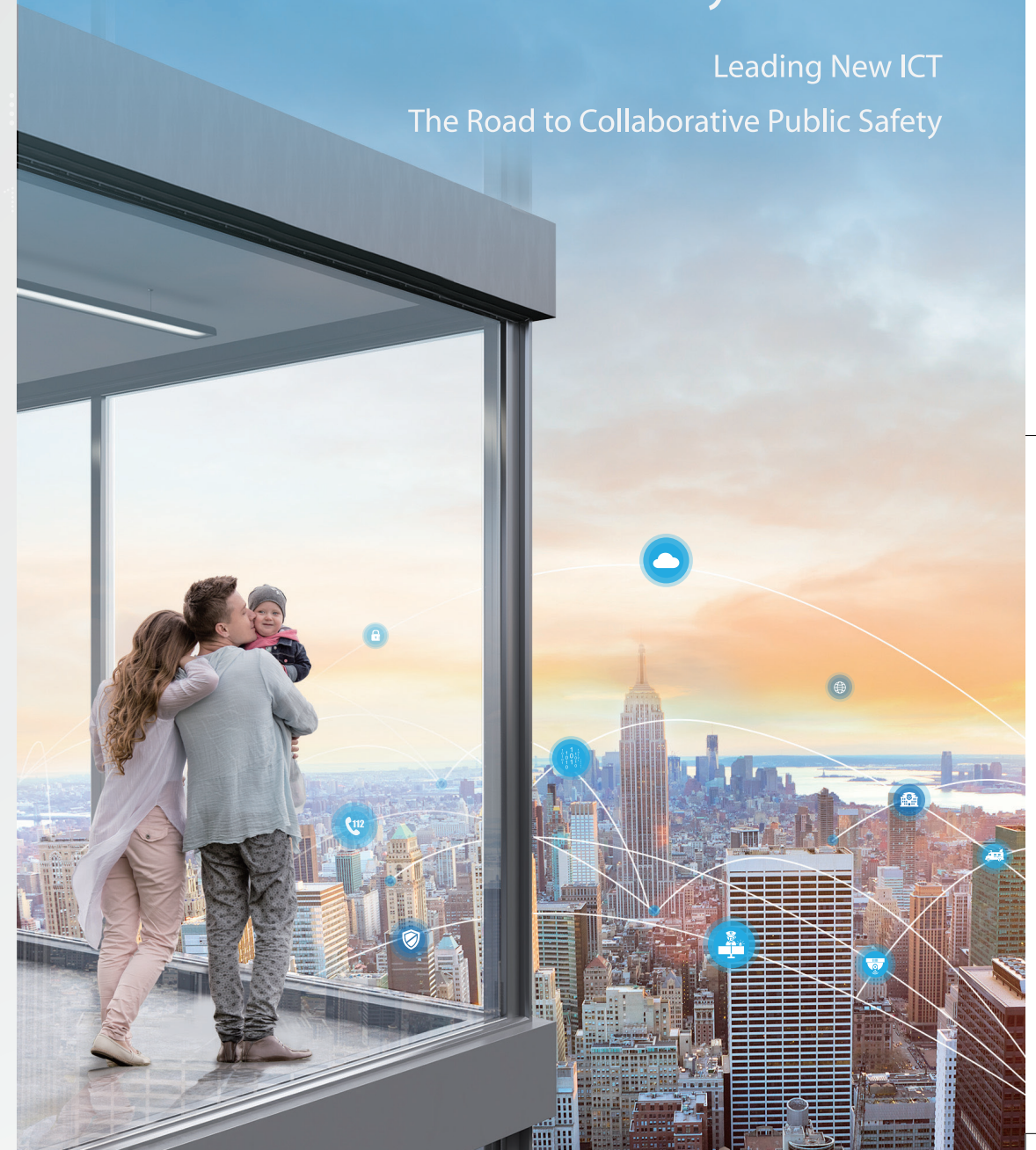




Huawei Safe City Solution



Leading New ICT
The Road to Collaborative Public Safety



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Huawei Safe City Solution at a Glance

Building a Best-in-Class Safe City Solution with Partners

Safe City is a primary solution in the public safety industry, and presents a strategic opportunity to build Smart Cities. By leveraging new ICT technologies, Huawei works with customers and partners to build automated, intelligent policing information systems. In this way, Huawei aims to promote the digital transformation of the public safety industry, enhance city security, and improve social and economic benefits.

