

IP TV

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The study on SLA system architecture for IP TV

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Abstract

In this paper we describe SLA metrics and software architecture for newly upcoming IP TV service. Firstly we show the general description for IP TV. This consists of brief description of IP TV, the general figure of configuration and elements of IP TV network and communication protocol stack of IP TV data transmission for deriving communication quality parameter.

And we propose SLA metrics depending on quality measurement point. According to the measurement point the measurable SLA metrics are different.

The total view of the IP TV SLA measurement and management architecture is shown. When the quality measurement point is the routers that consist of internet node, the IP media NMS is the quality collection system. And when the quality measurement point is the IP TV STB(Set-Top Box), the IP media collector and Quality Collection Server are the quality collection system.

And we show the software block diagram of IP TV SLA processing system and the other related network management systems.

I. INTRODUCTION

According to development of communication network, communication users require the high quality communication service than simply connection between the sender and the receiver. So for assuring the high quality communication service communication service provider make the defined communication service provision contracts with the communication service user. If the contracted promise is not kept, the providers give the penalty money to the users. By this action the providers do their efforts to keep the communication quality high. So these efforts give the users the good assurance and give the provider the user's reliability. The providers have the higher incomes than the other

providers. The contract between the communication service providers and the users is SLA(Service Level Agreement). In this paper we propose the SLA metrics and SLA software architecture for the IP TV.

1.1 IP TV general

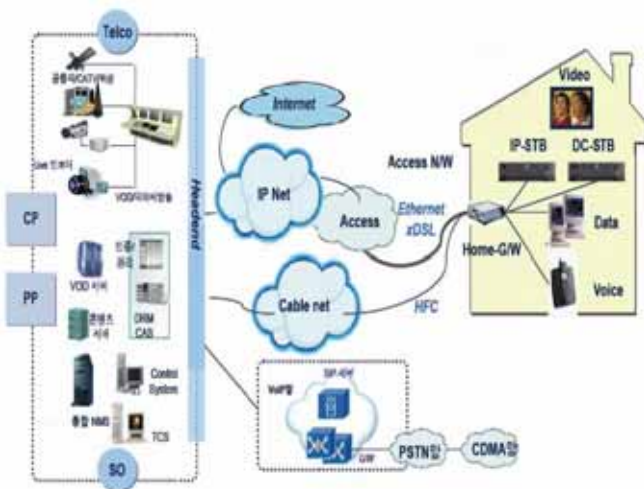


Figure 1. The general structure of IP TV

IP TV service is the bilateral high speed internet service, is communication by IP packet, sends standard definition-level image, and provides triple play service including streaming image service. When IP TV sends image, voice, data contents, it uses MPEG-2 TS. According to the high data speed, it uses BcN(Broadband convergence Network) when it delivers contents. At figure 1 we show the general structure of the IP TV.

1.2 Protocol Stack for IP TV transmission

We show the protocol stack for the IP TV transmission at figure 2.

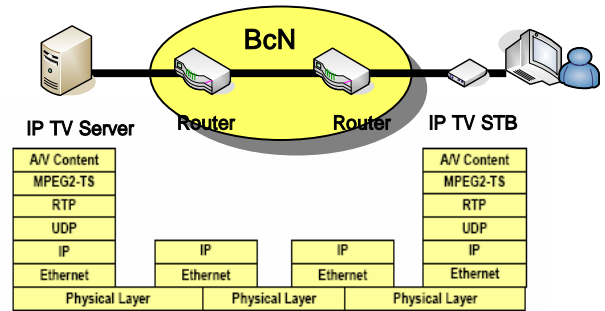


Figure 2. Protocol Stack for IP TV transmission state

Depending on the figure 2, at the router that consists of the internet we can see only the IP layer data. So the IP layer data can be measured.

At the IP TV STB(Set Top Box) the A/V(Audio/Video) contents can be measurable. At this point the TPS(Triple Play Service) data can be measured.

Depending on this figure, at the IP TV server all protocol layer of IP TV is shown. IP layer carries information of the upper layers. For the real time transmission UDP is used. RTP is used for real time transmission. The MPEG2-TS is often used as transmission data encoding function. At the highest layer, the IP TV contents, namely TPS, are positioned. And the information of the upper layer is encapsulated and carried by IP.

At the router we can see only the IP layer data. The upper layer is encapsulated. So we can't measure the performance of the upper layer, such as UDP, RTP, MPEG2-TS, A/V content. So for measure the IP TV performance we should measure the performance of IP.

At the IP TV STB the protocol stack of IP TV transmission shows that we can know the information of all communication layers. So we can measure the performance data of the upper layers of IP layer. The important layer, A/V content is revealed at this point. This is important because we

have concern at the information of the layer. Only at the point we can measure the performance of the A/V contents. The A/V content layer have the interest information for measuring the end-to-end information.

