

A white and blue city bus is shown in motion on a city street. The bus is white with a blue stripe along the side. The front of the bus has a large windshield and a digital display showing the route number "14" and the destination "via HAWTHORNE" and "via BROADWAY". The bus is moving towards the right, and the background is blurred, suggesting speed. A large green triangle is overlaid on the right side of the image.

MAKING THE CONNECTION IN TRANSPORTATION

How Transit Operators Can Consolidate
Cellular Connectivity for Smarter, Safer,
and More Efficient Operations

THE EXPANDING MISSION FOR TRANSIT AUTHORITIES

As Jim boards the bus for his morning commute to his downtown office, he pays his fare by swiping his debit card in the fare reader. An onboard passenger counter ensures the vehicle remains within capacity limits. A separate system provides the central dispatcher with the bus's location, speed and schedule status.

Jim quickly settles into his seat beneath a digital advertisement that changes every 60 seconds. At the back of the bus, a surveillance video camera helps the transit authority security team monitor the safety of the vehicle and passengers from its central headquarters. Jim takes out his smartphone, connects to the vehicle's passenger Wi-Fi, starts his music-streaming service and gets started on his email for the busy day ahead.

Behind the scenes, multiple devices are at work, managing all of these processes, routing data, and connecting with central dispatch.

Transit agencies are struggling with a rapidly growing number of applications and how to economically implement all of them:

- Fare collection and payment terminal backhaul
- Computer-aided dispatch and automatic vehicle location (CAD/AVL)
- Untethered dead reckoning GPS capability
- High-speed passenger Internet access
- Passenger counters
- Closed-circuit security cameras
- Remote engine diagnostics and fuel consumption
- Vehicle telematics, including speed and idle time
- Digital maps, signage and advertising

Digi offers 5G all-in-one solutions tailor made for transit operations that support the full range of connectivity needs. We also provide an intelligent network via Digi Remote Manager®, and a selection of options for mobile end-points to build a transit system that's right for you.



Digi solutions for transportation offer an all-in-one mobile communications system for secure high-speed connectivity between vehicles and a central dispatch/data center.

SIMPLIFYING SYSTEM CONNECTIVITY

As IoT technology has advanced, transit agencies have gradually added multiple applications and systems to their fleets of vehicles — often with differing methods of connecting to the Internet. The municipal authority may have started with GPS navigation and vehicle tracking CAD/AVL systems, and then later added on-board and in-terminal payment systems that needed backhaul to the central office. Then came passenger Wi-Fi, digital signage, security cameras and more.

The result for many transit agencies was a multitude of systems that do not integrate with one another, and that use differing Internet connectivity methods and cellular carriers. For municipalities already burdened with managing large fleets while maintaining an IT infrastructure within a tight budget, the challenges can stack up. And with even more hardware, software and connectivity to maintain and manage, the risk of system failure only increases.

For many transit systems, the answer is to consolidate all their vehicle connectivity through a single, robust connection platform.

Digi solutions for transportation offer an all-in-one mobile communications system for secure high-speed cellular connectivity between vehicles and a central dispatch/data center, with centralized visibility and management across the deployed network.

Ideal for challenging transportation and mobile environments, Digi TX64 routers offer dual-module LTE-Advanced connectivity with true enterprise-class routing, security, firewall and an integrated VPN. Future-built with a high-speed quad-core CPU, the Digi TX64 provides a flexible interface design with an integrated Gigabit Wi-Fi access point, USB, serial and four-port wired Gigabit Ethernet switch, GNSS and Bluetooth.

Passenger Wi-Fi is managed securely and is separated from communications for the onboard vehicle systems. Triple carrier aggregation on each cellular interface can be combined to deliver up to 1.2 Gbps to passengers. Onboard systems retain priority and any remaining bandwidth is made available to Internet traffic.

Dual cellular and dual Wi-Fi modules provide true segmented traffic flow of private and public data for fare collection, CAD/AVL data, camera log backhaul and passenger Wi-Fi access. Most importantly, the software-defined features from the cutting edge operating system to integrated Digi TrustFence® security, system-wide intelligence with Digi Remote Manager® and peerless reliability with Digi SureLink® make TX64 and TX54 industry-leading solutions.

