iVANET (iStack Based VANET)

VANET, Inc. (the "Company") is engaged in developing and marketing leading-edge yet highly cost effective mobile data enhancement solutions and products for VANET with unparalleled IT and communications capabilities, designed to improve wireless network performance, reduce computational cost, and expand network capabilities.

Based on myriad of research results and its internal investigation, VANET Inc. is developing innovative solutions that will pave unique way in improving wireless network performance. The Company plans to introduce its new iVANET solutions in July 2023. Its target market represents large revenue potential embracing virtually every wireless device, wireless gateway and Internet-end-host in the world.

iVANET Solution

For car manufacturers, a major engineering challenge in advancing VANET system is the scalability of the 802.11p standard. iVANET's solution offers an efficient way to compliment 802.11p with 802.11ax, using a bonded spectrum. It provides robust, an optimized environment for both bandwidth and overall performance enabling up to 200% functional improvement.

IP Over ATM Routing Algorithm

VANET's IP over ATM routing algorithm features a low latency and an ultrafast relay algorithm to route packets between vehicles without compromising delays due to transmission. Its reliable feature builds the foundation for endless sum of applications pertaining to car safety and high bandwidth Internet access, leveraging cost-free and license-free spectrum.

frTCP Technology

VANET offers a suite of products that enhances the efficiencies of network communication. Modifying the Transport Layer of the TCP stack, VANET's frTCP technology provides the optimal use of bandwidth and cost savings to businesses. Why not save millions on capital reinvestment to your business's network backbone?

VANET Technology

In recent years, Vehicular Ad Hoc Networks (VANET) technology attracted the enormous commercial interest from car manufacturers for its value-added proposition in providing intelligent and secure cars. Further incentive to this value-added proposition is the regulatory pressure that grows amongst local government agencies across the globe. Although this technology is still in its infancy, it is highly anticipated that manufacturers will be pressured to make critical decisions on the technology when deployed en masse. In commercial environment where deployable VANET technology is eventually available to the automobile industry, establishing comparative advantage is then becoming a critical issue for car manufacturers—let alone rectify the technological standards that support sustainable and scalable infrastructure.

iVANET Technology

Powerful, Scalable and Lightening Fast Network Anywhere—and it's License-Free!

VANET Inc. figured out a unique way to apply our strengths so that the network environment, commercial providers and users are all winners. We provide iStack based VANET(iVANET) technology which can operate data traffic management efficiently and fairly in a distributed P2P environment, with its patented algorithms alongside a bonding technology. Using efficient, bandwidth bonding technology. iVANET inexpensively and securely provides high-bandwidth, delay-minimized and secure communication for TBox users at a minimal cost. Our new solution dramatically improves bandwidth performance by using a license-free spectrum that is many folds greater than what WAVE 802.11P could possibly provide.

Major technical challenges and opportunities

Cars provide a plethora of information through GPS, cameras, built-in sensors, road congestion and information that is pertinent to its current location. High-speed vehicles at motion pose multiple opportunities and challenges for solution providers to tailor the right solution for car manufacturers. Some of the major technical challenges and opportunities surrounding a vehicular-to-vehicular (V2V) environment include:

- **Rigidity of the IP protocol**
- **Distributing valid content to a subscriber that is location and temporal specific**
- **Cost and regulatory concerns on spectrum usage**

Rigidity of the IP Protocol

Mesh for All Situations

VANET Inc.'s iStack provides network operators to create a virtualized network—on top of a heterogeneous IP network—using an overlay abstraction by providing key atomic elements (the c-nodes: ingress, egress, forwarding, splitting, multicast and a combination thereof). This virtualized overlay will remove rigidity of the IP protocol by allowing a host to move from one address to another, without impacting the transfer of information, as the vehicle may be moving from one network to another. Then this will let vehicles in the cloud to focus on relevant content that has disseminated, as opposed to the host address providing the data.

Integral Framework for Cloud-Based Environment

iStack solution provides the necessary framework in a true cloud-based environment for vehicular-to-vehicular (V2V) and vehicular-to-infrastructure (V2I). In traditional cloud model, services such as storage, applications, computing power and the alike are centralized in single or multiple data centers for the requester. In Vehicular Cloud environment, however, there are significant and dynamic differences between what is observed from traditional model.

iSTACK

iSTACK is VANET Inc.'s original and powerful solution to address the rigidness of the IP protocol. iSTACK provides solution to fundamental mobility issues due to the nature of the IP framework. By providing fast handoffs between networks and bonding multiple connections, it enables the user to leverage all available bandwidth in a single session.

