

XIA Vehicular Use Case

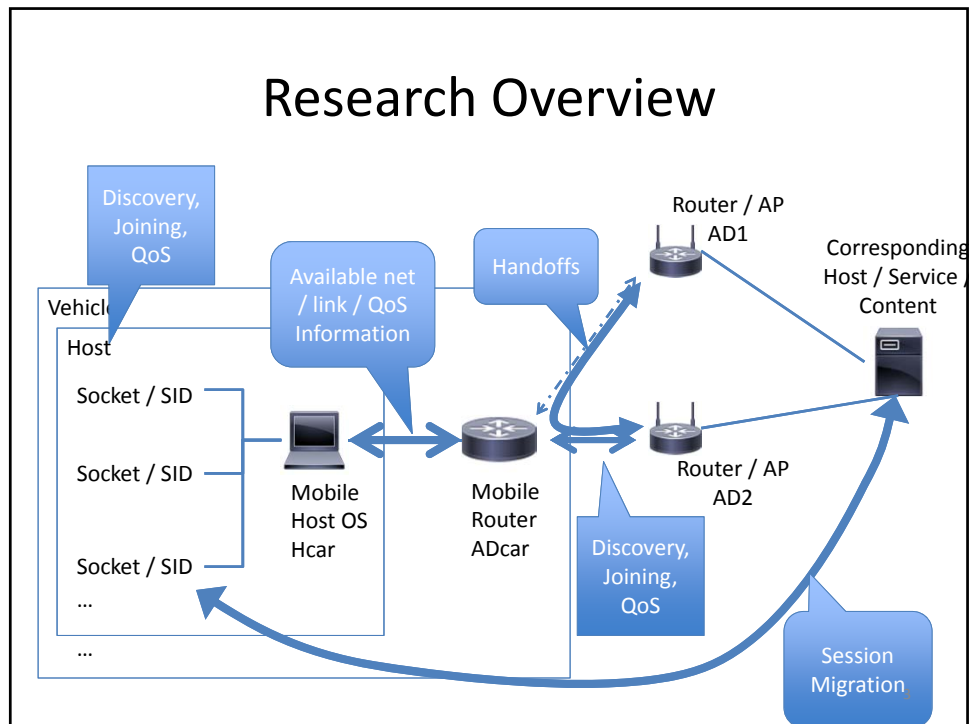
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Why Vehicular?

- Challenging example of high speed mobility
 - Temporal and spatial variation in link quality
 - Multiple technologies; multi-homing (focus: DSRC)
 - Short-lived connections (small cells)
- Inter-domain networking focus
 - Switching between multiple access networks
- Mobile network approach raises new research questions
- Raises economic and public policy issues

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System Components

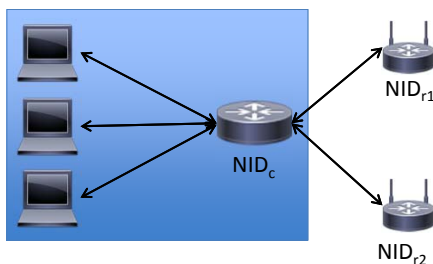
- **Inter-domain network mobility**
 - Connecting networks, quickly
- **Network joining protocol**
 - Host or network joining a network
- **Optimizing end-end performance**
 - Use caching, in-path services, ...
- **Infrastructure and deployment**

Flow, Device and Network Mobility

- XIA supports session and device mobility
 - Active session migration for both mobility and multi-homed in-bound load balancing
 - Device discovery using rendez-vous service
 - Uses DAGs and intrinsic security
 - Route optimization by default
- Network mobility raises additional challenges
 - Routing to a mobile network
 - Managing addresses in mobile network
 - Multi-homing and handoff

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Routing and Handoff



- How to best do inter-domain hand-off
 - Minimize disconnections, e.g., soft handoff
 - How to choose access?
 - Who is in control?
- Host addresses can use loose source routing
 - One route to NID_c
 - Could view car as one device (e.g., SIDs in-car)
- Multi-homing offers egress/ingress choices
 - Who is in control/pays
 - Who is in control and how do we manage addresses?
 - What about QoS choice?
 - Economic implications

