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CEO, Italtel

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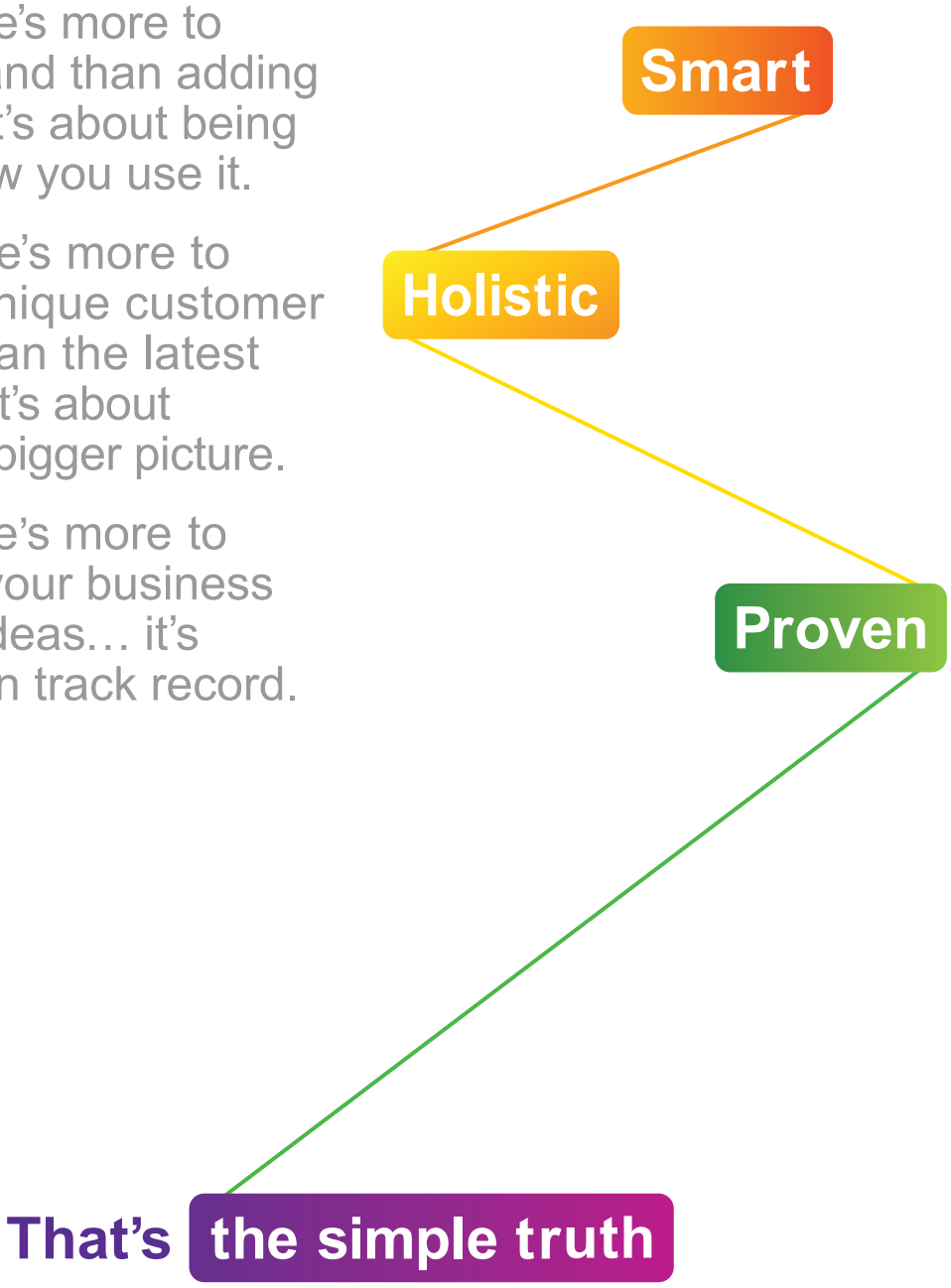

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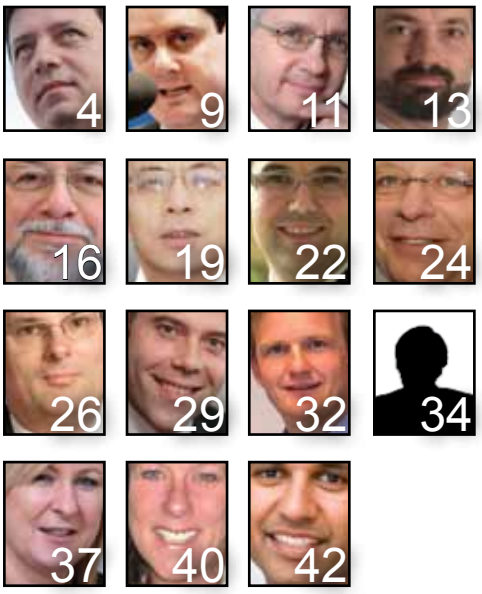

Connections

Wired and wireless carriers alike are hard pressed to keep up with the rapid growth of digital traffic. Video growth is aggressively pushing network capacity limits - and this is not just for YouTube; non-Internet IP video traffic for high-definition video, on-demand viewing, over-the-top content traffic and the like are also growing rapidly. Nevertheless, margins are dropping, since traffic is growing faster than revenues; this will have an impact upon the ability of many service providers to finance the needed network upgrades.

Although business usage is growing, it is growing more slowly than consumer usage. Business traffic margins will remain high, but the need for increasingly sophisticated support, network management and services will strain the resources of many carriers.

Wireless, especially mobile, network traffic is growing - doubling each year in some regions. Current wireless and backhaul networks will not be sufficient to handle the traffic. New fibre-based network expansion, innovative solutions including fixed broadband access for femtocell offloading, better network management, signal compression and more will be needed.

The growing popularity of cloud computing and M2M (*machine-to-machine*) applications will certainly further complicate this already complex situation.

The theme of this issue of *Connect-World Europe* is *Network Capacity - meeting the challenge*.

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Eastern Europe and the digital dividend

by Marius Catalin Marinescu, President, ANCOM, Romania

In Romania, as in much of Eastern Europe, there is a great need for the benefits that broadband, especially mobile, can bring. Mobile broadband, as in most developing regions is the best option. The move to digital TV frees frequencies that are ideal for LTE broadband, but the allocation of these frequencies and the coordination of the policies with neighbouring countries raises complex issues. Romania has been at the forefront of regional efforts to resolve these issues and bring broadband to its people.

Marius Catalin Marinescu is the President of ANCOM, .the National Authority for Management and Regulation in Communications of Romania. Mr Catalin Marinescu has worked in the communications sector, both for companies such as Romtelecom and for public institutions such as the Inspectorate General for Communication and Information Technology, which he presided over, and the General Council of Bucharest, where he was responsible for the management of the IT hub.

Marius Catalin Marinescu is a telecommunications engineer, a graduate of the Faculty of Electronics and Telecommunications of the Polytechnic University of Bucharest, where he also earned his diploma in Advanced Telecommunications Technologies. Catalin Marinescu holds a Master's degree in Management and Change in the Public Sector, from the University of Manchester, a CODECS Professional Certificate in Management, and a certificate in central and local administration from the Indiana University, Indianapolis.

The battle for lower frequencies

Digital dividend for the digital divide - Bidders in the 2010 German spectrum auction were especially interested in the so called digital dividend spectrum. €3.576 billion or 81.6 per cent of the total outcome derived from the auctioning of 60MHz of spectrum in the 790-862MHz band, while 298.8MHz in other various bands (1,800, 2,100 and 2,600MHz) attracted only €809 million!

Why is there such huge interest in this newly freed band; is it because of their good propagation in difficult rural areas? The digital dividend band is also attractive for mobile communications; it could increase Internet penetration and significantly impact the economy by driving innovation, job creation, productivity and competitiveness, especially in regions like Eastern Europe.

Re-farming GSM spectrum - Last year, the European Commission amended the GSM Directive so the 900MHz band can now be used for any technology, including 3G/4G. Many regulatory bodies started to allow cellcos to use this band for 2G and 3G networks, leading to problems with spectrum limitations. Now, in Romania, 3G incumbents want spectrum in lower bands as well, to compete with new 3G cellcos on an equal footing, but the spectrum is not available.

CDMA 450 operators and LTE - In September 2010, six mobile operators from Russia, Latvia, Belarus, the Czech Republic, Mongolia and Romania that run CDMA networks in the 450MHz band asked the ITU and their respective regulators for permission to deploy LTE networks in the band.

EU - broadband for all - The EU 'Internet for all EU citizens' programme also increased demand for this spectrum. To improve the economy, the programme aims, by 2013, to provide all EU citizens with basic broadband coverage and, by 2020, with fast broadband coverage at 30 Mb/s. The EU hopes to have at least half of Europe's households subscribing to 100 Mb/s broadband access by then.

The LTE advantage - Currently, the best technology for EU broadband coverage is LTE using the lower frequency bands to reduce capital expense. Cellcos in Europe are already using LTE in field trials and Germany is the first country that auctioned the digital dividend spectrum - one of the biggest bidding contests since the 3G contests in 2000.

Nevertheless, despite several commercial launches, LTE is still not a mature technology and few handset models are available - but the market is pushing hard…

Digital dividend - a regional approach

Harmonisation of spectrum usage on a regional basis is needed for economies of scale, to drive down handset and network

BT's Global IP Exchange - A world-class IP clearing house solution

by Beaztriz Butsana-Sita, Managing Director, Global Telecom Markets, BT Global Services

Interoperability is a business critical consideration for all communication provider customers.

And the BT IP Exchange is an interoperability service that enables fixed, mobile, legacy and next generation networks to interconnect in a way that minimises the cost of protocol conversion and other aspects of inter-working for operators. Specially developed to meet the growing need for connectivity between VoIP operators, traditional communications providers and converged service providers, it provides essential interoperability between the various communications technologies currently in use. Thus it is urgently important to assuring the continued growth of the IP-based communications market to meet the demands of VoIP operators for simplicity and cost savings.

Creating a sustainable and successful IP-based voice business

With IP Exchange, operators and communication providers are provided with the ability to make calls to PSTN, international and mobile numbers using the IP protocol. It therefore provides the essential gateway between a communications provider's own soft switch and traditional and IP networks. The product is a key development in enabling the growth of VoIP services, offering communication providers a simple and robust interoperability solution without the need for a major capital investment. In addition, the IP Exchange offers market-leading financial settlement services for calls terminating on the provider's network.

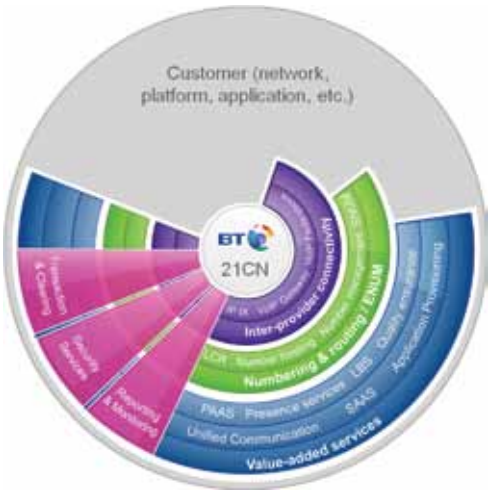
For many corporate customers and end users, the advantage that operators and providers can deliver to them through using the IP Exchange, is quality.

For providers on the other hand, it offers quick and easy access to new customer services with minimal investment, making the creation of sustainable business models in the IP space much easier. The IPX is also designed to provide the benefits of scalability as an operator's or provider's business expands.

Interoperable connectivity = Simplicity + Flexibility

IP Exchange customers immediately benefit from having a range of connectivity options to choose from. These include the Numbering and Routing required for the IP Exchange to allow providers to migrate end users from TDM services to IP. The Transactions and Clearing Capability rationalises billing and settlements for in- and out-payments, handling them as efficiently as in the SS7 Interconnect world.

Beyond the necessary tools that are part of the solution, providers can rely on working with BT as a stable provider in the growing and dynamic world of IP Communications. ●



IP Exchange can uncover opportunities for service providers:

- Generation of revenue streams addressing new customers
- Ability to compete effectively in a converged world
- Access to a scalable solution for a growing business
- Benefits from future IP Exchange developments

equipment costs, make broadband access affordable and to reduce the region's digital divide. Coordination, however, is more complex because our region is on the border of the EU.

First regional summit on the digital dividend - On March 30, 2010, Bucharest hosted the first regional summit on the Digital Dividend in Central and Eastern Europe. The summit organized by ANCOM, assembled representatives from Bulgaria, Croatia, Greece, Hungary, FYR of Macedonia, Republic of Moldova, Montenegro, Republic of Serbia, Slovenia and Romania. The summit sought to identify the challenges of the digital switchover and of the allocation and usage of the freed band and aimed to facilitate regional coordination, and covered regulatory and strategic matters related to digital dividend and business- and technology-related topics.

It was the starting point for future cross-border coordination and a regional calendar. The participants also analysed other hot topics: spectrum harmonisation, frequency problems at borders, how to regulate, the importance of bilateral/multilateral meetings for a regional approach, etc.

The second regional summit on the Digital Dividend - Belgrade hosted the second regional summit on the Digital Dividend in Central and Eastern Europe (June 15-16, 2010). The event organised by the Ministry of Telecommunications and Information Society brought together representatives of 13 countries to develop a unified approach to the allocation of the digital dividend.

The summit proposed a website dedicated to regional synchronization of digital dividend band usage and to accelerate common decisions on the auctions and timing, technology to be used, etc.

Romania organises a new international event - ANCOM is continuing its mobile communication regional harmonisation efforts; it organised a new event in Bucharest (May 12, 2011) dedicated to regional radio spectrum strategies. Auction design and timing in our region are among the topics on the agenda.

Auction design - going for a regional approach

Beauty contest or auction? - Another hot topic is how to design the contest to best award the digital dividend band. According to the economists, 'a well-designed auction is the method most likely to allocate resources to those who can use them most valuably'.

Auctions are not new in telecommunications - USA and FCC pioneered spectrum auctions in 1994. Auctions came later to Europe, such as in UK, in 2000 - the biggest auction ever - or in Germany, and 3G licences were awarded at huge prices. The results of auctions are much higher than with beauty contests. The money became available for governments to use for national broadband development or, in the worst case, they could go to the state treasury. The 3G auction in the UK in 2000 raised US$34 billion (£22.5 billion), equivalent to 2.5 per cent of the country's GDP, enough to build 400 hospitals. The beauty contest for 2G licences attracted only £40,000.

Rather than relying on regulatory bodies and governments to assess the merits of competitors' business plans, an auction 'forces them to put their "money where their mouths are" when they make their bids,' according to Professor Paul Klemperer.

Economists and cellcos could argue that the auction high prices could increase cellcos indebtedness and harm their investment capacity. Do large auction fees slow investment because of capital market constraints? Theoretically yes, but it seems unlikely. For instance, Telefonica paid over US$7 billion for a German 3G licence and almost nothing on its Spanish licence, but this seemingly had little impact upon Telefonica's investments in Germany and Spain.

One could argue that high licence costs are transferred to end-users as tariffs. Like any company, cellcos charge prices that maximise their profits, independently of past spectrum costs. Even if governments decide to refund licence fees, the tariffs would remain unchanged, because it would be irrational for a company to lower its price below the level the market can support.

A big problem with beauty contests is that they may expose the regulators to hidden costs: comparative selection criteria are typically time consuming to define and analyse and this process can take longer than expected. Moreover, decisions are vulnerable to legal challenge, leading to unpredictable costs. By contrast, the costs associated with running an auction are fairly predictable once the auction format is defined. Furthermore, one can expect to recoup these costs through revenues from the award, while some countries, like Denmark, require winning bidders to share the regulator's costs, in addition to paying the fees.

Digital dividend, 2.6GHz and CapEx - Because of its better propagation, the 790-862MHz low-frequency digital dividend band is ideally suited for mobile broadband in rural regions where population density is typically low and scattered over large areas, while the higher network capacity 2.6 GHz high-frequency band is ideal for higher density urban areas. When bundling 800MHz and 2.6GHz bands in the same auction, the investments for developing LTE networks are minimised - a very important issue for a developing region facing an economic downturn.

CEE and LTE based services

The March 2010 Bucharest summit in launched a debate - Are the Central and Eastern European markets ready for the services based on the digital dividend? - to determine when a business case based on the new band and technologies could appear in our region.

