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DEPARTAMENTO DE SISTEMAS DE INFORMACIÓN
CORDINACIÓN DE INVESTIGACIÓN Y POSGRADOS
DOCTORADO EN TECNOLOGIAS DE INFORMACIÓN

IT PhD Information Technologies PhD

SIM RESEARCH CENTER

IBM

Smart traffic for Guadalajara City: crowdsourcing, analytics and forecasting for commuting time optimization

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Urban Systems Collaborative
Webinar
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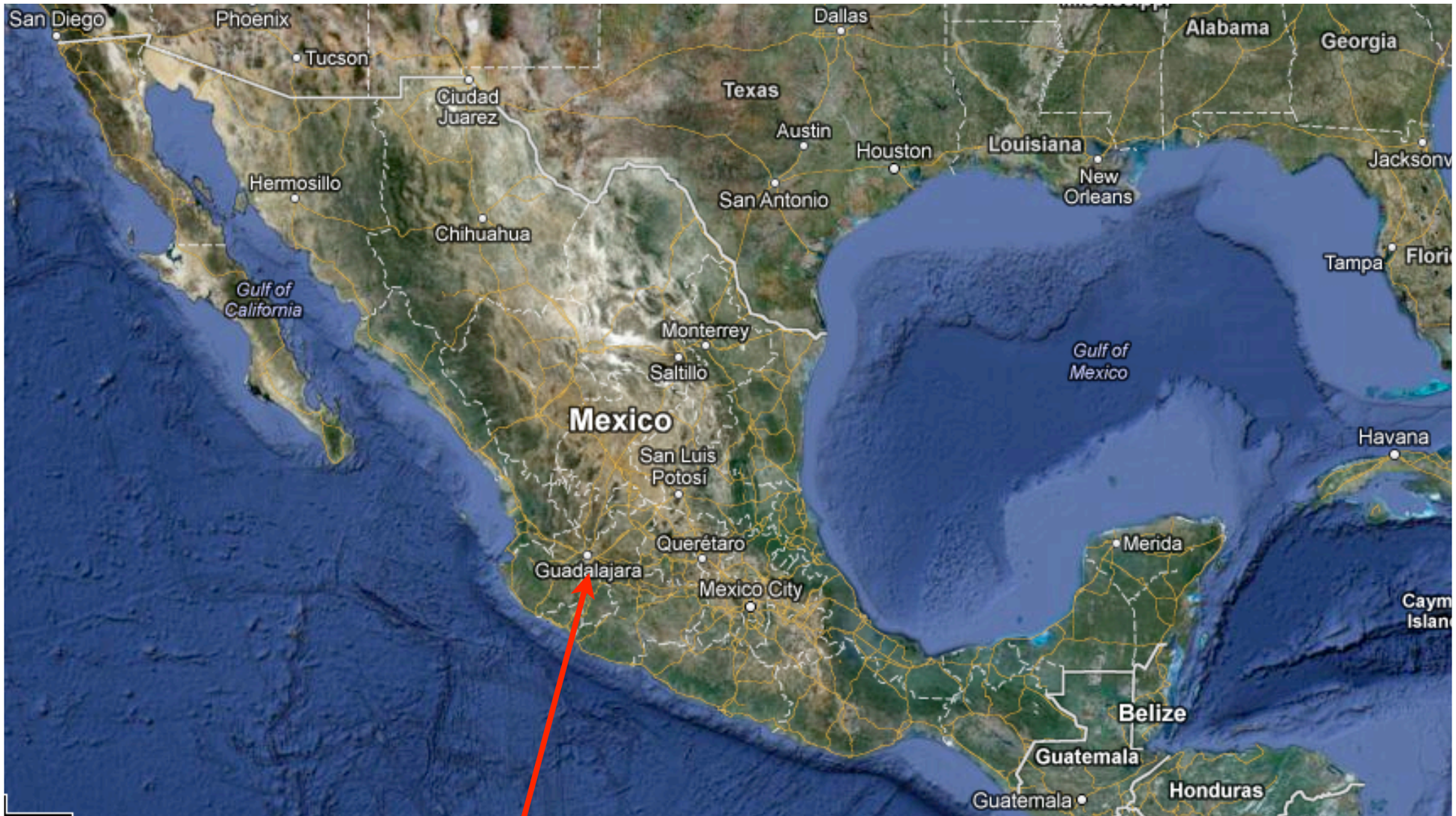
Agenda

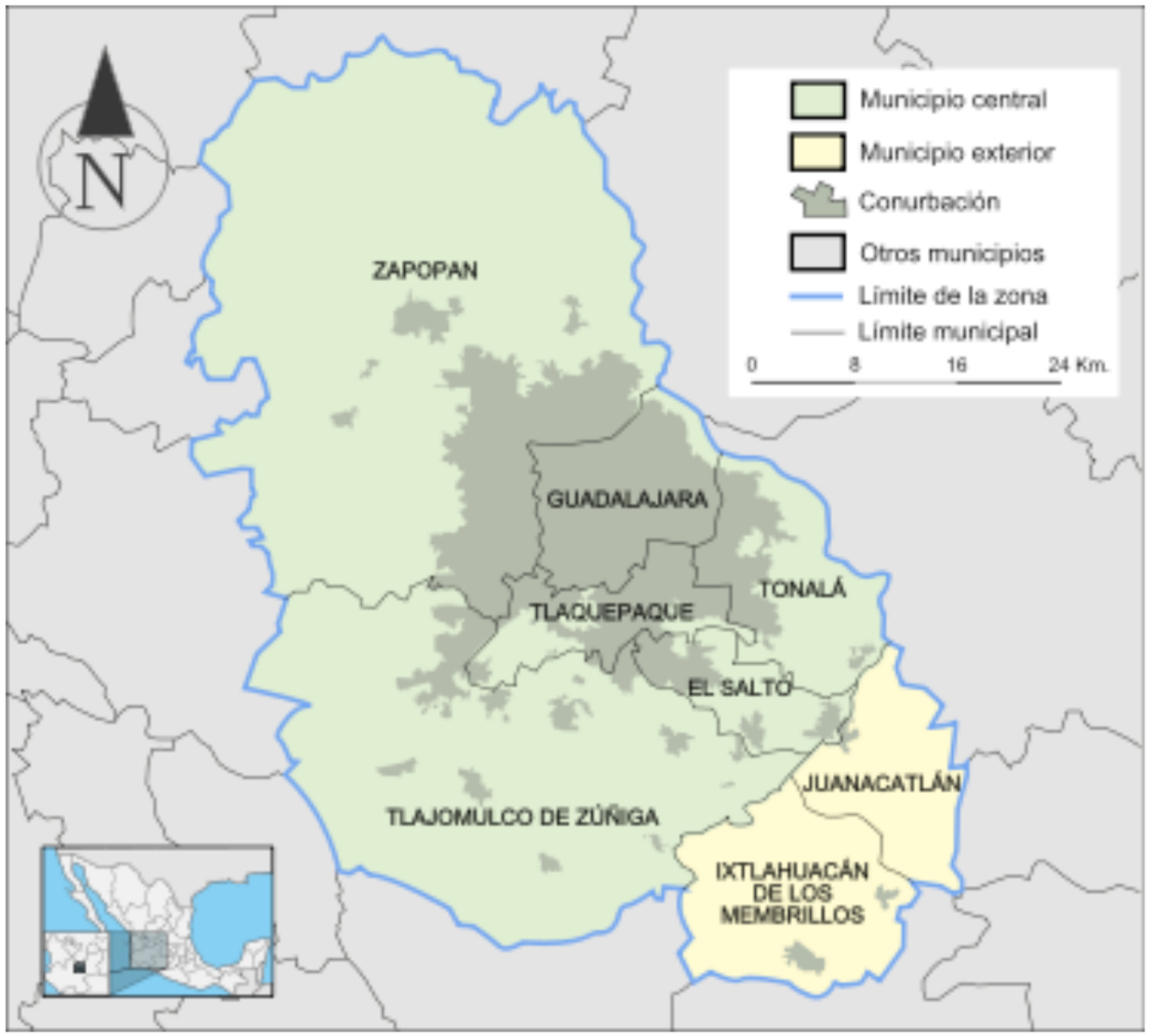
- Context in Guadalajara City
- The project development:
  - Architecture, TOTEMS, Organization
- Current achievements
- Discussion & concluding remarks



