Developing POD-MMI Application Supporting With HTML 4 for DTV

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Abstract

In the present-day communication domain, the interface Component validation is controlled in a programmable manner. This has led to the development of different types of interface techniques such as Man-Machine Interface (MMI) defined by the cable stack to interact with the user for conditional access system. This paper deals with the wide scope of validating the hardware & software components. The hardware component involves Conditional access (CA) system which at the Point of Deployment (POD) connects to the digital TV (host). HTML 4 is used to interact with the user for displaying information messages from POD and/or to accept the necessary data. Depending on the Digital TV system configuration, we use HTML engine with various levels of capabilities. The instability in the View ML browser is enhanced by bug-fixing it.

Keywords: *Point Of Deployment, Conditional Access System, Man-Machine Interface, HTML, Digital TV, Entitlement Control and Management Message.*

1. Introduction

Man Machine Interface is defined by the cable stack to interact with the user for conditional access system. This paper has the wider scope of validating the hardware components that are involved during the point of deployment with Conditional Access System in order to connect to host or digital TV. Interaction with the user is provided with the help of a software component, HTML 4 and later displays the information messages from the point of deployment till the acceptance of necessary data

Genesis Microchip Inc. uses the View ML HTML parser and displays engine which is available off the shelf for its Digital Television products. Depending on the digital television system configuration, we use HTML engine with various levels of capabilities. The View ML browser by itself is found to be not stable and hence needs lot of bug-fixes and enhancements.

The unauthorized access to the receipt data is protected by a collaboration of scrambling and encryption in a conditional access system. At the basic level of a Conditional Access System, it is a mechanism to deliver broadcast services to the subscribers who are authorized to receive the services and to protect those services from others to access it. The architecture of a system includes two major components i.e. scrambling and encryption before transmitting the program. Scrambling is used for the transformation of video and audio of a program, which results in the program distortion and makes it not viewable. The scrambling algorithm controls this transformation in the system. The restoration of the program to its viewable form is done by the receiver's system using the corresponding descrambling algorithm.

The control mechanism of scrambling and its opposite is achieved using a control word. Scrambling is the lead, consists of a control word which is utilized by the descrambler in order to descramble the program. The operation involves the transmission and reception process. Service providers use a hierarchical encryption method to transmit the control word to the consumers. Encryption safeguards the Secret keys and this procedure escorts the data element safely.
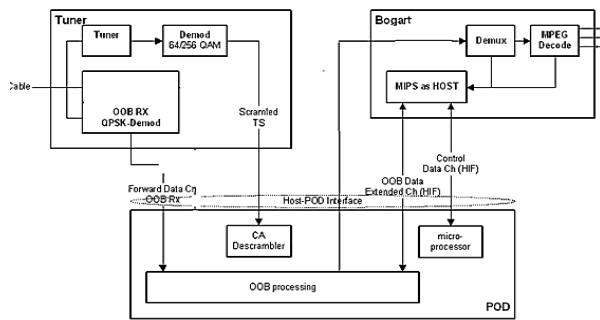
2. Block Diagram

Figure 1. Block Diagram

2.1 Tuner (DRX3942)

Tuner block is as-well called as Network interface Module. The Digital Cable Network supports Advanced Television Systems Committee standards, i.e. (i) in-band Tuner and Quadrature amplitude modulator. The MPEG transport stream is received through this path in the de-modulator which is scrambled or free to view (clear). (ii) Out-of-band Quadrature Phase Shift Key modulator and demodulator support out-of-band data communication between Head end to Point Of Deployment.

2.2 Bogart (Gm10500)

This serves two main functionalities from Conditional Access point of view. (i) Microprocessor without Interlocked Pipeline Stages which act as Host processor in the system and communicates with point of deployment through Data and Extended channels and controls the system. (ii) Descrambling transport stream for Copy protection and MPEG Audio Video decoding of ES for a program in transport stream, is one of the major processing carried out by the Bogart.

2.3 Point of Deployment

Point of deployment is also referred as module in the standard. This module sits inside a personal computer card. Processing of conditional access messages is done in the point of deployment Module (e.g. Extraction of Control Word and Service Key from Entitlement Control Message and Entitlement Management Message). Descrambles the Scrambled transport stream based on the conditional access entitlement. Then re-scrambling transport stream based on copy control information for copy protection.

