

## Wireless Backhaul – Faster, Bigger and Better

**A**s bandwidth-hungry mobile multimedia applications follow Voice-over-4G on a world-wide scale, many network operators are rushing to supplant their old T1 or E1 copper backhaul lines with fiber and/or microwave connections. There is no single magic solution for ramping up backhaul – it must be worked out on a site-by-site basis.

The existing backhaul infrastructure includes equipment, OSS systems, and operational staff that must be accounted for when setting the direction for a 4G backhaul architecture. Connection-oriented Ethernet (COE) promises high quality, protected, broad-scale aggregation for the Ethernet traffic that will dominate 4G backhaul networks. COE provides deterministic point-to-point paths for Ethernet connections and reserves resources for those connections through the network. This resource reservation, coupled with admission control, minimizes packet loss, latency, and jitter and allows for 50ms dedicated protection switching.

The industry is examining several options for COE, including PBB-TE, VLAN switching, PWE3/MPLS, MPLS-TP, and T-MPLS. Also, there are various approaches for T1 circuit emulation (in addition to native SONET transport) to support existing 2.5G/3G wireless networks. These technologies have enormous differences in operations, performance, and the

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ability to integrate into current backhaul networks. Fujitsu Network Communications, for example, has concluded that Ethernet-only approaches – PBB-TE and VLAN switching – provide significant advantages over IP/MPLS approaches in provisioning simplicity, software management, OSS integration, and network evolution. Carriers can leverage their existing network investment to support both TDM and packet traffic requirements in 2G, 3G, and 4G networks.



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For example, Exalt Communications designs, makes and markets next-gen wireless backhaul systems for service providers and enterprises worldwide. Exalt products are designed to solve the network bottlenecks associated with the increasing demand for IP-based voice, data and video applications and the resulting migration from TDM to IP-based networks.

Amir Zoufonoun, Founder and CEO of Exalt Communications, says, "We've focused on what we call a huge universal problem. People across all industries are now shifting their networks toward IP from TDM. Everybody realizes that's a better way to move traffic, and they can save money. The way we win against our competi-

tors is that we offer TDM and IP capabilities in every product we ship. Operators value that because they know they're going to transition to IP, but they also have a tremendous investment in their existing TDM infrastructure, and they want to preserve that investment as long as possible. So we give the customer a path to smooth the transition from TDM to IP, which is of great value to them. The same dynamics are at play in the government market, whether it involves things such as a

camera backhaul application in the Homeland Security world, or in a mobile network for backhauling traffic from a cell site, as we transition from 2G to 3G and eventually 4G. So, the dynamics are the same and the drivers are the same, and in all cases people are talking about delivering hundreds of megabits per second, so the days of expanding a system sufficiently just by adding another T1 or E1 are gone. It won't solve the bandwidth problem because every person is expecting tens of megabits of bandwidth to be delivered into their device, be it a laptop, PDA or smartphone."

"We saw this bandwidth problem appearing four or five years ago," says Zoufounoun, "and indeed it turned out to be *the* problem from a backhaul standpoint. We see more and more proof points concerning these two trends: the transition to IP and huge increases in the demands for bandwidth. So we're absolutely sure we're on the right track."

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"In mobile networks, 4G is around the corner," says Zoufounoun, "and you need multi-hundred megabit-per-second bandwidth at the network edge, which means you need a lot more than that in the 'middle-mile' of the network. And then there's a mix of TDM and IP-based base station technologies, ranging from TDMA, CDMA and GSM to HSPA, EVDO, WiMAX and then LTE. So this is definitely driving the way people think about backhaul – they want to put a backhaul system in place that's 'future proof' and that's music to our ears, because we've developed a universal platform with that capability."

"In terms of the economics of backhaul," says Zoufounoun, "in the legacy, voice-dominant networks, on a good day, the carriers make 8 cents on a dollar. As we transition toward data-dominant services, however that model is not sustainable. Carriers are spending about \$20 billion a year on these backhaul services. So money is available, that's part of the carriers' Opex, so the question is, how do you scale? What do you do? The answer is microwave radio, the payback period of which for very high speeds is measured in a few months. So it makes a lot of sense to fund microwave backhaul connections with Opex and pay for it, own it outright within a few months, and then have no recurring charges after that."

"An alternative solution is to install new fiber," says Zoufounoun. "But running new fiber to every base station doesn't make sense because it costs \$200,000 per mile. Wireless micro-

wave, on the other hand, has been following a sort of Moore's Law. The price is constantly going down, and the functionality is going up. At the same time, you can instantly deploy these microwave devices, whereas with fiber you have a very long wait time, sometimes up to nine months or even longer. And there are instances involving zoning issues where you can't even run fiber to where you want it to go."

"So our mission at Exalt Communications is to create a 'one-stop shop' for microwave backhaul," says Zoufounoun. "Today it's mostly point-to-point in nature. But point-to-point is just one topology. People are used to it and they know how to deal with it. But their mindset has to change within the customer base to use other topologies. Also, as microwave is used more frequently, people will think differently about the way they deploy microwave if it becomes their primary backhaul connection as opposed to being a 'last resort' alternative or auxiliary connection. People will then think about more complex topologies and start deploying them. We're definitely on that bandwagon. We are highly supportive of other topologies. It's not just a technology question, it's really a psychological question. Are operators comfortable designing a complete network made up of microwave radios? Once they are comfortable with that, we at Exalt think that other topologies are going to be part of these networks."

