

WiFi Networks Research Testbed for Commodity Routers

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Introduction

Motivation

What is that?

Architecture

Overview

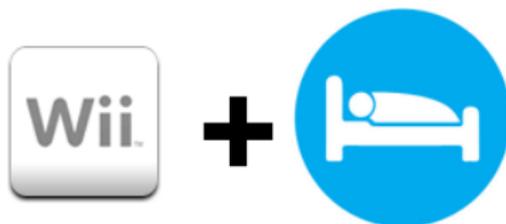
Implementation

WiBed Server

End of story



Wait what?



Really?

- Are you into networking?



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- Do you want to do realistic experiments?



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Then you need:



What is WiBed?

WiBed is:

- A software platform aimed at deploying network experiments
- Also an OpenWRT-based platform to easily deploy and manage your mesh network
- Designed to run on commodity (cheap) IEEE802.11 routers
- Your best option for wireless networking experiments :)



What is WiBed?

but WiBed is also:

- An effort started by "hackers" in the WBMv6
- Complement Community-Lab.net testbed (Low Cost, Low layer Experiments)
- Fast-installed self-organized mesh network



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Architecture Overview

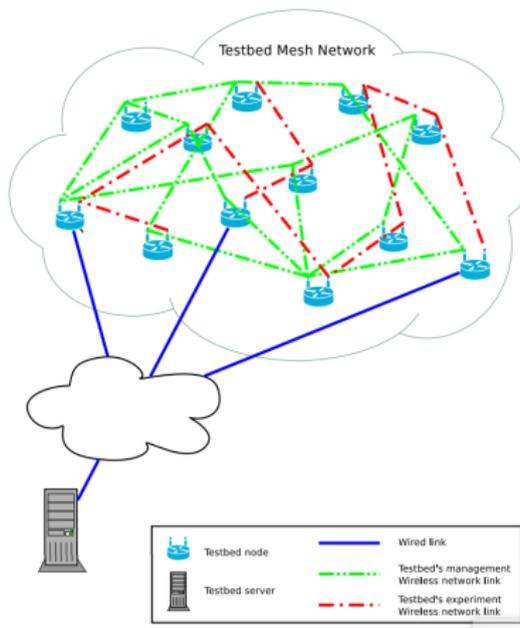


Figure: WiBed Architecture

Design Overview

- Nodes behave like FSM (idle-prepare-deploy-run-finish-idle)
- Communication with server through management mesh network
- REST-API pulling mechanism: every N seconds nodes pull state info and orders from server
- Node access mainly from the server web-UI
- Based on OpenWrt trunk
- Organized in packages, OpenWRT-compatible feed
- Management Network based on batman-adv



Hardware

- Node must be compatible with OpenWRT Linux (minimum 4MB flash)
- Node must have at least two radios (one for mgmt, one for experiments)
- Node must have at least one USB port (to store the overlay)

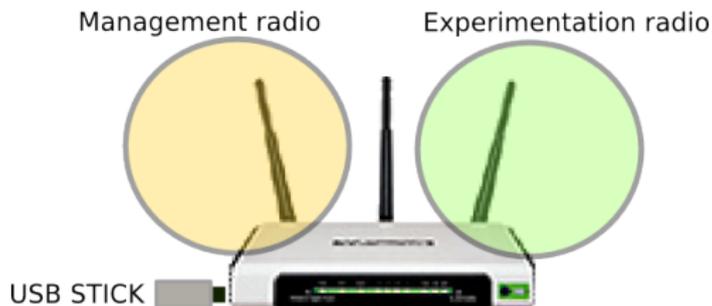


Figure: WiBed Node hardware

Diagram

- Nodes self-configure during the first boot
- IP address, hostname, ssid, etc. based on MAC address
- Experiments are overlays which are installed in the nodes
- Once an experiment finish, the overlay is removed and node goes back to initial state

