

# Configuring SANTap

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This chapter describes Cisco SANTap and provides configuration information and other related procedures.

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- [Information About SANTap, page 1-1](#)
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## Information About SANTap

Cisco SANTap is one of the Intelligent Storage Services features supported on the Storage Services Module (SSM), MDS 9222i Multiservice Modular Switch and MDS 9000 18/4-Port Multiservice Module (MSM-18/4). These three SANTap enabling platforms will be referred to with the general term Services Nodes (SNs). The Storage Services Module (SSM) supports SANTap in Cisco MDS SAN-OS Release 3.0(2a), 3.0(2b), 3.1(1), 3.1(2), 3.1(2a), 3.1(2b), 3.1(3a), and 3.2(2c) or higher, and in Cisco NX-OS 4.1(x). The MDS 9222i Multiservice Modular Switch and MDS 9000 18/4-Port Multiservice Module (MSM-18/4) support SANTap only starting from Cisco NX-OS Release 4.1(x).

The Cisco MDS 9000 SANTap service enables customers to deploy third-party appliance-based storage applications without compromising the integrity, availability, or performance of a data path between the server and disk.

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The Cisco SANTap service can run on the following modules and switches:

- The Cisco Storage Services Module (SSM) and 18/4-Port Multiservice Module (MSM-18/4) which can be installed into any Cisco MDS 9500 Series switch or Cisco MDS 9200 Series multilayer intelligent storage switch
- The MDS 9222i Multiservice Modular switch

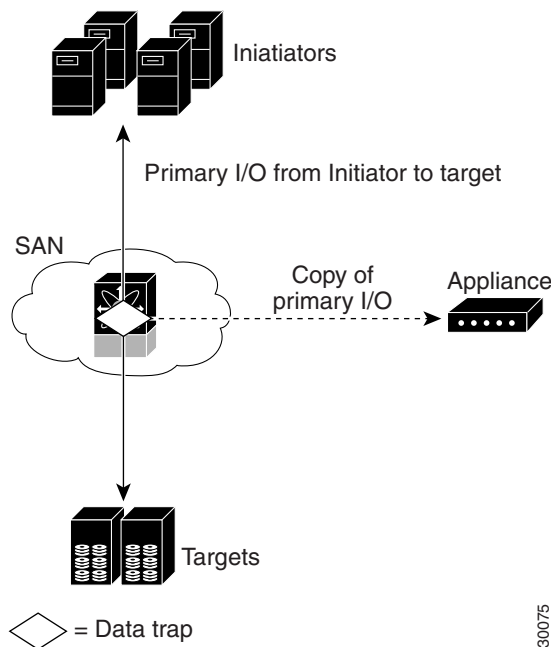
The architecture of these services nodes enables SANTap to service devices connected directly to the ports on the module, or devices connected anywhere in the fabric, including devices attached to legacy switches.

The SANTap feature allows third-party data storage applications, such as long distance replication and continuous backup, to be integrated into the SAN.

SANTap provides several advantages such as high performance, low cost of ownership, high availability, ease of deployment, and high interoperability.

The protocol-based interface that is offered by SANTap allows easy and rapid integration of the data storage service application because it delivers a loose connection between the application and an SSM, which reduces the effort needed to integrate applications with the core services being offered by the SSM. [Figure 1-1](#) shows integrating third-party storage applications in a SAN.

**Figure 1-1 Integrating Third-Party Storage Applications in a SAN**



This section includes the following topics:

- [SANTap Control and Data Path, page 1-3](#)
- [SANTap Proxy Mode, page 1-3](#)
- [Migrating SANTap from a 9513 Chassis to a 9216 Chassis, page 1-4](#)
- [Concepts and Terminology, page 1-6](#)
- [SANTap on the SSM, page 1-6](#)

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- [SANTap Scalability Matrix, page 1-7](#)

## SANTap Control and Data Path

SANTap has a control path and a data path. The control path handles requests that create and manipulate replication sessions sent by an appliance. The control path is implemented using an SCSI-based protocol. An appliance sends requests to a Control Virtual Target (CVT), which the SANTap process creates and monitors. Responses are sent to the control logical unit number (LUN) on the appliance. SANTap also allows LUN mapping to Appliance Virtual Targets (AVTs). You can have a maximum of 512 target LUNs.

SANTap does not require reconfiguration of either the host or target when introducing SANTap-based applications. Also, neither the host initiator nor the target is required to be directly connected to an SSM. The configuration is accomplished by assigning Cisco-specific WWNs to the virtual initiators (VIs) and Data Virtual Targets (DVTs). A host initiator or a target can be connected directly to an SSM. However, you must partition the SAN using VSANs.

You must configure the host initiator and the DVT in one VSAN and configure the VI and the target in another VSAN.

You can use SANTap to remove your appliance-based storage applications from the primary data path in a SAN. Removing these applications from the primary data path prevents them from compromising the security, availability, and performance of the SAN. SANTap copies the data at line speed and makes it available to other storage applications; these storage applications are prevented from affecting the SAN while maintaining the integrity of the data that storage applications need.

Dynamic LUNs is a feature introduced in Cisco SAN-OS Release 3.2(1). When one or more LUNs are removed or added on the backend target during the periodic scan, SANTap automatically uninstalls the deleted DVT LUNs and installs any additional LUNs. Uninstallation of the deleted DVT LUNs occurs even if the total number of LUNs remains the same.

In previous releases, when the set of LUNs changed on the target, the original LUN list was displayed on the DVT. The new and changed LUNs were not reflected on the DVT. However, if the total number of LUNs increases, then the additional LUNs are installed and displayed on the host.

Before Cisco SAN-OS Release 3.2(1), a user had the following options for displaying the LUN list on the DVT:

- Shut down the host interface: Purge the DVT LUNs for the IT pair. All the LUNs for the existing IT pair were removed, and the correct set of LUNs is recreated when the host logs in.
- Reload the SSM.

In Cisco SAN-OS Release 3.2(1) or NX-OS Release 4.1(x), SANTap supports 32-bit LUNs on the target.

## SANTap Proxy Mode

SANTap proxy mode is designed to provide SANTap functionality to devices connected anywhere in the fabric, whether using modern SANTap-capable switches or legacy switches. Proxy mode allows SANTap to be enabled in a fabric with minimal downtime and minimal reconfiguration and recabling. The keys to SANTap functioning in this mode are the ability to segment fabrics using VSANs and the virtual interfaces that the SSM presents to the fabric. These virtual interfaces can be added into any VSAN and present a virtual initiator to the target in one VSAN and present a virtual target to a host in another VSAN.

