5G blooms on Elastic OTN

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As the 5G era approaches, the scenarios and use cases in which it can be applied are beginning to emerge, bringing with them a set of diverse requirements from the network and different pressure points that need to be addressed. Delivering enhanced mobile broadband – a key selling point of 5G – will need the delivery of ultra-high bandwidth, while the massive machine-type communications and ultra-reliable low latency communications (uRLLC) links needed for the Internet of Things (IoT) will need ubiquitous connectivity and latency lower than any current connectivity. As a result, new 5G services also bring tough requirements on the bearing network, requiring the on-demand connectivity and end-to-end control of services that form the pot and soil of the 5G flower.

There are several challenges posed by this, not least that the “on-demand” network means different things for different applications. It needs to provide on-demand quality and an on-demand service-level agreements (SLAs), while also delivering dynamic bandwidth according to traffic changes to improve the operating network’s resources and efficiency, saving investment and increasing income.

Secondly, uRLLC services have requirements for an incredibly low latency, with an end-to-end delay less than one millisecond. This requires a solution that includes a wide-range of network architecture optimizations – including the introduction of Mobile Edge Computing – low delay forwarding technologies and network routing optimization, including optimal route computation.

A changing picture

With more and more IoT services deployed on the data center, this network architecture naturally evolves to the data center, meaning that data center interconnect (DCI) services are becoming increasingly key. In fact, this is one of the fastest growing sectors in optical network services, bringing new requirements on the bearing network. This network now needs to provide more flexible and efficient connections, including real time response, faster service provisioning, on-demand services and an SLA for the new commercial model – all within a streamlined operation for ease of management.

In addition, the demand for private lines on the bearer network – security, low latency, diversity and intelligence – means it needs to support an open virtual network interface that improves the tenant experience and resource sharing, fast service provisioning and on-demand network and service. This bearing network has gone through the traditional network era and the IP era, and each network evolution has accompanied significant progress in bearing network technology. Now we’re entering the cloud era, where networks must evolve again and bearing technology must move with it.

Solutions that match problems

Today's optical transport network (OTN) needs to be end-to-end, enhanced and elastic. A solution that meets these criteria is capable of matching the ever-increasing requirements of big video, wireless, government and enterprise private lines, DCI and other new services that operators will need to provide with the network of tomorrow. This reliable, elastic OTN needs to marry the twin attributes of ultra-large capacity and ultra-low delay securely to provide a solution that delivers the operator benefits of 5G services – such as intelligent control capability, automated operating and global pooling – while also matching end-user requirements.

This kind of network may seem a long way off, but examples such as ZTE's Elastic OTN are showing that 5G innovation is very much on the current agenda. Elastic OTN balances the three layers of programmability to utilize spectrum according to the service requirement and optical physical performance, ensure end-to-end connection performance through the programmable node and provide a service that is on demand.

When it comes to resource pooling, solutions such as Elastic OTN work off a virtualized data center philosophy. With this, the data center virtualizes its computing and storage resources in order to match service changes and improve utilization of those resources. To visualize this, it helps to imagine the optical network as a pipeline and network traffic as water that can be slow- or fast-flowing. In a traditional network which cannot be flexibly adjusted, the pipeline needs to be big enough to handle the fastest flow, which means of the majority of that pipe isn't used when the flow is slower. ZTE's vPIPE solution – which forms part of Elastic OTN – learns from the philosophy of the virtualized data centers, applying virtual pipe resourcing for the IP and optical network. This allows the pipeline to expand or contract according to the volume of data travelling through the network automatically via a software defined network controller, improving bandwidth utilization by up to 60% to 80%.

Delivering tomorrow's services

For the ubiquitous connection requirements of 5G services, an elastic, on-demand network capable of handling bandwidths of up to 100G while still delivering quality of service will be key, but it is also important for it to work out of an open interface to allow it to be used with agility and efficiency. Network elements such as ZTE's Unified MANO Expert, which converges the capabilities of network systems and provides unified opening interfaces for network management, operation and control, have an essential role in delivering the nuts and bolts of 5G connectivity.

As the world gets ready for 5G, network operators are finding that an elastic, optical-based approach is going to be required if they are to satisfy potential application scenarios. The key values of this kind of elastic OTN solution – agility, efficiency and versatility – make it most suited to the needs of the network both now and in the future,

where investment and innovation will see the 5G network act as a key enabler of tomorrow’s world.