White Paper

# 7 Myths & Facts of Wireless Backhaul IP Migration

*The increase in cellular traffic raises challenges for mobile operators. Past experience shows that cost-per-bit grows in direct proportion with the growth in capacity. No less troubling is the erosion in revenue per transported bit which will only worsen with new media-rich services. Decoupling cost and capacity becomes the major theme in the industry, driving the shift towards all-IP networks.*

*This paper describes some of the common myths - and basic facts - regarding mobile backhaul networks migration to IP.*

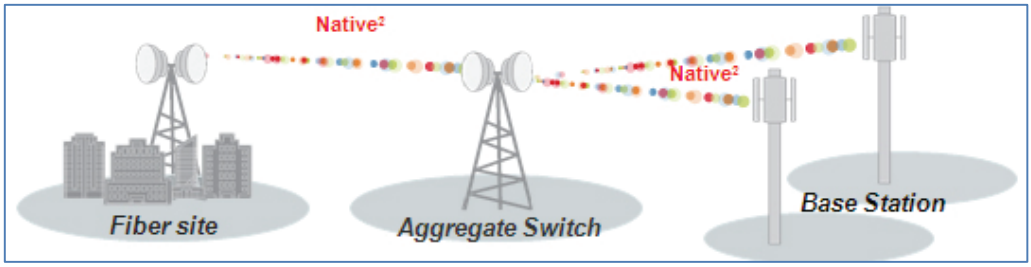
## 1. Myth: "The migration to all-IP backhaul requires building and maintaining two separate networks – one for TDM and another for pure IP"

**Fact:** There's simply no business case that can justify building two parallel networks.

Although all-IP networks are the end-game for mobile backhaul, the migration phase will take several years. During this time both TDM and IP equipment within will coexist within the operator's network.

The **Native²** concept, also referred to as "offload" or "hybrid", suggests a gradual Ethernet phase-in with a later phase-out of TDM by delivering native Ethernet alongside native TDM. Two different transport paths, TDM for voice, IP for data, will be maintained during this time, taking advantage of a single platform that supports both native TDM and native Ethernet. The beauty of the Native² concept is that a single device can be used not only throughout the entire migration process, but also later as a pure IP/Ethernet solution.

The aim of IP migration for backhauling traffic is to reduce costs rather than increase them. Hence, re-use of existing infrastructure is essential. **Native²** from Ceragon, means no future replacement of equipment is required, capping legacy investments and protecting CAPEX for years to come.




***Native² - Carries traffic in native form during the interim***

## 2. Myth: “Packet-based networks cannot provide Carrier-Grade service and are unfit for commercial roll-out”

**Fact:** Packet networks are ready to deliver Carrier-Grade services using Ethernet transport. MPLS (Multi Protocol Label Switching) and PBB TE (Provider Backbone Bridge – Traffic Engineering), provide enhancements to Ethernet transport and bring connection oriented features to packet networks. MPLS and PBB TE allow operators to manage data paths within large networks supporting hard QoS, 50 ms resiliency and carrier-class OAM tools in Ethernet environments.

Ceragon, in cooperation with some of the market’s leading system providers, is already demonstrating PBB TE and MPLS Carrier-Grade Ethernet traffic over high-capacity microwave links.

## 3. Myth: "Any radio with an Ethernet interface can be considered an 'Ethernet radio'"

**Fact:** Having an Ethernet interface simply means that the system can support Ethernet traffic. But this in itself is usually not enough. Operators are driven to migrate to Ethernet backhaul in order to reach lower cost-per-bit for transporting huge volumes of mobile broadband traffic through the network. Adding an Ethernet interface to PDH systems and even mapping Ethernet over SONET/SDH does little to relieve cost pressure from the operator who still needs to maintain a costly and relatively inefficient network.

Migrating to Ethernet transport is about supporting a variety of features including granularity, scalability, additional capacity and carrier grade functionalities. PDH, with its limited available bandwidth is unable to answer the requirements of next-generation Ethernet networks. Mapping Ethernet traffic over SONET/SDH (EoS) does have the advantage of using a reliable and available technology. But on the other hand, it introduces delays – or latency – due to the encapsulation process, and prevents the operator from taking advantage of the main benefits of Ethernet (flexibility, granularity, better network utilization, etc.).

