

Traffic and Wireless Communication

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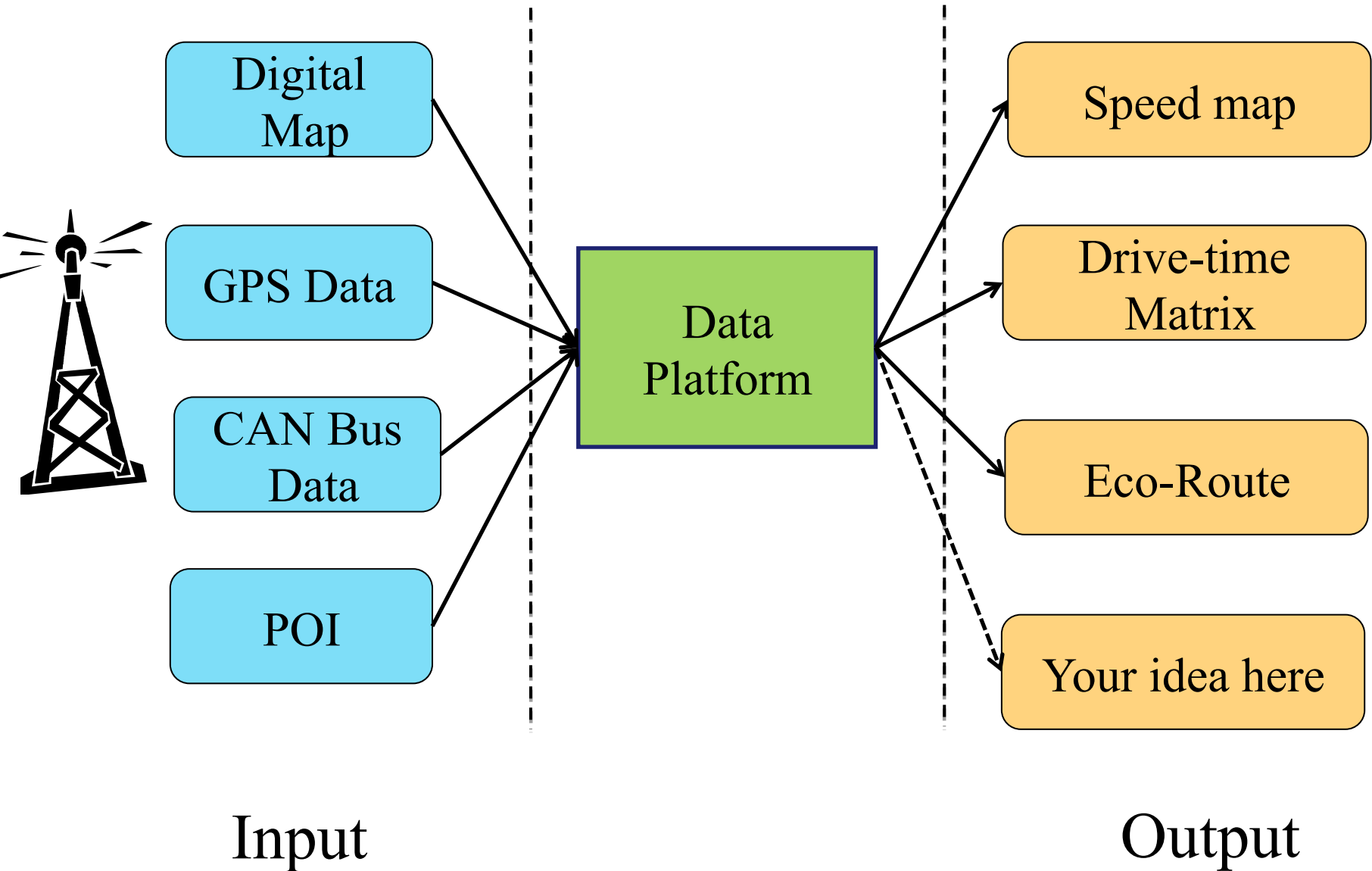
Department of Computer Science

