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Written Between 2013-2015 by Michael Sheehan

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Thunderbolt 3 and USB Type-C: the 40 Gbps Dynamic Duo

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How Thunderbolt 3 and USB Type-C Connector Came Together, Adding 40 Gbps Speeds

As the computer, tablet and smartphone industries move toward adoption of the new USB Type-C connector, a new version of Thunderbolt is quickly approaching. With speeds topping 40 gigabits per second, Thunderbolt 3 promises to provide another solution to unify various display, docking, power, storage and network protocols currently available under the USB Type-C standard, with data transmission speeds beyond that of USB Type-C as well as other protocols like DisplayPort and PCI Express. Initially, Intel engineers hadn't considered using USB Type-C when developing Thunderbolt 3.

USB and Thunderbolt have been widely used to connect various peripheral devices providing storage, display, and recently, power capabilities though distinct ports on devices. And until now, these ports have been separate. When work by Intel began on Thunderbolt 3, the port was going to continue to be unique until standards began to emerge for USB Type-C.

A USB Type-C connector.

"The early exploration was started a couple of years ago and that's when we were looking at which connector to use or to develop a new connector," says Jason Ziller, Intel's marketing director for Thunderbolt. "At the very beginning of our [Thunderbolt 3] research, [USB Type-C] did not exist and so we were exploring other options or doing a brand new connector."

According to Ziller, the "eureka moment" occurred when Intel engineers realized they could use USB Type-C as the port and protocol for Thunderbolt 3. USB Type-C offers a small, reversible, fast connector that also included 100W charging capabilities. The previous versions of Thunderbolt used the same connector as Mini DisplayPort (MDP), which is approximately 5.4 mm high and 8.3 mm wide.

Thunderbolt 3 had two primary goals: double the speed of Thunderbolt 2 from 20 Gbps to 40 Gbps, and lower the Z-height (the thickness of the port and cable) of the connector. USB as well as Thunderbolt have been pushing data transfer speeds since their introductions.

Evolution of Speed

Protocol	Speed	Year Released
USB 1.0	12 Mbps	1996
USB 2.0	480 Mbps	2000
USB 3.0	5 Gbps	2008
Thunderbolt	10 Gbps	2011
USB 3.1	10 Gbps	2013
Thunderbolt 2	20 Gbps	2013
USB Type-C	—	2014
Thunderbolt 3	40 Gbps	2015

"Our philosophy with Thunderbolt in general is to be the fastest connection to the PC and to lead in capability and performance in that way," says Ziller. "As we roll out this current technology, we will continue to look forward and try to figure out what the next speed increase would be."

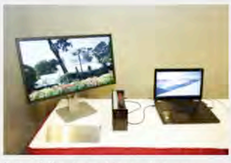
As devices continue to present thinner form factors, the space for ports is being compressed as well. USB Type-C has less height than both USB Type-A and previous Thunderbolt connectors. Intel engineers were faced with the task of squeezing more out of an increasingly thinner space.

Because the Thunderbolt engineering team didn't have to reinvent a connector, the biggest challenge was developing two combined 20Gb fiber channels. Thunderbolt 2 had two combined 10Gb fiber channels that achieved the throughput of 20 Gbps.

Dual DisplayPort displays from a single Thunderbolt 3 dongle.

Power to Do More

Thunderbolt 3 handles multiple protocols, including DisplayPort, USB and PCI Express, which means there are multiple use cases consumers can benefit from. The 40 Gbps speed allows for dual 4K displays (or a single 5K) display to be connected. As with USB Type-C, Thunderbolt 3 supports 100W charging, including power for 15W bus-powered devices as well.



External discrete graphics running over Thunderbolt 3.

Like previous versions of Thunderbolt, certified peripheral devices, of which there are currently over 250, can be daisy-chained together, meaning they can be plugged into one another and data and power can be transferred between the computer and these devices without reducing speeds or dropping data.

Since Thunderbolt 3 supports PCI Express, laptop users have the ability to plug in third- party external graphics cards to allow for high-performance playback of graphics.

Cost-effective Cables

Consumers were concerned about cable options for Thunderbolt 3 as previous versions of Thunderbolt cables were costly. Ziller shared good news regarding cables as there will be several types of cabling solutions available. Traditional USB Type-C passive cables will be available at a lower cost and serving the general USB marketplace. These passive copper cables have no active components and will support speeds up to 20 Gbps as well as USB3.1, Thunderbolt and DisplayPort 1.2.

For active Thunderbolt cables there are two versions, copper and optical. The copper one contains active components and can handle the new Thunderbolt speeds of up to 40 Gbps. Like its other copper sibling, the cables can be up to 2 meters in length. The optical version of the Thunderbolt cable, available in 2016, increases the length limit to 60 meters, which means it can be used for peer-to-peer networking and small workgroups. The Thunderbolt protocol in general can handle 10Gb networking but for longer distances, an optical cable would be needed.

Full docking options from a single cable.

While there is an active push toward a world without wires, Ziller believes Thunderbolt 3 is the "stepping stone" to get there as Thunderbolt 3-based, single-wire docks will dramatically reduce the need for multiple cables going to multiple peripherals.

"One of the big things we push with Thunderbolt 3 is what we call single-cable docking. So with a single cable to your notebook you can connect to everything on your desktop, your 4K displays, your high-performance storage, your Ethernet, your keyboard and mouse, everything, plus you can charge the notebook," says Ziller. "No wires is a great vision; we all want to go there. Single-cable docking is a great stepping stone to no wires."

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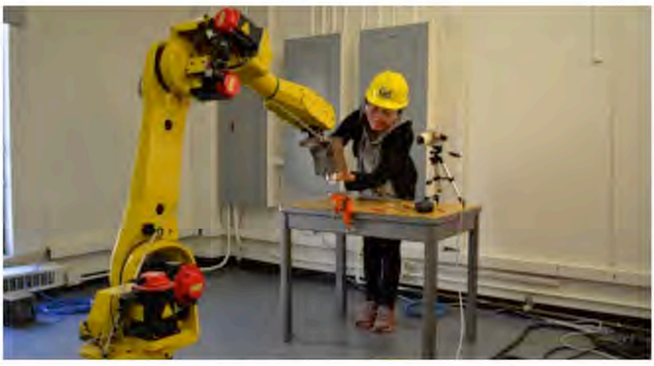
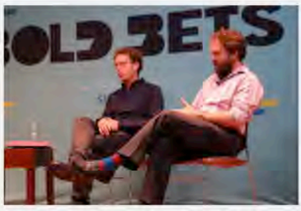


Experts speaking at a UC Berkeley event talk about the realistic evolution of robotics, factories and the shift of entrepreneurship.

Contrary to what you may see at the movies, robots will not come to rule the world any time soon, experts say. Ken Goldberg, University of California, Berkeley professor of industrial engineering and operations research, and Otherlab CEO Saul Griffith, spoke at event focused on the factories of the future titled "Bold Bets: Tomorrow's Industrial Entrepreneurship." Both agreed that having humanoid-like robots in the near future should be left to science fiction.



(L-R) Ken Goldberg and Saul Griffith both agree that humanoid robots are far from being ready to take over roles of humans in factories.

"Machines are very good at lots of things: precision, repetition. But they are extremely bad at any type of creativity or insights," said Goldberg. Intuition, something humans take for granted but machines simply cannot learn on their own yet, is important. And future automation systems need to be able to understand when to call for help when faced with a decision.

"Machines are overweight, blind, stupid, slow and weak," said Griffith, explaining that current humanoid robots have many huge components, cannot truly see what they are doing, only do what they are told (like playing back a prerecorded macro), and for the amount of power they demand, are much slower and weaker than their human counterparts. It takes a human about 100 or 200 watts of power to lift 30 pounds; it takes an industrial robot about 10 kilowatts to do the same action. Griffith believes these limitations need to be optimized if we are to truly have mobile and smarter robots.

But there is hope on better automation and robotics: what Goldberg and others call "Industry 4.0 – the Industrial Internet." As more robots and machines are connected to the Internet, they can be linked together to share data and software. By offloading many of the complex, CPU-intensive calculations of today's robots to the cloud, robots of the future could be lighter weight and consume much less power, with better performance.

"Machines are overweight, blind, stupid, slow and weak." - Saul Griffith

Risk-taking at the university

While some may be funded by corporations, these types of innovations largely emerge from academic environments. "Universities are well-setup to [take risks]," explained Goldberg. "The tenure system and various approaches that let you take a chance let you do something that may fail. Industry is different; there you can fail and you can lose your life savings or lose your job. Here in the university...you can take all kinds of chances."

Griffith wishes that universities were even riskier and bolder, but the limitation is the availability of capital.

"You have to shift the risk into the academic community and maintain very close ties to it," said Eric Benhamou, founder and generation partner of Benhamou Global Ventures and former CEO of 3Com. "There has to be a very close ecosystem, relationships and collaboration between the researchers and the academic community and the people who do more of applied research inside the industrial complex."

Forging a new factory future

Certain tasks that require intricacies and precision beyond a human's means, such as computer chip production, are where machines excel. Even then, automated chip factories could see a shift.

Former Intel CTO Justin Rattner believes the factories and fabrication facilities of the future will evolve to shift from massive scales of single production units to more customized production in smaller volumes.

(L-R) Justin Rattner and Eric Benhamou share the stage at "Bold Bets: Tomorrow's Industrial Entrepreneurship (And How Everything Will Change)," an event hosted by UC Berkeley and The Atlantic.

"There are certain things that require an economy of scale," said Rattner regarding chip manufacturing. "We are very likely to see chip factories that shift from making a few designs at very high volume to make hundreds or thousands of designs in low volume."

"What has happened in the last 20 to 25 years is that it has gotten that much harder to justify to shareholders spending that kind of money just to get fundamental research done," said Rattner. "Timelines have moved in. And the most important thing is that people have to think less about invention and more about innovation...getting the idea to a form where a product organization can engage and turn that thing into something you can sell."

Top image: CITRIS Berkeley

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New Wearables Face the Same Old Challenges

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New Computer History Museum exhibit showcases evolution of wearables.

While wearables may be the latest rising trend, the concept of technology that can be worn on one's body has actually been around for decades. Some of those original concepts even faced the same challenges that current devices currently are up against. A new exhibit, "On You: A Story of Wearable Computing" at the Computer History Museum in Mountain View, California, showcases how wearables have evolved and overcome many challenges during that time.

In 2001, Thad Starner, who was part of the original MIT "borg," founder and director of the Contextual Computing Group at Georgia Tech's College of Computing, where he is also a professor, and co-curator of the exhibit, published an article in IEEE Micro that outlined the challenges of wearable computing at that time. In the paper, Starner presented several critical challenges facing wearable computing including power and heat, networking, mobile input, and display, each of which is showcased at the exhibit, complete with wearable examples of the time.

Clint Zeagler, co-curator and co-designer of the "On You: A Story of Wearable Computing" show at the Computer History Museum.

It turns out, many of the challenges confronting developers of wearables in the past decades still hold true today. But smaller circuitry, advanced power and communications capabilities, and better graphical outputs have turned the field of wearable computing into a skyrocketing movement.

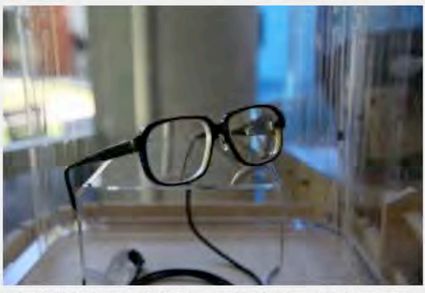
"The show is a really good retrospective of how we met the challenges along the way to be able to get the device that you can wear," explains co-curator and co-designer of the exhibit, Clint Zeagler, who is a research scientist at Georgia Tech's Interactive Media Technology Center.

Connectivity is Key

According to Zeagler, wearable computing early on had vast challenges. "There was no cloud in the early '90s," says Zeagler. "We went from a motorcycle battery to something that is one-fourth of the size." Mobile input was another hurdle, especially when coupled with minimal or lack of connectivity.

"If I want to have a mobile computer, one of the things that I want to be able to do is give input to that computer while I'm walking, otherwise I'm wearing it, but I'm having to stand in one spot," explains Zeagler. Connected wearable users 15 years ago had to use a "bag phone" to be able to get a signal to a connected wearable, but "if you moved 3 feet then everything had to be reconfigured," says Zeagler.

The trend to build wearable computing sprouted up across the globe, primarily driven by the military, academia and medical industries as well as makers who were creating their own wearable systems for personal use. Many of these inventions are on display at the show.



Designed by Mark Spitzer in 1997 for Thad Starner, the MicroOptical prescriptive glasses can be viewed as a precursor to Google Glass.

Several of the items at the show are one-of-a-kind inventions, including a pair of prescriptive glasses designed by Mark Spitzer in 1997. Specially made for Starner, the glasses sported a monochrome display that had a 9-degree field of view and a 320 x 240 pixel resolution. The LCD panel in the earpiece had its image projected and reflected through the lens and is quite similar in design to Google Glass. According to Zeagler, Starner wore the glasses for only a couple of months because the weight of the glasses kept causing it to slide off his face, impairing the viewing of the display.

The FIDO, an academic prototype, explored the idea for canine wearables to assist in the communication between service dogs and their handlers.

There are even wearables for dogs on display at the exhibit. The Fido Project, which Zeagler worked on in 2013, examined ways for assistance and rescue dogs to use wearables to better communicate with their handlers. According to Zeagler, the designers were faced with a similar human interface challenge but this time with canines. Tug and bite interfaces were tested, with the team eventually finding that a bite interface, using a capacitive air bladder (not on display at the show), had the most effective performance.

A Look to the Future

While the exhibit aims to look back at the evolution and challenges in the wearable space, it also provides glimpses of the future.

"If you talk about consumer wearables, most of what is out there right now are fitness tracking devices," says Zeagler. "There were a lot of people in academics trying to log their activity. But then when they got that data, it was a bunch of numbers. An academic can look at those numbers and say 'oh, I did a lot of walking this day' but the general public doesn't want to look at just a stream of numbers."

Zeagler says the industrial, product and experience designers helped evolve academic design into producing "an output that gives an experience that is helpful to the individual." Zeagler believes the next evolution similar to fitness trackers will come with heads-up displays. He also thinks the fashion industry, using "fully integrated garments where the technology is actually woven into the fabric of the garment" will be a huge disruptive force to the wearable marketplace.

Some older wearables, including the Herbert 3 design in 1994 by Greg Priest-Dorman, were quite bulky because of the components.

While Zeagler believes wearables could detach from the smartphone, no device will be completely autonomous from the network – wearable devices must connect to something eventually, whether it is a smartphone or directly to the cloud. What will change are the form factors, the size and inevitably, the function.

"The thing about wearables is that we have a cellphone that will do everything that we want it to do," says Zeagler. "I think what you will see with wearable technology is peripherals that start to interface with that. I don't think it will be one killer use or application; it's going to be a killer existence."

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Intel's Automotive Technology Center Built for Speed, Innovation

June 23, 2015 Share

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Accelerating software and hardware production cycles from the hotbed of the auto industry in southern Germany

In the southwest corner of Germany, away from Intel's various offices in and around Munich, a small team of Intel engineers are developing automotive technology using a novel new approach to Intel's traditional hardware and software development cycles.

The Intel Automotive Innovation and Product Development Center was established in 2012 in Karlsruhe, Germany, a hotbed of automotive industry and just a few hours away from major car manufacturers like BMW, Mercedes-Benz, Audi and Volkswagen as well as major suppliers like Bosch and Continental.

Intel engineers (L-R) Kevin Murphy, Rolland Pieper, Marco Demezzi, and Ralph Wittmann inside the underground garage with a pre-production Jaguar XJ.

The center employs a hundred automotive engineers, over 40 percent of whom have Ph.D.s, and covers all aspects of automotive technology design, including hardware, software, silicon and consulting. They have produced and implemented several reference designs to date and have been instrumental in getting Intel inside future models from Jaguar, Toyota, Hyundai, among others.

The center even includes a secure car park/test driving area and an underground garage designed to allow Intel and its partners and customers test and showcase the technology being developed there.

Focused on in-vehicle infotainment (IVI) and telematics, and most recently the IVI brains within the 2016 Jaguar XF sports sedan and 2016 Jaguar XJ luxury sedan that the British car company calls "InControl Touch Pro," Intel engineers have produced several automotive solutions while adhering to rigorous and stringent automotive quality requirements that are second only to military requirements.

But potentially more surprising is the detour Intel took from its traditional silicon, hardware and software development cycles in order to meet aggressive production cycles outlined by the automotive industry.

Adapting to Rapid Technology Cycles

In the automotive industry, timelines are different than silicon production cycles for traditional computing, so the design team had to adapt to match up with the development cycles of new vehicles.

"To make sure our silicon could intercept the timeline [the car manufacturers] needed, we had to come up with innovative approaches...to allow Intel to release silicon earlier outside the company," explains Kevin Murphy, engineering director and site manager at Intel's Automotive Center. This allowed car and equipment manufacturers to test the hardware and software and configure their applications. Releasing out of cycle was termed the "good-enough silicon approach" and is now used routinely across Intel when an accelerated customer schedule must be met.

Kevin Murphy is the engineering director and site manager at Intel's Automotive Center.

Intel's software approach also had to be transformed to match the release schedule for car manufacturers.

"They want features released early, iterated often, so they have multiple times, multiple touch points and multiple opportunities to give feedback on how they want the feature to evolve," says Murphy. "We came up with a whole different software development methodology – basically we were doing one major release per month."

Part of the accelerated release cycle was developing a continuous integration environment where the software team can compile and deliver a new software image every 24 hours. This new process received several software quality awards as a result, including Intel being the only non-automotive qualified supplier to receive an "A" quality audit rating by leading tier-one auto suppliers from Bosch, Denso and Magneti Marelli.

Intel's In-Vehicle Infotainment Innovations

"What we provide today is an IVI reference system that the car customers can adopt," says Murphy. "It will accelerate their adoption of Intel technology into the car but also the adoption of their new technology into their lifecycle so they can go to market much faster with our reference design."

The BMW i3 electric vehicle utilizes an Intel processor and is manufactured in Leipzig, about 320 miles from the Intel Automotive Center in Karlsruhe.

Intel aims to differentiate from others in the market such as Nvidia and Qualcomm by providing an all-in-one solution consisting of hardware, software, silicon and technical consulting as a "system-level sale," says Murphy.

The center has generated over 30 patents (either filed or in review) and engineered an "instantly on" IVI system that boots up in less than two seconds. Fast boot is critical for today's automotive features such as a rearview camera, which has to be available as soon as a driver starts the car.

"Because the car is a safety-critical device, we wanted to get that system to come up really fast, and we wanted to take the image from the camera on that system really fast as well," explains Murphy. "To do that, we had to come up with the technology that we call the 'Instant-On Startup Capability.' The whole IVI system will come up in two seconds and, as part of that, it will render the image from the rear camera onto the display. In PC language, that's a complete cold-boot startup."

Murphy says it took his team about a year and a half to reduce the startup time from today's 15 seconds typical of a Linux PC to under two seconds through optimizations of the kernel and only having critical systems as part of the boot up process.

Bringing Ethernet to the Car

Murphy and his team have also been working on how to handle audio and video signals inside the vehicle. Today's cars typically have miles of cabling , but the Intel automotive team replaced proprietary cabling with an Ethernet-based system to distribute the audio and video signals, thus standardizing the system, reducing weight and lowering costs. Murphy said the team also developed an innovative way to bridge and synchronize the A/V streams, a first, according to Murphy, for any connected car.

A reference design that contains the processor and memory required to run the in-vehicle infotainment (IVI) in a car. It's the first system built with Ethernet audio and video bridging (AVB), replacing a glut of wires with a single cable to each display in the car. It can also receive input data from devices such as cameras.

Among the first vehicles to deploy the audio video bridging (AVB) technology will be the 2016 Jaguar XF sedan.

"When we went about designing this together with Intel, we went about it the way a technology company would do, not a car company," said Chris McKinnon, product marketing director at Jaguar, about the technology in the 2016 Jaguar XF sedan. "And we really thought about the end user who are used to using tablets and expecting a swift response, touch and swipe technology, and that's what we have with the InControl Touch Pro. It's based around a 10.2-inch screen. It has quad-core processors from Intel. And really delivers a number of unique features."

Intel's Automotive History in Germany

While Intel has provided silicon for various automotive solutions for several years out of its embedded technology group, now known as the Internet of Things Group, the automotive segment became a significant new focus in 2010, according to Murphy.

Indeed, the connected car and autonomous driving technologies have spurred rapid growth over the last several years, with more than 80 percent of the innovation and new features attributed to electronics, according to PwC BI Intelligence estimates that revenue from automotive connected services is expected to reach $152 billion by 2020.

The 2015 Hyundai Genesis packs a 1.3GHz Intel Atom E660 with GMA 600 graphics and a 64GB SSD to run its in-vehicle infotainment (IVI) system.

"We wanted to create a worldwide automotive product innovation center, and R&D center, and we decided to locate that in Germany because the bulk of the innovation today for the car industry is centered out of Germany," explains Murphy. "We wanted an independent site from sites that Intel already operates in Germany."

Wind River, a subsidiary of Intel, also works with the design center, providing an additional 50 to 100 engineers in an automotive center of excellence in Romania.

Murphy and team aren't putting on the brakes on innovation despite some recent design wins. Working in the same space as some other technology companies, such as Nvidia, the team is looking at replacing hydro-mechanical gauges with software-based instrumentation. In addition to reducing weight, electronic gauges offer customization options for both the driver and manufacturer.

Murphy also proposes rear- and side-view cameras that pipe the images through the existing IVI infrastructure so drivers can look forward to having 270-degree visual coverage of the sides and rear of their vehicles.

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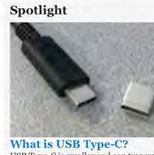

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The Universal Stylus is Coming

June 11, 2015 **Share** Like 8+1 TAKE THIS CONTENT

Tech companies are working together to create a stylus standard that would work across multiple devices.

Unlike the mouse and keyboard, which can be used with just about any PC or laptop thanks to standards such as USB, the active stylus is typically designed for use only with its intended companion device. But the Universal Stylus Initiative (USI) organization is penning ways to break the barriers of the proprietary stylus tied to a particular device.

Penning standards

In 2014, Intel realized the active stylus marketplace had opportunity to grow while improving end-user experience and driving down costs for manufacturers. At the Intel Developer Forum 2014, Intel met with OEM and touch hardware vendors to create an initiative to bring ubiquity to styluses. Along with Intel, they formed what is now the Universal Stylus Initiative. Current participants of the initiative include Lenovo, Synaptics, Wacom, Atmel, Pentech, Sharp, Silicon Integrated Systems, Waltop, Dell, EETI, ELAN, FocalTech Systems, Primax, Weida Hi-Tech, Solid Year, with more expected to join.

Arvind Kumar, senior principal engineer within Intel's client computing group (CCG) and technical session chair of USI, speaks at a USI meeting in Taipei, Taiwan.

At a recent meeting in Taipei, Taiwan, members of USI agreed upon portions of the 0.3 version of the technical specification, which standardizes features such as a common discovery mechanism and packet formats to communicate inputs like pressure or button presses.

"If a user bought a Microsoft Surface Pro with a stylus, a Samsung Galaxy tablet with stylus, a Lenovo ThinkPad with a stylus, they all will have a stylus that will only work with that device," explains Arvind Kumar, senior principal engineer within Intel's client computing group (CCG) and technical session chair of USI. "USI will create an industry standard that will allow any pen/stylus manufacturer to make a universal stylus that will work with all USI compatible devices."

Kumar asserts the stylus is gaining traction as an input device. He equates a touch interface to a mouse where users can pick and choose, drag and drop items on a display. A stylus, on the other hand, is more of a keyboard replacement. Kumar believes someday soon you will be able to write your password using a stylus rather than relying on a virtual or physical keyboard.

"Writing is becoming a first-class experience," explains Kumar. "You simply can't write with your finger."

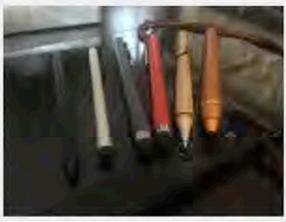
Kumar outlines three areas to create a successful active stylus ecosystem: the experience must be better; there must be universal interoperability; and there must be robust application and operating system support.

A demonstration of the fine control required for drawings and calligraphy on a digital device.

"We want to make sure that we enable the best handwriting and touch experience on our platforms," says Kumar. "We want users to have a fluid and flowing natural writing experience. We are doing part of this with Intel Precise Touch technology on our platforms. Interoperability is another aspect of the usability. We are leveraging the initiative to solve this problem. This will lead to a greater adoption of styluses in the market. It will lead to a greater number of writing applications."

Evolving the stylus

The active stylus differs from a traditional or passive stylus. Passive styluses are electrically conductive, do not have battery power, and merely act like a fine-tipped finger, while active styluses typically have battery power, may have additional functions tied to buttons, can transmit pressure and other information, and be extremely precise.



A collection of both active and passive styluses.

"We would like to make ourselves useful in establishing a meaningful environment in which customers and users can freely manipulate digital pens on mobile devices to do creative things very casually," says Nobutaka Ide, vice president of Wacom's technology solution marketing. "Computers were manipulated by keyboards and mice, but creative professionals have been heavily relying on pen to unleash their creativity on PCs for their works. The same applies to mobile devices. Touch control is available on mobile devices, but finger touch is only good for selecting icons or consuming content."

End users desire a more ubiquitous approach where an active stylus or pen would work on multiple systems regardless of the manufacturer, says Kumar. Similarly, there is a desire by the stylus industry for broader penetration, which requires a collaboration and agreement by manufacturers, according to Kumar.

"As the IT industry and customers' ability to manipulate their devices mature, we believe the stylus, the most intuitive tool in human history, is about to gain momentum rapidly among mobile products," says Ide. "To facilitate digital pen's penetration, industry collaboration is vitally important, and we think the Universal Stylus Initiative can support it."

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Smart Chicken Coop: Hacking the Henhouse

June 5, 2015 **Share** Like +1 TAKE THIS CONTENT

Small-scale farming gets smart and connected with chips, development boards, RFID tags, and webcams

While homes are slowly adopting the Internet of Things, clever makers have wired up their urban farms in their backyards. Ann Nelson wanted to connect what some call her "Taj Mahal" of chicken coops to get a better sense as to what her poultry was up to.

"This was just a fun project I made up to win a Galileo board in a New Mexico site competition," says Nelson, an Intel IT technical project manager in New Mexico. Galileo is a small microcontroller development board based on the Intel Quark apps processor that enables simple, interactive system designs. Initially envisioned as a means to determine which hens were laying the most eggs, Nelson's project evolved into a much more intricate design, complete with RFID bands for the chickens, webcams for remote monitoring and weight sensors within the nesting boxes.

The coop is wired with Cat5 cables that run to the house. coop. The green box is a sprinkler system controller for the yard that grows food for the chickens.

Nelson's poultry property consists of three areas:

- the coop – a 6-foot by 16-foot screened and roofed environment,
- the henhouse – a 6-foot by 4-foot structure containing the nesting box, and
- the large fenced area – consisting of two sections, 32 feet by 10 feet and 32 feet by 8 feet.

The nesting boxes, where the hens lay their eggs, is temperature controlled and also packs RFID readers and weight sensors.

The nesting box is where the majority of the technology roosts. There are three nesting boxes measuring 12 inches cubed, with one blocked off for technology use. An automatic heat lamp is tied to a temperature sensor connected to the Intel Galileo board, which turns on when the temperature drops below 30 degrees. The nesting boxes have RFID readers and weight sensors that track the contents inside and can determine if a hen has laid an egg. The doors on the nesting box are opened via servo motors, and the henhouse itself is attached to a gearbox motor and a paint roller.

And, of course, the entire environment has webcams, one each in the henhouse, coop and yard to remotely monitor chicken commotion via the web. Nelson's mother, who lives in Minnesota, periodically checks on the chickens throughout the day.

The flock consists of four hens she got from a county fair and a rooster that was "a pity purchase rescue from a feed store." The rooster, a bantam and actually the smallest of the group, is appropriately named "Goliath." The hens' names come from their physical attributes: "the multicolored one," "the black one with the weird tail," "the orange neck one," and "the broody white one."

Tech pecking order

But, just like any farm, repairs and upgrades are always needed to overcome challenges or failure. The RFID reader seems to work only 30 percent of the time, and the chickens are partly to blame for this. "I can't teach the chickens to wave their ankles at the RFID reader," says Nelson.

A hen with an RFID leg band, which doesn't work all the time due to the chickens. "I can't teach the chickens to wave their ankles at the RFID reader," says Nelson.

A particularly hot (120 degree) summer day fried out the Wi-Fi repeater, forcing Nelson to run Cat5 cable from the web cameras to an Ethernet switch in the coop, and from the switch to her home router. She plans to add cooling holes and an automatic fan to prevent future overheating.

Future upgrades to the IoT coop may include using an Intel Curie module as a chicken health and activity tracker as well as Bluetooth for chicken identification.

"I have a whole list of future add-ons: water and food alerting system, tweet when someone lays an egg," says Nelson. "I would like to have a working identification system – 'hen No. 1 laid a 1.6-ounce egg in nesting box A at 2:13 p.m.' – so much to do and learn, so little time."

The Galileo, a scale and RFI setup. Nelson details, "The scales have 4 load sensors each. Each load sensor has 3 wires, and is ½ of a wheatstone. I joined two load sensors to make 1 wheatstone bridge and connect each wheatstone bridge to an instrumentation amplifier (TI INA125p). I calibrated the voltage output of the amplifiers to known egg weights and hen weights."

Nelson believes her chicken coop automation system could have practical enterprise uses, for example to check the chemical levels in tanks by weight in a facility.

For now, however, Nelson is focusing on her backyard. She has been integrating her chicken coop with programming using C, Python, PHP and HTML. Nelson's project is among a growing trend of wired henhouses, ranging from extremely geeky using an Arduino development board to quite elegant in their design.

"I think a chicken coop is a great learning platform – low risk and so much potential," says Nelson. "It is a platform for learning and exploring new technologies, new for me. All this development is slow, as I really am making it up as I go along. Thank heaven for open source information and code!

"Besides, chickens just by themselves are so much fun and humorous. Why would three, 5-pound birds squeeze into one square-foot nesting box?"

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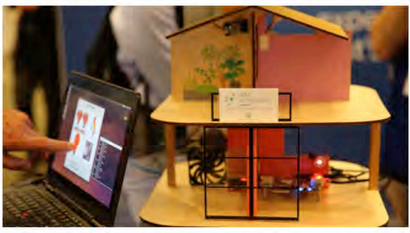


Enabling IoT in the home could depend on connecting legacy systems

Major players in the computing industry expect tremendous opportunity in the Internet of Things (IoT) and are rapidly developing new products and services. But while the demand for IoT exists from businesses, consumer uptake may not keep pace.

Currently 4 percent of consumers own an IoT device in their homes, and nearly two-thirds plan to buy one in the next five years, according to a 2014 study by Acquity Group. Despite the on-going hype, there are some who aren't as confident in the steady consumer adoption of IoT devices in the home. Michael Holdmann, CEO of ConnectingYourThings, says consumer adoption has actually slowed.

Ashish Dua, co-founder of Switchmate, believes consumers have little motivation to replace existing, perfectly functional devices with IoT-enabled ones. "The way we think adoption is going to be driven is by reducing the barrier to installation by making it simple," says Dua.

Switchmate was among the 150 exhibitors at IoT World 2015, the world's largest event of its kind with over 4,000 attendees, showcasing connectivity, hubs, sensors, and back-end management services and data analytics solutions.

A visible trend that emerged from the show was retrofitting legacy hardware, with several vendors showcasing devices and services allowing for older, non-smart and non-connected objects to become IoT-enabled.

Switching on IoT

Switchmate, which recently completed Indigogo funding, aims to enable IoT initially within traditional homes and apartments. The company demonstrated an Internet-connected device that fits on top of existing wall switches, enabling the turning on and off of lights via a smartphone app.

Switchmate is an Internet-connected device that fit on top of existing wall switches, enabling the turning on and off of lights via a smartphone app.

"With products that are out there today, there is that level of installation that is required and we want to remove that," says Andy Landles of Switchmate. "We think that will increase the adoption rate of the smart home today, and that anyone who wants to use smart home products, can."

The initial version of Switchmate is Bluetooth-only, but an Internet-connected hub to allow connectivity remotely is under development. What's unique about this IoT light switch is that it simply snaps on top of existing switches, which is particularly appealing to those people who may not be DIYers or those residents who aren't allowed to make modifications to their living environment, like renters.

"What we believe the trend in IoT is right now is that there is only a 2 percent adoption rate in IoT, and those of us being in the [San Francisco] Bay Area believe that it could be more than that," says Dua.

Landles says other similar types of devices are coming, ones that can be simply integrated with existing infrastructure without complicated installation, such as heating or cooling duct vents that automatically open or close.

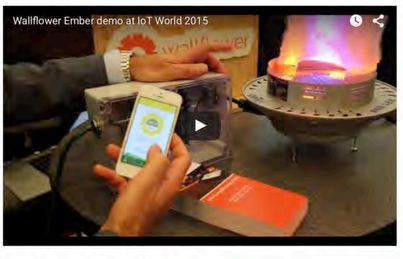
Connected Cooker

Another company, Wallflower, also aims to retrofit existing appliances present in a majority of households that may not be Internet-enabled or IoT-connected in the first place, namely the stove or cooktop. According to Victor Jablokov, CEO of Wallflower, the No. 1 cause of home fires in the United States is unattended stovetops. Its IoT device aims to prevent this and can be retrofitted onto existing stoves.

"We, essentially, are providing a device that will make something that has never been smart, smart. And it's retrofittable to any stove in the marketplace – no matter if it's 30 years old or brand new," says Jablokov.

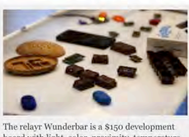
The Wallflower Ember is a device which that with either electric or gas stoves and could help prevent fires.

The Wallflower Ember is a device that works with either electric or gas stoves. While it's a bit more complicated to connect the gas version, says Wallflower Vice President of Hardware Engineering Iain McDonald, both the electric and gas versions produce the same results. If a stove is left on past a predefined time, users are notified via an alert to their smartphone. They can choose to ignore the alert or extend the time threshold, should what's on the stove be merely simmering. Or they can initiate a remote shut off of the gas or electricity to prevent a fire. Jablokov says insurance companies are particularly interested in the product, which could be sold through these insurance companies or used to provide rate discounts on homeowners insurance should they be installed.



Making IoT Sweet and Easy for Developers

Another exhibitor at IoT World 2015 sought to lower the barrier of entry for those interested in creating solutions. Relayr Co-Founder Jackson Bond believes it is critical for there to be relatively little friction to entry when developing for IoT.



The relayr Wunderbar is a $150 development board with light, color, proximity, temperature, humidity, sound, gyroscope and accelerometer sensors.

"Like so many technological revolutions, it is all about the tools," says Bond. "If the tools are easy enough for the right people, then you are going to start having solutions built."

Relayr provides both software as a cloud-based back-end IoT service and a $150 development board with light, color, proximity, temperature, humidity, sound, gyroscope and accelerometer sensors, all cutely packaged and themed as the WunderBar, complete with Willy Wonka-esque fonts. Relayr's goal in developing the kit, explains Bond, was to basically break out all of the sensors currently contained in smartphones, allowing developers to place sensors practically anywhere.

"If you can take those sensors out of the phone, be completely modular and take those sensors and put them on anything you want without knowing anything about electronics, and you can start programming those sensors against that sensor data from any thing around you, well that would be amazing," explains Bond.

Bonds says BSH Hausgeräte GmbH, which includes Bosch and Siemens brands, is working with relayr technology to explore connecting 400 million devices that are currently not connected.

"Most of their devices are still dumb, and I'm not going to change my working dishwasher for the next 10 years because it works," says Bond. "But you could still provide sensors that you just attach to the thing to collect that data, which would be very valuable for future product development...it's sort of a retrofit idea."

Legacy systems are prevalent not only within corporations but also in the home, and potentially represent a marketplace in which decision-makers are non-early adopters or are those reluctant to incur huge capital expenses installing completely new connected systems. Retrofitting and mapping of legacy systems could be the solution.

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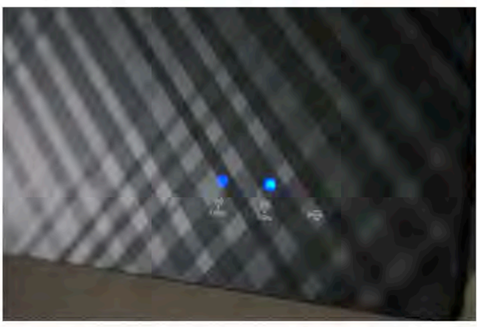

Little changes to a work or home environment can dramatically improve a wireless network.

Anyone who has a wireless network at home knows that performance can be variable. There are several things that can be done to optimize a Wi-Fi environment, from simply placing the Wi-Fi router higher up to changing the type of wireless encryption the router is using.

1. Bad router location

If the router is on the floor or under a desk, get it to a higher location. For better performance, have it at least five feet off of the ground. If possible, ensure a clear line of sight. Wi-Fi signals travel in a circular pattern outward which means that it should be centered in the room needing coverage. If the router is mounted on a ceiling, Intel wireless expert Eric McLaughlin suggests making sure that the antennas are pointed down and in different directions from each other.

Routers should be placed up high in a central location for best performance.

2. Too many wireless devices

The more wireless devices demanding bandwidth from the Wi-Fi router, the lower the transmission speed. If there are many devices in use streaming multimedia, for example, the bandwidth supplied by the Internet Service Provider (ISP) may reach its peak, potentially resulting in inadequate speed for some connected devices. McLaughlin suggests moving from an 802.11b/g/n router to one of the new 802.11ac routers, which will increase bandwidth and capacity on your network.

3. Check the furniture or move your device

Any time furniture is moved, it affects the Wi-Fi wave emanating from the Wi-Fi router. If signal degrades and furniture was recently moved, either the router position should be changed or the furniture moved again. "You can also re-orient your laptop or other Wi-Fi device," says McLaughlin. "Studies show that even small movements – shifting a couple inches left or right, up or down- can either impact or benefit your Wi-Fi experience by as much as 30 to 60 percent."

4. Physical barriers

Walls, doors, mirrors and other physical items can also reflect the wireless signals coming from the router. Sometimes even the least obvious items can be culprits in causing degraded Wi-Fi signals. Look at mirrors or pictures or book cases to see if they are potentially blocking signals. "Floors or ceilings also impact Wi-Fi experience," McLaughlin points out. "If you're not getting good coverage or throughput on your network, move the router either upstairs or down and try again."

5. Other competing devices

Keep in mind that there are many other devices that emanate wireless signals. Cordless phones, microwaves, televisions, Bluetooth devices, baby monitors and more can potentially affect Wi-Fi signals. Ideally, the router should be located away from competing devices. "Step away from the microwave, or the cordless phone while in a Wi-Fi session and you should see almost immediate improvement," adds McLaughlin.

Other wireless devices can interfere with a Wi-Fi signal.

6. Watch the "Dead Zones"

No home is without areas where Wi-Fi coverage is spotty. This could be due to the placement of furniture or where the Wi-Fi router is positioned. There are ways to eliminate areas of bad coverage by using an additional Wi-Fi router or using a Wi-Fi extender which piggy-backs on existing Wi-Fi coverage by "daisy chaining" your coverage. More streams (or antennas) in your router helps with range and dead spots. McLaughlin recommends buying a 3 or 4 stream router if Wi-Fi connections are vital to you in your home.

