A mesh-topological, low-power wireless network platform for a smart watering system

Background :

The plant watering system lies at the heart of agriculture since it directly affects product yields, as well as the quality of products. Therefore, controlling when plants should be watered and determining how much water the plants need concerning the current environmental conditions are crucial for the plant growth.

Targets :

- Developing weather stations, sensor nodes, valve-control nodes, and a controller node
- Developing a smart watering system based on a mesh-topological WSN
- Developing a smart watering system based on a NerveNet-LoRa WSN

Speaker : Jessada Karnjana
National Electronics and Computer Technology Center, Thailand

A mesh-topological, low-power wireless network platform for a smart watering system

Project Members :

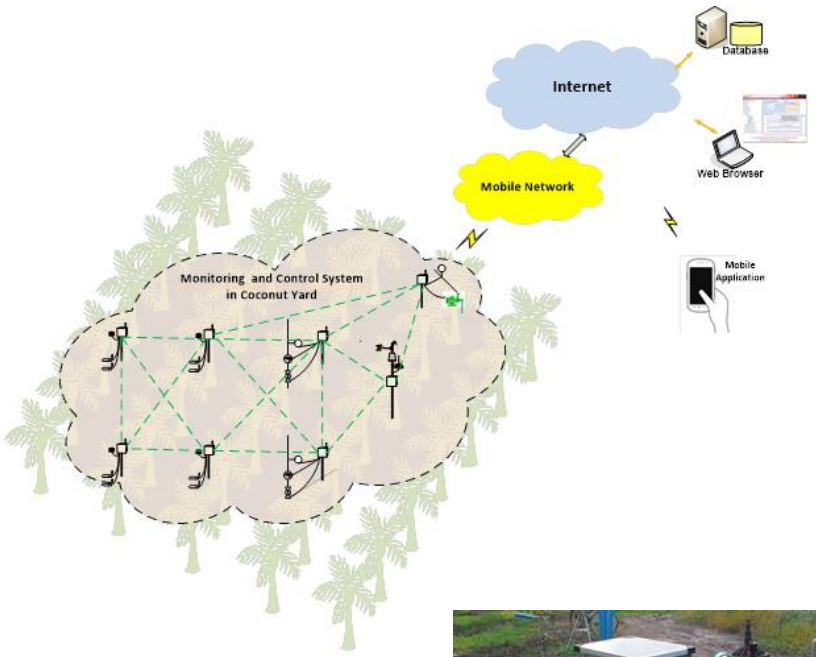
National Electronics and Computer Technology Center (NECTEC)
National Institute of Information and Communications Technology (NICT)
Universiti Teknology Brunei (UTB)
Department of Agriculture and Agrifood (DAA)
University of Computer Studies, Yangon (UCSY)
Universiti Teknology Malaysia (UTM)

Project Duration : 3 years (Jun 2018 – May 2021)

Project Activities

System Overview

Experiments at Kehakaset Coconut Farm, Pathum Thani, Thailand



Project Activities

2018

- Kick-off meeting at NICT, Japan (Jul 2018)
- NECTEC-NICT technical meeting on NerveNet application at NECTEC, Thailand (Aug 2018)
- A draft of CRDA (last year we planned to sign by the end of DEC 2018 and to submit to NICT before 2019; unfortunately, we have yet to sign!)
- Experiment with NerveNet/LoRa at NECTEC, Thailand (Sep 2018)
- Visiting Brunei's site by Thanika-san (Nov 2018)

2019

- 2nd Meeting at UTB, Brunei (Jan 2019)
- System implementation and testing for UTB (Feb – Oct 2019)
- Special meeting with Dr Jennifer's team (ET-based Irrigation) for research idea exchange and collaboration in Bangkok (Mar 2019)
- 3rd Meeting at UCSY, Myanmar (Jul 2019)
- CRDA

Project Activities (Highlight & Recap)

All

Kick-off Meeting

Demonstration of the NerveNet/LoRa system (Jul 2018)

