

ISDN to IP Migration:

Turning a necessity into an opportunity for the global communication's industry

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Customer White Paper



The combined pressure of market demand for low-cost, high-speed communications, obsolescence and the cost of maintaining legacy ISDN based networks and increased competition from an aggressive ISP sector is forcing incumbent carriers to accelerate plans for a phased transition from ISDN to an IP based infrastructure. How and when the communications industry responds to this growing pressure will ultimately determine the success of the individual players. For ILECs who are slow to react to this major technology shift the future outlook is for continued erosion of their traditional voice based revenues as the more agile CLECs are able to offer commercially attractive, bundled voice and data services to entice their existing customers.

Having invested heavily in their ISDN infrastructure and support systems, incumbent carriers in particular now face the challenge of finding the optimum technical solution that can meet the short term market requirements, provide the platform for the long term development of their businesses and, at the same time, maximize their substantial network investments.

OneAccess is a major provider of multi-service access router technology to the global telecommunications industry. Operating as a strategic technical partner to the majority of European carriers and ISPs, OneAccess' advanced IAD devices are enabling the communications' industry to streamline the ISDN to IP transition process and ensure that ILECs and CLECs are able to deliver competitive unified communications services for their customers.

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1. INTRODUCTION

For most network operators, if they have not already begun the transition, there is increasing pressure to migrate their legacy ISDN infrastructure to one based on an all-IP technology. With equipment obsolescence and the high cost of maintaining and supporting a rapidly aging technology, combined with the threat to their traditional revenue streams most incumbent carriers are either planning or executing the replacement of their ISDN services to business customers.

However, in many regions there is still a significant demand for ISDN services, particularly from enterprise level customers who have invested in ISDN based PBX systems and are not yet ready to move to a VoIP platform. For ILEC's the challenge is how to maintain this important revenue stream while transition to the next-generation network, IP environment.

Most operators have deployed the same core technologies to build out their infrastructures but there is a wide variation in the way the networks have been architected to meet local market requirements. Typically the carrier networks have been built utilizing some combination of ATM/TDM protocols to provide POTS and ISDN services, with broadband services delivered via DSLAMs located in the local exchange or central network. But exactly how the technology has been rolled out by the individual carriers will greatly depend on a variety of technical, commercial and regulatory factors specific to the operator's geographic coverage area.

This means that every carrier needs to engineer an ISDN replacement solution which is not only tailored to their core network topography but reflects the specific key drivers of change applicable to the individual carrier. In many cases the primary motivational factor is internal as the business, and in particular the infrastructure team, looks to reduce operational costs. In others, the pressure is greatest from the business development teams, who are struggling to retain or grow their revenue streams in the face of competition from IP based service bundles delivered by aggressive competitive operators.

A number of European operators have recognized that this transition represents an opportunity to deliver both operational cost savings, and create a platform for their nascent managed services portfolio, particularly VoIP and video conferencing as businesses also look for cost and efficiency benefits offered by a unified approach to their communications requirements. Whatever the reasoning, the problem ultimately rests with the engineering teams to solve; at least the issue of cost combined with the requirement to deliver a service platform capable of supporting a range of current and future IP based business services to underpin the long term success of the company.

The aim of this white paper is to provide a better understanding of the opportunities and challenges facing the communications industry as the result of the once in a generation change and to demonstrate how OneAccess is currently supporting many of the world's leading operators to ensure the process results in the maximum RoI for all the stakeholders in this process.

