McLaren APPLIED

CONNECTIVITY IS KING FOR PASSENGERS AND OPERATORS

ACTIVE ANTENNA AND FLEET CONNECT

Good public transport connectivity improves both:

- The experience of passengers by increasing WiFi download speeds and stability.
- The service delivered by operators by enabling fast upload of vehicle and environment data.

Radio-Frequency (RF) communication products traditionally use passive antennas to receive signals in combination with an active modem to provide a logical interface. In a public transport environment, the physical characteristics of the vehicle force the passive antenna to be mounted on the exterior, with the delicate electrical modem on the interior. This necessitates the use of RF cables – the quality and installation efficiency of which have a significant impact on the cost and performance of the product. We wanted to pioneer an alternative solution to this challenge by moving the modem and computer into the antenna itself, thereby reducing the weight, cost and installation effort of lengthy RF cabling.

EDGE INNOVATION TO ENHANCE PASSENGER EXPERIENCE

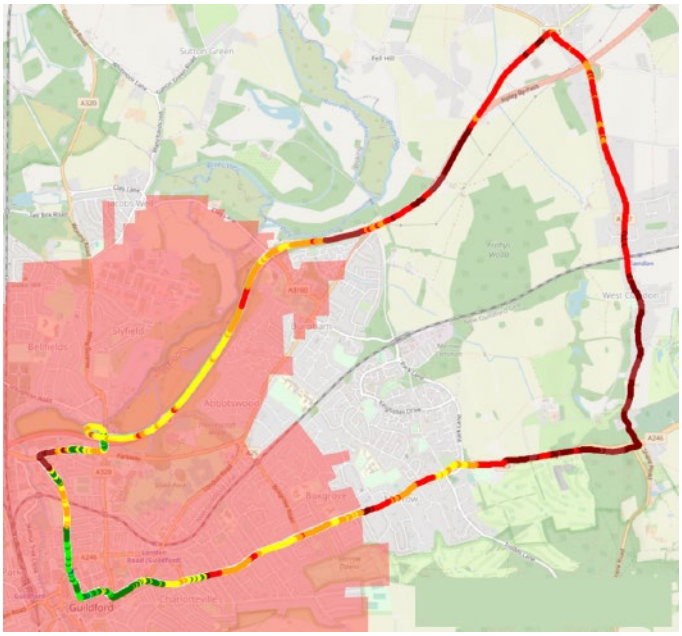
McLaren Applied, long-term connectivity expert from the world of motorsport, partnered with HUBER+SUHNER, a developer and manufacturer of components and system solutions for electrical and optical connectivity, to integrate the passive antenna and active modem elements into a single assembly – SENCITY® Rail ACTIVE rooftop antenna (hubersuhner.com).

In order to test that this innovative approach delivers improved performance many tests have been performed. In one early test a vehicle was mounted with both a new Active Antenna and a passive one, then driven along the same route twice, once with each antenna operational.

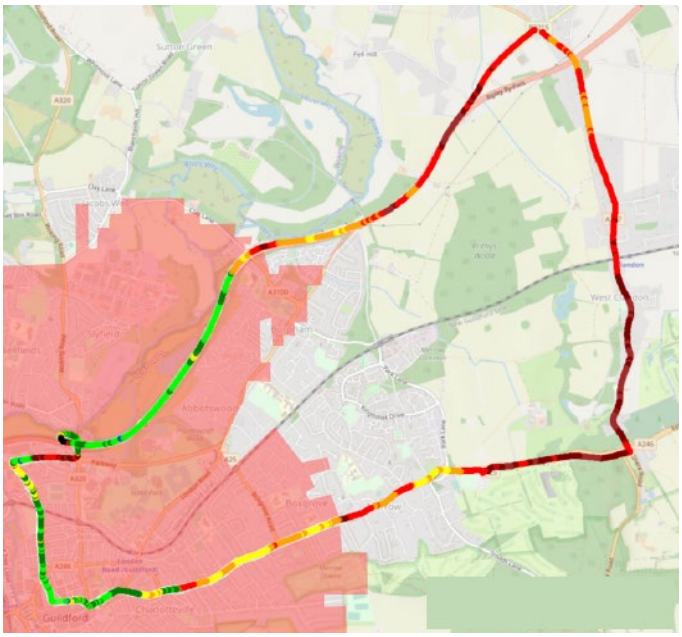
The graphs to the right show the enhanced download speed performance compared between the two antennas in this mixed 4G, 5G, urban and rural setting.

With 5G being increasingly rolled out across many countries, the performance delta between the active and passive antenna will only continue to grow.

Map 1: Passive Antenna



Map 2: Active Antenna



SOFTWARE INNOVATION TO INCREASE OPERATIONAL INSIGHTS

Moving the active modem elements of an antenna into the antenna is just one innovation pioneered by McLaren Applied. Leveraging our many years of motorsport expertise in delivering real-time vehicle data to the pit wall via RF communications, we also built a software solution that increases the stability of connectivity – Fleet Connect (mclaren.com/applied/industries/transport/).

