

Commvault® IntelliSnap® Technology FlashArray Integration for Oracle® Database

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Executive Summary

Enterprises today increasingly turn to array-based snapshots to augment or replace legacy data protection solutions that have been overwhelmed by exponential data growth. Management and automation are an integral parts of being able to effectively leverage array-based snapshots. Efficient and integrated use of array-based snapshots are key requirements in protecting enterprise applications.

Pure Storage FlashArray snapshots form an intrinsic part of the way the Purity Operating Environment reduces complexity and maintains efficiency. FlashArray snapshots delivers superior space efficiency, high scalability, and unmatched simplicity in management. FlashArray snapshots are always thin provisioned. Space is not preallocated during snapshot creation. As new or changed data is written to the source volume, new capacity is allocated to the newly-written or overwritten blocks while unchanged blocks are shared between snapshots and volumes. Additionally, the Purity Operating Environment data structures allow snapshots to preserve the granular data reduction efficiencies of volumes through global deduplication and compression, thus volume snapshots require minimal physical capacity on flash drives. Since FlashArray snapshots are entirely metadata constructs, they can be created from a volume in a matter of milliseconds regardless of the allocated size or used space of the source volume.

Commvault® adds orchestration and functional value on top of the Pure Storage FlashRecover Snapshot technology with the IntelliSnap® Technology snapshot management feature set. IntelliSnap technology streamlines and simplifies snapshot management by centralizing snapshot management across one or many storage arrays; automating object, application and database recovery; and linking snapshots to backup processes. The tight coupling of managed snapshots along side of data protection and recovery operations enables Commvault software to provide a complete view into data across applications, devices, operating systems and locations, cutting administrative overhead and improving access, availability and IT efficiency.

Goals and Objectives

This paper provides an overview of the Commvault IntelliSnap technology integration with Pure Storage FlashArray to protect Oracle databases and deliver superior recovery point and time objectives. This includes initial configuration of the FlashArray object in Commvault including all pre-requisites and a walkthrough of various recovery option use cases and their workflows.

In-depth instructions on the configuration, setup and use of the IntelliSnap software is beyond the scope of this paper. For additional details, please refer to <u>Commvault documentation</u>. Performance testing of backup and recovery functions is out of scope this this document.

Audience

This paper is written for database, storage and backup administrators interested in IntelliSnap technology integration with the Pure Storage FlashArray snapshot technology to deliver superior recovery point and time objectives for Oracle databases served by Pure Storage FlashArray. Familiarity with Oracle databases, Pure Storage and Commvault IntelliSnap technology is recommended.



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Pure Storage, Inc. 650 Castro Street, Mountain View, CA 94041 http://www.purestorage.com



Pure Storage Overview

Who knew that moving to all-flash storage could help reduce the cost of IT? Pure Storage FlashArray makes server and workload investments more productive, while also lowering storage spend. With Pure Storage FlashArray,



organizations can dramatically reduce the complexity of storage to make IT more agile and efficient, accelerating your journey to the cloud.

Pure Storage FlashArray's performance can also make your business smarter by unleashing the power of real-time analytics, driving customer loyalty, and creating new, innovative customer experiences that simply weren't possible with disk. All by Transforming Your Storage with Pure Storage FlashArray.

FlashArray//m, the latest product line from Pure Storage, enables you to transform your data center, cloud, or entire business with an

affordable all-flash array capable of consolidating and accelerating all your key applications.

Mini Size—Reduce power, space and complexity by 90%

- 3U base chassis with 15-120+ TBs usable
- ~1kW of power
- 6 cables

Mighty Performance-Transform your datacenter, cloud, or entire business

- Up to 300,000 32K IOPS
- Up to 9 GB/s bandwidth
- <1ms average latency

Modular Scale—Scale FlashArray//m inside and outside of the chassis for generations

- Expandable to $\sim \frac{1}{2}$ PB usable via expansion shelves
- Upgrade controllers and drives to expand performance and/or capacity

Meaningful Simplicity-Appliance-like deployment with worry-free operations

- Plug-and-go deployment that takes minutes, not days
- Non-disruptive upgrades and hot-swap everything
- Less parts = more reliability

The FlashArray//m expands upon the FlashArray's modular, stateless architecture, designed to enable expandability and upgradability for generations. The FlashArray//m leverages a chassis-based design with



customizable modules, enabling both capacity and performance to be independently improved over time with advances in compute and flash, to meet your business' needs today and tomorrow.

The Pure Storage FlashArray is ideal for:

Accelerating Databases and Applications—Speed transactions by 10x with consistent low latency, enable online data analytics across wide datasets, and mix production, analytics, dev/test, and backup workloads without fear.

Virtualizing and Consolidating Workloads—Easily accommodate the most IO-hungry Tier 1 workloads, increase consolidation rates (thereby reducing servers), simplify VI administration, and accelerate common administrative tasks.

Delivering the Ultimate Virtual Desktop Experience—Support demanding users with better performance than physical desktops, scale without disruption from pilot to >1000's of users, and experience all-flash performance for under \$100/desktop.

Protecting and Recovering Vital Data Assets—Provide an always-on protection for business-critical data, maintain performance even under failure conditions, and recover instantly with FlashRecover.

Pure Storage FlashArray sets the benchmark for all-flash enterprise storage arrays. It delivers:

Consistent Performance—FlashArray delivers consistent <1ms average latency. Performance is optimized for the real-world applications workloads that are dominated by I/O sizes of 32K or larger vs. 4K/8K hero performance benchmarks. Full performance is maintained even under failures/updates.

Less Cost than Disk—Inline de-duplication and compression deliver 5 - 10x space savings across a broad set of I/O workloads including Databases, Virtual Machines and Virtual Desktop Infrastructure.

Mission-Critical Resiliency—FlashArray delivers >99.999% proven availability, as measured across the Pure Storage installed base and does so with non-disruptive everything without performance impact.

Disaster Recovery Built-In—FlashArray offers native, fully integrated, data reduction-optimized backup and disaster recovery at no additional cost. Setup disaster recovery with policy-based automation within minutes. And, recover instantly from local, space-efficient snapshots or remote replicas.

Simplicity Built-In—FlashArray offers game-changing management simplicity that makes storage installation, configuration, provisioning and migration a snap. No more managing performance, RAID, tiers or caching. Achieve optimal application performance without any tuning at any layer. Manage the FlashArray the way you like it: Web-based GUI, CLI, VMware vCenter, REST API, Windows PowerShell, Python or OpenStack.



//m70 Up to 400 TBs in 11U 300,000 32K IOPS



//m20 15 – 120 TBs in 3U 150,000 32K IOPS



FlashArray//m Specifications

	//m20	//m50	//m70
Capacity	 Up to 120+ TBs effective capacity* 5 - 40TBs raw capacity (base chassis) 	 Up to 250+ TBs effective capacity* 30 - 88TBs raw capacity (w/shelves) 	 Up to 400+ TBs effective capacity* 44 – 136TBs raw capacity (w/shelves)
Performance	 Up to 150,000 32K IOPS** <1ms average latency Up to 5 GB/s bandwidth 	 Up to 220,000 32K IOPS** <1ms average latency Up to 7 GB/s bandwidth 	 Up to 300,000 32K IOPS** <1ms average latency Up to 9 GB/s bandwidth
Connectivity	 8 Gb/s Fibre Channel 10 Gb/s Ethernet iSCSI Management and Replication ports 	 16 Gb/s Fibre Channel 10 Gb/s Ethernet iSCSI Management and Replication ports 	 16 Gb/s Fibre Channel 10 Gb/s Ethernet iSCSI Management and Replication ports
Physical	 3U 742 Watts (nominal draw) 110 lbs. (49.9 kg) fully loaded 5.12" x 18.94" x 29.72" FlashArray//m chassis 	 3U – 7U 1007 - 1447 Watts (nominal draw) 110 lbs. (49.9 kg) fully loaded + 44 lbs. per expansion shelf 5.12" x 18.94" x 29.72" FlashArray//m chassis 	 5U - 11U 1439 - 2099 Watts (nominal draw) 110 lbs. (49.9 kg) fully loaded + 44 lbs. per expansion shelf 5.12" x 18.94" x 29.72" FlashArray//m chassis

//m50 Up to 250 TBs in 7U 220,000 32K IOPS

* Effective capacity assumes HA, RAID, and metadata overhead, GB-to-GiB conversion, and includes the benefit of data reduction with always-on inline deduplication, compression, and pattern removal. Average data reduction is calculated at 5-to-1, below the global average of the FlashArray user base.

** Why does Pure Storage quote 32K, not 4K IOPS? The industry commonly markets 4K IOPS, but real-world environments are dominated by IO sizes of 32K or larger. FlashArray//m adapts automatically to 512B-32KB IO for superior performance, scalability, and data reduction.