A

B

C

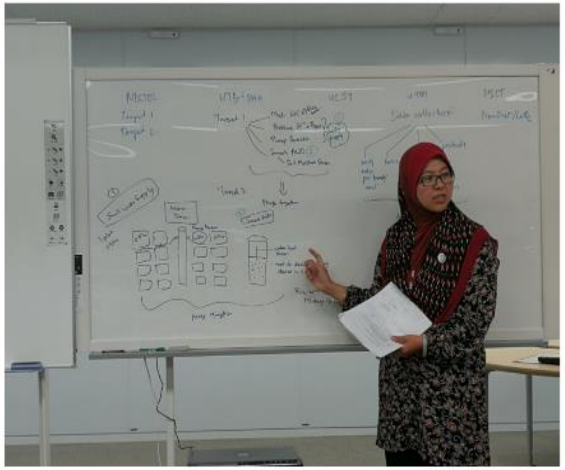
(A) Presentation by Dr. Owada
(B - C) Demonstration by Dr. Owada and Dr. Sato

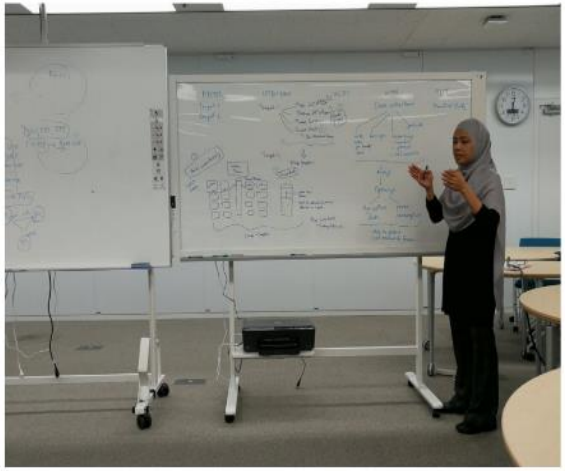
Project Activities (Highlight & Recap)

All

Kick-off Meeting

Brainstorming and discussion on the work breakdown and project plan(Jul 2018)





A B C D E

(A) Dr. Sato and NECTEC discussed the NerveNet.
(B) Dr. Wida explained her idea to the group.
(C) Dr. Khin and Dr. Thi planned for their work.
(D) Dr. Sharifah explained her contribution to the group.
(E) Woman power in our group!

Project Activities (Highlight & Recap)

NerveNet/LoRa

Experiment with NerveNet/LoRa (Aug – Sep 2018)

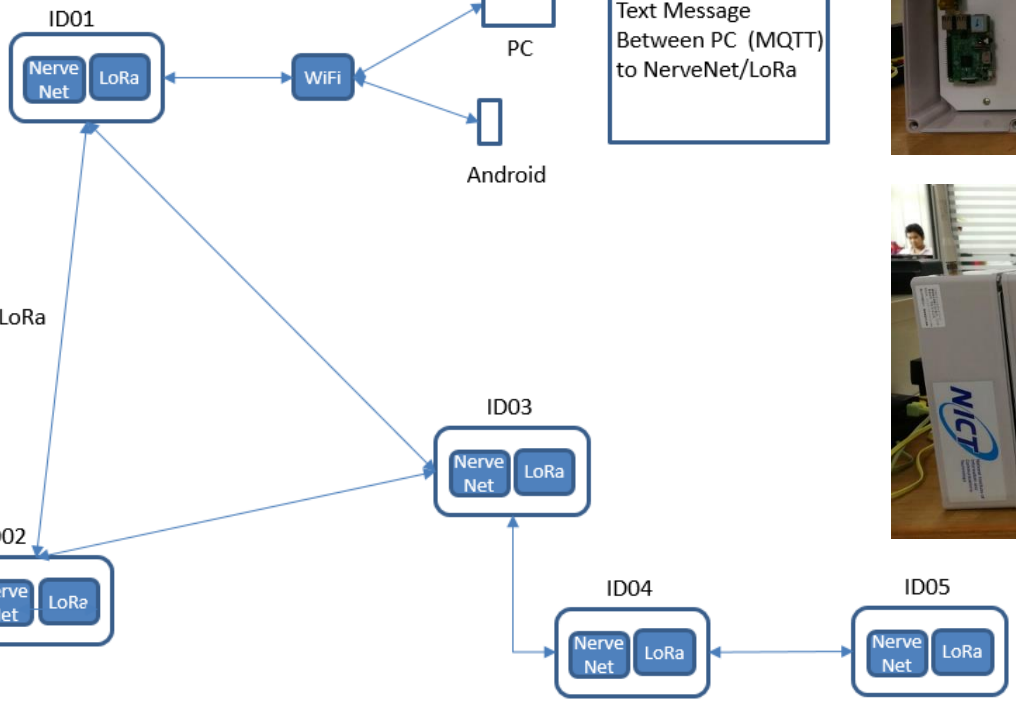
NICT will provide 5 sets of NerveNet/LoRa
Set up the configuration
Check the connection with network manager
Develop Simple Sample program

