



AGENSI ANGKASA NEGARA. KEMENTERIAN SAINS TEKNOLOGI DAN INOVASI

*National Space Agency, Ministry of Science, Technology and Innovation*



# **DEVELOPMENT OF INDOOR AND OUTDOOR LOCATION TRACKING SYSTEM FOR ALZHEIMER'S PATIENT**

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**NEGARAKU**

# Outline

- Background
- Alzheimer Trigger, Tracking and Tracing System (ATTracT)
- Indoor Positioning System and test result
- Implementation
- Concluding Remarks



# Background

- Dementia: Umbrella term used to describe a loss of mental ability that cause problem with memory, language skills and mental agility
- Alzheimer's Disease (AD): disease that affects the multiple functions of brain cells
- Resulting in impaired memory, thinking and personality change
- Affect adults at any age, but usually occurs after age 65

**47 million**

**people live with dementia worldwide now, and expected to triple to 135 million by 2050**

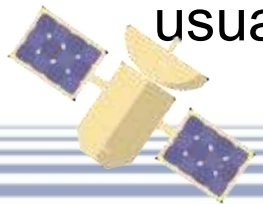
*(Source: World Alzheimer's Report 2016)*



**123,000**

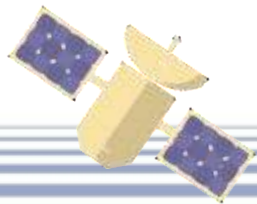
**peoples in  
Malaysia with  
dementia in 2015**

*(Source:  
Alzheimer's Disease Foundation Malaysia)*



# Alzheimer patient Report of missing..

- 6 in 10 people will wander
- 70% of those lost 3 times or more
- 46% of wanders not found within 24 hours involved in accidents



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## Missing, Wandering Alzheimer's Patients A Growing Concern

07/26/2013 08:48 am ET



"There's approximately 125,000 search-and-rescue missions where volunteer teams are deployed ... for missing Alzheimer's patients every year," said [Kimberly Kelly](#), founder and director of Project Far From Home, an Alzheimer's education program designed for law enforcement and search and rescue personnel.

The estimated number of reported cases is conservative, because not every department contributes to the reports, she said.

"With 5.5 million people with the disease, and 70 percent wandering away at least

# In Malaysia...

Thursday, 13 July 2017 | MYT 1:46 PM

Senior citizen with Alzheimer's missing since Tuesday evening

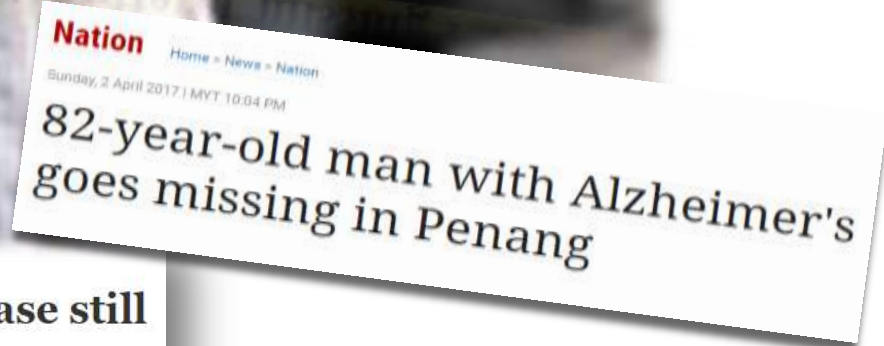


Sinar ONLINE TELUS & TULUS EN Nasional Politik Edisi Semasa  
13.68 ] Warga emas alzheimer dilapor hilang  
T 2017

Warga Emas Hidap Alzheimer Hilang Sejak Selasa

Alzheimer's sufferer missing for a week

Warga emas alzheimer dilapor hilang



Nation Home - News - Nation  
Sunday, 2 April 2017 | MYT 10:04 PM  
82-year-old man with Alzheimer's goes missing in Penang

Man with Alzheimer's Disease still missing after a week

Posted on 27 June 2017 - 12:15am



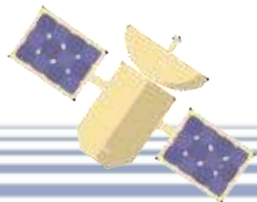
Hidap Alzheimer Dan Dementia, Warga Emas 87 Tahun Hilang Selepas Keluar Dari Rumah