Table 1. Pure Storage FlashArray//m Series.

Purity Operating Environment

Purity implements advanced data reduction, storage management and flash management features, and all features of Purity are included in the base cost of the FlashArray//m.

Storage Software Built for Flash—The FlashCare technology virtualizes the entire pool of flash within the FlashArray, and allows Purity to both extend the life and ensure the maximum performance of consumer- grade MLC flash.

Granular and Adaptive—Purity Core is based upon a 512-byte variable block size metadata layer. This fine-grain metadata enables all of Purity's data and flash management services to operate at the highest efficiency.



Best Data Reduction Available—FlashReduce implements five forms of inline and post-process data reduction to offer the most complete data reduction in the industry. Data reduction operates at a 512-byte aligned variable block size, to enable effective reduction across a wide range of mixed workloads without tuning.

Highly Available and Resilient—FlashProtect implements high availability, dual-parity RAID-3D, non- disruptive upgrades, and encryption, all of which are designed to deliver full performance to the FlashArray during any failure or maintenance event.

Backup and Disaster Recovery Built-In—FlashRecover combines space-saving snapshots, replication, and protection policies into an end-to-end data protection and recovery solution that protects data against loss locally and globally. All FlashProtect services are fully-integrated in the FlashArray and leverage the native data reduction capabilities.



Pure1 Manage—By combining local web-based management with cloud-based monitoring, Pure1 Manage allows you to manage your FlashArray wherever you are – with just a web browser.

Pure1 Connect—A rich set of APIs, plugin-is, application connectors, and automation toolkits enable you to connect FlashArray//m to all your data center and cloud monitoring, management, and orchestration tools.

Pure1 Support—FlashArray//m is constantly cloud- connected, enabling Pure Storage to deliver the most proactive support experience possible. Highly trained staff combined with big data analytics help resolve problems before they start.

Pure1 Collaborate—Extend your development and support experience online, leveraging the Pure1 Collaborate community to get peer-based support, and to share tips, tricks, and scripts.

Experience Evergreen Storage



Tired of the 3-5 year array replacement merry-go-round? The move to FlashArray//m can be your last data migration. Purchase and deploy storage once and once only – then expand capacity and performance incrementally in conjunction with your business needs and without downtime. Pure Storage's vision for Evergreen Storage is delivered by a combination of the FlashArray's stateless, modular architecture and the ForeverFlash business model, enabling you to extend the lifecycle of

storage from 3-5 years to a decade or more.

Commvault[®] IntelliSnap[®] Technology Overview

Commvault IntelliSnap technology integrates with native storage array snapshot engines to provide consistent point-in-time recovery copies for large data sets and enterprise applications. IntelliSnap technology quiesces applications or file systems, triggers the storage array-based snapshot, and returns the system to a fully operational state within minutes. By incorporating and linking snapshots with backup and archive operations, Commvault software makes more online and offline copies available for recovery while reducing data protection's impact on production systems. IntelliSnap technology harnesses the power of array-based snapshots to accelerate backup and recovery.



IntelliSnap technology integrates with array-specific APIs in order to execute snapshot management functions. These functions include configure, create, retire, mount, mine, dismount, monitor, retain, revert and restore — and are managed and executed in the same way regardless of hardware platform. Thus, IntelliSnap technology can consolidate and standardize snapshot management and snapshot-based recovery across nearly all-leading storage platforms.

IntelliSnap technology enables a modernized approach to data protection by merging storage system hardware snapshots directly into the data protection process. IntelliSnap technology integrates tightly with both host applications and with the system software specific to each hardware array. As the central orchestration point between the two, the IntelliSnap technology feature drives snapshot creation, indexes the contents and can then push application-consistent and deduplicated backup, archive or DR copies to secondary storage, tape or cloud. IntelliSnap technology normalizes snapshot operations so they look the same and operate the same way regardless of application or storage platform. For longer-term retention copies, Commvault software offloads deduplication, backup and encryption to a separate (proxy) host to minimize impact to production systems. By automatically integrating application intelligence with hardware snapshots, Commvault software is able to reach through the application and file systems into the storage array, discover volume/disk configurations for the snapshot operations, and coordinate these operations with proper application awareness and log management, minimizing administrative configuration and eliminating any scripting requirements.

The Commvault snapshot menu enables granular retention options, such as hourly snapshots retained for a day or daily snapshots retained for a week. The snapshot menu is also enabled with an option to retain a set number of snapshots, which can help eliminate the days/cycles conversation with storage and application administrators. These indexing and retention changes help align storage snapshot retention with standard data protection operations, and are available for all applications and storage platforms. Smart use of IntelliSnap technology to manage native snapshots should ensure the creation of more recovery points for fast recovery without adding complexity.

Commvault Software Overview

The Commvault software platform is an enterprise level, integrated data and information management solution, built from the ground up on a single platform and unified code base. All functions share the same back-end technologies to deliver the unparalleled advantages and benefits of a truly holistic approach to protecting, managing, and accessing data. The platform contains modules to protect and archive, analyze, replicate, and search your data, which all shares a common set of back-end services and advanced capabilities, seamlessly interacting with one another. The Commvault platform addresses all aspects of data management in the enterprise, while providing infinite scalability and unprecedented control of data and information.



Figure 1. Commvault Data Platform.

Commvault IntelliSnap Technology and Oracle Database

IntelliSnap technology integration with Oracle (including RAC) allows you to protect large databases (even those in the extreme TB size range) within a few minutes. The Oracle iDataAgent (iDA) provides consistent backups by quiescing the database for a few seconds while taking the native array-based snapshot and forces a log switch. Along with data volume, it also identifies the archived redo log volume(s) and takes snapshot to preserve the logs for replay or point-in-time recovery.





- 1. Commvault[®] Agent requests database be quiesced for protection
- 2. Storage is automatically discovered to ensure changes are automatically tracked
- IntelliSnap software communicates with the storage array to take snapshot(s)
- Optionally snapshots can be mounted to a Proxy for further operations such as long term protection, or secondary workloads

Rapid recovery is available using an application-aware revert operation on the Pure Storage FlashArray. By keeping the recovery within the storage array there is no need to transfer blocks over the network and through a backup server. This provides far faster restores. In addition, many revert operations are delta-block based, meaning only the changed blocks need to be restored to return a volume to a previous state.

IntelliSnap technology integrated with Pure Storage enables the MyClone feature, which uses native array-based cloning function to create an application-aware copy of the source database. The copy can be used for secondary workloads like development, testing or reporting. The snapshot functionality of Pure Storage FlashReduce is instantaneous and consumes very minimal space for maintaining the metadata at the time of the snapshot creation.

Creating test/dev clones from the production environment instantly through IntelliSnap technology eliminates the need for manual, labor-intensive refreshes and scripts, significantly reducing overhead and accelerating test/dev operations.



System Requirements

The following requirements exist in order to use IntelliSnap Technology integration with the Pure Storage FlashArray:

- FlashArray 400 or FlashArray//m series
- Purity v4.1.1 (or higher)
- REST API: v1.4 (found in Purity v4.x and higher)
- Licensing:
 - Pure Storage arrays require no additional licensing for IntelliSnap software functionality
 - Commvault IntelliSnap technology requires licensing based on the data being snapped
- Protocol Support: Fibre Channel or iSCSI
- Commvault software version 10 service pack 12 or later

Pre-Requisites

The following requirements need to be completed before walking through the configuration steps and use cases presented in this document.

- 1. **Commvault CommServe server** The CommServe is the command and control center of the CommCell architecture. The CommServe server handles all activity between agents, and communicates with MediaAgents. It also contains the database that stores all the information pertinent to the Commcel component. Commvault CommServe server should be setup and configured before proceeding. We have setup the CommServe server on a Windows 2012 R2 virtual machine, configured the Linux clients and deployed the iDataAgent for Oracle on those clients that hosts the Oracle database.
- 2. **Oracle Database** An Oracle database needs to be installed and running for use in the various use cases discussed in this document. This paper uses two Oracle 12c Release 1 (12.1.0.2) databases (**prod** and **test**) with archived logs enabled on two Red Hat Enterprise Linux 7.0 hosts (**mickey** and **minnie**).
- Pure Storage Volume A single volume needs to be connected and ready to the Commvault CommServe virtual host. Figure 2 illustrates a volume named E:\Commvault Library which is connected to the Commvault virtual machine instance.





Figure 2. Pure Storage volume used for the Disk Library.



FlashArray Configuration for IntelliSnap Software

The Pure Storage FlashArray includes everything required to perform IntelliSnap software operations—there is no special licensing, configuration or management appliance needed. A minimal amount of configuration is required inside of Commvault software to add and authorize a FlashArray. The following section describes how to register and configure a FlashArray object into the IntelliSnap software.

