



## Next-Gen PON

SARDANA merges metro and access networks

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- > Six Top Analysts Forecast 2011 — and Beyond
- > Comcast Goes Green to Save Millions Annually
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— Intracom Telecom's Spiros Spirou with France Telecom's Dr. Philippe Chanclou (right)

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



# leading edge

## *A new age of smart mobile Internet begins*

The new era of smartphones and mobile tablets is beginning to unfold. Industry analysts expect 330 million new smartphones to be sold in 2011, as well as 42 million tablets (twice the number sold in 2010). Since smartphone users consume 10 times more bandwidth than others, mobile carriers face clear challenges in the years ahead.

New 3G and 4G networks are coming on stream to address bandwidth and capacity needs. But in the long run, delivering the mobile Internet will require more bandwidth and more intelligence. To learn more about our next-generation platform that's purpose-built for the needs of the mobile Internet, and new professional services that deliver actionable intelligence to enable better decisions and maximize profit, see Tellabs at Mobile World Congress in Barcelona, Spain, Feb. 14-17, at stand 2A47 in Hall 2.

Customers around the world have chosen Tellabs Mobile Solutions for more than 160 networks. In Asia-Pacific, we're helping customers succeed in the world's fastest-growing mobile markets, with millions of new subscribers added each month. Keeping up with growth while reining in costs is how we help customers succeed.

**VMS Mobifone's new mobile backhaul network handles 3G and more.** Vietnam's largest carrier is rolling out a new mobile backhaul network for 3G, enabling it to continue rapid expansion (page 8). Soon, VMS's 2G traffic will roll on to the same backhaul network. The result: 30% savings on mobile backhaul. And there's a bonus: because it's packet-based, VMS's backhaul network is ready for 4G as well.

**What's ahead in mobile communications?** Our panel of industry analysts foresees more speed, more value for users and more service innovations in 2011 (page 6). Not only will services be faster, so will the rate of change. One analyst foresees more than 1.2 billion new users of mobile Internet services by the year 2014.

**The trend toward greener networks and operations continues.** Many service providers are taking steps to make their networks, facilities and vehicles more energy-efficient. A leader in the green movement is Comcast, which is pushing fiber deeper into its U.S. network as the company embraces "green wherever it makes good business sense" (page 14).



**Leapfrogging a generation of technology offers a tremendous upside.** Tellabs is working with universities and with France Telecom on SARDANA, a new optical access technology that reduces capital costs by converging metro and access networks (page 12). SARDANA offers 32 times more bandwidth per fiber with 3 times the reach of today's passive optical networks. Our new technology will enable service providers to operate with fewer central offices and meet the needs of mobile backhaul networks too.

As 2011 and the Year of the Rabbit begin, we at Tellabs wish you a Happy New Year.

A handwritten signature in blue ink, which appears to be "Sanjay Patel", is shown on a white background.

*Sanjay Patel*  
Vice President – Asia Pacific

# upload

## Not All Futurecom Attendees See the Light

**At Futurecom São Paulo in October 2010, no one was disputing the fact that service providers have their hands full trying to keep up with Internet traffic. So it was surprising that a Tellabs poll of 400 attendees found that so few have gone optical.**

Only 18% of respondents have deployed packet technology, and even fewer are using DWDM.

“Service providers are missing an opportunity by not incorporating packet optical transport technology into either the core or metro part of their networks,” Juan Luis Balbas, Tellabs director of technology for Latin America and the Caribbean, recently blogged.

One potential barrier to adoption is the perception that core IP networks have a high total cost of ownership.

“Yet service providers can reduce that TCO by offloading from the routers 80% of all the IP traffic traversing their core networks,” Balbas said. “Because that 80% – consumer Internet, IPTV, VoIP and VoD services – typically goes to only one or two peering points in a given

metropolitan area, it doesn't need to go through the routers.”

That router-bypass strategy can save 51%-75% of CapEx. Yet only 6% of Futurecom survey respondents believed that those savings were achievable. Operators willing to buck that conventional wisdom could slash their overhead costs to gain a competitive advantage.

For the rest of the Futurecom survey results and Balbas' analysis, visit [www.tellabs.com/blog](http://www.tellabs.com/blog) and click on “A Missed Optical Opportunity.”



**Try a few questions from the Futurecom São Paulo survey and see how your responses compare with what most attendees said. Then find out what Tellabs says service providers can reasonably expect in real-world deployments.**

**How much CapEx can you save using packet optical transport to bypass core routers for Internet, VoIP and IPTV traffic?**

**28% of Futurecom attendees surveyed said 15%-50%, and 18% said less than 15%. Tellabs finds that service providers can reasonably expect 51%-75%.**

**How much energy can you save using packet optical transport to bypass core routers for Internet, VoIP and IPTV traffic?**

**22% said 10%, and another 22% said 30%. Only 4% said 65%, which is the amount that Tellabs says service providers can reasonably expect.**

**How much space can you save using packet optical transport to bypass core routers for Internet, VoIP and IPTV traffic?**

**30% said 15%-50%, and 16% said less than 15%. Tellabs achieves 51%-75%.**

## GLOBE TELECOM SHAKES UP THE PHILIPPINES BROADBAND MARKET

“We came up with what we thought would be the ideal network,” Jesus Romero, head of enterprise segments at Globe Telecom, told *Insight* nearly a year ago. Filipinos clearly agree: Since then, Globe's broadband customer base nearly doubled to more than 1 million.

