

WHITEPAPER

# 5G Deployment Reality

The stats, challenges, solutions & everything in between

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# EXECUTIVE SUMMARY

To understand the current state of global 5G network deployments, Fierce Wireless conducted a survey of wireless industry network professionals, involved in the planning, design or deployment of the 5G network, in mid-2021. While the survey was fielded to MNOs across the globe, over 50 percent of the respondents were located in North America. Seventy five percent of respondents said their network was still being deployed or had been deployed, or that commercial 5G service had already been launched. And two thirds of respondents said that their MNO would have deployed 5G before the end of 2021 (two fifths said they deployed before the end of 2020) and another 20 percent said they expected deployment sometime in 2022.

The survey also asked the MNO respondents to identify and rank the top issues that impacted the speed at which MNOs are deploying 5G network equipment. While many of these issues are dependent on local market conditions, many factors can be improved by the MNOs themselves. Similarly, some factors, such as the availability of new spectrum, will likely take some time to address and improve.

But there are many other issues that can be addressed by the MNOs with careful network design, planning and vendor selection. For example:

- **Front/mid/backhaul:** All modern cell sites require fronthaul, midhaul and backhaul, provided with either a fiber or microwave wireless link, as long as sufficient bandwidth at low latency is available. The issue with fiber is one of cost but wireless backhaul uses existing wireless bands to provide a broadband, low latency connection suitable for both fronthaul and backhaul. Aside from faster network deployment and reduced operational costs, wireless front/backhaul with MIMO shows a 61 percent capex savings compared to fiber (source: Ceragon).
- **Ability to get cell sites:** Since 5G tends to use higher frequency bands than previous generations, the signal propagation is lower and hence the cell site covers a smaller area. The benefit is that the overall capacity of the 5G network increases, but this of course requires more physical cell sites. If an MNO can upgrade the backhaul links on a cell site to increase capacity without visiting the site, changing the equipment or adding additional equipment, then some of the zoning and permissions process necessary for a new or upgraded cell site may be avoided. This would then reduce the time taken to deploy the network and thus get to commercial service faster.

- **Space on towers:** Since 5G networks support higher bandwidth to each user, the front- and backhaul capacity required in the cell is higher than for 4G. If wireless front- and backhaul is being used, this may mean additional and/or larger equipment to provide the necessary capacity. Ceragon's solution to this problem enables a second channel for front- or backhaul on the same microwave radio – multi-core. The result is double the capacity using the same radio, saving on equipment costs and installation, as well as the space on the tower. Ceragon has shown a 30 percent capex reduction.
- **Skilled labor issue:** This factor was identified as a major issue in the 5G network professional survey. The solutions to this problem are varied but take time to implement and can be expensive. The choice of 5G network equipment can ease this problem – if current network equipment can be upgraded to support 5G or a cell site visit is avoided by upgrading capacity remotely, then the need for skilled labor is reduced and the installation resources can be used elsewhere. Some vendors also provide additional software tools that reduce the required skills of the installer.
- **Financing:** The new Open RAN initiatives and disaggregations help the MNO to manage its spending on new equipment. If previously the MNO bought a full wireless solution with radio and indoor units from a single vendor and then added an additional CSR from a big routing company, disaggregation now allows source the radio from their preferred vendor, add a whitebox to replace both the IDU and CSR and then load the preferred NOS to meet the MNO's exact requirements, and a centralized radio management application to perform the task of the traditional IDU HW.

There are many issues MNOs are facing deploying 5G networks. Global deployment of 5G networks is far from complete – many MNOs are either starting their deployments now or are still in the planning phases. And once the initial 5G network deployment is complete and commercial service is launched, additional 5G capacity will have to be added as the subscriber base grows.

*The MNOs can ease 5G network deployment through careful network design and equipment and vendor selection, as this paper discusses.*



# INTRODUCTION

The majority of MNOs have either launched their first 5G commercial services or are in the process of deploying networks. As part of the research for this paper, Fierce Wireless conducted a global survey of MNO network professionals to understand the current state of 5G network deployment around the world.

