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## Business Rules

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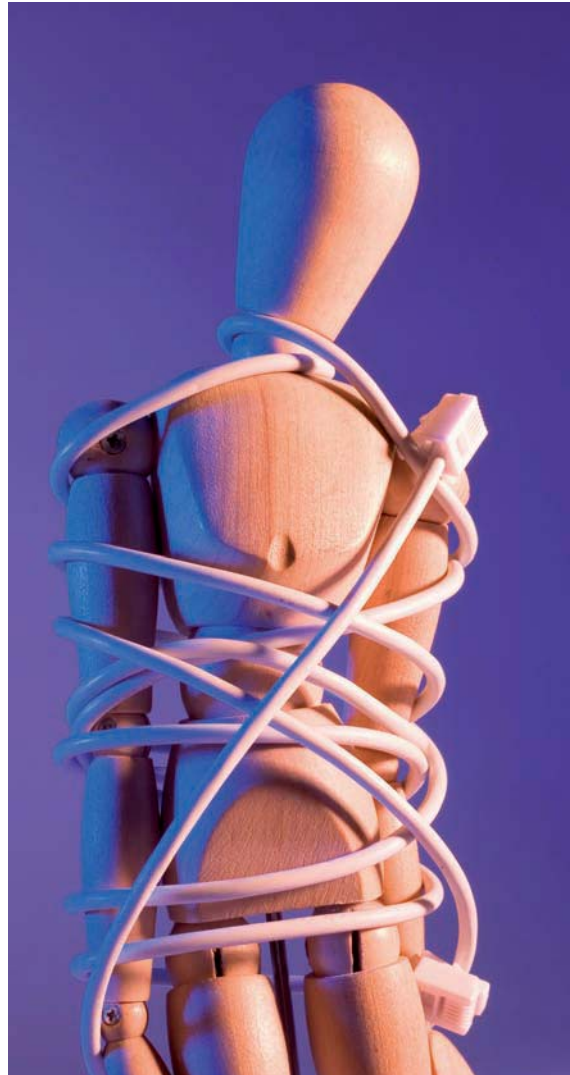
**Incorporating OSS/BSS Watch**

# The Network Management Challenge

**Ethernet just keeps on going from strength to strength, but with the growing demand for services and deployments, service providers must focus on effectively managing an increasingly complex network, says Chris Chartrand**

**E**thernet has continued to evolve and overcome new challenges since the dawn of the age of networked computers. What started in the LAN as a simple, high-speed (10Mbps) broadcast technology for interconnecting computers has evolved from its original copper wire format to cover optical fibre and wireless physical media at speeds up to 10Gbps, with 40Gbps and 100Gbps already on the horizon. More recently, an industrial-strength version of the technology called Carrier Ethernet has emerged as a reliable and cost-effective way for service providers to offer enterprise WAN data connectivity, wireless backhaul and other telecommunications transport services. The next big challenge facing both Ethernet technology and service providers is how to cost-effectively manage these new Carrier Ethernet networks and services.

By remaining true to its heritage of being simple, high-speed and highly standardised yet flexible, Ethernet has continued to win the battle against competing technologies in the LAN. To become carrier-grade, Ethernet has evolved to add service scalability, quality of service (QoS) and operations, administrations and management (OAM) capabilities and standards to the protocol. Today, Carrier Ethernet is fast supplanting the traditional data services delivered to enterprises and other large organisations. In fact, Ethernet is starting to replace ATM, Frame Relay, and TDM-based T1/E1 and T3/E3 circuits in the enterprise data connectivity services market.



Recent industry analyst reports support this view. Infonetics says that service providers reported 90-100 per cent increases in their Ethernet traffic in 2006 and 2007 and projects worldwide Ethernet services revenues to grow to \$69.2 billion by 2009. Heavy Reading, a research firm that closely tracks the equipment market for the gear used to build the networks to support these services, predicts the global market for Carrier Ethernet Switch/Routers (CESR) will grow at a 25 per cent CAGR

## An entirely new approach to managing disparate networks is emerging, one that combines the capabilities of an EMS and an NMS for multi-vendor, multi-technology networks, with a carrier grade scalable and secure architecture built using open, standards-based interfaces

over 5 years to \$3.76 billion in 2010.

The case for Carrier Ethernet is easy to make: it is scalable, reliable, fast to deploy and offers compelling cost savings. The pervasiveness of Ethernet technology has led to high volume components, which has delivered an extremely low cost per bit. The emergence of Carrier Ethernet is happening at a time when companies are experiencing an explosion in the volume of data they generate. For some, content is now measured in terabytes rather than gigabytes. And the volume of enterprise data is expected to grow exponentially, driving demand for ever-increasing amounts of bandwidth to move large volumes of information around a corporate campus or across the globe.