II. IP TV SLA METRICS

At the figure 3 we propose the IP TV SLA metrics measured at the point of the router and at the point of IP TV STB.

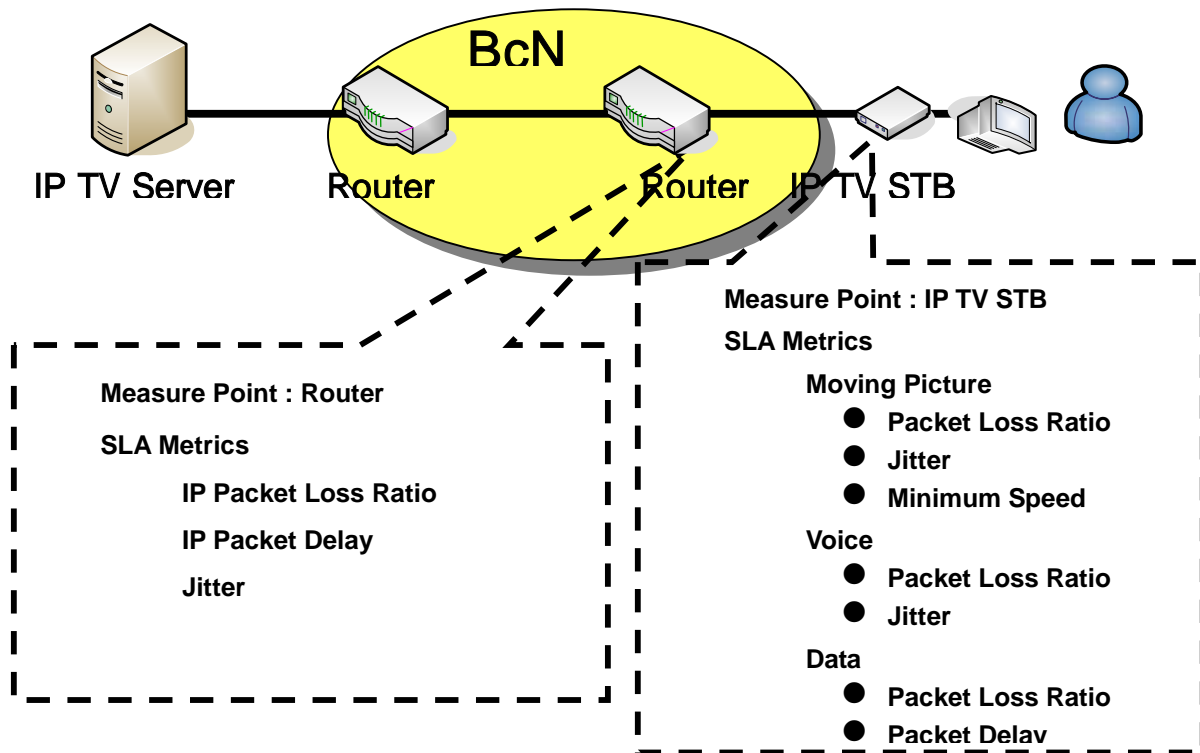


Figure 3. IP TV SLA metrics proposed at the different point

We propose the SLA metrics measured at the router and the IP TV STB.

By the figure 2, at the router we can measure the IP level-communication quality. So the SLA metrics are

- 1) IP Packet Loss 2) IP Packet Delay

The SLA metrics are measured at the IP Media NMS.

By the figure 2, at the IP TV STB we can measure the communication quality of the A/V contents. So the measurable SLA metrics derived to the minimum set

- 1) at the Moving Picture
 - A. Packet Loss Ratio
 - B. B. Jitter
 - C. C. Minimum Transmission Speed
- 2) at the Voice
 - A. Packet Loss Ratio
 - B. Jitter
- 3) at the Data
 - A. Packet Loss Ratio
 - B. B. Packet Delay

The Packet Loss Ratio is shown commonly, for the packet loss is fatal to the related contents. The metrics are measured at the IP TV STB by the IP media collector.

III. IP TV SLA ARCHITECTURE

3.1 IP TV SLA system architecture

The figure 4 is shown the IP TV SLA system architecture.

