BrianTel

FreeBSD in geographical wireless networks for internet access

May 16th 2008 - University of Ottawa, Canada

Massimiliano Stucchi
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Agenda

- Welcome everybody
- What do we do @ BrianTel
- How we do it
- Technologies involved
- Where are we using FreeBSD?
- Where we are _not_ using FreeBSD
- Why?
- Conclusions and future work

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BrianTel

- Full fledged ISP running in Milan
- Present in many facilities in Italy and Europe (also owns one in Switzerland)
- Run our own BGP4 network, have IPv4 and IPv6 peerings
- Offer ADSL, SHDSL, SDH connectivity services
- Main focus is Wi-Fi connectivity
- Colocation and IP transit as well

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Why Wi-fi ?

- Italy has a broadband coverage of 36% of total area, be it xDSL or fiber
- Of this 80% are major cities and big suburbs
- Incumbent telco (Telecom Italia) does not have interest in spending money to expand coverage
- Other Telcos behave in the same way
- Wi-Fi license is cheap and easy to get

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Why Wi-fi ?

- Wi-Fi is a cheaper solution, no landline is required, so no fee to pay any other telco
- We can offer VoIP services over Wi-Fi (with some restrictions)
- (in many areas) better service

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Wi-fi Infrastructure 1/4

- Service is delivered through repeaters and towers, installed on mountains, mounts, and private buildings
- Repeaters form a partial-mesh network
- This network is connected to different facilities where fiber is present, and where we buy capacity and/or transit

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Wi-fi Infrastructure 2/4

- Every repeater and/or tower runs a (private) Autonomous System on its own
- They speak BGP to exchange routing information
- (Trying to move to OSPF, though)
- Think of the repeater as a bunch of systems altogether (PTP Links, users, various)