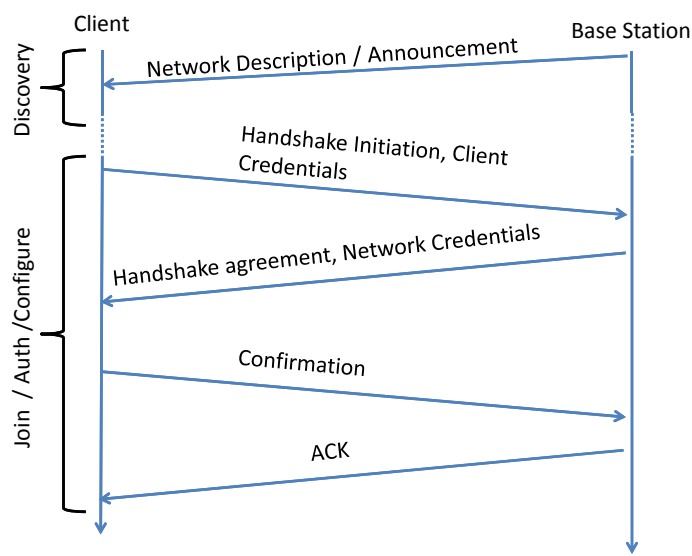
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Network Joining Protocol

- Allow device or network to attach to an access network securely and efficiently
 - Mutual and flexible authentication, negotiation about services and options, minimize RTTs
- Approach uses a cross-layer, pipelined approach
 - Replaces the “one protocol at a time” approach
 - Combine information and actions for multiple protocols in one message
 - Largely neutral to layer 2 and 3 technologies but need to respect ordering

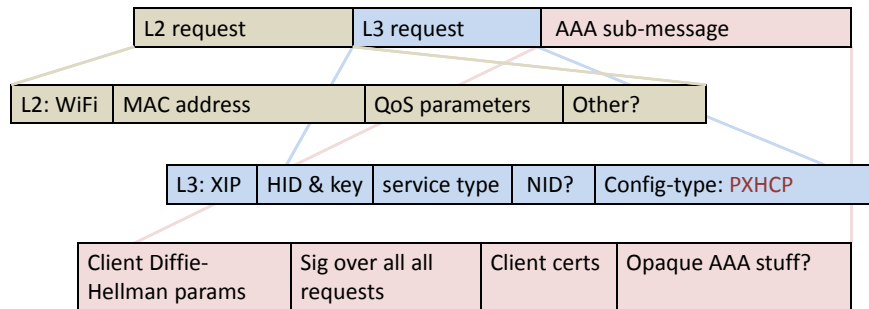
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Network Joining



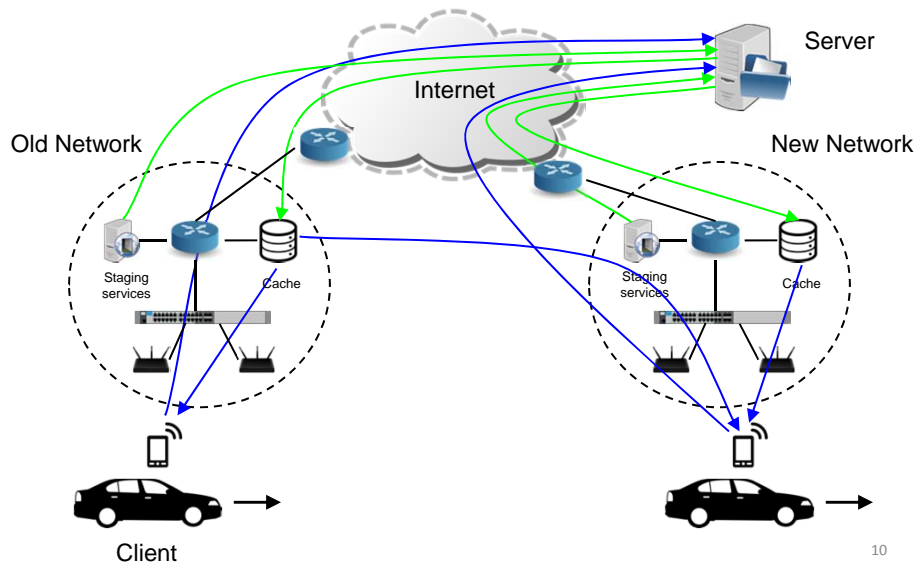
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Join/Auth/Configure Handshake 1



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End-to-End Optimization



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DSRC Testbed

- 5* base stations along 1-2 miles of road.
- Arada RSUs
 - 5.9 GHz DSRC
 - IP, WAVE stacks
 - XIA over WAVE?
- Attached to GigE campus LAN.
- Connect to wired XIA nodes.



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DSRC Testbed

