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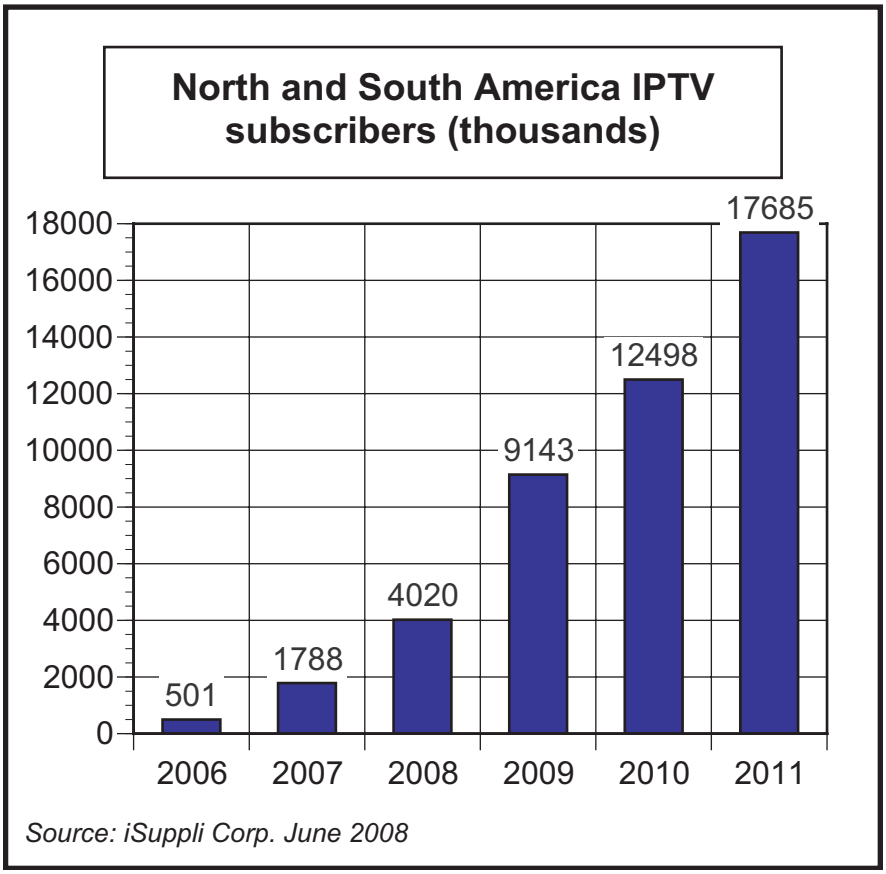

Source: iSuppli Corp. June 2008

Areas of Interest...

POLICY

Ofcom introduces voluntary broadband speed code

UK's telecom regulator Ofcom has introduced a voluntary speed code of practice to regulate the advertisement of Internet service providers' (ISPs') broadband speeds. For instance, fixed-line ISPs would need to give an accurate

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representation of the speeds supported by their lines when selling the packages. If their estimates are accurate, the ISPs would be able to solve any technical problems affecting broadband speeds and also provide customers with the option of migrating to a lower-speed package.

The UK-based ISPs will also have to give precise information on usage limits. Although the regulations are not enforceable, as many as 32 ISPs have agreed to honor this agreement. According to Ed Richards, Ofcom's chief executive, the introduction of a voluntary code will provide broadband users with a lot of clarity with regard to the speeds they are receiving. Meanwhile the Internet Services Providers' Association (ISPA) UK has urged the regulator to include wireless cellular operators in the purview of this code.

SERVICES

Telefonica's Brazilian division to invest $384 million to expand broadband services

Spain-based Telefonica has said that its Brazil-based telecom division will spend $384 million in 2008 for expanding its broadband networks and services.

The telecom giant plans to set aside about $306.84 million of this amount to enhance the division's ADSL network, while the remaining $75.48 million will be invested to boost its optical fiber infrastructure. According to BNamericas, this capital expenditure is a tenfold hike from the $312.98 million set aside for Telefonica Brazil's broadband pilot projects last year. The unit is planning to expand broadband coverage to an additional 400,000 homes this year. Currently, around 2.2 million subscribers use its services in 407 Brazilian municipalities.

Covad announces expansion of its broadband services

US-based wireline service provider Covad Communications announced that it has expanded the coverage of its T1 high-speed Internet service to an additional 285 cities though a deal with Earthlink affiliate New Edge Networks.

These new cities are in the states of Arizona, Arkansas, California, Florida, Colorado, Georgia, Idaho, Illinois, Louisiana, Michigan, New Mexico, Minnesota, North Dakota, Ohio, Oklahoma, Washington, Nevada, Texas, Utah, and Wyoming, among others. The company's business-class T1 service comprises three options: 384 kilobits per second (kbps), 768kbps, and 1.5Mbps.

CONTRACTS

Korean E-commerce Web site boosts Ethernet routing and security with Juniper Networks

Juniper Networks Inc., a provider of high-performance networking, announced that Seoul-based Gmarket, one of the world's largest consumer e-commerce Web sites, is paving the way to scale Web-based transactions with Juniper Networks MX960 Ethernet Services Routers.

The MX-series routers boost Gmarket's network capacity and manageability by consolidating multiple Gigabit Ethernet switching solutions into an easily managed topology that uses JUNOS software, Juniper's single-source code network operating system. The MX960's Access Control List (ACL) capabilities also fortify Gmarket's network security.

In addition, Gmarket deployed Juniper Integrated Security Gateways (ISG) — purpose-built, high-performance firewall and VPN gateway — to secure against network threats.

This upgrade follows Gmarket's previous deployment of Juniper's NetScreen-5400 firewalls, designed to deliver best-in-class performance capabilities and configuration flexibility for large enterprise, carrier, and datacenter networks. The NetScreen-5400 can scale to 30Gbps of firewall and 15Gbps of VPN

throughput, and handles up to 1 million concurrent VPN user sessions to provide secure access to Gmarket's Web servers, network applications, and databases, which host highly sensitive e-commerce data.

"JUNOS was the key differentiating feature for our purchase decision," said Kiseok Lee, group manager of Gmarket's System Operation Group. "Its proven reliability, excellent CLI tools, and powerful filtering functionality enable us to provide more reliable and secure services to our customers.

The cflow and port-mirroring functions offer real time traffic visibility and detailed analysis. Additionally, the MX-series seamlessly interoperates with our NetScreen and ISG firewalls.

"We're confident we selected the best platform to meet our current and future requirements," added Lee. "While our initial assessment pointed to the MX480, with six interface card slots, we decided to go with MX960 routers — which provide up to 12 — to accommodate future expansion. The Juniper network infrastructure is already delivering superior network performance and return on investment. We are now considering future expansion with the new Juniper Networks EX-series Ethernet switches."