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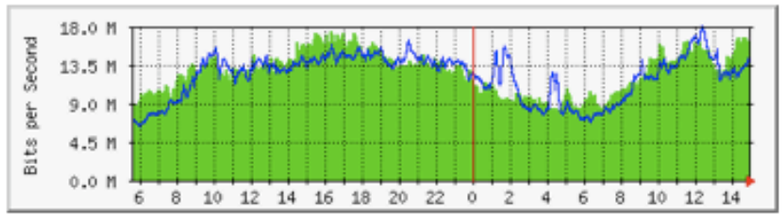
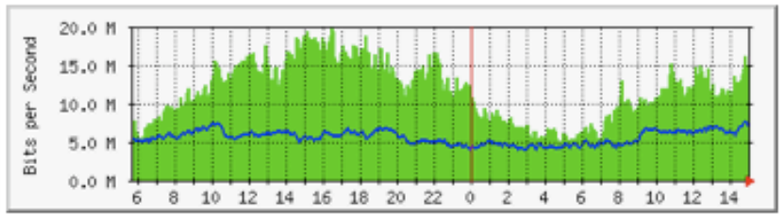
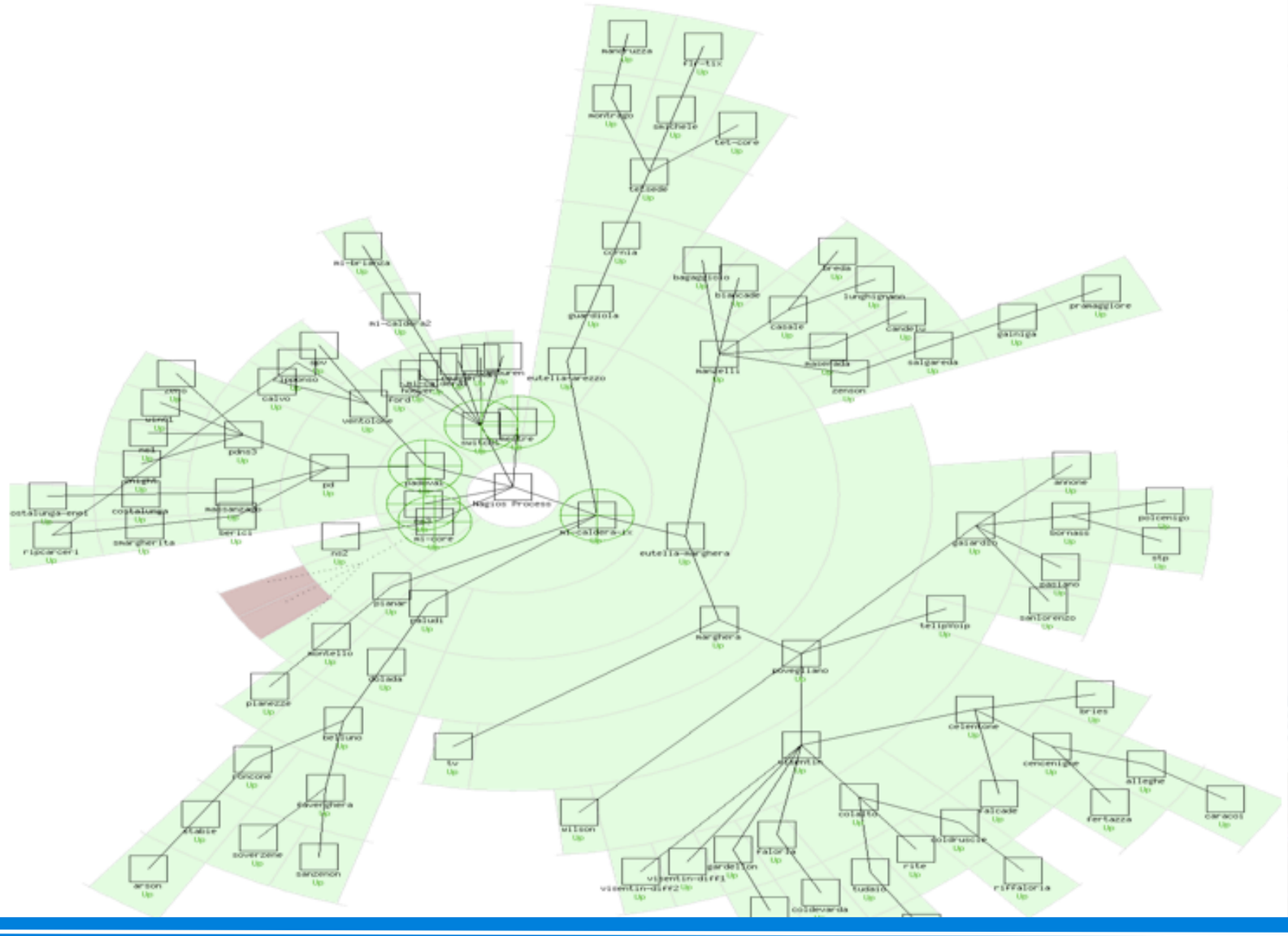
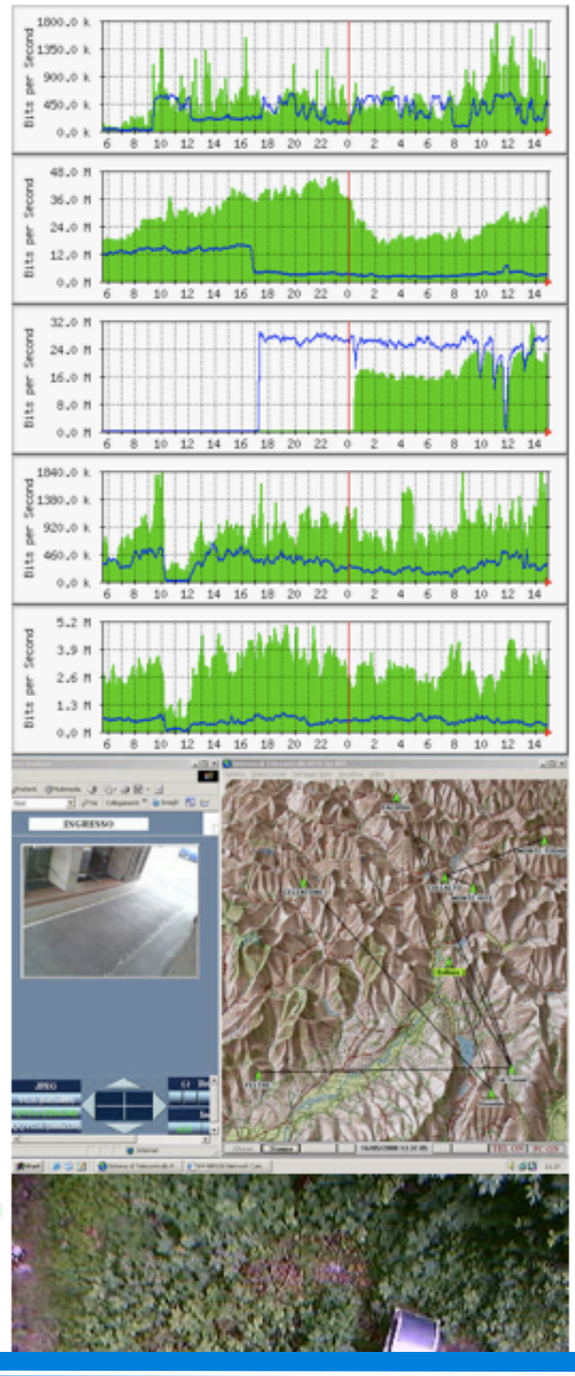
Wi-fi Infrastructure 3/4









