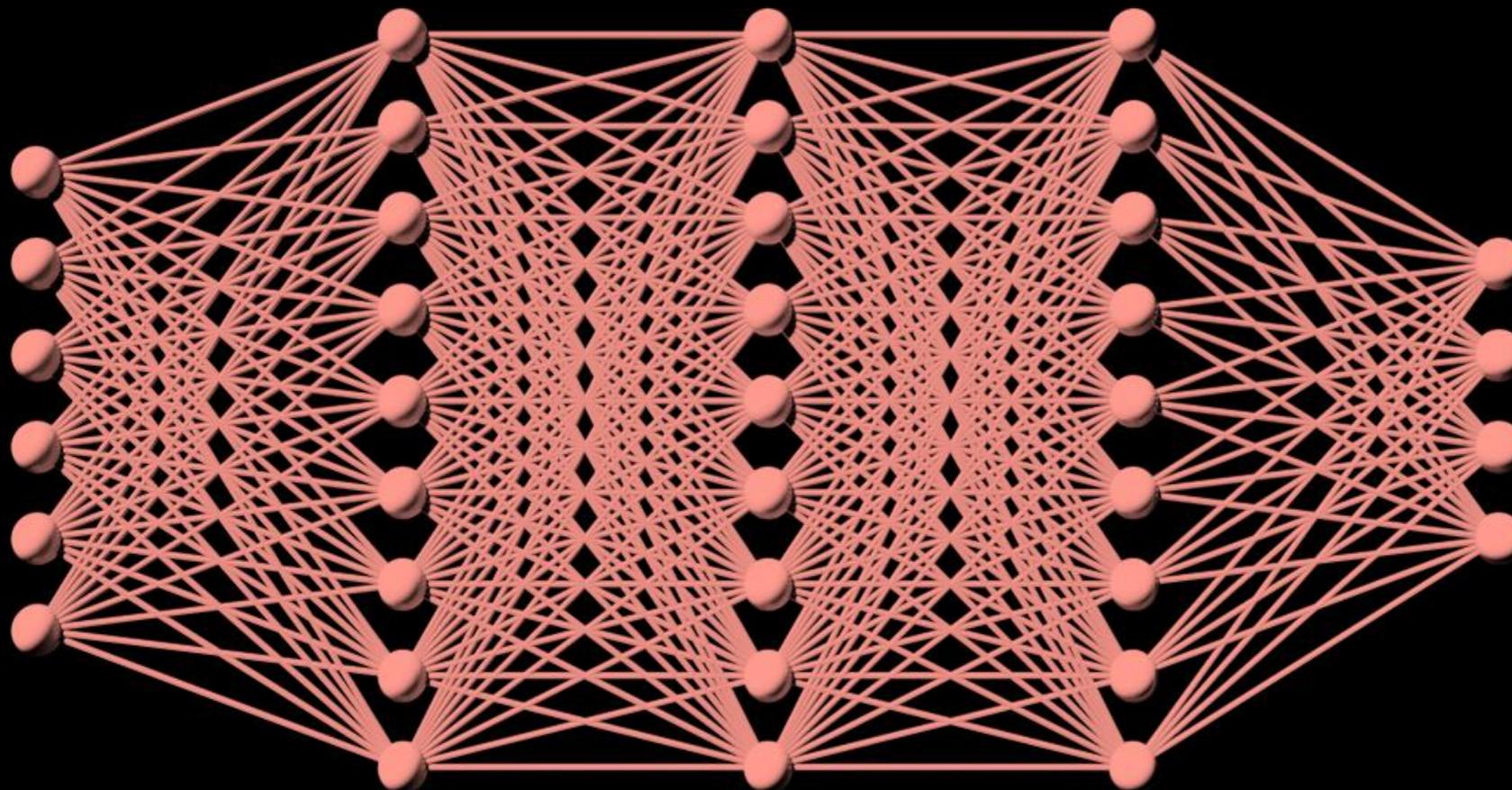


Huawei Wireless Intelligence enables future automated networks

Monica Paolini, Senza Fili



A conversation
with Kevin Xu,
Head of Marketing
Operations,
Huawei Wireless
Solutions



In collaboration with



Huawei: Profile

“Automation is necessary for future network” is Huawei’s response to the increasing complexity in wireless networks that is driving costs up without a corresponding increase in revenues. HetNet topologies and network slicing are two examples of this trend toward greater complexity – a trend that also multiplies the opportunities to expand subscriber services. To manage complexity and costs, the wireless industry needs to optimize the use of resources more effectively.

