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Leveraging Ethernet Backhaul to Fight Churn

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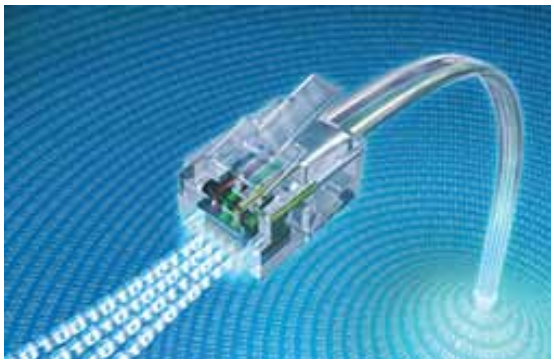

Mobile operators and wholesale network infrastructure providers are embracing Carrier Ethernet in order to future-proof for explosive data growth and 4G mobile networks while, at the same time, reducing operational expenses. Deploying an Ethernet-based backhaul network is key to achieving the business objective of cost containment—driving down "per-bit" costs for transporting increasing data traffic. But to realize this objective, service operations teams must overcome four key challenges:

- assuring performance of cell sites and emulated traditional technologies over Ethernet
- guaranteeing the same end-to-end quality as traditional TDM
- right-sizing the Ethernet backhaul infrastructure as data traffic explodes, and
- managing the complexities associated with class of service and MPLS traffic engineering

Having the right Ethernet-based performance management system is critical to meeting these challenges and to ensuring the quality services end-users demand from their mobile provider.

Although Carrier Ethernet is the emerging technology of choice for next-generation networks (4G), operators still have to support their legacy 2G and even 3G radio networks, which use legacy transmission standards like TDM or ATM. Pseudowire or circuit emulation technologies are enabling operators to seamlessly support legacy transmission interfaces over a pure Carrier Ethernet network, but transmission connections to individual cell sites are still prone to multiple

problems ranging from weather to careless configuration changes. The operations teams that traditionally managed the tools for testing legacy

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connectivity now need similar tools to assure the availability and quality of emulated connections over Carrier Ethernet. Furthermore, the capability to troubleshoot transmissions to each cell site in real time is vital for comprehensive service management.

In the fiercely competitive mobile market, operators who deliver poor service quality to their customers are extremely likely to experience churn. Proactive assurance of the mobile backhaul is critical in addressing this challenge. End-to-end quality degradations in the mobile backhaul lead to local market/regional issues that affect service experience for an entire population of mobile users. With operators looking to push their top-line revenue by introducing more and more value-added applications that are streaming-oriented (e.g., video) and real-time (e.g., gaming), stringent end-to-end quality guarantees are essential and demand monitoring and measurement across the multiple classes of traffic separation.

The need to assure data service experience as well as the compulsion to adhere to strict timing synchronization make it imperative to consider end-to-end quality assurance techniques even before rolling out the Ethernet backhaul network. The recognition of this by the industry has led to the introduction of end-to-end Ethernet assurance standards like IEEE 802.1ag and ITU-T Y.1731, or more generically, Ethernet OAM. Popular Carrier Ethernet infrastructure vendors like Cisco, Alcatel-Lucent, ADVA and others have followed suit by introducing standards-based, "built-in" instrumentation within their offerings to measure end-to-end quality of Carrier Ethernet. Leveraging

such instrumentation is inherently advantageous in that service providers can avoid the costs of deploying explicit probes (that may be expensive as well as intrusive) across the entire Radio Access Network (RAN) backhaul. Furthermore, if the Ethernet backhaul being deployed consists of multiple vendors, some of which may not be standards-compliant or have proprietary instrumentation, operators need to be able to leverage the vendor instrumentation in a generic manner. This clearly implies the need for effective service assurance platforms that can leverage vendor-specific instrumentation to portray the end-to-end quality of the Ethernet backhaul using vendor agnostic key quality indicators.

In a Carrier Ethernet environment, over-sizing a network infrastructure to meet growing traffic demands is counterproductive because it defeats the advantage Ethernet provides in that it is a more flexible and scalable technology. Under-provisioning, on the other hand, would compromise end-to-end transport quality and cause other problems such as sloppy synchronization in the RAN. Therefore, rightsizing the components of the Carrier Ethernet backhaul infrastructure is necessary to realize the advantages of Carrier Ethernet's flexibility and scalability, while also ensuring end-user quality of experience.

Rightsizing is complicated, however, by the extremely temporal data traffic patterns generated by mobile consumers. For example, holidays and events have a significant influence on consumers' messaging and browsing patterns (e.g., Times Square on New Year's Eve). Additionally, demographic factors cause variation in data traffic spatially—there is more data traffic in New York than in Arkansas. An accurate comprehension of these fluctuating traffic patterns requires deep analytics of traffic utilization. Industry-proven concepts such as "busy day" and "busy hour" designations are crucial in determining the worst stress levels of the backhaul network. Furthermore, hourly baselines, engineering benchmarks such as 95th percentile, and accurate traffic forecasts based on historical traffic usage are indispensible to achieving the objective of rightsizing the network and planning maintenance and engineering activities intelligently. Being able to accomplish this down to every sub-element (interface, class of service, and VLAN) requires industry-grade assurance tools that demonstrate proven scalability and performance. With rightsizing being an ongoing effort, the ability to continuously baseline end-to-end quality over long periods of time becomes necessary to ensure that the chosen infrastructure sizing can meet service quality expectations.

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Finally, Carrier Ethernet introduces complexities not faced with T1 backhaul. T1 brought only channelization, but Ethernet backhaul brings challenges such as the management of VLANs (for traffic separation), classes of service (for traffic prioritization), pseudowires, Ethernet virtual lines, Ethernet virtual LANs (for broadcast TV), and MPLS tunnels. The same transmission-engineering and transmission-operations teams that managed the more deterministic TDM technology are being entrusted with a far more sophisticated transmission medium in Carrier Ethernet, and they need the right set of assurance tools to measure and report on performance in a holistic manner. Engineering an end-to-end connection between a cell site and the upstream controller using Carrier Ethernet requires an orchestration of all of the aforementioned entities, as a modification of any one entity requires a deep and ongoing analysis of the other entities from a performance perspective.

Carrier Ethernet is the transmission medium of choice for mobile backhaul. For all of the foregoing

reasons, having the right service assurance solution is indispensable when it comes to exploiting the advantages Ethernet backhaul offers. Mobile operators should seek a solution that provides proactive performance management and reporting capabilities across a multi-vendor Carrier Ethernet environment and mobile domain. Equipped with such a solution, they can realize the business objectives behind Ethernet backhaul while ensuring the quality experience end-users demand from their mobile services.