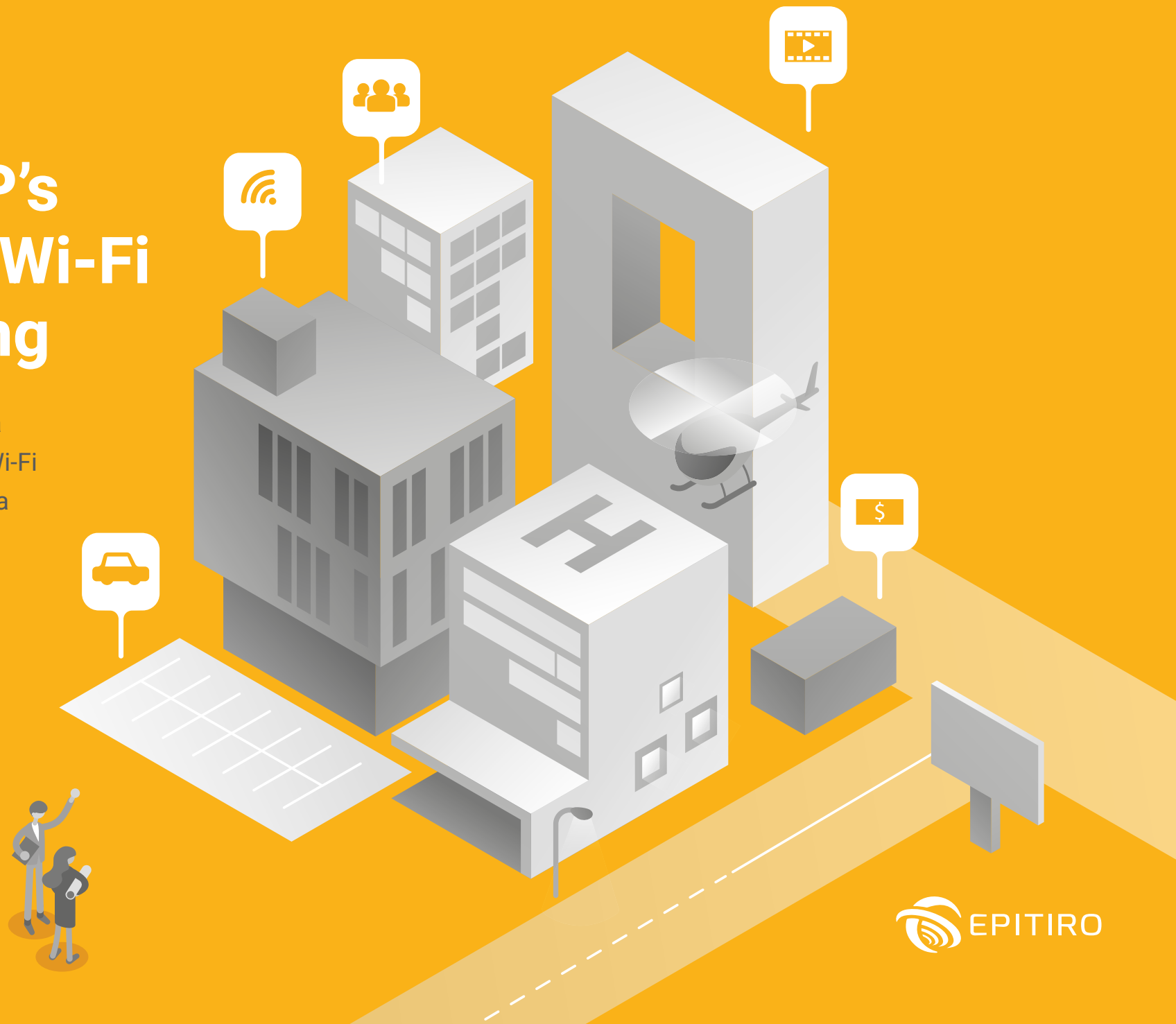
The MSP's guide to Wi-Fi offloading

Developments in data offloading to public Wi-Fi networks in the 5G era



EPITIRO

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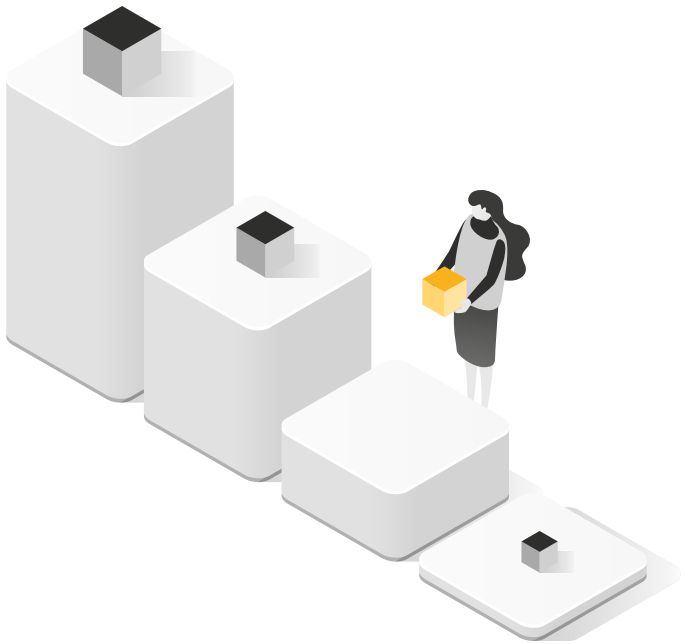
Champions of either 5G or Wi-Fi 6 can often be found arguing the case for their preferred technology ousting the other.

In truth however, both technologies – which offer significant performance improvements over their previous iterations – provide different benefits for different use cases in different environments.



The emergence of 5G has been a game changer for carrier-based, licensed mobile internet connectivity, offering users higher speeds, lower latency and greater capacity.

But it's not yet the magic bullet for all scenarios. The reliability and economics of indoor cellular continues to pose problems for mobile network operators.

5G is generally delivered using a higher frequency than its 3G and 4G predecessors to better serve bandwidth-hungry applications. High-capacity millimeter wave (mmWave) is sometimes touted as the 5G the gold standard, but it suffers from poor propagation over distance and it has higher attenuation through walls, resulting in worse in-building penetration characteristics. Moreover, interference from existing indoor Wi-Fi networks can be found to compromise the performance of some 5G radios.

Reliable, high performance indoor 5G networks call for expensive and time-consuming deployment of small cell hardware, in partnership with building managers.

So, while 5G is the preferred option for wide-area coverage, for the foreseeable future Wi-Fi, which relies on unlicensed spectrum, will remain the preferred choice for indoor use.

Significantly, Wi-Fi has evolved at the same pace as cellular technology and its credentials have been reinforced with the advent of 802.11ax, better known as Wi-Fi 6. Wi-Fi 6 has raised the performance bar in crowded, end-user environments, improving efficiency and capacity as the number of internet-connected wireless devices proliferate.