By consolidating vehicle connectivity for all your applications and subsystems, Digi TX64 can improve operational efficiency, increase on-time schedule performance and extend the life of your vehicle fleet.

For implementers, consolidated connectivity offers the following three distinct advantages.

1 SEGMENTING SECURE AND NON-SECURE DATA WITH ONE DEVICE

Most transit authorities want to ensure that data from their high-security applications, such as fare readers and payment systems, are segregated from less-critical applications, such as digital advertising. These critical applications require three important characteristics:

- **Encryption to prevent unauthorized viewing of your data**
- **Message integrity to ensure data hasn't been tampered with en route from the vehicle to the central office**
- **Authentication to verify the message is from a valid source**

Traditionally, the practice was to deploy a separate, dedicated router for each application or subsystem. Digi TX64 and TX54 change this with their encryption, authentication and message integrity features. The

result is unified, secure and isolated traffic. The key technology is IPsec, a protocol for securing Internet communications through authentication and data encryption. Using IPsec, the router can establish a virtual private network (or “tunnel”) using the public networking infrastructure.

Digi employs this feature in the Digi TX64 and TX54 routers to enable transit authorities to create multiple separate, autonomous and simultaneous VPN tunnels from a single router — one tunnel for each application or subsystem's traffic. In this manner, high-security payment data can travel on its own protected VPN tunnel without impacting — or being impacted by — other data traffic.

2 PRIORITIZING TRAFFIC

Even when you route all of your wireless connectivity through a single device, that doesn't mean all data traffic has the same value. Certain subsystems — such as payment terminals or bus-engine data — must take priority, while passenger Wi-Fi and digital signage are





less important. For example, you don't want your payment transactions blocked because a passenger is streaming a music video.

The goal is to ensure that the high-priority traffic has the lowest latency.

This is achieved through the IETF standard for differentiated services, an enhancement to the Internet Protocol (IP) that lets you configure bits in the IP packet header to designate the priority of the traffic. Using quality of service (QoS) settings at the router, you can specify the importance of the data in that packet. This method is universal, so that IP packet receives priority throughout its journey — all the way to the back office or data center. In this manner, you ensure your connectivity prioritizes the data traffic that matters most.

This is particularly relevant in mission-critical communications used by first responders, including the FirstNet, Frontline and other public safety networks for emergency group communications, interagency communications and location tracking.

