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WHITE PAPER

Enabling IPTV: What Carriers Need to Know to Succeed

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OVERVIEW

Carriers around the world recognize that the emergence of digital video over IP networks, often referred to as IPTV, presents them with a tremendous opportunity to tap into the multibillion-dollar pay-TV market. With more than $55 billion in subscriber revenue in 2004, United States pay-TV services represent a high revenue-generating business opportunity for service providers (SPs). Moreover, the international opportunity for IPTV subscriber growth is tremendous, with services being rolled out across the Asia/Pacific region including China. The Asia/Pacific opportunity alone could reach as much as 20 million IPTV/TV over broadband subscribers by 2009.

At the same time, pressure is mounting on telecommunications companies (telcos) to outline and execute a successful digital video strategy, largely because of increased erosion in their core wireline voice business and the continued lag in DSL subscription levels compared to cable's commanding lead in the high-speed data race. Still, if carriers are to succeed in the complex and highly competitive entertainment market, they must address a number of challenges, such as network architecture, bandwidth requirements, content acquisition, management, storage, delivery, and back-office integration.

IPTV Defined

Before delving into the market opportunity for IPTV, it is important to understand exactly what IPTV is and is not, as a fair amount of confusion surrounds its definition. Some of the confusion is attributable to misconceptions over the use of the term IP, while further confusion stems from regional differences about what constitutes a pay-TV service.

First, IPTV does not mean the Internet. IPTV does not mean unlimited access to video content delivered over the Internet. Instead, IPTV refers to Internet protocol (IP), which is a transport protocol, a delivery mechanism, and not necessarily the Internet. There are existing Internet-based video services (MovieLink or CinemaNow) that deliver on-demand digital content to a PC via a broadband connection but, these services do not typically deliver content to a TV viewing environment.

Secondly, IPTV service implementations vary on a geographic basis. Differences exist depending on local market conditions and requirements, particularly in the mix of broadcast and on-demand content deployed by SPs. As a result, not all global IPTV deployments look and feel the same, with telco TV deployments in Asia/Pacific varying greatly from IPTV implementations in the United States and Canada.

IPTV is multichannel and on-demand programming delivered via DSL or fiber and typically offered by a telco or broadband service provider (BSP).

Market Drivers

In the past year, IPTV has emerged as a hot topic within the global digital entertainment and telecommunications industries. Several key market developments have contributed to its recent rise in prominence.

- The telcos' core wireline voice business continues to erode as substitute technologies — wireless and broadband — increasingly displace wireline services and contribute to shrinking voice revenue. Additionally, emerging voice over IP (VoIP) services are an increasingly competitive threat to residential wireline voice revenue as virtual network operators like Vonage and cable multiple systems operators (MSOs) lure subscribers away with aggressive price cuts and feature-rich service bundles. As a result, telcos are looking to expand into new service areas to offset flagging voice revenue.

- The pay-TV market represents a tremendously lucrative revenue opportunity. The U.S. pay-TV market generated more than $55 billion in revenue for cable and satellite providers in 2004. Thus, U.S. telcos are eagerly looking to capitalize on the significant revenue opportunities associated with digital video services. Internationally, incumbent telcos often have a significant advantage over cable in that robust DSL and fiber networks are already in place, whereas there is a lack of digital cable TV infrastructure. Still, the global opportunity is a blend of tapping into new and incremental revenue streams and leveraging existing broadband infrastructure.

- The triple play — the combination of data, voice, and video services — is the first step on the path to truly converged networks, devices, and services. The value proposition of the triple play is that it enables SPs to drive revenue gains by increasing the average revenue per user (ARPU) through bundling data, voice, and video services together. The triple play also locks in the customer to multiple services delivered by the same provider, thereby effectively reducing churn, increasing customer loyalty, and driving greater customer spend with one provider. Based largely on the cable MSOs' recent success, the triple play has become a business necessity to leverage network investments and compete effectively in the evolving landscape.

- Broadband and video compression technologies have matured to the point where it is now feasible to offer competitive and compelling IPTV services. The advent of new DSL technologies, such as ADSL2+ and VDSL, as well as advances in fiber technologies have led to the increased bandwidth throughput necessary to deliver a quality video experience over DSL and/or fiber networks. At the same time, advanced compression technologies — H.264 and VC1 — have made delivering video over IP much more bandwidth efficient.

Global Opportunity

IPTV is a global phenomenon and as such presents an opportunity for telcos around the world to benefit from the delivery of video over IP networks. Still, regional differences apply, as local market dynamics and broadband infrastructure characteristics define the nuances of local pay-TV markets and the associated opportunity for IPTV service implementation.