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Wi-fi Infrastructure

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Wi-fi Infrastructure 4/4

- Every fiber exchange point has a profiler, enforcing QoS policies and shaping bandwidth for users
- These factors are controlled by a custom-built application (PHP, PostgreSQL), which also does billing
- We control every aspect of the job via this application (towers, users, IP classes, delegation and reverse delegation)

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Wi-fi Infrastructure

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Wi-fi Infrastructure

calvo	78.26.64.30	monte calvo	44 25 53 N 11 22 39 E	via Emilia 22 40048 San Benedetto val di Sambro (BO)	0	ventolone	settore 90°	78.26.104.0/24 78.26.65.0/24 finita 78.26.64.0/24 finita	78.26.64.30 00:0B:6B:81:42:14 diff 78.26.64.114 00:0C:42:0C:E2:52 diff1 78.26.64.114 00:0C:42:0C:E2:72 diff2 78.26.64.114 00:0C:42:0C:E2:75 diff3	federico tomitano oppure Franco Gianni ik4ade@excite.it 3389506318	0	1093
campocroce	77.42.107.78	campocroce	0	via chiesa campocroce 4 mogliano veneto (TV)	0	77.42.107.78	3 settori da 120°	78.26.74.0/24	00:0B:6B:81:7B:6B diff1 scorze 00:0C:42:0C:E2:31 diff2 casale 00:0B:6B:81:7C:56 diff3 mestre	Ugo Franco industrie bacologiche	0	1955
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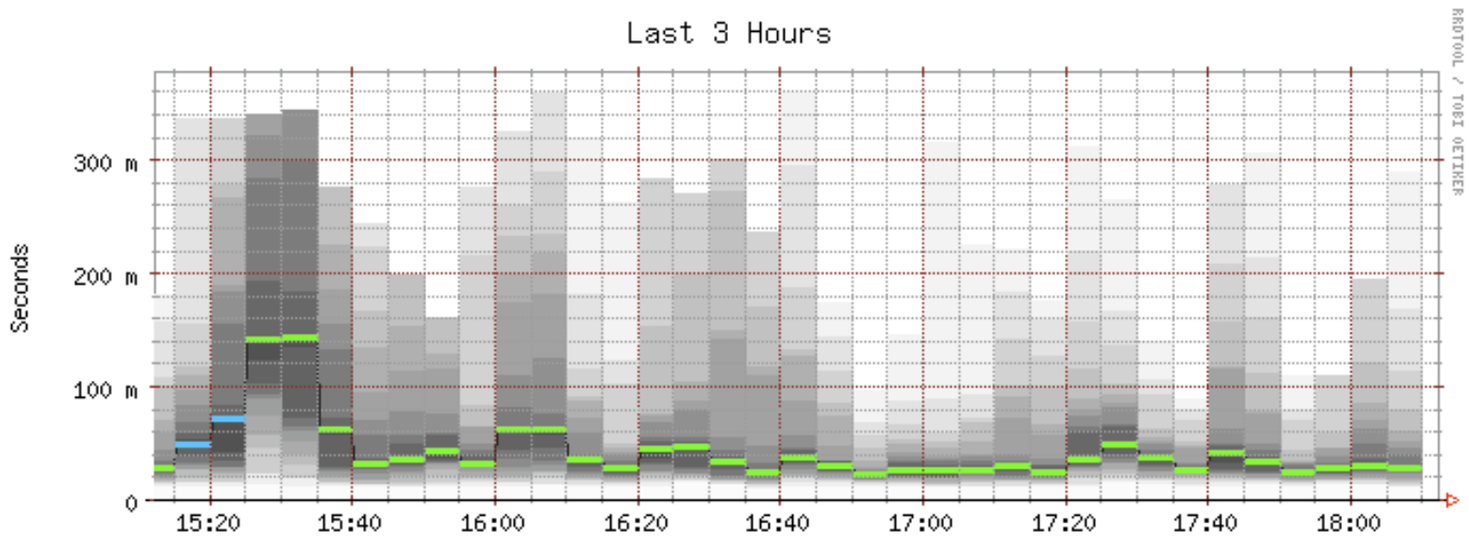
Wi-fi Infrastructure