Of the network professionals surveyed, 56 percent said that their MNO had already launched 5G commercial services, while just six percent said they had no plans as yet for 5G network deployment. The remainder were in the process of planning

or deploying their 5G networks but had yet to formally launch commercial service.

The survey showed that there are many issues MNOs are facing deploying 5G networks, from limited space on existing cell sites for new equipment to limited spectrum and local or regional regulations limiting the deployment of new cell sites.

This paper discusses the impact of some of those 5G network deployment issues and how the impact can be lessened through careful network design, equipment reuse and vendor selection.



# THE REALITY OF 5G DEPLOYMENTS

To understand the current state of global 5G network deployments, Fierce Wireless conducted a survey of 100 wireless industry network professionals between April and June 2021. The survey was conducted online and asked a series of questions to determine the current state of 5G network deployment for that particular MNO.

The first chart below shows the survey respondent's department – note that the survey was only completed by industry professionals involved in the planning, design or deployment of the 5G network.

The survey was fielded to MNOs across the globe, but over 50 percent of the respondents were located in North America (figure 2).

The survey also asked about the current state of 5G network deployment (figure 3) – note that just six percent said their

Figure 1: Respondent department

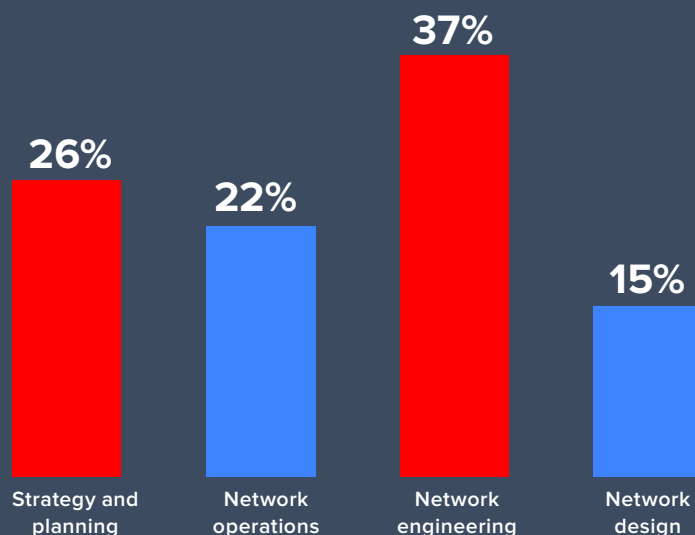
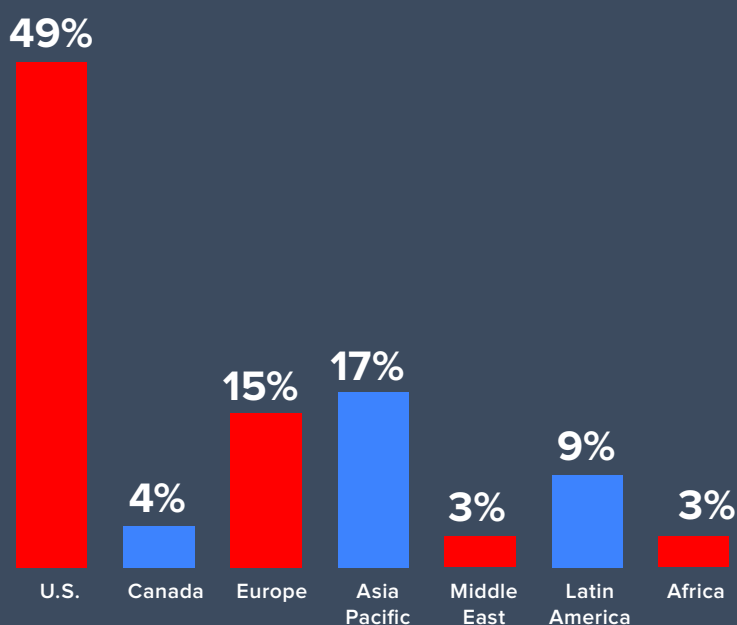


