



MPIRICAL 
Innovating Telecoms Training

Mpirical Quarterly

Your complete guide to what's new from
your global training partner

August 21-October 21 edition

At a glance

- 5G Use Cases
- Explore 3 new courses
- NEW features in the LearningZone

Introduction

As we approach the final stretch of another year impacted by the global pandemic, it's clear to see how much technology has shaped our way of living. With 5G shining as a key enabler for many use cases, we focus our attention on the various scenarios in which it is used, and take a glimpse into the social implications arising from 5G release.

With several new courses, new LearningZone content, and more to come in the new year, we can't think of a better note on which to end 2021. We hope you enjoy!

-The Mpirical Team



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Learn Something New!

Explore our newest 5G courses



Interactive

NEW: Delivering 5G Voice

Available LiveOnline and OnlineAnytime, or register your interest in future LiveOnsite dates

This course will explain how voice services are delivered across a 5G system, utilizing IMS based voice services termed VoNR (Voice over New Radio). The course will cover areas such as architectural requirements, protocols, APIs and initial procedures. In addition, a variety of call scenarios will be examined, including service continuity scenarios related to LTE and CS networks. Note that this course is similar in content to VoLTE System Engineering from an IMS operational perspective. However, the key differences relative to 5G will be explored.

[Explore full course details](#)

2 days
(LiveOnsite,
LiveOnline)
12 hours
learning
(OnlineAnytime)

12
CPD Learning
Credits


Level: 2
(Intermediate)



NEW: 5G Use Cases

Interactive

Available LiveOnline and OnlineAnytime, or register your interest in future LiveOnsite dates

This course will cover a broad variety of current and future 5G use cases, exploring scenarios across areas such as Industry, Enterprise and Consumer markets. Some cases are an evolution on the current 4G LTE network, simply enhanced by a faster and more reliable 5G network. Others are entirely new, only possible through the improved bandwidth, low latency and ultra reliability that 5G provides.

[Explore full course details](#)

1½ day
(LiveOnsite,
LiveOnline)
3 hours
learning
(OnlineAnytime)

3
CPD Learning
Credits


Level: 1
(Beginner)



Interactive

NEW: MMTC and 5G

Available LiveOnline and OnlineAnytime, or register your interest in future LiveOnsite dates

Building on the material covered in 5G System Engineering, this course focuses on the use of 5G to support the growing IoT ecosystem and in particular, the support for MMTC within 5G. As such, the course focuses on the modifications which have introduced in Release 15 and Release 16 of the 3GPP technical specifications in order to support the billions of low power devices covering an eclectic range of use cases. In particular, the evolution of NB-IoT and LTE-M will be discussed in light of the 5G system along with the role of the NEF in efficiently transferring small data packets across the network. Finally, a number of MMTC enhancements will be addressed including eDRX, Power Save Mode and the introduction of Early Data Transmission.

[Explore full course details](#)

1 day
(LiveOnsite,
LiveOnline)
6 hours
learning
(OnlineAnytime)

6
CPD Learning
Credits


Level: 2
(Intermediate)

Unlimited Access to more than 60

technology courses
exclusively with
Online Anytime 

23

5G courses

13

4G courses

8

2G & 3G courses

7

Emerging
Technology courses

9

Complementary
Technology courses

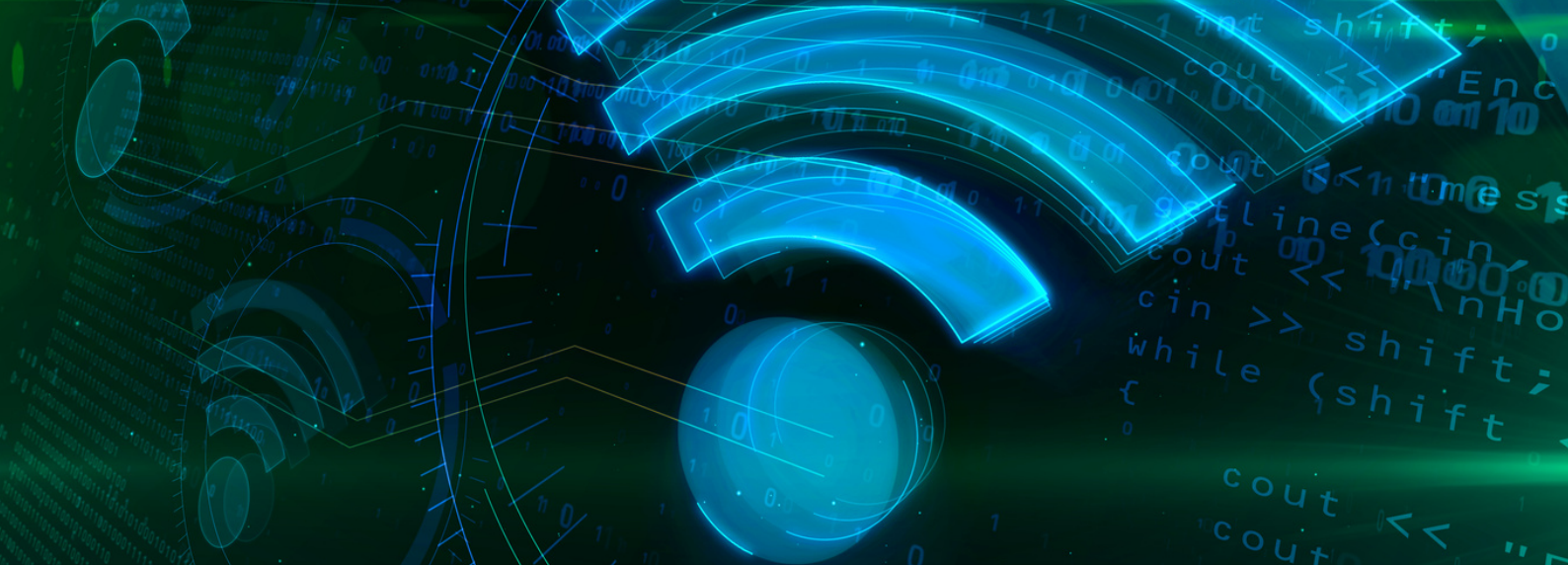
3

Multi Technology
courses



Blog Picks

A selection of our latest and greatest learning and technology blogs this quarter...



