Podcast Episode

Public Sector
Embracing Digital Transformation

5G, Edge and AI

Darren W. Pulsipher & Dr. Anna Scott – Aug 19, 2021

Content with your current Wi-Fi? Why change to 5G? It's a complicated but important question.

In today's episode, Darren discusses the groundbreaking changes 5G will bring to the edge and AI with Dr. Anna Scott, Chief Edge Architect, Intel.

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Anna's background is in the industrial and manufacturing side of information. She has a Ph.D. in chemical engineering, as well as an MBA. She spent 15 years working as a process and design engineer, later doing startup work and engineering management. She has been with Intel for a little over six years, the last two and a half working in the public sector team where she primarily supports Intel's IoT and edge activities, increasing involvement in 5G because 5G, along with AI, is dramatically changing that space.

Network Transformation Foundational to 5G Infrastructure

In the industrial world, IoT was not anything new; it was just hardwired. With systems now moving to wireless, they have the close coupling of IT plus OT to convert analytics instead of just having a set of process data specific to that OT world. A different set system now marries that to the business, so this is being pulled into the same space. Although there are some very defined differences in use cases and architectures in the public sector, such as military and smart cities, there is a common convergence in the analysis, application, and time frame to make better business decisions.

IoT has taken so long to move out of manufacturing and into other areas, primarily hardwiring costs. Security has also been a roadblock.

5G is now unleashing the IoT and edge world because of cost-effectiveness, especially the consumer side. However, when it comes to critical business infrastructure, it is a different conversation about how to do it to protect the data. 5G will be transformative, but it is not happening just yet on the commercial side. Part of the gap is because of the delay between when the standards are released, and the hardware to take advantage of those standards are produced.

This timing is not unexpected for anyone who has spent a lot of time with 3GPP or other driving standards bodies. Right now, you can stand up a 5G network, but we are at the stage of doing testbeds where we have to demonstrate the value of 5G. We need to show new use cases that cannot be supported by LTE or by 4G.

Multiple 5G Deployment Models Deliver Flexibility

Why not stay with Wi-Fi 6 instead of using 5G? The answer is complicated. Many of the standards organizations driving 5G were also driving Wi-Fi 6, so it is a complementary technology. The differentiator is in the equipment, so you need to know the details of your use cases to determine the most cost-effective. For example, 5G is amazing, but it would not be best to put a 5G network on a cruise ship because penetration is not there to make sense. The

environment is not friendly to any wireless signal, but Wi-Fi 6 with access points makes more sense.

5G is compelling for several reasons and can do things that 4G and LTE cannot. For augmented reality and virtual reality, you need very low latency and high bandwidth to enable more interactive use cases, for example, equipment or machine repair. It would be best if you had a remote expert that is standing looking at a problem that can do video and audio streaming with an overlay of drawings and capabilities that are being managed back from a central location or remote location that is bringing all of that knowledge and expertise directly to the point at which you are trying to do work. That type of use case cannot be done over an LTE network. Bandwidth plays a part, but latency is the driving force. To not get sick while using a headset, you have to have low latencies with no delay or go asynchronous.

The LTE and 4G world have changed because of 5G due to how they managed the spectrum. One area where this is changing in the industry is that it is now possible for a company to get a priority license for CBRS spectrum and stand up their private network, wholly divorced from the federal significant telecommunications company. For example, a large manufacturer can cover a considerable space more cost-effectively with a private LTE than with access points. There are also significant benefits, such as if you want to reconfigure your space and you do not want all of your workstations to be hardwired, or say you have to move around enormous pieces of metal such as airplane fuselage in your space that could interfere with Wi-Fi signals, you can stand up the infrastructure to be portable and not fixed to hardwire locations.

Security is a core concern for any organization. Although 5G was not written with security in mind, 6G will be. Luckily, with the capabilities of 5G, we can do a lot around zero-trust networking and other security measures that will instill customers with confidence about how their data is being moved across networks.

The 5G standards had changed the problem of a few years ago when wireless infrastructure existed in proprietary hardware and proprietary software, with a licensed spectrum only a few companies could afford. Software-defined networking enables the ability to host network infrastructure on standard, off-the-shelf hardware. There is no need for specialized hardware as in previous generations. This is also happening on the LTE side with, for example, making the CBRS spectrum available and getting away from the proprietary hardware and software.

Intel spends much time working with disruptors that are using our FlexRAN reference architecture. The FlexRAN architecture becomes the basis for helping disruptive technology proliferate in the new 5G marketplace because it provides a 5G software stack running on standard, off-the-shelf hardware where proprietary hardware was previously required. Now there is a space with much more openness and portability, and the cost of entry is much cheaper than it used to be. It is no longer just a few companies controlling everything. Intel and others are trying to open everything up and take advantage of open standards to support these disruptors and change the entire dynamic.

5G Spectrum and Regulation for Tomorrow's Networks

With improved connectivity, low latency, and high bandwidth, many new use cases will be available. How 5G will be monetized is what is changing across the market. For example, a cloud service provider and a telecommunications company can provide better services for their customers because they are no longer siloed. They are a combined business effort of what matters: quality and prioritization. Another way to look at this is that cloud service providers are buying capabilities that will open up network functionality in the same way that telecommunications companies are exploring what they can do on the cloud side. Again, the silo is broken down; the data pipe is no longer a set of services.

It is not clear how all of this will fall out, except that it is redefining what kind of work you can do because of data accessibility and where those workloads will live. There is a tremendous value in seamlessly going from edge to cloud and doing it based on the customer's need, which is now possible.

A New Compute Paradigm Supports New Data Demands

5G is unleashing many different architectural models. For example, it gives two options of architectures for AI, whereas before, there was only one with limitations.

Without the high bandwidth provided by 5G, AI was limited to inference on the edge devices, which required pushing AI models out to the edge devices. This cumbersome restriction increased the AI development and deployment cycle and limited the number of AI workloads leveraged at the edge. With an increase in bandwidth, enormous data streams from cameras or sensors can be sent back to a data center, enabling multiple AI workloads to be run and continuous AI learning to occur. This allows organizations to run both inferences on edge and improve the deep learning required by so many organizations' ever-changing demands on their data.

With AR, for example, 5G means that headsets can be mobile instead of tethered with the same capabilities because 5G allows for sharing larger datasets in an untethered world. The data centers' traditional walls are being broken down.

If you do not have much tech support or detailed knowledge of keeping your systems running, you can run it all in the cloud. If you do not want your data on the cloud, you can do a version that's on-prem over a private network that gives you all the types of functionality to aggregate and correlate data to provide a high-level understanding of what is happening in your system in a secure, cost-effective way.

Your data can now reside on edge, in the cloud, on-prem, or in what Cisco calls the fog. It does not matter where your application runs so that you can use the most cost-effective model. For example, there are massive savings in not having a hardwiring component or using a private LTE structure rather than Wi-Fi access points in industrial spaces. Getting these types of costs down will lead to the ability to have super-rich data. These cost and physical connectivity barriers are what has been missing for IoT to take off the way everyone predicted.

Anna predicts that for non-control applications, the next two years will be different because of 5G. A simple example is that in industry, someone could take their regular PC out of the office and onto the factory floor and do everything there. 5G will change what is possible concerning controlling and controlling robots and

machines over a wireless network in the next five years. The next level of transformation will be that you can control a wireless network and do it safely and effectively, putting no one at risk. This will take a lot of validation and stringency of review, but it is on the horizon.

Also, it will be exciting what your favorite cloud service provider and telecommunications company will do together to change what is possible from a services standpoint.