



Scientia Education Investment Fund Grants

Final Report

3 August, 2019

Interdisciplinary Student Design Platform for Interactive Internet-Of-Things Network

**School of Electrical Engineering & Telecommunications,
Faculty of Engineering**

Prof. Gang-Ding Peng

Email: G.Peng@unsw.edu.au

Tele: 02 93854014

Prof. Vijay Sivaraman;

Prof. Jinhong Yuan;

Prof. Faz Rahman;

A/Prof. Toan Phung;

Dr Yanhua Luo;

Prof. Nigel Lovell;

Prof. Sri Parameswaran;

Prof. Xuemin Lin;

Dr Wen Hu;

Dr Lina Yao;

Prof. Jun Wang;

Prof. Gangadhara Prusty

1. Executive Summary

This project builds up an optical fibre network based integrated platform for our students to work in cloud environment involving optical, electrical and computer networks and IoT techniques.

With the help of this project, we create a cloud service platform for students and participants of the university. The platform will connect three schools of Faculty of Engineering through an optical transmission network, along with conventional networking equipment such as servers, routers and switches to create a cloud platform.

We focussed on significantly enhancing the engineering and innovation contents of our engineering programs and foster the students' professional and career capabilities. Specifically, this project addresses SEIF and Faculty priority areas:

- Incorporate an element of research integrated learning or work integrated learning
- Integration of self-directed and student-led design and project work into the engineering student experience

This SEIF project has achieved these objectives by 1) creating an interactive learning & research environment and training UNSW students from different engineering fields to collaboratively deal with real world technological problems; 2) establishing a 3-node high speed network underpinning a campus wide cloud platform for current and future UNSW students; A large number of students have actively participated and contributed to this project. Part of the outcomes in this project is directly linked to students' work, in the form of technical reports, including over 20 BE or ME theses and project reports, and seminars, are disseminated to UNSW students and staff, as well as wider industrial community; 3) establishing a UNSW Cloud Society for UNSW students to interact with academics and engineers and among themselves.

While project has progressed mostly very well, it is affected by the refurbishing of EE building and by the significant cut of the budget. Further continued efforts and, as proposed in the original plan, a second stage support in deploying the 3-node network at three sites on campus and creating a real student-led campus wide cloud environment are necessary for greater and full impact on UNSW students' learning and training experience.

2. Outcomes and impact

Cloud platforms with great IoT capabilities have become a significant field because their great potential in modern IT based society. Currently almost all the main IT corporations, including Amazon, Google, Microsoft, Alibaba, Baidu, Huawei and Tencent, have invested heavily in this field.

As proposed, we have worked on the building of a campus-wide interactive platform on photonic network technologies, as sketched in Figure 1,

