

CSG Lights up Every Household



**SRv6 Best Practices for End-to-End Service  
in Multi-Area, Multi-Vendor Network**

# Overview of the Guangdong Power Grid

The Guangdong Power Grid serves 21 municipalities in Guangdong Province and also supplies electricity to Hong Kong and Macao, making it one of the largest provincial power grid companies in China. **With one of the largest power supply scales in the world, a highly complex grid structure, and demanding operational requirements, it provides a critical energy foundation for the Guangdong–Hong Kong–Macao Greater Bay Area.**

Peak load  
Over **164.93** million kilowatts

the peak load of the Guangdong power system reached 164.93 GW. The highest in China.

Total electricity consumption  
Over **950 billion** kilowatt-hours

In 2025, Guangdong's electricity consumption reached 958.973 billion kWh. The highest in China.

Population Served  
Over **100 million** people

supplies electricity to 21 cities in Guangdong, as well as Hong Kong and Macao, serving over 100 million people.

Substations  
**3,000+**

the Guangdong Power Grid has built more than 3,000 substations at 35 kV and above.

Due to its long coastline and the imbalance between load centers and power resources, the Guangdong Power Grid faces complex operational challenges and significant safety pressures. **It is therefore essential to accelerate the development of a new power system and promote digital transformation to support Guangdong's high-quality economic and social development.**

### Feature 1

As of March 2026, Guangdong's offshore wind power installed capacity continues to rank first in the country, with a cumulative grid-connected capacity of over 12 million kilowatts.

### Feature 2

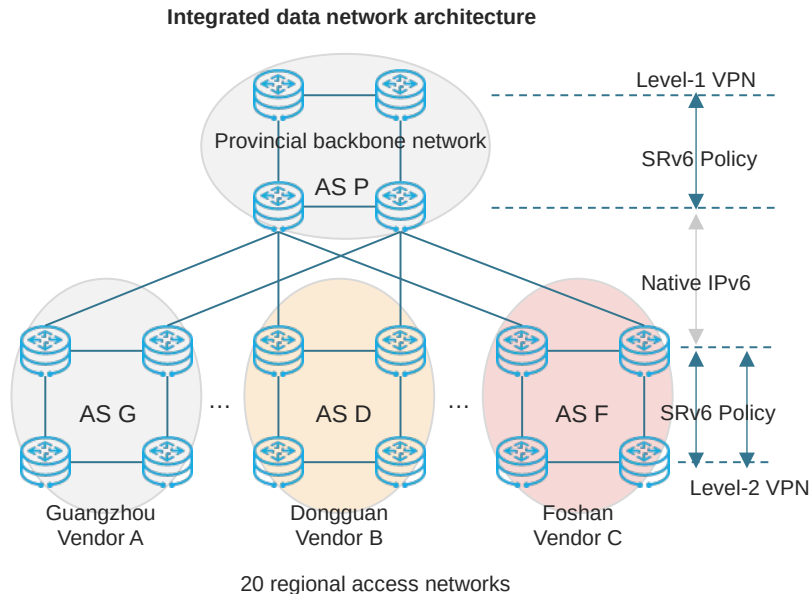
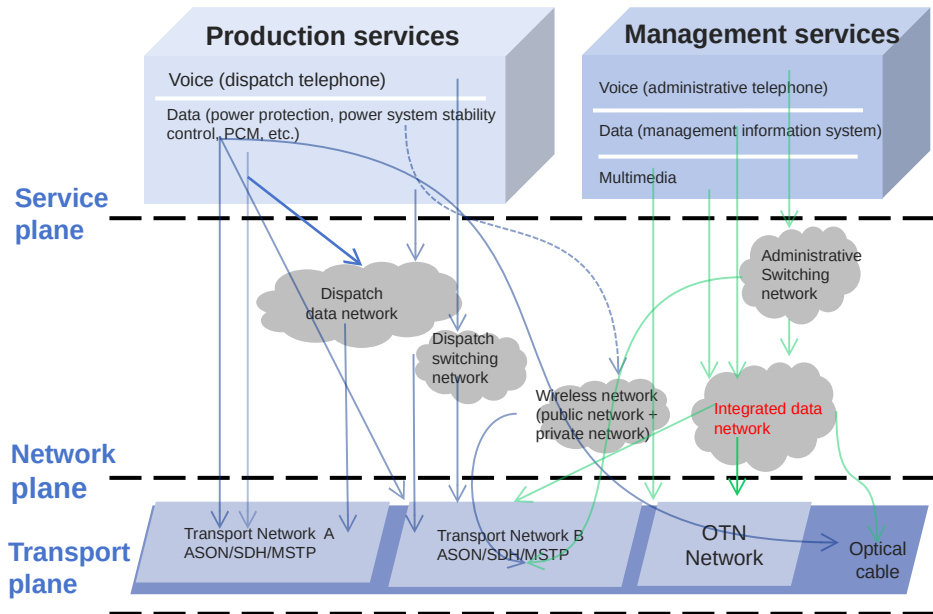
By July 2025, Guangdong Province's installed green energy capacity exceeded 80 million kilowatts, making it the largest power source in the province, surpassing coal power capacity.

