RCR Wireless News
INTELLIGENCE ON ALL THINGS WIRELESS

The telco AI opportunity

By Sean Kinney

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THE THREE BIG TELCO AI QUESTIONS

If you've recently attended or watched or read about any tech industry conferences, you've noticed the characterization of artificial intelligence (AI), both generative AI (gen AI) and more classical AI, as a sort of panacea for business problems regardless of industry. Telecom is no exception. The idea of telco AI solutions for everything from network management and optimization to customer management and churn reduction has been broadly seeded, partnerships are being formed, vendor-led thought leadership is picking up pace, and it's clear telco AI will be part of the landscape going forward.

For Rakuten Mobile in Japan and its sister network hardware/software provider Rakuten Symphony, telco AI is just AI. This is because these two parts of Rakuten are part of a much larger whole that provides a wide range of services, including banking, e-commerce, financial services and more. The company is developing various AI engines and applications that are trained using data from across the enterprise, not just from Rakuten Mobile for Rakuten Mobile and so forth.

The first two big telco AI questions—does the problem require AI? If so, do I have the right data?

Rakuten Symphony Managing Director and President of OSS Rahul Atri laid out the group's approach to AI. "We always believe in building platforms," along with driving adoption and fostering a culture of innovation. He laid out a three-legged stool problem around AI. First, do we have the data? Second, what's the cost? Third, did this create new efficiency that would otherwise not be achievable?

Rakuten Group maintains a unified data lake; "we knew data would be the new oil," Atri said. On cost, "People do see that coming but I don't think many people are even talking about cost—cost of training a model, cost of cloud resources, cost of investment in even figuring out the use case." In terms of efficiency, this is the big one; "Do you even need AI? Could it be a data insight problem? Can it be solved by a typical workflow engine?"

Looking more broadly at automation tooling, which includes the use of telco AI solutions, Atri laid out a process: first is analyzing data, second is finding the root cause of a particular focus item, and third is making a decision or taking an action. The first and third steps are the easy ones, he said, highlighting that locking onto a root cause is "where we need [AI model] training and fine tuning…Focus on step two."

Atri also talked through the use of large language models (LLMs) for telco AI applications. He enumerated distinct phases in a typical user journey starting with the use of chatbot and refining natural language processing. The next phase introduces an LLM that can access proprietary data and become domain and business specific in an effort to combine data with context. He made the point that one operator may have an AI solution accessed by customer care agents, RF engineers or senior executives, all of whom would want different information from the tool based on the varied contexts of their positions.

He also hit on a point of debate in both telecoms and, more broadly, amongst enterprise AI users—is building an LLM from scratch in service of a particular industry a better approach than fine tuning an already available LLM? "You can build telecom LLMs as much as you want to," he said. "Do you want to? I don't think so." He used the analogy of building a cloud-native telecom network as compared to building a cloud that supports a telecom network. Worth noting that Rakuten Group, with its shared data lake, uses multiple LLMs.

Data-driven, software-first operations are key to telco AI success

So if all signs point to AI being the right solution; but do you have the right data for that solution? Rakuten Symphony Chief Marketing Officer Geoff Hollingworth stressed the importance of "data fidelity" in increasingly automating previously manual network processes. He advised operators to "go underneath the jargon and the hype and the terminology. Embrace a business-driven, ROI-driven use case, user group, work stream approach to starting to investigate yourself, how to understand what these new technologies from automation, data and AI can do for you, and be very, very disciplined and prescriptive in that."

Rakuten Mobile uses the analogy of autonomous vehicles where Level 1 refers to minimal (but some) driver assistance capabilities, Level 3 suggests conditional automation where most things are automated but some manual inputs are required, and Level 6 means the vehicle performs all driving tasks under all conditions with no need for humans.

Going up in levels of autonomy, Hollingworth envisioned "a keyboard with no buttons on it in the network operations center." But to get to this state, AI isn't the starting point. "The journey really starts without AI because the only way that any machine can see what is happening to it or what it is experiencing is because of the data that it can actually understand. And having access to that data is the number one level of transformation…and there's a couple of aspects to data that it's always important to understand. The first aspect is what is the fidelity of that data?"

Another analogy, this one with Google Earth: "If you're out looking at the earth from the moon, you don't see much detail, but you zoom in, the moment you go down to another level of detail, you can start to actually make a different level of intelligent decision based on the added information. The enemy of good decisions

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is the average, is what people say. The second aspect of data is timeliness. So obviously having availability of that data as close to the moment and making it available to the engines that are watching it, the AI models, that then can interpret it is another factor on getting to a journey that you want to have full automation,

full autonomy."

