Technical Note – Response to TRAI

Synamedia

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Background

This note is being prepared in response to the Consultation Paper On Interoperability of Set Top Box that has been issued by TRAI on November 11th – 2019.

This note has been prepared by Synamedia with inputs from the following:

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This note is comprised of comments from Synamedia along with particular responses to the consultation questions that appear throughout the document.

Synamedia appreciates the thorough work that has been invested in the preparation of this document and thanks TRAI for the opportunity to respond to this paper.

General Comments

In addition to our responses to the questions, we are providing some general concerns regarding interoperability. While we certainly welcome TRAI proposal and concerns on increase in the e-waste out of STB replacement and respect the initiative to make the process of changing an operator smooth and without bearing additional expense of STB to end user (consumer), we call your attention on the following challenges:

- The current environment is not conducive to interoperability
- Even if we define interoperability, there will always be a need to replace STBs
- Interoperability between cable and satellite is very difficult and expensive
- Interoperability will cause for reduced security

In the discussion below, we elaborate on each of those points.

The current environment is not conducive to interoperability

1. It is important to note that in the Indian Cable market, there is only ONE cable operator operating in any given region. Customer's simply do not have a choice to select a preferred Cable operator. The customer must to settle for the only operator that provides a feed in his area. That being the case, there is little discussion of inter-operability for cable customers. Of course there are

customers that move from one area to another and this switch cable providers. But it is our understanding that they are not a large enough population to justify the definition of an interoperable STB.

2. In order to really introduce STB interoperability and allow total freedom of choice, the primary and necessary solution would be the creation of a Combined Cable Infra structure, in which the end user can receive the Cable signal of all Indian Cable TV Operators. That would really allow the consumer to have total choice of operator

3. In the current state of affairs, a user, who is cable subscriber and wishes to migrater to a different operator, would need to migrate to DTH. Of course you realise that the Cable signal is DVB-C, while DTH is DVB-S. Transmission and receiving technologies used in these two sectors are different and hence we cannot use DVB-C STB for DTH or vice versa. So the user would need to get a new STB in any case. Furthermore, as we discuss in the responses to the questions, if we wish to have both transmissions handled by one STB, the cost would be high and the entire burden of the increased cost would be on consumer or subscriber and entire efforts to reduce the STB cost and burden on consumer is not addressed.

4. Currently, there are around 200 Million STB's deployed, many of which still have a life span of 5 to 10 more years. In general, in India, the user does not have the tendency to change the Cable TV service provider and uses the STB for several years, and in many cases for decades. So this attempt to reduce e-waste will end up creating e-waste of these 200M+ existing STB's!

Even if we define interoperability, there will always be a need to replace STBs

5. There are constant developments taking place in every vertical. For example, MPEG-4 technology is gaining popularity among operators. There are certainly going to be new technologies in years to come, and to adopt new technology, replacement of STB is the only option.

6. Taking reference from telcoes, it is very clear that there is no interoperability between 2-G device and 3-G or 4G device. You cannot receive the 4G signal on a 3G device, and user needs to change the device while changing the operator of 3G to 4G. Maybe what is good enough for telcos should be good enough for STBs.

7. Today DVB-C and DVB-S are commonly used technologies. If in the future an IP TV Operator comes in and user wants to get his or her feed, there will again be a need to change the STB, as most of the STB's deployed today do not have IP port. Now putting all these interfaces on single unit is going to increase the cost and again we would end up giving all these to user who wants to settle either only on DVB-C or DVB-S or wanted to go for only IPTV.

8. Now if someone has an Ethernet port on his or her STB but with new technologies (like 5G) coming in, instead of Ethernet, user wants to connect the STB on OTT services over Wi-Fi. The user will need to change the STB to receive OTT service over the 5G.

Interoperability between cable and satellite is very difficult and expensive

9. Most cable operators provide SD video signal as MPEG -2 and use low-cost MPEG -2 STB's, whereas DTH operators use MPEG -4 Video Technology for video Feed and for STB. One cannot receive MPEG-4 Video signal over MPEG-2 STB's and replacement of STB is the only option.

