The Internet of Autonomous Vehicles

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WHY MASSIVE DATA BETWEEN VEHICLES AND THE CLOUD?

**VEHICLE TELEMETRY, SAFETY AND FLEET ANALYTICS**
Manage product life cycle, improve safety, lower maintenance costs, maximize fleet ROI

**HIGH-BANDWIDTH INTERNET TRAFFIC**
Mobile Wi-Fi for passenger, content for onboard screens

**URBAN DATA FOR SMARTER CITIES**
Urban sensing using vehicles, IoT sensors, data APIs

**VIDEO CAMERAS**
Increase security and safety, reduce risks, build maps

**AUTONOMOUS VEHICLES**
Accelerate product and time-to-market Maps, software updates, Internet traffic

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SAFETY DATA
INFOTAINMENT
HIGH RES MAPS
SOFTWARE UPDATES
ROAD DATA
VEHICLE TELEMETRY
PASSENGER DATA
SECURITY VIDEOS
CAMERAS
40 MB/S
RADAR
100 KB/S
GPS
50 KB/S
LIDAR
70 MB/S
La Rambla, Barcelona (2017)

- 400 people per hour
- 330MB per hour
- 50 cars
- 0MB per hour

La Rambla, Barcelona (2025)

- 400 people per hour
- 1.6GB per hour
- 20 AVs
- 160GB per hour
How can we move terabytes of data between vehicles and the cloud?
### THE OLD WAY OF THINKING ABOUT NETWORKS

Using networks as silos increases data costs and will leave you outside the upcoming urban mobility revolution.

<table>
<thead>
<tr>
<th>Network</th>
<th>Purpose</th>
<th>Limitation</th>
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<tbody>
<tr>
<td>DSRC (V2X)</td>
<td>Safety applications</td>
<td>75Mhz of free spectrum and 27 Mbps of available bandwidth</td>
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<tr>
<td>Wi-Fi</td>
<td>Vehicle subsystems communications</td>
<td>Unsuitable for data offload on the move (5s connection setup time)</td>
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<td>Unsuitable for V2V communication (50 m range)</td>
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<td>4G LTE</td>
<td>Infotainment</td>
<td>Prohibitive cost at scale (100$/month on pax Wi-Fi for shared mobility cars)</td>
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<td>Security OS Updates</td>
<td>Unsuitable for mission critical teleoperations (connection latency &gt; 100ms)</td>
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VENIAM PLATFORM
MULTI-NETWORK, MULTI-PURPOSE, UPGRADEABLE

10 YEARS OF R&D | AWARD-WINNING TECHNOLOGY | 80+ PATENTS
DEVELOPED IN PARTNERSHIP WITH MIT AND CARNEGIE MELLON
Moving >1TB/vehicle/day

Get the most bandwidth out of all the wireless interfaces in your vehicle
10x Longer Range than Classical Wi-Fi
100x Faster Connection Setup
12x Cheaper than Cellular

STANDARD WI-FI 50m

V2X
V2I
V2V
KEY HARDWARE, SOFTWARE, AND CLOUD COMPONENTS FOR CONNECTED VEHICLES

Our technology & IP solve the essential networking challenges in connecting moving things

- **Hardware**
  - Onboard Units
  - Access Points

- **Networking Software**
  - Connection Control Algorithms
  - Mobility Control Protocols
  - Delay-Tolerant Protocols
  - Mesh Networking & Multihop
  - Cyber-Physical Security

- **Cloud**
  - Network Control/Software Updates
  - Data Analytics
  - APIs

- **10 YEARS OF WORLD-CLASS R&D BY VENIAM TECH FOUNDERS AND THEIR TEAMS**
Veniam is 5G

- Manageability
- Mobility
- Diversity
- Low Latency
- Location & Context
- Network slicing
V2V MESH IS THE MOST COST-EFFECTIVE SOLUTION FOR OTA UPDATES

V2V MESH SOFTWARE UPDATES ARE 90% CHEAPER!

Monthly SW update size and cost for NYC for a top OEM

V2V Mesh only requires software updates via 4G in <5% of active fleet, leading to:

- Full rollout in 1-2 days for shared mobility vehicles
- Full rollout in 7 days for private consumer vehicles

*Model based on mobility patterns observed in Porto, Portugal
VENIAM®

The platform that moves terabytes of data between vehicles and the cloud.