Philips Digital Set-Top Boxes

September 2005

Delivering Video and Advanced Services through IP Set-Top Boxes

- An industry summary by Royal Philips Electronics

INTRODUCTION

Increasing availability and acceptance of Voice-over-IP (VoIP) services is eroding profits and decreasing Average Revenue per User (ARPU) for service providers, especially telecommunication operators (telcos). Consequently, telcos and multi-service operators (MSOs) need to consider how to boost their service offer. Enabled by emerging broadband technologies, notably improved Digital Subscriber Line (DSL) techniques, operators are steadily making video services available over IP - along with telephony and data.

This paper describes the evolution of Video-over-IP and related services, as part of a 'multi-play' service package offer. The effect on and uptake by telcos, other service operators and broadcasters are examined in relation to the availability and significance of increasing bandwidth. Enabling compression and decoding (codec) technologies and standards are described, with their present and future developments. As are Quality of Service (QoS), system architecture and content protection methods.

We discuss delivery of a broad range of feature-rich services to the home via IP, with the digital set-top box as the gateway, looking at both provider and consumer perspectives and benefits. Also discussed is the impact on and role of set-top box and other consumer electronics device manufacturers, specifically Philips. We end with a look at business opportunities and models, and with a prediction of how the market may develop in the next few years. We examine the positions of the various players and how partnerships with suppliers like Philips can offer unique paths to anticipated opportunities.

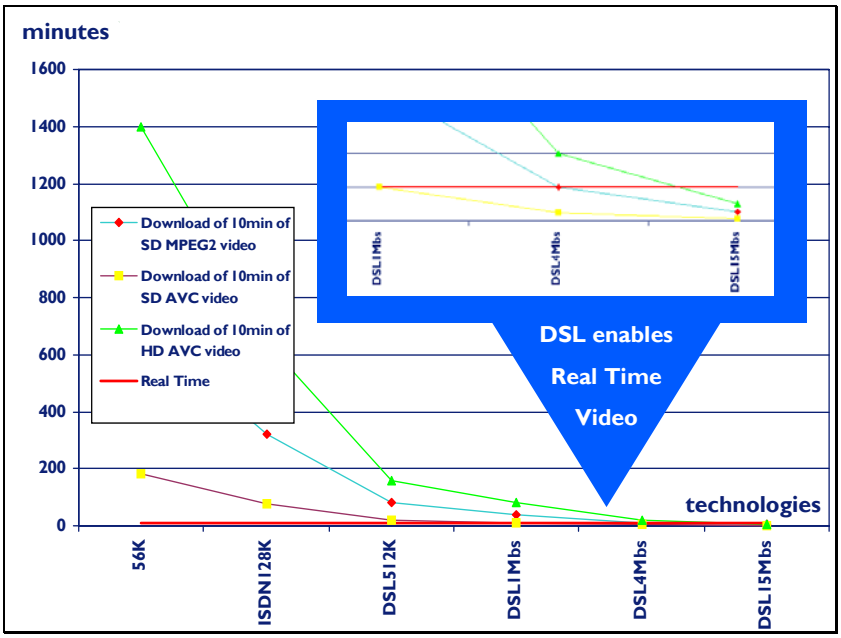
First VoIP, now TVoIP…

Many people in the developed world are familiar with the abbreviations 'IP', 'ADSL' and the word 'broadband'. And even if they do not know exactly how these technologies work, it is likely that they are aware of their impact.

The widespread availability of the Internet in our homes and in offices tends to be taken for granted these days, in the same way as the telephone. Nevertheless, both should surely be regarded as wonders of technology, despite their introductions being about one hundred years apart. In 1996 the two technologies became formally united in the Voice over Internet Protocol (VoIP) Forum, an industry-initiative working group of the International Multimedia Teleconferencing Consortium (IMTC). Service providers therefore became Multi-Service Operators (MSOs), but Public Switched Telephony Network (PSTN) services still took priority over IP-based technology.

Today, VoIP is quite successful (for consumers), mainly thanks to high-speed (broadband) Internet and cable (both copper and optical fiber) connections. Unfortunately, this has had a negative effect on revenues for telecommunication (telco) operators simply because VoIP calls can be made worldwide for the cost of a local call, or even less. Telcos inevitably realised that to reduce subscriber churn they would have to consider expanding their service offer to more than voice only. This is where the Digital Subscriber Line (DSL)

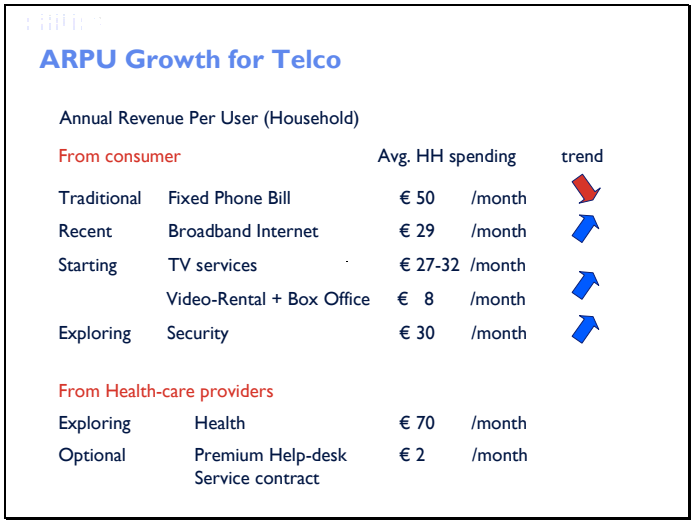
connection and its various forms have truly begun to play a major role by providing much greater bandwidth than its predecessor, ISDN.



