



Background :

In today's highly digitized society, ICT technologies play a critical role in preserving health and safety of vulnerable citizen especially women, children and the elderly. In recent years, there is a growing need for monitoring citizen's lifestyle including their health status. Besides health, continuous awareness of their current location is also becoming more critical.

Targets:

To design and develop a collaborative framework which facilitates real-time tracking of a target person even when GPS signal is not available, while collecting motion data to infer his or her lifestyle and health status taking into consideration the culture, lifestyles, behaviours and infrastructures of ASEAN countries.

Speaker:

SMN Arosha Senanayake, Senior Member/IEEE



Project Members :

Project Leader: Dr. Chieng Heng Tze (David), MIMOS, Malaysia

Project members: Dr. Huan-Bang Li (NICT, Japan),
Dr. SMN Arosha Senanayake (UBD, Brunei),
Dr. Dao Trung Kien (MICA, Vietnam),
Senior Professor Minoru Sasaki (Gifu University, Japan)*

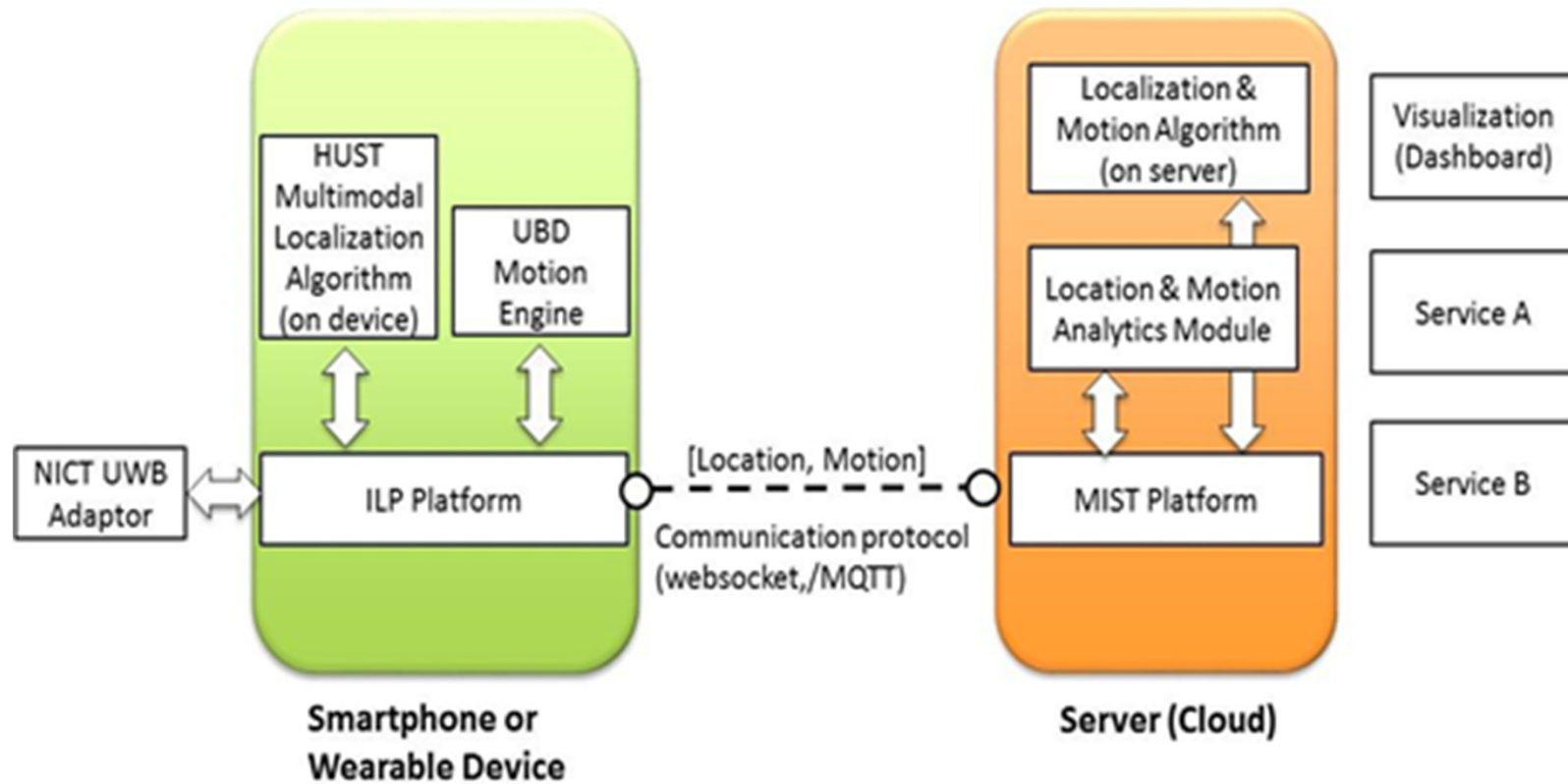
Project Duration :

