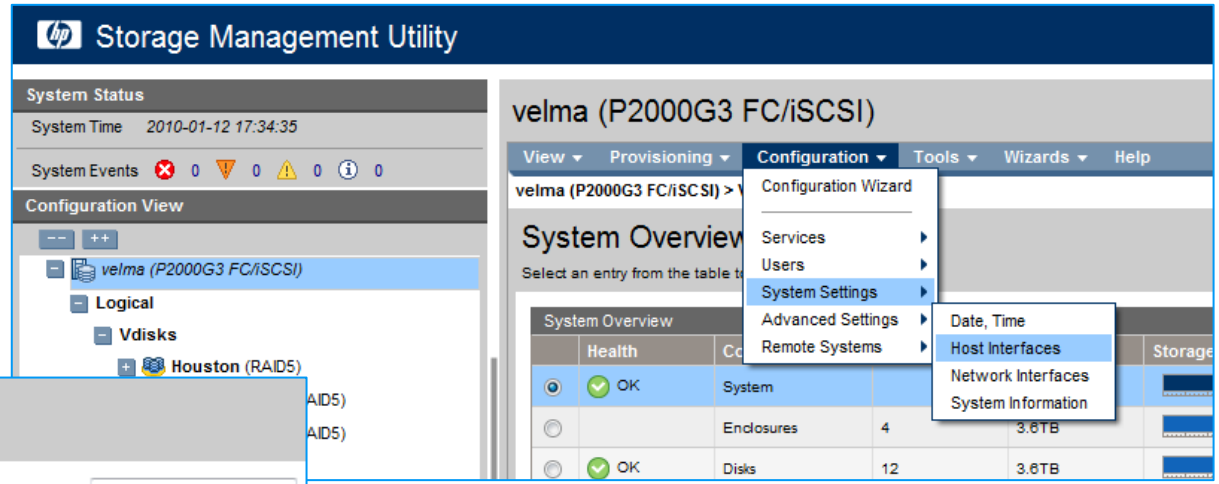
REMOTE SNAP SET UP REQUIREMENTS: CONNECTING 2 SYSTEMS FOR REPLICATION

- Replication requires that the local and remote systems be able to communicate over the Ethernet network
- All iSCSI ports must be configured with IP address
- Both systems must be connected to Network via Ethernet switch Or via FC switch, if using FC to replicate.
- The server accessing the replication set needs only be connected to the storage system host containing the primary volume



HOST INTERFACE SETUP

1



2

Configure Host Interface

Modify the settings for the host interface

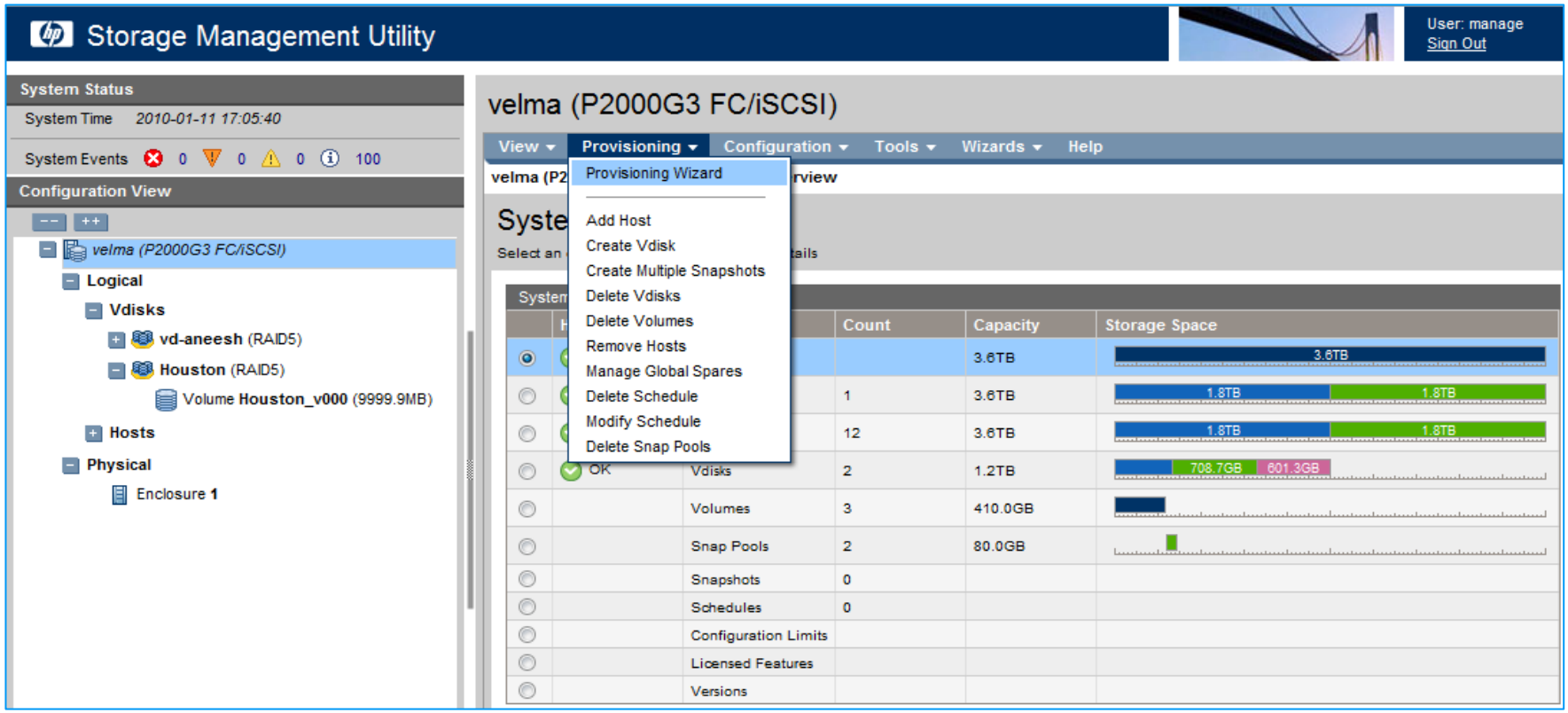
Port A1 (FC):	Speed:	auto	Connection Mode:	loop
Port A2 (FC):	Speed:	auto	Connection Mode:	loop
Port A3 (iSCSI):	IP Address:*	16.83.136.227		
	Netmask:*	255.255.248.0		
	Gateway:*	16.83.136.1		
Port A4 (iSCSI):	IP Address:*	16.83.136.228		
	Netmask:*	255.255.248.0		
	Gateway:*	16.83.136.1		
Port B1 (FC):	Speed:	auto	Connection Mode:	loop
Port B2 (FC):	Speed:	auto	Connection Mode:	loop
Port B3 (iSCSI):	IP Address:*	16.83.136.229		
	Netmask:*	255.255.248.0		
	Gateway:*	16.83.136.1		
Port B4 (iSCSI):	IP Address:*	16.83.136.230		
	Netmask:*	255.255.248.0		
	Gateway:*	16.83.136.1		

TIP

- Make sure you can 'ping' all the Ethernet addresses prior to creating any replication sets
- Use CLI command "verify remote-link" or the SMU's Tools -> Check Remote System Link.

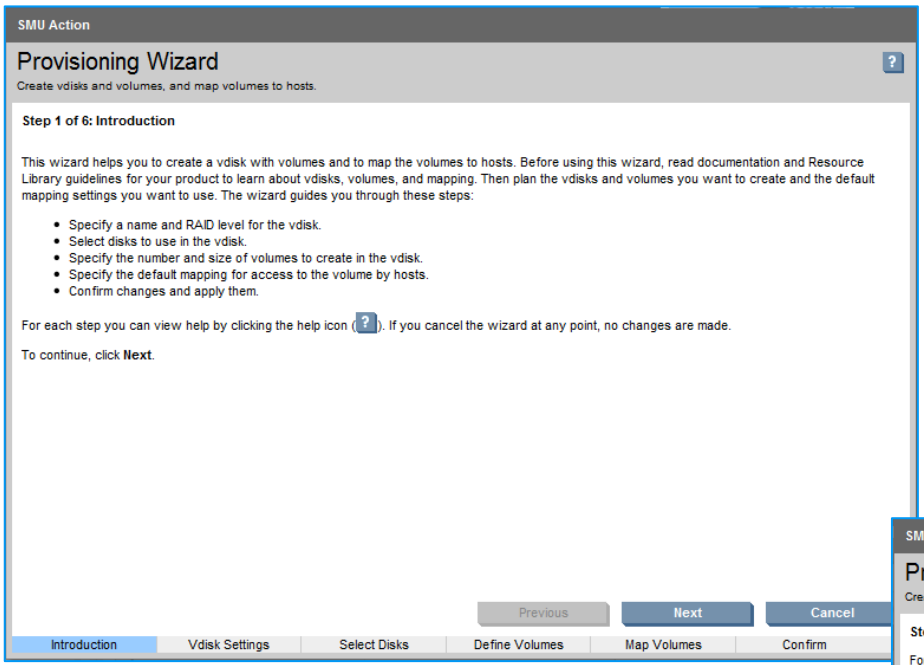
PROVISIONING WIZARD : VDISK CREATION

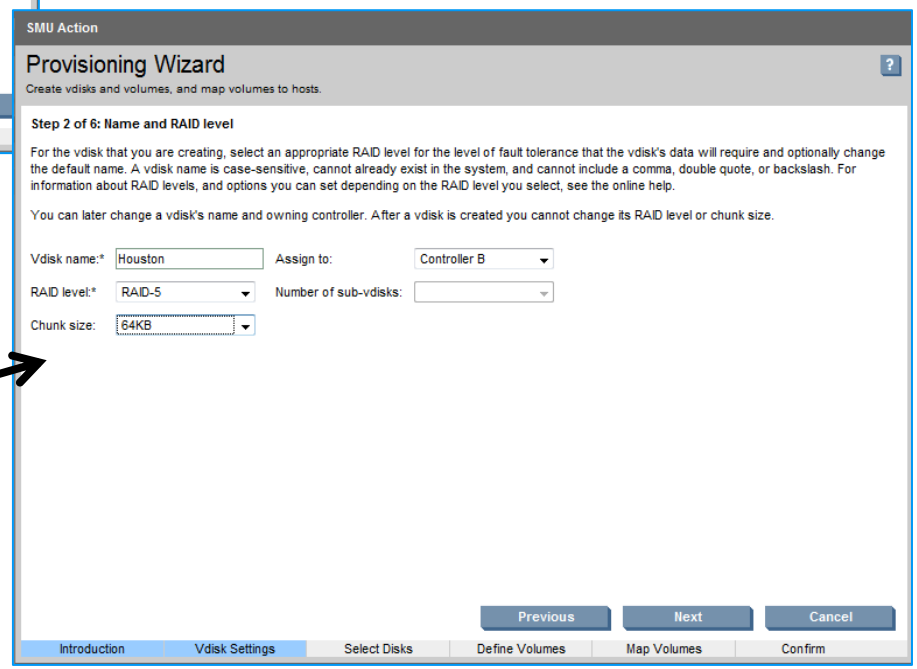
REQUIRED ON BOTH LOCAL AND REMOTE SYSTEMS



TIP: You must create a vdisk on both local and remote systems prior to initiating a remote snap