Comparison of modem, ISDN and DSL download speeds for different media

However, with voice revenues and the number of calls declining, fixed line service providers are looking at sources other than voice and data to increase revenues. We now see telcos and cable and satellite TV companies beginning to offer so-called triple-play (video, telephony and data), or even 'multi-play' (multimedia and data) services at affordable cost to consumers.

Multi-play services already being envisaged include, in addition to conventional video and audio, video conferencing, music-on-demand (MoD), video-on-demand (VoD), broadcast (TV and radio), games, web access, e-commerce, home control and healthcare. These services, and how they are (or will be) delivered, will be discussed in more detail later in this paper.



THE BROADBAND BANDWAGON

Today, most major telcos (including some mobile), cable and Internet service providers offer broadband to both their residential and business subscribers. Although broadband technology is substantially advanced, the market is still relatively undeveloped.

At year-end 2004, broadband penetration of households in the USA was just below 55 per cent – equal to about 34 million connections and an increase of more than 35 per cent from end 2003 (Figure 1). Penetration is expected to exceed 70 per cent by end 2005. However, it should be noted that only about 13 million of broadband connections in North America are DSL. Western Europe enjoyed a growth of 16 per cent for the 12 months up to end 2004, reaching a total of almost 40 million connections, of which 79 per cent are DSL. The most rapid growth was seen in Greece, Ireland, France, Italy and the UK. The European Union has the largest regional DSL share with 31 per cent of worldwide connections.

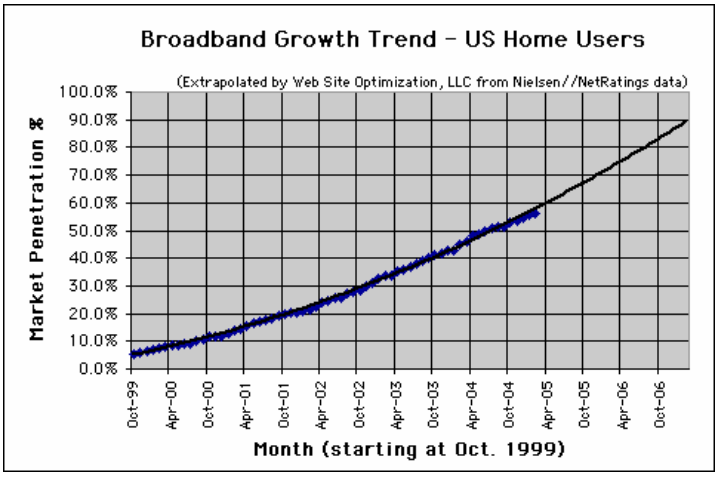


Figure 1 – Broadband household penetration in the USA (source: Nielsen/NetRatings data, 2005)

In the Asia-Pacific region fixed-line broadband connections grew by 50 per cent during 2004. In that year China emerged as the new regional broadband subscriber leader with more than 21 million connections (but only 1.6 per cent of population) – more than double from 2003 (Figure 2). This puts Japan in second place with more than 19 million connections (15.2 per cent of population), and South Korea in third place with just over 12 million connections (25 per cent of population) but still leading in terms of household penetration (almost 80 per cent), and approaching saturation. Also in terms of household penetration, Hong Kong has grown significantly (now 60 per cent). In most countries, while subscribers are adopting DSL quicker than cable, consumers in some areas still prefer to subscribe to their cable provider for broadband rather than to their telephone operator.

Broadband access usually has different subscription tariffs depending on the service provider, the package offered and the bit rates (anything from 128kbps up to 20Mbps). In some regions, fierce competition rapidly forces service providers and network operators to reach the limit of their network capacity. Consequently, these players have to differentiate with new services, such as storage capacity for end users or music delivery, which are additional to the mere bandwidth offer. This means that operators, especially telcos, are being forced to seek partnerships with music and TV content owners, and software houses. Despite the hurdles they may encounter in the setting up of these partnerships, an

increasing number of network operators and service providers are convinced that there is enough demand for video services through broadband, notably DSL, from which they can make money.

Country	2003 (x 10^6)	2004 estimate (x 10^6)	03/04 Growth (%)	2004 Population	Broadband penetration as % of population
Australia	0.707	1.52	115	20.3	7.5
China	10.74	21.4	99	1,300.5	1.6
Hong Kong	1.246	1.49	20	6.9	21.7
India	0.14	0.47	236	1,082.9	0.04
Japan	13.69	19.49	42	127.9	15.2
Malaysia	0.11	0.234	113	25.5	0.9
New Zealand	0.095	0.168	77	4.0	4.2
South Korea	10.75	12.1	13	48.4	25.0
Singapore	0.395	0.49	24	4.3	11.4
Taiwan	2.89	3.53	22	22.6	15.6
Thailand	0.01	0.14	1,456	63.7	0.2
Total A-P	**40.776**	**61.03**	**50**	**3531.9**	**1.7**

Figure 2 – Estimated broadband connections Asia-Pacific, Q4 2004 (Source: Gartner, January 2005)

Whether this is through cable or IP varies from country to country, especially in Europe. In the USA a number of operators are using their high-speed optical fiber data networks, sometimes combined with copper, to bring TV programming to subscribers. As in 2003, DSL was again the dominant broadband technology installed on a global basis, accounting for 62 per cent of worldwide broadband connections in 2004. In the Asia-Pacific region, DSL dramatically increased its share of the market, largely because of massive deployment and uptake of DSL services in China in 2004. In Asia-Pacific and Europe, a number of broadband service providers also began offering faster ADSL2, ADSL2+, and VDSL-based services, further encouraging uptake of DSL. In the USA, DSL trailed cable modem services by nearly a 2:1 margin in 2004. Yet DSL achieved record new subscriber additions for the year, largely due to drastic price discounts and extensive coverage implemented by a number of telcos.

