Big Data in 5G Distributed Applications

CS3 Summary

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Summary

- The 5G network represents ***highly complex and heterogeneous network*** that integrates massive amount of sensor nodes and diversity of devices such as:
  - macro and small cells with different radio access technologies (GSM, WCDMA, LTE, and Wi-Fi) that coexist with one another.
- Such network vision leads to traffic volume of tens of Exabytes per month that further ***demands networks capacity 1000 times higher than now***. Such traffic volume is not supported with nowadays cellular networks.

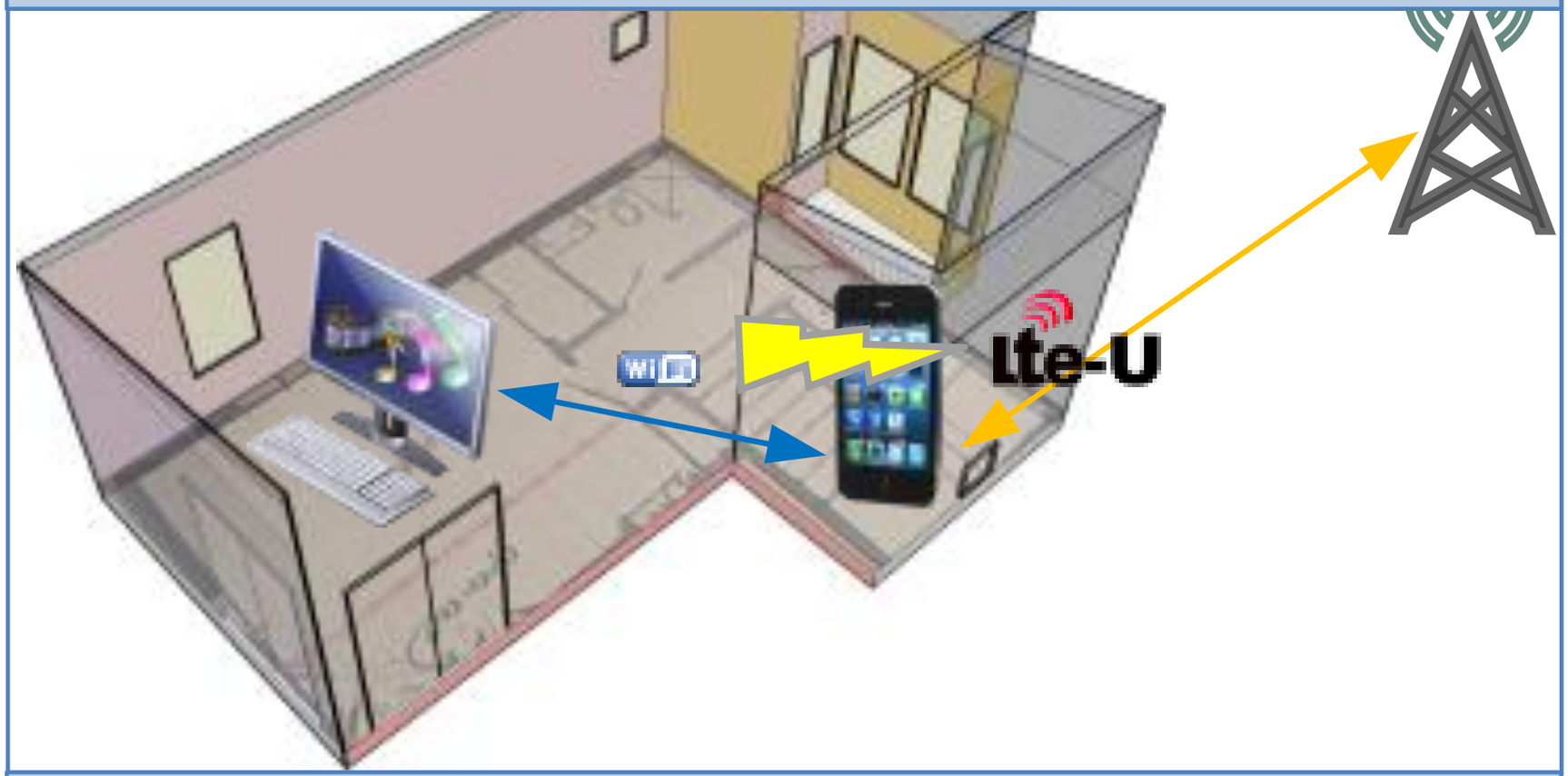
Summary

- Practical deployment of 5G networking systems needs some new critical issues to be resolved on different areas such as:
  - 1) coordination mechanism,
  - 2) power consumption,
  - 3) networking behavior prediction
  - 4) positioning systems
  - 5) 5G cloud robotics
  - 6) ultra/high live video streaming in wireless networks
  - 7) multi-party trust based on blockchain for process monitoring
  - 8) virtual and augmented reality applications

Summary

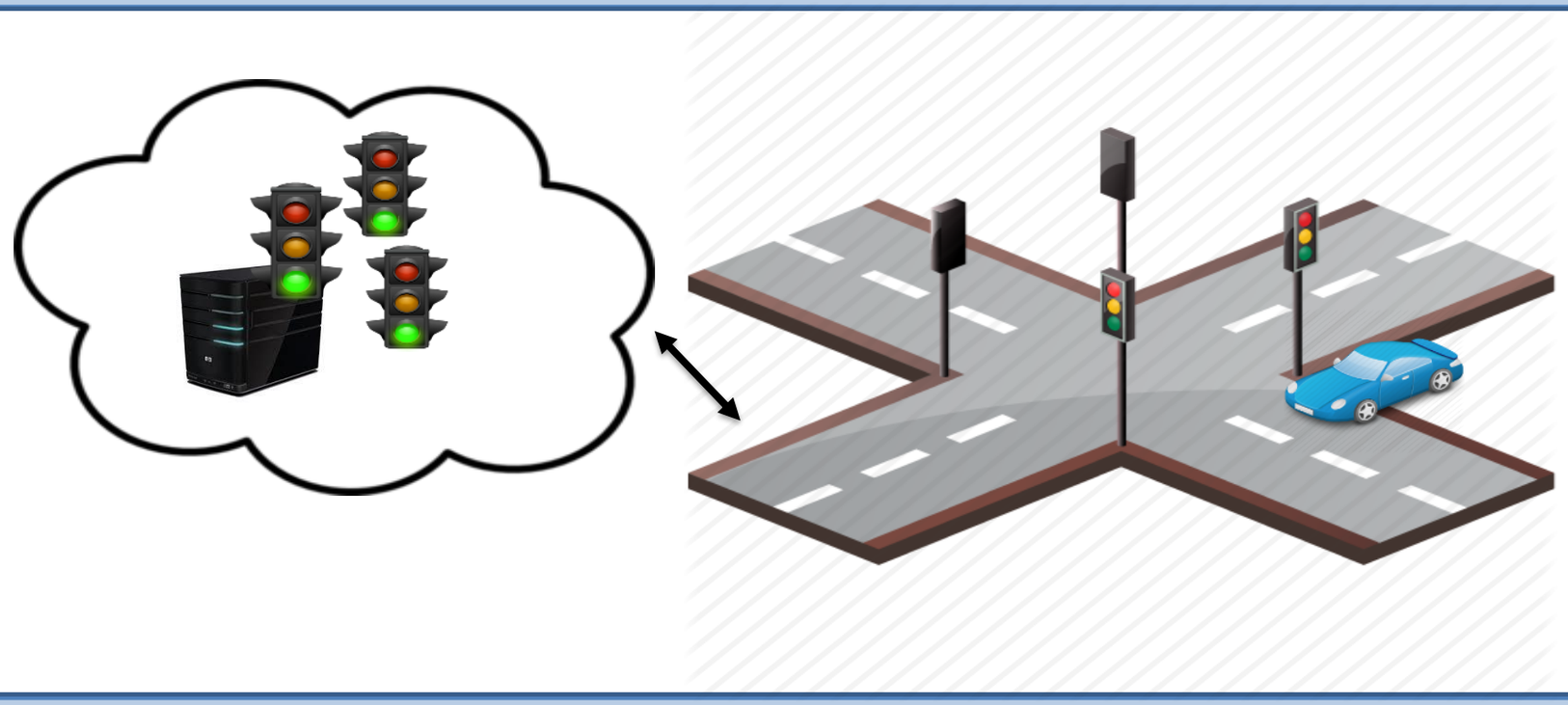
- Because of the high scale of 5G systems combined with their inherent complexity and heterogeneity, ***Big Data techniques and analysis will be the main enabler of the new 5G critical issues.***

COORDINATION: *Home Network*



During the typical evening, all devices are active and have to be actively coordinated in order to provide satisfactory level of service.

