

## Riverbed<sup>®</sup> SteelFusion<sup>™</sup> Appliance: Snapshot Handoff Host with Pure Storage

Solution Guide

Version 1.0 March 2015



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NetApp Manageability Software Development Kit (NM SDK), including any third-party software available for review with such SDK which can be found at http://communities.netapp.com/docs/DOC-1152, and are included in a NOTICES file included within the downloaded files.

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### **Joint Solution Overview**

This document describes the integration between Riverbed® SteelFusion<sup>™</sup> and Pure Storage arrays to provide data protection for branch offices via application consistent snapshots. SteelFusion appliances can create application consistent snapshots on LUNs projected to branch offices. This solution guide provides detailed step-by-step instructions on how to configure and use the SteelFusion appliance's new snapshot handoff host's architecture. The steps have been tested on Pure Storage FlashArrays with Purity Operating Environment version 4 using Fibre Channel LUNs and with SteelFusion 3.0 and 3.6.

## **Riverbed SteelFusion Product Family Solution Overview**

The SteelFusion Product Family enables users and applications in branch office locations to write to and access centrally managed storage while maintaining local disk performance. By accelerating branch access to data center Storage Area Networks (SANs), IT organizations no longer need to provision and maintain dedicated storage resources in branch offices.

The SteelFusion Product Family solution consists of two components:

- **SteelFusion Core appliance (SteelFusion Core)** a physical or virtual appliance that resides in the data center alongside centralized storage.
- **SteelFusion Edge appliance (SteelFusion Edge)** a physical appliance that resides in the branch office.

SteelFusion Core mounts Fiber Channel LUNs provisioned from the data center storage infrastructure and shares this with branch offices running the SteelFusion Edge module as shown in Figure 1. SteelFusion Edge virtually presents one or more iSCSI targets in the branch, which can be used by services and systems running both within the Riverbed Virtual Services Platform (VSP). SteelFusion Core analyzes mounted file systems and is able to proactively stream data to the branch locations using innovative block-level prediction algorithms. This industry-first capability allows data from centralized storage to be available wherever and whenever it is needed. Through asynchronous block-based write acceleration, SteelFusion Edge module ensures that data created in branch office locations is securely stored in the data center.



Figure 1: SteelFusion Core and SteelFusion Edge network topology overview

## Pure Storage Flash Array Product Overview

Pure Storage is the leading all-flash enterprise array vendor, committed to enabling companies of all sizes to transform their businesses with flash.

Built on 100% MLC flash, Pure Storage FlashArray delivers all-flash enterprise storage that is 10X faster, more space and power efficient, more reliable, and infinitely simpler, and yet typically cost less than traditional performance disk arrays.



Figure 2: The FlashArray FA-405, FA-420, and FA-450

#### Pure Storage FlashArray FA-400 Series 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 by delivering:

#### **Consistent Performance**

FlashArray delivers consistent <1ms average latency. Performance is optimized for the real-world applications workloads that are dominated by a range of IO sizes. Full performance is maintained even under failures/updates.

#### Less Cost than Disk

Inline de-duplication and compression deliver 5 – 10x space savings across broad set of IO workloads including Databases, Virtual Machines and Virtual Desktop Infrastructure. These data reduction capabilities drive the cost per usable unit of storage to a level at or below that of comparable disk-based storage systems.

#### **Mission-critical Resiliency**

FlashArray delivers >99.999% proven availability, as measured across the Pure Storage installed base. Operations are totally non-disruptive and performance is maintained even during faliures.

#### **Disaster Recovery Built-In**

FlashArray offers native, fully integrated, data reduction-optimized backup and disaster recovery at no additional cost. Set-up disaster recovery with policy-based automation within minutes. 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: Webbased GUI, CLI, VMware vCenter, Rest API, or OpenStack.

Pure Storage FlashArray FA-400 Series includes FA-405, FA-420, and FA-450. A FlashArray is available for any application and any budget.

## The Problem: Addressing Branch Office Data Backup Challenges

Geographically distributed organizations face major challenges managing their remote office and branch office storage needs, whether they decide to store the data locally or at the data center. Organizations today are experiencing an explosion in data growth together with a request to improve their backup and recovery processes while containing storage costs and keeping data secure. On top of that, growing concerns include having adequate lab space for all the storage and IT gear and finding qualified IT personnel with the appropriate storage skills to manage and configure backup and recovery processes.

Today's solutions to these challenges vary depending on the size, the distance, and the geographical location of these remote branch offices leaving IT storage administrators to implement a variety of different approaches.

One approach, for example, is to back up data locally. This approach provides fast recovery but requires deploying expensive and complicated storage arrays and/or backup tapes at the branch office and does not provide geographical disaster recovery protection. Moreover, maintaining tapes and running backup agents at each branch office is cumbersome, fragile, and error prone.

