IP WAVE - New Extensions

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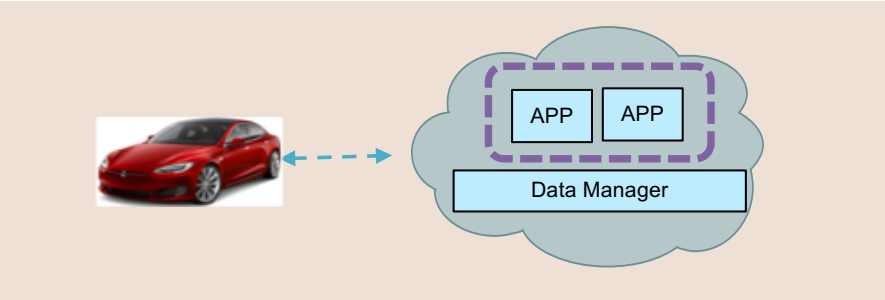
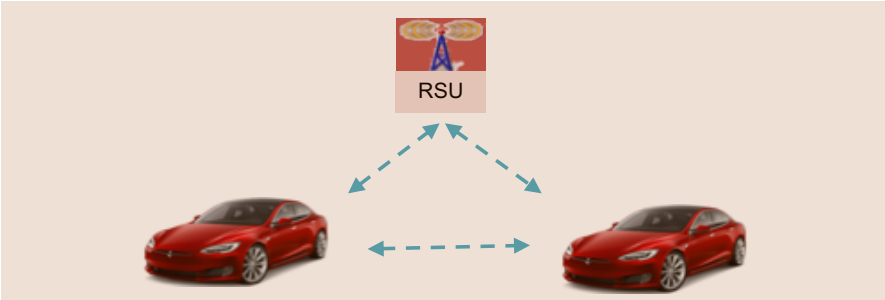
Context

- Regulatory Clearances in place. FCC has allocated 75 MHz of spectrum in the 5.9 GHz band for DSRC communications.
- IEEE has standardized a set of protocols standards for Wireless Access in Vehicular Environments (WAVE). 3GPP has a study on CV2X.
- SAE has specified DSRC message set in SAE J2735 for use in vehicular safety application and OBU requirements in J2945.
- Efforts on IPv6 over 802.11-OCB. Focus on the basic transmission and reception of IPv6 PDU on a 802-11.OCB media without any explanation on the operation of IPv6 neighbor discovery.
- Development of protocols by SDO's with no E2E system view. Several gaps in protocols, security and manageability.

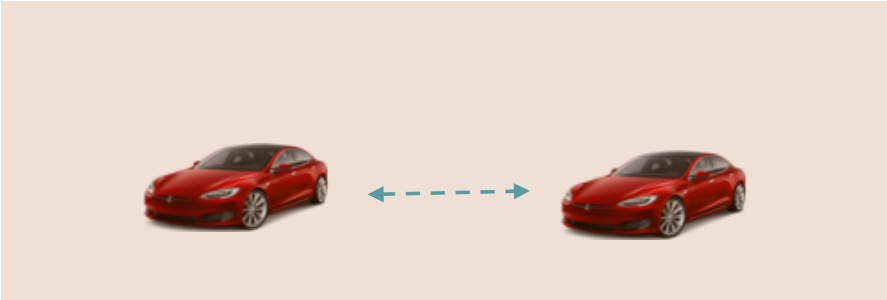
Connected Vehicle - Use-Cases



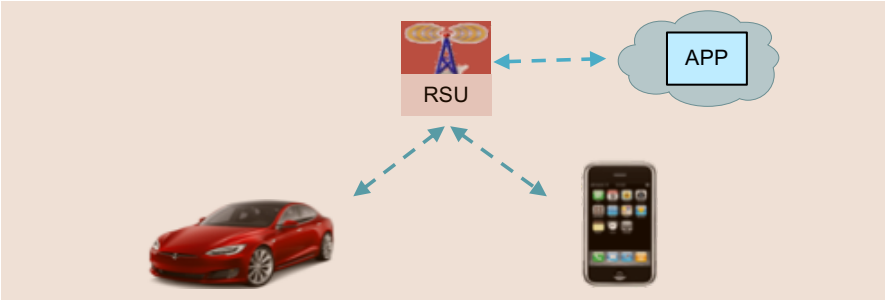
Vehicle to Infrastructure



Vehicle to Vehicle (Infrastructure Mode)



