



Networks on the Move

What to Consider When Choosing In-Vehicle Solutions

Overview

As the digital transformation in IT continues to create the need for an Elastic EdgeSM, traditional tethers to the central office have all but vanished. Physical boundaries continue to decrease in importance, and organizations of all types require constant and dependable in-vehicle connectivity to keep up with changing business imperatives. Dependable mobile connectivity keeps vehicles on the road longer, helps enterprises better manage their fleets, and allows businesses and organizations to better serve their customers.

In this white paper, we will explore applications used for fleet networks, how in-vehicle connectivity is being implemented, challenges and best practices, and application-specific considerations.

For mobile enterprises that can't afford downtime, LTE networking solutions are a reliable, secure, and cost-effective means to ensure always-on connectivity.

Of course, transportation presents challenges not found in a traditional office environment. Traveling along bumpy roads, traversing service areas, and powering devices using a vehicle battery are factors requiring special consideration and planning. A full solution should take into account all aspects of virtual and physical layouts, as well as anticipated usage. You'll find that you're not simply choosing hardware and a data plan, but rather looking holistically at how to optimize a comprehensive solution to extend your network to the road.

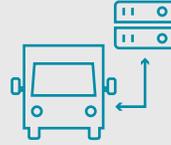
Wireless, cloud & software-defined technologies enable businesses, agencies & transportation providers to:



Offer courtesy WiFi



Utilize & remotely manage digital signage



Access databases securely from the road



Process credit card payments



Actively monitor vehicle location, status & activities being recorded on video



Power in-vehicle command centers for public safety & public sector applications



Create Virtual Cloud Networks (VCNs) & Software-defined Perimeters (SD-Perimeters)



Create operational efficiencies to save time, money & man-hours

In-Vehicle Connectivity: How It's Used

Real-Time Updates & Remote Management

Organizations deploy network connectivity in fleet vehicles to handle data entry and process credit card payments immediately. Internet of Things (IoT) systems make it possible to automatically update and track inventory. GPS tracking now gives businesses the ability to do more than identify the locations of their fleet vehicles; businesses can monitor stops, watch for unnecessary trips and mileage, and recognize safe drivers — all from a remote location using cloud-based software.

Top 10 Reasons Fleet Managers Use GPS Telematics¹:

1. Driver behavior
2. Location information
3. Accurate odometer & engine hours
4. Asset utilization
5. Fuel management (fuel level, fuel usage, HPG)
6. Fuel codes & analytics (service intervals/PM, DTC codes)
7. Route management
8. Customer service (ETAs, delivery, dispatch)
9. Crew productivity
10. Insurance (claims analysis, lower risk)

Video Streaming & Digital Signage

With constant mobile connectivity, vehicles can deploy digital signage that can be configured and updated from a remote location. For enterprises and agencies with security concerns, video-streaming capability offers the advantage of real-time surveillance, making it possible to monitor security from a remote location and alert authorities immediately when problems arise.

Secure, Efficient Remote Database Access

First responders and emergency services use mission-critical mobile connectivity to monitor, analyze, and diagnose patients on the road. Paramedics can access vital information and update records immediately, while law enforcement officers use secure connectivity to check drivers' licenses and vehicle registrations, and file digital incident reports in real time. These features and more help enterprises keep their people on the road longer and at headquarters less often.

WiFi for Passengers

Today's transit commuters and leisure travelers want Internet access almost as much as they want a seat and an on-time arrival. Offering guest WiFi is simply part and parcel of creating a good rider experience. Rolling enterprises must be able to offer commuters heightened productivity while blocking undesirable content and managing bandwidth usage.

Challenges & Best Practices

Decision makers should move strategically when deploying mobile connectivity solutions, following industry best practices and viewing the fleet network not as a separate technical endeavor, but rather as an extension of the organization's existing systems. The network should be deployed to integrate seamlessly with existing infrastructure.

Remote Monitoring, Maintenance & Updates

Challenge: For optimal operation, wireless routers require regular software and firmware updates, configuration, maintenance, and troubleshooting. Many organizations, however, are logistically unable to dock their fleet several times a week in a centralized location to install updates, fix issues, or transmit data.

Solution: A software-defined, cloud-based remote management service can enable software/firmware updates, configurations, security patches, and maintenance of wireless devices from a remote location while ensuring that sensitive data stays safe. Also, because a mobile router on a cellular network utilizes dynamic, private IP addresses, the management service should not require a static IP to connect to the router.



**One in five
vehicles on the
road will have a
wireless network
connection
by 2020.²**

- 1 **Source** (Page 2) http://www.fleetanswers.com/sites/default/files/2016%20Telematics%20Survey%20Report_0.pdf
- 2 **Source** <http://www.gartner.com/newsroom/id/2970017>

Furthermore, a routing solution should offer the ability to quickly offload large files — such as video surveillance — via non-cellular WAN to help mitigate cellular data usage and get vehicles back on the road faster.