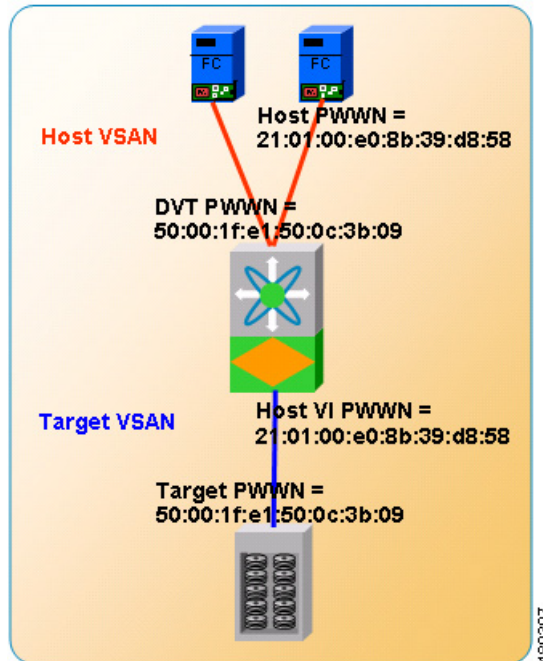
SANTap proxy mode offers the following advantages:

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- The ports to which the storage devices and hosts are attached are not moved.
- Devices can remain attached to a legacy switch rather than be migrated to a modern SANTap-capable switch.
- More than four hosts can use the same data path processor (DPP).
- The SANTap service is not coupled to a physical port.

Figure 1-2 shows a SANTap proxy mode-2 example.

**Figure 1-2 SANTap Proxy Mode-2 Example**



## Migrating SANTap from a 9513 Chassis to a 9216 Chassis

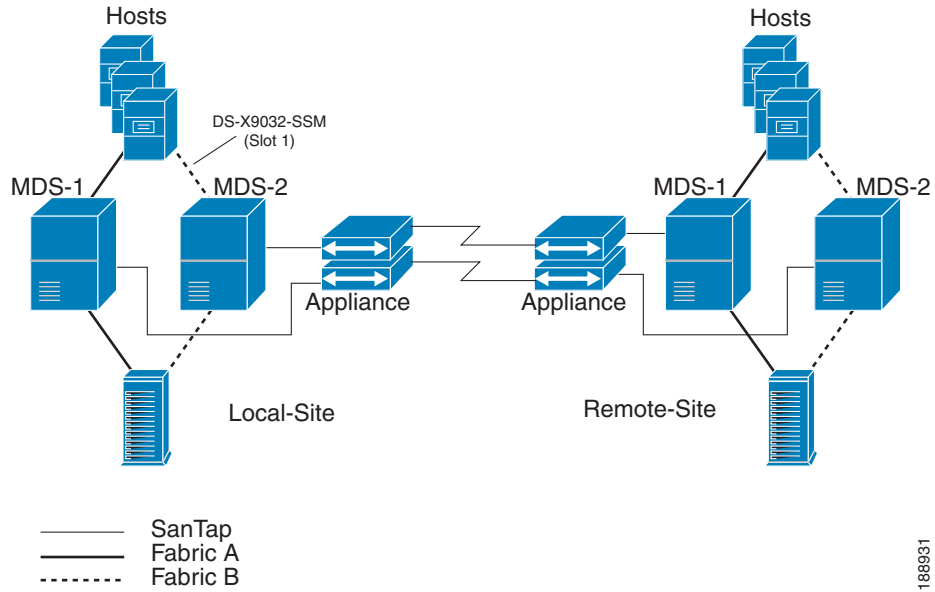
This section explains the environments required for migrating SANTap from an existing MDS 9513 to a MDS 9216 switch and provides the migration procedure.

A dual-fabric topology setup provides extra resiliency during this migration procedure. Both of the fabrics in Figure 1-3 are built using MDS 9513 Directors, which need to be replaced by MDS 9216 Switches. The appliance setup is also a dual-node cluster configured for continuous remote replication (CRR) between the local and remote sites.

Figure 1-3 shows the setup before migration.

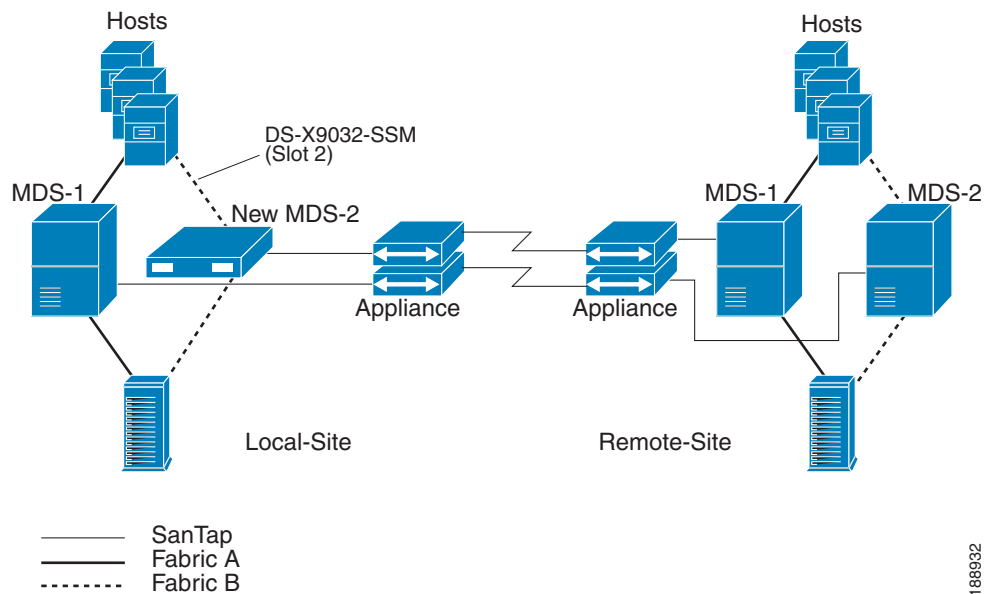
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**Figure 1-3 Setup Before Migration**



The Fabric B switch on the local site (MDS-2) should be replaced by an MDS 9216 (new MDS-2) switch. The same SSM card used in the current topology (MDS-2) will be swapped with the MDS 9216 switch on slot 2. After reconfiguration, the SANTap configuration with the appliance should be reestablished. [Figure 1-4](#) shows the setup after migration.

