Comments on Pre-Consultation Paper On Set Top Box Interoperability 4 th April, 2016

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Introduction

TRAI called for meetings of stakeholders on 4th Nov 2015 at their office for discussing the issues of inter-operability in unidirectional and bi directional networks. During the meeting it was also proposed that a small group may be formed which may come up with a concept paper on possible scenarios of achieving technical interoperability. Mr. Ankan Biswas, Chairman Digital Broadcast Council, CEAMA had been asked to coordinate with the group members so that the concept paper may be developed. TRAI had requested the group to come up with a concept paper for available solutions for achieving interoperability in unidirectional and bidirectional networks with proposed solutions. The paper below has been put together collating the feedbacks received for the members of the group.

We would like to present the same paper as the comments from the group of stakeholder present at the meeting on 4th Nov 2015.

Issues of Interoperability of Set Top Boxes and proposal for its solutions in both uni directional and and bi directional networks.

Background

Broadcast TV scenario

India has come long way from being two-channel analogue terrestrial broadcasting country to an evolved broadcast market with 800 plus digital channels with many more trying to enter the broadcasting space in one hand and deployment of eighty plus million of digital of STBs on the other. With present ongoing digitization drive along with implementation of addressability through DAS deployment, regulatory and consumer forum attention is now to address consumer satisfaction, electronic waste and sustainability of electronics. Pay TV business process has a legacy of proprietary technology and vertical business models creating difficulty for implementation of inter-operability. It is natural for India to focus on inter-operability seriously now.

Conditional Access

The CAS (Conditional Access System) is the key to a broadcast pay TV system, where every subscriber actually receives all the broadcasted channels including scrambled ones. And it is only the CAS security system that ensures that content delivery pipe from the operator to the set top box is secured. In addition, CA systems provide a mechanism of addressing each STB uniquely. The CA system ensures that the control words (CW) which are used to scramble contents at the Headend are only available to the authorized customers and only authorized customers are able to decrypt the control word and then only authorized subscriber is able to use the CW to descramble the scrambled content and able to view the content, thus making the content and the network secure. Keeping the entire process secure through secrecy was the foundation of CAS.

DVB standard

India follows DVB (Digital Video Broadcasting) standard for broadcasting. DVB standard defines how the content is to be scrambled using DVB CSA algorithm through DVB CSA scrambler, a DVB standardized instrument. DVB also defines the transmission protocol how and where the packets of digitized content including the scrambled content are to be positioned within the transport stream. DVB states that the CW will be encrypted within the ECM (Entitlement Control Message) and the EMM (Entitlement Management Massage) will be the way of authorizing the consumer for viewing a program, and DVB also defines how and where ECM and EMM are to be positioned and sent through the same transport stream so that the set top box is able to retrieve them and act accordingly. However DVB leaves it to the individual CAS system to use proprietary protocol to devise the entire system of ECM and EMM generation and management.

CAS Vendors

Each conditional access system (CAS) is specific to a CAS vendor. Each CAS defines respective security specifications including proprietary algorithm and procedure to implement them on the Head End and STB. Every CAS vendor licenses these to the Headend operator and STB manufacturer. Each STB model is licensed, tested, verified and then certified to be compliant with a particular CAS. The CAS vendor enables the operator to broadcast protected content and prevent theft of services. Their uniqueness to specific vendors and their algorithm and architecture, make it difficult for customers to switch between content providers

Set Top Box Providers

Presently each conditional access system requires embedding CAS specific secrets in the SOC, signing Software images and ensuring that the CAS cannot be bypassed. This is one of the primary reasons STBs are designed to not switch between CAS easily. This process also makes the Set Top Box providers dependent on the operator to identify the particular CAS to be embedded in the set Top Box which may be deployed in that operator’s network. The STB vendor is also dependent on the particular CAS vendor to license the security algorithm (technology) to embed into the STB. Thus the STBs providers cannot make inter operable STB’s until a frame work of inter operable STB is standardised.

