December 2023

"PRIVATE CELLULAR OR WI-FI?" ISN'T AN EITHER/OR QUESTION: YOU CAN HAVE BOTH

WHITE PAPER

Prepared by
Zeus Kerravala

ZK Research
A Division of
Kerravala Consulting

INTRODUCTION: WE LIVE IN A WIRELESS WORLD

The world used to rely on wired connections. The phones we used back then plugged into the wall. The computers we used were plugged into modems or Ethernet jacks. The introduction of mobile phones started to change that gradually, and then Wi-Fi accelerated that shift. No longer tethered to our desks, we could roam the office—or the world—without worrying about connectivity. Users don't really care which technology connects them as long as they stay connected wherever they are.

But there has been a definite separation between wireless connections in the wider world—such as 4G and 5G—and campus-based Wi-Fi. So, a shift has been underway, accelerated by the pandemic, that has placed increased importance on wireless access—whether it's 4G/5G or Wi-Fi.

Business operations have been dragged into the future. Things that were once an exception are now the norm. For example, in retail, touchless payments with wireless point-of-sale (POS) terminals are standard; tablets are critical learning tools for students in school systems around the world; and physical event tickets are a thing of the past, as sports and concert venues now use ticketless entry systems that rely on apps and wireless connections.

These changes have catapulted wireless to the forefront. Connections that were once considered networks of convenience have transformed into essential primary tools.

An increasing number of businesses are bringing once-separate information technology (IT) and operational technology (OT) together while significantly increasing the number of Internet of Things (IoT) devices. At the same time, high-bandwidth and latency-intensive applications such as video and voice that were once tethered (quite literally) to wired networks can now perform just as well on wireless connections. That's because wireless access speeds are now equal to or even faster than those delivered by wired networks.

At the same time, two enterprise wireless connectivity methods have emerged, creating confusion among buyers: Wi-Fi 6/6E (with 7 on the horizon) and, with 5G now available, private 4G/5G.

With all of this as background, the media and many industry watchers have concocted a debate over which technology would win. This report examines all the issues and investigates whether it really is a zero-sum game. Does there need to be a winner and a loser, or can the two technologies work together? If so, what will it take to make that happen?

SECTION II: WHAT ARE THE DIFFERENCES BETWEEN CELLULAR AND WI-FI?

To get started, it makes sense to examine the differences between Wi-Fi and cellular technologies. Although they both use wireless spectrum, the way they function is entirely different.

ABOUT THE AUTHOR

Zeus Kerravala is the founder and principal analyst with ZK Research. Kerravala provides tactical advice and strategic guidance to help his clients in both the current business climate and the long term. He delivers research and insight to the following constituents: end-user IT and network managers; vendors of IT hardware, software and services; and members of the financial community looking to invest in the companies that he covers.

Key Facts About Wi-Fi and Cellular

Wi-Fi	Cellular
Technologies	
Wi-Fi 6/6E is the current standard for this technology. Wi-Fi 6, like previous generations, continues to work on the 2.4- and 5-GHz spectrum ranges, while Wi-Fi 6E, an extended implementation, also operates on the 6-GHz spectrum.	Cellular has different standards in different regions (e.g., CBRS in the United States, n77 in Europe), which adds to the complexity of global deployments.
Spectrum	
Wi-Fi uses unlicensed spectrum, which is both a strength and a weakness. The upside is the ubiquity and ease of connecting. On the downside, the unlicensed spectrum makes it subject to interference and congestion—both of which can be unpredictable.	Licensed cellular spectrum ensures higher reliability and predictability. Cellular 4G is widely available, with 5G deploying and 6G on the horizon. Notably, private 5G can use any available spectrum.
Deployment	
Wi-Fi is easy to deploy and affordable, with limited deployment models, such as short-distance outdoor bridging and mesh backhaul. In addition, Wi-Fi is ingrained in our society and understood by everyone. An entire industry of people sprung up with the skill sets to design, deploy, monitor, and troubleshoot Wi-Fi, which is something private 5G can't match.	Private 4G/5G can be difficult to deploy, with a limited number of infrastructure vendors, multiple deployment models, including DAS, and small cells that extend the public networks into buildings. Private 4G/5G solution providers use other technologies for in-building deployments (similar to Wi-Fi), providing service to buildings, campuses, or venues.
Availability	
Wi-Fi is ubiquitously available and widely deployed across laptops, computers, phones, and consumer devices.	Cellular technologies are ubiquitous on phones and tablets. But there is limited value in having cellular in devices such as laptops. Intel tried to enter that market and failed miserably—mainly because 4G/5G radios can be two to three times as expensive as Wi-Fi. The cost of 5G radios, while still more expensive than Wi-Fi, has decreased in recent years. But broad rollout might also require SIM card deployment and management at scale.
Simplicity and Scalability	
Because of its simplicity, Wi-Fi can scale from one access point to tens of thousands of access points depending on an enterprise's needs and growth rate.	5G can scale as well, but it's more complex.
Business Model	
Wi-Fi is simple: purchase, configure, and deploy.	5G typically still works as a subscription model.
Range	
The effective range for access points is in the low hundreds of feet.	Cellular's connectivity range is in the high hundreds to thousands of feet, and public 4G/5G transmits across a wide geographic area.

