Cisco Transportation Smart Solution 1.0

What You Will Learn

This solution overview explains how the Cisco® Transportation Smart Solution (TSS) 1.0 helps transportation operators improve safety, mobility, efficiency, and passenger experiences in a variety of settings. It's written for transit agencies, rail operators, public safety, and government organizations. It's also of interest to network service providers and systems integrators that work with rail operators and transit agencies.

What Is Cisco Transportation Smart Solution 1.0?

Cisco TSS 1.0 is a set of validated network designs for railways and other mobile transit environments. It has been created to help you comply with the latest legislative mandates for worker and passenger safety. It's intended to also boost your operational efficiency and revenue. And help you transform your passengers' experiences with new services.

The TSS foundation is a high-performance unified mobile and [Multiprotocol Label Switching (MPLS)](#) network. With it, you can consolidate the aging and disparate proprietary networks you have today into a single, far more powerful IP network. Today, the TSS 1.0 portfolio contains the following components:

- **Cisco Connected Rail:** [Cisco Validated Designs](#) for Connected Train, Connected Trackside, Connected Station, and Positive Train Control (PTC) subcomponents. This solution is customized for railway applications.
- **Cisco Premium Mobile Broadband (PMB) 1.0:** [Cisco Validated Designs](#) for private, public, and hybrid 4G Long-Term Evolution (LTE) access networks. These networks are interoperable with Wi-Fi, 3G, and other wireless networks. Cisco PMB 1.0 can be used with Cisco Connected Rail designs and is also a key enabler for nationwide public safety networks currently under construction around the world and other mass transit operations.

Overcoming Communications Obstacles

Most rail operators want to improve passenger and employee safety. Provide mobility to passengers, staff, and systems. Operate more efficiently. Attract more riders.

But a few obstacles are getting in the way. One is that each rail application connects to its own purpose-built network. Maintaining multiple networks is costly. And it also prevents you from linking systems together to share data.

Consolidating all of your separate networks onto a single, reliable IP network, however, makes it finally possible to link previously unconnected people, process, data, and things. The approach is called the Internet of Everything, and it's transforming the transportation industry.

Today, for example, **personnel** at trackside might not be able to communicate directly with local police if they use different radio technologies. However, connecting all types of communications devices over an IP network lets everyone involved in incident response communicate directly. Securely. Efficiently.

Today, **processes** like checking whether a passenger needs extra time to board before doors close are largely manual. Someone goes out and checks up and down the length of the train to check. Connecting IP video surveillance cameras to the network, though, lets the train operator spot any stragglers right on a video screen. The benefit is greater safety.

Today, **data** like schedule updates has to be manually entered into digital signage at stations. But when both the database and the digital signage connect to the IP network, the process can be automated. The benefit is improved efficiency.

Today, **things** like video surveillance cameras and wireless access points need their own network and their own power outlet. With an onboard IP network, you can now provide Power over Ethernet (PoE) to as many cameras and wireless access points as you need. Onboard Wi-Fi and video surveillance help to increase ridership, because passengers can work or browse the web. They also feel safer.

Figure 1 summarizes how Cisco TSS 1.0 addresses today's transportation challenges and goals and how you can benefit.

Figure 1.   Cisco Transportation Smart Solution Benefits

Cisco Connected Rail
· Connected Train   · Connected Trackside
· Connected Station   · Positive Train Control

· Improve safety and security
· Boost mobility
· Increase productivity and efficiency
· Enhance the passenger experience
· Create new revenue opportunities
· Make more informed decisions

Cisco Premium Mobile Broadband

· Converge multiple disparate networks
· Reduce both capital and operating costs
· Simplify network management
· Improve situational awareness
· Shorten incident response times
· Deploy end-to-end IP next-generation network

Cisco Transportation Smart Solution 1.0

Validated Designs for Implementation Success

Cisco TSS 1.0 is a tested way to manage rail, public safety, and other mass transit systems over one reliable, high-performance IP network. Each solution includes a Cisco Validated Design to help you experience the benefits sooner and reduce your implementation risk. Cisco Services provides a complete set of services to help plan, build, manage, and support the solutions.

You can start with any combination of TSS 1.0 components and add others later. Each validated design is described and shown in the following sections.

Connected Train

Value: Cisco Connected Train helps you create a safe and appealing passenger experience.

To increase safety, for example, install high-definition (HD) Cisco Video Surveillance IP Cameras in train cars. They help deter employee theft, passenger misconduct, and vandalism. When incidents do occur, rail officers or local police can view live video streams on any mobile computing device. By viewing the video on the way to the car, for example, officers can learn about the situation at hand and prepare themselves accordingly. Personnel can also review video later as part of incident investigations and in response to passenger injury claims.