Hollingworth continued: "And then what's interesting is that all of that is true if you just want to automate. So automation is both a receiver of data so it can decide what to do, but also automation generates data at a different granular level so you can actually analyze it. And that's one of the areas that Rakuten really has taken a leadership role in because they have digitalized all of the processes involved in winning the network, and that's a great asset then. Without that data, you can't see things and without that horizontal unified data, you will be down to level one automation where you are doing binary automations, go faster, go slower. But a bit like cruise control in a car is a good example of a level one automation."

Another important thing to consider as telco AI solutions are adopted, Hollingworth said, is around the organization, the people. This gets into an interesting area wherein telco AI needs data but much of the relevant process data is either stored in a legacy fashion or held in the minds of workers. So how do you convert institutional memory into data that can be fed into telco AI systems?

Hollingworth called this piece "the number one problem. And an interesting question always to ask, if somebody reaches out and asks you, 'I want AI to solve my problems,' it's always interesting to take a step back and ask the first question, 'Well, how do you make decisions today and what data do you use to make those decisions and how do you get access to that data?' And nine times out of 10, in a lot of situations, especially in very institutional organizations, they're not using very much data. They don't have very much data and therefore if you haven't got the data, you can't expect a machine to make better decisions than a human can. So data is 90% of the work in AI."

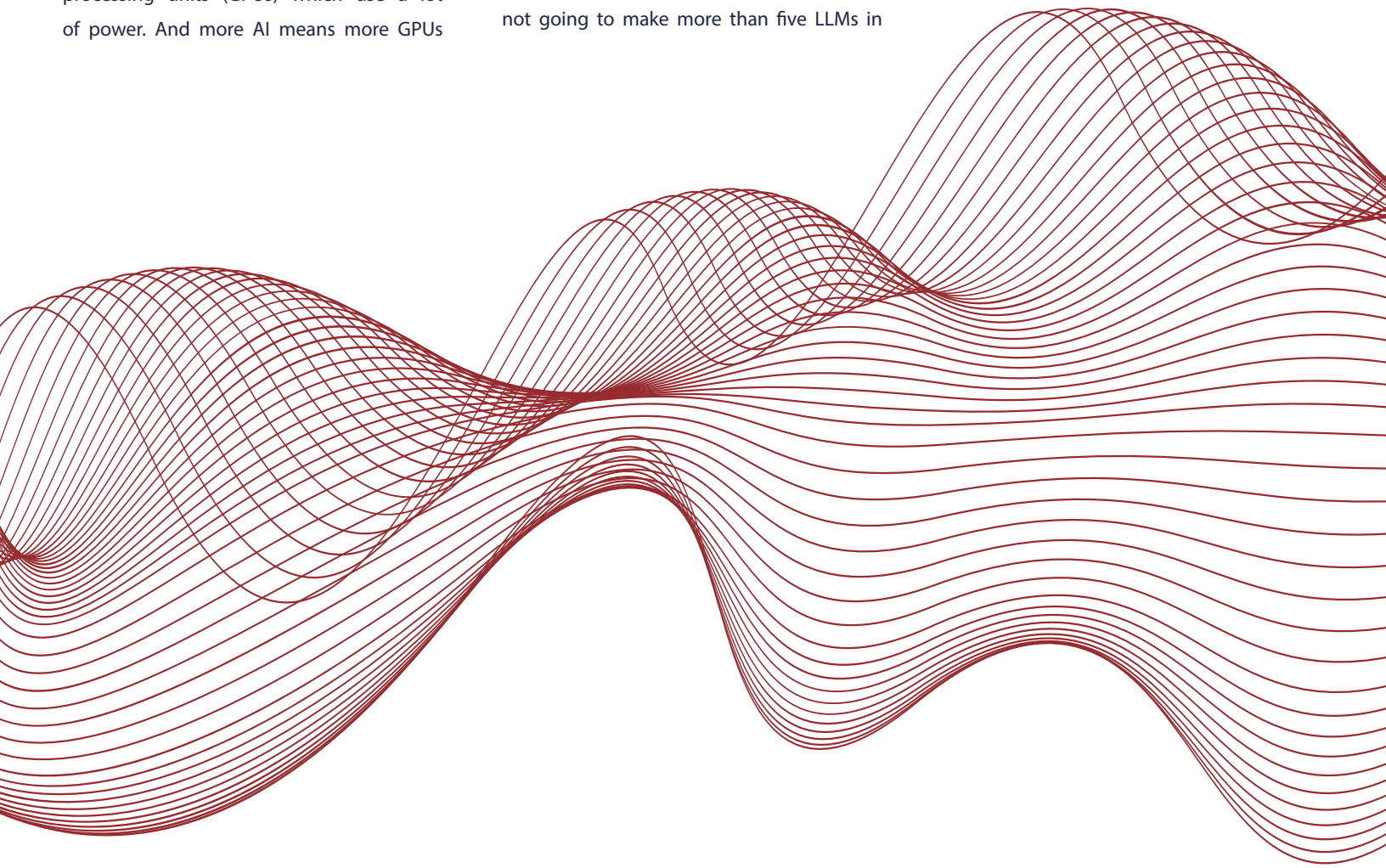
(Image courtesy of 123RF)

And the third big telco AI question—what does this mean for the environment?

