



# ***Communications Research Profile at Chula EE***

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***Director, Industrial Liaison Program  
Faculty of Engineering  
Chulalongkorn University***

**ASEAN-NICT Round Table 2015**



# Chulalongkorn University



Chula is the oldest and among the most prestigious universities in Thailand, located in the heart of **Bangkok**.

- 19 faculties and 23 colleges and research institutes
- Students: 38,000 (25,000 UG; 11,000 Master; 2,000 PhD)
- Faculty staff: 2,800





# Chula Engineering

Over **300** highly qualified full-time faculty members graduated from renowned universities worldwide



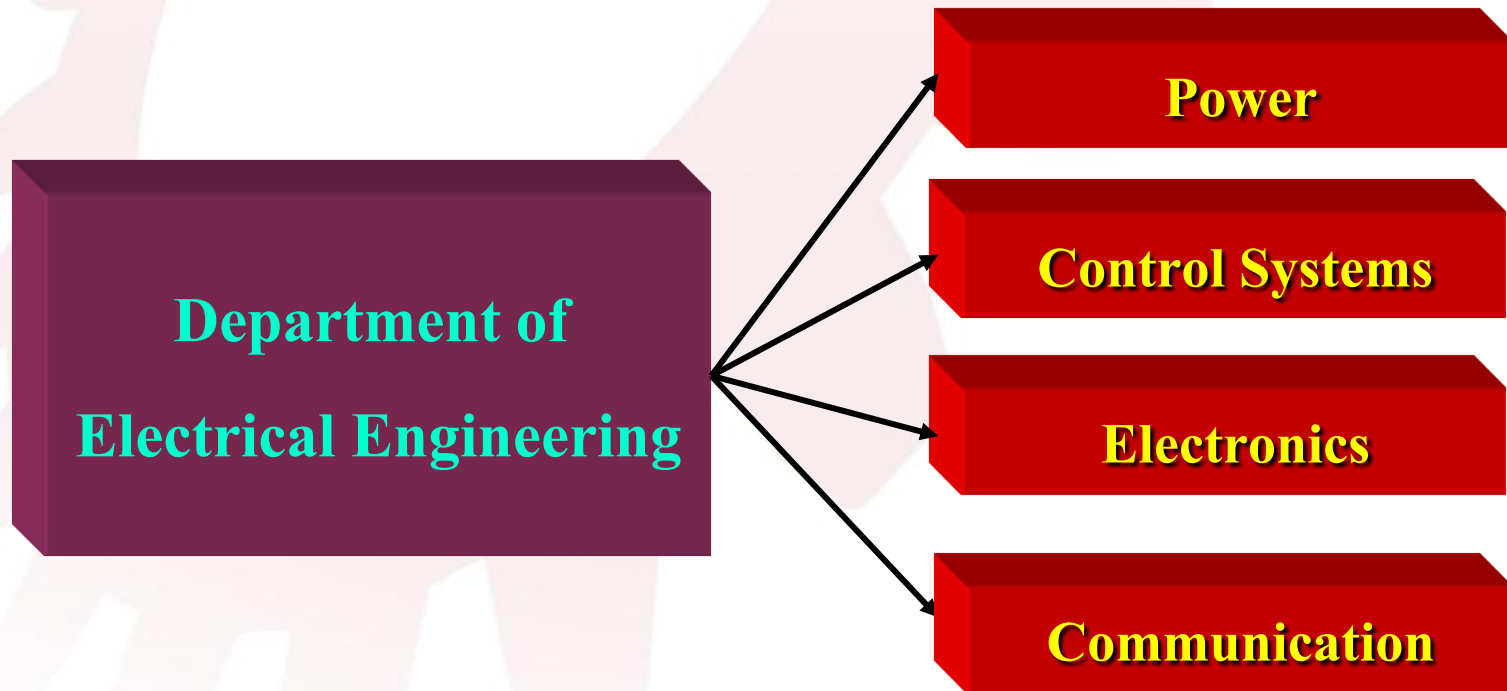
12 departments **Civil**, **Electrical**, **Mechanical**, **Computer**, **Industrial**, **Chemical**, **Mining & Petroleum**, **Environmental**, **Metallurgical**, **Water Resource**, **Survey**, and **Nuclear Engineering**

**1,000** NEW undergraduate students admitted each year with highest score from national entrance exam

More than **5,000** total students undertaking **58** regular **4** and international programs



# Structure of Department





## Research Laboratories

Power Systems

High Voltage

Semiconductor Devices

Bio Electronics

Embedded System and IC Design

Industrial Instrumentation

Power Electronics

Control Systems

Digital Signal Processing

Telecommunication Systems

Electromagnetic

Smart Grid and  
Renewable Energy

**Power Electronics**

**High Voltage  
Engineering**

**Nanoelectronics and Photonics**

**Smart Health Biomedical  
Engineering**

**Embedded Systems & Robotics**

**Advanced Control and Optimization**

**Telecommunications and  
Information Networking**

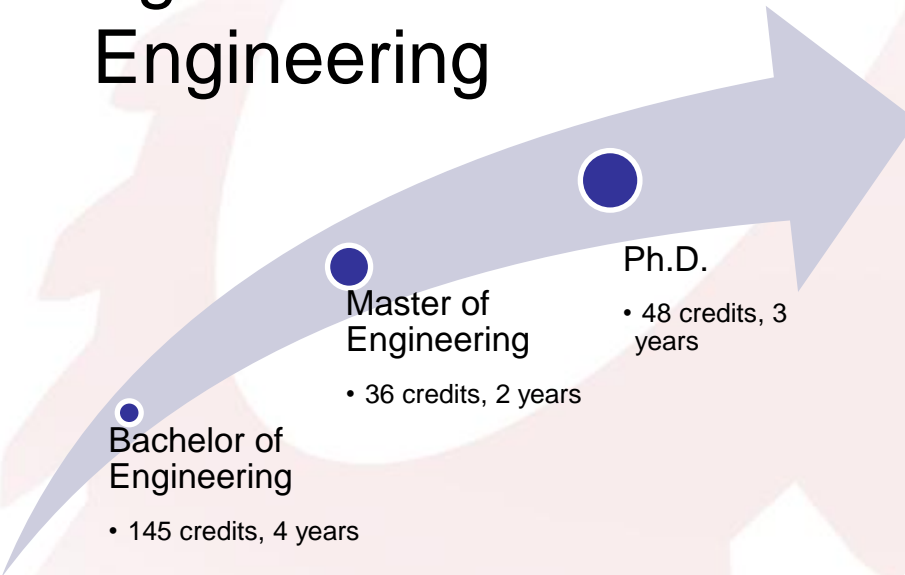
**Microwave and Light wave  
Communications**

**Multimedia & Signal Processing**

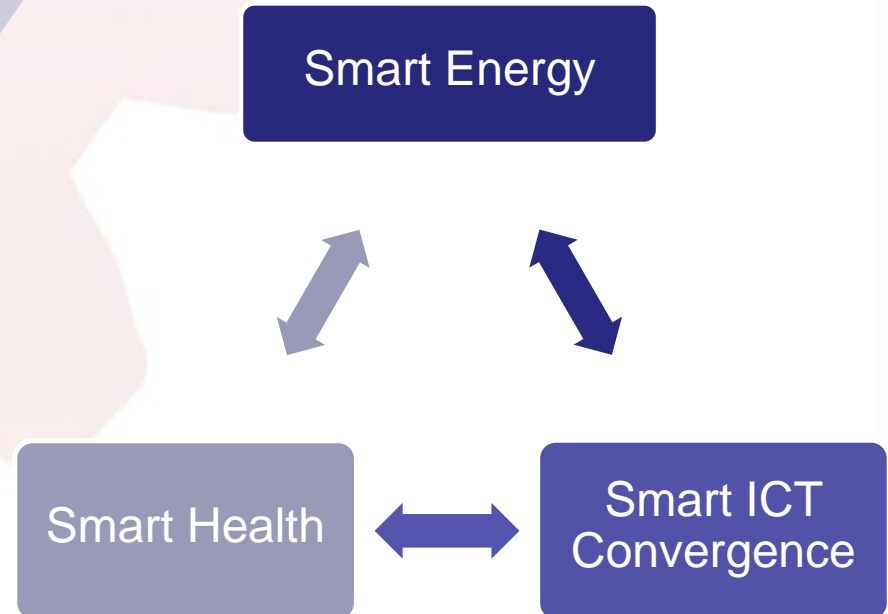


# Study Programs and SRA

## Programs in Electrical Engineering



## Strategic Research Area



### Continuing program

1. Bachelor and Master Program: 5 years
2. Master and Ph.D. program: 4-5 years
3. Postdoctoral program 1-3 years



# Telecommunication Systems Research Lab

Dr. Lunchakorn Wuittisitikuljij	MAC Protocols, Visible Light Communications, Non-Binary LPDC Code
Dr. Prasit Teekaput	Telecommunications
Dr. Chaodit Aswakul	Intelligent Transportation System, Ad Hoc Network , NGNs, Traffic Modelling and Controls , Smart In-Building Energy Management
Dr. Chaiyachet Saivichit	Networking Protocols Design and Performance Analysis, Aviation Ad Hoc Networking, NGNs, Telecommunication Economics.
Dr. Watit Benjapolakul	Wireless Networking, Energy Management System





