ADVANCED WIRELESS TECHNOLOGIES AND THEIR IMPACT

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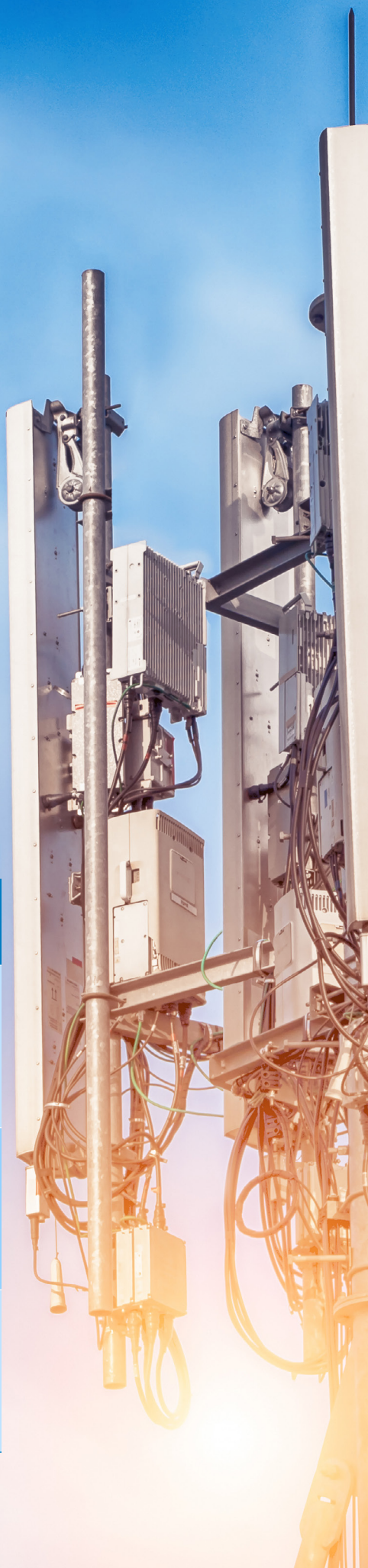
Advanced Wireless Technologies - Overview

Key Advanced Wireless Technologies

- Advanced communication technologies such as 5G, Wi-Fi 6, and NB-IoT are set to accelerate digital transformation for business processes and service deliverables
- The COVID-19 pandemic has further accelerated the demand for better connectivity to support remote working, online learning, and automation
- Companies and network personnel across the globe are looking to boost their wireless networking investments in order to sustain, given the unprecedented changes occurring in the market



Advanced wireless technologies	Current Adoption	Next 5 years	Future Outlook / Growth Potential
5G			• Adoption rate expected to mature in the next three to five years • North America and Europe - key initial adopters of 5G. APAC is expected to be a key market in the next few years
Wi-Fi 6 (802.11ax)			• Over 5 billion of Wi-Fi enabled devices expected to be shipped by 2025 • Around 90% of smartphones will be Wi-Fi 6 enabled by 2026
Narrowband IoT (NB-IoT)			• Fastest growing wireless technology in the areas of IoT, specifically across industries such as energy & utilities, healthcare, and manufacturing

Advanced Wireless Technologies - Application Areas and Growth Potential

End-users	Benefits	Growth Opportunities
Enterprises	Real-time visibility, insights, and control over assets, products, lower latency, and services	**Healthcare industry:** Virtually monitor patients using data from personal health and fitness trackers, boosting their ability to diagnose, treat, and direct patients **Manufacturing industry:** Equipment maintenance using IoT, sim-card connected devices, robotics, etc.
Consumers	Faster connectivity, data transfer, media streaming	**Smart homes,** smart retail shopping through smart stores, advanced voice and video calling, etc.

