Reinventing Transport Networks for the Future

NEC is helping mobile operators prepare for the next wave of mobile backhaul network technologies that are likely to be introduced by 2020

Challenge

As more and more consumers become dependent on mobile services for work and leisure, mobile operators need to invest in their network to keep pace with traffic growth while facing the challenge of Over The Top (OTT) services that are affecting their bottom lines. This is creating the need for a total solution that provides flexibility, agility while helping them reduce costs and monetize new services. It also needs to adapt easily to next generation technologies without requiring forklift upgrades to future-proof their investments.

Solution

High capacity, wide bandwidth microwave transport – combined with the resource optimization capabilities of SDN/NFV and a powerful Telecoms Operations and Management System (TOMS) and Traffic Management Solution (TMS) – provide a scalable solution to overcome the challenges of rising cost and customer expectations of a better quality network experience and new innovative services.

Benefits

- Improve QoE
- Create new business opportunities and services
- Optimize network traffic

For carriers and telecom operators, ROI maximization, CAPEX reduction, and revenue generation are realized.

With the ever increasing consumption of video content on smartphones, combined with innovative new Over The Top (OTT) content, cloud and enterprise mobility services, telecom operators are under intense pressure to make costly capital investments in reinforcing their network infrastructure. By the year 2020, capital investment is forecast to surpass 1.7 trillion dollars, and revenue increase to slow down to 2.9% year-on-year. On the other hand, revenues for OTT players are forecast to grow 16% in the same period. [Source : GSMA The Mobile Economy 2014]

Even with recent advances in mobile technology, end-users, however, are not fully satisfied with the Quality of Experience (QoE) they receive. Congestion in the network caused by a lack of resource optimization adversely affects latency and performance levels, and combined with the slow rate of deployment of innovative new services, this leads to low customer satisfaction ratings.

Brute force capital investment in network infrastructure is no longer able to sustain revenue and QoE improvements. A drastically different, smarter approach is required for future mobile networks. Using limited resources, data traffic must be transported dynamically, efficiently, and stably at high quality levels. Various working groups and standards bodies have reached a general consensus that intelligence and flexibility are key aspects of future mobile networks to maximize the business benefits and improve the QoE, as well as enable the hassle-free and rapid deployment of services and new network elements. Future Radio Access Technology (RAT) networks, such as LTE-Advanced, need to be operated in an automated and flexible way with over one Gibabit per second (Gbps) class backhaul transport. They will need to support a ten-fold increase in transport capacity and intelligent service orchestration to accommodate between 10 and 100 times the traffic volumes.

As a leading innovator in computing and communications, NEC is working on various fronts to lay the foundation for a smooth and rapid deployment of advanced mobile technologies. This document outlines the key enabling advanced transport solutions, as well as NEC's vision about how networks will change in the run-up to 2020, to assist telecom operators to define their network evolution strategy.

Evolution of Services

Mobile services have changed tremendously over the past decade. With 2G, the mobile network basically carried voice traffic with comparatively low levels of data. With 3G, mobile broadband usage grew but voice was still dominant. In the 4G era, new data-hungry services emerged and the volume of video traffic and use of enterprise mobility apps grew inexorably. These services stress the overall performance of the network, especially when microwave backhaul is involved, which gives consumers a low quality network experience and increases churn rates, impacting revenues and limiting the uptake of innovative new services.

By 2020, network operators will need radio access technologies that enable the rapid and flexible creation of end-to-end (E2E) services that deliver high performance and low latency levels. A network-wide understanding of resources through proper analysis and optimization is crucial.
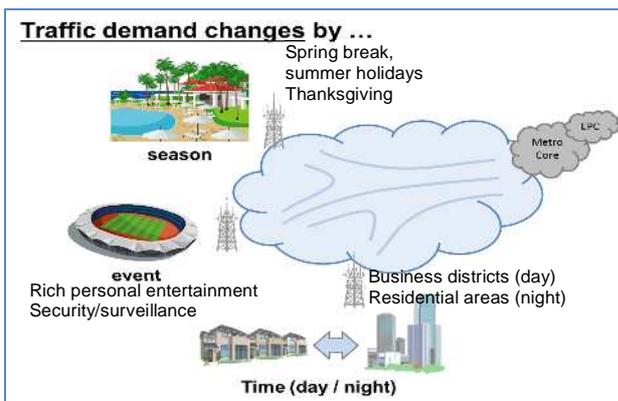
Mobile Backhaul's Role in Maximizing QoE

The consumers' perception of QoE and the effective end-to-end network management by the operator are closely related. Dynamically steering services around failures in the network and optimizing bandwidth usage in the last mile to the end-user are some of the approaches for E2E QoE management. Innovations in network devices, especially in the mobile backhaul area, will be essential.

