



Telecom Regulatory Authority of India



Recommendations

on

Interoperability of Set-Top Box

New Delhi, India

10 April, 2020

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CHAPTER 1 INTRODUCTION

1.1 The Indian TV industry has developed into the world’s second largest TV viewing industry, with a global outreach of 836 million¹ viewers. As per the industry estimates, at the end of the year 2018, there were 298 million households in India, out of which 197 million households had TV sets.²

1.2 Predominantly, the pay-TV services are being delivered through cable TV and Direct to Home (DTH) systems. Other modes of TV broadcasting such as Internet Protocol TV (IPTV), Head-end In the Sky (HITS) have miniscule subscriber base as compared to the cable TV and the DTH systems.

1.3 Television broadcast service delivery chain

There is a chain of service providers to deliver all the TV channels which includes content generation and consumption by end users as depicted in Figure 1.

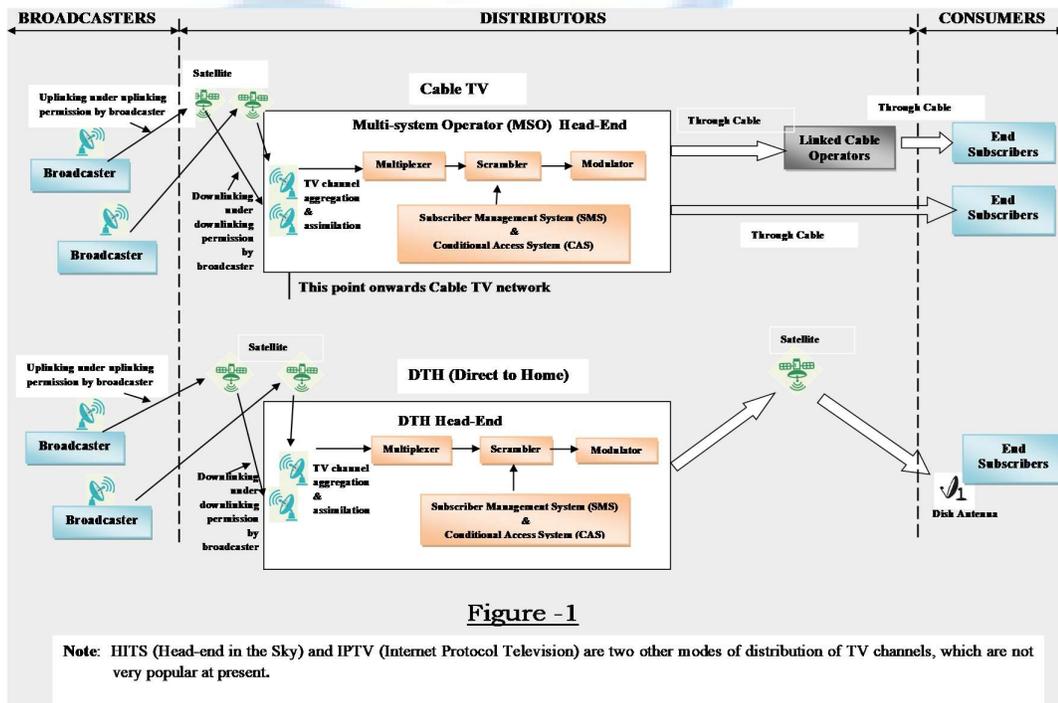


Figure 1: The chain of service providers

¹ BARC Report, Broadcast India 2018 Survey, July 2018

² FICCI-EY Report, 2019

Security of pay-TV content is most important in the service delivery value chain. The Distribution Platform Operator (DPO) who receives all the TV channels and retransmits the combined feed after due encryption becomes the key stakeholder in ensuring content security. The DPO is responsible for deploying the Conditional Access System (CAS), appropriate middleware and the set-top-boxes. Therefore, the CAS vendor and STB manufacturer operates together and provides the necessary support to the DPO to ensure that the pay-TV content remains secure. A DPO decides the CAS provider as per its security needs and market requirements. The DPO then places order to the STB manufacturer for supplying STBs. The STB manufacturer pays a license fee to use CAS in his STB and signs a non-disclosure agreement with the CAS provider. Consequently, STBs are exclusively configured based on the CAS employed by the DPO. The DPO supplies the STBs to his subscribers. Figure 2 illustrates a typical business cycle.

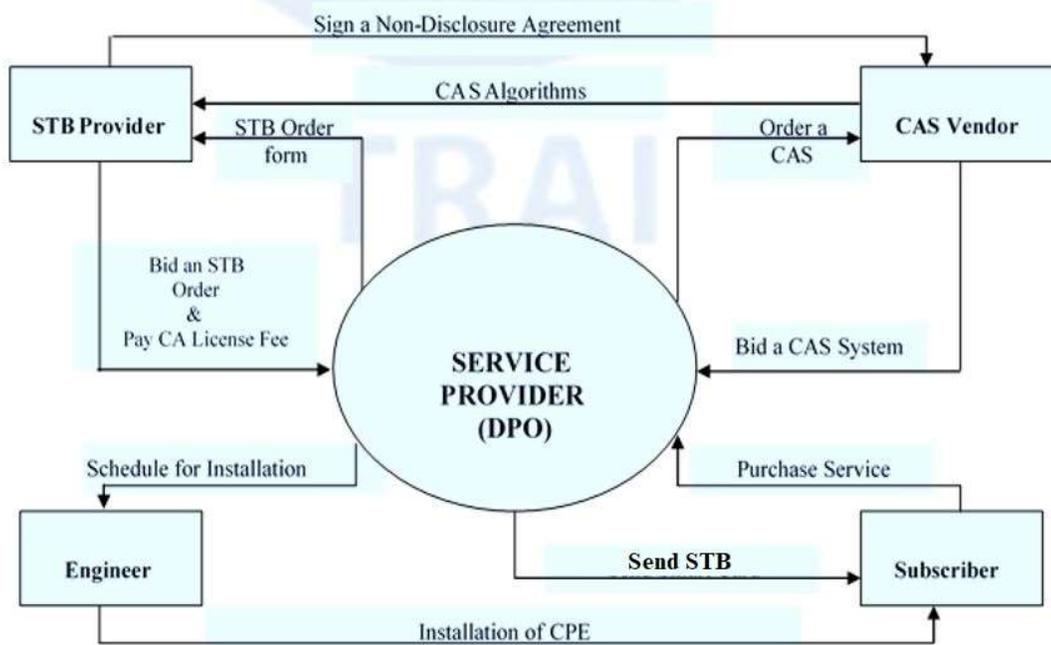


Figure 2: Business Cycle in Typical Pay Television Market

The present ecosystem of STB and CAS is extremely rigid. There exists a rigid end-to-end relationship between a DPO, CAS, middleware

vendor, STB manufacturer and Chip designer. Effectively, this results in STB being dedicated specifically to a given set of DPO, CAS provider and STB manufacturer. This results into deployment of non-interoperable STBs.

1.4 Context for interoperability of STBs and steps taken by TRAI

1.4.1 Interoperability of a consumer premises equipment plays an important role for the growth of any sector. While non-standardization leads to poor adaptability, non-interoperability creates captive consumers. Such consumers cannot exercise their freedom to change service providers due to artificial barrier created by a non-interoperable device. Such barriers subvert the competition thereby defeating the free-market play. The capital markets and market economy thrive in open competition with minimum barriers. Barriers of any kind introduce economic inefficiencies thereby hindering growth.

1.4.2 Ever since digitization became mandatory, there have been discussions to introduce STB interoperability. The Ministry of Information and Broadcasting (MIB) has sought recommendations of TRAI (also referred as “the Authority”) on requirement of technical interoperability as mandated by clauses 7.1 and 7.2 of DTH License Conditions on several occasions.

