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1. Overview and Background

During the operation of video surveillance systems, unexpected problems in storage devices, such as failures in network, power supply or HDD, may occur, interrupting the video recording and causing video information to be lost. While a camera failure only affects the loss of video data for one channel, a failure in the storage device results in losing video data from all the cameras connected to the storage device.

If the system is monitored by the user in real time, the user may become aware of the problems and take the necessary measures. However, important information records would continue to be lost while the issues are being resolved. If the system is not monitored by the user, then the duration of video loss may get longer, further increasing the severity of the situation.

As failure to continuously record video feeds in facilities that require 24/7 video recording, such as banks, airports, and other high security facilities, may lead to serious losses, a preventive measure against such failures is needed.

Hanwha Techwin's NVR (Network Video Recorder) and SSM (Smart Security Manager), which is a VMS, features a failover function that minimizes data loss by activating a spare NVR or PC on stand-by, even if the recording is interrupted by a system failure.
2. Failover Technology

2.1. About Failover Technology

Failover (failure recover) is one of the technologies for coping with failures that may occur during system operation. By definition, failover technology is a back-up mode used to provide uninterrupted service by having the secondary system fill in for the primary system in case the primary system is interrupted due to malfunctioning or regular maintenance. This is frequently used for servers, network systems, and databases.

![Flowchart of Hanwha Techwin's Failover System](image)

**Figure 1. Flowchart of Hanwha Techwin's Failover System**
2. Failover Technology

A failover feature consists of two systems: a primary system that is mainly used and a secondary system that serves as a back-up in case the primary system fails. The failover configuration is marked by the number of primary systems that can be backed up and the number of available secondary systems.

A failover system in the N+1 configuration would consist of an unlimited number of primary systems and one secondary system. In case of a failure, the secondary system can only fill in for one primary system. It therefore cannot provide 100% backup operation if two or more primary systems fail.

If an NVR system supports 10+2 failover, it means that two secondary systems can serve as the backup for up to ten primary systems. An NVR capable of N+M failover system means that there are no restrictions on the number of primary and secondary systems.

![Figure 2. Configuration of Failover System](image)

2.2. Failover System in Hanwha Techwin's NVR

Hanwha Techwin's NVR has an N+1 failover system. One secondary NVR stands by at all times. If the main NVR fails, then the secondary NVR is activated. Once the main NVR is recovered, the status of the secondary NVR changes from active to standby.

The configuration for the basic communication is shown in Figure 3. NVR_Main represents the main process of the NVR, and Failover_Server and Failover_Client processes have been added for the failover system. Within the NVR, the communication between processes is handled via IPC, and failover-related communication between NVRs is handled via net socket.
2. Failover Technology

The modular configuration of the failover system and the data flow are shown in Figure 4. Failover manager and failover agent processes are included in the main process of the NVR. The failover agents of each NVR exchange the status of NVR and control each other via the failover manager.

*IPC: Inter-Process Communication

Figure 3. Communication in Hanwha Techwin's NVR Failover System

Figure 4. Module Configuration of Hanwha Techwin's NVR Failover System
2. Failover Technology

If the normal NVR fails, then the failover agent sends various system information (e.g. network camera information) registered on normal NVR to the standby NVR. The standby NVR then provides the same services as the normal NVR.

The status of Hanwha Techwin's NVR failover system is shown in Figure 5. The system status is categorized internally into four states, each with designated roles such as diagnosing failure and sending failure details. Failback is a function that sends the video data stored on the standby NVR to the normal NVR after the failure has been resolved through the failover process.

*HB Packet: Heartbeat Packet

Figure 5. Status Transition in Hanwha Techwin's NVR Failover System
2. Failover Technology

2.3. Hanwha Techwin's SSM-HA-based Failover

SSM-HA (High Availability) is a program for achieving the failover function of SSM (Smart Security Manager), which is a Hanwha Techwin's VMS (Video Management Software).

SSM-HA retrieves information from the primary PC to the standby PC (secondary) to restore the system and continue operation if the PC running the Media Gateway or Recording Server fails due to network issues. Once the failure in the primary PC is resolved, the failback function sends the information and video stored on the standby PC to the primary PC and continues normal operations.

SSM-HA receives signals from primary client in 1-second intervals. If the signal is not received for 20 seconds or more, then it determines that the primary client has failed. SSM_HA then follows up by performing the failover function. SSM-HA supports the N+M failover system configuration.
2. Failover Technology

Figure 7. Example of Failover System Configuration in SSM-HA 1:1

- <N+1>
  - SM
  - HA Server
  - Install HA Server program on a PC used for SM (System Manager) or Standby without adding another PC.
  - RS : Recording Server / MG : Media Gateway

< N+M >

Figure 8. Examples of Failover System Configuration in SSM-HA N+1 and N+M
3. Conclusion

Thanks to its proprietary and patented technology, the Hanwha Techwin failover function relieves concerns regarding loss of data in case of failures and strengthens the reliability of the recorded data. Another advantage of Hanwha Techwin's failover function is that a failover system can be set up simply by deploying an additional NVR or PC as a secondary system, without adding more servers.

- Models Supporting the Failover System
  *(To be updated upon release of new supported products)*