There's no question that AI will impact telecommunications and essentially every other industry eager to boost productivity and streamline operations while also striving for product and/or service differentiation. But at what cost? Training AI models requires a lot of compute horsepower that today is primarily delivered by graphics processing units (GPUs) which use a lot of power. And more AI means more GPUs which means more power. And regulators have taken note. In the U.S., lawmakers have put forward a bill outlining an assessment of AI's environmental footprint and standardization of reporting long-term impacts. The European Union's AI Act will require reporting on AI-related resource consumption over a particular AI system's lifecycle. There's also increasing discussion of sustainable AI. And there's a bit of circularity in that AI could help industries of all sorts optimize and decrease resource consumption, but doing so requires more resource consumption by AI.

Which brings us back to Atri: "I'm concerned about the cost and environmental impact. We all have been seeing it, we all have been noticing it, talking about it. But I don't think anyone has stepped on it and said, 'We're not going to make more than five LLMs in a year.' Everyone is in a rush to create more. Everyone wants to be more efficient…So [I'm] scared about those impacts."

He effectively made the case that AI can help drive broad forward progress that's meaningful to individuals, to companies and to the world, but there has to be consideration of the environmental impact. "I'm super excited that this will turn into something good, super worried that every ChatGPT query is consuming water somewhere, it's consuming power somewhere…I think these are two scenarios that if we can balance them, the technology is great. We can build a lot of innovation."



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HOW TO BUILD LLMS FOR TELCO AI APPLICATIONS

If you've used consumer-facing generative artificial intelligence (gen AI) tools like OpenAI's ChatGPT, Google's Gemini or Microsoft's Copilot, chances are you've gotten back some interesting and relevant responses. Chances are you've also gotten back confusing nonsense that you struggle to map to the initial query you posed. That's one of the problems with LLMs with tens of billions of parameters. The software is combing through such a huge volume of data that finding the figurative needle in the haystack—the magic that takes your query, puts it into the appropriate context and returns information that you'd describe as intelligent—is hard to do consistently. So what does that mean for industry-specific gen AI solutions, say, some sort of telco AI tool for infrastructure planning or network optimization or any other of the host of use cases you'll see touted on conference stages?

Bigger isn't always better and, at some point, you have to get started

Basically it means that LLMs need to become smaller language models that start with a high-level view of the world's information, pare out the noise, then layer in domain-specific data and proprietary, business-specific data. This difficult step of curation is how companies can bring gen AI to bear across their operation and realize the productivity and efficiency gains that intelligent assistance can deliver. From there, it's a matter of more training, better inferencing, developing confidence in the machine, organizational buy-in, then you're off to the races.

"The key things to remember here are two things," Ishwar Parulkar, CTO of Telecom and Edge Cloud at AWS, explained in an interview with *RCR Wireless News*. "Firstly, one model doesn't fit all…Secondly, bigger is not always better. There is a tendency to think the more the number of parameters… it's going to be better for your job. But that's not really true." Smaller models, dialed in with tuning—which can include prompt engineering, retrieval augmented generation (RAG) techniques and entering manual instructions—can give better results, he said.

For IBM, AI and multi-cloud are key strategic priorities; for operators, this is about moving from manual processes to automated processes. IBM General Manager of Global Industries Stephen Rose delineated four broad categories of use cases: customer care, IT and network automation, digital labor and cybersecurity.

In terms of consumer-grade AI versus enterprise-grade AI, specifically telco AI, he said the big issues are around where the data comes from, the security of it, understanding any biases and the general trustworthiness of the system. "If you actually look to enterprise-grade AI," he said, "it starts foundationally with you know where the data is coming from, and therefore you can trust it and you can be more specific and unique in the way that you apply the AI because you know exactly where the data comes from. I think for [communications service providers] going forward, and for the industry as a whole, I think the main opportunity is two things."

He continued: "One is finding ways to be willing to share privileged data. So, we talk about a lot of the data was hidden behind firewalls or it was within an organizational constraint let's say. But now we're actually seeing as openness as a general concept is becoming sort of pervasive across the industry, the data fabric that you can actually build that underpins AI is becoming more accessible in ways that we've never seen before. So I think there's not only an opportunity within organizational silos within a particular organization, but even within a particular ecosystem. So, I think there's huge opportunity for us in both domains, but I think if we work to less proprietary but privileged data and then the openness within the privileged data, then you get to do really interesting things with AI."

