

Wireless Community Networks

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Seattle Wireless (2000)

Pyramid: pyramid - Konqueror

Location Edit View Bookmarks Tools Settings Help

kernel news me networking Google Security reference funny misc asterisk enp sysadmin debian wireless hardware backuppc

https://192.168.1.1/admin/ifssettings.php?device=eth0

Pyramid: pyramid Metrix Communication LLC NYCWireless : Pebble Building a wireless access ...

Pyramid Linux

Brought to you by Metrix Communication LLC

Logged in

Network Settings

ath0 eth0 eth1

Disable eth0

Dynamic address (DHCP)

No DHCP server

Masquerading (NAT) for all outbound packets

Serve DHCP

Use DHCP Relay To server: _____

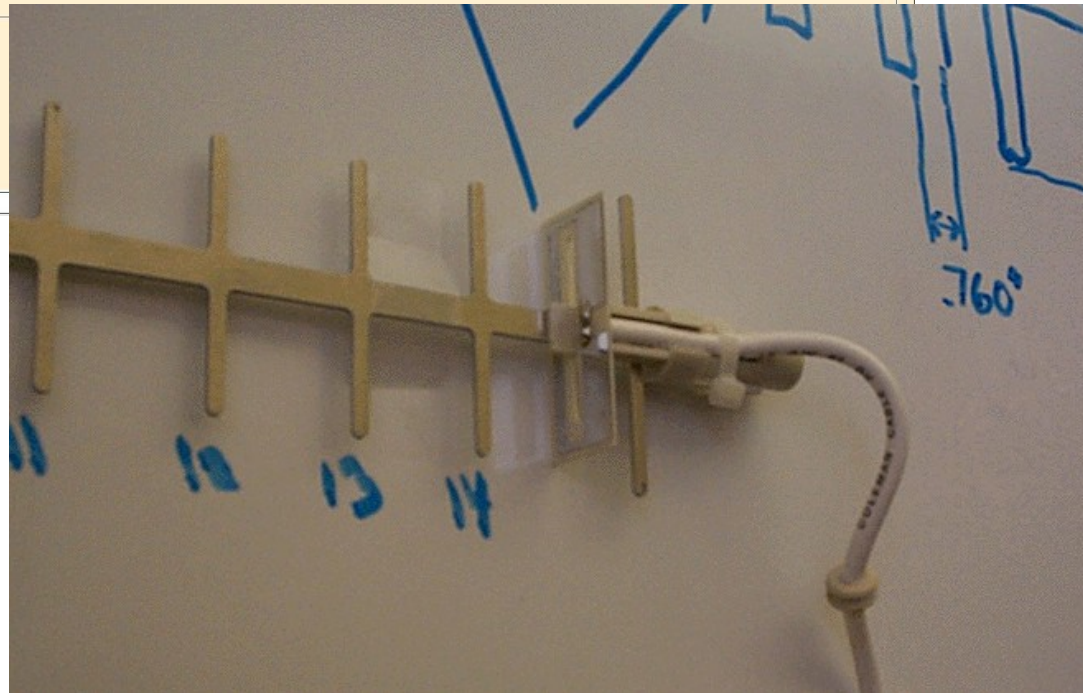
Static address

IP address	192.168.1.1
Netmask	255.255.255.0
Broadcast	192.168.1.255
Gateway	
Static DNS	

Current settings for eth0

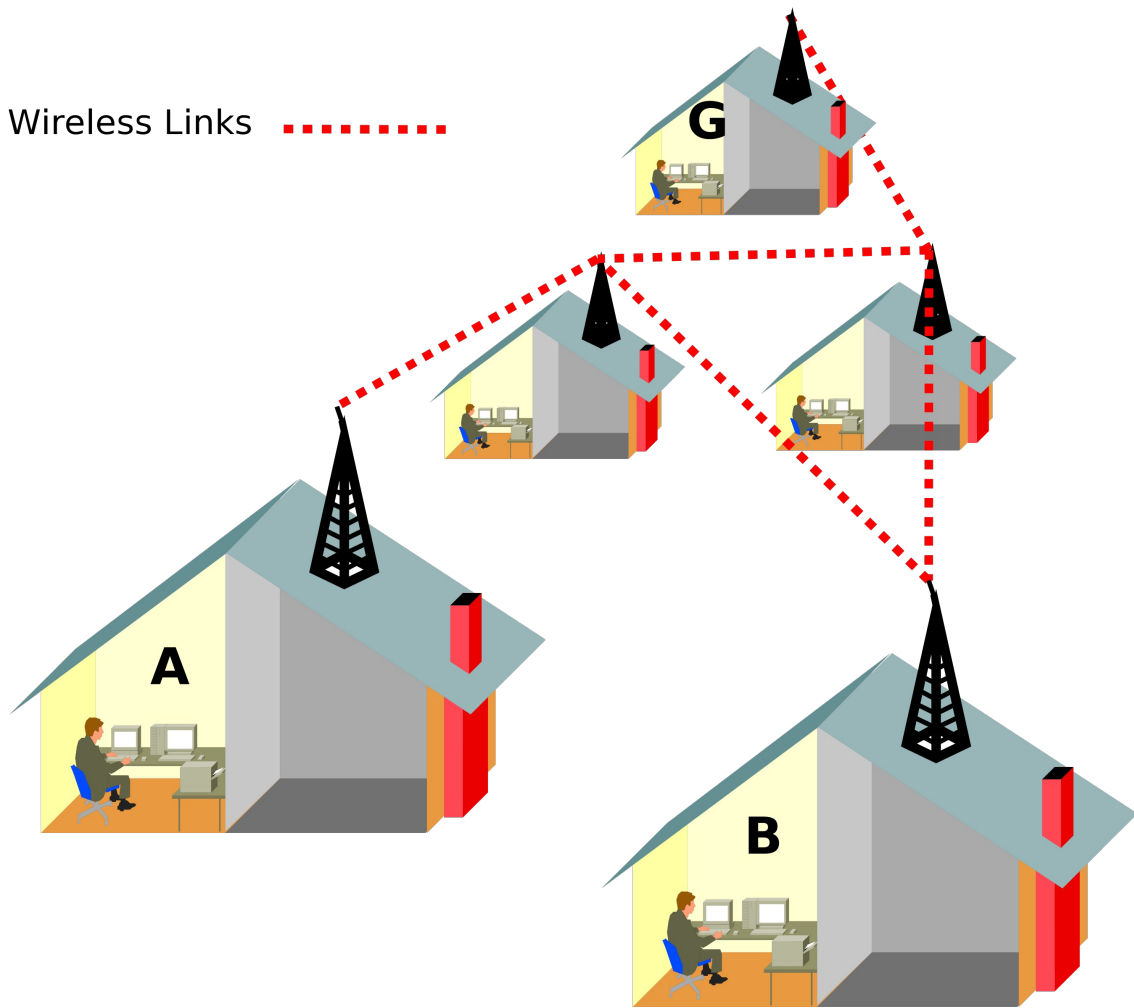
Ethernet address:	00:00:24:C1:1D:F0
IP address:	192.168.1.1
Netmask:	255.255.255.0
Broadcast:	192.168.1.255
Gateway:	
DNS:	

Commit Changes



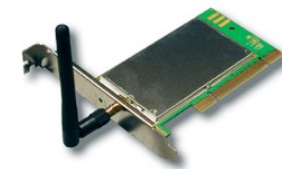
Wireless Community Networks – The Idea

Wireless Links 



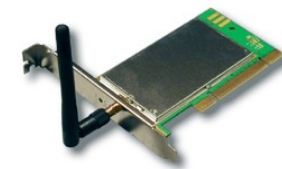
Wireless

- **IEEE 802.11 a.k.a. Wi-Fi**
 - Wireless networking technology
 - Unlicensed band(s)
 - Available in stores since ~2000
 - Cheap
 - Everywhere



IEEE 802.11

- **IEEE 802.11a:** 5GHz, up to 54Mbps
- **IEEE 802.11b:** 2.4GHz, up to 11Mbps
- **IEEE 802.11g:** 2.4GHz, up to 54Mbps
- **IEEE 802.11n:** 2.4 and 5GHz, up to 600Mbps
- **IEEE 802.11ac:** 5GHz, Gigabits

