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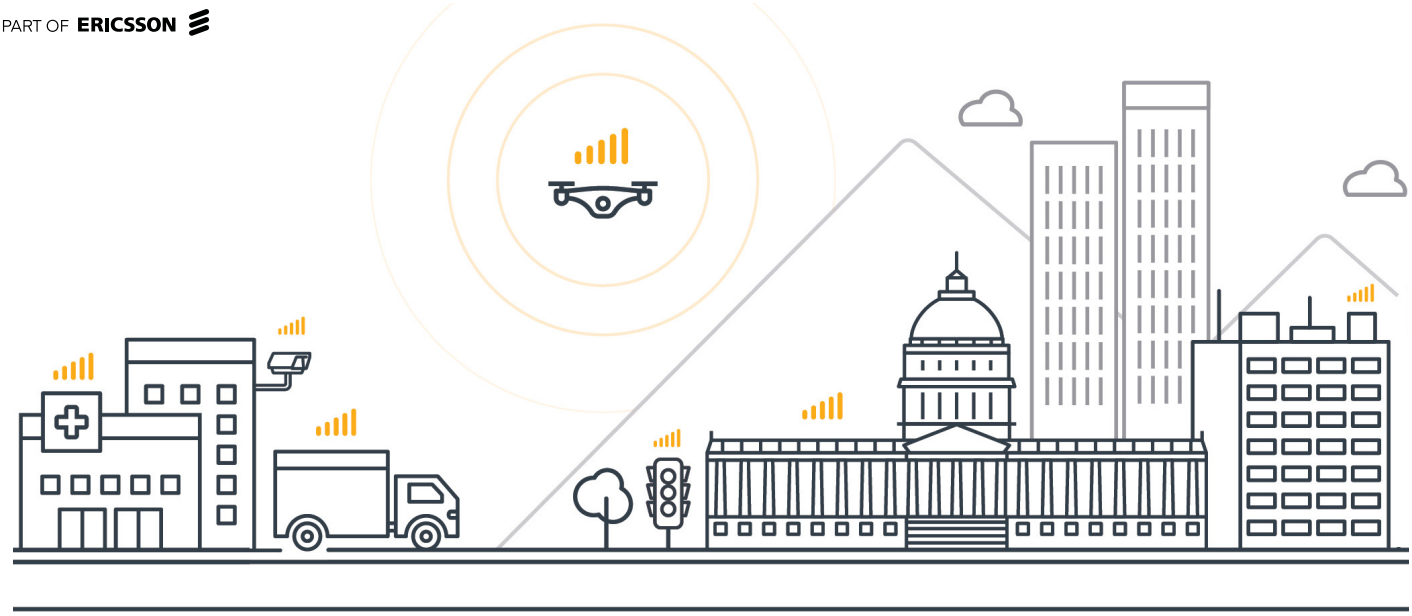
WHITE PAPER



WANs Beyond Wires

5 Strategies for Greater Agility, Diversity, and Reach at the Network Edge

The New WAN Environment of Clouds, Things, and Mobility

Cloud services, IoT devices, and greater mobility are pushing businesses beyond the architectural constraints of wired networks. Each of these are driving demand for broader reach, increased diversity, and better operational flexibility to serve new use cases that drive competitive advantage. Together they are putting a strain on wired network capabilities and having a powerful impact on wide-area network (WAN) architectures. Wireless WANs, based on the capabilities of 4G LTE and more powerful 5G technology, are becoming an essential part of any organization's digital transformation.

Over the past 20 years, similar demands fueled the move from wired Ethernet LANs to Wi-Fi. Nobody thinks about being close to an Ethernet jack anymore. As reliability, security, distance, and bandwidth improved, the flexibility and economics of Wi-Fi trumped those of wired LANs. LTE and growing 5G services are having the same effect on wired WANs, especially when integrated with and building on the capabilities of software-defined WANs (SD-WANs).

SD-WAN was the First Step in WAN Transformation

SD-WAN brought some very important capabilities to enterprise networks. Consolidating multiple network functions reduced both hardware and operating costs. Support for multiple WAN links improved reliability and enabled both bandwidth aggregation and traffic segregation. Application recognition and policy-based routing created new opportunities for network optimization.

Cloud-based management made it easier to deploy and manage network devices. These were necessary first steps in the transformation of WANs. But the resulting networks are still tied to wires, instead of the people and devices they are meant to support.

