Advanced Private Wireless Forecast:
5G and WiFi 6E

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WIRELESS WATCH

Executive Summary

Companies mentioned: America Movil, AT&T, Audi, Bell Canada, Bharti Airtel, BMW, Bosh, Celona, China Mobile, China Telecom, China Unicom, Conexio, Deutsche Telekom, Ericsson, Ford, Fujitsu, General Motors, Gree Electric, GSMA, Hitachi Kokusai, Huawei, Juniper Networks, Kacht, KT, LG U+, Ligado Networks, LS Telecom, Lufthansa, Mercedes-Benz, Millicom, Nokia, NS Solutions, NTT Data, Omron, Qualcomm, Porsche, Rakuten Mobile, Reliance Jio, Siemens, Schneider Electric, Sharp, SK Telecom, STC, Telefonica, Telus, T-Mobile, Toyota, T-Systems, Verizon, Volkswagen, WEG, ZTE

"Rethink has a commitment to forecasting markets that others shy away from — those on the verge of radical transformation"

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Methodology

We have taken our baseline for private 5G networks from our previous small cells report and then worked forwards in time to 2028 on the basis of interviews with operators and technology providers, early deployments by major enterprises, and publicly available information from the GSMA and others. For WiFi, we are forecasting just deployments of the latest generation 6E which have yet to begin beyond trials and again considered feedback from established players in that field. The impact of a smoother handover between WiFi and cellular enabled by AI based techniques is also taken into account, since this will avoid enterprises having to choose between the two and employ each where appropriate in line with an "always best connected" strategy.

For both 5G and WiFi we have forecast numbers of cells deployed each year and then on the basis of average cost per cell the revenues generated from sales of the networking equipment.

Report Objectives

The report combines forecast and analysis of high-performance wireless network deployments by enterprises and public sector organizations over the next 7 years running up to 2028. We focus solely on the latest generations of cellular, that is 5G, and WiFi, that is 6E, since these are the options providing the capacity, speed and latencies that will serve emerging use cases across multiple vertical industry sectors.

In both cases, deployments are at an early stage, especially for WiFi 6E combining the performance gains of WiFi 6 with the extra 1200 MHz capacity enabled by opening up a third band in the 6GHz area in addition to the existing 2.4 GHz and 5 GHz bands. Strongest growth will occur in the 5G sector, which will also dominate use cases requiring the most de-

terministic performance and lowest latencies. That therefore is the main focus, but the report also considers the impact of smoother handover, which will usher in a new chapter for heterogenous networks (Het Nets) combining WiFi 6E and 5G. We define Het Nets as locations where users can access both cellular and WiFi. These range from cases where users switch between cellular and WiFi manually to completely integrated cores where devices are connected automatically and transparently to whichever is best at the time according to criteria such as cost, signal strength and anticipated QoS.

Deployment rates of private enterprise 5G will vary widely by both geography and industry sector, so that the forecast dices the numbers by both of these. Since growth will be led particularly by a few key countries and sectors, separate forecasts are made for each of these. These include the four leading countries likely to drive private 5G adoption, that is the US, Germany, China and Japan. It also includes the six leading vertical sectors, manufacturing, retail, transportation, healthcare, public sector and energy. Factors governing differential growth across the sectors and geographies are discussed.

Executive Summary

Private 5G networks are on the verge of rapid take off to generate a surge in annual revenues for network equipment from $1.5 billion in 2021 to $19.3 billion in 2027. Growth will be fastest in most markets from 2022 to 2025 before tailing off and declining towards the end of the period after 2027 as saturation approaches.

The level of penetration shows up most clearly on the graph of cumulative 5G deployments by cell, which will continue to rise beyond 2028 in all areas as lagging enterprises catch up. By 2028 there will be 26.6 million private 5G networks deployed around the world, up from 1.1 million in 2021. This growth will occur in all regions but will be most striking in the four countries leading the private 5G field now, the US, Germany, China and Japan.

Of these four, China stands out for facing stronger regulatory resistance to private 5G where roll out is dominated by the three great state-owned monopolies, China Mobile, China Telecom and China Unicom. But strong upsurge from the county's enterprises, including government agencies as well as manufacturers, looks like opening up the country's enterprise 5G field to rapid growth.