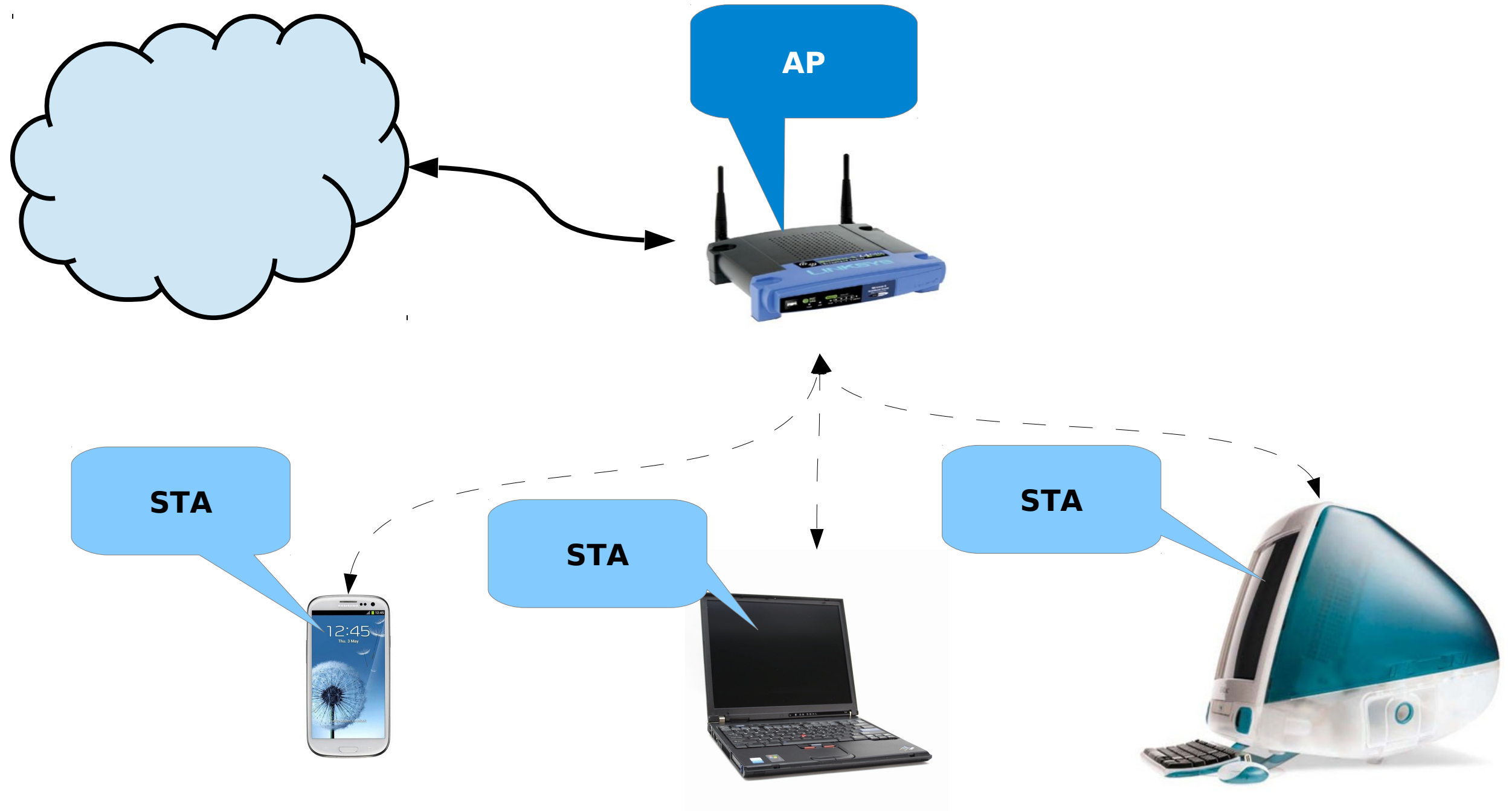


Wireless

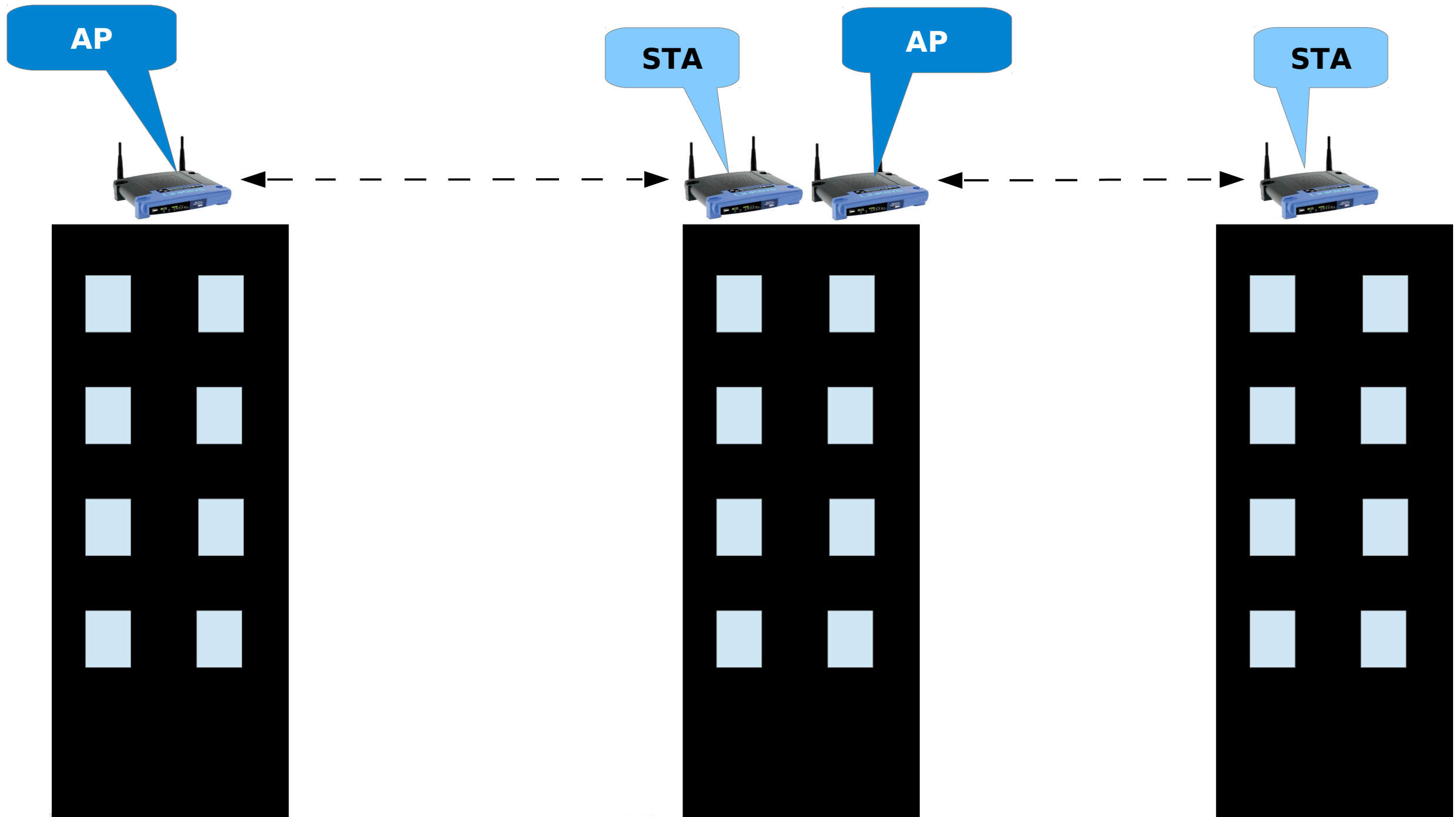
- 3 main operation modes for IEEE 802.11 devices:
 - Access Point (AP)
 - Station (STA)
 - Ad-Hoc
- } Infrastructure mode