Active trials and commercial deployments exist across North America, Europe, and Asia/Pacific.

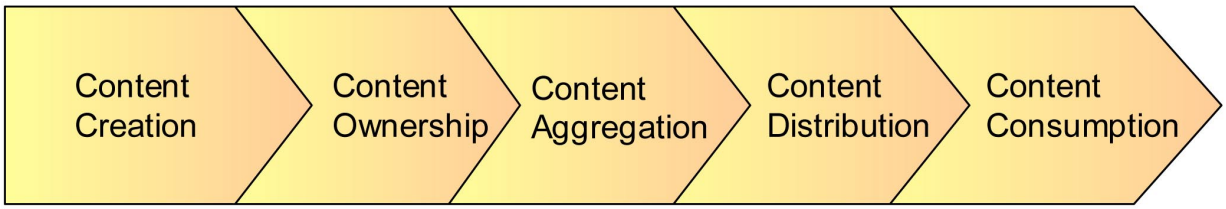
- In Italy, alternative broadband provider FastWeb has more than 200,000 subscribers to its FastWeb TV service. The IPTV service delivers a broadcast and on-demand service via an IP-based architecture over FastWeb's fiber optic and DSL networks.
- In Hong Kong, PCCW has signed on more than 400,000 subscribers to its NOW pay-IPTV service.
- In the United States, IPTV has moved from being a predominantly small or rural telco-dominated niche market to a mainstream regional bell operating company (RBOC) priority as evidenced by SBC and Verizon's recently announced plans to upgrade their network infrastructure and deploy IPTV and other advanced services to a majority of their consumer customer base.

The IPTV Value Chain

The IPTV value chain itself comprises two value chains: content distribution and IPTV infrastructure. Content management governs the content life cycle from creation to consumption (see Figure 1). The content life cycle is not unique to IPTV, but rather it is standard within the already existing entertainment content distribution flow.

