Wireless Optimisation

MUM Yogyakarta, 9 October 2015
Achmad Mardiansyah
(achmad@bie.telkomuniversity.ac.id)
Telkom University, Indonesia

Agenda

- Introduction
- Wireless in general
- Optimisation
- Demo (requires audience participation)
- Q & A

INTRODUCTION

Where is Telkom University?

- Located in Bandung, Indonesia
- 7 Faculties, 27 schools
- Areas: Engineering, Communications, Computing, Bussiness and management, Arts
- 650+ Academic staff, 400+ Administration staff, 20000+ students
- An exchange program
- Runs mikrotik academy program

Mikrotik academy @ TEL-U

- Started in 2013
- Embedded into schools curricula
- 100% hands-on
- Get MTCNA certification

Speaker Introduction

- Name: Achmad Mardiansyah
- Base: Bandung, Indonesia
- Linux user since ’99
- Mikrotik Certified Trainer (MTCNA/RE/WE/INE/UME/TCE) -> www.glcnetworks.com
- Mikrotik Certified Consultant
- Mikrotik Academy coordinator
- Experiences: Telco engineer, Sysadmin, PHP programmer, project manager and Lecturer
- http://au.linkedin.com/in/achmadmardiansyah

WIRELESS IN GENERAL

What is wifi?

- International standard for wireless communication
- Defined by IEEE, number 802.11x
- Wifi operation mode:
  - Infrastructure mode. Requires access point (AP)
  - Ad hoc mode. Clients are connected without AP

Wifi layers:

Data Link Layer (MAC)	802.2			
	802.11			
Physical Layer (PHY)	DSSS	FHSS	Infrared	

Wifi standard & data rate?

Telkom University

standard	release	Max rate	2.4 GHz	5 GHz	remark
802.11a	1999	54 mbps	--	yes	
802.11b	1999	11 mbps	yes	--	
802.11g	2003	54 mbps	yes	--	Improvement of 802.11b, backward compatibility
802.11n	2010	300 mbps	yes	yes	Support MIMO, requires gigabit cable (e.g. cat6)
802.11ac	2014	400 mbps	--	yes	

Infrastructure mode

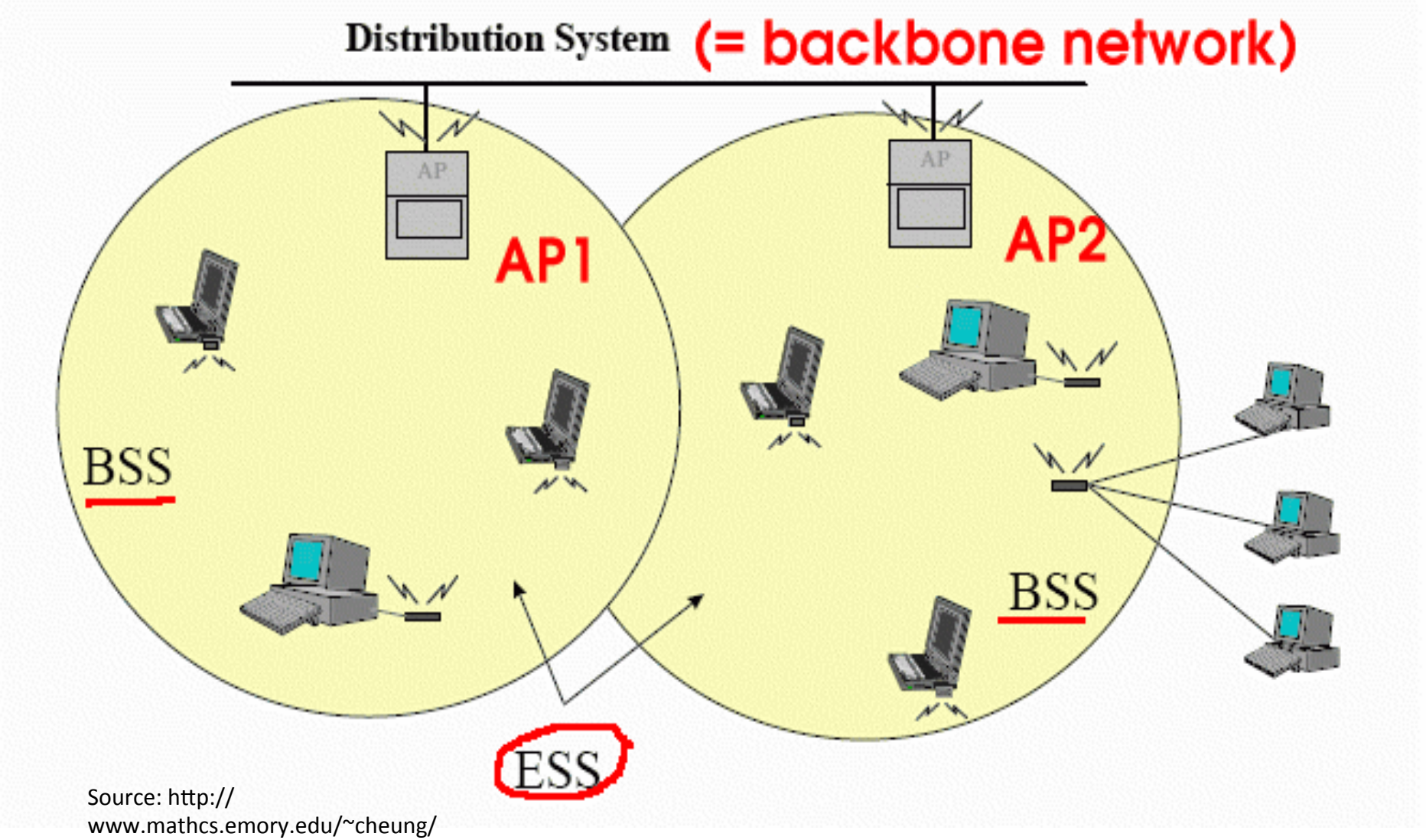
- Each station (STA) connect to AP
- An AP provide a coverage area named **BSS** (Basic Service Set)
- BSS is identified by BSSID/SSID, consist of 12HEX, usually taken from AP's MAC address
- BSS is known as cell

Can we extend the coverage?

Telkom University

Yes. Its called the **ESS** (extended service set).