**GreenNet**

Green Network

**RoadNet**

Road Network

**VirNet**

Virtualised Network

**MoveNet**

Mobile Vehicular Network

**NRG@EE-CU**

**HetNet**

Heterogeneous Network

**EconNet**

Economics in Network

**CogNet**

Cognitive Radio Network



# GreenNet Mission

- **IEEE-1888 Building Energy Management System (BEMS) Testbed in Thailand**
- **Thai Energy Saving Awareness**
- **Integration with Country's Smart Power Grid**



**With technical supports and collaborations from Prof Esaki, Prof Ochiai (U. of Tokyo, Japan) and Smart Grid Cluster (EE-Chula, Thailand)**



# RoadNet Mission

Application of *information*,  
*communication* and *control* technologies  
for city traffic management  
in oversaturated road networks.



**RoadNet– GREEN – CLEAN**

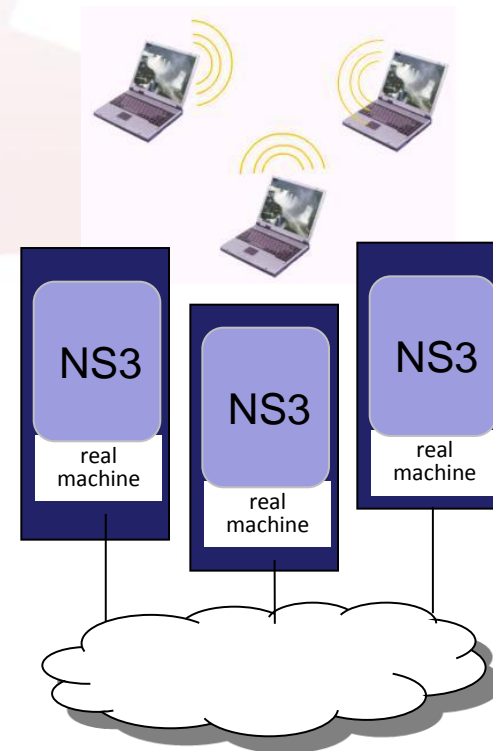
**RoadNet– GREEN – CLEAN**

**RoadNet– GREEN – CLEAN**



# MoveNet Mission

Construction of mobile  
vehicular ad hoc  
communication testbed  
platforms (NS2/NS3) and  
development of data  
dissemination &  
transmission protocol.





## *VirNet Mission*

Open software defined networking for future core network technologies and realisation of traffic engineering research outcomes on practical-scale network testbeds

## *HetNet Mission*

Survey of machine learning potentials in HETNET and strategic initialisation of IMS-enabled platform for intelligent wireless heterogeneous network selection testbed

With collaboration from UNIFI Project (Prof T. Magedanz, FOKUS/UT Berlin, Germany)



## **CogNet Mission**

- Analysis of present Cognitive Radio Networks.
- Presenting efficient and practical schemes using Game Theory.
- Simulation based on MATLAB for different scenarios/schemes.

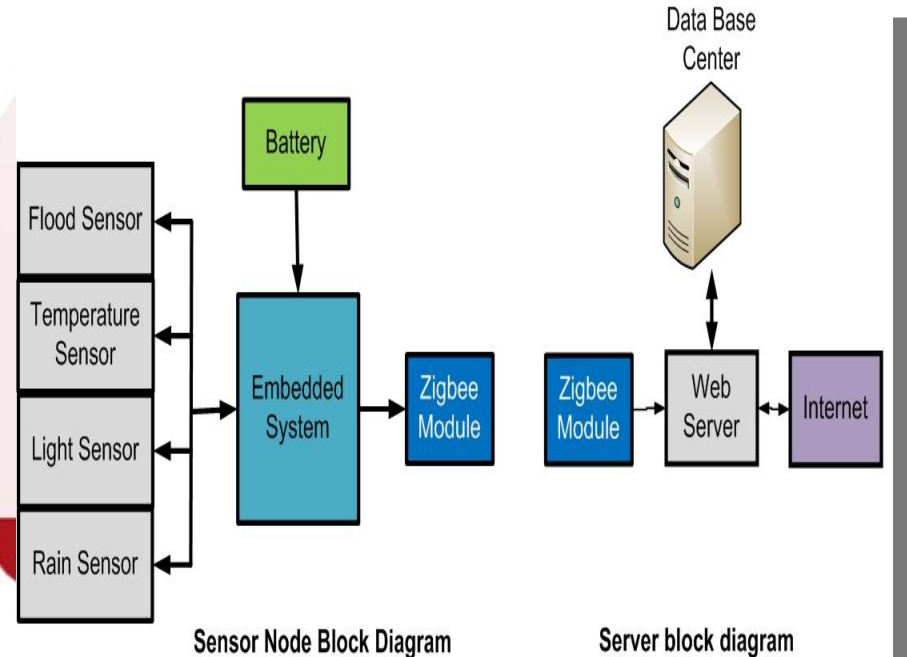
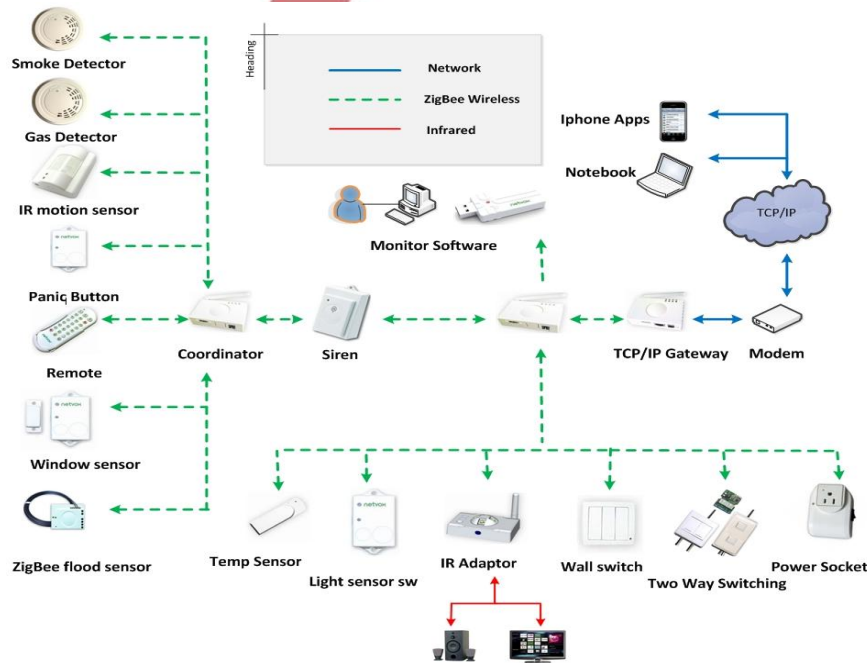
## **EconNet Mission**

**Exploring other engineering-related socio-economic aspects of network technology deployment in society**



## Prototype of IEEE 802.15.4 Devices (ZigBee) Application to Future Home Energy Management, Natural Disaster Alarm and Home Automation Services

