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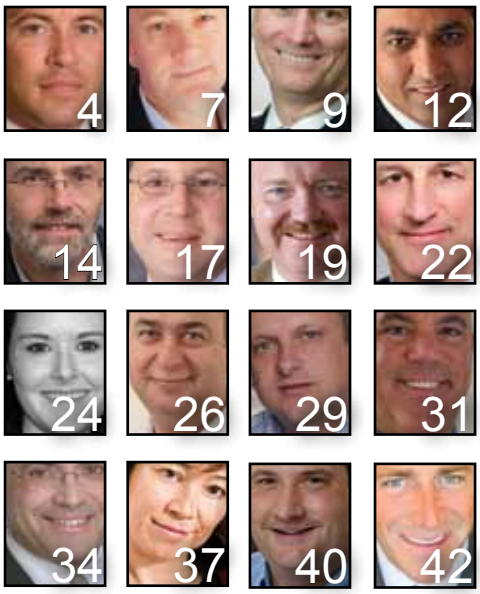

Connections

Businesses - despite the downturn - are spending on IT and telecom services, LAN/WAN infrastructure, and storage hardware, as well as data, wireless, and security services. Good news for the service providers that can get sound new products to the market that meet the demands and simplify the lives of Chief Technology Officers (*CTOs*)/ Chief Information Officers (*CIOs*).

Consumers are pushing many operators' broadband capacity to the limit. New devices - iPhones, Android smartphones, tablets and the new services and applications they support - are snowballing data traffic at an astounding rate.

Although their specific needs may be different, almost everything that both consumers and businesses need depends upon the network. The availability of robust wired and wireless networks to handle the increasingly heavy data loads that advanced applications demand - and today's devices gulp down - is crucial for the sector's expansion and the world's continuing economic recovery.

Fibre, 3G, LTE, WiMAX, mobile broadband, network convergence, all-IP networks are all part of the emerging, often ad hoc, network architectures that service providers are struggling to deploy to keep up with the demand. The growth of these networks is vital if cloud computing, M2M, universal communications, everything or anything-as-a-service, social networking, video-conferencing, video-on-demand, among many others, are to keep up with the demand and grow.

This edition of Connect-World North America focuses on the network - the core of the ICT sector's development concerns. The theme of this issue is - It's the network.

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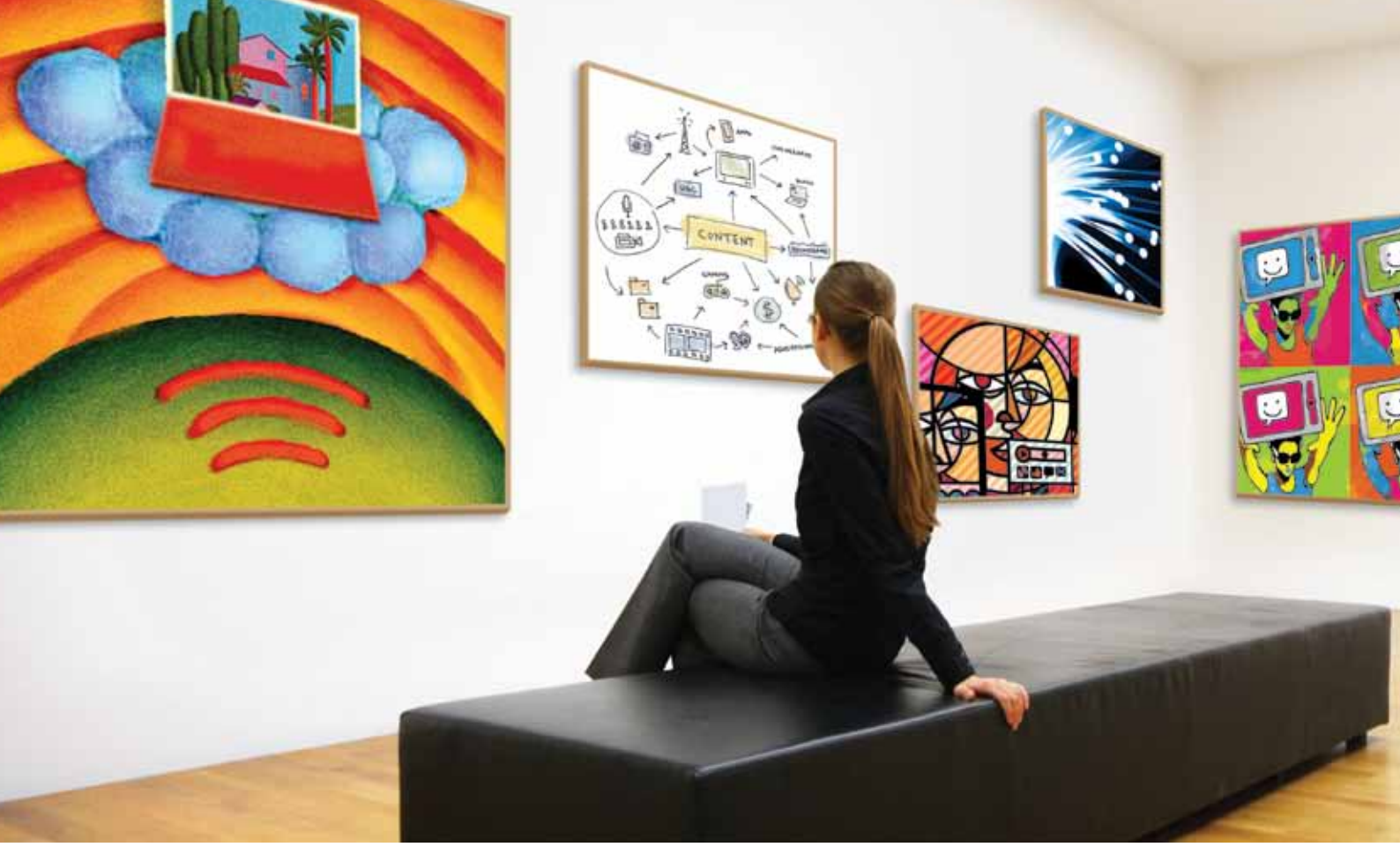

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The keys to the network of the future

by Grant Seiffert, President, Telecommunications Industry Association (TIA)

Today, demand for mobile broadband is rising exponentially. The growth is driven by smartphones and data traffic and both smartphone sales and data traffic are growing at astounding rates. Some analysts expect that by 2014, mobile video will account for 90 per cent of network traffic. In addition, machine-to-machine traffic is also starting to rise rapidly. The rapid build-out of network infrastructure is vital to meeting the demands of the future; this infrastructure must be secure, reliable, scalable and sustainable.

Grant Seiffert is the President of the Telecommunications Industry Association (TIA), the leading advocate in Washington, D.C., for the information and communications technology (ICT) industry; he oversees its policy, standards, educational, networking and marketing efforts. TIA's member companies represent the entire supply chain of the ICT industry. Mr Seiffert joined the TIA as Director of Government Relations, representing the equipment industry's interests. Mr Seiffert later became Vice President and directed domestic and global policy and interacted with the US Congress, the FCC and the Administration, as well as with international regulatory bodies and government leaders. Prior to joining TIA, Mr Seiffert served five years with Senator John McCain.

Grant Seiffert holds a Bachelor of Science degree in political science from Radford University.

The future of the network is now - it's a cliché, but true. The future of the network is its role in redefining global business models, opening markets, empowering innovation and moving to the core of business models not traditionally dependent on ICT.

To realize the full potential of the network of the future, there are important issues we, the ICT industry, need to address - but first, a reality check.

It's no secret that extreme demands on the network are exceeding current capacity and demand is only going to continue to rise exponentially.

Let me share a few predictions from the just-released Wireless Market chapter of the TIA 2011 ICT Market Review & Forecast:

- The smartphone share of wireless handset unit sales increased from 21.8 per cent in 2008 to 37.5 per cent in 2010. By 2013, the majority of handset unit sales will be smartphones, and smartphone share of unit sales will reach 54.9 per cent by 2014.

- The data market is expected to overtake the voice market by 2014, rising at an 18.6 per cent compound annual rate to US$107 billion. Data will account for 51 per cent of overall wireless services spending in 2014. The growth of the data segment is being driven by the explosion in the number of smartphones, whose owners generate more than ten times the data traffic of standard mobile phone owners.

We consider these to be fairly conservative estimates, though our research tells us that these trends are intensifying. We've seen predictions from other analysts that by 2014, mobile video will account for 90 per cent of the network traffic.

There's more to come: there will soon be more than five billion electronic devices connected to the Internet, according to IMS Research. In addition, the number of computers and laptops connected to the Internet is now outnumbered by the number of smartphones and other devices that are hooked-up, and this is expected to skyrocket with machine-to-machine (*M2M*) communications. With the roll-out of IPv6, enough addresses will be available to connect every imaginable device to the Internet.

As the number of intelligent devices grows, and M2M connectivity proliferates in vertical industries from healthcare to transportation, the physical infrastructure needs to accommodate these applications and appliances.

Fortunately, the scope of the needed massive build-out of the communications networks is not lost on Washington. For the first time in decades, the support for communications technology is front and centre in the presidential agenda. As President Obama said in a recent speech, "When it comes to high-speed Internet, the lights are still off in one-third of our households. If we build it they will come, but we've got to build it."

President Obama and his tech support team have pledged their commitment to reallocating spectrum to enable wireless broadband. Also, the FCC has begun the process to transition the Universal Service Fund (*USF*) to broadband, to ensure that all Americans can enjoy the benefits of broadband-enabled technology. While this action is deeply appreciated, Washington is a city bound by process, so don't expect USF dollars to begin flowing for a few years.

Growth of the network today is the key to meeting the demand of the future, keeping in mind that the network must be secure, reliable, scalable and sustainable, and that innovation is at the core of everything in the ICT industry.

At TIA we've identified several key areas of focus for the future success of the network:

Converged networks - new services and applications

Here we're tracking growth of virtual private network (*VPN*) architectures, 3DTV business, bundling, and over-the-top (*OTT*) service with traditional carrier services, opportunities in telepresence markets, service provider opportunities in education, healthcare and government verticals and developer tools, design applications and digital media add-ons.

The key driver in network convergence is the accelerating move from last-generation technologies like TDM for voice and ATM for data to a more consolidated network running on an IP, Ethernet and an optical foundation. The result is better flexibility and lower cost for today's networks. Convergence is also helping networks to be much more application- and service-focused - letting carriers deliver Web and cloud services online and facilitating the delivery of IP mobile apps and services over today's 3G and 4G networks.

Converged networks - technologies

As service providers strive to leverage their network assets to deliver a broad array of business, residential and mobile services, the optimization of their transport infrastructure stands to play a key role in ensuring profitability and a superior user experience.

The challenge for service providers is to establish a scalable backbone infrastructure. Closer integration of IP and optical transport networks offers significant opportunities for reducing transport costs and increasing network efficiency. A converged network backbone leverages optics and IP together to deliver the lowest cost per bit for reliable transport across the backbone for existing and emerging services.

Meanwhile, network decision-makers are faced with choices on an array of access technologies that have long-term implications for their networks.

Mobile backhaul, data and video networks

The volume of data produced by smartphone usage is straining current backhaul and transport network capacity. Legacy T1 circuits cannot scale to meet the demands of multimedia apps. New architectures and applications are driving business opportunities giving broadband network operators, wireline carriers, infrastructure partners and new entrants opportunities to participate in the business of providing affordable, reliable, bandwidth for mobile network operators.

The Utility network

The communications needs of electric utilities are evolving as smart grid, advanced meter infrastructure and advanced technologies are deployed.

As a two-way digital communications network, the network connecting smart meters is expected to control appliances at consumers' homes to save energy and reduce cost. The energy network itself will control demand and response. Grid automation and a wide variety of smart grid applications - including such applications as the integration of electric vehicle recharging and the use of renewable energy sources to power the grid - will become increasingly common.

A fundamental aspect of a smart grid is its communications network layer - an industry-wide, interconnected IP communications network - which allows the fast and integrated deployment of smart grid applications. For the country's largest utilities, the telecom planning and operations effort is intense, complicated and currently consists of multiple, applications-specific sub-networks.

The smart grid presents a unique opportunity for telecommunications operators to become established players in the electricity value chain, although the structure of the smart grid market is far more complex than that of telecom operators' traditional markets. Careful preparation and understanding of the market dynamics, technology considerations and expectations of the energy services market - by both utilities and telecom operations - are critical.

Security management

Security management has always been an important component of network operations. In today's cyber world, a nation's vital communications and utilities infrastructure can be brought down in minutes by hostile attacks, so the need for critical infrastructure protection (*CIP*) and advanced cyber security is at an all-time high. Industry collaboration is essential in developing standards-based frameworks (information, process, application and integration) to address the security needs of the network.

M2M and connected devices

As the number of intelligent devices grows (to 430 million in 2013 from 73 million in 2008), and machine-to-machine (M2M) connectivity proliferates in industries from healthcare to transportation, the physical infrastructure needs to accommodate these applications and appliances. Development of technical standards is the key to ensuring that each device can connect to the network and communicate.

ICT industry vision

Finally, ICT industry leaders must adapt to the changing business models of network operators, to the network and technology demands of a billion more devices; they must help define the era of applications from the manufacturers' perspective.

The business of broadband communications is changing rapidly; it's a new world of services for network operators and their technology partners.

We need to change our notion of the network. Customers don't have to choose services from their carrier. Today, services come from anywhere on the Internet or the cloud and they can be delivered by anyone who can serve a need.

There are new challenges at every turn, but given the ICT industry's history of innovation, the challenges are opportunities to be conquered, and the future of the network is in the best hands possible. ●

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Innovate or follow the leader?

by Keith Willetts, Chairman and CEO, TM Forum

Telecom services still rely on their two oldest products - renting lines and selling minutes - and mobile is only the same thing without wires. These products generate around US$ 1.5 trillion a year globally, but competition is moving into the market. To stay competitive operators have to dream up new sources of revenue, but what should they aim at? The answer is in the digital economy, services in the cloud and doing what operators already do best, but with partners.

Keith Willetts is the Co-founder and Chairman of the TM Forum, one of the largest and most influential communications industry associations in the world. Mr Willetts held executive positions at BT and TCSI as well as serving as board member or chairman of a number of software companies in the UK, US, Ireland, Sweden and Dubai. Mr Willetts is a regular presenter and writer; he also co-authored the highly influential book, The Lean Communications Provider. Mr Willets is the winner of the editors' special award for outstanding service to the industry at the Global Telecoms Business Innovation Awards 2010.

As President Obama succinctly put it in his recent State of the Union Address: "In America, innovation doesn't just change our lives. It's how we make a living."

While he honoured Edison and the Wright brothers in that speech, he could have mentioned Alexander Graham Bell. With due deference to Scotland and Canada, no other American invention has changed more lives of more people in the whole of history. Now, with a global customer base heading towards five billion people, and the Internet and smartphones generating unprecedented volumes of network traffic, instead of rejoicing, many communications operators around the world have their head in their hands. Market saturation, substitution, competition and regulation continue to squeeze revenues and margins, and although volumes - particularly for data - are rising dramatically, it's driving up costs for new network investment more than offsetting any gains in revenue. Traditional services such as fixed-line voice are in decline in most markets, while high-margin services such as international/roaming calls are under severe pressure from 'left-field' competitors such as Skype - now the world's largest international phone company.

To the average Joe, telecom looks like a highly innovative industry. At the technology level it certainly is, but telecom services are still reliant on the two products that Bell would instantly recognize - renting lines and charging for phone calls - and mobile is only the same thing without wires. These two products generate around US$1.5 trillion a year globally, but are coming under pressure from all directions. So most operators are now looking at how to stay competitive in their current business while they dream up new sources of revenue. 'Transformation' is the big buzzword: moving from a high-cost base, poor customer service and low innovation model to lean-mean-agile and innovative players who care about their customers.

While many are making good progress, there are still plenty of pitfalls. Just like a three-legged stool, which either wobbles or falls over if one leg is too short, concentrating on aggressive cost-cutting without worrying about quality just drives customers to competitors. These two are easy to compare

with the real route to long-term growth - continuous innovation of new products.

Innovation is hard because it means taking risks. It means letting your people experiment and tolerate any failures from time to time. Apple had its share of turkeys before becoming the world's most valuable tech company. But the brutally honest truth is that communications companies are not innovating at the product level. All of the communications gizmos we see today such as apps stores, mobile social networking, maps, access to vast video and music libraries, cloud services and so on are mainly coming from the so called 'over-the-top' players. Sure, we in the telecom business can complain that they are getting a free ride on billions of dollars worth of infrastructure investment, that they can turn on a dime because they have relatively lightweight R&D and not even make a profit while their shareholders shower them with money, but just try to name a truly eye catching service innovation from the communications industry in recent years. Prepaid mobile perhaps and short messaging maybe, but in truth both of these were sort of accidental successes. Mobile money - well possibly, but actually none of these started life in the home of innovation: the USA.

I've been in the communications business all of my life and for much of that time nearly everything smart and new in communications came from west of my home in England. Today we look eastwards more and more for service innovation and even then there's precious little really new; it's just more rehashing of ways to bill a customer.