Network upgrades are a major reason for that growth. In 2008, the operator's Globe Business unit deployed an MPLS-enabled IP core network based on the Tellabs® 8800 Multiservice Router Series. That upgrade meant Globe Business now could use a single platform to maintain its legacy ATM/Frame Relay revenue while offering new Ethernet and IP services.

For an inside look at Globe's transformation, visit [www.tellabs.com/insight](http://www.tellabs.com/insight) and check out “An ICONic Network” in the 2Q 2010 issue.



## Mobile Backhaul Spending to Hit \$117 Billion by 2014

Analysts and vendors such as Tellabs have spent the past few years warning that WiMAX and LTE will send backhaul traffic through the roof. It turns out they weren't crying wolf. Case in point: Sprint said some of its WiMAX sites are backhauling 30 times more than their CDMA counterparts.

To keep up with that workload, carriers will spend nearly \$117 billion on backhaul by 2014, a recent In-Stat report predicts. That's 41% more than 2009, including everything from new infrastructure to leased lines.

"We're seeing an emerging industry consensus that the optimal solution involves running fiber optic cable straight to each base station, with the Ethernet protocol as the backhaul," said Chris Kissel, an In-Stat analyst. "While this solution is prevalent in areas where fiber is available, the ability to install new fiber is cost-prohibitive in many locations and physically impossible in others."

That's a major reason why In-Stat expects the microwave market to grow from \$159 million in 2009 to \$874 million by 2014. The firm also predicts:

- By 2014, more than half of North American backhaul capacity will be dedicated to LTE.
- In Western Europe, backhaul capacity will triple between 2010 and 2014, to nearly 60,000 Gbps.
- Ethernet will be the dominant carrier technology by 2014, with 85% usage in base stations.

"The best solution for each operator depends upon a unique combination of factors, thus expanding the universe of potential solutions and suppliers," Kissel said.

One example is Tellabs' partnership with Nokia Siemens Networks (NSN), which has enabled interoperability between NSN's FlexiPacket Microwave Radio and the Tellabs® 8600 Managed Edge System.

"By working together, NSN and Tellabs can offer network operators classic OpEx savings," Damian Dalgliesh, head of mobile backhaul sales at NSN, said in a recent *Insight* article. For the rest of that story, visit [www.tellabs.com/insight](http://www.tellabs.com/insight) and check out "New Partners Bring New Solutions" in the 4Q 2010 issue.

## U.S. Teens Text More, Talk Less

American teenagers love SMS: The average teen sends and receives 3,339 text messages per month, up 8% over 2009, according to a recent report from The Nielsen Company.



That's the most of any demographic group. Texting falls off a cliff after age 18, when usage plummets to 1,630 per month. Even so, every demographic group through age 64 is texting more than they did 1 year earlier.

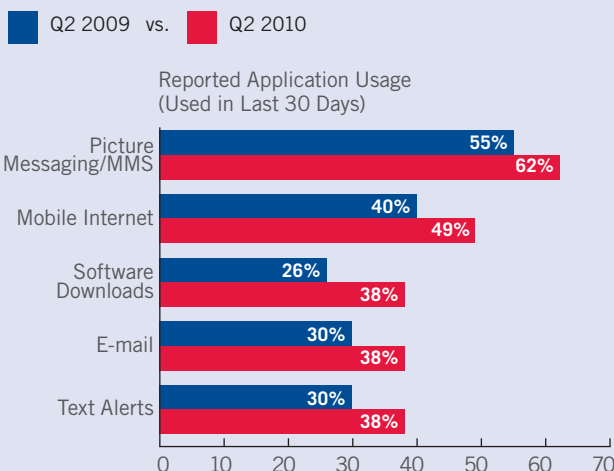
Nielsen also found that teens aren't a homogenous group. For example, females are the biggest texters, at 4,050 messages per month compared with 2,539 for males.

There's also a big gender difference when it comes to talking. Although males and females are both talking less – 14%, to be exact – and texting more compared with 2009, girls average 753 minutes per month and males 525.

The reasons for texting's popularity also have changed. In 2009, teens texted instead of calling because it was fun, Nielsen said. In 2010, fun was still a major motivation, but teens now also identified ease and speed as major reasons why they prefer to text rather than talk.

Although texting is coming at the expense of talking, that's not the case when it comes to apps and other data services. Between 2009 and 2010, monthly teen data usage increased from 14 MB to 62 MB, with males using the most: 75 MB.