"In any event, the market is really big," says Zoufounoun. "About \$5.7 billion today. However, it is fragmented. I got excited in this space in 2003 and returned to it after 24 years because providers were not moving at the same rate that the market was progressing. They're extremely customer-driven, and there's an opportunity for a new company such as Exalt to come in and take share, serving the market a bit better in terms of offering innovative and future-proof products."

### Subtle Complexities in the Marketplace

Tellabs provides solutions for wireline and mobile networks, including the Tellabs IntegratedMobile solution that transports new 3G services and streamlines mobile networks to lower backhaul costs; the Tellabs DynamicHome solution that brings to the home the triple play of broadband voice, data and video services; the Tellabs MultiservicePLuS and AssuredEthernet solutions that deliver business services; and Tellabs Global Services which provides professional services for networks.

Stu Benington, Tellabs' Director of Portfolio Marketing, says, "We divide the mobile backhaul market into discrete chunks. The market varies by both region and the demographics of a given country or specific market. There are emerging markets that we target, and those are characterized as still being 2G and GSM ramp-ups. The challenge with these operators is getting tens or hundreds of thousands of subscribers added every quarter, and achieving scale as quickly as possible – nothing fancy, just getting those raw subscriber counts up. And then there's the more developed economies that are attempting to manage this transition from 2G to 3G to 4G."

“Then there’s the matter of what sort of physical connectivity is taking place, whether it’s copper, microwave or fiber,” says Benington. “That’s a very important piece of the puzzle, but it’s certainly not the only piece as an operator undergoes this migration. It’s just as challenging as navigating the changes in technology that goes over the physical connection. There’s traditional TDM circuitry was set up for 2G and still is used pretty heavily out there and then with the initial stages of 3G ramp-up there was a lot of ATM RAN [Radio Access Network] deployments. Moving on to Ethernet and IP, that’s now in various stages of acceptance as these transitions occur.”

“One key thing we see and have worked with our customers on, involves looking at all of the variables that come into play when you’re trying to manage this migration, both to provide the best end user experience and for achieving the lowest cost of rolling out the services from capital and operational standpoints,” says Benington. “That could concern what physical media you use, what types of lu bearer traffic connections you should use, what your network architecture topology looks like. Is it point-to-point? A ring? A mesh? What interfaces are you talking about from the transmission side as well as from the infrastructure side? As an example, you might say, ‘Hey, let’s go deploy Ethernet to the cell site, because it has many properties that help us move to 3G and 4G.’ That may be all well and good, but there might be connections for the radio interface that are still TDM, because there’s a lot of that technology still out there. Or it’s a mix of TDM and Ethernet. How do you ‘combine’ that over whatever backhaul you’re doing, be it microwave, copper, or what you?”

“Other considerations relate to what the business model looks like in a given market,” says Benington. “In the U.S. it’s basically a retail/wholesale model. That brings with it certain financial considerations that are different than the technology considerations. T1 is still dirt cheap from a wholesale standpoint in America. Financially it makes sense to continue to use T1s, even though the best technical solution is to make some aggressive moves toward Ethernet over fiber, or a more IP-centric architecture.”

### More an Art than a Science?

Providing sufficiently large “pipes” for wireless backhaul will challenge the abilities of carriers, network operators and all sort of service providers around the globe. Fortunately, many operators appear to be moving from TDM to Ethernet/IP and from T1s/E1s to fiber and/or microwave despite current economic conditions. **NGN**

*Richard Grigonis is Executive Editor of TMC’s IP Communications Group*

### Companies mentioned in this article:

**Exalt Communications**

[www.exaltcom.com](http://www.exaltcom.com)

**Fujitsu Network Communications**

[www.fujitsu.com](http://www.fujitsu.com)

**Tellabs**

[www.tellabs.com](http://www.tellabs.com)

## From the Desk of Michael Khalilian



by Michael Khalilian

### NGN Forum & IMS Forum Expands Its Plugfest Series

The NGN IMS Forum, the only industry association dedicated to interoperability and certification of IP Multimedia Subsystem (IMS) and Next Generation Networks (NGN) applications and services, has announced that its seventh IMS/NGN Plugfest will be held June 1-5, 2009 at the InterOperability Lab (UNH IOL) in Durham, NH. The NGN IMS Forum Plugfests are the industry’s only interoperability events covering NGN services over 3G, LTE, WiMAX, wireline and cable broadband.

The Plugfest 7 will cover all types of interfaces used in IMS, NGN, LTE and WiMAX utilizing Diameter for control and management, network operations (OSS/BSS) and integration with NGN applications and services. The event will address

the needs of protocol stack vendors and users, equipment vendors using Diameter in functions such as Call Session Control, Home Subscriber Servers, Charging, Policy Management, and Security. Diameter is an Internet (IETF) protocol developed to strengthen security and augment functionality of RADIUS (Remote Authentication Dial In User Service) and to deliver AAA (Authentication, Authorization and Accounting) functionality in Next Generation Networks. Together Diameter and the SIP (Session Initiation Protocol) support the delivery of voice, video, text and multimedia in NGN, or “all IP networks”.

With this Plugfest we continue to expand further into service delivery, the control and management, including billing, protocols and standards according to NGN, LTE and IMS architecture and framework. Plugfest 7 is a continuation of the IMS Plugfest series that started two years ago.

Forum membership and Plugfest participation is open to all companies. For online registration and info contact the forum at: [info@imsforum.org](mailto:info@imsforum.org) or visit [www.NGNforum.org](http://www.NGNforum.org). **NGN**

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