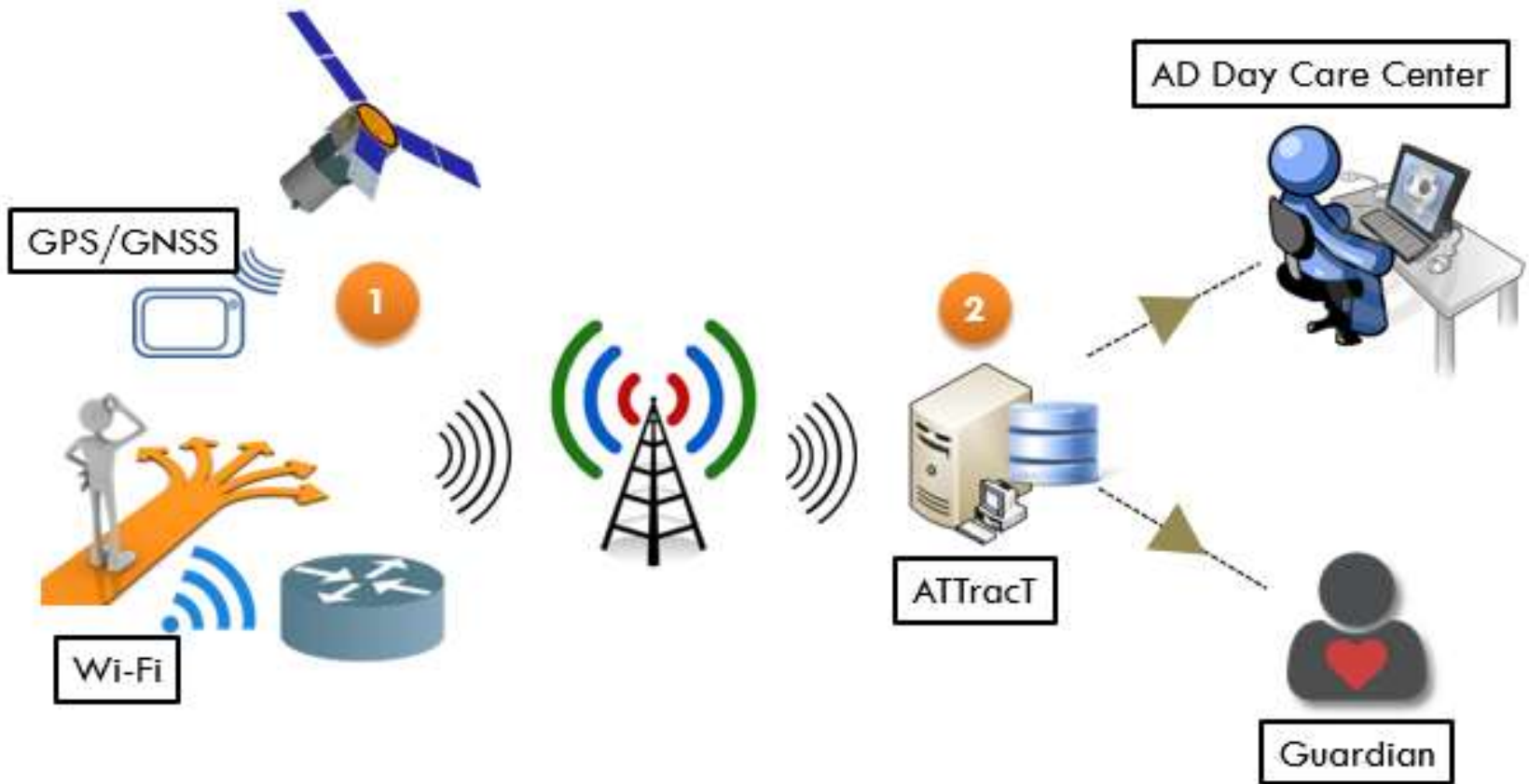


**Alzheimer Trigger, Tracking and Tracing  
System (ATTract)**

- ANGKASA has developed ATTracT for Alzheimer's community.
- Integrate the Wi-Fi network capability to determine the location of a person with AD for the both indoor and outdoor environment
- It aims to provide caregivers with an alternative method of monitoring the movement and improving the safety of their loved ones who have AD.
- The movement of the person with AD will be monitored using a wrist watch enabled with GPS while the guardian will be able to track and monitor the person in real time via their smart devices.
- Social Innovation Program - aims to benefit the community at the grassroots level by exploiting satellite technology



# System Architecture



1. Transmission of signals include position information through a GNSS/WiFi-capable device to a central server.
2. The central server will handle a map display and shows the location of the device in real time
3. SIM card is used to connect and identify information about the user and local WiFi network