Our region is still developing and 3G networks and services are not yet mature here. The networks do not cover the whole population or country (except for UMTS 900MHz networks which have a better coverage in Romania, despite their late arrival), while the speed, even if increasing, is still far from adequate. Accordingly, the usage of mobile data does not yet need the capacity potential LTE can bring. Nevertheless, the usage of portable PCs and smart-phones is increasing steeply and driving demand for mobile data. This will put pressure on network capacity within the next few years. Also, given today's low fixed-access Internet penetration, the potential market for mobile access seems huge.

The demand for mobile access is strongly related to the region's economics. Low GDP, low average wages, low purchasing power and the present economic downturn in much of our region are hindering the demand for mobile access. However, time is working in our favour.

The region will have to wait until after 2013 for the first commercial launches of LTE and the digital dividend band, although licences could be awarded sooner - in 2012, for instance. This will give time for the technology to mature and for the cellcos to prepare the commercial launch. By 2012, it seems the economic recovery is also likely to arrive. LTE is going eastward! ●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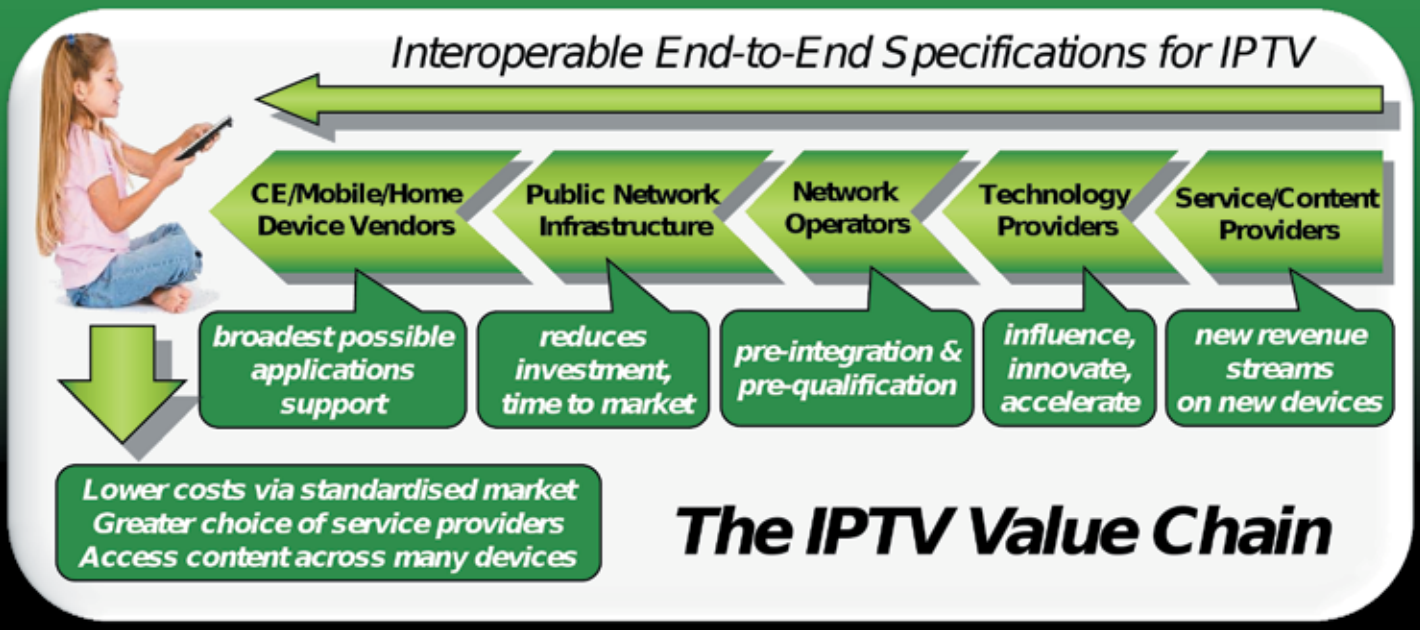

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Keeping the pace...

by Luigi Gambardella, Executive Board Chairman, European Telecommunications Network Operators Association, ETNO

Studies show a rapid increase in Internet traffic and a decline in the revenues of network operators who deliver this traffic. This disconnect gives telecoms operators little incentive - and few resources - to invest in additional capacity. Internet content providers have little incentive to use bandwidth efficiently and end-users' flat rate data plans give them less reason to economise. An Internet business model that addresses this imbalance and creates an equilibrium in which risk and returns are fairly distributed is needed.

Luigi Gambardella is the Chairman of the Executive Board of ETNO, the European Telecommunications Network Operators association; he is also Vice President Relations with European Institutions and International Organizations. Mr Gambardella is also President of EUBrasil, the Association for the development of the relationship between Brazil and Europe; a Member of the Advisory and Support Group of BUSINESSEUROPE; a Member of the Board of the European American Business Council; a Member of the Board of the European Internet Foundation; a Member of the BIAC - Business and Industry Advisory Committee - at the Organisation for Economic Co-operation and Development (OECD); a member of the Competitiveness Working Group of the European Round Table of Industrialists; President of Puntoit, the Italian association for the development of the digital economy and a member of Comitato Europa of CONFINDUSTRIA. Previously, Mr Gambardella,was in charge of relations with the National Regulatory Authority at theTelecom Italia Group; earlier he ran regulatory and Institutional affairs for Olivetti.

Luigi Gambardella graduated in economics from Bocconi University in Milan.

The Internet has become more and more embedded in our everyday lives. It is radically changing the way we work, spend our leisure time, receive healthcare and education and interact with public authorities. The way in which citizens are using the Internet has also been evolving radically over the past few years.

The use of so called 'over-the-top' applications such as Voice over Internet Protocol (*VoIP*), social networking sites or video downloads has become increasingly popular over the years. The number of VoIP users, for instance, has increased in Europe by more than 600 per cent over the past five years. In Italy, the subscriber audience for the main social networking sites has increased by more than 2000 per cent from 2008 to 2009.

These applications have, of course, played a role in stimulating people to take up broadband, but these bandwidth hungry services are also generating a considerable growth in traffic.

Internet traffic delivered via fixed networks is growing at 35 per cent a year while via mobile networks at more than 100 per cent. These trends are accelerating with the deployment of new mobile devices which enable users to connect to these bandwidth hungry applications also while on the move. Traffic growth will further accelerate with the rapid development of new solutions such as cloud computing or machine-to-machine (M2M) communication.

Several recent studies[i] have highlighted a structural disconnect between the rapid increase in Internet traffic - largely driven by video content - and stable or even declining revenues of network operators who deliver the traffic to the end-consumer. This situation is exacerbated by the fact that Internet content providers have limited economic incentives to use the available bandwidth in an efficient way. In addition, end-users often subscribe to 'flat rate' data tariffs and have limited control over the amount of traffic that they generate.

This disconnect between delivered traffic volumes and operators' revenues depresses the incentives for telecoms operators to invest in additional capacity. Without significant investment in new bandwidth capacity, however, the rapid traffic increase may lead to network congestion that will, in turn, have an impact on the entire Internet value chain, to the detriment of economic growth and service innovation.

An evolution of current Internet commercial models will help to address the economic imbalance and send the right signals to encourage investment and increase the efficient usage of transport capacity.

A reflection on a new and sustainable economic model for the Internet is essential if Europe is to achieve the ambitious goals of its Digital Agenda and provide universal broadband coverage of 30Mbps by 2020 and 100Mbps to 50 per cent of households. To meet these targets, an investment of up to €300 billion will be required by industry, as estimated by the European Commission.

Rapid growth in Internet traffic and the need for substantial investments in network capacity have placed the viability of the current economic model of the Internet at the heart of the policy debate. Neelie Kroes, Vice President of the European Commission for the Digital Agenda, recently identified "the sustainability of the current Internet ecosystems" and the need for alternative business models in the Internet as one of the priority issues for her CEO round table initiative on investment in broadband networks.[ii]

ETNO believes that to create a sustainable economic model for the Internet, it is necessary to achieve a balance of the interests of all stakeholders - from content rights holders and online services providers, to providers of enabling technology and network connectivity, to manufacturers of end-devices to end users - while maintaining the openness and innovation capacity of the Internet.

The ultimate goal is to increase overall efficiency and achieve a favourable outcome for all stakeholders concerned. This will involve finding an equilibrium in which risk and returns are fairly distributed, taking into account the value created for consumers. Players across the entire value chain must have incentives to invest in infrastructure and services and to innovate. This will lead to an overall increase in value for consumers and businesses as well as economic growth.

Several possible business models are currently being considered that would better align investment incentives with technological and market developments to create additional value for consumers.[iii] These could, for example, include offers for quality of service delivery for services with high-quality requirements (e.g. video-conferencing and cloud services). There is yet uncertainty about which models can be implemented in a reasonable timeframe and which ones will be successful. Most probably a variety of commercial arrangements will help to ensure the long-term sustainability of the Internet. The overall objective is to work out value propositions that are balanced across the value chain and at the same time to attract more consumers and enable an ever more sophisticated usage. Working towards this new equilibrium will help to achieve the broader policy objectives in the area of broadband and in particular the broadband targets of the 'Digital Agenda for Europe'.

The EU Regulatory Framework for e-communications services - in particular its open-Internet-related provisions - and the possibility to develop different business models are interlinked. It is important that regulators and policy makers do not preclude, or stifle the development of, market outcomes that improve incentives for investment in the underlying network infrastructure and encourage a more efficient use of network capacity. Flexibility should apply to pricing structures including value-based pricing, interconnection agreements, network management solutions and offers of different levels of quality on end-user and wholesale markets.

Policy makers and regulators in Europe have so far adopted a cautious monitoring approach to markets, also in view of the strong competitive pressures on EU telecommunications markets. ETNO believes this approach to be the correct one. It is aligned with the European regulatory framework, which already foresees important non-discrimination safeguards. Imposing or prohibiting a specific solution would prevent the global Internet ecosystem from finding efficient solutions.

To achieve a sustainable Internet model also requires a level playing field across the Internet value chain. This implies that all players offering online services to European citizens are subject to the same data protection or security requirements, regardless of their geographical location or their economic sector. This will contribute to strengthening users' trust and confidence.

As leading e-communications operators in Europe, ETNO member companies already account for more than two-thirds of investment in new high-speed services and networks. They also directly contribute to the objectives of the Digital Agenda by bringing high-speed broadband to remote and rural areas, through public-private partnerships. With their innovation efforts in fields such as healthcare, education or energy, they develop solutions that contribute to solving today's major societal challenges.

Realising the vision of the Digital Agenda and enabling all Europeans to reap the benefits of high-speed broadband is one of the pillars of the EU 2020 Strategy for growth and jobs. This is essential for Europe to maintain its leading position on the global stage.

All players of the value chain must contribute to meeting this challenge. ETNO members are committed to continue playing their part.●

[i] For example, "A Viable Future Model for the Internet," AT Kearney, December 2010 (http://www.atkearney.com/index.php/Publications/a-viable-future-model-for-the-internet.html). "Assessment Of A Sustainable Internet Model For The Near Future," ESMT, January 2011 (http://www.esmt.org/fm/13/ESMT_Sustainable_Internet_White_Paper.pdf)

[ii] European Commission, MEMO/11/135 of 03/03/2011

[iii] Ibid.

Leveraging network assets for broadband

by Stefano Pileri, CEO Italtel

Broadband operators have fallen behind because of the brilliant over-the-top providers' strategy that is driving the huge growth of data traffic. Nevertheless carriers have a good chance to evolve their networks and catch-up by changing their business model. Network upgrades, QoS through intelligent traffic management over IP network, innovative subscriber data management and the new paradigm introduced by cloud computing might be the key factors for wireline and wireless carriers to keep on track with the growth of the Internet market.

Stefano Pileri is the CEO of Italtel. Previously, Mr Pileri served as CTO of Telecom Italia Group and was responsible for fixed-mobile integration and the Network Planning, Engineering and Marketing in the Network Division. At SIP, an Italian telecom operator, he served in a series of increasingly responsible positions in the Network Management Systems Department including as head of the Network Development and Operations in the Emilia-Romagna region.

Stefano Pileri earned a BS in Electronic Engineering and a Master's in Applied Electromagnetism.

In recent years carriers have faced rapidly growing demand for data traffic. On one hand, this helps them increase their customer base, especially for mobile broadband access; on the other hand this sort of access generates great amounts of data traffic in both fixed and mobile networks.

According to Cisco VNI Mobile data traffic forecast 2010-2015, global mobile data traffic was 0.24 exabytes per month in 2010 (159 per cent growth over 2009 against an expected growth of 149 per cent). The strong growth is due to the widespread adoption of smartphones by mobile subscribers and the growth in the number of laptops connected to mobile broadband (63 per cent growth in 2010), which generate a much higher traffic profile - 22 times higher than that of a smartphone and five to six times higher than that of a iPhone or Android phone. About three million tablets connected to the mobile network for the first time in 2010; the tablets' data usage profile is five times higher than that of a smartphone.

Video is the application that generates the most data traffic. At the end of 2010, mobile video traffic accounted for 49.8 per cent of total mobile data traffic; it will account for 52.8 per cent of this traffic by the end of 2011.

The forecasts for the future are very impressive. Total traffic will probably grow to 6.3 exabytes per month by 2015, a 26-fold increase over 2010. As mobile connection speed increases, and mobile device capabilities improve, usage of high-definition video will overshadow streamed content and video upload. Of the 6.3 exabytes per month crossing the mobile network by 2015, 4.2 exabytes will be due to video.

Carriers need to upgrade their networks to meet the increasing demand for capacity; the question is how they can finance these upgrades. So far, most operators have been offering flat rate tariffs for fixed broadband access and volume and time-based tariffs for mobile broadband. Some have introduced tiered tariffs, but these have had little impact upon heavy usage in the short term, so revenues have risen more slowly than traffic, so to meet the network capacity challenge carriers will need to review their business models and positioning.

Upgrading a wireless network is more complex than for a fixed one. Wireless carriers need to optimize radio spectrum usage by increasing the number of antennas and tuning their coverage using pico and femtocells. Adoption of LTE should also improve efficiency thanks to the OFDM (*orthogonal frequency-division multiplexing*) technology, also used by WiMAX, which provides more bandwidth and optimized radio channel use. Nevertheless, it requires high performance in the core network - the Evolved Packet Core - in terms of latency, time of response and total throughput.

Investments in the next generation fixed access network, foster not only the adoption of a wide set of services, starting with high-definition TV, but also build mobile

backhaul capacity and speed the adoption of full IP signalling.

The role of carriers in the value chain from devices to applications has shrunk, due to the strong alliances between device vendors and over-the-top providers that have tended to limit the carriers' role to dumb pipe providers. While device vendors and OTT providers increase their revenues, carriers all over the world are trying to find ways to profit from this traffic and compensate them for the increasingly heavy traffic on their networks. A Google/Verizon joint policy proposal attempts to stimulate regulatory changes and give wireless operators the possibility to differentiate traffic in their networks and to promote investment in new platforms for innovative services.

The success of broadband operators might well depend upon harnessing their assets and evolving their business model according to a new scenario which depends upon developing a partnership ecosystem.

The operator's main assets include the ability to manage traffic at different network layers (access network, core network and interconnection domain); access to subscriber data regarding devices, preference profile and usage; and a service platform to provide new services leveraging on network capabilities shared with partners. These assets give operators the means to turn a dumb pipe into an intelligent one - if given some flexibility in the network neutrality principles.

QoS and OTT monetization

The management packet data traffic on the network to improve the quality of service (*QoS*) can improve the quality of experience (*QoE*) for those end users who are willing to pay for it.

Among applications that would benefit from a workable QoS policy are those whose quality does not resist network delays and inefficiency, including such real-time applications as video-streaming, Web TV and the like.

Moreover, guaranteed QoS is needed for critical applications such as telemedicine, smart cities applications, metering in general and for business applications like cloud computing and video communications that require high end-to-end quality and reliability. Operators throughout the world need to work together to create cooperative mechanisms that simplify interworking between their networks and enables them to guarantee QoS anywhere.

Businesses need interoperability between operators for applications such as telepresence, high-definition video communication and tele-worker tools. SLA (*service level agreements*) and QoS policy for IP to IP interconnection has to be defined for both inter- and intra-carrier domains.

