

Smart Traffic: A Case Study for Developing IoT Applications in Vietnam

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Outline

- Introduction: Smart Traffic at HCMUT
- Opportunities and Challenges
- Solutions
- Future work
- Conclusion

Introduction

- Transportation development does not keep up with economic and population growth.
 - HCMC in 2015:
 - > 8 million people
 - > 7 million motorbikes
- Traffic congestion becomes a major concern.
 - Traffic in HCMC:
 - No. vehicles increases ~10%/year
 - Street capacity increases ~2%/year



Existing Solutions



Building temporarily
steel bridges



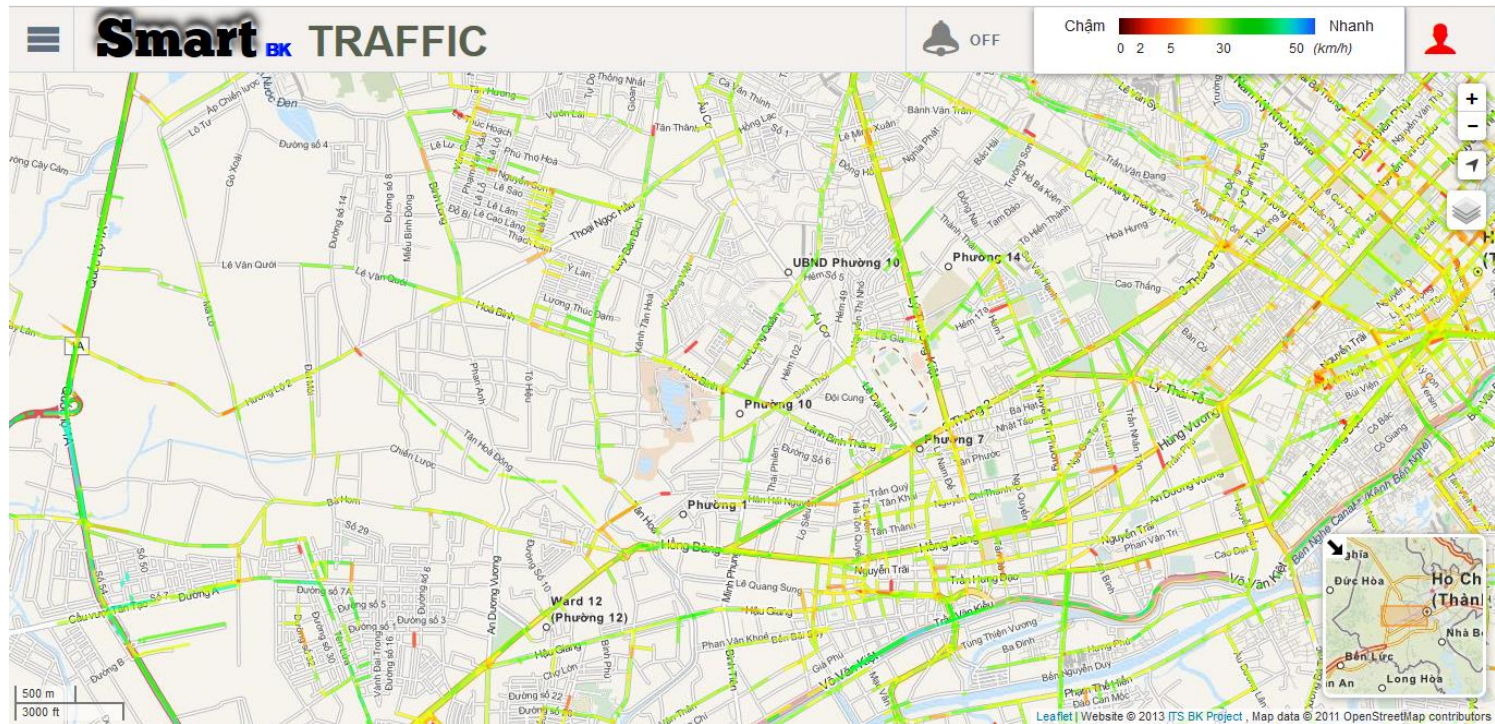
Broadcasting traffic condition
via Radio