Safe City Solution

Omnipresent Sensing, 360° Protection | Efficient Collaboration, Rapid Response | Smart Decision, Fast Processing



Converged Command (ICP + IoT)

Multi-channel alarm reporting, unified dispatching
Visualized command, cross-agency collaboration



Policing Big Data

Efficient collision comparison
Real-time warning and surveillance deployment

Intelligent Surveillance

- All-scenario access network
- Software-defined camera
- Million-level network access
- Software and hardware decoupling, data and application decoupling
- Diverse applications

Road Safety

- e-Police
- Traffic checkpoint
- Road surveillance

Critical Communications

- eLTE broadband communications network
- Trunking system with public/private, broadband/narrowband convergence



Policing Cloud

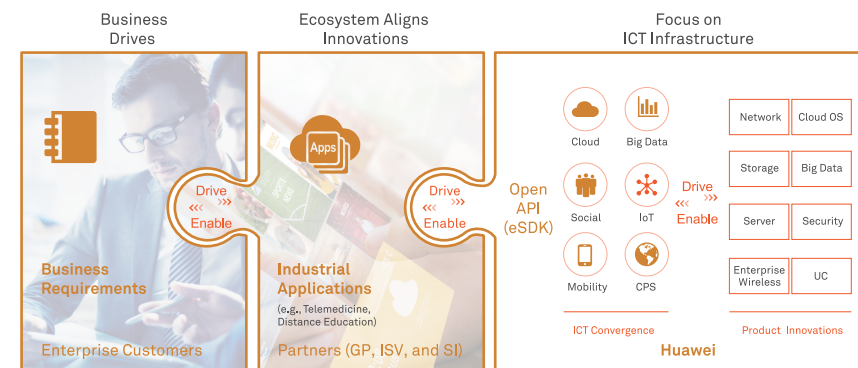
Resource sharing

Service integration

Cloud-based application

1 Combing one-stop ICT + Huawei Digital OS + global ecosystem to provide the best-of-breed Safe City Solution

BDII Build Up a Win-Win Ecosystem



- Builds a converged command center solution by partnering with Intergraph (Hexagon), the Top 1 Computer-Aided Dispatch (CAD) solutions provider in the world.

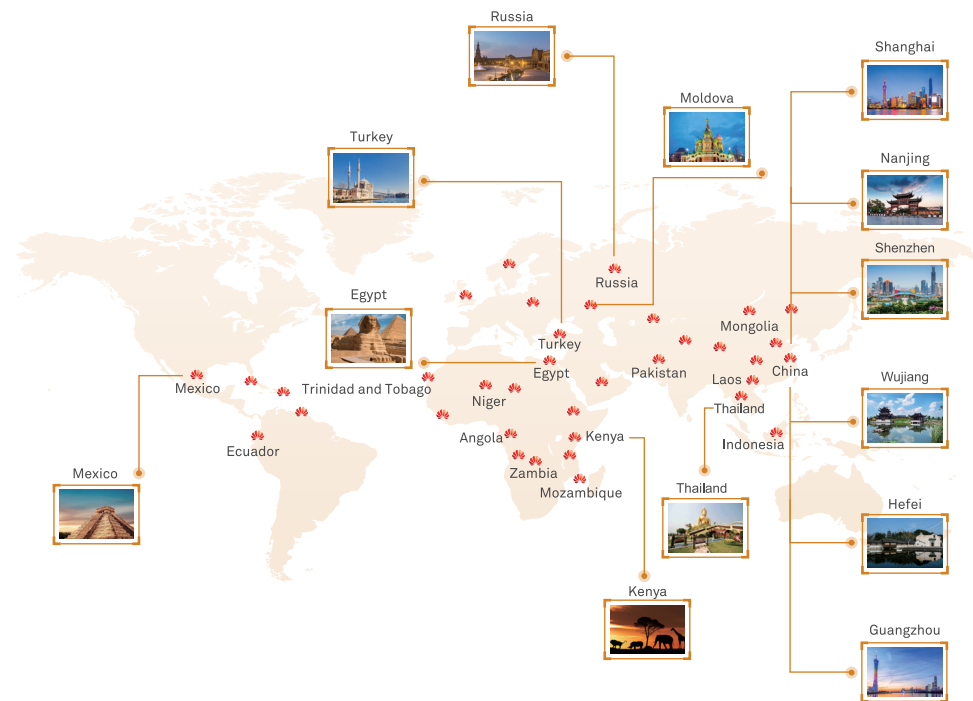
2 Huawei: globalized brand + localized delivery and maintenance platform across 170+ countries and regions