QoS and content delivery networks

Video applications are largely responsible for current network congestion and capacity shortages. This problem will get worse as content that is currently broadcast migrates to uni-cast streaming where each user will have their own dedicated streams. This problem is more acute on mobile networks due to bottlenecks on the radio channels.

Only the service provider can provide the end-to-end control needed to resolve this issue. One way to reduce the impact of video services on the network and improve the quality experience, is to change the broadband network architecture by storing content closer to the end user.

Most content delivery networks (*CDNs*) provide a broad range of services including caching, rendering and transcoding. The service provider's value can grow by combining a CDN with QoS and dynamic mechanisms that adapt data flows to network conditions and device types.

Identity management and profiling

Another important opportunity for operators is to unlock the value of subscriber data. They have customer information related to network parameters, devices, fixed and mobile lines, email boxes and location and, with restrictions according to privacy laws, the customer's usage profile.

By unifying subscribers' data, operators can expose and broker data to third parties cooperating in the delivering of new services and, finally, play the role of identity providers trusting authentication and critical transactions across several Internet applications.

The evolution of e-government and smart cities applications also requires strong identity management for privacy and security reasons.

Operators could become the system's identity management providers (*IDP*), managing subscribers' credentials and the authentication process for different services. Operators can also be part of a federated environment that certifies credentials within the IDP universe despite the variety of authentication methods of (IMEI, USIM, NFC, fixed line, etc.) used by different IDPs.

Cloud Computing

Cloud computing is changing the pattern of IT resource consumption. Cloud computing addresses the growing demand for distributed processing capacity, memory and storage. It also meets the need from enterprises and application providers to externalize part of their infrastructures by buying online services on a pay-per-use basis.

Cloud computing lets carriers use a bottom-up approach to services: from infrastructure as a service (*IAAS*) to platform as a service (*PaaS*) and in some case software as a service (*SaaS*), or even brokering third-party network capabilities as a service (QoS, Identity Management, CDNs, etc.).

No one knows which services will be successful, but they will certainly use a cloud enriched by network as a service approach. Examples include e-government, smart cities, smart grid, real-time collaboration based on HD/3D video, augmented reality, modelling and holograms.

Infrastructure as a service is a short-term opportunity for service providers operating in a domestic marketplace. Service providers can leverage their existing customer base to offer bundles of cloud resources together with access and guaranteed QoS. To be successful, service providers must dispel customers' fear to store their personal data in a globally dispersed, worldwide, cloud. Domestic service providers can offer trusted relationships, security policies, service reliability and data storage at their own domestic facilities.

Broadband operators have fallen behind because of the brilliant over-the-top providers' strategy that is driving the huge growth of data traffic. Nevertheless carriers have a good chance to evolving their networks and catch-up by changing their business model. Network upgrades, QoS through intelligent traffic management over IP network, innovative subscriber data management and the new paradigm introduced by cloud computing might be the key factors for wireline and wireless carriers to keep on track with the growth of the Internet market. ●

Meeting the network capacity challenge

by Stefano Nocentini, Network Director, Telecom Italia

Mobile and fixed network operators face unprecedented challenges to their core businesses and must evolve their networks to meet market requirements. Mobile data is exploding, putting great pressure on the access and backhaul networks and complicating the management of limited spectrum resources to increase coverage and capacity. Fixed networks are facing mounting competition in their all-important voice services from over-the-top (OTT) service providers; they need to evolve carrier grade rich media services with guaranteed quality of service and full service interoperability among carriers.

Stefano Nocentini is Telecom Italia's Network Director; he joined Telecom Italia shortly after graduating as an engineer and, over the years, has served in a number of increasingly responsible positions. Mr Nocentini is currently responsible for Telecom Italia Domestic Network - both fixed and mobile, managing all innovation, planning, engineering and operations network activities. He also leads the governance decisions processes over the TI networks abroad (Latam). Previously, Mr Nocentini was responsible for Telecom Italia Lab, internal TI organization in charge of innovation, engineering and testing processes of services platforms and network technologies. Mr Nocentini also contributed to TI project development of next generation network, data network evolution, network intelligence platforms and services deployment and ISDN network.

Stefano Nocentini graduated in Electronic Engineering from La Sapienza University in Rome.

The network is the core asset of service providers. Its technological transformation and its expansion are key challenges. Network development is very expensive and risky. Forecasting customer behavioural trends is essential for making the right investment decisions and for minimizing the related risks.

Relevant market demand trends are reshaping network architecture, putting great pressure primarily on access, less on metro and minimal impact on backbone.

Mobile data service

The first big challenge is with the mobile network. The explosion of mobile data is significantly modifying the mobile access network. In Italy, mobile data traffic grew 70 per cent in 2010, more than three times fixed traffic growth, even though mobile is 20 times less in terms of volume. Data dongles have a greater impact than smart-phones.
The forecast for mobile traffic growth in Italy is even more interesting, tripling volume during the next three years and becoming 10 per cent of overall traffic - a big issue for installed access capacity.

Mobile access network capacity is keeping up with this growth. Therefore it is necessary to focus on the following factors:

- number of frequencies/carriers available - Increasing the spectrum utilised is expensive, but unavoidable. Western countries are defining new frequency allocation due to improved digital efficiency in broadcasting - the digital dividend - and are making additional spectrum available;
- spectral efficiency - 3G+ and LTE technologies are significantly improving what can be carried by the single spectrum slice;
- backhauling capacity - Fibre, microwave links and copper bonding technologies are efficiently increasing backhauling capacity needed to guarantee on-air capacity,
- and, number of coverage cells - Micro and pico-cells are helping to fill the small coverage gaps, especially in dense urban areas while femto-cells are helping to better cover the indoor areas and offload traffic on the fixed network, where available. The increasing number of cells will generate a complex frequency coordination problem to avoid mutual interferences.

Doubling of on-air capacity every year in order to meet new customer demand is expensive and the current business model, based on flat rates and no charge for the over-the-top service providers, should soon be revised because mobile operators face heavy investments and decreasing margins.

New devices and applications, like e-books and tablets, are changing customer usage profiles, now based on always-on connection

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with continuous traffic data interactions with the network.

The new usage profiles require dynamic capacity allocation models that go beyond the traditional static resource planning approach. Being always-on connected is making micro traffic flows more random and difficult to forecast and results in some temporary capacity crisis spots on the access network with poor performance.

New technologies, like the evolution of self-organizing networks (*SON*), that enable fast adaptation of coverage to changing needs and maximise the exploitation of available capacity inside cells will help to manage micro demand peaks and deliver a better quality of service.

Another mobile usage trend to carefully monitor relates to machine-2-machine (*M2M*) and Internet of things services. M2M solutions enable connection and management of remote measurement systems; its expected impact on the network in the medium term is not relevant. Nevertheless, M2M will require a different approach to network planning given the number of objects to manage - perhaps more than ten times the number of human connections - and the fine-tuning needed for coverage.

New SIM management capabilities and additional micro coverage will be more important than additional on-air capacity. Proximity technologies can help the clustering of machine connections and simplify management of the Internet of things.

The Internet of things will probably have a much more disruptive effect on the network in the long term because the number of connected objects will be much greater with, say, bottles or T-shirts connected, and the related traffic will have much different patterns.

Fixed data services

The next big challenge is the fixed network. Traffic growth generated by fixed data services in Italy will be impressive, with around 20 per cent CAGR (*compound annual growth rate*) during the next three years and the volume forecast for 2013 of around two thousand petabytes.

Two main market trends are reshaping access and requiring new capacity:

- consumer video will shift from peer-to-peer to Internet video and visual applications, and by 2014 will account for 90 per cent of overall traffic in Italy;
- and, cloud computing for the business segment that will generate high-value traffic and require guaranteed quality of service.

The first trend, consumer video, requires good quality very high bandwidth on the access and metro networks to deal with the high-definition and 3D video traffic. Because of the limited access capacity of the copper technology still used by telcos, video applications will gradually force operators to shift to fibre access. Point-to-point fibre architecture is competing with more efficient point to multipoint implementations (mainly GPON) that are succeeding in large-scale implementations.

In any case, large-scale fibre implementation will depend on the success of new fibre-based services, the value perceived by the customers and upon a public financial commitment to avoid a new type of digital divide in non-profitable areas.

Cloud computing will transfer many enterprise computing resources to the network as soon as security and performance issues are solved. The 'x-as-a-service' business model can be powerful - it will add flexibility and efficiency to current enterprise operational model. Like most business services, cloud computing will be less relevant in terms of contribution to overall capacity, but it will be relevant in terms of value generated by network usage.

Implementing fibre access solutions for enterprise customers also introduces valuable spare capacity that will enable on-demand connectivity services with end-to-end quality.

Virtualization technologies and use of fibre access will strongly enrich service offerings to enterprises. Conversely, consumer services will probably move to two different demands: current web-based applications access, mostly related to mobile infrastructure, and bandwidth-hungry applications that will require a powerful fixed fibre-based access.

Other issues

There are other challenges related to network capacity evolution.

Efficiency and network capacity - One Gigabyte, on either mobile or fixed access network, has to be moved efficiently. This means that current networks must be simplified by collapsing different network layers and reducing technological complexity. This transformation is difficult because today's network complexity is the result of many years of accumulating leading network technologies; then too, backward compatibility is still a strong market requirement. Internal efficiency transformation projects are vital to guaranteeing a cost structure that meets challenging market requirements.

Quality of service - Network neutrality is the cornerstone of current regulation, but there is a growing demand for quality-driven network services that guarantee a certain level of performance on the network. Quality is required not only by business customers that traditionally require a private network, but increasingly by premium consumers and by over-the-top providers that need network quality to deliver premium services to final users. Network application-delivery services need to give providers a specified level of network quality for their applications and guarantee end-to-end performance. This offers additional value both to application providers and to final users - easily perceived by OTT (*over-the-top* - services provided via the Internet) service providers and the final customer.

Voice services - Voice services are gradually changing their nature. Plain old telephony services (*POTS*) are getting richer and richer; with IP implementation they are evolving into multimedia unified communication services with full social network integration. This transformation of fixed services could become the standard implementation model for mobile LTE in the future.

Traditional voice services are still the most important revenue and margin generators for a telco, nevertheless they are becoming more and more irrelevant in terms of their contribution to generated traffic.

OTT providers are becoming the main competitors - including for voice. To preserve the telcos' traditional markets, they need to seamlessly evolve carrier grade rich media communication services, and provide full services interoperability among different providers and guaranteed quality of service. ●

Future-proof fibre optic infrastructure

by Dr Ing. Ziaedin Chahabadi, Chairman and CEO, Executive Board, Keymile

Fibre to 'x' (*FTTx*) is the key to meeting the vast demand for higher bandwidth. Transmission of TV signals requires particularly high levels of bandwidth. High-definition television (*HDTV*) and three-dimensional television (*3D-TV*), for example, need up to 50Mbps per TV channel, but copper wire DSL transmission has reached its limits. FTTH (*fibre-to-the-home*), or fibre optic transmission to the customer, has enough bandwidth to cope for the next 20 years. The debate on which infrastructure is best for network operators is still ongoing.

Dr-Ing. Ziaedin Chahabadi is the chairman and CEO of the Executive Board of KEYMILE International GmbH. Previously, Dr Chahabadi served as a member of the Executive board of the QUANTE group in Wuppertal. Dr Chahabadi was also Head of the Technology section, Deputy Managing Director, and one of the founding members of Ke Kommunikations-Elektronik GmbH. Dr Chahabadi began his career at Kabelmetal electro GmbH in Hanover, a subsidiary of the Alcatel group, as head of the department of transmission technology.

Dr-Ing. Ziaedin Chahabadi, earned his doctorate at the University of Hanover in high-frequency engineering.

The telecommunications industry has more than ten years' experience with optical networks and arguments about their pros and cons have been going on for just as long. Fibre optic networks can be laid right into the home (*FTTH*) by using both passive optical infrastructures (*P2MPP*) and point-to-point optical infrastructure (*PtP*).

The key difference between active and passive access technology lies in how the fibre optics are used. Ethernet point-to-point active networks use dedicated fibre optics from the central in-feed point to the customer. In the case of passive optical networks (*PON*) unpowered optical splitters are used to route signals to customers. Both passive and active optical networks bring the fibre optics as close as possible, ideally into, the subscribers' homes. In terms of transmission quality and bandwidth, FTTH is technically the best option.

Passive optical networks (*PONs*)

The first element in a PON network is the OLT (*optical line termination*), which provides standard Ethernet interfaces with the core network and PON interfaces with the subscriber. The PONs used today are usually Ethernet-PONs (*EPON*) or Gigabit-PONs (*GPON*) and in the future Gigabit-Ethernet-PONs (*GEPON*) or WDM-PON. Currently, EPON installations are widespread in the Far East; GPON, on the other hand, is common in the US and Europe.

With PONs, the signal on the fibre optic to the subscriber is split by a passive splitter to several optical subscriber lines. The splitter is either located in an outdoor housing, or directly in the cable, for example in a sleeve. The network has a point-to-multi-point like (*P2MP*) structure.

In FTTH network architecture, an optical network termination (*ONT*) unit implements the subscriber's access by changing the optical signal into one, or several, electrical interfaces like Ethernet, POTS and ISDN. ONTs with VDSL interfaces are available for FTTB applications to bridge to the existing subscriber lines in the home. In this case, each subscriber receives a VDSL (*very-high-bitrate digital subscriber line*) modem to terminate the network.

Ethernet point-to-point (*PtP*)

In Ethernet point-to-point network structures, all subscribers receive their own fibre optic line that terminates at an AN (*access node*) optical concentrator. Therefore, in contrast to PON systems, there is a direct connection from the subscriber's CPE (*customer premises equipment*) to the central optical port. The interfaces comply with the Ethernet

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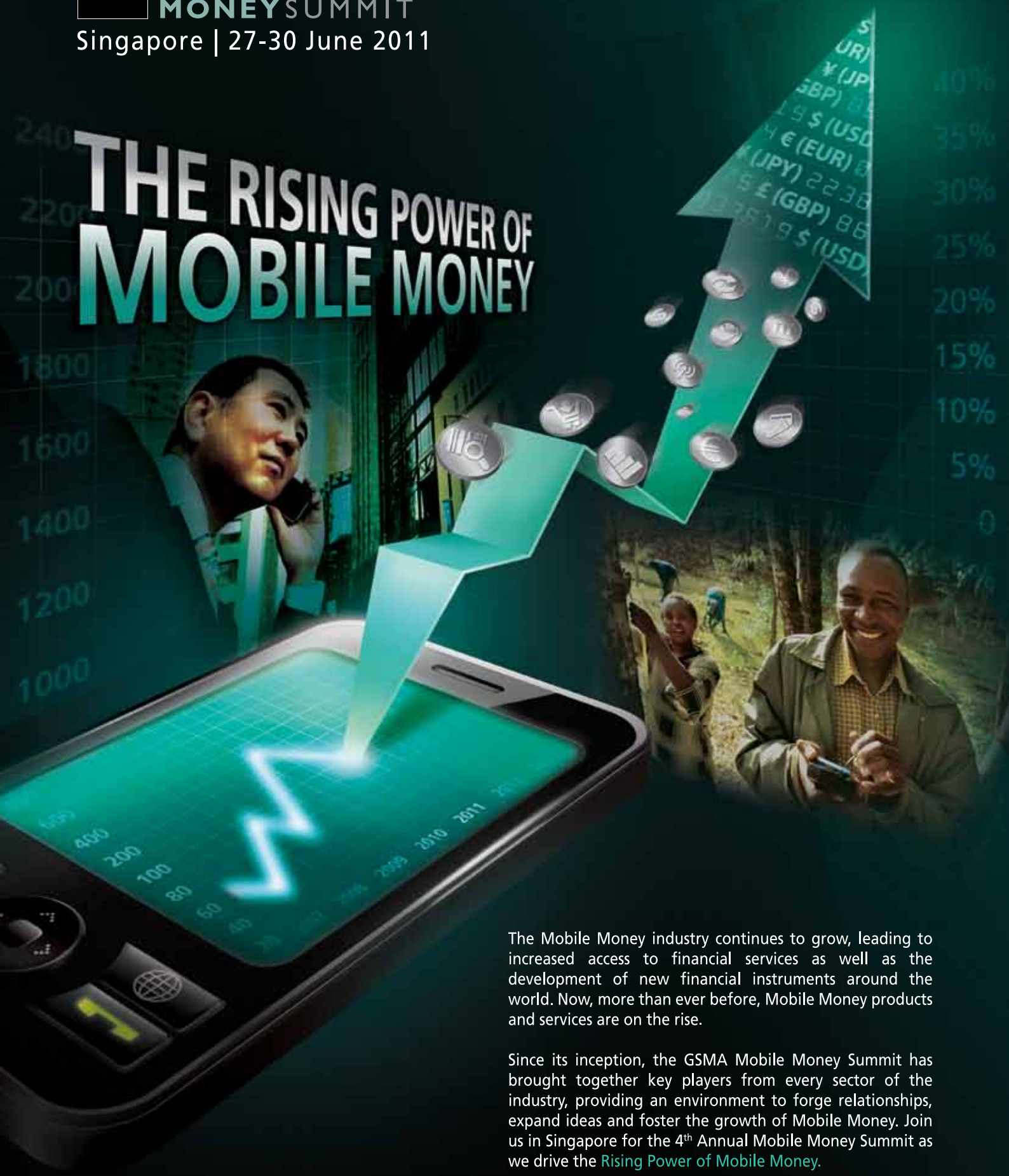

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standard, already used in core networks for years. Usually, each subscriber receives bandwidths of 100Mbps or 1,000Mbps. Depending on the technology used, one or two fibre optic lines can be used for data transmission; in today's FTTH applications, single fibre systems are usually deployed. Due to the dedicated fibre optic line for each subscriber, changes in bandwidth can be customised to suit the functions and services required. In the case of FTTB (*fibre to the building*) applications, a micro DSLAM (*digital subscriber line access multiplexer*) distributes the data within the building via the existing telephone cable to the customer's home using VDSL.

