Wireless Networking Research Activities

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Bio

- PhD in ECE, UMD (2000)
- 2000-2009: held research positions at major U.S. Industry R&D Labs, e.g. HRL Labs, Malibu, CA and Lockheed Martin ATC, Palo Alto, CA
  - PI for DARPA- and GM-funded programs
- July 2009: Assistant Professor, Electronics & Comm. Eng. Dept., Faculty of Engineering, Cairo University
  - Holds a joint appointment with the Wireless Intelligent Networks Center (WINC), Nile University
- Editorial Board Member
  - IEEE Transactions on Mobile Computing
  - Wiley International Journal of Satellite Communications and Networking
- Publications co-Chair of IEEE GLOBECOM 2012
- TPC Member of major IEEE and ACM networking conferences
- Served on NSF and Fulbright panels
- 7 issued U.S. Patents and 4 more pending applications
- More than 1600 citations according to *Google Scholar*
- Senior Member, IEEE

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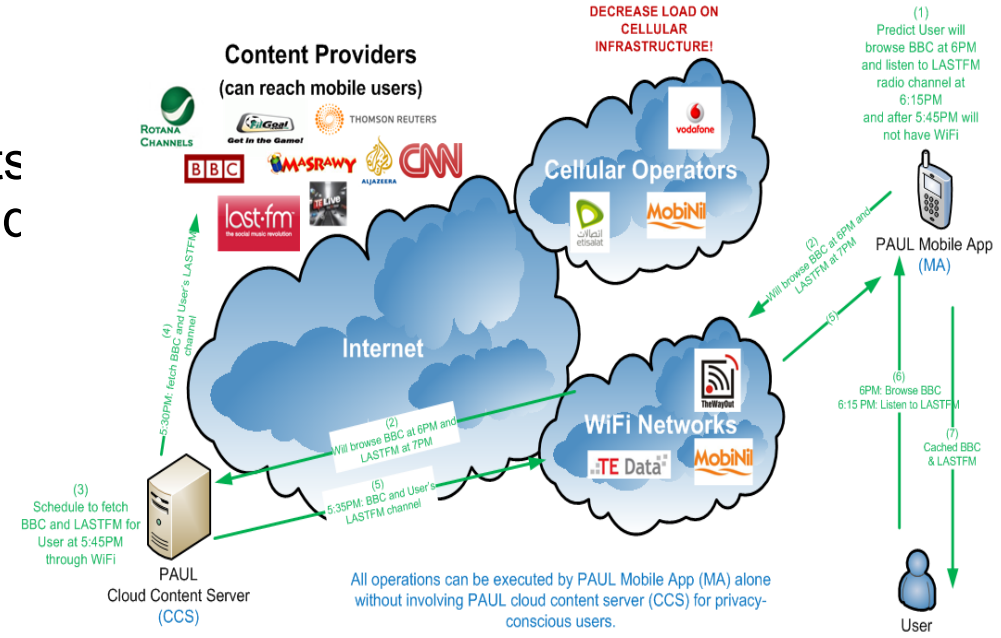
Ongoing Research Activities

- NTRA/ITIDA, Egypt: Proactive Content Delivery (2012-2013)
- QNRF, Qatar
  - LPI: C.F. Chiasserini (Politecnico di Torino) “GAD: Green and Dense – Future Wireless Access Networks” (2013-2016)
  - LPI: M. Krunz (U. of Arizona) “Opportunistic Real-time Comm” (2012-2015)
- Google, USA: Proximity-based Delay-Tolerant Profile Relaying for Androids (PDAs) (2011-2013)
- General Motors, USA: Vehicular Networks (2010-2012)
- Microsoft Research, UK: Cost-effective Mobile Healthcare (2010-2011)
- FP7 Marie Curie IRSES, EU:
  - PI: L. Tassiulas, University of Thessaly, Greece “CoopLab” (2012-15)
  - PI: O. Ercetin, Sabanci University, Turkey “AgileNET” (2012-15)

Proactive Content Delivery for Mobile Networks (NTRA/ITIDA, Egypt)

- **Collaboration:** Smartec-Group, Ohio State (*project kickoff: April 2012*)
- **Need:** the ever increasing demand for spectrum gives rise to the cellular networks congestion
- **Objective:** leverage users' interests and mobility to ease congestion and enhance users' experience
- **Research Issues**
  - Stochastic models for connectivity and content usage patterns
  - Proactive Scheduling Algorithms
- **Impact**
  - Egypt share in the lucrative mobile content delivery market
  - Synched with MIDEAST transition from infrastr. to service competition



Ample opportunity for innovation and market penetration with a patented, disruptive technology

GAD: Green and Dense Wireless Access Networks (QNRF, Qatar)

- **Collaboration:** Politecnico di Torino and Qatar University
- **Need:**
  - How to design future radio access (dense and heterogeneous) networks
  - 1.4 Billion tons of Carbon emissions (3%) will be contributed by ICT by 2020
- **Objective:** design a GAD wireless access network that leverages its unique features and translates the unquestionable complexity of the system into an opportunity for achieving (or approaching) optimality
- **Research Issues:** builds upon the promising Cloud Radio Access Network (C-RAN) vision
  - Define the GAD network architecture; major entities and associated protocols
  - Develop optimization/queuing-theoretic formulations capturing GAD trade-offs
  - Build in-lab testbed and outdoor demonstrator of the GAD system (in Qatar)
- **Activities underway**
  - Better understand GAD's impact and importance for local and regional cellular carriers