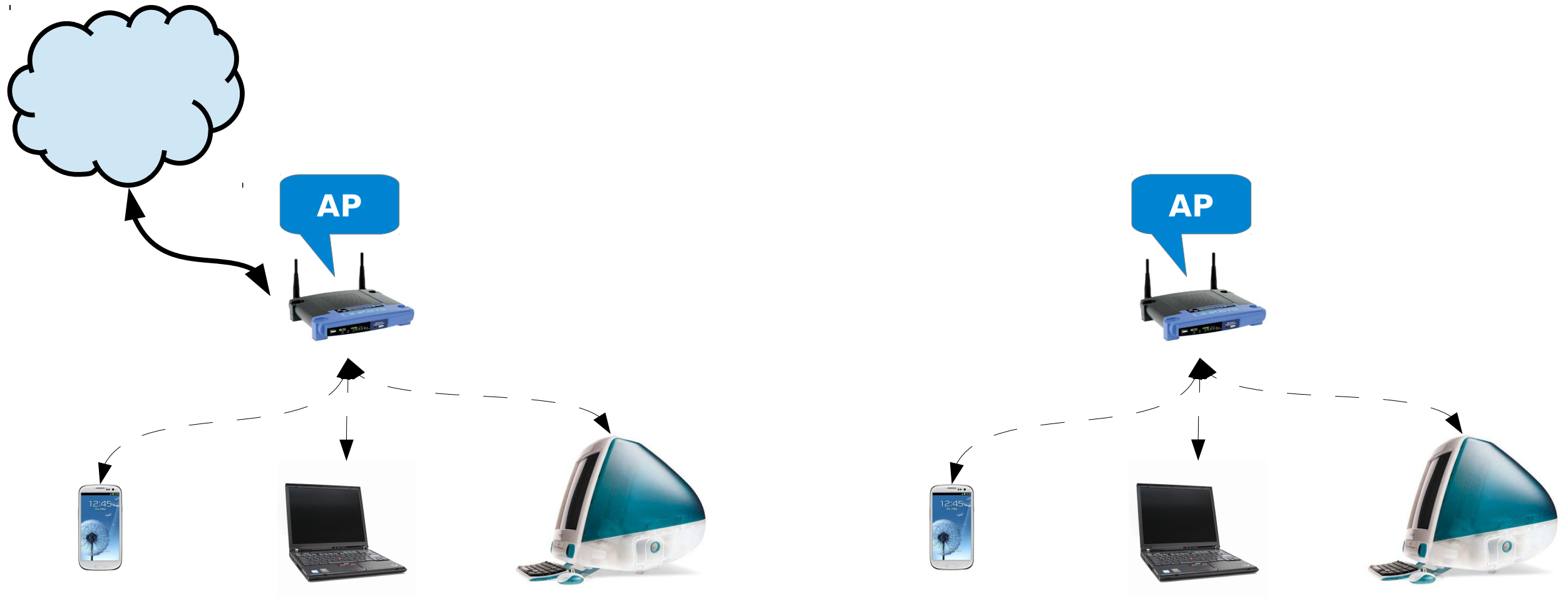
Infrastructure mode



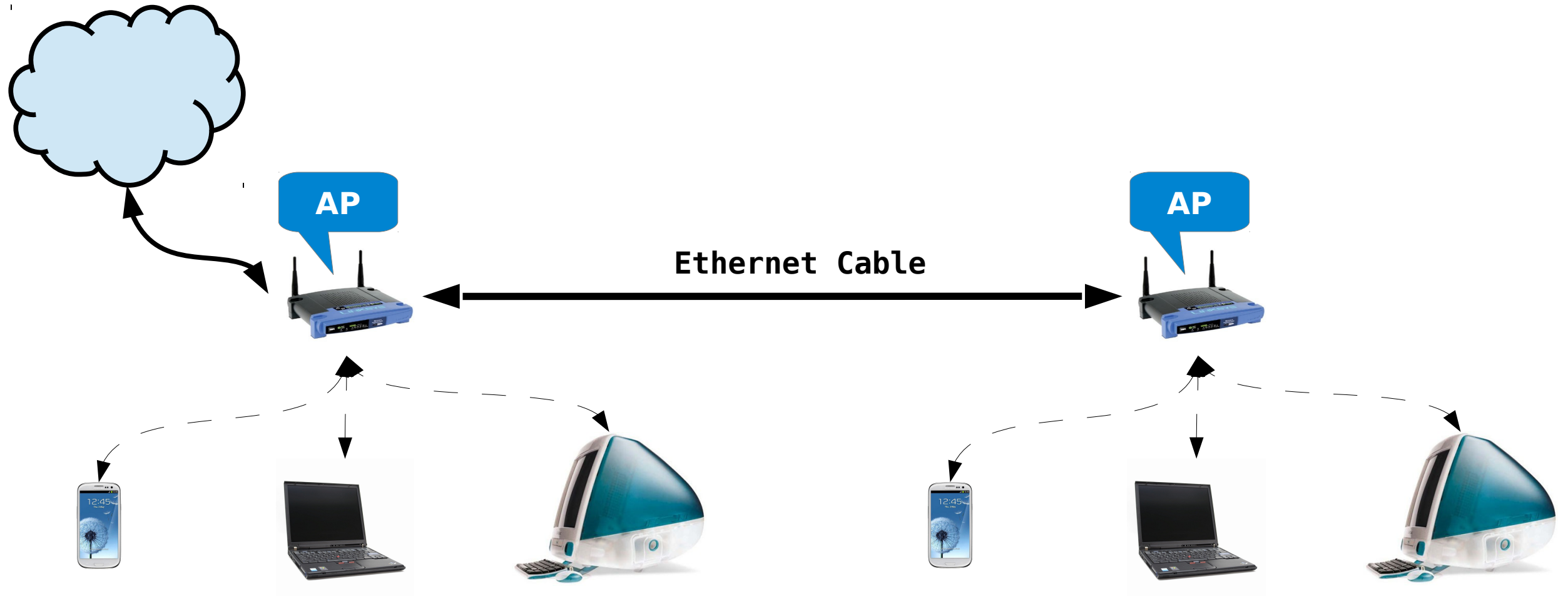
Infrastructure mode



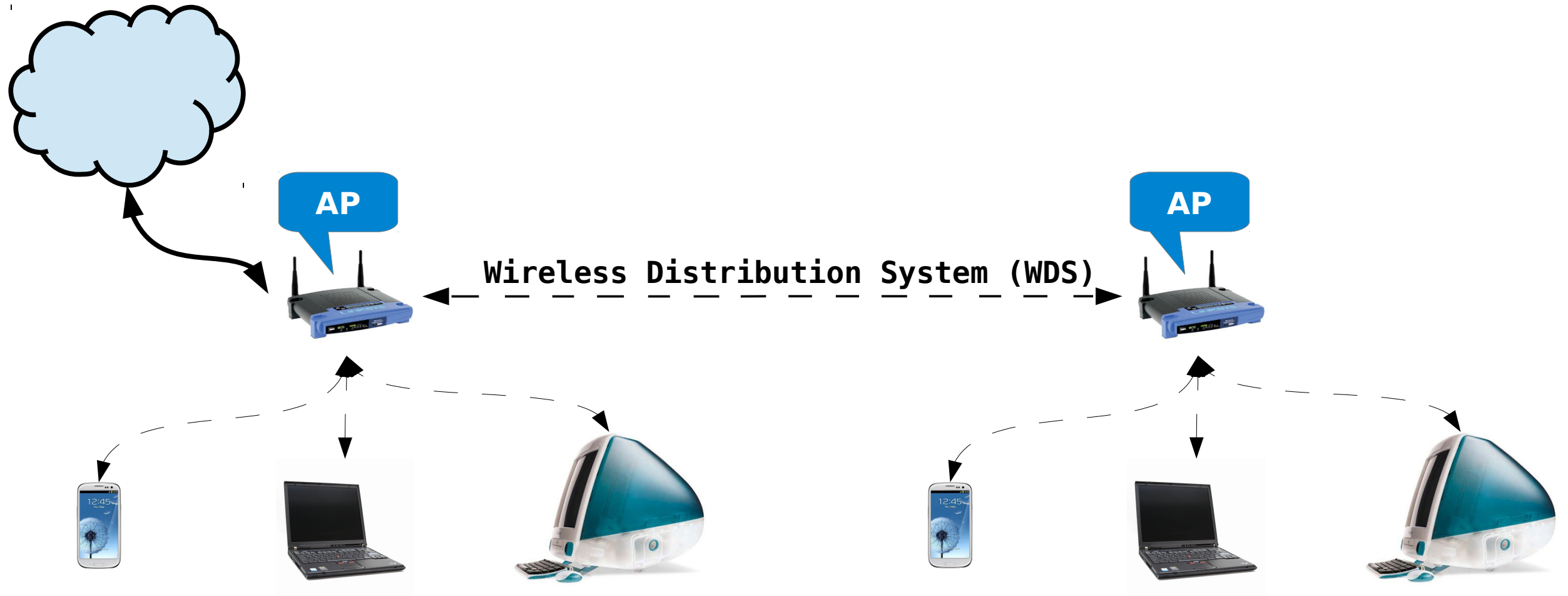
Infrastructure mode



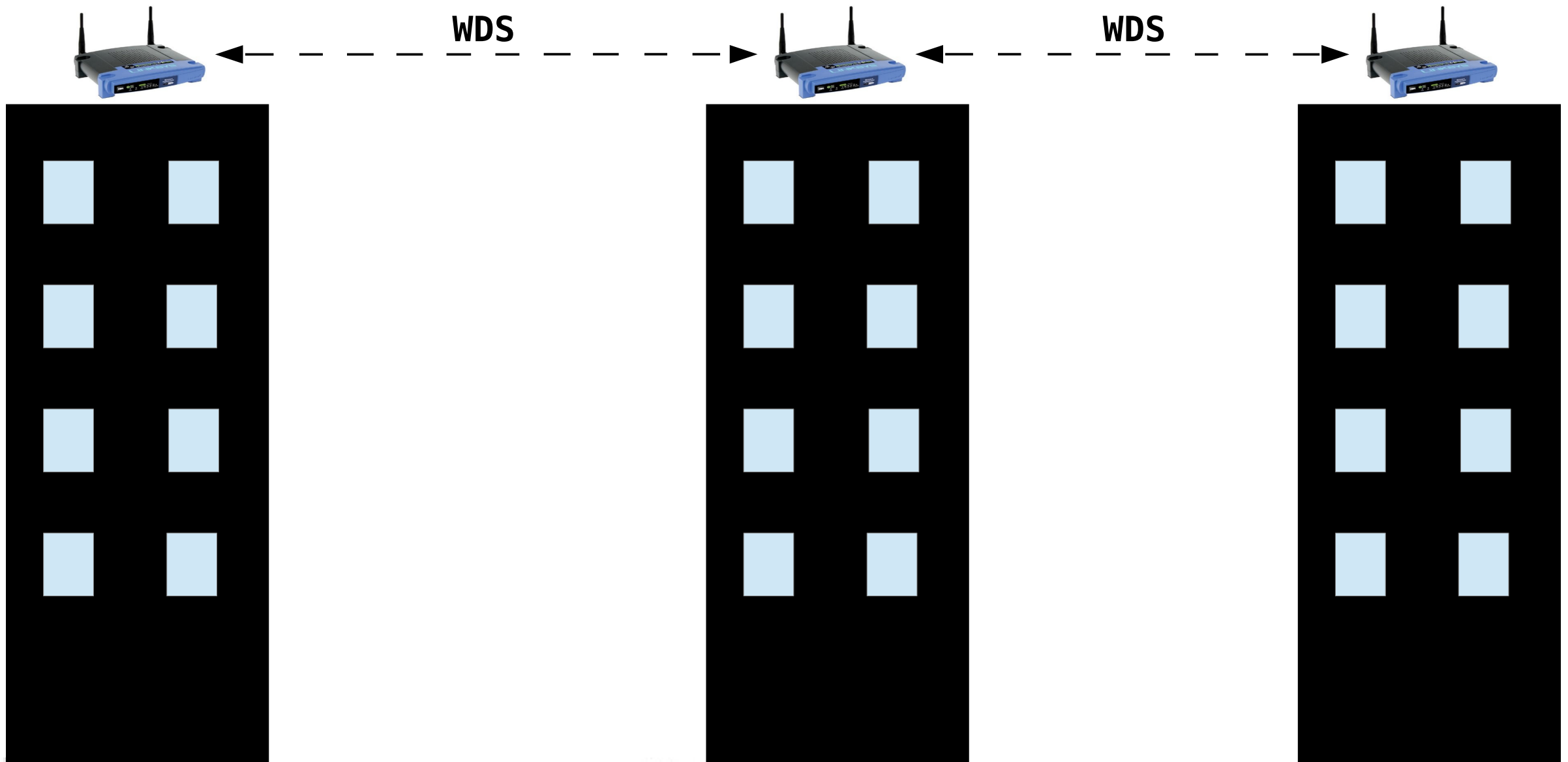
Infrastructure mode



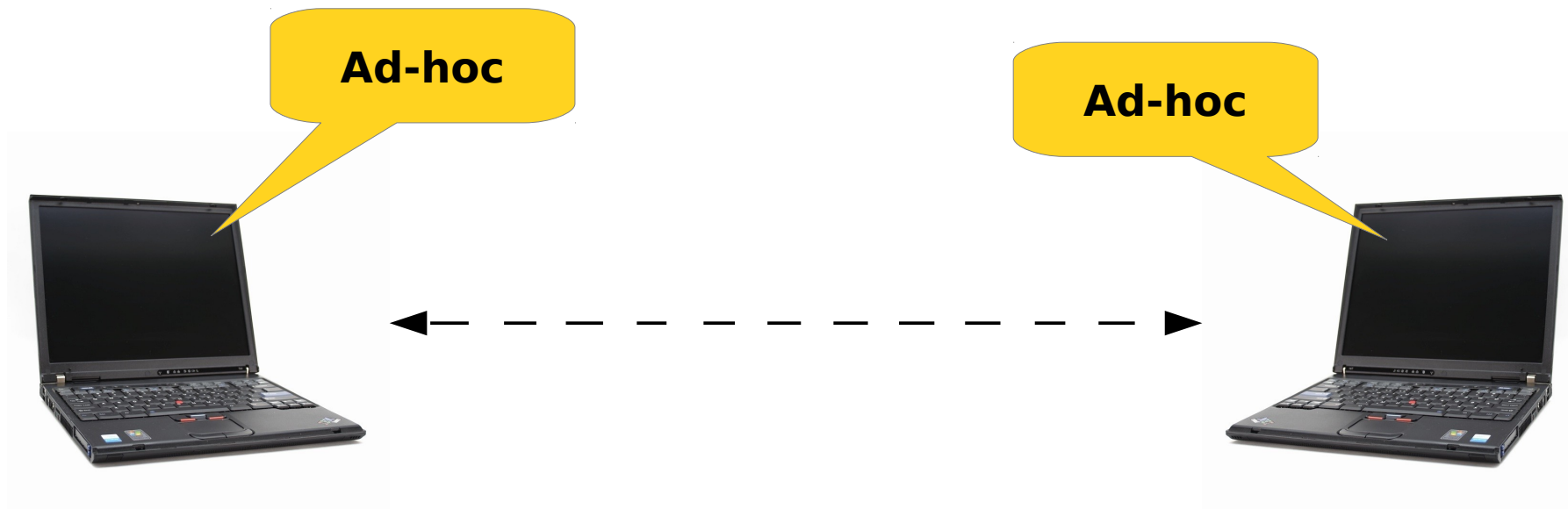
Infrastructure mode



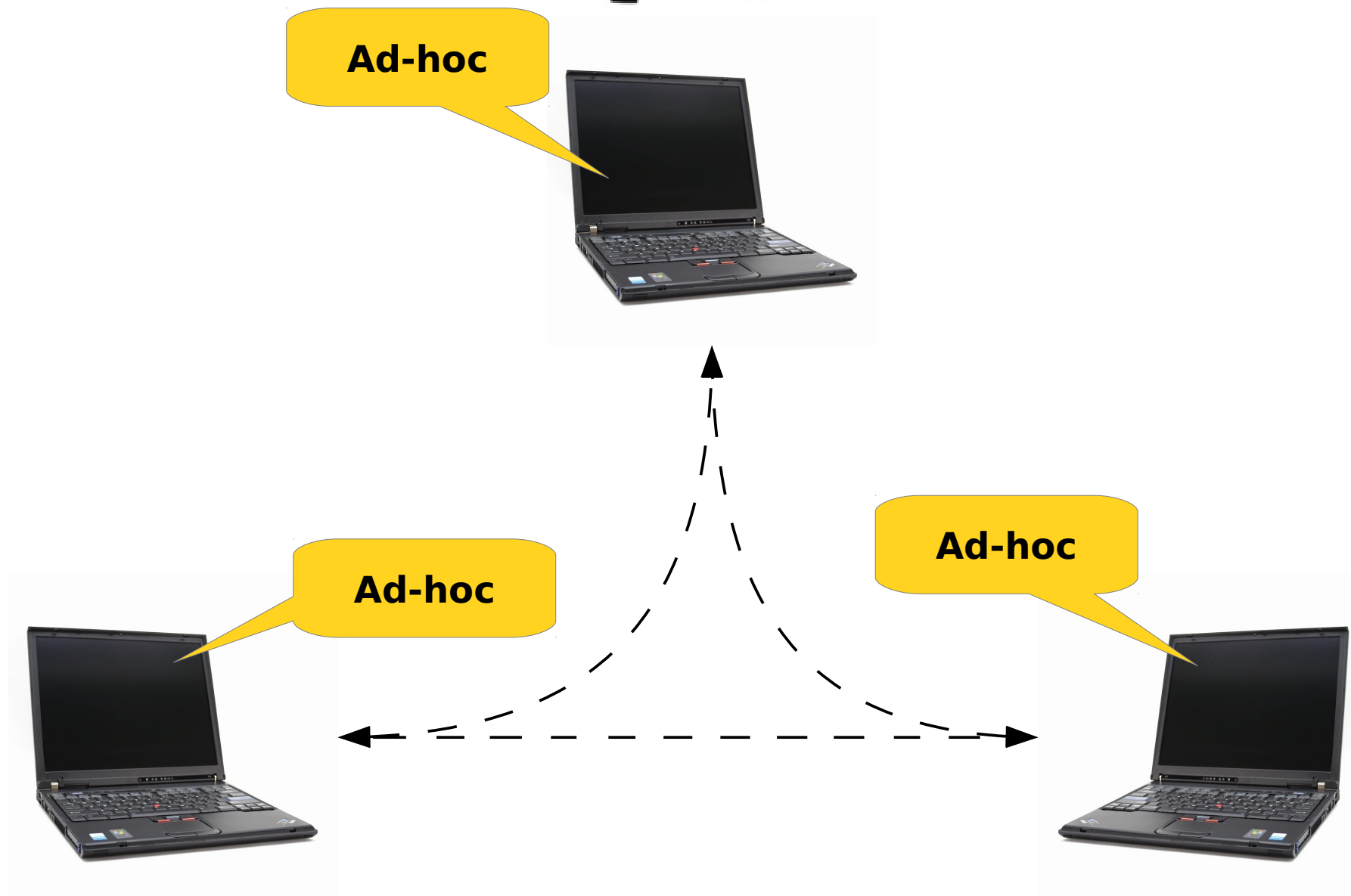
WDS



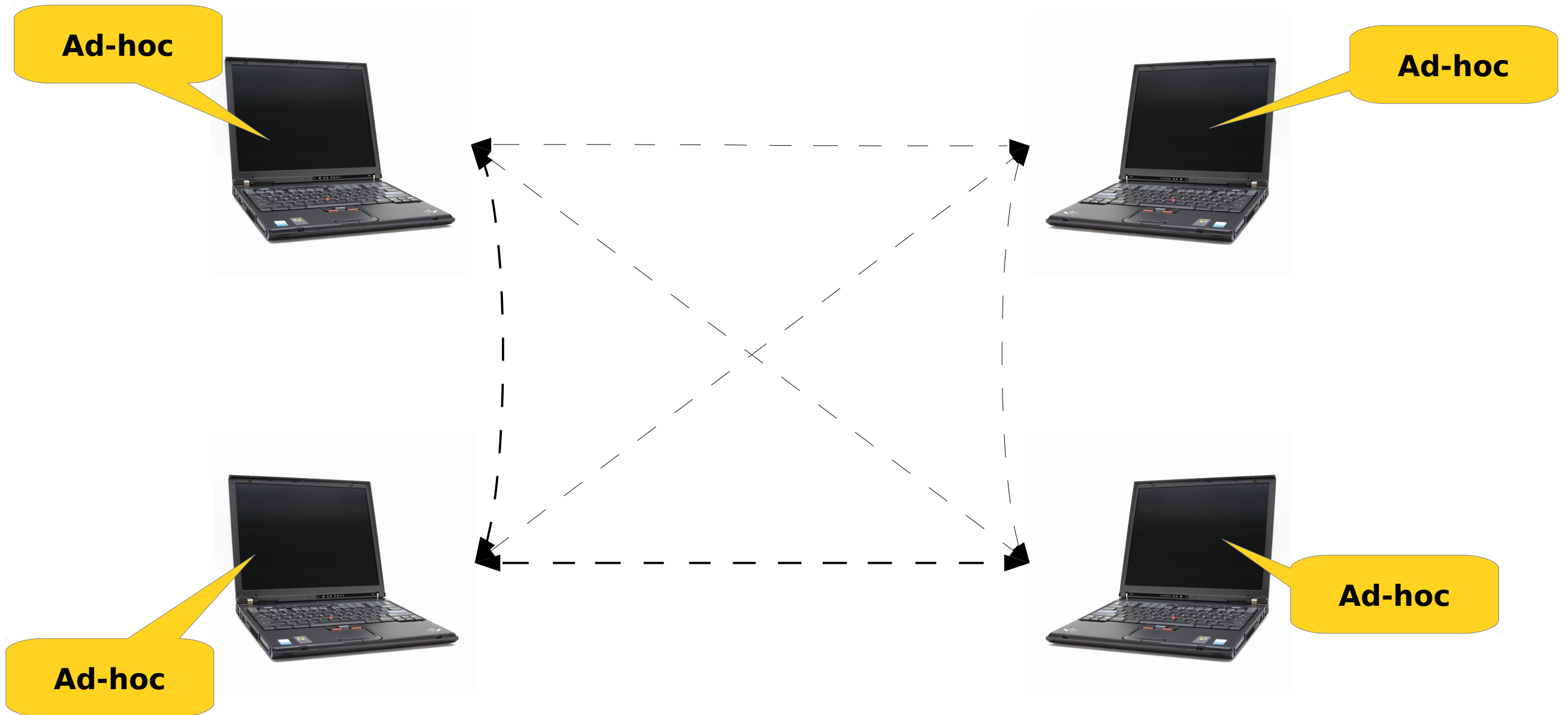
Adhoc mode



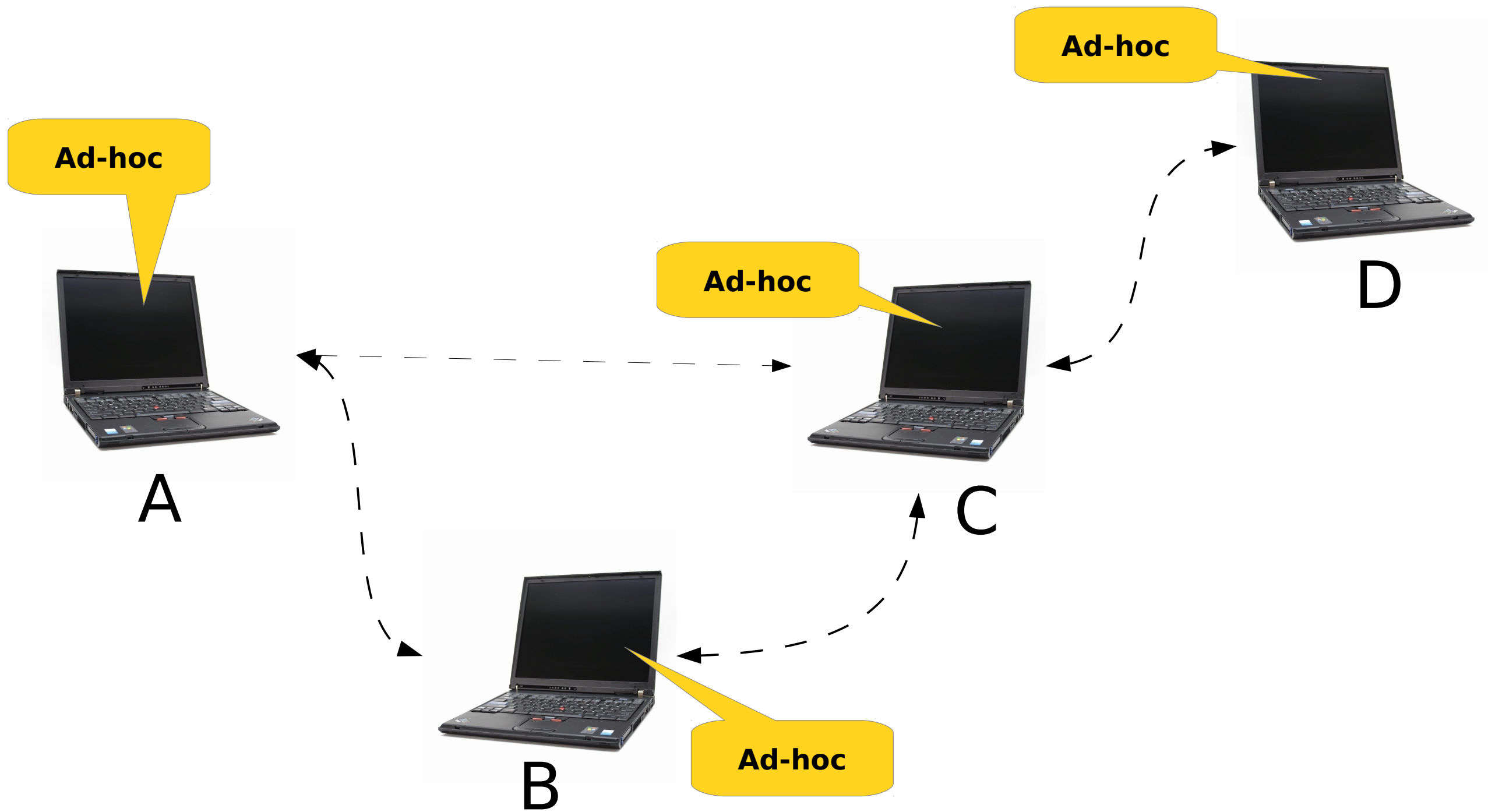
Adhoc mode



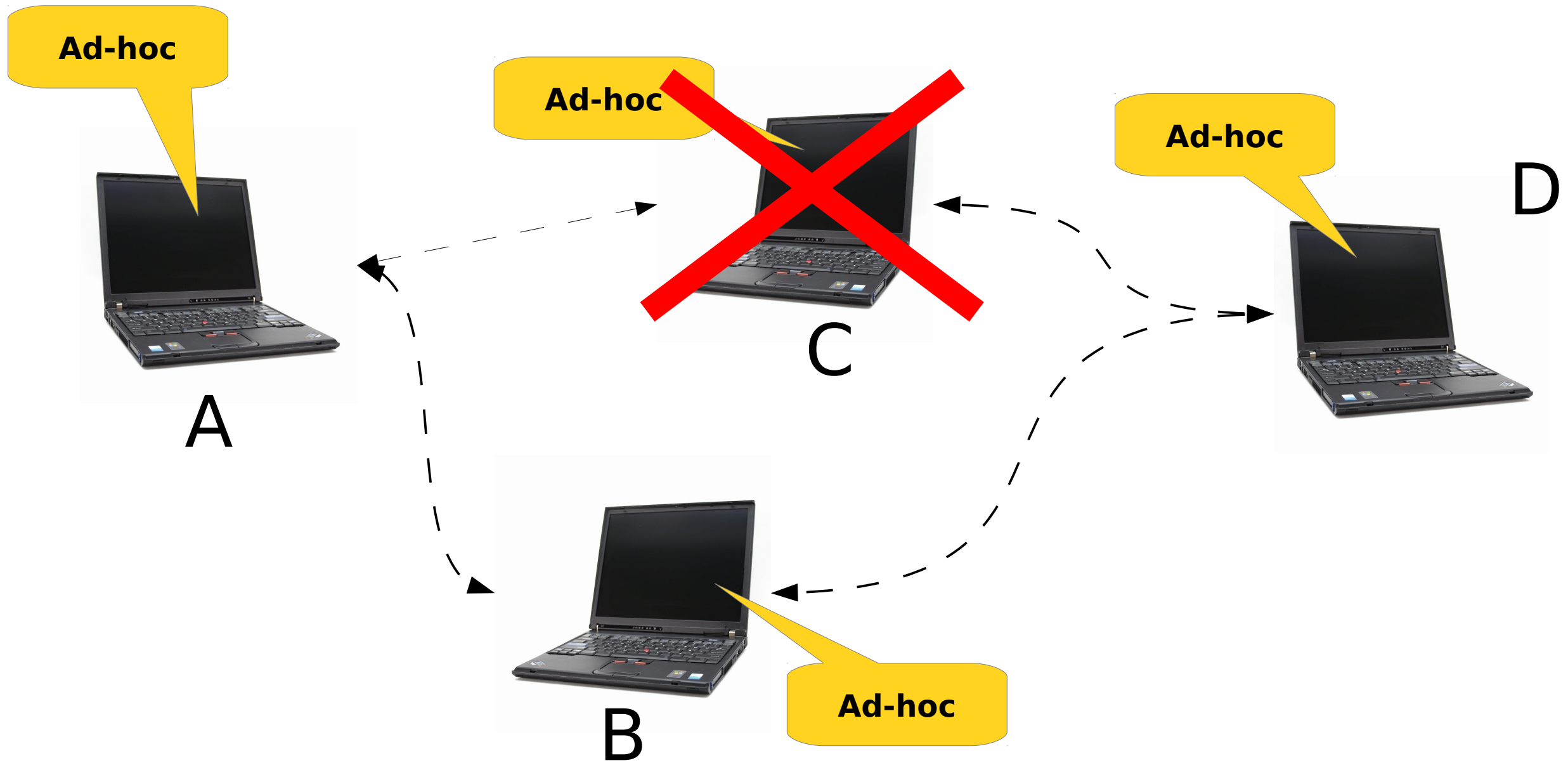
Adhoc mode



Adhoc mode



Adhoc mode



Mesh networks

- 3 or more devices in ad-hoc mode can form a **mesh network**
- Need for a **routing protocol** to automatically reconfigure the network:
 - wireless links are unstable
 - devices can be turned on or off (e.g. power outages)
 - devices can break or crash
 - in some scenarios devices can move (MANETs)

Routing protocols

- Devices in a mesh need to run a **routing protocol**, periodically exchanging data about the **status of devices and links**