So it's obvious here that data quality informs quality of AI-enabled outcomes; to put that another way, garbage in, garbage out. But here's the rub. Operators have a huge volume of highly personalized, highly contextual data on the consumer side. On the operational side, there's an enormous amount of network telemetry that exists and that can be leveraged. The problem is operators have historically under-utilized the data they have whether that's in service of a customer-facing outcome or an internal optimization.

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The "vicious cycle" of telco AI data inputs

In talking through the data piece and the data for AI piece, McKinsey and Company Senior Partner Tomas Lajous set up the idea that the network is a proxy for the user experience, so an improved network corresponds to an improved customer experience. "Where AI comes in, is that now we can use AI to understand everything that's happening on the network and understand relative to individual needs whether the experience is there or not. So, for starters, just by having this data, telco is going to improve the product. And of course improving the product is the first step to improving the overall experience for the customers, and to start bringing sources of differentiation in a competitive environment."

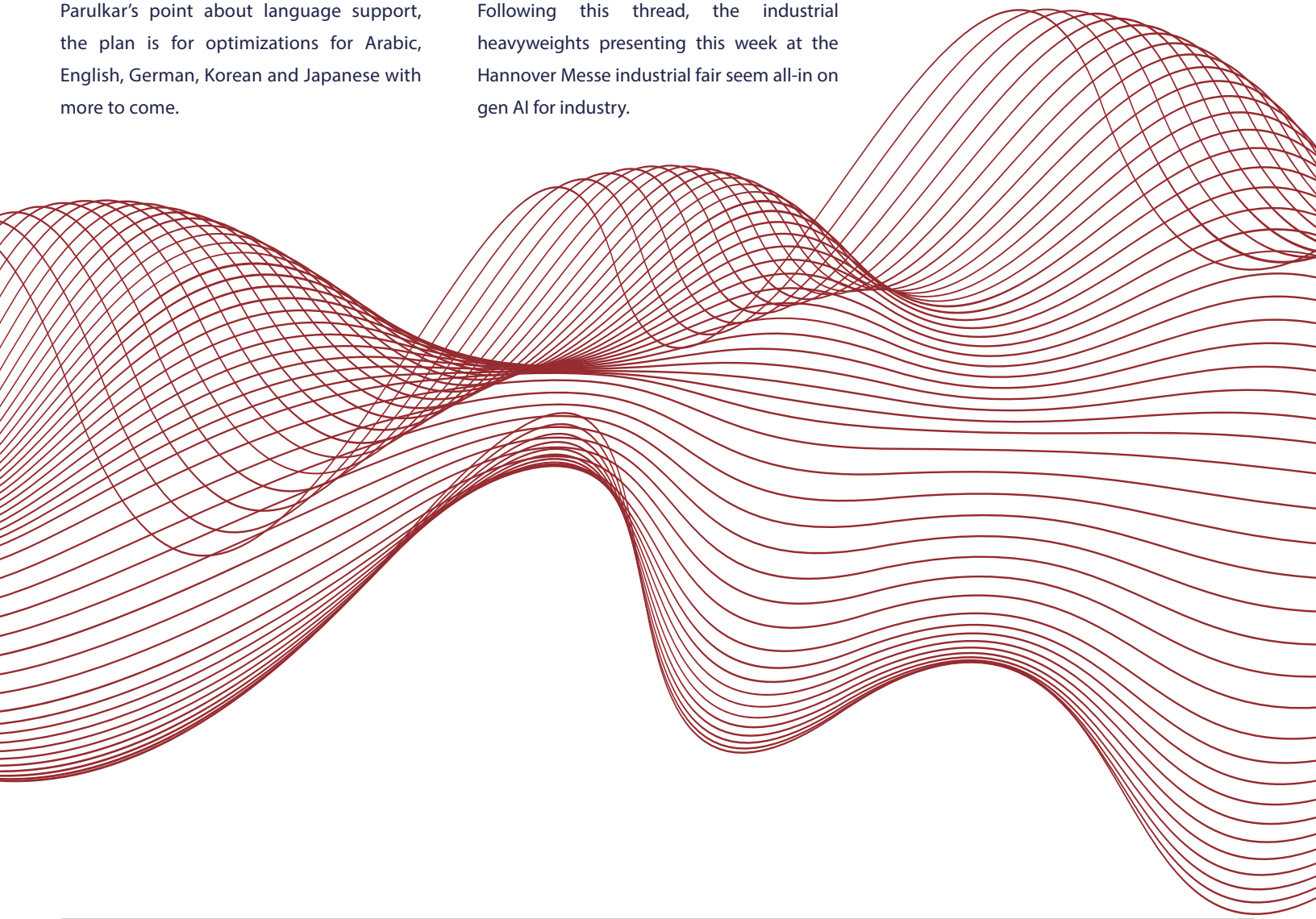
As for the siloed nature of operator's data: "In the telecom space, we've been suffering with a vicious cycle of bad data leading to bad or insufficient AI, leading to less focus on generating data, leading to bad/insufficient data, and so forth…But we are breaking out of it."