- Use cable as backbone
- ESS is identified by ESSID/SSID
- User can do **roaming** from one BSS to other BSS, based on signal strength
- This is known as distributed system (DS)

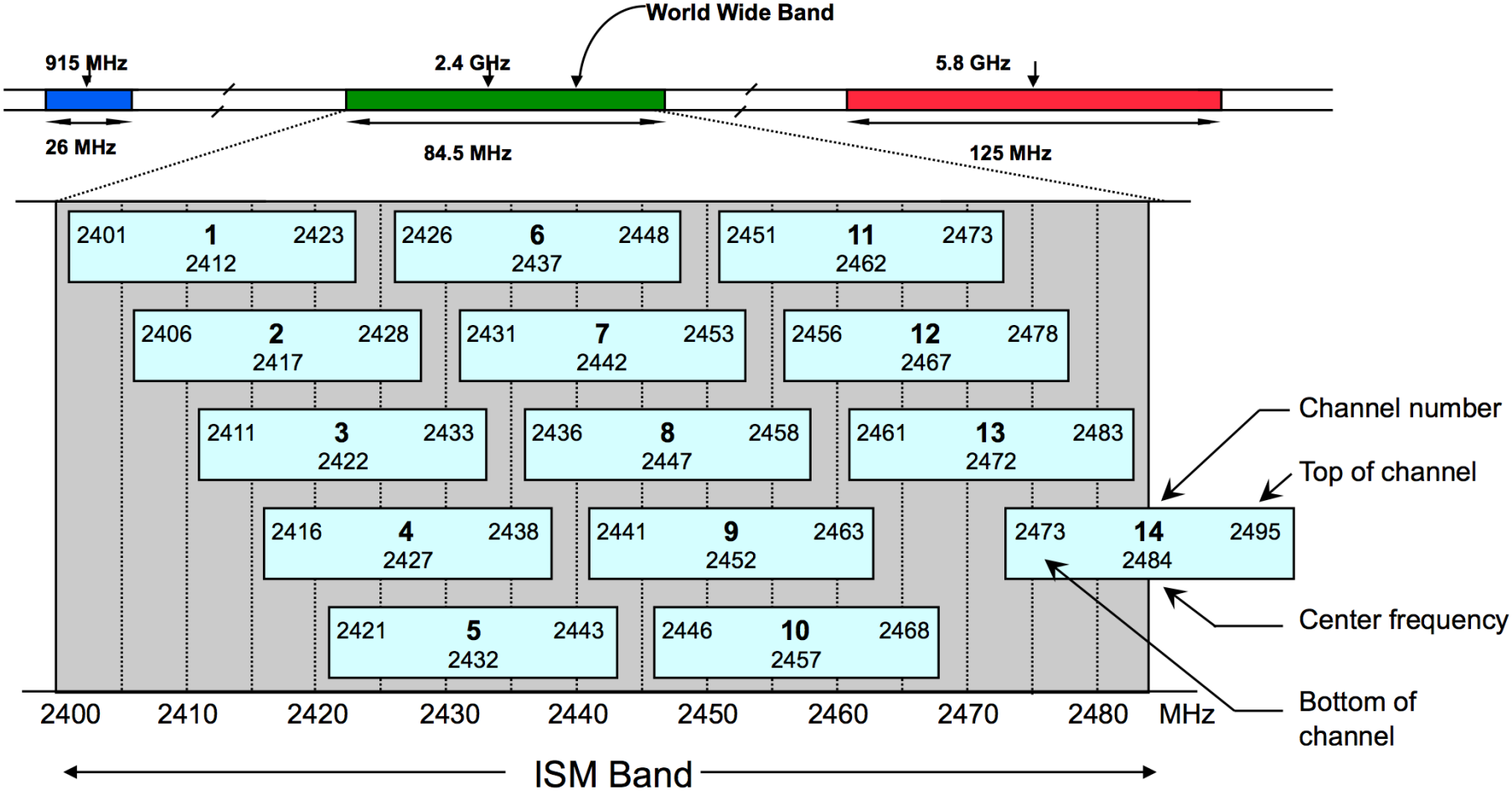


Source: http://
www.mathcs.emory.edu/~cheung/
Courses/455/Syllabus/3a-MAC/
FIGS/wireless-topology.gif

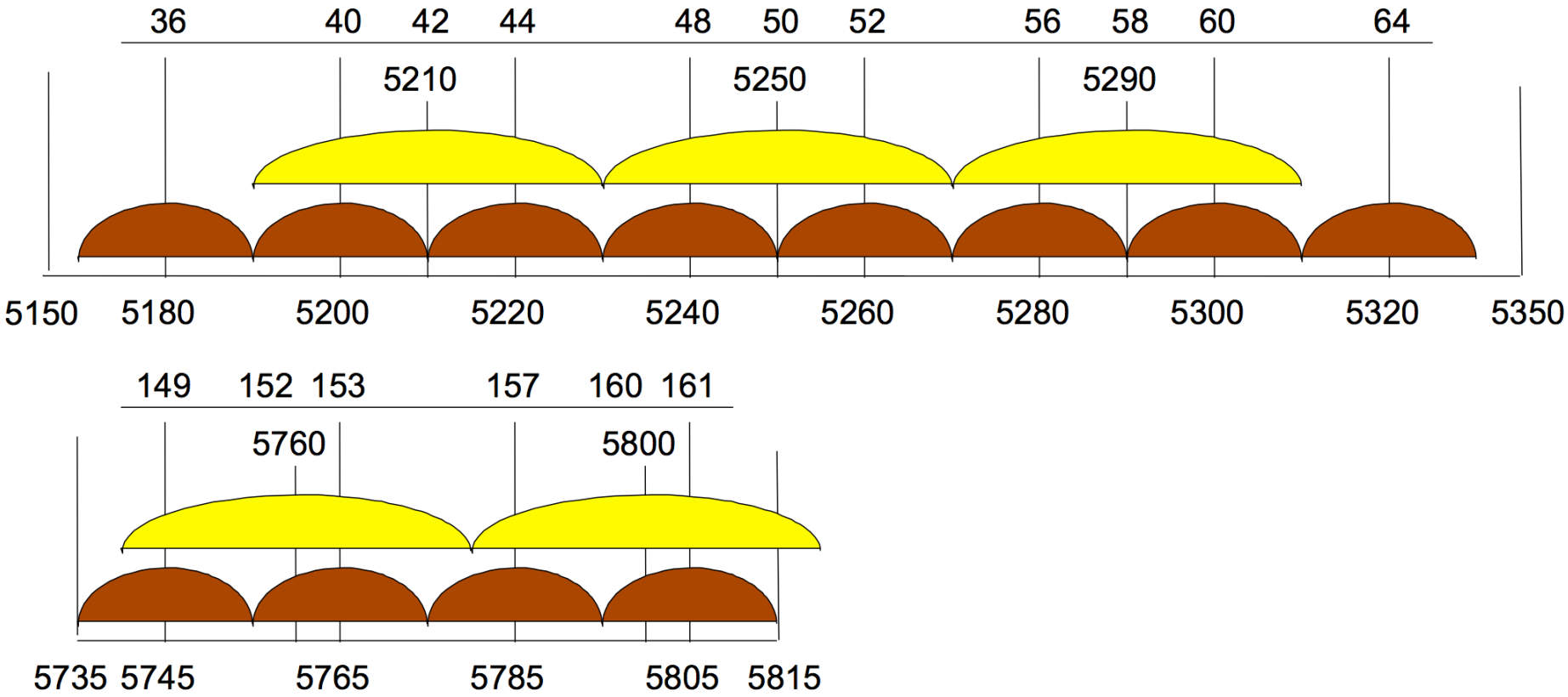
Is it possible if the backbone is wireless?

Yes. It is called wireless distributed system (WDS)

802.11 (2.4GHz) channel?

