Experiences and Research in Community Networking:

Community-Lab.net and Guifi.net

http://confine-project.eu
http://community-lab.net

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Community networks?

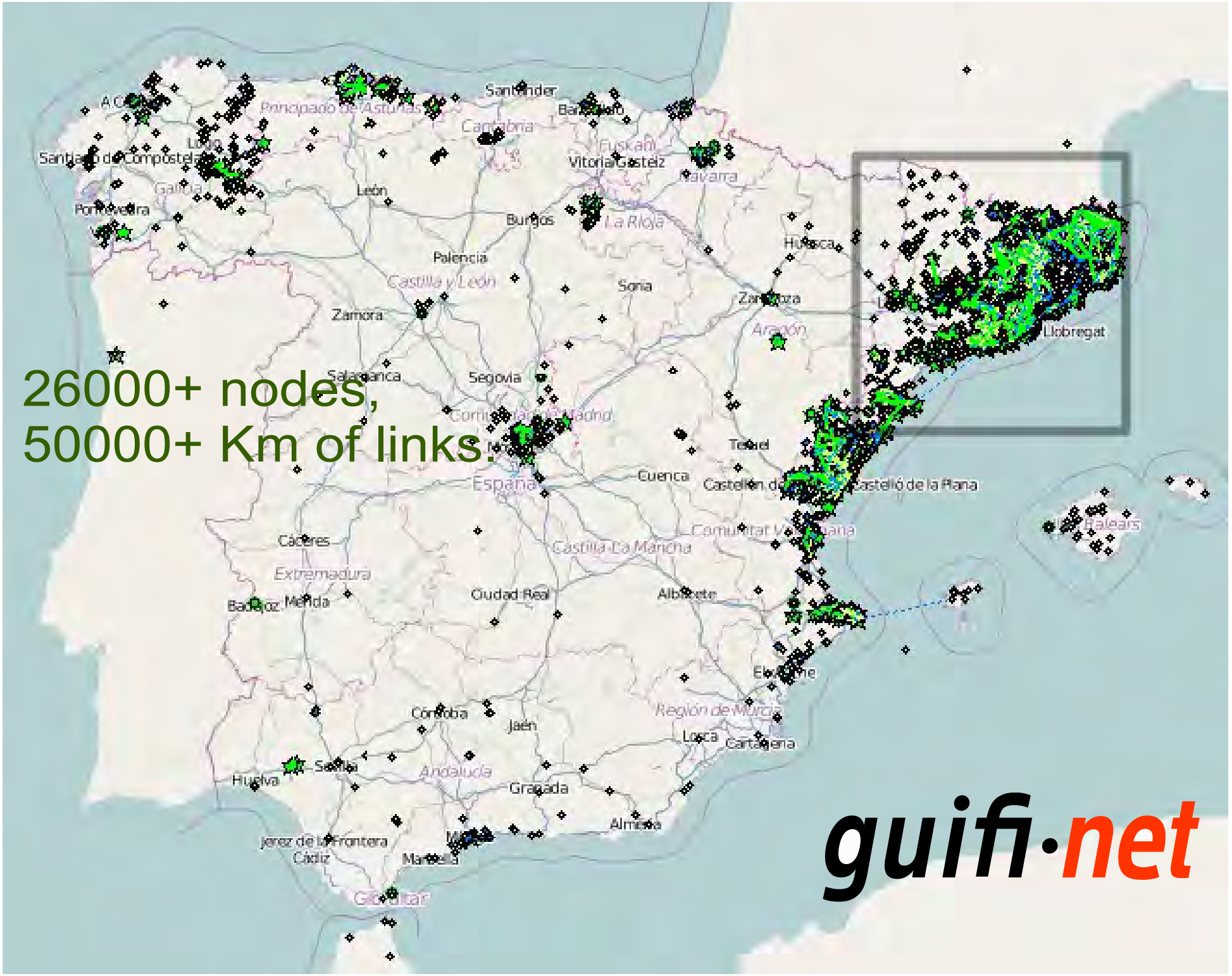
- Digital Society for 7B people
- Multiple models may be needed
- Local communities have their own digital infrastructures = local development
- Not just pipes, socio-economics: participation, crowdsourcing, businesses, sustainability