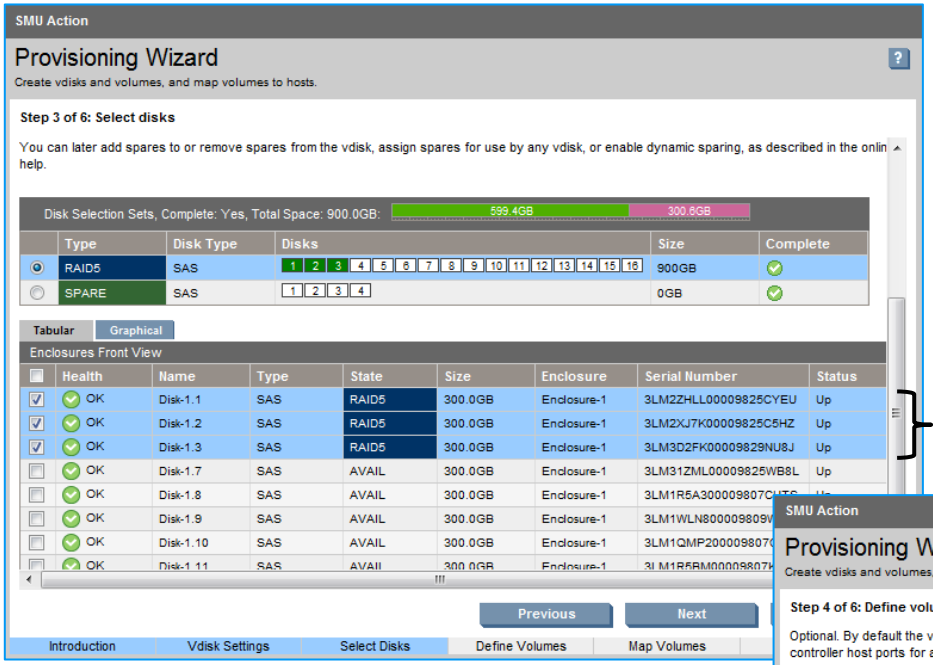
PROVISIONING WIZARD STEPS 1 & 2



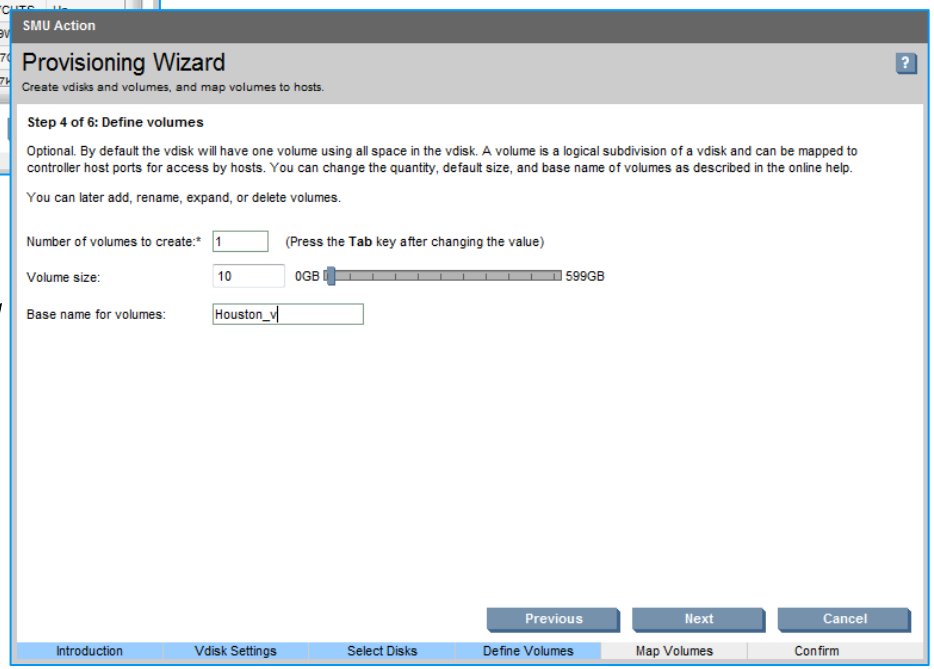


- Enter the vdisk name
- Assign the controller
- Set the RAID level
- Verify the Chunk size

PROVISIONING WIZARD STEPS 3 & 4

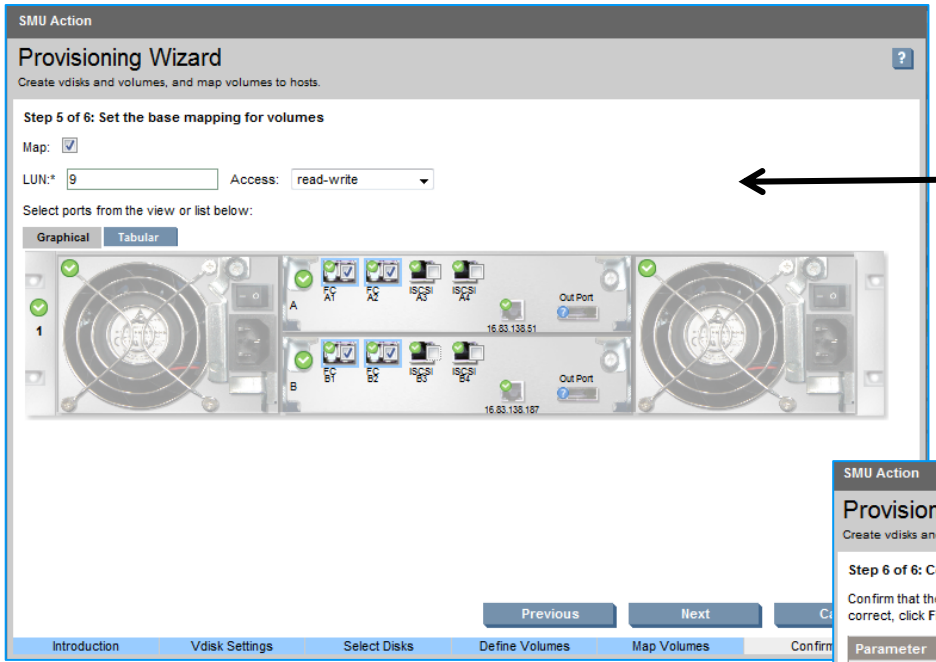


- Select the disks to be placed in the vdisk
- If desired designate a spare drive

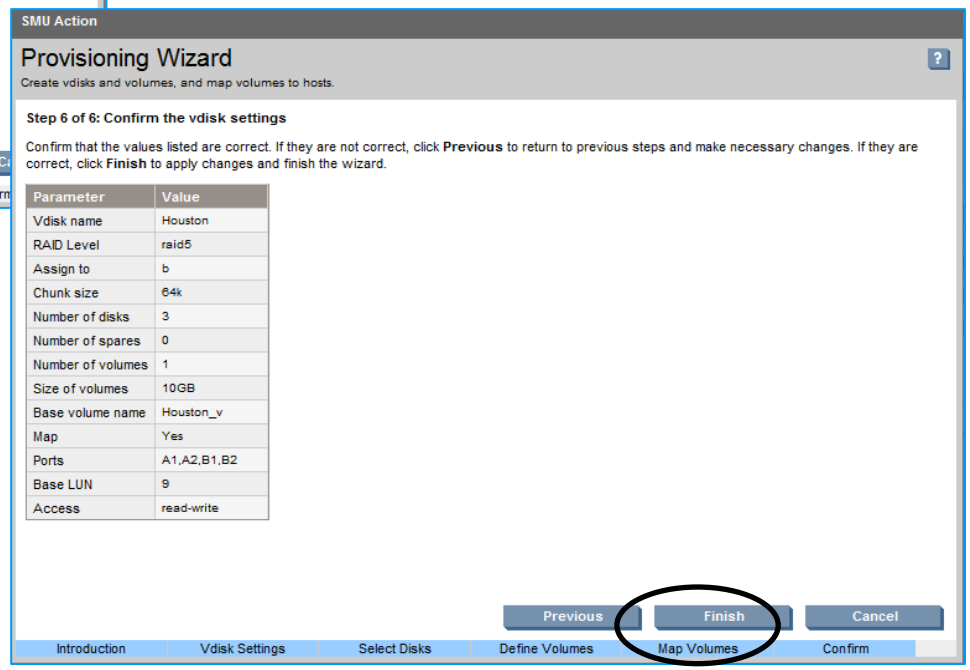


- Enter the number of volumes to create
- Enter the size of the volume(s)
- Enter the volume name, or base name if multiple volumes will be created

PROVISIONING WIZARD STEPS 5 & 6



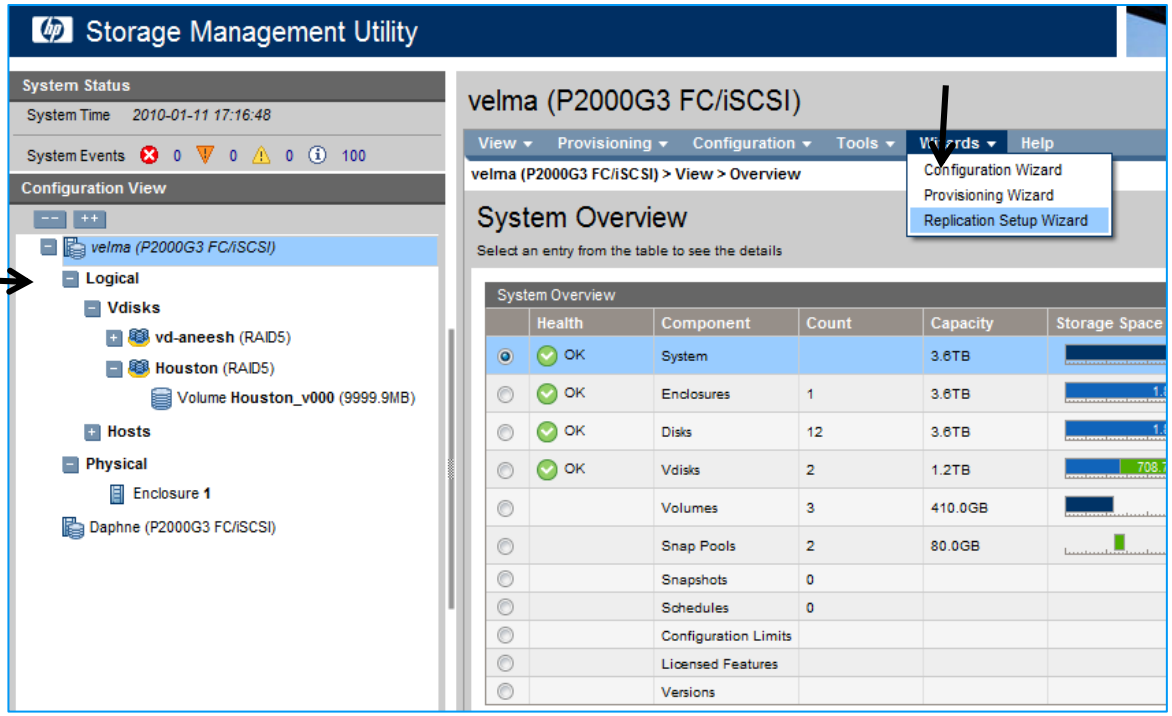
- If you want the default mapping you can assign it here
- If you want explicit mapping you need to perform that after the wizard completes