Context
Guadalajara City (GDL)

GDL Facts

- Founded in 1539
- 4.2 million people in the metropolitan area
- 4x growth in last 20 years
- 6 Municipalities interconnected
- 17 Km distance crossing north to south
- 1/4 of Mexico City

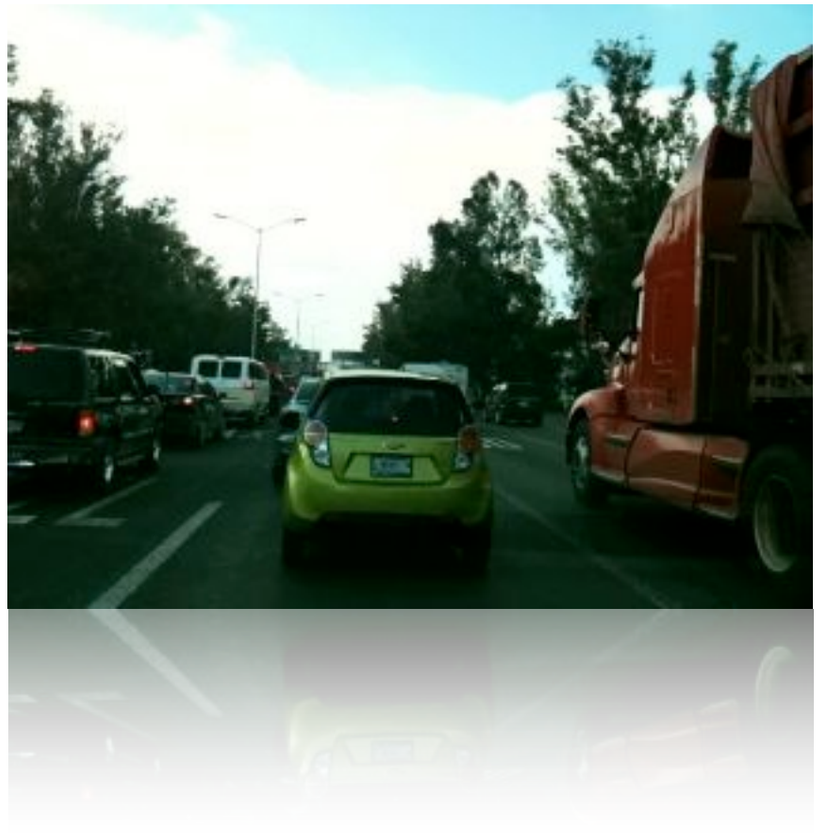


GDL compared with other world cities

#	City	Population (millions)
1	Tokyo	8.477
2	New York	8.175
3	London	7.754
4	Rio de Janeiro	5.940
5	Guadalajara	4.200
6	Madrid	3.373
7	Buenos Aires	2.891
8	Chicago	2.696
9	Paris	2.234

Traffic facts in GDL

- 1.7 million private vehicles
- Lack of efficient public transport services
- Public systems about traffic information are not available
- During rainy season, flooding causes traffic jams in many areas of the city
- City roads infrastructure is not enough in peak time



Smart Traffic project for GDL

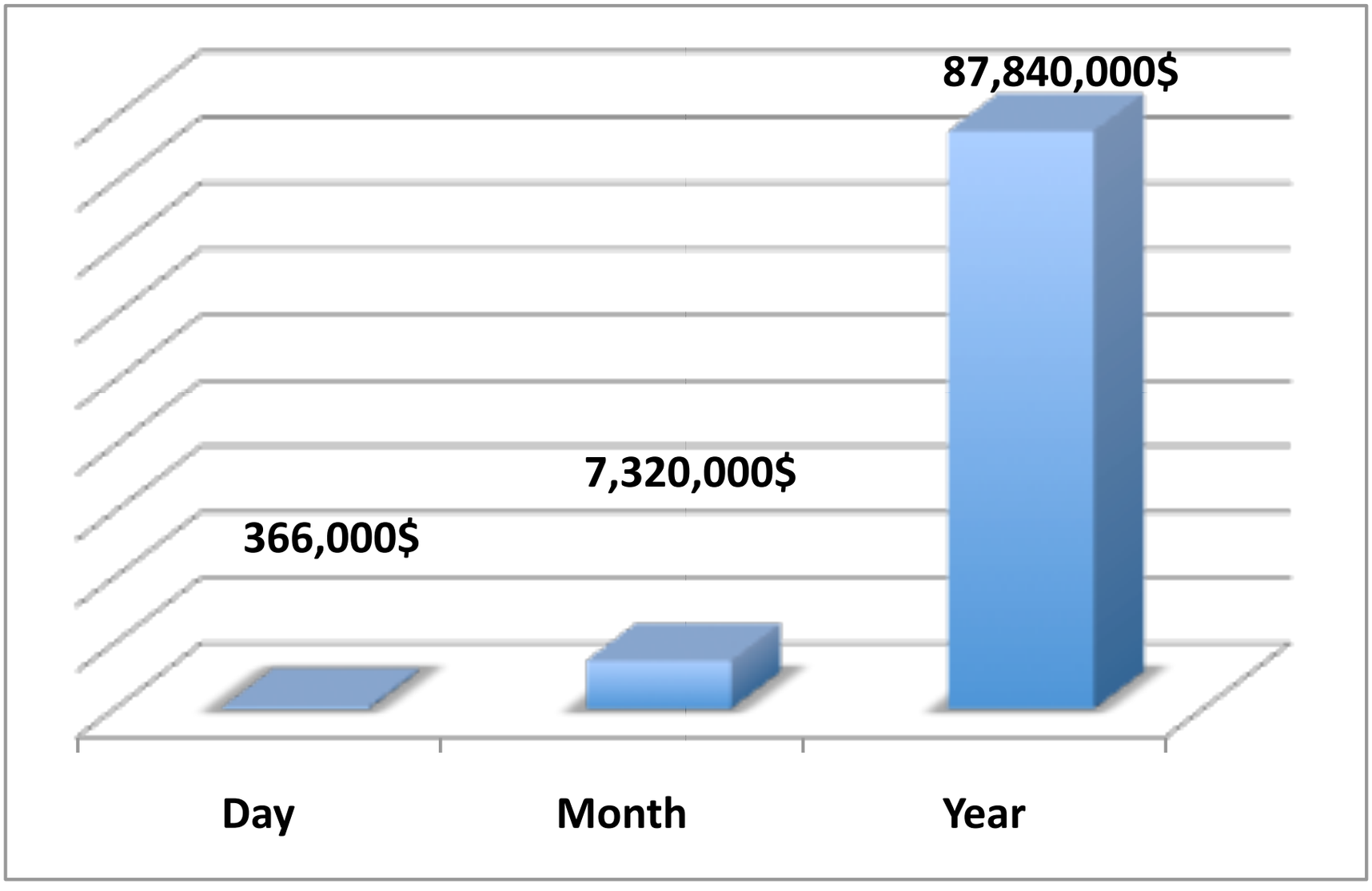
Project Goal

Reduce commuting times by 15% in the metropolitan area of Guadalajara City

Over 1.7 million of cars, save15% of commuting offers a potential daily saving* of $366,000.00 USD in productivity time for the city + reducing in pollution rates of CO2 emissions

