



## School of Computing and Engineering

### An IoT Big Data Streams Processing Framework in Data Centre Clouds

**Primary supervisor:** Dr. Wei Jie

**Application deadline:** 6 November 2015

**Expected start date:** January 2016

**Duration:** This is a three year position.

#### Research context

Internet of Things (IoT) is a part of future Internet and comprises many billions of Internet Connected Devices (IDOs) or 'things' where things can sense, communicate, compute and potentially actuate as well as have intelligence, multi-modal interfaces, physical/virtual identities and attributes. IDOs can include sensors, RFIDs, social media, business transactions, smart consumer appliances, lab instruments, etc. The vision of IoT is to allow 'things' to be connected anytime, anyplace, with anything and anyone, ideally using any path, any network and any service.

This IoT vision has recently give rise to the notion of IoT Big Data applications that could produce billions of data streams and Zeta byte of data to provide the knowledge required to support timely decision making. Some emerging IoT Big Data applications include emergency situations awareness, smart manufacturing, customer sentiment analysis, credit card fraud detection, remote sensing image processing, and so on.

IoT Big Data applications need to process and manage streaming and multi-dimensional data from geographically distributed data sources. All these data sources are available in different formats, present in different locations, and reliable at different confidence levels. A number of issues need to be addressed in the implementation of next-generation IoT Big Data streaming processing model and associated techniques, in particular,

- Dynamic data fusion for heterogeneous and multi-source Big Data streams

The ability to make sense of data by fusing it into new knowledge is a critical requirement of IoT Big Data applications. Therefore multi-source data fusion is a very important area of current research. The key aspect in data fusion applications is the appropriate integration of all types of information or knowledge.

- Autonomic Cloud resource provisioning and configuration for IoT Big Data streaming

While data centre Clouds offers an abundance of resources, they do not offer any support for performance-driven autonomic provisioning and configuration of resources in response to changes in the volume, variety and velocity of IoT Big Data streams. It is essential to develop techniques for data centres to monitor and predict the requirement / behaviour of IoT Big Data streaming, and automate Cloud resource provisioning and configuration to meet QoS needs.

#### Research goal

We aim to develop an IoT Big Data stream processing framework in data centre Clouds. More specifically, the project aims:

- Develop an innovative approach for diffusion and processing (detection, collection, storage, extraction and reporting) of streaming IoT Big Data from multiple sources
- Implement a software framework that will enable autonomic provisioning and configuration for IoT Big Data application over Cloud resources
- Demonstrate the IoT Big Data stream processing framework on real applications (e.g. customer sentiment analysis) and deploy them on private and public Clouds as IoT SaaS applications.

#### Candidate Profile

The ideal candidate should have an MSc or equivalent degree in computer science and combine solid theoretical background and excellent software development skills. Strong commitment to reaching research excellence and achieving assigned objectives is required, as well as an ability to work in a collaborative and interdisciplinary environment. It is expected that the PhD candidate will carry out applied research work that will start from the establishment of a theoretical framework, continue with the implementation of a software prototype and the experimentation with real data, and conclude with the validation of a proposed solution through real applications/case studies.

Background knowledge and/or previous experience in the following areas/technologies, will be considered very favourably:

- Big data storage and processing
- Cloud computing architecture, infrastructure, and solution design
- Data fusion techniques
- Storage, Data, and Analytics Clouds
- High Performance Cloud Computing
- Cloud applications and experiences

**Further Information**

For general enquiries about the application process visit our [How to Apply](#) page.

Questions regarding academic aspects of the project should be directed to [Dr Wei Jie](#).

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