

IPX: The Second IP Revolution

with Foreword by Yankee Group

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FOREWORD BY YANKEE GROUP

A powerful trio of technology developments in the past decade is triggering a new wave of global transformation. The Internet Protocol as a digital communications standard combined with the increasing demand for broadband capacity and the game-changing economics of wireless networks are inciting a revolution whose impact will be far greater than the sum of these parts. Ultimately, it means that all of us will be connected to the things we care about.

Yankee Group has christened this the 'Anywhere' revolution because it is changing the role of location in everything we do as consumers and enterprises. Some truisms about Anywhere:

- Anywhere's scope will be massive, affecting all corners of the world and taking decades to fully unfold. Likewise, its impact will be massive, disrupting billion-dollar businesses and creating a near-trillion-dollar component of the global economy. We believe that it will dwarf previous technology revolutions. During this period, battles will rage over the role, architecture, financial support and rights of this Anywhere Network™.
- The fundamental change in consumer experience enabled by the Anywhere Network is the radical re-centering of experience around consumer discretion and choice. The past 15 years of technology-enabled consumer empowerment are a mere prologue to this shift; to date, this empowerment has forced consumers to operate within stovepipes of information, media and technologies.
- Anywhere services must be accessible to the end user without a significant delay no matter "where" they connect. For some services, such as communications, access must be instantaneous. For others, like Web-based content, access speeds should broadly match those the customer has come to expect in his or her home environment using broadband connectivity.

The burden of accomplishing this vision of Anywhere is distributed across the services ecosystem. Service providers cannot achieve it on their own. To deliver an immediate user experience, improvements will be necessary in devices, user interfaces, modem performance, content adaptation and network provisioning including peering arrangements.

Mobile service providers who wish to compete successfully in the Anywhere world will need to invest more into their service delivery environments to optimize them for the new reality of an evolving competitive landscape, fickle end-user demands, and a shift from communications only to converged communications, Internet, media and entertainment centric service strategies.

Anywhere dictates support for high-quality, secure connectivity for IP-based applications such as IM, FMC, presence, P2P, video, and Web 2.0 mash-up services. IP is both the present and future architecture for value-added services across the spectrum of fixed and mobile services. A new peering architecture will soon be required which goes a step beyond the traditional best-effort Internet for service delivery and we view an open and flexible IPX model for service exchange as part of the critical path to realizing this vision.

INTRODUCTION

Mobile IP-based services are central to future growth in an increasingly converged fixed/mobile telecoms industry. Service provider margins are under increasing pressure with the commoditization of voice and messaging, while a global economic downturn has impacted both consumer spending and operator investment. End-to-end delivery of innovative multimedia services however, calls for the inter-working of fixed and mobile networks and adoption of new business models. IP eXchange (IPX) provides an efficient commercial and technical solution to interconnection, management and billing of IP traffic—ensuring that person-to-person voice and messaging services are delivered securely over a private IP backbone, with guaranteed quality of service (QoS) and equitable distribution of revenues amongst the value chain.

LEGACY TELECOMS LANDSCAPE IN A CHANGING WORLD

The advent of IP Telephony (or 'Voice-over-IP') and the Internet represents the most significant industry shift to date and, while the majority of voice traffic is today generated via legacy circuit-switched networks, ultimately, VoIP will become the norm rather than the exception – shifting TDM traffic to packet-switched networks and opening up opportunities to extend communities and services seamlessly between the wired and wireless worlds, and vice versa.

For service providers, the creation of new revenue streams and the ability to differentiate services has become imperative. Mobile service providers have experienced phenomenal success with text messaging (SMS), but the proliferation of voice and messaging bundles has resulted in falling ARPU (average revenue per user). Meanwhile, fixed-line service providers have seen margins eroded by a combination of fixed-mobile substitution, intense competition from dynamic alternative telcos, and ISPs offering aggressively priced VoIP services.