Another approach is to centrally back up branch office data to the data center. While this approach provides geographical disaster recovery protection, it requires expensive data replication software and/or licenses and will slow down the data recovery process. In the event of a disaster, this approach requires a restore of all the data back to the branch office before you can resume operations.

#### Use Case 1: Backup with SteelFusion

In a SteelFusion solution, data is consolidated in the data center and at the same time projected to the branch office. This results in the speed of local backup solutions while simultaneously providing high-performance geographically distributed access to centralized storage. The backup can be performed without requiring expensive data replication software and/or licenses in a central location where skilled IT storage personnel reside. They can provide geographical disaster recovery protection by managing and configuring storage arrays, backup tapes; and deal with any unforeseen issues.

In the case of a disaster, because the data is available at the data center and SteelFusion Core can stream the data (as needed to the newly deployed hardware at the branch office), the restore can be done without performing full data restores, providing fast recovery.

In case of data loss (mistakenly deleted files, deleted directories, virus, and so on), SteelFusion appliances work with array-based snapshots, mirroring methodologies and with traditional backup software, allowing both data protection and recovery to be performed from the data center.

# Use Case 2: Remote ESX(i) Servers Running on SteelFusion Edge Consolidated Storage

A typical use case for VMware<sup>®</sup> ESX<sup>®</sup> or ESXi<sup>®</sup> servers using remote storage in a branch office environment using SteelFusion Edge appliances is when a customer has storage needs at many remote sites and wants to have local performance, continuous uptime even during WAN outages, and constant protection of the data at a centralized location in case of disaster at any of the branch offices. The ability to centrally provision new block storage, perform regular backups and monitor the overall infrastructure is an important aspect of this use case Figure 3.



Figure 3: Topology for ABC Corporation with remote ESX servers

## **Snapshot Handoff Hosts Solution Overview**

Here is an overview of how the new snapshot handoff hosts feature works and the factors you need to consider when designing your SteelFusion deployment.

This section covers the following topics:

- Snapshot Handoff Hosts
- Topology Overview

#### **Snapshot Handoff Hosts**

In the past, SteelFusion appliances supported application consistent snapshots only on specific models of storage arrays. Now, with the snapshot handoff host feature, SteelFusion appliances can support application consistent snapshots on any storage array. With configured snapshot handoff hosts, SteelFusion appliances will hand off the snapshot operations to an external host to perform, instead of directly instructing the storage array, thereby giving you the ability to provide your own scripts to manage their storage arrays that can be plugged into SteelFusion appliances framework.

#### **Topology Overview**

Figure 4 shows the topology and the logical representation of how the data moves during handing off snapshot to an external host.



Figure 4: Snapshot handoff host topology

The following are the sequence of events:

- 1. A user triggers a snapshot on the projected LUN, manually or from a configured schedule on the SteelFusion Edge.
- 2. The SteelFusion Edge interacts with either the Microsoft® Windows® servers running on the LUN or the VMware ESXi server which is hosting the virtual machines (VM), to quiesce the applications, flush the data and create

an application consistent state. The SteelFusion Edge denotes the application consistent state by inserting a snapshot marker in the data stream. The data and the snapshot marker traverse the WAN and reach the SteelFusion Core.

- 3. On detecting the snapshot marker in the data stream, the SteelFusion Core hands off the snapshot request to the configured host.
- 4. The handoff host interacts with the storage system to take the snapshot.
- 5. The storage system triggers the snapshot.
- 6. The handoff host tells the ESXi host to mount the new volume created from the LUN snapshot on the array.
- 7. Backup software connects to the ESXi host to back-up the VMs.

## **Deploying Snapshot Handoff Hosts**

This section describes the process and procedures for deploying snapshot handoff hosts. It includes the following topics:

- Deployment Prerequisites
- Solution Deployment Prerequisites
- Storage System Setup
- Handoff Host Setup
- SteelFusion Core Setup
- Trigger a Snapshot at the SteelFusion Edge

#### **Deployment Prerequisites**

Figure 4, on the previous page, shows the reference architecture and the topology that was configured and tested to develop this solution guide. Each component is referenced starting from right to left.

#### Storage System

The storage system is the Pure Storage array that we will be interfacing with to call snapshots and assign HBA permissions.

#### Handoff Host

The handoff host is the Windows Server used to orchestrate commands against the Pure Storage array and VMware ESXi and/or vCenter server host. Riverbed supports Windows 2008 R2 server as handoff host for SteelFusion 3.0. Riverbed supports Windows 2008R2 or 2012R2 for SteelFusion 3.6.