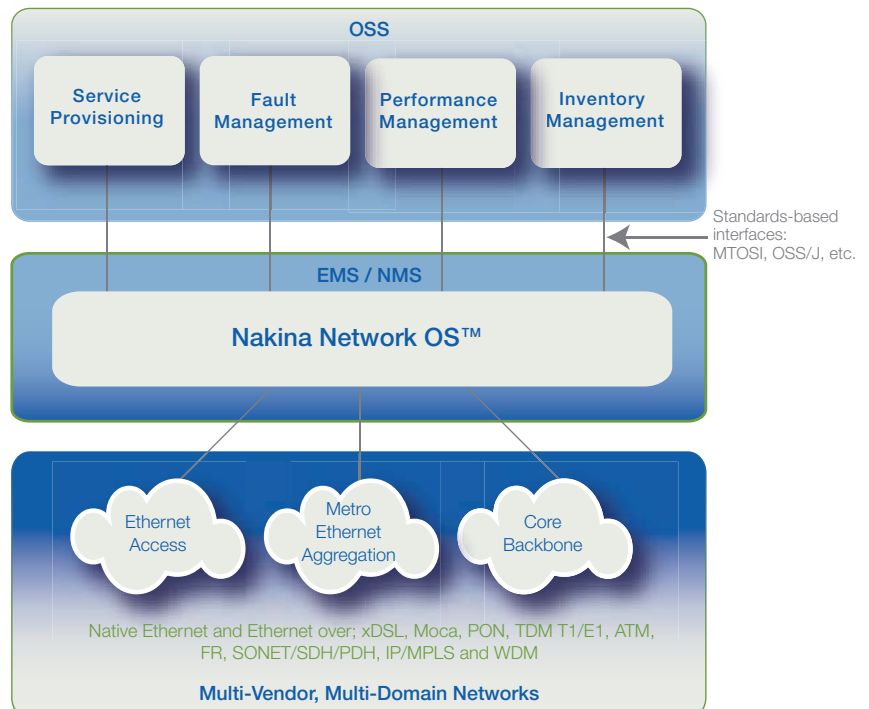
These next-generation Carrier Ethernet infrastructures will provide scalable bandwidth, support competitive new services and reduce capex and opex costs for service providers. To accomplish this, they are deploying Ethernet devices from multiple vendors in their access, metro and core networks using a variety of technologies that include Ethernet over copper, HFC, optical, TDM, IP/MPLS and wireless. And this is where the next challenge lies: while there is growing demand for services, and deployments are underway, how can service providers effectively manage an end-to-end service that traverses an increasingly complex network comprised of so many different pieces of equipment and technologies?

To offer broad coverage of Carrier Ethernet services, service providers often have to revamp and reconfigure their infrastructures to ensure end-to-end integration. Delivering even the most basic service fulfilment function requires orchestrating a complex web of multi-vendor networks transporting data

across multiple domains (optical, Ethernet, IP/MPLS). Wherever possible, service providers must reduce back-office OSS/BSS and data transport complexity, optimise overall network management and “sweat existing assets.”

Although carriers talk about ‘the network’ as if their infrastructures are one monolithic system, in reality most service providers run their business and their Carrier Ethernet services on a hybrid mix of legacy (TDM, SONET/SDH) and next-generation (IP/MPLS, Ethernet, WDM, WiMAX) technologies and equipment from a wide variety of network equipment providers (NEPs). Often, each device has to be manually interfaced into the network. Adding a new device type or application to the

### Universal mediation and abstraction of multi-vendor, multi-domain networks



“Today, the real challenge is how to fit all these neat technology pieces together. The industry consensus is that cobbling together management software in the traditional way is no longer effective”

mix typically requires upgrading both hardware and software across the entire telecom network system – not an easy task considering that many of today’s new services and networks, including Carrier Ethernet and wireless backhaul (see box), are built with a complex mix of products.

The challenge of managing these multi-vendor networks can be huge. Thousands of network devices from multiple vendors using multiple technologies must be orchestrated to function together smoothly. Traditional element and network management systems (EMSs / NMSs) are often inadequate to the task. Indeed, EMSs are really only a partial solution. They tend not to be open, secure, or scalable, and they do little to minimise network complexity. To provide a single new Ethernet service across multi-vendor, multi-domain systems requires stitching together a tangled web of networks and applications – potentially spanning hundreds or thousands of network nodes using many different software interfaces.

“Today, the real challenge is how to fit all these neat technology pieces together - and do it in a reliable, scalable, and cost effective way,” says Dan Baker of Dittberner Associates. “The industry consensus is that cobbling together management software in the traditional way is no longer effective.” (Dittberner recently issued a report on this topic, “*The Telecom Integration Middleware Market: Network & Element Management, Semantics, SOA & Interconnect Solutions*” which can be found at <http://www.technology-research.com/mid.htm>.)

For service providers, the traditional approach to the problem has been to use a mix of management software point solutions. First, an EMS is deployed from each of the different equipment vendors in their network. Since these are vendor-specific, typically a configuration system is also deployed to help fill in their weaknesses and to scale up the network infrastructure build process across hundreds or thousands of devices.