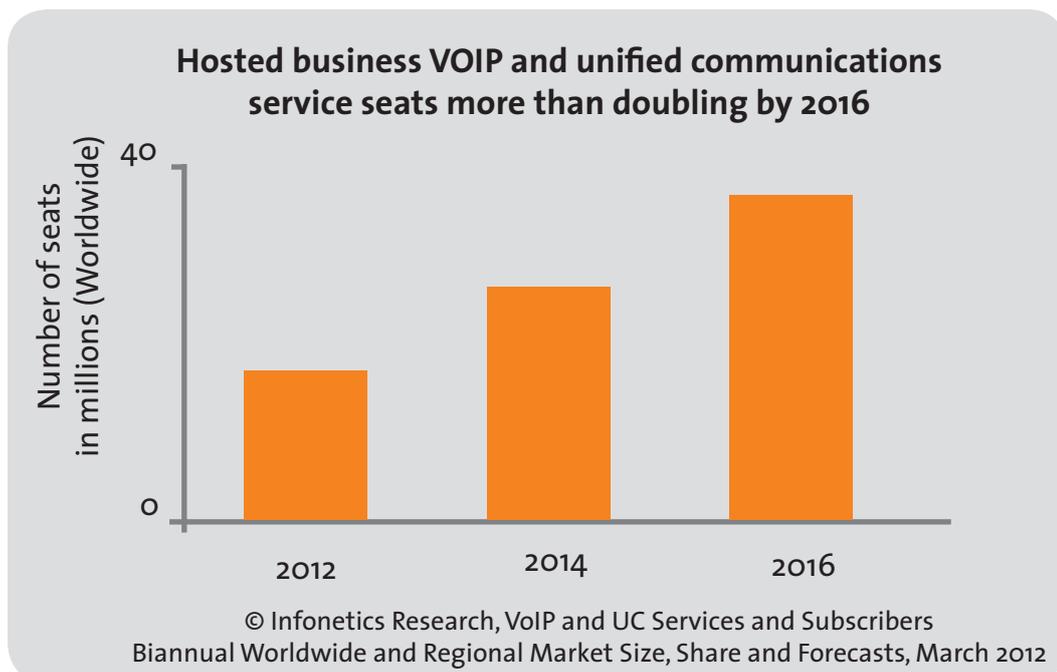
2. MARKET OVERVIEW

Carriers are facing increasing demand for faster, cheaper and more flexible services both from their residential and business customers, with exponential growth rates forecast in VoIP, video and Internet connectivity for at least the next five years. Whilst there are some significant regional variations there is a consensus amongst the main industry watchers that residential and small business subscribers will continue to be the largest sector of the market but with the highest growth coming from the business segment.

In the current economic climate many businesses have begun to re-evaluate their entire IT and communications infrastructure in the search for cost savings without sacrificing core features and functionality. This has led to widespread re-evaluation and replacement of legacy phone systems with the latest in VoIP technology, including hosted and managed IP-PBX services and SIP trunking, with global revenues in this sector alone forecast to exceed \$20billion by 2015¹.

2.1 VoIP Market Highlights

- Global service provider revenue from business and residential/SOHO VoIP services totaled nearly \$58 billion in 2011, up 16% compared to 2010.
- The number of seats for hosted business VoIP and unified communications services is forecast to more than double between 2012 and 2016.
- SIP trunking service revenue jumped 128% in 2011.
- Hosted PBX and UC service revenue went up 33% and seats up 44% in 2011².



¹ ABI Research

² Infonetics Research

2.2 The Impact of Cloud and Mobile Communications

While replacement of legacy voice systems is a key factor in the massive growth in IP traffic other technology and service innovations, particularly in the Cloud and mobile device sectors, are not only major contributory factors but are also revolutionizing established office-based business practices. This shift towards an anywhere, anytime requirement for high speed access to applications and data means that businesses are looking for integrated triple and quad-play services from their Telco partners to cover their fixed-line, internet and mobile requirements in one bundle.

As a result of this trend it is forecast that the number of devices connected to IP networks will be nearly three times as high as the global population by 2016, with each of us having three networked devices generating 15 gigabytes of IP traffic, an almost 400% increase compared with 2011.

Overall, business IP traffic is expected to grow at a 22% CAGR over the next 5 years driven by increased use of mobile or fixed business internet services and adoption of advanced video conferencing in the enterprise segment. In particular, use of Web-based video-conferencing is expected to grow faster than average business video-conferencing, at a 45% CAGR over the same period³.

Fixed-Mobile Convergence

Demand for FMC and related femtocell technologies is rapidly gaining momentum with 61% of operators already offer femtocell and FMC services to enterprises according a 2011 Infonetics survey, a further 29% plan to offer the services in 2012, and the other 10% by 2013. Driven by the global adoption of smartphone and tablet devices the market for FMC is set to explode from 2012 and achieve 100% CAGR to reach \$2.98Bn by 2015⁴.

