What's fueling today's modern mass transportation systems? It isn't just petroleum, electricity, or even biomass. It's data.

Increasingly, rail transportation system operators rely on data and automated decisions to ensure safe, reliable service, as well as sustainable revenue generation. That means getting more cars on the rails and transporting passengers and goods more quickly without compromising safety. These imperatives—business and safety—are driving the movement away from rail-based signaling, intended to prevent collisions or track congestion, to wireless, digital positive train control (PTC) systems.

With PTC, trains become “self-aware.” Every train knows not only its own location and speed, but also that of every other train in the system—as do central system operators—reducing the risk of collisions. These imperatives—business and safety—are driving the movement away from rail-based signaling, intended to prevent collisions or track congestion, to wireless, digital positive train control (PTC) systems.

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PTC is a prime example of the Internet of Things (IoT) in action: leveraging wireless networks and cloud-based control systems to optimize performance, and making critical decisions in milliseconds. It has implications that extend beyond rail systems. Regardless of the mode of transportation, system operators are concerned with the same issues: safety, reliability, and economic viability. IoT makes the following possible:

- **Real-time equipment tracking:** Cloud-based central control systems will enable operators to pinpoint any piece of equipment.
- **Inter-equipment communication:** Much as PTC helps avert rail accidents, planes can report turbulence to other planes, alerting pilots to take appropriate precautions; urban mass transit vehicles can report traffic delays or accidents.
- **Predictive maintenance:** Rather than simply alerting drivers, vehicles will transmit defect data directly to engineers. Predictive maintenance will identify components in need of repair, eliminating the need to take equipment out of service for routine inspections and preventive maintenance.
- **Remote upgrades:** Operators can upgrade software over the air in hundreds of connected devices spread across hundreds of vehicles simultaneously.
- **Fuel management:** System operators will have better visibility into fuel consumption and efficiency, potentially saving millions in fuel costs.
- **Improved passenger comfort and convenience:** Carriers can offer more onboard amenities. Transit riders can know how soon the next bus is coming. Air travelers can be alerted to delays via their mobile devices before they leave for the airport.

**ADDRESSING CHALLENGES**

- **Security:** With wireless networks managing transportation systems carrying thousands of passengers, protection against hackers and malware is paramount. This requires a comprehensive security approach from the boundaries of the Internet to the device level. Security needs to be built into every device, starting at the base of the software stack.
- **Real estate:** Space within rail cars, transit vehicles, and airplane cockpits is limited, requiring networked devices to be small, light, and unobtrusive. Advances in multi-core technology make it possible for fewer devices to perform more tasks.
- **Safety:** Connected devices in vehicles must be able to receive software upgrades and patches in ways that do not impede their safe operation.
WIND RIVER SOLUTIONS

Few companies are as well equipped as Wind River® to help organizations determine how to leverage IoT today. In fact, Wind River has been delivering solutions that power interconnected, automated systems for decades. With more than 30 years of embedded leadership and innovation, our technology is at the heart of more than 1.5 billion embedded computing devices around the world.

Wind River has translated that unmatched embedded experience into deep expertise in the transportation sector, making the company a trusted partner to developers, builders, and operators in all transportation modes. We combine superior embedded technology with professional design services to develop end-to-end solutions that unlock new business potential and unleash productivity.

Wind River provides the operating systems and software that deliver the underlying intelligence—including security functionality—enabling transportation systems, networks, and devices to perform safely and reliably. Wind River Intelligent Device Platform enables developers of transportation applications to jump-start development, with pre-configured software components that leverage Wind River Linux and incorporate security features.

We help customers expand capabilities, maximize existing infrastructure, and manage risk as they identify the best and fastest path to value. By helping convert data into actionable insight, Wind River is helping enterprises realize the promise of the Internet of Things.

Architecture of a positive train control system