To do so, Huawei promotes the introduction of Wireless Intelligence across the network, to help operators find ways to improve performance and automate network operation in real time.

A massive increase in data traffic, coupled with an equally impressive increase in computing power, has created an environment in which Wireless Intelligence can thrive, building upon AI, machine learning, deep learning, and reinforcement learning. Moving ahead of the rule-based expert systems of the near past, we have now entered a machine learning phase that uses network data more extensively and efficiently. Huawei expects a deep learning phase and a cognitive phase to follow, centered around the creation of logic.

Wireless Intelligence adds the following in wireless networks:

- Unified data management
- Analytics

- Automation and closed-loop operations in planning, deployment, monitoring, and service assurance
- The ability to evolve through the use of cloud-based applications and open APIs

Rather than being confined to narrow domains, the impact of Wireless Intelligence will spread horizontally end-to-end across wireless networks, as a comprehensive tool box that operators can use to address challenges wherever they arise.

Huawei’s trials and initial commercial deployments give insight into the contribution that Wireless Intelligence makes. For example:

- **LampSite topology optimization.** Topology and RF planning in diverse scenarios, taking into account user distribution analysis and traffic distribution, to increase capacity and reduce interference

- **Adaptive KPI anomaly detection.** Using historical data and fixed thresholds based on expert experience to detect KPI issues and define a more sensitive adaptive threshold using machine learning predictions, resulting in a 90%-plus reduction in fault alarms
- **Motorway traffic recognition and optimization.** Use of traffic patterns to estimate traffic demand and optimize RAN configuration (e.g., antenna tilt) to reduce congestion and call drops
- **Massive MIMO pattern optimization.** Use of machine learning modeling to define and set antenna parameters
- **Bottom user throughput optimization.** Use of machine learning for root cause analysis to understand and resolve subscriber issues, such as dropped calls



Increased network complexity is a driver for Wireless Intelligence

Source: Huawei

Huawei: Interview

Wireless Intelligence enables automated networks

A conversation with Kevin Xu, Head of Marketing Operations, Huawei Wireless Solutions

The networks of the future will be automated, but how will we get there? Today's networks are only marginally automated, and network optimization still mostly consists of painstaking manual processes. What is the path that will enable us to leverage artificial intelligence, machine learning, and analytics, and evolve to the automated networks that 5G requires?

I talked with Kevin Xu about the role of what Huawei calls Wireless Intelligence in setting the path and enabling network automation. Kevin Xu is the Head of Marketing Operations at Huawei Wireless Solutions, which is part of R&D at Huawei.

Monica Paolini: Kevin, thanks for sharing your thoughts with us today. I know you have worked in the wireless domain for years, and now your focus is on network automation. What is the high-level approach to automation at Huawei?

Kevin: This class of technology doesn't have a standard vocabulary yet.

First, we consider artificial intelligence a GPT, a general-purpose technology that can be applied to all the suitable cases or scenarios.

Second, we do believe that this kind of technology will create real value for the telecom industry. That's why we have used artificial intelligence to develop research and many solutions.

Third, on a higher level, the entire wireless industry is just beginning to realize how to approach, and how to deploy, artificial intelligence technology.

That's why we think that at this early stage for the telecom industry, we need to focus on the real value that artificial intelligence creates for operators.

Monica: Traditionally, we have a lot of AI in other fields as well. It's not a telecom technology. What is AI's role in the wireless industry?

Kevin: I want to start with the data. When we talk about artificial intelligence technology, it all comes from big data and data analysis. It is a precondition for the outcome. In wireless networks, a tremendous amount of data is generated every day, every second.

