



Intrinsa EnterpriseServer™ and EnterpriseStorage™ Infrastructure for High Availability Needs

V1.0

White Paper



Introduction

This document is designed to provide the reader with an overview of Intransa's *High Availability* (HA) infrastructure platform solutions for video surveillance and other demanding physical security applications. It is not designed to be an installation manual or system design, but instead to give the reader an understanding of the design and capabilities of this powerful and flexible solution.

Failure Resistance and Recovery

The most common use of video surveillance systems is to insure physical security of assets and safety of people. These systems have allowed organizations to keep track of areas without having to staff personnel to physically be present in every room, every hallway, or every doorway of every location. For many customers, this scale makes it possible to responsibly fulfill their mission.

With typical modern video surveillance deployments, during every minute of every day, IP-based network cameras are sending uninterrupted streams of data, each of which must be recorded non-stop. Failure to record this data successfully implies a potential risk of lost video, and a fundamental benefit from the investment has been lost.

These systems are complex devices with electrical circuits that with continuous use can get hot and burn out like light bulbs or have moving parts such as rotating disks, reader arms, and spinning fans that can wear out over time. Intransa systems use redundancy to protect these systems from common failures, such as:

- *Redundant power supplies which not only can withstand a single power supply failure, if attached to separate power sources, but also can offer a defense against a single grid outage*
- *Redundant network ports not only survive the loss of a single NIC, but also the loss of a network switch*
- *Redundant fans for system cooling*
- *Redundant disk drives, (discussed in more detail below)*

RAID

One of the most important points of defense for these systems is having extra drives to withstand the failure of a single drive within the recording platform. Intransa EnterpriseStorage™ platforms include RAID (Redundant Array of Independent Disks) technology. To understand the benefits of RAID, a brief introduction of the most commonly used techniques follows.

Perhaps the simplest approach is RAID level 1 or RAID 1. Under RAID 1, a group of two or more disks are divided into pairs and every block of data is mirrored (duplicated) onto both partner drives of the pair. This is called mirroring because a drive and its partner are kept as perfect copies of each other. If one of the drives fails, the partner drive still has all of the data. This approach can survive one or more drive failures as long as only one drive of any pair of disks has failed. While simple to understand, the problem with this approach is that it uses twice the amount of total (raw) storage as is needed by the application, since each drive has a paired counterpart.

A slightly more complex but significantly more affordable solution in larger systems is RAID 5. RAID 5 allows for a more optimal use of multiple disk drives and still be able to survive a full disk failure with protected data. In RAID 5, a single disk is needed for parity for an arbitrary number (N) of disks, providing an effective capacity of N-1 (instead of N/2 as with RAID 1). Therefore, in a 4 drive RAID 5 configuration, you get the effective storage of 3 drives with one drive being used for parity. This technique is a little slower recording the data to the disks than RAID 1, but that can be largely handled in the storage system and RAID 5 is fundamentally cheaper when compared to costs of mirroring. It is therefore the most common approach in physical security and many IT applications. An issue with RAID 5 is that it can only survive a single drive failure. If, when a drive fails, it isn't replaced with a new, working drive, then a subsequent drive failure can cause the system to lose data.

A third approach, called RAID 6, builds on top of RAID 5 capabilities by adding a second parity disk. The consequence of this technique allows up to two drive failures for N number of drives. The effective storage of an arbitrary number of disks (N) is now N-2 and the impact on performance is worse than for RAID 5, but the application can survive up to two drive failures without losing data. As disk drive sizes continue to grow from 1 to 2 to 3TB and beyond each, RAID 6 is increasingly popular.

For a more detailed and comprehensive look at RAID technologies and how they apply specifically to the unique requirements of video surveillance systems, please review *"Understanding RAID Systems for Surveillance Storage"* published by SecurityInfoWatch.com at <http://bit.ly/MPmprl>.

Clustering

A final area of vulnerability is associated with an entire node failure. This can happen when a motherboard burns out, the system crashes or there is a catastrophic failure where a component - such as a power supply - and its pair fails at the same time.