Wiring & Electrical Issues

Challenge: Wireless routers use the vehicle's battery as a power source, but the device can drain battery voltage in cars and buses. This can cause brownout or blackout when the vehicle starts, eventually ruining the router.

Solution: An ideal routing solution should be engineered specifically for in-vehicle use, with a DC input voltage range of 9-36V. Spike protection and ignition sensing also help ensure the router will withstand the volatile electrical environment of a vehicle. If these features are not in place, then a power conditioner or voltage regulator is critical.

Placement

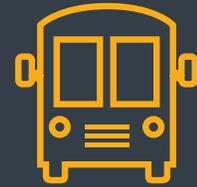
Challenge: Reliable connectivity depends on correct placement of the wireless router and antenna, and placement needs differ based on the vehicle design, size, and connectivity expectations. Vehicles transporting many users could require multiple routers to serve high-volume needs, but usually space is limited.

Solution: It is vital for routers to be installed with an understanding of the physical and virtual barriers that may hinder or even sever connectivity. Each router should be correctly placed and installed for maximum connectivity, and the number of devices needed to best serve passengers must be calculated based on anticipated usage. It is also recommended to physically secure all network devices and equipment; many organizations keep networking devices behind a locked panel or in a cabinet.

Extreme Temperatures

Challenge: Weather conditions and temperature fluctuations can adversely impact sensitive router hardware. When vehicles operate in extreme heat or cold, the wireless router can be irreparably damaged. Even normal weather conditions such as sunshine streaming through glass windows on a summer day can heat a vehicle to the point of ruining the device.

Solution: Routers should be able to withstand extreme temperatures, both when the vehicle is in operation and when it is being stored. Devices should be designed to endure temperatures between -30 through 70 degrees Celsius.



Only 45% of mass transit passengers say they're satisfied with their ability to browse the Internet during their ride.³

³ **Source** <https://www.ericsson.com/res/docs/2015/consumerlab/ericsson-consumerlab-commuters-expect-more.pdf>

Terrain

Challenge: From trains speeding down the track to school buses navigating bumpy rural roads, vehicles often experience high levels of vibration. Routers must be able to withstand rough terrain without coming loose from the vehicle or breaking.

Solution: Installation brackets should be designed to handle the roughest of terrains without coming unscrewed or breaking. Devices and installation solutions should be tested according to MIL STD 810G and SAE J1455 standards to ensure that routers are protected against bumpy roads.

Choosing a Carrier

Challenge: With multiple carrier options available and a patchwork of service areas along any given route, choosing a cellular provider can be complex.

Solution: Unique reception needs should be studied and evaluated prior to choosing a carrier to ensure the proper plan and carrier for each situation. The evaluation should include an analysis of service and route maps and a test drive. A site survey can be used to gather reception data for specific routes and help decision makers choose the best carrier for reliable coverage.

Addressing Multi-Carrier Needs

Challenge: A site survey may reveal a need for dual-carrier connectivity in areas and on routes where a single carrier can't provide the coverage needed for reliable connectivity.

Solution: It is important to choose a dual-modem solution that can quickly and seamlessly switch from one carrier to the other without intervention from the vehicle operator or a network administrator back at headquarters.

Application-Specific Considerations

Education & Mass Transit

When vehicle operators offer WiFi for passengers, the need for content filtering and policies that govern such filtering invariably arises. Education agencies are required to block certain types of sites, while transit authorities may wish to prevent downloads, streaming, and inappropriate content. Cloud security software and remote cloud management enable IT managers to customize content rules and traffic settings and be alerted to security vulnerabilities immediately.

Success Story

Ewing, New Jersey Police Department

When the Ewing Police Department began experiencing problems with legacy in-vehicle network equipment, it needed to find dependable replacements. The IT staff wanted a way to configure, monitor, and manage all of its devices from one central location.

Additionally, they sought a way around the reliability issues they were having with their VPN connection, which would often drop when officers drove between cell towers or under a bridge.

Cradlepoint and its cloud networking service, NetCloud, provided a technology combination that allowed the department to deploy a mobile LAN, keeping officers connected to critical online applications from anywhere — just as if they were at headquarters.

“It works seamlessly and Cradlepoint showed us that we could manage everything remotely. The officers don't have to do anything to get it to work.”

Robert Green,
director of technology,
Ewing Police Department

Security

First responders, law enforcement, school buses, and businesses all benefit from the added security of deploying interior and exterior vehicle security cameras. Enterprises and agencies can leverage Internet connectivity to stream video feeds in real time and access recordings without docking the vehicle. Such immediacy can maximize the effectiveness and ROI of surveillance cameras.

Under some circumstances, enterprises may not wish to expend the amount of cellular data required to offload video in real time. In those cases, it is preferable to have the option to quickly offload video via a secondary, non-metered WAN source.

