

A Focus on IPTV in Canada

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The purpose of this white paper is to provide a definition and background to Internet Protocol Television (IPTV). Technological and market opportunities as well as challenges will be reviewed with a focus on the Canadian market.

The acronyms and technical terms bolded throughout this paper are defined in the glossary on the last page.

What is IPTV?

IPTV stands for Internet Protocol Television. It is the delivery of television programming via **IP Networks**. Traditionally, television broadcasts have been delivered to viewers via one-way networks such as satellite (e.g. Bell Xpress Vu, DirectTV) or cable (e.g. Rogers TV, Comcast). The prevalence of two-way Internet broadband access networks provide operators the opportunity to layer on additional services on their network pipes such as voice (**VoIP**) and now video. Fibre investments (**FTTx**) combined with **VDSL** for the last mile over copper wires represent the architecture of choice for Telco's to deliver these services to residential customers. Cable providers on the other, use a combination of fibre and the **DOCSIS 3.0** standard to accomplish the same goals. There are three broad categories of video content that can be delivered via IP networks under the IPTV category:

- Live streaming of broadcast television
- Time-shifted programming also called Catch-Up TV. This is the replay of a TV show that was broadcasted in the past. This is very similar to VOD described below as the end-user does not need to set their **DVR** or **TiVo** to record these shows.
- Video on Demand (**VOD**) provides access to a library of videos (movies, TV series) with the ability to play it on demand.

IPTV is 'On-Net' meaning that it is distributed on a closed-loop managed network which allows the provider to control the quality of the service. End-users require a Set Top Box (STB) configured and provided by their service provider. The STB allows for two-way communications on an IP network and decoding of the video stream for viewing on a television. STB's can also be purchased at retail stores and a few examples are provided under the next section. IPTV providers specify which STB's they support.

What is Over-The-Top?

Video content that is available to anyone with broadband access is called Over-the-Top (OTT) to distinguish it from IPTV. OTT content delivery is not managed or controlled in any way by the provider of the content and is therefore delivered to anyone with Internet access on a best effort basis (e.g. Netflix, Hulu, Apple TV). There is a vast amount of content available on the web that

can be viewed on a computer or mobile device for free. As well, there are media players/digital media receivers available at retail stores, such as the Boxee Box, VUDU and the Xbox 360 game console, which can be used as a STB to view OTT content on a television.

Advantages of IPTV over OTT

IPTV is a managed service and the provider will ensure a smooth experience for their customers. OTT is a best effort service since the providers do not supply or control the high speed connection to the end-user. Some IPTV services are more open than others and will enable their customers to access OTT content and the web on the television. Actually, many IPTV service providers offer a plug-in to Netflix given its growing popularity.

Hybrid Offerings

Hybrid STB's give operators the ability to deliver Digital Television (**DTV**) to viewers via either satellite or cable and also provide IP connectivity. The major advantages of using a hybrid STB are the ability to: (1) leverage the existing DTH (Digital to Home) Telco or Cable infrastructure rather than using precious IP bandwidth for the downstream broadcasts of hundreds of High Definition (**HD**) and Standard Definition (**SD**) channels; (2) continue with existing content rights agreements rather than re-negotiate for IPTV rights; and (3) provide interactivity and innovative application via the IP connection. Hybrid STB are said to increase **ARPU** as the IP services constitute a value-add for the DTH provider¹. By 2015, all STB shipments worldwide will consist of the Hybrid kind².

Why is IPTV Important to Innovation?

IPTV opens up a realm of possible innovations at each step of the supply chain from how video content is created, acquired, encoded, stored and delivered to end-users as well as how end-users can view and interact with the content.

