Ethernet always wins

Public Ethernet

Ethernet always wins

One of the key issues facing network operators today as they move towards advanced, multi-service networks is the cost-effective deployment of a broadband access network. Ethernet is emerging as the leading access technology standard, because of its simplicity and cost effectiveness. As a consequence, Public Ethernet solutions are increasingly being seen as the ideal access solutions. This article will discuss why Ericsson is convinced that Public Ethernet is the way to go for residential, business, and metro access.

The main factors for choosing Ethernet are its low cost in terms of hardware and operation and the ease of installation and configuration. An important step Ericsson has taken to bring Ethernet closer to the residential

TIM SPRINGER

endusers is its Ethernet DSL Access (EDA) solution. This solution provides the classical ADSL services to the endusers. However, from the DSLAM to the operator backbone network it uses Ethernet for the data transport and not ATM as most other DSLAM vendors. This solution allows the operators to start profiting from the Ethernet advantages today without having to build an expensive (fiber) infrastructure. The change from ATM to Ethernet should help to make xDSL profitable. The further development of the EDA solution foresees an Ethernet over copper solution where also the last (or first) mile transport (from the DSLAM to the enduser) becomes Ethernet based. Public Ethernet will start in the Metro networks, e.g., Metro rings, but soon will find its way into the residential access networks. Ericsson's EDA solution is a very good starting point for all xDSL providers to start using Ethernet.

Broadband Market Overview

The broadband market worldwide is growing rapidly, driven by regulatory pressure, the necessity for operators to develop new revenue streams, the increasingly sophisticated demands of private and business endusers, and the competitive necessity to exploit these opportunities.

The growing needs for new forms of communication from households and businesses, plus the huge growth in enterprise data services, mean that copper local loop and the supporting SDH metropolitan networks are no longer the best solution. For the local loop, the revenue returns from traditional services like POTS voice is decreasing, while consumer demand for new services and applications is increasing. However, to provide these new services, like Virtual Private Networks (VPNs) and Video on Demand (VoD), and thus generate new revenue streams, a new form of access is required.

DSL is an alternative for the near future, for homes and small businesses connected to existing copper. But what about new network deployments, what about larger businesses with greater bandwidth needs, and what about the bandwidth needs of these homes and small businesses in the future?

For metro networks there is a similar problem. The SDH networks, which were designed for carrying vast quantities of voice traffic, are very inefficient for carrying the data packets that make up over 80% of the traffic carried today. Therefore, it is also time for a new form of metro access.

Today there are two main "pipes" into a home: twisted pair and coax (or hybrid fiber coax). In the next decade it is likely that there will be a single physical interface to the home: fiber. With its unlimited capacity, fiber to the home, building, antenna or curb (in general FTTx) will be able to deliver all existing and future "bandwidth hungry" services, but FTTx infrastructure requires a tremendous initial investment. Several Telco's have already made outlays in FTTx deployments. However, the new FTTx plants were built either on a very limited, experimental basis, or in expensive Greenfield developments. Many plans to build or expand new fiber infrastructures have been postponed until the market stabilises. Because virtually all Telco's are in the same wait-and-see mode, the competitive pressure to be first to market with fiber infrastructure is not apparent today.

On the other hand, endusers are very interested in bundled services because of technological and cost advantages. Endusers see significant advantages in dealing with a single entity for customer ser-

vice, receiving one monthly bill for all telecom services, progressive discounting, and several more. Recent studies have shown an increased demand for broadband services and the willingness of the consumers to pay for additional services. This presents a dilemma. Service providers must retain profitability by reducing costs, yet cannot ignore the revenue opportunities of bundled services. As a result Telco's have re-evaluated their strategies for delivering bundled services that add video and high-speed data to current telecom offerings. Until FTTx becomes reality bundled services are delivered over xDSL. However, so far xDSL has not been a viable technology for video services and, more importantly, xDSL has not been very cost effective.

