IBM System Storage N series
Gateway Implementation Guide for RamSan Storage

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Preface

About this guide

This guide provides guidelines that apply to all storage array vendors for how to set up your storage array to work with an IBM® N series gateway running Data ONTAP® software. The information in this guide pertains to all supported gateway platforms.

Note

Data ONTAP software runs on multiple hardware platforms. This documentation might describe features that are not supported on your platform.

Attention

In this document, the term *gateway* describes IBM N series storage systems that have been ordered with gateway functionality. Gateways support various types of storage, and they are used with third-party disk storage systems—for example, disk storage systems from IBM, HP®, Hitachi Data Systems®, and EMC®. In this case, disk storage for customer data and the RAID controller functionality is provided by the back-end disk storage system. A gateway might also be used with disk storage expansion units specifically designed for the IBM N series models.

The term *filer* describes IBM N series storage systems that either contain internal disk storage or attach to disk storage expansion units specifically designed for the IBM N series storage systems. Filer storage systems do not support using third-party disk storage systems.

Audience

This guide is for system administrators who are familiar with operating systems such as UNIX® and Windows® that run on the storage system's clients. This guide does not discuss basic system or network administration topics, such as IP addressing, routing, and network topology; it emphasizes the characteristics of the gateway.

Relationship of this guide to other guides

This guide is intended to be used in conjunction with other information in the gateway and Data ONTAP libraries. The following table describes the relationships between this guide and other documentation.

Guide name	Information includes...
Installation Requirements and Reference Guide	◆ General guidelines for creating and making array LUNs available to gateways. ◆ Quick start installation instructions for connecting devices together and for installing Data ONTAP on a gateway that uses only third-party storage. ◆ Reference information. ◆ Detailed background information including layout in aggregates and checksums.
Implementation Guides	◆ Vendor-specific details about how to set up a storage array to work with gateways. ◆ More detailed configuration examples than are provided in the *Installation Requirements and Reference Guide*.
Implementation Guide for Native Disk Shelves	Information about setting up the storage on the native disk shelves connected to the gateway.
Gateway *Setup, Installation, and Management Guide* and the Data ONTAP software setup guide*s*	Detailed steps for setting up the gateway, including information about installing Data ONTAP software for installations using only third-party storage. These guides are most helpful to installers new to Data ONTAP setup and installation.
Data ONTAP guides	Detailed information about all Data ONTAP features used by all systems running Data ONTAP, for example, storage features and data protection features.

See the gateway *Interoperability Matrix* for details about Data ONTAP releases that support the gateway, supported switches, supported firmware, capacity, and maximum array LUN count.

Supported features

IBM System Storage™ N series products are driven by NetApp® Data ONTAP software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details. Information about supported features can also be found at the following Web site:

www.ibm.com/storage/support/nas/

A listing of currently available N series products and features can be found at the following Web site:

www.ibm.com/storage/nas/

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected properly.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.

Using the documentation

Information about the N series hardware products is available in printed documents and a documentation CD that comes with your system. The same documentation is available as PDF files on the IBM NAS support Web site:

www.ibm.com/storage/support/nas/

Web sites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates.

- For NAS product information, go to the following Web site:
  www.ibm.com/storage/nas/
- For NAS support information, go to the following Web site:
  www.ibm.com/storage/support/nas/
- For AutoSupport information, go to the following Web site:
  www.ibm.com/storage/support/nas/
- For the latest version of publications, go to the following Web site:
  www.ibm.com/storage/support/nas/

Accessing online technical support

For online Technical Support for your IBM N series product, visit the following Web site:

www.ibm.com/storage/support/nas/

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following Web site for support telephone numbers:

www.ibm.com/planetwide/

Supported servers and operating systems

IBM N series products attach to many servers and many operating systems. To determine the latest supported attachments, visit the following Web site:

www.ibm.com/storage/support/nas/

Firmware updates

As with all devices, it is recommended that you run the latest level of firmware. For information on firmware updates, visiting the following Web site:

www.ibm.com/storage/support/nas/

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support. See the *Gateway Upgrade Guide* for your version of Data ONTAP for more information on updating firmware.

Special messages

This guide contains special messages that are described as follows:

Note

A note contains important information that helps you install or operate the system efficiently.

Attention

Attention contains instructions that you must follow to avoid damage to the equipment, a system crash, or loss of data.

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Implementation Overview 1

About this chapter

This chapter provides an overview of how to integrate IBM® N series gateways with supported RamSan storage arrays.

Note

IBM gateway models and filers with gateway functionality are both referred to as gateways.

Topics in this chapter

This chapter discusses the following topics:

- "Overview of RamSan storage arrays" on page 3
- "RamSan and solid state disk technology terminology" on page 5
- "What Data ONTAP supports for RamSan storage arrays" on page 7

Generic storage allocation terms used in this document

The following generic terms are used in this document.

array LUN: A logical device that has been mapped to a storage array port and, therefore, is available to a host for storage. If it is clear from the context that the LUN is on the array, *LUN* is used by itself.

Note

On a RamSan storage array, each logical unit has an internal number assigned by the system and an external number, a logical unit number or LUN, which is the external number presented to hosts.

native disks, native disk shelves: Disks and disk shelves that are sold as local storage for systems that run Data ONTAP software.

Additional information to read

This guide is intended to be used in conjunction with other information in the gateway library. In particular, refer to the additional documents in the following table.