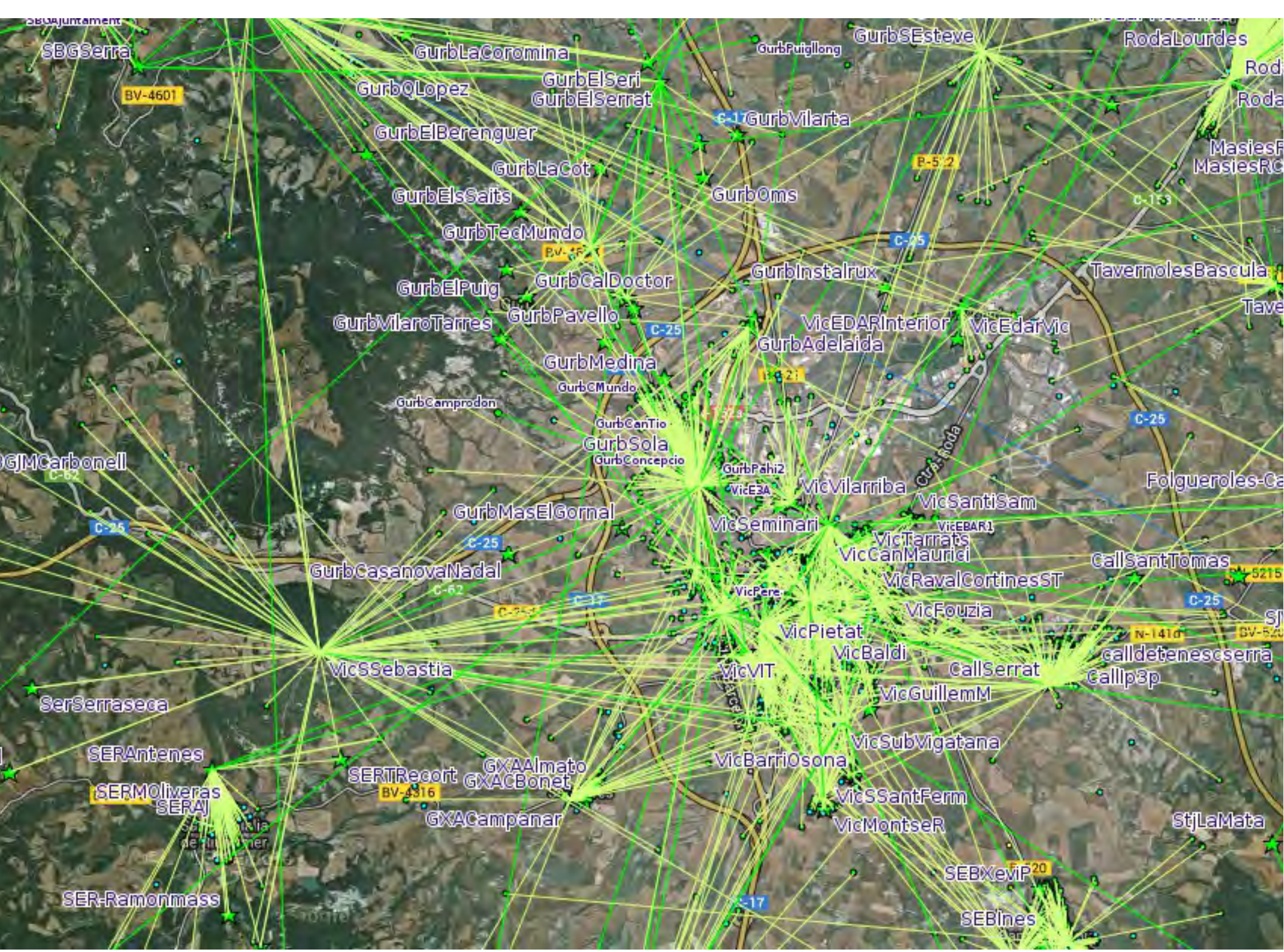
Community networks!

- What: A cooperative local net infrastructure
- Where: local, community (city, region, area)
- Who: You, neighbors, build and operate it

→ Commons pool resource:
“Don't buy the network, be the network!”

- Self-organized and decentralized IP networks and services built and operated by citizens for citizens