### National Data Usage Among Teens



Source: The Nielsen Company

For more insight, visit [www.tellabs.com/blog/index.cfm/2009/6/10/Welcome-to-the-Jungle](http://www.tellabs.com/blog/index.cfm/2009/6/10/Welcome-to-the-Jungle)



**As the global economic funk grinds on, consumers remain hunkered down with the things that mean the most to them, such as their iPhones and broadband. At the 2010 Tellabs analyst conference, 6 analysts discussed why consumers see value in telecom and how service providers can capitalize on that perception.**

Following are some highlights from those conversations. An extended video version is available at [www.tellabs.com/resources/multimedia](http://www.tellabs.com/resources/multimedia).



**Ray Mota, managing partner**

**for ACG Research:** A lot of people really didn't pay attention to the economy. Now they realize that the economy has a major impact on technology.

What's happened is, you move from this concept of what we call "mindless consumption of data." A lot of carriers and a lot of enterprises would solve the problem by just throwing more bandwidth at it.

They're moving to, "I need to put more intelligence on the network." With that intelligence comes QoS capability, types of quality.

Even in a down economy with less discretionary income, people were willing to spend up to \$300 for the iPhone. It wasn't really anything new with that device from a wireless technology perspective.

But it created the front-end experience where they

made the device almost like dial tone, where you pick it up, and you can do things. So people are willing to pay for that experience, and they're willing to pay more.

We recently did a survey of about 41 service providers around the world. The No. 1 priority, at least from the executive perspective, was how do we bring more customer value?

No. 2 was service innovation: What service innovation is out there, and is there technology to align there to give that business value from that perspective? No. 3 was cost optimization.

Those are the 3 priorities from a carrier perspective right now, which was different than what I thought it would be. It's interesting that innovation had a higher priority than cost, even in a down economy.



**Dana Cooperson, head of Ovum's network infrastructure practice:**

We're seeing some technology shifts. For example, in optical we're expecting to see a lot more activity in OTN in 2011.

The industry's gone past the debate of do we need OTN? OTN as a technology has been in the network for a long time: It's been used as part of a digital wrapper to allow transport networks to more effectively carry packet traffic, for example. The move to OTN switching is what's new.

We're seeing two OTN switching trends. One is the inclusion of integrated OTN switching within a platform like the Tellabs® 7100 Optical Transport System that does photonics (WDM) along with a bunch of other things, such as SONET SDH and packet aggregation and grooming.

The other trend is the OTN switch that lets operators pack the wavelengths more effectively and efficiently so that the traffic can be transported. This "big, honking switch" is a standalone, multi-terabit switch that will take the place of the old SONET SDH switches and provide a point whereby the traffic can be groomed before it gets onto the long-distance wavelengths. It will also allow router bypass for traffic that does not require routing.

The standalone OTN switch is about network efficiency in the deep core, and about having a touch point in the network to look at the different kinds of traffic, Ethernet and so on, as it enters and leaves the core network. That's a very different application than the integrated OTN switching capability, which is more about improving multi-service, multi-layer efficiency in the metro.

There's also just the need for speed, the need for capacity and scalability. The need for folks like Tellabs to provide 40G/100G capacity wavelengths to their customers is becoming a very, very big thing.



**Michael Howard, principal analyst and cofounder at Infonetics Research:** I think the biggest difference between 2010 and 2011 will be an acceleration of what's been happening.

Between this year and 2014, for example, there'll be 1.5 billion new mobile subscribers, but 1.2 billion more mobile *broadband* subscribers. Mobile broadband is accelerating in all parts of the world.

With the increase in devices, and smart devices causing maybe 10 times more bandwidth on the backhaul networks, carriers have been rushing to increase the capacity of their backhaul networks.

Carriers have been moving to packet backhaul: IP and Ethernet. It's really the only cost-effective solution for the backhaul problem. In 2009, 57% of the spending for backhaul was on Ethernet equipment. In 2010, that's up at 65%.

**CapEx:** Capital Expenses

**HSPA:** High-Speed Packet Access

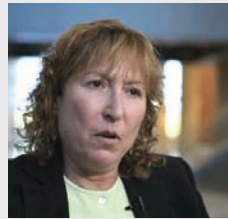
**LTE:** Long-Term Evolution

**OTN:** Optical Transport Network

**QoS:** Quality of Service

**SDH:** Synchronous Digital Hierarchy

**SONET:** Synchronous Optical Networking



**Eve Griliches, managing partner at ACG Research:** One of the things that you've done in the analyst conference is talk about targeted advertising. That's really where the service providers are going to be making some money.

Vendors are going to have to help the service providers do that. They can start adding levels of intelligence into the optical network to enable more of those services.



**Iain Gillott, founder and president of iGR:** The discussion is going to change from what *will* LTE be like to what *is* it like. All the people who, like AT&T, were planning it are going to get asked, "When are you going to do it?"

Even though HSPA+ may be 99%, 95% of the way there, it won't be seen as enough by the financial markets or the press. I think the discussion's going to change very quickly.



**Andre Viera, telecom infrastructure program manager at IDC:** There's a bit of a pickup in certain regions in terms of the demand for network infrastructure.

