The V2X Intersection:

Vehicle Priority & Preemption

Learn how vehicle priority and preemption provide immediate benefits when applied to transit, emergency vehicles, freight, and more.

Panasonic

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Agencies and automotive OEMs agree that emerging vehicle-to-everything (V2X) technology is defining our transportation future. With more federal funding available than ever, governments are helping institutions invest in that future. But, as with any emerging technology, there are multiple platform, hardware, and software options for an endless list of potential transportation use cases.

Signalized intersections are literally at the crossroads of problems and solutions for V2X applications. Here, we share technology-enabled options for managing V2X intersection travel, and examples of various use cases.

Telematics and V2X

It's important to distinguish V2X from vehicle telematics. While both technologies create a stream of data from vehicles, telematics is only a part of the larger V2X environment.

Vehicle telematics logs operational information about a single vehicle in isolation, like windshield wiper status, vehicle mileage, and braking data. This data is often processed and shared after a time lag that renders it incapable of supporting real-time safety and mobility outcomes.

V2X, however, turns vehicles into real-time data probes using bidirectional, low-latency communication. In a V2X environment, each vehicle communicates instantly with infrastructure via roadside units (RSU), with other vehicles via onboard units (OBU), with transportation agency control centers, and more.

Today's cars have a lot to say...

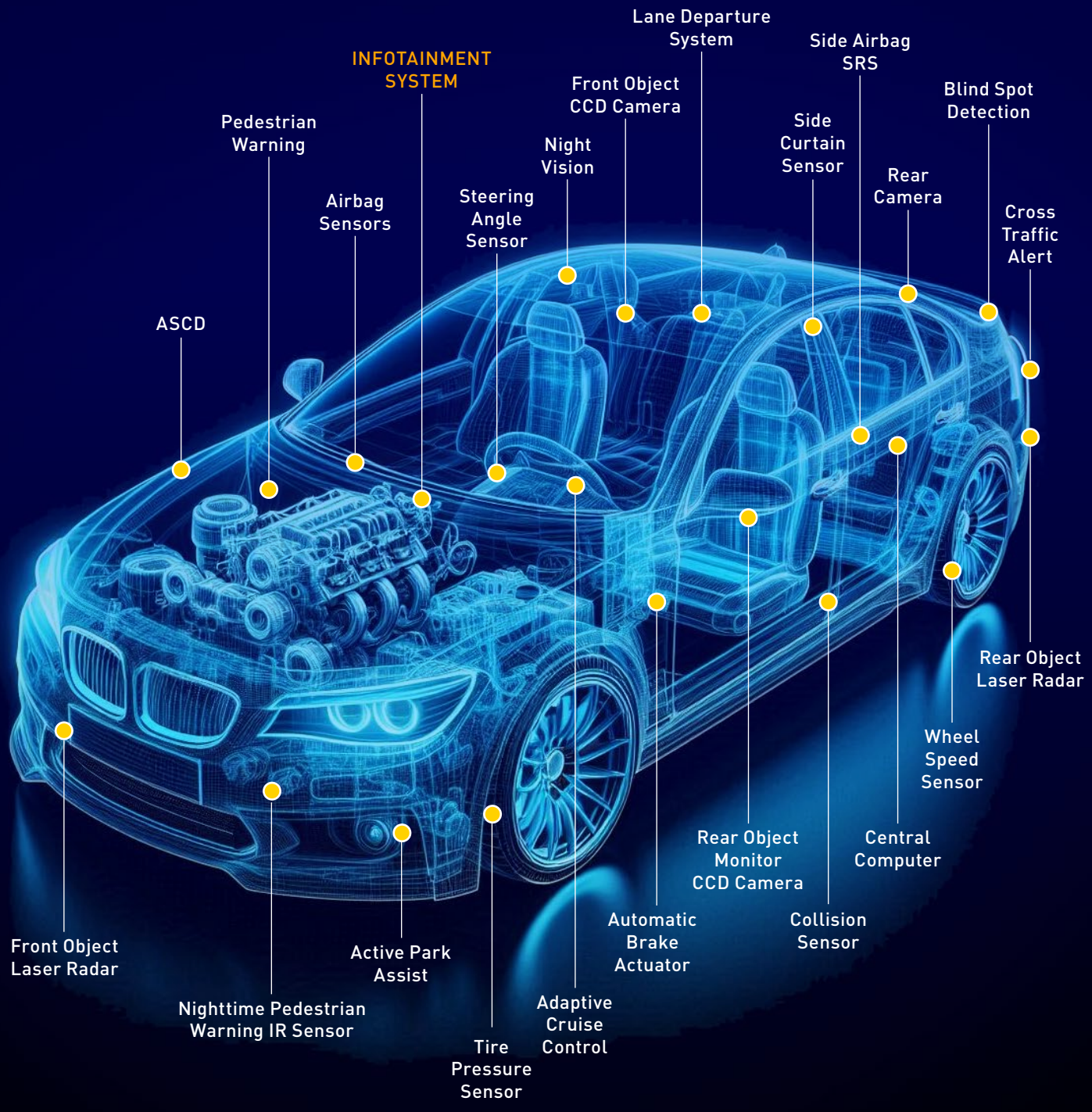

Figure 1: Vehicle telematics are one source for building a comprehensive V2X data platform.

V2X at Intersections

Historically, intersection transportation features like emergency vehicle preemption (EVP) and transit signal priority (TSP) have been deployed using a variety of analog technologies. These include infrared emitters which allow certain vehicles to request prioritization at equipped traffic signals.

The V2X ecosystem enables a wider range of more advanced capabilities. Because V2X is based on standardized, software-defined capabilities, specific applications are driven by code instead of hardware. Software code can be readily updated to support both changing regulatory guidelines and evolving technology. This protects V2X system investments from obsolescence and ensures a flexible and upgradable transportation technology platform.

Many new use cases can now accommodate advanced roadway geometries, unique signal timing needs, or important safety initiatives, including Vision Zero programs.

The following examples highlight the wide range of features and services possible via today's V2X. These use cases can be implemented individually, or several can be combined, all utilizing the same underlying, cost-effective hardware.