FIGURE 1

Content Distribution Value Chain

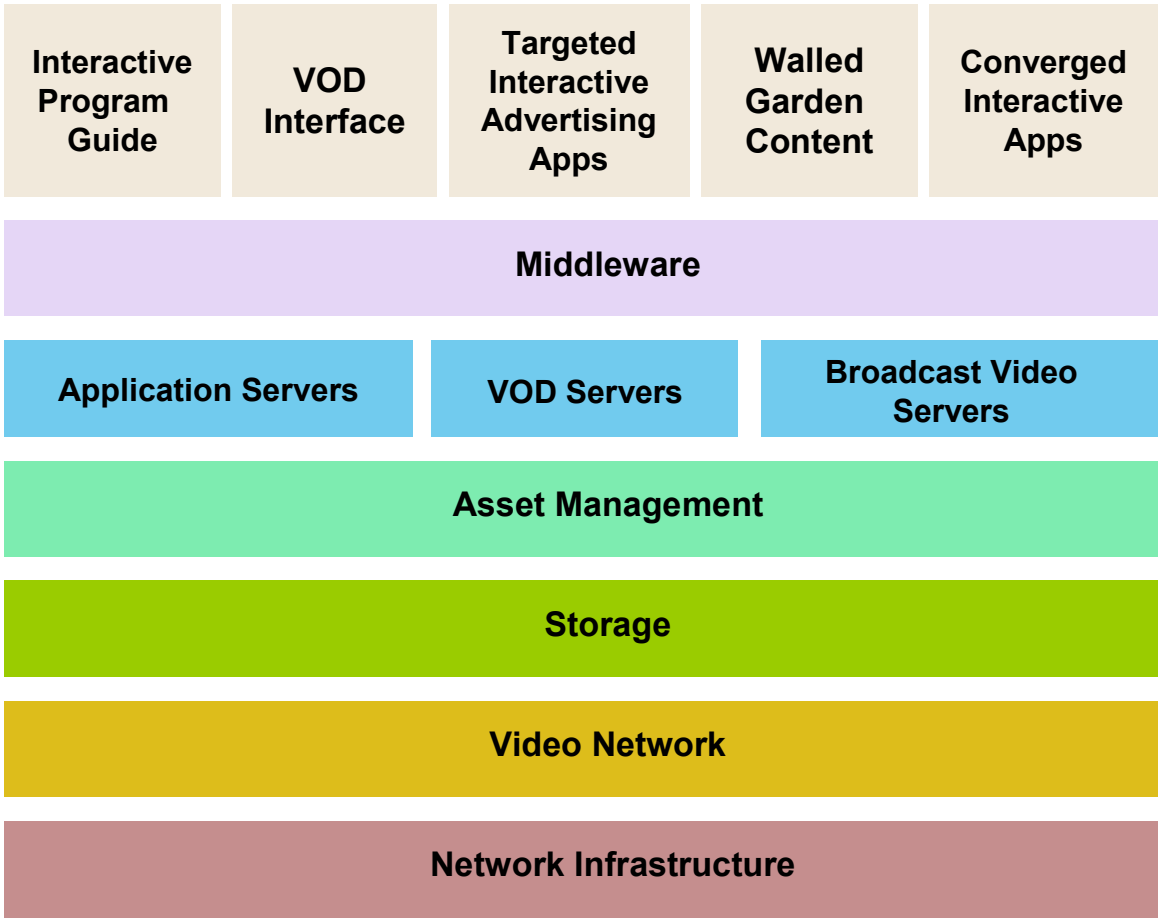


Source: IDC, 2005

IPTV infrastructure encompasses the specific equipment infrastructure, systems, subsystems, and software required to successfully execute on the content life cycle (see Figure 2). The content distribution value chain directly links to the IPTV infrastructure value chain, as it is a required element to make an IPTV implementation work. The IPTV infrastructure value chain includes content acquisition, management, and delivery.

FIGURE 2

IPTV Infrastructure Value Chain



Source: IDC, 2005

CONTENT ACQUISITION, MANAGEMENT, AND DELIVERY

Fundamentally, IPTV is about entertainment, specifically video entertainment. If telcos are to successfully offer IPTV services, they must understand how content flows — from creation to consumption. As such, they must identify and understand all the components of the content value chain: what they must do to acquire content for distribution, how they manage the content once they have acquired it, and ultimately how they deliver the content to the end user. This is a multistep process with specific business and technical requirements.

Content Acquisition

An IPTV service is only as good as the content it offers. At the same time, not all content is created equal. Thus, a successful IPTV service launch requires that a telco gain a full understanding of the video content acquisition, management, and packaging process. There are three distinct but not mutually exclusive categories of content: linear, on-demand, and exclusive. An appropriate blend of the three categories defines a competitive, full-featured pay-TV offering.

- **Linear.** This is a traditional multichannel pay-TV service, offering an assortment of channels structured around service tiers — basic, advanced basic, and premium — that represent the full lineup of broadcast programming. Content is linear in that viewers must adapt to the traditional grid-style programming schedule that currently exists on cable, satellite, and over-the-air TV.

- **On-demand.** Linear is slowly giving way to the emergence of on-demand content consumption. Existing cable-based VOD services offer a wide array of programming choices from movies to sports to niche and local shows available for viewing at the request of individual subscribers. Programming is streamed "on-demand" to the viewer from a video server system to a set-top box device. Many feel that on-demand is the future of video content consumption.

- **Exclusive.** While not a required element of a pay-TV service, exclusive content is programming that is unique to an individual SP. Generally used as a competitive service differentiator, exclusive content provides consumers with a reason to choose one SP's service over another SP's. Examples of exclusive content include DirecTV's NFL Sunday Ticket and NECN News on Comcast.

For telcos new to the video business, acquiring content can be a tricky proposition. Subscribers will expect the full complement of linear channels as part of any IPTV service offering. An even greater content acquisition challenge for the telcos, though, is that content must be acquired or licensed at competitive rates. Incumbent pay-TV SPs (cable and satellite operators) have a legacy of decades worth of experience acquiring content and negotiating content licensing agreements. Without acquiring compelling content for each of the three content categories at competitive rates, any telco IPTV offering is doomed to be a marginal success at best.

Content Management

Content management is a crucial component of a comprehensive IPTV solution. Content management refers to programming as well as advertising, which is inserted into programming and intelligently routed to individual viewers. Content management encapsulates a number of critical systems, which can be categorized into three distinct buckets: reception and encoding; rights management; and back office billing, provisioning, activation, and monitoring.

Reception and Encoding

Content is not created equal. As a result, maximizing the competing goals of compression efficiency and visual quality is a difficult but critical balancing act, with content types dictating the outcome. For example, a fast moving sports program may require more bandwidth than a slower moving, static news program.

Encoding is a necessary process, with advanced compression technologies such as H.264 (a variety of MPEG-4) or Windows Media VC1 potentially helping SPs reduce the bandwidth required to deliver a standard or high-definition video stream by as much as 50%. Even though SPs receive most content in MPEG-2, which is well suited for incumbent cable and satellite operators, instead, future IPTV deployments will deliver content to end-users as H.264. Although content delivered over an IPTV system does not need to be converted to H.264, a typical IPTV deployment will employ advanced compression technologies to deliver content most efficiently.