- **Global delivery and maintenance platform:** 3 global and 9 regional Technical Assistance Centers (TACs) + 45 logistics and spare parts centers, implementing delivery and maintenance across 170+ countries and regions
- **Rich partner resources:** 100+ ICT partners, 550+ certified service partners, and 120+ authorized service partners

Huawei Safe City Solutions' Global Footprint

Protecting Enchanted Kenya

3 Diverse success stories worldwide: 1 billion population in 230+ cities across 90+ countries



Huawei Safe City Solutions serve **1 billion** people in **230+** cities across **90+** countries.

• **Success story:** Safe City Project for Kenya



The project built an all-in-one Safe City solution that neatly combines call-taking and dispatching, eLTE broadband trunking, video surveillance, and intelligent analysis (license plate recognition and traffic violation detection). The project provides devices for 18,000 police officers and visualizes command processes.

- On November 26, 2015, the solution guaranteed a successful visit to Kenya by Pope Francis. In a 0.12-square-kilometer place with more than 300,000 people and 10,000 police officers, the solution ensured zero incidents and complaints.
- According to an interview with the Kenyan tourism minister in July 2016, the international tourists had increased by 14% in the country since the deployment of the solution.
- The IHS - Safe City White Paper shows that the local public satisfaction has increased by 21% over police agencies and 36% over government agencies.

Huawei Safe City Solution Key Messages

Converged Command

Multi-channel alarm reporting | unified dispatching | Visualized command | cross-agency collaboration

【Challenges】 Unobservable on-site conditions, difficult information sharing and command across agencies



Low-efficiency in Alarm-receiving

- Phone-call only, no ways for deaf people
- No automatic alarming by machine
- No unified alarm-receiving



Slow response

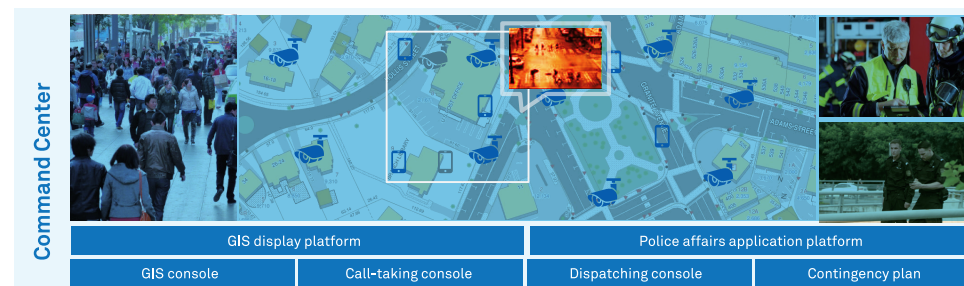
- Multi-layer dispatch
- Rely on manual efforts, lack of automatic tools
- No Geo-based information