Simple Sample Program

Send
& Receive
Text Message
Between PC (MQTT)
to NerveNet/LoRa

LoRa Table

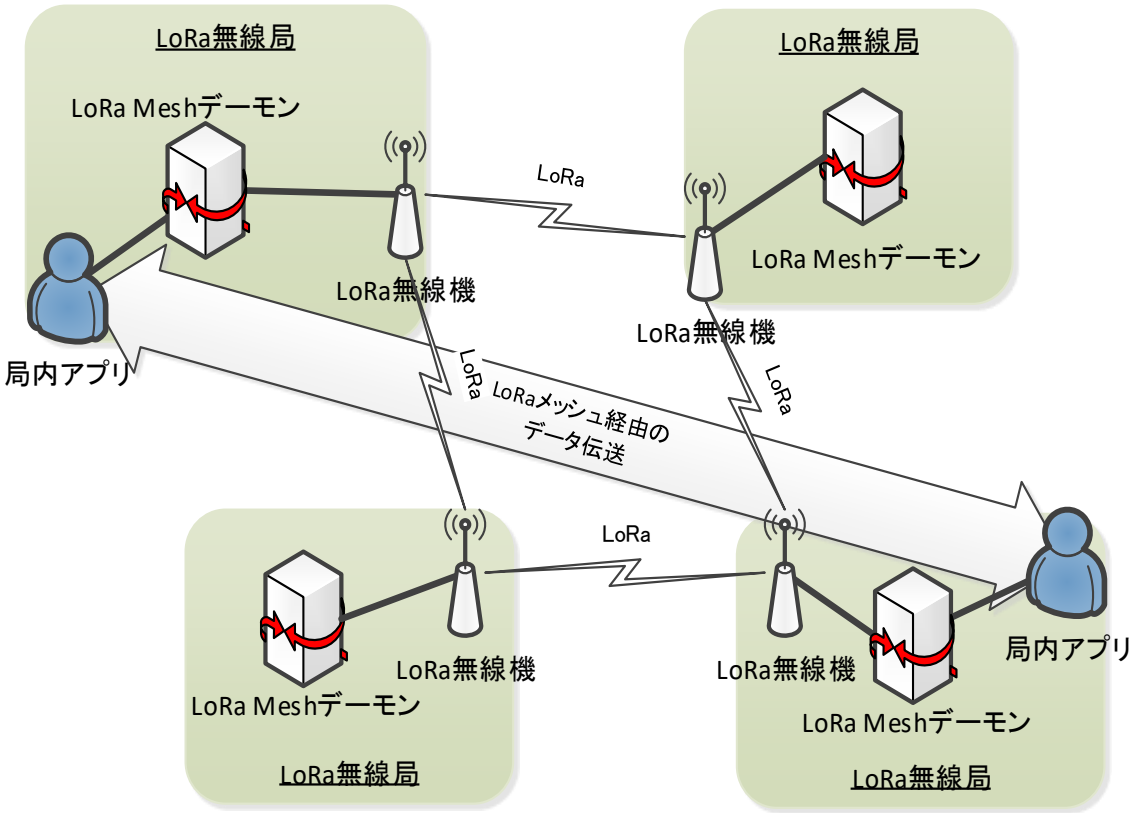
Send	Receive
ID01	ID02
ID01	ID03
ID01	ID04
	:
	ID03