10. On MPEG -4 SD STB, user cannot view HD video, and on MPEG -4 HD STB, user cannot view the 4K video. Tomorrow operator may send the signal in 4K / 8 K and again to view that quality of the signal, change of STB is the only option. We cannot have STB interoperability for such use cases, and today user needs to change the STB only in case of upgrading the technology if he or she wishes too. (Ex: To move from SD to HD, or HD to 4K)

Interoperability will cause for reduced security

11. At the present, global piracy is a big threat for content and service providers and hence having a very good CAS (Conditional Access System) is critical. A good CAS system, not only protects the content, but enables monetization and monetization is the most important thing for any operator.

12. Typically, CAS comes with an embedded part in SoC of STB, which is critical. By suggesting the CAS to be standardized and downloadable, means opening the doors for piracy.

13. Any robust solution, requires end to end integration of CAS with the unique STB Chip, MW, SMS and many other eco-system products. These integration are often complex and allow every CAS vendor to take unique advantage of their capabilities. If downloadable CAS is mandated, this integrations are likely to not be possible.

14. Synamedia strongly feels that interoperability at the cost of compromising on content security is not recommended.

15. For reference please note the MovieLabs ECP specification for premium content. It is clear that in order to be compliant with ECP, every standard must include basics such as SMP and forensic watermarking.
https://movielabs.com/ngvideo/MovieLabs%20Specification%20for%20Enhanced%20Content%20Protection%20v1.1.pdf

Answers to TRAI's questions.

Q1. In view of the implications of non-interoperability, is it desirable to have interoperability of STBs? Please provide reasoning for your comment.

It is the opinion of Synamedia that in principle interoperability may desirable. However we feel that mandated interoperability is not desirable. We feel that Venders should be allowed to agree among themselves if they would like to be interoperable and to what extent. We also feel that the costs of interoperability far outweigh any benefit it might offer.

Q2. Looking at the similar structure of STB in cable and DTH segment, with difference only in the channel modulation and frequency range, would it be desirable to have universal interoperability i.e. same STB to be usable on both DTH or Cable platform? Or should there be a policy/ regulation to implement interoperability only within a platform, i.e. within the DTH network and within the Cable TV segment? Please provide your comment with detailed justifications.

Any interoperable STB will add manufacturing costs. These costs will be rolled onto the consumer. It is not right to make a consumer that does not plan to ever be in a cable environment to pay for a cable demodulator. A healthy market might have DTH boxes, cable boxes and boxes that support both.

A portable Cable STB really offers little value as in order to migrate from one cable platform to another, a customer needs much more than a portable STB. He needs to physically move to a new home.

Q3. Should interoperable STBs be made available through open market only to exploit benefits of commoditization of the device? Please elaborate.

No. STB's are not like Mobile Phones. Even mobile phones are not completely interoperable. 3G phone does not work on 4G and so 4G would not compatible for 5G… GSM only handsets does not work on VoLTE..

A fundamental part of Pay TV service is differentiation in Look & Feel of UI which carry the Operator Branding, Functionalities & Capabilities of STB's. Every Operator wants to launch STB's with different Functionalities and Capabilities as based on this they provide VAS. Many functionalities of Middleware depends on Box specs, where as there are few operators who did not used MW and have gone ahead with native MW. From Content security point of view, CAS is integrated with SoC, MW, SMS. These integrations do not disappear just by making a box interoperable.

Q4. Do you think that introducing STB interoperability is absolutely necessary with a view to reduce environmental impact caused by e-waste generated by non-interoperability of STBs?

We think it won't help. Today, there are around 200 Million STB's on the ground, which still have a life span of 5 to 10 more years or more. In general, in India, the user does not have the tendency to change the Cable TV service provider and uses the STB for a very long period or in many cases for decades. We are trying to reduce the e-waste but end up creating e-waste of these 200M+ existing STB's.