1 April 2017 – 31 March 2020 (36 Months)

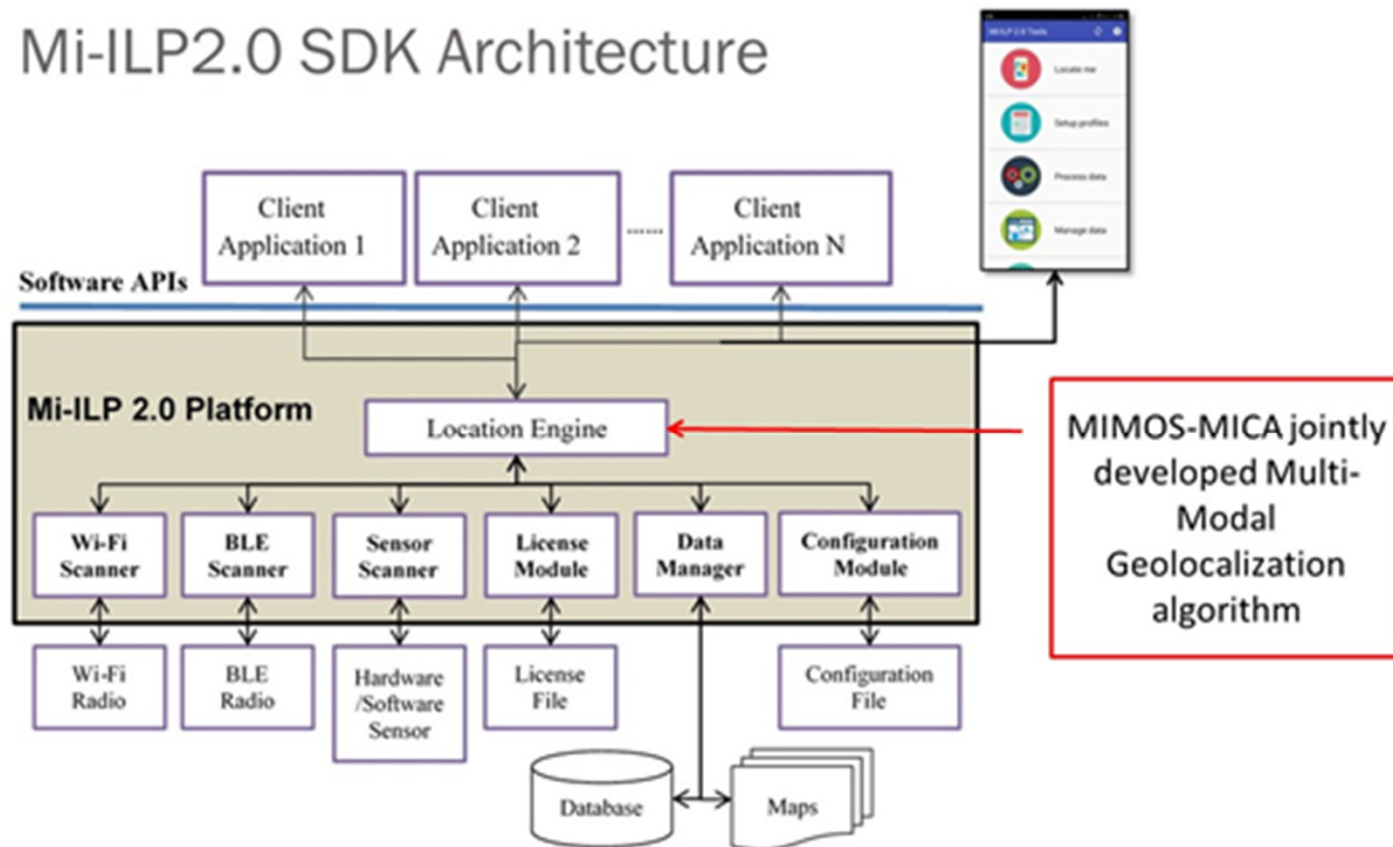
Project Budget:

USD74,075

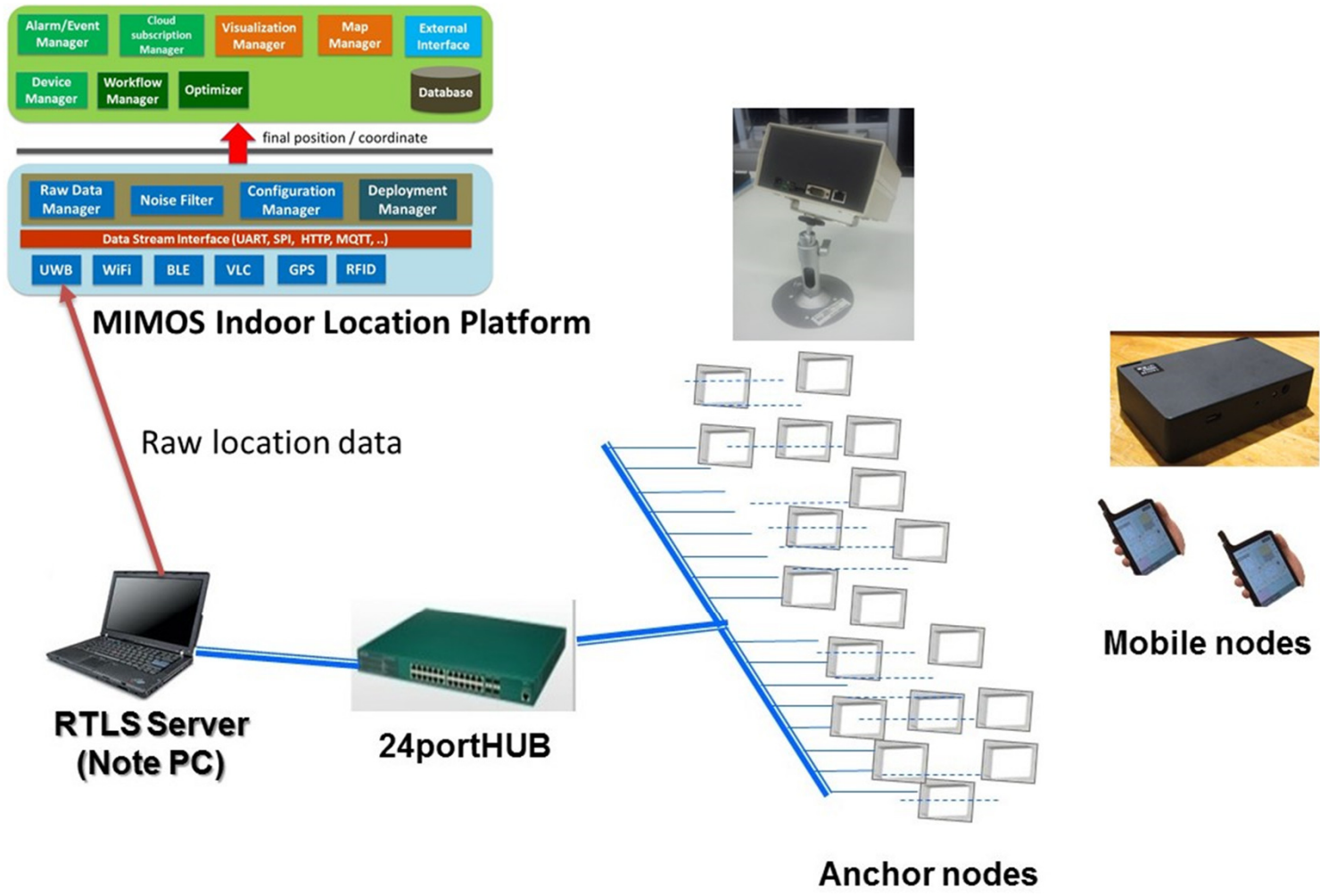
Overall System Architecture

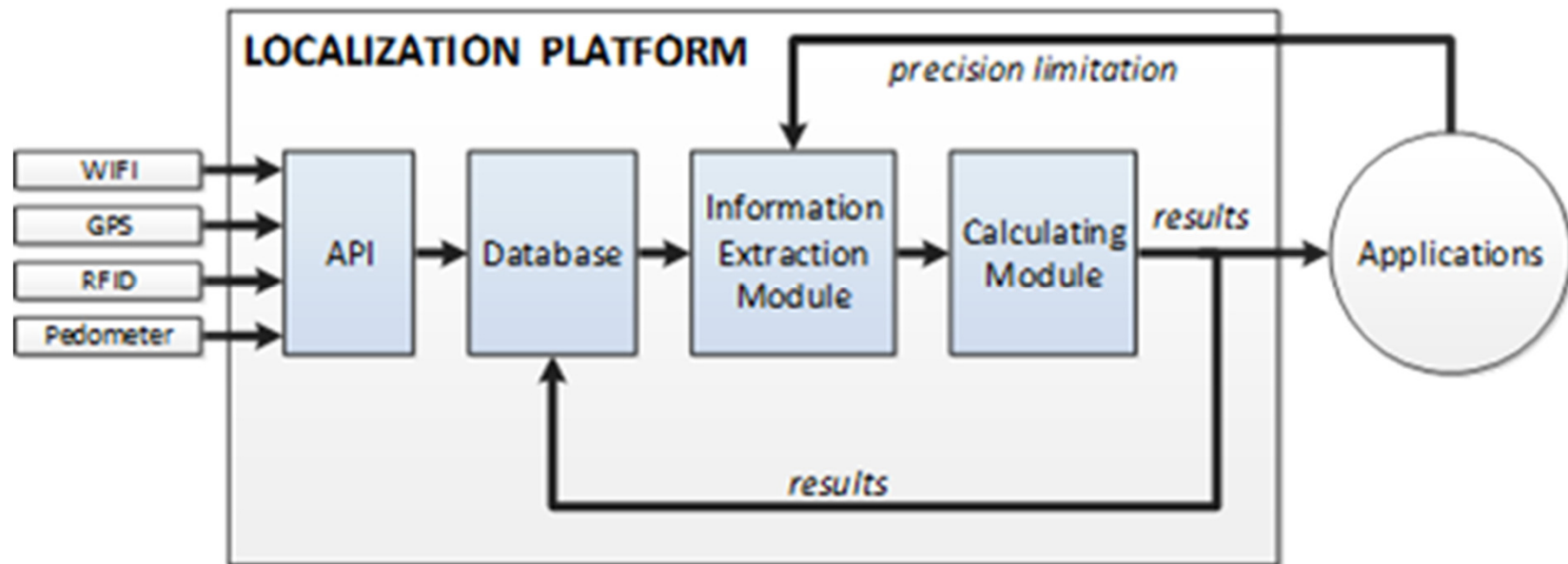