Associate Professor Dr. Watit Benjapolakul

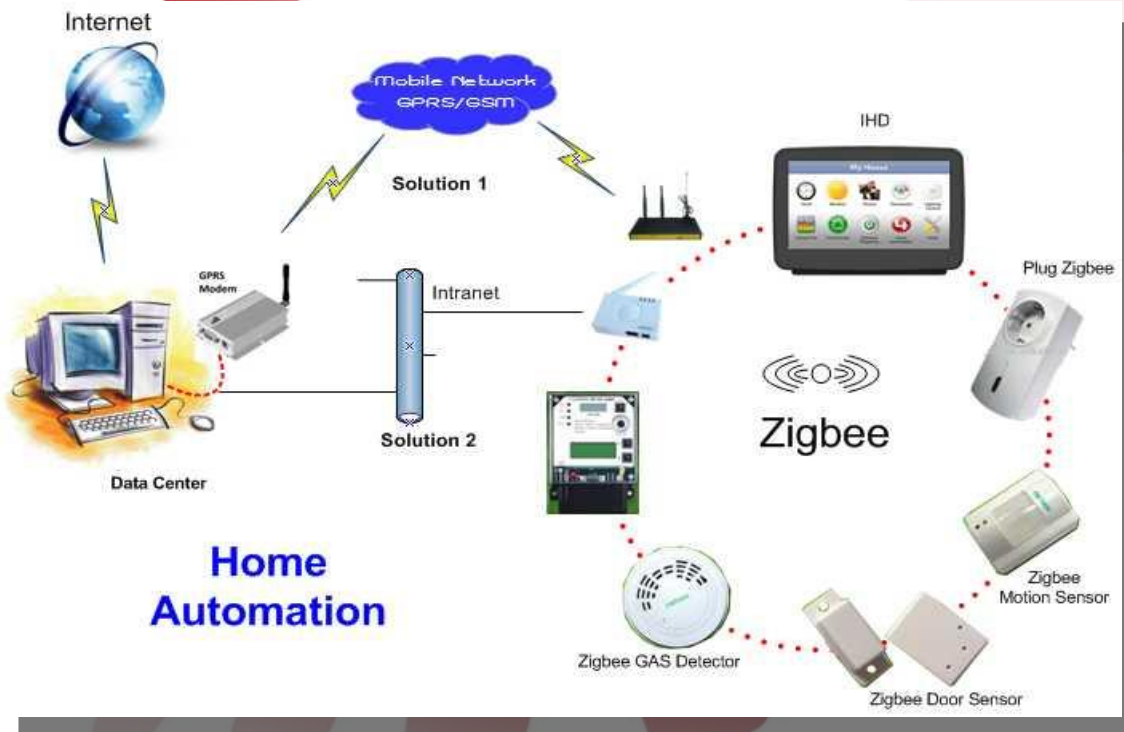


This research aims to design and implement a prototype system, includes flood level & weather sensors to prevent damage from natural disasters, many sensor stations from outside home to measure and send parameters through a wireless network server.



## Development of In Home Energy Visualization Application for Energy Management System in Smart House

Associate Professor Dr. Watit Benjapolakul



This research aims to design and develop In Home Energy Visualization (IHEV) application for energy management system in smart house.

This application will display energy usage information from analysis or meter reading to notify the status of energy consumption to the user.



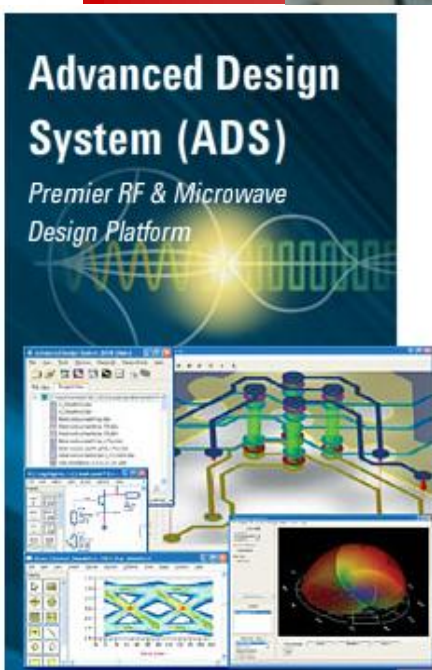


# Lightwave and High-Speed Communications

***Assoc. Prof. Dr. Duang-rudee Worasucheep***



## Design and Analysis



HP Workstation (Xeon Quad Core CPU)  
Model : XW6600

- Installed ADS2009 update1 license software
- Use to design and simulate high speed PCB layout.

Stereo Zoom Microscope AT-223

Use to verify PCB layout fabricated from  
PCB manufacturer.



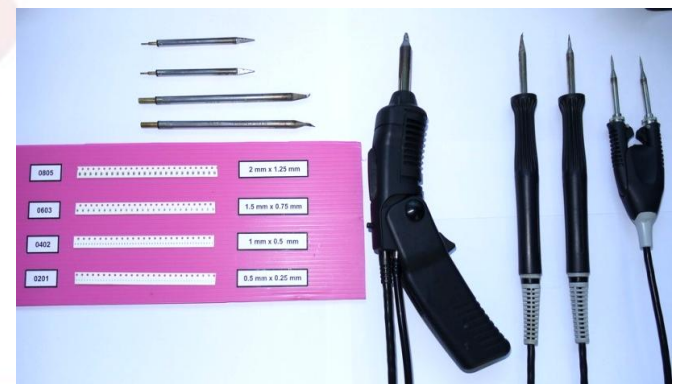
# Soldering Station



Rework and Soldering Station



Vacuum Purification Systems

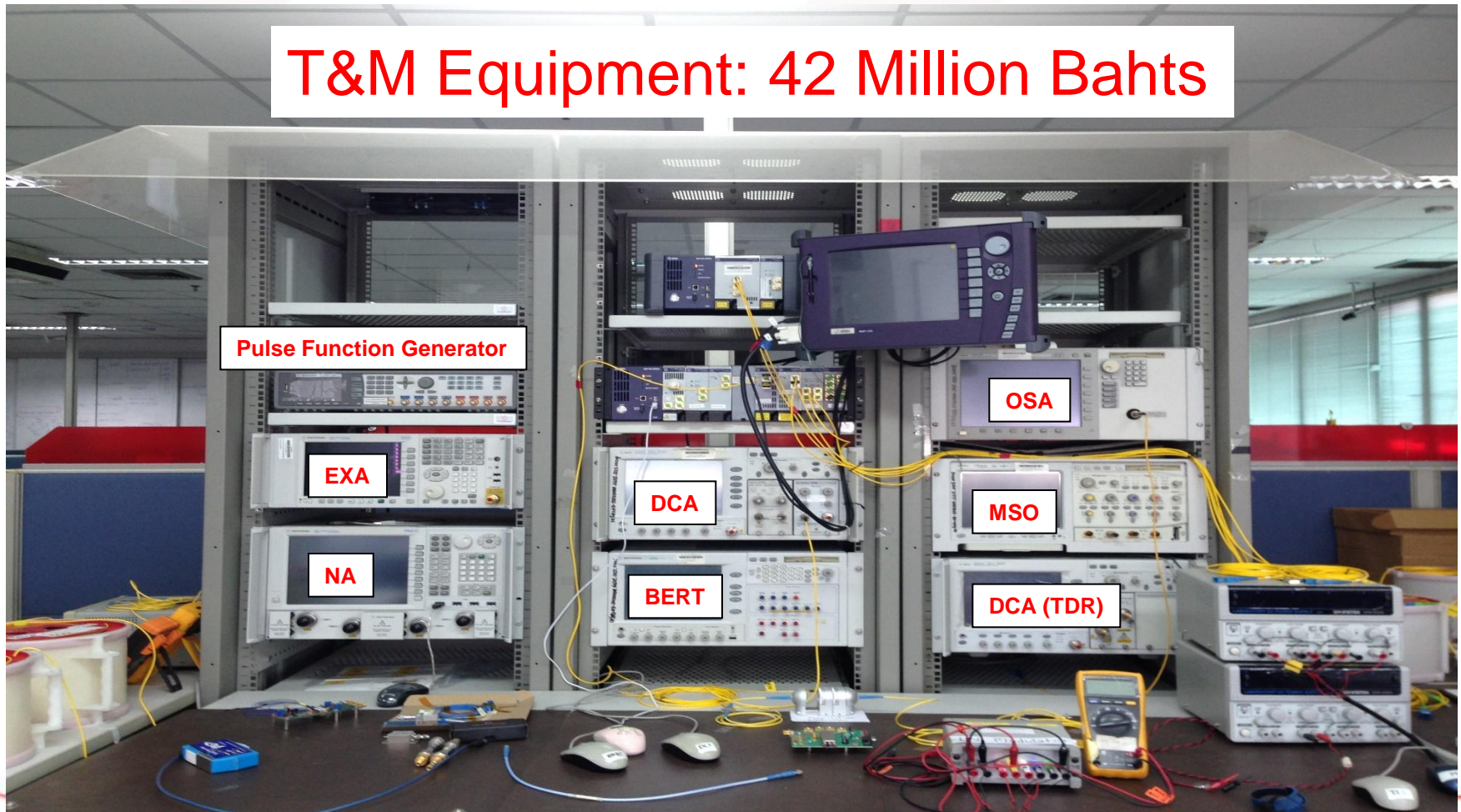


Various types of Soldering Tip and SMD



# Electro-Magnetic Research Laboratory, Chulalongkorn University, Thailand

**T&M Equipment: 42 Million Bahts**





# Probes and Accessories



- Agilent Active Probe, 4 GHz : **1158A**  
4 GHz probe offers you a full 4 GHz of system bandwidth, giving you accurate insight into your high-speed devices.



