Jadavpur University TEQIP-III Sponsored
One day Seminar on
"Towards 5G Developments"
6th July 2018, Seminar Room, ETCE, JU

Brief Report:

With the successful implementation and deployment of 4G networks, wireless communication standard already starts its journey towards the next level to 5G, with a promise for improved coverage and higher data rate and ultra-low latency. Numerous advancements are happening around 5G like IoT, interactive television, virtual reality, social gaming, 3-D high definition video, driverless cars, robotics, and interactive mobile games etc., all are bandwidth hungry.

To know more about 5G and the present Industry deployment stands: The Broadband Wireless Communication Lab of ETCE Department organized the one day seminar financially supported by TEQIP-III and technically sponsored by IEEE ComSoc Kolkata Chapter on 6th July 2018, in the Seminar Room of ETCE, 4th Floor. Prof. Iti Saha Misra of ETCE Dept. Was the coordinator and Mr. Nirmoy Modak was the co-coordinator of the seminar.

The one day seminar was very successful in respect of good number of participants from Jadavpur University itself and neighbourhood engineering colleges along with a very good coverage of 5G developments happening worldwide. There were all together 50 members in the seminar; 15 from organizing committee and speakers, other 35 participants from Jadavpur University (15), Heritage Institute of Technology (5), Narula Institute of Technology (5), Techno India Saltlake (6), Meghnad Saha Institute of Technology (2), Govt. College of Ceramic Technology (1), TCS, Kolkata (1) from various position of masters students, research scholars, faculties and industry professional.

Eminent industry experts were among the speakers. There were three lectures, in the morning session **Mr. Tarun Gupta from National Instrument, India, Business Manager** spoke on Prototyping 5G using standard Off-the Shelf tools giving thrust to massive MIMO and Cloud RAN, in the after lunch session there were two lectures, first one was delivered by **Mr. Indrajit Sanyal from Ericsson**, Senior Director and Head of Cloud & Core, Business Unit Digital Services, **on 5G - Out of the lab into the neighborhood**, this was about actual 5G deployment scenario. The last lecture was delivered by Dr. Tamal Chakroborty, alumnus of ETCE, Jadavpur University, delivered on IoT based solutions for Intelligent Transportation System in Urban India by enabling key 5G Technologies.

The seminar inaugurated at 10.30 am in presence of HOD, of ETCE Prof. Sheli Sinha Chowdhury, all speakers and participants. TEQIP-III Coordinator and DEAN, FET, Prof. Chiranjib Bhattacharya, TEQIP-Nodal Officer Academic , Prof. Sudipta De were there among the invitees who incidentally could not present at the inaugural session for their other engagements, however they both have attended the post lunch session. Prof. Iti Saha Misra, the program coordinator delivered nice welcome address highlighting the need of such seminar. She told that 5G technology is a promise to provide instant multimedia communication in a better way for which at the backdrop tremendous infrastructural

developments, research and billions of billions dollars in business are involved. Today's seminar would enable the scope to learn this partial effort from the Industry experts. **Prof. Sheli Sinha Chaudhury, HOD of E.T.C.E, J.U.** highlighted the growth of modern multimedia applications and growing demand for higher throughput low latency network to ensure the quality aspect of these applications. She wished that all the participants should get a glimpse of technological advancement in the field of 5G at the end of this one-day seminar.
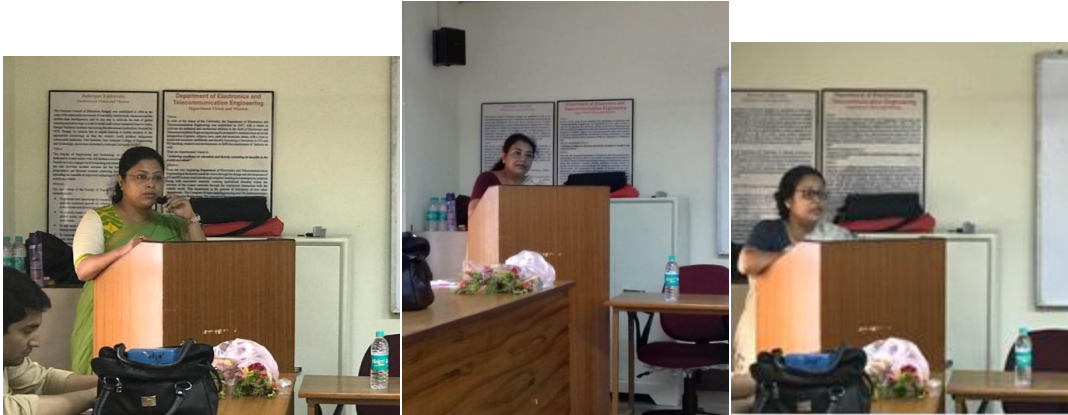
Inaugural Session: 1. Ms. Anindita Kundu , Jadavpur University Alumnus, now at HIT, Kolkata anchoring the session, 2. Prof. Iti Saha Misra , ETCE, JU, Program Coordinator delivering welcome address, 3. Prof. Sheli Sinha Chaudhury, HOD, ETCE, speaks for the program