Service providers around the globe have been migrating their CapEx from more traditional areas to mobile Internet. Definitely you're going to see that trend continue.

It's the touch points that people have in their networks. Everyone around the world now has access to more devices that allow them to be connected to each other.

As the touch points increase and the bandwidth for those touch points increases, people are using more and more of that as if they were using their computers in their homes. So it's really a fantastic trend that's going on.

Because of the personalized use, I see that people are going to have their own personal applications on all the time. They want to stay connected to other people and to what's going on in the world. There's almost like an umbilical cord to the Internet. ■



For more insight, visit [www.tellabs.com/resources/multimedia](http://www.tellabs.com/resources/multimedia)

# For VMS MobiFone, MPLS is Key

*Vietnam's largest operator turns to Tellabs for a new backhaul strategy as it rolls out 3G.*

*By Joan Engebretson*



**Although nearly 1 out of every 2 Vietnamese mobile users are its customers, Vietnam Mobile Telecom Services Company (VMS) isn't content to rest on its laurels. Instead, the state-owned operator – which sells service under the MobiFone brand – is aggressively upgrading its network to stay on top in a market that some analysts forecast will be as big as Japan's by 2014.**

Backhaul is a prime example. VMS knew it needed to add backhaul capacity to keep up with customer demand for the bandwidth-intensive data and multimedia services that its UMTS upgrade would enable.

But even as it was preparing to deploy 3G, VMS also was looking ahead to 4G, whose all-IP design gives operators new options for reducing OpEx, including on the transport side.

For 3G, VMS opted to use a backhaul network architecture based on the Tellabs® 8600 Managed Edge System. That choice has enabled VMS to minimize both CapEx and OpEx today while also providing the foundation for 4G tomorrow.

### **A Clear Choice: MPLS**

VMS first learned about Tellabs' approach to mobile backhaul at a workshop that Tellabs conducted for the carrier.

"After attending the workshop, we realized the important considerations and issues involving the transport networks to support 3G and 4G services," said Nguyen Dang Nguyen, vice president of network planning and management for VMS. "We also understood the scalability and potential of a high-speed, packet-based transmission infrastructure. We assimilated important concepts for design, planning and dimensioning the transmission architecture for next-generation networks."



*Headquartered in Hanoi, MobiFone is the largest telecommunications provider in Vietnam, with 41% of the mobile market.*

***“The Tellabs product is more attractive because it combines both ATM and IP packet processing in one box, which saves CapEx and OpEx.”***

— Nguyen Dang Nguyen, vice president of network planning and management for VMS

VMS's 2G network relied heavily on leased lines, as well as some SDH and PDH microwave links for backhaul. The operator considered reusing this infrastructure for its 3G backhaul, perhaps enhancing some of it to support Ethernet.

Nguyen and his team also liked the idea of using MPLS, which can be transported over a variety of physical links, including SDH and higher-bandwidth, more economical Ethernet links. MPLS became even more attractive after they learned at the Tellabs workshop that numerous Tier 1 mobile operators use it to support 2G and 3G backhaul, integrating the two networks onto a common packet infrastructure.

VMS decided to deploy its 3G network in 3 phases.

The initial phase would use ATM connectivity for delay-sensitive voice and control plane traffic, with all other traffic running over IP. Next, VMS will move the traffic from its TDM-based, legacy 2G backhaul network onto the same packetized backhaul infrastructure implemented for 3G. In the third phase, all 3G traffic would be handled as IP.

VMS also anticipated eventually deploying 4G service and wanted to plan its 3G network in a way that would simplify the 4G upgrade. In the process, VMS wanted to minimize the cost of leased circuits and optimize its existing investment in SDH and PDH microwave infrastructure.

### **Bridging Two Worlds**

After carefully considering various options, VMS determined that an MPLS backhaul architecture, centered around the Tellabs 8600 system, would help it achieve all of these goals. Even so, VMS was concerned that its technicians were accustomed to certain maintenance and troubleshooting capabilities inherent in their traditional SDH approach—and that MPLS would not support the same capabilities.

But the Tellabs 8600 system has an important feature that helped address these concerns: It supports packet loop testing so that even when it's using MPLS circuits for transport, VMS technicians still can measure the circuit performance of these packet-oriented circuits.

"If there were a problem, this capability would help us identify the problem conveniently and easily so that it could be solved quickly," Nguyen said.

### **Early Efficiency**

VMS chose a network architecture that uses Tellabs 8600 systems installed at 2 types of key anchor points in its backhaul network: Hub Site and RNC Site locales.



Vietnam's aged wireline infrastructure can't keep up with its population of more than 87 million.

At the Hub Site locales, some Tellabs 8600 network elements aggregate traffic from multiple Node Bs. Typically, the Hub Site-located Tellabs 8600 is connected via a leased Fast Ethernet circuit to a second Tellabs 8600 installed next to an RNC.

In other parts of the network, SDH microwave radios connect Hub Site and RNC Site locales. In both scenarios, the Tellabs 8600s use MPLS to communicate with each other.