- Verify all settings are correct
- Click 'Finish' to complete the provisioning wizard


CREATE YOUR
FIRST REPLICATION

STARTING THE REPLICATION SETUP WIZARD



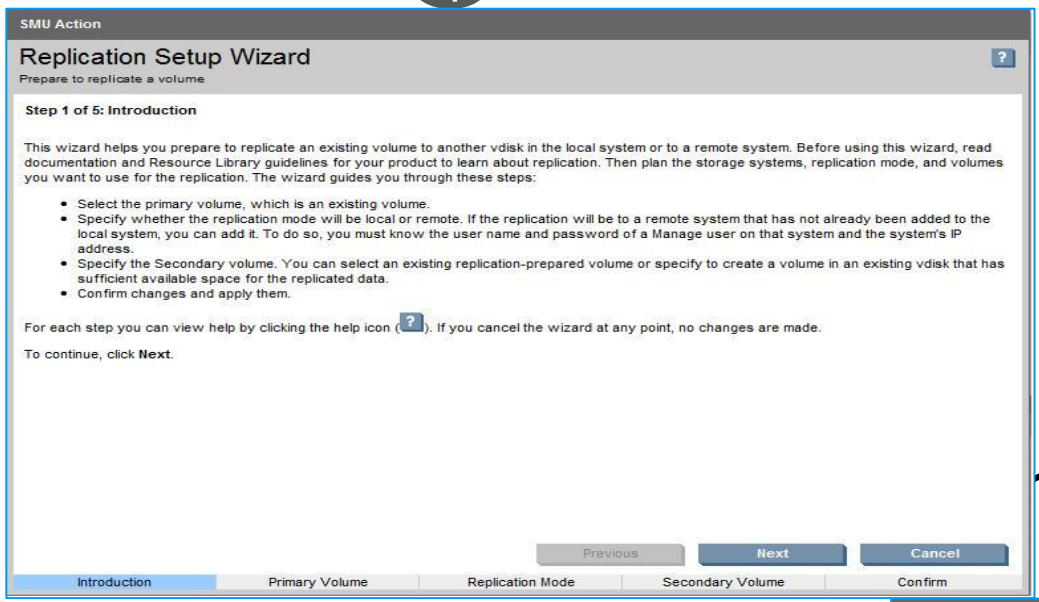
- Select the top level system
- Select Wizards -> Replication Setup Wizard

TIP

- You can follow and perform these steps on your Storage Array
- Just create a separate – non production – volume and follow along
- You can also perform these steps on a single G3 array

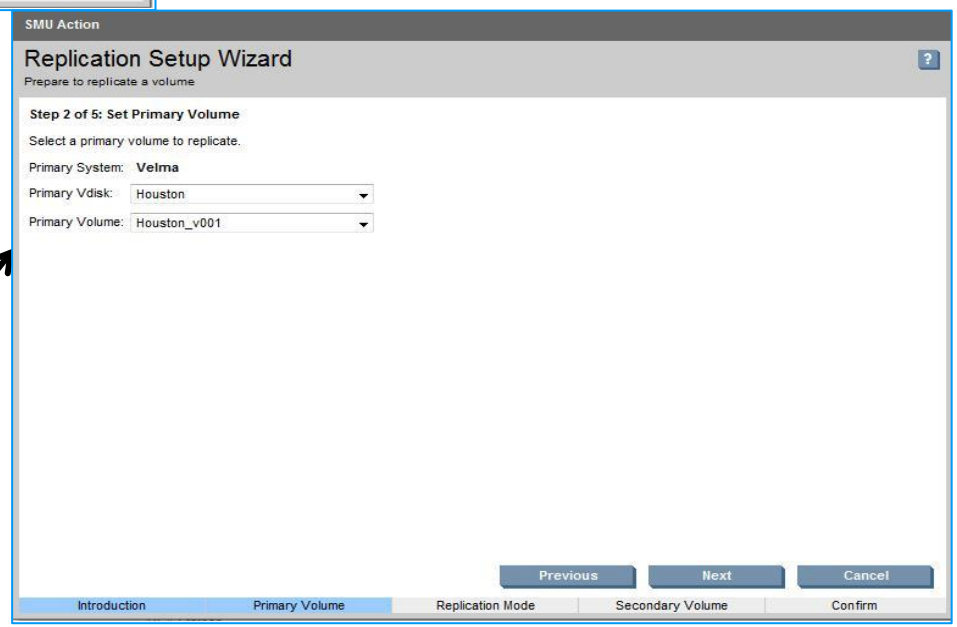
REPLICATION SETUP WIZARD STEPS 1 & 2

1



- The first step out lines all the following steps
- Make sure you have completed all the prerequisites

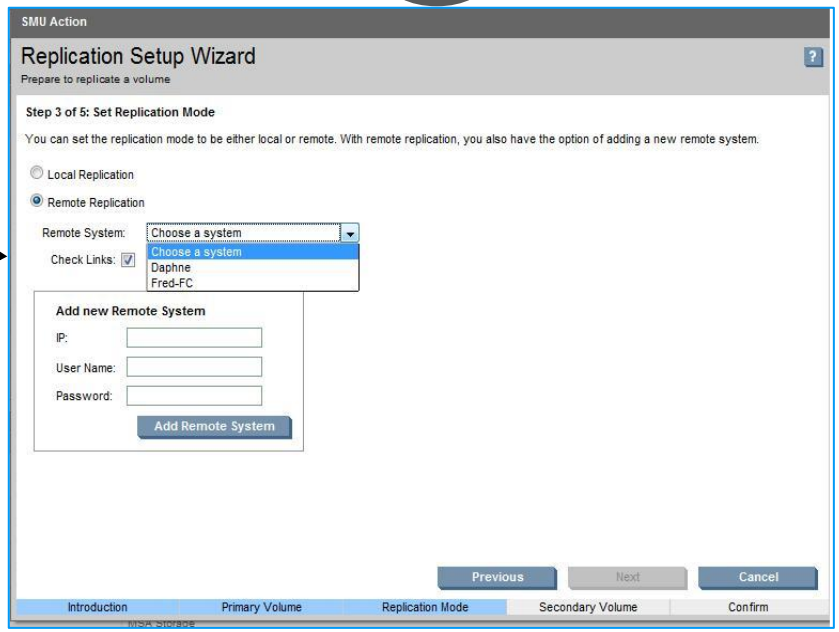
2



- Select the 'Primary Vdisk'
- Select the 'Primary Volume'

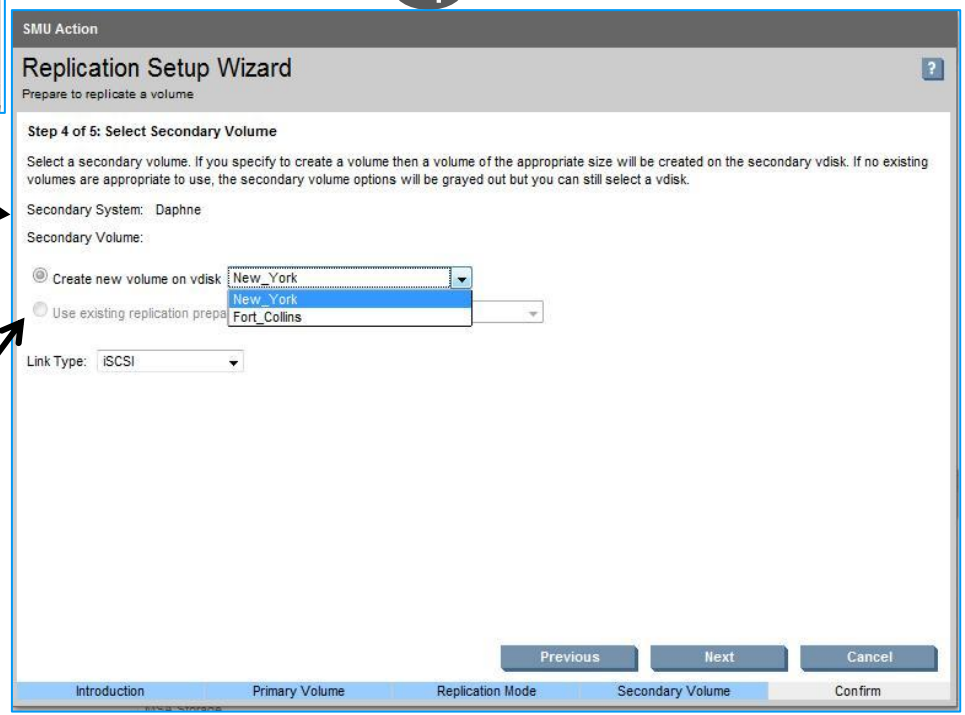
REPLICATION SETUP WIZARD STEPS 3 & 4

3



- Select either 'Local' or 'Remote' replication
- If your remote system is already identified, select it from the drop down box
- If your remote system is not yet discovered, add it here
- If user selects check link box it will verify the link between the systems

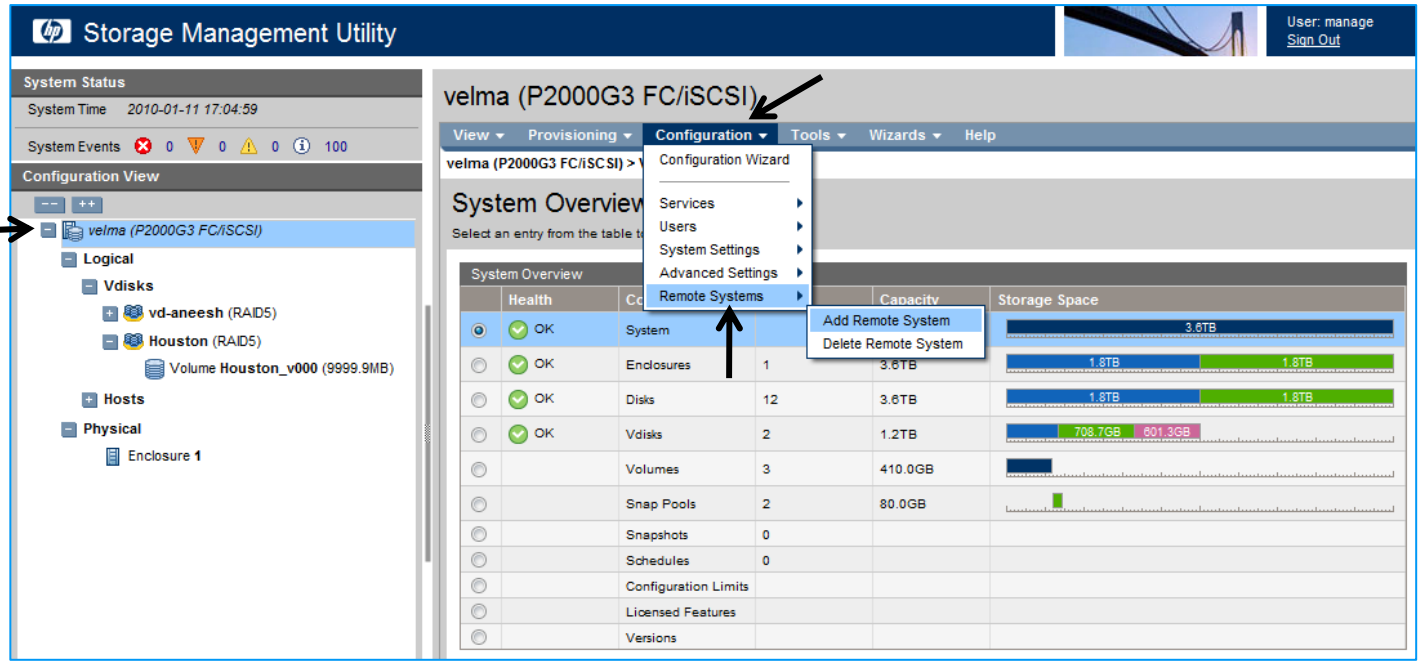
4



- Step 4 shows vdisks available on the remote site
- Select a remote vdisk
- Select the desired link type