5G and Wi-Fi 6 are expected to be the main catalysts for innovative technologies including AI, edge computing, and cloud

Key Industry applications	Advanced wireless technologies enabling development in emerging technologies		
	IoT	Edge Computing	AI
Manufacturing			
Healthcare			
Transportation			
Retail			

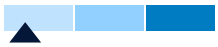
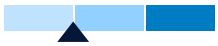
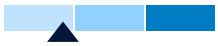
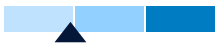
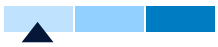
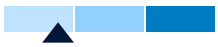
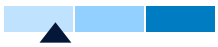
Market impact: Low | Medium | High

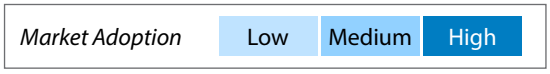
Advanced Wireless Technologies - Industry Impact / Relevance

Level of Impact/Relevance	Industries	Top Use cases
Expected to drive performance and facilitate faster speed, improve security and connectivity, and aid data-based decision making	**Banking/Financial Services**	Advanced analytics, automation
	Media and Entertainment	Advanced analytics, remote monitoring, automation, AR / VR
Likely to be an essential part in improving performance and productivity across these industries. Investments are likely to grow gradually in this decade.	**Transportation / Logistics**	Asset tracking, automation, predictive analytics
	Agriculture	Remote monitoring, automation
	Automotive	Asset tracking, automation, advanced analytics, vehicle-to-vehicle communication
Likely to be an essential part in improving performance and productivity across these industries. Investments are likely to grow gradually in this decade.	**Healthcare**	Telemedicine, remote monitoring, healthcare management, Advanced analytics
	Retail (electronics, wearables, etc.)	Asset tracking, automation, analytics
	Energy	Predictive maintenance, automation, machine-to-machine communication
	Manufacturing (Industry 4.0)	Predictive maintenance, automation, machine-to-machine communication, Advanced analytics

Advanced Wireless Technologies - Regional Insights

Current Adoption Levels and Outlook

Regions	Wi-Fi 6		5G	
	Current Adoption	Key countries and outlook	Current Adoption	Key countries and outlook
NA		• Highest adoption level globally, Canada has outpaced US in terms of paving way for Wi-Fi 6E spectrum • Expected to be the second largest market by 2025 (around 25% global share)		• Expected to be deployed widely by the three major suppliers by end of 2021 across the US; around 48% of mobiles to be 5G equipped by 2025 in the US
LATM		• Currently in deployment stage across key countries including Brazil, Chile, and Mexico • Supportive policies encouraging faster adoption in the region		• Initially deployed in December 2020 across Brazil and Uruguay, the region is expected to have 15 million connections by 2022 and 62 million by 2025
Europe		• Companies in countries such as UK, Germany, and The Netherlands are currently piloting its adoption		• Comparatively slower adoption than the US and some APAC countries • Around 34% of mobiles are expected to be 5G equipped by 2025
MEA		• Saudi Arabia and UAE were among the first countries to have the spectrum allocation, thus driving adoption rate in the region		• UAE was among the first countries to deploy the 5G commercially, however the deployment is lagging behind in the region due to economic development issues in some countries
APAC		• Expected to dominate the market by 2025 with nearly 50% share • China, Japan, South Korea, and India to be major markets		• The pandemic impacted commercial roll-out in major countries such as India and Australia during 2020 • 5G adoption in China will account for 47% of mobiles connections by 2025



Advanced Wireless Technologies - Procurement Best Practice

Deployment on a pilot basis

- As enterprises and companies are keen on deploying advanced wireless technologies such as Wi-Fi 6 and 5G, adoption of these technologies are more likely to be implemented on a pilot basis to test the network standards and capabilities for its use cases
- Further, implementation of pilot programs facilitates buyers to understand allocation levels for more demanding uses for consumers or Industry (such as Industry 4.0)
- *For instance, Nokia deployed a 5G standalone test in collaboration with Columbian operator Tigo in the Columbian city, Medellin in December 2020. The test will allow to measure network standard in various use cases such as fixed wireless access, robots, connected cars, VR cameras, advanced analytics, health, and smart lighting (Source: Nokia press release)*
- *Lufthansa Technik partnered with technology and network providers, Vodafone and Nokia, to deploy its private wireless 5G networks and facilitate testing for its two projects in the field of VIP completion and engine overhaul at Lufthansa Technik's Hamburg base, Germany in February 2020. The 5G network will allow it to test new technologies using AR, remote inspection of engine parts, real-time communications via video streaming with technicians, etc. (Source: Lufthansa Technik press release)*

Impact:

- Likely help in evaluating and deciding the allocation level of network for various use cases
- Evaluate the potentials and capabilities of advanced wireless technologies for various use cases

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