PREDICTION: *5G Network*

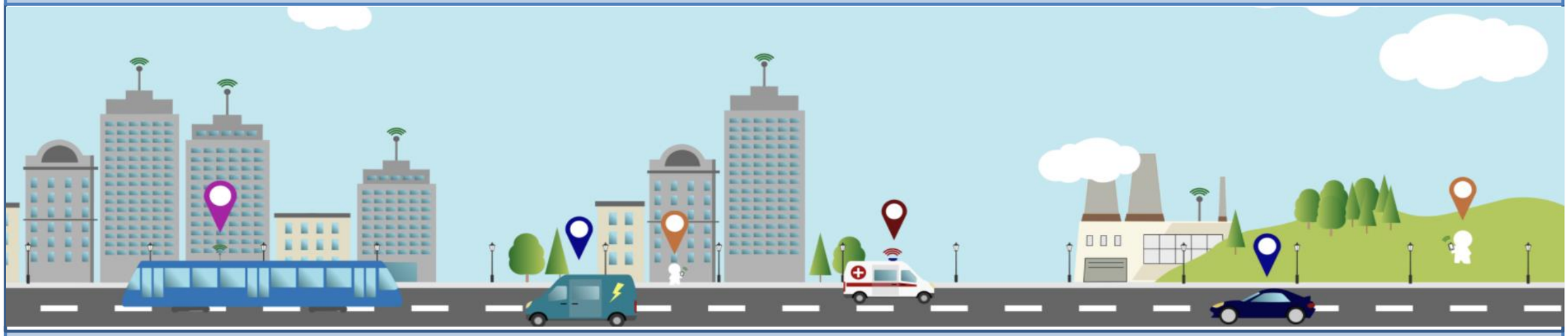


During rush hours, there is a high demand for WiFi traffic due to a large number of people using personal devices potentially impacting traffic management system. Traffic predicting and giving recommendations to users that participate in traffic.

PREDICTION: *Content consuming*

Mobile users consume images, videos and music, which increase thought time. By predicting content consumption we can increase network functioning and increase throughput and transfer speed.

POSITIONING AND LOCATION AWARENESS IN FUTURE 5G NETWORKS



In many places positioning needs help from mobile communication networks. Cities with skyscrapers are one example of the problematic regions. Autonomous vehicles, transportation, traffic control need this kind of service. If we consider the problem from the smart city point of view we notice that there are many new user groups as pedestrians, cleaning and maintenance services, management and administration.

