Highway authorities must provide mobile connectivity to their maintenance staff vehicles, security patrols or other first responders, such as police patrol cars, to ensure better service and security for motorists. There are only two options available to enable the provision of such critical communications: cellular telephones and private wireless networks. Both should be seriously considered by highway authorities.

**Bandwidth and Availability Requirements**

To assure high-quality yet cost-effective communications for moving vehicles, the relevant highway authority should commit itself to guarantee 5-10 Mbps of bandwidth per vehicle, regardless of any pathway limitation. In addition, reliable communications with maintenance staff vehicles, security patrols and other first responders must be available 24/7. Given that CCTV video surveillance, Wi-Fi access for staff, voice over IP (VoIP), push-to-talk over IP (PTToIP), and other critical data applications all have to be supported simultaneously, the network must deliver high performance with minimum downtime.

The cellular option immediately presents three insurmountable problems:

- Outage time resulting from unpredictable traffic loads and the number of users can compromise the availability of even the best cellular network
- Mobile operators can have limited or inconsistent coverage and capacity in rural areas, through which inter-urban routes pass
- For critical applications such as operational CCTV or PTToIP, there is a strong need for traffic encryption and integrity, neither of which is possible using consumer devices over any cellular network

Moreover, the highway surface and other issues can often complicate the installation of communications network infrastructure in areas that are not covered properly by cellular operators.

**Highest Throughput with Per-Vehicle QoS Guarantees**

RAD’s Airmux Mobility solution for highway staff communications, part of its Service Assured Networking (SAN) solutions portfolio for transportation systems, is an ideal alternative for such demanding scenarios. It delivers the highest throughput and guaranteed bandwidth to each vehicle. It also offers bi-directional and asymmetrical bandwidth with per-vehicle quality of service (QoS) guarantees. This allows critical services, such as video streaming, to be transported to and from the vehicle and control/operations centers, PTToIP and Internet connectivity even when traveling at speeds of up to 250 kph (155 mph).
Reduces Costs and Risks
Airmux Mobility delivers the best-in-class radio performance and interference immunity available to base stations, be they above ground or underground. This reduces the risks and additional costs that would otherwise have to be incurred by relying on different technologies, such as Wi-Fi. The use of sub-6GHz bands reduces OpEx by eliminating licensing fees while providing the same dedicated bandwidth allocation. In addition, SLAs are delivered to each vehicle with the same or even better quality and interference immunity that could be attained with alternative radio equipment. The solution assures a fast handover time of 50ms, which allows continuous critical application transmission (for CCTV, for example) along the highway. The handover process functions independently of any central unit (controller) and all decisions are decentralized at the radio level, so there is no single point of failure.

RAD’s Airmux Mobility solution is comprised of its Airmux-5000 point-to-multipoint Ethernet radio and a fiber optic backbone based on its Megaplex-4 next generation multiservice networking platform and ETX IP and Carrier Ethernet demarcation line, together with PacketLight devices. Configuration, provisioning, monitoring, and network and end-to-end service management are provided by the RADview network management and orchestration system.

High-speed mobile access for moving vehicles
## Features

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>Control of bi-directional and assymetrical bandwidth</td>
<td>Enables QoS guarantees data communication for critical applications on moving vehicles</td>
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<td>Long-range antenna coverage between base stations</td>
<td>Virtually no need for massive access equipment installation along the highway</td>
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<tr>
<td>Compatible with high vehicle speeds and provides greater bandwith</td>
<td>Delivers critical services such as PTT, video streaming on moving vehicles at up to 250 kph (155 mph)</td>
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<tr>
<td>Fast handover time of 50ms</td>
<td>Compliant with critical requirement for CCTV Video surveillance applications</td>
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<tr>
<td>Handover is independent of a central unit (not controller-based handover)</td>
<td>No single point of failure</td>
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**Airmux-5000**
Point-to-Multipoint Ethernet Radio

**ETX-2**
IP and Carrier Ethernet Demarcation

**Megaplex-4**
Next-Generation Multiservice Networking Platform

**PacketLight**
Complete Solutions for WDM/OTN and Dark Fiber Applications

**RADview**
Network Management and Orchestration System