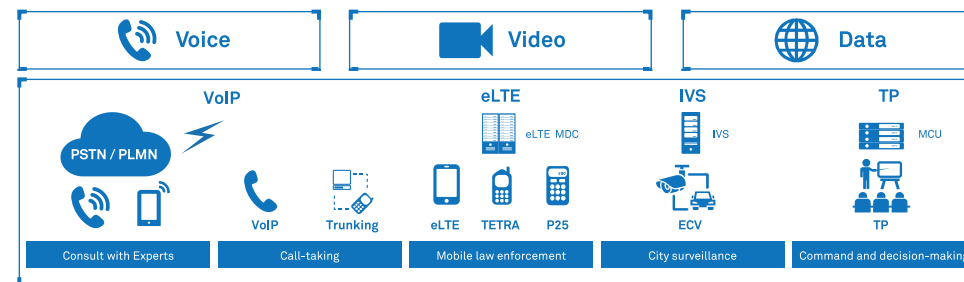
Inefficient coordination

- No unified communication across different systems
- Voice only, no multimedia data

【Solution】 World's first visualized converged command system



Integrated Communication Platform (ICP)



Visible:

- observable on-site conditions and resources (police and emergency resources), unified command on the same GIS map



Converged:

- Integrated Communication Platform(ICP) provides converged communication methods, seamless video (video surveillance, conferencing, mobile phone, and trunking terminal), voice (eLTE broadband trunking, TETRA narrowband trunking, and Internet), and data (GIS and SMS) interaction across terminals; collaborative management of a single incident across agencies

【Key Technology】 : Industry's top CAD & GIS, all communication product offerings, converged and open capabilities (eSDK), product interoperability, in-depth convergence with service systems



Intelligent Surveillance

All-scenario access network | Cross-regional, multi-level sharing video cloud

【Challenge 1】 Complex city environments, low image definition, difficult video backhaul, insufficient intelligent analysis



High bandwidth consumption

- 4~8M bps for 1080P



Difficult network coverage in complicated city environments

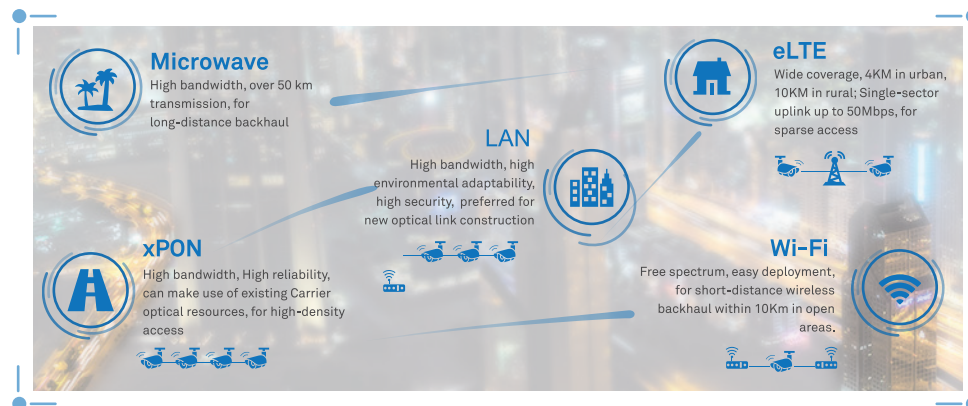
- High costs of optical cable deployment in some urban areas, resulting from high land cost and long construction period
- No optical cables in remote areas and hard to deploy optical cables in complicated landscapes (such as rivers and mountainous areas)



Failing to deliver clear video images in all scenarios

- Unclear video images at night, under backlight, or in rain/fog

【Solution】 Industry-leading awareness, analysis, and warning methods for comprehensive security protection



All-scenario access

- Provide wired (industrial switch, industrial router, and GPON) and wireless (microwave, eLTE-U, and WLAN) access solutions to support video access in all scenarios.



Awareness:

- Huawei's all-scenario access network implements online data backhaul from diverse cameras and sensors.
- Huawei's cameras embedded with self-developed chips support starlight low-illumination and WDR to deliver all-weather 4K video images.