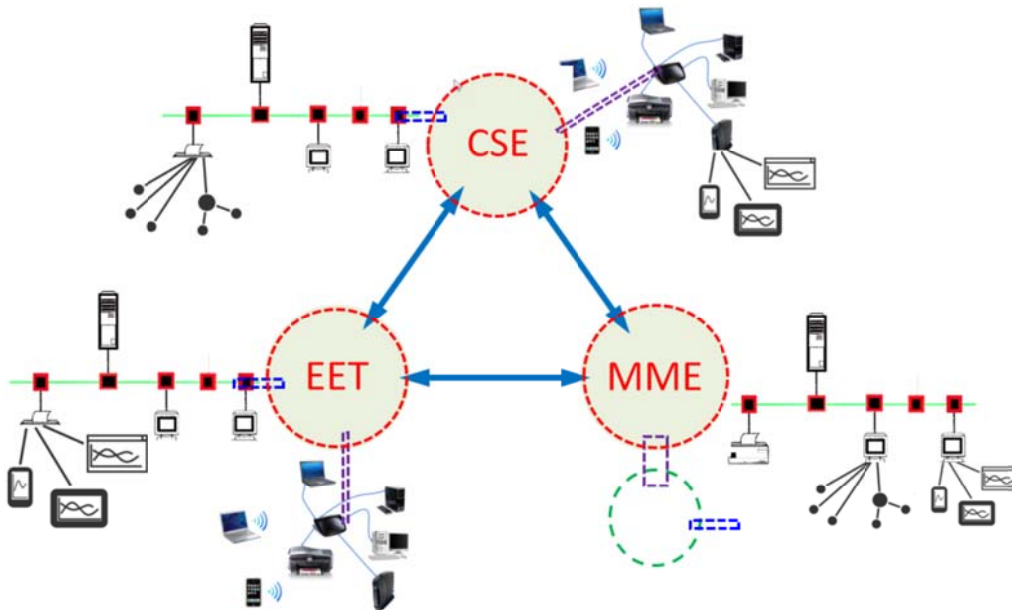


Figure 1 Overview of the 3-node campus-wide educational platform linking Electrical Engineering and Telecommunications (EET), Mechanical and Manufacturing Engineering (MME) and Computer Science and Engineering (CSE) across UNSW.

Supported by this SEIF project, we have

- ✓ **Provided technical and research training for many undergraduate and postgraduate students to engage their thesis and project work closely related the project**
 - Student from different engineering schools have engaged closely with the project work in three clusters: photonic transport systems, networking and service solutions, IoT and sensing technologies;
 - All together 24 students have completed their theses based on their work in this project; In form of seminars, thesis and project reports, the outcomes the project have been disseminated to UNSW students and staff, as well as industrial researchers and engineers. Please see **Appendix A** for detailed evidences.
- ✓ **Established a physical cloud service platform, as shown in Figure 2 and Appendix B: 3-Node UNSW Cloud platform, based on photonic, electronic and computing network technologies, by and for UNSW students;**
 - Most of the hardware and software for the platform are acquired and tested;
 - Key parts of the network have been experimentally tested in lab;
 - Full system experiments and tests are continuing;
 - System implementation at three schools is expected in early 2020;

