



# The Basic Architecture of IPTV

This document is one in a series of articles focused on helping executives, sales people and other personnel who are interested in IPTV to better understand the elements that impact the business case for IPTV.

The articles view IPTV from a business and basic technical perspective building upon information gathered throughout the series.

After reading these articles, the reader should have a good understanding of what matters within the IPTV ecosystem.

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## An IPTV Overview

The Communications and Entertainment industries are experiencing a major shift in business models. This shift is introducing new services, new competitors and new challenges.

One major challenge falls within the digital distribution of content. The challenge is not dissimilar to that being faced by the recording industry today. How can this new digital distribution method be leveraged while also protecting intellectual property rights? IP Television (IPTV) offers a compelling option as a controlled method through which to distribute content using Digital Rights Management over a secure network.

People commonly associate IPTV with a cable or streaming video entertainment substitute. This perception is a disservice to IPTV. Although entertainment is perhaps the most important service delivered through an IPTV system, IPTV is essentially a host of applications built on Internet Protocol that deliver user's with control to choose a myriad of rich content. When combined in a triple or quad play service portfolio, the user gains substantial control over their network of services and content.

IPTV should not be confused with Internet TV which is essentially a method for streaming video content to the user over the unsecured internet. Internet TV does not offer the content security, the Quality of Service (QoS) or the simplified control over the user experience offered by IPTV.

Large service providers are investing billions of dollars to upgrade their infrastructure to support IPTV while other smaller service providers are evaluating options including building their own systems or outsourcing the IPTV infrastructure, content acquisition and service management to firms such as SES-Americom Inc., Eagle Broadband Inc., and Auroras Entertainment.

So why are service providers investing in IPTV? IPTV introduces a new revenue stream aimed at delivering top line growth while also enhancing the service bundle needed to reduce the churn of traditional telephone customers. Since increased competition and bundled services will further erode the prices of traditional ala carte services (telephone, broadband, entertainment), managing ongoing costs within the IPTV ecosystem will be critical to making an IPTV business case work.

The IPTV network architecture chosen will depend upon many factors including the services portfolio to be delivered, the existing network investment, the need for competitive differentiation, the volume of POPs to be served and a variety of customer care and user interface requirements. Figure 1 illustrates a typical IPTV ecosystem.

“US telcos will succeed simply because they have no choice but to succeed, and they’ve opened their pocketbooks to make that happen.”

Meir Lehrer—VP NDS

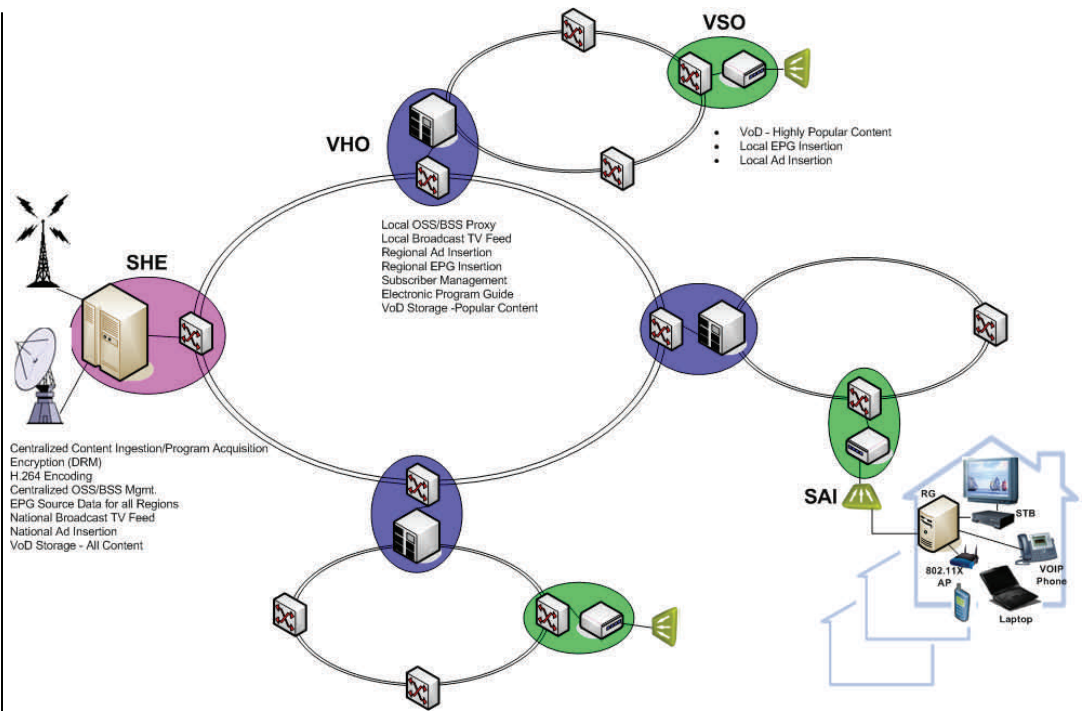


Figure 1 – High Level IPTV Architecture

**Super Head End (SHE)** - The SHE is the brain of the IPTV system. This is where the national broadcast channels and other content are received and distributed. The content is put through a process of ingestion (capture from various sources – satellite, fiber feeds, other) and then encrypted (First formatted for compatibility with the chosen STB then Digital Rights Management is applied to protect the content from being pirated) prior to delivery to various parts of the network. The main storage for the Video on Demand (VoD) content is also located at the SHE. Other key functions such as service management, subscriber authentication (what content should the subscriber be allowed to access), IP address management and fault and performance management can reside at the SHE or can be managed at the Video Hub Offices. A redundant SHE can be employed for backup.