For example, in a platform that is normally protected with two power supplies, if one fails and is never replaced, and then after a period of time the second power supply also fails, it will bring down the whole system. The implication is that the associated system, its applications and/or storage will go offline and video will be lost. As with previous examples, the only way to defend against this kind of failure is to have redundancy, this time at the system level. One or more of these systems needs to be combined together in such a way so that if there is a full system failure, a replacement system can take over. These collections are referred to as a "Cluster."

A simple cluster might be two identical systems, one running an application, the second being a standby ready to take over. To be ready to take over, it needs to have comparable access to network and storage as well as have comparable capacity to execute whatever services were being performed on the primary node. In this example, you need two to get the capacity of one.

Storage Clustering with Intransa EnterpriseStorage™ ST600

Intransa launched the Intransa EnterpriseStorage™ ST600 High Availability base system in October 2010 to fulfill a demand in the market for High-Scale & High-Availability on the ability to store & read video data. The ST600 family itself is the latest generation of the Intransa StorStac™ modular storage system, and includes our patented and patent-pending Video Data Management and Retention™ (VDMR™) software technology.

Typical ST600 applications include critical infrastructure, such as airports, power stations, hydro-electric dams, etc., plus high security applications, such as casinos, hospitals, Department of Defense, prisons, etc.

The ST600 base system has the following specifications:

- 2U rack mount
- 12 bay storage (12TB, 24TB or 36TB)
- RAID 6 configuration
 - *RAID6 = 10TB, 20TB or 30TB useable storage*
- *Fault Resilient Configuration box*
 - *800W AC dual redundant power supplies, 100-240V, 50-60Hz, 5 Amp*
 - *SATA-II hot-swap, low energy/hi density disk drives*
 - *Field-replaceable components*
 - *Advanced RAID Support*
- Internal Drive for OS - ESX & Linux on solid state SSD
- Network Connectivity
 - Ports
 - *(7) 1GbE ports standard*
 - Networks
 - *(7) 1GbE networks supported standard*
 - *(4) back-end 1GbE interconnects (with redundancy)*
 - *(2) iSCSI network (with redundancy)*
 - *(1) management network*
 - Optional 10GbE network
 - *(2) back-end 10GbE interconnects (with redundancy)*
 - Expansion – 3 x SAS ports for connecting up to 3 x EX900-HA Storage Expanders providing an additional 12TB, 24TB or 36TB raw storage

An ST600 base system can be expanded *vertically* by adding up to 3 x EX900-HA Storage Expanders in a *star wire* configuration, i.e. each EX900-HA Storage Expander is connected via a SAS cable (supplied with the ST600) directly to the ST600. The ST600 has 3 x SAS ports as standard for connecting 3 x EX900-HA Storage Expanders.

The EX900-HA Storage Expander has the following specifications:

- 2U rack mount
- 12 bay storage (12TB, 24TB or 36TB)
- RAID 6 configuration
 - *RAID6 = 10TB, 20TB or 30TB useable storage*
- *Fault Resilient Configuration*
 - *800W AC dual redundant power supplies, 100-240V, 50-60Hz, 5 Amp*
 - *SATA-II hot-swap, low energy/hi density disk drives*
 - *Field-replaceable components*

Nodes & Clusters

A **ST600Node** is made up of a ST600 base system plus 0-3 EX900-HA Storage Expanders. The maximum amount of raw storage in a ST600 Node is 144TB (made up of 1 x ST600-36TB-1 Base Storage Module plus 3 x EX900-36TB-1 Storage Expanders).

A **ST600Cluster** is made up of 2 or more **ST600Nodes**. It is possible to have up to 12 x ST600 Nodes in a single cluster, giving a maximum raw storage capacity of 1.7PB (12 x 144TB). Refer to Figure 1 for an example of a 3 Node ST600Cluster.

Each enclosure within a **ST600Node** supports RAID 6. If up to 2 disks fail in an enclosure the disk(s) will be rebuilt by the remaining disks in the enclosure.