Innovations over the past 10 years have translated into lower cost equipment and improvements in video technology performance thus producing a virtuous effect in the marketplace: as better video experiences are provided to consumers, they watch more videos. One particular such video innovation, the **MPEG-4** standard, has fueled this cycle: one HD channel compressed with MPEG-4 requires about 5 Mbps of data bandwidth which is a great improvement over the previous MPEG-2 standard which required three times more bandwidth. As well, the MPEG-4 standard offers manufacturers and developers new functionality that lowers the cost of video equipment and the operational cost of distributing video.³ For example, wide angle high definition video cameras can be purchased for as little as \$300 enabling professionals and

¹ IMS Research (http://imsresearch.com/news-events/press-template.php?pr_id=885)

² <http://www.broadbandtvnews.com/2010/08/19/boom-time-for-hybrid-boxes/>

³ MPEG-4 Industry Forum: "MPEG-4 The Media Standard", November 2002, p.5 and p.17.

enthusiasts alike to create content, upload it to the Internet and share it with anyone. The video technology ecosystem continues to make strides fuelling investments in the video medium⁴.

The two-way nature of IP networks enables software developers to create an interactive and personalized experience for end-users (for interactivity to be possible, a receiver and a transmitter feedback channel is needed and IP networks represent the best solution). Although interactivity is possible with existing satellite and cable networks when used in tandem with modern STB's and the Internet (Hybrid model). Examples of interactive applications are:

- Interactive Electronic Programming guides (**EPG**) that use metadata to deliver intelligent searches. For example, searching the past 14 days of TV content by keywords or by an actor's name (a common feature offered by the Canadian IPTV providers), then find suggestions on what to watch rather than just scrolling up or down a static program guide. Providers can limit searches to their own available content or open searches out to the cloud by bringing the web to the TV in a similar fashion to GoogleTV⁵. In addition, the ability for end-users to write reviews and choose content based on viewers' rating and reviews promotes the re-use of older content that one might not think of watching.
- Engaging the viewers with real-time voting and real-time feedback to live television programming for a "lean-forward" engagement as opposed to a traditional "lean-back" approach.
- The ability to look up a player's stats while watching a sports game, or control the camera angle.
- Connecting with social networks to invite friends or family to watch along remotely.
- Using a mobile device to control the television EPG or interact with TV applications.
- The flexibility for viewers to create the own channel by selecting and aligning the content they enjoy the most.
- Integrating VoIP to the television in order to view who is calling you and decide whether to answer, forward the incoming call to a mobile device or to voice mail.
- Etc.

Video content can be viewed not only on TVs and PCs but also on portable wireless devices. As end-users demand the flexibility to view content anytime, anywhere on any device, innovative wireless devices (e.g. smartphones, tablets), better ways to store data (CDN – content delivery networks) and greater availability of wireless bandwidth (4G wireless networks, WiMax, WiFi, Femtocells) are emerging to meet the needs of the digital generation.

Going a step further from IPTV into the "Connected Home", innovations in by consumer devices companies such as Samsung and Sony are surfacing where multimedia content can be viewed and shared seamlessly between various home connected devices (e.g. photo files, music and games stored on your PC can be viewed / played on your TV). Samsung offers a Software Development Kit (SDK) for interested developers to create TV Apps for the Samsung television

⁴ Will Richmond, VideoNuze: Robust-Ecosystem-Promises-that-Online-Video-Will-Keep-Looking-Better-and-Better, <http://bit.ly/eVdnKF>

⁵ GoogleTV: <http://www.google.com/tv/>

and has provided a proprietary marketplace for developers to sell their Samsung TV Apps⁶. Sony is providing a connected experience through their partnership with Google to offer a seamless integration with Google TV⁷.

How is North America positioned in IPTV?

The North America leaders in IPTV are Verizon with 3.3 millions FiOS TV customers⁸ and AT&T with 2.7 million U-Verse TV customers⁹. FiOS TV is offered to a total of 12 million premises and AT&T is available to 23 million U.S. homes. Together, Verizon and AT&T own approximately 22% of the worldwide market as of the end of 2009 which totaled 27.7 million subscribers¹⁰. By the end of 2010, however, the global IPTV market is forecasted to reach 41.2 million subscribers (33% growth)¹¹! France is ahead of the US with more than 8 million subscribers, then China with 3.5 million and Korea with 3 million subscribers respectively¹². The top providers in the countries with the most IPTV subscribers own 77% of the worldwide market:

Market Penetration	Top Providers*	Subscribers
France : 29%	Free (Iliad SA) and Orange (France Telecom)	8.1 million
China & South Korea: 26%	China BesTV, Korea Telecom	7.3 million
USA: 22%	Verizon FiOS TV AT&T U-Verse	6 million
77% of Worldwide IPTV Market estimated @ 27.7 million subs.		