* Estimation based by 3 salaries at GDL per day

Potential savings for GDL city

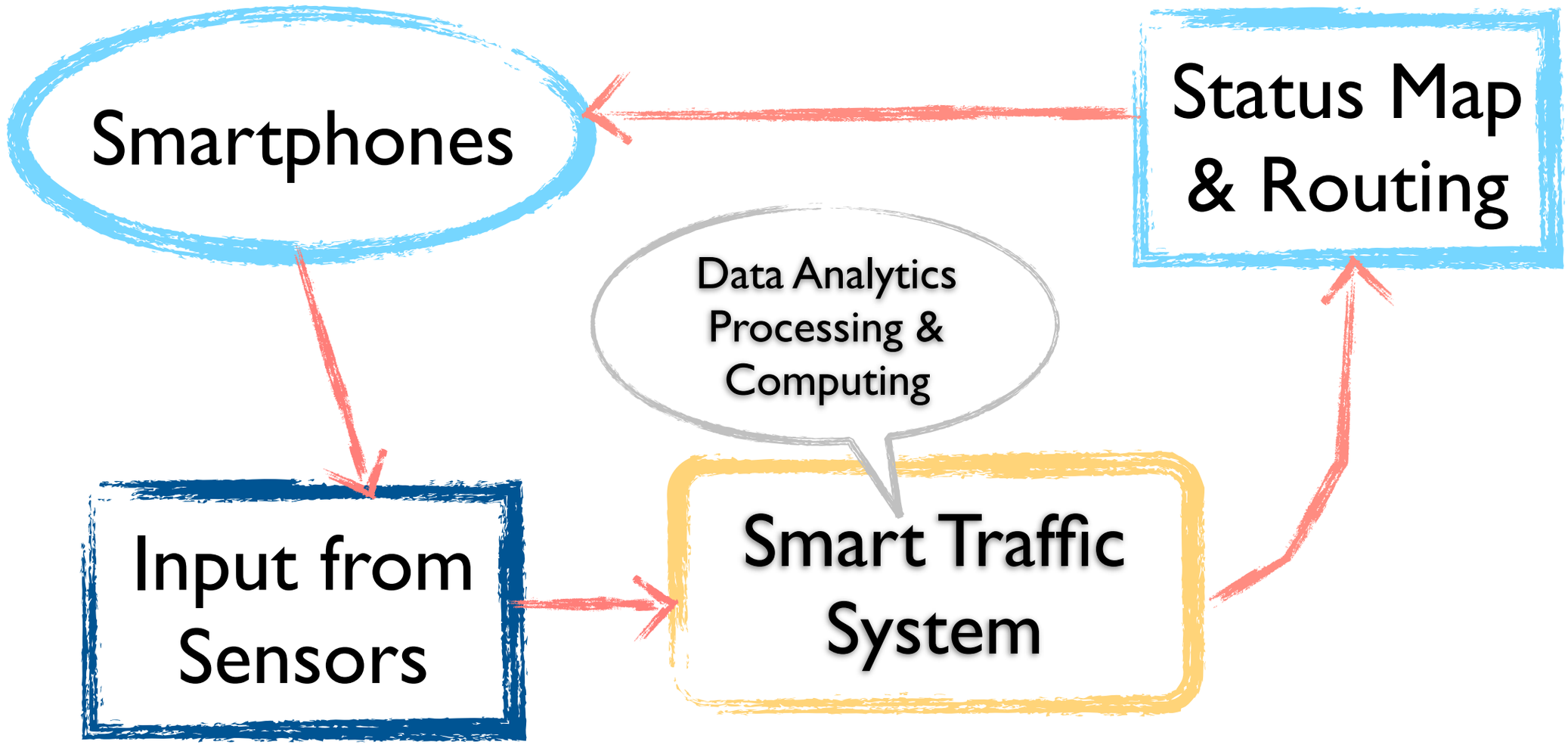


Other goals

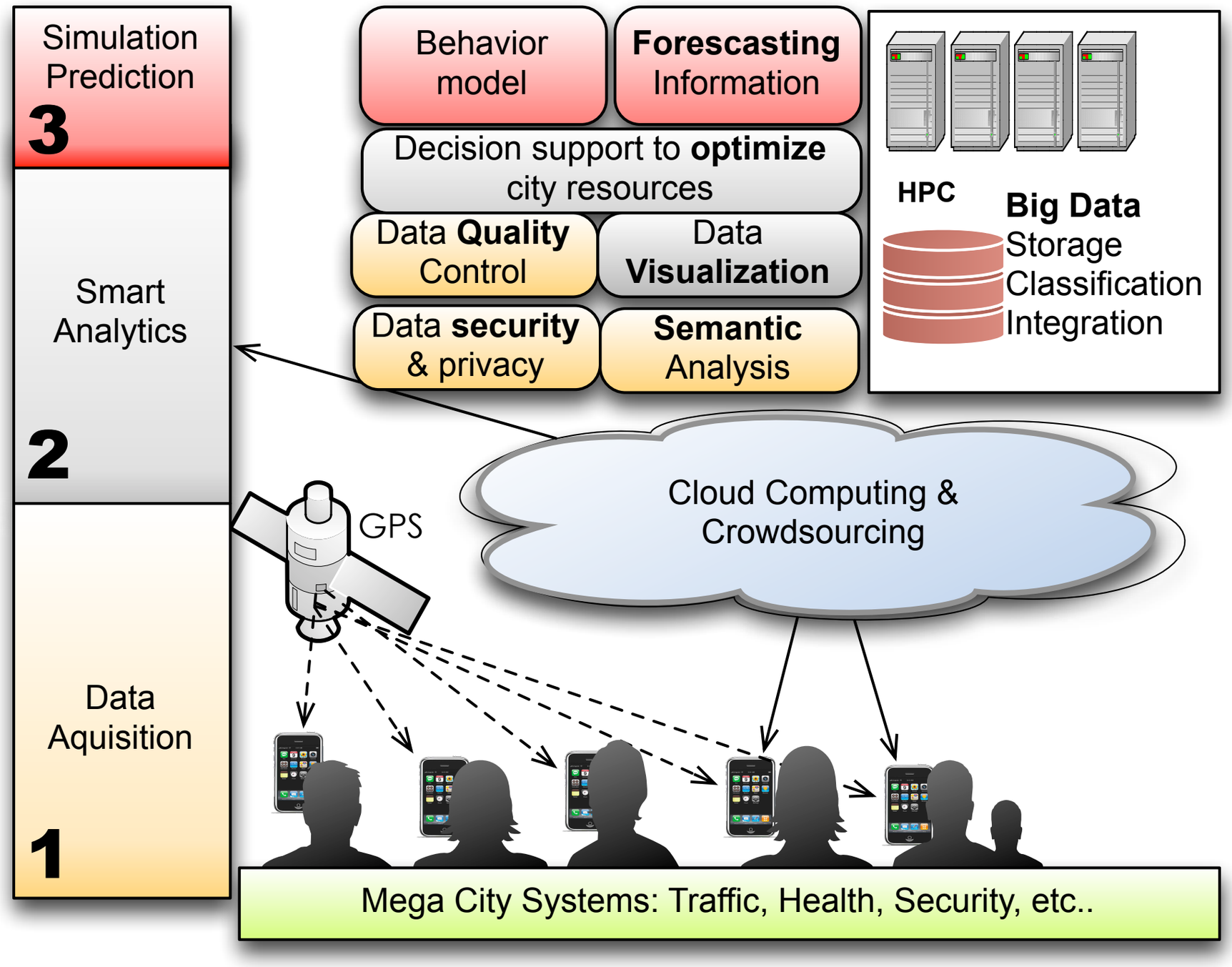
- Develop software applications demanding HPC support
  - Traffic is the first of a set of systems to leverage the economy of the region and to attract new investments
- Prepare a group of skilled professionals to deal with complex projects
- Create, in long term, a world class research center focused on solving complex problems related to cities and industries