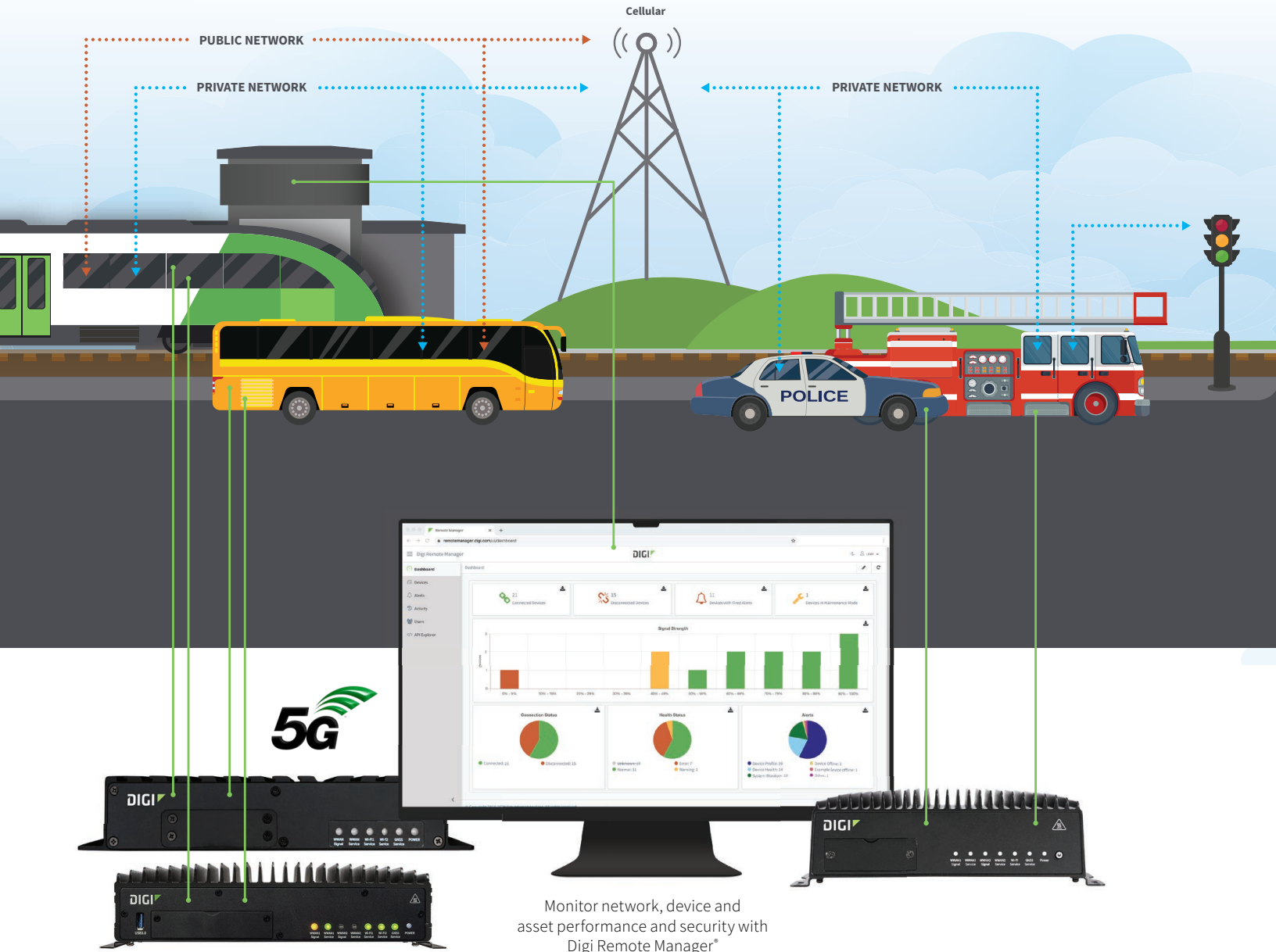
3 HIGHLY RELIABLE CELLULAR CONNECTIVITY

City officials and residents expect their regional transit systems to be safe and to run on schedule — and that onboard systems such as fare collection and Internet access be fully operational. This requires a cellular communication link that is fail-safe and secure, with high bandwidth and low latency. Digi routers are purpose-built for such a task:

- Dual cellular interfaces (5G NR with LTE fallback and LTE Cat 20), include dual-SIMs for each cellular module, enabling seamless automatic failover
- Digi SureLink® maintains persistent connections ensuring rapid, always-on communications
- Advanced cybersecurity features keep hackers out and the system running

The combination of the Digi TX64 and TX54 integrated software for security, reliability, monitoring and predictive maintenance, plus industry-leading hardware features, enable onboard systems to operate at their peak performance. The outcome? A more efficient and friendly transit service for the community served.

Versatile on-board public and private data connectivity.



Monitor network, device and asset performance and security with Digi Remote Manager®

DIGI TX64 5G Rail and Digi TX64 5G (FirstNet Ready™) PUBLIC TRANSPORT AND RAIL APPLICATIONS

- High-speed passenger Wi-Fi
- On-board security video
- Infotainment and digital signage
- Operator VoIP
- Fare collection
- Automated passenger counter
- Computer-Aided Dispatch (CAD) and Automated Vehicle Locations (AVL)
- Untethered Dead Reckoning

DIGI TX54 (FirstNet Ready™) PUBLIC SAFETY APPLICATIONS

- Body worn camera
- Automated license plate reader
- Mobility tablet
- LMR to LTE gateway
- Vehicle camera
- Location (GPS)
- FirstNet Ready™
- Passenger Wi-Fi

