HUAWEI

Leading New ICT, Building a Smart City Brain

Huawei Smart City IOC Solution

Challenges

As populations grow, resource shortages restrict urban development. Cities around the world are facing more and more problems every day that hinder normal operations. Municipality’ s responsibilities include the provision of public services, as the public security, public transportation, electricity and water supply. . City administrators need to obtain a variety of information regularly to allow them to be aware about the status of the city operations, take preventive measures, and promote communication and collaboration among departments.

However, for most cities, key information is often buried in the systems of different functional departments, and resource sharing and cross-department collaboration are often difficult. These systems cannot provide a clear picture of comprehensive city operations information to help city administrators make scientific and accurate decisions for better city services and faster economic growth. On top of this, multi-department coordination on emergency handling needs further improvement. Therefore, it is imperative for cities to build unified city operations monitoring systems and integrated emergency coordination systems to facilitate cross-department collaboration and better support decision-making.


Government data
Internet data
IoT data
Warning
Awareness
Decision-making
Action

Trends

Smart City construction requires a powerful "brain" to streamline data silos, implement information sharing, convergence and combine the physical and digital worlds to improve city operations. Enabled by the development of ICT technologies, the unified and visualized Smart City Intelligent Operation Center (IOC) satisfies all of these requirements.

The IOC is the brain of a Smart City. Built on smart application systems, the IOC focuses on key fields such as municipal facilities, urban transportation, public safety, ecological environment, macroeconomy, and public opinion. The IOC fully streamlines and integrates the operations information of functional departments and spotlights city operations monitoring, warning, decision-making, and handling. In this way, the IOC helps to improve city operations management and emergency handling efficiency.

In short, city management is shifting from vertical governance to convergence and sharing, and the IOC is the core project for Smart City converged management.

Solution

Overall Architecture

Huawei's Smart City IOC solution combines technologies such as cloud computing, Internet of Things (IoT), ultra-broadband, big data analysis tools, and artificial intelligence (AI) with data. In this way, the IOC achieves complete closed-loop management from perception in the physical world, to decision-making in the digital world, to intelligent implementation in the physical world. The following figure shows the overall architecture of the solution.

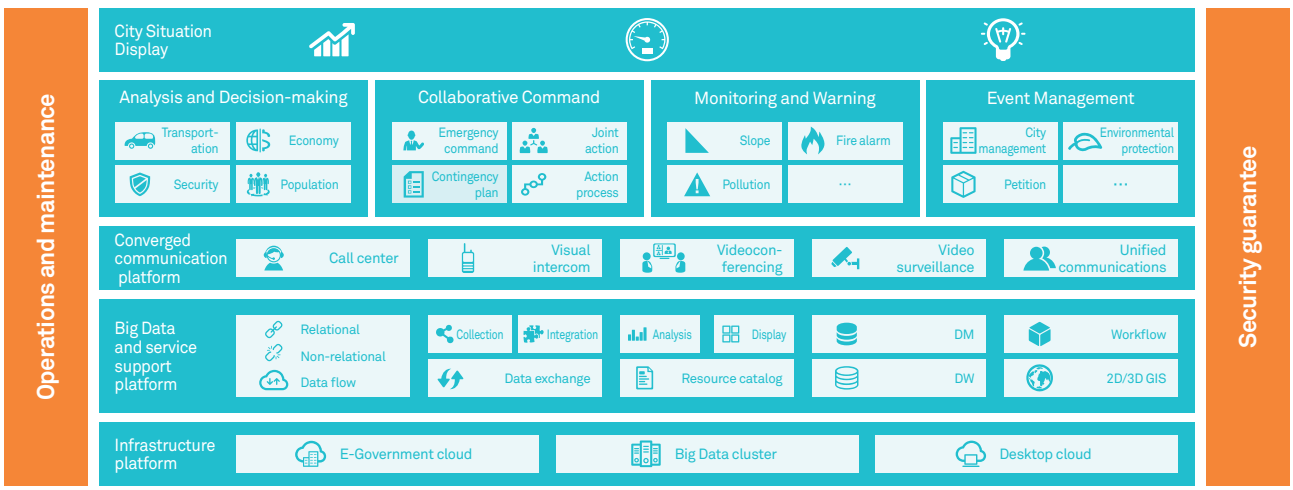


Figure 1 - Overall architecture of the IOC solution

The new solution architecture includes:

- Infrastructure platform: supports the e-Government cloud, big data cluster, and desktop cloud.
- Big data and service support platform: covers technologies such as data collection, cleaning, exchange, storage, integration, management, analysis, and mining.
- Converged communication platform: supports the call center, video intercom, videoconferencing, video surveillance, and unified communication.
- Comprehensive display layer: displays the overall situation of city operations, analysis and decision-making, event management, monitoring and warning, and linkage command.
- Support systems: includes the standardization system, information security system, and O&M system.