Wi-Fi 7

Wi-Fi Evolution

As Wi-Fi 6 capable devices become more prominent in the market, and more and more countries open the unlicensed 6GHz band (Wi-Fi 6E), you could be forgiven for thinking that the technology was in a pretty good place and there would be limited appetite for further changes. However, although the capabilities of Wi-Fi 6 are indeed impressive, the evolution of the technology continues with the development of Wi-Fi 7 or more specifically IEEE 802.11be. This aims to build upon the work undertaken in Wi-Fi 6 through the more optimal use of the new 6GHz band in order to achieve even higher throughput, lower latency, and greater reliability. As such, this should enable Wi-Fi to better support the growing demand for video streaming, wireless gaming, Industrial IoT (Internet of Things) and ER (Extended Reality) etc. Furthermore, the technology aims to also build upon the current Wi-Fi Alliance's Passpoint technology to support a more open and seamless roaming experience.



Figure 1 Wifi Evolution

However, before we get ahead of ourselves, it is worth pointing out that the IEEE are not due to publish their 802.11be technical amendment until 2024 with commercial equipment / certification programme expected shortly after. That said, the IEEE have already proposed several features for Wi-Fi 7 (Release 1 / Release 2) which provide an interesting glimpse into the capabilities of the next generation of Wi-Fi.

Wi-Fi 7 Features

Wider Channels, Higher Order Modulation and More Spatial Streams

Entitled "Extremely High Throughput" it is not surprising to see that Wi-Fi 7 will support higher data throughputs. Whereas Wi-Fi 6 supports a nominal theoretical maximum of 9.6Gbps, Wi-Fi 7 aims to improve this by a factor of 4.8 to achieve a theoretical maximum of 46Gbps. This is achieved by making several changes such as increasing the channel bandwidth from 160MHz to 320MHz, adding a new modulation technique (4096 QAM), which adds a further 20% gain, and the doubling of the MU-MIMO (Multi User – Multiple Input Multiple Output) spatial streams from 8 (Wi-Fi 6) to 16 (Wi-Fi 7).

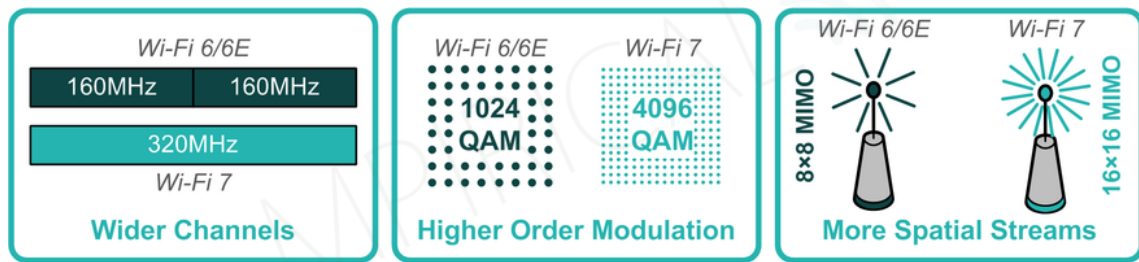


Figure 2 Wider Channels, Higher Order Modulation and More Spatial Streams

Improved QoS

In order to support real-time applications, and thus their requirements for low latency, the task group responsible for the development of Wi-Fi 7 is examining the work undertaken by the IEEE 802 TSN (Time Sensitive Networking) group. Although the inclusion of such approaches will not be straight forward, there are several TSN features which may be mapped over to the 802.11be standard. Furthermore, QoS support in Wi-Fi networks has typically been supported through a process termed EDCA (Enhanced Distributed Channel Access) although this may be better supported through more sophisticated OFDMA (Orthogonal Frequency Division Multiple Access) scheduling.

Enhanced OFDMA

OFDMA was first introduced into Wi-Fi as part of the 802.11ax (Wi-Fi 6) standard as a more efficient means of allocating the available radio resources. Unfortunately, the actual mechanism supported by Wi-Fi 6 is insufficiently flexible in that it only permits a single RU (Resource Unit) of a pre-determined size to be scheduled towards a Wi-Fi station. Wi-Fi 7 however expands upon this by adding the ability to schedule multiple RUs to a single client.

Furthermore, Wi-Fi 7 extends the concept of channel (preamble) puncturing, first introduced in Wi-Fi 6, as a means of preventing the scheduling of RUs on busy channels i.e. to counter the underutilization of channel resources caused by the rigid channel bonding rules of earlier iterations of Wi-Fi. Wi-Fi 7 therefore extends puncturing across the entire 320MHz channel at the granularity of 20MHz.

Multi-link Operation

One of the most significant changes proposed for Wi-Fi 7 is its support for MLO (Multi-link Operation). This enables the transmission of data packets concurrently on multiple channels which may or may not exist in the same band (2.4GHz, 5GHz and 6GHz). This not surprisingly can drive up overall data throughput, provide higher degrees of reliability through packet duplication not to mention the lowering of end-to-end latencies.

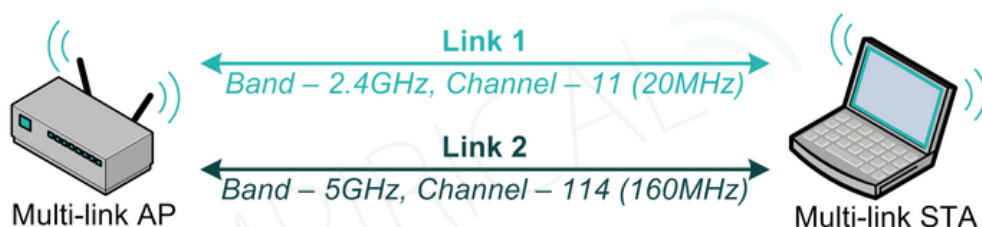


Figure 3 Multi-link Operation

Multi Access Point Coordination

Another significant proposal for Wi-Fi 7 is the introduction of coordination between neighbouring Access Points. Although this capability is supported in some enterprise solutions from certain equipment vendors, its inclusion in

802.11be aims to standardize such capabilities as coordinated scheduling, beamforming, and potentially a distributed MIMO (Multiple Input Multiple Output) architecture.