Inter Operability

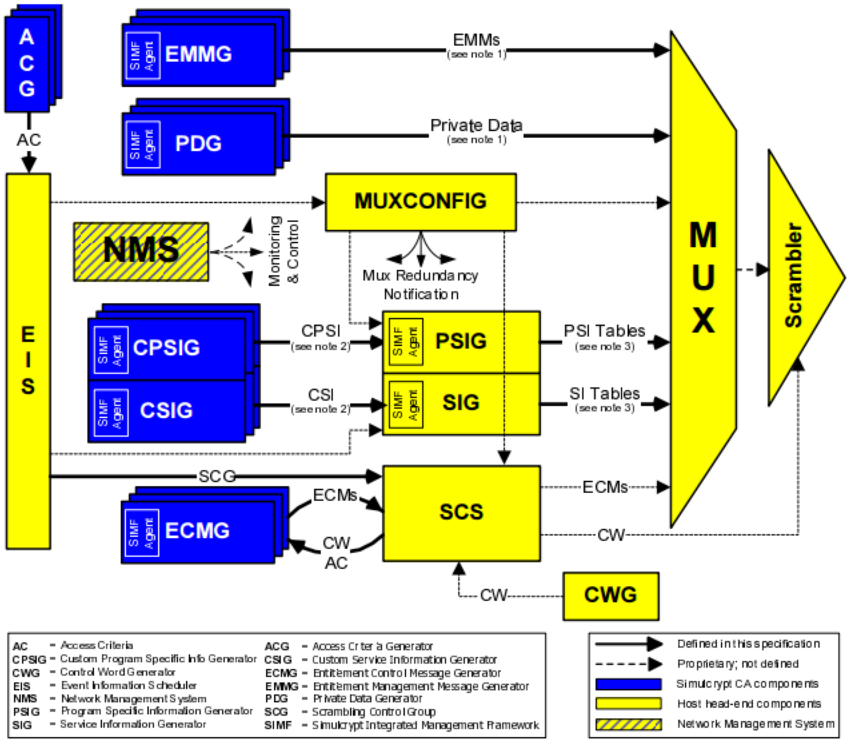
Inter operability is required for an open market creation, possibility of free consumer choice and advantage of volume of scale. Legislative will to standardize inter operability specification and enforcement of standard in implementation are two important aspects along with cooperative association of all stake holders for inter operability be successful.

Inter-operability of CAS for the Head End (for Operator)

Before elaboration of inter operability in STB domain, let us consider how the proprietary nature of CAS not only impacts consumer but also the operator. Initially the operator also used to be locked into a single CAS vendor as the Headend system also used only one proprietary CAS. The operator who is the owner of the broadcast business required a solution of inter operability of CAS on the Head end. Solution evolved and standard was published. Following paragraphs elaborate the technology framework which enabled operators to select, change a CAS and to create an environment for the coexistence of multiple secure CAS technologies all on the same platform.

Implementing this Simulcrypt framework enables a operators to keep competition alive and prevent the stagnation of prices and technology which happens in a market where competition has ceased to exist.

ETSI TS 103 197 V1.5.1



AC	= Access Criteria	ACG	= Access Criteria Generator
CPSIG	= Custom Program Specific Info Generator	CSIG	= Custom Service Information Generator
CWG	= Control Word Generator	ECMG	= Entitlement Control Message Generator
EIS	= Event Information Scheduler	EMMG	= Entitlement Management Message Generator
NMS	= Network Management System	PDG	= Private Data Generator
PSIG	= Program Specific Information Generator	SCG	= Scrambling Control Group
SIG	= Service Information Generator	SIMF	= Simulcrypt Integrated Management Framework

NOTE 1: EMMG⇔MUX.
NOTE 2: C(P)SIG⇔(P)SIG.
NOTE 3: (P)SIG⇔MUX.

DVB Simulcrypt System Architecture

Framework of Head-End Standardization (Simulcrypt enabling CAS interoperability on Head-End)

Simulcrypt is a standard DVB protocol published by ETSI TS 103 197 v1.5.1 for use in broadcast TV head ends to enable multiple Conditional Access systems to co-exist in the same network.

The standard also defines the interface between conditional access systems and head end multiplexing components.

There are three key advantages of DVB-Simulcrypt to operators: -
1. It provides interoperability between multiplexers, scramblers and Conditional Access Systems.
2. It enables Conditional Access Systems to co-exist on the same network
3. It prevents a CAS vendor who implements a compliant system from locking out other CAS vendors.

