

RCR Wireless News

INTELLIGENCE ON ALL THINGS WIRELESS

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What will the wireless workforce look like in 2030?

By Catherine Sbeglia Nin





Introduction: Supply can't keep up with demand

The evolution of 5G into a more open, software-defined and cloud-native network technology brings with it material changes in the types of skills connectivity vendors and providers need to design, build and manage networks. As a result, telecom companies are investing more heavily in re-skilling current employees while sourcing talent from new and different pools. Government funding, spurred mostly by the COVID-19 pandemic, is also contributing to a changing landscape in which building out fiber in underserved communities has taken center stage.

The wireless industry, though, is not just changing; it's also growing. Christine Machovec, an economist with the Bureau of Labor and Statistics (BLS)

told *RCR Wireless News* that this industry is projected to grow by 0.9% annually over the 2021-2031 period, faster than the 0.5% growth that the BLS projects for the total economy over the same period. "As the industry continues and completes 5G wireless construction of small cell infrastructure and looks forward to future advances in telecommunications technology, workers will be needed to construct, maintain and support customers in transitioning to new technologies," said Machovec.

These technology changes, coupled with the expansion of the wireless industry, points to one clear fact: The supply of qualified, skilled tech workers can't keep up with the demand. "The reality is every company has a wireless strategy; every company is undergoing a digital transformation of some sort;

every company can, in their industry, be a tech company," argued Nicki Palmer, chief technology ambassador at Verizon, suggesting that individuals in those critical talent pools — which include roles like systems engineers and integrators, fiber technicians and overwhelmingly, software engineers — are being sought after in nearly every single industry, from wireless to retail to healthcare, making them a hot commodity. "When you project out, I think we are underestimating the demand for these skills," Palmer cautioned.

This report explores some of the biggest technology trends impacting the wireless workforce, where some of the biggest gaps are and how industry players are responding. The report also explores the increasing efforts around diversity and inclusion in the telecom sector.



Image courtesy of Verizon

Open networks

Director of Wireless R&D and Chief Technologist at Corning Shirish Nagaraj explained that while the company is in full support of network disaggregation and has embraced open standards, this move does create notable challenges, particularly around systems integration. System engineering and integration, he said, has become front and center, and so has the need for employees that can oversee the harmonization between different network components.

“A lot more focus has to be put into systems engineering and integration,” Nagaraj said. “[It] has become even more important, especially when working with partners to bring together an entire system.”

And that ecosystem of partners is expanding, according to Vishal Mathur,

global head of engagement at Telecom Infra Project (TIP), who told *RCR Wireless News* that TIP, like Corning, wants to see increased adoption of open and disaggregated network solutions, but that TIP, again like Corning, recognizes the workforce challenge this transformation introduces. He explained that new vendors entering the market promotes healthy competition, creating choice and opportunity, but it also requires “a continued outside-in look at where the gaps are.”



Image courtesy of Telecom Infra Project (TIP)



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Shirish Nagaraj, Director of Wireless R&D and Chief Technologist, Corning

“When I say gaps, it comes down to when you break up telecom networks into a series of areas that all stack up together to create something brand new, then each of those areas become areas where there are new addressable markets — new hardware providers or software developers or new orchestration experts,” Mathur continued.

Open RAN recently gained notable federal support in the U.S. in the form of the \$280 billion CHIPS and Science Act, signed into law in August 2022. The bipartisan bill, approved

by Congress in late July, will channel \$52.7 billion into American semiconductor manufacturing and research efforts and billions more into federal scientific research & development (R&D). In addition to semiconductor manufacturing, the CHIPS Act broadly supports R&D and workforce development with \$13.2 billion set aside for these areas. But it also earmarked about \$1.5 billion for the acceleration of open architecture systems.

Mathur shared that TIP appreciates the government's attention to supporting a more open telecom ecosystem,



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Vishal Mathur, Global Head of Engagement, Telecom Infra Project

adding further that for TIP, workforce development is a key to its own view on how to drive a path to Open RAN in the U.S. market. “Within that, we made sure that we baked in the ideology of driving skills development as the ecosystem grows,” he said.