The MX960 platform delivers up to 960 Gigabits per second (Gbps) of switching and routing capacity, which enables more revenue per platform and provides the scale to help maximize Gmarket's return on investment. Purpose-built for the most demanding network applications, the MX-series establishes a new industry standard for capacity, density, and performance.

Gmarket's ISG 1000 and ISG 2000 gateways integrate best-in-class Deep Inspection firewall, VPN, and DoS capabilities into a single platform. They enable secure, reliable connectivity, along with network and application-level protection, for critical, high-traffic network segments. The ISG series can be upgraded to support full intrusion detection and prevention (IDP) capabilities to provide robust network and application layer protection against current and emerging threats.

"Network-based businesses such as Gmarket depend on highly scalable infrastructure that performs at a high level and without unnecessary complexity or overhead," said Tim Kang, vice president of Korea for Juniper Networks.

"The Korean market recognizes the unique value of the MX-series in delivering high-performance, innovative routing and ease of management."

China Telecom selects Alcatel-Lucent for IP metro area network expansion

China's biggest landline operator, China Telecom, has inked a multimillion-Euro contract with French vendor Alcatel-Lucent for expanding a countrywide IP metro area network.

Alcatel-Lucent bagged this contract via Alcatel Shanghai Bell, its flagship firm in China. Under the terms of the deal, Alcatel-lucent will be responsible for providing IP routing solution to China Telecom, which will allow the operator to deliver IP services to business and residential users.

China Telecom would also be providing multiple IP-based services like IPTV, 3G broadband wireless, and virtual private network (VPN) services on one network infrastructure. Alcatel Lucent Shanghai Bell president Olivia Qiu said that the deal reflects the confidence shown by China Telecom in the vendor's service routing portfolio.

FIBER OPTICS

Nigeria's Phase 3 Telecom has spent $100 million on fiber-optic project

Nigeria-based telecommunications carrier Phase 3 Telecom said that it has spent more than $100 million on an optical fiber project that could drastically improve the range and

quality of telecom services in the country. The company's chief executive officer, Mr. Stanley Jegede, has said that the company remains committed to boosting its telecom services and is willing to invest another $200 million to expand its fiber-optic coverage across Nigeria. He said that Phase 3 invested $100 million to deploy fiber-optic cables in various cities of the country. The firm currently provides international voice services to GSM, PSTN, pan-European calling card players, and Tier 1 traffic carriers. Phase 3 also provide international connectivity via SAT3 in the city of Lagos, where a gateway links to its PoP in London, thereby establishing connectivity with more than 370 carriers.

Nokia Siemens Networks announces plans to prioritize wireline broadband access R&D investments

An enormous hunger for bandwidth is driving the fixed broadband access networks and will lead into a hundredfold traffic growth until 2015.

This development and the operators' need for revenue growth are driving Nokia Siemens Networks' investment in fiber-based next-generation optical access (NGOA) technologies. At the same time, the company plans to limit its investment into existing Gigabit passive optical networks (GPONs) due to the fact that the mass-market rollout of fiber-to-the-home (FTTH) is unlikely in the short term.

Nokia Siemens Networks plans to focus on DSL and next-generation optical access (NGOA) technology and limit its investment in existing Gigabit passive optical networks (GPONs). In parallel, NSN will develop next-generation optical (NGOA) technologies aiming to take a leading role in the future FTTH market. Nokia Siemens Networks will also continue its fixed access investment in DSL by introducing new products addressing the increasing deployment of FTTC/B.

"Fiber is progressing closer to the home with the focus today on fiber-to-the-curb or building with last mile connectivity based on proven DSL technology," said Christoph Caselitz, Nokia Siemens Networks chief market operations officer.

"Our view is that mass market roll out of fiber-to-the-home is unlikely in the short term due to regulatory uncertainty and the operator's business cases. This will be different with the NGOA technology, where we will target to take a leading role."

IPTV

Telekom Austria selects Alcatel-Lucent to enrich IPTV offering

Alcatel-Lucent announced that it has been selected by Telekom Austria, Austria's major service provider, to enrich Telekom Austria's IPTV offering. The operator is launching two state-of-the-art features — time-shift TV and high-definition TV (HDTV) — enhancing the service experience of its aonTV subscribers. One week prior to the start of the European soccer championship (Euro 2008), aonTV customers will be able to stop live broadcasts, take a break, and then continue to watch the transmission of the program, thanks to Telekom Austria's time-shift TV capabilities. Additionally, the launch of Telekom Austria's HDTV service brings to the Austrian households the next level of visual quality and TV experience.

"From June on, we can offer the aonTV users the newest Time shift TV functionalities without additional investment. Our customers can now enjoy a higher degree of convenience and freedom to watch the programs they want," said Hannes Ametsreiter, chief marketing officer, Telekom Austria TA AG and chief officer marketing, sales & customer services, mobilkom Austria. "Alcatel-Lucent is our trusted partner for the delivery of IPTV middleware and the related integration services, enabling us to enrich our aonTV offering with a range of innovative applications."

Sony, NTT, and several others decide agree upon unifying technical standards for IPTV services

Nippon Telegraph and Telephone Corp. (NTT), Sony Corp., and several other companies said that they have decided to unify technical-based standards for Internet Protocol television (IPTV) services. A forum formed by three telecommunications companies — KDDI Corp., NTT and Softbank BB Corp. — would lead this standardization process. Around 15 organizations and business, in addition to two individuals, have joined this forum. The members include the likes of Matsushita Electric Industrial Co, Sony, Toshiba Corp., Hitachi Ltd., and Sharp Corp. and also five commercial television broadcasters in Tokyo and Japan Broadcasting Corp.

On Telecom unveils IPTV in Greece

Greek telecommunications operator On Telecom has unveiled its ON TV IPTV service in the country. This service includes a video-on-demand (VoD) service with over 1,200 titles each month, On Multiplex movies channel, pay-television packages including Discovery (comprising Discovery Science, Discovery World, and Discovery Travel and Living), National Geographic (NatGeo Wild, NatGeo Music), Baby TV, adult channel Dorcel TV, and On sports (NASN, EXPN Classic, Extreme Sports). Users would be able to play eight games via On TV Games using the remote control. On Telecom will also provide all the channels of Greece-based satellite service provider NOVA. The pay-TV packages will cost between EUR2 ($3.11) and EUR8 ($12.47), whereas the entire On TV package is available for EUR15 ($23.38) a month.

South Florida gets AT&T U-verse IPTV

AT&T has launched its U-verse TV and U-verse High Speed Internet in parts of Miami-Dade and Broward counties. AT&T U-verse services will be launched in Palm Beach County on July 28. AT&T U-verse brings together your TV, broadband, and AT&T wireless services all on one bill, with unique features that provide a new level of integration, convenience and control. AT&T U-verse TV and High Speed Internet services are delivered over AT&T's advanced IP network.