Public Ethernet is now emerging as the key to unlock the potential of this immature market, and make broadband profitable. Simply speaking, a Public Ethernet system is a widely accessible network built on Ethernet standards extended across a larger metropolitan area or long-haul network. In effect, a cross between an enterprise Ethernet network and a PSTN.

Fig. 1. The network picture.

Why Ethernet?

Until now, much of the access network debate has focused on the challenges of building a suitable physical infrastructure, with particular regard to the financial implications. Although these challenges remain, equipment and installation costs are falling, and successful implementations worldwide have proven the suitability of fiber access solutions for broadband services. Today's discussions are concentrating on the choice of a transmission solution. Carriers and service providers want stable and future-proof solutions that are flexible enough for today's rapidly changing landscape. It is key, to balance investment in new equipment with the capabilities of existing infrastructure, and to stay one step ahead of market demand while building a foundation for future revenue generation.

Ethernet-over-fiber meets these requirements. Fiber meets bandwidth demand from video-rich applications, while Ethernet is the most cost-efficient technology to do the job. After 30 years of widespread volume usage in enterprise networks the price per performance ratio is superior and the technology is proven and well known. Prospects are growing
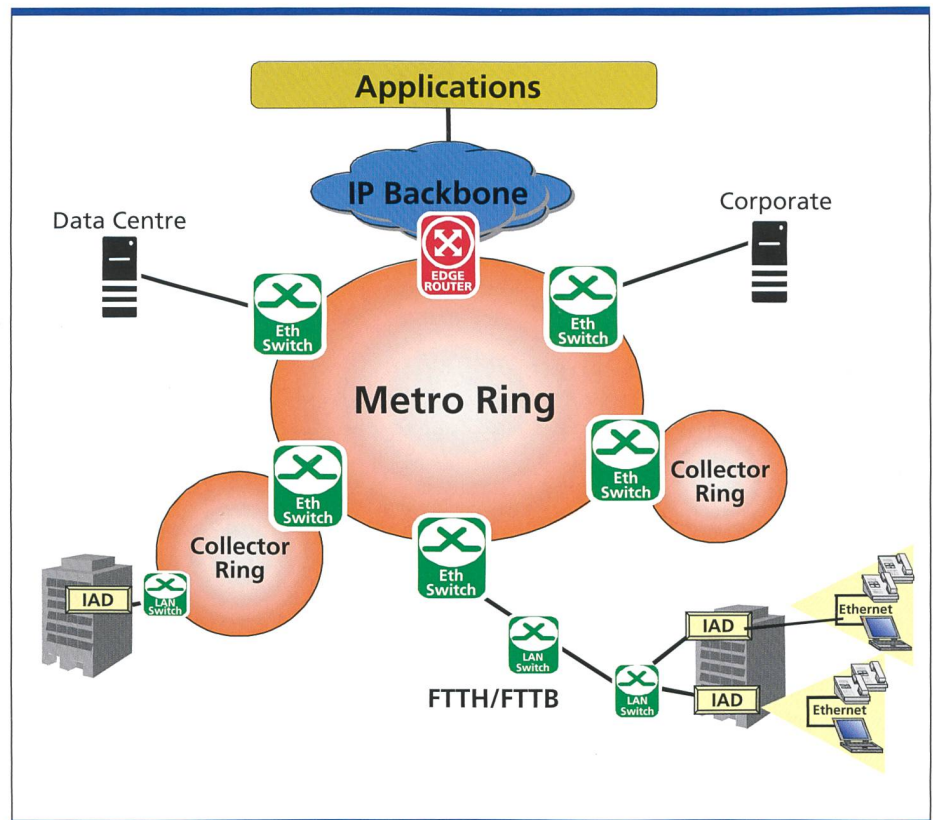
even better with the IEEE "Ethernet in the First Mile" (EFM) standardisation efforts that will be ready by 2003, securing interoperability and further reducing the cost of Ethernet access solutions.

