TRAINWISE

Powered by QuesterTangent

Train communication networks

TrainWise® is a flexible, comprehensive solution for passenger trains and locomotives that employs leading edge technology in a rail-robust package. This suite provides a unified interface to monitor and manage all on-board electronic vehicle systems. This means easy integration for rail manufacturers, enhanced operational and maintenance management for transit authorities, and a superior passenger experience.

Improving fleet performance with data networks

Trains have a service life that is 10 to 20 times longer than most high tech electronics products. As a result, there is a plethora of network types and technologies embedded in operational train fleets. These networks range from custom, simple, low bandwidth, isolated networks to standardized, complex, high bandwidth networks shared by all of the modern train systems.

With advances in vehicle technology, new trains have become more data driven. Applications such as video surveillance, passenger information systems, and health monitoring have placed a higher demand on train communication networks. Fleet operator expectations for managing and transmitting data quickly and securely have increased dramatically.

More than ever, fleet operators and rail vehicle manufacturers need companies with an in-depth understanding of train communication networks to provide strong integration and increase compatibility with older fleets.

With more than two decades of experience delivering networked train systems, Quester Tangent has the equipment and the expertise to revive an aging car series or build new high-speed rail vehicle networks.

Experienced network integrator

Quester Tangent has long-standing, proven experience delivering fully customized train communication network solutions for both new and modernization projects. TrainWise® Communication Networks use modern technology, comply with relevant standards, include products with built-in configuration, and provide customers with complete interface control documents for lasting peace of mind.

TrainWise Communication Networks are expandable, configurable and adaptable to fleet operators' needs.

TrainWise Communication Networks enable the integrated use of multiple wired and wireless products including on-board Powerline, Ethernet, LonWorks, standard RS232 and RS422.

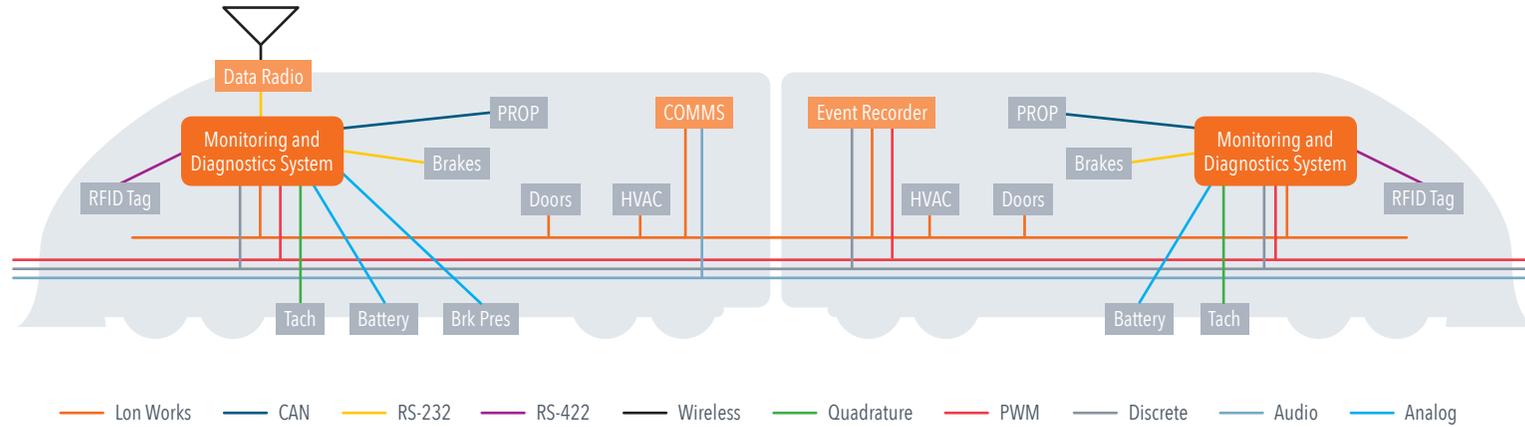## Quester Tangent network integration experience

