

CHALMERS



IPTV the future of television?

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Abstract

The goal of this course was to give an insight in what is done in the industry in the area of computer communication and distributed systems. This was done through some seminars and a small project. In the project a relevant topic was to be chosen and studied. I choose to investigate how IPTV works and what its pros and cons are against today's cable, terrestrial and satellite television.

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1. Introduction

1.1 Background

This project is a part of the course EDA390 Computer Communication and Distributed Systems which in turn is a part of the Communications System concentration at the department of Computer Science and Engineering at Chalmers University of Technology.

1.2 Aim

The aim for this project/report is to get a better understanding on IPTV works and what its pros and cons are against the more common distribution mediums cable, terrestrial and satellite.

1.3 Project assignment specification description

The project was to do a concentration in relevant topic in the area of Computer Communication and Distributed Systems. I chose IPTV as my topic and to investigate in how it works and why we might choose it instead of cable, terrestrial or satellite. The focus was on which pros and cons there is with IPTV.

2. IPTV

2.1 What is IPTV?

With IPTV you usually mean distribution of television or video content over a controlled IP network, where the end consumer receives the information through a set-top box which is connected to its normal broadband connection. Just because its name is IPTV (Internet Protocol Television) it does not mean that information is sent over the internet, only that IP protocol is used. So you should not consider streaming video over the internet as IPTV.

Below is a table of differences between IPTV and internet video services, where you can see that the two differs a lot.

	Broadband TV	Internet video streaming
Footprint	Local (limited operator coverage)	Potentially supranational or worldwide
Users	Known customers with known IP addresses and known locations	Any users (generally unknown)
Video Quality	Controlled QoS, "broadcast" TV quality	Best effort quality, QoS not guaranteed
Connection bandwidth	Between 1 and 4 Mbit/s	Generally below 1 Mbit/s
Video format	MPEG-2 MPEG-4 Part 2 MPEG-4 Part 10 (AVC) Microsoft VC1	Windows Media RealNetworks QuickTime Flash, and others
Receiver device	Set-top box with a television display	PC
Resolution	Full TV display	QCIF/CIF
Reliability	Stable	Subject to contention
Security	Users are authenticated and protected	Unsafe
Copyright	Media is protected	Often unprotected
Other services	EPG, PVR (local or network)	
Customer relationship	Yes; onsite support	Generally no
Complementarity with cable, terrestrial and satellite broadcasting	Potentially common STB, complementary coverage, common metadata	Pre-view and low-quality on-demand services

Table 1 – Differences between closely-controlled IPTV (BTV) and open Internet video services [5]

2.2 What features does IPTV offer?

The biggest difference with today's distribution of television is that you choose which information you want to have everything is not broadcasted as with terrestrial, cable and satellite. Another big difference is that you will be able to have a high capacity two way communication and have the ability to interact with the service provider, for example you request a movie from your TV-guide and the program is delivered to you. Other things that could be provided with IPTV is interactive applications (e.g. video blog) or transactional applications (e.g. TV shopping). Because of the point-to-point connection IPTV offers, every user will be able to view their own individual broadcasts. You will be able to have VoD(Video on Demand) which is your on personal video store where you can decide when you want to see the movie. EPG(Electronic Program Guide) and PVR(Personal Video Recorder), where the EPG will be fully interactive with your own personal needs. You will also be able to use features like pause, fast forward and rewind when you are watching a movie on your TV. It will be possible to have personalized advertising. You will be able to decide yourself, which kind of advertising you would like to see.

2.3 Technologies behind IPTV

The two primary protocols used for IPTV are IGMP version 2 for channel change signalling for live TV and RTSP for Video on Demand. There are of course other protocols, for example to distribute and route multicast groups between routers you can use the PIM-SM protocol [4]. For sending live-TV multicasting is used, this is because it would be impossible to withhold the bandwidth it would require to send with unicast. The providers of IPTV in Sweden are all using MPEG-2 for distributing there media. This means, as you can see below in table 2, that SDTV will require for full quality a bit rate of 4-6 Mbps. To watch HDTV other compression algorithms like H.264 are required otherwise it would consume too much bandwidth.

SDTV (Standard Digital Television)	HDTV (High Definition Television)
MPEG-2: 4-6 Mbps	MPEG-2: 20-24 Mbps
H.264, WM9: 2-3 Mbps	H.264, WM9: 10-12 Mbps

Table 2 – Typical bit rates for SDTV/HDTV [5]

2.4 Problems with IPTV

Today even though 90% of the households in Sweden have access to broadband many of those have to low bandwidth to get an acceptable quality of the media. The networks have to be built so that the End-to-End QoS can be guaranteed, which is not the case with most of the networks today. Set-top boxes are expensive and if you want to watch another channel on a different TV you will have to buy another box.

