

Storage

Platform variants

The ISAAC® Platform comes in different variants, each with different storage capabilities. All platforms have 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 230 & 430, Nemesis 630 & 830 have a single logical storage unit for the system, ISAAC configuration data and metric data, whereas Prelude 232 & 432 and Nemesis 632 & 832 have an additional logical storage unit for the Media.

Except for Foundation, which is an embedded platform, and the Quorum Applianceⁱ which comes with Nemesis, which only have 1 single SSDⁱⁱ disk, all Prelude and Nemesis come with a combination of SSD and HDDⁱⁱ disks configured in RAID 1ⁱⁱⁱ or RAID 1 and RAID 10ⁱⁱⁱ arrays.

Disk Configurations

Single SSD Disk

- 1 x 512GB SSD Disk (Usable 512GB)
- Models: Foundation 110 & Quorum Appliance
- Disk connection: SATA^{iv} 6Gbps

RAID 1 SSD Arrays

- 2 x 960GB SSD Disks (Usable 960GB – 3 DWPD lifetime^v)
- Models: Prelude 230 & 232 and Nemesis 630 & 632
- Disk connection: SATA 6Gbps

Or

- 2 x 1.92TB SSD Disks (Usable 1.92TB – 3 DWPD lifetime)
- Models: Prelude 430, 432 and Nemesis 830, 832
- Disk connection: SATA 6Gbps

RAID 10^{vi} HDD Arrays

- 6 x 2.4TB-10k HDD Disks (Usable 7.2 TB)
- Models: Prelude 232
- Connection: SAS^{iv} 12Gbps

Or

- 6 x 2.4TB-10k HDD Disks (Usable 7.2 TB)
- Models: Nemesis 632
- Connection: SAS 12Gbps

Or

- 6 x 8TB-7.2k HDD Disks (Usable 24 TB)
- Models: Prelude 432
- Connection: SAS 12Gbps

Or

- 6 x 8TB-7.2k HDD Disks (Usable 24 TB)
- Models: Nemesis 832
- Connection: SAS 12Gbps

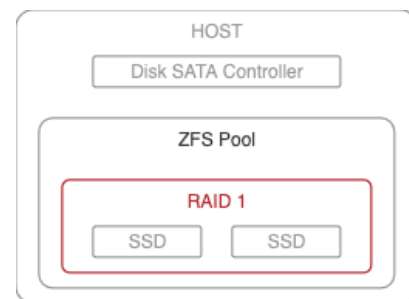
Storage Topologies

Foundation F110 topology

Single SSD, connected internally to the unit with SATA. One logical volume provides a usable storage capacity of 512GB.

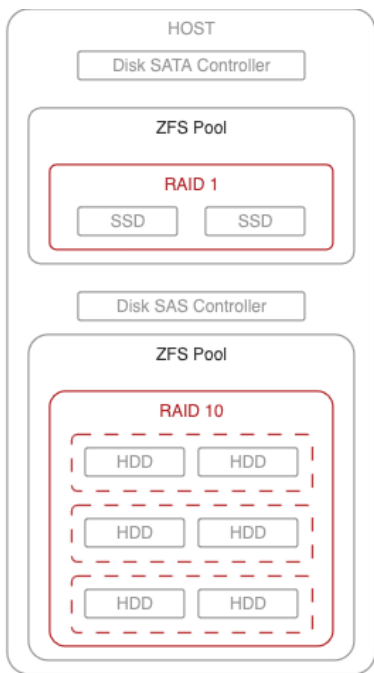
Prelude 230 and 430 topology

Single RAID 1 Array of SSD, connected internally to the host with SATA. One logical volume provides a usable storage capacity of 960GB for Prelude 230 and 1.92TB for Prelude 430.



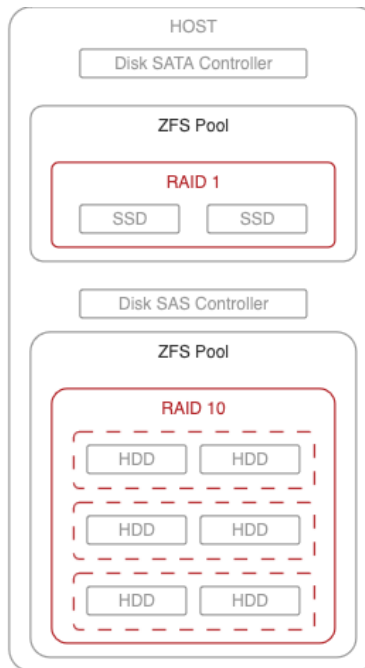
Prelude 232 and 432 topology

One RAID 1 Array of SSD connected internally to the host with SATA and one RAID 10 array of HDD, connected internally to the host with SAS. Each array is used in an independent logical volume. The usable storage capacity is 960GB and 7.2TB respectively for each volume for Prelude 232 and 1.92TB and 24TB respectively for each volume for Prelude 432.