Passive optical vs. point-to-point

Almost any network topology is feasible using PON and Ethernet PtP. However, a network operator should decide early on which architecture is likely to be able to cope with demands in 15 to 20 years, because an investment in infrastructure with a return on investment (*ROI*) of around ten years should last and not require changes after five years.

A recent study by WIK-Consult, on "Architectures and competitive models in fibre networks", emphasises the long-term impact of investments1. The authors come to the conclusion that point-to-point fibre optic access networks initially cost about ten per cent more than point-to-multipoint networks, but the higher investment costs pay for themselves due to the greater and more long-term usage for private households and business customers. This is of course a crucial factor.

In a point-to-multi-point structure, which is required for PON systems, network operators save real cash on the initial investment. The reason for the saving is that they do not have to lay as many fibre optic lines as if they had used a point-to-point structure from the very beginning. PON's weak point is the optical splitter. Where a high level of bandwidth is required for the customer, this network component might have to be replaced. In the worst-case scenario, additional fibre optic lines might also be necessary to upgrade to a point-to-point structure.

In terms of bandwidth per subscriber, PtP is better. The maximum bandwidth per subscriber is much higher. Also, the opportunity PtP gives to allocate heavy users their own, separate, bandwidths provides more flexibility than PON systems can. Depending on the splitting factor, a PON connection via fibre optic lines provides less bandwidth than a VDSL2 connection via copper wire. When it is a question of increasing the bandwidth, PtP architecture is superior to PON's point-to-multipoint architecture. Subscribers can easily obtain upgrades without having to change the network architecture or the service of other subscribers.

Within a PON tree, since all subscribers share the same optical fibre, if a single termination causes faulty synchronization or there is an undefined optical signal, remote location of the defective ONT may not be possible. With PtP architecture, both the fibre optic path and the end customer's ONT is clearly identifiable. In the worst-case scenario, the laser to the optical concentrator can be deactivated individually from the control centre. As regards availability, PON also does worse than PtP, because redundant connections to customers' sites from the same PON have not been implemented or even planned.

Until now, it was a common belief that GPON systems use much less power than Ethernet point-to-point systems because they divide up the laser's light on the OLT to several fibre optic lines, while in point-to-point systems one single laser each is used. However, the GPONs optical transmission signal has to be higher because of the optical splitter attenuation. In fact, the power consumption of a control centre with an active optical 100Mbps system and a GPON system with a 16-fold splitter are about the same. If we compare the systems' terminal equipment, we will notice significantly higher power consumption in PON terminal equipment (approximately eight W in GPON compared with four W in PtP) because it needs more power to transmit upstream in order to overcome the splitter's attenuation. Overall - considering the control centre and customer equipment - Ethernet point-to-point systems use less power.

For years, the role of PON systems was splitting up cable-TV signals coming in simultaneously on the same fibre optic line. As a result, network operators were able to offer traditional cable-TV, Internet, voice and IPTV using the same infrastructure. Now, more modern Ethernet point-to-point systems also offer this functionality, so that external equipment for feeding in cable-TV, or even another fibre optic line, is no longer needed.

It should be noted that generic comparisons of technology only serve as initial rough guides. While network operators in Asia prefer passive optical networks, a study by the FTTC Council Europe found that in Europe 73 per cent of FTTH/FTTB installations are based on Ethernet PtP (IDATE Study, FTTB Council Europe 12/2010). The result of this study is not surprising because about 80 per cent of the investment in new fibre optic infrastructure does not depend on the use, or not, of active technology but upon the cost of laying fibre optic lines on a widespread basis. The most important point is that the new infrastructure can keep up with growing customer demand over the next 20 to 30 years. The low incremental cost of a point-to-point infrastructure will enable sustainable use for a long period.

Ethernet point-to-point technology is ideal for network operators who want to lay their own fibre optic infrastructure or who used debundled fibre optic paths to attract business customers, multi-residence buildings, local authorities and universities. In these cases, PtP easily provides the required flexibility, quality and security that PON networks, due to their structure, struggle to provide.

	PON	Ethernet/P2P
Number of optical interfaces (CO)	Low	
But higher demands made on the ONU	High (1:1)	
TV support	IPTV/CATV	IPTV/CATV
LLU	Not supported	Is supported
Flexibility	Low	
OLT technical upgrades mean all ONUs have to be exchanged	High	
Per subscriber		
Fault tolerance	Low	
A faulty ONU can disrupt the whole PON	High	
Single subscribers can be isolated - no impact on the whole region.		
Fault diagnosis on the infrastructure	Complex	Easy

Table 1: FTTx - PON v. Point-to-Point (P2P)

Cloud computing comes to telecoms

by Lv A Bin, Vice President, Cloud Computing, ZTE Corporation

Cloud computing gives companies and individuals access to a wide variety of services without the need to invest in the infrastructure needed for a variety of sophisticated computer services; they pay only for the infrastructure and applications they use, for the time they use them. Mobile and fixed telecom service providers offer the broadband connections needed to access cloud-based services, but network infrastructure costs are rising more rapidly than income, and operators need ways to capture more of the revenues.

Lv A Bin is the Vice President for Cloud Computing at ZTE Corporation joined ZTE where he is in charge of the company's cloud computing products. During his long career with ZTE, Lv A Bin has engaged and worked in technology development, marketing and planning, intelligent networks and value-added services with special emphasis upon telecom network architecture, mobile Internet, and cloud computing.

Lv A Bin earned his Master's degree from Harbin Institute of Technology.

Cloud computing technology arose when Internet businesses, early in their development, were trying to solve the critical issues of continuously increasing total cost of ownership, large-scale deployment of resources and large volumes of business data as well as fast-changing business models. Cloud computing technology is now gradually being introduced to the telecommunications industry as demand from operators for mobile Internet services has started to take off.

By adopting Internet cloud computing concepts, the telecoms industry can organize and supply many telecoms network resources including storage, computing and software services. Cloud computing technology has become a new trend in telecoms development, and it has completely overturned the industry's traditional methods of providing resources and user applications. The cloud is likely to bring fundamental reforms and in-depth industry integration between the telecom and IT sectors.

For example, a telecoms operator can change the traditional vertically organised independent platform construction approach to construct a safe resource pool system that has computing, storage, network and operational management capabilities. Within the resource pool, the operator can deploy multiple service platforms on demand and enable resource sharing, on-demand resource allocation, green energy savings, high reliability, high scalability, and lower capital and operating expenses (CapEx and OpEx).

Furthermore, service providers can develop new services in the IaaS (*infrastructure as a service*) resource pool, including cloud-based IDC services, virtual desktop services, and cloud-based network disk services. In this way, the telecoms operator provides Amazon-type EC2 or S3 services (S3 provides storage and Elastic Compute Cloud, EC2, offers resizable computing capacity in the cloud), dynamic rental of computing, storage, network and office desktop capability. The operator's billing system can let customers use services according to their needs, and pay for them according to the applications used. This

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"With the rise of cloud computing, however, the trend towards making the operator just a channel to enable fees to go to other service providers has intensified. Currently, the operator has to allocate bandwidth for access to cloud services, thus increasing the work of its network."

way they can get higher quality services at a lower price.

In addition, the operator can construct a PaaS (*platform as a service*) cloud platform on the IaaS resource pool to provide an open environment, including standard provision capabilities and interfaces. Meanwhile, Internet service capabilities can be mixed or integrated with telecom service capabilities, including IM (*instant messaging*) services and Internet of things' service capabilities.

The new services are then generated, providing a simple messaging service (*SMS*) cloud, multimedia message service (*MMS*) cloud, wireless application protocol (*WAP*) cloud, and/or an AppStore (*Applications Store*) cloud to optimise and enrich the openness and effectiveness of the PaaS layer in the IaaS resource pool. With the introduction of third-party development cooperation, operators can explore a new business mode with support from cloud operations. In addition, through the cloud they can provide plentiful SaaS (*software as a service*), storage networking solutions (*SNS*) cloud and e-Trip services, and compete in the wider Internet market as well.

Cloud computing brings new opportunities and challenges to operators.

The ecosystem of cloud computing includes terminals, channel and cloud. At present, most operators offer customised terminals to their customers - sometimes as many as half of all their terminals - in addition to tablets and netbooks. This means that, PCs aside, operators can control the way that over half of the terminals on their network operate. Because operators basically control all the access and core networks, they firmly control the network channels. ISPs, however, control the cloud services. Operators provide some fundamental services (including equipment rooms and bandwidth) that enable users to access the cloud services, but they would like to profit from a much wider range of services.

Therefore, a common topic of discussion now is how an operator can avoid becoming just a bit pipe for other providers' fee-earning services, especially since large scale 3G networks are now in service. When people use broadband connectivity to access Internet applications, relatively little revenue goes to the operators. Today, attention is focused on the traditional Internet 'tycoon' Google, and the new VIPs such as Facebook and Twitter. Mobile users keep increasing their revenue streams, so their market value keeps rising. Despite enormous investments in network development, operators' gains have not increased correspondingly and they still have to deal with complaints from customers that their connections are too slow or that it is impossible to surf the Internet.

With the rise of cloud computing, however, the trend towards making the operator just a channel to enable fees to go to other service providers has intensified. Currently, the operator has to allocate bandwidth for access to cloud services, thus increasing the work of its network. The operator also has to continuously expand its capacity to ensure its customers have good experience with the service, but since its revenue is limited, at times declining, this is increasingly difficult. In China, for example, when a China Mobile customer uses his/her handset to access a cloud service provided through China Telecom's fixed network, China Mobile must pay streaming fees to China Telecom, reducing the revenue it retains for its own services. Often, higher download charges cannot compensate the cost of streaming fee payments.

How can a telecom operator avoid becoming just a channel - a bit-pipe? If it exerts its influence on the cloud service provider, it can not only provide infrastructure such as equipment rooms and broadband, but also provide virtual servers, as well as additional services to its customers. There is no reason why operators can't act like Amazon, which provides S3, SimpleDB (a distributed database web service used with EC2) and other value-added services. In the PaaS layer, the operator can use its communications capabilities, introduce Internet capability and set up a unified development, test, host, and release platform so content providers can rapidly develop their services and offer them online. In the SaaS layer, the operator can provide Web-based conference organising services and IMS-based customer services to let customers rapidly use the services by themselves.

To escape becoming a mere bit-pipe, telecom operators need, in addition to developing the cloud-layer services, to redefine their business models, take a lesson from the marketing methods developed in the Internet era, and take full advantage of its basic terminal and channel resources. In this way, telecom operators will be able to share in the benefits - and revenues - of the cloud-computing era. ●

The growth of cloud services

by John Gillam, Programme Director Cloud Services, BT Global Services

Many senior decision-makers aren't all that interested in the cloud; they want more productivity, efficiency, customer satisfaction and security for their data and operations. Service providers must focus on solutions for these real business issues and on solid returns on the user's investment. Cloud computing puts a vast amount of computing and telecom infrastructure at the service of users. It makes organisations more efficient and flexible and users only pay for what they need as they need it.

John Gillam is the Programme Director for Cloud Services at BT Global Services; he has over 15 years' experience within the ICT sector. Prior to his current position, Mr Gillam held several senior product management positions within BT, most recently managing the development of the Applications Assured Infrastructure suite of services. Before joining BT, Mr Gillam spent several years with Infonet Services Corporation as Senior Product Manager.

Mr Gillam has been both winner and finalist in product innovation industry awards associated with application base SLAs, e.g. GTB Awards, Winner Best Corporate Innovation 2008.

John Gillam holds a B.T.E.C. H.N.D. in Electrical and Electronic Engineering.

Corporate boardrooms around the globe face unprecedented challenges. Achieving cost leadership whilst operating globally; ensuring operational predictability and managing risk; innovating and reducing time to market; serving customers and citizens better. Many are interested in the potential for cloud services to help, but are unsure of their suitability, especially in terms of operational control, security and regulatory compliance, reliability and service.

Despite all the hype surrounding the cloud, senior decision-makers aren't all that interested. What matters to them is how they make their people more productive, improve their operational efficiency and drive up customer satisfaction.

The cloud isn't really about the technology. What matters is what cloud can deliver, and that's where service providers must focus their attention - on solutions that address real business issues and deliver not just benefits, but solid returns on investment.

For cloud services to be truly transformational they must address user and customer satisfaction, innovate in a manageable way, save money, manage risk, and fulfil an organisation's potential.

Seeing through the clouds

There is a lot of confusion in the marketplace about what cloud services actually are. We see cloud computing and cloud services as different sides of the same coin. Cloud computing is related to the infrastructure but cloud services are related to business functions and each depends on the other.

Cloud computing functionality residing in the network enables cloud services. That functionality derives from a vast number of processing cores, disc platters and the network's data switches and routers. The ability to access all this computing power derives first from virtualisation and second through automated provisioning. The service provider's role is in the creation and ongoing management of services utilising the computing components that reside in the cloud.

Service providers that are not software companies or hardware manufacturers have an advantage since they can get very involved merging together the best parts of each of these technologies to bring scale, flexibility and value-added managed services to their customers. The cloud is disrupting the industry supply chain so sometimes a partner becomes a competitor and at other times the roles reverse. There is no room in a commoditised and highly competitive market to stand on your own - co-operation in the cloud is important.

More than just a trendy catchphrase, the cloud brings business benefits. With the potential to help organisations save up to 30 per cent on running costs, the numbers speak for themselves. More importantly, our research shows that the cloud makes people more productive, delivers better customer service, and makes organisations more efficient and flexible overall. Cloud services allow organisations to access the infrastructure and services they need, as and when they need them.

Operationally, without doubt, business support systems elements are changing as customers only pay for what they need as they need it. The good news is that these are the elements which telecom operators have built their businesses on. Some often overlook the fact that the plain old phone call is the original cloud service. Of course most of the products and services from the 21st-century telecom operator are much more than line rental and call charges, and this has required a vast amount of financial commitment in physical assets to deliver services, even if they are virtualized.

Operators have to manage the risk in investing in hardware and software assets to create shared platforms that customers can use to run a leaner business. The business model challenges and resulting profit margins will derive from the telecom operator's ability to rapidly re-use or share and 'over-subscribe' resources.

As enterprises become more mobile, the age of PCs tied to desktops is coming to an end. The cloud represents an opportunity to 'compress' wasted resources such as hardware and storage. Cloud services are much more flexible. People can access the same solutions from every building on an organisation's network - even from homes, hotels and customer premises - and can be more productive as a result.

Cloud services can be turned on, up, down or off very quickly. There's no need to wait weeks or even months while technology for an in-house solution is ordered, delivered and installed.

Simply, the advances in hardware and software, specifically the ability for software to decouple what is used 'logically', from what's used 'physically', has removed the biggest barrier service providers face, which is the ability to scale. When coupled with intelligent networking all the physical barriers are removed and service providers can deliver the service without constraints of locality, where is most efficient and cost effective for you, all while meeting your business performance requirements.