The cost effectiveness of xDSL solutions may be significantly improved if the data transport is changed from ATM to Public Ethernet. For example, an operator, like Swisscom migrating from narrowband over a twisted pair connection, could implement an Ethernet-over-WDM solution in the metro network in combination with an Ethernet uplink from the DSL Access Multiplexer (DSLAM) in the access network.

The major benefit of Ethernet is its scalability, as opposed to fixed-speed connections. Users can order a bandwidth increase online and upgrade their connection at 10% to 20% of the cost of getting an additional private line, and all without any CPE swap-out inconvenience. An Ethernet connection will be approximately 30% cheaper than a TDM-based private line.

Access Technology

The traffic being carried over the access networks is primarily data traffic. Today the data traffic amounts to roughly 80%

and it is continuously growing. Also, the total amount of traffic on access networks is growing. Aggregated voice, data, and Internet traffic in the metropolitan areas alone is projected to grow enormously. The vast majority of this traffic originates on a LAN network of some form. The most dominant LAN technology is Ethernet; with at least 95% of LANs now based on Ethernet. In fact approximately 99% of the LAN ports shipped in 2002 were based on Ethernet. So if most of the traffic we want to carry is Ethernet based, surely the technology of choice for building these next generation access networks should be Ethernet. Also, if high capacity is what we require, then surely fiber should be the physical medium.

Why Fiber Ethernet?

While there is a wide range of access technologies available to choose from, Ericsson is focusing on Fiber Ethernet. Besides the fact that most of the

traffic starts on Ethernet there are many reasons why Fiber Ethernet is the best choice.

The argument for fiber as a medium in the metro area is fairly simple. Firstly, fiber offers unparalleled bandwidth capacity. Secondly, in the metro areas there already exists a vast amount of fiber. This fiber is already there in existing SDH metro networks and also over the last two years vast amounts of new fiber have been laid. For the local loop networks fiber also makes sense. For new deployments, fiber costs about the same as a new copper network but has all the capacity benefits. The bandwidth requirements for the residential and SME subscribers that would connect to this local loop are increasing by 60 to 70% per year and therefore will soon demand the deployment of fiber.

The main arguments for choosing Ethernet are its low cost in terms of hardware and operation and ease of installation and configuration. The CAPEX for Ethernet equipment for equivalent bandwidth when compared to SDH equipment is 6 to 10 times lower. However, lower initial equipment costs are not really enough, more important is that OPEX costs are lower. Also, OPEX-wise Ethernet is clearly superior to, for instance, SDH. The main reasons for this is that Ethernet networks can be upgraded in stages which enables "targeted" upgrades with little or no customer outages and without the need to change all interfaces. From forecasts it is suggested that Ethernet will be able to deliver one megabit of data 4 to 6 times cheaper than SDH. It is expected that within the next 5 years this Ethernet advantage will increase to be 20 times cheaper compared to SDH.

Finally, Ethernet is the transmission technology most closely tied with IP and while it is cost efficient, it also has many quality of service features that enable it to carry a whole range of services beyond the basic LAN traffic for which it was originally designed.

The Network Picture

The Ericsson network vision is a unified, IP-based, connectivity network with all users connected over some form of Ethernet ac-

Fig. 2. The Ericsson EDA solution.

cess. These endusers will, over this multi-service network, have access to a range of multimedia services, from a central service creation/selection platform. This Ethernet solution may involve the deployment of fiber right to the home or office, or may involve radio or copper as the last drop. In fact, we have developed an Ethernet-based DSL solution for this purpose. But, fiber is the ultimate solution and the only one that can supply the bandwidth required of the myriad of multimedia applications of the future. This network provides full service transparency, where endusers can access any service from any terminal at any time. This is what we call the "killer environment", which supports any service to any enduser. However, while it is the service platform that provides the services it is truly the Ethernet access that enables their cost efficient delivery to the endusers.

