Connect-World

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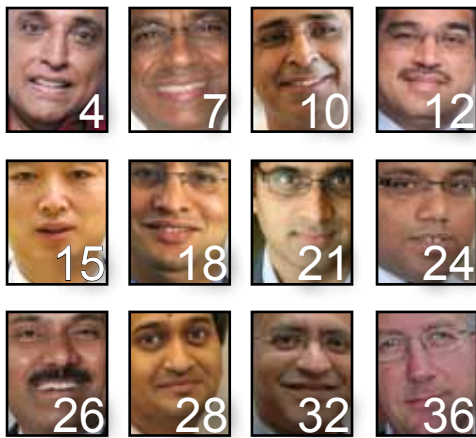# 3G comes to India

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Connections

India's auctions of 3G spectrum licences in 2010 marked the start of a new era for the country's approximately 600 million mobile users. The 3G spectrum will give them better Internet access and will accelerate the growth of everything from eGovernment to eHealth, eCommerce, telemedicine and much more. Service providers and equipment vendors for businesses and consumers alike will all be hard-pressed to keep up with the demand for everything from smartphones to consumer application, from infrastructure to billing, and with network management services.

Despite the expected growth of 3G-driven revenues, there are concerns that the prices paid for the spectrum will have the auction winners struggling for years to recuperate their investment. Some industry observers predict that there will be a wave of consolidations in the sector as a result.

Whatever happens, we can be sure that business users and consumers will both benefit greatly from the significantly enhanced services that 3G makes possible and that competitive necessity - and the need to generate a strong return on investment - guarantees.

One can expect that the focus on consumer needs will be redoubled as companies move to stake out their positions in this extremely dynamic market.

The theme for this issue of *Connect-World India 2011* is *3G comes to India.*

Fredric J. Morris,
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India's 3G challenge

by Rajan S. Mathews, Director General, Cellular Operators Association of India (COAI)

Mobile broadband demand in India, the world's second largest wireless market, has been quite low - only 274 million wireless data subscribers. The introduction of 3G mobile broadband will drive the mobile market and, for the first time, bring a new range of services to rural India - services at par with those their urban counterparts enjoy, such as tele-medicine, e-education, weather reports, farming practices, market and commodity prices - services that can lead to a substantially better standard of living.

Rajan S. Mathews is the Director General, Cellular Operators Association of India (COAI). Prior to joining COAI as DG, Mr Mathews served as COO of US Operations and Corp.CFO and VP of Telargo Inc, overseeing all of the company's Financial, Treasury, Accounting, Tax, Administrative and Human Resource functions. Prior to joining Telargo, Mr Mathews was President of Afghan Wireless Communications Company, VP and CFO of Call Sciences Inc., and at A T & T Wireless, where he held a number of executive leadership positions, including Divisional CFO, Corporate Controller, President and CEO of one if its largest joint ventures – Birla-AT&T in India (now IDEA). Earlier in his career, Mr Mathews was a finance executive at such companies as Beatrice International, Tri-Star/Columbia Motion Pictures and senior consultant at Pricewaterhouse Coopers. Mr Mathews served on the boards of several for-profit and non-profit organizations.

Rajan S. Mathews earned both his Master of Business Administration and Master of Arts degrees from Rutgers University and he is a CPA from the State of New Jersey.

In 1994, India's teledensity was one per cent; today, it just crossed 60 per cent, and in rural India 30 per cent. India has come a long way. The transformation is due to the aggressive and sustained growth of the mobile industry, which has gone from strength to strength in recent years.

COAI members are now gearing up to launch third generation (*3G*) mobile broadband to bring high-end data services on mobile phones to India.

We believe that all citizens of India should have access to broadband and the transformative opportunities it offers. Broadband represents an enormous opportunity; it provides a platform to improve the quality of life of our citizens from all walks of life and increases their opportunities to generate income and foster innovation. Broadband-based services help businesses reach new markets, improve efficiency and enhance the government's capacity to deliver critical services. Availability of broadband services attracts new investment, creates jobs, provides a larger and more qualified labour pool, and increases productivity through infrastructure creation and access to new and improved services.

Demand for mobile broadband has been dismally low in India. Fixed-line broadband in India, as of June 2010, counted upon only 18 million Internet subscribers, whereas there were 274 million wireless data subscribers. Wireless simply enables faster broadband rollout; it should be the preferred route to build penetration.

Higher bandwidth coupled with technological innovation will radically change the country's mobile market, as the higher speed data throughput enables the delivery of a wide array of multimedia services, such as video streaming, music, movie downloads and mobile TV.

The introduction of 3G is exciting for rural India as well. It will bring connectivity - for the first time - to India's enormous population in rural and remote areas. It will bring them a whole new gamut of services that can significantly improve the quality of their lives and, in many ways, bring them services at par with those their urban counterparts enjoy through services like tele-medicine, e-education, weather reports, farming practices, market and commodity prices.

Introduction of 3G will not only provide operators an opportunity to enhance their service offerings and expand service to rural areas, but in the process, will also generate new revenue streams for the operators - sorely needed in a scenario of rock bottom tariffs and ever falling ARPU.

Key challenges

It will not be simple to expand 3G services. A number of important issues must be resolved including the lack of local vernacular content, the need to increase interest in and demand for 3G broadband, the lack of sufficient radio-spectrum, the cost of deployment, regulations for tower placement and right-of-way, base station power supplies and the need to channel monies from broadband spectrum auctions into a National Broadband Fund.

Availability of vernacular content - Ample local language content will be a key enabler for the uptake of mobile broadband amongst the rural masses. Without suitable, pertinent, content, people have no reason to adopt 3G.

Increase in demand - Demand for 3G must increase in order to justify its deployment and to guarantee a return on the investment. Demand will increase to the extent that people feel that mobile broadband is useful and this depends upon how they perceive the economic or personal value they derive from it. It also depends on their awareness of the ways that broadband usage can enhance their productivity and quality of life or benefit society.

There is a need to develop content and applications for the local population that are relevant, usable and understandable. The availability of an abundant variety of mobile applications is essential to attract new users. Many stakeholders - service providers, vendors, developers and content producers - are investing heavily in the creation of application (*app*) stores which let users browse and download applications at little, or no, cost. This trend is likely to increase.

More spectrum - Globally, mobile operators have enough spectrum to promote data services aggressively. India, however, only auctioned 2x5 MHz of 3G spectrum thus far; with such limited spectrum, operators must be cautious about how aggressively they offer data-intensive services. Given the exponential growth of mobile data services in other countries, we believe that there is a need to allot more spectrum for mobile broadband services in the near future.

Financing the deployment - The telecom sector has a high-cost structure and, compared to global benchmarks, the total levies and duties paid to governments at every level in India are high, so there is a need to rationalize the cost structure of the sector and make it possible to provide affordable services.

Uniform tower policy - At present, each state, municipal body and civic authority has different policies and guidelines regarding cell phone antenna towers; this complicates and impedes the growth of mobile communication in the country.

In some cases, state government, local or municipal bodies have banned the installation of towers in residential or other specified areas. If 3G services are to be successful, uniform, countrywide, guidelines and policies are needed to facilitate the installation of towers, cables, optical fibres and the like.

Right-of-way (*RoW*) - The exorbitant right-of way charges levied by many municipalities are weakening the service providers' business plans. Operators must frequently deal with a number of agencies to obtain RoW clearance; this delays the network rollout and increases the cost. The situation is worsening; recently, many municipalities have begun to impose additional levies. RoW permission should be dealt with on a priority basis, be granted within a specified timeframe and be reasonably priced.

Availability of power - An uninterrupted power supply is of paramount importance to high-quality mobile broadband service. We believe it would be in the public interest to supply power to service providers at subsidised rates so operators can provide the public with mobile broadband at more affordable rates. Keeping in mind the lack of power supply in many rural areas, the Government should consider providing support from the USOF (*Universal Service Obligation Fund*) to supply power for the BTSs (*base transceiver stations*) and BSCs (*controllers*). Further, the USOF should provide special subsidies to service providers who deploy alternate energy sources in rural networks.

Building a broadband fund - The Government has earned far more from the 3G and BWA (*broadband wireless access*) auctions than was originally anticipated, so it would be desirable and appropriate that

part of the funds - say, at least, 20 to 30 per cent - received from the broadband spectrum auctions be channelled back into the sector in order to help achieve the nation's broadband objectives. Whenever broadband spectrum is auctioned in the future, part of earnings from those auctions should be transferred to the National Broadband Fund to further broadband service development.

Future prospects

India is the world's second-largest wireless market so 3G broadband has a huge potential market.

The country's 600 million mobile users, availability of low-cost handsets, limited availability of other broadband services, a growing number of 3G-enabled handsets, India's young demographic profile, growing demand from the enterprise sector and greater use of Value-added services will all help to drive 3G-service uptake. The government is currently investing heavily in social sector programmes. Such programmes as the Employment Guarantee Scheme (MGREGA), National Health Mission, and Sarv Shiksha Abhiyan are all infusing significant amounts of money into rural economies and local spending power is on the rise. With greater spending power the ability to pay for new technologies such as broadband is on the rise.

With 3G, we expect the following trends to emerge:

Web-browsing is likely to be the most used mobile broadband service in India, with music and video-related services following close behind;

data services will be segmented by type and subscription plans will be tailored to the needs of each sector of the population, with the tariff plans being highly competitive and innovative;

price - affordability - will probably be the most important determinant of 3G service take up, followed by content;

and, initially, 3G services will be concentrated among urban subscribers. ●

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.

Next steps for India's telecom

by Ashok Jhunjhunwala, Professor, IIT Madras

Indian telecom has grown significantly in the last decade and contributed greatly to the country's social and economic growth. The government has profited from licence fees, spectrum charges, universal service charges, service tax and tax on equipment. Still, the sector needs to deliver services, especially broadband, to rural regions and to restructure both the privately held and government-controlled operators to reduce costs by unbundling the infrastructure so all service providers can use it and benefit from the lower, shared, costs.

Dr Ashok Jhunjhunwala is a Professor at IIT Madras where he also leads the Telecommunications and Computer Networks group (TeNeT) that works with industry to develop technologies relevant to India. Dr Jhunjhunwala also chairs the Rural Technology and Business Incubator at IIT Madras and the Mobile Payment Forum of India. Dr Jhunjhunwala is a Board Director of the State Bank of India, as well as of TTML, Polaris, 3i- Infotech, Sasken, Tejas, IDRBT, Tata Communications and Exicom. Dr Jhunjhunwala is a member of the Prime Minister's Scientific Advisory Committee and a member of the Constitution of Scientific Advisory Council to Honourable Chief Minister of the Government of Jammu and Kashmir, Science and Technology Department.

Dr Jhunjhunwala has received a great many major awards, honours and honorary degrees for leadership, outstanding contributions to research, science and technology and, as well, his humanitarian activities. He is a Fellow of World Wireless Research forum, IEEE and Indian academies including INAE, IAS, INSA and NAS.

Dr Ashok Jhunjhunwala received his B.Tech degree from IIT, Kanpur, and his MS and PhD degrees from the University of Maine.

Over the last decade, India has done well in expanding its telecom network to every nook and corner. Even though its tariffs are the lowest in the world, innovative steps such as the hiving off of towers into a separate business brought down the infrastructure costs and enabled the operators to make profits even with ARPUs as low as Rs100 (about US$2.25).