7. What's the Frequency?

There are two main frequencies for Wi-Fi signals, 2.4 GHz and 5 GHz. The older standard, 2.4 GHz is much more crowded, meaning there are other devices that may overlap or share the frequency. This can potentially slow down connectivity speeds. "The single biggest thing you can do to increase Wi-Fi experience is move your connection to 5 GHz," says McLaughlin. "While there can be some impact to range, the overall benefit is substantial because there are few competing devices."

Also, within each frequency, there are channels that can be automatically selected by the Wi-Fi router as being interference-free, or the channels can be selected manually. There are many applications that can audit a Wi-Fi environment to see all conflicting channels or channels with more overlap.

8. Old Equipment

If a Wi-Fi router frequently has to be rebooted or restarted, it may be time to invest in a new Wi-Fi router that supports new standards such as 802.11ac, which adds to 802.11 a/b/g/n. Some Wi-Fi routers have multiple antennae, which allows capacity to be aggregated to have a faster combined speed for supported devices, potentially up to 6.77 Gbit/second.

Old hardware may benefit from a firmware update, or may be due for a replacement.

9. It's the Network

Speeds could be throttled if the connection between the ISP modem (cable, DSL or fiber) is constrained. Ensure that the modem and the router have Gigabit Ethernet speeds, otherwise true throughput could be slower than what is paid for. Also, make sure the modem supports the latest protocols – e.g., DOCSIS 3.0 for cable modems. "For the time being, your internet connection will be your bottleneck," McLaughlin says. "Check out what your family members are doing if you are seeing slow network performance; if they are streaming video or are taxing your internet connection and your network."

10. Update Firmware and Drivers

Manufacturers of Wi-Fi cards and routers often optimize and update the software that powers Wi-Fi cards and routers. Features and fixes are often released to make the Wi-Fi experience better and potentially faster.

"Wi-Fi bugs and issues are notoriously difficult to find because there are so many variables. Getting up to date means you are taking advantage of testing and fixing done by Intel, OEMs, users, corporations, etc. so you'll get the benefit of someone else finding your bug," says McLaughlin.

Bonus: Tweak the Settings

Many Wi-Fi routers can optimize and prioritize certain types of traffic. That is to say, multimedia or gaming streams can be given priority over standard web browsing or email for example. "One interesting thing on some of the newer routers is QoS (Quality of Service)," suggest McLaughlin. "It's not very user-friendly, but can optimize your overall network performance. For example, you can prioritize video, voice, or gaming traffic. The router then allocates bandwidth and prioritizes accordingly."

The encryption method can also impact speed. On 802.11n and 802.11ac routers, it's best to choose WPA2 with AES encryption to get the best speed, as using the older WEP and WPA security with TKIP encryption will reduce throughput.

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Working Toward the Internet of All the Things

With the chance to connect "sensor to the cloud in every industry on the planet," Rose Schooler believes the Internet of Things (IoT) opportunity is massive. But interoperability, along with provisioning and managing these devices, are critical factors for success.

Schooler is vice president of the Internet of Things Group and general manager of the IoT Strategy and Technology Office at Intel. Her organization is responsible for delivering platforms for the networking and storage market segments as well as providing solutions for telecommunications service providers.

Schooler, who recently spoke to over 1,000 attendees at IoT World in San Francisco, California, sat down to discuss her work and what she thinks is required for companies to be successful in the often-hyped world of IoT.

Question: What recommendations would you have for developers who want to get into the IoT space?

***Rose Schooler**: I recommend this to anybody in any market at any time. This is generic but pretty important. You have got to focus on some kind of end user interest or problem. You have to either improve the way they live, you have to help them save money or make money or improve customer experience. And I think if you start with those kind of basic end-user tenets, and build your solution based on solving a problem in that domain, I think that is step one. Step two is then how do you leverage whatever is available that is out there that is horizontal, that is scalable, and somewhat open source – because the more open, the more interoperable, the more industry validation has been done of the interfaces, I would look to not stand up something that's very vertical or very proprietary, but look to see what you can do with what is open standards-based, horizontal platforms.*

Q: What's needed for successful IoT solutions?

***Schooler**: I think to successfully deploy an IoT solution, you have to create ease-of-use and scalability from the sensor to the gateway to the network to the cloud, and have the ability to run analytics either on the edge or in the data center. I don't think that one takes precedence over the other, though I would say that if you can't connect the device, you are kind of stopped in your tracks there.*

Q: Is there one area that is of more importance for developers working on IoT?

Schooler delivers the opening keynote at IoT World 2015 in San Francisco, California.

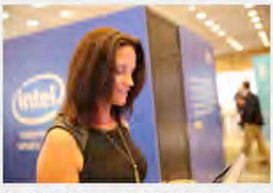
***Schooler**: The ability to have devices connect to the network seamlessly, support multiple protocols, and easily ingest data off of the things – I wouldn't call more important – but I would call 'step one' in the evolution of enabling IoT solutions. And then once you can connect that device, identify it, provision it, and manage it you can also look at how security is a critical foundational element from sensor to gateway to network to cloud. You need to be able to harden the device, secure the data transmission, and make sure you are monitoring and managing in real-time your security performance throughout your end-to-end solution.*

Q: What have you seen from IoT that really excites you?

***Schooler:** Some of the initial adoption pilots or use cases that you see are around how people are transforming their businesses, how are they becoming more efficient with their utilization of their assets, and I think those are great use cases, but what really excites me emotionally is how IoT can help solve some of the big global challenges that we see in front of us today, around the fact that if we look ahead at a population of 10 billion people in 2040, we are going to need to produce 70 percent more food than we produce today, we are going to consume 56 percent more energy, we are going to have a much bigger set of carbon dioxide emissions. So how can we use technology building blocks configured to IoT solutions to not only transform businesses but to also help solve some of the global challenges.*

Q: With so many emerging technologies and opportunities in IoT, how will everything be able to talk to each other? Will it take cooperation among major players to steer things in a common direction?

***Schooler**: When you look at how massive this IoT opportunity is, it's literally sensor to cloud in every industry on the planet. So you are trying to create an über horizontal platform and the über scale experience. You are not going to get 100 percent of that. You are still going to have some uniqueness at the sensor, you are going to have some uniqueness at the application. But everybody looks at that opportunity and says if it were a bingo card, I can play 'cover all'. I have got to figure out if I'm going to go for a postage stamp or if I'm going to try and get regular bingo. As people do that, they say 'if I'm going to try to do that and get a regular bingo, then if I'm going to fill out the rest of the card, I'm going to need the rest of the ecosystem to do so'. I do believe that there is still some room for improvement, on isolating and identifying and pulling together the critical set of standards bodies – there are a million of them right now and we need to start focusing on the ones that are really going to drive the industry forward and accelerate the opportunity.*



Rose Schooler has worked at Intel for over 25 years, initially joining as a graduate rotation engineer. She later had roles as a fab process engineer and director of marketing before working on IoT.

Q: What is Intel doing in this space?

***Schooler**: From a solution perspective [Intel] is trying to cover the bingo card. But we aren't going to be the ones that provide all of the chips. We are going to have to go for help. Intel has an unsurpassed, scalable silicon story. When you look ahead from Curie to Quark to Atom to Core to Xeon, we have the most comprehensive silicon portfolio in the industry. Add to that the software assets we get from McAfee and Wind River, and a strong interest and desire to extend security both in silicon and software from sensor to cloud. In addition to that, we have a history of defining platforms that deliver scale. We have a history of building ecosystems and we have a history of standing up use cases quickly where we can iterate and learn repeatedly. That is what we can bring to bear on IoT.*

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Are Bodies Good Passwords?

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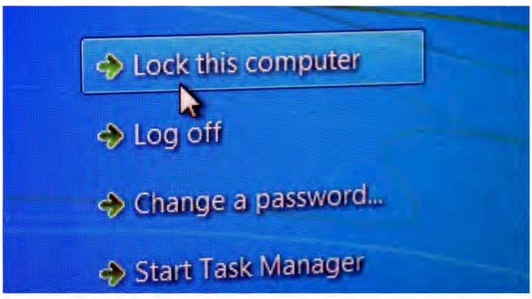
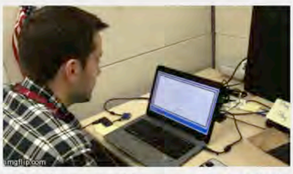


Traditional passwords are not secure; could biometrics be the solution?

The current system of simple passwords "have simply run out of steam," believes Richard Reiner, vice president of technology at Safe Identity within Intel Security. "[Passwords] don't scale to the situation we have today where every user has dozens or hundreds of sites and apps they need to log in to. [Passwords] can be hijacked easily by malware, and whole databases of passwords are stolen from sites by hackers and then cracked offline."

Some sites and services such as Google, Facebook and Twitter offer greater security with two-factor authentication, where an SMS authentication code is required along with a password. But Reiner states that "these systems are all a little different, are a little complex to set up and to use, and are only accepted by a tiny percentage of consumers."



Intel employee Ryan Bell demonstrates True Key's facial recognition from Intel Security using an HP EliteBook 850.

"A good authentication system is convenient, easy to use, and highly secure," says Reiner, adding that flexibility is important too to scale between less intrusive authentication methods, such as for casual reading apps, to highly sensitive data protection, such as for banking. "For the newspaper app, it might, for example, know that the user is on her home Wi-Fi network, and use that fact — without bothering the user to type or do anything — to unlock the app. For the bank site, it might authenticate the user by choosing the best biometric her device can support, whether that is facial recognition, fingerprint, iris scan, or something else."

Ironically, engineers and scientists have been studying where and how biometrics could augment authentication for more than a decade. According to a 2004 IEEE study, "An Introduction to Biometric Recognition," there were several factors identified as useful when considering biometrics, including universality, distinctiveness, permanence and acceptability.

More recently, security engineers are now using multiple points of reference for developing new authentication methodologies and systems: what you know, what you have and what you are.

"What you know" is traditional authentication, such as passwords and secrets. "What you have" simply consists of an authenticated device like a key-fob that has changing numbers, a wearable or a badge. The newest entrant is the "what you are" element, which is where biometrics come into play.

Biometric authentication

According to Pablo Piccolotto and Patricio Maller from Intel's Argentina software design center, there are some clear design principles that must be adhered to when creating new authentication methods using biometrics. Specifically, they must be secure and convenient, non-invasive and not so easy to use that it diminishes the perception of security.

"Technology needs to change in order to entice users to want to use it." -Kane Cheshire

Jason Martin, a security and privacy research engineer working in Intel Labs, believes there are two types of authentication technology having the most promise: human-to-device authentication and device-to-device or service authentication.

"On human-device, I'm very excited about the rate of novel biometric exploration, and the ways in which biometrics are being integrated into user expected flows," says Martin citing examples such as 3D facial recognition on desktop computers or fingerprint readers on mobile devices. "For wearables we're seeing new biometrics being explored based upon the biosensing capabilities brought about by even more personal devices."

Other examples of moving beyond the password include Microsoft's work on Windows 10 credentials where the password is actually replaced, as well as work by the FIDO Alliance.

Martin also points out that "the ubiquity of smartphones and eventually wearables ... opens up the possibility of replacing physical locking technologies."

The TouchID fingerprint reader on an iPhone can be used to unlock a MacBook Pro using MacID.

A good example of a system that uses these three factors in authentication is an Apple device-only third-party application called MacID. MacID uses a TouchID-enabled iPhone that allows users to unlock their compatible Apple computer using within-range iPhone's fingerprint scanner. After an initial Bluetooth pairing and password authentication on both devices, unlocking a Mac merely requires fingerprint authentication.

"Biometrics are awesome," says Kane Cheshire, the creator of MacID. "I know some people don't agree with them and that they should be used as usernames instead of passwords, but you only have to see the success of Touch ID and the biometric logins that Windows 10 will have to see it's going to be used more and more in the coming years."

Similarly, True Key, a new authentication service for consumers from Intel Security, conveniently pairs facial recognition or other biometric identifiers such as a fingerprint, the trusted devices owned or used by a user, and traditional password control to create a profile to allow for easier logging in on password-protected systems.

Challenges

Ramune Nagisetty, principal engineer within Intel Labs who is designing biometric wearables, cites three primary barriers to integrated biometric authentication systems: technology, business and user experience. In order for the technology to be successful, the solutions must be low power, have a small form factor, and work across a variety of devices, she says. The challenge, according to Nagisetty, will be in the sharing of identification and authentication schemes across vertical ecosystems, which could include cooperation between competing companies such as Apple, Google and Microsoft. Lastly, users fear an "Orwellian future," as Nagisetty puts it, where citizens are monitored and identified en masse, perhaps without their knowledge or acceptance.

"Multi-factor authentication solutions like True Key are the future." -Richard Reiner

Other concerns exist around the fact that it is impossible to change a user's physiological or behavioral characteristics. What if a fingerprint – something that can't be changed – is compromised? When using voice recognition, what if a user has a cold or lost his or her voice?

"Multi-factor authentication (MFA) solutions like True Key are the future," says Reiner. "By providing multiple forms of authentication, with an intelligent policy engine that can make decisions about the best way to authenticate a user with the best possible user experience, while protecting the user with the right level of security for what the user is trying to do, this approach can make users lives easier and more secure."

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Contextual Sensing: How Smartphones Will Learn About You

April 14, 2015 **Share** TAKE THIS CONTENT

New software development tools make sense of sensors to help mobile devices become more sensitive to user needs.

The 2013 film "Her" featured an operating system that could personalize itself to the user to the extent where the intelligence appeared anything but artificial. By taking cues from user data and its environment, the OS was able to respond to the user's needs, even on an emotional level. While "Her" was science fiction, progress in the area of contextual computing is bringing such intelligent systems one step closer to science fact.

A smartphone that's able to contextually sense an office environment may be able to automatically switch to silent mode.

From GPS sensors to accelerometers to gyroscopes, smartphones already have been capturing and utilizing sensor data to enrich a user's experience. Services such as Google Now combine user data with location to provide information on nearby attractions and travel times for calendar appointments, but much more can be done with smarter sensors.

For example, an ambient audio sensor along with calendar and location data could give a mobile device the contextual awareness to determine whether it can alert you with either an audible cue or a subtle vibration instead if you are in a meeting or movie theater.

Dedicated hardware listening to sensors

In 2012, Intel introduced a sensor hub, a low-power hardware solution dedicated to gathering data from multiple sensors. Other industry players recognized the value of a dedicated sensor hub and also developed solutions. In 2013, Apple integrated a sensor data-collecting M7 chip into the iPhone 5S and Qualcomm repurposed its Hexagon DSP to handle sensor data.

Intel has since incorporated sensor hubs into mobile-focused Atom chips such as Merrifield, Moorefield, and, most recently, Cherry Trail.

"The demand for the sensor hub is the awakening of contextual sensing where always-on sensing is required without [the smartphone] being engaged," says Claire Jackoski, sensor planner within the client components group at Intel.

Analytics firm IHS predicted 658.4 million sensor hubs shipped in 2014 and forecasts shipments to reach 1.3 billion units by 2017.

But what good is sensor hardware without the software to know what to do with it? To make sense of a collection a sensor data, developers need to put it into context.

Knowing who you are and what you're doing

"Humans are very contextual by nature," says Lama Nachman, senior principal engineer for User Experience Research, who runs the Anticipatory Computing Lab at Intel. "It's very hard to come into somebody's world without understanding the context."

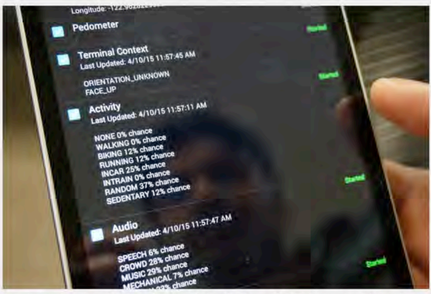
To this end, Nachman believes for contextual sensing technology to be adopted by users, the technology has to be able to learn proper behavior from users. Nachman likens this to a child's learning. As they make mistakes, "you have to teach them and then over time…you can see [them] evolve."

A visual overview of Rule Learner from the context sensing SDK.

To enable a device to learn the proper behavior of the individual user, it must be taught and trained, and it should also have the contextual awareness to do so. Intel is providing developers the tools to accomplish this with a contextual sensing software development kit (SDK) and underlying hardware.

Ned Hayes, product manager for the context sensing SDK and context service at Intel, outlines that context also needs to pass between devices to understand which device is active, such as switching from laptop to smartphone, as well as how it is being used, allowing better interpretation and prediction of activities. Software analyzes and extrapolates data coming from hardware – think of it as big data for small devices – and developers can programmatically present actions or outputs based on the intersection and understanding of various sensor data.

"If a developer wants to know everything that a user is doing, [they] need to know the user's context and create a narrative of the user's day," says Hayes. "Our system allows developers to have a holistic view of this user's behavior."



A testing app interprets data from the sensor hub and makes probabilistic guesses on the user's activity and environment.

Intel has taken numerous algorithms believed to be helpful for understanding a user's behavior and created on-device rules and context engines that operate within the sensor hub.

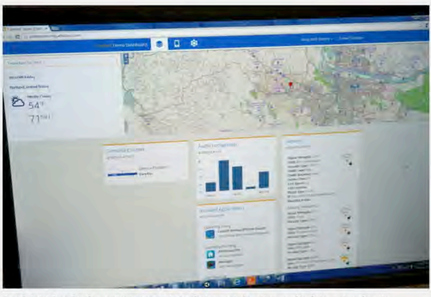
"Our intention is to make developers more productive and allow them to write an application that can run anywhere," explains Hayes.

Sensor hubs can make devices run better

Specialized always-on sensing chips are more efficient at their tasks than a general CPU, leading to overall power savings and decreased overhead for other systems to perform at greater capacity. But taking advantage of dedicated sensor hubs requires tweaks in software.

"All too often, these algorithms are not optimized to run in the sensor hub," says Hayes. "So if you are trying to do a pedometer, many of the systems out there haven't actually done the work to run it in the sensor hub as a separate call, so it is actually running in the CPU which runs down the battery and which means that depending on your connectivity and battery life, your phone life might not be as long, and the responsiveness might not be as good."

All is not lost should a device not have a sensor hub; a developer using the context sensing SDK can gracefully execute the code within the CPU. This makes a developer's work a bit easier as the context engine will run the appropriate code based on the hardware environment.



A web interface for the context sensing SDK that reports location, audio data, networks, etc.

The Atom-powered Asus ZenFone 2 is one of the first mobile devices to include the contextual sensor hub and associated software allowing it to respond to gestures using ZenMotion. Speaktoit, a "personal assistant" for smartphones and tablets, uses the context sensing SDK to augment its aid to go beyond the stock assistant features of Apple Siri, Google Now and Microsoft Cortana by allowing for customized commands, remembering places and services, and offering functions matching a user's location and schedule.

With the latest sensors now listening and learning where we are, what we are doing, and guessing what our next action or activity will be, it might not be too much longer before we have intelligent conversations with our smart devices.

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The Looming IoT Energy Drain

April 2, 2015 **Share** Like +1 TAKE THIS CONTENT

Wireless power may be the best solution as energy demand by IoT devices outstrips supply.

With 25 billion connected Internet of Things (IoT) devices expected to come online by 2020, finding an adequate and efficient way to power each device is critical to the success of this emerging technology.

A "connected thing" could be anything from a smartphone and laptop, to a wireless sensor network, medical and military equipment. Connected things are also found in electronic signage, digital merchandising and even inventory tagging. And each of these "things" can contain a multitude of sensors.

Sandhi Bhide, Intel's director of innovative IoT solutions, is extremely energy conscious.

According to Sandhi Bhide, Intel's director of innovative IoT solutions, the energy required to power these devices and their internal sensors is "huge," and demand for energy is outstripping supply. Bhide believes the next wave of IoT devices will not be able to rely entirely on batteries and wired power.

Bhide extrapolated the following example: in 2012 there were approximately 75 million vehicles shipped with an average of 80 sensors in each vehicle, equaling 6 billion sensors total. If the average wattage of power per sensor is 1 watt, this means that 6000 megawatt-hours are consumed by these sensors. By 2020, an expected 110 million vehicles will ship that year with 200 sensors per vehicle, which equates to 22 billion sensors in automobiles alone consuming an estimated 22,000 megawatt-hours. Bhide puts this into easier to understand examples: 6000 megawatt-hours equals approximately 4.8 million customers consuming energy (the population of Lebanon); and 22,000 megawatt-hours is equivalent to 17.8 million energy customers (the population of Shanghai) – just to power sensors in automobiles.

As greater quantities of connected devices and sensors push the total energy consumption meter higher, advances in chip and sensor design as well as energy harvesting technologies need to evolve in order for the ecosystem to be sustainable.

"Energy harvesting technologies to allow devices to power themselves—even 1 milliwatt saved across 50 billion devices translates into a lot of power," say Intel Labs leader Wen-Hann Wang.

Energy generation, or more accurately energy loss prevention, comes in all sizes and forms, such as photovoltaic (solar), thermal and mechanical (vibration or electromagnetic).

Using light energy from the sun is already well-researched and advanced to the point where PCs can run directly off a solar panel.

Intel engineer John Tompkins demonstrates that a single 20 W panel can power a 2 in 1 PC.

Racing down the tracks to energy generation

Many electric and hybrid vehicles use friction to generate power – actually capturing energy being lost through regenerative braking systems. Greenrail, an Italian startup, has developed a system that can be retrofitted into railways that incorporates a piezoelectric (vibration) system that generates electricity as trains pass over.

Similarly, walking or running shoes outfitted with piezoelectric generators can generate enough electricity to power small devices such as GPS sensors, receivers and perhaps even a smartphone.

Modern cars are packed with sensors, and hybrids like the Toyota Prius recover energy from deceleration and braking.

But energy generation by vibration or friction depends on external movement, so researchers are also turning elsewhere to capture potentially lost energy.

The waves are all around us

Another source of energy could be scavenging radio waves already in the air. This harvesting method looks so promising it compelled Joshua Smith, an associate professor at the University of Washington and former principal investigator at Intel Research Seattle, to form an energy-harvesting start-up.

"Moore's Law, in addition to giving us more transistors and cheaper transistors, is also giving us more energy efficient computing," says Smith. "If you compare energy efficiency of computing in 2010 to 1940, it's improved by a factor of a trillion, and it's continuing to scale.

"Now we can start thinking about powering certain workloads wirelessly, even using pre-existing radio waves that are already in the air. The amount of power in the air hasn't really changed that much since 1950."

Smith is referring to radio and TV broadcast transmissions, which is the focus of his research into wireless ambient radio power. He believes this ambient energy can be captured from the air without changes to the existing infrastructure. According to Smith, all that you need to capture radio frequency (RF) power are antennas and circuitry, which many devices have already.

"I think wireless power is the best solution because...our devices are already built to transfer information using electromagnetic waves and so just adding the capability to do power through that same antenna, form factor and housing is attractive," explains Smith. "We are already using electromagnetic signals for communications so if we use it for power as well, everything can be consistent."

A kitchen thermometer, with LCD display being powered by RF signals from a TV tower 4 km away.
Photo: University of Washington

Vital for a connected future

While there are various methods to capture energy, as well as new chip designs to make the capture, usage and storage more efficient, considerable advancement is needed in this area to support the billions of sensors coming online in the coming years.

"If we don't find a comprehensive solution to this energy problem, then there is no way that we will be able have an Internet of Things," declared Smith. "It just won't be feasible."

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Pocket Avatars: Mapping the Facial Expressions of Millennials

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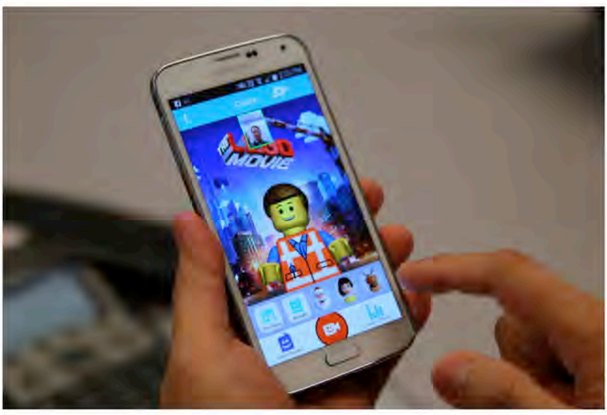


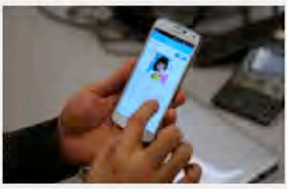
But are millennials giving Pocket Avatars any "face time?"

In 2014, Intel navigated into new waters when it released Pocket Avatars, a messaging app available for iOS and Android, which is aimed at the millennial demographic and allows users to send expressive, short video messages using preselected characters or avatars.

While there are an abundance of messaging applications for mobile devices, Pocket Avatars differentiates itself by allowing users to map their facial gestures to a chosen 3D avatar, including the likenesses of Katy Perry, Lego, Annoying Orange and even President Obama. The mobile app maps over 30 points on a user's face and can even distinguish between the sticking out of a tongue versus the opening of a mouth. The gesture points are then used to control the facial expressions of avatars in a video, which can then be messaged publicly or privately.

Bandwidth-friendly technology

According to Wenlong Li, who leads the Pocket Avatars engineering team in China, one of the project's initial goals back in 2008 was to investigate how to use a facial gesture tracking algorithm and avatar mapping to reduce the amount of data transmitted during video conferencing. With initial prototypes of the technology, Intel engineers were able to achieve a 40 to 60-times reduction in the amount of data by shifting from video transfer to the simple transmission of facial data points used to animate the avatar.



Katy Perry is one of several celebrity likenesses available in Pocket Avatars.

By 2011, the focus was on the detection, mapping algorithms, improving accuracy, and enhancing the rendering of the avatars, Li said, with the desire to create an animated graphic representation of a user. The algorithm accuracy increased over the years, and by September 2013, the Pocket Avatars project had full backing of then-new CEO, Brian Krzanich.

Even with executive support, however, the company chose to downplay the brand and nowhere within the app is there an Intel logo. The Intel name only appears on app store listings and within the Terms of Use, Privacy Policy and Legal Information.

"This was intentional," said Richard Hannah, general manager of marketing at Intel. "This is a new, untested project for Intel."

Mapping to millennials

Although they have not said what the specific target numbers are, Pocket Avatars is still looking for more active users. "We are still in that iteration phase, still in that experiment phase, still trying to figure it out," said Hannah. "We haven't reached the goals that we have set for ourselves... we need to see more active daily users and a more rapid viral adoption rate before we'll claim success."

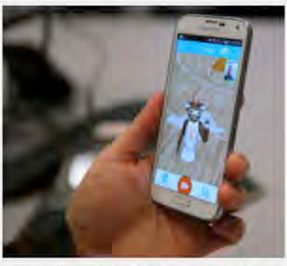
"You need to have an enormous subscriber base in order to be seen as a player," Hannah said. "It takes a lot of effort to catch fire..."

To achieve broad scale, Pocket Avatars has to work on a wide variety of devices and operating systems and with varying specifications. The engineering group had to develop extremely efficient algorithms to produce a favorable user experience regardless of the hardware.

"Our goal is that we don't require people to buy something to make it work," explains Josel Lorenzo, product manager on Pocket Avatars. "[Users] will use their existing device and OS and we will try to make it work there."

Ironically, the app may be attracting an audience that is even younger than the team initially had planned. "What we have built is an app that is cute, whimsical and fun," said Hannah, but 18-24 year olds are looking for something that is "cool, hip, and edgy."

"It really is a new paradigm to teach people that their face is being mapped," said Mary Smiley, engineering general manager at Intel. "They literally have never seen it before."



Lorenzo demonstrates Pocket Avatars with Hook 'Em, the mascot of the University of Texas.

"We've got a product that ostensively is right in the sweet spot of what [these users] want to do, but we have a look, feel, aesthetic and some content partners that is a jarring moment for those people – they say 'oh, this is designed for kids, this isn't for me,'" said Hannah.

Lorenzo likens growing an app to building a business.

"There are so many [apps] out there, the way people use apps now is really about trying it and maybe they will forget it, or, if they do like it so much, what would make them come back a week or a month later," said Lorenzo. "When you build a business, it's not just about going out and starting it, you actually have to see how it evolves. And when you see that, that is when you can take deeper learnings in that phase."

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Plugging Laptops into the Sun with a Smart Solar Charger

March 20, 2015 **Share** TAKE THIS CONTENT

A smarter, more efficient method of charging laptops will potentially bring PC-based education to more parts of the developing world.

Intel has come up with a new way to power laptops and tablets with solar energy at far lower cost than traditional systems by using a unique combination of micro-controllers and other circuitry to provide direct current from panel to device.

John Tompkins, who works in Intel's prototyping lab, recently completed a project bringing energy harvesting to education within developing nations, where power infrastructure simply doesn't exist. The World Vision 'Spark' project, which brings Classmate PC laptops and Internet to students in developing countries, uses the traditional method of converting sunlight into electricity. But Tompkins and his team have developed a Smart Solar Charger (SSC) that is both more power-efficient and affordable.

Tompkins in a lab working with Intel Education PCs and solar panels.

Direct from the source

Typical solar charging systems today involve complex systems with a charge controller that feeds direct current (DC) power to a bank of lead-acid batteries, which connect to an inverter that outputs alternating current (AC) power (like what comes out of your wall sockets).

All of those conversions are not very energy-efficient, says Tompkins, who also cites the high cost. "Any time you manipulate power by controlling its voltage, storing it in batteries or converting it to AC, the system uses a little power as it goes downstream and reduces the system's overall efficiency."

A Classmate PC charging from a near-final version of the SSC, each of which can charge up to four laptops at once when supplied with adequate power from the solar panel.

What the SSC does differently is take DC power from the solar panels to directly charge the device. This not only eliminates the need for bulky AC/DC conversion hardware, such as bulky and expensive lead-acid batteries, but also enables computer-based education in some remote areas where it's impossible to transport large equipment.

"By eliminating the charge controller, batteries and inverter, we're providing a much more efficient and cost-saving solution," says Tompkins. "The way we look at it is: there is already a battery in the laptop; we are just utilizing the battery that already exists on the platform and not adding another layer of batteries," says Tompkins.

A traditional solar installation on the left compared with the Smart Solar Charger infrastructure on the right.

Lighting and appliances rely on AC power, but computers require DC power, which is why many electronic devices come with a charging brick. In designing an improved way to charge computers using solar power, Tompkins' team had the freedom to design a system with a specialized purpose.

"Since our goal is to charge DC devices, we can take a different approach," explains Tompkins.

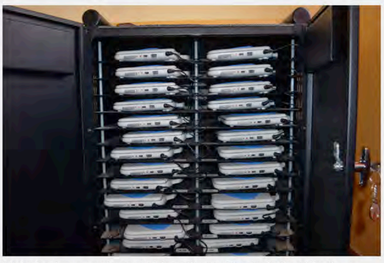
Although the power from the sun is DC, the SSC ensures that the electrical output is adequate to charge one or more laptops, as solar-generated energy does not provide a constant voltage due to changes caused by cloud cover or moving shadows. Such power fluctuations could damage the device's power circuit.

"The SSC prevents this from happening by only turning on the power ports when there is enough power from the panels to support 100 percent what the laptop needs," Tompkins says.

Cost benefits

This school in Peru helped in testing the Smart Solar Charger hardware.

This seemingly more simple system also allows it to be much less expensive to produce and maintain. Tompkins estimates the cost to be a couple thousand dollars to power 16 to 20 Classmate PCs, compared to the tens of thousands of dollars for a traditional system. A single lead-acid battery alone costs $600 to $800.



A locker in a classroom used to store and charge Classmate PCs using the Smart Solar Charger.

Future versions of the SSC are expected to accommodate devices that require only 5 to 19 volts, like smartphones, tablets, displays or even items that do not have rechargeable batteries, such as radios. A prototype has been built that can adapt the outgoing voltage based on the power needs of the device being plugged in.

Intel has also demonstrated an integrated solution that places the SSC technology inside a laptop. Referred to as Alternative Power Architecture (APA), the chipset regulates power going into the machine so that solar panels can plug directly into the power port without the need for an external box. A lightweight 20-watt portable solar panel is enough to power and charge a single 2 in 1 PC (pictured at top).

The current versions of SSC can power the Classmate PC and the Education Content Access Point; and another variant, created by Cellpoint Systems, can power any USB device. Pilot projects using this technology are expected to commence this year.

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Squaring Off with Round Tech

March 3, 2015 **Share** Like 8+1 TAKE THIS CONTENT

A roundup of the latest tech gadgets that are taking on a more well-rounded form.

Take a casual survey of personal technology and electronics on the market today and you will notice the majority of them are rectangular in shape. But there is a rising trend, or perhaps a return, to more rounded design.

The smartwatch is the latest area of debate of round versus square. The circular screen of the Motorola Moto 360 Android Wear watch makes it stand out among competitors with more traditional, rectangular screens, such as the Samsung Gear, Pebble and even the upcoming Apple Watch. Just revealed at the 2015 Mobile World Congress (MWC), the LG Watch Urbane and Huawei Watch smartwatches both also have perfectly round displays.

Why round?

Motorola design chief Jim Wicks cites "time" as the biggest inspiration behind the round design of the Moto 360, which recently won the award for best wearable at MWC.

"Eighty-five percent of the watches sold in the world are round, and there's a reason for that – its comfort and people are used to it," Wicks adds. "When you go back in civilization, time was always represented with a circle, whether it was the sundial or pocket watch."

Apple makes a case for a rectangular watch face, but features roundness in its design.
Image credit: Apple

Apple, a company known for its focus on design, is sticking to a rectangular design for its Apple Watch. In an interview with the New Yorker, Apple design lead Jony Ive explained why the Apple Watch has a rectangular screen: "When a huge part of the function is lists'—of names, or appointments—"a circle doesn't make any sense," Ive said. Even then, the Apple Watch features a circular dial and a rounded case with no abrupt edges.

Wicks feels differently, saying that the round shape actually maximizes screen area for what's most comfortable when worn on the wrist. "If you took the same diagonal," Wicks said, gesturing at the Moto 360's round display, "and made a square device, you'd have a decent amount of surface area, but the corners of the material would be poking into your wrist bones. So with a round display, you get the maximum surface area while maintaining a very comfortable fit."

Android wear smartwatches: a Samsung Galaxy Gear Live in between a pair of Motorola Moto 360s.

A few informal polls suggest that users prefer round watch faces, but it remains to be seen which design approach will ultimately win customer favor. There's considerable research that suggests that humans innately prefer rounded objects – and the consumer electronics industry seems to be leaning towards making products with that in mind.

A 2006 study conducted by Harvard Medical School wrote: "Our findings indicate that humans like sharp-angled objects significantly less than they like objects with a curved contour, and that this bias can stem from an increased sense of threat and danger conveyed by these sharp visual elements."

Another study from 2013 from the University of Toronto builds on empirical research going back almost 100 years to the 1920s showing a preference for curved over angular designs in our architectural environments.

Now, besides just smart watches, curvier designs are a rising trend in consumer electronics.

Computers

The cylindrical Mac Pro that Apple touts is the "future of the desktop."
Image credit: Apple

Although Apple is going rectangular with its watch, the company revealed in 2013 a new Mac Pro that is completely cylindrical in design. But Apple wasn't the first to experiment with a rounded PC; announced in 2004, First International Computer (FIC) launched the Piston in 2005, a small-form-factor (SFF) PC. Similar to the Mac Pro, the Piston used a unique form of air flow and venting to cool the components via the cylindrical chassis.

One possible reason why more computers haven't used round designs is because the form factor is not conducive to third-party components that are frequently flat and rectangular.

Thermostats

Honeywell Lyric and Nest thermostats.
Image credit: Boutique

For decades, thermostats were round, mainly driven by Honeywell's design dating back to 1953. The T-86, otherwise known as "The Round" was designed by Henry Dreyfuss. Earlier thermostats typically had mercury thermometers and some sort of a clock mechanism. In the 1970s and '80s, thermostat designs reverted back to a rectangular format and started including electronic and digital interfaces.

In 2011, Nest Labs, now owned by Google, re-introduced the round thermostat design to the market with its innovative "learning thermostat." In August 2014, Honeywell too re-introduced its version of the round thermostat known as the Lyric.

Smartphones

While rectangular screens dictate much of the form of smartphones, Korean companies LG and Samsung are experimenting with curved smartphone displays. The LG G Flex 2 curves the device so the screen cradles the user's face like an old-fashioned phone would. The Samsung Galaxy S6 Edge has curves that bring the screen edges right into the palm of the user's hand.

Monohm says Runcible takes design cues from the pocket watch.
Image credit: Monohm

Making its debut at MWC is a perfectly round smartphone called the Runcible, from the startup Monohm, which aims to be a lifestyle piece.

Televisions and monitors

LG's 34-inch ultra wide and curved UCD monitor.
Image credit: LG

Ironically, early television sets made with cathode ray tubes (CRTs) pushed a circular image due to the nature of the designs. As display technology advanced to LCDs, LEDs, DLP and other technology, displays not only became flatter, they also became rectangular. Now we are coming full circle with the most cutting-edge high-definition TV designs exhibiting a gentle curve in toward the viewer.

Wearables of the Future

The Intel Curie SoC is small enough to fit on a jacket button.

The Intel Curie, a tiny system-on-a-chip (SoC) is placed on a circuit board that's perfectly round and small enough to fit on a jacket button. Curie is intended for wearable technologies and integrates in the Quark SE SoC a motion sensor and Bluetooth radio that runs off a coin-sized battery.

Rounding out the tech

Why then, with so much research showing that people prefer round objects, are the vast majority of devices today are still rectangular?

Oshin Vartanian, adjunct assistant professor of the department of psychology at the University of Toronto Scarborough, says the leading explanation involves the economics of manufacture. "In other words, we see more sharp than round objects because the former are less expensive to manufacture and mass produce. Whether this is really true remains to be determined empirically, although it is the reason frequently given by designers and manufacturers."

Vartanian, who led research in finding preference for curvilinear architecture, cautioned that the preference for rounded objects isn't observed universally. "In our own studies we always find a significant minority that prefers sharp, angular objects. There could be lots of reasons for these individual differences, based on past experiences, formal training and schooling, cultural background and the like. Nevertheless, despite these variations, most people seem to exhibit a preference for curvilinear design."

Will technology design follow what the researchers have found? Time, and perhaps the round smart watches, will tell.

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Toy Story: the Intel and Mattel Startup

February 12, 2015

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Joint collaboration led to series of connected toys

With the North American International Toy Fair set to begin next week and speculation building around a Google-Mattel announcement ahead of the show, few people may recall an earlier partnership between Silicon Valley and the venerable toy company.

In the late 1990s Intel and Mattel forged a unique relationship that led to a series of connected toys, which also provides some interesting insight into early thinking around smart toys and user experience.

Mattel Inc. and Intel Corporation went beyond collaborating on devices; the two companies actually created a startup and gave it a brand of its own. Aiming to combine the technology and innovation around computing at Intel with the toy-design expertise of Mattel, the joint venture became the birthplace of several "smart" toys under the Intel Play brand.

According to Herman D'Hooge, who managed the Smart Toy Lab initially, Intel was (and still is) constantly looking for ways to extend the use of the personal computer in the home. Today, it's RealSense 3D cameras and perceptual computing, but back then the connected toy offered a unique new usage for families and children. Ironically, one of the toys produced offered an early look at today's perceptual computing concept.

Herman D'Hooge initially managed Intel's side of Smart Toy Lab

"My team was trying to understand how computing in the home could be useful away from the computer," recounts D'Hooge. "One of the areas we identified as an essential area of interest was things that kids play with…and that led us to think about toys as a new category as a peripheral for computers."