- Agilent Miniature Passive Probe, 10:1, 10 MOhm, 1.5m: **1165A**

General purpose probe for use with the InfiniiVision 7000, Infiniium 8000 Series and 54830 Series oscilloscopes



- Agilent TDR Probe Kit : **PS-X10-100**  
TDR Probe Kit Handy Probe Solution for TDR measurement with bandwidth > 15GHz (Differential)



- Agilent 3D probe positioner: **N2787A**

3D probe positioner with flexible, articulating arm



- Agilent 18 GHz Differential TDR/TDT Probe Kit : **N1021B**  
The N1021B is an ergonomically designed handheld probe to interface TDR/TDT modules such as the 54754A to printed circuit boards (PCBs) and components



# Optical Fiber Testbed



## Optical Fiber Testbed:

In our LAB, there are 4 types of optical fiber, G.652, G.652.D, G.655, DCF. All their length is about 400 km.



- Fitel Fusion Splicer, Cleaver and accessories : S177  
the Fitel S177 is the most compact and lightweight core aligning fusion splicer.



- NetTest OTDR Model : CMA4500

- Highest Dynamic Range in the industry-50dB
- OTDR, Loss Test Set and VFL in a single module



- Optical Fiber

- NDSF (G. 652 up to 220 km)
- NDSF (G.652.D up to 260 km , low loss water peak)
- NZ-DSF (G.655 up to 50 km)
- DCF up to 22 km



# DSP Research Lab

<b>Dr. Charnchai Plumepitiviriyavej</b>	<b>Medical Image Segmentations, Pattern Recognitions and Classifications, 3D Image Reconstruction and Modeling</b>
<b>Dr. Chedsada Chinrungrueng</b>	<b>Adaptive filtering, Biomedical Signal and Image Processing, Medical Imaging</b>
<b>Dr. Suvit Nakpeerayoot</b>	<b>Signal Processing for Communications</b>
<b>Dr. Widhayakorn Asdornwised</b>	<b>Lossless Image Compression, Wavelet Transform, Multiple Classifier Systems, Speech and Character Recognition</b>
<b>Dr. Supavadee Aramvith</b>	<b>Video Processing and Analysis in Surveillance Applications, Wireless Video Coding and Transmission, Image/Video Classification and Retrieval Techniques, Multimedia Communication Applications</b>
<b>Dr. Nisachon Tangsangiumwisai</b>	<b>Adaptive Filtering Techniques and their Applications, Noise Reduction Techniques for Speech Enhancement, DSP Applications</b>