Consequently, end user behaviour has altered irreversibly. The popularity of new person-to-person communications mediums such as text and instant messaging, online gaming and peer-to-peer file sharing has also demonstrated the potential for new IP-based services.

THE FMC CHALLENGE

Seamless and device agnostic end-to-end delivery of such services - the goal of Fixed/Mobile Convergence (FMC) - presents the biggest challenge, given that the current telecoms landscape comprises four disparate network access types:

- Public circuit-switched telephony networks (PSTN)
- Public packet-switched telephony networks (xDSL, FTTP, CMTS)
- Cellular networks (GSM, CDMA, UMTS and beyond)
- Fixed wireless networks (WiFi, WiMAX)

Each access network is based on a variety of standards, technologies and protocols. Public Internet, for example, employs 'best effort' technology that is unable to match the quality of service (QoS) delivered by circuit-switched networks for real-time applications such as voice. Similarly, IP Telephony over the public Internet suffers from issues such as latency, jitter and packet loss.

Fixed-line networks originally built for POTS (Plain Old Telephone Service) have evolved into multi-layered topologies combining both circuit- and packet-switched technologies to meet demand for higher-speed data services and increased capacity. Such networks have become increasingly costly to maintain and cannot match the flexibility, efficiency and scalability of modern packet-switched and next-generation network (NGN) architectures.

Mobile service providers now face a similar scenario, having introduced general packet radio services (GPRS) and third-generation cellular technologies (i.e. W-CDMA, CDMA2000 and beyond) employing a mix of TDM and IP to support higher-speed data services. A further challenge for mobile service providers is to replicate the levels of QoS and security inherent within the fixed-line (i.e. circuit-switched) domain. Other wireless access technologies, such as WiFi and WiMAX, are limited to providing local-area coverage and require reliable inter-connection with backhaul networks for transport of IP traffic.

Enabling service interoperability across fixed and wireless networks is arguably the greatest contributor to the delivery of true Fixed-Mobile Convergence (FMC – see Table 1). Consumers and business users expect the same functionality and availability of an application or service, regardless of the device and network employed. Meanwhile, network operators and service providers must find a way to manage their end-to-end delivery on a global scale, while ensuring, security, QoS and the equitable and sustainable apportionment of revenues between all members of the value chain.

Table 1: What is Fixed/Mobile Convergence (FMC)?

- FMC can be used in a number of contexts – from the combination of fixed and mobile technologies within the customer premises equipment/end-user device (i.e. broadband, cellular, PSTN and WiFi), to inter-working between fixed and mobile/wireless networks.
- FMC's key value proposition is in extending communities from mobile to fixed, and vice versa, enabling person-to-person communications via IP-based applications with the same functionality, regardless of the device or network employed.
- In a true FMC environment, it would be possible to make a video call from a 3G mobile phone to a PC, or access your online gaming account from your mobile and/or fixed-line phone.
- Effectively, FMC delivers all applications, to any location and device, thus increasing service availability to end users, making businesses more efficient, and providing increased revenues for network operators and service providers.

THE CAPEX CONVERGENCE CONUNDRUM

Competitive pressures continue to mount and established service providers risk losing control of the value chain as Web-based players enter the telecoms domain and change the rules of engagement. Not surprisingly, IP-based modernisation programs are already underway within fixed incumbents (PTTs), local exchange/independent operators (LECS/ILECS) and mobile operators. The key drivers are:

- Cost efficiencies—in both future CAPEX and OPEX requirements
- Ongoing standardisation around SIP (Session Initiated Protocol), IP Multimedia Subsystem (IMS) and NGN
- The ability to support IP-based multimedia services on top of voice
- Simplified management and delivery of services
- Improved time-to-market

Each service provider's circumstances may vary dramatically according to factors such as legacy infrastructure, replacement cycles and market focus. However, irrespective of the investment required, the simple fact is that for established players, TDM is getting more expensive to run than IP. The general consensus is that NGNs will not replace existing networks. Rather, NGN projects will see expansion of transmission speeds and capacities to augment existing service delivery mechanisms, while growing the installed user base.

