What is IPTV and Why All the Fuss?

IPTV is a simple and low-cost broadband product replacement concept with massive implications for business and society. In its simplest form, IPTV protocol enables the creation of a single-shared use high-speed transport infrastructure.

The new transport and service infrastructure can deliver digital television, data, and voice signals, along with connectivity services to consumers, while also enabling—upon demand—P2P exchanges between content creators and consumers.

The design implication is that the proposed IP suite and multiplexing processes can be used to deliver broadband, that is, multiple services with multiple signal types, at a fraction of the cost of extending the current time divided multiplex (TDM) telephone network and/or the hybrid fiber coax (HFC) TV and channel slotted satellite/radio networks.

The use of IP protocols to transport the audio, video, and voice signals is not new at all. However, the usage of significant amounts of broadband consumer bandwidth and IP to meet the high performance and quality demands of rich media signals is actually quite new to the market.

Massive amounts of consumer bandwidth, IP packet switching, and routing all together provide a much more flexible service infrastructure. This could even be used to eliminate the current expensive and inefficient service overlays for each revenue stream.

Figure 1 is a simplistic rendering of today's general service infrastructure (on the left) and the planned IPTV infrastructure (on the right). Each legacy network on the left has its own capital, resources, and service operation dedicated to a single service. The spare idle capacity for subscriber growth, service restoration, and changes is also dedicated to each service. In total, the overall cost of revenue production increases and the general efficiency of the

network capital declines, all as new services are added. On the right is a single infrastructure that captures scale economies, by adding a home media gateway and simple broadband capacity additions that will meet demand and service objectives.

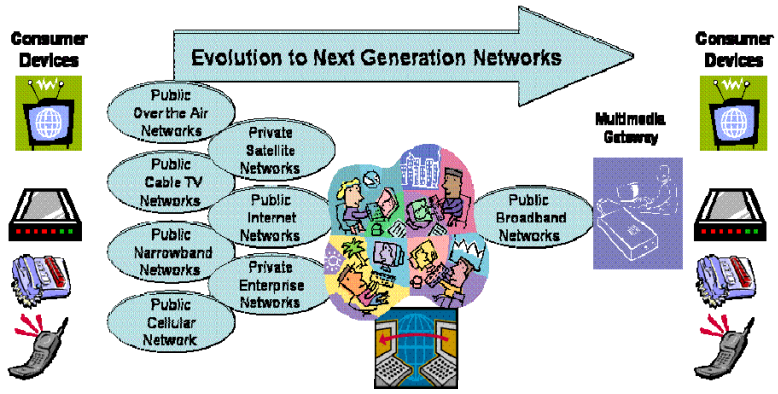

Figure 1: *The general requirements of IPTV infrastructures*

The IPTV Infrastructure Overview

The planned IPTV converged infrastructure is designed to deliver massive amounts of bandwidth to the bandwidth starved home. In theory, the placement of new to-the-home and in-home pipes from the on-site proprietary media gateway to the STB and the media center PC allows the delivery of IPTV and Web TV, along with traditional data and legacy voice, all at the same cost of service.

The converged network shown in ***Figure 2*** enables a single infrastructure to deliver more services and more revenue at higher margins and ultimately declining costs, by first cannibalizing the existing revenues and then eliminating the costs. ***Figure 2*** describes the new network.

Figure 2: *Microsoft vision of the IPTV architecture*

Figure 2 shows that all content is digitized, encoded, and stored on ingested servers to be played out over the private IP transport system. This storage and play-out eliminates the current complex chores of determining decoding needs at the consumer device and bandwidth needs at the channel level—that is to say, how the signal was encoded, what the frame rate is, which compression standard was used for video and audio, and if the device supports the encoding standard.

The IPTV infrastructure, in addition to simplifying the private network and user devices, also reduces the total network delivery cost both through inexpensive media gateways at the consumer site and shared use media gateways to the legacy networks.

As shown in ***Figure 2***, IPTV produces transport media independence. Virtually any broadband transport media, such as cable, fiber, hybrid fiber coax, DSL, and over-the-air wireless transport can convey the modern IP-based rich media signals, to any consumer equipped with the proprietary media gateway and IP STBs. As seen in ***Figure 1***, however, Web TV can also be delivered to virtually any IP device with sufficiently managed bandwidth terminating on the media center without STBs.

In fact, the implied ability to connect PCs, phones, and home data/voice/video services to the same infrastructure, with no dedicated service overlays, makes the new multiple channel IPTV process more than just another carrier overlay network. In most countries, not including the US, the single IP infrastructure should produce a significantly lower cost per door passed, cost per customer, and cost per service, rather than building the same channel capacity using the current fixed-slot, TDM equipment.

