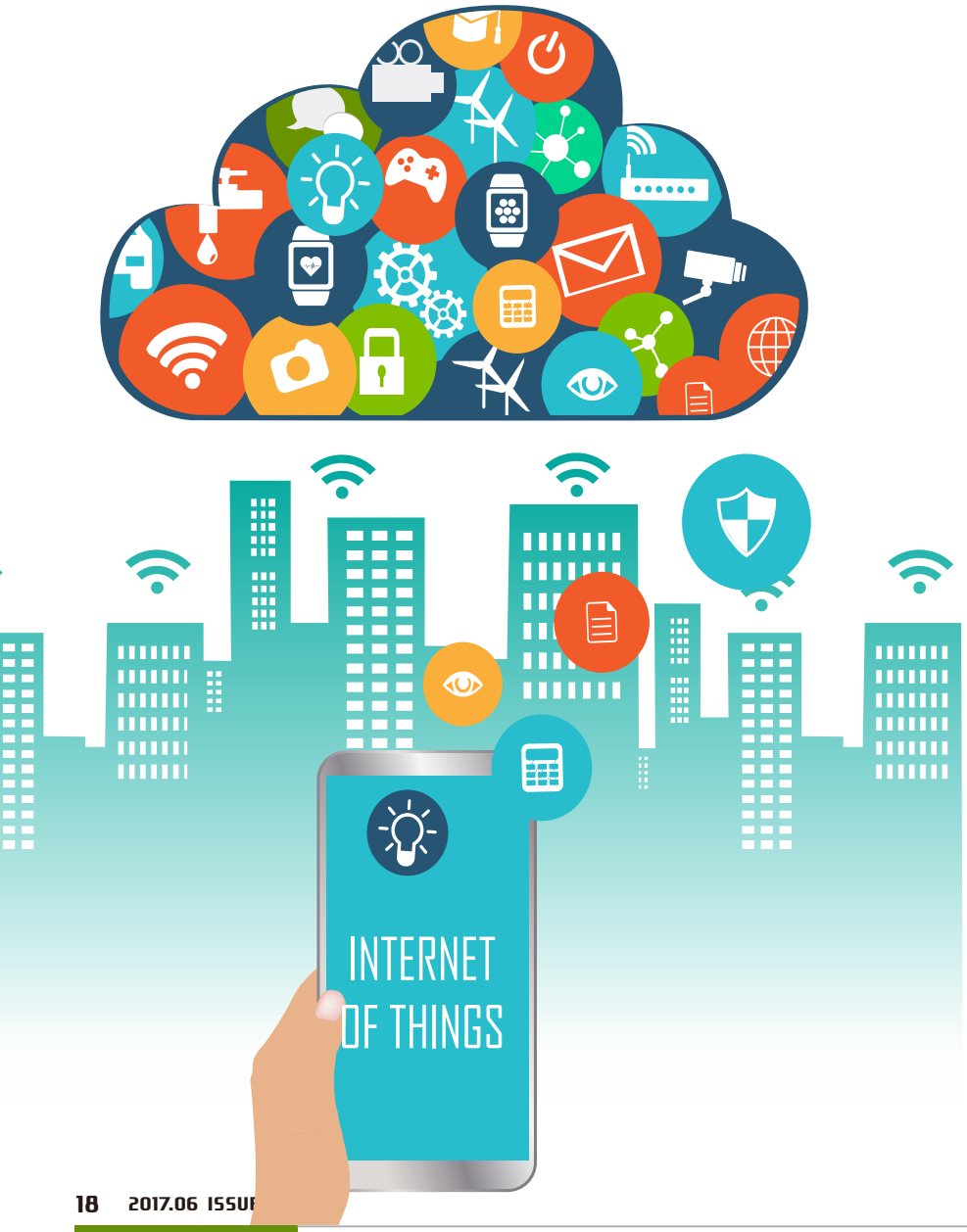
Mobilize your spectrum boundaries with All-Cloud

Although mobile subscriber growth is slowing, broadband connections will hit 6.2 billion by 2020 and 8.5 billion by 2025, 2.5 billion of which will be at gigabit speed in 2025. Moreover, the prevalence of mobile ultra-broadband, smart devices and homes, AR, VR, and wearables will see each user generating 30 GB per day by 2025, up from less than 1 GB now.

By Wang Yufeng



Two major trends

Mobile technology has quickly spread from the consumer sector to manufacturing, where it's enabling digital transformation across verticals. Smart manufacturing, for example, is riding on the back of tech like wireless voice, multimedia communications, wireless video surveillance, data collection from mass sensors, real-time scheduling, and remote robotics.

At the same time, the Internet of Vehicles (IoV) will emerge as the next major mobile market, with all new vehicles networked by 2025. Drivers and passengers will be able to access a wide variety of cloud services online, including V2X services, infotainment, and fleet

management services.

Fast reactions

As business boundaries expand, operators will move deeper into verticals, adapting and integrating network capabilities. This will introduce new requirements for mobile networks and force operators to reconfigure their models for managing network resources.

Low latency is critical for certain applications in both smart manufacturing and IoV. For example, critical control in a smart factory requires 1-ms latency – Huawei's X Labs and Kuka jointly developed a 5G industrial robot where the master and slave arms need to exchange information every 4 ms for precise coordination, requiring stable latency under 1 ms. Conversely, interaction between sensor data has much lower requirements. In an IoV scenario, a column of networked cars driving at high speed to reduce fuel consumption requires less than 3 ms latency, while in most V2X scenarios, 20 ms latency can meet requirements.