According to the ITU (International Telecommunication Union), NGN migration and investment strategies typically start with five currently separate networks based on TDM (PSTN, IN, SS7, Mobile, Data ATM/IP) and entail:

- Migrating to single IP-based NGN at core segment
- Migrating to IP-based NGN at edge and access segments
- Incorporating partial pre-IMS open service architecture
- Incorporating full end-to-end IP mode with IPv6
- Implementing full IMS functionality

“As commoditization continues to impact ARPU, there is a definite requirement for service providers of every tier and type to control cost.

Moving to an IP technology to peer lowers cost significantly by removing the need for multilateral agreements between operators.”

Yankee Group

THE PATH TO IP AND THE IP EXCHANGE (IPX)

Convergence of applications, devices (dual-mode phones) and networks is taking place globally, albeit at varying levels. Some markets are only just starting to embrace mobile data services, whereas others are looking to launch into all-IP rollouts that can support:

- SMS & MMS (IP based)
- IM
- Push-to-Talk over Cellular (PoC)
- Rich Communications Suite
- Video Sharing
- Video Calling
- Presence and Group Management
- Other services based on SIP/IMS
- Voice (packet-based)

The creation of such services is the catalyst for migration and, although there will be much transference between circuit-switched and IP in the interim, the latter will inevitably become the dominant form of traffic. Currently, interconnection of IP is optimised for the public Internet, with service providers unable to distinguish between voice and data services or guarantee quality connectivity.

Traditional telecoms interconnects are based on bi-lateral contracts or the purchase of wholesale capacity, and the sheer volume of agreements, access mediums and applications is becoming unmanageable. A private network for the transport of IP Telephony and other real-time/conversational person-to-person applications is required because:

- Service providers want to offer managed services they can charge for
- The paying subscriber demands high-quality service
- True IP applications require a managed network with classes of service

THE ACCESS/APPLICATIONS DIVIDE

The IP Exchange (IPX – see Table 2) bridges the access/applications divide by enabling the secure transport of any kind of application/rich media, between any type of access network, with varying levels of QoS:

Table 2: What is IP Exchange (IPX)?

- IPX provides a gateway to a global managed IP network supporting end-to-end QoS and the principle of cascading interconnect payments.
- The GSM Association (GSMA) completed IPX specifications in 2006 and the first phase of trials of packet voice services over IPX-enabled networks completed in 2007. Further trials are ongoing.
- The IP Interworking Alliance has been formed to provide an environment whereby stakeholders from mobile operators, fixed operators and carriers can agree to technical specifications and commercial templates for the IPX, which will facilitate the global interworking of IP services.

For service providers, the key benefits of IPX include:

- End-to-end QoS, enabling consistent and predictable service delivery between end users
- Prioritisation of time-sensitive applications over less demanding services
- Service Level Agreements (SLAs) apply from end-to-end across multiple IPX segments
- Full route traceability and connectivity between 'trusted' entities
- Fair remuneration to all members of the value chain
- Universal service interoperability (across access networks)
- Single connection and commercial agreement for global reach

The major challenges for IPX are:

- Reconciling current mobile and fixed service provider business models (IPX introduces a more transparent pricing model unfamiliar to fixed service providers)
- Fixed service providers may be tempted to continue using the public Internet for its low cost base rather than embracing IPX for its quality and security
- Efforts by mobile service providers to orchestrate FMC delivery via IPX may be in vain if web-based service providers conquer that market before the mobile service providers are ready

EXCHANGE EVOLUTION

As the name suggests, the GPRS Roaming eXchange (GRX) was developed to facilitate the roaming of GPRS data. The 'hubbing' model then evolved to enable mobile service providers to extend international MMS and SMS to the full GSM community and beyond. Developed by the GSMA, hubbing delivers major operational and financial efficiencies to mobile service providers by removing the need to establish bilateral inter-working agreements with each and every service provider for the exchange of multimedia and text messages. Service providers only have to connect once to a hub to reach all the other networks connected to that hub and to that hub's peers.

