IEEE ComSoc Distinguished Lecture Tour Report
AP DLT#11 New Zealand/ Hossain: 1411
09 November - 14 November, 2014

Lecturer:
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Sponsored by the IEEE ComSoc and hosted by the IEEE New Zealand North and South ComSoc Chapter and IEEE New Zealand Central ComSoc Chapter, I undertook a DLT during 09 November – 14 November, 2014. I delivered three lectures in the following locations: University of Canterbury, Christchurch; Callaghan Industrial Park, Wellington; and AUT University, Auckland. Also, I had an informal meeting with the graduate students of AUT University and several people from industry about publishing in IEEE journals, impact factor of the IEEE journals, issues related to plagiarism etc. The information about the lectures is provided below.


Venue: Department of Electrical and Computer Engineering, University of Canterbury

Time: 5:30 pm – 7:00 pm

Abstract: 5G cellular wireless networks are expected to be a mixture of network tiers of different sizes, transmit powers, backhaul connections, different radio access technologies (RATs) that are accessed by an unprecedented numbers of smart and heterogeneous wireless devices. The multi-tier cellular architecture of 5G networks, where small cells are overlaid on the macrocells and also there is provisioning for device-to-device (D2D) communications, is expected to not only increase the coverage and capacity of the cell but also improve the broadband user experience within the cell in a ubiquitous and cost-effective manner. The traditional radio resource and interference management (RRIM) methods (e.g., channel allocation, power control, user offloading, cell association or load balancing) in single-tier networks and even some of those developed for two-tier networks may not be efficient in this environment and a new look into the RRIM problem will be required. Furthermore, introduction of many new techniques and technology and additional degree of freedom (e.g., carrier aggregation, coordinated multi-point (CoMP) transmission and reception, concurrent connection to several wireless access technologies and seemingly moving between them) that will be used in 5G multi-tier networks will significantly influence the resource allocation and interference management problems. In this seminar, I will focus on the RRIM problem in 5G
multi-tier and cognitive cellular networks. Starting with the visions and requirements for 5G multi-tier cellular networks, the challenges of radio resource and interference management (e.g., power control, user association) in these networks in co-channel deployment scenarios will be outlined. Open research issues and possible approaches to tackle those issues will be described.

**Audience:** 25+ (staff, students, and people from industry)

**Comments:** The lecture was well attended. After the seminar, there were interesting discussions on the evolution of future generation cellular wireless systems, the 5G systems in particular. Thanks to Professor Peter Smith and Dr. Chris Hann for making a very nice arrangement for the lecture. I would like to specially thank Professor Krys Pawlikwoski for giving me a short tour around the city, in the absence of Professor Harsha Sirisena, who acted as the liaison for my visit to the University of Canterbury for the talk.

**Photo:** See attached (“uc.jpg”)

**Lecture#2 (11 November, Tuesday):** Evolution Toward 5G Cellular Networks: Key Enabling Technologies

**Venue:** Callaghan Innovation Campus, Wellington

**Time:** 3:00 pm – 4:30 pm

**Abstract:** 5G cellular wireless networks are expected to be a mixture of network tiers of different sizes, transmit powers, backhaul connections, different radio access technologies (RATs) that are accessed by an unprecedented numbers of smart and heterogeneous wireless devices. The multi-tier cellular architecture of 5G networks, where small cells are overlaid on the macrocells and also there is provisioning for device-to-device (D2D) communications, is expected to not only increase the coverage and capacity of the cell but also improve the broadband user experience in a cost-effective manner. Also, for reducing energy consumption from fixed power sources, energy harvesting will be a key technique for the mobile devices in 5G networks. In addition, for improving the spectral efficiency, cognitive radio techniques will be used. Starting with the visions and requirements for 5G multi-tier cellular networks, several key enablers for 5G systems will be outlined.

**Audience:** 30+ (primarily people from industry and also a number of graduate students)

**Comments:** This lecture was also very well attended. Most of the attendees were from industry. Also, there were a number of graduate students from the Victoria University of Wellington. There were more than 30 attendees. After the lecture, Dr. Terence Betlehem gave me a brief laboratory tour of their Sensing and Automation group. In the laboratory, several teams work in 3-D audio, sonar and
communications as well as cognitive radio. Also, I met with some students who wanted to discuss with me about their research work, involvement with IEEE ComSoc, etc. I believe this discussion was very fruitful and encouraging to the students. Thanks to Dr. Terence Betlehem for making a very nice arrangement for the lecture.

Photo: See attached (“wellington.jpg”)

Lecture#3 (13 November, Thursday): Evolution Toward 5G Cellular Networks: Enabling Technologies

Time: 9:30 am – 10:30 am

Venue: AUT University, Auckland

Abstract: 5G cellular wireless networks are expected to be a mixture of network tiers of different sizes, transmit powers, backhaul connections, different radio access technologies (RATs) that are accessed by an unprecedented numbers of smart and heterogeneous wireless devices. The multi-tier cellular architecture of 5G networks, where small cells are overlaid on the macrocells and also there is provisioning for device-to-device (D2D) communications, is expected to not only increase the coverage and capacity of the cell but also improve the broadband user experience in a cost-effective manner. Also, for reducing energy consumption from fixed power sources, energy harvesting will be a key technique for the mobile devices in 5G networks. In addition, for improving the spectral efficiency, cognitive radio techniques will be used. Starting with the visions and requirements for 5G multi-tier cellular networks, several key enablers for 5G systems will be outlined.

Audience: 35+ (staff and students from AUT University and University of Auckland, and also several attendees from local industry)

Comments: The audience was very enthusiastic to hear about the emerging 5G systems – the visions and requirements for such systems as well as the enabling technologies for these systems. There were a number of interesting questions from the audience. I would like to specially thank Dr. Nurul Sarkar, who acted as the liaison for my visit to Auckland.

Photo: See attached (“auckland.jpg”)