Despite the challenges it introduces, both Mathur and Nagaraj agree that open networking can actually be a significant advantage for someone just entering the industry because it allows for the development of different software, creating a sort of sandbox environment ideal for learning. “As long as it is facilitated in the right way, you can actually bring in more players and more individuals into that space to learn on the job, but also apply new solutions that they can take to market. It’s just a wonderful, complementary approach to upskilling and... commercial development of solutions that are needed in the market,” stated Mathur.

‘AI everything, automation everywhere’

5G Standalone (SA) deployments utilize a core network design aligned with cloud architecture. This architecture enables 5G networks to deploy new services at a larger scale and faster speed, and also requires extensive network automation and intelligence.

“Networks will be able to self-adapt,” explained Nagaraj. He added that moving forward, wireless engineers need to know basic machine learning

(ML) and artificial intelligence (AI) principles. Even those working on the hardware, because automation has to occur at every level of the network. “[Hardware] engineers will start to need to think about hardware as being software-defined and reconfigurable,” he said. “They need to embrace and learn about ML and AI technologies because that is the future.”

According to Mathur, as the technology itself continues down this path of more and more automation, it’s leading to a “brand new world” where the skill mix within the operator, vendor and systems integrator sectors is changing dramatically, but perhaps also converging with one another.

Verizon, recognizing this, conducted an in-depth analysis of the current workforce to help it project out what skills it might need in the future. According to Palmer, a handful of priority talent pools, informed by the trends in the industry, emerged. Those trends, she said, include self-optimization networks and the move toward “AI everything, automation everywhere.” Some of the skill sets that began to show themselves as a result included a “deep knowledge” of cloud, data analytics and AI and security. When it comes to security, Palmer clarified that this knowledge of security must include “all shapes and sizes — not just core network security but thinking about it across the lifecycle... including the products and services that you offer.”

Is software engineering the biggest gap of all?

The flexibility 5G enables requires a similar level of flexibility in the underlying network infrastructure. Proprietary, single-purpose hardware is giving way to general-purpose hardware running virtualized network functions. The basic idea behind network virtualization is to decouple software from hardware, and to run network functions, like a firewall or encryption, for instance, on virtual machines (VMs). This allows operators to lower capital and operational expenses while also gaining dynamacy in capacity provisioning, spectral resourcing and service management.

However, such a drastic change, argued Nagaraj, completely changes how code is developed and written. “There is a lot of retraining of our existing workforce to get up to speed on cloud technologies and how to not only develop code and write software, but also the deployment engineers have to be familiar with cloud technologies,” he said.

As a result, software development is one of the areas being most impacted by the changing wireless industry, and where one of the most glaring gaps is emerging. According to the BLS, 1.2 million software engineer roles in the U.S. are to remain unfilled by 2026, and the US Labor Department estimates that the global shortage of software engineers may reach 85.2 million by 2030.

Telecom companies are exceedingly aware of this need. “Do we have that talent today?” Verizon’s Palmer questioned. “There are pockets within our organization in those critical job families where it is difficult to hire today. I’m not talking about fueling our growth ambitions for talent for the future; I’m talking about today. We have businesses that are 100% software, and that talent is highly sought after.”

She was careful to dispel an idea that is becoming popular in some circles, which suggests that because of the headline-grabbing layoffs occurring at big tech companies like Microsoft and Meta, this is no longer a problem. “We

can just go hire them, every company is saying that,” said Palmer, adding that this simply isn’t the case. Here, we return to her earlier comment about the fact that every company is a tech company, from Verizon itself to Walmart, and therefore, they are all looking to hire individuals with technical and software engineering skills. The demand for these skills, she summed up, is off the charts.

Verizon is not the only one feeling pressure from this growing skills gap. Vodafone in 2021 announced plans to add nearly 7,000 software engineers to its workforce by 2025 as part of its increased investment to meet surging demand for digital connectivity.



Its software engineer recruitment efforts, said Vodafone, will “complement the existing 9,000 employees already working in this area.”

“Obviously, that then leads to the conversation of supply and demand,” Elizabeth Rumsey, senior global product manager at Vodafone Business, acknowledged in a conversation with *RCR Wireless News*. “It’s not like all of these people are sitting around without jobs, so how do we fill those roles?”