1.4.3 In 2006, the Ministry of Information and Broadcasting sought recommendations of TRAI on several issues related to a DTH license, which, inter-alia, included technical interoperability in case of set-top boxes with recording facility, namely personal video recorder (PVR) or digital video recorder (DVR). After due consultation process, the Authority furnished its recommendations to the MIB on 25th August 2006³ and recommended that there should be no dilution in the technical interoperability conditions given in DTH license.

1.4.4 The MIB, in September 2007, while referring to TRAI recommendations dated 25th August 2006 again sought the recommendations on the

³ <https://main.traai.gov.in/sites/default/files/Recommendation25aug06.pdf>

issue of interoperability of set-top box. After considering the observations mentioned in the MIB's reference dated 28th September 2007, TRAI furnished its recommendations to the MIB on 30th January 2008⁴. The Authority, in this regard, recommended retention of existing technical interoperability conditions and updating the standards for set-top boxes and asked to adopt MPEG-4 compression format. These views were reiterated, in March 2009 in response to the MIB's reference dated 2nd February 2009.

1.4.5 The MIB sought recommendations of TRAI on the licensing issues relating to DTH services again in 2014. In response, TRAI recommended⁵ retention of existing technical interoperability conditions and updating the standards of set-top boxes, and that the license conditions should mandate the licensee to comply with the tariff order/scheme prescribed by TRAI for commercial interoperability. Further, BIS should come up with updated specifications for STBs from time to time, and while doing so BIS shall consult TRAI.

1.4.6 Simultaneously, commercial interoperability of CPEs for DTH services was also explored by the Authority. The Authority notified in 'The Telecommunication (Broadcasting and Cable) Services (Seventh) (the Direct to Home Services) Tariff Order, 2015 (2 of 2015)⁶ dated 1st April 2015, which, inter-alia, made it obligatory on the part of DTH operators to provide set-top boxes to subscribers on outright purchase basis or on hire-purchase basis or rental basis and provided a mechanism wherein the subscriber had the option to return the earlier CPE to the erstwhile operator and claim an appropriate refund/payback.

1.4.7 Post the notification of the New Regulatory framework for broadcasting sector, a unified regulatory framework for different platforms has been put into place. Chapter V of Telecommunication (Broadcasting and Cable) Services Standards of Quality of Service and Consumer Protection (Addressable Systems) Regulations, 2017 (No. 2 Of 2017)⁷

⁴ <https://main.traai.gov.in/sites/default/files/recom30jan08.pdf>

⁵ <https://main.traai.gov.in/sites/default/files/DTH-Reco%28New-Licensing-Regime%29-uploaded.pdf>

⁶ https://main.traai.gov.in/sites/default/files/BnCS_Seventh_DTHServices_Tariff_Order_01Apr2015.pdf

⁷ https://main.traai.gov.in/sites/default/files/QOS_Regulation_03_03_2017.pdf

dated 3rd March 2017 deals with set-top-box. Commercial interoperability in these Regulations is achieved through the provision of surrendering the CPE inbuilt in the rental schemes offered by the DPOs.

1.4.8 It was observed by the Authority, that even though provision for commercial interoperability applicable vide TRAI Regulations described above, continues to remain in letter, and it is not being adopted in true spirit by the service providers because of opaque pricing models for STBs.

1.4.9 Moreover, in response to Lok Sabha Unstarred Question No. 2420 dated 11th March 2016 relating to interoperability of set-top-boxes, the Ministry of Information and Broadcasting, based on inputs provided by TRAI, furnished details relating to efforts being made for achieving STB interoperability. This became an assurance arising from the reply given, to carry out consultation with stakeholders on the subject.

1.4.10 TRAI has since continued its efforts towards pursuit of technical interoperability of STBs. In this regard a pre-consultation paper on set-top box interoperability was issued on 4th April 4 2016⁸. The consultation paper explored various available solutions for achieving interoperability in unidirectional broadcast.

1.4.11 TRAI continued its collaboration with IIT-Bombay and Centre for Development of Telematics⁹ (C-DOT). Subsequently, C-DOT in close coordination with TRAI, developed solution architecture for interoperable STBs by putting the proprietary conditional access functionality in smart card and making the STB as a generic platform.

1.4.12 TRAI released a consultation note on 'Solution Architecture of Technically interoperable Set-Top Boxes' based on the solution developed by C-DOT on 11th August 2017.¹⁰ In response to the consultation note, a total of 20 comments were received from stakeholders. While C-DOT designed interoperable STB and tested it

⁸ https://main.traai.gov.in/sites/default/files/Pre_consultation_paper_on_interoperability_final.pdf

⁹ <http://www.cdote.in/cdoteweb/web/aboutus.php?lang=en>

¹⁰ https://main.traai.gov.in/sites/default/files/Consultation_note_on_STB_interoperability_110817.pdf

under lab conditions, testing with commercial CAS systems and STBs and demonstration of interoperability is still pending.

1.4.13 In light of the efforts taken by TRAI on interoperability of STBs, the Standing Committee on Information Technology, in their Forty-Fourth Report (Sixteenth Lok Sabha) on 'Status of Cable TV Digitization and Interoperability of Set-Top Boxes'¹¹ dated 29th December 2017 relating to the Ministry of Information and Broadcasting had also recommended MIB and TRAI to take urgent steps to achieve interoperability of the set-top boxes in a definite time frame.

1.4.14 While testing and demonstration of the solution was awaited from C-DOT, TRAI held discussions with other stakeholders to help in finding alternate solution(s) to establish STB interoperability. It emerged that an alternate framework could be possible with existing chipsets and with minimal changes in the existing ways the STBs are deployed using Over-the-Air (OTA) based software uploaded by respective DPOs. This solution based on Downloadable CAS was explored by the Authority by engaging a consultant having domain expertise on the subject.

1.4.15 The Authority conducted stakeholders' workshops in Delhi on 9th May 2019, and in Mumbai on 21st May 2019 to present the suggested solution architecture to the industry and invite feedback/suggestions from them. TRAI also constituted a committee of experts to review the solution architecture based on Downloadable CAS. The committee flagged certain additional concerns with the proposed solution.

1.4.16 In view of the above, TRAI decided to deal with the issue comprehensively by exploring all possible solutions that can achieve interoperability of the set-top-box in unidirectional broadcast network. With this objective, TRAI issued a consultation paper on *suo-motu* basis on 'Interoperability of Set Top Box'¹² on 11th November 2019 to seek the suggestions/comments from stakeholders. The last date for submission of the comments was 18th December 2019 and that of the counter-comments was 30th December 2019. The Authority received

¹¹ http://164.100.47.193/Isscommittee/Information%20Technology/16_Information_Technology_44.pdf

¹² https://main.traai.gov.in/sites/default/files/CP_STB_Interoperable_11112019.pdf

thirty-seven (37) comments and one (01) counter-comment. The comments and counter-comments are available on TRAI's website. An Open House Discussion (OHD) was held on 29th January 2020, in Delhi, for detailed discussions. Sixty-nine stakeholders participated in the OHD, representing five PSUs, ten industry associations, eighteen broadcasters, seventeen MSOs, nine LCOs and ten individuals in private capacity.

1.4.17 Based on the written submissions of the stakeholders and the discussions in the OHD, the issues have been examined in depth and recommendations have been framed. The responses were widely divergent, and the Authority has taken a comprehensive view after due analysis including international experience to arrive at the recommendations.

1.4.18 The general issues regarding the interoperability of STB and responses received from the stakeholders have been duly deliberated and analyzed in Chapter 2. Similarly, Chapter 3 deals with the summary, analysis and the recommendations based on responses on technical issues and suitable solutions. Chapter 4 lists the summary of recommendations.