So my call is to the communications industry, particularly in the US, to unlock the creativity and innovative spirit that still beats in its heart. We need some real charisma, leadership and risk-taking if the communications industry is not going to be the commoditized bit carrier that it has nightmares about. There are numerous organizational, people and cultural barriers to overcome if telecom is to reach its true potential and innovate its way to growth. Our sector's culture originally encouraged reliability and solid engineering above all, so many of our people still tend to avoid any failures and mistakes, but that fosters risk-avoidance behaviour so people avoid risks and are reluctant to try new things. Layers of committees don't help either as they tend towards making bland and boring decisions rather than bold ones. Most existing lines of business in a communications company are so humongous that they dwarf whatever new and innovative services arise and, therefore, get first bite at the cherry for resources. This can lead to new services being a bit shaky and under-resourced, and usually with lots of people ready to say 'told you so' when it goes wrong.

Leadership is another big factor. It was very telling that at a recent conference run by TM Forum, we showed pictures of 20 leading CEOs in high-tech sectors and the audience could name most of the guys running Google, Amazon, Apple and so on, but nobody could recognize the telecom CEOs - and this was mainly a telecom audience!

So what might those new products and services be? Well there are always pundits predicting the next big thing in the telecom business - often these tend to be hopelessly way off base. But there really are huge and untapped market opportunities waiting to be exploited - but not necessarily by aping cable or Internet companies to come up with lookalike content or applications. To paraphrase Bill Clinton, I think the answer is the digital economy, stupid.

The core competency of a communications company is to help others do something useful - they provide the means by which anyone, anywhere on the planet can communicate easily and simply - but they don't do the talking. So expand that idea to allow anyone, anywhere on the planet to do business in the digital economy - and I don't mean just bit shifting. More and more goods and services are moving to digital format; movies, books, music and applications are here now, but all kinds of cloud services are fast approaching. The most obvious is raw computing and storage cloud services like Amazon's Elastic Compute Cloud service, but the really innovative area is in cloud applications - software as a service (*SaaS*). SaaS replaces things previously done by software on your desktop computer or by a head office server. Companies like Salesforce.com are mushrooming by providing all manner of services to businesses and individuals on an online basis.

On top of that are huge numbers of complementary businesses springing up such as smart grids, for example, where the gas or electricity meter is connected back to the grid so that the energy generated can be dynamically adjusted in accordance with demand and billing can be automated without someone coming to read your meter. Online healthcare, eGovernment and mobile money services are all popping up around the world. Then there are the estimated ten trillion devices that will become network-enabled over the next decade. This 'machine-to-machine' market is where devices embedded in everything from your car to your washing machine to your central heating will be permanently online. That makes five billion people talking on a mobile look like a niche market!

Instead of trying to beat application innovators at their own game, communications companies could really leverage their core competencies and tap into these new revenue streams by innovating in a different part of the value chain - by being their enabler: providing not just the transport networks but providing a whole range of value-added services like authentication, billing, security and customer care. Think FedEx - they'll ship a parcel, but they will also handle your taxes, customs and so on for extra cost.

That's essentially a business-to-business, partner-based approach. It's where telco economies of scale come into play as well as core competencies in service operation, handling large numbers of transactions, including the tracking and billing for them, which communications companies do very well. This approach demands new thinking and innovations - partnering skills being one of the biggest - a weakness in an industry that has been used to calling all the shots for a long time. Another angle is the network engineering innovation that's needed to underpin cloud services - poor latency is the enemy of the cloud - when you tap on the screen or hit the return key you want it to work, not dither for a few seconds.

Still, telecom companies are often motivated more by market defence than market innovation. So put it another way if you like, if communications companies don't partner with cloud providers, then they the providers will just build the infrastructure they need and be even more threatening to the communications companies - after all Google is currently one of the world's largest buyers of undersea cable capacity.

It's currently all there for the taking - but it won't be there for long. To quote that great innovator, Steve Jobs, CEO, Apple Inc: "Get out there and innovate - it's what separates the leaders from the followers!" ●

The foundation of a connected world

by Walter B. McCormick, Jr., President & CEO, USTelecom

Broadband, the essential foundation of the growing Internet-based information economy, depends upon investment in a robust and continually innovating US wireline broadband infrastructure. The health and growth of the Internet and the US overall innovation economy are inescapably intertwined with the continued health of a vast, fibre-based broadband infrastructure. Investment in both fixed and mobile networks is needed to make this infrastructure work for all Americans and to aggressively pursue the next chapter of a strong, competitive US innovation economy.

Walter McCormick is the President and CEO, USTeleco. Prior to joining USTelecom, Mr McCormick served as President and CEO of the American Trucking Associations. His background also includes service as General Counsel of the US Department of Transportation; as General Counsel of the US Senate Committee on Commerce, Science and Transportation; and as a partner with Bryan Cave LLP, an international law firm of more than 500 lawyers. During his tenure on the professional staff of the US Senate, he was recognized by Roll Call magazine as one of the 50 most influential staffers on Capitol Hill. Mr McCormck is a member of the President's National Security Telecommunications Advisory Committee, the Board of Trustees of Rockhurst University, the Federal Communications Bar Association, the District of Columbia Bar, and the Missouri Bar.

Walter McCormick holds degrees in journalism and law from the University of Missouri. Mr McCormick has studied international economics and political science at Georgetown University, and has completed the program for senior managers in government at Harvard University's John F. Kennedy School of Government.

President Obama is right to place significant emphasis on connecting the nation to the many opportunities of the high-speed Internet. The State of the Union address set a goal of connecting 98 per cent of the country to the mobile Internet in the next five years. The president spoke of the importance of additional wireless spectrum to the Administration's mobility goals, but there is another critical component, as well - the essential foundation that can only be met by continuing investment in a robust and continually innovating US wireline broadband infrastructure.

There is a broad public misperception about mobility. Some mistakenly believe that it's all about wireless. But, for the high-speed Internet to thrive - and for additional spectrum to be leveraged to its full potential - there has to be vigorous, ongoing investment in the fixed wireline networks that tie together wireless communications.

Simply put, understanding the nexus between wireline and wireless is essential for advancing the next generation of broadband-fuelled innovation and growth in this country.

Rising bandwidth demand

At the end of 2010, nearly 180 million Americans connected to the high-speed Internet. Americans have embraced broadband faster than multi-channel video, cell phones, home computers, and even the telephone. Today, the US is among the global leaders in data usage (that is, bandwidth consumed per user), and in network investment to keep pace with the soaring demand.

As more Americans connect to the Internet via broadband, the more important those connections become for virtually every facet of modern life. From doing our jobs to maintaining our health, seeking entertainment to reducing our carbon footprint, broadband is an essential tool in our modern lives.

The conventional wisdom is that broadband's expansion is fuelled primarily by wireless data growth. While it's an important part of the story, it misses two critical points. First,

wireless growth cannot happen without high capacity wireline backhaul. And, second, online video - especially high-definition video - is by far the greatest bandwidth driver in absolute terMs

Think of WiFi in our homes; it hops a few feet without a cord, and then goes right to a router, then into the wall, and then into the wireline infrastructure. The same thing happens with wireless Internet in a hotel room or Starbucks. As demand grows, quality connections depend in no small part on getting that wireless connectivity into the central wireline network as quickly and efficiently as possible.

This is a well-understood fact in engineering circles. As Bob Pepper, who leads Cisco's global policy efforts, explains: 'There is no such thing as a mobile network. Networks are fixed. Devices are mobile." This observation was backed up last year by the US. General Accountability Office, which noted that, "the majority of wireless traffic actually flows over the wireline telephone system".

So it's important that as we talk about the possibilities of the future - whether it's smartphones or the booming applications market, Facebook, YouTube or whatever comes next - that we acknowledge that all of this innovation is supported by strong, nimble wireline networks.

The benchmark for what makes a robust network will continually move. Between 2000 and 2009, data traffic on wireline networks increased by a compound annual rate of nearly 80 per cent. That pace will continue to climb briskly, in the 30-40 per cent annual range, for the next five years. Much attention is focused - and rightly so - on rapidly expanding mobile data traffic, but the lion's share of data traffic today - by several orders of magnitude - is being fuelled by online video.

A majority of Americans watch at least some television content online. So much so, that the volume of video traffic is the fastest growing category (measured by volume) of Internet traffic - it is expected to quadruple from 2009 to 2014 alone. To get a sense of the difference in scale, mobile data traffic is expected to grow from 16 to 795 Petabytes (one billion megabytes) per month from 2009 to 2014. By comparison, consumer and business data usage will nearly double to close to 4000PB/month, while online video is expected to more than quadruple to 12,650 PB/month. One sign of the changing times: Netflix is now the second largest video subscription service in the US. With 20 million subscribers, it trails only Comcast.

Unprecedented value proposition

Yet despite this rapidly rising usage, what we pay for broadband has held steady over the past decade. The value of broadband service has vastly expanded. Americans now spend as much time online as they do watching television - a 120 per cent increase since 2005. Yet they pay nearly 50 per cent per megabit less than they did in 2008.

While US consumer usage of various communications services has soared, the per centage share of disposable income for related bills has remained flat for a decade.

It should come as no surprise then that Americans are quite happy with their broadband service. According to a recent Federal Communications Commission survey, 91 per cent of Americans say they are "satisfied" with their service, an enviable number for any heavily used service.

Next wave of innovation

Looking ahead, there is growth coming with new technology applications. Data storage is moving to the cloud, remote online holders of all the information in our personal and professional lives. As these fast-emerging cloud technologies become more popular, leading to a nearly US$150 billion market by 2014, they will continue to require high-quality bandwidth to the data centres, so applications can be run and stored. Robust underlying fixed connections are critical to cloud computing's reliability and scale.

Broadband also makes possible smart grid technologies to enhance energy efficiency and help consumers and businesses save on their monthly utility bills. Broadband is also driving profound change in American medicine - vastly improving the quality of care and empowering patients to take charge of their health, while significantly reducing medical costs.

Investment matters

What makes all of this progress possible? Investment in the network. We start from a strong position today. Despite a weak economy, US broadband providers have steadily invested more than US$50 billion annually in high-speed infrastructure throughout the nation - all to keep pace with the growing appetite of consumers and the need to support the new and more bandwidth-intensive offerings utilized throughout our society.

In fact, the broadband community is one of the single largest investors in the US economy today, and its related sectors - information and communications and other advanced technology sectors - create jobs that pay on average 52 per cent more than the national mean.

Constructive, connected policy

Rare in the world, the US has actual choices among competing broadband infrastructure - and our networks benefit from about a third more annual investment than those of our more heavily regulated European counterparts as a result. To keep our competitive edge, we need to safeguard this advantage and build on our progress to date.

Federal policy makers need to ensure that there is integrity to the financial fundamentals that underlie network investment, including intercarrier compensation and universal service. Congress needs to make sure that there is a focused effort from the regulatory agencies to separate out archaic uneconomic regulation from the kind of targeted consumer protection rules that the president wants to remain in place.

In the case of the communications industry, we have a build-up of regulation that has accumulated over almost 100 years. It will be a big job for the Federal Communications Commission to undertake this review, but it is important work and the broadband community stands ready to constructively engage with regard to this effort.

It's the network

At the end of the day, the continued health and growth of the Internet and our overall innovation economy are inescapably intertwined with the continued health of our vast, fibre-based broadband infrastructure. We need robust investment in both fixed and mobile networks to make this infrastructure work for all Americans and to aggressively pursue the next chapter of a strong, competitive US innovation economy. ●

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Is your backhaul network ready for Ethernet?

by Vikas Arora, Chief Technology Officer, EXFO

The smartphone, the social Internet and multimedia applications - and the traffic they generate - are forcing wireless service operators to adopt packet-based Ethernet/IP in their access and core networks. Ethernet reduces both CAPEX and OPEX and provides economically scalable backhaul to deal with rising bandwidth requirements. Nevertheless, migrating to Ethernet/IP-centric backhaul networks is a challenge, especially with regard to maintaining QoS to maintain quality and reliability for each service. The use of appropriate test strategies helps guarantee network performance.

Vikas Arora is the Chief Technology Officer at EXFO. Mr Arora's 18 years of technical and business leadership experience spans IP voice, video, Ethernet, optical networks, service assurance and network management. Mr Arora was a co-founder and CTO of iPine Networks, later acquired by Nakina. At Nortel, Mr Arora held senior management and architect positions within the OpenIP and optical business units.

Vikas Arora earned a Bachelor of Technology from G.B. Pant University and a Master of Science in Computer Science from the University of Saskatchewan.

Service lifecycle testing for QoS and QoE

The growing demand of mobile data-centric services is driven by smartphones, the rollout of 3G/4G next-generation mobile broadband networks, and the popularity of social media (for example, Facebook and Twitter) and multimedia applications (for example, gaming and YouTube). To meet this demand, operators must upgrade their mobile backhaul networks.

With 25 per cent to 30 per cent of their OPEX allocated to network operations - most of which is dedicated to backhaul networks - operators are looking at ways to migrate to more scalable and cost-efficient technologies to support future bandwidth requirements and to protect future investments. IP/Ethernet solutions are not only seen as new opportunities, but also as new challenges, since operators need to validate, assess and guarantee the performance and the quality of their services.

Unlike traditional circuit switched networks, IP/Ethernet networks are efficient at using the available capacity of the network. However, they also introduce new impairments, which affect the QoS and QoE. While applications can manage with some loss, their overall quality will suffer if that amount of loss becomes too high. The same applies to other key performance indicators (*KPIs*), such as latency and jitter.

With this in mind, operators must change the way that they test their networks; performance testing is no longer enough. With IP/Ethernet, both network and service performance must be tested. This means that they must be equipped to manage the user experience across the network in a scalable manner, no matter the architecture.

As operators move toward packet-based IP/Ethernet backhaul networks, they must: 1) have the right tools; 2) have the right field and operations crews; and 3) have the capacity to align with the IP/Ethernet service activation requirements - all of which across the full network and service lifecycle.

Mobile backhaul assessment

The service lifecycle can be divided into four phases: network construction; service turn-up and burn-in; service assurance; and service troubleshooting. Network construction describes the physical wiring of the network elements. Service turn-up relates to validating that the Ethernet service has been installed and provisioned correctly. Service assurance relates to measuring the key performance indicators (*KPIs*) for 24/7/365 service, validating that service-level agreements (*SLAs*) are being met, and ensuring that any service problems are being detected. Service troubleshooting relates to fixing problems that are detected, validating that the fix performed actually solved the problem.

Construction

Before turning up new services, technicians must characterize the physical link that connects the tower to the network. In most legacy networks, the physical link is made of copper. In new 3G/4G deployments, fiber is becoming the preferred medium.

Characterizing the link allows a field technician to locate physical-layer faults, qualify the copper local loop, determine link loss, return loss measurement, qualify WDM channel and validate connector cleanliness.

Turn-up and burn-in

Service turn-up and burn-in is the only time that operators can perform full-line-rate testing; it is

essential to test and validate that services (that is, VLAN and CoS) are properly configured/ provisioned to deliver the performance defined in a customer's SLA. Typically, this includes a guaranteed level of throughput, a guaranteed level of burstable throughput as well as a guarantee on loss, latency and delay variation, etc. These tests can be saved for future reference. Comprehensive reporting is essential to demonstrate that the service delivered meets the SLA.

Performance criteria need to be met: network availability and mean time to repair (*MTTR*) can easily be verified, but performance criteria are more difficult to prove. Demonstrating important parameters (e.g., performance availability, transmission delay, delay variation, link burstability and service integrity) cannot be done with a single ping test. Testing a network's QoS requires tools to simulate real-life scenarios, including multistream traffic generation, per-flow analysis and measurement of QoS parameters.

The International Telecommunications Union (*ITU*) has recently standardized a new service activation methodology - Y.1564 - which is geared toward Carrier Ethernet and takes into account the important KPIs of the Ethernet services running over today's network architecture.

The ITU-T Y.1564 document describes a two-phase approach to measuring the performance of Ethernet-based services over point-to-point or point-to-multipoint networks. The first phase is the service configuration test, which verifies that the network is correctly configured for each service. The second phase is the service performance test, which provides a method to test the long-term quality of the network. EtherSAM (Y.1564) offers an ideal test strategy for today's and tomorrow's wireless backhaul networks, while reducing cost and improving MTTR.

Service turn-up can be accomplished in one of two ways: inside-out testing or outside-in testing.

Inside-out testing refers to running a turn-up test from a central test head to a device at the demarcation location that is in loopback. The device at the demarcation location can be a cell site router, a NID, a handheld, or a performance endpoint device, as long as it is standards-based.

Outside-in testing refers to running the turn-up test from the demarcation location to a central test head.

Inside-out testing tends to be more economical than outside-in testing because it does not require another person at the demarcation location. By automating the procedures necessary to put the remote device in loopback, inside-out testing can be run whenever necessary. One important aspect is to capture key service metrics in both directions to record any direction-specific characteristics.

Before mission-critical applications are fully deployed, a 24-to-72-hour testing period is required. This serves to evaluate the service performance in real-life conditions. Operators can remotely or locally verify the performance of backhaul connections with line-rate test traffic by running the EtherSAM (Y.1564) or RFC 2544, and other nonintrusive testing protocols, such as the Ethernet OAM CFM suite (IEEE 802.1ag and ITU-T Y.1731) - without requiring a disruption of the traffic flow.

Service monitoring

Wireless service providers are not only facing OPEX challenges as their backhaul networks grow exponentially; they also face new QoS and QoE challenges. To acquire and retain customers, operators must focus on their subscribers' QoE and use it as a competitive advantage.