Control Word (keys used in the scrambling algorithm) generation and Scrambling of content are performed by the multiplexer and not by any single CAS. The Control Words (CW) are then passed to both conditional access systems in parallel to be protected and packaged in standard containers specified by DVB Simulcrypt called ECMs. Each CAS produces it's own proprietary ECMs and passes them back to the multiplexer where than can be multiplexed into the transport stream along with the content encrypted by the multiplexer.

Thus Conditional Access systems can independently control access to the Control Word required to recover the content.

Entitlement Management Messages (EMMs) are the CAS specific Entitlements required by the client devices to 'unlock' the ECMs on the client. This is CAS specific and proprietary data and so is generated independently by each CAS and multiplexed into the transport stream.

DVB-Simulcrypt is a widely accepted and core part of the modern digital broadcast system. Operators who understand the flexibility enabled by the adoption of this standard have used it to transform their business.

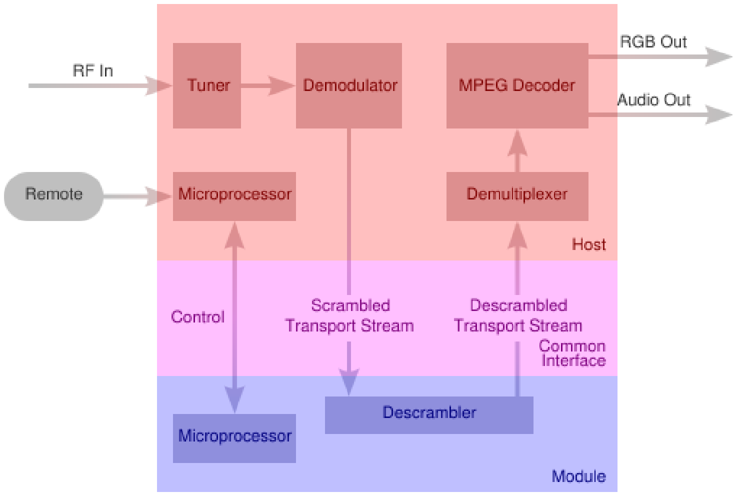
DVB Simulcrypt implementation not only allows the operator to implement multiple CAS in the Head End and allows the subscriber in its network to use different Set Top Boxes embedded with different CAS so long those CAS's are implemented in its Simulcrypt Head End.

Inter-operable STB (Inter-operability of CAS for consumer)

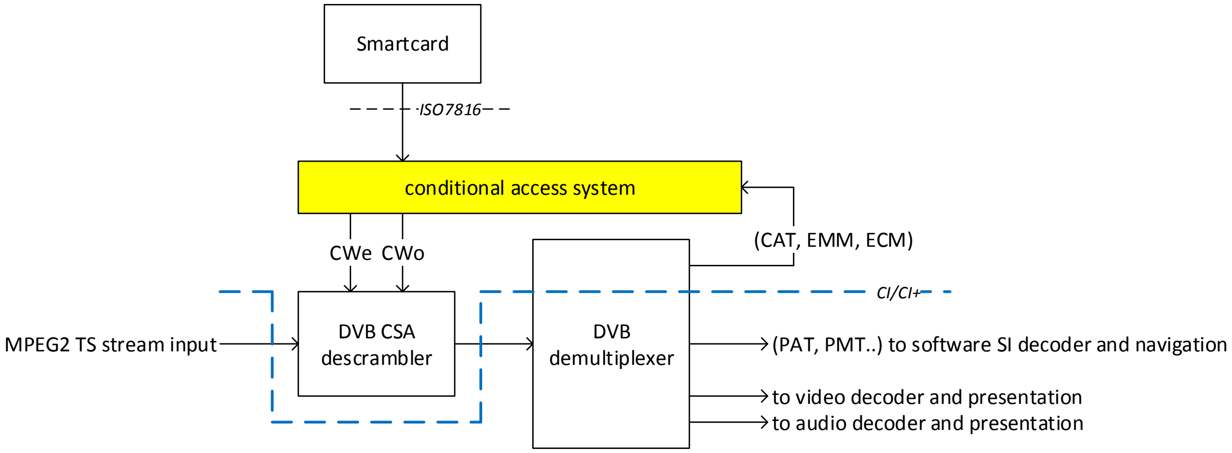
DVB CI

Digital Video Broadcasting or DVB has defined Common Interface standard, a technology which allows separation of conditional access functionality from a Host which may be a digital TV or STB into a removable conditional-access module (CAM). The host device (STB or TV) is responsible for tuning to pay TV channels and demodulation of the RF signal, while CAM is responsible for CA descrambling. The Common Interface allows them to communicate with each other.