SPs receive content in a variety of ways, including via satellite or terrestrial broadcasts. The requirements of the content distribution system then dictate how the received content is encoded. Typically, encoding national content intended for distribution throughout the entire service footprint occurs only once at the master head-end, assuming the SP has the necessary infrastructure in place to distribute national content to regional head-ends or hubs. The master head-end then passes the encoded content to the regional hub. The regional hub also receives and encodes local content. This is a cost-effective way of managing the encoding process as it greatly reduces the need for high-capacity encoding at the regional level, thus minimizing the expense of purchasing costly encoding equipment.

Rights Management

When implementing an IPTV solution, SPs must fully address content protection and digital rights management (DRM). The methods by which end-users consume content will dictate the content protection requirements, i.e., how the content is protected and the nature of the content protection.

Traditionally, pay-TV content is protected during transmission, from the head-end to the set-top box. Cable and satellite operators have employed conditional access security systems that serve to restrict content usage to only those authorized to view the content. In IPTV, similar usage rules still apply; however, SPs should design rights management systems with an eye on the emerging digital home. Thus, content needs to be secured during transmission *and* usage rules need to accompany a piece of video content throughout its usage lifespan, which may include storage within the

customer premise equipment (CPE) itself, distribution to client devices within the home, and eventually distribution outside the home to a mobile device as well.

As a result, for SPs to offer their subscribers next-generation flexible usage scenarios, traditional conditional access needs to morph into digital rights management. In other words, telcos building an IPTV system from scratch should not mimic legacy rights management systems but instead look to the future, the digital home, and digital lifestyle.

Back-Office Billing, Provisioning, Activation, and Monitoring

IPTV network architectures demand best-of-class back-office content management systems able to address the increasingly sophisticated ways in which content and advertising are served to individual subscribers. Two key back-office components include customer relationship management and digital asset management. On a fundamental level, these systems must be able to handle billing for subscriptions to linear as well as on-demand content. Linear content, for example is typically billed on a subscription basis according to the specific tier of service being subscribed to. On demand, however, is more complex in that different types of pricing and packaging models are often offered, including subscription and a la carte at various price points with potentially different usage rules.

Systems must also handle service activation in such a way that subscribers get what they pay for and at the same time, SPs do not give anything away free of charge.

The provisioning subsystems also must be able handle complex tasks associated with content location on the network as well as the delivery of that content to the subscriber. Because IPTV systems are designed primarily to push to consumers only the content they request at a specific time, it is far more complex than cable systems in which all linear content is typically broadcast simultaneously. Further, the multi-tiered nature of an IPTV system, which encompasses a master head-end and a host of regional hubs, lends itself to distributed storage of on-demand content. Therefore, that content must be accessed on the fly from wherever it resides. The system also needs to keep track of content once it has been delivered to the consumer for billing and rights management purposes.

Digital asset management involves far more than maintaining control over programming. SPs with the right tools in place can harness the power of digital content distribution through digital ad insertion in general and targeted ad insertion in specific. These tools must be able to locate advertising assets on the network and seamlessly integrate them into programming to target the particular type of content being viewed, the audience demographics, or viewer profile. Thus, the system must be intelligent with respect to targeted advertising campaign management and digital asset location and delivery.

Content Delivery

The delivery of video content within an IPTV framework is what really separates IPTV from legacy radio frequency (RF) cable systems. IP is unique architecturally in that it may prove to be far more efficient than cable in terms of bandwidth usage.

One of the key distinctions between cable and IPTV is the notion of gating factors. The gating factor for cable is the plant, meaning how many megahertz the plant is. For example, a 750MHz cable plant can offer only as much content as will fit within this spectrum. Whereas the gating factor for IPTV is the size of the pipe coming into the home. A 30Mbps pipe can deliver only as much content as will fit down the pipe, although this does not limit the total amount of available content. This has important implications in the balancing act between linear and on-demand programming.

In the cable world, a linear channel is broadcast out to everyone. It consumes a fixed amount of spectrum whether it is viewed or not. To add more channels, spectrum must be allocated from the fixed, limited supply. To add a high-definition channel, even more spectrum has to be allocated. Today, linear channels remain the primary context in which viewers access their favorite shows, even as the transition from a linear programming environment to an increasingly on-demand one progresses. Time shifting, via a DVR, still depends upon linear programming as head-end caching of all broadcast content is far from a reality. With linear's importance maintained, and more high-definition channels becoming available, the cable spectrum crunch is coming.

