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STARLINK

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STARLINK
CONNECTED



220 Mbps
DOWNLOAD



20 ms
LATENCY

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With Speedcast's Head of Rail, Dr. Spencer Dando

Starlink Takes Rail Wi-Fi Beyond the Cellular Dead Zone

Rail operators have traditionally relied on Wi-Fi delivery via a terrestrial model: antennas and routers on the train aggregate mobile-network coverage that varies by route, carrier footprint, terrain and the density of competing users.

While that approach can work well on well-covered corridors, it leaves passengers without service in dead zones and remote stretches of track, resulting in a sub-par user experience. As the demand for home-like Internet quality rises, an increasing number of passenger rail lines are turning to Starlink as a backup or replacement for terrestrial, cellular-based connectivity.

Speedcast's Starlink-based approach changes the game. Rather than relying primarily on ground-based cellular towers, the installation uses roof-mounted low-Earth-orbit satellite terminals to connect the train directly to a broadband satellite constellation, then distributes that capacity through the onboard network. The distinction

is not only higher headline speeds: it shifts the connectivity challenge from continually finding usable terrestrial coverage to maintaining a resilient satellite link while the train moves at speed through a changing environment.

In this interview, Speedcast's Head of Rail, Dr. Spencer Dando, discusses what that change means in practice—from antenna placement, power and integration with rolling-stock systems to the realities of operating across difficult terrain.

The conversation also examines how satellite connectivity can complement, rather than simply replace, cellular networks, and why installation, network design and service management are as important as the satellite link itself in delivering a dependable passenger Wi-Fi experience.

SMW: What prompted Speedcast and your rail customer to install Starlink connectivity, and what objectives was the customer hoping to achieve?

Dando: Speedcast is partnering with a North American passenger rail customer and its systems integrator to bring Starlink connectivity to a brand-new fleet of next-generation intercity trainsets serving a Pacific Northwest corridor.

The operator chose Starlink to provide reliable end-to-end connectivity rather than the patchy cellular coverage that has defined rail Wi-Fi for decades.

They wanted the onboard experience to match the ambition of the new equipment, providing consistent, high-speed connectivity.

The objectives were twofold: give passengers a more airline-like, delightful onboard experience and give the customer a single connectivity platform that could also carry operational traffic, including crew

communications, telemetry, diagnostics and video – not just passenger internet.

Seven production installs have been completed to date, and testing is being completed ahead of entering passenger service by the start of Q4 2026.



SMW: How is the Starlink system installed and integrated on the train—from the roof-mounted terminal to the onboard Wi-Fi and communications network? What rail-specific testing and certification were required?"

Installation:

Dando: The whole solution is delivered as a fully managed service. The first eight trainsets are being fitted with Gen2 Starlink terminals; the remaining fleet will move to the Starlink Gen3 terminal fitted with a new Speedcast-designed ruggedization framework and a protective, aerodynamic shroud, making

Speedcast the first provider to bring a rail-ready Gen3 Starlink terminal to market.

Integration:

The terminal is a low-profile, electronically steered, flat phased array antenna; roof-mounted, paired with a repackaged PSU/data interface unit that installs anywhere on the train as a technical cabinet using custom rail-compliant cables and connectors and a rail-designed mounting frame for vibration-resistant installation.

Testing:

We're leading the Gen3 rail terminal effort to engineer and certify it to internationally recognized rail standards, including standards that define environmental, electrical, mechanical, and safety requirements for electronic equipment used in railway applications. This covers everything from rolling stock electronics, fire protection, and tunnel pressure-pulse fatigue to extensive shock and vibration testing.

On this deployment specifically, the operator has run its own in-house operational testing on the route, and results have confirmed the reliability of the solution and its ability to deliver large volumes of data cost-effectively – enough that the operator has since asked for five times the data throughput originally specified.

SMW: What measured performance has the system delivered on this route, including throughput, latency, availability, and passenger capacity? How do those results compare with the system's rated performance?

Dando: The Starlink Performance Gen3 terminal is rated for download speeds up to 400+ Mbps and upload up to 25 Mbps, with typical latency of 25–60 ms, which is well under the 99 ms threshold that matters for real-time applications.

Speedcast's own rail-specific figures show peak throughput of 500 Mbps down / 40 Mbps up. With the current Gen2 terminal, we are seeing sustained throughput of roughly 150/20 Mbps per terminal, and network

uptime above 98% within the service area.

The rail operator reports that performance is now consistent across the entire route, a marked change from its prior cellular-only-based experience.