Around this same time, Mattel was looking to counteract the erosion of its toy consumers to video games. According to D'Hooge, after doing some market research, Mattel realized if it could license the Intel brand, it could potentially generate more revenue for its toys. When the original concept was presented to Andy Grove, who was Intel's CEO at the time, his reaction was lukewarm at best, says D'Hooge. D'Hooge paraphrased Grove's response as "Intel is about real technology and not plastic toys."

Smart Toy Lab hardly child's play for Intel, Mattel

The Eugene Register Guard covered the Smart Toy Lab in February 2000.
(source: Google News archive)

Eventually, however, Grove came to embrace the partnership. In the spring of 1998, executives from Mattel's Strategic Planning Department and the Developer Relations Department at Intel decided to further explore the idea of creating interactive high-tech toy concepts and developed a business plan that led to the birth of the Smart Toy Lab. According to D'Hooge, the lab was designed to act like a startup. They even leased space in a trendy neighborhood in downtown Portland, away from the office complexes at Intel a dozen miles away in Hillsboro, Oregon.

"It was a collaborative project," says D'Hooge. "The philosophy was to keep our headcount very small, keep under the radar so we could move quickly without being burdened by any internal bureaucracy or processes and approval loops."

The initial vision of the team was to create toys that were fun, open-ended, educational and innovative, but they also had to be perceived as being high-tech and had to involve a personal computer.

By the summer of 1998, the Smart Toy Lab had developed eight toy concepts, three of which were chosen in the fall of that year as ones to market under the new "Intel Play" brand: the Intel Play QX3 Computer Microscope, the Internet Discovery Set and the Intel Play Me2Cam Virtual Game System. Another, the Internet Discovery Set, which would have used a radio frequency (RF) tag reader to allow kids to browse websites based on RF tags in toys, was too complex, owing to the fact that it needed Internet safety controls and browsing software specifically designed for kids. The team decided not to pursue development of this concept.

In February 1999 at the International New York Toy Fair, early prototypes of both the QX3 Microscope and the Me2Cam system were presented. And based on positive feedback, the Smart Toy Lab rushed to get the products into mass production in order to hit the 1999 holiday shopping season. The QX3 was available by September 1999 and the Me2Cam by October. The QX3 was rated the top-selling multimedia toy of the 1999 holiday season.

The whimsical Intel Play logo, using a previous version of Intel's logo that appeared on Intel Play products.

Instead of operating like a traditional optical microscope, the QX3 contained a built-in camera that transmitted live video via a USB connection to a PC. Using a complementary metal oxide semiconductor (CMOS) sensor, miniature halogen bulbs and lenses, and optical magnification of up to 200x, the QX3 was able to compete with entry-level laboratory microscopes on the marketplace at that time, all while hitting the desired $99 price point.

The Me2Cam Virtual Game system, released in 1999, consisted of a USB-connected camera and a series of immersive, virtual games that users played using movements and gestures.

The Me2Cam, priced at $69, was a tethered, USB PC camera. Consisting of a series of interactive and immersive, arcade-style games, the Me2Cam was one of the first, commercially available, consumer-oriented PC application products using computer vision technologies. After a user's background was masked out by the Me2Cam software, the user appeared on the computer screen and could interact with five virtual games via gestures, movement or by "touching" objects. Using gestures to manipulate objects on the screen was a precursor to Intel's Perceptual Computing Initiative today albeit with far less compute power and lack of 3D cameras.

A variety of factors led to the eventual closing of the Smart Toy Lab, including the dot-com bust, limited revenues from the venture and internal changes at both companies. In May 2000, Intel and Mattel decided to formally dissolve their joint venture. Intel's Connected Products Division, however, continued with the Intel Play toy line, hired a few Mattel personnel and over the next year, produced two additional products: the Computer Sound Morpher in the fall of 2000 and the Digital Movie Creator in 2001. These were the last products produced under the Intel Play brand.

In March 2002, Intel discontinued the Intel Play brand, and it was sold and rebranded under Digital Blue, part of the Prime Entertainment holding company. The QX3 microscope, while discontinued, can still be found for sale online. It has since been replaced by the QX5 and QX7, which are both based on and build upon the original design from Intel Play.

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Diabetic Glucose Monitoring Becoming More Intelligent and Connected

February 2, 2015 Share

From a regulated "bionic pancreas" study to parent groups hacking medical devices, diabetes treatment enters a new era.

"I'm feeling funky right now," Aimee Jose says, glancing at her "bionic pancreas" for a status check on her blood sugar levels. "The number here says that I'm fine, but I don't feel fine, so I need to confirm it."

Jose, a certified diabetes educator and nurse at the Palo Alto Medical Foundation, has had Type I diabetes, a disease affecting as many as 3 million people in the United States alone, since she was 12.

A traditional glucose meter which analyzes blood coming from a finger prick.

While her "bionic pancreas" suggests that she is, in fact, fine, her body is telling her otherwise, so she pricks her finger to get a tiny amount of blood for her glucose meter, a device that has been available to diabetics for over 20 years. "The meter is the gold standard," Jose says.

While this gold standard is a device two decades old, now emerging are medical devices providing life-saving diagnostics, monitoring and treatment that are becoming smaller, smarter, integrated, talkative and even extendable through clever software work.

The Bionic Pancreas

Jose has been participating in a 40-person study with Boston University and Massachusetts General Hospital testing out an apparatus called the "bionic pancreas." This device is a connected, collection of devices actually, consisting of a Dexcom continuous glucose monitor (CGM), an iPhone 4S with a specialized app, and two Bluetooth-connected automated pumps (one with insulin and the other with a hormone called glucagon). Together, the bionic pancreas automatically monitors and regulates Jose's blood sugar levels.

Type I diabetes is an autoimmune disease where the body attacks insulin-producing beta cells within the pancreas. Without insulin, the body doesn't metabolize certain nutrients like carbohydrates properly, leaving them to sit in the system. This sugar floating in the blood is what a diabetic measures, explains Jose. The body needs insulin to take that sugar out of the bloodstream to get it to muscles and cells to use as fuel.

Insulin and glucagon infusion pumps are directly attached to the body as well as connected via Bluetooth to the continuous glucose monitor and an iPhone.

Not only does the bionic pancreas monitor Jose's glucose levels, it automatically regulates those levels using infusions of either insulin or glucagon into her bloodstream based on her sugar levels as reported by the CGM, which communicates via RF (radio frequency) with a platinum sensor injected under Jose's skin. The sensor is replaced weekly. The iPhone is physically connected to the monitor, which sends readings every five minutes. To manage sugar levels, the iPhone is paired via Bluetooth to two Tandem t:slim pumps to automatically infuse insulin and glucagon into the bloodstream.

Traditionally, diabetics had to manage their sugar levels manually. Since 1995, Jose has been on an insulin pump that infuses insulin directly into her bloodstream. Before the pump, Jose had to manually determine how much insulin she would need to cover the food she was going to eat and then inject herself with the appropriate dosage. The insulin pump made things a bit "easier."

"The beauty of the insulin pump was that you pre-programmed it with the appropriate ratios, and it did the math for you," says Jose. But there are still a considerable amount of manual steps required according to Jose: use the finger prick, go to the insulin pump, count carbohydrates prior to eating, enter in her blood sugar level into the pump, receive the insulin infusion, and then wait 15 minutes prior to eating.

Jose's continuous glucose monitor transmitter has a platinum sensor that is inserted under her skin weekly and transmits to the monitor.

The bionic pancreas aims to fully automate this process. "Now, I don't do anything," Jose says.

Challenges still face the bionic pancreas, which is in clinical trials and pending FDA approval. The hormone glucagon, which raises sugar levels, is not shelf-stable as a liquid. Type I diabetics carry an emergency kit with them as a "rescue medicine" when they hit a "really bad low," explains Jose. The liquid must be mixed with a powder in order for it to be used. This means the glucagon pump must be refreshed with new liquid daily. A shelf-stable version of glucagon is being developed.

"The invention of the continuous glucose monitor, in my opinion, is probably the most helpful tool in diabetes management outside the development of insulin," says Jose.

The traditional finger prick meter is "just a moment in time," explains Jose. The CGM provides a more continuous reading, taken every five minutes. According to Jose, all blood sugar meter are required by the FDA to have an accuracy of plus or minus 20 percent as compared to a lab blood draw. The latest Dexcom CGM now has an accuracy of 9 percent, according to the company.

"That's the best technology that we have right now to manage medicine decisions – life threatening dosages of medicine," says Jose.

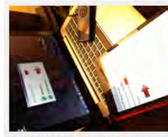
Parents are Hacking the Continuous Glucose Monitor

Others recognize the importance of the CGM in diabetes management. In fact, parents who desire remote monitoring of their kids' sugar levels are developing means to extend the capabilities of such devices. A group of parent engineers, developers and hackers, created a DIY project called Nightscout and have essentially open-sourced a means to allow real-time, remote access to a CGM data via browsers, smartphones, tablets and Pebble watches.

John Costik, a software and systems engineer, whose 6-year-old son, Evan, was diagnosed with Type I diabetes in 2012, felt that the tools he and his wife were given to care for their son were "inadequate for such a data-heavy disease."

"We realized that if we collected the right information and analyzed it correctly, we could do a lot more for him and keep him healthier than we were expected to," says Costik on the treatment of his son. "When we were looking at technology options, the Dexcom G4 was and still currently is the best glucose monitor available."

Costik and his wife received the CGM for their son in February 2013, and after one week of his son in daycare, they realized they didn't want to be disconnected from the data coming from their son's monitoring unit. Out of the box, it can only transmit data from the arm sensor to the unit.



One of the first iterations of the Nightscout Windows uploader program.
Photo: John Costik

"I quickly realized that I didn't want to be away from that information," says Costik. "I wanted to see his blood sugars every five minutes."

Costik began analyzing the CGM's Windows software and discovered a way to communicate with the unit directly. He wrote a simple Windows application that polled the CGM receiver every five minutes for data and uploaded the data to a Google Docs spreadsheet automatically. He also wrote an iOS app for him and his wife to use.

Next, to make the process more convenient and mobile, reducing the need to lug a laptop with the monitoring unit, Costik created an application that worked on an Android phone and was connected via USB. As the cellphone was attached to the CGM receiver, the data could be then uploaded to the cloud. Costik shared his code so others could develop with it.

At that point, Costik was contacted by Lane Desborough, whose son, Hayden, was diagnosed with Type I diabetes in 2009. Desborough wanted to develop a system similar to Costik's and through their collaboration formed Nightscout, a term Desborough concocted.

The first Nightscout rig had a mobile phone tethered with the Dexcom Continuous Glucose Monitor and transmitted sugar levels to an iPhone.
Photo: John Costik

"What Nightscout does is liberate that data [from the CGM]," says Desborough. "Nightscout takes the data out of the CGM, pumps it up into the cloud, from which it can then be viewed on any web browser around the world and even things like a smart watch."

Desborough developed a software program using Costik's shared code and various open source web services and frameworks. In a few weeks, Nightscout became an "effective and reliable" system to remotely monitor Hayden's diabetes. The code was then shared on a GitHub repository, which now includes code for the Pebble Watch, iOS, Windows Phone, Android and other devices.

Jason Adams, who had been in contact with Costik throughout the process and whose daughter also suffers from Type 1 diabetes, hired a software engineer and created a Facebook group called CGM in the Cloud. Awareness of the project skyrocketed, says Costik. The Facebook group currently has over 10,000 members. And, the Nightscout Foundation was formed in 2014.

"The story is very simple," says Costik. "I want my son to have as normal a childhood and life as possible.

"We want to validate that these systems really do improve outcomes. And I think we have enough data and we have enough volunteers to share their data to show that people are healthier with remote monitoring," says Costik. "Moving forward we want to look at how do we take this data and nutrition data and carb data and insulin data and develop better tools to help folks manage that aspect.

"If we can treat highs and lows without as much intervention from users that would be wonderful. We will continue to see it evolve into that," says Costik on the future of Nightscout and other systems similar to the bionic pancreas.

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20 Tips to Prepare Your Technology for the Big Storm

January 26, 2015 **Share** Like g+1 TAKE THIS CONTENT

Having your electronics ready for an emergency can make your tech a lifesaver.

There is nothing worse than being unprepared for a major storm, whether it is a blizzard, hurricane, flood, tornado, power outage or earthquake. While ensuring that your home or apartment has adequate food, water and other emergency supplies, you should also think about the technology that you use and rely on.

1. Charge your batteries
Make sure that computers, tablets, cell phones and other devices are fully charged. There are ways to charge your smartphones faster as well. When possible, have spare batteries available for lower-tech flashlights and other devices.

2. Gather cables
Be sure that you have the device charging cables for your various devices.

3. Change power settings on laptops
Desktop computers in a power outage are pretty much useless unless you have them attached to an Uninterrupted Power Supply (UPS). But laptops have rechargeable batteries that can provide hours of life for emergency communications. Set the power options to the most conservative energy setting possible (e.g., reduce the screen brightness, turn off the display and/or hard drives after a short time, use stand-by or hibernate settings).

4. Get a 12 volt USB charger for your vehicle
If the power goes out in your home, your vehicle could provide charging power for your smart phone or tablet.

5. Get a solar-powered battery or UPS or hand-cranked charger
If there is sun, you can get solar panels that charge batteries. In bad weather conditions that obstruct the sun, however, consider purchasing a UPS. You can also get hand-cranked chargers for smaller devices.

6. Put modem & WiFi router on a UPS
If the power goes out, so will your network, unless you have a means to power these network devices. Consider putting them on a battery power supply.

7. Learn how to tether your laptop or tablet to your phone
Many wireless providers offer means to share your wireless data with a tablet or computer. This is useful when there is no power for your modem or WiFi environment.

8. Get an "old phone"
Many cordless phones will not work if the power is out. You can still use a POTS (Plain Old Telephone Service) or landline phone that simply plugs into the phone jack. According to the New York Times, VOIP or Internet Phones may not work in a power outage.

9. Update your smartphone contacts
FEMA recommends that you have mobile, text and email contacts for those people you want to stay in touch with during an emergency.

10. Take current photos of family, pets & loved ones
NY.gov has several recommendation including having a current photo of people AND pets can possibly help in locating them.

11. Bookmark relevant utilities' status pages
Locate and bookmark the power, gas, water and telephone utilities pages that talk about outages. Bookmark weather service sites as well.

12. Get some cash
If power or communications go out, be sure to have some cash on hand as ATM may not work or could be out of cash.

13. Digitally gather important documents
Scan or take photos of important financial or family documents and store them securely in the cloud and/or on a thumb or flash drive.

14. Wired keyboard and mouse
Any device that requires batteries or recharging will need power. If you are not using a laptop and can power a desktop, even briefly, consider using a wired keyboard and mouse to conserve batteries.

15. Stock up on sealable, water-tight, plastic bags
SurvivalCommonSense has many recommendations for using plastic bags for emergencies. Plastic bags are a great way to store small tech like tablets and smart phones and keep them away from the elements.

16. Keep your tech "warm"
TechHive tested how various cell phones performed at low or freezing temperatures. Some smartphones do need to be above (or below) a certain temperature in order to operate.

17. Get some touch-screen gloves
It is often quite difficult, if not impossible, to operate a touch-screen/capacitive device with heavy gloves on. Consider investing in a pair of gloves that work with capacitive touch screens.

18. Unplug unneeded devices or tech
If the power does go out, you should be sure all of your electronics are unplugged since power surges or spikes can happen when the power comes back on which can potentially damage your devices or electronics.

19. Install news apps
Install local and national news and weather apps on tablets and smart phones. Many of these provide live video and news casts.

20. Install friend-finder apps
Use social networking apps and geo-location apps to keep track of your friends and family.

When it comes to gadgets, devices and electronics, water, temperature and power are important things to consider in an emergency, and they don't necessarily play nicely together.

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Gas Pumping, Guitar Strumming and Designing Wearables that Provide an Emotional Connection

One of Ramone Nagisetty's first jobs was wearing a blue jumpsuit, cleaning windshields and pumping gas. She was also a principal engineer within Intel Labs designing wearables that monitor biometrics as well as provide an emotional connection to others. Oh, and she just started a band, Rocket 9, in her free time, playing gigs almost every weekend for the past couple of years.

Question: Why did you become an engineer?

Ramone Nagisetty: My mother is an engineer. I was born in the former Soviet Union in Moscow and my mother is Lithuanian. My mother has a master's degree in physics from Moscow State University. She also has a master's degree in electrical engineering from the University of Toledo. And her third master's degree is in computer science, more specifically in artificial intelligence, and she got that while she was working as a full-time engineer at Ford. My mom had two kids, three master's degrees and a full-time career, and we lived 75 miles away from Detroit so she also commuted 150 miles a day. So if you want to talk about where you can find inspiration for hard work and being super-motivated, it's not too far. This person, my mother, did all of this.

I think what is important is that in the former Soviet Union, women were considered to be equal in the workforce. Women in engineering, women in construction and women in all sorts of different fields – that have taken longer here for women to break into – in the 1930s, women were already breaking into those areas in the Soviet Union.

My father is a math professor and taught at the University of Toledo. And so between having a mother as an engineer and father who's a mathematician, it seemed pretty obvious that going into engineering would be a possibility.

I wasn't that interested in doing what my parents wanted me to do so I was more interested in things like architecture and philosophy. My parents basically said they would not appreciate it that much, and if I wanted to study something besides engineering, I would have to come home and go to community college.

Q: What was your first job?

RN: I pumped gas in high school. I was one of those people wearing the Standard Oil blue jumper, washing your windshield, checking your oil and tires, and pumping your gas.

Q: What turned you on to engineering?

RN: I actually didn't like the course work for engineering that much. But what I found was that when I got my first summer internship, and I worked as an intern at a company called Chicago Laser Systems, it changed everything.

Nagisetty inside an Intel lab.

All of a sudden I was doing real hands-on work, I could see my results. It turned out that getting out of the classroom and into the more hands-on internship situations was a tipping point for me when I realized that I actually really liked engineering. I liked doing hands-on work; I liked seeing results.

I studied general electrical engineering, and that is how I got my first job at IBM in Essex Junction, Vermont. And that was also really eye-opening because having a general purpose engineering degree is one thing, and then going into the workforce, where it's a very specific type of work, required a lot of learning as well. What I did at IBM was work on device characterization, essentially characterizing transistors – that's pretty specific – and I didn't have that much training or theoretical background from college in that area, and so what I found was that after two years at IBM, I wanted to go to graduate school to get a better theoretical understanding of transistors. So I went to UC Berkeley and got my masters in electrical engineering there; my specialization was in transistor device physics.

Q: How did you get your job at Intel?

RN: Intel was recruiting on campus for this thing called the Rotation Engineering Program and I was offered a position, actually, on the spot.

I started in the rotation program in New Mexico, and I worked three different rotations there. And when I took my final placement, my goal was to actually work on the leading-edge transistor technology development and that happens in Hillsboro, Oregon. Hillsboro is the epicenter of world-class technology development in the entire world, as far as I'm concerned.

I actually went to a conference called the IEDM (International Electron Devices Meeting), and I met up, just per chance, with a bunch of folks from Intel in Hillsboro and explained that I was looking for my final placement. And they were really interested in me because of my background in transistor device physics.

Q: How would you describe your time at Intel?

A hardware prototype for wearable technology.

RN: I have had three main phases in my career [at Intel]. The first one was working in logic technology development [LTD] in the Technology and Manufacturing Group [TMG]. In this phase, I did device characterization where I delivered several process technology nodes – 65 nm, 45 nm, 130 nm, 180 nm. For 65 nm, I was the lead technology development engineer. I have patents in the area of high-performance transistors related to strained silicon.

Then I decided I wanted to see what else Intel does, and I wanted to understand more about what makes products compelling and successful. It was actually pretty difficult to leave technology development because I was really an expert in that area...but I really wanted to explore the new frontiers outside of transistor technology development. So I went to Intel Labs in 2008, and I started running strategic technology programs.

These technology programs reported straight up into Intel's executive management. It was kind of the opposite of transistor technology development because transistors are essentially very small, and you have to be very detail-oriented – the level you are looking at is the atomic level. And then you go to strategic technology programs, and you are essentially on the complete flip side, and you are talking more about things in systems integration and technology roadmaps and the future. You are all of a sudden going from the carpet to the sky. I was exposed more to the long-term strategy, which was a very important phase of my career.

Q: What are you working on currently?

RN: A few years ago, still at Intel Labs, I started to get back into doing hands-on engineering work, and so I moved into a different organization within Intel Labs. For the last couple of years, I have been specifically focused on wearable technology. When I say wearable, I'm talking about wrist-worn form factors and also things like rings and badges.

I have three different types of wearable form factors where we develop new usage models, which can be related to things like security and authentication or biometrics use for health and wellness and also biometrics related to emotions and emotional connection between people.

Test prototypes for wrist-worn wearables.

I proposed a seed project in 2011 that had to do with wearables and biometrics. That was actually before things like the Fitbit and the Nike Fuel had come out, and the only thing that even resembled it looked like what we have today in wearables was Apple's iPod Nano that you could put onto a wristband.

Now I'm starting a new project that has to do with maintaining an emotional connection between people through wearables. Every time technology has evolved, one of the first usages for technology has been for people to communicate with each other. That's true whether we are talking about people writing letters and sending them across the country using the Pony Express, to sending telegrams, then telephones allowed people to stay in touch and communicate, and then came smartphones, and we can communicate using videos and more than just words. The next step is to actually be able to use wearables to allow people to be continuously connected.

Wearables that are being created for health and fitness can also be used generally for certain types of emotional connection as well because a lot of our emotions actually manifest themselves through different types of biometric signals.

We are just on the brink of a whole new set of usage models related to wearables. In the world of wearables, I don't expect or want a wrist-worn wearable to do what my phone does, just like I don't want my phone to do what my laptop does. All of these things have their distinct advantages.

Q: You starting playing music recently, what prompted you to do so?

Nagisetty has a music studio for practice in her home.

RN: In February [2015] it will be five years since I got a guitar and four years since I started recording. I put out my first EP about a year and a half after I got my guitar. I've always really enjoyed music, my brother is a professional musician, so I have been surrounded by music my whole life, but I never really had a talent or proclivity for it. About five years ago, it was Presidents Day weekend. I was really bored, to tell you the truth, a little bit bored with my life. I felt like I had achieved a lot of things, I had a really wonderful career, a wonderful home life and husband, and had achieved a lot of those things that we strive for in our lives.

On a whim, I went to a guitar store with a friend and picked up an electric guitar. Within a few months, I was writing my own songs.

My first teacher wasn't the right teacher. What I think that is really important and actually what makes a really good teacher is finding the way to teach that individual. Certain people are going to learn theoretically and other people will want to learn songs and mostly that's what I do. Some people are much more intuitive, some people will learn by seeing and reading music, some by hearing music. And so I think a really good teacher is actually one that can adjust their teaching style to what the student's learning style is.

Q: What about women in technology?

RN: I went to university into engineering school and it was always dominated by men and there weren't very many women, but it never actually bothered me at all. It seems like if you have grown up this way, you don't feel like you don't belong because this is how it's always been.

Until eight years ago, I didn't really do a lot with women in technology and STEM because I always felt like these programs were for somebody else and that they weren't really for me. I didn't really understand the benefit of those programs.

About eight years ago, we had our first Women's Principal Engineer Forum at Intel, and I was invited to attend this event even though I wasn't yet a principal engineer. I actually wasn't planning to go, I just thought "I don't really need that," but what happened was that Kelin Kuhn was actually the person who sent me an email and copied tons of people on it saying, "these are the people I want speaking for the Women's Principal Engineers Forum," and she had this list of speakers and I was one of them.

Kelin Kuhn

I think Kelin is the smartest person I've ever met, and if she tells me that I'm going to be a speaker at this forum, well I'm going to the forum and I'm going to do what she tells me to do.

I had a chance to present work that I had been doing for a long time that I was really an expert in, but for the most part, it had always been presented at conferences by people other than myself, people who were more senior, people who were recognized as spokespersons for Intel. So I really never had that chance to stand up and talk the data that I had been working on for a long time. So I had this chance to get up and speak and what I found was that it was great! It was great to get that feeling that I actually am more than capable of speaking to this information and that this opportunity gave me some insight into how valuable that is.

So I came back from the Women's PE [principal engineer] Forum that first year and I thought "you know what, I wonder if I should be a PE." So I went down the path to become a principal engineer, but it wouldn't have happened if I hadn't had that opportunity at that forum to present...to kind of step into some bigger shoes and say, "Hey these shoes fit pretty well." It gives you the courage to take that next step.

What I discovered was that these types of events are actually really important. And the other thing is, it's really important to establish a network of women that can give you support when things aren't going so well because a lot of times when things aren't going so well there aren't going to be other people who are going to relate to what you are going through.

One of the things I do tell people at these events if you can come away with one new friend...who can relate to the challenges you face because that friend will be someone you can rely on when things get tough.

I have attended every single Women's Principal Engineer and Fellows Forum since that first year, and I work with anybody who wants to have any type of mentoring in their career.

Q: What advice do you have for people thinking about entering engineering?

"The teachers who resonated with me had the biggest impact on my career..." -Ramone Nagisetty.

RN: There is something there about making connections between technology and engineering and the things that you love that sometimes doesn't really come through when it is not presented in a way that you can understand. And that same kind of comparison about finding a music teacher who can teach you according to how you would like to learn or how you would best learn is important. That same analogy works when you are trying to connect people with technology and engineering – finding ways to present those concepts is important for those students to grasp.

In my education, the most important thing has always been the teacher, and I can say for a fact that the teachers who resonated with me had the biggest impact on my career and that's going to be true whether we are talking about teachers or role models, especially nowadays when technology is becoming so personal. When they realize that can create things that are useful and that have a special place in their lives, then you are connecting the technology side with the human side with the emotional side. And when I think you can make those connections, you will appeal to a much larger base of people, including girls and women, in terms of studying engineering.

I do think that having a more diverse group of people, pursuing engineering, will result in more creative uses and solutions. You can have a lifetime career and never get bored. To encourage not just girls and women, but all sorts of people from all sorts of diverse backgrounds, to pursue engineering I think is a good thing.

It's important to realize that engineering IS a creative outlet. The more that people can realize that it is creative, I think the more interested they'll be in pursuing engineering.

Q: What's your favorite song?

RN: I think "Mirror" [by the Velvet Underground] is a great song that I'll cover some day. And also, it ties into the importance of being able to relate to role models and teachers.

> "I'll be your mirror
> Reflect what you are, in case you don't know."

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CES: Looking Back on Curious Tech

January 8, 2015 Share

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From wearables to mobile accessories, a look at some of the oddest tech from the past six years at CES.

Every year at CES in Las Vegas, thousands of high-tech gadgets are on display. Some will be the darlings of the tech trade show, some will win awards, a select few may become "must-have" category killers but most will never be heard from again. Here's a look back at some consumer electronics that made a mark over the past six years and not always in a positive way.

CES 2015: Racing into Silence

While the tech goodies are still being unveiled at CES 2015, a couple of items grabbed some "outlandish" attention.

Some CES attendees entered the "shell of silence," namely Silentium's Comfort-Shell. "It basically looks like a giant, white version of those spiky shells that Lakitu throws in the original Mario," wrote Jacob Kastrenakes of The Verge. Despite its odd looks, any way to deaden the noise that is characteristic of CES is a blessing.

While CES had smartphones-a-plenty, the Tonino Lamborghini 88 Tauri phone definitely "raced" to the top...in price. Revving in at $6000 and in scarce supply, this racecar-inspired smartphone design turned a few heads and left others scratching theirs.

"With a stitched leather finish that's the real deal and gold-plated stainless steel surrounding this phone, you're bound to stand out in the crowd if you're crazy enough to even want to pay $6,000 for pure stupidity," said The Verge's Tom Warren.

While a Lamborghini, the vehicle, has elegant design on the outside and is powered by a beast on the inside, this phone only has the nice exterior.

CES 2014: Helping the body?

What could go wrong with health-related technology? Hopefully nothing, but some design and product features found in some of the CES 2014 health tech were questionable at best.

A bit creepy looking – mother is always watching – the Sen.se Mother has "Cookies" to hand out as it watches and monitors its family. This Russian Doll-looking devices captures temperature and motion data from attachable sensors called Cookies.

"Even Joan Crawford wasn't this creepy." – Michael A. Prospero (Laptop Magazine)

And as you wander the house being watched by the Sen.se Mother, you might be wearing a laser helmet by iGrow which claims to thicken thinning areas of the scalp as well as strengthen hair follicles.

"This is a helmet with lasers inside? It makes your hair grow? There aren't enough sarcastic question marks in the world to express our skepticism on this one," wrote Rachel Feltman (Quartz).

To round out the "healthy" tech, there is the Foreo Issa toothbrush. The "unique" design of this toothbrush raised many eyebrows. As Gizmodo's Mario Aguilar put it "It vibrates like your Sonicare, and comes in woozy pastel colors. Let's not kid ourselves: this is a sex toy disguised as a dental revolution."

CES 2013: Stick a Fork in High-Tech Health

CES is a proven launch pad for health and fitness gadgets, but sometimes those gizmos go a step beyond useful such as the HAPIfork, which vibrated if you ate too fast, and did rake in some official awards in 2013.

"This was the most popular entry in the 2012 Was A Stupid Year category," said John Mitchell, in ReadWrite.

"Little matter that it looks like a toy, needs connecting with a USB cable and wouldn't be acceptable in any decent restaurant..." said Matt Warman in The Telegraph.

There were also a few products at CES 2013 that were in the crapper — literally — such as the iPotty, which coupled a training potty for kids with a tablet holder.

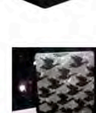
"The iPotty is a children's potty with a built-in iPad activity stand...Make sure you teach your toddler what the real purpose of an iPad is at an early age," said TechHive.

CES 2012: Smart Watch in the Bag?

It wasn't a wearable and certainly not a smart watch, but it made multiple worst of CES lists back in 2012. The "Watch your Bag" was a watch and a bag and a color light show as well.

"Some products are hard to sum up in a sentence. And then there's 'Watch Your Bag,' the alarm clock that comes with a bag, filled with a rainbow of morphing colors.' What it can't tell you, however, is why anyone might find such a proposition appealing," said Brian Heater in Engadget.

The march of accessories also continued in 2012 with one of the biggest and loudest of all: the iNuke Boom speaker for the iPhone. The behemoth boasted 10,000 watts, weighed 700 pounds, cost a mere $30,000 and dwarfed the iPhone docked atop it.



"Is the iNuke Boom ridiculous? Absolutely. But it's also fun and completely cognizant of its audacity, which is something we commend even if we don't feel comfortable dropping fat stacks of cash on a monstrous beast," said Buster Heine in Cult of Mac.

CES 2011: Bling for Your Smartphone (or Tablet)

The smartphones and tablets were getting slicker and more powerful, but the cases were the eye candy. From glitzy faux gems to glitter and other snazzy options, there was no shortage of bling.

"Seriously, folks, how many cases do you actually need? From shiny be-dazzled iPhone cases to every bizarre iPad stand/case/kiosk thing, the one thing that CES had in plenty was cases. Look, we appreciate a well-designed case as much as anyone, but do we really need four dozen of each type? Don't answer that — it was a rhetorical question. Color us sick of iPhone and iPad cases, with only a few notable exceptions," said Rob LeFebvre in 148Apps.

"The custom-made crystal case (in the Lux Mobile booth)... costs a whopping $3,000 — just about six times the value of the iPad it's actually supposed to hold," said Mike Schramm in TUAW.

CES 2010: More Wearables in Search of a Use Case

In 2010, CES offered up such forward-looking innovations as Android-based "smart" microwaves and "unbreakable" phones. And the march of wearables continued with products such as the Phubby, an elastic, smartphone-carrying wristband.

"Now this one takes the cake... an ugly wristband with a pocket that you can slide your iPhone into. It's basically a fanny pack for a new generation," said Paul Cash on Yahoo.

"We have to ask: what's so wrong about carrying your phone in your pocket?" said the Huffington Post.

CES 2009: Wearable Tech Tries Too Hard

By all account, the Consumer Electronic Showcase will continue to be jam packed with wearable technology, but it's hardly the first wearable sighting at CES. Back in 2009, the Cell Mate promised to provide a wearable, and truly "hands-free" option for holding your smartphone — no Bluetooth connection required. Coverage at the time was less than positive.

"It's possibly the single most embarrassing-looking contraption we've seen in years," said Evan Shamoon in the Huffington Post.

Not to be outdone, the iCap offered a new way to listen to music, hands-free. With a 1GB MP3 player and built-in speakers, you (and those around you) could hear it all . . . hands-free.

"Hear that kids? If you use any product other than the ridiculous looking iCap, you're practically playing Russian Roulette with Dr. Death," said Darren Murph in Engadget.

While many of the products from the past 5 years may have garnered "worst of show" notoriety from tech critics, some offer a glimpse at the technology trends that emerge from CES.

Images: Cell-Mate, Gesten Technologies, South Mill Design, TUAW, Can You Imagine, Behringer, Hapi.com, CTA Digital, Android Police, recombu, Sen.se, iGrow Laser, Foreo.

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Toddler Tech Crawling into CES 2015

January 7, 2015 Share

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Are children and baby-tech the newest new thing? As wearables and fitness trackers enter the mainstream, attentions now turn to babies and toddlers.

From connected onesies to smart pacifiers, innovative new products for children and parents are increasingly present at the International Consumer Electronics Show (CES). Call it the Internet of Toddlers, as Engadget did last year when the Mimobaby smart baby onesie hit center stage, generating buzz for the growing segment.

Most health-related technologies available today, wearables especially, are made for adults looking to monitor their heart rates and track their fitness activities, but after the baby onesie last year, multiple new product debuts at CES 2015 may be indicators of an increasing trend amid the shift to wearables and smarter, connected devices everywhere.

Here's a quick round-up of some interesting new developments.

Smart Pacifier

The Pacif-i tackles the challenge of interface between a technology and a very young, untrained user by making an easily acceptable item smart: the pacifier. The Pacif-i will constantly monitor a baby's temperature and upload it via Bluetooth to a smartphone or tablet. It can also alert parents when the device – hopefully tethered to the baby – crawls outside a set distance up to 20 meters. Through the app, parents can make the Pacif-i emit sound, which could help in locating an elusive child and the smart pacifier.

TempTraq temperature sticker

Should your baby not use pacifiers or you'd like to add another temperature reading method, TempTraq is a soft, stick-on patch that goes in the underarm, and will provide constant monitoring to your smartphone or tablet for 24 hours. The app will record temperature history and will also send notification alerts if reaching certain threshold temperatures.

mamaRoo rocker

The rocker is a classic way to soothe a baby. The creation of electric baby rocker freed parents up from actively pushing it, and the mamaRoo takes it a step further by enabling control from your mobile device via Bluetooth. From the app, a parent can switch rocking modes and sound settings.

Baby Glgl bottle

From the makers of 10S Fork that helps to pace bites to at least 10 seconds apart comes the Baby Glgl, named after the glug-glug sound of a feeding baby, meant to help prevent gas or colic. Packed with an inclinometer, the Baby Glgl tracks the weight and angle of the bottle and lights up with arrows informing the parent to adjust accordingly to ensure that the baby isn't gulping air.

MonBaby tracker

Parents, especially first-time parents, of infants constantly check on their newborns to see if they are sleeping well and in what position. Constant checkups are not only potentially disruptive to babies, but also stressful and time consuming for parents. MonBaby, a button-shaped device that attaches to clothing, hopes to do the checking for you, while also recording breathing and heart rates to an app. MonBaby will also send alerts to your phone should there be something out of the ordinary, hopefully allowing both parent and baby to sleep more soundly.

Smart Clip for car seats

Demonstrated at Intel's booth this year is the Smart Clip for car seats. The Bluetooth-enabled device doubles as a safety buckle while also connecting to a smartphone app that will report back on temperature and the Smart Clip's remaining battery life. The most important feature, however, is that it will send an alert should the Smart Clip still be enabled while falling out of range with the smartphone, preventing a forgotten passenger left behind.

Kodak Baby Monitoring System

The Kodak Baby Monitoring System, developed by Seedonk, modernizes the traditional audio baby monitor by adding support for an HD Wi-Fi camera. Parents may opt for even more security by integrating crib and door sensors, as well as other sensors that can detect movement and track sleep patterns and report to the Seedonk app.

Safe Outlet

The Safe Outlet by San Diego-based Brio, aims to provide an additional layer of safety as toddlers become inquisitive about their surroundings. Many children each year are injured when they put metallic objects into plugs. The Safe Outlet senses and can differentiate between plugs and tiny fingers and will disable the outlet's power if the latter is present. It does this by switching to a 24 volt mode where it can actually check the electrical resistance coming through the plug. Only if it detects an actual powered device, and not a tiny hand, will it send the full 120 volts.

Sproutling baby monitor

Sproutling, launched in August 2014, has updated its baby monitor product for CES 2015 to include technology that not only monitors a resting baby, but also performs data analytics to determine what the optimal sleeping conditions are for the specific child. A wearable band collects the baby's skin temperature, movement, heart rate and sleep position. The Sproutling smart charger also captures room temperature, light levels, noise and humidity. All of this data is sent to a smartphone app where it is analyzed and presented to the parent so they understand their child's sleep patterns and environment better.

SleepIQ bed

Even Sleep Number has some technology for kids as they introduced the SleepIQ Kids bed at CES 2015. Like some of the baby wearable products mentioned, the SleepIQ Kids bed has sensors that monitor breathing, movement and heart rate. This bed is very similar to the one introduced last year at CES 2014, just in a smaller size. According to Sleep Number, the SleepIQ Kids bed integrates with a family sleep dashboard, can alert parents if the kids get out of bed, has various lighting like under-bed lights to help guide them back to the bed if they get up, and even has a monster detector.

TempTraq image credit Tom Resnick/Flickr.

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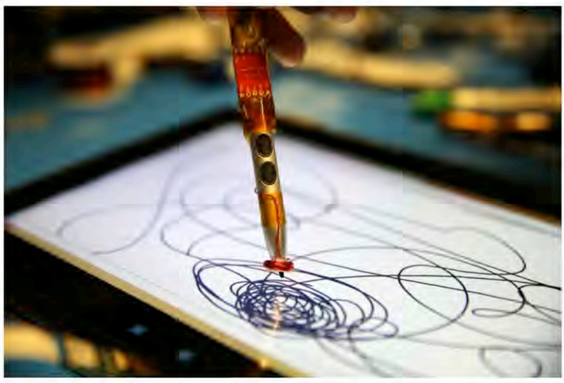

NFC allows the traditional active stylus to be self-powered and do more.

The active stylus is due for an upgrade, and it is currently being ripped apart and completely redesigned and rebuilt to make it more functional and address user complaints.

Some of the issues surrounding active styli – according to Shwetank Kumar, director of touch engineering within Intel's human interface technology group – are batteries running out of charge, lack of consistency between stylus manufacturers, the and the stylus technology being proprietary, meaning styli are tied to a single type of device. Often stylus manufacturers work with display OEMs or ODMs to ensure their active stylus technology is baked into the screen.

At Intel, engineers are working to develop a next-generation active stylus, one that eliminates the need for a battery to power it and uses NFC as the core component.

Near field communications (NFC) has long been a part of computers, tablets and many smartphones. It allows for very low-powered communications between devices and even objects where an NFC chip is embedded. It is used in smart bathrooms and was part of CES badging, for example. Having a small but powerful size, many unique use cases are popping up to bring better and different functionality to existing products.

A tablet modified to work with an NFC stylus

Typically, NFC-enabled devices like tablets, kiosks and computers are destinations, says Anand Konanur, a senior radio frequencies engineer within Intel's PC Client Group. When a user taps against a kiosk, they get a visual response of the action. With a PC, the NFC coil, which measures 4 cm by 6 cm, is typically somewhere on the back of the display.

