A Seemingly Impossible Story of 4,400 Miles, Fiber, and Copper

30,000 critical roadside assets need to be connectable on a new IP network —including Gantry Signs, Signaling, and traffic enforcement CCTV cameras— **across 4,400 miles of motorways and major A-roads.**

It's long been easy to justify the promise of fiber connectivity. Given its sprawling urban reach, the transition to fiber can be relatively simple for most businesses. Barring instances of location-, topographic- or cost-prohibitive factors.

However, with vast projects such as with Highways England, *how does one cover thousands of miles with 10's of thousands of connections and a potential network that runs from the Penzance to Berwick Upon Tweed?*

Good question. *The short answer? Actelis' advanced hybrid fiber-copper solutions provide the flexibility Highways England needed for a ubiquitous communication network. Actelis' technology enables safer roads and faster, more advanced real-time monitoring and control—while providing the driver a better travel experience.*

Some background: in 2018, Highways England revised the National Road Transport System (NRTS) contract. The new NRTS contract focuses on the need for a network upgrade to enable IP-based applications to run across a newly upgraded fiber-installed infrastructure. The NRTS operates and maintains the telecommunications services that link 30,000 critical roadside assets (signs, signals, cameras) to seven regional control centers and the National Traffic Operation Centre. This enables Highways England to operate, monitor, and control its network safely and efficiently. NRTS also delivers all-new IP/Ethernet services to the regional centers and for new, efficient and responsive smart motorways.

In March 2018, the new NRTS contract (of up to nine years) was awarded to Telent, with the objectives to modernize the NRTS network, deliver new services, and replace expired equipment.

The new network is deployed over fiber links—with any legacy copper links following suit. However, the new-world fiber connection is not ubiquitous—and likely will not be for a while. About one-third of the NRTS network remains reliant on legacy copper links. This lag presents serious technical challenges: existing copper and new fiber networks must marry without compromising service quality, reliability, or security. Both fiber and copper connections must provide reliable high bandwidths (over extremely long distances) in ring and linear add-drop topologies.

Enter our story's heroes: Telent and Actelis. Telent, a leading UK technology company headquartered in Warwickshire, specializes in designing, building, operating, and maintaining UK's critical digital infrastructure. And Actelis, headquartered in Fremont, CA, is a market leader in high-performance broadband over hybrid fiber-copper networks, providing ITS & IoT infrastructure solutions.

> *"The combined reliability of the Actelis solution with the bespoke housing we need to integrate into our network meant that this solution was the obvious choice"*
>
> Design Authority
> Highways England

Actelis and Telent designed a secure, hybrid architecture that seamlessly integrated the different network components. The system includes compact, hybrid fiber and (bonded) copper managed switches, supplemented by remotely powered smart repeaters, which enable fiber-grade service over long copper cables. Actelis solutions support ring, add-drop, and linear deployment architectures. The equipment is installed in standards-based, temperature-controlled 19" racks and limited-space, non-temperature-controlled roadside cabinets. Actelis also offers compact DIN rail solutions for flexibility.

So, with all this technical wizardry, did they compromise security? No! Network security was a major concern, so Actelis' solution met this challenge head-on. Its platforms provide high-speed, reliable, and cyber-safe solutions incorporating advanced traffic encryption and data scrambling. These platforms offer connectivity to modern IP devices, as well as legacy, serial, and SCADA devices.

So, security was uncompromised. Remote Management, Troubleshooting, and network traffic controls, then? Alas—again, no! Actelis' solutions offer full remote management capabilities with comprehensive troubleshooting tools, which minimize technicians on-site and ensures high availability. Platforms' advanced Quality of Service (QoS) functionality guarantees sensitive applications like CCTV have the highest priority—with minimum delay or distortion. This high-fidelity ensures that regional monitoring teams receive high-quality, real-time video even in large configurations involving 20-hop rings, enabling them to identify safety issues on time., and deliver alerts to smart signs in a timely fashion.

To meet stringent SLA requirements, Actelis' MetaASSIST View and MetaASSIST EMS were deployed. The "Zero Touch Provisioning" features, scheduled tasks, new installations, and global provisioning changes enable an efficient and concise low-touch deployment workflow, simplifying maintenance and troubleshooting. MetaASSIST EMS is integrated into Highways England's existing alarm management system via the EMS' Northbound interface. This integration allows the regional control centers and the National Traffic Operation Centre to monitor all alarms from a single system. Actelis MetaASSIST EMS also enables monitoring of other non-Actelis devices, allowing teams to monitor end equipment such as CCTV cameras—without middleware or additional management applications.
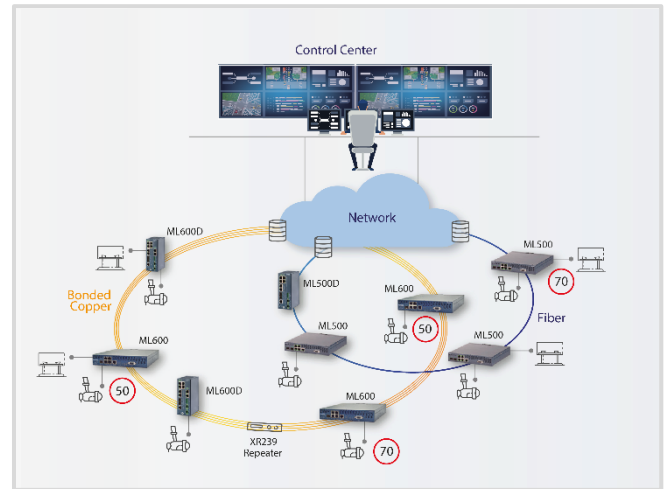
> *"Our team has been hugely impressed with the design flexibility Actelis technology offers. It has simplified the complex design allowing us to achieve our core objectives."*
> *- CTO Telent*

And so, that's how we surmounted the challenge of providing a modern IP infrastructure to an organization with a huge footprint and multiple legacy connection points. Telent and Actelis demonstrated it *is* possible to plan and roll out hybrid copper and fiber networks successfully. Not only can one instantly modernize hybrid fiber-copper networks, but these networks can upgrade flexibly with client needs over time. *The Actelis portfolio has proven its flexibility, yet again, by enabling teams to provide fiber connections where possible, high-speed copper where not, and still preserve an easy low-touch upgrade when needed—delivering a truly future-proof network.*

Whether by magic or simply technological ingenuity,
Actelis makes the modernization of hybrid copper-fiber infrastructure possible and seamless.

Actelis
Networks™