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LTE-Ready Microwave for NG Wireless Backhaul

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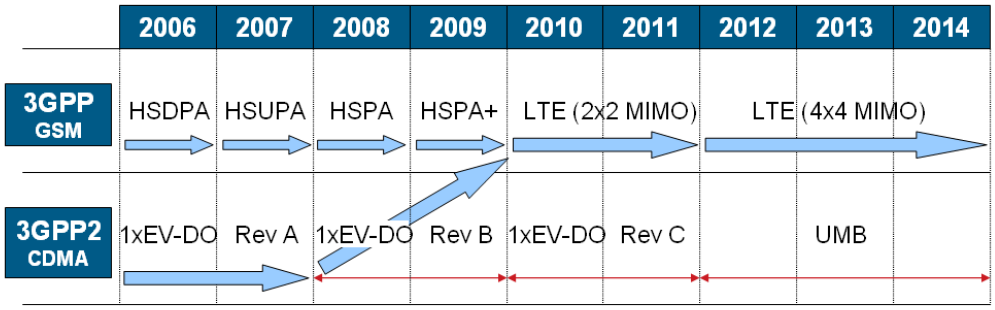
Introduction

Long Term Evolution (LTE) is the term dubbed by the Third Generation Partnership Project (3GPP) that oversaw UMTS 3G development of 3GPP as a high data rate, low-latency, packet-optimized radio access technology. The basic idea behind LTE is the enabling of far higher speeds with a much lower packet latency in order to allow expanding wireless communications support multimedia applications and become a true wireless broadband technology.

In order to achieve these goals, LTE specifications deal with aspects beyond the air interface, and champion a flat packet-based architecture eliminating BSC and RNC devices. A simplified and more efficient network is provided, enabling ease and flexibility of deployment and operation.

Adopted by both GSM and CDMA operators, LTE is the next evolutionary step for today's deployed 3G networks, whether wideband CDMA (W-CDMA), High Speed Packet Access (HSPA), or HSPA+. As such, LTE is expected to become the first single global standard for cellular communications.



Source: Infonetics - LTE Infrastructure and Subscribers Biannual Worldwide Market Size and Forecast, October 2009

The implications of LTE on the backhaul network are numerous. Bandwidth-intensive services, including services requiring a high degree of quality of service (QoS), must be supported, along with existing legacy voice services. Since it is one of the dominant backhaul technologies, Microwave (MW) transport equipment needs to evolve to cope with the new challenges.

What Does it Take to be LTE-Ready?

LTE imposes several challenges on the backhaul network in general and on MW transport equipment in particular. These include:

- Scalability – from TDM to Ethernet, from low rates to high rates, and from MW to fiber
- QoS – support of various classes of service (CoS) that include guaranteed QoS
- Synchronization – support of voice over packet infrastructure, especially call handover between cell sites
- Legacy support – simultaneous support of previous wireless generations
- Efficient bandwidth utilization – smart handling of both TDM and Ethernet
- Flexibility – ability to adapt easily to various network scenarios and mitigate migration risks
- Unified management – enhanced means to provision, monitor, and maintain data services over various physical bearers

In order to be LTE-ready, MW transport equipment must evolve from being a simple transport pipe to a networking device that forms integral part of the transport network. The capabilities required from the LTE-ready MW go way beyond its previous level, and include multiservice and enhanced networking features.

ECI's BG-Wave – the Multiservice Radio Node

ECI's Multiservice Radio Node (MRAN) is well positioned to cope with the challenges imposed by LTE requirements. It incorporates cutting-edge radio technologies together with full-blown multiservice and networking capabilities. These are detailed in the following sections.

Scalability

Scalability is provided across three different axes:

1. **Capacity** – from supporting multiple T1/E1s up to 1 Gbps.
2. **Services** – from supporting TDM-based services to supporting Ethernet-based services.
3. **Technology** – from supporting MW-only transport bearer to simultaneous support of MW and fiber.

These three scalability characteristics apply to the different aspects of LTE evolution. Higher capacity is required to cope with the bandwidth-intensive services; native Ethernet support is required for efficient handling of the very same services; and fiber support is required, especially at hub sites, to link the access to the metro where higher data rates of aggregated traffic need to be delivered.

