University of Antwerp
Faculty of Science

Advanced Networking Lab: Feedback on 5G Labs

2023-2024

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Overview

Where we are now

Lab Structure: Status

Lab	Timeline
~~Lab 1: Pre-reading~~	~~15 April – 21 April~~
~~Lab 2: Basic Design~~	~~22 April – 28 April~~
~~Lab 3: RF Planning~~	~~29 April – 5 May~~
~~***Deadline Labs 1-3: Sunday, 5 May 2024***~~	
Deadline Labs 1-3 Feedback: Friday, 10 May 2024	
Lab 4: Configuring OpenAirInterface	6 May – 12 May
Lab 5: Running OpenAirInterface	13 May – 19 May
Lab 6: OpenAirInterface Walk Test	20 May – 26 May **(@ The Beacon)**

Lab 6: OpenAirInterface Walk Test

- **Wednesday, 22 May 2024**
  - 10:00 – 12:00: Group 2
  - 13:00 – 15:00: Group 1
- **@ The Beacon**
  - Sint-Pietersvliet 7, 2000 Antwerp

Feedback

5G Labs 1-3

Lab 2: Basic Design

- **Minimum & maximum distances**
  - **Minimum distance**
    - = shortest possible distance between UE and RSU
  - **Maximum distance**
    - = largest distance between UE and RSU *that you want to support*
    - Explain your choice!

Lab 3: RF Planning

- **Numerologies**
  - Possible values: 0-6
  - **But**:
    - FR1: $\mu \in \{0, 1, 2\}$
    - FR2: $\mu \in \{2, 3, 4, 5^*, 6^*\}$ **optional*
  - Possible μ depends on NR band
    - See 3GPP TS 138.101-1, Table 5.3.5-1: "Channel bandwidths for each NR band"

Table 4.2-1: Supported transmission numerologies.

μ	$\Delta f = 2^{\mu} \cdot 15$[kHz]	Cyclic prefix
0	15	Normal
1	30	Normal
2	60	Normal, Extended
3	120	Normal
4	240	Normal
5	480	Normal
6	960	Normal

3GPP TS 38.211 version 17.1.0 Release 17

Table 5.1-1: Definition of frequency ranges

Frequency range designation	Corresponding frequency range
FR1	410 MHz – 7125 MHz
FR2	24250 MHz – 52600 MHz

3GPP TS 38.101-1 version 17.5.0 Release 17

Lab 3: RF Planning

- **Wireless propagation models**
  - **Choosing the model**
    - More than just frequency and distance to consider
    - Each model represents a specific environment, with a specific set of assumptions
      - Explain why your choice fits our use case!
    - Result: *path loss formula*
  - **Using the model**
    - Link budget calculation: $P_{Rx} = P_{Tx} + G_{antennas} - L_{cables} - L_P$
      - Where L_P is path loss, calculated using your propagation model

Model	Frequency range (MHz)	Recommended use
COST-231	800-2000	0.02 < d < 5 km, UMTS, GSM1800, LTE
Erceg-Greenstein	1900-6000	0.1 < d < 8 km, Fixed
IMT-2000	800-2800	Indoor office, vehicular, outdoor to indoor
ITU-526	30-1000	Fixed
ITU-529	300-1500	1 < d < 100 km, GSM900, CDMA2000,
ITU-1411	300-100000	0.005 < d < 1 km, short-range
ITU-1546	30-4000	1 < d < 1000 km
Okumura-Hata	150-2200	1 < d < 20 km, GSM900, CDMA2000,
WLL	30-10000	Fixed receivers, Microwave Links, WiMAX

Final Remarks

- **References!**
  - Especially if you quote or paraphrase
  - Doesn’t have to be fancy – link is fine