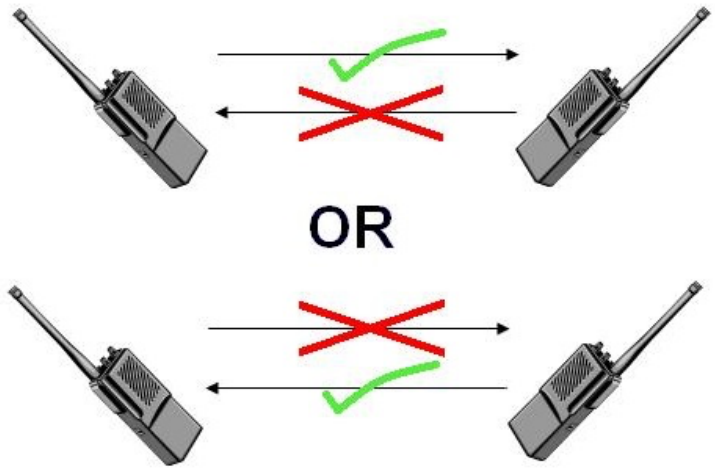


802.11 (5GHz) channel?



Is 802.11 full-duplex or half-duplex?

- 1 channel for all user
- When 1 station is sending, others must wait
- No timeslot allocated for each station
- CSMA/CA



CSMA/CA

- Carrier Sense Multiple Access / Collision Avoidance
- **Every station** on the network **should be able to listen each other**
- If not -> hidden node problem

Wireless terminologies?

In wireless, we use term:

- Station/CPE (Customer Premise Equipment) is the device that connects to AP
- Access Point (AP) as the main controller

In wired networking: client / server

Wireless topology?

- PTP (point to point), single antenna
  - Usually for long distance
- PTP, dual antenna (dual antenna)
  - long distance, backhaul
  - Can use mikrotik dual nstream protocol. 1 tx, 1 rx (full duplex)
- PTMP (point to multi point)
  - Usually for end-user. Eg. Café, campus, offices
- WDS (wireless distributed System)

OPTIMISATION

What is optimisation?

Telkom University

optimization

Also found in: **Medical**, **Legal**, **Financial**, **Acronyms**, **Encyclopedia**, **Wikipedia**.

op·ti·mize (ŏp′tə-mīz′)

tr.v. **op·ti·mized**, **op·ti·miz·ing**, **op·ti·miz·es**

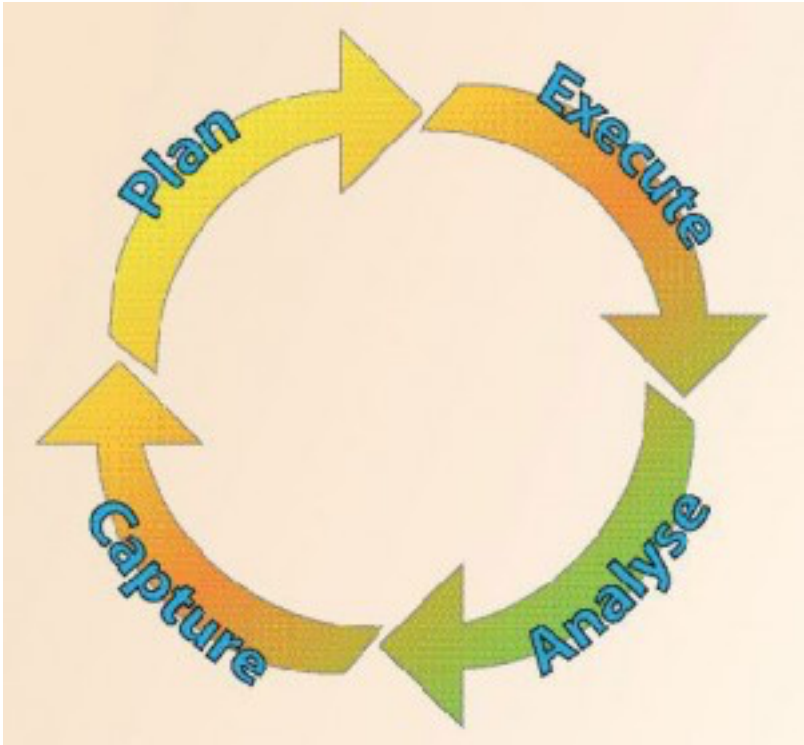
1. To make as perfect or effective as possible.
2. *Computers* To increase the computing speed and efficiency of (a program), as by rewriting instructions.
3. To make the most of.

---

op′ti·mi·za′tion (-mĭ-zā′shən) *n.*

What to expect from optimisation?

- Stable connection
- Can achieve the limit of technology
- Note:
  - Wireless is dynamic
  - It is a continuous process



