Traffic Performance Measurement Using High-Resolution Data –

Recent Developments on the SMART-Signal System

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Problem: Arterial Traffic Congestion

The Solution: SMART-SIGNAL
(Systematic Monitoring of Arterial Road Traffic Signals)

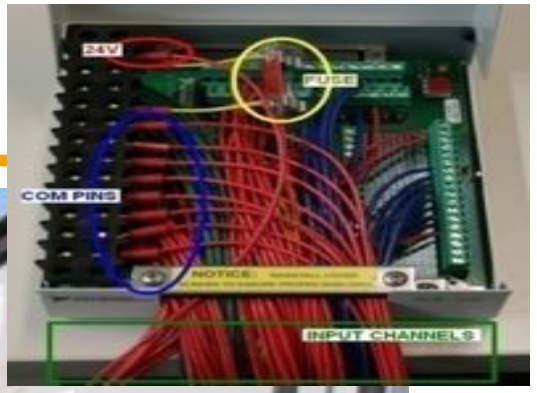
- An automatic and continuous data collection system from existing traffic signals
- A performance measurement system for intersection queue length and arterial travel time, especially under congested traffic conditions
- A performance tuning system for optimization of traffic signal parameters

Technology Innovations

- **It provides solutions to two long-standing traffic engineering problems:**
  - **how to measure intersection queue length when the vehicular queue spills over to the detector location, and**
  - **how to estimate arterial travel time reliably.**
- **The two algorithms to solve the above problems are patent-pending.**

