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Improving STB devices' Parental control

Veton Z. Këpuska, Mahmood Alfathe
Electrical and Computer Engineering Department Florida Institute of Technology, Melbourne, FL 32901, USA

ABSTRACT
Parental control for TV viewers is an open field as many efforts were provided to provide trusted solutions for this issue. Although this technology was improved and developed, but it still leaks a good and robust solution as it is related to critical age of viewers. This paper introduce a new hybrid technology that depends on the information transmitted along with the Audio and Video (EPG), also extra resources from internet were used to enhance the decision in the EPG engine in the proposed system. All viewers enrolled in the system were successfully authenticated / de-authenticated depending on their registered age in the database and on the age related for each program.
Keywords **-** parental control, IPTV, Authentication, EPG, web mining, text parsing.

I. INTRODUCTION

In the last decade electronic devices witnessed a huge development. One of these devices is the Set Top Box or STB. STBs are the front panel of the users who use satellite, cable, and IPTV technology to receive TV or Radio channels. Nowadays with the hardware development and the increase demand of users STB devices have many new features added to it like the ability of connecting them to the internet to use internet resources like the web streaming which is known as the IPTV. A lot of offers have been made to improve the ability of users to control the media broadcasted through their TVs or any other projecting device. The ability to control the media broadcasted to the children was a strong demand from 86% of parents who believed in the survey [1] that the decision about what children what should see on TV is the parents' responsibility not the governments. As a solution to control the media broadcasted to viewers, many of STB software companies adopted the "lock channel" option as a solution for TV parental control problem Parental control feature available in most STBs provides an option for parents or adults to lock channels with a master "4 numeric digits" password as they believe these channels may have improper content for their children. The survey in [2] shows that 88% of parents do not use the parental control. This work introduces a new technology to control what is broadcasted over media. As many information are broadcasted beside the data broadcasted which is initially the Audio and Video Data. The EPG, or the Electronic Programming Guide. The information included in the EPG can be hired to enhance the parental control. The system is implemented by developing an EPG engine to extract necessary information. This engine is programmed using Python environment, as Python can run on both Windows and Linux operating systems, to make sure the proposed system has an ability to run on different platforms. Users with phones and tablets are able to view media with the variety of platforms that operate these devices as this service is being provided within the application layer which is a standardized layer among different operating systems.

II. LITERATURE REVIEW

In the last two decades, many methods have been developed for improving parental control. In 1989, Euro-crypt systems required Conditional Access (CA) from customers to view the provided programs [3]. A (CA) is defined as method by which one can obfuscate a digital-television stream, with access provided only to those with valid decryption smart-card [4]. In 1990 the British Satellite Broadcasting, the first company which provided direct broadcasting through satellite, required from all customers to provide a password or a pin number to view a user-selectable threshold program [5]. In 1997 Digital library Architecture for interactive television was implemented [6] as (the librarian) was introduced to manage the digital library content for end users to manage their overall preferences. In 2001 [7] researchers proposed a system of a pre-determined parental viewing for the ATSC digital TV. The V-chip [8] which reads the information encoded in the rated program and block unwanted programs depending on the rating setup selected by parents. The V-chip was enforced to be equipped for all TV manufacturers who produce TVs of (13 inches) or larger. In [9] a management system at the cable service provider was suggested, this system depends on extra settings of parents for all channels that they are subscribed to, these settings could be changed anytime over internet. In 2007, an authentication procedure using fingerprint and face detection methods to get access to the network was suggested [10]. In 2007 [11] researchers proposed a parental

control based on speaker class verification, in this paper the authors demonstrated a parental control system that depends on parents definition for the type of material that their children can view, this system used the voice to distinguish between adults and children. Researchers in [12] implemented the Radio Frequency Identification (RFID) as an extra device supplied to each viewer, each RFID will define the assigned profile for each user. In 2013, an authentication system and interactive system based on face and gesture Biometrics was proposed [13].

III. THE PROPOSED SYSTEM

This system seeks to enhance the parental control of STB devices that stream IPTV, by checking the content of the program displayed: is it suitable with the age of the viewer or not? Using the EPG streamed with the Audio and Video data is a new method to determine the name/ title of the program (Movie, TV program). When the user requests a specific stream the "current-time" of the request is used to search the EPG-data table related to the requested stream, as most of TV programs broadcasts in front the EPG-data tables every 24 hours. The EPG -data table has a lot of programs and a lot of other information related to each program, so the best program-search method is done by time. By comparing the user's request-stream-time (current-time) with all other time-data provided in the EPG-data table. The next stage after time matching is to extract the program name. Extracting program name, and other information like "program description": which is a brief discerption which provides information to allow/ reject user request. By default all web streams are always connected to the internet to stream, this provided a good chance to pass the "program name" to external database like [14] a professional website which is conserved in helping parents to decide if specific media is suitable for their children or not. The EPG engine will request the program-name extracted from the EPG-table from [14] and parse the output by locating specific data within the requested web pages, which will provide the suitable age for the requested program-name. This stage was developed to enhance the decision of the authentication server.