Can you trust the cloud?

If you believe you can 'opt out' of the move towards cloud computing and services, think again. Opting out of the cloud for the majority of us would be as futile as suggesting we can do without the Internet. Cast your mind back to the 90s when the Internet, if you had heard if it, was an option, but in 2011 the Internet is everywhere. The cloud is no different, you may try to dodge it for a year or two, but inevitably you'll need to embrace it. So I'd recommend you take responsibility now, for your own, your families' and your business' 'information' in the cloud.

Think about how and where your information is stored and how important it is to keep it safe. Safety comes at a price, and not all information is equal. A scanned copy of your driving licence and passport in the wrong hands could lead to identity theft but picture of granny and the kids is of little value to a thief but may have sentimental value to you. Equally, a private investment bank may have legal requirements to keep data within a country's border.

Ask yourself this: Do you know where your all your information is? Do you know who can access it? Do you care? I bet you know who is able to enter your house; don't you think you should know who could access the information you place in the cloud? Put a value on your data; make sure you choose cloud services that offer the security level relevant to the importance of your data. There is little point in paying for the encryption of the family photos; in fact you may wish to share them with the world on social network sites. However, the document scans of your driving licence and passport might warrant encryption so only you can access it.

Like any service, your only recourse if something goes wrong is documented in the terms and conditions you agreed. How often do you tick the 'I agree' box at the bottom of the web page without reading them in detail? Would you do the same if the same terms and conditions were posted through your letterbox? I confess I don't read them very often; the main reason, I suspect like many of you, is that we choose service providers we trust. But that isn't always good enough.

You may pick a service provider who delivers all the technical assurance you need to keep your data in the right place and protected from viruses and malicious attacks, but what if they go bust? Can you get your data back? What about the offsite backup tapes? Do you even know if your data is being moved around?

Cloud services are still in their infancy, yet they are having a profound impact on our lives. Cloud services will continue to flourish and the devices we use to access them will continue to improve. One challenge on the horizon is the lack of a universally accepted digital identity. Over time this will be a necessity for our safety in a digital world, but both the technology and cultural barriers have a way to go.

So forget the technology - that's the service provider's job; focus on the service you're buying. Be safe, take responsibility, but above all embrace it. ●

Wire-line, mobile backbone and fixed broadband

by Dr Herve Fevrier, EVP and COO, Xtera Communications, USA

Mobile broadband, cloud computing and video services grab our attention because they hold the promise of transforming the way that we live, work and play. But each of these applications relies on the evolution of the wire-line network to be successful since it is the combination of services over mobile and wire-line networks that will have the greatest impact upon availability and usability. The evolution is underway with the increased popularity of Raman amplification and the emergence of 100Gb/s line rates.

Dr Herve Fevrier is the EVP and COO of Xtera Communications Prior to this assignment, where, previously, he was in charge of photonics development as well as marketing, business development and sales. Prior to Xtera, Dr Fevrier served Alcatel in a wide variety of posts including Director of the Photonic Networks research unit, Senior Director for DWDM Product Development Worldwide, VP & GM Optical Networks Alcatel USA and VP Network and Product Strategy Alcatel Optics.

Dr Herve Fevrier received his doctoral degree in Physics from the University of Paris; he holds a Physics engineering degree from the Ecole Centrale de Paris.

Wire-line network

Mobile broadband growth is the rave of the industry and will be an important source of revenue growth for service providers. According to a report by Ovum: "By the end of 2015 there will be three billion mobile broadband connections worldwide serving 2.4 billion people." Many of these users will take advantage of iPhones, iPads and other smart mobile devices that give them access to information anytime and anywhere. This provides new revenue opportunities for service providers who appear to be losing wire-line customers.

The popularity of mobile, however, does not mean that the wire-line network is going away or becoming less important. In fact, mobile broadband services benefit from a far-reaching, high-quality, wire-line network. Service providers that can converge mobile and wire-line services can take advantage of consumers growing appetite for high-bandwidth applications and the associated service markets that are still in the early stages of growth. In addition to mobile broadband services, service providers with high capacity wire-line networks will see opportunities in the emerging cloud and video services arena.

The continued evolution of the wire-line network must remain a key part of the strategy to growing these services. According to Ovum, by the end of 2015, 2.6 billion people will still have access to a wire-line broadband connection at home, and 1.4 billion will be using both wire-line and mobile broadband services. These broadband users will overwhelm a network that is not able to scale to support the new emerging services.

The need for a scalable wire-line network was identified in the late 90s, driven by reports that the Internet was doubling every six to nine months. The phenomenal Internet growth rate led some to forecast that the wire-line network could not keep pace. The worry was that the Internet traffic would outpace the available capacity of the network. Service providers all around the world aggressively deployed more fibre to support the forecasted growth. Now as the new emerging services, mobile broadband, cloud and video services, gain in popularity, along with the continued growth of the Internet, the fibre based wire-line network must scale as well.

Thankfully, the technology exists to support this growth for years to come. The technology is dense wave division multiplexing (*DWDM*). DWDM is the core technology that transforms a fibre so that instead of carrying a single wavelength, it carries multiple wavelengths. So, for example, instead of carrying a single wavelength at 10 Gb/s, it can carry N x 10Gb/s. Transmitting multiple wavelengths provides increased capacity and flexibility. The increase in capacity allows more information (data, graphics, video) to be transmitted faster. The use of multiple wavelengths provides the flexibility to deliver information to different locations and to group data that has similar transmission characteristics.

DWDM and its associated technologies, reconfigurable optical add/drop multiplexers (*ROADM*) for example, continue to provide capacity growth, flexibility to support various bandwidth-hungry applications and to drive down networking cost. The line rates that are supported by DWDM also continue to increase. Just a few years ago, the maximum practical line rate was 10Gb/s. The highest fibre capacity could be achieved by using a DWDM system with all-Raman amplification (in-line, all-optical, distributed signal amplification for all-band wavelength coverage), providing 240 x 10Gb/s or 2.4Tb/s on a single fibre. Today, new systems are available that support multiple wavelengths at 10Gb/s, 40Gb/s and 100Gb/s. Coupling 100Gb/s with the latest Raman-based DWDM system continues to provide the highest capacity in the industry. Using the latest Raman system with 100G, service providers are now able to achieve 150 x 100Gb/s, that is, 15Tb/s on a single fibre.

There are many applications enabled by DWDM and ROADM based wire-line networks. These applications will enrich the lives of consumers and simplify the life of business owners.

It might be helpful to take a quick look at how evolution of the wire-line network supports growth of mobile broadband, cloud and video services.

Links between mobile and wire-line networks

Mobile networks use radio waves to transfer information to and from mobile devices and towers or antennas. However, these networks rely on line of sight transmission. They have a typical range of .5 to 5 miles. Given the right circumstances they can reach up to around 25 miles. However, all mobile networks eventually connect to a wire-line network. Mobile networks are a quick way of providing communications to emerging areas, but they must tie to a wire-line network to interface to the Internet and to the rest of the world. When broadband is transmitted over mobile devices, the range of transmission is shortened.

Broadband information is normally transferred for the greatest distance possible using high-speed wire-line networks (generally optical networks) and then converted for transmission by mobile networks.

Cloud computing

The recent global recession served as a catalyst to promote change in the way we live, work, and play. Businesses are turning to technology to make them more efficient. One area that is emerging is cloud computing. For many, the idea of cloud computing holds the promise of transforming the way that we create, store, access and share information.

Cloud computing not only holds the promise of helping businesses to cut costs, but also could change the structure of business itself in both the short term and long term. However, the success of cloud computing could very well depend on the ability of the communication network to handle the enormous increase in traffic that cloud computing could generate.

The goal of cloud computing is to simplify the process of creating, storing, accessing, and sharing information while dramatically lowering costs. This goal will be accomplished by shifting the service and cost of high-power computers and storage to a third-party. The network of computers at the third-party remote location is typically referred to as the cloud. Hardware and software demands on the user's side decrease. The user's computer only needs the ability to run the cloud computing systems interface software, by using a Web browser or other simple interface. The third-party provides cloud services, such as hardware maintenance, software updates, backups and transfers. While this simplifies the activity at business locations, it increases the load on the network.

If the network does not provide fast and easy access to the information in the cloud, or if the network is not reliable, cloud networking and its associated services will not be successful.

Video based applications

Video applications are also increasing rapidly and threatening to overwhelm communication networks. Real-time video is growing in importance, and video communication traffic is accelerating. According to Cisco's visual networking index: "Video-on-demand (*VoD*) traffic will double every two and a half years through 2014." This growth provides both an opportunity and a challenge to communication service providers.

Video applications require a lot of network bandwidth, but do not always provide a proportionate amount of revenue. The key for service providers is to create a high capacity, multi-use network, capable of handling a large number of diverse applications. Each application can be valued differently and the service provider will be able to charge accordingly. In addition, the network must be scalable. Initially, the network will be sized to minimize cost. As video services grow in popularity, the network can be scaled accordingly.

Raman-based DWDM networks provide a number of features which make them attractive for high-capacity multi-use. Systems using all-Raman-based amplification can handle the highest number of wavelengths. This remains true even as service providers move to higher bit rates like 100Gb/s. The additional wavelengths not only can be used for additional capacity, they can be used to provide increased flexibility. They provide a greater degree of choice when deciding how to route services. Services are converged onto a common fibre, but have diverse starting and ending points. This is an important step in creating high-quality networks that support the different characteristics of various applications. In addition, DWDM networks using Raman amplification support longer delivery distances. Longer distances can be used to eliminate intermediate sites and thus improve the quality of the signal and drive down cost.

We tend to hear a lot about emerging mobile broadband services. This occurs because these services have the ability to transform the lives of people in emerging and established economies. Anytime, anywhere access to broadband services can both simplify and enrich our lives. But it is the combination of services over mobile and wire-line networks that will have the greatest impact. And to be successful, these services require a scalable wire-line network using technologies like Raman and 100Gb/s to maximize capacity, reach longer distances and drive down the cost of providing services.

Mobile search apps - data on the go

by Simon Bain, CTO and founder of Simplexo

The need to access vital information whilst on the move is necessary for many businesses. Secure web search applications let people instantly search all of the information on their own desktops, from any mobile device, with a single-click. With cloud computing, security is a primary concern. With dedicated mobile search applications most security risks disappear; once the search is complete, the information is scrubbed from the device's memory, so there is no risk if the device is lost or stolen.

Simon Bain is the Founder, CTO and Chief architect of Simplexo Ltd's software solutions; he is a highly respected figure in the structured markup industry and a frequent spokesman on XML applications. Previously, Mr Bain consulted for SoftQuad providing customer integrations and XML expertise. He delivered the first XML introductory seminar for IBM and is on the Board of the Sun Microsystems User Group.

It came as no surprise that data traffic has exceeded the volume of voice calls on the world's wireless networks for the first time this year, with consumers today relying heavily on mobile devices to access digital content such as the Internet and in particular, social media sites such as Facebook, Twitter and LinkedIn.

The data explosion has created a major challenge for mobile phone operators who are now under pressure to meet demands for mobile Internet services. The surge in data traffic is placing a strain on network capacity in some areas and mobile operators are struggling to cope with the soaring demand for increased bandwidth, which is needed to access rich and complex digital content in real-time.

The need to access vital information whilst on the move is certainly a requirement for many businesses; however, having sophisticated support, network management and services is a continuous challenge for carriers. The rising use of multiple mobile devices to access and create digital content is further driving the demand for improved wired and wireless networks and services. For example, IT consultancy, Unisys, has approximately a third of its 25,000 employees using their own personal smartphones and PC tablets to access company email and other data as part of a pilot project[1].

As a result, IT managers are now finding an increasing number of employees asking for help to hook up their iPads and other personal portable digital devices to company IT systems so that they can access their company email, calendar, contact list and other services on their own devices.

This new way of working with technology can be seen as a 'consumerisation' trend, and is raising an opportunity for forward-thinking leaders who embrace it to dramatically improve productivity as well as employee morale.

The major challenge for companies is authenticating multiple devices for each employee and maintaining overall system security. Authentication is often quite costly so only a handful of employees can actually benefit from having this luxury; it especially limits users who normally have reduced access.

Security fears regarding remotely accessed information are especially high in the public sector. Government workers using smartphones have recently been issued new guidance by CESG to help them work remotely and securely.

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.

The new guidance has been developed in collaboration between providers and CESG (UK, *Communications-Electronics Security Group*) government cyber security experts, in response to the public sector employees' need to use smartphones to connect to their official work networks remotely[2].

As the number of people using multiple devices continues to soar and the demand to connect employee personal devices with company systems grows, so does the requirement for secure information web search applications, which let people instantly search their own desktops from any mobile device. A sophisticated mobile search application can help eliminate the problem of running effectively with the low bandwidth currently available on 3G networks. With the right applications and desktop control software, users no longer need high bandwidth to remotely access and efficiently download information from their desktop computers.

The Butler Group of independent analysts report that information-based workers spend up to 20 hours a week searching for information and worse, for information that they sometimes never find. With people relying on multiple devices, searching for information and files could become even more complicated, inaccurate and tedious. Due to 'consumerisation', applications that enable secure remote desktop search are set to grow in popularity and demand in 2011.

Using a real-time mobile search application, people can search all of their information with a single-click - even media files on removable memory cards. With a single search, users can get results from local files, SMS Text messages, emails, social networking sites, Exchange server and SharePoint.

Cloud computing - a challenge for managers trying to embrace remote search - is the talk of the year and at the top of every CIOs agenda. A recent survey by the Cloud Industry Forum, a non-profit organisation, revealed that end user organisations continue to express anxieties about data security, privacy and sovereignty.

It is clear that when it comes to cloud computing, security is a primary concern for users. However, given the current number and variety of cloud-based services, businesses need to ensure that its employees are protected from IT threats. With dedicated mobile search applications this risk disappears; as soon as the search is complete, the information is scrubbed from the device's memory, so there is no chance of data theft if the device is lost or stolen.

The growing popularity of cloud computing and machine-to-machine (*M2M*) applications will certainly add to the pressure for improved network capacity and mobile Internet applications. M2M is not a new concept; however, the familiar uses of M2M services such as fleet tracking, inventory management and remote monitoring are no longer the beginning and end of the market. There is renewed interest in M2M, largely due to the growing popularity of a new range of connected consumer electronics that provide M2M with a human dimension. The telecoms industry has claimed that this is blurring the statistical lines somewhat, with some organisations, for the sake of marketing, count tablets as connected devices.

Today, employees welcome the ability to access all of their working files, general information and personal social media content when out of the office and this will press the demand for mobile search applications. In order to address security issues, managers need to adopt mobile search applications that eliminate individual searches on multiple data sources - leaving no trace of their searches.

An effective mobile search application will deliver the up-to-date information you need, on demand and in real-time, without presenting unwanted results that waste valuable time. Businesses embracing this new working culture will benefit from having improved productivity and more effective communications. Mobile search will give employees greater flexibility, and the resources needed, to make strategic decisions away from the office.

By adopting a secure mobile search application, businesses will also benefit from providing all employees with full access to the authorised information and files that they require. Unlike an access authentication key, employees can access internal files and their company intranet securely from a mobile device exactly as they would using their PC at work or home. This eliminates the need for access authentication keys, which are extremely costly.

As more services move to the cloud and M2M and Internet applications are further developed, we will see a greater demand for mobile search applications that facilitate access to the user's own information and that provide the user with tools to manage their files efficiently. Forgetting where a file is stored or what communication was last made with a supplier will become irrelevant and a thing of the past; a single click will be all that it takes to search accurately and find the information you need from any one of your mobile devices.

From a security aspect, people using a secure mobile search application on their mobile device will no longer need to worry about the threat of data loss and leakage. Not one trace of your information searches will be left, so the security issues surrounding accessing confidential data out of the office are automatically solved; you will have access to the same information you would if working at your PC. ●

1. http://www.ft.com/cms/s/0/093e8cee-6785-11e0-9138-00144feab49a,s01=1.html#axzz1Js1i7ygv
2. http://www.publicservice.co.uk/news_story.asp?id=16037

Money on your mobile

by Roelant Prins, CCO, Adyen Global Payments

Early mobile payment systems based upon the WAP protocol were not notably successful. Today's mobile payment systems can count on broadband access to the Internet via sophisticated applications loaded in powerful smartphones, and their usage is growing rapidly. Airlines, banks, merchants, charities, among others, are all seeing mobile payments jump ahead and analysts report signs that by 2012 more than 400 million people will be using their mobile phones to make payments. A cashless society might not be too far away.