Customers can currently order AT&T U-verse services in parts of dozens of communities in Miami-Dade, Broward, and Palm Beach counties. U-verse services will be installed for Palm Beach County customers beginning July 28. AT&T will make U-verse services available to more homes throughout South Florida on an ongoing basis.

ETB to unveil IPTV in Colombia by March 2009

Colombia-based telecom operator ETB is intending to commence the trials of its IPTV service in November 2008 and plans to commercially launch the service by March 2009. ETB CEO Fernando Panesso said that the telecom firm plans to put in $51 million to launch the IPTV service in Colombia in spite of regulatory ambiguities. Although ETB does not own a pay-TV license (needed by the National Television Commission), it certainly has a license for operating IPTV as a VAS (value-added service). Meanwhile, the operator's broadband user base is expected to increase to 800,000 by 2012 from the current 300,000.

Slovenia's T-2 to launch IPTV in Croatia

Slovenia's alternative telecom carrier, T-2, is contemplating entering the Croatian market to launch an IPTV services in that country. According to media reports, the carrier, which is owned by Zvon Ena Holding, has already invested around $0.32 million for its Croatian operations, which are likely to commence this autumn. T-2 currently operates a triple-play service in Slovenia. Unlike Slovenia, Croatia has a well-structured IPTV market with T-HT's MAXtv being the No. 1 player.

PTCL to launch IPTV in Pakistan

Pakistan Telecommunication Company Limited (PTCL) is preparing to launch its Internet Protocol television (IPTV) services in the country. Dr. Sadiq Al-Jadir, commercial SEVP, said that the telecom operator would provide this service using advanced technologies. IPTV is a multichannel TV service that is brought to users' homes through the Internet Protocol. This new service by PTCL will enable its customers to get many digital-quality television channels as well as voice telephony and high-speed broadband over a single connection.

PTCL is currently the biggest converged services provider in Pakistan. It provides telecom services like data and basic voice telephony, Internet, and videoconferencing, among others, to residential as well as business customers.

Guangxi Telecom selects UTStarcom's RollingStream IPTV platform

Guangxi Telecom has chosen UTStarcom's RollingStream IPTV platform to deploy a new interactive advertising system. Guangxi Telecom is the first service provider in China to deploy IPTV for building-based video advertising.

UTStarcom will provide Guangxi Telecom with 3,600 concurrent IPTV streams for the initial deployment of the interactive advertising system in 14 Guangxi cities. In the first phase, set-top boxes will be deployed in supermarkets, department stores, office buildings, and Guangxi Telecom's facilities in Nanning, Liuzhou, Guiling, Qinzhou, Guigang, Wuzhou, Beihai, and Baise.

UTStarcom's RollingStream end-to-end IPTV system currently supports more than 850,000 live IPTV subscribers globally and maintains a current total system capacity of more than 2.5 million subscribers as a result of recent successful deployments in China with China Netcom and China Telecom; in India with Bharti Airtel, MTNL/Aksh and United Telecoms Limited; in Sri Lanka with SLT; in Japan with Softbank; in Latin America with Brasil Telecom; and in Taiwan with Markwell.

IPTV middleware spending spree expected

Communications market research firm Infonetics Research reported that the combined Internet protocol television (IPTV) and switched digital video (SDV) equipment market increased 12% sequentially to $1.3 billion worldwide in 1Q08.

Infonetics' report, IPTV and Switched Digital Video Equipment, Services, and Subscribers, indicates revenue growth is being driven by growing numbers of service providers rolling out new IPTV networks or expanding existing networks to support more subscribers. The market is also getting a push from cable MSOs introducing switched video capabilities into their digital TV networks to free up bandwidth and offer more high definition (HD) content to their subscribers.

"While most of the segments we track in the IPTV market are seeing consistent quarterly growth, IPTV middleware is going to be an especially interesting segment to watch. We're expecting an IPTV middleware spending spree over the next few quarters because a lot of the early IPTV service providers are running into scaling issues with their off-the-shelf middleware.

Those providers are going to have to replace their IPTV middleware with a more robust solution to replace or augment their first-generation deployments. Middleware issues are one of the main root causes of IPTV rollout delays, so early hiccups have to be addressed quickly," said Jeff Heynen, directing analyst for IPTV at Infonetics Research.

Other report highlights:

- The number of IPTV subscribers is forecast to hit 93 million worldwide by 2011
- Worldwide IP set-top box revenue grew 10% in 1Q08 over 4Q07
- Motorola continues to lead the worldwide IP set-top box (STB) market in 1Q08, although

its closest competitors made major inroads this quarter, reducing Motorola's lead

- ADB takes the lead in 1Q08 in worldwide hybrid IP/over-the-air STB market share
- Cablevision was the first to roll out switched digital video; it will soon be followed by other MSOs in North America, then those in Europe/Middle East/Africa (EMEA) and Asia Pacific (APAC), who face an uphill battle for triple play subscribers
- France remains the hotbed of IPTV activity, with Orange, Free, and neuf all battling for IPTV subscribers
- Telco IPTV operators in Western Europe, particularly France, Sweden, and Italy, continue to give away their IPTV service to hold on to their broadband subscribers

Infonetics' report provides market size, market share, and forecasts for IPTV equipment, including integrated digital headend platforms, video on demand (VOD) and streaming content servers, IP video encoders, universal edge QAMs, IPTV middleware and content delivery platforms, and IP STBs. The report also tracks IPTV, cable IPTV and cable SDV service revenue and subscribers.

Companies tracked include ADB, Alcatel-Lucent, Amino, ARRIS, Celrun, Cisco, Dasan Networks, Ericsson, Huawei, Microsoft, Motorola, Netgem, Nokia Siemens, OptiBase, Pace, Phillips, Sagem, Samsung, Scientific Atlanta, Sumitomo, Tatung, Telsey, Thomson, Tilgin, UTStarcom, Yuxing, and others.

TECHNOLOGY

Motorola expands its Broadband Access Network portfolio

Motorola has announced the expansion of its Broadband Access Network portfolio. The firm believes that this move will enable cable TV service providers push fiber optics closer to the home and still shield their investments in current infrastructure. The "deep fiber" products would allow operators to convert amplifiers into optical nodes, which will facilitate direct migration to fiber. Motorola said that this would significantly cut outage times and installation expenses. Moreover, its expanded portfolio would also cause a twofold increase in the receiver density at the fiber-optic headend. Motorola is also launching a 1GHz DWDM (dense wavelength division multiplexing) narrowcast transmitter for segmenting its E-CWDM (enhanced coarse division multiplexing) solution. This provides around 40 wavelengths for addressing the demand for Internet, video-on-demand, and telephony services.