Viewing Graph 'wmauto 77.42.124.58 - Traffic/Latency'

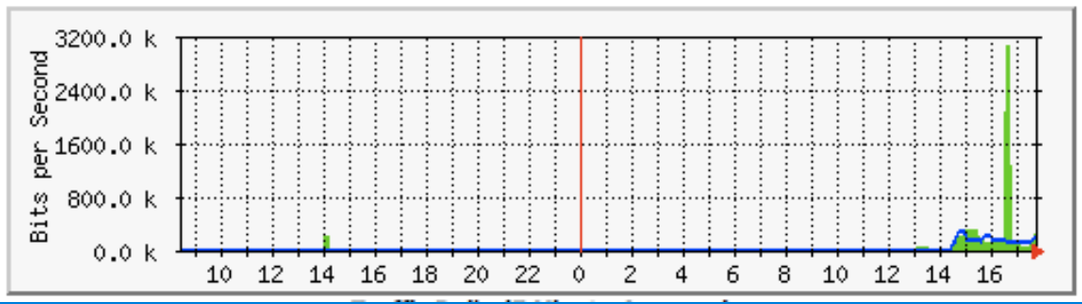
77.42.124.136/29 *wmaut0* 1280/257-50/50 00:0b:6b:4f:a3:92 montello Data ordine: Data attivazione: Attivo
Modifica Telnet Config Mail Mail RIPE Traceroute Ping Attiva Attiva Fake

Specificare (opzionalmente) ragsoc, comune o email cliente

Ragione Sociale	Contatto	Indirizzo	email	tel	fax	piva	codice cliente
Carrozzeria fratelli Mazzocato di Mazzocato Massimo	Massimo Mazzocato	0	admin: carrozzeriamazzocato@wm-auto.it tech: carrozzeriamazzocato@wm-auto.it	042386643	042386649	00565340262	1267 Servizi attivi



Latency last 3 hours



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Wi-fi @ users

- We install an antenna on user's roof, or any point where there's direct eye-sight towards our cells
- POE provides power for the equipment, so no need to run power cables, just ethernet
- Every user is assigned a /30 for PTP and a /29 for their use. Moreover, a DHCP with a private class is installed on every access board
- YES, we're "wasting a lot of IPs", but we're adhering to what RIPE ncc asks us to do