### Feature 3

transmits abundant hydropower and other energy resources from western regions to power load centers, including Guangdong, via its 'eight AC and eleven DC' ultra-high voltage transmission lines.

# Overview of the Guangdong Power Grid Communication Network

The Guangdong Power Grid's power communication network covers power plants and substations at or above the 35 kV voltage level. Using power communication optical cables, an optical transmission network has been established, on which multiple communication service networks—such as the data network—are deployed. Each service network is implemented with two or more independent planes, and different networks carry various types of services, including production control, production management, and administrative management. **The Guangdong Power Grid operates two major power data networks, comprising more than 10,000 devices.**



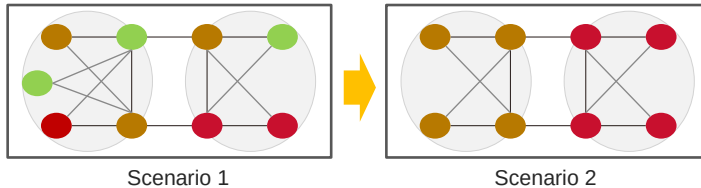
# Key Challenges in Large-Scale Deployment of SRv6 in Power Data Networks

Guangdong Power Grid is upgrading its integrated power data network from IP MPLS to SRv6, which involves a complex networking scenario with multiple vendors and NMSs. The upgrade process encounters the following key issues:

## Mixed network with hybrid vendors devices and NMS

There are two networking scenarios for the power data network:

- Scenario 1: A single city network with devices from multiple vendors deployed in an interleaved manner.
- Scenario 2: Different city networks use devices from different vendors.



Hybrid networking leads to multi-vendor NMSs, making it difficult to implement the value technology of SRv6.

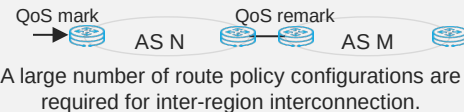
- SRv6 services are difficult to provision. Configurations are performed node by node by different vendors
- Network status cannot be analyzed in a unified manner, making SRv6 path optimization difficult to deploy.

## Difficult services assurance in mixed network

The construction of intelligent substations is accelerating, and the power data network is accessing a large number of new services.

Type	Services	Latency	BW
Video Services	Inspection Robot	≤100ms	12~40Mbps
	CCTV		4~12Mbps
	Smart Helmet		4~12Mbps
Traditional Services	Mobile Operation	≤200ms	4Mbps
	Monitoring of Device		<100kbps
IOT Services	RFID	Seconds	<10kbps
	Temperature sensor		
	Humidity sensor		

SRv6 tunnels span across multi-vendor networks, making the deployment of end-to-end service assurance complex.