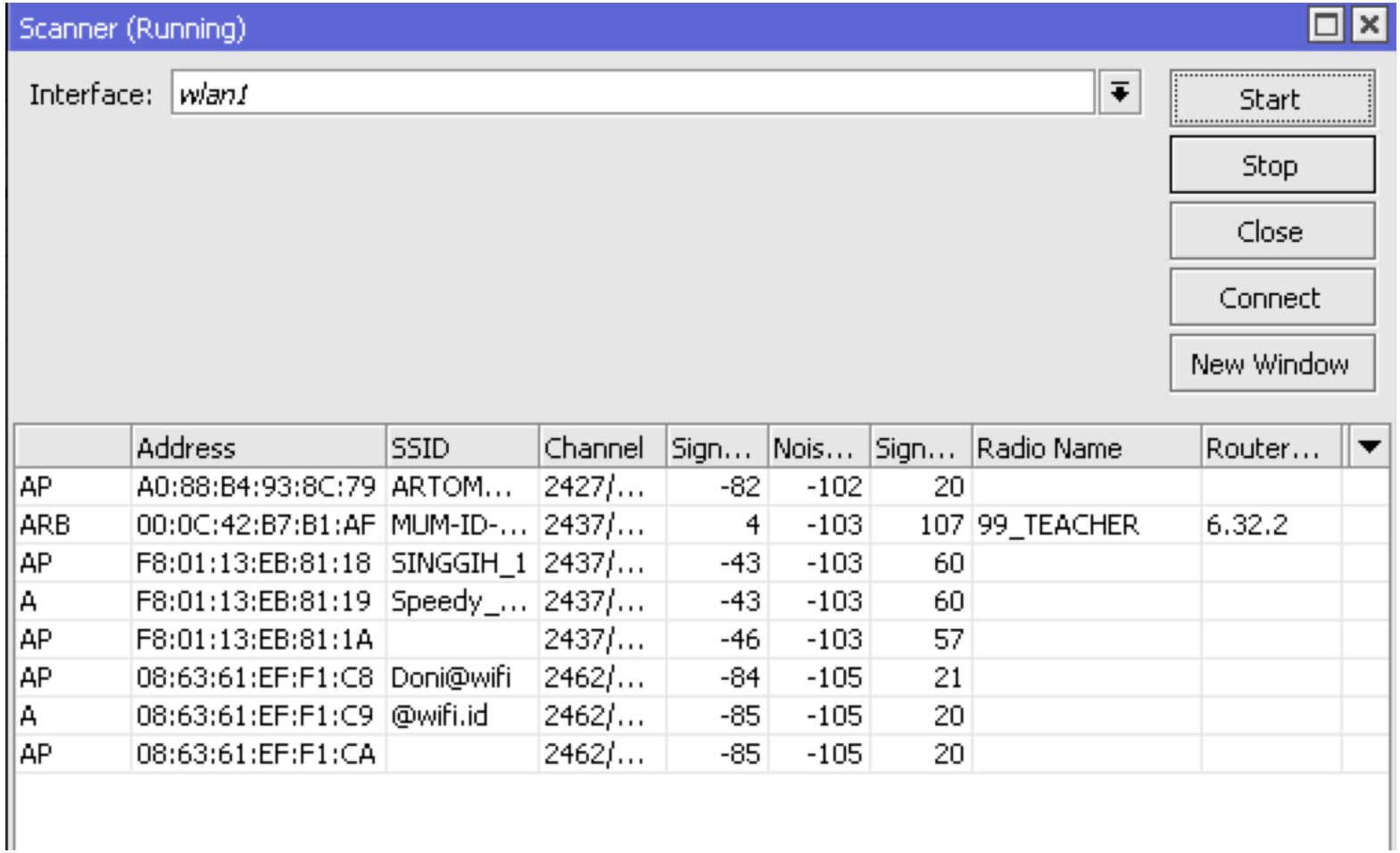

RouterBOARD 951G 2HnD
RouterBOARD 951 2n
RouterBOARD 750
Ethernet
Power
RES
PWR
ACT

DEMO

CPE optim

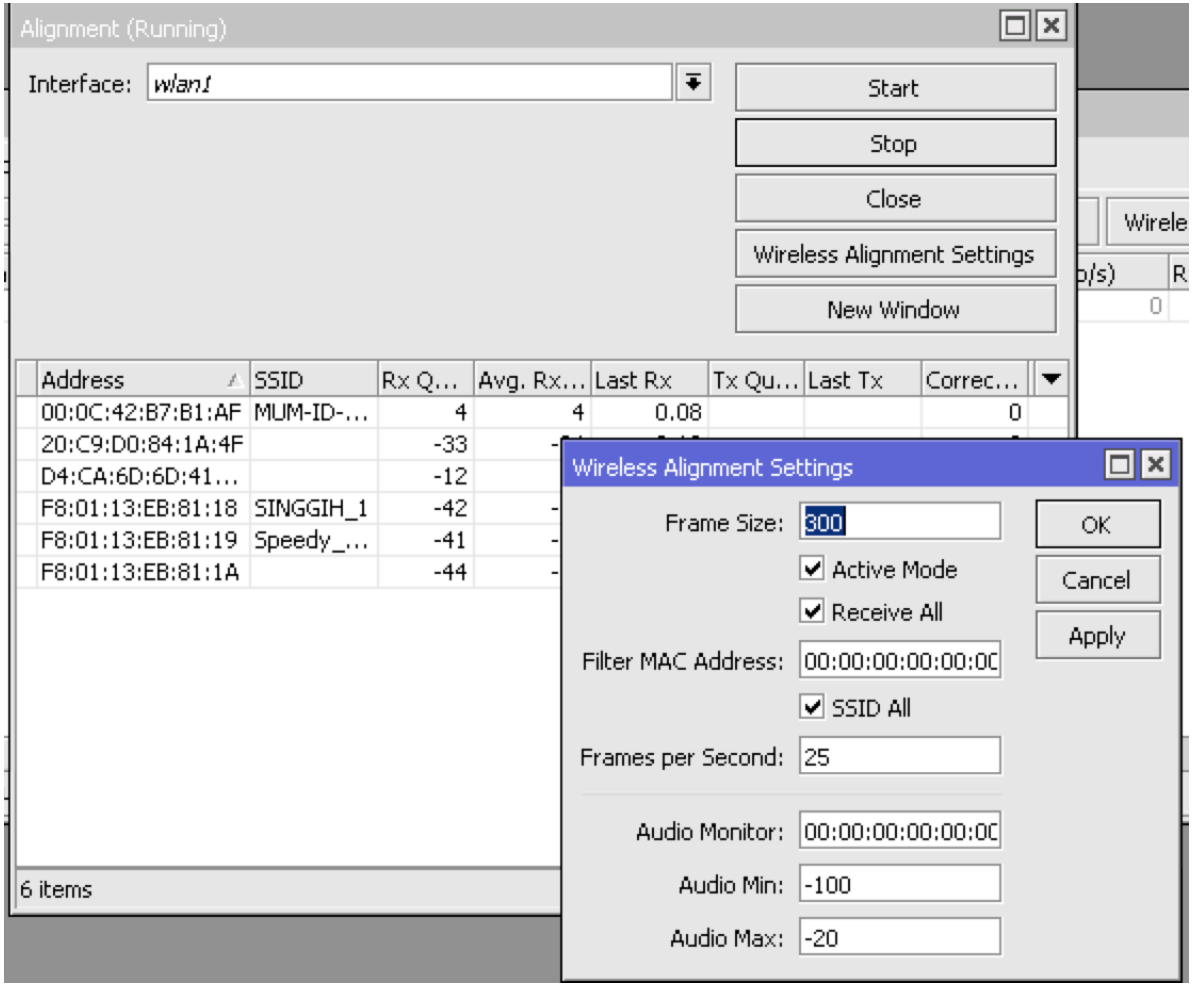
- GOAL: Make sure a CPE can establish a connection to AP
- Tools
  - Scanner
  - Alignment (audio beeper)
  - Quickset