Wireless WANs are the Next Step

Wireless connections can bring increased diversity, greater network agility, and broader reach to enterprise networks. Supporting diverse types of network connectivity to create a more reliable WAN is the foundation for Wireless WANs. Building on this capability, wireless edge solutions add cellular links as a connection option. This expands the reach of enterprise network functionality to the people, places, and things where work is happening. The network intelligence at the core of SD-WAN solutions makes switching between links, segregating specific traffic types, or quickly opening a new business location almost effortless.

From 4G LTE to 5G

Carriers are making cellular a practical option for Wireless WAN links with evolving flat-rate pricing options and bandwidth-boosting enhancements such as Gigabit-Class LTE. Emerging 5G services offer even greater performance and opportunity for new services. More than just increased bandwidth, 5G technology delivers a wide range of new capabilities and use cases. For example, 5G is designed to deliver ultra-low latency, enabling new applications that require faster response times. Enhanced antenna and transmission techniques can massively increase the number of devices and conversations that each 5G station can handle, making wireless support for IoT networks and other high-density applications a reality. With Gigabit-Class LTE widely available now, and 5G services rolling out from most major carriers, it is becoming much easier to pull a network out of the air, whenever and virtually wherever the business needs it.

— 5 Strategies for Wireless WANs —

Wireless WANs solve multiple problems for business networks, create new opportunities, and lay the foundation for further transformation and innovation. This paper outlines 5 key strategies for Wireless WAN deployments:

No. 1

Enhancing network failover

No. 2

Augmenting network bandwidth

No. 3

Making wireless the primary link

No. 4

Expanding IoT capabilities

No. 5

Boosting business mobility

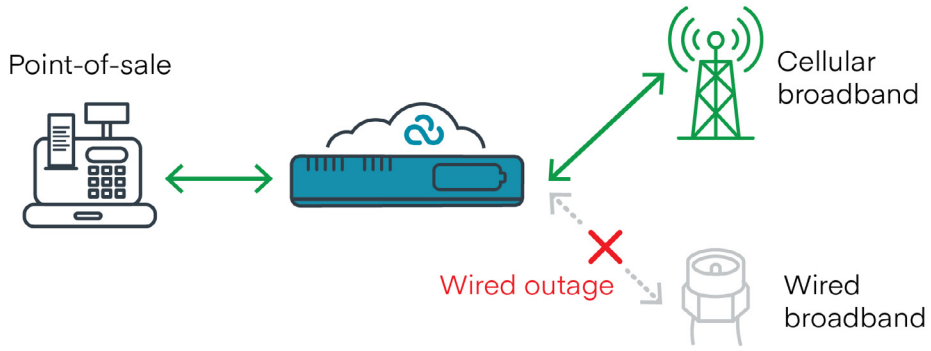
No.1 Enhancing Network Failover

Key Wireless WAN Capabilities:
- Availability
- Reliability
- Bandwidth

Wire, Wireless, Repeat

High availability tops the list of WAN requirements in any digital enterprise. Cloud applications and services have made WANs essential; an operating WAN is increasingly becoming essential in accessing mission-critical enterprise functions. Network uptime and nonstop operations have become key performance indicators for IT management. Historically, organizations added more wires into the building to ensure network availability and seamless failover, from different carriers if necessary, for greater resilience.

Unfortunately, adding another wire is not enough to ensure continuous operations. Pulling another wire through the same conduit or trench is not going to deliver the required diversity. Installing a new physical wire may also take too long for many projects. Instead, enterprises are building layered availability with different types of connections — some over wire, some over the air. Then simply repeat as needed to achieve the desired level of availability.



Nonstop Availability

With networks forming the foundation for enterprise digital transformation, nonstop availability is critical. Wired-to-wireless failover seamlessly switches from one type of link to another, without any network or service disruption. With lower-bandwidth LTE connections, SD-WAN policies identify the critical traffic to carry on the wireless link. Higher-bandwidth Gigabit-Class LTE and 5G connections can failover all traffic. Enterprises can also deploy wireless failover functionality quickly and easily — much faster than waiting for installation of a new wire or an alternate service provider.

Out-of-Band Management

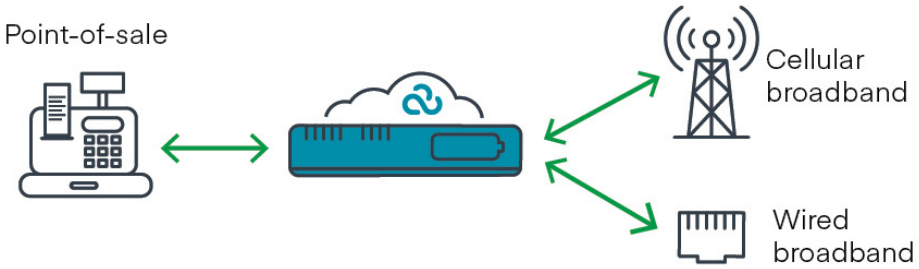
When wired links go down, network management capability is lost along with the remote traffic. With most land-line disruptions happening within the last mile, secondary landlines often are also down, leaving the remote unit unreachable. Wireless links provide an efficient Out-of-Band Management option, connecting directly to the console port on one or more remote devices. Network managers can easily and securely diagnose and fix problems over the air, without having to leave the office, roll a service truck, or painstakingly walk a local employee through the troubleshooting process.

