Wireless Networking [ET4394]

Edition 2018: Project division

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Tips on Wireshark "Sniffing"

- **Sniffing**
  - Suggestion: Use tshark + shell script (or Python or Matlab)
  - Collect as much data as you can (I mean: hours, various days)
  - Files will be large so code carefully!
- **Report+Code**
  - Code must be REPLICABLE
  - Add your datasets
  - Report in LaTeX only (source add to github), 4 pages max
    - To the point – no intros/grandiose backgrounds/etc.
    - **More on that at the end!**
- **Presentation**
  - 5 min/group

Wireshark “Sniffing” Projects

- **W1: Provide data on SSID of a large set of APs**
  - *Average length, lexical information (common/words), no. hidden APs, how many people do not change default AP name*
    - The more – the better!
  - @Campus, @Dorm, @Street, etc.
- **W2: Provide distribution of frame types**
  - RTS, CTS, ACK, Broadcast, etc.
  - Collect their lengths and corresponding information, like data rate used for transmission
    - The more – the better!
  - @Campus, @Dorm, @Street, etc.

Wireshark “Sniffing” Projects

- **W3: Provide data on channel distribution, channel sizes and PHY types (a/b/g/n/etc.)**
  - Which channels are used mostly and by whom
  - @Campus, @Dorm, @Street, etc.
- **W4: Activity detection with MAC frames**
  - Can you spot someone passing by your AP?
  - How often and at what points of day users appear?
- **W5: Measure SNR (Signal strength + noise) per frames per situation**
  - Versus AP to station distance

Wireshark “Sniffing” Projects

- **W6: Provide information on modulation formats vs data rates**
  - Per PHY type, @Campus, @Dorm, @Street, etc.
- **W7: Provide information on random access parameters**
  - Lengths of preamble, IFS, etc.
- **W8: How many CRC faults can you observe in the measured data**
  - Try to find the correlation with SNR, data rate, channel selected, etc.
  - Experiment with few scenarios: mobile, long range, indoor/outddoor

Wireshark “Sniffing” Projects

- **W9: Experiment with traffic injection and measure collision rate**
  - Run large youtube video from many stations extract as much data as you can
- **W10: Measure number of retransmissions**
  - Pick few scenarios
- **W11: Extract information of used security per AP**
- **W12: Extract information on chipset and vendor type**
- **W13: Measure information on multi-antenna system**
  - Supported or not, how many ports present, etc.
- **W14: Measure frame content to overhead**
  - i.e. how much signaling data must be sent in every frame

SDR Projects: Software

- **We will work with MATLAB WLAN Toolbox**
  - Available for free to all TU Delft Students
  - Install all necessary packages, especially:
    - *Communications Toolbox*
    - *Signal Processing Toolbox*
    - *SDR toolbox*

Let me know this week if you managed to install it!

Let us divide the groups now!

Music: Mitch&Mitch (From Warsaw)

SDR Projects

Each group will do the project in steps

- Make FM radio receiver run on your PC (and understand it)
  - **All groups will get RTL-SDR dongle from me next week**
  - **Deadline: 26 Februaury, 23:59 (hard deadline)**
- Understand the necessary components of 802.11 PHY with examples (will be given in a minute)
  - **Deadline: 8 March, 23:59 (hard deadline)**
- Run the test cases and understand EVERY feature of it (will be given in a minute)
  - **Deadline: 15 march, 23:59 (hard deadline)**
- **Complete the assignment**
  - **Will be given per group on 8 March@class**
  - **Deadline: as given yesterday**

SDR Learning Modules: All SDR Groups

- **SM1: 802.11 OFDM Beacon Frame Generation**
  - **https://nl.mathworks.com/help/wlan/examples/802-11-ofdm-beacon-frame-generation.html**
- **SM2: 802.11ad Waveform Generation with Beamforming**
  - **https://nl.mathworks.com/help/wlan/examples/802-11ad-waveform-generation-with-beamforming.html**
- **SM3: 802.11 OFDM Beacon Frame Generation**
  - **https://nl.mathworks.com/help/wlan/examples/802-11-ofdm-beacon-frame-generation.html**

SDR Learning Modules: All SDR Groups

- **SM4: 802.11ad Waveform Generation with Beamforming**
  - **https://nl.mathworks.com/help/wlan/examples/802-11ad-waveform-generation-with-beamforming.html**
- **SM5: 802.11 OFDM Beacon Receiver with Live Data**
  - **https://nl.mathworks.com/help/wlan/examples/802-11-ofdm-beacon-receiver-with-live-data.html**
- **SM6: 802.11ac Waveform Generation with MAC Frames**
  - **https://nl.mathworks.com/help/wlan/examples/802-11ac-waveform-generation-with-mac-frames.html**

SDR Projects

- **S1: 802.11ac Signal Recovery with Preamble Decoding**
  - https://nl.mathworks.com/help/wlan/examples/802-11ac-signal-recovery-with-preamble-decoding.html
- **S2: 802.11ac Transmitter Modulation Accuracy and Spectral Emission Testing**
  - https://nl.mathworks.com/help/wlan/examples/802-11ac-transmitter-modulation-accuracy-and-spectral-emission-testing.html
- **S3: 802.11ac Multi-User MIMO Precoding**
  - https://nl.mathworks.com/help/wlan/examples/802-11ac-multi-user-mimo-precoding.html

SDR Projects

- **S4: 802.11n Packet Error Rate Simulation for 2x2 TGn Channel**
  - https://nl.mathworks.com/help/wlan/examples/802-11n-packet-error-rate-simulation-for-2x2-tgn-channel.html
- **S5: 802.11p and 802.11a Packet Error Rate Simulations**
  - https://nl.mathworks.com/help/wlan/examples/802-11p-and-802-11a-packet-error-rate-simulations.html

Tips on SDR Project

- Play with all parameters and ask!
- Don’t be afraid if you don’t understand something
  - **See point above**
- I will provide a good learning material (for people with small communications/signal processing background at) next class

NS3 Projects

- **Simulate a large 802.11 network**
  - **N1: as a function of traffic type**
  - **N2: as a function of PHY**
  - **N3: as a function of mobility**
  - **N4: as a function of propagation channel type**
  - **N5: as a function of antenna pattern**
  - **N6: as a function of MAC type**

NS3 Projects: Tips

- **NS3 is a hell of a program, so be ready!**
- Start TODAY with playing with the code examples
- Script everything!
  - also data collection and plotting
  - Ideally: you should run ./run_my_ns3_simulation and you should get all the plots you need for your report
- I will provide an example report from previous year pointing to certain requirements

Report Requirements

- Each report: 4 pages **MAX!**
- Straight to the point
  - No "Internet of Things is a technology of the future. It is expected that 20 billion devices will (…)" in the introduction
- **LaTeX** only!
- Figures should have confidence intervals
- If figure looks weird to you – its probably wrong!
  - **Redo experiment and check to point above!**
- Proper English
- Everything uploaded to github.com (i.e. collected data/report/scripts)
  - One of you can be the main

Obligatory Consultation Day

- We need to pick a day for consultations:
  - 2 hour max per week in one shot
  - First come/first serve or per reservation?
  - After the class, but when?
  - EWI or building 28?

Suggestions?

Comments on Group Work

- The same grade is given to all members of the team
  - I will ask at the end each group if you want **weighted split**
- Having troubles working with your peer? **Please report**!
- Work hard **together**
  - Even if one student is good, the other should still deliver
- Not everybody is a team-player/delivers
  - Suck it up and **welcome to the real world**!