LiTO: Local intelligent Traffic Orchestrator

By roadsAI

Booklet

Part of: H2020 5G-IANA Open Call Winners' Booklet Series

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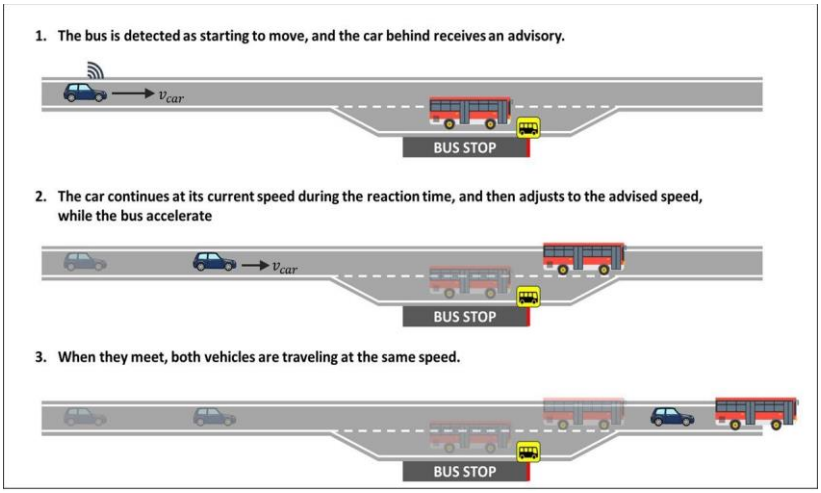
INTRODUCTION

✓ *Overview of Local intelligent Traffic Orchestrator (LiTO)*

LiTO's Real-Time Advisory System. The objective of this use case was to assess the LiTO system's ability to provide real-time driving advisories in a connected vehicle environment. The system enabled drivers to adjust speed based on a bus's distance and speed when leaving a station, demonstrating its potential to enhance road safety and efficiency through real-time decision-making and low-latency communication.



A connected car uses real-time speed advisories via 5G telemetry to synchronize with a bus's acceleration, ensuring smooth traffic flow and coordinated driving.

Telekom Slovenia Testbed. The Telekom Slovenia testbed offered flexibility in scheduling, minimal restrictions on camera use and timing, and reliable 5G connectivity that met the testing requirements. Valuable support was provided by the Telekom Slovenia team, contributing to a smooth and successful demonstration.

✓ Objectives

5G-IANA Deployment and Technical Objectives: The primary goal of 5G-IANA was to deploy the LiTO system on a fully local 5G network without relying on the internet. This setup enabled real-time advisory evaluation in a low-latency environment, ensuring the system's effectiveness for future road safety and traffic management applications.

Technical Objectives and Performance Assessment: The demonstration focused on key performance metrics, including end-to-end latency, bit rate, and network stability under real-world conditions. The system successfully detected and recognized two connected vehicles in a test scenario, generating and transmitting real-time driving advisories. These results highlight the system's potential for integration with connected vehicle environments and automated driving applications.

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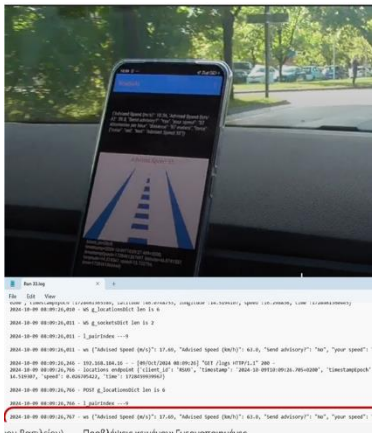
Testing Setup & Results

✓ Testing & Qualitative Evaluation

Setup & Demonstration



5G-Enabled LiTO Use Case: Enhancing Traffic Flow and Road Safety. This use case demonstrates how 5G-enabled LiTO (Live Traffic Optimization) technology improves urban traffic flow and road safety by enabling real-time communication between vehicles and infrastructure. When a bus departs from a stop, real-time telemetry is used to calculate speed advisories for vehicles following behind. These advisories help cars smoothly adjust their speed to match the bus's acceleration, minimizing sudden braking or delays. Leveraging 5G's ultra-low latency and high reliability, the system significantly enhances driving efficiency, passenger comfort, and safety in urban scenarios.The figure on the right captures a snapshot of the real-time advisory system in action during the demonstration at the testbed. The upper section displays the Android app running in the vehicle, visually presenting the advised speed. The lower section highlights the corresponding log entry received at the VM, showing that the advisory message was processed on the 5G-IANA platform and sent at the recorded time. The log confirms the execution of real-time telemetry and advisory calculations.

