Test Bench Development for IEEE 802.11-based WLAN Performance Evaluation and Measurements

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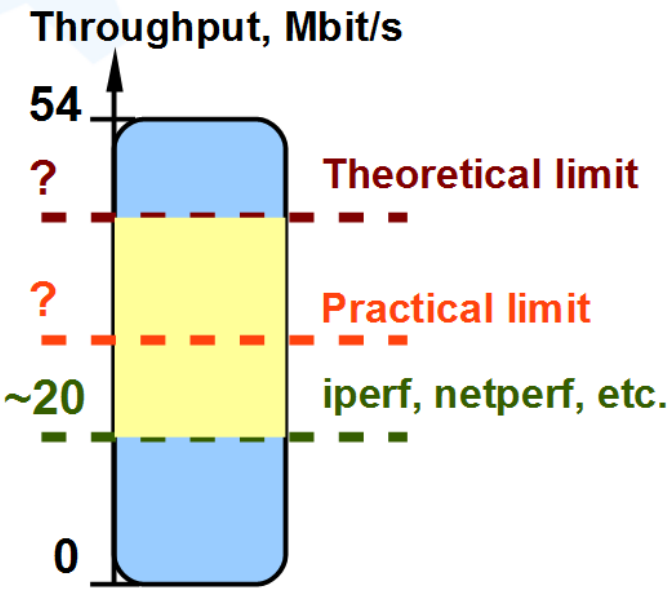
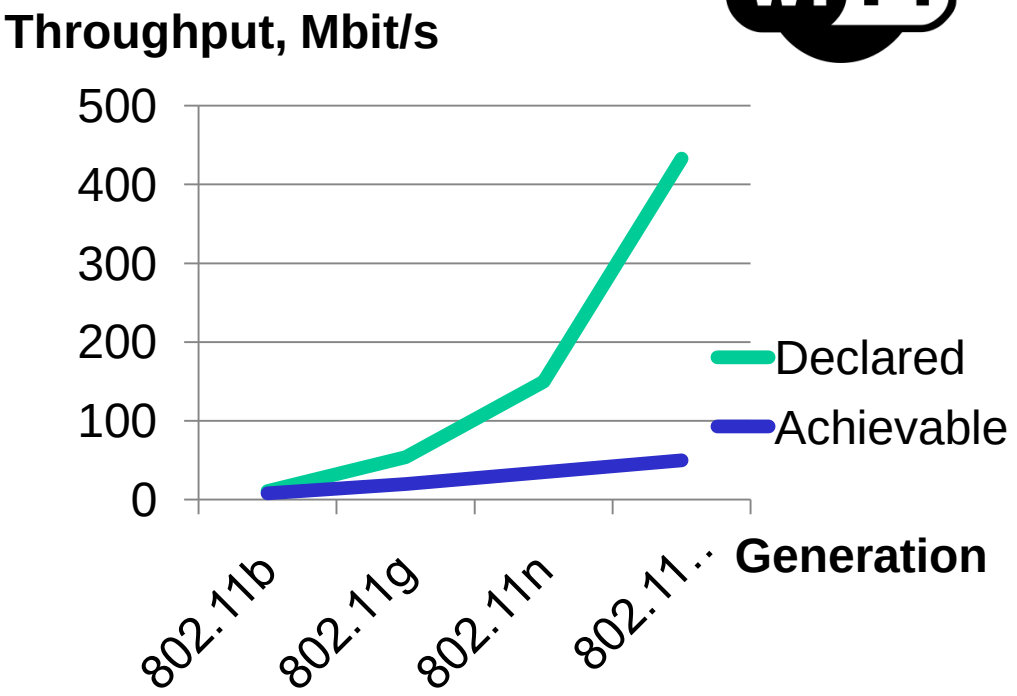
Problem topicality

- 802.11 (Wi-Fi) – **de-facto standard** for WLAN
- Need for **real** performance evaluation