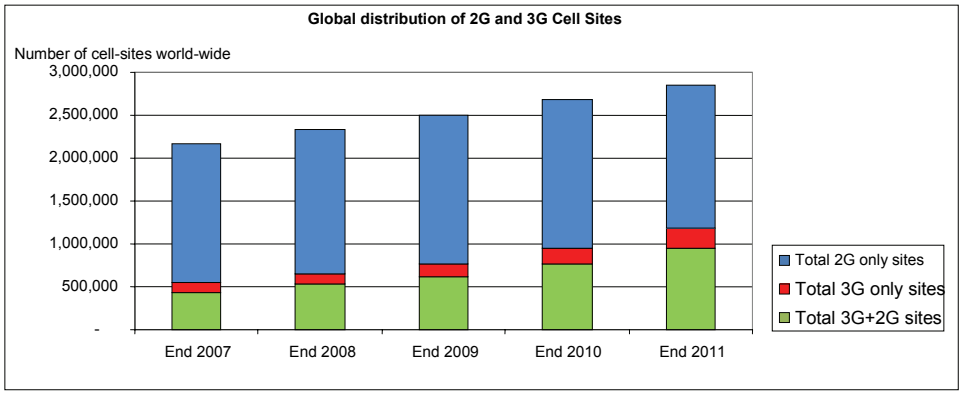
In contrast Native Ethernet radio is simpler, more flexible, reduces delay and offers better granularity and higher throughputs. For example, lab tests show that a native Ethernet microwave system supports on average more than 15% higher data rates than a TDM system under the same conditions. As mentioned before, mapping Ethernet over SDH also introduces latency. Real-time applications, especially voice and video, are highly sensitive to latency, so in some cases, EoS can seriously degrade the quality of real-time services. Native Ethernet introduces no latency and is thus much more apt to deal with real-time multimedia applications.

## 4. Myth: "Backhaul Migration to IP/Ethernet is dependant on Ethernet base-station such as WiMAX and HSPA and therefore its future is uncertain"

**Fact:** The migration to all-IP networks is a cross-industry trend driven by the need for added capacity and is not dependant on any single technology.
We are already at a point in which mobile data traffic exceeds mobile voice traffic in some parts of the world. The staggering growth in packet data on the access and backhaul segments of the carriers' networks coupled with eroding revenue-per-bit drives mobile operators to look for more cost-efficient networking solutions. They find these solutions in IP/Ethernet.

Networks based on IP/Ethernet are simply less expensive to operate and maintain compared with existing TDM. IP also allows for better flexibility and truly efficient network utilization, helping to decouple cost and capacity. Last, IP/Ethernet is taking over as the "transport technology of choice" because it allows efficient streaming of advanced applications such as mobile TV which will be the future revenue generators for cellular operators.

Today, Ethernet interfaces are being introduced into base stations. As this trend increases, operators will need to upgrade their legacy TDM equipment with backhaul systems that are able to support IP/Ethernet. Native[2] solutions, that can carry both TDM and Ethernet natively, are ideal for serving this requirement.




***From 2010 onwards operators will deploy Ethernet also in new 2G cell sites (source: Light Reading)***

## 5. Myth: “Microwave is totally transparent and not service oriented. Therefore it is irrelevant to the Ethernet migration discussion”

**Fact:** The shift to all-IP/Ethernet networks, dictates that backhaul systems become more intelligent. Only by incorporating Carrier-Ethernet functions would microwave solutions be able to cope with additional bandwidth and provide the high quality of service (QoS) expected of high-end telecommunication networks.

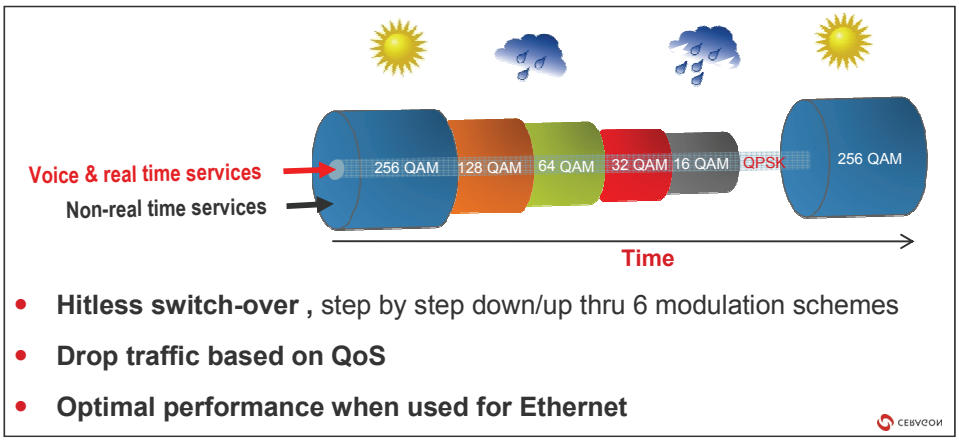
Adding Ethernet intelligence to high-capacity microwave backhaul systems will allow operators to exploit the many advantages of their new IP networks including enhanced network optimization; flexibility to support changing data-rates rather than being confined to a fixed frame size; enhanced QoS for voice and premium real-time video services; and network awareness for dynamically adapting to network service changes and enabling the best performance at any given time.

