



Set-tops: Flexibility to Execute in Multiple Network Environments is the Key for Today and Tomorrow

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Ever-Changing Environment

As is the case in all modern industries, technology has a way of both helping and confusing the masses – U.S. Cable is no exception. With the recent FCC mandate of separable security in full force (with the exception of some much publicized waivers), all in the industry have a firm grasp of the requirement that set-tops must now deploy with CableCARDS™. However, there is still some confusion as to the connection of today's current "native" environment with tomorrow's OpenCable™ environment (encompassing Open Cable Application Platform (OCAP)™ software environment) and how/when an operator should change from one to the other. Does the CableCARD™ dictate an immediate need to move to OpenCable? If so, won't this require entirely new software stacks, EPGs, VOD client applications, network servers, carousels, DOCSIS™ DSG infrastructure, and in some cases new set-tops? Although most of these changes are necessary for OpenCable™ set-top deployments, fortunately, CableCARD™ does not force this chain of events. Let's drill down to understand why this misconception exists and look at solutions available today that promote a smooth transition from "native" environments to OpenCable™.

Transition Complexity

Cable operators have made a tremendous investment in today's cable infrastructure; and as such, the FCC mandate does not require a transition to OpenCable™, but rather that new CableCARD™ set-tops (vs. embedded security) work in today's environments. These new set-tops that incorporate separable security yet still work in *native* (e.g., non-OpenCable) environments are best termed *native* Host platforms.. These *native* Host devices that run in existing networks are helping to make a smooth transition to OpenCable™. As the industry moves towards the OCAP software environment, these set-tops will be classified as OpenCable™ Hosts (adhering to the OCH2.0 specifications).



Although it is important to transition to future technology initiatives like OCH/OCAP, the prudent cable operator will use a systematic and methodical approach in adopting such changes. For example, there is no question the benefits of DOCSIS DSG for two-way communication to/from the set-top to the head-end far outweighs today's older technology of the "legacy" out-of-band (OOB) return path. Yet, switching over from OOB to DSG is quite a challenge - both logistically and financially - for the operator. Taking this example a bit further by adding in the transition to OpenCable™ with its new infrastructure, host software (e.g., OCAP), and applications (e.g., Java environment) then even the largest operators will see how this is an overwhelming task.

Protecting the Investment

To find the win-win for cable operators and technologists, one must start at the end of the delivery-chain and work upstream. In cable, the set-top is the end device that can be the catalyst for change upstream. Common sense dictates the "flash cut" theory of change rarely going smoothly, so what we need is a smooth migration or evolution to these new environments. The problem is that most of the recent influx of set-top suppliers don't offer a flexible migration path for operators. These players need the flash cut theory of a total and complete switch-over to OpenCable™ environments, anything less is too complex for them. Fortunately for the cable operators, Pace offers flexibility in all of our set-tops – meaning the Pace CableCARD™ platforms can execute in either "native" or OCAP host software execution mode, thus easing the transition for the operator while also providing a choice of operating modes. Yet, can all set-top vendors offer this flexibility? And if not, why?

The Right Choice Offers Flexibility

Choice: One criteria operators should consider in set-top selection is which set-top vendors provide the flexibility for a smooth migration from *native* to OpenCable™ environments. In fact, the best choice of platforms would be those that can operate in either environment – like a dual-personality. From a set-top vendor perspective, one way to accomplish this is to both: (a) design the set-top hardware with this goal from the start and (b) allow for the set-top to accept an *over-the-cable* software download of either software image necessary to execute in Native or OpenCable™ environments.

Many set-tops today (even some of the newer ones) do not have this dual-personality flexibility designed in, thus the operator has no way to transition from *native* to OpenCable™ (e.g. *flip* the operating environments) via *over-the-cable* software downloads. Much like many of the older legacy set-tops are not designed for OCH mode, some of the new-to-market set-tops can only execute in the OCH mode because they were not designed to have this dual-personality, thus to deploy these set-tops all of the infrastructure must be in-place and operationally bug-free.



In addition to the benefit of flipping set-top operating environments that dual-personality set-tops provide, these flexible platforms also provide expense relief for the operators because no new set-top investments are needed for OCH transitions which leads to additional savings of not having to do truck-rolls to swap out *native* Host set-tops.