Mess of approaches

Simulation

Analysis

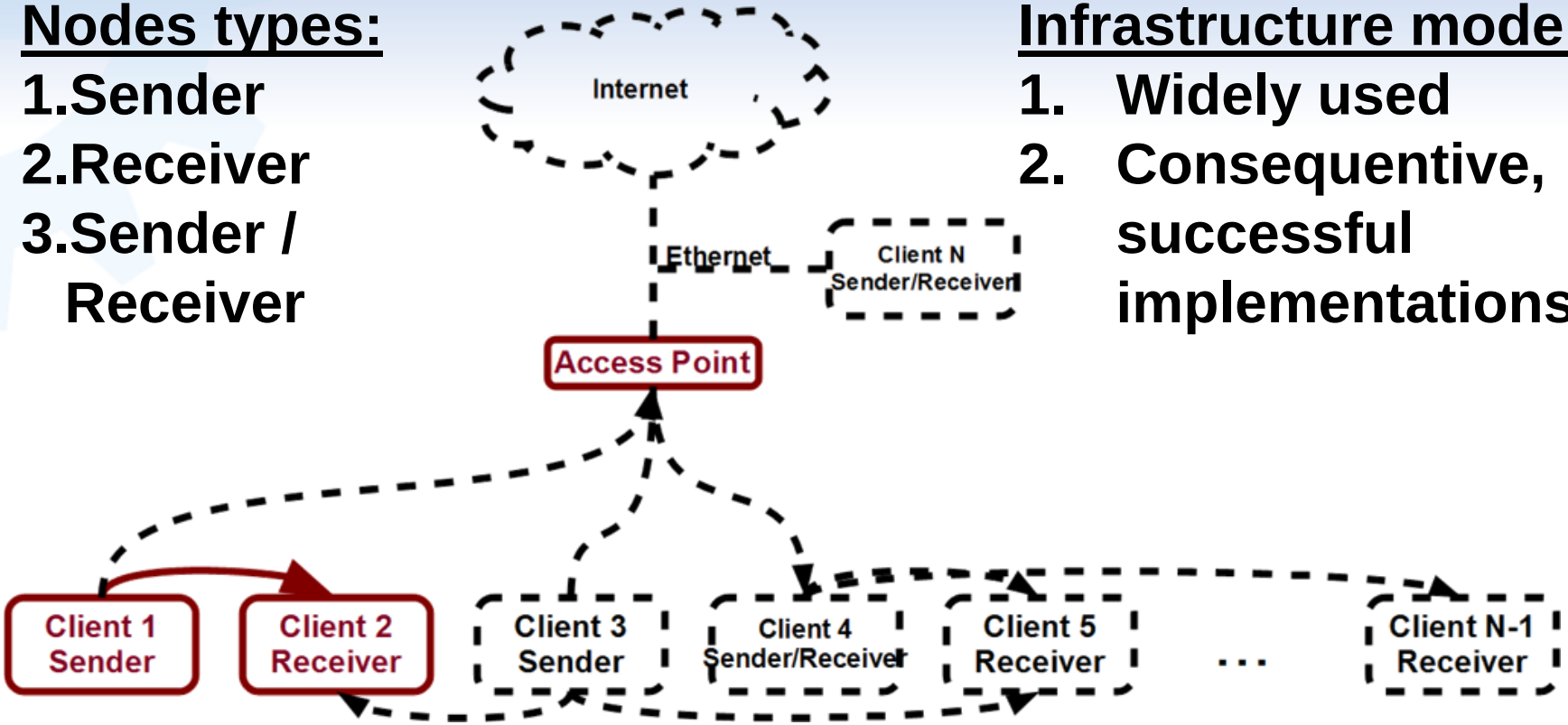
Measurements

Harmonization is required

General use case

Nodes types:

1. Sender
2. Receiver
3. Sender / Receiver



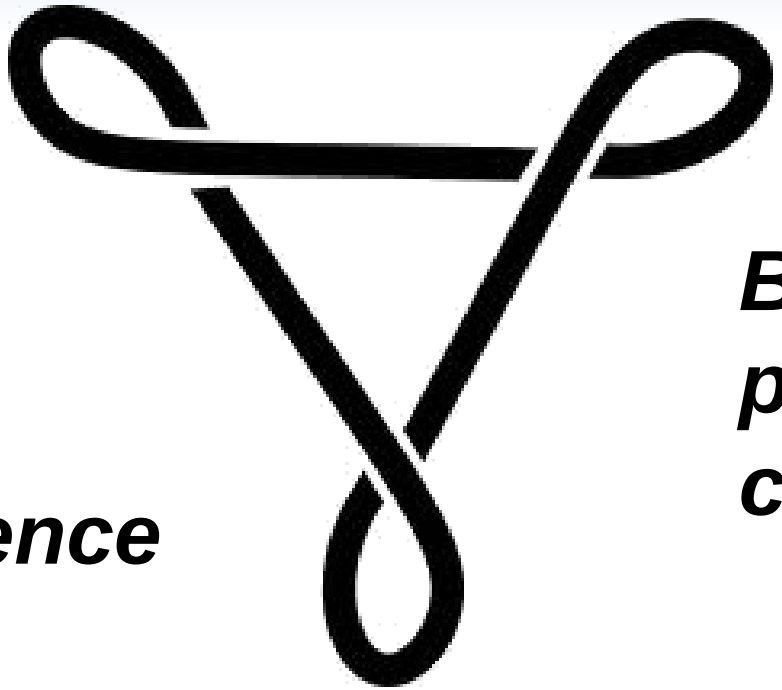
Infrastructure mode:

1. Widely used
2. Consequentive, successful implementations

Harmonization is proposed

Measurements

Analysis

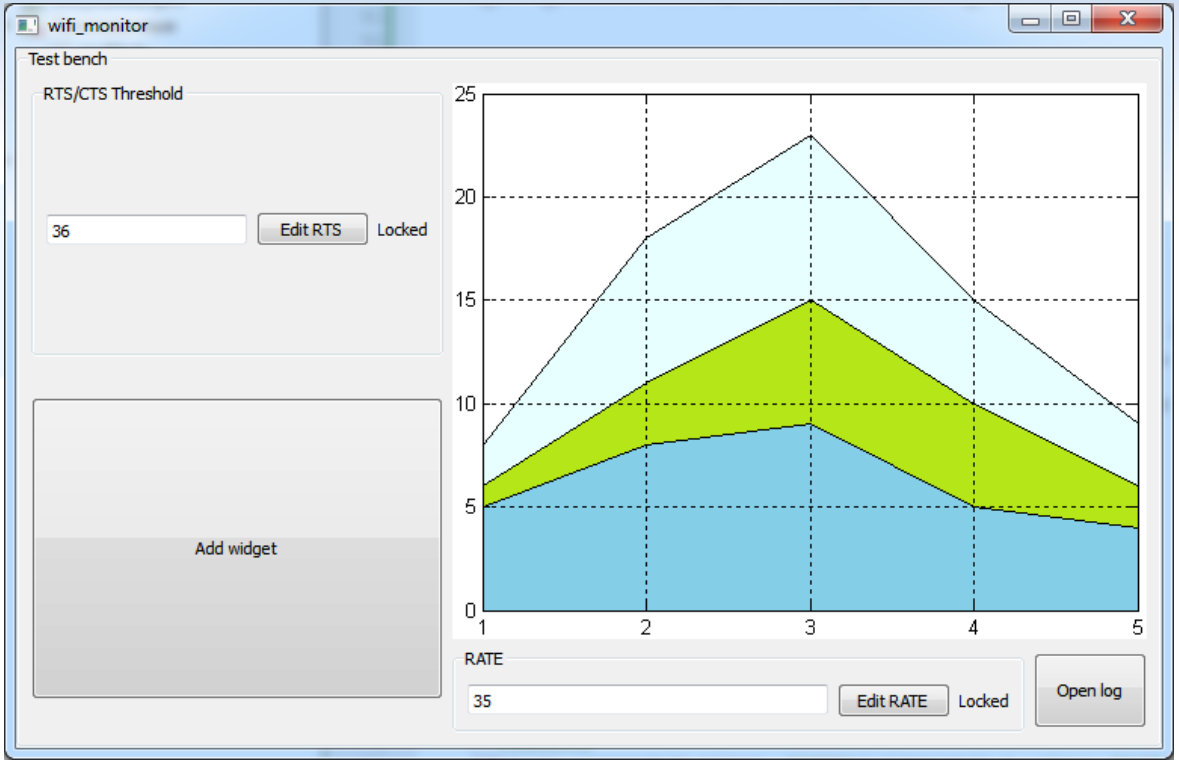


Model convergence

Best practices consideration

Simulation

Measurements

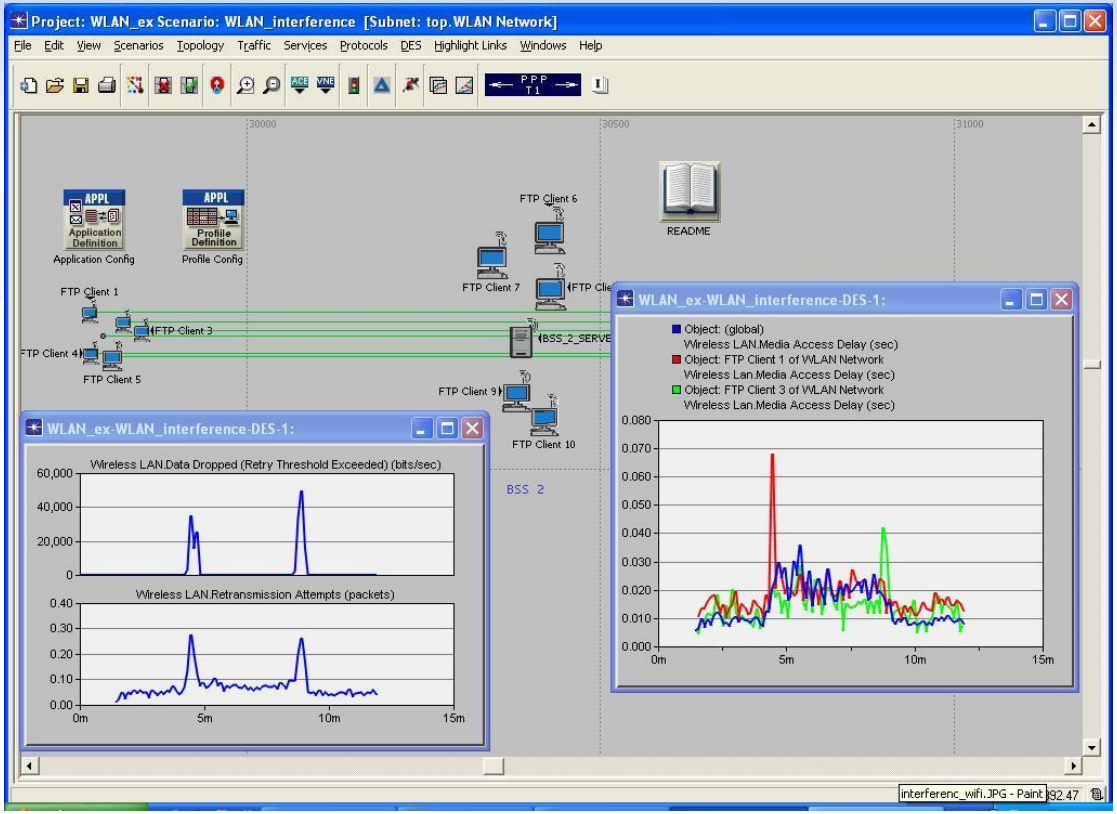


Metrics:

1. Throughput
2. Packet Error Trace (PET)
3. Average Delay
4. …

Open-source driver is required

Simulation



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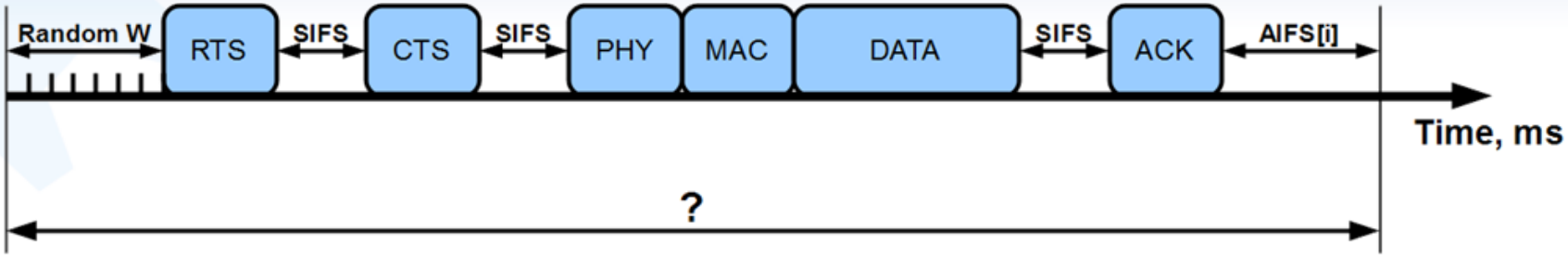
Non-analytical models verification

