



Industrial 5G

A global opportunity for the UK to accelerate adoption of 5G into an industrial setting

2019

What is Industrial 5G?

“**Industrial 5G**” is the term promoted by the Digital Catapult to capture the conceptual framework, architectures, principles and best practices guiding 5G deployment and integration with specific industries’ processes and systems.

5G is the first mobile technology system that has been designed with the deliberate intention to meet the advanced digital communication and connectivity requirements of industrial environments (e.g. manufacturing, transport, logistics, energy, construction, etc.), in addition to the consumer-focused mobile Internet. There is significant interest in how 5G can be deployed and used in these environments, as well as the benefits that adoption of 5G can provide to the digitalisation of industrial activities. To meet this growing demand and fully realise the value of 5G, collaboration between the mobile industry and other industry sectors is crucial. This close working relationship will deepen and broaden the exploration of what is possible, learning together how existing and new systems can be integrated and deployed in real world environments, and what new business models will evolve over the coming months and years.

5G is also an extensive, global, mobile technology standard. Originally targeting consumer communications, the specifications, standards, products and best practice system integration guides and expertise are largely for that domain. The UK Government’s 5G Strategy rightly sees 5G as a significant innovation opportunity. The key questions and focus should be both:

1. How can 5G technology help enable the digital transformation of industries?
2. How can 5G technology itself be developed to meet these requirements purposefully?

In addressing this ambition in both directions there is a clear opportunity in the next 2 to 4 years for the UK to establish leadership in scoping what the specific 5G solutions for industries will look like. As the 5G standards mature over this timeframe and consumer mobile broadband is deployed across the country, specific tailored 5G solutions for individual industries will need to emerge, that have a clear business case, and are deployable and manageable at scale.

We expect “Industrial 5G” to be further refined both in the UK and globally over the course of the next few years. To ensure the UK takes a leading global role in establishing and developing the concept into maturity, Digital Catapult’s ambition and role is to help coordinate and bring together the key ingredients and players to maximise collaboration and demonstrate the potential it can offer all parts of the value chain.

What problems will Industrial 5G solve?

Industrial 5G will provide a common framework that will inform industrial sectors and sub-sectors, the supply side of innovative technology companies and the telecommunications sector - on:

1. **How to deploy 5G in industrial environments.** In particular how to exploit 5G characteristics towards an integrated advanced digital infrastructure fit for digitalised processes in industries.
2. **How to achieve interoperability and coherence within and between 5G system.** In particular looking at how legacy systems can be integrated within the 5G service architecture or operate on top of it; and across regulatory domains.

It is also a means to other specific practical ends, in particular the provision of a standardised, affordable, scalable, resilient, future-proofed, high-performing advanced digital infrastructure platform that can be adapted to many other industrial applications.

Why 5G?

There are obvious questions to ask: what problems does 5G, as a key part of the advanced digital infrastructure, solve for industry? What new problems does it create? What is it going to make easier, or more complex? What is missing? A historical perspective is important. 3G (UMTS) was conceived as a universal mobile service platform but did not fulfil expectations of the wide range of services it could deliver. Nevertheless, it kick started the integration of mobile broadband with Internet services, and led to 4G, which delivered the consumer mobile internet services that transformed our social lives. 4G achieved the architectural and physical layer step changes to make these services a success in the consumer domain and in certain enterprises. Meanwhile, many capabilities of 3G and 4G that could be interesting for Industrial 5G remain unexploited.

5G is a very significant update, as well as an evolution, of 4G. It is designed to be operated in different ways from 4G and also to provide services that cannot be delivered by 4G. However, we will need to tackle an important challenge facing this evolution, namely: how can we ensure that 5G will represent the ideal level of simplicity that masks unavoidable complexity? How can we make sure that it is the latter? One way to do this is to establish a minimum subset of 5G specifications to the minimum subset that deliver on the requirements for specific industries - i.e. defining Industrial 5G.

In order to find positive answers to the question; Will 5G networks and systems applied into industry live up to expectations?; we need to collectively understand if it is:

- **Standardised** - at the right level for industry? Does it enable digital innovation? What are the gaps - system integration, technology blocks, interoperability?
- **Scalable** – can a local small standalone network suitable for a startup be scaled up to serve a large enterprise spread across multiple sites? At what size will it transition to a non-standalone network that would be supported better by a mobile network operator's shared platform?
- **Safe** - given that some industrial processes and the products they deliver have safety-critical considerations, what new safety hazards could arise?
- **Secure** – are new vulnerabilities created that compromise safety and operational integrity? Does the 5G solution make it easier or harder to secure the system(s)?
- **Resilient** – can availability, continuity, integrity, latency and responsiveness be maintained at required levels for the services to be implemented?
- **Future-proofed** – can new services supporting new functions be introduced easily? Can different industry sectors be supported?
- **High-performing** – what is the extent of compromises to achieve eMBB, mMTC and URLLC? What do applications really need? Are there inherent potential inefficiencies in balancing the demands by applications, e.g. can spectrum utilisation be optimised?
- **Affordable** – what is the entry cost? Does it offer value for money? Do capital and operational costs exceed revenues as the network grows? What are the business models?
- **Mobile** – like earlier generations, 5G will provide seamless network mobility, which is a problem that the Internet architecture does not address. Will this be scalable for large numbers of simple devices such as sensors or actuators? Will there be seamless operation indoors and outdoors?
- **Effective for industry** - looking closely at the 5G network as an integrated advanced digital infrastructure, does the 5G system architecture (combined with edge computing, network softwarisation and orchestration) facilitate the allocation of resources to support industry's network functions and the services they provide? Is multi-tenancy possible while maintaining the control that industry typically requires?

The above list acts as a starting point, and is expected to grow as discussion and activities around "Industrial 5G" build momentum. These questions are also linked by trade-offs that may give different answers when the working assumptions and requirements are taken into account.

Digital Catapult and Industrial 5G

“Industrial 5G” will accelerate the digitalisation of industrial activities through 5G adoption. It is also the national initiative, that will bring together activities from the UK Government’s Department for Digital Culture Media and Sport (DCMS) **“Industrial 5G Testbeds and Trials”** projects. This national programme will help to define the approaches, standards, best practices and use case examples of 5G in an industrial setting that will strengthen the concept globally, making it tangible, and placing the UK at the heart of global leadership in this space. This will draw upon our world class 5G ecosystem, research institutions and supply side of innovative technology startups and scaleups - bringing them together with industry to solve real world challenges and seizing the significant opportunity of the 4th Industrial Revolution for the UK.

The **“Industrial 5G”** term was adopted by Digital Catapult during its wide-reaching engagement with UK manufacturing, logistics, telecommunication and IT industries in preparation of the Industrial 5G Testbeds and Trials Programme Competition.

More information about the competition can be found at the below URL:

<https://www.gov.uk/government/publications/industrial-5g-testbeds-and-trials-competition-guidance-and-supporting-documents>



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