Low tariffs, affordable to even the poorest in the country, enabled the addition of 15 to 20 million subscribers every month, taking the total subscriber numbers to over 750 million. Very low SMS charges and even lower tariffs for bulk SMS have proved invaluable for entrepreneurs and small businesses. Various services are providing information including to farmers. Mobile money transfers and electronic payments have been facilitated and innovative applications of SMS such as fraud prevention on credit card purchases have become possible. At the same time, equipment makers consider India as their biggest market. Further, the government collects huge revenues from telecom as taxes, spectrum charges and revenue share in addition to entry fees (amounting to over 30% of total telecom revenue). The 3G and BWA spectrum auctions were highly delayed; but have finally happened and generated over Rs100,000 Crores [one crore equals ten million rupees] for the nation. Policies such as USF support for shared towers have brought telecom to our rural areas. Telecom is thus not just an engine of the Indian economy, but also a force for inclusive growth.

The challenges

However, not everything is okay. There are huge challenges. It is clear that the telecom sector's contributions to the nation have happened in the midst of serious weaknesses in its governance and regulations. The result has been the recent exposure of a spate of scandals in the sector. This is threatening to pull down all that has been achieved so far. This is happening even though broadband in India has not yet taken off, and is in its infancy. It needs careful nurturing over the next several years.

Further, there is too much competition amongst telecom service providers leading to tariff wars. While it may bring down tariffs temporarily, the operator's business

is fast becoming unviable. At the same time, the spectrum price in recent 3G/BWA auctions have been too high; the sky-high price was due to shortage, with eight to ten service providers bidding and only three to four winners. The unacceptable cost of losing was that their entire business might have no future. So operators ended up bidding much higher amounts than what made business-sense. One of the casualties of this may be that it could delay roll out of broadband services in rural India, as they would be less lucrative.

Also, today India imports virtually all the equipment needed to provide telecom services and these importation costs are second only to India's oil importation costs. What is ostensibly manufactured in India is really just assembled with very little added value. India makes very few telecom products and owns very little intellectual property in this domain.

Finally the State-owned telecom operators are struggling to survive, although they have huge infrastructures. Their return to health is important to India's effort to take broadband to every corner of the country.

Overcoming challenges

India has to take concrete steps to overcome these challenges. The steps include:

Deploying 3G and 4G broadband - India should use its USO (*universal service obligation*) funds to quickly take optical fibre to each of its several hundred-thousand telecom towers. The build-up can be done by companies selected using reverse auctions. The fibre would enable 3G/4G base-stations to be deployed on these towers at relatively small cost and enable broadband to reach all over India quickly.

Unlike most developed countries, India does not have adequate wireline infrastructure. Thus wireless is essential to provide broadband. Unfortunately the recent BWA auctions do not place enough spectrum in the hands of the operators to provide such service widely. India has to find four to five bands of 20MHz for fourth generation wireless technology deployment and auction it in 2011.

Viable operators - Having earned significant revenues through telecom taxes and auctions, the government should now focus on making the industry stronger and viable. Ten to twelve telecom operators cannot

survive and will only pull each other down. The government should now allow sharing of spectrum amongst operators without any restriction and without looking for additional revenue. Similarly, it should allow mergers and acquisitions amongst operators at no additional costs. India needs to enable its operators to do a lot more to take affordable broadband everywhere.

Harnessing value-added services - Value-added services have not been leveraged enough in India. To avoid restricting use of bulk-SMS, as it did when the Ayodhya high-court judgment was due, it should regulate and register businesses which use these services; it should pass regulations to open the data pipes to new entrepreneurs and services and regulate SMS interconnect.

Promoting India - Today the value-added in telecom equipment through local manufacturing and assembly is only marginal. The value is contained mostly in designs, IPRs and ability to choose and replace components. So India needs to focus on R&D and acquiring IPR. Enhanced financial support will be required. At the same time, a fund needs to be created to encourage entrepreneurship in this field, India also needs a Telecom Development Standards Organization (*TSDO*) consisting of academia, industry and government and led by the former.

Improving security - IT security will be an increasing concern for the country. Any electronic product could have malware planted in its ICs, its hardware, its drivers, in its operating system or in the applications it runs. These would be virtually undetectable. For example, a few hundred gates of malware amongst millions of gates in an IC is extremely hard to detect. Deposits of source codes do not solve the problem. The only way would be to have trusted equipment in the network. Diversity helps as one obtains equipment from different vendors; and as much as possible, one should attempt to use Indian made/designed equipment at least for critical parts of the infrastructure.

Saving state telecom operators - The state-owned operators are in trouble. Manpower costs are over 30 per cent of total expenses, whereas the same number is about ten per cent for private operators. At the same time, the revenue is stagnant. One needs to move quickly to bring these organizations back to health.

There is no reason why, as most private operators have done, the state telecom operators' towers cannot be hived off as a separate company. This new company can hire transferred state operator employees and private investment could be encouraged. All operators could share the towers, making this a profitable venture.

Similarly the state-owned operator could hive off its national backbone as a separate venture, transfer some of its employees to the venture, seek private investment and enable sharing to make it profitable. To strengthen the broadband infrastructure, local loop assets can be treated similarly so they can be used by multiple operators.

As many of the employees would be transferred to the new companies, the parent company - with these three strong, profitable, ventures as its subsidiaries - could compete well with private operators. Of course it will need a strong board and a competent Managing Director to execute these steps well.

Summing up

Indian telecom has done well in the last decade. India's citizens have gained a lot. The government has earned significant revenue through licence fees, spectrum charges, universal service charges, service tax, and tax on equipment. Now one needs to focus on making the industry healthy, taking broadband to its villages, promoting Indian products and the telecom manufacturing industry, as well as on building a secure infrastructure.

The exposures of scandals point to serious weakness in governance and regulations. It is hoped that the current exposures would help in cleansing the system. At the same time, one hopes that the gains will not be frittered away, but consolidated instead. ●

Inclusive growth through telecom in India

by Sandeep Girotra, Head of Sub Region - India, Nokia Siemens Networks

India's telecom sector is growing rapidly; it is likely to generate as much as 15.5 per cent of the country's GDP by 2015. The rollout of 3G mobile broadband will contribute significantly to other sectors of the economy and bring to life the country's vast rural areas. Microfinance and eBanking services for the unbanked majority, eHealth, eGovernment, eEducation, smart power grids and entertainment are just a few of the services that 3G will bring to many regions for the first time.

Sandeep Girotra is the Head of Sub Region - India at Nokia Siemens Networks; he has over 20 years of experience in telecommunications, information technology, test equipment and telecom services industries in Indian and multinational organizations. Mr Girotra previously served in a number of important positions at Nokia Siemens Networks (formerly Nokia Networks) over the years, including as Account Director (Key Account Management), Head of Strategy and Business Development and Head of Sales for Business Solutions. Prior to joining Nokia Siemens Networks, Mr Girotra held key positions in organizations such as RPG Telecom & Shyam Telecom, Hewlett-Packard India and Tektronix India.

Sandeep Girotra is an engineering graduate from the Birla Institute of Technology and Science.

The Indian telecom industry is a success story with no parallel; it is taking fast strides to enable the socio-economic development of the country's billion people. As per a National Council for Applied Economic Research (*NCAER*) report, communications is recognized as the fastest growing sector in India's transformation from an agrarian to a services economy, recording a 25.7 per cent growth during 2001-08.

Over the years, the share of communications in the Indian GDP has increased from 0.7 per cent in the 1980s

"Over the years, the share of communications in the Indian GDP has increased from 0.7 per cent in the 1980s to 5.7 per cent in 2007-08. It is likely to reach 15.5 per cent by 2014-15."

to 5.7 per cent in 2007-08. It is likely to reach 15.5 per cent by 2014-15. The Indian telecom sector's 764 million subscribers, one paise (there are 100 paise per rupee) per second tariff, 60 per cent population coverage and 3G are some achievements of Indian telecom's shining story that we all can be proud of. This stellar success is a result of the great contributions from the

entire ecosystem - government, operators, device makers, equipment makers and investors for believing in the potential of India, investing in India, innovating in India and doing their bit.

With the ushering in of 3G and BWA (*broadband wireless access*), the local communications industry has the

> **"In agriculture, telecoms can play a role in integrating rural India with the rest of the country and help widen markets, create better information flows and lower transaction costs. Although some farmers have phones, a lot still needs to be done in terms of educating them on how they can use mobile telephony to improve their livelihood."**

opportunity to take this success story to the next level by positively impacting on other sectors and driving inclusive growth in India. We believe that the sector growth until now has been strongly driven by the 'demand' side of the market. Systematic and innovative work by key players created an entirely new ecosystem, which addressed an almost endless consumer demand cycle for connectivity. As a result a well-oiled engine ran at full throttle - enabling our industry to grow and evolve continuously to new highs. All in all - success came about with very well catered demand and supply equations that made good economic sense for everyone.

3G like 2G will also be a hit. We may see millions of subscribers being added in the same way that 800 million got connected to 2G. Our telecom sector has done it before and will do it yet again. Unlike other growing markets, with an equally strong demand for communications, India is advantageously positioned for the future. A robust ecosystem with strong innovation capabilities and a massive subscriber base of 800 million differentiates us. Add to that, people in our telecom industry - engineers, entrepreneurs and business leaders - are assets unique to India.

In the eyes of rest of the world, these factors constitute a strong force that can produce the next big success story, one that can drive the next level of socio-economic transformation.

From linking gram panchayats (village or small town level self-governments) to shiny offices, from education to health, from microfinance to mobile payments - all are achievements beyond basic affordable communications. These are some areas essential to India's development and they can be addressed by the telecom industry. In fact, the sector's role must go beyond laying the links, but also taking the lead in uniting other industries such as health, finance, education and governance.

Take microfinance, for instance - if merchants, banks, operators, investors and suppliers come together, we can create a banking infrastructure for true financial inclusion. Imagine a team where investors contribute funds for India's microfinance project instead of just telecoms. A team that telecom policymakers construct by roping in policymakers from finance companies, commerce and state governments, where all operators representatives think like one channel to the unbanked, where all suppliers jointly innovate to create a common technology platform and where public and private banks unite to define common operations. I am confident that this will enable India to reach out to the unbanked much faster and more efficiently. Players in this emerging ecosystem are already working together on some aspects like mobile payments, but largely through exclusive limited partnerships. A common integrated approach would work far better and provide the benefits of scale.

There is a similar story in the case of mobile health, which can leverage telecoms to ultimately improve access, affordability and quality of healthcare. While there are many mHealth initiatives in play, they are still far from serving the needs of a country of over a billion people.

In agriculture, telecoms can play a role in integrating rural India with the rest of the country and help widen markets, create better information flows and lower transaction costs. Although some farmers have phones, a lot still needs to be done in terms of educating them on how they can use mobile telephony to improve their livelihood.

In education, telecom can ease the need for good teachers to be physically present in each remote school. The telecom sector can partner with the education industry to bring alive the dream of one hundred per cent literacy. One hundred per cent literacy in turn will trigger further growth for the telecom sector as a result of people consuming more services like SMSs.

Smart grid systems, which can help supply the country with uninterrupted electricity 24x7 across the nation, even in remote locations, would also require telecommunications to coordinate and control power flows. Smart power grids are still in the early development phase, but with wireless technology, they can be built quickly and, therefore, can reach more widely into both urban and remote areas.