Project Activities (2019 Event)

NerveNet/LoRa

NerveNet/LoRa Introduction at USM (Mar 2019)

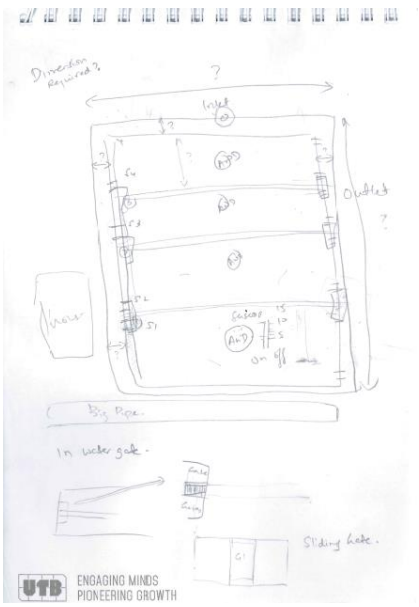


Project Activities (Highlight & Recap)

NECTEC, UTB, DAA

Visiting Brunei Site

Wasan, Brunei (Nov 2018)



Project Activities

All

2nd Meeting

UTB, Brunei (Nov 2018)

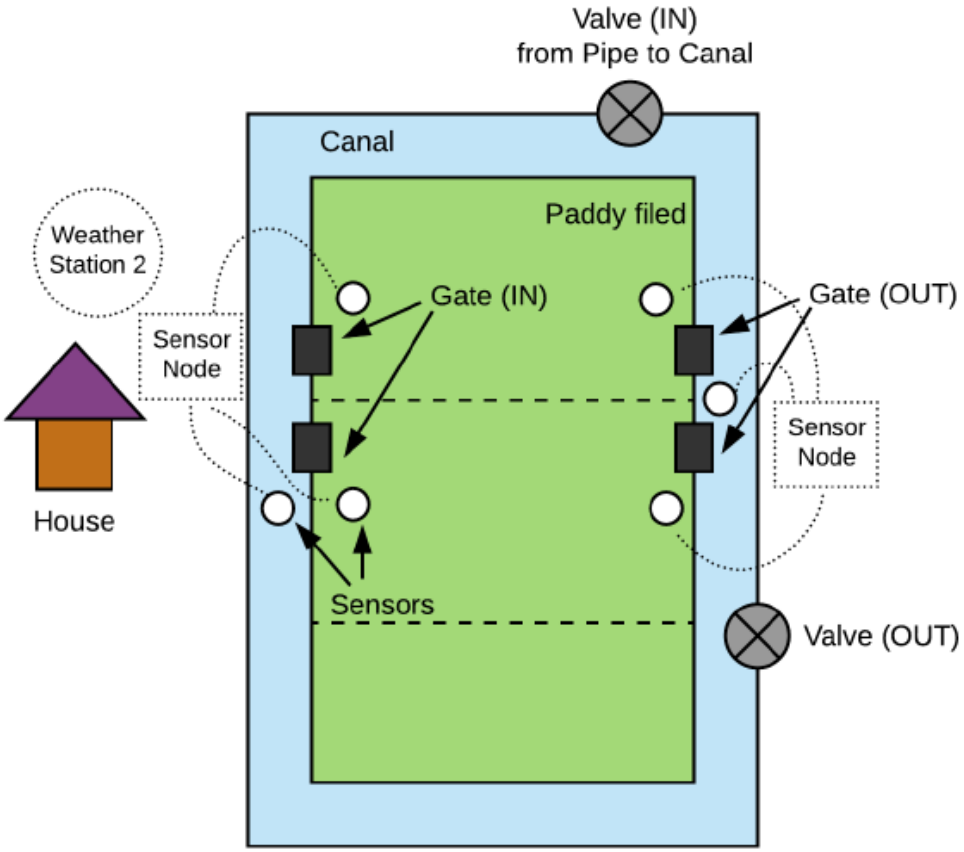
Objectives according to the plan (as stated in the proposal)	Actual status
1. Updating statuses of the project.	Done
2. Gathering requirements for the system implementation in Brunei.	Done
3. Discussion on the system implementation in Brunei.	Done
4. Visiting the experiment site and field survey.	Done
5. Project planning for the second experimental site.	Done
6. Organizing a common session with the Peat swamp project.	Done