Q5. Is non-interoperability of STBs proving to be a hindrance in perfect competition in distribution of broadcasting services? Give your comments with justification.

No. Broadcasters are providing services to all Operators and in India we do have MUST CARRY Clause…

Q6. How interoperability of STBs can be implemented in Indian markets in view of the discussion in Chapter III? Are there any software based solution(s) that can enable interoperability without compromising content security? If yes, please provide details.

Synamedia feels that interoperability will compromise content security. Having a publicly defined security system will create a high incentive for pirates to hack it. We strongly feel that there is NO software based solution that can enable interoperability without compromising content security.

Specific comments pertaining to the solutions outlined in chapter 3:

1. **Smart card based approach**
   This of course is the most secure of all solutions outlined. As is to be expected, there are costs associated with this extra security.
   As the paper notes, this is indeed not "interoperable" in the sense described in the document. It is possible for a platform to replace the CAS vendor without replacing the STB. This is done as a matter of routine. However, it is not possible for an individual subscriber to take his/her STB from a one platform to another as the card based STB will have a secure bootloader in place.

2. **DVB CI**
   DVB CI is indeed Interoperable in the sense that an STB can migrate from one operator to another. However, every time the STB migrates, the user will need to buy a new CAM as under spec, the implementation of the CAM is specific to the CAS vendor. Each CAM has CAS proprietary HW and software that is specific to the CAS vendor. As noted in the paper, this adds significant cost to the STB and at no advantage to the subscriber that does not need this interoperability. (as noted in the general comments, most Indian subscribers do not need interoperability and cannot migrate from one platform to another).

3. **CI+**
   In our opinion, while not ideal, CI+ has the advantage over downloadable CAS. Nonetheless, we find that revocation at a large scale rarely works, and that once a DVB_CI+ has been hacked, it is virtually impossible to recover.

4. **DVB_CI+ with USB**
   This one has Syanmedia particularly concerned. The ubiquitousness of the USB interface will make a very tempting targeted for pirates. We understand the motivation for it, however there is strong concern that the USB will end up being a lucrative target for hackers.
   Synamedia has extensive experience and expertise in this area and would gladly provide more details and guidance to TRAI if requested.

5. **Downloadable CAS**-
   The question asked is: **Are there any software based solution(s) that can enable interoperability without compromising content security?"**
   And the answer is **NO**. In the following sections we related to particular suggestions.
   a. The idea of multiple key ladders is a very good idea. If downloadable CAS is adopted, it is criticle that mutlile key ladders be used, and that they be fused on the STB at manufacturing time.
   b. ECI.
      Synamdedia is currently working with the ITU on improving the ECI. The current ECI draft has several shortcomings, including:
         1. It does not mandate multiple key ladders.
         2. It does not mandate forensic watermarking
         3. It does not mandate a Secure Media Pipeline for the entire video path.
         4. The revocation mechanism is rather limited and is vulnerable to filtering attacks. In our opinion this is one of the main shortcomings of the ECI standard.

Q7. Please comment on the timelines for the development of eco-system to deploy interoperable STBs for your recommended/ suggested solution.
The timelines are going to be driven by the chip vendors and the STB manufacturers. The CA vendors are not likely to be a bottleneck here.
Please keep in mind that any ecosystem must keep in mind the millions of already deployed STBs that are not going anywhere any time soon. Any ecosystem must continue supporting these STBs.

Q8. Do you agree that software-based solutions to provide interoperability of STBs would be more efficient, reduce cost of STB, adaptable and easy to implement than the hardware-based solutions? If so, do you agree ETSI GS ECI 001 (01-06) standards can be adopted as an option for STB interoperability? Give your comments with reasons and justifications.

Yes. Initially a software based solution will reduce the cost of an STB. That is because the integration of an STB will be easier when all interfaces are standardised.

However – there will be a dear price to pay.

1. The customer that already has a working STB will now need to buy a second interoperable STB. Even if this is a cheap box, it is not a justified expense as the customer already has an STB.
2. Once the interoperable system has been broken (as it will inevitably be), the content providers will demand better security or will stop providing their premium content to the markets that have adopted the interoperable STB.