Konanur and his team realized that users wanted to tap their NFC devices directly against the screen and not on the back of their computer so his team wanted to get what he calls "NFC-friendly" screens where the magnetic signals pass directly through the display.

Konanur believes NFC incorporated into the front of the display screen instead of the back of the device can be used for a variety of other tasks like communicating with small devices and even charging these devices. Previously, displays were thicker with a large metal casing but more recently, the metallic deflector sheets that are used to maintain brightness are being replaced with non-metallic sheets, opening up the ability to have NFC coils directly within the layers of the displays.

Once Konanur and his team had displays with NFC coils behind the screen, they set out dissecting active styli, stripping out much of the circuitry and the AAAA battery. An AAAA battery holds a 1.5 volt charge and is typically thinner than the more common AAA battery. The premise of the work undertaken by Konanur was that a simpler system would cost less to manufacture while also potentially providing additional communication abilities. The initial ripping apart and retrofitting of NFC technology in the device is only the first step toward a complete overhaul and redesign of the active stylus.

NFC circuitry that can function through the LCD display

"We started off trying to replace the battery just to make it cheaper and also to let this anxiety from people go away that they will lose their stylus in the middle of something important and that it will get discharged," says Konanur. "How do you know that you will always obtain power as required?

"But in doing so and also using NFC, we realized that you can add a communication link between the stylus and the PC," says Konanur. "You can pre-program the stylus to act as a particular way, you can pair a stylus with a PC. There are things we can do now with storing little bits of information in the stylus." Konanur said with the few kilobytes available in storage on the NFC stylus profiles, different user preferences, configurations or other types of data could be stored potentially.

An NFC stylus that's able to charge wirelessly from the tablet

Other benefits to NFC-powered styli include a more environmentally friendly design with the elimination of battery recycling as well as a more open standard for application developers and industrial designers. Konanur also believes that with the gained space within the stylus, other sensors could be added to make the stylus more of a stand-alone device to augment the functions of the PC, or to provide additional functionality when coupled with computer algorithms.

Challenges still exist, however, according to Kumar and Konanur, specifically around larger displays as well as ensuring the NFC-powered stylus has active power immediately with no perceptible delay. While smaller, 7- to 8-inch screens on tablets can use a single NFC coil potentially, larger form factors may require other types of solutions such as having multiple NFC coils behind the screen in various locations or charging a stylus when it is contained within the device, which could also require a small, rechargeable battery or a super capacitor, says Kumar.

"I think the pen is a very important aspect of the user experience on tablets, which has so far been largely ignored or slapped together through some combination of what ecosystem players have been able to do themselves," says Kumar. "There really should be no reason in this day and age that you have to carry a paper and a pen anymore, you should just be able to use an electric pen across the board on different devices."

"At the end of the day, a stylus can be a very finely crafted instrument," says Konanur. "It's probably a computing device in its own right."

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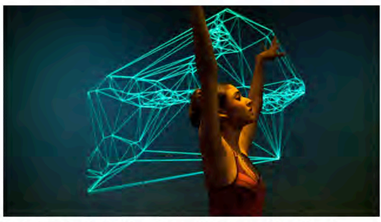


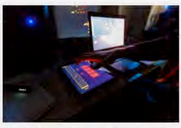
Brooklyn Ballet turns to local hacker community to bring wearable technology to traditional ballet for 'The Nutcracker'

Brooklyn Ballet artistic director, Lynn Parkerson, wanted her ballet company's version of Tchaikovsky's "The Nutcracker" to reflect the diverse community surrounding it. Not only does she incorporate pop-and-lock dancers along with waltzes, but also enlisted the help of NYC Resistor, a local hacking collective, to bring wearable technology to a classical ballet holiday production.

"'The Nutcracker' is sacred," says Parkerson, who founded the contemporary ballet company in 2002. Brooklyn Ballet is a relatively new company, and while Parkerson wants to keep with tradition, she wants her production to be different. And she turned to technology to augment and enhance various aspects of her choreography.

Technology Tracking Dancers

A couple of years ago, Parkerson wanted to show dancers' movements from a different perspective. She turned to a local biomechanical engineer who had taken a ballet class. As it turned out, this engineer was also a member of NYC Resistor where collaborative technology problems and projects are regularly shared. The project caught the attention of Nick Vermeer, who manages the sales engineering department of a telecommunications company, is an active member of the hacker collective, and "a huge ballet fan," in his words.



Visualization controls on an iPad, operated by Nick Vermeer. (photo: Billie Ward)

Using USB webcams mounted to the above-stage lighting grid, open source software, available on-hand computers and a zero-dollar budget, Vermeer and team crafted an intricate means to behind the onstage dancers in real time. The webcams tracked the dancer movement and converted the data into multi-touch data. They chose multi-touch, data that comes from a tablet or a trackpad, because interfaces for this data type already existed and could be easily simulated for testing. From there, a second program generated visual effects in real time. They later added a lighting board controller for the iPad to control the visualizations.

Parkerson wanted to take the technology further in other dance productions. As she saw projected stars on the back screen, she thought these to be like snowflakes, which added another dimension to the dance and made her think about the "Waltz of the Snowflakes" in "The Nutcracker."

"It's an interesting experiment," says Parkerson. "We had this backdrop that was related to what the dancers were doing. You would see the dancers do something and then in the back, you would see something related. We were trying to keep the choreography and the content front and center and then adding this overlay."

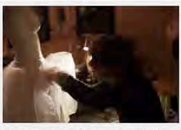
Sensors in Costumes Can Have Issues

The technology moved from the stage screen and onto the dancers themselves for two dances in the Brooklyn Ballet's "The Nutcracker." NYC Resistor members, Nick Vermeer, Billie Ward and Olivia Barr crafted LED-sparkling tutus for the "Waltz of the Snowflakes" and an accelerometer-embedded, illuminated shirt specifically for a pop-and-lock Drosselmeyer, the magician in "The Nutcracker."

With six strings of LEDs sewn into the tulle, the lights of the tutu react to the dancer's movements based on data received by the sensors. (photo: Billie Ward)

The tutus had three main components apart from the various layers of tulle, the controller (a Teensy 2.0 that has an Arduino-compatible development environment), an MPU-6050 SparkFun motion sensor board, and six strings of RGB architectural LEDs. Vermeer has placed the initial Arduino tutu controller code on GitHub for others to use freely.

The construction was not without issues, says Vermeer. They had difficulties in choosing a conductive wire for the electronics. Many of the available wire options were too brittle or not solderable. The team finally landed on robotics sensor wire that was extremely flexible, "like wet spaghetti," explains Vermeer.



Nick Vermeer, ballet fan & member of NYC Resistor hacker collective, sews in LEDs to a tutu. (photo: Billie Ward)

"The biggest problem we encountered with the tutus was that we didn't anticipate the amount of static electricity they would generate," says Vermeer. "There are several different layers of tulle, and they are different types of tulle. Well, when you rub two dissimilar materials together they generate a static charge, so the controller chip that is on-die on the LED has no or minimal ESD [electrostatic discharge] protection so every single performance, the dancers would kill a strip or two of the LEDs so we would have to go in and cut out the LED and replace it."

The Pexel shirt, with embedded accelerometers in the pectoral area and wrists, and the pop-and-lock Drosselmeyer dancer, Mike "Supreme" Fields, also had technical barriers to overcome. It had to be designed to be flexible yet tight-fitting enough to detect the popper's chest movements. But this posed issues as Fields literally popped out all of the wires and solder joints when he first wore it. Designer Olivia Barr had to find a material that was stretchy enough and still fit the body perfectly but did not stretch the wires within.

Brooklyn Ballet's pop-and-lock dancer, Mike "Supreme" Fields, tests out the Pexel shirt 1.0 with embedded accelerometers and LED lights. (photo: Billie Ward)

"With wearables, that's one of the main problems," says Barr. "There are all kinds of things you don't expect. When you are doing a thing that is a wearable, you are in constant motion. You have to worry about things like static, sweat and movement – all kinds of things that can short you out and break you down."

Traditional and Modern Trends Merge

Will wearable technology further integrate into classical ballet? Trends are "pointe"-ing in that direction, literally. Barcelona-based, product designer Lesia Trubat González, who has experience in graphic and industrial design as well as communications, created technology to work with ballet pointe shoes to track a dancer's movements and convert them into brush strokes on a digital screen.

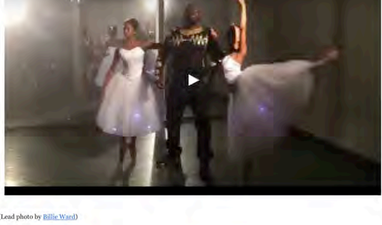
"This was my starting point because I had already worked with dance gestures, traces and motion before, inspired by a lot of dancers who already use their motion for creating art," says González. "I am an amateur ballet dancer, and I am also very interested in technology. After research I could see how technology is starting to be implemented in the world of dance."

Brooklyn Ballet's Parkerson knows of González's sensor-enabled ballet shoes. "We have been talking about doing some version of that too. We are also thinking about the pointe shoe and that pressure when you step into a pique arabesque, if you could visualize that would be a really interesting thing to show."

Ballet pointe shoes with embedded motion sensors designed by Barcelona-based Lesia Trubat González.

"We at the ballet company want to keep the tradition and beautiful magical quality that is the story, and the technology is to just enhance that, whether it is stars in the sky or glistening snowflakes, or pop-and-lock dancers," says Parkerson. "[Technology] is great for pop-and-lock dancers because their movements are very small. For me, pop-and-lock dancers are really the character dancers of our day. So instead of the classical pantomime, we are kind of taking the urban vernacular forms, so there is a real practical use of the technology for those dancers, otherwise you don't see it on a big stage…the technology can sense very small micro-movements.

"We are trying to bring new things to the form," says Parkerson, "and see what happens to the form when we do that."



(Lead photo by Billie Ward)

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What to Know When Buying a PC, Laptop or Tablet

December 11, 2014 Share

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Some tips to keep in mind when shopping for a new computer or mobile device.

The holiday shopping season is upon us and many consumers are heading out to purchase a new PC or laptop to refresh or add to their technology collection. The choices for laptops, PCs and tablets have expanded over the years and often can be confusing for the end user. It's important to understand what is available as well as what is important to have or not from a feature perspective. Is it better to put your money towards a larger display or more RAM? Do you need to have an HDMI output or look for a higher capacity battery?

Key shopping factors

There are certain criteria that you should consider no matter what kind of computer you're searching for:

- **Consider how the computer will be used** – Start by determining who will use the computer, how it will be used, and for how long. For example, someone who needs to create charts and graph, or write reports or do online research, will need a more-sophisticated computer than someone who only plans to casually browse the web. But if the person plans to listen to music, stream videos or play games, you'll want a machine with more memory, faster processor speed, and better graphics and sound.
- **Hard disk versus solid-state drive** – Laptop users have two choices; the traditional hard disk drive (HDD), or the solid-state drive (SSD). HDDs are suitable for everyday use, but they are more fragile than SSDs and can be damaged by dropping, exposure to extreme weather, and general negligence. SSDs are more durable, quieter, and faster. But they also cost up to eight times as much, and the available drive size tends to be smaller than HDDs (2 TB on average for HHDs, 256 GB for SSDs).
- **How portable do you really need?** – When trying to decide how big of a laptop to buy, ask yourself how many days a week you plan to carry it around with you. The more you plan to travel, the smaller or lighter a device you'll probably want. If you plan to carry your computer only once a week or less, a larger model may be acceptable. Smaller laptops, such as Ultrabooks, usually with screens about 10-12 inches (diagonally) are about 2.5-3 pounds on average. Larger units, with 15-plus-inch screens, can be more than twice that.
- **What's the Wi-Fi capability** – All new PCs have Wi-Fi capability, and they're capable of supporting the 802.11n or earlier wireless networking standards. But some models, especially newer Ultrabooks, can use the faster and more-stable 802.11ac standard. It's effectively an upgrade to 802.11n, so if your existing router and other devices can use that standard, they'll work with 802.11ac.
- **Beware of "bloatware."** – Lower-priced laptops often include trial versions of software for everything from PDF readers to anti-malware. Expect to spend a couple hours cleaning unwanted apps from the computer when you get it home.
- **In-person trumps online** – When you buy an item online, you don't always know what you're getting. Buying it in person, when possible, gives you a chance to go hands on with how it feels to type on the keyboard and use the trackpad. It's also easier to return the product if it's not to your liking.
- **Check the computer's warranty** – Just about every computer vendor offers a limited one-year warranty on new computers. These warranties cover defects in workmanship only. Extended warranties, including the "good proof" ones covering owner negligence, cost an extra $150 to $600 or more for additional years. You'll have to weigh the worth of such a warranty.
- **Carefully consider no-interest payment plans** – PC retailers will usually offer some type of low- or no-interest credit plan with your computer purchase. You can save a lot of money with such a plan, and squeeze the machine's purchase easily into your household budget—especially since that price will ultimately include new versions of software for your new PC. But remember that you really only save money if you stick to the credit plan's terms—i.e. "12 months, no interest" means you must pay off the machine within 12 months, or face accumulated interest charges. And, consider that every new credit account initially affects your consumer credit score. Do you research here before jumping on any offer that might only be attractive on at first glance.

Now that you have the general buying recommendations, which type of device should you get: desktop PC, laptop/Ultrabook or a tablet?

Desktop PCs

If you need a lot of data storage space, a larger visual display (without having to buy another monitor), greater capability to hook up accessory tools like a printer, external drive and camera, and generally a lot more power in the graphics and data processing departments (a must if you're into graphics-heavy projects), a desktop is your best bet.

Things to keep in mind include:

- **Traditional desktop or all-in-one (AIO)?** – Most desktop units today are AIO models, model, where the monitor and hard drive are combined, and the only separate components are your mouse and keyboard (frequently wireless). There are advantages, as you don't have any cables to deal with unless you hook up some type of external device like a hard drive or CD/DVD/Blu-ray burner. The AIO also uses laptop components, including CPU, memory and optical drive, meaning it will run quieter and use less energy. But, traditional, multi-piece desktops tend to be more powerful, less-prone to system crashes, and, unlike many AIOs, they're upgradeable.
- **Display resolution** – Make 1920 x 1080 (the HD standard) your minimum choice; 2540 x 1440 is better to avoid seeing individual pixels. If you're buying a machine with a large display (27 inches or more), go for 3200 x 1800 if possible.
- **CPU speed** – AIOs start at Intel Core i5 level, but go for an i7 processor if you can. The i7 is now the standard in a desktop PC.
- **Memory** – In terms of size, you'll want a system with a minimum of 8GB. However, you'll also want to make sure it has extra memory slots to allow addition of more memory if desired. Otherwise, you may have to replace all the existing memory to upgrade.
- **Hard drive size** – Bare minimum these days is 1TB, but if you plan to do a lot with video and other graphic programs, you'll want to at least double or triple that requirement.
- **Inputs or ports** – Look for 2 system with at least two USB 3.0 ports, a card reader, and an HDMI input. A Thunderbolt port, faster than USB 3.0, is a definite plus.

Laptop and Ultrabook PCs

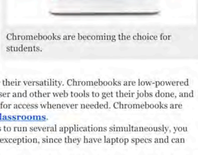
Image: Mike Licht/Flickr.

Laptops are the choice of most computer users, as the units are portable and capable of doing just about everything they would need a PC to do. They're also fairly inexpensive compared to their larger desktop and AIO cousins. But there's a lot more choice involved when buying a laptop.

Here are some points to keep in mind:

- **CPU type** – Your main choices are dual core and quad core. Dual core-driven machines are suitable for web surfing, creating and sharing documents, and streaming messages. They're becoming less common, but some of the lower-to mid-priced laptops still use them. Quad-core laptops offer more power, but they're also going to be louder, hotter and use more energy.
- **Screen size** – As with AIOs, the higher the resolution, the better the image viewing, and the larger the screen size, the higher the resolution should be. Native resolution is now 1920 x 1080 (also known as 1080p). Some 15-inch or larger screens are into ultra-high definition territory of 2560 x 1440 or better.
- **Battery life** – Compare products carefully here. Even a laptop that boasts it can get 8-plus hours in battery life gets less than half that amount if you're watching video. And, keep in mind that more-powerful batteries weigh more.
- **Weight and thickness** – Current laptops are already famous for being lightweight—anything above six pounds is considered "heavy." Newer laptops—particularly Ultrabooks—are practically paper-thin and feather-light, with some barely topping 2.5 pounds and a half-inch thick. But remember that sometimes "super light" means "not so durable." If possible, try picking up the laptop or Ultrabook by one corner, or try typing with it in your lap instead of on a solid surface. If it feels flimsy instead of firm, durability could be an issue.
- **Touchscreen** – This is a standard now for laptops and Ultrabooks, although some older models are not touch-enabled. When considering this feature, make sure the model you're buying has at least 10 touch points, so that it fully supports Windows 8.
- **Choose carefully** – Some laptops, especially those in the thin and light category can't be easily upgraded in terms of memory, graphics card or hard drive. This can take them from top of the line to crawling behind in only a few years. So, research the upgradability of the models you are considering. If it's a model that can't be upgraded, then buy the best you can afford to give it the longest lifespan.

Tablets and Chromebooks



Chromebooks are becoming the choice for students.

As the middle ground between laptops and handhelds, tablets offer some of the flexibility of a laptop, thanks to their ability to run basic business productivity suites and Internet apps. They're smaller, lighter and overall less expensive than their larger PC brethren. In some cases, such as with Chromebooks, they're practically plug and play. However, they are even more limited when it comes to keeping them technologically up to date, and they're starting to face competition from smartphones, which are becoming larger and more tablet-oriented.

Here's what you should keep in mind when shopping for a tablet:

- **2-in-1 or Chromebook?** – 2-in-1/hybrids function as a tablet and a laptop and are popular for their versatility. Chromebooks are low-powered laptops for people who rely mostly on the web browser and other web tools to get their jobs done, and want to be able to store all of their data in the cloud for access whenever needed. Chromebooks are increasingly becoming **the laptop of choice for classrooms**.
- **Necessary use** – If you are a multitasker who likes to run several applications simultaneously, you probably won't want to buy a tablet. Hybrids are an exception, since they have laptop specs and can handle heavier use.
- **Operating system** – Remember that the OS on a laptop or desktop PC has to be compatible with the tablet's if you want to use the same apps.
- **Storage, processing and memory** – Stick with at least 32 GB of data storage size, but more is always better as you gather more files. Go with at least a dual-core processor, especially with a Windows tablet, as the CPU determines what the tablet is capable of. With system memory, you won't have much choice, as most tablets carry 2 GB maximum. Again, more means more.
- **Ports** – As with laptops, a Windows tablet can offer a number of ports for connection to other devices, and vice versa. These include USB, micro-USB, SD card and HDMI.

While there are a lot of factors and decision points when deciding between PC's, laptops and tablets, it comes down to personal preference and carefully identifying the right tool for the job.

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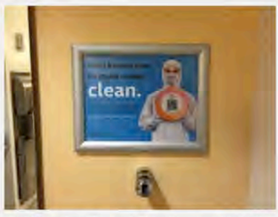
Intel Takes IT into the Toilet on a Global Scale

December 2, 2014 **Share** Like G+1 TAKE THIS CONTENT

Near field communication flushes away lengthy process for toilet paper requests.

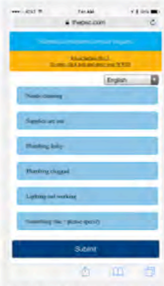
Deep in the bowels of Intel headquarters in Santa Clara, Calif., the restrooms have been plumbed with technology designed to enhance the experience of uh ... freshening up. From overflowing toilets to empty towel dispensers to faulty faucet motion sensors, Intel employees can now swipe their washroom maintenance requests using smartphones. Capitalizing on the success of its Silicon Valley high-tech restroom initiative, Intel is rolling out the program to 22 site campuses across the world.

Near field communications (NFC) chips installed in the restrooms of Intel's Robert Noyce Building at the beginning of 2014let employees anonymously report maintenance needs with a tap of their mobile phone. Those without NFC-enabled smartphones have the option to scan a QR code.



Employees can file maintenance requests with their smartphones using the NFC tags or QR codes in restrooms at Intel facilities in many countries.

Based on positive feedback from the Silicon Valley pilot, Intel is re-plumbing restrooms in all of its global offices to include NFC andQR codes. In order to ensure a clean flowing process, signage is being translated into eight different languages and the mobile application is being updated to have the most commonly reported restroom issues being the most accessible within the app. Each of the restroom signs is custom-coded for that particular restroom so that when the mobile application is triggered, it is for that restroom. 2,215 signs with NFC/QR codes will be hung worldwide.



Both the NFC and QR code send the user to a site to report any work needed.

Streamlining the service request process addressed a big challenge for facility maintenance staff, according to Joe Maestas, a former project manager for Intel Corporate Services involved in the initial pilot program.

"One of the things that everybody loves to complain about is bathrooms," he said. "But people never report issues."

That general lack of movement prompted Maestas and his team to plunge into finding a way to unclog the restroom maintenance request process and get things flowing down the right pipe.

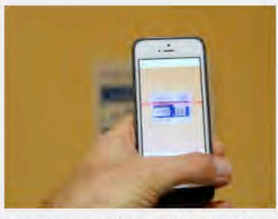
According to Suzy Hart Langdell a communications specialist in the projects and solutions team of Intel's Technology Manufacturing Group, there are over 20,000 restroom service requests per year worldwide.

"There is [generally] a 15- to 30-second time period from when a person sees something to when they will report it — if you make it really easy," said Maestas. "Outside that 30-second window, the opportunity is lost."

Previously, employees could submit service requests via an 11-step process on the company intranet or call them in, neither of which had much sense of urgency. The restroom signs with NFC chips and QR codes keep opportunities to report issues from going down the drain by making the process easy — now three clicks or fewer — and immediate.

Initially, usage has been divided along gender lines with approximately eight in 10 requests coming from men's restrooms. According to IT in the Toilet, a study conducted by marketing firm 11Mark, smartphone use in the bathroom doesn't differ much for men (74 percent) and women (76 percent), but men are more likely to bring their smartphone: 30 percent claimed they never go to the bathroom without their phone, compared with 20 percent of women.

"I know I don't bring my phone into the restroom," said Michelle Creed, a project manager on the program. "Maybe the guys keep it in their pockets or have it on their belt. So, that could be the difference, the mobile phone actually going with the person."



Apple iPhone scans QR code to launch work order submission form.

A life-sized sticker graced the mirrors of Intel bathrooms, informing — and potentially startling — those seeking relief.

In order to attract restroom visitors to use the new system and ensuring that bathroom "surfaces" are clean, Intel corporate services teased a giveaway of a Microsoft Surface Pro 3 that Intel employees could enter to win using the new smartphone restroom app. Funny thing is, the janitorial staff in charge of clean restrooms noticed an increase in bathroom "issues" as people tried to enter via reporting a problem in the restroom. The link to enter the giveaway did not require an "issue" being entered, however.

Regardless of where the requests come from, there is some anecdotal evidence that the new smartphone process has shortened response time to maintenance requests. Maestas cites the example of an empty soap dispenser that was refilled before the person who submitted the request had even left the restroom.

"From a customer perspective, that is what you want — real-time results," he said.

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Smart IP Cameras Can Read Traffic, Identify Pedestrians

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Video analysis previously accomplished on powerful servers now done on a chip in a smart camera.

Want to know what a car was doing prior to hitting a pedestrian? Tracking a vehicle when it enters a scene, coupled with identifying a jaywalking pedestrian could prove the pedestrian is at fault and not the vehicle. With older systems, law enforcement had to follow each object or person individually, but new security cameras launching in China with smarter chips are assisting law enforcement agencies in the analysis of vehicle and pedestrian traffic with real-time results.

Gone are the days of reviewing hours upon hours of back-to-back video surveillance footage from a traffic camera or waiting for a back-end server to complete analysis to discover critical instances, anomalies or activities such as traffic accidents, parking violations or robberies. Using the hardware and software built into a smart camera, law enforcement will now be able to track multiple objects simultaneously within the scene, avoiding having to review longer segments of captured video.

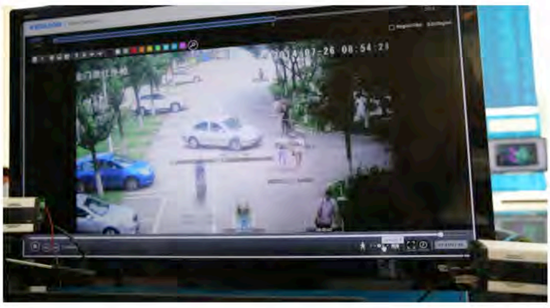
An Intel reference design smart IP camera.

Using an Intel Atom E3845 processor embedded within a security camera for onboard analysis – a task previously reserved for high-end, back-end servers – unnecessary background footage is automatically ignored or removed while pedestrians, vehicles and bicycles are extracted and categorized in real time.

In just six months, Intel engineers were able to create a reference design, complete with hardware and software, to remove server-side processing, and provide a self-contained camera that is both high-performing and consumes relatively little power. With video recording capabilities of 30 frames per seconds in 1080p resolution, a new type of video analytics is now performed by the camera.

Kedacom, a video conference and network surveillance system manufacturer in China, is the first corporation to adopt Intel's reference design in its smart IP camera solution, which provides car, people and object differentiation. An Internet protocol (IP) camera is a digital video camera attached to a computer network or the Internet allowing it to send and receive data, often used for surveillance.

With the hardware and software combination, hour-long videos can be "compressed" into a much shorter length of time, sometimes merely a few minutes, as well as into a smaller file. This is accomplished with the camera itself actually analyzing the video, identifying and isolating various objects in the scene, and then overlaying these identified objects in a much shorter video. The resulting video, which is delivered to the back-end servers, shows a static background with the objects overlaid in motion.

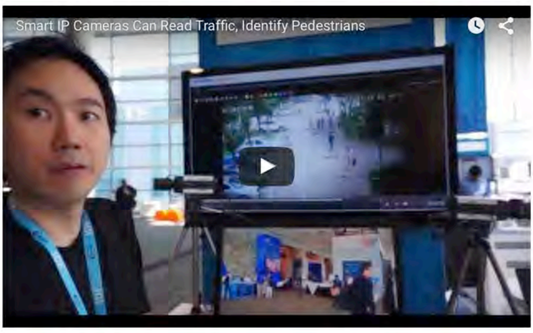


According to Mike Wong, business development manager within Intel's Internet of Things Group in China, previous IP cameras only encoded and compressed video that was filmed; this video was then sent to a centralized server for decoding and analytics. These back-end servers were powered by Intel Core or Intel Xeon processors with network video recorder (NVR) software and transcoding software used to convert different types of video formats including AVI, Motion JPEG, MPEG2/DVD, MPEG/VCD, MPEG4, H.264, H.265 and others.

"By enabling in the camera itself, we conduct metadata extraction and/or object/people/car differentiation in real time in the front end, without the need to transmit the entire video stream backward., just need to transmit the 'useful' data/results on demand," said Wong. "For comparison, previously we needed a Core or even Xeon CPU [on the network video recorder server] or on the backend to decode the compressed and transmitted video feed, then conduct the algorithm, metadata extraction, sorting, filtering, etc."

The global market for video surveillance equipment is expected to grow by more than 12 percent by the end of this year and revenue is expected to rise to $15.0 billion, up from $14.1 billion in 2013, according to HIS Research's "Trends for 2014 – Video Surveillance Trends for the Year Ahead" whitepaper. Driving these numbers are a variety of new technologies, analytics, sensors and vendors.

Heng Juem Han, platform architect from Intel China's Internet of Things group, envisions the smart IP camera technology will be used within shopping malls for crowd monitoring, traffic counting and business intelligence with the back-end servers being freed up to perform data collection and data mining. The technology could eventually become incorporated into consumer video monitoring products, moving beyond the traditional "hot spot" and "zone watching" they currently do.



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Up in the Air: Will Wearables Cause Travel Confusion?

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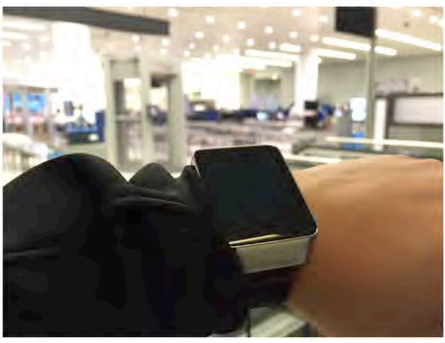

What you need to know about traveling with your shiny new wearable through airport security and what to do with it on the airplane.

Thinking of gliding through airport security wearing your new FitBit, Basis, Android Wear watch or soon, your Apple Watch? Think again. New wearable technology in the form of smart watches, activity trackers and jewelry with embedded tech are the latest gadgets making their way through airports, which may cause confusion for security screeners as well as passengers.

The Federal Aviation Administration (FAA) and the Transportation Security Administration (TSA) have yet to fully write official policies around security, safety and usage of wearable technology, but currently such devices are treated no differently than the other electronics you may bring on your travels.

The security checkpoint at Denver International Airport.
Photo: Dan Paluska/Flickr.

"There are millions of things that people can bring through a checkpoint so it's hard to give a policy or directive on one piece whether it's a phone or other type of jewelry, so it's in the best interests of the passenger to get items screened or put through an X-ray machine just to verify that they do not alarm," according to Ross Feinstein, press secretary for the TSA. "Our goal here is to ensure that there are no prohibited items on the passenger or in their luggage when they get access to the airport."

The TSA says that over 1.75 million people pass through its security checkpoints every day.

When asked about the classification of wearable technology, a spokesperson for the FAA said the agency considers wearable technology to be a personal electronic device (PED). The agency considers a PED to be any piece of lightweight, electrically powered equipment device capable of communications, data processing and/or utility. Examples range from handheld, lightweight electronic devices such as tablets, e-readers and smartphones to small devices such as MP3 players and electronic toys.

In terms of distinction between a wearable and a tablet, for example, the FAA doesn't discriminate.

"If the device performs PED functions, then PED rules apply," said a spokesperson for the FAA.

It is not clear how much attention companies working on wearable technology are paying to security situations such as at airports, but the issue is bound to become more prevalent as more devices come into the market. Because there's no specific policy in place, experiences – and opinions of protocol – during travel may vary.

My Intelligent Communication Accessory, or MICA, is a fashion wearable that features Intel technology and the design aesthetics of Opening Ceremony.

Tim Pettitt, product line manager in Intel's New Devices Group who helped design the MICA wearable, says that while Intel and Opening Ceremony follow the Federal Communication Commission's (FCC) guidelines on capabilities needed, they haven't worked directly with the TSA or FAA.

Pettitt says whether or not your wearable has a cellular modem may determine what actions you need to take when going through security or using it on an airplane.

"In most cases, you can leave your wrist-worn wearable on through security and won't need to power it off in flight," says Pettitt. "Most airlines are not concerned about Bluetooth and will explicitly tell you to shut down your Bluetooth device if required. However, if you have a device, like MICA, which has a cellular radio, you need to put it into airplane mode just like you would a phone."

A recent travel experience while wearing a Samsung Galaxy Gear Live Android Wear was in line with Pettitt's statement. For security checkpoints that allowed jewelry and other accessories to remain on the person, the smart watch was treated no differently – though it's unclear if security personnel recognized that it was an electronic device.

A Samsung Galaxy Gear Live Android Wear watch in airplane mode.

Fashion wearables such as the MICA may further blur the lines of what's considered jewelry and a PED. While removing a bracelet or necklace may just be a minor inconvenience, tech-laced clothing with integrated sensors could pose logistical problems for passengers asked to place all electronic items in the plastic bins.

Onboard aircraft, passengers are now always instructed to switch all personal electronic devices into airplane mode, and most wearable devices today have such on/off capabilities for radios.

"For travel purposes, we did make it possible to turn off the wireless capabilities directly from the touch-screen interface of the new [Basis] Peak," said Jef Holove, former CEO of Basis and now general manager in Intel's New Devices Group. Basis, a maker of biometric smart watches, was recently acquired by Intel.

While there's yet to be a formal policy in place, agency representatives and wearable makers recommend following a number of guidelines when traveling with wearables.

7 Tips for Travelers with Wearables

Consolidate – Feinstein recommends consolidating all of your electronic gadgets into your carry-on, handbag, purse or briefcase and passing your carry-on through the X-ray screening device.

Leave it at home – If you don't absolutely need your expensive wearable, it's best to leave it at home.

Fully charge your wearable –Condé Nast Traveler reported the TSA wants travelers to validate that your cell phone is real by powering it on. When asked about this new policy, Feinstein said it was for certain airports outside the United States for flights coming to the United States and that it was not a policy implemented in domestic airports. It's often difficult to find free plugs and enough time at airports to charge your device, and most airplanes don't have plugs.

Avoid realistic replicas of weapons – If there is any question as to the nature of your wearable, Feinstein says the device will be confiscated.

Follow the PED rules – As per FAA guidelines, if the flight attendant asks you to turn off your wearable or put it in "airplane mode," do it otherwise you may have it taken from you.

Put in "Airplane mode" – Pettitt recommends that if your wearable has a cellular radio, it's best to put it in "airplane mode" (which also helps conserve battery life).

Double-check the storage bin – Feinstein recommends that users should always double check the security bins to ensure nothing is left behind.

An example of what not to travel with, this suspicious looking art piece fouled the travel plans for a man in 2012.
Photo: TSA.

Remember, not every security screener has seen each and every wearable on the market. Some ankle-worn activity trackers have even been confused by authorities as a law enforcement ankle bracelet. When in question, err on the side of over-explaining or putting the device in your carry-on.

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Technologies Mimic the 5 Senses to Monitor Pipelines

October 29, 2014 **Share** TAKE THIS CONTENT

Technology advances enable proactive detection of leaks, breaches and ruptures.

In 2013, the U.S. Department of Transportation reported 623 gas and hazardous liquid pipeline incidents that resulted in 10 fatalities, 47 injuries and an estimated cost of $336 million in property damage. Material, weld and equipment failures represented over 28 percent of the causes, with corrosion and excavation damage accounting for 18.3 and 17.7 percent, respectively, for the years 1994-2013.

In 2010, a fatal natural gas explosion in San Bruno, California, prompted Pacific Gas and Electric (PG&E) officials to evaluate their existing pipeline monitoring technologies and recently have begun implementing new methods to ensure their pipelines are safer.

Pure Technologies staff insert the PureRobotics tool into a live pipeline in Calgary, Alberta inspect for structural deterioration.
Photo credit: Pure Technologies Ltd.

To prevent potentially dangerous and damaging accidents, other organizations such as TransCanada Corp., which is building the Keystone XL pipeline, and the Washington Suburban Sanitary Commission (WSSC) that serves the Maryland and the Washington, D.C. metropolitan area, are employing technologies that essentially see, hear, touch, smell and taste various aspects of their pipelines.

"Pipelines use a primary leak detection system called Computational Pipeline Monitoring (CPM) that uses a wide variety of measurements of the flow, pressure, temperature, density, etc. in the pipeline to determine the operating condition of the pipeline," wrote Brian Wagg, director of business development and planning at C-FER Technologies, in an email. "These measurements are compared to a real-time model of what the flow conditions should be in the pipeline to determine if there is something unusual happening, such as an over-pressure event or leak."

According to Wagg, monitoring and leak detection systems "can be installed inside the pipeline, run through the pipeline at intervals, installed outside the pipe in the trench, or be used on vehicles or on aircraft to monitor gas releases into the atmosphere."

Sight

Helicopters outfitted with laser spectroscopic systems "see" methane gas from the air based on how laser light in methane concentrations reflects back differently to the sensor. PG&E has been testing an airborne, laser-based system for leak detection.

Juan Gil, a manager at TransCanada, says that, while the company uses infrared sensors to detect temperature changes in the pipeline at some of its pump stations, which could mean structural failures, the Keystone XL will instead focus on using flyovers coupled with software analytics in conjunction with cabling with various sensor types.

In certain situations, visual inspection is still a human's job. According to Lyn Riggins, spokesperson for the Washington Suburban Sanitary Commission, pipes larger than 55 inches are often inspected by humans, assuming the pipeline can be drained through diversion. But with smaller pipe sizes, the WSSC employs robots to crawl through pipes to allow for remote visual inspection of pipelines.

The PureRobotics platform is a condition assessment tool that identifies structural deterioration in critical pipelines. The system also features inline video to observe internal pipe conditions.
Photo credit: Pure Technologies Ltd.

PG&E also utilizes mini-robots with high-definition cameras, and 3-D cameras that visually maps the *outside* of pipelines.

While humans and robots may be suited to inspect water systems, interior inspections of oil pipelines are impossible due to oil's opaque nature, according to Bruce Dupuis, who handles threat management teams at TransCanada.

"It wouldn't be particularly productive. [A robot] is not going to see through the oil," Dupuis said. "Even if you diverted flow to a different line, you would have to evacuate product out of the line, which would be a huge logistic nightmare."

Instead, according to Dupuis, TransCanada uses other technologies due to its use of steel-walled pipes, unlike in water systems where typically they are concrete. "Between magnetic flux leakage technology and ultrasonic, we can get a very accurate and clear representation if there is any degradation to the pressure containment capability of the pipe."

Sound

Acoustic sensors are often used for pipeline break detection, according to Gil. When a breach occurs, a baseline acoustic signature becomes altered as fluid or gas escapes. Frequently, acoustic monitoring employs fiber optics or other embedded or traveling sensors.

The SmartBall leak detection platform is able to locate pinhole sized leaks in live pipelines. The tool is free-swimming and can complete long inspections in a single deployment.
Photo credit: Pure Technologies Ltd.

Within the Keystone XL and WSSC infrastructures, a relatively new device, a "smart ball" outfitted with acoustic sensors is floated through the pipelines, often ones not accessible by humans. Dupuis points out that these balls do have limitations as they only detect leaks when the balls float past them. As the ball comes in proximity of a leak, there is a higher confidence of detection, explains Dupuis, adding that they should be used in conjunction with CPM, TransCanada's primary monitoring system.

Smart balls should not be confused with "PIGs," or pipeline inspection gauges, another device frequently used by pipeline companies, says Dupuis. While a smart ball flows along the pipeline with the liquid, a PIG is tight-fitting to the pipe.

In a PG&E Current's article, the company proposes "making about 200 miles of pipeline segments 'piggable,' in which an inline inspection tools known as a pig is inserted into a pipeline to gather detailed information."

Touch

Pressure changes, temperature fluctuations and abnormal vibrations can also signify issues. According to Gil, TransCanada uses CPM, an industry standard, which provides real-time transit modeling. Temperature, mass flow and density sensors, coupled with complex math algorithms allow for the identification of anomalies.

This is a scaled-down version of a state-of-the-art pipeline simulator known as the External Leak Detection Experimental Research (ELDER) test apparatus. It is being used by TransCanada to test the different Cable Based Leak Detection technologies in a unique Joint Industry Partnership with fellow pipeline operator Enbridge and the Governments of Alberta and Canada.
Photo credit: TransCanada Corp.

Fiber optic cables, for example, are used to detect changes in temperature. As a laser travels through the cable, changes in temperature causes the light to scatter differently.

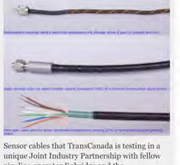
TransCanada is evaluating the use of pressure wave leak detection that is able to detect and locate leaks based on the negative pressure wave. Existing leaks compared with new leaks provide different wave forms that can be detected and differentiated.

Another innovation being developed by a University of Alberta mimics human skin and the sensory cells within. The project extends the concept to wrapping pipelines with a membrane covered in micro-electromechanical strain gauge sensors, which communicate to pipeline operators. The 5 mm sensors would communicate wirelessly about the structural health of pipelines. PG&E has been experimenting with a similar technology of wrapping flexible film with tiny embedded sensors around pipes for real-time ultrasonic wave monitoring.

