

## Harnessing the Potential of Ethernet Backhaul

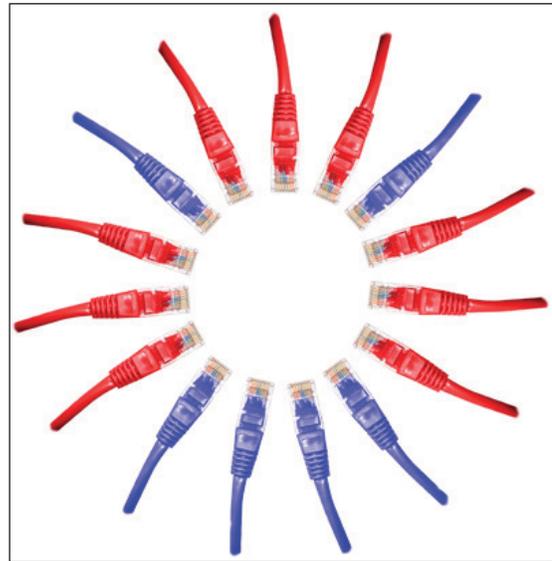
By Juan Prieto, InfoVista

For service providers, it's no secret that mobile data traffic has exploded over the last few years.

AT&T, for example, in one of its FCC filings related to its ill-fated attempt to acquire T-Mobile USA, cited capacity constraints as a chief motivation behind the merger. The company noted that the smartphones that had become ubiquitous on its network consumed 24 times the data of conventional handsets, and that overall mobile data consumption had increased by 8,000 percent between 2007 and 2010.

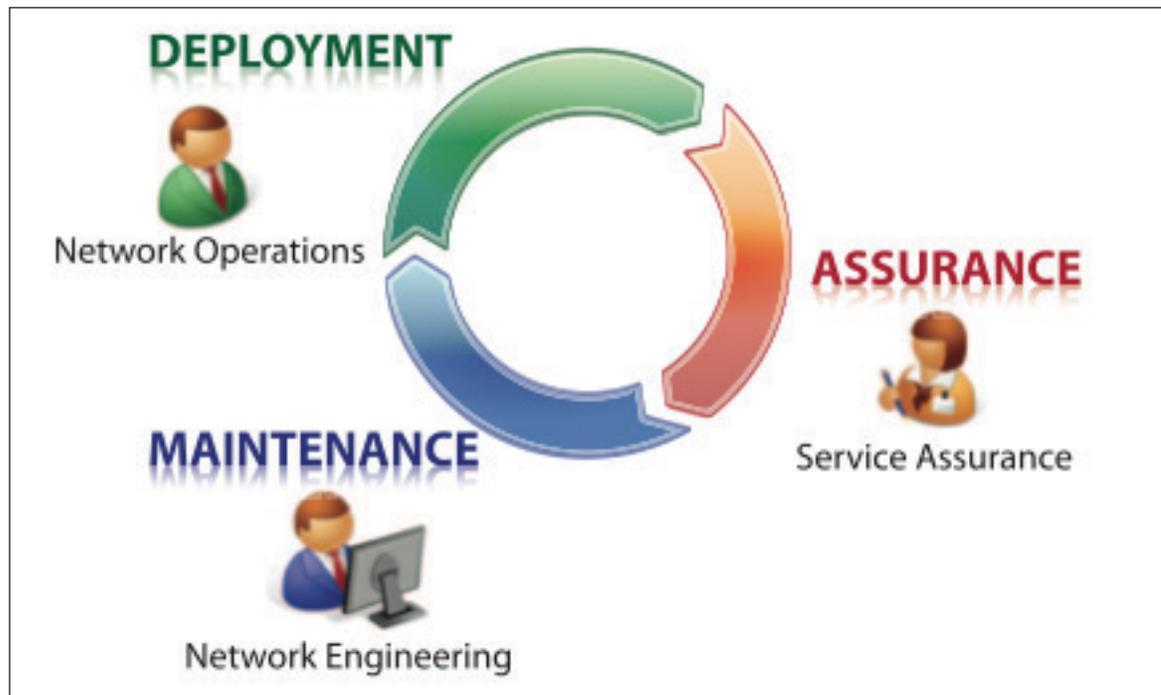
And complex handsets are only one component of the growing bandwidth capacity demands. Tablets, which are capable of consuming many times the amount of data used by smartphones, and other data-capable devices are continuing to grow in popularity and complexity. In addition, machine-to-machine connections, cloud computing, and other trends in communications are likewise escalating demands on existing infrastructure.