Special care, however, is need for mobile backhaul using wireless links. Since resources are limited compared to wired solutions, various measures are necessary to ensure that the network is fully optimized and latencies kept at a minimum at all times.

The evolution of mobile backhaul technology alone, unfortunately, will not be sufficient to keep pace with the rapid changes in radio access technologies. Network convergence also plays a vital role in creating an efficient and optimized network. Convergence between wired and wireless, backhaul and fronthaul, to name a few, are necessary to lay the foundation for future radio access networks.

## NEC's Strategy for Network Optimization

With the advent of a diversity of OTT players in the WiFi video, voice and instant messaging areas and rapid uptake by consumers, network usage must be carefully analyzed and coordinated to boost capacity and improve the overall experience for end-users.

NEC is highly active in international standardization bodies for advanced radio access technologies and well aware of the requirements and challenges facing Communication Service Providers (CSPs). We continue to enhance our innovative solutions that can dynamically control resource allocations and change communication paths.

One such solution is SDN (Software Defined Networking), which has its roots in datacenter and enterprise applications, and are being adapted and enhanced for and adapted to telecom carrier sector. NEC has opted to pursue an integrated business solution, combining the physical infrastructure and network controller functions of SDN with a telecoms operations management system (TOMS) incorporating both operational and business support systems (OSS/BSS). The task of managing networks is getting more burdensome and complex by the day, and SDN can help alleviate these strains.

NEC also believes that mobile edge computing – which places resources closer to the edge for quicker service delivery and to reduce traffic across the network, and device programmability – that enables new features and services to be easily added to the core node functionality (such as bandwidth coordination), are viable methods to further optimize the transport network.

Similarly, NEC's New Last Mile managed service initiative – which includes solutions that feature advanced interference reduction algorithms and Self-Organizing Network technologies (SON) – delivers a consistently high QoS to users and minimizes network resource usage through intelligent traffic and device management. This takes away the complexity associated with deploying HetNet platforms for LTE and beyond.
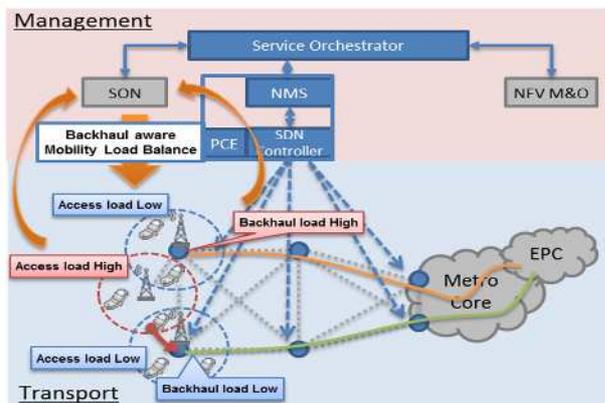
Traffic Level Optimization

Further improvements in QoE can be achieved by intelligently managing the ever rising mobile data traffic levels spurred by device and content service innovations. NEC's Traffic Management Solution (TMS) not only maximizes QoE, but also Return on Investment (ROI) by effectively optimizing traffic depending on the real-time condition of networks.

In combination with SDN and TOMS, TMS becomes an even higher value-added service control solution. Linking visualized traffic information with SDN helps improve the efficiency of network operations by dynamically designing and elastically reconfiguring networks in line with traffic patterns, and applying Big Data analysis on collected traffic data to help create new business opportunities and operations.
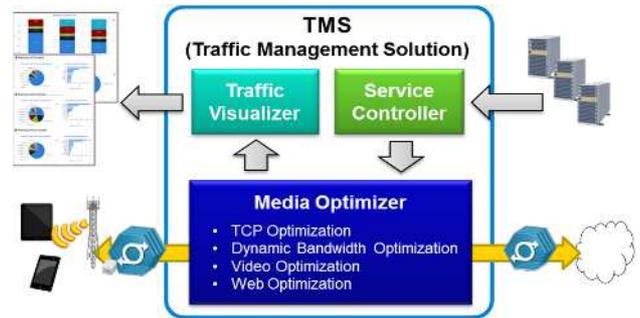
Social Infrastructure

The ubiquity of wireless access is changing the way people and machines communicate. The significance of an intelligent network is critical in venues such as stadium where a high concentration of spectators congregate. Live entertainment can be enhanced with immersive and interactive personal communications to smartphones, including real-time multi-angle TV broadcasts that can be viewed onsite or remotely. The network also has to cope with bursts of thousands of tweets and social network posts. At the same time, security and surveillance must not be taken lightly.