India's telecom story is still far from over. In fact, the industry now has the opportunity to play a much greater and more integrated role in helping the country achieve sustained economic growth by serving the needs of the masses. ●

3G - controlling the threats

by Naresh Wadhwa, President and Country Manager, Cisco India and SAARC

Solutions exist that give operators ways to provide better service delivery and establish more granular control over the deployment of services. These solutions help identify subscribers, classify applications, guarantee service performance, provide information about IP services and guarantee network security for operator and user alike. Some are deployed at the network edge, they let operators control network traffic and subscriber usage. This helps increase average revenue per user (*ARPU*), strengthen customer loyalty and guarantee the delivery of innovative data services.

Naresh Wadhwa is President and Country Manager of Cisco - India & SAARC region. Prior to his current role, Mr Wadhwa headed Cisco's marketing organization for Asia Pacific based out of Hong Kong. Mr Wadhwa began his career at Cisco India as a Sales Manager responsible for Cisco's Enterprise, Commercial and IT services business. Subsequently, Mr Wadhwa was given responsibility for the telecom business in India. Next, in Hong Kong, Mr Wadhwa held a variety of positions in Channels, Commercial Strategy and Operations for North Asia. Prior to Cisco, Mr Wadhwa worked with 3Com Asia Ltd and Wipro Infotech. Mr Wadhwa, an industry veteran, was ranked among India's most influential technology leaders in 2008 by 'Great CIO', Asia's largest Social Network of CIO's. Mr Wadhwa is an active member of several Trade Policy Committees such as the CII and ASSOCHAM.

Naresh Wadhwa earned his Engineering in Electronics degree from Mumbai University.

The era of third-generation (*3G*) mobile services has arrived in India and it will revolutionize the entire mobile application market. 3G will provide subscribers access to an ever-expanding array of high-bandwidth applications. 3G data services, unlimited, high-quality mobile content, audio- and video-streamed in a few seconds will give users a very rich experience. 3G gives mobile operators an opportunity to offer excellent content and services to subscribers, but the need for service differentiation is urgent.

Ironically, however, the launch of 3G services by private operators in India aroused controversy regarding 3G security issues; real-time interception of video calls is the highest profile issue. If the issue cannot be resolved, operators might need to withdraw these services and this could substantially reduce their profitability. The concerns regarding 3G security arise because the 'always-on' connections made possible by these networks expose subscribers and operators to a growing number of malicious threats.

The biggest threat is from cybercriminals trying to steal data and make money. Cybercriminals steal consumer's personal data to access and use their credit cards, bank accounts and the like. They access confidential business data, source code for vital company applications and probe for strategic data - corporate espionage - that competitors can use. These threats are not new; they have existed for some time on the Internet. However, the ubiquity of mobile services combined with the ease of access make high-speed mobile networks a fertile hunting ground. Today, smartphones are becoming more affordable and corporations are adopting 'any device' policies for corporate network access, which heightens security risks.

Why 3G networks are vulnerable

3G networks are vulnerable because mobile operators, acting as Internet service providers (*ISPs*), are opening up their formerly closed networks to numerous other operators, data networks and the public Internet, to offer a wider array of services and content to their subscribers. Enabled by 3G, a variety of device types - smart phones, personal digital assistants (PDAs), notebook computers and data-capable feature phones - provide anytime anywhere access to data, so far more elements are susceptible to an attack.

Attackers use a variety of tools to penetrate mobile operator networks - e.g., 'botnet'-based denial of service attacks, mobile

malware, attacks which exploit unprotected weaknesses in signalling protocols (*SIP*) or other protocols that are integral to many operators' networks. Mobile malware can spread through multimedia messages (*MMS*) - over any distance. Since MMS can go to email addresses, it serves as a cross-platform carrier - spreading malware from a PC to a mobile device or vice versa and impacts on a mobile operator's operations.

Attacks can originate either outside the mobile network i.e. in the public Internet, private networks and other operators' networks or within the mobile network i.e. from devices such as data-capable handsets and smart phones, notebook computers or even desktop computers connected to the 3G network. Cabir was a virus that originated inside the mobile network; this mobile virus was unleashed in Helsinki in 2005. The virus spread via file transfers and infected thousands of phones all over the world before being quarantined. The Slammer/Sapphire worm, however, originated outside the mobile network in 2003. Slammer/Sapphire destroyed 20 per cent of the global Internet traffic, shut down 13 thousand cash machines, delayed airline flights, and for a short period of time rendered emergency services in Washington useless.

With the arrival of 3G, operators are working to migrate their networks to the IP Multimedia Subsystem (*IMS*) architecture. IMS uses open, standard, IP protocols to create communications links between various types of users. These connections can, and will, traverse multiple networks - the PSTN (*public switched telephone network*), the Internet, the mobile network, a cable network and/or a WiFi connection - each of which has unique vulnerabilities to different attacks.

With 3G, hackers can peep into mobile phones just as they do with computers, listen to phone calls, check messages and control data on the phone. Data can be vulnerable to theft and misuse if a mobile phone is misplaced or lost. Attacking data networks can defraud the mobile operator of airtime, render the network unusable for a period of time and help hackers acquire subscriber information to steal their identities or billing/credit card information.

Hijacking a subscriber's IP address and using it for the attacker's own purpose generates bills to legitimate users for time and services they did not use. In 2004, a leading USA mobile subscriber database was compromised when an attacker hacked into the network

and viewed millions of user-sensitive data (social security numbers, dates of birth, voicemail PINs, and passwords to email accounts). This not only hurt the service provider's revenue and credibility, it also hurt millions of subscribers' whose sensitive personal information was stolen or misused. Another type of attack, overbilling, involves a malicious user hijacking a subscriber's IP address and then using it to initiate fee-based downloads or using the connection for their own purpose. In either case, the legitimate user is billed for activity they did not authorize or use.

Attacks targeted at subscribers can include 'marketing harassment' where an attacker uses text messaging or other cellular phone services to pester subscribers, and generate extra charges for the subscriber. In 2006, more than 98,000 unsolicited short text messages were sent to wireless customers in the USA informing them that they had won a cruise and asking them to call and claim their prize. The attacker organization harassed subscribers with their messages, tainting the mobile service provider's image in the bargain. Legal action was needed to stop further harassment.

Virus propagation across 3G networks is a major cause for concern. Mobile viruses degrade the overall user experience and operators must bear the support and network-management concerns that denial-of-service (*DoS*) attacks bring. A DoS attack on an operator's network denies Internet service to the operator's customers, overwhelms the available bandwidth with meaningless data traffic, and impairs subscribers' ability to use their cell phones. DoS interruptions affect both the mobile operator (lost revenue) and the subscribers (no service).

Securing the 3G network

According to a study conducted by the iGR technical consulting firm, "the estimated total impact of a three hour network outage on a prepaid operator's network is US $20.5 million. This means that there is a need for strong, multilayered, security technology - both in today's 3G world and in tomorrow's IMS environment. It is not just mobile networks - most networks are vulnerable. Building security means taking an architectural approach to implementing security solutions in the network. Corporations need to think about data security in terms of encryption and access control (VPNs, identity based network access, strong passwords, etc). Service

Providers need to protect end users by using techniques such as spam filters, web-security and content filtering.

Mobile operators must implement a layered defence for their network that concentrates, whenever possible, wireless data services into a smaller number of data centres to protect end users. Mobile operators must deploy a variety of network safeguards such as firewalls, intrusion detection and prevention (*IDP*) and virtual private networks (*VPNs*). Operators should also make client-side anti-virus and firewall software readily available to their subscribers who use smart phones, notebooks and other susceptible devices and the firewalls they deploy must be robust enough to handle the traffic flow. Intrusion detection and prevention systems (*IDP*) complement firewalls by rapidly detecting attacks within the traffic that flows into the network.

Operators need to adopt security policies that reflect the threats they face in the 3G world. Given the widespread use of WiFi and the evolution towards IMS based networks, they need to work with each other and the ISP community to vigorously protect traffic that flows between the networks. To improve control over network and user activity, operators must enable networks to differentiate between services such as web browsing, music downloads, video streaming, VoIP, or P2P traffic and control the quality of individual services.

As new 3G services proliferate, potentially beyond the mobile service provider's control, operators must equip their networks with service control capabilities to analyze traffic usage, control bandwidth allocation between the various services, and secure the network from malicious traffic. Adding service control elements to mobile data networks can provide mobile operators with a rich set of tools to manage network traffic, address performance and, as well, service security concerns.

Solutions exist that give operators ways to create new paradigms for better service delivery and establish more granular control over the deployment of services. These solutions help identify subscribers, classify applications, guarantee service performance and provide information about IP services. Specifically built to be deployed at the network edge, they offer operators unparalleled control over network traffic and subscriber usage. This helps increase average revenue per user (ARPU), strengthen customer loyalty and guarantee the delivery of innovative data services.●

Service-driven growth, devices, networks and the cloud

by Justin Chen, Chief Operating Officer, Huawei Technologies India Pvt. Ltd

With the advent of 3G, mobile data will be the fundamental growth driver and should account for half of mobile revenue within a few years. Residential use, the digital home, will change operators from communication pipe to smart content pipe providers. With broadband, media - in the traditional sense - will be replaced by networked content on three screens and machine-to-machine communications will outnumber human communication. Cloud computing will provide IT services online and the user will buy services instead of hardware.

Justin Chen is the Chief Operating Officer of Huawei Technologies India Pvt. Ltd, Huawei's largest overseas R&D centre. Prior to his appointment, Mr Chen was the Director of Huawei's Software Message & Application department. Mr Chen has also held several senior positions in a number of Huawei's division including as the Head of Huawei Software's General Test department.

Justin Chen holds an Engineering Master's Degree in Survey & Information Science from Central South University of Technology in China, specializing in the area of GIS.

India's telecom market

India is among the few economies that has stood firm and tall after the global financial crisis; this is mainly due to the country's financial sector performance, favourable population demographics, increased domestic consumption and inherent resilience. The Indian economy registered growth of 7.4 per cent during 2009-2010, supported by several government initiatives that enabled development of various sectors. The contribution of agriculture to the overall Indian GDP has declined in recent years and that trend should continue in the future. This highlights the transformation of the rural economy from agriculture-based to a more balanced mix of sectors. This shift will generate further self-employment and empowerment of the rural masses. This, in turn, will increase the technology requirements of the rural population, which will boost telecom investments further.

Service revenues have not increased commensurately with traffic, so mobile data service operators globally are facing slow returns on investments. Although mobile data service traffic might increase 50 to 100 per cent,

corresponding revenue might only grow by 10 to 20 per cent. Uncertain returns cause operators to hesitate before committing to heavy network investments. However, delaying deployment of mobile broadband can lead to a loss of subscribers and slowing of critical business momentum.

2011 and beyond

The telecom industry is undergoing a transformation. By 2020, we will see noticeable growth in the following critical directions, which will pave opportunities for profitable growth:

First, mobile broadband is making the transition from voice to data communications. In the past ten years, mobile voice subscribers worldwide have grown from 700 million to over five billion, with India adding over 200 million voice users every year. In the next decade, the number of mobile broadband data subscribers should grow from the current miniscule numbers to over 200 million users. Mobile data will be a fundamental growth driver. In the next 5 to 8 years, global mobile data should account for half of mobile revenue, driven by user-generated content and video communications.

Second, the increasing importance of 3G for households will pave the way to the digital home and a shift in the operator's position in the telecom value-chain from 'communications pipe' to 'smart content pipe'. Broadband networks will alter the model of content distribution and media, in the traditional sense, will disappear, replaced by networked content on a 3-screen experience.