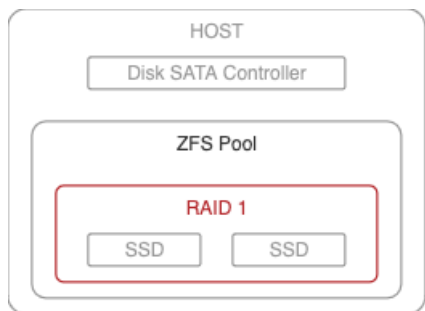
Nemesis 632 and 832 topology

Each host has one RAID 1 Array of SSD connected internally to the host with SATA and one RAID 10 array of HDD, connected internally to the host with SAS. Each array is used in an independent logical volume. The usable storage capacity is 960GB and 7.2TB respectively for each volume for Nemesis 632 and 1.92TB and 24TB respectively for each volume for Nemesis 832.



Nemesis 630 and 830 topology

Each host has a single RAID 1 Array of SSD, connected internally to the host with SATA. One logical volume provides a usable storage capacity of 960GB for Nemesis 630 and 1.92TB for Nemesis 830.



General Storage Usage

Foundation series

ISAAC® Foundation does not utilize a VM for the Workspace; all services and user data use a single 512GB disk.

ISAAC® VM Storage usage

The ISAAC® VM has one or two virtual disks attached to it, depending on the underlying operating system (see Workspace Data Storage chapter for further details). When there are two, one is for 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.

On systems where there is a distinct HDD storage pool for media or bulk content (Prelude x32 and Nemesis x32) and when there is a separate VM disk for the Object Store, the object store virtual disk will be allocated on the HDD pool and the VM's operational virtual disk^{vii} on the SSD pool. In case there is only one VM disk, it is allocated on the HDD pool.

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.

Other additional VMs added for custom configurations afterwards may have one or multiple virtual disks. The location of these disks must 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^v) 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.

Proxmox Storage usage

Proxmox 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.

Storage expansion

Initial virtual disks capacity is allocated as thick provisioning. This capacity can be increased, adding virtual disks to expand the storage capacity, up to the physical available space. Additional physical disks can also be added if storage requirements change, up to the available physical space in the host. These operations are done by SMI support personnel.

Workspace Data Storage

The ISAAC® Workspace uses (reads/writes) different types of data. They are stored in different locations (logical and physical) depending on their nature, the generation of the system and the model of system.

Logical Storage Level

On the logical level, we can split the data into the data which are stored in the Object Store and the data which are not stored in the Object Store, referred as General Data.

The Object Store contains the following data:

- Media Manager content (all files uploaded in the media manager).
- Document Center content (all files uploaded in the Document center).
- Backups
- Image, Playable and Composition thumbnails.
- Modules' data. This is a provision as it is currently not used.

Physical Storage Level

For new systems running on StageOS^{viii} there is only one virtual disk, with the system, general data and the Object Store. It is either located on the single SSD Pool for systems Prelude x30, Nemesis x30 and in the single 512GB disk for Foundation, or in the HDD Pool for systems Prelude x32 and Nemesis x32.

For systems not running on StageOS^{ix} there are two virtual disks (except for Foundation which has only one disk, a 512GB SSD), the first one with the system and general data, the second one with the Object Store. The first disk is always located on the SSD Pool for all systems, whereas the second disk is either located on the single SSD Pool for systems Prelude x30, Nemesis x30, or in the HDD Pool for systems Prelude x32 and Nemesis x32.

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- ⁱ Quorum Appliance is connected to the hosts via dedicated links, its role is to ensure the quorum to vote during a failover.
 - ⁱⁱ Solid State Drives are disks made using static memory as opposed to Hard Disk Drive made using moving mechanical parts.
 - ⁱⁱⁱ Redundant Array of Independent Disks which combine multiple disks for redundancy and/or speed improvement.
 - ^{iv} Serial Attached SCSI and Serial Advanced Technology Attachment are two norms to connect a storage to a server/machine.
 - ^v Drive Writes Per Day measures how many times the entire drive can be overwritten each day of its life.
 - ^{vi} RAID1 & RAID 10 disks are technically ZFS striped mirror, RAID1 having a single strip.
 - ^{vii} 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.
 - ^{viii} 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.
 - ^{ix} StageOS is a Linux based OS, the new underlying operating system developed by Smart Monkeys powering ISAAC Workspace. It is available from the Workspace 2.5 on new systems delivered after August 2025.