# Software

Phonegap



To develop mobile apps in Android platform

Microsoft Visual Studio



Web based application development

PostgreSQL

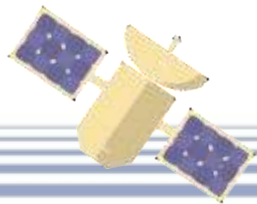


Database development

Windows Server

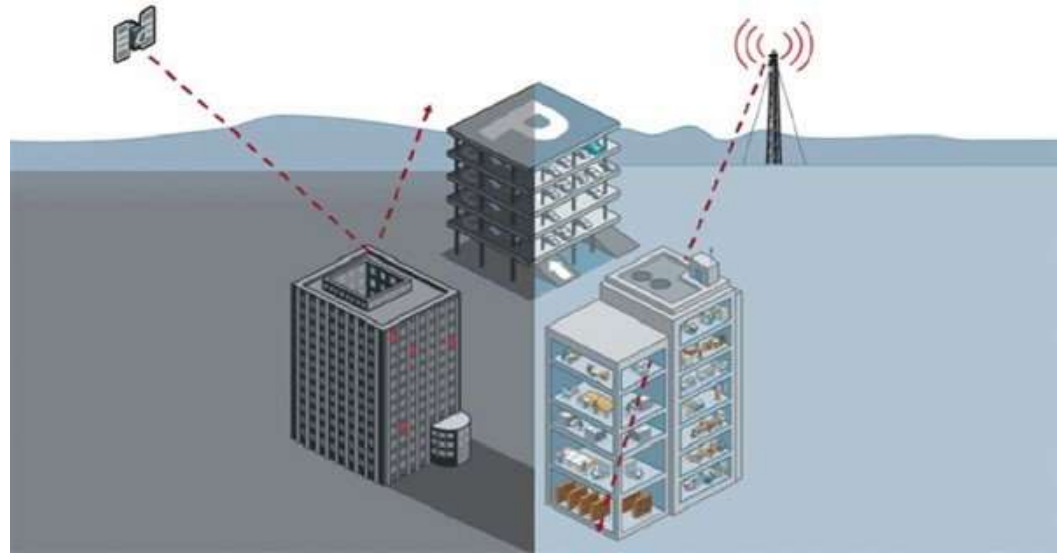


Server operation system



# Indoor Positioning System

- GPS has made a good impression in terms of accuracy and is the preferred location-based system for outdoor positioning
- However, GPS signals don't work indoors or in narrow streets as they tend to attenuate and scatter by roofs and walls
- Indoor positioning is more complicated due to need certain infrastructure to be in place indoor.



# Available Indoor Positioning Technologies

The technologies used today for indoor positioning differ in terms of accuracy and costs

## Wi-Fi

- Not requires investing in specialized hardware, where existing Wi-Fi infrastructure can be used
- Large range coverage (up to 150m)
- Enabled Wi-Fi is sufficient
- Detects floor level

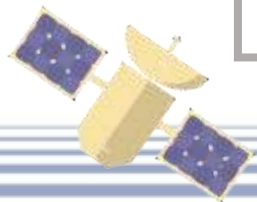


## Bluetooth

- Maximum range of coverage is 30m indoors
- 1-3 meters accuracy

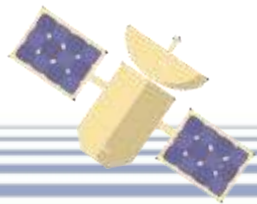
## RFID

- Demonstrated its capability in location-based system
- Cost of deploying and implementing could be high