Demonstration Overview. The setup involved Android-based devices configured as Onboard Units (OBU) and Roadside Units (RSU), using a native app for real-time telemetry data transmission and advisory reception. Advisories were displayed visually and audibly on driver interfaces, ensuring clear and actionable guidance. A Virtual Machine (VM) hosted within the 5G-IANA infrastructure served as the Multi-access Edge Computing (MEC) platform, running a Python-based web server. The MEC processed telemetry data from both OBUs and RSUs, running the LiTO algorithm and distributing real-time speed advisories.

The figure on the right illustrates the car and bus locations with real-time advisories from one of the test runs. Blue markers represent the car's position and speed at different time points, while the red marker indicates where an advisory was issued, recommending a speed reduction to 35 km/h. This advisory was calculated based on the distance and speed of the bus (green marker) to enable smooth deceleration without sudden braking. All devices communicated seamlessly through Telekom Slovenia's 5G network, utilizing dedicated 5G SIM cards for reliable connectivity.

Technologies and Methods:

- **Linux VM:** MEC platform for processing LiTO data.
- **Python Web Server:** Managed real-time data exchange.
- **Native Android App:** Enabled OBU and RSU functionality.
- **5G Connectivity:** Provided by Telekom Slovenia for rapid, reliable communication.

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Qualitative Analysis

5G-IANA Field Test: Evaluating LiTO's Performance. The 5G-IANA field test at Telekom Slovenia assessed LiTO's ability to provide real-time driving advisories based on a bus's proximity and speed. Key findings include:

- **Latency and Responsiveness**
  The network achieved an average latency of 59 milliseconds with minimal variability, ensuring rapid advisory transmission. With calculation times of just a few milliseconds, the system demonstrated potential for integration with automated driving solutions requiring ultra-fast communication.
- **Network Coverage and Reliability**
  Telekom Slovenia's 5G network provided stable, uninterrupted coverage, maintaining seamless data flow between the connected car and server. This reliability ensured smooth system operation without data transmission interruptions.
- **Advisory Timing and Effectiveness**
  Advisories were delivered at optimal moments, enabling drivers to adjust speed smoothly when approaching a bus. For example, at 09:09:27, an advisory prompted the driver to slow to 35 km/h, demonstrating the system's ability to facilitate safer, more controlled deceleration.

✓ Results

The **5G-IANA program** provided valuable insights that strengthened business planning efforts. Through strategic tools like **SWOT analysis** and **Business Model Canvas (BMC)**, a solid foundation was established for future market positioning and exploitation strategies. **The** organization of **Open Call 2** was well-structured, with clear guidelines and timelines. **Coaching sessions** effectively supported project initiation, outlining key milestones and deliverables. While email communication was efficient, responsiveness on Slack could be improved.

Technical Challenges & Solutions

The **Open Application Experimentation Platform** had potential but faced testbed limitations and technical issues, leading to the use of a **Linux VM** as an alternative. Additionally, deploying a server as a container within the platform's environment proved challenging, prompting a workaround to ensure the demonstration stayed on schedule.

Key Conclusions & Future Plans

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Building on this success, future efforts will focus on expanding the use case into broader intelligent transportation systems, leveraging the 5G-IANA platform's advanced capabilities to drive innovation in connected vehicle ecosystems.

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Online & Multimedia Material

Video content, including a recorded live demonstration and explanation, is available on the 5G-IANA YouTube channel. Scan the QR code on the right to watch:

SCAN ME

Discover more about Link Robotics' and other success stories available on the 5G-IANA website by scanning the QR code on the right:

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