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|  | **HUAWEI eSight**  Safe City O&M Technical White Paper | | 附件1-16K |
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| **Issue** | **01** |
| **Date** | **2015-06-15** |
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| HUAWEI TECHNOLOGIES CO., LTD. | |
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# Overview

Safe City is a super-large comprehensive information-based management system established by the government's safety agency to maintain harmony and security in society. Depending on cooperation and interaction among the technical protection, physical protection, and personnel protection systems, the Safe City system meets the requirements on communication and video surveillance from the aspects of urban security management, traffic management, emergency command, disaster and accident warning, as well as production safety monitoring. In addition, the Safe City system can integrate peripheral systems, such as the alarm and access control systems, as well as link to the broadcast system.

The Safe City system includes the video surveillance, video storage, intelligent analysis, wired network, wireless network, mobile locating, data center, cloud computing, computer-assisted dispatch (CAD), and geographic information system (GIS) subsystems, containing massive and diversified types of devices. The complexity of the Safe City system poses a great challenge for the operation and maintenance (O&M) system to monitor device running status, provide good network quality and surveillance service availability, and protect urban security.

# Customer Challenges

## High O&M Costs due to a Great Diversity of Devices

The Safe City system uses diversified types of devices, such as cameras, storage devices, servers, switches, firewalls, passive optical network (PON) access devices, and 4G wireless devices, which may be provided by different vendors and comply with different management protocols and requirements. In this scenario, conventional O&M solutions need to deploy multiple management systems and allocate dedicated personnel for each type of device, which brings high costs in management system deployment and O&M manpower.

## Difficulty to Manage Massive Terminal Equipment

The Safe City system has high requirements on real-time surveillance over the entire city and all-day recording. To meet the requirements, the system has deployed massive terminal equipment, such as cameras, optical network units (ONUs), and 4G access terminals. In addition, the devices are often scattered in different places, making device management more difficult.

## Difficulty to Detect Video Traffic Exceptions

The video surveillance service is key to the Safe City system. However, users are often encountered with the problem of a sudden increase or decrease of video traffic, while they cannot see any exceptions from cameras. Too large video traffic will quickly occupy the storage space and shorten the overall video storage period. Too small video traffic will cause garbled characters on video images or video loss and affect case cracking. Users are plagued by the difficulty in detecting video traffic exceptions in a timely manner.

## Difficulty to Locate Bearer Network Faults

To save construction costs, the customer may choose to lease an existing network of the carrier or other network providers as their service bearer network. The lessor is responsible for monitoring and maintaining the network. In this case, the bearer network becomes a blind area for Safe City O&M personnel to monitor, and the O&M personnel cannot quickly locate network faults that affect video services. When a fault occurs, the O&M personnel first need to check the running status of devices in their monitoring scope. If the devices are running properly, they will ask the bearer network lessor to locate and rectify the fault on the bear network. The entire fault locating process is troublesome and inefficient, and services are affected for a long time.

## Difficulty to Know the Video Surveillance System Running Status Comprehensively

The Safe City video surveillance system has deployed massive terminal equipment as well as video recorders and video servers, which are expected to generate bulk video data. Users may have difficulty in obtaining information about device status and performance comprehensively, timely, and accurately, as well as discovering the bottleneck of video storage resources.

# Huawei Safe City O&M Solution

eSight is a next-generation overall O&M solution designed by Huawei for the enterprise basic network, unified communications, telepresence conference, video surveillance, and data center. eSight allows users to monitor and manage configurations of devices from different vendors and of different types in a unified manner, as well as monitor and analyze network and service quality. In addition to supporting unified management and associated analysis for enterprise resources, services, and users, eSight provides an open and flexible platform for the Safe City O&M personnel to customize an intelligent management system tailored to their needs. To sum up, eSight promises to be the best Safe City O&M solution.