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The Reduction Project

Center for Data-intensive Systems

Research Area: Main Idea



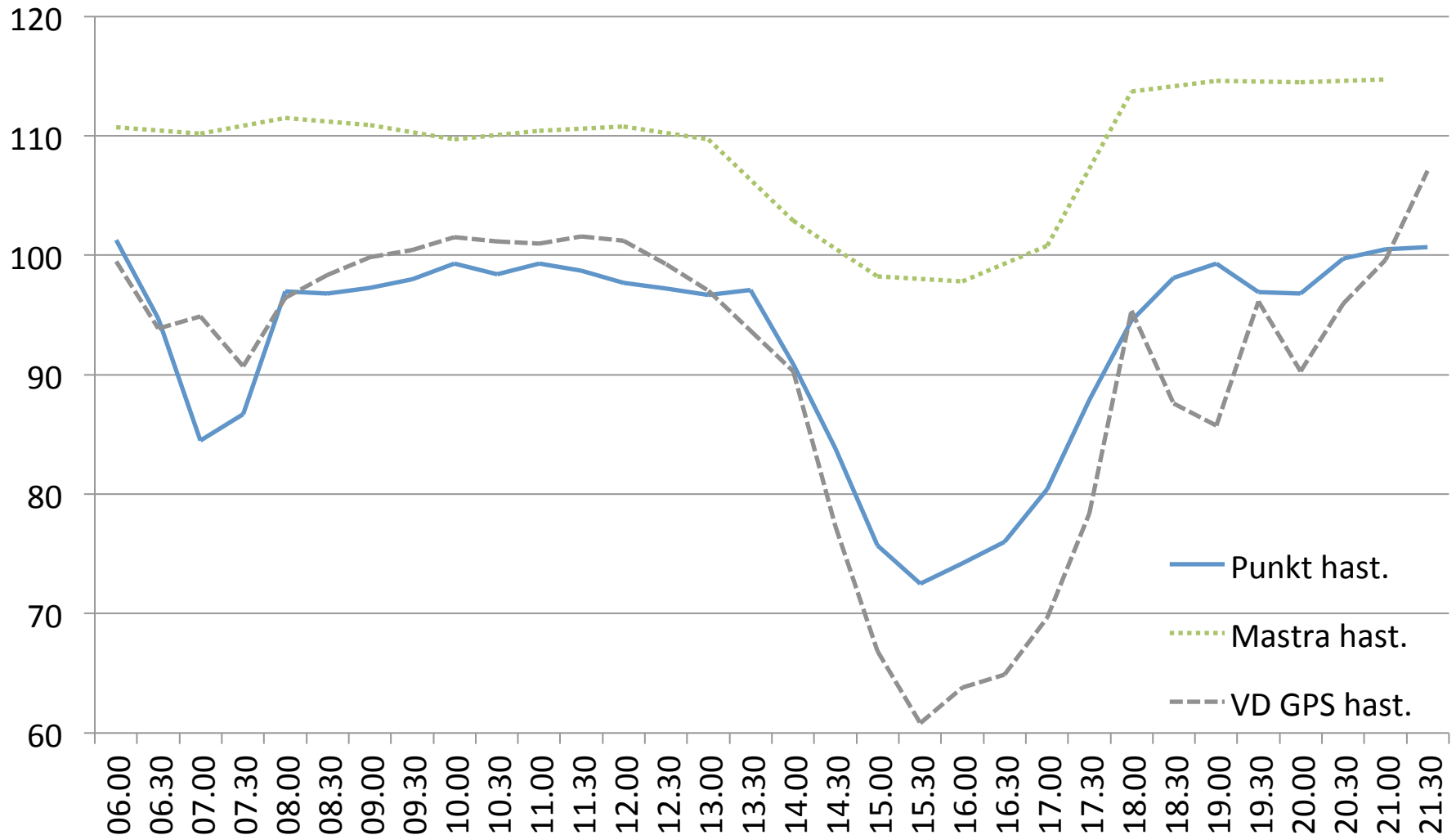
Computing Turn-Times



Køge Bugt Freeway, South Bound



- Greve S. to Karlslunde



Result: University to Airport



Smallest Consumption

Least Time

Shortest Distance

Method	Distance (km)	Cons.	Time
Smallest consumption	13,75	1875	14:04
Least time	13,75	1875	14:04
Shortest distance	11,50	2343	21:21

Goals (very overall)



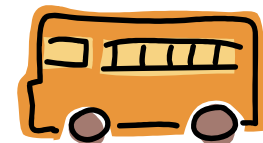
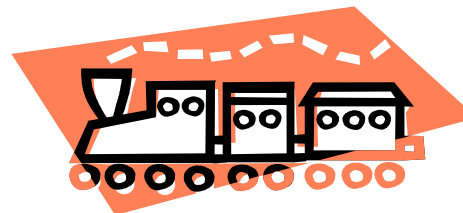
- Lower congestion
 - A major cost (10 Billion DKK in Greater Copenhagen Area)