TRAI

CHAPTER 2 GENERAL ISSUES AND ANALYSIS

2.1 Any set-top box (STB) used for receiving the pay-TV broadcast services performs essentially the same functions, i.e. signal reception, demodulation, decryption, decompression and retrieval of audio/video data streams for display on the TV set. However, the STBs supplied by different DPOs remain distinct from each other and do not interoperate. The STB is tightly coupled to the service provider owing to concerns related to content security and other commercial reasons. Specific hardcoded configuration of some parameters for each DPO by the intermediary solution provider is the root cause of this problem. In the prevailing scenario, if a subscriber wants to change the service provider, a new STB has to be purchased. Factors leading to non-interoperability have been dealt with in more detail in the consultation paper along with various elements in the distribution network and broadcast value chain.¹³

Though, the interoperability of set-top box is mandated in DTH segment as per the extant license conditions, in practice, STBs of one DTH service provider do not support reception of signals of other DTH service provider as a default. More details and reasons for this situation are elaborated in the following chapter.

2.2 Implications of non-interoperability of STBs

Non-interoperability of STBs has manifold consequences for the entire ecosystem which are summarized below:

- a) Non-interoperability restricts choice to the consumer. It creates a barrier to freedom of consumer desirous of changing his service provider. Any consumer desirous of changing the service provider, has to pay for the STB of the new service provider. This entails additional cost, thereby becoming a deterrent for the consumer.

¹³ https://main.trai.gov.in/sites/default/files/CP_STB_Interoperable_11112019.pdf

Such migration cost often leaves consumers stuck with their current service provider, thereby infringing upon their freedom of choice.

- b) Non-interoperability results in virtual lock-in of the subscribers with the current service provider. It provides an opportunity for the pay-TV operators to retain monopoly on their subscribers. This type of business model with captive-consumer base is not conducive for improvement in quality of service through open competition. Rather, it has adverse effect on competition and service quality in the pay-TV distribution market.
- c) Non-interoperability of STBs also has huge financial implications. As per the industry figures, till March 2019 more than 54 million STBs are lying idle or unused in DTH segment alone, a sizeable chunk of the same contributed due to non-interoperability of STBs. Since the inactive STBs cannot be used for reception of services of the other operator, the money invested into the STB goes waste. Considering an initial capital expenditure around \$25 per STB, a total of \$1350 million capital is lying unused in DTH segment. The exact data in respect of cable TV services is not available but it is anticipated that the number of inactive STBs would be of similar order.
- d) Since an STB rendered idle due to change of service provider by a consumer cannot be reused, it results into electrical waste and electronic equipment waste (e-waste). According to the Global E-waste Monitor 2017, India generates about 2 million tonnes (MT) of e-waste annually and ranks fifth among e-waste producing countries, after the U.S., China, Japan and Germany. Under Section 21 of E-waste (Management) Amendment Rules, 2018; manufacturer, producer, importer, transporter, refurbisher, dismantler and recycler of electrical and electronic equipment (EEE) shall be liable to pay financial penalties as levied under the

provisions of the Environment (Protection) Act, 1986 and rules made thereunder for any violation of the provisions under these rules. In case of pay-TV segment in India, responsibility shall fall upon all stakeholders in the value chain, and any failure to comply the said rules shall attract financial penalty.

- e) On the other hand, interoperability of STBs may create an opportunity for availability of the interoperable STBs through open market. The commoditization of the device may attract major electronic gadgets and appliances brands, resulting in further innovation and quality improvement. Further, associated increase in volumes can be expected to bring down the prices.

Comments received from the stakeholders

- 2.3** In view of the factors leading to non-interoperability of set-top box and implications of non-interoperability, the Authority invited comments from all stakeholders on pertinent issues such as desirability of interoperability in view of e-waste consideration and other implications and about implementation of interoperability separately for cable and DTH platforms or on universal basis. Comments were also invited on availability of STBs through open market.
- 2.4** Most of the stakeholders including the broadcasters, their associations, MSOs and few individuals have favored interoperability of the STB. As per them interoperability will provide additional degree of freedom to the consumers while choosing any service provider. At present a consumer can't migrate to other service provider due to cost barrier in terms of necessity to buy new STB. It was also mentioned that on account of non-interoperability, smaller DPOs are unable to compete with bigger DPOs. Bigger DPOs have advantage in negotiating better price owing to large volume. They can also subsidize STBs due to better financial capacity/cross-subsidization. Interoperability can serve to provide a level-playing field in this respect. Few stakeholders have commented that interoperability of STB will save a lot of capital expenditure apart

from reduction in the generation of e-waste. However, it was cautioned that there should be no dilution of content security features.

Whereas few other stakeholders have suggested that interoperability will create a technology barrier, distort competition and is not in the consumers' interest. Some stakeholders have pointed out that the User Interface (UI) plays an important role in service differentiation. It is a Unique Selling Point (USP) of DPOs. They have further commented that in this regard middleware acts as a bridge between the OS and the subscriber applications. Thus, the middleware is responsible for the navigation experience, visual, graphics, electronic programming guide details, logical channel number, platform services, etc. DPOs have proprietary middleware licensed from different vendors. Many functionalities of middleware depend on the STB specifications, whereas there are few operators who do not use feature-rich middleware and have gone ahead with native middleware. Accordingly, in interoperable scenario, the middleware of one DPO may not work with STBs of another DPO. Therefore, interoperable STBs will render this USP ineffective. In interoperable STBs DPO designed UI can't be as appealing as in the case of DPO specific STBs.

- 2.5** Most of the stakeholders have supported the fact that interoperability will help reduce e-waste. The stakeholders, however state that the figures of e-waste generated due to STB, as provided in the consultation paper are too high. Further, that a large chunk of STBs are high-end STBs as consumers are seeking more feature from STBs. Therefore, it may not be correct to state that interoperability will solve the issue of e-waste completely. As per them the e-waste is an outcome of technological advancement and customer aspiration to align himself with the latest technology. E-waste issue can be tackled by digitally recycling the STBs. Some suggestions were also received to explore other ways, such as mandate TV manufacturers to provide in-built provisions for multiple CAS and Tuners for satellite and cable instead of providing set-top box, which shall result in the reduction of e-waste. However,

almost all stakeholders have agreed that interoperability will reduce STBs related e-waste.

2.6 Regarding platform-specific or universal interoperability, many stakeholders were in favour of interoperability across platforms. It was pointed out that cable TV consumers were usually served by a single-cable network in last mile. Therefore, only cross-platform implementation will provide interoperability in actual sense to them. However, there were also comments that due to significant difference in the structure of STBs for cable and DTH segments, the cost of the STB will increase if the provision is made to include tuners for both satellite and cable transmission, which shall be borne by the consumers.

2.7 Regarding availability of STBs through open market, many stakeholders commented that the commoditization of set-top box will drive down the prices, reduce power consumption and will promote indigenous manufacturing. Few service providers expressed concerns that the open-market manufacturers may not maintain same security standards. Such scenario will result in more incidences of piracy and will be detrimental to interest of all service providers. It was also opined that interoperable STBs will not have convenience features of operator specific STB. There were also some concerns about post-installation maintenance and service of open-market STBs.

Analysis

2.8 On the desirability front, it is clear that STB interoperability is favored by most of the stakeholders. The Authority considers that the consumer choice and free-market play should be the driving factors in the pursuit of interoperability. While analyzing the divergent views on the need of interoperability, one can infer that non-interoperability of STB restricts freedom of choice, as a customer needs to change STB if one desires to change the service provider. Evidently, this entails a cost on new STB. Such cost barrier paves the way for creation of captive market. A captive market creates discrimination for such consumers. *‘Such discrimination*

*is clearly bad for the captives because they are monopolized*¹⁴. Further, as also pointed out by few stakeholders, non-interoperability introduces market asymmetries. DPOs with greater financial and investment capacity have the capability to offer discounts on cost of the STB which cannot be matched by smaller DPOs. This creates a non-level playing field in the market.