Smell and Taste

Detecting hydrocarbons, an organic compound consisting entirely of hydrogen and carbon and present in gas and oil, can be done via "taste" and "smell," according C-FER Technologies' Wagg. Vapor-sensing tubes actually capture and transmit vapors to a sampling station where they are subsequently analyzed. If, for example, hydrocarbon vapors are detected, a leak could be causing it. Similarly, other types of gasses could be sniffed out by this type of sampling.

Likewise, cables outfitted with hydrocarbon sensors can react to the detection of hydrocarbons within liquids. A cable can essentially "taste" the surrounding environment in soil or water for the presence of hydrocarbons, which would signify the presence of a leak.



Sensor cables that TransCanada is testing in a unique Joint Industry Partnership with fellow pipeline operator Enbridge and the Governments of Alberta and Canada.
Photo credit: TransCanada Corp.

And Don't Forget Intelligence

Big data and analytics can tie the collected sensor data together to make it useful for predictive maintenance and proactive monitoring.

Intel's Shahram Mehraban, who has been studying the issue as part of the company's Internet of Things business, believes the pipeline industry is still in its infancy when it comes to technology innovation. He attributes this to: Moore's Law still being applicable with more powerful, smaller and less-expensive sensors and edge devices coming to market; the pervasive access to new wired and wireless technology; and advancements in big data and data analytics in order to provide broader and deeper analysis for pipeline monitoring operations.

A small drone powered by Intel Edison used to demonstrate a pipeline monitoring model.

And experimentation with sensors, communications and monitoring solutions continues. At the Intel Developer Forum (IDF) 2014, Kevin Williams, a platform architect in Intel's intelligent platform solutions group, developed a demonstration complete with drones, infrared sensors and gateway communications to illustrate pipeline monitoring. Williams admits that infrared communications to drones is not feasible for real-world environments, but the purpose of the proof of concept for IDF was to showcase how the coupling of technology from sensors to gateways can be innovative within the critical and established pipeline monitoring industry.

The end goal of all of these experiments with existing and new technologies is for economic and environmental good as pipeline monitoring moves from reactive action to proactive predictions, all using combinations of tech-driven senses.

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Hydrogen Fuel Injection a Green Upgrade for Thirsty Semi Trucks

October 10, 2014 **Share** TAKE THIS CONTENT

Diesel engines upgraded with hydrogen fuel injection are both more efficient and cost-effective.

At events and trade shows like International Consumer Electronics Show (CES), exhibitors often have to bring in booth materials that require giant moving trucks. The cost to transport demo materials – sometimes across thousands of miles at a time – isn't cheap, and fuel costs are one area where modern automotive technology can help, while also leaving a smaller carbon footprint.

Hydrogen Injection Technologies' aftermarket supplemental hydrogen on-demand fuel system.

As an example, Intel uses three hydrogen fuel-injected trucks to ship trade show materials around North America, such as CES and the Intel Developer Forum (IDF). The trucks travel thousands of miles a year between conference centers, trade shows and Intel facilities, going coast-to-coast spanning from Portland, Oregon to Miami, Florida, and even across borders into Canada, packed full of booth parts, displays, furniture, electronics, demo kiosks, graphics and other critical show materials. Non-hydrogen injected semi-trucks average between 5 to 6 mpg, whereas the Intel-branded hydrogen trucks average around 6.3 mpg. During a recent trip through California, an Intel hydrogen truck averaged 7.2 mpg representing a significant carbon footprint reduction.

How it works

The hydrogen-injected trucks are outfitted with an aftermarket supplemental hydrogen on-demand fuel system produced by Hydrogen Injection Technology, Inc. (HIT). Using a process of electrolysis, the generators produce hydrogen on-demand. Once the hydrogen is made, the hydrogen gas is sent through a dryer that extracts moisture before the hydrogen injector sends the proper amount of hydrogen gas into the air-intake of the engine.

Hydrogen injection has been in development since the 1970s and works by injecting hydrogen into a traditional combustion engine, which allows the engine to burn cleaner with more power and lower emissions. Hydrogen is injected into the air prior to entering the combustion chamber. Hydrogen burns 10 times as fast as diesel and, when mixed with the diesel in the combustion chamber, accelerates the rate at which the diesel burns.

HIT's system differs from fuel cell vehicles recently demonstrated by carmakers such as Chevrolet, Honda, Hyundai, Mercedes-Benz and Toyota, which use hydrogen to power an electric motor to drive the car. Instead, the system used in the Intel-branded hydrogen trucks supplements the diesel combustion engine, enhancing fuel efficiency.

Cost and fuel savings

Using calculations provided by HIT, a truck that drives 120,000 miles annually can cost over $80,000 in fuel alone, given an average semi-truck fuel economy of 6 miles to the gallon and the current price of diesel in California of $4.08 per gallon. According to HIT, depending on the product, companies can save between $10,000 and $16,000 per year in fuel costs. A typical HIT product costs $15,000, not including installation charges.

The truck is branded clearly indicating that it's hydrogen fuel injected.

In 2013, Intel saved over 77,000 gallons of diesel through the consolidation of freight onto the fewest trucks possible. Over 600 gallons of diesel were conserved by using the hydrogen-injected trucks for four North American trade shows in 2013.

However, as part of a complex corporate sustainability initiative, simply having a hydrogen-injected or "green" truck would not be sufficient, said Lou Cozzo, manager, executive keynote group and sustainable events program at Intel.

Smart shipping

"Most of the avoidance comes from shipment consolidation, rather than the "green" technology, which is relatively small in terms of impact, but still very important," said Cozzo.

According to Cozzo, Intel's inbound and outbound event shipments are planned for efficiency where the highest number of packages are placed on the fewest number of trucks.

The Intel-branded hydrogen truck about to leave an Oregon facility.

"When you consider different departments, staff and agencies are sending all kinds of materials to and from an event from and to various locales, this takes extra effort to coordinate and make sure everyone's items are ready and on time to go together on the same truck, as opposed to just letting people ship everything willy-nilly," Cozzo explained.

"It's important to contextualize this data as the estimated benefit of smart, sustainable planning processes," said Cozzo on the impact to the carbon footprint. "It compares two alternative scenarios – separate shipments if no one took the time to thoughtfully schedule and plan flow-of-freight with using fewer trucks in mind, and the scenarios where improved consolidation is able to happen. The carbon avoided is the difference between the two scenarios."

In fact, S&M Moving Systems, the company that manages the hydrogen-injected semis and shipping in general for Intel events, reported a 917 metric ton CO_2 emission reduction for 2013 by using the combination of shipment consolidation and hydrogen-injected trucks.

Intel has used the hydrogen-injected trucks since 2010.

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Debate over Cellphones in Schools Continues

October 7, 2014

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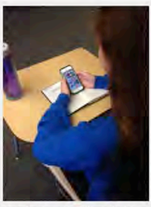
Smartphones in K-12 brings controversy – disruptive or necessary for learning and safety?

The debate over cellphones in schools is heating up. As phones, tablets and other digital devices become more pervasive, schools across the country are continuing to grapple with policies that range from outright bans to free and open use in the classroom and everything in between. According to teachers, students and administrators – even those at the national level – there is no easy answer and many questions remain.

"National PTA does not have an official stance on whether or not cellphones brought by students to campus should be allowed," Heidi May, media relations manager for the National Parent-Teacher Association, said in an email. "The association does support and recognize the importance and benefits of technology in learning."



A student uses her iPhone during class at Campolindo High School in Moraga, California

According to current policies in place across select schools in the U.S., there is one overriding theme: technology and personal devices, such as smartphones, are here to stay with the potential to enhance the learning experience. Beyond that, the policies on usage particularly for so-called "bring your own" devices vary dramatically.

In Bowling Green, Ohio, teachers are given the discretion to allow personal devices in the classroom on specific projects. In Corcoran, California, the Corcoran Joint Unified School District allows students to use their own devices with a teacher's permission, but the district reserves the right to search personal devices if they feel any school rules have been violated. Students cannot record media or take pictures on school property unless they have permission from a school staff member and the person whom they are photographing.

The Oak Hills School District in Cincinnati, Ohio has been working on the bring your own device issue for several years, writing and rewriting policies to meet the changing dynamic in its classrooms. The district has taken a strong educational approach that involves buy-in from students, teachers and parents around "acceptable use." They even have a personal devices "passport," which includes an acceptable use policy and requires students' and parents' signatures.

A sign outside a classroom at Westview High School in Beaverton, Oregon.

The New York City Department of Education flat out bans personal devices on school property, paving the way for privately-operated phone trucks that will store a student's phone for $1. The ban was put in place by former NYC Mayor Michael Bloomberg during his administration, but current mayor, Bill de Blasio, who acknowledges that his son frequently violates the current policy, vows to allow cellphones in schools in the next update to the discipline code this fall.

Policies can even vary within a school district. In Lafayette, California, elementary and middle school students may carry devices in their bags, but they must be switched off during the entire school day. Lafayette high schoolers, however, may use their phones while on break.

"I was honestly shocked that kids could bring their cellphones into the classroom," said Ken Bakar, who has a high school sophomore and a sixth grader in the Lafayette School District. His daughter, Madeline, however, recounted how she used her cellphone to text her parents when the high school went into lock down following student threats via social media, despite being told not to by teachers while crouched under desks.

Cellphones for Safety

Safety is another issue some parents and administrators argue in favor of allowing use of devices in schools.

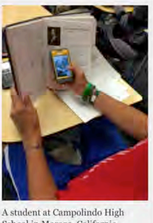
At Westview High School in Beaverton, Oregon, students are allowed to use their phones during the lunch hour and according to teachers and students, most do.

At Moore School District in Moore, Oklahoma, which was hit by a massive tornado on May 20, 2013, the policy was recently revised to allow students to keep phones with them rather than in their lockers. Brad Fernberg, assistant superintendent for secondary schools, acknowledged that the schools were fighting a losing battle against phones generally, but said after the tornado it just made common sense.

"We weren't winning the battle," Fernberg said. "You aren't going to win with parents who give their child a cellphone, so they can reach their child when they need to."

During the tornado that struck the community and damaged several schools, the cell networks were immediately overwhelmed and calls weren't going through, but texts transmitted successfully.

At Westview High School in Beaverton, Oregon, two years ago, teachers confiscated devices if they were found being used in the classroom, but last year, that policy was reversed due to complaints and complications managing all the devices and the restrictions. This year, the school decided to allow phones on school grounds, but they cannot be used in the classroom.



A student at Campolindo High School in Moraga, California conceals his phone to check fantasy football app.

The Beaverton School District now implements a three-tiered "Off and Away" policy regarding phone use in class. A teacher may confiscate a student's phone found used during class for *any reason* (emphasis noted on written policy). The student may retrieve the phone from the main office on the first infraction. Only parents can collect the phone on the second occurrence, and the third offence and beyond will add a written behavior referral.

Megan Staropoli, a French teacher at Westview High School, recognizes the difficulty in keeping students from their connected lives. Nevertheless, she believes that class time should be devoted to learning, and that students shouldn't answer their phones for anyone other than President Obama.

"It hasn't been a big issue yet," said Staropoli, who acknowledges that she gives the kids permission to use their phones to connect and get caught up for a few minutes at the end of class if the day's work is complete.

Ethical Concerns

Thomas Duffy, a 10th and 11th grade English teacher at Campolindo High School in Moraga, California, paraphrased the school policy similar to others: "If the phones create a distraction, the teacher can take the phone and either return it to the student at the end of class, or send it to the office, where the student can pick up the phone at the end of the day."

"I find the students distracted by their phones," said Duffy, who added that they can also represent a potential ethical hazard. "Students take photos of tests and quizzes, and then send those photos to friends. Those tests, which require time and energy to develop, are no longer valid or fair. Big problem."

According to Duffy, Campolindo staff continues to discuss the pros and cons of cellphone use in the classroom and have not agreed to—nor implemented—a school-wide policy that goes beyond what is already in effect.

Some students at Campolindo High School in Moraga, California may make an instant copy of class notes by taking a photo of teaching materials.

As much as phones can be distractions, there is little doubt that they are effective communication tools. Emerging commercial programs like Remind, a free app that allows teachers to text message students and stay in touch with parents, are helping to integrate smartphones with education. According to Remind, one million teachers now communicate with 17 million parents and students via the mobile phone and text-based system. The app is particularly popular in Georgia and Texas, with 50 percent and 40 percent of teachers, respectively, using the system. Remind recently closed a $40 Million Series C round of funding.

"We are entering a different era...in terms of education and technology," Duffy said. "Cellphones could be an incredibly powerful tool for learning, but also have the potential to be a crutch, a distraction, and a cheating device. On the one hand, I think it's cool that a kid can take a picture of whatever notes I might make on the board. On the other hand, perhaps that student would have gained something by going through the process of filtering, processing and writing those notes down on paper. Many questions remain."

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Intel Research Scientists Hack Slot Cars to Illustrate Vulnerabilities and Security of IoT Hardware.

You're driving through downtown, heading to a new hot spot as your Internet-connected GPS gives you the best directions with real-time traffic updates, when suddenly your car veers out of control and accelerates onto the sidewalk. Were you just hacked? As part of a demonstration, Intel research scientists oversimplify the risks of a world of Internet of Things (IoT)-connected devices as they remotely hack into the speed controls of a targeted slot car and force it to shoot off the track.

Sixty-nine percent of consumers plan to buy an in-home IoT device by 2019, according to the 2014 State of the Internet of Things study conducted by Acquity Group. By the end of 2015, an estimated 13 percent of consumers will own an IoT device. As the world races towards the next embedded, IoT or wearable system, the checkered flag can potentially mean that shortcuts are taken and hardware security is overlooked according to some Intel Labs research scientists. When systems on chips are micro-sized, they often have only functions that are dedicated to their core instruction sets, and not secondary functions like security. In the ongoing quest for miniaturization, larger components, previously dedicated to hardware security, are dramatically reduced or even eliminated.

"These resource-constrained platforms are 'naked' now," says Meiyuan Zhao, senior research scientist for security and privacy research in Intel Labs.

Zhao believes that as embedded systems become more common and critical in items such as medical devices and automotive systems, security architectures need to evolve to provide run-time security functionality at the hardware level. To tackle this problem, researchers at Intel are creating TrustLite, a general-purpose security feature for the so-called "naked" resource-constrained environments where tiny, self-contained computing systems often have limited space to hand non-critical functions. TrustLite provides techniques and protocols at a hardware level that protect the control units within various modern system architectures, like the ECU (engine/electric control unit) in cars, in order to prevent malicious execution of commands.

"The devices we are targeting with our technology typically have zero security features," says Patrick Koeberl, security architect in the emerging security lab within Intel Labs. "At these design points, security typically drops off the table because of cost concerns: 'We can't afford the extra transistors – or energy – we don't have the power budget.'"

Without protection, an ECU that governs speed, timing, valves, air/fuel mixtures and other controls of a vehicle can potentially be remotely breached by sending invalid sensor data. TrustLite, an Intel labs project, engages a failsafe protocol when unauthorized access is detected.

Zhao demonstrated how a vehicle's control systems, specifically its telematics, could be remotely breached to inject commands to the system (e.g., increase the speed of a vehicle remotely). Using TrustLite to create a trusted execution environment, the malicious commands are thwarted. Instead of speeding up, the vehicle shuts down – the preferred response to a hack.

"TrustLite uses the concept of a lightweight trusted module (LTM). This is a software component that we can protect with strong, hardware-underpinned security guarantees," explains Koeberl. "In the case of the demo, the LTM implements the throttle control functionality. The LTM concept is a general feature that could be anything: an attestation service, a third-party payment app, a sensor calibration routine, etc."

The labs scientists have designed TrustLite and execution-aware memory protection as a low-cost and energy-efficient way to enhance security of low-end platforms, systems, sensors and even resource-constrained IoT endnodes.

Moving from a simple slot car example to a vehicle hurtling down the road poses much more complexity. A toy is one thing to play with, security of real-world systems like vehicle control is another.

V2V: Vehicle-to-Vehicle Communications

In August, the National Highway Traffic Safety Administration (NHTSA) released a report studying vehicle-to-vehicle (V2V) communications titled "Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application." Among its detailed analysis, the NHTSA discusses the importance of security of V2V – vehicles transmitting information from one to another – safety applications and their communications.

A slot car Ferrari stays on track thanks to hack protection.

"The basis of a relevant V2V security system is 'trust' — a requirement that thousands of data messages will be authenticated, in real time, as coming from a trusted (if unknown) source," states the NHTSA report.

Wearable tech, embedded devices, on-board systems and IoT-enablement depend on security being present and robust.

"If the vision of end-to-end security for IoT is to become a reality, we need to address the devices at the lower end of the compute continuum," says Koeberl. "Only then can we ensure security from the cloud all the way down."

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Volunteer organization brings technology to schools where water, even power are scarce.

In Kenya, living off of the earth literally means exactly that: you build with what you have around you. If there is only red soil, the buildings are made of red mud bricks; if you only have sticks and stones, town construction reflects those materials. This is what Intel Event Marketing Manager Cindi Wiggin noticed as her van wound its way to Matete, a small village in the Western Province of Kenya. As part of a 17-day program, Wiggin and others brought a new type of building material to the Chimoi Primary School in Matete: silicon.

Wiggin recently participated in the "Spark a Child's Digital Future" program. Organized by World Vision, Intel, Microsoft and the British Council, the program brings new technology to communities where there is none. World Vision goes into villages to feed and treat sick children, console anguished parents, and even employ school kids as interns. Another part of the outreach is bringing technology to school labs. Wiggin, an Intel employee for 23 years, jumped at the chance.

Middle school kids at Chimoi Primary School in Matate, Kenya.

Wiggin and her family are no strangers to travel. She and her family have been to Thailand, the Philippines, Mexico, Honduras and Nicaragua, among other locations, and tend to shy away from the overly touristed areas.

"We are travelers, not tourists," Wiggin said.

(L-R) Matete teachers Anne Iminza and Beatrice Akosa receiving personal instruction from Intel employee Cindi Wiggin.

Wiggin was part of a team of five employees participating in the Intel Education Service Corps (IESC) effort, which brought ruggedized Intel classmate PCs, a server and additional workstations to the Chimoi Primary School in Matete. IESC is an international, skills-based volunteer program working with government entities and NGOs to facilitate Intel technology use in education, healthcare and economic development. Since 2009, over 300 Intel employees have completed 62 assignments in 20 countries.

The Chimoi Primary School has an enrollment of over 500 students with an average class size of 40 students. There is no running water, and villagers have to walk for hours just to get fresh water. The school is made out of cement bricks, and power to the school is heavily regulated, despite temperatures frequently reaching over 90 degrees with 70 percent humidity.

Wiggin said power was turned on only when it was needed for the computers. Some computer labs are not connected to the power grid and use portable generators, or even solar power, to run the computers. Sometimes laptops are charged at nearby schools and then brought back to the school without power.

The children in this school district get on average 1 hour a month due to the number of kids and computers at each school.

From an Internet-connectivity standpoint, frequently only 3G wireless connections are available. A typical computer lab within Matete consists of a 3G modem connected to a Wi-Fi router. The router connects to a Windows MultiPoint Server, multiple student laptops (classmate PCs) and a teacher laptop. Depending on the class size, there is anywhere from one to three students per computer.

But Wiggin initially had mixed reactions to the outreach.

"What the hell are we doing here?" Wiggin asked. "They need food, medicine and water. Why are we worried about computer labs?"

Chimoi Primary School where it's not uncommon to have upwards of 70 kids in each class.

It turns out that bringing technology tools and training unveils an entirely new world to the students, teachers and community. A survey conducted by the team showed that 33 percent of the computer labs are used between 10 and 20 hours per week or more, while 66 percent are used less than 10 hours per week.

"When talking to the teachers and kids, they saw the world opening up," said Wiggin. "It brought hope and dreams and a drive to do more."

The environment is a challenge, said Wiggin. There is an average of 12 children per family, resulting in crowded schools. According to Wiggin, 60 percent of students are orphans either due to AIDS or tragic accidents.

Now back in the U.S., Wiggin still receives Facebook messages, text messages and phone calls from the teachers of the Chimoi Primary School.

"The teachers just completed their third teacher training session and are using the technology with their students on a regular basis," Wiggin said.

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Using Big Data and Computer Vision to Simulate Aging

Have you ever wondered what you'll look like in 50 years? Thanks to computer vision technology, it's no longer a big mystery. The University of Washington and Intel Labs embarked on a facial aging project using big data to analyze and predict the way people's faces age.

Demonstrated at Intel Developer Forum 2014, finding your predicted future face is exceptionally easy through the use of an iPhone app. All the user has to do is input some information relating to age, gender and ethnicity, then select or take picture of herself using the front-facing camera. The rest then appears like magic.

Behind the scenes, however, are big data and clever algorithms. Greg Leeming, director of the Intel Technology Science Center for Visual Computing at the University of Washington, explained that behind the curtain is a big data approach.

"We go out to the Internet and grab huge numbers of pictures and organize those pictures into collections of flows. For an individual flow, we would have pictures when a person was a baby, age 3, age 4, etc. and create sequences of how those people age over time," Leeming explained. "We then apply computer vision to those sequences of pictures to track how pixels move in an optical flow pattern from one picture to the next, and with that you can predict how people are going to age over time.

"Once you average many of those sequences together, you get a sense of how people age. And it turns out people age in very predictable ways, and so now one can apply the algorithm to an individual's picture and show how that person is going to age very, very accurately."

Greg Leeming works for Intel Labs at the university collaboration office. He's the director of the Intel Technology Science Center for Visual Computing at the University of Washington.

The research team, Ira Kemelmacher-Shlizerman, Supasorn Suwajanakorn and Steven M. Seitz of the University of Washington, released a research paper on this facial aging technology.

Besides serving as a looking glass into our future selves, the facial aging algorithms could prove to be an invaluable tool to supplement law enforcement sketch artists in the long-term search for suspects or missing children.

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Launching Edison into Near Space

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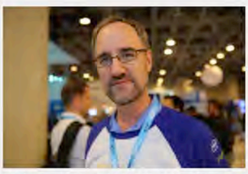
Helium-filled and Edison-powered Balloon Reaches Altitudes of 100,000 Feet

When Mikal Hart, a networking engineer at Intel, posted some GPS parsing software to an internal collaboration board several years ago, some coworkers in England decided to use his code for a project that they were working on. This is pretty typical. What isn't typical, however, is the lofty project the English group inspired Hart and some of his Austin, Texas-based colleagues to embark on.



Intel networking engineer Mikal Hart helped to launch Edison into near-space.

With several electrical components – including the recently released Intel Edison platform, a computer-on-a-chip that packs a dual-core Atom and Quark CPU along with networking hardware that can serve both the hobbyist market and the growing Internet of Things market – and advice from across the pond with lots of rapid testing and rework all done during Hart's and the team's free time, they launched a balloon that reached near space, producing spectacular high-definition photos and video along the journey.

"As a statement of their gratitude for me helping them out, they said 'Mikal, you must launch your own balloon,'" said Hart after working with the English team. "They kept insisting and providing me with technical assistance on where you go to buy a balloon, how do you figure out how much helium to put in, what do you use to pad the insides and keep it from freezing at altitude…Finally we said 'Yeah, let's do that and launch our own balloon.'"

Launching Into Near Space No Longer Rocket Science

The Intel Edison tiny computer-on-a-chip alongside a compatible Arduino board.

Before the 2014 Intel Developer Forum (IDF), Hart and his colleagues secured a section of the Edison display booth for their balloon project. The only problem was that they had only done two test flights and one had been a disaster, resulting in permanently losing one balloon. They had only just received the Edison a month prior as well. However, five days before IDF, the team had its second successful launch, descent and recovery of the near space balloon, demonstrating the ease of which hobbyists can now launch their own projects into near-space – within local government regulations. Reaching an altitude of around 100,000 feet, the balloon and its inner brains and communication devices recorded the trip via GPS, satellite communications and HD photos and video.

Altitude and location information were relayed real-time via satellite while a connected GoPro camera recorded both HD video and photos that were recovered once the balloon returned to Earth. The Edison received and relayed GPS coordinates to the Iridium satellite chip and interacted via an ad hoc WiFi network with the GoPro camera.

"We under-inflated our first balloon," said Hart on the failed flight. "We gave it just enough helium to get off the ground but not enough helium to get off the ground *quickly*. So it was a very leisurely ascent and because it was so slow, we think the batteries froze or ran out. Half way through the decent, it stopped transmitting."

According to Hart, temperature, both hot and cold, is critical to a flight's success or failure. And altitude affects the temperature in unexpected ways.

"It's colder at 10,000 meters than it is at 20,000 meters. It gets very cold around 15,000 meters and then it actually warms up."

Temperatures can get as low as 50 or 60 degrees Celsius below zero. Hardware components and computer chips tend to run better colder than warmer but extreme levels of cold can be detrimental to any kind of performance whatsoever. The team learned, though, that the GoPro camera generated some heat as it filmed. By carefully insulating the box housing the Edison, Iridium chip, GPS, GoPro and batteries, they were able to minimize temperature fluctuations. However, over-insulating the payload could also cause over-heating. At one point, the team recorded 40 degrees Celsius in the payload.

The styrofoam casing insulated and protected the technology from extreme temperatures and a crash landing on its trip to and from near space.

"We got quite a thrill out of it. We plan on doing many, many more balloon launches and we have a lot of variations planned," said Hart. They want to stabilize the motion that affected the initial flights' video capture, equip the payload with more sensors like one to record outside temperatures during the flight, as well as launching before dawn in order to capture a sunrise picture at 100,000 feet.

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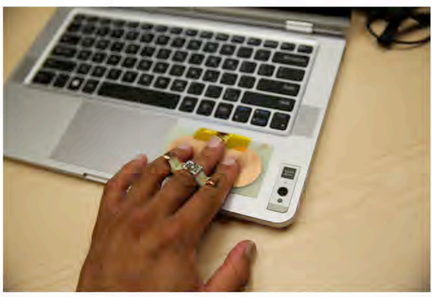


Transferring data via worn devices, 'body area networks' and touch

Using the body to communicate through speech, expressions or gestures is something humans have been doing since the beginning of our existence. But what if we could send and receive that information by touching a sensor or a screen?

A group of interns participating in the Intel Collaborators program is doing just that. They are using human body communications (HBC) as a way to send and receive data between devices simply by touching a sensor while wearing a device.

Human body communications has been around for a decade and falls under some more general industry terms like body area networks, body coupled communications and intra-body communications. With sensors, chips and transmitters becoming smaller and requiring little to no power, the networks for "things" on the body is increasingly relevant today.

Two PCs outfitted with custom touch sensors that capture snippets of data stored on a non-powered ring.

"You are not radiating through the air," explains Jerry Sydir who works in the wireless communications lab at Intel. "You are actually putting electrical signals over the surface of the body."

Many people think about wearables working with smartphones, but fewer realize they can be useful with PCs and laptops.

"What are the other new interactions we can provide to the user, especially with the emergence of wearables?" asks Anand Konanur, a senior radio frequencies engineer within Intel's PC Client Group. "We would like for the PC to play its rightful share in this ecosystem…to allow PCs to interact with wearable devices."

Taking Touch to the Next Level

Touching a sensor or a screen shows user intent, says Konanur. Using traditional communication protocols like Bluetooth or Wi-Fi has congestion and is passive. Touching "makes data physical."

"As we've seen, touch has become a very dominant mode of interaction," says Konanur. "What we were trying to see is if touch could be extended to act as another communication medium or input."

Konanur and Sydir led two interdisciplinary interns, Patrick Buah Jr. and Arsen Zoksimovski, to prove that HBC is indeed feasible and achievable. In 12 weeks, they were able to produce three working demonstrations, complete with hardware and software, of the technology in action.

Intel interns Arsen Zoksimovski (left) and Patrick Buah Jr. set up the prototype of the human body communications demonstration they worked on at a showcase.

Buah, an undergrad from Howard University in Washington, D.C., and Zoksimovski, a Ph.D. candidate from Northeastern University in Boston, participated in the HBC project under the guidance of Intel engineers Konanur and Sydir. Buah, who studied computer engineering, had never had any industrial or business experience, but over the 12-week internship he helped create the software and application interfaces for the various demos.

Zoksimovski, who is researching the propagation of electronic waves, was able to extend his knowledge to understanding how electromagnetic communication could work via the human body. And he learned how to overcome electromagnetic interference within the body and how minimally or non-powered devices could accurately read, write, store and transmit data. This is the second year Zoksimovski participated in the Intel Collaborators internship program.

Transferring Data Through the Body

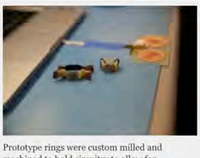
At a desk within Intel Labs, one of the prototypes, which was designed and machined by the interns, was demonstrated: a very small graphics file, an emoticon, was copied from one laptop, which was modified to include a touch-sensor, to a worn ring and then transferred to another equally modified laptop via a user touching the sensor. According to Konanur, the data has to be small in size – a few bytes – in order to be stored on the non-powered ring.

The three proofs-of-concept were:

1) Moving clipboard data between two PCs – Because the wearable rings were not powered, the file size has to be small, like text or very small images.

2) Creating an application framework – Building upon the previous demo, which was limited to the clipboard application, and extending an API for any application. For example, a user taking geo coordinates from a mapping application and touching a GPS device to transmit location.

3) Touch to print – Created the ability to store the ID of a document for printing and then go to an enabled printer and touch it so the document would print out there.



Prototype rings were custom milled and machined to hold circuitry to allow for demonstrations of human body communications. A touch sensor is also connected to a modified laptop to allow communication through touch.

"The challenging thing was to make this work with all of the power loss that goes through the human body," says Zoksimovski. "We had to tune the electric circuit using capacitors and inductors so that it's as low loss as possible in order to have as stable a connection as possible, so that we can transfer the amount of data for copy-paste. It has to happen fast so that you don't have to hold your hand or your finger on the touch pad for longer than a second."

"That's actually one of the novelties," says Zoksimovski about the lack of a power source within the ring prototype. "It's a benefit not to have a battery in the wearable device, but at the same time it's challenging because you have to deal with the power loss."

Both Buah and Zoksimovski agree wearables are increasingly relevant today and the market will grow dramatically.

The Future of Wearables

Making wearable technology more natural to use and fashionable may be the future. At New York's Fashion Week, Opening Ceremony and Intel jointly showed off a smart bracelet made from snakeskin and adorned with freshwater pearls. Next-generation fashion wearables could have human body communications technologies built right in to the gadget.

Buah sees the human body communications market going in two directions. One is where you have multiple devices on your person using your body as a channel, where the network is "on top of yourself" and different wearables can communication with each other. And the other is where on-body devices can communicate with devices that are off your body, similar to what their projects demonstrated, or when two people touch each other and their worn devices can communicate via the act of the two individuals making contact.

"[Human body communication] can expand the usage of wearables," says Buah.

"In our project, we had communication through the human hand," says Zoksimovski. "It's something that in my opinion is a gap between wearable devices on a shirt and a computer, a laptop, or a tablet, so that gap can be bridged and data can be transferred either for synchronization or uploading or downloading data."

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Apple Watch Revealed: The Original

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Silicon Valley giants had wearable timekeepers long before smart watches.

A couple of decades before the Pebble Watch, the Samsung Gear, the Sony Smartwatch, the i'm Watch, the Moto 360 or the LG G Watch were a couple of other time pieces worn on the wrist and produced by two Silicon Valley natives. In 1995, Apple had its own branded watch to help with a marketing campaign for its new operating system. And 20 years before that, Intel had the Microma digital watch.

Apple System 7.5 ad that gave upgraders a choice of free software or a watch. (Source: Macmothership.com)

In 1995, Apple aimed to lure consumers to upgrade their Macs to System 7.5, then the latest operating system, by offering either a free version of Casady & Greene's Conflict Catcher, a program designed to help eliminate start-up issues or conflicts between application extensions, or an Apple Logo Watch. The Conflict Catcher software had an estimated value of $99.95 at the time. It can be assumed that the Apple Watch had a similar street value. Recently, these vintage Apple watches have sold on eBay for over $120.

Later, wristwatch bands for the touchscreen sixth-generation version of Apple's iPod Nano, which had a square form factor, were used to create the first Apple "smart watch." There is some speculation that Apple, long rumored to be working on a device many have dubbed the "iWatch," may reveal its wearable offering alongside the iPhone 6 at its invite-only event on Sept. 9. Little is known about the iWatch at this point, but a natural assumption is that it will work with the new HomeKit smart home and HealthKit health tracking features of iOS 8.

Intel & Microma's High-Tech Watches

These original Microma watches reside inside the Intel Museum in Santa Clara.

Believe it or not, Intel had the idea for a smarter watch more than four decades ago. In 1972, Intel acquired digital watchmaker Microma, which had developed liquid-crystal displays (LCDs) for use in products such as digital watches. The quartz crystal oscillator was used as a time base, proving to be more accurate than traditional mechanical watches. The integrated circuit found within the Microma watch was considered to be one of the first examples of a system-on-a-chip (SoC), an Intel 5810 CMOS, as it contained all of the electronic components including analog and interface circuitry. In 1978, Intel sold the Microma name to a Swiss company and the watch designs to Timex.

Intel co-founder Gordon Moore said the company released the first watch with an LCD and hoped to do more.

"The thought at the time was that the wristwatch could become much more than just a watch," Moore said. "You could add functions to it."

Intel, which acquired wearable maker Basis earlier this year, has indicated there may be a fashion-oriented product shown at Fashion Week in New York which starts Sept. 4, and may reveal more at its Intel Developer Forum in San Francisco that runs Sept. 9 to 11.

Microma made the first watch with an LCD display.

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Tech Interns Create Smart Bike Helmet That Could Save Your Life

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Interns at Oregon State University and Intel produce smart helmet prototype with potentially life-saving features.

For the past half year, a group of five undergraduate students from Oregon State University has been working with interns at Intel to create a smart safety helmet for cyclists. In a perfect world, the primary function of the helmet – to detect a crash and communicate to emergency contacts – would never be used.

The job of today's bicycle helmets is to provide protection to the head in a crash. The group of interns wants to extend this functionality, especially when used with smaller children, as well as provide tests to determine if a rider involved in a crash may have suffered a concussion and requires medical attention. Viewed as a "smart helmet," which is connected to a smartphone, the prototype uses sensors (e.g., accelerometers) to detect a crash and communication hardware to automatically dial a predefined emergency contact. Built into the helmet are above-the-ear speakers, a microphone, an LED headlamp and a 3.7V, 2600mAh lithium-ion battery. The team also created a custom logic board that incorporates Intel Edison along with Bluetooth, magnetometer, gyroscope and two accelerometers.

3D printers helped to create the outer shell of this smart helmet prototype.

A smartphone app, developed in Java parallel with the hardware, serves as the companion to the smart helmet's functions and features. The app enables a user's smartphone to record ride distance, speed and the path. It currently runs on Android but can easily be ported to other platforms.

Abhay Dharmadhikari, a technologist and architect in the Device Development Group for Intel, who has been at the company for over 17 years, mentored the interns working on the smart helmet. Dharmadhikari has a personal interest in the helmet project, as he has two children, ages 8 and 12, who are cyclists. Children are seldom good communicators and are often embarrassed to talk about problems or don't give the full picture, shared Dharmadhikari.

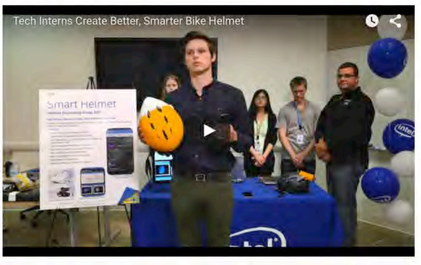
"If my kids get into a crash, we will never know what happened. Did they hit their heads? Did they get really injured? Because when they come back [after biking] they just say 'I got hurt,' so we aren't really sure how bad it was," said Dharmadhikari. "Could we build something that would help us understand; [and] if a crash happens, the helmet can act like a black box?"

Smart helmet intern team (L-R) Spencer Kresge, Cam Tu Vo, Aniket Borkar, Kyle Dillon

The intern team, along with OSU student Evan Meichtry and OSU professor Don Heer, behind the helmet likened it to the automobile assistance program OnStar, but for cyclists. In the event of a crash, the smartphone application initiates communication with the bike rider through the helmet speakers and microphone to ask if he needs help. If he says "yes" or does not respond, the app automatically will call and/or text the emergency contact (which can be 911) with location information. The rider can also be asked several medical questions to assess if he's suffered a concussion or other injury, such as asking the rider to read the current time on an analog clock displayed on the companion app.

The helmet also stores crash data that can be analyzed after the fact to better understand the incident, like a "black box" for bicyclists. The helmet will store sensor data, which is helpful in telling doctors which part of the head sustained the impact. The companion app can also connect to the cloud to upload and pool ride and crash data, so that the crowd-sourced data can be used to better understand head injuries as well as identifying dangerous intersections.

Because the interns developing the prototype wanted to extend the functionality to something useful beyond emergency situations, the microphone and speakers can be used for hands-free calling as well as streaming music. Because the speakers do not cover the ears, the bicycle rider can still hear the surrounding environment.



"We think of the helmet as a platform and there are many things we can do with it. We focused on the present features from a product perspective," noted Dharmadhikari, adding that haptic feedback could be a future feature.

The cutout on the back stores the Intel Edison-based circuitry.

The smart helmet project is part of an extensive internship program that Intel has with university graduate and undergraduate students. The Intel Collaborators program is on its third year employing undergraduate and graduate students and Ph.D. candidates from around the country to participate in high-visibility, cross-functional mentored programs. Contrary to traditional Intel intern programs, which are typically funded by individual business units at Intel, the Collaborators program receives support and funding from Intel Human Resources.

"We believe in this next generation of students and mentoring them and helping them become better engineers; that is our motivation," said Dharmadhikari on the internship program at Intel. "I believe in working with the students where they really have energy and challenge the energy with the right problems and tools."

Inside the custom 3D printed outer shell is a real bicycle helmet inner shell.

The smart helmet project started in December 2013 with the five selected interns initially devoting their free time to the project. Once school had completed, four of the five worked full time as official Intel interns. Three students are studying computer and electrical engineering and one is studying computer science.

Cam Tu Vo is a junior at Oregon State University studying computer science, and at her internship at Intel she works in web development. Vo extracted crash data from databases and visually represented it in a way that was useful to users or researchers.

"The tasks were fairly straightforward in the beginning, but it gradually became interesting after more feedback. My manager really focused on the user interface and meaningful information," Vo said. "From those expectations, I had the opportunity to work with graphics and 3-D model manipulation of our helmet."

The intern team finally got the chance to show off their smart helmet at an Intel Collaborators showcase.

"A camera man told us about a close friend's death. He said our smart helmet would have contacted emergency services after the bike accident and could have saved his friend's life," Vo recalled. "The man expressed true appreciation, which gave me the sense that I am a part of something that can positively impact people's lives. It was such an adrenaline rush for me."

Katie Hauser, a Harvey Mudd College graduate and new Intel employee working with Dharmadhikari and the interns, participated in a Harvey Mudd College Clinic program on an Intel project before graduating last year. This experience helped impassion her to working with other interns.

"I really enjoy helping people solve problems and debug code," says Hauser. "I find it fun and rewarding to help current students with projects like this...help them learn things for themselves while pointing them in the right direction. I enjoy tutoring and teaching because I learn so much from it too."

A built-in LED light on the Smart Helmet controllable through the smartphone app.

For interns like Vo, this is just the beginning. "My time at Intel was an eye-opening experience. I received many insightful advices from my informational interviews. I know now more than ever the necessity of higher education. I decided to pursue my master's after graduating at OSU and if opportunity arises, I'll come back to Intel next year."