Location and Temporal Content Distribution

Contrary to content requests seen in stationary nodes, vehicular data requests cannot rely upon a specific publisher since vehicles continually come in and out of the network. Therefore, cars must rely on stored data in a V2V cloud environment that would possibly be cached in the local storage of other vehicles in the fleet outside the initial publisher(s). Leveraging other vehicular resources, such as sensory data and processing power would be accessible on vehicles to use, providing a cloud that is independent from the Internet.

Applications outside the safety will include the advertisement of location-based services within the driver's vicinity. We find location-based mobile advertising (LBMA) in a pull-mode today as we can see in Google's form of advertisements. Push-mode is not used for the very reason that scale of the server infrastructure required would be staggering. The concept of pushing data to non-stationary nodes would have to be continually polled by the server's infrastructure to compute its exact location. That is why pull-mode is the ideal paradigm to use in advertising model when P2P technology is not being used. To ensure the safety, advertisements that are pertinent to the driver's location can be displayed with minimal user interaction by leveraging the polling aspect from the vehicles and/or roadside units.

Push Communications

Divergent from WAVE 802.11p, VANET Inc.'s platform provides a full P2P solution and P2P servers will reside in the base station located on the car. Push-mode advertisements would not be possible without this. Without waiting for a poll, push technology minimize networking cost while providing the comprehensive information that is needed to optimize operations.

Cost and Regulation Concerns

IEEE 802.11p is an approved amendment to the IEEE 802.11 standards to add wireless access in vehicular environments (WAVE), a vehicular communication system. Its main purpose is to support Intelligent Transportation Systems (ITS) applications. The spectrum band is licensed (ITS-RS band: 5.85-5.925 GHz).

Main issues with 802.11p are follows:

- **The spectrum is licensed: a license fee is required**
- **There is really only one channel at 5.86-5.92 GHz with data rate in the range of 3-27 Mbps.**

VANET's High-Performance and Cost Saving Solution

iVANET uses 802.11ax/ay unlicensed bands, each with a raw data rate of 54 Mbps. As a result, the total data rate is about ten times bigger. Additionally there is no license fee to pay. The 802.11a channels are rarely used by common Wi-Fi devices so we can use these bands for free!

Optimized Operation

The WAVE/802.11p is a pure ad hoc network. It means that all communications happen in same channel. With this arrangement, RF interference will be severe; it requires explicit MAC-layer protocols and overheads to resolve such interference issues. But in VANET's VANET, we do not have to anticipate these RF interference issues since we use multiple orthogonal channels. Our issue then is to allocate the channels efficiently and fairly.

Integral Application

Therefore WAVE/802.11p is only suitable for ITS/telematics applications. It is NOT suitable for VMI (vehicle mobile Internet) and high-bandwidth applications. VANET Inc. VANET is designed from ground up for VMI and high-bandwidth applications between vehicles and to the Internet.

Communication Management

Relying on 802.11p alone will not be sustainable as more and more vehicles begin to adopt VANET technology. Additionally as the demand to retrieve non-sensory information increases—such as requests to the Internet—it will compromise available bandwidth for sensory based requests that are important in support of driver's safety.