Private wireless networks will be deployed at a faster rate than 5G as a whole in most markets, as mobile networks combined with edge compute become capable of meeting more use cases and enabling new applications in manufacturing process, UAVs, remote healthcare, advanced transportation and others.
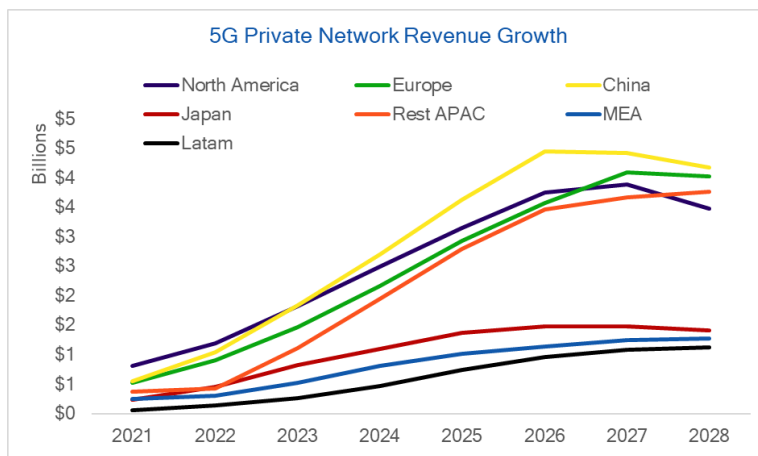
While 5G will account for the lion's share of the growth over the whole forecast period, there will still be a significant number of 4G private networks being deployed over the next few years. Similarly, on the WiFi front, the last generation 5 is dominant at present but it will be the latest 6E that takes over during the forecast period and offers an alternative to 5G for some of the emerging cases. There will also be a revival of heterogenous networks combining WiFi and cellular under these two latest generations as new AI based techniques finally deliver the smooth handover that has proved elusive for so long.

Given the significant performance and capacity advances, coupled with improved cellular coexistence, WiFi 6E is on course for a similar growth trajectory as private 5G, tailing off later in the forecast period. It is true though that only the next generation WiFi 7 that will start being deployed after 2024 will close the gap on 5G in peak performance, capacity and low latency. Our forecast numbers for WiFi 6E also include early deployments of WiFi 7 without making any distinction.

Certainly, until that 7th generation comes along, WiFi will lack the deterministic behavior required for the most demanding ultra-low latency real time applications, such as control of UAVs. In these scenarios 5G will be preferred but WiFi will continue to coexist for applications where best effort performance is adequate. This will include some of those use cases touted for 5G under the eMBB category concerned mostly with high capacity, although WiFi 6E itself still has to justify investment in the upgrade from WiFi 5. 5G will emerge in some cases as an immediate alternative to WiFi 6E.

There are also common factors affecting both private 5G and WiFi 6E roll out, such as chip shortages and other continuing impacts of the global Covid-19 pandemic. All these will impede deployments in the short and medium term, with both service providers and their equipment suppliers reporting a slowdown resulting from changed working practices during the pandemic and disruptions within the supply chain.

In the longer term though, 5G will enable much greater harmonization within the private network field generally. For some enterprises where blanket indoor coverage is established there will be more concerted migration from WiFi to cellular for private wireless communications. But unless such 5G coverage is almost ubiquitous, users will continue with WiFi and indeed penetration will increase around new best effort use cases.
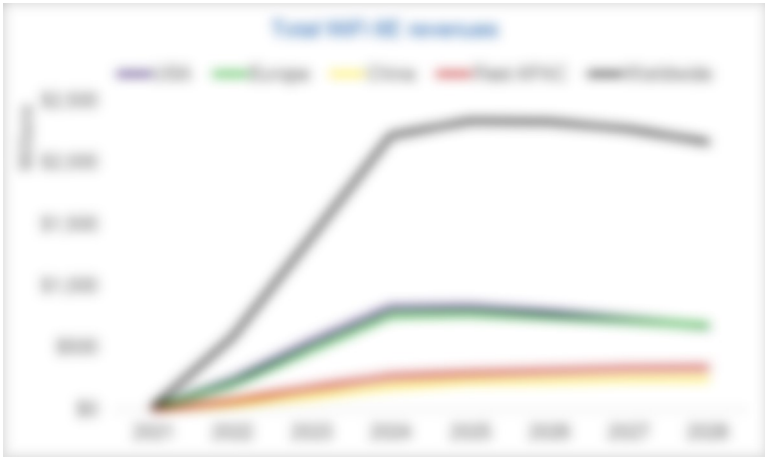
Who should buy this report?