The challenge for the public access network is to deliver all services with a range of requirements on QoS, security, and bandwidths. For voice services no delay and no jitter 64 kbit/s, for personal video little delay and jitter for 256 kbit/s will do. For streaming high definition audio and video you need a very high bandwidth up to 20 Mbit/s and for security IP-VPN and filtered e-mail and www connections. Instead of a circuit in the POTS switched copper lines access networks these are tunnels in a public access infrastructure. These tunnels are managed from an edge node. The edge node is really the site of the old local exchange, and is a multi-service switch with a provisioning platform.

Ericsson's Vision

Optical distribution is the only future-proof solution to replace the copper infrastructure. Optical is expected to dive into significant price erosion, as installation costs are dropping and thereby triggering a huge market.

The perception that Ethernet is only used in the LAN is fading. The trend is that Ethernet will be used in all parts of the network. The IEEE 802.3ae standard specifies 10GE (Gigabit Ethernet), which is very attractive for metropolitan networks using full duplex fiber over 10–40 km links. This will leave ATM and SDH behind due to costs and scalability. Ericsson's vision with Public Ethernet Access is to deliver 100 Mbit/s Ethernet for the same price as today's ISDN. That is 1000 times (!) more bandwidth to deliver an explosion of new (broadband) services.

Ericsson has taken an important step in this direction with its Ethernet DSL Access (EDA) solution. This solution provides the classical ADSL services to the endusers. However, from the DSLAM to the operator backbone network it uses Ethernet for the data transport and not ATM as most other DSLAM vendors. This solution allows the operators to start profiting from the Ethernet advantages today without having to build an expensive (fiber) infrastructure. In addition the change from ATM to Ethernet will finally make ADSL profitable. The further development of the EDA solution foresees an Ethernet over copper solution where also the last (or first) mile transport (from the DSLAM to the enduser) becomes Ethernet based.

Ethernet First Mile Alliance

Ericsson is one of the founding members of the Ethernet in the First Mile Alliance. The Ethernet in the First Mile Alliance (EFMA) promotes Ethernet access technology and open standards that support multi-vendor interoperability. The collaborative project, involving leading infrastructure and service providers worldwide, supports the EFM standardisation work of the Institute of Electrical and Electronic Engineers (IEEE 802.3ah). Its overall aim is to expand the global market for Ethernet access solutions – not only through its support of standardisation efforts, but also through marketing, commercialisation and network deployments. For more information about the EFMA visit its web site at http://www.efmalliance.org.

The EFMA is convinced that Ethernet is efficient and cost effective and that its use in the First Mile access network will benefit subscribers, service providers and equipment manufacturers by combining the proven service functionality with the

benefits of the public network. The robust, well-known and simple Ethernet technology will play a major role in the deployment of fiber-rich, broadband access networks with improved capabilities.

Services

Customers are willing to pay money on a monthly basis for access service. For more than a hundred years this fee has been around $ 20 to $ 30 a month, so roughly "a dollar a day". On top of the (basic) access fee customers are willing to spend money on all kind of services. Examples are internet account, web browsing and chatting, watching pay TV, renting video or DVD, mobile SMS/MMS messaging, newspaper subscription, and POTS voice. This means "a dollar a day" access, and many more dollars for services. Now, if you could just bundle them all over your access medium.

It has been seen that, to offer no services above high speed access is not generally sustainable. But to offer the most advanced services today will not necessarily be profitable either. One of the keys to success is to deliver services in steps. Beginning with the more basic services, for which there is high demand today, and gradually rolling out new services as the demand grows and as people become more and more used to these types of services. Another key success factor is the bundling of services. Having the correct bundle of services is very important in both attracting and retaining customers. The Ethernet infrastructure is ideal for this kind of strategy due to the open service nature of Ethernet and the ease of allocating bandwidth-on-demand. One thing to be noted is that most of the services that we see as being successful are more communication-based services. These are the services that people are actually willing to pay for. While many in the industry are saying that content is most important, it has been seen that people are not so willing to pay for it. Therefore, the successful service providers will be those who complement the content with communication.

