LAAS-CNRS

Pole SINC meeting
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Metrology in the Wireless Networks

State of art & our work

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PLAN

1. Introduction
2. State of Art
3. Our Work

Wireless Access

→Wireless devices are becoming more preferable by users,
→Rapid deployment of wireless networks in various environments,
→This is certainly becoming the main way of accessing networks ,
→This is one of the main business for operators to gain the market,

→But wireless networks are still largely unknown:
✓Bad knowledge of the wireless medium behaviour,
✓Bad knowledge of traffic characteristics,
✓QoS requirements ~ network design parameters [6],

PLAN

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Measurement: a New Task

→Initially: much of the work was:
✓ Analytic models [1,5,12,13],
✓ Simulation techniques [8,9,10],

→Recently: task of measurement,

→Special workshops:
✓WiNMee (Wireless Network Measuremet) since 2003,
✓WiTMeMo (Wireless Traffic Measurement and Modeling) since 2005,

Others' Work

→Measurements at the wired portion of the wireless network:
✓Using wired sniffers,
✓Concerns upper layers: IP layer [2], Application layer [7,11],
✓Includes only traffic that successfully traverses the wireless medium,

→Measurements at the wireless portion of the wireless network:
✓Using wireless sniffers,
✓Concerns lower levels: PHY layer [1,5], MAC layer [4,7,12],
✓This disclose characteristics of the wireless medium itself,

→Missing ring: intertwined effect between lower & upper layers,

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Problematic Issue

Our motivation:

→Capturing aspects of wireless networks requires more than monitoring at any one layer in the protocol stack [3],

→Instead, cross-layered monitoring is needed,

→For this we need:

- ✓ Monitor data at each layer,
- ✓ Observe the intertwined effects,
- ✓ Comprehensive assessement ,

Cross-layered monitoring

Example:

→Monitor metrics of each layer:
✓PHY layer: signal strength,
✓MAC layer: Retry fail,
✓IP layer : RTT,
✓App. Layer: Encoding bitrate,

→Traces:
✓Over time,
✓Over sequence,

→Observe intertwined effect,

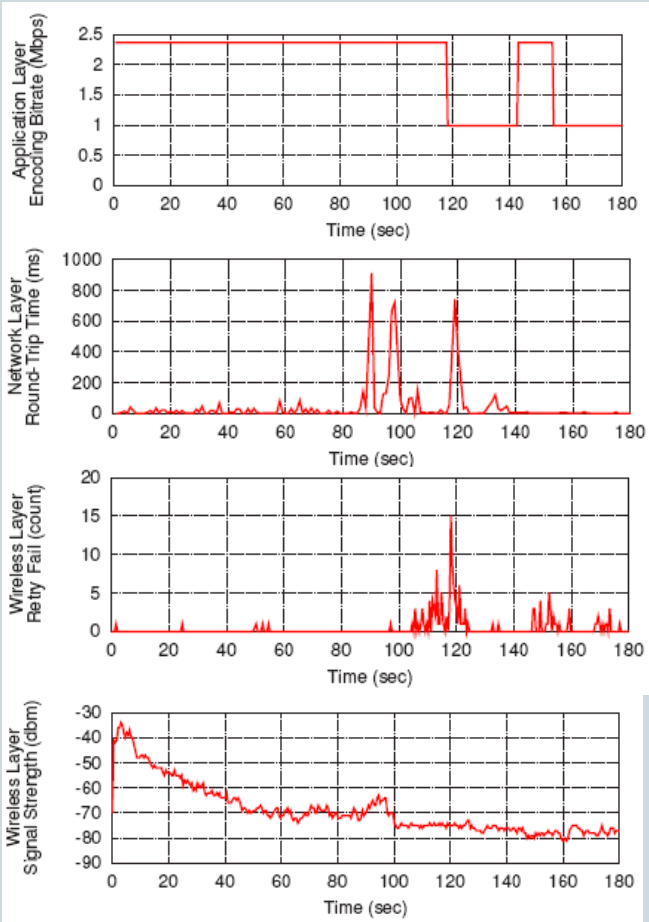

Figure (1): Multiple layer performance at a wireless client in WiFi [3]

Objective

→Monitor real wireless networks: WIFI, GPRS, WIMAX,… etc,

→Layer metrics:
✓PHY layer: SNR, signal strength, … etc,
✓MAC layer: error bitrate, resent frames, frame lost, … etc,
✓IP layer: RTT, inter-packet time interval,… etc,

→Analyze the monitored data:
✓understand the intertwined effect between layers,
✓Analytic models,

Objective

Design & developpe a Cross-Layered Monitoring Tool (CLMT):
✓Hardware,
✓Software,

→Design & develop:
✓ Traffic,
✓QoS policy,
✓Performance characterization
✓Modeling tools (especially at low level layers),

→Propose an architecture for wired/multiple wireless networks adaptaion aiming at coping with QoS requirements,

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Thank you for your attention