Third, the transition from human-to-human communications towards machine-to-machine communications is becoming a reality. By 2020, there will be over 50 billion connected devices on our planet.

Lastly, the CT (*communications technology*) to ICT (*information and communications technology*) transformation is another important trend enabled by cloud computing. The wide deployment of broadband networks enable usage of IT services in a similar fashion as telecom services. In other words, consumers and enterprises can switch from buying IT products to buying IT services; this means that consumers can pay as they use instead of paying a high, fixed cost. Just like the electricity you use today. This trend is inevitable as software migrates from

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Mobile broadband

Just as the development of the wireless industry in India presents telecom industry players with new challenges, it also presents unprecedented opportunities. 3G development together with the introduction of LTE services will drive the growth of mobile broadband market within the next few years. This will create a promising business environment and provide the tools necessary to benefit from the upcoming mobile broadband era.

Realizing the tremendous opportunities presented by ubiquitous broadband is essential for Indian operators to establish and maintain a future competitive edge. As the demand and consumption of mobile data services will grow simultaneously, operators may have to impose mobile data caps to restrict usage beyond defined limits and evolve towards usage-based billing.

3G network-sharing deals will also be rampant in India as operators eye pan-India coverage. Whether this will drive full market consolidation is still unclear.

Smart devices and applications

The steady growth in smart terminals usage and tablet devices, and the introduction of Android 3.0, is expected to encourage application developers to design new applications for smart devices.

Innovative technology, particularly Web 2.0, development of widgets etc. have enriched mobile broadband services by improving interactive experiences and enabling traditional enterprise and Internet applications on mobile devices. It is likely that by the end of 2011, an additional 100 thousand applications will be on the market globally. Many of the applications will use cloud computing platforms, and will cater to a wider range of users needs.

The proliferation of mobile data networks and the growing variety of feature-rich smart devices with front cameras, will increasingly drive mobile video calling as mobile broadband becomes available to more users.

The vendors' efforts to reduce smartphone costs will open new opportunities to create devices for mass markets. A global study reveals that 25 per cent of the total handsets sold in 2011 will be smartphones and this will contribute to 3G adoption.

Location and sensory features on smartphones - as GPS, accelerometers, gyroscopes, special displays etc. have been driving applications development globally. Handset manufacturers are adding such 'killer' features to the devices to give them a competitive edge.

Besides, m-health, m-payment and mobile financial services will also be interesting to watch for. Mobile computing on new devices and through a wide range of applications will also witness development.

More than 40 per cent of the Indian population is 'unbanked', that is, they have no formal banking relationships; accordingly, financial inclusion delivered by m-commerce is another growing opportunity. Mobility and the cloud will bring banking and e-payments to the masses.

Cloud business

Operators will find that the limited capacity and interrupted user experience generated by legacy networks will continue to present challenges. So we expect heavy adoption of hosted services on carrier-grade cloud platforms offered by new 'service providers' with whom operators will partner for business models based on pure capital and operating expenses, hybrid or revenue-share models.

The move towards 'digital shopping malls', where operators become a one-stop shop for user-centric services, will drive applications hosted by service providers. Other service providers, including network equipment providers, will offer a full bouquet of services and customized applications in their hosted data centre. Operators will simply connect to the cloud and offer its services to start earning revenues instantly. This is a win-win model for operators, service providers and developers, but more importantly, provides the fastest time-to-market advantage.

Operators will ramp up their cloud offering and marketing activities with large enterprises and SMEs. Cloud computing will soon make the transition between 'early-adopter' to mainstream status.

The IT industry will increasingly depend on mobility, cloud-based applications, service delivery, value-generating overlays of social business and new IT services.

Indian enterprise IT spending for network and services of will reach US$77 billion in 2011. Decoupling of hardware and software will grow, with virtualization and outsourcing becoming key service delivery models. The private cloud model will evolve as infrastructure, software and service providers work together on new offerings and value-added solutions.

Better access network topologies will be deployed to provide DSL-level bandwidth for users across the board. Two clouds will work together to deliver the most cost-effective means of enhanced user experience.

a 'high-speed cloud', consisting of pico and AP BTSs (*access point, base transceiver stations*) typically deployed in densely populated urban areas to deliver an average bandwidth of 2Mbit/s;

and, a 'continuous cloud' of Macro BTSs applied for wide coverage delivering a bandwidth of 256 to 512 kbit/s.

Flexible network mapping permits manageable, controllable mobile broadband networks, ensuring continuous network coverage in various scenarios, and provides users with inexpensive, quality broadband services. Convincingly, the 'two clouds' concept can reduce the cost-per-bit by as much as 70 per cent.

Convergence and IP

We are witnessing an increasing number of operators looking at implementing flat, future-proof RAN (*radio access network*) solutions to support multiple wireless systems using a single uniform platform. IP technology will help operators achieve convergence and evolution of networks for different technology systems, with smoother upgrades.

Backhaul

Wireless backhaul technologies such as e-band, converged Carrier Ethernet infrastructure for multi-service backhaul for 3G and BWA and packet radios will grow in 2011. GPON (*Gigabit Passive Optical Networking*) and FTTx (*fibre to the X*) are also expected to gain some traction in deploying fibre-based backhaul solutions, based on packet transport.

Finally, the migration towards LTE will reuse existing hardware to minimise upgrade costs. The technologies are mature and enable a smooth upgrade to LTE in different frequencies on different technologies without hardware swaps.

The coming three tears will focus largely on terminals and applications, innovative business models for telecom and integrated telecom+IT services. 3G, LTE and backhaul will drive technological innovation.

Telecom operators, device manufacturers, application developers and network infrastructure vendors are all working to help the entire ecosystem meet consumer demands starting with the rollout of 3G and early LTE service. ●

Mobile backhaul - the key to 3G in India

by Sanjay Nayak, Co-founder and CEO, Tejas Networks

The success of 3G in India depends upon the ability of the backhaul networks to deal with the expected increase in traffic. Using existing infrastructure to keep costs low, while adopting next-generation Carrier Ethernet packet transport technologies that can drastically reduce the cost per bit without compromising reliability or performance is the best available strategy. For now, operators can use Carrier Ethernet networks for best-effort Internet traffic and existing mobile backhaul networks for more quality sensitive services including voice.

Sanjay Nayak, is the co-founder and CEO of Tejas Networks, Bangalore. Mr Nayak is a technocrat with over 23 years of experience ranging across the telecom, networking and Semiconductor industries in India and the USA. Prior to founding Tejas Networks, Mr Nayak was Managing Director of Synopys India. Mr Nayak is a frequent speaker on the subjects of telecom industry, innovation and entrepreneurship from India. He is on the governing council of Government of India's Telecom Export Promotion Council (TEPC), Executive Council of Indian Semiconductor Association (ISA), CII National Committee on ICTE and a Trustee of Deshpande Foundation for Social Entrepreneurship (India).

Sanjay Nayak earned a M.S. degree in ECE from North Carolina State University and B.E in ECE from the Birla Institute of Technology, Mesra.

Operators in India have to focus on two main areas to ride the 3G wave profitably: packaging and pricing their 3G offerings to convert their high-paying 2G/2.5G customers to 3G and building their mobile backhaul network to handle the imminent 3G data explosion. If, AT&T's five thousand per cent iPhone-driven traffic increase is reproduced in India 3G broadband service, then demand will explode and backhaul traffic will tax available network resources.

Mobile backhaul

Backhaul has grown over the years from being a mere traffic delivery pipe to an application enabler. So far, a significant portion of the investments by Indian operators went into building a basic wireless infrastructure, but going forward the focus will be upon scalable, flexible and cost-effective mobile backhaul infrastructure based on optical fibre or microwave radios according to circumstances.

With 3G, the share of data services in Indian operator's revenues will increase, although voice will continue to be the major contributor. Operators will need to strike a balance between providing such new-age data services as high-speed Internet access, mobile TV, video calling etc., and the need to continue providing basic voice service and data services such as SMS, GPRS etc. all on the same backhaul network. An intelligent mobile backhaul solution can help them strike this balance.

Mobile backhaul can enable Indian 3G operators to:

achieve ROI quickly - Time to market is a key determinant of how quickly an operator can recover their investment in spectrum licence fees;

ensure quality 3G services - Operators can give their users bandwidth guarantees and assure superior QoS enabled by supporting features such as HQoS (*hierarchical quality of service*) in the backhaul equipment;

prevent disruption to 2G business - We expect that even in 2015, 60 per cent of mobile connections will still use 2.5G, so upgrading the networks to 3G should not disrupt 2G operations;

reuse existing network assets - Existing Indian telecom networks, built predominantly for voice traffic, will require innovative solutions to extend their lifespan by reusing such infrastructure components as microwave radios, optical transmission equipments and fibre on the ground to support data, VAS and content services;

achieve network convergence - Traditionally, Indian telecom networks were built and operated in silos with separate overlays to transport mobile services, fixed-line voice

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and leased line traffic. The growth in packet traffic on 3G networks will strain this deployment model and operators will look to synergistically combine these disparate networks to maximize network utilization.

Backhaul needs

3G operators in India will use a variety of approaches to deploy 3G backhaul networks. The differences will be based on their existing network infrastructure. The few large operators own end-to-end networks, but some of the newer operators lease bandwidth from third parties.

One category of operators, known as greenfield operators, do not have legacy 2G backhaul networks to support during 3G rollouts, so they can rollout a pure packet Carrier Ethernet network. Another category, the brownfield operators, have existing 2G backhaul networks and voice customers that need continuous support. They need sophisticated packet processing capabilities they can use on existing infrastructure to minimize disruption of their current revenue generating services. A third category will keep their 2G backhaul and 3G backhaul networks separate. Both voice and data contribute significantly to the revenues of these operators and they have enough voice and data traffic to justify two separate networks or because their mobile voice services and broadband are separate business units.

Backhaul approaches

3G operators would take a three phase approach to build backhaul capacity - optimize-offload-overhaul. A brownfield operator would start with the first phase, while a greenfield operator and an operator that wants separate overlay networks would jump in at the third phase.

Optimize - The current backhaul infrastructure of most carriers in India makes extensive use of PDH and SDH microwave in the access layer. 3G/LTE is expected to strain these networks given the high-bandwidth requirements of multimedia traffic, but the business models to help monetize packet transmission are not yet sufficiently mature. Hence operators are reluctant to make significant investments in new transport equipments or in new fibre to meet the surge in 3G/LTE traffic. Another option is to buy additional frequency spots to expand available microwave capacity. However, congestion in the 6-38 GHz microwave band and the burden of annually recurring spectrum charges for

new frequency blocks are dissuading operators from taking this path.

A backhaul optimization of three new technologies to help carriers maximize reuse of this PDH/SDH infrastructure while minimizing upgrade costs is necessary. Some methods such as unlocking hidden bandwidth in protection channels of current SDH Microwave rings, aggregating PDH and SDH into Ethernet and open ring ERPS, that provides sub-50ms recovery even without reserving protection bandwidth can be used to free up access bandwidth for 3G. Packet Optical transport equipment helps build this optimization by supporting Voice (TDM) and Data (Packet) processing natively.