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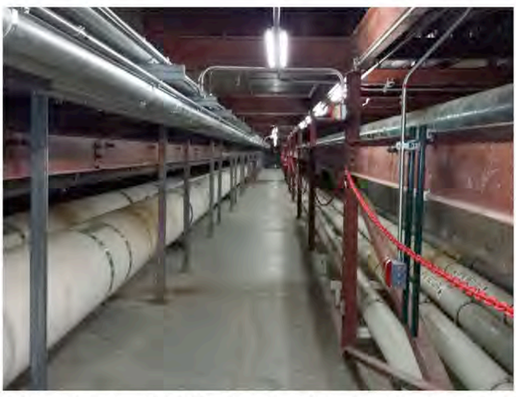


Intel considering new 'digital buddy system' for workers alone in isolated areas

Jeannine Chavez was saddened when she learned that a former co-worker had died after falling at an industrial wastewater treatment plant in Maryland in January. It wasn't until he failed to return home from his weekend shift when he was discovered, a day later, at the base of a ladder where he was working alone on a Sunday.

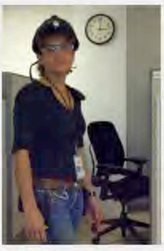
Chavez, a facilities tech for 14 years, and several other Intel employees resolved to form a task force to make sure similar accidents don't happen at Intel, which has over 100,000 employees and several thousand contractors working at hundreds of office buildings, manufacturing facilities, warehouses and support buildings around the world. Chavez believed that these sorts of incidents could be avoided using off-the-shelf smartphone and wearable technology.

What they hope to create is a new "digital buddy system" to help locate and keep track of lone workers. Preventing workplace injuries has always been a high priority for Intel, but a new system would take aim at preventing the type of accident that claimed Chavez's friend.

Lone workers, or people who work in isolated or remote locations often by themselves, are fairly common in the workplace today. Often with shifts at night or on the weekends, these workers are frequently required to perform work with no one else present.

While lone worker monitoring programs currently exist ("Help! I've fallen and cannot get up" – Life Alert was founded in 1987), they are often pricey, require complex and proprietary systems, and frequently do not meet the needs of specific corporate, industrial and municipality environments.

First Generation Lone Worker Apps Don't Cut It



Intel facilities worker Jeannine Chavez.

When Chavez and her team started investigating potential solutions to protect lone workers, they found a wide range of proprietary systems and smartphone applications. An informal count within the Apple App Store shows 24 apps targeted toward the "lone worker." Within Google Play, there are approximately 40 relevant lone worker apps.

Most smartphone applications, according to the team, have several common features including an alerting function via SMS or email, panic buttons (or buttons that allow the user to send an "OK" signal), and GPS integration. Some even use smartphone accelerometer features to detect rapid movements (e.g., a crash or fall).

"We assumed there was an app to meet our needs," said John Gabaldon, a corporate services employee involved in the effort at Intel's New Mexico facility. "Some of the apps require the wearer to constantly acknowledge that they are OK. If the wearer does not acknowledge, then an escalation email or text is sent out with location and help needed. Others incorporated the accelerometer of the phone to send out a help needed if it detected an impact. Others had a panic button that could be used in emergencies."

"Many of the apps had good qualities, but the goal was making something that didn't require user input and didn't send out nuisance [or] false alarms," said Gabaldon.

According to Chavez and Gabaldon, these current systems are not perfect and there are scenarios specific to industrial environments that require a smarter solution.

"There are locations that are very isolated – no Wi-Fi, cellular or GPS connections," said Chavez. "Maintenance and calibrations often occur in basements or isolated corners."

Apart from connectivity, additional biometric data can make a difference.

Incorporating existing and new technologies into the standard lone worker system is required for success, according to the team. Integrating existing door scan data signifying location or using Bluetooth beacons to track users where cellular or Wi-Fi connections are not available are just a couple solutions the team is evaluating. But more critically is the incorporation of biometrics via smart health devices like earbuds or watches that can then detect abnormal changes to heart rate in conjunction to rapid accelerometer changes, which could indicate a dramatic fall or accident.

Privacy Concerns

Biometric information could open up new privacy concerns. "I would only use a wearable that I could choose who and when I would like to share my information," says Chavez. "At work I would have no issue sharing my biometrics and would like those on my team to know my whereabouts when my biometrics give reason for concern."

There is also the issue of accuracy of biometric readers and whether they are reliable enough to detect critical changes to pulse rates or other measurements. Also, would a manufacturer of a wearable biometric device be held liable should a reading be missed or misinterpreted?

Even outdoor environments, such as this New Mexico Intel facility service yard, could pose potential risks for lone workers in the event of an accident.

Basis, a maker of biometric smart watches and a company recently acquired by Intel, has purposefully stayed away from medical and safety monitoring.

"We have intentionally not optimized a product for medical, injury or safety use cases," said Jef Holove, former CEO of Basis and now general manager in Intel's New Devices Group. "We are a mainstream consumer product."

Holove also believes along with potential liability issues, there are regulatory concerns as well. Before the legality, regulatory or accuracy issues are tackled, the system needs to be prototyped.

"The hope was to use one of the new smart wearables to detect pulse or heart rate and send that data to a smart phone," said Gabaldon. "There are watches that collect this data, but also earbuds or forehead devices. The goal was to show a proof of concept that this data could be pulled into an app."

This remains one of the larger challenges for the team of facility workers. They agree that the infrastructure and servers are there, as are the smart wearable devices for gathering biometric data. All that is left is tying the right smart health device with the appropriate software to create that always watching digital buddy for lone workers.

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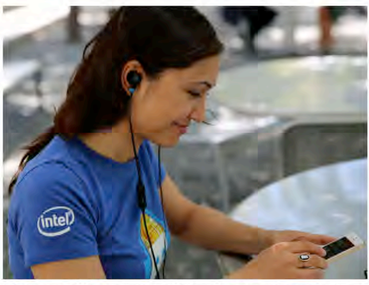


Intel Engineer Indira Negi's passion for running, biometric experience and maker skills pushes her smart earbuds design to market with 50 Cent's audio company.

When she literally jogged on-stage to join Intel CEO Brian Krzanich in his opening keynote at International CES 2014 in Las Vegas, engineer Indira Negi was there to demonstrate the Intel smart earbuds that she and her team had developed, but the "smart" design she showed off also helped solve an issue the avid runner had personally encountered. And now, SMS Audio, a premier audio headphone and accessory brand from Curtis "50 Cent" Jackson, has revealed a new smart, biometric earbud product based on Negi and team's reference design.

Intel engineer, Indira Negi, joined Intel CEO Brian Krzanich during his International CES keynote address to demonstrate the Intel smart earbuds reference design she helped design.

Within a day after the on-stage introduction of the Intel earbud prototype at CES, SMS Audio eagerly met with Negi and the New Devices Group to discuss development of an SMS Audio product based on the reference design, according to Negi.

For the past seven months, Intel engineering and design teams have worked with SMS Audio to bring the SMS Audio BioSport In-Ear Headphones to market using technology originally developed by Nagi and her team. Intel designed the layout and circuitry, handled the system integration, and wrote the firmware that powers the features, Among them is the a ability to harvest power from the smartphone; the earbuds do not require a battery.

The final design for the SMS Audio BioSport In-Ear Headphones

"[SMS Audio] had influence on the industrial design but it was our industrial designers who made the changes and showed [SMS Audio] the proposals and they did the selection and provide feedback."

"[SMS Audio was] very open to us and our suggestions. They are a headset company and they understand sound very well so they had a ton of feedback on how it should sound, how the acoustic chambers should be. From how the device should function, what the data should be or how many bits of data there should be, they followed our lead."

Intel and SMS Audio together refined the data architecture and added industrial design and enhanced acoustics while building up the robustness of the in-ear product.

"Electrically it is similar," says Nagi on how the final product compares with the reference design she worked on. "But from the way it looks – the industrial design – it is completely different. It looks very much like an SMS Audio product."

It All Started With a Problem

"I am a runner — I get hives from the sun, I have to run with gloves on," said Negi about running with a smartphone. "That means when there is a bad song, I have to take out my phone, take off my gloves, unlock my phone and change the song."

The SMS Audio retail model alongside prototypes leading up to the final product.

Starting from solving a problem that she knew all too well, Negi, a sensors systems engineer in the Intel New Devices Group, and a team set out to create a device and software that would monitor heart rate and adjust music playback based on sensor feedback. The result was the Intel smart earbuds reference design, developed in collaboration with Valencell.

Negi's study of bioelectronics and biosensors in graduate school — she earned a master's degree in electrical engineering from Arizona State — lent her a keen appreciation of the value of biometric monitoring.

One project she worked on while at ASU measured stress levels in saliva using specially treated paper. When you are working out, you are stressing your body in a positive way, explained Negi. If you work out too hard, this becomes negative stress, which can increase the chances of getting injured. She also worked on molecular imprinted polymers while at ASU coated with biochemical sensors that reacted only to specific molecules.

"It was only in grad school that I found my passion for bio-sensing electronic devices," said Negi. "I was lucky."

A Maker at Heart

Though she has a zeal for bio-sensing technology, Negi also enjoys building on a larger scale.

"It's de-stressing for me to work with my hands," said Negi, who built her own furniture while in graduate school. "I made a table, a bookshelf and a really wobbly chair."

Intel engineer Indira Negi designed a backyard "squirrel chaser" that uses an Arduino, infrared sensor and servo motor.

And she's not just a furniture maker. When Negi noticed that the holiday lights hung in her backyard had been chewed by squirrels, she created what she calls a "squirrel chaser."

"I didn't want to kill the squirrels," said Negi. "I just don't want them in my yard."

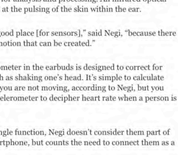
Built using an infrared sensor, servo motor, buzzer, Tupperware and an Arduino board, the device watches for squirrels. When it detects motion, the squirrel chaser makes a loud noise (the buzzer) and the servo motor waves a flag. Negi said she plans to add a camera to her invention to capture the squirrels in the act.

Negi is also building a fountain in her backyard and likes to sew and paint. She doesn't distinguish between her different maker projects or put much stock in gender-based stereotypes about activities.

"I don't know why certain things are supposed to be men-tasks or women-tasks because in my head, they are all the same," she said. "You are just building."

"Smart" Biometric Projects

The Intel smart earbuds reference design that Negi and the team developed aren't the only project she's worked on that used biometric sensors. One research project integrated sensors directly into a smartphone.



The Intel smart earbuds reference design captures movement and heart rate data using an accelerometer and infrared sensors.

"People use their phone all of the time," said Negi. "We want to make all of the sensing opportunistic. We wanted it to happen incidentally. We wanted for it to happen on its own."

That research project led to her work on the Intel smart earbuds, which actively monitor heart rate via sensors and can be integrated with smartphone applications to provide additional functionality like helping to choose music.

Originally, the smart earbuds were designed to work with Intel-powered phone, but then the team changed direction.

"We wanted it to work with every phone," said Negi. "That was a much harder problem because all of the connectors were already used."

A typical headset has four standard connectors, left audio, right audio, microphone and ground. The team didn't want to use Bluetooth, but instead worked on a wired earbud design.

"[A wired earbud] doesn't need power, doesn't need to be charged, doesn't need to be paired," said Negi. "It's always ready to go."

Intel engineer Indira Negi wearing an early prototype of the Intel smart earbuds reference design.

The Intel smart earbuds harvest energy from the smartphone microphone jack, which was challenging because of the limited power envelope and the need to use the same port for both power and data.

"We had a lot of very interesting electrical engineering problems to solve," said Negi.

All of the processing is done on the smartphone. The earbuds simply transmit the raw data captured by its sensors to the smartphone for analysis and processing. An infrared optical sensor looks at the pulsing of the skin within the ear.

"Ears are a good place [for sensors]," said Negi, "because there is no other motion that can be created."

The accelerometer in the earbuds is designed to correct for motions such as shaking one's head. It's simple to calculate heart rate if you are not moving, according to Negi, but you need the accelerometer to decipher heart rate when a person is active.

Because the Intel smart earbuds reference design are single function, Negi doesn't consider them part of the Internet of Things until they are connected to a smartphone, but counts the need to connect them as a plus because it's familiar.

"It is a wearable that you have no resistance against because you already use them," she said.

A version of this content was originally published January 20, 2014.

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What's New with Wireless Charging?

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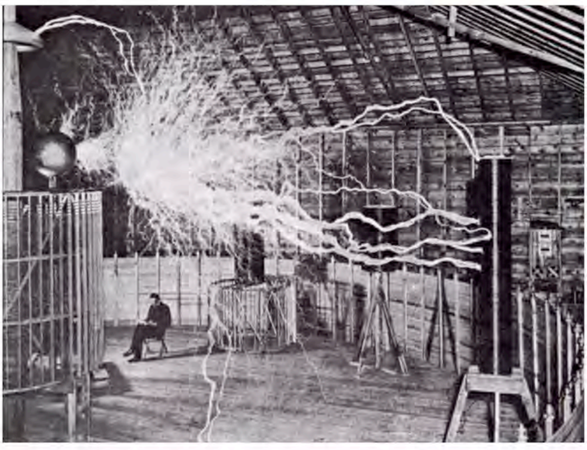

Inductive charging is hardly new, but the technology and the promise are advancing.

If you've been keeping up with trade shows and tech blogs, you might think that some new breakthrough in wireless energy transfer has taken place in the past year. It hasn't.

While companies ranging from Starbucks to Apple and Intel are increasingly focusing efforts to help consumers cut the power cord in new and unique ways, the underlying technology behind many of these advents is not new. In fact, it's more than a century old, grounded in the work of an eccentric Serbian-American scientist named Nikola Tesla.

Nikola Tesla pioneered some of the earliest attempts at wireless power transmission before the turn of the 20th century. In the late 1890s, he'd succeeded at wirelessly lighting lamps. Though Tesla never became a household name associated with wireless power, the inductive charging techniques he invented would see a renaissance some five decades after his death in 1943.

It Begins with a Toothbrush

Innovation is often born in unlikely places and when it comes to wireless charging. The Braun Company was perhaps well ahead of the curve. Since the early '90s, its rechargeable toothbrushes have utilized induction as a wireless (and waterproof) charging solution.

Nikola Tesla's Wardenclyffe lab building, seen in 1904. (Image source: commons.wikimedia.org)

Other early iterations of wireless charging include transcutaneous energy transfer systems found in surgically implanted devices, such as artificial hearts. In the mid- 90s, Hughes Electronics released the Magne Charge interface, which used inductive charging paddles to power some of the first electric vehicles from General Motors and Toyota.

Arguably, the last major breakthrough in wireless charging occurred in 2006 at the Massachusetts Institute of Technology, where a team led by Marin Soljačić discovered a method for transferring power between coils separated by a few meters. The MIT researchers found that the range could be extended even further through magnetic resonance.

Today, resonance-based wireless charging is fundamentally grounded in the same principles that Tesla pioneered more than a century ago, but incremental advances have enabled entirely new technologies with transformative potential, such as electrified mass transit systems.

"Mass-Bus-Transit is one of the most valuable transportation areas for wireless charging and could enable a complete fleet conversion to flexible, economical and environmentally friendly transport," said Micheal Austin, vice president for BYD America.

What Comes Next

Intel and others have been talking about wireless charging for years. Intel's former lab located at the University of Washington in Seattle had wireless charging as part of its charter. And in 2009 researchers were demonstrating a magnetic resonance project sending radio signals and power in the same transmission.

Today, the idea and the technology is gaining momentum.

Intel has said that it is working on a completely wire-free laptop by 2016 using WiGig to transfer video and graphics wirelessly, and with wireless charging. Kirk Skaugen, Intel's PC client group SVP demonstrated how wireless technology could be integrated into a table that could simultaneously charge a laptop, phone, headset and tablet. The company also demonstrated a wireless charging bowl at CES in January.

At CES 2014, Intel demonstrated a wireless charging bowl for various devices.

The next few years will be interesting to watch if the industry can settle on a common standard. The Rezence standard, backed by the Alliance for Wireless Power (A4WP) appears to be gaining traction according to A4WP's marketing chair, Geoff Gordon, who not surprisingly says Rezence is the future of the industry.

"We are weeks or months away from commercialization, whereas other organizations like the Wireless Power Consortium (WPC), is just not starting to address this type of technology," Gordon said. "So if they do decide to go down this path on their own, they're looking at still 12, 18, 24 months to be what we are today."

That doesn't mean there aren't interesting implementations in the works based on other standards such as Qi, backed by the Wireless Power Consortium. Among the most unique is Nokia's promise of wirelessly charging pants and compatible with Lumia-series smartphones.

Intel and WiTriCity have recently teamed up on a licensing agreement that will allow Intel to integrate WiTricity's wireless charging technology into its chips. Both companies support the Rezence standard.

Whether it's Qi, Rezence or some other standard that eventually finds mainstream adoption, innovation and excitement around wireless charging is accelerating.

(Image source: Wikimedia Commons)

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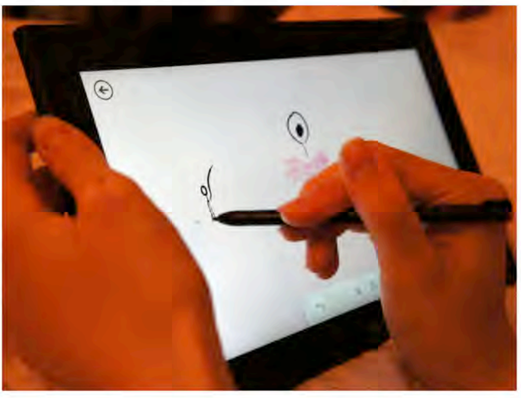

Maybe Jobs wasn't right, drawing with fingers doesn't match need for precise strokes

As touch-based computing exploded over the past several years, the stylus seemed to quietly fade from view. But recent developments indicate the stylus is coming back in style and may occupy an increasingly important space especially as tablets take on enhanced performance and capabilities for digital artists and creators.

The tablet and stylus have a long history together. Earliest records indicate the stylus was used around 4000 B.C. as a bronze or bone tool used to scrawl on moist clay tablets. Stemming from the Latin word stilus – meaning "a stake; a pointed instrument, used by the Romans, for writing upon wax tablets" – the ancient stylus was an early ancestor of the everyday pencil or pen, as well as the more modern stylus used on PDAs, smartphones, tablets and computers.

In the late 1980s and early '90s, the personal digital assistant (PDA) ushered in a new generation of mobile computing led primarily by the popularity of the Palm Pilot.

When the iPad launched in April 2010, it was missing the familiar stylus.

"Stylus computing has been around for quite a long time, there were some issues with implementation, and then there was one major blocker. Steve Jobs made some really great calls. One of his greatest virtues was that he made calls," says Michael Gough, Adobe's vice president of experience design. "He created a lot of clarity of what Apple would and would not do. But it didn't mean that he was always right."

"One of the things he said was you don't need a pen or a pencil. Well those of us that have tried writing with our finger or drawing with our finger know that it is a substandard experience," says Gough.

A Difference of Opinion

Despite the recent onslaught of pen-based tablets, stylus designers and manufacturers have differences of opinion over whether the stylus will make a strong comeback.

"It's possible the mass-market demand for tablet pens will decrease," says Peter Skinner, co-founder of TenOneDesign, a firm that designs styli, cases, apps and stands. "Our first product launch was a pen for the original iPhone in 2007. Since that time, demand for an iPhone-specific stylus has dropped even though iPhone shipments grew. This is, in our opinion, largely because the market's perception of a phone needing a stylus changed."

Will styli for tablet follow the same track?

Several recent developments indicate the stylus is coming back. Several tablet manufacturers are including precision styli in their offering, not only to provide additional functionality but also to enable artistic creativity. Popular tablets that come with pens include:

- Samsung Galaxy Note 10.1 was introduced with its proprietary S Pen.
- Microsoft Surface Pro – the Surface Pro 2 incorporated Wacom's proprietary digitizer layer, the Surface Pro 3 transitions from Wacom in favor of an active capacitive stylus.
- Fuhu DreamTab uses Wacom technology as well.
- Lenovo ThinkPad Tablet 2 uses a battery-free digitizer pen.

Adobe's entrance into the hardware market was with a stylus and ruler called the Ink and Slide.

Even Adobe has gotten onboard with pen-based computing with its recent announcement of its first-ever hardware product, the Ink and Slide, a precision, cloud-based stylus – which stores color pallets, brushes and even clipboard items in the cloud – and ruler for iPad users.

"Tablets may be subject to the same perception shift. When the iPad launched, a common knee-jerk reaction was, 'Where's the pen?'" says Skinner. "Since that time, we suspect many people have been trained to think of a tablet as touch-only without the need for pen input."

Douglas Little, senior public relations manager at Wacom, disagrees.

"Pen input continues to grow. It's an alternative input method that all of us can relate to. Among professional digital artists, designers, animators, film editors, photographers, etc. the pen is a vital piece of equipment in their tool kit," says Little. "For the enthusiast, hobbyist and general consumer, the pen provides a clever and fun way to be creative."

Adobe's Gough says mice and keyboards block creativity while pen-based activity encourages it.

"There is something about the overall experience of the combination of the digital tools and the analog tools that helps people get past blocks. Whether it's creative blocks or just a general discomfort, it seems to unlock some kind of energy that makes them want to do these things."

"By bringing these analog capabilities back to the digital environment, I think we are going to unlock a lot of creativity, and we are going to make things easier to use," says Gough. "I think it will actually be a big trend."

Styli Galore

There are several types of styli in the market:

- **Passive** – essentially plastic and pen-like, these styli are "dumb" and are electrically conductive, bridging your hand and the display.
- **Capacitive** (active) – these emulate finger touches and can even recognize hover actions with a cursor following the pen.
- **Bluetooth** (active) – building on the capacitive capabilities, Bluetooth styli have the ability to transmit pressure. Instead of the screen capturing pressure, the pen's tip or nib reacts to pressure and that information is passed via Bluetooth to the device and/or application. These styli can have additional programmable buttons for right clicking or erasing.
- **Digitizer** (active) – Wacom developed a technology (Electro-Magnetic Resonance) where a "digitizer layer" is sandwiched within the device's touchscreen allowing styli to be highly precise, battery-free and pressure sensitive.
- **Combinations of the above –** Some styli, like Adobe's new Ink pen — a battery powered, Bluetooth-enabled capacitive stylus — use a combination of capabilities like cloud connectivity.

"What seems to be clear is that your brain works differently with pen and paper than it does with mouse and keyboard. When people need to come up with an idea, they grab a pen or pencil," says Adobe's Gough.

With everything moving digital, stylus manufacturers hope that when consumers want to be creative, they combine the analog with the digital.

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Robots, development boards, sensors and big data show 50 percent water savings.

Last year California had the driest year in recorded history and this year isn't getting any better. In fact, a snow pack survey on May 1, 2014 recorded only 18 percent of average. Governor Edmund G. Brown Jr. has declared a state of emergency and the entire California agriculture industry is looking for help, and solutions.

But before the state of emergency was declared, a small-scale high school science project was underway, aiming to show how precision monitoring and irrigation could achieve a 50 percent water savings using Intel Galileo development boards, moisture sensors, cloud-based data collection and robotics watering systems.

Could this be the solution on a broader scale? Researchers at the University of California, Davis and elsewhere are looking at similar approaches.

The science project's hypothesis was simple yet bold, applicable to small and large scale environments: Can water usage be reduced without impacting plant yields? Two freshman high schoolers in Folsom, California, (with a little help from their fathers) set out to prove in a small scale what many others, including UC Davis, are also pursuing.

Automated Monitoring and Irrigation at a Small Scale

"We decided to do this experiment because California is currently suffering in a huge drought and we discovered that we wasted over 60 percent of our water in agriculture when farmers use a flood irrigation system," said Resya Sastry, a freshman at Oak Ridge High School in Folsom. "That is when they just let water flood the plants and the plants absorb as much water as they need. This leaves an excess amount of water wasted."

For about $450, Sastry, age 14, and Maya Jayanth, age 15, also a freshman at Mira Loma High School, teamed up with their fathers to put together an end-to-end Internet of Things-enabled, robotic-controlled plant monitoring and watering system. Both fathers work at Intel.

CLICK TO VIEW VIDEO
Intel father/daughter team uses robotics, Galileo boards, moisture sensors and IoT to create small-scale precision farming model that could hold promise in reducing drought impact in California.

Starting with a trip to UC Davis and the U.S. Department of Agriculture, they initially conducted research with the help of Dr. Malli Aradhya, senior scientist and plant geneticist at UC Davis, and Bob Coates, associate professor at UC Davis' agricultural engineering department. The team later visited Scribner Farms in Sacramento, California, to learn about flood irrigation.

Once they understood methodologies behind building a plant bed, the team chose to use Pisum Sativum (the garden pea) for the experiment because of its rapid germination, self-pollination and ability to cross-pollinate. Based on a recommended water amount of 300 millliliter per day, the team wanted to document the yield and pod length, as well as the root and root-to-shoot ratio, and the plant height based on varied amounts of water.

Using four Intel Galileo boards, each outfitted with five soil moisture sensors, connected to an Intel IoT analytics kit, the apparatus regularly checked how dry or wet the plant's environment was.

Once germinated, the peas were arranged in a lighting- and moisture-controlled environment in order to get watering treatments of 50, 100, 200, 300 and 400 ml. After calibrating the watering, a robot was developed to automate the watering process using various components including a BeagleBone Black, four Vex 12 volt motors and solenoid valves to discharge the appropriate amount of water to each plant.

A robot, controlled by a BeagleBone Black development board, was outfitted with water and solenoid valves to deliver precise amounts of irrigation to the peas.

The robot was conceptualized by the high school girls who first drew a sketch outlining how it would work and what components would be needed. Having studied robotics for five years, they were able to assemble the robot based on their design. It had two motors and a chain to drive the wheels, and the BeagleBone Black development board was configured to control coordination between its movement and the solenoid valve, which dispensed water. A trip switch sensed where the robot was on the metal grid, allowing it to open and shut the solenoid valve once it was properly aligned with the plant.

After real-time moisture analysis using the IoT solution and three months of growth and pea production, the team analyzed the results. They discovered they could save 50 percent of the water by using precision (automated and sensor-monitored) irrigation while still maximizing the yield.

Jay Kyathsandra, Maya's father and a product marketing manager at Intel, views the science project as a classic miniature IoT implementation that could have broader implications on a much larger scale.

"The IoT aspect is the ability to collect a range of moisture and weather data from each plant and ambient conditions and stream the data for real-time trend analysis and storage in the cloud in a Hadoop database," said Kyathsandra, "The big data aspect is data stored in the backend and ability to do analytics."

The team submitted their project to the 2014 Synopsys Sac STEM Fair and won first place in the Energy & Transportation category.

Precision Farming at a Grander Scale

The project could be a sign of bigger things to come. UC Davis, which has been doing research in this area for several years, currently has three agricultural and biological engineering solutions using the Internet of Things and connected devices and sensors as drivers. Intel is currently working with UC Davis to reduce the costs of the $3,000 kits currently used in the water monitoring system, replacing them with Intel Galileo development boards as gateways and transmitting captured data to the cloud.

Freshmen high schoolers, Resya Sastry and Maya Jayanth, holding their trophy after they won first place at a Sacramento science fair for their precision irrigation project entry.

Kyathsandra said he hopes his daughter's experiment provides a snapshot of the benefits of using sensors and real-time monitoring. "We see widespread use of sensor data feeding to real-time monitoring and decision making systems, enabling farmers to deliver the optimal amount of water, specific to their crop, weather conditions and soil type," said Kyathsandra.

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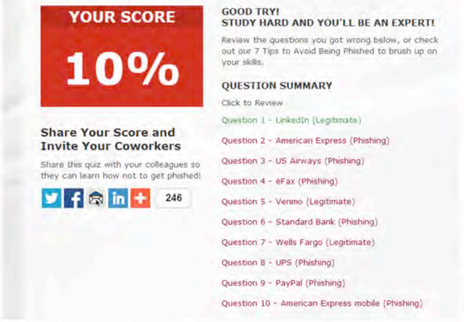

McAfee Phishing Quiz reveals roughly 65 percent of respondents can't properly identify email scams.

Email is one of the oldest "modern" forms of communications. While it provides near real-time discussions, alerts and sharing, it also has become one of the most popular ways hackers gain access to locked-down business environments. Despite powerful security solutions and diligent IT departments, often it is awareness and education that help keep corporate environments secure.

Emails received on smartphones can be fraudulent as well, but click-and-holding a link can show the actual URL behind the link.

While viruses, Trojan horses and other malicious software remain high in the ranks of security concerns, email scams – specifically phishing scams – are being crafted to socially engineer access into secure business environments.

A Pew Research survey from September 2013 showed "21 percent of Internet users have had an email or social networking account compromised or taken over by someone else without permission." The survey was based on telephone interview data of a sample of 1,002 adults ages 18 and older.

The most frequent types of cybercrime incidents are malware, phishing, network interruption, spyware, and denial of service attacks according to a 2014 US State of Cybercrime Survey published in May 2014 and co-sponsored by PricewaterhouseCoopers, the U.S. Secret Service and others.

While current security suites as well as modern browsers do offer features to prevent users from clicking on malicious or fraudulent sites, often it takes time for updates to be propagated to end users and these updates vary based on the software or browsers and how current both items are. To combat this, many businesses are turning to the tried-and-true method of awareness and education to reduce the number of security incidents from phishing attempts.

Testing Employee Cyber Safety Knowledge

McAfee, a subsidiary of Intel Security Group, recently posted a Phishing Quiz as a way to increase awareness as well as drive education. Quiz-takers are presented with 10 actual emails from a variety of popular banking and social sites.

Within an "emulated" email client, users can dig into the validity of emails by hovering over links and reviewing email addresses and are then asked to determine if the email is legitimate or a phishing attempt.

Example of a phishing email purportedly coming from American Express.

Once the quiz is completed, the user receives a score and has the opportunity to dive into why a particular email is or is not legitimate.

"IT guys are so tired of their employees forwarding emails to them asking them: 'Hey, is this a phishing attempt or a real email? I can't tell,'" said Dave Bull, director of product marketing of Content Security Technology at McAfee, about the inspiration behind the quiz. "We wanted to alleviate the pain of the IT guy and we wanted to empower the employee as much as possible."

Since May 12, the vast majority of quiz respondents have identified only 6-7 emails correctly – 65 percent accuracy on average – and fewer than 10 percent correctly identified every email example as either legitimate or a phishing attempt, according to McAfee. Bull said one company who participated in the quiz discovered the lowest performing group within the company was the finance group, the "people handling the money."

Another Way to Test and Train Employees

Corporations can take other approaches to training their employees. Companies such as PhishMe and KnowBe4, firms providing security awareness training and testing, offer programs for companies to test their employees through simulated phishing attacks.

KnowBe4 issues fake phishing scams directed towards pre-defined email addresses within a business. The results of the phishing test is later provided to the company outlining success or failure as well as the actual employees who are deemed "high risk" based on their responses.

Sometimes a "Prairie Dog" phenomenon happens when employees receive simulated phishing attacks with heads popping out of cubicles.

"The bad guys are business people too. They pick the low-hanging fruit and get into networks the easiest way – social engineering the end user," says Stu Sjouwerman, founder and CEO of KnowBe4. "Employees need to be inoculated against this as part and parcel of every organization's defense-in-depth deployment. Simulated phishing attacks are by far the best way to do this."

In 2013, KnowBe4 conducted 3600 phishing tests for its customers, and from an initial average baseline of 15.9 percent of users clicking on phishing emails, the average 12 months later was 1.28 percent. The 12-month period also included training.

A "Prairie Dog" phenomenon was witnessed regularly according to Sjouwerman where upon the receipt of a simulated phishing attack, employees would pop their heads out of their cubicle asking their co-workers: "Hey, did you get this email too?"

An Ounce of Education

McAfee and other security experts recommend several methods to prevent being "phished."

- **Update your software** – This includes browsers, operating systems, email and security software.
- **Verify emails** – Email servers can be hacked or forged so ensure that any links you click are from a trusted source, or visit that site directly via manually typing in the Web address.
- **Not every email is real** – Scammers are getting increasingly good at forgery. While some fake emails may contain misspellings, bad formatting or improper grammar, some of the newer scams are practically impossible to distinguish from valid emails.
- **Not every email ADDRESS is real** – Scammers have become quite good at spoofing email addresses as well.
- **Check URLs carefully** – You should always hover over (or long-press on smart phones) URLs that are within emails because while they may look legitimate, the actual link may go to a malicious site.
- **It's not only email** – Malicious social engineering has evolved beyond email. Sophisticated outbound (and inbound) phone scams can be used in conjunction with email phishing. Don't call numbers that appear within seemingly legitimate emails as they may go to fraudulent phone banks.

With training, users can learn how to successfully identify valid emails from fraudulent ones.

"It's so important to have employees educated on the subject," says Dan Flaherty, product marketing specialist at McAfee. "We often think of email protection as the front line into these attacks coming into your network. Your employees are really the soldiers on that front line. They are the first filter."

Common sense frequently proves to be one of the best tactics in phishing prevention. If something simply feels strange about an email, it often is better to simply avoid any type of action and merely delete the email instead.

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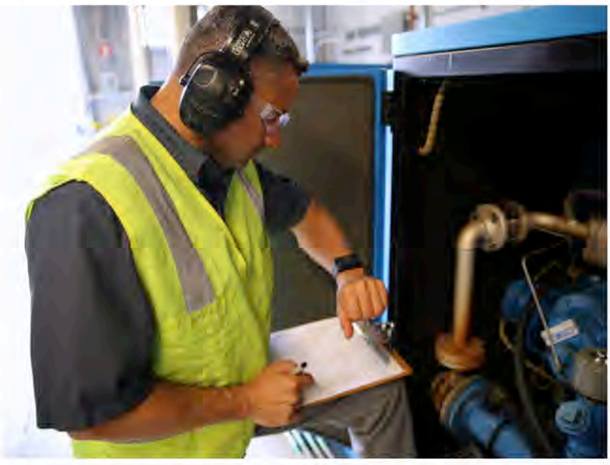

Testing wearables in factory environments.

While consumers view wearables as simply a hot new technology trend primarily geared toward activity tracking and exercise, Intel is piloting a smart watch program to test its viability within its factory work environments.

With initial test criteria of reducing or eliminating the incidences of "missed" alerts and minimizing the number of steps to view alarm notifications, the 3-month pilot program at multiple Intel campuses produced relatively positive results as well as a few new ideas.

According to Azriel Klein, an Intel technician based in Israel who led the pilot, steps to view an alert or page triggered by a failing machine or system notification were reduced from nine to one using a Pebble smart watch versus a traditional smartphone.

After evaluating a few of the smart watches available, Intel chose the original Pebble because it was inexpensive and integrated with a variety of Android and iOS smartphones being used in the factory today. Intel purchased a handful of Pebble watches that employees were allowed to retain after the pilot. Since the pilot began, Intel has also acquired Basis, a company that makes a fitness watch.

The pilot was targeted primarily at technicians who service infrastructure and equipment in a factory environment — areas with loud noise or where it is difficult to physically remove a smartphone from a pocket.

"If you are using latex gloves, you need to pull them off, take your phone from the pocket, unlock it, and read the text," Klein said. "It's annoying!"

There were other advantages. Vibrating alerts on the wrist were also less likely to be missed than a vibrating smartphone in a pocket, minimizing the possibility of "phantom pocket vibration syndrome."

"[The smart watch] works great in noisy environments and offers better reliability," said Klein. "It's very hard to miss an alarm when it vibrates on your wrist."

Response time in reading alerts also increased. According to Klein, the average time to view an alert traditionally on a smartphone was 23 seconds which involved hearing the alert or feeling the vibration, removing the smartphone from a pocket, removing a glove, typing in the security code, opening the messaging application, reading the message and putting the smartphone back. With the smart watch, the time was reduced to less than 4 seconds which simply involved feeling the vibration on the wrist and lifting the arm to view the message.

And there is the politeness factor.

"If you are in a meeting or training, you can have your smartphone in your pocket and you don't have to reach in to get a notification," says Julio Sanchez, an Intel technician at one of Intel's campuses in Santa Clara, California. "It is low profile...you don't make a big scene and interrupt or be disrespectful."

A few complaints

The program was not without complaints, however. Sanchez said he didn't like having to charge the smart watch every 4-5 days (smartphones, however need to be charged daily). Also, the Pebble currently cannot display all of the notifications on its display, requiring the technician to still review longer-length alerts on the smartphone.

"You can miss a long text because [the Pebble] is not capable of receiving all of that data," says Sanchez. "Sometimes it is too much data coming in."

Other complaints by participating pilot members included: the lack of a repeating alert option, the Pebble itself was too bulky, not being able to store all of the data for a longer period, and software and firmware issues when the Pebble was updated causing notifications to be missed.

Smart watches provide easy access to critical notifications to workers in loud or harsh work environments.

The next generation of work wearable

For Sanchez, Klein and other pilot members, the pilot was an introduction on how wearables in the workplace can create efficiencies, but the team already wants the next generation.

"We should wait for more capabilities," said Sanchez. "Like being a phone and smart watch...kind of like Dick Tracy."

Others in the pilot group echoed this with some wishing the smart watch would replace the phone altogether.

"I think it will be great to use [a smart watch] as a 'second phone.' I don't want to give up my smartphone, I need it, I want it," says Klein. "But, I want the [smart watch] to be individual and independent...and that way, I will be able to get messages, emails, notifications, etc. without having my phone on me."

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That Little USB Thumb Drive Could Be a Big Security Violation

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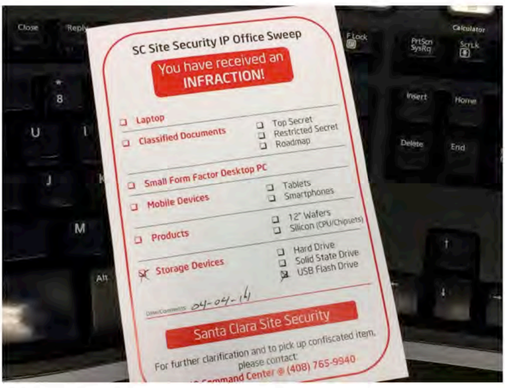
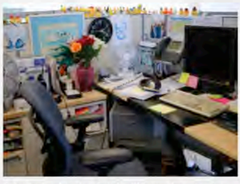


Intel Practices Safety Management by Walking Around.

At Intel, most office employees work in open cubicle environments, so it's not surprising to see laptops, key chains, documents and thumb drives laying out on desks while roaming the hallways. Unfortunately, there is risk involved in all of this "openness," and that's why Intel performs IP security sweeps on a random basis. A single thumb drive can result in a red notice left behind as a reminder.

But that's not all that raises a red flag when security guards roam the cubicles after-hours. They look for a variety of violations sitting in clear line of sight like confidential documents or even old silicon wafers, and the red or blue tickets they leave behind give employees mixed feelings.



A typical cubical at Intel will have documents, sticky notes and more, but Intel Security often looks for obvious signs of risk out in the open, whether they are thumb drives, confidential documents, unlocked laptops left overnight or other items posing a risk.

Common to many large technology companies, Intel has an open environment when it comes to employee workplaces. Rows of cubicles and open desks while good for collaborating, can also pose potential security violations. Intel doesn't take security risks lightly and often performs "security sweeps" that look for violations out in the open.

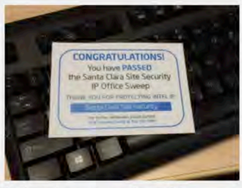
"There is an element of the security sweeps that goes way back. There is a concept called SMBWA – safety management by walking around," says Malcom Harkins, chief security and privacy officer at Intel. "That dates back because of our manufacturing history, 20 plus years."

