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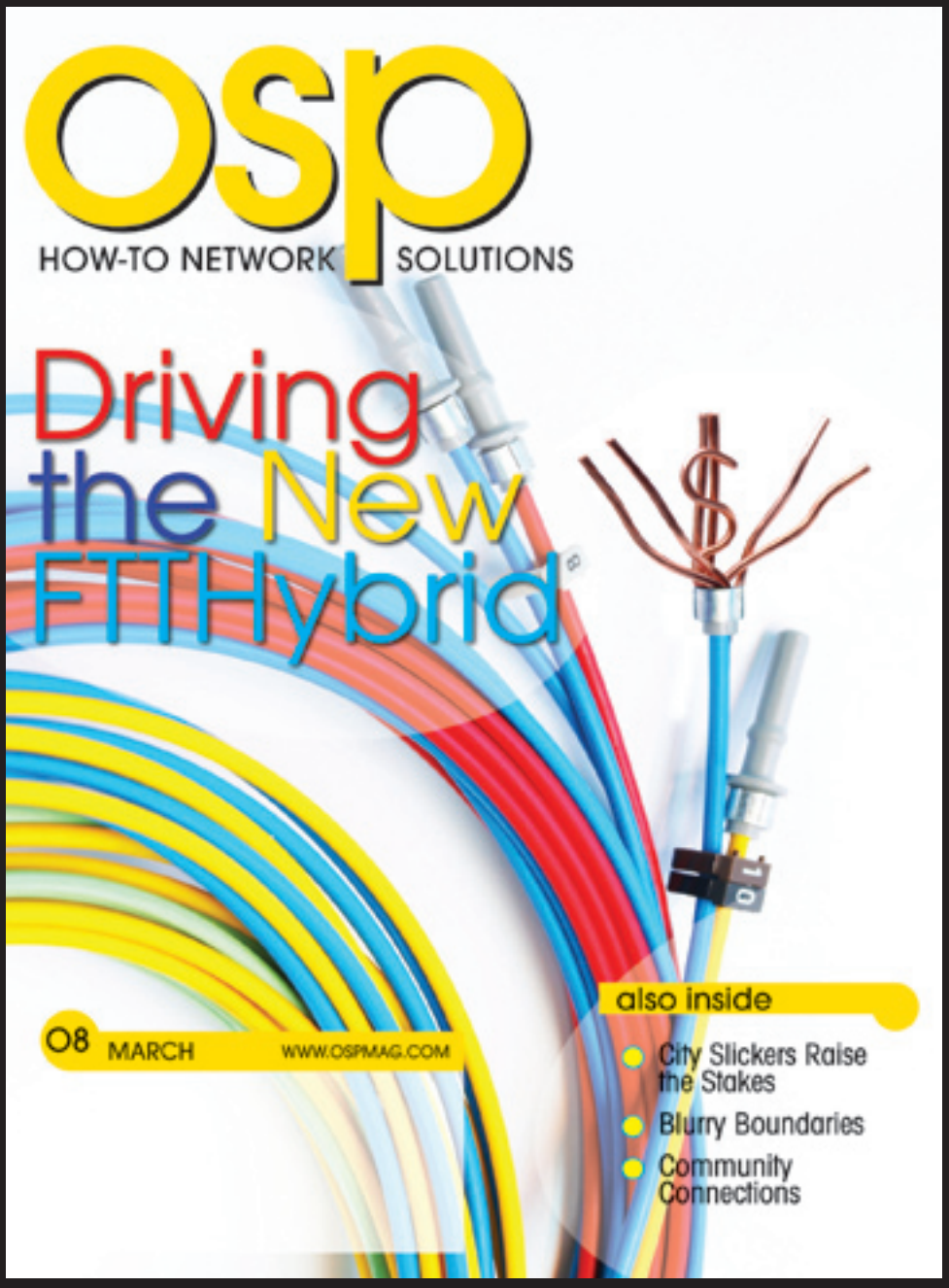

"Blurry Boundaries"
by Eric Koopferstock of Fujitsu Network Communications
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WIRELINE Blurry Boundaries WIRELESS

Wireless Backhaul Requirements Increase to Meet Mobile Data Demands

By Eric Koopferstock

The market demand for fiber in the outside plant has never been stronger. What's more, the service and flexibility demands being placed on it are greater than ever before. The new environment is being driven by continued ratcheting-up in bandwidth, higher speed services, and higher rates of fiber availability. Probably the biggest new element, however, is the "fibering up" of wireless infrastructure as higher bandwidth and reliability demands make that necessary.

