Cloud Infrastructure

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Hard Problems/Definitions

- Mobile cloud (V2V),
  - Combination of two?
  - Energy is a problem
  - Data process
  - Connectivity, security/privacy
  - Network latency, how to control? Wireless bandwidth
  - Current V2V (802.11p) is not good
  - Moto company use cloud, latency is not issue, only focus on their own vehicles

Applications?

- V2I, map, services
- V2V
  - Application drive architecture
- Real time response
- Using cloud to detect anomaly
  - Failure
  - Proactive monitoring, manufacturing
- Dynamic route guidance
- Using incentives
  - Route, shortest route
  - Minimum toll

What would cloud Infrastructure allow?

- If enough data, data tells you the route
  - However, privacy issues
  - What kind of Laws
  - What kind of Cyber insurance?
- Economic incentive to build cloud
  - Cut energy consumption by 1%, 10%?
  - Real time analytics of traffic, city, district wide control save money, traffic time
  - If cloud control non car, cars can be combined with other infrastructure (grocery shopping)
  - Air traffic control, use cloud to route, use fuel…
  - Entertainment systems

  - Computing
  - Data aggregation, disseminiation, information sharing
  - Should connected to smart city, (waiting time at hospital, bank, etc.), then have smart plan.

What Challenges?

- Huge system, millions degrees of freedom
- How much actuation is needed?
  - Small part? Large part?
- Optimal state
  - congestion
- How to use cloud to control infrastructure? Optimize infrastructure
  - Automated traffic speed
  - Different time scale,
- Need standard
  - open source
  - Sensors and actuators, which one is better, actuate the driver? Try to find the balance
- Needs to be adaptive, deal with uncerntainty
  - If people is out of the system
  - Transition from old city to smart city
- Need new science, control
  - mapreduce not suitable
- Optimize in Multiple transportation systems (bus, train, plane)
  - Interact among themselves
  - What should we optimize? What are objectives? (travel time, fuel consumption, emergency situation), priority. Multi-objective optimization, transition
  - Enforced

Reduce Tech. Barriers moving from car to public transportation?

- Need AI?
- Dynamic optimization
  - Need to do at multiple checkpoints
- Congestion, latency, security
  - If everybody communicate to the cloud
  - Privacy
- Architecture
- UAVs
- Political and Infrastructure
  - zipcars,

Issues

- Cost
- Social?
- On-demand feature
  - Economically better
  - Existing: Taxi v.s. bus