SECTION III: WI-FI AND PRIVATE 4G/5G ARE COMPLEMENTARY, AND YOU SHOULD DEPLOY BOTH

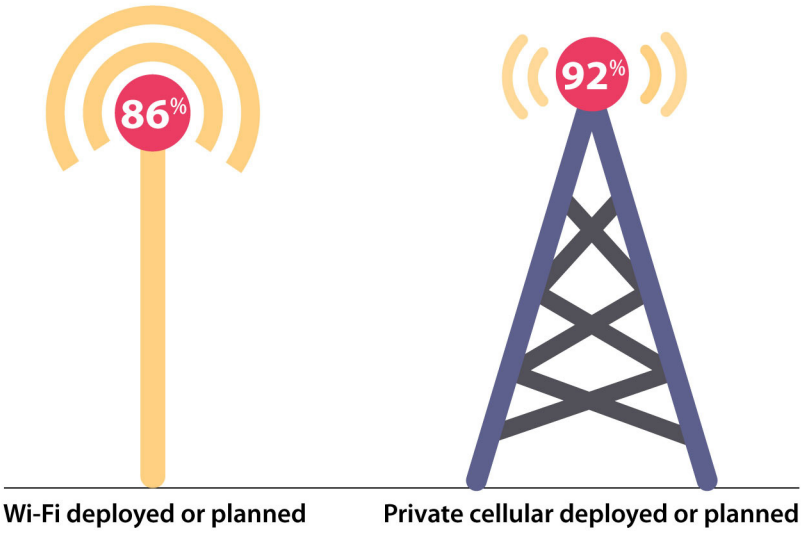
The media love a controversy—so much that they'll do anything to foment an argument, and that's the case when they consider cellular and Wi-Fi. Therefore, it's no surprise that, contrary to much of the media chatter, cellular will not kill Wi-Fi, and Wi-Fi will not eradicate cellular. The two technologies are highly complementary. Simply put, they work well together, and enterprises can use them in concert to create a network that meets their wireless requirements.

The ZK Research 5G – Wi-Fi Deployment Survey found that 86% of organizations have deployed or plan to deploy Wi-Fi 6/6E/7. In addition, 92% have deployed or plan to deploy private cellular (Exhibit 1). This underscores the complementary nature of these technologies.

For most businesses, Wi-Fi will remain the primary wireless network for indoor connectivity. The reason for that is simple: it's the lowest-cost and easiest-to-deploy technology that meets the needs of most workers, including file sharing, video conferencing, VoIP, and collaboration. Enterprises should use private 4G/5G to augment their Wi-Fi deployments, with the best use cases coming when the services are mission critical.

In addition, temporary outdoor venues can deploy both technologies simultaneously—and in a way that underscores their complementary nature. For example, Wi-Fi can handle connectivity to user devices, while private 4G/5G provides backhaul connectivity to the core. This approach is significantly simpler and cheaper than laying fiber and takes advantage of the individual attributes of Wi-Fi and cellular.

Exhibit 1: Enterprises Have Deployed or Plan to Deploy Both Wi-Fi and Private Cellular



ZK Research 5G – Wi-Fi Deployment Survey

Complementary Uses of Wi-Fi and Cellular	
Industry	**Use Cases**
Manufacturing	Asset monitoring Autonomous vehicles IoT gateways
Transportation and logistics	Outdoor operations Video surveillance Remote control
Government	Smart city initiatives Public safety Fixed wireless
Healthcare	Medical devices Front-line worker connectivity
Sports and entertainment venues	Public safety Automated checkouts Facial recognition

SECTION IV: UNIFIED MANAGEMENT MAKES WIRELESS MAGIC

One thing IT has been constantly battling over the past few decades is siloes. Systems, software, and even departments have cropped up in isolation so much that this has challenged even the most organized IT group to know what's happening. Consequently, contemplating another set of siloes—covering private cellular and Wi-Fi—is probably not something most IT managers would have at the top of their wish lists. However, with a unified management approach, they won't have to worry about it.