AUTOMATIC FAILOVER MAINTAINS UPTIME

Modern transit requires equipment that leverages robust and resilient connectivity. This implies three careful design considerations:

- Dual redundant communications
- Complete cellular connectivity — with failover between carriers
- 5G and LTE coverage for faster connectivity

For every cellular module in a Digi TX54 or Digi TX64, there are 2 SIM cards. That means a vehicle can use its router to connect over two different wireless carriers, such as Verizon and AT&T. If one carrier goes down (or out of range), Digi TX64 and Digi TX54 auto-switch to another carrier across dual cellular modules. Dual cellular radios, each with dual SIMs (WWAN 1 and WWAN 2), ensure a seamless ‘sub-second’ transition between two carriers to avoid any interruption during critical service times.

PCI COMPLIANCE FOR TRANSIT AUTHORITIES

The payment card industry (PCI) standard for security is an important consideration for transit authorities that accept fare payments using debit or credit cards because PCI compliance is required for processing card-based payments.

This involves securing the device components, connectivity and transactions. The Digi TX64 is ideal for achieving PCI compliance because all of the requirements can be incorporated into the router:

- Stateful firewall
- Encryption
- Network segmentation
- Event logging
- User authentication



THE NEW STANDARD FOR DUAL REDUNDANT COMMUNICATIONS

Passengers today demand a faultless onboard Internet experience. And with so many transportation options, transit agencies that are unable to provide seamless Wi-Fi will struggle to grow or even retain their ridership. Meanwhile, agencies must also be able to integrate vehicle data from engines, logistics programs, fare collection, cameras and digital signage, all while maintaining the highest level of security.

The Digi TX64 meets these complex simultaneous needs with dual 600 Mbps Cat 11 cellular modules and dual high-speed Wi-Fi radios so that transit organizations can securely segment private data from public data. Internet access for riders is managed separately without impact to onboard communications systems.

- Digi Remote Manager®: a web-based management platform monitors both device and network health in mobile locations with automated updates to minimize service disruptions
- Video and vehicle data offload over 1.7 Gbps 802.11ac Wi-Fi backhaul; via Digi Remote Manager, vehicles can prioritize data offloading at a depot via Wi-Fi so as not to incur high cellular data plan costs
- Passenger Wi-Fi over 867 Mbps 802.11ac access point: Digi TX64 supports all IP-enabled passenger devices with the most recent technology
- Wired Gigabit Ethernet (4-port) for onboard systems: eliminate the need for a separate network switch on board
- Quad-core 1.91 GHz, 64-bit CPU: future-built high-speed architecture supports higher 5G network speeds as infrastructure is updated