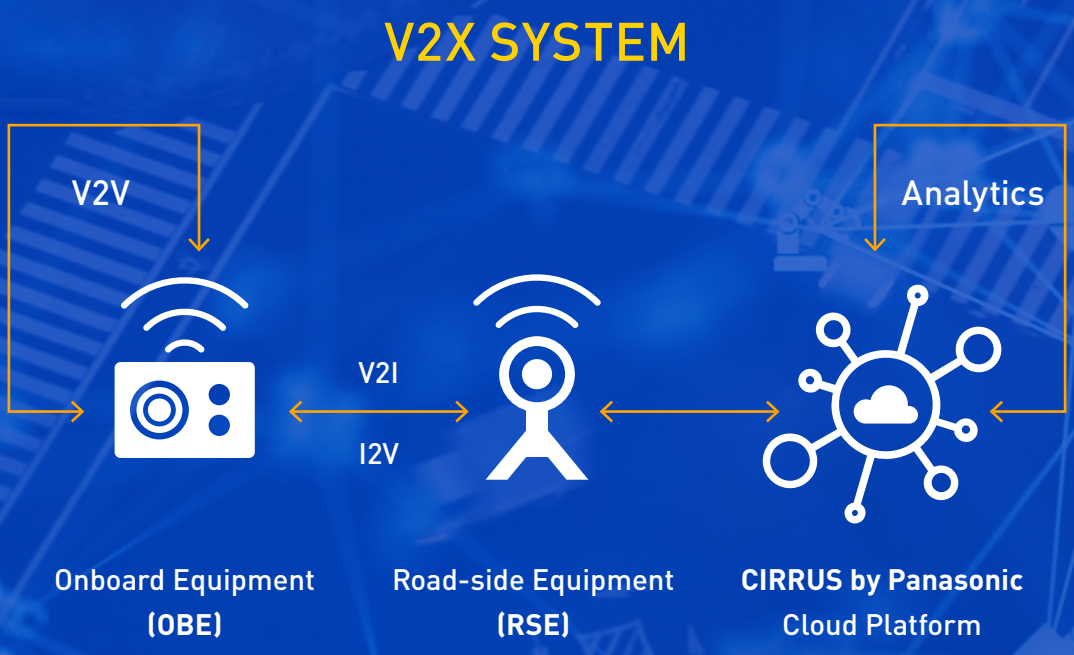

Figure 2: V2X platforms bring together data inputs from vehicles, roadside signals, and Internet of Things (IoT) devices to create a digital ecosystem for tracking, managing, and understanding road activity.