26000+ nodes,
50000+ Km of links.
guifi·net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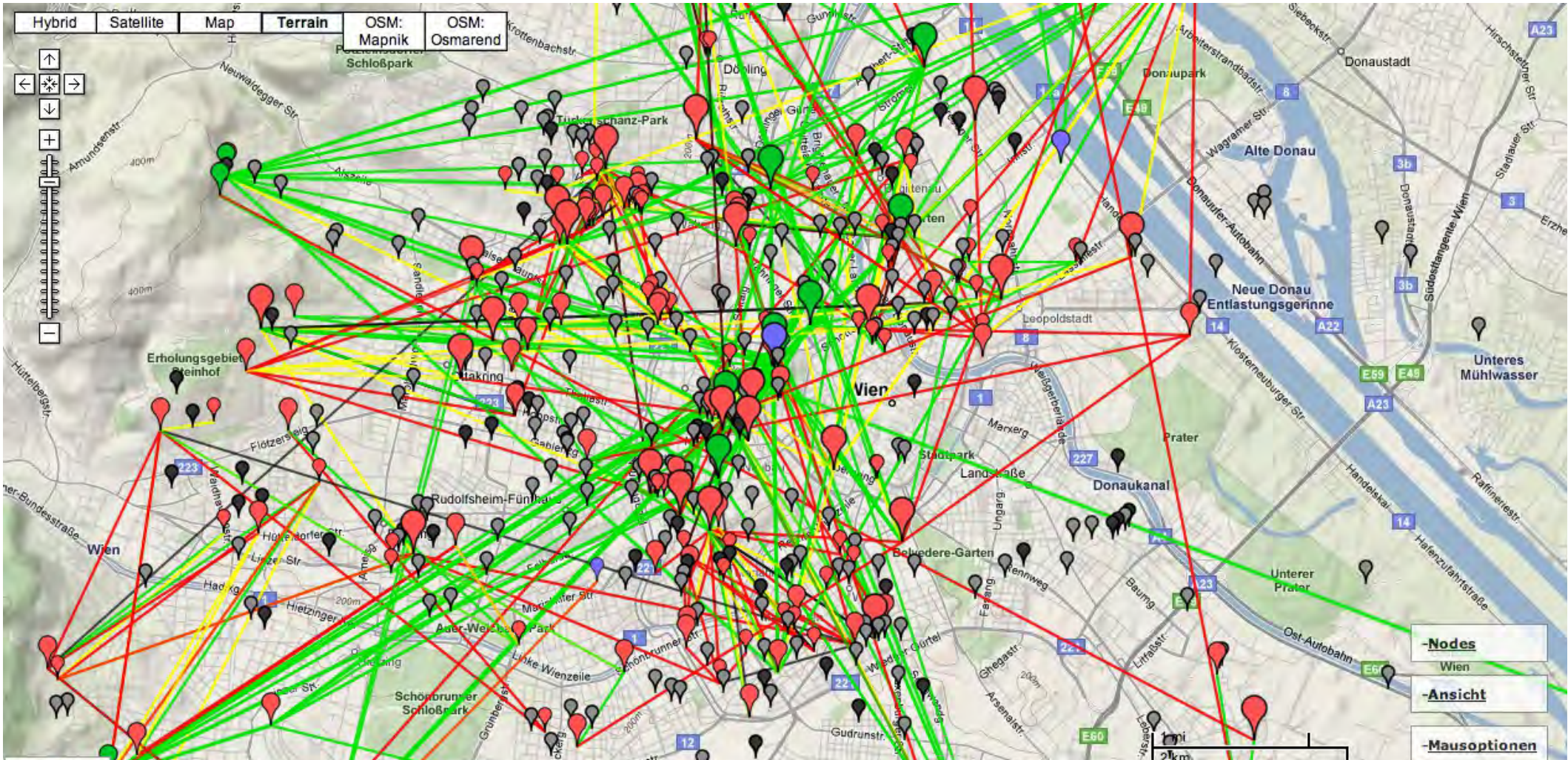
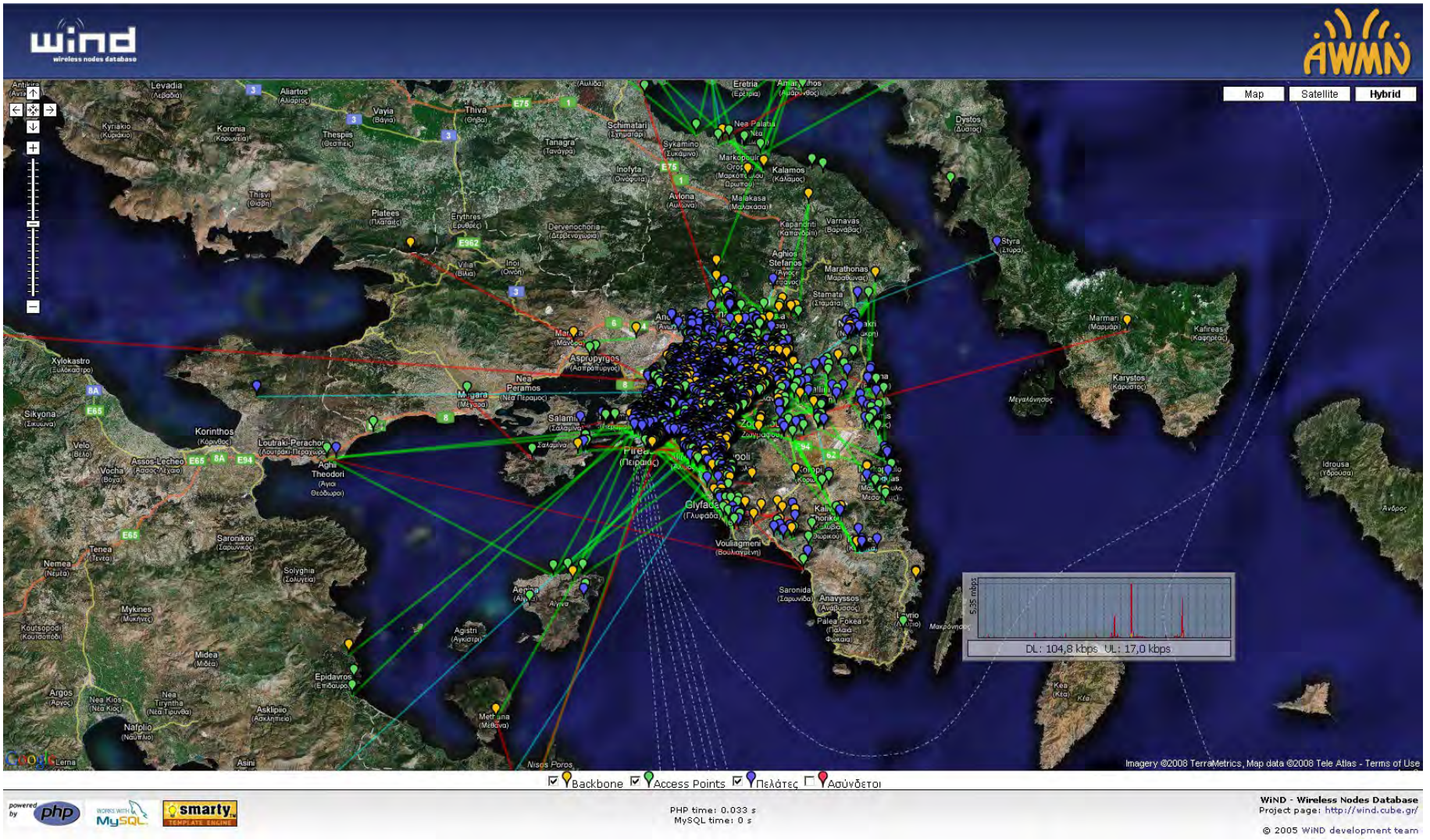
GurbVilarta
GurbLaCot
GurbElsSaits
GurbOms
GurbTecMundo
GurbElPuig
GurbCalDoctor
GurbInstalrux
TavernolesBascula
GurbVilaroTarres
GurbPavello
VicEDARInterior
VicEdarVic
GurbAdelaida
GurbMedina
GurbCMundo
GurbCamprodon
GurbCanTio
GurbSola
GurbConcepcio
GurbPahi2
VicE3A
VicVilarriba
VicSantiSam
VicEBAR1
VicSeminari
VicTarrats
VicCanMaurici
GurbMasElGornal
GurbCasanovaNadal
CallSantTomas
VicRavalCortinesST
VicPere
VicFouzia
VicPietat
VicBaldi
VicSSebastia
VicVIT
CallSerrat
CallIp3p
VicGuillemM
SerSerraseca
VicSubVigatana
SERAntenes
VicBarriOsona
GXAAlmato
GXACBonet
SERTRecort
SERMOliveras
SERAJ
VicSSantFerm
GXACampanar
VicMontseR
StjLaMata
SEBXeviP
SER-Ramonmass
SEBInes
Folgueroles-Ca
C-25
C-17
C-62
N-141d