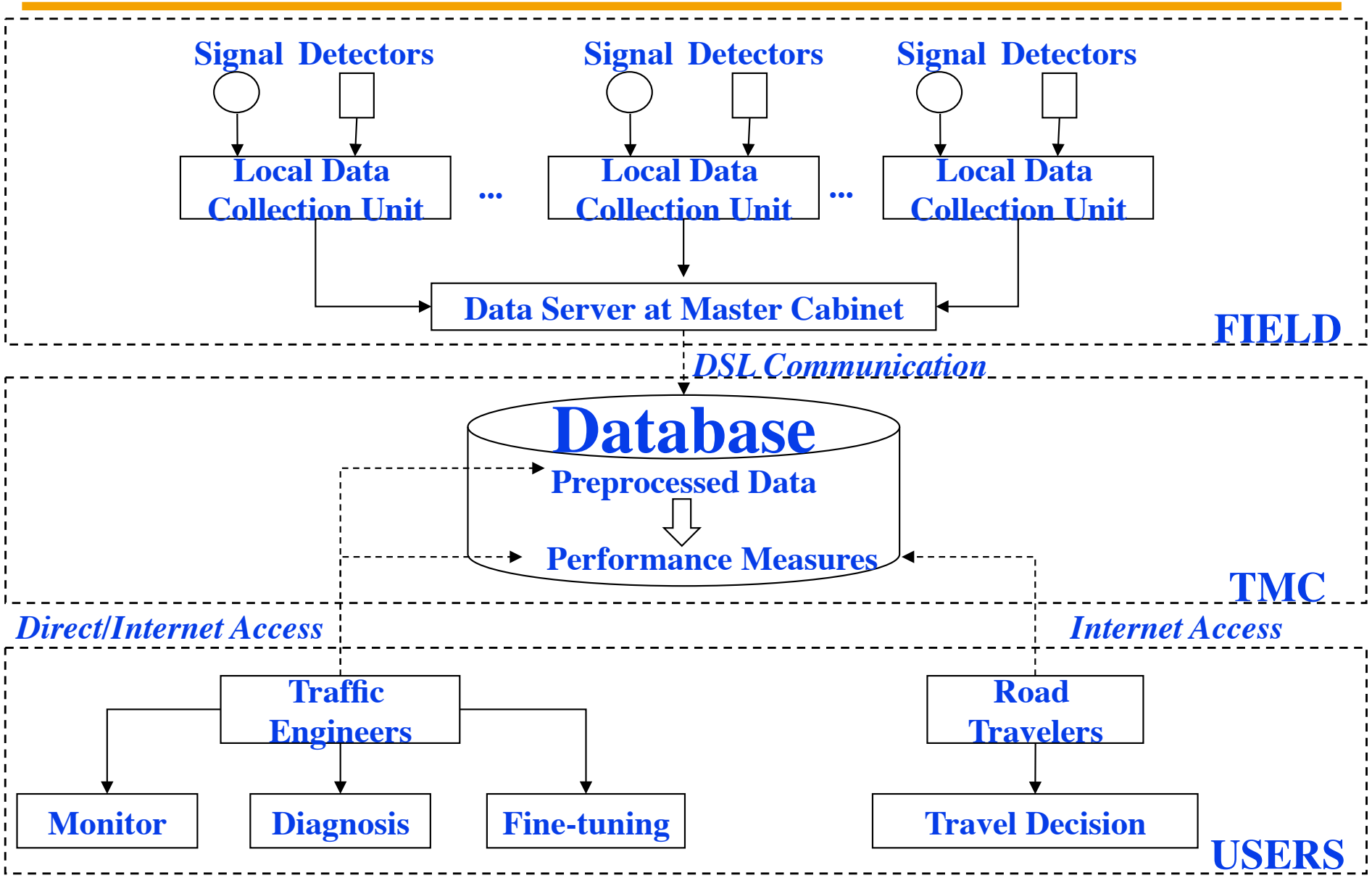
Data Collection

Terminal Box



DAC

SMART-SIGNAL System Architecture



SMART-SIGNAL Implementation Sites

- 11 intersections on France Ave. in Bloomington (March 07 – June 09)
- 6 intersections on TH55 in Golden Valley (Feb. 08 – Sept. 09)
- 3 intersections on PCD in Eden Prairie (Current)
- 6 intersections in the City of Pasadena, California (Iteris, Current)
- 14 intersections on TH13 (Fall 2011, Expected)
- 16 intersections on TH55 (Fall 2011, Expected)

