Centralised privacy processors and controllers – lessons from the i-Tour project

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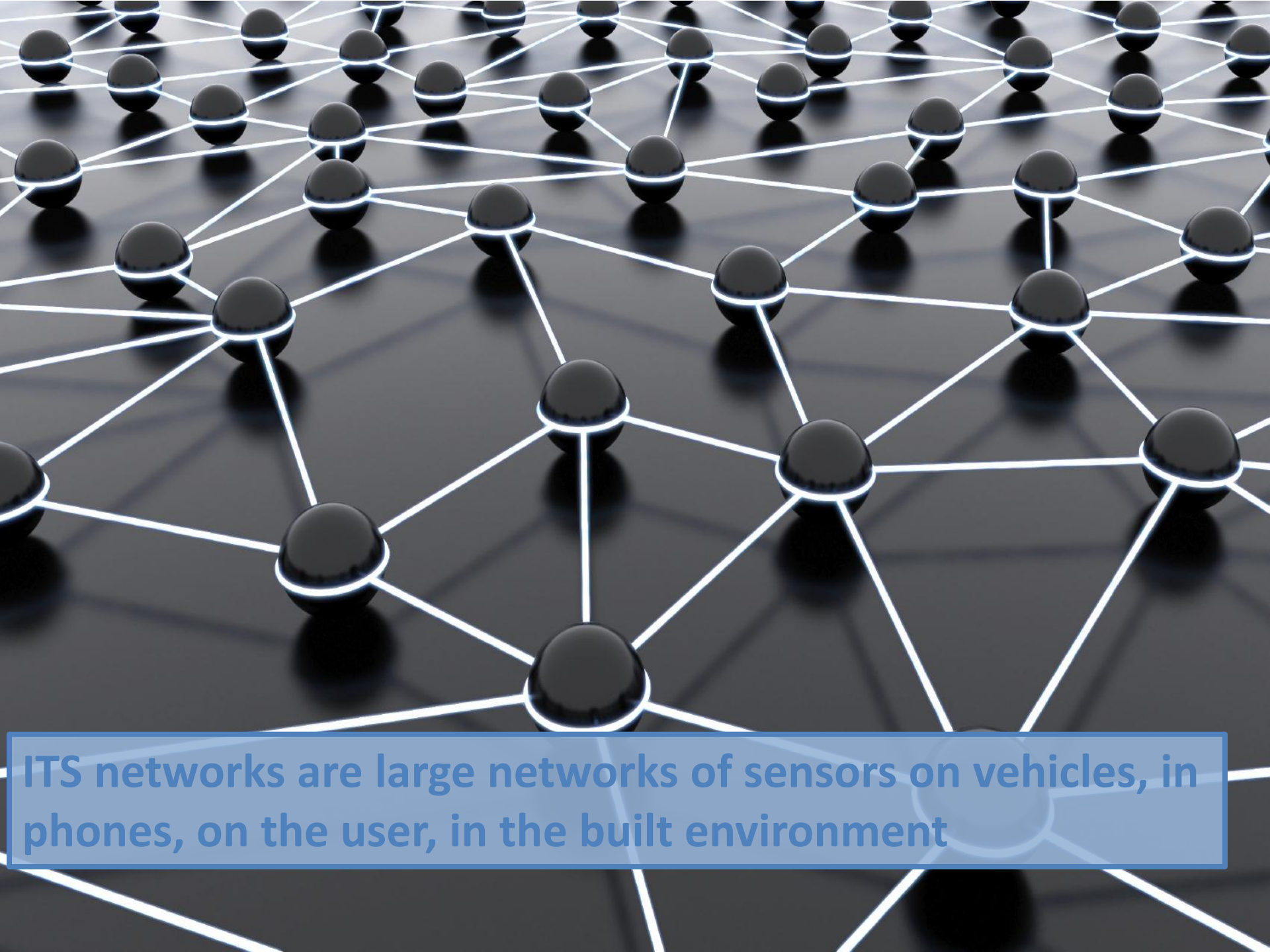


ITS networks are large networks of sensors on vehicles, in phones, on the user, in the built environment