The point of deployment Module includes following blocks:

1. Conditional Access Descrambler
2. Out-of-Band (OOB) Processing
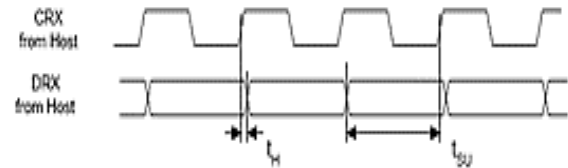3. Host point of deployment – OOB Interface

Figure 2. POD Input Timing diagram

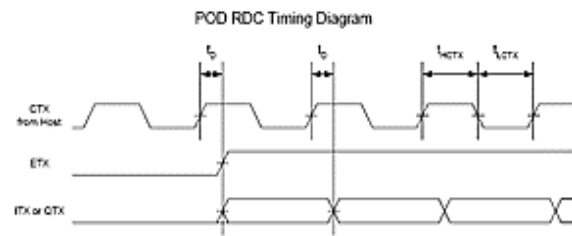Timing is measured with Input/output Timing Reference level at 1.5V.

Figure 3. POD Output Timing diagram
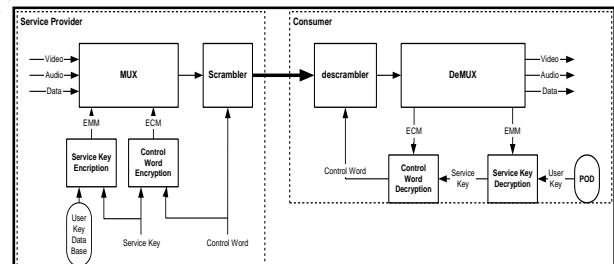
3. Conditional Access System

Figure 4. Conditional Access Concept Diagram

A blend of Scrambling and Encryption protects the data from unauthorized access at the receiver end in a conditional access system. Control word is secured by encrypting the message with a service key (which is common to all users) at the service provider side and simultaneously transmitted to all consumers with the 'right of permission' to access the control message in order to overcome the limitation of Bandwidth.

The security is further enhanced by providing distinguished user key via smart card to individual users. This encrypts the service key which consumers receive as Entitlement Management message and further unlocks it. In addition, control word is procured by unlocking the entitlement message using the obtained service key which the descrambler uses.

For safety measures and to protect data from hackers, Control word and Service key is regularly changed according to a particular sequence of seconds and once a month respectively.

3.1. Conditional Access Initialization

There are 4 possible conditions that can cause the PCMCIA interface initialization phase. They are:
1) The Host and POD module are powered up at the same time. After both have performed their internal initialization, then the interface initialization will begin.
2) Host has been powered and in a steady state. A POD module is then inserted. After the POD module has performed its internal initialization, the interface initialization phase will begin.
3) The Host has performed a reset operation for some reason (spurious signal, brownout, software problem, etc.) that has not caused the POD module to reset. The Host shall go through its initialization and then shall perform a PCMCIA reset on the POD module. After the POD module has performed its internal initialization, then the interface initialization shall begin.
4) The POD module has performed a reset operation for some reason (spurious signals, software problem, etc.) that has not caused the Host to reset. The Host shall incorporate the timeout detection and will thus detect a timeout and will perform a POD reset.

4. Conditional Access Application Modules

Conditional Access module is a collection of following resources. Each resource provides specific services.
- Application Info
- Man Machine Interface
- Conditional Access
- Copy Protection
- Host Control
- Homing
- POD Firmware upgrade
- System time
- Low Speed communication
- Specific Application
- Generic Feature control
- Generic Diagnostic support
- Common download specification

5. System Time

If the POD module desires, it shall open a single session to the System Time resource to allow the POD module to receive system time from the Host.
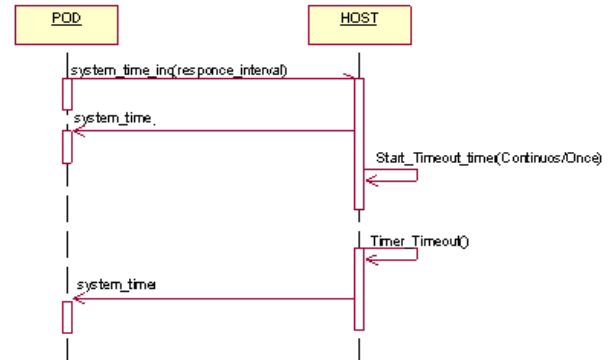

Figure 5. System Time sequence diagram

6. Scope of HTML

We are using HTML 4 specification in order to display the status of the system through a browser. HTML is the acronym for hypertext mark-up language. According to World Wide Web Consortium, HTML publishes for global distribution information. HTML was initially created by Tim Berners-Lee and later modified to make it a universally understood language that all computers may easily understand.