The Common Interface is used as interface between the CAM and the TV or device. All Host equipments (STB or TV) built with DVB Common Interface must comply with the EN 50221-1997 standard, that enables the addition of any CAM in STB or DTV to adapt it to different kinds of CAS.



For receiver end, DVB Common Interface (DVB CI), along with common scrambling system has been used worldwide to promote interoperability of different CAS systems either with different smart cards or with soft CAS which uses no smart cards.


Smartcard
ISO7816
conditional access system
(CAT, EMM, ECM)
CWe CWo
CI/CI+
MPEG2 TS stream input
DVB CSA descrambler
DVB demultiplexer
(PAT, PMT..) to software SI decoder and navigation
to video decoder and presentation
to audio decoder and presentation

CI/CI+

CI/CI+ has been mandated in several markets to promote interoperability across different conditional access systems,. One of the reason of less than wide acceptability is because CAM module was positioned at higher price to the users (PRICE) by CAS vendors and compatibility issues exist with boxes already deployed in the field.

CI+ 2.0

As the next step for interoperability, DVB CI+ 2.0 (on USB) has been proposed. CI+2.0 on USB remain an attractive way for its widely accepted protocol but with a generally available USB port. The advantage is that CI/CI+ is a verified specification and USB2.0 port appears on most of the box. However the disadvantage is that there is no USB-based CI+2.0 solutions and CAMs today.

DVB CI implementation experience

From market data of implementation, it is clear that DVB CI is a very acceptable device in Europe and Cable Card (Similar standard to DVB CI in US) has been very successful in US. In Europe, because many countries having coverage of multiple broadcasting footprint and availability of plethora of programs with different languages in one hand and legal and logistical challenges for distributing operator STB's across many national borders on the other, DVB CI has become a convenient solution for Europeans. Also one of the main reason of the DVB CI implementation in Europe is the deployment of DVB CI interfaces in TV's. Nobody would like to buy a TV embedded with a particular CAS and getting locked with a particular a Pay TV operator in one hand and on the other hand the TV manufacturers would not like to manufacture so many different versions of TV each embedded with a different CAS. DVB CI interface is a defacto standard for European DTV.

Possible approach for DVB CI implementation

The same approach of DTV with only DVB CI interface without any CAS may be also implemented for set top boxes for cable system in India, wherein the set top boxes would be sold without any embedded CAS and the CAM modules would be sold by the operator directly. This would create a huge open market for standard Set top boxes without any embedded CAS. Also the demand of CAM modules will increase and prices of the CAM modules will drastically reduce to an affordable level. However, this will require standardization of Set top box hardware and middleware specification.

Down loadable CAS

Technical background

Presently at manufacturing stage of STB, CAS software is downloaded on to the STB as a image. STB is built with lot of protection involving keys/ keys Ladders prohibiting any unauthorized download. However the existing general perception, that once the CAS is deployed it is not modified, is not true! The CAS is regularly modified and changed due to upgrade requirements and also for deploying additional security measures. This is done through broadcast in 'Over The Air' mode, this process is known as OTA. The modified part of CAS is received by all the STBS in the network through OTA in broadcast mode and required modification is implemented on the STB. Modification through OTA is done both for CAS and middleware. The STB is built with lot of protection using keys/ Key Ladders which prohibits any unauthorized OTA activity. Presently proprietary algorithm is deployed to block any other CAS to be down loaded through OTA.

Even in the unidirectional broadcast system available presently it is possible to use the same OTA process to download a different CAS on the STB keeping similar protection mechanism in place but standardizing it. However bidirectional network will provide higher levels of security for such downloading.

