VENIAM

WHITE PAPER

Smart Cities meet Connected Vehicles

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Veniam's disruptive approach to the US DOT Smart City Challenge

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Goal of this white paper

This white paper provides an overview of the many innovations Veniam is bringing to the market in the connected transportation and smart city space. We strongly believe that the disruptive concepts and out-of-the-box ideas in this paper can give your city the competitive edge it needs to win the US DOT Smart City challenge.

What does Veniam do?

Veniam turns vehicles into Wi-Fi hotspots and builds city-scale vehicular networks that expand wireless coverage and collect terabytes of urban data. In controlled spaces, such as ports and container terminals, Veniam's game-changing solutions ensure that all mobile workers and assets are securely connected, no matter where they are or at what speed they are moving. Our hardware, software and cloud components are running in the world's largest network of connected vehicles, including taxis, waste collection trucks and the entire public bus fleet in Porto, Portugal, offering free Wi-Fi to more than 300.000 active users. Veniam is backed by leading venture capital firms and strategic investors.
Veniam currently has offices in Mountain View, California; Porto, Portugal; and Singapore.

Who is the Veniam Team?

Veniam's tightly knit team combines technology pioneers with seasoned operatives and business executives, all of whom are committed to making a positive difference in people's lives, their communities, and their professions. We build products to connect our world and deploy innovative networks to enable a wide range of new and disruptive services.

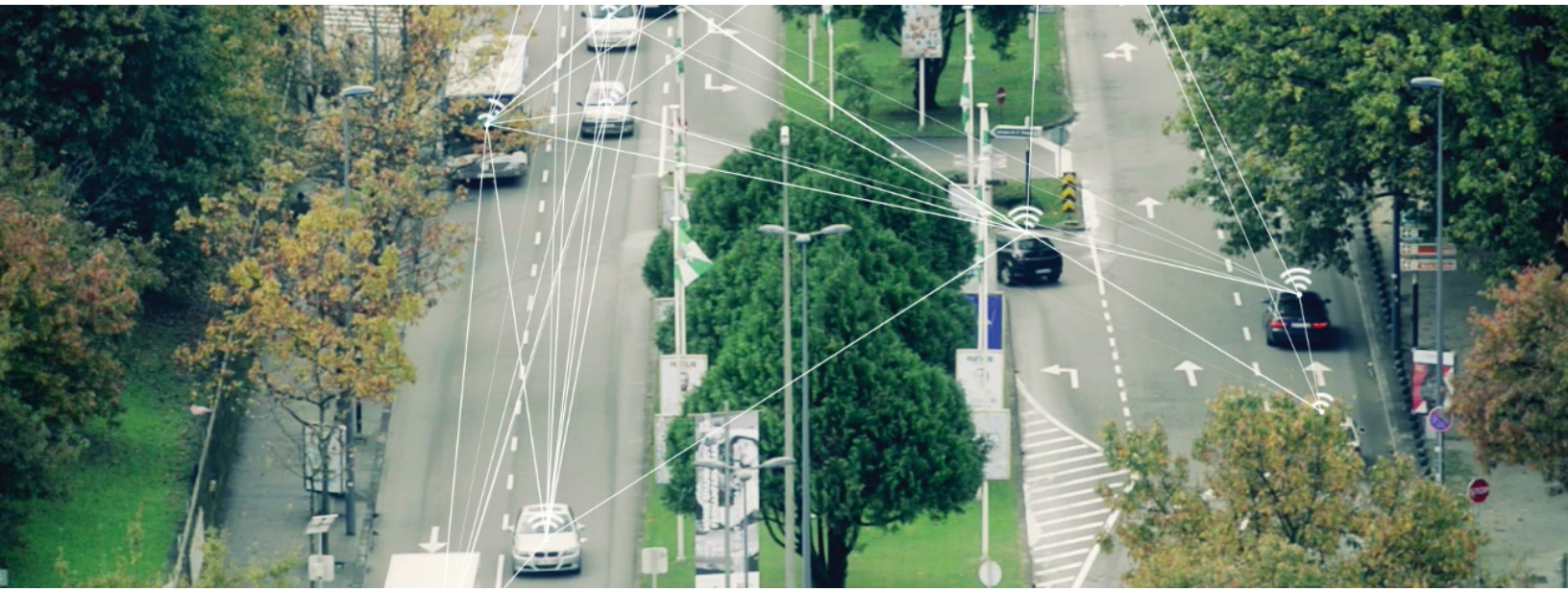
What is Veniam's Value Proposition?

Veniam expands Internet access on a massive scale to create a moving mesh network for smart cities – turning vehicles into mobile hotspots, enabling them to connect to each other and the Internet. Veniam helps offload mobile data from overwhelmed cellular networks to the existing Wi-Fi and fiber infrastructure through the innovative and cost-effective use of V2X (DSRC) communications. Veniam's cloud-based managed services also enable connected vehicles to be ready for the deployment of safety-related V2V applications and autonomous driving.

vWhat is new about Veniam's approach to Smart Cities?

Veniam's managed services turn moving vehicles into active nodes Internet, thereby offering new ways to leverage commercial fleets and city infrastructure for better services and quality of life.

- Veniam helps public and private fleets collect massive amounts of high definition data from their vehicles in a cost-effective manner.
- Veniam helps smart cities collect urban data in a cost-effective manner. Veniam turns vehicles into mobile sensors that capture data from various city sensors and transport that data to the cloud.
- Veniam helps provide high quality Wi-Fi to fleet passengers. Mobile data usage is only going to skyrocket – and cellular networks are going to be overburdened by this data usage. Veniam helps offload mobile data usage from congested areas through the innovative and cost-effective use of the DSRC and delay-tolerant networking.