The handoff host requires the following installed:

- Python 3.3+
- VMware SDK for Perl 5.1+ for SteelFusion 3.0, 5.5+ for SteelFusion 3.6
- PowerShell® 4.0+

#### **SteelFusion Appliances**

The data center SteelFusion Core used was a SteelFusion Core Virtual Edition (SteelFusion Core-VE) VGC-1000-M running software version 3.0. The SteelFusion Edge module used was running software version 3.5 and located on a physical appliance at the branch.

#### **SteelHead Appliance**

The data center SteelHead appliance was a SteelHead 550M running RiOS software version 8.5.0.

#### **WAN Simulator**

The WAN simulator was operating as a T1 (1.5 Mbps) link with 100 milliseconds round-trip delay and was connecting the branch office and data center setups.

#### **Branch Windows Server**

The branch windows server was a Windows 2012 server.

#### **Solution Deployment Prerequisites**

- Administrator access to the storage system and SteelFusion appliances to make changes such as enabling iSCSI, adding initiator groups, etc.
- SteelFusion Core and SteelFusion Edge appliances installed and powered up.
- VMware administrator credentials for hosts at the SteelFusion Edge (VSP) and ESXi proxy host in the datacenter.

#### Storage System Setup

The Pure Storage FlashArray system setup begins with a LUN mapped to the SteelFusion Core through Fibre channel. For more information on this, please refer to *SteelFusion Core and Edge Deployment Guide*.

A Host Group must be created on the Pure Storage array for the ESXi proxy host.

To create the host group, go to the Pure web interface, browse to **Hosts**, click on the **+** and **Create the Host Group**:



Subsequently, a host must be added to the host group. Click on the gear icon on the right and add the name of the ESXi proxy host.

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When adding the host, you must select the ESXi proxy host's WWN(s).

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#### Handoff Host Setup

The scripts\* can be refactored to work with your file locations (\***Please contact your Riverbed or Pure Sales team to obtain the scripts referenced in this Solution Guide**). By default, the scripts assume that:

- Python 3.3+ is installed in: E:\python34
- VMware SDK for Perl 5.1+ for SteelFusion 3.0, 5.5+ for SteelFusion 3.6 is installed in:
- E:\Program Files (x86)\VMware\VMware vSphere CLI
- PowerShell® 4.0+ is installed and powershell.exe is accessible in %PATH%

- 1. Extract the rvbd\_handoff\_scripts.zip package into E:\rvbd\_handoff\_scripts
- 2. Open a Command Prompt by clicking Start, Run, and type "cmd" and hit enter.
- 3. In the Command Window, run:
  - a. E:
  - b. cd rvbd\_handoff\_scripts
  - c. e:\Python34\python.exe cred\_mgmt.py
  - d. Follow the menu screen and add credentials to your ESXi proxy host.

```
- Setup new DB
  - Add/Modify Host
3
  - Delete Host
  - Show all passwords
  - Exit
Enter Operation: 1

Setup new DB
Add/Modify Host
Delete Host
Show all passwords

  - Exit
Enter Operation: 2
            : 10.33.195.145
Host
Username
            : root
Password : password
  - Setup new DB
- Add/Modify Host
  - Delete Host
  - Show all passwords
  - Exit
Enter Operation: 4
Host: 10.33.195.145 User: root Password: password
  - Setup new DB
  - Add/Modify Host
- Delete Host
3

    Show all passwords

    Exit
Enter Operation: 5
Good Bye!
```

- 4. Open up pure.ps1 in notepad and modify lines with your PureStorage array credentials i.e.:
  - a. \$user = "pureuser"
  - b. \$pw = "pureuser"

### **SteelFusion Core Setup**

To set up SteelFusion Core:

1. Under the **Configure > Storage > Snapshots** configuration tab, click the **Handoff Hosts** tab.

- 2. Click Add a Handoff Host and fill in the required fields.
- 3. Click Add Handoff Host, as shown in Figure 55.
- 4. After you have filled the required fields, click on the Add handoff host link.



Figure 5: Add handoff host

Fie	ld Description
Hostname or IP address	This should be the hostname or IP address of the handoff host.
Username	This is the username of the administrator/user who has administrative privileges on the handoff host and this field should adhere to Domain\Username format.
Password	This is the password of the administrator/user who has administrative privileges on the handoff host.
Confirm Password	Confirm the above-mentioned password.
Script Path	This is entire path needed to execute the script that interacts with the storage array. In this example, it was: • E:\Python34\python.exe E:\rvbd_handoff_scripts\pure_fc.py • pure_fc.py is the script that interacts with the storage array.
Script Arguments	Arguments that should be passed to the script. This field is completely dependent on your script. In our implementation, we used:     work-dir e:\rvbd_handoff_scripts    array purelababccompany.com    accessgroup proxy    protect-category manual The accessgroup is the host group that created in the Storage Subsystem Setup. The "protect-category" is mandatory if you want the ESXi proxy host to mount the datastore and register the VMs that you want to protect. Valid options for protect-category are hourly, daily, weekly, or manual. The selection must match the selection in the Snapshot Schedule Policies tab i.e. if you enable snapshots every day at 12am and 2pm, the protect-category would be hourly, if you're selecting every Sunday, Monday, etc., the selection would be daily.