No.2 Augmenting Network Bandwidth

Key Wireless WAN Capabilities:
- Bandwidth
- Segmentation
- Parallel Networks

More Links, More Bandwidth

One big advantage of SD-WAN is simultaneously aggregating multiple links to create more bandwidth, as an alternative to ordering (and waiting for) a single, faster line. Augmenting a wired link with a wireless link, or using multiple wireless links, is a powerful alternative technique for quickly increasing available bandwidth. With LTE reaching estimated speeds up to 50 Mbps, Gigabit LTE up to 350 Mbps, and 5G over 1 Gbps, wireless link capabilities are quickly meeting or exceeding the capacity of traditional wired connections. Of course, these additional links also continue to provide seamless failover, with appropriate policies for which applications or devices get priority.



Different Links, Different Services

Beyond just adding more communal bandwidth, SD-WAN capabilities and wireless links supply the option to burst capacity under specific circumstances, such as peak periods or major updates, or provide reserves for mission-critical applications. Many organizations take advantage of these functions to identify and treat traffic differently, separating devices or applications and assigning them to a specific primary link. For example, keeping generic web traffic separate from Point-of-Sale terminals, or visitor networks separate from critical database and financial applications.

New Links, New Services

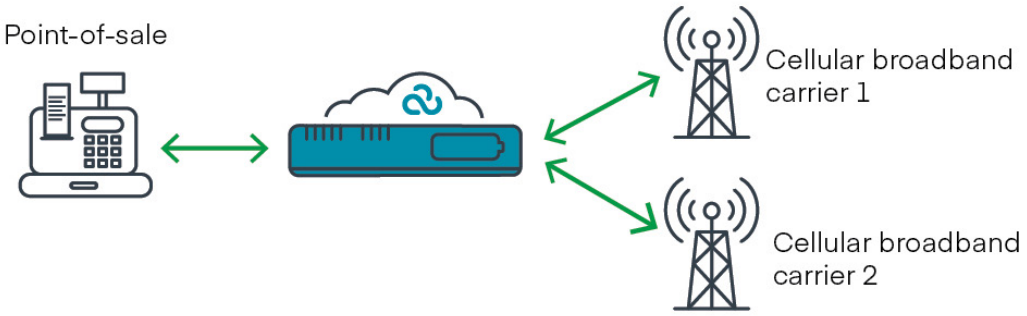
As the availability and capacity of wireless links increase, they create interesting opportunities to quickly add new services to encourage digital transformation, improve customer experiences, or enhance regulatory compliance. It is often faster and more secure to deploy segregated, parallel networks for new services, instead of going through potentially months of negotiation, configuration, and testing to add them on existing links. For example, a major retail bank quickly added digital signage to its branches to improve product education and ease wayfinding for better customer experiences. Using separate wireless links, the company rolled this initiative out very quickly and easily isolated the new signs from any other branch traffic without expanding the attack surface or adding additional risk to existing services.

No.3 Making Wireless the Primary Link

Key Wireless WAN Capabilities:
- Agility
- Reliability
- Reach

Wireless When You Can

People have embraced and prefer wireless connectivity in their offices and homes. Why? Because the reach and agility of wireless is worth far more than the shrinking bandwidth advantage of wires. Many banks, retail stores, insurance agents, and other types of branch offices are looking at Wireless WAN links for the same reason. Wireless WANs bring greater operating agility to these locations, making it faster and easier to open or move stores and offices. Sometimes they may want to trial a location, expand if it works out, and quickly redeploy if not. Or the layout of the branch may change frequently, due to merchandising or staffing changes, and it is much easier to move a wireless endpoint around than a wired one.



Wireless When You Must

There are many other business scenarios for primary wireless networks, where wires are simply not a viable option. For example, short- to medium-term operating locations, or ones without a building, such as construction sites, pop-up stores, or outdoor markets. Or just a need to move to where the customers are due to unanticipated issues or disruptive situations, from major municipal repairs or construction projects to natural disasters and public health emergencies. The cost and time of getting wires in these scenarios is prohibitive and unrealistic. Instead, businesses can quickly pull a network right out of the air and have full control to decide when, where, and how long to set up remote locations.