HTML 4 is a World Wide Web Consortium recommendation for HTML, which is developed together with the vendors like IBM, Microsoft and Netscape Communications. World Wide Web Consortium continues to joining hands with the vendors to facilitate extensions for multimedia objects, layout, scripting styles, forms, math and sheets. World Wide Web Consortium plans are implementing the work in further versions of HTML.

HTML is used for formatting Web pages to display information in a comfortable viewing environment. But it's incapable to provide all the features the user seeks in an information application. The list of the inadequacies include searching, link management and site management. The structure of HTML is designed and dedicated for the purpose of providing few formatting options in pages. There is not enough processing needs provided for an information application in the HTML structure.

6.1. HTML 4'S Test Page Hierarchy

1) Test for character set
2) Test for Links
3) Test for All HTML 4 specific tags like as

     a.   Tables
     b.   Images
     c.   Anchors
4) Test for Forms
5) Test for Java scripts covering all Java syntactic structures."
6) "Test for Applets."
7) "Test for misleading HTML Tags and default behaviour."
8) "Test for combination of different HTML tags."
9) "Test for style sheets."

7. Results

The paper titled Developing POD-MMI Application Supporting with HTML 4 for DTV is best suitable for accessing the different channels. Prior to transmission, scrambling is used to transform the video and audio content of a program, which makes the received program distorted and not viewable. Thus it provides higher security features.

The figures below displays the test setup and the output video stream that could be obtained after the implementation of the work on a HTML supported browser.
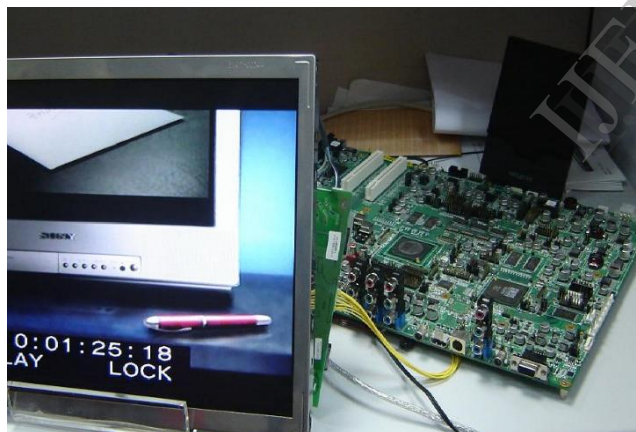

Figure 6. The Test Setup

Figure 7. Output Video Streams

The major advantages of using this technology is to that it is very easy to use for a user who lacks the knowledge of the technology. As this is software oriented no extra hardware is required and the user need not do any circuit connections for the purpose of viewing programs. From the programmer's virtue the designing of the webpage content is much easier as many modern tools are available which yields in higher features designing. One of the major impact of this technology is that the protection from the data hacking from unauthorised access is not possible as the highest order of encryption and decryption methods are used.

8. Applications

▪ Digital Television Applications is one of the recent applications which is more widely used. This concept based on this paper for television viewing in the future would create more accessibility to the world of internet and applications for all its users without any extra cost.
▪ Satellite transitions and receiving would play a major role while using internet which reduces the problem of wired transmissions and also tapping of lines for the unauthorised distributing.
▪ The browser can be used for running different applications and file types that are compatible with this product resulting in having all-in-one hardware.

9. Future Scope

The major requirement for supporting this work is to have a device which supports higher graphics and few compatible codec libraries. In the upcoming versions of this work, the better resolution can be achieved with lower bandwidth. By this enhancement we can also achieve the design meeting the standards of the SCTE (Host-POD interface standard).

10. References

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