In order to get that content, operators might end up deploying a proprietary STB, a cost that will be rolled on to the customer and that will offset.

A good case study is the CableCard. A failed attempt at standardization that ended up costing the industry 2Billion USD.

The attached study shows that after CableCard was deployed, 600,000 portable devices were deployed where during the same period 55Million operator provided STBs were deployed.

https://ecfsapi.fcc.gov/file/60001707436.pdf

(See for instance the 2010 FCC report page 4033.

https://digital.library.unt.edu/ark:/67531/metadc28495/m1/792/)

Synamedia is engaged in discussions with ITU with the objective of improving the ETSI ECI spec so that if it is accepted by the ITU it will address several of the concerns expressed by the security vendors.

It is also important that in the India market one way to reduce costs is to take a currently deployed STB and continuously find new vendors to supply parts at a discount. Requiring a new STB, will prevent this from happening for several years.

We feel that the ECI standards should not be adopted. The standard is very complex (over 500 pages long) and in several places has ambiguities and unclear paragraphs. This will make the standard extremely hard to implement. And it will be virtually impossible to check that an ECI host has been properly implemented. It is our suggestion that at the very least, TRAI wait until a reduced and perhaps more clear version of ECI has been published and then consider adopting it.

Q9. Given that most of the STB interoperability solutions become feasible through a common agency defined as Trusted Authority, please suggest the structure of the Trusted Authority. Should the trusted authority be an Industry led body or a statutory agency to carry out the mandate? Provide detailed comments/ suggestion on the certification procedure?

The role of Trusted Authority is indeed crucial to ensuring the security of any STB interoperability solution.

Whether the TA is led by an industry consortium or a statutory body, we suggest that the TA must have the following attributes:

- Must be trusted by all players to act fairly and impartially
- Must be capable of implementing the strongest physical and digital security measures to protect the secrets used for the solution
- Must have the authority to revoke specific STBs

In general, the Trust Authority as described in section 3.5.2 of the paper is adequate. It is important to note that the Trust authority does not get its trust from its architecture, it gets its trust from its ability to operate according to its definitions, and from its ability to enforce its policies, contracts and frameworks. Often private bodies are the ones that are most properly incentivised to maintain trust.

Q10. What precaution should be taken at planning stage to smoothly adopt solution for interoperability of STBs in Indian market? Do you envisage a need for trial run/pilot deployment? If so, kindly provide detailed comments.

We do not feel that STB interoperability is the necessity and do not suggest anything of above.

Q11. Interoperability is expected to commoditize STBs. Do you agree that introducing white label STB will create more competitions and enhance service offerings from operator? As such, in your opinion what cost reductions do you foresee by implementation of interoperability of STBs?

Interoperability might create more competition in a very limited area. Perhaps in price and user functionality. However all competition and innovation in the area of content security will be stifled.

On the other hand, we might see cost rising due to the need to incorporate multiple tuners

As mentioned, there are very high probability of content security getting compromised, which would be very costly.

Q.12 Is there any way by which interoperability of set-top box can be implemented for existing set top boxes also? Give your suggestions with justification including technical and commercial methodology?

Unfortunately, interoperability necessarily means that the security level is that of the Lowest Common Denominator. In other words, the security of all operations is no higher than the security of the weakest one.

In the case of existing STBs, the Lowest Common Denominator is DVB CI. In this official DVB page https://www.dvb.org/standards/dvb-ci-plus DVB themselves admit that DVB CI is inherently insecure (and this was the main reason for developing the DVB CI Plus standard). The use of DVB CI would pose an insurmountable threat to the entire Pay TV business in India.

There is no other interoperability mechanism that could apply to all the different STBs in India, some of whose manufacturers are long defunct.

Therefore the conclusion is regrettably that no interoperability solution is practical for existing STBs.

Q13. Any other issues which you may like to raise related to interoperability of STBs

See our comments in the section General Comments above.