- Some routing protocols are **especially designed for wireless mesh networks**:

- **OLSR**

- **B.A.T.M.A.N.**

- batmand

- BMX

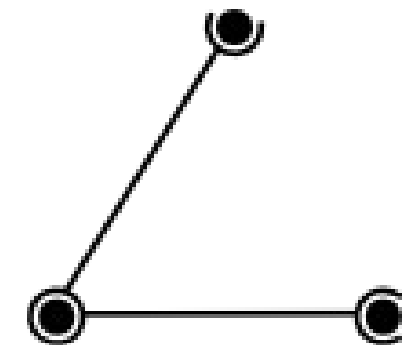
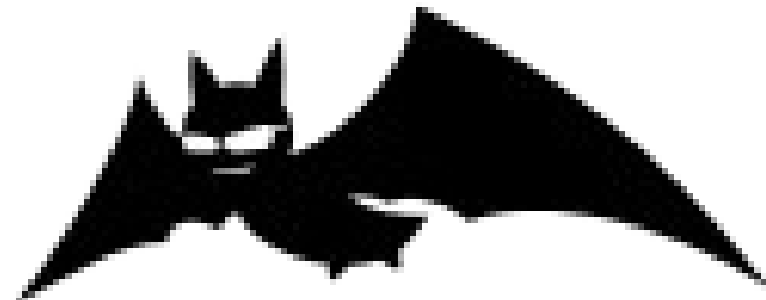
- batman-advanced

- **Babel**

- ...

```
/* re-insert on candidate tree with the better metric */
new_tc->path_etx = new_etx; Insert into the global tc tree.
olsr_sp_add_cand_tree(cand_tree, new_tc);
/* avl_insert(&tc_tree, &tc->vertex_n
/* path update needed and bump the hop count */
* Initialize subtrees for edges
new_tc->next_hop = tc->next_hop; avl_comp
new_tc->hops = tc->hops + 1; avl_init(&tc->prefix_tree, avl_co
```

olsrd
an adhoc wireless mesh routing daemon



Babel

Open Firmware



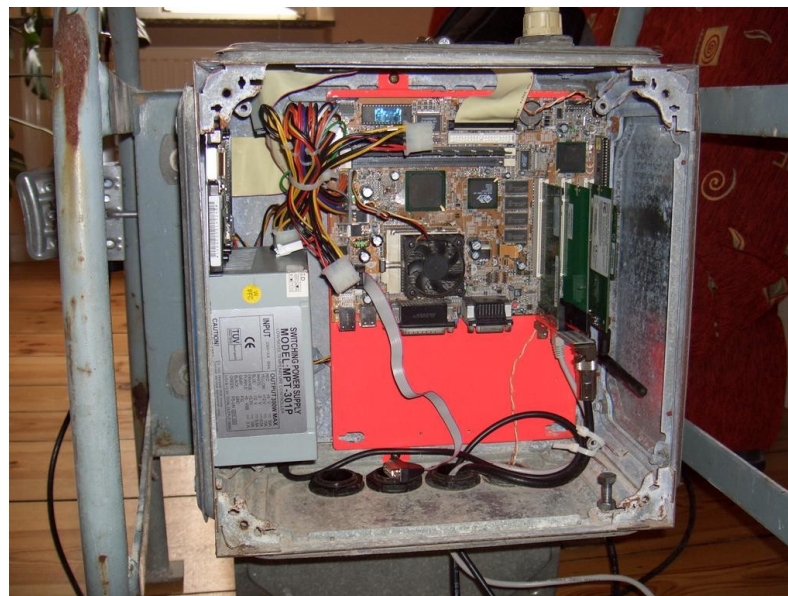
- Open firmwares:
 - **Linux distributions on embedded devices**
 - “turn a 50 euro router into a 400 euro router”
 - Package management, especially **routing protocol daemons**
 - E.g. :
 - **OpenWrt**
 - Dd-wrt

OpenWrt
Wireless Freedom

```
mmc1: new SDIO card at address 0001