Standardization is the key for inter-operability. However standardization would not eliminate proprietary implementation of encryption technologies by individual CAS. Implementation concept of downloadable CAS to make the STB inter operable is dependent on standardization of various blocks of the STB in the similar way that standardization of various blocks of Head End enabled various CAS systems to run on same Head-End under Simulcrypt implementation described earlier.

The purpose of technical standardization is intended to create interfaces and technology platforms on which multiple CAS vendors can operate and innovate to deliver the best choice of technology to operators and subscribers at competitive prices. However, standardization if excessively prescriptive or poorly designed can be used as a tool to lock out innovation and limit the ability of multiple vendors to provide services at competitive pricing. It is for this reason that the idea of standardization of the 'CAS Framework' should be promoted and not the idea of standardization of any particular CAS.

There is often a common perception that a CAS, once deployed, can never be changed. However some operators in conjunction with CAS vendors have shown in a number of real deployments that this is not the case and actually downloaded different CAS on existing STB's in a running network.

Following paragraphs elaborate the technology framework which enables change of CAS on a STB and create an environment for the coexistence of multiple secure CAS technologies in the network and where any CAS may be downloaded on any STB by the operator according to the agreement with the consumer. Implementing this framework enables a market to keep competition alive and prevent the stagnation of prices and technology which happens in markets where competition has ceased to exist. This is similar to having a framework for the head-end, it is important to define a down loadable CAS framework for the set-top box in order not to become locked-in a single CAS vendor either as a consumer or as the operator.

STB Framework (STB standardization to enable inter-operability on STB through Down loadable CAS)

There are following key items which must be standardized in this frame work to enable it to be interoperable
1. Standard software downloader
2. Standard boot loader
3. Standard key ladder
4. Standard OTA Channel

Standard Software Downloader

The standard software downloader is essential in order to ensure that all deployed STBs have a practical means by which a new software image can be installed and downloading of new images are not blocked. This is essential should consumer decides to change its CAS and / or the operator.

A number of standards already exist today for Software downloader which could be used as standard in this framework, although if there are compelling reasons other standards may be defined. One example is DVB specification for System Software Updates (DVB-SSU) which enables the update of STBs using a defined and standard broadcast channel in simple and efficient manner. A variety of means of signaling may be standardized to control the Over the Air (OTA) download and target the update at individual STBs or groups of STBs.