For information about...	See...
Data ONTAP releases that support the gateway, supported switches, supported firmware, capacity, and maximum array LUN count	Gateway *Interoperability Matrix* at http://www.ibm.com/storage/nas/ **Note** The *Interoperability Matrix* is the final authority on the storage array models and license code and firmware controller versions that the gateway supports.
Creating LUNs for Data ONTAP on the storage array and setting up access to them (generic information for all vendors and storage arrays)	Gateway *Installation Requirements and Reference Guide*
How to configure the gateway	Gateway *Installation Requirements and Reference Guide* Gateway *Setup, Installation, and Management Guide* (detailed procedures)
How the gateway operates and what you need to plan for a successful deployment with the gateway	Gateway *Installation Requirements and Reference Guide*

Overview of RamSan storage arrays

Type of storage on RamSan storage arrays

The RamSan-500 storage array is an enterprise-class storage array based on RAID-protected flash storage. A RamSan-500 uses solid state disk storage rather than disk-based storage (spinning disks). Devices that use solid state disk storage are much faster than conventional hard drives and, as a result, can achieve maximum throughput without needing to add storage devices. Conversely, disk-based storage arrays require a large number of disks to achieve maximum throughput. Space requirements and overhead increase as the number of disks increases.

Note

Solid state disks look like a disk drive to the operating system; they can be mounted, formatted and used just like any other disk. Solid state disks come in two primary types: *RAM-base*d (DDR RAM) and *Flash-based* memory.

How redundancy is provided by RamSan models

The RamSan-500 is flash-based storage that is fronted by a RAM-based cache. The flash units are hot-swappable and are in a RAID-3 configuration to provide redundancy in case one flash unit fails.

How Data ONTAP views LUNs from a RamSan storage array

From the point of view of Data ONTAP, array LUNs created from a solid state disk are indistinguishable from array LUNs from other vendors' storage arrays. However, on a RamSan storage array, LUNs are created from RAM-based or flash-based media, not from storage that spans several disks, as is the case for storage arrays that use disk-based storage.

Best type of data to store on a solid state disk

There are no limitations on the type of data you can store on SSD. Typically, however, the best type of data to store on SSD is data that is accessed frequently—the type of data that benefits the most from the increased performance and system utilization provided by SSD. Applications that particularly benefit from SSD include online transaction processing, data warehousing, file system metadata acceleration, database systems, non-linear video editing, software configuration and versioning tools acceleration and testing or benchmarking. An entire database does not have to be stored on SSD; you can store only the most recent data on SSD and the remainder on disks.

Customers use SSD in different ways. Some customers constantly move older data to slower RAID systems for archiving. Some customers only move logs, indices, temporary tables, and so on to other systems. In all cases, the goal is to put only frequently-accessed data on SSD.

RamSan and solid state disk technology terminology

access policy

On a RamSan storage array, a policy that you must set on each logical unit that identifies which initiator world-wide port names (WWPNs) are allowed to communicate with the LUN through a particular storage array target port, or that all WWPNs of the initiators connected to the storage array port can access the LUN.

Backup Mode

The method that the RamSan storage array uses to back up data to the array's internal hard disk drives.

cached flash RAID

A solid state disk with a large DDR RAM cache in front of flash memory that is used as primary storage. This combination leverages benefits of flash: density, cost, non-volatility, and read performance together with the benefits of DDR: extremely fast read and write performance.

DDR RAM

Double data rate or DDR memory is a type of very fast computer memory. DDR RAM is based on the same architecture as Double-Data-Rate Synchronous Dynamic Random Access Memory (DDR SDRAM) but utilizes the clock signal differently. DDR memory is designed to function at two memory operations per clock cycle. This effectively doubles the speed of the memory over the older synchronous memory modules.

flash memory

Flash memory is non-volatile, which means that no power is needed to maintain the information stored in the chip. Flash-based and disk-based storage have very different characteristics. Disks tend to have higher capacity and be less expensive. Flash devices are more power efficient and have much better performance for random requests than disks. Additionally, they do not have the mechanical limitations of disks.

I/Os Per Second (IOPS)

IOPS is the standard unit of measurement for I/O (Input/Output) operations per second. IOPS measures performance and is usually seen written as the following:

- Total IOPS: Average number of I/O operations per second.

- Read IOPS: Average number of read I/O operations per second.
- Write IOPS: Average number of write I/O operations per second.

Logical Unit (LU)

A logical unit of storage on a RamSan storage array. A logical unit is identified by two numbers. The system assigns an internal number for each logical unit, which is unique on the storage array. You specify the LUN (logical unit number) that is presented externally to hosts. For a LUN to be presented to a host, you must configure an access policy for the Logical Unit.

Logical unit access policy

See "access policy" on page 5.

LUN

Logical Unit Number. This is the external number for a logical unit that is presented to hosts. (Gateway documents use the term array LUN.)

non-volatile memory

Computer memory that can retain the stored information, even when not powered. Examples of non-volatile memory include read-only memory, flash memory, optical disk drives, and most types of magnetic computer storage devices—for example, hard disks, floppy disk drives, and magnetic tape,

solid state disk (SSD)

A data storage device that uses memory as the storage media. To the operating system, a solid state disk looks like a disk drive. You can mount solid state disks, format them, and use them like any other disk.

Solid state disks come in two primary types: RAM-based and Flash-based.

volatile memory

Computer memory that requires power to maintain the stored information; if the external power is lost, the memory is lost. Most forms of modern random access memory are volatile storage.

What Data ONTAP supports for RamSan storage arrays

Data ONTAP releases and systems supported with RamSan

This guide provides information about the storage arrays that the gateway supports at the time of publication. Not all models described in this guide are supported in all Data ONTAP releases. To determine which storage array models are supported in a particular Data ONTAP release, see the gateway *Interoperability Matrix*.

Note

The gateway *Interoperability Matrix* is the final authority about which Data ONTAP releases, storage arrays, firmware, switches, features, and so on that gateways support.

RamSan storage array models supported

At the time of publication of this guide, gateways support the following RamSan storage array platforms.

- Family 1
  - RamSan-500

Note

In the context of this discussion, storage arrays that are in the same *family* share the same performance and failover characteristics. For example, members of the same family all perform active-active failover or all perform active-passive failover. When you set up a Data ONTAP aggregate, you cannot assign array LUNs from different storage array families or from different vendors to the same aggregate.

