SIMBED+: Replicable Real Wireless Networking Experiments using ns-3

GOALS

- **Repeat** and **reproduce** past experiments executed in **non-controlled** environments
  - Support for **MIMO** and **shared radio spectrum**
- **Adapt Offline Experimentation** (OE) approach for Fed4FIRE+
  - Capture traces of **link information** and **position of nodes**
  - Reproduce conditions of past experiments using **Trace-based ns-3 simulations**
- **Evaluate OE approach** using **w-iLab.t** and **CityLab**

CHALLENGES

- Which **traces to capture**?
  - SNR, Number of Radio Streams, PHY Rate, Channel Occupation, Position of Nodes
- How to **automatically capture traces** and **generate Trace-based ns-3 simulations**?
- How to **show the advantages of the OE approach**?

DEMO SETUP

Scenarios

- **SubExp#1** – Point-to-point Wi-Fi (**w-iLab.t**)
- **SubExp#2** – Multiple access Wi-Fi (**w-iLab.t**)
- **SubExp#3** – Point-to-point Wi-Fi (**CityLab**)
- **SubExp#4** – Multiple access Wi-Fi (**CityLab**)

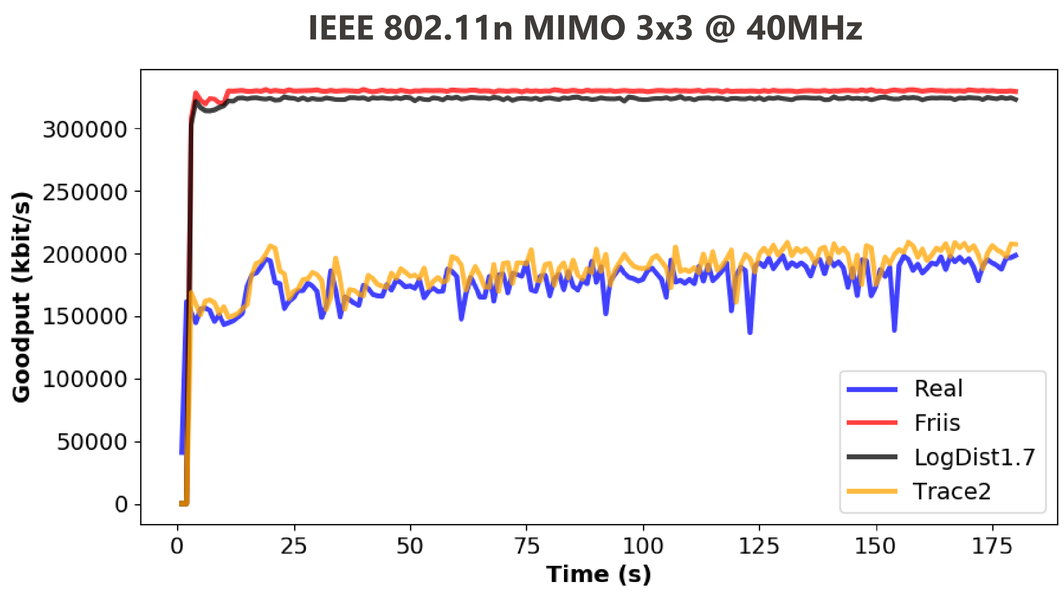
Different link qualities using 1 AP and 1-2 STAs

- **Variable link distances:** depending on selection of nodes
- **TX-Power:** 0 to 17 dBm

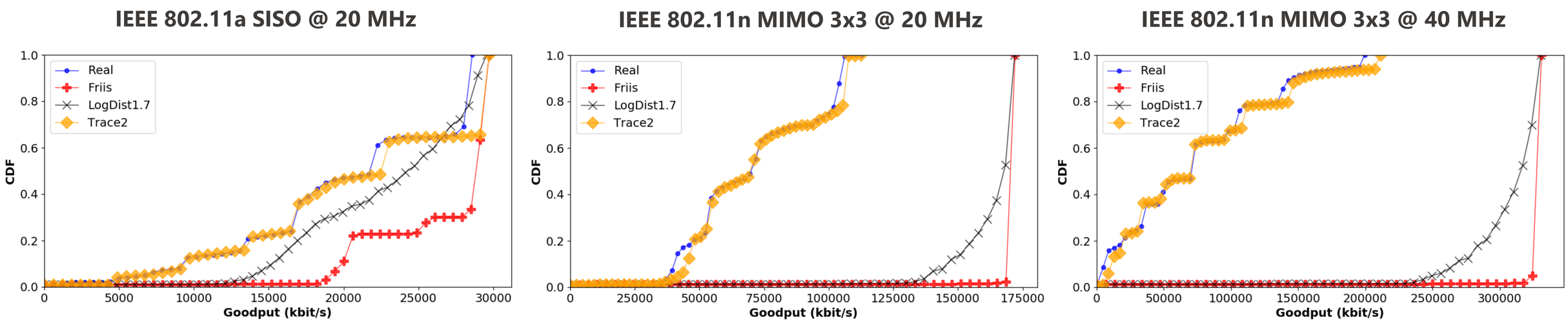
Traffic generation

- **Offered load above link capacity**
- Unidirectional and bidirectional **UDP** flows

RESULTS



MORE RESULTS



Additional link information allows accurate reproduction of the real experiment

CONCLUSIONS

- **OE accuracy improved** with **additional link information**
  - More realistic **auto rate adaptation**
  - **MIMO** support with varying number of radio streams
- **OE** approach → **repetition** & **reproduction** of **experiments**
  - Considering **MIMO** in **complex multipath** scenarios
  - Even if real **testbed** becomes **unavailable**
- **OE** needs further evaluation in **non-controlled** environments
  - Next phase of SIMBED+ experiments (**CityLab**)

FUTURE WORK

- Run experiments on **CityLab** testbed
  - Focus on **non-controlled** environments
  - Focus on reproducing **shared radio spectrum**
- Publish **conference** and **journal papers**
- Keep **improving OE approach** after SIMBED+
  - Automatically **adapt/fine-tune propagation loss models**
  - Add support for **Augmented Experimentation**