Storage

Platform variants

The ISAAC® Platform comes in different variants, each with different storage capabilities. All platforms have a storage for the system, ISAAC configuration data and metric data. Prelude and Nemesis platforms also have options for dedicated storage for Media or other content.

ISAAC® Foundation F110, Prelude 210 & 410, Nemesis 610 & 810 have a single logical storage unit for the system, ISAAC configuration data and metric data, whereas Prelude 212 & 412 have an additional logical storage unit for the Media. Nemesis 612 & 812 while having an additional physical storage unit for Media or other content, have a single logical storage as a unified storage pool.

Except for Foundation series, which is an embedded platform and only has 1 single SSD (1) disk, all Prelude and Nemesis series come with a combination of SSD and HDD (1) disks configured in RAID 1 (2) or RAID 1 and RAID 10 (2) arrays.

Nemesis series being a cluster, with at least 2 hosts, and providing High Availability and in some cases Fault Tolerance, the storage is centralized in a SAN (3) connected to the hosts.

Disk Configurations

Single SSD Disk

- 1 x 512GB SSD Disk (Usable 512GB)
- Models: Foundation 110
- Disk connection: SATA (4) 6GBps

RAID 1 SSD Arrays

- 2 x 960GB SSD Disks in RAID 1 (Usable 960GB – 3 DWPD lifetime (5))
- Models: Prelude 210 & 212
- Disk connection: SATA 6GBps

Or

- 2 x 1.92TB SSD Disks in RAID 1 (Usable 1.92TB – 3 DWPD lifetime)
- Models: Prelude 410, 412 in the host
- Disk connection: SATA 6GBps

Or

- 2 x 1.92TB SSD Disks in RAID 1 (Usable 1.92TB – 3 DWPD lifetime)
- Models: Nemesis 610, 612, 810, 812 in the SAN
- Disk connection (in the SAN): SAS (4) 12Gbps
- SAN-Host connection 2x (redundant) SAS 12Gbps

RAID 10 HDD Arrays

- 6 x 1.2TB-10k HDD Disks in RAID 10 (Usable 3.6 TB)
- Models: Prelude 212 in the host
- Connection: SAS 12GBps

Or

- 6 x 4TB - 7.2k HDD Disks in RAID 10 (Usable 12 TB)
- Models: Prelude 412 in the host
- Connection: SATA 6GBps

Or

- 6 x 8TB - 7.2k HDD Disks in RAID 10 (Usable 24 TB)
- Models: Nemesis 612, 812 in the SAN
- Connection 2x (redundant) SAS (4) 12Gbps

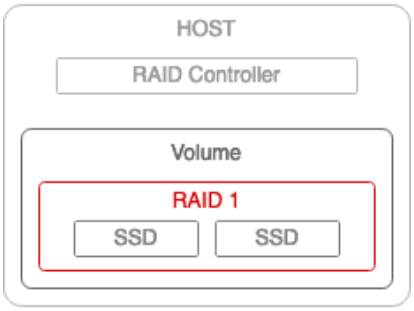
Storage Topologies

Note: this section only applies for Prelude and Nemesis series.

ISAAC® Prelude and Nemesis servers use different storage topologies based on the model, and the options that these models provide.

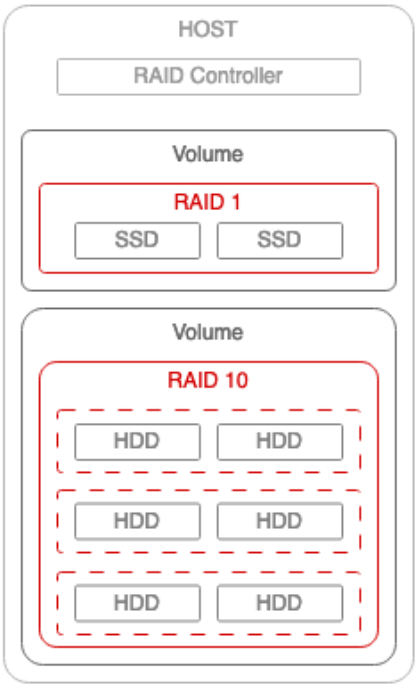
Prelude 210 and 410 topology

Single RAID 1 Array of SSD, connected internally to the host in SATA. One logical volume provides a usable storage capacity of 960GB for Prelude 210 and 1.92TB for Prelude 410.