Note: These steps are performed once per array, which allows IntelliSnap software to integrate with Pure Storage FlashArray.

FlashArray Credentials Setup

To manage a Pure Storage FlashArray from Commvault software the credentials must have "storage admin" privileges or higher. The default Pure Storage FlashArray account, "pureuser", has the required privileges and can be used for testing purposes. We recommend using a dedicated account for use with IntelliSnap software in production environments.

For this configuration Pure Storage Directory Service integration is being used with an Active Directory account named "Commvault Administrator".

Once you have determined the credentials to be used for configuration, log into the Pure Storage FlashArray Web Management interface to generate an API token for the Commvault credentials as given below.

- 1. Click System tab
- 2. Click Me under Users
- 3. Click the **d** (gear icon)
- 4. Click Create API Token



Figure 3 Creating API Token for the logged in user to the FlashArray

Now an API Token has been created for the Commvault Administrator account we need to retrieve the token to be used in the Commvault Array Management setup. Retrieving the API Token requires the same steps involved in creation of the token.

- 1. Click System tab
- 2. Click **Me** under Users
- 3. Click the deve (gear icon)
- 4. Click Show API Token
- 5. Highlight the token and copy (CTRL+C)



Figure 4. Viewing the API Token.



Figure 5. Copy the API Token

Commvault Array Management Setup



Once the FlashArray has been configured with the credentials the next step is to add the FlashAray to the Commvault Array Management interface.

1. Start and login to the Commvault Administrative Interface. This does not have to be the same credentials as previously setup with the Pure Storage FlashArray, but those same credentials can be used if desired. Once the Commvault Administrative Interface is running you will be presented the view shown in Figure 6.



Figure 6. Commvault Administrative Interface

2. Select the **Storage** tab to begin the Array Management setup. Follow the numbered steps to begin adding the Pure Storage FlashArray.

commvault - v10 R2 Commcell Console	_ 🗆 X
Home Tools Storage Configuration Departs 2 Support	۵ (۲)
Library and Media Hardware Array Drive Management Maintenanc Storage	commvault SIMPANA,
CommCell Browser	4 ▷ 🗉
k ⊕ Clent Computer Groups	우ㅁ곱
Glent Computers	9
Policies Reports Content Director Workflows Array Management	
Name Control Host User Name Snap Vendor Name Type Description	Add Edit Delete List Snaps K Cancel Help
This section guides you through the process of greating and configuring the clents	and the second second

Figure 7. Array Management from Commvault Administrative Interface

3. After clicking Add in Step 2 select the Snap Vendor dropdown and pick PURE Storage. (Note: If you are not on v10 R2 SP12 version or above, Pure Storage will not show up in the list)



Figure 8. Selecting PURE Storage for Snap Vendor

4. In the **Name** field enter either the IP Address or Fully Qualified Domain Name (FQDN) of the Pure Storage FlashArray.

0	2	Array Properties
General Snap	Configuration Security	
Snap Vendor	PURE Storage	_
Name 🌔	orafs-m50-1-ct0.dev.purestorage.com	
Control Host		
Credentials		- 1
User Acc	ount	
Chan	ge	1
Description		
Pure Sto	rage FlashArray //m50	
		1
م م طالب ال	and the second descent days and the second days are set of the second days are second days are set of the second days are second days	المسادي والمتري المحمول والمحمول والمحمد المحمد

Figure 9. Array properties for the Pure Storage FlashArray

5. Next click **Change** shown in Step 4 above to enter the credentials from the FlashArray Credentials Setup section. The **User Name** is equivalent to the **logon name** from Active Directory. For example this configuration the Commvault Adminsitrator account's logon is **commvault-admin**.

The API Token from the FlashArray Credentials Setup should be used for the **Password** and **Confirm Password**. The password in this dialog box is not the logon accounts password.



🕐 Enter User Na	me and Passwo 🗙
User Name:	commvault-admin
Password:	••••••
Confirm Password:	•••••
ОК	Cancel Help

Figure 10. Enter username and API Token



The Pure Storage FlashArray Users API Tokens never expire. API Tokens can be deleted and re-created by a Pure Storage FlashArray storage admin. If deleted and re-created, make sure to update the Array Management information for the specific FlashArray.

6. Optionally, enter in a **Description** for the FlashArray to provide more detail on the specific system. Now click on the **Snap Configuration** tab. This tab provides the user with advanced settings for the behavior of IntelliSnap technology and FlashArray interaction. Pure Storage and Commvault recommend **leaving the default settings.**

°	Array Properties	x
Gener Snap Configuration Security		
Configuration		
Comgutation		
Mount Retry Interval seconds	30 🛫	
Mount Retry Count	5 🛫	
Connect to a Host Group		
Use Host if Host Group is not available		
Enable Diagnostic Logging		
	all all a second to be and another and an and the set of the second second	

Figure 11. Snap Configuration default values

There are no changes required to be made in the **Security** tab.

0

Leave all advanced settings at the default values—these settings should only be changed on an as-needed basis ideally at the functional level only. Please note that these settings can be overridden for specific operations.



Commvault Software Storage Resources Library Setup

A Storage Resource needs to be created for storage the output of operations that are performed using the Commvault software and Pure Storage integration. For the Pure Storage integration, a Disk Library will be created in this section out of the three library types available.

Steps

1. From the Commvault Administrative Interface select the Storage Resources → Libraries → Add → Disk Library...



Figure 12. Creating a Disk Library

2. Enter a meaningful **Name** to describe the Disk Library then select the [...] to select the **Disk Device**. Select the server for MediaAgent. In our instance, the MediaAgent is also on the same CommServe server.

	Add Disk Library
Name:	Pure Storage Library
MediaAgent:	commvault 💽
• O Loca	al Path
Disk	Device:
O Net	work Path
Conn	lect As:
Pass	word:
Verify	y Password:
Folde	er:
	OK Cancel Help

Figure 13. Add a new Disk Library



3. The **Commvault MediaAgent** will query the host for any volumes that are available. Figure 14 shows the volume that will be used for the Disk Library (E:\). For this setup create a **New Folder** called **Library**, then click **OK**.

0	Browse for Folde	r			x
commvault	Name	Size	Type Folder	Modified	*
÷	Library		Folder	8/4/2015 7:49 PM	
2_ок	Close New	Folder		7/27/2013 1.37 AM	~

Figure 14. Browse for Folder and create a New Folder

Figure 15 shows the newly created Disk Library named Pure Storage Library.

View		Configure Fe	atured	
CommCell Browser	₽	🛶 Getting Started 🗙 📑	Libraries 🗙 💽 Job Contro	oller 🗙 🔋 Event Viewer 🗙
💫 commvault	^	👌 commvault 🗦 🌊 Storage F	Resources > 📑 Libraries >	
🗄 🚭 Laptop Clients		Name	Status	Manufacturer
Media Agents		🔢 Pure Storage Library	Ready	Disk
Client Computers				
🔄 🎜 commvault				
Security Storage Resources				
Libraries				
E:\Library				
	=			
	and the second se	المورد الدراكة فرحو المعورات	and the set of the set of the	and the second

Figure 15. New Pure Storage Disk Library

Commvault Software Storage Policy Setup

IntelliSnap software functionality requires a Storage Policy in order to control retention and other operations. For the use cases presented in this document a single Storage Policy will be created to execute the various IntelliSnap software operations. Multiple client computers can utilize a single Storage Policy depending on the configuration options.

Steps

1. From the Commvault Administrative Interface expand the **Policies** and right-click the **Storage Policies** node in the navigation treeview. Click **New Storage Policy** to launch the wizard.



Figure 16. New Storage Policy Wizard

2. Select **Data Protection and Archiving** as this Storage Policy will be used for protecting the Oracle databases. Click **Next.**

Create Storage Policy Wizard
What will this storage policy be used for?
Storage Policy Type
O Data Protection and Archiving
CommServe Disaster Recovery Backup
Cancel < Back Next > Finish

Figure 17. Storage Policy Type

3. Entering a meaningful name for the Storage Policy, Pure Storage IntelliSnap and click Next.



0	Create Storage Policy Wizard	×
Enter the storage poli	cy name	
Character Dalian Manage	1	
Storage Policy Name:	Pure Storage IntelliSnap	
Incremental Storage Policy		~
Provide the OnCommand U	nified Manager Server Information	
	Cancel < Back Next > Fini	ish

Figure 18. Storage Policy Name

4. Select the newly created Disk Library, **Pure Storage Library**, from the dropdown list that was completed in the previous section. Click **Next**.