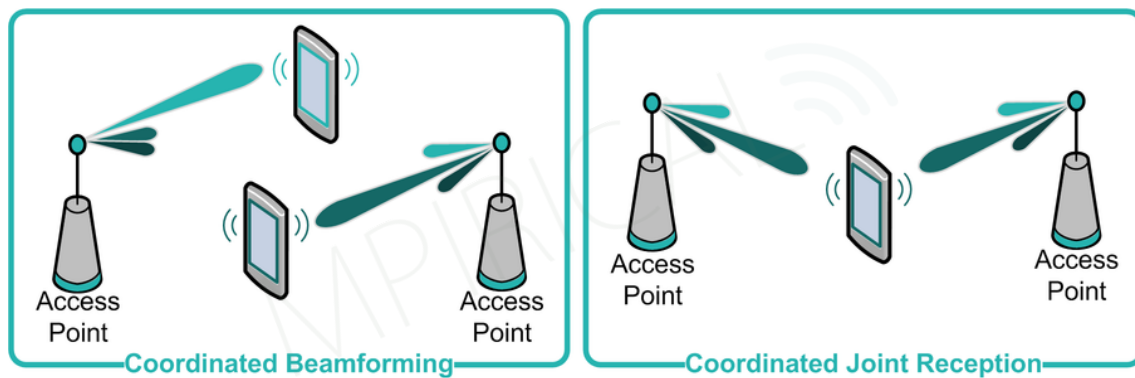


Figure 4 Multi Access Point Coordination

Implementing Multi Access Point Coordination will not be without challenges and for that reason, it is anticipated that this feature may be delayed until "Release 2" which won't be formalized until 2022/2023.

So, even though we may need to wait a few more years to get our hands on Wi-Fi 7, it certainly appears at this stage in its development that it will represent another significant step forward in Wi-Fi's evolution.



Author: Graeme Green
Published: 22nd October 2021



5G. Will it Break the Technology Social Norm?

Globally, as a society, we are clearly at a stage where our predominant form of electronic communication is through mobile technology. More notably, the Internet. We no longer have simple human-to-human communication but also machine-to-machine communication. Billions of devices creating a labyrinth of information accessible at any moment. The 5G infrastructure, as we all know, is designed to handle this constant increase in connected devices and the increase of data throughput that comes with it. This immediate access to information also has significant social, economic, cultural and political implications on individuals.

Given that access to the Internet is increasingly taking place through mobile technology, this also means that how people access and use 5G will have consequences on their life chances. Increasingly, people are using the Internet for day to day activities such as shopping, social networking, looking for jobs and business opportunities and for entertainment. Within the era of 5G this trend is invariably set to increase. This suggests that those people with unrestricted access to 5G and have the ability and skills to fully utilize it have a distinct advantage over those with restricted access, or those who, for a variety of reasons, are unable to fully utilize 5G in pursuit of their life goals.



Digital Inequality

The term “Digital Divide” is often used to refer to unequal access to digital networks such as the Internet. In practice, the term “Digital Divide” has been used to differentiate between those who have access to a communication medium and those who do not. We could argue that this is no longer appropriate as the majority of society is, in some way or another, “online”. Individuals however do have varying levels of access throughout the world so would the term “Digital Inequality” be more appropriate? A stated goal of 5G is to provide universal mobile access to the Internet and so “Digital Inequality” could be seen as more descriptive of how society is likely to engage with 5G as opposed to “Digital Divide” which has an implication of binary access.

However we look at it, it’s fair to say that digital inequality and digital divides are rooted in social inequality. When the Internet was conceived in the early 1990’s it was advertised as a fairer access to information for all, but unfortunately it soon became apparent that certain social groups such as the highly educated and those on higher income were more likely to use the Internet. 5G offers the same promise of providing equal access to information channels and social networks, and it is therefore pertinent to explore these potential digital inequalities.



There are 4 dimensions that have been identified within digital inequality. Lack of experience with new technology, non-possession of technology such as computers or smartphones with access to communication networks, lack of digital skill and finally, lack of usage opportunities. When the Internet was introduced, inexperience with the emerging technology and the possession of the devices needed were the most critical dimensions. People most affected by this included the elderly, those with low educational qualifications, those on low incomes, as well as those who lived in rural areas.

As a general rule, the young and the educated are better able to adopt and experiment with new technologies and to use them in their day to day lives. In contrast, the elderly and less educated are less inclined to adopt new technologies. An example is, again, the Internet whereby in advanced economies, the elderly are less likely to use the Internet even though it has the scope to offer them a better livelihood given their potential restricted mobility as a result of age. If the elderly are able to access and use the Internet, then it becomes possible for them to take greater control of their lives by using it to undertake every day activities such as banking, shopping and even getting medical advice.



With advances in Internet and networking technologies, including 5G, it is apparent that more and more activities are going to be accessible over the Internet, thereby making access to 5G a necessity for modern day life. 5G will enable a wide variety of sensors to be connected to homes and to individuals, and this will enable doctors to monitor the health conditions of the elderly directly and in real time. Hence, it is of direct benefit to the elderly if they are sufficiently motivated to engage with emerging 5G technologies.

5G promises equal access to all individuals regardless of location. This means that even people in rural areas should have the same level of access as people in urban areas. However, compared to urban areas, rural areas are more sparsely populated, and therefore more expensive to connect. The task of interconnecting rural areas cannot therefore be left solely to mobile network providers. Governments have to contribute to this through formulating appropriate policies, giving incentives to network providers, and directly investing in network infrastructure. Just as it is the responsibility of governments to provide people with access to fixed broadband, perhaps access to 5G should also fall under this remit?

5G also promises to make the complexity of emerging technologies more transparent to end users. This is extremely important as technology and devices that are not user-friendly can cause access problems in practice. 5G users shouldn't see a significant jump in the look and feel of their devices. Plus, with the increased application of Multimodal user interfaces, people can interact using hand gestures and facial gazes. Multimodal user interfaces reduce the need to learn complex sequences of instructions, and in this way, they make complex technology more tractable. In addition, we are also witnessing the advent of intelligent personal assistants. These personal assistants simplify man-machine interfaces by anticipating user



needs and issuing commands and requests to the underlying technology to carry out various tasks on behalf of the user. This will help realize another goal of 5G, namely, to facilitate personalized services for end users.