#### Associate Handoff Host to a LUN

- On SteelFusion Core, browse to **Configure > Storage > LUNs**.
- Expand the LUN you want to associate the handoff host with, click the Snapshot tab and then click Configuration tab, as shown in Figure6.

- Click the radio button for Handoff Host and from the drop down list; select the host you just added.
- Click Test Handoff Host button to test if the handoff host configuration is correct.
- If the result comes back as Successful as shown in Figure 77, click Update Settings.



Figure 6: Associate handoff host to a LUN

**Note:** When you are using the handoff host, the proxy backup configuration is done via the script with the "--protect-category" argument and you will not see the proxy backup configuration in the SteelFusion Core interface.

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Configure > Storage > LUNs 2 Status of all configured luns.							Enter se	arch text
	Type †↓	Status †4	Size †4	Granite Edge †↓	Portal †	Pinned †↓	Prepop	Remove
snapshot_handoff (P3PdBZuTJike)	ISCSI	Unmapped	500 MB	kabar-vva48	10.32.146.161, 10.32.146.162	No	Disabled	Ō
Details     Edge Mapping     Failover     MPIO     Snapshots     Pin/P       History     Scheduler     Configuration     Configuration     Configuration       General Settings     Storage Array     None ±     Configuration     Configuration       Image: Configuration     Image: Configuration     Configuration     Configuration     Configuration       Image: Configuration     Configuration     Configuration     Configuration     Configuration       I	f Host is being u	sed.						

Figure 7: Test handoff host

### Trigger a Snapshot at the SteelFusion Edge

To trigger a snapshot at the SteelFusion Edge:

- 1. From the SteelFusion Edge, click **Configure > SteelFusion Storage**, navigate to **LUNs** page and click **Take Snapshot** button. This should create a new snapshot on your storage array.
- 2. Click the trash icon to test if snapshot removal works, as shown in Figure . However, Riverbed recommends that you use the schedules to trigger a snapshot and use the **Take Snapshot** only for testing purposes.

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Figure 8: Take snapshot

## **Best Practices**

The best practices are not requirements, but Riverbed recommends that you follow these suggestions because they are intended to guide you to achieving designs that get the most out of the SteelFusion appliances while reducing configuration and maintenance requirements.

The following table displays Riverbed's best practices for snapshot handoff hosts.

Best Practice	Description
Harden the handoff host.	Because the handoff host contains passwords, be sure to secure access to the machine.
Windows User Account has administrative privileges	The Windows user account that is created for handoff should have "Administrator" privileges and password protection so that SteelFusion Core can run winexe services. This service is used by SteelFusion Core to login and run handoff script on the handoff host
The Username should be in domain\Username format.	The Username of handoff host, which you add on SteelFusion Core, should be in the format domain\username.
Do not pass sensitive information in scripts path.	The arguments that are passed to SteelFusion Core under script arguments are stored in clear text. Riverbed does not recommend you pass sensitive information like passwords. These can be passed in the handoff host directly.
Logging	Keep the Logging Level on the SteelFusion Core to Notice to avoid logging your passwords in plaintext.

## **Troubleshooting Tips**

When troubleshooting configuration, increasing the log level to Info under Settings > System Settings > Logging on the SteelFusion Core will help immensely. Please revert the change after the implementation is complete to avoid seeing passwords displayed in plain text.

Symptom	Potential Resolution
Snapshot fail	There are many reasons why the snapshot can fail. Refer to the log to drill down further.
Snapshot fail	If the log message shows, "ERR: b"The input line is too long.\r\n", the command with arguments was too long for Windows to interpret. Consider using the IP address instead of a long hostname.
Datastore not mounting in ESXi	Presenting datastores with the same VMFS volume UUID can be problematic for ESXi. If you do experience the LUN device being presented to ESXi and the LUN not being mounted with the script, you may need to reboot the host. You can confirm this by running "esxcfg-volume –l" if you SSH into the ESXi console and see: Can mount: No (the original volume has some extents online)
Datastore not mounting in ESXi	Check if the snapshot was successfully completed at the SteelFusion Edge. If so, notice the type of snapshot. Confirm that the type of snapshot matches the protection-category argument being passed in the script.



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