ARPU DOWN, COSTS UP

With telcos' prices and revenues for traditional services being forced down, customer churn increases resulting in reduced ARPU. Telcos therefore need to look for new ways to keep existing subscribers and attract additional ones and maintain their ARPU by providing value-added services that can be sold for higher prices. The solution is to launch products faster, sell more bundled services to users, improve response to service needs and form sound partnership strategies. At the same time it is becoming more and more necessary to adapt billing and customer care solutions to rapidly changing market trends, regulations and technologies. This further emphasises the need to explore new revenue streams and consolidate billing systems to increase operational efficiency and minimize costs.

Telcos are also attempting to extend the life cycles of existing networks and optimize capital investment by offering legacy networks to other operators to support regulatory and business requirements. They are also recognising that faster turnaround time for new applications is essential. And, with services becoming increasingly complex, it is most important to ensure that service configuration and delivery are seamless across devices and

environments.

VoIP FIRMLY ESTABLISHED

With the rapid availability and take-up of VoIP services, consumers are eagerly embracing the opportunity to significantly reduce their calling costs. Moreover, service providers and consumers are benefiting from the rich bouquet of services that VoIP now enables, including, for example, web-like phone displays, information services, file sharing and multi-member conference calls and chat.

VoIP is now an established service being offered by telcos and numerous other carriers providing high-quality two-way audio. However, the business is somewhat hampered by the multiple standards for VoIP that make the interoperability of different vendors' products and the high number of protocols a continuing concern. Added to this are the apparently significant initial costs of set-up, including changing phones (POTS are not suitable for VoIP) and PBXs, as well as the addition of gateway and gatekeeper devices that can negate some of the benefits of VoIP.

Nevertheless, the industry is moving forward and the direction of entire networks is certainly toward an IP–based architecture, with voice traffic following a corresponding increase. There are many challenges still to be addressed, but the benefits of VoIP continue to draw mounting levels of interest, pushing the technology further into the mainstream of communications.

PAY-TV OPERATORS

While digital cable operators aim at delivering VoIP services, and telcos at offering TV-over-IP, the established satellite pay-TV operators continue to promote their services through a satellite dish. Significantly, in some European countries, satellite penetration is lower in cities, while DSL deployment tends to commence in cities. Therefore, owners of bouquets initially distributed over satellite are also interested in selling their offers over DSL.

Some cable operators are also looking at DSL, since the number of homes not connected by cable is extremely high. A number of cable and optical fiber operators are therefore considering renting DSL lines from DSL wholesale vendors, to obtain growth without the up-front investment that cable deployment requires.

It should also be noted that DSL is a point-to-point network, which enables personalized offers, customized per end-user. From this point of view, DSL is very much in line with the standard of living in developed countries.