A key feature of 5G is the widespread utilization of IoT devices. These IoT devices will have application in logistics, utilities and healthcare, as well as our homes, all with the potential to improve our quality of life, taking charge of mundane day to day aspects of our business and social lives. A consequence of this is that the need for digital skills may simply disappear as IoT devices are more widely utilized.

Final Thought

There is plenty of evidence to suggest that 5G will usher in a generation of equal opportunity technology users. However, history is against us.

With each new generation of mobile technology there has always been a promise of better quality of life for all and with only early 5G deployments to evaluate, it may be too early to make assumptions. It is clear that the divide between those with, and those without is closing but is it quick enough? Will 5G break the technology social norm?



NetX

Step *inside* the mobile network

Have you discovered the power of NetX? This incredible tool can be used to enhance your Mpirical learning experience or as a reference to guide your projects. Available for individual purchase or as part of an OnlineAnytime package.

Step inside the virtual network



Author: Nick Jones
Published: 27 September 2021

LEARNING

How to Keep up the Learning Momentum Post-Covid

At the height of the Covid pandemic, online learning figures spiked as lockdown gave us an ideal time to reflect and reevaluate our personal goals. Now that a sense of normality appears to have returned to the world, what can be said for all that time we once invested in our learning and personal development? Do we push it to the wayside as we focus on other priorities? Or, do we take advantage of our new mindset by continuing to harness that hunger to learn?

While you may already know what the answer should be, it's always nice to have that extra little nudge to get you back on the right track to success. In this nudge... er, blog... we bring you the top five ways to keep that lockdown learning momentum going strong...

1. Set yourself an action plan

What do you want to achieve? Be clear in articulating your goal and scale your action plan to suit your existing level of understanding. If you're learning a concept from scratch, research any prerequisite information you may need to know. This will ignite that initial curiosity and make diving into your core learning content seem less daunting.



Divvying up your larger learning goals into smaller 'checkpoints' will also make your plan more manageable. For example, if your objective is to learn how standalone 5G networks are deployed, you might first learn what a standalone network is, followed by what 5G network architecture is. To help get you started, why not sample some short, easy to digest content, such as our '2min On' video series?

2. Schedule time... and stick to it!

Next, carve out learning time each day. While this may seem fairly obvious, you'd be surprised at just how effective it can be to your overall learning growth. Whether you prefer an early morning study session, or a late night knowledge binge, the important thing is that you're dedicating a minimum amount of time to learning each day. Tracking your progress by marking off days you've completed your study time on a calendar will serve as a visual reminder to continue working towards your end goals.



3. Decide your own learning paths, and have fun!

Gone are the days when everything we learned came from a single source. Today, we are living in the age of self-teaching. With so many resources to choose from – digital encyclopedias, YouTube, learning portals, forums, webinars, textbooks, even Netflix documentaries... (the list is seemingly endless!) you can be in control of your learning. Immersing yourself in a variety of materials will not only help keep you engaged, but will also cater to different learning styles



4. Start a study group

There's power in numbers! In the same way you feel more inclined to go for that 6am run if your running club is waiting outside your door, you could also find that extra bit of motivation to learn if you're part of a study group. Schedule in a mutually convenient time, meet up in person or through a virtual meeting room, share your notes, engage in discussions about learning material, and reflect on topics that impact your colleagues or peer group. Study group not your thing? Why not join an online forum or discussion board? You'll soon find that partnering with others on your learning journey can open you up to new ideas and make you more receptive to your own learning content.



5. Remember that investing in your personal development is investing in you.

There's a reason it's called 'personal development'. That's because your knowledge is unique to you; it's something you possess – and it can never be taken away. To quote the Roman philosopher Marcus Tullius Cicero, 'Cultivation to the mind is as necessary as food to the body'. When we learn, we grow. It's as simple as that.



And don't forget to reward yourself for your learning triumphs, because learning new things is a triumph. Treat yourself when you've hit a learning goal; brag about your accomplishments on your CV; or simply revel in the satisfaction of knowing you have invested in you.



Author: Morgan Oag

Published: 3rd September 2021



Improving the Digital Divide with 5G

Out of the 176 operators that have launched 5G services currently only 14 commercially support 5G SA (Standalone) operation. These Standalone 5G networks mainly utilize Mid Band frequencies, with the most common being deployed using the 3.5GHz band (Band n78). This is usually supplemented with additional frequencies that have been re-farmed from 4G or using features such as DSS (Dynamic Spectrum Sharing) to increase the 5G capacity. However, a few service providers have utilized the relatively new low frequency bands which were released as part of the Digital Dividend process (frequencies released due to analogue TV “switch off”). Whilst many have deployed LTE in these bands, a few have started to use them for Standalone 5G operation. These Low Bands not only offer great deep indoor penetration due to operating at a lower frequency, but they also can be used to improve the digital divide in many rural areas.

5G Deployment and Bands

Generally, the terminology used to describe the frequency bands for 5G are Low Band, Mid Band and High Band. Figure 1 illustrates some of the well-known bands.