3. The other mediums, terrestrial, cable and satellite

3.1 Terrestrial

The analogue terrestrial network is today being replaced with a digital network. This will be finished by October 2007[3]. The conversion to digital transmissions is done to be able to have a higher utilization of the frequency space, to provide better quality of the transmitted television, to provide multi channel sound and to provide more channels. The digital terrestrial network is today consisting of five transmitting networks (so called MUX:es), where four of the networks cover 90% of the people in Sweden and the fifth network covers about 50% of the people. When the analogue network is totally shut down, some of the freed bandwidth will probably be used for upgrading with two new MUX:es [2]. One MUX is able to transmit with a bandwidth of 22 Mbps which makes it possible to provide about six [2] different SDTV channels or one HDTV channel given that the transmission is in MPEG-2. If MPEG-4 H.264 would be used, which is not the case today even though tests have been made, there would be possible to send two HDTV channels and about eight SDTV channels per MUX. Today Boxer has exclusive rights too broadcast terrestrial. They provide 31 channels where 6 are free and the rest is payment channels. The terrestrial network does not have interactive features or any capability of delivering VoD or NEAR-VoD. Interactivity does not work because it is not a two way communication and VoD/NEAR-VoD is not possible because the limited bandwidth in the network. There is a possibility to have interactive features if you use another channel for uploading information for example the phone line, this is not anything that the operator Boxer is providing. EPG does work but not interactively.

3.2 Cable

Cable is today the most important way of distributing television. It has the biggest share of all the viewers in Sweden of the four types of distributing television. There are about 70 operators all over Sweden and they cover about 65% of all households [6]. The leading operators is Comhem which has over 1.3[3] million costumers and a selection of over 100 channels, UPC Sverige AB, CanalDigital och Tele2Vision [6]. Cable has the advantage that it has a high bandwidth and because of that it is able provide many channels at the same time. There are possibilities to have interaction to for example ordering movies directly form your remote. There is also the possibility to convert it to IPTV because it is possible to have broadband through the cable network. Features as NEAR-VoD is possible and is already provided by for example UPC and ComHem. EPG is standard for digital-TV though cable.

3.3 Satellite

There are over 2 million people in Norden that get their television from satellites. Most of the channels are distributed by the satellites SIRIUS and THOR. Both satellite systems cover all of Sweden. With satellites it is possible to send a lot of information. The satellite system SIRIUS itself has the possibility to send about 400[7] channels if it is used to its maximum. The two major operators for distributing television for end consumers are CanalDigital and Viasat. They both have a big selection of channels. Because of the high capacity that satellites offer, it is possible to provide NEAR-VoD. The operator Viasat provides a service for the channel tv1000 that give movies and everything else on the channel three different starting points. This is done by simply sending the same thing on three different channels with a time delay between them. Both providers have EPG for their digital-TV costumers. Interactive features are possible if a different channel for sending information is used and it is provided by both major operators by connecting the set-top box to the phone line. The feature that they provide is that you are able to order movies or sport events directly from your remote.

4. Conclusions

I think the biggest advantages with using IPTV over the other distribution methods is that with IPTV you will be able to decide your self what information you want to be provided with and that you will be able to have real on-demand services as VoD and not NEAR-VoD as some of the other distribution methods provide. And you will also be able to provide a bigger selection for the VoD service with IPTV than with the other distributions methods. For the operators you have the advantage that you only have to send the channels that people are watching, for example if every viewer would watch the same channel the server would only need to send that channel. Because of this it is also possible to provide a lot of channels. A problem for all distribution methods is that if HDTV is to be provided it is not possible to use MPEG-2 for compression because it requires too much bandwidth instead MPEG-4 or equivalent compression method has to be used and the problem with MPEG-4 is that it requires a lot of processing power and that makes the set-top boxes very expensive. A downside with IPTV is that many of today's broadband accesses are to slow to receive an acceptable quality of the television broadcasts. There is also the problem that there are not that many people that have access to IPTV today. The service providers have not yet implemented their services in that many networks yet.

IPTV is definitely a part of the future in television, even though it only will be an option for those with a high bandwidth broadband. But hopefully all in Sweden will have access to high bandwidth broadband, though it probably will not happen in the near future, then it would be an option for everyone.

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Appendices A Abbreviations

IPTV	Internet Protocol Television
BTV	Broadband TV another name for IPTV
SDTV	Standard Digital Television
HDTV	High Definition Television
EPG	Electronic Program Guide
PVR	Personal Video Recorder
QoS	Quality of Service
VoD	Video on Demand
NEAR-VoD	The same as VoD only that it has specific starting points that's not decide by you
MUX	Multiplexer
RTPS	Real-Time Publish-Subscribe protocol
IGMP	Internet Group Management Protocol
PIM-SM	Protocol Independent Multicast-Sparse Mode protocol