Wireless for High Availability and Reduced Management

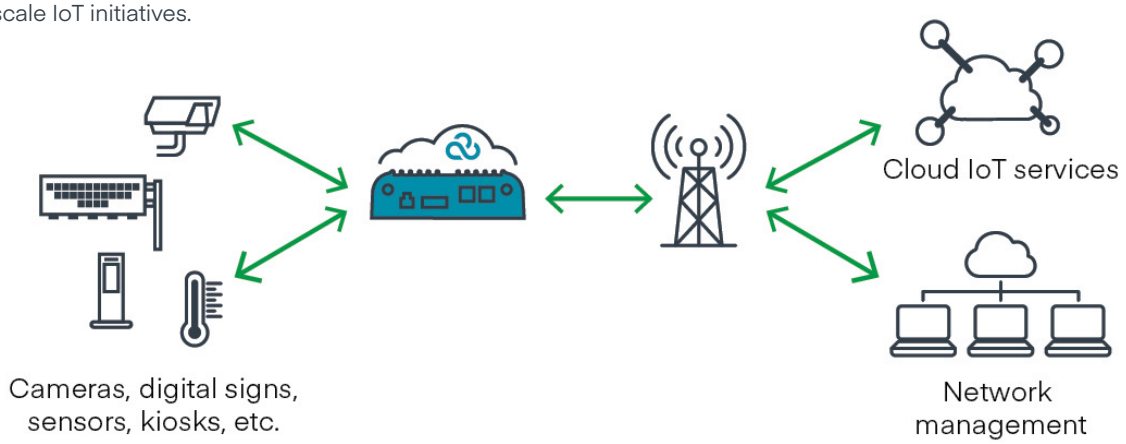
An interesting application of making wireless the primary network connection is building a highly redundant network with reduced operating costs. Organizations with regional or national operations often have to deal with hundreds or even thousands of ISPs for their branch office links. While these wired networks may have redundancy, the operating and administrative complexity can result in configuration errors that impact availability. Not to mention the time and costs required to manage all of the contracts. A simpler and more cost-effective alternative is national contracts with several wireless carriers, resulting in consistent configurations and easier network management. For maximum availability, each branch can have two routers with separate links to different carriers.

No. 4 Expanding IoT Capabilities

Key Wireless WAN Capabilities:
- Device Capacity
- Security
- Reach

Video, Kiosks, and Industrial Plants

Many people think of IoT as small, occasional bits of data, with little impact on the existing network. In some cases that may be true, for individual devices such as door sensors, thermostats, or lighting controls. But when they grow into smart buildings, smart cities, or robotic manufacturing, they become a lot of things generating a lot of traffic. While these IoT scenarios may get more press, the leading use cases are bandwidth-hungry things, such as video surveillance, self-service retail kiosks, and all sorts of medical, manufacturing, and industrial operations. The low latency and increased bandwidth of wireless links are critical for many organizations as they deploy these large-scale IoT initiatives.



Private Networks, Inside and Outside

Sometimes IoT devices are equipped with integrated wireless capabilities and can connect directly to a cellular or Wi-Fi network. However, as the number of devices grows, it costs too much and takes too much time to manage hundreds (or thousands) of SIM cards and wireless network subscriptions or access points. In this scenario, organizations look to deploy their own Private LTE or emerging Private 5G networks inside a large building or outside covering a campus. Sometimes called wide-area LANs, these networks typically use spectrum dedicated to the organization and aggregate all IoT traffic, delivering extra control and security with predictable costs and easier management.

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Segmentation and Security

Many deployments of IoT devices are critical parts of digital transformation initiatives, from detailed industrial controls to developing a greater understanding of customer behavior. In these environments, as the networks connect more and more highly sensitive data and devices, security and segmentation become paramount. Keeping the IoT devices on a separate network is an easy and effective way to increase security, separating the potential attack surfaces for corporate and IoT systems.

Segmentation also serves as an extra firewall for the underdeveloped security controls found on many IoT devices. IoT traffic stays completely private and within the organization's control, never venturing onto public cellular or Internet networks. Segmentation also enables clear visibility of IoT device activity and facilitates whitelisting techniques that only allow connections to and from trusted assets. Finally, separate IoT networks support multi-role administration so that both IT and OT groups can centrally and securely manage their respective functions.