Your passengers can enjoy onboard Wi-Fi and mobile applications that deliver entertainment, advertising, and scheduling information. For increased efficiency, use the onboard network to access passenger information systems (PIS).

Solution Components: The Connected Train Cisco Validated Design includes:

- Cisco IE 2000 and 3000 Industrial Ethernet Switches, one in each car: These ruggedized switches provide PoE so that you can install wireless access points and video surveillance cameras without adding power outlets.
- Cisco 819 Integrated Services Router (ISR): The router acts as a mobile access gateway to networks outside the train - Wi-Fi, 4G LTE, and 3G. It is built to withstand harsh environmental conditions including shock and vibration, moisture, extreme temperatures, dust, and wind. The router connects to Wi-Fi when possible, such as when near the station. Otherwise it connects to 4G LTE or 3G cellular networks.
- Cisco Video Surveillance, including ruggedized IP cameras and Cisco Video Surveillance Manager. You can build customized video surveillance networks to meet your exact requirements. Easily manage video systems. Retrieve and view live or recorded video anywhere, anytime.
- Ruggedized Cisco Aironet® Wireless Access Points.

Connected Trackside

Value: The Connected Trackside solution connects all of onboard systems of the train to the trackside network. It replaces older proprietary supervisory control and data access (SCADA) networks with an IP network that's secure and reliable.

One way to take advantage of a trackside IP network is to make passenger boarding safer. Today, personnel watch over the platform and radio the operator if someone needs extra time to board. With the Connected Trackside solution, the train operator can view high-quality video of all boarding points. This model is more efficient than assigning staff to watch the doors and radio the operator. It also provides video evidence for passenger injury claims.

Rail officers, local police, and incident commanders also enjoy improved communication. They can communicate directly using any kind of radio, fixed or mobile phones, and PC with client software. Officers can use a smartphone to join radio talk groups and also to share video or images such as station maps, possibly shortening response times.

Solution Components: The Cisco Validated Design for the Connected Trackside solution includes:

- Cisco [ASR 901, ASR 903](), and [ASR 1002 Aggregation Services Routers]()
- [Cisco IE 2000 Industrial Ethernet Switch]()
- [Cisco 1240 Connected Grid Router (CGR 1240)]()
- [Cisco IP Interoperability and Collaboration System (IPICS)]()
- [Cisco Video Surveillance IP Cameras]() and [Video Surveillance Manager]()

Connected Station

Value: Cisco Connected Station makes the station an attractive place to go, helping to increase ridership and giving a boost to local economies. High-performance Wi-Fi allows commuters to download or upload large files before or after their ride. Touchscreen kiosks provide wayfinding, transportation schedules, and local attractions. Video surveillance cameras and help-point telephones create a safer environment for passengers and employees. You can also display important alerts and public service announcements, or sell advertising on kiosks for a new revenue source.

**Solution Components:** The Connected Station Cisco Validated Design includes:

- Cisco IE 2000 or IE 3000 Industrial Ethernet Switch
- [Cisco Digital Signs]()
- Cisco IPICS
- Cisco Video Surveillance IP Cameras and Video Surveillance Manager
- [Cisco Unified Communications]()

Positive Train Control

Value: Positive Train Control (PTC) is a U.S. federal safety law passed by Congress in 2008 with which most passenger and freight railroads operating in the U.S. must comply. The goal is to help prevent train-to-train collisions, derailments, and other human-caused accidents.

Cisco has teamed with Lilee Systems to provide a state-of-the-art PTC solution (Figure 2). It blends Lilee expertise in software-defined PTC radio equipment and Cisco expertise in networking.