Roelant Prins is the Chief Commercial Officer at Adyen. Prior to joining Adyen as CCO, Roelant lived in London and worked in the Royal Bank of Scotland Group's payment division, managing the team responsible for corporate sales in the UK. Mr Prins began his career as a consultant and later entered the online payments industry. Mr Prins has held various management roles in sales and business development for organisations specialising in payment solutions and international e-commerce.

Making payments online is now firmly part of the mainstream, but next generation smartphone technology is causing many to consider mobile payments and m-commerce as serious alternatives.

Heightened demand for fully functional, easy-to-use mobile services and applications that can support our increasingly hectic lifestyles means that there is now an array of mobile apps that can handle almost anything. As a channel for the movement of money, mobile represents a massive area of opportunity for banks, building societies, retailers, gambling, travel and dating merchants.

The technology to support this application of mobile technology has actually been in existence for a number of years. So what has happened to bring money to our mobiles and what further developments are in store?

'Worthless Application Protocol'

Back in the late 1990s the likes of Nokia, Motorola and Ericsson came together to develop a universal standard that, they believed, would be integral to the successful implementation of the Web on wireless devices. This worked by converting existing, data-heavy Web pages into a simplified language for viewing on micro mobile browsers.

The Wireless Application Protocol (*WAP*) was incorporated into a range of first generation smartphone devices and this was followed by the development of a multitude of mobile Web services to take advantage of this new technology. Most of the major European banks developed mobile Web-enabled banking services for their customers, and merchants began accepting payments through mobile channels.

However, WAP was overhyped.

The first smartphone Web-enabled devices, launched in 1999, fell far short of expectations. A combination of cost (WAP's charging model forced users to pay each minute, regardless of the amount of data received), closed connectivity (WAP only worked with native WAP and Web-to-WAP proxy content) and chronic speed issues, meant that the devices were met with widespread derision and the adoption

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of monikers such as 'Worthless Application Protocol' and 'Wait And Pay'.

Despite its flaws, WAP was a significant step forward and revealed the burgeoning demand for data services and ever-greater data speeds over mobile.

Money as a virtualised reality

The lessons learned from WAP have resulted in mobile technological advancements that have begun to outstrip even that of some PC's and laptops. Today, smartphones with data-optimised mobile technologies deliver much higher speed and, as well, much better accessibility and functionality; they are now capable of offering high-quality IP-based mobile broadband.

Advances in mobile telephony are such that there now exists a very real opportunity for mobile technology to become the primary channel for customer interaction - and banks and merchants have noticed.

Juniper Research, a telecom industry analyst, has estimated that more than 400 million mobile subscribers are likely to use their mobile phones for payment purposes by 2012 - almost double the number now. Many retail banks have already announced mobile banking applications, the most recent of which being First Direct, the Internet banking arm of HSBC. Its mobile banking application for the iPhone is the result of overwhelming customer demand for mobile services. An Android version is expected later in 2011.

With Web pages now heavily optimised for mobile, using the native interface of the handset, consumers can now feel more secure entering card numbers, making payments and checking account details. Furthermore, it is possible to use single-click technology when making transactions, which simplifies the mobile payment experience for returning shoppers.

As money becomes more of a virtual reality, it is becoming increasingly clear that innovative service offerings have made mobile the 'must have' channel.

Information overload

Studies show that adoption of mobile payment technologies has grown more quickly than the Internet and email. The Internet, new media, 24/7 communication and connectivity and powerful business tools have bombarded us with more information than ever before - making us more willing to adopt technologies that make our lives just that little bit simpler.

Tickets please!

The airline industry was one of the first to embrace mobile payment technologies. The ability to purchase or change plane tickets with the simple click of a button on a mobile phone is enormously attractive to both the airlines and their customers.

There is also room for some interesting diversification with the technology.

For instance, Malaysia Airlines introduced its MH app last year, enabling passengers to access deals online that are dependent on their current GPRS location. Heathrow Airport has also recently entered the fray with its own Heathrow Express app, providing passengers with the opportunity to book tickets online and use 'their phone as a ticket'.

Proliferation of mobile payment technology is such that data from a recent Airline Business SITA trends survey suggests that 70 per cent of all airlines will be selling directly to passengers who have used their mobile devices to purchase tickets by 2013 - big business indeed.

Playing the odds

'Bet in Play', the ability to gamble whilst an event is ongoing, has become one of the most popular activities in gaming and, as such, services have developed that cater to its time-sensitive nature.

The gaming industry has always experienced very high conversion rates, thanks largely in part to payment systems that have been modified to provide streamlined, uncluttered payment processes - making it as easy as possible for consumers to make that 'I have a feeling' bet. Mobile technology allows gamers to make a bet whilst in a pub watching a game on TV or whilst in the stands at the event.

So called social gaming has also benefitted from mobile payments, with players more likely to 'top up' gaming credits at the touch of a button. Research has shown that 17 per cent of mobile gamers play one to three times a week, and one reason for this is the rise in popularity of social networking sites such as Facebook.

Social networks offer a vast array of games that involve topping up 'game credits', enabling users to play against friends or other users anywhere in the world - and competition drives users to keep buying gaming credits.

Niche appeal

In certain niche markets, where small, impulse purchases are often made, an upturn in online and mobile payment conversion has been reported. One example is the postcard industry. Consumers can take a photo on their smartphone, send the picture to a postcard company and pay, online, before the photo is loaded on to a postcard and then posted. Simple, yet highly effective.

This same impulse factor has also been noted with charitable donations. In the 48 hours following the Haitian earthquake disaster, over £2.5m in donations were received via SMS and other mobile payment systems.

Charities in the UK have also been quick to adopt mobile payment technology. An impulse donation might be set off by a TV program or advert or by reading a magazine article. With 26 per cent of the UK population using a smartphone, the impulse to donate can now be satisfied at the click of a button. After the first donation, all that is required is the CVC (*card verification code*) to donate again.

Technology also exists that enables smartphone users to make transactions via photographic identification. For example, when purchasing an item via a smartphone in a shop, a barcode with prepaid money will be presented to the customer's phone. When the merchant completes the transaction, a passport-style photo will appear, proving that the customer is not attempting to transact fraudulently.

The future is here

Predicting the future is always difficult, but some things are certain.

The proliferation of WiFi networks and ever more powerful smartphones and wireless devices has made it very easy for people to transact and handle money over mobile.

Talk of a 'cashless society' might not be as far away as we thought. ●

Enhancing network capacity with IP and compression

by Oddbjørn Bergem, CEO, Nevion

Maximising network capacity is a critical goal for video network service providers. Video over IP offers the flexibility to scale bandwidth to provide just the right amount of throughput to deliver content. JPEG 2000 compression maximizes the capacity of any video network, but works best in an IP environment. JPEG 2000 and IP are a perfect match, providing flexibility and scalability while delivering the video quality that service providers and their broadcaster customers have come to expect from professional contribution transport.

Oddbjørn Bergem is the CEO of Nevion. Previously, as a scientist, project leader and later head of engineering for Saclantcen international research centre, Mr Bergem authored three books and more than 30 scientific articles while managing a staff of 40 engineers. After a leadership role at Kongsberg Group, he joined Network Electronics as CEO. Mr Bergem is currently active on several boards of directors in the international technology community.

Oddbjørn Bergem holds a PhD in information technology and a master's degree in information technology and automation from the Norwegian University of Science & Technology (NTNU). He also earned an MBA from Ashridge Management College, London.

It's no secret that in today's climate, maximising network capacity is a - perhaps the - critical goal for video network service providers. More capacity brings the ability to transport more content, which brings more revenue. Capacity is the currency of today's video network. The more you have, the more valuable your network. Further, more efficient use of available bandwidth creates greater efficiencies and lowers costs. Simple enough, but increasing network capacity, especially under budget constraints, requires ingenuity, forethought and maximising the benefits that state-of-the-art technology can provide. Whether fine-tuning an existing network or implementing a new infrastructure, a network that maximises capacity requires not only careful consideration of the entire transport chain, but also the monitoring, control and management of that chain. Intelligently managed video networking can go a long way towards contributing to increased capacity. All in all, a worthwhile endeavour considering that the benefits of increased capacity - from more content transport to lower costs - translate directly to increased ROI.

The gifts of managed IP

IP's inherent properties bring several key advantages in terms of efficient capacity usage. Think of it as an environment of un-wasted space. Video over IP offers the flexibility to scale bandwidth to provide just the right amount of throughput to deliver content. IP is not limited by performing only at predefined speeds, where bandwidth is often unutilised because of the need to have extra bandwidth for peaks. Unlike SONET/SDH (*Synchronous Optical Networking/ Synchronous Digital Hierarchy*), the need for 160Mbps of bandwidth does not force the user to consume two OC-3 circuits (155Mbpsx2) potentially wasting 150Mbps of unused bandwidth. IP is a highly flexible environment of easily addressable direct connections, a significant departure from the manual setup of a traditional point-to-point broadcast network. However broadcasters, in particular, must have the confidence that IP can deliver consistently high-quality, and be assured that it comes with the essential reliability and performance that the industry expects. IP is standardised, highly flexible, and can deliver guaranteed quality of service, as well as low capital and operating expense when it is properly engineered and managed.

An IP video delivery chain entrusted with professional contribution video must deliver consistently excellent quality of service.

The rise of HD (*high-definition*) and increasingly 3G has also increased bandwidth requirements for broadcast contribution systems, highlighting the need for maximising capacity. Legacy infrastructures - satellite, SONET/SDH and ATM among them - are costly as they offer more limited scalability and flexibility for HD transport. IP offers broadcasters an easy and efficient way to avoid costly infrastructure overhauls while staying competitive and moving with the rising tide of HD adoption.

For those considering migrating to IP, modular solutions mitigate costs and often integrate with legacy infrastructures. Instead of complex, expensive installation of less ubiquitous, flexible and configurable equipment for video networks, IP solutions provide economies of scale in addition to bandwidth optimisation.

JPEG 2000 - the big squeeze

JPEG 2000 compression is a valuable tool for maximising capacity in any video network, but it's particularly valuable in an IP environment. In many ways, JPEG 2000 occupies a place in the industry similar to that of IP some years ago - known but not widely understood.

JPEG 2000's underlying structure is the key to its advantages. The highly flexible code stream obtained after compression of an image is scalable and can be decoded in a variety of ways. As a standard, JPEG 2000 allows for high bitrates - much higher in implementation than H.264. This is critical for high-quality transport, because certain infrastructure types impose bandwidth limits that are strict, but not severe. For example, HD will not fit into Gigabit Ethernet or OC-12 (622Mbps), but the entire pipe can be dedicated. So you can compress very lightly to fit into the pipe and achieve high-quality visually lossless compression. This also leverages the bandwidth scalability that is inherent in IP, where video can be transported at a desired rate with JPEG 2000, never consuming more bandwidth than is required.

JPEG2000 outperforms MPEG-2 Intra throughout the entire bit rate range, and can scale to higher rates than H.264. At the low end of the bit rate spectrum, H.264 outperforms JPEG 2000.

With the scalability of IP networks, the optimal amount of compression can be applied in order to use a minimum amount of bandwidth. Any two nodes can be connected in real-time, without the need to establish permanent circuits, thus providing extreme flexibility in bandwidth distribution. For these significant gains, JPEG 2000 and IP are a perfect match, complementing each other with flexibility and scalability while delivering the highest video quality that service providers and their broadcaster customers have come to expect from professional contribution transport.

JPEG 2000's low latency compression, and ability to maintain high video quality even after multiple encode/decode cycles, ensure that its advantages in network capacity are not outweighed by unacceptable disadvantages. Increased capacity without end-to-end quality is worthless. In a similar way, professional deployments of video over IP take full advantage of forward error correction (*FEC*) and buffering to ensure that when video arrives at its destination, its quality does not suffer due to packets that might have been delayed in transit.

Even with extreme compression, JPEG 2000 compressed images degrade with subtle blurring - not annoying blocking and tiling.

Video services management - increased capacity

Advanced video services management can enable more capacity through better resource management. In addition to efficient planning for capacity through inventory control and performance data, the most sophisticated management systems provide the ability to adapt to needs that can change in minutes.

A look at a recent IP-based HD video transport application for a high-profile European sports broadcasting organisation perfectly illustrates how smart video services management can reduce the infrastructure required in a video-over-IP network, thereby extending network capacity and saving costs.

Onside TV Production, the media production arm of the Swedish Football Association, the governing body of football in Sweden, receives content from small studios onsite at 16 different stadiums. Its programming is known as Klubb TV. Historically, these remote studios could only make file-based transfers to Onside TV's main production facility often more than 50km away. Through the installation of a JPEG 2000/IP transport compression solution and advanced management software at Onside TV, Klubb TV's local production sites are able to stream live content over a 100Mbps IP circuit. Perhaps even more significantly, the connection management function of the IP management platform now enables the primary production facility to use only three decoders to support the 16 different locations by dynamically shifting the connections to where they are needed - whether scheduled in advance or on an ad-hoc basis. Further, the on-site studios are now able to connect directly to the main facility and utilise web-based tools to manage their content. The management platform also provides key scheduling, provisioning and complete monitoring of all video-over-IP services.

By implementing a JPEG 2000/IP solution and advanced connection management, the Swedish Football Association's Klubb TV can stream live content to a primary production facility, where only three decoders are used to manage connections with 16 stadium-based studios.

The ability to link to multiple locations on an as-needed basis enables rapid and flexible content production and delivery. Even more significantly, installing hardware for nearly 20 dedicated connections would have been too costly for the production house. Technology and smart management combine to create multiple benefits. Perhaps nowhere is the proper management of live content more visible than in live sports broadcasting.

More capacity, more opportunities

There has never been a better time to take advantage of recent technological advances to improve network capacity, as well as the quality of the video we industry transport and manage. As always, getting the most from the latest technologies - from JPEG 2000 compression to video services management - requires specialised knowledge and the right choice of solutions. For example, nearly all JPEG 2000 implementations are based on the same chip technology. Each implementation's fine-tuning and optimisation will define its ability to meet and exceed expectations related to bandwidth maximisation, quality and latency. Likewise video over IP continues to evolve to provide greater security and deliver other benefits significant to professional broadcasters. The optimum combination of technologies can present service providers with game-changing new flexibility and efficiency. Maximising capacity to make bandwidth not just available, but attractive, to broadcasters at a price they can afford, is a goal that makes the required research and planning a very good investment, both for short-term gains and over the long haul. ●

A holistic approach to video optimisation

by Will Blench, Vice President and General Manager EMEA, Openwave

Video content already accounts for about half of network traffic and will account for 75 per cent within a few years. Operators are upgrading their networks to 4G to handle the expected traffic, but it will be almost impossible - and expensive - to keep up with the expected growth. There are other ways, however, to handle the traffic. Congestion-triggered optimisation and compression can automatically reduce network loads - and costs - during peaks and reduce the need for network build-out.

Will Blench is the Vice President and General Manager EMEA for Openwave; he has more than 20 years of experience in enterprise software, communications technology, sales and business development. He started his career at Hewlett-Packard, where he worked in EMEA roles in technical consulting, product management and channel management. After this, he took the position of VP EMEA for Cramer Systems and subsequently VP Sales EMEA for Amdocs following the acquisition of Cramer by Amdocs.

Video content is network-intensive, requiring more wireless network bandwidth than any other applications - including email, P2P applications and web browsing.

The proliferation of mobile devices, along with improvements in device capabilities and network bandwidth, has caused a tremendous increase in mobile data volume, with traffic set to hit one EB (*Exabyte*) per month within the next three years. In 2010, global mobile data traffic almost tripled for the third year in a row, while smartphone use doubled. The average amount of traffic per smartphone user rose to 79MB per month, up from 35MB in 2009.

Smartphones represent only 13 per cent of total global handsets in use today, but they represent over 78 per cent of total global handset traffic.