Alcatel-Lucent evolves its Triple-play Service Delivery Architecture

Alcatel-Lucent announced several new enhancements to its Triple-play Service Delivery Architecture, which pave the way for new, sophisticated, and innovative multimedia services. Going beyond the initial, mass-market solution requirements for IPTV, voice, and Internet services, the new architecture enhancements now enable consumers and business partners to choose the quality of experience they want, for the content they care about and at a price they are prepared to pay. As service providers evolve their network architectures to support triple-play consumer broadband services, their focus is shifting to maximizing the return on investment. The new features being introduced— including new hardware and software enhancements for Alcatel-Lucent's Service Router portfolio — will enable service providers to offer their subscribers a high quality of experience for an expanded portfolio of broadband content and applications.

Comcast and Cisco announce successful live network demonstration of the world's first 100GbE router interface

Comcast Corporation, a provider of entertainment, information, and communications products and services, announced that it has

successfully completed a 100 Gigabit Ethernet (GbE) technology test over its existing backbone infrastructure between Philadelphia and McLean, Virginia, using the industry's first 100GbE router interface developed for the Cisco CRS-1 routing system. This demonstration is another example of Comcast's commitment to technology that supports the rapid growth of new applications and services.

The Cisco CRS-1 100GbE interface uses Comcast's existing optical infrastructure to enable transmission of 100GbE over DWDM fiber-optic networks. Using this type of technology will enable companies like Comcast to increase bandwidth per wavelength by a factor of 10 over the initial deployed capability. It also creates efficiencies by simplifying routing and operations through the use of statistically multiplexed 100GbE links, in comparison to carrying the same amount of traffic split over more commonly used 10GbE links.

"This demonstration is another important step in the future of 100GE networking and we're pleased with Cisco's latest advancements," said John Schanz, executive vice president of national engineering and technical operations for Comcast Cable. "Comcast's single converged core IP network already carries more video, voice, and data traffic than any other, and this new achievement will allow us to scale for tomorrow, while continuing to drive capital and operational efficiencies today."

"The Cisco CRS-1 was purpose-built to deal with the exploding growth in IP traffic that has been fueled by video-based services," said Kelly Ahuja, Cisco vice president and general manager of core routing business unit. "By developing a 100GE interface for the Cisco CRS-1 platform, providers like Comcast can take advantage of economies of scale, flexibility and increase the quality of service delivery as they move towards 100G IPoDWDM networks."

The implementation tested by Comcast and Cisco is consistent with the emerging IEEE 802.3ba 100GbE standard and validates the use of 100GbE and IPoDWDM technologies over Comcast's own production network, which was the first, and is currently the world's largest, 40G IPoDWDM network.

PARTNERSHIPS

Teknovus and NTT Communications collaborate on penetration of enterprise market

Teknovus, a provider of Gigabit Ethernet passive optical network (G-EPON) chips for the deployment of triple-play services in broadband access networks, announced that Furukawa Electric's (Furukawa) G-EPON SFP (small form factor pluggable) ONU, based on Teknovus' G-EPON ONU chip, was displayed through NTT Communications Corporation (NTT Com) for enterprise customers at Interop Tokyo 2008.

NTT Com is a Japanese carrier providing advanced information and communications technology (ICT) solutions worldwide

Furukawa is a communications system vendor providing G-EPON systems, including the first G-EPON SFP-ONU solution, the FITELwave AG9, which fits entirely within the standard SFP, enabling network solution providers to expand rapidly into fiber-based networks. Furukawa's SFP ONU enables plug-and-play for FTTx without requiring AC adaptors, Ethernet cabling, or changes to existing LAN software.

The Teknovus-based SFP-ONU works with any standard SFP port enabling a wide range of applications, including the following:

- Enterprise switches and routers for fiber to the desktop
- Mini-DSLAMs for fiber-to-the-basement
- IP-PBXs and soft-switches for fiber-to-the-business
- HGW with SFP socket for fiber-to-the-home in one box
- WiMAX/Femtocell Backhaul for fiber-to-the-base station

The Teknovus-based SFP ONU offers all of the advantages of the Teknovus G-EPON chip design, such as guaranteed SLAs (service level agreements), advanced traffic management, multiple LLIDs, application-aware filtering, IPv6, and optical monitoring and management. Teknovus provides the only PON chip that fits into the SFP form factor, which requires a small chip and extremely low power consumption.

"NTT Com is highly regarded for their managed network solutions around the globe," stated Mr. Ryoji Takaichi, Teknovus general manager of Japan. "We are very pleased to be working with NTT Com to create new solution offerings based on the SFP-ONU, expanding their support of fiber-based networks for the enterprise markets."

MERGERS AND ACQUISITIONS

Zayo Group acquires its seventh regional firm

Startup telecommunications service provider Zayo Group Inc. has made its seventh regional acquisition by buying Northwest Telephone Inc. for an unrevealed amount. Zayo announced that this deal would provide it with 1,500 miles of optical fiber cable, which link rural areas to urban regions in Oregon, Washington, and Idaho. This acquisition of Washington-based Northwest Telephone also allows Zayo to enter the Pacific Northwest region. The startup telecom player currently owns 18,500 miles of regional and metropolitan fiber-optic cable in 20 states. It has a headcount of nearly 325 in the US and expects yearly revenues of $160 million.

Freenet invites declarations of interests for its broadband division

The board of Germany-based telecom Freenet has invited expressions of interest (EoIs) for its broadband division from interested buyers. Freenet is being assisted by M&A consultants Arma Partners LLP in its endeavor. The first phase is likely to witness an initially nonbinding business sale. Freenet's decision to sell its broadband division is in line with its plan to become the biggest mobile operator of Germany by acquiring Garman cellular operator Debitel. The total mobile user base of the two firms is 19 million. Freenet had 1.19 million DSL users by the end of March 2008, in addition to 2.56 million narrowband users.

Belgacom buys Tele2 Luxembourg and Liechtenstein for $325.24 million

Belgium-based Belgacom announced that it has bought Tele2 Luxembourg, which operates as Tango. Tele2 Luxembourg currently provides fixed-voice, cellular, and DSL services in Luxembourg. It has 26,000 landline users, 238,000 mobile customers, and 10,000 broadband subscribers. Its EBITDA had reached $48.71 million in 2007. Under the agreement, Belgacom would also take over Tele2's Liechtenstein mobile and landline operations. The firm has decided to buy 100 percent shares of Tele2 Luxembourg for around $325.24 million. Owing to its strong presence in Luxembourg, Belgacom expects to get synergies of close to $39.28 million. The deal awaits clearance from appropriate antitrust authorities.