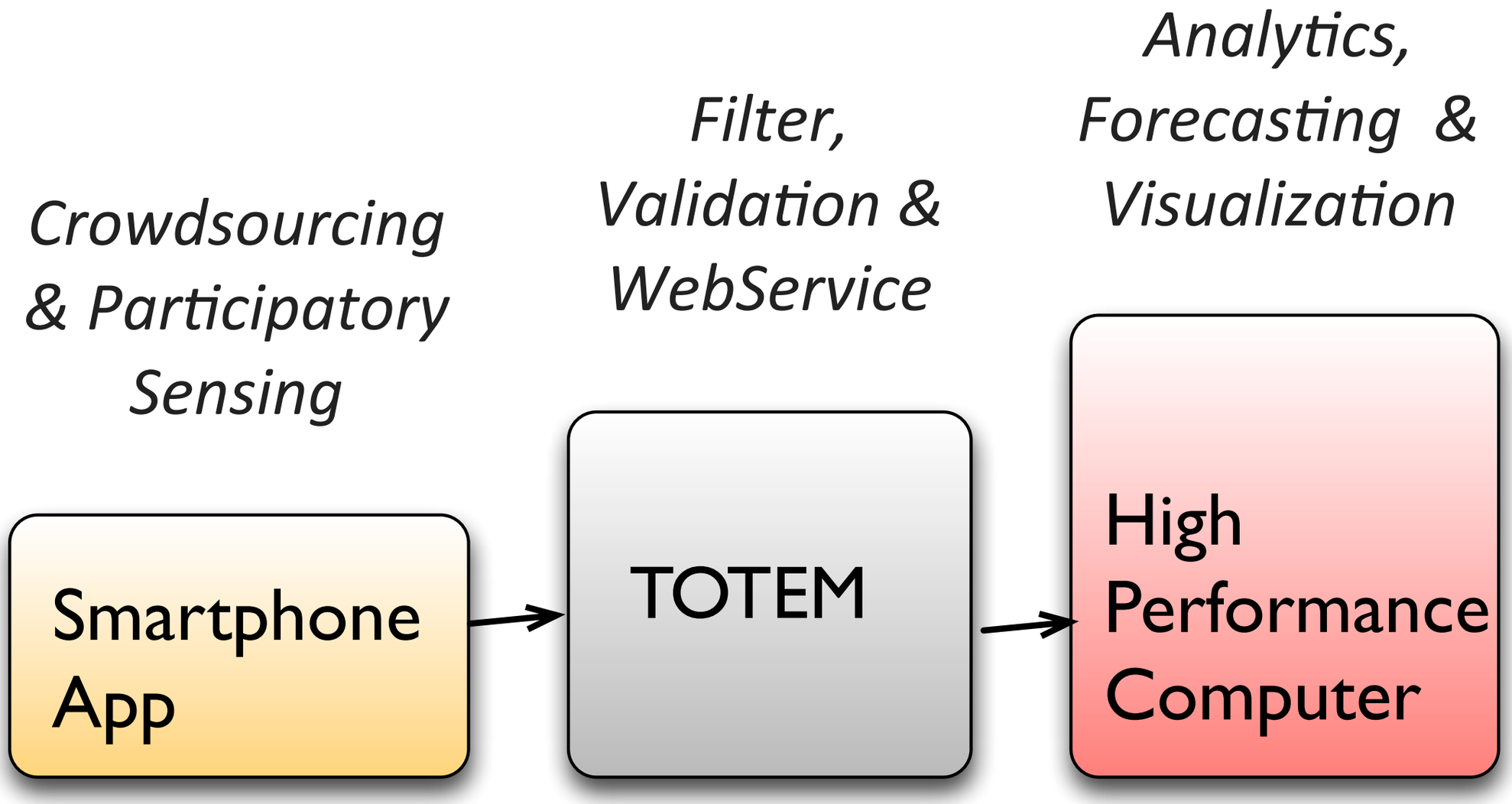
GDL is an excellent platform to test traffic solutions because it scales by 1/4 to Mexico City

Smart Traffic System



Overall Architecture

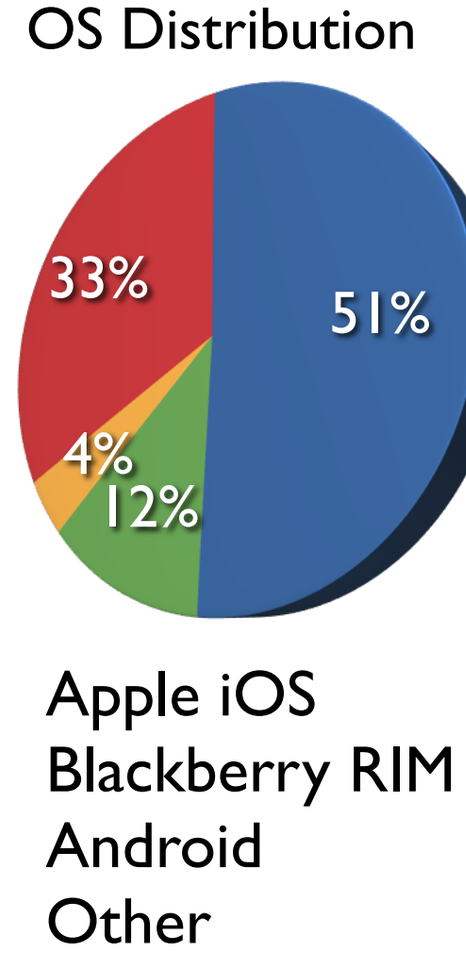




Architecture Components

Smartphones for crowdsourcing feasibility in GDL

	Mexico	Jalisco
Population	112M	7.3M
Mobile phone	83.5M	5.44M
Smartphone	25M	900K



[admob metrics 2010] , [TNS Mobile Life 2011]

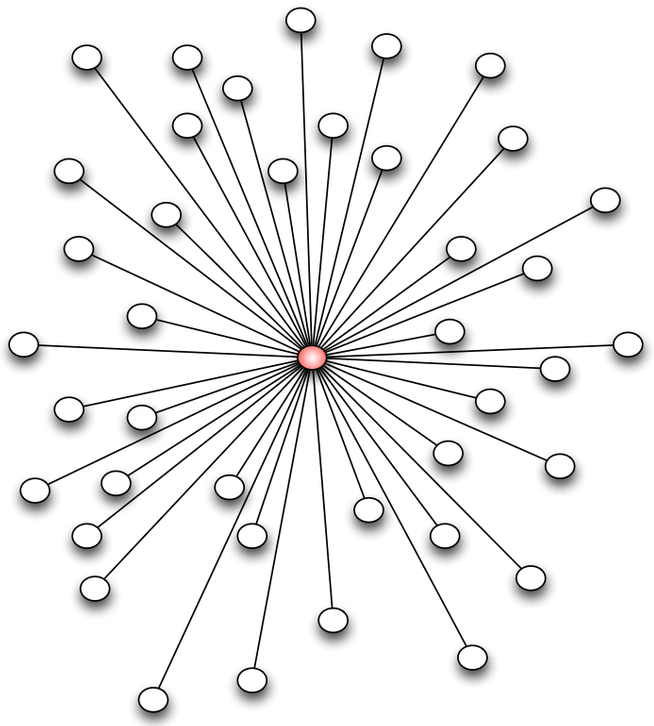
Open questions

In GDL City

- How to interconnect sensors?
- How much data to process for the city?
- What about security and data storage?

