Overview

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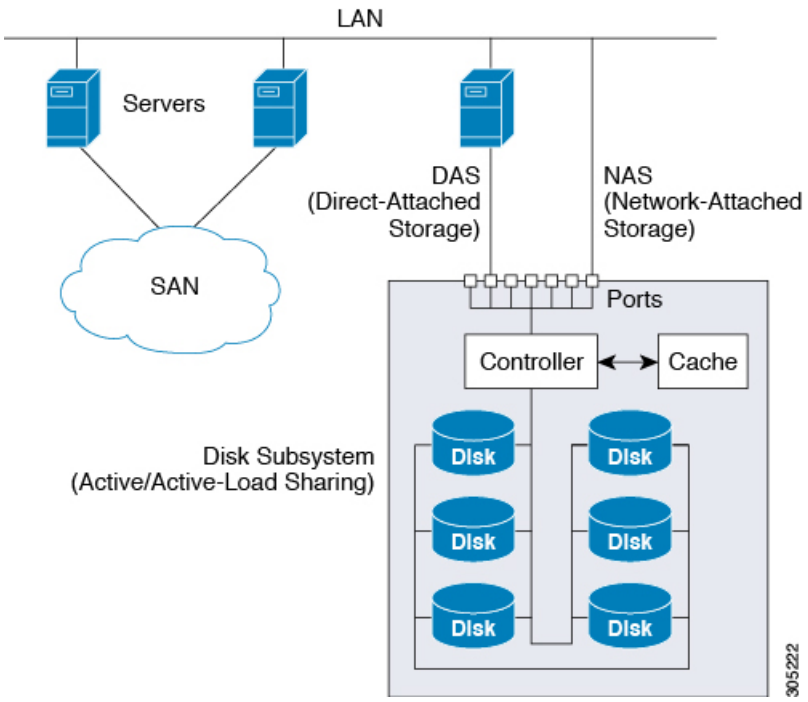
This guide describes how to configure the following storage management tasks:

- Ports and Port Channels
- Named VSANs
- SAN Pin Groups
- SAN Uplinks
- Pools
- FC Identity Assignment
- Storage-Related Policies
- Storage Profiles
- FlexFlash SD Card Support
- Direct Attached Storage
- Storage Inventory

Storage Options

The following are the UCS Manager storage options and the benefits of each.

Figure 1: Cisco UCS Manager Storage Options



- **Direct Attached Storage (DAS)**—This is the storage available inside a server and is directly connected to the system through the motherboard within a parallel SCSI implementation. DAS is commonly described as captive storage. Devices in a captive storage topology do not have direct access to the storage network and do not support efficient sharing of storage. To access data with DAS, a user must go through a front-end network. DAS devices provide little or no mobility to other servers and little scalability.

  DAS devices limit file sharing and can be complex to implement and manage. For example, to support data backups, DAS devices require resources on the host and spare disk systems that other systems cannot use. The cost and performance of this storage depends upon the disks and RAID controller cards inside the servers. DAS is less expensive and is simple to configure; however, it lacks the scalability, performance, and advanced features provided by high-end storage.

- **Network Attached Storage (NAS)**—This storage is usually an appliance providing file system access. This storage could be as simple as an Network File System (NFS) or Common Internet File System (CIFS) share available to the servers. Typical NAS devices are cost-effective devices with not very high performance but have very high capacity with some redundancy for reliability. NAS is usually moderately expensive, simple to configure, and provides some advanced features; however, it also lacks scalability, performance, and advanced features provided by SAN.

- **Storage Area Network (SAN)**—A SAN is a specialized, high-speed network that attaches servers and storage devices. A SAN allows an any-to-any connection across the network by using interconnect elements, such as switches and directors. It eliminates the traditional dedicated connection between a server and storage, and the concept that the server effectively owns and manages the storage devices. It also eliminates any restriction to the amount of data that a server can access, currently limited by the number of storage devices that are attached to the individual server. Instead, a SAN introduces the flexibility of networking to enable one server or many heterogeneous servers to share a common storage utility. A network might include many storage devices, including disk, tape, and optical storage. Additionally, the storage utility might be located far from the servers that it uses. This type of storage

provides maximum reliability, expandability, and performance. The cost of SAN is also very high compared to other storage options.

SAN is the most resilient, highly scalable, and high performance storage; however, it is also the most expensive and complex to manage.

Storage Design Considerations

UCS storage physical connectivity has a slightly different design consideration as compared to LAN physical connectivity. The following are some design considerations for SAN connectivity:

- Northbound storage physical connectivity does not support virtual port channels (vPCs) like LAN connectivity.
- Port channels or trunking is possible to combine multiple storage uplink ports that provide physical link redundancy.
- Redundancy of storage resources is handled by the storage itself and varies from vendor to vendor.
- Connect storage through northbound Cisco storage devices, such as Nexus or MDS Fabric Switches.
- It is possible to connect storage directly to UCS Fabric Interconnects, which is recommended for small implementations because of the fabric interconnect physical ports consumption and increased processing requirements.
- Software configuration including VSANs and zoning is required for providing access to storage resources.