Brocade to buy Foundry

Brocade announced a definitive agreement to purchase Foundry Networks Inc., a performance and total solutions provider for network switching and routing. Brocade believes that the acquisition will position the company as a leading provider of enterprise and service-provider networking solutions, with innovative technology and product leadership from the Internet to the heart of datacenters.

The acquisition will bring together two financially strong companies in complementary technology sectors and allow the combined entity to better address today's customer needs, as well as the evolution toward converged networks. Brocade also believes that the

combined company will be well positioned to create unique synergies and to take advantage of the respective technologies, customer segments, and distribution channels of the two companies to accelerate growth and innovation in key markets.

"Through this deal, Brocade has now uniquely positioned itself in the networking industry to deliver a leading, alternative solutions portfolio spanning local, metro, wide and storage area networks," said Zeus Kerravala, senior vice president of Global Enterprise Research at the Yankee Group. "The breadth and depth of this portfolio make Brocade a viable option for customers looking for complete networking solutions capable of addressing their constantly evolving and increasingly complex IT challenges."

FTTX

Verizon expands high-speed broadband network into western Kentucky

US-based Verizon Wireless said that it has expanded its high-speed wireless network in the western Kentucky area. According to the company, the expansion covers areas like Benton, Burna, Eddyville, Draffenville, Kuttawa, Fulton, La Center, Sturgis, Marion, and Wickliffe. Greg Haller, president of the Kentucky/Indiana/Michigan region for Verizon Wireless, stated that the expansion of the high-speed broadband wireless network would enable its customers to access the latest wireless technology. Verizon Wireless's customers will now be able to access the main services: V CAST, which enables users to get access to downloadable videos, music and 3D games, and BroadbandAccess, a high-speed wireless service which provides a mobile office experience to the company's customers.

Verizon introduces FiOS for Business

Verizon on July 10 launched FiOS TV for Business, a new subscription-television service designed for small and medium-sized businesses, delivered exclusively by Verizon's advanced all-digital, 100 percent fiber-optic network.

The new offering makes the picture quality and reliability of FiOS TV readily available to all types of small-business venues — ranging from medical office waiting rooms to banks, building lobbies, restaurants, and taverns.

"The introduction of FiOS TV for Business brings an extraordinary TV experience to the commercial viewing space," said Monte Beck, vice president of business marketing for Verizon. "Judging from the positive consumer response we've had to FiOS TV, it can give a competitive advantage to businesses that offer TV viewing to their customer."

U-verse comes to Tulsa

Tulsa-area residents now have a new choice for their television and communications services. AT&T Inc. announced the launch of the company's integrated suite of AT&T U-verse services, including AT&T U-verse TV, AT&T U-verse High Speed Internet, and AT&T U-verse Voice.

AT&T says that U-verse brings together TV, broadband, home phone, and AT&T wireless services, all on one bill, with unique features that provide a new level of integration, convenience, and control.

AT&T U-verse TV, High Speed Internet, and Voice services are all delivered over AT&T's advanced Internet Protocol (IP) network.

Customers can currently order AT&T U-verse services in parts of Tulsa, Jenks, and Owasso. AT&T will make U-verse services available to more homes throughout the area on an ongoing basis.

"With the launch of AT&T U-verse TV, Tulsa customers are finally getting a better choice in video entertainment services," said Ryan Stafford, AT&T general manager for Oklahoma and Arkansas. "And we're taking it even further by making your services work

together and offering cool features you can't get anywhere else."

Verizon adds 22 channels

Verizon FiOS TV has launched 22 new channels, including 15 additional high-definition (HD) channels. FiOS TV customers in Fort Wayne now have more than 440 HD choices available at any time, with a total of 41 HD channels and more than 400 HD video-on-demand (VOD) titles offered each month.

The first in a series of channel additions coming this year, new content includes sports favorites like the Big Ten Network and new HD channels like CNBC, Bravo, and USA. The next series of content additions will include more HD channels, including CNN, TBS, Lifetime, three new Starz channels, and two new Showtime channels, as well as 16 new multicultural channels.

Verizon will continue expanding its FiOS TV channel lineup this year, with a major focus on HD content. By year-end, Verizon will offer all available major HD programming.

"High-definition and sports content are among the most popular TV programming, and we're bringing the best of both to FiOS TV," said Terry Denson, vice president — FiOS TV content and programming. "The addition of new HD and sports channels, along with the new multicultural content and more, is part of our commitment to lead the industry in the scope and quality of our programming."

Ignis Photonyx receiving EU support

The European Commission has through the ICT program recognized Ignis Photonyx for their next-generation WDM PON technology.

Together with other leading European telecom system providers like Ericsson AB, Ignis Photonyx will lead a joint development effort for enabling more cost-effective broadband services.

The project is granted funding of EUR3 million from the European Commission.

The project, called GigaWaM, was initiated by Ignis Photonyx and will be technically lead from Ignis PLC-fab in Birkeröd, Denmark.

More than 160 European telecom projects applied for EU funding through participation in the ICT program. Only 27 projects were accepted, and GigaWaM led by Ignis Photonyx received significant recognition.

Behind the EU ICT program is the entire European telecom industry, with committee members from the leading and fastest-growing telecom providers in Europe.

"This is a strong recognition of the unparalleled expertise and know how in Ignis Photonyx – and our faith in WDM PON. The GigaWaM project is fully aligned with the strategic roadmap for Ignis Photonyx. We are today a leading supplier of WDM PON components and we aim to further grow and strengthen this position," said CEO Magnus Breidne at Ignis Photonyx.

The size of the market for WDM PON products that will be the offspring of the GigaWaM project is estimated to be around EUR230 million annually within the next four to five years.

This will support the fast-growing and ever-increasing demand for higher bandwidth and help the international ICT industry improve the offering of triple-play services and applications such as high-definition TV and video-on-demand.

"As the WDM PON market is maturing we will experience increased pressure on performance effciency and production cost. The GigaWaM project is focusing on technology that can offer high speed broadband to low cost across all markets," said Breidne.

Current technology using copper lines has reached maximum capacity, and the demand for next-generation technology is accelerating. WDM PON will replace today's GPON technology, and the aim of the GigaWaM project is to develop a prototype of a WDM PON optical subsystem.

EVENTS

Rapid convergence of broadcast and telecoms drives growth of mobile, IPTV, and digital signage at IBC 2008

The rapid growth in the consumption of broadcast content on devices other than the traditional TV screens is reflected across the exhibition, conference, and business briefing programs at IBC2008.

IBC covers all aspects of the creation, management, and delivery of content. Recent years have seen a steady rise in attendance from the telecoms sector as carriers and mobile operators seek a better understanding of the broadcast sector and evaluate IPTV and mobile multimedia revenues as a supplement to stagnant or declining voice ARPU.

This year, the opening theme day of the IBC Conference on Thursday, September 11, is dedicated to "Content Access via the Web" and will explore how consuming content across devices as diverse as mobile phones, PCs, multimedia players, and games consoles is affecting the traditional broadcast value chain.

