Introduction

- Joined CAIA in 2005
- Prior to that:
  Melbourne Univ., Australia (5 years); Siemens, Hungary (6 years)
- Research interests:
  Mathematical modelling, computational probability, performance evaluation, optimization and design for data networks and communication protocols
- Current focuses:
  Networks that utilise wireless communication (Intelligent Transport Systems, WiFi/WiMax, Smart Grid and Sensor networks);
  And also in mechanism design and network energy efficiency
Application Driven

- Voice, Data, Game, Video
  - WLAN, WiFi (hotspot), WiMax networks

- ITS (safety, efficiency and environmental)
  - V2V, V2I (WiFi, DSRC) networks

- Monitor, tracking, management
  - Sensor networks, Smart meter, Smart Grid

Research questions

- Voice, Data, Game, Video
  - WLAN, WiFi (hotspot), WiMax networks

Capacity problem, traffic interaction is not well understood, QoS guarantee is a challenge

voice capacity (Kewin S., Philip B.)
mechanism design (Suong Ng., Lachlan A., Ihsan Q.)
### Research questions

- ITS (safety, efficiency and environmental)
  - V2V, V2I (WiFi, DSRC) networks

Reliability, mobility, security and human factor

MAC performance (Imrul H., Lachlan A.)
handoff (Fazl N., Philip B., Jason B.), test-bed (Jason B.)

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### Research questions

Energy constraint, noisy network and disorderly data pattern

PLC network (Mehdi K., Nasser H.)

- Monitor, tracking, management
  - Sensor networks, Smart meter, Smart Grid
Research outcome: Example in ITS

(a) Rear-end collision avoidance using routine safety messages

Slow vehicle A broadcasts its presence
Fast approaching vehicle B passes car A on a quick maneuver
Driver in fast approaching vehicle C is warned of a slower car A ahead

(b) Extended emergency brake light using event safety messages

Vehicle A broadcasts its braking event to all vehicles behind it
Driver in B is warned of car A’s braking despite an obstructed view


Reliability for Safety

Packet Delivery Ratio

Vehicle Density (vehicles/meter)

(12,2,200)
(24,10,200)
(24,10,400)
**Proposed Solution**

Tagged Node
- Event message
- SIFS
- Event message
- SIFS
- Event message

Hidden Node
- Regular message #1
- DIFS
- Regular message #2

Receiver
- Collision
- Collision
- Success

**Enhanced reliability**

![Graph showing packet delivery ratio vs. vehicle density]
Plan to put it to the Test