

Overview

This chapter provides an overview of the Cisco I/O Accelerator feature and includes the following sections:

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About Cisco I/O Accelerator

The Cisco MDS 9000 Family I/O Accelerator (IOA) feature provides Small Computer System Interface (SCSI) acceleration in a storage area network (SAN) where the sites are interconnected over long distances using Fibre Channel or Fibre Channel over IP (FCIP) Inter-Switch Links (ISLs).

IOA provides these features, which are described in the following sections:

IOA Supported Switches

IOA is supported on the following switches:

- Cisco MDS 24/10-Port SAN Extension Module on Cisco MDS 9700 Series switches
- Cisco MDS 9250i Switch

IOA Unsupported Switches

IOA is not supported on the following switches:

- Cisco MDS 9220i Switch
- Cisco MDS 9132T Switch
- Cisco MDS 9148T Switch
- Cisco MDS 9148S Switch

- Cisco MDS 9396T Switch
- Cisco MDS 9396S Switch

Unified Acceleration Service

IOA provides both SCSI write acceleration and tape acceleration features as a unified fabric service. These services were provided in previous releases in the form of Fibre Channel write acceleration for remote replication over Fibre Channel links and FCIP write acceleration and tape acceleration over FCIP links. Fibre Channel write acceleration was offered on the Storage Services Module (SSM) and FCIP write acceleration and tape acceleration were offered on the IP storage services modules. IOA offers both the write acceleration and tape acceleration services on the Cisco MDS MSM-18/4 module, SSN-16 module, and 9222i switch as a fabric service. This eliminates the need to buy separate hardware to obtain Fibre Channel write acceleration and FCIP write acceleration and tape acceleration.

Topology Independent

IOA can be deployed anywhere in the fabric without rewiring the hardware or reconfiguring the fabric. There are no restrictions on where the hosts and targets are connected to. Both the Fibre Channel and FCIP write acceleration is supported only on PortChannels but do not support multiple equal-cost links. FCIP tape acceleration is not supported on PortChannels. IOA eliminates these topological restrictions.

Transport Agnostic

IOA is completely transport-agnostic and is supported on both Fibre Channel and FCIP ISLs between two sites.

High Availability and Resiliency

IOA equally supports both PortChannels and equal-cost multiple path (ECMP) links across two data centers. This allows you to seamlessly add ISLs across the two data centers for capacity building or redundancy. IOA is completely resilient against ISL failures. IOA uses a Lightweight Reliable Transport Protocol (LRTP) to guard against any ISL failures as long as there is an alternate path available across the two data centers. Remote replication and tape backup applications are completely unaffected by these failures.

Improved Tape Acceleration Performance

IOA tape acceleration provides higher throughput numbers than the FCIP tape acceleration, which is limited by a single Gigabit Ethernet throughput.

