



The *Mobile World Congress Americas* had its inaugural show in partnership with CTIA in San Francisco from Sep 12 – Sep 14, 2017. More than twenty-one thousand delegates from 110 countries came together to discuss and find out about the latest in mobile networks, mobile devices and mobile services. In parallel, Apple launched iPhone 8 and iPhone X at their own separate event, along with the LTE-connected Apple Watch.

Azita Arvani spoke on a panel on Accelerating Infrastructure Entrepreneurship. She was also a speaker on an innovation panel along with other distinguished women tech executives; organized by Women in STEM.

Americas: A Tale of Two Regions

Looking at North America and Latin America, there is a big difference between market size and growth, and adoption of the mobile technologies, according to GSMA's Trends 2017 report.

North America's total operator revenues were \$259 B in 2016 and projected to decrease to \$236B in 2020. The CAPEX will also go down from \$37.2B in 2016 to \$34.8B in 2020.

By contrast, Latin America – while a much smaller market – is expected to grow its operator revenues from \$75B in 2016 to \$88B in 2020. The CAPEX will also grow from \$16.9B in 2016 to \$17.3B in 2020.

One reason for the contrast is the smartphone penetration rates. In North America, smartphone penetration was at 78% in 2016 increasing to 81% by 2020. In Latin America, only 55% of subscribers had smartphones in 2016 growing to 71% in 2020 which will help increase the data usage and hence increase the ARPU. North America will be the leading region in 5G mobile connections with an estimated half of its mobile connections running on 5G by 2025. At 63%, North America also led the 4G adoption rate in 2016.

5G Starting Earlier While LTE Growing Strong

There was a lot of talk about 5G, the future generation of cellular networks that will bring lots of goodies with it. 5G will enable ultra-broadband – at least ten times faster than LTE. It will enable massive IoT while supporting billions of connections and it will facilitate mission critical applications by improving the responsiveness of the networks five fold.

While the use cases for 5G are many and varied, most operators are looking at high bandwidth applications like streaming high definition videos or augmented/virtual reality as the initial 5G applications. In the US, carriers are focusing initially at last mile delivery (fixed wireless) use case.

The global launch is expected to come as early as 2019 with US, China, Japan and S. Korea as early adopters. The Olympics in Korea and Japan in 2018 and 2020 are planning to showcase 5G. However, according to the latest GSMA trend report, the 5G uptake will be slower due to continued growth in 4G LTE. By 2025, 4G will still account for two third of global mobile user base.

4G LTE growth is fueled by new versions of LTE that have progressively better carrier aggregations, MIMO antennas and higher order modulation technologies. This enables speeds of 1Gbps and latencies in few milliseconds on LTE, such as Nokia's 4.9G solution.

To feed the 5G vision and its amazing features, telecom players are looking for lots of spectrum in low, mid and high bandwidth frequencies in all combinations of licensed, unlicensed, and sharing modes.

Broader Playground for Innovators and Entrepreneurs

More than ever before, telecom enables a huge playground for innovation and entrepreneurship. Azita Arvani spoke on the MWC Americas 4YFN (4 Years From Now) panel on Accelerating Infrastructure Entrepreneurship where she discussed these opportunities. Looking at our DNC model of Devices, Networks and Content will help put things in perspective. In networks 5G will enable an amazing and diverse array of use cases. The various spectrum bands with different sharing modes will provide new networking options for operators, enterprises, and new entrants. The network will be managed by scalable and distributed software in the cloud that will make them programmable and enable network slicing. In devices: a whole host of smart devices from cars to wearables to drones and robots will be connected to the network. In content there are lots of media in low and high definition that will entertain and inform us along with tons of metadata that will feed our analytics and AI engines to develop insights, decisions, and actions. All of these DNC possibilities need to be enveloped in reliable security and privacy services.

Combining all of these options will provide infinite combinatorial opportunities for innovators and entrepreneurs to thrive on. We must create a virtuous innovation cycle in telecom where the established

incumbents support the innovative startups and startups partner with incumbents. So, together, telecom players along with their ecosystem would disrupt from inside out.