*Figures based on latest publish financial report as the time of writing this paper

In Canada

IPTV roll-outs by operators in Canada have been very slow and restricted to limited geographical areas due to network infrastructure limitations. Given the Telco oligopoly in Canada, there is less of a need for these organizations to innovate and differentiate their services to win customers, although we are beginning to see some competition between Bell and Videotron encouraging investments by Bell to provide faster broadband speeds and IPTV services to win customers in Quebec¹³. Telus, Sasktel and MTS have offered IPTV for some time while Bell and Bell Aliant are just now rolling out an offering on their new fibre networks. The cable providers, Videotron, Shaw Rogers and Cogeco are focusing on improvements to their VOD platform and content libraries while slowly deploying **DOCSIS 3.0** technologies which will offer the bandwidth required for 2-way IPTV applications. It is interesting to note that Bell,

⁶ <http://www.samsung.com/us/appstore/>

⁷ <http://discover.sonystyle.com/internettv/>

⁸ Verizon 3Q2010 Investors' Bulletin

⁹ <http://www.att.com/gen/press-room?pid=18680&cdvn=news&newsarticleid=31312&mapcode=financial>

¹⁰ Gartner, Inc. *Forecast: IPTV Subscribers and Service Revenue, Worldwide, 2008-2014*

¹¹ MRG, Inc. *Semiannual IPTV Global Forecast, June 2010*: <http://www.mrgco.com/iptv/gf0610.html>

¹² Informa Telecom, IPTV World Forum, February 2010.

¹³ <http://www.globeadvisor.com/servlet/ArticleNews/story/gam/20100828/VIDEOTRONATL>

Rogers, Shaw and Videotron each own content media companies (CTV, CanWest and Quebecor respectively).

IPTV is only available to 10% of the Canadian population and adopted by 2% of households¹⁴. We estimate that **Canada has about 430,000 IPTV subscribers** (see table below) **or almost 7% of the North American market**. However, Canada with 10% of the U.S. population should have 10% of the U.S. IPTV penetration or over 600,000 subscribers if the market had grown at the same rate. Furthermore, the set of features and functionality offered by Canadian IPTV operators are basic such as control of the **PVR** over the Internet and the ability to search the **EPG** with keywords however, the features available are not as leading edge as Orange in Europe, for example, which provides a common user interface on three screens (TV, PC and mobile) and integrates with social media. Furthermore, Canadian IPTV operators are all using Microsoft Mediaroom as a platform which is limiting their ability to differentiate and to innovate in unique ways.