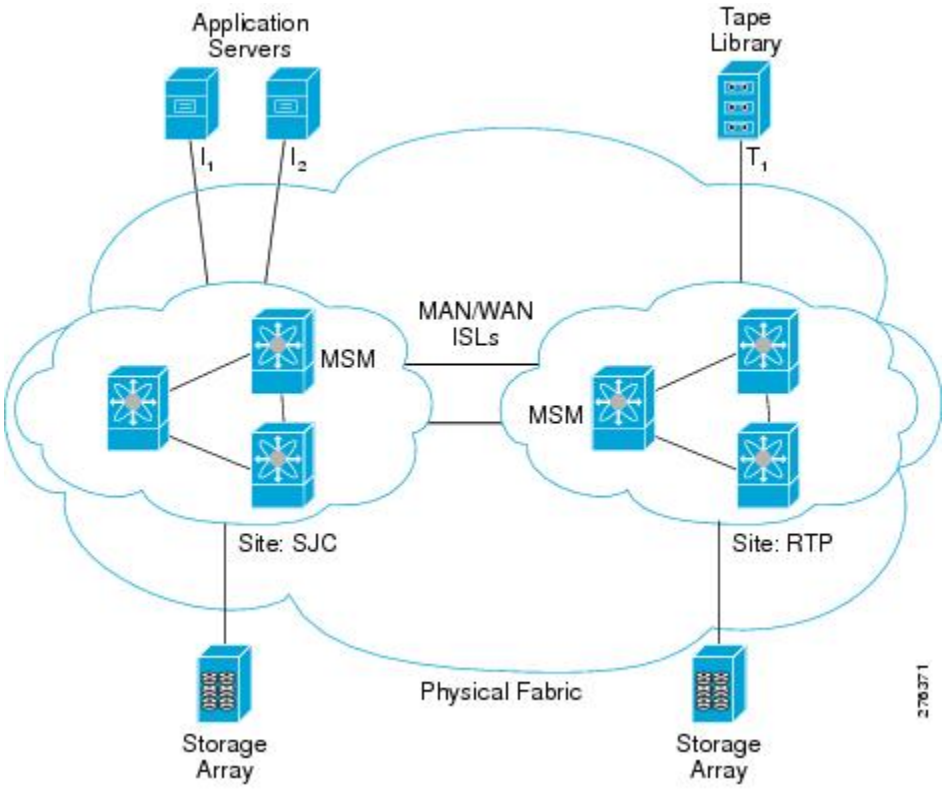
Load Balancing

IOA uses clustering technology to provide automatic load balancing and redundancy for traffic flows across multiple IOA service engines that can be configured for the IOA service. When an IOA service engine fails, the affected traffic flows are automatically redirected to the available IOA service engines to resume acceleration.

Example IOA Topology

Figure 1: Fabric with Two Sites, on page 3 illustrates a physical fabric that consists of two sites in different locations interconnected across the MAN or WAN using Fibre Channel or FCIP links. Remote replication and remote tape backup services run across these two data centers.

Figure 1: Fabric with Two Sites



Note This topology illustrates a single fabric only. In a dual fabric, the second fabric is an exact replica of this topology, and the concepts that are described in this document are applicable to the second fabric as well.

Terminology

The following Cisco IOA-related terms are used in this book:

- **Fabric**—A physical topology of switches interconnected by Fibre Channel or FCIP ISLs.
- **IOA Site**—Represents a set of switches within the physical fabric that is in a specific physical location. Multiple IOA sites within the physical fabric are typically interconnected over a MAN or WAN using Fibre Channel or FCIP links. IOA provides the acceleration service for flows traversing across sites. As a part of the IOA configuration, the switches must be classified into appropriate IOA sites. Acceleration

is provided for flows traversing the MAN or WAN across sites. The main reason to classify the sites is to select the intersite flows for acceleration. No intrasite flows will be allowed to participate in acceleration.



Note When using the CLI, only the switches where IOA is deployed need to be classified into a site. When using the Cisco DCNM-SAN, all the switches in a physical location need to be classified into a site. The site classification is used internally by the Cisco DCNM-SAN to automate the classification of the flows that traverse across sites.

- **IOA Interface**—Represents a single service engine in the MSM-18/4 Module or the SSN-16 Module. An IOA interface must be provisioined to enable IOA service on the service engine. The MSM-18/4 Module has one service engine and the SSN-16 Module has four service engines, which directly represents the number of IOA interfaces that can be created on these modules. In the CLI, an IOA interface is represented as **interface ioa** *x*/*y* where *x* represents the slot and *y* represents the service engine ID. With the SSN-16, the service engine ID can be 1 to 4. Each IOA interface requires a IOA license to be checked out.

  An IOA interface must be brought up administratively to enable the IOA service on the service engine.