Concerns of ITS as a sensor network

- Using mobile devices as sensors
  - Who does it give its sensor data to? Does it trust the receiver will use it well? Can the sensor function be switched off?
- Using people as sensors
  - What are you sensing? Is this going to come back and adversely affect me?
- Using mobile devices as computing nodes
  - Is this realistic?
  - For example how much excess computing power is a car maker going to install?
- Using people as data sources
  - Not just sensor data but opinions too? How to develop trust in their input

Concerns expressed in i-Tour

- The reason for travel is often personal
  - Leisure, work, family travels are not open for all to see and exploit
- A traveller's viewpoint is too low to see the "right path"
  - Needs help from a trusted authority with a better viewpoint
- Asking for directions is naturally a verbal/aural process
  - Often doesn't just concern the shortest/quickest route but the one that fits to the person (e.g. via this type of shop, suitable for a baby buggy, with indoor secure bike parking close to the destination, …)

Building trust in i-Tour

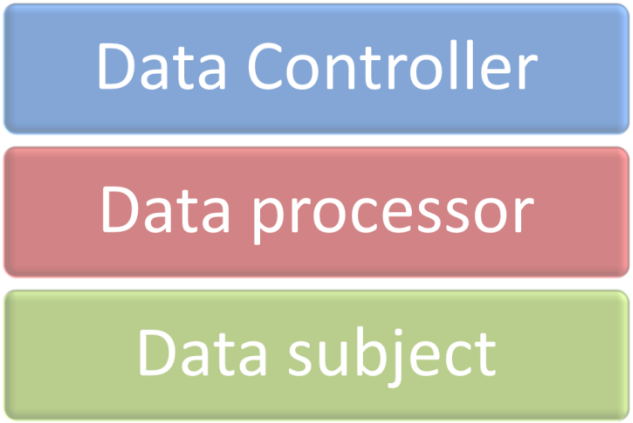
- Trust is developed over time from the analysis of actions, reactions, and contributions
  - Requires observation and interaction over time
  - Requires contextual knowledge
  - Trusting party-A in context-X does not mean having to trust party-A in context-Y

The i-Tour trust architecture

- Developed from multiple viewpoints
  - Trust in users
  - Trust in content
  - Virtual community analysis
- Root of trust is in the “core”
  - No direct peer to peer trust
  - All “apps” from the service suite come from the core

Privacy roles and locations

- Roles are identified in legislation (for EU)
- Data controller and data processor roles are embedded in the “core”
- Consent for data use is managed through the “core”



Trust based access control

- Two primary user types:
  - Registered users, Guests
- The aims:
  - To indicate to the system and other users how to treat data supplied by any user acting as a prosumer.
  - Manage the degree of access offered to users based on their historic interaction with the system and the value of their interactions as noted by both the system and by other system users.

Core i-Tour app

Weather forecast at start and arrival

Current trip overview

Detailed data on journey segments

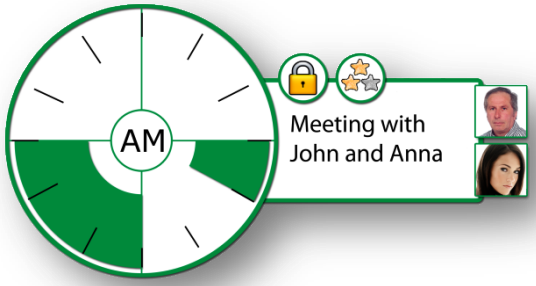
Main commands
- Calendar
- Map
- Alerts & Messages
- i-Tour Games
- Statistics and rewards

