SWINBURNE UNIVERSITY OF TECHNOLOGY

# Who am I? What do I work on? Some past and current work

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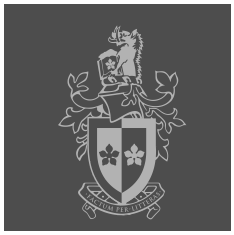


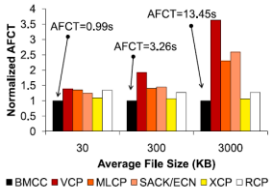
## Who am I?

- Postdoctoral Research Fellow at CAIA (Since Oct 2010)
- Network Research Intern at BBN Technologies, MA USA (Summer 2009)
  - Global Environment for Network Innovations (GENI) Unit
- Qualifications
  - Ph.D. in Computer Science, University of Pittsburgh, USA, August 2010
  - BSc (Hons) in Computer Science and Mathematics, LUMS, Pakistan, July 2005
- Research Interests
  - Green Networking, Future Internet Design, Wireless Systems
    - Protocol/Architecture Design and Implementation, Performance Analysis and Modeling
  - Congestion Control, Wireless Protocols, Testbeds for Experimentation

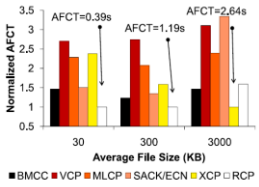
## An Efficient Framework for Congestion Control

*Doing more with less*

- Many congestion control protocols exist
  - End-to-end (e.g. CTCP, CUBIC)
    - Have performance limitations
  - Networked-based (e.g. XCP, RCP)
    - Hard to deploy
- *How can we achieve high performance while being amenable to deployment?*
  - Use the existing two ECN bits to convey high resolution congestion feedback (up to 16-bit in our case)
  - Work with Lachlan Andrew and Taieb Znati
  - For details, see corresponding publications
    - "Congestion Control using Efficient Explicit Feedback" in Infocom'09
    - "Two bits are enough" in Sigcomm'08 (Short paper + Poster)




(a) $C_l = 10\,\text{Mbps}$




(b) $C_l = 100\,\text{Mbps}$



## Global Environment for Network Innovations (GENI)

- Suite of infrastructure for enabling at-scale experimentation
  - Heterogeneity, Virtualization, and Deep Programmability
- Worked on GENI Cluster B
  - PlanetLab, OpenFlow/Enterprise GENI, GpENI, MAX, SPP
  - Setup a testbed inside BBN and enabled federation with the public PlanetLab
  - Participated in the design, evaluation, and integration processes of GENI
  - Evaluated GENI software (Geniwrapper), analyzed Cluster B aggregate technologies and designed an experiment
- Challenges
  - Stitching virtual slices across heterogeneous technologies in a scalable manner
  - Providing repeatability, modifiability, and realism across heterogeneous technologies
- Work with Aaron Falk, Christopher Small, Chip Elliot, Heidi Dempsey

## Congestion Control For Minimizing Flow Completion Times


- Users care about flow completion times
  - E.g. Google search queries, facebook photo downloads/Newsfeed
  - Yet prior literature hardly focuses on directly minimizing flow completion times
- How can we approach this problem?
  - Use insights from size-based scheduling theory
  - Prioritize short flows over long flows
  - How can we achieve this via end-point congestion control?
    - Has Implications for energy efficiency
  - Work with Lachlan Andrew



## Incentive-compatible Wireless MAC Design

- Existing wireless MACs (e.g. 802.11e) provide service differentiation using priorities
  - Low priority traffic (e.g. bulk data transfers) have an incentive to claim to be high priority traffic (e.g. voice traffic)
  - How can design a MAC that is incentive-compatible?
- Idea:
  - Provide a trade-off curve to users so that they can choose between different service impairments
    - E.g. bulk data transfers can tradeoff delay for high throughput
  - Work with Hai Vu and Lachlan Andrew

## Some Past Projects

- Role of feedback in congestion control protocols
  - *How rich a feedback is good enough?*
- Incremental deployment of ECN-compatible congestion control
  - *What mechanisms should be employed to allow interoperability?*
- Capacity estimation in 802.11 wireless networks
  - *How can we reliably track the time-varying capacity in a 802.11 WLAN?*
- Performance benefits of wireless network coding
  - *How much gain can network coding provide in a wireless network? under what conditions is it useful to employ it?*
- Buffer sizing for Internet routers
  - *How should we size router buffers in the presence of bi-directional traffic*



# Thanks

**http://caia.swin.edu.au/cv/iqazi/**