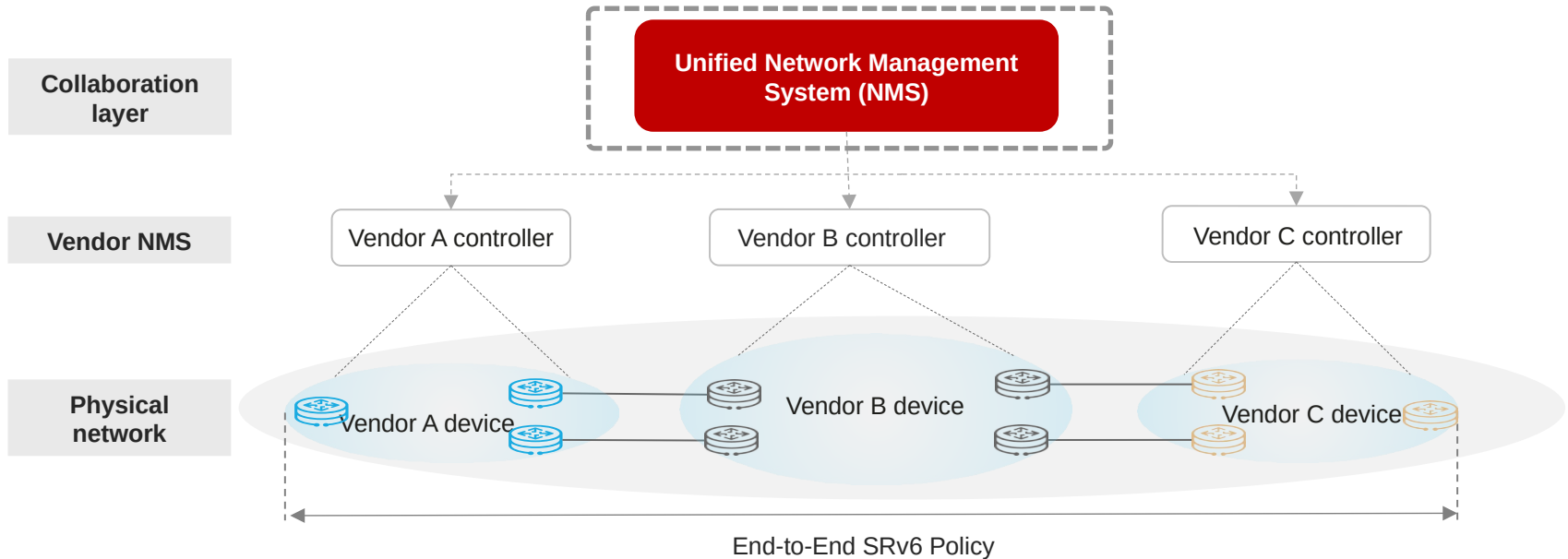


All services involved in inter-AS interconnection need to be marked with QoS again.

**The power data network has the challenges of multi-vendor device networking and multiple network management system, which makes it difficult to provide differentiated end-to-end assurance for multiple services in smart substations.**

# Multi-Area, Multi-Vendor Network O&M Based on Unified NMS

The Guangdong Power Grid leverages a unified Network Management System (NMS) to seamlessly manage multi-vendor systems. Its three-layer architecture—**network device, vendor NMS, and Unified NMS**—enables comprehensive **monitoring, configuration, and analysis of the network**. Operational data from different vendors feed into the unified NMS, providing complete network awareness. The unified NMS supports end-to-end service orchestration, enabling one-click deployment of SRv6 services across multi-area, multi-vendor network.



# Key Capabilities of Unified NMS

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## Network Monitoring

- **Visible and Guaranteed Services:** Service status is fully visible, with real-time monitoring of configuration, packet loss, and latency, all of which can be recorded and replayed. This visibility drives path optimization, ensuring a high-quality user experience.
- **Network Flow Visibility:** Provides real-time insight into specific traffic flows and enables rapid detection of performance anomalies.