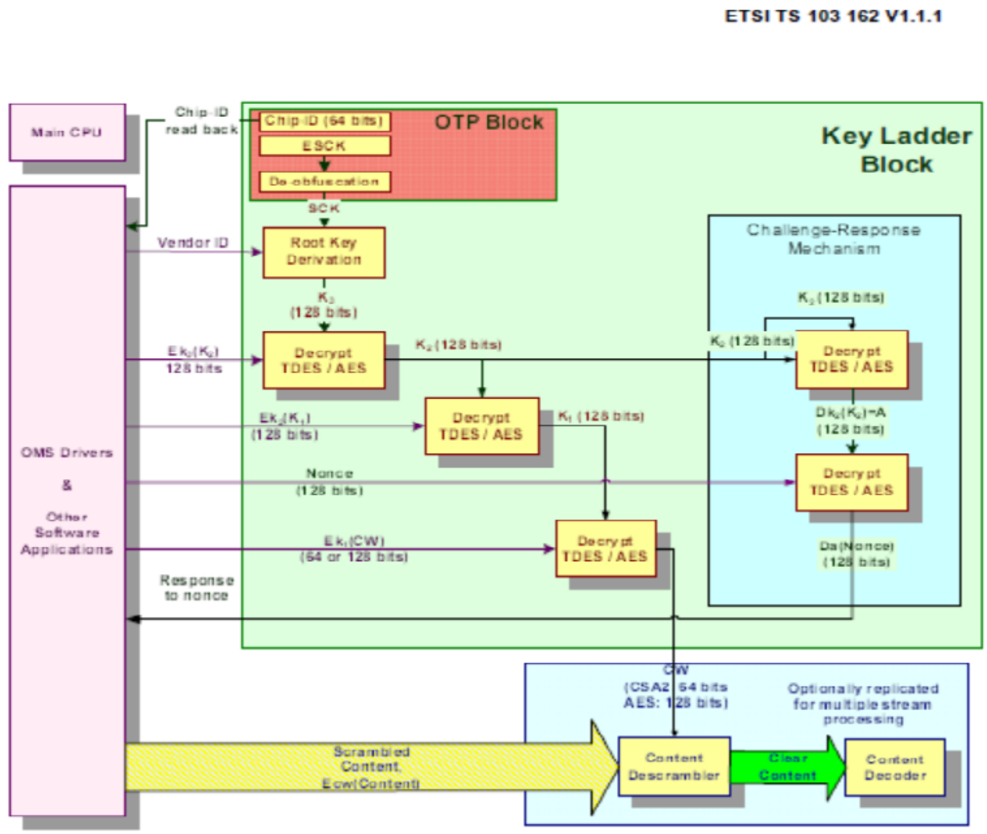
Standard Boot loader

It is impractical to replace the boot loader on a STB once the box has been deployed. For this reason, within a standard Conditional Access Framework, it must be standardized for all vendors to use the same boot loader. There should be no intellectual property belonging to CAS vendors within the boot loader which is not freely available for use by other CAS vendors. The boot loader must provide the features necessary to initialize the chipset and verify the application image but contain no CAS vendor specific functionality.

Standard Key Ladder

CA vendors typically hold critical signing keys and use proprietary key ladder configurations. Without this information being released to other vendors it becomes impossible for the operator to swap out the incumbent CAS on deployed boxes. Therefore, the ownership of the key ladder configuration and keys must be moved from individual conditional access vendors to an independent authority.

ETSI TS 103162 Key Ladder Standard is the most accepted configuration for standard key ladder implementation.



Key Ladder Functional Diagram

This key ladder specification is designed to support the dynamic substitution and replacement of either sink or source device in a manner that maintains the security and integrity of the underlying content distribution network. The specification enables the portability of sink devices between content distribution networks by permitting the field upgradeability of sink devices to work with previously unknown source devices. The specification also enhances the capability of networks to upgrade their source devices without disrupting the capabilities of already fielded sink devices.

In conjunction with information regarding the keys/key ladders and other box specific details required for the framework should be held in escrow enabling this data to be released under clearly defined criteria to a specific operator for addressing a particular STB for down loading.

With access to keys and the key derivation provided by the Key Ladder, CAS vendors may compete in the market and incumbents cannot block the competition restricting access to deployed STBs.

Through the unrestricted downloading through OTA process through the standard OTA channel, the CAS Libraries is to be updated by the Head End as per requirement and the CAS specific parameters are downloaded and upgraded into the box as per requirement by Head End. If smart cards are used for the STB, pairing of CAS ID and Smart Card is performed through OTA.

Optional Features

The STB specification should only mandate the bare minimum specification for Downloadable Conditional Access to work. The framework should not mandate unnecessary features as these can tend to limit innovation and may increase cost of STBs available in the market.

Benefit of Downloadable CAS Framework

Creating a framework which is inclusive and enable change rather than prevent it directly benefits consumers in two ways. Competition leads to the reduction in the cost of STB over time which is a cost directly passed on to the subscriber, no matter whether the STB is given initially at a subsidized rate or charged upfront. Secondly, competition results in feature innovation which continually enhances the services which can be offered to subscribers.

The STBs at the customer premise needs to be software upgradable to cater to better video and audio quality and a better consumer experience with enhanced software. A software upgradable STB can open the door to managing the differences between operator networks. More stringent quality requirements should be established in STB specs for both hardware and software. The STB needs to be upgradable in terms of software and in addition have consistent performance and also a long life. Hardware across vendors should support a baseline level of functionality across all middleware for interoperability of core services. These STBs need to have a minimum CPU performance, memory, flash, graphics and security capabilities to support requirements across all operators. In addition, quality of hardware impacts the life span of the STB. A specification should be put in place for a defect rate to be below a certain threshold . Operators who deploy STBs need to be motivated to only deploy STBs that meet the requirements for quality and minimum hardware and SW features.

Downloadable CAS system is the most promising solution today because of its advantage :
1) Simple and straight forward extension of today's advanced hardware system solutions.
2) Already some reference specifications in China and US.

However its success is dependent on CAS vendors providing compliant solutions and operator adoption.