## Unified Device Management

eSight supports different protocols, including Simple Network Management Protocol (SNMP), Technical Report 069 (TR-069), Storage Management Initiative - Specification (SMI-S), and Intelligent Platform Management Interface (IPMI). The protocol adaption capability allows users to manage a wide assortment of devices, such as cameras, storage devices, servers, switches, firewalls, PON access devices, and 4G access terminals. eSight helps achieve end-to-end service management throughout the Safe City solution and save O&M costs.

eSight-based unified device management



## Massive Terminal Equipment Management

### Camera Management

For cameras, eSight provides alarms triggered by camera disconnection, secure digital memory card (SD card) fault, full SD card space, over-temperature, and high CPU or memory usage. Based on the alarm information, users can easily identify the faulty camera and rectify the fault quickly. For example, if a camera goes offline, users can check the access device and link status to determine whether the fault occurs on the camera or the access part. If the SD card is faulty or the SD card space is full, video recording or storage will be affected, and users can resolve the problem by, for example, re-inserting the SD card, cleaning dust, deleting unnecessary video, or replacing the SD card with a new one. If the device temperature, CPU usage, or memory usage is too high, the camera may be abnormal or video quality may decrease, and users can restart the camera to rectify the fault.

### ONU Management

For ONUs, eSight provides the device status monitoring, port status monitoring, and link management functions. Users can check the ONU running status, status of the link from the ONU to the optical line terminal (OLT), and status of the camera access port to locate faults, for example, camera disconnections, without the need to go to the surveillance site.

### 4G Access Terminal Management

In the 4G wireless access scenario, a large number of 4G access terminals need to be deployed. The 4G access terminals will undergo multiple times of upgrade and configuration file delivery. It is time-consuming and nerve-wracking to upgrade so many terminals and manage so many software version files and configuration files. eSight provides the function of managing software files and upgrade software in batches for 4G access terminals. Users can remotely upgrade multiple devices concurrently and set different upgrade tasks for devices of different models. This function saves users much time and labor.

eSight also allows users to remotely maintain and manage 4G access terminals in batches without the need to go to the terminal site. For example, users can query and modify 4G access terminal parameters (such as the WAN port, LAN port, firewall, DHCP, and port mapping), perform the IP ping test to check the terminal connectivity, reset terminals, restore terminals to factory settings, and test the connectivity between a terminal and multiple lower hosts.

## Video Traffic Monitoring

With the traffic analysis or performance monitoring function of eSight, users can learn about video traffic information about cameras and identify cameras with abnormal video traffic.

Camera access



* Traffic analysis

eSight can monitor in real time and accurately analyze traffic data of each port on IP network devices (for example, switches), and display traffic changes of each traffic source. Based on the traffic data, users can quickly identify cameras with abnormal video traffic.

* Performance monitoring

eSight can monitor the receive rate of the camera access port connected to the switch or OLT in real time to help users identify cameras with abnormal video traffic.

## Segmental Fault Diagnosis

With the network performance measurement and diagnosis function enabled, eSight can send diagnosis packets among network elements (NEs) or links to test network performance, which allows users to quickly locate the network segment where video surveillance service exceptions occur.

eSight segmental fault diagnosis



As shown in , when detecting an exception in a video service, maintenance personnel can select the IP network devices on both ends of each network segment to check the quality of the network segment. This can help quickly locate the faulty network segment and rectify the fault, shortening the period when the video service is affected.

## Video Surveillance Service Data Statistics

eSight provides a variety of data statistics functions for users to learn about video surveillance service status. Charts and diagrams are used to present statistics about running status, performance, and resource usage of video surveillance devices across the network, providing references for system optimization and resource capacity expansion.

Table 3-1 describes the video surveillance service data statistics functions provided by eSight.