Figure 2: Respondent geographic region



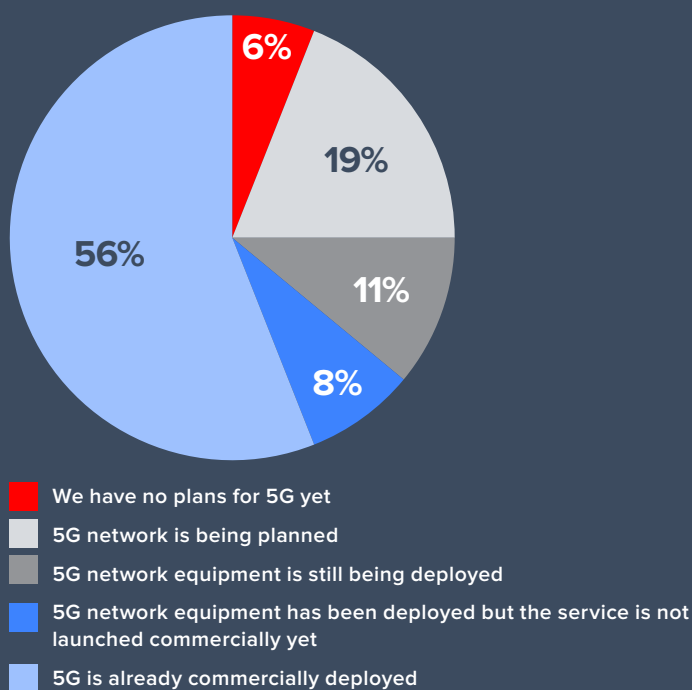
Source: Fierce Wireless MNO 5G Deployment Survey, 2021

MNO had “no plans for 5G yet” and just 19 percent said that their “5G network was still being planned.” The remaining three-quarters of respondents said their network was still being deployment or had been deployed, or that commercial 5G service had already been launched.

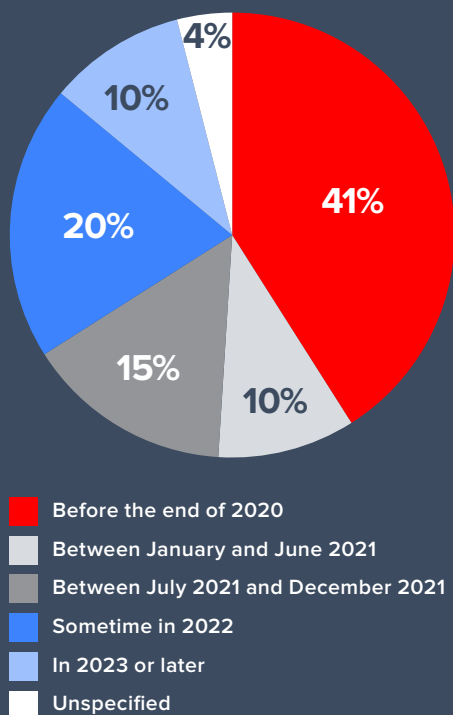
Figure 4 shows the current 5G deployment timeframes from the survey. Two thirds of respondents said that their MNO would have deployed 5G before the end of 2021 (two fifths said they deployed before the end of 2020) and another 20 percent said they expected deployment sometime in 2022. Only 14 percent said they expected deployment in 2023 or later, or did not specify a timeframe.

The survey also asked the MNO respondents to identify and rank the top three issues that impacted the speed at which MNOs are deploying 5G network equipment. The figure below shows the ranking of the various items (ranking based on the sum of first, second and third places with points for each place).