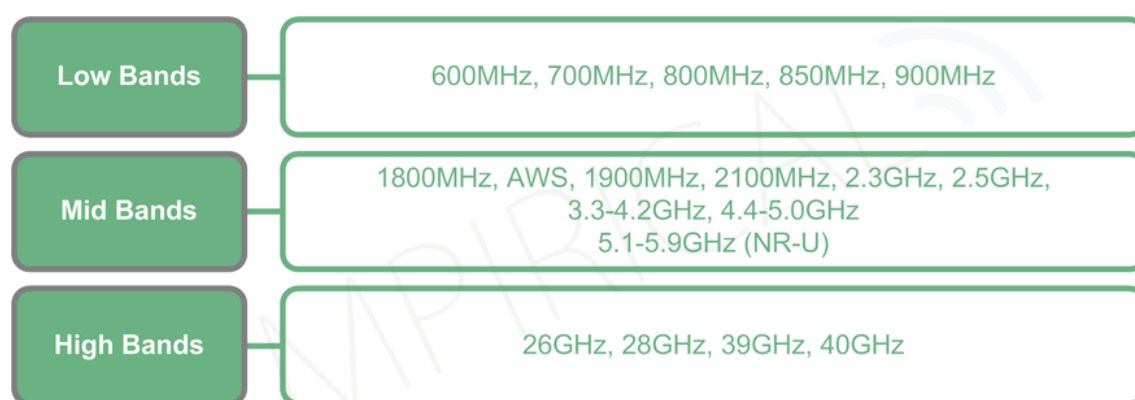


Figure 1 Band Terminology and Example Bands

The actual spectrum used by a Standalone 5G service provider varies based on their current spectrum allocation, as well as any refarming strategy from legacy technologies (2G, 3G and 4G).

In terms of Low Bands usage:

- 600MHz – Currently this is only available in ITU Regions 2 and 3 (See Figure 3).
- 700MHz – Typically utilized for 4G with some 5G deployments.
- 800MHz – Typically utilized for 4G deployments.
- 850/900MHz – Historical 2G bands. Some refarming for 3G, 4G and 5G developments.

Typically, most Standalone 5G service providers have chosen one or two key frequency bands to provide an umbrella of 5G coverage. This usually includes at least one Low Band channel (700MHz to 850MHz) if available, or in some cases it may be a Mid Band frequency. The issue with the latter is that it becomes costly to provide ubiquitous coverage especially to rural areas and deep indoor locations. As illustrated in Figure 2, a service provider will typically utilize a combination of frequency bands (and technologies), with Low Band being the more cost effective for rural deployments.

Unfortunately, the amount of Low Band spectrum available varies based on the country, as well as the service provider's allocation.

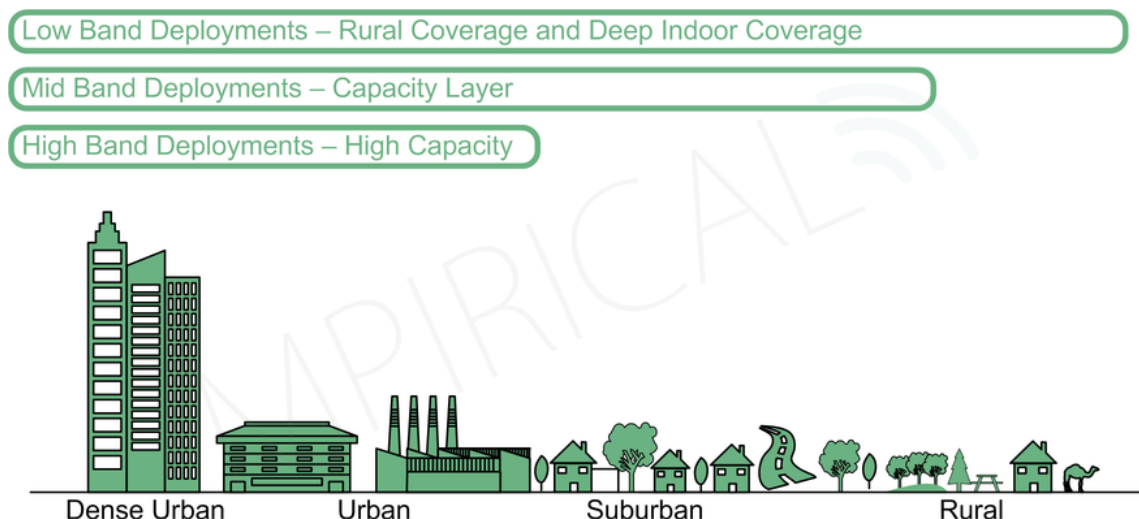


Figure 2 Typical Deployments per Band

Requirement for Additional Low Band Frequencies

Video streaming is a huge part of digital equality. On-demand streaming increases the bandwidth consumption, which at the Low Bands is limited. As streamed on-demand video increases there will naturally be a reduction in the number of people watching TV. As such, the valuable spectrum that is used to support a huge number of digital TV channels becomes unsustainable. It is this shift towards on-demand video which has triggered WRC-23 (World Radio Conference 2023) to re-evaluate, or at least discuss, the number of digital TV channels required. As illustrated in Figure 3, adding bandwidth from an additional Low Band channel, e.g. Channel 2, will increase the capacity / data rate at the required locations, i.e. Rural (as well as deep indoors). It is also worth noting that 5G provides better performance than 4G for the same amount of spectrum – hence it would be the preferred technology of choice.

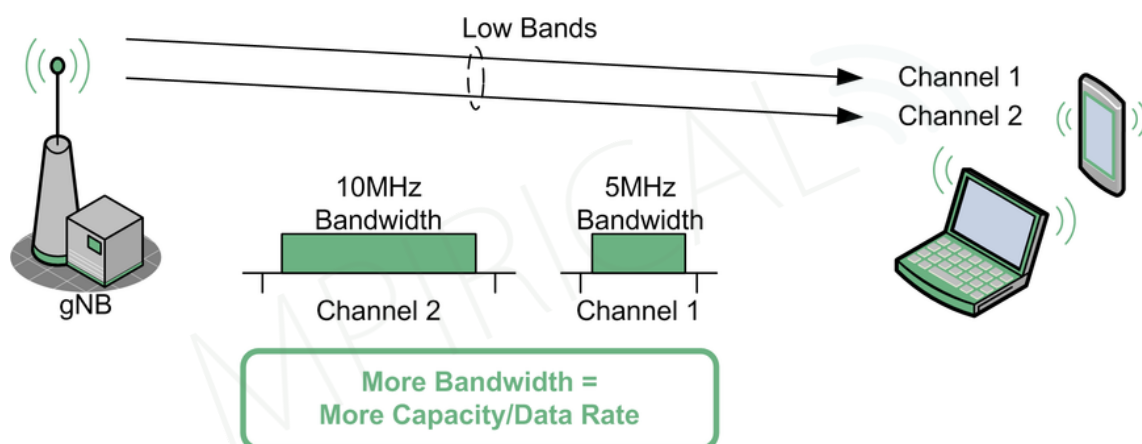


Figure 3 Additional Low Bands

As previously mentioned, Low Band is a scarce resource and therefore typically a service provider may only have a small amount of bandwidth, usually 5MHz or 10MHz, which when compared with the 40MHz+ of Mid Band spectrum they may have, highlights the limitation.

