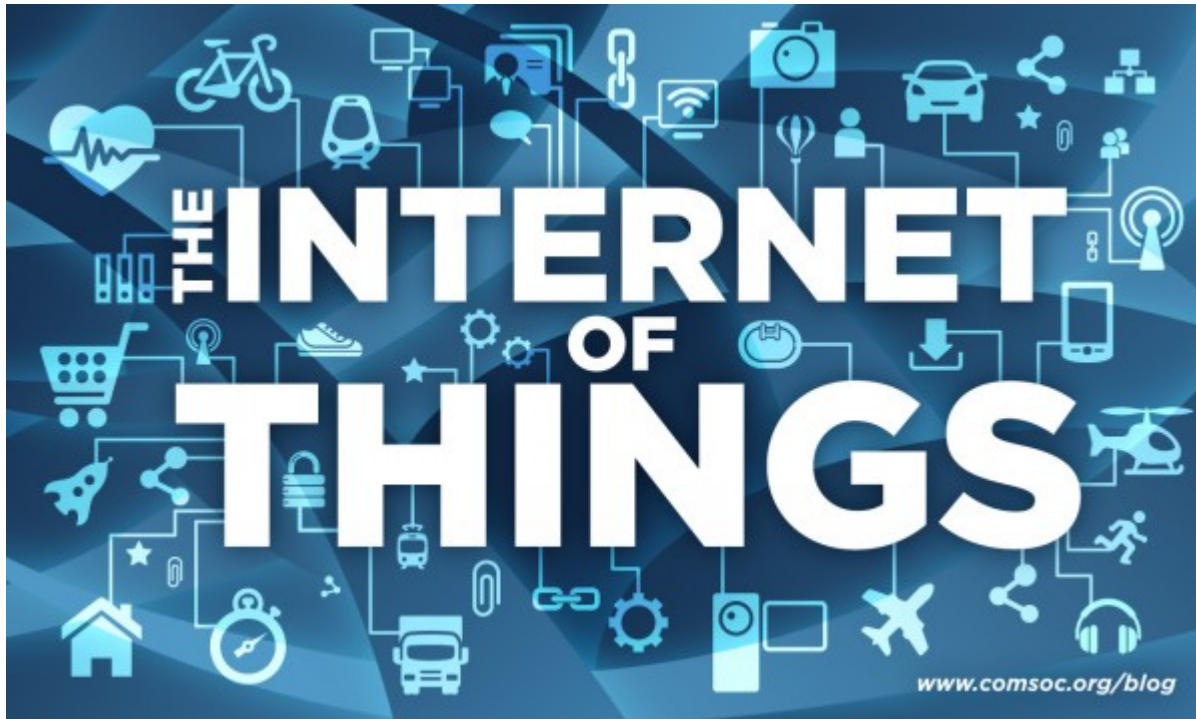


The Internet of Things (and With Things)



(By **Roberto Saracco**, [IEEE ComSoc](#) Senior Member, Chair of ComSoc Strategic Planning Committee)



Roberto Saracco

It is happening. More and more objects (mostly sensors so far) are connected to the Internet. Take a look at [Pachube](#) as an example. They started just five years ago with the idea of providing a place where people can send information generated by their sensors and share information. Now they have hundreds of thousands of feeds. I have no connection, nor interest in Pachube, but I take them as an example of what is happening: Ever more objects are connected to the Internet; it is getting easier to do this; there is a growing interest in sharing data; startups are at work to figure out how to leverage this new phenomenon. Now, let's go step by step.

STEP 1: Why is this happening? Easy: because it can!

Electronics is cheap, and getting cheaper by the day. Hence you can have embedded electronics in many objects. It is also much less power hungry, so you can power it by scavenging stray energy in the environment. No connection to the mains is needed (or expensive batteries to change after a few days or months...).

Electronics and software make objects aware of their environments. They can sense a variety of characteristics around them and convert these into data. Welcome to the growing world of sensors, a world that HP estimated to reach hundreds of billions by the end of this decade (Cisco has a lower forecast, but still many many billions).