Installing surveillance
cameras

Smart Traffic at HCMUT

<http://traffic.hcmut.edu.vn/>



Opportunities

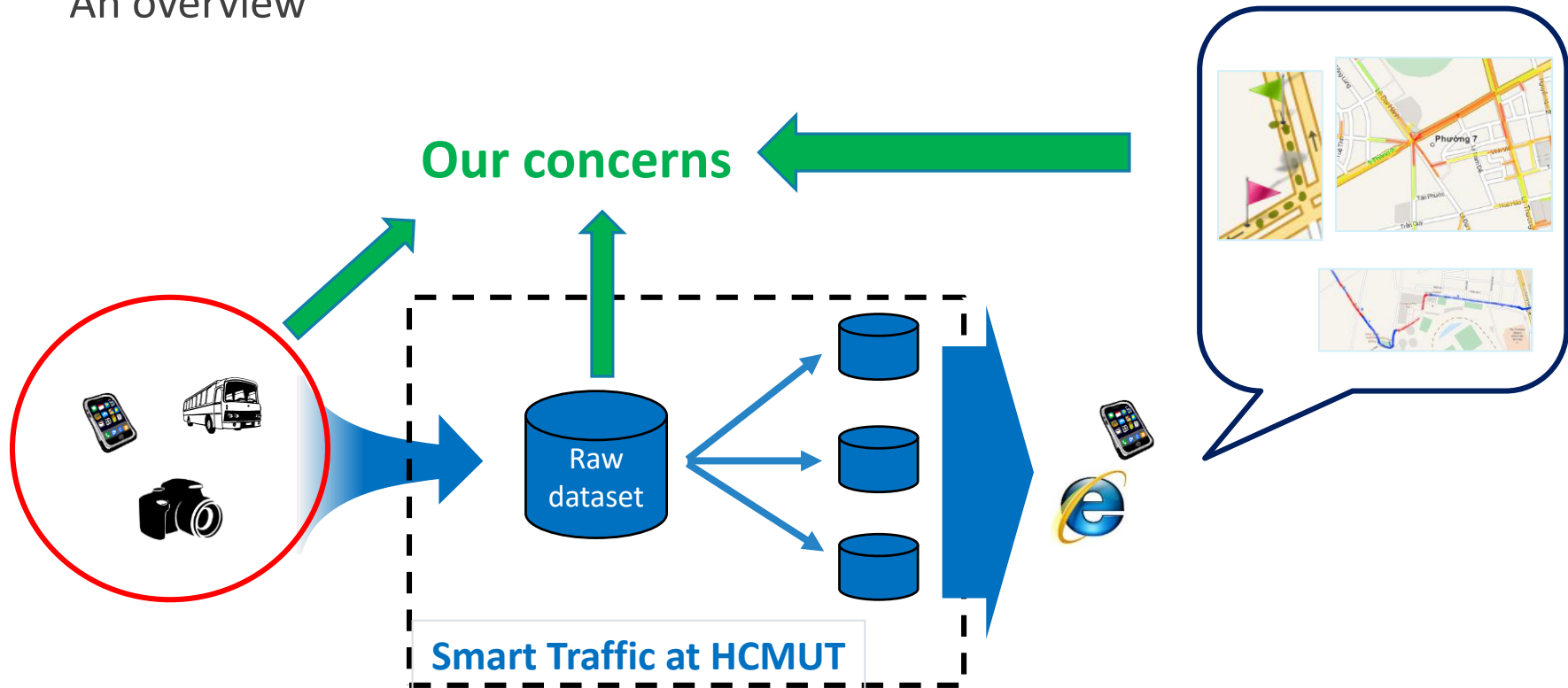
- Management point of view
 - Receive a lot of support and motivation from different management levels of the city.
 - Have access to sensing data.
 - Calculation results are tested and used in realistic conditions.
- Technical point of view
 - Applications of IoT and ITS technologies are still new in Vietnam
 - Transportation in Vietnam has some unique characteristics
 - A lot of rooms for new applications and research ideas