Continuous monitoring requires a centralized and integrated service assurance solution that automatically launches periodic tests from an MSC (*mobile switching centre*) to all MSC-served cell sites through CESR (*carrier Ethernet switch/routers*) and/or performance endpoints to allow operators to address possible problems without deploying unnecessary resources. Performance endpoint devices (*PEPs*) provide wire-speed loopback capabilities, integrated responder capabilities (including two-way active measurement protocol support) and OAM capabilities for non-intrusive, in-band testing (including support for IEEE 802.1ag and Y.1731 OAM). Tests can occur from a centralized test point to the PEP or from a portable device located at a specific test point to the PEP.

Ideally, PEPs are deployed at all handoff points to provide remote, in-service test capabilities. By doing so, operators can perform continuous monitoring and ensure that any degradation is quickly detected. Because the device is always located at this point, there is no need to send technicians to the test site if or when an issue is detected. Technicians can troubleshoot the segments that lead to the path location issues and determine which segment is failing.

Troubleshooting

Troubleshooting begins when anomalies are detected during the monitoring phase. Real-time actionable information enables operators to remotely launch performance metrics, improving the MTTR (*mean time to repair*) by segmenting the network and isolating probleMs

Unfortunately, the monitoring tool cannot always pinpoint the exact cause of a network fault. When additional testing is needed, the tools used during the installation and commissioning can be used to find intermittent or hard-to-diagnose problems and provide the 'birth certificate' that can be used as a performance baseline.

IEEE 802.1ag (CFM) provides many of the tools necessary for segmenting service probleMs This standard defines mechanisms that allow a provider to test to various key points. Also, continuous testing to these key points in the service path, in addition to the demarcation location, provides valuable historical information that can be used to identify hard-to-debug, transient probleMs The biggest advantage of the CFM tests is that these can be run without having to take the traffic down. For even further troubleshooting, one or more turn-up subtests (throughput, latency, loss or back-to-back) can be used.

The key aspect of these service-troubleshooting procedures is to restore service performance and avoid truck rolls as much as possible. For advanced troubleshooting requirements, multi-stream traffic can be generated at wire speed to the performance endpoint or a handheld tester.

Mobile operators must now evolve from only managing network performance to also managing service performance. Testing the network with a simple ping is not enough; performance indicators must constantly be validated and measured on a per-service basis.

Understanding the mobile backhaul network architecture is very important. During installation, commission and turn-up, one must validate the SLA parameters to certify the quality of the services being deployed. This certification enables providers to create 'birth certificates' and then use them as a report for their end-customers.

PEPs are the perfect addition to any network: they are the right tool, designed to fulfil the need for test responder and loopback capabilities; they are cost-effective and enable scalability.

Using a 24/7 monitoring system helps providers ensure that their services meet SLAs. If the monitoring systems have testing capabilities, they can provide a first level of troubleshooting without any truck rolls. To investigate further and pinpoint the source of the problem, the same portable test equipment used for installation is perfect.

Test equipment and monitoring systems become the stepping stone to better QoS and QoE, while providing greater OPEX. ●

Carrier Ethernet to LTE's rescue

by Thomas Mock, Senior Vice President, Corporate Marketing and Communications, Ciena

Mobile network operators are transferring their wireless infrastructure to the Long Term Evolution (*LTE*) standard to obtain the low latency and high bandwidth needed to deliver rich content to smart mobile devices. The number of global subscribers should reach 6.5 billion by 2014, so wireless operators will face an enormous challenge dealing with backhaul on their networks. Carrier Ethernet-based backhaul from cell sites can help them in the design of their LTE network and reduce total cost of ownership (*TCO*).

Thomas Mock is the Senior Vice President of Corporate Marketing and Communications for Ciena Corporation; he oversees a variety of functions, including experiential marketing, Web and community marketing, public and industry analyst relations and internal communications. Prior to assuming this position, Mr Mock served as the Company's Senior Vice President, Strategic Planning; Vice President of Portfolio Management; and Senior Director of Product Management. He also served as Product Marketing Director for Ciena's short haul and access product lines after joining the company as the International Product Marketing Manager. Prior to Ciena, Mr Mock managed the product development organization for a T1 multiplexer company.

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As the popularity of smartphones and other intelligent mobile devices increases, mobile network operators (*MNOs*) recognize that revenue growth hinges upon their ability to deliver a wider range of mobile broadband applications and services, which require higher bandwidth and lower latency, to deliver the expected service quality. For example, to achieve the consistent video download required for smooth playback, a video stream viewed on a tablet computer might require HD-quality bandwidth with rapid access to large content files. Delivering such applications and services will, of course, quickly overwhelm the capacity of current 3G wireless networks - and the backhaul networks associated with them.

This ubiquitous trend drives MNOs worldwide to adopt new wireless technologies, including WiMAX and LTE. These next-generation technologies address the limitations of mobile radio access, enabling the high throughput and low latency necessary to carry the new bandwidth-hungry services. For instance, the LTE 3GPP (Release 8) specification provides downlink peak rates of at least 100Mb/s, with future LTE releases offering rates up to 1 Gb/s. If needed, this specification also provides support for seamless interworking with older network technology such as GSM, cdmaOne, UMTS, and CDMA2000.1.

MNOs can certainly benefit from the higher spectral efficiency of 4G to support more users and higher usage rates. Although the cost per base station should be similar to 3G, LTE's higher spectral efficiency will allow operators to realize significant cost savings (according to Booz & Co., up to 75 per cent on a per-bit basis). The lower cost is critical to offering wireless service plans at reasonable rates. Early deployments of LTE also suggest that it leads to much higher usage rates per month, with the amount of bandwidth consumed by intelligent mobile devices quickly catching up with the levels of consumption characteristic of wired broadband connections.

Deploying next-generation mobile access technologies, operators are facing significant pressure on the critical wireless backhaul portion of the network, which ensures that the traffic flows between cell towers and the terrestrial core network. Legacy networks cannot cost-effectively meet the demand for data backhaul as they have been built with lower bandwidth voice services in mind.

To take advantage of LTE, operators need hundreds of Mb/s per cell site for backhaul, compared to multiples of T1s (n times 1.5 Mb/s) or E1s (n x 2 Mb/s) for earlier generations. This paradigm shift in backhaul calls for networking options that scale cost-effectively - the only way to minimize total cost of ownership when migrating to LTE base stations.

How Carrier Ethernet fits in

The number of base stations (called evolved NodeB, or eNB) deployed can grow tremendously as LTE services are rolled out. When scaling an LTE network, connectivity can be optimized and associated costs reduced in line with the simplicity and reliability of the backhaul network. Deploying a packet backhaul network, mobile network operators and backhaul suppliers usually consider two technology options: IP/MPLS (Layer 3) and Carrier Ethernet (Layer 2).

A main problem with IP-routed Layer 3 (L3) IP/MPLS network solutions is that they force backhaul providers to extend complex forwarding paradigms (data plane) and complex dynamic routing and signalling protocols (control plane) all the way from the metro and aggregation network into the access domain. Moreover, with leased IP backhaul services, the IP-based backhaul provider often must coordinate IP information with the mobile network operator.

The added complexity of IP/MPLS solutions can dramatically increase both CAPEX and OPEX. This is most evident with regard to operating, troubleshooting and maintaining the network. Each protocol-specific forwarding plane has its own associated suite of OAM (*operations, administration and maintenance*) functionality. This introduces additional complexity when coordinating and managing OAM services across complex protocol stacks, often with partial OAM support (such as with IP), leading to higher operating costs. The complexity can also lead to higher hardware costs, as the processing power at the backhaul routers must support computation and storage of statistical data related to the performance and fault management planes.

A simpler option that offers far lower total cost of ownership is a Layer 2 (L2) Carrier Ethernet network for cell site backhaul. L2-VPNs can efficiently provide point-to-point, point-to-multipoint or multipoint connectivity. Layer 2 switching offers stability and simplicity, and fewer protocol layers mean simpler provisioning, management and restoration. An Ethernet network, enhanced with carrier-class attributes, not only provides the right connectivity, but also enables backhaul providers to offer a rich suite of OAM functionality to provision, measure and troubleshoot their networks. By leaving the IP functionality to the mobile endpoints that actually need it (such as the eNB and the Evolved Packet Core), and avoiding it in the backhaul portion of the network, carriers can manage backhaul costs much more efficiently, using simpler forwarding rules that are based on subscriber policies to facilitate or constrain connectivity as required.

The OAM functionality is particularly interesting to look at, as Carrier Ethernet has a rich set of measurements and tests that a network manager can tap into for crucial information. For instance, using the standardised Ethernet OAM toolkit you can measure the latency and throughput in real time, and so see how the network is really doing against the SLAs. This, of course, means that you can address issues on your network as soon as they arise.

Scalability of the technology is also key - a national LTE network will have thousands, if not tens of thousands, of cell sites, so it is critical that the backhaul rollout keep up with the pace of the network's growth. Essential to achieving this kind of scale is automation, which allows for zero-touch provisioning - where installing a device and setting it up does not require days and an army of highly skilled specialists, because once connected to the network, the node is able to seamlessly configure itself. When you are scaling at a pace of hundreds of cell sites per week (as many of the large operators do), this feature is critical to the successful rollout of your LTE network.

When adopting a packet backhaul model, Ethernet acts as more than just an interface between the wireless network elements and the transport network elements. Ethernet's popularity as the transport layer for IP packets in LANs is well documented. Additional Carrier Ethernet functionality makes it perfectly suited for transport across a WAN. Interfaces compliant with the Metro Ethernet Forum (*MEF*) standards can provide the interoperable demarcation for mobile network operators to use the packet backhaul network. At the same time, MEF-compliant services enable virtualized bandwidth resources to support point-to-point, multipoint and point-to-multipoint connectivity with traffic engineering functions, which guarantees network resource allocation that enhances performance.

Carrier Ethernet's cost advantages are quantifiable. Customers using it for mobile backhaul show savings of as much as 30 per cent in both CAPEX and OPEX, compared with the costs of using a Layer 3 solution. A Carrier Ethernet-based mobile backhaul network, whether fibre, microwave radio or millimetre radio-based, also permits strong levels of control and robust functionality, making it a truly cost-efficient LTE backhaul solution. With the help of Carrier Ethernet, operators can scale their networks quickly and achieve the lowest cost per bit as they increase bandwidth to meet growing user demand. It also enables network operators to match the connectivity provisioned across the network with the data traffic seeking to use that capacity, and helps backhaul providers avoid costly over-provisioning of the network, even as MNOs demand multiple classes of service across it.

The advent of LTE is an excellent opportunity for both mobile network operators and backhaul providers. Residential users have demonstrated tremendous demand for mobile bandwidth, while enterprises worldwide seek to leverage wireless connectivity to access new business applications flexibly. Thanks to the fourth generation technologies, MNOs can deliver SaaS, cloud computing, and other services over high-speed mobile broadband connections. Satisfying the growing demand for these services and the voracious consumption of bandwidth that they bring about, while holding the line on cost, requires a smart approach to solving backhaul bottleneck - Carrier Ethernet is the epitome of that smart approach. ●

ITU,UNESCO,UNCTAD and UNDP will co- organize the WSIS Forum 2011 from 16-20 May.
Each year the WSIS Forum is hosted by ITU in Geneva, Switzerland.

Background

The World Summit on the Information Society (WSIS) is a UN process that was initiated in two unique phases in order to create an evolving multistakeholder platform aimed at promoting Information Society at the national, regional and international levels. The goal of WSIS is to achieve a common vision, desire and commitment to build a people-centric, inclusive and development-oriented Information Society where everyone can create, access, utilize and share information. The UN General Assembly endorsed the hold¬ing of the World Summit on the Information Society (WSIS) in two phases. The first phase took place in Geneva from 10 to 12 December 2003 and the second phase took place in Tunis, from 16 to 18 November 2005. In 2003, the number of participants was 11,000 representing 175 countries and in 2005 the number of participants was more than 19,000 representing 174 countries. Since then, a cluster of WSIS-related events was held on an annual basis . In 2009, the cluster of WSIS-related events was rebranded as WSIS Forum.

WSIS Forum 2011

The objective of WSIS Forum 2011 is to celebrate leadership and innovation in the ICT sector. WSIS Forum 2011 will gather governments, private sector, international organizations, civil society, academia and other individuals from all over the world in one venue to network, develop partnerships and scan new business models available in the market.

Format

Held over five days, the event will attract an audience of approximately 100 senior decision-makers from ICT industry who generate impact at the global level. The Forum is a multi-stakeholder platform and an estimate of 800 participants from 140 countries is anticipated. The forum expects more than 10 ministers, 5 deputy ministers and other senior government representatives as well as members of the parliaments. The forum agenda will feature an opening ceremony, high level dialogues, roundtables, exhibition, thematic workshops, country workshops, WSIS Action Line facilitation meetings, interactive sessions and knowledge exchanges. The event will be covered by leading screen and print media from all over the world. New and innovative ways of participation including Remote Participation facilities will be provided under the leadership of ITU i.e. audio-video webcast, Adobe Connect and Live Blogging giving the opportunity to stakeholders participate remotely all over the world. Social media will be an integral part of WSIS Forum 2011. Two innovative campaigns will be an integral part of WSIS Forum 2011. "i write for WSIS FORUM" aims to empower stakeholders to write and report on all WSIS related events and activities, sharing their work and ideas with thousands of WSIS stakeholders online worldwide. "i meet you at WSIS FORUM" is a social matchmaking tool that will provide every onsite participant with the opportunity to network with professionals in their domain from different sectors and countries present at the WSIS Forum 2011.

The forum will focus on policy and implementation leading towards real action, assessment and progress, particularly on ICT4D projects. WSIS Forum 2011 will be held in line with the World Telecommunication and Information Society Day (WTISD), WTISD was held in Shanghai Hall of the Expo Center last year.

A different network? Driving the changes

by Jack Waters, Chief Technology Officer and President, Global Network Services Level 3 Communications

For years, sector analysts have worried about the ability of networks to handle the extraordinary growth of data traffic, but continuing innovation has come to the rescue time and again. There is no reason to doubt that providers will invest to add scale and improve efficiency while innovators find ways to reduce complexity and cost whilst increasing speed, throughput and quality. Despite the dire predictions, the networks will soon be able to handle the flood of video and advanced applications traffic.

Jack Waters is president of Global Network Services and Chief Technology Officer for Level 3 Communications, responsible for global network architecture, engineering and operations. Previously, Mr Waters was an executive staff member at MCI Communications, Inc. with responsibility for network architecture, design and implementation. Prior to MCI, Mr Waters was Director of Engineering and Operations for SURAnet.

*Jack Waters earned his Bachelor of Science degree in Electrical Engineering from West Virginia University (*WVU*) and his Master of Science degree in Electrical Engineering from Johns Hopkins University.*

How many cell phones do you think are in use today around the world? Amazingly, the number is already more than five billion, approaching the world population of 6.8 billion. The number of connected devices keeps growing rapidly, as cell phones extend their reach from cities to farmers' fields and as TVs, gaming consoles and even cars join the fray. This impressive array of personal connectivity devices is accessing an equally dizzying array of network-based applications, from movie-streaming to digital bookstores, social networks and virtual farMs At the other end, we have millions of enterprises clamouring to get their data, services, information, products and advertisements to as many of these users as possible. In the middle of it all is the network.

In terms of bandwidth demand alone, today's networks have a considerable challenge, but they are also tasked with supporting a highly variable set of services and business models, from wireless calling and cable TV to video-on-demand and popular Web-gaming applications. While the demands on today's networks are clear, the requirements of future networks are perhaps counter-intuitive.

Driven by consumer demand, devices and applications are changing and growing in sophistication, and, in so doing, they are changing the way that the network is used and the requirements it must meet. It's interesting to note that while we assume technological advances will continue unabated in applications and devices, we tend to see the role and function of the network as being considerably more static. Nonetheless, the function that the network serves - and thus the requirements it must meet - will continue to change significantly to meet the demands of the applications it supports for consumers and business users.

In other words, at the core of it all is still the network - it just isn't the same network that it used to be. The network will continue to

evolve, because it has to. To illustrate this point, we need to look at some of the obvious trends we are seeing in telecommunications and their implications.

Device and application proliferation

Clearly, smartphones, hand-held computing devices such as tablets and Internet-enabled devices such as TVs and gaming consoles have grown exponentially. Even more prolific are the applications that ride on top of these devices. Looking at just one example, the Apple App Store alone boasts over 350,000 available applications, with countless more being developed daily.

Applications moving to the edge

Where once many applications were embedded, proprietary network functions (such as SMS texting, voice calling and broadcast TV), today, Internet-based services give users new options that leverage a different service model (such as Internet-based IM services, VoIP calling, and video-streaming applications).

The application development environments at the edge provide a fertile ground for opportunity, since applications can be written on top of a standard IP development platform, rather than having to navigate SS7 or other specific and often proprietary development interfaces. This more open environment decouples the need to understand embedded network functionality, and therefore encourages new innovation, the fruits of which drive further increases in demand.

The popularity of cloud computing solutions

A Gartner report indicated that in 2010, cloud computing services already represented over ten per cent of external IT service spending, and 46 per cent of respondents reported that they would be increasing their cloud computing investments in the future. By leveraging services 'in the cloud', enterprises can reduce the costs of hosting applications, such as servers and staff, while tapping into a wide range of solutions.