TRANSIT AUTHORITY	PROJECT	IN SERVICE DATE	NETWORK INTEGRATION	NETWORKS						
				SERIAL	LONWORKS	WIRELESS	ETHERNET	CAN	WTB	POWER LINE
NYCT	New	2000	No		•					
SkyTrain	New	2000	Yes	•	•			•		
NJT	New	2003	No	•	•	•			•	
SEPTA	New	2010	Yes	•	•					
AMT	New	2010	No	•					•	
Detroit People Mover	Retrofit	2011	No	•						
MBTA	New + Overhaul	2013	Yes		•	•	•			•
MTA Maryland	New	2013	No		•	•	•	•		
PATCO	Overhaul	2014	Yes				•			
Rapid KL	Retrofit	2014	Yes		•		•			
WMATA	New	2015	Yes*			•	•			
MARTA	Retrofit	2015	Yes	•			•		•	
Denver RTD	New	2016	Yes	•	•					

*Quester Tangent was responsible for Train to Wayside Data Transfer (TWDT).

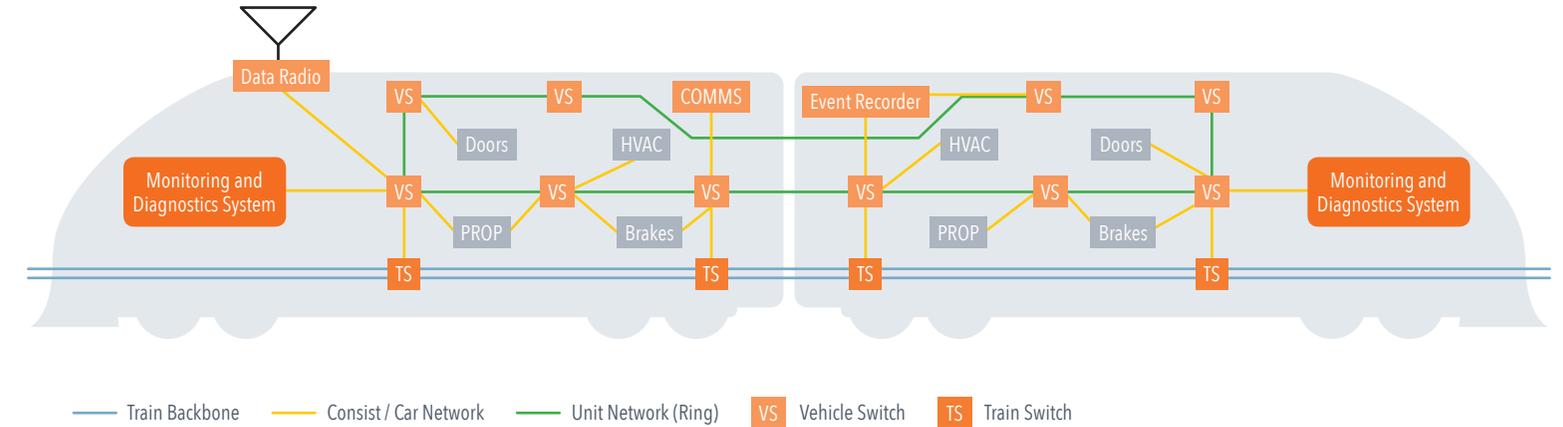# Flexible network solutions for better connectivity

Mixed networks and signals

Quester Tangent provides a wide variety of equipment and support for trains operating with a mixture of data networks, and analog and frequency signals. This example shows how our control and monitoring products, event recorder and COMMS systems can work seamlessly with a broad range of on-board network and signal architectures.

Integrated digital networks

Quester Tangent has expertise in the design and implementation of state-of-the-art network systems. This figure shows how we can provide robust, fault-tolerant network solutions based on complex topologies involving train, consist and train-to-wayside communication.

Mixed networks and signals diagram legend:
— Lon Works — CAN — RS-232 — RS-422 — Wireless — Quadrature — PWM — Discrete — Audio — Analog

Integrated digital networks diagram legend:
— Train Backbone — Consist / Car Network — Unit Network (Ring) — VS Vehicle Switch — TS Train Switch

Network products

Mobile Gateway

Manages and controls communications between on-train systems and wayside. This controller incorporates a customizable combination of Wi-Fi, cellular and GPS technologies for full flexibility and coverage. It manages data storage and transmission to handle connection interruptions, prioritizes data transfer, and ensures maximum use of the wireless channel. Innovative encryption, firewall, and certification protocols ensure the highest level of data security.

Whether coupled with other TrainWise and FleetWise® products or integrated with existing equipment, the mobile gateway provides operational efficiency through reliable train-to-wayside transmission of vital fleet information.