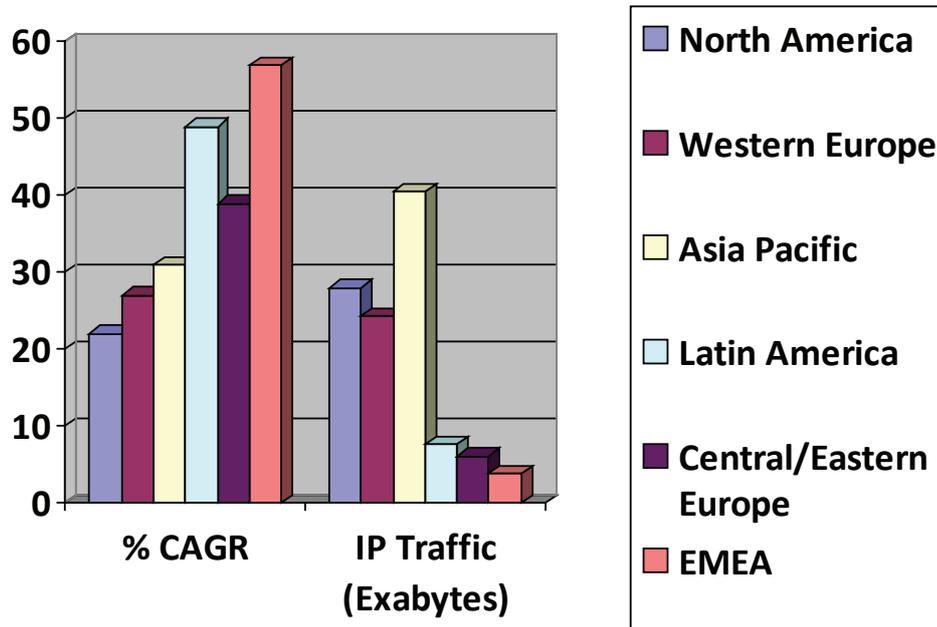
As a consequence of this trend a growing number of operators are offering free femtocells to their consumer subscribers, including SFR France, Softbank in Japan, and Cosmote in Greece.

2.3 Regional Factors

The rate of adoption of business IP-based services shows some considerable regional variations reflecting the maturity of the market as well as the specific competitive and regulatory landscape in different regions. Although IP traffic is growing fastest in the Middle East and Africa, followed by Latin America, the Asia Pacific region represents the biggest sector by volume and revenues, with North America and then Western Europe in second and third position.

³ Based on a summary of analyst projections including SNL Kagan, Ovum, Informa, Telecoms & Media, Infonetics, IDC, Frost & Sullivan, Gartner, ABI, AMI, Arbitron Mobile, Ookla, Strategy Analytics, Screen Digest, Parks Associates, Yankee Group, Dell'Oro Group, Synergy, comScore and Nielsen.

⁴ Infonetics 2011



While carriers in each of these regions face a range of challenges and commercial pressures to provide the platforms needed to support the demand for IP based services, the lack of competition and the fact that the traditional Telco's are still able to leverage significant RoI from their existing infrastructures are contributing to the delay of investment decisions in some countries. However with many of the core technologies that form the carrier backbone approaching end-of-life status, the emphasis for these laggard carriers is very much on the word "delay". Sooner or later the RoI calculation will go into reverse as the cost of maintaining legacy systems becomes unsustainable, forcing operators to start the migration to an all-IP network.

3. FORCES FOR CHANGE

As discussed in previous sections, the multiple pressures for changing to an all-IP, next-generation network means that many of the major carriers are either at early stages of transition or have already begun to launch their integrated services packages to their customers. However there remain a large number of operators who are still evaluating their options, particularly in regions where the market has either not been fully deregulated or does not represent a large enough business proposition to attract interest from the ISP sector.

3.1 Increasing cost of maintaining obsolete technology

Where operators have little direct competition the immediate pressure to make IP infrastructure investments is significantly reduced. However these carriers have to face the prospect of gradually decreasing margins as the cost of maintaining their ISDN/legacy systems accelerates year on year. In some cases the core networks are based on technology that can be over 20 years old, which, apart from becoming more likely to be a point of failure in the system, can be difficult to maintain or replace as support from the original vendors is gradually withdrawn.

3.2 Declining ISDN knowledge and expertise

As well as the rapidly aging technology itself, carriers who are still to begin the transition will also need to consider the inevitable decline in their in-house knowledge and skills base. Today's breed of telco engineers are leaving colleges and universities with a new skill-set compared with the generation responsible for building and supporting the current ISDN based infrastructures. In addition to planning for the phased transition of their core networks, carriers also need to plan for the transition of the human resources needed to support the new systems and avoid the increased cost of migration in the future.