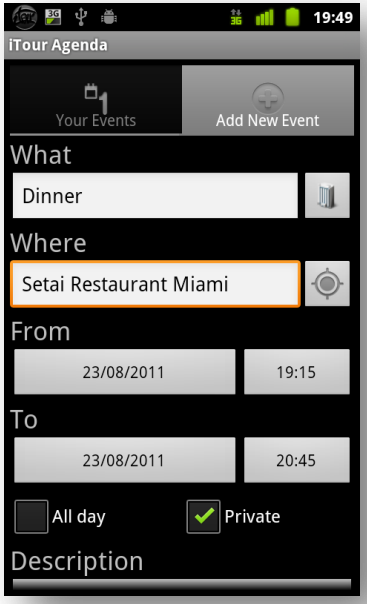
Area for messages and alerts

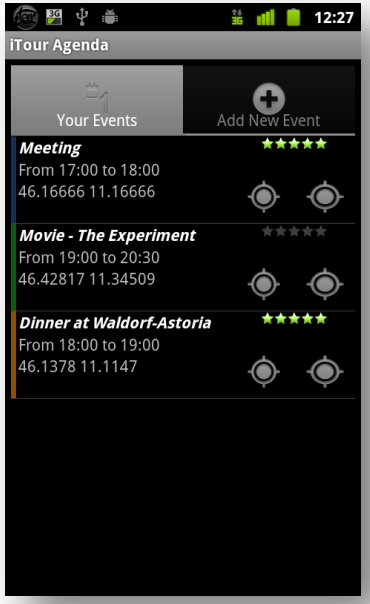
NLP interface assistant

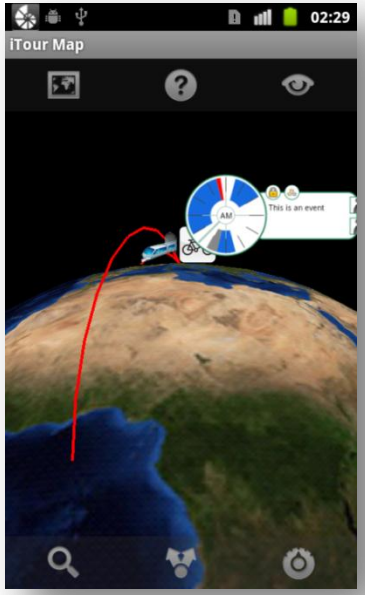
Integrating ITS to everyday living

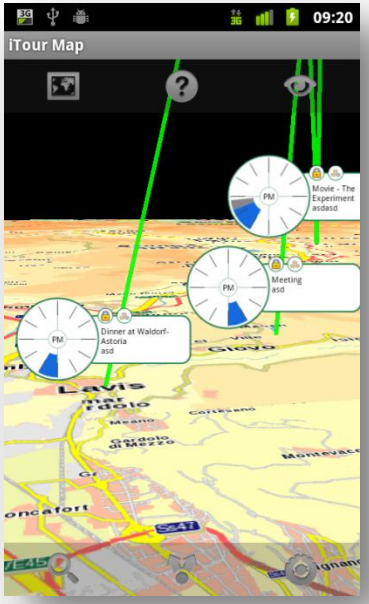
- Google Calendar Integration
- Allows Custom Data (e.g. Rating)
- Stored on i-Tour DataBase to allow spatial queries
- Geolocalised Events shown and connected on the map



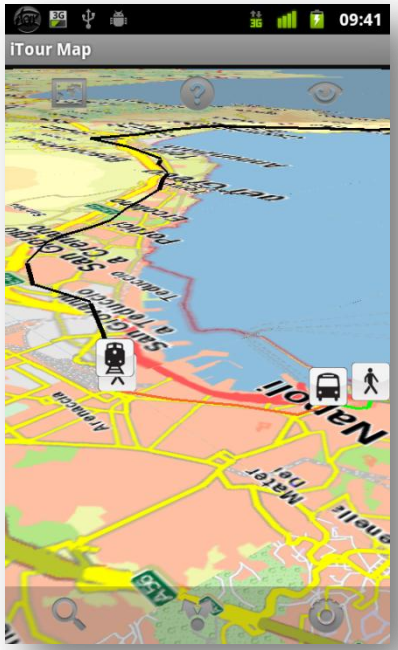


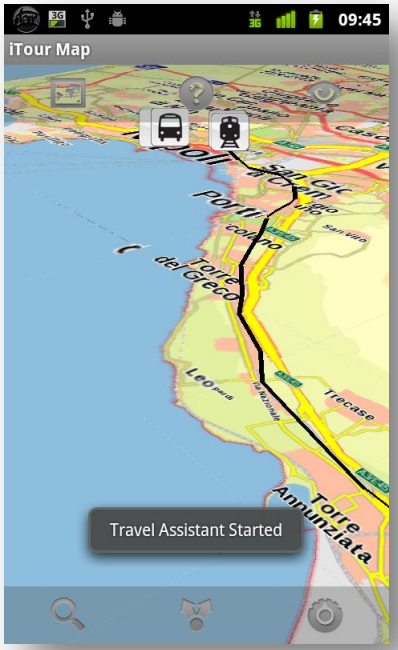






Routing function





3D view
(WMS Navteq Imagery)