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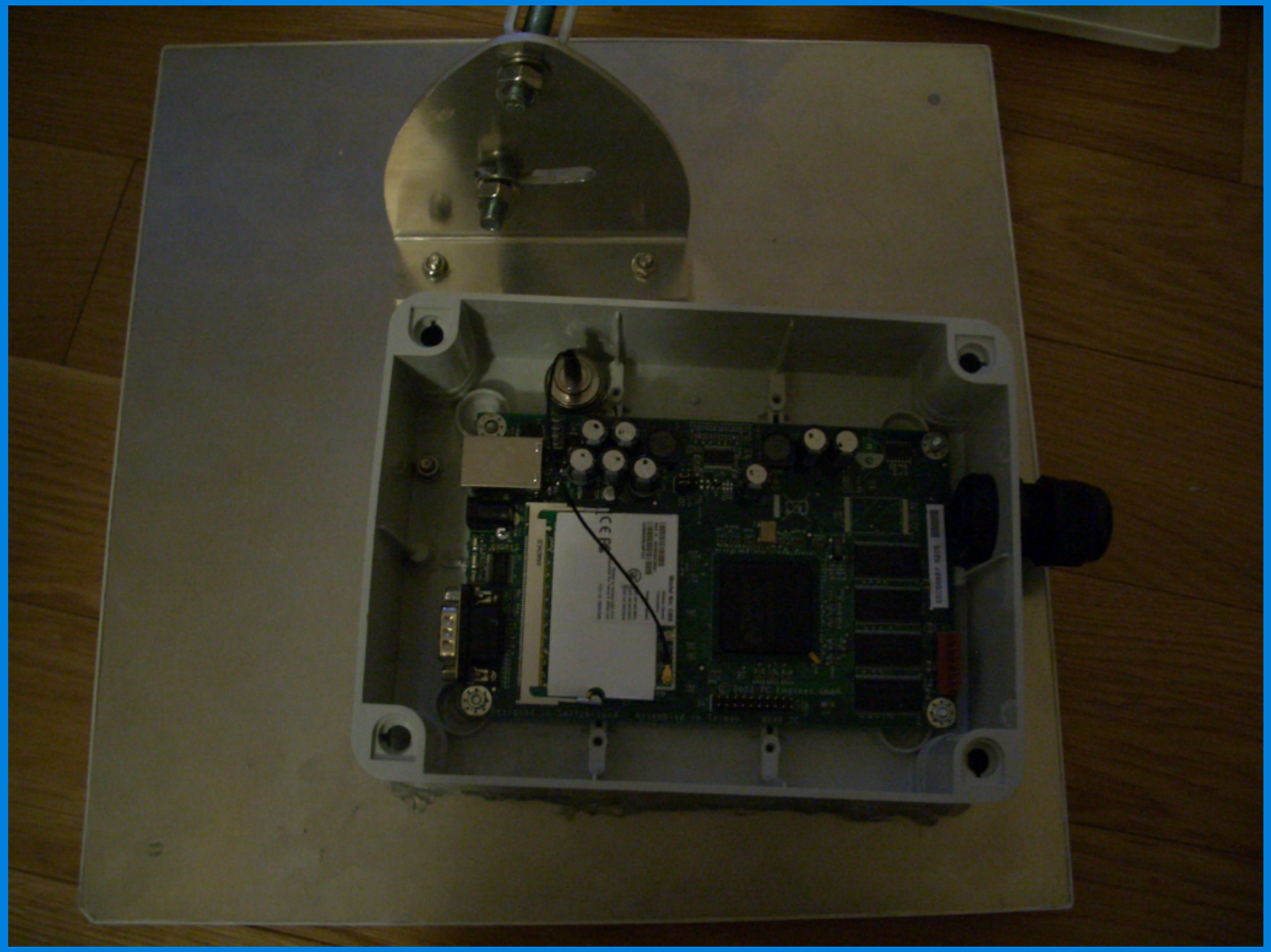
Wi-fi @ Users



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Wi-fi @ Users

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Wi-fi Coverage

- Veneto (Venice, Treviso, Belluno, Vicenza, Verona)
- Friuli-Venezia-Giulia (Udine, Pordenone, Aviano)
- Lombardia (Milan, Bergamo, Pavia, Lodi)
- Tuscany (Florence, Arezzo)
- Umbria (Perugia)
- 5 hours by car east to west northern Italy
- 3.5 hours by car north to south in Tuscany

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Summing Up

- INFRASTRUCTURE
  - Repeaters
  - Profilers
  - Web Servers
  - Peering and routing
- USERS
  - Access devices

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Repeaters

- Need:
  - Routing (IP, BGP, OSPF)
  - Radius auth for admins
  - good wireless support
- We use:
  - Mikrotik for access repeaters
  - If possible, FreeBSD for PTP links

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Repeaters

Why Mikrotik ?