IPTV, however, is a means for SPs to avoid these legacy issues and adopt a network architecture that makes sense for the present and the future. Within the IPTV framework, most linear channels are delivered only when requested by a viewer, or blocks of popular channels are broadcasted but can be switched out in the event that bandwidth is needed for something else. This notion of unicasting content, as opposed to broadcasting content, enables IPTV to deliver programming into the home while offering a virtually unlimited lineup of channels, standard and high-definition. Therefore, in a properly designed IPTV deployment, the factor gating cable — the spectrum of the cable plant — is circumvented. As long as the bandwidth into the home is sufficient, linear and on-demand content is accessible from an ever-increasing content library.

Server and storage architecture is critical to a successful IPTV deployment as both the linear and on-demand content needs to be addressed. It is in the on-demand environment that SPs need to take care to adopt best-in-class scalable solutions. On-demand is growing in importance with consumers beginning to expect larger libraries of content as they transition from viewing linear content to viewing what they want, when they want. Standard and high-definition on-demand content is also increasingly being used for competitive differentiation as a way to attract and retain subscribers and represents an all-important incremental revenue stream for SPs.

Telcos looking to deploy IPTV have a unique advantage over their cable competitors. Cable, particularly in the United States, has already moved aggressively into VOD. Although this may give cable a temporary advantage, next-generation server and storage solutions can offer IPTV a means to leapfrog the competition. Cable today is saddled with legacy first-generation non-standards-based solutions that lack a migration path to simple scalability. Although equipment upgrades are beginning to occur, often from standards-based solutions vendors, the industry will be mired in legacy systems for the foreseeable future.

IPTV is starting from scratch so telcos have no legacy systems with which to contend. Thus, telcos should adopt next-generation standards-based on-demand solutions that

will offer both the power to deliver a competitive service today, while being scalable enough to migrate to an increasingly on-demand world tomorrow. This involves having best-in-class storage solutions that are multitiered — that is, integrated storage systems that can be easily upgraded with additional storage, and that can intelligently move content from master head-ends out to the network's edge. This multitiered approach can help operators minimize the costs associated with needless redundancy while providing first-class reliable service to subscribers. This is needed not just for programming content, but for advertising assets as well, which will be required for insertion within the on-demand environment. All told, the storage component of the server architecture can make or break the operator's ability to seamlessly add capacity and therefore add value to a consumer's IPTV experience.

IPTV INFRASTRUCTURE

A next-generation network is an essential enabler for IPTV services. Telcos are upgrading their legacy networks in an effort to realize the revenue opportunities associated with delivery of digital video services. However, SPs are pursuing different strategies with respect to network upgrades and build-outs, as which strategy to select is often driven by a variety of considerations: time-to-market, legacy network topology, the costs associated with network rebuilds, and assumptions regarding what constitutes a competitive video offering.

Architecture of Telco Broadband Network

Existing Network Architecture

Existing network architecture varies greatly by SP and geographic region. Previously, networks were not designed with the bandwidth necessary to offer video services in mind. Rather, fiber and DSL networks grew out of the need to initially offer traditional wireline voice and later emerging data services. Although bandwidth constraints dictate the broadband download speeds that SPs can offer their customers, bandwidth takes on an entirely new context once IPTV enters the picture. For the most part, the bandwidth capacities of networks in North America trail those in Europe, which in turn trail those in Asia/Pacific. In general, fiber passes millions of homes in Asia/Pacific, whereas in Europe and even more so in North America, it is still restricted to more isolated instances in urban areas. In Asia/Pacific and to a lesser extent in Europe, the average download speed of 8Mbps achievable with ADSL is sufficient for standard-definition IPTV services, even using less efficient MPEG-2. Many SPs are also upgrading to newer, more advanced DSL technologies such as ADSL2+ and VDSL, which deliver much greater bandwidth speeds at a comparable price as ADSL. In the United States, however, even 4Mbps is a rarity for DSL service outside of some independent local carriers and telcos specifically targeting the business market. Moreover, with the growing importance of HDTV in the United States, even 8Mbps simply will not be competitive in the near future.

Network Enhancement and Upgrade

Today's networks range from the old and inferior to the new and robust. SPs worldwide have prioritized, to varying degrees, network rebuilds to offer both high-speed Internet service and IPTV. In the United States, the RBOCs are mapping out aggressive network rebuild plans, largely because of a favorable regulatory environment in which the telcos can now build out fiber networks while maintaining exclusive use of these networks — that is, they will not be forced to allow competing providers to offer services over their newly rebuilt fiber plant. These infrastructure plans have turned attention to IPTV, as the requisite bandwidth will finally be available.