Offload - When packet traffic has increased sufficiently and there is greater predictability in data service usage, carriers can start offloading data to an overlay network. The overlay can use a physically separated, different, fibre strand or a different microwave frequency or it could be virtually created on the existing network. There are a variety of ways to create overlays depending on the specific situation of the operator and his network constraints, such as:

i) deploying IP microwave equipments on an additional microwave carrier;
ii) using Ethernet modules on existing hybrid microwave radios and sharing the air interface with TDM;
iii) and, partial rollout of new fibre in locations with high 3G usage and installing Gigabit Ethernet rings using Carrier Ethernet equipment.

The advantage of option iii) is that the operator can use advanced packet handling capabilities in these products to start up-selling higher-margin services and tailored 3G plans to the existing subscriber base. A key feature of Carrier Ethernet standards i.e. Hierarchical QoS which enables different quality of service parameters to be set for different types of data traffic, will be useful for option iii) of this phase.

Overhaul - In Phase II of the backhaul migration, voice and TDM leased line services have native support. This is reasonable since mobile voice on TDM will continue to be an important revenue driver for the next several years and cannot be compromised. However, with voice itself using packet interfaces (Voice over IP) in newer 2G BTS equipments, the carrier can choose to retire its legacy network at an appropriate time. The residual TDM traffic can then be transmitted on emulated

circuits over pure packet backhaul networks using special mapping techniques that also maintain accurate synchronization information for the emulated TDM circuits.

In the absence of a circuit-based network, timing delivery and transport to the LTE eNodeBs (*Evolved Node B supports LTE air interfaces and handles radio resource management*) will be critical. TDM requires low latency and jitter for reliable transmission and this requires guaranteeing adequate bandwidth, prioritization and buffering on 'engineered' and protected paths that minimize packet losses, delays and reordering. TDM emulation in LTE also imposes additional expectations typical of circuit services such as performance monitoring, service restoration and service quality.

Using Carrier Ethernet, circuit emulation allows voice to be carried over a data network. Packet synchronization assures voice users a high level QoE (*quality of experience*); 'protected tunnels' created in the data network replicate the resilience of voice networks.

In the near and medium term, operators will continue to witness a dramatic increase in traffic with 3G services like video applications (*over-the-top, video calling, mobile TV*) and high-speed Internet access.

The rapid divergence between network traffic volumes and costs associated with transporting this content will present significant operational and business challenges to operators in the coming years. Operators have to prepare for this surge by adopting next-generation packet transport technologies based on Carrier Ethernet that can drastically reduce the cost per bit without compromising on fundamental transport requirements like service reliability, determinism, fault management and performance assurance.

The recommended approach would be to start this transition by offloading best-effort Internet traffic to a more cost-effective Carrier Ethernet network layer and retaining the more high-value QoS sensitive services including voice on the existing mobile backhaul network. At an appropriate time, when the business models for the new packet-based services are more mature, the legacy infrastructure may be retired and completely replaced by an end-to-end Carrier Ethernet transport. ●

3G in India

by Manish Dalal, VP-APAC, Verisign

Because of 3G, mobile Internet users will far outnumber Internet access via PCs or tablets. Currently, India's businesses rank low by international standards in the use of ICTs. This may be partly due to a certain lack of infrastructure, but it is also due to the lack of adequate broadband connectivity. The advent of 3G mobile broadband will dramatically change this picture and make a wide variety of online business and financial services available to a vast number of people.

Mr. Manish Dalal is the Vice President for Verisign Naming Services, Asia Pacific. Prior to Verisign, Mr Dalal was Yahoo's Senior Director of mobile products for India. Before joining Yahoo!, Mr Dalal was a Principal at Strategy Consulting Firm Pittiglio Rabin Todd McGrath (PRTM), consulting to senior management in blue-chip telecom companies. Prior to PRTM, Mr Dalal led Motorola's product management efforts for cellular messaging.

Manish Dalal holds a Bachelor's Degree in Computer Engineering from Rochester Institute of Technology, a Masters Degree in Electrical Engineering from Cornell University, and an MBA from the University of Chicago.

The digital divide is arguably the broadband divide now. India today boasts 81 million Internet users while the number of broadband users is very low at only ten million users.[1] While Internet access helped accelerate the trend from voice to data, these worlds may now be converging. This potential convergence offers the dual benefits of new interactive multimedia services coupled with the flexibility and mobility of wireless technology. The launch of 3G services will help to realize the full potential of this convergence.

The mobile phone is perhaps the most rapidly adopted technology in history, even faster than the radio.[2] Globally, the number of mobile phone users crossed the five billion mark in 2010. (See Figure 1.) Compared to other technologies, the mobile phone has seen rapid adoption in developing countries (*see Figure 2*).
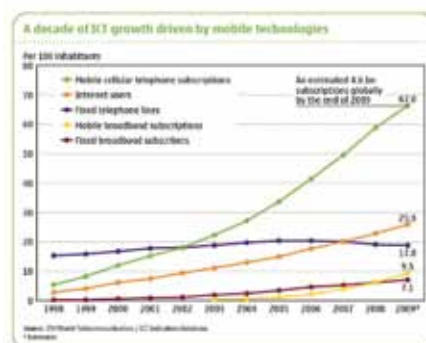
Figure 1: Mobile Penetration in the Last Decade
Source: ITU World Telecommunication/KT Indicators Database
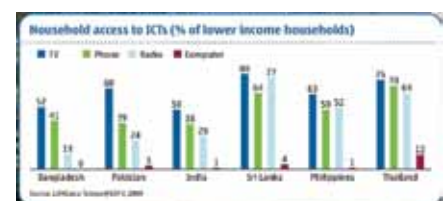
Figure 2: Household Access to Technology (per cent of Low Income Households)
Source: LIRNEasia Teleuse@BOP3, 2009

Now, the mobile phone is poised to bridge the broadband divide with the launch of 3G. The mobile phone is likely to become the primary device for Internet connectivity in the world by 2020.[3] India is already second only to the United States for Internet browsing on mobile phones, registering the second highest number of Web page views using handsets.[4]

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

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

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

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

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

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

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

"Hosting the events in their new, in-town venues will enhance sourcing activities, networking opportunities and knowledge-sharing potential both on and off the

exhibition floors. In today's fast-paced, ever-changing technology industry, face-to-face and open forum meetings have never been more important."

Highlights of BroadcastAsia2011

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

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

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

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

Highlights of CommunicAsia2011

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

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

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

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

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

Mobile broadband will add significantly to the total number of Internet users and it is expected that India's Internet population will surge to 237 million by 2015.[5] At such a time, the number of mobile Internet users may far outnumber the users that access the Internet via PCs or Internet tablets.[6]

In developed countries where mobile broadband is already prevalent, better mobile handsets and innovative applications are enabling the further use of new services such as social networking, gaming, music, videos, and financial transactions over the Internet. More and more of these sophisticated handsets/handheld devices are becoming increasingly affordable in developing nations as well.

It may be interesting to review how ICT (*Information and Communications Technology*) and broadband connectivity are in use today and what their contribution is to the overall productivity of the world's working population. The Connectivity Scorecard[7] developed by Leonard Waverman of Haskayne School of Business at the University of Calgary has made a qualitative assessment of ICT and broadband by digging deeper into the installed ICT base and considers ICT's use by measuring the working population's skills and studying parameters like the use of enterprise software and women's access to ICT. India was placed at the 21st spot in the Scorecard for 2010 that mapped 50 developing nations across the globe making it the worst performer among the BRIC nations.[8] A contributing factor to this low score has presumably been the lack of business infrastructure.[9] Business usage also returned a low score on this Connectivity Scorecard. This could perhaps be due to the relatively low adoption of ICT among SMEs (*small and medium enterprises*) in India.

3G changes the equation

The advent of 3G is likely to change the picture dramatically. It has been shown that increased broadband deployment can have a significant impact on productivity and economic growth.[10]

The areas of education, healthcare and mobile commerce are expected to be among the early beneficiaries of 3G. In a country as vast as India, healthcare delivery in the hinterland has always been a challenge. With 3G, rendering of simple services like medication reminders to more complex applications like remote diagnostics and monitoring become

possible. 3G services are likely to be easy to deliver and cost-effective too.

Similarly, 3G has the potential to make banking and payment solutions more convenient and more accessible. It is also likely to usher in the mobile cash era making it hassle free to conduct both business-to-business and consumer-to-business monetary transactions on the mobile.

Gearing up!

Most players in the Internet business are gearing up to address the increase in network traffic that new connected devices such as smart phones may bring to the Internet. Domain Name System (*DNS*) Services are proactively working to ensure the continued stability and security of the critical Internet infrastructure under their stewardship. At the heart, is the need to increase its capacity to process DNS queries by more than a thousand times, from a capacity of about four trillion queries per day, to a capacity of more than four quadrillion queries per day by 2020.

While some may question whether daily DNS demand will reach the four quadrillion queries-per-day mark, even by 2020, experience in DNS management shows that the network must be robust enough to handle even the severest of spikes, so they must be prepared accordingly. As they say - "The past is not usually a good way to predict the future." Consequently, it is necessary to invest in an ecosystem that can and will support a population far larger than the one currently communicating and transacting on the Internet today and one that shall increase even further with the onset of 3G.

SMEs and 3G

Mobile users see their mobile phones as a tool to help them work, live and communicate more effectively. This view is likely to be reinforced by the advent of affordable 3G services in India. SMEs are becoming more aware of the possibilities of data services and, accordingly, SMEs too may begin to quickly adopt broadband mobile Internet in India. 3G, for instance, can enable a small business owner without a bank account to make or receive payments. A small business can also use mobile broadband to communicate with and support their customers through a robust mobile website.

Benefits for stakeholders

Improved broadband connectivity helps achieve several economic and social benefits. However, for them to accrue to the concerned stakeholders - businesses, consumers and the government, alike - there needs to be widespread use of the broadband services being offered. 3G should help enable just that. ●

[1] *According to a report titled "237 mn internet users in India by 2015". Available on http://economictimes.indiatimes.com/infotech/internet/237-mn-internet-users-in-india-by-2015-report/articleshow/6479094.cms*

[2] *According to the report titled "Teleuse@BOP3, 2009" released by LIRNEasia. Available on http://lirneasia.net/projects/2008-2010/bop-teleuse-3/*

[3] *http://www.pewinternet.org/Reports/2008/The-Future-of-the-Internet-III.aspx*

[4] *According to Emerging Markets: You've got mail, Expanding Horizons 1/2010. Available for download on http://www.nokia.com/corporate-responsibility/news/expanding-horizons*

[5] *According to a report titled "237 mn internet users in India by 2015". Available on http://economictimes.indiatimes.com/infotech/internet/237-mn-internet-users-in-india-by-2015-report/articleshow/6479094.cms*

[6] *According to Emerging Markets: You've got mail, Expanding Horizons 1/2010. Available for download on http://www.nokia.com/corporate-responsibility/news/expanding-horizons*

[7] *www.connectivityscorecard.org*

[8] *www.connectivityscorecard.org/countries/india*

[9] *www.connectivityscorecard.org/countries/india*

[10] *http://www.connectivityscorecard.org/broadband/*

Big 3G business

by Shali Thilakan, Managing Director, India Cable & Wireless Worldwide

India's auction of spectrum for 3G and Broadband Wireless Access opened a new era in Indian telecommunications. Bringing 3G services to India's rural and urban masses will significantly impact the county's social and economic development and will change the lives of hundreds of millions of citizens. The challenges are great. Today's access network, backhaul and power supply does not cover much of the country's rural and remote areas and today's networks are not yet prepared for the traffic 3G generates.