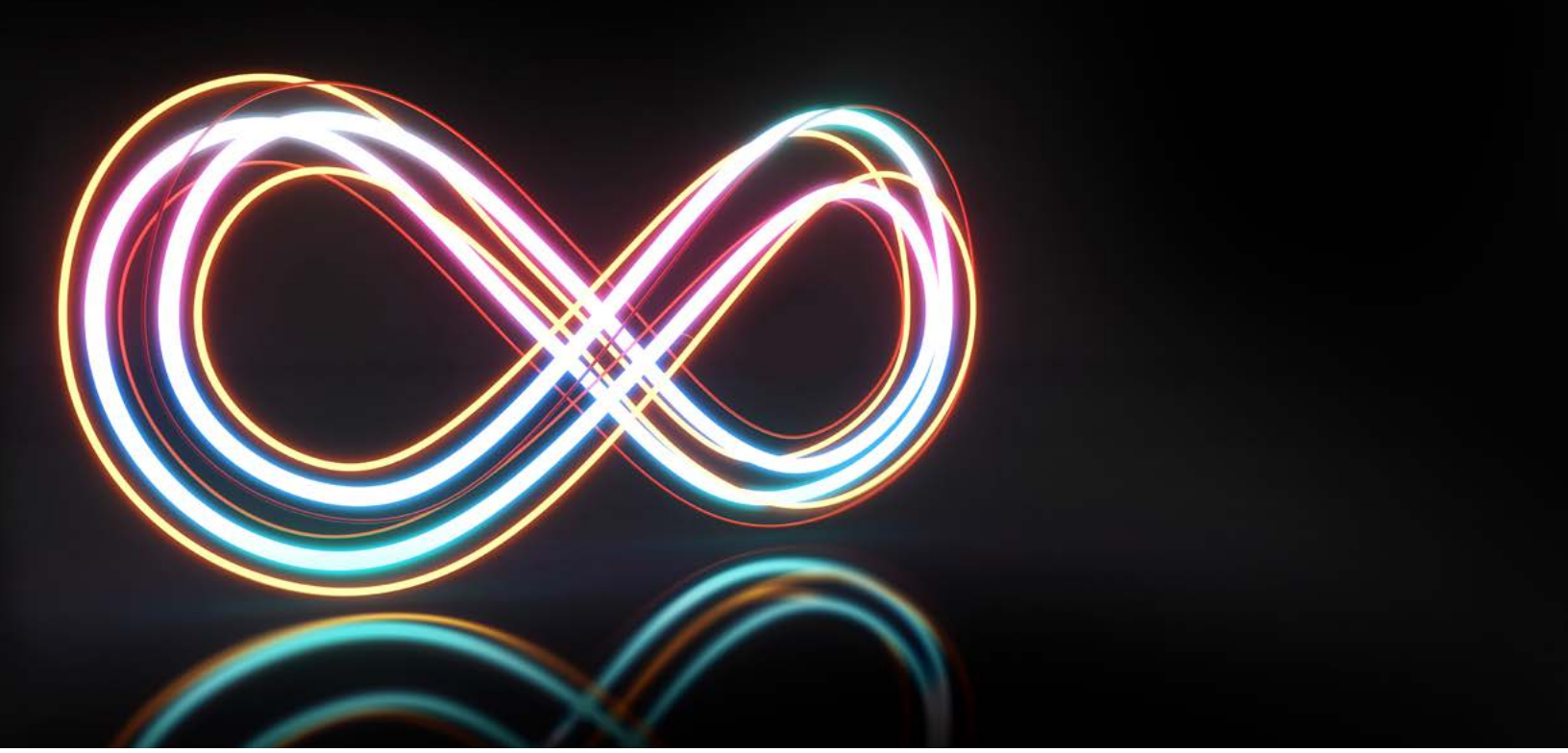
Back to Parulkar's comment that domain-specific LLMs were in the future—that comment came in an interview conducted in November last year. Fast forward to Mobile World Congress in February this year and Deutsche Telekom, e& Group, Singtel, SK Telecom and SoftBank announced the Global Telco AI Alliance; the companies plan to start a joint venture to develop telco-specific LLMs with an initial focus on digital assistants and chatbots. And, also to Parulkar's point about language support, the plan is for optimizations for Arabic, English, German, Korean and Japanese with more to come.