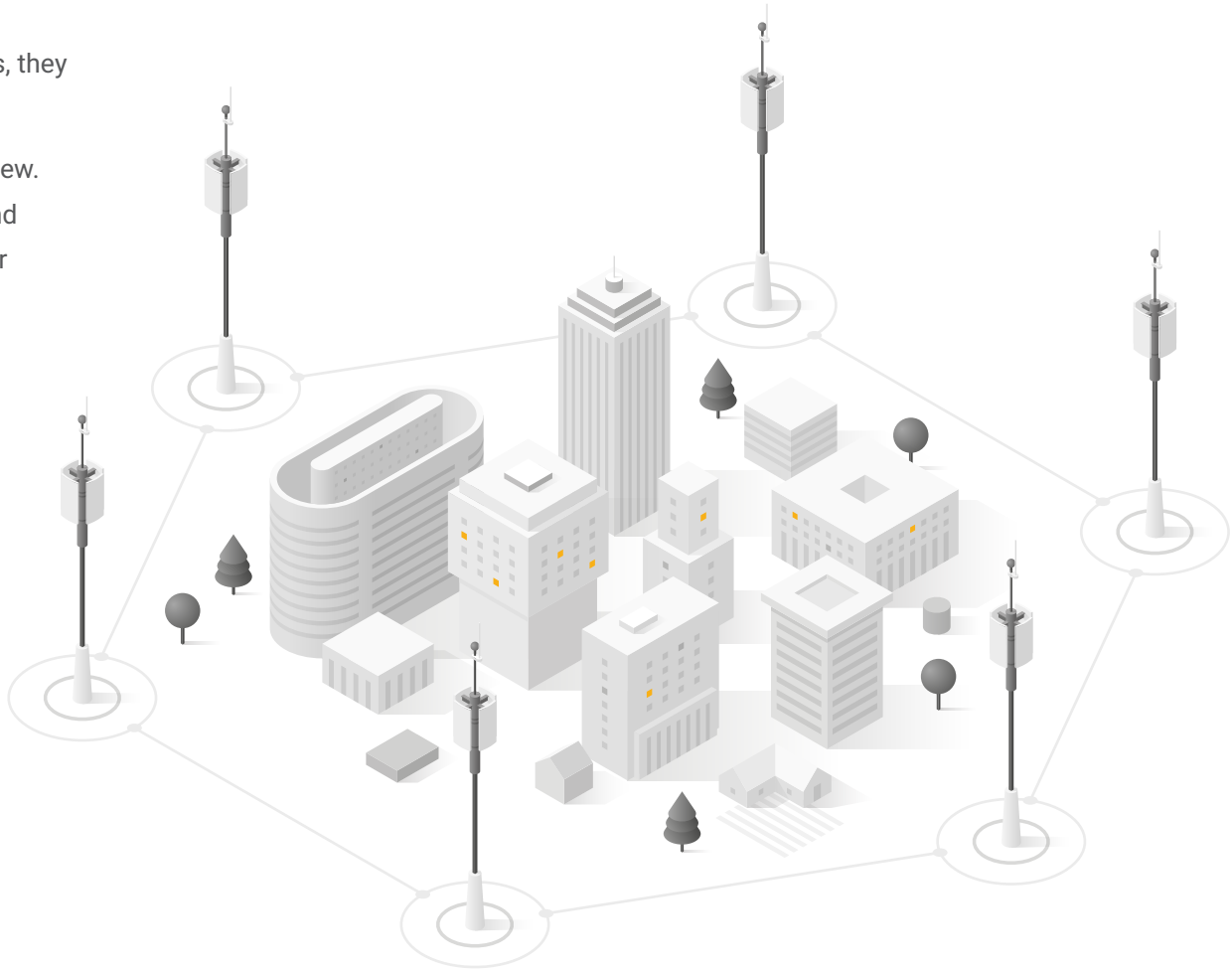
The future of seamless network roaming

Wi-Fi and 5G are more than just complementary technologies, they now have the capacity to converge.

Coordination between Wi-Fi and cellular, in itself, is nothing new. Wi-Fi calling, for example, has long enabled users to make and receive calls via their Wi-Fi connection, rather than via cellular radio. But much closer integration is now possible.

Despite U.S. mobile network operators spending in excess of $80 billion to acquire spectrum through an FCC (Federal Communications Commission) auction in January 2021, estimates suggest that the ever-growing demands for data services means that a spectrum deficit beckons[1].

Combined with the challenges of providing 5G services in indoor environments, this is strengthening the case for leveraging Wi-Fi 6 infrastructure to offload cellular traffic.



1 Maximizing Spectral Efficiency to Overcome A Spectrum Deficit in a 5G World, Resonant, January 2021

Better together?