"The Digital Dividend: HD, mobile, broadband or new media?" the theme on Saturday, September 13, will examine the options, opportunities, and issues that may arise when telecoms operators compete for spectrum released by the transition from analogue to digital terrestrial TV transmission.

Sunday's theme, "Content production: technology, creativity and business in an era of headlong change," will provide invaluable insight into the broadcast sector's perspective of the creative and commercial implications of the rapidly changing media landscape.

Elsewhere in the conference program, Thursday's Technical paper sessions will include an in-depth look at technical innovations in the area of "IPTV and the networked home."

Mobile will also be the focus of "What Caught My Eye," in which an expert reports on the notable innovations to be found on the exhibition floor. For Sunday's "What Caught My Eye" session at 11.00 a.m., Mike Short, VP R&D at Telefonica O2 and president of the Mobile Data Association will unveil the most exciting mobile-specific innovations to be found at IBC2008.

Monday's program includes tutorials from DVB & ETSI on "Open Standards, Technology & Implementation," outlining the evolution of the Digital Video Broadcast standard to accommodate a number of distribution scenarios including DVB-H for handhelds. IET hosts another tutorial on "Digital delivery & getting content to the consumer."

Mobile, IPTV and Web TV products, services, and applications can be found across the IBC exhibition. In addition, dedicated Mobile and IPTV Zones bring together innovative application developers, content providers, and technology companies pioneering in these important new fields. More than 30 companies are exhibiting in the Mobile Zone, including industry leaders such as Qualcomm MediaFLO, MobiTV, and Nagravision, while nearly 50 organizations from Aceedo Broadband to ZyXEL Communications Corp. feature in the expanded IPTV Zone.

Digital Signage — the use of IP-networked flat screens to distribute information, advertising, multimedia, and TV content in retail environments, transport hubs, and stadia — will have its own Zone in response to the interest generated by an overflowing seminar on the subject at IBC 2007.

Mobile, IPTV and Digital Signage will also feature in the 2008 IBC Business Briefing Programme. Conceived to complement the peer-reviewed IBC Conference, the free-admission Business Briefings provide a platform for content providers, application developers, and technology companies to share their experiences of the impact that mobile, broadband, and IP worlds are having on the creation, management, and delivery of content. Early confirmed speakers include Qualcomm

MediaFLO and Nagravision on Mobile; Dolby, Edgeware, Miniweb Interactive, the Open IPTV Forum, and Tandberg on IPTV; and Sony on Digital Signage.

MARKET INTELLIGENCE

China beats US to emerge as the biggest broadband subscriber market in Q1

Market Research Company Dittberner Associates stated that China has overtaken the United States as the biggest broadband market in Q1. China posted a growth of 29 percent when compared to the previous year and ended the quarter with 71.6 million users. This is around 1.4 million more than the US, which witnessed a subscriber growth of 12 percent in Q4 of 2007. Meanwhile, the worldwide global broadband user base increased 5 percent in Q1 to reach 355 million. Japan, Germany, the UK, France, and Korea follow the US. Germany posted the second-biggest yearly growth at 23.4 percent, while Korea's growth was the lowest at 4 percent. According to Dittberner, Germany is unlikely to overtake the third-ranked Japan anytime soon. Meanwhile the DOCSIS 3.0-compliant 100Mbps HFC is the leading broadband technology globally; Korea-based Hanaro Telecom has taken the lead in this technology and added over 400,000 users since Q2 2007.

France's broadband user base increases to 16.225 million

According to French regulator Arcep, the country added nearly 675,000 new broadband users in the first quarter of 2008, increasing the total user base to 16.225 million by the end of March from 15.551 million in December 2007. This represents a 19 percent increase from 13.676 million a year back. The regulator said that nearly 15.475 million subscribers use ADSL, while the remaining people use fiber optics, cable, or satellite. Arcep also said that the total number of wholesale access lines rose by 338,000 in the first quarter to 7.825 million. Of these, nearly 5.521 million were accounted for by unbundled local loops.

BT announcement represents first major step towards next-generation access in the UK, says Analysys Mason

At last, BT has decided to invest in fiber on a large scale. This is great news for the UK, and will remove some of the awkward questions about why the UK is languishing behind many other nations in the provision of high-speed broadband. BT's announcement is primarily about VDSL/FTTC, with some limited FTTH. Financially, this is a sensible step for BT, and should not preclude a move to more widespread FTTH in the longer term.

In Analysys's view, the total investment of £1.5 billion for 10 million homes looks reasonable, although the press release states rollout "to as many as 10 million homes by 2012," so actual coverage may be lower. The Broadband Stakeholder Group (BSG) is currently investigating the costs of FTTC and FTTH on a national basis, and importantly, how costs vary with geography.

There are two other aspects of the announcement that are worth mentioning.

First, it is not yet clear what BT's statement on the role of regulation and fair return on investment will mean in practice. BT appears to be asking for more symmetric regulation, whereby other fiber operators will also be required to wholesale their services. Ofcom is expected to provide details of its proposals for regulating NGA in September this year. It will be fascinating to see to what extent, if any, Viviane Reding's recent comments on a "risk premium" for NGA investments factor into Ofcom's thinking.

Second, Analysys expects there will be greater emphasis than envisaged on the issues associated with subloop unbundling (SLU). This will now be a very important consideration for alternative operators' future strategies. To date,

SLU charges have not been the subject of as much regulatory scrutiny as LLU charges. This is now likely to change. However, it is not clear to what extent BT will be promoting a generic Ethernet access product (as being developed for the Ebbsfleet FTTH deployment) over VDSL/ FTTC.

The reference to iPlayer is also interesting, especially as many of the issues around delivery of video services relate to backhaul, not access networks. Lower charges from exchanges to core network will be good news for local loop unbundlers, but it is far from clear how bitstream-based ISPs, which still support a large part of the broadband user base in the UK, will be affected. It is possible that the gap between the LLU and bitstream cost bases will get wider.

Finally, BT's announcement suggests both urban and rural areas will benefit. This may be true in the long term, although it seems unlikely that there will be significant rural deployment for the £1.5 billion figure indicated. This raises a wider public policy question: What about the remaining 60 percent of homes?

BT states that it wants to work with local and regional bodies to focus investment, which makes sense. It is also consistent with recommendations in Analysys's report for the BSG on public-sector intervention in next-generation broadband. However, there may be an even greater role for the public sector in stimulating investment beyond the initial 40 percent coverage, and almost certainly a larger role for the public sector, compared with what happened with the initial rollout of first-generation broadband.

Comment by Matt Yardley, partner at Analysys Mason.