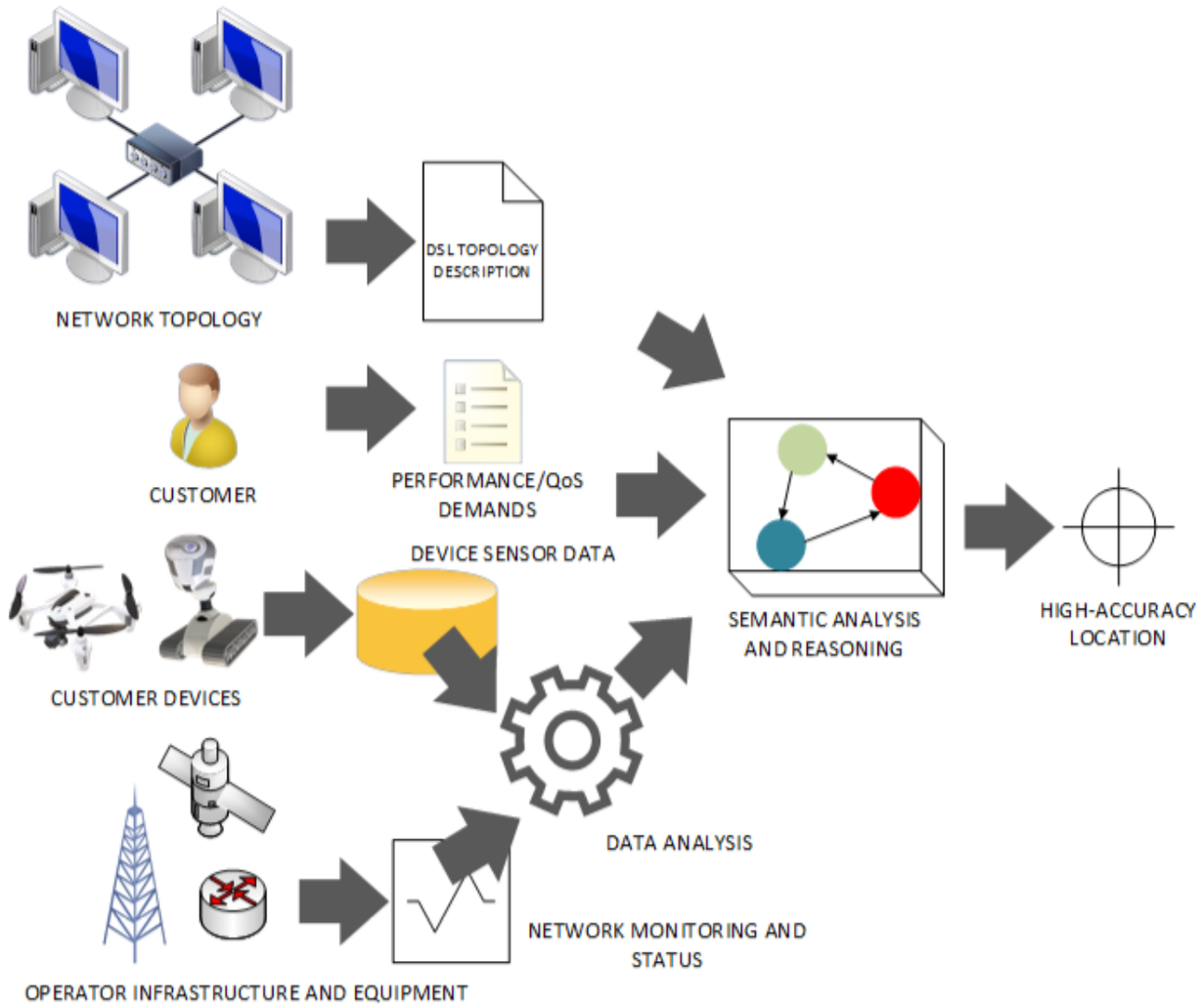
Use Cases Requirements

- ***Network requirements***
  - Network with 5G capabilities; faster and higher-capacity networks, which can deliver video and other content-rich services; massive connectivity of devices based on different technologies, etc.
- ***Application requirements***
  - Consistent process mining over Big Data triple store; Network capability mesurement module; Resonning module; Learning and Prediction module (for example, Neural Network); Optimization module; Corresponding domain and application Ontologies; etc.
- ***Storage requirements***
  - Big Data triple store; Possibility to handles large amounts (a petabyte or more) of data; Distributed redundant data storage; Massively parallel processing; Provides Semantic Big Data processing capabilities; Centrally managed and orchestrated