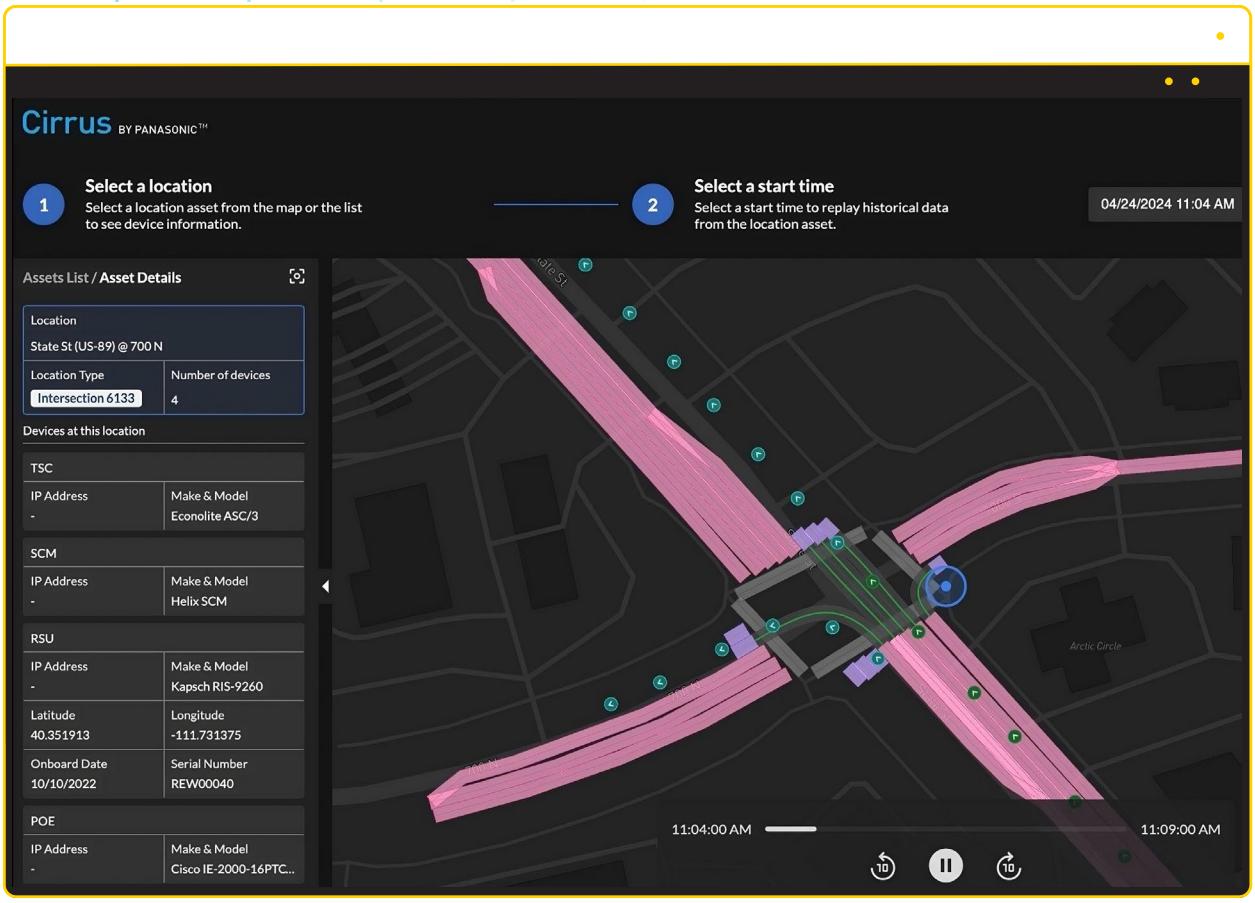

Figure 3: V2X intersections can be managed for vehicle priority and preemption, with historical data easily available for research or documentation.

Emergency Vehicle Preemption (EVP)

EVP systems allow equipped and authorized first responder vehicles (may include fire, ambulance, police, and other fleets depending on agency policy) to request near-immediate green lights for the appropriate lanes of approach at outfitted traffic signals. Existing traffic signal controllers switch the lights, and all safety protocols are fully respected including yellow and red transition time and pedestrian clearance.

Signal preemption can be configured to trigger for all phases of an approach or only select phases indicated by the approaching vehicle. These options are enabled by intersection geometry settings (MAP files) and corresponding vehicle GPS location, time to arrival, and other variables.