Various Implementation Issues of Inter operability

Any standardization effort is easier done if implemented in the beginning. However there is a huge deployment already creating many challenges as elaborated below.

Currently, in India Cable networks, there is a huge variety of software, conditional access, billing systems, cable plant frequency plans, quality, and regionalization that create STBs that are not fully interoperable between all networks. The incompatibility in each area is driven by various market, business, and implementation decisions made by each operator. In addition, unidirectional cable CAS do not have as strong methods to authenticate the STBs in such a way as to ensure that none of them are hacked and still using their certified CAS. Each conditional access system requires embedding CAS specific secrets in the SOC, signing SW images and ensures that the CAS cannot be bypassed. This is one of the primary reasons STBs are designed to not switch between CAS easily.

Middleware among various set top boxes varies. Each vendor and operators may choose different middleware that provides unique features, provide better customer experiences and differentiated services examples are VOD, PPV, DVR, and Interactive Programing. An interoperable STB would need to be capable of providing interoperable services across networks. This should also be kept in mind when looking into interoperability. In turn, the hardware architecture of an STB is usually tied to their middleware capabilities and software enhancements. A STBs CPU, memory, flashes and IO vary widely across operators. For interoperability at some level, a minimum baseline feature set is needed, while also giving operators room to provide value added services and adapt to their customers' requirements

The quality of current India cable networks barely makes them operable and definitely difficult to inter-operate. Typically, each operator and each head-end requires some level of software tweaks to handle imperfect Headends, unique frequency plans, noncompliant encoders, out of spec RF artifacts, etc. This makes it hard to get proper behaviour from the same STB if the network is changed. Well implemented standards compliant networks become important for STB to be plugged in from one network to another. Cable networks need to be upgraded to be grounded, 2-way capable and provide consistent RF frequency plans. To enable standardisation of STB's for inter operability the Cable networks must comply to DVB Simulcrypt specification and become inter-operable to various CAS.

Another point to be noted is that billing needs to be standardized across MSO's for the system to be interoperable. Currently, depending on the billing model, billing and the money flow can either be directly between the viewers and the Subscriber Management System (SMS) operators or it can pass via the Subscriber Authorization Systems (SAS) operators or the transmission system operators. The billing systems and provisioning systems are tied to the CAS system further complicating interoperability. Consequently, sensitive information about the names and addresses of subscribers can be known only to the appropriate service provider or alternatively to the CAS provider. Here is where we need standardization one way or another for interoperability.

For in interoperability one first starts with the importance of quality and then describe the system aspects needed for interoperability. In defining quality, one needs to look at both the network and the STB. The networks should have upgraded quality to ensure uninterrupted unidirectional or bidirectional transmission which have minimized noise and interference. The RF performance of networks should be as high as possible so that the STB is not limited in performance due to a lower quality cable network. To go a little deeper into this aspect it should be recognized that Radio Frequency (RF) performance of Cable networks clearly do not possess the quality required for interoperability. Better quality of networks would give better RF performance, which in turn enhances throughput. With higher throughput the Multiple System Operator (MSO) can provide higher quality services over the same networks. This translates to better consumer experience, for example going from Standard Definition to High Definition. In addition bidirectional networks need to be standardized on both upstream cut off frequency and total bandwidth of operation and the quality of the network to support this.

While one looks at the drawbacks of a unidirectional transmission network the reasons why
a bidirectional transmission network could provide a distinct advantage and future upgradability brcpmes clear. In a unidirectional CAS, the client application is secured by binding it to the specific STB make. Also, any upgrade of the application is controlled through intervention of the security vendor. This ensures that:
a. The client application is not tampered with to hack the operator network
b. No unwanted application can be installed to sabotage the operator network

Unidirectional CAS security systems do ensure that content delivery pipe from MSO to the set top box is secured. In addition, CA systems provide a mechanism of addressing each STB uniquely. The CA system ensures that the control words (CW) which are keys to encrypt and decrypt the content are secure. The problem with unidirectional systems is that if security on any of the STBs is compromised either by tampering of the application itself or by hacking and decrypting the control words, there is no way of identifying the population of STB's at which it was compromised. If an STB is to support multiple CAS, then strong methods of authentication are required when upgrading a STB from one CAS to another.