- Registration list
- mac-telnet (useful for installations)
- scriptable interface
- radio name
- runs on cheap, small hardware

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Repeaters

Why Mikrotik ?

#	INTERFACE	RADIO-NAME	MAC-ADDRESS	AP	SIGNAL...	TX-RATE	UPTIME
0	wlan-diff2	bignami	00:0B:6B:84:9B:77	no	-75dBm...	24Mbps	1w6d8h54m14s
1	wlan-diff2	bordin	00:0B:6B:83:7E:2E	no	-70dBm...	24Mbps	1w6d8h54m14s
2	wlan-diff1	stellaristorante	00:90:4B:C6:94:02	no	-68dBm...	18Mbps	1w6d8h54m13s
3	wlan-diff1	stellacasa	00:0B:6B:4F:65:30	no	-69dBm...	18Mbps	1w6d8h54m13s
4	wlan-diff2	sentier	00:0B:6B:4F:A9:7C	no	-77dBm...	24Mbps	1w6d8h54m12s
5	wlan-diff2	ebottarel	00:0B:6B:84:9A:6D	no	-75dBm...	24Mbps	1w6d8h54m11s
6	wlan-diff1	cosmosmontaggi	00:0C:42:0C:E2:29	no	-79dBm...	18Mbps	1w6d8h54m9s
7	wlan-diff2	area52srl	00:0B:6B:81:44:66	no	-82dBm...	24Mbps	1w6d8h54m9s
8	wlan-diff2	raserasrl	00:0C:42:18:36:08	no	-75dBm...	24Mbps	1w6d8h54m6s
9	wlan-diff2	computerprofessi	00:0B:6B:4F:A9:A6	no	-76dBm...	24Mbps	1w4d7h59m27s
10	wlan-diff2	malaica	00:0C:42:05:84:A8	no	-64dBm...	24Mbps	1w4d3h30m54s
11	wlan-diff1	rolandodebiasi	00:0B:6B:83:85:6C	no	-75dBm...	18Mbps	1w2d20h34m25s
12	wlan-diff1	eddimariotto	00:0B:6B:85:F1:51	no	-75dBm...	18Mbps	1w2d19h31m8s
13	wlan-diff1	faverogabriele	00:0C:42:05:86:4E	no	-80dBm...	18Mbps	1w2d19h17m14s
14	wlan-diff1	gbortolin	00:0B:6B:84:99:43	no	-72dBm...	18Mbps	1w2d9h3m28s
15	wlan-diff1	vlorenzon	00:0B:6B:84:B8:FF	no	-75dBm...	18Mbps	1w2d9h3m28s
16	wlan-diff1	mmariotto	00:0B:6B:84:B8:AB	no	-74dBm...	18Mbps	1w2d9h3m28s
17	wlan-diff1	llucchetta	00:0B:6B:84:9B:21	no	-76dBm...	18Mbps	1w1d4h52m15s
18	wlan-diff1	faveroauto	00:0B:6B:81:45:DE	no	-74dBm...	18Mbps	1w22h37m15s
19	wlan-diff1	urimkaja	00:0B:6B:83:85:66	no	-74dBm...	18Mbps	1w20h39m3s
20	wlan-diff2	mspagnol	00:0C:42:18:36:12	no	-79dBm...	24Mbps	1w12h17m57s
21	wlan-diff2	mauropcs	00:0B:6B:4F:67:CE	no	-75dBm...	24Mbps	1w9h45m24s
22	wlan-diff1	sbertazzon	00:0B:6B:83:83:B6	no	-73dBm...	18Mbps	1w5h4m54s