Storage Configuration Sequence

Follow the suggested sequence to configure a storage network:

1. Configure and enable server ports, uplink ports, and FC ports.
2. Create a management IP address pool (typically on the same subnet as the UCS Manager Admin IP address).
3. Create an UUID Pool, MAC Pool, WWNN Pool, WWPN Pool (or populate the corresponding "default" pools). Embed domain ID's. Use Fabric-specific Pools for MAC and WWPN (for example, Fabric-A, Fabric-B).
4. For SAN boot, create a unique "Boot Policy" for each storage array boot target.
5. Create VNIC templates (for example, eth0-A, eth1-B) that both draw from the above MAC Pool, and are associated with Fabric-A and Fabric-B respectively.
6. Create VHBA templates (for example, fc0-A, fc1-B) that both draw from the above WWPN Pool, and are associated with Fabric-A and Fabric-B respectively.
7. Create service profile templates that draw from all earlier established pools, policies and templates, as appropriate.
8. Instantiate the service profile from the template and associate the service profile to a given blade, or set the service profile template to associate with a particular server pool.

Storage Protocols

Fiber Channel, iSCSI, and Fiber Channel over Ethernet are protocols for SAN connectivity.

- **iSCSI**—An industry standard protocol for attaching various I/O peripherals such as printers, scanners, tape drives, and storage devices. The most common SCSI devices are disks and tape libraries.

  SCSI is the core protocol to connect raw hard disk storage with the servers. To control remote storage with the SCSI protocol, different technologies are used as wrappers to encapsulate commands, such as FC and iSCSI.

  Fiber Channel protocol provides the infrastructure to encapsulate the SCSI traffic and provided connectivity between computers and storage. FC operates at speeds of 2, 4, 8, and 16 Gbps.

- **Fiber Channel (FC)** consists of the following:
  - Hard disk arrays that provide raw storage capacity.
  - Storage processors to manage hard disks and provide storage LUNs and masking for the servers.
  - Fiber Channel Switches (also known as Fabric) that provide connectivity between storage processors and server HBAs.
  - Fiber Channel Host Bus Adapters: They are installed in the computer and provide connectivity to the SAN.

  Fiber Channel identifies infrastructure components with World Wide Numbers (WWN) . WWNs are 64-bit addresses which uniquely identify the FC devices. Like MAC addresses, it has bits assigned to vendors to identify their devices. Each end device (like an HBA port) is given a World Wide Port Number (WWPN) and each connectivity device (like a Fabric switch) is given a World Wide Node Number (WWNN).

  A Fiber Chanel HBA used for connecting to a SAN is known as an initiator, and Fiber Channel SAN providing disks as LUNs is known as a target. The Fiber Channel protocol is different from Ethernet or TCP/IP protocols.

- **Fiber Channel over Ethernet (FCoE)** transport replaces the Fibre Channel cabling with 10 Gigabit Ethernet cables and provides lossless delivery over unified I/O. Ethernet is widely used in networking. With some advancement such as Data Center Ethernet (DCE) and Priority Flow Control (PFC) in Ethernet to make it more reliable for the datacenter, Fiber Channel is now also implemented on top of Ethernet. This implementation is known as FCoE.

The UCS Manager SAN Tab

From the SAN tab, you the UCS administrator can create, modify, and delete configuration elements related to SANs (FC, iSCSI) or direct attached FC/FCoE, NAS appliances, and communications.

The major nodes in this tab are the following:

- **SAN Cloud**—Ths node allows you to:
  - Configure SAN uplinks, including storage ports and port channels and SAN pin groups.
  - View the FC identity assignment

- Configure WWN Pools, including WWPN, WWxN, and WWxN, and iSCSI Qualified Name (IQN), pools.
- View the FSM details for a particular end point to determine if a task succeeded or failed and use the FSM to troubleshoot any failures.
- Monitor storage events and faults for health management.

- **Storage Cloud**—This node allows you to:
  - Configure storage FC links and storage FCoE interfaces (using SAN Storage Manager.
  - Configure VSAN settings.
  - Monitor SAN cloud events for health management.

- **Policies**—This node allows you to:
  - Configure threshold policies, classes, and properties and monitor events.
  - Configure threshold organization and sub-organization storage policies, including default VHBA, behavior, FC adaptor, LACP, SAN connectivity, SAN connector, and VHBA templates.

- **Pools**—This node allows you to configure pools defined in the system, including IQN, IQN suffix, WWNN, WWPN, and WWxN.
- **Traffic Monitoring Sessions**—This node allows you to configure port traffic monitoring sessions defined in the system.