Committed to promoting Carrier-Grade Ethernet solutions, Ceragon takes an active role in the Metro Ethernet Forum (MEF). As part of this activity Ceragon has already cooprates with some of the industry’s leading system vendors to deliver MPLS and PBB-TE/PBT Ethernet over microwave.

## 6. Myth: "Microwave technology has an inherent capacity limitation and migrating to IP will not solve this issue"

**Fact:** With data throughput of up to 900Mbps over a single radio channel, Point-to-Point microwave backhaul solutions such as Ceragon's wireless IP solutions, offer sufficient capacity for supporting high quality bandwidth hungry services such as real-time video and other multimedia applications. These high-capacity solutions are ideal for both the access and aggregation segments of the mobile backhaul market.

New modulation schemes such as Ceragon's Adaptive Modulation technique (shown in the figure below) maximize spectral utilization, enabling operators to easily meet – and even exceed – their service level agreements. Adaptive Modulation also contributes to significant reductions of operators' OPEX and CAPEX by reducing antenna size and allowing operators to reach longer distances with less "hops" and a lower equipment count.




***Adaptive Modulation from Ceragon***

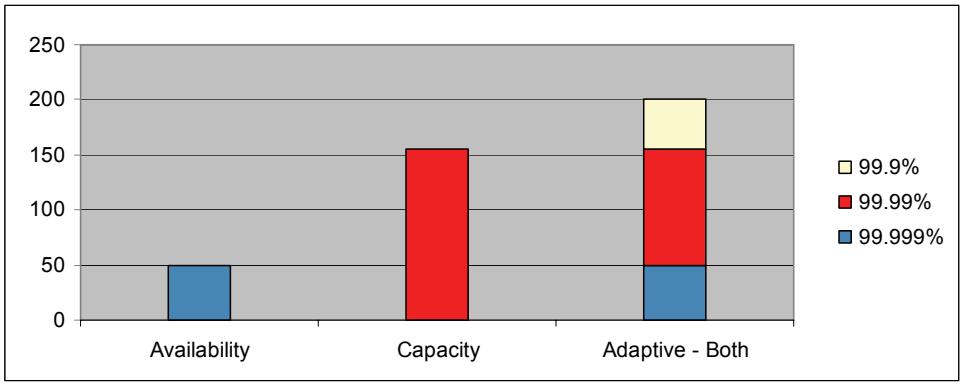
## 7. "Ethernet radio links are less reliable than TDM radio links"

**Fact:** Ethernet radio actually offers two dimensions of improvement over TDM; one is higher bandwidth, the other higher reliability.

Let us look at the example below. In the TDM - or non native Ethernet world, an operator has to make a choice between requirements, in this particular case, a single service carrying 50Mbps at 99.999% availability delivering a 45mbps DS3 service – or - a single service carrying 155Mbps at 99.99% availability delivering a STM-1/OC-3 service.

Now let's look at the same scenario in a native Ethernet environment. In this example, a native Ethernet Microwave link enhanced with adaptive modulation offers a series of services including: Carrier-Grade 50Mbps at 99.999% availability, a second service providing 105Mbps at 99.99% availability and a third service delivering 45Mbps at 99.9% availability. Over all 200Mbps can be delivered with no extra investment on spectrum

In other words, an Ethernet radio can provide the same carrier-grade, five-nines availablilty as TDM. And it does so without having to compromise capacity. On top of this, in the example before us, an Ethernet radio with adaptive modulation offers additional capacity an operator can utilize. Additional capacity, no compromise on availabilty. That's Ethernet radio.




***Ethernet Microwave with Adaptive Modulation***

***Better overall capacity and availability***