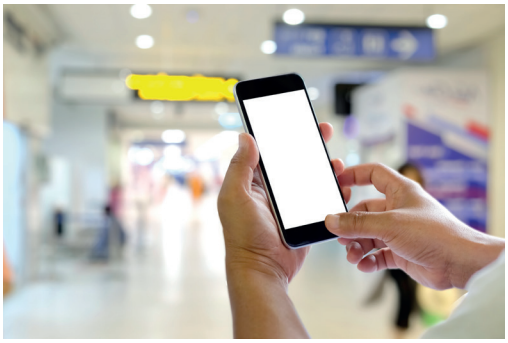
Is 5G the only wireless network airports need?

Most airports have multiple outdated wireless systems

Many airports will have a plethora of different wireless systems including at least a Public Mobile Network, Public Wi-Fi, Private Mobile Radio Network for operational communications, and Public Safety radio network for security. At least some locations will have extended this by the implementation of private Wi-Fi networks and private "slices" on mobile networks.



In many locations coverage no longer meets requirements due to building changes, operational changes or damage to infrastructure. Additionally, use cases have developed putting additional strain on the intended design of infrastructure, and frequently prohibiting the implementation of new use cases due to technology limitations.

The cost of providing such infrastructure is substantial which has led to a varying quality of service. Predominantly the focus has been meeting the operational needs of the Airport, after all this directly impacts profitability, at the expense of quality of passenger access to wireless services. Public access has often been left to mobile operators installing equipment within the airport in the areas they deem profitable. Systems are often outdated – for example operational PMR systems may be voice-only or have very limited data capabilities.

Consolidating all of these wireless networks into one future-proof system would both save costs and improve wireless connectivity. Might it be feasible?

New digital solutions could provide big productivity boosts

Imagine an airport where every single item needed at a gate, from cargo, to food, to steps, to wheelchairs, to fuel, to baggage and more, had a location tag and a central computer could check on its location and raise alerts if it was not moving towards the gate in good time. Or an airport where almost all passenger control was automated with e-gates, e-tickets and passenger flow monitored automatically, raising alarms when transit times rose. Or temperature control tags on just-in-time temperature dependent freight allowing it to be automatically monitored throughout its movement through the airport. Or drones which could be quickly dispatched to investigate perimeter breaches, runway debris and more. All of these, and many more applications, are all technically possible. They all promise rapid payback as airports become more productive and the chances of delays lessen. But the reason many are not implemented is lack of suitable wireless connectivity.

Could we not only consolidate current wireless solutions, but also enable a "digital airport", future-proofed for the next decade or more?

International consultancy, simply delivered.
www.erkmar.com
tel: +44 203 034 2457
email: info@erkmar.com

5G promises much

5G aims to deliver across three different requirement sets:

- Enhanced mobile broadband, providing better service to consumers.
- Massive machine connectivity (MMC), enabling the Internet of Things.
- Ultra-reliable and low-latency communications (URLLC) providing the reliability and quality needed for the most exacting tasks.

5G allows network slicing with differential quality of service across the same network. It enables edge computing allowing airports to keep data locally.

If it can deliver against all of these promises it could both unify and future-proof airport communications. But things are never that simple.

Airports are unlikely to gain their own spectrum

Spectrum and telecom regulatory issues have not featured highly on many wireless communication systems that have been implemented in airports so far[1] . For example, Wi-Fi is implemented without license or regulation by governments, you can just install and go ahead. 2/3/4G requires only authorised Mobile Network Operators with suitable spectrum and operational licenses to install and operate, so to date they have operated autonomously. Private mobile radio (PMR[2]) systems are spectrum licensed and some light touch regulations apply but these are well known by the PMR industry. Put simply in 2/3/4G you cannot simply go, buy a system, install, operate and deliver service unless you are a recognised, existing Mobile Network Operator.

5G opens up substantially greater opportunities for private, or enterprise systems. National regulators want to encourage uptake, competition and operational deployment and so may have enabled: -

- Access to mmWave[3] spectrum that can be licensed to any business to buy, implement, and operate a 5G network. Many countries wrap into this license the appropriate operational approval to deliver service also. This means an airport could be granted a mmWave license and then go buy a system, install it and operate.
- Sharing or assignment of C-Band[4] spectrum by an MNO to others. Technically this is very interesting. For the first time an MNO can grant access to the radio spectrum for others. In practice this means that an Airport can seek an MNO willing to lease radio spectrum so the airport can buy, install, and operate their own infrastructure for exclusive use by the airport.
- The ability to share one infrastructure across multiple operators. In a 5G deployment this is significantly simplified.
- Very high throughput and low latency communications as a result of access to "new" radio spectrum. This means large numbers of users in small areas enjoy quality access, or bandwidth hungry applications can work effortlessly in a wireless network.

The key message is that airports will need to work with MNOs if they want a 5G system tailored to their needs or exclusive to the airport. Going it alone is simply not viable in a complex telecoms system.

Many of the airports needs are a year or more away

Of all the 5G features, only enhanced broadband is currently available. The standards, for key features such as Stand Alone (SA[5]) which underpin MMC[6] and URLLC[7] services are due in 2020, but equipment may not be available until 2021. Worse, current 5G systems can only be implemented through a coupling to a 4G system, making self-deployment of 5G by an airport all but impossible. 5G is truly a fluid situation but one that will, without doubt, ultimately be implemented and successful.