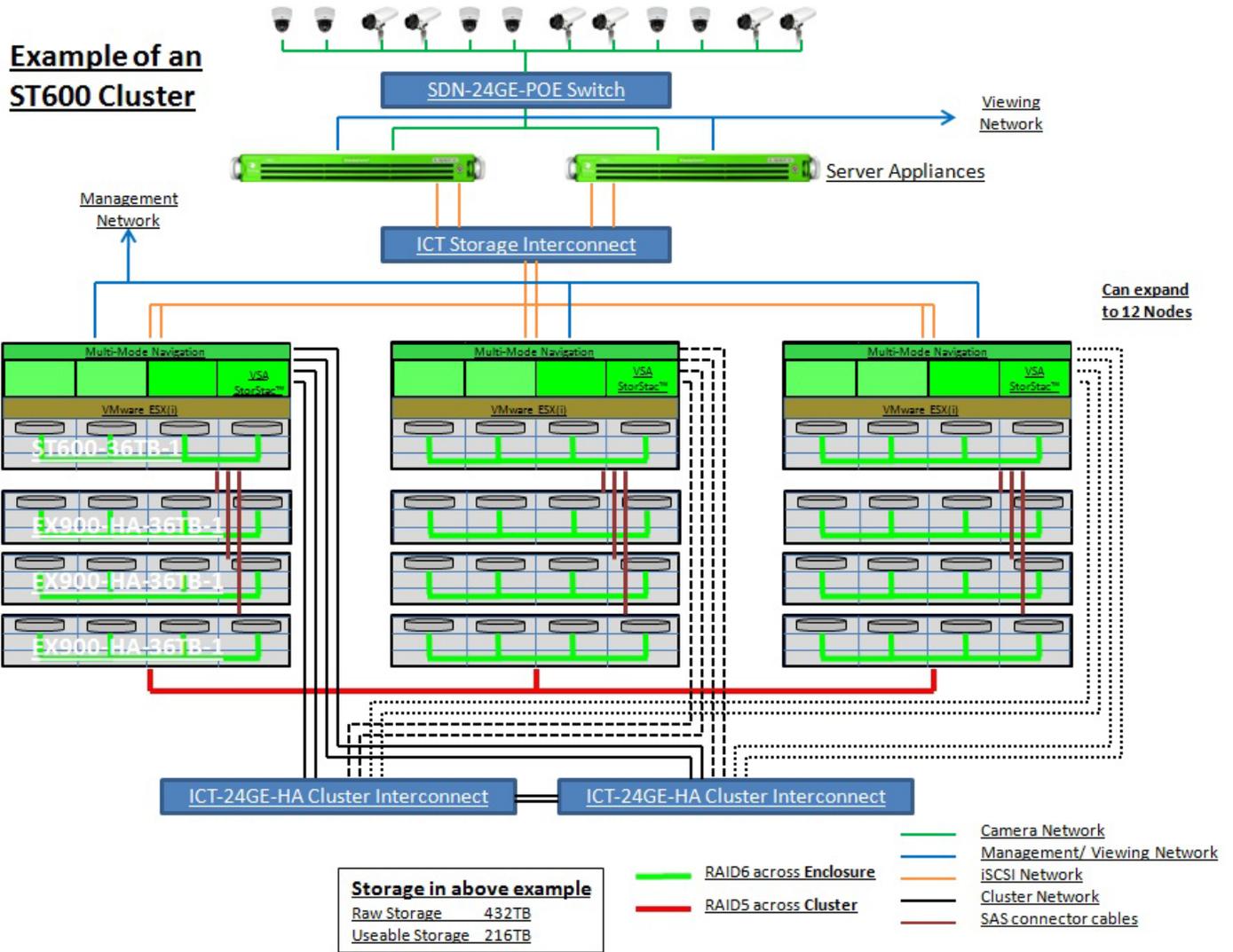
A **2 Node ST600Cluster** can support RAID 1 mirroring. In this way whatever is recorded on Node 1 is mirrored on Node 2. In the event of either Node 1 or Node 2 failing the Node can be rebuilt by the remaining Node. This rebuild is done across the cluster network.