To use this technology, operators start with a good advantage, because all of them have plenty of data and enough computing resources, and they can find a lot of value through this technology.

Today, wireless networks create a lot of operations and maintenance challenges, due to the networks' complexity.

From 2G to 5G, there are many bands, many frequencies, and many scenarios: the macro-cell site, the small-cell site, and many other things. A

technology such AI is well suited to wireless operators, who can adopt this technology to find a smart, easy way to optimize the network performance, as well as to simplify the maintenance.

Monica: As you say, it's a perfect case, because we have so much data, but also so much to learn, because we still don't know how to optimize the network. In this context, what is the role of automation?

Kevin: We use several concepts to describe what we call Wireless Intelligence. From our side, the first stage towards the automation of the entire network is some basic intelligence technology.

Automation is a bigger concept. We also started it as a basic-level technology, with a goal to make the entire network automatically operated or maintained. Network automation needs to start with some basic functions.

Monica: Mobile operators traditionally – and I would say surprisingly – have always done many things manually, in a just-turn-the-knob operation mode.

Automation is going to require a big change for operators. How big a change is it really, and what



needs to happen? What needs to be done differently?

Kevin: First, I need to clarify one thing. Working with partners like Huawei, operators already use a lot of automated technology to maintain and manage their networks. A lot of tools also apply for network optimization, and they are very helpful.

The changes ahead of us are driven by new use cases. If you look at the network today, it's getting more and more complicated, because we want to deploy new layers, new technology, new spectrum.

Every day, we ask ourselves the same questions. Can we make the wireless indoor coverage better? Can we deal with the uneven traffic in the entire network? When we maintain a network, we also make a very good utilization issue for the entire asset.

We must get more revenue, so we should think about using this asset to get more revenue. Efficiency, also, should be considered. To achieve better results, we are thinking we should meet the new requirements. That's why we think about Wireless Intelligence technology.

We expect three changes to happen.

First, it's about performance and network optimization. With some combination of parameters manually set by human beings, we might meet some limitation, such as latency. The new machine learning algorithms will find the best way to solve a problem.

The second change might be in operations and maintenance, O&M. In this case, we might have some work we can deliver to the machine learning



Wireless Intelligence tackles massive MIMO

Source: Huawei

or intelligence technology, and free up people for other tasks.

The third change is about new business opportunities. Sometimes we define a scenario based on the coverage. In a rural area, an urban area – those are based on coverage.

Through Wireless Intelligence, maybe we may find other types of scenarios that open new business opportunities.

Monica: We will see huge changes both on the operational side and the revenue side. The better you manage network complexity, the more revenues you may get from your network assets.

In discussing any topic in telecoms today, we inevitably end up talking about 5G. But there is much work that can be done, should be done and will be done, before 5G. What is that work, in terms of both automation and Wireless Intelligence?

Kevin: In Huawei, we have an approach for using some technology for what we call 4.5G, which will prepare 4.5G to evolve to 5G. In the current stage, a lot of technology uses 4.5G. Massive MIMO is an example of a 5G technology that already is being deployed ahead of 5G as part of 4.5G.

For this kind of installation, some Wireless Intelligence technology also can be applied. For example, there're some parameters in this massive MIMO network. You need to consider a combination of different parameters to achieve the best performance.

This is deployed today. You have to solve these issues today, not with full 5G. For products such as massive MIMO, we have Wireless Intelligence solutions to help people find the best combination of parameters for all scenarios.

In urban areas, high-rise buildings, rural areas, high-density areas – automatically, Wireless

Intelligence will enable operators to find the best combination of parameters. There are some cases where Wireless Intelligence is already in use, but there is also a much wider scope for future thinking.

Monica: A lot of the preparation for 5G can be done ahead of time. How dependent is the success of 5G on automation, Wireless Intelligence, and all technologies that rely on big data?

Kevin: First, 5G enables more possibilities for the industry as it adopts Wireless Intelligence. Our company's vision is to be the leading ICT solution provider, and we are committed to realizing this vision of a Wireless Intelligence connected world.

