

## Comments from PCCW

We believe that this is the most challenging aspect of the NIMS project, to develop and manage a framework technical architecture and STB to support multiple RSPs over the NIMS platform.

The level of difficult of this challenge should not be underestimated and it is important that the technical framework for the architecture of the STB and its ongoing support be robust enough to manage not only the competitive and various innovative interactive service requirements of the RSPs but also be able to maintain logical/firewall security and separation between traditional PayTV type RSPs and those providing content over the open Internet to the levels demanded by international PayTV content providers.

PCCW has the experience of carrying multiple wholesale RSPs on its IPTV platform, but this is only manageable and controllable by PCCW having total control of the STB, its features and the support for the interactive services. All software upgrades are performed and tested by PCCW and the RSPs are managed by allowing a standard content distribution interface and interactive capability to the RSPs. We believe that anything which devolved that capability to individual RSPs will be risky and most challenging to manage.

We have made some comments related to the document under review to assist you understanding our thoughts of those challenges and some suggestions as to what capabilities need to be catered for. Here are those comments:

1. Section 4.1: Given the main aim of NIMS is the sharing and operation of NIMS Common Featured STBs by multiple national RSPs, data security and protection between RSPs should be considered of critical importance and mandated here. This is similar to using a PC or iPad to access multiple websites/apps, the secure data to each site should only be decrypted by the designated RSP.

2. Section 7.3.2: In order for the content from different NIMS compliant headends to be viewable, the NIMS CF STB should support a common set of CA/DRM that headends could choose from based on their preference and commercial terms with each CA/DRM vendors. However, this could render the cost of a NIMS CF STB as quite high as the licence fees for multiple CA/DRM clients could also be high (if they need to support multiple). Mandating a single CA/DRM regime could be more manageable and cheaper, but would need to be one which is acceptable to the majority of major Content Providers (e.g MPAA).

3. Sections 7.3.3 – 7.4.2 These assume that the NIMS CF STB has a common boot-up process, followed by a selection screens for all RSPs and then each RSPs can preserve their end-user experience and branding. This also has implications:

i. Common modules maintenance:

✧ In our experience, chipset vendors will develop new firmware to support more capability on their chips over 2-3 years. That would require regular firmware upgrades to the common parts of the NIMS CF STB. If this was maintained by NIMSCo, then NIMSCo would need to regression test all RSP's services before changing the common

modules. This will ultimately limit the software upgradability of the NIMS CF STB due to the effort required and the complexity which would ensue.

✧ One good example would be if multiple RSPs allow recording onto a local hard-drive, the formatting and folder definition of the hard-drive has to be common and shared to avoid one RSP's recording program affecting/deleting another RSP's recorded program, etc. This therefore requires a set of common recording functions, but also thereby limiting the uniqueness or innovation of an RSP's service. Indeed whilst this is but one example of the importance of the common "middleware", it demonstrates the importance and simplicity of network provided solutions like Network PVR instead of local hard-drives....and helps defray STB costs.

ii. If each RSP implement their interactive services and features on some software modules within the STB based on common application environments:

✧ Then the release of new features from one RSP must not affect another RSPs features/applications, so a very modular STB s/w design is required to partition and allow for upgrades partial/separate software modules on the STB, independently and "on-the-fly". Therefore the memory locations of each RSP's module in each NIMS CF STB has to be clearly defined and segmented (to avoid intrusion and damage when one RSP accessing other RSP's memory space). This will be a challenging task to define manage for all circumstances and features which may be innovated and arise..

✧ Careful testing of the RSP's module to be compliant to the STB application environments and not affecting other RSP services with need to be made before RSP services can be released (NIMSCo perhaps need to certify Apps and ensure quality, like Apple iTune store,). Again, this will be a costly and complex process of regression testing. The cost of failure on the overall STB performance could be very significant from an end user customer point of view.

✧ An Interactive service of one RSP could also be so demanding on the STB processing power that the performance of other services could be affected (eg simultaneous playback and recording) if they are to be allowed to occur concurrently. This needs further study.

iii. Alternatively, one way to avoid these problems would be if the service is implemented via HTML like web pages. However the downside of this would be that the performance of some services would be slower than STB resident services because functions like games, media sharing/playback or fancy UI would have to be rendered in the network, yet would run better locally instead of over web services.

I hope this puts some perspectives on the issues and challenges arising from the objectives of this document.

Regards  
PCCW IPTV Team