Needless to say, a pay-as-you-grow architecture is supported to avoid paying for technologies and features that will only be required in the future.

E2E QoS

With the proliferation of services on one hand and the need to efficiently manage costly bandwidth on the other, there is a strict need to impose various CoS through QoS mechanisms. These range from best effort to guaranteed QoS. Support of MPLS-TP guarantees service features like bandwidth, jitter, latency, etc., as well as provides sub-50 msec transport grade restoration through Fast ReRoute (FRR). These enhanced features extend capabilities that in the past were available only with advanced networking equipment within the metro part of the backhaul network down to the cell site, as close as possible to the end user. Over the air, advanced Adaptive Coding & Modulation (ACM) techniques are the mechanism used to keep the guaranteed services up and running in the event the quality of a link is degraded.

Synchronization

In order to avoid mutual interferences between neighboring cell sites and to allow seamless handover between cell sites, each cell site derives its transmission frequencies from an accurate frequency reference. This reference is inherent to TDM-based links as they transport frequency information for their own usage and proper operation. As the TDM links are being replaced by Ethernet-based ones, the frequency reference is lost. Synchronization schemes like IEEE1588V2 and Sync Ethernet have been developed to overcome this issue, which requires proper support by LTE-ready MW.

Legacy Support

Even with the shift to LTE, 2G and 3G networks will continue to operate. As 2G and 3G networks have coexisted for the past several years, so too will LTE coexist alongside 2G and 3G. Simultaneous support of both TDM-based and packet-based services is therefore required from LTE-ready MW equipment. In addition, flexibility to set the mix between TDM and Ethernet support is necessary to support the gradual shift towards a packet-based centric network.

Efficient Bandwidth Utilization

With the rise of traffic volume that the backhaul network needs to handle, special importance is given to efficient handling of available transport bandwidth. As was seen before, smart handling of both TDM and Ethernet is required. In the case of TDM traffic, grooming of partially populated TDM links is the main tool. Further bandwidth optimization can also be achieved by the use of circuit emulation and MPLS-TP to carry TDM traffic over packet-based links. In the case of data traffic, statistical multiplexing is a powerful tool to support far more services with only a fraction of the bandwidth allocated to TDM traffic.

Shared Infrastructure

Due to the huge costs associated with laying new infrastructure, service providers are looking to share equipment and thus investments. The BG-Wave management system is ready to support infrastructure-sharing by supporting Customer Network Management (CNM), allowing each service provider control to manage its own portion of the infrastructure.

Unified Management

The shift to LTE packet-based services imposes new challenges on the operation and maintenance of the network. In order to operate and maintain the new services efficiently, mechanisms like IEEE802.1ag and Y.1731 should be supported, and the same transport look and feel used in the past continued, also with respect to data services. With an eye to the future, management of MW equipment must also concurrently support fiber bearer in order to enable full E2E service provisioning.

Summary

LTE imposes several challenges on the backhaul network in general, and on MW equipment in particular. The BG-Wave MRAN, a full-blown networking element, is LTE-ready MW equipment ready to cope with these challenges. As its name indicates, LTE is an evolutionary process that coexists with legacy services and technologies. Flexibility to switch or concurrently support various technologies is therefore an essential characteristic of LTE–ready equipment.

The ECI BG-Wave is NG MW transport equipment delivering far more than possible by today's MW equipment capabilities. The BG-Wave incorporates comprehensive multiservice and networking capabilities to cope with upcoming LTE challenges.

About ECI Telecom

ECI Telecom is a leading global provider of intelligent infrastructure, offering platforms and solutions tailored to meet the escalating demands of tomorrow's services. Our comprehensive 1NET approach defines ECI's total focus on optimal transition to Next-Generation Networks, through the unique combination of innovative and multi-functional network equipment, fully integrated solutions and all-around services.

For more information, please visit http://www.ecitele.com.

1Net defines ECI's focus on facilitating our customers' optimal transition to Next-Generation Networks, through the unique combination of innovative and multi-functional network equipment, fully integrated solutions and all-around services

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