0	Create Storage Policy Wizard	x
Select a defaul	It library for this primary copy	
Library:	Pure Storage Library	
	Cancel < Back Next > Finis	:h

Figure 19. Default Library for Primary Copy

5. Select MediaAgent from the dropdown list, commvault, then click Next.

0	Create Storage Policy Wizard	×
Select a Media	aAgent for this copy	
MediaAgent:	commvault	7
	2	
	Cancel < Back Next > Fi	nish

Figure 20. Select the MediaAgent

6. Leave all of the **default values** for the streams and retention management criteria. Click **Next.**

Create Storage Policy Wizard	x
Enter the streams and retention criteria for this policy Number of Device Streams: $50\frac{1}{2}$	
Choose the Primary Copy's Aging Rules:	
iDataAgent Backup data	
Infinite/ 15 $\frac{1}{2}$ Days 2 $\frac{1}{2}$ Cycles	
Data Archive/Compliance Archiver	
✓ Infinite/ 365 → Days	_
Cancel < Back Next > Finish	_

Figure 21. Default values for streams and retention criteria

7. Deselect **Yes** as this setup is focused on using the IntelliSnap software integration with the Pure Storage FlashArray which provides the data reduction features through the Purity Operating Environment.

Create Storage Policy Wizard
Do you want to enable Deduplication for the primary copy?
Enable use of Partitioned Dedunication Database
Cancel < Back Next > Finish

Figure 22. Do not enable deduplication

8. The final step in the **Storage Policy Wizard** is to review the settings and then click **Finish** to create the policy.

0	Create Storage Policy Wizard
Revi	iew your selections.
	Name: Pure Storage IntelliSnap Primary Copy: Primary Library: Pure Storage Library No. of Streams: 50 iDataAgent Backup Aging Rules: infinite Data/Compliance Archiver Aging Rules: infinite Retain Snaps by Number of Jobs: N/A Deduplication: No
(Click Finish to create the Storage Policy
	Cancel < Back Next > Finish

Figure 23. Storage Policy Wizard settings review

The newly created **Pure Storage IntelliSnap** storage policy can be seen in the Commvault Administrative Interface.



0		commva	ault - v10 R2 Commcell (Console			_ 0 >	×
Home Tools Storage Configuration	n Reports View	Support						3
CommCell Job Event Controller Viewer	Scheduler Control Panel	What's Getting new? Started				S	mmvault IMPANA,	4
View	Configure	Featured	🔽 lah Cashallar, M 🗎	Frank Harris and			4.5	J
Communit	Getting Started	x storage Policies x	Job Controller X	Event viewer X			4 P	
F Client Computer Groups	ommvault > 19	Policies > 🚉 Storage Policies	>				÷ 🗆	
E PLaptop Clients	Name	Туре	No. of Streams	No. of Copies	Incremental Policy	Deduplication	Description	*
E Media Agents		maily bisasta hacarany ba	ing i				Automatically created	\land
Client Computers	📕 Pure Storage IntelliS	inap Standard	50	2				
Commvault Security Social Resources Social Resources Replication Policies Replication Policies Social Resource Recommvault Pure Storage IntellSnap Social Resources Vault Tracker Policies Vault Tracker Policies Social Resource Conterto Deloise Conterto Director Conterto Director Wortflows								

Figure 24. Pure Storage IntelliSnap Storage Policy shown in the Commvault Administrative Interface

Right-click the newly created **Pure Storage IntelliSnap** policy and choose **All Tasks > Create New Snapshot Copy**.



Figure 25. Create New Snapshot Copy for the Pure Storage IntelliSnap policy

Enter a name for the new **Snap Copy Properties** and then select the **Library** and **MediaAgent** from the respective dropdown lists. The **Library** to select is the one created earlier, **Pure Storage Library**. The **MediaAgent** to select is the one that was used in the Storage Policy Configuration Wizard, **commvault**.

General	Retention	Selective Copy Copy Policy	Associations Adv Data Paths	anced Deduplication Data Path Config	Provisioning juration
Copy Information Copy Name:	1		Storage Snapshot Copy		
Primary C	ору	🗸 A	ctive		
Selective	Сору				
Default Index De	stination				
Library:	Pure Storage	Library			-
MediaAgent:	commvault				T
Drive Pool:		3			-
Scratch Pool:					<u>v</u>

Figure 26. Snap Copy Properties for the Pure Storage IntelliSnap policy

The final step is to click on the **Retention** tab and see that the **Enable Data Aging** is checked and the only modification that is necessary is to update the **Basic Retention Rule for All Backups** from **Infinite** to **Retain for** a set numbers of days, for example **15 days**.

	<u>py Fallen Behind</u>	Selective Copy	Associations	Advanced	Deduplication	Provisioning
General	Retention	Copy Policy	Data Path:	S	Data Path Config	uration
🖌 Enable (Data Aging					
🔿 Spool Co	opy (No Retentio	n)				
🔘 Retain S	inaps by Number	of Jobs 24				
Basic Reten	tion Rule for All B	3ackups				
🔘 Infinite	•					
) Retain	for	15 📩 Days		2 🕺 Cycle	95	
• <u>Retain</u> Extended R	for etention Rules fo	15 📩 Days or Full Backups		2 📩 Cycle	95	
Extended R For	For etention Rules fo	15 Days or Full Backups 90 Days Keep	Please Select	2 Cycle	Day(s)	
Retain Extended R For For For	for etention Rules fo Infinite/	15 1 Days or Full Backups Days 90 - 365 - 0ays Keep	Please Select	2 🕺 Cycle Grace	Bay(s)	

Figure 27. Retention option under Pure Storage IntelliSnap policy

All of the prerequisites have been completed and now we can begin walking through several different use cases that illustrate common activities that database or line of business administrators perform.



IntelliSnap Technology and Oracle DB Functions

IntelliSnap technology in conjunction with Pure Storage offer an extensive feature set with rich controls. The following section outlines main features of IntelliSnap technology integration with the Pure Storage FlashArray. For detailed information on setup and use of the IntelliSnap software please refer to Commvault documentation in the References section at the end of this document.

The following functions are the main operations directly involved with IntelliSnap technology for Oracle databases:

- 1. Create an array-based snapshot of an Oracle database
- 2. In-place rapid recovery of a large Oracle database using hardware revert feature
- 3. Perform a point-in-time recovery of an Oracle database
- 4. Clone an Oracle database instantly for dev/test purpose

The subsequent use cases are not meant to be an exhaustive list of features but instead is meant to demonstrate common backup and recovery workflows for IntelliSnap technology and Oracle database environments.

The following diagram illustrates the system and the configuration used for all the use cases.



Figure 28. Lab environment overview

In the next several sections several use cases will be outlined with procedures to deploy, configure, manage, backup, mount and recover to point-in-time copies of Oracle databases.



!

As mentioned in the Pre-requisites section all of the components should be installed on the **Linux** server to be able to use the IntelliSnap technology. These include MediaAgent and Oracle iDataAgent from Commvault software Version 10 R2 setup.

Prerequisites for IntelliSnap software array-based snapshot

Components required for IntelliSnap technology backup

- Enable IntelliSnap technology at client level, the client in this case is the Oracle database host.
- Discover Oracle instances on the client.
- Create and configure a subclient for Oracle database.
- 1) Expand the **Client Computers** node in the CommCell Browser. The **mickey** server should be visible, if it is not, perform a **Refresh** using the Commvault Administrative Interface **View** tab **Refresh** button. Right-Click the Client Computer, **mickey** to access the properties.

General Version Security Activity Control Client Name Client Name: mickey
Client Name mickey
Client Name: mickey
chert tanet interey
Host Name: mickey.dev.purestorage.com
CommServe HostName: orasimpana
Physical/Virtual: Physical
Edit
Client Information
OS: Linux 3.10.0-123.el7.x86_64
Platform: x86_64
Time Information
Time Zone: (UTC-08:00) Baja California
Clock skew with CommServe: 5 Sec(s)ahead of CommServe
Description
OK Cancel Advanced 🖓 Save As Script Help

Figure 29. Client Computer Properties for client (mickey)

Click on the **Advanced** button at the bottom of the dialog. With the **Advanced Client Properties** dialog open check the **Enable IntelliSnap** option.



e A	dvanced Client	Prop	erties for n	nicke	ey 💌
Content Indexing	Additional Settin	gs	Deduplicati	ion	Web Server URLs
General Groups Fir	ewall Configuration	Netw	ork Throttle	Polici	ies Job Configuration
CVD Port : 8400 Evmgrc Port : 8402 ✓ Enable IntelliSnap Enable retry on n Retry Frequency (s Retry Count	1 etwork errors seconds) 30				
Retry Count	40				

Figure 30. Advanced Client Properties for client (mickey)

2) The next step is to discover the database instance located on the mickey server. Expand the Client Computers node in the CommCell Browser. The mickey server should be visible, if it is not perform a Refresh using the Commvault Administrative Interface View tab Refresh button.