Cellular IoT: From LPWA to Wearables

The 3GPP standards provide two cellular connectivity options for Low Power Wide Area (LPWA) networks. A reminder that LPWA use cases are generally for large scale deployments with thousands or millions of endpoints and require low cost devices with low data rates and long battery lives on order of 10-20 years. The two 3GPP standards - LTE-M and NB-IoT - are meant to be complementary. The LTE-M option supports higher data rates, lower latency and mobility for applications such as connected cars. The NB-IoT is best for use cases with lower data rates which don't need very low latencies on devices with low mobility, such as smart meters. AT&T and Sprint are currently focusing on LTE-M. Verizon is using LTE-M now and will be testing NB-IoT capability next year. T-Mobile US will build a US-wide NB-IoT network next year. There are also a few proprietary and non-3GPP IoT network technologies such as Sigfox. There is also a hybrid chip which was just announced that includes both cellular and Sigfox IoT connectivity. On the consumer side, a new era of cellular connected wearables has started with the launch of Apple Watch Series 3 with LTE. While this is not the first time a wearable has its own cellular connection, this watch has a greater chance of reaching critical mass and starting a trend for wearables. Stay tuned!

New Intelligent Devices

There are a number of new intelligent mobile devices in the market. We met Niccolo De Masi, President of Essential and got a chance to play with his own Essential phone, the new Android smartphone with edge to edge display, no bloatware, and a cool way of snapping on new accessories such as a 360-degree camera. Is this a flash back to Handspring of 1999 with its cartridges with a 21st century twist? There were also plenty of robots at the show. Cubroid develops what it calls coding blocks that come in shape of cubes with sensors and wireless connectivity. Kids can assemble these cubes together (and with regular Legos) to create and program their own robots. Kwilt Shoebox is a storage accessory to store your photos and videos from your phone and access them from anywhere. The device will sell for \$49.99 with no monthly fees.

Can Combinations of (Networks + Content) or (OTT + Devices) Create Growth or Complexity?

There is a consolidation theme around convergence of telecom giants with media companies. Verizon acquired AOL in mid 2015 and Yahoo in mid 2017. Meanwhile, ATT acquired DirecTV in mid 2015 and is on the verge of merging with Time Warner. GSMA Trends 2017 report has taken a look at the enterprise value of several major telcos against several tech companies from 2010-2016. While GSMA report's select tech company valuations have gone up by 3.5 times over that period, the telecom valuations have not seen this strong of a growth. Meanwhile, Google bought Motorola's phone business in 2012 which they later sold to Lenovo. Google is now buying HTC's smartphone business to focus on creating a better experience on the Pixel phone. Facebook acquired virtual reality headset company Oculus, back in mid 2014. While Google and Facebook have both gone up in enterprise value, the reason doesn't seem to be the consolidation with a hardware company.

The Dark Side of Big Data Forces Tighter Regulation

While getting gobs of data about people and things and constantly finding relations between them creates many opportunities to do good, there are bad actors that constantly look for ways to take advantage of the big data as well. Some recent events put issues of data protection, trust and security under a new light. A few days before the MWC Americas show, Equifax, one of three major US credit bureaus, revealed that it had been hacked and its database of personal data for 143 million Americans was compromised. Facebook also disclosed that they had sold targeted political ads to Russians during a 2-year period. Twitter and Google are facing similar accusations. These problems are not limited to the online giants. Every "free" mobile app is likely capturing personal data whether consumers are aware or not. In each of these cases, either the regulation or the oversight of that regulation for data protection does not exist. Separately, European Union has introduced a new General Data Protection Regulation (GDPR) which dictates how companies will protect EU citizens' personal data. The rules will go into effect in May 2018.

And One More Thing...

Exercising on a stationary VirZoom bike while playing VR games using Samsung's Gear VR headset was really cool - even for a non-gamer.

Disclosure: Azita Arvani runs Innovation Partner & Venture Management at Nokia. This report does not reflect Nokia's views.

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