Augmented reality view

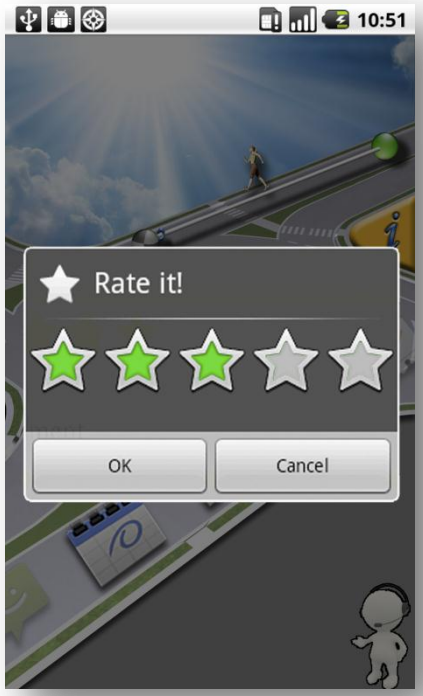
Localised real-time data

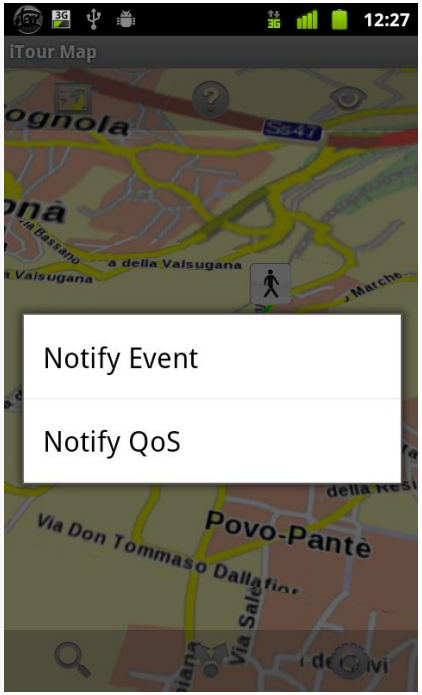
Alert visualisation from

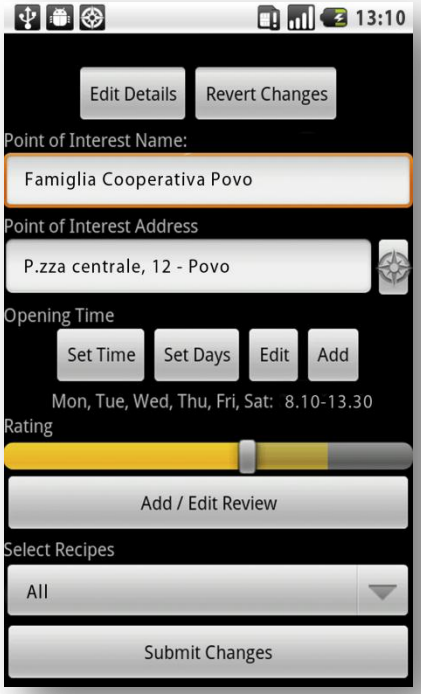
MuoversiInCampania.it

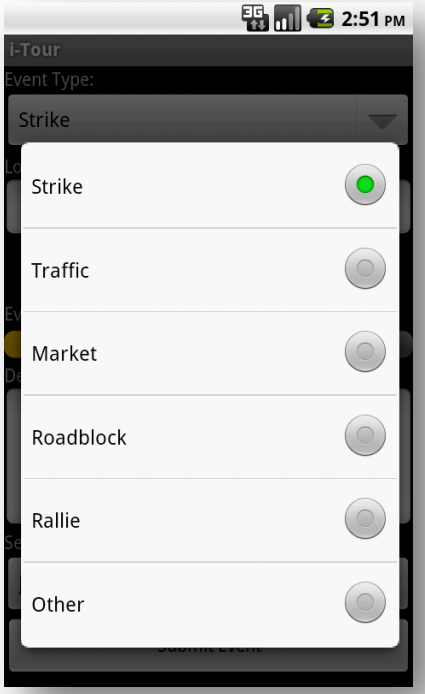
This could use data from CAM and DENM too – an LDM?