As is common with many technology companies, security and the protection of intellectual property are huge concerns. Threats to infrastructure, systems and devices are ever-present and evolve in real time. But while a company may be locked down from a firewall and network perspective, it is often the more mobile and portable side of technology that pose the biggest risks to corporations.

Tablets, laptops and smartphones often have corporate security frameworks and software installed in them if they are to be connected to corporate infrastructure, allowing security and IT administrators to remotely disable, lock or even wipe compromised devices.

But often, these security measures have a limit in their effectiveness when it comes to other portable devices like USB hard drives or thumb drives. And this is where corporations move from software solutions to manual intervention to reduce the risk. At Intel, security officers perform regular checks of employee workstations looking for obvious violations of security policies.

Depending on what if any violations are found, the employee might just get a notice left behind on the desk as a reminder. In other cases, the person may have to talk with his or her manager to remind them of the guidelines. Multiple violations could be escalated higher. In other cases, if the desk is clean of violations, a "Congratulations, you passed an IP Security sweep" notice might be left behind.



Intel security sweeps can also result in congratulatory notes.

Sometimes the biggest security risks come in the smallest form factors. NSA whistleblower, Edward Snowden, reportedly snuck out many of the leaked and highly classified documents on a regular basis using a simple, inconspicuous USB thumb drive, a device allegedly banned from NSA offices.

Portable USB thumb drives, which Intel security will flag but not take, pose a variety of risks. They can be transmitters of viruses or malware between work and home and are increasingly being targeted by hackers as easy ways to distribute malicious payloads. In fact, the Stuxnet virus may have been planted in a Russian nuclear plant via an infected USB stick, according to Kaspersky.

And USB thumb drives can pose a threat via the unintentional dissemination of intellection property external to corporate physical and virtual firewalls.

While incredibly useful and handy, USB thumb drives can pose a serious security risk to businesses, inbound by way of infecting computers and outbound as a means to steal intellectual property.

A 2011 survey conducted by Credant Technologies of more than 500 dry cleaners and launderettes around the United Kingdom found that more than 17,000 USB sticks or thumb drives were left behind in 2010 when clothes were dropped off to be dry cleaned.

Often, these USB thumb drives are not password protected nor encrypted.

Thumb drives have risks and benefits. Because they are small, they can get lost, stolen or misplaced. It's the company's responsibility to set security expectations as to what should or should not be stored on them and provide technical mechanism to employees to protect the data on the thumb drive, Harkins says.

Depending on the business, government office or corporate facility, security sweep violation outcomes can range from simple warning notifications to employee terminations or criminal actions being leveled at the violator. And sometimes, the employee may no longer be an employee when the violations are uncovered.

So, whether an employer takes a laissez-faire approach to security or rigorously cracks down on security violations, employees should take some time to ensure their pesky little USB thumb drives remain under their control and protection. Left plugged into devices in the office, they can be easily pocketed with confidential information within; left in a pocket, they can be lost or picked up by a third party; and connecting them to infected hardware, they can unleash unknown havoc to other environments.

"Wow, as a new employee, I didn't even know that these sweeps were done!" said Ellen Healy, a recently hired Intel employee who received a security sweep a few months after she arrived. "I felt a bit scared when I saw some of those red citations on other desks as I walked to my cube."

Even a clean desk with nothing on it can be cited as this one was because of thumb drive left out in the open.

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Open Bike Initiative Rides into the Internet of Things

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Next-generation bike sharing piloted at Intel campuses in Oregon.

A volunteer team consisting of members of the Oregon Transportation and Education Consortium, the Westside Transportation Alliance, the Bicycle Transportation Alliance, the Community Cycling Center, Intel employees and other volunteers is collectively spinning their cognitive wheels in hopes of developing the next generation of bike sharing. The group is working to improve on previous bike sharing arrangements by reducing infrastructure costs, connecting riders via IoT devices, and removing traditional bicycle check-out "hub" requirements.

As it turns out, it's also a little more complex and not yet ready for prime time, but that hasn't dimmed the goal of advancing the bike sharing system functionality and ease of use.

Intel has an avid bicycling community at many of its campuses in Oregon, California and Arizona with an active online user group of over 450 members. Anything from bike part swaps to group rides, commuting recommendations, and rides supporting various non-profit organizations are discussed regularly within the groups.

Using funds from an Intel Sustainability in Action's grant, the Open Bicycle Initiative (OBI) was formed in 2013 by a small group of Intel employees to evaluate ways to meld technology and bike sharing. The grant program started in 2009 and is designed to support employee initiatives such as this. Since its start, Intel has funded approximately 10 projects with an average of $13,000 awarded. Now, the initiative is expanding, with technology at the heart of a new generation of bike sharing.

Prototype of IoT bike sharing device which is attached to a bicycle – part of OBI version 2.0 bike sharing development.

A Primer of Bike Sharing

Community bike sharing has undergone a transformation over the years. With each iteration, efficiencies have grown.

- **Generation 1** – Using a traditional "grab and go" model, Google has over 1,100 bicycles that employees simply take and peddle of down the road. This first-generation model is fairly successful but bikes are frequently stolen or returned in a damaged state.
- **Generation 2** – The second generation of bike sharing models the airport luggage rack model where bicycles are "checked out" from a rack using some sort of payment or currency and then returned to a rack.
- **Generation 3** – Third-generation sharing involves a check-out kiosk that can be expensive, with averages of $25,000 for ten bicycles.
- **Generation 4** – Fourth-generation bike sharing represents a much more technologically advanced model. It is frequently kiosk-less, has either a smart lock or a smart dock, GPS integration and each bicycle can be tracked. This is the model that the Open Bicycle Initiative group targeted with their development work on OBI versions 1 and 2.

Engineering a New Bike Sharing Code

A rack of bicycles used during the OBI 1.0 pilot program in an Intel campus in Portland, Oregon.

The first version of the Open Bicycle Initiative (OBI 1.0) was an SMS-based system consisting of 30 bicycles and 334 distinct employee riders who completed over 1100 rides, all located in Intel's Hillsboro, Oregon, campuses not far from Portland, Oregon, which is known as one of the most bike-friendly cities in the United States. The company employs some 17,000 spread out at multiple campuses in Oregon so bike alternatives make sense. Under the initial program, riders registered for the program, then went to a rack that had a bike-sharing bicycle, and checked out the bicycle by texting the number of the bike to a central communication hub. Within 30 seconds, the rider received a text back with the combination to the bike lock.

During the initial pilot, 40 percent of riders said they used the bikes for exercise, 60 percent for lunch travel, 50 percent to visit another campus, 24 percent to visit off-campus appointments, and 29 percent to use for their "last mile" commute from various public transportation options, including bus and rail, to an Intel campus.

"Though designed to be a last mile option to get from the transit location to the office, the majority of the trips were intra-campus trips and trips off campus for lunch," said Joel Morrissette, a staff technologist and one of the several co-founders of the Open Bike Initiative at Intel. "People are unpredictable and they kind of do what they do."

Despite Washington County and the Intel campuses being bike-friendly, the only negative feedback from the OBI 1.0 riders turned out to be complaints about lack of bike infrastructure in the form of roads and bike trails around the Intel campus itself. Some employees also said Intel is still car-centric and could do more to support biking infrastructure.

The OBI group has also produced a detailed internal document outlining areas of improvement for bicycling around Intel's Hillsboro campuses.

Bike Sharing Has Growing Worldwide Popularity but Not without Challenges

"The United States has seen nearly exponential growth of its systems over the last four years, and many cities in South America and Southeast Asia are poised to adopt bike sharing programs in the coming years," says Susan Shaheen, co-director of the Transportation Sustainability Research Center (TSRC) and adjunct professor in civil and environmental engineering at the University of California, Berkeley.

According to Russell Meddin who manages the popular Bike-sharing Blog, as of February 2014, there were bike sharing programs in 686 cities representing 717,000 bicycles in 55 countries with over 33,000 bike sharing stations. These numbers continue to grow and can be viewed on an interactive Google Map noting all of the worldwide implementations of third-generation bike sharing programs.

An interactive Google Map created and managed by Russell Meddin depicting worldwide bike sharing programs representing 686 cities and 717,000 bicycles in 55 countries.

"The development of sustainable business models and creative funding mechanisms will be an important component of bike sharing's next growth phase," Shaheen says. "Corporate sponsorships will need to continue to help fund systems; non-profit organizations will need to provide operational services and advocacy, education, and outreach; and local governments will be needed for funding, outreach, and planning."

Next Generation, Open Source, IoT Bike Sharing

OBI 2.0 is currently under development based on learning from the 1.0 initiative. The desire is to design and build a prototype "smart lock" device as the foundation for a generation 4 bike sharing system, and as an alternative to more costly generation 3 type of bike sharing systems.

Generation 3 bike sharing systems rely on expensive racks and kiosks as well as modified, customized bicycles.

The approximate cost per bike of the Intel-led, OBI 2.0 model (a generation 4 system) is targeted to be much lower than generation 3 programs according to Morrissette. The system is rack- and kiosk-less and uses commodity bicycles versus highly customized bicycles common to generation 3 systems. The flexibility of the system helps keep the costs low, and the technology deploys off-the-shelf electronics.

According to Morrissette, the OBI 2.0 system will employ an Internet of Things (IoT) stack:

- Box – contains accelerometer, GPS and temperature sensors, and communicates with the main server and back to the bike
- Backend service – has an API, is a hosted service, and connects to any mobile device
- Frontend service – is a mobile application that allows users to reserve or check out a bicycle

The Open Bike Initiative (OBI) 2.0 mobile application provides location awareness for bicycles, making them easier to pick up and track.

The volunteers working on OBI 2.0 are building over 30 hardware devices that include a GPS, cables that go around the bike frame – complete with an alarm that triggers if the bike cable is cut – and communications circuits to connect with the software that manages the bike sharing. The box that goes on the back of the bicycle uses inexpensive parts including a car door actuator, and the circuit boards are made in China.

The Intel Open Bike Initiative (partial) team recently participated in a talk at the Portland Art Museum.

OBI 2.0 is not a fully functioning system yet as the team has encountered challenges with the communications devices within the circuitry and is working on software and hardware modifications to correct, but the goal is to pilot the OBI 2.0 system with 10 bicycles at Intel and 20 other equipped bicycles at two other locations in Oregon.

"Our hope would be that the maker community would pick up on the design and improve upon it," said Brad Biddle, an Intel lawyer who helped found the OBI group.

"Ultimately we would like to change the world in our own small way," said Biddle. "Our hope is that an open source generation 4 bike sharing system will mean that there is a cheaper, better way to do bike sharing, which means there will be more bike sharing in the world and ultimately that will mean environmental and social benefits, while giving people better transportation options."

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Chromebooks Emerging as Classroom Contender

May 1, 2014 Share

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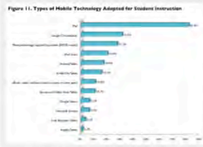
Low-cost laptops emerging as a new alternative for schools with increasing focus on budgets, ease of use, web applications.

Apple and Microsoft have long dominated the education market as the preferred computing platforms for grades K-12 in the U.S., but Google — and Samsung — are emerging as significant challengers with a new crop of Chromebooks for schools. Citing low cost, quick boot times, easy maintenance, and increasing use of web-based applications, schools throughout the country are increasingly looking to Chromebooks for their computing needs, according to analysts and school district IT managers.



According to a national survey on Mobile Technology for K-12 Education sponsored by Amplify, a maker of an Android-based tablet purpose built for the education market, the iPad remains the No. 1 mobile technology device in classrooms around the country, followed by Chromebooks.

According to Futuresource Consulting, one in four devices sold into K-12 schools in the U.S. are Chromebooks, and the platform is emerging as a strong contender to Apple's well-established market position. And there are signs the trend may not be confined only to the U.S.

ABI Research, who has been tracking Chromebook shipments closely, said the government of Malaysia deployed over 100,000 Chromebook systems to schools last year, and as administrators overseeing that program learn from that initial implementation, ABI believes there is significant upside potential to grow the total area market (TAM).

All told, ABI says that Chromebook shipments hit 2.1 million units in 2013 and is expected to reach 11 million worldwide by 2019. According to a recent study sponsored by Amplify, a maker of an Android-based education tablet, Apple, and the iPad specifically, is still the most common type of mobile technology adopted by school districts. The iPad is followed closely by Chromebooks and other 'mixed' technology supplied by students, including the iPod Touch.

Chromebooks are low-cost laptops starting at around $279 that are built using Google's Chrome OS and powered by chips from Intel, Samsung, and others. They launched initially in 2011 but picked up steam over the last year with several sleek new designs coming to market. Multiple PC makers have Chromebooks in the market today including Samsung, HP, Acer, Dell, Lenovo, and Asus.

According to Google, the systems can save schools on average $5,200 per device over three years. The company has also said more than 5,000 schools have deployed them, representing more than 20 percent of school districts in the U.S.

So far, Samsung appears to be emerging as the clear leader in terms of systems deployed in U.S. schools. But there are also systems coming into schools from Acer, Lenovo, and other computer makers.

Intel for its part has been actively supporting and promoting the use of Chromebooks for schools with a series of webinars, tips, videos and more on its K-12 blueprint website for teachers and educators. Acer and Intel recently offered K-12 schools the opportunity to pilot the Chrome OS with a free 30-day trial of its C720 Chromebook

According to ABI, a few examples of the largest deployments at U.S. schools in 2013 include:

- 18,000 Samsung Series 3 Chromebooks at Cherry Creek Schools in Colorado estimated at just over $5 million
- 5,100 Samsung Chromebook 550's at Passaic Public Schools in New Jersey for about $1.5 million (plus an additional 8,200 units already this year)
- 4,500 Samsung Series 5 at Richland School District Two in Columbia, S.C., for about $1.4 million (the district also deployed 14k Chromebooks in 2012)

Examples of initial deployments, pilot programs and even a second wave of purchasing this year are everywhere. Lombard Middle School in Galesburg, Ill., is rolling out 2500 Acer Chromebooks to cover its 6th-12th graders as part of the school district's 1:1 Computer Program.

On a smaller scale, the Board of Education for the Kearney, Mo., R-1 School District recently approved the purchase of 300 Chromebooks at a cost of $110,120 for distribution within the district. In Hillsboro, Ore., the Hillsboro School District recently purchased 160 Chromebooks as part of a pilot program to investigate possible larger roll-out over time.

The Shift Has Started

Jeff Orr, senior practice director at ABI Research, says there is definitely a shift happening and a lot of it is based on the web model.

"A parallel [to the Enterprise market] exists in the K-12 education market on the basis of increased choice of platforms and vendors, except for one distinct criterion: content," Orr says. "For K-12, the stars and moon have aligned such that a lot of content applications and custom content development platforms for educators have moved to using the web as the delivery vehicle. This makes for an ideal setting for Chromebooks to deliver on affordability, manageability and usability without compromising the access to curriculum and tools needed by educators."

Part of the allure of Chromebooks in addition to their low cost is a free suite of Google communication and collaboration tools including email, calendar, and documents that allow students and teachers to share and collaborate from anywhere even outside the classroom.

Bedford Public Schools in Michigan is a classic example. They recently started shifting away from Microsoft software and Windows-based hardware to Google Apps and Chromebooks. It's no wonder Microsoft has publicly challenged Chromebooks with a series of advertisements as part of their 'Scroogled' campaign, seeking to paint Google as tracking users wherever they go in order to sell more advertising.

Jennifer Earl, director of instructional technology and who oversees the technology used by approximately 4800 students in the Bedford District, says the shift to Google Apps was a key part of their decision. They evaluated Chromebooks along with traditional laptops, netbooks, tablets and the Apple iPad.

"We just officially launched our Google Apps for Education domain at the beginning of the school year so this has been a year of learning for everyone, staff and students alike," says Earl, adding that Google Docs is now the established platform for meetings, minutes, agendas and more.

The Bedford Public School District in Michigan is deploying Chromebooks to all 3-12 graders by 2018.
Image source: bedfordedtech.weebly.com

380 Chromebooks were distributed to Bedford 6th graders in January and the plans are to deploy 800 additional Chromebooks in order to have a 1-to-1 ratio of device-to-student. According to Earl, all students in grades 3, 4 and 8 will have Chromebooks in 2015-16 and the high school will transition to Chromebooks in 2016-18. Chromebooks are actually assigned to individual students for use at school and home, she said.

Questions Remain

Many questions still remain about the viability of Chromebooks over the longer term, according to Orr. "Some privacy organizations have expressed concern that the inherently connected nature of Chromebooks makes them vulnerable to data integrity concerns and sharing of student information with Google and potentially other private entities without the consent of the students' families, teachers and government," he said.

And there is the question of whether Chromebooks are durable enough to withstand challenges of student use and classroom environments.

Shortly after Chromebooks were distributed within the Bedford schools, they started seeing large numbers of returns for the same type of repair – a missing OS. The district discovered a technical issue with some hard drives that weren't properly attached, and slight jarring caused a disconnection. They turned it into a learning exercise with students, who opened the devices and deployed a fix to all of the Chromebooks within a few days.

What companies stand to win from Chromebooks? ABI's Orr says to date, the contributions of Samsung, Intel and of course, Google, are the most notable, but he expects multiple solutions will still be deployed in schools.

"The companies least likely to feel the joy of Chromebooks would consist of Microsoft and Apple," Orr said. "As with any existing market segment, K-12 education has grown using solutions from both vendors and will continue to. The difference is that the pool of choices available is continuing to expand and Chromebooks deserve a look alongside Windows OS, Mac OS and Linux-based computing solutions."

(Chromebooks image source: Google)

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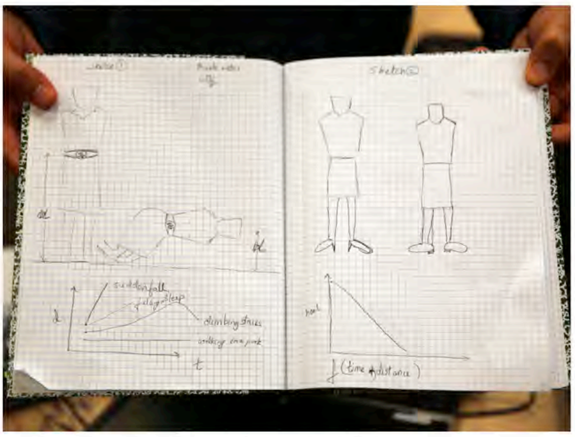

Looking for feelings and emotions amid the technology.

Designers and engineers often create code or cool new hardware without thinking as much about the human side of the technology. At a recent Intel workshop that might be seen as counter-intuitive, engineers were being trained to think about real-world applications first, the technology itself second.

“Don’t build with technology just for the heck of building a piece of tech. Build for a purpose, for the user,” said Carlos Montesinos, a research scientist at Intel on collaborative design who co-sponsored the workshop. “Design with the user in mind and then technology will follow.”

For half a day, Intel engineers with no experience designing with Intel’s new Galileo development boards got a crash course on how the development board works and how it could be programmed. They then spent time designing simple wearable projects that solved real-world issues. The second part of the day was hands-on tinkering work making a rudimentary version of the product they had conceptualized, using various sensors and inputs, actuators and outputs.

Wearables of All Types

Prior to working with the circuit boards or even brainstorming on the design, the workshop participants learned about the human factor involved in designing and understanding wearable devices.

“When we look for a solution, we look for the feelings and the emotions that a solution evokes in a person — what motivates people to wear technology,” said Ana Rosario, user experience researcher at Intel. “Once we understand the emotional feeling behind the things we wear, then we can design wearable experiences that people are going to be compelled to wear.”

From technology woven into fabric to prevent malaria to motion-detecting and haptic feedback-enabled Pilates active wear, wearables can take all shapes and forms. And this was the point of the workshop – forcing the design beyond the technology and into the human factor and what the user truly wants.

According to Rosario, sensors embedded within fabrics are design to “understand” and naturally interact with the body, and often the resulting wearable extends functions of your body, even beyond what you have. For example, this scarf-turned-airbag-helmet designed by Hövding provides additional protection beyond the skull.

“You cannot control user experience, but you can design for it,” said Rosario on the framework for the workshop.

The event was focused primarily on the conceptualization and design work of rudimentary wearable devices, and the Galileo board provided a quick and easy way to prototype designs.

Getting actuators and input sensors to work was core to the Galileo development board wearables workshops, with team members collaborating on the design and technical implementation of the design.

Engineering Real-World Solutions

Workshop participants, ranging from server architects to software and hardware engineers, put away their engineering degrees and collaborated in groups of three, eventually producing the name and function of their wearable product as well as drawing an initial design based on their own wants and needs.

These concepts were presented at the end of the workshop and voted on by workshop peers. Only the product concepts were part of the voting, the Galileo board development results were not.

Among the designs were:

- “Well-belt” – a wearable for the elderly with built-in accelerometer sensors and communication outputs that detects when a fall has occurred and phones or texts a care provider.
- “Baby Galileo” – tackled the problem of the shopping parent needing to amuse their young child while also helping the child’s motor development. Using accelerometers and motion sensors, wristbands worn by young children issue spoken commands (e.g., “lift your left arm”) in a motion-centric form of interactive play.
- “Hush” – designed to measure how loud people are talking and give them an indication of volume. According to the team, this wearable could be particularly useful for noisy co-workers or yelling parents.

Intel’s new Galileo development board provided wearable workshop participants with a method to quickly and easily prototype their wearable designs.

The winning concept was the “Fevometer,” which would use thermal sensors built into a baby’s outfit and cap to allow parents to be notified if their baby had a fever. As the makers of this design were parents, they pulled from real-world experiences to use technology to augment their lives. This was similar to the Mimo Baby wearable prototype from Rest Devices that Intel showcased at CES earlier this year. Rest Devices bills itself as a company that “makes simple and human-centered devices that keep people healthy and relaxed.”

When event co-sponsor and application engineer at Intel, Afifa Tawil, was asked what wearable she would create, she immediately thought of nighttime Ultimate Frisbee. “We currently use glow-in-the-dark Frisbees and colored glow sticks. Wouldn’t it be cool if the Frisbee changed colors so we knew which team has it,” says Tawil. “If the glow sticks could become ‘wearables’ that would be kind of cool.”

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Career Networking with High Tech 'Mocktails'

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Intel, McAfee and Wind River branded "mocktails" spotted at career expo.

Fruity umbrella drinks aren't commonly associated with Silicon Valley tech firms, but that's exactly what one of the industry's founding companies was serving up at a recent career event.

At a career expo held at the Intel Santa Clara, Calif., headquarters, not one, but three signature "mocktails" were being shaken and stirred. Attendees at the employee-only career event could sip their choice of an Intel Blue Colada, McAfeeni or Wind Riverita. The drinks, celebrating Intel and its subsidiaries, McAfee and Wind River, were designed with input from employees.

Amid the high stakes game of corporate branding the non-alcoholic drinks added a splash of fun to the event and may have piqued the curiosity of some employees who otherwise wouldn't have attended.

It was not the first foray into branded beverages for Intel, which ranks as the world's ninth most valuable brand according to Interbrand. At both 2012 national political conventions, Politico's Nightly Lounge, which the company sponsored, served the Intel Fusion, made with Ketel One vodka, blueberries and club soda. The recipes for the three branded mocktails packed less of a punch.

Intel Blue Colada

Served blended or shaken

Ingredients:

- 3 ounces of coconut milk
- 1 ounce of coconut syrup
- 2 ounces of pineapple juice
- 2 ounces of sweet & sour mix
- Blue food coloring

Optional: Crushed or blended pineapple

Garnish: Whipped cream, fresh shaved pineapple and skewered pineapple or stalk of the pineapple (leaves) and a cherry

McAfeeni

Ingredients:

- 2-3 ounces of pomegranate juice
- 2 ounces of cranberry juice
- 1-2 ounces of strawberry puree
- 1-2 ounces of lemonade
- 0.5 ounce of club soda

Garnish: blueberries and boysenberries

Wind Riverita

Ingredients:

- Blended pineapple and peaches
- 1 ounce of sweet & sour mix
- 1-2 ounces of lemonade
- 0.5 ounce of Roses Lime
- 0.5 ounce of Sprite

Optional: Trim the glass with sugar

Garnish: Lime wedge and cherry

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Teacher Using Minecraft to Extend Education Beyond Physical Classroom

March 12, 2014 **Share** Like G+1 TAKE THIS CONTENT

Minecraft mod enables immersive and interactive coursework in Kuwait school.

Despite teaching in oil-rich Kuwait, a humanities instructor encounters Internet technology woes but is breaking through to his students by creating Internet-enabled courseware using a Minecraft modification to drive student engagement.

"For a country that is as oil-rich as Kuwait, [the government has] not invested well in Internet technology," says Eric Walker, a middle school humanities teacher at The American International School of Kuwait. But this did not prevent him from expanding his humanities curriculum to include the Internet-based Minecraft game into his instruction.

Walker has produced his own implementation of MinecraftEdu within his teaching. Called "The World of Humanities," Walker's world allows his students to extend their education beyond the physical classroom walls into the virtual world of Minecraft.

Within "The World of Humanities", a MinecraftEdu world, online students encounter ancient artifacts and architecture while learning history in the process.

The Minecraft mod, "The Wonderful World of Humanities," allows students to interact with history within a virtual world while undertaking various historical quests created by teachers.

Minecraft is a "sandbox" computer game with no specific goals to accomplish where players navigate a variety of user-created worlds. Launched in 2009, the core gameplay involves the breaking and placing of 3-D objects, mainly "blocks," and interacting with online users and non-player characters. Recently, Warner Bros. secured the rights to the game and has announced plans to make it a full-length movie.

Walker has been a gamer since he was 7 years old. From first-hand experience, he knew video games "were a huge motivator." While he does believe there are bad sides to some video games, "not all are bad — it depends on the content of the game."

Two years ago, Walker learned about MinecraftEdu, which is a collaborative modification to Minecraft managed by a small team of educators and programmers who are working with Swedish company Mojang AB, the creators of Minecraft. MinecraftEdu consists of custom, teacher- and student-specific versions of the Minecraft game, server software, world-building tools and a free library of worlds that instructors can use to modify the game for teaching.

"[Technology in the classroom] can be a real frustration, but there are still ways to make things work," says Walker. "Taking a 'supplemental' approach to technology, instead of a 'substitution' approach, is necessary. In the classroom, technology can be used to optionally enhance and enrich learning, but the technology cannot be relied on as the sole conveyor of the required information and activities."

Walker took a different approach to implementing Minecraft within the classroom. Despite infrastructure challenges, he moved the experience beyond the classroom and into the home. In a traditional environment, teachers set up a classroom-based Minecraft server within a local area network (LAN) and then students connect their devices to the server, all in the class. Because he didn't want to detract from the in-class learning environment, Walker decided to host his Minecraft environment externally, in this case with a server in Dallas, Texas, and students remotely accessed the server using their tablets or laptops from their homes.

Technology or lack thereof is not a roadblock for implementation or usage of "The World of Humanities." So despite Internet access being mainly driven via WiMAX or cell technology, gameplay of the learning world is not directly impacted.

"[Because] World of Humanities isn't a 'twitch-based' game that requires instant communication, latency has a minor effect on actual gameplay," says Walker. "More often the quality of a student's personal laptop computer is the cause of what they complain of as 'lag,' which is actually the choppiness of the frame rate as rendered by their video card."

Within "The World of Humanities," a MinecraftEdu world, online students encounter ancient artifacts and architecture while learning history in the process.

Minecraft and The World of Humanities don't require high-end computers, says Walker. He has modified his files and folder structures of his teaching mod to ensure optimal performance when accessing his remotely hosted server. The server specifications depend on the number of simultaneous users. In Walker's case, 25-35 simultaneous students can be handled with a 4-processor server with 1 GB of RAM. For student computers, dual- or quad-core i5 or i7 processors with 2 GB of RAM running OS X or Windows is sufficient. Walker does recommend having a "semi-decent" video card for renderings, adding that many schools don't have those type of specifications. He encouraged his students to "bring you own device."

But technology wasn't the only reason why Walker chose a different path. He didn't want the technology to be a distraction within the classroom.

"Whereas many other teachers around the world use MinecraftEdu to construct 'lessons' that replace a class period, World of Humanities is an always-on enrichment world that students can connect to from home," says Walker. "And that deepens and enriches their understanding of content that has already been learned in the classroom, or that will be learned in the near future.

In the classroom, Walker teaches about Aristotle, Alexander the Great or the Great Wall of China. After class and away from school, he works on creating supplemental, interactive content within The World of Humanities -- conversations with Aristotle and quests to find artifacts from history, all within the MinecraftEdu framework. And then he opens those worlds to his students.

Walker has created so much content for his mod that he estimates if one were to paste it into a single-spaced document, it would fill 400 pages with text.

But what about the results of his efforts? Walker has seen improvements not only in the grades of his students but also in non-measureable ways. He has witnessed increased in-class discussions and engagement from previously shy students. And he's seen an increase in what he calls "digital citizenship," where students are becoming more helpful and respectful. And online friendships of students who meet within his game have moved to the physical world as well.

Because of its success, Walker has made his Minecraft mod and documentation available to other teachers around the world.

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Engineers Capture Sustainability in Photos

March 3, 2014 **Share** TAKE THIS CONTENT

Intel employees from around the world contribute sustainability photos for interactive mosaic.

Sustainability can mean many different things, and those various interpretations are on display in the thousands of images submitted by Intel employees for an Earth Day photo project.

Photo submissions have poured in from Intel employees from around the globe, including some from India, Vietnam, China, Israel, Mexico, Malaysia and the United States. The photos capture visually what sustainability means to each shutterbug. The photos will be incorporated into an interactive digital photo mosaic that is scheduled to be unveiled on Earth Day on the Intel company website.

Who knew sustainability could mean so many different things through the viewfinder? Here are a few of the photos submitted by Intel employees:

"Sustainable Energy from Mother Earth"

Photo by Kee Seng Heng, system validation engineer, Penang, Malaysia

"This image captures the sunset moment, which is used as the source of light for the light bulb. This represents that we should go green at any point of time to protect the mother Earth," said Kee.

"Free Air Cooling"

Photo by Fiacre Goggin, data center manager, Dublin, Ireland

The photograph is a blend of two photos that Goggin says represents free data center cooling via outside fresh air in a data center.

"Save Water Save Earth...Each Drop Counts"

Photo by Gaurav Khare, software engineer, Bangalore, India

"This photo signifies the importance of each drop of water in human life, since we know we have a very limited fresh water resource," said Khare. "Still some people do not realize how important it is."

"Nature's Alternate Solution to Metal/Mining"

Photo by Ramesh Babu, audio driver engineer, Bangalore, India

The photograph represents the growing importance of alternatives for metals, according to Babu, who says that forest area is diminishing due to mining.

"Little Nature"

Photo by Karen Hernandez Morales, tech lab, Zapote, San Jose, Costa Rica

This tree, called "yellow Cortez," produces flowers once a year in March, according to Morales. It has been in her grandparents' backyard for more than 40 years.

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Intel Engineer Produces Super Bowl Ad for $300

February 3, 2014 **Share** Like G+1 TAKE THIS CONTENT

'Doritos Time Machine' spot wins Super Bowl ad contest.

While the Seattle Seahawks and Denver Broncos were competing on the field in the Super Bowl, some of the most familiar brands in the world were locked in their own struggle to capture consumers' attention with the high-priced ad spots that ran during the annual game. This year amid the slick Super Bowl ad spots developed by some of the leading creative talents in advertising, a DIY ad for Doritos created by an Intel engineer and an aspiring filmmaker grabbed attention during the opening minutes of the game and a $1 million prize for its creators.

"I was able to produce this [ad] for $300 since everyone was willing to work for free," said Raj Suri, an Intel systems analyst who produced and co-wrote the Super Bowl ad with director Ryan Thomas Andersen and actor Daved Wilkins.

The trio's submission in the 2014 Doritos Crash the Super Bowl contest not only aired during the first quarter of the Super Bowl, it is already approaching 2 million views on YouTube. The contest-winning 30-second spot also earned its creators a $1 million cash prize, a trip to the Super Bowl and an opportunity for the director to be on the set of the upcoming film "Marvel's The Avengers: Age of Ultron."

In the contest-winning ad, "Doritos Time Machine," a boy named Jimmy, convinces a Doritos-eating passerby, Mr. Smith, to try a time machine that he claims is powered by the tortilla chips. Mr. Smith gamely climbs into the cardboard box, which Jimmy then shakes while eating Mr. Smith's Doritos and making time machine sound effects. Then an older man shoos Jimmy off his lawn and when Mr. Smith emerges from the time machine, he mistakes the man for an older Jimmy and is awed to be in the future.

Director Andersen's son Gavin, who played Jimmy, inspired the Doritos commercial, according to Suri, when he asked his father to create a time machine after seeing the movie "Back to the Future."

According to Suri, filming of both versions of the commercial, shot at Andersen's family home in Arizona, took only 8 hours, but the editing consumed 80. Suri, who works at Intel's Ocotillo, Ariz., campus, has been with the company 16 years.

Originally, there were two versions: The winning submission was actually an alternate ending, according to Suri. In the original version, Mr. Smith doesn't believe the time machine works and at the end, the time machine teleports him to a prehistoric time.

"It's a good thing we shot that alternate version," said Suri. "Both were good, but the alternate was clearly funnier."

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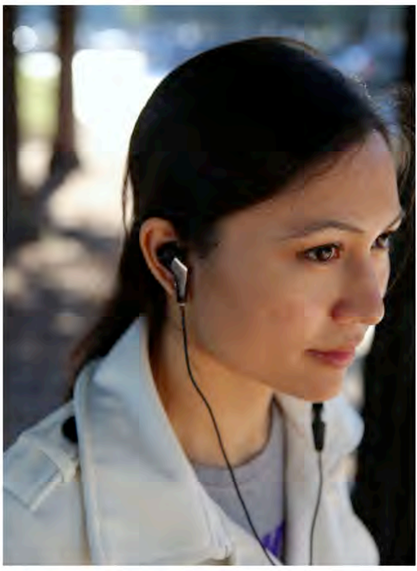


Indira Negi brings passion for running, biometric experience and maker skills to development of Intel smart earbuds.

When she literally jogged on-stage to join Intel CEO Brian Krzanich in his opening keynote at International CES in Las Vegas, engineer Indira Negi was there to demonstrate the Intel smart earbuds that she and her team had developed, but the "smart" design she showed off also helped solve an issue the avid runner had personally encountered.

"I am a runner — I get hives from the sun, I have to run with gloves on," said Negi about running with a smartphone. "That means when there is a bad song, I have to take out my phone, take off my gloves, unlock my phone and change the song."

Starting from solving a problem that she knew all too well, Negi, a sensors systems engineer in the Intel New Devices Group, and a team set out to create a device and software that would monitor heart rate and adjust music playback based on sensor feedback. The result was the Intel smart earbuds reference design, developed in collaboration with Valencell.

Intel engineer, Indira Negi, joined Intel CEO Brian Krzanich during his International CES keynote address to demonstrate the Intel smart earbuds reference design she helped design.

Negi's study of bioelectronics and biosensors in graduate school — she earned a master's degree in electrical engineering from Arizona State — lent her a keen appreciation of the value of biometric monitoring.

One project she worked on while at ASU measured stress levels in saliva using specially treated paper. When you are working out, you are stressing your body in a positive way, explained Negi. If you work out too hard, this becomes negative stress, which can increase the chances of getting injured. She also worked on molecular imprinted polymers while at ASU coated with biochemical sensors that reacted only to specific molecules.

"It was only in grad school that I found my passion for bio-sensing electronic devices," said Negi. "I was lucky."

A Maker at Heart

Though she has a zeal for bio-sensing technology, Negi also enjoys building on a larger scale.

"It's de-stressing for me to work with my hands," said Negi, who built her own furniture while in graduate school. "I made a table, a bookshelf and a really wobbly chair."

Intel engineer Indira Negi designed a backyard "squirrel chaser" that uses an Arduino, infrared sensor and servo motor.

And she's not just a furniture maker. When Negi noticed that the holiday lights hung in her backyard had been chewed by squirrels, she created what she calls a "squirrel chaser."

"I didn't want to kill the squirrels," said Negi. "I just don't want them in my yard."

Built using an infrared sensor, servo motor, buzzer, Tupperware and an Arduino board, the device watches for squirrels. When it detects motion, the squirrel chaser makes a loud noise (the buzzer) and the servo motor waves a flag. Negi said she plans to add a camera to her invention to capture the squirrels in the act.

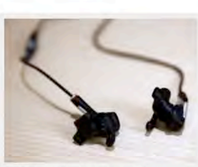
Negi is also building a fountain in her backyard and likes to sew and paint. She doesn't distinguish between her different maker projects or put much stock in gender-based stereotypes about activities.

"I don't know why certain things are supposed to be men-tasks or women-tasks because in my head, they are all the same," she said. "You are just building."

"Smart" Biometric Projects

The Intel smart earbuds reference design that Negi and the team developed aren't the only project she's worked on that used biometric sensors. One research project integrated sensors directly into a smartphone.

"People use their phone all of the time," said Negi. "We want to make all of the sensing opportunistic. We wanted it to happen incidentally. We wanted for it to happen on its own."



The Intel smart earbuds reference design captures movement and heart rate data using an accelerometer and infrared sensors.

That research project led to her work on the Intel smart earbuds, which actively monitor heart rate via sensors and can be integrated with smartphone applications to provide additional functionality like helping to choose music.

Originally, the smart earbuds were designed to work with Intel-powered phone, but then the team changed direction.

"We wanted it to work with every phone," said Negi. "That was a much harder problem because all of the connectors were already used."

A typical headset has four standard connectors, left audio, right audio, microphone and ground. The team didn't want to use Bluetooth, but instead worked on a wired earbud design.

"[A wired earbud] doesn't need power, doesn't need to be charged, doesn't need to be paired," said Negi. "It's always ready to go."

Intel engineer Indira Negi wearing an early prototype of the Intel smart earbuds reference design.

The Intel smart earbuds harvest energy from the smartphone microphone jack, which was challenging because of the limited power envelope and the need to use the same port for both power and data.

"We had a lot of very interesting electrical engineering problems to solve," said Negi.

All of the processing is done on the smartphone. The earbuds simply transmit the raw data captured by its sensors to the smartphone for analysis and processing. An infrared optical sensor looks at the pulsing of the skin within the ear.

"Ears are a good place [for sensors]," said Negi, "because there is no other motion that can be created."

The accelerometer in the earbuds is designed to correct for motions such as shaking one's head. It's simple to calculate heart rate if you are not moving, according to Negi, but you need the accelerometer to decipher heart rate when a person is active.

Because the Intel smart earbuds reference design are single function, Negi doesn't consider them part of the Internet of Things until they are connected to a smartphone, but counts the need to connect them as a plus because it's familiar.

"It is a wearable that you have no resistance against because you already use them," she said.

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10 Tips to Boost Online Safety for Kids

January 15, 2014 **Share** Like G+1 TAKE THIS CONTENT

Education, parent involvement crucial to guarding kids' online safety and reputation.

Getting online isn't much of a hurdle for digital natives, but keeping kids safe on the Internet can be a huge challenge for parents. And while you're keeping an eye out for threats in cyberspace, don't forget to watch your kids closely too — they can max out your credit card or worse with just a few clicks.

"My son had two to three hundred dollars' worth of purchases on Amazon," said Tracy Ross of McAfee, who works with its Online Safety for Kids program. Ross' 6-year-old son had tapped Amazon's 1-Click button on her tablet without knowing that it would actually purchase items. McAfee is a subsidiary of the recently announced Intel Security Group.

Ross had stored all of her credit card information within Amazon and enabled 1-Click shopping, which allows for easy purchases of products online. She gave her child the tablet to play with, without thinking about the financial data she left out in the open.

