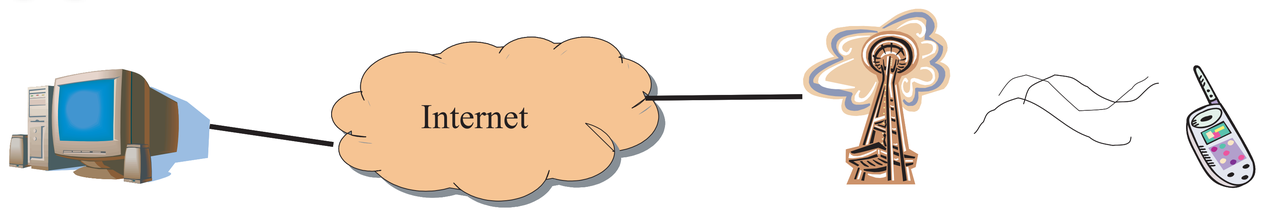
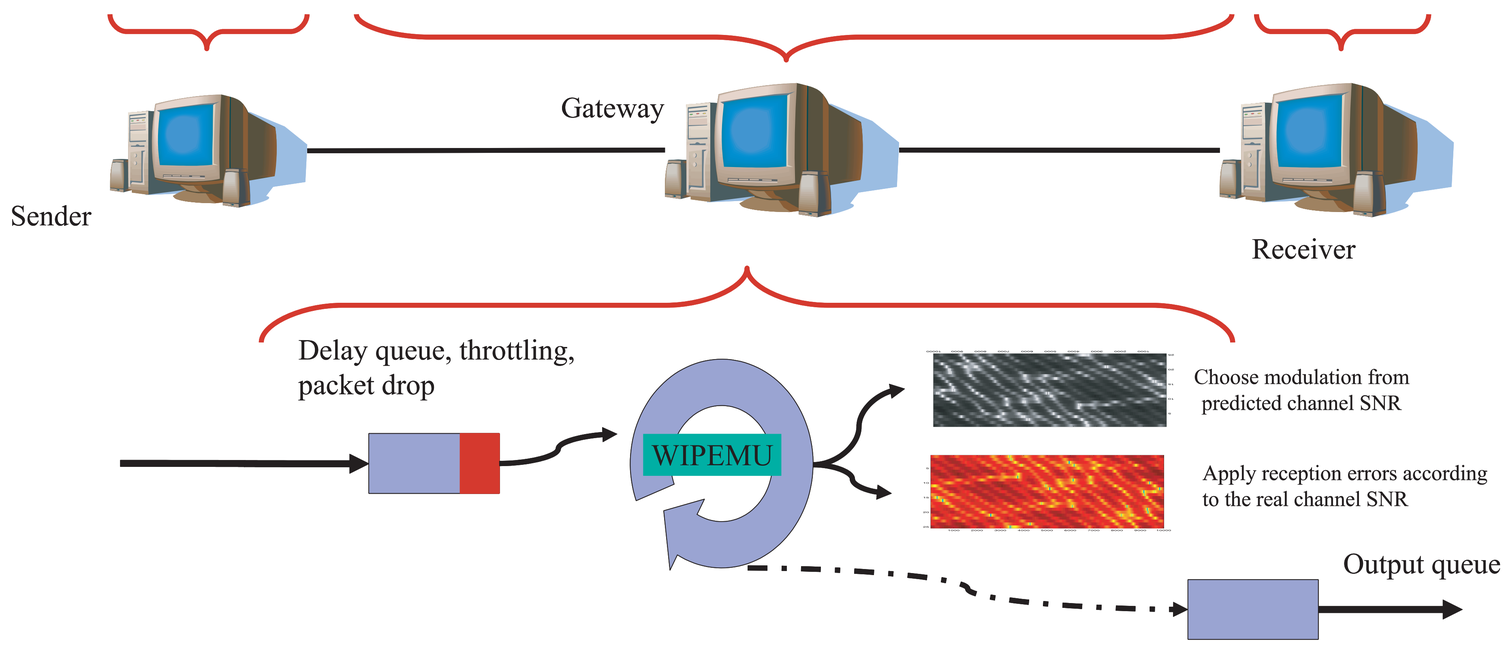
# The Wireless IP project

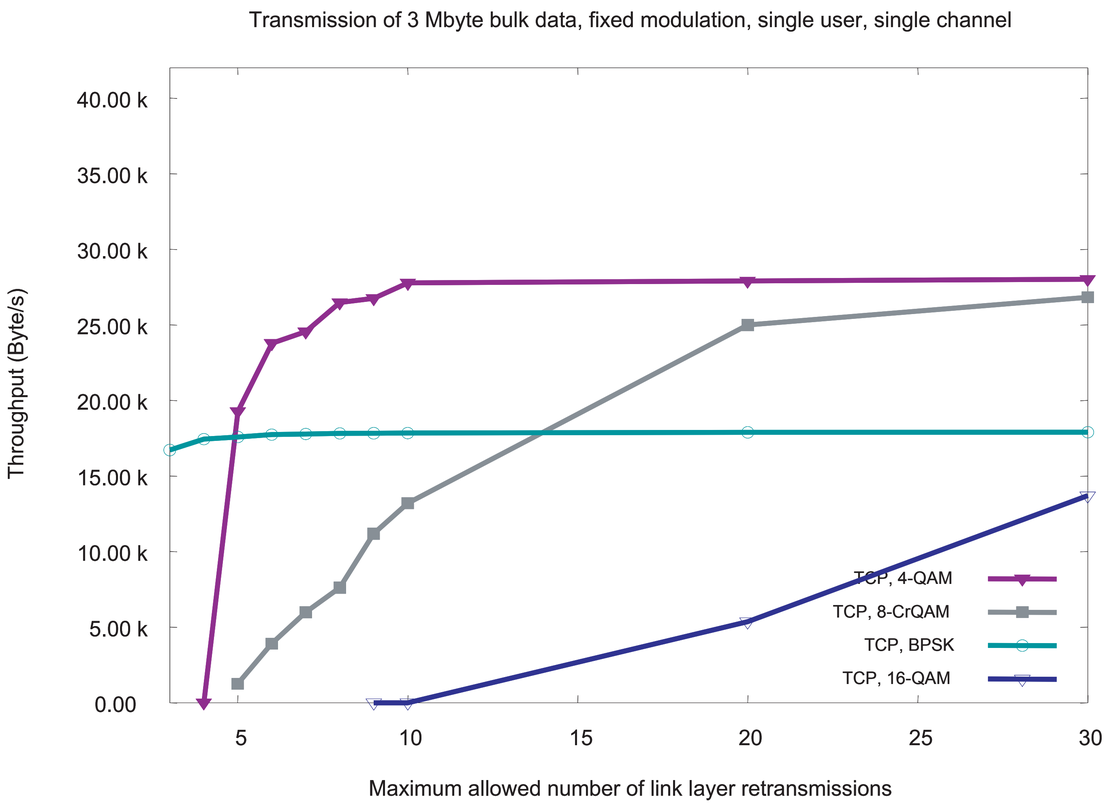
## WIPEMU - Emulation of the downlink proposal