# Wireless Video Transmission

Objective: To improve video quality under error prone channels



(a) Original frame

Random IR: 25.2dB



Fixed IR: 28.3dB



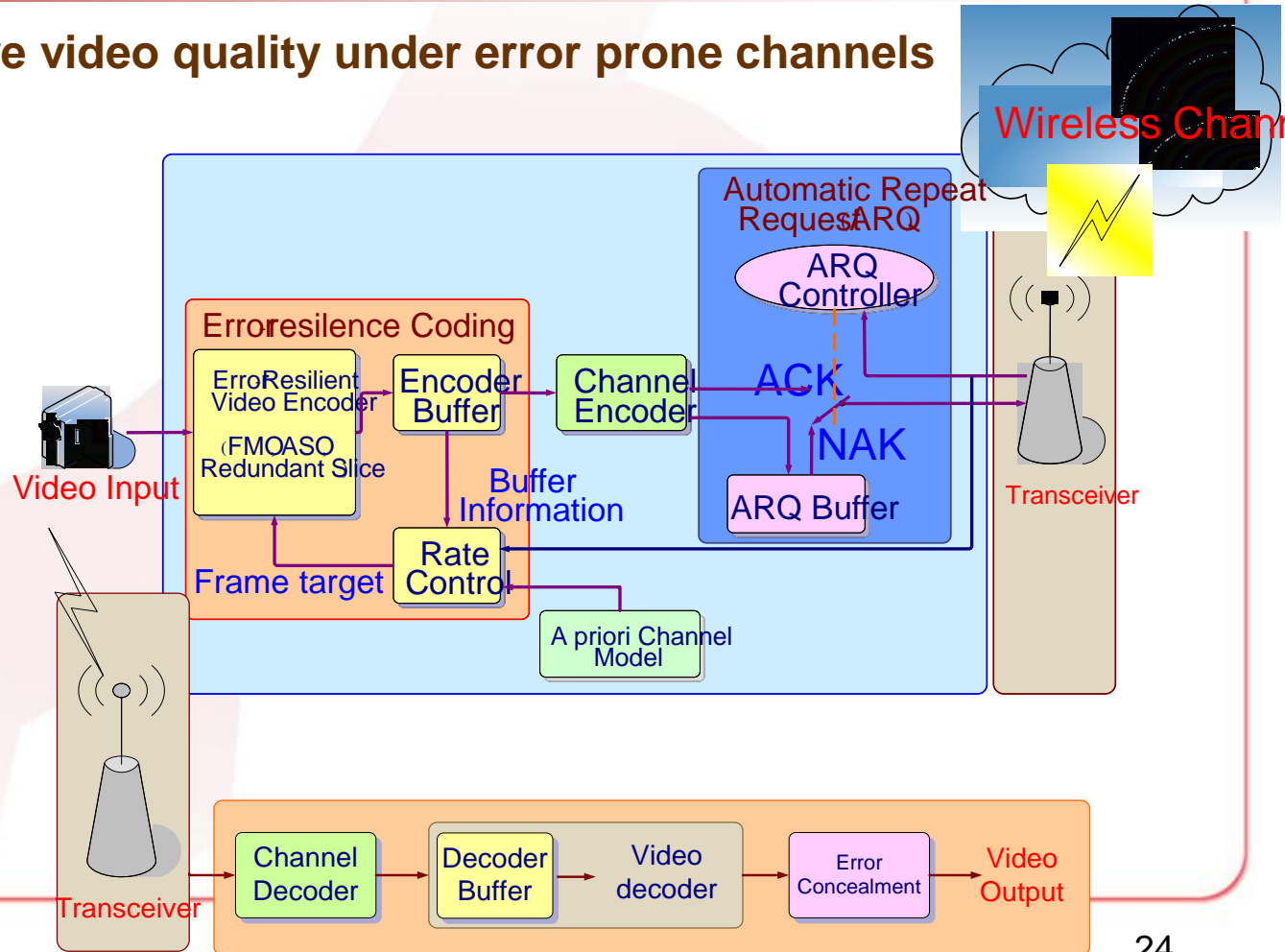
Fixed IR + no CP: 28.9dB



Adaptive IR + CP: 29.6dB



(b) Comparison in slow fading case







# Video Analytics for Surveillance System

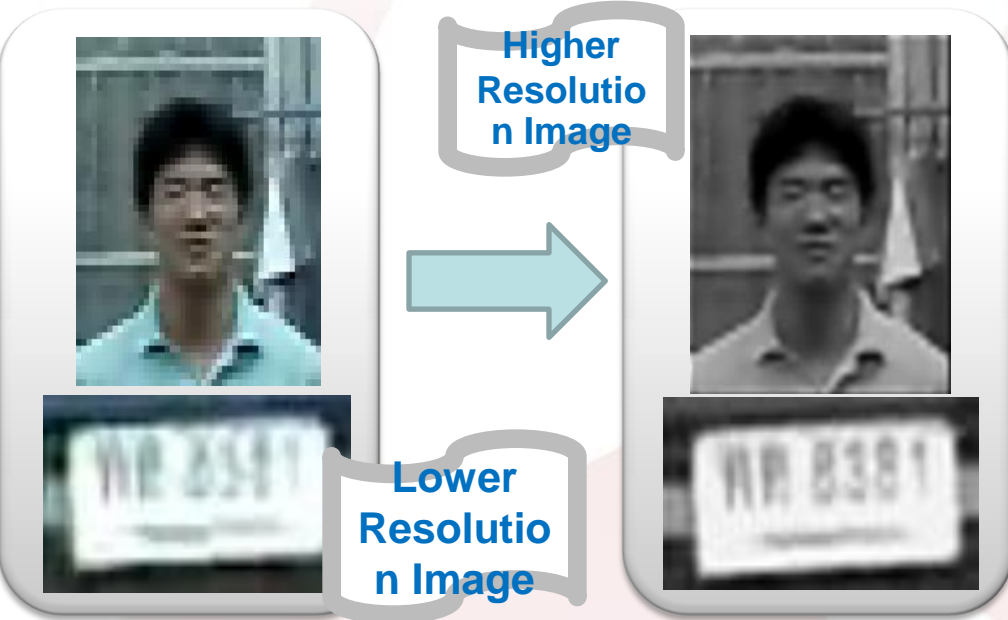
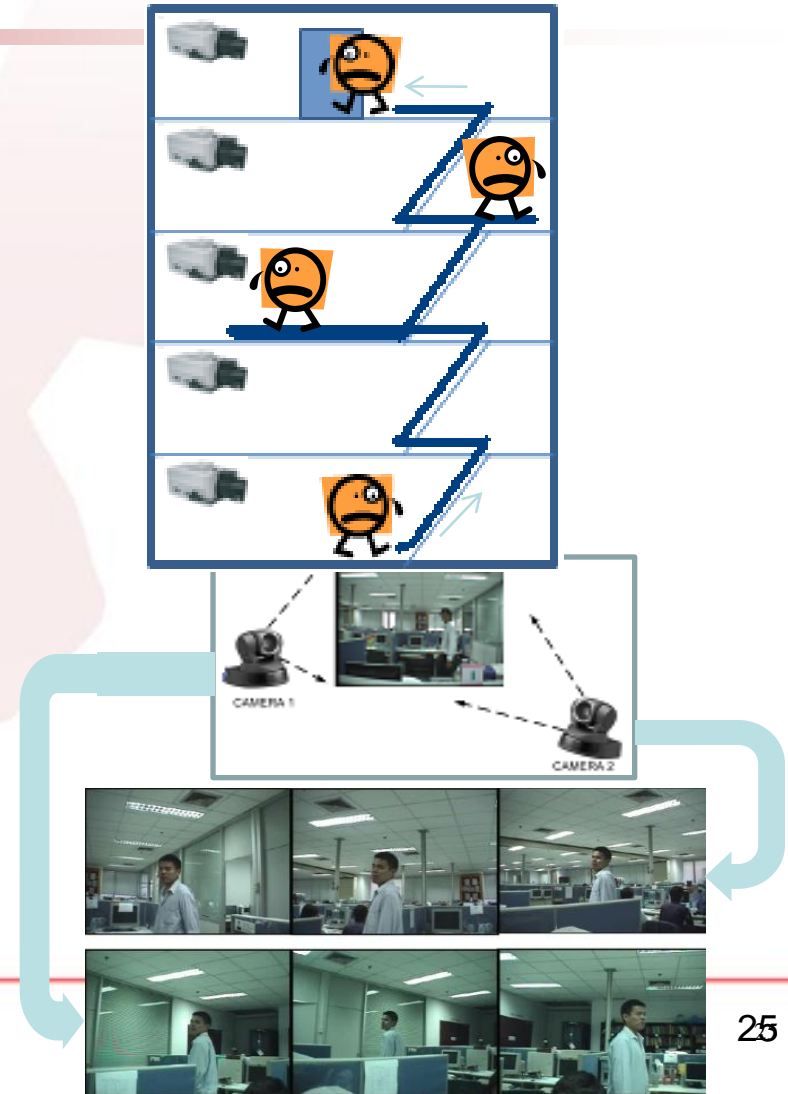


