



Next-Gen PON

SARDANA merges metro and access networks

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“SARDANA shakes up PON and brings the potential for a new suite of high-quality services.”

— Intracom Telecom's Spiros Spirou with France Telecom's Dr. Philippe Chanclou (right)

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