FunkFeuer

- Around Vienna and Austria



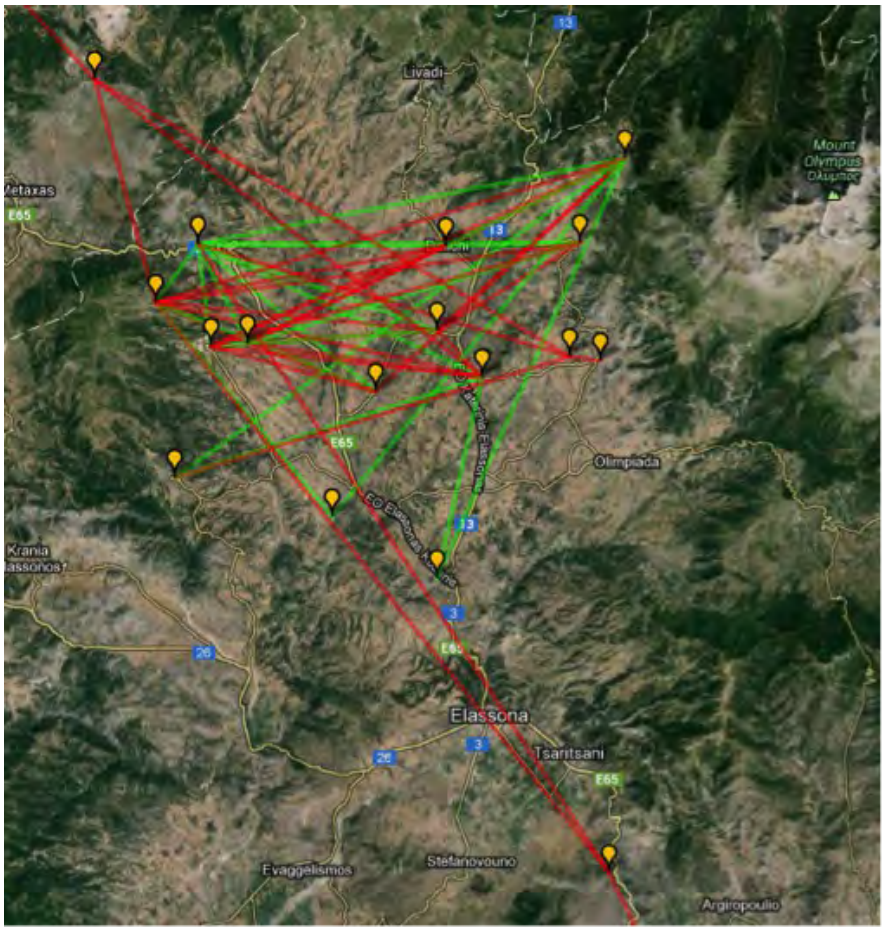
Athens Wireless Metropolitan Network



- A network of computers connected without wires, created by a community of geeks, radio amateurs and fans in Italy
- Stats: 305 nodes, 1763 planned, 30 hotspots

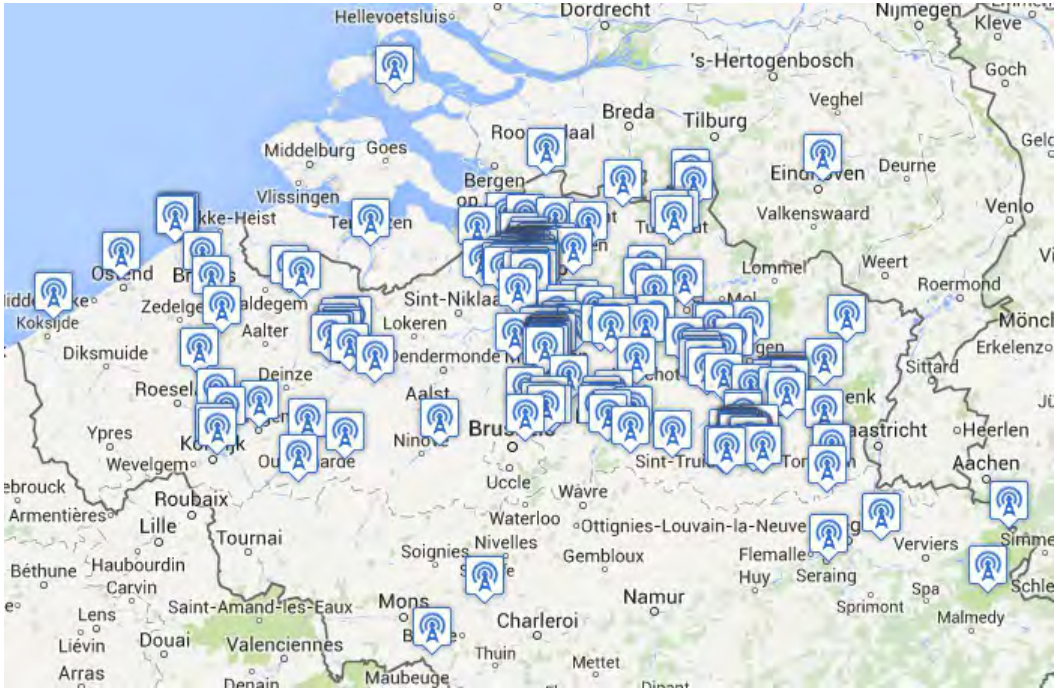
Sarantaporo.gr

- Sarantaporo village – and its fifteen surrounding villages, located in Elassona Municipality, Greece
- Since 2010,
  15 municipalities,
  160 nodes