In Phase 1 of VMS's 3G network deployment, IP datagrams handle data traffic, while ATM cells carry delay-sensitive voice and control plane traffic over the MPLS links using Pseudowire (PWE3) emulation. The Tellabs 8600 also supports ATM IMA, enabling early termination of ATM IMA links, from the Node Bs, at the Hub Site locales.

The ATM cells are then extracted and encapsulated as MPLS-based Pseudowire circuits and transported over a packet-based transmission. This approach enables early packetization of the backhaul network, thus allows statistical multiplexing to happen closer to the access network.

With this design, network transport efficiency is experienced as early as possible in the traffic's journey. The PWE3 technology will also play an important role when 2G traffic, based on the TDM framing format, is moved onto the new backhaul network in Phase 2.

"The Tellabs 8600 Multiservice Routers at the Hub Site and RNC Site locales work as a pair to enable legacy traffic and interfaces to be transparently transported over a MPLS-based packet network infrastructure," said Richard Jung, Tellabs strategic business development manager for Vietnam.

The platform's ability to support both IP and ATM traffic aggregation was an important reason why VMS chose Tellabs. Edge network devices from some other manufacturers are not able to support both traffic types and instead require two separate pieces of equipment.

But as Nguyen explained, "The Tellabs product is more attractive because it combines both ATM and IP packet processing in one box, which saves CapEx and OpEx."

***"We are happy with the product and the technology and the support we have received from Tellabs."***

— Nguyen Dang Nguyen, vice president of network planning and management for VMS

#### **Fast Savings**

The Tellabs 8600 also eliminates the need to lease expensive SDH circuits to support high-bandwidth, best-effort, Internet-bound mobile traffic, resulting in additional cost savings. For handling such traffic, the Fast Ethernet circuits are more economical on a cost-per-bit basis than the SDH circuits that VMS is phasing out.

Fast Ethernet also uses bandwidth more efficiently because unlike SDH, it supports statistical multiplexing, eliminating the need to "nail the bandwidth" of the transmission link like PDH/SDH circuits usually do.

"If you lease SDH circuits and groom them using SDH, there is no multiplexing gain to talk about when using this method to transport best effort user traffic," Jung said. "You

will burn a lot of bandwidth, and be forced to use the high QoS that is inherent on these leased lines, to transport the datagram traffic that is based on best-effort QoS classes. This is both wasteful and inefficient.”

Tellabs also maximized the VMS backhaul network’s efficiency with a network architecture that uses a single Tellabs 8600 at the RNC Site locale to connect to multiple co-located RNCs. This design enables a higher speed interface, such as STM-1, between these RNCs and the RNC Site-based Tellabs 8600, while the lower speed E1 connections are terminated early in the Hub Site locale Tellabs 8600 node.

This approach enables VMS to increase the number of Node Bs that can be terminated and controlled per RNC, instead of having each RNC terminated to the Node Bs directly with native E1 interfaces. Those E1 interfaces usually are a limited and expensive resource.

Apart from using more cost-effective, packet-based leased circuits, VMS also wanted to be able to continue to use as much of the company’s existing microwave backhaul infrastructure as possible. The solution was to use groups of microwave radios to create an SDH ring between the Tellabs 8600 anchor points at the Hub Site and RNC Site locations and to run MPLS over this SDH infrastructure.

“It enables VMS to re-use their SDH infrastructure as a packet-based network,” Jung said.

This approach provides the best of both worlds: The packet-based MPLS network has the resiliency and robustness of a SDH network, yet it enables the efficient transport of packet-based datagram traffic.

### Phasing Out ATM

Beginning in 2012 or 2013, VMS plans to make its 3G backhaul network even more efficient by enabling it to carry delay-sensitive voice and control plane traffic in IP format rather than using ATM.

In order to support this traffic, the backhaul network must be able to support packet synchronization technologies. Initially the Tellabs 8600 at the Hub Site location will provide synchronization to each Node B over the E1 connection to the Node B.

Eventually VMS may use packet synchronization techniques such as Synchronous Ethernet or IEEE 1588v2 Precision Timing Protocol over the Ethernet connections between each

Node B and the Hub Site-based Tellabs 8600. There, the RNC performs a phase or frequency time synchronization over the packet based with the Node B base stations.

VMS also considered how 4G would impact the 3G backhaul network. In 4G networks, unlike previous generations, individual BTSs can communicate with one another, rather than communicating only with the RNC. This capability requires the backhaul network to support multipoint IP-VPN, a feature the Tellabs 8600 includes.

### At Least 30% Backhaul Savings

Nokia Siemens Networks was chosen for the VMS 3G contract in 2009 and integrated the Tellabs 8600 system for the mobile backhaul deployment. Several segments of the network have been operational since late that year, with additional segments going live on a regular basis.

The carrier expects to have the deployment completed by 2011.

VMS plans to move traffic from its 2G network onto the new backhaul infrastructure in its 2010 3G expansion.