The seminar was structured in a way that helped participants to walk through several aspects of 5G, starting from the relevance of 5G standard, prototyping of 5G, several experiments and development happening across the globe, different cutting edge technologies involved in standardizing the 5G concept and finally how the 5G technology can be used to solve our day to day problem like transportation through ITS.

Mr. Tarun Gupta gave an excellent presentation on Prototyping 5G using standard Off-the Shelf tools: covering two 5G research areas at extreme ends – Massive MIMO Prototyping and Cloud RAN (CRAN) Prototyping. 5G research areas have a lot of influence over present Aerospace and Defence industries. The presentation is divided into three part: (i) Various research activity in 5G domain, (ii) Massive MIMO on the physical layer side to optimize network performance, (iii) Cloud RAN (CRAN). Segregating the physical part of the network from the higher layers gives more flexibility to network designer which enables the aggregation of multiple higher layers of network for optimum performance. However, network optimization or prototyping of Physical layer depends on selection of processing platform, application development environment, triggering and synchronization, etc. Such prototyping platforms are available commercially in the form of tools and frameworks and can be used to develop 5G testbeds. This presentation also highlighted several important areas of 5G technology such as: cloud data storage, ultra-reliable low latency communication (URLLC), narrow band IoT (NBIoT), Non-Standalone New Radio (NSASR), Stand Alone New Radio (SANR), Time Sensitive Network (TSN) and control/data plane segregation. Different 5G vectors are also discussed which includes Massive MIMO, Advanced Wireless Network, Multi RAT and mm Wave. Digital Beam Forming and alternative solution to OFDM is also discussed. Advanced topics like Network Function Virtualization (NFV), Software Defined Networking

(SDN), Cloud RAN is mentioned and possible prototype implementation with commercial off the self (COTS) digital cards by NI was presented.

Mr. Tarun Gupta of National Instrument, India, presenting his lecture

Mr. Indrajit Sanyal of Ericsson Global Services had a wonderful presented on 5G - Out of the lab into the neighbourhood: showed the real up to date applications on 5G developed by Ericsson. 5G is a promising technology expected to come at the end of 2020. Several trials have been conducted by Ericsson to test the promises of 5G technology across different geographical areas. In Russia, Ericsson and MTS have jointly provided a superior mobile broadband experience through Europe's largest deployment of Massive MIMO (Multiple Input, Multiple Output).

Mr. Indrajit Sanyal of Ericsson Global Servives, Kolkata, delivering his lecture

In February 2018, Ericsson, Korea Telecom and Intel conducted a 5G trial in a dense urban environment in the centre of Seoul. Ericsson and Verizon have showcased what low latency can keep cars and drivers on track. AT&T and Ericsson have conducted Fixed wireless 5G trials in Austin, Texas and provided high throughput, low latency broadband to local enterprises. IoT connections are now expected to reach an estimated 3.5 billion in 2023. New massive IoT cellular technologies such as NB-IoT and Cat-M1 are fuelling this growth. Finally, Distributed

Cloud, Edge computing & Network slicing will provide agility & quick response time to various industry. Main objective of this presentation was to introduce the audience about some of the experience of Ericsson's journey in 5G area.