Project Activities

All

2nd Meeting

UTB, Brunei (Nov 2018)



Project Activities

Research Exchange

Evapotranspiration (ET)-Based Irrigation System with Internet Of Things (IoT) Integration For Smart Farming Application Addressing The Asean Impending Water Crisis (Mar 2019)

Project Activities

All

3rd Meeting

UCSY, Myanmar (Jul 2019)

Project Activities

All

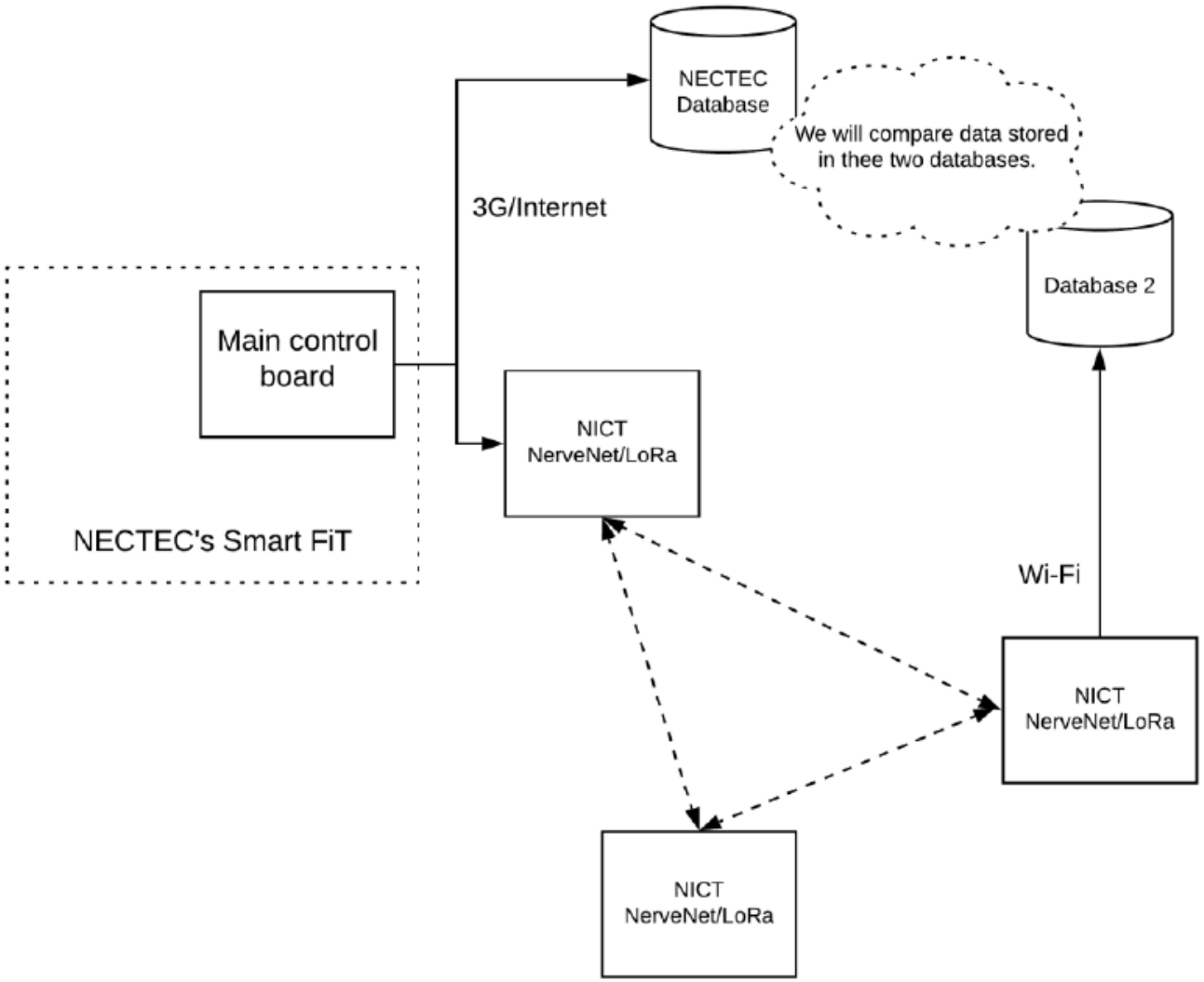
3rd Meeting

Field survey, Myanmar (Jul 2019)