Requirement to dedicate the RamSan storage array to the gateway

The RamSan storage array must be dedicated to the gateway.

Number of storage arrays behind the gateway

You can deploy multiple storage arrays behind a gateway. The storage arrays can be from the same vendor or from different vendors.

When to use non-RamSan storage also

For the RamSan-500, it is recommended that you use non-RamSan storage to hold the root volume and spare LUNs for core dumps, although it is not required. The non-RamSan storage can be either a native disk shelf or array LUNs on another supported storage array. By putting the root volume and spare LUNs for core dumps on non-RamSan storage, you can save space on the RamSan storage array for transactions for which fast performance is especially beneficial.

Supported storage array firmware

See the gateway *Interoperability Matrix* for information about supported firmware versions. The *Interoperability Matrix* is the final authority on the firmware versions that the gateway supports.

RamSan firmware upgrade restriction

RamSan supports live download of new firmware, but the procedure to activate the new firmware is disruptive.

What Data ONTAP does not support for RamSan storage arrays

Data ONTAP does not support the following functionality with RamSan storage arrays:

- MetroCluster configurations
- Gateway neighborhoods
- Direct attachments between the gateway and the RamSan storage array
- Sharing the RamSan storage array with non gateway hosts.

Data ONTAP Setup Guidelines for RamSan 2

About this chapter

This chapter provides guidelines for provisioning LUNs on the RamSan storage array for Data ONTAP. This chapter also provides guidelines for setting up and optimizing Data ONTAP and gateway hardware for use with RamSan storage arrays.

Note

See the gateway *Installation Requirements and Reference Guide* for general guidelines about setting up array LUNs for Data ONTAP and access to them.

Topics in this chapter

This chapter discusses the following topics:

- "Guidelines for assignment of array LUNs to Data ONTAP" on page 2
- "Guidelines for sizing array LUNs for Data ONTAP" on page 4
- "Guidelines for optimizing gateway performance" on page 6
- "Location of the root volume and spare LUNs for core dumps" on page 8
- "Guidelines for creating aggregates" on page 9
- "Guidelines for gateway port usage" on page 10
- "Using FlexCache with RamSan storage" on page 12

Guidelines for assignment of array LUNs to Data ONTAP

Considerations for storage partitioning for RamSan storage

RamSan storage arrays consist of a uniform pool of storage. Spindle count and detailed layout of storage, which you need to plan for with disk-based storage arrays, are not applicable to RamSan storage arrays. With RamSan storage arrays, there is no concept of using RAID groups (parity groups) to divide up storage.

With RamSan storage arrays, the primary consideration for determining the number and size of LUNs to create is what you need to support your configuration. Consider the following to determine the size and number of LUNs you need:

- Do you need different LUNs for different purposes?
- For the amount of storage you need, how many LUNs do you need to stay within the Data ONTAP limits, and what size should they be? (See "Guidelines for sizing array LUNs for Data ONTAP" on page 4 for more information about Data ONTAP limits.)
- Is there a performance reason to have multiple LUNs? For example, do you need to use more than one back-end channel that is, multiple LUN groups, to optimize performance?

Because RamSan storage arrays are solid state devices, there is no reason to configure more LUNs than are required. The simplest approach to provisioning is to configure the largest LUNs you can to meet your space requirements. There are no performance benefits or penalties as a result of choosing multiple smaller LUNs over a single larger LUN.

Note

Sharing the RamSan storage array with non gateway hosts is not supported.

Maximum number of array LUNs you can allocate to Data ONTAP

See the gateway *Interoperability Matrix* for the maximum number of array LUNs that Data ONTAP supports for each RamSan storage array.

Required number of paths to an array LUN

Data ONTAP expects a storage array to provide access to a specific array LUN on only two of the storage array ports: one is the primary path and the other is the alternate (secondary) path. A given LUN is accessed through only one port at a time. (See the gateway *Installation Requirements and Reference Guide* for details about paths.)

When you map an array LUN, you select the two array ports that the gateway can use to access the LUN. Ensure that the two ports that you select to access a given LUN are from alternate controllers to avoid a single point of failure (SPOF). A SPOF would occur if the two ports you selected were on the same controller and the controller failed.

Limitation for using LUN 0

Do not use a LUN with a LUN name of 0; that is, the external number of the logical unit that is reported to the attached SCSI host cannot be 0. If you want to use the system-named Logical Unit 0 for Data ONTAP, be sure that you assign a LUN number (the external number) that is greater than 0.

Guidelines for sizing array LUNs for Data ONTAP

Relationship of Data ONTAP units of measure to storage array LUN size limits

The size of the array LUNs that you can create on the storage array is limited by the minimum and maximum array LUN sizes that Data ONTAP supports. The Data ONTAP definition of a gigabyte (GB) might not match the definition of a GB for your storage array. When you determine the minimum and maximum array LUN sizes for your storage array, you need to consider whether the units of measure for your storage array are different from Data ONTAP units of measure.

The Data ONTAP definition of a GB is as follows:

One GB is equal to 1000 x 1024 x 1024 bytes.

See the gateway *Interoperability Matrix* for the general rule about Data ONTAP minimum and maximum array LUN sizes. Each gateway *Implementation Guide* contains specific information about the equivalent minimum and maximum limits according to the vendor's calculation of units of measure.

Minimum and maximum array LUN sizes with RamSan storage arrays

RamSan storage arrays calculate units of measurement differently than Data ONTAP does. The minimum and maximum usable array LUN values shown in this section are based on the assumption that the units of measurement for a RamSan storage array are calculated as follows.

Unit	Formula for calculating
GB	1024 x 1024 x 1024 bytes
MB	1024 x 1024 bytes
KB	1024 bytes

If you plan to use a large-sized LUN that is close to the maximum capacity that Data ONTAP supports, ensure that the size you specify does not exceed the size shown in the "Maximum usable value" column in the following table.