- **IOA Switch**—Represents a switch that has one or more IOA interfaces configured for the IOA service. The terms IOA switch and IOA node are used interchangeably in this configuration guide.
- **IOA Cluster**—A set of IOA switches that can operate in a coordinated manner to provide the IOA service. An IOA cluster can only span two IOA sites. If there is a consolidation site that has connectivity to various other sites, each site pair must be represented by a unique IOA cluster. A switch may participate in multiple IOA clusters due to this reason, but each IOA interface is bound only to one IOA cluster. This architecture allows for cluster scalability and limiting the scope of configuration distribution as appropriate.
- **IOA N Port**—Represents a Fibre Channel N port represented by a port world-wide name. IOA requires that the site to which the N port belongs and the VSAN ID be configured. The site classification is required to identify how to redirect the traffic flow for acceleration.
- **FC-Redirect** —Fibre Channel Redirect (FC-Redirect) infrastructure provides the ability to redirect a flow to a specific service engine in the fabric to provide certain intelligent services such as Storage Media Encryption and Data Mobility Manager. This infrastructure has been extended for IOA to redirect the flow to two service engines in the fabric that can then work together to provide the acceleration intelligence.

Both the host and the target or tape must be directly attached to a FC-Redirect-capable switch.

- **IOA Flow**—A flow that is accelerated across the MAN or WAN by the IOA cluster. Each IOA flow is identified by initiator PWWN and target PWWN.

  IOA provide bidirectional acceleration for each configured flow. A separate reverse flow configuration is not required.

- **IOA Flow Group**—A set of IOA flows classified for a specific purpose. For example, if the same IOA cluster is being used for remote replication and backup, you can have all the replication flows classified into the replication flow group and all the backup flows classified into the backup flow group.

Note You can have more than one IOA service engine in the same site in the IOA cluster. This is the preferred configuration when an IOA service engine fails, then all the flows bound to it can be automatically moved to another available IOA service engine in the same site. This function is taken care of by the IOA cluster based load balancer.

Clustering

IOA is offered as a clustered service that consists of a set of switches that operates in coordination with each other. Clustering provides the following advantages:

- **Single point management**— IOA can be managed as a fabric service from a single switch. You do not need not configure multiple switches individually to provide IOA as a fabric service.
- **Automatic load-balancing**— You can provision all of the flows that need to be accelerated through IOA. Clustering allows these flows to load balance automatically across all the available IOA service engines within the cluster. It also makes it easy to plan for capacity as you only need to add an additional IOA service engine when you need to add more throughput within IOA.
- **Resiliency**— Allows automatic failover of the IOA flows whenever an IOA service engine fails on any of the switches. If a switch fails, an alternate switch in the cluster takes over the failed flows to maintain the continuity of the IOA service.

IOA clustering uses standard algorithms to provide consistency and reliability of the configuration metadata required for the service to be operational. A master switch is internally elected by the clustering infrastructure to perform certain tasks such as load-balancing and failover. To keep the process simple, we recommend that you provision the IOA from the master switch. If the network fails, which partitions the switches in a cluster, a standard majority node-based quorum algorithm is used to decide which partition should be operational to guarantee the consistency.

An internal node ID that is allocated as a part of adding the switches to the cluster is used in the master election algorithm. If you intend to manage IOA from a specific switch or a site, we recommend that you use this switch as a seed switch when a IOA cluster is configured, and also add all the nodes in this site before you add the nodes from the remote site into the IOA cluster.

Hardware Requirements

IOA is supported on the Cisco MDS 9000 Family 18/4-port Multiservice Module MSM-18/4, the Cisco MDS 9222i Switch, the Cisco MDS 9250i Switch, and the 16-Port Storage Services Node (SSN-16) module. Each MSM-18/4 Module, 9222i Switch, and 9250i Switch has one service engine that can be configured for the Cisco IOA service. The SSN-16 module has four service engines that can be used for the IOA service.

IOA scaling with NX-OS release 6.2(3) is supported only on Supervisor 2a module and not supported on Supervisor 2 module.

Software Requirements

To enable the IOA feature on the MSM-18/4 Module or SSN-16 Module, the MDS 9000 Family switch must run Cisco NX-OS Release 4.2(1) or later. To enable IOA on the MDS 9250i Switch it should run Cisco NX-OS

Release 6.2(5). You must also use Cisco DCNM-SAN 5.2(1) to manage the switches. Hosts must be connected to a switch running Cisco SAN-OS 3.3(1c) or later. Targets must be connected to a switch running Cisco NX-OS Release 4.2(1) or later.