CPE tool: scanner

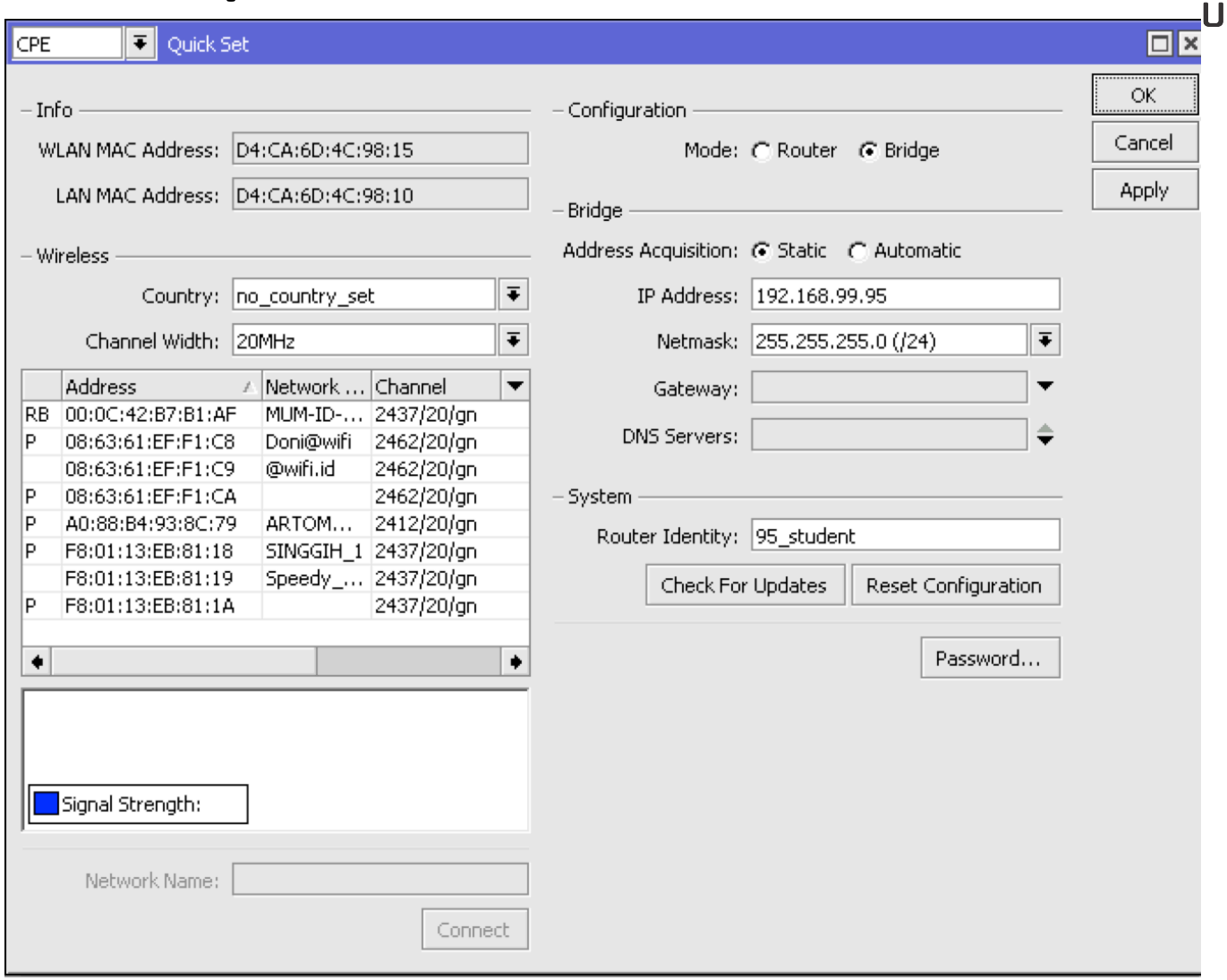


	Address	SSID	Channel	Sign...	Nois...	Sign...	Radio Name	Router...
AP	A0:88:B4:93:8C:79	ARTOM...	2427/...	-82	-102	20		
ARB	00:0C:42:B7:B1:AF	MUM-ID-...	2437/...	4	-103	107	99_TEACHER	6.32.2
AP	F8:01:13:EB:81:18	SINGGIH_1	2437/...	-43	-103	60		
A	F8:01:13:EB:81:19	Speedy_...	2437/...	-43	-103	60		
AP	F8:01:13:EB:81:1A		2437/...	-46	-103	57		
AP	08:63:61:EF:F1:C8	Doni@wifi	2462/...	-84	-105	21		
A	08:63:61:EF:F1:C9	@wifi.id	2462/...	-85	-105	20		
AP	08:63:61:EF:F1:CA		2462/...	-85	-105	20		

CPE tool: Alignment (beeper)