Crowdsourcing localised data







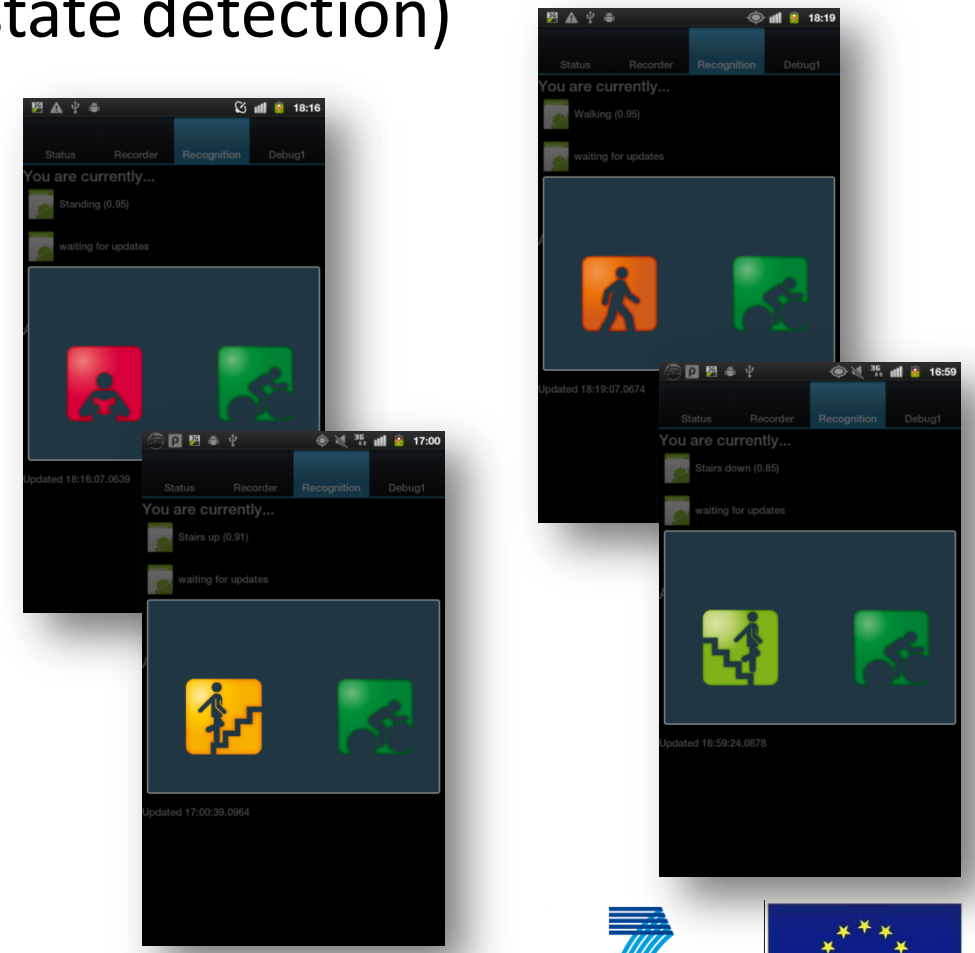


A centralised (L)DM function may be seen as a crowdsourcing application

Setting of different travel modes

(automatic state detection)

- Based on several user learning sets
- Uses support vector machines to recognize user states
  - Standing
  - Walking
  - Running
  - Go upstairs / downstairs
  - Travelling on motorised vehicle
  - Indoor / Outdoor



The challenges faced by NLP

- Vagueness and implicitness is a key characteristic of natural speech
- Accuracy is not a defining characteristic of natural speech but is essential in the response
- NLP has to be fast – as fast as normal conversation
- Interface and app demands knowledge to compensate (e.g. Apple's SiRi)

LBS and natural language interaction

POSITION + “show me the nearest indian restaurants where I can pay with credit card”

results

Spatial data

SQL query

Geospatial repository

Conclusions

- Transport is societal and societies work through sharing knowledge and building from that shared base
- Trust is centred on learning from relationships
- Processing for complex systems needs to exist across the system
  - In ITS-Ss and in the core
  - Compliance is measured in the core

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Thank you for your attention