Figure 31. Oracle Agent within the client (mickey)

Expand the mickey server, select Oracle. Right-click on Oracle and select All Tasks and Discover Instance.

If Oracle iDataAgent is not installed as part of the pre-requisite on the client server, the **Oracle** entry will not show up in the browser under the client.





Figure 32. Discover Instance

Click **Yes** to let the agent discover all the Oracle Instances on the **mickey** server. On Linux and Unix, instances must be present in the /etc/oratab file to be discovered.

0	Discover Instance X
?	Oracle Instances will be discovered. Do you want to continue?

2.1) Expand the **Client Computers** node in the CommCell Browser and expand **mickey** and select the **Oracle** agent. It should show the discovered instances.



Figure 33. Discovered Instances

3) Select **prod** instance and right-click and **select All Tasks -> New Subclient.**





Figure 34. Creating a New Subclient

3.1) This next step involves setting up the New Subclient for the prod database. There are multiple tabs and options that need to be configured for the subclient. The tabs that will be focused on are General, Storage Device, IntelliSnap Operations, and Logs Backup. In the General tab set the Subclient name and Description.

0	Creating New Subclient		X
Storage Device Activ General 1 Itent	ity Control IntelliSnap Ope Backup Arguments	rations Pre/	Logs Backup Post Process
Client Name:	mickey		
iDataAgent:	Oracle		
Instance (ORACLE SID):	prod		
Subclient name:	prod_subclient	2	
Description			
PROD database on i IntelliSnap Technolog	mickey server to show how gy works with Pure Storage	Commv FlashArr	ault ay
	ОК	Cano	el Help

Figure 35. New Oracle instance Subclient Properties

3.2) Select the **Storage Device** tab and select the data storage policy **Pure Storage IntelliSnap** that was created earlier.



C		(Creating N	New Subclie	ent		×
	General Co Storage Device	ntent 1 ctivity	Backu Control	ip Arguments IntelliSnaj	p Ope	Pre/ rations	Post Process Logs Backup
	Data Storage Policy	Data Tran	sfer Option	Deduplication			
	Data Storage Polic	y					- 11
	Number of Data Ba	ackup Stream	ns:		~		auts
	×						
	4						
					ОК	Canc	el Help

Figure 36. Select Data Storage Policy for new Subclient

3.3) Select the **IntelliSnap Operations** tab and check **IntelliSnap** option, which will throw a warning "Changing IntelliSnap state will cause the next backup to be converted to a full backup", select **Yes**. Select **Pure Storage Snap** from the available Snap Engines.

0	Creating New Subclient
General Content Storage Device Activ	ity 1 IntelliSnap Operations Logs Backup
IntelliSnap 2	DUDE Storage Spag
	Manage Array
Use Proxy	
Use source if proxy i	s unreachable
Use RMAN for backu	р сору
Enable Snap Integrit	y Check
	OK Cancel Help

Figure 37. Enable IntelliSnap technology with Pure Storage Snap

3.4) Select **the Logs Backup** tab and make sure **Backup Archive Log** option is enabled. Select the **Archive Delete** option is selected if you want to manage the archive logs through this subclient.

0		Creating N	ew Subclien	t	X
General Storage Device	Content Activit	Backup y Control	Arguments IntelliSnap (Dper 1	Post Process Logs Backup
Backup Ar Archive	rchive Log e Delete	2 3 jable Swite	h Current Log	Use Rmar	n for Log B
Select	ArchiveLog De	stinations for E	lackup		
				Ad	dete
Select	ArchiveLog De	stinations for [elete		
				Ad	d
				Dele	ete
			4 Ок	Cano	cel Help

Figure 38. Setup Logs Backup for new Subclient

3.5) Click OK to create the new subclient **prod_subclient** for the **prod** database.

Note: Similar setup was performed on the **minnie** server to discover the **test** instance and setup the subclient.



Use Case 1: Create array-based snapshot of an Oracle database

Performing a backup using IntelliSnap technology integrated with Pure Storage issues calls to Pure Storage FlashArray's API to perform the snapshot operations. IntelliSnap technology places the Oracle database in hot backup mode while invoking the array-based snapshots to make sure the snapshot backup is application consistent. This backup is equivalent to a full backup where the database can be restored completely with all logs or to a specific point-in-time.

For this use case the database **prod** on physical host **mickey** is used. The database is setup on two volumes **fs_prod_data01**, which holds all datafiles, and **fs_prod_fra01**, which holds all archived redo logs. Each of these volumes is mounted on the server as ext4 filesystem.



This is a simple example just to show how backups, restores and point-in-time recovery can be used with Pure Storage and IntelliSnap technology.

In the CommCell Browser expand the **Client Computers > mickey > Oracle > prod** to display the **Subclient** list. Right-click on **prod_subclient** and select **Backup.**



Figure 41. Backup PROD database

After clicking the **Backup Options** dialog with display. By default, the **Full** and **Immediate** options are selected; click **OK** to begin the backup.

C Backup Options for S	ubclient: prod_subclient
Backup Options Select Backup Type	Job Initiation
Full Status of SID (prod): OPEN Refresh	Immediate Run this job now Schedule Configure Schedule Pattern Configure
3	P OK Cancel Advanced P Save As Script Help

Figure 42. Backup options at the subclient

After starting the Job click the **Job Controller** tab to view the running job. Figure 43 shows the running Job ID is **1300**.





Figure 43. Job Controller view of Job 1300

Figure 44 shows the corresponding FlashRecover Snapshot, **fs_prod_data01.SP-2-1300-1446780952**, for volume **fs_prod_data01** and **fs_prod_fra01.SP-2-1300-1446780956** for volume **fs_prod_fra01**.

fs_prod_data01 fs_prod_data01	d Total Reduction 92.8 to 1			Data Reduction 9.2 to 1	\$ -
) L 2 9	Jsed .17 GB
Volumes Snapshots 9.00 GB 174.05 MB					
Connected Hosts and Host Groups (1)	Snapshots (12)	Details		1-12 of 12	¢-
NAME	PGF	ROUP SNAPSHOT	SNAPSHOTS	CREATED	
fs_prod_data01.SP-2-1300-144678095	2		1.42 MB	2015-11-05 11:35:52	
s_prod_data01.SP-2-1298-144077802	4		1.36 MB	2015-11-05 10:47:05	1
s_prod_data01.SP-2-1295-144677607	Job ID: 1300		2.46 MB	2015-11-05 10:14:36	
• fs_prod_fra01 00 TB	Total Reduction >100 to 1			Data Reduction 13.7 to 1	\$ -
✓ fs_prod_fra01 .00 TB	Total Reduction >100 to 1			Data Reduction 13.7 to 1	sed 77.08 MB
Volumes 245.68 MB Volumes 245.68 MB	Total Reduction >100 to 1			Data Reduction 13.7 to 1	sed 77.08 MB
fs_prod_fra01 rovisioned .00 TB Volumes 245.68 MB Snapshots 231.40 MB Connected Hosts and Host Groups (1)	Total Reduction >100 to 1 Snapshots (13)	Detalls		Data Reduction 13.7 to 1 U 4 1-13 of 1	Sed 77.08 MB
	Total Reduction >100 to 1 Snapshots (13)	Detalls ROUP SNAPSHOT	SNAPSHOT	Data Reduction 13.7 to 1 U 4 1-13 of 1 3 CREATED	sed 77.08 MB
	Total Reduction >100 to 1 Snapshots (13)	Details ROUP SNAPSHOT	SNAPSHOTS 3.29 ME	Data Reduction 13.7 to 1 U 4 1-13 of 1 3 CREATED 3 2015-11-05 11:35:56	sed 77.08 MB
	Total Reduction >100 to 1 Snapshots (13) PG	Details ROUP SNAPSHOT	SNAPSHOTS 3.29 ME 2.16 ME	Data Reduction 13.7 to 1	ised 77.08 MB

Figure 44. Pure Storage FlashArray view of the snapshot (Job 1300)



Use Case 2: In-place restore of an Oracle database

In this use case, the database **test** on **minnie** server will be reverted using the hardware revert feature in IntelliSnap technology which uses Pure Storage FlashArray snapshot feature behind the scenes to copy the snapshot on to the current volume.

The **test** database is **1TB** in size and since hardware revert feature in IntelliSnap technology is used to perform the in-place restore, the activity should be completed quickly irrespective of the size as Pure Storage FlashArray's snapshot copy feature is instantaneous as it performs metadata level changes and not the actual data revert.