Vehicle to Vehicle (Direct Mode)



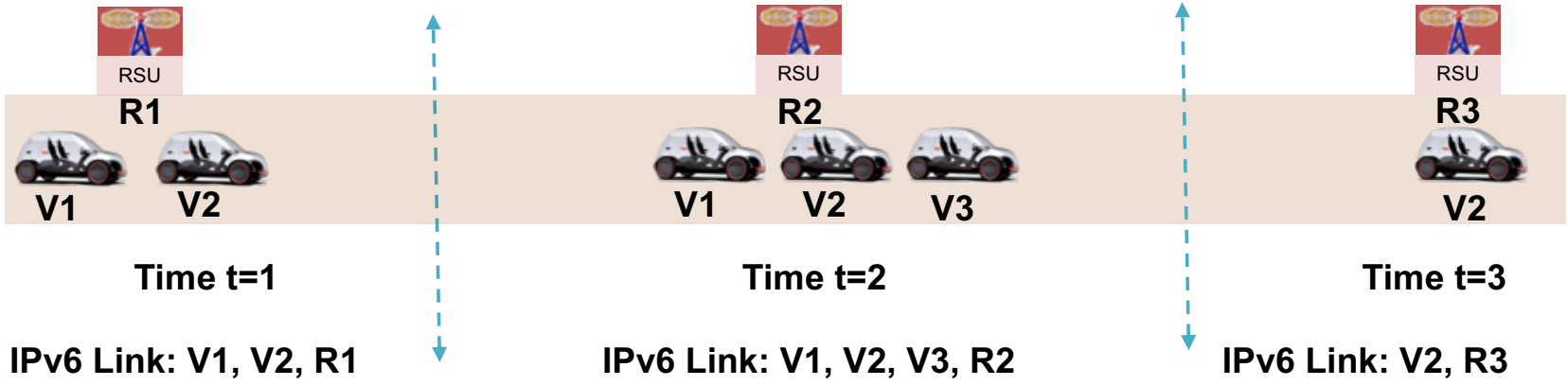
Vehicle to Pedestrian

IPv6 ND for 802.11-OCB

- What exactly defines an IPv6 link in such environments
- Which entity hosts the IPv6 prefix? Is that the RSU, or the router on the wired side of the RSU
- How do nodes discover the first-hop router on the link
- Is there a necessity for supporting DAD in such environments
- How can we optimize classic ND for such environments. How does ND security work.
- What is the topological relation between IPv6 prefixes hosted in the vehicle to the topology of the RSU's access link
- How do vehicles and infrastructure exchange prefix information. How does security work

IPv6 ND for 802.11-OCB

- In 802.11-OCB mode, all nodes within a wireless range can communicate with each other. There is no concept of association, or authentication. Any node can transmit messages and those messages are seen by all other nodes in that range.
- Nodes are fast moving. A set of nodes come in proximity and stay together for a transient period of time and few secs later the members of the group completely change. Number of groups may also change. Classic IPv6 ND is unsuited for such environments.