Analysis:

- Application-defined cameras and a video analysis platform featuring device-pipe-cloud collaboration incorporate industry-leading intelligent analysis algorithms.

【Key Technology】 : Better connected network, H.265 video codec, open intelligent analysis platform with high-performance computing

【Challenge 2】 Localized video storage, difficult cross-regional/ cross-agency sharing, low search efficiency, slow concurrent video browsing



Limited networking, leading to difficult data sharing

- Surveillance systems are constructed separately and resources are not fully networked, leading to difficult data sharing.
- Resource isolation, soiled mode, and lack of coordination make it impossible to dispatch and share software and hardware resources in a unified manner.



Limited platforms, leading to difficult business innovation

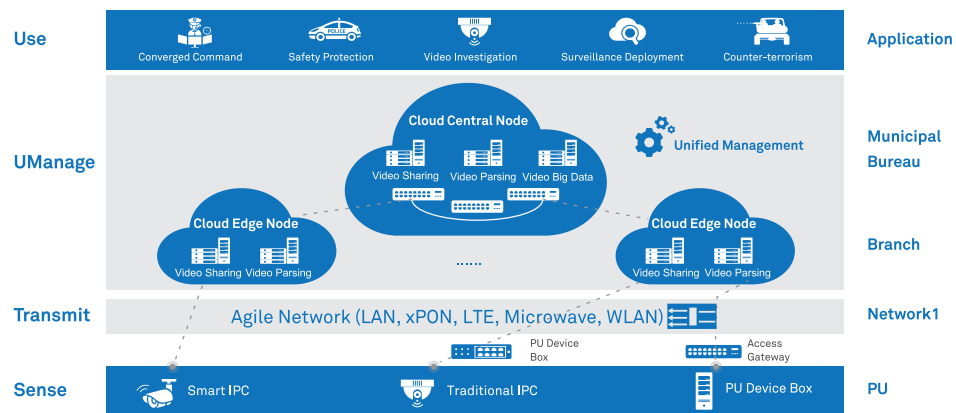
- Software and hardware are coupled, hindering hardware resource sharing and forming computing and storage resource silos.
- Data and applications are coupled, hindering data integration and sharing and forming data silos.
- Business innovation is difficult for customers due to vendor lock-in.



Limited applications, leading to low case solving efficiency

- Useless: Applications fail to address actual requirements.
- Ineffective: Applications deliver low accuracy.
- Lack sufficient AI and Big Data applications regarding facial images and vehicles.

[Solution] Industry-leading cross-regional, multi-level sharing video cloud platform searches hundreds of billions of data records within seconds.



Million-level network access

- One network: The efficient private video network support non-blocking, low-latency data transmission and possess industry's first wired and wireless capabilities.



Software and hardware decoupling, data and application decoupling

- One cloud: One open cloud platform enables sharing and elastic scheduling of computing and storage resources.
- One pool: One data water system integrates various types of data to form a unified video image information database.
- One platform: Provides unified video management, parsing, and Big Data service capabilities.
- Second-level search for hundreds of billions of feature data records



Diverse applications

- One network: The efficient private video network support non-blocking, low-latency data transmission and possess industry's first wired and wireless capabilities.

[Key Technology] : Industry's first all-cloud video cloud architecture as well as distributed cache technology and multi-algorithm service framework used in high performance computing

Critical Communication

LTE broadband communications network | Trunking system with public/private, broadband/narrowband convergence

[Challenge] Voice-only narrowband trunking; additional network required for broadband services, resulting in high cost and difficult management