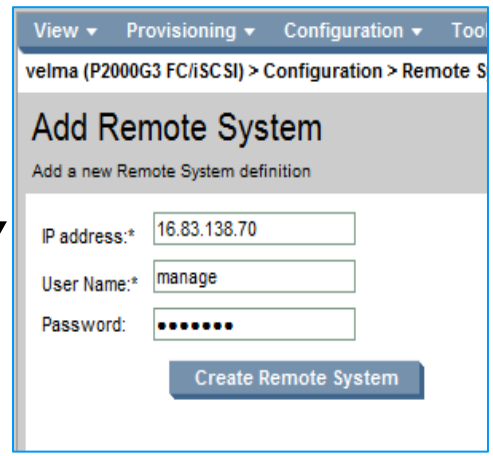
if the remote system has a replication prepared volume of the same size of primary volume , it will be available in the "Use existing volume" drop down box.

ADD REMOTE SYSTEM



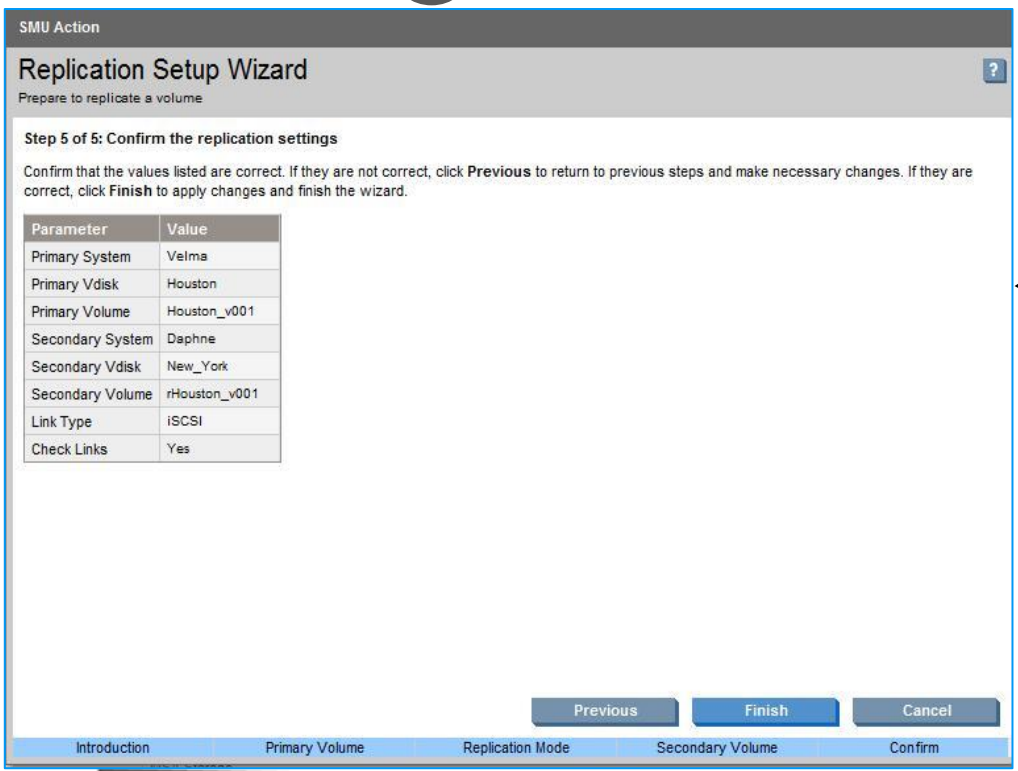
TIP

- You can also add a remote system manually, prior to starting the replication wizard.
- Highlight the system in the left pane
- Click Configuration -> Remote Systems -> Add Remote System
- Enter the IP Address, Username and Password



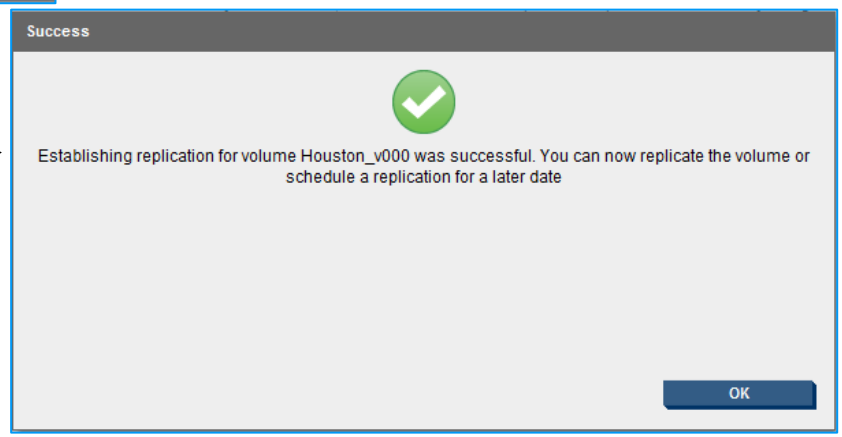
REPLICATION SETUP WIZARD STEP 5

5

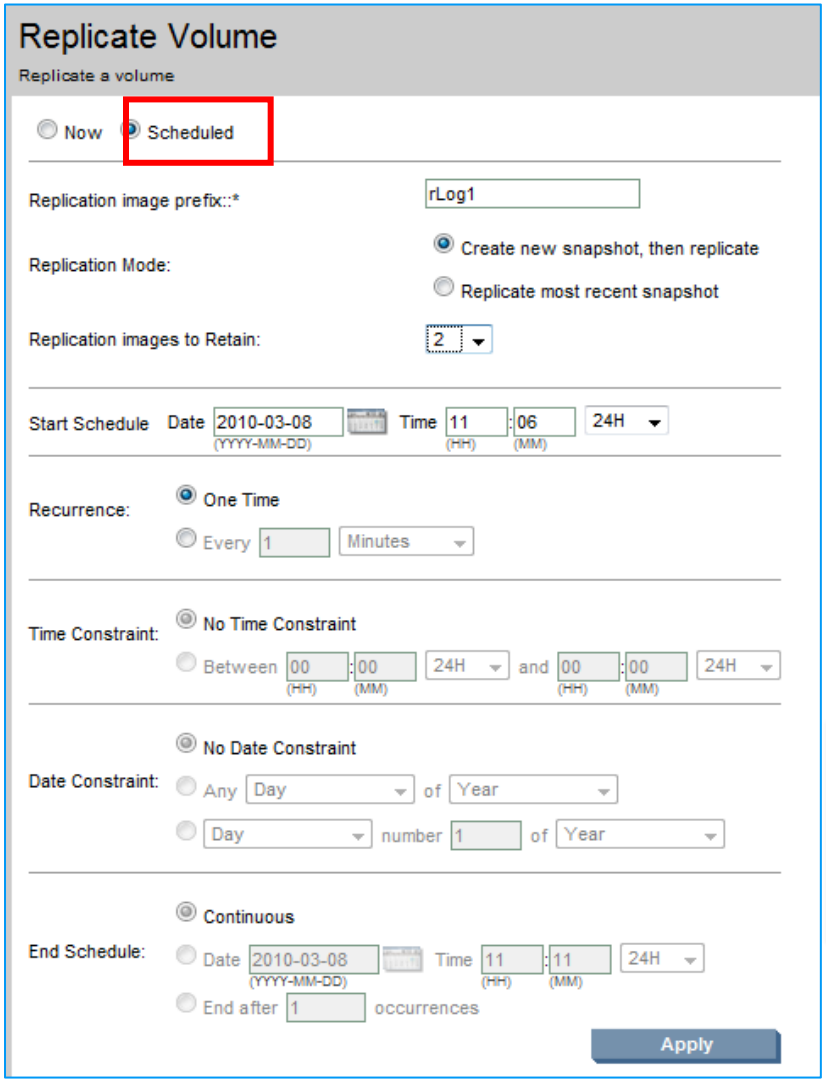


- Verify all settings are correct
- Click 'Finish' to complete the replication setup wizard

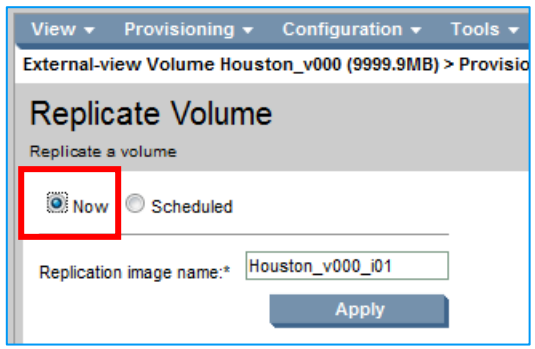
- This establishes the replication set but does not start the replication process
- After clicking 'OK' you will be placed at the screen to replicate the volume



SCHEDULED REPLICATION OPTIONS: REPLICATE 'NOW' OR 'SCHEDULED'



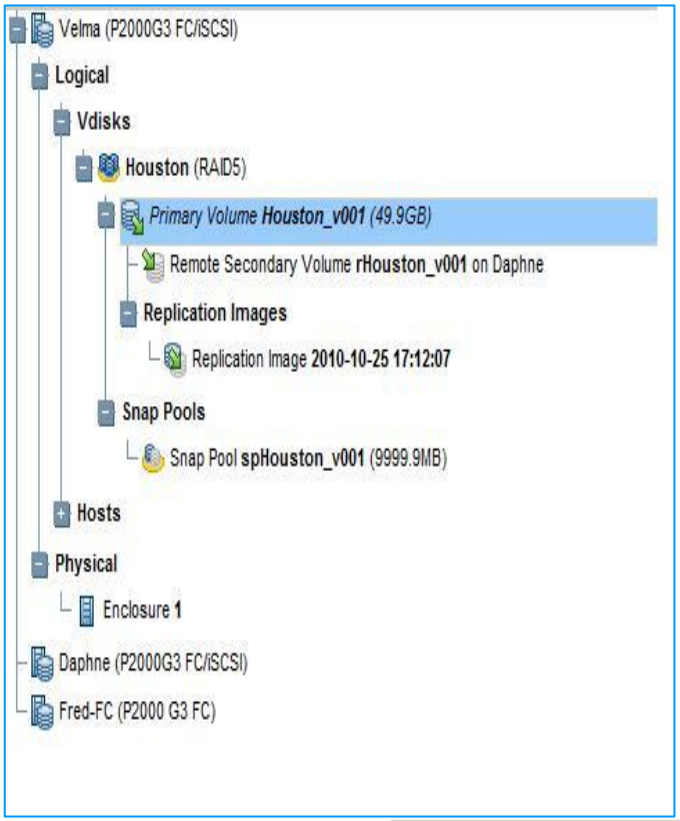
- Scheduled replications have many options
  - For details click the "?" icon



