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Internet's future on display at Singularity U.

by **Daniel Terdiman**

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MOUNTAIN VIEW, Calif.--The Internet of the future is an intelligent network capable of proactively acting on our needs, following us wherever we go, helping provide us with focused health care, and possibly ushering in a new energy paradigm.

This is the vision that James Canton, CEO of San Francisco-based **Institute for Global Futures** think tank, shared with students in the executive program of **Singularity University**. His broad-reaching, theoretical talk here Wednesday touched on many of the same elements of the all-encompassing network more or less overlaid on people's consciousnesses in science fiction by the likes of **Vernor Vinge**. Still, Canton's vision seemed plausible, particularly in light of the curriculum of so-called exponential technologies being taught at Singularity University, which **kicked off its first classes** last summer.

Canton's vision of this future Internet begins with four key drivers: telepresence, mobility, artificial intelligence, and specific vertical market segments such as health care.

In a straw poll of the 40-odd students in the Singularity program, the majority felt that mobility was the most important of those drivers, and Canton said this made sense given that billions of people use the Internet and that the figure will only grow. The idea, then, would be for the Internet of the future to comprise large numbers of networks talking to nodes that are independently communicating with one other, "having their own conversation," he said.

Indeed, Canton predicted a future in which the Internet is embedded just about everywhere: in every imaginable kind of object--from TVs to phones to walls--and that every product and device--even people--will have an IP address. He added that while such a vision may seem distant, the U.S. Food and Drug Administration has already approved a chip that could be embedded in people's bodies. In Miami, he noted, the latest fad is women wearing clothes with chips embedded that can be scanned to verify their identities so that they don't need to carry purses.

Similarly, he said, government workers in Mexico City can't get into buildings without having some sort of wearable identification chip.

It will be a key component, then, of the Internet of the future, Canton predicted, that everything will have an IP address and that, thus, we will be living in a "blended reality" where information is constantly streaming at and around us across physical and digital artifacts.

Proactive search
Today, Canton said, in order to find information online, we have to turn on our computers and go look for it. "But what if you didn't have to do that?" he asked the executive students. "What if it found you?"

The idea, he said, is a worldwide system of intuitive networks that pay attention to us, know our likes and desires, and proactively feed us the information we need to act on such preferences.

"We're on the cusp of that," he said, with the Internet "intuitively sensing who you are, and what your needs are and paying attention to your behavior and to what you think is important."

Such systems wouldn't just be with you at home. They would travel with you everywhere, he suggested. The kinds of devices we see as discrete today--our phones, computers, TVs, and cars--will "at the end of the day, all...get mashed up," he said.

That means, he said, that each of us will have our own

"personal Internet layer...that lives in your own personal Internet cloud [and] deciphers what's next" for us.

It's not clear when such a system will be functional, he acknowledged, given that it would require a great deal of artificial intelligence that has not yet made its way into consumer technology. But it's not so far off, he suggested. In fact, he said, as much as 30 percent of the technology necessary for such concepts to be part of our everyday lives has already been built. And what's in the lab today, he pointed out, is in the marketplace tomorrow.

James Canton
(Credit: IGF)

Canton added that the model for such AI-based systems is one that already dominates the planet: biology. The networks of the future will mimic living ecosystems, he said.

At Singularity University, students are getting high-level, intense lectures on fields of study such as nanotechnology, biotech, AI, robotics, bioinformatics, and the like--all of which fall under the rubric of exponentially growing technology. And the Internet of the future is essentially a mashup of these technologies, Canton said.

As a result, the Internet will be smart in a way we can barely imagine today and could finally help us solve systemic crises like health care and poverty while creating thousands, perhaps millions, of new companies in the process--or even entirely new markets.

Megacities

As the Earth's population expands, it will result in the blossoming of dozens of new megacities, Canton said, but current data infrastructures are incapable of handling the needs of the new metropolises. "There is not enough storage or bandwidth to deal with this reality," he said. "We have to get better...at how we enable that future to emerge."

Perhaps as many as 80 of the next 100 megacities will require next-generation Web infrastructure, he predicted, and society will have to find ways to "migrate to that infrastructure."

Ultimately, the "one key bucket of technology" that may drive the future of the Internet is quantum mechanics, Canton said, and that will create new dynamics such as humans being able to "design space and time" and the possibility that the contents of the entire U.S. Library of Congress could fit on something no bigger than a thumbnail.

In the process, we may be able to access and process in real time so much medical data that we will have the wherewithal to eliminate huge numbers of deaths or illnesses.

Internet 3, 4 and 5

Some may feel that it's too early to be defining such a future, but Canton clearly isn't one of them. We are currently living in the "Middle Ages" when it comes to computing networks, he said, and we are surrounded by dumb devices and machines that cannot think for themselves.

However, he said, an "Internet 3" will be a "collaborative Web" that will have at its root a cooperation between people and machines.

His vision of an "Internet 4" includes evolutionary networking that has a major self-organizing principle and has human reproduction as an inspiration. "Internet 5" will mimic living ecosystems and feature smart and aware physical spaces, embedded intelligence, and systems that can take actions such transferring energy among themselves as needed.

"It's not that far out," Canton said. "I believe it's already started."

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