Added to this, tablets, which consume even larger volumes of data than smartphones, are on the rise. In 2010, three million tablets were connected to the mobile network with each tablet generating five times more traffic than the average smartphone

While devices are one problem, data type is another. Among the various forms of mobile data, video is quickly becoming the dominant data type in carrier networks. Over the past two years, YouTube video size and bandwidth have increased from 20MB and 30MB with a corresponding increasing bit-rate from 300Kbps to 500Kbps. In addition, many web advertisements are now delivered as videos instead of flash animation. Mobile video traffic was 49.8 per cent of total mobile traffic at the end of 2010, and will account for 52.8 per cent of data by the end of 2011. Within the next few years, it is expected to comprise 75 per cent of all mobile network traffic.

This growth is a worrying trend; as video consumes more of the available bandwidth, mobile service providers are experiencing a tremendous strain on their operations and video is becoming the cholesterol of our mobile networks.

Throwing money at the problem, such as costly network infrastructure expansion, is not necessarily the answer. Not only

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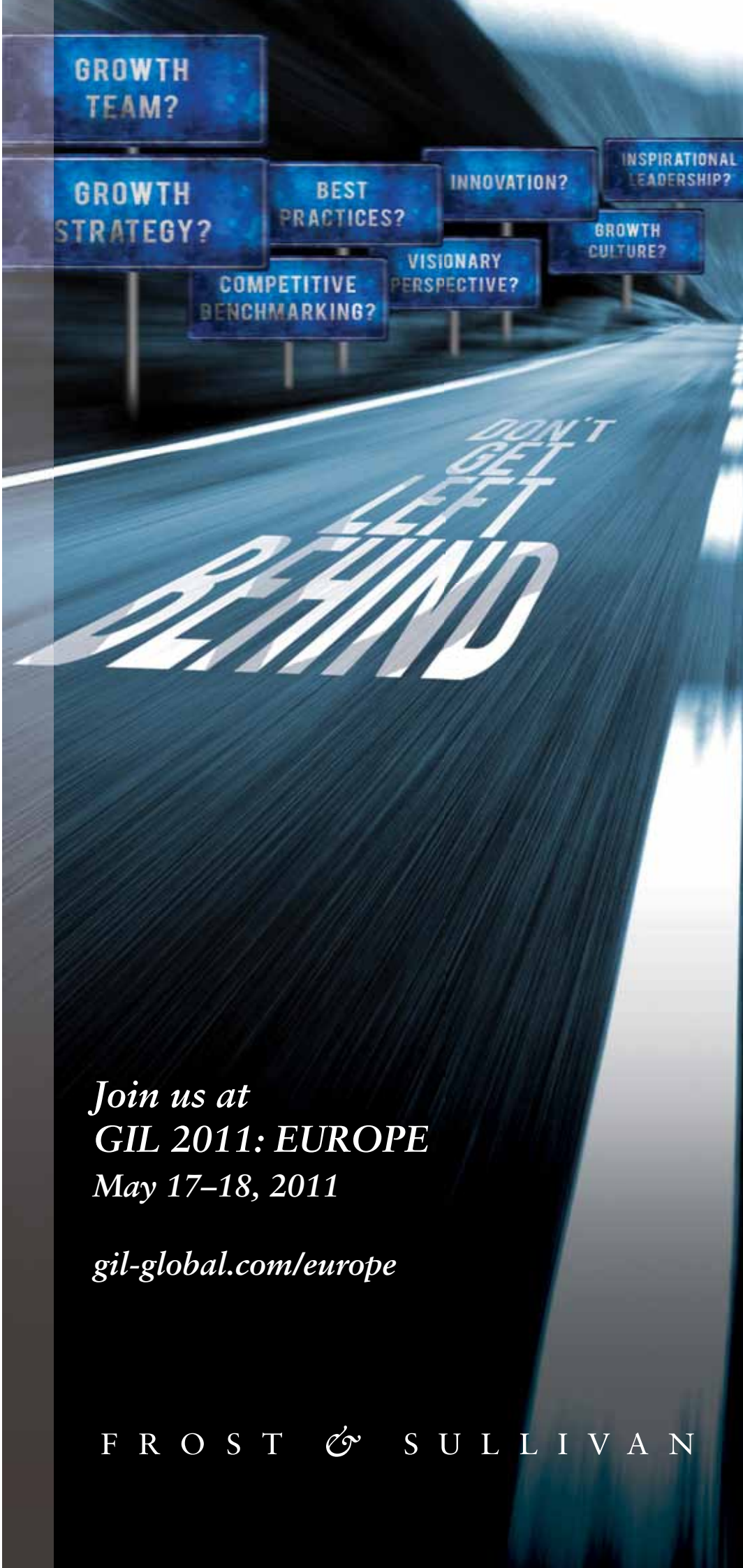

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can few operators do this and still remain in business, ultimately they will be left with the same problem as before because bigger waves of data are coming - including HD video and machine-to-machine communication to name two. Instead, operators need a solution that can reduce data traffic volume by using optimisation techniques such as compression to deliver optimal visual quality while improving user experience through intelligent delivery mechanisms. Managing the network in this way will not only offer subscribers a glitch-free video experience, but will also open up revenue-generating opportunities for operators themselves.

Addressing bandwidth

One of the primary reasons that more and more mobile operators are rolling out their 4G networks is to accommodate the growing demand for video content. 4G networks will provide increased bandwidth and higher data transmission rates, and operators initially felt that this would allow users to enjoy the high-definition video and video-conferencing features of mobile devices. A key selling point of the 4G wireless system was that it would provide a comprehensive IP solution where multimedia applications and services can be delivered to the user on an 'anytime, anywhere' basis with a satisfactory high data rate, premium quality and high security.

However, as machine-to-machine technology continues to come online, and richer media is appended to messaging, traffic levels could quickly exceed 4G capacity.

The solution is complex. This new 4G world will be different from previous technology upgrade cycles because of the abundance of over-the-top (non-operator) services that will use 4G networks for only the cost of access. Building more infrastructure capacity cannot be a complete solution if operators are to manage this growth and expect to turn a profit. So how do operators build a sustainable business model in this new 4G world?

Intelligent caching - a technique that prevents additional bandwidth consumption every time a popular video is requested - is one strategy that could work for many operators. Caching the most frequently viewed videos closer to the network edge results in faster download and playback, and prevents wasted bandwidth that occurs from retrieving the same video repeatedly from the server of origin. The key to intelligent caching is close monitoring of the network to constantly and dynamically update the list of videos that need to be cached.

Still, caching alone is not enough to deliver mobile video to a mass audience; a more effective approach would be to take a combined software and hardware approach to manage a variety of traffic types in real-time.

Congestion-triggered optimisation

Video optimisation is a clear and effective solution to the data traffic problem. Compressing images and content can aid delivery without compromising bandwidth.

The cost savings are pretty impressive too.

Here's a common carrier profile - Carrier X has 12 million subscribers and is experiencing data growth of 100 per cent year-on-year, with video content equalling about 40 per cent of its traffic mix. According to market estimates, Carrier X will have total network spending of about US$153M, but by deploying an effective video optimisation solution, the company could save US$36 million. This equates to around 24 per cent in the first year alone, with further savings achieved over the following years as well.

Optimising all of the content all of the time can be expensive and an administrative burden on network operators. The majority of operators do not want to touch data traffic unless there is a problem, and, for many, their problems pertain to a specific region, a specific user type, or a specific type of long-form video traffic. The trick is to optimise only when necessary.

Companies should look to deploy congestion-aware optimization strategically, at the busiest cell sites, or activated at peak times. A tier one operator in North America uses congestion-triggered optimisation to address traffic challenges only in specific cities, such as New York, San Francisco and Atlanta. Alternatively, self-optimising techniques can be deployed which automatically trigger optimisation when network conditions reach certain congestion thresholds and video quality degrades. Optimisation is triggered only when there is a video quality issue caused by too much data traffic.

In each of these instances, congestion-aware optimisation provides an intelligent capability to automatically trigger optimisation as soon as it detects congestion in the network on an individual user basis. Compression is applied only to congested flows, providing significant hardware footprint savings to the operator.

The benefits for the operator are clear - smart optimisation will significantly lower an operator's total cost of ownership by reducing transmission requirements up to 40 per cent when required by network conditions. It also offers a clear advantage to subscribers by improving the overall mobile video viewing experience during periods of peak congestion, leading to another key operator benefit - higher average revenue per user (*ARPU*). ●

Connecting tomorrow's data centre

by Anne Marie Kenneally, Vice President of Sales for EMEA, CommScope Enterprise

Virtualisation, cloud computing and high-bandwidth services like video-on-demand are already driving organisations to upgrade their networks, some to 100GbE, to prepare for the coming data traffic onslaught. Organisations would be wise to spend a bit more initially for a more robust upgrade to avoid heavy additional costs and operational turmoil in the future. Upgrades need state-of-the-art intelligent infrastructure solutions to proactively track and monitor data centre activity and to regulate network traffic, end-user activities, applications, networking protocols, servers and such.

Anne Marie Kenneally is the Vice President of Sales for Europe, Middle East and Africa (EMEA) for the CommScope Enterprise Solutions Division; she has over 20 years' experience in the industry, with a career that began with AT&T. Since then Ms Kenneally has led the Lucent Technologies' SYSTIMAX enterprise cabling market in UK/Ireland, before becoming Managing Director of the Lucent Technologies SYSTIMAX business in EMEA, and thereafter Vice President of the SYSTIMAX business under Avaya. Ms Kenneally moved to CommScope when it acquired the SYSTIMAX business from Avaya.

In addition to her business qualifications from INSEAD, amongst others, Anne Marie Kenneally holds an Honorary Fellowship from the Institute of Sales, Ireland (2005) for her outstanding contribution to the growth of the SYSTIMAX business in the EMEA region.

The amount of data we now consume on a daily basis is truly astronomical. In 2007, IDC estimated that the world's total digital content was 161 billion gigabytes; by 2009, that figure had reached 487 billion. If our planet's digital content were now printed and bound into books it would form a stack that would stretch from Earth to Pluto ten times over.

Given the surge in consumption of digital information over the last decade, it may come as no surprise that 2010 saw a 50 per cent increase in the amount of data being transferred over the world's networks. More shocking is Gartner's recent prediction that the amount of data running across networks may increase to 4400 per cent of current levels by 2020.

Nowhere is the pressure of this information-overload felt more strongly than by organisations and the IT networks powering them. Over the last decade the demands that companies place on their networks and data centres have increased exponentially. Amsterdam's AMS-IX Internet exchange - one of the largest Internet exchange points in the world - recently made the switch to 100 Gigabit Ethernet (*GbE*) to support a huge increase in capacity. This came in response to seeing traffic double at the exchange every eighteen months and the need to maintain high-speed connectivity, 24/7 availability and unshakable reliability.

Since the first publication of the Ethernet standard almost 30 years ago, data rates have rocketed skyward. The 40 and 100GbE standards, recently ratified by the IEEE 802.3ba committee, are a far cry from the early 10Mb/s connections of the 1980s; they will become essential by 2015.

Virtualisation, cloud computing and high-bandwidth services like video-on-demand are driving the need for increased access network speeds. A recent forecast from Gartner supports this scenario, predicting that fully 50 per cent of workloads will be running on virtual machines by the end of 2012. Networks around Europe are already being upgraded to support these unprecedented levels of data traffic. For example, Verizon recently announced the rollout of a 100GbE link between Paris and Frankfurt, a portion of the company's European long-haul network.

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Given the potent combination of these pressures, the question facing enterprises around the world is not whether to upgrade their data centre infrastructure, but when.

Tomorrow's networks, today

Many large enterprises currently operate networks installed about ten years ago and are attempting to run applications that weren't even in existence when the network was originally designed. As the pace of technological development continues, enterprises must look to deploy flexible infrastructure that can keep pace with the future demands of virtualisation and cloud computing.

Given the relatively modest cost increase between installing 10GbE OM3 cabling and 40/100GbE-ready OM4 cabling, enterprises should be deploying higher bandwidth infrastructure now, especially for connections between the access switch and the core of the network in the data centre.

Although deploying the most current, forward-looking standard for fibre in the data centre will increase capital expenditure (*CapEx*), deploying solutions today that will require time-consuming and expensive upgrades in the future is a far less cost-effective strategy in the long-term.

Enterprises that do not future-proof their data centres today, will face the need for wholesale upgrades in three to five years that may generate significant downtime. For this reason, organisations should be careful not to reduce their initial CapEx at the cost of greater operational expenditure (*OpEx*) during the total lifetime of their infrastructure. Purchasing better quality equipment can also reduce the need for ongoing maintenance and technical support during a data centre's lifetime.

While the decision to deploy 40/100 GbE connections in the data centre today makes good financial sense, increasing bandwidths also presents enterprises with additional concerns.

100 GbE - the cost of downtime

As the bandwidth of each individual link in the data centre rises, so does the cost of a connection failure. The huge volumes of data that will soon be running across individual cables will mean that the failure of even one connection can have a significant impact upon a data centre's overall performance.

Unfortunately the rapid increase in network complexity in recent years has produced many more potential points of degradation and failure in data centres - from an accidentally severed cable to a software security false alarm halting all network traffic.

While the chances of outages have increased, so too have the negative consequences of downtime. Not only can IT infrastructure failures severely damage your business, it will also negatively impact the businesses of those who depend on you.

Reduced network performance can have a significant impact on an organisation's productivity, corporate image and bottom-line. Infonetics Research has found that the average enterprise loses 3.6 per cent of their annual revenue through network downtime. Without access to essential communications tools and business-critical applications, employees are unable to maintain services and customers may look elsewhere.

It is essential then that enterprises have the tools in place to proactively track and monitor data centre activity. Businesses are rapidly waking up to the reality that the less efficient methods used in the past for maintaining their networks and tracing faults are no longer adequate.

Nevertheless, any system that aims to monitor and control a network faces a considerable challenge, since it must regulate network traffic, end-user activities, applications, networking protocols, servers and network hardware devices.

Intelligent infrastructure

The answer is Intelligent Infrastructure Solutions (*IIS*) - systems that provide the missing link between real-time network management tools and the traditionally passive structured cabling infrastructures that connect network devices together.

By providing insight into the physical layer, IIS helps IT professionals and network managers ensure the efficiency of their network by providing accurate reports for capacity management; generating real-time alerts to detect, locate and resolve any unauthorised changes within the network; providing automatic discovery and tracking of physical location of devices connected to the network in real-time; and proactively applying changes utilising electronic work orders in support of change management.

During the economic downturn of 2009-10, many CIOs had to implement cost-cutting measures in their enterprise ICT architecture. Having deferred or under-spent on infrastructure upgrades, many CIOs now face the issues of supporting faster data rates and improving efficiency with aging or underpowered infrastructure.

Yet, because of this need for growth and evolution, enterprises still have the opportunity to implement solutions now that will help them steal a march on their competitors. Gartner recently forecast that over 50 per cent of enterprises will expand their current data centres by the end of 2011 and more than 30 per cent are building new data centres to combat and overcome the capacity challenges ahead. These companies should take advantage of this opportunity to deploy a physical layer infrastructure that can handle the deluge of data and improve system performance across the board. Businesses need to ensure that the foundation is in place to take advantage of next-generation services today - and that foundation is IIS.

Organisations unsure about immediately committing to IIS should, at the very least, ensure that their systems are upgradeable. There are now IIS solutions available which offer the ability to either upgrade or retro-fit intelligence into passive network infrastructure, although not all of them offer this for both copper and fibre networks.

The need for IIS will only become more pressing as the IT sector continues to evolve and services like cloud computing increase pressure on data centre efficiency. Intelligence is the best solution for these types of environments to keep precise operational control and thus to deliver a seamless service through the cloud. Given that many businesses will soon depend on providing a seamless virtualised service, or utilising such a service, the importance of greater network control and reliability is clear.

With these systems in place, enterprises will have well-rehearsed plans in place to recover from system problems, and solutions in place to eliminate the potential for human errors. Systems should also be implemented that automatically plan and schedule maintenance, as this is key to ensuring ongoing infrastructure reliability.

The adoption of 40 and 100GbE will create new possibilities for network connectivity - supporting new ways for us to work and interact in homes, offices and enterprises. In order to adapt and thrive in the face of these new possibilities, it's essential that CIOs ensure their data centres are ready for the future.

[i] *Source: Gartner - http://www.gartner.com/it/page.jsp?id=1211813*

Capacity demand - challenging traditional models

by Caroline Ward, Group Commercial Director, Geo Networks

Digital traffic is growing aggressively, and network operators are battling to economically meet the demand, but traditional telecoms business models are not designed to support this expansion. Until operators migrate to fibre, bandwidth shortages will occur with increasing frequency and severity. To give businesses the tools they need to develop and expand, network operators need to open up access to their networks, selling fibres to let companies reduce their costs as they grow, and give them complete control over their infrastructure.