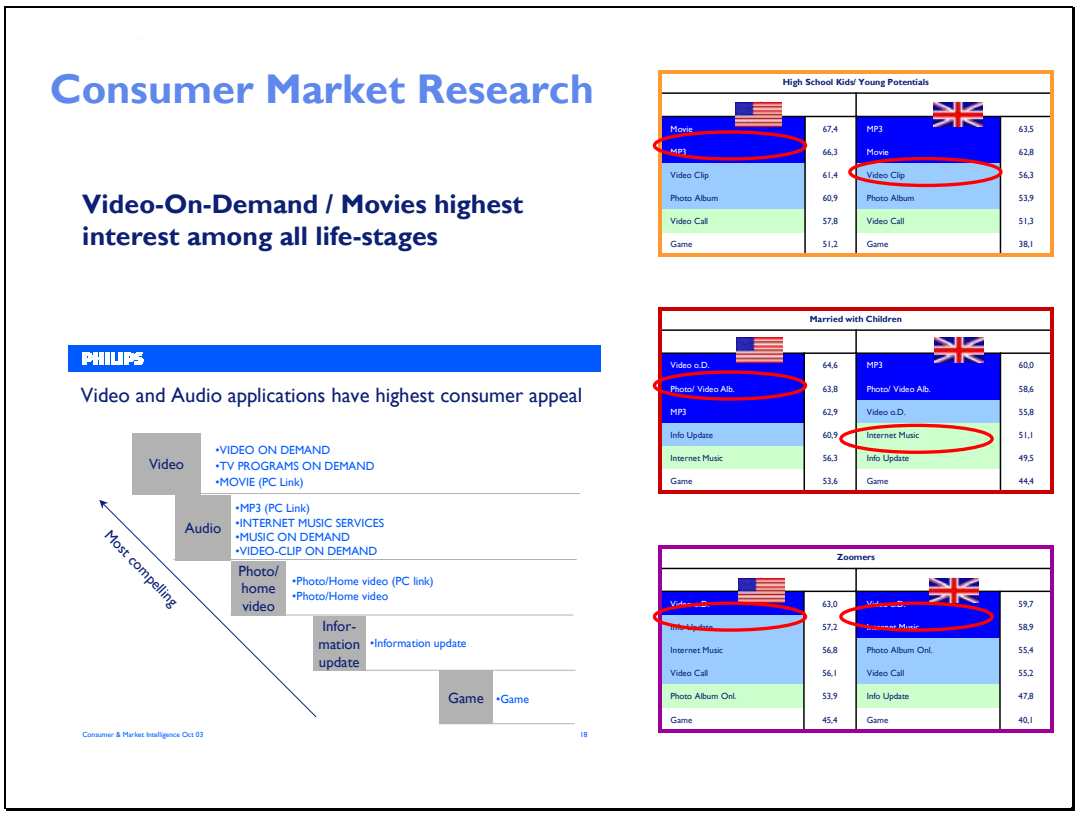
SMARTER CONSUMERS

Disposable income is increasing, and more and more telecommunication-, digital radio- and TV-based services are becoming available. So, too, are the devices that go along with them. Consumers in the developed world have become more aware of what their money can buy. At the same time, they are more discernible and, therefore, more demanding.

The majority of today's consumers are aware of what multicast TV programme broadcasting can bring them (even though they may not know what the expression means).

They will soon also become aware that all the services that they are familiar with will also become available through video and television over IP (TVoIP) as the technology and viable business models further develop and start to be implemented. In short, they know what they want and they want it now.

In fact, the emergence of Video-over-IP will enable even more feature-rich services to be offered. Video-on-demand (VoD), subscription VoD, TV programmes, Internet video and music, PC link movies and MP3 music, games, local content publishing and personal and business information will all be easily and affordably available within the household.



Consumer insight – Market Research

One innovative new service is the combination of VoIP and TVoIP that integrates caller ID telephony with TV programming, allowing the calling parties information to appear on the TV screen. This gives the opportunity for the viewer to pause the programme and take the call or even to forward it as a voicemail message to listen to later, all via their remote control.

In an even more interesting combination of the two technologies, it now becomes realistic to launch Videophony, which is the consumer version of expensive, professional videoconferencing systems. Philips devotes considerable effort to satisfy consumer expectations, and actively supports the migration of the major communication carriers from rigid analog networks to flexible digital IP-based transmission. An example of this is the recent launch of Philips VP5500 WiFi cordless videophone that offers both personal and familial video conferencing.

In addition to the TV set itself, the device that is instrumental in bringing these services to the home is the IP set-top box. When the set-top box integrates a hard-disk drive, it can function as a Personal Video Recorder (PVR). Interestingly, an IP PVR not only offers TV-over-IP on the TV set, but it can also function as an answering machine for incoming videophone calls that cannot be answered personally.

What is an IP Set-Top Box?

An IP set-top box (IP STB) is a device that receives digital TV channels from a broadband source, selects and decodes the appropriate audio-video streams, and eventually sends the final picture to the TV set to which it is connected.

The IP STB can integrate a modem and routing functionality. In such a case, it is directly connected to the socket that the telco or MSO has installed in the house. Alternatively, it is connected to an external modem (or router).

The IP STB can integrate a Hard-Disk Drive (HDD) which is used for recording and playing back audio-video content, in a richer way than a VCR. Alternatively, it can rely on storage capacity located on the telco or MSO network (remote PVR).

The IP STB integrates Copy-Protection and Digital Rights Management systems, that allow business models to be built on such service deliveries.

The IP STB can offer broadcast TV content, like conventional terrestrial TV, but it can provide much more, such as:

- Real Video-on-Demand (VoD (more convenient than DVD rental shops),
- Extensive Electronic Program Guide (EPG) (richer than printed TV guide),
- Voice-over-IP (VoIP) and Videophony (digital telephony plus a Webcam),
- Rendering of PC stored content (music, movies, digital pictures, etc),
- Enriched Interactivity (e.g. voting, communities, gaming)
- Email and Instant Messaging,

These and many other functions make the IP STB *the* enabler for IP-based services delivered to the home.

ENABLING TECHNOLOGIES

The chief limiting factor to fully implementing Video-over-IP is bandwidth. Video typically requires thirty times more bandwidth than audio. Even though more bandwidth has become available (Bonded ADSL2+ can provide up to 25 Mbps, though typical telco planning is on delivering 15Mb/s), this alone is not the solution to effective and efficient Video-over-IP transmission. The answer lies more in compression techniques. Current ISO-defined MPEG-2 compression has now reached its theoretical limit; and, while MPEG-2 Video-over-IP is now viable over broadband networks, it cannot deliver multiple, simultaneous TV services, or high-definition content. Currently work is in progress today in the DSL Forum to strengthen the DSL network to provide an optimum environment and quality of experience for video via DSL.