- Non-scheduled replications "Now" are immediate
  - Creates a replication when the Apply button is clicked. This replication must be managed manually

TIP – keep your schedules simple

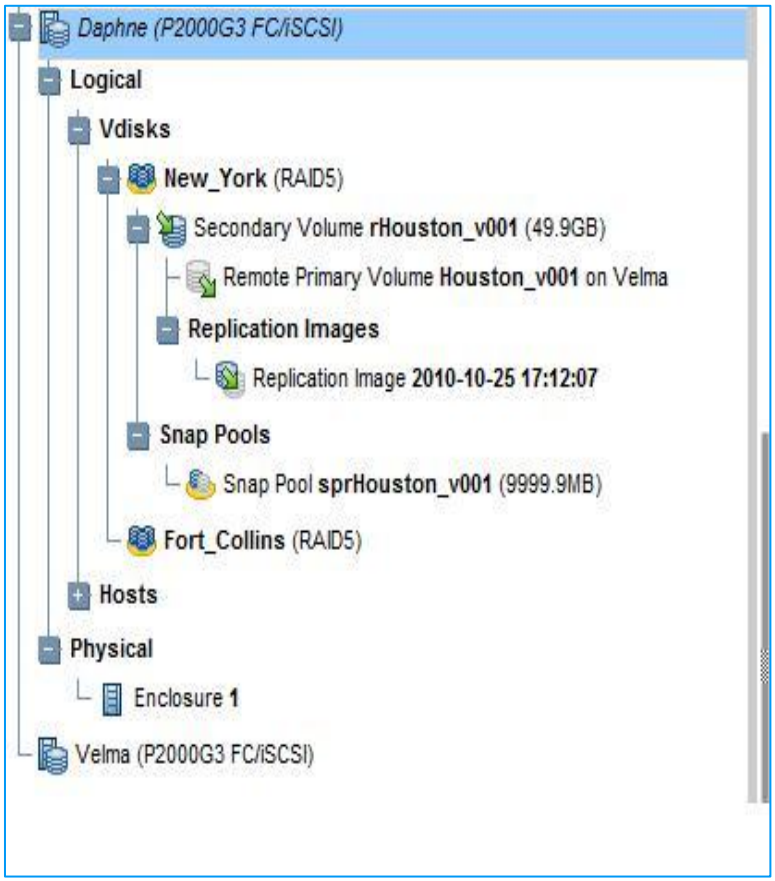
SYSTEM VIEW WITH REPLICATION LOCAL SITE:



Name	Definition
Primary Volume <volume name>	The original "Volume"
Remote Secondary Volume <remote volume name>	View of the remote volume on the local site – note the volume name will start with 'r' and it is residing at remote system
Replication Images	Tree branch showing *local* site replications
Replication Image <creation date/time>	Subcomponents/Nodes of replication images (snapshots) branch showing individual *local* site replications
Snap Pool <name>	An internal volume, which cannot be host mapped, used to store data associated with replication snapshot at local site.

- As replications are initiated replication images will appear under the volume to which they belong
- None of the replicated images will appear on a server until they are exported to a snapshot and mounted

SYSTEM VIEW WITH REPLICATION: REMOTE SITE



Name	Definition
Secondary Volume <remote volume name>	Holds a replica of the original "Volume". This volume is NOT mountable – note the volume name will start with 'r'
Remote Primary Volume <volume name>	The original "Volume" represented on the remote site, resides on the local site
Replication Images	Tree branch containing *remote* site's completed remote replications
Replication Image <creation date/time>	Subcomponents/Nodes of *remote* sites' replication images (snapshot) branch showing individual *remote* site completed replications
Snap Pool <name>	An internal volume, which cannot be host mapped, used to store data associated with replication snapshot at remote site.

- As replications are initiated replication images will appear under the volume to which they belong
- None of the replicated images will appear on a server until they are exported to a snapshot and mounted

INITIAL REPLICATION

- The initial replication between a primary and secondary volume requires that a full data copy occur between the two volumes
  - What this means is that an initial replication will copy every block on the volume
  - This can take a significant amount of time depending on the amount of data and the link between the local and remote sites
- Once the copy is completed, the first replication image (snapshot) is taken on the remote volume, resulting in a "replication sync point"
  - This replication sync point indicates the replication image (snapshot) on the local site and the remote volume are identical

TIP: To help manage the initial replication you can perform a Physical Media Transfer

PHYSICAL MEDIA TRANSFER

- A physical media transfer is a process by which you perform a local replication of the volume(s) to be transferred
  - This must be done to a different set of disks(make sure secondary volume resides on a different vdisk).
  - Once the replication is complete, perform “detach” operation on secondary volume.
  - Once “detach” is completed do “stop” operation on the vdisk which has the secondary volume
  - Move the physical disks to the remote site and insert disks to the remote system
  - Perform “start” operation on the vdisk, followed by “reattach” operation on the secondary volume.
- Manual data transfer steps
  - Detaching a replication volume
    - Used to physically remove a replicated volume from the local system.
    - Must be performed prior to doing “stop” operation on the vdisk
    - Detached volume remains part of the replication set but is not updated
    - If you intend to move the disks' drive enclosure, it should be at the end of the chain of connected enclosures.
    - Before removing drive enclosure from the system, shut down or power off the enclosure
    - Ensure that the Detach Replication task completed successfully
    - After the drive enclosure is powered off there will be unwritable cache data in the drive enclosure
  - Reattaching a replication volume
    - Do “start” operation on the vdisk.
    - Now “reattach” a replication volume that has been physically moved from another system into this system. After the volume is reattached, the replication set can resume replication operations.

TIP => Best practice is to power down the enclosure or shutdown the controllers before inserting the disks prior to reattaching the volume. Otherwise you may wind up with “leftover” disks and the vdisk would need to be reconstructed.

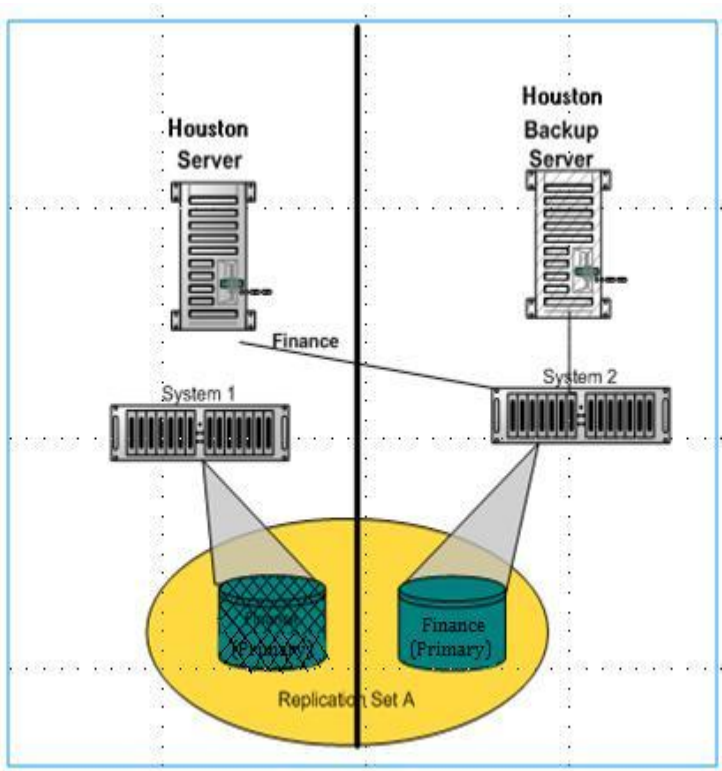

RECOVERY
OPTIONS

RECOVERY OPERATIONS

- Now that we have created a replication, let's look at recovery operations/options in the case of disaster or an accident
- We'll examine
  - How to bring up a recovery site
  - How to bring the local site up-to-date

DISASTER RECOVERY: NODE RELOCATION

- Remote Snap has the ability to bring up a disaster recovery site
  - To bring up a remote site the secondary volume must be converted to a Primary Volume
    - Rollback to a snapshot on the remote site – this will keep track of any changes that happen on the remote site
    - By default the volume syncs to the latest replication snapshot
    - Any data that has not been replicated is lost
  - New Primary Volume (on the remote site) can be mapped to a LUN and used just as the original volume was used.



HOW TO BRING UP A RECOVERY SITE

- Converting a secondary volume to primary volume can be done via SMU or CLI
- Now you can mount the volume "rHouston_v001" to the host(this volume is now the primary volume)
- To fail back convert the primary volume to a secondary volume

TIP: Since secondary volumes cannot be mapped, un-map the primary volume before converting it to a secondary volume

CONVERTING A SECONDARY VOLUME TO PRIMARY VOLUME USING CLI

- Through CLI, change the secondary volume to a primary volume
  - set replication-primary-volume volume rHouston_v001 primary-volume rHouston_v001
  - *NOTE: (*rHouston_v001 *is your secondary volume and this command must be run for your remote system, after this command is run successfully* rHouston_v001 will become primary volume*)*
- Now you can mount this volume (rHouston_v001)

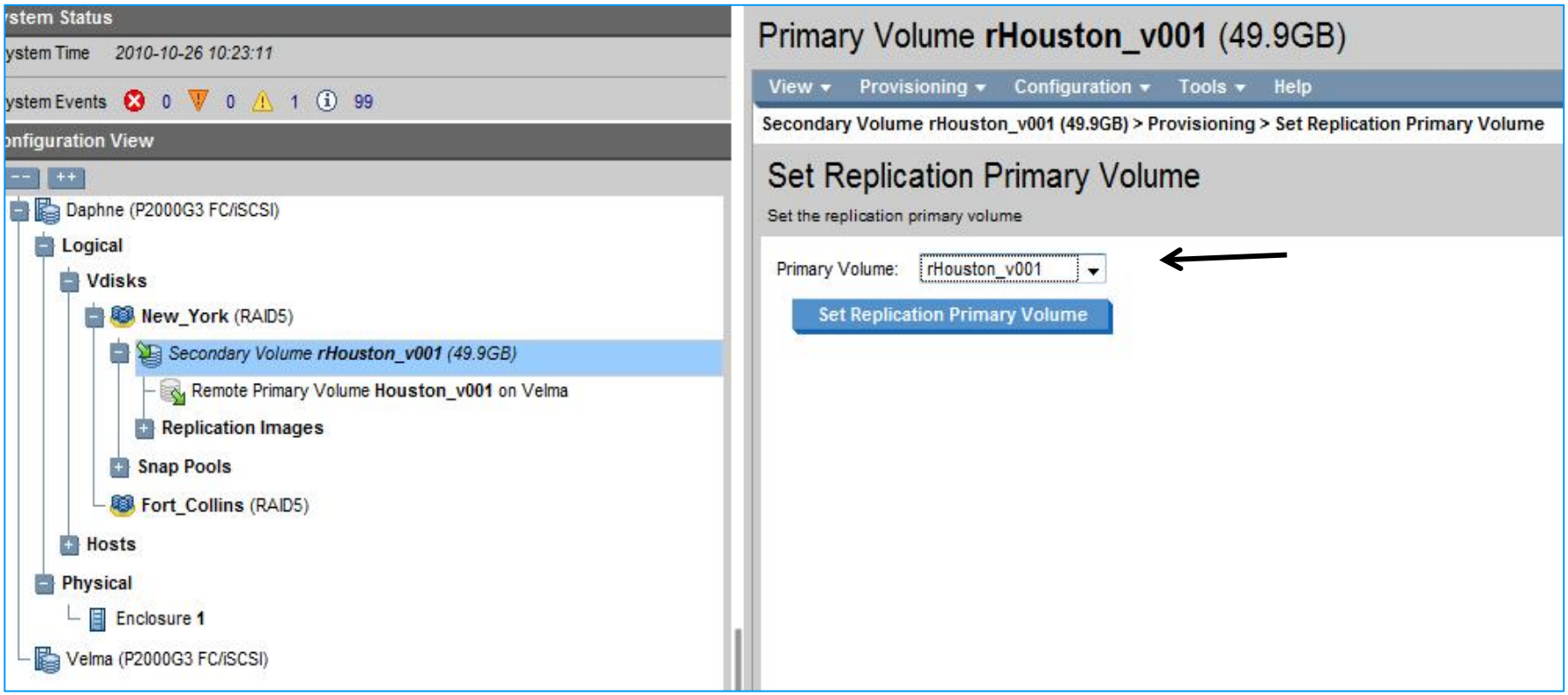
{TIP: Since the volume was previously a secondary volume , it had no mapping. You'll need to map it after converting it to primary volume so that hosts can mount it.}

