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FEEC
Faculdade de Engenharia Elétrica e de Computação
UNICAMP


# Towards an Emulator for Software-Defined Wireless Networks

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# Agenda

1. Introduction
2. Mininet-WiFi
3. Demonstration
4. Related Work
5. Limitations and Future Work
6. Conclusions

# 1.
# Introduction

## Popularity of WiFi Networks

Importance of emulating / simulating wireless networks to evaluate performance, test and debug protocols as well.

## Software-Defined Wireless Networking

Centralized control of wireless networks, separating the data plane and control plane, programmatic network control via OpenFlow.

# Goal

## Mininet-WiFi

**Goal:** providing high fidelity emulation for reaisticl network evaluation in a controlled environment to support research in wireless networking and SDWN.

**Approach:** Leverage code (Mininet) and lessons on fast prototyping and experimental evaluation (emulation) in wired SDN

# Challenges

## Wireless channel Emulation

- Propagation
- Broadcast
- Modulation
- Mobility

## Realistic experiments

- Reproducing real networks behavior

# 2.

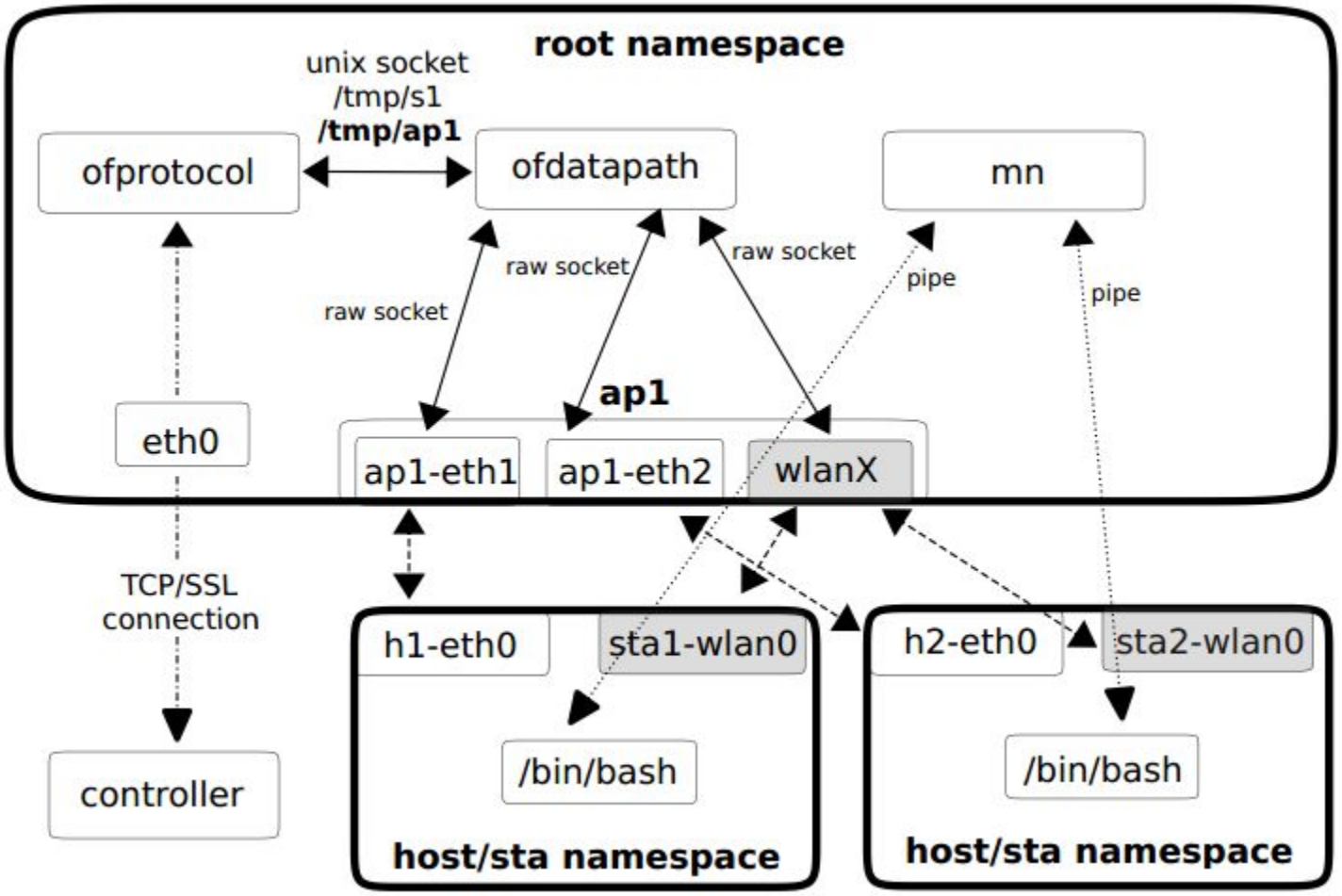
# Mininet-WiFi

**Emulator in support of Software-Defined Wireless Networking**

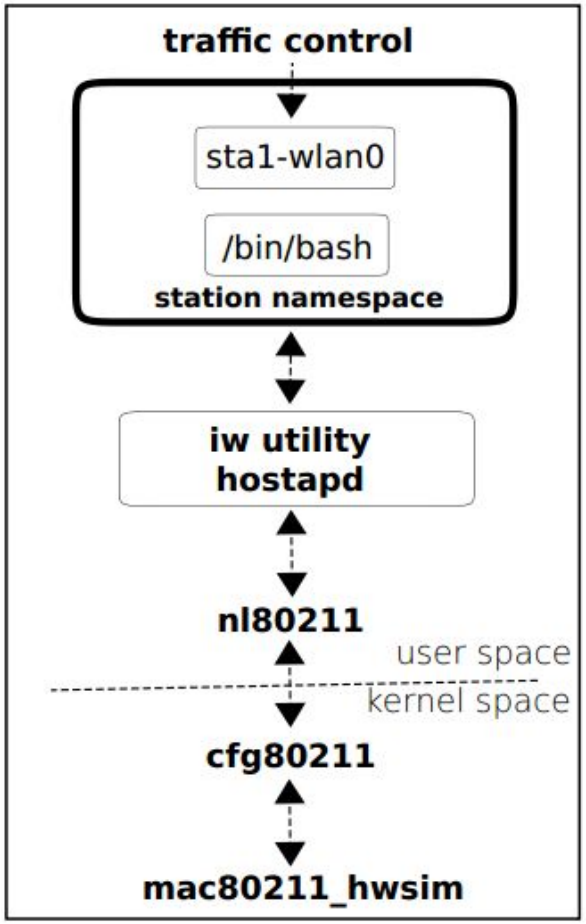
**Fork of Mininet**
(based on lightweight virtualization / Linux containers)

**mac80211_hwsim/softmac**

# Architecture



# Architecture



# Command Line Interface

```
alpha@alpha-Inspiron-5547:~$ sudo mn --wifi
*** Enabling Wireless Module
*** Creating network
*** Adding controller
*** Adding Station(s):
sta1 sta2
*** Adding Access Point(s):
ap1
*** Associating Station(s):
(sta1, ap1) (sta2, ap1)
*** Starting controller(s)
c0
*** Starting 1 Access Point(s)
ap1 ...
*** Starting CLI:
mininet-wifi>
```

# Working within Mininet-WiFi

## mininet-wifi>

### Network

| Ping | Iperf | iw |
| --- | --- | --- |
| sta1 ping sta2 | sta1 iperf -c 10.0.0.1 | sta1 iw dev sta1-wlan0 scan |

### Queries

| Noise | Position | Distance |
| --- | --- | --- |
| noise sta1 | position sta1 | distance sta1 sta2 |