So, what are the implications of these changes? The nature and scale of network traffic is changing, and user demand is largely driving these shifts. As consumers and business users move to Internet-based applications, network providers are seeing less and less demand for the embedded applications that once provided their traffic bread and butter. For example, comScore reported that Internet video-viewing grew 71 per cent year over year in 2010. As a result, traditional cable networks providing linear television saw their subscriber count fall for the first time.

While it is certainly a matter for debate, one can imagine a future where the Internet and IP-based networks become the networks for delivery of most - if not all - services. The embedded network intelligence that helped provide these services will move to the applications at the edge of the network. Voice services, voice routing, SMS texting and traditional broadcast TV will likely be overshadowed by Internet-based options over time, driven by continued adoption curves and future innovations.

These trends are driving escalating bandwidth demand, which is not likely to slow in the foreseeable future. Cisco's Visual Networking Index predicts that by 2014, the Internet will be four times larger than it was in 2009, with the equivalent of 12 billion DVDs of data crossing the Internet every month. There was a time when industry prognosticators estimated that Internet traffic growth would have slowed and levelled off long before now; but they failed to factor in the data-intensive innovations of the past decade. Nor can we accurately predict future innovations, which will create even greater demand.

These trends are unrelenting, and consumers and business users want unfettered access to their Internet-based applications. Which brings us, full circle, back to the network. How can networks meet the demands of the future?

For over a decade, some industry watchers have asserted that networks won't be able to scale to meet future demand, but continued innovation has allowed us to defy those predictions. Networks can meet the demand - but they must continue to adapt with a focus on improving scale and increasing efficiency.

To achieve scale, networks need to keep adopting higher speed technologies, economically. One example is 100Gbps interface technology. We see 40Gbps interfaces as a necessary stop-over on the way to 100Gbps - but it needs to be a brief stop on a fast trip to 100Gbps if we are to quickly scale to meet demand. Higher scalability will also require a reliance on standards-based, commodity-driven technology and components to derive the necessary economies and efficiencies of scale to support future growth. Ethernet is a good example of a commodity technology widely applied in the enterprise, in data centres and by carriers to deliver scalable and cost-effective solutions. Although the standards for 100Gbps - such as packaging akin to CFP2/QSFP2 and optical interfaces such as SR4/SR10 - are being debated, we view the direction this technology is headed as very encouraging.

Networks must also become increasingly efficient. A good way to increase efficiency is to combine high-scale optical networks with clusters of content delivery network (*CDN*) servers. While often thought of as a delivery technology for video content, CDNs will also play an expanded role in supporting the efficiency of the network, helping to meet the scale, cost and quality that will be demanded by consumers. CDNs take advantage of the high price/performance improvement rates that we see with commodity servers (processors, memory, and disks) and provide an alternative to buying more networking equipment.

Multiprotocol Label Switching (*MPLS*), originally used to build multi-service networks, is seeing new utility in driving scalability and efficiency. The use of MPLS LSPs (*label switched paths*) limits the size of routing tables in the network core, reducing memory consumption and processing resources. It allows network providers to expand networks more efficiently, and over time, technologies like MPLS will allow networks to be even more resilient than they are today.

To summarize, we believe that the networks of the future can continue to scale to meet escalating demand, driven by data-intensive user applications. To get there, providers will need to focus their spending on those investments that add scale, efficiency or both. They will need to reduce complexity in the network to meet scalability objectives, as well as cost and quality requirements. And they should add intelligence in the network only when it supports the goals of scalability and efficiency.

There's little question that communications innovation will continue. Consumers will have seemingly limitless options for viewing and experiencing content through increasingly advanced devices and applications. And in the middle of it all is the network - but what will that network look like? Designed for resiliency, agility and ingenuity, the network of the future will be capable of meeting the demands of the changing technology landscape, even if it plays a different role than the networks of the past.

Converged packet backhaul

by Dr Alan Solheim, Vice-President, Corporate Development, DragonWave Inc.

Demand for mobile services has never been greater, but existing mobile networks need updating to handle the added traffic. Hybrid systems handle legacy TDM (*time division multiplex*) and Ethernet, but are costly. Converged packet solutions offer both TDM and Ethernet on a single flat-IP network. The economic benefits of converged packet networks are significant; the CAPEX savings, however, are dwarfed by the simpler network's OPEX savings and the enhanced revenue opportunities available to an operator with a scalable, responsive network.

Dr Alan Solheim is the Vice-President of Corporate Development at DragonWave Inc.; he has more than 25 years of telecommunications industry experience. Previously, Dr Solheim was VP of Product Management and responsible for the introduction of DragonWave's packet microwave product line. Prior to joining DragonWave, Dr Solheim was Chief Technology Officer at Innovance Networks, a reconfigurable optical networking start-up. Dr Solheim also held various roles at Nortel Networks, most recently as VP responsible for market strategy in the metro transport group. Dr Solheim worked on six generations of fibre-optic transmission systems, and was the system design authority for Nortel's OC-192 program. Dr Solheim was the principal or co-author of over 50 patents. Dr Solheim also writes a bi-monthly column

"The Middle Mile" for Internet Telephony, and has numerous papers in industry journals such as European Communications, Mobile Europe and Converge Digest. Dr Solheim has acted on a variety of industry and conference committees such as 4G World, IWPC, CTIA, WCA, GITEX and numerous Webinars.

Dr Alan Solheim holds a PhD in Electrical Engineering from University of Waterloo.

The rapid adoption of smartphones, tablet computers and mobile broadband enabled laptops has had a profound impact on the way that we work, communicate and interact socially. While the benefits and drawbacks of an always-connected lifestyle can be debated, there is little doubt that the general public will not be willing to give up their new appliances any time soon. If anything, the demand for more/better/faster is escalating. What impact has all of this had on the underlying telecom network?

On wired networks, IP traffic overtook circuit-switched voice traffic nine years ago. Mobile networks have been traditionally more weighted to voice calls; however, recently the same milestone took place within the wireless domain. In early 2010, data traffic accounted for slightly more than 50 per cent of all traffic carried over mobile networks. While this event was certainly not unexpected, it did arrive several years sooner than many had expected. This was due in large part to the unmitigated success of the iPhone, which opened the door for a new breed of mobile device and spurred a rapid transformation in the profile of a typical mobile user.

Mobile network traffic mix

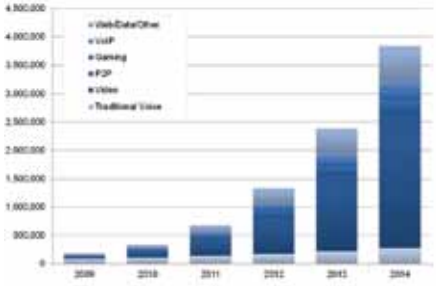

Figure 1: illustrates the rapid growth of data traffic - driven in large part by a surge in video traffic over mobile networks. Video traffic is growing at an annual rate of 130 per cent, representing 66 per cent of the mobile traffic mix by 2014[1]

The unprecedented growth (*shown in Figure 1*) translates to good and bad news for mobile operators. On the one hand, demand for their mobile services has never been greater; on the other, existing mobile networks are driven well beyond their intended capacity. In addition, the revenue growth for mobile services unfortunately does not match the exponential growth in data - meaning that cost per bit must drop dramatically if future mobile services are to be profitable.

Moving to the next generation of mobile access networks is an important step in

achieving this goal, but operators are then faced with the question of how best to backhaul TDM traffic on the existing network, as they evolve to packet-based 3G and 4G networks - all while simplifying their operations and reducing their total cost of ownership.

Choosing backhaul solutions

To ensure a smooth transition to packet-based mobile networks, it is essential that operators select a backhaul solution that will meet near-term requirements without compromising the future performance of their network.

In addition to supporting this evolution, the backhaul network should be viewed as a strategic asset which has a critical role in unlocking advanced applications and services while providing operators with several important competitive advantages, including:

- rapid time to market with new services;
- flexible on-demand scalability to eliminate stranded capital and deliver a future-proof network;
- advanced Quality of Service (*QoS*) support;
- low latency;
- carrier-grade availability;
- simple operation and self-healing architecture;
- lowest total cost of ownership

Hybrid backhaul

Hybrid systems offer the benefit of carrying TDM (*Time Division Multiplex*) and Ethernet in their native forMs This is done either by leaving the existing TDM backhaul solution in place and overlaying an Ethernet backhaul solution, or by deploying new backhaul equipment that can handle both TDM and Ethernet in their native forMs This allows service providers to continue to support existing TDM traffic while simultaneously expanding their capacity for data traffic, but comes at a significant operational cost.

Figure 2: A hybrid microwave architecture with parallel TDM and Ethernet networks

The downside to supporting TDM and packet natively is the need to deploy, operate and maintain two parallel networks. As illustrated in Figure 2, this involves having both Ethernet and TDM infrastructure, including TDM-switching equipment throughout the network. Beyond the complex intra-office cabling and congested racks, this approach also requires separate management and provisioning platforms, which introduces significant operational and management complexity and cost. If leased E1 or T1 circuits originally handled TDM backhaul, this hybrid approach has the added burden of paying ongoing lease charges to the local wireline carrier - who may well be affiliated with the wireless operator's competition.

As TDM becomes a significantly smaller piece of the mobile traffic pie, operators with hybrid solutions will eventually look to simplify their operations in order to achieve a fully optimized flat-IP network. In other words, many hybrid solutions risk being a barrier to most operators' ultimate end-goal. Let's look at one technology in particular:

Microwave has been the technology of choice for the majority of mobile backhaul on a global basis. Despite the popularity of hybrid microwave systems, when TDM was still the predominant type of mobile network traffic, the debate surrounding the adoption of hybrid systems vs. pure packet or converged packet microwave systems, is essentially over; the market for hybrid systems has been in decline since early 2010[2], while the market for packet-based microwave systems has been accelerating[3].

Converged packet backhaul

Offering both TDM and Ethernet interfaces, using converged packet solutions, is another way to solve the same problem. The difference, compared to conventional hybrid systems, is that rather than transporting parallel TDM and Ethernet networks, these products converge all data and voice traffic, creating a single flat-IP network.

Figure 3: A converged packet microwave architecture

Additionally, unlike conventional hybrid systems, which are built for legacy TDM traffic, but have the capability to transport Ethernet, converged packet microwave system are engineered from the ground up as packet-networks, but fully support TDM traffic to enable a smooth transition to a flat-IP, uncompromised, end-state network.

One of the primary advantages of a converged backhaul network is the reduction of network elements; they do not require extensive intra-office connections or TDM switching throughout the network. The economic benefit of a simplified converged packet network can be significant, but the exact savings are dependent on each operator's particular starting point. The capital expense savings - however large they may be - are dwarfed, however, by the operating expense savings of a simpler network and the enhanced revenue opportunities available to an operator with a scalable, responsive network.

Today, any backhaul solution deployed today must deliver the capacity, scalability and performance needed for advanced applications well into the future. Looking at the rapidly evolving traffic mix on mobile networks, as well as the shift to 3G and 4G networks, it is clear that the ultimate goal for service providers is to have a single, reliable and unified packet-based network that will support both legacy and emerging services.

Today's converged packet backhaul solutions offer operators the simplest and most cost-effective approach to achieving this goal. Positioned for the future, these systems deliver a packet-based architecture that still provides complete support for TDM circuits, while providing the following key benefits:

- lower capital expenditures, maintenance, and management costs;
- simple migration to the next-generation network without compromising legacy traffic;
- higher network utilization, lowering costs of transmission;
- implementation of strategic investments in IP/MPLS and Ethernet infrastructures - freeing; resources that are currently invested in maintaining legacy infrastructure;
- advanced synchronization support and clock recovery mechanisms;
- a flexible future-proof architecture.

This approach enables operators to evolve their network gradually over time as their traffic and service mix changes, arriving at an uncompromised end-state network optimized for next-generation applications and services.

[1] *Source: Cisco Systems, 2010 and DragonWave Inc.*
[2] *Wireless Backhaul from an All-IP Perspective, MMaravedis Research, September, 2010.*
[3] *Wireless Backhaul from an All-IP Perspective, MMaravedis Research, September, 2010.*

Global Broadcasting, Media and Infocomm Communities Unite at BroadcastAsia2011 and CommunicAsia2011

Future of digital content delivery on show at Asia's largest industry event

SINGAPORE – Two months from opening, BroadcastAsia2011 and CommunicAsia2011 – Asia's most distinguished business event for the global broadcasting, digital media and infocomm technology industries – are set for a milestone year.

To be held from 21 - 24 June at the award-winning Suntec Singapore and the prestigious Marina Bay Sands respectively, BroadcastAsia2011 and CommunicAsia2011 will return as the industry event of choice in Asia. The event will serve as the premier launch pad for companies to introduce cutting-edge technologies and solutions designed to enhance global connectivity for consumers and businesses, and shape the future of digital content delivery across the world.

Event attendees will experience an enhanced show atmosphere with the introduction of new TechZones and Technology Trails, which distinctly organise key exhibitors by breakthrough technologies. The abundance and variety of purpose-built conference room, seminar room and hospitality suite facilities at the venues allows for increased high-level networking and knowledge-sharing opportunities between business and industry luminaries and attending government officials from across the globe.

These developments follow the success of last year's event, which attracted a total of over 55,000 industry visitors, exhibitors, conference speakers and delegates, and media guests from over 100 countries and regions. In 2011, attendees can look forward to a myriad of the newest technologies, products and solutions from about 2,000 multinational and small and medium companies.

"There is no other combination of events worldwide where the broadcasting, digital media and infocomm technology industries come together in one city during the same week. Together, BroadcastAsia2011 and CommunicAsia2011 serve as the key international platform in Asia for business leaders, government officials and trade professionals to network, discuss the hottest industry trends and critical issues, and pursue high-growth opportunities that will shape the way digital content is delivered to and between us, both in work and play," said Mr. Victor Wong, Project Director of Communication Events, Singapore Exhibition Services.

"Hosting the events in their new, in-town venues will enhance sourcing activities, networking opportunities and knowledge-sharing potential both on and off the exhibition floors. In today's fast-paced, ever-changing technology industry, face-to-face and open forum meetings have never been more important."

Highlights of BroadcastAsia2011

Asia's leading digital multimedia and entertainment industry event, BroadcastAsia2011 continues to be the most important platform for industry leaders and professionals to form strategic partnerships and gain unique insights on the latest broadcast and digital multimedia technologies, solutions and equipment. With GDP growth in Asia forecasted at about 7 per cent in 2011, higher than any other region in the world, the trade show is expected to garner strong interest from emerging markets across Asia.

In its 16th edition, BroadcastAsia2011 will showcase a global array of the latest technologies, applications, equipment and solutions in film and TV. Themed "Integrating Technology, Experiencing Content," the spotlight at this year's show will be on the latest in 3D, playout services and special effects technologies as well as Hybrid broadcast broadband TV (HbbTV), a new technology projected to be an industry game changer.

Returning exhibitors include Canon, Evertz, Grass Valley, Harmonic, Harris, Hitachi, Playbox, Sennheiser and more. The exhibition welcomes some new exhibitors – Leader Electronic and Thomson Broadcast / Video Networks – and locally-based companies Coastal Electronics, Furukawa Electric, and John Davids. 12 international group pavilions from Belgium, China, France, Germany, Italy, Korea, Norway, Singapore, Spain, UK, USA and international digital broadcasting organisation World DMB will also be featured.

With the momentum behind the growth of 3DTV and HDTV panning out in the market, the BroadcastAsia2011 International Conference will offer more sessions to address the latest needs and technologies in the broadcasting industry. This year, more than 60 renowned speakers will cover topics related to IPTV, Digital TV and HbbTV – one of the most exciting developments in the broadcasting and media industry today.

Highlights of CommunicAsia2011

CommunicAsia2011 is the business networking platform of choice in Asia for the global ICT community and offers attendees the unique opportunity to witness the forefront of industry technology and innovation, as well as the chance to preview and test the newest technologies that will shape the future of communications.

Themed "Shaping Vision, Creating Reality," CommunicAsia2011 will feature breakthrough developments that push satellite technology boundaries, as well as a sneak peek into the latest market-ready devices and solutions and dynamic new industry deals set to change the pace of ICT communications in Asia and worldwide. Leading returning exhibitors include ABS, BlackBerry, Emerson Network Power, Eutelsat, Irdeto, LS Cable, Falcon Interactive, Fluke Networks, Huawei, Inmarsat, Intelsat, PCCW Global, SkyPerfect JSAT, SES WORLD SKIES, THAICOM and ZTE Corporation; new participants include AsiaSat, Conax, 3M Touch Systems, National Instruments, Tata Communications, Tektronix, Vislink, Vu Telepresence and VNL. CommunicAsia2011 will also welcome Singapore-based exhibitors including Aztech Technologies, EON Reality, ST Electronics (Satcom & Sensor Systems), ST Teleport, Webvisions and XPEGIA.

23 international group pavilions, including representation from Australia, Bangladesh, Brunei, Belgium, Canada, China, France, Finland, Germany, India, Indonesia, Israel, Korea, Malaysia, Norway, Philippines, Singapore, Sweden, Taiwan, UK and USA, will display a strong presence on the CommunicAsia2011 show floors.

The CommunicAsia2011 Summit will feature distinctly titled forums and workshops that address the most compelling issues and challenges in the ICT industry. This year, the spotlight will be on broadband driven trends, Cloud Computing and Mobile Value Added Services. Extended sessions dedicated to these topics will be added to the conference, alongside the latest topics on Satellite Communications, Security, and the ever growing Mobile Marketing industry.