Challenges

- High volume of data
 - Sensing data are collected continuously from multiple sources.
 - High sample rate is required to deliver high accuracy calculations
- Real-time processing
 - Required for instant actions
 - Strict deadline
- Unreliable network infrastructure
 - Long delays
 - Packet losses

Smart Traffic at HCMUT

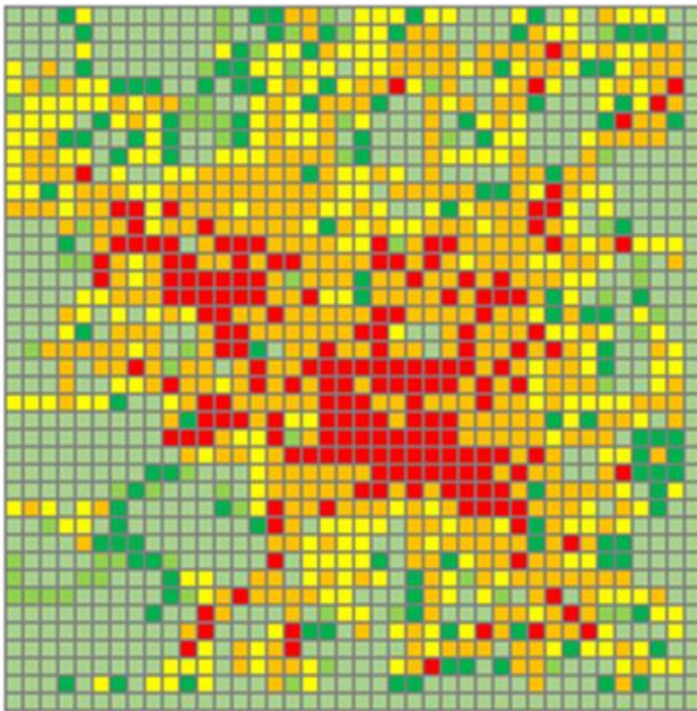
An overview



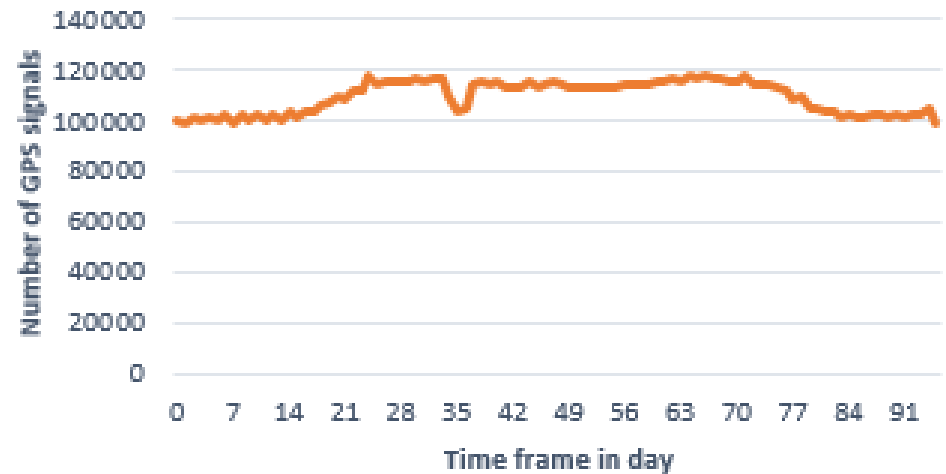
Real-time Processing

- Challenges
 - Huge data, short deadline
 - Continuous processing
- Solutions for Smart Traffic
 - Parallelization is the key
 - Develop a high performance storage system for quickly putting and getting records