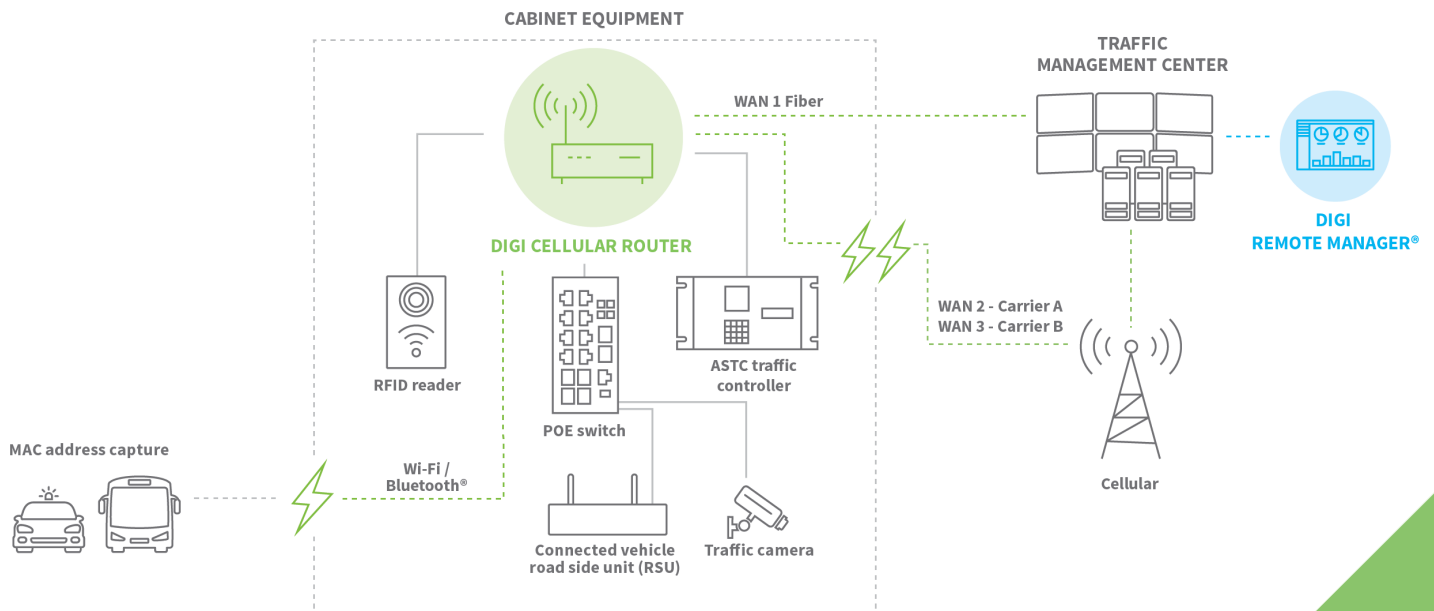
FIRSTNET READY DIGI TX54 ROUTER FOR PUBLIC SAFETY NETWORKS AND APPLICATIONS

The high performance and versatility of FirstNet Ready™ Digi TX54 routers make them ideal for mission critical use cases requiring continuous connectivity, field longevity, edge computing and public safety communications.

Designed to meet the demands of first responders, including FirstNet “extended primary” industries like utilities and transportation, the Digi TX54 includes concurrent and independent dual-cellular interfaces that prioritize critical communications during an emergency. Available with dual Wi-Fi radios, Digi TX54 also segments passenger Wi-Fi from fare collection, data, video and other transit applications to ensure passengers are getting the best Wi-Fi experience.



- 867 Mbps 802.11ac Wi-Fi for WAN or LAN service with dual Wi-Fi radios to securely segment data across dual 600 Mbps Cat 11/12 cellular modules
- Future-built with dual-core 880 MHz MIPS processor
- Cryptographic co-processor with secure key generation keeps company and customer information safe
- Digi Remote Manager minimizes service disruptions with web-based management tools to update and monitor device and network health





CONCLUSION

The future of transit belongs to agencies, operators and authorities that can leverage smart, secure and cost-efficient connectivity solutions to improve the rider experience, lower costs and improve safety and performance. With cellular routers like Digi TX64 and TX54, they can consolidate remote connectivity and simplify their infrastructures.

WHY DIGI?

Digi International is your mission critical IoT solutions expert, with the broadest range of wireless transit products, a cloud computing platform for command and control of your entire network, and development services to help customers plan and deploy infrastructure and connectivity upgrades faster and at a lower cost. The entire Digi solution set is tailored to allow any device to communicate with any application, anywhere in the world. Look to Digi for what's next to keep you up to speed and up to date.

Key Takeaways

- A proliferation of subsystems has created disparate, unintegrated transit applications that all use independent connectivity strategies.
- Agencies can move beyond connectivity and consolidate their communications through a single on-board cellular router that supports everything from CAD/AVL and fare-card swiping to passenger Internet and digital signage.
- A single router can manage traffic for both secure and non-secure applications using IPsec and VPNs for separate, autonomous protected data streams.
- Passenger payments and other critical applications can be prioritized by configuring IP packet headers.
- Carrier redundancies can minimize the risk of downtime and give transit authorities more flexibility in their choice of carriers.

Contact a Digi expert and get started today

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