She explained that Vodafone has launched a brand-new program in which the company internally reskills its current employees to train up as software developers. “You’ve got the angle of going out into the external market, bringing in those skills you didn’t have before, but the thing I really like is retaining people that are already part of the company and the culture,” she said. Externally, she continued, software recruitment efforts are centralized around Vodafone’s two new skill hubs, located in Malaga, Spain and Dresden, Germany.

“Vodafone is rapidly shifting up the gears to support the dramatic digital transformation that businesses and society are undergoing,” Johan Wibergh, chief technology officer of Vodafone, said in 2021. By 2025, the operator anticipates that more than 50% of its employees will work in software engineering. Vodacom, part of Vodafone Group, also adopted a similar strategy, said the company.



Image courtesy of Corning

How is rural broadband funding impacting the telecom workforce?

The Covid-19 pandemic put the need for more ubiquitous broadband front and center as those lacking adequate connectivity struggled to make the necessary shift to online work, school and personal connection. In response, the U.S. government earmarked billions of dollars for various aspects of broadband deployment, through various legislative efforts that include, but are not limited to, the Rural Digital Opportunity Fund, The American Rescue Plan and the \$2 trillion Coronavirus Aid, Relief, and Economic Security (CARES) Act.

“The government has shifted a lot of funding in the last few years,”

confirmed Baicells CTO Jesse Raasch. “There is a bigger shift towards fiber rollouts [from wireless]. There are still gaps out there, but with the government’s attention and the new technology that’s there, it’s starting to slowly change.”

This is great news because cost is one of the biggest barriers to closing the digital divide — it is simply too expensive to put in the infrastructure that the return on investment takes too long or is simply non-existent, network operators have said. However, with the sector now flushed with cash, another challenge has emerged: finding the fiber technicians to do the job.

“The continued push for increased broadband access to underserved areas is resulting in workforce need for



Image courtesy of Corning

buildout of physical internet connections, especially during the COVID-19 pandemic and its spotlight on home internet use,” commented the Bureau of Labor and Statistics’ Machovec. “5G and broadband expansion to underserved areas of the country have spurred current demand for telecommunications line installers and repairers and telecommunications equipment installers and repairers [as] government investment in the telecommunications sector has supported construction of broadband and mobile internet connections.”

The number of jobs in the U.S. in 2021 that fall under the category of telecommunications equipment installers and repairers was 178,000,

stated the BLS. The agency expects the numeric change in employment from 2021 to 2031 to be 14,000 in this sector. Research firm Zippia took a closer look at fiber optic technicians specifically and concluded that as of September 2022, there are more than 23,625 fiber techs currently employed in the U.S.

This likely isn’t enough. “It is a pain – you talk to any operator big or small, finding workers is the hardest thing,” said Raasch. “At this point, getting the grants and the funding is easy.” He added that in addition to funding at the federal level, each state also has local funding available. “Pretty much any operator that’s in the ISP business has been getting some funding, so

then it’s just a matter of finding the workers and we hear the complaints all the time. There is a constant demand, and funding doesn’t exactly solve that issue.”

For many in the industry, then, the focus has become fiber tech training. AT&T and Corning Incorporated, for instance, jointly created a new training program that aims to equip thousands of technicians and network specialists with the skills related to the design, engineer, installation and management of fiber broadband networks. The program, called the Fiber Optic Training Program, includes training on optical fiber and networking, network design, hands-on splicing, connectorization, field construction for cable deployment, testing, and system turn-up. The



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Jesse Raasch, CTO, Baicells

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training program will also include network system lab visits, and technician ride-alongs.

In a blog post, Jeff Luong, president of Broadband Access and Adoption Initiatives for AT&T, discussed this need further: “Highly trained workers are needed and needed quickly. There is a surge in network building across the U.S. as the private sector is investing heavily in broadband. For example, AT&T’s capital investment for 2021 totaled \$21.6 billion, with much of it dedicated to fiber and 5G. In addition, local governments are contracting with the private sector to build out broadband connectivity. These local officials are taking advantage of tens of billions of federal dollars available to build networks.”

Corning’s Nagaraj explained to *RCR Wireless News* that the company is focusing on fiber-based networks because it’s the one medium that can deliver the kind of throughput and latency necessary for the various applications 5G makes possible. “But many of the workforce and technicians that are used to doing it with copper-based technologies now have to [know] fiber-based technology. We have identified this challenge... so we are investing heavily on trying to bring up that kind of fiber knowledge in the general workforce, but also in the wireless workforce [because they] are not used to dealing with fiber-based transport,” he said.