In countries with highly developed TDM and channel slotted infrastructures, such as the US, the low cost per door passed with IP should enable the new IPTV operators to effectively compete in terms of price and performance. As a result, they can cannibalize current video and telephony service revenues that use the slotted networks and best effort data overlays.

The Current Data Infrastructure

The current Internet version of streaming TV and file transfer with local play-out was introduced in the mid-1990's with the deployment of streaming media. This involved the PC capturing bits and displaying them on the consumer's screen and playing out the sound to the audio equipment, without first creating a complete file at the receiver.

The data service Internet overlay, built on top of the current public switched telephone networks (PSTN) in an TDM infrastructure does not have the performance capability, scalability, or local access bandwidth needed to support mass market multiple channel IPTV service. As will be discussed later, a Web TV service requires lines to support 20 to 30 megabits per second, and now few service lines as such actually exist.

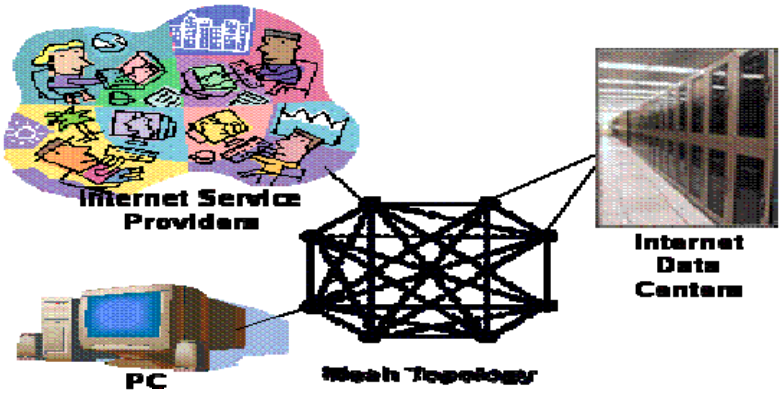

Figure 3: *Current Internet overlay data network topology*

As shown in ***Figure 3***, ISPs, individual ADSL/CMTS users, and even data centers are interconnected with small shared use pipes to the public data network backbone, where capacity is virtually unlimited. While bigger pipes could be purchased at higher prices, where available, the backbone itself lacks the necessary synchronicity and latency management needed to control the quality of services and user experience.

Privately-managed enterprise network IP infrastructures exist, using private lines and multiprotocol label switching (MPLS). Scaling such networks for residential IPTV seems impractical and the bandwidth still has to be placed into the access market; regardless, this will probably be achieved in a high density cluster of people. New IPTV infrastructures are needed to solve the access bandwidth problems on a cost-effective basis. The IPTV plan is to provide big pipes and aggregated high value content to a large number of paying residential customers.

Most people attribute the current Internet streaming process to Microsoft, which was introduced to the PC market in the mid-1990s. Streaming packet-based video was operational in UNIX environments and proprietary video servers, as early as 1992. The streaming Internet TV process has been evolving for over 10 years, as part of the Internet cauldron of hype and hope.

The Microsoft Media Player release 10 is in the field today. Other media players from Apple, Real Player, and a myriad of other independent software vendors (ISVs) also exist and most have a high degree of Internet streaming software maturity.

Although the current streaming processes work, they are not easy for consumers to use and they still have video coding, audio complexities, and player anomalies, in addition to the problems caused by the lack of bandwidth and the over-subscription of connections.

One must consider the availability of massive amounts of new digital access bandwidth to the consumer home and a new non-Internet backbone, designed for video quality performance. This new bandwidth infrastructure makes Web TV applications and multiple channel IPTV applications practical and economically viable.

In fact, with enough bandwidth, home media gateways and PCs could eliminate the need for a proprietary STB. However, a right STB built into the TV with web application services could, in theory, eliminate the need for the home PC and still satisfy the demand for voice, data, and video services.

The architectural model conflict between the PC and STB is both a technical and business issue. Based on its nature and operation, the PC puts network resources under the control of the consumer device, such as in P2P networking, while the STB puts the consumer and their devices under control of the network supplier, as in client/server networking.

Overall, the "fuss" behind IPTV mostly surrounds how the handling of both network resources and content consumption impacts account control, wallet share, and profits.

Commercial Realities

In the US, IPTV technologies enable current telecom service operators to take a "fresh shot" at the existing $60 billion in TV advertising and $70 billion in cable, satellite, and over-the-air TV

subscriber revenues. The commercial fight for account control and wallet share from TV are reflected in the service bundling terminology and service packages, such as in triple play (voice, data, and video services from a single provider) and in quadruple play (the addition of cellular phone service to the bundle). ***Figure 4*** reflects the physical topology of wires, cable, fiber, and wireless connections into the home.