- Application/s can now be switched to rHouston_v001 – this is our new primary volume at the remote system

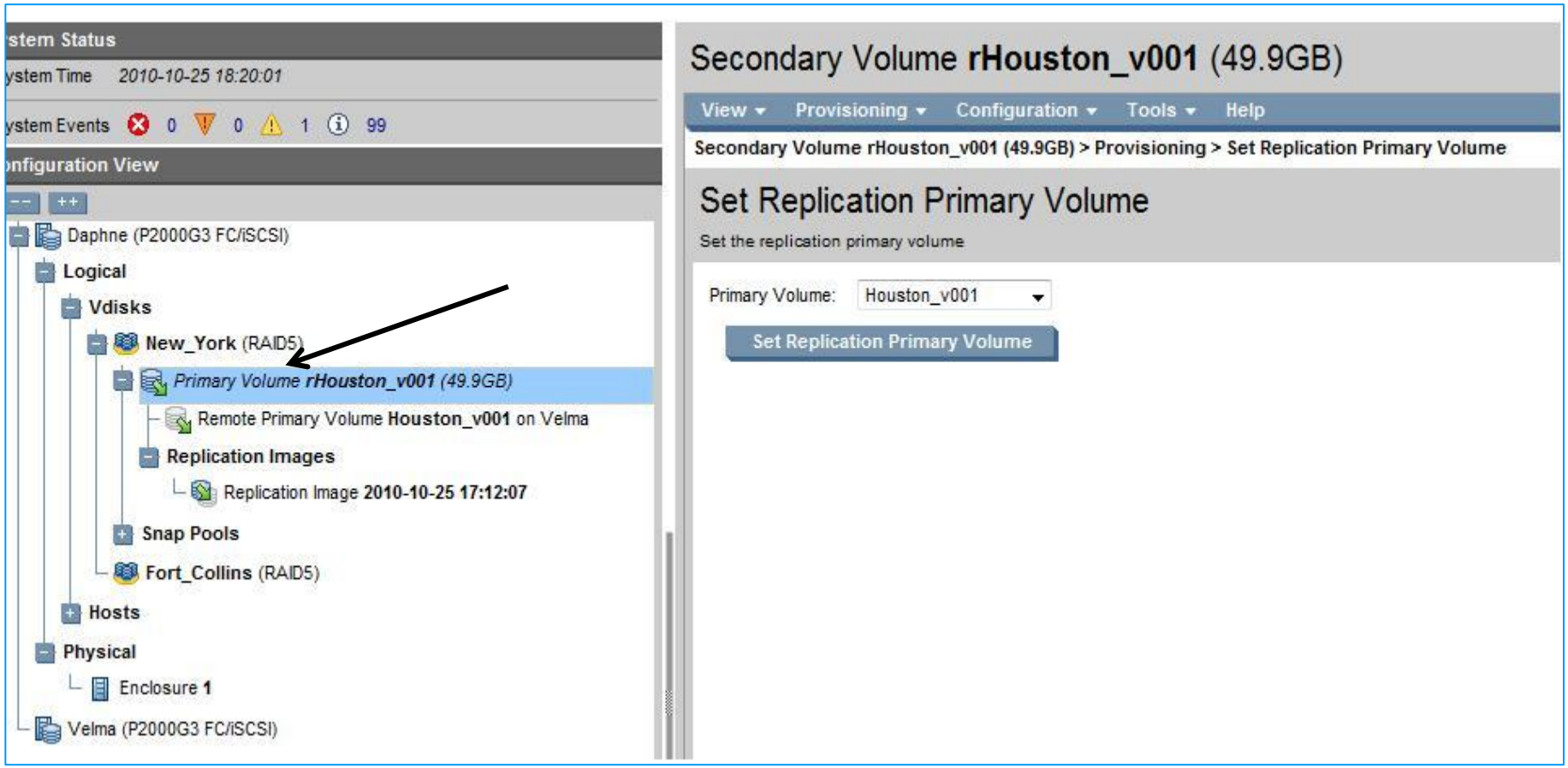
```
# set replication-primary-volume volume rHouston_v001 primary-volume rHouston_v001
Info: Setting the primary volume of the replication set. This may take a couple of minutes...
Info: Started setting the primary volume of the replication set. (rHouston_v001)

Info: Successfully set primary volume of replication set rHouston_v001 to rHouston_v001. (rHouston_v001)

Success: Command completed successfully.
```

CONVERTING A SECONDARY VOLUME TO PRIMARY VOLUME USING SMU

- Using SMU, change the secondary volume to primary volume
  NOTE: (in the example below, rHouston_v001 is our secondary volume)
- Now you can mount this volume (rHouston_v000)
- Application/s can now be switched to rHouston_v000 – this is our new primary volume at the remote system



Secondary volume has been converted to Primary Volume



DISASTER RECOVERY FAILBACK

- Once the catastrophic failure has been addressed, if the user wishes to move the disaster volume back to the original volume, a series of steps will need to be followed
  1. Make the original primary volume (be sure to Un map it first) a secondary volume
     - As a secondary volume it can receive data from the current primary volume
  2. Replicate any data written to the remote disaster volume to the original primary volume (now set as a secondary volume)
     - Can be performed in a single replication or in multiple replications
     - Host access to the disaster volume (currently primary volume residing on remote system) should be halted. This is to ensure that all data has been transferred properly
  3. Once data has been replicated back to local site, convert the secondary volume(original primary volume at local site) back to primary volume and convert the disaster volume(primary volume at remote site) to secondary volume.
  4. Move the applications to the original primary volume at local site.
  5. Re-establish the replication set to the remote site.

ADDITIONAL TERMINOLOGY

- Replication Sync Points
  - When a snapshot is replicated from the local to remote sites, the snapshot becomes a replication sync point
  - The sync point is a set of data that is represented on both local and remote locations
  - Used to determine the delta data from that sync point to a later snapshot
  - Note that a snapshot is considered a sync point only when the same point-in-time is represented on both locations
- Queued Replication Snapshots
  - New replications can be initiated even while other replication snapshots are in the process of being replicated
  - Allows user to create replications at discreet intervals even while other replications are ongoing
  - A replication initiated while another to the same remote volume is ongoing will be queued, and will not actually begin to transfer data until the current replication completes

OTHER TASKS YOU CAN PERFORM PART 1

- Replicate a snapshot
  - Provides the capability to replicate an individual snapshot to the associated replication volume
  - Only snapshot preserved data is replicated; snapshot modified data is not replicated.
- Removing replication from a volume
  - If you no longer want to replicate a volume, you can dissolve its replication set. When a replication set is dissolved:
    - A rollback is automatically performed to the latest available snapshot on the replication destination volume to ensure that data is consistent.
    - Any replication images associated with the replication volumes are converted to standard snapshots. Snapshots are converted regardless of the number of snapshots allowed by the system's license.
    - There is no longer a relationship between the volumes or their snapshots on the two systems

OTHER TASKS YOU CAN PERFORM PART 2

- Suspending replication
  - You can suspend the current replication operation for a selected volume
  - You must perform this task on the remote system that owns the replicated volume
  - Once suspended, the replication must be resumed or aborted
- Resuming replication
  - You can resume a suspended replication operation to resume normal operation
  - You must perform this task on the system that owns the replication destination volume.
- Aborting replication
  - You can abort the current replication operation for the selected replication volume. The current replication may be running or suspended.
  - You must perform this task on the system that owns the replication destination volume.