The objectives for this use case are as follows:

- 1. Create a table (DO_NOT_SHOWUP) on the **test** database
- 2. Recover the **test** database in place on **minnie** server using hardware revert option from the latest backup, so the recovery should be completed within couple of minutes.
- 3. Validate the table DO_NOT_SHOWUP is indeed not showing up in the recovered **test** database.

Procedure

1) Create the table (DO_NOT_SHOWUP) on the **test** database for validation.

[oracle®m	innie:test:~]\$ sqlplus	"/ as sysdba"
SQL*Plus:	Release 12.1.0.2.0 Pro	oduction on Tue Nov 10 00:49:38 2015
Copyright	(c) 1982; 2014; Oracle	e. i All rights reserved.
Connected	l to:	
Oracle Da With the	tabase 12c Enterprise Partitioning, OLAP, Adv	Edition Release 12.1.0.2.0 - 64bit Production vanced Analytics and Real Application Testing options
SYS@TEST>	• @showspace	
Space Det	cails	
Allocated Used Spac	Space : 1,062.88 GB ce : 688.54 GB)
SYS@TEST>	create table DO_NOT_SH	HOWUP (msg varchar2(100));
Table cre	ated.2	
SYS@TEST> Name	desc DO_NOT_SHOWUP	Null? Type
MSG		VARCHAR2(100)
te falled	1: Broken pipe	
TUO NOV 1	• 100TE	
	0 00.30.00 131 2013	
SYS@TEST>	select name, db_unique	e_name, instance_name from v\$database, V\$instance;otssh
NAME	DB_UNIQUE_NAME	INSTANCE_NAME
TEST	test	test The two columns highlighted with boxes
SYS@TEST>		interface. To mount a specific snapshot,

Figure 45. Test database details for validation

2) In the Commcell browser, expand **minnie** server and select **test** database, right-click and select **All Tasks -> Browse and Restore**



Figure 46. Browse and Restore

2.1) Click **View Content** from the next pop-up.

C Browse and Restore Options	X
Time Range Advanced Options	
Show Objects to Restore using following criteria	
1 O Time Range	
Absolute Time	
Time Zone: Client Time Zone (UTC-08:00) Baja California	_
Start Time	
Monday, November 9, 2015 🔷 Tuesday, November 10, 20	Ŧ
1 : 10 AM	
Table View	
R	
	_
	<u> </u>
View Content Cancel List Media Help	

Figure 47. Browse and Restore Options



2.2) Select the database test and click Recover All Selected

CommCell Browser		tarted 🗙 🚺 test 🗙 🚺	Job Controller 🗙	🟓 Event Viewer 🗙	😭 Client: minnie (Latest D	× 🔹	> 🗉
💑 orasimpana 🛛	^	😭 Client: minnie (Latest Dat	a)			P 🗆	5
Client Computer Groups		Current Selected: SID: test					
Hardia Agents		Oracle			_		
			Name		Туре		×
			IOPS		Tablespace		()
		-	SYNDAT	TA	Tablespace		
🖃 📕 Oracle			SYSAU)	(Tablespace		
	_		SYSTEM	1	Tablespace		
	-			BS	Tablespace		
🖻 🔬 minnie				BS1	Tablespace		
			USERS USERS		Tablespace		
E Security							
E Storage Resources							
🚊 ··· 👿 Policies					2		
Monitoring Policies							
Replication Policies							
🕀 📆 Schedule Policies							
🕀 📷 Storage Policies	\sim						
							\sim
Agents							
	» •		2 Recover All S	Selected Nev	Browse		
7 object(s)			orasimpana	- ffffffff 10 R2 adı	nin 🕘		

Figure 48. Select database for recover

2.3) Make sure the Destination Client is the same as the source (**minnie**) and click the Advanced button to select advanced restore options.

🕐 Oracle Restore Options minnie SID: test 💌
General Job Initiation
Destination Client: minnie v Number of streams to use for restore:
Catalog Connect: / @
Restore Control File Restore Archive Log Restore SP File
Restore Data Recover Duplicate DB
✓ NO CATALOG Use Snap Restore
The latest Database View:
2 test B 2 SVDATA B 2 SYSNDATA B 2 SYSTEM B 2 UNDOTBS B 2 UNDOTBS1 B 2 USERS
Status: OPEN Refresh New Browse
Script Preview Cancel Advanced Save As Script Help

Figure 49. Advanced restore options



2.4) Under the **General** tab, select the **Use hardware revert capability if available**.

Oracle Advanced Restore Options for Client: minnie SID: test
Custom Rmap 2011 Redirect Options Restore Ctrl & SP Files Recover
General Cedence Data Path Encryption Pre/Post Startup Alert
Use hardware revert capability if available 2
SNAP Restore Options
Use Rman Restore
O Use FileSystem Restore
OK Cancel Help

Figure 50. Use hardware revert capability for restore

2.5) Click the **Options** tab and select **Switch Database mode for Restore** which will restore the database and bring it up automatically.

🕐 🛛 Oracle Advanced Restore Options for Client: minnie SID: test 🗾
General Copy Precedence Data Path Encryption Pre/Post Startup Alert Custom Rman Script 1 Options Restore Ctrl & SP Files Recover
Time Zone: (UTC-08:00) Baja California
□ Reset Database
Reset Logs Yes 🔽 🗌 No Re-do Logs
Switch Database mode for Restore
Validate Disable Oracle Channel Restore Failover
Set DBID
Max Open Files:
Set DB Incarnation
OK Cancel Help

Figure 51. Advanced Restore Options

2.6) Click the **Recovery** tab, select the **Latest Backup Time** option to revert the database from the latest backup and click **OK**.

Oracle Advanced Restore Options for Client:	minnie SID: test 🛛 🗙
General Copy Precedence Data Path Encryption F Custom Rman Script Redirect Options Restore	Pre/Post Startup Alert Ctrl & 1 Recover
Recover	
○ Current Time	l⊋
O Point In Time esday, November 10, 2015	
Latest Backup Time 2	
O Latest SCN Number	
З ок	Cancel Help

Figure 52. Select latest backup time for restore

2.7) From the Job controller the status of the job 2343 and all job details can be viewed. In this case, the in-place restore completed in 1 minute 51 seconds and the Events tab shows the volume that pertains to the datafiles was reverted successfully.

	Operation	Client Co	Agent Type	Phase	Storage Policy	MediaAgent	Status	Progress	Errors
2343	Restore	minnie	Orade Dat	N/A			Completed	100%	
	Restore	lob Details For	Job ID: 2343		x				
eneral Pro	ogress Streams A	Attempts Events							
Current P	hase:	N/A							
State:	0	Completed							
Elapsed ti	me:	00:01:51							
	f Files Restored:	0							
Number o									
Number of Size of Ap	plication:	0 Bytes							
Number o Size of Ap Last Job U	plication: Jpdate Time:	0 Bytes Not Applicable							



0	Job Details for Job: 2343				
General	Details Attempts Events				
E	Jo Date	C Description			
3 2937	2343 11/10/2015 1:28:25 AM	ora Restore iob [2343] completed. Clien 🔨			
3 2936	2343 11/10/2015 1:27:15 AM	min Volume [/c02] reverted successfully			
3 2935	2343 11/10/2015 1:26:34 AM	ora New restore request received for cli			
		~			
	OK Close	Previous Next Help			

Figure 53. Restore Job details for Job 2343

3) The database **test** was restored from the backup and we could verify the database was recently created, started and the table DO_NOT_SHOWUP is indeed not available as we restored from the latest backup, which did not include the table.



Figure 54. Validation of test database after hardware revert

In this use case, the database was restored from the last backup and incomplete recovery was performed and hence the database was opened with resetlogs option, which warrants a full backup of the database. Meanwhile, performing this on a production database will cause data loss of all changes since the last backup and hence review if this is an option to be performed on a production database as per your standard operating procedures.



Use Case 3: Point-in-Time recovery (PITR) of an Oracle database

Point-in-Time recovery (PITR) is a key operational requirement for Oracle databases as it protects against the unplanned downtimes. For example,

- 1) Human errors: A DBA accidentally dropped tables or deleted/updated records in production database. These changes need to be undone.
- 2) Media errors: The database could not perform complete recovery after a media failure as needed redo logs or incremental backups were not available.
- 3) Operations hiccups: Database upgrade fails in the middle of a patch upgrade.

Point-in-time recovery is an **incomplete recovery** as it does not use all the available redo or completely recover all the changes on the database. The database is restored to a specific full backup followed by application of redo logs or incremental backups to re-create all the changes up to a point-in-time before the unwanted change.

The objectives of this use case are as follows:

- 1. Insert records on to **prod** database on the table **recovery_test** with date and time information.
- 2. Make sure the current redo log files are archived.
- 3. Perform point-in-time recovery to a specific point-in-time.
- 4. Validate the records to show the database was recovered to a state prior to the point-in-time.