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Repeaters

Why Mikrotik ?

```
[max@montello-diffusione] interface wireless registration-table> /tool mac-telnet 00:0B:6B:4F:A3:92
Login: admin
Password:
Trying 00:0B:6B:4F:A3:92...
Connected to 00:0B:6B:4F:A3:92

  MMM      MMM       KKK                          TTTTTTTTTTT      KKK
  MMMM    MMMM       KKK                          TTTTTTTTTTT      KKK
  MMM MMMM MMM  III  KKK  KKK  RRRRRR     OOOOOO      TTT     III  KKK  KKK
  MMM  MM  MMM  III  KKKKK     RRR  RRR  OOO  OOO     TTT     III  KKKKK
  MMM      MMM  III  KKK KKK   RRRRRR    OOO  OOO     TTT     III  KKK KKK
  MMM      MMM  III  KKK  KKK  RRR  RRR   OOOOOO      TTT     III  KKK  KKK

  MikroTik RouterOS 2.9.34 (c) 1999-2006       http://www.mikrotik.com/

(251165 messages not shown)
jan/04/2000 17:33:33 system,error,critical login failure for user claudia from 70.42.226.11 via ssh
jan/04/2000 17:33:37 system,error,critical login failure for user contab from 70.42.226.11 via ssh
jan/04/2000 17:33:39 system,error,critical login failure for user diala from 70.42.226.11 via ssh
jan/04/2000 17:33:42 system,error,critical login failure for user douglas from 70.42.226.11 via ssh
jan/04/2000 17:33:45 system,error,critical login failure for user erian from 70.42.226.11 via ssh
jan/04/2000 17:33:48 system,error,critical login failure for user silvia from 70.42.226.11 via ssh
jan/04/2000 17:33:54 system,error,critical login failure for user fernando from 70.42.226.11 via ssh
jan/04/2000 17:33:57 system,error,critical login failure for user fernando from 70.42.226.11 via ssh
Terminal linux detected, using multiline input mode
[admin@wmauto] >
```

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Repeaters

Why _NOT_ Mikrotik ?

- It's not opensource software
- We can't tie it to what we want to do
- No IPv6 support
- Development is not following a straight line

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Repeaters

Why FreeBSD ?

- It's opensource
- We like it !
- IPv6, all bits and pieces.
- Customizable

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Repeaters

Why _NOT_ FreeBSD ?

- Does not run on cheap embedded hardware (we're really looking into a fully working MIPS port)
- No way to identify customers on a repeater

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Profilers

- Our control system generates QoS rules from the users database, creating config files for our profilers.
- They are downloaded by different boxes and used
- These files are firewall configs, mainly
  - pf + altq in northern Italy
  - ipfilter in Tuscany and Umbria (to be changed)

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Routing and peering

- We're peering with different carriers and customers to whom we offer transit
- We also have various circuits (E3, SDH) running to different parts of Italy
- Two solutions:
  - Ethernet is done via FreeBSD with Quagga
  - E3, SDH via Cisco 7206 with PA-A3-E3 (only two per chassis...)

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Access devices

Why are we using Mikrotik ?

- mac-telnet
- radio-name
- cheap hardware, POE
- easily scriptable for both setup, troubleshoot (on the phone) and any other use, Winbox (windows client, downloadable from any device via http)
- continuous association with available repeaters with same ssid

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Access devices

Why _NOT_ Mikrotik ?

- license fees
- too easy to tamper with :-P
- no IPv6 support
- we don't like it that much...

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Access devices

Why FreeBSD ?

- more customizable
- more secure
- IPv6 support
- we could also install full fledged proxies for home users, on more powerful hardware, though

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Access devices

Why _NOT_ FreeBSD ?

- no mac-telnet
- you need to know the assigned IP before mounting any device
- harder troubleshooting process (bad experiences)

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What can then be done for FreeBSD ?

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WIP

- We're working on implementing what's missing
- It's a slow work, we have to take care of our network (and are only 4 people)
- We're looking into the MIPS port, so that cheaper hardware could be used

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WIP

- FreeSBIE-based (obviously !)
- Working mainly on wireless, in order to integrate what's needed
- Internal codename is AirBSD, but we're still unsure if we'll use it or not
- Going to be released when we actually have something working, under BSD License
- If you want to contribute, move on !

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WIP

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Questions ?

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Thanks for coming

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