## Configuration Delivering

- **Simplified Interfaces, Function-Oriented:** Unified NMS communicates through a standard interface, hiding device differences and focusing on network service functionality.
- **Autonomous orchestration and reliable configuration:** Autonomously orchestrates services, generates service configurations, and allows users to preview configurations before delivery and roll back configurations in case of delivery failure.

## Network Analysis

- **Path awareness and historical playback:** Provides real-time path query and historical playback to quickly identify the causes of service path changes.
- **Path preview and online optimization:** Based on the built-in cloud map algorithm, the system can provide optimization recommendations for the current forwarding path.

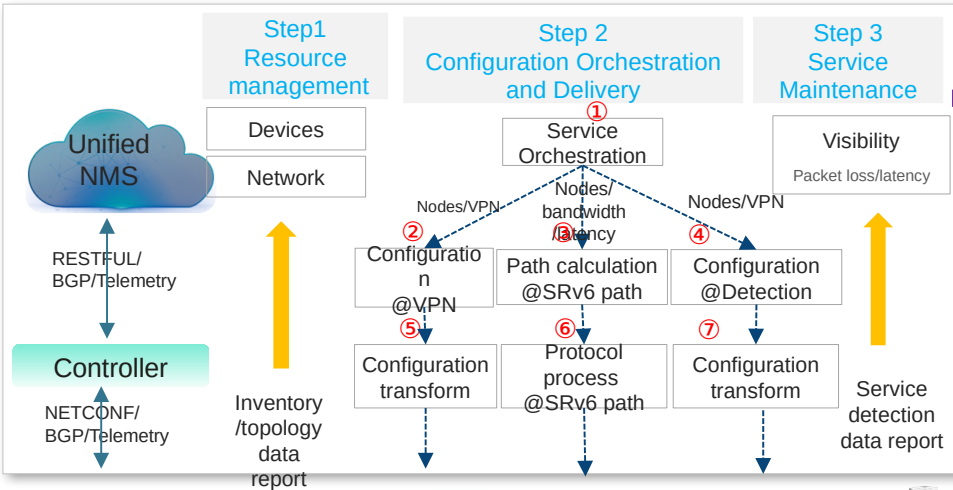
# Case 1: Simplified SRv6 VPN Deployment and Real-time Path Optimization

**A video conference between City A and the headquarters across different network domains**

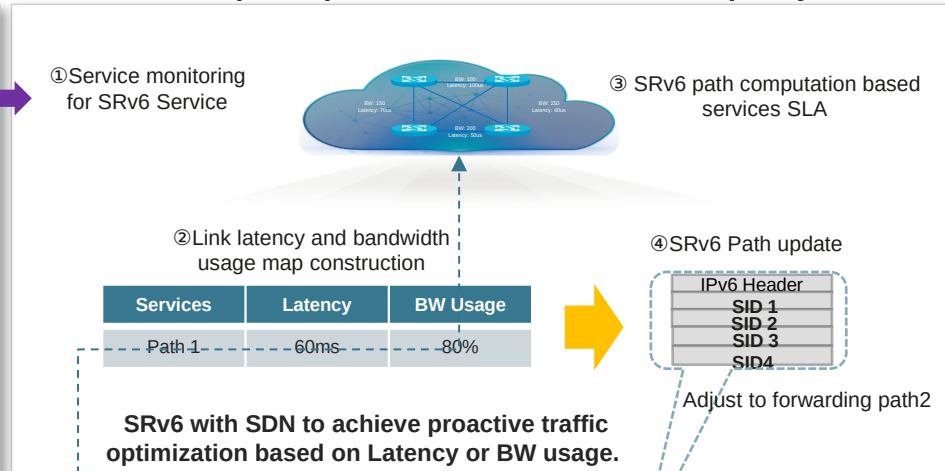
**Req 1:** During the service provisioning phase, enable ultra-simple and rapid deployment of video conferences across different network domains.