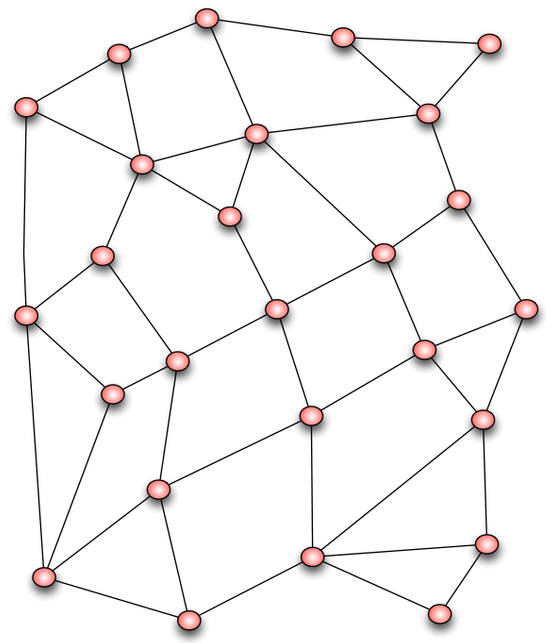
Definitions

Network interconnection



Centralized

Descentralized



Distributed

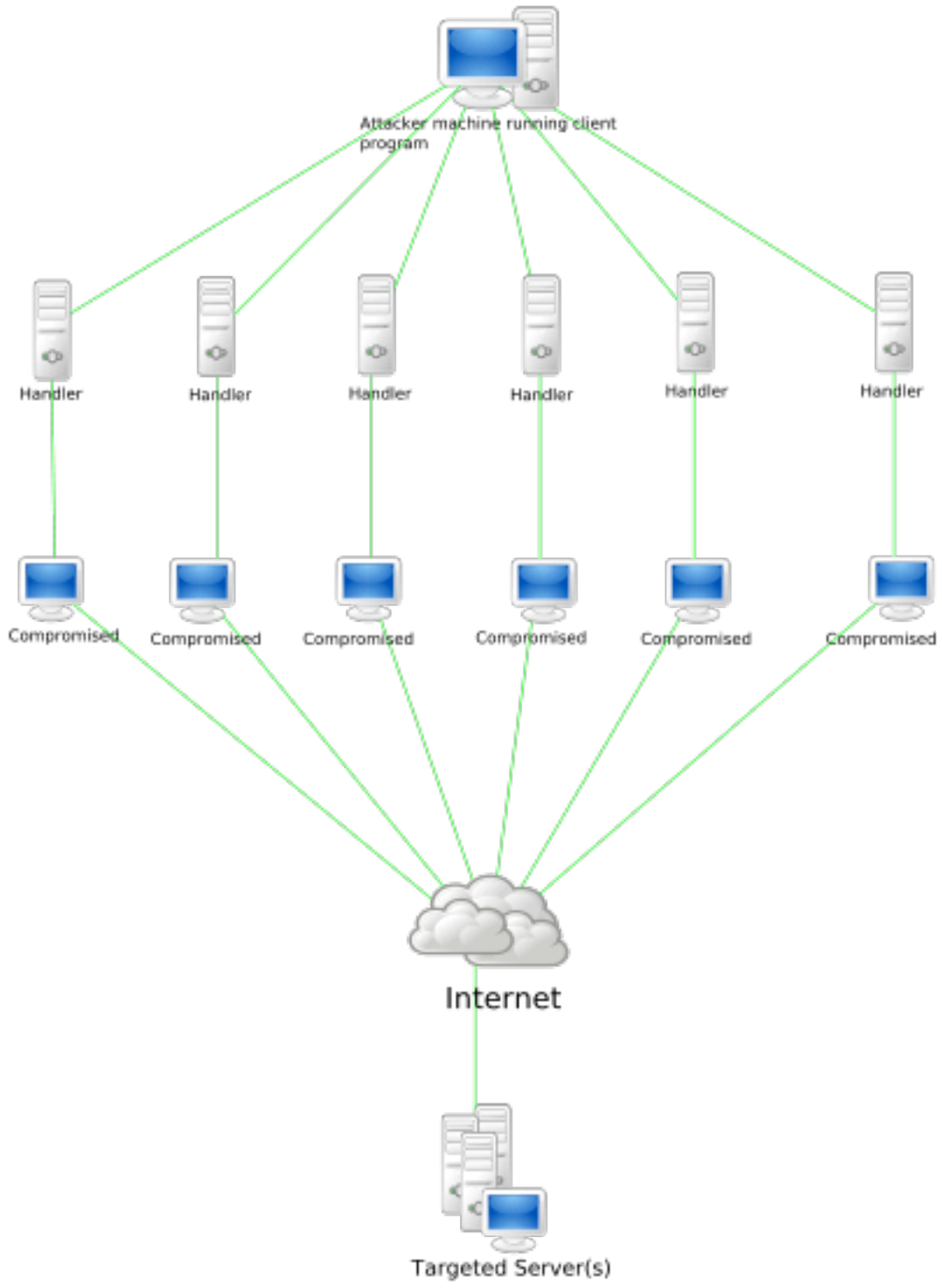
GDL Data input

1.8 PB per year

- 3.8 millions of Cellphones@177 TB/Year in SMS Messages
- 900K Smartphones@1.5TB/Year GPS_Images_Audio_Video_Repports
- 800K Social Network users@500MB/year Facebook-Twitter-Blogs
- 800K Traffic Web Site users@100TB/Year