A **3 or more Node ST600Cluster** can support RAID 5 protection across the nodes in the cluster. In this way if any one of the Nodes in the Cluster fails the remaining Nodes will rebuild the Node which has failed. This rebuild is done across the cluster network.

There is a cost to RAID protection. Each level of RAID reduces the amount of useable storage available to the system. With RAID 5 you typically lose one disk capacity. With RAID 6 you typically lose 2 disks of recording capacity.

With High Availability Clustering, you lose a whole Node's capacity for useable storage to the cluster. For example, with a 3 Node Cluster, only 2 Nodes are available as useable storage. The fewer the Nodes in the Cluster the more costly this is. The more Nodes in the Cluster the less costly it is.

Figure 1. Example of an ST600 Cluster



Refer to Table 1 for an illustration of actual useable storage. This table assumes a cluster with RAID 6 across each enclosure and RAID 5 across the Cluster.

Interconnects

Intrinsa interconnects are internal components required in each Intrinsa EnterpriseStorage™ ST600 configuration. They are fault resilient with dual power supplies and are stackable for redundancy and to allow for expansion without taking the system offline. Interconnects are available in 24 port configurations, depending upon the system configuration requirements. These are dedicated interconnects - using alternative products will void the warranty of the system, since performance and operation cannot be guaranteed.

Table 1. Raw & Useable Capacity (3TB Drives)

Cluster Size	Max. Raw Capacity (TB)	RAID Type	Usable Capacity (TB)
2	288	RAID6 + RAID1 (Mirror)	108
3	432	RAID6 + RAID5	216
4	576	RAID6 + RAID5	324
5	720	RAID6 + RAID5	432
6	864	RAID6 + RAID5	540
7	1008	RAID6 + RAID5	648
8	1152	RAID6 + RAID5	756
9	1296	RAID6 + RAID5	864
10	1440	RAID6 + RAID5	972
11	1584	RAID6 + RAID5	1080
12	1728	RAID6 + RAID5	1188

Parts Numbers

Here follows a list of Intransa parts for the Intransa ST600 EnterpriseStorage™ base system, EX900-HA Storage Expanders plus Interconnects.

Part Number	Description
ST600-12TB-1	ST600 Base system, rack mount, high availability config (requires minimum of 2 x ST600 appliances) with 12TB hot-swap SATA-II, RAID 6 protected capacity (RAID 5 across a cluster for HA), Intransa VDMR technology
ST600-24TB-1	ST600 Base system, rack mount, high availability config (requires minimum of 2 x ST600 appliances) with 24TB hot-swap SATA-II, RAID 6 protected capacity (RAID 5 across a cluster for HA), Intransa VDMR technology
ST600-36TB-1	ST600 Base system, rack mount, high availability config (requires minimum of 2 x ST600 appliances) with 36TB hot-swap SATA-II, RAID 6 protected capacity (RAID 5 across a cluster for HA), Intransa VDMR technology
EX900-HA-12TB-1	EX900 HA Storage Expander 2U rack mount. 12TB raw storage capacity (10TB available recording capacity) with 12 x 1TB SATA-II hot-swap disk drives with RAID 6 protection
EX900-HA-24TB-1	EX900 HA Expander 2U rack mount. 24TB raw storage capacity (20TB available recording capacity) with 12 x 2TB SATA-II hot-swap disk drives with RAID 6 protection
EX900-HA-36TB-1	EX900 HA Expander 2U rack mount. 36TB raw storage capacity (30TB available recording capacity) with 12 x 3TB SATA-II hot-swap disk drives with RAID 6 protection
ICT-24GE-HA	Interconnect for connecting 1-12 ST600 Series HA Base systems in a Cluster (min. 2 required per Cluster)
ICT-STACKING-CBL	Stacking cable for ISC-24GE-HA & ICT-48GE-HA Interconnects 12" (30CM) (x1 required per ICT-HA Interconnect)

Note: This list is subject to updating at anytime due to the introduction of new features and options.