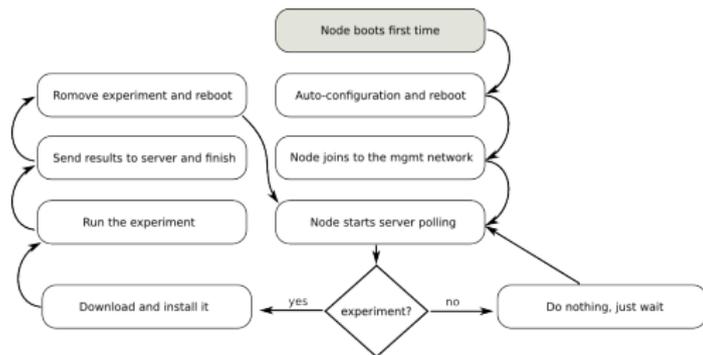


Figure: WiBed Node functional diagram

OverlayFS 1/2

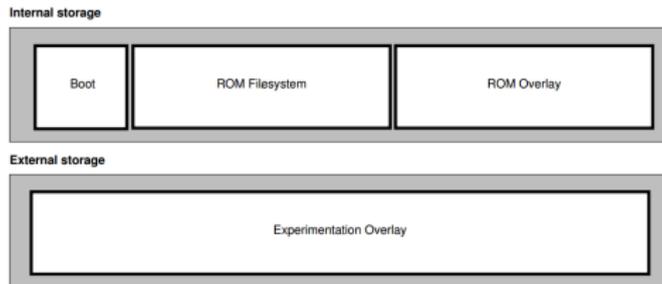


Figure: WiBed Node Filesystem



OverlayFS 2/2

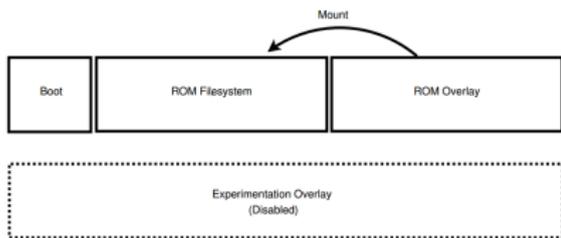


Figure: Node in IDLE state

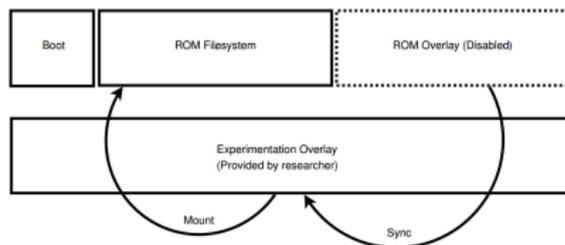


Figure: Node performing experiment

Config file

- WiBed uses UCI to manage the configuration
- It is flexible and allows many options

For instance, management network device can be defined as “list ifaces radio2/radio1” meaning if radio2 exists, it will be used, otherwise radio1

```

config wibed general
option node_id '00ff'
option recovery_timer '00'
option last_cmd_id '0'
option command_id '00'
option status '0'
option api_url 'http://wibed.confine-project.eu/'

config wibed experiment
option exp_id '0000'
option ov_url 'http://wibed.confine-project.eu/send_ov'
option save_url 'http://wibed.confine-project.eu/api/results'

config wibed upgrade
option version '01'
option model ''
option auto '0'
option upg_url 'http://wibed.confine-project.eu/upgrade'
option upg_timer 'http://wibed.confine-project.eu/upgtimer'

config wibed management
list ifaces 'eth0.1'
list ifaces 'radio0/radio1'
option channel5 '36'
option channel2 '11'
option bssid '02:C0:FF:EE:C0:DE'
option ssid 'wibed'
option ipv4_net '10.99.R1.R2'
option ipv6_net 'fdb:a:99:R1R2::1/64'
option ipv4_lan_net '192.168.R2.1'
option country 'UZ'
option txpower '20'
option is_gw '0'

```



Figure: WiBed Node functional diagram

Wibed Server

- *Server*: Tornado Web Server
- *Our system*: Flask app + SQLite
- A REST API for interaction with nodes
- A web interface for interaction with users



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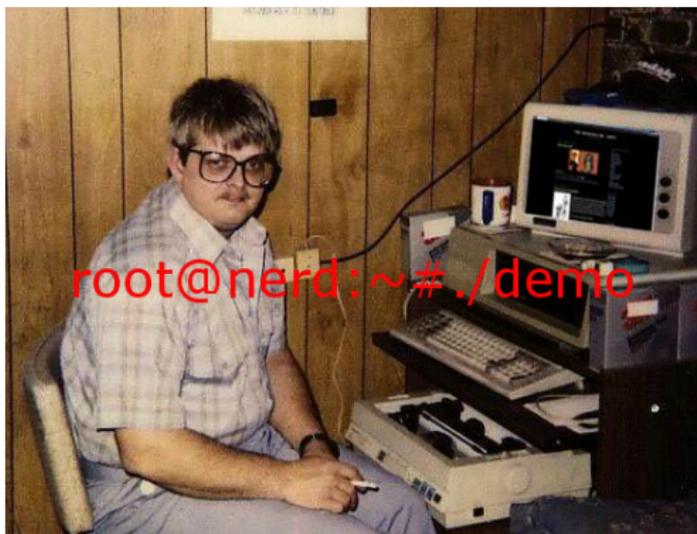


More info

- [Wiki](#)
- [Paper](#)
- [Repo](#)
- [Us](#)



Got you!



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