

## Chapter 3

# IPTV Challenges and Solutions in Metro Networks

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### ABSTRACT

*The Internet Protocol-based television (IPTV) uses digital TV technology and transmits TV and video contents over IP-based networks, where customers can have more choices in watching TV programs and interacting with it. In this chapter, different challenges and solutions proposed for IPTV are studied. We present an introduction to IPTV, its features, its applications, network factors for deploying IPTV, and an overview to IPTV networking infrastructure. Moreover, we study different factors in video coding that have an effect on optimizing the bandwidth and are robust against impairments. In addition, different challenges in IPTV over optical and wireless networks are reviewed. Besides, we study different solutions to improve VoD services. These methods use NVoD and TVoD to improve unicast services. We also study the methods that use features of networks and videos to improve multicasting services in IPTV. Finally, we discuss the methods to improve QoS in DSL and wireless networks.*

### INTRODUCTION

Digital Television is the most advanced version of Television technology improved in the last century. Digital TV provides customers more choices and interactivity. New technology called Internet Protocol-based Television (IPTV) uses

digital TV technology and transmits it over IP based networks (Driscoll, 2008), (Moawad, 2008). IPTV is a technique that transmits TV and video content over a network that uses the IP networking protocol. With increasing the number of users, performance becomes more important in order to provide interest in video content applications and relative services. The requirement for new video applications on traditional broadcast networks

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(cable, terrestrial transmitters, and satellite) opens a new perspective for the developed use of IP networks to satisfy the new service demands (Driscoll, 2008).

Internet Protocol Television, IPTV, Telco TV, or broadband TV is delivering high quality broadcast television and/or on-demand video and audio content over a broadband network. On the other hand, IPTV is a mechanism applied to deliver old TV channels, movies, and video-on-demand contents over a private network. The official definition approved by the International Telecommunication Union focus group on IPTV (ITU-TFG IPTV) is as: "IPTV is defined as multimedia services such as television/video/audio/text/graphics /data delivered over IP based networks managed to provide the required level of quality of service and experience, security, interactivity and reliability" (Driscoll, 2008, pp.2).

We shall study different challenges and solutions proposed for IPTV in this chapter. We first present a background on IPTV such as its features, its applications, network factors for deploying IPTV, and an overview to IPTV networking infrastructure. Then, we will discuss challenges of IPTV in different contexts, and state solutions for each challenge. We will also study the methods that use features of networks and videos to improve multicasting services in IPTV. We will discuss the methods proposed to improve QoS in DSL and wireless networks. Finally, we present future research directions and conclusion at the end of the chapter.

## **BACKGROUND**

In this section, we provide definitions, discussions and networking infrastructures of the IPTV.

### **IPTV Features and Applications**

In this subsection we shall discuss features and applications of IPTV. IPTV has a number of features as follows:

- Support for interactive TV: IPTV provides two-way communications facilities that allow service providers to deliver a complete sample of interactive TV applications. IPTV has some types of services such as live TV, high definition TV (HDTV), interactive games, and high speed Internet browsing.
- Time shifting: IPTV along with a digital video recorder is used for recording and storing IPTV content for later viewing.
- Personalization: IPTV supports two-way communications and permits end users to personalize their TV viewing habits by allowing them to decide what and when they want to watch a program.
- Low bandwidth requirements: Instead of delivering each channel to each end user, IPTV allows service providers to only transmit the channel that the end user has requested. This significant feature allows service providers to optimally use bandwidth of their networks.
- Accessible on multiple devices: Viewing of IPTV content is not limited to televisions. Consumers can use their PCs, mobile devices, and PDAs to access IPTV services (Driscoll, 2008), (She et al., 2007), (Lambert et al., 2009), and (Ikeda, 2008).

The following list shows a number of IPTV applications, where each application needs different QoS requirements in order to be delivered in the best quality to end-users:

- Entertainment TV services (e.g., television channel and video-on-demand).
- Security (e.g., surveillance systems);
- Real-time communications (e.g., video telephony, teleconferencing);
- Interactive applications (e.g., interactive TV and gaming);
- Internet sharing and streaming (e.g., user-created video content and web-based

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