Image Superresolution

Cooperative Camera tracking





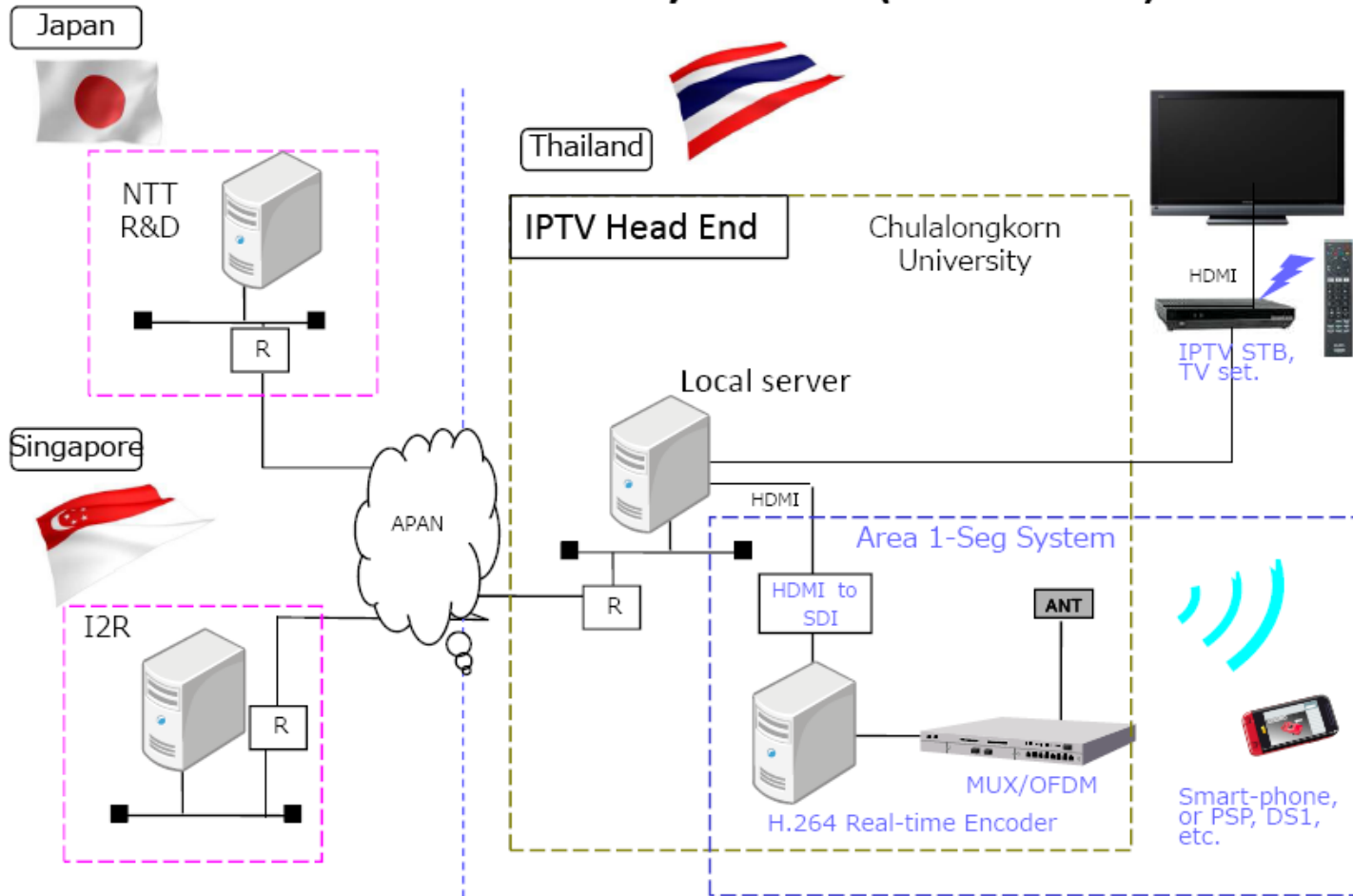
# CCTV Monitoring Test Site

Communication Engineering Division at Eng Building 4, Fl. 12, 13





# IPTV Testbed



Collaboration with NTT AT, Waseda University, ONBTC





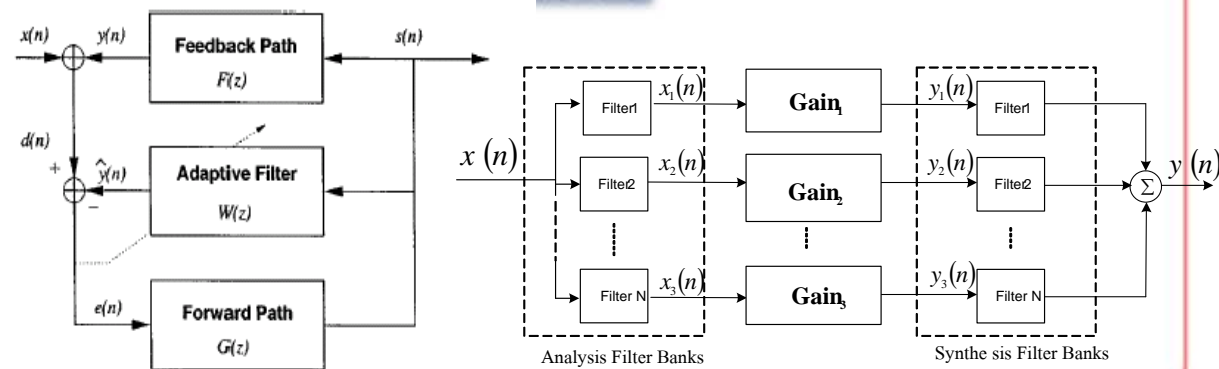
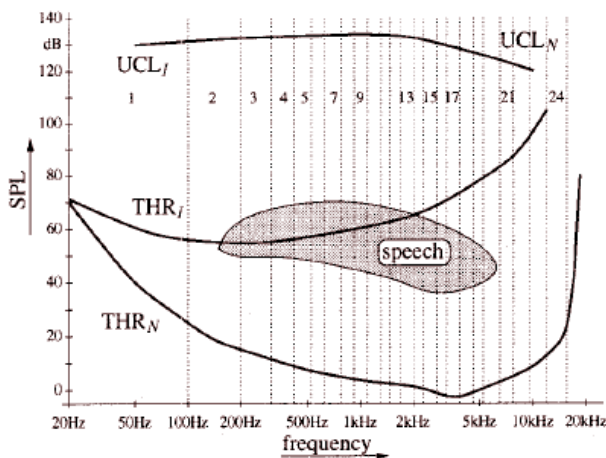
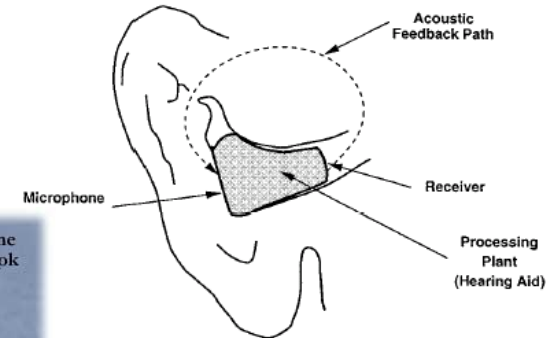
# DSP Techniques in Hearing Aids Applications

## Problem

- Whistling sounds (feedback path)
- Limitation of usable gain

## Approach

Acoustic Feedback Cancellation (AFC)  
Multi-band Compression Hearing Aids



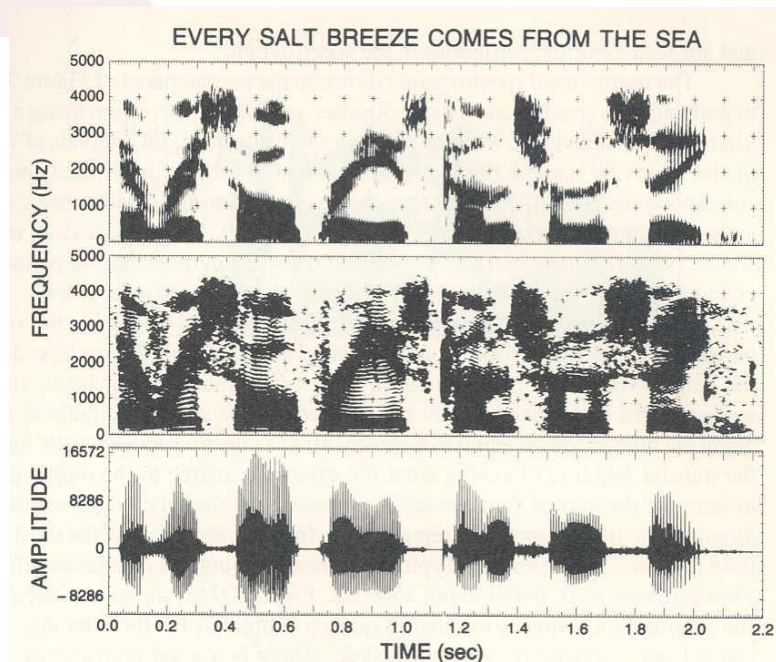
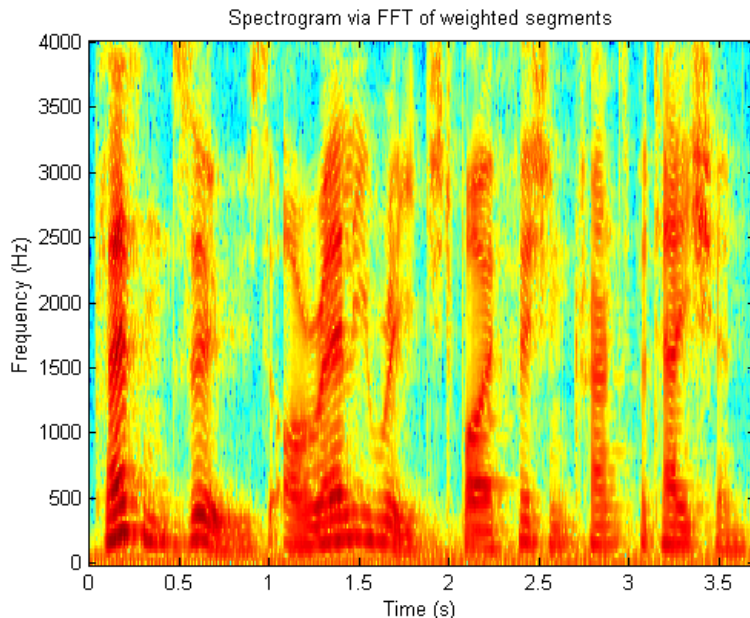
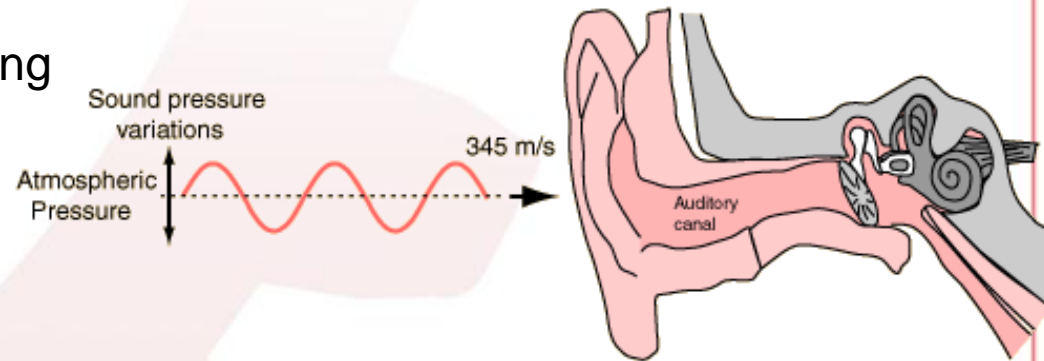


# Noise Reduction Techniques with Application to Hands-free Telephony in Car Environment

**Aim:** To reduce the effect of additive background noise, while introducing minimal speech distortion

## Approach

- Acoustic Noise Cancellation using Adaptive Filters
- Spectral Subtraction/Suppression Methods