Looking at what set-top vendors need to do to accomplish dual-personality designs reveals the headline technologies necessary for either *native* Host or OCH environments. For *native* Host set-tops, the platform must have an out-of-band (OOB) tuner with a QPSK Demodulator for downstream communication and an upstream QPSK Modulator for the return path. Intelligent software is then required to allow the set-top to utilize this OOB hardware such that either the DVS-178 or DVS-167 message protocol is followed to achieve 2-way communication. Furthermore, Motorola and Scientific-Atlanta (Cisco) networks each have additional messaging requirements to process specific network and conditional access messages, thus the set-top must be able to process these messages as well. Native mode also has specific software requirements at the application level where there are specific electronic program guides (EPG) and Video on Demand (VOD) clients that must be ported to the set-top to complete the set-top's NPH software execution image.

For OpenCable™ environments, the set-top must be designed to adopt the technologies that are laid out in the OCH hardware specifications. Such additional technologies include DOCSIS™ DSG as another mechanism for 2-way communication in contrast to the OOB communication used in native mode. As mentioned earlier, DSG offers superior bandwidth and communication advantages, yet the benefits come with a cost of incorporating a DOCSIS cable modem, additional memory, an additional tuner and a QAM16 Modulator. Similarly, the overall OCH platform must have more memory and CPU processing capability (as opposed to native execution mode) to support the OpenCable™ software environment which includes a Java Virtual Machine and Java applications.

Going a step further, a flexible set-top design should also include the ability for an intermediate step to OpenCable™ with the ability to again *flip* execution environments, this time, to an On-Ramp environment. Some in the industry refer to On-Ramp as a stepping stone to OpenCable™ as it has many attributes of the OpenCable™ software requirements, yet with some concessions to allow less capable platforms to retain a look-n-feel of the same applications executing on OCH platforms. Here again, it's about providing choice to the operator of which environment they wish to execute without the set-top dictating the way.



As one can start to see that supporting a dual-personality platform requires much up-front set-top design and not an after-thought of loading a new software image on the set-top. These are just some of the concepts operators must consider when making their set-top selection.

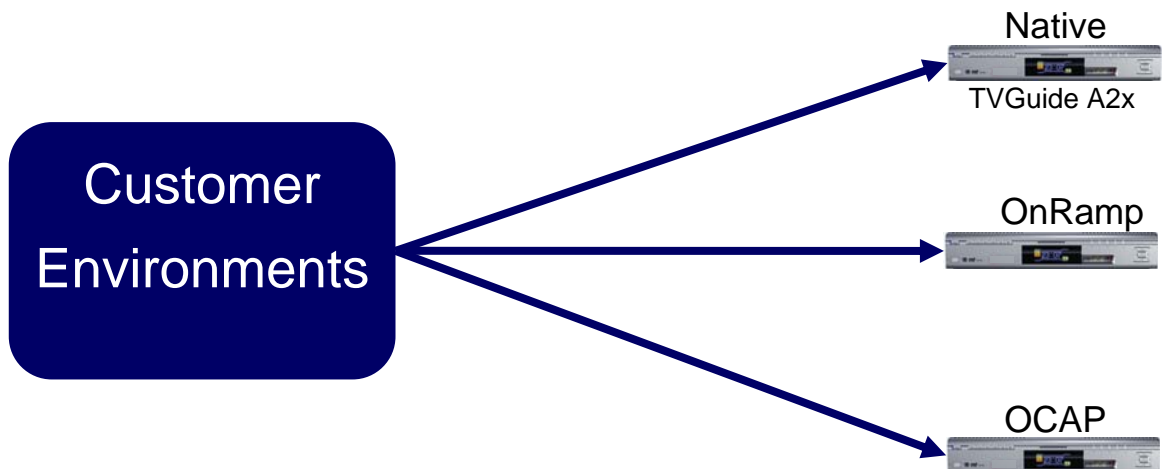
Operating Modes Via Software Download

Mode	Classification	Comm Path	App Env.
Native	Native Host	OOB	Native EPG & VOD
On-Ramp	Native or OpenCable Host	OOB or DSG	Java
OCAP	OpenCable Host	DSG	Java

Transition Steps that Flexible Set-tops Can Achieve:

- Native -> OCAP
- Native -> On-Ramp
- Straight to OCH

Given this flexibility that Pace offers, the operator can ensure the business continues without hiccups.





The Future Requires a Contingency Plan

Set-top vendors have to have design philosophies where they provide the operator with flexibility and choice, for this is the best contingency plan one can have. And given today's changing environments, an operator can take comfort in knowing their set-tops have what it takes to be the catalyst for future change regardless of its timing and direction. Doing so, provides a much-needed contingency plan for a solid return on investment. And that is what makes a win-win for both operator and set-top vendors.

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Chris Dinallo's responsibilities for Pace focus on U.S. Cable digital set-top box development, future technological directions, and participation in standard bodies. Other cable related papers may be found at:

http://www.pace.com/americas/content/webcontent.asp?nav=products&fullid=technology_whitepapers

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