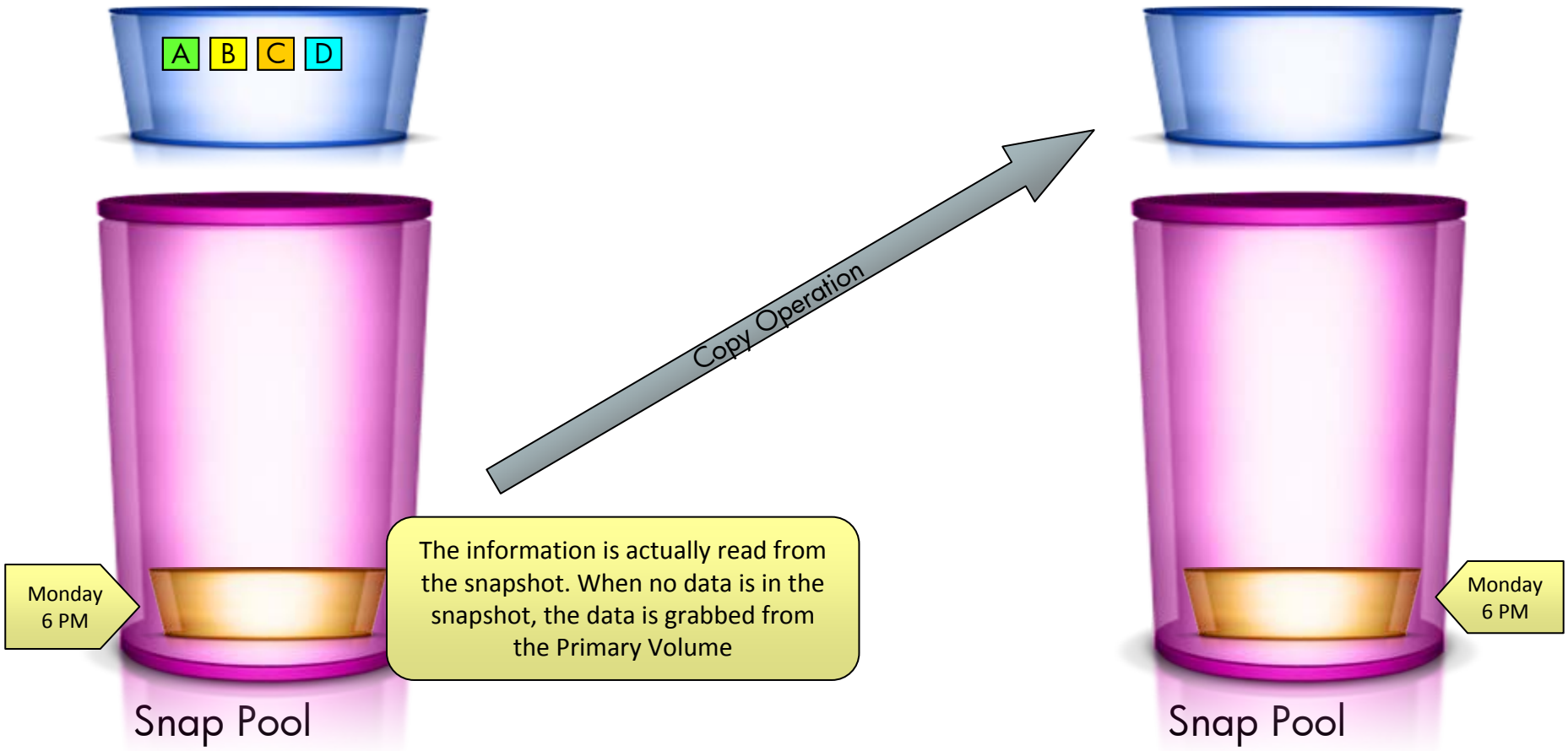
OTHER TASKS YOU CAN PERFORM PART 3

- Exporting a replication image to a snapshot
  - You can export a replication image to a standard snapshot. For example, you could export a replication image from a secondary volume for use on the remote system.
  - The exported snapshot can be used like any other standard snapshot, including being mapped or deleted. Changes to this snapshot will not affect the replication image.
  - NOTE: The task will not succeed if the resulting snapshot would exceed license limits.


REPLICATION:
UNDER THE HOOD

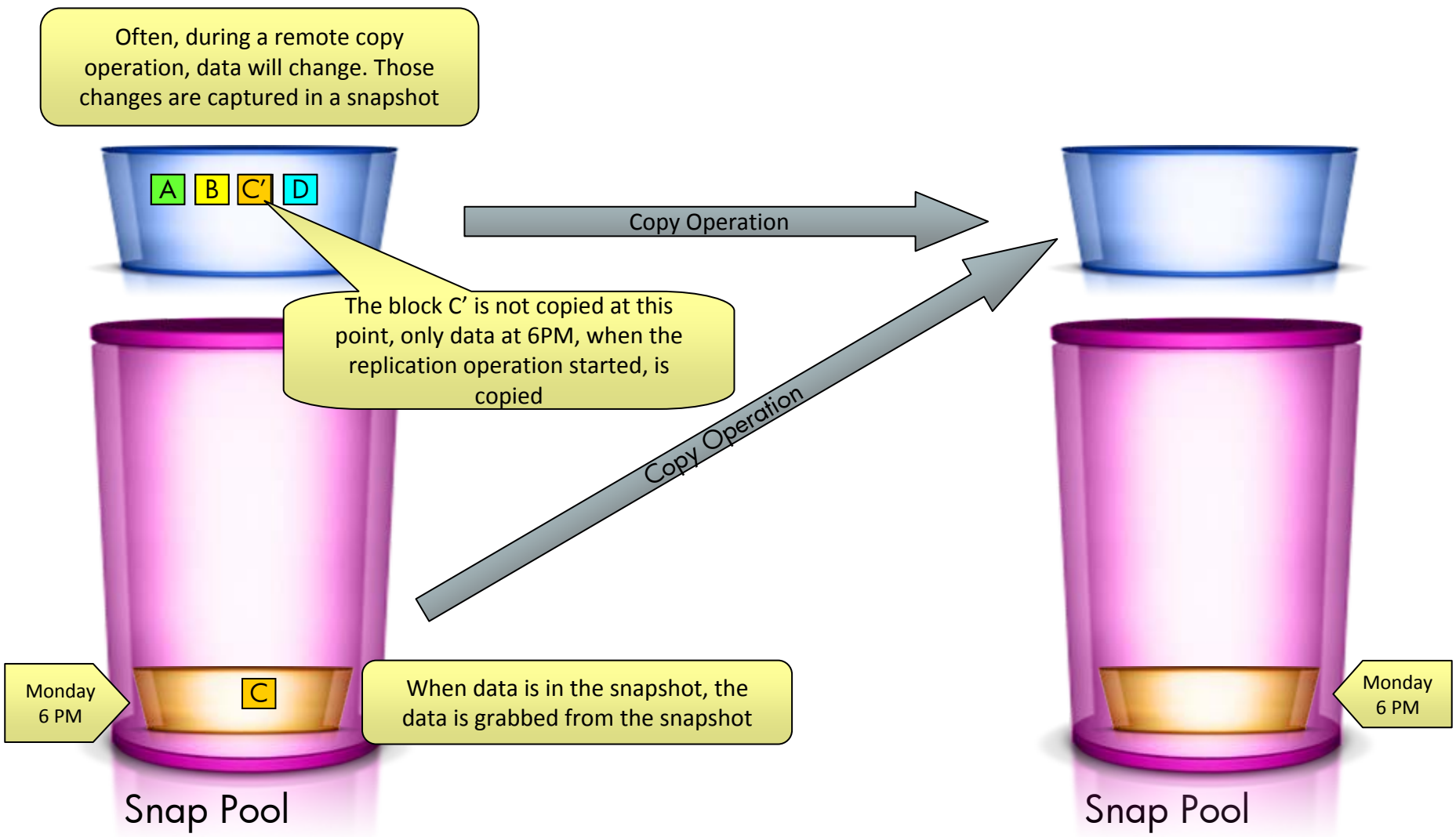
UNDER THE HOOD: REPLICATION INITIAL COPY

When the remote copy operation is initiated, a snapshot is created to capture the current state of the Primary Volume

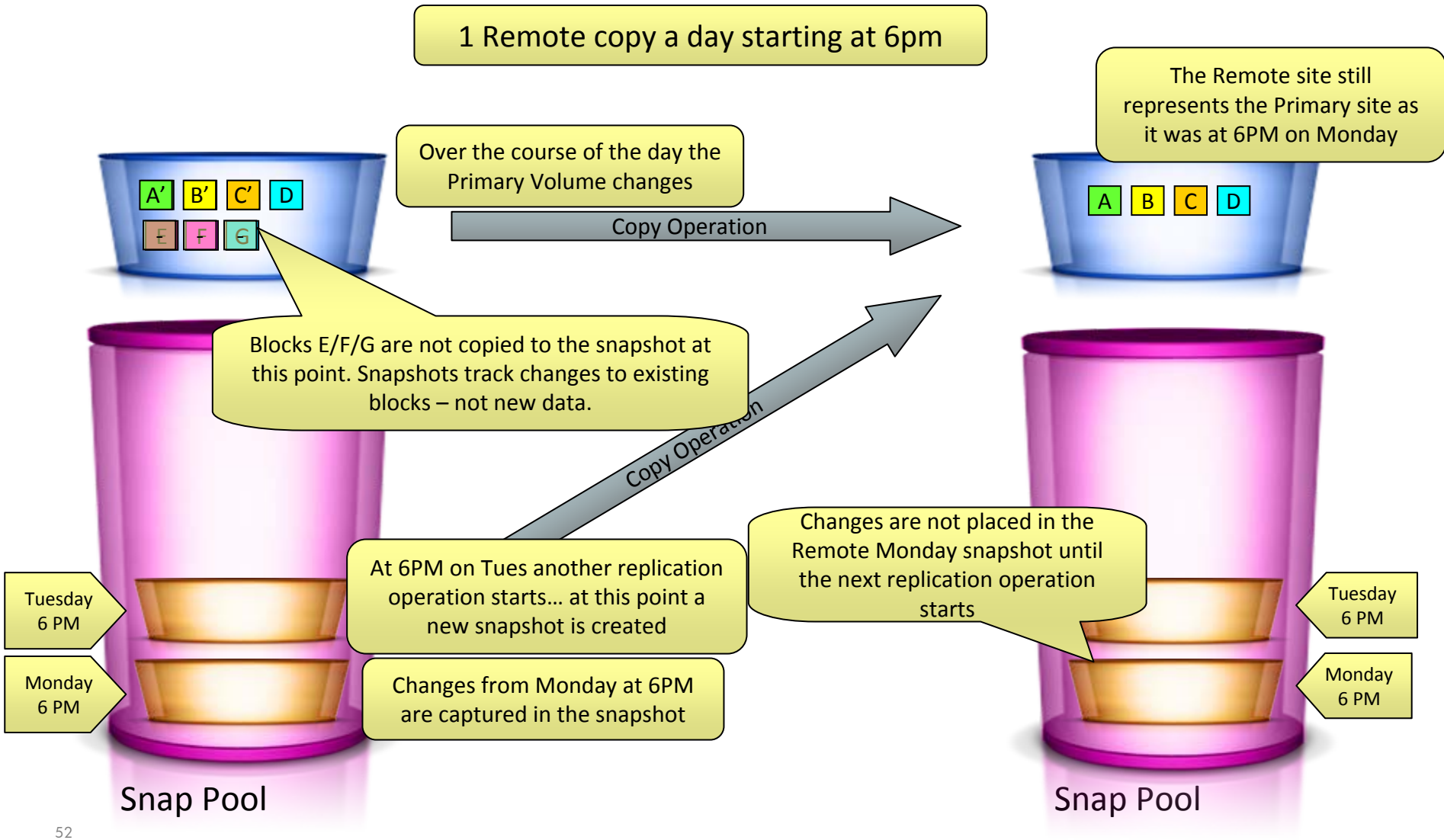


The information is actually read from the snapshot. When no data is in the snapshot, the data is grabbed from the Primary Volume