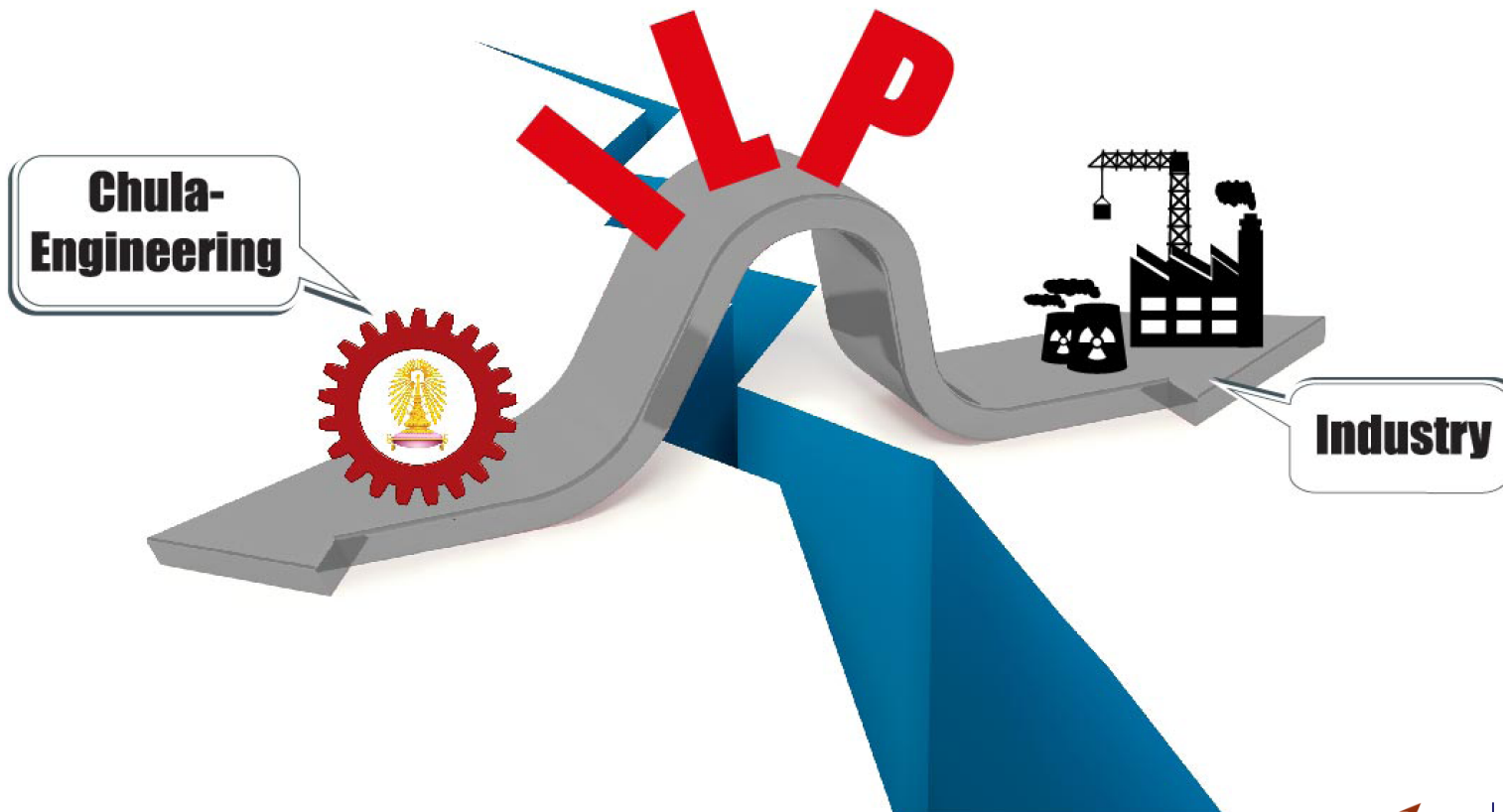


# ***What are our next moves?***

**"Moving Forward to University  
Industry and Government (UIG)  
Linkage"**



# Industrial *Liaison* Program

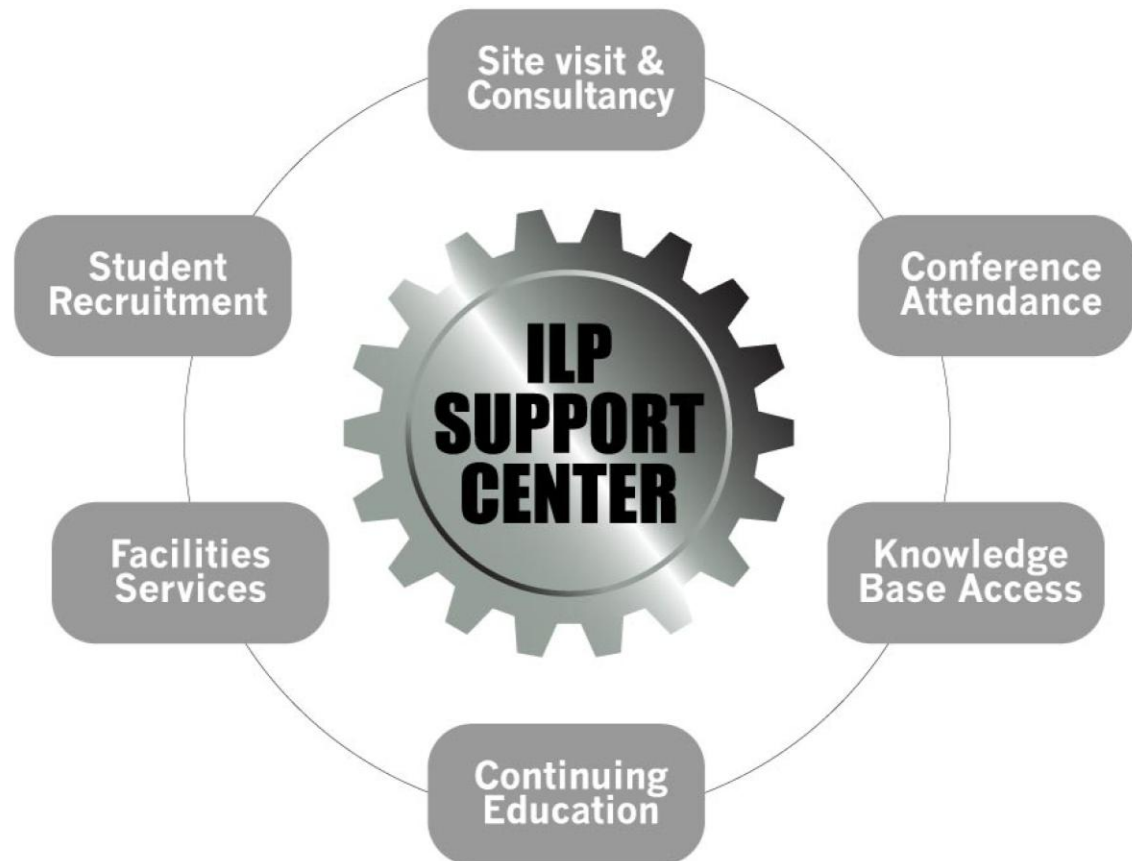






# ALLIANCE IN DEVELOPMENT

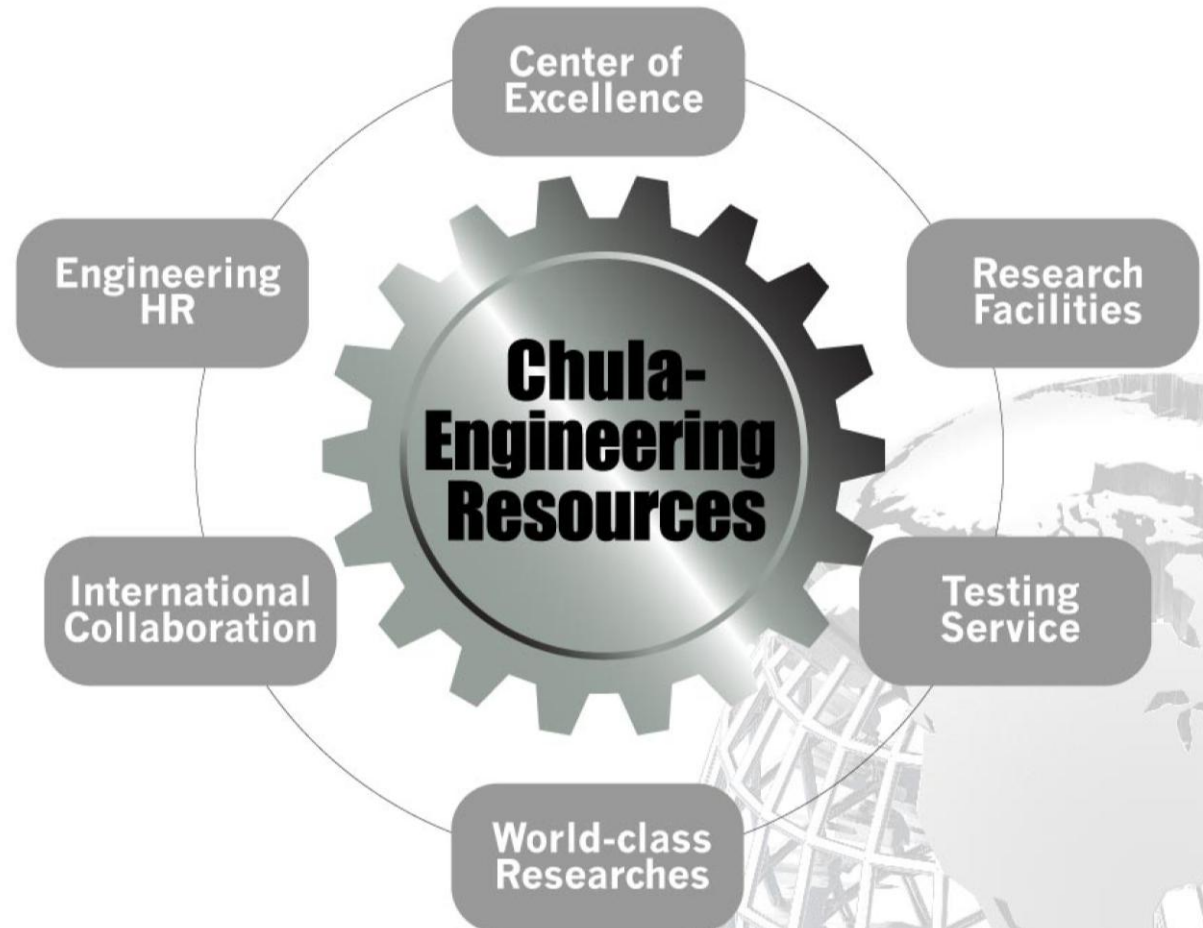
“ SUPPORTS  
THAT MATCH  
YOUR NEEDS  
”