Wireless België

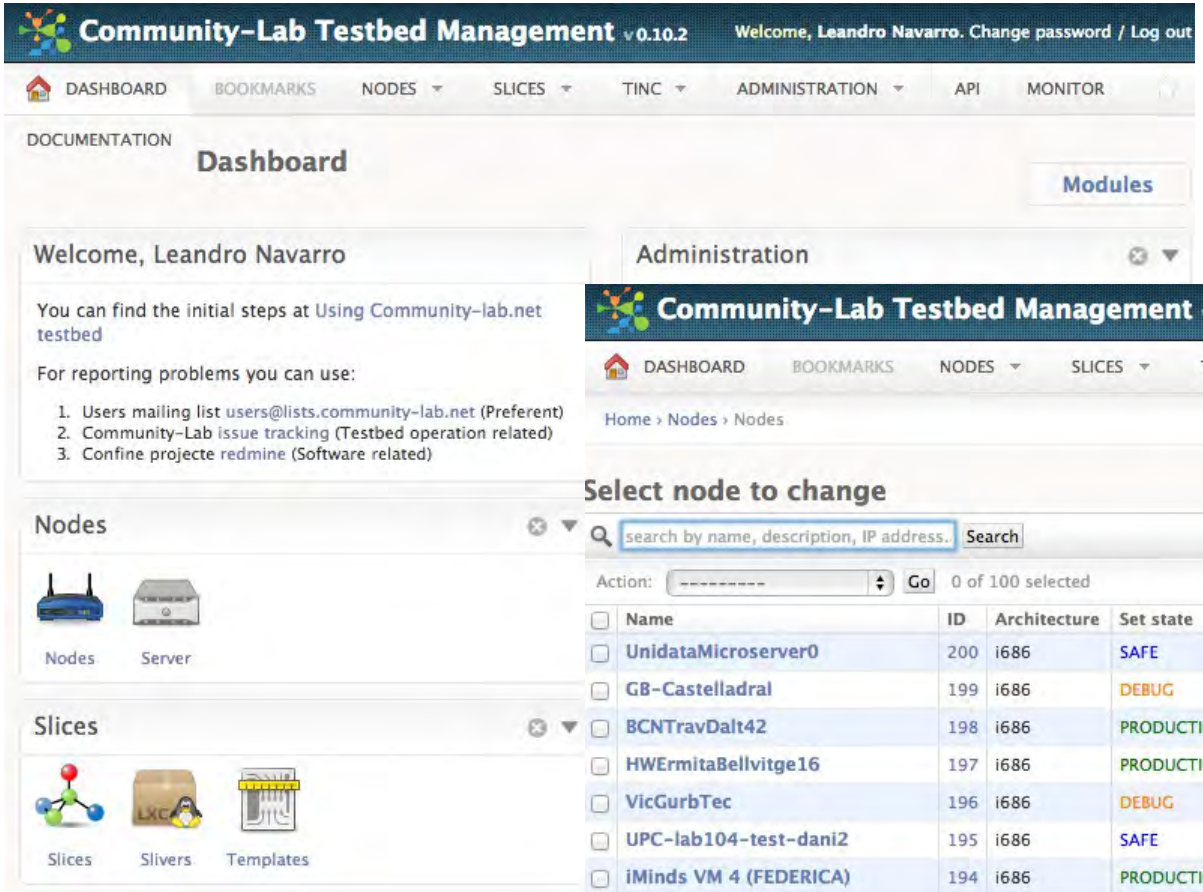
- Around Belgium and Netherlands
- Collaboration with Antwerpen U (iMinds)
- Since 2004, around 600 nodes

