SigNet

From Signal to Network

http://signet.i3s.unice.fr

Team

Permanent staff

networking	**Guillaume Urvoy-Keller** - Prof. UNS - *traffic analysis - scheduling*
signal/telecom	**Luc Deneire** - Prof. UNS -*wireless - multiple antennas*
signal	**Jérôme Lebrun** - CNRS researcher- *algebraic aspects*
telecom/netw.	**Lucile sassatelli** - Ass. Prof. UNS - *network coding - mobile social networks*
networking	**Dino Lopez** - Ass. Prof. UNS - *transport layer - green networking*

Team

- PhD Students

signal/telecom **Boris Kouassi (I3S/Intel)** - *Cognitive radio*
signal **Miguel Hisojo** - *Spatio-temporal codes*
networking **Neetya Shrestha** - *Mobile social networks*
networking **Sonia Behlareth (I3S/Orange Lab)** - *Cloud computing*
networking **Imane Mnie-Filali (I3S/TMG)** - *Multi-content distribution*
networking **Riccardo Ravaioli (I3S/INRIA)** - *Networking neutrality*

- (Recent) Interns

networking **Adrian Arsene** - *Network level performance in virualized environement*
networking **Tram An La** - *Bandwidth estimation in 802.11 networks*
networking **Tam Nguyen Hoang** - *Implementation of XCP*
networking **Madhusanka Liyanage** - *Mixing scheduling and network coding*

Transport protocols

- TCP $\rightarrow$ core element of Internet's stability
- Reno works well for low bandwidth ($<$100 Mb/s) and low latency ($<$150 ms) paths
- New Linux/Windows implement new versions: Compound, Cubic.
  - High utilization
  - Fairness
- Challenges in exotic environments: fat pipe between data centers, virtualization environment, satellite links. Also, energy reduction mechanisms (change of routing, live modifs at physical layers)
- Contributions:
  - Implementations within kernels, e.g. XCP that relies on partial/full feedback from routers
  - Study of lot's of cubic connections in cloud streaming scenario
  - Inter and intra virtual machines communications
  - for NS-2 for e2e energy consumption

Mobile Social Networks

- Mobile ad hoc networks with no instantaneous end-to-end path: Delay Tolerant Networks
- Made of human beings: ***mobile social networks***
- *Challenges*: designing routing and transport protocols based on the Store-carry-and-forward paradigm
- *Tools*: Network coding, social knowledge, and network models (stochastic, fluid,...)
- *Contributions*:
  - Modeling information dissemination in mobile social networks
  - Design of optimal routing schemes based on network coding, accounting for energy and memory consumptions
  - Smart acknowledgment schemes for reliable unicast/multicast schemes

Traffic Analysis and Size-based Scheduling

- Traffic analysis
  - Root cause analysis of TCP connection in residential network (ADSL, FTTH, mobile), i.e., *Why does this connection achieve this rate?*
  - Statistical Traffic classification: deep packet inspection is challenged by legal and technical (encryption) issues
  - Measurement tools: capacity and available bandwidth estimation – measuring without remote party cooperation
- Size-based scheduling
  - Typical snapshot of IP traffic: mice and elephants (web browsing vs. large downloads)
  - *Elephants like FIFO/droptail, mice not that much.*
  - Size-based scheduling $\rightarrow$ Favor short transfers over large transfers
  - Extension to 802.11 WLANs
  - Low memory footprint, accounting for rates

Cognitive Radio

- In mobile networks, one frequency per user - allocated even if no traffic
- Idea: cooperation between primary and secondary user
- Various solutions
  - Signaling between primary and secondary user
  - Mutual information on spectrum usage $\Rightarrow$ interference avoidance
- Contribution: study on signaling overhead and throughput gain trade-off.

Continuous phase space-time coded modulation

- Continuous phase modulation combined with Space-Time Codes
- Contributions
  - CPM ST-coding schemes based on L2 -orthogonality
  - Application of CPM to MIMO systems
  - Trade-off between decoding complexity (improved with L2 orthogonality approach) and synchronization constraints
  - Extension to multi-user system (future work) - combination of FDM and CPM

Contracts

- ANR (National Research Agency) TRouP WilMA - mobile social networks
- Orange Lab (PhD supervision) - cloud computing
- TMG (PhD supervision) - content distribution
- Intel (PhD supervision) - cognitive radio