D&I: Broadening the definition of diversity, and finding other routes into telecom

As the industry looks ahead to 2030 and how the evolving workforce might take shape, there is growing emphasis being placed on diversity and inclusion, because it’s the right thing to do, but also because it’s good for business.

“To illustrate to you just how important Verizon thinks this is, I’ve been in this role for not quite a year, and it was formed precisely to work on these issues,” Palmer shared. She went on to explain that Verizon had already been implementing “tons” of new programs and strategies around diversity, but like much of the telecom sector, continued to find that it wasn’t enough: “There are a few things we know: We know the work is changing, dramatically; we know that as good as we are, we are nowhere near where we want to be [with diversity].”

Her role, then, is to take a serious look at the trends, technical and otherwise, and model out the numbers to help Verizon meet its workforce goals, including those around diversity and inclusion. “The broad trends are really showing themselves, but when you couple those trends with the trends that we see in women and diversity in STEM and what’s happening with tech talent generally, to me, it evolves into almost a crisis situation if you believe that you really need—not just



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Nicola Palmer, Chief Technology Ambassador, Verizon

want—a diverse workforce to usher in all of the revolutionary stuff,” she said.

Nagaraj agreed. “It’s the way to get innovation going,” he said of diversity. “Everyone comes to the table with different ideas, whether it’s designing new systems or testing in the labs or even deploying these systems. Diversity is a critical value for us, and it gives us a competitive edge.”

But even as companies actively work to change their workforce balance, looming gaps around gender and race still exist. According to Zippia’s latest data, for instance, only 12.3%



Image courtesy of Verizon

of telecommunications engineers in the U.S. are women. Further, 64.5% of all workers with this job title are white. Women fair slightly better when it comes to the role of telecommunications analyst, where 36.7% are women, according to Zippia. Again, though, over 60% of those in this role are white. When you look at roles out in the field, the gender discrepancy becomes even more glaring: A shocking 94.4% of telecommunications installers are men.

Previously in this report, the serious need for software engineers in the telecom, and tech space more broadly, was explored. However, current numbers suggest that women and people of color stand to miss out on becoming part of this highly sought-after workforce. The Zippia data shows that only 22% of software engineers in the U.S are

women. And when it comes to race, 34% are Asian, 8.1% are Hispanic or Latino, while a mere 4.4% identify as black or African America and another

devastating .2% are American Indian or Alaska Native.

In response, at least to the gender gap, programs like Vodafone's Code Like a Girl program, which offers coding courses to young women, are growing in popularity around the world, as are other efforts that foster an interest in STEM fields more broadly within underrepresented groups. Such programs aim to tackle the fact that young girls, when compared to their male counterparts are overwhelmingly more likely to believe they are not good at STEM subjects, even though research suggest they often perform better on exams. According to findings published in 2019 by England's Department for Education, 60% of boys cited one of the STEM subjects as their best, while just



Image courtesy of Vodafone

In 2017, 500 girls across Vodafone's 26 markets were taught to code as part of the carrier's Code Like a Girl program