3.4 Protecting future revenues

Innovative Cloud services, Web-based video conferencing and universal employee Internet access are all forecast to grow at double digit rates for at least the next 5 years, before stabilizing at annual multi-billion dollar levels from there and into the foreseeable future. For carriers this represents a massive opportunity to not only add new revenue streams and increase ARPU but, if intelligently exploited, can also help to protect their customer base from the threat of churn in the future as new competitors enter the market.

3.5 Saturation of street cabinets

Move to all IP needs equipment to be installed close at the premises. In many cases street cabinets are fully occupied and therefore ISDN needs to be moved out before any new equipment can be installed.

4. MIGRATION OPTIONS

Network architecture, financial constraints, local market conditions and future revenue projections dictate that each operator needs to develop their own individual migration path and IP-services implementation strategy. In practical terms this means adapting and enhancing the existing infrastructure to enable the delivery of IP services utilizing the existing backhaul systems, with minimal disruption to the core network, while protecting current investments.

CPE v ISDN Concentrators

Given that the requirement for ISDN features and services will not disappear overnight, from a technology perspective decisions need to be made on how to adapt the existing infrastructure to enable customers to continue to utilize their ISDN-PBX technology in the new IP environment. Carriers have two basic options a) Maintain some ISDN services directly to the customer using an ISDN concentrator deployed in front of the Central Office MSAN/DSLAM or b) provide customers with an on-premise multi-functional smart router capable of supporting ISDN on the LAN side and IP on the backhaul connection.

Whilst both approaches can be used to satisfy the short-term requirements of existing ISDN-PBX system users, only the CPE option gives Telcos the opportunity to offer customers a range of incremental, IP based, voice, data and video services, ultimately delivering increased ARPU and long-term customer relationships.

For ILECs the concentrator option could be viewed as a more technically straightforward solution to the problem of protecting traditional telephony revenues, particularly for large organizations who are not interested in moving to an IP based voice platform in the short to medium term. However this somewhat short-sighted approach can leave carriers exposed to the growing threat posed by the more agile CLECs, who are able to offer aggressively priced service bundles via their own router hardware installed at the customer network edge.

In practice due to legacy infrastructure constraints some operators are forced to adopt a two-tier process during the transition phase to satisfy the ongoing demand for continued ISDN service from key customers while the MSAR infrastructure coverage is completed. In these cases the concentrator option can provide a short term solution but cannot support the wider UC and FMC requirements, which will be the basis of sustained revenue growth in the future.

5. ONEACCESS MULTI-SERVICE ACCESS ROUTERS

OneAccess provides a complete range of network access equipment to telecom service providers, operators and carriers. With a team of world-class hardware and software engineers together with an extensive network of offices covering the globe, OneAccess can offer both customization services combined with local technical support for all its customers.

Manufactured to ISO 9001 standards, OneAccess products are designed to give service providers and operators the agility to rapidly develop and roll out new or upgraded business services with minimal operational impact and maximum RoI potential.

The OneAccess family of multiservice access routers (MSAR) covers the complete range of data, voice and mobile network access requirements for SME and enterprise customers. Each product in the range is available with a variety of feature pack options to enable rapid service rollout with minimal costs of deployment and operations.

All OneAccess routers share the same OneOS operating system and consistent management interface. This ensures a smooth upgrade path for operators transitioning to more advanced products in the OneAccess range. The OneOS router management system includes an industry-compatible CLI interface and supports the latest TR-069 CPE control standard enabling seamless integration with existing telecom infrastructures.

Incorporating an extensive range of management tools, OneOS enables fine-grained control and monitoring of CPE devices and branch office networks. With support for application aware traffic shaping and acceleration, VPN, Firewall and IPsec functionality OneOS enables operators to create advanced network services that meet demanding SLA requirements.

6. ONEACCESS SUCCESSES

Many of the world's leading carriers have opted for the CPE approach based on the OneAccess family of multi-service access routers (MSAR). The following case studies provide an illustration of how OneAccess is working with two major European Telcos who are currently responding to the challenge of migrating legacy ISDN networks.

6.1 Belgacom

Belgacom is the leading operator in Belgium and has a broad experience with different customer groups: private individuals, professionals, companies and institutions. Belgacom's continuous innovation has resulted in a comprehensive range of products and solutions for landline and mobile customers.