2.9 The Authority has taken note of the concern raised by few stakeholders regarding the differentiation of their User Interface being curtailed in the interoperable STBs. In this regard the Authority is of the opinion that in cases where a subscriber would opt for a change of service provider, quality of customer service and content offerings are expected to be the driving factors rather than the look and feel of the operator service. Therefore, product differentiation or full compatibility of middleware cannot be seen as a reason to restrict a customer from exercising this freedom of choice. The Authority also feels that in addition to enabling product differentiation through User Interface, the middleware is also responsible for communication with other layers/components of the STB value chain and in this sense also a factor in defining robustness of the STB against hacking. Therefore, the Authority is of the opinion that regardless of the solution for implementation of interoperability and irrespective of the interoperability of the middleware in terms of supporting full features and functionalities of the User Interface, the operators have to ensure that the middleware conforms to the other basic functionalities and content-security requirements as defined by the identified solution framework for interoperability.

2.10 The Authority also noted that it would be ideal to have a universal interoperable STB which can be adopted for both cable and DTH segments. However, the cost implications of such a proposal need to be taken into consideration, especially, when such cross-platform interoperability would be needed by a fraction of the consumers. Therefore, enforcing such a feature on 100% STBs whereas only an

¹⁴ Armstrong, M, and J Vickers. 2019. "Discriminating against Captive Customers." *American Economic Review: Insights* 1 (3): 257–72.

extremely small fraction will ever use such feature is not prudent. Moreover, design and development of SoC for universal STB would add time delays in its implementation.

2.11 Therefore, in the interest of consumers, the Authority is of the view that as of now introduction of platform specific interoperability (i.e. STBs are interoperable within the cable TV segment and similarly within the DTH segment) will be practical and realistic. The Authority will continue its endeavor to consider universal cross-platform interoperability. The Authority will maintain an overview of technical/techno-commercial developments in this regard.

2.12 Some service providers have shared concerns regarding the after-sales service of STBs procured from open market. A general oversight of electronic gadgets and appliances market reflects that such suppliers/vendors set up a strong service and maintenance network. Moreover, an open-market approach will allow DPOs to focus on their core activity of distribution of TV channels. The Authority is of the view that the availability of STBs in an open market will stimulate retail competition and may result in quality enhancement, both in the product and the after-sales service. There is a high possibility that an open product attracts some of the major electronic appliances' brands into the STB supply chain. Such suppliers will bring in more efficient distribution chain, thereby benefitting the consumers. Furthermore, associated increase in volumes of STB with standard configuration can be expected to bring down the prices. Therefore, it will be useful if all service providers give an option to consumers to either obtain the STB from them or bring in their own interoperable STBs. All service providers may be enjoined to provision the service on STBs procured directly by the consumers from open market. Such STBs must be compliant to the extant BIS standards/TRAI regulations, etc.

2.13 Few stakeholders have submitted e-waste related data of various electronic products and devices, and have contended that contribution of STBs to e-waste generation is relatively less. However, it is difficult to agree with this view in absence of comprehensive data including that of

STBs. Furthermore, the question is not whether STB is biggest contributor to e-waste. It is whether e-waste resulting from non-interoperability can be tackled by adopting technology solutions. Looking at the serious impact of e-waste on the environment, the menace of e-waste has to be tackled at every front for effective control. Therefore, there is a clear case to introduce interoperability so that the STBs are not rendered idle whenever a consumer switches over to a new distribution operator.

2.14 The Authority is conscious that the implementation of interoperability will require the existing distribution ecosystem to realign with the new development. A mandate to enforce availability of STBs exclusively through open market may necessitate drastic changes in the existing business and supply-chain process. Such a mandate can be counterproductive. In comparison, the stakeholders with their existing partnerships and business cycles may perhaps ensure smoother implementation of interoperability. Weighing both the options in this regard, the Authority is of the opinion that interoperability of STBs may be mandated agnostic to the equipment provider, i.e. all STBs must be interoperable, whether provided by the service providers, or by open-market vendors. It will be mandatory for the DPOs to configure interoperable STBs (STB complying with the BIS standards) even when they are procured by consumers directly from the open market.

2.15 Quite a few stakeholders have mentioned that millions of STBs are already deployed. Further, any stipulation to replace all the existing STBs with new interoperable STBs will impose high costs while only a few consumers may be seeking change of their existing service provider. Therefore, there is little justification in seeking change of all the existing STBs. The Authority accepts this suggestion. It is to note that all existing STBs in DTH segment are compliant with interoperability as per the BIS standards IS-15377 released in 2003 or subsequent standards IS-15954 released in 2012. As regards the cable TV segment, the existing STBs are not interoperable. Having considered the responses, the Authority is of the view that the interoperability of STBs for cable TV segment is

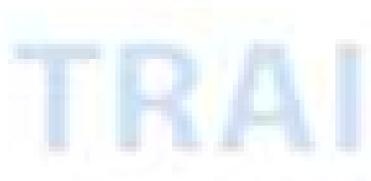
equally necessary. The interoperable STBs for cable TV segment may be introduced with prospective effect.

2.16 Accordingly, the Authority recommends that:

2.16.1 All the Set-Top-Boxes in India must support technical interoperability in principle, i.e. every STB provided to a consumer must be interoperable.

2.16.2 Ministry of Information and Broadcasting may include a suitable clause/ condition in the permission/ Registration/ Cable Television Network Rule mandating all the DPOs (DTH as well as MSOs) to compulsorily facilitate service provisioning through the interoperable STBs either provided by DPOs or procured by the consumers from open market.

2.16.3 There are technical and commercial constraints to universal STB. Therefore, Interoperability of STBs, with effect from the date as prescribed vide the extant clause/ condition, shall be ensured within the DTH or cable segment. That is, the interoperability shall be applicable within the DTH segment and within the cable segment respectively.



CHAPTER 3

TECHNICAL ISSUES AND ANALYSIS

In pursuit of a suitable technical solution for interoperability of set-top box, TRAI carried out extensive pre-consultations. TRAI engaged with all the stakeholders, ranging from technology providers such as, CAS and SoC vendors, STB manufacturers, system integrators and representatives from international bodies such as Digital Video Broadcasting Project (DVB) and Motion Picture Association (MPA). In addition, experts from eminent institutes like the IITs, C-DAC, etc. have also been consulted for suggesting the way forward. The Authority also received inputs from independent domain experts and international regulatory agency(ies). Discussions were held with service providers in broadcasting sector that is DPOs, LCOs and broadcasters and also with TV manufacturers. Inputs were also invited from standard-making bodies and consortia such as ETSI, DVB and BIS. Based on the inputs, all the suggested/discussed technical solutions were described in the consultation paper. In addition, the questions encouraged stakeholders to suggest any other possible technical solution to help introduce interoperability of STBs.

Currently available/proposed solutions are at different stages of development cycle/implementation. Some of the solutions are under deployment in some countries/regions, while others are at a development stage. Further, some of these solutions were developed specifically for unidirectional TV broadcast, whereas some recent standards are inclusive. That is, these standard incorporate provisions for newer distribution mediums like IPTV, OTT, etc. Brief summary of the possible solution approaches is as follows in subsequent section. More details are available in the consultation paper¹⁵ available on TRAI's website. Chapter 3 deals with the comments received in response to the consultation paper and the discussions/comments received in Open House Discussion.