Lack of situation awareness

- Description by voice is incomplete and inaccurate



Low efficiency in collaboration

- Command in voice only
- Voice-only not good enough for seamless cooperation

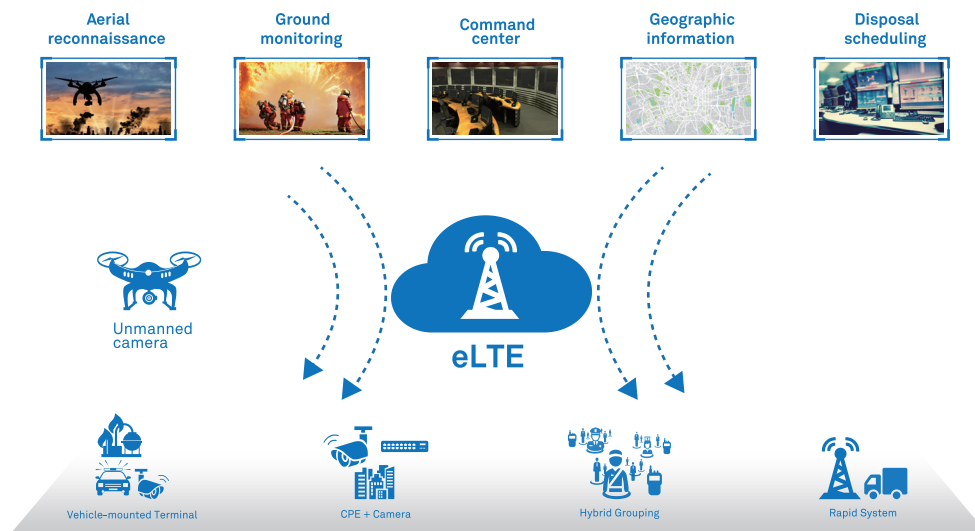


No interwork with other system

- Private network only, no communication across different systems



【Solution】 Industry's first broadband trunking system, dedicated trunking, and real-time video dispatching on the same network



Real-time video dispatching:
 • a single base station supports upload and distribution of 27 video channels

Dedicated trunking:
 • TCCA mission-critical standards, industrial-level design, IP67 protection, Ex ic IIC T4 explosion-proof certification, -40°C to +65°C working environment for CPE

Unified network:
 • one eLTE network replaces two networks (TETRA narrowband trunking and broadband access)

Quickly establish a communications network:
 eLTE Rapid builds communication networks within 15 minutes

【Key Technology】 : 4G LTE, air interface protocol optimization, Android-based terminal

Policing Big Data
 Efficient collision comparison | Real-time warning and surveillance deployment

【Challenge】 Scattered management of massive amounts of data with complex structures, insufficient analysis and real-time warning capabilities

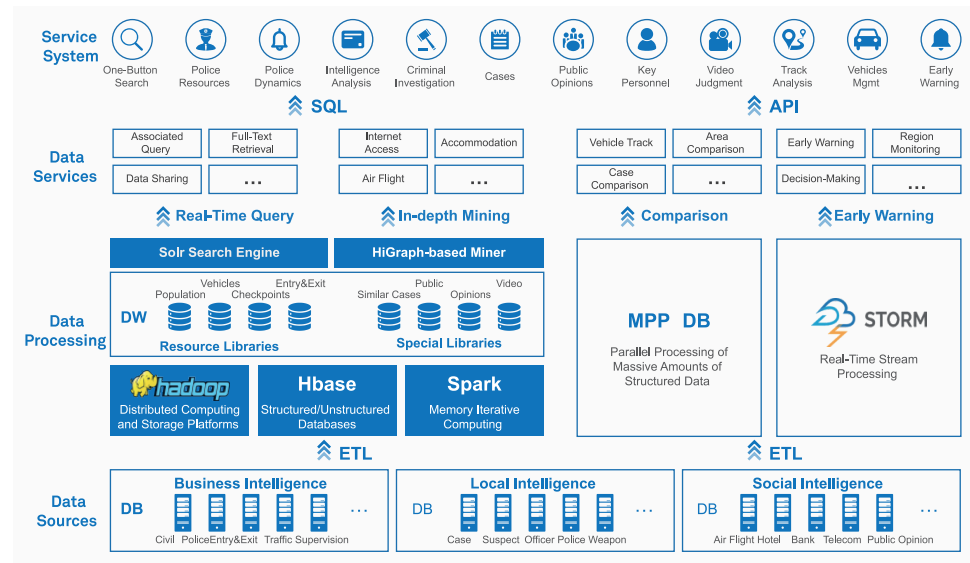
Massive amounts of data: inefficient search and mining
 • Difficult to exploit value from exponentially increasing structured and unstructured data

