

**ICT Virtual Organization of ASEAN Institutes and NICT
ASEAN IVO Forum 2016
Call for Presentations**

Submission and Registration Form

I. Title:

Energy Efficient Next Generation Passive Optical Network (NG-PON) for Sustainable Green ASEAN Communication Network Infrastructure

II. Author(s)—Full name (First name family name):

- 17 members from 7 organizations; 2-Malaysia, 3-Japan, and 2- Indonesia

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1. FKE & MJIIT, Universiti Teknologi Malaysia, Malaysia.
2. Tokai University, Japan.
3. Waseda University, Japan.
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5. TM Research and Development, Cyberjaya, Malaysia.
6. Research Center for Informatics, Indonesian Institute of Sciences (LIPI), Indonesia.
7. Dept. of Electrical Eng. and Information Tech., Universitas Gadjah Mada, Indonesia.

IV. Topic selection:

Topic (2) Smart Society: ICT applications for community and environment.

Under sub-topic (A) Smart Community

The focus of this project fall under ICT infrastructure in providing energy efficient optical network solutions to ASEAN regional problems.

Keywords : Green ICT, Resource Savings, Power Reduction, Secure and Clean ICT environment, Energy Efficient PON, GPON, XGPON, Sustainable Network.

IV. Abstract:

(i) Overview

Increasing ICT infrastructure has led to significant power consumption. With the increasing number of high bandwidth applications and devices used in backbone networks such as optical networks units has increased the energy consumption of optical networks, which is an important issue that has to be addressed. In this proposal, we would like to set up a consortium for a research collaboration focus on energy efficient paradigms for optical communication network. With the comprehensive project collaboration comprising transdisciplinary research works between members would be an impact to the development of sustainable and energy efficient ICT infrastructure in the region of south East Asia in considering tropical environment. This project includes advanced research for the green ICT devices, sub-systems, physical and MAC layer for PON infrastructure of the local telecommunication services. This collaborative project will connected telecommunication player with the practical solution developed by research institute of ASEAN countries, which later can provide joint contributions to the international standardization bodies such as the ITU-T and APT for standardization.

(ii) Intellectual Merit

In the present world the evolution of internet has drastically increased the demand of ICT facilities thus leading to massive expansion of ICT infrastructure throughout the world. But on the other hand this has also led to increased power consumption by this sector. Moreover, the energy consumption of home broadband network is expected to increase further in near future. Many researchers have focused on this problem and presented power models and their solutions to reduce power consumption of the internet and telecommunication networks. The most critical area consuming about 70% of the total power in these networks is the access network. In this integrated project, our focus is on the wire-line access networks and the interest is narrowed to the energy consuming behavior of passive optical networks (PON), featuring higher energy efficiency compared to other standard fixed access technologies, which makes them a natural starting point to work on for further improvements. A new model will be proposed for the PON system which will reduce its overall systems power consumption without degrading the Quality of Service of the Network. In the end, the performance of the new energy efficient PON system will be compared with the other competing passive optical networks in terms of its power consumption, deployment cost and Quality of Service. Research

output from the member will be shared in term of joint publications, standardization activities and joint proposal for future works.

(iii) Broader Impacts

The proposed project is an important step towards a smart partnership of regional research communities by leveraging on the existing research facilities and laboratories of each participating institution. This project requires support from the ASEAN-IVO funding bringing together researchers in the field of optical network technology to promote and encourage more research works on green communication network technology within IVO members. This project would benefits to both researchers and Telco provider of ASEAN community by considering the existing network infrastructure in this project through a comprehensive regional study which later can be referred as a new standard and the research findings will be useful inputs to the international standardization bodies such ITU/APT.

(iv) Targets, Methods and Implementation

The overall structure of this project and relation of proposed the subtopics contributed by members are depicted in the Figure 4, it shows the current collaborations among the different research institute and the proposed areas of work. The detail of the target, methods and implementation of each respective subtopics can be found in the attachment at the end of this proposal. In this project, we are focusing on two GPON layers but not limited to the Physical and MAC layer, in which the devices, sub-system or higher layers would support the whole project implementation. Among the Physical layer based approaches found in literature to overcome this problem are; (i) Improving fabrication process, (ii) Using Burst Mode Clock and Data Recovery (BM-CDR) instead of Continuous Mode Clock and Data Recovery and (iii) Using Vertical Cavity Surface emitting Laser (VESCL) instead of DFB Lasers as being relatively more energy efficient. However there many issues on the device and subsystem specification and parameters should be look into on improving each energy consumption which later increases overall system performance energy efficiency. In the MAC layer, there are three solutions that we are working on; redesign GPON frame, adopting adaptive rate and improving the ONU sleep mode.