Network Reliability

Many organizations use Virtual Private Networks (VPNs) to provide their mobile employees access to important data and applications housed at the organization's data center. For fleet employees, from truck drivers to police officers, every minute counts; connecting to the VPN wastes precious time. The need to connect to the VPN can become a significant source of frustration and wasted time if employees must reconnect every time the LTE signal temporarily drops.

Fleet enterprises should consider deploying a software-defined virtual overlay network that can function as a mobile LAN, keeping vehicles authorized on the network even when the LTE signal is temporarily interrupted.

Parallel Networks

For organizations offering guest WiFi to passengers and requiring applications that carry critical data — like Point-of-Sale — it is a best practice to implement Parallel Networks, or physically air-gapped networks for maximum network security. Parallel Networks hinder hackers from gaining access to sensitive applications within in-vehicle networks by pivoting from other areas, such as the guest WiFi or digital signage.

Fleet Management

Enterprises can use software with integrated geofencing technology to track vehicle routes and driver behavior on the road. This intelligence allows fleet managers to monitor route efficiency, look for redundancies or wasted time, and reconfigure routes for maximum effectiveness.

On-Site Services & E-Commerce

Fleets can leverage secure Internet connectivity to offer customers on-site payments and input data. To protect customers and keep sensitive information secure, software with encrypted communication protocols safeguards against eavesdropping and helps mitigate the potential for a security breach.

Hot Spot Connectivity

Police, first responders, mobile healthcare providers, and many other organizations may need connectivity to extend well beyond the vehicle's perimeter. This requires a router and management solution capable of delivering WiFi securely, as well as an external antenna able to extend the WiFi range.

Top 10 Telematics / GPS Monitoring Benefits Identified by Fleet Managers:



1

Improved driver behavior



2

Improved driver safety



3

Accurate utilization tracking



4

Increased fuel savings



5

Accurate odometer/engine hours readings



6

Improved productivity



7

Reduced maintenance costs



8

Reduced emissions



9

Preventive maintenance notification



10

Shorter delivery time

Cradlepoint’s Ruggedized Mobile Routing Technologies

Cradlepoint’s COR Series solutions are an industry-leading solution for wireless connectivity, providing instant, reliable networks that can be managed, monitored, and secured remotely.

Cradlepoint COR Series Features Ensure Mission-Critical In-Vehicle Connectivity

Ruggedized & tactical routing platform	✓
Most reliable cellular connectivity	✓
Band 14 / FirstNet capable	✓
Dual-modem, dual-carrier option	✓
Active GPS — integrates with CAD / AVL software	✓
Ignition sensing	✓
Dual-band, dual-concurrent WiFi (2.4/5.0 GHZ)	✓
Supports over 100 WiFi clients (MDT/MDC, dash cams, LPR, EKG, medicine cabinet, etc.)	✓
WiFi-as-WAN (video offload)	✓
Software-defined, remote cloud management service (NetCloud)	✓

In addition to these application-specific features, all Cradlepoint solutions can be managed and configured with Cradlepoint’s software-defined, cloud management service, which lets IT and operations teams manage, configure, and troubleshoot the network without needing to bring vehicles back to headquarters.

Additionally, Cradlepoint’s NetCloud service allows enterprises to deploy overlay VCNs to quickly and easily create an SD-P. For the first time, organizations can apply consistent security services to traffic across the network, without the hassles associated with traditional VPNs.

To learn more visit cradlepoint.com/in-vehicle

Customer Success:



We are exceedingly happy with the Cradlepoint technology... It works seamlessly and Cradlepoint showed us that we could manage everything remotely. The officers don't have to do anything to get it to work. It is always there and always on."

Robert Green, Director of Technology, Ewing Police Department



Given our budgetary constraints, we had to optimize our officers' use of their time. Giving them dependable network connectivity meant that they no longer had to drive back and forth across town to headquarters to file their reports. That's a big win for us in terms of available hours on patrol."

Garry Beaty, City of Boise Chief Information Officer



FLYMOTION
UNMANNED SYSTEMS



The ability to remotely monitor, manage, and adjust their mobile networks anytime, anywhere, is a significant opportunity that our clients can take advantage of through NetCloud."

Ryan English, FlyMotion President & Co-founder



After the installations, Cradlepoint provided the resources needed to merely flip a switch and offer free, LTE-based WiFi to all of our riders instantly."

Larry Mixon, Acting Vice President of Information Technology for San Antonio's VIA



We looked at a lot of other vendors, and none of them compared to the quality of the product and the sales and engineering service we received, even in the initial stages. Cradlepoint was unmatched by every other vendor we talked to."

Jason Sharenow, Broadway Elite Chief Operating Officer

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 27,000 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.

©Cradlepoint. All Rights Reserved.