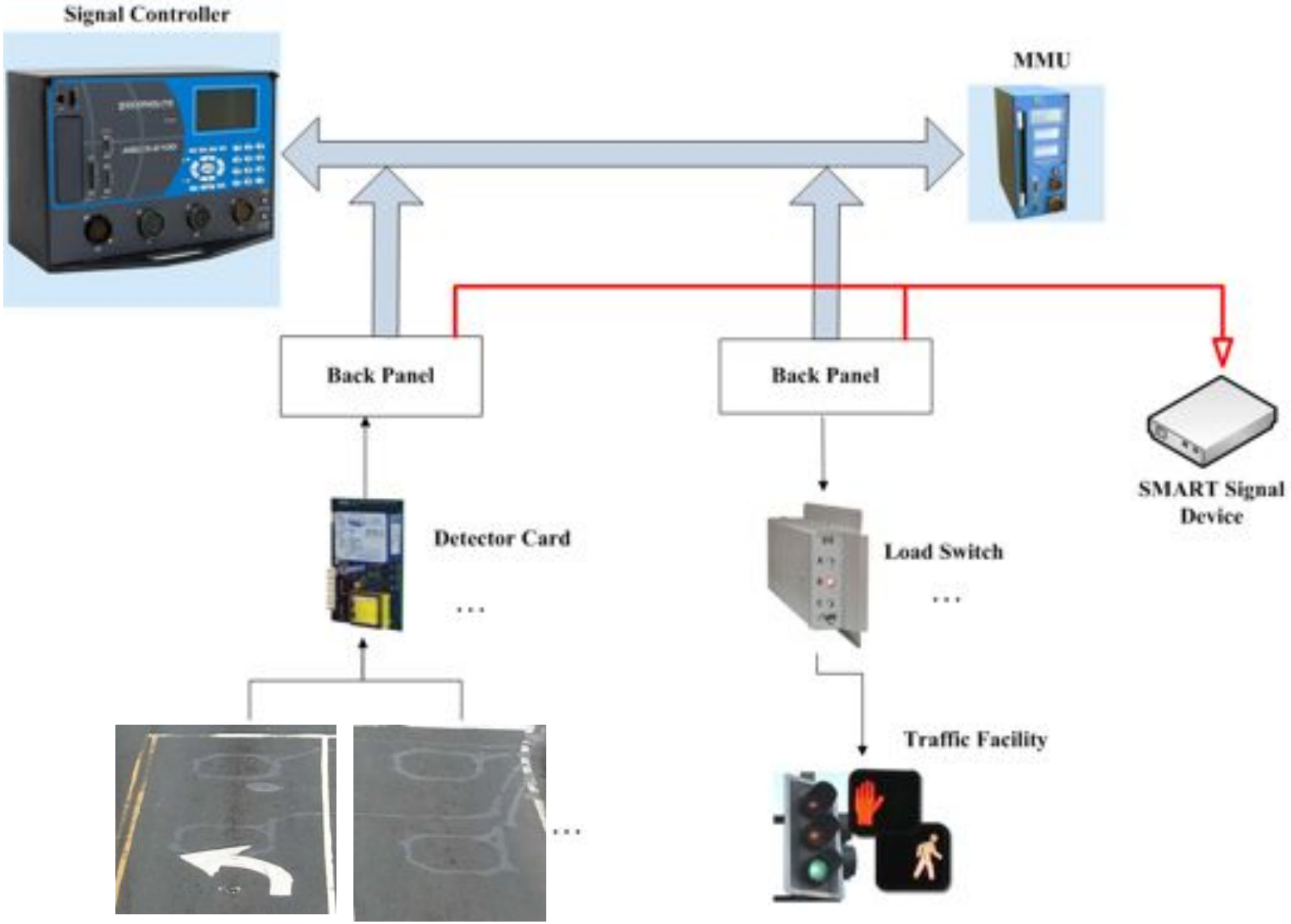
Recent Developments

- **Expanding System Functionality**
  - **New algorithms are being developed**
- **Developing New Data Collection Hardware**
  - **Mainly for the TS-2 Cabinets**
- **Developing An Integrated Web Portal**
  - **www.signal.umn.edu**
- **Technology Transfer**