(v) Leveraged Resources and Participants

The proposal would be an important set-up on gathering energy efficient optical network researchers in this region. As referred to detail of each 10 subtopics given in the attachment, the advanced techniques and their knowledges are indispensable for research and development of a new energy efficient communication system and network technologies. Despite different level on target areas and remote locations of each group project member, effective collaboration between the groups/institutes and integrating their cutting-edge knowledges is strongly requires to makes in this IVO project visible globally. On top of that, there are many other potential institutes and research centers in the ASEAN region could be invited later during the project implementation to create bigger impacts in the field of the energy efficient communication infrastructure specifically in improving GPON service deliveries. The strong advantage of the project is based on existing good collaboration within

members under different layers: device, subsystem, networks and standardization. Hence, the proposed project aims is to leverage on existing project facilities and to crowd project equipment resources among IVO-ASEAN members and associates.

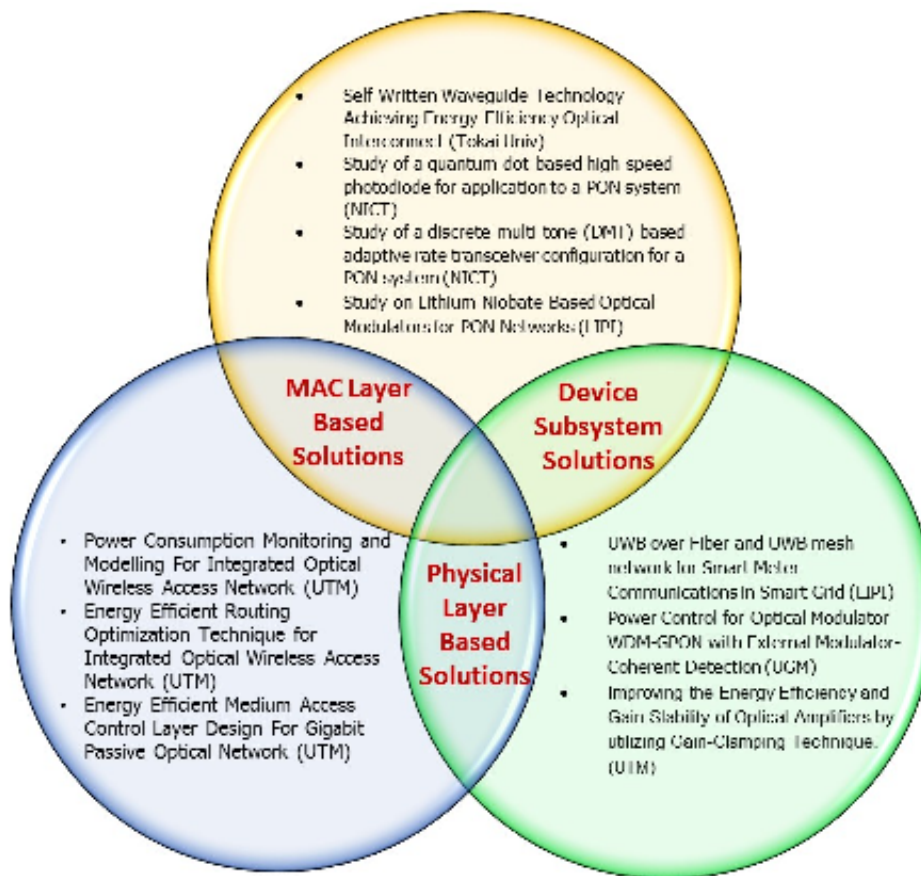


Figure 4: Project team structures and areas indicating relationship of each proposed subtopics solutions

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VI. Support for speaker—circle or underline any that you wish to request:

- Round trip fare at discount economy class
- Accommodation