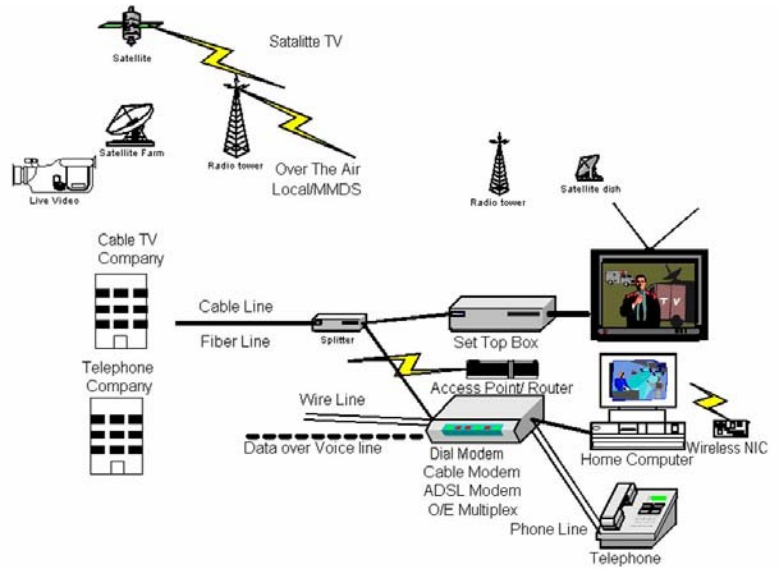

Figure 4: *Physical Topology*

For a number of marketing reasons, bundled service packages come at a lower retail price than the discrete services, and this usually means profit margins go down for the legacy infrastructure, while the new competitor gains market share and new revenues.

It should be noted here that these new packages do not impact the physical infrastructure, and they only seem to increase revenues for the "new guy" in the short range.

At some point, the new TV service operators will need massive cost improvements versus the legacy providers, or both supplies will soon have margin and profit problems, similar to the AT&T

attempt to convert the company into a cable TV supplier. In fact, IPTV technologies hold out the promise of both providing lower cost and better margins.

Now, the fight for account control and wallet share has already redefined a large part of the industry and will continue to do so into the near future. The wave of mergers, acquisitions, bankruptcies, and financial mischief were partially the result of deregulation and positioning for IPTV-like broadband services to the mass consumer market.

These cataclysmic events have punctuated the transition toward the next generation networks, as carriers moved away from the public utility service model and began to develop new business models, based on both profits and the exploitation of their competitive advantages.

The impact of this shift from public utility service, that is, the quasi government agency servicing consumers, to Wall Street style profits is reflected in the ***Figure 5***. From 1990 to 2002, household spending on communications increased faster than any other consumer spending category. Moreover, unlike simple inflation that drives the increase behind many of the other categories, the key to communications growth has been the new services that were not generally available in the 1990 public utility market. This was actually driven by regulators, government agencies, and government protected monopolies.

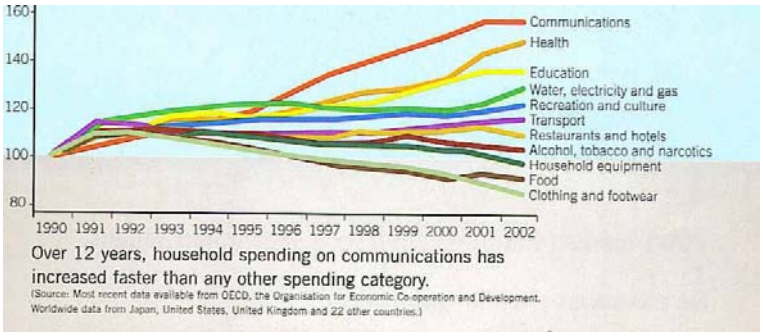

Figure 5: *Wallet share growth from deregulation*

These new services and increased revenue forces are a major driver behind the evolution of IPTV services and the deployment of IPTV and Web TV transport technologies. In the following chapters, we will see that IPTV technologies can have a significant impact on current operation costs and can help offset the cost for operating the declining cash revenue in legacy public carrier services; wireline analog voice, long distance toll charges, and analog cable TV revenues are actually in steady decline in most countries.

The new IP technology and service offerings can also be used to create an overwhelming competitive "new service" edge that can help carriers initiate new service bundles and portability packages that can help them "poach" the accounts of tomorrow, in a large drive for market and wallet share, account control, advertising dollars, and new profits.