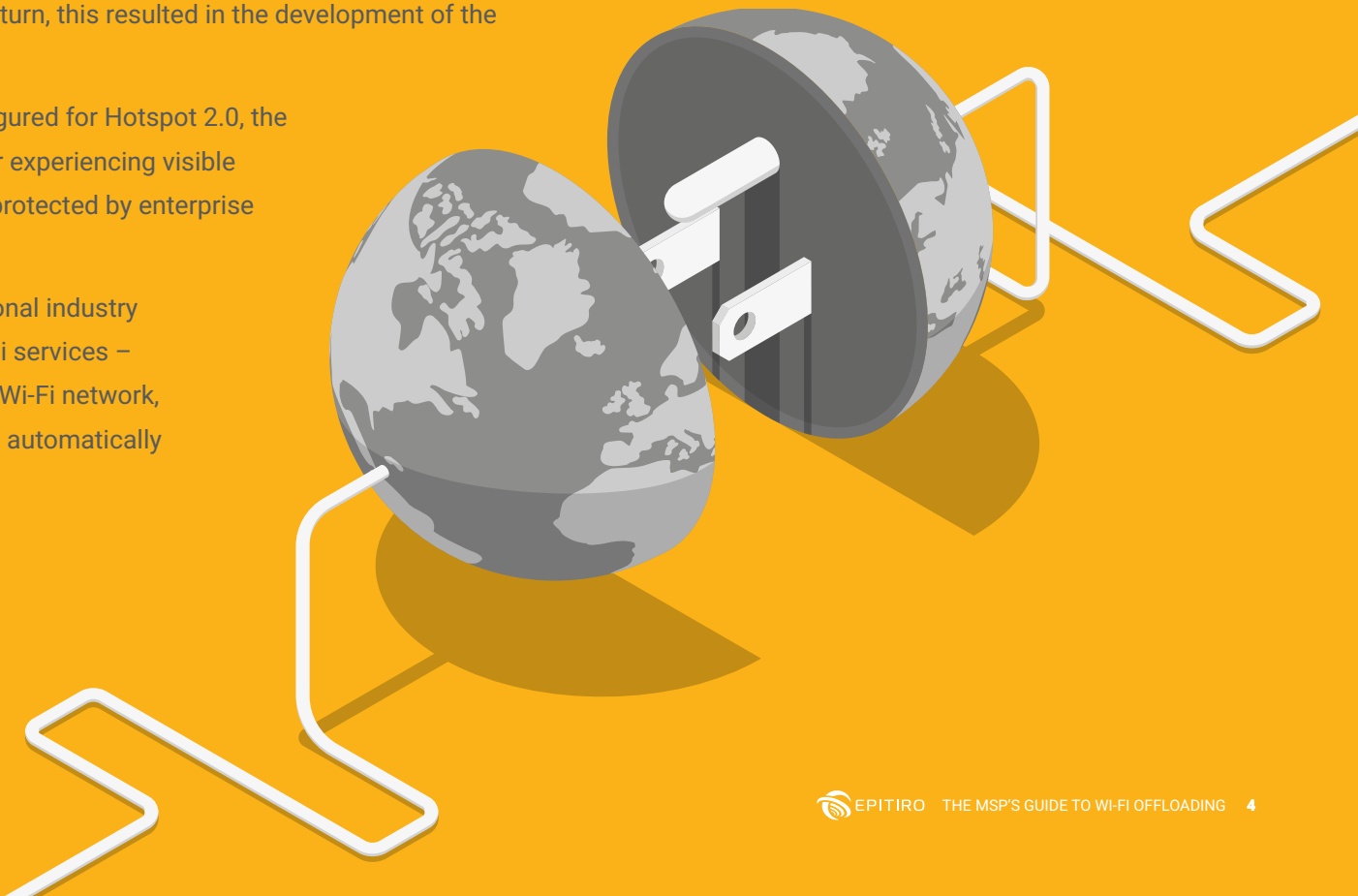
Practically, what does data offloading mean for the end user?

