

Cool, Calm and Connected: 3 Design Principles for Connected Objects

Contributor Laurie Lamberth | Wednesday, February 3, 2010

Last month's Consumer Electronics Show in Las Vegas featured a flood of new connected devices catering to needs as diverse as entertainment, personal security, home energy efficiency and biometric monitoring. Each of these devices is intended to improve its owner's quality of life -- but it's easy to imagine being surrounded by a cloud of these "helpful" personal devices, all simultaneously sounding their alarms, experiencing chaos instead of calm. Think of when the doorbell and the phone ring at the same time -- then multiply that stress by two, four, six or more. Ouch.

Our approach to industrial design and the man-machine interface must be updated for devices which function within a cloud of connected objects. Human factors engineers, the people who make devices and services easy to use, need to consider how the "smart" machines surrounding a person will individually *and* collectively operate in a manner that honors the person's humanity and limitations --respecting attention limits, interruption tolerance and preferences. In a 21st-century update to John Donne's famous saying, "no man is an island," no connected device should be an island: they must include machine-to-machine (M2M) interfaces so they can communicate, coordinate and sync with each other to provide the best collective support with the least amount of intrusion.

Fortunately, some really smart people have thought about this problem. One was Mark Weiser, the late CTO of Xerox's Palo Alto Research Center, who foresaw it in the mid-90's. Weiser observed: "Designs that encalm and inform meet human needs not usually met together." In his view, [calm technologies](#) free our focus for what's important by tracking peripheral activities in the background and raising them to our attention only when needed.

Weiser suggested that product design processes should consider the context in which a device will be used as well as its physical design and features, in order to "...most fully command technology without being dominated by it." The International Telecommunications Union echoed this sentiment in its 2005 report, [The Internet of Things](#): "In a world increasingly mediated by technology, we must ensure that the human core to our activities remains untouched."

We can find ways to streamline how connected objects communicate and cooperate, how they connect and stay connected to the cloud, and how they use the capabilities of the cloud to create the maximum benefit for the user. Here are a few considerations that designers working on the next generation of connected objects should ponder, to be sure

that their devices create calm and not chaos.

1. Devices should be interoperable - and harmonious.

A gang of individual devices isn't a "cloud" unless they communicate and coordinate. Devices must be able to sense each other's presence and know how and when to share information, interrupt each other or be quiet. The [U-SNAP Alliance](#), short for "Utility Network Access Port," is working to make devices communicate directly; its June 2009 draft specification supports communication between Wi-Fi, ZigBee and Z-Wave devices, with more technologies on the way. U-SNAP includes such disparate members as smart energy pioneer [Comverge](#), Honeywell's [Trilliant](#) division and [Google](#).

Beyond supporting inter-device communication, not much has been done to harmonize their activities. [Ford Sync](#) manages switching across multiple devices inside selected Ford models for phone calls, text messages, information access and entertainment, but similar technologies haven't made it to our homes and offices. Until now, multi-tasking has applied to a particular device: my cell phone knows to interrupt a text session for a phone call, but not that my [chumby](#) is in the room; and it certainly doesn't know whether or not it should switch to silent operation when I'm listening to a podcast on the chumby.

Whether connected devices will be harmonized through an application or set of protocols is uncertain. The [Open Mobile Alliance](#) - an industry group that publishes specifications for common mobile device functions such as data synchronization, browsing and device management - has several working groups addressing device interoperation, but it will be some time before any standards emerge from this process.

2. Connected devices should stay up to date effortlessly.

Once a device is connected to a personal cloud, and possibly also to the Internet, there are still connectivity challenges to address, such as keeping the device's software and firmware compatible with its carrier networks. Many electronic devices require periodic updates: common reasons include fixing bugs, adding features, and updating networking and security protocols. We've become accustomed to software and firmware updates to our computers, mobile phones and DVRs, and there's an explosion in the devices that need this support, including any software-driven connected device such as entertainment consoles, wireless fitness and medical devices, connected appliances and security systems.