Nguyen estimated that using the Tellabs 8600 has saved at least 30% in the costs paid to its wholesale network provider for connectivity.

“Instead of using TDM and separate Ethernet circuits, we can aggregate all that traffic onto one transmission link,” Nguyen said.

Overall savings undoubtedly are even greater when the savings created by the multiplexing gain and the ability to control more Node Bs per RNC are factored in.

Nguyen is confident that the Tellabs platform will support a smooth transition when the company moves voice and control plane traffic onto IP and when VMS deploys 4G.

“We are happy with the product and the technology and the support we have received from Tellabs,” Nguyen said. ■



*VMS Mobifone is excited about modernizing its network to 3G and implementing an IP backbone to handle the expected growth.*

**2G:** Second Generation

**3G:** Third Generation

**4G:** Fourth Generation

**ATM:** Asynchronous Transfer Mode

**BTS:** Base Transceiver Station

**CapEx:** Capital Expenses

**IMA:** Inverse Multiplexing over ATM

**IP:** Internet Protocol

**MPLS:** Multiprotocol Label Switching

**OpEx:** Operating Expenses

**PDH:** Plesiochronous Digital Hierarchy

**QoS:** Quality of Service

**RNC:** Radio Network Controller

**SDH:** Synchronous Digital Hierarchy

**TDM:** Time-Division Multiplexing

**UMTS:** Universal Mobile Telecommunications System

**VPN:** Virtual Private Network

# SARDANA and the Bandwidth Boom



SARDANA's WDM technology will enable operators to offer premium-priced, high-bandwidth packages to both residential and commercial customers.

## ***Tellabs teams with major operators and researchers to develop next-generation PON.***

*By Jim Hinckley*

### ***Goodbye, dark fiber. Hello, new set of challenges.***

In the enterprise market, bandwidth-intensive applications have become the norm. Businesses are increasingly using videoconferencing and telepresence to save time and travel costs. Meanwhile, consumers are spending more time online playing games, sharing photos and watching videos — and increasingly from wireless devices such as smartphones and tablets.

That usage has operators scrambling to strike a delicate balance among capacity, speed, scalability, density, resilience and OpEx. Enter the SARDANA consortium, which is approaching a key milestone toward providing operators with new PON-based solutions to stay ahead of bandwidth demands.

Short for Scaled Advanced Ring-based passive Dense Access Network Architecture, SARDANA was founded in 2008 with European Commission sponsorship. Tellabs is the only infrastructure vendor in the consortium, whose other members include France Telecom's Orange unit and several major research universities.

"SARDANA shakes up PON technology and brings the potential for a new suite of high-quality services to our customers," said Dr. Philippe Chanclou, France Telecom manager of advanced access and home networks. "We're very excited to start the field trials in Lannion to demonstrate both the urban and rural scenarios of SARDANA."

### **Passive Convergence**

SARDANA's goal is to evolve GPON from the ITU-T G.984 standard to the new ITU-T G.987 standard and beyond. G.984 was notable for both its speed – 2.5 Gbps downstream and 1.25 Gbps upstream – and its support of non-native transport protocols such as ATM, Ethernet and TDM.

But G.984's complexity has limited its deployment. Issued in June 2010, G.987 has become the leading candidate for a FTTH GPON specification, largely because of interest from FSAN, a group of major operators and industry experts.

FSAN's research into 10G GPON produced the technical designs and system requirements for two classes of service: XG-PON1, which meets the G.987 standard by providing 10 Gbps downstream and 2.5 Gbps up, and XG-PON2, featuring 10 Gbps symmetrical.

In response, the SARDANA consortium came together in 2008 to develop a structure for next-generation PON networks. SARDANA merges the access part of today's networks with their core or metro ring, where multiservice Layer 2 and 3 functionalities now reside. The merger extends these capabilities out to locations that currently rely on a CO, including cellular base stations, homes, small businesses and rural areas.



***"By merging the metro and access parts of their networks, carriers can reduce capital costs."***

— Dan Kelly, Tellabs executive vice president, global products

“Convergence is what SARDANA is all about,” said Dan Kelly, Tellabs executive vice president, global products. “By merging the metro and access parts of their networks, carriers can reduce capital costs.

“Using passive products helps to reduce operating costs, and consolidating locations pares down labor expense, property tax, maintenance and other office-related expenses. SARDANA helps with all that.”

## 24 Months to Commercial Launch

Consortium members and European Commission representatives got their first demo of SARDANA on October 28, 2010, at the Tellabs facility in Espoo, Finland. SARDANA's public debut will be February 9-11 at the FTTH Council Exhibit in Milan, Italy, where consortium representatives plan to urge the ITU to consider incorporating SARDANA into the NG-PON2 standard.

## BIGGER, STRONGER, CHEAPER

SARDANA's compatibility with existing GPON technology is one of its benefits. Others include:

- **Fewer COs, reducing OpEx.**
- **100 km (62 mile) signal range, more than triple the reach of today's PONs.**
- **32 times more bandwidth on a single-mode fiber than today's best PONs provide.** SARDANA uses WDM to drive up to 32 10 Gbps wavelengths down a fiber where only one currently goes.