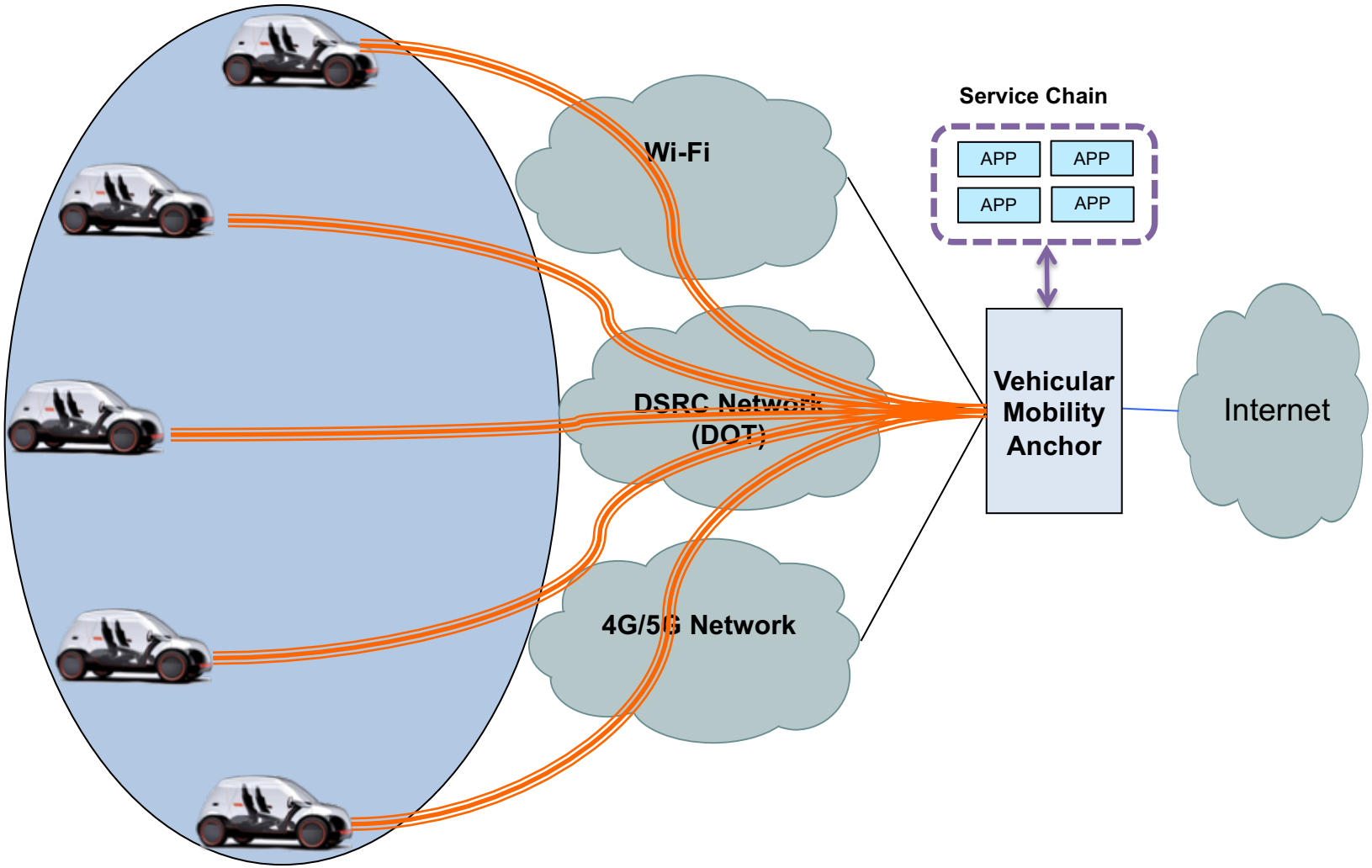


Vehicular Mobility Anchor

- How can we ensure there is reachability for the vehicular networks
- Given that the vehicle is equipped with multiple radio technologies (LTE, DSRC, Wi-Fi), how can multipath be supported
- What type of IP addressing will be supported for vehicular networks? Are those prefixes statically configured? Are those prefixes part of an aggregate block under the OEM, or the SP.
- How are services advertised and discovered
- How does the backhaul routing infrastructure manage the reachability of the vehicular prefixes and adapt to the changes
- Is there a need for a vehicular mobility anchor which can authorize the vehicle for IP prefixes and can manage the location/forwarding-path to the vehicular networks