Project Activities

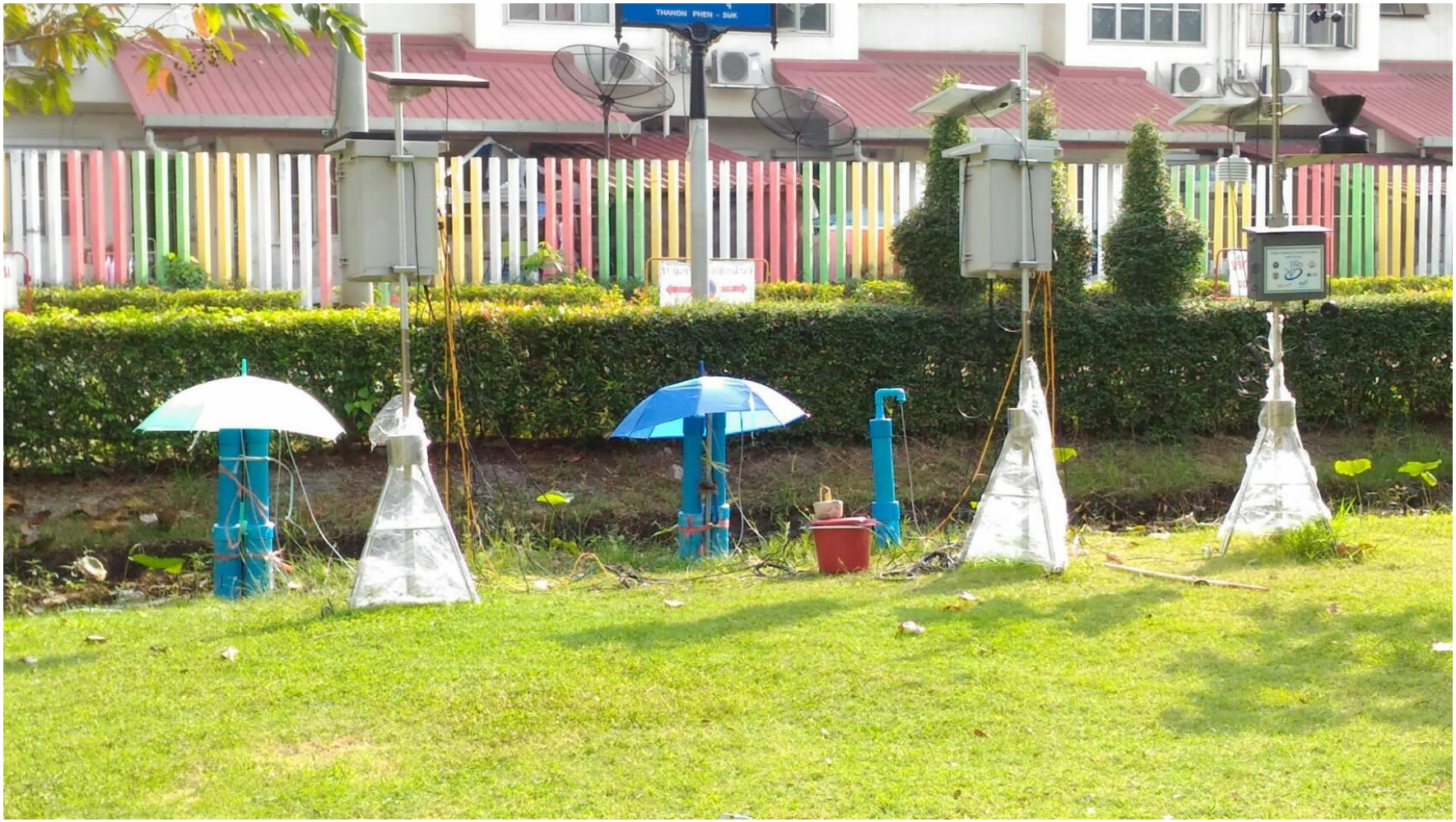
3rd Meeting

Design of NerveNet/LoRa-based system (Jul 2019)



