Mobile Crowdsensing and its Application to Smart Cities

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User rewarding in Mobile Crowdsensing Systems

- How to incentivize citizens to join MCS campaigns
- MCS systems require a large participation of users to be effective
- Develop smart contracts which run on distributed payment platforms
- Design user rewarding schemes depending on the campaign
Mobile Crowdsensing

- Appealing paradigm for sensing and collecting data
  - Monitoring phenomena in smart cities
- Sensing as a Service ($S^2$aaS) business model
- Sensors commonly available in mobile and IoT devices

Figure: Diffusion of mobile devices
Mobile Crowdsensing

- Appealing paradigm for sensing and collecting data
  - Monitoring phenomena in smart cities
- Sensing as a Service ($S^2$aaS) business model
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Figure: Diffusion of mobile devices
Mobile Crowdsensing Scenario

S²aaS Cloud Collector

Crowd

IoT Devices

Accelerometer Gyroscope Microphone Dual Camera Temperature

WiFi Data LTE
Energy-efficient MCS Systems

- Android application to emulate data reporting mechanisms
- Data delivery through Eduroam WiFi network
- Energy measurements with Power Monitor
- Network-related measurements with Wireshark
CrowdSensim

- Custom simulator for crowdsensing activities
- Performance evaluation in realistic urban environments

(a) Independent modules  (b) City scenario  (c) Heatmap

Access and download: http://crowdsensim.gforge.uni.lu
User Rewarding in MCS Systems

Cloud collector

Campaign organizer

Task allocation

User selection

User contribution and rewarding

Selected user

Recruited user

Citizens

WiFi

4G Cellular data
Distributed Payment Platforms

- Citizens may be reluctant in joining a campaign
- Reward users through micro-payments
- Distributed payment platforms based on custom built blockchains assume a fundamental role
- Develop smart contracts which run on distributed payment platforms
- Smart contracts follow rewarding schemes
  - Amount of data
  - Quality of Information (QoI)
  - Energy consumption
Conclusion

Energy-efficient MCS systems

- Development of a cost-effective data collection framework
- Methodology for energy profiling (Power Monitor + Wireshark)
- CrowdSenSim to simulate MCS activities in urban scenarios
  - Access and download: http://crowdsensim.gforge.uni.lu
  - Contact: crowdsensim@gmail.com

User rewarding schemes

- Smart contracts which run on distributed payment platforms
- Rewarding schemes according to campaign design
Thank You!

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