Just as these hubbing mechanisms broke significant ground in simplifying a more connected global mobile environment, so too will the IPX. IPX extends the GRX concept by enabling connectivity for fixed and other alternative/wireless service providers, allowing these service providers to interconnect in a much more open and flexible environment – as highlighted in the table below.

Table 3: GRX vs. IPX	
GRX	IPX
• Mobile operators only	• Fixed and mobile operators, content and application providers. Primarily data roaming.
• Primarily data roaming	• Primarily international person-to-person traffic, e.g. MMS, Packet Voice, Instant Messaging
• Simple network SIA	• Primarily international person-to-person traffic, e.g. MMS, Packet Voice, Instant Messaging

Not only is comprehensive SLA functionality now possible, the open environment also enables new business model opportunities, based on specific service and destination criteria. Combining such flexibility - over and above volume-based pricing—with end-to-end QoS for roaming and interworking (currently not supported by all GRXs), is a significant step forward.

BUSINESS MODEL INNOVATION

The most challenging aspect of Fixed-Mobile service interoperability is in reconciling the traditional business models of the fixed and mobile domains. Fixed/broadband Internet is largely based on a monthly connection fee and access to 'free' (i.e. ad-sponsored) services and applications. Mobile providers still have a tighter grip on the value chain, and want to avoid the 'bit pipe' scenario, e.g. customers using their Skype service from their iPhone; they need a managed environment in order to meet their subscriber quality service level obligations. IPX will give fixed and mobile service providers the means to combine quality services with the flexibility to agree on the right business models for each one.

THE CORPORATE OPPORTUNITY

An increasingly strong market for IPX is the provision of VPN services to multi-national corporations (MNCs) as a managed service—delivered by service providers.

For example, the IPX would afford those mobile service providers with fixed network assets (i.e. LLU and DSL) the opportunity to create MPLS IP-VPN services, and offer connectivity to MNCs as an international, private corporate network proposition.

The important aspect here is that IPX would enable mobile service providers to compete with established operators in this market, but differentiate their service offerings with a strong emphasis on mobile connectivity and FMC.

One specific application is the provision of hosted database services. The centralisation of IT and network resources is a key driver of this model. With many organisations now implementing highly-intelligent CRM and ERP systems that require frequent database queries, reliable and secure connectivity from remote sites will become increasingly business critical. Historically, such connectivity has again been provided via the public Internet, yet IPX will deliver a service that is far superior—providing a managed, trusted and secure alternative.

The service provider will be ideally positioned to act as the gateway into the IPX, while the IPX provider could host the centralised database on behalf of the end user. Alternatively, MNCs could continue with their existing corporate VPNs, but use IPX to build a more secure layer of connectivity above these services, and provide senior management with hierarchical access to sensitive data.

"Mobile operators get the opportunity to work with partner networks to offer international IP-VPN services over the IPX, to business customers.

It is not likely that such service offerings will compete with established players in the market for global IP-VPN corporate networks, but there certainly are specific opportunities that mobile operators can focus on. For example, post order tracking systems to enable secure fixed and mobile remote access to centralised database applications."

Paul Hodges
Executive VP
International Services
CSL Limited

“The crux of the battle lies in reconciling the established (and one-sided) operator model with that of the ‘free’ and open (two-sided) approach of the Internet. IPX has the potential to sit in-between these and ensure revenues generated by real-time IP sessions continue to flow via the networks, while allowing service providers to maintain their position in the value chain...”

Yankee Group

BRIDGING THE IP DIVIDE

The use of IP in the core network is prevalent amongst mobile service providers migrating to 3G and beyond, and service providers looking to realise operational efficiencies, improve time to market, and support new multimedia services. Incumbents have been slower to make the transition, given their substantial legacy investments, but many have an NGN strategy in place, and rollouts have commenced in markets such as Hong Kong and the UK.