## Python Code

# 3.
# Demonstration

# Reproducing related research

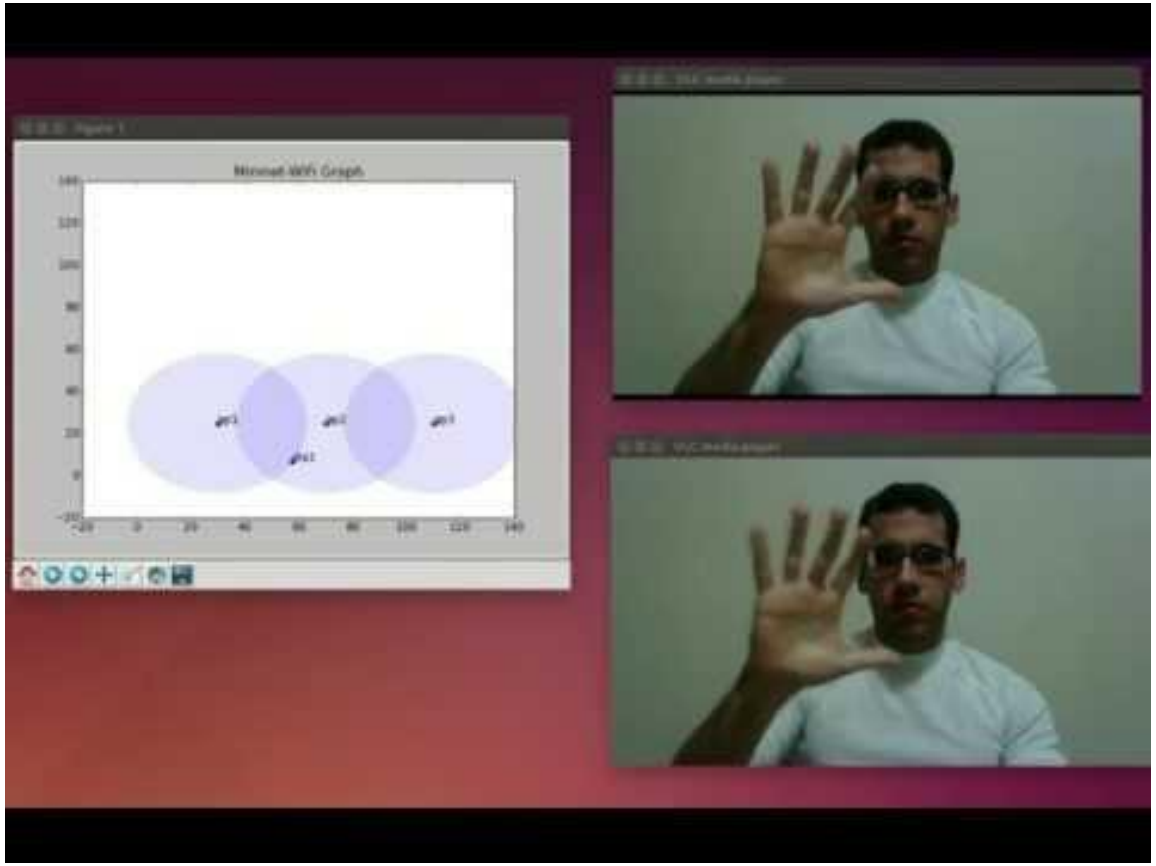
## Using all the wireless networks around us


http://archive.openflow.org/wp/uninterrupted-streaming-from-moving-golf-cart-with-openflow-wireless/

