DATAART

Convergence In The Internet Of Things Is Priming The Tech World For A Major Cultural Shift

October 18, 2014

Editor's note: Artyom Astafurov is the chief innovation officer at *DataArt* and co-founder of *DeviceHive*.

To anyone who is tuned into the tech world, it should not come as earth shattering news that machine-to-machine (M2M) technology and the Internet of Things have hit a major convergence point in the tech industry. What is fairly new however is that the two have become so closely intertwined with each other that you can no longer think about one without thinking of the other.

If you look back in time at the progression of both concepts though, you'll discover that these were in fact two starkly unrelated ideas at one point that have since evolved from a loose correlation to a tightly interwoven dependency. In fact, in order to understand from today's standpoint the current and future relationship between the two, you must first understand their nuances, as well as the transformations they have undergone as one technology has begun to flow into the other.

Yes, M2M technology and IoT have a complex relationship. But IoT is the only way to describe a movement in which machines as traditionally defined are no longer at the forefront of modern development. In order to explore this claim, a shift in focus needs to occur to bring IoT to the fore. So to jumpstart this discussion, we will explore here the key, underlying questions that need to be addressed: How has M2M technology evolved into IoT and what is the significance of this evolution moving forward?

Terminology

The concept of M2M technology originally emerged when computers were first networked and enabled to exchange data and transmit it unilaterally with one other. One of the first major M2M developments in the concept's history was OmniTRACS, a satellite-locating and messaging service created by Qualcomm, which appeared in the late 1980s. It is thanks to this service that computer networks were able to be successfully integrated into fields, including healthcare, security, telematics, payments systems, navigation, smart home systems, green energy, e-government and beyond.

Then enters IoT, a term that first appeared in 1999 and has been on Gartner's Top 10 Strategic Technologies list since 2012. According to Google Trends, the sudden leap of interest began in early 2014, mostly due to the increasing number of wearable devices appearing on the market. These "things" tend to be lightweight and low power. Many of them are not meant to be attached to machines, nor can they be considered computing "machines" themselves, meaning they don't have

terminals and operating systems for end users. And there are *billions* of these devices now, with experts across the board citing a massive proliferation yet to come.

IoT separates itself from M2M not only in the simplicity and quantity of devices involved, but also by how the devices communicate with each other. It's "the cloud" versus the cloud, with some help from "the fog" (extended cloud computing paradigm, defined here by Cisco) at the ground level.

Whereas M2M tends to rely on point-to-point exchanges between individual devices, IoT communications involve dispersed devices sharing data through a central server, resulting in exponentially more data based on the relationships and patterns that emerge. Electronic gadgets, vehicles, apparel, home appliances and more are expected to instigate a major cultural change – and arguably they have already begun to do so as evidenced by this fog phenomenon – with their capacity to report back and paint real-time pictures of our lives and daily habits.

Technology

The value of these pictures of consumers is what provides the monetary motor in IoT development. Sure, there are some critics who believe that IoT solutions may create long-lived devices that will accumulate decades of expenses through the costs of cloud infrastructure without ever generating new revenue, which would of course be hugely problematic in the business world. While these concerns have some merits though, I really think that any concerns over negative revenue streams will just propel companies to work harder to develop better business models, such as monetizing anonymized usage data and selling it to energy companies or giving insurance companies more data points so that they can better calculate risk models.

For years, ERP platform developers were the ones with the financial incentives to drive innovation of their products for large-scale deployment, since they were geared toward the business world where analytics could identify trends that have the ability to save millions of dollars. But now that the tools exist to analyze Big Data on consumers, there is an ROI for developing M2M systems and for capturing it and aggregating it (and then selling it to marketers).

A number of advances on the infrastructure side have enabled IoT as well:

More compact and powerful computer processors, allowing for greater device portability

The advent of IP Version 6 which has enabled IP addresses to accommodate the billions of anticipated new devices that are flowing into the market

The availability of customizable M2M frameworks to make the process of developing infrastructure that can handle billions of different devices more practical

Data carriers that can accommodate a more dispersed but lighter network (the "fog")

What It Will Look Like

As IBM has rightfully predicted, the evolution from mainframes to powerful PCs and then back to the cloud is causing the IoT pendulum to swing toward edge devices. The direction of the swing and its speed, though, will depend on technological advancements in networking, storage, RAM and processing power and how all of these elements will move ahead of or behind Moore's Law.

Here, it's important to note that this shift will not happen overnight; it will take a long time for communication standards to evolve to a state in which peer-to-peer communications are possible between edge devices. In this transitory period, we're already seeing this evolution in action. And thanks to proximal networking standards like AllJoyn, devices will be able to detect and transmit data themselves rather than relying on people to input it for them. Furthermore, realized advances will not be limited to just "sensory" capabilities. "Actuation" capabilities are becoming a reality, too. In other words, your home security system won't just tell you that you forgot to lock your door. It will lock it for you.

But let's not forget that IoT is much more than just gadgets. It can be about applying IoT intelligence to remote equipment monitoring of items such as vending machines (as an aside, one of the first applications of M2M tech was status reporting for vending machines using dial-up modems in the late 1980s and early 1990s).

IoT thus has various industrial applications that can decrease equipment maintenance costs and generate subscription revenues to offset cloud infrastructure expenses. As we understand it now, the Internet of Things is not just a collection of M2M devices; in the Internet of Things, you can make any "thing" connected and you can retrofit any connectivity into legacy industrial equipment and make it smarter.

We have all of the components to make this stuff happen now. True, in order to really get this industry shift off the ground, lots of fine-tuning is needed from open protocols, open source, and the involvement of the maker community. But once we have that in place, we'll be able to move exponentially closer to new territories and innovations, like cars that can warn each other about road hazards in real-time.

Complex machines will always be a part of the IoT, of course, and their role will grow as they are incorporated into physical solutions. In December 2013, Google announced its acquisition of eight robotics companies. With its subsequent acquisitions of Nest, Boston Dynamics and the artificial intelligence company DeepMind, it appears to be preparing for the IoT in whatever form it might possibly take.

Perhaps its future form may be less of a computer network and more of a real life object network where everything is a node, and robots are ready to act intelligently based on what various objects need. Ten years ago, did you think we'd be seeing drones rushing to repair a downed power line? With the pace of the industry right now, it's unlikely that it will take another ten before this is the new standard