**Figure 1-4 Setup After Migration**



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## Concepts and Terminology

Table 1-1 includes brief definitions of some of the common SANTap acronyms and terms.

**Table 1-1** SANTap Acronyms

Acronym / Term	Definition
AVT	Appliance virtual target. The portal through which an appliance can complete its synchronization with the target LUN. AVT can be thought of as a host proxy for the appliance.
CVT	Control virtual target. The portal through which an appliance communicates with SANTap. An initiator port on the appliance sends out SANTap Control Protocol requests to the SANTap process. When the request is processed, the response is sent back by the Cisco VI (virtual initiator) to a target port on the appliance.
DVT	Data virtual target. A DVT is created for every port on a multi-ported target that is included in SANTap-based services. The DVT is created in the host VSAN. Once a DVT is created and a host logs into the DVT, SANTap installs a DVTLUN for every configured LUN on the target for this host.
ILC	Intelligent Line Card. Line card module available with the MDS family of switches that has hardware assist that facilitate exchange management and SCSI header inspection. Many switch-based storage service applications run on this card.
ITL	Initiator/target/LUN tuple. Uniquely identifies a LUN on a target.
Session	A record/object that is created for every ITL whose WRITE I/Os the appliance is interested in. A session can be thought of as a target LUN that requires SANTap-based services.
SN	Services Node. A generic term that can refer to either a system (Cisco MDS 9222i switch) or a line card (Cisco MDS SSM or MSM-18/4 module) capable of offering intelligent services.
VI	Virtual initiator. SANTap creates 9 VIs in the appliance and target VSANs. In the appliance, VIs are used to send responses to SANTap CP requests and also to send copies of WRITE I/Os. In the target, VIs are used when the appliance is down and one of the SANTap recovery tools (ARL, PWL-BPR) is enabled.  <b>Note</b> If the appliance implementation chooses not to use these recovery tools, the VIs are not used.

## SANTap on the SSM

The SANTap service can be configured to run in proxy operating mode. This mode offers unique design advantages that allow SANTap to fit customer requirements with minimal changes to current configurations.

The SANTap service provides a reliable copy of storage write operations to a third-party appliance, which enables applications to provide data protection, data migration, remote replication, and SLA monitoring, without the disadvantages of deploying devices in-band within the data path or out-of-band in conjunction with host-based software agents.

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## SANTap Scalability Matrix

Table 1-2 lists the scalability limits for the SAN-OS and NX-OS releases that support SANTap.

**Table 1-2** SANTap Scalability Matrix on SSM

Attribute	3.1(2m)	3.1(3)	3.2(3)	4.1(x)
Hosts per DVT	16	16	64	64
LUNs per Host per DVT	256	256	256	256
LUNs per DVT	1 K	1 K	3 K	3 K
DVTs per SSM	16	32	64	128
Sessions per SSM	2 K	2 K	2 K	2 K
LUN ID address size	16	16	32	32
DVT LUNs per SSM	2 K	4 K	16 K	16 K
ITLs per DPP	1 K	1 K	3 K	3 K
ITLs per SSM	2 K	4 K	24 K	24 K

Table 1-3 lists the scalability limits for NX-OS Release 4.1(1i) on the MSM-18/4 module and the MDS 9222i switch.

**Table 1-3** SANTap Scalability on the MSM-18/4 Module and the MDS 9222i Switch

Attribute	4.1(1i)
Hosts per DVT	64
LUNs per Host per DVT	256
LUNs per DVT	3K
DVTs per SN	128
Sessions per SN	2K
LUN ID address size	32
DVT LUNs per SN	16K
ITLs per DPP	24K
ITLs per SN	24K

## Licensing Requirements for SANTap

The following are the licensing requirements to set up SANTap:

- [Software Licensing Requirements, page 1-7](#)
- [Hardware Requirements, page 1-8](#)

## Software Licensing Requirements

SANTap has the following software license requirement:

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- STORAGE\_SERVICES\_ENABLER\_PKG

The MSM-18/4 module and the MDS 9222i switch require the following licenses:

- STORAGE\_SERVICES\_184
- STORAGE\_SERVICES\_9222i

## Hardware Requirements

SANTap has the following hardware requirements:

- MDS 9222i: DS-X9222I-K9
- SSM: DS-X9032-SSM
- MSM-18/4: DS-X9304-18K9

## Guidelines and Limitations

Cisco SANTap has the following guidelines and limitations:

### **Configuration Using CLI and Cisco DCNM for SAN**

SANTap provides a set of CLI commands for configuration. It can be configured using the Cisco DCNM-SAN, which is a GUI-based application.

### **High Performance and Scalability**

The ASIC-based innovation provides high-throughput IOPS. SANTap offloads the replication tasks from the initiators and appliance. A host software, driver, license, and agent are not required.

### **High Availability**

The SANTap appliance does not reside on the primary data path. The primary I/Os are not impacted if the appliance becomes unavailable. The solution takes advantage of dual-fabric redundancy.

The appliances are in a highly available cluster.

### **Manageability**

There is no need to reconfigure end devices. SANTap works with heterogeneous hosts and targets. The hosts and storage can be added on-demand.

### **Ease of Deployment**

There is no rewiring required for SANTap. The hosts and targets do not have to be connected to the SSM. You do not need to reconfigure the hosts and targets.

### **Leveraging the SAN Investment**

The SSM can be deployed in the following switches:

- MDS 9216 or MDS 9216i Multilayer Fabric Switches
- MDS 9222i Multiservice Modular Switch
- MDS 9506 Director
- MDS 9509 Director



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- MDS 9513 Director

In addition, SANTap also works with Supervisor-1 and Supervisor-2 modules. The hosts and storage can be connected to the existing 1-/2-/4-/10-Gbps Fibre Channel switching modules.

#### **Protocol-Based Interface**

The protocol-based interface offered by SANTap allows easy and rapid integration of the data storage service application because it delivers a loose coupling between the application and the Intelligent Line Card (ILC), which reduces the effort needed to integrate applications with the core services being offered by the ILC.