Figure 2.   Cisco PTC Uses a Redundant, Resilient Backhaul Network and Cellular Backup
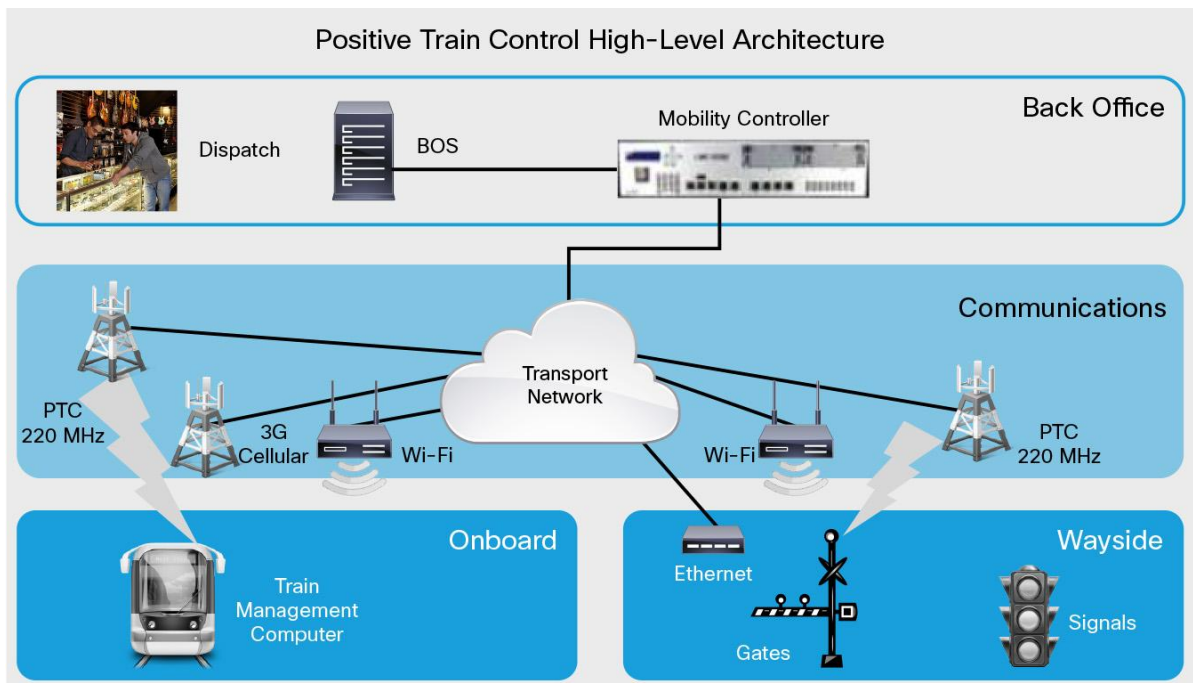
For a faster return on your investment, you can use the same digital data link and network you put in place for PTC for other purposes. For example, transmit information to train crews. Offer onboard passenger services. Or share real-time diagnostic locomotive information.

Solution: The PTC Cisco Validated Design combines these architectural components:

- Back Office Server (BOS) onboard train management system
- Wayside System including Wayside Message Server
- Cisco Unified MPLS for Mobile Transport (UMMT) backhaul network
- Lilee 220-MHz radios for the base station, wayside, yard, and locomotive
- Lilee mobility controller
- Cisco Unified Computing System™ (Cisco UCS®) E-Series Server to host the mobility controller (optional)

Deploy the Cisco PTC solution centrally or in a distributed fashion. Operate the mobility controller software on a traditional server or virtualize it on a Cisco UCS E-Series Server, a module that fits into your router to save space. Or select a tactical, all-in-one solution.

## Cisco Premium Mobile Broadband 1.0

Value: Cisco PMB augments your existing land mobile radio (LMR) network with multiple redundant backup options. If one network goes down, your router automatically connects to another. Cisco PMB can also use Wi-Fi, if available. If not, it can connect to any 4G LTE, 3G, or other radio network.

You gain three advantages from Cisco PMB:

- **Resilient communications:** Today, if the service provider network goes down, personnel cannot communicate. This situation is a safety risk. It also interrupts passenger services such as onboard Wi-Fi.
- **Enough bandwidth for video and image access:** Railroad police officers typically have only one way to communicate: two-way radio. With PMB, mobile officers can use smartphones or tablets to access the same public-safety information they would have at their desks. Law-enforcement databases. Maps. Hazardous materials databases. All this access increases situational awareness for better decision making.
- **Potential for cellular offload revenue:** Mobile device use keeps growing, and cellular carriers are looking to offload traffic to fixed Wi-Fi picocells. Rail stations are a good location because of their high-capacity fixed networks. Also, commuters might want to use certain applications at the station instead of on the train because of the higher bandwidth.

Solution Components: The Cisco PMB solution enables onboard routers to transition from one network to another without dropping their connection. The connection can change from Wi-Fi to cellular, from 3G to 4G LTE, and from one service provider's network to another (Figure 3).