In conjunction with CommunicAsia2011, EnterpriseIT2011 will comprise two TechZones – Sustainable ICT and Cloud Computing – and showcase key and emerging enterprise solutions that meet evolving needs of the "The Business World of Tomorrow." The event will bring together international buyers and sellers to evaluate business opportunities. Exhibitors will comprise software and IT systems providers, and include key companies such as Ecquaria, Extreme Networks, NComputing, Starvision and Zoho.

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Backhaul for a mobile revolution

by Dave Stehlin, President, Overture Networks

To enable next generation data and video applications, wireless carriers are building 4G networks. Carriers will use backhaul providers to connect their cell sites to mobile switching centres with high-speed, flexible, native Ethernet fibre optic links. By 2015, single carrier cell sites will need from 30Mb to 300Mb. Multi-carrier locations, about half of all cell towers, will require up to 500Mb, depending on location. Radio-hub sites will have to scale to 1GigE or more.

Dave Stehlin is the President of Overture Network; he has more than two decades of telecommunications industry experience. Mr Stehlin has been CEO of three venture-backed start-ups, most recently Ceterus Networks, which was acquired by Overture. Additionally, he was President of the Keptel and Network Transport divisions of Antec. Early in his career he held leadership positions with Keptel, Laser Precision and Siecor. He holds one US patent.

Dave Stehlin served as an officer in the US Marine Corps following his graduation from the US Naval Academy. He earned his MBA from National University.

There is no doubt that mobility will drive much of what we in the telecommunications industry think about and act on for years to come. Why? Because mobile communications is now a basic component of our lives whether at work or at play. For many, it's almost like breathing.

Behind this simple reality is a complex fabric of issues that mobile operators deal with on a daily basis and with increasing velocity. Issues such as service requirements, bandwidth, network architecture, customer segments, markets, partnerships, mobile devices, applications, service differentiation ... the list goes on and on and keeps a large and growing set of people very busy because the fact is simple, mobility is the new king of the hill.

Driving this change is, of course, the Internet and the possibility that it unlocks and creates. While basic voice service remains a requirement and texting continues to grow, the explosion is caused by data applications and, increasingly, with video services. Looking forward, tremendous data growth will be driven by a series of factors including a shift to smartphones, growing tablet usage, strong growth in the emerging markets such as Africa, the Middle East, Latin America and Eastern Europe, new mobile applications and a significant increase in mobile video traffic.

In fact, some sources believe that mobile video will be responsible for two-thirds of all global data traffic in 2015.

There are many aspects that go into building a mobile network that scales effectively as new services are created and assures the operational efficiency required to run a sustainable business. For this article we'll focus on the backhaul segment of the network.

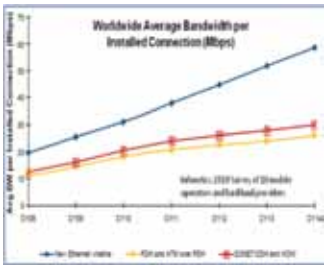
Even though we hold an un-tethered device in our hands, the network depends on landline connectivity back into the core. In North America, starting at the cell tower, backhaul is typically via a fibre or copper cable. Backhaul is, historically, the single most expense component of the network, and it will remain so as carriers move to 4G technologies.

To enable next generation data and video applications, wireless carriers are building 4G networks and are relying on backhaul providers to connect their growing number of cell sites to mobile switching centres with high-speed, flexible native Ethernet fibre-optic links. To some, cell tower backhaul is mundane when compared to the latest smart mobile device or the clarity of video downloads, but without scalable Carrier Ethernet connectivity the new networks simply won't work.

Capacity needed at the tower

The amount of capacity at the tower is determined by the population's demographic profile and density within the tower's footprint. A tower that serves a rural or suburban edge is going to have a different bandwidth profile than a tower in the urban centre. With growth, profiles will change over time and add to the need for a flexible network design.

A recent Infonetics study of the global network indicates that the average cell site currently consumes 15Mb-30Mb, but will grow to 20Mb-60Mb by 2014. This data indicates that the typical tower needs broadband backhaul. It is clear from this data that Carrier Ethernet is needed at all towers, and that the bandwidth need continues to grow at a rapid pace. It is also important to note that the carriers and backhaul providers indicated that cell sites that require scaling of bandwidth would leverage Carrier-Ethernet.



Because the global data is an average, it does not show the wide variation in density by market. For that detail, a model based on different market types is used. A breakdown by population density shows that not all cell sites in the network are alike. In North America, by the end of 2011, an average site in the urban centre will require 50Mb, a rural area cell tower will require 10Mb and suburban and urban edge locations will fall somewhere in the middle. The average US cell site houses more than two wireless carriers, so backhaul providers serving more than one carrier can expect to double or triple the bandwidth requirements per site.

The newest LTE equipment can pump up to 100Mb to each of the three sectors at each cell site and could enable a theoretical throughput of 300Mb per cell site. These values are for a single carrier cell site. Urban cell tower locations, with multiple carriers, could have bandwidth requirements in the 300Mb range.

Carriers are constantly looking for ways to describe their network as being faster than the competitors' - usually by pointing to the maximum possible capacity of the technology they are using instead of the actual capacity they are deploying.

Wireless carrier requests-for-proposals (*RFP*) to backhaul providers typically ask for a standard initial capacity and maximum scale potential capacity at every cell site. Usually there is not a breakdown by site or commitment to a growth rate by year. One of the largest wireless carriers, for example, states that their requirement is 50Mb on day one, growing to 300Mb, with some towers requiring a full 1GigE (*Ethernet transmission at 1 Gbps*). The conclusion for backhaul providers is that backhaul to all towers needs to be Carrier Ethernet.

The math shows that by 2015, single carrier cell sites will need from 30Mb to 300Mb depending on whether it is in a rural or urban site. Multi-carrier locations, about 50 per cent of all cell towers, will require between from 75Mb to depending on location. Radio-hub sites will need 1GigE or more.

Not all cell towers are the same, so optimal backhaul architectures should be flexible and scalable to address the specifics of the tower profiles in each market.

10GigE mobile backhaul

With the increasing reliance on mobile communications and the projected massive increase in bandwidth needs, wireless carriers and backhaul providers are now analyzing where in the architecture to deploy 10GigE. To determine where to use 10GigE, you must look into the mobile backhaul network architecture and the provider's fibre assets.

Depending on the size and scale of a backhaul provider network, there are either two or three layers of transport-aggregation-switching. Let's look at the three-layer scenario. A medium-large backhaul provider network will typically take advantage of a three-layer architecture, with an access, a collector and a core, as shown in the example.

In this larger network, the core is already 10GigE, scaling to nx10GigE (*n times 10GigE fibres*) or even 40-100GigE in the future.

A collector layer sits between access and the core. Because of the number of towers and their geographic distribution, it is more efficient to aggregate these with a local collector ring and backhaul high-utilization 10GigE to the core instead of backhauling all the access rings directly to the core.

Access should be a combination of 1GigE linear/rings and 10GigE G.8032 rings depending on the capacity needs at the tower and the number of towers per ring. While 10GigE for the core and collector rings should be the solution for virtually all networks, the decision of when to deploy 1GigE or 10GigE in access requires some analysis. Most networks should use a rational mix of 1GigE and 10GigE rings depending on the specifics of each group of towers being served.

The importance of mobile networks will continue to increase around the globe providing essential communications needs, enhanced business capabilities and exploding consumer applications. We've seen that there is an ever-growing set of interesting and potentially profitable applications that require the support of reliable and flexible networks capable of efficient growth. Backhaul from the cell site to the switching centre will remain one of the most critical aspects of the mobile network.

Backhaul providers have the dual challenge of delivering a scalable Carrier Ethernet service to the most towers possible while maximizing their CAPEX efficiency. A review of the data paints a clear picture that Carrier Ethernet is required at all cell sites to address this scalability.

Backhaul providers must develop a plan that supports scaling these networks over the next three to five years. Projected bandwidth profiles indicate a clear requirement for 10GigE in core and collector rings, and a rational mix of 1GigE and 10GigE G.8032 access rings.

We know that service providers focused on delivering maximum scalability are already architecting 10GigE solutions for mobile backhaul. They maximize their 10GigE footprint and at the same time optimize CAPEX efficiency by incorporating the three- to five-year bandwidth growth projections, equipment CAPEX and fibre costs into their design models.

Smart usage of 10GigE in network deployments ensures cost-effective and seamless scaling to handle the 300Mb-500Mb or more of demand at the cell tower. Market leading providers differentiate themselves by selecting 10GigE solutions that deliver on all areas: features, performance, operational flexibility and CAPEX efficiency. ●

Network performance and the cloud

by Katie Braband, Vice President Channel Development, PathSolutions

The hype surrounding the cloud has clouded a good many basic business and performance issues. The idea of moving business processes into the cloud to reduce expenditures is gaining momentum. It can be a good idea, but many companies have little notion of the impact the transition to the cloud can have upon the business - or even if the performance of their companies' applications and systems will be at least as good as that of their existing operations.

Katie Braband is the Vice President for Channel Development at PathSolutions a provider of automated network intelligence gathering solutions. Ms Braband, an experienced telecommunications professional, has strong ties to the network access, reliability and performance markets. Ms Braband served as Vice President for Business Development for Datto, Inc., a provider of backup and disaster recovery solutions, where she received several industry awards for her achievements. Among these were inclusion in Nine Lives Media's MSPmentor 250 list, a global report that identifies the world's leading managed services executives, entrepreneurs, experts and community leaders.

Katie Braband is a graduate of the McGuire Centre for Entrepreneurship at the University of Arizona's Eller College of Management.

'Cloud buzz' has reached a fever pitch around the telecom industry over the last six months. Even Microsoft has gotten in the act with its 'To the Cloud' campaign. For an enterprise, the concept of outsourcing or moving certain business processes into a hosted environment isn't necessarily new, but it seems that the desire to reduce capital expenditures by pushing critical business processes to the cloud is gaining more and more momentum.

While the economic arguments can be very compelling, it is just as important to peel back the covers and understand how applications and services use the existing network and the impact of the network connection's transition to the cloud. Fundamentally, if the resources used by business applications move to the cloud, it is crucial that access be no less restrictive than if they remained connected to the local backbone. Businesses still need to operate efficiently and profitably regardless of whether they connect their business tools and services to resources on-premise or in the cloud.

Network behaviour

It is important to examine how business functions and applications impact network utilization, and how the network, in turn, effects application performance and operation. For example, in a contemporary customer service centre, the agents are connected to a multitude of networked resources which give them ready access to customer information, inventory levels, order status, product data, voice communications, and other electronic communication channels, including Web chat, IM, and email. Consider that each of these separate applications could be described as a thread stretching from the agent's workstation to a unique, yet mission-critical destination - like a database, inventory management system, or communications server. A simple database query may comprise of literally hundreds of unique data messages exchanged between the agent workstation and a server on the network. In a call centre with tens or hundreds of agents, the number of transactions streaming through the network at any given moment can be staggering.

In a local area network (*LAN*) environment, most of these threads peacefully coexist with each other, and with the multitude of

threads connected to other agent terminals, and between other users and applications. If congestion occurs on a LAN link, packets may be buffered for a very short time before they are transmitted. This creates a barely perceptible delay on the part of the user. Within the enterprise, transit times are typically in the 2ms to 10ms range. Not even the blink of an eye. Delays of this order are not typically noticeable to a user, but as congestion increases, delay-sensitive applications like Voice over IP (*VoIP*) can be the first to indicate a problem.

VoIP and video in the LAN environment can be a barometer of LAN performance. Everyone knows what they like in a telephone conversation - clarity, no delay, and no dropouts. Since voice packets must arrive in the correct sequence and without loss, a poorly managed LAN can cause noticeable performance issues that are obvious to many, if not all, telephony users. People may not notice a 150millisecond delay in a data packet, but they will certainly complain when words are dropped and delays impede conversation on a voice call, or their video-conference fails during an important sales presentation.

Extra bandwidth doesn't solve the problem

Historically, with data-only networks, organizations would solve network slowdowns by throwing more bandwidth at the problem. LAN links were upgraded from 10Mb per second to 100Mb per second and later to 1Gb per second - far more bandwidth than the endpoints could possibly use. This excessive bandwidth can mask a multitude of sins. Even in the case of ten per cent packet loss, lost packets are retransmitted, and the user really doesn't notice that a five-minute file transfer takes 30 seconds longer. When addressing Wide Area Network (*WAN*) bandwidth requirements, the cost element puts a damper on employing excessive bandwidth.

While most network administrators typically want as much WAN bandwidth as possible, this bandwidth is typically purchased sparingly. As with any other business resource, managers are looking for acceptable performance at an acceptable price. As more mission-critical services rely on the WAN connection after the transition to the cloud, the performance of the WAN link and the resources in the cloud have an increasing impact on business performance and profitability.

Services like VoIP and video are highly intolerant of packet loss or the delays caused by buffering. As real-time applications, there is no opportunity to use extra LAN or WAN bandwidth to re-transmit lost packets, leaving the user with poor or unintelligible communication. For this, and other delay-sensitive applications, the 'just add more bandwidth solution' is ineffective.

Moving applications to the cloud

Going back to the concept of a string connecting the call centre agent's workstation to the order entry system server, consider how that connection is affected by moving the server off the LAN and into the WAN or the cloud. In the LAN, packets may traverse just three or four links and perhaps a switch and a router between endpoints. Identifying faults in the network that can contribute to packet loss and poor application performance is easily managed with the proper monitoring and optimization tools. However, when applications begin to reach out to the WAN for resources, the impact upon performance can increase dramatically.

With cloud-based services, a large variety of links, devices, and providers are involved in carrying data for the application. Any one of these various elements can introduce packet loss or delays - and all are out of the hands of the local network administrator. The potential for a 'blame game' and finger-pointing in response to poor performance is quite high. Again, proper network monitoring and optimization, as well as a comprehensive understanding of how applications use the network, are fundamental elements for a smooth transition and successful business operation.

However, given the many parties and elements involved in a cloud-based solution, identifying and troubleshooting performance problems can be complicated. Continuously monitoring the health and status of all links and devices involved in providing services is a powerful way to ensure performance and help eliminate finger-pointing and facilitate business operations.

Throttling productivity and communication

Performance failures in the larger cloud environment can lead to serious business probleMs The impact upon customer service, and customer satisfaction, can be dramatic if significant delays are introduced into the communications stream. Remember those hundreds of data transactions related to a simple database query. If sufficient bandwidth in and out of the network is not available, each of those transactions could be delayed and could result in irritatingly slow responses and reduced call centre productivity. Money can be lost as agents wait for information - possibly much more than that saved by moving network resources to the cloud.

In addition, as more application data traverses the portal to the WAN, the probability of degraded VoIP performance increases. So if a business is not careful, not only will customers be on the line longer waiting for customer service action, they may have to do it over a poor voice connection. While neither of these conditions alone is necessarily devastating, in combination they can drive customers away.

Is the cloud a good choice?

The point is not to dissuade businesses from taking advantage of the significant cost savings potential of moving resources and applications off-site. The CAPEX and even OPEX savings of cloud solutions have been demonstrated over and again. However, if a business is to have a successful transition from a 100 per cent LAN-resident application infrastructure to a hybrid or fully cloud, or WAN, resident infrastructure, they must understand the behaviour and demands of all of the applications using the network. Businesses must - and thoroughly - understand the details of their network's usage and health. Detailed analysis and monitoring of network utilization and performance is a critical part of gaining the insight needed to assure a smooth transition. After the transition, active performance monitoring of both LANs and WANs can help head-off congestion and delay issues before they impact customer service and satisfaction.

The bottom line of transitioning to a cloud-based network environment is that a business must understand how mission-critical applications and services actually use the network, and must ensure that all of the pipes that connect to the cloud can handle the load. Without this, the cloud will remain a mystery, and may never deliver the value that many businesses expect. ●

The smartphone challenge - reconnecting with subscribers

by Eran Wyler CEO & Founder, InfoGin

Mobile communication has gained enormous acceptance, but problems still exist for users and operators alike. Function-rich smartphones let users go directly to websites without passing through operators' portals and this has reduced the operator's opportunity to monetise data service, differentiate services and reduce churn. When operators resolve users' quality, accessibility and ease of use issues everyone wins and operators can regenerate their revenues. By delivering branded content and value-added services, operators become more than empty pipes from which others profit.

Eran Wyler is the CEO and Founder of InfoGin; he has over eighteen years of experience designing and developing state-of-the-art hardware and software solutions for leading Israeli high-tech companies. Prior to establishing InfoGin, Mr Wyler served as senior ASIC R&D Engineer for the network system division at ECI Telecom, where he was responsible for developing intelligent optical networking ASICs. Prior to ECI Telecom, Mr Wyler held senior R&D positions, including as head of R&D for Giga, a software and systems house, and at ORAD Hi Tec SysteMs Mr Wyler served in the Israeli intelligence force in an elite R&D unit as a hardware and software developer.

Eran Wyler is often called today to share his vision with analysts and leading industry policy makers.

In recent years, mobile operators have found it challenging to protect their 'walled gardens' and keep users engaged with their service offerings and brands. The widespread adoption of function-rich smartphones lets users go directly to their preferred websites without passing through operators' portals. This trend has caused a reduction in data service monetization and differentiation opportunities. As smartphones are the main traffic drivers, with more than 75 per cent of global data traffic, operators are now missing out on monetization opportunities for a large part of their throughput. With the constant introduction of new and more affordable smartphones, this per centage is likely to continue to grow. If operators are to stay relevant to the user experience, they will need to develop solutions that deliver significant added value to subscribers.