¹⁴ CRTC Monitoring Report July 2010 p.144 and p. 172

The Canadian IPTV Landscape

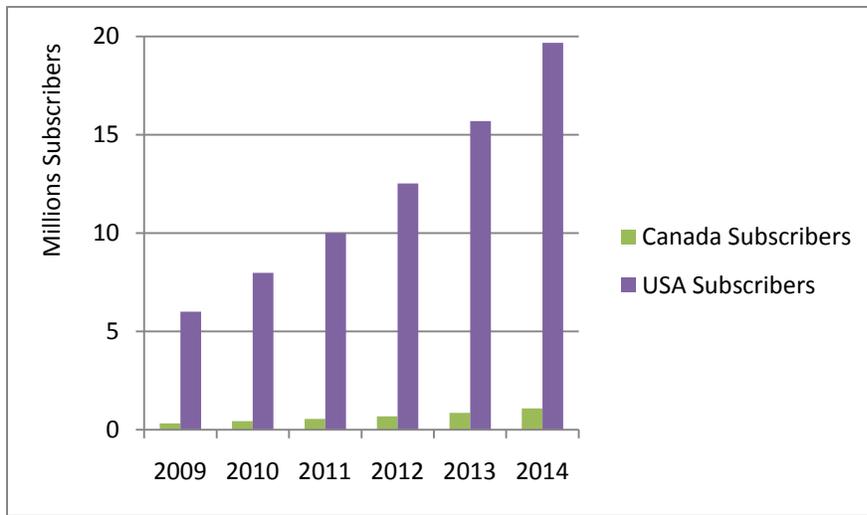
Operator	Telus	Sasktel	MTS	Bell & Bell Aliant
Solution	Optik TV	Max Entertainment	Ultimate TV	FibeTV/FibreOPTV**
Launch	November 2005	September 2002	January 2003	Small intro in 2005/06- broad commercial re-launch in late 2010
Subscribers*	266,000	77,831	86,500	Just launched/not reported yet
Special Features (All use Microsoft Mediaroom platform)	PVR Anywhere: pause show on one TV and continue watching on another TV. Record 3 shows at once.	PVR: Set PVR recordings from any computer with an internet connection. Record a show in one room and watch it in another.	PVR: Recorded shows can be played on any connected TV. Record 3 shows at once.	Remote PVR: manage your PVR using a computer or smartphone. Recorded shows can be played on any connected TV. Pause show in one room and continue watching on another TV. Record up to 4 shows at once.
	XBOX can be used as STB.	Currently upgrading to new Max (Microsoft Mediaroom)	TV Call Display. Watch up to 6 channels at once.	Picture in picture browsing.
	Keywords can be used to search the EPG	Keywords can be used to search the EPG	Keywords can be used to search the EPG	Keywords can be used to search the EPG
Availability	Calgary, Edmonton, Red Deer, Fort McMurray, Grande Prairie, Vancouver, Kelowna, Vernon and Whistler.	19 cities in Saskatchewan	Winnipeg, Brandon and Portage La Prairie	Toronto, Montreal, Fredericton
Price Point	Starts at \$50 per month to \$75 per month for HD.	Starts at \$39.95 for Basic Max to \$99.80 for Ultimate Max.	\$40.99 for basic to \$84.99 for a package with all the premium content.	Starts at \$32 per month to \$110 per month for the Elite package.
	The PVR is \$399 or \$15 per month rental and additional boxes for additional TVs are \$199 each or \$10 per month rental. Installation costs are extra.	Includes one set-top box, remote control, and modem. Add another set-top box for only \$2.95/mo. Add a wireless keyboard for \$79.95 each.	First PVR is \$5 per month. Additional PVRs are \$3/month each.	Must buy or rent an HD receiver or PVR. The receiver is priced at \$199 (or \$5 per month to rent) while the HD PVRs cost \$499 (or \$20 per month to rent).

*As of latest published financial statements. **Features and prices are representative of Fibe TV.

Trends – Subscriber Growth

IPTV worldwide has seen incredible growth and forecasts continue to be adjusted upward. Multimedia Research Group (MRG)¹⁵ forecasts that the number of IPTV subscribers globally will grow from 41 millions in 2010 to 101.7 millions in 2014 increasing their outlook by more than 20 millions recently. This represents a compound annual growth rate of 25.3%! If the USA and Canada grow at the same rate, the USA will have over 21 millions customers by 2014 and Canada will have just above 1 million. We believe these growth figures are achievable.

Table 1 - USA and Canada IPTV Subscriber Growth*



*The author's own extrapolation based on worldwide CAGR.