We will use the IntelliSnap technology hardware revert function that will use Pure Storage's native snapshot overwrite function to revert the volumes to a prior state and the archived logs till the specific point-in-time will be applied.



Point-in-time recovery scenario requires the archived logs location to be on a different volume than that of the datafiles.

Procedure

Make sure the snapshot backup is performed on the database as documented in Use Case 1: Create array-based snapshot of an Oracle database.

1) Figure 55 shows the table RECOVERY_TEST on **prod** database with the records that were inserted today with timestamps.



SCOTT@PROD> @select	
ID MESSAGE	DATE_CREATED
-05 ULSS 1 First record 515130	10/30/15 08:37:42
05 1155 2 2nd record FISTOR	10/30/15 09:42:28
28 17:08 3 3rd record 11516188	10/30/15 09:42:39
09 15:26 4 4th record F1516138	11/05/15 09:07:43
26 09 47 5 5th record 1516138	11/05/15 10:08:31
09 17:01 6 6th record 1516138	11/05/15 11:37:52
11 16:08 7 7th record F1516138	11/05/15 11:38:11
11 16:12 8 8th record [151613]	11/10/15 16:17:26
11 16:12 9 9th record F1516138	11/10/15 16:17:37
10 10th record	11/10/15 16:38:26
16 15 2011 11th record 1516138	11/10/15 16:38:37
	37200011318
11 rows selected.8044461516138	37200011319
SCOTT@PROD> insert into recove	ery_Test values (100,'Wrong record', sysdate);
1 row created. 6044461516138	137200011010 137200011010
SCOTT@PROD> insert into recover	ery_Test values (12,'12th record',sysdate);
1 row created. T RC44AP1516138	37200011007 137200011346
SCOTT@PROD> commit;	3720001108A 37200011033
Commit complete. BC444F1516138	137200011034 137200011347
SCOTT@PROD> connect / as sysdb	a 7200811215
Connected: 4 R01 80444F1516138	3720001101C
SYS@PROD> alter system archive	log current;
System altered.	37200011076 37200011027 32200011052
SYS@PROD> select name, db_unio	ue_name from v\$database;
NAME DB_UNIQUE_NAME	37200011011
0000	
PROD prod	13771969111011P
SYSEPROD> POT ROMAE1516138	G7709011021

Figure 55. Database (prod) validation before point-in-time recovery

2) The current redo logs are archived with the *alter system archive log current* command.

3) To illustrate the point-in-time recovery scenario a wrong record was inserted at **11/10/15 17:19:26** and we would like to return the database back to a point-in-time before this record was inserted. For this use case, we will use the time **11/10/15 17:00:00** as the recovery time and all transactions after this time will be rolled back.



SCOTT@PROD> @select	
ID MESSAGE	DATE_CREATED
	40/20/45 00 27 42
1 First record	10/30/15 08:37:42
2 2nd record	10/30/15 09:42:28
3 3rd record	10/30/15 09:42:39
05 11:55 4 4th record F151613	11/05/15 09:07:43
S 5 5th record	11/05/15 10:08:31
6 6th record	11/05/15 11:37:52
7 7th record	11/05/15 11:38:11
26 99 47 8 8th record 151613	11/10/15 16:17:26
9 9th record	11/10/15 16:17:37
10 10th record	11/10/15 16:38:26
11 16 11 11th record	11/10/15 16.38.37
100 Wrong record 51615	11/10/15 17:19:26
16 12 12th record	11/10/15 17:19:39
13 rows selected. SCOTT@PROD>	/ill recover till 10/15 17:00:00
에 보험하는 아이는 한 아이트 등 다	131/2(00)11014

Figure 56. Time to recover back

3.1) Navigate to the Commcell browser, select **prod** database, right-click, select **All Tasks -> Browse and Restore**.



Figure 57. Invoking Browse and Restore to perform PITR

3.2) Select the Latest Backup and click View Content to open the restore options.



0	Browse and Restore Options
Time Range	Advanced Options
Show Object	ts to Restore using following criteria
	atest Backup 🔿 Time Range
ſ	Absolute Time
	Time Zone: Client Time Zone (UTC-08:00) Baja California
	Start Time
	Monday, November 9, 2015 💌 Tuesday, November 10, 20 💌
	3:07PM - 3:07PM
	Table View
	2 View Content Cancel List Media Help

Figure 58. Browse and Restore Options

3.3) Select the **prod** database and click **Recover All Selected** button.

😭 Client: mickey (Latest Data)			Р С,
Current Selected: SID: prod			
	Name	Туре	
	RITA_TBS	Tablespace	
	SYSAUX	Tablespace	1
	SYSTEM	Tablespace	
	UNDOTBS1	Tablespace	
	💋 USERS	Tablespace	
			1
	I		
2	Recover All Selected	New Browse	
	and the second sec	and the second s	· · · · · ·

Figure 59. Select the database for PITR

3.4) Click the **Advanced** button to provide additional recovery options.



Oracle Restore Options mickey SID: prod
General Job Initiation
Destination Client: mickey \checkmark Number of streams to use for restore: $1 \frac{1}{2}$
Catalog Connect: [] / [] @
Restore Control File Restore Archive Log Restore SP File
Restore Data Recover Duplicate DB
✓ NO CATALOG Use Snap Restore
The latest Database View:
prod Prod RITA_TBS
Status: OPEN Refresh New Browse
Script Preview Cancel Advanced Brave As Script Help

Figure 60. Advanced Restore Options

3.5) Select the **Use hardware revert capability if available** option under the **General** tab. This will speed up the process of recovery to the previous full back using the array-based snapshot restore function instead of copying all the files.

🕐 Oracle Advanced Restore Options for Client: mickey
Custom Rmap Script Redirect Options Restore Ctrl & SP Files Recover General 1 eccedence Data Path Encryption Pre/Post Startup Alert
Use hardware revert capability if available
SNAP Restore Options
Use Rman Restore
O Use FileSystem Restore
OK Cancel Help
OK Cancel hep

Figure 61. Use hardware revert to restore the database

3.6) Select the **Options** tab and click **Switch Database mode for Restore** which will automatically bring down the database, recover and bring it back up on the server.



Oracle Advanced Restore Options for Client: mickey
General Copy Precedence Data Path Encryption Pre/Post Startup Alert Custom Rman Scrip 1 ct Options Restore Ctrl & SP Files Recover
Time Zone: (UTC-08:00) Baja California
Reset Database 🗹 Open DB
Reset Logs Yes 🔽 🗌 No Re-do Logs
Switch Database mode for Restore
Validate Disable Oracle Channel Restore Failover
Set DBID
Max Open Files:
Set DB Incarnation
OK Cancel Help

Figure 62. Advanced Restore Options

3.7) Select the **Recover** tab and enter the recovery time (**11/10/15 5:00:00 pm**) and click **OK** to go back to the Oracle Restore Options window.

0	Oracle Adv	anced Rest	ore Options	s for Clie	nt: mickey	/ SID: prod	×
General Alert	Copy Pro Custom Rman S	ecedence cript Rec	Data Path lirect Optic	End ons Res	ryption store Ct	Pre/Post , trl 8 1	Startup Recover
Recover	er						
0	Current Time						
۱	Point In Time	esday, Novem	ber 10, 2015	•	5:00:00	PM 📩	2
0:	SCN						
01	Latest Backup Tir	ne					
01	Latest SCN Numb	ber					
				3	ОК	Cancel	Help

Figure 63. Recover options to specify the point-in-time for recovery



Press **OK** to submit the job to start the database restore to the specific point-in-time.

נ 🚺	lob Controll	ler(Show All J	obs)					-	
								Fi	ters:
V	Job ID	Operation	Client Co	Agent Type	Subdient	Job Type	Phase	Status	Progress
	2363	Restore	mickey	Oracle Database			N/A	Completed	100%
~ ~ ~									

Figure 64. Job details for the PITR use case

The restore and point-in-time recovery took **1 minute and 35 seconds**. As requested the hardware revert was performed by reverting the volume (**fs_prod_data01**) mounted on /**d02** to the prior array-based snapshot.

Job Details for Job: 2363	Job Details for Job: 2363
General Details Attempts Events	General Details Attempts Events
	E J Date Description
Server End Time: 11/10/2015 5:30:40 PM	3094 2363 11/10/2015 5:30:40 PM Destero job [3262] completed
Duration: 00:01:35	3093 2363 11/10/2015 5:29:36 Ph Volume [/d02] reverted successf
Total Objects 0	
No. of Failures: 0	i i i i i i i i i i i i i i i i i i i
Size of Application 0 Bytes	
Previous Next Help	OK Close Previous Next

IntelliSnap technology for Oracle databases uses RMAN behind the scenes and the point-in-time command issued is highlighted below.