Scattered data: large numbers of heterogeneous data sources
 • Difficult to share data across a variety of siloed service systems

Delayed early warning: lack of real-time response
 • Time-consuming suspect and vehicle locating due to the lack of real-time processing technologies



[Solution] Big Data helps implement more efficient, accurate, and holistic “Prevention, Management, and Investigation”



Industry-Leading Hadoop Platform FusionInsight: Query Massive Data in Seconds

- Distributed storage and centralized sharing of structured and unstructured data
- Enhanced secondary indexing technology improves performance by 10x and queries 10 billions of data records in 3s
- The MPP DB supports PB-level data comparison with a 100% hit rate

HiGraph: In-depth Relationship Mining

- HiGraph: learns and processes 1000B sample data records and features, 3x speed higher than open-source MLLIB
- Spark: saves intermediate computing results in memory, avoiding frequent HDFS read and write operations, leading to a 100-fold mining efficiency increase



Storm Stream Processing: Real-Time Early Warning

- Collects 100,000 data records per second
- Processes real-time streams in seconds
- Analyzes 300,000 data records of 100 types in real time
- Supports result visualization

[Key Technology] : Enterprise-level Hadoop platform, Huawei-developed MPPDB distributed computing database, and policing Big Data service platform aggregating ecosystem partners

Policing Cloud

Resource sharing | Service integration | Cloud-based application

[Challenges] Distributed cloud data centers serve all police categories and enable unified O&M, independent operations, and smooth evolution to cloud without business restructuring



Hundreds of siloed application systems

- Due to different requirements, police of different types deploy IT systems separately.
- These police systems are mutually isolated, and 90% data cannot be shared. Police have to repeat operations in different systems when adding information about a suspect



Difficult IT system management, high operational risks

- Limited IT O&M personnel find great difficulties in resolving frequent faults arising from numerous systems
- Data centers lack disaster recovery capabilities. Services are at high risks

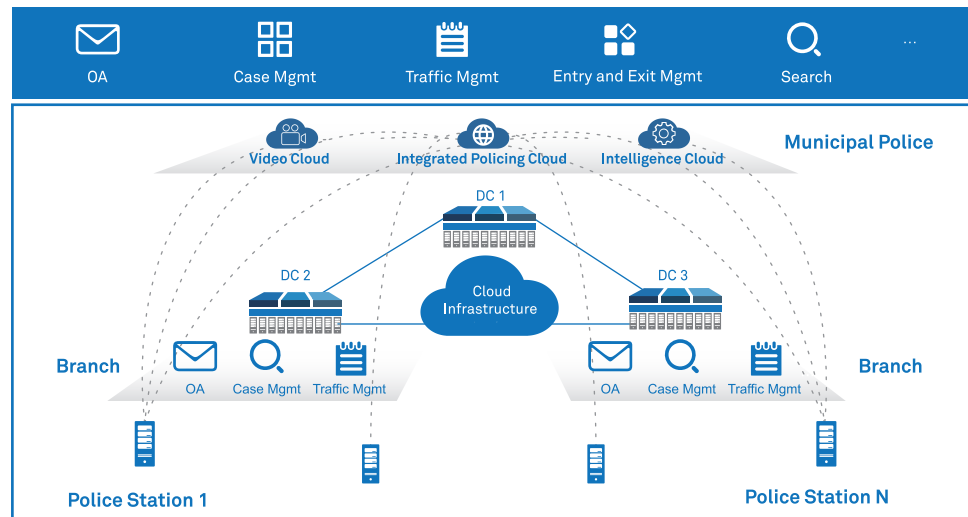


Costly and time-consuming service migration to the cloud

- In a siloed cloud platform, the migration of a single police system to the cloud is costly and consumes several months
- Different police systems have different cloud migration policies, requiring in-depth understanding of service features