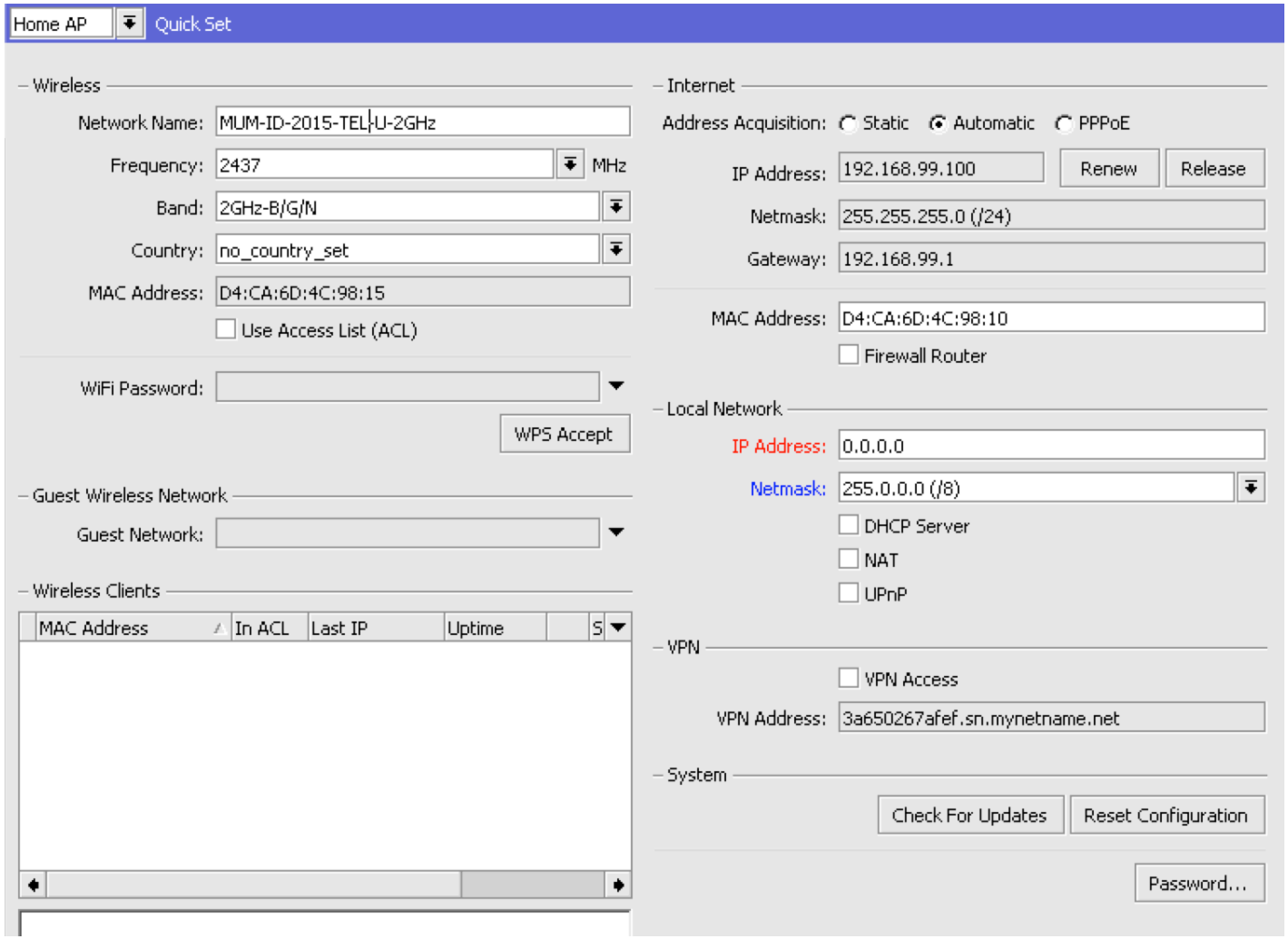
CPE tool: quickset



AP optim

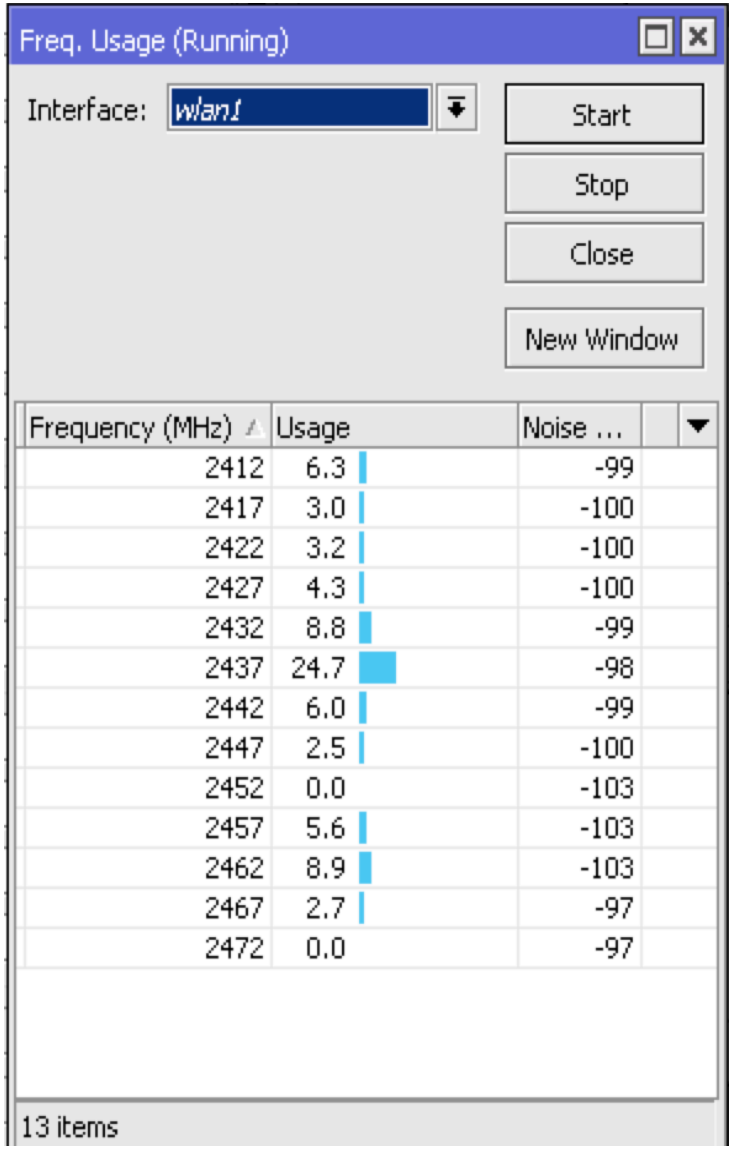
- GOAL: Make sure AP provides optimal service to CPE
- Tools:
  - Frequency usage
  - Snooper
  - Spectrum analyzer (thedude)

How to make mikrotik as an access point? (easy way)



AP tool: frequency usage

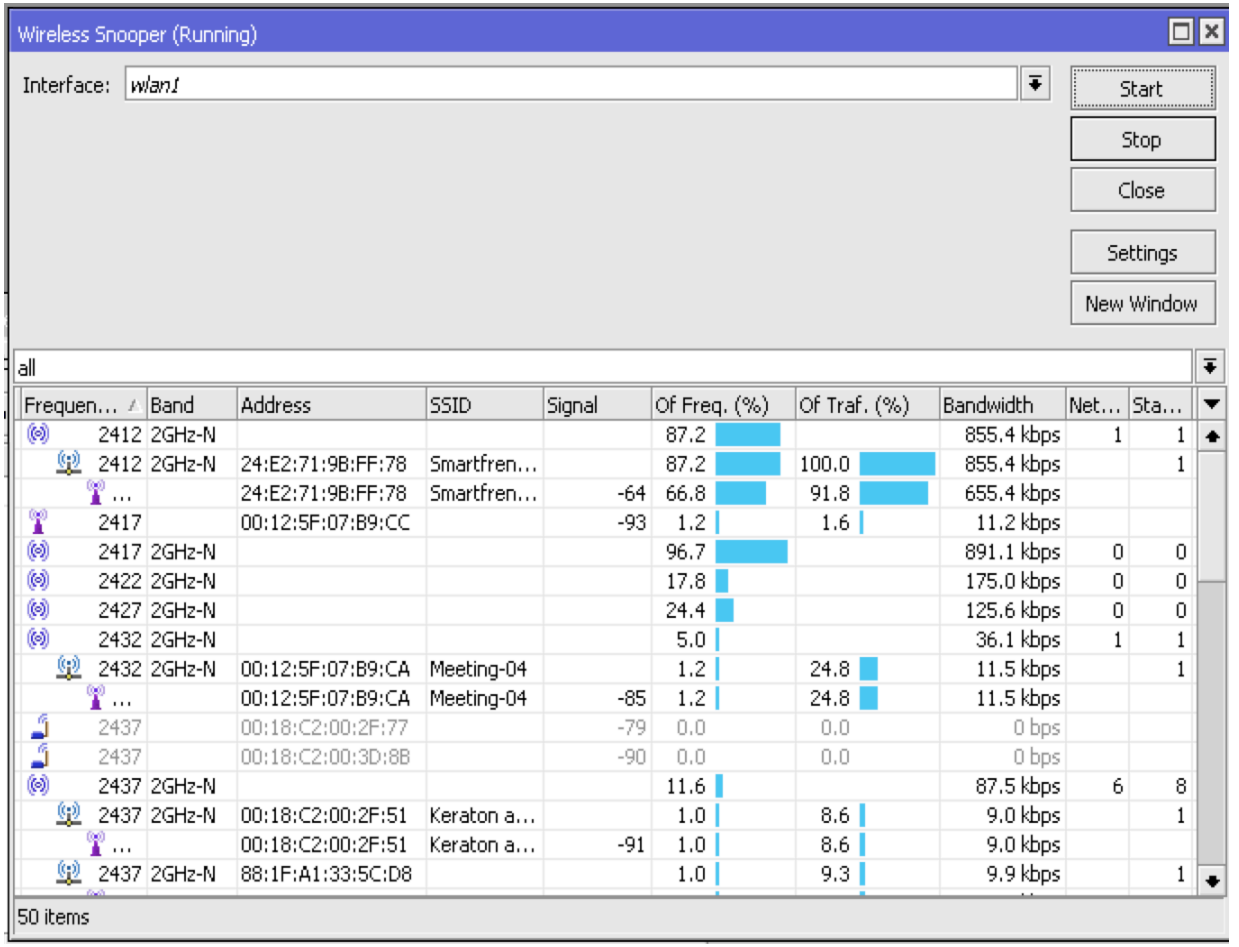
- To find less crowed frequency
- Get information about noise floor



