

# Dr Anil Kumar Rangiseti

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## Objective

To be part of an organization that strives for perfection in its field of work and to work towards becoming a pioneer in that field.

## Research Interest

- Software defined wireless networks
- 4G Networks
- Internet of Things
- 5G Networks

## Teaching Interest

- Computer Networks
- Network programming
- Advanced Network Wireless Systems
- Operating Systems
- Database Management Systems
- Object Oriented Programming
- Data Structures

## Work Experience

### Asst. Professor: (July 2018 – )

- Asst. Professor: Dept of CSE, **IIIT-Dharwad, Karnataka.**

### Asst. Professor: (Jun 2017 – July 2018)

- Asst. Professor: Dept of CSE, **SRM-AP University, Amaravati, Andhra Pradesh.**

### Research and Teaching Assistant: 5 years (July 2012- July 2017)

- As a Teaching Assistant and pursuing PhD in Department of CSE - **IIT Hyderabad.** Working with **Dr. T. Bheemarjuna Reddy** in the field of **Software Defined Wireless Networks**

**Asst. Professor: 3.1 years (Jun 2009 – July 2012)**

- Asst. Professor: Dept of IT, **GMRIT (NAAC A)**, Rajam, Andhra Pradesh.

**Publications (Journals)**

- Anil Kumar Rangiseti and Bheemarjuna Reddy Tamma, "Interference and QoS Aware Cell Switch-Off Strategy for Software Defined LTE HetNets", **Journal of Network and Computer Applications**. Vol.125, 2018, pp.115-129.
- Anil Kumar Rangiseti, Thomas Valerrian Pasca S and Bheemarjuna Reddy Tamma, "QoS aware load balance in software defined LTE networks", **Computer Communications**, vol.97, 2017, pp.55-21.
- Anil Kumar Rangiseti and Bheemarjuna Reddy Tamma. "Software Defined Wireless Networks: A Survey of Issues and Solutions. ", **Wireless Personal Communications**, vol.96, 2017, pp.1-35.

**Publications (Conferences)**

- T. V. K. Buyakar, A. K. Rangiseti, A. A. Franklin and B. R. Tamma, "Auto scaling of data plane VNFs in 5G networks," in Proc. of 13th International Conference on Network and Service Management (CNSM), Tokyo, 2017, pp. 1-4.
- Amogh P C, Goutham Veeramachaneni, Anil Kumar Rangiseti, Antony Franklin, and Bheemarjuna Reddy Tamma, "A Cloud Native Solution for Dynamic Auto Scaling of MME in LTE " in **Proc. of PIMRC**, October 2017, Montreal, QC, Canada.
- Malhar Thakkar, Lavish Agrawal, Anil Kumar Rangiseti and Bheemarjuna Reddy Tamma, "Reducing Ping-Pong Handovers in LTE by Using A1-Based Measurements" in **Proc. of NCC**, March 2017, IIT Madras, India.
- Thomas Valerrian Pasca S, Debashisha Mishra, Amogh PC, Nagamani Dheeravath, Anil Kumar Rangiseti, Bheemarjuna Reddy Tamma and Antony Franklin, "Architectural challenges and solutions for collocated LWIP-A Network Layer Perspective" in **Proc. of NCC**, 2017.
- Deepa Martolia, Vanlin Sathya, Anil Kumar Rangiseti, Antony Franklin A, and Bheemarjuna Reddy Tamma, "Enhancing Performance of Victim Macro Users via Joint ABSF and Dynamic Power Control in LTE HetNets", in **Proc. of NCC**, March 2017.
- Vanlin Sathya, Anil Kumar Rangiseti, Arun Ramamurthy and Bheemarjuna Reddy Tamma, "Maximizing Dual Cell Connectivity Opportunities in Small

Cells Deployments" in **Proc. of NCC**, March 2016, IIT Guwahati, India.

- Anil kumar Rangiseti, Hardik B Baldaniya, Pradeep Kumar B and Bheemarjuna Reddy Tamma, "Load-aware Hand-offs in Software Defined Wireless LANs", in **Proc. of IEEE WiMob**, October 2014.

## Educational Qualification

- **2012-2017**  
PhD (CGPA: **8.7**) in **Computer Science and Engineering (CSE)**  
from **IIT Hyderabad**  
**Thesis defended on 24th June 2017**  
**Thesis title:** Software Defined Approaches for Management of Mobility, Load and Energy in Wireless Networks  
**Thesis advisor:** Dr. Bheemarjuna Reddy Tamma

## Internship Program

- **IBM Research Lab –( Delhi )** internship program During May 19 to July 19 -2014

## Student Travel Grant Award

- **MOBIHOC-2013** - Selected for Student travel grant to attend the international conference conducted in Bangalore - India

## Awards

- **Received Excellence in Research award from IIT Hyderabad** during 2015-2016
- **Received Excellence in Research award from IIT Hyderabad** during 2013-2014
- **Winner in Techie Track Contest 2012** at AP State level - Conducted by Infosys Campus Connect Hyderabad.
- **Winner in Case Folio Contest 2012** at AP State level - Conducted by Infosys Campus Connect Hyderabad.
- **UGC-2012 NET** certified for lecture ship

## Skill Set

**SDN**  
**Virtual Routers**

Floodlight,Open vSwitch 1.9.3.  
Vyatta

<b>Software Routers</b>	Click 2.0.1
<b>Network Simulators</b>	NS3
<b>Programming languages</b>	C, C++, Java,
<b>Database systems</b>	Oracle, Mysql, PL/SQL.
<b>Scripting languages</b>	PERL, Shell
<b>Debugging Tools</b>	Gprof,Gcov,gdb Valgrind and wireshark.