Communications is getting more and more pervasive. You don't need to look for a gateway to connect to the Internet. The environment is, more and more, the connection gateway. The advent of LTE, or 4G, is a further step in this direction: it has larger capacity (not really needed for most "things" on the Internet, but useful when you have a growing demand from paying human beings and you do not want to cut your revenues by letting other stuff chew into your capacity), and moreover it has the capability to provide native IP connectivity. Now, this is crucial, since it makes possible to connect a "thing" with a chip costing 50 cents, rather than, as is the case today with 2 and 3G, with a stripped down cell phone that is still costing \$20.

[IEEE Communications Society \(ComSoc\)](#) is active in all these "enabling" technologies, from radio to networks and protocols. It is also active in the sensor area as well as in application areas (including health, possibly a driving business for IoT).

STEP 2: Is it business as usual? NO, it is not!

Our telecommunications networks were designed for symmetric traffic at 64 kb/s with individual transactions lasting about 3 minutes. A nice Gaussian shape. Internet has changed that. No more symmetric but asymmetric flows (the A in ADSL...) and no more 3 minutes average transaction but longer and bigger capacity eater (video is now the dominant traffic on Internet). Our (telecommunications) network has evolved to manage this, we have developed CDNs (Content Delivery Networks), the architecture has changed to manage head-ends and to shadow/mirror content around the network in a distributed fashion (along the way transforming our hierarchical network into a massively distributed and interconnected databases).

And now, it's changing all over again. That Gaussian curve that changed its shape to become an S curve with the Internet of Video, now changes its shape again to become an inverted Gaussian with its lowest point representing voice-human-communications. On the right the curve grows pushed up by video consumption (and generation -- more symmetry than before) and on the left, it grows, pushed by the billions of tiny transactions generated by the IoT. As the curve changes, new architectures are required and, most important, new biz models are needed; they in turn are being "invented" by new players.

And [ComSoc](#), again, is on target, looking at the future of the internet, at the future network architectures.

STEP 3: Is IoT the next Big Thing? NO, but is is an enabler!

IoT is using limited traffic capacity, and it is not going to generate tremendous revenues to operators in terms of traffic sale. Actually, the growing computation power in objects has already shifted most services outside of the network (owned by the classic operators), so in a way it is decreasing their revenues. New biz models to leverage the value of sensors have not proved successful so far, at least from the point of view of the operators.

However, the IoT is a piece in a puzzle of the connected world and mashed bits and atoms. This is what I call the Internet WITH Things (IwT).

Imagine a world where everything you see and touch is wrapped in bits and services, through seamless connectivity and personalization of the interaction. If you pick up a bottle of wine or look at a monument, you will be involved in a multimedia perception customized to you and your context. Who can provide this customization? Surely an operator. It is a world that has to be seamless and simple, and it is going to be a very complex world in terms of interacting technologies. Because of this gap between the complex reality and the need for seamless, simple perception, there is a need for management and that is an area where operators can have their say. It is not going to be easy; there will be many qualified competitors for what is to become the new communication market and fabric, but it is a market where Operators can play.

[ComSoc](#) is now at the edges of this new marketplace. It probably needs to partner with the [Computer Society](#) and the consumer electronics area, as well as several others. And it is a game where ComSoc can be a big player.

([Roberto Saracco](#) is currently an IEEE ComSoc Senior member, Chair of [ComSoc Strategic Planning Committee](#), a member of the Strategic Board of [IEEE](#), and [Director of Sister and Related Societies](#). He has published over 100 papers in journals and magazines, six books, including

"The Disappearance of Telecommunications" and articles in the scientific section of daily newspapers. He has also delivered keynotes at international conferences, and taught at Universities in Italy and around the world on the subject of Telecommunications. He has been selected in the ballot for ComSoc President, along with [Sergio Benedetto](#).)

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