This report will be valuable for all players in the private enterprise wireless space, particularly mobile operators and their technology providers. It is also aimed at enterprises themselves, particularly larger ones more likely to be actively involved in private network deployment. The report is also of great interest to the large number of new entrants to the mobile field on the back of the private network growth. These include traditional providers of enterprise data center systems, as well as start-ups specializing in the private network field.
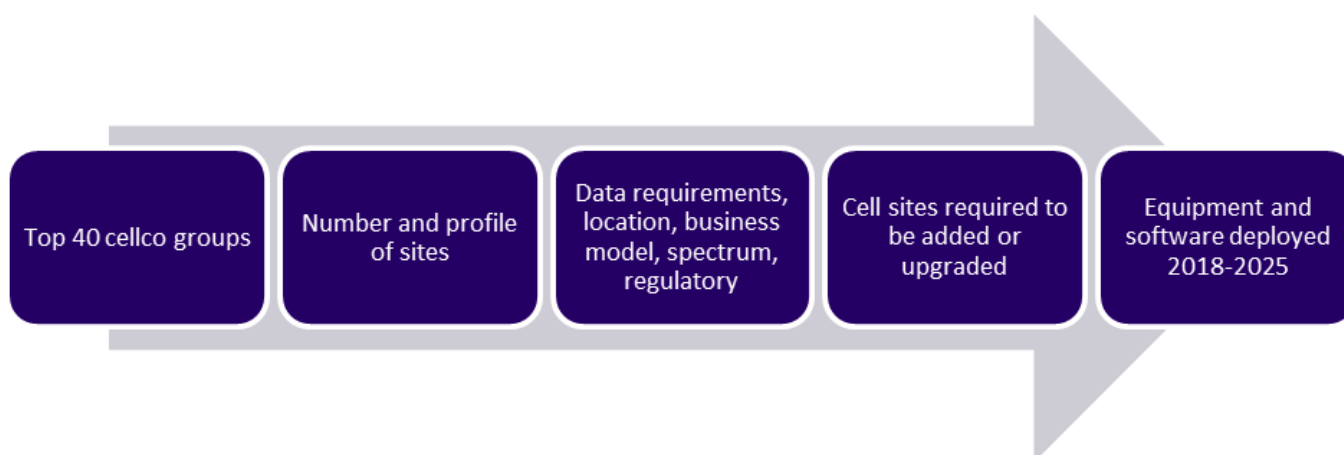
The Rethink RAN Research process summarized

These forecasts were based on a combination of data from:

- Detailed surveys, interviews and operator-by-operator modelling of the IMG-40 groups.
- Studies and modelling of the deployments and strategies of the top 100 4G/5G operators, as tracked by Rethink Technology Research's quarterly surveys, interviews and desk research.
- A survey of 78 tier one operators about their detailed plans for RAN deployments to 2026, and of 28 smaller and alternative operators.
- Input from ecosystem vendors on shipments, technology strategies and competitive landscape, also updated quarterly.
- interviews with other stakeholders such as IoT services providers and enterprises
- a calculation of the resources required in each type of location to achieve the MNOs' stated objectives.

Most of the forecasts refer specifically to nodes deployed within MNO networks, either by themselves or by partners. MNOs may also make use of third party nodes deployed outside their network and connected by wireline or WiFi; and many edge cloud services will run on infrastructure that is not used by MNOs at all.

| Top 40 cellco groups | Number and profile of sites | Data requirements, location, business model, spectrum, regulatory | Cell sites required to be added or upgraded | Equipment and software deployed 2018-2025 |

RAN Research: Forecasting disruption in wireless

Rethink Technology Research is a specialized research and consulting firm with 12 years' experience in surveying wireless, broadband, over-the-top and quad play operators. This has resulted in a broad research base of over 140 service providers (MNOs, telcos, cable and satellite operators, over-the-top providers) worldwide. These organizations are surveyed on a regular basis about their network infrastructure and business plans, and have a relationship of trust with Rethink.

Rethink also has deep relationships with the telecoms ecosystem (tier one device OEMs, vendors, technology developers, integrators, regulators etc), and is perceived as a thought leader in many areas of the telecoms and media sectors. Key areas of expertise and research experience include HetNet migration, small cells and carrier WiFi; transformation strategies for the RAN and the BSS/OSS; convergence of IT and network skills and platforms; device and chipset roadmaps; spectrum strategy.

Here are some sample titles of reports we have produced recently:

- Patterns of migration to the 5G core
- Fixed Wireless Access Will Combine with New Use Cases to Drive 5G Surge in High Bands
- MNOs labor under 5G complexity, tough choices with many partners
- Open RAN adoption patterns and forecast 2020-2026
- Small Cells Drive Microwave Backhaul Boom
- Private networks and shared spectrum making the 5G enterprise a reality
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About Rethink Technology Research

Rethink is a thought leader in quadruple play, emerging wireless technologies and the energy market. It offers consulting, advisory services, research papers, webinars, plus three weekly research services; Wireless Watch, a major influence among wireless operators and equipment makers; Faultline, which tracks disruption in the video ecosystem, and OTT video; and Rethink Energy, designed to forecast the changing energy landscape and its investment possibilities as renewables begin to take over from conventional fossil fuels.

"Giving people in leadership the news they need to hear, not want to hear."

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