IoTcloudServe@TEIN
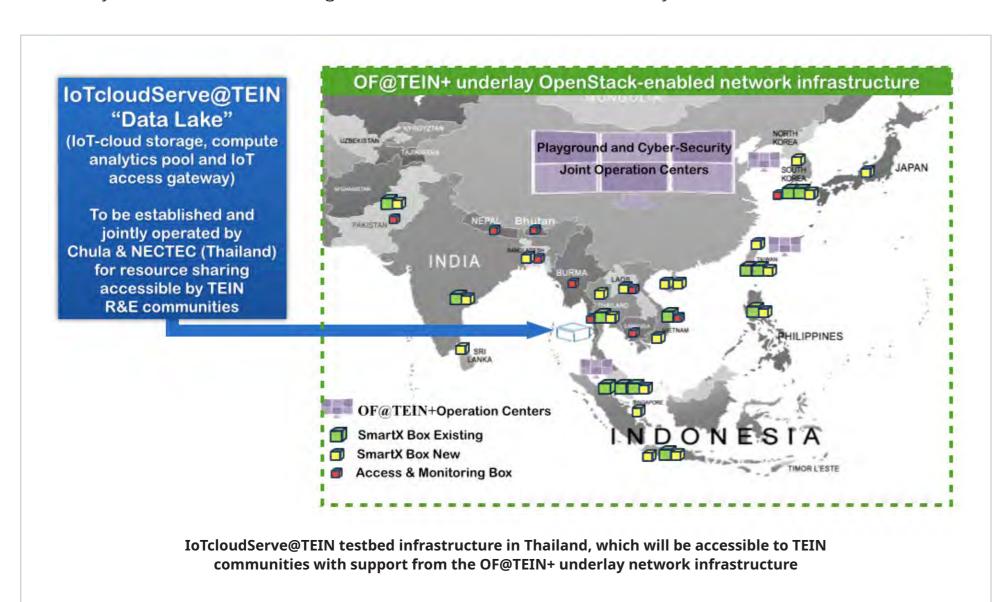
Data-Centric IoT-Cloud Service Platform for Smart Communities

Executive Summary

Proposed by ThaiREN, this project integrates the networked collaborative efforts of R&E communities from developed countries (Korea, Japan), from a developing country (Malaysia), and from the region's least developed country (Laos). The project has been designed around the principle of sharing networked resources and data as well as the lessons learnt during the process. The goal is to achieve a framework design and a proof-of-concept implementation for a data-centric Internet of Things (IoT)-cloud platform that can help enable IoT-domain service diversification. We believe that the problem of how to create a platform that combines widely accessible openness and commonly agreed security should be conducted not only by individual countries, but via a collaborative effort from interested TEIN partners in multiple countries; hence, the need for the TEIN-inspired interworking environment of R&E community activities.

The "data-centric IoT-cloud service platform for smart communities" project has the following key objective:
• To design, develop, and operate a centralised IoT-cloud service platform site (called "IoTcloudServe@TEIN") in Thailand, that is accessible across the TEIN community with the support of the OF@TEIN+ underlay network infrastructure.
• To demonstrate the usefulness of the developed IoT platform by running three data-centric IoT-cloud services in two selected TEIN sites, namely, Smart-Energy/Mobility@Chula (both at Chulalongkorn University, Thailand) and Smart-Agriculture@NUOL (National University of Laos).

IoTcloudServe@TEIN collaboration workshop I participants at National University of Laos (December 2018)

IoTcloudServe@TEIN testbed infrastructure in Thailand, which will be accessible to TEIN communities with support from the OF@TEIN+ underlay network infrastructure

The IoTcloudServe@TEIN platform is made up of a range of hardware and software components that must be designed, acquired/developed and operated. For the hardware part, the IoTcloudServe@TEIN testbed infrastructure ("Data Lake") serves as a big-data IoT-cloud storage, compute analytics pool and IoT access gateway. We plan to connect the Data Lake to make it widely accessible by the TEIN community with underlay connectivity enabled by OpenStack-based serving nodes distributed in the countries participating in the OF@TEIN+ project. This has already been approved by Asi@Connect and will be jointly operated by the University of Malaya (Malaysia) and GIST (Korea). In terms of software, the NETPIE project (https://netpie.io) created by NECTEC (Thailand) will be used to support secure device registration and management, as well as public data storage access. In addition to NETPIE, we plan to use the KAFKA framework (http://kafka.apache.org), adopting its streaming and distributed resilience data storage concept. This approach should enable scaling from small IoT data clouds integrated over TEIN towards a big data common platform. Combining MQTT-based NETPIE and KAFKA will enable our IoT-cloud service platform to serve a wide spectrum of IoT service requirements, namely, message-type IoT data (e.g. message queuing of time-series data) and streaming-type IoT data (e.g. real-time streaming of video).
Since our intention is to create a service platform that can be used widely by different TEIN R&E communities, after development the project aims to then demonstrate potential usage scenarios. The selected service demo sites are the Smart-Energy/Mobility@Chula projects (Chulalongkorn University, Thailand) and Smart-Agriculture@NUOL (National University of Laos). The first demonstration site in Thailand has been selected due to the large amount of resources that can be provided to the project through two already existing programmes - the CU-BEMS (Chulalogkorn University's Building Energy Management System) project, which has been created with the technical support of the CU-BEMS IEEE1888- protocol server engine from the University of Tokyo, and the Sathorn Model project. Without the need for heavy new investments in IoT sensors/actuators/analytics/applications, this proposal

therefore minimises requirements for Asi@Connect grant support in order to demonstrate IoT-cloud service sites over TEIN. Additionally, the local authorities whose connections are already been part of these projects can be brought into this Asi@Connect cooperation, enabling us to deliver not only a laboratory-scale trial, but also to showcase Asi@Connect's contribution on a wider community scale. The second demonstration site in Laos has been selected to further knowledge-transfer. The project can also demonstrate that the developed and operated IoTcloudServe@TEIN platform can service IoT developments by making use of the existing TEIN network infrastructure.

At the end of project, we hope that these two demonstration sites with three IoT-cloud services should provide concrete evidence that can convince other R&E communities within TEIN to use the developed IoTcloudServe@TEIN platform for their own domain-specific IoT developments. This would fulfil the criteria of achieving future project sustainability after Asi@Connect project support ends.

Project Reference Websites

https://github.com/IoTcloudServe
https://www.facebook.com/iotcloudserve

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