# LEADER IN ENGINEERING ACADEMICS

“OUR EXPERTS  
AND FACILITIES  
ARE AVAILABLE  
TO YOU”





# ILP Members



# SCG & Chula Engineering Collaborations

Current Status & Future Outlook



## Successful model :

Collaboration between **SCG-Chem** &  
**Catalysis Group**

Phase I (2550-2553)      31 MB

Phase II (2553-2558)      69 MB

**Outputs:**      27 M.Eng. graduates  
                     15 D.Eng. Graduates  
                     22 Int. publications  
                     3+ Patents



# University-Industry Partnerships

All SCG's  
BUs

All CU

Engineering's  
Departments



Innovations

Excellent

Graduates

Expertise from  
World Famous  
Professors/  
Institutes

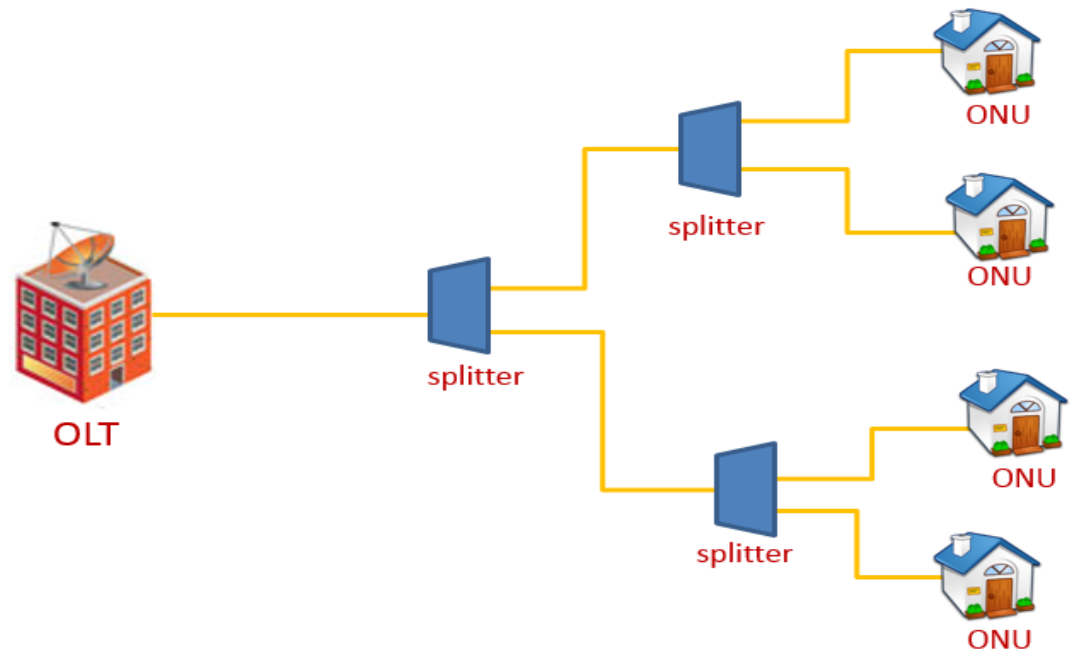
“Creative Workspace for

**Strategic Partnership Collaboration”**



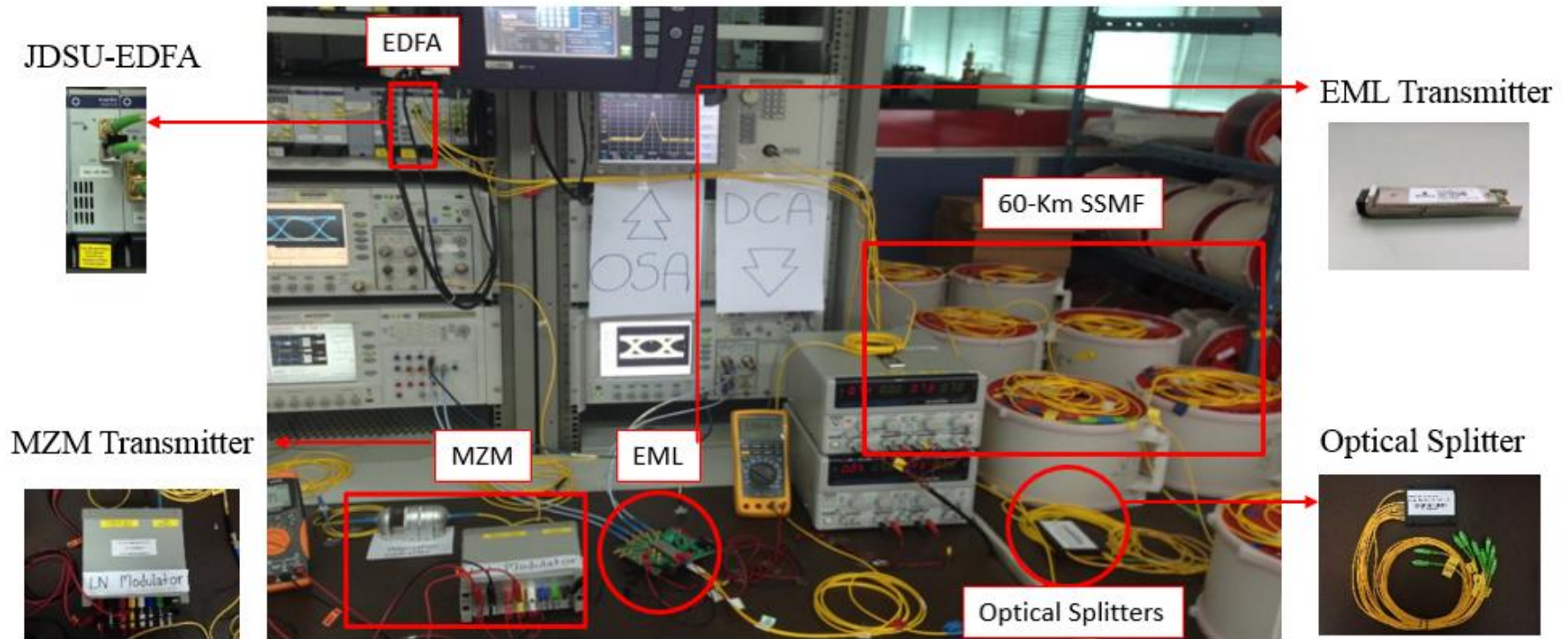
## Research Collaboration with NICT

- 10 Gb/s Optical Access Network with Long Reach and A Large Number of Subscribers





## Experimental Setup @ Electro-Magnetic Research Laboratory, CU, Thailand







## *International Cooperation at Chula EE*

- JICA Project for AUN/SEED-Net (2002-present)
  - 19 ASEAN Universities and 11 Japanese Universities
  - Chula EE has been host institution for EEE field
- Partner universities under European research framework
- International Collaborative Projects



# *International Project Activities*

- JAXA WINDS project: Video lecture transmission multicast to collaborators from 2007- present  
Tokyo Tech, Hokkaido, Chula EE, UP with support of NICT (Japan), NECTEC (Thailand), ASTI (Philippines)
- The 2011 Asian School of Automatic Control  
Chula EE, sponsored by IFAC, ACA, AUN/SEED-Net, ECTI
- IPTV experimental testbed, NBTC, Waseda Univ, NTT, Chula EE
- Building Energy Management System, ERI, Showa Shell Sekiyu K.K. (Japan), University of Tokyo



# *International Project Activities*

- OF@TEIN (OpenFlow-based Software Defined Networking Testing Infrastructure over TEIN), collaboration with GIST, Korea
- PARE student exchange program with Hokkaido University, Japan
- Establishing Sustainable Academic Structures in Next Generation Network Infrastructures and Future Internet Technology at Universities in Developing Countries from the Southern Hemisphere  
with TU Berlin, UCT – South Africa, Chile, HUST Vietnam, Chula EE
- And many more....



# *Opportunities for Collaboration*

## Visiting Professor at Chulalongkorn University

- Short term (4-5 months)
  - Co-lecture/research project collaboration
  - CU supports stipend of USD 2,000-3,300 per month (depend on the qualifications)
- Long term (9-12 months)
  - Co-lecture/research project collaboration
  - CU supports stipend of USD 2,000 per month



# *Opportunities for Collaboration*

- Student exchange for researches
- Undergraduate student exchange with CU International School of Engineering
- Partner universities in EU FP7 projects



# Contact Information

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