## Default Settings

Table 1-4 lists the default settings for SANTap parameters.

**Table 1-4**      **Default SANTap Parameters**

Parameters	Default
SANTap feature	Disabled.
DVT I/O timeout	10 seconds.
DVT LUN size handling flag	1 (enabled).



#### **Note**

The LUN-size handling flag is enabled by default.

## Configuring SANTap on the SSM Using the CLI

This section describes how to configure SANTap and includes the following topics:

- [Task Flow for Configuring SANTap on SSM, page 1-9](#)
- [Enabling SANTap on the SSM, page 1-10](#)
- [Deploying SANTap, page 1-10](#)
- [Configuring DVTs on the SSM, page 1-11](#)

## Task Flow for Configuring SANTap on SSM

Follow these steps to configure SANTap on SSM:

- 
- Step 1**    Enable SANTap on the SSM.
  - Step 2**    Deploy SANTap on the SSM.
  - Step 3**    Configure DVTs on the SSM.
-

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## Enabling SANTap on the SSM

### Restrictions

- Only one intelligent service can be configured on a single SSM.

### Detailed Steps

To enable the SANTap feature, follow these steps:

	Command	Purpose
Step 1	switch# <b>config t</b> switch(config)#	Enters configuration mode.
Step 2	switch(config)# <b>ssm enable feature santap</b> <b>module num</b>	Enables the SANTap application on the entire SSM in the specified slot.
	switch(config)# <b>no ssm enable feature santap</b> <b>module num</b>	Disables the SANTap application on the entire SSM in the specified slot.

## Deploying SANTap

### Detailed Steps

To deploy SANTap, follow these steps:

**Step 1** Identify the Storage Service Module (SSM) slot number.

```
switch# show module
Mod  Ports  Module-Type                Model                Status
---  ---
1    16     1/2 Gbps FC/Supervisor     DS-X9216-K9-SUP     active *
2    32     Storage Services Module    DS-X9032-SMA        ok

Mod  Sw              Hw              World-Wide-Name(s) (WWN)
---  ---
1    4.1(1)         1.0             20:01:00:05:30:00:43:5e to 20:10:00:05:30:00:43:5e
2    4.1(1)         0.5             20:41:00:05:30:00:43:5e to 20:60:00:05:30:00:43:5e
Mod  Application Image Description          Application Image Version
---  ---
2    SSI linecard image                4.1(1)

Mod  MAC-Address(es)                Serial-Num
---  ---
1    00-0b-46-a1-a4-28 to 00-0b-46-a1-a4-2c  JAB065004G7
2    00-05-30-00-ad-12 to 00-05-30-00-ad-16  JAB070605MW
* this terminal session
```

**Step 2** Verify that a SANTap license is installed.

```
switch# show license usage
Feature                               Ins  Lic  Status Expiry Date Comments
                               Count
-----
STORAGE_SERVICES_ENABLER_PKG  No   0   Unused                Grace 106D 18H
```

**Step 3** Enable SANTap services on the SSM module.

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```
switch(config)# ssm enable feature santap module number
```

**Step 4** Check for SSM provisioning.

```
switch# show ssm provisioning
Module   Ports/Nodes   Application   Provisioning Status
-----
       7         1-32         santap         success
```

**Step 5** Create two VSANs.

SANTap uses two VSANs: a Back-End VSAN (BE-VSAN) and a Front-End VSAN (FE-VSAN). The BE-VSAN includes all storage targets, RPAs, and the control virtual target (CVT). A FE-VSAN includes host initiators and the data virtual target (DVT), which is a virtual representation of a storage target.

**Step 6** Create a CVT in the BE-VSAN.

```
switch(config)# santap module number appl-vsan number cvt-name name
```

**Step 7** Create a DVT in the FE-VSAN.

You must create a DVT for each storage port that you want to replicate. You can create several DVTs in one FE-VSAN or create DVTs in different VSANs.

