Problem Statement for Vehicle-to-Infrastructure Networking

draft-jeong-its-v2i-problem-statement-00

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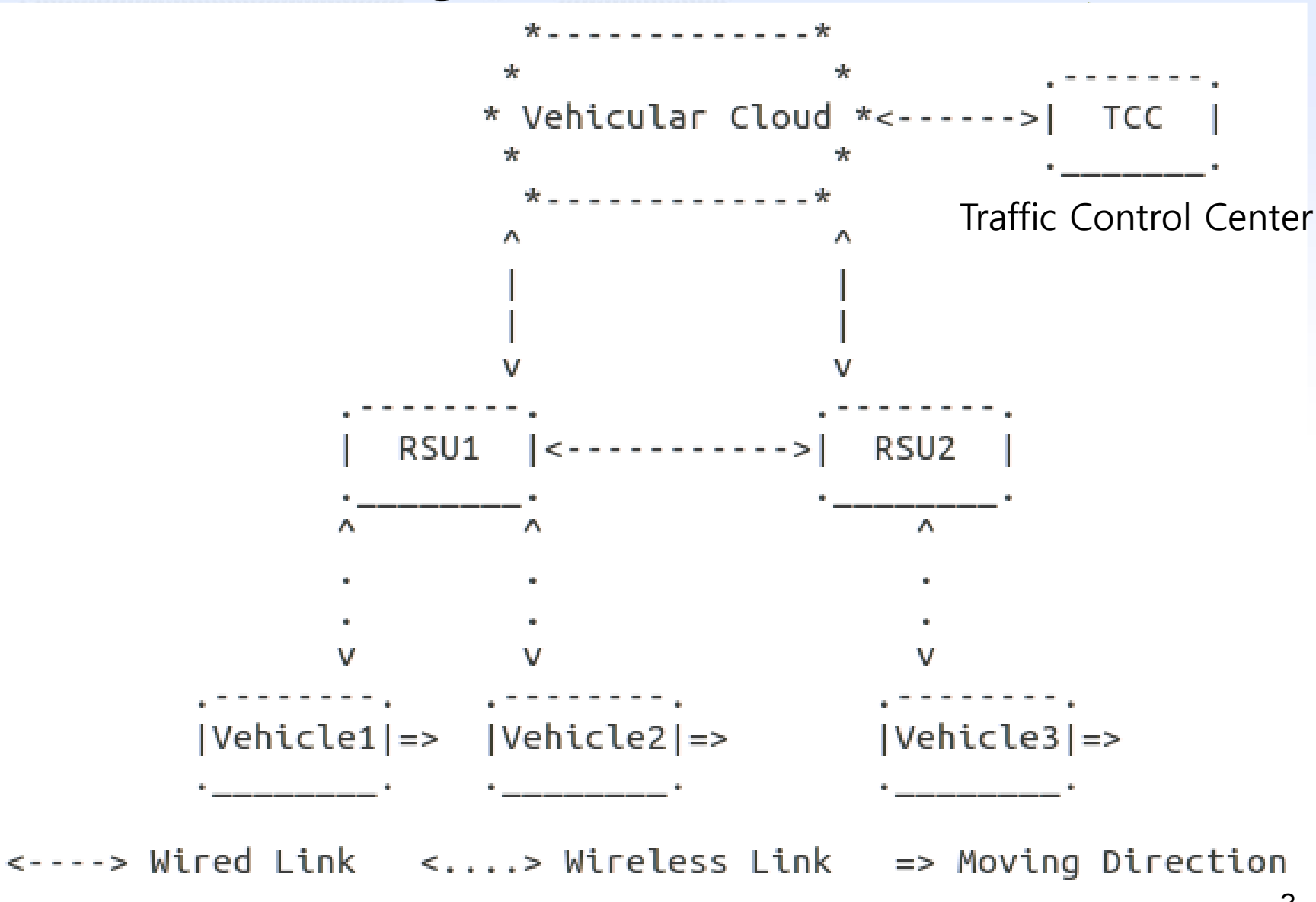
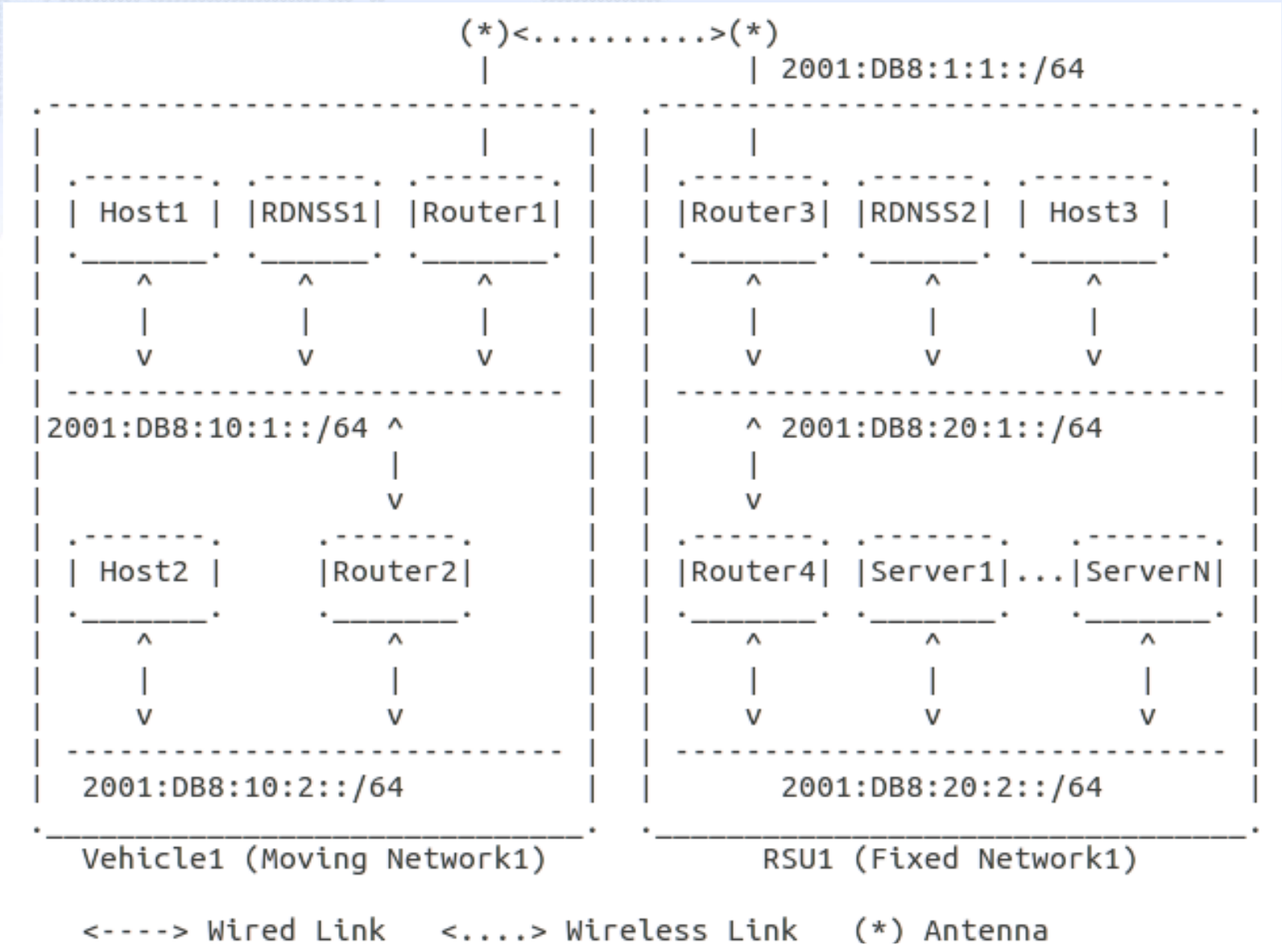
Introduction to V2I Networking

- Objective of this draft
  - To specify the problem statement for IPv6-based Vehicle-to-Infrastructure networking.
- Assumptions for V2I
  - IEEE 802.11p is considered as MAC protocol.
  - IPv6 is considered as Network-layer protocol.
  - Road-Side Unit (RSU) is connected to the Internet as an access point for vehicles.
- Focus of this draft
  - Networking issues in one-hop communications between RSU and vehicles.
  - Internetworking between a vehicle's internal network (i.e., moving network) and an RSU's internal network (i.e., fixed network).

