

Content sharing between Digital Decoder and secondary devices

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Abstract – The communication is playing very important role in today's households. Secondary devices like smart phone, iPads have become part and parcel of today's households. Digital Decoder is also joining the league as the market is trending towards digital infotainment. As the digital decoder market is exponentially growing in the emerging markets of Asia Pacific region and rest of the world, the secondary devices communication with digital decoder is also gaining momentum. With the revolution of mobile industry, the need to enable the users to watch the contents of the digital decoder on their secondary devices is gaining even more importance. This project tries to capture some of the important interactions between secondary devices and the digital decoder. However, the aim of the project is to achieve the basic communication between the clients and digital decoders and present the selected content on the secondary devices. Additionally, an attempt is made to implement some of the modules which cover basic use cases associated with the secondary device communication and later appropriate actions can be implemented to improve the sentiment of the people.

The network connectivity is assumed to be under controlled environment and the same can be extended to the unmanaged networks. The basic protocols used include the MPEG and Digital Video Broadcasting for getting the Audio Video content to the digital decoders and Universal Plug and Play for communication between the digital decoders and the secondary devices. The actual device content is transferred through secure channel and the device validation is also part of the security requirement

Index Terms – Digital Decoder, Secondary Devices, Digital Rights Management, Streaming

INTRODUCTION

Entertainment industry is very vast and contributes to the chunk of economy for any nation. Getting the world connected through a communication channel was seen as major challenge in the past decade. The introduction of digital television, computers followed by smart mobile phones has seen phenomenal growth in the recent past. The recent trend shows that the

migration of analog content to digital content is gaining momentum and user expectation and experience is improving day by day. The demand and need for this migration is inevitable and most of the world is waiting for different solutions for providing flexibility and world class experience.

We understand that the greed for the digital data is growing exponentially. The demand for providing flexible options for the content portability across the secondary and multiple available screens and the content management is becoming even more important at the same time it is very challenging. Several techniques are already available in the current market. However, when it comes to content protection while the data being shared across multiple screens is still an open and is continuously evolving technology. There is a huge demand in the market that the content bought by the user should be able to be seen on multiple devices at the same time with assurance of content not being tapped by any unauthorized users.

Next generation Decoders -

The low end digital decoders were looking for additional enhancements to meet up to the market needs. One of the major enhancements includes the addition of permanent storage facility to the existing digital decoder along with the additional front end or tuner device to perform the record functionality looks as in Figure 1.

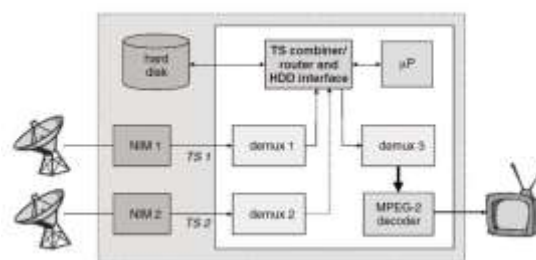


Fig. 1: Digital Decoder with Storage

Home gateway networked with digital decoder -

In order to allow equal access to all external information sources to all the terminals of a home with full interactivity, it is tempting to propose a client/server type of architecture as illustrated by Figure 2. In this concept, a set-top box (server) with an important processing power and equipped with high capacity hard disk(s) ensures interface with all external networks (cable, satellite, terrestrial, ADSL, and/or plain old telephone). It is directly connected to the main TV set or screen in the home and to simpler terminals (thin clients) by means of an internal high-speed network either wired (e.g., an extension of IEEE1394 as proposed by the HAVI committee) or wireless in the 2.4 or 5GHz frequency band (e.g., one of the versions of IEEE802.11 already used in the PC world).

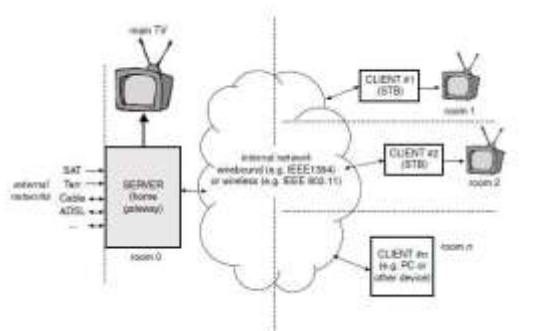


Fig. 2: Architecture – Home multimedia network

One of the advantages of this solution is its evolution, which can be ensured mainly by updating or upgrading the server, since the clients are dumb terminals that are merely able to send requests to the server and to display the requested audiovisual services, whatever their origin (external networks or local disks) and their nature (audio/video, graphics, Internet pages). However, this solution faces many obstacles, even if we assume the problems linked to the standardization of the communication network are resolved: for example, compatibility with the many middleware's and conditional access systems of pay TV operators, wiring constraints for the wired solution and bandwidth constraints for the wireless solution, as well as complete unavailability of all terminals in case of a problem at the server.

