

Muhammad Kumail Haider

Contact Information	Department of Electrical and Computer Engineering Rice University 6100 Main Street, MS 366 Houston TX, 77005	<i>Cell:</i> (832)800-2625 <i>E-Mail:</i> kumail.haider@rice.edu
Research Interests	Wireless networks with an emphasis on cross layer design, and modeling and evaluation of protocols for medium access in Next-Gen WiFi systems. Transport and network layer protocols in computer networks.	
Education	Ph.D. , Electrical and Computer Engineering (Expected: July 2018) <i>Rice University</i> Advisor: Prof. Edward Knightly	
	M.S. , Electrical and Computer Engineering (December 2015) <i>Rice University</i> <ul style="list-style-type: none">• Advisor: Prof. Edward Knightly• Thesis: Overhead Constrained Joint Adaptation of MCS, Beamwidth and Antenna Sectors for 60 GHz WLANs with Mobile Clients	
	B.S. , Electrical Engineering 2009-2013 <i>LUMS School of Science and Engineering, Pakistan</i> <ul style="list-style-type: none">• Senior Thesis: An experimental platform for Cooperative Communication• GPA: 3.98/4.0 (<i>major</i>), 3.96/4.0 (<i>cumulative</i>) Brief Coursework: Mobile and Wireless Networking, Topics in Internet Research, Wireless Networking for Under-Resourced	
Publications	(1) M. Haider and E. Knightly. “ Mobility Resilience and Overhead Constrained Adaptation in Directional 60 GHz WLANs: Protocol Design and System Implementation. ” in Proceedings of ACM MobiHoc, Paderborn, Germany, July 2016. (2) Khan, M.T.; Anwar, T.; Haider, M.K.; Uppal, M., “Efficient Relaying Strategy Selection and Signal Combining using Error Estimation Codes”, IEEE WCNC 2014. (3) Haider, Muhammad , Asad Ismail, and Ihsan Qazi. “ Markovian Models for Electrical Load Prediction in Smart Buildings ” Int. Conf. on Neural Information Processing, 2012,	
Professional Experience	Rice Networks Group, Rice University Graduate Research Associate, Advisor: Prof. Edward Knightly <i>Mobility management in 60 GHz networks</i> Dec 2013-Present	
	Intel Labs, JF Campus, OR Wireless Connectivity Intern, Supervisor: Dr. Minyoung Park <i>ns-3 based implementation of Next Gen WiFi systems</i> May 2015 - Aug 2015	
	CS Dept. LUMS School of Science and Engineering Research Assistant, Advisor: Dr. Qazi <i>Load prediction, demand response and communications in Smart Grids</i> Feb-Aug 2012	
	Teaching Assistantships Rice University: Communication Networks (Prof. Knightly) LUMS SSE: Communication Systems	Fall 2014, Fall 2015 Spring 2013
Research Projects	MOCA: Mobility Resilience and Overhead Constrained Adaptation in Directional 60 GHz WLANs <i>Master’s Thesis, Advisor: Prof. Edward Knightly</i>	

Design, implementation and evaluation of MOCA, a protocol for Mobility resilience and Overhead Constrained Adaptation for directional 60 GHz links with mobile clients. Since mobility-induced link blockage and misalignment cannot be countered with MCS adaptation alone, we introduce a probing feedback mechanism before data transmissions to identify link impairments, and devise proactive mechanisms to restore broken directional links with minimum overhead. Moreover, we analyze the role of beamwidth in directional networks in terms of overhead, achievable rate, and mobility resilience and propose an algorithm for joint adaptation of data rate and beamwidth, based on client and environmental mobility.

MAC protocol design for Full-Duplex Wireless Infrastructure Networks

Course Project (Wireless Networking), Advisor: Prof. Edward Knightly

Design and ns-3 implementation of a new MAC protocol for a full duplex AP serving half duplex stations. This protocol explores opportunistic transmissions in presence of weak links among stations or hidden terminals. Results show 60% improvement in network throughput.

Implementation of a MAC for Directional Wireless Infrastructure Networks

Course Project, Mobile Networking, Advisor: Prof. David B. Johnson

Implementation, evaluation and improvement of a MAC protocol for directional 60 GHz networks. We introduce a new way for directional ARP and topology discovery to overcome temporary disruptions in LOS path between the AP and any of its associated stations.

An Experimental Platform for a Cooperative Communication Network

Bachelor's Senior Design Project, Supervisor Dr. Uppal (PhD Texas A&M)

System level implementation of a 3-Node relay network using USRP1 devices with MATLAB SIMULINK UHD and Gnu-Radio interface. Work includes simulation and evaluation of different cooperative schemes and using error estimation codes for optimal combining.

Electrical Load Prediction and Communications in Smart Grids

Modeling and prediction of electricity consumption using continuous and discrete time Markov chains. Our models capture the inherent uncertainty in load profiles more efficiently than deterministic models like Neural Networks. Work also includes analysis of different modes of communication in smart grids.

Undergraduate Projects

- Research Internship: *Study of Quantum Hall Effect using silicon semiconductor substrate, making of a hall probe and making connections to n-type material using ohmic contacts*
- Study Project: *A Study of Energy Procurement Strategies for Renewable, Intermittent Sources*
- Forward Converter: *Design, computer simulations and hardware implementation of a Forward Converter circuit with multiple outputs and ground isolation*

Skills

- MAC Protocol design for Next-Gen WiFi networks, including Full Duplex, UHF and 60 GHz communications
- Experience with 802.11 standards (a/b/g/n/ac/ad)
- **Programming:** ns-3, C/C++, MATLAB, Assembly
- **Software:** MATLAB, ns-3, SIMULINK, GRC, tcpdump, Awk, Excel, wireshark
- **Hardware:** Interfacing with USRP devices, WARP platform
- **Communication Skills:** Proficiency in spoken English, Experience in academic and technical report writing, Research paper writing
- Strong Organizational, Professional and Problem Solving Skills

Awards & Honors

- 2nd Position in Electrical Engineering, LUMS SSE (batch size 110)
- *LUMS Deans Honor List of Distinguished Students* : all semesters
- **National Talent Scholarship** by Govt. of Pakistan (2009-2013)

- National level distinctions at Secondary and Higher Secondary School Examination, Pakistan.
- A part of the program: “*Academic Tour to Top Ranked Universities in Europe and UK*”, by Pakistan Government; traveled Sweden, France, Germany, Netherlands and UK and visited over 30 prestigious universities including Oxford and Cambridge. Visit included research laboratory tours, meeting with professors and PhD students and interaction with students from diverse academic and cultural backgrounds

**Relevant
Coursework**

- *Graduate:* Mobile and Wireless Networking (Prof. David Johnson), Communication Networks, Wireless Networking for Under-Resourced (Prof. Edward Knightly), Introduction to random processes.
- *Undergraduate:* Topics in Internet Research (Audit), Computer Networks, Digital Communications, Wireless Communications, Error Correction Coding, Digital Signal Processing, Feedback Control Systems, Electromagnetic fields and waves, Renewable Energy Systems, Power Electronics