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Vehicle Area Networks:

Making the Environment Smart

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Public safety and commercial fleets increasingly rely on mobile communications between headquarters and the field. As the volume, velocity, and importance of data increase, it becomes crucial not only to maintain robust and seamless connectivity but to share it among devices. The devices themselves are taking on more and more of the work of analyzing data locally, effectively becoming part of a swarm of computational power that conserves data transmission bandwidth and cost while turning raw data into actionable intelligence for business, public safety and utilities. When the raw data includes video, the devices themselves can remove identifying or confidential aspects—for example, blurring the faces of people other than a suspect or lost child—a process known as denaturing the video.

A vehicle area network (VAN) is a mobile, broadband- connected Wi-Fi network that lets personnel in the field use various handheld devices to securely exchange video, infrastructure information, GIS and other data with each other and with headquarters or dispatch. The network and connectivity are provided by a mobile broadband router that connects to the internet using 4G LTE or other cellular technologies, or in some cases over special networks such as FirstNet (B14) or private cellular networks and radio. A broadband-connected VAN is especially useful for situational awareness when multiple personnel are on-scene, in the same vehicle, or in a special operations trailer or incident command center.

Some routers are capable of connecting to multiple networks, switching seamlessly between them or keeping more than one connection open concurrently. This capability is important when personnel are managing large public events, power outages, natural disasters and other circumstances where cellular networks can become congested with traffic. A multi-radio cellular router with a VAN can find the most reliable network available and share the connection with personnel, even if they are from multiple agencies.

Cellular routers that include accelerometers and GPS radios become more than simple communications devices, making it possible to track and log vehicle location, driver behavior and collisions. A router that can connect to the OBD-II or J-Bus port provides detailed real-time vehicle data including engine temperature, fault codes and other operational information. Programmable routers that include robust development platforms make it possible to create applications that analyze and act upon location, driver and vehicle data as well as data from other sensors and devices on the VAN.

> " The combination of a programmable device, a smart application, and a connection to the cloud creates a technological convergence that powers the next revolution: intelligence at the edge and the Internet of Smart Things.

Data Analytics and Intelligence at the Edge

As remote sensors increase in numbers and provide denser streams of data, it is no longer practical to backhaul all the data in its raw form. The simplest forms of data analytics—indexing, sampling and video denaturing—are giving way to more complex data analysis techniques that transmit refined information or even make autonomous decisions at the data collection point a reality. Sophisticated edge processing applications rely on the VAN for collaboration with other devices nearby and the ability to inform or query on-scene personnel via smartphones, tablets or laptops. Video processing is an especially compelling use case for intelligence at the edge: imagine being able to circulate a clip showing a suspect or a lost child while protecting the privacy of others in the area via automated denaturing or other processing.

For more about intelligence at the edge and the Internet of Smart Things, see Convergence: Enabling Intelligence at the Edge.

VAN Challenges

Unlike the fixed network that IT manages, a VAN is remote, often moving, and can change its makeup and connectivity often. With a fleet of service or public safety vehicles, there might be hundreds or even thousands of VANs to manage. Personnel using the VANs still need support for software and devices, patches and upgrades need to be applied, new devices may need provisioning, and all the while, a persistent data connection must be maintained.