The spectrum problem

Spectrum is mobile operators' most precious asset. And it's scarce, especially the 900 MHz golden spectrum band. An estimated 74 percent of telcos have less than a 10 MHz block of the 900 MHz band. They spend huge amounts of bidding for spectrum, with 10 MHz costing around US$40 million and 10 MHz of 900 MHz commanding up to US$98 million. One Thai operator bid a staggering US$2 billion for a block of 900 MHz.

Because operators' spectrum consumption will grow to meet consumer and industry demand, they must maximize spectrum resource efficiency as a matter of priority. Over the past 10 years, telcos have substantially increased spectrum efficiency by using SingleRAN base stations for refarming. Spectrum refarming allows the static allocation of 5 MHz of a 10 MHZ block to UMTS and 5 MHz to GSM, but it doesn't allow spectrum resources between different standards to be dynamically re-shared.

Standards and spectrum decoupling is therefore required to reuse spectrum and maximize spectrum efficiency, enabling operators to go from refarming to sharing.

Taking it to the clouds

Cloud allocation and scheduling of different mobile network resources, such as OM, RRC and PDCP, must be based on service scenarios. In the future, a greater need for local computing will arise from services with high bandwidth and latency requirements, such as mobile VR/AR and machine vision, to guarantee user experience.

Wireless

When an operator develops new services, very different requirements from different applications and scenarios can emerge with data speeds (from Kbps to Gbps) and latency (from seconds to milliseconds). Network complexity might increase due to the jump in frequency bands, standards,

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SingleRAN to CloudRAN

Oriented towards 5G evolution, CloudRAN is a unified wireless cloud architecture based on SingleRAN. Its three main features are as follows:

Pools hardware resources: In traditional architecture, resources are centralized in a single site, preventing dynamic resource adjustment within a region. CloudRAN changes this by meeting the diverse hardware resource requirements of different services during the implementation process and carrying out overall scheduling to efficiently allocate resources.

Flexible architecture: CloudRAN uses real-time and non-real-time scheduling layers. The real-time layer is closer to the user, enabling accurate and efficient air interface resource management. The non-real-time layer is centrally deployed and can coordinate multiple technologies and perform cross-site scheduling. CloudRAN network functions can be deployed based on demand to different nodes, including wireless, backbone aggregation, and even core aggregation nodes, maximizing network efficiency and capabilities.

Automates service deployment: Flexibly defined new service processes and interfaces can automate resource scheduling and fault handling. Voice, video, and IoT will become the main service types of mobile networks, and increase requirements. CloudRAN supports network slicing for network functions customization and orchestration. It automates the deployment of different services on the same network, enabling new technologies to be rapidly deployed.

CloudRAN's advantages will make it the next deployment standard for wireless network architecture. By reconfiguring the most critical access network architecture with cloud technology, operators can meet the diverse requirements of the future.

Conceptualized in April 2016, the first field POC for Huawei CloudRAN will be completed in 2017, with small-scale commercial adoption predicted for Q2 2018. The technology will help operators develop new services with greater agility to gain a head start in the market.

CloudRAN's benefits

CloudAIR shatters air interface bottlenecks: A key resource for MBB networks, CloudAIR uses cloud technology to centrally schedule and efficiently utilize air interface resources, that is, spectrum, power, and channels. Operators can then focus on improving efficiency and flexibly deploy various services to enhance user experience.

Spectrum cloudification eliminates limits: mainly includes sharing solutions for GU and GL spectrums, LTE, and 5G NR new air interface spectrums. Huawei has

completed the first commercial deployment of the GU spectrum sharing solution with Vodafone India and verified the GL spectrum in Thailand. Huawei will optimize its GU and GL spectrum sharing solutions to boost spectrum efficiency. It has proposed sharing standards for LTE and 5G NR new air interface spectrum, which have already gained widespread industry acceptance. Standardization work is currently taking place under the 3GPP framework.

Power cloudification maximizes power utilization: mainly includes power sharing within and between standards. Huawei has developed sharing solutions for carriers between GSM and UMTS and between GU and GL standards, commercially deploying the solutions on a global scale. In 2018, Huawei will also launch LTE and UL and GUL power sharing solutions between multiple bands to further boost power efficiency.

Channel cloudification builds user-centric networks: mainly includes D-MIMO and UC-MIMO. TDD D-MIMO has been tested and verified on Japan's SoftBank and China Mobile's networks, and is set for commercial launch in Japan. FDD D-MIMO will be available in 2018 and, in the future, UC-MIMO will enable user-based network resource scheduling.

CloudAIR's benefits

Better utilizes air interface resources: Spectrum cloudification enables rapid deployment of new standards; power cloudification enhances cell capacity; and channel cloudification improves service continuity at the cell edge. Spectrum, power, and channel cloudification all enhance air interface utilization for better user experiences.

Fast coverage for new standards: The most important requirement when introducing a new standard is fast network coverage. This requires deployment of the new standard on the existing frequency band, so new and old standards can share the same frequency band. The new standard quickly reaches the same coverage as the old standard and uses spectrum resources based on demand according to changes in penetration and traffic.

The long-tail problem of old standards: 2G and 3G networks will exist over the long-term in many regions; for example, the US carrier AT&T started to retire its 2G network in 2011 but has yet to complete the process. Today, old standards only constitute a small amount of traffic but they continue to occupy golden spectrum and will do so over the long term, resulting in wasted resources. Through dynamic spectrum sharing of new and old standards, CloudAIR prevents waste by allocating the vast majority of spectrum resources to new standards based on traffic demands.

All-Cloud network innovations will allow operators to overcome various limitations affecting mobile networks and create all kinds of new possibilities. Fully cloudified networks will become the infrastructure for digital transformation in all sectors, opening up new business opportunities for the mobile industry.