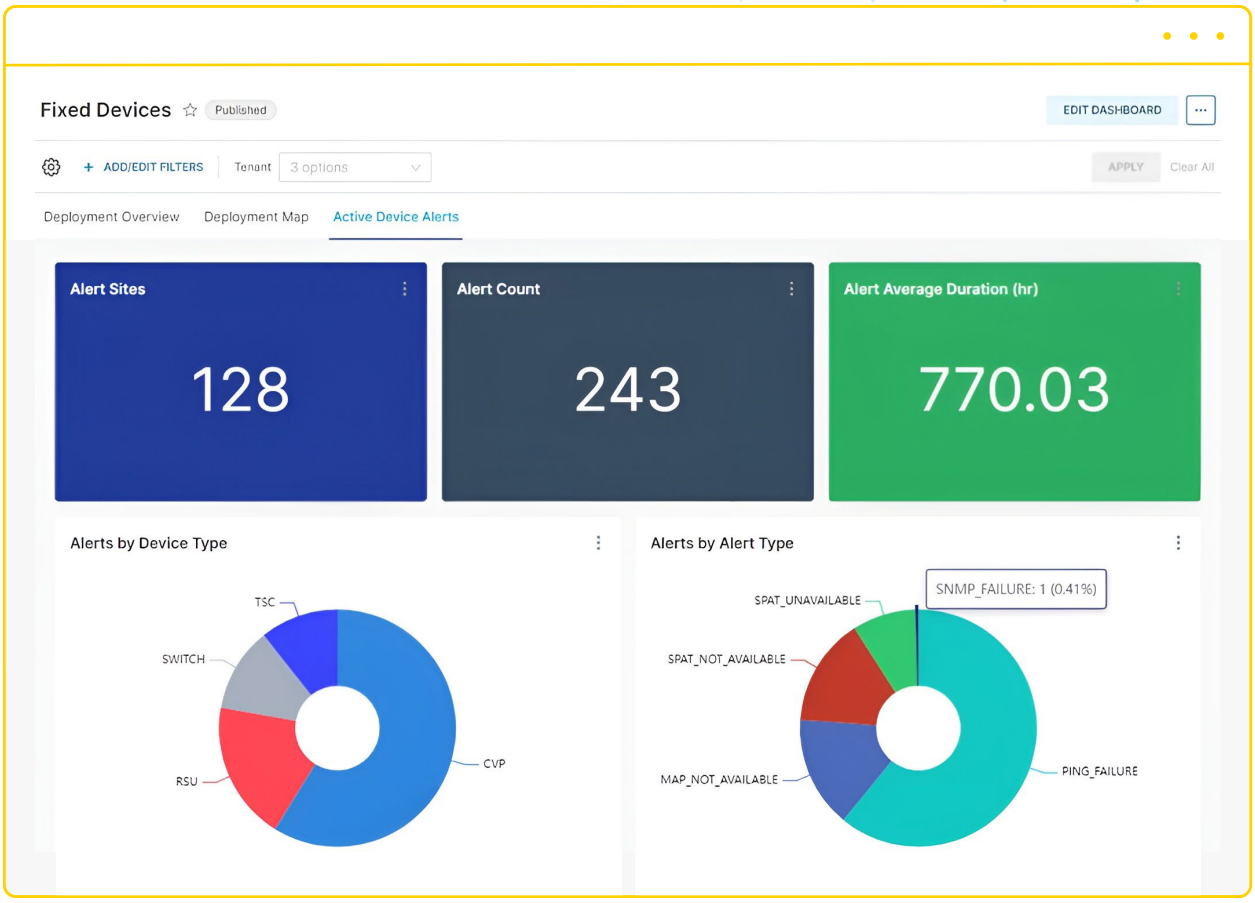

Figure 4: CIRRUS V2X shows preemption and priority data plus individual fixed device health alerts.

Transit Signal Priority (TSP)

Equipped transit vehicles can request various forms of prioritization at outfitted traffic signals. Priority can include green extension, accelerated red, or other forms of priority (within safety parameters) for transit vehicles. Priority can be triggered by programmable conditions including, transit vehicle occupancy rates, time behind schedule, congestion conditions, and other options.

SIGNAL PRIORITY
Shortened red or extended green light to reduce intersection delay.

Transit Signal Priority
(TSP)

SIGNAL PREEMPTION
Immediate change to green for rapid intersection crossings.

Emergency Vehicle Preemption
(EVP)

Snowplow Signal Preemption
(SSP)

Fleet Priority or Preemption

Either priority or preemption can be enabled for equipped agency fleets such as safety-critical snowplows or DOT maintenance trucks. Configuration is completely customizable to accommodate a wide range of applications and use cases depending on local needs or policy priorities.

Vulnerable Road Users

V2X provides the foundation for future protections at intersections for vulnerable road users (VRU) such as pedestrians, cyclists, or other micro-mobility modes. Protection can be structured in two ways: Signal prioritization for these modes, and vehicle alerts for equipped drivers in the vicinity of the intersection.