Note

The minimum LUN sizes shown in the following table do not apply to the root volume. See "Minimum array LUN size for the root volume" on page 5.

If you are specifying in...	Minimum usable value	Maximum usable value
GB	2 GB	976 GB
MB	1,049 MB	975,000 MB
512-byte blocks	2,048,001 512-byte blocks	2,047,500,000 512-byte blocks

Note

Storage arrays vary as to how you can specify LUN size (that is, in GB, MB, or 512-byte blocks).

See the gateway *Installation Requirements and Reference Guide* for guidelines about the implications of different size array LUNs on Data ONTAP storage.

Best practice recommendation for array LUN size

Best practice is to create fewer larger array LUNs rather than more smaller array LUNs.

Minimum array LUN size for the root volume

The minimum array LUN size shown in this section does not apply to the minimum array LUN for the root volume. It is strongly recommended that you do not set the size of a root volume below the minimum root volume size shown in the gateway *Interoperability Matrix*. The reason is that you want to ensure that there is sufficient space in the root volume for system files, log files, and cores. If a system problem occurs, you need to provide these files to technical support.

Guidelines for optimizing gateway performance

How using multiple FC initiator port pairs optimizes performance

A RamSan storage array provides uniform (fast) performance for all its storage, regardless of how the storage on the RamSan array is partitioned and accessed. Therefore, you do not need to do anything unique on the RamSan storage array to optimize its performance to work with Data ONTAP. You can, however, optimize the performance of the gateways by using multiple port pairs on the gateways to access multiple groups of LUNs on the RamSan storage.

When you use multiple port pairs on the gateways, the load of requests is spread over the gateway ports, resulting in more effective bandwidth usage. Each gateway port pair accesses a different group of LUNs on the storage array. A gateway sees each LUN over only two paths.

Note

LUN group and *groups of LUNs* are used in gateway documents to mean LUNs that the same gateway FC initiator port accesses through the same storage array target port. With RamSan storage arrays, there is no concept of RAID groups or LUNs being grouped by a configuration entity such as a host group (as is the case on some other storage arrays that gateways support). However, with RamSan storage arrays, sets of LUNs can have the same access policies, so in that sense LUNs with the same access policies could be considered to be a LUN group.

Requirements when setting up multiple LUN groups

When setting up your configuration to use multiple gateway port pairs, set up your configuration as shown in the following table.

When setting up the...	The requirement is...
Gateway	◆ Use multiple port pairs.
Storage array	◆ Use as many ports as possible to provide access to the LUNs you have allocated for Data ONTAP. ◆ The different LUN groups are accessed through different ports. ◆ Each internal number (logical unit handle) that identifies a logical unit must be unique on the same storage array, but the external numbers presented to hosts—the LUNs—can be duplicated on different ports. ◆ You must set an access policy on each LUN to specify which gateway initiator ports (WWPNs) can access the LUN through the storage array ports that you identify. See "Access policy requirements on RamSan storage arrays" on page 25 for more information.
Switches	◆ You must use switch zoning to identify the target ports that the gateway initiator ports use to access each group of array LUNs. ◆ All target ports used to access LUNs in the same LUN group must be accessible through the same switch.
Data ONTAP aggregates	◆ Create one large aggregate and assign LUNs from the different LUN groups to the same aggregate.

Location of the root volume and spare LUNs for core dumps

Requirements and recommendations for RamSan storage arrays

RamSan-500 storage arrays: A RamSan-500 storage array has sufficient capacity to store Data ONTAP root volume and spare LUNs for core dumps. However, it is recommended that you install the root volume on non-RamSan storage, either on a native disk shelf connected to the gateway or on LUNs on another supported storage array. Likewise, it is recommended that the spare LUNs for core dumps be located on non-RamSan storage. This strategy enables you to save the space on the RamSan storage array for applications for which the RamSan's fast performance is particularly beneficial.

Guidelines for creating aggregates

RamSan storage is fast storage, so an aggregate made up of LUNs from a RamSan storage array is faster than an aggregate composed of LUNs from a disk-based storage array. Ensure that you follow Data ONTAP restrictions against mixing storage types so that you can achieve the best possible performance from your aggregates.

Restrictions against mixing storage types in an aggregate

Data ONTAP does not support mixing different types of storage in the same aggregate because mixing different types of storage degrades performance. Do not mix LUNs from disk-based storage arrays in the same aggregate with LUNs from RamSan storage arrays.

You cannot mix LUNs from different model families of the same vendor in the same aggregate.

Minimum aggregate size

See the gateway *Interoperability Matrix* for information about the minimum aggregate size for different gateway models.

Guidelines for gateway port usage

How ports are named on gateways

The number and labeling of ports on gateway systems differs on different models. Some models include both cards and onboard ports. Ports are labeled as shown in the following table.

For...	Port labeling is...
Onboard ports	The FC initiator ports are onboard ports and are labeled 0a, 0b, and so on.
Ports on a card	The FC ports on each card with FC initiators are labeled FC ports 1a and 1b, 2a and 2b, and so on. The number represents the slot. One port on each of two different cards is configured to ensure redundancy to the port pair on the storage array. Then, if one card fails, the port on the other card is used. You can use either port on a card.

Guidelines for port usage for FCP customers

The port usage guidelines for FCP customers are as follows:

- Use the onboard ports for FCP targets. That is, if four targets are needed, use ports 0a, 0b, 0c, and 0d for the targets.
- Install two quad 4GB Fibre Channel cards into legal slots. For example, if you install two 4-port cards into Slot 1 and Slot 2, use 1a and 2a on the quad card to connect to native disk shelves, use 1b and 2b to connect to the RamSan storage array, and so on.

Guidelines for port usage for NAS customers

The port usage guidelines for NAS customers are as follows:

If...	Then...
There is only one RamSan storage array behind the gateway	Use onboard ports 0b and 0d to connect to the RamSan storage array.