This breakthrough delivers 128 times the bandwidth of G.984 GPON and will enable operators offer premium-priced, high-bandwidth packages to large commercial customers. For smaller businesses and residential customers, SARDANA provides higher split ratios: up to 1,024 subscribers per PON.

- **Cheaper, simpler installations.** Today's optical network connections rely on a pair of laser transmitters for one specific frequency of light to and from the end-user's location. SARDANA replaces these transmitters, which can cost as much as \$1,000 each, with smaller, colorless ONTs.

Because they have no laser and need no tuning, these passive ONTs are much less expensive and can manage all 32 incoming wavelengths. That slashes inventory requirements.

- **Greater network resiliency, thanks to a dual-ring architecture.** This also gives PONs greater stability comparable to Ethernet and legacy SONET platforms.
- **More bandwidth and network intelligence for smart mobile backhaul applications.** Only optical networks can keep up with skyrocketing mobile data traffic.



**“This is the first step we've had with Tellabs, and it was perfect.”**

— Dr. Philippe Chanclou, France Telecom manager of advanced access and home networks

Although SARDANA is at least 24 months from commercial rollout, Tellabs and others are already talking about the applications it can enable or dramatically improve. HDTV, UHDV and 3D TV are some potential consumer beneficiaries, along with holographic telepresence and telemedicine in the business market.

“The challenge [for service providers] is, how do you deliver more and more services at higher bandwidths and make the economics work when revenue per user is largely fixed?” Tellabs' Kelly said at the Espoo demo. “At Tellabs, we understand that very well, and it challenges us to innovate and drive down costs.”

## “Pushing the Envelope”

But perhaps the largest, most immediate market opportunity is mobile backhaul, which is struggling to keep up with about 130,000 TB of traffic per month, according to iGR, a research firm. By 2014, the monthly load will hit 990,000 TB.

Carriers that use mostly legacy transport protocols for backhaul – such as PDH, ATM over PDH or SONET/SDH – have seen their service charges per connection rise significantly more in recent years than those using PON or Ethernet. To rein in their backhaul costs, carriers increasingly are seeking GPON services.

“The focus [of SARDANA] is on pushing the envelope from a technology perspective: How can we solve bandwidth problems of capacity, density and reach to deliver high-bandwidth services in the metro and access networks?” Kelly said.

It's a question that just about every major service provider is asking, putting SARDANA in the right place at the right time. ■

**3D:** Three Dimensional

**ATM:** Asynchronous Transfer Mode

**CO:** Central Office

**FSAN:** Full Service Access Networks

**FTTH:** Fiber to the Home

**GPON:** Gigabit Passive Optical Network

**HDTV:** High-Definition TV

**ITU:** International Telecommunication Union

**NG-PON2:** Second Next-Generation Passive Optical Networks

**ONT:** Optical Network Terminal

**OpEx:** Operating Expenses

**PDH:** Plesiochronous Digital Hierarchy

**PON:** Passive Optical Network

**SDH:** Synchronous Digital Hierarchy

**SONET:** Synchronous Optical Networking

**TB:** Terabyte

**TDM:** Time Division Multiplexing

**UHDV:** Ultra High-Definition Video

**WDM:** Wave Division Multiplexing

**XG-PON:** 10 Gbps Passive Optical Network

# Comcast Goes Green

*From its plant to its vehicles, America's largest cable operator is ferreting out inefficiency, saving millions of dollars annually so far.*

By Dawn Bushaus

*Visitors to the 58-story Comcast Center headquarters building in Philadelphia might be impressed by the building's striking architecture and seasonal gardens. But they probably don't know that these features aren't just for show. Instead, they help make the building more energy-efficient — just one of the many ways Comcast is going green.*

Because of data centers, the information and communications technology (ICT) industry is responsible for 2% of the world's carbon output, which puts it on par with the airline industry. A 2007 Environmental Protection Agency report to Congress predicted that this year, annual U.S. data center power consumption will double to 100 billion kilowatt hours. That's \$7.4 billion a year.

As the largest cable operator in the United States, Comcast feels the pain of energy consumption.

"We have electric bills in excess of \$300 million annually, so there is obviously an opportunity for efficient solutions that can help us address that," said Sam Chernak, senior vice president of network architecture at Comcast.

*Comcast's new headquarters is the largest LEED-certified building in the United States. Its highly efficient design is one of the ways that Comcast is reducing its \$300 million-plus annual electric bill.*



## Green is Good

Comcast also sees an opportunity for it and other ICT companies to play a leadership role in reducing energy consumption.

*A 2008 report from The Climate Group, an independent not-for-profit organization dedicated to advancing technology that cuts global carbon emissions, shows that while ICT's 2% carbon footprint will nearly double by 2020, the sector's ability to offer products and services that reduce energy consumption could cut carbon emissions 5-fold. That would save 7.8 Giga-tons of carbon dioxide.*

Comcast has embarked on several initiatives to reduce energy consumption, which promises a 2-fold benefit of saving money and helping the company become a better corporate citizen.