usb 1-1: configuration #1 chosen from 1 choice
regulator_init_complete: incomplete constraints, leaving IO_1V8 on
regulator_init_complete: incomplete constraints, leaving CORE_1V3 on
regulator_init_complete: incomplete constraints, leaving IO_3V3 on
pcf50633-rtc pcf50633-rtc: setting system clock to 2000-01-07 12:57:48 UTC (947249868)
BMI Get Target Info: Exit (ver: 0x20000059 type: 0x1)
eth0 (sdio_ar6000): not using net_device_ops yet
AR6000 Reg Code = 0x40000060
UFS: Mounted root (jffs2 filesystem) readonly on device 31:6.
Freeing init memory: 352K
Please be patient, while OpenWrt loads ...
```


Network Nodes

- Network nodes hardware has gone through many stages:
 - PCs on the roofs
 - Self-made antennas
 - Off-the-shelf routers with modified firmware
 - routerboards
 - router+antenna in embedded devices suitable for outdoor operation



Network Nodes

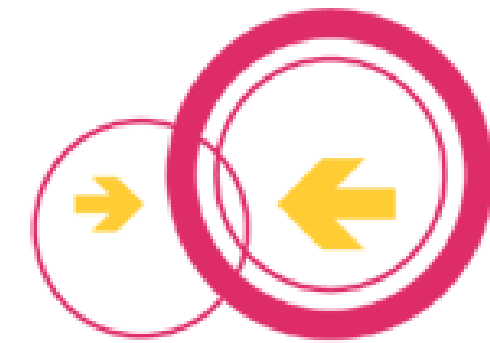
- Typical node today
 - Outdoor router(s) with custom firmware + embedded antenna on the roof
 - Ethernet cable
 - Power over Ethernet
 - Indoor router