Figure 65. RMAN details behind the scene of PITR

3.8) Logging onto the **prod** database and checking the records in the RECOVERY_TEST table shows that the transactions after 11/10/15 17:00:00 have not been applied.



Figure 66. Validation after PITR of prod database



Use Case 4: Oracle database cloning for secondary usage

The **cloning** functionality has become the most sought out feature with the introduction of highly optimized array based snapshots from Pure Storage. IntelliSnap technology in integration with Pure Storage provides a simple and easy way to clone Oracle databases instantly irrespective of the size.

As cloning in Pure Storage FlashArray is instantaneous, and the clones deliver the same level of performance as production and do not consume the same amount of space as production; this use case caters to various copy data management requirements in organizations. For example,

- 1. Testing/Development: Instantaneous, high performance clones are made available to development/testing teams to support agile development and unblocked sprints.
- 2. Analytics/Reporting: Instantaneous, high performance clones are made available to data scientists for analytics, discovery and reporting workflows.
- 3. Operation support: Instantaneous clones are made available to the application support teams to troubleshoot issues.

There are various other use cases for the Oracle database cloning functionality that is beyond the scope of this document and we will focus on illustrating how the source database can be cloned using IntelliSnap technology with Pure Storage.

The objectives of this use case is

- 1. Clone the source database **prod** from **mickey** server using the latest backup as **dev** on **minnie** server.
- 2. Show the contents of **prod** and **dev** to validate the cloning functionality

Procedure

1) Verify the contents of the source database **prod** before cloning the database.



Figure 67. Validation of source database

2) Expand the Commcell Browser under Client Computers and get to **prod** database. Right-click on **prod** database, select **All Tasks -> Clone**



Figure 68. Clone option

3) Click **View Content** on the next screen.

Clone Options
Time Range Advanced Options
Show Objects to Restore using following criteria
O Latest Backup O Time Range
Absolute Time
Time Zone: Client Time Zone (UTC-08:00) Baja California
Start Time End Time
Monday, November 9, 201: Tuesday, November 10, 20
10:32 AM
View Content Cancel List Media Help

Figure 69. Clone option from latest backup

4) Select the **prod** database and click **Clone** to open up the restore options.



	d 🗙 💽 Job Controller 🗙 🗎 Event Viewer 🗙 😭 Cl	ient: mickey (Latest D 🗙
🛱 Client: mickey (Latest Data)		
Current Selected: SID: prod		
⊡-I → Ø prod 1	Name	Туре
	RITA_TBS	Tablespace
	💋 SYSAUX	Tablespace
	SYSTEM	Tablespace
	UNDOTBS1	Tablespace
	💋 USERS	Tablespace
	2 Clone New Browse	

Figure 70. Source database selection for cloning

5) Select the destination server, **minnie** in this case under the **General** tab.

Oracle Restore Options mickey SID: prod
General Clone Options Job Initiation
Destination Client: minnie v 1 streams to use for restore: mickey
Catalog Connect orasimpana
INO CATALOG

Figure 71. Destination client location selection

6) Click the **Clone Options** tab and provide the new instance name (**dev**), pfile location and the Snap Mount location. Commvault software will create the pfile if it does not already exist. Select the appropriate **Reservation period** which reserves the cloned database for the specified period of time. Default is 1 hour. Press **OK** to close the window and submit the cloning job.



č	Dracle Restore Options mickey SID: prod
General Clone Options	lion
Clone Options	
Instance Name:	dev v 2
ORACLE HOME:	prade/product/12.1.0/dbhome_1 Browse
ORACLE User:	oracle
PFile:	2.1.0/dbhome_1/dbs/initdev.ora Browse
Snap Mount Location:	/p02 Browse 4
Reservation Period:	30 🖞 days 0 📩 hours 5
Force Cleanup	-
Online Log Files	
◯ Group ◯ File	
Group Number	Size Reuse S
	<u>^</u>
Add Edit	Delete
File Name	Size Reuse 😵
	~
Add Edit	Delete
	6 Cancel 🚱 Save As Script Help

Figure 72. Clone Options for the target database

The Job Controller shows the job 2352 submitted to clone the database and completed.

Recover Jobs	Stub Recall Jo	bs				
Operation Type	Job ID	Status	Started Time	End Time	No. of Objects	Destination Client
Restore	2352	Completed	11/10/2015 11:39:16 AM	11/10/2015 11:40:55 AM	0	minnie

The cloning function took just 1 minute and 38 seconds to complete.



🁌 Job Details for Job: 2352 🗙
General Details Attempts Events
Server Start Time: 11/10/2015 11:39:16 AM Server End Time: 11/10/2015 11:40:55 AM Duration: 00:01:38 Total Objects 0 No. of Successes: 0 No. of Failures: 0 Size of Application 0 Bytes
OK Close Previous Next Help

Figure 73. Run time of cloning database

7) Right clicking the job and selecting **View RMAN log** shows the activity performed by the job which uses RMAN functionality to create an empty database named **DEV**, cataloging the redo logs from **PROD** and recover the database to the latest backup and open the **DEV** database in resetlogs mode.

🖧 Oracle Restore Log (Job ID : 2352):	Solution Oracle Restore Log (Job ID : 2352):
File Edit Search	File Edit Search
Go to Page 1 ding Go Previous Next First Last View All	Go to Page 1 Go Previous Next First Last View All
Cloning/mounting data and log volumes from Snap backup Job 1306 Initializing an empty ORACLE instance dev on minnie Creating control mie Executing sql [@/p02/2352/create_ctrl_file.sql quit;] Rman Script:	RMANN> Recovery Manager complete.] Executing SQL script [alter database open resetlogs; exit;] Shutdown db to Change the DBID. And then restart it. Executing sql [shutdown immediate;
[run { allocate channel ch1 type disk format '%U'; catalog controlfilecopy '/p02/2352_snap_2_838/archivelog/backup.ctl.galaxy'; catalog start with '/p02/2352_snap_2_838/archivelog/' noprompt; } exit;]	startup mount pfile='/u01/app/oracle/product/12.1.0/dbhome_1/dbs/initdev.ora'; quit;] Executing sal Ishutdown immediate; startup mount pfile='/u01/app/oracle/product/12.1.0/dbhome_1/dbs/initdev.ora'; alter database open resetlogs; quit;
Rman Log:[Recovery Manager: Release 12.1.0.2.0 - Production on Tue Nov 10 11:39:57 2015 Copyright (c) 1982, 2014, Oracle and/or its affiliates. All rights reserved. RMAN> connected to target database: DEV (DBID=303455707, not open) using target database control file instead of recovery catalog	J Executing sql [create temporary TABLESPACE ts_temp TEMPFILE '/p02/2352/temp.dbf' size alter database DEFAULT TEMPORARY TABLESPACE ts_temp; exit;]

The Figure 74 shows Commvault IntelliSnap technology with Pure Storage has created two new volumes from the source volumes (**fs_prod_data01** and **fs_prod_fra01**).

- Hosts +	Total Reduction Provisioned Total Reduction 7.98 TB 92.5 to 1	Data Reduction 30.6 to 1
📼 donald		Used
D mickey		324.28 MB
v= minnie	Volumes Snapshots 60.50 MB 263.78 MB	
- Volumes +		
Filter	Connected Volumes (7) Host Ports (4) Details (0)	1-7 of 7 🏾 🔅 -
CV 45 Clone	NAME Cloned volumes from _{UN PROVISIONED VOLUMES SNAPS}	HOTS REDUCTION
CV_46_Clone	CV_45_Clone connected on minnie 6 1 TB 1.21 MB	0 GB 30.6 to 1
CV_8C44AF1516138372000	CV_46_Clone 7 1 TB 0 GB	0 GB 30.7 to 1

Figure 74. Volumes mounted by Commvault IntelliSnap

8) Verify the cloned database **dev** on **minnie** server.



Figure 75. Cloned database details



Summary

The combination of Pure Storage FlashRecover Snapshot technology with IntelliSnap technology provides the following benefits.

- Powerful data protection for Oracle databases and meets stringent SLAs and more rigorous applicationspecific recovery point and time objectives.
- Quickly restore entire databases within moments of failure, without administrator intervention.
- Create instantaneous, high performance clones of Oracle databases consuming very little space.



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About the Author



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Somu has over 20 years of experience with Oracle Databases and specialized on performance tuning dating back to the days with Oracle Corporation where he was part of the Systems Performance Group (SPG) and later with Oracle Applications Performance Group. During his career with Oracle Corporation, Logitech, Inspirage and Autodesk he wore multiple hats ranging from providing Database and Performance Solutions to managing Infrastructure, Database and Applications support hosted in-house and over Cloud platforms.

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