“We will embrace green wherever it makes good business sense,” Chernak said.

In 2009, Comcast formed a sustainability working group to identify ways the company can become more energy efficient. The company also initiated a young leadership program for rising-star employees and gave them the task of identifying ways Comcast can improve.

Collectively, those efforts have identified 4 main target areas:

- Energy-efficiency in buildings, such as data centers, and in the network
- Better fleet management
- Increased telecommuting
- Waste reduction

In terms of energy efficiency, Comcast is working to improve airflow and upgrade air-conditioning equipment in its 8 data centers, which will result in \$2 million in savings over the next 5 years, Chernak said. The company also is rolling out a PC-management program that will encourage employees to power down computers when they leave for the day.

### Fiber's Carbon Footprint

On the network side, Comcast continues its push to replace power-hungry coaxial cable with fiber. Its plant currently consists of about 600,000 miles of HFC.

“The biggest power consumer for us is the plant because there is so much of it,” Chernak said. “We are taking this passive, non-powered piece of glass and laying it into the network, so by definition there is an inherent greening of the network as you push fiber deeper.”

The company is also spearheading an effort to develop a next-generation edge device called the Converged Multiservice Access Platform (CMAP), which merges QAM channel systems with CMTSs.

“With the CMAP, many more subscribers could be provisioned per box, and the power profile on a per-subscriber basis is a fraction of what it has been historically,” Chernak said.

Comcast plans to have a CMAP prototype in its lab early this year, with deployment slated for late 2011 or early 2012.

Better vehicle fleet management is another goal for Comcast. With 38,000 vehicles, the company operates the

fourth-largest fleet in the United States, so improving fuel economy is important. Since 2009, 80% of all Comcast vehicles purchased have been flex-fuel-capable, and all passenger vehicles have been hybrids, Chernak said.

Taking employees' cars off the roads can also reduce Comcast's carbon footprint. Currently about 5% of its 20,000 customer service representatives are participating in a work-at-home trial. The preliminary results are encouraging.



*“By definition there is an inherent greening of the network as you push fiber deeper.”*

— Sam Chernak, senior vice president of network architecture at Comcast

### Waste Not, Want Not

Waste reduction is Comcast's fourth area of focus. The company's Philadelphia headquarters is the largest Leadership in Energy and Environmental Design (LEED) certified building in the United States. Comcast also provides recycling bins throughout the building.

Comcast encourages paperless billing, as well, and about 20% of its customers have adopted it. The company also has moved to e-proxies for shareholder meetings, reducing paper use by 85%.

Comcast has not yet set specific carbon-reduction goals, nor has it begun using alternative forms of energy such as solar, wind or fuel cells. But those options are on the horizon, Chernak said. The company is also looking into how it can help its customers use cable technology to manage their homes' energy consumption.

According to The Climate Group's “Smart 2020” report, ICT companies such as Comcast could help save \$800 billion annually in energy use by enabling applications such as smart buildings and homes and smart electricity grids. The report also anticipates savings from replacing physical products, such as servers, with virtual ones.

“We have this wonderful broadband connection into 17 million homes in America, so there's a natural extension of our services to include home, light and energy management,” Chernak said.

“Comcast's goal is to deliver tools to help consumers be as green as they want to be. Ultimately, the world will find its green equilibrium on both the consumer and corporate sides.” ■

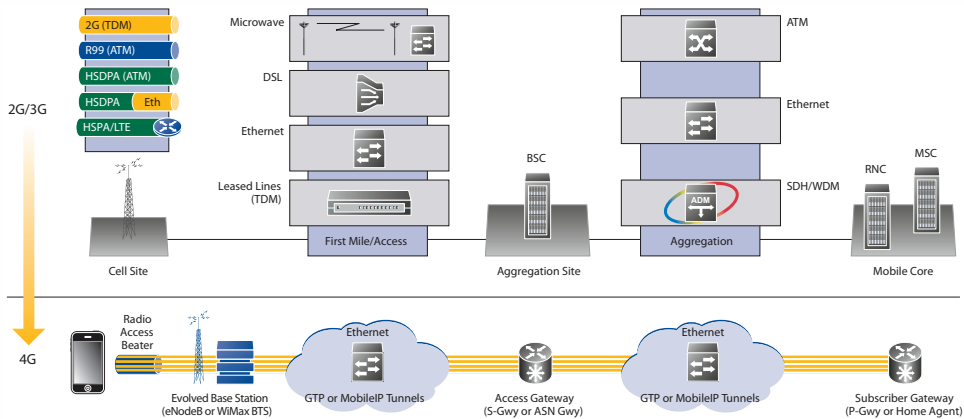
**CMTS:** Cable Modem Termination System

**HFC:** Hybrid Fiber Coax

**ICT:** Information and Communications Technology

**QAM:** Quadrature Amplitude Modulation

## Tellabs® Smart Backhaul — Advancing 3G Networks with 4G Intelligence



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