Content Protection techniques -

There are multiple technologies available in today's market for protecting the digital content. Conditional Access is most popular in standalone digital decoder environments. However, the demand for the digital content to play across the

secondary devices is increasingly growing and this is seen as at most important to realize. For this purposes we have Digital Rights Managements available from various vendors

DRM – Digital Rights Management

The DRM ensures that the content is protected against any theft and only the authorized personal are given access to view the digital content. Content portability is effectively achieved with the help of available DRM technologies. However, the use of digital management is not universally accepted to be available all across. The DRM is getting popular with the content being requested to be made available on the secondary devices. DRM technologies enable broadcasters to enforce different access criteria such that it stops from content being misused. There are different vendors who are providing DRM solutions in the industry. The technologies include-

1. HDS – HTTP Dynamic Streaming was developed by Adobe. It's a streaming over HTTP to device which supports Adobe Flash or Air. Android doesn't support HDS protocol.
2. HLS – HTTP Live streaming protocol developed by apple for iOS devices and quick time player. Android 3.0 is included with the HLS support. HLS is adopted as primary and common streaming protocol in most of the websites.
3. HSS – HTTP Smooth streaming is an answer to other streaming protocols. Runs on IIS and Silverlight player. HSS is seen as highly customizable compared to other streaming protocols.

TV is moving on to the secondary devices and most importantly onto the smart phones. Because of this migration, the viewing experience on the connected secondary devices typically targets at providing superior experience on any connected device.

UPnP -

UPnP is the set of networking protocols that allows the networked devices to be connected together. The networking connectivity could be Wi-Fi, Ethernet etc. UPnP is fundamentally reserved for communicating between secondary devices, TV's, digital decoders and other electronic devices available at home. The UPnP extends the plug and play technology which dynamically allows devices to be added or deleted from the given network. The configurations for the device are exchanged automatically resulting in hassle free connectivity for the user devices. The UPnP comes with

different components like addressing, discovery, description event notifications, controls and presentation options. There are specific standards available for audio video standards and its components. There are few problems noted with UPnP that the protocol as such doesn't provide any validation mechanism for the given user devices. We need to add additional plugin onto the native protocol such that the authenticated devices are only allowed to be networked

Content transfer onto the secondary devices:

As such in today's scenario there are multiple vendors in the market who captures the metadata information from the digital decoders and place it on the secondary devices. The protocol has been established such that the metadata can be parsed from the broadcasting environment and stored onto the digital decoders. Additionally, the parsed metadata of the stored content is also made available to the secondary devices but not capable of storing it onto device which is on the move.

Technology Reused -

Figure 3 flow diagram explains how the digital input signal to the digital decoder is handled in today's scenario. The digital decoder is fitted with two tuners, permanent storage and associated display devices. If we carefully observe the display part of the decoded input, it is single output signal which is getting split across multiple output channels available on the decoder. The multiple output channels would include HDMI, CVBS and SCART devices. Though there are multiple output terminals available, the same content would be displayed on all the outputs. Though the decoder hardware comes with an added advantage of decoded content stored on the permanent storage because of the display limitation, the recorded content is not being utilized effectively

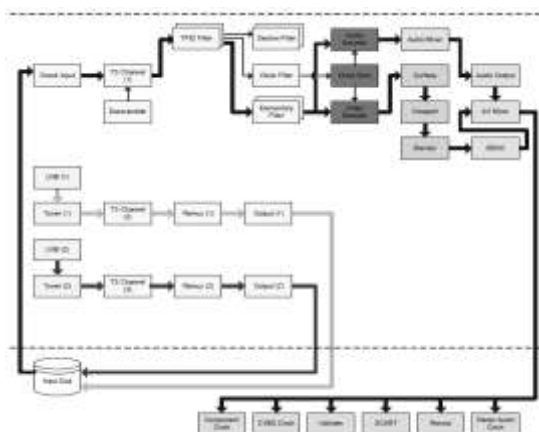


Fig 3 Recording/Playback Scenario

Futuristic System -

The proposed system is based on the available existing digital decoder functionalities. The content which is stored on the digital decoder can be decoded and can be pushed onto the authorized secondary device such that the authenticity and the basic principle of security are maintained.

In order to stream the content onto the secondary device in order to stream the content onto the secondary device we need to make sure two things are achieved –

- 1) The device to which streaming is performed is authorized user device
- 2) The content which is being transmitted is encrypted to be secure

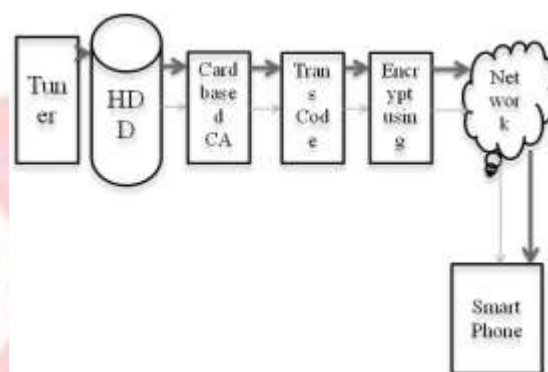


Fig 4 Content Streaming Flow

The simple flow diagram of the proposed system looks as shown in the Figure 4. Further enhancements to the system would include easy to use UI, flexibility to provide all the functionalities available in the digital decoder to be made available to the secondary device such that the secondary device becomes complementary digital decoder

System Architecture -

The system architecture which would fit into the existing requirements is presented in the figure 5. It contains various elements as captured.