Shali Thilakan is the Managing Director for Cable&Wireless Worldwide's India region. he has more than 12 years of experience in the telecom industry. Mr Thilakan been a part of Cable&Wireless Worldwide for more than nine years and has held various leadership positions in the organization. Until recently, Mr Thilakan was the Director for Enterprise Sales in India. Prior to joining C&W Worldwide, Mr Thilakan was working with Telecom Italia. An accomplished speaker, Mr Thilakan has delivered keynote addresses at many seminars and conferences.

Shali Thilakan has a Bachelor of Engineering (B.E) from SSVPS College of Engineering.

India's new 3G roadmap creates a significant opportunity for telecom providers to help create and sustain the networks that will fuel 400 million connections in the next four years. The successful conclusion of the auction of 3G cellular and Broadband Wireless Access (*BWA*) spectrum and the subsequent allotment of this resource to dozens of service providers has helped the Indian government raise over a trillion rupees (over US$8 billion). The telecom industry's significant financial commitment to 3G signalled clearly that India would remain a robust, exciting and challenging turf, not just for wireless service providers, but also for the entire global communications ecosystem.

3G was not just the sensible way to go; it was the only way forward, if India's own fierce determination to empower her billion plus citizens through technology was to succeed in a reasonable period. A recent, March 2011, study by the London-based Wireless Intelligence on India's 3G rollout suggests that earlier estimates of the speed and scale of broadband rollout have been too conservative. Indeed, the report suggests that Indian 3G s will reach 400 million connections within four years, effectively upgrading one in three wireless subscribers to broadband speeds.

Interestingly, the study suggests that metropolitan areas like Mumbai, Delhi and Kolkata, where 3G might be expected to escalate the fastest, will soon be outstripped by upwardly mobile semi-rural reaches, in states like Punjab, Bihar and Andhra Pradesh.

Therein lays one of the key challenges before the telecom industry - providing broadband networks in India's vast rural hinterland, where there is little copper or fibre connectivity and where electricity is intermittent or unavailable during business hours.

3G and wireless broadband can address some of these 'last mile' challenges but high-speed connectivity is only part of the solution. A combination of technologies like Multi Service Platforms (*MSPs*), Multi Protocol Label Switching (*MPLS*); Internet-based virtual private networks

(*IP-VPN*) and application performance management are often needed before wired and wireless service providers can ensure the required Quality of Service (*QoS*) or Service Level Agreements (*SLAs*) from their own contractors.

Wireless Internet and broadband networks also give hope to small businesses, including those working from home-based 'virtual offices'. A recent study by Google found that only a small fraction of India's micro-, small- and medium-sized enterprises (*MSMEs*) - some two million out of an estimated 35 million, operate online. Interestingly, nearly half of all these 'connected' companies actively use the Net as a business-to-business trading window. Burgeoning broadband availability will only see this trend grow as leading MSME verticals - insurance, information technology, IT hardware, travel and tourism harness 3G as a differentiator and look to their telecom providers to provide it in a competitive manner.

Even in the urban business environment, zippy, reliable wireless broadband may slowly 'encroach' on the traditional turf of pure, wire-based networks like Ethernet or work alongside them as a 'hot standby' option. Already available from a few early movers, is what is known as an integrated communication manager or 'network in a box'. This is a one-box solution for alternative access modes - integrated voice, data and multiple GSM/CDMA mobile connections. These boxes promise to cut communication infrastructure and expenditure for small businesses, hotels, hospitals or educational institutions, by almost a third. The box's solutions combine ISDN voice/data, cellular GSM, and broadband Internet and allows businesses to mix and match these communication channels throughout their establishments to provide the most cost effective connection in any given scenario.

The last annual Consumers and Convergence Report from KPMG found that users in India - even illiterates - were in many respects, more mature accepters of technology than those in more developed geographies. They have given a firm thumbs up to mobile banking. Thirty-eight per cent already use their phones to shop from a retailer's site and 43 per cent were ready to do banking transactions. To meet their heightened expectations for 3G, the banking and financial services sector is having to ramp up its secure wireless

transaction networks and extend them into rural reaches, where there is little fixed-line ISDN connectivity.

3G wireless networks hold out the possibility for quick and efficient connectivity and not just to ATM machines in areas with no fibre. They are also fuelling a host of innovative branchless banking solutions, which use a combination of technologies such as 3G, biometric identification and near field communications (*NFC*). It is now possible for a retail-banking agent to carry all of a branch's records on a smartphone attached to a thumb print or card scanner and to disburse cash to customers who present a smart card containing their account history.

Several public sector and Grameen (rural) banks are already trying this out on a pilot scale. They are disbursing payments under the Mahatma Gandhi National Rural Employment Guarantee Act in Andhra Pradesh, Uttarakhand and the North Eastern states. India has been a hotbed of innovative technological solutions for what we call 'zero banking' - 'zero', as in no physical infrastructure. The Bangalore-based product company, Integra MicroSystems, made headlines and gained customers four years ago when its iMFAST (Integra's Mobile Financial Applications Secure Terminal) banking solution had its global unveiling at the CeBIT show in Hannover.

The insurance industry too, is poised to expand its reach in India, thanks to the opening up of the sector to respected global players; secure high speed data networks are central to its new growth plans. When one of the world's largest insurance groups, serving 30 million customers worldwide, extended its footprint to India, it was able to seamlessly integrate its onshore and offshore customer service operations with its international arms through converged Internet Protocol-driven technologies such as IP telephony, IP video conferencing and high speed Internet services.

The growth of 3G broadband networks and services in India is good news for the retail supermarket business that has already begun migrating smoothly from the four main metropolitan centres to dozens of secondary towns and cities. A booming consumer middle class has come to expect and demand the identical retail shopping ambience and quality of service that was hitherto available only to the fortunate few,

who could holiday and 'shop-till-they-drop' in places like Dubai or Singapore, Kuala Lumpur or Hong Kong.

If there is one lesson which all telecom industry players serving India have learned in recent years it is this: Solutions for India must often be crafted in India, keeping in mind the unique challenges and opportunities that the subcontinent offers. Additionally, India's innovation and creativity has the ability to deliver solutions for a demanding global market.

While the core opportunities in India, for mission-critical communication providers remain in the business-to-business or b2b arena, many of their offerings end up touching the end user or consumer in a manner that was unthinkable even a couple of years ago. That is because technologies like 3G end up 'morphing' many enterprise or corporate tools into mass consumer ones. An excellent case in point is IP-based, high definition video conferencing.

Hitherto a preserve of enterprises that could hire or own a hyper real tele-presence type of facility, the technology has been 'democratised' thanks to consumer access to HD TV screens, HD webcams and broadband home networks. International research shows that face to face contact - either by video conferencing or in person, was still the preferred way to 'seal the deal' in modern business. An overwhelming 96.4 per cent of respondents in India said they would be more likely to make business decisions if they see the people they are dealing with, while 70 per cent said they expected to see video conferencing become a regular practice.

Prudently, the Indian government's broadband policy remains platform and technology neutral. In an earlier era, CDMA was allowed to grow alongside GSM. Today cellular 3G, and broadband wireless technologies like WiMAX and LTE have all been licenced - and Indian customers are assured that no single technology will be foisted on them. They will have a choice - and they will decide. ●

3G - bringing interactivity

by Vijay Yadav, Managing Director, UTStarcom India

Demand for broadband connectivity in India is growing and services providers are rushing to rollout 3G and high-end WiFi/WiMAX. Users are looking for faster connectivity at affordable prices and service providers are working hard to deliver the high-quality experience that users expect. Nevertheless, although the number of users is approaching 800 million, service providers are facing a decline in ARPUs. Service providers are hoping broadband and the value-added services they make possible will halt this decline and build profits.

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Mr Yadav leads the company's operations in South Asia, Middle East & Africa based out of India. Prior to UTStarcom Mr Yadav worked in such leading technology companies as 3COM and CommWorks.

Vijay Yadav holds a B.E degree in Civil Engineering from BITS, Pilani and a M.Sc. in Chemistry from the same institute.

We have come a long way in the communication landscape. From the time of mailing letters at the post office to the age of landlines and mobiles, we have witnessed several interesting phases. There are more than 700 million mobile users and more than ten million broadband users in India. This indicates powerful outreach by enabling everyone in our country to communicate and interact with anyone seamlessly. I believe the current communication era is the best time for all; be they technology providers, operators or end users, all are moving towards an era where seamless connectivity will be the reality and real-time interactivity will play a major role in communications-based services.

The world has evolved and reached new levels of interaction. Online communication has increased significantly and now, social networking is redefining communications driven by its rapidly rising user base. The demand for high-end connectivity is also rising and services such as 3G and high-end WiFi/WiMAX are growing everywhere. Users are looking for faster connectivity at affordable prices and service providers are working hard to deliver the high-quality experience that users expect.

There is a huge demand for innovative services that service providers are striving to meet; they are working to enhance the user's experience by enabling them to do more. The focus on innovation is directly linked to end-users demand. Users want fast, seamless, integrated solutions, products and services that provide real-time access to just about everything and, as well, help them connect with loved ones 24/7 and service providers are in a race with the competition to find ways to meet these demands.

Given the requirements of this highly demanding market, service providers are constantly - and heavily - investing in the search for technology and solutions. Although the number of phone users in India is approaching 800 million, service providers are facing a decline of their ARPU (*average revenue per user*) and this is impacting everyone in the sector's eco-system. We all understand just how price

> **"The rise of smart phones, as anyone here can see, has brought significant changes to the communications sector. Smart phones can do things far beyond what basic mobile phones can handle, but service providers need to offer a full range of applications and content to take advantage of the smart phone's capabilities."**

sensitive the Indian market is - for most users affordability is the deciding factor when they choose services. To tackle this issue, the sector is betting heavily on VAS (*Value-added Services*) to build revenues and generate profitable.

Another situation that we need to understand is the growth of smart devices. Devices that enhance connectivity and functionality via embedded, high-power processor chips are called 'smart devices'. Smart devices let one take pictures, make calls, watch video, listen to music, play games, shop online and connect with friends via social networking sites. There is a big demand for such devices and also the services and bandwidth to support them.

Looking at the broadband penetration in the other parts of the world, the Indian government is taking aggressive steps to push connectivity via broadband to every corner of India. The government understands the benefits that building a robust infrastructure to bring broadband service to every corner of India will bring. These are big projects, and the government is investing the time and money needed to ensure the proposed National Broadband Plan by TRAI becomes reality.

India's policy and programmes to build a robust eco-system to support the anticipated demand for high-end solutions and services necessary to support the country's continued growth and development. If done correctly, the new broadband infrastructure could create a win-win situation for everyone. Service providers will be able to offer relevant services at affordable prices and users will have more options to explore, but how can we create this win-win situation?

Given the range of relevant scenarios, 3G seems to be the best way for India to help create a seamless access solution and a win-win situation. Spectrum for the third generation - 3G - standard of connectivity was sold at auction last year. A few operators have already launched this service in India, which promises to grow significantly.

Today, there is huge demand in the market for seamless connectivity and users are beginning to expect much more from the services they get. Users want uninterrupted - but affordable - high-speed communication and a good choice of relevant services. Relevant, in this case, means services that help us constantly keep up with our social, business and entertainment needs.

This can easily be achieved via 3G's faster connectivity that lets one download heavy files quickly or enjoy a high-definition video without interruptions for buffering. This is already available in India; BSNL and MTNL were the first to offer 3G services here and other leading private players are following closely behind.