"We want our customers to experience the best possible service," Deutsche Telekom board member Claudia Nemat said in a statement. "AI helps us do that."

Beyond telco AI for telcos, there's a sub-theme playing out that corresponds to what we'd traditionally consider telco companies reaching deeper into various enterprises in an effort to expand market share by selling private networking, edge compute and other solutions. Nokia, which has seemingly led the charge into enterprise, ahead of Mobile World Congress trialed an industrial AI chatbot for its MXIE system, a 5G/edge bundle for industrial applications. This product taps the MX Workmate LLM which Nokia billed as the "first OT-compliant gen AI solution" according to the company. Following this thread, the industrial heavyweights presenting this week at the Hannover Messe industrial fair seem all-in on gen AI for industry.

Discussing MX Workmate, Nokia's Stephane Daeuble, who looks afters solutions marketing for the vendor's enterprise division, shared a perspective on the introduction of gen AI that, while focused on industrial enablement, is also relevant to telco AI and really to AI in general. "When we had this in our hands, we wondered what to do with it," he said. "Is it too early?…[But] we now have a solution that's greater than the sum of its parts. And equally, we always launch early. We were early with private wireless—back in 2011. People were like, 'What are you doing?' But we were right. This is the same, and it will take time. But if you don't start, it never happens."





(Image courtesy of 123RF)

VIAVI SOLUTIONS ON USING AI FOR TESTING AI, AND THE ROLE OF NETWORK DIGITAL TWINS

Operators, generally, are currently (and have been for some time) going through a number of significant transformations, chief among them the shift to cloud-native 5G Standalone and the disaggregation of hardware and software in the RAN. The idea is to build out a more efficient, future-ready platform that reduces costs while creating new avenues for service delivery and monetization. Then AI hit the scene.

VIAVI Solutions CTO Sameh Yamany, in a conversation on the heels of Mobile World Congress in February, noted that the complexity of increasingly automated modern networks has already prompted automation of the vital test and measurement processes VIAVI works on with its customers.

Referencing this confluence of complexity, Yamany said, "Adding in AI and integrating AI both on the network side and the services side and the cloud side, as well as the testing side, it introduces for us challenges and opportunities." AI-enabled use cases like network optimization, monitoring and troubleshooting all rely on operators' data, he said; that data "can be fed in real time to AI systems to help improve efficiency and availability." But before that happens, it all has to be tested. In addition to working on standardized AI models and test methodologies, Yamany said VIAVI is tapping AI to test AI.

"We talk about the concept of digital twin where you can actually use AI to build and mimic real world network conditions with all this complexity and facilitate the comprehensive testing across diverse scenarios," he said. Drawing on existing data sets and developing testing frameworks results in a solution that can "find patterns, anomalies, during the testing time and enable more coverage and quickly detect defects…[AI] can immediately generate these kind of 'what if" scenarios that we didn't see…or we never thought of before." In this sense, it's "AI testing AI."

As part of VIAVI's programmatic 6G research program, and in cooperation with Northeasterm University's Institute for Wireless Internet of Things and the Open6G research center, the company recently discussed work on a city-scale digital twin of a 6G network. This would support AI-based radio frequency propagation and channel modeling. One goal is incorporating higher-layer KPIs in the digital twin to accurately simulate how variability in network conditions impacts application performance.

Another aspect is testing neural receivers which VIAVI is doing using a unit developed in-house using open source libraries and proprietary data for the transceiver architecture. The company described it as follows: "The base station employs an AI-aided constellation design, where the modulation block is replaced with a neural network to design a customer constellation for the receiver. The…neural receiver is generalizable over various channel models and modulations, delay and Doppler, signal-to-noise ratio and other conditions, which is vital for deployment in practical systems."

VIAVI's Ian Wong said the work with Northeastern "has led to breakthroughs in the use of AI/ML for radio propagation modeling. We believe this research is critical in enabling large-scale network digital twins, which VIAVI is well-poised to deliver given our leading network emulation solutions in the lab and network monitoring and optimization solutions in the field, gathering data from actual operator networks."

Big picture, Yamany said, "Telcos are trying to explore how AI-driven solutions can optimize these network and edge resources and also offer applications specifically for AI-hungry… services and support innovative use cases. I think the integration of AI technology is enabling today a lot of telecom operators to address complex challenges, improve operational efficiency, and deliver innovative services for their customers. Everyone understands the value of AI right now. It's a buzzword but, at the same time, we're seeing good examples of how AI can help the network in general."