*Figure 3: Respondent 5G Deployment Status*



*Figure 4: Respondent 5G Deployment Status*



Source: Fierce Wireless MNO 5G Deployment Survey, 2021

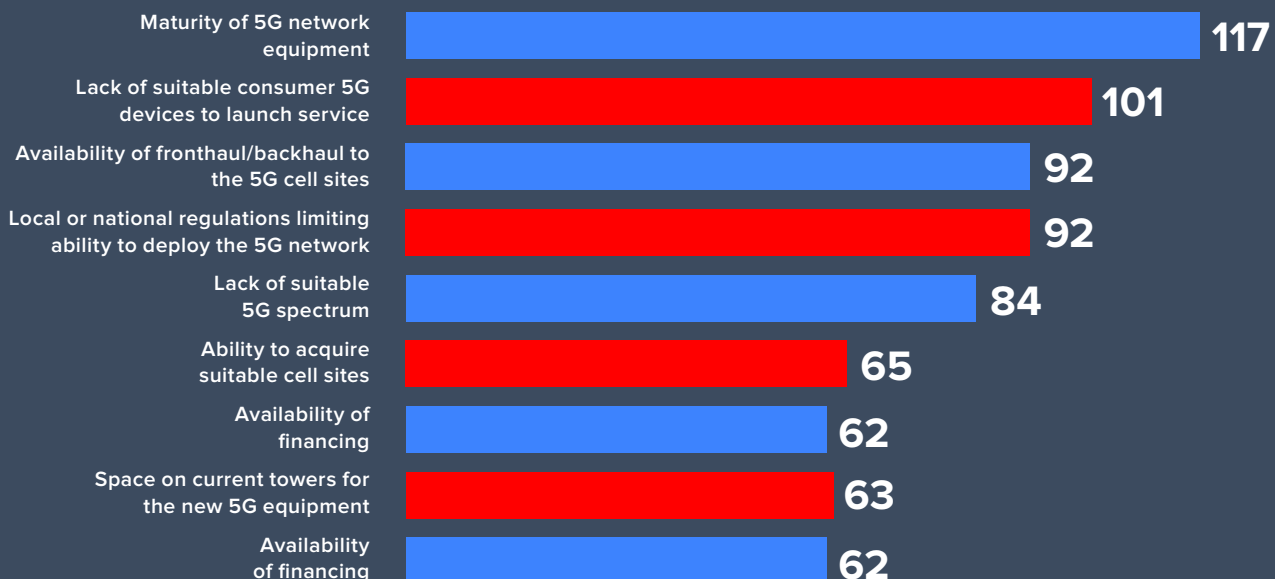
The main 5G deployment issues in ranked order are:

- Maturity of 5G network equipment
- Lack of suitable consumer 5G devices to launch service
- Availability of fronthaul/backhaul to the 5G cell sites
- Local or national regulations limiting ability to deploy the 5G network
- Lack of suitable 5G spectrum
- Ability to acquire suitable cell sites
- Space on current towers for the new 5G equipment
- Availability of financing
- Availability of skilled labor to deploy the 5G network
- Other.

While many of these issues are dependent on local market conditions (such as the availability of skilled labor – obviously this varies by country and region), many factors can be improved by the MNOs themselves. For example, having space available on current towers for new 5G equipment can be improved by careful selection of the network solution and planning to incorporate the current network and the new 5G service in the same equipment.

Similarly, some factors will likely take some time to address and improve. Governments, for example, typically take years to identify and auction new spectrum. And typically, new spectrum, especially for 5G, is expensive for the MNOs to acquire.

**Figure 4: Respondent 5G Deployment Status**



Source: Fierce Wireless MNO 5G Deployment Survey, 2021



# OPTIMAL MARKET SOLUTIONS TO THE TOP 5G DEPLOYMENT CHALLENGES

While some factors impacting the deployment of 5G services are outside the MNOs control (or very difficult to influence), many other issues can be addressed by the MNOs with careful network design, planning and vendor selection – some of these issues are discussed in this section.

If the MNO is able to address these network deployment issues, 5G services will be available sooner and to more of the licensed coverage area. This results in faster time to revenue and an improved ROI on the 5G network investment for the MNO.



