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Driving autonomy with the Network Cloud Engine

5G and cloud will bring a wealth of exciting new services such as VR, AR, live streaming, and autonomous driving, leading to a boom time for the entire ICT industry. These new services will also generate huge amounts of traffic: Huawei's Global Industry Vision (GIU) 2025 predicts that the data generated in 2025 will hit 180 ZB.

The dynamic complexity of services will greatly increase network complexity. That's why reducing OPEX is one of the biggest challenges for operators today, alongside improving user experience and increasing agility.

What's causing these challenges?

The main source is existing network systems. Network complexity is growing

exponentially, but legacy problems in current networks still remain. While the device-centric, manual O&M approach is over, dynamic network scheduling is beyond human capability. Thus, the only solution is a high degree of automation.

5G networks will need to support not only high-speed and enhanced mobile broadband services, but also ultra-reliable and low-latency machine-like communication for applications

like autonomous vehicles and smart medicine. New, far higher requirements will have far outstripped the capabilities of passive O&M, which rely on user complaints and equipment failure alarms for service guarantees.

New business models for operators

The proliferation of cloud services will enable operators and enterprises to migrate the focus of their business

development to a broad range of vertical markets. Business models will shift from B2C to B2B and B2B2X. The main requirements for implementing enterprise/industry digital IT and network agile integration will be network openness and the ease of integrating capabilities.

Based on its ongoing development of network end-to-end (E2E) industry chain links, Huawei has released the industry's first automated network platform, which integrates management, control, analysis, and smart AI functions into the Network Cloud Engine (NCE). Serving as a unified network brain, on the downstream side the NCE enables centralized management, control, and analysis of the global network. Business and service intent supports resource cloudification, full lifecycle automation, and intelligent closed-loop data-driven analysis. And upstream, it provides open network APIs and rapid IT integration, supporting B2C and B2B e-commerce services and multi-tenant management. The NCE will fully enable operators and enterprises to build user experience-centric automated, intelligent networks.

Connecting physical networks and business intent

As the brain of the entire network, the NCE connects the physical network with business intent, and supports the full implementation of Huawei's Intent-Driven Network (IDN). NCE includes four key capabilities: ultra-capacity cloud-based platform; full-lifecycle automation; intelligent closed-loop based on big data and

AI; and, an open, programmable enabling app ecosystem based on scenarios.

Ultra-capacity cloud-based platform:

Based on Cloud Native cloud architecture, the NCE operates on private and public clouds, and also supports an on-premise deployment model. Its high capacity and flexible scalability deliver the largest system and user access capacities in the world, allowing networks to transform from the offline model of scattered data and multi-level O&M to an online model of data sharing and open processes.

Full-lifecycle automation: Based on unified resource modelling and data sharing services, the NCE enables serialized solutions for different service scenarios, including home broadband, enterprise interconnections, cloud interconnections, enterprise cloud, and mobile bearer. This allows full-lifecycle automation across multiple network technology domains, enabling device plug-and-play, network switch-and-run, business self-service, fault self-healing, and risk alerts.

Intelligent closed loop based on big data and AI:

The NCE consists of four engines: intent, automation, analysis, and intelligence. These form a complete, intelligent closed-loop system. The NCE uses telemetry to collect and aggregate massive amounts of network data, enabling real-time situational awareness of the network. Unified data modelling builds in big data analytics and insights from the entire network. The NCE also uses algorithms based on Huawei's 30 years of experience in the telecommunications field to execute automated closed-loop analysis, predictions, and decision-making on user intent. Problems

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can thus be solved before customer complaints occur, reducing service interruptions and ensuring customer satisfaction.

Open and programmable for a scenario-based app ecosystem:

The NCE includes the programmable integrated development environment Design Studio and a developer community for customers. Design Studio supports southbound connections to third-party network controllers and network devices, and northbound integration with the cloud and AI training platform and IT applications. Customers can also use it to purchase Huawei-native apps, and innovate and develop apps by themselves or with the support of third-party system integrators.

The NCE's four main capabilities can fully support service innovation for operators, enterprises, developers, and partners and maximize network business value.

Smart networks for smart business

Joint innovation between Huawei and leading operators and enterprise customers has applied the NCE to a range of use cases to achieve smart and automated networks. As of the end of 2018, Huawei had collaborated with leading customers on 25 NetCity innovation projects and launched over 60 commercial use cases.

In the area of 5G service scenarios, Huawei NCE launched four key capabilities for 5G bearer scenarios in 2019: rapid 5G base station service provisioning; active and precise fault location; service smartification and optimization; and intelligent fragmentation. These capabilities will help operators achieve E2E automation for 4G/5G hybrid networks and build future-ready smart mobile bearer networks that support rapid deployment, proactive prevention, and optimal experience. It will also help carriers expand in the vertical industry market.

In cloud service scenarios, the Huawei NCE fully enables innovation in service scenario-based solutions for application in, for example, data centers, enterprise campuses, and SD-WAN. Today, Huawei is a leader in the domain of cloud data center networks. Huawei's CloudFabric data center network solutions have been adopted commercially by over 6,400 enterprises worldwide, turning data centers into commercial value creation centers.

In 2018, Huawei's Cloud Managed Network and SD-WAN cloud services were officially deployed in its public cloud. Enterprise users can now purchase convenient, fast, and cost-effective cloud services on Huawei Cloud's official website. Huawei Cloud's campus management solution included collaborations with over 100 managed service providers worldwide

to provide quality services to corporate customers worldwide.

Network automation and smartification is set to be a gradual process of evolution. Therefore, Huawei is working with upstream and downstream industries to build an open industrial ecosystem. Huawei's NCE has passed integration certification or interoperability testing with over 40 industry partners and industry players, including services for coordinators, public cloud, cloud platforms, and network value-added services.

To achieve open network capabilities, the NCE solution includes a developer enablement platform, DevZone. It provides a comprehensive learning, development, and verification environment for application innovation for partners, developers, and customers. By the end of 2018, the NCE solution had provided over 400 APIs; underpinned collaboration with third-party certification bodies like EANTC, IOL, and SDNCTC; and interfaced with mainstream equipment vendors' controllers and transponders. Together, a flourishing ecosystem has been built.

The network industry has entered the IDN era, a key stage in network evolution from automation to smartification. As the intelligent brain of the network, the NCE will fully accelerate this process, speeding up the arrival of the era of autonomous driving networks. 