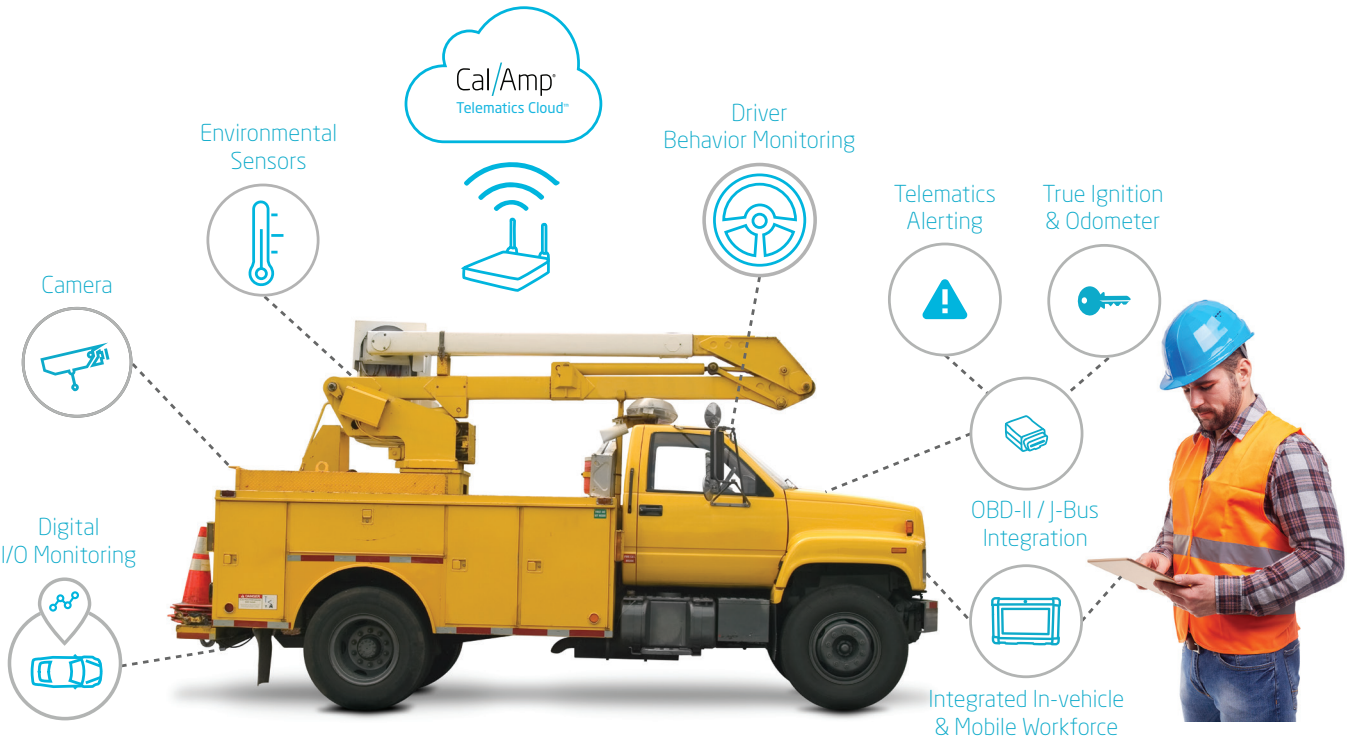
While a vehicle is in motion, it may travel into and out of coverage areas for different networks, requiring the router to switch between them quickly, seamlessly and automatically. Some organizations employ a combination of different networks to support remote personnel, including limited-bandwidth private radio and public and private cellular networks, which require

routers that can connect to more than one network at the same time. Managing which networks are used for various types and volumes of data is important for controlling the cost. Knowing the location of the vehicle and how it is being used provides additional cost benefits, although they are not central to the operation of the VAN itself.

To protect business knowledge, sensitive law enforcement or patient data, payment processing details and other confidential information, both the VAN and its connection to the corporate network and the internet must be secured by VPN and other methods.

Meeting The Challenges

When considering deploying VANs, it is important to design a complete solution that takes into account end-to-end security, network management, connectivity and the needs of the personnel who will be using it. Enterprise fleets, for example, should use sensors to protect high-value personnel and equipment. In the public safety sector, security and the ability to connect to FirstNet are more important. At the heart of the VAN is the router, which must provide secure, robust connectivity, intelligence, sensor inputs and outputs, and other capabilities required by remote personnel and fleet managers.



To meet these challenges, look for a router with the following capabilities:

Remote management.
It is not always practical to take vehicles offline when equipment needs to be upgraded or configured. Look for a router that enables remote over-the-air provisioning, configuration and upgrades.

Vehicle bus integration.
A router that connects to J-Bus and OBD-II ports on fleet vehicles can send real-time vehicle health and operational data to ensure service and maintenance issues are addressed before costs become excessive. Look for a router that can take action when values cross specified thresholds.

Programmability.
A router that includes an application development platform enables real-time custom processing of vehicle health and location data, driver behavior, and data from connected sensors.

Security.
Look for routers that are VPN-capable and use protocols such as IPsec to protect data.

Multiple radios.
Look for a router that can switch networks and carriers intelligently and transparently. No single technology has coverage capabilities for all locations and circumstances, so the ability to connect to multiple networks concurrently is important when communication must remain uninterrupted en route to an incident or work location.

FirstNet (B14) capability.
For public safety, the router must have the ability to connect to FirstNet as well as commercial carriers at 4G LTE speeds. Look for a router with multiple radios and the ability to connect to multiple carriers.

GPS.
Situational awareness, customer service and route management require a router with GPS capability for automatic vehicle location (AVL) and vehicle tracking. This capability also lets you set up geofences that trigger alerts or actions based on where the vehicle travels. For additional cost savings, a router should be smart enough to connect to the IT network when a vehicle enters the garage, becoming a Wi-Fi client instead of a hotspot.

Accelerometer.
For operational safety and cost savings, an accelerometer lets you monitor driver behavior and detect collisions.

Wired networking capability.
Look for a router with wired Ethernet for connection to vehicle-mounted computers.

> " Officers at a scene can even transmit photos and videos from witnesses' cell phones.