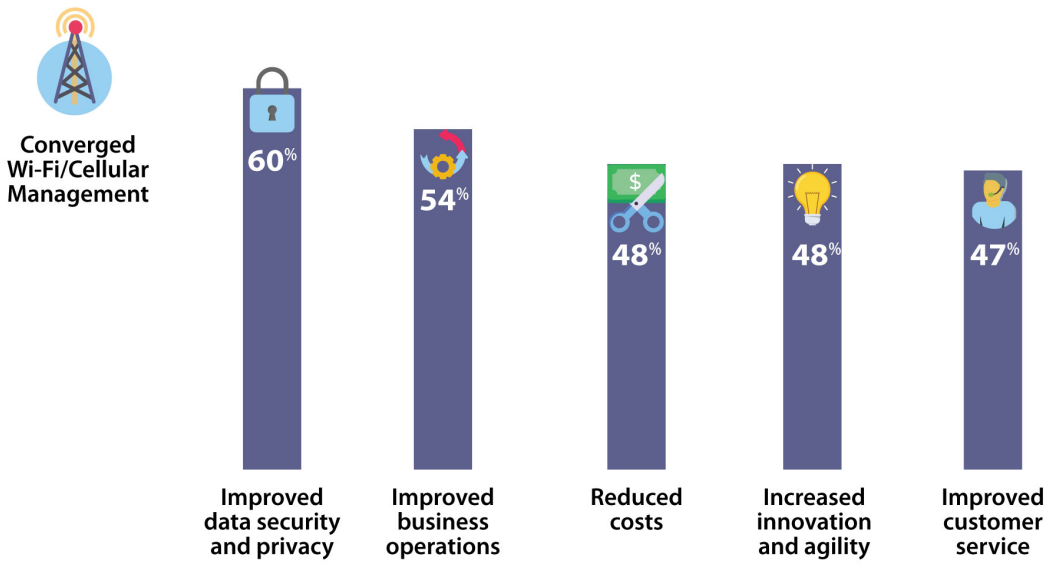
In the ZK Research 5G – Wi-Fi Deployment Survey, we recently found that organizations use two to five different systems to manage their access networks—including wired, Wi-Fi, and private cellular. No wonder this is a headache for IT. Such scattered management means staff must configure the networks and set policies repeatedly, which wastes time—and the results of our survey support that.

Respondents told us that siloed management wastes 17% of an IT organization's time, along with 19% of the money allocated to running the networks. That kind of inefficiency is a clarion call for unified management, which explains why 88% of the companies we surveyed believe converged management would benefit their organization. In addition, 95% of the industries that are current users of private cellular believe converged management will be beneficial.

The survey found that converged management would bring several benefits, including improved data security and privacy, improved business operations, reduced costs, increased innovation and agility, and improved customer experience (Exhibit 2).

The right solution should handle convergence at the management layer, not within the access points, because coverage varies. For example, one 4G or 5G radio might sit alongside dozens of Wi-Fi access points.

Exhibit 2: The Many Benefits of Unified Wi-Fi/Cellular Management



ZK Research 5G – Wi-Fi Deployment Survey

SECTION V: CONCLUSION AND RECOMMENDATIONS

In the argument between private cellular and Wi-Fi, you *can* have it all—and you can have it all seamlessly.

We live in a wireless world, and ZK Research believes that users and devices will stop thinking about whether they're using Wi-Fi or cellular; all that will matter is that there is a connection. However, to be effective, enterprises should manage these two complementary technologies from a unified console. In considering a solution, we make these recommendations:

Make sure it's cloud delivered. The flexibility of the cloud will make management simple and accessible from anywhere.

Look for AI-based analytics. Analytics that can be predictive and proactive will simplify the task of managing Wi-Fi and private cellular.

Get a solution from a company with a broad ecosystem of partners. Partners are a crucial ingredient in the cohesive management of disparate systems and technologies.

Ensure the company has a services organization to guarantee smooth deployment. In deploying these kinds of technologies, the services that a vendor brings to bear will be critical.

Ask about the company's history of success with complicated venues. If the stories are slim or nonexistent, look elsewhere.

See if the company has licensing flexibility. Flexible license terms will ease your entry into unified management of Wi-Fi and cellular.

Make sure the company has you covered on campus, in the data center, and with wide-area networking so you can have a seamless end-to-end network. If a company comes up short in any of those areas, look elsewhere.

ZK Research has reviewed Extreme Networks' offerings for the unified management of Wi-Fi and cellular and found its Infinite Enterprise concept compelling. The company's mix of products and services under the "One Cloud, One Network, One Extreme" vision shows that unified management is not only possible—it is a reality.

Moreover, the company's history of deploying in complex environments—everything from hospitals and ports to manufacturers and Major League Baseball stadiums—makes a strong case that it can handle just about any challenge that Wi-Fi and cellular can throw at it. Therefore, ZK Research recommends looking at Extreme Networks' unified management solution, which is part of ExtremeCloud IQ.

CONTACT

zeus@zkresearch.com

Cell: 301-775-7447

Office: 978-252-5314