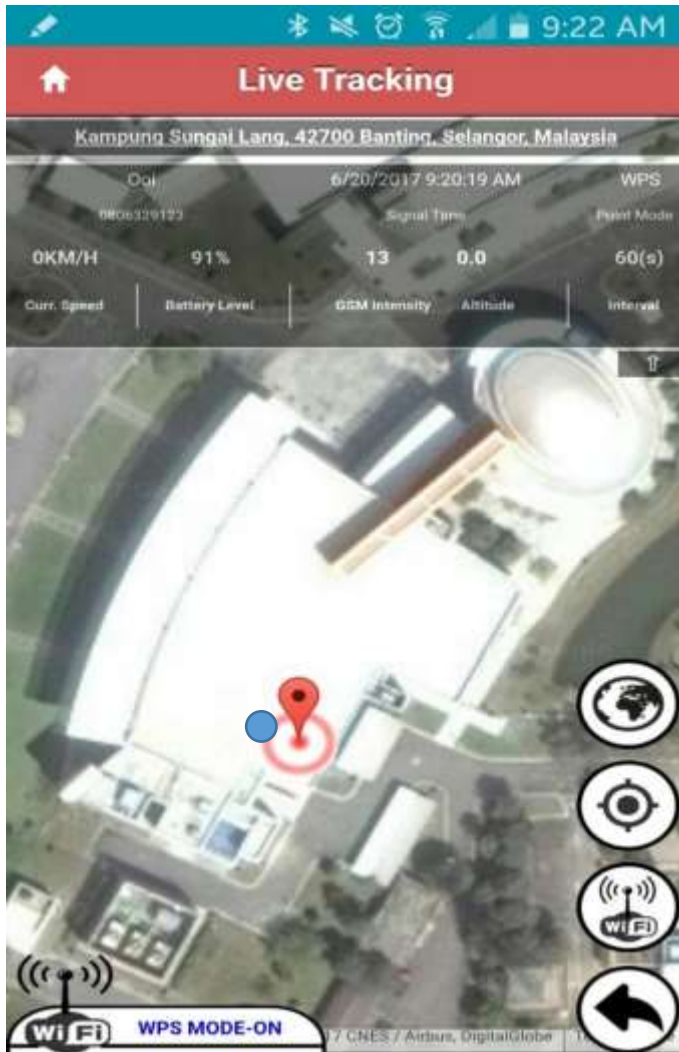


# Wi-Fi

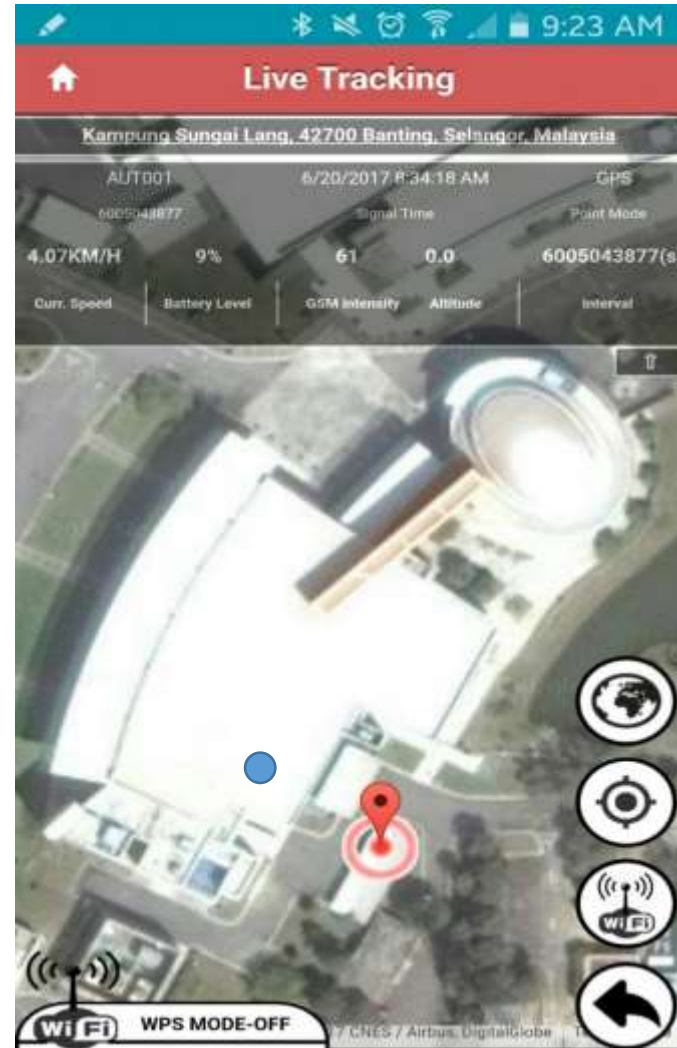
- Most often used for indoor navigation system
- Each available Wi-Fi access point transmits specific data
- Calculate the current location of the end user device by using a RSSI (Received Signal Strength Indication) and MAC address
- Only functions with Android devices due to technical restrictions (Not for iOS devices)