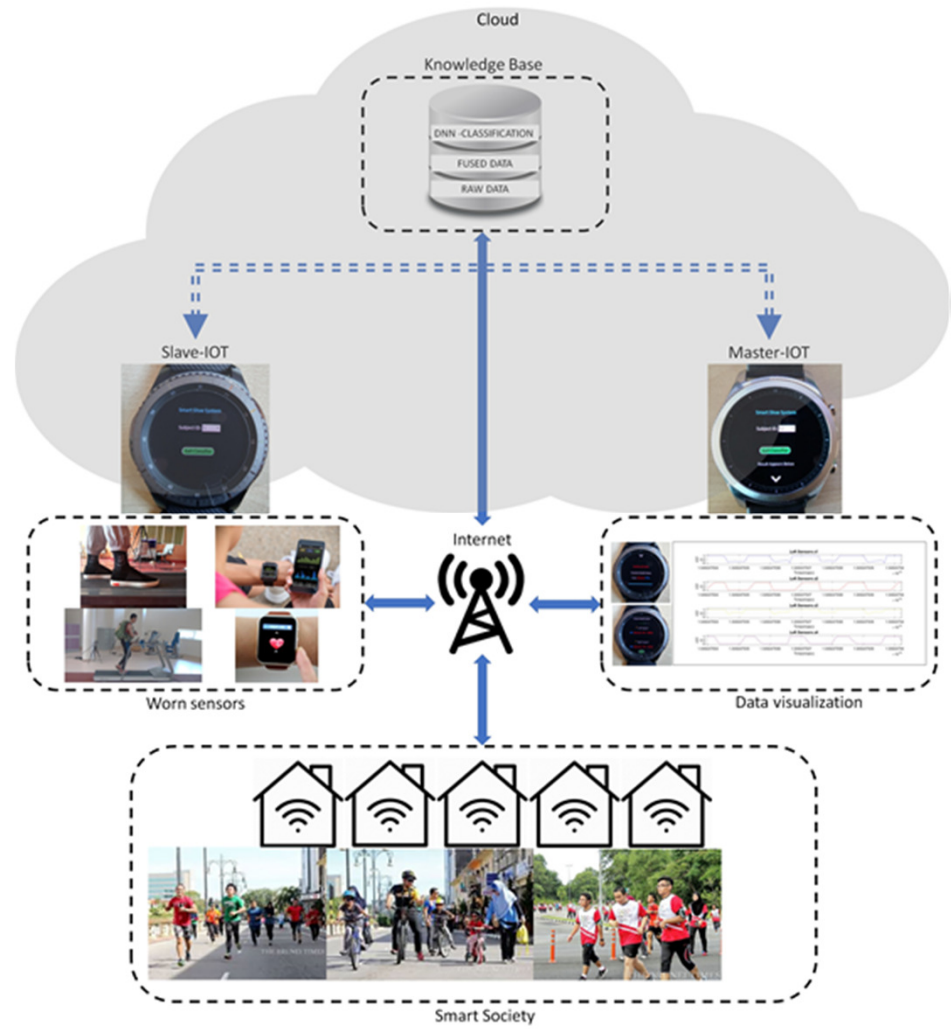
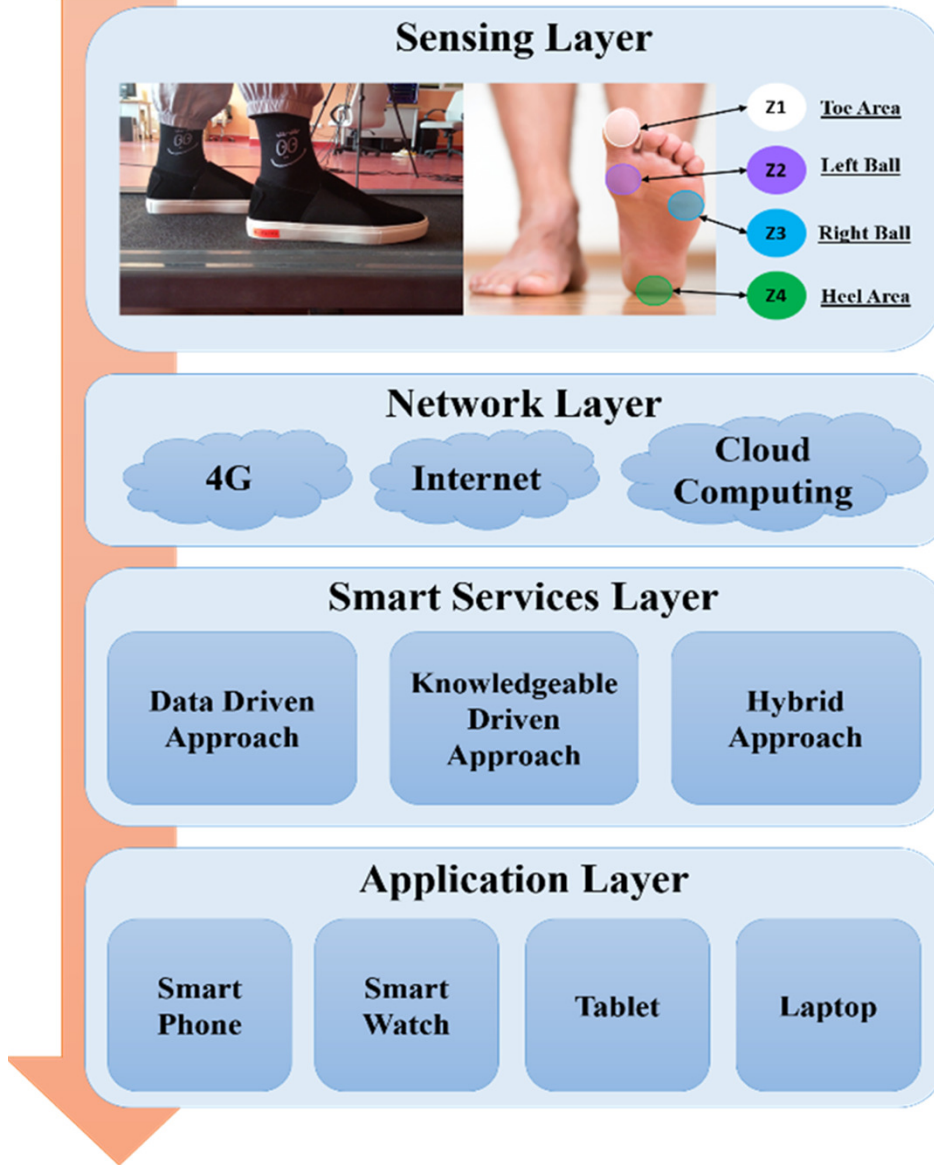
Mi-ILP2.0 SDK Architecture