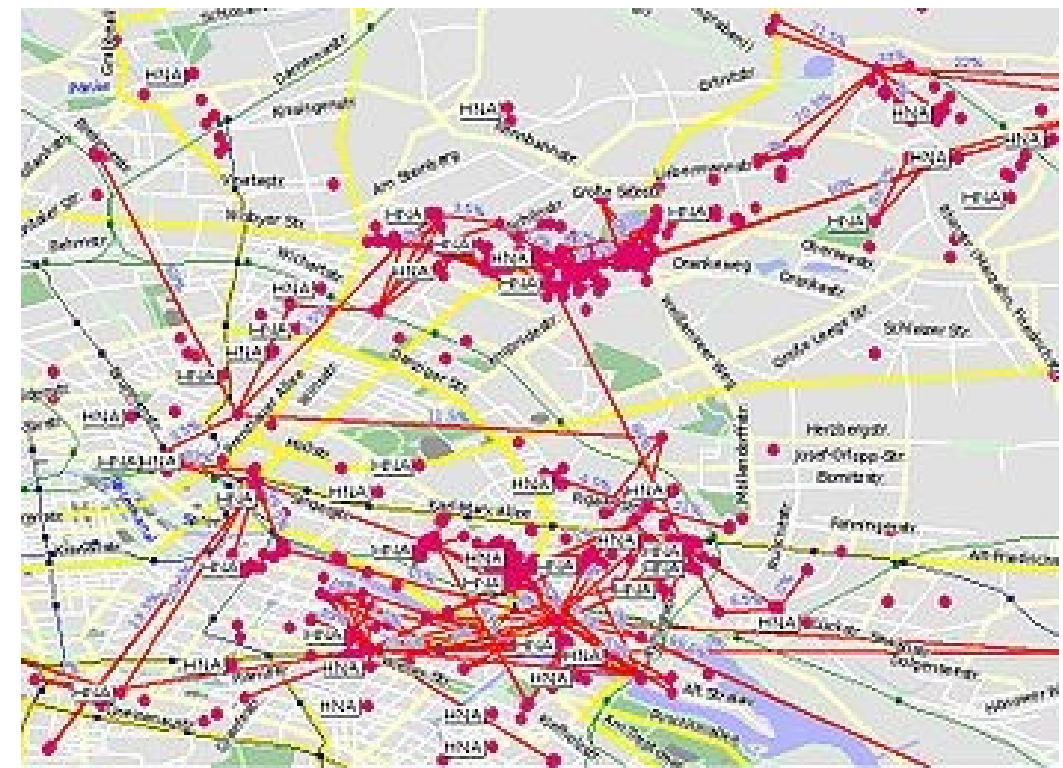


Wireless Community Networks in Europe

- “Freifunk” == free radio
- Started from **Berlin**, spread all over Germany
- Mesh
- Huge contributions to (but not only):
 - Open source routing protocol daemons
 - Open source tools
 - Wireless Commons Manifesto