The need for new mobile solutions in industrial applications in many different vertical sectors, such as power, transportation, health care, security and public safety, is also rising. NEC is well positioned to offer a total solution that integrates ICT infrastructure – including cloud management platforms, advanced image recognition and Big Data analytics technologies and backhaul – for city-scale or site-specific M2M programmes. In order to adapt to rapidly changing priorities, its tempting to replace cables with wireless links that can be easily reconfigured. NEC is able to provide Communication Service Providers with wireless links with similar delay, capacity, and reliability as wired connections.

Along with the trend for using commodity server platforms for various networking devices – such as switches and routers, and even EPCs and CPEs – edge computing has started to garner attention. Edge computing pushes applications, data, and computing power away from data center or server farm to the edge of the network, enabling analytics, knowledge generation, and data acquisition, right at or near the source. Using virtualization, edge computing platform can be hosted on the same platform as the network element.

Lower latency and therefore faster response is expected of edge computing, thus the significance of high-

performance backhaul and transport is clear, especially beyond LTE-A. Tight integration with radio equipment enables easier analysis of traffic characteristics, needs, and radio conditions, allowing immediate changes to be made to the system to ensure the high QoE of the connected devices and improve the efficiency of infrastructure usage with a more intelligent and optimized network. The synergy between edge computing and intelligent and programmable networking elements opens the door for new revenue opportunities.

Conclusion

Advanced networks will be required to be secure and stable with almost no delay, not to mention higher speeds. Also, it is expected that they will be required to be flexible enough to change communication paths and channel capacities as needed, while maintaining high-rate-of-return cost efficiency.

NEC iPASOLINK solution offers various leading edge features to bolster mobile backhaul networks in the run-up to 2020, such as high order modulation schemes, high frequency/wide channel radios, and optical integration. For instance, our E-band solution, the iPASOLINK EX, offers multi-gigabit capacity in a compact outdoor enclosure. Furthermore, the iPASOLINK series boasts industry-leading low latency architecture and pioneered the use of Gallium Nitride (GaN) to triple the transmitter power output while minimizing energy usage and costs.

As services become more varied and complex, NEC's SDN and NFV solutions will add flexibility to the transport network, optimize resource usages and allocations, thereby controlling the flow of traffic effectively. This in turn, results in improved performance over the radio links.

NEC's BRM, Backhaul Resource Manager, is one such solution which is relevant to SDN. It is a centralized application that analyzes backhaul resource usage, such as capacity and traffic paths, on the fly in order to optimize the entire backhaul network.

Our related TMS solution comprises of a media optimizer, visualizer and the service controller. The media optimizer enables traffic to transit the network while consuming as little bandwidth and resources as possible through techniques such as TCP optimization, video pacing – which delivers the next frame of video on a just-in-time basis – and advanced compression algorithms. While the visualizer collects and stores traffic logs and visualizes the analyzed data. The service controller creates control policies based on how much traffic is on the network and pushes them to the media optimizer to create a continuous improvement feedback loop.

NEC's partnerships with other leading ICT industry players in specialized domains is also vital to deliver a total solution package tailored specifically to each customer. We have ongoing relationships with industry leading switch/router and optical transport vendors with cutting edge innovations.

With its expertise across the radio access, transport, core network, data center, telecoms operations management and system integration domains, NEC is committed to creating a world where people and things in the world can communicate with each other anytime and anywhere.

In this way we're "Orchestrating a brighter world", helping to overcome the challenges presented by population growth, urbanization and the need to better protect the environment.

About NEC Corporation

NEC Corporation is a leader in the integration of IT and network technologies that benefit businesses and people around the world. By providing a combination of products and solutions that cross utilize the company's experience and global resources, NEC's advanced technologies meet the complex and ever-changing needs of its customers. NEC brings more than 100 years of expertise in technological innovation to empower people, businesses and society. For more information, visit NEC at http://www.nec.com.