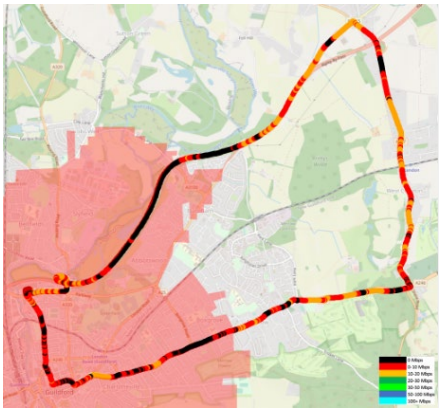
Fleet Connect's algorithms can aggregate any available network regardless of its source, including 4G, 5G, mmWave, WiFi and satellite, at high speed. We can also integrate any third-party system (ie media, infotainment, CCTV) as well as features such as a captive portal or authentication services.

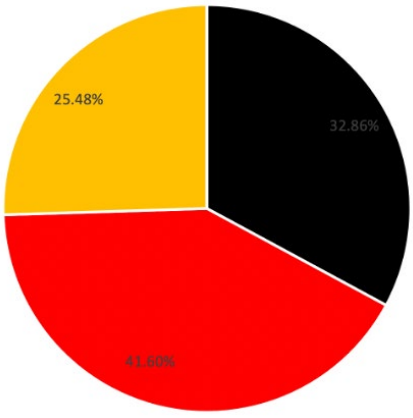
This ability to aggregate a wide variety of signal types is particularly important for public transport networks operating across the country and outside of conurbations. Through being able to utilise any signals available, overall stability is increased.

A sustained performance is crucial for **data upload use cases**, as it enables operators to have no gaps in the operational, vehicle and environmental data they receive from sensors, as well as reducing blank spots that might impact Electronic Point of Sale (EPOS) revenue. Better throughput is particularly important for large data offloads.

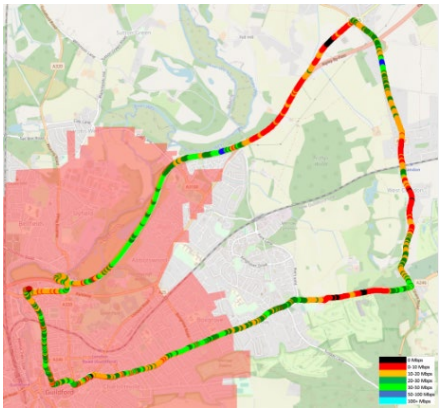
We decided to test how our Fleet Connect software could optimise large data offloads by conducting a further drive test. The below is a working example of two Active Antennas running Fleet Connect and aggregating two separate mobile networks. Data was transferred continuously during the journey from an on-vehicle laptop to McLaren's Cloud Platform. Areas with 5G coverage are shaded red. All other areas are within 4G coverage.