## **Thesis Title: Software Defined Approaches for Management of Mobility, Load and Energy in Wireless Networks**

**Abstract:** Proliferation of smart mobile devices and their applications demand Mobile Network Operators (MNOs) to expand their infrastructure to address coverage and capacity issues. Cellular networks, with their current inflexible and expensive network infrastructure, are facing various challenges in efficiently handling the exponentially growing traffic demands of users. MNOs have started dense deployment of Long Term Evolution (LTE) Heterogeneous Networks (HetNets) with various small cells (Femto Base Stations (FBSs), pico, micro, etc.) under overlaying Macros for expanding network coverage and offering higher data rates. To further augment capacity of cellular networks, Wi-Fi Access Points (APs) are also being deployed by MNOs. However, dense deployment of small cells increases control plane complexity in handling Radio Access Network (RAN) tasks like load balancing, interference management, mobility management and energy savings. In distributed LTE-RANs, in order to solve RAN control plane tasks efficiently, various cells need to exchange a lot of messages over X2 interface. Moreover, deployment of a lot of small cells can lead to higher energy consumption. Besides, changing existing solutions or incorporating new solutions can lead to increase in capital expenditure (CAPEX) and operational expenditure (OPEX) of operators. Aforementioned issues raised need of simplification of control and management tasks and efficient usage of radio resources in wireless networks such as LTE HetNets and IEEE 802.11 based Wireless Local Area Networks (WLANs). This could be achieved by adopting novel networking paradigms which could simplify the task of network management and control tasks, and allow faster deployment of newer solutions on top of existing network hardware equipment by software updates/upgrades. Software Defined Networking (SDN) is a revolutionary technology which makes networks more agile and flexible by separation of data plane and control plane tasks. In this thesis work, in order to offer seamless mobility in multi-channel enterprise WLANs environment, a programmable WLAN architecture is used. Specifically, a seamless load-aware hand-off algorithm is proposed and its performance is evaluated on a Software Defined WLAN (SD-WLAN) testbed. Proposed load-aware hand-off algorithm not only offers seamless mobility in enterprise WLAN, it also effectively utilizes neighbor APs for offering load balance in the network. Besides, in order to provide programmable, flexible and scalable solutions for LTE-RAN, a Software Defined-LTE-Radio Access Network (SD-LTE-RAN) framework is proposed using OpenFlow enabled eNodeBs (OFeNBs). Proposed SD-LTE-RAN framework is implemented in NS-3 simulator with OpenFlow module and then used for evaluating the performance of various load balance algorithms and cell switch-off mechanisms.

Exponential growth of mobile subscribers and various applications' data traffic requirements cause exorbitant load in LTE networks. As User Equipments (UEs) are typically associated with a near-by cell (eNB), spatio-temporal variation in traffic demands makes the LTE networks suffer from load imbalance problem. Due to the distributed nature of eNB operation in LTE-RAN, traditional solutions to tackle load imbalance problem could lead to excessive overhead over X2 interface. Hence, managing densely deployed cells is very challenging in the existing distributed LTE RAN. In this thesis work, load imbalance issue is addressed by proposing a novel Quality of Service (QoS) Aware Load Balance (QALB) algorithm on the SD-LTE-RAN framework. For taking load balance decisions, the QALB algorithm considers loads of neighbor cells, QoS profiles of UEs and their expected throughputs w.r.t. neighbor cells. Unlike existing load balance algorithms, it does not change handover-offset parameters of cells to avoid ping pong handovers. The QALB runs in linear time, hence it is suitable for real-time deployment of LTE networks. In various load balance experiments conducted in NS-3, proposed QALB algorithm is able to maintain better QoS data rates (>80% of their configured Guaranteed Bit Rates (GBRs)) for more than 70% of the cells in the network, while existing load balance solutions are able to do the same for only 50% of the cells in the network. In overall, the QALB algorithm is able to decrease the total network overload by 15% compared to existing solutions. We also evaluated the QALB algorithm in mobility scenarios and identified that it is able to decrease average network overload by 10% compared to existing solutions. To evaluate the network wide fair load distribution, we defined Load Balance Index (LBI) using Jain's Fairness Index and found that QALB is also able maintain better LBI compared to existing solutions.

Besides, in order to reduce energy costs of the HetNets, we propose an interference and QoS aware cell switch-off strategy (IQ-CSOS) on the SD-LTE-RAN framework. The IQ-CSOS also runs in polynomial time, hence it is suitable for real-time deployment of LTE networks. Unlike existing CSOSs, in cells selection for switch-off and their UEs handover to overlaying Macros, IQ-CSOS considers both traffic load of small cells and their cross-tier interference effect on Macros. Hence, IQ-CSOS is able to provide higher energy savings. In evaluation, unlike existing works, we investigate both network energy costs and QoS satisfaction of sessions during CSOS decisions. In performance evaluation carried out in NS-3 under various test scenarios, it is identified that IQ-CSOS is able to provide 50-80% of network energy savings in terms of small cells energy consumption. Besides, it is able to provide 30% more energy savings compared to existing CSOSs with slight affect on network QoS.