If...	Then...
There are multiple storage arrays or additional native disk shelves behind the gateway	You must have additional FC initiator ports. Use onboard ports 0a and 0c to connect to native disk shelves. Install two quad 4GB Fibre Channel cards into legal slots. For example, if you use Slot 1 and Slot 2, use 1a and 2a on the quad card to connect to the first RamSan storage array, 1b and 2b to connect to the second RamSan, other storage array, or disk shelf, and so on.

Using FlexCache with RamSan storage

What FlexCache is

The FlexCache feature is a storage performance accelerator for Data ONTAP. In a FlexCache configuration, the gateway acts as a caching device for an origin server. You create storage volumes that cache READ data from an origin (or source) volume. FlexCache volumes provide a scale out or an efficient data distribution model for serving data faster to clients (or hosts) where the environment is read-intensive.

- FlexCache provides faster access times by caching data closer to the clients.
- FlexCache scales out IOPS against shared data. It can balance host load across multiple caching systems that run Data ONTAP.
- FlexCache can offload storage controller resources, as well as network infrastructure, by serving IOPS from a cache.

Benefit of using FlexCache with RamSan storage

The benefit of using a RamSan storage array in a FlexCache configuration is that data is served from flash, not disk, resulting in fast response times.

Licensing requirement for FlexCache

A valid additional license is required to run FlexCache.

Where to find more information about FlexCache

See the Data ONTAP *Storage Management Guide* for more information about FlexCache.

Supported Configurations 3

About this chapter

This chapter discusses the configurations that Data ONTAP supports for all supported RamSan storage arrays. Use the configurations in this chapter as guidelines when you are connecting your gateway to your storage array and setting up zoning.

Topics in this chapter

This chapter discusses the following topics:

- "Your guide to interpreting the illustrations" on page 14
- "One 4-port array LUN group configuration" on page 16
- "Two 4-port array LUN groups configuration" on page 18
- "Standalone with two 2-port array LUN groups configuration" on page 20

Configuration that is not supported with RamSan storage arrays

Data ONTAP supports only fabric-attached configurations with RamSan storage arrays; direct-attached configurations are not supported.

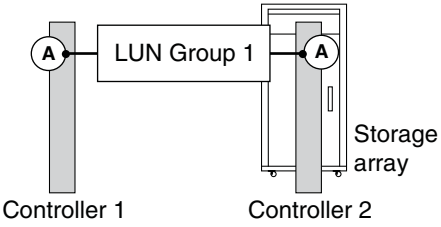
Your guide to interpreting the illustrations

RamSan equivalent of a LUN group

The configuration examples shown in this chapter show LUN groups. *LUN group* and *groups of LUNs* are used in gateway documents to mean LUNs that the same gateway system FC initiator port accesses through the same storage array target port. With RamSan storage arrays, there is no concept of RAID groups or LUNs being grouped by a configuration entity such as a host group (as is the case on some other storage arrays that gateways support). However, with RamSan storage arrays, sets of LUNs can have the same access policies, so in that sense LUNs with the same access policies could be considered to be a LUN group.

How the illustrations show redundant paths and array port pairs

In each illustration in this chapter, the port pairs on the storage array are shown in relation to the LUNs on the port, with the ports on alternate controllers. Different storage array models, even those from the same vendor, might label the ports differently from those shown in the examples.



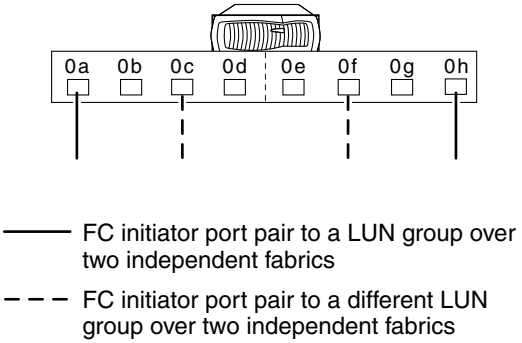
See the gateway *Installation Requirements and Reference Guide* for rules for setting up redundant ports on the gateway and examples of valid and invalid configurations.

How the illustrations show redundant paths and port pairs for gateways

As you look through the illustrations, notice that on the gateway the connections from the gateway FC initiator ports are set up for redundancy.

The following illustration shows an N7xxx series model, which has both onboard FC initiator ports and cards. In this example, two different redundant port pairs are used. Redundancy is achieved on the gateway because each port in a pair is on a different bus.

You can use multiple port pairs on a gateway to access LUNs on the same storage array, if each gateway port pair accesses a different group of LUNs and each gateway port in a pair accesses a different fabric.



See "Two 4-port array LUN groups configuration" on page 18 for an examples configuration with multiple port pairs and multiple LUN groups.

When to use non-RamSan storage also

For the RamSan-500, it is recommended that you use non-RamSan storage to hold the root volume and spare LUNs for core dumps, although it is not required. The non-RamSan storage can be either a native disk shelf or array LUNs on another supported storage array. By putting the root volume and spare LUNs for core dumps on non-RamSan storage, you can save space on the RamSan storage array for transactions for which fast performance is especially beneficial.

