

# ShaPy - network emulation framework

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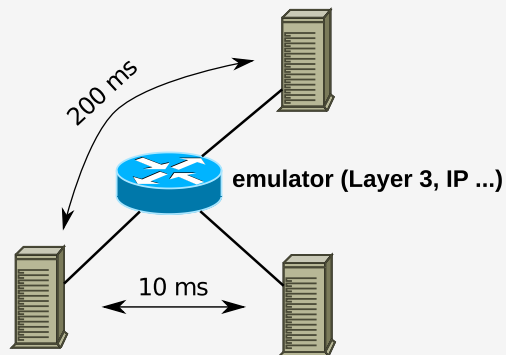
## Problem

- Testing a complex peer-to-peer application
- Simulation is slow and requires reimplementation of the p2p protocol
- We need to test the **real** application
  - in **real** environment
  - **without support** from the app itself
  - its **real** speed

=> **emulation**

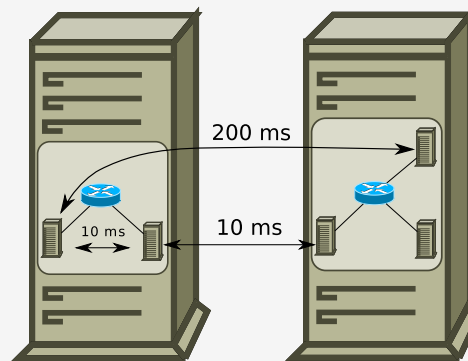
## Network Emulation

- Many standard emulation solutions
- ... but they all require large amounts of HW
- The Bad: each app instance = 1 PC
- What if we could run more than one instance on one PC?



## Local Network Emulation

- Multiple app instances on one PC
- network separation of app instances within one PC (no virtualization etc.)
- Otherwise local apps behave as if they were communicating over a real link
- The Bad: TCP/IP stack design doesn't count with this type of use
- Linux allows us to circumvent this



- instance identified by an IP address
  - one interface = multiple addresses
- OS automatically assigns source IP when unspecified by the app
  - often source IP = dest IP ... wrong
  - override bind() and connect() in libc and inject the correct IP

## Linux Traffic Control

- allows us to easily create a complex packet scheduler in the kernel
- the scheduler creates conditions similar to the real network (latency, speed etc.)

## ShaPy

- configures and controls the scheduler
- comprehensive framework that allows to easily create a virtual network with the desired properties (e.g. latency)
- pure Python implementation
- example network (note the latencies):