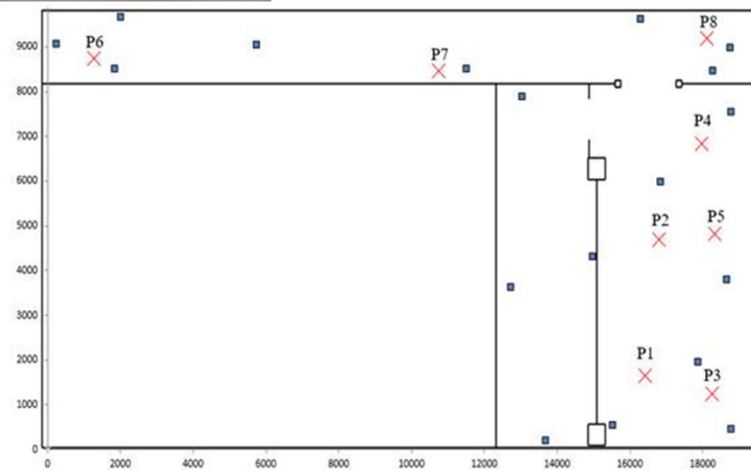
ILP with UWB Positioning Adaptor – NICT and MIMOS



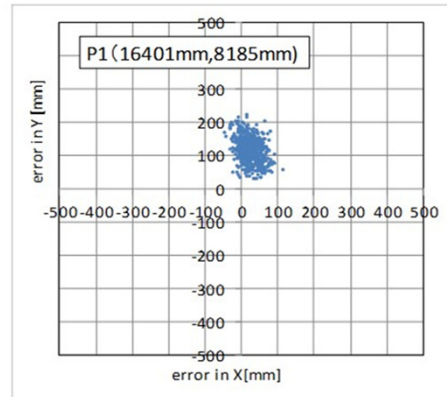




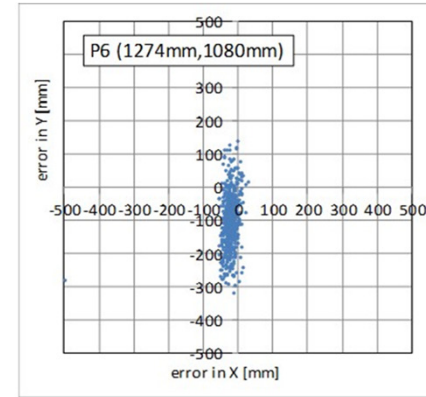
Installation and Set up by MIMOS and NICT Teams