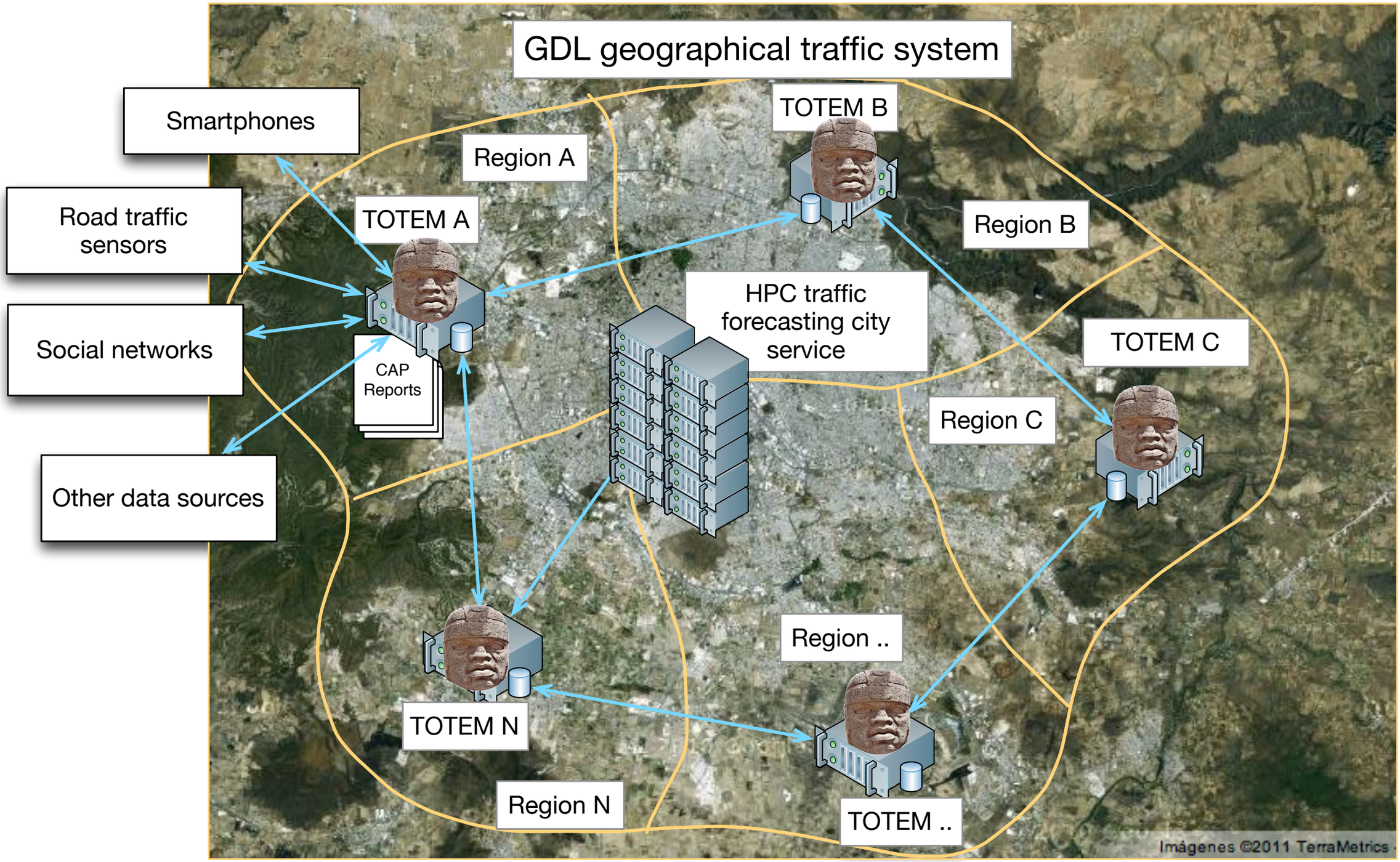
Security Issues

- Sensitive information from users can expose their privacy
- Sniffers can intercept traveling information
- DoS attacks