One major feature of 5G for operators is going to be eMBB, as well as enabling the wireless industry to be digitalized, and to connect more devices and processes, such as intelligent manufacturing, remote medication, and health treatment.

Point number one, 5G can enable a lot of new industries which already have intelligent solutions, but the wireless connection provides a better stage.

Point number two, 5G networks enable a lot of new features, like the bandwidth. The high throughput, stability, and very low latency create possibilities for new applications. Previously, maybe GPS gave us location information. With some new features in 5G, maybe we can get a very accurate positioning through the whole network.

Monica: As you mentioned before, you've been working on this for some time now. It is all relatively new, but you have quite a lot of experience already. What have you learned as

you've worked on this?

Kevin: To be honest, the telecom industry is not the leader in AI, because a lot of internet companies in other sectors started earlier.

So first, it's time for the entire industry to catch up with this golden age, to create real value.

Second, as I mentioned before, operators do have a unique advantage for using this technology, because they have great data. They update their data every day. All this input should be professionally analyzed. It's a very good asset.

Third, today we don't think we should be too excited about Wireless Intelligence technology. We need to consider, what's the real value? We should not follow some hot concept but find the real value for the operator.

Rather than hype the technology, we prefer to start with real values created for the operator. Step by step, we can approach new concepts.

Monica: You're working with a lot of operators. What are they telling you?

Kevin: In general, operators ask for this technology. They really care about this kind of technology. Recently, we've received more and more requests to cooperate on this topic.

They want to understand the general concept of Wireless Intelligence, and how to approach it. Today, there are many concepts, many studies, many voices in the wireless industry. They take different approaches, but they all point towards this real value for the network.

Monica: You've been working with operators on many case studies. One I find very interesting is the one on massive MIMO. Can you tell us about that?

Kevin: This is a very interesting and successful case. Massive MIMO technology is a new product concept which needs more optimization of parameters. With three or four parameters, plus the coverage scenario, you will have plenty of



Customer value from Wireless Intelligence

Source: Huawei



combinations. You can use them to configure your products. It'll result in different coverage, different performance.

In this massive MIMO case, you have 300 combinations as options for one site, one cell, to configure the parameters.

Doing it manually, you find several combinations based on your experience. You try one, and you try another one, to see the results, and you adjust a little bit. It takes maybe months, several months, to find the best combination of parameters for one cell, or one site.

Now we use a machine learning algorithm for this. The machine learning algorithm will set up one option. Let's assume it's not the best one; the optimization software will automatically try another one, get the feedback, then run a third one, and so forth.

This gets done very quickly – maybe only a few days, maybe less, if the optimal scenario is found early on. Machine learning has really reduced optimization time. Once the site is optimized, it will accommodate a huge amount of traffic, and this will create the value for operators by increasing revenue. It's a really exciting case.

Monica: It increases revenues, but also, they can get more out of the hardware that they already have in place. They can squeeze out better performance. It's a winning situation, both on the revenue side and on the cost side.

Kevin: Yes. Sometimes, people cannot find this best combination manually, but the machine learning can.

Monica: It's a tangible benefit. During all the trials you've done with operators, what are the key advantages of your solutions?

Kevin: There are several unique values from Wireless Intelligence.

First, it takes us beyond the limitations of expert experience. Previously, a lot of optimization was based on some engineer's experience, and on-site execution.

This new Wireless Intelligence technology is the best and most appropriate solution in some very difficult cases, where the complexity is too high for a human to tackle.

The second value is the efficiency improvement. Today, new elements of the network are deployed and used in new scenarios we find every day. With the resources we have today, how can we improve the network performance? Wireless Intelligence gives us a way to create a higher-efficiency outcome for the entire network, not just for any single one resource.

The third value is in the new opportunities. It's not artificial intelligence or Wireless Intelligence itself that creates new business opportunities. It's what people do with it. They're collecting data and analyzing data. This will be a very good input for the marketing and the promotion team. They can find more links from the sales to the network service. This is also an approach that works for the entire industry.

Monica: Let me ask you a final question. What's next at Huawei? What do you plan to work on over the next few years?

Kevin: In general, our vision already is to establish an intelligent, connected world. Huawei has several business units. I think you already heard about this On-Device AI, which was announced by our terminal side.