The Belgacom Group has a long history of being early adopters of communications' technology and product innovation that has resulted in the ability today to offer business and residential customers a range of bundled services including quad-play solutions to deliver integrated landline and mobile telephony, Internet and television.

Innovation

Innovation is a core part of the Belgacom Group DNA. The company has continuously demonstrated this adaptive capacity by launching hi-tech products and services, such as ADSL, which celebrated its 10th anniversary in 2008, mobile telephony and, more recently, Belgacom TV.

Two thirds of current revenues are generated by products or services which did not exist 15 years ago. Today, the richness and diversity of its IDTV product offering places it among the pioneers in this sector, and the scope of its unified connectivity platform for the professional market (Explore) is unique in Belgium.

Company Highlights

- The number of subscribers choosing bundled services grew from 302,000 in 2008 to 1,089,000 in 2011.
- Through its Belgian and Luxemburg subsidiaries, Proximus and Tango, Belgacom provides mobile phone services for 5.5 million customers.
- 1,590,000 Belgians use Belgacom for their Internet services and 1,211,000 subscribe to Belgacom TV.

ISDN Migration

Belgacom, as many other European operators, is in the process of adapting and upgrading its telecommunications infrastructure. The Move to ALL IP (MaIP) program is designed to match the evolving market needs and technological evolutions, and to provide a future proof business transformation.

As part of this process Belgacom has put in place plans to close and dispose of approximately 65 of its local exchange buildings that will no longer be required once the MaIP project is completed in around 2020 by which time Belgacom's aim is to have migrated all its legacy customers from ISDN to an IP-based platform.

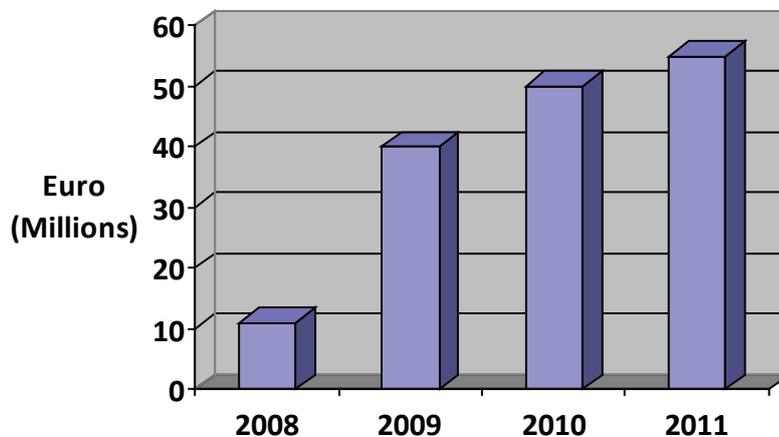
Move to all IP program

The long-term business transformation project "Move to all IP" (MaIP) has three main objectives:

- A network transformation in which end-of-life legacy technologies will be gradually replaced by IP-based alternatives.
- An IT transformation that will increase efficiency through further automation and the reduction of manual handling time.
- The customer interaction model will shift towards customer self-management, giving the customer more control during interactions such as sales, installations and repairs by investing in product simplification and intuitive e-tools.

The first switching out-phase, which began in 2011 and has already migrated more than 2,000 lines is on track to enable the first redundant exchange building to be emptied by end 2012. So far, EUR 154.2 million has been invested in the MaIP project, of which EUR 55 million were invested in 2011.

The roll out of the new sales support tool to enable enhanced monitoring and diagnostic services, including modem and set-top box problems is underway and a full Ethernet backbone together with the development of tools and equipment to prepare the migration towards a full IP network has been completed.



Belgacom MaIP Investment Program 2008-2011

Why OneAccess?