Analysis. Assumptions

- **Nodes number - const**
- **Saturation**
  - Every node has a packet ready to transmit
- **Transmitting buffer is full**
  - Data is sent by portions
- **Transmitting power – const**
- **Rate – const**

Analysis.
Performance benchmarking

Throughput estimation for 2 nodes:



$$T = \frac{1(Mbyte)\cdot 8(bits/byte)}{\frac{W_{\min}+W_{\max}}{2}\cdot SLOT + 3\cdot DIFS + RTS + CTS + DATA + ACK + AIFS[i]}$$

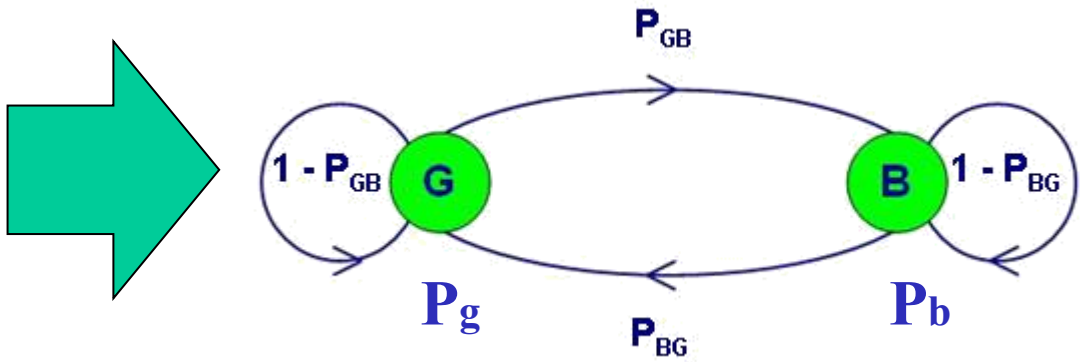
Extrapolation approaches for N nodes exist

Analysis. Channel models

Packet Error Trace

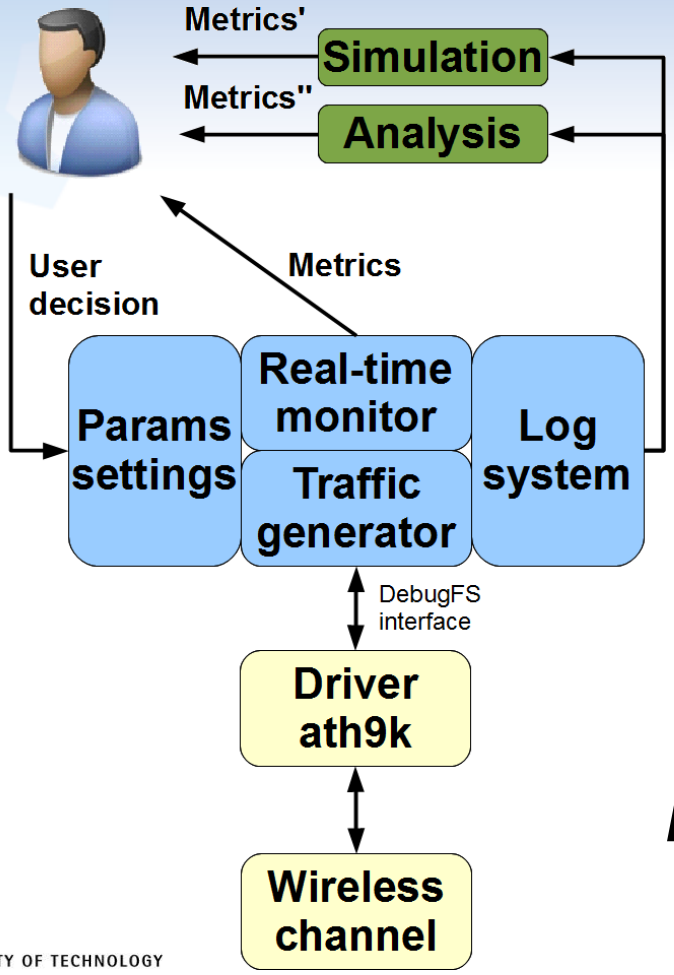
1000101010110101 1
0001010101010101 0
1010100010101010 1
0111010101101001 0
0000010101010101 0…

