5G Will Accelerate a New Wave of IoT Applications

By Rishi Vaish and Sky Matthews

5G is driving change in the Internet of Things (IoT). It's a powerful enabling technology for a new generation of use cases that will leverage edge computing to make IoT more effective and efficient.

In many ways, the narrative of 5G is the interaction between two inexorable forces: the rise in highly reliable, high-bandwidth communications, and the rapid spread of available computing power throughout the network. The computing power doesn’t just end at the network, though. End-point devices that connect to the network are also getting smarter and more powerful.

The increasingly dynamic and powerful computational environment that's taking shape as telcos begin to redesign their networks for 5G will accelerate the uptake of IoT applications and services throughout industry. We expect that 5G will enable new use cases in remote monitoring and visual inspection, autonomous operations in large-scale remote environments such as mines, connected vehicles and more.

The rapidly expanding range of computing options requires a much more flexible approach to building and deploying applications and AI models that can take advantage of the most cost-efficient compute resources available. These AI models can now even run on edge devices that connect to the network edge, allowing more secure and efficient processing of data.

The Power of the Verizon Collaboration

At IBM, our AI-driven IoT solutions are supporting digital transformation across a broad range of industries. These solutions are being adapted to run on Red Hat OpenShift, the Kubernetes management platform that allows workloads to be deployed across many different environments as part of IBM’s vision of hybrid cloud computing. In cases where workloads are running directly on a device—such as a drone inspecting a transformer—we have integrated them with our new edge computing solution to flexibly manage the distribution of these IoT edge workloads at scale.

Our recently announced collaboration combining Verizon’s wireless networks with IBM’s Maximo Asset Monitor will accelerate this transformation and help companies make the most of IoT and edge computing. The first solution developed by the partnership will help industrial companies detect, diagnose, and fix potential problems in critical assets before they become unmanageable risks.

See Verizon's Sampath Sowmyanarayan and IBM's Kareem Yusuf discuss the two companies' collaboration

Before we dive deeper into the new wave of IoT applications, let's detail the benefits of the powerful one-two punch of edge computing enabled by 5G, which delivers both higher bandwidth and lower latency than today's 4G and LTE networks.

The increased bandwidth allows more data to be sent during a given period of time, which is a particularly significant gain for demanding payloads like video. As a result of this increased capacity, the use of video sensors and video data streaming are expected to greatly increase, spurring broader use of unmanned (drone and robotic) inspection and monitoring applications.

The lower latency of 5G—the time it takes for data to reach its destination—will allow us to respond to data more quickly. While the average latency of a 4G connection is 50–100 milliseconds, the comparable figure for a 5G connection could be 10ms or less.

The higher bandwidth and lower latency of 5G will, in turn, accelerate the adoption of applications that utilize edge computing, where the computational work is performed close to where data is being created and actions are being taken.

IoT Use Cases

There are many ways that this combination of 5G and edge computing can enable new applications and new innovations in various industries. IBM and Verizon, for example, are developing potential 5G and edge solutions like remote-controlled robotics, near real-time video analysis and other kinds of factory-floor automation. Let's look at several of these use cases in IoT environments.

Remote Inspection: Technicians in many industries must deal with maintenance of equipment that's remote or difficult to access. Utility poles, transformers and other equipment in the energy grid are distributed over thousands of miles but need to be regularly inspected and maintained in order to avoid service disruptions. This often involves sending technicians to visually inspect equipment to identify any problems—an expensive and resource-intensive proposition. 5G opens the possibility of using drones or remote cameras to inspect, sending images, video and other sensor data to AI in the cloud for automated detection of problems.

As one case in point, IBM is developing a civil infrastructure solution to monitor aging bridges, tunnels, highways and railways. The solution will use near real-time IoT data generated from sensors placed on structures as well as stationary cameras and drones. It will merge that IoT data with industry-specific analytical models to help identify and measure the impact of damage such as cracks, rust and corrosion, as well as displacement vibrations and stress.

Drones can perform aerial inspections of structures, utility wires and gas pipelines, sending back visual data. Such remote inspections, which can be carried out without the cost sending out a crew, can catch early indications of problems, avoiding potentially catastrophic structural failures, pipeline leaks or downed utility wires.

Visual Inspection: In manufacturing, visual inspection of operating assets and the production line can be enabled by the low latency of 5G. Using product quality as an example, cameras capture images as products roll down the line. The images are analyzed by AI to spot defects or quality problems. This brings to the edge a function that's common today. For example, IBM currently offers AI-powered visual inspection to accurately spot product and equipment defects.

On a broader level, 5G can enable factories to easily add wireless sensors and equipment which can connect directly to 5G network without the need for extensive wiring or local IT equipment to maintain and manage. Connecting manufacturing equipment directly to cloud services such as IBM’s Predictive Maintenance will help ensure maximum uptime and reduce maintenance costs.

AI and Augmented Reality (AR) Technician Assistance: Technicians must often get advice and guidance on problem solving from other more experienced resources. 5G and edge computing will provide the bandwidth and dynamic workload management to enable technicians in a wide variety of environments to reliably use virtual and augmented reality, giving them remote guidance and assistance when and where it’s needed. For example, IBM Assist for field technicians uses an AI advisor and bidirectional AR-based collaboration to make life easier for technicians in the field by offering “next best action” and visual instructions from enterprise knowledge or from a remote expert.

Buildings and Facility Management: 5G will enable easier connectivity of sensors in buildings to drive new solutions for energy efficiency, occupancy management and visitor experience. This is even more true for larger facilities with many assets that require monitoring and maintenance, such as stadiums, airports, malls and schools.

Connected Vehicles: Modern automobiles are already collecting large amounts of data, and it's anticipated that autonomous cars may collect more than 1 terabyte of data per day. The lower latency of 5G coupled with more bandwidth and more reliable connectivity will enable many kinds of applications in connected vehicles.

With the low latency of 5G, there are opportunities for more bi-directional communication where data is potentially shared with other nearby vehicles, greatly expanding the range that any one vehicle can “see.” This will be especially important for autonomous vehicles where the aggregate data from many vehicles in an area can extend the reach of any individual vehicle’s built-in sensors, allowing them literally to see farther, and to see through obstacles and around corners for greater safety.

Agriculture: Drones will autonomously survey crops in the field using visual analytics running near the edge to assess factors including growth rates and pest losses. This information could allow farmers to optimize harvest time and more efficiently target particular areas for pesticide or other interventions.

Shipping and logistics: Large numbers of shipments and shipping containers can be continuously tracked and monitored, providing more precise control and predictability over supply chain logistics.

Finally, the 5G network is designed to service IoT kinds of use cases from day 1, unlike 3G and 4G. This will enable new kinds of pricing models and much greater adoption of wireless connectivity in a broad variety of IoT applications.

We are truly just starting to scratch the surface of the revolutionary possibilities that 5G and Edge computing will create.

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