ITS Charter Proposoal

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Charter

Goal

The goal of this group is to standardize IP-based protocols for establishing direct and secure connectivity between moving networks, some of which could be fixed permanently or temporarily.

Moving Network to Nearby Moving Network Communications

The group is concerned with all situations involving moving network to nearby moving network communications. For example: vehicle-to-vehicle communications, nomadic user wearing a PAN and communicating to a homenet, vehicle-to-infrastructure communications, wagon-to-wagon in a train, or train-to-intersection signaling.

Example from the automobile communications space

Automobiles and vehicles of all types are increasingly connected to the Internet. Entertainment apps enhancing comfort, reliable data exchanges for road safety, and automated driving are features coming in automobiles to hit the roads from now to year 2020. Highlighting increased safety as an immediate result of hyper-connectivity applied to vehicles, public authorities worldwide are increasingly mandating secure communication technology requirements in vehicles.

Emergency apps for new instrumented ambulances carry many benefits both to the users and to society in general.

Why IP?

Today, there are several deployed Vehicle-to-Internet technologies, including car tethering through driver's cellular smartphone. However, Vehicle-to-Vehicle and Vehicle-to-Infrastructure communications are still being developed. To improve on a situation of link-specific data exchanges, and enable independent application sets to share the same links, IP data exchanges are needed. Enabling IP communication between vehicles (V2V), and between vehicles and the immediate infrastructure (V2I), will provide (0) ability to reach the rest of the world on the Internet (1) short and deterministic delays, (2) fast forwarding through scalable paths of routers, (3) ease of reuse of existing Internet applications in a vehicular environment.

Moving network to nearby moving network communications involve link layers such as: 802.11p OCB (Outside the Context of a Basic Service Set), 802.15.4 with 6lowpan, 802.11ac, VLC (Visible Light Communications), IrDA, LTE-D. Only the IP protocols are capable of running on each of these links and establish IP paths across them in an interoperable manner.

Scenarios?

There are a few scenarios exhibiting the need to communicate from one moving network to another nearby moving network.

In the automobile space, the Cooperative Adaptive Cruise Control and Platooning features consider that vehicles close to each other exchange data describing their kinematic status. At the cross-roads, the moving network inside a vehicle exchanges data with the moving network in the red-light pole.

Several public safety scenarios involve moving networks. Distinct organizations deploy different moving networks (in-vehicle, on-person) at an incident scene. These networks need to interoperate in order to more effectively understand and deal with the incident scene.

In connected rail scenarios the moving network deployed in trains communicate with other moving networks at the cross-points.

What kind of solutions?

The current technical solutions considered to achieve moving network to nearby moving network communications are of two kinds: IP routing protocols for n-hop path management and 1-hop link-scoped IP protocol enhancements. The 1-hop link-scoped protocols include the protocols for route establishment involving ICMP Router Advertisements. The n-hop path management protocols include n-hop path establishment protocols (e.g. Babel, OSPF) and n-hop path search protocols (most notably AODV and derivates).

In this proposed Working Group the focus is on 1-hop protocols, and leverage from other Working Groups for the n-hop situations.

In some of the moving network applications the window of opportunity for exchanging data with the immediate infrastructure may be very short. For example, a car driving near a road-side unit may have only 5s to exchange with that RSU (depending on speed, RSU range and number). (ephemeral connections).

What kind of requirements?
The requirements for mechanisms for moving network to nearby moving network communications are focusing on low delays of the data paths, reduced number of messages for path establishment, application friendly, resilience to attacks, compatibility with DHCP and Mobile IP.

In addition, some moving network to nearby moving network applications involve IP multicast mechanisms (e.g. virtual siren); thus C-ACC the 1-hop IP moving network to nearby moving netowrk mechanisms will need to gracefully support IP multicast.

Due to the inherent characteristics of safety-related communications, all new moving network to nearby moving network mechanisms must afford authenticity and confidentiality where necessary. Dynamically establishing ephemeral communication paths between automobiles in public areas must offer privacy safeguards for the end users (passengers).

Establishing 1-hop IP V2V paths must not break the existing on-board protocols and applications which communicate with the Internet, possibly via multiple radios.

In a moving network deployed in an automobile, typically one exit point connects the moving network to other moving networks. However, in a more general manner (and to support reliability) any new mechanism of moving network to nearby moving network communications should support multi-homing: one router to use multiple interfaces towards outside the moving network, or multiple routers.

Current version of Internet protocols
The group will only work on IPv6 solutions.

What SDOs may need this work?
The requirements and standards for moving network to nearby moving network communications, often involving IPv6, and novel V2V and V2Infra concepts, are developed mainly at ISO TC204 "Intelligent Transport Systems", 3GPP, ETSI, NHTSA and IEEE. For Vehicle-to-Internet communications, 3GPP LTE and other cellular technologies represent the long-range connectivity method; for Vehicle-to-Vehicle communications, LTE Direct is currently specified, as well as OCB mode of IEEE 802.11. Several use-cases exhibit a need for IPv6 data exchanges between vehicles: ETSI's Cooperative Adaptive Cruise Control and Platooning. The IEEE developed a popular link for short-range communications - IEEE 802.11p "WAVE". The NHTSA wrote a set of requirements for V2V communications.

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Work Items

- use-cases for moving network to nearby moving network communications
- Problem Statement for moving network to nearby moving network communications
- Problem Statement for moving network to infrastructure network communications, including DNS
- Security and Privacy Requirements for moving network to nearby moving network communications
- Solutions, which might include new protocols or extensions to existing protocols. With MIB.
- IPv6-over foo, where foo is pertinent for moving network to nearby moving network communications (e.g. 802.11p, VLC, LTE-D, 802.11ad)
- List of Research Papers in the V2V domain, identifying which uses IP