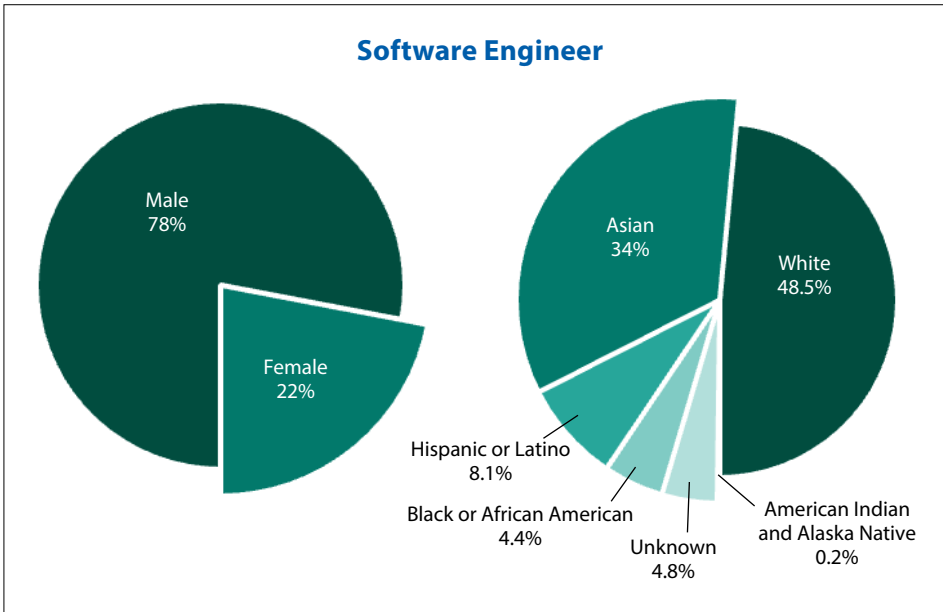


Image courtesy of Zippia



“Education and life-long learning is becoming even more important because everything is evolving so fast, so whatever you know when you join the industry, you’re going to have to continue to upskill over your career.”

Elizabeth Rumsey, Senior Global Product Manager, Vodafone Business

33% of girls did the same.

While much of these efforts focus on gender diversity, Rumsey has seen that definition of diversity evolve over her 10 years at Vodafone Business. She commented that initially, diversity in the telecom space almost exclusively referred to gender diversity. “We had our target to get to 30% women in senior manager and above roles, which we met. Now there are a lot more goals around cultural diversity and a lot more activity, internally, is around neurodiversity for things like ADHD and dyslexia.”

Another major workforce shift, according to Rumsey, is that telecom companies are embracing “other routes” into the industry via things like apprenticeships and graduate programs. It is new perspectives such as these that represent the perfect intersection

of the networking and technology trends mentioned above — all which require a new level of workforce agility and reskilling — and the push to make telecom careers more accessible. “Education and life-long learning is becoming even more important because everything is evolving so fast, so whatever you know when you join the industry, you’re going to have to continue to upskill over your career anyways, especially as we’re living and working longer. It’s more about continuous learning, not the formal certification when you’re twenty-something years old. It’s taking a more diverse view of how to assess those things,” Rumsey summarized.

Mathur also connected the dots between the tech trends and the diversity trends, commenting: “You think about how the industry is changing

and there is a real paradigm shift in the way network engineering works all the way from how students are taught and who is brought on board and enrolled in universities. I would hope to see real government and industry action towards driving forward a balanced workforce.”

He also shared that TIP is finding that diversity and inclusion is high on the list for nearly every operator, vendor, integrator and government it speaks with. “Gone are the days of this being a man’s



world,” argued Mathur, adding that instead telecom is becoming a world for whoever wants to be here. “And this can be a force of nature in driving this industry forward,” he said.

Conclusion: ‘Standing the test of time’

When taken together, the transformations hitting the telecom workforce require the breakdown of the traditional knowledge silos that have long plagued the industry.

“Silos could have been an okay thing in the past when things were vertically integrated from the same vendor; it’s no longer a possibility now,” argued Nagaraj, elaborating that with all of these disaggregated components being integrated together, it has become essential for network operators to encourage cross training and knowledge

sharing between its employees and business units. “Look at a typical [software] development engineer — if that person doesn’t know exactly how these different components are coming together and getting deployed in the field, they won’t be able to understand how to even develop the code.”

The idea of creating a workforce in which every employee has basic knowledge of the cloud, or security, or automation can feel like a big task for companies and a big ask for employees. And it is. But Palmer believes it’s achievable. “We are so interconnected today in the networks that the effects of a single action can be very far reaching. It’s more important to be able to work together and communicate and understand the breadth of what we’re working on. It’s hard, but I think it’s achievable. I mean, we thought 4G

was hard, we thought putting a core network together was hard. I’m a big believer that we can get there,” she offered.

Finally, looking ahead to 2030 means thinking about the next generation of networks and what else might be coming down the line. Nagaraj, however, feels strongly that the workforce changes being put into place now are setting the foundation for future network evolutions. “How we are training our workforce today will, I think, stand the test of time,” he said. “A lot of the fundamentals we are putting down now will carry forward to 6G, especially on the network automation side. Beyond 5G, networks will need to embed even more intelligence into themselves — the principles and how we are training our workforce today will, I think, stand the test of time as we evolve.” (☞☞)

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