```
switch(config)# santap module number dvt target-pwwn pwwn target-vsan number dvt-name name
dvt-vsan number lun-size-handling 1
```

The BE-VSAN is zoned using the WWNs of the host initiator ports and the storage target ports. The same WWNs will be used in the FE-VSAN. Consequently, the back-end zoning scheme may be used for the FE-VSAN.

At this point, all I/O activity between the host and the target is relayed by SANTap. The I/Os are relayed from the actual host port in the FE-VSAN to the actual target port in the BE-VSAN via the DVT and the host port VI. This process has no impact to the hosts and is completely transparent.

## Configuring DVTs on the SSM

### Restrictions

- In Cisco SAN-OS Release 3.2(1) or NX-OS Release 4.1(x), SANTap supports 32 host initiators per DVT.

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## Detailed Steps

To configure a DVT, follow these steps:

	Command	Purpose
Step 1	switch# <b>config t</b> switch(config)#	Enters configuration mode.
Step 2	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id</b>	Configures the pWWN, target VSAN (which contains the target and VI), DVT name, and DVT VSAN (which contains the host and the CVT).
	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id dvt-port num</b>	Configures the pWWN, target VSAN, DVT name, DVT VSAN, and DVT port.  <b>Note</b> SANTap has to be provisioned for the entire module 2. When using the <b>interface</b> command, it should be provisioned on interface fc1/1-4. If not, you will not be able to provide the dvt-port option.  The DVT port maps to one of the ports on the SSM. You can assign a port for explicit load balancing or not assign a port, which allows the SSM to select the port and handle the load balancing (default).
	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id lun-size-handling num</b>	Configures the pWWN, target VSAN, DVT name, DVT VSAN, and LUN size handling flag (enabled). Enabling the LUN size handling flag allows special LUN resize handling by the vendor. The default LUN size handling flag value is 1 (enabled).
	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id io-timeout seconds</b>	Configures the pWWN, target VSAN, DVT name, DVT VSAN, and timeout value in seconds. The timeout determines the interval after which to time out I/Os on the target side. The range is 10 to 200 seconds and the default value is 10 seconds.
	switch(config)# <b>no santap module num dvt target-pwwn pwwn-id</b>	Removes the DVT configuration.

## Configuring SANTap on the SSM Using DCNM-SAN

This section includes the following topics:

- [Creating a SANTap CVT SSM, page 1-13](#)
- [Deleting a SANTap CVT SSM, page 1-13](#)
- [Creating a SANTap DVT SSM, page 1-13](#)
- [Deleting a SANTap DVT SSM, page 1-14](#)

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## Creating a SANTap CVT SSM

### Prerequisites

- You have to configure a logical port on a switch to create the CVT for SANTap. CVTs create the control path, which processes the SANTap service requests sent by an appliance. Before requesting the SANTap service, the appliance contacts the CVT, and specifies the initiator and the target for replicating the data flowing between them.

### Detailed Steps

To create a SANTap CVT, follow these steps:

**Note**

SANTap must be enabled and provisioned as a service on the SSM module of the selected switch.

## Deleting a SANTap CVT SSM

### Detailed Steps

To delete a SANTap CVT, follow these steps:

- Step 1** Expand **End Devices**, and then select **Intelligent Features** from the Physical Attributes pane.  
You see the FCWA tab in the Information pane.
- Step 2** Click the **SANTap CVT** tab.  
You see the SANTap configuration in the Information pane.
- Step 3** Select the SANTap CVT that you want to delete.
- Step 4** Click **Delete Row**.  
You see the DCNM-SAN confirmation dialog box.
- Step 5** Click **Yes** to proceed with the deletion or click **No** to discard the changes.


## Creating a SANTap DVT SSM

### Detailed Steps

To create a SANTap DVT, follow these steps:

- Step 1** Expand **End Devices**, and then select **Intelligent Features** from the Physical Attributes pane.  
You see the FCWA tab in the Information pane.
- Step 2** Click the **SANTap DVT SSM** tab.  
You see the SANTap configuration in the information pane.

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- Step 3** Click **Create Row**.  
You see the create SANTap DVT SSM dialog box.
- Step 4** Select the switch on which the SANTap DVT SSM will be configured.
- Step 5** Select the **interface**. This is the port on the module where the DVT will be created.
- Step 6** Select the VSAN ID in which you want to create the SANTap DVT SSM.
- Step 7** Select the port WWN of the real target for which this corresponding DVT is being created. The DVT has the same port WWN as the target.
- Step 8** Select the target VSAN ID for the VSAN of the real target for which this DVT is being created.
-  **Note** Uncheck the **Automatically Choose Interface** check box to select the interface.
- 
- Step 9** Assign a name to this SANTap DVT SSM.
- Step 10** Check the **LunSizeHandling** check box if you want to use the real target LUN size for the virtual LUN or the maximum LUN size supported (2 TB).
- Step 11** From the IOTimeout drop-down list, select the I/O timeout value for the DVT. The default value is 10 seconds.
- Step 12** Click **Create** to create this SANTap DVT SSM.
- 

## Deleting a SANTap DVT SSM

### Detailed Steps

To delete a SANTap DVT, follow these steps:

- 
- Step 1** Expand **End Devices**, and then select **Intelligent Features** from the Physical Attributes pane.  
You see the FCWA tab in the information pane.
- Step 2** Click the **SANTap DVT SSM** tab.  
You see the SANTap configuration in the Information pane.
- Step 3** Select the SANTap DVT that you want to delete.
- Step 4** Click **Delete Row**.  
You see the DCNM-SAN confirmation dialog box.
- Step 5** Click **Yes** to proceed with the deletion or click **No** to discard the changes.
- 

## Configuring SANTap Multiservice Module Using the CLI

This section includes the following topics:

- [Task Flow to Configure SANTap on MSM-18/4 Module, page 1-15](#)

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- [Enabling SANTap on the MDS 9222i Switch and the MSM-18/4 Module, page 1-15](#)
- [Deploying SANTap on the MSM-18/4, page 1-15](#)
- [Configuring DVTs on the MDS 9222i Switch and MSM-18/4 Module, page 1-17](#)

## Task Flow to Configure SANTap on MSM-18/4 Module

Follow these steps to configure SANTap on the MSM-18/4 Module:

- 
- Step 1** Enable SANTap on the MDS 9222i switch and MSM-18/4 Modules.
- Step 2** Deploy SANTap on the MSM-18/4 Module.
- Step 3** Configure DVTs on the MDS 9222i switch and MSM-18/4 Modules.
- 

## Enabling SANTap on the MDS 9222i Switch and the MSM-18/4 Module

You will need a license to provision SANTap. Set the **boot ssi** value for module 1 (MDS 9222i Switch) and then reload the switch before you provision SANTap on Module 1.

SANTap can be enabled on an MDS 9222i Switch and an MSM-18/4 platform.

Enter the following command to enable SANTap on an Octeon-based Module:

```
switch(config)#
switch(config)#ssm enable feature santap module x
```

*module x* is where the MSM module is present.

## Enabling SANTap on the SSM

The following command enables SANTap on the SSM:

```
switch(config)#
switch(config)# ssm enable feature santap module 1
```



**Note** SANTap can be enabled on SSM Module 2.

---

## Deploying SANTap on the MSM-18/4

### Detailed Steps

To deploy SANTap, follow these steps:

- Step 1** Identify the MSM slot number.

```
switch# show module
```

Mod	Ports	Module-Type	Model	Status
1	22	4x1GE IPS, 18x1/2/4Gbps FC/Sup2	DS-X9222I-K9	active *

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```

Mod Sw Hw World-Wide-Name(s) (WWN)
---
1 3.2(1a) 0.610 20:01:00:0d:ec:4a:c8:40 to 20:12:00:0d:ec:4a:c8:40
Mod Application Image Description Application Image Version
-----
1 SSI linecard image (Packaged in SAN-OS) 3.2(1a)

```

```

Mod MAC-Address(es) Serial-Num
---
1 00-17-5a-b5-6d-1c to 00-17-5a-b5-6d-24 JAE1123KB03

```

\* this terminal session

### Step 2 Verify that SANTap license is installed.

```

switch# show license usage
Feature Ins Lic Status Expiry Date Comments
-----
FM_SERVER_PKG No - Unused Grace expired
MAINFRAME_PKG No - Unused -
ENTERPRISE_PKG No - Unused -
DMM_FOR_SSM_PKG No 0 Unused -
SAN_EXTN_OVER_IP No 0 Unused -
PORT_ACTIVATION_PKG No 0 Unused -
SAN_EXTN_OVER_IP_18_4 No 0 Unused -
SAN_EXTN_OVER_IP_IPS2 No 0 Unused -
SAN_EXTN_OVER_IP_IPS4 No 0 Unused -
10G_PORT_ACTIVATION_PKG No 0 Unused -
STORAGE_SERVICES_ENABLER_PKG No 0 Unused Grace 117D 23H
switch#

```

### Step 3 Enable SANTap services on the SSM module.

```
switch(config)# ssm enable feature santap module number
```

### Step 4 Check for SSM provisioning.

```

switch# show ssm provisioning
Module Ports/Nodes Application Provisioning Status
-----
12 1-1 santap success

```

### Step 5 Create two VSANs.

SANTap uses two VSANs: a Back-End VSAN (BE-VSAN) and a Front-End VSAN (FE-VSAN). The BE-VSAN includes all storage targets, RPAs, and the control virtual target (CVT). A FE-VSAN includes host initiators and the data virtual target (DVT), which is a virtual representation of a storage target.