Summary

Thanks to the significantly lower component costs (CAPEX) and thanks to its simplicity in operation and maintenance (OPEX) Ethernet is seen as the ideal access solution. Although FTTx, and especially FTTH, requires major initial investments, it
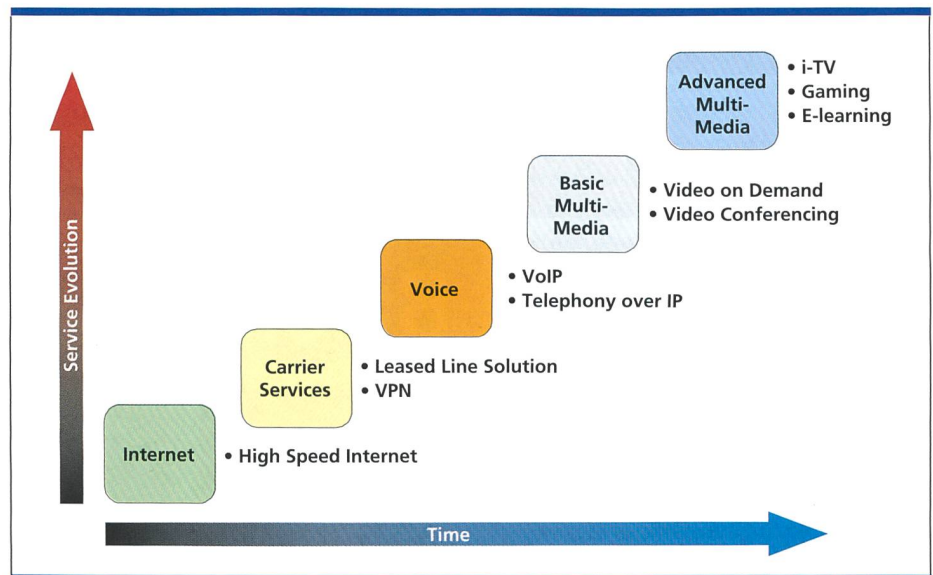

Fig. 3. Services.

is clear that optical distribution is the only future-proof solution to replace today's copper infrastructure. Besides the initial investment also the services that would need the bandwidth as offered by FTTH are not readily available. Only a bundling of different services, such as in the case of a "triple play" scenario (Telephony, high-speed Internet, and TV), would provide a sound business case.

Public Ethernet will start in the Metro networks, e.g., Metro rings, but soon will find its way into the residential access networks. Ericsson's Ethernet DSL Access solution is an excellent starting point for all xDSL providers to start using Ethernet in their access networks. In any case the clear trend is: "Ethernet always wins."

6

Dr. Tim Springer, *Account Manager Broadband, Ericsson AG, Bern, telephone 031 998 34 33*

Zusammenfassung

Public Ethernet

Die erheblich tieferen Komponentenkosten (Investitionskosten) und die Einfachheit von Betrieb und Wartung (Betriebskosten) lassen Ethernet als die ideale Lösung für den Teilnehmeranschluss erscheinen. Wenngleich FTTx und vor allem FTTH höhere Anfangskosten bedeuten, liegt auf der Hand, dass das optische Verteilnetz die einzige zukunftsträchtige Alternative zum heutigen Kupfernetz ist. Kommt hinzu, dass die Dienste, die auf die von FTTH gebotene Bandbreite angewiesen sind, nicht so bald verfügbar sein werden. Nur wenn man verschiedene Dienste bündelt – also etwa von einem Drei-Pfeiler-Szenario aus Telefonie, Breitband-Internet und TV ausgeht – , hat man einen brauchbaren Businesscase. Das Public Ethernet wird von den Metro-Netzen (Metro-Ringe usw.) ausgehend seinen Weg ins Teilnehmeranschlussnetz finden. So bietet sich die Ethernet-DSL-Access-Lösung von Ericsson den Anbietern von xDSL als idealer Ausgangspunkt für den Einsatz von Ethernet in ihren Anschlussnetzen an. Die bisherige Erfahrung zeigt: «Ethernet setzt sich immer durch.»