Challenging environment for operators

There are three main areas in which operators are suffering under current mobile market conditions:

1. Service monetization - The reduction in portal traffic results in fewer opportunities for the operator to monetize its data services. As profit margins for smartphone data services continue to decrease, the loss of portal-associated revenues compounds the problem.

2. Branding - When users browse directly to their preferred websites, the operator loses the branding opportunities previously available through portal pages and additional data services. This substantially weakens the operator's brand awareness and is a contributor to overall churn.

3. Added value for subscribers - Without the ability to differentiate the operator's service and provide true and unique value to subscribers, the operator loses service 'stickiness' and the ability to combat churn.

Operator value-added content strategies

As operators struggle in the face of these challenges, many have recognized the

need to deliver something new - content that integrates well with a user's browsing activity while connecting customers to the brand and driving revenues back to the operator. Content overlays enable operators to deliver a customized experience to users with quick and easy access to their favourite Web content, applications and services. At the same time, this approach provides operators with the means to boost revenues and reduce costs.

It's time for operators to put their own stamp on the smartphone browsing experience. With a second, transparent, layer on top of a device's built-in browser, operators can control what, how and when content is displayed. This enables users to see the operator's 'floating' layer on top of a browser session, providing a natural, seamless experience.

Operator-controlled content

Laying content over a device's native browser gives the operator a new channel of interaction with subscribers, and the possibilities of that channel are vast. They include:

- Premium content and services - This can include content and services traditionally offered by the operator's portals, such as ring tones, true tones, fun tones and wallpapers.
- Advertising - Laying transparent content over the browser generates real-estate opportunities that are owned by the operator, who can connect to any third-party ad-serving platform in order to maximize advertising effectiveness and boost revenues.
- Customized search - Operators can define and monetize a search service and leverage it to provide more value to its subscribers and generate additional revenue opportunities. Incorporating ads into the search results is also possible and provides further monetization opportunities.
- Content optimization - Operators can develop the ability to reduce content size in a manner that still displays the content in a fully viewable format, but minimizes the bandwidth needed to deliver it, reducing the amount of data by an average of nearly 30 per cent.
- Branding - Those benefits address the monetary challenges that operators face. However, brand awareness is another problem in the market, one that can also be solved with operator-delivered content. When the operator has a voice in the user experience, it can add logo placements to the main menu, brand the search experience, promote operation-branded services and Web applications, and direct traffic to portal pages.

Giving subscribers more than they expect

In addition to maintaining revenue streams from existing customers, operators today are understandably concerned about competitive edge. The market is crowded, and many players are competing primarily on price. An operator who produces a better user experience gains a lot in a saturated industry.

Mobile operators can use their content real estate by speeding a user's path to his or her favourite applications. An operator can place a toolbar on a transparent layer or as a floating image at the bottom of the screen on netbooks and laptops with the user's most-used icons, number of unread messages, Twitter feeds and, of course, operator information. Such a toolbar makes the operator not just a pipe for other companies to reach its customers, but a valuable partner in consumers' smartphone usage.

This content layer can also be the vehicle to deliver alerts and notifications to users from their social networks and to enable smarter mobile shopping. By clicking on pre-set, customized icons, users can gain easy access to a realm of applications that allow them to compare prices and receive discounts, coupons and advertising inserts.

The operator can also leverage the unique information it has about its subscribers to provide a better search service. This information can include demographic, behavioural and location information that can be used to provide highly targeted and relevant search results. Finally, an operator-owned content layer can accelerate browsing to reduce the amount of traffic and download times, decreasing latency by more than 60 per cent.

Certainly, consumers have their common gripes about browsing on mobile devices. Many devices still do not natively support JavaScript, Flash and video. Operators can greatly enhance the user's experience by removing these browsing roadblocks, or at least steering around them. Content adaptation capabilities enable the operators, for example, to alter a Flash object into an animated GIF, solving a user's problem and differentiating that user's experience from one that they might have had with another company.

The customer wins, the operator wins

Mobile communication has matured rapidly in recent years, but problems still exist for both users and operators. When the latter offer to solve the issues of their customers, everyone wins: operators have a huge opportunity to regenerate their revenues and redefine their value in the mobile market and the end-user can enjoy easy access to applications, content and services. By delivering branded content and related value-added services to subscribers, operators become far more than an empty pipe from which others profit.

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CSPs dealing with the network

by Thibaut Bechetoille, CEO, Qosmos

The world economy is well on its way to becoming a true 'network economy'. The growth of network data due to the accelerating adoption of mobile and cloud computing by business and consumers requires networks and their underlying technologies to meet new demands. Advanced forms of DPI enable CSPs to optimize the massive volume of data crossing networks, secure data in transit, track data for regulatory and business purposes, and help content providers to monetize data through new service offerings.

Thibaut Bechetoille is the CEO of Qosmos, a company specialised in network intelligence technology. Prior to Qosmos, Mr Bechetoille founded Maiaah! a VPN Provider, where he served as CEO until the company was acquired by Easynet. Previously, Mr Bechetoille was General Manager of Wellfleet/Bay Networks France; Director, EMEA Channels, for Nortel Enterprise Solutions; and Product Manager, for Bridge Communications. After Bridge Communications merged with 3Com, he became Marketing Director, Southern Europe. Mr Bechetoille started his career in the Silicon Valley as a Software Engineer.

Thibaut Bechetoille holds both a Masters degree in Engineering from ENSIMAG and an Executive MBA from HEC Business School.

The world economy is well on its way to becoming a true 'network economy'. From business computing to consumer services to social networking, 'there's an app for that' and more on the way. CSPs (*communications service providers*), especially telcos and MNOs (*mobile network operators*), face challenges and opportunities to provide the infrastructure that can support the volume, diversity of applications and future innovation the new network economy presents.

At the forefront of resolving issues surrounding traffic management, network security, convergent billing, and enabling evolution into new types of services are major enhancements to a familiar technology - deep packet inspection (*DPI*). As networks evolve, so must their underlying technologies and advanced forms of DPI are the true enablers of the new network economy. DPI is being sped up to operate in real-time at 4G network data rates and to capture data as it cross networks with much greater granularity. A transition from 'inspecting' network traffic to technology for mining traffic in real-time for 'intelligence' is already well underway by leading telcos and their network equipment vendors.

CSPs need network intelligence for real-time visibility into network usage to meet their evolving operational and business demands. They will increasingly use it to improve their own business agility as well as to accommodate the new innovations of partnering vendors and content providers. In this regard, CSPs will leverage advanced DPI with network intelligence both internally and as an enabler for other companies participating in the network

economy. For example, a CSP should and will be able to tell a content provider how often their app is used; by what type of subscriber demographic; how often during a day, week or any requested time period; on what type of device; and more. This enables the provider to adjust, create and target content or a service for maximum customer appeal and provider value, as well as implement pricing tiers based on content or service and usage.

Through their CSP, content providers will be able to implement better parental controls and even parental alerts on what applications their children use, when, how often and where. Businesses will be able to prioritize availability of services and content to higher-value customers, and gain the insight to cross-sell and up-sell more effectively to targeted audiences.

Internally, CSPs with network intelligence will be much better equipped to migrate their OSS/BSS from segregated systems based on subscriber-location to convergent, location-agnostic, services and billing. They will have the network visibility to manage traffic and absorb the coming explosion in data volume caused by the growing acceptance and innovation of social networking; cloud computing; and consumers working, shopping, paying bills, watching videos, playing games, reading books, and who knows what else, from their smartphones and tablets anywhere, anytime.

Today, one can begin watching a movie on a TV or computer and continue viewing using a computer or smartphone while en route to an airport, at the airport or even in the air. We're not that far away from seeing credit and debit cards follow the path into obsolescence that CDs and DVDs are taking today. We'll use our smartphones to pay for purchases at checkout, in stores and online. In fact, everything in our wallet today will someday be accessible from a smartphone.

Advanced DPI with network intelligence is the only way that CSPs will be able to manage, track and monetize the massive increases in business and consumer network data transactions. It will also be the only way to comply with government mandates for data retention and to work with law enforcement agencies to police the network economy through lawful interception. Surely, as the network becomes even more indispensable for business and personal transactions, detecting dark Web and criminal activity will be even more important to protecting the public.

Advanced forms of DPI with network intelligence will also lead to the innovation of new applications previously unaddressed by traditional DPI, such as AppStore analytics that detect conversion and revenue rates of music downloads across music genres, demographics and age groups. Just as enterprises today operate 'smarter' and more productively with business intelligence by monitoring and analyzing data extracted from their various management systems, CSPs will increasingly use network intelligence based on the real-time decoding of protocols and extraction of data crossing their networks.

In the same way that business intelligence relies on metadata to correlate and analyze information extracted from enterprise applications, network intelligence uses metadata and content extracted from the data in motion on a network. It is the real-time protocol decoding and metadata extraction with network intelligence that enables advanced forms of DPI, which have been called 'DPI on steroids', and what CSPs need in order to remain relevant in the network economy.

Network intelligence is a new technology unto itself, created by DPI experts as a back-end to upgrade and expand the capabilities of known DPI applications and to fuel the innovation of the new solutions desperately needed to manage, protect and help monetize a rapidly growing and evolving industry.

CSPs and equipment vendors once had the time and resources - and no other alternative - to develop their own DPI for specific vertical solutions, but the speed of industry change today and the new skill sets required for advanced DPI with network intelligence strongly favours reliance on third-party specialists. The tools, expertise and ongoing support for network intelligence already exist for CSPs and vendors to enhance their existing solutions and build entirely new ones. The offerings available from third-party network intelligence specialist companies are not plug-and-play, nor can they be, but they clearly reduce time to market for advanced DPI solutions from years to months. They also eliminate most of the development risks, costs and post-deployment support, such as for keeping protocol and metadata libraries updated.

Third-party DPI also allows CSPs and vendors to focus on their core expertise, rather than divert resources and staff to developing technology that in all likelihood would be extremely difficult to match, let alone keep pace with, ongoing network intelligence innovation. There is already a formal ecosystem in place, the Network Intelligence Alliance (www.nialliance.org), for developers and vendors to accelerate advanced DPI solutions for CSP customers. Members include companies that already specialize in equipment and software for CSP infrastructure, network intelligence technology, high-speed packet capture and processing, and processing platforMs

Through collaboration, technology integration, and raising the awareness of companies in the network data value chain, the Network Intelligence Alliance is delivering the technology for managing, securing and monetizing 4G networks. This benefits CSPs, content providers and device vendors with infrastructure solutions to support their innovations, and virtually eliminates strategic decisions to build network intelligence versus buying pre-developed tools and complete applications that already integrate Advanced DPI.

Adoption of third-party network intelligence technology has been growing from developers of high-performance semiconductors, multi-core microprocessors, multi-port network adapters, and solutions for policy control, traffic management, and network monitoring to solve the capacity challenges of mobile broadband. Other areas where Advanced DPI with network intelligence is making an impact include cyber security, market research, data retention and lawful interception.

The unabated growth of network data due to the accelerating adoption of mobile and cloud computing and the changing demands on CSPs by the emerging network economy will make 2011 the 'year of network intelligence' - to optimize data transport over networks, secure data in transit, track data for regulatory and business purposes, and monetize data through new service offerings. ●

4G with WiFi - changing the wireless game

by Mel Yarbrough, Chief Operating Officer, Towerstream

The exponential growth of mobile Internet traffic is forcing wireless operators to find ways to handle the traffic. The number of mobile broadband subscribers reached 600 million at the end of 2010; it should reach five billion by 2016. To support this growth, mobile network capacity will need to increase 20 to 25 times. By supporting the seamless transfer of traffic to advanced, carrier-grade, WiFi access, wherever available, operators can greatly improve the user experience while simultaneously reducing their network costs.

Mel Yarbrough is Towerstream's Chief Operating Officer, responsible for the strategic development and execution of the company's corporate business plans as well as leadership of the sales, marketing, operations, engineering and customer care departments. Mr Yarbrough came to Towerstream from Hoovers (D&B; Dun and Bradstreet), where he served as VP of Business Development and VP of Sales. Prior to joining D&B, Mr Yarbrough worked in several executive sales and marketing positions, including roles at StarCite and Handango. Mr Yarbrough's wireless experience began with PageMart (Weblink Wireless) where he held several leadership roles.

Mel Yarbrough holds a B.A. in Economics from Southern Methodist University and a Juris Doctorate from Vanderbilt University School of Law.

With the flexibility to handle voice, data, and video over Internet Protocol, 4G networks are undoubtedly changing the mobile broadband landscape in profound ways. But with mobile data traffic expected to increase 39 times by 2014, and new data-hungry smartphones and tablets coming to market in overwhelming numbers, how can next-generation wireless networks keep up with the crushing amount of data being consumed by mobile users? As data hungry mobile devices continue their huge adoption curve, it is becoming clear that carrier class WiFi networks are required as a data-offloading supplement to 4G networks. In fact, as the major carriers continue to build 4G networks, WiFi data offloading will become even more accessible, and the potential for 4G networks to make offloading of lower margin bits will become a reality.

According to recent numbers from global research firm IDC, smartphone manufacturers shipped 100.9 million devices worldwide in the fourth quarter of 2010, an 87.2 per cent increase from the 53.9 million units that shipped in the final quarter of 2009. This represents the first time that smartphones have surpassed PCs in terms of number of units shipped in a quarter, and Google's Eric Schmidt recently predicted that PC sales would not catch up. According to Schmidt, "the phone is the new PC", and he identified the smartphone as representing the future of games, productivity, apps, and more.

Further contributing to the strain on wireless networks is the increasing market penetration of tablets devices. In fact, Yankee Group expects over 63 million tablets to be in use by 2015. Moreover, Google's Android OS has recently experienced rapid growth, powering every significant device launched at this year's Mobile World Congress and rivalling Apple's iOS platform for market leadership. Demonstrating its wide user adoption, Google says it is now activating over 300,000 Android-powered devices each day, with 170 total devices on the market.

It is apparent that the wireless industry is evolving to a point where consumers expect seamless access to the Internet regardless of device, and it is only a matter of time before Internet-enabled mobile devices are ubiquitous. This rapid penetration of data-hungry smartphones and tablets is already having a significant effect on network loads, and as mobile devices continue to increase in numbers, networks will become even more congested. For example, according to Cisco, a smartphone generates about 24 times more data

on a wireless network than a standard feature phone, whereas a tablet generates a staggering 122 times more data consumption than a basic feature phone.

To cope with these expected increases in mobile data traffic, the major wireless carriers are investing billions of dollars in 3G and 4G network infrastructure. However, these investments are not anticipated to fully relieve the current strain on wireless networks in congested areas with high levels of mobile broadband usage. Verizon has reported that its LTE upgrade will increase data capacity by four times, but mobile data consumption is expected to grow at a much faster rate - as much as 39 times by 2014, according to Cisco's Visual Networking Index. More strikingly, Huawei, a Chinese telecom provider, expects the global level of mobile data traffic to rise 500 times by 2020. As such, it should be clear that current 3G and 4G networks by themselves are not sufficient to handle this staggering increase in data consumption.

WiFi momentum

According to Deloitte, the volume of data uploaded or downloaded from mobile devices via public WiFi networks will grow by 25-50 per cent in 2011 - much faster than the growth of data carried over cellular broadband networks during this same time. Video is the major driver of this data traffic growth, as users are consuming an ever-increasing amount of video with smartphones, tablets, and other mobile devices. In fact, Deloitte predicts that WiFi is likely to become the default network for video applications.

As recently as four years ago, WiFi-enabled handsets did not have critical mass. However, the introduction of the iPhone disrupted the wireless industry and WiFi is now ubiquitous in mobile devices coming to market. More recently, WiFi has become essential to the user experience for smartphones and tablets. And since an increasing number of smartphone and tablet applications run only on a WiFi connection, access to a fast and reliable WiFi network is becoming imperative for smartphone users. As a result, devices and carriers will need access to reliable WiFi networks to offer consumers a more complete user experience.

The proliferation of WiFi hot zones as well as seamless hand-off capabilities between networks and devices are contributing factors to the expected increase in WiFi usage over the coming year. In fact, a pilot WiFi program in Manhattan has demonstrated the incredible demand for a carrier class WiFi network from users of smartphones and other connected devices in highly congested areas. As this WiFi initiative moves into its next phase this year, we believe it will be the fastest portable network in Manhattan.

Furthermore, WiFi growth will also likely be driven by the transition from 'all-you-can-eat' mobile data plans to ones with a capped monthly usage. For instance, one hour of streaming video at 500kb/s would eat up the entire allowance of a monthly data plan capped at 200Mb. Also, in anticipation of a crush of new iPhone users on its network, Verizon recently announced plans to penalize its heaviest data users with reduced throughput speeds for the current and following billing cycles. Policies like these will encourage consumers to migrate to WiFi networks instead of facing the prospect of data speeds grinding to a halt.

WiFi offloading

It is clear that WiFi data-offloading has the potential to become a cost-effective and easily accessible solution for the major wireless carriers to relieve the crushing strain on their networks from high volume mobile broadband users. However, there are some potential roadblocks that must be resolved before WiFi offloading is widely adopted.