Veniam's ability to provide cost-effective internet access to thousands of consumers on the move as a cloud-based managed service offers unique competitive advantages to cities that who want to become more attractive to millennials and knowledge workers:

- Daily engagement with consumers of specific demographics;
- Reliable and fast Wi-Fi experience;
- Cloud managed advertisement;
- Targeted campaigns at specific times and locations (bus line, specific area, time of the day);
- Advanced analytics with demographics and user behavior;

Ultimately, Veniam's solutions help reduce the social divide by enabling low-income citizens to access the Internet during their daily commutes.

What is Veniam's Value Proposition?

Veniam offers a unique opportunity to enhance your application to the US DOT Smart City Challenge applicants. Our cutting-edge technology for building mesh networks of connected vehicles has been commercially tested and has been operating in a mid-sized city for 18 months. It is used daily by tens of thousands of citizens. Veniam's managed services enable your city to leverage an industry grade solution that fulfils the following promises:

- Provide high-quality Internet connectivity to more citizens located both inside and outside buses, taxis, service vans and other vehicles;
- Use the vehicles as mobile sensors to collect massive urban datasets with high resolution, useful for a number of smart city applications, from environmental monitoring and traffic control to smart waste management and public safety.
- Build smart city services seamlessly on top of Veniam's platform to monitor, understand and manage the urban flows of people, vehicles and goods and citizen patterns, while empowering city services with new sources of revenue, information and connectivity;

For examples of Veniam's real-world smart city applications please read the case study of Porto, Portugal made available in the annex.

How does Veniam's Technology work?

Veniam's networking technology is uniquely positioned to become the platform of choice for connected vehicles, enabling them to participate in DSRC-based safety applications, run software updates over the air and deliver secure communications between each vehicle and any wireless device in its vicinity. Veniam's solutions are key enablers for future of on-demand transportation services, including those with autonomous vehicles.

Veniam's solutions make use of the DSRC frequency band on the 5.9GHz band, reserved for Intelligent Transportation Systems. Veniam's innovative technology leverages the 15 patents that use advanced multi-hop, vehicle-to-vehicle, and vehicle-to-infrastructure (together known as V2X) communication technology – extending network range to 10 times that of traditional Wi-Fi, with 100x faster connection setup at a cost 12 times lower than cellular. Veniam's Internet of moving things is enabling next generation 5G heterogeneous networks.

Veniam has applied proprietary IP from more than a decade of world-class research and development compliant with wireless standards – developed in collaboration with top universities, such as Carnegie Mellon, MIT, University of Aveiro, and University of Porto. The company has developed and delivered a unique full-stack platform that includes all the hardware, software, network and cloud components required to build networks of vehicles and other moving things, supporting unprecedented smart city services.

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HARDWARE

DSRC-enabled

DSRC = 802.11p

Wi-Fi (802.11a/b/g/n/ac)

Bluetooth 4.0

Enhanced GPS location

Inertial Sensors

OBD-II Integration

SOFTWARE AND NETWORK

Advanced mesh networking protocols

Software updates over the air

Smart connection management

Delay-tolerant networking

User session mobility handover

Multi-network setup configuration

VPN session management

CLOUD

Real-time network and fleet monitoring

Live fleet and urban events and alarms

Historical fleet behavior and tracking

Advanced analytics and visualizations

RESTful APIs

Big data storage and processing

Geospatial analysis

MOBILE WI-FI SERVICE

Real-time monitoring of connected users

Splash page content management

Audience and service usage analytics

Mobility patterns and consumer behavior analysis

Cloud managed digital advertising campaigns

Is Veniam's technology compliant with existing US regulations?

The vehicular networking technology that Veniam deploys is fully compliant with the DSRC / IEEE 802.11p standard, as well as with US FCC and USDOT regulations for the 5.9 GHz band, which has been reserved for intelligent transportation systems. Veniam's hardware for both onboard units and roadside units has been certified and tested to operate under the aforementioned spectrum range.

Veniam's technology platform and connected vehicle expertise will help significantly to accelerate and expand the results and impact of the US DOT's target deployment of connected vehicles and smart city applications.

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What are the economics behind Veniam's smart city solutions?

Veniam provides a turnkey and seamless vehicular mesh networking solution for moving things. Customers pay the initial CapEx and a monthly fee for a platform of devices and and cloud services - including network management, software updates, and access to data streams and analytics. Recurring fees for managed cloud-based services such as vehicle data, camera feeds, and Wi-Fi hotspots with advertising are assessed on a case-by-case basis.

The economic impact of Veniam and its connected vehicle technology is enormous. There are one billion vehicles around the globe and 15 million cars sold annually. Veniam's proprietary vehicular network technology connects infrastructure, people, and things to the Internet and to each other – solving soaring fuel prices, urban gridlock, polluted cities, and changing climate – a transformational approach to personal transportation.

Much has been said about the Internet of Things in the past decade, but we have seen little movement in the space. Leveraging the one billion vehicles around the globe, Veniam's proprietary vehicular network technology connects infrastructure, people, and things to the Internet and to each other. The ability for citizens, their devices, and anything with a sensor to efficiently and cost effectively connect is unprecedented and will bring to the cloud massive sets of new physical data that shed light into the inner-workings of urban settings. This new data will usher in smarter cities, and connect more people to the environments through which they move – improving the quality of life and creating multiple socio-economic benefits that to date have only been conceptualised in theory.

Where can I learn more?

Veniam has proven that connected vehicles and its fully managed solution enable cities to become smarter and to address the future of transportation with connectivity, data and enhanced services. Please find bellow some references:

Veniam's Connected Transportation Case Study ›

Veniam's award-winning demo presentation
CableLabs Innovation Showcase ("best new product most likely to succeed") ›

Business Insider ›

FastCompany ›

MIT Technology Review ›

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