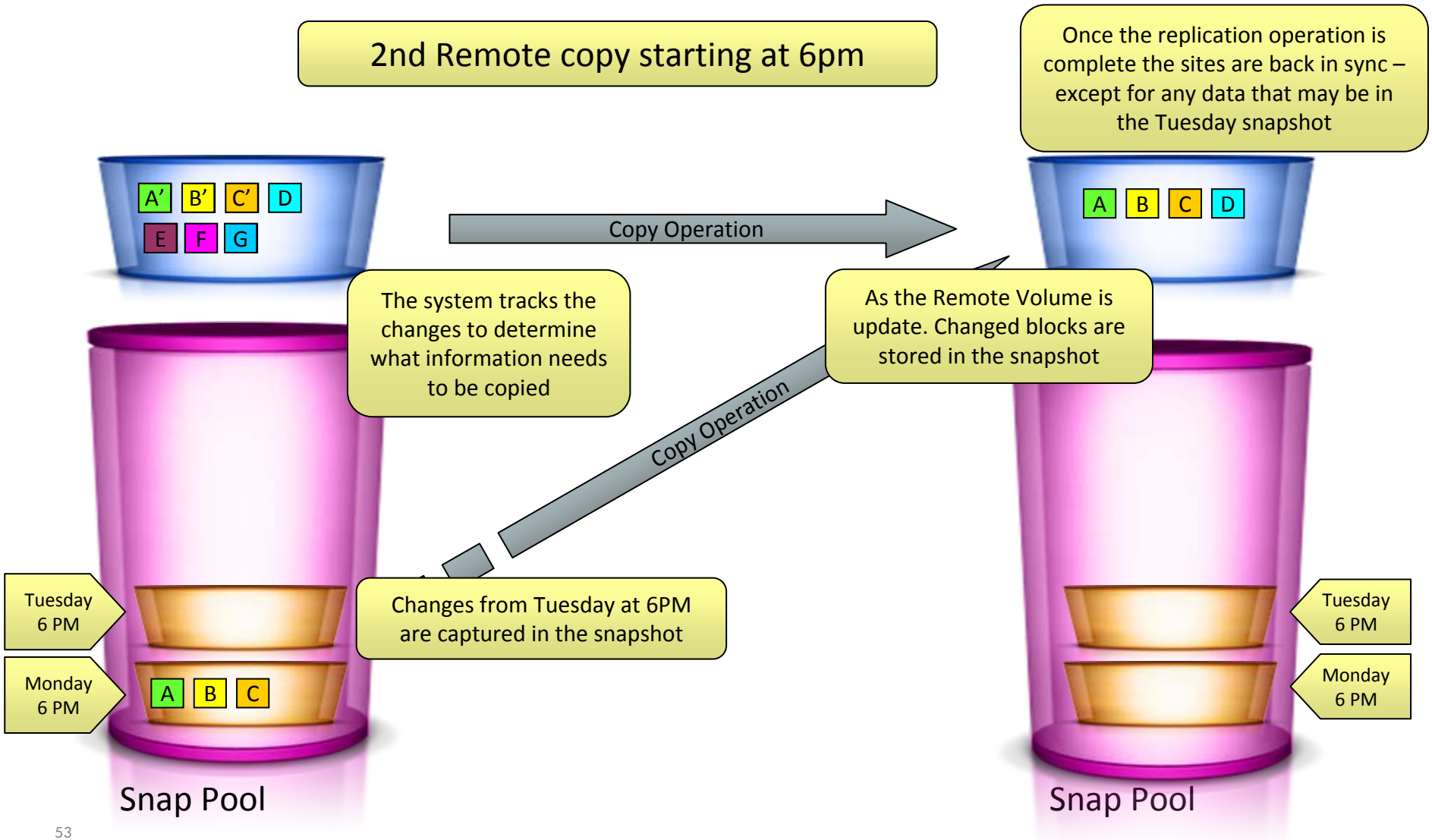
UNDER THE HOOD
INITIAL COPY – BLOCKS CHANGING



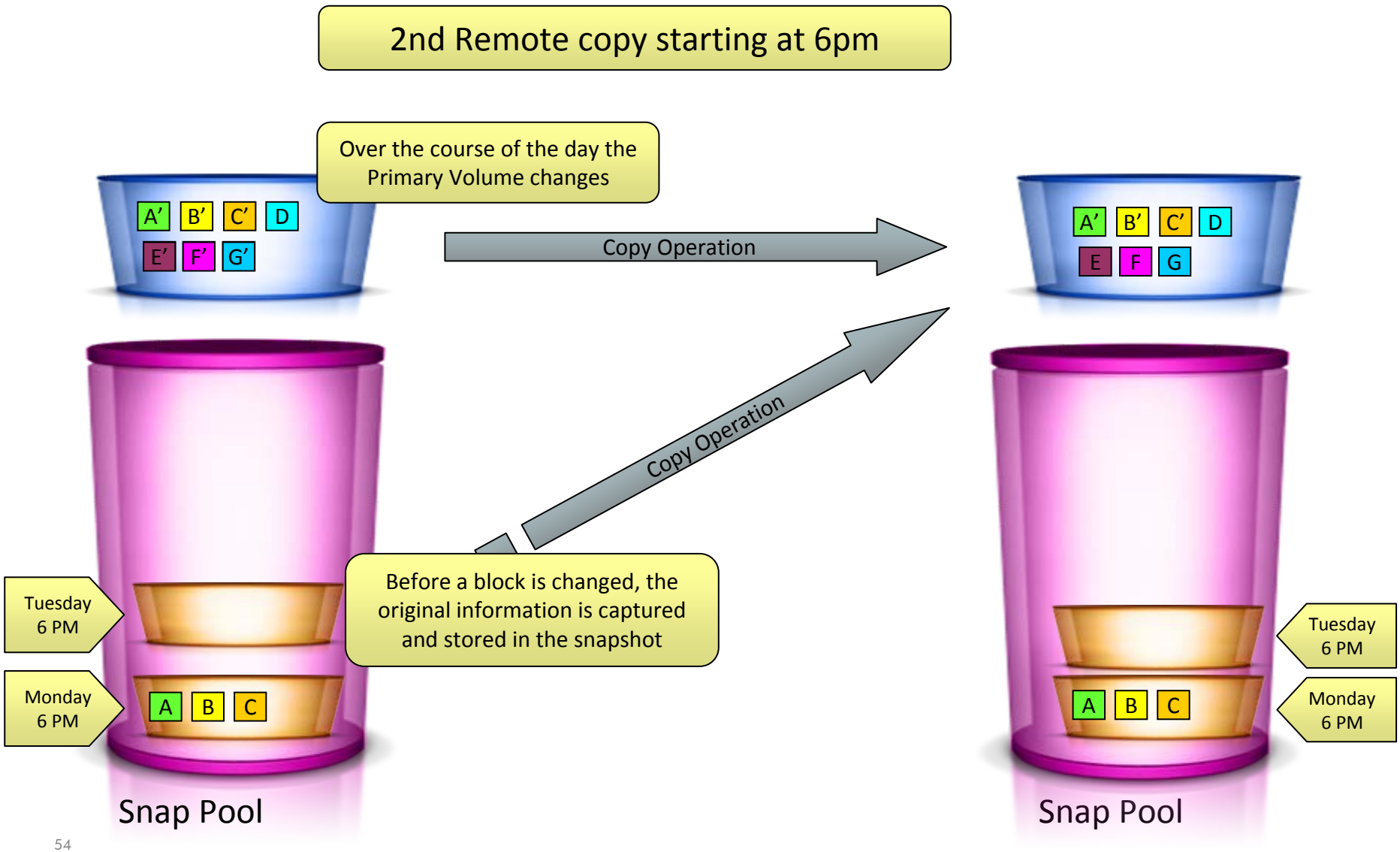
UNDER THE HOOD: SECOND REPLICATION PART 1



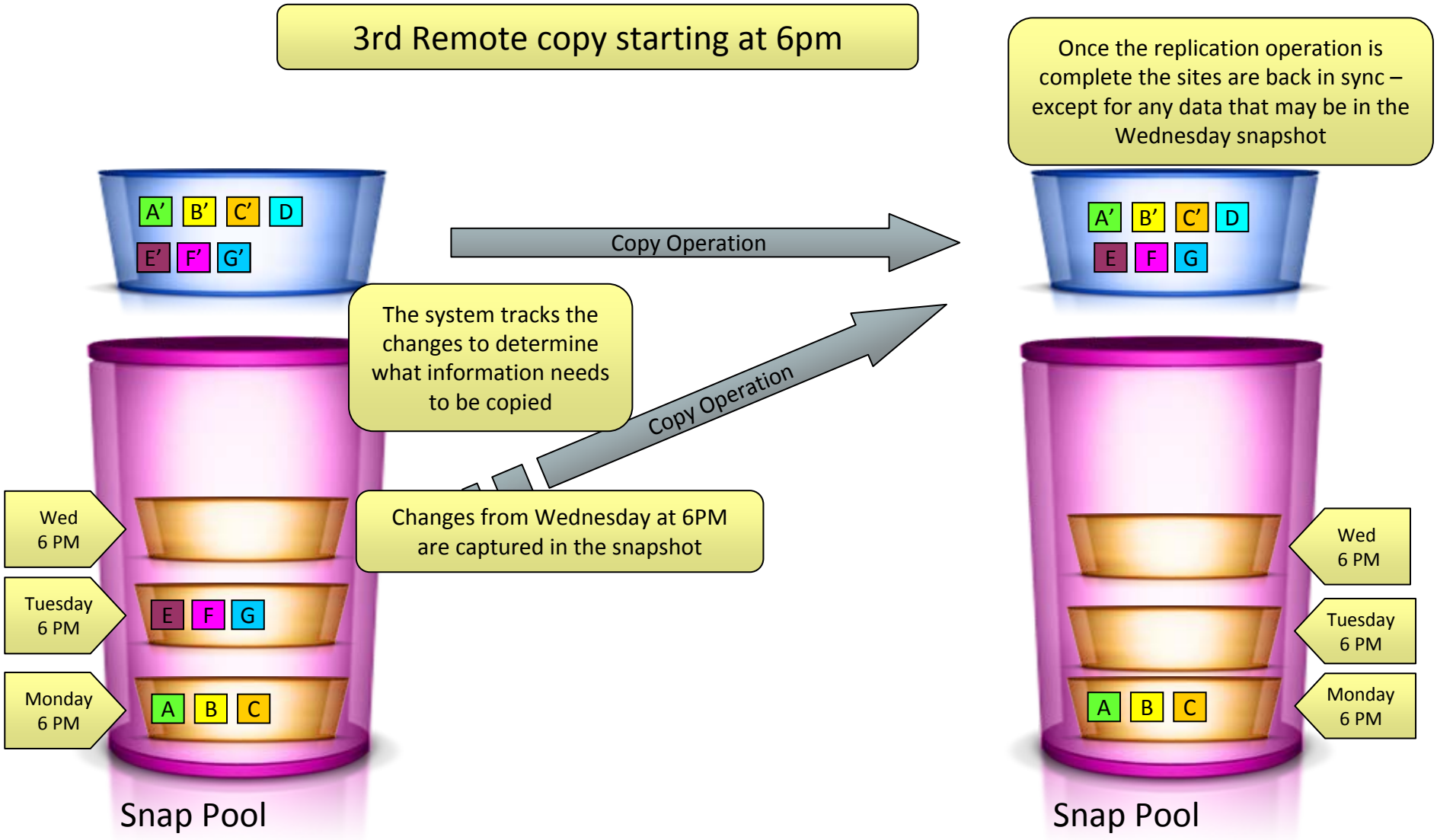
UNDER THE HOOD: SECOND REPLICATION PART 2



UNDER THE HOOD: SECOND REPLICATION PART 3



UNDER THE HOOD: THIRD REPLICATION



For more information, helpful tools and resources please visit the following sites:

Web pages:

HP P2000 G3 Remote Snap

www.hp.com/go/RemoteSnap

HP P2000 G3 FC/iSCSI Combo Array

www.hp.com/go/P2000

Whitepapers:

Upgrading the HP StorageWorks MSA2000 G1 to the P2000 G3 MSA

http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA0-8284ENW.pdf

Upgrading the HP StorageWorks MSA2000 G2 to the P2000 G3 MSA

http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA0-8304ENW.pdf

Best Practices for HP MSA2000 G1, G2 and P2000 G3

http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA0-8279ENW.pdf

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