Build-out strategies are not consistent across SPs, nor are they uniform across all of a provider's markets. A number of factors affect these strategies. Time to market is important and influences the decision regarding how deep to push fiber into a network. Network topology and underground-versus-overhead fiber upgrades are also contributing criteria. Cost is also important. In the United States, the cable industry has already spent more than $80 billion over the past decade on the hybrid fiber-coax infrastructure upgrades required for data, video, and voice services. The RBOCs have not talked in dollar terms anywhere near that amount, although they are only taking their first fiber steps.

The alphabet soup of DSL technologies is an important consideration that an SP must address as it plans its IPTV rollouts. The selected DSL technology determines bandwidth and works hand-in-hand with network architecture. Today's standard DSL service typically utilizes ADSL, which allows for 8Mbps over copper lines shorter than 14,000 feet on average. While this maximum speed seems impressive, it cannot be uniformly maintained across a service area, particularly for those subscribers some distance away from the central office (CO). IPTV requires at least a minimum level of bandwidth to all customers. Advanced DSL technologies dramatically improve upon today's standard ADSL, with ADSL2+ enabling downstream data rates of 20–25Mbps on limited loop lengths and VDSL enabling even greater bandwidth speeds. Although VDSL2 standards are still in development, conventional wisdom is that VDSL2 will be able to offer the greatest possible loop reach with corresponding downstream data rates in the 25–30Mbps range. However, while these throughputs are sufficient for single or even multi-TV standard definition IPTV services, they simply do not offer the capacity required of a competitive IPTV service in the United States where multiple TVs and high definition are market requirements.

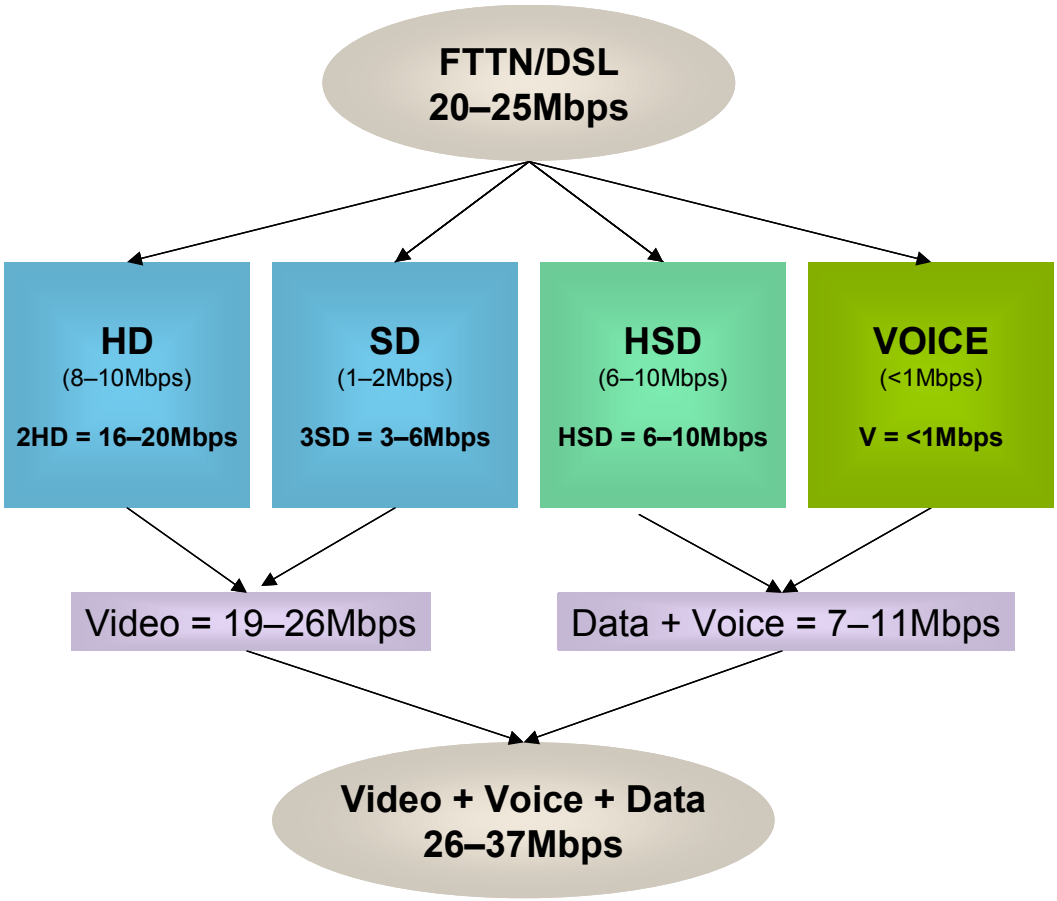
Resulting Bandwidth Capacity

The current round of infrastructure improvements will begin to level the bandwidth playing field worldwide with fiber rollouts increasing capacity in each of the major regions. Although certain Asian markets, most notably South Korea, continue to raise the already high bar even higher, Europe and North America are also moving toward significant bandwidth upgrades. This is good news for the IPTV market, as increased bandwidth allows for more streams of higher-quality video content. Again, rates will not be uniform as operators and consumers feel the comfort — or the pinch — of those build out strategies.