Broadband subs in Asia-Pacific to cross 170 million this year

Asia-Pacific's broadband subscriber base is expected to reach 171 million by the end of 2008, representing a year-on-year growth of 31.5 percent and a household broadband penetration rate of only 19.7 percent.

The surge in demand for broadband is driven by the growing popularity of video-on-demand, multiplayer online games, video content sharing and social networking services such as YouTube and Facebook, and the aggressive push by operators to offer innovative bundled triple- and quadruple-play services.

New analysis from Frost & Sullivan (http://www.communicationservices.frost.com), "Asia Pacific Broadband Access Technology and Market Comparison," reveals that the broadband subscriber base in the region — covering 13 Asia-Pacific countries — reached 129.7 million in 2007 and estimates this to reach 321.8 million by end-2013, at a CAGR (compound annual growth rate) of 19.9 percent (2008-2013).

The total broadband revenues in Asia-Pacific stood at US$28.1 billion in 2007. This is projected to reach a market size of US$42 billion by end-2013, growing at CAGR of 7.1 percent (2008-2013).

If you are interested in a virtual brochure, which provides service providers, vendors/ manufacturers, end users, and other industry participants with an overview of the Asia-Pacific broadband access technology market, then send an email to Sarah Lourdes at sarah.lourdes@frost.com, with your full name, company name, title, telephone number, fax number, and email address. Upon receipt of the above information, an overview will be sent to you by email.

The total number of broadband subscribers grew 19.2 percent in 2007, and household penetration rate stood at 15.2 percent. By 2013, the household broadband penetration rate is forecasted to hit 33.7 percent.

The top five Asia-Pac countries with the highest household broadband penetration rates in 2007 are South Korea (90.8 percent), Hong Kong (83.8 percent), Taiwan (76.8 percent), Singapore (73.1 percent), and Australia (63.2

percent). Japan has a 57.8 percent penetration rate, while the remaining seven markets have household broadband penetration rates of less than 50 percent. India and Indonesia registered the lowest penetration rates, at 1.4 percent and 0.57 percent, respectively.

"As fixed-line substitution and voice migration to mobile continues, broadband value-added services (VAS) become critical drivers for fixed-line service providers," noted Frost & Sullivan senior industry analyst Yong Lih Khoo.

"Operators are as such aggressively promoting attractive bundled and discounted price plans, encouraging migration from narrowband, introducing local content and innovative services such as IPTV, as well as overall improving service levels and affordability," he added.

The various government nationwide broadband master plan initiatives, particularly in the more-developed nations, are also providing the impetus for the deployment of wider network infrastructure and coverage, and the development of local broadband content and applications, thus driving broadband uptake.

In terms of broadband access technology, Khoo believes that a wide range of access technologies — FTTH (fiber-to-the-home), FTTN (fiber-to-the-node), FTTB (fiber-to-the-building), DSL (digital subscriber line), WiMAX and other wireless technologies — would continue to co-exist depending on the strategic outlook of the operators, existing infrastructure and price points in a given country.

He said, "FTTx in its various forms — FTTH, FTTB, FTTN — would play a significant role in the next three to four years due to its potential of providing greater bandwidth to the premise, compared to copper wires. Some countries like Hong Kong are already providing speeds up to 1Gbps, while other countries like Singapore are following suit.

"Deploying fiber as close to the home as possible enables operators to be future-ready for the bandwidth explosion that new services like multi-screen IPTV with recording and the concurrent high speed Internet needs," Khoo added.

"Although service providers are rolling-out FTTx, the profitability of new services like IPTV remains questionable as these deployments would typically have a long payback period," Khoo said, adding that in a credit crunch environment, most operators are likely to be cautious before deploying full-fledged FTTH although it is a future-proof technology.

"Hence FTTN would still be a more preferred option for low- to medium-density geographies like Australia and Malaysia," said Khoo.

In most of the developing markets, however, Khoo believes that basic DSL-based services would continue to drive the bulk of deployments, but are expected to face some competition from the various forms of wireless broadband technologies.

The "Asia Pacific Broadband Access Technology and Market Comparison" study is part of the Communication Services Growth Partnership Service program, which also includes research in the following markets: WAN services, enterprise mobility, IPTV, user-generated content (UGC), social networking, online and mobile content, telecom services, managed and hosted services, and network transformation case studies.

All research services included in subscriptions provide detailed market opportunities and industry trends that have been evaluated following extensive interviews with market participants. Analyst interviews are available to the press.

FTTH group studies usage

According to a new report from the FTTH Council Europe, improvements in broadband connectivity speeds are having a direct impact on consumer bandwidth usage, with demand per broadband home growing at almost 20 percent per annum over the last five years.

The research, undertaken with Ventura Team LLP, is believed to be the first of its kind to directly test the hypothesis of Nielsen's Law of Internet bandwidth against patterns of fiber and ADSL broadband usage in Europe.

Joeri Van Bogaert, president of the FTTH Council Europe, explained, "Everyone is familiar with Moore's Law for Computing, and Nielsen's Law takes a similar approach to measuring Internet bandwidth.

Whilst Moore sees computing power grow 60 percent annually, Nielsen states that the bandwidth available to a high-end user grows at 50 percent per year.

For the first time, we wanted to find out if this increase in available speed is true and is related to an increase in consumer demand and usage."

In summary, the FTTH Council Europe report findings are as follows:

- European broadband speeds are rising at 50 percent+ per annum;
- High-end broadband usage per home is growing at 20 percent per annum;
- FTTH broadband homes drive three times more traffic than ADSL in Europe.

The first part of the research tested Nielsen's Law from a technology perspective. It was found that a decade after it was first conceived, Nielsen's Law is still working well as a guide to the trend in broadband speeds, as the growth rate of 50 percent per annum held true for all European countries evaluated.

Secondly, the study tested Nielson's Law from a usage perspective, examining European broadband traffic patterns across a sample of 100,000 broadband homes using FTTH.

The results of this research show that high-speed broadband usage is growing at an annual rate of 20 percent.

To further qualify this growth in user demand for increased bandwidth, the study compared fiber broadband usage with ADSL across four European countries and found that fiber homes currently drive three times more traffic than ADSL homes.

Floyd Wagoner, of the FTTH Council Europe's Market Intelligence Committee that headed up this research, explained, "This rise in usage when fiber networks are in use is significant at this stage of market evolution. Already there is a large difference between the traffic used by ADSL and fiber users, and this despite the fact that many of the mass market applications that will realise the potential of fiber are not even available yet. We expect this to increase significantly as fiber adoption continues to increase across Europe and further services are developed with fiber in mind."

According to Van Bogaert, the message is simple: "When customers have faster connections they use them more. When discussing FTTH business cases and investments, two basic questions about bandwidth always arise: Who needs all that bandwidth and what will they use it for? I think the findings provide a compelling answer.