SMW: How does Starlink compare with the cellular-based connectivity or other satellite systems that the rail sector has traditionally used for onboard Wi-Fi?

Dando: On this deployment specifically, the customer reported that the biggest difference is consistency: performance now holds up evenly across the entire route, including remote and rural sections that terrestrial networks don't reach well, a marked change from the highly variable cellular coverage it experienced previously.

SMW: Could this capacity allow the operator to relax traditional rail Wi-Fi limits on video

streaming and other high-bandwidth uses? What should passengers expect when public Wi-Fi launches?

Dando: Yes. Those policies generally reflect the bandwidth limits of the systems they replace, which might be fine for most browsing, but not for video. The throughput Starlink delivers, with peak speeds of 500 Mbps down/ 40 Mbps up, is built to support HD streaming for every passenger onboard, and not just a handful.

On this deployment, the customer is currently running the service operationally before

expanding it into a full customer Wi-Fi rollout, so passengers should start to notice the difference as that rollout proceeds.

SMW: Beyond passenger Wi-Fi, which operational applications can use the connection, and which are already planned for this deployment?

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Dando: It will support operational as well as passenger use. The connectivity layer carries passenger Wi-Fi, media and entertainment, and voice. It's also built to carry the operator's operational traffic, including crew communications, command and control, train location and telemetry, live CCTV backhaul, remote diagnostics, and fleet-wide analytics.

SMW: How are passenger traffic and operational technology kept separate, and what protections are in place for safety-related systems and operational data?

Dando: Operational applications require higher security than passenger WiFi. Before a train operator will allow public traffic (passenger WiFi) and operational traffic to share the same connection, certain security features must be implemented.

Operational traffic can run over Speedcast's



PNI service, which is a direct, secure, off-the-public Internet connection between the train, the operator's enterprise network, and its private IT/OT environments – protecting the integrity and security of operational data.

When Starlink is deployed with our SIGMA intelligent edge platform, the solution becomes even more secure. Speedcast's network management platform applies zero-trust security and IPSEC connectivity. This keeps SCADA, telemetry, onboard systems, and safety-related traffic separate from general passenger internet use and supports the operator's alignment with IEC 62443 cybersecurity practices for OT environments.

SMW: During a full train or peak-demand period, how does the network reserve and prioritize capacity for railway operations while maintaining a usable passenger experience?

The major connectivity change Starlink has introduced to transport is an extremely reliable, high-bandwidth and low-latency connection. This makes the connection much more efficient as more data packets can be transmitted reliably, and far less re-transmission is required, which would otherwise consume more bandwidth.

Data traffic using the Starlink connection can also be prioritized, and rules can be applied so operational data always has priority over passenger data, or a minimum bandwidth can be reserved for operational data. We can now deliver enough bandwidth to the train to enable a pleasing passenger experience while also reliably supporting operational communications.

SMW: What remains before this solution can be deployed broadly across additional fleets and routes—rail certification, approvals, hardware availability, or other constraints?

Dando: It is the full re-certification of the Gen3 terminal. The Gen3 rail terminal is being engineered and certified against internationally recognized rail standards that

define environmental, electrical, mechanical, and safety requirements for electronic equipment used in railway applications. This covers everything from rolling stock electronics, fire protection to tunnel pressure-pulse fatigue to extensive shock and vibration testing.

That effort is nearly complete, and it will be ready for deployment during 2026. It's been happening behind the scenes in parallel with our technical team's Starlink Gen2 terminal rollout on this rail customer's first eight trainsets.

SMW: If this deployment proves successful, what could passengers realistically expect over the next few years in terms of coverage, streaming, video calls, reliability, and other onboard digital services?

Dando: If this deployment continues to prove out, the operator has signaled an appetite to grow the program well beyond the initial trainsets. The current operational-testing phase will soon give way to a full public Wi-Fi rollout, delivering consistent high-speed coverage across the



entire route rather than just parts of it, and when the Starlink Gen3 rail terminal completes certification, an even more capable, higher-throughput, more resilient version of the same service will be available. Over time, that also opens the door to more airline-like passenger-facing amenities such as entertainment streaming, video calls, and real-time journey information throughout the itinerary.



Dr. Spencer Dando serves as Head of Rail at Speedcast, where he draws on deep expertise in railway operations and satellite communications to design and deliver high-speed, low-latency connectivity for rail customers around the world. A transport and technology leader with a proven record of winning, developing and delivering innovative customer-facing projects, he has led the design and rollout of digital passenger and transport solutions throughout Europe, Africa, the Middle East and Asia. Dr. Dando holds a PhD in Chemistry from Brunel University of London.