Service Functions

The IOC is divided into the categories of normal management (e.g, decision-making support and event management) and emergency management (e.g., monitoring and warnings and emergency command). The city dashboard displays a summary of city operations in the normal and emergency statuses, as well as city operations indicators, alarms, workflows, on-site videos, and instant messaging.

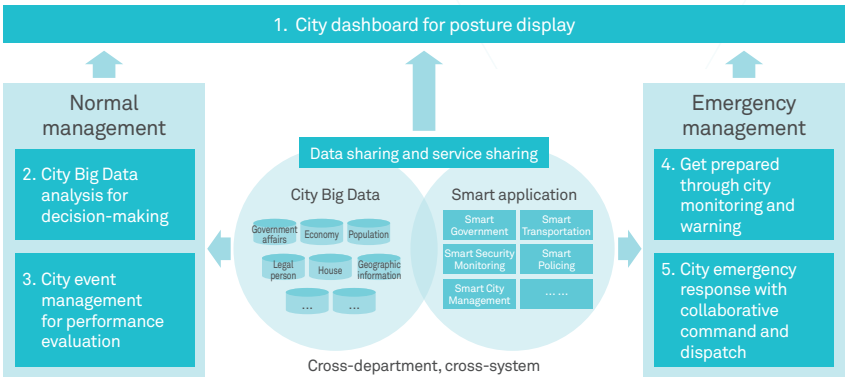


Figure 2 - IOC Application Domain

City dashboard

The city dashboard of the IOC provides comprehensive and multi-dimensional perception and display of a city's macro- and micro- operations statuses. The dashboard can:

- Display key indicators of city operations, such as land planning, economy, transportation, population, and ecological environment;
- Present business data such as those of buildings, fire protection, sanitation, energy consumption, public opinion, and key locations;
- Monitor the distribution and running status of city infrastructure, such as street lamps, manhole covers, water, electricity, heating, and gas lines in real time;
- Locate equipment and display specific information about it.

Figure 3 - City dashboard – overall operations status

Figure 4 - City dashboard – Locating equipment and displaying equipment information

Decision-making support

The IOC can perform comparison analysis, correlation analysis, trend analysis, prediction, and drill-down analysis on city-level big data, and provide visualized analysis results. Through thematic analysis of city management challenges, the IOC seeks scientific solutions based on data to assist city administrators in making decisions. For example, the IOC can release warnings of high-risk enterprises based on enterprise profiles and prediction models, assisting city administrators in developing regional economic policies, or analyze the impact of population migration on transportation, education, medical care, and the environment to facilitate city planning.

Figure 5 - Developing regional economic policies based on enterprise profiles and prediction models

Figure 6 - three Identifying population migration patterns to support city planning

Event management

The IOC dispatches cross-department event management, monitors event handling processes, updates and optimizes processes, and evaluates process performance, improving the efficiency of cross-department collaboration. The IOC event management function is not designed to replace the existing business application systems of each department. Instead, it connects to those systems to streamline cross-department operations. Through the comparison and convergence of existing events, it can predict future events to make the event management by municipal government departments more intelligent.

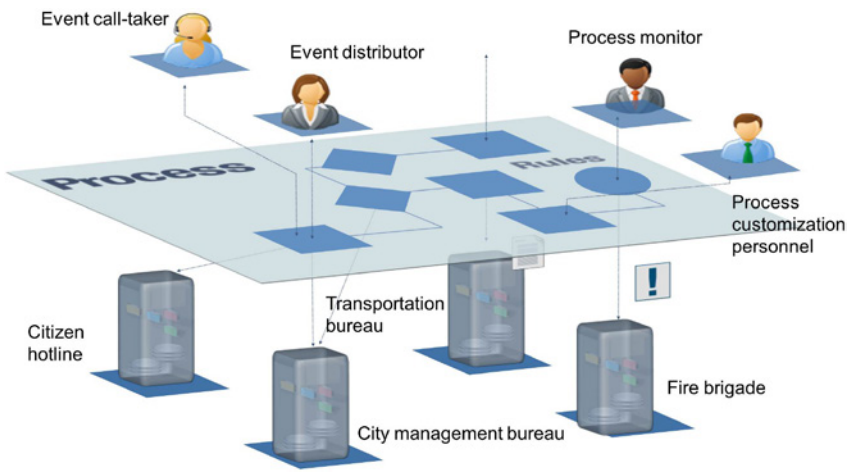


Figure 7 - Event management process monitoring

Monitoring and warnings

The IOC collects and filters alarm information (such as geologic hazards, social instability, bad weather, major outbreaks, severe traffic accidents, explosive substances, production safety risks, and major fire risks) from the application systems of different departments. Then, the IOC performs correlation analysis, detects potential risks based on warning models, determines alarm risk levels, and responds to each alarm by taking measures such as emergency response, event management, and analysis and assessment.