The rise of smart phones, as anyone here can see, has brought significant changes to the communications sector. Smart phones can do things far beyond what basic mobile phones can handle, but service providers need to offer a full range of applications and content to take advantage of the smart phone's capabilities. So, with 3G to support, service providers must offer interesting value-added services that will enhance the experience of such smart devices. Value-added services, or VAS, are extremely important to service providers as a source of extra revenue to counter India's declining ARPUs.

Analysts have long predicted that the Indian telecom industry's growth will depend more upon VAS - especially video - than upon voice. The demand for video content was never significant in the past because the high bandwidth needed for quality reproduction was never available. Today, 3G can easily support video's high bandwidth requirements and enhance the overall experience.

Care is needed when choosing the 3G infrastructure to ensure that the technology will make it possible to offer the service at affordable rates. Technologies such as PTN (*packet transport network*) can provide the connectivity needed throughout the network using fibre interconnections. PTN provides capacity up to 10GB and beyond - more than

sufficient for the carriers' current needs - and it is affordable. PTN also offers low power consumption; standard PTN equipment consumes only 50 watts and further and needs less space to install than most other options.

In a nutshell, 3G offers the Indian telecom sector's entire eco-system a great many benefits - if we implement it correctly. So far, India has been moving in the right direction thanks to the government's and the industry's proactive attitudes. ●

3G in India - it's not just bandwidth

by Dr Shantigram Jagannath, Vice President & Managing Director, Airvana Networks India

3G is coming to India, and operators are busy rolling out last-mile access and backhaul networks. 3G networks are deploying slowly, but 3G-compatible handsets have been on the market for three years so most business users and high ARPU users already have smartphones that support 3G. These networks are expensive, and ARPUs in India are among the world's lowest, so operators are looking to value-added services and lower cost network technology to reduce costs sufficiently to enable affordable broadband.

Dr Shantigram Jagannath is the Vice President and Managing Director of Airvana Networks India. Prior to joining Airvana, Dr Jagannath was a Senior Software Architect at Photonex responsible for the architecture, system software and protocols for ultra-long haul optical network systems. Dr Jagannath has authored several papers and has made several presentations and tutorials in the areas of Quality of Service, congestion control and TCP/IP. In Bay Networks, later Nortel Networks, Dr Jagannath was a senior architect in the software group for high-end routers. Dr Jagannath also has eight US Patents to his name for routing protocols, VPN protocols and algorithms for scheduling in high speed fabrics.

Dr Jagannath has a B.Tech from the Indian Institute of Technology in Chennai, India, MS from North Carolina State University and a PhD from Columbia University in New York.

Awaiting 3G

3G is coming to India. Operators are working to revolutionise the country's data connectivity by building the last mile access network to deliver data services to hundreds of millions of subscribers. India currently has nearly 600 million 2G subscribers and adding new ones at a clip of over ten million a month - most of the growth is happening in the rural parts of the country and almost all of it is happening on the existing 2G GSM and CDMA networks.

The segment of high-end users, those with significantly high usage and high payment plans, is not where the growth is happening; rather, the subscriber growth is on the lower-end segments, mostly rural and users of pre-paid plans. Despite their remarkable growth in numbers, these subscribers each contribute relatively little to the operators' revenues and earnings. The relatively smaller number of higher-end subscribers, the top ten per cent, contribute inordinately - nearly 50 per cent - to earnings and revenue. These subscribers will be the first to adopt 3G.

Although 3G networks have been slow to deploy, widely available higher-end feature phone and smartphones in India have supported 3G as a standard offering for the last three years. Hence, most business users and high ARPU users already have phones that support 3G. In 2009, FICCI (*The Federation of Indian Chambers of Commerce and Industry*) estimated that the sales of 3G handsets would grow to US$11.2 billion by 2013 with a significant portion of the growth coming from high-end handsets. The phones have been available for a few years; we are just awaiting the rollout of 3G networks in India.

Differentiation

In India the task of rolling out 3G is very different from what it was in Japan, Europe or in the US. While we can learn from the experiences in those countries, there have been many changes since then. Today we live in a world of social networking, video telephony, peer to peer sharing, mobile applications and gaming, touch-screens with intuitive interfaces, low cost (US$100) affordable smart-phones, dual core CPUs on phones running at 1GHz+ clock speeds, high resolution mobile cameras and 16Gb+ phone

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memories. We are also rapidly morphing into a world of tablets and personal home base stations known as femtocells.

Amid the 3G excitement and optimism there are a few questions - which, if answered well, will dictate the success of the roll out.

The 3G network comes at a huge cost to the service provider: significant spectrum cost already sunk; additional cost to build out the infrastructure for service coverage; cost to upgrade backhaul networks to support 3G; cost of integrating the management and billing systems; not to mention the cost of acquiring and holding on to subscribers. As a result, the service provider is under pressure to fully utilize the capacity and generate as much return on the capital invested as possible - despite the competitive, cost-sensitive, environment that leads to significant price erosion.

Today the 2G networks' ARPU lies around Rs 100 - less than a tenth of the ARPU in other parts of the world (except China). As the high end subscribers move to 3G, ARPU for 2G networks is likely to drop even more. How can operators use 3G to drive differentiation and maintain their pricing power? Coverage, quality and service levels are table stakes, necessary for the network to be considered of value for content providers and subscribers alike. Verizon succeeded in the US in differentiating itself on coverage and service; AT&T built its subscriber base on brand and by bringing in fancy handsets. What will be the differentiation in India?

Designing for the load

There is increasing penetration of smart phones and mobile applications, and these bring with them an ever increasing load on the network - both for signalling (for example - messages between the network and phone for setting up and tear down of connections, and messages that control mobility of the handsets) and data resources. The impact of smartphones on signalling loads on the networks - Android phones far exceeding the signalling load of email phones like the BlackBerry, and the Android phones are the fastest growing phone segment in sales worldwide.

Smartphones and the newer touchscreen-based phones place a much higher load on networks than feature phones and the impact on networks is growing rapidly as more users adopt these devices.

Service providers all over the world must upgrade their networks to cope with these trends - they are increasing the signalling horsepower of their radio network infrastructure and building out more bandwidth in their backhaul networks for the data traffic. Equipment vendors understand the new needs and preparing next-generation products to help service providers to cope with the changes. Service providers in India have an opportunity to do it right as they deploy new networks to provide coverage in underserved or unserved regions - using the most advanced network infrastructure to increase spectrum usage efficiency, build in higher capacity signalling, and use femtocells for enhancing indoor coverage.

It's not just bandwidth

Given the proliferation of smart handsets and smart applications, should the operators be satisfied providing a robust pipe, or can they participate in the value being generated? Some of the operators are well ahead and have entered into partnerships with others who have been there, done that - for example, Tata Tele with NTT DoCoMo; there is no other operator in the world who can lay a claim to innovative service platform like DoCoMo can. Will Tata Tele be able to replicate that here, and can the other operators follow suit?

Voice communication beats everything else as the killer application for mobile technology. The value of voice to both the service provider and the subscriber increases with every new subscriber - with more people using voice, there are more people to communicate with, so usage increases; with greater usage operators can find more ways to enhance revenue. Until now, the operators have had a grip-hold on voice as an application and have shared in the growth and slide of its revenues.

The Internet on the other hand is a hub and spoke kind of application; providers post content on the network and subscribers can access it. In India the broadband Internet penetration is currently about one per cent. Mobile Internet access would be the first, low hanging fruit, application for 3G. It can lead to significantly higher economic and social activity among those who get connected to the Internet for the first time.

The challenge service providers face is to create a platform that enables applications. This has to be done before 3G becomes just a high bandwidth dumb pipe commodity.

Service providers need to differentiate themselves by offering a robust applications platform and distribute advanced services they can monetise. In partnerships with banks, service providers can help develop mobile payment initiatives, tie-ups with micro-finance institutions that leverage the service provider's reach into the rural areas and other monetary services for subscribers. Mobile phones are already part of the point-of-sale transactions (airline boarding passes, mobile payment solutions) - for authenticating of the parties involved and tying up the transaction in the back-end.

3G optimism

Smartphones are increasingly sophisticated; they incorporate high-end processors, advance touchscreen features and intuitive user interfaces. Software for smartphones is advancing apace. There are significant advances in operating systems with open interfaces, and application developers are producing countless innovative, high-value, applications for mobile platforms.

Operators now have access to infrastructure equipment and services from equipment vendors that understand what it takes to roll out 3G. There are advances in network architectures ranging from ultra-scalable macro radio access, which increase the capacity of the macro network, to femtocells that bring the signal directly to heavy users via wireline and consequently offload the wireless network. Small cells significantly reduce the operators' capital and operating expenses; as their use grows, economies of scale are reducing the prices for the components of the radio access network. The lower prices help operators cut the cost of building out their networks.

Some talk about the winner's curse - the high cost of winning the 3G spectrum auctions. Nevertheless, there is no better time than now to roll out 3G in India and capture the market - the higher costs will force innovation and differentiation in the build out and deployment of services.

The 3G vision is not limited to providing greater bandwidth - following close on 2G's success, 3G can be a catalyst of social and economic change for India's hundreds of millions of subscribers. ●

Video, the catalyst for 3G success in India

by Arvind Rao, CEO and co-founder, OnMobile

Mobile operators in India, as in most countries, have had to invest heavily in 3G and they are counting on video revenues to generate the return on this investment. Within two years, 3G service revenues will account for 46 per cent of wireless service revenues. Given affordable 3G handsets and the availability of content, 3G will enable a video-driven revolution. This, in combination with attractive rate plans from operators, will drive the real success of 3G video in India.

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The mobile industry in India is in an exciting and challenging stage. We are at the cusp of a revolution that will dramatically change the way that Indians interact with one another and the catalyst for this shift is 3G. For a long time, 3G has held out the promise of a richer, more interactive mobile experience for consumers. Now that it's finally here, some questions are being raised about the viability of 3G services, the ability of operators to recover their huge investments in spectrum, and the willingness among users to pay for premium offerings. While these concerns may be valid, especially in a

price-sensitive market like India, 3G is sure to be a tremendous success here.

India is among the most mature markets for mobile value-added services (*VAS*). In a decade, we have transitioned from basic calls and texting services, to advanced VAS such as reverse ring back tones and 'social' address books. For ring back tones alone, consumption grew by 55 per cent in 2009 over the previous year. However, the biggest gap in value-added services has been video and multimedia. 2G and 2.5G cannot provide the bandwidth and speeds required for the

enhanced experience that mobile video enables. This will change with 3G, which is making high-quality video content on the mobile a reality.

According to the Federation of Indian Chambers of Commerce and Industry (*FICCI*), in India, the 3G subscriber base is expected to hit 90 million by 2013, accounting for 12 per cent of the overall wireless user base. By 2013, 3G service revenues are expected to generate US$15.8 billion, accounting for a 46 per cent share of overall wireless service revenue. With 3G enabling faster and more robust

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mobile Internet and higher bandwidth for data, it is video that can make or break its deployment in India.

Once 3G gains steam, consumers will experience three significant benefits - on-demand access to content, higher speeds and a greater variety of multimedia content. For example, if you take movies, 3G will enable consumers to get movie updates much faster, and the content will definitely include video trailers and other rich content. With the VAS space in an exciting phase of growth, high-speed connectivity will bolster innovation by removing bandwidth constraints.

