**Nine Communications Technology trends for 2019**

The CTN Editorial board, having just returned from the IEEE Communications Society New Year party week upon the IEEE luxury yacht in Monte Carlo (I know you always suspected this is how we spend your membership dollars) are now sufficiently recovered to put together our annual list of hot topics for the communications industry. As always we would like to add the caveat that we are just engineers and these are not stock tips. This year we start the year with a brand new editorial board and two of the board, Angel and Yingzhen, have joined Alan in putting together this list, so it will probably be a lot better this year.

Enjoy,

Yingzhen Qu, Angel Lozano and Alan Gatherer

**1. Machine Learning. If you are not doing it, people will still shun you at parties and now your children will laugh at you too**

Moving up to the number one spot for this year. Well it is actually happening now, especially in some network planning functions and radio resource management. Everyone is now trying to use it all the way down to the physical layer. Now that there is some real use, we expect this year will be when it turns and starts rolling back down the hype curve, such is human nature (in fact we expect AI to become disappointed in itself sometime this year and need some counselling). But in the meantime the activity in ML will continue to rise in comms, and the CTN EB will certainly milk it for a few articles. Implementation in the edge of the network might be a big topic for this year. Federated Learning, you heard it here first. Unless of course you already heard it somewhere else…

**2. THz frequencies: where communication meets positioning and imaging**

A defining feature of 5G has been the breaking of the 6 GHz ceiling. But what can we say, this is already boring. Beyond, vast horizons of idle bandwidth had long awaited designers brave enough to face the challenges that these millimeter-wave frequencies present: small antenna apertures, lack of diffraction around obstacles, atmospheric attenuation of rain and snow, device power consumption, cost, etc. Now researchers are starting to explore the even higher frequency frontier that lies between 100 GHz and 1 THz, where the aforementioned challenges become even more taxing, but the promises also multiply: besides even broader swaths of free bandwidth, their tiny wavelength makes these frequencies suitable for high-resolution positioning and even crude imaging. If this blend of possibilities fructifies, applications await for short-range systems, vehicular networks, or drone-to-drone connectivity, among others.

**3. The post-cellphone era is near**

We made a first mention of this last year, and it is not something bound to happen overnight, so here we go again. The cellphone, and more recently its smartphone incarnation, has long been the undisputed darling of wireless communications. Other devices do connect to wireless networks, but their volume has barely registered to date. The appearance of a myriad of satellite gadgets such as smart-watches, eyeglasses, or wearable devices has made little impact on the network so far. And where is that smart city we should all have been living by now? However IoT is making quiet progress into the network with device growth estimated in the 20-30% range, though their data volume remains quite low to date. It is expected that new IoT applications will put more demand on the network for bandwidth. We say this with the caveat that video will continue to drive mobile data volume and will increase its share in all probability in 2019. Vehicle to network and industrial control are the darlings of 2019 to watch out for. Anyway we will call 2019 the year of IoT and see what happens. For that thing that sits in your pocket and you pay more attention to than your family, this year will be the year of the unfolding smart phone, which we think is totally cool and may lead to a more fundamental change than just driving yet more video demand, that could be called “post smart phone”. However, the transformation of IoT is expected to be more profound, with a progressive shift from human-borne transceivers to domestic appliances, vehicles, robots, drones, and industrial equipment. Machines taking over from humans: sound familiar? Oh and has anyone not watched the self driving car knocking over a robot at CES? 2019 is the year of robot-on-robot violence. We called it.

**4. LTE continues to be more important than 5G**

Boring but true. Every year Ericsson published a very nice mobility report and this year they are predicting that LTE subscribers will continue to grow through 2021 and that 5G will be frankly a bit of a blip until then. LTE has a lot of juice left in it and the new peripheral technologies such as IoT and ML will give LTE a boost thru 2021. So don’t throw that book on LTE away quite just yet.

**5. The IT guys sneak quietly into the building**

Anyone notice that ATT became a media company last year? The fact that the Justice Department went to court for the first time since the Nixon administration to challenge such a merger is a sign of the significance of this development. Wiser heads than us tell us that the rise of Netflix is causing a lot of people in the content delivery business to rethink their future. And we communications engineers are in the content delivery business aren’t we? We will throw some other random fuel on this fire in the form of eCPRI, which is changing the way the physical layer is partitioned in the network and became a massive deal in 2018. Add to that the continued progress of the Open RAN organization which has at least gotten really cosy with Facebooks TIP efforts, if not exactly merged with them yet and all of this seems to have a certain pattern to it. Are the telecoms and IT communities finally really coming together? And what does this all really mean for the way we deploy and develop cellular equipment. Anyway, we will call 2019 the year of IT convergence and see what happens.

**6. The Techlash Continues**

In 2018, Google was fined $5 billion by the EU for Android antitrust violations, which broke the previous record of $2.7 billion fine from the EU in 2017 over manipulated search results. Facebook CEO Mark Zuckerberg testified at Capitol Hill regarding the usage of personal data by Facebook. Also in 2018, the EU started a new law for protecting data privacy. It’s called the GDPR, General Data Protection Regulation, which will have significant impacts on how the apps and services use and protect our personal data. We expect that coming into 2019 security and privacy will continue to become more and more important as more people become more aware, and perhaps paranoid, about how their data is being used. Security then becomes a principle in the development of IoT technologies, smart city, and vehicle communications and so on. Already security has become a more pressing topic in the standards bodies and there is opportunity for new technology in this area. So we will call 2019 the year of security focused networking.

**7. Massive MIMO implementation continues to be at least as exciting as Massive MIMO theory**

Resurrecting this one from last year because we were right about it and it is not going away quite just yet. The power and cost remain non-trivial issues and now we are discovering that the algorithms given to us by the academics need some tweaking. We once again typed “massive MIMO implementation” into IEEE explore and found our 287 papers since 2015 had increased by 22% to 351 papers but this is half the rate of last year. So maybe we are beginning to settle down a little. We expect that 2019 will be a year to focus on mobility tracking and capacity optimization.

**8. Security, Privacy and the supply chain**

In the interest of pointing out the elephant in the room we have to say something about the global supply chain. To mix our metaphors we will stay away from the 3rd rail of passing any opinion on this complex and political topic. But it is undeniable that the communications community is rethinking how it cooperates. From where to hold an international conference, if there is risk that some of the attendees might not be able to get a visa, to how we secure public confidence in our complex supply chain. Even the issue of how we communicate professionally and under what rules is being called into question. There is no doubt that most equipment in our networks today has passed through many countries and been worked on at some level by many engineers of many nationalities and constructed with components from all over the globe. If our customers need a change in this system there is the potential for some serious disruption and this will underlie all of the other hot topics we have mentioned so far. As technologists we must believe there are technical solutions to this problem and we are hopeful that the technical community can get ahead of the politicians in this area. So we predict that 2019 will be a very interesting year for the IEEE which at its heart is an organization that tries to foster communication and cooperation among its members.

**9. 6G. Lets try this again**

We probably weren’t correct that 2018 was the year of 6G as 5G continued to prove to be a good place for the academics to play. But we note that there is at least one 6G academic workshop early this year and will reset our prediction. We expect that THz and AI will play a strong role in 6G study in 2019. We again predict that there will be a continuing trend towards the standard specifying less and less as we leave gaps in the specification for machine learning to set chunks of the modem operation on the fly leading to a new era for how standards are developed.