Nevertheless, IPX and the emergence of a two-tiered Internet is a self-fulfilling prophecy. Critics may argue that a private Internet will stifle innovation and will only benefit service providers, but this is simply not the case. The different interconnect models employed by the public Internet and circuit-switched networks will continue to co-exist in the IPX future, with fixed service providers using the public Internet for the low-cost transit of data services.

In being key to inter-working, the role of IPX in delivering FMC is significant. Quite simply, any service provider looking to carry IP Telephony traffic and other real-time applications globally, with circuit-switched levels of QoS and reliability, will require IPX.

IPX: TODAY + TOMORROW

THE ANALYST PERSPECTIVE: YANKEE GROUP

A global IP network will be an important element in realising Yankee Group's 'Anywhere' vision – a technology ecosystem for users to interact with and personalise any application from any location, on any device, at any time. Although such a model creates new revenue opportunities, it also raises two key questions:

- How can service providers maintain sustainable profitability?
- What strategies will help service providers maintain their position in the value chain?

From a technology perspective, IMS is challenged in delivering on this promise, but the fact remains that in an all-IP world, network operators will need to differentiate based on levels of service, and the ability to serve real-time, session-based applications that cannot be delivered effectively over the unprotected and open Internet.

As commoditisation continues to impact ARPUs, there is a definite requirement for operators of every tier and type to control cost. Moving to an IP technology to peer lowers cost significantly by removing the need for multilateral agreements between operators. However, there are a number of challenges faced in getting all members of the value chain onboard:

- The value proposition for service providers will largely be focused around churn reduction and extending brand acceptance, given that consumers have come to expect IP services for free
- Fixed-line next-generation rollouts have slowed considerably as a result of cost cutting, landline loss (to mobile), and lack of business case for replacing legacy switches
- Business users making IP investments have been reluctant to break away from the PSTN completely, while fixed/mobile convergence (FMC) is not a priority

It is clear that the mobile community, and specifically the GSM community, will drive migration to IPX from current GRX networks. Success will ultimately hinge on buy-in from fixed-line and alternative operators, while a further set of stakeholders to take into account are OEMs of CPE—whether of devices or call control servers.

The crux of the battle lies in reconciling the established (and one-sided) operator model with that of the ‘free’ and open (two-sided) approach of the Internet. IPX has the potential to sit in-between these and ensure revenues generated by real-time IP sessions continue to flow via the networks, while allowing service providers to maintain their position in the value chain by understanding the profile, presence and value of the subscriber, and leveraging these properties in conjunction with brand and quality of user experience.

The main difference however, will be that devices are more open, and the networks more standardised. Meanwhile, the IPX dynamic for business-class services is that operators can offer something much more robust, secure and private than the open Internet – whether for FMC, or integration of an IP Telephony/VoIP platform with other line-of-business applications.

“By providing a trusted gateway between service providers, and corporations and content/application providers, the IPX opens new markets.

Operators will be able to offer enterprise customers a high-performance and secure private IP backbone for connectivity to centralised databases.”

Sybase 365

THE VENDOR PERSPECTIVE: SYBASE 365

Commentary from: William Dudley, Group Director, Product Management

Michel Van Veen, Group Manager, IPX/GRX/MMX Product Marketing

IPX migration will gather momentum in 2010, driven primarily by the requirement for the transit of IP Telephony. Operators in Europe and, to a lesser extent in North America, will be the early adopters, using IPX to improve network performance over long-haul connections (i.e. reduce latency), while negating the need to convert traffic between IP and TDM.

Person-to-person (P2P) applications – such as instant messaging (IM) & presence, chat and video calling – will follow, with mobile operators already implementing the enabling technologies. Although it will take some time before the required handsets achieve mass market penetration, IPX will be essential in supporting longer-term growth in these applications.

However, time is not necessarily on the operator's side. A consortium of companies including Skype, Microsoft, Google and Yahoo has started to put pressure on the EC (European Commission) and the FTC (Federal Trade Commission - US) to force mobile operators to open up their networks and allow all web applications, like Skype VoIP from the iPhone.