# ATTracT - Test result

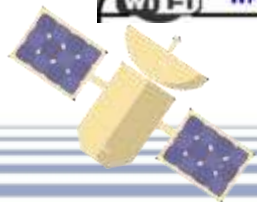


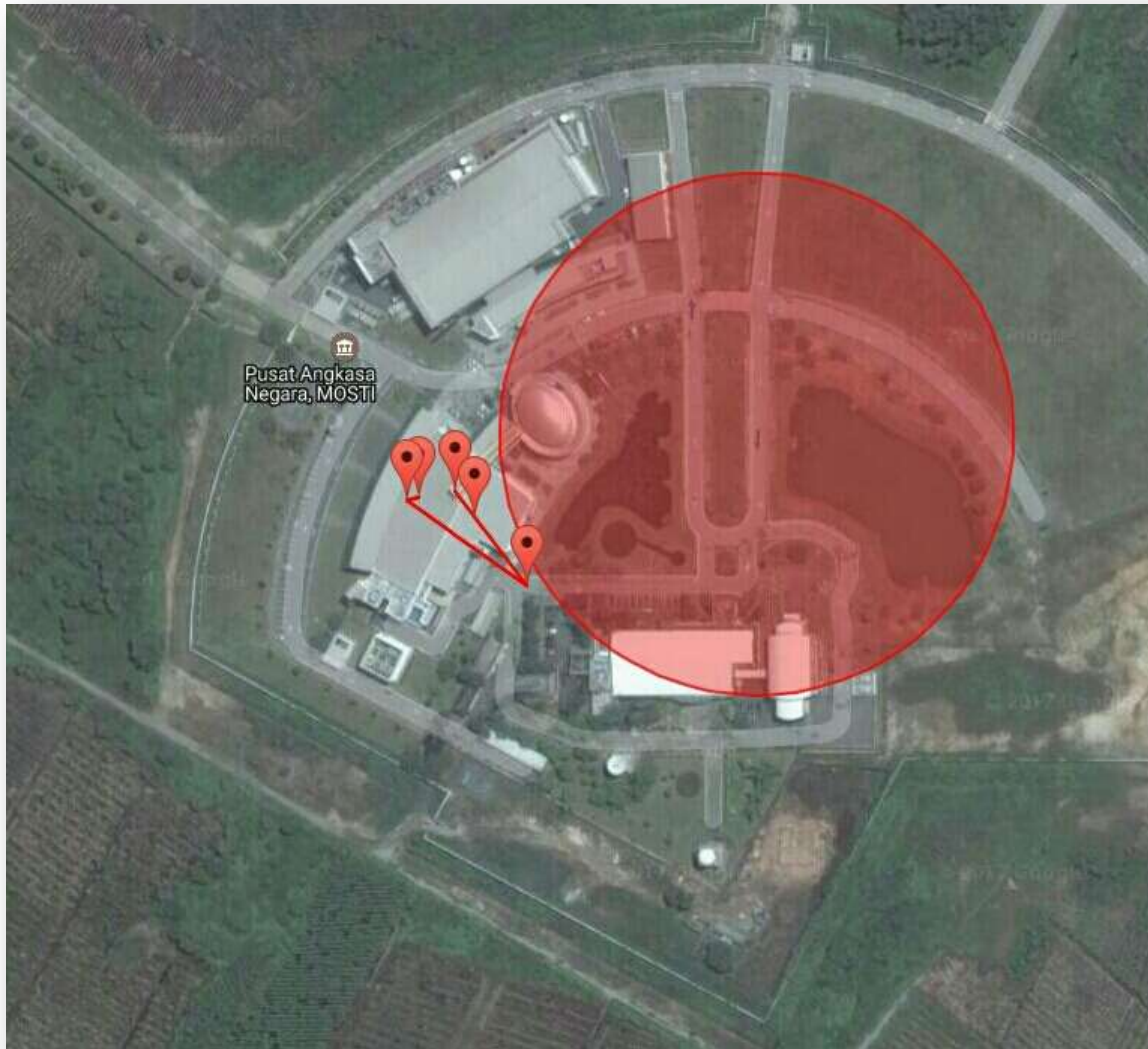
WiFi mode – On



WiFi mode – Off

● Actual location





# ATTRACT



Account setting 

JIA XIAN



Real-Time tracking  
(WPS / GPS)

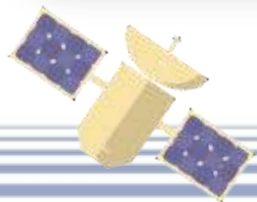


Virtual Boundary  
Setting (Time / Zone)



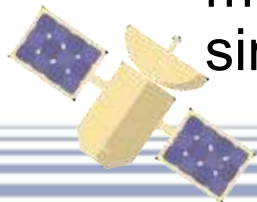
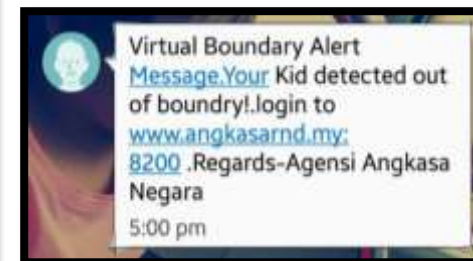
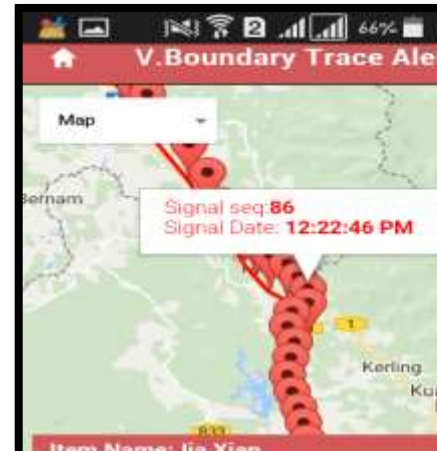
Trace Record  
(Alert)

Indoor positioning accuracy  
~ 20 meters



# ATTracT- other features

- i. Mobile apps for the caregivers to monitor the patient, setup virtual boundary of the activity zone and **time activation** according to the **schedule every single day**
- ii. Alert would be sent to the smart devices of the caregivers and patient's movement history could be saved
- iii. Real-time **monitoring system** for caregivers centre to track movement of all patients simultaneously



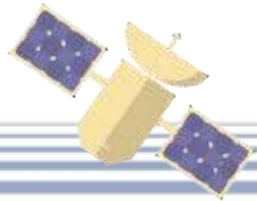
# ATTracT- caregiver centre

**VIRTUAL BOUNDARY MONITORING CENTER**  
Angkasa Trigger Tracking and Trace (ATTracT)

The screenshot displays a satellite map of Cyberjaya, Malaysia, with a red circular virtual boundary centered on the area. Three user locations are marked with red pins and labels: ALZ018, Ooi, and Sharizal. The interface includes a top navigation bar with icons for Basemap, Home, and Power, and a right-hand panel with status sections: 'Out Of Virtual Boundary' (0 users), 'In Virtual Boundary' (4 users: Ooi, PROTON PERSONA, Sharizal, ALZ018), and 'Active Virtual Boundary' (2 boundaries: Sharizal and ALZ018). A table at the bottom lists active virtual boundary signals.