3.1 Developing the EPG Engine:

The EPG can be defined as a service for television or radio that display information about the current broadcasted content. [15] Standard defines EPG as data that is carried out by Event Information Tables (EIT). The EIT are combined through the broadcasted data by multiplexing it within the MPEG-2 transport stream along with other service data, as it will be broadcasted all together through satellite, cable, or terrestrial networks. EIT tables are generated individually for each service. Each table can contain sub-table, segments, and sections. All EIT tables share the same bandwidth and Packet Identifier (PID). EIT tables can be divided into two groups:

3.1.1 Present /following:

This type of tables contain information about the current event (on-air), and the next following event on the schedule. These tables are updated each 2 seconds as users should retrieve information whenever they switch to a new channel.

3.1.2 Schedule:

These tables usually caries information for contents up to 64 days in the future. The update repetition for such type tables is every 10 seconds for the next 24 hours.

EIT tables are based on dynamic data as they are required to be updated very often. To build EIT tables, separate devices called EPG Builder are used, usually called EPG Generator or EPG Inserter. EIT generator diagram is shown in Fig. (1), also transport stream multiplexing is shown in Fig. (2).Every Event could have one or all the following elements:
Event_id: Unique Identification number.
Start_time: Described in the Coordinated Universal Time (UTC), which is based on Unix Time Stamp.

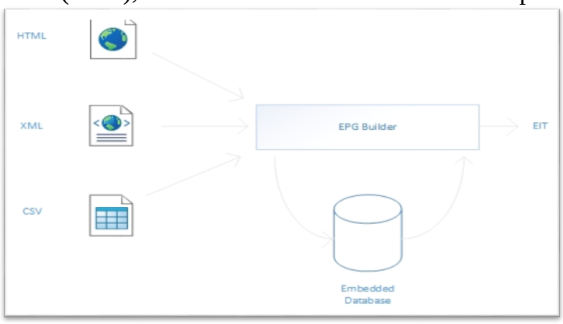

Figure 1: Building EPG

Duration: Time in seconds to describe the duration of the event.
Event_description: A short Description for the event shown on the current time that would provide the viewer abbreviated information about the event.

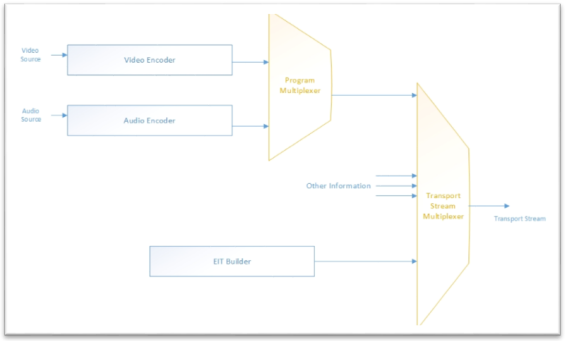

Figure 2: Transport stream multiplexing

After extracting EPG tables from the received content, as shown in Fig. (3), the output is delivered

to the EPG Engine. The EPG Engine is the core for all necessary information required to evaluate the current TV program. The EPG Engine is shown in Fig. (4) along with other IPTV system sources. After receiving EPG tables from the decoder, the analyzing is conducted. The terrestrial ATSC TV broadcast in the area of Florida-Brevard County, specifically in Melbourne city can be received through ATSC TV Tuner, in this proposal the ATI TV Wonder 600 [16] was chosen to be used as a terrestrial TV source. With the ATI TV tuner with a basic antenna, the TV tuner could receive 26 TV channels. The EPG Engine is designed to scan the 26 channels' EPG files. The EPG files are delivered to the EPG Engine as XML files. Each time a user

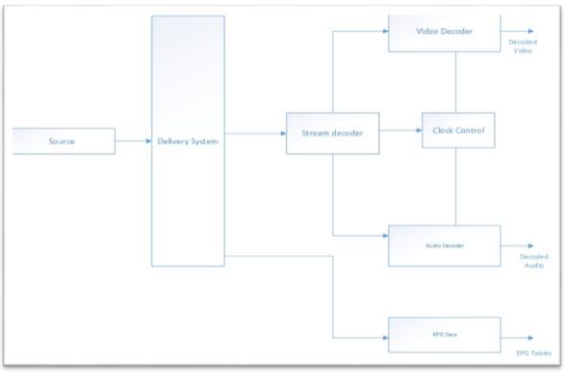

Figure 3: Extracting EPG tables

request a specific TV channel the authentication server will activate the EPG Engine.