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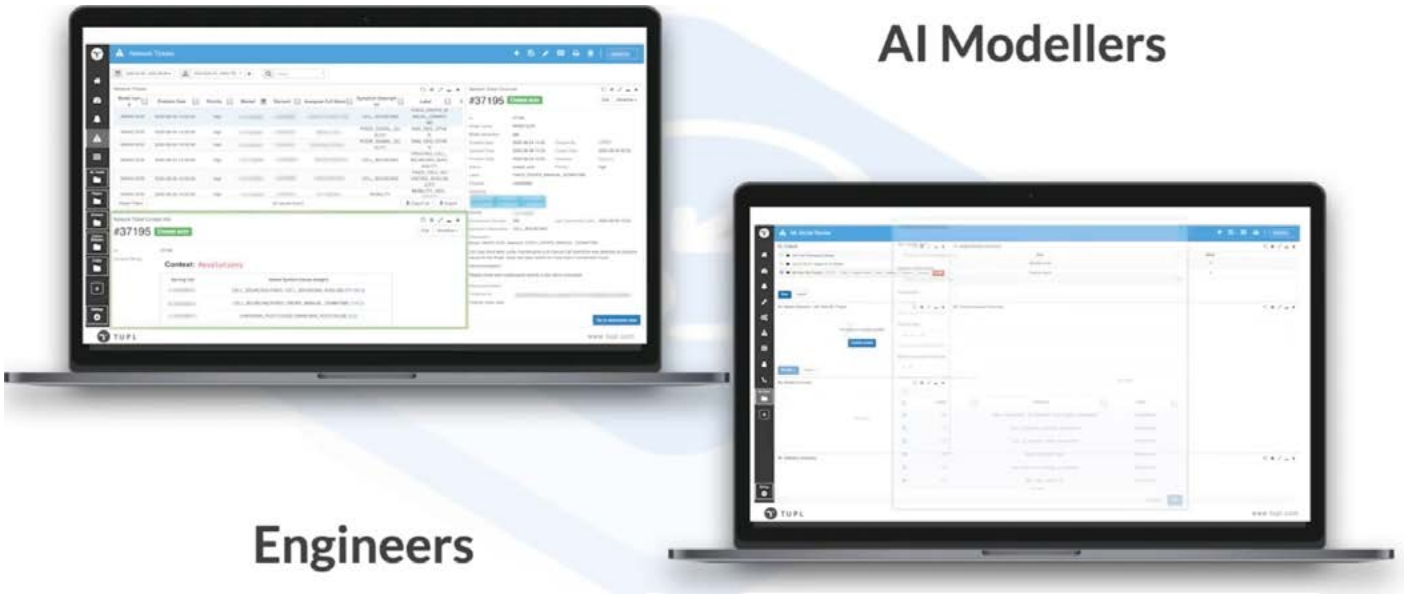

(Image courtesy of Tupl)

'AI IS A MEANS TO AN END'— FROM DATA AND ANALYTICS TO DECISIONS

Founded in 2014, Tupl—based on the mathematics term "tuple" meaning a type of ordered list—has focused on AI-enabled operations automation for teleco operators. In conversation with *RCR Wireless News*, CEO Petri Hautakangas made the important distinction between deriving insights from analytics and using that data-based insight to make a decision. "You can slice the analytics 100 different ways," he said. But, "It can create too much noise. You have to be reaching digitalized decisions."

In terms of telco AI products, Tupl has offerings for customer care and engineering and operations. For the latter, Hautakangas talked through Network Advisor which is designed to reduce time spent on manual tasks that sit with network engineers, things like monitoring performance, troubleshooting, cluster optimization, going through iterative processes to fix issues, and so on.

"Engineers, they have a high bar. They are responsible for network actions," he said. Hautakangas laid out a "chicken and egg problem" emerging due to increasing network complexity in a time when workforces are contracting and experts are retiring. "It's a fruitful area, looking at automation engineering work in a drastic way. We have seen a huge uptick in interest in this Network Advisor area."

In terms of how the solution is tailored to the needs of particular customer, including getting institutional knowledge from network engineers and putting it into a decision engine, Hautakangas emphasized the need to co-create models with Tupl customers. "It's always a customer-specific logic even though KPIs are the same," he said. "But the decisions are customer-specific. They drive it."

In the push to do this in a closed-loop fashion, the CEO gave the example of detecting an issue with radio performance, automatically detecting the root cause, then sending standardized information out to field operations staff who have everything they need to fix the issue in a single touch. "It'll take a while to go from open to closed loop," he said. "But I don't see resistance from the engineers to go to closed loop."

PETRI HAUTAKANGAS
CEO
Tupl

Beyond the Network Advisor solution, Tupl also has tools for automation of power savings, RF shaping, unified performance management and NOC automation. In terms of how operators are directing their telco AI spend, Hautakangas said the thinking is less about budget and more about addressing pain points in a manner with a clear ROI. "Everything should be paid in a few months time by savings generated, by efficiencies generated, by the system," he said. "We actually challenge our potential customers always, right after the kind of problem statement…let's look at the numbers. How big of a problem is this? Then we can figure out if this has legs for automation. Qualitative arguments don't fly."