WATCH ID	NAME	SIGNAL DATETIME	V BOUNDARY NAME	V BOUNDARY TIME
0806329123	OOI	6/25/2017 11:46:38 PM	OOI	10:00-AM-06:00-PM
359710048057492	PROTON PERSONA	7/11/2017 11:28:58 AM	CYBERJAYA	11:00-AM-11:00-PM

Monitoring system setup for observing user movement





**VIRTUAL BOUNDARY MONITORING CENTER**  
 Angkasa Trigger Tracking and Trace (ATTracT)

ANGKASA MALAYSIA  **ATTracT** PUSAT TERAPI

0 Out Of Virtual Boundary

2 In Virtual Boundary

2 Active Virtual Boundary

**Virtual Boundary Setting**

ID: 0

OriginalID:

Virtual Boundary Name: Sharizal

Time From: 11:00-AM

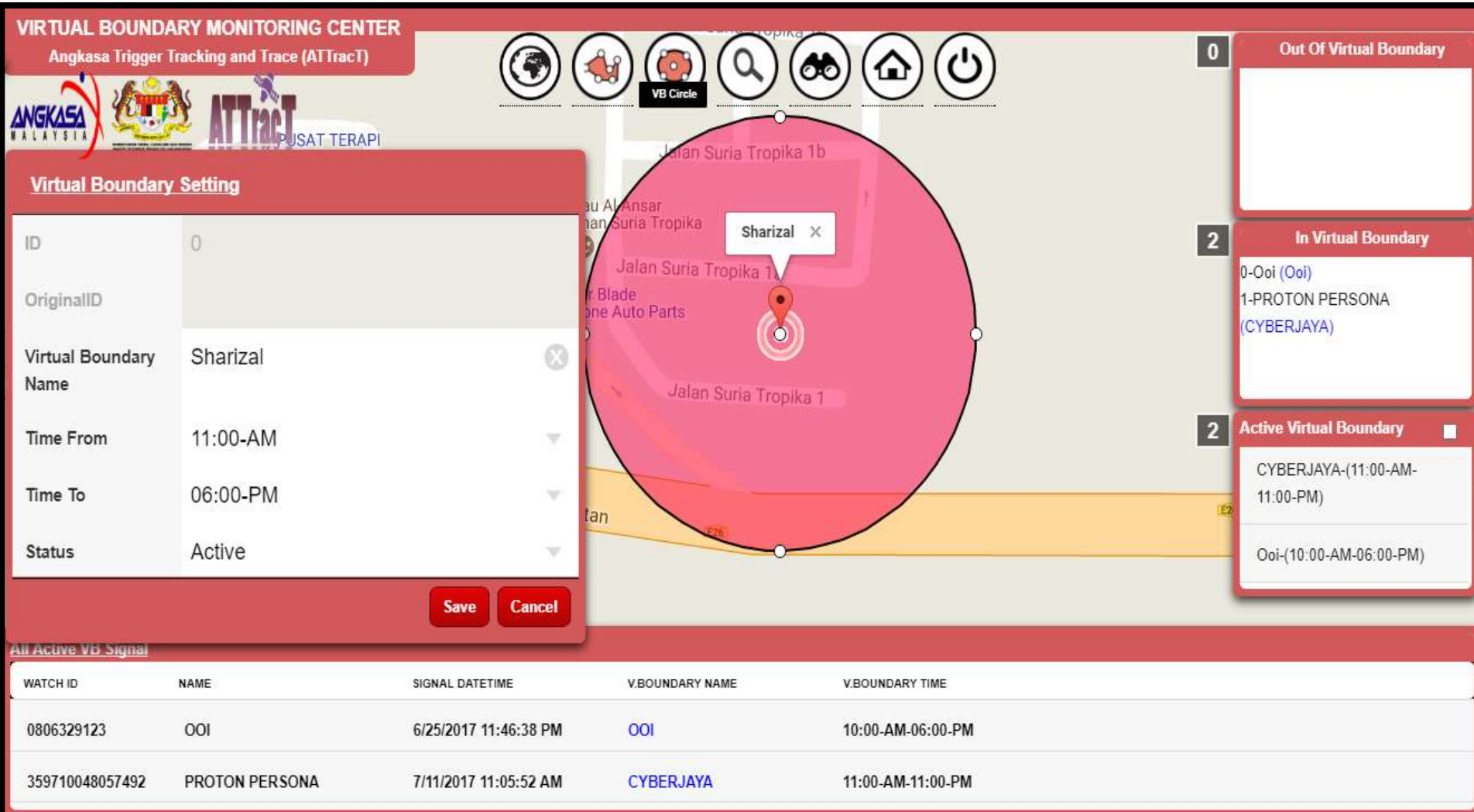
Time To: 06:00-PM

Status: Active

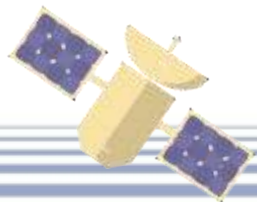
Save Cancel

**All Active VB Signal**

WATCH ID	NAME	SIGNAL DATETIME	V.BOUNDARY NAME	V.BOUNDARY TIME
0806329123	OOI	6/25/2017 11:46:38 PM	OOI	10:00-AM-06:00-PM
359710048057492	PROTON PERSONA	7/11/2017 11:05:52 AM	CYBERJAYA	11:00-AM-11:00-PM



Virtual boundary setup in care centre for observing user movement



**VIRTUAL BOUNDARY MONITORING CENTER**  
 Angkasa Trigger Tracking and Trace (ATTracT)

ANGKASA  
 ATTracT

Find GPS Signal

Sharizal

Cancel Search

Sharizal

0 Out Of Virtual Boundary

4 In Virtual Boundary

5 Active Virtual Boundary

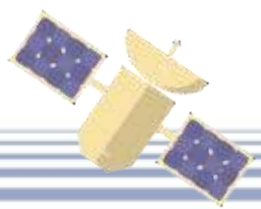
0-Ooi (Ooi)  
 1-PROTON PERSONA (CYBERJAYA)  
 2-Sharizal (Sharizal)  
 3-ALZ018 (ALZ018)

Sharizal-(11:00-AM-06:00-PM)  
 ALZ018-(11:00-AM-06:00-PM)

**All Active VB Signal**

WATCH ID	NAME	SIGNAL DATETIME	V.BOUNDARY NAME	V.BOUNDARY TIME
0806329123	OOI	6/25/2017 11:46:38 PM	OOI	10:00-AM-06:00-PM