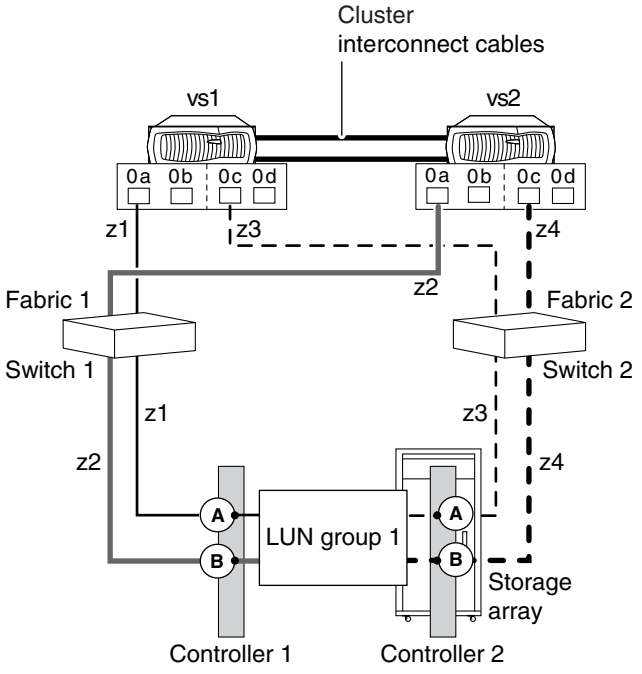
Note

The illustrations in this chapter do not show a native disk shelf connected to the gateway.

One 4-port array LUN group configuration

In this configuration, each target port is accessed by a single gateway FC initiator port from the HA pair. You use zoning to ensure that there are only two paths to an array LUN.

Although this configuration uses more ports than if you were to use just one 2-port array LUN group, it has better failover than if you were using one 2-port array LUN group. In this configuration, the array LUNs are still served from two storage array ports, with one array port going to vs1 and the other array port going to vs2.

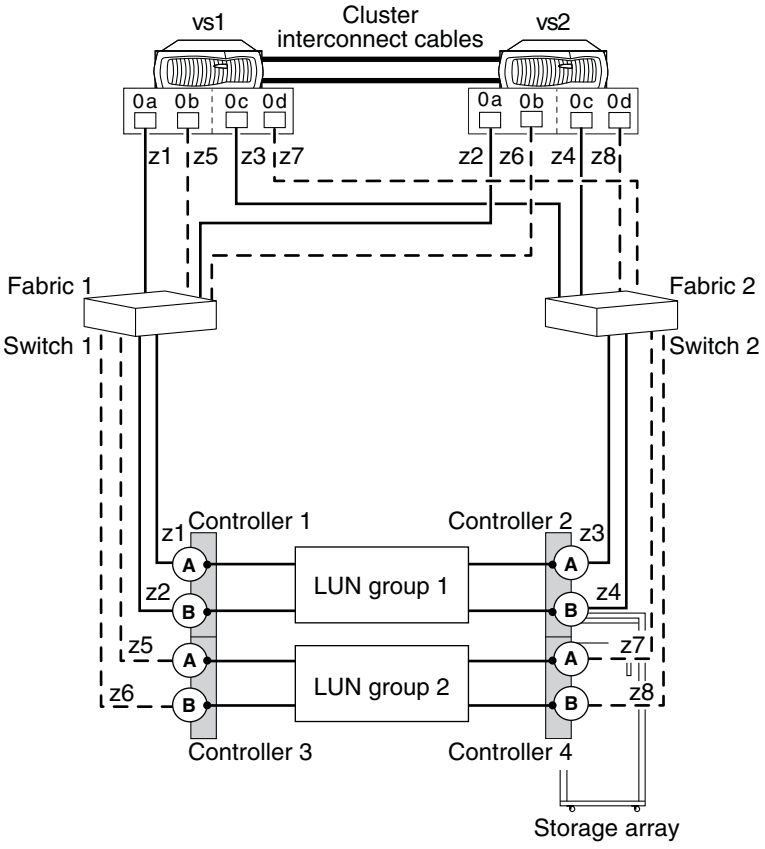


Zoning information: The following table shows single-initiator zoning for this example with an N5xxx series gateway HA pair. Single-initiator zoning is the recommended zoning strategy.

Zone	Gateway		Storage array	
Switch 1				
z1	vs1	Port 0a	Controller 1	Port A
z2	vs2	Port 0a	Controller 1	Port B
Switch 2				
z3	vs1	Port 0c	Controller 2	Port A
z4	vs2	Port 0c	Controller 2	Port B

Two 4-port array LUN groups configuration

In this configuration, each gateway port pair accesses a separate group of array LUNs. Zoning is single FC initiator to single array target port, with no fan-in.



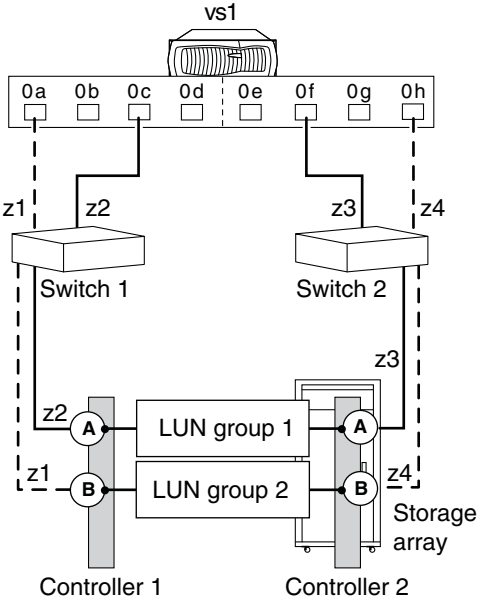
Zoning information: The following table shows single-initiator zoning for this example with an N5xxx series gateway HA pair. Single-initiator zoning is the recommended zoning strategy.

Zone	Gateway		Storage array	
Switch 1				
z1	vs1	Port 0a	Controller 1	Port A
z2	vs2	Port 0a	Controller 1	Port B
z5	vs1	Port 0b	Controller 3	Port A
z6	vs2	Port 0b	Controller 3	Port B
Switch 2				
z3	vs1	Port 0c	Controller 2	Port A
z4	vs2	Port 0c	Controller 2	Port B
z7	vs1	Port 0d	Controller 4	Port A
z8	vs2	Port 0d	Controller 4	Port B

The gateway 0a and 0c ports on both nodes see array LUNs in LUN group 1. The gateway 0b and 0d ports on both nodes see array LUNs in LUN group 2.