Powerline Train Gateway

Enables communication between vehicles within a train consist utilizing Power Line Communication technology. Affords train operators and maintainers the flexibility to access data from anywhere on the train. This product is a perfect fit for legacy trains because it provides connectivity without having to add new trainlines, delivering significant cost savings. Optional Car Detect provides advanced consist information like train sequencing, orientation, and inauguration.

The built-in Ethernet interface allows the Gateway to gather and exchange data with on-board systems. When combined with TrainWise control and monitoring equipment, consist information and other data can be made accessible to train operators and maintainers through on-board crew touchscreen displays.

Network peripherals

Quester Tangent offers complete turnkey network solutions for rail car manufacturers and operators, including a full line of components and peripherals.

Ethernet Switches
» Managed and unmanaged vehicle switches
» Power-over-Ethernet (PoE)
» Ethernet train backbone nodes

Network Gateways and Adapters
» TCN WTB and MVB
» CAN
» LonWorks
» Serial
» USB

Modems
» Wi-Fi
» Cellular

Other
» Network testers
» Protocol analyzers

Supported protocols

Quester Tangent supports numerous custom and standardized protocols for on-train and wayside networks.

Rail Transit Protocols
IEEE-1473, IEC 61375 (TCN), TRDP, TTDP, R-NAT

Internet Protocols
TCP/UDP/IP, DHCP, DNS, IGMP, SNMP, FTP, HTTP, NTP, PTP

Link Protocols
VLAN, LLDP, RSTP, VRRP, LACP, PPP

Security
VPN, SSL, TLS, RADIUS, CHAP, Kerberos

Other
CANopen, LonTalk, LSI

Why work with Quester Tangent?

A to Z network experience
Quester Tangent has more than 20 years of experience successfully providing network integration and engineering services for all types of train networks. Our solutions span the full spectrum from legacy serial to modern Ethernet-based networks.

Custom services
We have complete in-house electrical, mechanical, software and system engineering capabilities, backed by project management expertise. As an independent integrator, our engineers can create a new and fully customized network design incorporating our state-of-the-art equipment as well as components from third-party suppliers. We follow modern engineering techniques, are compliant to industry standards, and produce complete documentation, including product specifications, fault management plans, training materials, and user manuals.

Customer satisfaction
We work closely with our customers and suppliers to clearly define communication network needs and ensure that a requirements management process is in place. We understand each specification, investigate feasibility options, and provide the project management and quality assurance oversight to carry the project from conception and design to integration and support.

Lasting peace of mind
Our inventory tracking and document management systems provide support to the customer throughout the system lifecycle. All bill of materials, interface control documents, test reports and other supporting documents are kept up to date throughout the life of the project and maintained perpetually in Quester Tangent's databases. These systems ensure that our customer service team can always provide customers with full support based on accurate information.

Investment protection
Quester Tangent creates products that meet the train's service life cycle. We manufacture user friendly and modular bench and portable test equipment for rapid troubleshooting of on-board electronics. This allows for a proactive approach to maintenance. Quester Tangent's Total TrainLife Care promise covers end-of-life management for electronic components to support our products long past the initial warranty. This comprehensive approach maximizes the useful life of all our products.

Reduced life cycle costs
We provide economical and easy upgrades of cellular, Wi-Fi and GPS technologies with a modular, changeable and expandable approach to system design. All of Quester Tangent's communication network products are low-maintenance and reliable for cost-effective operation. We design products with our customers' bottom-line in mind.

Customer Highlights

Proudly supplying:

Partner in operational efficiency

Founded in 1983, Quester Tangent is a leading North American supplier of train electronics and software solutions for the passenger rail and locomotive industries. Quester Tangent features a complete portfolio of rail technology products: **TrainWise**, flexible on-board train and locomotive electronics, **FleetWise**, innovative wayside software and **TestWise**, comprehensive test equipment products.

The **TrainWise** suite encompasses monitoring, diagnostic and control products, event recorders, on-board trainline and wireless network communications, passenger information systems, and CCTV products. These service-proven turnkey solutions provide rail manufacturers and transit authorities with superior reliability, improved operational performance, advanced diagnostics, and enhanced rider comfort and peace of mind.

Contact Quester Tangent today at 1 855 510-7837 and find out how a TrainWise communication networks solution will help you.

QUESTERTANGENT
Delivering Train Electronics

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