359710048057492	PROTON PERSONA	7/11/2017 12:23:58 PM	CYBERJAYA	11:00-AM-11:00-PM

System allows to search the patient's location



# Attract Login History Report

Report Menu

## 1). Attract Login History Report

LAST LOGIN DATE	USER NAME	ACCOUNT NO
7/11/2017 12:58:00 PM	ALZ009	3083-Nov-2017-6
7/11/2017 11:01:42 AM	solwehan	1036-Nov-2016-5
7/11/2017 9:40:03 AM	Mzi	2047-Nov-2016-5
7/8/2017 6:47:27 PM	Test	3054-Nov-2017-6
7/8/2017 12:11:56 PM	ALZ001	3055-Nov-2017-6
6/27/2017 11:35:06 AM	alz020	3073-Nov-2017-6
6/25/2017 12:39:37 PM	ALZ002	
6/25/2017 12:27:24 PM	AUT001	
6/24/2017 7:33:22 PM	ALZ016	
6/23/2017 12:38:54 PM	ALZ012	
6/19/2017 8:35:41 AM	ALZ032	
6/19/2017 8:33:51 AM	LYDIA	

113 Records

Print  
Total 3 pages

Destination: Save as PDF  
Change...

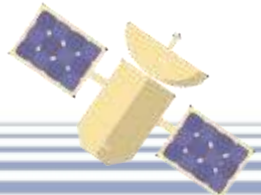
Pages: All  
e.g. 1-3, 8, 11-13

Layout: Portrait

Paper size: Letter

Save Cancel

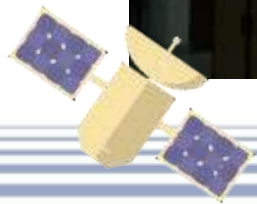
Generate the trace record for each patient





## Implementation overview

# Project Implementation with Alzheimer's Disease Foundation Malaysia



# Evaluation form



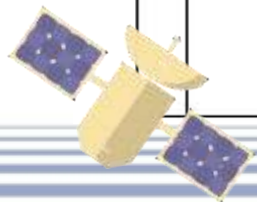
TRACKING SYSTEM FOR ALZHEIMER'S PERSONS  
MOSTI SOCIAL INNOVATION PROGRAMME



## QUESTIONNAIRE

1	Full name of Alzheimer's (AD) Person (name according to NRIC):	AD Person NRIC Number:
2	AD Person Home Address:	
3	Full name of Guardian/Caregiver (name according to NRIC):	Relationship of Guardian/ Caregiver with AD Person:
4	Contact (Mobile) number of Guardian/Caregiver:	
5a	Why you wish to participate in this pilot trial?	
5b	How this device will help you?	