Figure 3.   Cisco Validated Design for PMB
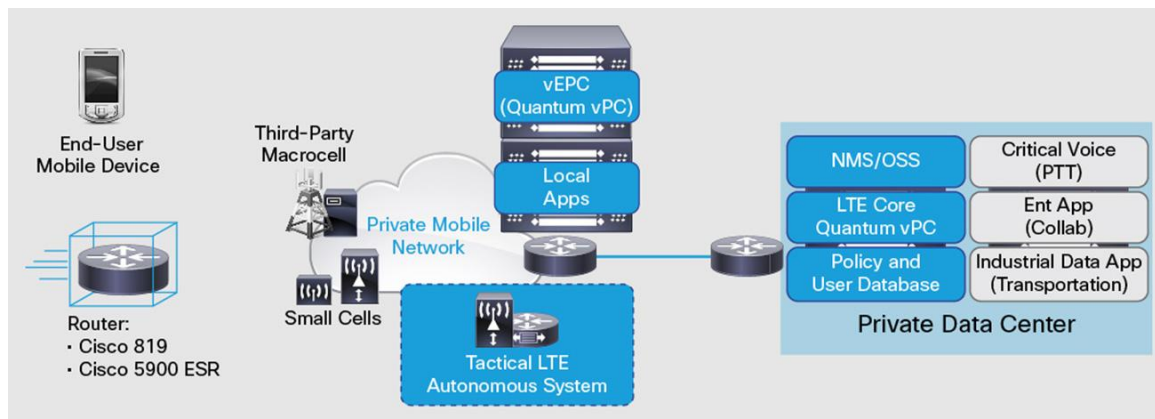
Rail operators and public safety agencies and their network service providers can use the Cisco PMB solution to build their own LTE networks. Or they can use it to connect to commercial LTE networks, gaining more control over the connection.

The solution is flexible, so you can use any combination of features that you need:

- Deployment model: Choose a centralized, distributed, or all-in-one deployment. Support Wi-Fi and 4G LTE and 3G from any service provider.
- 4G LTE capabilities: Standard 4G LTE capabilities include quality-of-service (QoS) control, preemption, mobility, and roaming. To route certain traffic differently, such as video, use deep-packet inspection (DPI) to see the application that generated the traffic. Use advanced failover features for business continuity. Integrate with satellite backhaul.
- Automate configuration and management of customer premises equipment: Use Cisco Open Network Environment (ONE) for software-defined networking (SDN) and other kinds of network programmability.
- Provide voice over LTE service using Cisco Hosted Collaboration Solution (HCS) for cloud providers.

Network Security

As the multitude of connected sensors and devices grows and video surveillance and other applications move to IP, the importance of physical and network security becomes even more critical.

Network-aware intelligence and end-to-end physical security for video and all networked applications are at the heart of Cisco TSS 1.0. Cisco understands the importance of network security and continues to lead the industry in standardization and protocol development. Cisco Validated Designs based on proven technologies not only reduce implementation risks but also are designed to meet the highest levels of security.

Why Turn to Cisco?

Cisco is committed to solving the complex communications problems facing railways, mass transit, public safety, and other transportation organizations. We've teamed with a number of industry leaders to make sure that the solutions we design and test match the real-world needs of the industry.

Using Cisco for your transportation communications needs, you can achieve the following:

- Minimize risk and accelerate deployment using Cisco Validated Designs. They provide a complete, end-to-end architecture. We built Cisco Validated Designs with input from transportation industry leaders such as Bombardier, BNSF Railroad, Network Rail, and San Francisco Metro Transit Authority (SFMTA).
- Engage Cisco Services for help in planning, building, managing, and supporting Cisco TSS. Our services include Strategy and Analysis, Assessment, Design, Deployment, Optimization, Product Support, Solution Support, and Operations Management. We apply our experience with transportation providers around the world to help you improve system operational efficiency, scalability, security, and profitability.
- Lower costs by integrating multiple SCADA networks onto a single IP network, built on proven Cisco network devices.
- Withstand shock, vibration, extreme temperatures, dust, wind, humidity, and moisture, thanks to Cisco ruggedized components.
- Comply with National Institute of Standard Technology (NIST) standards for public safety.

Cisco Services

From strategy to execution, we help you plan, build, manage, and support your Cisco Transportation Smart Solution. We apply our industry leading experience to help you improve system operational efficiency, scalability, security, and profitability with an end-to-end approach that aligns outcomes to your business goals.

For More Information

To learn more about Cisco Services for Connected Transportation Solutions, visit: http://www.cisco.com/go/transportation or http://www.cisco.com/go/connectedrail.

To see how Cisco is helping to transform mass transit, view this video: http://www.youtube.com/watch?v=f5hiU8UUlNs.