Trends – Revenue Growth

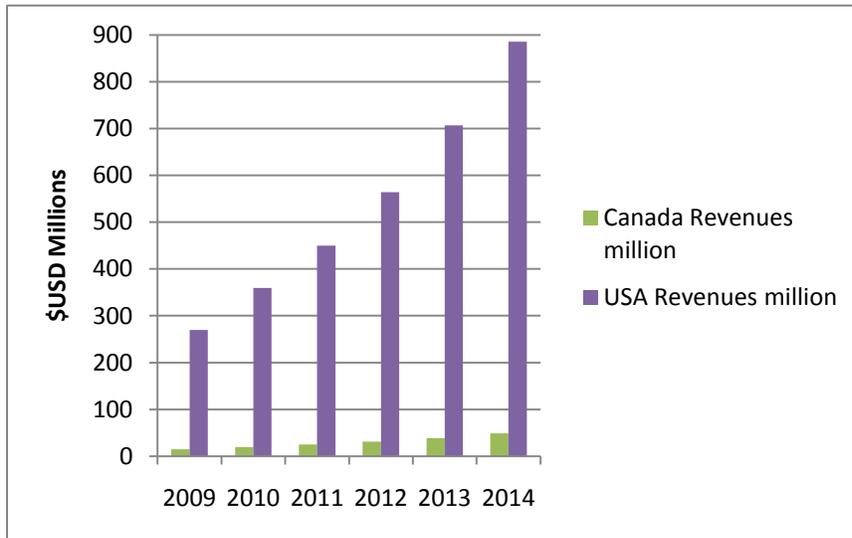
The fastest growing IPTV countries are China and India but due to very low **ARPU** in those countries, Europe and North America will generate the largest revenues. Again, MRG forecasts a strong global upward trend from \$17.5 billions in 2010 to \$46 billions by 2014; a CAGR of 27%!

Canada and USA revenue growth for IPTV were calculated using the subscriber forecasts shown in Table 1 and *Light Reading's* reported IPTV ARPU of USD \$45 per subscriber per month¹⁶. Based on this assumption, USA will reach revenues of \$885 millions and Canada will achieve revenues of \$47 millions by 2014. However, as OTT gains momentum and customers find more of their content online for free or at lower prices, competition will increase and these revenues figures might be too optimistic.

¹⁵ MRG, INC. "IPTV Global Forecast 2010 to 2014, Semiannual IPTV Global Forecast Report".

¹⁶ http://www.lightreading.com/document.asp?doc_id=195780

Table 2 - USA and Canada IPTV Revenue Growth*



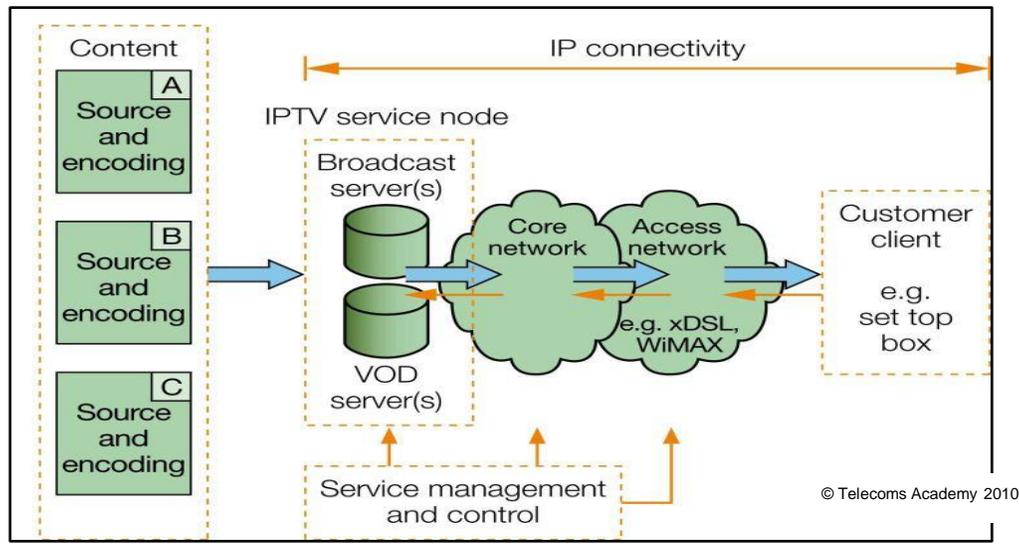
**The author's own extrapolation based on industry ARPU IPTV package.*

Challenges

Integration of the various video infrastructure service components, bandwidth availability and quality of service are challenges on the technical side. On the financial side, providers are having difficulties figuring out how to monetize IPTV since so much content is now available for free. Acquiring content rights has been a real struggle even for giants such as Google (Google TV: an OTT service in collaboration with Sony and Logitech)¹⁷.