This problem can be mitigated by enabling a return path capability on the network and the STB. On a bidirectional STB, the Client application upgrade process can be controlled by the MSO and any tampering of software can be identified. For content security, bidirectional STBs enable easy identification of both control word sharing and cloning of STBs thus overcoming the problems faced by a
unidirectional network. Since bidirectional networks offer a greater degree of security over conventional one way networks, interoperability amongst different security vendors would be relatively easier to achieve.

There are a diversity of techniques that enable a bidirectional network. These include having a return path with Wi-Fi to a client gateway, Cellular Data or integrated modem functionality. The most accepted and standardized solution for a bidirectional cable system is to have the Headend and the STB be DOCSIS (Data Over Cable System Interface Specification) compliant. DOCSIS enabled STBs have been used worldwide and are suitable for any type of CAS Technique requiring interoperability. DOCSIS provides standardization, Quality of Service (QoS) and upgradability to cable networks and is the most accepted worldwide bidirectional standard for Cable plants.

DOCSIS implementation across networks helps avoid non-standard implementations and helps standardize interoperability. Deviant implementation of headend equipment leads to the need for STB changes to accommodate idiosyncrasies of each network. The end goal is interoperability and this should be met with all headends that are implemented, without the need for headend and network specific changes to STB drivers to account for deviations in standards. This needs to be enforced and tested against. An extended benefit of DOCSIS is that it provides a broadband pipe into the home opening the door to a wide range of consumer services. Examples are broadband networking, Over the top (OTT) applications, Educational services, IP Telephony etc.

However, it is expected to take considerable time for Indian cable system for DOCSIS implementation and for downloading CAS on OTA would not need huge data pipe hence along with DOCSIS all other network technologies for return path should be considered for CAS return path implementation.

PROPOSAL

Given the above points of discussion, following proposal for interoperable cable networks and STBs are recommended:

A. The Cable networks must be ETSI 103 197 Simulcrypt head standard compatible so that head end is inter-operable with different CAS.

   Cable Network performance criteria including RF performance should be defined and mandated. Network quality and RF performance improvement would allow inter-operable solution to be flawlessly implemented.

B. For unidirectional network EN 50221-1997 standard or DVB CI must implemented on all STB's to provide inter-operability for all DVB compliant CAS.

   All CAS vendors must provide DVB compliant CAM

   Implementation of CI+2.0 on USB may be considered when standard is published

For effective DVB CI deployment TRAI may consider a option of mandating retail sales of set top boxes without any embedded CAS and CAM module sales by the operator

C. Standardise STB frame work for Downloadable CAS including
   a. Standard software downloader
   b. Standard boot loader
   c. Standard key ladder.
   d. Standard OTA channel

   All CAS vendors should implement downloadable CAS.

D. TRAI to mandate downloadable CAS for Bidirectional networks. Bi directional network enhances security of CAS and makes downloadable CAS more secure. The transmission system between the Headends and the STB to be made bidirectional to give the flexibility to the CAS vendors for interoperability and enhanced security.

E. DOCSIS and other available return path technologies to be standardized for creating bydirectional networks for Down loadable CAS which will also allow many additional value added services on Cable network.

F. Hardware requirements should be defined for software upgradability. To provide a longer shelf life for the STB and hence lower overall cost to the consumer, it is also suggested that STBs be upgradable in terms of software to enhance quality when needed.

5. CONCLUSION

In the submitted proposal for interoperable Cable Network the solutions were given for achieving interoperability both in unidirectional networks and bidirectional networks. The solution stresses the need for standardisation of cable plants and STBs to give higher quality and better experience to the customer and provide a frame work for interoperability standard. In order to give the customer the ability to choose content from different service providers at a lower cost, interoperable conditional access system (CAS) standards have been suggested for both unidirectional and Bidirectional cable network. The combination of improved quality and enhanced service experience to the customer has been taken into consideration at every step of making the proposal. In addition billing systems and Middleware standardization are also required.

The group is grateful to TRAI for allowing us to participate in making this proposal. We are eager to cooperate in future for further efforts towards making inter-operability as success.

Kind regards
Ankan Biswas
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Digital Broadcast Council
Consumer Electronics Appliances Manufacturers Association