The other key factor is wrapped up in the uptake and availability of devices. Primarily devices and pricing is driven by consumer uptake of mass manufactured devices. As with any new evolution

1 Regulations vary from country to country and what is stated here is a general regulatory position. Individual regions may implement approaches differently
2 PMR some regions know this as LMR, Land Mobile Radio
3 mmWave is a spectrum band, or range of frequencies for implementing the technology
4 C-Band spectrum is the range of frequencies between 3.2GHz and 4.8GHz allocated to Mobile Network Operators. Generally these are the first bands where 5G is implemented.
5 SA: Stand Alone mode is where a device can operate independently on 5G without first needing to register and gain access to resources on another technology, typically 4G.
6 MMC: Machine to Machine Communications also known as IoT
7 URLLC: Ultra-Reliable Low-Latency Communications.

of wireless communications it is chicken and egg; you need infrastructure to attract customers and customers to invoke the availability of devices. Many things are conspiring to slow this chain of requirements from general economic slowdowns, to the recent pandemic. However, as with the fluidity of standards the fact is that 5G devices are available, they will become cheaper and users will take up the technology. Infrastructure manufacturers similarly will develop the equipment, and operators implement systems.

Airport coverage could be challenging

Coverage, or rather validating coverage attained, is more complex in a 5G world. The use of MiMo[8] , and a variety of link management techniques means that reliance on simple field strength measurement to validate coverage or a simplistic coverage prediction plot being reliable is not a valid option. As well as coverage, actual throughput and latency is a key metric that impacts directly upon user experience and is the main driver for implementing a 5G system. This becomes relevant in two specific ways:-

- Validation that the infrastructure delivered meets the requirements of the contract. This is a contract / project assurance activity. This ultimately impacts on user acceptance and use for the system procured.
- Ensuring the system is performing in the real world as expected and assuring it continues to do so. With many critical services dependent upon the infrastructure, validating its continued performance is essential.

The best way to achieve validation of coverage is through using a user-based measurement capability. This is a developing area but one such approach utilises the user device to undertake automated background measurements of quality of signal and throughput.

One such example is ngSpecView[9] .

Wi-Fi is here to stay

It is feasible that 5G could replace PMR, could consolidate all public systems and any other private or shared solutions. But it is unlikely that it will replace Wi-Fi. This is because Wi-Fi is both the only wireless solution in many devices such as laptops, and because Wi-Fi is needed to relieve the capacity demands on cellular networks.

To address some of the issues in Wi-Fi a new standard WiFi6 is now available that provides for better management of large systems and enhanced capacity, mitigating some of the shortcomings of present Wi-Fi.

Doing nothing is risky

Given the uncertainties, the fact that 5G is not yet fully ready, and the overall airport environment reeling from Covid-19, it would be easy to simply put wireless, and more broadly digital, to one side and await more certain times. But there are good reasons not to do that.

Huge benefits from implementation – delay risks loss of value

As discussed earlier, there are many applications that could create huge value for airports. Waiting to implement these will mean the value is realised later. Where airports compete for airlines or for passengers it could lead to a competitive disadvantage that may take many years to recover from.

Public MNOs need more capacity

Even if the airport decided to delay, MNOs need to move ahead with 5G implementation in order to deliver increased capacity in the ultra-dense airport environment to maintain their consumer base.

If the airport waits, they will be unable to influence MNO deployment which could lead to many disadvantages such as inadequate coverage for operational use, lack of certain facilities, inability to subsequently add to the network, earn revenue from sharing infrastructure with Public MNOs, and more.

8 MiMO: Multiple Input Multiple Output is a technology where each "base station" uses multiple antennas to direct radio energy to the user who is actively using the system. The outcome is the signal strengths constantly vary depending upon the location and numbers of users.
9 ngSpecView is a joint development between Erkmar Ltd and NG Networks that utilsies consumer devices to gather coverage, capacity and qualtiy measurements. Contact Erkmar Ltd for details.

Spectrum may come and go

The airport might wish to acquire spectrum, perhaps in mmWave bands, or in core 5G bands where shared access is possible. But often spectrum acquisition is a once-in-a-decade process. Delaying could mean that airports lose the flexibility of having spectrum of their own.

It is always best to have a strategy

Having a wireless strategy only makes sense in the context of a broader "digital" strategy covering wider technological introduction. Given the transformation a bold digital strategy can make to the airport, there is a strong case for developing such a strategy at the highest levels of the organisation (and not just in the IT group).
Such a strategy would make it clear what wireless connectivity is needed and how best it could be delivered.

No two airports are identical, and there are important national differences

While there will be similarities across airports – after all they are all in the same business – there will be important differences. These will relate to factors such as national spectrum position, desires of the national MNOs, size of the airport, ambitions of the airport, capabilities of the teams on hand and more. Hence the need for each airport to craft its own strategy, although ideally while discussion issues that require inter-operability and harmonisation across a wider base.

The prize is a perfectly functioning airport

If these steps are taken and with good support a technologically advanced wireless infrastructure can deliver the platform for extensive digitalisation in all areas of airport operation and passenger experience. Having the platforms that are flexible to enable use cases that drive down costs, increase capacity or improve safety is essential.

In all areas of life, the advancement of connectivity is key and those that lead are held as leaders in the modernisation of business and society globally.

Erkmar Ltd

Suite 342
17 Hollywell Hill
St Albans
Al11DT
United Kingdom

Email: info@erkmar.com

Phone: +44 203 034 2457

Twitter: @erkmarltd

www.erkmar.com

Erkmar