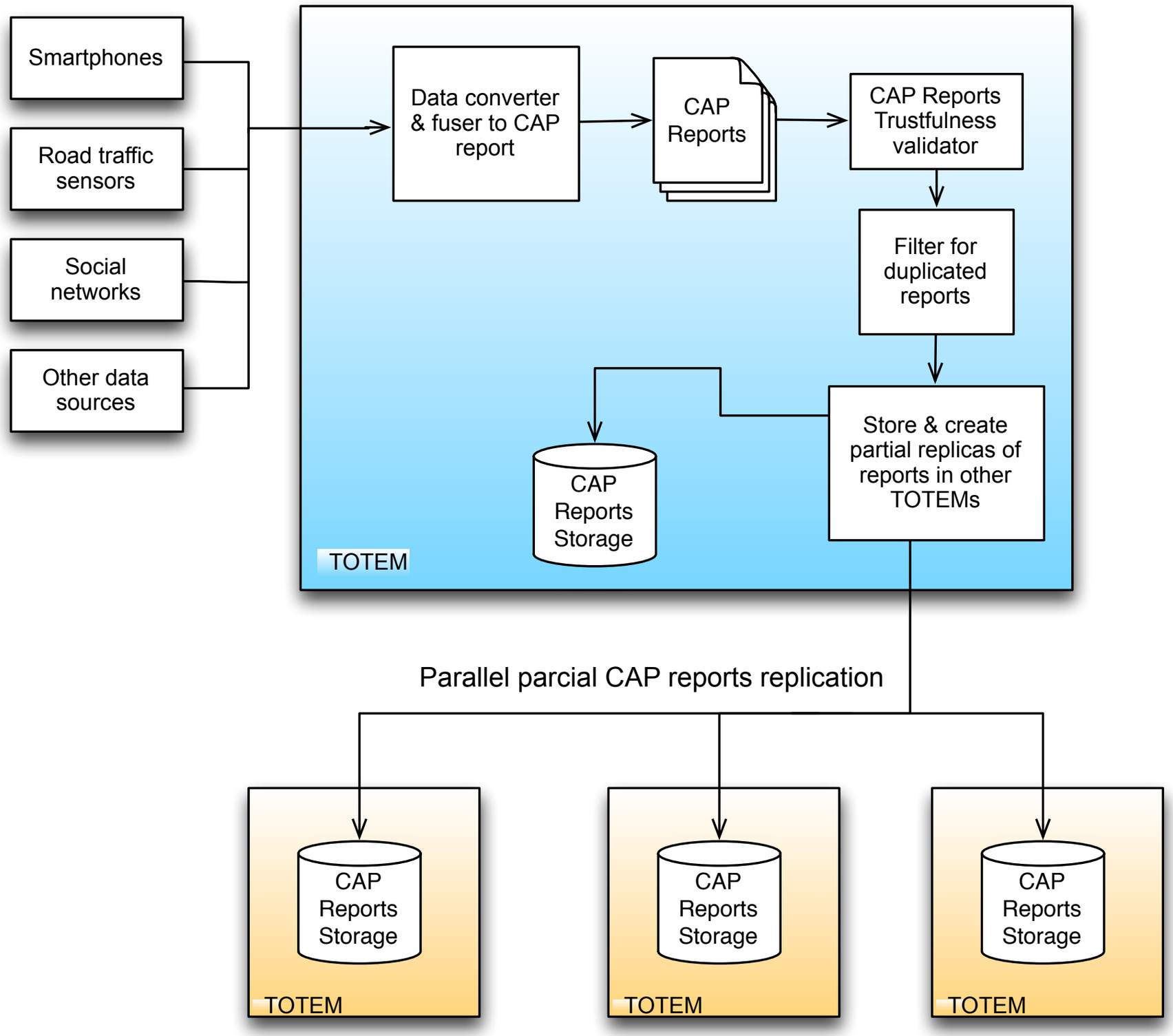


TOTEM Architecture

Talk abOut The statE of Metropolis



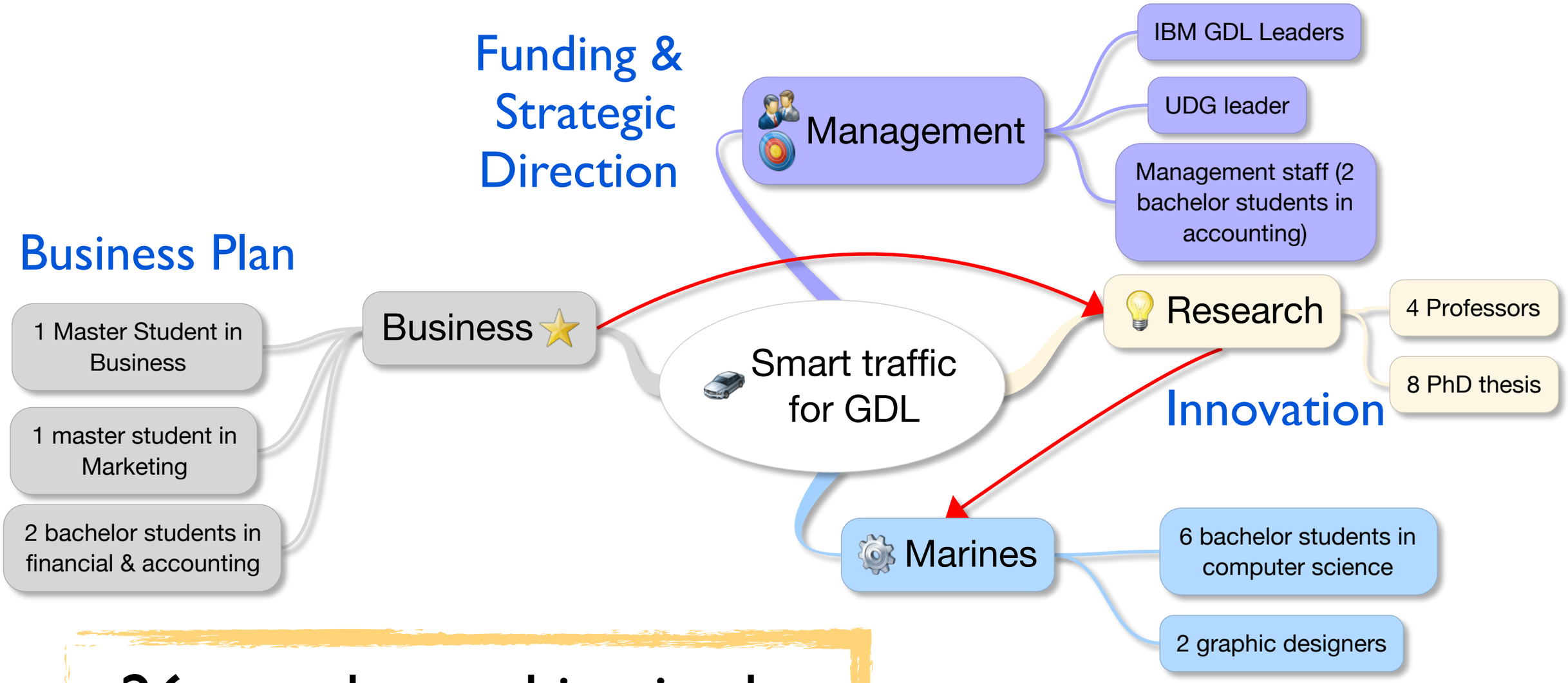
TOTEM distribution by geographical regions



TOTEM Computing

Current achievements

Team organization

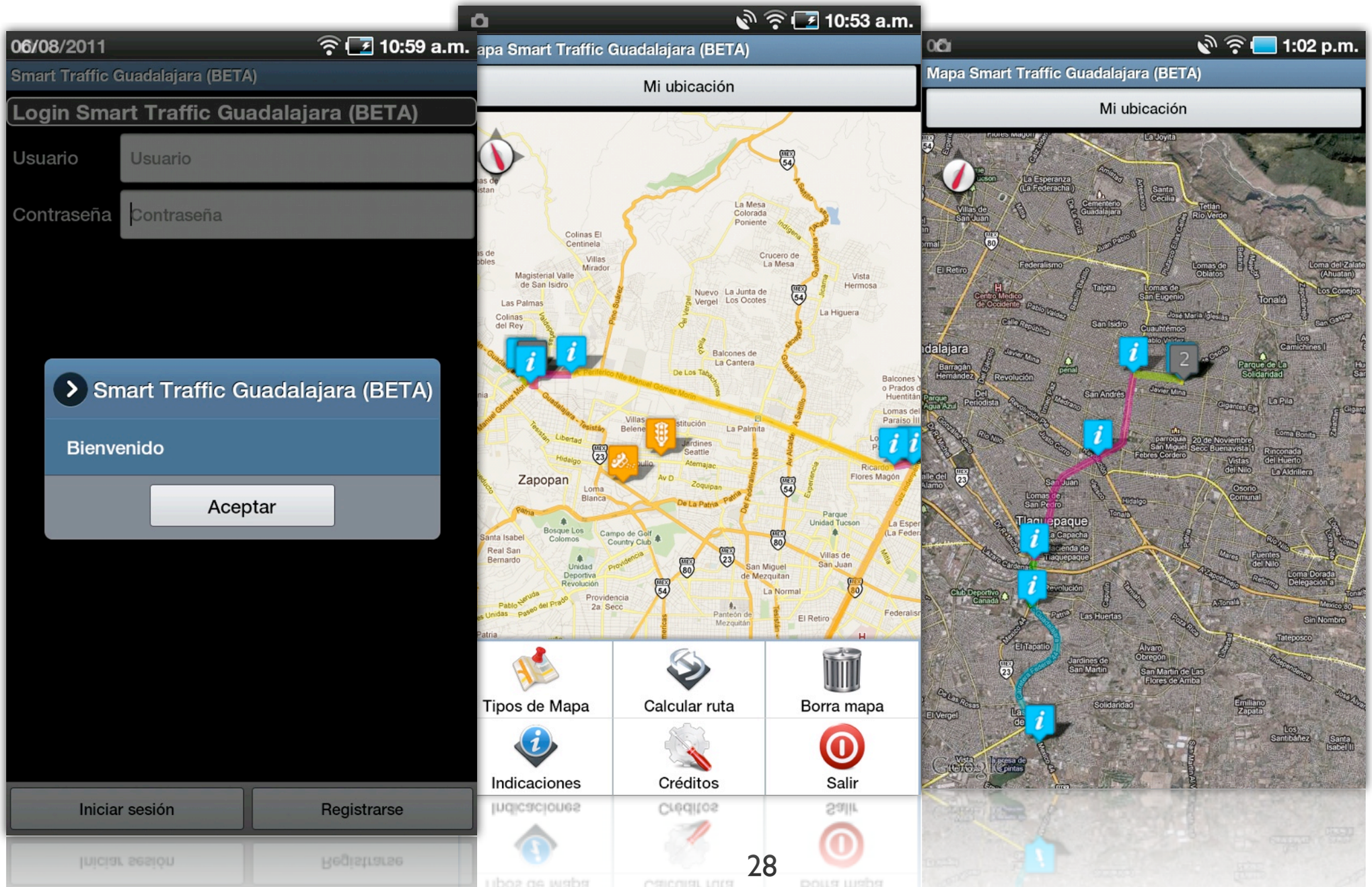


26 people working in the project under SCRUM/ Agile Methodology !