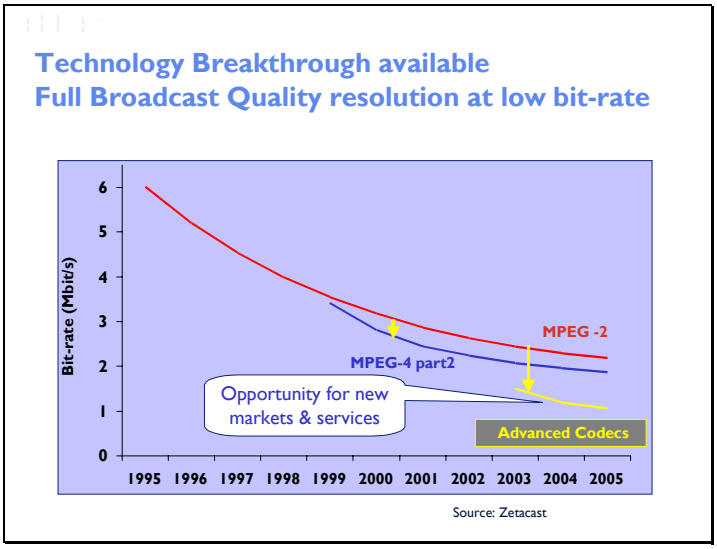
The DSL Forum

Established in 1994, the DSL Forum is an international industry consortium of nearly 200 leading service providers, equipment manufacturers and other interested parties, focused on developing the full potential of broadband DSL to meet the needs of the mass market. With the established goal of 500 million subscribers by 2010, the DSL Forum works to streamline processes, develop specifications and share best practices that set the stage for effective deployments, and explosive global DSL growth. By developing new standards and embracing new applications, the DSL Forum is tailoring DSL to meet the needs of the next generation of multi-media services and the online community. *(www.dslforum.org)*

The Digital Video Broadcast (DVB) consortium also plays a part, and its DVB-IPI (IP Infrastructure) standard is now available as a European Telecommunications Standards Institute (ETSI) standard. DVB-IPI relies on standards from the IETF (Internet Engineering Task Force) and on the MPEG-2 transport standard as defined by ISO. The conventional broadcast TV networks DVB-T, DVB-S, and DVB-C are also based on MPEG-2 TS.

These standards therefore allow systems to be constructed using the same audio/video streams with mostly the same head-end equipment, regardless of the physical layer schemes (e.g. same TV content for both DVB-S, via satellite, or DVB-IPI, via ADSL). A number of European Commission projects are working on DVB-over-IP systems.

However, the video-encoding algorithm that was in use in these systems - the MPEG-2 codec - has limited potential for DSL networks. The improved emerging techniques are advanced codecs based on MPEG-4 part 10 (ISO's MPEG-4 part 10 = ITU's H.264 = JVT's AVC) and Microsoft's Windows VC1 (standardized version of the codec included in Windows Media Video 9). The same advanced codec technology is also applicable to High-Definition Television (HDTV) transmission, which needs even greater bandwidth and/or greater compression than Standard Definition. It is therefore now a priority for IP network providers, since it is also key to extend the coverage of video delivery (with ADSL, the bandwidth erodes when the distance increases between a household and the Point-of-Presence - where the head-end equipment is located).



Nowadays, VC-1 and H.264 encoding equipment is not yet capable of reaching the performance that the standards allow. As it has been the case with MPEG-2 encoders in

the past, it will take some years before the new encoders can exploit all the bandwidth saving and quality improvement tools that could be implemented. However, the receiving equipment (the set-top box) will be able to support all the features from the start, to avoid any legacy of immature end-user equipment.

QUALITY OF EXPERIENCE

Telcos and MSOs that offer broadband services, especially with DSL, quickly learned the importance of installing an infrastructure that can provide close to a 100 per cent chance of success at each connection location. Moreover, that it can guarantee bandwidth in line with their promises, in order to maintain a competitive edge and avoid subscriber churn.

A survey of 6,000 individuals in the UK by net.com, reported at ITU Telecom World 2003, shows that more than 80 per cent of consumers with broadband Internet connections are interested in guaranteed Service Quality from their providers. About 70 per cent of these – equalling more than half of all broadband users – would be willing to pay a premium for high Service Quality. It seems that the remaining 20 per cent would settle for poorer basic connectivity rather than have premium service at a premium price. Subscribers are therefore applying pressure to telcos and ADSL re-sellers to provide better Service Quality.

Now, instead of providing a fixed and limited service, for which the monthly service fee decreases over time, providers are aiming at offering customers a wider range of rich IP services. Therefore, a provider is looking for greater bandwidth and guaranteed performance for multimedia applications. This improved performance and service quality will ultimately give customers a reason to make this DSL provider the first choice for broadband services.

With the increasing advantage in flexibility of all-IP equipment, and with Video-over-IP becoming a key offer, a new industry alignment has to be achieved that must guarantee a satisfactory Quality of Experience (QoE). This means, for example, that the end-user must not see irregularities on his TV when other traffic is in progress, whether in his own network or upstream.

The DSL Forum addresses IP Quality of Service (QoS) through its TR-059 technical report. This report describes an architecture that allows DSL providers to add an IP QoS overlay to existing networks. The TR-059 IP-centric architecture includes improved mechanisms for the transfer of traffic between network and application service providers, maintaining QoS and traffic prioritization on a per-user and per-application basis, all the while supporting many users-to-many applications via single DSL connections.

However, due to the intrinsic nature of the Multicast[1] traffic, losses can occur on some networks, which may generate artefacts on a TV screen where video is delivered over IP. In aiming for ultimate Quality of Experience, Philips and its partners are able to bring their experience to enable telcos and MSOs in adapting solutions to their own environment.