Integration: There is a lot of complexity associated with ingesting, storing, encoding, transcoding and multiplexing video streams for delivery to the home. Any integration or interoperability problem along the way, from the video capture to the video retrieval through the STB in the home (see diagram below) can create a negative impact on the user experience.

¹⁷ <http://www.cnbc.com/id/40337416/>



Bandwidth: Video has intensive bandwidth requirements and is intolerant to packet loss, out-of-order packets and resends. Consumers may want two to three TV's in their home with HD programming and may want to use the Internet or make a phone call using VoIP simultaneously while watching TV. These data intensive demands on networks will only increase as more and more video media is carried on IP networks.

Quality of Service (QoS): For IPTV, quality of service affects the speed of channel changes and the quality of the viewing experience. On traditional one-way broadcast networks, all the channels are always “present” on the wire so that channel switching happens instantaneously and data bandwidth is not an issue. On IP networks, however, for best utilization of the network resources, many channels are not always present or only a subset is and, for this reason, channel changes can be slow. Testing and optimization of channel changes becomes a primary concern for operators in order to reduce latency of channel changes. Another main concern is the quality of the viewing experience such as image jitter, out of synch audio and the ability to play, pause and resume the video without issues. Again, this relates to the intensive bandwidth nature of video content and the ability of the underlying network infrastructure components to deliver a good quality experience under high network utilization. A managed network, as opposed to the public Internet, permits operator to control and adjust components of the network in such a way to optimize quality.

Monetization: IPTV operators usually offer a similar TV package to satellite and cable operators: monthly Pay-TV packages, a la carte specialty content, flat fee or Pay-Per-View VOD content. However, major operators such as Verizon¹⁸, are now confirming the trend that future generations of consumers will not buy Pay-TV or service bundles (Internet, pay TV, and telephone), or they may opt for some mix of free and paid online-delivered alternatives. Free and less expensive sources of content such as HuLu, Netflix, Apple TV, and broadcasters' OTT web TV content (Catch-Up TV) is posing a threat to the pay-TV industry. The changing environment forces IPTV operators to differentiate themselves by offering unique applications,

¹⁸ Verizon CEO: Cord cutting is real: http://news.cnet.com/8301-31001_3-20017388-261.html#ixzz16ggDJhS9

unique content and unique advertising methods in order to monetize their service.

Content: The changing environment is a threat to broadcasters and movie studios. Both are afraid that the content industry will suffer the same fate as the music industry¹⁹ and are threading carefully when it comes to negotiating content rights. IPTV operators must offer their customers content they want to watch in order to remain viable. As content rights are being tightly guarded by the owners, securing content has become very difficult unless the operator has deep pockets or a large number of subscribers.

Regulatory: A final challenge exists for new IPTV entrants on the regulatory side. In order to distribute satellite broadcasts to homes in Canada, the operator is required by the **CRTC** to obtain a **BDU** (broadcast distribution undertaking) license and may require additional Video-On-Demand licensing. The administration process is lengthy (typically 8 months to 1 year). Some aspects of OTT are currently “gray areas” where no decisive legislation exists. Regulation reduces competition as all BDUs must carry the same basic channels and incumbents have the right to question new applicants which may slow down the process considerably.