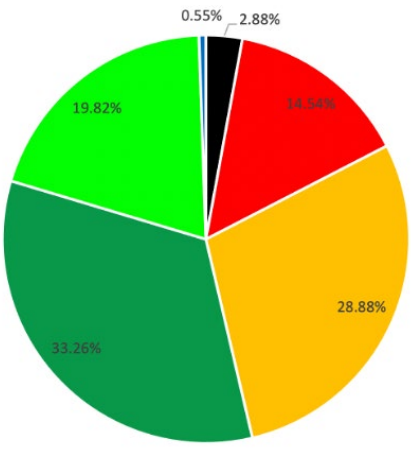
Map 1: Network 1 Uplink Throughput



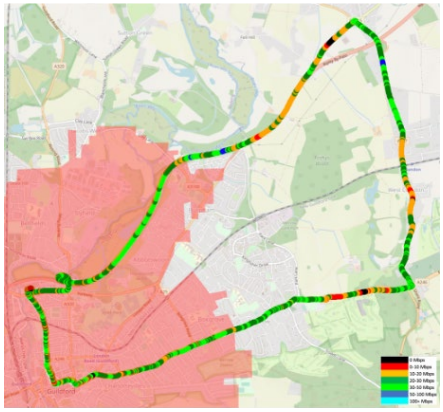


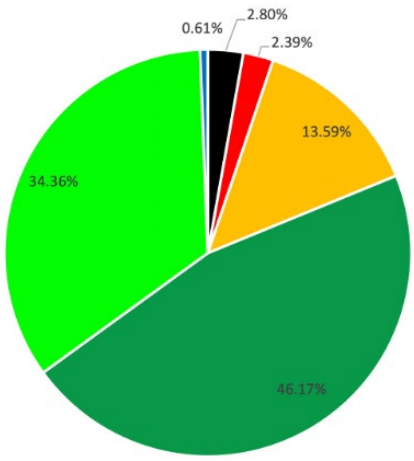
Map 2: Network 2 Uplink Throughput



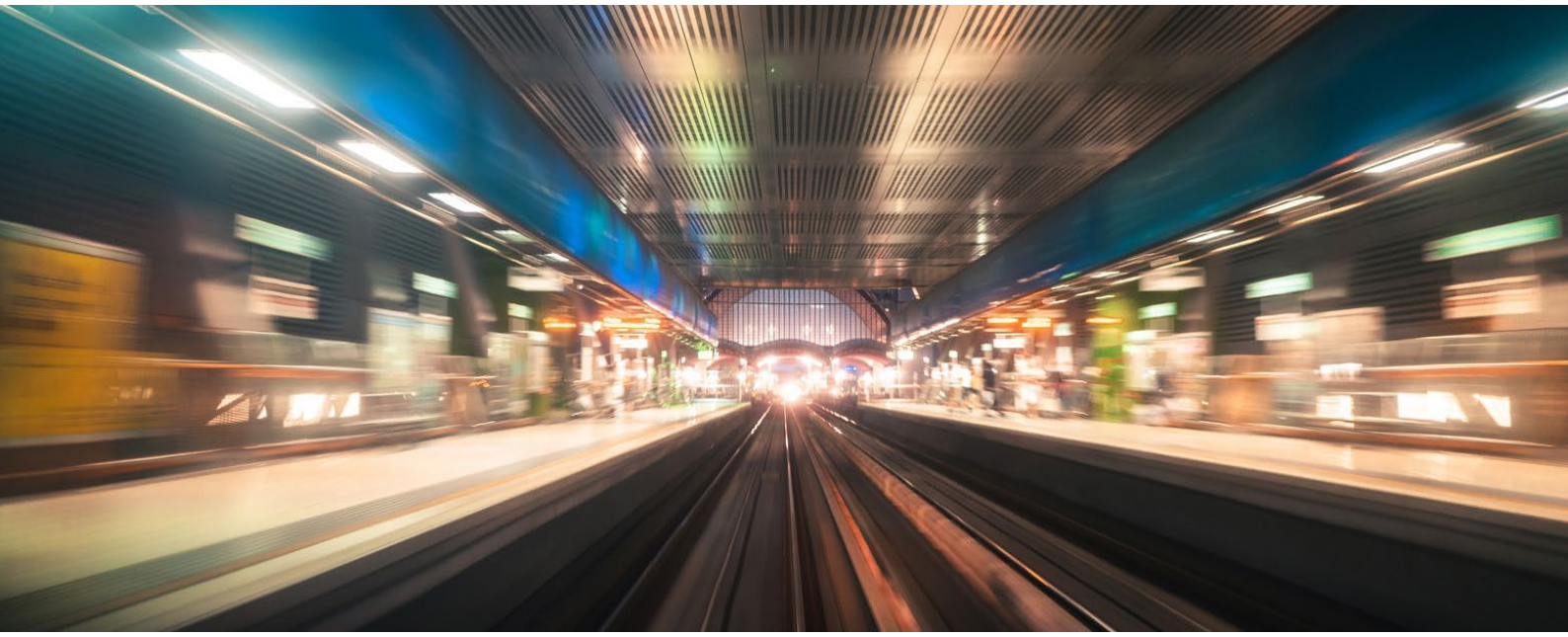


Map 3: Fleet Connect Uplink Aggregation





■ 0 Mbps ■ 0-10 Mbps ■ 10-20 Mbps ■ 20-30 Mbps ■ 30-50 Mbps ■ 50-100 Mbps ■ 100+ Mbps



ACTIVE ANTENNA + FLEET CONNECT: THE MULTIPLIER EFFECT

Our testing shows the following advantages of our connectivity innovations for public transport in performance compared to passive antennas:

1. Up to 10x download and 4x upload performance increases over traditional passive solutions.
2. Gigabit throughput has been demonstrated with Active Antennas and Fleet Connect on moving vehicles.
3. Cell edge coverage was extended by up to 500m due to reduced cable losses. Resulting in a significant reduction of spots with no useable network and higher average throughput.
4. By combining the Active Antenna with Fleet Connect (McLaren Applied's patented connectivity solution), we can achieve over 65% less connectivity 'dropouts' in public transport.

The benefits of using Active Antennas are amplified when used in conjunction with the Fleet Connect. In other words, when Fleet Connect comes into action to minimise connectivity black spots, the raw signal in the vehicles have been already optimised by Active Antenna.

For transport operators looking to optimise both, Active Antenna and Fleet Connect work together to achieve this 'multiplier effect', enabling them to leverage best in class edge innovation and F1-inspired software to reach a new frontier in public transport connectivity.

For more information contact:
McLaren Applied Ltd
Victoria Gate, Chobham Road, Woking Surrey GU21 6JD, United Kingdom
Tel: +44(0) 1483 261 400
Email: applied_enquiries@mclaren.com **mclarenapplied.com**