¹⁵ https://main.trai.gov.in/sites/default/files/CP_STB_Interoperable_11112019.pdf

Technical Solutions

3.1 Card-based approach developed by C-DOT

3.1.1 Developed by Centre for Development of Telematics (C-DOT) in 2017 for the Indian market, this solution pivots on separating the network specific software features of distributor and the STB hardware. The proprietary features of the distribution network are put into a smart card, thereby making the STB a generic platform. In this case the interoperable STB would contain operator specific configurable blocks. The configuration of those blocks would be made through the smart card. Whenever a subscriber wants to change his service provider, he would require to obtain the smart card from the new DPO. For facilitating interoperability, C-DOT has envisaged establishment of a trusted agency which acts as a nodal point for record maintenance and acts as underlying systems enabler. The trust agency is responsible for issuance of authentication codes to each of the STB manufacturers as well as to the DPOs. Using these authentication codes, the STB manufacturer would fuse the STBs at the manufacturing stage with individual secure keys. Each operator will have their own smart cards that will inter-work with the interoperable STB from any manufacturer. Authentication/identification of operator specific configurable blocks in STB and its configuration is envisaged through a light weight but secure layer of abstraction between STB and smart card by using industry standard cryptographic algorithms.

3.1.2 The smart-card-based solution was successfully tested in lab conditions, using separate instances of CAS developed by C-DOT. However, field testing with the third-party CAS solution is still to be conducted with different industry stakeholders.

3.2 DVB CI

The DVB Common Interface (DVB-CI) specifications, released in year 1997 as industry standards EN 50221, prescribe a system in which a

removable Conditional Access Module (CICAM), with appropriate rights, unscrambles the protected content and routes it back to the Host over the same interface. In the year 2014, these DVB Common Interface specifications were extended by the CI Plus specifications, notified by The European Telecommunications Standards Institute through ETSI TS 103 205 specifications. The specifications provide common methods, independent of the up-stream CA system, for mutual authentication of the CICAM and Host, and link encryption over the return interface from the CICAM to the Host. 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. A subscriber who desires to change his service provider can take the CAM module of the new service provider and insert in interoperable STB or TV set having DVB CI port.

DVB CI and DVB CI Plus solution has been under deployment for quite a few years and as per industry inputs, there are over 660 million CI Plus devices deployed in Europe and other regions around the globe¹⁶. Therefore, this solution is industry proven and has been successfully in use since more than fifteen years.

3.3 DVB-CI Plus 2.0 with USB:

One of the limitations of the DVB CI/CI+ standards is the dependence on PC Card interface defined in CENELEC EN 50221 [1] for the Conditional Access Module. Over the years, the usage of PC-card interface has reduced across other devices. The hardware cost of PC-card interface and the connector remains high compared to other possible interface(s). Such constraints with the CI/CI+ solution have been addressed in the updated common interface standard, DVB-CI + 2.0. The connector for the second-generation Common Interface is an industry standard USB Standard-A connector USB 2.0 and USB 3.1 which can be connected in almost all the STBs/TV because USB

¹⁶ <http://www.ci-plus.com/deployments/>

connector is present in almost all the devices. The second generation common interface using USB Standard-A connector USB 2.0 and USB 3.2 are the part of the new standards defined in the ETSI TS 103 605¹⁷. Released in October 2018, DVB CI Plus 2.0 devices¹⁸ with USB interface are available for deployment. A consortium partnership of M/s Irdeto, MStar Semiconductor, SMIT Holdings Limited and TP Vision demonstrated ready for certification USB products in International Broadcasting Convention (IBC) 2018¹⁹.

3.4 Downloadable CAS

This solution is based on the change of CAS on a STB using ‘Over-the-Air’ (OTA) download. The underlying feature of this solution requires that basic CAS version of different CAS solutions with its security features is pre-loaded in the SoC chipset. It creates an environment for the coexistence of multiple secure CAS technologies in the network. The full feature CAS of a service provider can be downloaded on any STB as and when service is configured for a specific customer. During this process the pre-loaded basic building block of the CAS software is expanded with the full version. Security of the CAS is implemented through key-ladders which are fused onto the SoC at the fabrication stage. Operationalisation of the functionality is envisaged through a Trusted Authority (TA)/Industry Licensing Authority (ILA) shall be custodian of the secret chipset key (SCK) and SCK manipulation function. ETSI TS 103 162 is the Underlying Protocol for interoperable set-top box through Downloadable CAS architecture.

Downloadable CAS is known to be deployed in some networks in different regions of the world, with solution providers often carrying out the role of the TA/ ILA. It can be a good solution for interoperability in a controlled environment, with few CASs in the network. However, in a country like India where more than 15 CASs are already deployed,

¹⁷ https://www.etsi.org/deliver/etsi_ts/103600_103699/103605/01.01.01_60/ts_103605v010101p.pdf

¹⁸ http://www.smit.com.cn/engr/cam/engr_usb.html

¹⁹ IBC is one of the biggest conference and exhibition of Pay TV Broadcast sector held in September every year.

<https://www.mesalliance.org/2018/09/17/ibc-2018-ci-plus-2-0-usb-cam-ready-to-deliver-pay-tv-services-globally/>

there can be a requirement to accommodate new entrants as well. The limitation in terms of number of CASs that can be accommodated in the SoC can be major constraint with respect to this solution.

3.5 Embedded Common Interface (ECI)

ECI specification has been conceived to have embedded common interface for exchangeable CA/DRM solutions incorporated through software-download ability. It envisions working of legacy unidirectional pay TV, two-way IPTV and currently developing OTT solutions all on a single STB platform. The specification also incorporates the requirement of multi-screen environment of video consumers; wherein the same household consumers use number of video screens, such as TV, computers and other mobile devices, and consume videos concurrently and move from one display to the other. The specifications incorporate number of CA/DRMs working concurrently and connect different devices from one CPE (consumer premises equipment). However, to incorporate all these required functions a new STB structure has been envisioned. Standards for the Embedded Common Interface have been released by ETSI as a group of 6 standards from ECI 001 01 to ECI 001 06 from 2017 to 2018.

Comments of the stakeholders

- 3.6** Looking to the alternate possible approaches to interoperability, stakeholders were invited to offer their comments regarding how interoperability could be implemented, about software-based solutions as efficient, cost effective and easy to implement approach, and also about probable timelines for development and deployment of a suitable solution for interoperability.
- 3.7** Stakeholders were also requested to comment upon suitability of ETSI GS ECI 001 standards for interoperability, about precautions to be taken at the planning stage for smooth adoption of interoperability solution in Indian market and also about structure of the TA.

- 3.8** In their response quite a few stakeholders, especially the technology vendors are of the opinion that interoperability could be implemented using a combination of technologies. It was suggested that the ubiquitous presence of USB interface in all devices makes DVB-CI with USB a logical and easily integrable solution, more so as these solutions are already under deployment in Europe and other jurisdictions.
- 3.9** There was also a suggestion that interoperability can be achieved by using hardware root of trust-based CAS inside TVs, which is already deployed by few TV vendors. Hardware root of trust-based CAS inside TVs does not require any additional hardware. Hence interoperability across cable and satellite networks can be achieved without compromising content security and with forensic watermark can be achieved.
- 3.10** On the other hand, few stakeholders including broadcasters and distributors raised the concern about robustness of the software-based solutions regarding content security. They were of the opinion that there should be extensive field trials before software-based solution can be mandated.
- 3.11** There were divergent views regarding the expected timelines. Stakeholders commented that it would largely depend on identifying a suitable solution and would be driven by joint efforts of the stakeholders like CAS, SoC, OEM vendors, system integrators, etc. All stakeholders agreed that any solution that is still not deployed will require anywhere between 18 to 24 months for development and proof-of-concept testing.
- 3.12** With regard to the adoption of ETSI ECI standards, some of the stakeholders opined that the proposed software-based ETSI standards is not a pure software-based standard. However, if implemented, these will provide significant freedom for making technical changes. Though initially the development cost may be a bit high, but with the increased adoption, costs of STB will also reduce in long term. Some other stakeholders, however have questioned the feasibility of actual solution.

In their opinion, the standards have quite-a-few pending issues vis-à-vis security and cost implications. These stakeholders have stated that the software-based solutions for interoperability have not been tried and tested so far. Such solutions require extensive trial before considering the implementation. Besides, the ETSI ECI standards do not meet ECP specifications and do not require/create secure location for watermarking. Moreover, such software-based solution requires mandatory certification of all devices. Such certification will increase costs that will have to be borne by consumers.

