Update from -07 Version (1/2)

• This document (-08) is updated from
  – draft-ietf-ipwave-vehicular-networking-07

• Major Updates
  – Review of Volunteer Reviewers
    • Charlie Perkins (Done)
    • Sri Gundavelli (Done)

  – Key Work Items for IPWAVE Problem Statement
    • Neighbor Discovery (with Vehicular Link Model)
    • Mobility Management
    • Security and Privacy
Update from -07 Version (2/2)

• Major Updates
  – **Reflection** of the Comments from Charlie Perkins and Sri Gundavelli on This Version.

  – **Section 4.1: Existing Protocols**
    • The existing protocols for IP vehicular networking are summarized and analyzed through a gap analysis.

  – **Figure 1: Vehicular Network Architecture**
    • A vehicular network architecture is modified to clarify the concept of a multi-link subnet.

  – **Problem Statement**
    • The statement of Vehicular Neighbor Discovery and Vehicular Mobility Management is clarified.
Vehicular Network Architecture

Figure 1: A Vehicular Network Architecture for V2I and V2V Networking
Neighbor Discovery (ND) (1/3)

• **Link Model**
  – The legacy IPv6 ND protocol is not suitable for vehicular wireless links.
    • The existence of unidirectional links due to interference and different Tx power levels.
    • Unreachability between two nodes with the same prefix due to node mobility and highly dynamic topology.
    • Reachability between two nodes in a multi-link subnet having multiple wireless links with the same prefix.
  
  – IPv6 ND should be extended to support the concept of a Vehicular Link Model in a multi-link subnet.
    • Vehicles communicate with each other via V2V and also communicate with an RSU via V2I with a wireless interface configured with a global IPv6 address.
Neighbor Discovery (ND) (2/3)

- **New Features for Vehicular ND (VND)**
  - Lightweight Duplicate Address Detection Detection (DAD)
    - ND Optimization for 6LoWPAN [RFC 6775]
      - RS-trigger-unicast RA for ND control traffic reduction
      - Unicast-based **Multihop DAD** with a router
    - RSU and MA can perform the **Multihop DAD** for a vehicle.
  - A single address configuration in a multi-link subnet
    - A vehicle does not change its IP address while its handover in a multi-link subnet is performed between RSUs.
  - VANET-based multihop forwarding in a multi-link subnet
    - **VND** can play the role of **routing in a connected VANET**.
Neighbor Discovery (ND) (3/3)

- **Vehicular Neighbor Discovery (VND)**
  - Example: IP Address Registration through Multihop DAD [draft-jeong-ipwave-vehicular-neighbor-discovery-06].
Mobility Management (MM) (1/3)

• **Requirements**
  – Seamless Connectivity during Movement
  – Timely Data Exchange between Two End Points

• **Design Principles (1/2)**
  – **Proactive Mobility Management**
    • A vehicle’s *mobility information* can be shared with RSUs and MA.
      – Mobility information (e.g., position, speed, direction, and trajectory) by a GPS receiver and motion sensors is available.

• **Proactive handover** can be performed with the mobility information.
  – Handover operations are performed in advance along the vehicle’s trajectory (i.e., navigation path).
Mobility Management (MM) (2/3)

- **Design Principles (2/2)**
  - **Network-Based Mobility Management**
    - **Network infrastructure** (e.g., RSUs and MA) can handle a vehicle’s handover along its trajectory.
      - It performs DAD, data packet routing, and horizontal/vertical handover for the sake of vehicles.
    - **A vehicle’s address configuration** through network infrastructure can reduce configuration traffic with multihop DAD and unicasted RA.
Mobility Management (MM) (3/3)

- **Vehicular Mobility Management (VMM)**
  - Example: Network-Based Proactive VMM
    [draft-jeong-ipwave-vehicular-mobility-management-00].

Proxy MIPv6-Based Handover

DMM-Based Handover
Next Steps

• **WG Last Call**
  – This version is good enough for WGLC.

• **IESG Submission and RFC Publication**
  – We aim at submitting it to IESG this April so that it can be published as an RFC before the IETF-105 Montreal meeting.

• **Rechartering of IPWAVE WG**
  – After the RFC approval of IESG, IPWAVE WG can start the Rechartering for IPWAVE Basic Protocols:
    • Vehicular Neighbor Discovery
    • Vehicular Mobility Management
    • Vehicular Security and Privacy Management.