The IOC can also interconnect with an IoT system to obtain real-time equipment status information, analyze and detect potential risks in real time based on warning models, generate warning messages, and assist in emergency response through geographic locating, on-site video access, and owner notification through multiple channels (email, phone, SMS, and WeChat). For example, based on the city's weather forecast, real-time IoT monitoring information, and historical data, the IOC can perform risk analysis on waterlogging-prone districts, release warning messages, and formulate a contingency plan. In addition, based on IoT pipeline monitoring and big data flow processing models, the IOC can conduct real-time monitoring of and warnings about gas pipelines to minimize risks.

Figure 8 - Releasing warning information of urban waterlogging risks, based on real-time and historical data such as meteorological and water utilities data

Emergency command

When a major event occurs, the emergency command system handles command and dispatch based on the preset emergency plan. Because the IOC platform has streamlined data and service processes, the police, transportation, firefighting, and rescue resources can be quickly queried, located, and centrally dispatched during emergency commanding. Cross-department, cross-region, and cross-industry collaboration shorten response time to major events and minimizes associated losses.

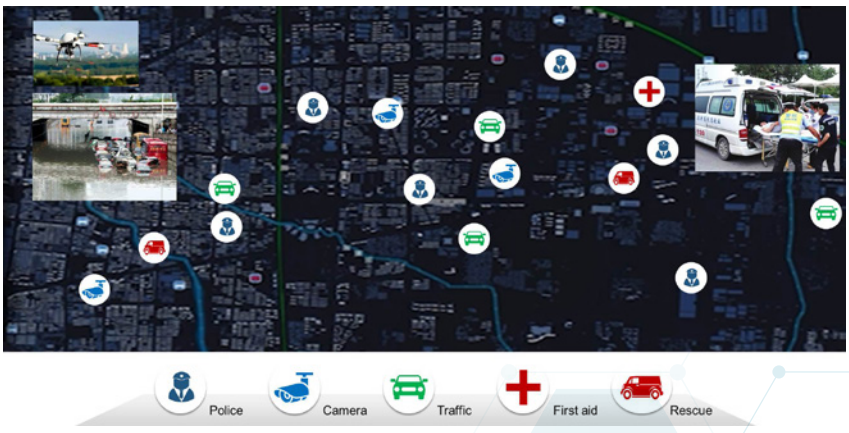
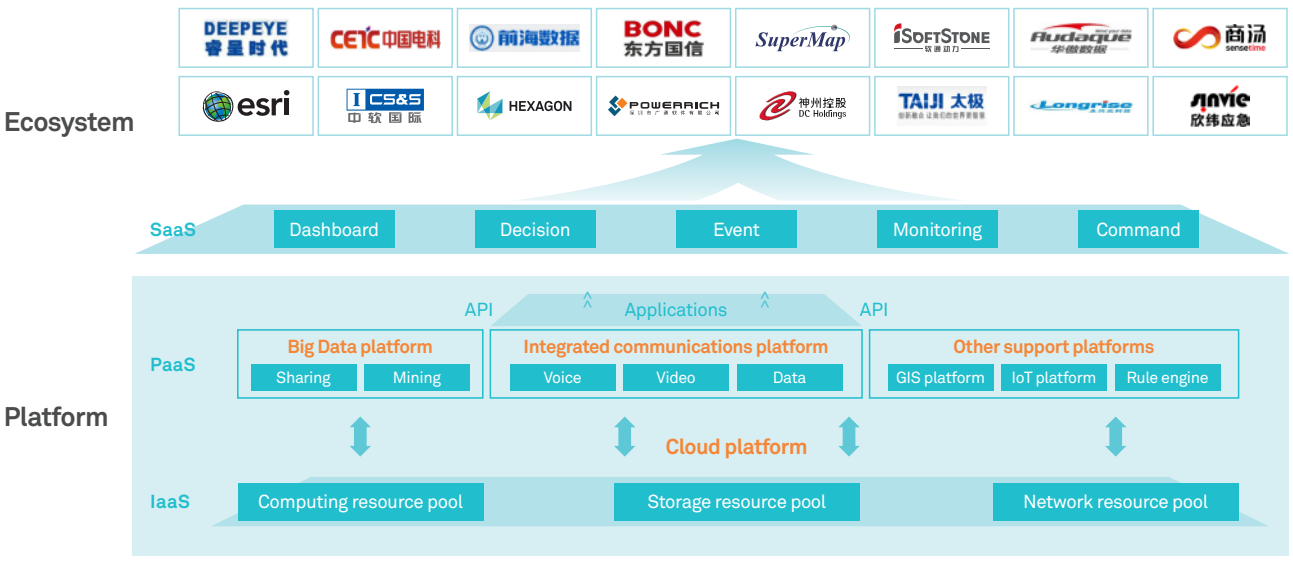


Figure 9 - Cross-department collaborative command for emergency response

The key to the success of IOC lies in the platform and ecosystem.

