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Case Study: University of Sheffield AMRC North West

Credit: University of Sheffield AMRC

The University of Sheffield Advanced Manufacturing Research Centre (AMRC) conducts research into advanced manufacturing technologies and techniques. Working with more than 120 industrial partners, the AMRC helps manufacturers become more competitive, productive, and sustainable by harnessing state-of-the-art processes and technologies.

Beginning its 5G journey in 2019, the AMRC was a very early adopter of the next-generation technology. The organisation has vast expertise in Industry 4.0 applications and utilises the most advanced technology including 5G to solve complex industrial and manufacturing challenges. Working with some of the world's leading aerospace companies on cutting-edge projects with demanding manufacturing challenges, the team are always on the lookout for the latest technology to increase efficiency, improve manufacturing safety and above all else, reduce defects, wastage, and quality issues.

Assessing its options for the newly opened £20m AMRC North West facility in Lancashire, the AMRC selected the high-performing Nokia Digital Automation Cloud (NDAC) application platform that underpins Telent's 5G Private Network services. This was deemed the most advanced technology on the market to address the AMRC's complex needs and help it undertake its digital transformation. The AMRC wanted to explore multiple models of deploying 5G and carry out cost benefit analysis for the use of 5G in manufacturing. These models include but are not limited to the highly flexible fully private models like Telent's installation, using Mobile Network Operators' public spectrums, and hybrid models. The AMRC evaluated the technology to see how it could help improve its operations and solve challenges for its manufacturing customers.

Undertaking its 5G journey

This wireless solution creates an on-premises 5G network that is dedicated to the AMRC, providing coverage across the AMRC North West site. The 5G Private Network delivers high capacity, high-speed and secure connectivity with ultra-low latency. It seamlessly takes advantage of the availability of licensed, yet low-cost spectrum allocations, with the solution using 5G wireless access points that provide a greater coverage area than alternative on-premises wireless solutions, such as Wi-Fi.

Telent helped provide the initial guidance and support to help the AMRC fully utilise the newfound capabilities at its disposal. This was something that continued throughout the project. Telent implemented the full turnkey installation, configuration, commissioning and system integration.

The AMRC required fifth-generation technology to enhance the use and enable greater control of fixed arm and mobile robots, as well as Computer numerical control (CNC) machines used in advanced manufacturing of aerospace components. Leaning on the expertise from Telent to assist the AMRC on its journey of discovery, Telent helped to provide added value during the project, getting all aspects of the technology working and integrated with its existing infrastructure. The connectivity provided by the NDAC solution helped reduce defects, improving the overall quality of its offering.

Leveraging next-generation applications

As there were very few devices around that were compatible with the 5G installation, the team at AMRC North West developed their own devices going way beyond "bring your own device" (BYOD). Routing data from devices through existing gateway devices added too much latency so the team needed to develop their own data transfer protocols and techniques for faster data transfer. There were vast amounts of data from sensors that had to be processed. High bandwidth and low latency provided by the solution enable near instant analysis of this remotely.

Previously, the data analysis was conducted locally, in the factory, right next to the manufacturing cell or the machines and the robots. As the components were hardwired, the processing power was limited, scalability and reconfigurability were also limited. The AMRC can now leverage Artificial Intelligence (AI) analysis and process the data online from devices and sensors in real-time, while machines continue to operate in a live environment. The enhanced data processing capabilities allow the team to undertake virtual testing and qualify products while they are being built. Being able to take this data off the manufacturing cells, transfer it over 5G to a data centre for processing and send it back to the device in near real-time is hugely powerful as it helps the team to detect defects during the process, and prevent them if possible, by changing the manufacturing parameters, or stopping the build from progressing until the issues have been remedied, therefore improving quality and reducing defects. 5G provides the backbone, with the AMRC also looking at augmented reality and virtual reality technologies to improve its manufacturing processes.

The 5G Private Network project for the AMRC is another example of Telent's expertise of designing, building, supporting and managing mission-critical networks for its customers. This 5G Private Network offered the AMRC both enhanced reliability and flexibility. With high-speed, highly secure connectivity supporting a range of applications from Internet of Things (IoT) to Push To Talk (PTT) and Push To Video (PTV) communications, the AMRC had access to greater efficiency, innovation and reduced operational costs now, and in the future.

"The 5G Private Network is the de facto technology that provides the AMRC with consistent wireless coverage, high bandwidth and low latency for greater levels of operational efficiency. This allows for state-of-the-art technology solutions to be leveraged for process control and automation. By working alongside Telent on this project, we now have access to reliable, unfailing connectivity and the knowledge to fully leverage from this newfound capability and help our customers prosper in the new age of Industry 4.0."

Dr. Aparajithan Sivanathan,
Head of Digital Technology, AMRC North West

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