Three new trends are affecting the deployment of fiber and its impact on what is traditionally thought of as wireless. The question is really more about the blurring of wireless and wireline networks, and how providers can cost effectively address both. These three trends are:

Trend 1: The Incredible Shrinking SONET

The latest advances in access products allow outside plant implementers to simplify, shrink the size, and expand the capabilities of outside plant (OSP) cabinets in ways that weren't possible before. The latest generation of synchronous optical network (SONET) equipment follows the product shrinking curve of integrated circuits and provides services and flexibilities previously available only in much larger units. Today's SONET access products come in space-thrifty 2RU packages that compare very favorably with products that were typically up to 8RU in the previous generation. In addition to the space savings, the best of the newer products feature fully hardened components and allow for compliance with the GR-487-CORE standard with operating temperatures that span from -40 to +65 degrees Celsius. Even better, the service interface cards cover requirements for DS1, DS3, and Ethernet applications, with optics from OC-3 through OC-48 in some instances.

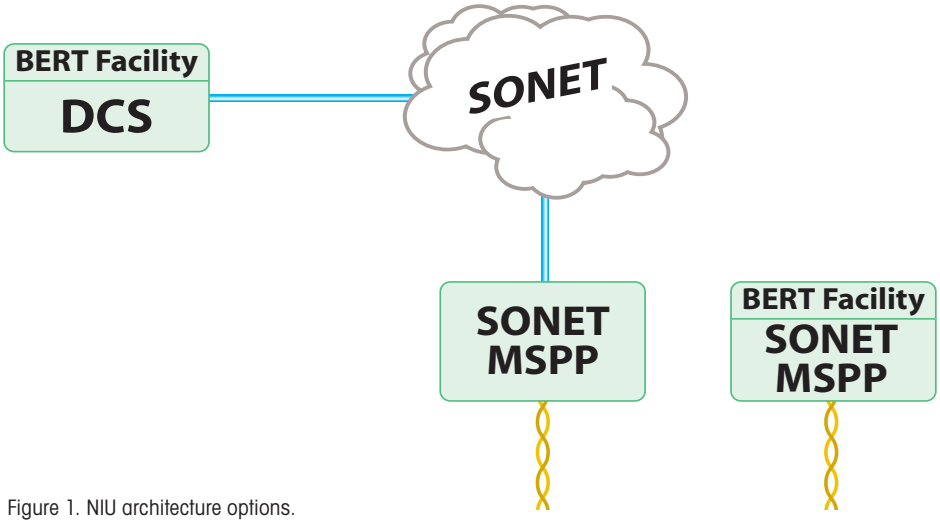

Figure 1. NIU architecture options.

Trend 2: Hardened Ethernet Interfaces

In today's environment, it is crucial to ensure that service expansion flexibility is available to meet growing requirements. As a result, hardened Ethernet interfaces are emerging that can meet the requirements of both customer premises equipment (CPE) and the OSP. These hardened Ethernet interfaces are still somewhat new in the market but are becoming necessary for meeting requirements in next-generation wireless applications.

Trend 3: NIUs Going Extinct?

Also new are network interface unit (NIU) features built directly into the SONET platform. Traditionally NIUs have been deployed in many organizations to provide a greater ability to ensure service level agreements (SLAs) or to isolate problems.

Incorporating NIU features into SONET products provides savings in several ways. The first way is related strictly to cost since removing the NIU is a direct reduction in the capital cost of every line that is installed. The second savings comes from a reduction in space requirements since there is no need for NIU itself nor the wiring and wiring allowances to reach a separate NIU shelf. The final area of savings comes in the form of reduced power and cooling requirements since the removal of the NIU also removes the need for extra power.

Understanding the NIU requirement may be vital to the choice of the SONET equipment. Some of these new NIU-enabled DS1 cards provide only basic loopback functionality. This may be acceptable if full test equipment is easily available at appropriate points in the network. However, cards that include remote test functionality (including bit error rate test, or BERT) offer much simpler operations so the actual line can be tested directly at the remote site. As shown in Figure 1, both units are capable of the appropriate loopbacks which can allow a signal to be tested without sending a technician to the site. However, in one case the DS1 signal needs to be re-routed through the network to the point where a BERT facility is available. If the BERT functionality is included at the SONET element itself, then testing can be done directly without need for extra steps or equipment.