Server Clustering with Intransa EnterpriseServer™

Intransa also offers High Availability capability with the Intransa EnterpriseServer™ SE45 series to provide highly reliable recording. Intransa EnterpriseServer™ and EnterpriseStorage™ systems operate together to deliver a complete front-and-backend High Availability video surveillance infrastructure.

There are three methods available for Server Failover. The best method depends on the Video Management System chosen for the application plus the size of the system and Availability requirements.

The methods are as follows:

1. VMS Failover. This does not require any additional software from Intransa, only one or more failover servers. However, typically it is only on the recording servers – there is no failover on the management server. Available with at least the following certified Intransa Technology partners:-
 - *DVTel*
 - *Genetec (Omnicast edition)*
 - *Milestone (Corporate edition)*
 - *OnSSI (Ocularis 2.0 ES edition or later)*
2. Windows Clustering
 - *Requires Windows Server 2008 R2 Enterprise edition on each server*
3. VMware ESX Virtualization with VMware HA Feature
 - *Requires ESX on each server in a cluster*
 - *Requires vCenter manager on a separate server*
 - *Requires Service Contract*
 - *3 x EnterpriseServer™ SE45s can be connected in a Cluster providing Failover on the Write application. Additional EnterpriseServer™ SE45s can be added.*

Refer to Figure 2 for an example of a 3 Node ST600 cluster with EnterpriseServer™ SE45s in an HA configuration.

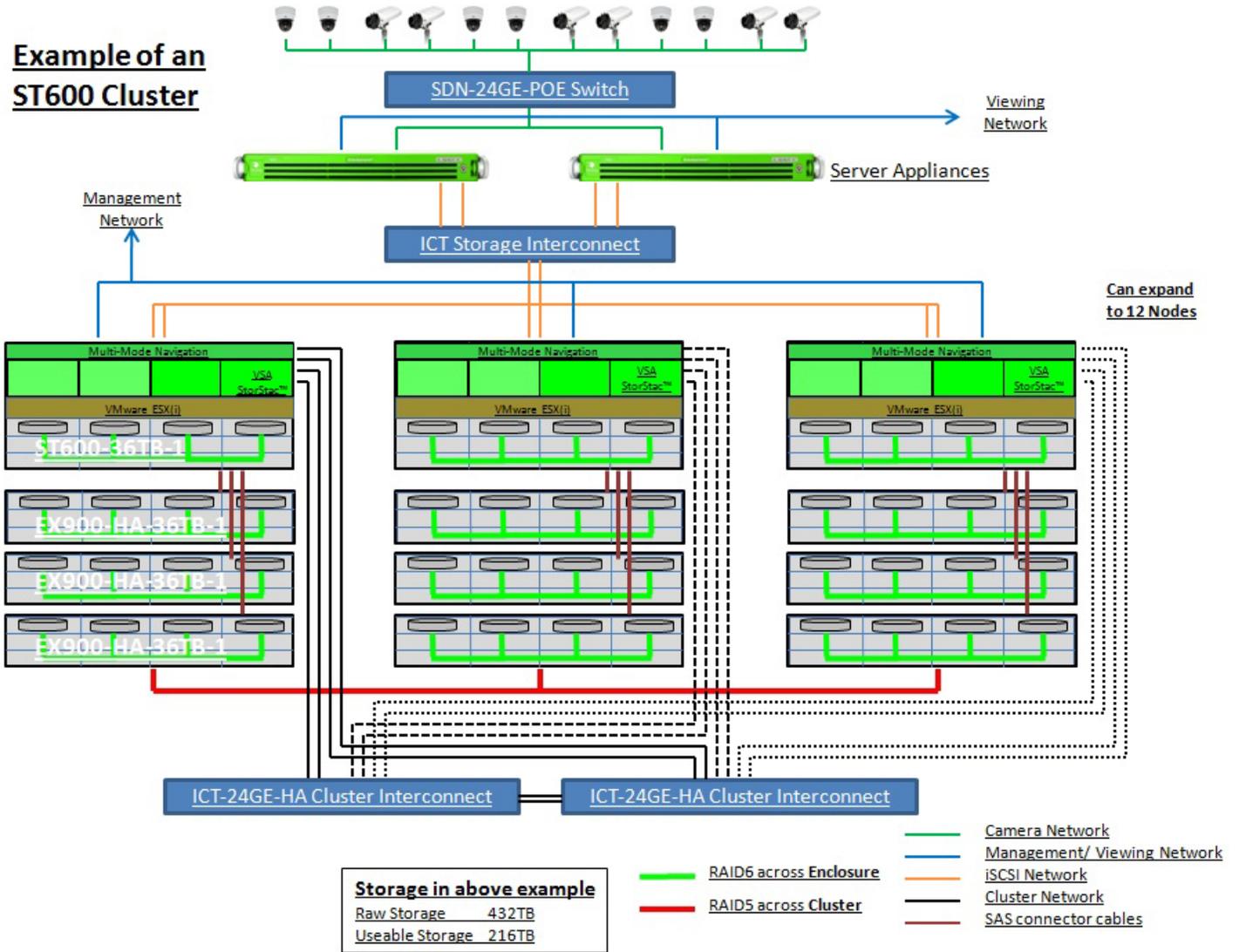
High Availability Server Bundle Parts Numbers

