

Smart TV: Will Moore's Law define TV architecture?

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The TV until now has evolved at a pace largely detached from Moore's Law, an observation that the number of transistors on a unit area of integrated circuit doubles every two years. Its consequence is that computing power doubles per unit of cost in the same time.

TV has remained largely isolated from this trend for several reasons: TV capability has been closely tied to broadcasting standards until now, which have evolved at a much slower 'infrastructure' rate. After all, changes in broadcasting ultimately require rebuilding of studios, refitting transmitter masts or satellite launches. The industry started to move faster as TV chips became increasingly digital, with CMOS gradually taking over from analog. Moore's Law powered integration of functions into a single TV IC, but by 2010 this had largely played out.

With broadcast requirements static for the time being, innovations in TV capability have instead been for Internet services and interactivity: Smart TV. These have brought a convergence of functions between TVs, tablet PCs and smartphones. Each can decode and display H.264 video, surf HTML web pages and encode video and audio. A high-end TV really is a large-screen smartphone! The consequence of the TV tracking the capabilities of handhelds is easily seen in the number of processor cores in the latest Smart TVs from Samsung: 2012's models have 2 cores, while 2013 products will have 4.

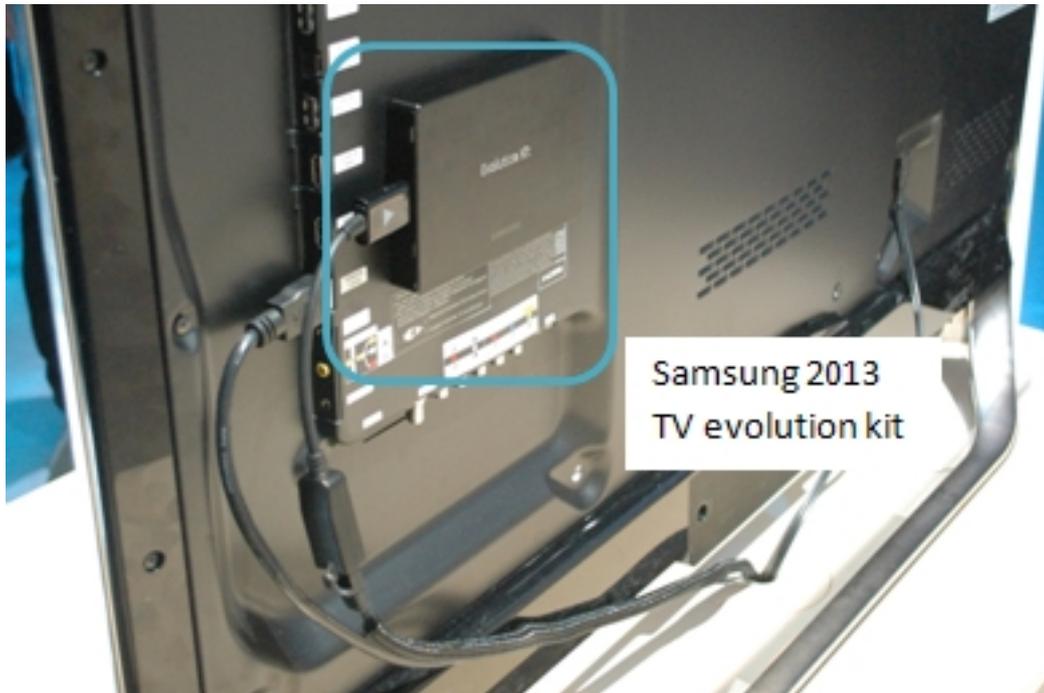
A collision occurs when the lifetimes of these devices are considered: a TV typically lasts 6-8 years in service, according to our [TV Replacement Study \[1\]](#). A mobile phone has a life (at least with the original owner) of around 2 years. So consumers own phones on a single Moore's law cycle, while TVs are expected to last for several cycles. The capabilities of the TVs can be expected soon to lag far behind. While software updating is feasible, the gap in CPU power will limit its usefulness.

TV owners can be expected to perform mid-life updates to their sets to access attractive services by buying set-top boxes or unobtrusive MHL sticks which do not require an additional remote control and are fed power by the host TV. Samsung has also promised upgrade kits to its premium TV customers - this promise made in

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2012 was fulfilled at CES this year. However, the fact that the unit completely bypasses the processing in the TV (it even has its own Ethernet jack) shows just how hard it is to modernize even recent hardware.



Setmakers face three alternatives:

1. Continue as before and hope that consumers do not become sensitized to the rapid obsolescence (and growing uselessness) of their Smart TVs.
2. Give up and keep the processing outside the TV, which effectively becomes a monitor.
3. Rethink system partitioning and seek a way to maximize TV functionality yet isolate unstable and fast-evolving elements.

Arguably the first option is being pursued already in China and Japan, while the second appears to exist in North America, largely because US TV is locked inside pay-TV providers' set top boxes.

The third would require that the TV becomes a kind of 'docking station'. Home audio has gone through bleak years recently as it first fought MP3 players head on with increasingly irrelevant CD systems. However, first with iPod docks and then Bluetooth wireless audio links, the category has learned to play nicely with personalized devices. While it may never return to its status symbol glories of the 1970s and 1980s, Hi-Fi is coming back! A visit to any trade show gives a wide variety of systems with attractive and individual design.

If audio is any guide, the shift of video content consumption to personalization and portability will be hard for the TV set to fight. Consumers will reach for their smartphones and tablets to search and watch shorter-form content. The TV needs to retain its relevance by making it easy to screen longer-form content or fetch

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material with search tasks performed by the handheld. DIAL and Miracast are open standards that allow these functions: DIAL installs a duplicate app in the TV, while Miracast could be the video equivalent to Bluetooth audio. At the same time, MHL allows an HDMI socket to become a transparent expansion port to permit additional decoders to upgrade the TV. (We analyze these and other technologies in the [Quarterly TV Design and Features Report \[2\]](#).)

Some Chinese set makers are already moving in this direction with their 'Roku-ready' TVs which allow a small Roku MHL stick to expand the TV to a Roku-powered Smart TV. Similarly, pay-TV providers in Europe are attracted by the idea of a STB that can be mailed in a small padded envelope.

Set makers need to consider carefully whether the costs and support burdens of Smart TVs will deliver the long-term added value to them (and their consumers). More open platforms may be an interesting alternative to fighting tablets and smartphones head-on.

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