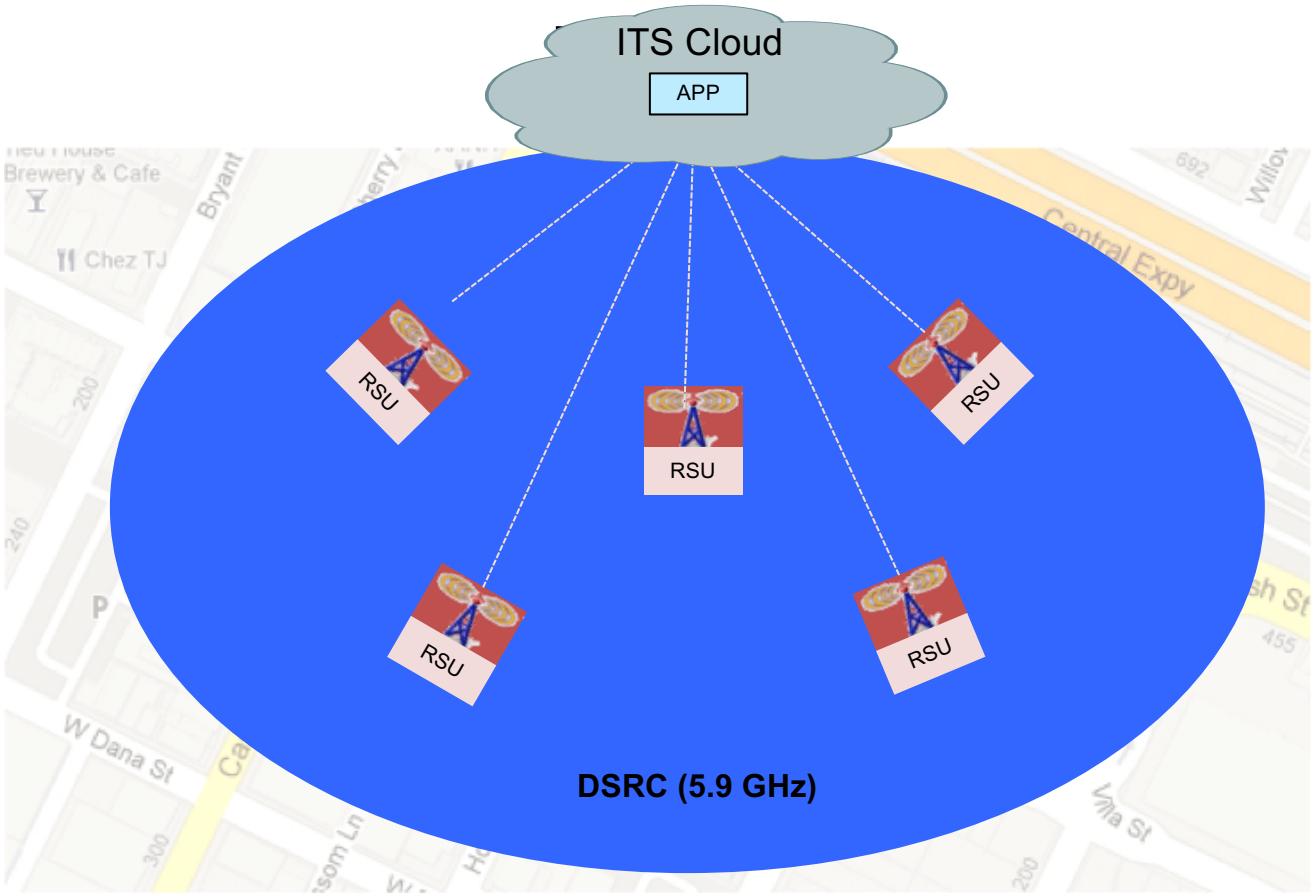
Vehicular Mobility Anchor

- Do we need to introduce the concept of an anchor for vehicular networks?



RSU Manageability

- What does it take to deploy and manage RSU? Do we need a new protocol interface?



Summary

- Define an architectural view of a vehicular network. Identify the key functions and interfaces
- Identify the protocol extensions for supporting the architecture and those interfaces
- Potential work items that IP WAVE group should explore
  1. Architecture for Vehicular Networks
  2. IPv6 ND Support for 802.11-OCB
  3. Vehicular Identity and Service Authorization
  4. IP Mobility Support for Vehicular Networks
  5. Protocol Interfaces for RSU Manageability

Questions?