GAD C-RAN is a paradigm shift in designing future RANs that caters to the quest for Green, Broadband wireless access

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Opportunistic Real-time (ORT) Communications (QNRF, Qatar)

- **Collaboration:** Univ. of Arizona and Qatar University
- **Need:** the spectrum scarcity problem is becoming more pressing with the wide spread of wireless devices and surge in demand for real-time (multimedia mobile broadband)
- **Objective:** develop new theory and inspired decision policies for spectrum sensing and resource allocation for opportunistic real-time (ORT) comm.
- **Research Issues**
  - Delay-constrained sensing/probing strategies for ORT Communications
  - Optimal resource allocation (power, rate) policies for ORT CR networks
  - Cognitive relays for supporting ORT Communications
- **Activities underway**
  - Project Kickoff: April 2012
  - Explore strategic partnerships with regional and international ICT industry
  - Regional relevance with global impact

It is projected that by 2015, 68.5% of the Internet traffic will be generated by mobile video

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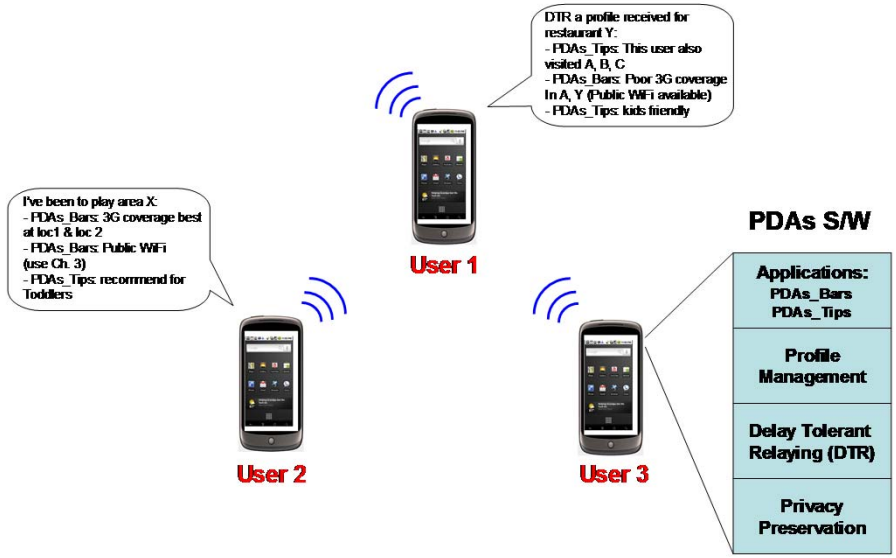
PDAs
(Google Faculty Research Award, USA)

- **Need:** the 4.5 billion phones worldwide can be further utilized for the benefit of the users
  - Egypt: 55+ million mobile subscribers
- **Objective:** leverage anonymized mobile user profiles for enhanced user experience and connectivity
- **Research Issues**
  - Profile content, matching, management
  - Opportunistic profile relaying
  - Proximity-based privacy preservation and trust models
- **Activities underway**
  - Project started: Oct. 2011
  - What is the killer app for such technology?



Direct phone-to-phone communications should be further leveraged for enhanced user experience

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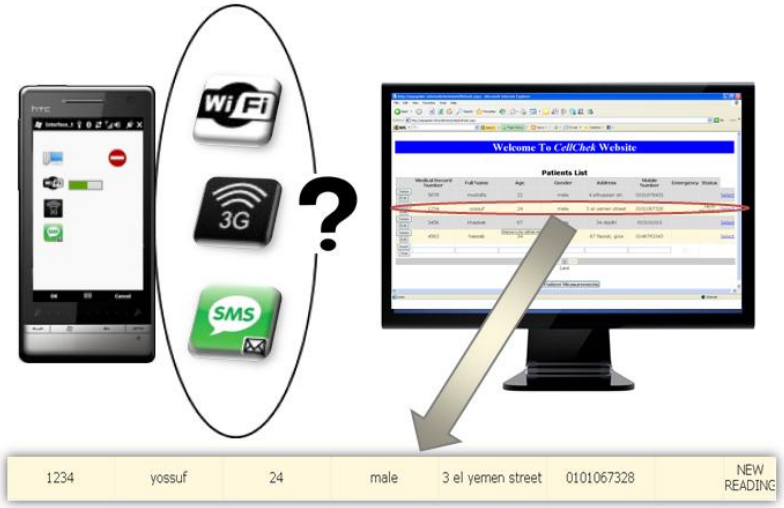
Cost-effective Mobile Healthcare (Microsoft Research, UK)

- **Need:** Healthcare services in underserved communities are either costly or not immediately available
- **Objective:** bring qualified healthcare to disadvantaged citizens in Egypt in a cost-effective manner
- **Research Issues**
  - Leverage mobile phone sensors, e.g. accelerometer, along with BSNs
  - Utilize 3G, WiFi, Bluetooth interfaces
  - Leverage *free* phone-to-phone direct communications, when applicable
- **Activities underway**
  - Partnerships with local startups (e.g., *PulseEG*) and medical facilities
  - **Project Completed Aug. 2011** (*exploring possible extensions*)



***CellChek* Testbed**

Time is ripe for mHealth, among other mobile, applications in the MENA region given the ubiquity of cell phones

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