Beyond telco, but also as a function of telco in some cases, Tupl has offerings for agriculture, healthcare, industry and utilities. The bigger picture here is telcos working overtime to develop enterprise business and attendant new revenue. Hautakangas said Tupl recently went through the first commercial implementation in Europe with a group of operators taking on agricultural process automation.

But regardless of the industry, "AI is a means to an end," Hautakangas said. "Analytics and insights don't bring too much value. The value comes from going beyond that to making decisions."

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ON THE PATH TO 6G, 'BEING CLOUD-NATIVE IS A REQUIREMENT FOR BEING AI-NATIVE'

Last year McKinsey and Company published a report titled, "The AI-native telco: Radical transformation to thrive in turbulent times." Lajous of McKinsey and Company acknowledged that being cloud-native, a pillar of 5G, is a requirement for being AI-native, part of the vision for 6G, and that today operators have yet to become cloud-native.

"The notion of having a cloud-native telco, I think, is part and parcel to having an AI-native telco," Lajous said. "And I think it's worth it to just anchor a little bit on how we came to this notion of AI-native. Which is to say, if we were to start a telecom company from scratch today, what would be the best way to put it together? And that's where we landed on the best way to put it together is by having AI at the core. And that means having AI assist essentially every decision and operating model, and a culture that embraces AI in order to do so, all the way from marketing and call centers to the network."

Doing that, he said, means "you need very deep technical architecture that goes with it. And the best way to do [that] is by bringing in the cloud. And so you do require cloud for the AI part of it."

Lajous continued by describing elements that operators need to put in place: modernization of network technologies in all domains, the move to 5G Standalone core, and OSS/BSS upgrades. That last one relates to actually provisioning, charging and consuming services on the cloud-native network. As to how this relates to AI as an enabler of data monetization, Lajous acknowledged that regulatory constraints, user opt-ins and other factors have kept operators from fully leveraging the highly personal, contextualized data available to them.

Back to this idea of starting a telecom company "from scratch"—that's not a luxury available to many and even modern cloud-native greenfield network builds like those undertaken by DISH Wireless in the U.S. and Rakuten Mobile in Japan have not translated into business success. Even so, the idea of becoming AI-native isn't really a prescribed future state, Lajous said, rather it's a "concept of how they need to be thinking about the future."

(Image courtesy of 123RF)

The NVIDIA of it all

As the undisputed leader in accelerated computing for AI, NVIDIA's telecom business is pitching its portfolio for near-term 5G-related use cases but it would seem the real focus is perhaps longer term. In the here in now, NVIDIA is working with operators, notably SoftBank in Japan, to inject AI into existing moves to cloud-native 5G and distributed, connected edge computing infrastructure. Combining AI with the radio access network (RAN) and distributed compute would allow for RAN-facing AI use cases like driving spectrum efficiency while also retaining the compute overhead to offer up AI-as-a-service.

NVIDIA's SVP of Telecom Ronnie Vasishta highlighted the scalability of the solution and the flexibility of a multi-use architecture as compared to "telecommunications networks [that] are built for a single purpose," which is supporting peak demand. "So you're over-provisioning the 5G network for peak demand. As new AI applications come in, that peak demand is going to grow, the power required to power this network is going to grow, the compute requirements for that network are going to grow," he said.

To address this, NVIDIA's concept is to take into account the delta between peak and average utilization, and put the difference to work by standing up "AI factories. In fact, Vasishta continued, "5G becomes a software-defined overlay within that datacenter and can be provisioned to the use requirements of the 5G network in an automated way. That means that even if you're running RAN at 25% of what you would've done in a proprietary network, you can run it at that rate and the rest of the datacenter is being used for AI…That's very easily said but it's difficult today," he acknowledged. But the vision remains: "5G now runs as a software-defined workload in an AI factory."

Thinking longer term, and back to our look at the role AI will play in the slow transition from 5G to 6G, at its big annual conference in March, NVIDIA announced a 6G Research Cloud platform, including its Aerial Omniverse Digital Twin 6G network simulator, a full software-defined RAN stack for real-time network programming, and the Sionna Neural Radio Framework which is a GPU-accelerated library for rapid complex system prototyping. That's a long way to say NVIDIA has a very robust 6G portfolio that leverages its core GPU technology and addresses a nascent, but valuable, market niche.

"The massive increase in connected devices and host of new applications in 6G will require a vast leap in wireless spectral efficiency in radio communications," Vasishta said. "Key to achieving this will be the use of AI, a software-defined, full-RAN reference stack and next-generation digital twin technology."

RONNIE VAISHTA
Senior Vice President, Telecom
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