Wireless Data as the New Driver

Driving the need for these new SONET devices in the OSP is the increasing bandwidth and reliability demands in the wireless world. A couple of years ago, fiber to the cell tower was the mantra chanted across many major trade shows. This was a direct response to the concern about voice reliability within the wireless world.

Today, all that has changed. Bandwidth is being driven both by increased voice demand (in the form of more DS1s) as well as new data services. With the latest set of data phones allowing functional use of the Internet on the go, most providers are racing to add high-speed data services to a larger and larger footprint.

Additionally, many service providers are defraying the costs of driving fiber to the cell towers by providing services to as many wireless operators as possible on a single tower.

There seems to be no set deployment methodology for this. It is taking the form of leased individual services, leased services on a fiber loop, and leased services on dedicated fiber. Figure 2 shows three ways of delivering higher bandwidth to a wireless site:

1. Serving all services from a single SONET network element (NE).
2. Providing each carrier with a dedicated SONET NE.
3. Providing each carrier with a dedicated fiber pair.

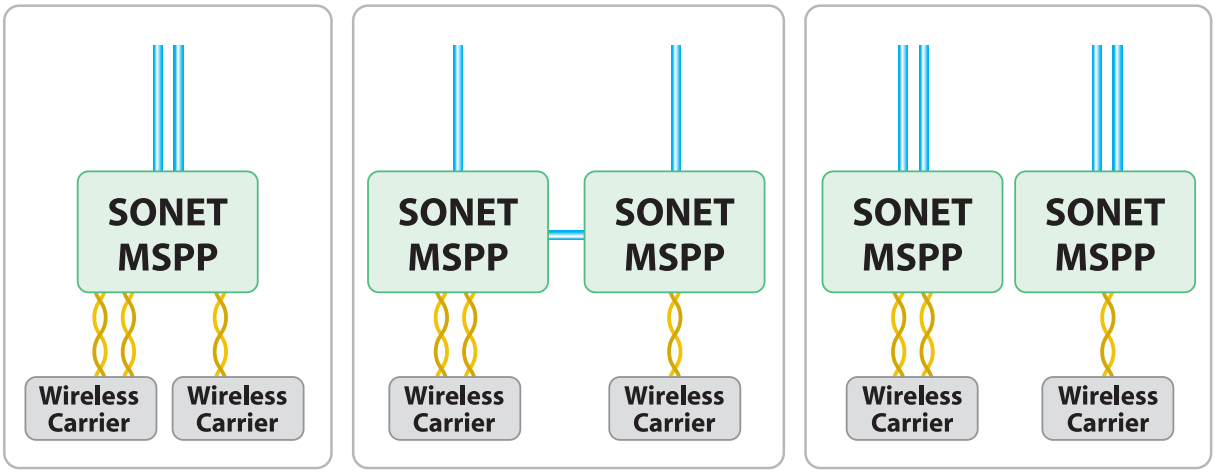

Figure 2. Three alternatives to deliver leased services.

Typically, wireless tower sites are space constrained, and cabinets are mounted very close to one another on H-frames, pads or poles, and are directly exposed to the elements. The good news is that the small footprint SONET platforms allow much smaller cabinets with lower power requirements than ever before. Also, clever designs are providing solutions that provide significant improvements in ease of use, and access to space.

Providers that want the most from their SONET solutions should use these three criteria to evaluate the solutions available:

Criteria A. Physical Design

Cabinets need to be isolated from the intense environments of which they are a part. Therefore, they should be sealed and have a heat exchanger. The location of this heat exchanger can be significant if it impedes access to the cabinet or adjacent cabinets.

Access to the front and rear of mounted equipment is also important. Some cabinets have sliders while others have load bearing rear-mounted hinges. An innovative new design incorporates a pivot within the cabinet itself.

Criteria B. Power Requirements

This can be a function of both the cabinet and the equipment within. In some cell sites +24Vdc or -48Vdc powering is available and can be applied directly to the equipment. In other designs there is a need to include power conversion from 24Vdc, 48Vdc, or 120Vac.

In 120Vac designs there is usually a need for 8-hour battery backup. Service providers should look for a cabinet with a separately vented add-on compartment designed for this purpose.

Criteria C. GFCI Outlets and Surge Protection

A GFCI outlet is offered on some systems. This provides power to test equipment at the cabinet. Some cabinets also have an additional GR-47 compliant surge protected power line that can be used to power to a nearby NIU. This is useful in cases where services are being handed off as electrical signals. It's also helpful where the end customer, or service provider, needs to provide handoff at a physical NIU.

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