JUNIPER RESEARCH

More Than a Data Rate: How 5G Will Transform Enterprise Connectivity

written by **Juniper Research**

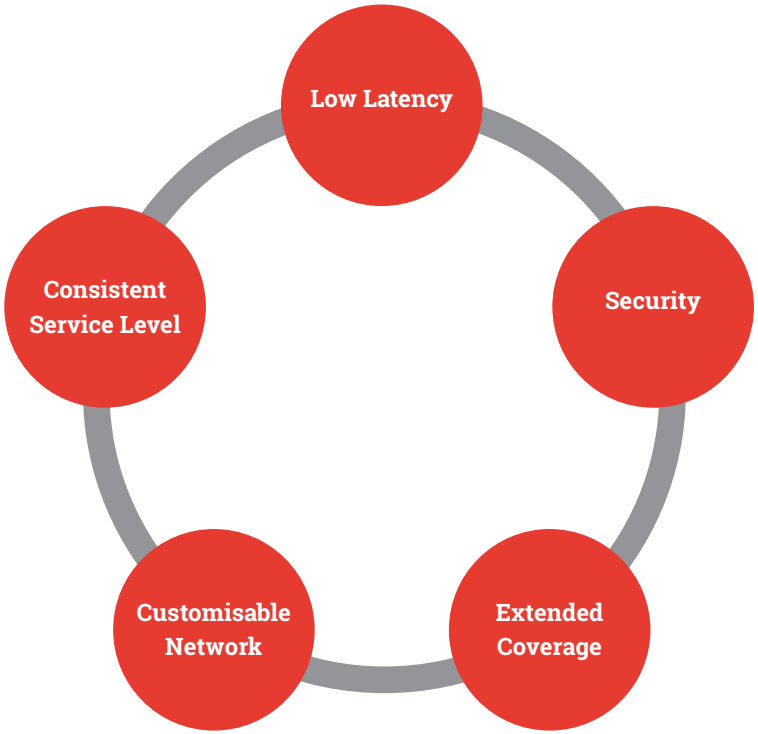
SIERRA WIRELESS®

More Than a Data Rate: How 5G Will Transform Enterprise Connectivity

Much of the conversation about 5G roll-out has been focused on data speeds for consumers, highlighting the ability to download videos in a matter of seconds or stream content with little to no lag time. However, the standard itself is increasingly focused on enterprise connectivity, thanks to the features getting incorporated into 3GPP standards for 5G. This enables features beyond the raw data rates that allow the technology to be of far greater use to enterprises than previous cellular connectivity standards. In addition to increased data throughput, 5G can enable a wide range of new use cases for enterprises.

This article will showcase how 5G connectivity can provide benefits to every kind of business that needs data transfer.

Figure 1: Key 5G Connectivity Benefits



Source: Juniper Research

More Reliable Network Architecture with Network Slicing and High-speed Wire-free Capabilities

5G can offer dedicated forms of connectivity through network slicing, which can also enhance security. This allows network users to partition the bandwidth they are using for specific devices and services, guaranteeing a consistent level of service for mission-critical applications. This means that 5G cellular connectivity can be relied on to provide near-continuous coverage in many situations, including environments with moving elements and a large amount of metal. This makes 5G ideal for providing connectivity to factories and other industrial environments.

Network slicing can also be used to section off sensitive data to specific devices, keeping data accessible only to those endpoints that need it, enhancing security. It also means that, where 5G public infrastructure is available, enterprises can leverage those through a slice of the network, rather than needing to set up their own independent network connections, which they would have to for Wi-Fi or even 4G LTE networks handling confidential data. This will reduce the cost of network deployment and total cost of ownership where 5G connectivity already exists; enterprises simply need to arrange for a slice of the public cellular network to be assigned for their use cases.

Perhaps the biggest benefit of 5G for network design is that it has a high enough data rate that wired network connections can be entirely dispensed with, while still providing data speeds of over 1 Gbps, making it comparable to ethernet connectivity. This makes it far easier to plan flexible work setups and move equipment to alternative locations, without needing to account for network access points. This will allow many more multipurpose production areas that need flexible equipment configurations (eg in factories or shared workspaces), as well as reducing installation costs across a whole range of industries.

Table 2: 5G Spectrum Band Properties

Spectrum Band	Frequencies	Primary Features	Use Cases
mmWave	24-100 GHz	High Speed	Connected cameras High-density interior connectivity (eg stadiums, events) Last-mile urban connectivity & smart city functions
Mid-band	2-6 GHz	High Capacity	Robotics AR/VR Interior connectivity
Low-band	Below 2 GHz	Wide Coverage	Offshore connections Rural connectivity Gaming and media applications

Source: Juniper Research

Multiple Frequencies Brings Capability-based Connectivity

This wide range of possible applications is supplemented by 5G's wide range of possible spectrum usage. The different frequencies available have features that mean they are suited to different use cases. However, despite all these differences, they can still coexist in the same network thanks to the Access & Mobility Management function of 5G networks. All 5G traffic is taken through this portion of the network before being routed to the RAN. This is what allows network slicing, and is also what enables different use cases to be segmented by their requirements.