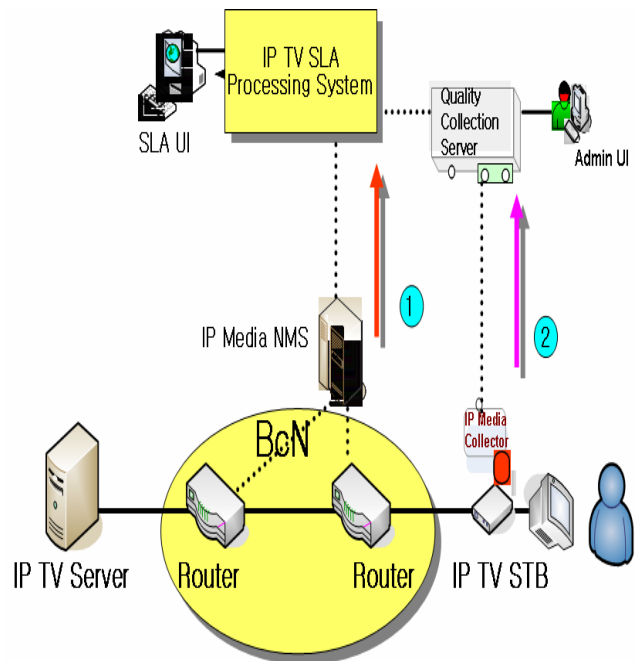


Figure 4. IP TV SLA system architecture

The IP TV SLA system architecture can be divided to the two part.

The first one is that the measurement point is the router shown by circled number 1. The measured data at the router is collected at the IP Media NMS. And the data is sent to the IP TV SLA Processing System described at the figure 5. This measure method provides the PE-to-PE quality measure data.

The second one is that the measurement point is the IP TV STB by circled number 2. The measure

data at the IP TV STB is collected by the IP Media Collector. The collected data are sent to the Quality Collection Server. The Quality Collection Server collects quality data from the numerous IP Media Collectors. The collected data by Quality Collection Server are sent to the IP TV SLA Processing System. This measure method provides the CE-to-CE quality measure data.

Figure 5 show the schematic diagram of IP TV SLA software architecture.

In this figure we describe the software architecture of the IP TV SLA processing system. As shown at the previous page, there are two way collecting, recognizing and displaying the value of IP TV SLA metrics.

3.2 IP TV SLA software architecture

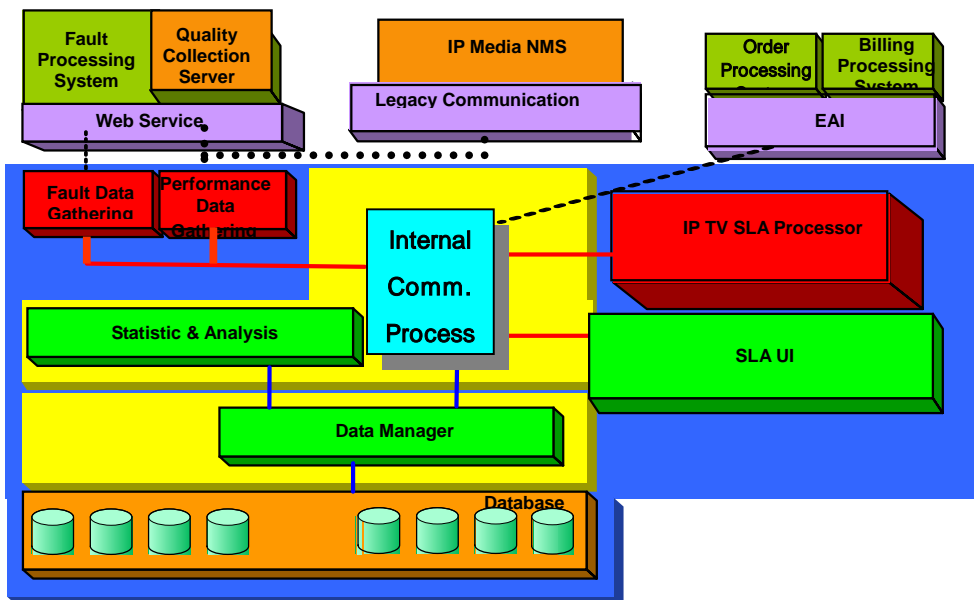


Figure 5. IP TV SLA software architecture

Firstly the performance data from router is sent to the IP Media NMS. By legacy communication the data is collected to the Performance Data Gathering and is adapted for the processing within the SLA processing system.

Secondly the performance data from IP TV STB is collected by Quality Collection Server, and sent to the Performance Data Gathering by web service.

Performance Data Gathering collects the performance data from IP Media NMS by router and

from Quality Collection Server by IP TV STB. The data is sent to the IPTV SLA Processor, for IP TV SLA function via Internal Communication Processor.

The processed data by IP TV SLA Processor are saved to or called from Database by Data Manager. The SLA data is analyzed or statically processed by Statistic and Analysis module.

During the SLA processing action, IP TV SLA Processing System has interaction to the other network management systems, that is, Fault Processing System, Order Processing System, and Billing Processing System.

The IP TV SLA processing procedures are displayed to the IP TV SLA administrator by the SLA UI.

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