3.2 The Authentication Server:

The main function of the authentication server is to do the following tasks:

3.2.1 Enrollment phase:
Store all users' information.

3.2.2 Extract Important Information:
The Authentication server has the ability to read important information from the EPG engine.

3.2.3 Requests' handling:
All user's IPTV requests will be only through the authentication server.

3.2.4 Make Decision:
Process user's data to decide if the user is eligible or not to view a specific IPTV stream (Authentication).

In this work, both EPG engine and User Authentication system were successfully implemented. Providing the IPTV as web service, all parts of this system are programmed with web compatible languages. The EPG engine was developed using Python [17], database was developed using MySQL [18], and all other web pages were developed using PHP [19]. Users' final web pages that contain web streams that consists of HTML [20] web pages built by PHP. All user's request were successfully handled, depending on the age of each user which is stored in the database.

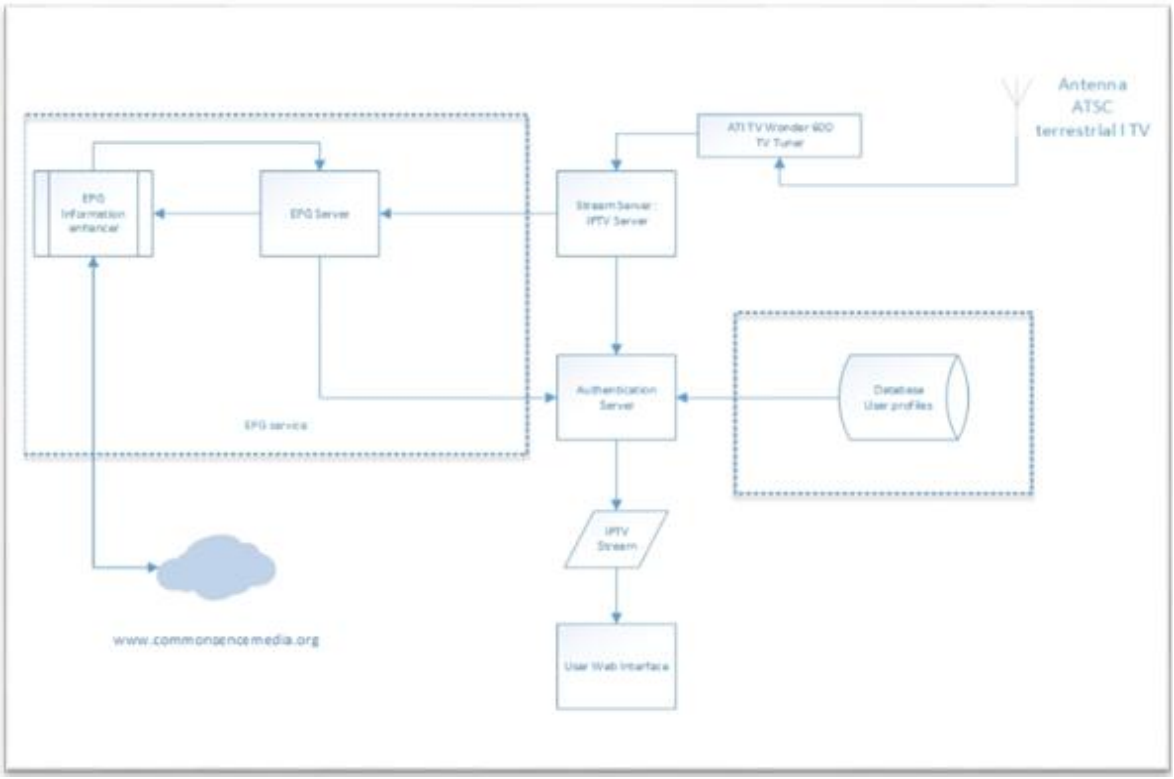

Figure 4: System Diagram

IV. Conclusion

The objective of this research is to implement a new technology to enhance the parental control for IPTV devices. The EPG was extracted from the original stream, and extra resources from the internet were used to enhance the decision result. Data / web mining was implemented in different stages. The system was successfully tested for all enrolled users with the variety of ages to make sure that each user will be authenticated depending on his/ her age.

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