Standalone with two 2-port array LUN groups configuration

As the illustration shows, one gateway port pair accesses LUNs in one LUN group on the storage array and a different gateway port pair accesses LUNs in a different LUN group on the storage array.



The following table shows the relationship between the gateway port pairs, storage array port pairs, and LUN groups for this example with an N76xx or N78xx series gateway standalone system.

Redundant gateway port pair	Redundant storage array port pair to which the RamSan LUNs are mapped	LUN group
0a and 0h	Controller 1, port B Controller 2, port B	LUN group 2
0c and 0f	Controller 1, port A Controller 2, port A	LUN group 1

Zoning for this stand-alone configuration: The following table shows single-initiator zoning for this example with an N76xx or N78xx series gateway standalone system.

Note

Each pair of ports (the FC initiator port on the gateway and the target port on the RamSan storage array) must be in its own fabric zone so that it cannot see other devices or ports.

Zone	Gateway port	Storage array		
Switch 1				
z1	0a	Controller 1	Port B	LUN group 2
z2	0c	Controller 1	Port A	LUN group 1
Switch 2				
z3	0f	Controller 2	Port A	LUN group 1
z4	0h	Controller 2	Port B	LUN group 2

Configuring RamSan Storage for Data ONTAP 4

About this chapter

This chapter provides information about configuring parameters on a RamSan storage array to work with gateways and provides an overview of setting up the gateways, the switches and the storage array to work together. For details about how to configure a RamSan storage array, see your vendor documentation.

Topics in this chapter

This chapter contains the following topics:

- "About LUN provisioning on a RamSan storage array" on page 24
- "Data ONTAP recommendations and restrictions for RamSan settings" on page 25
- "RamSan-500 configuration overview" on page 28
- "How to begin Data ONTAP setup" on page 32

About LUN provisioning on a RamSan storage array

How LUNs are created on RamSan storage arrays

When you provision LUNs on a RamSan storage array, you create logical units. The system automatically assigns each logical unit a unique number (logical unit handle) that identifies that logical unit internally. You assign each logical unit a number (LUN), which is the number that is presented externally to hosts. Hosts use the LUN to access the logical unit.

The internal number used to identify a logical unit must be unique on the same storage array, but external numbers presented to hosts to identify LUNs can be duplicated on different ports.

Host group and host type equivalents on RamSan storage arrays

If you are familiar with storage arrays from other vendors, you might be accustomed to configuring host groups and host types. The term host group is used on some storage arrays to describe a configuration parameter that enables you to specify host access to ports on the storage array. Host type is a setting on some storage arrays that enables the storage array to recognize the gateway. The following table summarizes the equivalent configuration entities on a RamSan storage array.

For this configuration entity on some vendor's storage arrays...	You do this on a RamSan storage array...
Host group	You must set an access policy on each logical unit to identify which WWPNs can access the LUN through the array ports that you identify.
Host type	There is no Host type setting. You do not have to configure the RamSan storage array to recognize the gateway.

Data ONTAP recommendations and restrictions for RamSan settings

Data ONTAP provides some recommendations for RamSan storage array settings and imposes some restrictions.

Restriction for using LUN 0

RamSan automatically assigns a number of 0 (zero) to the first logical unit. Data ONTAP does not support LUN 0 as the external number for a logical unit. Therefore, if you plan to use the Logical Unit 0, you must give it an external LUN number that it greater than 0 (zero).

Backup Mode setting

For each logical unit that you create on a RamSan storage array, you must set the Backup Mode individually. Backup Mode is the method that the RamSan storage array uses to back up data to the array's internal flash storage. The following table describes the Backup Mode settings.

Model	Option descriptions
RamSan-500	**Writeback:** Caches incoming writes in the battery-protected cache and synchronizes the writes to flash as a background process. This mode provides better performance than Writethrough mode. Use this mode for LUNs for Data ONTAP. **Writethrough:** Forces all the writes to be written to flash before acknowledging the write as complete. This mode is not recommended for LUNs for Data ONTAP.

Access policy requirements on RamSan storage arrays

RamSan storage arrays require port-level LUN security. You must configure an access policy (LUN masking) for each logical unit that you create. The options for the access policy setting are shown in the following table.

Possible setting	Description
Specific WWPNs	You select the WWPNs of the initiators that are allowed to communicate with the LUN. When you select specific WWPNs, you mask the LUN from any other initiators. It is recommended that you specify the WWPNs for the gateway FC initiators that can access the LUN instead of setting an Open Access policy. By specifying the WWPNs that are allowed to access the LUN, you avoid inadvertently including initiators that you do not want to access the LUN. **Note** A zone grants or restricts access only to a given *port* on a storage array. More than one host can be zoned to the same storage array port. However, sharing a RamSan storage array with a non gateway host is not supported.
Open Access	If you set Open Access, the LUN is presented to all the WWPNs of the initiators that are connected to the storage array port.

How to achieve redundancy when setting the access policy: You achieve redundancy by making sure that you configure redundant initiators to the target ports—for example, by linking gateway FC initiators 0a and 0c to the storage array ports 3a and 4a.

How to associate a LUN group to an initiator port pair when setting the access policy: Before configuring the access policies for the logical units, you need to plan which LUNs are to be accessible by each gateway FC initiator port pair. Essentially you are dividing the LUNs into groups, each group is to be accessible by a different gateway FC initiator port pair. When you configure the access policy for a logical unit, ensure that you are following your plan for LUN groups when you link the initiator WWPNs to the array target ports.

Other RamSan settings

For all other RamSan settings, follow Texas Memory Systems' recommendations.

Caution about using the RamSan initialization LUN function

Through the CLI, the RamSan storage array provides an “initialization” LUN function for newly-provisioned LUNs. You do not need to use this function with array LUNs for Data ONTAP. However, if you do use this function for a Data ONTAP LUN, do not initialize that LUN after you use the Data ONTAP `disk assign` command to assign the LUN to a Data ONTAP storage system.