Next, a service activation system is deployed to achieve automation and flow-through provisioning. Finally, all these

systems must be integrated into the inventory system. Since inventory is typically the only centralised view of the network, carriers often cram in as much detail as possible, resulting in overly complex inventory models that slow the integration process. Every time new devices are added to the network, interfaces must be rebuilt and tested against both the service and the underlying EMS layer – a process that can easily take 18 months to complete.

Increasingly, the answer to this problem will be pluggable EMS/NMS frameworks that solve most of the multi-vendor, multi-domain issues up front. “Carriers need a common mediation framework that allows solutions to plug in and be configured more easily,” Baker says.

Next-generation Carrier Ethernet and wireless backhaul networks, among other methods of transport, require a new type of network and element management system that can provide a universal mediation function that hides the complexity of the different technologies and vendors’ equipment below it and offers a single interface to higher layer back office OSS/BSS systems.

This universal mediation layer allows higher-level applications or services to be developed independently while simultaneously enabling new network equipment to be introduced and updated beneath it. This type of architecture helps service providers roll out their next-generation services and network infrastructure much faster in multi-vendor build-outs such as in Carrier Ethernet, wireless backhaul, residential broadband, triple play and IPTV networks.

“Service providers are clearly looking at multi-vendor EMS platforms,” Dittberner’s Dan Baker says. “Operators would love to take some of their heavy integration costs out of the equation. It’s a matter of taking the data model native to each network element and mapping that to a common model, thereby improving the overall ability to provision and monitor the network. By definition, then, a multi-vendor management platform must be good at bridging the network platform and OSS/BSS worlds.”

If it contains a meta-data model that understands

## Carrier Ethernet is scalable, reliable, fast to deploy and offers compelling cost savings

relationships across multiple NEs and OSS functions, an abstraction and mediation framework can also deliver a larger and highly valuable network management view that transcends all equipment and technologies. “As it is, network managers often find themselves flying in the dark,” Baker says. “If you want to optimise your network resources, you have to be able to see what you are dealing with. There may be substantial network assets that are not being put to the best use.”

For Carrier Ethernet to truly deliver on its promise, service providers must address the challenge of trying to scale their management solutions to deploy, remotely manage and provision their Carrier Ethernet networks, while also facilitating the rapid integration of new devices into their existing OSS/BSS.

Fortunately, an entirely new approach to managing disparate networks is emerging, one that combines the capabilities of an EMS and an NMS for multi-vendor, multi-technology networks, with a carrier grade scalable and secure architecture built using open, standards-based interfaces. An effective vendor-neutral mediation and abstraction layer helps by providing a hierarchical view that abstracts away the details of the network elements – limiting what the inventory system needs to know about the network.

Under this scenario, when a carrier wants to add a new Ethernet supplier, the carrier arranges for the supplier to integrate with the vendor-neutral architecture framework, a step which greatly simplifies back office integration. Nakina Systems is a leading independent software vendor that offers this type of solution with their Nakina Network OS™ product. In real service provider network deployments of their solution, the roll out of Ethernet services has been completed 50 per cent faster than with the traditional approach.

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### Wireless Backhaul

Nowhere is the trend in Carrier Ethernet more apparent than in wireless networks. As wireless carriers move to 3G, 4G or all-IP networks to launch new content-rich services such as picture messaging, video and IPTV technology, huge demands are placed on wireless backhaul infrastructures. Leased T1 and E1 lines are quickly becoming overburdened, driving many mobile operators to look for alternative, higher bandwidth transport methods. This growing demand for large bandwidth at an affordable cost makes it a perfect match for Carrier Ethernet.

The process of handing off service from wireless base station towers to mobile switching centres or other access points on wireline networks, wireless backhaul represents both the highest cost and the biggest bottleneck to delivering next-generation, high-speed wireless data services. According to industry analysts, global wireless service provider backhaul expenditures are expected to amount to \$19.4 billion in 2007, ranging from 10 to 35 per cent of the annual operating costs of the individual companies.

While the adoption of wireless data services in the US has lagged behind Europe, the United States alone now has several hundred thousand cellular towers, which means that there are more than a million worldwide that could use Ethernet to support 3G and emerging 4G wireless services. In fact, wireless backhaul has become a catalyst for Carrier Ethernet growth in North America.

Wireless backhaul networks are in a constant state of flux because new NEs are continuously added to the network. Provisioning Ethernet (or practically any circuit-based network) can easily throw inventory out of sync to the point where carriers' circuits and other “ghost assets” get lost: they are sitting there in the network, but because the management systems don't recognise them, they aren't being used.

“To activate a customer service in 3G, it's not enough to provision the Home Location Register (HLR) properly,” says independent industry analyst Dan Baker of Dittberner Associates. “You also have to touch the Gateway GPRS Support Node (GGSN) that acts as a gateway between a General Packet Radio Service (GPRS) wireless data network and other networks. You are also likely to connect to a service delivery platform, plus other equipment, to provision a service. It's no surprise that it's become a nightmare to manage wireless multi-vendor networks and do it right.”