

# CloudMetro brings certainty to an uncertain future

*Future-oriented metro networks are necessary to respond to continuous service innovation, maximize network value over the next two to three years, and enable operators to take the driving seat in the cloud era.*

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## Metro networks for a new age

**T**he past 15 years has seen two major stages in metro network evolution. In the first, multiple protocols and modes

like SDH, ATM, and ETH coexisted, with each corresponding to one network and requiring a dedicated maintenance team. The OPEX of managing multiple networks wiped out any cost savings from new tech, and so a new construction roadmap was needed.



The rapid development of broadband services like video required unified ultra-broadband networks, leading to the second stage of metro network development. Huawei's SingleMetro solution integrated multiple vertical networks into one horizontal network and combined multiple boxes into a single device on a unified platform, minimizing costs in technology evolution and traffic growth, while boosting profits and efficiency.

But, digital transformation has resulted in an uncertain future for metro networks. New industries and services need more from



metro networks, including high bandwidth, high reliability, and low latency. Flexible architecture, flexible resource scheduling, simple transactions, and faster service provisioning are all crucial features of a better customer experience. Metro networks' transformation must adapt to the complexity of integrating future tech, service diversity, and the fragmentation of commercial models.

## Monetizing the pipe

Huawei CloudMetro reconstructs metro networks with cloud technology and includes resource management, smart connectivity, and flexible architecture as native capabilities. The solution's five main tools are resource pooling, modular services, intelligent O&M, automated management, and an open platform.

**Resource pooling** decouples resources through IT and network technologies, thus enabling on-demand flexible adjustment, improving the utilization of network resources, and making it possible to manage and control tens of millions of users.

**Modular services:** provides "Lego-style" modular service capabilities that can be flexibly deployed on demand, reducing service deployment costs and slashing new

service rollout times.

**Intelligent O&M** automates online planning and simulation capabilities to rapidly locate and correct faults.

**Automated management** delivers one-click service deployment across domains, cities, and vendors, and enables offline-to-online flexible service scheduling.

**Open platform** provides an abundance of network services by rapidly integrating third-party applications.

CloudMetro makes networks function-centric instead of NE-based. It forms a multi-service edge (MSE) real-time forwarding layer, network cloud engine (NCE) service, and resource management layer based on different function attributes like service forwarding, resource management, user management, and connection management. Each function can be configured as required, achieving network functions atomization and better adaptation to different network environments. The IP-based MSE unifies the flexible forwarding and scheduling of multiple services, calculates services in real time, and guarantees ultra-high bandwidth and ultra-low latency. The NCE centrally manages and distributes multiple users, services, and connections. Because of their flexible

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architectures, the MSE and NCE collaborate to transform network-centric deployment into service-centric.

## Fixed Broadband: Years to months

CloudMetro extracts and centralizes user management functions on MSE devices, and separates the forwarding plane from the user plane, facilitating flexible expansion. In the new architecture, centralized cloud deployment in the control plane fully utilizes the cloud's strong computing capabilities. A single rack can manage tens of millions of users and dynamically expand resources based on loads. The forwarding plane features high-performance hardware, with each rack providing Tbps of forwarding capability and the ability to process high-bandwidth services with low latency.

Integrating fixed broadband services involves adjusting service modes and frequent changes to service policies, which results in a heavy workload and makes integration difficult. The cloud NCE handles the management and service functions of CloudMetro, achieving "Lego-style" on-demand deployment capabilities for service modules. Orchestration enables network functions chaining, so fixed broadband service functions can be autonomously selected and flexibly deployed, and resources can be dynamically expanded or reduced according to service requirements.

The software module implements dedicated service functions to improve VAS capabilities,

reducing integration costs by 70 percent, cutting service development from months to days, and enabling greater innovation. Standardized northbound interfaces (NBIs) eliminate previous application limits by opening up capabilities for third-parties. This is supported by Huawei's remote online verification lab, which now focuses on joint development with industry partners for industry-wide gains.