- Lower number of traffic accidents
 - Cost for humans
 - Cost for the society



- Lower fuel consumption and green-house gas emission
 - Major concern at national and international level

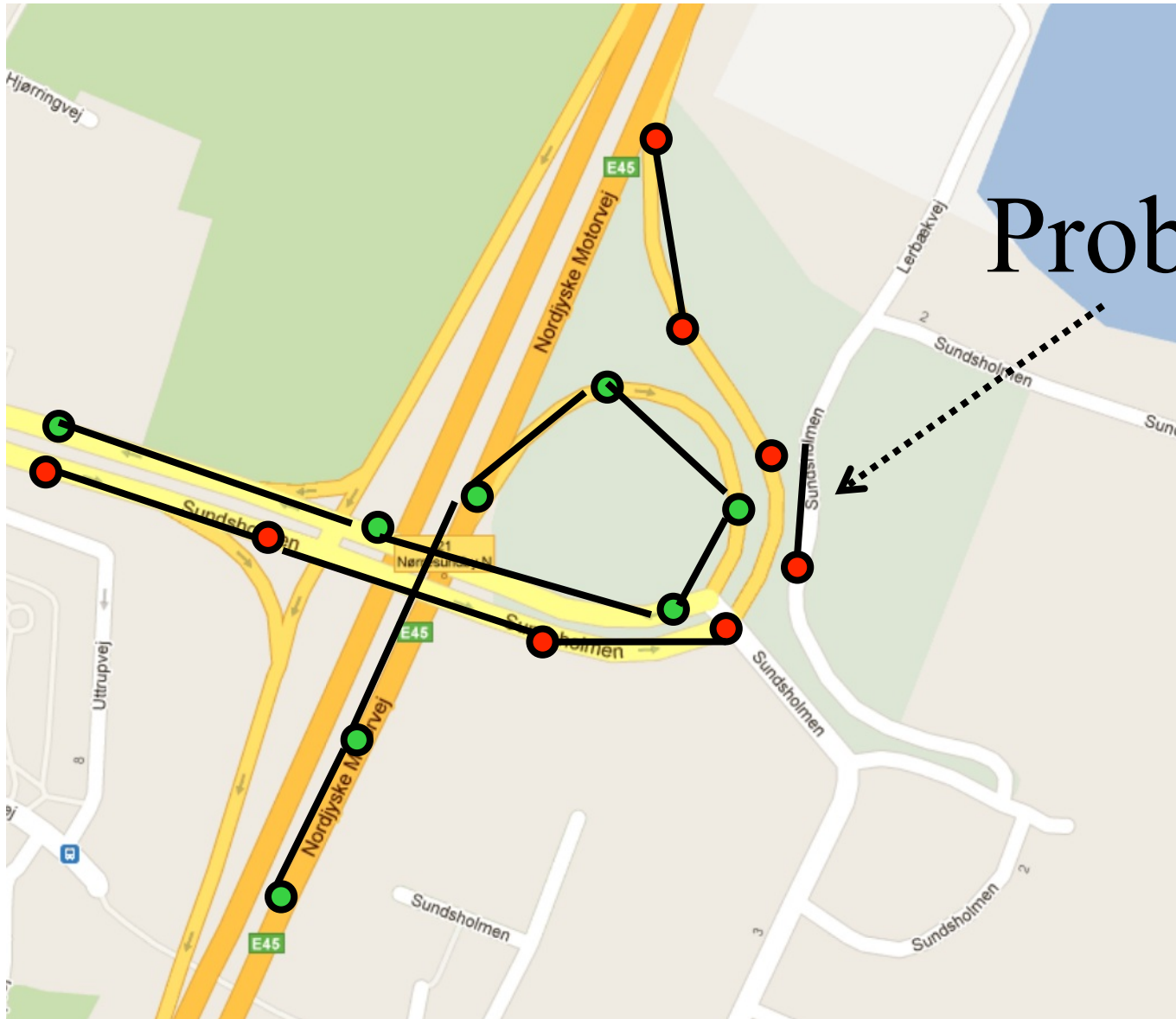
- Better utilization of road network and vehicles
 - Multi-modal transport