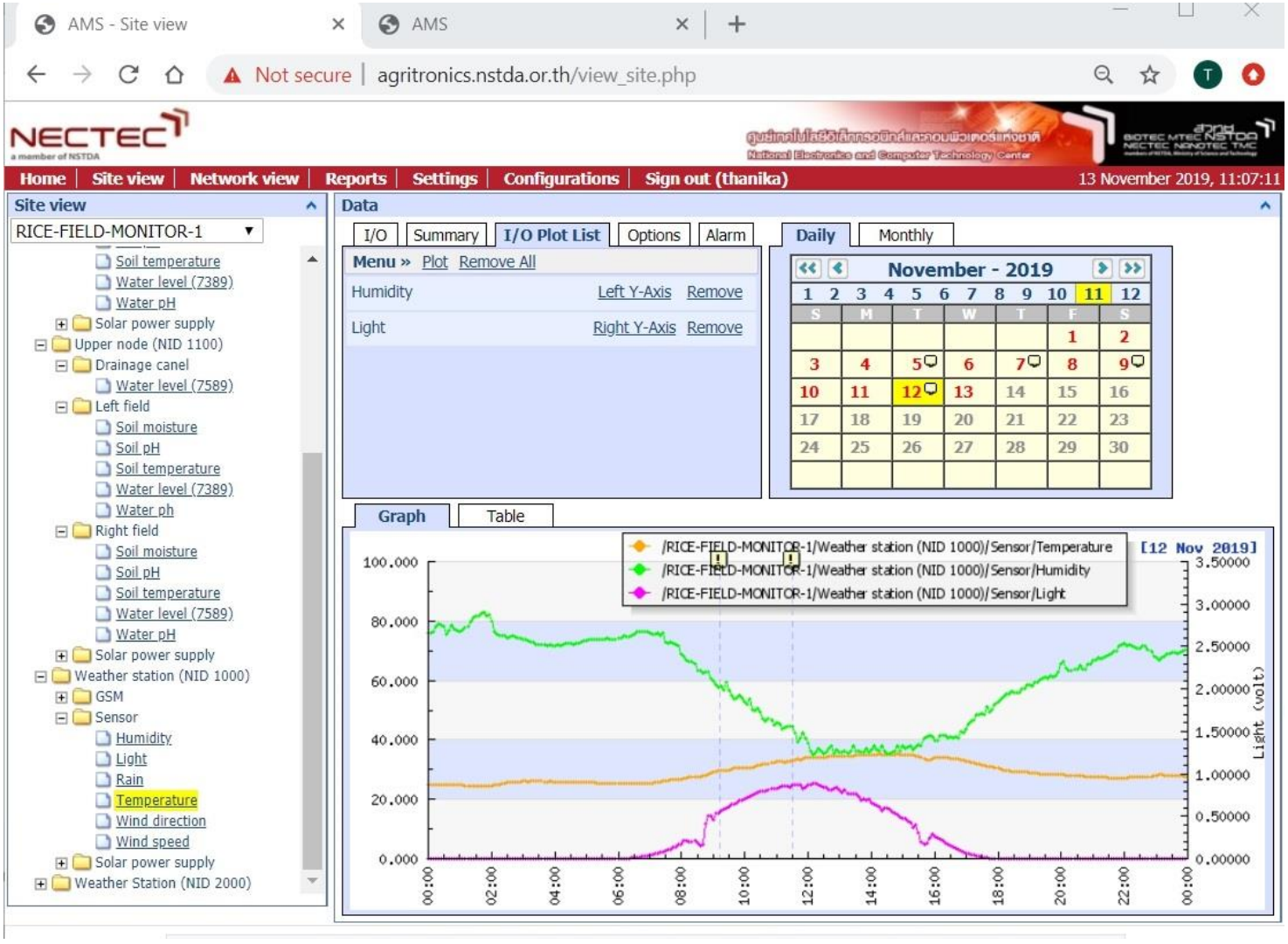
Implementation & Testing at Thammasat University (Feb – Oct 2019)