This trend is likely to continue. Cisco's Visual Networking Index (VNI) reports that global mobile



data traffic grew 2.3-fold in 2011, which was the fourth consecutive year in which mobile traffic at least doubled. In addition, the VNI reports that only 12 percent of handsets around the world are smartphones, but those handsets account for 82 percent of global handset traffic. As the number of handsets grows, there's enormous potential for

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additional mobile data growth. With this in mind, Cisco anticipates an 18-fold increase in mobile data traffic between 2011 and 2016.

This unbelievable amount of data has to be carried somehow, which makes the necessity of a comprehensive backhaul strategy that much more clear.

### Why Ethernet?

Furthermore, Ethernet has emerged as the technology of choice, over legacy TDM. According to telecommunications research firm Infonetics, over 100 network operators are actively deploying IP/Ethernet-only backhaul to carry all traffic, including data and voice. In just one year, between late 2009 and late 2010, Infonetics says that the percentage of network operators planning all-IP/Ethernet backhaul, as opposed to hybrid or TDM networks, had increased from 45 percent to 65 percent.

Perhaps most tellingly, Ovum research reports that by 2015, 88 percent of backhaul connections will be carried over Ethernet.

There are three main motivations behind this trend towards Ethernet backhaul:

- Wireless data traffic is exploding. In addition to the estimates from Cisco mentioned above, reports from Ericsson estimate a tenfold data increase between 2011 and 2016, and wireless providers around the world are reporting growth rates in excess of 100 percent per year. Smartphones have obviously played a role in this massive acceleration, as have tablets (which consume five times the bandwidth of an

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average smartphone, Cisco says). However, there's also a major behavioral component to the growth as more users clamor for bandwidth-intensive social media and video applications.

- Mobile network operators (MNOs) are simultaneously moving towards 4G technologies, with LTE taking root in markets around the globe. Research firm Maravedis estimates that by 2016, there will be 350 million LTE subscribers.
- The costs associated with carrying voice and data from cell sites are in great need of reduction, and the cost-per-bit of carrying this traffic via Ethernet is drastically reduced compared to TDM. Infonetics estimates that Ethernet backhaul connections are an average of six times cheaper than their TDM equivalents.

### Potential Hurdles

With all of these indicators pointing the way to Ethernet backhaul, the direction of the industry is fairly clear. However, Ethernet is not without its challenges.



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Whereas circuit-switched transport technologies, like ATM and TDM, have been in use for decades and have come to be known for their fixed, “non-shared” bandwidth and remarkable reliability, Carrier Ethernet is still relatively unproven. It’s a dynamic technology, with physical and logical layer independence and variable bandwidth capabilities. While this flexibility can be a beneficial aspect of Carrier Ethernet, it also brings a new set of challenges for wireless operators who are not accustomed to the technology.

The biggest casualty of Carrier Ethernet’s flexibility, when not properly managed, is end-user QoS. Performance management is made cripplingly complex by Carrier Ethernet’s inherent heterogeneity and its interoperability with existing infrastructures. After all, while backhaul networks as they exist today include Carrier Ethernet, their underlying infrastructures are a mixture of new and old transport technologies. The physical infrastructures often include copper, fiber, and microwave, which are, in turn, often deployed across multiple physical topologies. In addition, Ethernet services like E-Lines, E-trees, and E-LANs can be deployed to mirror various logical topologies.

When all this is combined with additional complicating factors (multiple equipment vendors, portions of the network leased from wholesale providers, etc.) the sheer number of Carrier Ethernet scenarios is mind boggling. Andy Sutton, principal architect at Everything Everywhere Ltd., has calculated that there are approximately 158 architectural permutations available for deploying viable Carrier Ethernet backhaul circuits.

So the challenge, for MNOs, is to be able to capitalize on the data capacity promises of backhaul networks,

## How can wireless CSPs harness the potential of Carrier Ethernet without getting bowled over by its complexity?

broadly, and the potential cost-savings of Ethernet backhaul, specifically, all while maintaining high levels of network visibility, end-user QoS, and overall levels of revenue.