Figure 4 illustrates the bands that will be discussed as agenda items at WRC-23. One item that will be discussed is related to lower frequencies, including those below 700MHz (470-694MHz). These bands are typically utilized by other systems such as “digital TV” in various ITU Regions. It is worth noting that regions 2 and 3 already have access to some of these bands with a few North American providers utilizing 600MHz for 5G deployment. Note that the agenda is not all about Low Bands, with key discussions on many Mid Bands strategies.

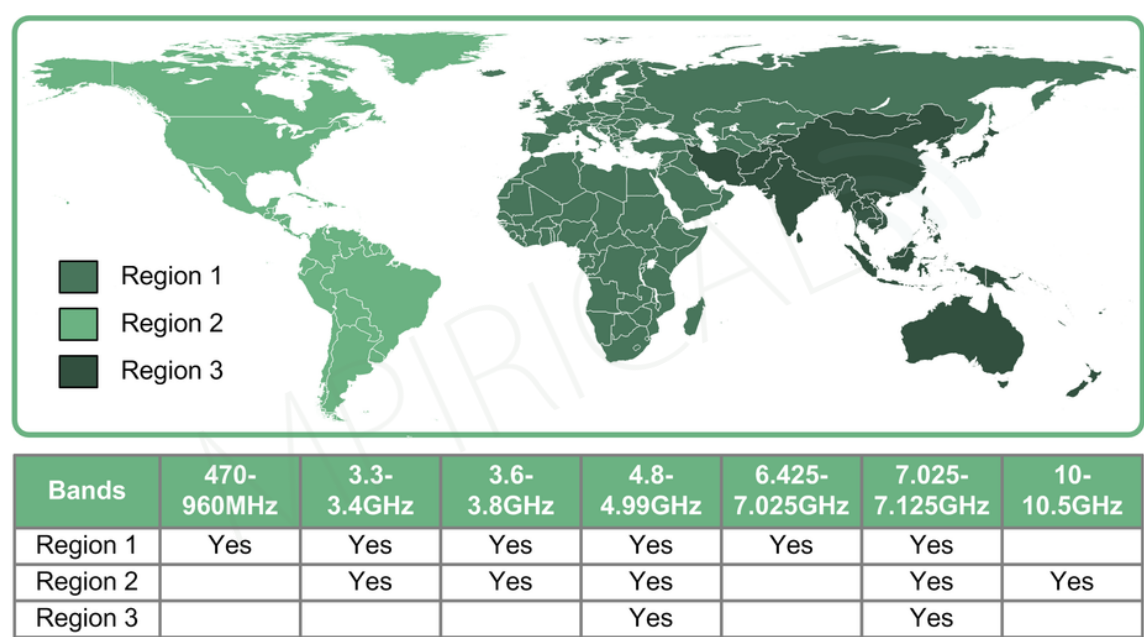


Figure 4 WRC-23 Discussion on Future Bands

Additional Limitations

Unfortunately, having these Low Bands “free” for 5G is only part of the process. Additional limitations for deployment relate to spectrum license, ongoing licensing costs, as well as the overall deployment costs. Unfortunately, some governments and regulators look at 5G spectrum as a revenue generation process, which sometimes causes a reduction in the amount of investment left for actual 5G deployment, which when related to the Digital Divide may limit the expansion into some rural areas.

Conclusion

Whilst improving the digital divide is a difficult (costly) problem, 5G and access to new Low Band frequencies helps in providing a cost effective mechanism to get greater capacity and data rates in rural locations. Unfortunately, even with the 5G Low Bands, service providers are conscious on the revenue/sustainability of rural sites, whether deploying 4G or 5G. As such, it typically falls on government initiatives or offsetting new Low Band license costs with incentives/requirements to cover the rural areas and reduce the digital divide.



Author: Philip Nugent
Published: 24th August 2021



5 [unlikely] 5G Use Cases

What do cows, Manchester United and rubbish bins have in common? (Spare the witty comments, Manchester City.) It's 5G, of course!

Yes, we have all heard of the vast capabilities promised by the low-latency, ultra-reliable, high speed technology, including its applications in healthcare, financial services, utilities, gaming, consumer good... the list goes on. But, for a bit of fun, we thought we'd indulge the seemingly obscure (yet surprisingly innovative) ways in which 5G is helping us create a better future.

1. Waste management

Up first, we're talking rubbish. Well, not literally. Smart bins in cities are one of the small, yet mega-impactful examples of how 5G can contribute to a greener and cleaner planet. Smart bins loaded with 5G sensor technology can transmit data to waste removal authorities indicating when they are full. As a result, waste disposal trucks can strategically plan pickup routes, thus reducing CO2 emissions and freeing our streets from unsightly waste.



2. Sporting events

Over 90% of the world's leading service providers have claimed to trial 5G at various sports stadiums. With opportunities like extended reality and enhanced connectivity on the horizon, 5G can create fan experiences like never before. But for the sake of this exercise (we're looking at the weird and obscure, remember?) we turn instead to the real gem of opportunity: toilet queues. With 5G capabilities, real time analytics data can be used to anticipate and manage crowd densities, including wait times at ticket booths, concession stands, and – you guessed it, restrooms!



3. Truck platooning

Along with self-driving vehicle technology, 5G brings another awesome capability to transport and logistics companies; it's called 'truck platooning'. Effectively, it's the practice of using vehicle-to-vehicle communication to create streamlined convoys of trucks on the road.



The resulting reduction in air drag friction can improve fuel efficiency and cut CO2 emissions by up to 16%!