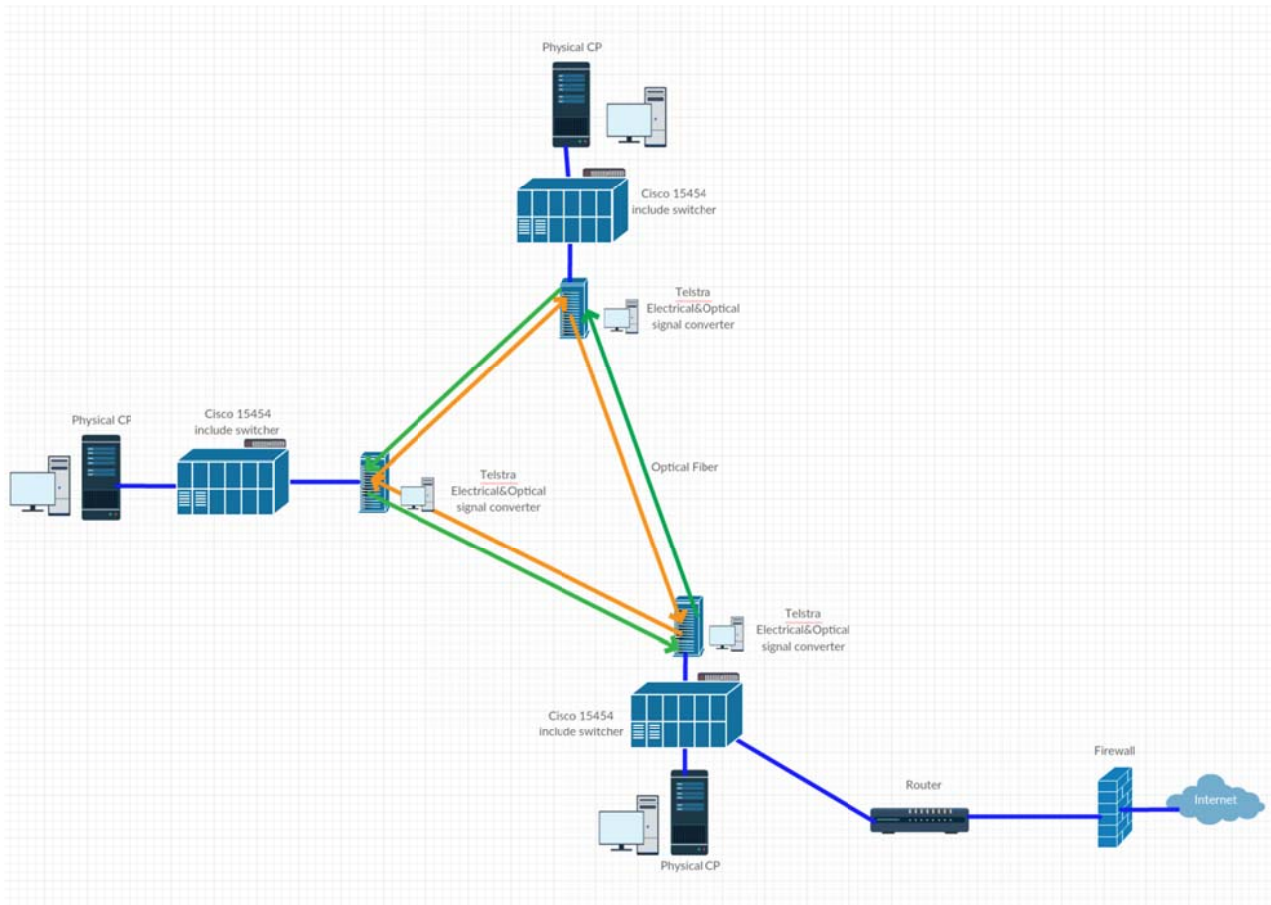


Figure 2 Campus based 3-node internal cloud platform in UNSW.

- ✓ **Established a UNSW student society - UNSW Cloud (UNCloud) (<http://www.unswcloud.club/>) that enables UNSW students to work on cloud service related development in the platform (see Appendix C: Report on the UNSW Cloud society in S2, 2019);**
 - Offering a platform for students to experiment with photonic, information, telecommunication and networking technologies;
 - Offering a platform for students to experiment with internet-of-things, artificial intelligence, deep learning, and data mining technologies;
 - Offering a forum for students from different schools to interact and collaborate; Weekly meetings and seminars are run by the society;
 - Offering a platform for students to interact and collaborate with industry; Invited lecturers from industry are organised and delivered;
 - Offering a platform for students to interact and collaborate with UNSW academic and researchers; e.g. UNSW Cloud members collaborating with Dr Liu of UNSW Chemistry

So far more than 30 project students have contributed to the project work and more have involved in the UNSW Cloud society activities. Now we still have to complete the final in-lab testing of the system and to deploy of the system into different locations in three schools. These are two remaining and important steps to enable UNSW students to use the platform. Two groups of project

students will continue the final system test and we expect the work will be completed in later 2019. This will be able to complete with the remaining fund. We expect that we will be able to complete the deployment and installation in early 2020. However, the cost for the deployment and installation of the system, estimated at \$20k ~ \$40k, is not yet secured.

3. Dissemination strategies and outputs

Since the beginning of the project work, a range of dissemination activities have been arranged.

All the students engaged with this project are divided into three project clusters: photonic transport systems, networking and service solutions, IoT and sensing technologies. Internally they will attend weekly general meetings or seminars to report problems, progresses and outcomes in project work from their or other clusters. These general meetings and seminars are open to UNSW Cloud members and interested students. Internally these students have also weekly meetings in their own cluster during each academic session.

Externally we have arranged academic exchange and discussion sessions with interested UNSW students and staff and with researchers and engineers from industry. In form of seminars, thesis and project reports, the outcomes as well problems in the project have been disseminated to UNSW students and staff, and sometimes with industrial researchers and engineers.

UNSW Cloud has arranged a few more meetings and seminars with industrial researchers and engineers.

4. Evaluation of project outcomes

We have not carried out quantitative evaluations of the project as yet.

Evidently the students engaged directly in project work in design, building and test of the 3-node system have produced high quality theses and reported their appreciation of the project experience. Also significant interest has shown in the participation of the project related events and the UNSW Cloud events.