[1] In the Video-over-IP domain, Multicast (one-to-many) is used to offer the equivalent of broadcast TV over IP (with no guarantee on the delivery of the data), while Unicast (one-to-one) is used for Video-on-Demand.

MORE THAN JUST TV

As digital TV (DTV) services become widespread, it might be interesting from an end-user perspective to buy only one device that can receive DTV from multiple sources (e.g., terrestrial and IP). From the point of view of the TVoIP service provider, this is a way to quickly make TV content available on the device that carries its logo. And, if the set-top box is a PVR, or if the service provider has network-based (remote) PVR, the perceived added value is even higher.

In addition to this, in the future we will probably see extra services that will truly make combined use of both delivery systems, with, for example, trailers being made accessible on-demand during broadcast shows. This will require that broadcasters establish partnerships with telcos.

With respect to the need for personalised services, it is worth noting that, by the intrinsic network structure, a DSL subscriber is an identified individual on the network whose set-top box is under complete control of the operator at any time. It means that VoD/MoD or trickle download on PVRs naturally comes to mind, as a replacement to DVD rental. The telco then becomes the point of billing for such services. It also means that audience metering can be immediate, and this might ultimately provoke a complete new way of initiating TV services.

As these IP networks are bi-directional, interactivity will also be possible with fewer hurdles than with PSTN modems that are integrated in some of the current satellite or terrestrial digital TV decoders. The Internet is a fast-moving medium, and trends that can be observed on it influence other fields, especially in TVoIP. Communities, 'blogs', newsgroups and content-sharing applications can all find a place of choice with TVoIP. Imagine that a proud father has recorded the latest video captures of his son on his IP PVR. The video footage can immediately be shared remotely with family and friends. TV-viewers could eventually become TV-producers, creating new channels to their unique specifications. New businesses will emerge from such new spaces of expression.

CONTENT PROTECTION

Protection of audio and video content has, from the beginning, been a major issue for network operators, content owners and service providers. Now that an increasing number of video-based services are becoming available over IP, and since it should be possible to distribute them digitally into the in-home network, the issue takes on a new and greater importance.

The term Digital Rights Management (DRM) refers to technical security measures that help companies manage rights on digital content and includes access and copy control mechanisms. DRM is, therefore, a key technology enabler for content owners and service providers to complement their infrastructure and offerings. In other words, they can enhance their services for subscribers and more quickly gain revenue streams. Subscribers themselves gain transparent access to usage rights on high-value content (live broadcast events, movies-on-demand, etc.) previously unavailable, without the need for proprietary plug-ins.

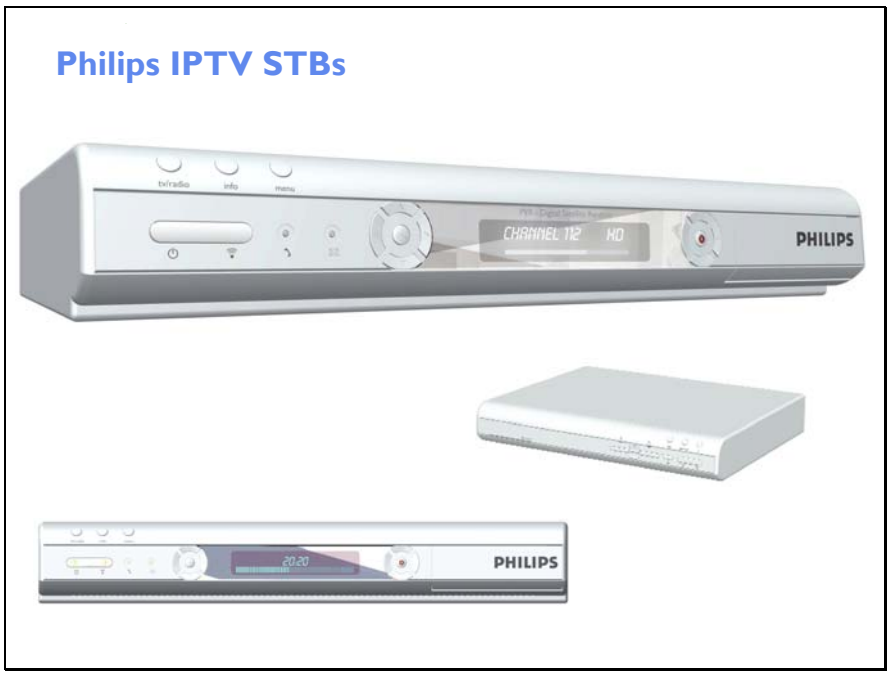
Why would TVoIP require a different solution for content protection and DRM than conventional conditional access (CA) systems like those used in the broadcast world? In fact, since IP set-top boxes benefit from a permanent bi-directional link, it is possible to envisage smart-card-less solutions that are still partially renewable. These solutions are usually based on Public-Key Infrastructures (PKI), making use of current advanced algorithms, and relying on specific on-chip security features. Smart-card-less architectures reduce deployment costs, and the management of subscriptions can be operated with less human intervention.

As mentioned before, since the content is carried over IP, and since in-home networks are becoming more and more an accepted idea, it seems natural to plan to offer the content in multiple rooms inside the home. DRM is then needed on all receiving devices within the home that (will) make use of the incoming or stored content. With a smart-card based system, it would have meant one card per location.