4. Underground mining

Robotics, simulation, and surveillance are just a few examples of how wireless technology can be used to reduce risk in potentially dangerous working environments – case in point: underground mines. The enhanced reliability of the 5G network provides continuous connectivity to vital operations, including remote operation of machines and equipment. Remote operation could also mean vast changes to the socio-cultural landscape of the mining workforce. What was once a traditionally able-bodied, male-

dominated career may now be accessible to a wider pool of workers, including females, people with physical limitations, or those restricted by travel.



5. Livestock and farming

We've saved the best – um, shall we say, most 'unconventional' – for last. 5G-enabled sensors are being used on cow tails (yes, you read that correctly) to detect when they are about to give birth. Apparently, cows move their tails more before and during labour (who knew?). The abnormal tail activity is identified by the sensor, which then triggers an alert to the farmer's mobile device, notifying him or her of the impending birth. The ability to anticipate the birth drastically improves the calves' chances of survival and offers farmers peace of mind during an ordinarily stressful time of year.



And there you have it. From intelligent bins to cow tails: 5 unlikely ways 5G is defining our future world. And for more use cases in these and other industries, why not explore our newest course, '[5G Use Cases](#)' – available now.



Author: Morgan Oag

Published: 22nd October 2021

Our Commitment to Learning

At Mpirical, we believe learning has the power to inspire. That's why we've partnered with greenlight for girls - a charity dedicated to inspiring girls from all over the world to pursue careers in science, technology, engineering, and mathematics.

So, for every course completion in our LearningZone, Mpirical donate £2 to g4g's cause. Together, we can inspire the next generation of girls to take on the world.

Did you know?



Females make up less than 25% of the tech workforce worldwide? If you want to make a difference, visit www.greenlightforgirls.org

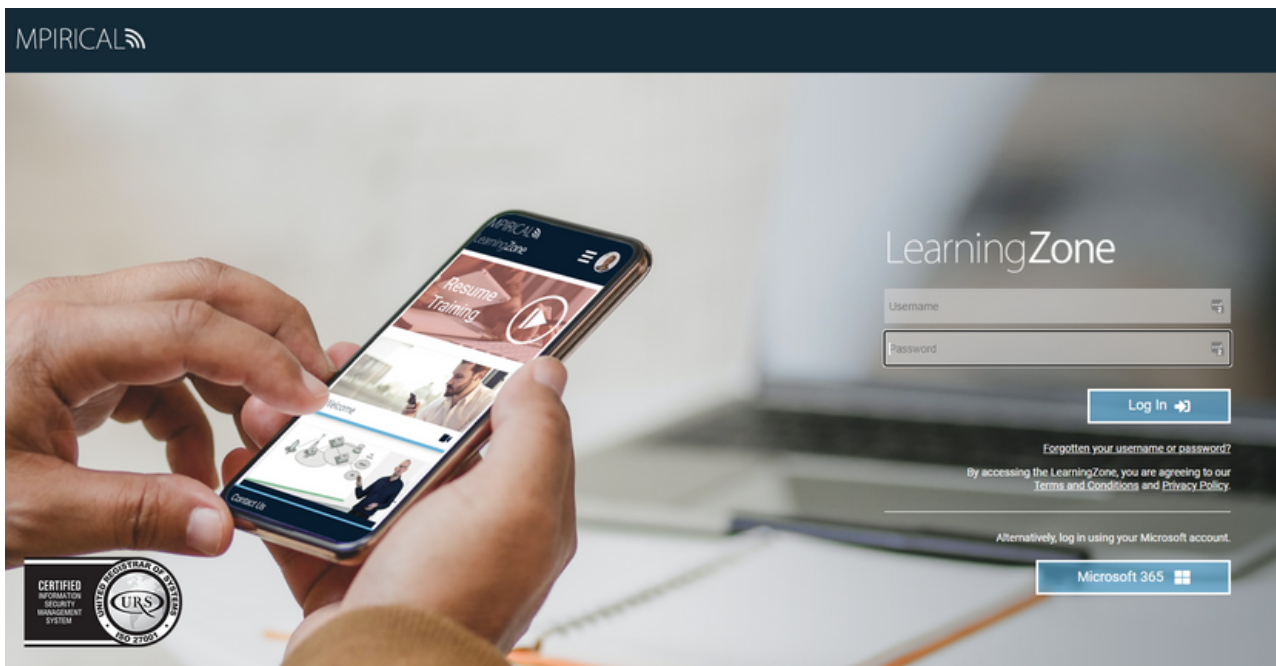


New to the LearningZone

We added some new features to your LearningZone this last quarter. Let's take a look...

1. Single Sign On

First up, you can now login with single sign on. With the new single sign on feature, accessing your LearningZone couldn't be easier. You now have the choice of using your LearningZone username and password OR your Microsoft 365 account login. To sign in with your Microsoft 365 password, simply select this option on the login screen and you're good to go!



2. More badges to earn!

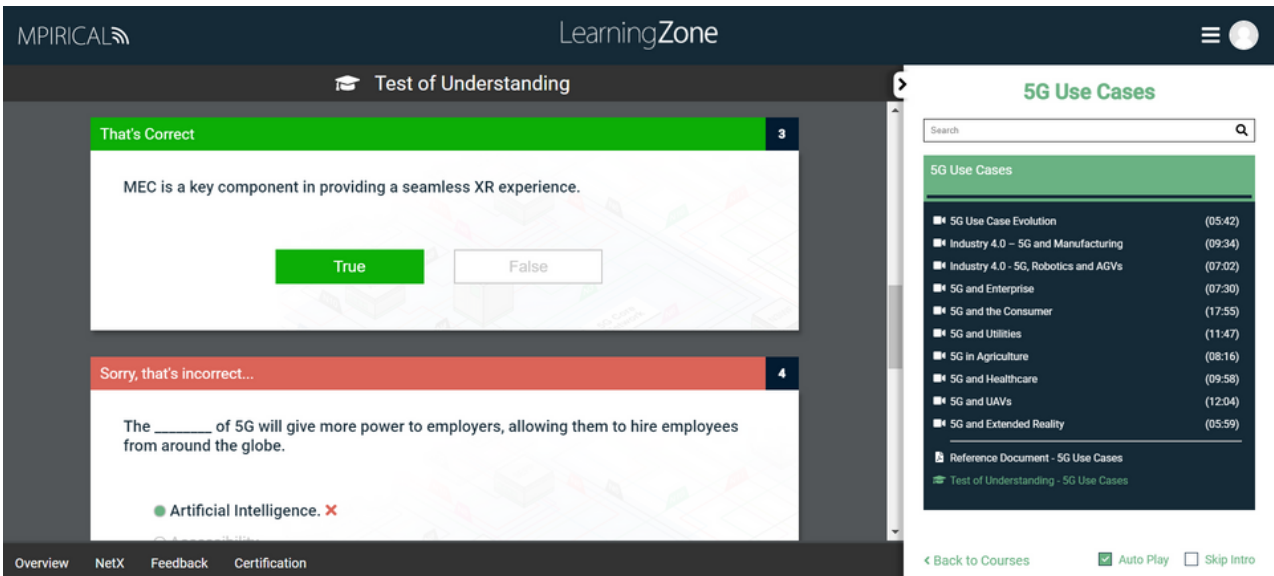
More badges = more opportunities to share your success with your colleagues and social network. Earn badges from accessing NetX, reading blogs, and completing training.