Those requirements allow different use cases to have the best connectivity form for those requirements. These are as follows (left):

Typically speaking, consumer use cases will be best served by low-band 5G, with mid-band and mmWave base stations offering connection densification in urban areas where required. Low band can also cater for most digital device connections that do not require real-time data flow, meaning many use cases on existing devices (such as 5G smartphones and tablets) are ideal for low-band usage. Low band has the best signal propagation characteristics, allowing it to cover a wider area. However, it will not have the same throughput capacity as higher-frequency bands, as well as having to contend with 4G and Wi-Fi signal in many cases until 5G SA can be used instead of these technologies.

Mid-band provides a high level of signal capacity, allowing for more complex data transfers, minimising latency. We expect most deployments that aim to leverage robotics and automation, as well as cellular AR and VR, to utilise mid-band 5G.

mmWave bands offer the highest speeds and amount of data transfer, making them ideal for those use cases that require high levels of data, such as connected video cameras relaying information for computer vision processes, and those use cases where minimal latency is vital to the safety of a use case. As a result, many smart cities use cases will use mmWave as part of mission-critical connectivity, from emergency services connectivity to smart traffic management.

Increase in Cloud & Edge Processing Thanks to Low Latency

5G networks can offer sub-5ms latency, which will enable near real-time data transfer for high volume use cases, such as video surveillance, which can generate over 233 MB per minute for some 4K cameras. Multiple cameras amplify this problem for 4G-speed connections, where different cameras need to use the same data pipe. As well as having the bandwith to send this data at once via 5G, the low latency 5G provides can supplement cloud applications for these cameras, including facial recognition for surveillance or computer vision-based automation, such as for autonomous vehicles.

Sierra Wireless is already looking to deploy these for vending machines, offering 'try before you buy' functionality for products like vending machine sunglasses, makeup and other cosmetic products, as well as video calling for more expensive and complex products. The low latency offered by 5G can ensure that the data coming from the endpoints is a near real-time feed, allowing for automatic responses to situations (such as changes to display adverts based on weather conditions), or for smooth video calling with a sales representative for more complex product purchases.

The low latency also enables a vast array of AI-driven applications, where cloud computing can make automatic adjustments based on information gathered from endpoints, relayed to the cloud and sent back to the endpoint faster than manual supervised interventions can achieve. This will enable everything from computer vision to automation and robotics, with data collated and available for review from any point on the network. This is also true of data-heavy feeds such as video cameras and automation, allowing easy monitoring of any aspect of a network's throughput, without impacting the performance of the network or its data gathering. However, we expect an increase in on-premises computing for these applications as well, in order to make the best of the low-latency capabilities on offer. This will lead to an increase in edge computing, as businesses seek to make the best use of the technology's properties.

For many other applications that need near real-time processing, the low latency of 5G means that on-device processing can be minimised, saving device power and enhancing the usefulness of simpler connected machines. This can also enhance the proposition of cloud processing, making applications like NLP (neurolinguistic programming) and digital voice assistant deployments more fluid. This could extend multiple interface interactions to many different forms of device, improving service accessibility.

While 5G RAN connections to the cloud can provide low enough latency for many use cases, we anticipate increased usage of edge computing via 5G cellular connections, to further reduce latency. 5G NSA (Non-Standalone) is currently the first form of roll-out for 5G networks, which have a 4G LTE network core. Until 5G SA networks are the majority of deployments, the network core will not be able to deliver the best possible latency for these applications. However, it should be noted that even with 5G NSA, latency will still be low enough for the majority of use cases, such as automation.

Multi-device, Customisable IoT Networks

5G connectivity can also support many devices on the same network, having a much higher capacity for connections than 4G; 4G connectivity deployed over a kilometre can support 4,000 connections, while 5G coverage in a similar configuration in the same area can support around 1 million connections, through a configuration called Massive MIMO (Massive Multiple Input, Multiple Output). This allows for many more devices connected to the network, and can support a wide array of IoT use cases. 5G connectivity is able to natively support NB-IoT solutions within its architecture, meaning that several IoT devices can be integrated within the same network as cellular devices without additional bas station software, easing device management and interconnectivity. This will make the back end of data platforms simpler to manage, making IoT deployments simpler and more effective when integrated with other systems.

5G's ability to manage different connectivity types and different segments of a network for guaranteed connectivity enhance the potential of private cellular networks. This gives the end enterprise user complete control over what can and cannot enter the network, increasing security and allowing for a more flexible approach to connectivity, as well as allowing for the coverage of the network to be entirely to the user's specifications, ensuring coverage of remote areas such as offshore platforms and mines.

Equipment Requirements & New Business Models

However, many of these use cases will require the hardware to change in order to fully make use of the new possibilities. This means both replacing endpoint devices to be able to receive 5G signals, and changing over to 5G network equipment. This is not an immediate necessity, as 5G NSA can offer a change over to the new standard without changes to the entire network.

This ability to change relatively piecemeal will allow a variety of new connectivity business models to emerge, as 5G services can be offered and installed as part of existing network functionalities, allowing '5G-as-a-Service' where the endpoints alone can be upgraded. This is also a change that can happen quickly, with same-day changeovers available in many situations.

However, while these new business models allow for flexible usage of 5G features, there will still be a degree of network interconnectivity and integration that is required. This will expand the role of existing systems integrators, which can then act as mediators between enterprises with specific requirements and the 5G network operators. These integrators can handle the complexity of any network management 5G capabilities require, allowing enterprises to focus on interpreting and utilising the data capabilities available to them through 5G connections.