Mobile operators have a window of opportunity to define their own services across IPX, but the development of having to allow access to existing web-based services is clearly a great threat.

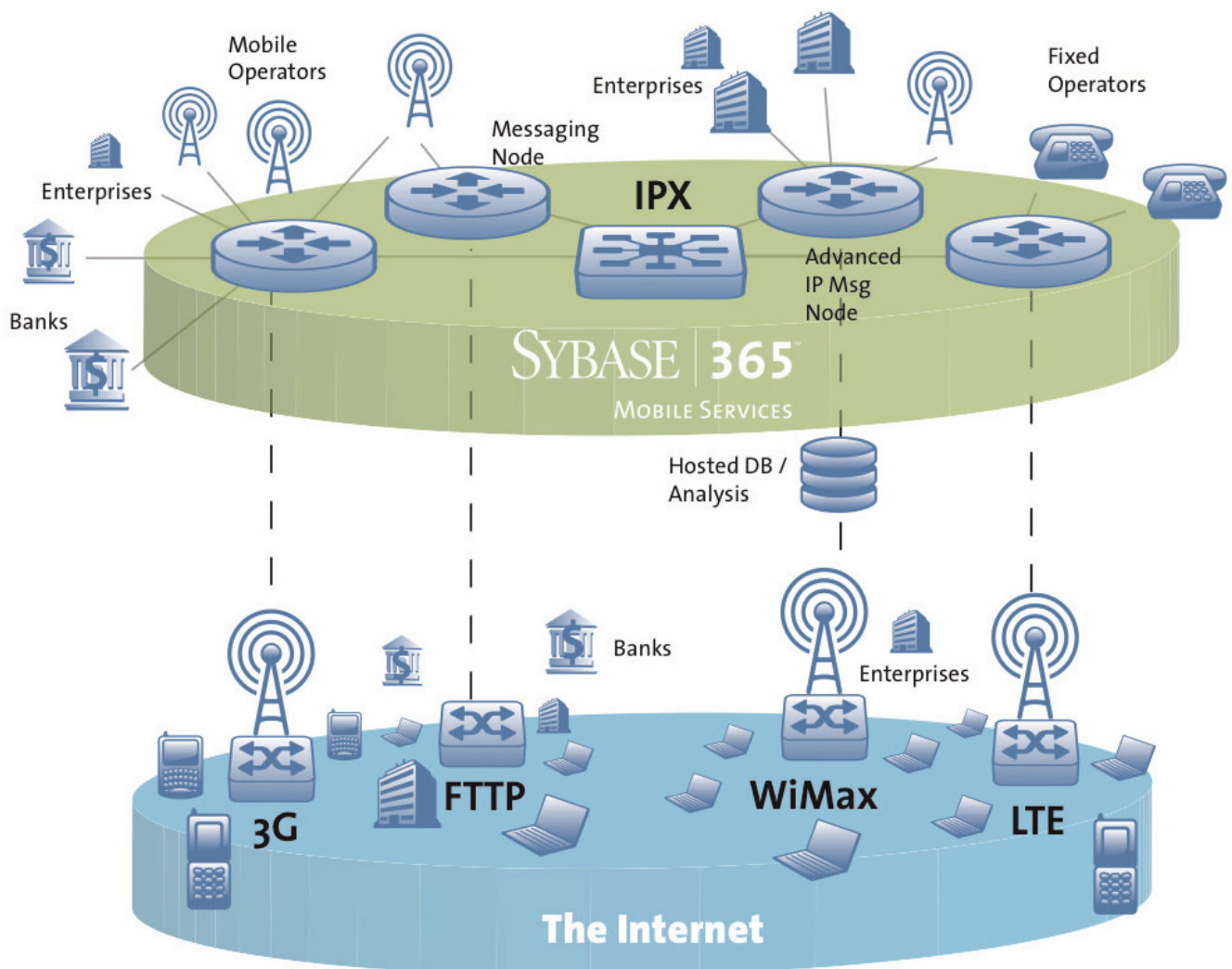
It is likely that the current economic environment will impact adoption of IP services as operators delay their next-generation network investments, and end users look to get more mileage out of their current devices. For service providers, IPX will deliver economies of scale while supporting fixed / mobile convergence. Current voice signalling and messaging traffic for example, will ultimately be transitioned to IPX to realise cost efficiencies.