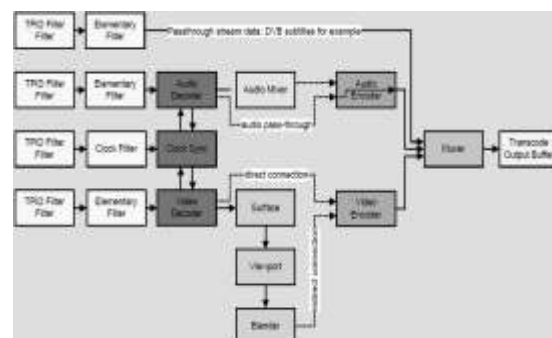


Fig 5 – Decoder Architecture

Content format and Streaming -

Content will be streamed to the second screen device and stored there. Once the content is fully acquired by the second screen device, the user will be able to play it. This is only allowed if the user has permission to do this. The Digital Decoder will process a single content SecDev loading request at a time. Morega and/or second screen device will manage the request queues. It is possible that the Morega device will be able to support several concurrent stream/transcode/transcript sessions from different Digital Decoders in the subscriber's home. The second screen device user initiates the content transfer process through Morega to the second screen device. Morega initiates streaming to the second screen device from the Digital Decoder. The content transfer by the Digital Decoder with storage capability occurs in the background and does not affect the Digital Decoder user experience. Social networking sites popularity is rising consistently when the new users are absorbed by various different means. It has become a trend for an individual to be an active in the social network sites where people will continue to respond to each comment of his friends or the people of his interests.

Transcripting the Content -

The Digital Decoder with storage capability performs entitlement checks against the required subscription services and the subscriber's current entitlements. If everything is valid, the security module sends the secure personal information to the security hardware for control word generation. If the CW generation from secure personal information fails due to lack of entitlement, FED limitation, etc., a CA hole occurs. The Digital Decoder uses the CWs to decrypt the content. The recorded content is DVB CSA decrypted by the Digital Decoder with storage capability in the normal manner for playback, using an MPEG-2 demultiplexor. This results in an unencrypted transport stream that contains only the elementary streams required for transcoding, audio selected language, and video. The Digital Decoder with storage capability chooses a session key to encrypt the content and encrypts the decrypted content on the fly, block by block, during content streaming. The message key is conveyed to the Morega device in the HTTP header of the first requested block.

Almost all companies now are thinking of merging or associating their solutions with the social global network sites where it can easily influence people

in the social network. They develop interactive communities and tools within the social network sites based on the individual interests or business interests where they can make sure the information about their products can be flown which will influence the users of social network to think information. This would help clinician's faster and more effective diagnosis.

DRM License and Re-encrypting the Content -

The Morega device requires a DRM encryption key for the specific playback session of the content item, and encrypts the transcoded content using DRM for the requesting second screen device. The encryption key is generated by the DRM for the requesting second screen device, inside the Morega device. The DRM in the Morega device generates a DRM content license for playback of the content item on a second screen device. The license is created using a license template downloaded from the DRM-Server. For DRM, the license is generated and protected using a Tier key to personalize the license to the specific household domain to which the destination device is a part of. The Tier key is domain-specific. This license includes business rules, as well as the encryption key selected by the Morega device to encrypt the transcoded content. The license expiration date will cover enough time to allow consuming the content on the go. The actual expiration is configurable and will be in accordance with customer defined business rules. If the subscriber is granted rights to play back the content, the content is sent to the second screen device application to be stored and decryption and decoding occur at time of playback.

Consumer Manager -

Consumer Manager maintains a database of the DRM households (domains) and registered devices associated with these households. Consumer Manager exposes an interface to customer SMS for household management — creating, deleting, querying information, etc. It also exposes an interface to the DRM Server for providing information about household. Consumer Manager keeps household username/password that is used for the second screen device registration, as well as the Hardware ID used for the Digital Decoder registration. If requested, Consumer Manager enforces the allowed number of devices associated with a household.

RESULTS and CONCLUSION -

This project covers the basic and minimal aspects of the content transfer from the digital decoder onto the registered secondary device. The major

problem which we tried to solve with this project is that the content which is readily available on the digital decoder is made available onto the user secondary devices so that the basic dead lock situation at the TV viewers is solved. This is a win-win situation for all the parties involved in this business. Service provider gets to earn revenue by delivering the content onto the multiscreen, content provider gets paid by increase in the usage of the content, and the user who is not able to watch multiple programs at a time are given a choice to view the same on any of the available free secondary device.

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