## Front/mid/backhaul

All modern cell sites require fronthaul, midhaul and backhaul – in a 5G network, these connections are:

- Fronthaul provides the broadband connection from the radio (RRU) to the distributed unit (DU)
- Midhaul is typically the connection between the DU and the centralized unit (CU)
- Backhaul provides the broadband connection from the CU back to the 5G core

Front/mid/backhaul can be provided with either a fiber or microwave wireless link, as long as sufficient bandwidth at low latency is available. The issue with fiber is one of cost – it is expensive to deploy both due to the labor required to trench and lay the fiber, but also the planning and zoning permissions needed to trench, etc.

If fiber is already available at the cell site, this can obviously be used for front/mid/backhaul. But if no fiber is available, or additional fiber capacity is needed, new fiber must be installed – this significantly increases the expense of installing 5G, as well as increasing the time-to-market.

Wireless backhaul uses existing wireless bands (including MWave, E-Band and Vband) to provide a broadband, low latency connection suitable for both fronthaul and backhaul. Since a physical cable is not required, there is no need to trench the street or highway – all of the equipment is mounted on the cell site.

Wireless connections can support the high bandwidths needed for front/mid/backhaul. For example, an Eband connection can support up to 20 Gbps (with channels up to 2,000 MHz) and new microwave equipment use wide spectrum bands (224 MHz) to provide 4 Gbps or 8 Gbps in a small physical form factor.

Aside from faster network deployment and reduced operational costs (no long-term fiber leases), wireless front/backhaul with MIMO shows a 61 percent capex savings compared to fiber (source: Ceragon). This comparison is between a 10Km fiber connection (\$17,750 for the fiber installation and \$15,000 for the Mux equipment) compared to a 4x4 MIMO wireless solutions (equipment with a 2-foot antenna at \$8,500 and installation cost of \$4,100).

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## Ability to get cell sites

The ability of the MNOs to acquire new cell site locations for 5G was highlighted as an issue in the survey of MNO network professionals. While the current cell sites would certainly be upgraded during a 5G network deployment, densification means that additional cell sites are typically needed for 5G. Since 5G tends to use high frequency bands than previous generations (including mid-band and mmWave frequencies), the signal propagation is lower and hence the cell site covers a smaller area. The benefit is that the overall capacity of the 5G network increases, but this of course requires more physical cell sites.

The ability of the MNO to install a new cell site is regulated by local or regional government (depending on the geography). As the use of mobile services has increased and more cell sites have been deployed, regulators have realized there is a revenue opportunity (planning and zoning fees, for example) and many citizens have become concerned (few people want a cell tower with the associated antennas and radio equipment behind their house). This has resulted in long lead times to get approval to build a new cell site, even a small cell (it is not unusual in the U.S. for the planning and zoning process to make more than two years).

Note that deploying a cell site is not just dependent on the radio and antennas on the tower or pole – equipment at ground level is also subject to zoning restrictions. And future modifications and upgrades (depending on the extent of changes that need to be made) may also be subject to zoning approval – this may apply to the upgrades from 4G to 5G network equipment for example.

If an MNO can upgrade the backhaul links on a cell site to increase capacity without visiting the site, changing the equipment or adding additional equipment, then some of the zoning and permissions process may be avoided. This would then reduce the time taken to deploy the network and thus get to commercial service faster. Ceragon's multi-core, all-outdoor microwave radios are good example of such a solution – instead of requiring an additional, split-mount radio to increase the backhaul capacity, Ceragon's solution can be upgraded remotely (without a site visit / without rolling a truck) and using the same radio (no additional boxes on the cell site). This results in an 83 percent TCO savings and 100 percent reduction in time-to-market (source: Ceragon).

## Space on towers

Deploying a new network technology, such as 5G, often requires more space on the tower – simply, there are more boxes (antennas, radios, front/backhaul) to put up. If the 4G equipment is relatively new, it may be software-upgradeable to support 5G. But if space is limited on the tower and the 4G equipment is older, new network equipment may have to be installed that supports both 4G and 5G protocols.

Since 5G networks support higher bandwidth to each user, the front- and backhaul capacity required in the cell is higher than for 4G. In short, a bigger pipe is required from the cell site back into the rest of the network to carry the 5G traffic. If wireless front- and backhaul is being used, this may mean additional and/or larger equipment to provide the necessary capacity.