Implementation & Testing at Thammasat University (Feb – Oct 2019)



Activities & R&D results

Implementation & Testing at Thammasat University (Feb – Oct 2019)



Societal Impact:

- A direct social impact of the proposed system is straightforward; that is, it improves farming productivity both in quality and quantity. Therefore, it can be an answer to the world's food shortage crisis. Furthermore, it has many impacts on various applications that share the same technological infrastructure. Since this work aims to study and implement, as well as to experiment with, a stable and reliable wireless platform with low-power consumption, the studied platform can be applied in other domains, such as environmental/earth sensing, area monitoring, and healthcare monitoring.

Conclusion:

Activities that have been done so far

- System requirements … done
- SWS: hardware and firmware development … done
- Laboratory testing … done
- NerveNet/LoRa-based preliminary experiment … done

Future works

- CRDA
- System installation in Brunei and Myanmar
- NerveNet/LoRa-based system (Target: Thailand)
- Data collection and analysis
- Publications

Future works

Year	Activity	Month											
		01	02	03	04	05	06	07	08	09	10	11	12
2019	Meeting #2 in Brunei (hosted by UTB)												
	CRDA signing (Delayed)												
	NECTEC installs the system at the Brunei site. (Delayed)												
	Testing/Evaluation/Data collection and analysis (Delayed)												
	Meeting #3 in Myanmar (hosted by UCSY)												
	CRDA signing (Asai-san will help us on the CRDA!)												
	Procurement process (UTB, UCSY, NECTEC)												
	Get an approval from NICT.												
	Site preparation in Brunei												
	NECTEC installs the system at the Brunei site. (End of OCT)												
	Site preparation in Myanmar												
	Knowledge transfer (NerveNet/LoRa) UTB student will learn about NN/LR from NICT.												
	NECTEC installs the system in Myanmar. (End of NOV)												
	Testing/Evaluation/Data collection and analysis												
	Attending the conference in KL.												
2020	Meeting #4 in Myanmar (hosted by UCSY) End of MAR.												
	Testing/Evaluation/Data collection and analysis												
	Meeting #5 in Malaysia (hosted by UTM) End of JUL.												
	Meeting #6 in Brunei (hosted by UTB)												
2021	Making a report for NICT												
	Final meeting #7 in Thailand ((hosted by NECTEC)												