CloudMetro unifies the allocation of IP addresses based on the whole BNG network and also the automated application, renewal, and release of services. It configures session and bandwidth thresholds based on the bandwidth and session consumption of each board in the resource pool, and scientifically schedules BNG board resources, so resources are effectively utilized. The NCE's multi-VM architecture flexibly scales in or out based on traffic changes by adding or releasing occupied VM resources, enabling second-level service-automated migration without interrupting service traffic. Various technologies ensure carrier-class reliability, such as active/standby protection on the control plane, dynamic healing by VMs when component faults occur, and network-level fault protection.

In 2017, Huawei and China Mobile rolled out a cloud BRAS pilot program based on CloudMetro architecture, jointly issuing the industry's first technical whitepaper on cloud BRAS based on separated control and forwarding planes. The two parties thus contributed metro network evolution by enhancing system theory and basic practices for innovating cloud architecture.

## 5G slicing

CloudMetro uses network slicing to support differentiated services. All network resources, including ports and services, are sliced E2E, achieving the isolated bearing of multiple services such as MBB, FBB, and B2B. The network can then meet differentiated SLA requirements on bandwidth and latency while maximizing the network's bearing capabilities. The forwarding plane is completely isolated, guaranteeing bandwidth and latency SLAs between different slices. Network analysis automates the management of the E2E lifecycle, including each network slice, service deployment, resource scheduling, and troubleshooting. Based on different stages of service development, new slices can be added or deleted without affecting other slices and the bandwidth of each slice can be adjusted on demand and in real time based on each service's bandwidth requirements.

Marking a solution first in the industry, Huawei's network slicing router (NSR) slices network resources as according to control and management, protocols, and forwarding. It creates E2E network slices according to specific scenarios, with each network slice acting as a logical, self-sufficient network. An independent network slice can be generated for a single service such as a video, IoT, or key communication. Different service

slices have independent O&M views on which resource scheduling and management can be performed, enabling on-demand network SLA, bandwidth assurance for slices in any scenario, and rapid fault location. The NSR can thus meet the service bearing requirements of differentiated SLAs in multiple 5G scenarios.

At MWC 2017, Huawei and Deutsche Telekom jointly presented their E2E 5G slice network, demonstrating how robots can improve production efficiency and reliability in the 5G network era. The bearer network used Huawei's 5G slice router to divide the network into three isolated slices, ensuring different latency requirements were met for each service. Network congestion due to heavy traffic in one slice was shown not to affect the bandwidth and latency of another slice responsible for precise robot tasks, thus verifying the Huawei slice router can meet SLAs for different slices.

## B2B leased lines

Enterprise leased line requirements have increased, in part because the offline subscription and provisioning of traditional leased line services are slow and inefficient.

SDN technology enables CloudMetro to implement online application and rapidly deploy services on leased lines, increasing service provisioning

efficiency tenfold, with one-click cross-region deployment cutting service provisioning time to minutes. The service application information sent from the program allows the standard interface on the controller to interact with the OSS system and automatically calculate routes based on configured policies, realizing the one-click deployment and adjustment of E2E services. Moreover, multi-layer service protection achieves 50 ms hitless switching. Enterprise customers can obtain leased service SLA information from a smartphone app for total service performance control anytime, anywhere.

In January 2017, China Unicom Guangdong and Huawei jointly launched the SD-UTN on-demand leased line range for enterprises based on CloudMetro architecture. These products provide government and enterprise customers with on-demand adaptability, security, reliability, and minute-level automatic provisioning, helping China Unicom Guangdong's 100 Building Plan to take root commercially.

For CloudMetro to mature and develop, joint promotion from partners across the industry is necessary. Huawei is active in this area, and is working with industry partners to rapidly roll out optimized solutions. CloudMetro is destined to become a key driving force for operators to digitize and innovate services. 