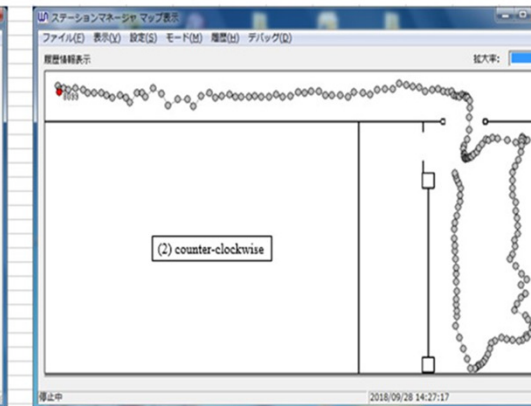
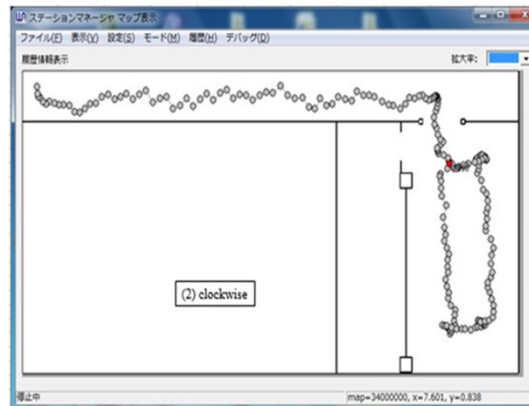
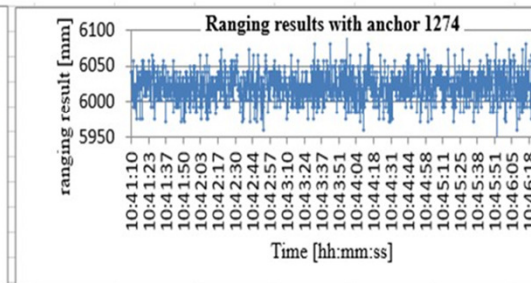
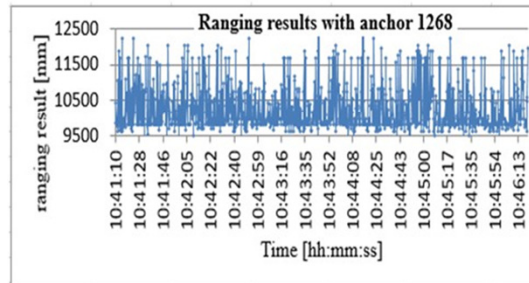
Ranging/Accuracy (Anchors – NICT) & Walking Tests (MIMOS)



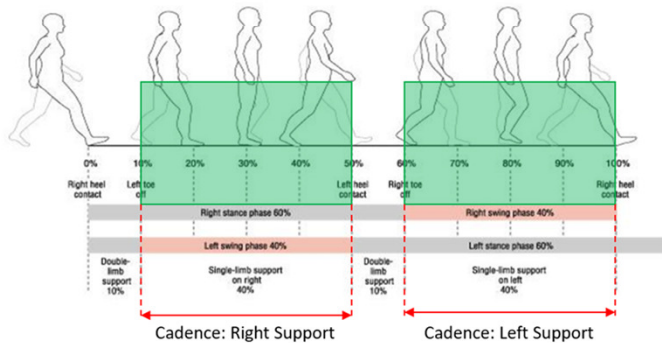
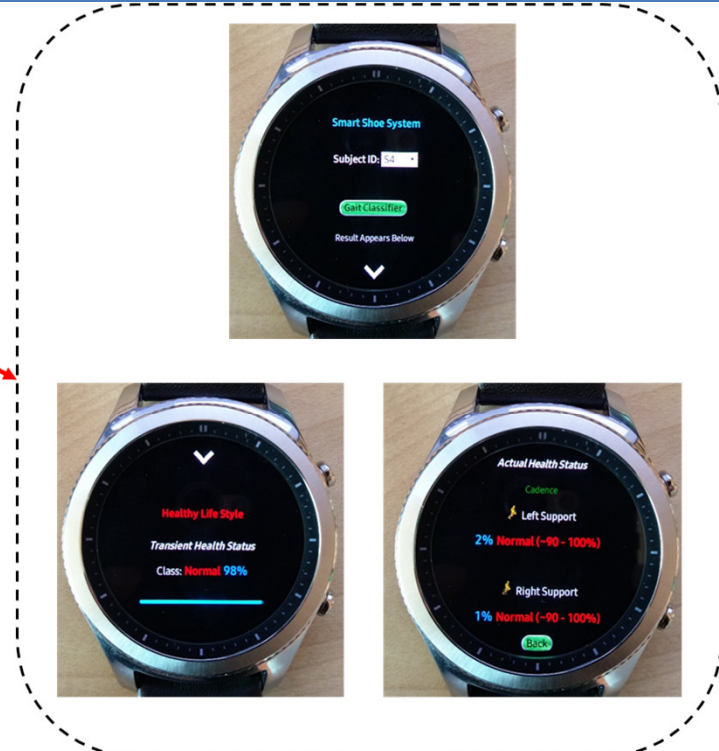
Position 1: within 20cm