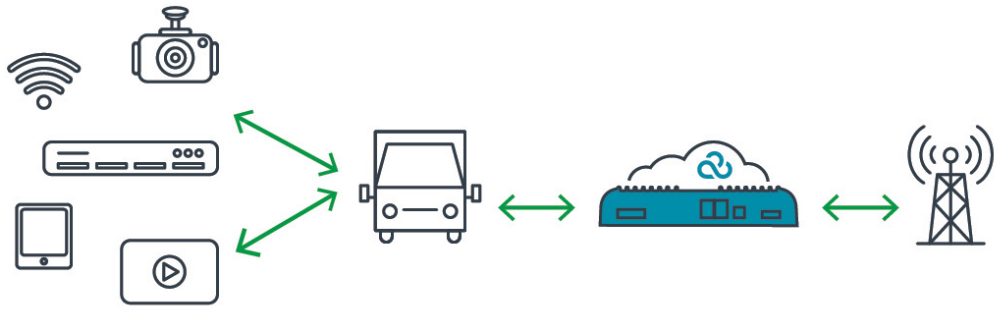
No.5 Boosting Business Mobility

Key Wireless WAN Capabilities:

- Agility
- Reach
- Latency

Greater Mobility is Coming

Business mobility, primarily in vehicles, is a large and growing market for data connectivity, as organizations look to eliminate paperwork, improve data collection, and enable real-time operations. A lot of this is being done today with LTE technology, and 5G will dramatically increase the opportunities. As carriers make the necessary 5G investments and transformations over the next 3 to 5 years, now is the time to start planning for greater operational mobility. Examples to consider include data and even video uploads in real time instead of back at the depot, automatic work and route adjustments, and whole-vehicle connectivity instead of just a single phone or device.



Video surveillance, video DVR, digital signage, Wi-Fi, Tablet, etc.

Wireless, Whenever, and Wherever

5G is not just one thing. It covers multiple frequencies, requires new towers and radios, and shifts carrier computing from the core to the edge. As 5G continues to roll out, the roaming capability to seamlessly go from city to city will energize mobility opportunities in a wide variety of industries. Public services, such as first responders, may be early beneficiaries, as they incorporate the potential of real-time video, remote diagnostics, and continuous data transmission during transport into their operations. Many others will also benefit, empowering organizations with network and service connectivity whenever and virtually wherever they need it.

An interesting emerging application is the availability of Wi-Fi hotspots within vehicles, to support multiple people and devices, such as multiple workers in a vehicle, commuters on public or private transportation, or students on a school bus.

Making Vehicles Part of the Network

With networks no longer made up of fixed locations, the expansion and elasticity of the network edge becomes a powerful part of digital transformation — and vehicles are the largest and fastest-growing part of this. Gigabit speeds, lower latency, and application-specific network overlays will direct greater capability, responsibility, and accountability further out to the edges of the organization. Leading innovators are already exploring opportunities provided by seamless handoffs from public to private mobile networks. For example, as an ambulance enters the private 5G zone of a hospital, it begins streaming clinical and diagnostic information directly into the hospital's systems, reducing the time necessary to triage and transition patient care, without distracting the in-vehicle team.

Transformation of the Network Edge

Enterprise and public sector networks can no longer be defined by fixed locations. Instead, they are made up of people, vehicles, pop-up locations, kiosks, cloud services, and an ever-growing universe of IoT devices. Rapid expansion of the network edge is enabling a vast array of new locations, innovative services, and digital transformation initiatives. The combined effect is greater organizational agility, built on the broad reach and expanding capabilities of Wireless WANs. These invisible but powerful networks, based on 4G LTE and 5G technologies, deliver fast, secure, and flexible connectivity wherever and whenever it is needed for enterprise, public sector, and critical frontline emergency services.

Why do we try to pull a network out of the air? To connect people, places, and things wherever and whenever the need arises. We should name radio communications based on what we are gaining, not what we are missing. Don't just go Wireless. Go Beyond Wires with Cradlepoint and Wireless WANs.

About Cradlepoint

Cradlepoint is the global leader in cloud-delivered wireless edge solutions for branch, mobile, and IoT networks. The Cradlepoint Elastic Edge™ vision — powered by NetCloud services — provides a blueprint for agile, pervasive, and software-driven wireless WANs that leverage LTE and 5G services to connect people, places, and things everywhere with resiliency, security, and control.

More than 23,000 enterprise and government organizations around the world, including 75 percent of the world's top retailers, 50 percent of the Fortune 100, and first responders in 10 of the largest U.S. cities, rely on Cradlepoint to keep critical branches, points of commerce, field forces, vehicles, and IoT devices always connected and protected. Major service providers use Cradlepoint wireless solutions as the foundation for innovative managed network services. Founded in 2006, Cradlepoint is a privately held company headquartered in Boise, Idaho, with a development center in Silicon Valley and international offices in the UK and Australia.

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