While it is apparent that WiFi offloading is a solution that will move the needle on the data congestion problem, there must be a seamless mechanism for mobile providers to transfer data from their broadband networks to WiFi. End users should not have to authenticate their handsets manually or be forced to log on to a WiFi network. Instead, user data should be seamlessly pushed from the carrier to the device, with the carrier doing the legwork of interacting with the web of networks on the back-end without any need for activity by the end user. Simplicity is key, and helping to bolster the argument of WiFi offloading as an effective model is the fact that most smartphones are equipped with automatic login capabilities with WiFi access already configured. For example, Extensible Authentication Protocol (*EAP*) is a very elegant solution for carriers to seamlessly hand off devices to a WiFi network.

WiFi and cellular broadband

The mobile Internet revolution is the biggest disruption the wireless industry has seen in decades. As mobile data traffic continues its exponential growth, it is crucial for wireless operators to figure out a sustainable solution to support this traffic. While the number of mobile broadband subscribers reached 600 million at the end of 2010, it is expected to almost double this year to a billion and climb to five billion in 2016. To support this staggering growth, it has been estimated that mobile network capacity will need to increase 20 to 25 times.

The battle between cellular broadband and WiFi should not be viewed as a zero-sum game; both models can be winners. In order to continue to offer customers exceptional service, mobile providers must offer a range of wireless and wireline technologies and help their customers tap into the appropriate mix to suit their particular needs. The goal for carriers should be to make the entire connected experience as seamless as possible for consumers through both next-generation broadband networks and WiFi deployments. ●

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Backhaul using smart microwave

by Shai Yaniv, Director of Product Management at Ceragon

Operators struggle with the ever-increasing demands for data capacity and the need to ensure high quality of service and user experience. Wireless backhaul solutions based on point-to-point microwave can support these requirements, but this will be done by systems that are more than mere dumb pipes. Smart microwave solutions, which are network and traffic aware, and which address operators' needs for efficiency, reliability, low cost and power reduction, will help drive next generation services, making them affordable and profitable.

Shai Yaniv is the Director of Product Management at Ceragon, a provider of high-capacity LTE-ready wireless backhaul solutions. Mr Yaniv has over 18 years of telecom industry experience with advanced communication systems, including wireless backhaul networks and broadband wireless access solutions. Prior to joining Ceragon, Mr Yaniv served in leading product management, marketing and business development roles at Alvarion, a WiMAX solutions provider.

Shai Yaniv holds a BSc in Electrical Engineering from the Technion, Israel's Institute of Technology and MSc in Electrical Engineering from the Tel-Aviv University.

Prior to the iPhone launch in mid-2007, AT&T hurried to rollout a major upgrade of its 3G mobile data service, in anticipation of a tenfold increase in network traffic. Appetite for mobile data and the number of smartphones and data-centric devices has only increased since then. In fact, data traffic over cellular networks should grow almost 40-fold until 2015, and UK firm Coda Research anticipates that in the US, mobile video will account for over 60 per cent of all mobile data usage. Can backhaul networks support such staggering capacities?

Network operators, utility companies, public safety organizations and enterprises are all struggling to meet the immense demands for data that are required by today's applications. At the same time, they must plan and prepare for the continued growth.

Microwave everywhere else

When examining the wireless vs. wireline alternatives, fibre's nearly unlimited capacity immediately stands out. However, the fibre option is not always practical. Whether due to deployment restrictions (rough geographical terrain) or regulatory restrictions (dense metropolitan areas) laying out fibre infrastructure may be too costly and time-consuming. In such cases, wireless, or more accurately, wireless backhaul based on point-to-point microwave, emerges as the best solution.

Microwave backhaul solutions are capable of delivering high bandwidth, carrier-grade Ethernet and TDM services. Microwave is suitable for all capacities up to several Gbps over a single link - and may be scaled up to multiple Gbps using aggregated links techniques. Unlike fibre, wireless solutions can be set up quickly and are much more cost-efficient on a per-bit basis from day one.

The end of the fat pipe era

Today, microwave backhaul offers much more than fat pipes connecting two endpoints. Microwave has evolved over the years and has accumulated advanced service features such as service and network topology awareness - features that until recently were only available using expensive external boxes for switching and routing traffic.

As networks become more complex, and user experience and quality of service become major differentiators between operators, the role of microwave systems within those networks is changing. Microwave backhaul should be much more than a dumb pipe. It must be smart.

The capacity characteristic of today's traffic requires attributes different from those of the installed base of legacy backhaul. One example could be the peak-to-average ratio; a 4:1 peak-to-average traffic ratio is not uncommon in backhaul networks. The microwave solution must be traffic aware in order to manage multiple applications with differentiated quality of service levels. For instance, voice calls consume relatively low bandwidths and require high priority with minimal latency. Web browsing or ftp downloads on the other hand, require high data volumes, but the user's quality of experience is less affected by latency issues.

Moreover, to ensure quality of service, a smart microwave backhaul solution should also be aware of network topology. It should integrate Carrier Ethernet functionality and be able to independently re-route traffic in case of network failure.

Microwave support for 4G backhaul?

The answer to the question of whether microwave can cope with future capacity requirements is a simple yes. Microwave can support multi Gigabit Ethernet over a single link, and real-life performance really depends on the available frequency resources, as depicted in the table. Advanced microwave supports high spectral efficiency and can better utilize the available spectrum. This translates into much more capacity at a given channel. Other, more developed microwave systems offer advanced lossless compression techniques, as illustrated in the table, that allow even more capacity over a given wireless link with additional support for burst peak-to-average issues.

Spectrum Channel Bandwidth	Microwave Radio Throughput	Ethernet Throughput with Enhanced Lossless Compression [up to Mbps]
10MHz	60	160
14MHz	85	235
28MHz	185	500
30MHz	197	530
40MHz	254	700
50MHz	336	920
56MHz	365	1000

Modulation: 256QAM

In our non-perfect world, most backhaul networks are not 'greenfield' infrastructures, but rather existing backhaul networks that are evolving. This evolution requires a smooth and risk-free migration plan from legacy networks to next-generation, packet-based communications. This is paramount for network operators - in common with electrical companies implementing smart grid applications. Replacing legacy TDM networks with IP based networks requires careful planning as it involves a gradual process, with a hybrid network having to provide simultaneous support of TDM and IP/Ethernet communications.

What makes wireless backhaul smart?

Service aware traffic management - Service aware traffic management refers to the ability to differentiate packets by type. The transmitted data stream may be composed of E1/DS1s, ATM, IP, or Ethernet. These packets may come from multiple sources and may have different quality requirements. Smart backhaul can prioritize the different flows and preserve the requirements of contractual service level agreements (*SLA*).

Service aware traffic management - The overall system gain of a backhaul system greatly affects capital investment and service quality. Sensitive receiver threshold performance enables superior system gain, regardless of the transmission power. From a business standpoint, high system gain affects the capital investment. For example, high system gain allows operators to reduce the number of links required to cover a given distance. It also allows the usage of smaller, less costly, antennas (this might also reduce rent fees when leasing tower-space from a third party). Last, high system gain provides superior network availability and quality of service in harsh weather conditions.

Power consumption - With the telecom industry taking its share of social responsibility and striving to conserve energy, power consumption is a key component of a backhaul solution. Obviously, low power consumption is also critical for achieving lower total cost of ownership targets, particularly in private networks.

Smart wireless backhaul will have an advanced power consumption scheme, based on real-time usage and environmental conditions. Smart power consumption can provide up to 50 per cent reduction in power consumption.

Minimal footprint - The common backhaul node integrates equipment from multiple vendors handling various wireless and wireline functionalities, so physical space is scarce, particularly if environmentally hardened outdoor units are required. Equipment designed with a minimal footprint helps to squeeze the maximum capacity into physical rack space.

Resiliency and modularity - With network requirements constantly evolving, any microwave backhaul solution implemented today must be modular and inherently capable of supporting the new challenges and requirements of tomorrow. Topology awareness is an important feature, since a smart wireless backhaul will assure that the traffic will get from point A to Point B even if there is a network failure by recalculating an alternate path.

When high capacity is not enough

Operators today struggle with the ever increasing demand for more data capacity and the need to ensure high quality of service and user experience. Wireless backhaul solutions based on point-to-point microwave can support these requirements, but this will be done by systems that are more than mere 'dumb pipes'. Smart microwave solutions, which are network and traffic aware, and which address operators' needs for efficiency, reliability, low cost and power reduction - will help drive next-generation services, making them affordable and profitable. ●

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Mobile Internet needs better WiFi

by Ms Selina Lo, President and CEO, Ruckus Wireless

Much of the growing flood of data traffic on mobile networks comes from or goes to WiFi-enabled smartphones and tablets. Some 'superphones' routinely average more than 1GB per month. Millions of smartphone users already know from their poor user experience that mobile operators have a real problem. 'Smart' versions of WiFi with adaptive antenna technology that supports dynamic beamforming can transform WiFi into a ubiquitous utility to help alleviate the problem and give users a positive mobile broadband experience.

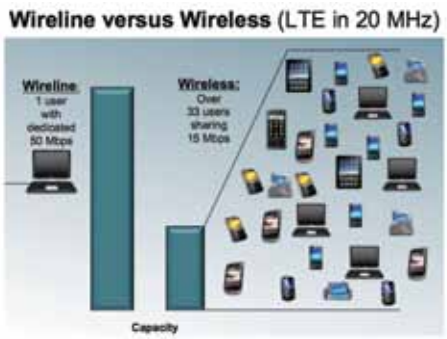
Selina Lo is the President and CEO, Ruckus Wireless. As a former Vice President within Nortel Networks' Content Business Unit and Data Network Business Unit, Ms Lo is recognised for creating and developing the market for content-based switching. Ms Lo joined Nortel when it acquired Alteon WebSystems where she had served as Vice President of Marketing. Prior to Alteon, Ms Lo was the Vice President of marketing at the Centillion Business Unit of Bay Networks. Centillion was a networking start-up co-founded by Ms Lo that developed the first token ring switching system. Centillion was purchased by Bay Networks. Ms Lo's career also includes several management roles at leading network and computing companies including Network Equipment Technologies and Hewlett Packard.

Selina Lo She holds a B.S. degree in Computer Science from the University of California at Berkeley.

Enterprises and carriers must rethink their networks as new wireless-only devices flood the air. With the barrage of data traffic hitting corporate and mobile networks from WiFi-enabled smartphones, tablets and other bandwidth-hungry devices, enterprises and carriers must contend with data volumes that exceed network capacity, and crowded airwaves that can be impossible to navigate.

It is now imperative for enterprises and carriers to rethink their infrastructure architectures from the outside in - with a keen eye on managing RF spectrum resources (the new wire), as well as latency and delay that are effectively killing multimedia transmissions.

According to industry analysts, data traffic continued to increase across all networks in 2010. Some so-called 'superphones' routinely average more than 1GB per month, and by the end of 2010, it's expected that the average US consumption per smart device will be approximately 325MB per month - up a staggering 112 per cent from 2009 alone.



Source: Rysavy Research, 2010

Additionally, Cisco's mobile data trends research estimates that 66 per cent of the world's mobile data traffic will be video by 2014 and that mobile video will grow at a compound annual growth rate of 131 per cent over the next five years. If these stats pan out, traffic will present a real problem for networkers.

Smarter WiFi helps data-hungry devices

Meanwhile, millions of Blackberry and iPhone users already know that mobile operators have a real problem on their hands from painful first-hand experience. Even where 3G networks are highly developed,

demand for connectivity is outstripping supply at an unprecedented rate. The cost of transporting data is rising faster than revenue, and poor user experiences resulting from network congestion raise churn.

These devices are also being incorporated into the enterprise in droves. IT departments must now deal with how to provide secure, fast and reliable access to a whole new class of devices that don't have Ethernet ports. The only way into and out of these devices is 3G or WiFi - neither of which have a strong history of performing well. Although 802.11n dramatically increases potential bandwidth and seems ideal for wireless access, the problem is realising this 'potential'. While the standard increases the capacity of the technology from 54 megabits per second (*Mbps*) to 300 or more, users never see this kind of performance, ever - no matter what price they pay.

Beamforming - an option defined within the 802.11n standard - is a specialised method of radio frequency (*RF*) transmission developed to increase the range and performance of WiFi signals. However, while useful, generic beamforming doesn't take into consideration the explicit control or directionality of these signals to a given client.

However, adaptive antenna technology that supports dynamic beamforming - the latest innovation in WiFi - takes this a step further by directly altering or controlling the form and direction of signals to help determine the fastest and cleanest path at any time.

Often referred to as 'smart WiFi', WiFi signals are formed and directed to each client using a multi-element, high-gain directional antenna array. APs (*access points*) transmit WiFi signals directly to each client only when they are needed, using the highest performing signal path and without network administrators having to position APs or antennas. Because each WiFi signal is a focused RF 'beam', range is extend by up to a four-fold increase without wasting signal on areas where it is not required - a quality which is really making WiFi sceptics sit up and listen.

Smarter WiFi for 3G offloading and seamless integration

The latest developments in Smart WiFi solutions also offer significant benefits for operators looking to economically increase capacity and extend network coverage. As these more reliable forms of WiFi prove themselves capable of handling offload of data traffic from 3G networks, operators are taking a more strategic view of the technology. They want to utilise it beyond simple hotspot operation and fully integrate it into the mobile infrastructure. To do so requires a complete collection of products that include customer premise equipment, access points, point-to-multipoint wireless backhaul, network gateway services and remote management - all of which can work seamlessly with existing core cellular network services.

Because WiFi networks introduce many new nodes into the mobile operator's network, seamless integration with and the services provided through the existing cellular core must work flawlessly, without increasing the load on the 3G/LTE infrastructure.

Recent innovations in this area include advanced capabilities that enable transparent interactions between core services, such as HLR/HSS, PCRF and AAA, and the WiFi network. Beyond data offloading with smart WiFi systems, operators can now quickly deploy reliable wireless coverage and capacity at the lowest possible cost per bit - and address the massive opportunity for high-speed data services that alternatives such as WiMAX cannot, due to deployment costs and complexities.

To achieve the full promise of WiFi, operators need a well-conceived, carrier-built architectural approach that spans the radio access network, backhaul and core cellular infrastructure - addressing issues such as provisioning, seamless authentication and IP mobility. With a controlled and cooperative WiFi/cellular infrastructure, operators can offer a high quality service to subscribers while monetising services that travel over WiFi.

Ultimately, for carriers and enterprise to adequately support the data onslaught hitting their networks from a flood of wireless devices, they must look to technologies that can deliver the reliability and performance needed to provide consistent services.

Adaptive antenna technology that supports dynamic beamforming is one technology ready to transform WiFi from a technology of convenience into a ubiquitous utility - good news that comes at just the right time to deliver a positive mobile experience to iPad-toting end users over the next decade. ●

Case study

Smarter WiFi helps Rock Bottom reach new high

Rock Bottom Restaurants, based in Louisville, Colorado operates a variety of casual dining restaurants. It turned to smart WiFi technology to deliver more reliable wireless technology supporting higher speeds and more stable client connections.

"As the world goes wireless, there's a real opportunity within our industry to radically enhance the guest service experience through the use of more advanced WiFi," said Rob Jakoby, VP of IT at Rock Bottom Restaurants. "With everything becoming electronic, smarter WiFi technology gives us the opportunity to introduce new services and applications, while improving the overall efficiency of our operations. This will give us the foundation to build our future technology on."

Jakoby noted that recent advances in WiFi technology are enabling new applications such as tabletop payment and media devices that allow customers to access multimedia content and video streaming and online gaming. Meanwhile, the same wireless infrastructure can also support point of sale and secure guest access.

"Given a limited IT staff to serve so many remote locations, we needed a WiFi system that could deliver robust connectivity with a lot of horsepower, be ultra simple to deploy, remotely manageable and all at an affordable price point," said Jakoby. "We found these competing requirements were not addressed with conventional 802.11 technology."

Rock Bottom replaced its legacy 802.11g system with a smart WiFi 11n solution in each of its restaurants, managing all the APs as a unified system using a remote WiFi management platform. This gives Rock Bottom the ability to quickly and easily perform bulk configuration, proactively troubleshoot the network from a single location, gather statistics and actively monitor each AP.

"Given the type of interactive and multimedia applications we envision in the future, the ability to deploy higher speed 802.11n systems in our restaurants at 802.11g prices is a big win for us," said Jakoby. "With the flood of smart phones and WiFi-enabled handheld devices hitting the market, customers have come to expect carrier class wireless connectivity. Smart WiFi technology helps us meet these expectations in a very affordable fashion."

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Energy and infrastructure for LTE deployment

by Paul Misar, Director, Product Management, Energy Systems, Emerson Network Power

As LTE evolves, service providers will move toward data-only networks, carrying voice in standard VoIP format. To reduce infrastructure costs, operators will shift network topology and the system requirements at each cell site. This will drastically reduce power requirements and make alternative and renewable energy more financially attractive. LTE is also forcing a convergence of wireless, wireline and cable networks to provide backhaul. Distributed antenna systems with multiple antennas throughout the neighbourhood help achieve the speeds needed for data-intensive services.

Paul Misar is Director, Product Management, Energy Systems for Emerson Network Power. Mr Miser has more than 15 years of experience in the telecom outside plant industry, both in the wireless and wireline arenas, focused on product management, design and implementation.

Paul Miser holds a BSME from the University of Illinois, Chicago.