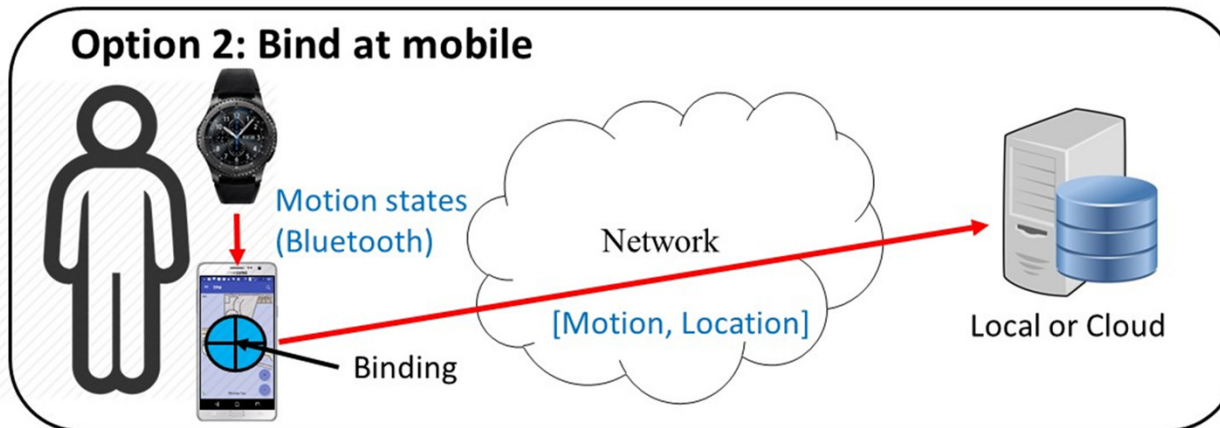
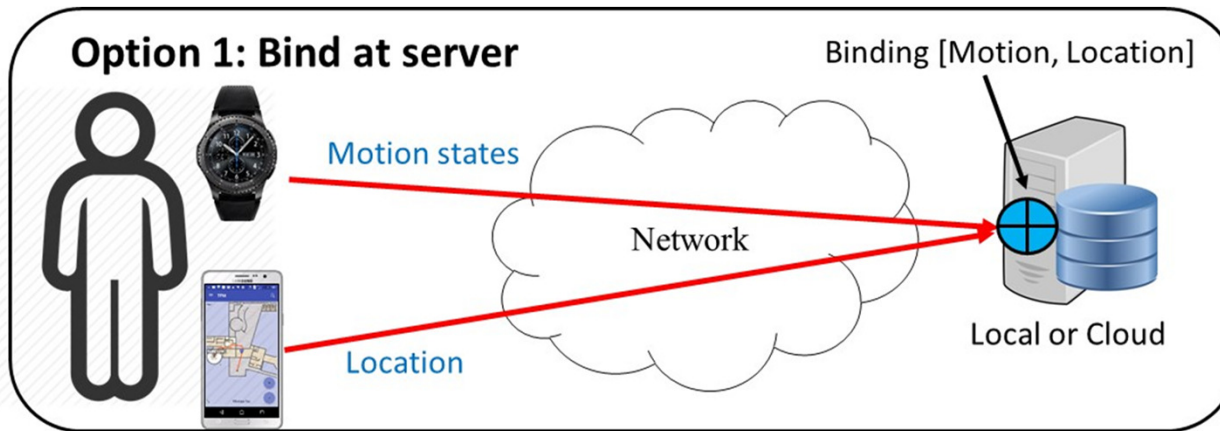


Position 2: within 40cm



Motion Reasoning using MS-IoT (UBD)





No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
1	Smartphone-Based User Positioning in a Multiple-User Context with Wi-Fi and Bluetooth	Viet-Cuong Ta, Trung-Kien Dao, Dominique Vaufreydaz, Eric Castelli.	MICA Institute, HUST, Vietnam	2018 International Conference on Indoor Positioning and Indoor Navigation (IPIN)	24-27 September 2018	Nantes, France
2	Master-Slave IoT for Active Healthy Life Style	SMN Arosha Senanayake, N. H. Kadir, M. S. A. Bin Suhaimi and M. Sasaki	Universiti Brunei Darussalam, Gifu University	2019 12th International Conference on Human System Interaction (HSI)	25-27 June 2019	Richmond, VA, USA
3	Performance Analysis of Enhanced Delta Sampling Algorithm for BLE Indoor Localization	Mohd Faiz, David Chieng, Alvin Ting, SC Ng, Idawaty	MIMOS, Malaysia	2 nd Future Smart Cities (FSC 2019)	5-6 Nov 2019	Xiamen University, Sepang, Malaysia