FTTP, of course, offers the best-case scenario in which SPs have the most flexibility. In fact, FTTP could be leveraged to build out an RF network, similar to that used by cable, to handle the broadcast of heavily viewed linear channels. On-demand and IPTV can coexist with the RF service to offer consumers a full complement of content. The limitations of fiber, however, will likely be felt most in the fiber-to-the-node (FTTN) implementations. Even with an anticipated network speed of up to 26Mbps, SPs will be challenged with respect to offering top-tier programming options (see Figure 3).

FIGURE 3

Bandwidth Capacity and Consumption Sample Scenario



Source: IDC, 2005

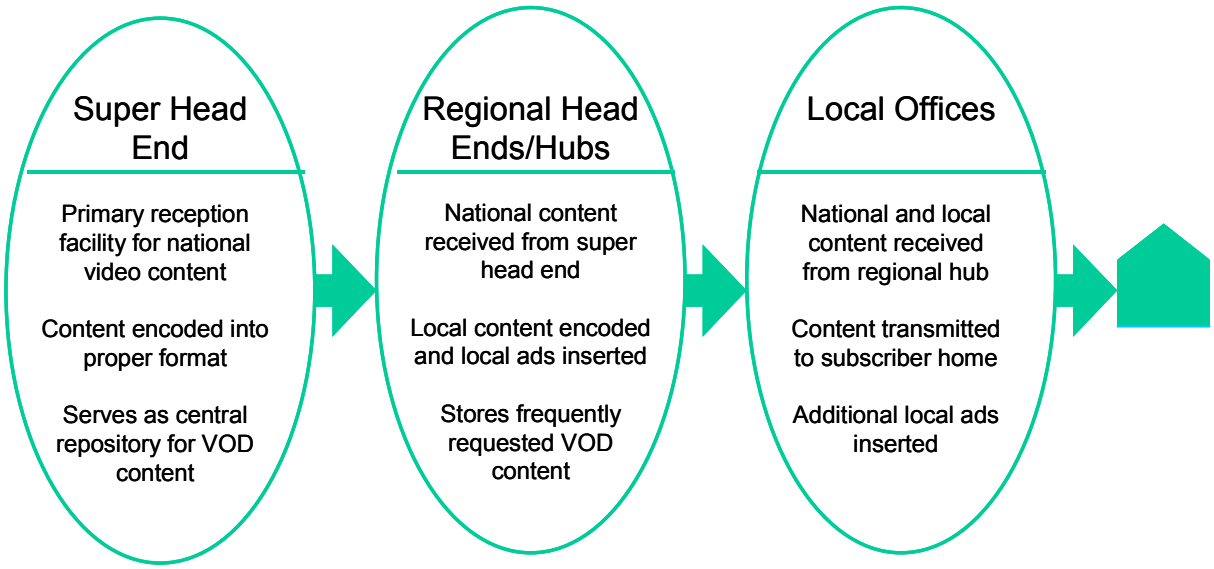
As can be seen in the figure above, video quickly eats up the available bandwidth. Thus, SPs must carefully evaluate what their network will support, and whether the resulting IPTV offering can be competitive with improving incumbent cable and satellite TV services. Consider the possibilities in a top-tier subscriber's home: this subscriber may have a high-definition television. Because this customer was likely a cable subscriber, he has been using a dual-tuner HD DVR set-top box through which he routinely watches HD content, while, on occasion, simultaneously recording another HD program. That single HDTV is therefore consuming two HD streams, and at average bit rate of 8Mbps per stream, that one viewing environment requires 16Mbps. That same subscriber may have two other televisions also on at the same time — the kitchen and in a teenager's room for example — consuming another 2–4Mbps at standard definition. It is clear that if the SP now wants to offer 10Mbps broadband service, 26Mbps falls short. So there are significant implications to how an SP approaches bandwidth requirements. Perhaps the high-end subscriber cannot be targeted, but is the above-mentioned consumer even high-end, or will that be considered high-end in two or three years? The stakes are high with bundled data, voice, and video services able to pull in upwards of $150 a month of recurring revenue.