With so many to earn, you'll be on your way to Guru status before you know it!

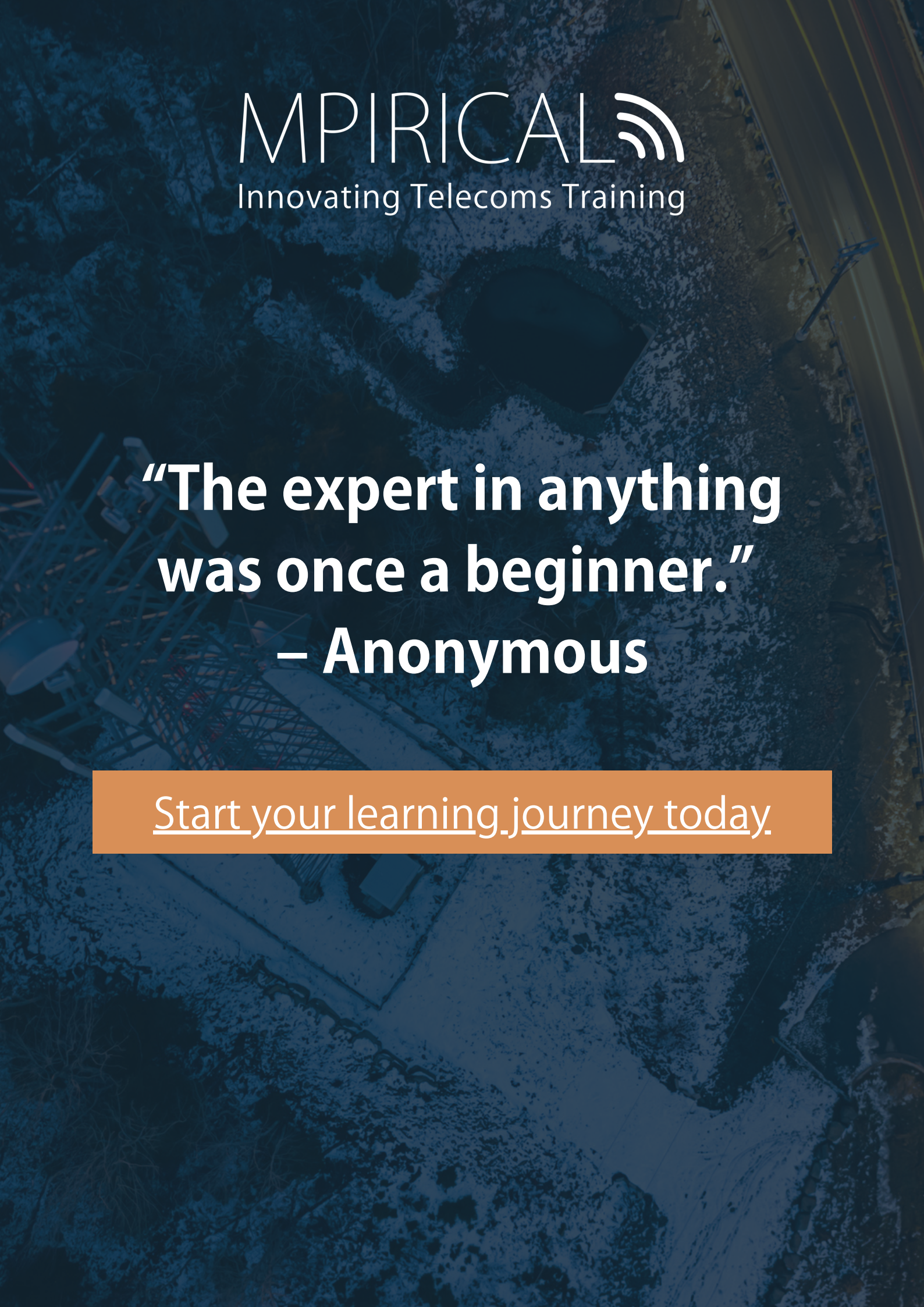
 Complete Introduction to 5G and 5G Use Cases and get 75% in all tests	 Complete ten pre-selected courses and get 75% in all tests.	 Complete five pre-selected courses and get 75% in all tests.
 Complete Wi-Fi System Engineering, Wi-Fi Calling and Wi-Fi Offload and get 75% in all tests.	 Complete five pre-selected courses and get 75% in all tests.	 Spend 15 hours on the LearningZone, open NetX 6 times, read 2 blog posts.
 Spend 15 hours on the LearningZone, open NetX 6 times, read 2 blog posts.	 Spend 15 hours on the LearningZone, open NetX 6 times, read 2 blog posts.	 Spend 15 hours on the LearningZone, open NetX 6 times, read 2 blog posts.

3. The test of understanding has a new layout

Questions are now displayed one at a time with red and green color coding so you can easily spot your results.



Watch this space... more LearningZone updates coming soon!

An aerial photograph of a telecommunications site, featuring a tall tower with multiple antennas and a surrounding landscape with some vegetation and a road.

MPIRICAL 
Innovating Telecoms Training

**“The expert in anything
was once a beginner.”
– Anonymous**

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See you in 2022!