Caroline Ward is the Group Commercial Director at Geo Networks. Ms Ward has a number of years of board-level experience, gained in organisations including Sun Microsystems and IBM. She joins Geo from Oracle where she was Professional Services Director for a region comprising UK, Ireland, Benelux and the Nordic countries. Prior to this role, Ms Ward held other strategic positions at Sun: Storage Director for UK and Ireland, Systems & Technology Executive for UK, Ireland and South Africa, and Director of Telco & Media for UK and Ireland.

Caroline Ward holds a BSc (hons) in Applied Human Psychology from the University of Aston in Birmingham.

Mobile network operators (*MNOs*) recently reiterated their position that content providers such as Google should pay telecoms companies for the delivery of their material to end users. While this question falls under the wider net neutrality debate, it's evident that Internet-related business models are changing. Mobile, wireless and fixed network operators are reinventing themselves to differentiate beyond commodity bandwidth, while media companies are adopting new, consumer-driven technologies including high-definition (*HD*), Super-HD and three-dimensional television (*3DTV*) viewing. With wireless and mobile traffic doubling year-on-year, MNOs are relying on new technologies such as femtocells to offload the traffic onto their fixed lines, which puts increasing pressure on the fixed line network operators.

While they are staving off the immediate pressure with these quick-fix solutions, both wired and wireless carriers are effectively creating a fragile environment that won't be able to meet future bandwidth demands. The way data is provided and consumed has changed, and business models are evolving with this. The enterprise is going mobile, with the rapid and extensive adoption of smart devices such as Blackberrys and iPhones for corporate use. Meanwhile, retail consumers expect mobile phone contracts with unlimited data service as a basic right and mobile operators continue to partner with technology companies to deliver machine-to-machine (*M2M*) innovation.

In order to manage this data explosion, traditional telecom business models need to reflect this new market, protecting and delivering service to these valuable growing markets. Organisations, now more than ever, need their own dedicated networks, controlled, owned and future-proofed by them, in order to support their business strategy.

21st-century business

The past seven years have seen a tidal wave of change where the ongoing development of the Internet and ultra-fast networking is forcing a realignment of supply and demand business models. Customers are looking for fundamental change. Rapid development of residential

broadband will be needed to offload some of the phenomenal data growth that mobile operator customers are experiencing. Infrastructure to enable innovative new companies to supply content, software and services to the growing numbers of data-hungry consumers is also a priority.

The UK has reached a watershed; our copper infrastructure can no longer support the growing needs of today's data-intense businesses. Copper has reached the end of its useful life, and only wholesale change to the current telecoms business models which can resolve this.

Legacy technology and copper

Today's operators will have little future if they rely on copper. Technology can extend the life of copper networks to some extent, but only fibre can fully support the business models of today - and tomorrow. Optical fibre is becoming the UK's fourth utility, but it relies on an open access marketplace in order for the benefits to be fully realised.

To support the demands of its customers, operators need to change their provisioning model. Today's customers need the flexibility of their own fibre and the scalable bandwidth that it provides. Customers and service providers shouldn't be penalised for growth by the levy of expensive bandwidth charges when requirements increase, as is too often the case with traditional managed service models. Neither should they be constrained by bandwidth, forced to select and prioritise their critical applications.

A new way of thinking

Organisations that require data-intensive transit are increasingly moving toward a new ownership model. Customers and service providers are looking to become true proprietors of their fibre network, owning and controlling it as if they were a telecoms company themselves, but without the overhead of having to build their own assets. This new way of thinking eliminates the existing practice of providers locking customers into procuring 'layer two' services, such as managed or lit fibre, and for the first time provides access to 'layer one' technology, such as dark fibre, which the customer can own and light as they wish.

This new model puts the customer in charge: commissioning incremental bandwidth on their own network whenever they need, at a fraction of the time and cost associated with traditional models. All of a sudden, bandwidth is accessible and the total cost of ownership decreases, which is imperative for preparing organisations for growth, both in terms of customers and volume of data.

TV and film production is one example of how the industry is rapidly evolving at the hands of customers. These industries have been catalysts for innovation, and have brought about fascinating new technology, such as the BBC iPlayer, high-definition television (*HDTV*) and three-dimensional television (*3DTV*). By owning and controlling their own networks, today's media companies can separate traffic and send different content down different wavelengths. For example, a single dedicated fibre can support up to 480 channels of live content, or the waves can be isolated to send less critical traffic such as non-live content - TV on demand, for example - or internal corporate data. Eliminating bandwidth constraints means that, for the first time, content deliverers need never compress and decompress traffic. This represents an upgrade in the quality of content output and offers uncompromising quality and freedom for the delivery of live content. Nevertheless, it is not just media companies themselves that need the bandwidth; production and post-production companies are also gearing up for HDTV and require additional bandwidth to deal with file transfers.

The financial sector has also adopted the new telecoms business model with ease. Financial institutions are provisioning networks comprising multiple dark fibres, putting them in control of their data and providing a truly future-proofed solution. As mobile banking uptake continues to strengthen, banks are predicting up to 300 per cent ROI (*return on investment*) according to analysts. The attractiveness of the mobile banking proposition as a way to increase market share will place a strain on networks not poised for rapid scalability.

Finally, mobile operators and service providers are under increasing pressure from heightened competition and consumers expecting basic services for free, so service providers differentiate themselves and profit from innovation and value-added services. Barriers to entry continue to drop, and usage patterns are exploding for both search and application service providers (*ASPs*), both in numbers of users and in network demands from the users. A scalable, reliable fibre backbone is the only solution to meet this data explosion.

Additionally, with organisations regaining control and no longer subject to both the long lead times and price increases associated with traditional telecoms models, they are free to scale up and down to suit their needs. This new model represents an exciting and liberating change, providing the UK's talented innovators with the tools to empower and control their own assets.

Operators can extend their networks all they wish using traditional methods such as copper and ADSL+ (*asymmetric digital subscriber line*), but until such time as the entire network is fibre-based, bandwidth droughts will occur. Fibre is the stable, future-proof infrastructure of choice, capable of transmitting enormous quantities of data in both directions at the same time. It has no challenger as today's - or tomorrow's - transport mechanism of choice. To provide businesses with the tools they need as they develop and expand their operations, network operators need to open up access to their networks, allowing companies to benefit from cost savings as they grow, and giving them complete control over their infrastructure.

The last couple of years have been tough economically, and as we move forwards it's critical that the telecoms world adopt a business model that works and supports sustainable commercial growth. We need to be prepared for new and intense network pressures, such as the high-definition, interactive services the international community will expect around the Olympics. The UK will not be able to support that growth if we can't meet the capacity challenge, which is why operators need to not only invest in a fibre infrastructure, but also open up the operational model to allow companies to flourish.

Network capacity growth pains

by Sanjay Castelino, VP of Product Marketing, SolarWinds

With the rapid uptake of cloud computing, software as a service (*SaaS*), virtualised network environments and mobile wireless devices, IT administrators need to manage existing network capacity to support business-critical applications. Network performance monitoring solutions help organisations optimise their bandwidth usage of existing and ensure that critical traffic such as Voice over Internet Protocol (*VoIP*), among others, are allocated more bandwidth than less demanding traffic. Today, monitoring an enterprise's network performance is one of a network administrator's most significant activities.

Sanjay Castelino is the VP of product marketing at SolarWinds, an IT management software provider. Mr Castelino leads the company's end-to-end IT solutions for network, systems, application, storage and virtualization management initiatives; he is also responsible for all its product, technical and community marketing functions.

Previously, Mr Castelino worked at NetStreams as VP of marketing and business development. Mr Castelino was also the VP of product marketing and management at Motive computer and electrical engineering.

Data growth is a big challenge for organisations of all sizes. According to Gartner's report (November 2010), nearly half of the enterprises ranked data growth as one of their three biggest daily challenges. Network utilisation for data services continues to rocket globally, and organisations are increasingly under pressure to manage existing capacity in the most effective way possible. With volumes of data set to rise further - IDC predicted a rise in digital stored data from about 1.8 Zettabytes in 2011 to more than 7 ZBytes in 2014 - businesses are faced with the challenge of managing the complexity of data traffic and explosion of growth.

With the rapid uptake of cloud computing, software as a service (*SaaS*), virtualised network environments and mobile wireless devices, IT administrators are turning towards ways to proactively manage existing network capacity in order to support business-critical applications.

Maximising existing infrastructure

Historically, an answer to ever-increasing volumes of network data has been to buy a bigger Internet pipe. However, due to current economic conditions, financing of network upgrades at this scale is no longer feasible.

Instead, organisations are looking at ways to manage growing capacity needs by understanding how critical applications are running over existing bandwidth, where performance of these applications can be improved, where the bottlenecks are and how existing bandwidth can be optimised. Applications are the life-blood of businesses and understanding exactly how critical applications perform is essential to ensuring that both company and customer-centric services are running effectively over the network.

Network performance monitoring

Network performance monitoring lets businesses view their capacity availability and performance issues within and around their network. Without the proper network monitoring solution to monitor virtualisation, wireless and wired network gear, businesses can be vulnerable to overextending their bandwidth. The right

performance monitoring solution provides an important insight into how applications are utilised, whether resources on the network are appropriately sized and they also provide data for forecasts and future requirement trends.

By monitoring network capacity and usage, companies can determine how applications are running on the network and the ability to control and manage how network resources are allocated in order to accelerate business-critical applications.

Today, capacity planning is growing in importance as enterprises turn to virtualisation to help control costs. In a large data centre, utilisation and application workloads can fluctuate dramatically over the course of a few weeks, days, or even within a single day. For example, a slightly improper virtualisation setup in which the company assigns the VMware ESX server to the incorrect network interface controller (*NIC*) would create an immediate bottleneck. Taking user error into account when implementing a virtualisation strategy makes it all the more important to have a comprehensive view of network performance and the ability to efficiently and quickly plan capacity requirements.

How technology can help

Business traffic such as voice over Internet Protocol (*VoIP*) and other critical services should receive precedence over less demanding types of traffic. Prioritising bandwidth allocation means that more bandwidth can be given to specific users and certain services, which require higher quality of service (*QoS*) to work reliably, are supported more effectively.

Technologies such as NetFlow, IP SLA (Cisco's IP SLA verifies network performance and identifies network problems) and class-based quality of service (*CBQoS*) allow network engineers to prioritize traffic for business-critical applications over other traffic and help manage bandwidth more efficiently.

Network performance soars or suffers based on what users are doing. NetFlow is a network protocol designed to monitor network traffic and help businesses identify and prioritise applications and business-critical content. It provides a useful perspective on where and how bandwidth is being consumed (both critical and non-critical). So employees using the corporate network for bandwidth-hogging applications like streaming YouTube and music or playing World of Warcraft® can be swiftly stopped.

IP SLA allows companies to test connections and protocols over the wide area network (*WAN*). If a company is hosting a VoIP call between an office in New York and another in London, you'd want to ensure that the service's performance does not degrade on the network.

For instance, let's say that Site A is having no voice quality issues calling Site B. However, a user at Site C is reporting choppy sound and dropped calls when calling Site B. IP SLA would have helped identify this issue before the user called to complain or submitted a helpdesk ticket. Site A doesn't see the same issue because it is taking a different routing path to Site B than is Site C.

Using IP SLA to test network performance and connections to other sites on the WAN, users can verify if VoIP performance is adequate to ensure satisfactory quality.

In addition to NetFlow and IP SLA, CBQoS can provide additional insight into an organisation's application utilisation and help enforce traffic prioritisation.

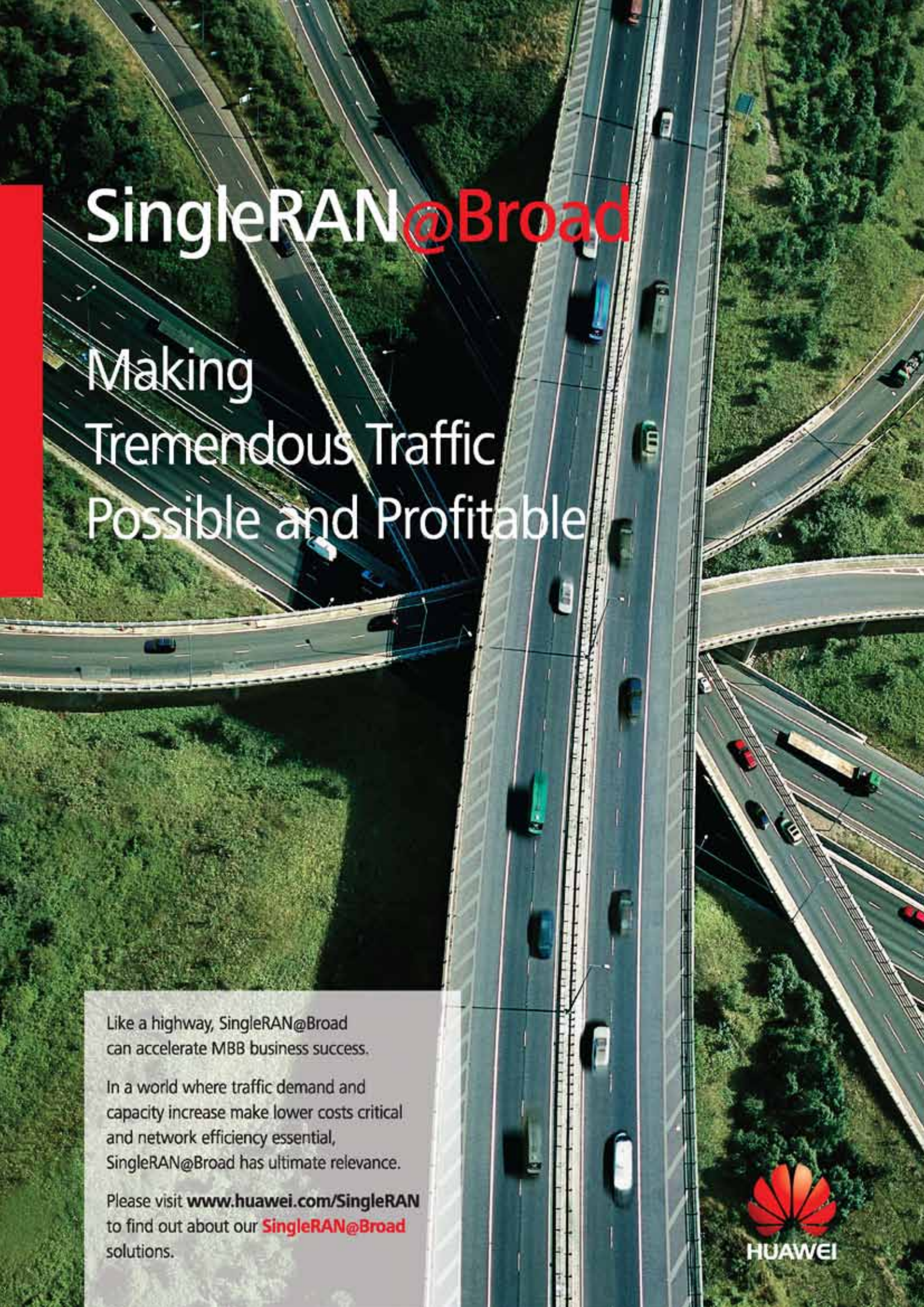
CBQoS is a resource reservation system; it reserves and prioritises resources based upon a set of defined polices that ensure business-critical traffic such as VoIP and video-conferencing are of the highest quality.

On networks with a variety of shared resources and limited bandwidth, CBQoS is one of the most effective and inexpensive ways to reduce network congestion.

These technologies help uncover hidden bottlenecks on the network and between company sites by verifying how sites communicate with each other; they also prioritise the more critical applications and services running on the network.

While NetFlow, IP SLA and CBQoS are key technologies to manage bandwidth, analyzing the data can be time-consuming and difficult to understand. To save time troubleshooting, IT administrators should invest in network monitoring solutions that automate this process.

However, even with a network performance management solution, prioritisation rules and policies aren't perfect and can have unintended consequences. Think of it this way: you can setup a rule as soon as you have a snapshot of your traffic, but your traffic can change and the rules based upon the snapshot might not behave as expected given the new conditions. That is why monitoring an enterprise's network performance is one of a network administrator's most critical activities.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