- Understanding the real needs and requirements to existing practices at the center
- To evaluate the effectiveness and benefits of the systems developed for AD
- To evaluate the efficiency / accuracy of indoor positioning system using Wi-Fi



# NST newspaper - 30 July 2017

Newspaper clipping from the Sunday Times, dated 30 July 2017, page 10. The article is titled "A LIFELINE FOR ALZHEIMER'S PATIENTS" and is part of a "Spotlight" feature. It discusses a new tracking system for Alzheimer's patients called ATTracT, developed by the Science, Technology and Innovation Ministry. The article includes a photo of a man and a woman, and a photo of a man holding a device. The text describes how the system works, its features, and how it is used. It also mentions that the system is currently in its trial run and aims to provide caregivers with an alternative method of monitoring their family members.

**10 NEWS**

**TRACKER**

**A LIFELINE FOR ALZHEIMER'S PATIENTS**

A state-of-the-art tracking system for Alzheimer's disease patients has been developed by the Science, Technology and Innovation Ministry. Now in its trial run, the programme aims to provide caregivers with an alternative method of monitoring their family members, writes **SUZANNA PILLAY**

**T**WO Alzheimer's disease (AD) patients made headlines this year when they went missing, leaving their worried family members to look for their loved ones in vain.

In March, Lee Keng Hin, 71, from Bishan, was thought to be found after visiting Kuala Lumpur Hospital (KHL) with family members.

Three months later, another AD patient, Yeock Chuan Abdul Halim, 68, from Shah Alam, was reported missing after being spotted at a bus stop in Seremban, near a hypermarket.

Data from the United Nations on the prevalence of AD over a projected population of more than 30 million Malaysians in 2025, indicates that an estimated 261,000 or more are expected to have AD.

From this figure, more than 60 per cent of AD patients wander off on their own.

If they are not found within 24 hours, up to half of them may be involved in life-threatening situations.

According to Alzheimer's Disease Association (ADA), in the US, 60 per cent of AD patients wander off on their own. Above this age, a person's risk of developing AD also rises significantly every five years. It is 2.6 times in younger people.

As the number of people aged 65 and above will exceed 50 per cent of the population by 2020, more Malaysians are increasingly vulnerable to the disease.

Technological advancements developed at National Science Agency (Angkasa) hope to aid these loved ones and ensure AD patients are getting the care they need.

Angkasa's Tracking, Monitoring and Alerting System (ATTracT) is a state-of-the-art tracking system developed to monitor the location of a person with AD at all times.

Funded by the Science, Technology and Innovation Ministry's (MOSTI) Social Innovation Programme, the project aims to benefit the AD community at the grassroots level by using space technology and global positioning system (GPS) technology.

Monitoring the movement and improving the safety of people with AD were what attracted ATTracT to Angkasa research of Drs. Dai Wei Han.

It aims to provide caregivers with an alternative method of monitoring AD patients, indoors and outdoors.

It seeks to improve the safety of people living with AD by reducing the risk of them getting lost and hurt in the process.

"The momenta of senior citizens with AD will be monitored by ATTracT by a wireless mobile, with satellite, on-board, 3G/4G and cloud boundary control."

The system also uses a Wi-Fi network capability in conjunction with GPS, which will be useful when the GPS signal is weak or unavailable in an indoor environment.

The watch is to be worn by AD patients. The guardian or caregiver tracks and monitor patients in real time via smart devices.

The device will transmit the location of AD patients to caregivers every two to four minutes. Like smartphone devices, the device needs to be charged every one to two days.

The tracking system supports only Android mobile phones and works in all areas under tele coverage.

An alert will be sent to the guardian's smart device (up to four devices), which store the history of the AD patient's movement in case he crosses the virtual boundary during monitoring.

Beside the mobile device, a real-time monitoring system is set up in caregiver centres to receive all users' movements under their supervision.

The information and movements will be stored in a cloud.

Out of this with the ATTracT watches.

Approved by the Ministry of Health, the ATTracT watches are located at Angkasa headquarters in Seremban.

The watches are subject to the AD Care Centre and other agencies of the government.

**Spotlight**

**ATTracT**

**FEATURES OF ATTracT**

- Real-time location tracking for indoor and outdoor movements
- Movement zone/virtual boundary set up and time adjustment
- GPS alerts up to 4 smart devices
- History of movements and AD patient centre records the virtual boundary
- Monitoring system set up in AD care centres for observation and intervention

**HOW ATTracT WORKS**

- Approved by the Ministry of Health, the ATTracT watches are located at Angkasa headquarters in Seremban.
- All the watches are subject to the AD Care Centre and other agencies of the government.



## ALZHEIMER'S DISEASE FACTBOX

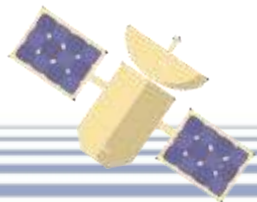


Source: Alzheimer's Disease Foundation Malaysia

INFOGRAPHIC NST

# Concluding Remarks

- This development provide caregivers with an alternative method of monitoring movement of AD for both indoor/outdoor
- Improve the safety of the AD patients by reducing the risk of getting lost and hurt in the process
- Benefit the community at the grassroots level by exploiting the space and GNSS technology





Thank you