Mobile broadband has become so significant in our daily lives that we have become accustomed to immediate broadband access at home, in the office and on the road. This results in an explosion - with more to come - in the amount of data moving through the wireless infrastructure.

To meet the demand for faster data connections, the industry has responded with two new wireless platforms - WiMAX and Long Term Evolution (*LTE*) - as next-generation wireless platform technologies. In North America, LTE is the choice of existing mobile service providers, providing many advantages over WiMAX technology.

LTE has led service providers to rethink their current deployment strategies in order to provide the highest data speed throughout their networks. Therefore, one of the main strategies has been to move to a 'nodal' infrastructure involving a greater number of sites with lower power requirements. In many cases, a single cell site services a number of antenna sites, drastically reducing the overall infrastructure and increasing network reliability, while decreasing the power requirement at each site and of the network as a whole.

LTE's promise of lower-powered sites imposes an overall shift in the network topology and the system requirements at each cellular site. These changes drastically reduce the amount of DC power required per site, the overall cooling requirements and the site footprint. LTE also is forcing a convergence of the wireless, wireline and cable networks. Greater data use and LTE efficiencies are pushing more data through the wired network. Within three to five years a new topology will emerge.

Wireless backhaul evolution

Data-centric standards such as LTE require a more robust network backhaul but using the wired network for this creates its own set of challenges. LTE's greater data use and efficiencies mean that more data must use wired network backhaul. Data, then, as it becomes a major revenue stream, will force wireline carriers to reconsider three specific areas:

- Cost - Dramatic increases in data traffic require additional bandwidth. Traditional copper-based T1 systems can't handle large data flows without increasing the line count threefold at each site. The cost of leasing these lines to connect to the local wireline provider could exceed US$10,000 per month, per site. It is more efficient to move to an Ethernet-based fibre or high-speed microwave backhaul system for LTE. The wireless provider will be able to maintain the link to the wireline network, increasing reliability and reduce infrastructure costs compared to relying upon the local exchange for backhaul services.

- Flexibility - Today's backhaul solution must be flexible enough to reliably handle legacy

infrastructure, second and third generation technologies, such as GSM, UMTS and CDMA and, as well, the future data backhaul needs of LTE. A backhaul solution, such as fibre-based Ethernet, is capable of providing a flexible, data -intensive, network connection for both today and tomorrow's radio technologies.

• Reliability - Backhaul traditionally is the network's weakest link. Reliability must increase as demand grows. Backhaul spending will increase as providers work to deliver the most robust backhaul systems.

Overall, broadband data network ownership will consolidate until just one or two dominant network management providers emerge. Front-end service providers that have few, or no, ties back into the managed data network will sell advanced mobile data products. In the near future, this will cause a major revolution in the market and affect the overall site infrastructure.

LTE and the wireless infrastructure

As LTE evolves, service providers will move toward data-only networks, carrying voice in the form of packetized data using a standard VoIP format. There will be great pressure to reduce infrastructure costs. Unified LTE standards will foster a more unified approach to cellular deployment with a 'do more with less' focus upon the costs for outside plant, DC power and site layout.

Infrastructure suppliers will have to provide solutions that can do more both in smaller, more cost-effective, greenfield sites and at legacy infrastructure sites. Traditional wireless sites won't disappear, but LTE forces providers to use innovative methods to extend the network closer to the subscriber. Mobile users are becoming more static, choosing the use of wireless devices over wired technology. 'Smart technology' homes will become more prevalent; they will use wireless network services to facilitate energy conservation via smart metering and to deliver full HD wireless television, phone service and high-speed Internet that exceeds the fastest wireline broadband currently available.

Data speed decreases as distance from the antenna grows; so to obtain the speeds needed for data-intensive services, wireless networks must move closer to the consumer. One method involves deploying DAS (*distributed antenna systems*) networks with multiple antennas throughout the neighbourhood, providing extensive coverage fed by a main DAS 'hotel' located in the network.

• The DAS hotel contains incoming utility power, DC rectification, radio systems, fibre splitter and management, node splitters, electronics and battery backup. DAS hotels can be housed in a walk-in enclosure or a series of small outside plant cabinets. Site style depends on availability and property cost, plus the need for growth. Low-growth potential sites are best served with several outside plant cabinets. Growth areas are best served with walk-in enclosures that can easily add radios, carriers, DC power and battery backup.

• Traditional sector antennas are split up, or duplicated, among several antennas fed via fibre, generally strung along existing utility wires.

• At each antenna node, power is fed by the utility company via a point of demarcation.
• Site nodal electronics are powered by approximately 200 watts DC at the site and generally do not have battery backup.

DAS network sites typically have three times the coverage of a traditional wireless site with the same number of carriers. Main DAS hotel sites do not require large DC power plants or large battery backups. Little or no amplification is needed to send the signal through the fibre network. Hotel sites can use less than half the current DC power and battery backup. From an infrastructure standpoint, sites require less AC power and a smaller infrastructure footprint.

Although a nodal site with antennas requires DC power, AC demarcation and outside plant cabinets, these components pale in size and energy compared to an equal primary radio site. In many cases, the nodal side is connected to the utility grids with no DC back up. This may evolve based on the critical nature of the data being transferred and the types of businesses or individuals served.

Existing providers will initially deploy LTE within the current infrastructure, especially if radio frequencies are available. Based on scalability and interoperability, the most cost-effective solution is to add an LTE radio system at an existing cellular site utilizing the existing radio infrastructure. This can be done by:

• deploying an LTE radio;
• deploying RXIAT (*Receive Antenna Interface Tray Subsystem*) equipment;
• use of existing DC power and DC backup (typically oversized at existing sites).

Speeds required at existing sites to maintain a 'digital house' will never be attained unless antennas are placed close to the subscribers. Ultimately, nodal sites may become the solution to properly distribute signal effectively through the network.

The energy factor

Cutting wireless network energy costs is essential for service providers. Estimates show that telecommunication networks consume nearly one per cent of global energy use. With more than four million cell sites deployed globally, the energy savings impact is significant.

Cellular site optimization is vital. The focus has been on the radio system and the amount of energy consumed by the radio and overall amplification of the signal at each site. Many greenfield deployments utilize remote radio heads, or 'Node B' configurations, at the primary cell site. These place the amplification and antenna at the top of the tower, leaving the radio, DC power and energy backup at the base. The overall efficiency of radio distribution saves DC power, outside plant and AC distribution by as much as 50 per cent per site. In addition, the LTE technology draws less power within a smaller footprint, further contributing to the energy use at each wireless site.

As power at the site continues to decrease, the advantages of alternative and hybrid energy sources become more financially attractive. A hybrid control system enables the deployment of renewable energy sources. In addition to utilizing grid power, plus a DC generator or DC batteries as standard backup, renewable sources incorporate power from solar, wind or fuel cells at each LTE site.

Hybrid site architectures reduce grid energy by approximately 25 to 30 per cent per site, and provide significant energy cost reductions when multiplied by the number of sites. US sites utilizing renewable energy sources can also realize a 30 per cent federal energy tax benefit. Several states offer tax incentives as well. Renewable energy also gives providers an environmental advantage that reinforces their overall sustainability message.

Decreased site energy consumption allows for a broader use of renewable and hybrid energy sources. This creates the opportunity to package the systems for rapid deployment, providing overall economy of scale and flexibility. Payback, based on current electric rates, should be from three to five years.

Wireless telecommunication infrastructure leaders will be those who find unique cost- and energy-efficient ways to enhance the transport network. ●

A flood of new devices

by J. Mark Howell, President, Brightpoint Americas

Operators need readily available, affordable, devices to sign-up users for their costly 4G networks. The transition to high-speed networks is accelerating and carriers need to recuperate their network deployment investments. Migrating users to the new networks is crucial to realizing the efficiencies promised by their deployment. Recuperating the investment requires minimizing total device investment, accelerating turnaround time on returns and maximizing device distribution. Carriers and manufacturers that can meet these goals will reap the benefits of the high-speed, connectivity market.

J. Mark Howell is the President of Brightpoint Americas; he is also its Co-Chief Operating Officer responsible for managing all aspects of the company's operations and activities in the United States and Latin America. Prior to assuming the role of President, Mr Howell served as Brightpoint's Executive Vice President and Chief Financial Officer.

J. Mark Howell received his Bachelor's Degree in Business Administration from the University of Notre Dame, and is a Certified Public Accountant.

America's four national carriers have little in common - at least, that is what they would like the consuming public to conclude. Each carrier's brand message suggests that the other three networks are constructed of expensive soup cans and thread. There is, however, one common theme embedded in all four carriers' communications. The primary message from all four carriers regarding their 4G, fourth generation, networks is their promise of high-speed connectivity, and the capabilities that the vast array of devices built for these networks offer.

A flood of new devices

Original equipment manufacturers (*OEMs*) unleashed a river of exciting industry news at CES 2011 show, reinforcing the expectation that we will witness a flood of 4G-capable devices over the next few years. The fervent hope of many - manufacturers, carriers, distributors and retailers - is that the device influx will accelerate replacement cycles and energize wireless and mobile device markets.

Whether consumers take advantage of 'The Fastest, Most Advanced 4G Networks in America', or plug in to 'America's Largest 4G Network', new devices are required. These new devices do more than generate a tally in the 'units shipped' box. They stimulate the markets for network bandwidth and for devices with wide-ranging functionality - two industry growth drivers that are essential to the evolution and convergence of wireless and mobility ecosysteMs

The growth driven by this market evolution will have wide-ranging impact upon the entire wireless ecosystem. Some estimates predict the global demand for 4G products will be in excess of 500 million units by 2015. Considering these numbers do not account for the quasi-4G 'HSPA+' products that are already hitting the US markets, the numbers are sure to be significantly higher.

Device cost increasing?

Another number poised to move higher is the device cost associated with these 4G devices. The industry needs to consider the predicted device volumes and create

the price/value propositions the market will accept given the higher average cost associated with these devices. This will help carriers quickly generate the returns needed to pay for their investments in building-out and maintaining these new high-speed networks. The North American market is conditioned to device subsidies. Truly, generating a positive ROI from the new networks is contingent upon getting the appropriate devices into the users' hands. Partners who can assist by extending the device life cycle and, as well, maximize device ROI are most likely to succeed in the evolving network capacity driven market.

The depreciation conundrum

New technology introductions and rollouts are almost inevitably accompanied by a corresponding rise in return rates on those devices. Buyer's remorse, improper positioning of the device's capabilities and limited usability/coverage areas often the cause the high return rates. While the devices still have worth, they cannot be sold as new. Much like a new car, the instant that it is driven off the lot, a new device dramatically depreciates in resale value as soon as it is 'used'. Minimising that depreciation is vital. Additionally, when a user needs to have a new device serviced or repaired, the importance of providing the customer with a viable replacement cannot be overstated.

With the existing generation of devices, suitable replacements that can perform the same or similar functions are fairly easy to find and supply. However, a newly launched device does not enjoy the same advantage as the volume, and time in market is naturally more limited. Dipping into a pool of new devices is not practical owing to the high additional cost - normally non-recoverable - of a new device.

Given that moving customers to newer, high-speed/high-capacity networks is a priority goal for carriers, and those new, high-dollar devices are required to drive customers to these networks, carriers face a dilemma. How can they best migrate customers, while at the same time limit device costs and maintain or increase customer satisfaction scores?

Charting a course

The most immediate solution is to establish a returns triage channel tasked with a quick turnaround of no-trouble-found (*NTF*) returns. Field replacement units (*FRU*) are almost always in demand, regardless of the device in question. However, a properly triaged NTF unit can be easily repurposed to supply and refill an FRU stock pool without requiring the manufacture of a great number of units that are not destined for retail sale.

New technology launches often lead to an increase in return rates for a variety of reasons. According to CNET.com, the computing industry experienced this in 2009 when return rates of netbooks spiked, reportedly hitting the 30 per cent mark with some manufacturers. In the majority of cases, the returns were the result of improper initial sales positioning, not device failures. A glut of returned, high dollar, devices with no faults - but not re-sellable for full value - looks pretty grim on a balance sheet. However, this same glut of devices is the ideal source for building a FRU stock pool.

Carriers adopt aggressive hardware pricing models to accelerate customer migration to new network platforMs Many independent agents face serious challenges when trying to offer the same products as those subsidised by operators at similar prices. In order to level the playing field, many have looked to the refurbished-device market for supply. Unfortunately, that market tends to deliver an uneven user experience, as it has been difficult for carriers and OEMs to exert much control.

Again, an approach where a carrier, an OEM - or both - partner with a solutions provider that can deliver a rapid triage and turnaround of returned devices is an attractive solution. Carrier and OEM involvement affords the dealer a source of approved, refurbished product that allows them to compete on price. Partnering with a third party for the physical triage/refurbishment offloads labour cost while providing a way to rapidly re-deploy these units to the market. It also offers the OEM and carrier a level of control not currently achieved - control that allows for them to more closely manage the end customer experience. Finally, this approach provides an avenue that did not previously exist to recover cost on high-dollar devices.

Navigating the flood

The message from the carriers is not changing; 4G networks are both the present and the future. Manufacturers are in lockstep; today's trickle of 4G devices is poised to rapidly become a flood. As the transition to high-speed networks continues to accelerate, and the associated carrier investment in that network build-out increases, avenues for cost recovery need to be explored and expanded. Migrating users to these newly deployed networks is crucial to realizing the efficiencies promised by their deployment. Being able to sell 4G capabilities positions carriers and manufacturers on the leading edge of the technological wave. Navigating the flood will require minimizing total device investment, accelerating turnaround time on returns and maximizing distribution of devices. The carrier or manufacturer who can successfully chart a course that meets these goals will be well positioned to reap the benefits promised by a high-speed, connected world. ●

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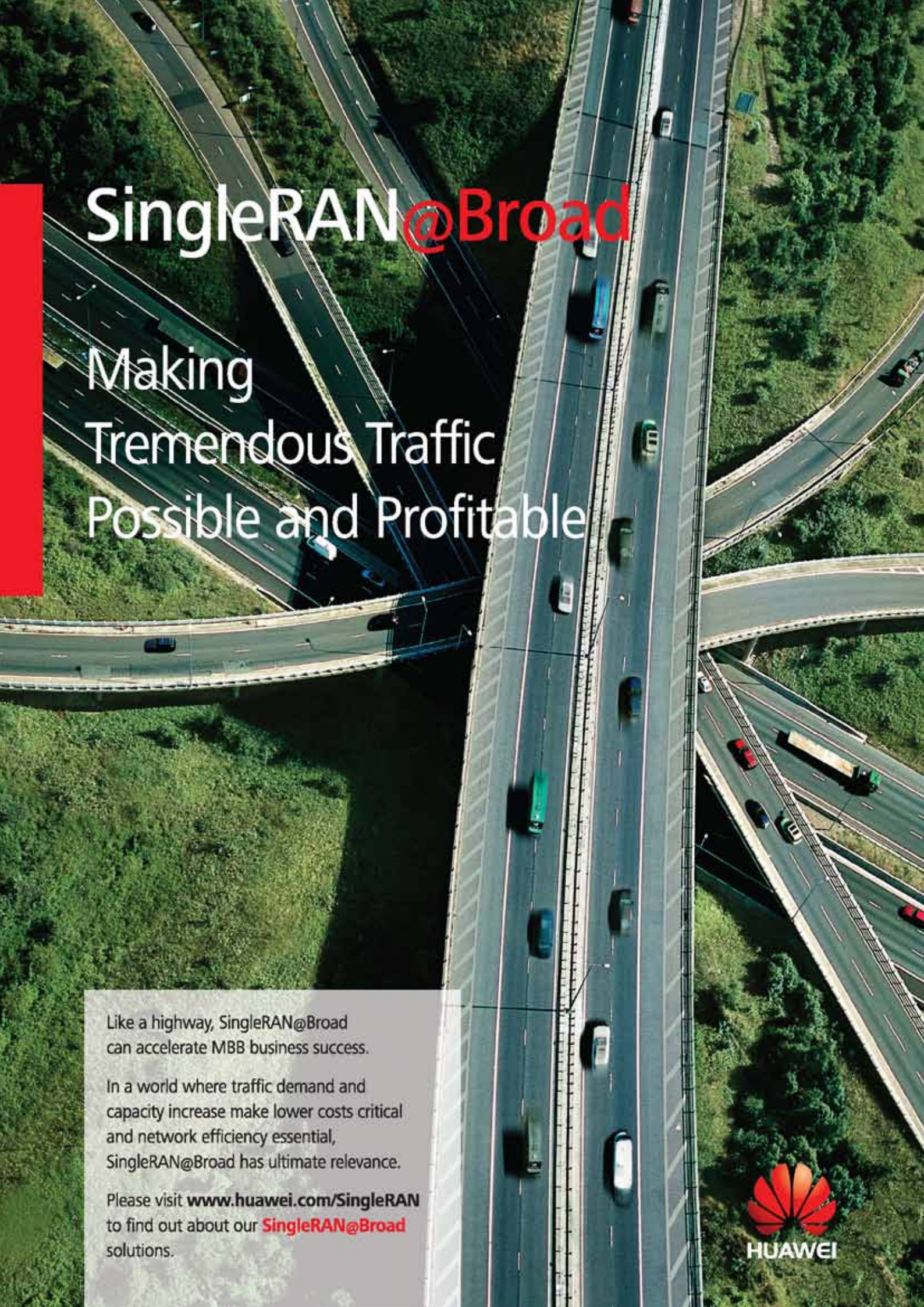
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