**Video Hub Office (VHO)** – The VHO acts as the relay point for distributing content to a regional market. VHOs can serve between 100,000 and 1,000,000 users. The VHO receives content from the SHE and distributes it to the subscriber either directly or through another office called a Video Serving Office. Prior to distribution, local channels are ingested and encrypted, channels are lined up for the local market and local ads are inserted. Popular VoD content is stored and distributed at the VHO.

**Video Serving Offices (VSO)** - VSOs can be employed, when warranted, either by a large enough subscriber base at the smaller market level or when there is a need to focus on a specific demographic requiring unique advertising zones or content. The VSO moves the frequently requested on demand content even closer to the subscriber.



**Customer Premise Equipment (CPE)** - The CPE combined with the home wiring makes up the home network. A typical configuration includes a Residential Gateway (RG) that connects to the serving access network. The RG also manages the control requests from each Set Top Box (STB) back to the video distribution network. A STB is connected to each TV and delivers the video and audio programming. The home wiring is an important aspect of the home network and can include CAT5/CAT6/Coaxial cable and possibly wireless. Although home wiring can be very costly, service providers typically choose to rewire the homes during the initial installation in order to avoid future problems.

**IPTV Middleware** - IPTV middleware is the software control layer that enables the delivery of the services. Current middleware offerings are provided by multiple vendors, each employing non-standard approaches. The middleware enables channel change control, Electronic Programming Guide browsing, VoD control including browsing and purchasing content, interaction with ad-insertion systems, and other customer facing control activities. Companies such as Entone, Kassena, Minerva and Microsoft provide IPTV middleware products.

**IPTV Video-on-Demand (VoD)** - VoD provides users with the convenience and choice to rent the content they want from the comfort of their own home. Initially viewed as a premium service by the cable companies to compete with the movie rental companies, its expansion to include free content has proven to be an effective churn reducer. An important consideration for the service provider is where to locate the VoD content. Placing all of the content at the head-end has the impact of requiring more bandwidth throughout the access network with the possible result of throughput constraints. Placing significant content at the edge of the network increases infrastructure, storage and operations costs. The right mix of centralized and distributed VoD content can improve the business case. As we'll see in a later article, the business case for VoD is challenging.

**Personal Video Recorder (PVR)** - The PVR, made popular by companies such as TiVO, is an essential service within IPTV and allows the user to selectively record, store and view their chosen content at any time. Although different service providers may employ varying approaches, the most common approach at this time is to include a single Set Top Box with PVR functionality that is networked to the other Set Top Boxes in the home. Although Network PVR (NPVR) is an available option, the resulting access bandwidth requirements could be problematic as the number of homes served from a single serving office could grow too large.

**Access Network** - The access network typically employs fiber to the node (FTTN) or (FTTH) using Video Digital Subscriber Line (VDSL). The bandwidth to the home ranges between 20 Mbps and 50 Mbps depending upon the access technology chosen. New access technologies bond (combine) the copper cable pairs running to the home to increase the bandwidth speed.



Although not necessarily part of the architecture, the EPG, DRM and Content greatly impact the IPTV business case. For that reason, we have included a brief overview of these subjects.

**Electronic Programming Guide (EPG)** - The EPG presents the subscriber with a robust navigation system to browse the available channels and the on-demand content. An easy to use EPG greatly enhances the customer experience. The EPG can also introduce a method to drive more advertising revenues.

**Digital Rights Management (DRM)** - The protection of content rights within digital distribution by the service provider is not only essential to reduce content piracy and revenue loss, it is also a liability taken on by the service provider through its agreement with the content providers. Since the IPTV service is delivered through a closed access network, the service provider can choose the approach that best meets their network architecture and operations philosophy. Various approaches exist today including encryption and key management. Looming on the horizon will be the need to allow integration across networks thus allowing a subscriber of one network to control their content while visiting another network. DRM will be a key enabler of choice and control for the subscriber.

**Content** - There is a blurring of what makes up content within the IPTV services portfolio. Clearly traditional entertainment material such as movies, broadcast channels, specialty channels, live events and various VoD content make up the lion's share of today's content. However, with the advent of personal content, the IPTV network becomes a distribution method through which non-traditional content could be distributed while maintaining content rights.

Firms such as BIAP Systems are introducing creative extensions to content. Examples include actively updated fantasy sports stats viewed real time during a sporting event or live links to auctions (eBay) while watching TV. Converged services such as instant messaging, picture/video push or product purchases using advertised specials and coupons will exercise the interactive nature of IPTV.

## What Matters in the IPTV Business Case?

This article provided a high level view of the elements within the IPTV ecosystem. The articles in this series are intended to help the business executive focus on what matters within the IPTV business case from a cost and revenue perspective.

Your comments and questions are appreciated. Contact us at: [sales@convergedns.com](mailto:sales@convergedns.com) if we can be of assistance.

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