freifunk.net

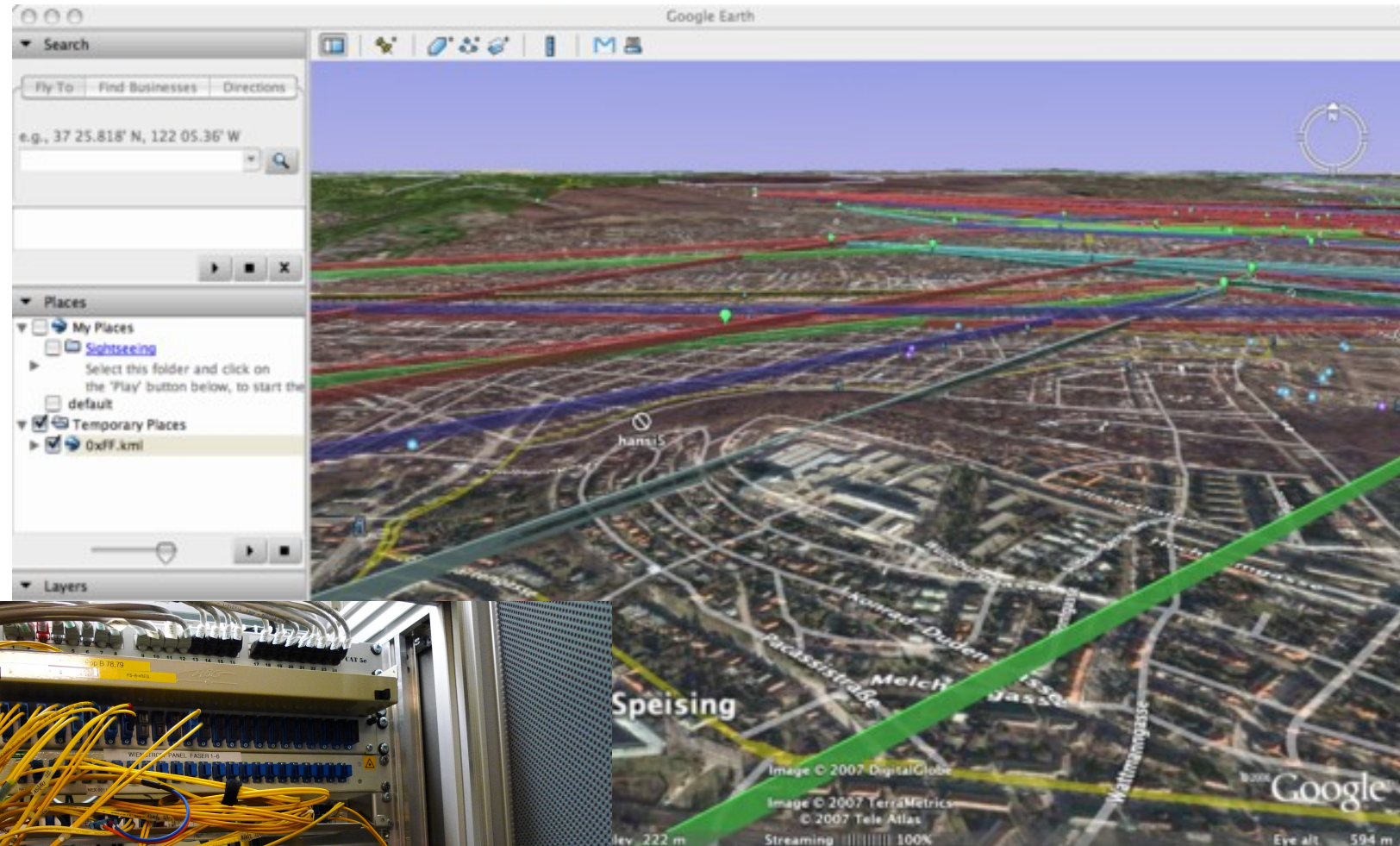




OxFF

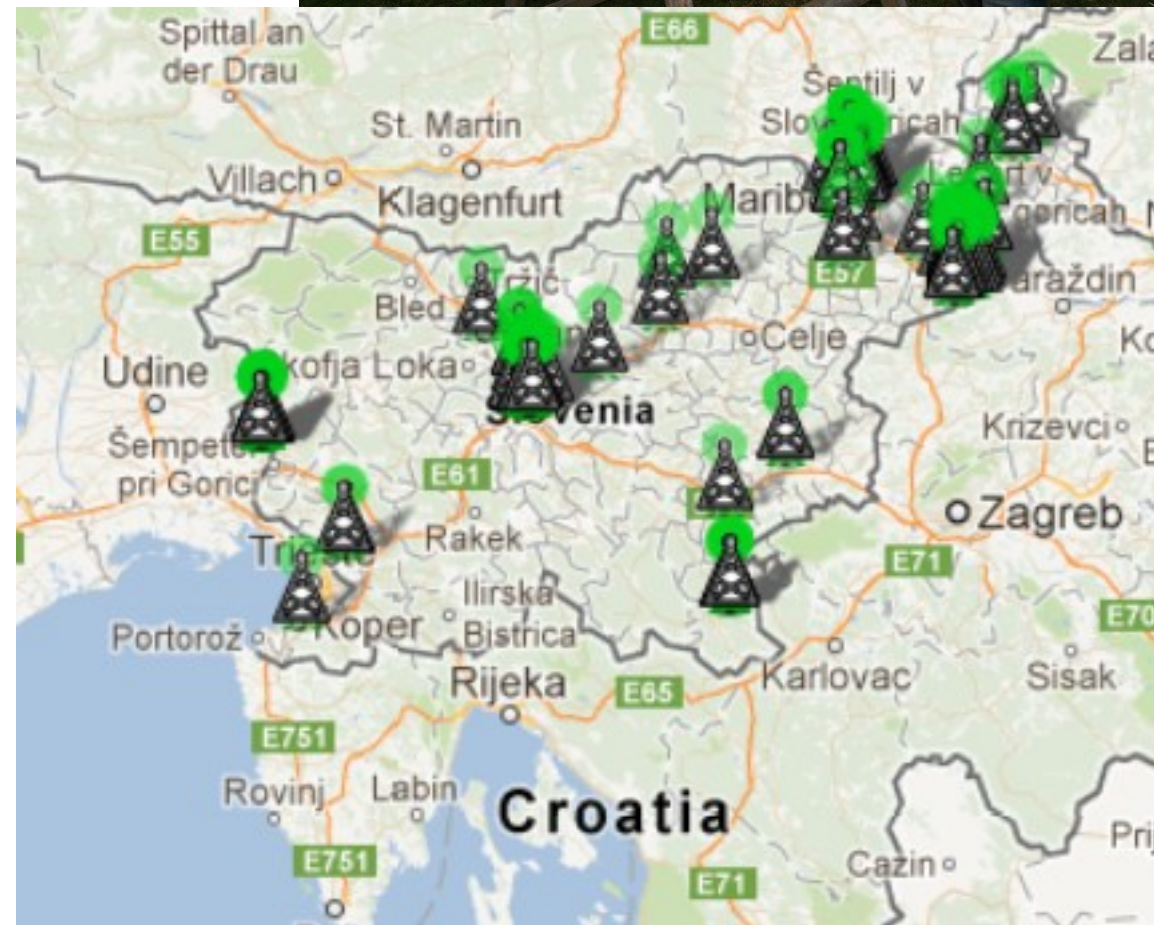
FUNKFEUER
FREE NET

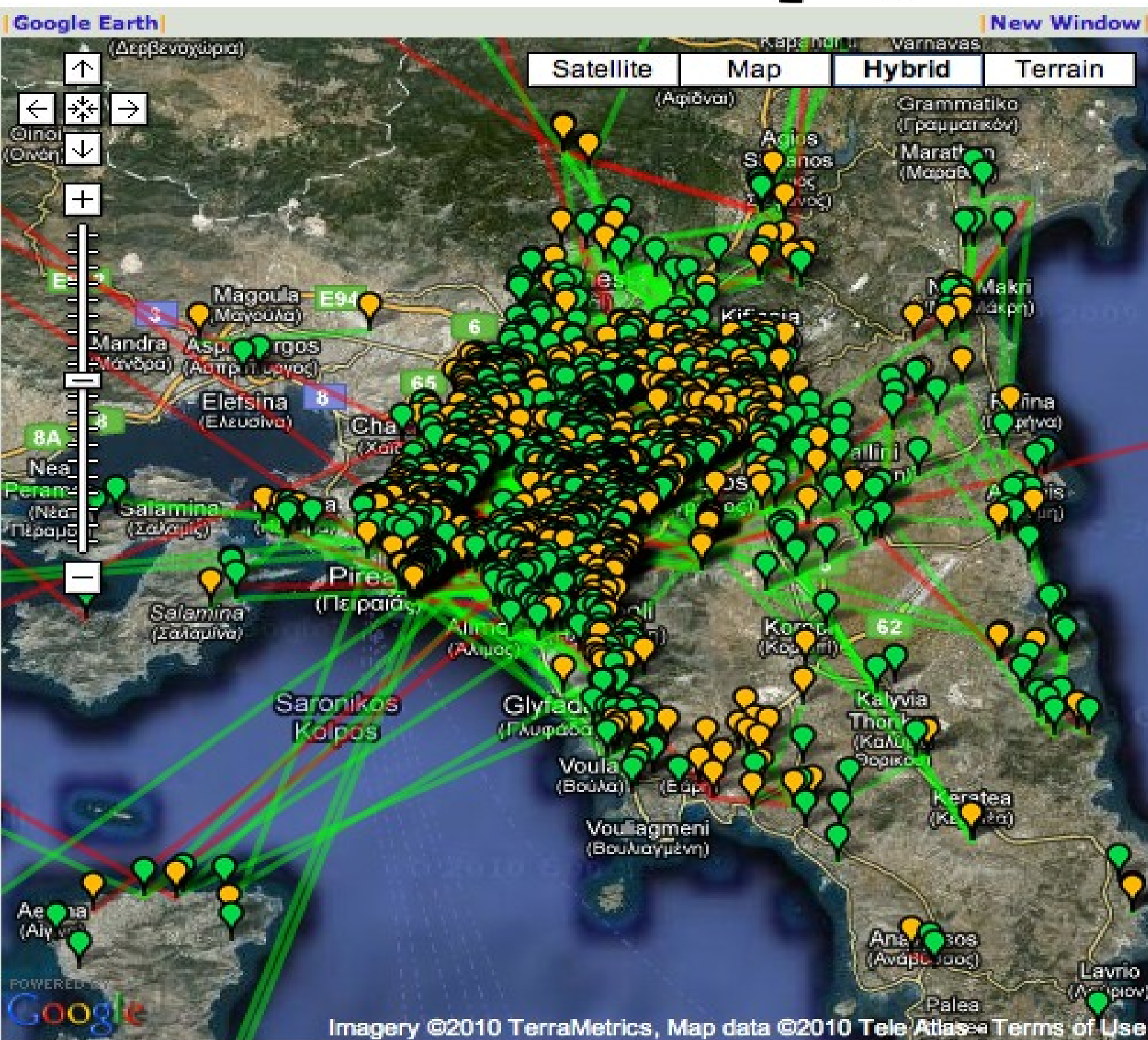
- Funkfeuer: Vienna, Graz
- IPv6 Mesh



Ljubljana+Slovenija – wlan slovenija

- WLAN Slovenija
- Towards a cross-border network



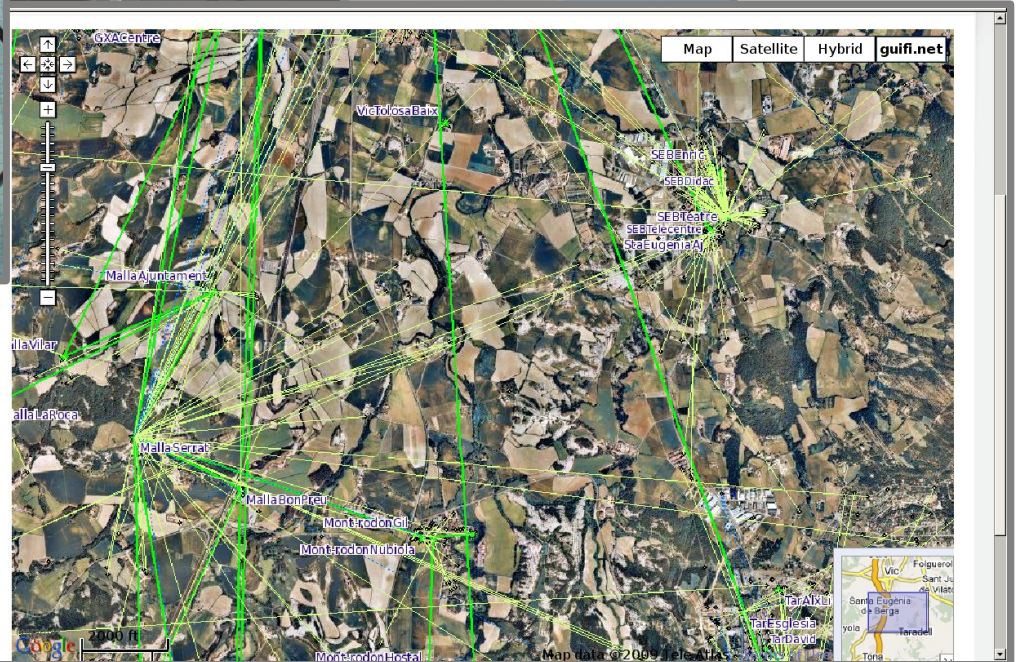


Athens Wireless Metropolitan Network (Greece)

2394/11222 active nodes
1169 backbone nodes
2739 links
789 access points
759/834 active services



Catalunya – Guifi.net

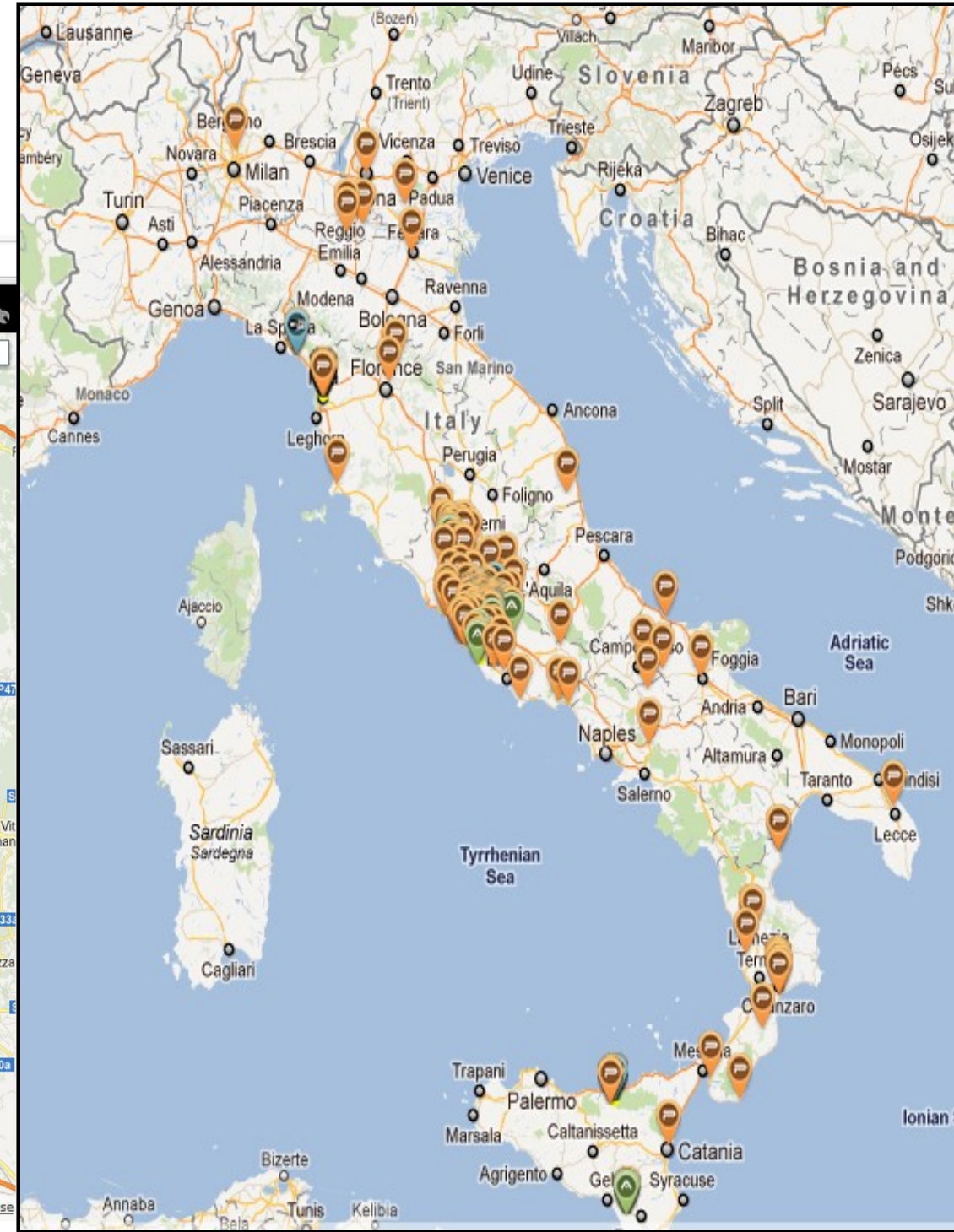
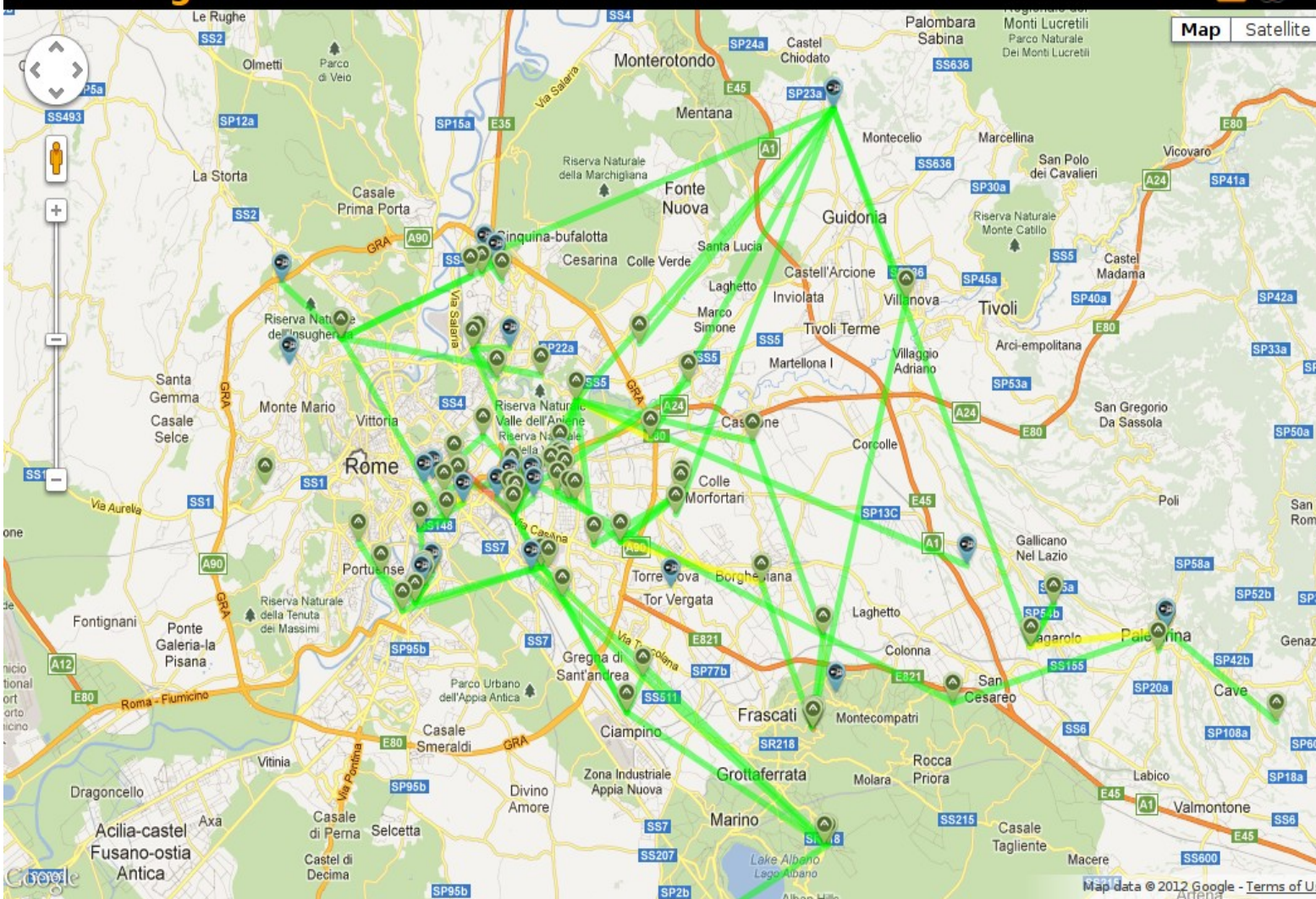