AP tool: snooper

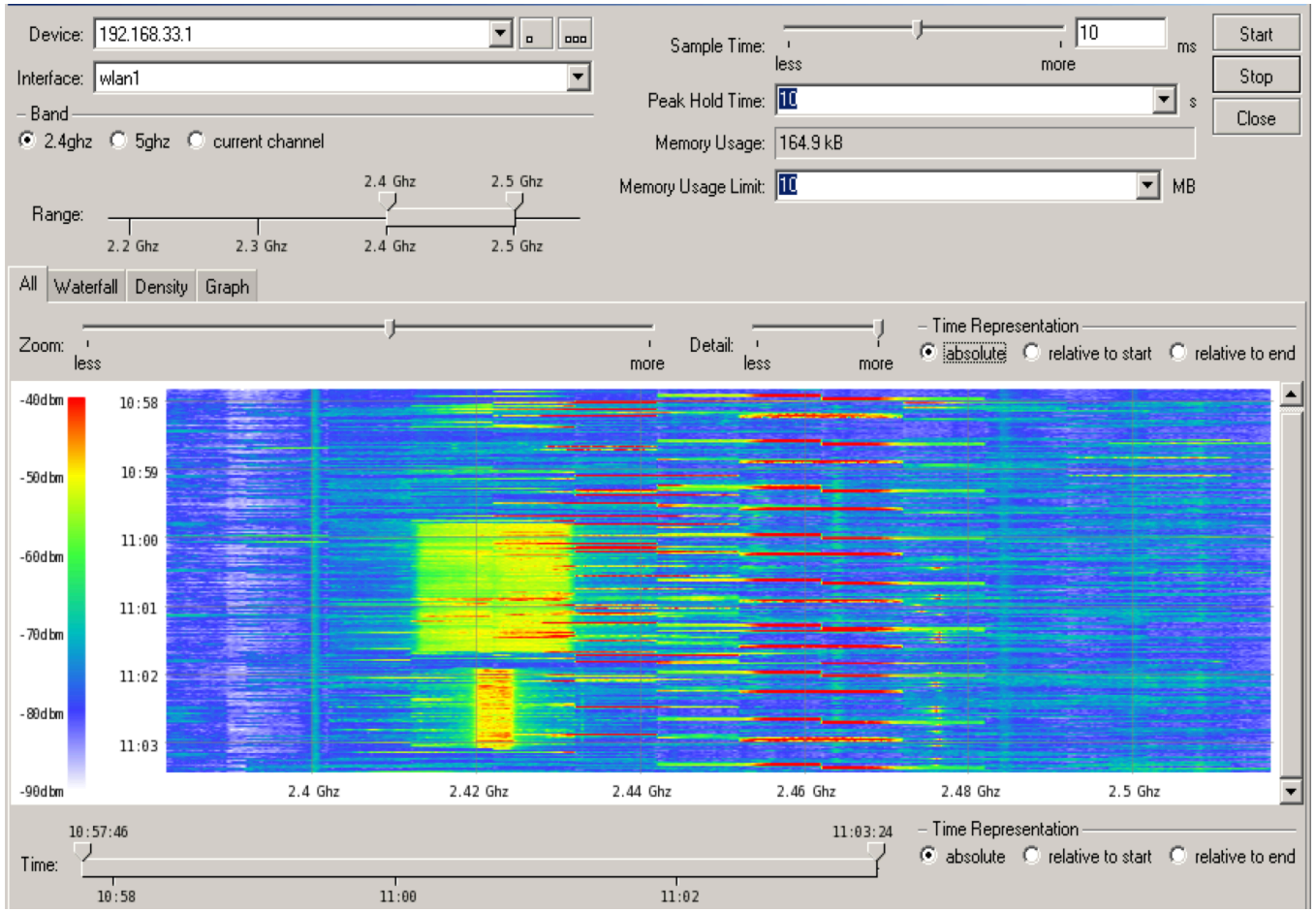
Telkom University

- Display load and traffic on each frequency



AP tool: spectrum analyzer

- Display interference with wider range
- Currently only available for atheros merlin chipset

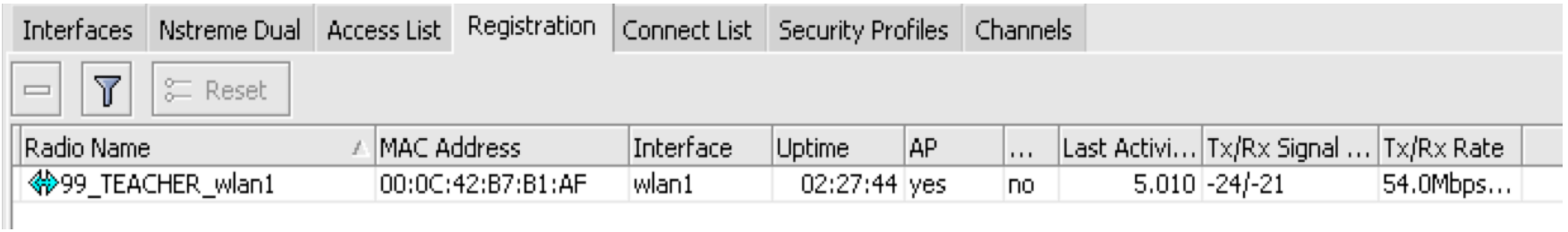


Suggestion to Mikrotik

- When we run previous wireless tools, connection will be off because wireless interface
- Suggestion: Put additional chipset that is used to perform optimisation tool