Gilbert Elliott model



$$P = \begin{bmatrix} p_{gg} & p_{bg} \\ p_{gb} & p_{bb} \end{bmatrix}$$

Test bench structure

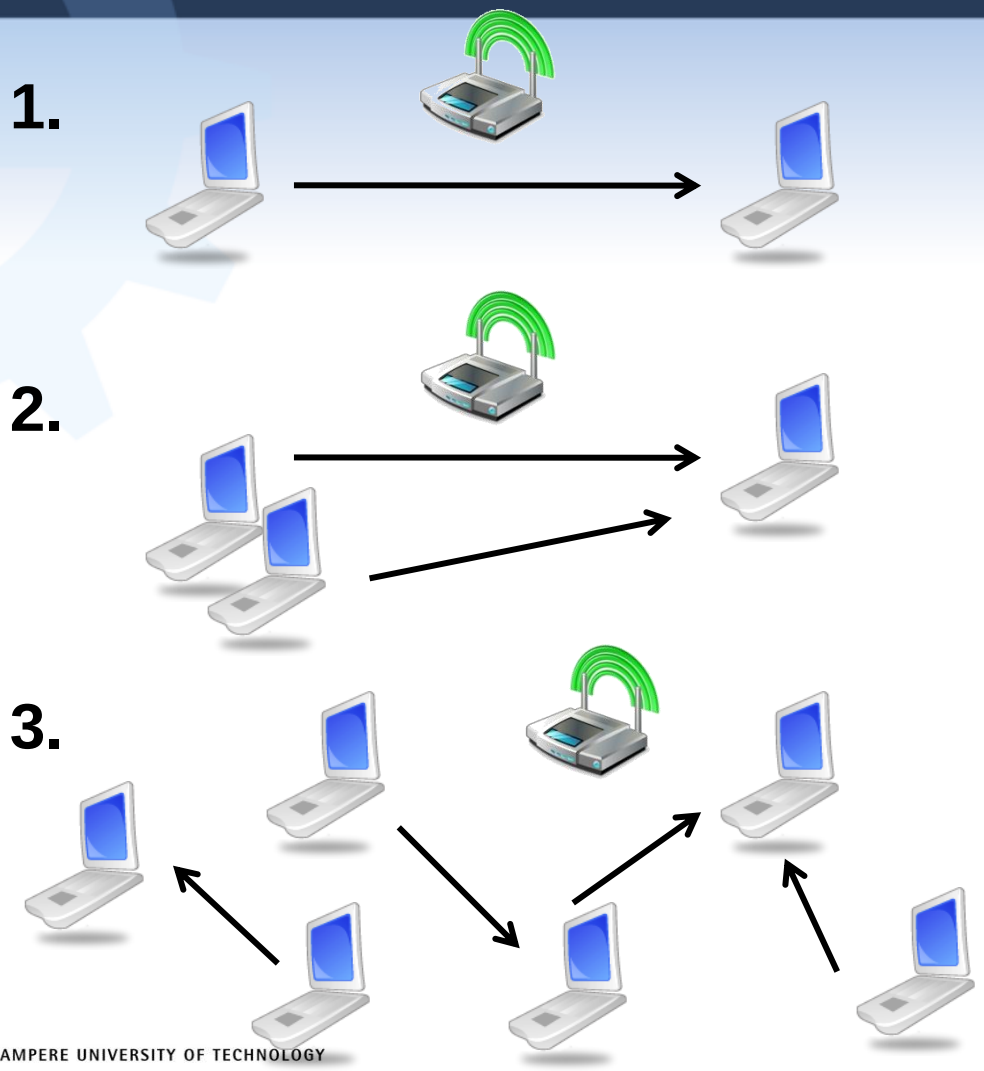


Metrics:

- **Throughput**
- **QoS policy**
- **RTS/CTS Threshold**
- **Packet Error Trace**
- **Rate**
- **Error probability**
- **…**

Benchmarking loop

Different network scenarios



Modes:

- ✓ **802.11 g**
- ❑ **802.11 n**
- 802.11 ac
- 802.11 ad

Conclusions

- **Approaches harmonization**
- **Performance benchmarking:**
  - Measurements
  - Simulation
  - Analysis
- **Performance assessment**

We are open for collaboration!

Thank you!