Huawei is committed to building open and easy-to-integrate platforms. We provide a big data platform, an industry enablement platform, a converged communications platform, and an IoT platform. We also open the platforms to partners (including Deepeye, BONC, Hexagon, SenseTime, Broada, Audaque, Esri, iSoftStone, Chinasoft International, and CETC) to develop the SaaS industry.



Best Practices

Starting a New Chapter in Longgang District with a Powerful City "Brain"

Background

A major administrative and economic region featuring a robust information technology industry, Longgang District in Shenzhen has promoted smart urban district construction since 2013 by orienting themselves toward community requirements and prioritizing infrastructure and urgent needs. Under the innovative architecture of "Terminal + Network + Database + Map + Cloud", Longgang has developed a batch of benchmark smart applications for smart governance and public benefits, and preliminarily established a leading and unique new smart district in China.

Longgang administrators have achieved notable improvements in urban governance and government work efficiency, but it is only the beginning for them. At the beginning of 2018, the establishment of the Longgang Big Data Management Bureau and operations of Longgang Smart Center have started a new chapter for Smart Longgang construction.

"We are embarking on a new journey," said Dai Bin, chief executive of Longgang district. "We need to seize the opportunities brought by the establishment of the Big Data Management Bureau, proactively plan, and take the initiative to make breakthroughs and new achievements in the construction of Smart Longgang."

Big Data + IOC, Improving City Management and Decision-Making Efficiency

The construction of the data sharing and exchange platform, big data management service platform, and spatiotemporal information cloud platform has greatly reduced the number of information silos in Longgang district. Longgang was the first district in Shenzhen to build a district-level level-3 information security protection image library and space information sub-platform. The Longgang government has subscribed to data from more than 60 municipal departments and obtained 2030 types of municipal data resources, more than 400 million municipal data records, and more than 20 billion district data records of various types. The preliminarily established big data database has laid a solid foundation for the construction of the Smart Longgang Operation Center.

The total built-up area of the Longgang Smart Center, known as the "Smart Brain", is 17188.18 square meters. The core IOC system accumulates information resources in the entire district, and displays the city operations status in an intuitive way based on the big data platform to build a command platform for scientific decision-making and precise scheduling. The platform's core functions take the form of one view (indicating the operations status of the entire district) and four centers (decision-making center, operation center, service center, and command center).

In the past, city administrators mainly used traditional statistical indexes, service reports, and special reports to determine the operations status of the whole district. Those approaches could not comprehensively, thoroughly, and intuitively reflect the overall situation. Now that the IOC system has been put into use, the 168 square-meter screen in the management center displays the operations status of the entire district. Through the visualization of the macro-operations situation in the whole district, the system displays multi-level indicators in economy, social life, and other aspects in an intuitive way. Longgang administrators can be comprehensively informed of the district overview, economic innovation, public safety, urban governance, people's well-being, living environment, and government construction records. As a result, administrators can gain in-depth insights into the economic and social operations status of the whole district.

Based on the advanced and powerful cloud platform, the Smart Longgang Operation Center implements in-depth data cleaning, comparison, and association; transforms the traditional data silos into a data neural network by integrating horizontal and vertical resources between departments; coordinates public security, firefighting, emergency handling, security monitoring, environmental protection and water services, law enforcement, and other departments based on the cloud platform, big data platform, and spatiotemporal information platform.

From a macroscopic perspective, the center assists in scientific decision-making using heat and distribution maps; from a microscopic perspective, the center performs refined management of city elements such as people, things, places, events, and emotions through data association.

How does the IOC assist administrators in making decisions? For example, industrial structure is crucial to economic development and a central issue for city managers. Although the high-tech industry has promoted the upgrading of Longgang industrial structure in recent years, the Longgang government still faces the challenges of industrial structure optimization, limited leading enterprises, and enterprise capacity migration. The IOC can display the overall move-in and move-out of enterprises in the entire district, and explore and analyze enterprise migration factors (such as the enterprise premise, population structure, and distribution of transportation, education, and medical facilities), and identify the improvement directions to promote industry development.

Smart City construction is an ongoing process. Currently, the Longgang District is still making efforts from the following aspects:

- Eliminating information barriers and accelerating the establishment of a district-wide big data platform to integrate and share data and provide cross-system, cross-department, and cross-business collaborative management services;
- Promoting big data applications in education, medical care, employment, social security, housing, transportation, and other industries, and developing various types of convenient application projects to improve the quality, equality, and convenience of public services.

As the "City Brain" grows more intelligent, Longgang anticipates rapid economic advancement and a continuous increase in the happiness of its residents.

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