AP tool: registration table

- Display signal strength for each client



AP tool: Wireless survey

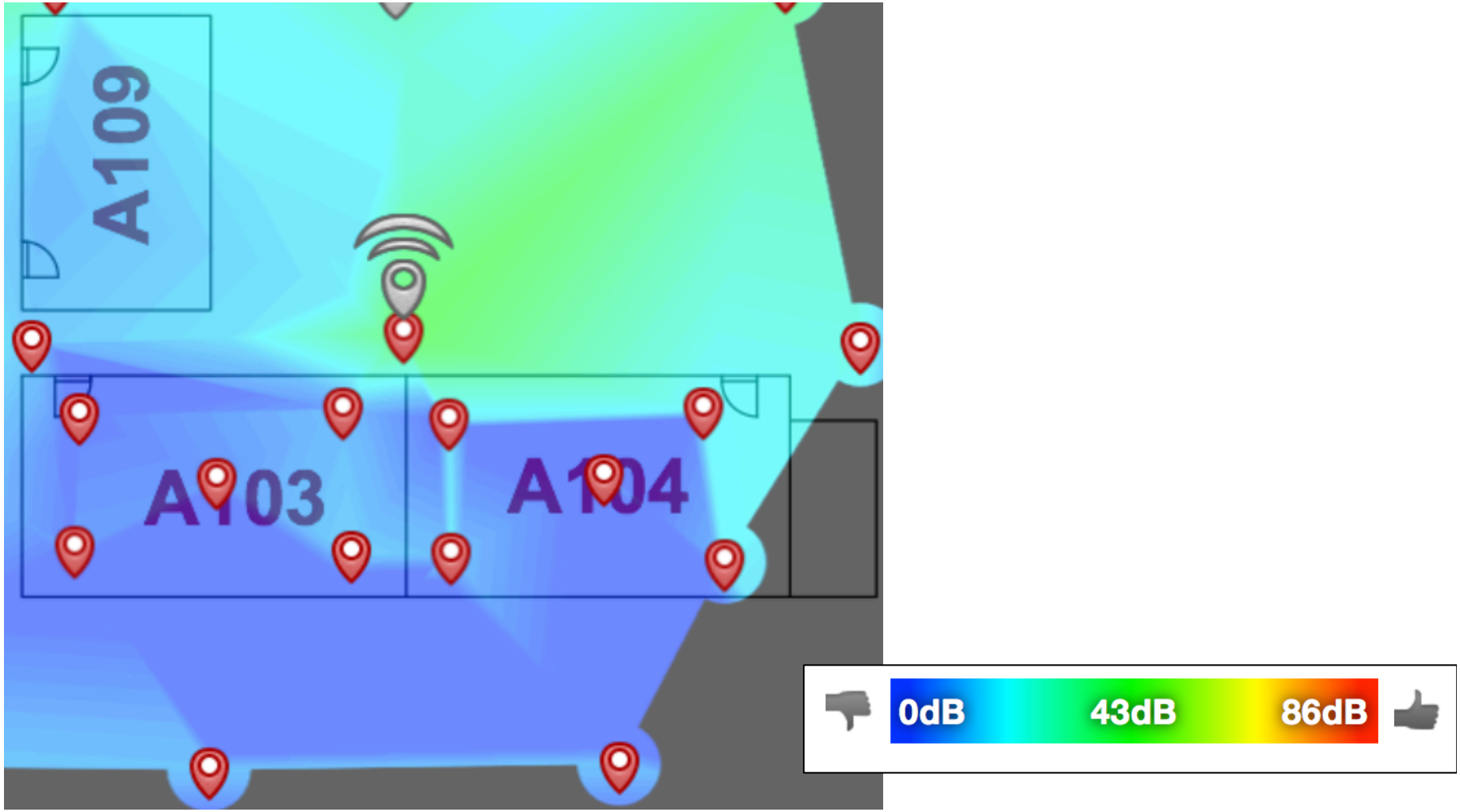
- GOAL: get a perfect location for AP
- The **ultimate weapon** for wireless troubleshooting
- Pick several samples points and analyse the performance
- Case study: troubleshooting of bad wireless access

Case study: AP location

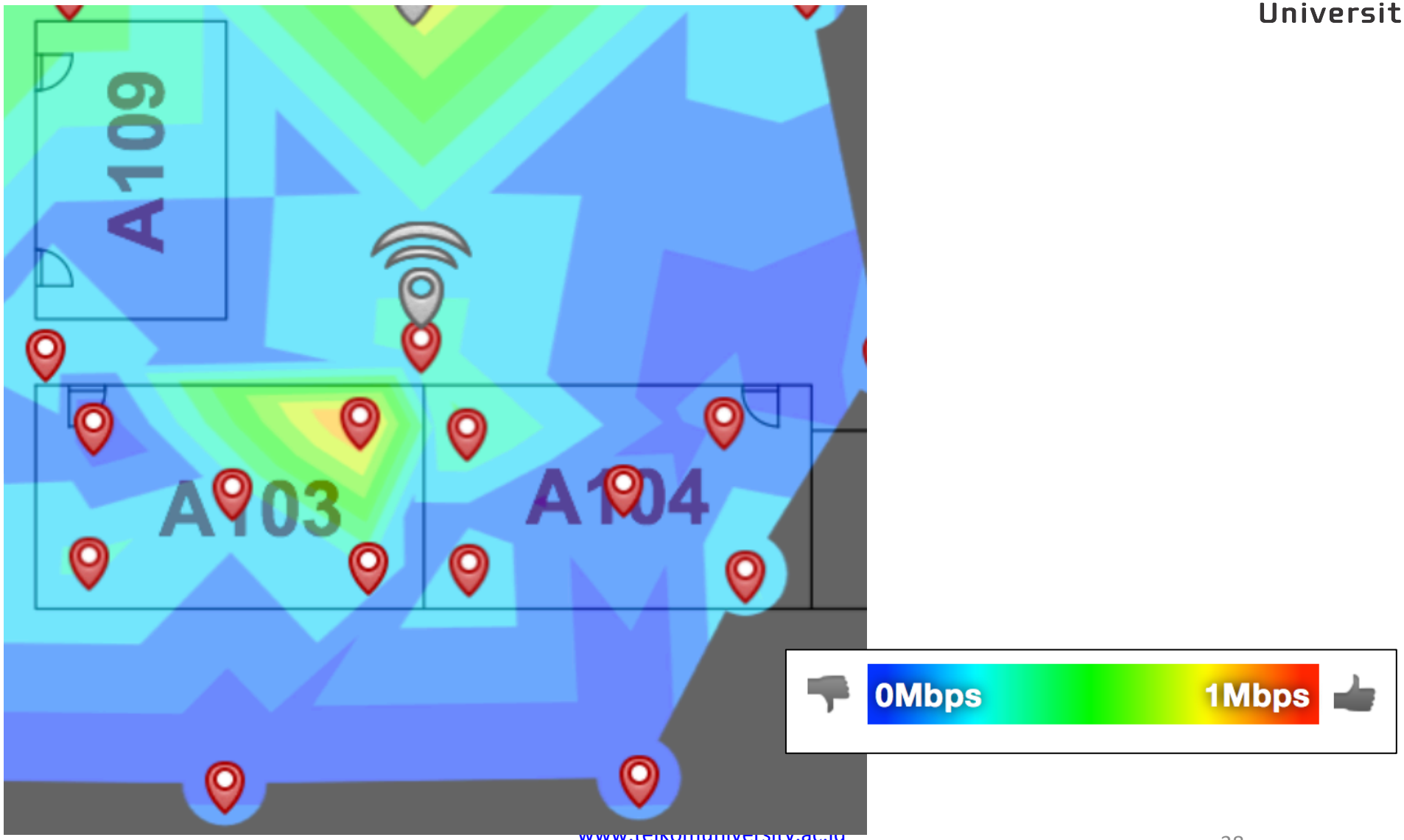
- AP is located outside the rooms
- To cover 2 rooms (A103 & A104)
- Is this enough?

Lets survey….

Signal to noise ratio (SNR)



Download test...



The Myths

- Wireless is difficult, cannot be seen -> use wireless tool, to visualise the spectrum
- Brand determines the performance -> The location is more important
- Wireless is complex -> get a correct understanding of how wireless works
- Add more bandwidth solves everything -> depends on location
- We do not need wire -> wire is still needed as its more reliable and has more physical bandwidth

Still curious about wireless?

Telkom University

Just come to our training course!!! ☺

www.telkomuni

Q & A

End of presentation

- Thank you
- Please put your feedback
- Stay tune with our schedule