Network Configuration for V2I Networking



Internetworking between Vehicle's Moving Network and RSU's Fixed Network



Issues for IPv6 V2I Networking (1/2)

- IPv6 Addressing
  - Two policies for IPv6 addressing
    - Local IPv6 addresses for vehicular networks
    - Global IPv6 addresses for internetworking
  - Local IPv6 addresses
    - Usage for road network services (e.g., emergency notification and navigation)
    - e.g., Site-local Address and Unique Local Address (ULA)
  - Global IPv6 addresses
    - Usage for general Internet services (e.g., email, web surfing, and entertainment)
  - Policies for global IPv6 addresses
    - Multi-link subnet for multiple RSUs
    - Single subnet per RSU

Issues for IPv6 V2I Networking (2/2)

- Neighbor Discovery
  - Adjusts for ND time-related parameters (e.g., router lifetime and NA interval), considering high-speed vehicles.
- IP Address Autoconfiguration (SLAAC and DHCPv6)
  - Supports the fast configuration, considering high-speed vehicles.
- DNS Naming Service
  - **IPv6 host DNS configuration** for Recursive DNS Server (RDNSS) and DNS Search List (DNSSL)
    - Through RA Options (RFC 6106) and DHCP Options (RFC 3646).
  - **DNS name resolution** through an appropriate RDNSS
    - Within a vehicle's moving network or an RSU's fixed network.
  - **DNS name autoconfiguration** of vehicle and in-vehicle devices
    - Through DNSNA (draft-jeong-its-iot-dns-autoconf-00), mDNS (RFC 6762), and DNS Update (RFC 2136).
- IP Mobility Support
  - Is required to the maintenance of TCP sessions through MIPv6.
  - MIPv6 parameter adjustment for high-speed vehicles

Issues for RSU-Vehicle Internetworking

- Main Issue
  - **Internetworking** between the vehicle's moving network and the RSU's fixed network
- Assumption
  - **Prefix assignment** for each subnet inside the vehicle or RSU through a prefix delegation protocol or
  - **Prefix pre-configuration** at manufacturing time (hardcoded)
- Problems
  - **Prefix Discovery**
    - The way routers in moving networks discover prefixes in the other moving networks.
  - **Prefix Exchange**
    - The way the vehicle(s) and RSU exchange their prefixes with each other.
  - **Networking**
    - **Unicast** between in-vehicle device and RSU device
    - **DNS naming service** for such devices

Next Steps for V2I Draft (1/2)

- Requirements for Prefix Exchange Protocol for V2I
- The Use of the Same Terminology for Prefix Delegation Protocol
  - With draft-petrescu-its-problem-01's Section 3.1 “Discovery Sub-Problem”
- Replacement of Site-local IPv6 Address by ULA
- Update for Complementarity for Mobile IPv6 along with NEMO and DMM
  - Direct communications (skip the HA) between a node in a vehicle’s moving network and a node in an RSU’s fixed network
  - A new method of connecting the vehicle’s moving network directly to the RSU’s fixed network

Next Steps for V2I Draft (2/2)

- Security Considerations
  - The use of TLS certificates for vehicle communications
  - Privacy considerations by a new ETSI activity (e.g., in-vehicle device's identifier generation)
- Terminology Update
  - With ISO 21217 (ITS station/communication architecture) and ISO 21210 (IPv6 networking for ITS)
- The Support of Multiple Wireless Media
  - e.g., 5.4GHz BRAN, 2.4GHz ISM, and IR other than 5.9GHz 802.11p
- Other Comments from ITS Mailing List