3.13 ETSI ECI standards require establishment of a Trust Agency. In fact other solutions like smart-card-based solution as well as the Downloadable CAS solutions also envision a trust agency. Therefore, the consultation paper raised questions in regard to the suggestions on the structure of such an agency. Whether such an agency should be statutory or semi-government or an industry-led body? Questions were also put on the suggested model(s) of such an agency. Few stakeholders have suggested that TA should be statutory/semi-government body while others argued in favour of industry-led body. A few stakeholders were of the view that a statutory body with adequate representation from both government and industry would be an appropriate structure for the TA. Moreover, some stakeholders considered that TA should be independent, technically proficient, able to secure sensitive information and it should have the authority to revoke clearances of defaulting STBs. Some of the stakeholders expressed their view that there is no need for TA as the common agency will lead to monopoly.

3.14 Regarding precaution to be taken at planning stage, some stakeholders were of the opinion that since it is a cost-intensive process, prior engagement with and on-boarding of key stakeholders and technical experts would be crucial for successful roll out of interoperability. It was also suggested that specifications for STB manufacturers including standards for compression, encryption, modulation resolution and middleware need to be defined first, before field trial.

Analysis

- 3.15** The Authority has deliberated upon the divergent views expressed on suitable solution approach and expected timelines. For further clarity on several relevant aspects, the Authority has also engaged with standards bodies such as DVB, ETSI, ITU, etc. Exhaustive interactions have been carried out with SoC vendors, CAS vendors, System Integrators, etc. To facilitate cooperation, the Authority entered into NDA (Non-Disclosure Agreements) with quite a few stakeholders. All such inputs have been analyzed keeping the consumer interest and free-market play as the principal objectives in adopting a suitable solution for interoperability.
- 3.16** The prolonged delay in field demonstration in card-based approach developed by C-DOT is a matter of concern. During further efforts by the Authority to examine the reasons for the same by engaging with the concerned industry stakeholders, some constraints have emerged. Few STB vendors have pointed out that as the solution is currently developed for card-based STBs, it does not fit into their product portfolio which has moved to cardless STBs over the years. They also pointed out to the lack of roadmap by C-DOT for adoption of the solution for cardless STBs as a deterrent. Few stakeholders also expressed concern over Linux-based platform used in the solution, citing it as commercially unviable because of increased memory footprint. Apparently, these issues have factored in stalling the field demonstration of this card-based solution. Failure to demonstrate the solution in multi-vendor field environment casts doubts over future adoption of this solution on a large scale.
- 3.17** The downloadable CAS approach appeared to have the benefit of simple and straight forward extension of existing advanced hardware system solutions. However, further examination revealed inherent constraints in the solution. It is noted that at present there are more than 14 different CASs deployed in India in different distribution networks. As the solution requires secret-secure keys of all CAS vendors to be fused on the SoC at initial, manufacturing stage, therefore a successful

implementation of the solution would need provision for secure keys of at least 16 CASs initially. Moreover, the solution must be scalable to accommodate any new entrant CASs. However, upon interaction with technology groups on this matter it emerged that while provision for accommodating 3–4 keys could be expected in present scenario. The feasibility and timelines for scalability to accommodate 16 CAS (or more) is uncertain. The limitation in accommodating all the existing players has been mentioned by a few stakeholders. Further the solution needs to provide for allowing new entrants into the ecosystem as pointed out by few stakeholders. One comment has raised the question of ascertaining the secure key/CAS responsible, in case security of an STB is found to be compromised. For instance, if a STB deploying downloadable CAS solution is found to be compromised, and prior to current active CAS, it was working on another CAS(s), it would be difficult and time consuming to ascertain whether the vulnerability was caused due to present deployed CAS or by any previous CAS deployed on that box. The comment pointed out that this, coupled with the commercial aspect of sharing of royalty/license fee to the CAS provider may lead to trust issues between stakeholders. Taking all the inputs into cognizance, the Authority is of the opinion that as sector regulator, TRAI cannot consider a solution which is discriminatory by not having provision for all players. Similarly, the constraints in including a new entrant operator makes this solution approach not suitable.

- 3.18** The ECI solution appears to be most comprehensive and forward looking in terms of the scope and flexibility it promises. It supports legacy unidirectional pay TV, two-way IPTV and currently developing OTT solutions all on a single STB platform. It also incorporates the requirement of multi-screen environment, covering TV, computers and other mobile devices concurrently. The specifications also support concurrent working of number of CA/DRMs. However, to incorporate all these required functions a new STB structure has been envisioned. The interactions with industry and standards bodies have revealed that even though the ETSI standards were released in 2017-18, there are no

instances as yet of implementation and field deployment of this solution, except for isolated attempts at the design level. Moreover, the concerns regarding ECI being unable to meet the requirements of the MovieLabs ECP specification can be a deterrent for content providers in distribution of their content on ECI-platform devices. The concerns are still under study and to be deliberated by ITU study group. In this situation, it is probably premature to consider this solution for field deployment in India.

3.19 Based on the comments received to the consultation, the open house discussion and other inputs, it is observed that the solution based on DVB CI standards is free from many of the issues and concerns associated with the other approaches. First and foremost, having been deployed for over a decade now, it is already a field proven solution which has further evolved with evolution of technology. There is no constraint to any CAS vendor in adopting the solution, they only have to come up with a CAM module and interface compliant to the standard. Moreover, most of the leading CAS vendors are already compliant to DVB-CI-based specifications. Whereas, in other solution approaches, the role of Trust Authority appears to be intrusive and on a continuous basis. On the other hand, CI Plus LLP, which is the Trust Authority for DVB CI Plus standard has very specific activities. It takes the DVB CI Plus Specifications as input and creates profile specifications stating the subset of the DVB CI Plus Specifications including CI Plus LLP specific Root-of-Trust details that shall be implemented for making CI Plus LLP compliant devices. CI Plus Licensees are required to go through CI Plus certification testing before they can register their devices and start ordering certificates. A Certification Test Report and a declaration of robustness are required for registration of a Device Type. Eurofins Digital Testing (EDT) is the official LLP Approved CI Plus Test Centre. DigiCert is the Trust Center appointed by CI Plus LLP for registration of Licensees and registration of Device Types. It is seen therefore that the DVB CI ecosystem has matured with time with established processes and support system. In this sense, it fits the bill

of “the least disruptive method of interoperability without adding another layer of operations so that it is efficient and cost effective” as suggested by few stakeholders as a criterion for suitability of the solution.

3.20 In the Indian context, CI interface is already mandated vide license conditions for DTH segment but there is no effective roll out. One of the reasons interoperability of DTH set-top boxes has not succeeded in field is because the DTH operators have not opened their set-top boxes to enable the consumer to add, modify and alter the satellite parameters to enable the STBs to receive signals from other satellites. An STB can be considered to be ‘Open’ only if the functionality of each and every module in that architecture is available in the public domain in the form of published international standards or de-facto industry standards. Another reason why interoperability has not been successful is the unavailability of Conditional Access Modules (CAM) of different DTH service providers. The BIS specifications for DTH set-top boxes only require each set-top box to have a Common Interface (CI) slot for the purposes of technical interoperability. Although all major DTH operators have agreed to the basic fact that the interoperability is a license condition, and have admitted in their affidavit filed in the Hon’ble TDSAT in the Petition No 60 (C) of 2010 (*Tamil Nadu Progressive Consumer Centre (TPCC) v/s Ministry of Information and Broadcasting and others*) that they are technically interoperable and are following the BIS notified standards/norms for the same. However, technical interoperability is achieved by plugging in the CAM of new DTH operator in the CI slot of set-top box provided by the existing DTH operator. As of now, the Conditional Access Modules (CAM) are not being supplied by the DTH operators owing to high cost of the CAM module as claimed by the DTH operators. Cost of a stand-alone CAM module can be 60%–70 % of the cost of STB. As CAM modules have not been made available, the DTH operators have started configuring their STBs only on their respective transmission signal frequency range. Due to this, even if the STB is compliant with BIS standards for PCMCIA

CAM module-based interoperability, in effect the STBs don't interoperate.