No:	Paper title:	Author names	Affiliation	Journal name:	The publisher of the Journal	The volume number and Pages
1	Wi-Fi Indoor Positioning Fingerprint Health Analysis for a Large Scale Deployment	KS Yeo, A Ting, SC Ng, D Chieng and N Anas	MIMOS, Malaysia	International Journal on Advanced Science, Engineering and Information Technology (IJASEIT 2018)	Indonesian Society for Knowledge and Human Development	vol. 8, no. 4-2, pp. 1411-1416, 2018.
2	High Precision Location Tracking Technology in IR4.0	Alvin Ting, David Chieng, Chrishanton V. Sebastampi, Putri S. Khalid	MIMOS, Malaysia	Journal of Advances in Technology and Engineering Research (JATER2019)	TAF Publishing	ISSN: 2414-4592, DOI: 10.20474/jater-5.3.4, 2019.
3	Collaborative Smartphone-Based User Positioning in a Multiple-User Context Using Wireless Technologies	Viet-Cuong Ta, Trung-Kien Dao, Dominique Vaufreydaz, Eric Castelli	MICA Institute, HUST, Vietnam	Sensors	MDPI	20(2): 405 (2020)
4	Array of Things for Smart Health Solutions,	Arosha Senanayake S.M.N., Khairiyah Binti Haji Raub S.A., Naim A.G., Chieng D.	Universiti Brunei Darussalam, MIMOS, Malaysia	Advances in Intelligent Systems and Computing	Springer, Cham	Vol 880, pp 598-615, 2018

PATENTS

- i) Huan-Bang Li et. al., NICT, “Radio Receiver”, US 10,277, 263 B2, USPTO (status granted)
- ii) David Chieng, Alvin Ting, MIMOS, “**System and Method for Locating a Device in an Indoor Environment**”, PI 2018001828, Filed at MyIPO (30-Oct-18).
- iii) David Chieng, Alvin Ting, MIMOS, “**Method for Self-Repairing Wireless Signal Fingerprint Database**”, PI 2018002217, Filed at MyIPO (29-Nov-18).
- iv) David Chieng, Alvin Ting, MIMOS, “System and Method For Estimating Geospatial Position”, PI 2018002738, Filed at MyIPO (31-Dec-18)
- v) David Chieng et. al., MIMOS, “**System and Method for Real-Time Object Tracking**”, PI20180002075, Filed at MyIPO (15-Nov-19)’
- vi) SMN Arosha Senanayake, Nursyuhada Binti Hj Kadir, “**Transient healthcare smartwatch operating system and method**”, bn/n/2020/0065, intellectual property office (IPO) Brunei Darussalam

EXHIBITIONS

- i) Malaysia Cloud and Datacenters Convention 2018, Bangsar South, Kuala Lumpur
- ii) Hypernet of Things (HOT) 2018, MITI Tower, Kuala Lumpur, Malaysia
- iii) Smart Factory 2019, MIGHT, Cyberjaya, Selangor, Malaysia
- iv) Talk on IoT 2019, Sarawak Energy, Kuching, Sarawak
- v) INDUSTRY4WRD SUMMIT 2019, MITI Tower, Kuala Lumpur, Malaysia

YouTube links:

<https://www.youtube.com/watch?v=zPCZEYe9Ri8> (Empire Subang Gallery)

<https://www.youtube.com/watch?v=6Uwyv9Vf2g8&t=48s> (IOI City Mall)

<https://youtu.be/s5CZckFRct4> (MS-IoT for Motion Reasoning)

Conclusion:

- Developed a collaborative framework which facilitates real-time tracking of a target person even when GPS signal is not available, while collecting motion data to infer his or her lifestyle and health status. The framework orchestrates a wide range of technologies such as localization technologies, machine learning and AI, sensor data analytics and cloud computing.
- On location tracking, a mobile and cloud-based Indoor Location Platform (ILP) which incorporates multimodal localization means and assisted by other sensor fusion techniques has been developed. In this platform, GPS and non-GPS positioning systems such as Wi-Fi/BLE fingerprinting, IR-UWB positioning, sensor-based and a hybrid of these localization techniques are adopted to provide continuous tracking of the subject of interest in both indoor and outdoor environments. Extensive trials have been carried out in not only laboratory testbeds, but also in factories and other commercial premises.
- On health or lifestyle monitoring, harvesting of motion data and context reasoning, using the IntelliHealth Solutions were carried out to assess, monitor and to provide feedback on a person's lifestyle. An intelligent knowledge base is formed and this enables the development of various transient wearable health OS solutions. Wearable motion interfacing and reasoning devices for general public were built to support trials and data collections involving people from public.

- To improve user experience in all walks of life, it is important to build a smarter indoor environment that is aware of dynamic object (human/machine) presence, their behaviours, status and needs, in order to activate or deliver the right actions.
- Advanced Ambient Intelligence (AAI) platform is proposed. This platform is expected to bring intelligence to our environments and makes those environments sensitive to us. The key element of AAI is context discovery, which can be realised by determining not only the location but also the surrounding condition of the object of interest.
- More importantly the environment is not only aware but are react proactively.
- Ultimately the ultimate vision to have a smarter and safer spaces for all walks of life.