【Solution】 One policing data center services all types of Police, Multiple Policing Cloud Data Center Managed as One



A unified multi-purpose police data center serves police of all types

- Logically isolated vDCs: serving police of different types
- 60% resource usage improvement: able to manage legacy third-party devices
- Three resource pools: able to accommodate 3,200 physical machines and 80,000 VMs



The Policing Cloud manages policing cloud data centers in a unified manner

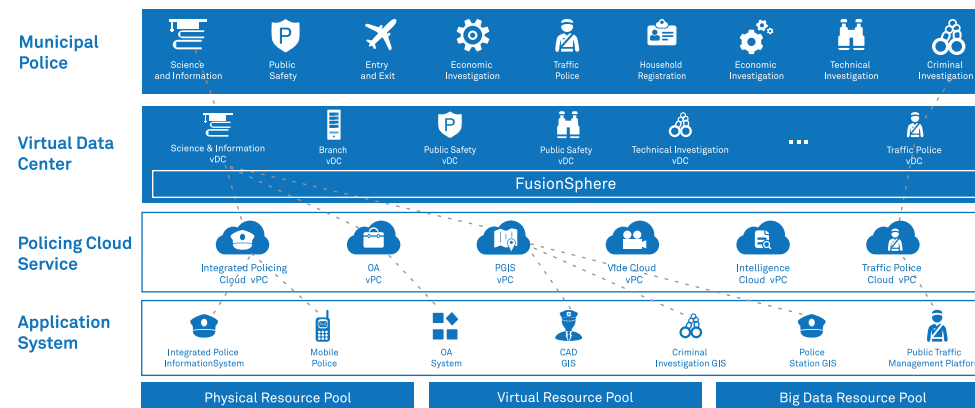
- Unified management: physically isolated and logically centralized multi-level policing cloud data centers
- Unified management: physical, virtual, brands of devices and Big Data resources
- Continuous service running: service-based cloud disaster recovery management



End to end service migration to the cloud

- Differentiated migration policies for different application systems
- Quick service migration to the cloud: support for mainstream commercial databases

【Key Technology】: Distributed architecture, unified management platform ManageOne, and high-availability disaster recovery





Road Safety

e-Police | Traffic checkpoint | Road surveillance

【Challenge】 explosive vehicle growth, frequent incidents, and difficult management



Soaring motor-vehicles across the globe

- Mostly in developing countries
- Insufficient road infrastructure



High volume of traffic accidents

- Higher accident rate in developing countries
- Main reason of death for young people
- Costs 3% of GDP globally



Insufficient traffic law enforcement

- Rely on manual work, lack of automatic tools
- Negligence, corruption

【Solution】 A holistic solution neatly combines surveillance, checkpoint, and e-Police services to enable intelligent transportation



Red-light-running capture



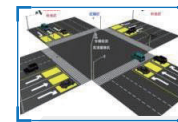
License plate recognition



Vehicle speed detection



Traffic Operation & Command center



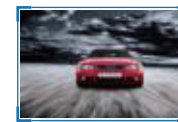
Traffic e-Police



Traffic checkpoint system



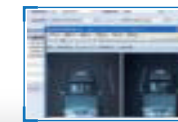
Traffic surveillance



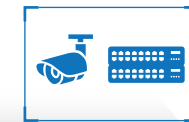
Vehicle trajectory tracking



License plate recognition



License plate related violations



Traffic snapshot Controller camera



E-Police

- Auto-recognition of red-light
- Capture red-light-running
- Close-up picture of license-plate



HD-checkpoint

- Automatic Number Plate Recognition (ANPR)
- Speed detection
- Virtual checkpoint



Traffic surveillance

- Real-time video recording and backhaul