In addition, by providing a trusted gateway between service providers, and corporations and content / application providers, the IPX opens new markets. Operators will be able to offer enterprise customers a high-performance and secure private IP backbone for connectivity to centralised databases. Certainly, there is the opportunity for mobile service providers with a strong presence in the business market to extend their portfolio and grow revenues using this approach.

Crucially, the IPX-centric ecosystem establishes a second tier of Internet over and above the 'best effort' employed by the Public Internet. This 'Internet 2.0' paradigm enables the concept of equitable payments between all stakeholders in the value chain, while ensuring the service quality and guaranteed delivery that are vital to the success of time-sensitive P2P applications.

Diagram 1: IPX is a Flexible Ecosystem

This diagram outlines the view that IPX will likely take. IPX can enable enterprises and hosted solutions to utilize a high QoS environment and support a variety of services across both fixed and mobile operators.



"The purpose of IPX is to provide a secure, high quality environment for services that are chargeable to the parties in the system. Things like free movie downloads or simple web browsing will stay on the Public Internet. These two worlds can co-exist."

**Paul Hodges
Executive VP
International
Services
CSL Limited**

THE OPERATOR PERSPECTIVE: CSL LIMITED

Commentary from: Paul Hodges, Executive VP International Services

Consensus in the market is that IPX will initially be used for Packet Voice interconnectivity between mobile carriers, replacing TDM technology. Although initial trials organized by the GSMA were primarily run by European operators, it would seem that Asia will be the market where Packet Voice will take off first - probably as soon as early 2010. New IP-based services will start to contribute to IPX volumes once mobile operators have introduced IMS into their networks and have launched new services. What will be critical is the adoption of the next generation handsets by the business and consumer market that will enable those services to users.

FMC's key value proposition is in extending communities from mobile to fixed, and vice versa, enabling person-to-person communications via IP-based applications with the same functionality, regardless of the device or network employed. The demand is definitely there because it does not make sense at all that common services only operate within their fixed or mobile island. You cannot explain to the average user that he cannot make a video call from a webcam PC, to a 3G handset, or that SMS and instant messaging (chat) have nothing to do with each other. People are right when they say that this should all be possible. All it takes is an appropriate regulatory framework, technology and standardisation.

Communication has moved from being a luxury to being a necessity of life from both a social and business perspective. What may possibly be impacted in the current macro economic environment is the development of new services, where major investment in new technologies is required. However, the current economic climate also offers an opportunity for IPX: one of the main drivers for Mobile Operators to migrate voice traffic from TDM to Packet Voice across IPX is cost reduction.

Mobile operators get the opportunity to work with partner networks to offer international IP-VPN services over the IPX, to business customers. It is not likely that such service offerings will compete with established players in the market for global IP-VPN corporate networks, but there certainly are specific opportunities that mobile operators can focus on. For example, to enable secure fixed and mobile remote access to centralised database applications – post order tracking systems are an example that spring to mind.

The purpose of IPX is to provide a secure, high quality environment for services that are chargeable to the parties in the system. Things like free movie downloads or simple web browsing will stay on the Public Internet. These two worlds can co-exist.

ABOUT SYBASE 365

Sybase 365, a subsidiary of Sybase, Inc. (NYSE: SY), is the global leader in enabling mobile information services for mobile operators, financial institutions and enterprises. We provide our customers with the widest offering in SMS, MMS and GRX interoperability, end-to-end mobile commerce solutions, innovative text messaging, mobile marketing and content delivery services. Sybase 365 processes more than one billion messages per day, reaching 800 operators and 3.4 billion subscribers around the world.

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