Manually switching between cellular data and public Wi-Fi – whether in an airport, shopping centre or sporting arena – can invariably prove frustrating, cumbersome and time-consuming due to the Wi-Fi authentication and reauthentication process.

To help overcome this issue, the Passpoint protocol was developed by the Wi-Fi Alliance to allow users to easily transition between partner networks. In turn, this resulted in the development of the Passpoint-certified Hotspot 2.0 standard.

When a device is in range of a Wi-Fi access point configured for Hotspot 2.0, the connection seamlessly moves to Wi-Fi without the user experiencing visible change. Data within the Wi-Fi network, all the while, is protected by enterprise versions of the WPA2 or WPA3 security protocol.

The Wireless Broadband Alliance (WBA) – an international industry organisation dedicated to improving interoperable Wi-Fi services – now has a vision of making the world a “a single, giant Wi-Fi network, allowing billions of people and their devices to connect automatically and securely to millions of Wi-Fi networks”.



Realising the Wi-Fi roaming vision

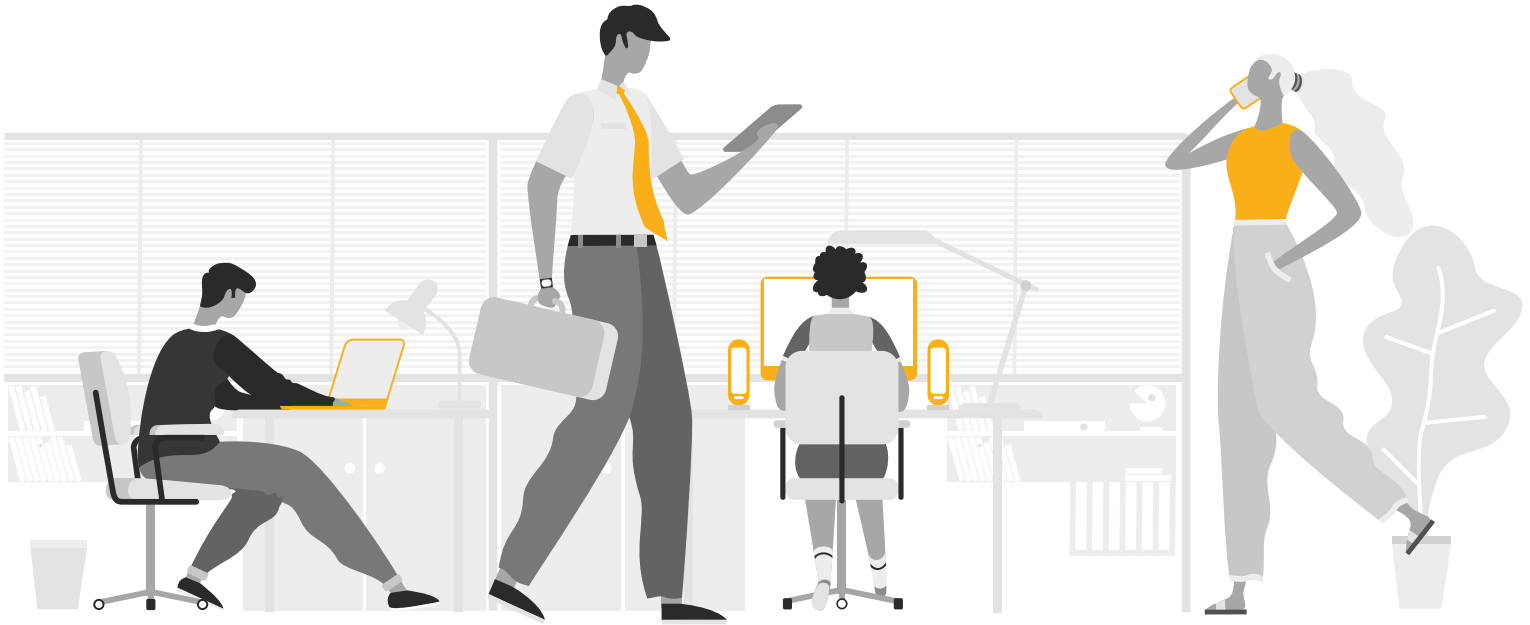
Building on the Passpoint roaming standard, the official launch of OpenRoaming in 2020 by the WBA is set to play a big role in realising this ambition.