### Step 6 Create CVT in the BE-VSAN.

```
switch(config)# santap module number appl-vsan number cvt-name name
```

### Step 7 Create DVT in the FE-VSAN.

You must create a DVT for each storage port that you want to replicate. You may create several DVTs in one FE-VSAN or create DVTs in different VSANs.

```
switch(config)# santap module number dvt target-pwn pwn target-vsan number dvt-name name
dvt-vsan number lun-size-handling 1
```



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The BE-VSAN is zoned using the WWNs of the host initiator ports and the storage target ports. The same WWNs will be used in the FE-VSAN. Consequently, the back-end zoning scheme may be used for the FE-VSAN.

At this point, all I/O activity between the host and the target is relayed by SANTap. The I/Os are relayed from the actual host port in the FE-VSAN to the actual target port in the BE-VSAN via the DVT and the host port VI. This process has no impact to the hosts and is completely transparent.

---

## Configuring DVTs on the MDS 9222i Switch and MSM-18/4 Module

A data virtual target (DVT) is a logical target port that resides on the switch and is used to intercept traffic for a real target.

### Restrictions

- Assigning a DVT to a different front-panel port is supported only on an SSM but not on an MDS 9222i Switch and MSM-18/4 Module. SANTap provisioning using the **interface** command is not supported on an SSM.
- In Cisco SAN-OS Release 3.2(1) or NX-OS Release 4.1(x), SANTap supports 32 host initiators per DVT.
- Do not use the **dvt-port** option for the MDS 9222i Switch and MSM-18/4 Module from the **dvt-port help** CLI.

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## Detailed Steps

To configure a DVT, follow these steps:

	Command	Purpose
Step 1	switch# <b>config t</b> switch(config)#	Enters configuration mode.
Step 2	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id</b>	Configures the pWWN, target VSAN (which contains the target and VI), DVT name, and DVT VSAN (which contains the host and the CVT).
	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id dvt-port num</b>	Configures the pWWN, target VSAN, DVT name, DVT VSAN, and DVT port.  <b>Note</b> SANTap has to be provisioned for the entire module 2. When using the interface command, it should be provisioned on interface fc1/1-4. If not, you will not be able to provide the dvt-port option.  The DVT port maps to one of the ports on the SSM. You can assign a port for explicit load balancing or not assign a port, which allows the SSM to select the port and handle the load balancing (default).
	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id lun-size-handling num</b>	Configures the pWWN, target VSAN, DVT name, DVT VSAN, and LUN size handling flag (enabled). Enabling the LUN size handling flag allows special LUN resize handling by the vendor. The default LUN size handling flag value is 1(enabled).
	switch(config)# <b>santap module num dvt target-pwwn pwwn-id target-vsan vsan-id dvt-name name dvt-vsan vsan-id io-timeout seconds</b>	Configures the pWWN, target VSAN, DVT name, DVT VSAN, and timeout value in seconds. The timeout determines the interval after which to time out I/Os on the target side. The range is 10 to 200 seconds and the default value is 10 seconds.
	switch(config)# <b>no santap module num dvt target-pwwn pwwn-id</b>	Removes the DVT configuration.

## Configuring SANTap on the MSM-18/4 Using DCNM-SAN

This section includes the following topics:


- [Creating a SANTap DVT MSM, page 1-19](#)
- [Deleting a SANTap DVT MSM, page 1-19](#)
- [Deleting a SANTap DVT MSM, page 1-20](#)

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## Creating a SANTap DVT MSM

### Detailed Steps

To create a SANTap DVT MSM, follow these steps:

- 
- Step 1** Expand **End Devices**, and then select **Intelligent Features** from the Physical Attributes pane.  
You see the FCWA tab in the information pane.
  - Step 2** Click the **SANTap DVT MSM** tab.  
You see the SANTap configuration in the information pane.
  - Step 3** Click **Create Row**.  
You see the create SANTap DVT MSM dialog box.
  - Step 4** Select the switch on which the SANTap DVT MSM will be configured.
  - Step 5** Select the **interface**. This is the port on the module where the DVT will be created.
  - Step 6** Select the VSAN ID in which you want to create the SANTap DVT MSM.
  - Step 7** Select the port WWN of the real target for which this corresponding DVT is being created. The DVT has the same port WWN as the target.
  - Step 8** Select the target VSAN ID for the VSAN of the real target for which this DVT is being created.
-  **Note** Uncheck the **Automatically Choose Interface** check box to select the interface.
- 
- Step 9** Assign a name to this SANTap DVT MSM.
  - Step 10** Check the **LunSizeHandling** check box if you want to use the real target LUN size for the virtual LUN or the maximum LUN size supported (2 TB).
  - Step 11** From the IOTimeout drop-down list, select the I/O timeout value for the DVT. The default value is 10 seconds.
  - Step 12** Click **Create** to create this SANTap DVT MSM.
- 

## Deleting a SANTap DVT MSM

### Detailed Steps

To delete a SANTap CVT, follow these steps:

- 
- Step 1** Expand **End Devices**, and then select **Intelligent Features** from the Physical Attributes pane.  
You see the FCWA tab in the Information pane.
  - Step 2** Click the **SANTap CVT** tab.  
You see the SANTap configuration in the Information pane.
  - Step 3** Select the SANTap CVT you want to delete.
  - Step 4** Click **Delete Row**.

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You see the DCNM-SAN confirmation dialog box.