3.21 There have been quite-a-few comments and deliberations regarding compatibility of feature rich middleware in case of interoperability. The comment that the user interface rendered using a combination of CAS and middleware is a unique selling point for some operators is true. The User Interface becomes more important for rendering value added platform-based services. However, the Authority sought information related to actual consumption of such value-added services vis-à-vis time spent on viewing TV channels. No authentic data/information was submitted by any of the DPOs who are making such points in their comments. From the available information, it is clear that consumption of feature rich value-added services and TV gaming is limited. Further, the DVB standards specify the basic interworking of Electronic Program Guide (EPG) and other important information rendered using the interoperable module. In case of interoperable STB working in a home network, all feature rich services are rendered. As and when a consumer migrates to other service provider, such interoperable STB would render the basic features without compromising on the basic utility of Electronic Program Guide, etc. If a consumer has decided to migrate to another service provider, it is explicit that the value-added services of such previous operator have not enabled retention of such consumers. Therefore, it is important that all networks/CAS providers comply with the specifications as regards rendering of EPG to enable smooth viewing experience on an interoperable STB.

3.22 Similarly, there have been discussions as regards STBs with different compression standards and modulation techniques adapted by various operators. Further, there are comments stating that in case a DPO adopts a future technology/compression standard, such interoperable STBs will not be upwards compatible. The argument does not hold well. Any changes in compression technique/modulation standard will render all existing STBs unusable, whether interoperable or not, unless such compression standard/modulation technique is backwards

compatible. An example of the same can be found in present operations of existing DPOs, where some DPOs are compelled to run multiple streams (using multi-encryption techniques) because they still have MPEG 2 based STBs in their network. Even for DTH sector where CAM-based interoperability exists, it is not possible to interoperate such old STBs (which use old compression standards) in network of other DTH operator who does not transmit a separate stream as per old standards. Such exceptions, however, should not hinder the possible interoperability for more than 80% to 85 % of the STBs that use contemporary compression and modulation standards.

3.23 In view of the above considerations, the Authority is of the opinion that in order to accommodate the divergent requirements for implementation of STB interoperability in India and to meet the desired objectives, a phased approach with the following steps can be adopted:

1. MIB may notify through licensing conditions or amendment in Cable Television Network Rules, 1994, as per the Cable Television Network (Regulation) Act, 1995 or through any other appropriate mechanism the mandatory use of DVB CI+ 2.0 (with USB CAM) as per the ETSI TS 103 605 specifications both for DTH STBs and STBs being used by MSOs from a prospective date. In this regard, current BIS standards for DTH STBs may be augmented to allow DVB CI+ 2.0 standards (with USB CAM) as per the ETSI TS 103 605 standards and new standards may be notified for MSO STBs, from a prospective date. This will enable more economical solutions for both STB and CAM modules. USB CAMs will have the benefit of optimization in power requirements from the CPE as host device is not required to feature specific 'CI+ enabled' USB sockets. Instead, a CPE could be able to accommodate a USB CAM in any of its USB 2.0 or 3.1 sockets simply by suitable software modification. Therefore, by removing need for the single purpose PCMCIA socket and exploiting the USB ports already available in most of the

devices, the standard is expected to attract more enthusiastic response from both DTH service providers as well as MSOs. It will also help to quickly reconfigure existing STBs design and roll out new solutions quickly. DTH operators generally quote high cost of the PCMCIA interface-based CAM as one of the reasons for lack of push to the extant standards. These new notifications will address this concern also.

2. A time of six months may be given to both DTH operators and MSOs to adopt DVB CI+ 2.0 (with USB CAM) as per the ETSI TS 103 605 specifications from the date of MIB notifications. MIB may also coordinate with BIS so that suitable amendments are brought by BIS within this time frame.
3. In addition to mandating the DVB CI standards for interoperability in cable and DTH STBs, it is pertinent to take note of the evolution of TV sets with technological advancements. There is a worldwide growing trend in the digital/flat panel display TV market and the smart TVs. The adoption of newer features is much faster in TV sets than STBs as TVs are designed and manufactured for much wider geographical markets. Therefore, there is an opportunity to leverage the capabilities of digital TV by requiring the digital TV sets to provide for an integrated DVB CI Plus 2.0 (USB based) port. USB CAM can be a practical and economical solution, exploiting the resources built into the TV, thereby reducing the implementation time and cost. Most of the smart TV manufacturers supplying in the international arena and also in India are understood to have designs/products ready as they are catering to the European and other international markets. Implementation in TV sets will save considerable cost for operators and consumers both, apart from associated benefits such as single remote, power saving, no cables, etc. It is, therefore, an opportune time that all digital TV sets may also be mandated to have an integrated CI port for interoperability.

MIB in coordination with TRAI and Ministry of Electronics and Information Technology (MeitY) may request BIS to suitably amend the standards for digital TV sets also to this effect. Timeline for such mandatory provisions may be decided by BIS in consultation with industry stakeholders.

4. In regards to the availability of a suitable software-based solution for interoperability, The Authority has noted from the comments and other inputs that at present there is no readily available software-based solution for interoperability.
5. Further, with regard to the DVB CI Plus based solutions found suitable for early deployment of interoperable STBs, it is also noted that there is already an established Trust Authority environment for the DVB CI Plus ecosystem in the form of the CI Plus LLP and their associated Test Center and Trust Center with defined testing and certification/registration processes in place.²⁰ Therefore, it may not be worthwhile to establish a new Trust Authority for these solutions. However, as and when any new solution is identified which is more efficient with better capabilities in terms of future requirements, the matter of appropriate Trust Authority can be discussed in accordance with the particular solution framework.

3.24 There were few comments suggesting that with emergence of OTT and IP-based services, adoption of interoperability of STB may be a late exercise and may not be useful. In this regard, the Authority is of the opinion that India is a diverse and fragmented market. Even as of now, there are STBs in service that were deployed over a decade back. Looking to the past and current trend as well as size of the TV market which stood at 197 million TV households in 2018 and is steadily growing, it can be reasonably posited that concurrent with the adoption of new services, there will still be a large-customer base which would

²⁰ <http://www.ci-plus.com/our-activities/>

continue to use conventional, unidirectional broadcast services.

3.25 The Authority also feels that observing the ongoing transformation of the sector and emergence of new technologies and rising popularity of newer media platforms like OTT, multi-screen, immersive reality content, etc., there is a need for long-term, comprehensive solution. With evolution of technologies, the consumer preferences also change and with that the industry requirements to fulfil such preferences also undergo a transformation. In the ensuing transformation in recent years, a common trend can be seen in the form of a shift to software-based solutions. Reasons for this paradigm shift are quite simple and intuitive. The benefits of economy, faster deployment and flexibility, which are inherent to software solutions are now further gaining importance in view of the increasing complexity of networks and devices. With the trend towards convergence of services and applications, there is a need for technologies that facilitate not only fast and smooth delivery of such services but also offer flexible and cost-effective solutions to the network or service provider in operation, maintenance and upgradation of their network or services. An additional capability of a software-based implementation is the ability to revise and upgrade security as threats and vulnerabilities evolve. For this purpose, the Authority would continue to engage with technology groups to explore best suitable software-based solutions such as ECI standards based or any other improved version that become available with advancement of technology and that remove dependence on hardware, thereby enabling smooth and economical solution to interoperability in a shorter time frame to roll out.