For example, despite the advancement in the motor industry, the average speed of today's modern car is actually under 30km/h, but that doesn't mean that the driver never exceeds this speed.

The same can be said for broadband usage; when the opportunity to utilise it to its full potential arises, consumers grasp it with both hands."

Study: FTTH favors incumbents

Definitive research released at the High Speed Europe conference is the first to analyze the business case of rolling out next-generation fiber networks across Europe.

The study, carried out by WIK, a European telecoms research and analysis firms, shows overwhelmingly that only incumbent operators, with their extensive infrastructure and customer bases, can profitably roll out high-speed fiber-to-the-home (FTTH) lines to large parts of Europe.

This raises the possibility that incumbents could once again increase their market share, reversing the trend towards more competition in telecoms.

The research, which was commissioned by the pro-competition group ECTA, covers six major countries (Germany, France, Spain, Italy, Portugal, Sweden) and combines results from these with independent research carried out for regulators, governments, and the OECD in other countries, which reaches a similar conclusion.

The WIK study demonstrates that, because of substantial economies of scale, replication of fiber access lines for high-speed services is not economically viable on any widespread basis.

The research shows that it is significantly more cost-effective for incumbents to roll out fiber networks than it is for entrant operators to do so. Incumbents can save up to 30 percent of their investment compared to standalone operators.

The three key reasons are that incumbents already own ducts on a nationwide basis; they can make substantial efficiency savings compared with their current network structure; and they already have the number of required subscribers that would pay for the investments simply

by switching customers from their existing lines. In some of the countries examined, significant viability was found for incumbents to roll out next-generation access networks even with a relatively conservative return on capital of around 10 percent, which is commensurate with returns made on today's regulated copper access networks.

Dr. Karl-Heinz Neumann, director of WIK, said, "Incumbents have accepted in principle the concept of open ducts, but this research clearly shows this is not enough.

Europe needs open networks and not just open ducts to generate a competitive environment and to develop an optimal degree of replicability and investment in a next-generation access environment. Dominant firms should construct their networks from the outset to foresee access. Open networks in a competitive next-generation access environment make good business sense and incumbents should improve their business cases by pursuing a positive attitude to infrastructure sharing and access."

Report: Bandwidth famine looms

An independent Global Bandwidth Study, commissioned by CIP Technologies, has revealed that the bandwidth glut is history and the world's consumers are facing a bandwidth famine.

Due to huge changes in network content and social behaviors, the bandwidth demand is set to exceed 160Tbps by 2010 — an annual demand that exceeds the equivalent of the combined broadband network usage of the previous decade (1998-2008).

The demonstrable explosion of consumers' use of online video and data services, which includes the BBC's iPlayer and YouTube, has seen the demand for Internet bandwidth soar. The BBC reported that over 21 million programs were requested on iPlayer in April 2008 alone, only four months after going live.

The author of the new independent study, David Payne, formerly of BT and now with the Institute of Advanced Telecommunications at Swansea University, has calculated that the increasing demands are not a temporary change in behavior, but the beginning of a massive requirement for additional bandwidth as the use of online video and data services increases.

Explained Payne, "Around the turn of the millennium, we used to talk about a bandwidth 'glut.' There was a lot of idle capacity. Networks now are being used in a way that few people foresaw, for example early take-up of personalised video, rather than broadcast television, dominating Internet video services. Based on a range of service scenario models, it is clear that demands for bandwidth will

continue to put increasing pressure on existing network infrastructures. By 2018, assuming that this capacity is made available by the operators; usage could grow to 40 to 100 times the levels seen in networks today. However it is difficult to see how operators can economically grow existing network architectures to meet this demand, and further consideration of the types of networks and the technology deployed is required if they are to ensure profitability.

"A significant investment is needed to ensure that businesses can share large files and send high quality images (for health, design and videoconferencing purposes) and home users are able to access and enjoy high definition Internet television (IPTV), on-line gaming and other services requiring large data transfers at high speed such as video-clip and image sharing."

David Smith, chief technology officer for CIP, said, "The Global Bandwidth Study demonstrates that current telecom networks will be unable to cope with the scaling demands for bandwidth. A step-change in technology is needed that can not only deliver this bandwidth demand at economic cost but also significantly reduce the amount of energy required to power and cool it. The current technology will be physically too large and energy-hungry to deliver the levels of bandwidth growth demanded by users. A new technology is required that will help deliver the bandwidth and support the telcos' challenge to reduce costs and their carbon footprint. CIP believes that photonic integration will be increasingly the way forward to provide the step change cost reduction per unit bandwidth necessary to economically meet projected demand."

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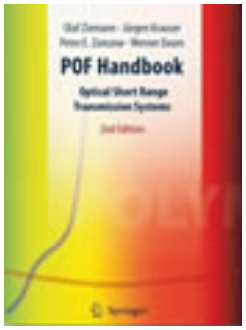

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Wednesday - August 20, 2008

Transmitter and Receiver for POF Systems
Olaf Ziemann, POF-AC Germany
- LED and laser for data communication
- Large area photo detectors
- Comparison of different wavelengths for POF transmission
- Coupling technologies for active components

Wed. AM Tutorial 9:00 a.m. - 1:00 p.m.

Large Core Diameter Optical Fibers
Olaf Ziemann, POF-AC Germany
- Polymer Optical Fibers, hybrid and glass fibers
- Standards for POF
- Optical and mechanical properties of POF
- Measurement techniques for large core diameter fibers

Wed. PM Tutorial 2:00 p.m. - 6:00 p.m.

Day 2: Passive Components and System Design
Thursday - August 21, 2008 Thu. AM Tutorial

Design of POF Systems
Olaf Ziemann, POF-AC Germany
- Review of published transmission systems
- Power budget calculation for POF systems
- Commercial available systems

9:00 a.m. - 1:00 p.m.

http://www.pof2008.com/westmeetseast/

Passive Components for POF
Karl-Friedrich Klein, FH Gie§en/Friedberg, Germany
- Connectors
- Attenuators, filters and mode converters
- POF surface preparation
- Measurement and calculation of connector losses

Thu. PM Tutorial 2:00 p.m. - 6:00 p.m.

Day 3: Test and Measurement, Environmental Tests and Status
Friday - August 22, 2008

Measurements on POF
Olaf Ziemann, POF-AC Germany
- Attenuation and bandwidth measurements
- POF-OTDR
- Climatic behavior and lifetime measurements

Fri. AM Tutorial 9:00 a.m. - 1:00 p.m.

Specialty Optical Fibers
Karl-Friedrich Klein, FH Gie§en/Friedberg, Germany
- Microstructured POF
- Silica glass and conventional glass fibers
- Fibers and light guides for power transmission
- UV fibers
- Specialty POF

Fri. PM Tutorial 2:00 p.m. - 6:00 p.m

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