Unintentional online buying sprees, such as Ross experienced, are among the more benign perils that children and their parents face on the Internet. Other, more sinister dangers take many different forms, such as cyberbullying, disclosing location information, privacy, basic online ethics and reputation.

Providing adequate online safety for kids goes far beyond simply installing anti-virus software and hoping that it will prevent issues. The following tips to tips to boost online safety may be obvious to some, but it's important to note that these go beyond putting security software on online devices and walking away. Parents must be vigilant about their children's online activities.

Online Safety Tip 1: Use Password Best Practices

It's wise to teach children not to share their passwords. Whether you're creating passwords for your kids or advising about how to do it themselves, passwords should be complex enough to prevent them from being easily guessed. Use a mixture of numbers, letters and upper and lower case characters to make passwords stronger.

Online Safety Tip 2: Update Your Security

Microsoft, Apple and the Linux community frequently release security updates to not only their operating systems but also for applications, including browsers. Staying current with those updates can help avoid many security vulnerabilities.

Online Safety Tip 3: Mind the Age Group

Many social media sites and online communities have age restrictions, but these are sometimes overlooked or ignored by children and their parents. There are communities designed for children under 13 that prevent interaction with adults.

Online Safety Tip 4: Avoid Pop-Ups

Clicking a pop-up window ranks high among the actions that spread malware and viruses — pop-ups can look like legitimate alerts. Showing kids how to close pop-ups correctly by not clicking them and disabling pop-ups within the browser can help mitigate this threat.

Online Safety Tip 5: Nurture Online Reputation

Children often don't understand the concept of an online reputation and that anything (photos or messages) posted to social media is permanent. Increasingly, colleges and universities as well as potential employers use social media history to learn more about candidates. As kids grow older, parents can caution them about sharing too much private information and the potential risks.

Online Safety Tip 6: Disable Location Services

Many smartphones can now include geographic or location data with photos or videos. It is relatively easy to extract embedded geo-tagged information from photos if location services are not turned off. Similarly, many social applications include "check-in" location information by default. Parents should consider turning off location services on photo, video and social media applications when possible.

Online Safety Tip 7: Watch for Virtual "Stranger Danger"

Parents often instruct children not to talk to strangers in the real world, so why should it be any different online? Be honest with kids about strangers and reinforce that they should NEVER meet an online connection in the physical world unless the parents know the person.

Online Safety Tip 8: Guard Personal Information

Parents should

instruct children not to share personally identifiable information online, specifically birthdate, where they live, what school they attend and what activities they do. This information could be easily used to find the child.

Online Safety Tip 9: Don't Hide, Stay Open

Whenever possible, have any Internet-connected devices used by children out in the open where they can be supervised. Be sure financial information is not present to prevent children buying things they shouldn't. Even consider setting up a separate account for kids and have parental controls active on those accounts. Similarly, when children have questions about their online activities, try to answer their questions — a missed opportunity could be a big loss, even a dangerous one.

Online Safety Tip 10: Be Involved

As a parent, don't be reactive; be proactive. Talk with children, regardless of their age, about the dangers of online activity, security and their online reputation. Don't wait for there to be an issue, get ahead of it to protect them.

It is critical to support and educate children about cyber safety, security and ethics. Many schools have programs to help, but often parents are a more appropriate and immediate resource for kids to learn how to be safe. With more threats as well as online social communities being created every day, the risks to children increase as well.

"It's not getting any better," says Ross. And security software and tools are simply that — tools. Education and parent involvement are more powerful means to keep children safe.

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CES: Can You Find Wearables Under $20?

January 10, 2014 **Share** TAKE THIS CONTENT

Low-cost smart watches, health trackers from Shenzhen and Taiwan-based companies spotted at CES.

Off the main expo floor at International CES you'll find row upon row of inexpensive gadgets made in Asia, from glitzy smartphone cases to cheap tablets to speakers. This is nothing new at the annual consumer electronics show in Las Vegas, but lurking among the multitude of tech you might expect to see were some items from the hottest category at CES this year: wearable technology.

Health trackers and smart watches from Shenzhen and Taiwan were spotted in the smaller booths at the Venetian Expo. These weren't the familiar products in the wearables category such as the Fitbit Force and Nike FuelBand or the newest such as the Sony Core and SmartBand and LG Lifeband Touch that were on display over in the cavernous halls of the Las Vegas Convention Center, but it wasn't just "knockoffs" either — there were some signs of innovation.

The Wime NanoSmart smart watch is available from Amazon for $125.

Some of the products on display, such as the Walkingspree activity tracker manufactured by Joint Chinese, a Shenzhen-based company, which looked eerily similar to some activity trackers available in the United States, are only available in large quantities. In-booth representatives quoted the pricing for this Bluetooth-enabled, lightweight (9 grams) activity tracker with an on-screen display at $18 per unit for 10,000 units.

The Walkingspree activity tracker manufactured by Joint Chinese sells for $18 with a 10,000-unit purchase.

Others, such as the Wime NanoSmart smart watch, are available for purchase on Amazon at prices still well below more familiar brand names. For $125, you could get a Dick Tracy-like device from the Taiwan-based company that has a slot for a GSM SIM card, Bluetooth and a 240×240 touchscreen LCD. The higher-end Wi-Watch A3 goes for $85, according to a representative in the trade show booth, but that price was for bulk purchases only. The A3 runs Android 4.2, has a micro-SIM slot, Bluetooth, Wi-Fi, GPS and a 320×240 touch-screen resolution.

While many of the companies exhibiting were primarily manufacturers searching for distribution channels to enter the United States, some had already found customers. Taiwan-based Maxwell Guider Technology, a design and manufacturing company, for one, had already inked a deal with Giant Bicycles.

A common complaint about health and activity trackers is battery life. Maxwell Guider Technology was showing its Power Watch, which uses a combination of familiar battery tech and low-power consumption to address such power concerns. The company's Power Watch uses a disposable coin battery that it says will last 6 months and an e-Ink display that draws little energy. Booth personnel quoted a $79 street price.

Another exhibitor, Health & Life Company, based in Taiwan, was focused completely on the healthy lifestyle market with a heart monitor, connected watch and smartphone app that retails for $300. The company was hoping to capture the attention of distributors and companies in the United States.

If the buzz at CES is any indication, the wearables market is only going to get hotter as big brands compete for consumers' wrists and wallets with activity trackers and smart watches, but the China tech ecosystem is already producing inexpensive products in the category.

The $79 Maxwell Guider Technology Power Watch is powered by disposable coin batteries and uses an e-Ink display.

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CES: Has the Disposable Tablet Era Arrived?

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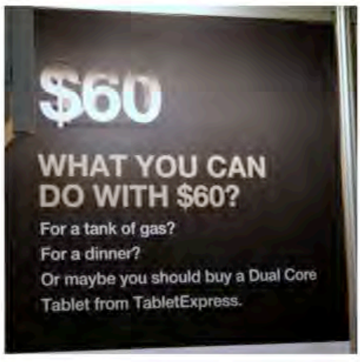
Tablets from Asian markets push entry-level devices to rock bottom price points.

One tablet manufacturer in the Shenzhen section at International CES is displaying a sign that asks, "What can you do with $60?" Based on an informal survey of the devices on display at the annual consumer electronics event in Las Vegas, $60 could almost buy you two 7-inch Android tablets. With tablet prices touching $35, the question begs to be asked: Have we entered the era of the disposable tablet?

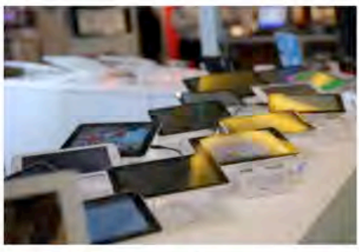
In the Venetian Expo of the annual technology trade show, more than 35 booths were selling cheap tablets in every shape, size and configuration imaginable. All those devices had one thing in common: They were incredibly inexpensive.



Tablet devices from companies such as Epudo and Kingnod were available in an array of different configurations with prices well below those from familiar brand names such as ASUS, LG, Samsung and Sony.

The price point for the least expensive tablet spotted in the Shenzhen section at CES was $33. For that cost, you get a single-core, WiFi-only, 7-inch tablet with 1 GB RAM and 4 GB flash storage. The plastic case device runs Android 4.1 or 4.2 and has front and rear facing cameras. A dual-core tablet on display from Shenzhen CTI Industrial went for $34. Moving up just a buck to $35, Hank Electronics was displaying a 7-inch single-core tablet running Android 4.2.

On the devices another price level upwards, you see features such as 3G, 4G/LTE, HDMI output and Bluetooth. A few more dollars upstream from the most inexpensive models starts to bring larger screens (8- and 9-inch models), screens boasting IPS/high pixel-density and dual or quad-core processors. Allwinner, Boxchip and Rockchip were among the processors spotted on the tablets in the Shenzhen section.



Though not impossible to order direct from the manufacturers, the inexpensive tablets spotted in the Shenzhen section at CES are not now available at retail in the United States, though some vendors were selling floor samples to attendees.

Even at the high-end, these tablets from the China Tech Ecosystem still carry price tags well below the entry-level devices from the biggest tablet brand names. The Shenzhen manufacturers are pushing price points upward, however, with the introduction of dual-OS (Android and Windows) tablets. So while the price on entry-level tablets may be approaching bottom, new dual-OS tablets are starting to emerge at the $250 price, according to PCWorld.

With such low-cost devices, perhaps the burner tablet may soon replace the burner phone. When you can walk into a convenience store and come out with a soft drink and a tablet for less than $40, it may be hard to deny the disposable tablet era is here.

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7 CES Transportation Tips

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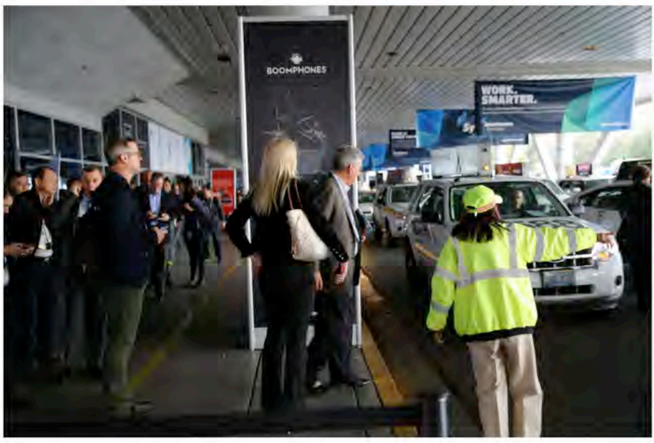

Dodge the long wait at the taxi line and more with these CES transportation tips that may save you time, money and grief.

There are easy ways to get around International CES and there are hard ways. Some transportation options for navigating the massive consumer electronics trade show can break the bank, while others are dirt cheap. Don't be discouraged by the lines or wait times at CES ... you WILL wait. But the following tips for getting to and from the Las Vegas Convention Center (LVCC) may make the waits a bit shorter.

CES Transportation Tip 1: Monorail

This is by far the most cost-effective option, especially if you are at CES for several days. There are only a few stops so pay attention to which stop is closest to where you are staying. Consider purchasing a discounted, multi-day pass with unlimited rides.

CES Transportation Tip 2: Shuttles

CES has free bus and shuttle service between many hotel and resort properties and the LVCC. The lines can be long on these so be prepared to wait. Try the first pick-up stop near the LVCC South Hall where the busses first come in. There may be less of a line compared to the second pick-up area directly in front of the Central Hall.

CES Transportation Tip 3: Walk

If you still have life left in your feet and a bit of stamina, consider walking to or from the LVCC. Travel in a group for safety reasons, avoid late night walks and stick to "the Strip."

CES Transportation Tip 4: Taxis

When the CES expo floor is open and right after it closes, be prepared to wait quite a while for a taxi, but that doesn't mean you can't try to hail a cab.

"Cabs are not supposed to stop on the road," said a taxi driver who requested to remain anonymous. "But if you have a $20 bill in your hand, they will slam on their brakes. Find a driveway where they can pull right off the main road so you can jump right in."

CES Transportation Tip 5: Rideshare Service

CES recommends using the Bandwagon priority rideshare service as an alternative to cabs. It allows you to split the cost of rides with others around Las Vegas. This is a bit more organized than simply trying to find a group of people in the taxi line going to the same place. And there is a priority line that could be shorter than the taxi lines.

CES Transportation Tip 6: Private Driver

If you have the funds or just want to ride in comfort, you can always rent a private car or limo and driver.

"Find a driver that knows the short cuts, service roads and side streets when there is traffic on the Strip," said a personal chauffeur who declined to provide his name. "When there is traffic, avoid the Strip at all costs."

CES Transportation Tip 7: Segway Rental

For about $100 a day, you can roll around CES on a Segway. Just be sure to think about where you can park it if you go into the LVCC. If you have a handicap placard, you can actually go through the show on a Segway after negotiating with the CES door staff.

"I used it to easily get to the convention center from my hotel," said John Graves, of Videolinks, referring to the Segway he rented. "It's easier to maneuver around than a scooter rental."

One way or another, be prepared to wait or pay up to expedite your travel. Even if you do go on wheels, there is no guarantee you will be able to avoid traffic unless you get a helicopter or jetpack, or rent a Segway. Your best bet is to find a driver who knows the back-roads and short cuts or doesn't mind getting yelled at by the traffic control personnel.

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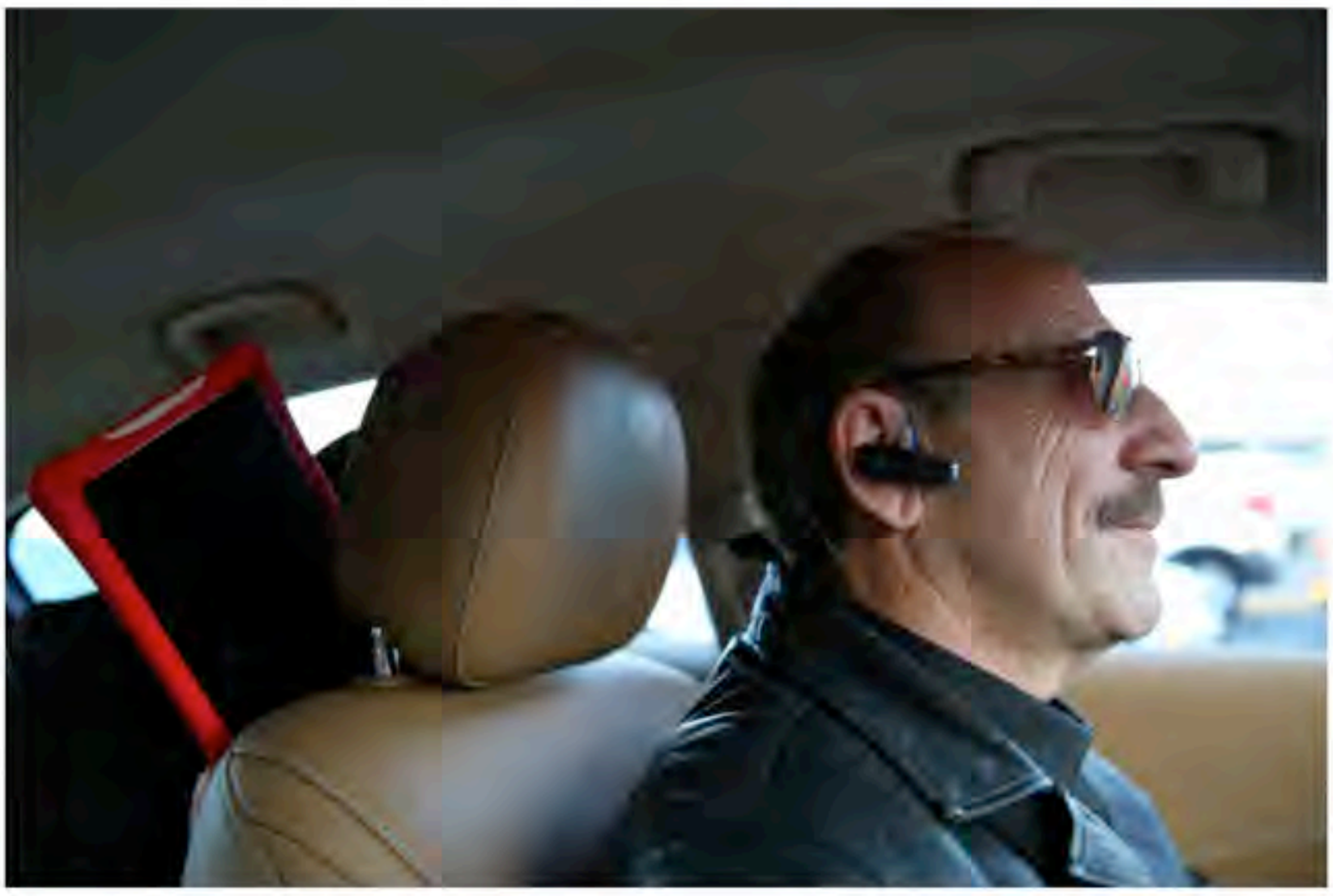

The new education and entertainment tablet for kids is getting the royal treatment in Las Vegas.

From double-booked appearances to being stalked by media and paparazzi, the Fuhu DreamTab is receiving celebrity treatment at CES 2014. In fact, in order to make appearances across Las Vegas during the sprawling technology trade show, the recently announced education and entertainment tablet has its own hired driver and car.

The new tablet from Fuhu, which also makes the popular Nabi devices, is intended for children. It includes animation, characters and stories from the DreamWorks Animation library, but can also stream shows from Nickelodeon, Cartoon Network and Disney. The tablet runs Android Kit Kat with Fuhu's own OS overlay and is powered by an Intel Atom processor. Children can run multiple applications simultaneously on the touch-screen HD device, which also has parental controls and is NFC-enabled. Both 8-inch and 12-inch versions of the tablet are planned. Pricing has not been announced.

Only 10 prototypes of the brightly colored Fuhu tablet were made for CES, and of those, just a few were available for display. With so few devices available, it was a challenge to schedule and manage demos for the device at different venues across Las Vegas. Securing exclusive transportation for the tablet made keeping the schedule possible.

"We have a special car," said Gina Moore, Intel field sales engineer. "It was logistically impossible to get [the DreamTab] everywhere. We wanted people to see it, touch it, experience it."

With a car and driver at its beck and call, the DreamTab also got another service that has become de rigueur for celebrities — its own Twitter handle.

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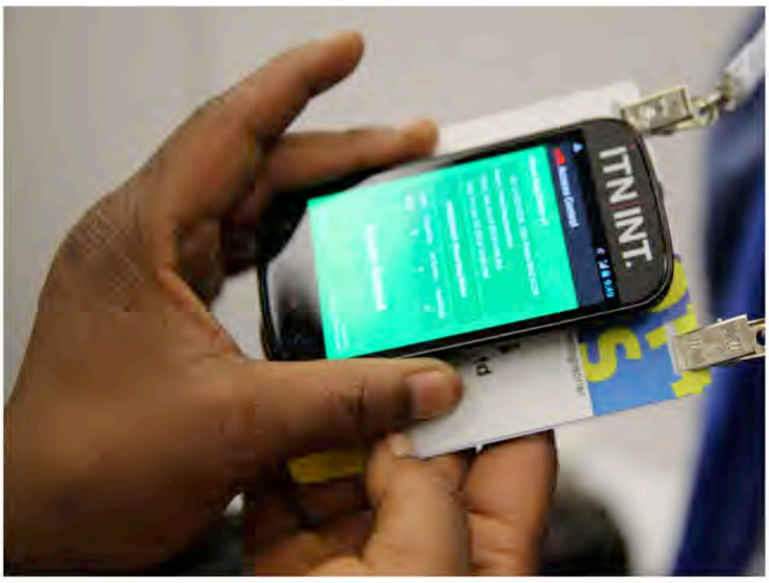


NFC chips embedded in CES badges speed check-in at events, booths.

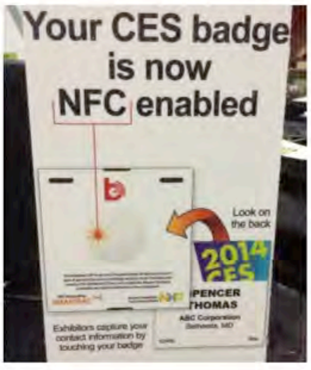
The so-called Internet of Things is expected by industry watchers to be among the major themes at International CES in Las Vegas. More everyday objects are becoming "smart" and that extends to the trade show badges attendees wear at the annual consumer electronics industry gathering.

The badges are embedded with a near-field communications (NFC) chip for the first time this year. The intent of the smart badges with wireless chips is to ease information exchanges in situations such as checking in at booths and events as well as storing information like lunch tickets for media attending the show. In the past, QR or bar codes were used for this process.

"We have new badges for the 2014 International CES that will result in greater ease of use, shorter lines and improved badge functionality for attendees and exhibitors by employing NFC technology," said Tara Dunion, senior communications director of the Consumer Electronics Association, which produces CES. "The NFC technology allows us to 'load' each badge with specific event information that pertains to that specific attendee. For example, each press badge has a press lunch coupon 'contained' within the badge."

NFC is a communication technology standard used for smartphones and other mobile devices to establish two-way radio communication between endpoints when they are in close proximity.

On the day prior to the show's official opening, media attendees were among the first to use the NFC badges to claim the backpacks and box lunches given to press.



"The lunch line will be a great way to test," said Ronald Kaplan, a media attendee and partner in SICons, a Los Angeles-based systems integration and computer forensic consulting firm. "In the past, they used a paper ticket. That's where paper shines — 'take the ticket.'"

Kaplan also noted that the badge scanning process appeared to be challenged by distance.

"I thought the proximity was a little too close," said Ronald Kaplan. "It might be a limitation of the technology."

That a technology-centric event was using the smart badges was refreshing to at least one media attendee.

"It's a step in the right direction," said Dylan Kaplan. "It's important for CES to use the latest technology."

The NFC chips embedded in the CES badges were provided by NXP and the badging system was developed in collaboration with ITN International and Smartrac. The badges are sponsored by Qualcomm.

According to the CEA, users' private information associated with each badge cannot be picked up by other NFC devices that do not have the proper credentials.

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10 Trade Show Survival Tips

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Get the most out of the next trade show you attend.

Trade shows are chaotic, carnival-like events that almost never go as planned, but a bit of preparation and on-site strategy can go a long way toward keeping you relatively sane throughout, thwarting the unexpected and setting you up for a successful event.

Here are some tips to make any major trade show a bit easier. First, the pre-show suggestions:

1. Pack Efficiently

Make a list, check it twice. Determine the best way to mix and match clothes. Check the weather of your destination. Layers of clothes are your friend. Don't over pack. If possible, don't check your bag and just have a carry-on suitcase and a backpack. Most importantly, be sure you have very comfortable walking shoes.

2. Plan Your Attack

You will be barraged by invitations to visit booths, schedule meetings or attend events, but pick and choose the ones that are relevant for you. For the most important meetings, try to set up an appointment ahead of time. When you plan your visits, try to group them by location so you aren't running from one end of the venue to another. Print out a copy of the booth floor plan and map out your routes. Also, review the local transportation options from your hotel to the trade show floor.

3. Pick Your Technology Wisely

Bringing lots of gadgets is dangerous on many fronts. Not only is there the theft concern, there is also the issue of keeping your mobile devices powered. If possible, bring extra batteries or use battery cases for your devices. Don't forget cables for syncing and powering your devices. Many smartphones are great for photos, video and audio recording — consider leaving dedicated devices behind. Wi-Fi and cellular data connections can sometimes be slow or over-loaded, so think about bringing a secondary cell phone (with hot spot capabilities) that uses a different carrier. And definitely bring extra storage in the form of thumb drives, storage cards and/or external hard drives.

4. Use Non-Powered Technology

Don't forget a notepad and pens as well as your business cards. Electronic note-taking is great, provided you have power or a non-empty battery. And have a comfortable backpack or messenger-style bag to carry your core gear throughout the day.

Once you are at the trade show, follow some of these tips to be effective:

5. Know the Area

Often, trade shows are in cities you may not know. Get some tips from your local hotel on transportation options and areas you may need to avoid. Ask hotel staff other than just the concierge for insider tips. Take a look at a map to know where you need to go. Be sure to check estimated transportation times of taxis, public transportation or on foot.

6. Stay Healthy

Be sure to stay hydrated throughout the show, especially if you flew to your destination. Try to wash your hands regularly (or carry hand sanitizer). Avoid doing too many handshakes by saying that you have a cold and you don't want to infect someone. Get as much rest and downtime as you can.

7. Manage Your Time

Try to allow extra time between meetings to be able to get from one point to another. When a trade show is in full swing, transportation can be limited. Also, crowds can slow you down so try to pad time between meetings.

8. Use Your Evenings Effectively

Charge all of your devices and extra batteries. Make notes or collect your thoughts at the end of the day while things are fresh in your mind. Plan your activities for the next day and what you will wear so you can get going quickly the next morning.

9. Keep a Record of Your Activity

Faces and names tend to blur together at the end of the day, so take pictures of people with their badges if you can. Write high-level notes on the back of any business cards you receive and take a photo of the business card later to attach with any written notes you have taken.

10. Use Social Media

Tell interested parties where you are or where you will be. You can also use social media to keep track of trending topics or people/vendors you are talking to. For example, set up a Twitter search for the keywords or hashtags of the show or to follow specific companies.

When the show is over, take some time to reflect on what worked and what didn't so you can be even more effective at the next trade show.

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Are Consumers Feeling Tablet Fatigue?

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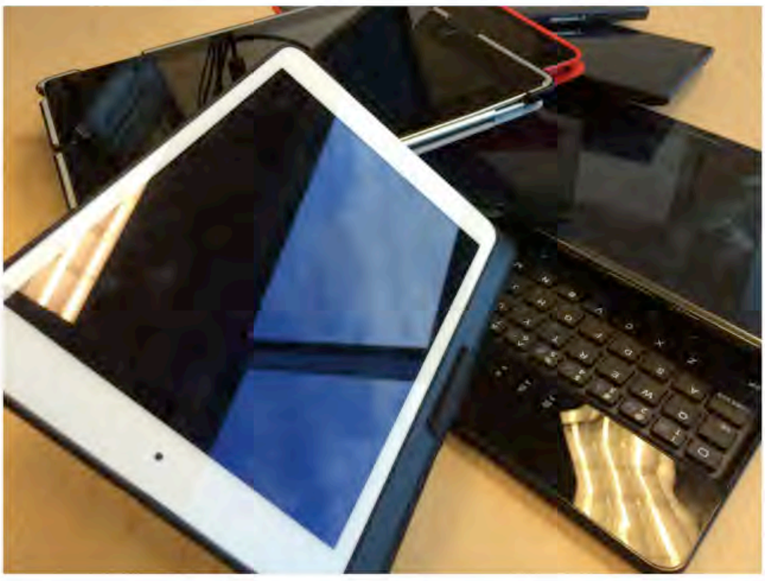

Tablet makers flooding market with new products risk overwhelming consumers, say analysts.

Consumers are buying tablets at a furious pace, yet approximately two-thirds of U.S. adults still don't own one, according to a report from Pew Internet Research. Tablet makers such as Samsung, Apple, Amazon, Microsoft and others are vying for those un-tableted consumers and the market is now awash with a dizzying array of sizes, features and price points. Such choice can mean it's a great time to be a consumer, but some analysts warn that buyers may be wearying.

"There may be a bit of tablet fatigue," said Mike Feibus, principal analyst, TechKnowledge Strategies. "Tablet development has slowed; it has plateaued."

That fatigue may be attributable, in part, to a market that was once defined by the Apple iPad moving to a new phase of fragmentation with multiple operating systems, app ecosystems and use cases.

"We've got kid tablets, we've got TV tablets, we've got ruggedized tablets, we've got tablets that just stick on the wall," said Ben Bajarin, principal at tech analyst firm Creative Strategies. "We are seeing this market segment."

As the market splits into segments, new niches are emerging, pulling consumers in a variety of directions.

"The tablet market is still so nascent," said Geoff Blaber, vice president research, CCS Insight. "And yet we've seen such mass commoditization so quickly I still think there is a lot of room for further shifts in terms of where the center of gravity lies in that market."

At CES last year, according to Blaber, consumers saw an "avalanche of new tablets" shifting from 9-inch and 10-inch form factors down to 7-inch sizes, but that may change.

"In the near term, that isn't going to change," he said. "The price points and a lot of the volume have shifted down to that 7-8 inch category. Two years out, a small proportion may start move back up to the larger screen sizes if we see this clamor and desire for the 2 in 1 proposition."

"We've got kid tablets, we've got TV tablets, we've got ruggedized tablets, we've got tablets that just stick on the wall," said Ben Bajarin, principal at tech analyst firm Creative Strategies.

The number of Americans who own a tablet increased 25 percent from 2012, according to another Pew research report, pointing to the potential opportunity for device makers. One analyst sees the rush of new products creating opportunity for consumers as well.

"We want more unique products," said Jon Peddie, president, Jon Peddie Research. "One of the reasons that the tablet has been so successful in the marketplace is because it gave us an opportunity. Before the tablet came along, our only choice was a PC."

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Wearables Are Hot, but It's Still Early Days

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Wearable technology driven by experimentation as consumer needs remain unclear, say analysts.

The buzz around wearable technology is growing fast with companies such as Samsung, Google and Qualcomm introducing products and a host of others, including Apple and Intel, widely rumored to be developing wearables. That buzz is expected to reach a fever pitch this year at International CES in Las Vegas, but according to several longtime tech industry observers, the market for wearables is still emergent.

CES 2014 will be about "super low-cost wearables of all kinds," said tech industry analyst Geoff Blaber, vice president research, CCS Insight.

Blaber's forecast indicates the relatively primitive state of the wearable technology market and it's a view shared by others as well.

"We are in the very early days of wearable computers," said Jon Peddie, president, Jon Peddie Research, a tech analyst firm. He believes wearables won't be commercial successes yet. The first wave of wearable devices in the phone format have been disappointing, according to Peddie. He cited slow response time, high costs and short battery life as hurdles the industry will have to overcome. Peddie does think wearables will play a critical role with the Internet of Things (IoT) in the future because, he said, it will "augment our life."

The way that wearables can augment our lives can differ widely. Some wearable gadgets focus on a particular niche, while others are more rounded and simply include connectivity or proximity interaction.

CES 2014 will be about "super low-cost wearables of all kinds," said tech industry analyst Geoff Blaber, vice president research, CCS Insight.

Another tech industry analyst, Ben Bajarin, principal, Creative Strategies, also sees lots of interest and excitement around wearables and IoT and expects increased activity with connected gadgets and appliances.

"Everyday things that weren't smart before are getting smarter through sensors and processors," said Bajarin. "Within the IoT movement, wearables will represent "experimentation, not necessarily innovation."

At this early stage, technology providers are still searching for what consumers will embrace and that will translate to a mass of wearable devices being announced at CES.

While there is a "fair amount of wearable activity," according to Mike Feibus, principal analyst, TechKnowledge Strategies, wearables are pretty much still at the experimental stage.

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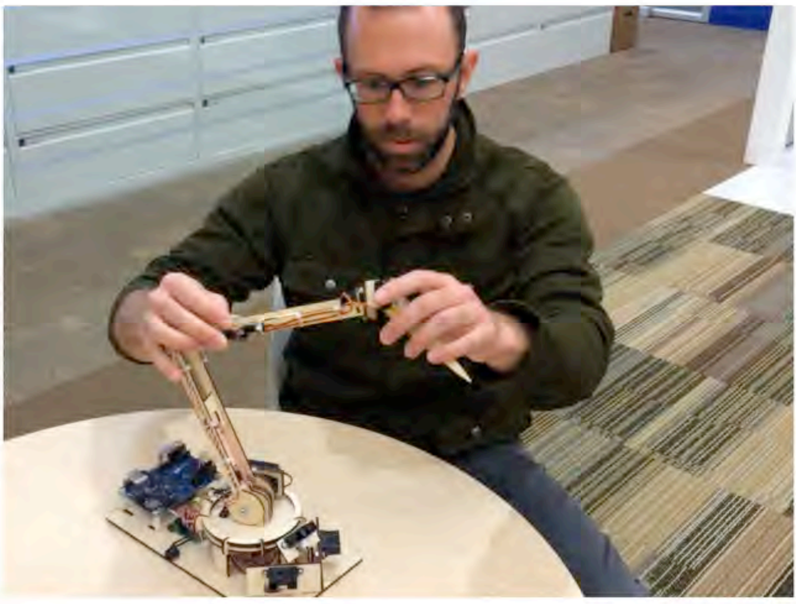
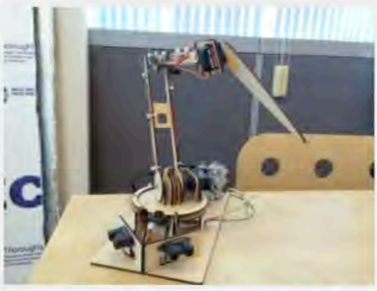


Maker robot reacts to Twitter and motion input.

Send a tweet to Data Monster if you dare — the robot has been known to respond violently to Twitter. Data monster doesn't only react to social media, the 2-foot tall, wood and metal robot can convert other data input into gestures, actions and motions, according to an Intel researcher.

Data Monster was designed to "abstractly look at data and assign meaning to the data," said Lucas Ainsworth, an Intel research scientist who developed the robot from a DIY robotics kit using the open source Intel Galileo computing board. It can respond to data input or sense physical motion.

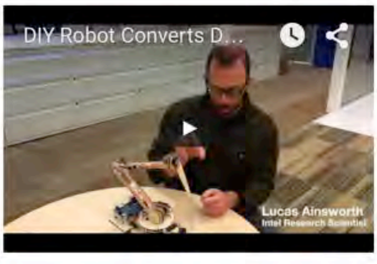
The custom robot, the first Ainsworth has built, can track hand movements using three infrared sensors. Its wooden robotic arm, controlled by servo motors, moves more actively when the sensors detect motion and becomes more lethargic as the motion subsides. Motion dampeners physically control the speed.



Looking like a prehistoric talon of a claw, Data Monster expresses itself via movements, gestures and excited twitches based on Internet data and localized movement.

Data Monster connects to the Internet using a standard laptop Wi-Fi card, allowing it to scan social networks or online data sources. When it detects a tweet with the word "datamonster," its arm moves without motion damping, mimicking agitation, offering an example of how mood can translate into physical gesture. People can customize other social media or other triggers within the robot's open source code.

"Every [Data Monster] that you build behaves differently, depending on who builds it," said Ainsworth. "Anyone who builds it can quickly make it their own."



The Data Monster development kit, including code and design files, is available for free download from GitHub. The Data Monster that Ainsworth built is made from laser-cut wood and powered by an Intel Quark System on Chip. Ainsworth noted that "we programmed the Data Monster to run completely using Arduino code, so there's no Linux knowledge required."

"While Linux tinkering can greatly expand the capability of the Galileo for this project, we wanted to maximize the accessibility for beginners," Ainsworth said.

Before Data Monster became a snake-like, jittery robot, it was an iPhone app with an animated monster that changed moods based on what was trending on Twitter. Moving it from a software application to a physical robot "is so much more captivating — it draws people in," said Ainsworth.

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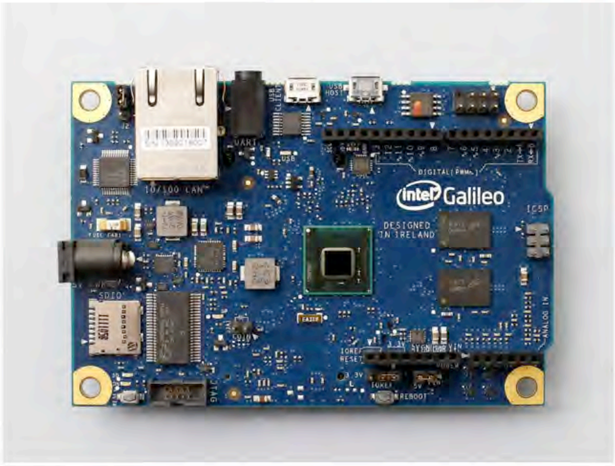


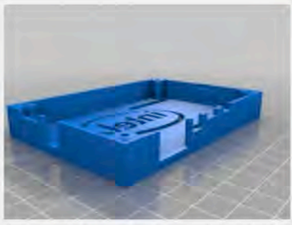
Arduino-compatible development board garners mixed reviews from some Intel makers.

Since the Intel Galileo development board was introduced at the Rome Maker Faire with much fanfare, the ranks of the longstanding maker community within Intel have swelled, but not all of them are raving about the Arduino-compatible board.

For members of the Intel maker group, the new product designed for their use created excitement. Some, like D. John Oliver, a senior system architect who has long been active in the maker group at the Intel Chandler, Ariz., campus, were particularly enthused that Intel CEO Brian Krzanich, himself a maker, made the announcement personally.

"I've never seen this in a CEO," said Oliver. "It's very refreshing." Several hundred employees have joined the Intel maker group since Galileo was announced according to Oliver and the group now has more than 1,000 members.

Intended for hackers and makers, the open source microcontroller board is based on the Intel Quark System on Chip (SoC). It's the first Arduino-compatible board to use Intel architecture — Intel previously launched MinnowBoard, an open source motherboard intended for x86 software developers and DIY computer makers. Galileo competes with products such as the ARM-based Raspberry Pi and BeagleBoard.



A 3-D model for an extruded case for the Intel Galileo development board created by maker and Intel engineer Michael Jassowski. Image source: Thingiverse.com

Announced pricing for Raspberry Pi starts at $25 and BeagleBoard at $45. Galileo is available for pre-order from Mouser for $69. Intel has announced plans to donate 50,000 of the boards to universities around the world.

Intel makers have already been developing projects with Galileo. Like other members of the Intel maker group, Michael Jassowski, an engineer based at the Intel Folsom, Calif., campus, received a Galileo board when it was released. He created an extruded case for the Linux OS board using an Intel Atom-based 3-D printer that was itself a maker project. He's now working to port his printer design to use Galileo.

"I am currently able to drive one stepper motor but am debugging some issues with position accuracy," he said. "I need to ensure the minimal amount of latency."

Compared to a traditional motherboard, Galileo is more cost-effective for the DIY 3-D printer project according to Jassowski. It will, however, require extra design thought to synchronize the five motors (3 for axis positioning and 1-2 for actual extruders), but Jassowski believes that he can overcome the latency to ensure accurate object extrusion.

Galileo board communicates wirelessly with a microcontroller via the 2.4GHz transceiver to demonstrate simple data encryption and transmission. Image source: Emma Fletcher

Oliver, for one, believes that Galileo has tremendous potential for makers. Nonetheless, he did express concern about its slower I/O compared to ARM-based Arduino boards and the lack of display port in the current version.

"The (Arduino) Uno is a great entry-level board for makers, with a mature support and community involvement," he said. "Raspberry Pi is attractive to users wanting built-in display output capabilities and a faster I/O."

According to Mark Bunney, a hardware engineer at the Intel Folsom campus who has used it for projects, the Galileo is "perfect as a teaching tool for average users. It's not targeted towards a 'sysadmin' (system administrator) nor is it a low-level controller," he said.

Bunney's first project using Galileo was a simple encryption and wireless transmission process. He was able to simply use the code he had originally created and with minimal effort, run his code successfully within the Galileo board's Linux OS.

Emma Fletcher, a software engineer in Folsom, was a maker before she joined Intel; when she was a student at George Washington University she helped found the GW Tech Collective, a student maker group. When she joined the company recently, she got involved in the Intel maker group.

"Intel employees are really excited about [the maker movement]," she said.

There is local interest in the maker movement according to Fletcher, who has begun outreach efforts to connect with makers who don't work at Intel.

"Everyone should love their technology," she said, adding that everyone should "go out and build."

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