OpenRoaming, underpinned by Passpoint, automates secure device roaming between networks that adhere to its framework. OpenRoaming automatically authenticates devices by using established identity providers, such as a service provider, device manufacturer or cloud ID.

The recent launch of OpenRoaming Release 2 in June 2021 promises to enable network and service providers – including mobile network operators, cable operators and ISPs – to offer an enhanced quality of experience (QoE) to their subscribers, including voice, high-definition video streaming, gaming and more.

With this release, the WBA said it has “accelerated the definition, development and scope of its global Wi-Fi Federation”. The Wi-Fi Federation aims to expand the Wi-Fi roaming ecosystem, promote global connectivity, solve secure auto-onboarding and create new opportunities for operators and venues to commercialise their networks.

According to the WBA, the release also includes “service enhancements for network service providers and operators, allowing them to guarantee their subscribers a defined, high-quality experience when using the OpenRoaming network”.



Other recent industry initiatives, helping bridge the gap between Wi-Fi and cellular networks, include Google's Orion Wi-Fi, a Wi-Fi offload scheme that allows privately-owned public venues to monetise their W-Fi by selling capacity to cellular carriers. Orion Wi-Fi informs local networks of the carrier's price and quality and, where appropriate, automatically and securely connects the user.

According to Google, Orion will work with most commercial and enterprise Wi-Fi networks without requiring hardware or software upgrades.

Over the next decade, as more devices are shipped with cellular-to-Wi-Fi roaming capability, the offloading of 5G connections to Wi-Fi networks is set to escalate apace.

Integrated Wi-Fi 6 and 5G access architectures are the future, allowing users to seamlessly roam from airport to airport, or from office to hotel to restaurant or coffee shop without having to manually enter a single network credential.

Ensuring quality service standards

In most cases, mobile network customers will have quality of experience (QoE) expectations and will have signed up to their provider's terms of service. These must marry with the service provision of the Wi-Fi networks their data is being offloaded to.

As the uptake of Wi-Fi by mobile carriers accelerates, robust measures will be required that ensure customers receive the standards of service they expect, whether they're using 5G of Wi-Fi.

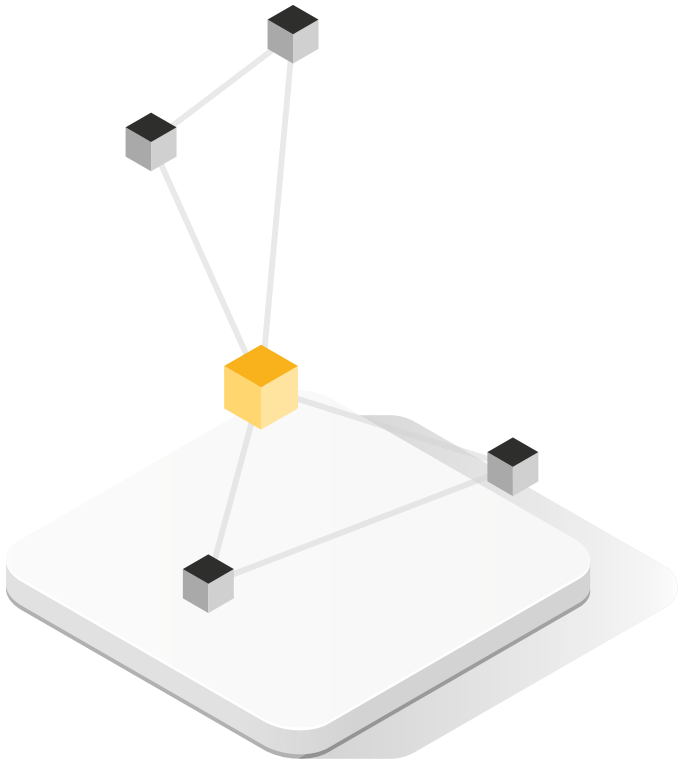
By continuously monitoring and measuring the performance of both the cellular and wi-fi network, MSPs and mobile operators can help ensure that the end users' QoE is not compromised.