Fleet Management



Map Matching

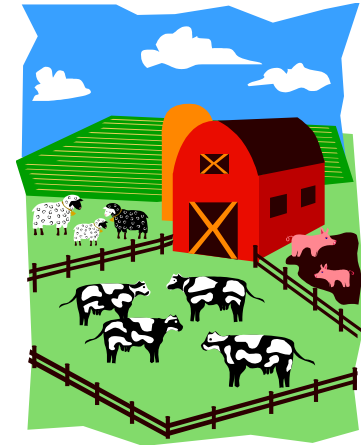


Problem

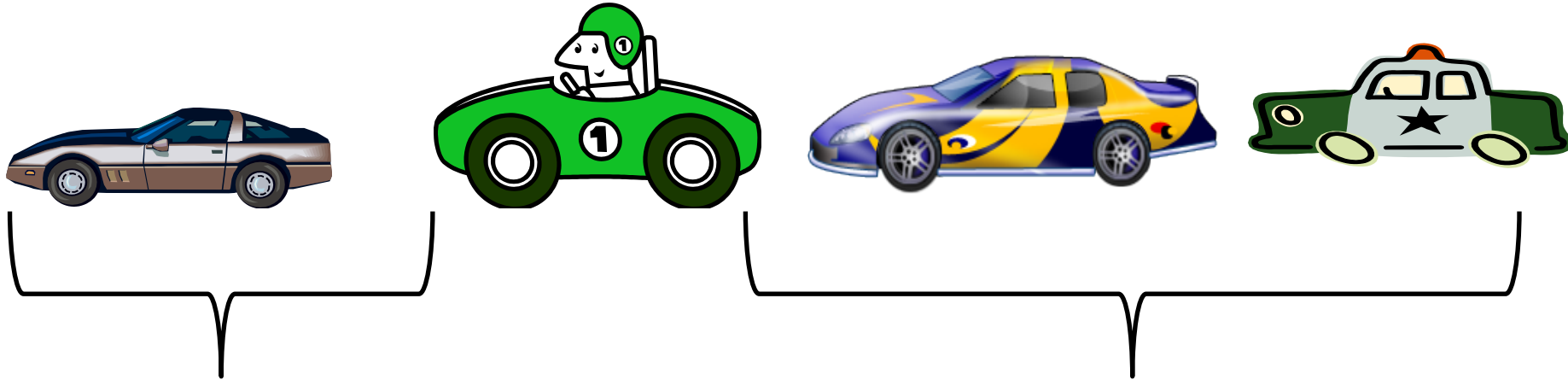
Requirements to Communication



- Must be cheap
 - Roaming prices are scaring users
 - Companies are very cost focused!
- Full coverage
 - Rural areas
 - Tunnels and “Urban canyons”
- High bandwidth
 - Lots of data we want to receive with a high frequency
- Be anonymous (when wanted)
 - To avoid “Big Brother”
- Easy to install
- Safe and secure (Folio and Antennas)
 - Road pricing then