Characteristics of Sensing Data

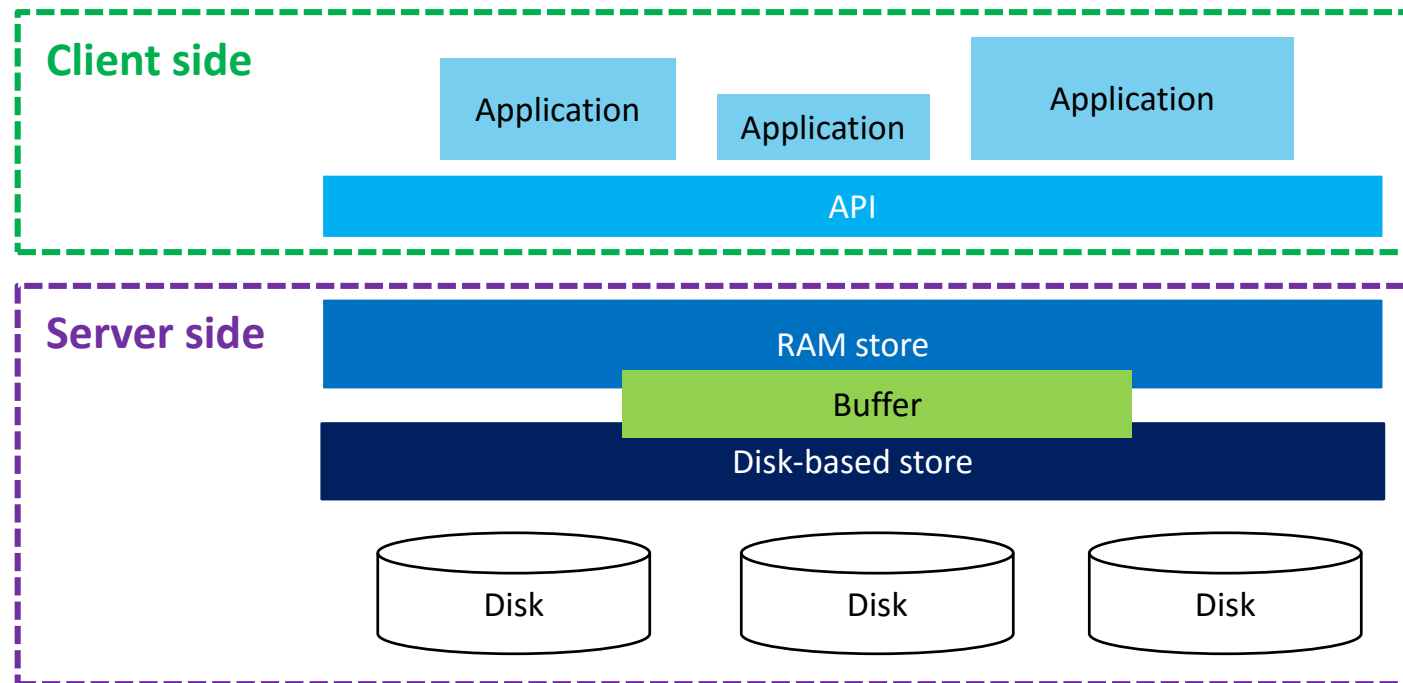


Spatial distribution



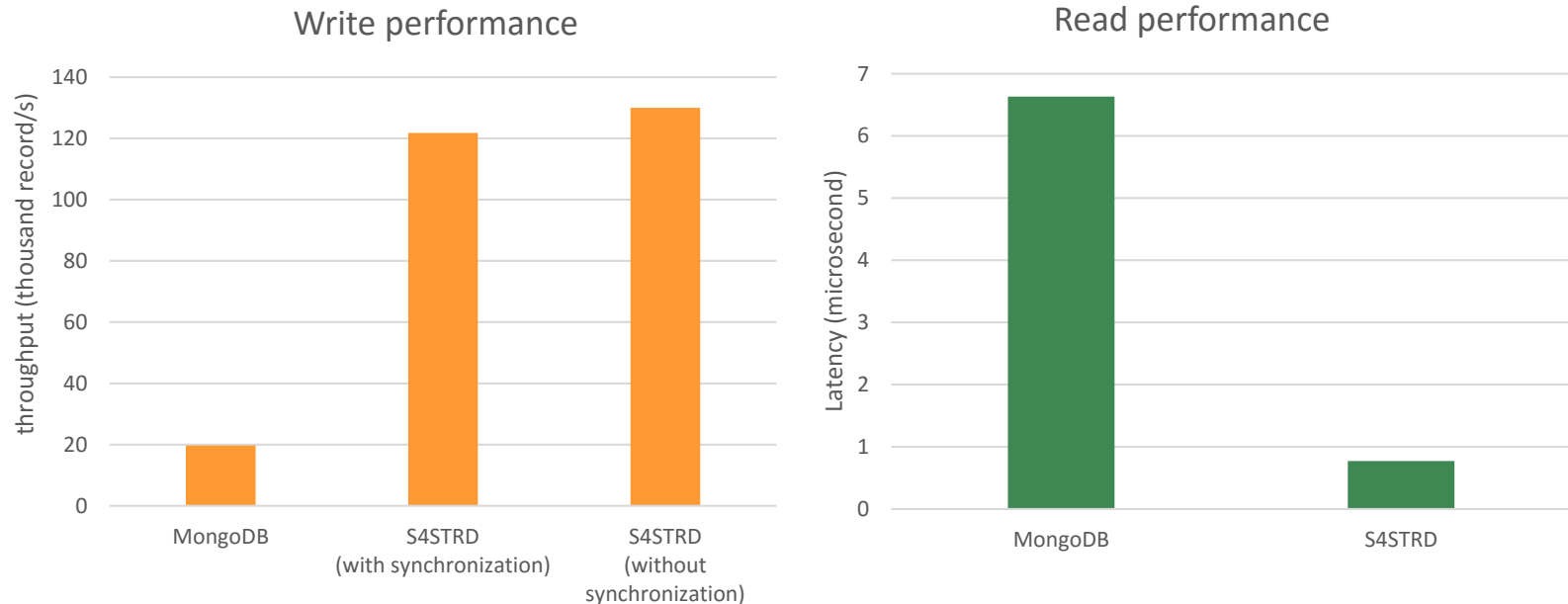
Temporal distribution

S4STRD Architecture



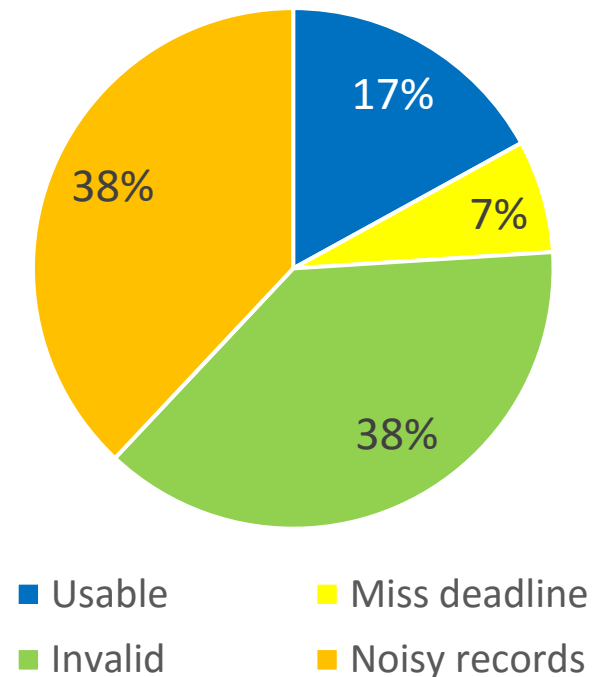
S4STRD Performance

Results from experiments on a cluster of three machines connected by Ethernet 1 Gbps



Other Challenges

- Low data utilization
 - Usable data account for < 17%
- How to evaluate computation results
 - Multiple data sources with different confident factors
- Need for a standard measurement that we can trust



Future Work

- Improve data utilization
 - Correction algorithms
 - Filter, fusion modules
- Develop a method to evaluate our estimation
 - Multiple data source with different confident factors
 - Decision making problems
 - Need for a standard measurement that we can trust
- Expand the system:
 - Real-time routing finding
 - Integrate into social networks

Conclusions

- Smart Traffic
 - Involves moving sensing devices, different types of networking infrastructure
 - Big and real-time data analytics
 - Aim at a very large community
- Our contributions
 - Give insight into development of IoT applications in Vietnam
 - Solutions can be reused in other similar applications

The End

Thanks for listening.