Ceragon's solution to this problem enables a second channel for front- or backhaul on the same microwave radio – multi-core. The result is double the capacity using the same radio, saving on equipment costs and installation (no site visit is required to enable the second channel), as well as the space on the tower (lower operational costs for tower leases). Thus, the necessary front/backhaul capacity could be enabled to support a 5G network without significant additional investment. Ceragon has shown a 30 percent capex reduction, with savings of approximately \$2,600 per link.



## Skilled labor issue

The shortage of skilled wireless installation crews is a problem in many markets, either due to a shortage of qualified labor or to the demands being put on existing crews to install more 5G equipment. This factor was identified as a major issue in the 5G network professional survey. The solutions to this problem are varied (including more training) but take time to implement and can be expensive. In the meantime, many MNOs are facing delays to getting their 5G network deployed.

The choice of 5G network equipment can ease this problem – if current network equipment can be upgraded to support 5G (for example, by using the same front/backhaul equipment) or a cell site visit is avoided by upgrading capacity remotely, then the need for skilled labor is reduced and the installation resources can be used elsewhere. Note also that some vendors provide additional software tools that reduce the required skills of the installer. An example is Ceragon's Ceraplan which enables the creation of the installation file in advance which the installer then simply loads into the system. Artificial intelligence can also be used in the management plane of the wireless backhaul solution to help the MNO identify a faulty site, even before it fails completely and causes an outage.

## Financing

The new Open RAN initiatives and disaggregations help the MNO to manage its spending on new equipment. The MNO can pick and choose the right DU hardware and software, and the right RU vendor, and mix and match between all. Similarly, the disaggregation of the wireless equipment for transport into hardware/software/radio allows the MNO to choose the optimal solution based on their needs without locking in a single vendor. If previously the MNO bought a full wireless solution with radio and indoor units from a single vendor and then added an additional CSR from a big routing company, disaggregation now allows source the radio from their preferred vendor, add a whitebox to replace both the IDU and CSR and then load the preferred NOS to meet the MNO's exact requirements, and a centralized radio management application to perform the task of the traditional IDU HW.

*[If] a cell site visit is avoided by upgrading capacity remotely, then the need for skilled labor is reduced and the installation resources can be used elsewhere. Some vendors provide additional software tools that reduce the required skills of the installer.*

# SUMMARY

As the survey conducted for this paper shows, there are many issues MNOs are facing deploying 5G networks. Global deployment of 5G networks is far from complete – many MNOs are either starting their deployments now or are still in the planning phases. And once the initial 5G network deployment is complete and commercial service is launched, additional 5G capacity will have to be added as the subscriber base grows.

Many of the issues MNOs face can be addressed by careful network planning, the reuse of existing network equipment and selection of a vendor that can provide cost-effective, scalable solutions. As we have discussed, these strategies can result in significant capital operational expenditure savings.



**Ceragon Networks Ltd.** (NASDAQ: CRNT) is the global innovator and leading solutions provider of 5G wireless transport. We help operators and other service providers worldwide increase operational efficiency and enhance end customers' quality of experience with innovative wireless backhaul and fronthaul solutions. Our customers include service providers, public safety organizations, government agencies and utility companies, which use our solutions to deliver 5G & 4G broadband wireless connectivity, mission-critical multimedia services, stabilized communications, and other applications at high reliability and speed.

Ceragon's unique multicore technology and disaggregated approach to wireless transport provides highly reliable, fast to deploy, high-capacity wireless transport for 5G and 4G networks with minimal use of spectrum, power, real estate, and labor resources. It enables increased productivity, as well as simple and quick network modernization, positioning Ceragon as a leading solutions provider for the 5G era. We deliver a complete portfolio of turnkey end-to-end AI-based managed and professional services that ensure efficient network rollout and optimization to achieve the highest value for our customers. Our solutions are deployed by more than 400 service providers, as well as more than 800 private networks, in more than 150 countries. For more information please visit: [www.ceragon.com](http://www.ceragon.com)