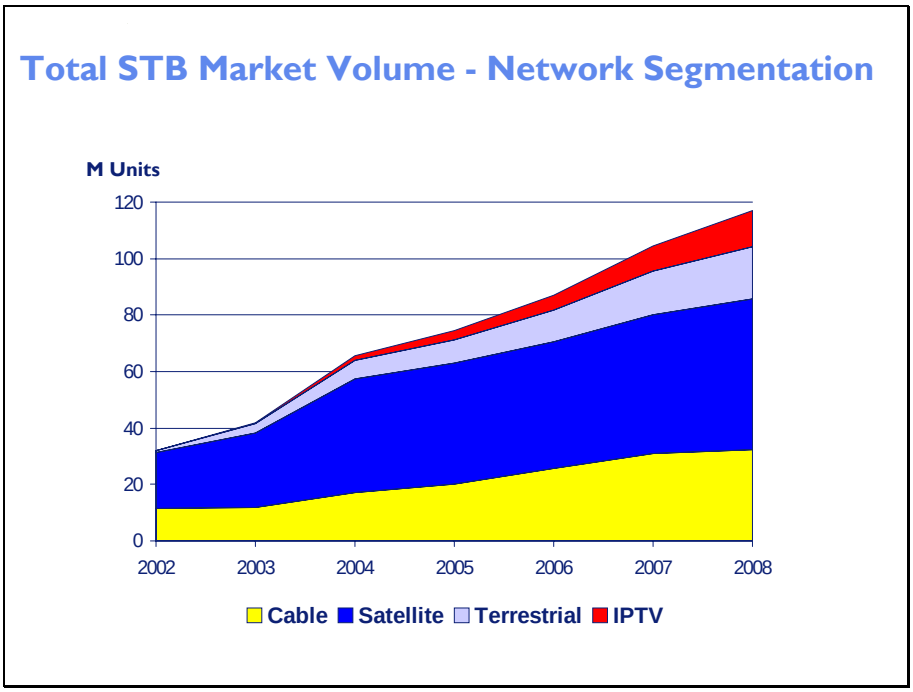
Philips has extensive experience in conditional access and digital rights management technologies for providing a secure environment to its customers. The company provides its own technologies for CA and DRM and works in close co-operation with leading CA and DRM solution providers.

PHILIPS' POSITION

Philips develops and markets world-class digital video set-top boxes for satellite, terrestrial, cable and, more recently, for broadband IP networks where considerable opportunities are seen. These products are developed for institutional, pay-TV retail and free-to-air retail markets where the company aims to obtain a leadership position. This will be achieved by leveraging the Philips brand name and competencies in DTV, HDTV and other key consumer electronics technologies.

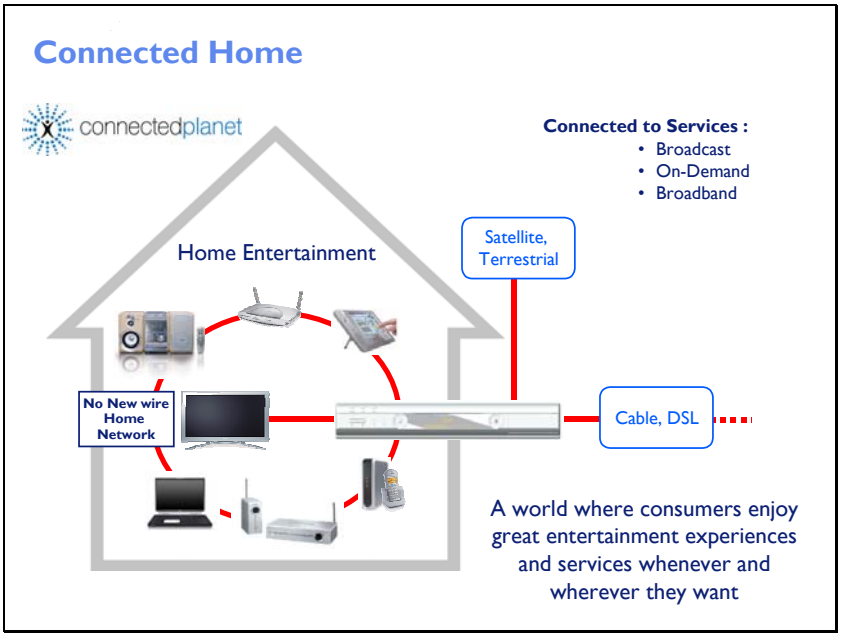


Philips has strong relationships with local authorities, key operators, broadcasters, service providers and suppliers throughout the world in the further development of set-top box markets and in the switchover of digital TV transmission. Taking this relationship further and recognising that a demand is emerging, Philips is working on IP set-top boxes with operators and engaging in field trials. These set-top boxes are all based on System-On-Chip solutions, enabling operators to offer Standard or High-Definition content over their networks at reasonable cost. Various set-top box models exist, including IP-only and PVR versions. There are also hybrid broadband and broadcast versions with satellite or terrestrial front-ends in addition to IP.



Market forecast Video-over-IP set-top boxes

The company's Connected Planet™ vision is strongly based on IP technology and access. The vision is oriented towards whole-home, multi-room solutions according to the requirements of advanced digital service providers. Connected Planet allows people to enjoy digital content anywhere at any time, enabled by the digital set-top box as the gateway and aided by state-of-the-art wireless connectivity.