Attention

Initializing the LUN after it is assigned to a Data ONTAP system causes the RAID label to be erased, which results in loss of any data written to that LUN and the loss of the aggregate to which the LUN belongs.

RamSan-500 configuration overview

Prerequisites to configuring the RamSan storage array

Before you start configuring access policies for your logical units, be sure that you know which gateway FC initiators you want to link to which storage array ports.

Task overview

The following table provides the high-level steps for configuring a RamSan-500 storage array and setting up the storage array, switches, and the Data ONTAP storage systems to communicate with each other.

Note

This overview directs you to install the gateways and connect all devices before configuring the RamSan storage array. You can configure the RamSan storage array before installing and connecting other devices. However, if you do so, you must manually enter the WWPNs of the gateways when you create the access policy for the LUNs you are allocating for Data ONTAP.

Step	Action
1	Determine the storage capacity that you need for the Data ONTAP systems.
2	Plan the number and size of the array LUNs for Data ONTAP. See "Guidelines for sizing array LUNs for Data ONTAP" on page 4 and the gateway *Interoperability Matrix* for recommendations about array LUN size.
3	On the storage array, confirm that the firmware on the storage array meets the version level required by Data ONTAP. See the gateway *Interoperability Matrix* for firmware version requirements. **Note** RamSan storage arrays do not support live upgrade of the array firmware.

Step	Action
4	Install each gateway as follows: **a.** Rack mount the gateway. **b.** Make sure the power is connected to the gateway and that the console is set up. See the gateway *Installation Requirements and Reference Guide* for detailed instructions. **c.** Power on the gateway. **d.** Interrupt the boot process by pressing Ctrl-C when you see the following message on the console: `Starting Press CTRL-C for special boot menu` **e.** Select option 5, “Maintenance mode boot,” on the floppy boot menu. Do not proceed any further with gateway installation and setup at this time.
5	Install the Fibre Channel cables to connect the gateway to the switch.
6	Connect the cables between the storage array and switches and between the switches and the gateways.

Step	Action
7	On the storage array, create a Logical Unit for each LUN you want to make available to Data ONTAP. See the gateway *Interoperability Matrix* for information about the maximum number of LUNs you can allocate to Data ONTAP for each RamSan storage array. Provisioning LUNs on a RamSan storage array involves creating a logical unit and then linking the LUN (the external number for the logical unit) to a port by identifying which initiators can communicate with the LUN through the port. The logical unit parameters of particular interest when creating LUNs for Data ONTAP are as follows: **Name:** A name for the LUN that is automatically assigned by the system. **Logical Unit:** An internal identifier for the Logical Unit that is automatically assigned by the system. **Logical Unit number:** The external number (LUN) that is presented to hosts. You specify this number. **Attention** RamSan automatically assigns a number of 0 (zero) to the first Logical Unit. Data ONTAP does not support LUN 0. Therefore, if you plan to use the Logical Unit 0 for Data ONTAP, you must give it a LUN that it greater than 0 (zero). **Size:** See "Guidelines for sizing array LUNs for Data ONTAP" on page 4. **Backup mode for the RamSan-500:** Data ONTAP supports the two Backup Modes that are available for the RamSan-500—Writeback and Writethrough. Use Writeback mode for LUNs for Data ONTAP.

Step	Action
8	For each Logical Unit you created, configure an access policy. An access policy determines which Worldwide Port Names (HBAs) are allowed to communicate with the LUN. This process links the LUN to a Fibre Channel port on the RamSan storage array and presents the LUN to the gateway FC initiator port WWPNs that you identify. **Attention** It is recommended that you identify the specific WWPNs that you want to access the port instead of specifying Open Access.
9	Zone the switches. Then verify that the communications between the storage array and the switch and the switch and the gateways are working. If you are setting up zoning using worldwide port names, the gateways and storage array must be powered on and running Data ONTAP (either in maintenance mode or in normal mode) for the worldwide port names (WWPNs) to be automatically discovered by the switch. Although you can obtain worldwide port names manually, automatic discovery of the WWPNs for the ports reduces the likelihood of errors. (See the gateway *Installation Requirements and Reference Guide* for information about how to obtain WWPNs manually.)
10	On the gateway, verify that all the array LUNs that were allocated for Data ONTAP are visible to the gateway. **a.** Enter the following command: `disk show -v` **b.** Verify that all the array LUNs that were allocated for Data ONTAP the gateways are visible. If you do not see all the array LUNs you expect, wait a short time, then enter the command again. There can be a short delay before the array LUNs are visible over the network.

How to begin Data ONTAP setup

When you are ready to set up and configure Data ONTAP

You can begin Data ONTAP setup and configuration any time after assigning array LUNs to the gateways and connecting the storage array and the gateway. The gateway *Installation Requirements, Quick Start, and Reference Guide* and the gateway *Software Setup, Installation, and Management Guide* describe how to set up and configure Data ONTAP.

If the gateway is...	Then...
Powered on	To start the setup program, enter `bye` at the boot prompt (CFE or LOADER depending on the gateway model).
Not powered on	See the instructions in the gateway *Software Setup, Installation, and Management Guide* for how to power up the gateway.

Troubleshooting A

Report to provide to Technical Support

If a problem occurs with a RamSan-500 storage array, you need to provide Technical Support a RamSan System Report. The System Report contains information about the system configuration, firmware version, environment, and a range of other information, including a copy of the system event log.

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IBM System Storage N series
Gateway Implementation Guide for RamSan Storage

Publication No. GC52-1342-00

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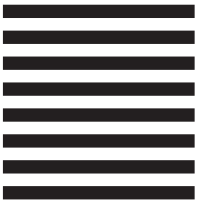

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POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
Information Development
Dept. GZW
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Tucson, AZ
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Fold and Tape **Please do not staple** Fold and Tape

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