In Vehicle

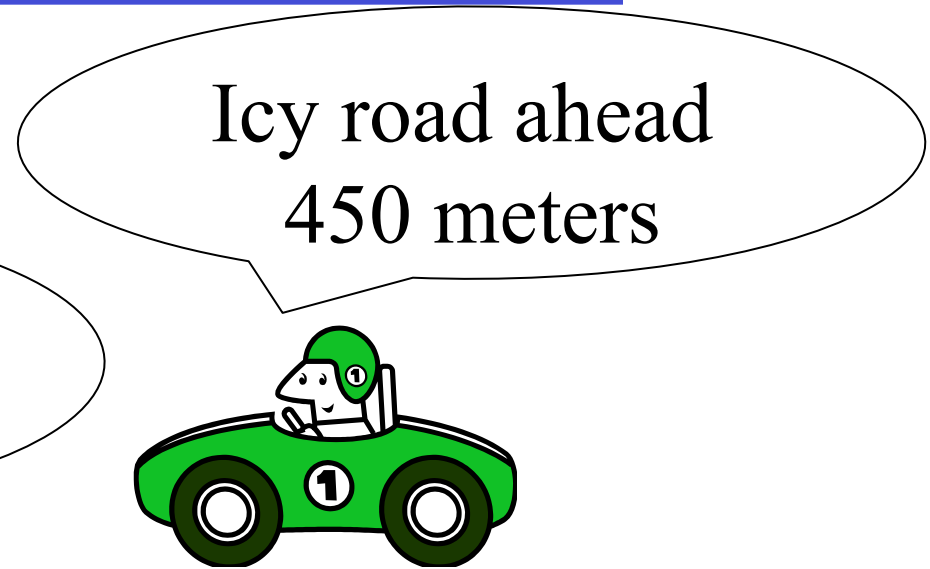


200m/1 vehicle

500m/2 vehicles

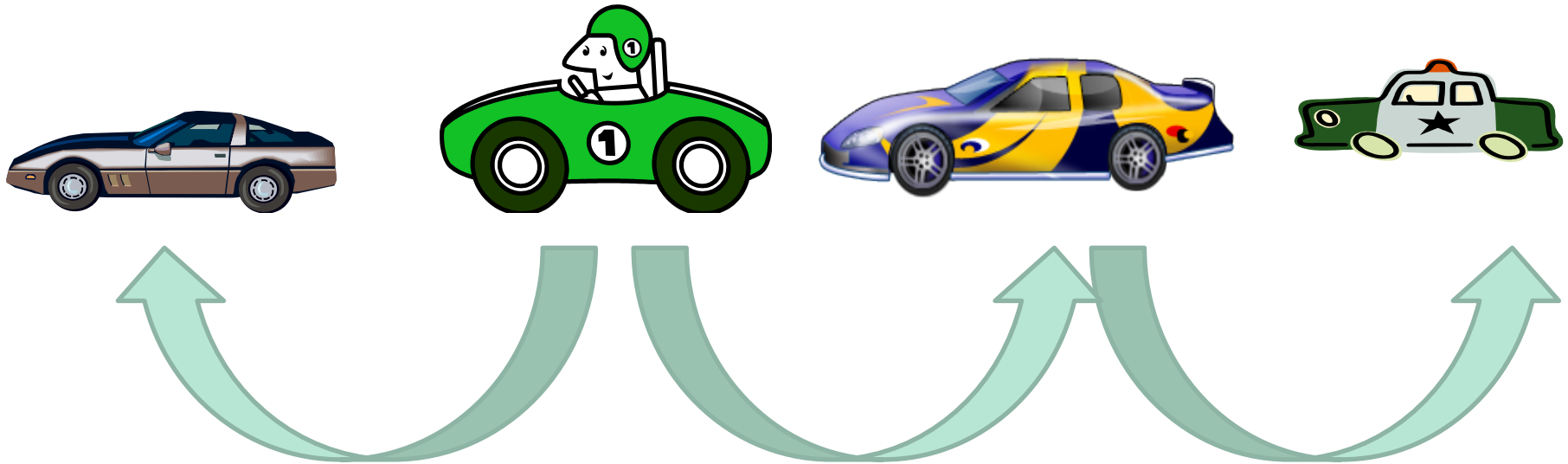
- Congestion detection
- Driver-style analysis (vehicles overtaken)
- Infrastructure “whistle-blower”
 - Water on road, bump-in-road
- Near-accident replay
- A weakness of probe-vehicles compared to induction-loops

Vehicle-to-Vehicle



- Avoid “big-brother”
- Load balancing (decentralized computing)
- Only receive relevant information (no broadcast)

Vehicle-to-Vehicle



“What do you see?”

“What do you see?
Forward!”

“What do you see?
Forward!”

Vehicle to Infrastructure



- Assist in map-matching
- Assist in lane detection on freeways
 - When overtaking
 - This can be very hard to detect
- Assist when stopping
 - Traffic related stop vs. non-traffic related
- Assist in congestion estimations
 - Measure and report on number of vehicles in queues
- Upcoming possibilities
 - Bluetooth devices
 - Road authorities are fairly conservative

Summary/Challenges



- How to get persons to sign-up
 - Have to ask 200-1000 persons to get a volunteer!
- Vehicle-to-vehicle communication
 - What can it be used for? (We do have ideas 😊)
- How to inform only the relevant vehicles?
 - Avoid broadcast (Spatio-temporal constrained)
- How to make it simple and cheap research experiments?
 - A research platform shared between projects
- Anonymous and secure communication?
 - Tell where you are without being able to lie!
- Eliminate in accurate GPS data
 - Galileo?
- Real-time information
 - Think TV and radio competing for commuters attention