A target environment for the Wireless IP system is the existing TCP/IP protocol used on the Internet. Therefore, it is essential to investigate how different parameter settings and design decisions on the link layer interact with this protocol.

Adaptive modulation level switch thresholds, ARQ persistence and scheduling policies are some of the interesting parameters to study. For this purpose, an emulator of the downlink system proposal has been created. With this tool, analytically derived parameter settings can be experimentally tested in a network test bed, with real protocol implementations and real applications communicating.



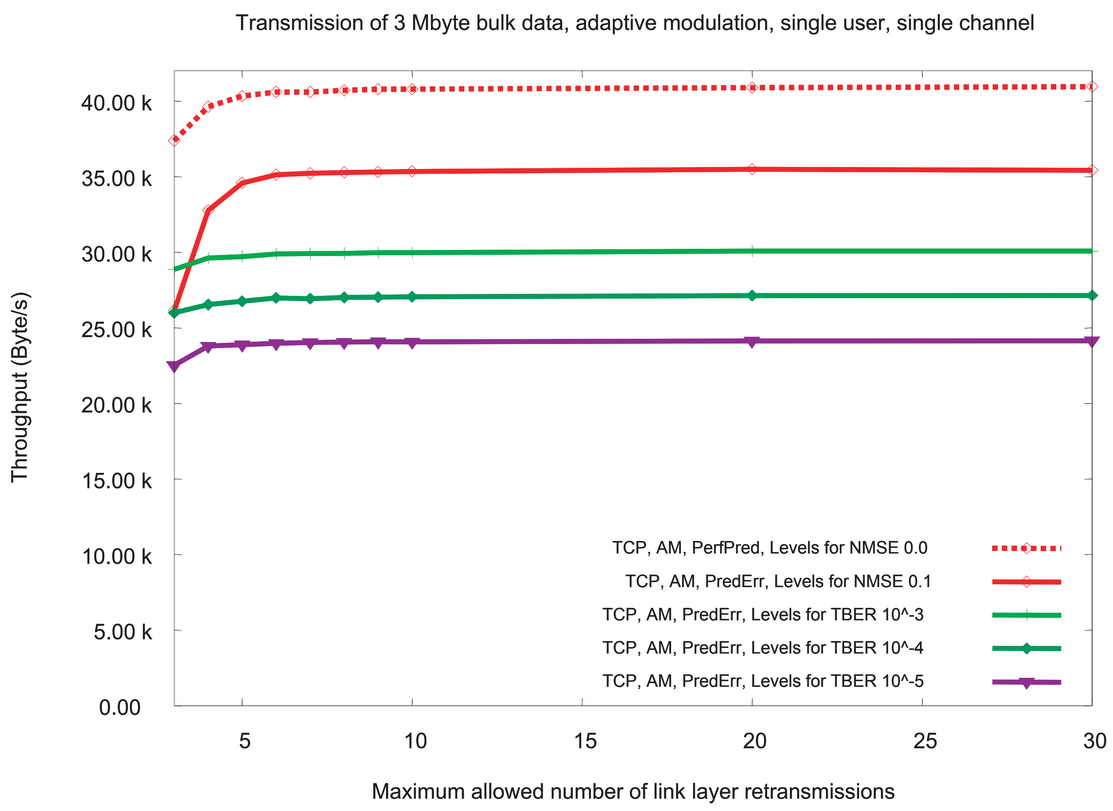




### Emulation overview

- Scenario: one mobile user, connected to a base station, is downloading data from a server on the Internet.

- Packets are captured in a gateway running the emulator. These are divided into link frames, and modulated according to predicted channel quality. Frames are subjected to errors according to the real channel quality.

-Erroneous frames are retransmitted until the maximum number of retransmissions is reached.




### Experiment output

- IP packets are captured at both sender and receiver. Emulator collects statistics on amount of frame errors and usage of modulation levels.

- This information can then be processed to obtain the studied metrics (throughput, delay, jitter, etc).

- Graphs to the right show experiments with varying modulation schemes (fixed and adaptive modulation), with a varying degree of link retransmissions.

- Experiments indicate that adaptive modulation with highly persistent link retransmissions should be used.

### Further need for development

WIPEMU currently handles a single user using a single channel, and should be extended to support multi-user over multiple channels. This allows for further investigations of the impact on the total system throughput, the impact of different scheduling algorithms and critera, different user traffic models, and more.