**Req 2:** During the service running phase, ensure guaranteed video conference quality with no lag and no dropped connections.

## Simplified and automated deployment of SRv6 VPN services



## SRv6 path optimization ensures service quality



The unified NMS makes the management across multi-area and multi-vendor network more efficient.

# Case 2: Application Enabled Networking Empowers SRv6 Policy Coordination

CSG develops application-aware function in Electrical OpenHarmony OS to apply SRv6 policy in cross-region network scenario constantly.

## Electrical OpenHarmony OS for Power Grid Endpoint

First unified IoT OS

Released in 2023 by CSG

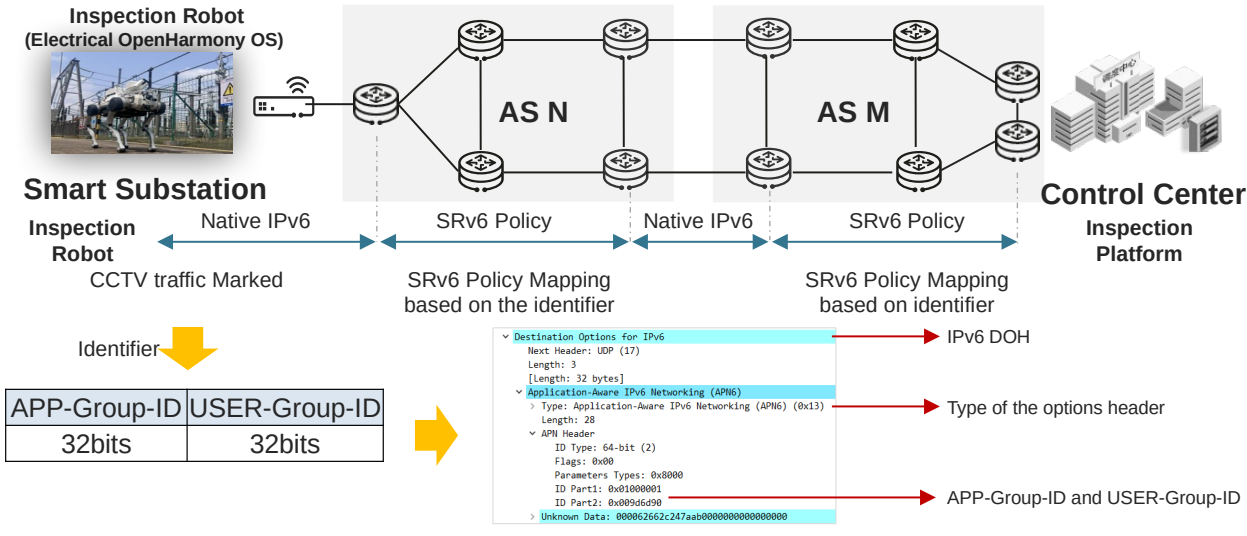
### Promotion Progress

Adapted to 900+ types of Endpoints

Deploy 100K+ Endpoints in smart substations



Electrical OpenHarmony OS implements the application-aware networking function on the Endpoints through the IPv6 destination options header (DOH), then the power grid data network identify the traffic of Endpoints to implement cross-region SRv6 policy constantly.



It is one of the potential approaches to address our challenges. Although it has not yet been standardized, we hope it can be finalized in the near future.

## Key Takeaways & Next Steps

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1. Guangdong Power Grid will continue to explore and apply SRv6 technology to empower the development of smart grids.
2. Exploring SRv6 and AI integration to drive intelligent network O&M.
3. The goal is to gain more innovative ideas from IETF working groups and relevant conferences, leveraging technology to advance the industry and promote large-scale SRv6 deployment in the power industry.

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Thanks