**Step 5** Click **Yes** to proceed with the deletion or click **No** to discard the changes.

## Deleting a SANTap DVT MSM

### Detailed Steps

To delete a SANTap DVT MSM, follow these steps:

- 
- Step 1** Expand **End Devices**, and then select **Intelligent Features** from the Physical Attributes pane.  
You see the FCWA tab in the information pane.
- Step 2** Click the **SANTap DVT MSM** tab.  
You see the SANTap configuration in the information pane.
- Step 3** Select the SANTap DVT that you want to delete.
- Step 4** Click **Delete Row**.  
You see the DCNM-SAN confirmation dialog box.
- Step 5** Click **Yes** to proceed with the deletion or click **No** to discard the changes.
- 

## Removing Appliance-Generated Entities

An appliance might terminate its SANTap application without removing generated entities on the MDS switch. This section describes how to remove these entities using the CLI on the MDS switch.

This section includes the following topics:

- [Removing AVTs and AVT LUNs, page 1-20](#)
- [Removing SANTap Sessions, page 1-21](#)
- [Removing Initiator-Target-LUNs, page 1-21](#)

## Removing AVTs and AVT LUNs

The AVT and AVT LUN configuration occasionally remains after a SANTap application terminates.

### Detailed Steps

To remove AVTs and AVT LUNs, follow these steps:

	Command	Purpose
<b>Step 1</b>	switch# <b>show santap module num avt</b>	Displays the AVT pWWNs.
	switch# <b>show santap module num avtlun</b>	Displays the AVT pWWNs and LUNs

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	Command	Purpose
Step 2	switch# <b>clear santap module num avt</b> <b>2a:4b:00:05:30:00:22:25 lun 234456</b>	Removes a LUN from the AVT.
	switch# <b>clear santap module num avt</b> <b>2a:4b:00:05:30:00:22:25</b>	Removes the AVT.  <b>Note</b> You can remove the AVT only after all the LUNs are removed.

## Removing SANTap Sessions

A SANTap session continues occasionally after a SANTap application terminates.

### Detailed Steps

To remove a SANTap session, follow these steps:

	Command	Purpose
Step 1	switch# <b>show santap module 2 session</b>	Displays SANTap session information on the SSM in slot 2.
Step 2	switch# <b>clear santap module 2 session 1</b>	Removes SANTap session 1 on the SSM in slot 2.

## Removing Initiator-Target-LUNs

The initiator-target-LUN (ITL) triplet identifies a LUN loaded on a DVT. The ITL configuration occasionally remains after a SANTap application terminates.

### Detailed Steps

To remove all LUNs for an ITL triplet, follow these steps:

	Command	Purpose
Step 1	switch# <b>show santap module 2 dvtlun</b>	Displays the target and host pWWNs for the ITLs on the SSM in slot 2.
Step 2	switch# <b>clear santap module 2 itl</b> <b>target-pwwn 22:00:00:20:37:88:20:ef</b> <b>host-pwwn 22:00:00:20:37:88:20:ef</b>	Removes an ITL on the SSM in slot 2.  <b>Note</b> The host port should be shut down before executing this command.

## Migrating SANTap Switches

This section describes the SANTap migration procedures and the environments required for migrating SANTap from an existing switch, such as an MDS 9513 Director, to another switch, such as an MDS 9216 Switch. The chapter also discusses how to move a host from a dedicated data path processor (DPP) to a different DPP.

This section includes the following topics:

- [Migrating the Switches, page 1-22](#)
- [Configuring the Replacement Chassis, page 1-23](#)

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- [Moving a Host from a Dedicated DPP to a Different DPP, page 1-23](#)

## Migrating the Switches

### Detailed Steps

To complete the migration procedure, follow these steps:

- 
- Step 1** Shut down the host port connecting to MDS-2.
- Step 2** Shut down the storage port connecting to MDS-2.
- Step 3** Clear all ITL sessions associated and AVT and AVT LUNs. Use the following command to clear all ITLs:

```
switch# clear santap module slot-number {avt avt-pwwn [lun avt-lun] | itl target-pwwn
host-pwwn | session session-id}
```

- Step 4** Delete the relevant SANTap and splitter configuration of MDS-2 from the appliance.
- Step 5** Delete DVT from MDS-2.

```
switch# conf t
Enter configuration commands, one per line. End with CNTL/Z.
switch(config)# no santap module num dvt target-pwwn pwwn
```

- Step 6** Delete CVT from MDS-2.

```
switch# conf t
Enter configuration commands, one per line. End with CNTL/Z.
switch(config)# no santap module num appl-vsan ID
```

At this point, all MDS-2 associated DVTs, CVTs, AVT and AVT LUNs are deleted.

- Step 7** Clear all persistent SANTap information from the SSM module. Use the **clear ssm-nvram santap module 1** command.

This command will purge all SANTap information for the SSM in slot 1.

- Step 8** Unprovision the SANTap feature on MDS-2. Use the following command to unprovision SANTap:

```
switch# conf t
Enter configuration commands, one per line. End with CNTL/Z.
switch(config)# no ssm enable feature santap module num
switch(config)# end
```

Verify that the SANTap feature is unprovisioned from MDS-2:

```
switch# show ssm provisioning
Module   Ports/Nodes   Application   Provisioning Status
-----
       7         1-32         santap         success
```

- Step 9** Power off the SSM module. The module is ready to be swapped over to the MDS 9216 chassis.

This completes the necessary steps on the MDS-2 switch. Ensure that the appropriate cable is connected to the MDS 9216 chassis.

---

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## Configuring the Replacement Chassis

### Detailed Steps

To configure the replacement MDS 9216 chassis (new MDS-2), follow these steps:

- 
- Step 1** Insert the SSM card removed from the MDS 9513 chassis and finish initial configuration of the switch.
  - Step 2** Ensure that the correct SAN-OS or NX-OS release SSI image is loaded on the switch.
  - Step 3** Install the license. An SSE license is required for the new chassis.
  - Step 4** Complete cable connection from the hosts, targets and the appliance to the new switch.
  - Step 5** Reconfigure SANTap on the new MDS 9216.

Refer to the “[Deploying SANTap](#)” section to reconfigure the new MDS 9216 chassis.

After reconfiguration, ensure that the appliance communicates to the new MDS-2 switch, and follow the same procedure to swap the Fabric A on the MDS-1 switch.

---

## Moving a Host from a Dedicated DPP to a Different DPP

### Restrictions

- Follow this procedure only if advised by Cisco Technical Support.