The third and final lecture was delivered by Dr. Tamal Chakrabarty , ETCE, JU Alumnus, on IoT based solutions for Intelligent Transportation System (ITS) in Urban India by enabling key 5G Technologies: Tamal has worked for his PhD in Broadband Wireless Communication Lab of ETCE, JU. This presentation started with the importance of transportation system in urban areas and provided a glimpse of how rapid advances in communication and computational technologies have led to intelligent solutions for transportation systems. Speaker has highlighted need of ITS, different challenges of ITS and finally emphasized on integration of IoT based services with the ITS applications towards building a pervasive environment considering drivers, pedestrians, passengers and law-makers.   This presentation also discussed the possibility of using Cognitive Radio Networks and Fog computing as part of the 5G network to assist quick and energy-efficient solutions for the unique challenges posed by ITS in India.

Dr. Tamal Chakrabarty delivering his lecture

TEQIP-III coordinator, Prof. Chiranjib Bhattacharya   Nirmoy Modak, Co-coordinator delivering valedictory speech

The end valedictory session was graced by Dean, FET and TEQIP coordinator, Prof. Chiranjib Bhattacharya and TEQIP nodal officer academic, Prof. Sudipta De. Dean Sir briefly addressed the audience and outlined the significance of such program bringing the industry professional to the academics. This one-day session ends with very beautiful and informative speech given

by Prof. Sudipta Dey who has highlighted different activities of TEQIP Phase-I, II and III at Jadavpur University. He spoke about digital education platform called "Swayam", its widespread necessity and possible contributions of different faculty members from JU have been discussed.

Prof. Sudipta De, TEQIP-III Nodal Officer in the middle in valedictory session
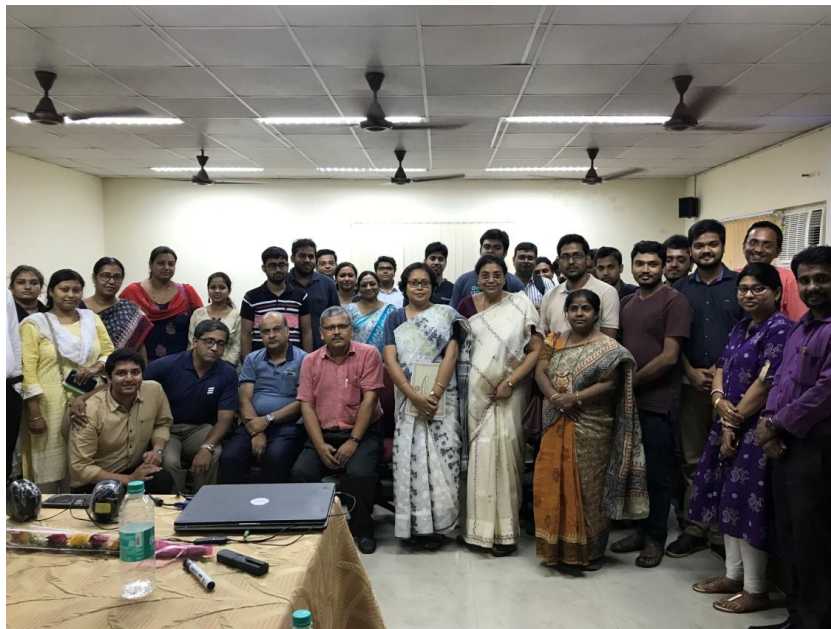
Participants, speakers and the organizers at the seminar

Conclusion: 5G is the future of wireless technology and this seminar covers most of the technological aspects of this upcoming technology like the prototyping aspect, different underlying technologies; several case studies conducted by different industries in 5G developments. A possible application of 5G to improve public safety through ITS is also discussed at length. In short, the presentations at this seminar have covered the implementation, testing, real time achievements with possible application of the technology to enhance public life. At the end of the day the enthusiasm and eagerness of all participants proved the success of conducting this one-day seminar.