Architecture of Video Distribution Network

The network infrastructure is only one-half of an IPTV solution. The other half is the video-distribution system. There are a number of key components within the video network, which form a tiered distribution system as seen in Figure 4.

FIGURE 4

Video Distribution Network Diagram



Source: IDC, 2005

- **Master or super head-end**. It is at the master head-end that most content is received, encoded, and sent out to individual regional systems. Because the master head-end can serve a number of regions, national programming feeds with national advertising can be processed then transported out to the individual regions. The master head-end can also serve as the central repository for on-demand content with large video libraries housed nationally for distribution to the regions. A tiered approach can be taken with respect to on-demand content, with frequently viewed titles replicated down to the local level with back catalog titles stored only centrally. Storage is a critical element of this tiered approach in that the use of intelligent storage solutions facilitates both operational and capital expenditure efficiencies.

- **Regional head-end or hub.** The regional head-end serves a particular market, although this market may be sliced into numerous smaller service areas. For example, the regional head-end may serve a large metropolitan area or a designated market area (DMA); but within that territory, there are districts that may have unique content, unique demographics, and unique advertising zones that necessitate a local approach to last-mile distribution. Content received from the master head-end needs to be transported on to consumer, but on the local level, channel lineups need to be set, local advertising needs to be inserted, and local content must be received and encoded. Regional replication of frequently requested on-demand content should be housed at this level with back-office asset-management intelligence in place to track usage, manage inventory, and access centrally stored content when requested. Subscriber management systems, including billing, provisioning, and DRM, ensure proper service delivery.

- **CPE.** The CPE or set-top box (STB) is the primary client device on the outer-most edge of the video network. Operators should be careful not to settle for a lowest common denominator, as the STB is becoming a key component of top-competitive pay-TV services. Even with the temptation to minimize CPE expenditures, a STB, with DVR and processing power and memory to handle a robust interactive program guide and other applications, is fast becoming a market requirement. Further, for operators to effectively compete against incumbent cable and satellite providers, taking steps to offer next-generation functionality before deploying legacy boxes will help create competitive differentiation. Connectivity between boxes within a subscriber's home will enable multiroom DVR in which content can be shared between rooms, fast becoming the next DVR requirement for advanced subscribers.

Across the network, it is imperative to have an effective monitoring solution to pinpoint trouble spots and service interruptions. Problem diagnoses made in advance of a service truck roll could facilitate subscriber fixes without onsite technician assistance. Unlike data services, which can tolerate momentary interruptions, video is similar to voice — consumers expect constant availability.

CONCLUSION

Successfully launching IPTV depends on choosing the right network architecture both in terms of fiber rollout and the video distribution system. On the fiber side, SPs

should take care to choose a solution that will provide enough bandwidth to launch a competitive video service. This means not only being competitive at launch but also for years ahead during which the competition will not be standing still. The video distribution system must be approached with a similar objective — compete today and tomorrow. To do that, SPs must select equipment that can scale as the subscriber base increases and services grow more robust. Best-in-class equipment will enable a high-quality IPTV offering and will provide a seamless migration path to more capacity and advanced applications without missing a beat. Preparing for this migration path is essential as competitive pressures increase and evolve. Therefore, solutions should be selected with a clear understanding that equipment choices could significantly impact one's ability to compete for subscribers and revenues.

Under the covers, SPs must also adopt software systems for content and subscriber management so that the network can run intelligently. By starting from scratch, IPTV SPs have the chance to learn from other solutions on the market and select only the best.

Time-to-market will be critical as the stakes grow. Revenue losses from declining traditional wireline voice services must be offset by emerging opportunities, yet IPTV must be done right at launch. That is, to attract and retain subscribers, telcos need to offer cutting-edge functionality in addition to the vast array of content choices already available from incumbent operators. Such is the dilemma of wanting to get to market quickly, but needing to get to market with the right blend of services. Equipment vendors can help in that they have built these systems before — video might be new to a telco, but video is not new to companies that have already been providing gear to the pay-TV market. A much-needed step is to map out the key components of the network and the necessary steps required integrating those components. These components should be evaluated with respect to both delivering a competitive video service within the established rollout timeline and enabling strategically selected value-added services.

The network is the essential enabler of a competitive IPTV deployment. The pay-TV market in the United States is reaching saturation so IPTV providers will need to capture market share through effective differentiation. Compelling content packaging, on-demand, interactive applications, and ultimately, integration of video and video devices into the digital home are more than the goals, they are the requirement.