Most importantly, video services in India will function as a key differentiator for VAS players in the industry. With increasing commoditization of the value-added services sector and high investment made in 3G by operators, it is important for them to cut through the clutter by providing high-quality video services. As mentioned, delivery of high-quality video services will be a key differentiator in 3G VAS offerings. Additionally, the handset manufacturing industry is increasingly developing 3G compatible phones with large screens to support video services and ensure a rich user experience. Therefore, seamless streaming of video on mobile phones be available given the huge investments and development in the 3G VAS segment.

However, as expectations regarding video services are high, quality becomes very important. As such, integration of services like 3G video calling will need the support of appropriate circuit-switched technology to achieve best video quality over 3G networks. The gateway should be able to dynamically adjust the video bit rate and ensure high-quality output for video calls.

Additionally, with increasing mobile bandwidth, wider screen handsets, more bandwidth-efficient coding, power-efficient decoding and more efficient and improved quality transcoding technologies, VAS providers are working to enable easier, more cost-effective and higher quality delivery of entertainment video content to consumers.

Along with all this, service and content providers are increasingly launching multi-screen strategies with seamless access to content between screens. Multi-screen can connect four different categories of screens: TV, PC, notebooks and netbooks through mobile cellular networks and mobile handsets. In fact, through time shifting and place shifting technology consumers can even access content at a later time. For example, a consumer may access professional or user-generated content through a PC browser, mobile browser or from their TV screen (via a set-top box or media computer). Consumers may also side-load the content to their mobile device, notebook or netbook for later viewing. Using network digital video recorders, consumers may program the recording of their favourite shows by simple instruction via text messages, IVR (*interactive voice response*) calls, browser access, an application or remote control.

Furthermore, this convergence will also allow consumers to take control of their mobile experience. We will soon be able to control many of our household and personal electronic devices from any device. For example, we may decide to take our video phone call on the TV or watch movies on the mobile phone.

Mobile video is particularly relevant in the Indian context, as it will foster the next phase of growth for entertainment VAS in India, which continues to be the main growth sector in the market. With a growing number of mature mobile users, as well as availability of suitable technology and handsets, data services will likely lead future VAS usage. These services will largely be related to watching television over mobile phones, gaming, downloading videos on demand and creating personalized content (e.g. social networking, uploading photos/videos).

Although innovation in video technology, affordable 3G handsets and availability of content, will be key enablers of this revolution, a combination of attractive rate plans from operators will drive the real success of 3G video in India. While the jury is out on the ability of operators to recover the huge investments they have made to provide 3G, we believe it will transform the mobile user experience in India and open up a whole new world of rich interactive applications and services. ●

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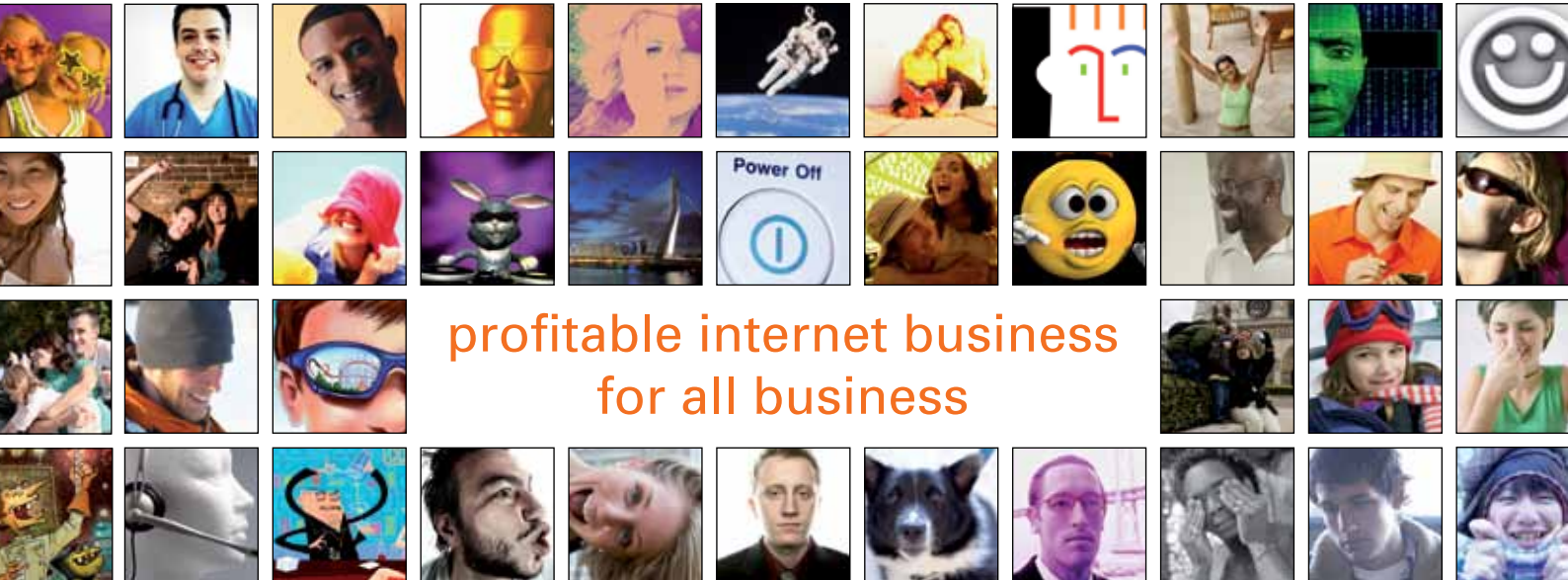
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Blowing your way - wind-powered base stations

by Mats Vilander, GM, SVP Global Sales Telecom for EMEA, Zephyr Corporation

Most mobile base stations in rural regions use diesel power and some use solar power. Diesel is expensive and polluting. Trucking diesel to base stations and theft of diesel fuel and equipment costs operators millions of dollars. Solar is not viable in cloudy or foggy regions; thieves target the panels so they require expensive security measures. The latest wind turbines can utilize existing towers; they generate energy in relatively low winds and their maintenance costs are quite low.

Mats Vilander is Zephyr Corporation's General Manager and Senior Vice President of Global Sales Telecom for EMEA. Mr Vilander has been in the telecom industry for almost two decades and has held executive positions at Ericsson, ZTE and in the telecom industry practice at Price Waterhouse Andersen Global Corporate Finance. During his career Mr Vilander has completed and led over 15 GSM licence bids and rollout all over the world.

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In February, the Telecom Regulatory Authority of India (*TRAI*) announced that it is developing a policy framework to reduce the carbon footprint of India's telecommunications services. It says that there are currently about 310,000 mobile towers in India of which around 70 per cent are in rural areas. About 40 per cent of the power requirement of towers in rural areas is met by grid electricity and 60 per cent by diesel generators.

TRAI cited industry estimates that claim the total consumption of diesel for telecom tower equipment powering and cooling is about two billion litres annually, which produces about 5.3 million litres of carbon dioxide. With the continued growth of the mobile subscriber base in India, these numbers are likely to increase, bringing into focus the need to use renewable energy sources.

TRAI said a total switchover from diesel would save nearly two billion litres of diesel - about 3 litres per subscriber.

Diesel generators are not just a problem in India; the telecoms industry as a whole has united in accepting that they are neither a commercially sustainable or environmentally sensible way of powering base stations in off-grid locations.

The global telecoms trade association, the GSMA, has long been working with operators around the globe to help them deploy alternative energy sources in off-grid areas. "Renewable energy base stations are the best way for mobile operators to extend their networks off-grid while minimising energy costs and their impact on the environment," says David Taverner, Senior Programme Manager for the GSMA's Green Power for Mobile programme.

Of course, there's no lack of sun in India and when we've discussed alternative power in the past we have usually been talking about solar. All the big vendors including Alcatel-Lucent, Ericsson, Huawei and VNL have solar-powered base stations in their portfolios. But solar does have its drawbacks: first, it is not suited to areas prone to fog and clouds. Second, the panels require a great amount of space and are relatively easy to steal, so they are usually surrounded by a fence and require constant

"Wind power has been around for thousands of years and has evolved from powering windmills in order to grind grain to becoming a reliable, sustainable and cost-effective energy source for powering base stations."

on-site security that, of course, adds to the operating cost.

It is time for operators in India to consider how they can harness the wind.

The development of wind power in India began in the 1990s, and has significantly increased in the last few years. Although a relative newcomer to the wind industry compared with Denmark or the US, India has the fifth largest installed wind power capacity in the world according to the World Wind Energy Report 2008. In 2009-10 India's wind power growth rate was the highest among the top four countries and as of 31 December 2010 the installed capacity of wind power in India was 13065.37 MW (megawatts) - Wind Power India - March 2010.

It is estimated that 6,000 MW of additional wind power capacity will be installed in India by 2012. Wind power accounts for six per cent of India's total installed power capacity, and it generates 1.6 per cent of the country's power.

A wind atlas is being prepared, which is great news for operators as it will be quite straightforward to work out if a telco site is suitable for wind power.

It seems like the telecom industry has been talking about wind power for a long time; the good news is that the technology has improved massively over the last few years. Previously, wind turbines weren't really mature enough for large-scale deployment. They were too expensive, required too much maintenance and the turbines were large, heavy and difficult to install - most importantly, they required high wind speeds.

All these problems have been solved with a new generation of small, lightweight, wind turbines which can be installed on existing towers and can generate energy at much lower (4 metres per second) wind speeds than earlier models. With proper installation, maintenance costs are close to zero as today's turbines can be controlled and checked remotely.

Commercial wind turbines

We are now starting to see commercial wind-powered base stations in the Middle East and Africa in both off-grid and on-grid areas at new sites and the retrofitting of existing sites is growing.

In off-grid situations wind power reduces the reliance on diesel generators. Operators who have implemented wind power are saving around 50 per cent of the diesel consumption at existing remote rural sites and, at times, up to 100 per cent of diesel at repeater sites. In addition, the costs and risks of transporting diesel fuel are reduced or, at times, eliminated.

According to Allen Nogee, an analyst at telecoms research firm In-Stat: "While diesel pollution is an environmental issue, what bothers operators the most is the cost of powering and securing the generators. Diesel fuel has to be trucked to remote sites, and theft of diesel fuel and equipment can cost operators millions of dollars. The solution is for operators to at least partially power remote base stations with wind turbines, solar panels, or both. This is truly a case where it pays to be green."

Some operators also use wind to compliment solar-generated power. Solar is used during the day and then wind is used day and night to both power the network and to charge up batteries.

Wind power ROI

The business case for an existing site depends on a number of factors:

- average wind speed in the area/site;
- height of the tower;
- site load, maximum load during the day;
- site design, the number of TRX (transceivers), base station type, transmission capacity;
- installed battery capacity;
- wind as a backup, or primary source, solar elements; and
- and, accessibility of site.

Obviously costs depend on the vendor chosen, but as an estimate, the cost of buying and installing two turbines which can power a typical rural GSM base station requiring 600-900 watts on an existing tower with 6-7m/s of wind is around Rs 726,000-968,000.

In-Stat predicts that, by 2014, over 230,000 cellular base stations in developing countries will be solar-powered or wind-powered.

Certainly wind power is now ready for commercial deployments. We hope that TRAI will recognise the potential of wind power in the telecoms industry.

Wind power has been around for thousands of years and has evolved from powering windmills in order to grind grain to becoming a reliable, sustainable and cost-effective energy source for powering base stations. ●

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