Computers update easily because they have generally have broadband connections and lots of available memory. Dedicated-purpose and mobile devices are harder to update due to memory and bandwidth limitations. One company leading the pack in firmware-over-

the-air (FOTA) technology is [Red Bend Networks](#), which developed their expertise in small-footprint updates by keeping early AOL customers up to date, and today updates software and firmware on a growing set of mobile devices including Android phones and the iPhone. Red Bend ensures needed updates actually process by running them in the background, without user intervention.

3. Energy conservation and charging must become priorities.

Switching to a different "current," simply keeping a collection of personal mobile and portable devices charged up is a second challenge. Though it seems mundane, mobile devices can't stay connected for long without sufficient battery life. Its one-day-at-best battery life is a common complaint against 3G iPhones. Further, the impact of a device going down will increase as we become dependent on their input and move them into Weiser's "background."

The first line of defense is conservation, and [Skinplex](#) from IDENT Technologies, AG allows devices to shut themselves off when they are not near a human. Skinplex takes the concept of "a network" to a new level, using the electrical conductivity of human skin to provide "ultra low-power proximity" technology that leverages a person's presence to activate functions within a device such as turning it on or off, starting or ending programs, opening doors or turning on lights. Automatically turning off a fitness tracker or Bluetooth headset when they are not near their owner would extend the device's battery life and improve its usability and connectivity.

Charging took a big step forward with the introduction of induction charging mats in 2009, and they seemed to be on every aisle at this year's CES. These mats that make it easy to charge multiple devices: plug in the mat, clip on compatible contacts (often styled as a case for the device), lay your devices on the mat, and that's it. Major battery companies [Duracell](#) and [Eveready](#) entered the market in 2009, following entrepreneurial start-ups [PowerMat, USA](#) and [Pure Energy Solutions](#). [Fulton Innovation](#) showcased a demonstration home with induction charging contacts built into desktops, lamps and kitchen counters - plus Dell's [Latitude Z](#) laptop, with a wireless docking station that features induction charging contacts and a wireless USB hub. Expect to see more big brands jumping to induction charging, and induction charging contacts becoming standard on mobile and portable devices.

Conclusion: Toward ubiquitous computing

Once a device is reliably connected to the cloud, it has access to applications, databases, and resources on a scale that is nearly unimaginable. Consider a connected object, such as

a touchscreen information panel: the device ships with minimal onboard programs and broadband connectivity, yet through this simple device, its owner can check on an important asset anywhere in the world, remotely lock or unlock another property, check the charge on their electric car battery, access vast information databases and communicate with family.

Arlene Harris, founder and chairwoman of Jitterbug Wireless, the cell phone company for seniors, thinks a lot about how connected devices can enhance our quality of life. She believes "the cloud's' unlimited intelligence" can allow us "to improve the prospects of positive outcomes - proactively" using data and computing power to create understanding "where the scaled analysis of such data was heretofore unthinkable."

Harris's thoughts echo Weiser's, whose "ubiquitous computing" concept described an environment in which all people and things are networked, and computing power is widely distributed. Weiser believed that the increasing availability of processing power would be accompanied by its decreasing visibility. As he observed in an article for Scientific American in September 1991: "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."

Will the new crop of connected consumer devices unveiled at 2010 CES live up to Weiser's and Harris's visions of ubiquitous, simple, and invisible computing? If not this year, maybe next year or the year after that. Sooner or later, if we pay close attention to how we interact with these new daily companions, work hard to make them fluidly easy to use, and find ways to coordinate their activities, we may reach the ideal of invisibility.

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Responses:

gcolburn
2010/02/03 at 11:5019

Agreed. To your second point, as consumers sync web-enabled devices, applications become more plentiful and more content becomes digitized, users will also want their content to stay up to date automatically. In other words, devices can recommend content based on usage patterns or user settings. Maintenance of digital media libraries (new shows, podcasts, etc.) will be important as the amount of content increases and on-demand expectations influence consumption habits. Maintenance of the in-home setup was one of the challenges identified in our consumer spotlight videos here: www.level-studios.com/connected

Laurie Lamberth
2010/02/04 at 13:1419

Garrett, Thanks for the additional info - that's a great study! Agree that synchronizing content is also a high priority. Appreciate your comments. - Laurie

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