# Demonstration

Using all the wireless networks around us

**within Mininet-WiFi**



# 4.
# Related Work

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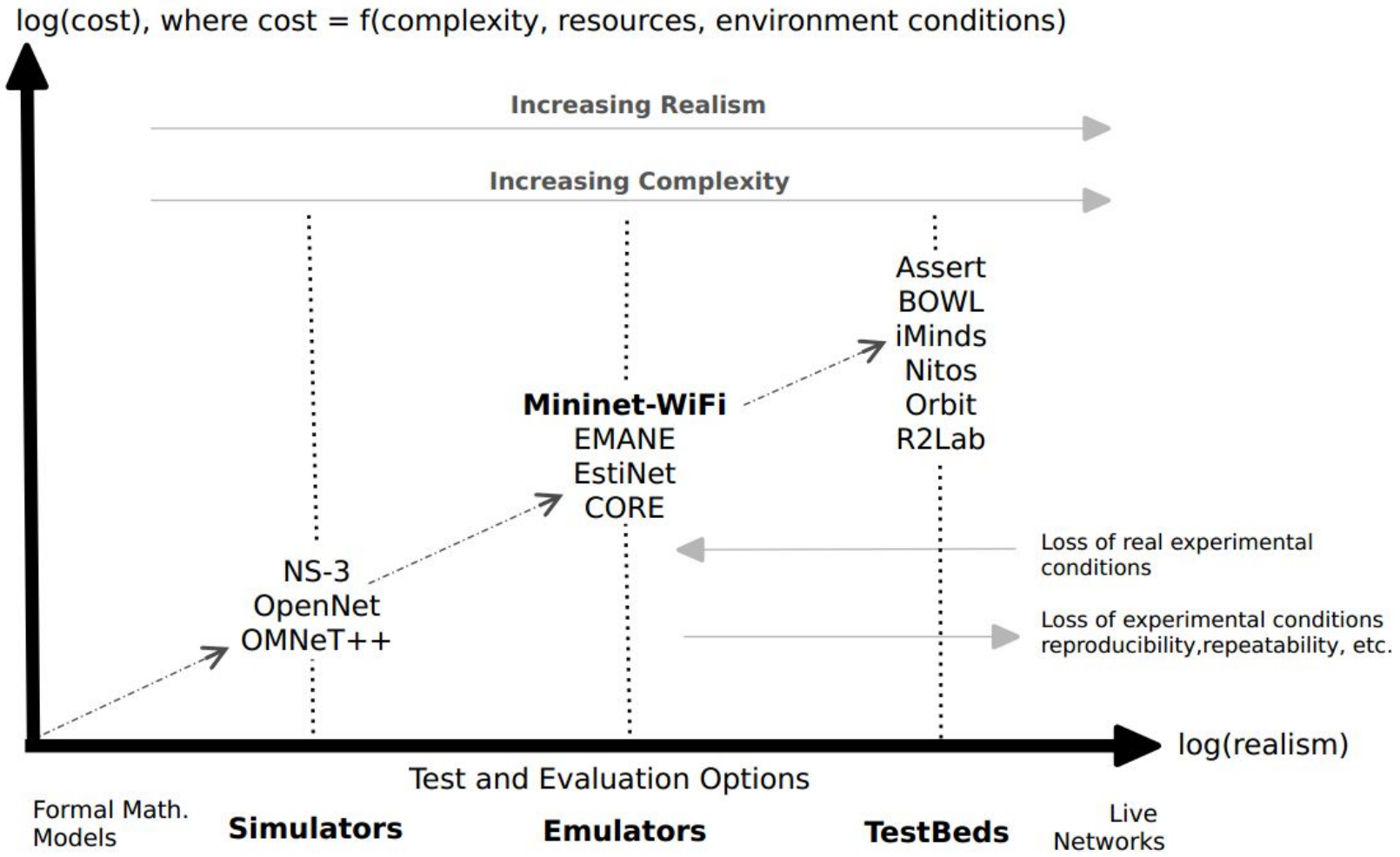

# 5.
# Limitations & Future Work

# Limitations and Future Work

## Good enough Abstraction of Wireless Channel

- ➔ Broadcast
- ➔ Propagation
- ➔ More Mobility Models
- ➔ Reproducing Real Network

**Further reading:**

Ramon Fontes, Samira Afzal, Samuel Brito, Mateus Santos, Christian Esteve Rothenberg. "*Mininet-WiFi: Emulating Software-Defined Wireless Networks*". In 2nd International Workshop on Management of SDN and NFV Systems 2015. Barcelona, Spain, Nov 2015

# 6.

# Conclusions

# Conclusions

**Popularity of WiFi Networks & SDWN**

**Evaluation in Controlled Environment (HiFi Wireless Emulator)**

**Collaborate on Future Research around Wireless Networking and SDWN**

# Thank you!

# Questions?

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**WebSite:** http://www.intrig.dca.fee.unicamp.br/

**Source:** https://github.com/intrig-unicamp/mininet-wifi

**Docker:** https://hub.docker.com/r/ramonfontes/mininet-wifi/

**Videos:** https://goo.gl/4P02YB