Public Safety: Situational Awareness in the Field

For first responders, a VAN provides inter-agency communication, multi-media data for situational awareness, and penetration into environments a cellular signal cannot reach. A connected VAN provides the means for mobile police officers to utilize standard and commercially available hand-held devices to access voice, data, and video communications outside of their vehicles. Mobile police officers and other first responders

can utilize communication and task-oriented applications that connect through a variety of wireless technologies—Wi-Fi vehicle hotspot, 4G Public LTE, Public Safety FirstNet LTE, LMR, satellite—enhancing safety and giving access to critical data and tools while on foot.

The command center can send previous call history, patient data, warrants and arrest records, environmental information, building plans, fire records, suspect and victim photos, and other information. The officers or agents can transmit photos, live videos and other data to command and to other personnel in the field or at the command center. Officers at a scene can even transmit photos and videos from witnesses' cell phones.

Technologies such as GIS, Esri, ShotSpotter and LexisNexis Link ID are increasingly important in the public safety sector, and VAN technology brings these solutions to the field. In-vehicle systems such as license-plate recognition and tracking devices rely on connectivity to retrieve supporting information. A broadband cellular router with GPS and VAN is becoming an indispensable tool in saving lives, recovering assets, fighting fraud and preventing crime. Coupled with an application development platform and additional sensors such as accelerometers, a router can become an automated reporting tool, sending important information that on-scene officers or agents would otherwise be too busy to relay.

Energy: Intelligent Trucks

For the energy sector, safety and availability are paramount. VAN technology on a bucket truck or other service vehicle can provide crucial information to a field technician who is on a pole or inside a building. A body-worn sensor that detects gas can be connected to the VAN to immediately alert both the technician and headquarters to leaks. Remote technicians can carry tablets and other communication devices to exchange information with other personnel, both at headquarters and in the field. The ability to obtain parts from another truck can save time and operational cost.

A router that is programmable provides additional flexibility. For example, the VAN can operate in different modes depending on whether the vehicle is in motion, whether the technician is inside the vehicle, or whether the bucket arm is raised.

In addition to a VAN, the router can be equipped with GPS and accelerometers to maintain safety, monitor driver behavior, provide route guidance and track vehicles to ensure the fastest response time. A router that can connect to the vehicle's J-Bus or OBD-II port can lower operating costs by monitoring vehicle health and ensuring timely maintenance.

Service Vehicles: Real-Time Intelligence

For commercial and service fleets, a timely response is one of the major factors in a satisfactory customer experience. The ability to deliver the correct service quickly makes the difference between happy repeat customers and higher potential churn. Adding a VAN to the service truck provides in-building penetration that helps technicians work untethered from the vehicle. The connected laptop lets field personnel download and update work orders, communicate with the backend for invoicing and parts inquiries, and even summon parts or help from other nearby drivers without having to trek back and forth to the truck.

When the router is equipped with a GPS, AVL and tracking information can be used to provide accurate estimates of arrival time to the customer or to find the nearest vehicle in real time for an urgent unscheduled call. Service managers gain the ability to reroute drivers in real-time using dispatch software to best utilize their fleet and meet customer expectations. For safety, a programmable router can be configured to turn off the VAN while the vehicle is in motion. As with other fleet vehicles, a router equipped with accelerometers, GPS and vehicle bus connections can maintain fleet safety and vehicle availability by monitoring driver behavior and vehicle location and health.

Conclusion

More than a simple data transmission tool, a VAN provides the framework for situational awareness and intelligence at the edge. As computational power becomes ubiquitous, VAN and other mobile networks bring the potential of distributed computing and autonomous decision-making and collaboration into public and commercial fleets. Smart routers and highly instrumented vehicles are changing the way police and firefighters, service technicians, and other remote personnel respond and provide service by giving them the tools to know more about each call before they arrive, collaborate with headquarters and remote personnel, and communicate information in real time.

For a complete solution, look for a VAN-capable programmable broadband cellular router with features such as: Multiple radios GPS and accelerometers Strong security protocols A robust platform for application development and customization

The best solutions will also provide cloud applications and a cloud platform as well as tablets and other hardware specifically designed to work with the VAN in commercial, public safety and industrial settings.

In the end, it is the cumulative power of these intelligent devices, the cloud, and smart applications that enable situational intelligence at the edge. These three technologies create a secure digital mesh of intelligence for situational awareness and informed decisions.

About CalAmp

CalAmp (NASDAQ: CAMP) is a telematics pioneer leading transformation in a global connected economy. We help reinvent businesses and improve lives around the globe with technology solutions that streamline complex IoT deployments and bring intelligence to the edge. Our software applications, scalable cloud services, and intelligent devices collect and assess business-critical data from mobile assets, cargo, companies, cities and people. We call this The New How, powering autonomous IoT interaction, facilitating efficient decision making, optimizing resource utilization, and improving road safety. CalAmp is headquartered in Irvine, California and has been publicly traded since 1983. LoJack is a wholly owned subsidiary of CalAmp. For more information, visit calamp.com, or LinkedIn, Twitter, YouTube or CalAmp Blog.

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