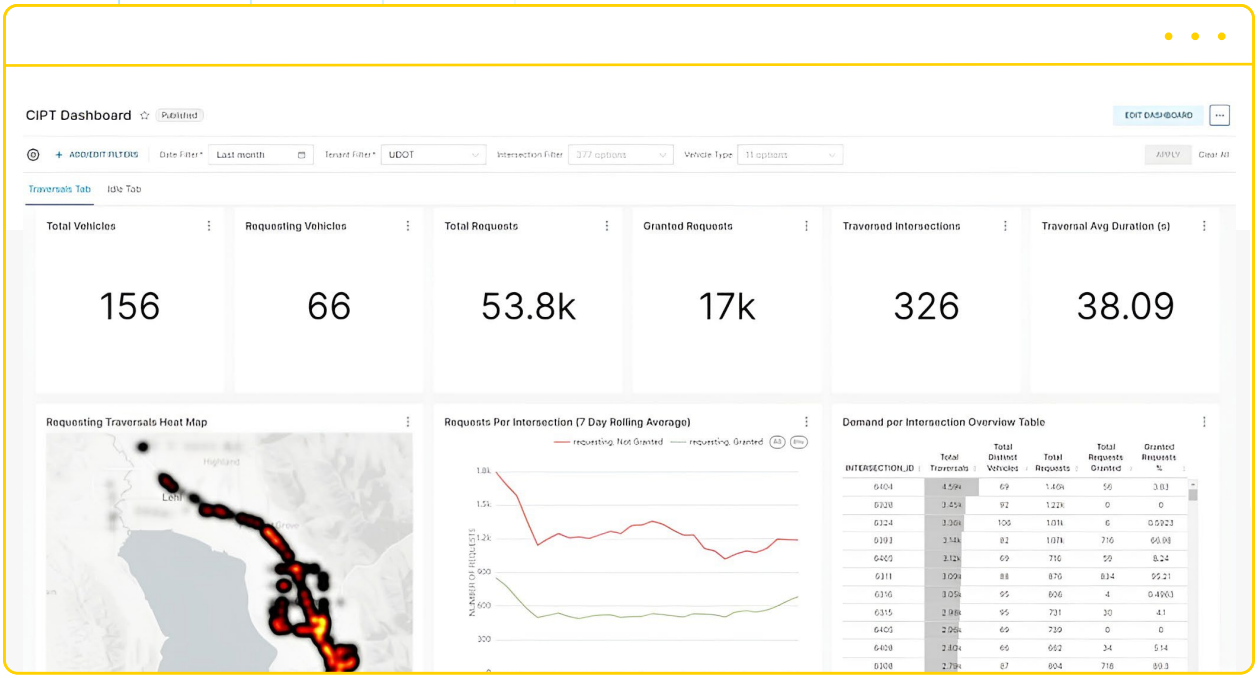

Figure 5: CIRRUS analysis of idle events at intersections and the impact on idling when priority and preemption is granted or not granted.

Freight Signal Priority (FSP)

Transportation agencies can work with private freight providers (for example, at ports or near logistics hubs) to provide prioritization for heavy freight vehicles at relevant traffic signals. This application can be customized to provide priority at certain times of day, or only under certain traffic conditions, and of course only for equipped and authorized vehicles at specified intersections.

In some cases, freight providers contribute to these and other infrastructure or operating costs either directly or through subscription programs. Freight priority can dramatically reduce vehicle emissions (from idling and vehicle startup), lessen roadway wear (from vehicle stopping), and improve freight movement which supports economic development in a region.

V2X components are fully extendable, so agencies can deploy signal preemption or priority today, and then expand without requiring new equipment.

Getting Started with V2X

V2X-based management from CIRRUS improves prioritization functionality in three ways:

01 CIRRUS hardware components are fully extendable, meaning you can deploy emergency vehicle preemption or transit signal priority today, and later expand to other applications without requiring any new equipment on roadways. New features and use cases can then be implemented over time, without replacing existing V2X devices.

02 CIRRUS systems provide extremely low-latency hardware necessary for safety critical applications and can collect this low latency data through cloud-based data management and data analytics platforms for modern, digitally native, or cloud-first programs.

03 CIRRUS V2X is based on national, open standards, and is well suited to ad-hoc deployments. Leveraging open-standards-based technology creates a consistent and scalable user experience, particularly between different jurisdictions or on projects with multiple stakeholders.

CIRRUS solutions deliver immediate return on CV investments for transportation practitioners by providing a suite of tools that allow traffic signals to communicate with equipped vehicles in real time. The requisite hardware, software, and data platforms exist today to immediately improve mobility and save lives.

If your municipality is considering connected roadway or intersection solutions, it's important to consider how V2X-based solutions for many traditional use cases can futureproof your investments. National-standards-based V2X communications are now widely available, in use, and affordable thanks to Panasonic's deep partnerships with DOTs and vehicle OEMs. The CIRRUS platform can efficiently scale for a wide variety of use cases.

About CIRRUS by Panasonic

CIRRUS by Panasonic is a division of the Panasonic Corporation of North America's Smart Mobility Office. Formed in 2017, our connected vehicle applications are among the first to shift signal priority applications from legacy hardware units to cloud technology.

The CIRRUS platform enables instant and safe communication between vehicles, infrastructure, intersections, and the operations teams who manage them. Our optimized, patent-pending algorithms incorporate data from edge devices, external systems, and cloud products for a scalable, complete, end-to-end solution.

Learn more at **https://mobility.na.panasonic.com/CIRRUS**.