Video surveillance service data statistics functions

|  |  |
| --- | --- |
| Function | Customer Value |
| Device online rate statistics | Collects statistics on the online status of peripheral units (PUs), such as cameras and video recorders, and provides references for the superior department to assess whether the device online rate of the subordinate department meets the standard. |
| Device offline rate statistics | Collects statistics on the offline status of PUs, such as cameras and recorders, and allows users to view the offline device list and rectify device offline faults. |
| SD card fault statistics | Helps users identify cameras whose SD card is faulty and rectify the fault by re-inserting the SD card or replacing the SD card with a new one to avoid impact on the video buffering function. |
| Hard disk fault statistics | Collects statistics on hard disk faults of PUs, such as digital video recorders (DVRs) and digital video servers (DVSs), for users to rectify the faults in a timely manner to ensure proper video storage. |
| Statistics on real-time video recording channels | Collects statistics on the number of real-time video recording channels within the specified scope. |
| Statistics on live video channels | Collects statistics on the number of live video playing and surveillance channels within the specified scope. |
| Statistics on video playback channels (platform media performance indicator) | Collects statistics on the number of video playback channels within the specified scope and checks whether the number exceeds the maximum value. |
| Statistics on video download channels (platform media performance indicator) | Collects statistics on the number of video download channels within the specified scope and checks whether the number exceeds the maximum value. |
| Video quality diagnosis statistics | After a camera runs for a long time, video quality exceptions may occur. The statistical report is used to collect statistics on the number of each type of video quality exception. The video quality exceptions include the following:   * Image brightness exception (too bright or too dark) * Image blur * Image noise * Color cast * Stripe interference * Image freezing * Image jitter * Video signal loss * Lens block |
| Recording plan execution statistics | Allows users to view the recording plan execution statistical graphics and the list of devices that fail to execute the recording plan correctly as well as rectify recording plan execution faults. |
| Video integrity statistics | Checks whether video from a device within a time segment is lost and provides video loss duration if there is video lost. |
| Packet loss ratio statistics | Checks whether video packets are lost on devices within the specified scope and specified time segment. |
| Disk usage statistics | Collects statistics on the storage space usage of devices within the specified scope and provides references for users to determine whether to expand the storage capacity. |

Video surveillance data statistical graphics



# Success Story

In the Hefei Safe City project, also known as Tianwang project, 12 key regions are zoned as surveillance areas, including city entrances and exits, crime-prone locations, arterial roads or secondary main roads, underpasses, footbridges, and rural-urban fringes. The project covers a wide range of areas and has a variety of devices deployed, such as routers, switches, firewalls, PON access devices, storage devices, servers, cameras (over 16,000), and ONUs (over 12,000 for video data access). The diversity, large number, and scattered distribution of devices pose a major challenge for the O&M system to ensure stable and ordered running of the project network.

Hefei Safe City project networking



Through eSight, the customer implements unified monitoring over the Hefei Safe City service system and surveillance platform as well as end-to-end management from cameras to the access network and from the data backhaul network to data storage devices. O&M personnel can conveniently obtain association information about devices and enhance troubleshooting efficiency. Therefore, the customer has deployed an O&M team consisting of only about 20 people to maintain up to 30,000 outdoor devices. The troubleshooting efficiency has increased from five camera offline faults per day to more than 20 per day, and the camera online rate has gradually increased from 80% to over 90%.

In addition, by monitoring service information, including the service overview, alarms, topologies, performance, resource usage, and health, the customer can comprehensively monitor running status of devices across the network, understand the overall layout of the Safe City network, and perform system optimization and capacity expansion based on the site requirements to ensure proper project operation.

At present, the Tianwang project has basically completed, and eSight has contributed much to device monitoring and troubleshooting. It is believed that, after the Tianwang project is officially put into use, eSight will play an increasingly important role in ensuring proper system running and assisting the Tianwang project in deterring crimes and protecting safety of peoples' lives and properties.

1. Acronyms and Abbreviations

|  |  |
| --- | --- |
| **C** |  |
| CAD | computer-assisted dispatch |
|  |  |
| **D** |  |
| DHCP | Dynamic Host Configuration Protocol |
| DVR | digital video recorder |
| DVS | digital video server |
|  |  |
| **G** |  |
| GIS | geographic information system |
|  |  |
| **I** |  |
| IPMI | Intelligent Platform Management Interface |
|  |  |
| **L** |  |
| LAN | local area network |
|  |  |
| **N** |  |
| NE | network element |
|  |  |
| **O** |  |
| OLT | optical line terminal |
| ONU | optical network unit |
| O&M | operation and maintenance |
|  |  |
| **P** |  |
| PON | passive optical network |
| PU | peripheral unit |
|  |  |
| **S** |  |
| SD card | secure digital memory card |
| SNMP | Simple Network Management Protocol |
| SMI-S | Storage Management Initiative - Specification |
|  |  |
| **T** |  |
| TR-069 | Technical Report 069 |
|  |  |
| **W** |  |
| WAN | wide area network |