The Cisco MDS 9710 Switch can have Cisco NX-OS Release 6.2(1) or 6.2(3) or above, if the hosts are directly connected to the Cisco MDS 9710 Switch that is participating in the IOA. But if the targets that are participating in IOA are directly connected to it (Cisco MDS 9710 Switch), then we must have Cisco NX-OS release 6.2(3) and above running on that Cisco MDS 9710 Switch.

After the target is connected to the Cisco MDS 9710 Switch with Cisco NX-OS Release 6.2(3) or above, IOA (master/slave) switch should be able to communicate with the Cisco MDS 9710 Switch (targets are connected) with at least one path where all FCR-capable switches are connected in between the IOA (master/slave) and Cisco MDS 9710 Switch.

License Requirements

The Cisco MDS 9000 Family IOA package is licensed per service engine and is tied to the chassis. The number of licenses required is equal to the number of service engines on which the intelligent fabric application is used.

IOA runs on the MDS 9222i Switch (native), MDS 9250i Switch (native) and on the MSM-18/4 Module and SSN-16 Module. The modules are supported in the MDS 9500 Directors and the MDS 9222i Switch.

On the SSN-16 Module, a separate license is required for each engine that will run IOA. Each SSN-16 engine configured for IOA checks out a license from the pool managed at the chassis level. For convenience, SSN-16 Module licenses can be purchased singly (the usual model) or in a package of four. Once they are installed into an MDS 9000 chassis, there is no difference between the IOA package of four and four single IOA licenses.

On the SSN-16 Module, because each engine is licensed independently, different licensed features can be configured on the four engines based on the following requirements for NX-OS Release 4.2(1):

- As with the MDS 9222i Switch and the MSM-18/4 Module, only one licensed feature can run on an engine at a time.
- On the SSN-16 Module, mix and match is supported for IOA and SAN Extension over IP in any combination (4+0, 1+3, 2+2, 3+1, or 0+4).
- Storage Media Encryption (SME) is not supported for mix and match in NX-OS Release 4.2(1).

To use the IOA features, Cisco MDS NX-OS Release 4.2(1) or later must be installed on a Cisco MDS 9000 Family switch and Cisco MDS9250i Switch must be running Cisco NX-OS Release 6.2(5).

Table 1: Cisco I/O Accelerator Licenses, on page 6 lists the available Cisco IOA licenses.

Table 1: Cisco I/O Accelerator Licenses

Part Number	Description	Applicable Product
M9250IIOA	Cisco I/O Acceleration License for MDS 9250i.	MDS 9250i
M92IOA184	Cisco I/O Acceleration License for MSM-18/4 on MDS 9200, spare.	MSM-18/4 on MDS 9200
M95IOA184	Cisco I/O Acceleration License for MSM-18/4 on MDS 9500, spare.	MSM-18/4 on MDS 9500

Part Number	Description	Applicable Product
M95IOASSN	Cisco IOA License (1 engine) for SSN-16 on MDS 9500, spare.	SSN-16 on MDS 9500
M92IOASSN	Cisco IOA License (1 engine) for SSN-16 on MDS 9200, spare.	SSN-16 on MDS 9200
M95IOASSN4X	Cisco IOA License (4 engines) for SSN-16 on MDS 9500, spare.	SSN-16 on MDS 9500
M92IOASSN4X	Cisco IOA License (4 engines) for SSN-16 on MDS 9200, spare.	SSN-16 on MDS 9200
M9222IIOA	Cisco I/O Accelerator License for MDS 9222i, spare.	MDS 9222i Switch



Note A device is either a switch or a module. When you enter the serial number for the device, make sure that you enter the serial number for the correct device; either the switch or the module for which you want to get the license. You can use the **show license** *host-id* command to find out which serial number to lock the license against.