WIRELESS COMMUNITY NETWORK

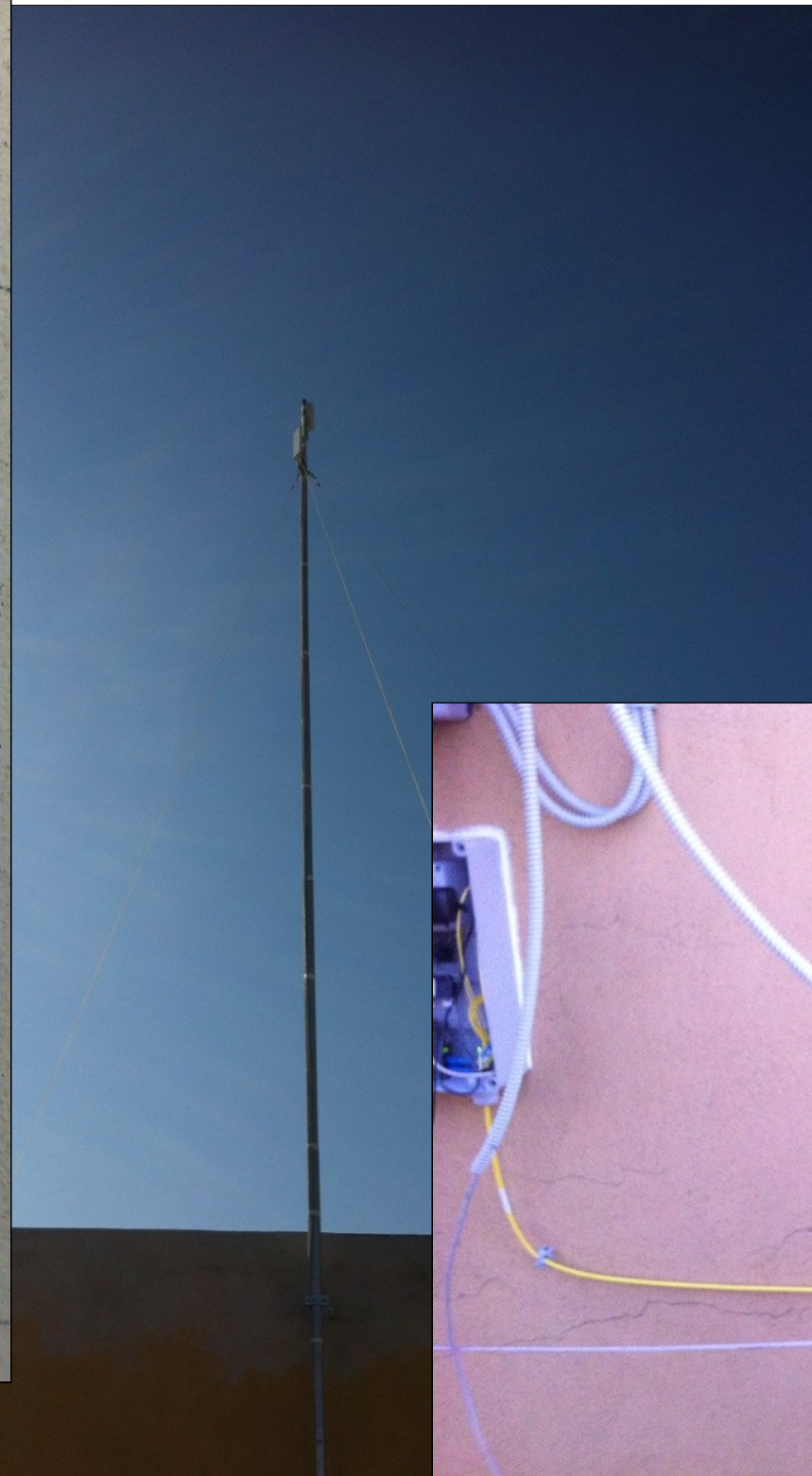
map.ninux.org

Ninux.org Nodi Attivi: 141 Hotspots 39 Nodi Potenziali: 502 Link Attivi: 123 (480 km)





IPv6 Autonomous System



- IPv6
- BGP (ASN 197835)





Internal Services



XMPP

NINUTU XOO!

Ricerca:

go!

Software Projects

github
SOCIAL CODING

OrazioPirataDelloSpazio | Dashboard | Inbox 118 | Account Settings | Log Out

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ninuxorg (Ninux.org - Wireless Network Community) | You are an owner of this Organization! | Edit ninuxorg's Profile

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Email: contatti@ninux.org
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Location: Italy
Member Since: Feb 23, 2011

7 Public Repos | 0 Private Repos | 11 Members

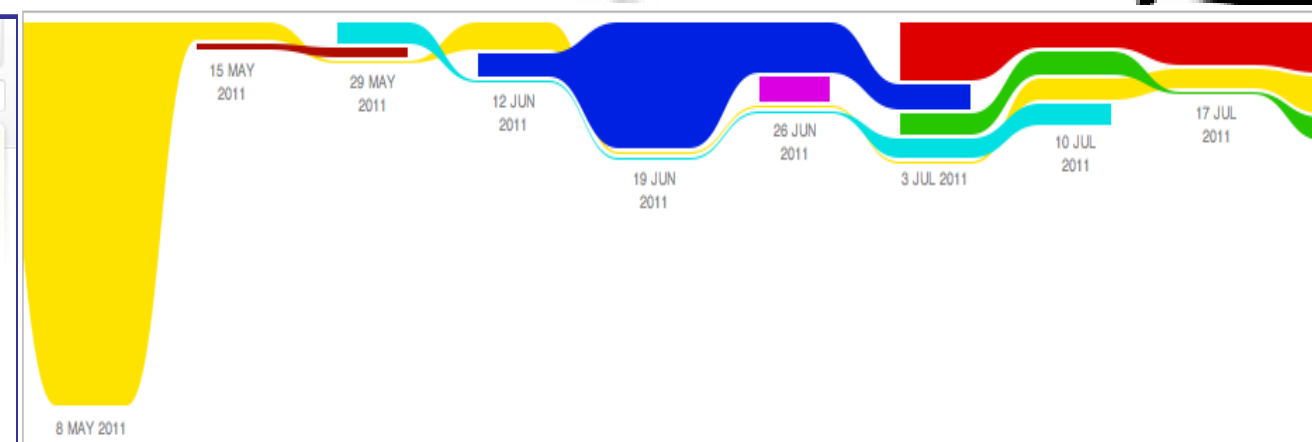
Repositories (7)

Find a repository...

All Repositories | Public | Private | Sources | Forks

nodeshot | JavaScript | 9
Wireless Community MapServer easy to use
Last updated 2 days ago

ninuxoo | Python | 2
Forked from c4u2/ninuu
ninux web search engine
Last updated November 10, 2011



List of hosted projects

Project Name	Description
autoconf	
cafone	
facebook-bot	
freenux	Scripts to share with neighbors an ADSL connection, using packet schedulers
graphics	Misc graphic stuff of ninux
irss	A moinmoin plug-in to have an rss feed related to a page
merpa	Mesh Routing Probe Analyser
ninuxdyndns	Ninux Dynamic DNS
obamp-netkitlab	
openpursuit	A web-based nerd game using Django platform
packages/ninux-ipkg-webiftheme	Ninux.org Community Webif Theme Packag
packages/nowolfsplash	A captive portal written in LUA
packages/olrs-ninux	Olsr daemon for ninux mesh network
packages/sar	Strong Anonymous Router
packages/zzz-ninux-ipkg-<arch>	Meta package to recompile ninux firmware
pgp-pp	PGP Permanent Party
say	mDns repeater
Tracker2GMaps	Draw data sent by the TZ-GT01 on the web with Google Maps
wardriving-ng	
xtables-addons	Implementation of loose/strict source routing in kernelspace as an xtables addon



Events



LAN PARTY

OPENARENA URBANTERROR

2 DICEMBRE 2011

@FUSOLAB
Via Giorgio Pitacco, 29
ROMA (Preneestina)

inizio ore 18:00 - ingresso gratuito

LABORATORIO CREATIVO FUSOLAB
VIA G. PITACCO, 29



Wireless Community Weekend

- **Wireless Community Weekend**
 - Yearly event
 - **C-base, Berlin, Terra**
 - Community networks enthusiasts
 - Developers
 - Barbecue!



Wireless Battlemesh

- **Wireless BattleMesh**
 - Paris, Brussels, Italy, Catalunya, Athens. Next: Denmark
 - **Challenge between routing protocols**
 - Developers, WCN activists, enthusiasts



- www.ninux.org
- contatti@ninux.org
- map.ninux.org
- twitter: @ninuxorg
- github.com/ninuxorg
- www.battlemesh.org
- www.freifunk.net
- www.funkfeuer.at
- www.guifi.net
- www.awmn.net
- ...