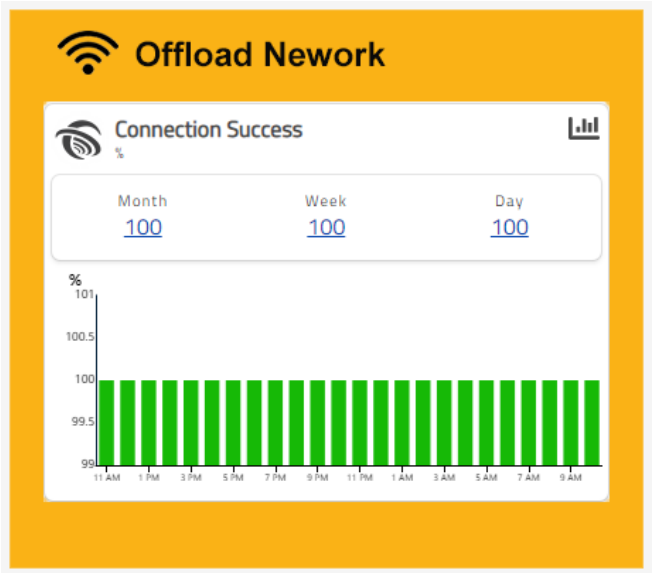
In many cases, the Wi-Fi network may not be owned, or managed, by the cellular carrier, for example, it may be operated by the venue owner. To ensure seamless movement of the service across the disparate networks, it is important to have detailed visibility of the network handshakes and their timing.

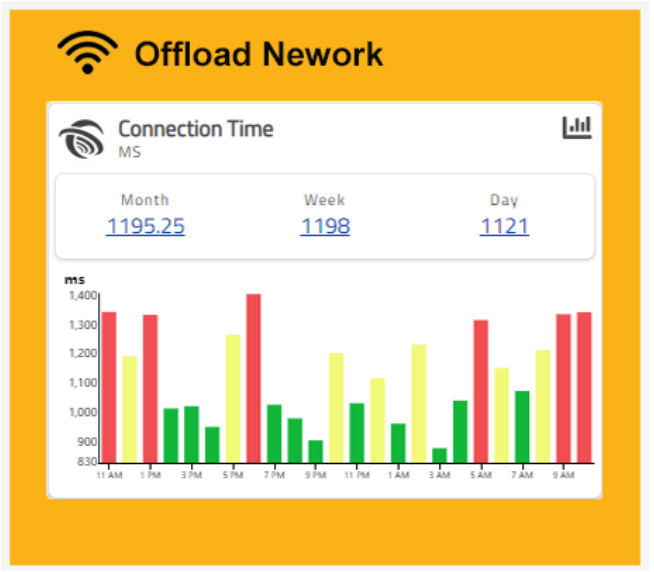
If one network does not acknowledge the transaction before timing out, the customer may get stuck on a network that is no longer visible as they move around the venue.

Measuring the offload connection success and paying attention to the timing of the network transitions can be crucial to ensuring a seamless customer experience.

When connections timeout or fail, it is critical to have visibility of the underlying mechanisms, and to know which party to the handover is causing the delay or error. An easy way to measure this key data is with Epitiro agents. The agents experience the service and network interactions just like a customer, while also collecting and reporting the essential, detailed data.







Here is a section of the handshake information as a customer is transitioned from one network to the other.

Epitiro agents support the authentication mechanisms used for carrier offloading, including 802.1x EAP – AKA, PEAP, TLS, and TTLS.

Customers at the forefront of Hotspot offloading and now OpenRoaming, use Epitiro to help ensure the quality of their outdoor and in-building services.

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