### Detailed Steps

To move a dedicated DPP to a different DPP, follow these steps:

- 
- Step 1** Shut down the Host Fibre Channel interface on the switch.
  - Step 2** Shut down the Target Fibre Channel interface on the switch.
  - Step 3** Delete the DVT associated to the host-target pair.
 

```
switch# conf t
Enter configuration commands, one per line. End with CNTL/Z.
switch(config)# no santap module num dvt target-pwvn pwvn
```
  - Step 4** Clear the related SANTap information for that host-target pair and reload the SSM module.
 

```
switch(config)# clear santap module slot-number {avt avt-pwvn [lun avt-lun] | <itl
target-pwvn host-pwvn | session session-id}
```
  - Step 5** Reload the SSM module.
 

```
switch# reload module X
```

*X* is the SSM module number.
  - Step 6** Verify that the virtual entries purged in step 3 and 4 are not present after the module reload.
  - Step 7** Create a DVT on the DPP, using the **dvt-port num** option.
 

```
switch# santap module num dvt target-pwvn pwvn target-vsant vsant-id dvt-name name dvt-vsant
vsant-id dvt-port num
```

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This will place the new DVT on DPP 4.

- Step 8** Verify the new DVT gets created in the appropriate DPP by using the **show isapi virtual-nport database** command.
- Step 9** Complete the remaining SANTap configuration to establish communication with the appliance.  
For more information, refer to the “[Deploying SANTap](#)” section.

## Verifying the SANTap Configuration

### Displaying SANTap Information

Use the **show santap module** command to display information about SANTap (see [Example 1-1](#) to [Example 1-6](#)).

#### **Example 1-1** Displays SANTap CVT Information

```
switch# show santap module 2 cvt

CVT Information :
  cvt pwwn      = 23:4f:00:0d:ec:09:3c:02
  cvt nwwn      = 23:9d:00:0d:ec:09:3c:02
  cvt id        = 135895180
  cvt xmap_id   = 135895212
  cvt vsan      = 8
  cvt name      = MYCVT
```

#### **Example 1-2** Displays SANTap DVT Information

```
switch# show santap module 2 dvt

DVT Information :
  dvt pwwn      = 50:06:0e:80:03:81:32:36
  dvt nwwn      = 50:06:0e:80:03:81:32:36
  dvt id        = 136773180
  dvt mode      = 3
  dvt vsan      = 12
  dvt if_index  = 0x1080000
  dvt fp_port   = 1
  dvt name      = MYDVT
  dvt tgt-vsan  = 9
  dvt io timeout = 10 secs
  dvt lun size handling = 0
  dvt app iofail behaviour = 1
  dvt quiesce behavior = 1
  dvt tgt iofail behavior = 0
  dvt appio failover time = 50 secs
  dvt inq data behavior = 0
```

#### **Example 1-3** Displays SANTap DVT LUN Information

```
switch# show santap module 2 dvtlun

DVT LUN Information :
```



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```
dvt pwwn      = 22:00:00:20:37:88:20:ef
dvt lun       = 0x0
xmap id       = 8
dvt id        = 3
dvt mode      = 0
dvt vsan      = 3
tgt pwwn      = 22:00:00:20:37:88:20:ef
tgt lun       = 0x0
tgt vsan      = 1
```

**Example 1-4 Displays SANTap Session Information**

```
switch# show santap module 2 session
Session Information :
  session id      = 1
  host pwwn       = 21:00:00:e0:8b:12:8b:7a
  dvt pwwn        = 50:06:0e:80:03:81:32:36
  dvt lun         = 0x0
  tgt pwwn        = 50:06:0e:80:03:81:32:36
  tgt lun         = 0x0
  adt pwwn        = 33:33:33:33:33:33:00
  adt lun         = 0x0
  aci pwwn        = 22:22:22:22:22:22:22
  cvt pwwn        = 23:4f:00:0d:ec:09:3c:02
  num ranges      = 0
  session state   = 5
  redirect mode   = 0
  mrl requested   1
  MRL : vsan 8 RegionSize 4806720, DiskPWWN 0x234f000dec093c02, DiskLun 0x 1,
  startLBA 1

  pwl requested   1
  PWL : type 2, UpdatePol 2, RetirePolicy 4, pwl_start 1

  iol requested   0
```

**Example 1-5 Displays SANTap AVT Information**

```
switch# show santap module 2 avt
AVT Information :
  avt pwwn        = 2a:4b:00:05:30:00:22:25
  avt nwwn        = 2a:60:00:05:30:00:22:25
  avt id          = 12
  avt vsan        = 4
  avt if_index    = 0x1080000
  hi pwwn         = 21:00:00:e0:8b:07:61:aa
  tgt pwwn        = 22:00:00:20:37:88:20:ef
  tgt vsan        = 1
```

**Example 1-6 Displays SANTap AVT LUN Information**

```
switch# show santap module 2 avtlun
AVT LUN Information :
  avt pwwn        = 2a:4b:00:05:30:00:22:25
  avt lun         = 0x0
  xmap id         = 16
  avt id          = 12
  tgt lun         = 0x0
```

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## Additional References

For additional information related to implementing SANTap, see the following sections:

- [Related Documents, page 1-26](#)
- [MIBs, page 1-26](#)
- [MIBs, page 1-26](#)

## Related Documents

Related Topic	Document Title
SANTap DVT Interoperability Support Matrix	The SANTap DVT Interoperability Support Matrix is located in the SANTap section of the <a href="#">Cisco Data Center Interoperability Support Matrix</a> .
SANTap Compatibility with Storage Service Interface Images	For compatibility information between SANTap, Cisco MDS SAN-OS software releases, and Storage Service Interface (SSI) releases, refer to the <a href="#">Cisco MDS SAN-OS Release Compatibility Matrix for Storage Service Interface Images</a> .

## MIBs

MIBs	MIBs Link
<ul style="list-style-type: none"> <li>• CISCO-SANTAP-MIB</li> </ul>	<p>The Cisco SANTap MIB provides an SNMP interface to create and delete a SANTap Control Virtual Target (CVT) and a Data Virtual Target (DVT).</p> <p>For more information on the SANTap MIB, refer to the <i>Cisco MDS 9000 Family MIB Quick Reference</i>.</p> <p>To locate and download MIBs, go to the following URL:  <a href="http://www.cisco.com/dc-os/mibs">http://www.cisco.com/dc-os/mibs</a></p>

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