### Capitalizing on Ethernet’s Promise

With all of that in mind, how can MNOs harness the potential of their Carrier Ethernet-equipped transport network without getting bowled over by its complexity?

The answer lies in a comprehensive and strategic approach to service quality visibility. While many providers already have the ability to monitor traffic over a specific link or through a specific probe, this tactical approach to performance management is silo-oriented and ineffective for the service assurance requirements SPs face today.

Instead, a Lifecycle-Aware Performance Assurance strategy should involve collecting the many isolated performance metrics, data, and Key Performance Indicators (KPIs) generated by equipment and Element Management Systems (EMS) software and consolidating this data into high-level KPIs and Key Quality Indicators (KQIs) to provide a central, end-to-end view of the network and overall, rather than case-by-case, service quality.



It is important that this comprehensive approach is lifecycle-aware for a number of reasons. As MNOs continue to expand, their networks move continually through lifecycles that generally include deployment, assurance, maintenance, and optimization. These activities are distinct in terms of scope, but, perhaps even more importantly, are distinct in terms of the groups that oversee the steps in the process. By supporting role-oriented views with specially tailored reporting templates, an end-to-end network performance view can help multiple departments to collaborate and overcome internal silos, while also receiving a view of the network that fits their respective needs. Proper lifecycle-aware visibility can, in short, drive collaboration and reduce significantly mean time to repair (MTTR).

Through this sort of collaboration, a unified performance visibility solution can promote significant OPEX and CAPEX savings. Existing monitoring solutions can be consolidated into a single, central tool, reducing CAPEX, while increased operational efficiency and reduced churn drive OPEX costs down. In short, Ethernet backhaul and the complexity it brings with it, if successfully and strategically managed, can become a competitive advantage.

#### **Step-by-Step**

Let's take the basic lifecycle steps we mentioned before one by one, and examine specific needs at each step.

**Deployment:** The first step in deploying a network is having a real-time view of the connections you're provisioning. Network operations needs a central, visual display of all physical and virtual network resources and connections if they are to proactively identify and troubleshoot any connectivity problems that may exist. A lifecycle-aware assurance solution can help here by providing crucial tools like automatic discovery of physical and virtual assets, drilldown-capable displays and connectivity maps, intelligent engines for real-time alarms, real time reports on service availability, with off-the-shelf support across major equipment vendors.

**Assurance:** Once everything is up and running, service providers need a single platform that consolidates various service quality management silos into a unified view of the network. Once again, leveraging real-time data collection, consolidation as

well as reporting of out-the-box multi-vendor KPIs and KQIs is critical for CSPs looking to obtain an agnostic view of the quality, performance and utilization of this next generation transport layer.

**Maintenance:** Engineers working to maintain and optimize the network want to be able to view relevant usage trends so they can prime the network for not only today's traffic, but tomorrow's as well. For this, they need a consolidated view of utilization statistics for all Carrier Ethernet backhaul interfaces and devices. In addition, they need high-level, actionable KQIs, including interface saturation and classes of service (CoS) loading and performance. In addition, they need trending and baseline reports, as well as drilldown capable reports.

#### **Our Solutions**

At InfoVista, we offer a proven carrier-grade Lifecycle-Aware Performance Assurance platform designed to provide MNOs' functional groups with actionable, real-time service visibility tailored to their roles. It is aligned with MEF (Metro Ethernet Forum) standards, ensuring seamless integration with today's and tomorrow's Ethernet infrastructure developments. The platform drives ROI with uniquely tailored and pre-packaged KPI and KQI-rich reports and dashboards, out of the box support for multiple equipment vendors and network technologies, and easy customization of service performance alerts.

While InfoVista's Lifecycle-Aware Performance Assurance solution is an ideal fit for assuring performance in the Carrier Ethernet Layer 2 and IP/MPLS L3 VPN backhaul network domain, it is by design a multiple domain solution. Its features and capabilities can be leveraged to assure performance of the radio access, mobile core and packet core networks.

As mobile data continues to grow at tremendous rates, backhaul is a necessity. With incredible cost-per-bit savings over TDM and a clear alignment with the next generation of wireless technologies, Ethernet is a clear choice for backhaul. The pieces are all there. All that's left is finding the right performance assurance solution to help you take advantage of the immense possibilities of Ethernet backhaul. At InfoVista, we understand that, and want to help you harness the promise of Ethernet backhaul through Lifecycle-Aware Performance Assurance.