3.26 Accordingly, the Authority recommends that

Interoperability of STBs

3.26.1 MIB may notify through licensing conditions or amendment in Cable Television Network Rules, 1994, as per the Cable Television Network (Regulation) Act, 1995 or through any other appropriate

mechanism mandatory use of DVB CI+ 2.0 (with USB CAM) as per the ETSI TS 103 605 specifications both for DTH STBs and STBs being used by MSOs from a prospective date.

3.26.2 A time of six months may be given to both DTH operators and MSOs to adopt DVB CI+ 2.0 standards (with USB CAM) as per the ETSI TS 103 605 specifications from the date of MIB notifications. MIB may also coordinate with BIS so that suitable amendments are brought by BIS within this time frame.

Interoperability through digital television sets (TV sets)

3.26.3 The Authority recommends mandatory provisioning of USB port based Common Interface for all digital TV sets in India. Ministry of Information and Broadcasting (MIB) in coordination with TRAI and Ministry of Electronics and Information Technology (MeitY) may request BIS to amend the specifications for digital TV sets to include provisioning of USB-based Common Interface port as per DVB CI+ 2.0 standard based on ETSI TS 103 605 standards. Such specifications must mandate TV manufactures to:

- a. Provide all digital TV sets with minimum one open-interface port based on DVB CI+ 2.0 standards permitting simple connection of USB CAM to allow reception of TV signals.**
- b. Provide the digital TV sets with built-in tuners to enable reception of TV content through both satellite and cable platforms.**

3.26.4 Setting up of Coordination and Implementation Committee:

- a. A Coordination Committee may be set up by the Ministry of Information and Broadcasting (MIB) having members from Ministry of Electronics and Information Technology (MeitY), Telecom Regulatory Authority of India (TRAI), Bureau of Indian Standards (BIS), and representatives of TV manufacturers. The**

Committee may steer implementation of revised STB standards for both the DTH and the cable TV segment. Further, the committee may maintain continuous oversight for setting up of the digital TV standards by BIS to provide for DVB CI Plus 2.0 port based on ETSI TS 103 605 standards and to have provision for reception of both DTH and cable TV signals.

- b. The coordination committee may steer the adaptation of the revised STB and digital TV standards in a time-bound manner.**



CHAPTER 4 SUMMARY OF RECOMMENDATIONS

The Authority recommends that:

- 1. All the Set-Top-Boxes in India must support technical interoperability in principle, i.e. every STB provided to a consumer must be interoperable. [Para 2.16.1]**

- 2. Ministry of Information and Broadcasting may include a suitable clause/ condition in the permission/ Registration/ Cable Television Network Rule mandating all the DPOs (DTH as well as MSOs) to compulsorily facilitate service provisioning through the interoperable STBs either provided by DPOs or procured by the consumers from open market. [Para 2.16.2]**

- 3. There are technical and commercial constraints to the universal STB. Therefore, Interoperability of STBs, with effect from the date as prescribed vide the extant clause/ condition, shall be ensured within the DTH or cable segment. That is, the interoperability shall be applicable within the DTH segment and within the cable segment respectively. [Para 2.16.3]**

Interoperability of STBs

- 4. MIB may notify through licensing conditions or amendment in Cable Television Network Rules, 1994, as per the Cable Television Network (Regulation) Act, 1995 or through any other appropriate mechanism mandatory use of DVB CI Plus 2.0 (with USB CAM) as per the ETSI TS 103 605 specifications both for DTH STBs and STBs being used by MSOs from a prospective date. [Para 3.26.1]**

- 5. A time of six months may be given to both DTH operators and MSOs to adopt DVB CI Plus 2.0 (with USB CAM) as per the ETSI TS 103 605 specifications from the date of MIB notifications. MIB may also coordinate with BIS so that suitable amendments are**

brought by BIS within this time frame.

[Para 3.26.2]

Interoperability through digital television sets (TV sets)

6. The Authority recommends mandatory provisioning of USB port based Common Interface for all digital TV sets in India. Ministry of Information and Broadcasting (MIB) in coordination with TRAI and Ministry of Electronics and Information Technology (MeitY) may request BIS to amend the specifications for digital TV sets to include provisioning of USB-based Common Interface port as per DVB CI Plus 2.0 standard based on ETSI TS 103 605 standards. Such specifications must mandate TV manufactures to:

- a. Provide all digital TV sets with minimum one open-interface port based on DVB CI Plus 2.0 standards permitting simple connection of USB CAM to allow reception of TV signals.
- b. Provide the digital TV sets with built-in tuners to enable reception of TV content through both satellite and cable platforms.

[Para 3.26.3]

7. Setting up of Coordination and Implementation Committee:

- a. A Coordination Committee may be set up by the Ministry of Information and Broadcasting (MIB) having members from Ministry of Electronics and Information Technology (MeitY), Telecom Regulatory Authority of India (TRAI), Bureau of Indian Standards (BIS), and representatives of TV manufacturers. The Committee may steer implementation of revised STB standards for both the DTH and the cable TV segment. Further, the committee may maintain continuous oversight for setting up of the digital TV standards by BIS to provide for DVB CI Plus 2.0 port based on ETSI TS 103 605 standards and to have provision for reception of both DTH and cable TV signals.
- b. The coordination committee may steer the adaptation of the revised STB and digital TV standards in a time-bound manner.

[Para 3.26.4]

LIST OF ACRONYMS

Sl. Nos.	Acronym	Full text
1.	API	Application Programming Interface
2.	BIS	Bureau of Indian Standards
3.	CAM	Conditional-Access Module
4.	CAS	Conditional-Access System
5.	CATV	Community Antenna Television
6.	C-DOT	Centre for Development of Telematics
7.	CI	Common Interface
8.	CPE	Customer-Premises Equipment
9.	CW	Control Words
10.	DAS	Digital Addressable Cable TV Systems
11.	DPO	Distribution Platform Operator
12.	DRM	Digital Rights Management
13.	DTH	Direct to Home
14.	DVB	Digital Video Broadcasting
15.	DVB-C	DVB standards for Cable Transmission
16.	DVB-CSA	DVB Common Scrambling Algorithm
17.	DVB-S	DVB standards for Satellite Transmission
18.	DVB-T	DVB standards for Terrestrial Transmission

19.	ECI	Embedded Common Interface
20.	ECM	Entitlement Control Message
21.	EEE	Electrical and Electronic Equipment
22.	EIT	Event Information Table
23.	EMM	Entitlement Management Message
24.	EPG	Electronic Program Guide
25.	ETSI	European Telecommunications Standards Institute
26.	HITS	Head-end In the Sky
27.	iDTV	Integrated Digital Television
28.	ILA	Industry Licensing Authority
29.	IPTV	Internet Protocol TV
30.	ITU	International Telecommunication Union
31.	LCOs	Local Cable Operators
32.	LNBC	Low-Noise Block Downconverter
33.	MHP	Multimedia Home Platform
34.	MIB	Ministry of Information and Broadcasting
35.	MK	Master Key
36.	MSOs	Multi-system Operators
37.	OFDM	Orthogonal Frequency Division Multiplexing
38.	OS	Operating System

39.	OTA	Over-the-Air
40.	OTT	Over-the-Top
41.	PCMCIA	Personal Computer Memory Card International Association
42.	QAM	Quadrature Amplitude Modulation
43.	QoS	Quality of Service
44.	QPSK	Quadrature Phase Shift Keying
45.	SC	Smart Card
46.	SCK	Secret Chipset Key
47.	SDN	Software Defined Networks
48.	SK	Service Key
49.	SoC	System on a Chip
50.	STB	Set-Top Box
51.	TA	Trusted Authority
52.	TDSAT	Telecom Disputes Settlement and Appellate Tribunal
53.	UHF	Ultra-High Frequency
54.	VHF	Very High Frequency