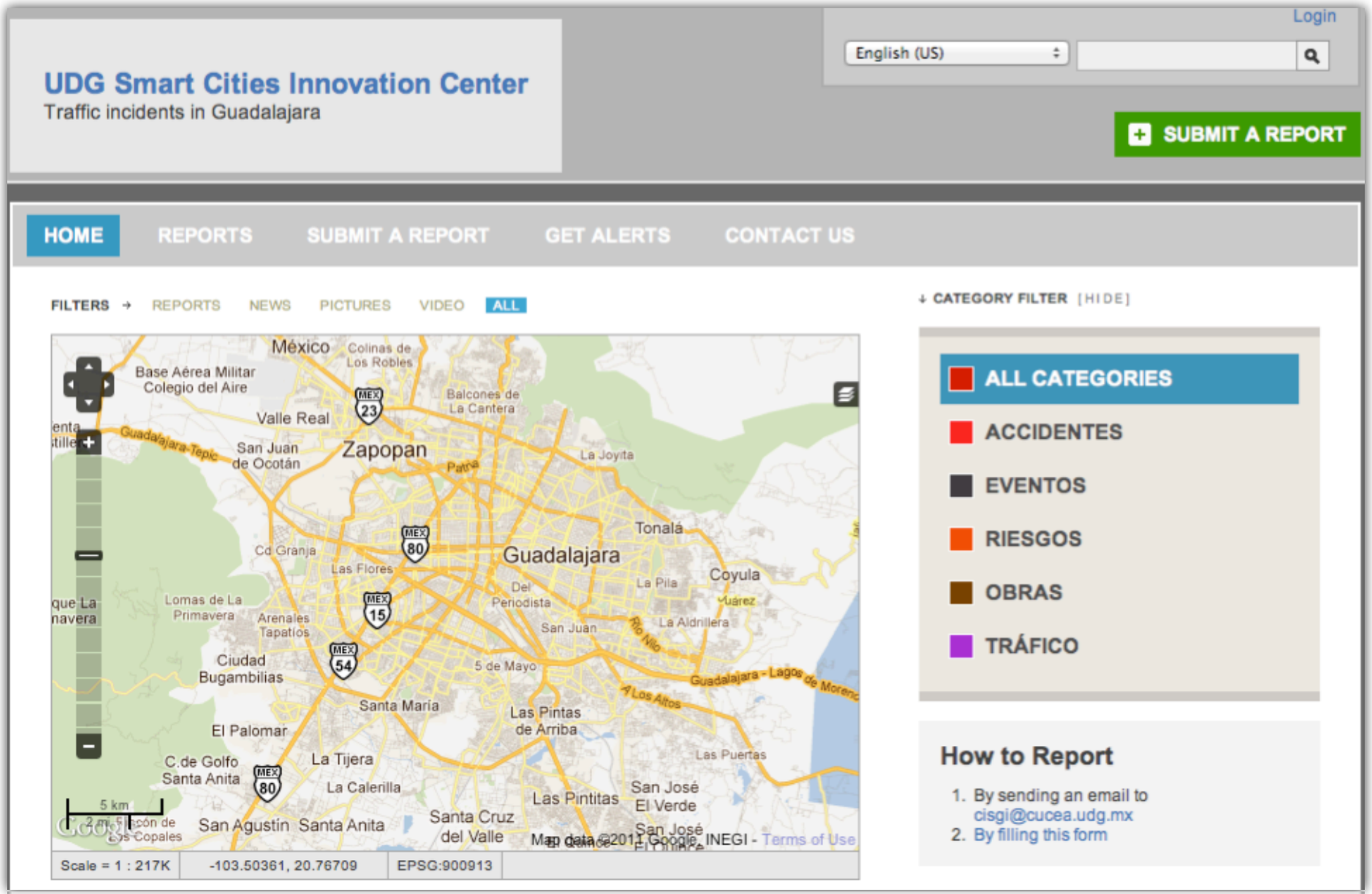
Research Topics

- Big Data
- Data quality & crowdsourcing
- Optimization for path planning
- Semantics for social networks
- Recommendation systems
- Next Generation Networks
- Augmented Virtual Reality
- Flow simulation for transport systems
- Cloud computing & security

First prototype of a mobile App integrating traffic information and route optimization



Web Site for traffic monitoring and forecasting

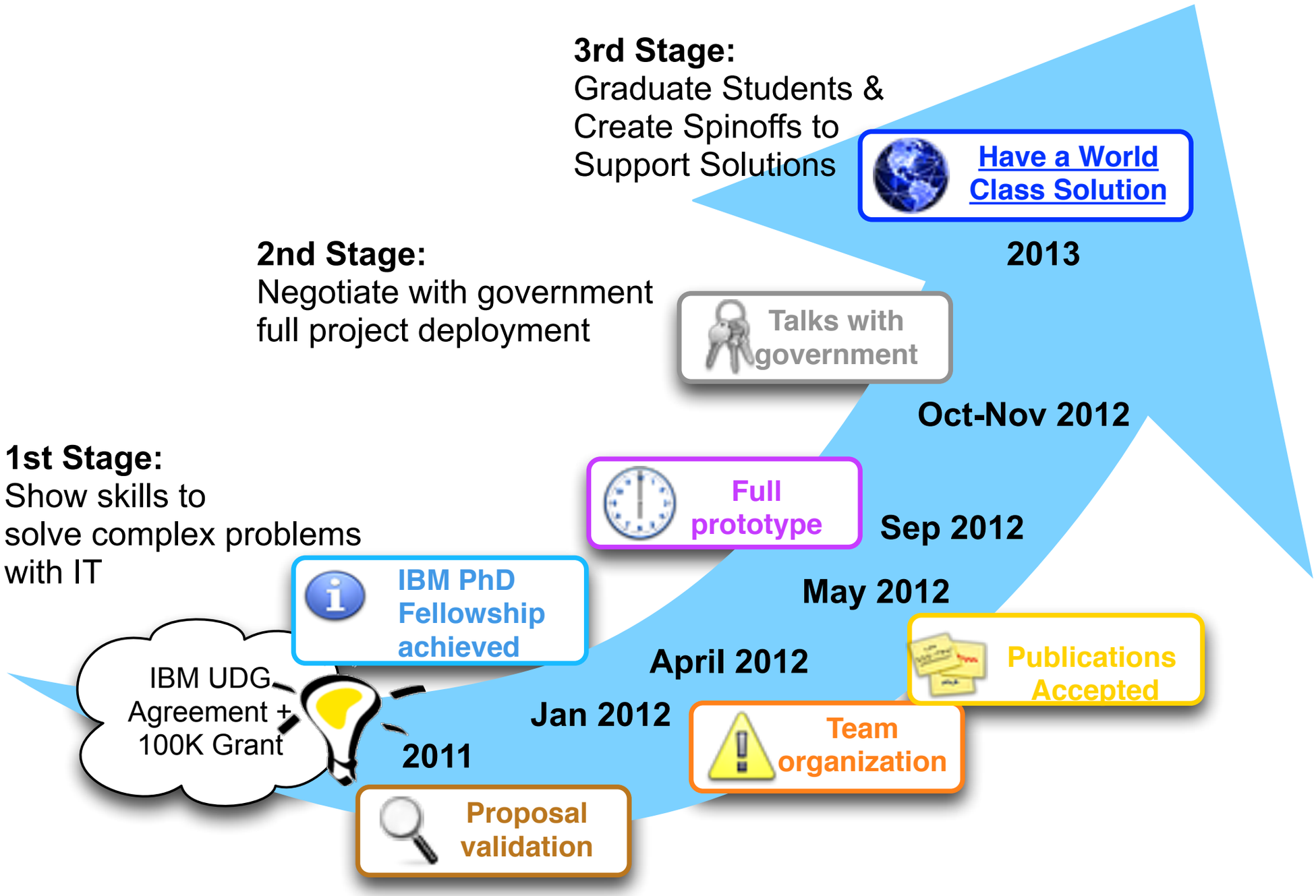


Where we are today?

3rd Stage:
Graduate Students &
Create Spinoffs to
Support Solutions

2nd Stage:
Negotiate with government
full project deployment

1st Stage:
Show skills to
solve complex problems
with IT



Discussion & concluding remarks

Concluding remarks

- The project is in the first stage
- Experience from both academia and industry to excel collaboration
- A group of passionate people dealing with the integration of different subsystems
- Based on the acquired experience we aim to enable a super computing center
- From the resultant traffic system we'll be able to develop IT solutions for other problems in cities

Thank you !