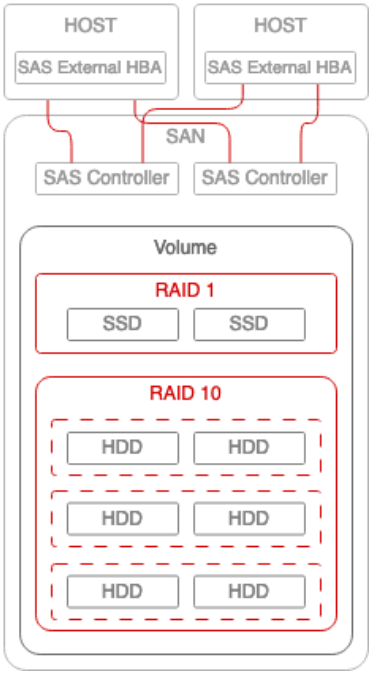
Prelude 212 and 412 topology

One RAID 1 Array of SSD and one RAID 10 array of HDD, connected internally to the host in SATA. Each array is used in an independent logical volume. The usable storage capacity is 960GB and 3.6TB respectively for each volume for Prelude 212 and 1.92TB and 12TB respectively for each volume for Prelude 412.



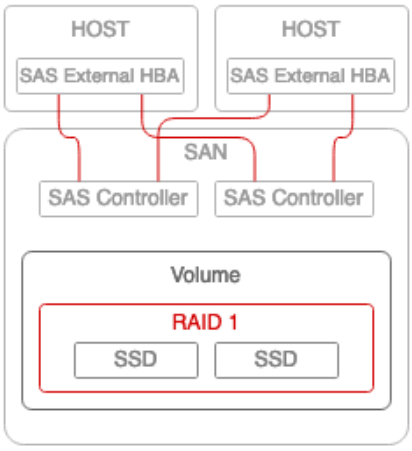
Nemesis 612 and 812 topology

One RAID 1 Array of SSD and one RAID 10 array of HDD, connected internally to the SAN. The SAN has two redundant SAS controllers connected to the two hosts in SAS. One logical volume comprised by the two arrays provides a usable storage capacity of 25.92TB for Nemesis 612 and 812.



Nemesis 610 and 810 topology

Single RAID 1 Array of SSD, connected internally to the SAN. The SAN has two redundant SAS controllers connected to the two hosts in SAS. One logical volume provides a usable storage capacity of 1.92TB for Nemesis 610 and 810.



Storage Usage

Foundation series

ISAAC® is not running on Foundation as a VM, but since Foundation has only one storage poll, all ISAAC services and data are in the same storage which has a capacity of 512GB.

ISAAC® VM Storage usage

ISAAC® VM has two virtual disks attached to it, one is or the VM itself and the general data and has an initial capacity of 128GB, whereas the second is dedicated for the object storage, which usually contains the media and has an initial capacity of 256GB.

Prelude x10 and Nemesis x10 series having only 1 storage pool, the two virtual disks are located there.

Prelude x12 series having two storage pools, the SSD based storage pool contains the VM and general data virtual disk, whereas the HDD based pool contains the object store virtual disk (6).

Nemesis x12 series having only 1 storage pool (in the SAN), therefore the two virtual disks are located there. However, the composite space of both arrays that this single pool exposes, automatically and transparently moves used blocks between tiers as it's used.

Other VMs Storage usage

Other optional VMs provided as part of an ISAAC® system only have one virtual disk. This disk is put on the SSD based storage pool (Prelude x12 series) or on the default single storage pool for other series.

Other additional VMs added for custom configurations afterwards may have one or multiple virtual disks. The location of these disks much be chosen based on their workload and data usage. These guidelines can be used:

- SSDs are lower capacity but much higher performance, especially for random mixed workloads (like running multiple VMs) as well as being lower power (so lower heat) and do not have any moving parts, which theoretically means lower maintenance.
- However, SSDs have a limited lifetime (DWPD lifetime (5)) and the performance can suffer if the used space exceed 90%
- HDDs on the other hand are higher capacity and well suited for files where large spans are written once, and read relatively often, especially with sequential reads.

VMWare Storage usage

VMWare also uses space on the datastore where the VMs are located to store the snapshots of the VMs. The amount of space used for the snapshots is variable and highly depends on the number of VMs that have snapshots and what these VMs are composed of.

This is one of the reasons why the virtual disks are created with a reduced initial size. They can always be expanded but not shrunk.

VMWare ESXI OS/logs are not using any space from the datastore, since every host has an additional storage controller with an SSD used for the OS.

Storage expansion

Initial virtual disks capacity, allocated as thick provisioning, can be increased, or additional virtual disks can be added to expand the storage capacity, up to the physical available space. Additional physical disks can also be added if storage requirement changes, up to the available physical space in the host or SAN. These operations are done by SMI support personals.

(1) Solid State Drives are disks made using static memory as opposed to Hard Disk Drive made using moving mechanical parts.
(2) Redundant Array of Independent Disks which combine multiple disks for redundancy and/or speed improvement.
(3) Storage Area Network is a storage appliance connected to one or multiple servers via dedicated links.
(4) Serial Attached SCSI and Serial Advanced Technology Attachment are two norms to connect a storage to a server/machine.
(5) Drive Writes Per Day measures how many times the entire drive can be overwritten each day of its life.
(6) HDD disks are generally well suited for media as they have large capacity and general sequential reads for media are not suffering by seek-time penalties.