¹⁹ Telco 2.0: *Can Telcos help save the Video Distribution Industry?*
http://www.telco2.net/blog/2010/10/entertainment_supply_chain_bre.html

Glossary

ARPU: Average Revenue per User

ADSL: Asymmetric Digital Subscriber Line. Telephone companies provide digital lines that carry voice and also data on their copper wires. Telephone companies will simply call this service 'high speed Internet'. If you subscribe to ADSL, you can plug in your phone line in a modem and plug your modem to your computer to link to the Internet. ADSL can deliver data (download) at speeds up to 8Mbps. ADSL2+ a more advanced technology, can deliver Internet at speeds up to 24Mbps. VDSL or very high bit-rate DSL, is now the chosen technology of Telco's for video applications as it delivers up to 52 Mbps. However, with any type of DSL technology, speeds diminish the longer the copper wire as such these are theoretical speeds. For example, VDSL can only operate on a maximum distance of 1,200 m and the furthest away your home is from where the Telco equipment is located, the lower the actual speed you will experience.

CRTC: Canadian Radio-Television and Telecommunication Commission

BDU: Broadcast Distribution Undertaking. An IPTV provider must obtain a BDU license from the CRTC in order to broadcast television content to homes.

DOCSIS 3.0: Data Over Cable Service Interface Specification is an international standard for the delivery of data over cable infrastructure. Theoretically this standard (also called D3) can provide download speeds of up to 152 Mbps and uploads of up to 27 Mbps. However, deploying DOCSIS 3.0 has challenges for operators: the underlying cable infrastructure must be upgraded with components that support the standard and customers will need new modems.

DVR: Digital Video Recorder. This is a Set Top Box with a hard drive that permits the user to record and store television shows. The user must select which shows to record. A TiVo is a type of DVR.

DTV: Digital Television

FTTx: The 'x' stands for the different ways to deploy fibre. The common developments are called FTTN for Fibre to the Node. There is also Fibre to the Curb (FTTC), Fibre to the Home (FTTH), depending on how far the Fibre is installed from the Central Office.

HD: High Definition in North America means an image resolution of 720p (1280 x 720 pixels) or 1080p/1080i (1920 x 1080 pixels, progressive or interlaced) with an aspect ratio of 16:9 (pixels wide by pixels height). An end-user requires 1.5 Mbps of data bandwidth to view on standard definition channel encoded with MPEG-4.

IP Network: A communication protocol to relay data packets across networks. IP stands for Internet Protocol and is the dominant protocol of the Internet.

Mbps: Megabits per second is a measure of the rate of data transfer. One megabit is one million bits.

MPEG-4: Stands for Moving Picture Expert Group. This group introduced the MPEG-4 compression standard in 2003 which was specifically designed for more efficient compression and streaming of audio and video content. It is an open standard quickly adopted worldwide by equipment manufacturers and software developers alike as it improves video and audio quality while reducing the necessary transmission bandwidth.

OTT: Over-the-top means delivered over the public Internet as opposed to a closed loop managed network.

PVR: Personal Video Recorder. Used interchangeably with **DVR**.

SD: Standard Definition in North America means an image resolution of 704 x 480 or 620 x 480 pixels with an aspect ratio of 10:11 (pixels wide by pixels height). An end-user requires 1.5 Mbps of data bandwidth to view on standard definition channel encoded with MPEG-4.

STB: An IPTV Set Top Box is a device (sometimes it can even be a computer with a hard drive) that provides a two-way communication on an IP network and decodes the video streaming media.

TiVo: A brand of DVR.

VDSL: Very-high-bitrate **DSL** provides data transmission of up to 52 Mbps downstream and 16 Mbps upstream. Therefore VDSL can support high bandwidth applications such as **IPTV**, as well as **VoIP** and general Internet access. VDSL is the technology of choice deployed by Telco's over their existing copper wiring used for telephone lines. **VDSL** is much faster than **ADSL** described above however the actual speed drops dramatically over distances (please see **ADSL** above).

VOD: Video On-Demand is a service that allows user to select a video to watch from a library of available titles.

VoIP: Voice over Internet. VoIP deliver voice communication over IP networks.