Trusted, flexible and responsive relationship

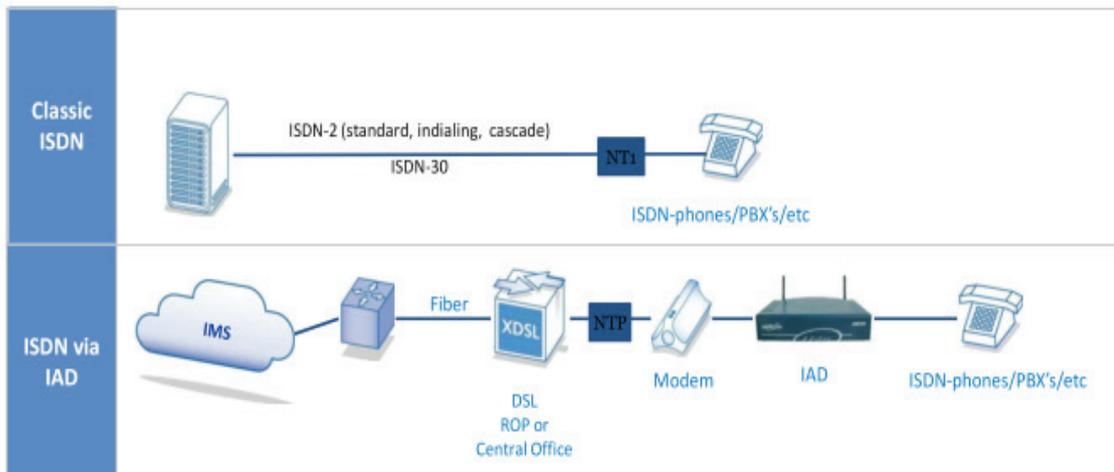
OneAccess has been a long term strategic partner for Belgacom and has a proven track record in meeting the company's exacting requirements over a range of projects.

OneAccess's series of multi-service access routers are able to support the full range of IP-services and customer network environments to allow seamless integration with legacy PBX systems as well as providing high-speed Internet access for video and IPTV services. The OneAccess MSAR devices are also able to support Belgacom's strategic aim of enabling direct customer control of the sales and service interface as well as granular analysis and remote diagnostic capability.

In particular OneAccess's ability to work closely with Belgacom's chosen partner Alcatel was a key factor in the selection of OneAccess routers for the MaIP project. As part of Belgacom's transport layer infrastructure upgrade, the company installed the Alcatel R5 Gigabit Ethernet NT cards in the R5 DSLAMs to provide ISDN emulation capability.

OneAccess worked closely with the MaIP team and Alcatel to ensure that the OA One100 series of integrated access device were able to support the non-standard XML protocols needed to deliver traditional ISDN services when installed between the modem and the end-user ISDN device as shown below.

ISDN IAD



Reasons for choosing OneAccess	
1	Trusted and responsive relationship & long term strategic partnership
2	Seamless integration with legacy PBX systems
3	OnaAccess devices able to support direct customer control of the sales & service interface
4	Ability to work closely with Belgacom's chosen partner Alcatel
5	Flexibility such as support the non-standard XML protocols needed to deliver traditional ISDN services
6	Granular analysis & remote diagnostic capability

6.2 Magyar Telekom



Connect ÉnCégem -
Irodai és mobilszolgáltatások
egyben



Magyar Telekom is Hungary's largest telecommunications company. The former state-owned business is now a fully consolidated subsidiary of Deutsche Telekom. Until May 6, 2005, it was (and informally still is) known as MATÁV and was formed under the name of Magyar Távközlési Vállalat (Hungarian Telecommunications Enterprise) in December 1989, when Magyar Posta (Hungarian Post) was split into three separate enterprises.

Today the Magyar Telekom Group covers three business areas: fixed telephony services, mobile communications, broadband Internet and business IT/networking services provided to customers under the brand names T-Home, T-Mobile and T-Systems. The company has a workforce of over 12,000 people generating annual revenues in excess of €2,200 (million).

Competitive Landscape in Hungary

Magyar Telekom operates in a highly competitive market in Hungary and neighboring countries. In addition, the company has seen its fixed line voice revenues decline, partly due to customer churn and partly due to the general trend towards increased use of mobile phone as the preferred communication option by many residential and business customers.

MT has responded to the challenge by refocusing its business communications strategy away from being thought of as a provider of communication services towards becoming recognized as a long-term business partner for its customers; offering businesses competitive fixed price service bundles to meet their voice and data requirements as well as professional IT services.

To deliver this strategy MT has committed to completely phasing out its ISDN services by 2016 for an all-IP infrastructure.

Bundled Services

MT is offering customers a range of bundled service packages that can be tailored to specific business needs with options for 5Mb or more ADSL connections for small businesses, through to fully WAN-optimized IP VPN functionality for larger, multi-site enterprises.

For businesses, each bundle comes with a range of network hardware and communication devices including the latest VoIP handsets, Blackberry smartphones, tablet PCs, micro-servers, printers and the OneAccess One100/One150 multi-service routers.