Wireless Intelligence is an important and interesting area – the entire wireless industry is focusing on this one; many other industries are too. This is one of our main research directions. For sure, we will keep an eye on it, and the research will continue for this one.

The second, as I've said, we are not in a rush to create a concept. We want to create real value. This is the major trigger point for Huawei Wireless. All our solutions and all our roadmaps are based on this point. We want to see what we can really do, and what value really can be created for our customers. This is how we do it.

The third direction in our vision for the future is 5G and 4.5G. The entire industry will be strengthened. The bandwidth, the performance in wireless networks will be much stronger and more powerful.

We do think all these things can be connected, and not only for the network element – maybe something else, too. The market requirements for Wireless Intelligence will grow fast, and we look forward to exploring more possibilities.

Glossary

AI	Artificial intelligence
API	Application programming interface
BP	Back propagation
CA	Carrier aggregation

eMBB Enhanced mobile broadband
GPS Global positioning system
GPT General purpose technology

ICT Information and communications technology
KPI Key performance indicator

MIMO Multiple input, multiple output
O&M Operations and maintenance
TCP Transmission Control Protocol

This interview is part of the report “Going deeper with automation. How to tame complexity in wireless networks” by Senza Fili in collaboration with FierceWireless

[Download the report](#)

About Huawei



Huawei is a leading global information and communications technology (ICT) solutions provider. Driven by a commitment to sound operations, ongoing innovation, and open collaboration, we have established a competitive ICT portfolio of end-to-end solutions in telecom and enterprise networks, devices, and cloud technology and services. Our ICT solutions, products, and services are used in more than 170 countries and regions, serving over one-third of the world's population. With 180,000 employees, Huawei is committed to enabling the future information society, and building a Better Connected World.

About Xu Yan (Kevin)



Xu Yan (Kevin) is Head of Marketing Operations, Huawei Wireless Solution. Mr. Xu leads marketing strategy and operations, program development and execution, new product launches and regional business development across Huawei Wireless products and solutions. Previously, Mr. Xu worked for various Huawei regional offices, gaining extensive knowledge of global markets. Previously, Mr. Xu worked for various Huawei regional offices, gaining extensive knowledge of global markets. Between 2012 and 2017, he held senior positions in Huawei's North Africa office, Middle East office, and Levant regional office where he served as Chief Wireless Engineer and Vice President of Products. During this time, he was responsible for product strategies and solutions design for significant projects in Morocco, Egypt, Jordan and Lebanon. Mr. Xu joined Huawei in 2006 as the Branding Director of Huawei Wireless Product Line. In this role he led brand management and operations across Huawei's Wireless products. Prior to joining Huawei, Mr. Xu worked for multiple telecommunication operators including China Mobile.

About Senza Fili



Senza Fili provides advisory support on wireless technologies and services. At Senza Fili we have in-depth expertise in financial modeling, market forecasts and research, strategy, business plan support, and due diligence. Our client base is international and spans the entire value chain: clients include wireline, fixed wireless, and mobile operators, enterprises and other vertical players, vendors, system integrators, investors, regulators, and industry associations. We provide a bridge between technologies and services, helping our clients assess established and emerging technologies, use these technologies to support new or existing services, and build solid, profitable business models. Independent advice, a strong quantitative orientation, and an international perspective are the hallmarks of our work. For additional information, visit www.senzafiliconsulting.com, or contact us at info@senzafiliconsulting.com.

About Monica Paolini



Monica Paolini, PhD, founded Senza Fili in 2003. She is an expert in wireless technologies and has helped clients worldwide to understand technology and customer requirements, evaluate business plan opportunities, market their services and products, and estimate the market size and revenue opportunity of new and established wireless technologies. She frequently gives presentations at conferences, and she has written many reports and articles on wireless technologies and services. She has a PhD in cognitive science from the University of California, San Diego (US), an MBA from the University of Oxford (UK), and a BA/MA in philosophy from the University of Bologna (Italy). You can contact Monica at monica.paolini@senzafiliconsulting.com.