Part Number	Description
BSE452-T6-HA-3	Bundle (3) SE45 Application Servers with VSA High Availability Server Software Suite, (1) SE15 EnterpriseServer™ with VSA HA Management Software Suite, (2) ICT Node Interconnects, Windows Server 2008 per Application Mode (6 in total)
BSE452-T6-HA-4	Bundle (4) SE45 Application Servers with VSA High Availability Server Software Suite, (1) SE15 EnterpriseServer™ with VSA HA Management Software Suite, (2) ICT Node Interconnects, Windows Server 2008 per Application Mode (9 in total)
BSE452-T6-HA-5	Bundle (5) SE45 Application Servers with VSA High Availability Server Software Suite, (1) SE15 EnterpriseServer™ with VSA HA Management Software Suite, (2) ICT Node Interconnects, Windows Server 2008 per Application Mode (12 in total)

Note: This list is subject to updating at anytime due to the introduction of new features and options.

Figure 2. ST600 Cluster with High Availability Video-Optimized Servers

Example of an ST600 Cluster



Intrinsa GroundCrew™ Phone-home Protection

Intrinsa EnterpriseServer™ and EnterpriseStorage™ platforms feature a standard, comprehensive 3 year warranty. Part of the resulting protection includes the Intrinsa GroundCrew™ phone-home feature. In the event that a component fails, our standard warranty includes advance shipment of a replacement part. GroundCrew™ phone-home proactively notifies our warranty department in the event of a fan, drive, power supply or motherboard failure to arrange delivery of replacement parts.

In combination with the advanced RAID support and clustering protection in Intrinsa EnterpriseServer™ and EnterpriseStorage™ platforms, replacement parts can often be installed before the system is visibly impacted.

Additional system protection is also available through our Advanced and Premium options, or by leveraging Intrinsa Pilot™ Live Monitoring.

Summary

For reliable video surveillance, high availability solutions are often the best approach. Intrinsa offers its customers a versatile range of High Availability products and services designed to provide a reliable and expandable infrastructure for video surveillance and other demanding physical security applications.

With features such as Read and/or write availability, advanced RAID protection, VSA Tiered Availability and VSA Energy Manager, Intrinsa EnterpriseServer™ and EnterpriseStorage™ platforms are designed to work together specifically for the unique demands of video and physical security applications. When combined with our inclusive standard 3-year warranty and the Intrinsa GroundCrew™ call-home feature, Intrinsa offers superior high availability solutions.

To learn more, please contact Intrinsa by email (sales@intrinsa.com), telephone, or via an Intrinsa Certified Channel Partner Program integrator today.



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