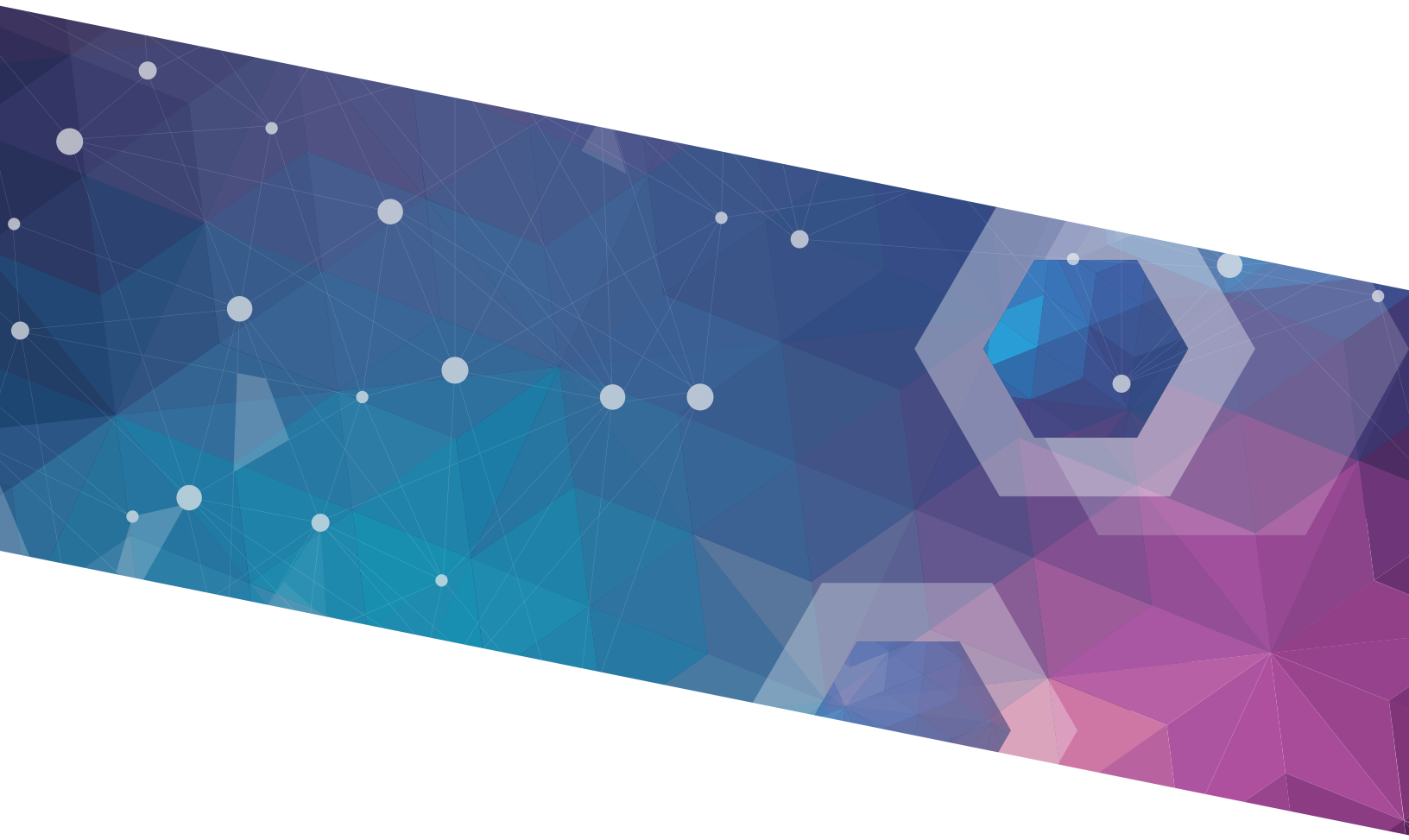
VANET Inc.'s iStack can easily be used to compliment the bands used for 802.11p when interference is experienced (load balance/failover) or if non-sensory based requests by leveraging the available bandwidth and channels provided by 802.11ac.

Compatibility

Since 802.11p is a modification of 802.11ax, it provides many commonalities between comparable protocols. So an integration of these protocols can reside seamlessly at the physical layer, providing efficiencies in power and capita utilization on the board. These two protocols can simply reside on a telemetic box using an embedded Linux based system.

KEY FEATURES – Basic Mobility and QoS (IP-TDMA Protocol)

Technical Specifications: Wireless LAN Interface	
Standard Compliance	IEEE802.11ax/IEEE802.11ay
Communication Protocol	Direct Sequence Spread Spectrum (DSSS),OFDM
Access Mode	Infrastructure mode, Ad-hoc
Security	WPA-PSK(AES, TKIP), 128/64-bit WEP
Technical Specifications - Wired LAN Interface	
Transmission Rate	
Transmission Encoding Method	100 BASE-TX 4B5B/MLT-3
	10 Base-T Manchester Coding
Access Method	CSMA/CD
LAN Port	LAN Port
Number of LAN Ports	4
LAN Port Connector	RJ-45
Mesh Functionalities	Auto-Configuration
	Self-Healing
	Routing in the mesh backbone
	Flow control in the mesh backbone
IP Protocols	IPv4 and IPv6



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VANET Inc. is one-of-a-kind wireless infrastructure and Application Company. Insisting on supreme technologies, VANET Inc. sets out to create the best Internet Solution Technologies to enable transparent and non-disruptive convergence for the next-generation-Internet.

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