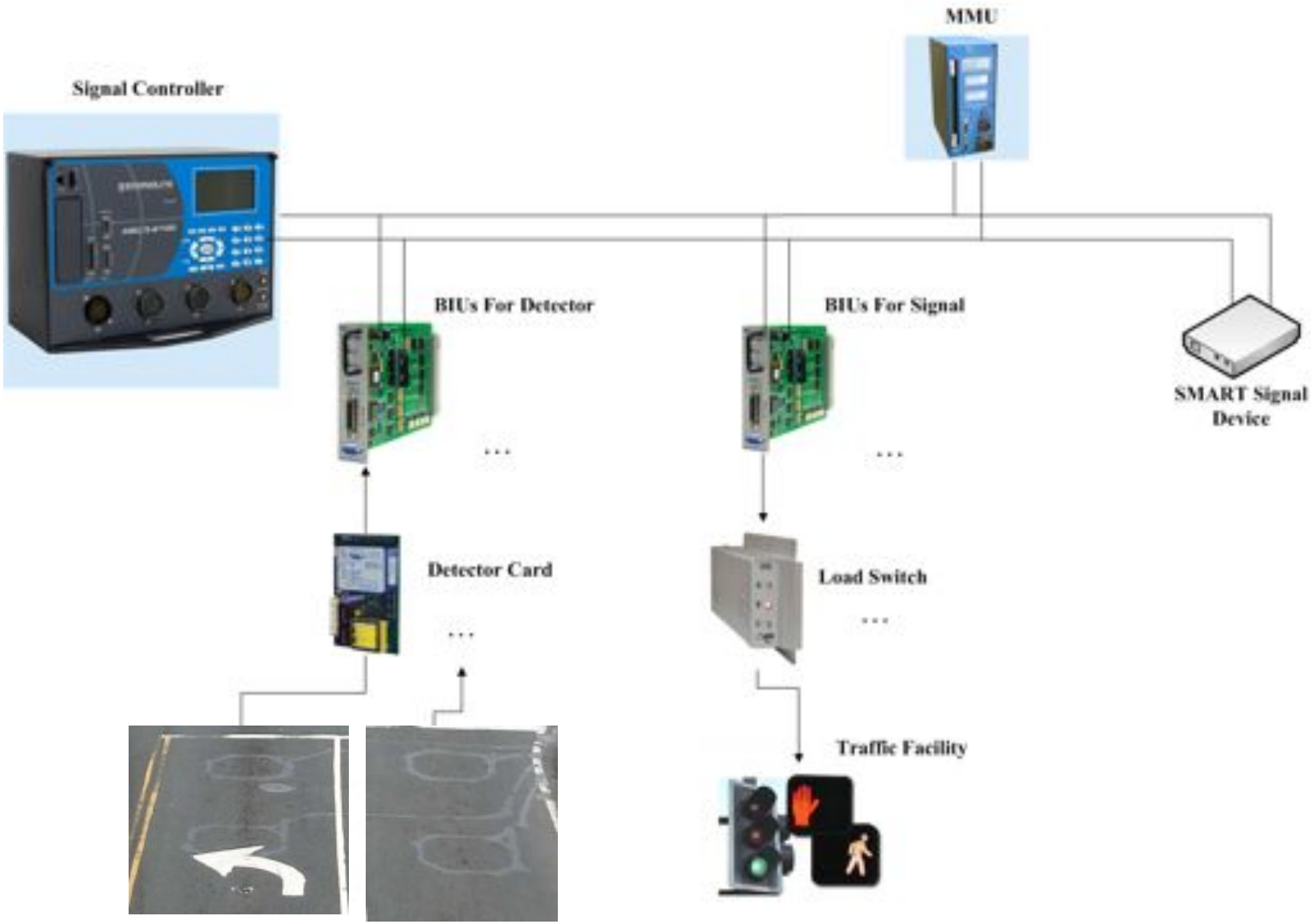
Algorithms Under Development

- **Vehicle classification / speed estimation**
  - **Both arterial and freeway applications**
- **Integrated Corridor Management (ICM)**
  - **Balancing freeway and arterial traffic**
- **Queue length / travel time prediction**
  - **Stochasticity of Arterial Traffic Flow**
- **Fine-tuning signal timing parameters**
  - **Offsets, Green Splits, "Break Points" for time of day …**