Future Challenges

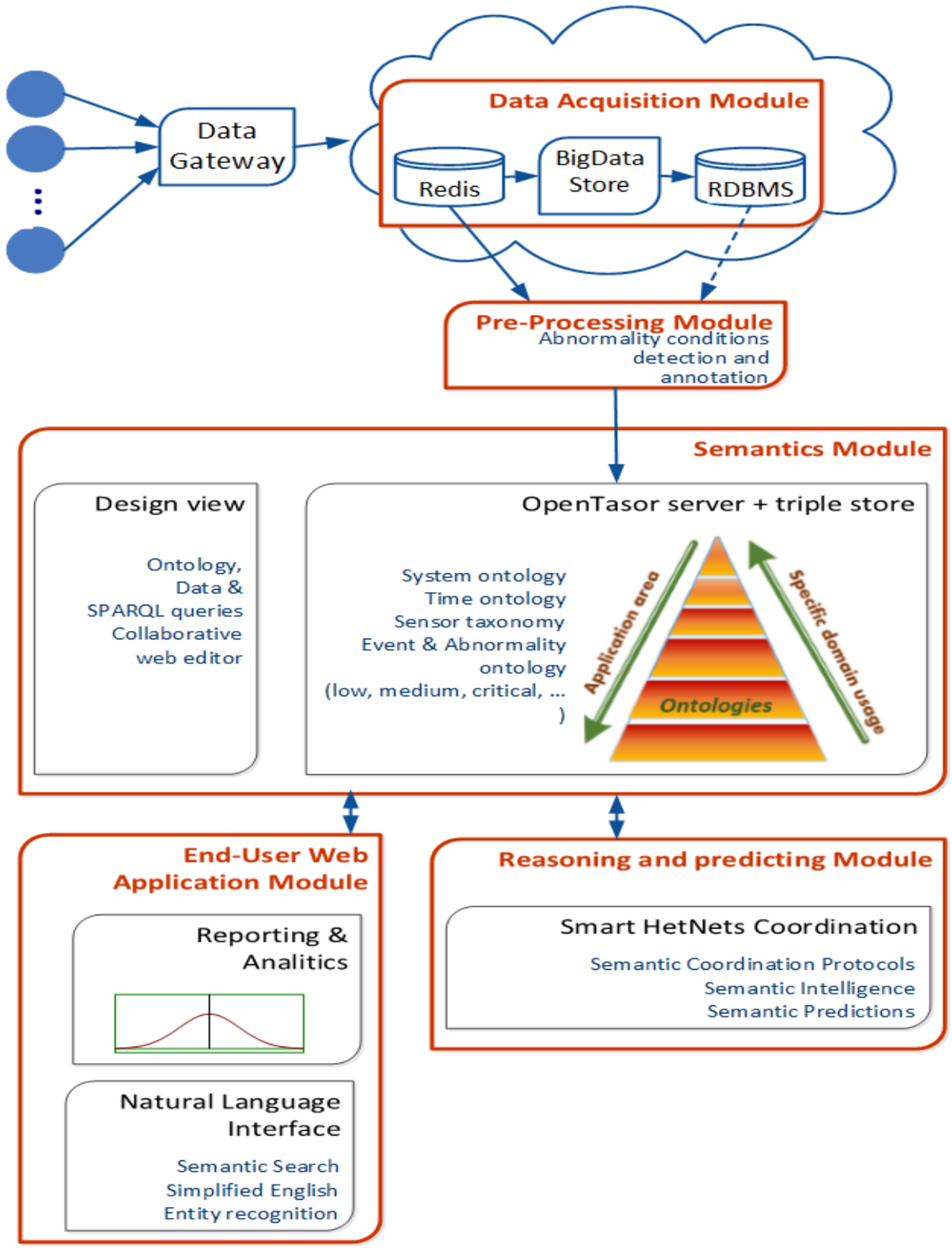
- Positioning challenges and possible error sources

- Semantic analysis of network topology and sensor data for high-precision localization in 5G networks



Future Challenges

- Infrastructure design of Semantic Driven Big Data in 5G Networking



Future Challenges

- **5G Security**
- **5G Simulations**
- **Radio-Access Research and Propagation Issues**
- **Millimeter Waves and 5G Standardization**
- **5G Modulation Schemes**
- **Machine Learning in Software Defined Networks**

Conclusions: What was done?

- ***We list and describe some of 5G use case***
- ***We identified requirements***
- ***We give state-of-the-art of current solutions***
- ***We give directions for some of use cases in the form of technologies, hardware, software, etc. and give short description and usage of each***
- ***We discussed on future challenges***
- ***All discussions we published as LNCS chapter:***

“Big Data in 5G Distributed Applications”

Conclusions: What was done?

- ***All discussions we published as LNCS chapter:***

  "Big Data in 5G Distributed Applications"

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CS3 Structure

Total number of members	11
Number of countries represented in CS3	5
Gender balance:	
Males	10
Females	1
Number of young researchers (until PhD+8)	7
Number CS members from of target countries	5