A selection of products from Philips broad IP portfolio includes:

IP set-top boxes

DiP5710 :	AVC-capable, IP set-top box
DiT5710 :	AVC-capable, IP and terrestrial set-top box
DiS5710 :	AVC-capable, IP and satellite set-top box
DiP7710 :	Fully featured AVC-capable IP PVR
DiT7710 :	Fully featured AVC-capable, double tuner, terrestrial and IP PVR
DiS7710 :	Fully featured AVC-capable, double tuner, satellite and IP PVR
DiP8700 :	High-definition AVC IP set-top box
DiT8700 :	High-definition AVC IP plus terrestrial set-top box
DiS8700 :	High-definition AVC IP plus satellite set-top box
DiP9700 :	High-definition AVC IP PVR
DiT9700 :	High-definition AVC IP plus terrestrial PVR
DiS9700 :	High-definition AVC IP plus satellite PVR
DiT9710 :	High-definition AVC+VC-1 IP plus terrestrial PVR
DiP3700 :	Basic MPEG-2 IP set-top box
DiP1700 :	IP MPEG-2 Zapper

PHILIPS

Advanced High Definition IPTV PVR

DiT9710

High Definition AVC/VC-1 IP+DTT PVR

Functions

- Video-over-IP
- H.264+VC-1 low bit-rate / MPEG 2
- High Definition
- Upgradable to Voice-over-IP and Video-telephony services (with dongle)
- PVR 160GB HDD
- DTT, double tuner included (Option : SAT)
- Option : no-new-wire connectivity (PLC, WiFi : dongles)

Benefits

- Consumer: Highest Video Quality available
- DTT, PVR
- Operator : Flexible Advance Platform for new Services

Discriminator :

- Time-To-Market with SoC solution

Digital Media Adapters :

SL300i:	Audio & Video Adapter with Streamium functionality
SL400i:	Audio & Video Adapter with Streamium functionality
SLA5520 :	Wireless Audio client/renderer with Streamium functionality
SLM5500 :	Wireless Audio and video renderer

Webcams

SNC600NC:	High-quality video chatting and games
SPC700NC:	Ultimate Videophone kit

Personal Videoconference

VP5500:	personal and family WiFi videophone handset

Base Stations

ADSL221:	All-in-one DECT, ADSL modem and WiFi base-station with VOIP
SNB6500	Wi-Fi base-station with Super G mode
SNB6520 :	WiFi base-station with Super G and USB for printer/storage/... connectivity
SNA6500 :	WiFi base-station with an integrated ADSL2+ modem
SNV6520 :	WiFi base-station with integrated ADSL2+ modem and VoIP functionality

Philips also has long experience in medical diagnostics, therapy and patient care. This experience will help providers to develop home healthcare services, enabled by video-over-IP, and as part of their total service offer. These services will allow people at home (patient end) to monitor their own physiological parameters (blood pressure, heart rate etc.) and

communicate with a care provider clinic (clinical end). The person at home will also be provided with trends, reminders, and lifestyle / self-care education. The clinic will analyze results and compare with comprehensive patient records to provide diagnosis and treatment if and when required. The same IP / broadband network can connect to medical device and pharmaceutical suppliers, family support groups and employer wellness programs.

A LOOK AT THE FUTURE

Currently, available TV-over-IP turnkey solutions are based upon technologies that had been loosely deployed in the early 90's. Since then there has been a high number of trials and, because most of them failed, no homogenisation has occurred. Nowadays, thanks to the enabling factors described earlier in this paper, the market is developing, and pressure for more unified and interoperable solutions is increasing.

However, we are not yet at a point where pure consumer electronics retail markets can be set up. TV-over-IP operators must still provide services in vertical markets, with solutions that are fully tailored to their business plans, and taking up from their former trials. Accordingly, the deployments are less cost-effective than they could be. This is where operators need to partner with companies that have strong roots and experience in the domains of DSL and DTV.

By nature, the telecommunication world has always based its solutions on long-lasting standards that were issued and adopted by the industry before commercial deployments. This was key to enable the establishment of communications among regions, countries, and even continents. In DTV, the deployments were first lead by pay-TV operators that were addressing narrower areas, so interoperability between the various local deployments was not crucial. Obviously, for economic reasons, some uniformity became necessary, and consolidation took place, resulting in today's pay-TV landscape. The players that were present during the early days of TV-over-satellite or TV-over-cable are now accustomed to dealing with maturing technologies and large volumes.

Such volumes absolutely require reliable solutions, and must not be subject to any legacy issues in the next few years. The TV viewer expects to use his TV for years, which is a quite different expectation than in the PC market where it is common to change to a new model every two or three years, and within that time accept numerous software upgrades.

Therefore, such markets must be backed by suppliers that can handle such volumes, whether for set-top boxes or for chipsets. And, since large silicon suppliers prefer to deal with large set-top box manufacturers, as large software companies do, it is clear that in several years from now, only network agnostic set-top boxes will survive.

In short, a shake-up and shake-out will take place in the solution provider arena. However, the same is true for telco operators and, depending on the country, there will most probably be only a few backbone bandwidth suppliers that will remain, and only a few resellers that may aggregate services for end-users. Hence, the market may constitute only a few players in each segment of the service delivery chain.

As Europe's largest consumer electronics company with many years of experience in TV and related technologies and consumer behaviour, Philips is in a strong position to play a major role in supporting the roll-out of TVoIP and advanced services. This is supported by strong partnerships with its suppliers, thanks to the enormous volume of business it does with them and the high level of mutual trust built into their relationships.

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