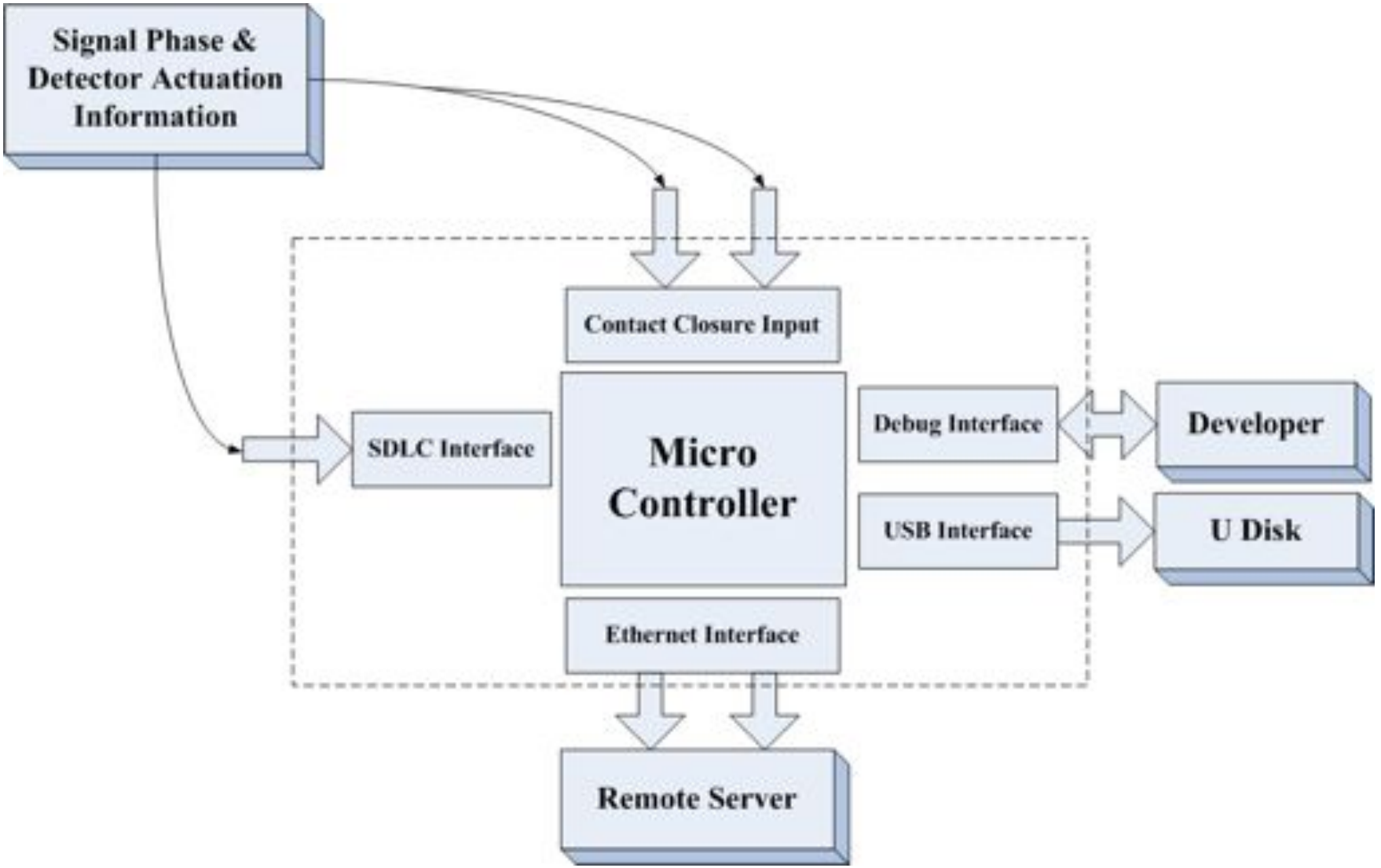
Data Collection in TS1 Cabinet

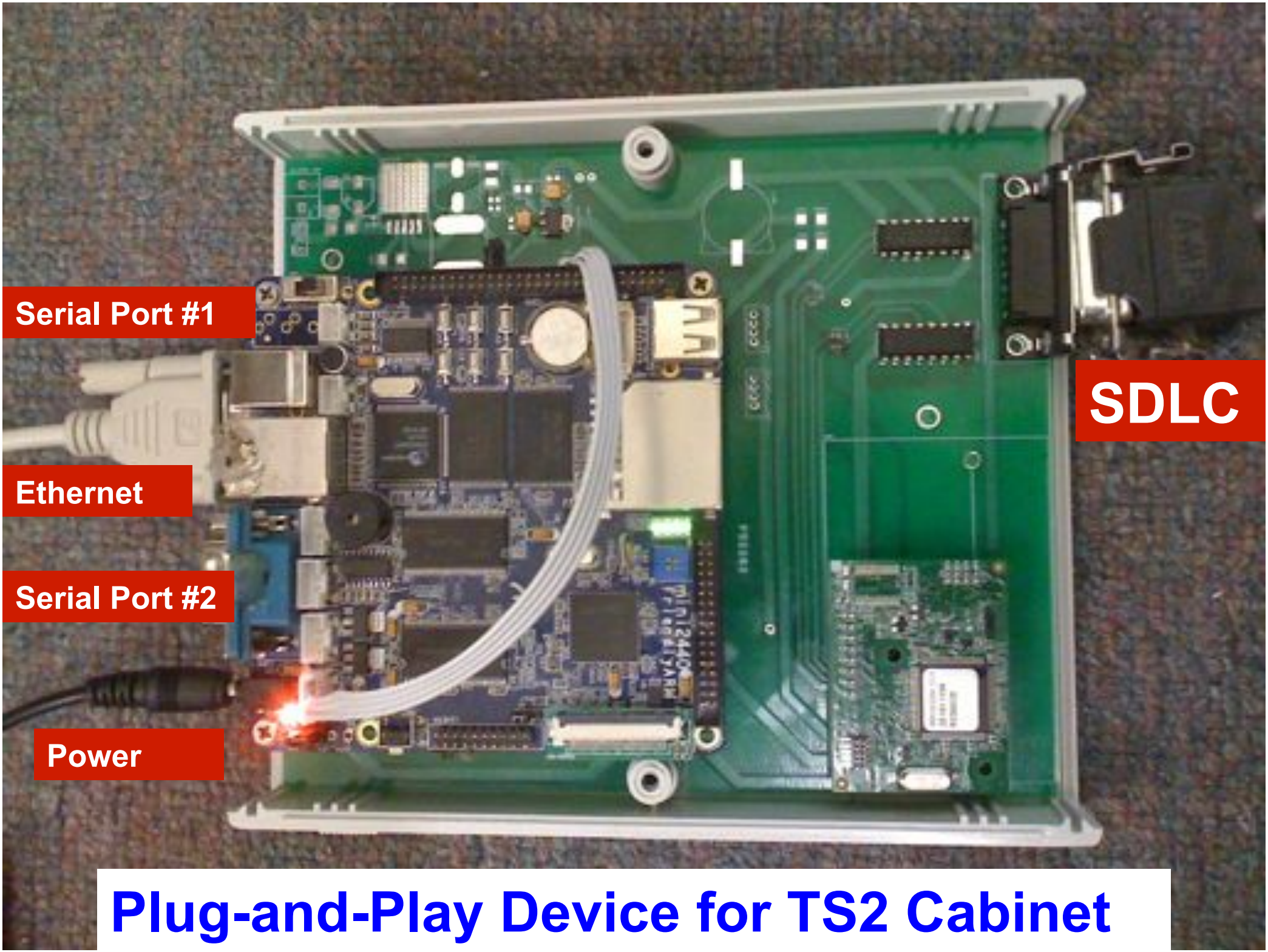


Data Collection in TS2 Cabinet



Hardware Design-Block Diagram



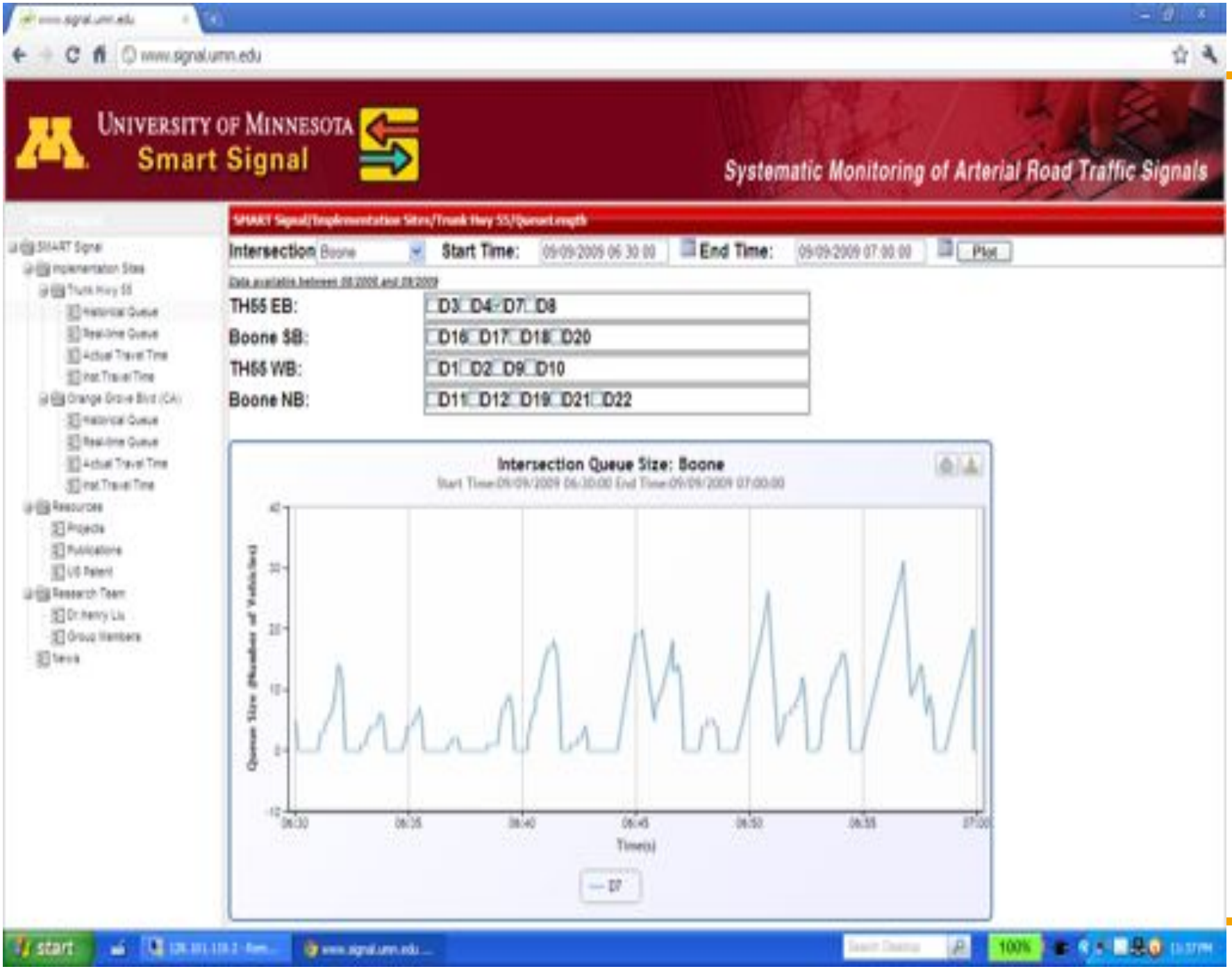


Plug-and-Play Device for TS2 Cabinet

Field Implementation

- **Four Simple Steps:**
  1. Plug in SDLC Port.
  2. Plug in power adapter.
  3. Plug in Ethernet connection.
  4. Turn on the power.
- **To debug in the field:**
  1. Connect your laptop with the device using the Serial Port.
  2. Log into the field device using the Linux system.

http://signal.umn.edu



Technology Transfer

- **Licensed to Iteris, Inc. for technology demonstration in the City of Pasadena**
- **In discussion with the University's OTC for a start-up company to commercialize the technology**

Lessons Learned from SMART-SIGNAL

- Although traffic is traditionally modeled as “continuous flow”, traffic, after all, is discrete.
- Measuring traffic flow parameters using the data collected at the individual vehicle level
- Don’t aggregate data before useful information being derived
- Technological advances support such data collection at affordable prices

Acknowledgements