IT Services, Hosting and Colocation

In line with its corporate aim of becoming a long-term, IT and communication partner with their customers, MT also offers a comprehensive range of Cloud-based business services under the Virtualoso brand. These include:

- Call management
- Fax management linked to existing fax numbers also available via smart-phones
- A multi-platform corporate email and calendar system
- Corporate mobile communications and device management
- Broadcast SMS services
- Managed, hosted and collocated server options
- Online meeting and video-conferencing
- Data backup and shared workspace

Working with OneAccess

OneAccess has a longstanding and trusted relationship with Magyar Telekom and were approached by the operator following a decision to launch a range of packaged business communications services for the SoHo and SMB market.

In the first instance MT wanted to be able to offer customers the opportunity to use IP phone systems to route calls via the existing ISDN lines. To meet this requirement OneAccess developed the One100A router with 2FXO ports on the WAN interface and an IP phone connection on the down link to the LAN.

The goal of the second phase was to fully replace PSTN/ISDN network and to introduce a 5 tier range of service bundles for which MT selected the One150A-2B router as the preferred platform.

Testing/Certification

At each stage of the project the OneAccess products were subjected to a series of rigorous and extensive tests in the MT labs to ensure that there would be no issues integrating with the existing infrastructure.

In particular, the OneAccess ONE100 and ONE150 needed to interoperate in a mixed vendor environment that included Ericsson DSLAMS and Huawei MSAN and IMS technology.

Interoperability testing included VoIP and data transmissions (PPPoE, RIP routing), PBX features, IP phones, Wifi and the management (TR 069, SNMP) interfaces.

Specific challenges which needed to be resolved before final acceptance and certification included:

- Support for common legacy ISDN feature sets to enable customers with ISDN phones to continue using them for the foreseeable future.
- Automatic numbering plan provision to use different area codes, number lengths and different numbers of ISDN phones.
- How to support 4 VoIP channels via an ADSL channel with limited uplink speed yet leaving enough bandwidth for Internet connection as well.

Provisioning and Management

In anticipation of rapid, high volume take-up of the new bundles services offer, MT specified that the CPE devices needed to have zero-touch provisioning and management as a key feature, supporting the TR-069 protocols.

Throughout the pre-production phase the OA and MT teams worked closely to ensure that the OneAccess One100 and One150 products integrated fully with the existing MT automated configuration server including modifications to various key parameters as well as translation of the Web interface into the Hungarian language.

Reasons for choosing OneAccess	
1	A longstanding and trusted relationship
2	The right products and migration path
3	Interoperability in a mixed vendor environment
4	Support for common legacy ISDN feature
5	Automatic numbering plan provision to use different area codes, number lengths and different numbers of ISDN phones
6	VoIP QoS for limited uplink speed
7	Zero-touch provisioning and management with TR-069 protocols

7. CONCLUSIONS

ISDN is rapidly losing out to IP technology as the de-facto method for delivering high quality voice and data services and as such, much of the carrier ISDN equipment has either reached or is approaching obsolescence. Consequently ISDN is now being replaced in a process of phased migration to an all-IP infrastructure by many of the major Telcos.

The move has been fuelled by the massive demand for a new breed of communication services from both residential and business customers particularly to enable access to bandwidth hungry, VoIP, streaming video and IPTV content that ISDN is unable to support.

Carriers are taking the opportunity to upgrade their core networks and strip-out redundant and high maintenance ISDN equipment to significantly reduce their operating costs.

At the same time they are able to add new revenue streams by offering customers a range of incremental IP-based services to compete with their more agile competitors. While these changes have a broad appeal to all types of business, particularly in the SMB sector, carriers also need to retain some ISDN services for larger enterprise customers who are operating legacy ISDN PBX voice networks. The challenge is how to protect this important revenue stream while moving to an all-IP backhaul infrastructure.

OneAccess is the preferred technology partner for many European and Global carriers. Working closely with the Telco infrastructure teams the OneAccess MSAR platform is a key component in ISDN to IP migration plans; maintaining services for legacy ISDN-PBX customers while supporting the growing demand for triple, quad, and now penta-play, IP-based communications services.

Based on world-class technology and R&D resources together with a global technical support network, OneAccess multi-service routers can be customised to easily integrate with existing Telco infrastructures, helping to drive down operational costs, protecting investments and supporting future business growth through the widespread uptake of bundled voice, data, video and mobile services.