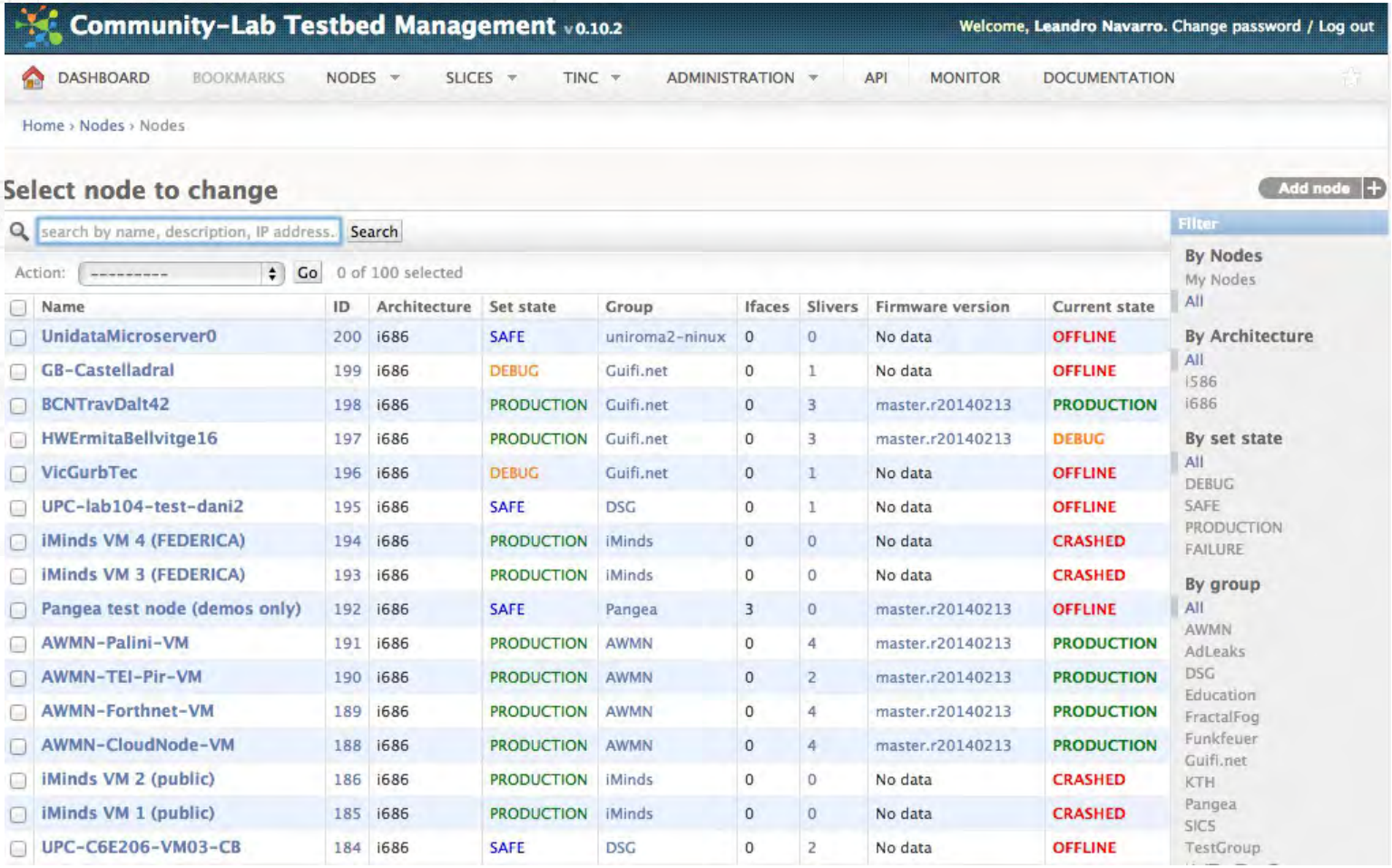


Community-Lab.net

- An open, distributed infrastructure for experimentation with Community Networks 
- A testbed with nodes and links embedded in community networks, many people too
  - *Research Devices* (hosts) connected to *Community Devices*
- A realistic environment for experimentation with the best and worst of real community networks

Community-Lab portal





Experiments

- Nearly passive: working with large open data traces
- Active experiments
  - Disruptive: Testing a new mechanisms
  - “Normal” traffic: Testing realistic conditions
  - Long-term running services (crowdsourcing)
- Social experiments
  - A large social community active in communication, coordination, collaboration

Technological experiments

Network level and below:

- Open data graph analysis: computer network
- Hybrid nodes with Ethernet attached radios (DLEP)
- Mesh routing: development of OLSRv2, BMX6
- Evolution of mesh routing: receiver-driven routing, multi-topology, power adaptation (MinstrelBlues)
- Resilience and Byzantine nodes in mesh routing
- Network virtualization/SDN for testbed and CN

Technological experiments

Application level:

- Sharing Internet access LBE
- Video streaming (PeerStreamer)
- CN routers (qMp) and cloud services (Cloudy)
- Interference, anomalies in experiments and services
- Privacy preservation: whistleblowing
- Network layer anonymisation
- Information-centric networking

Social experiments

Work with real communities:

- Analysis: topology, traffic, participation
- Social incentives
- Low-power networks in developing regions
- Community building
- Schools for local community development
- Analysis of sustainability factors

Community-Lab consortium: joining

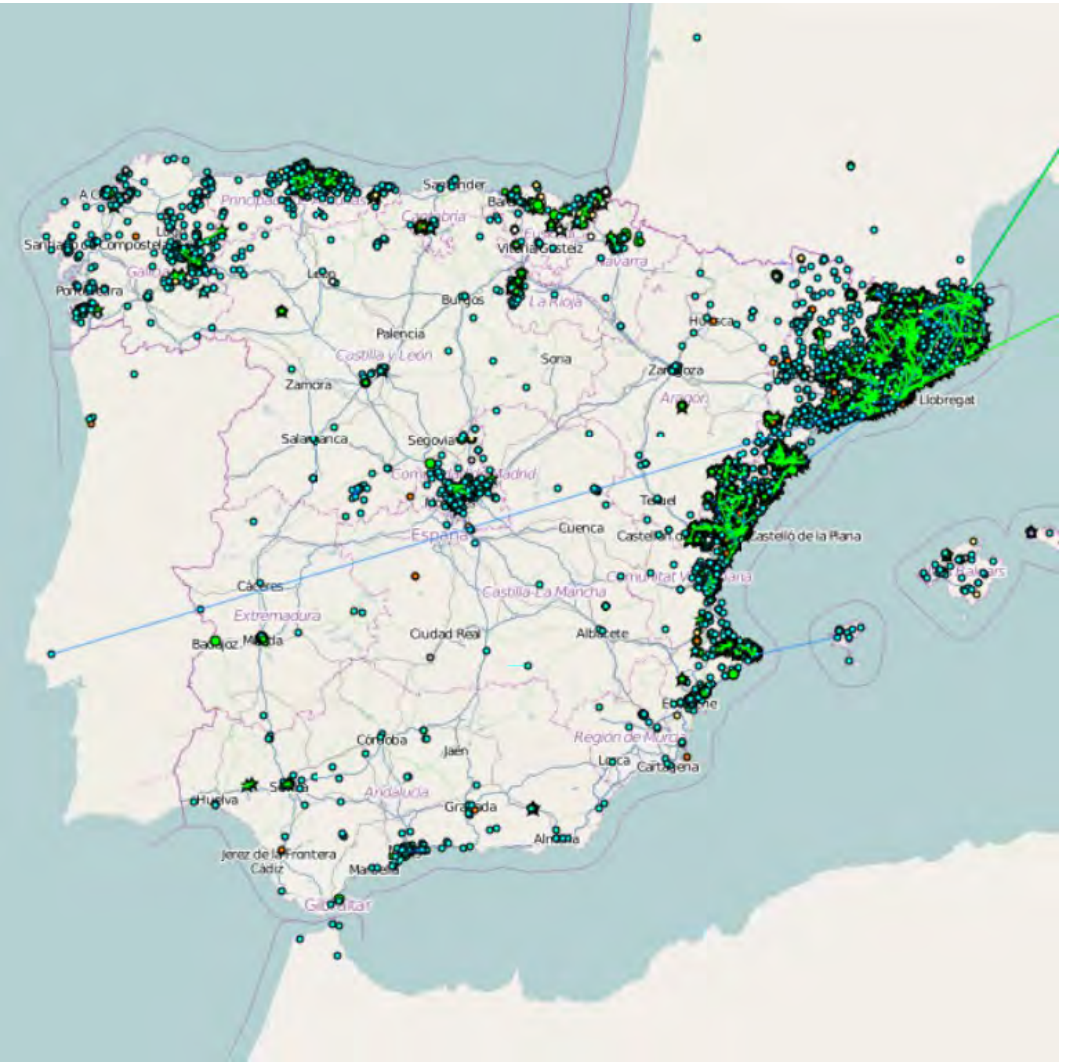
- Communities, Researchers
  - Accept the Acceptable Usage Policy
  - Register in community-lab.net, join mailing list

- Researchers and communities together:

  A couple of research devices embedded in a community network + local informal maintenance

guifi·net


2010/02/04 18:20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Vitoria-Gasteiz
Navarra
Burgos
La Rioja
Palencia
Castilla y León
Soria
Zamora
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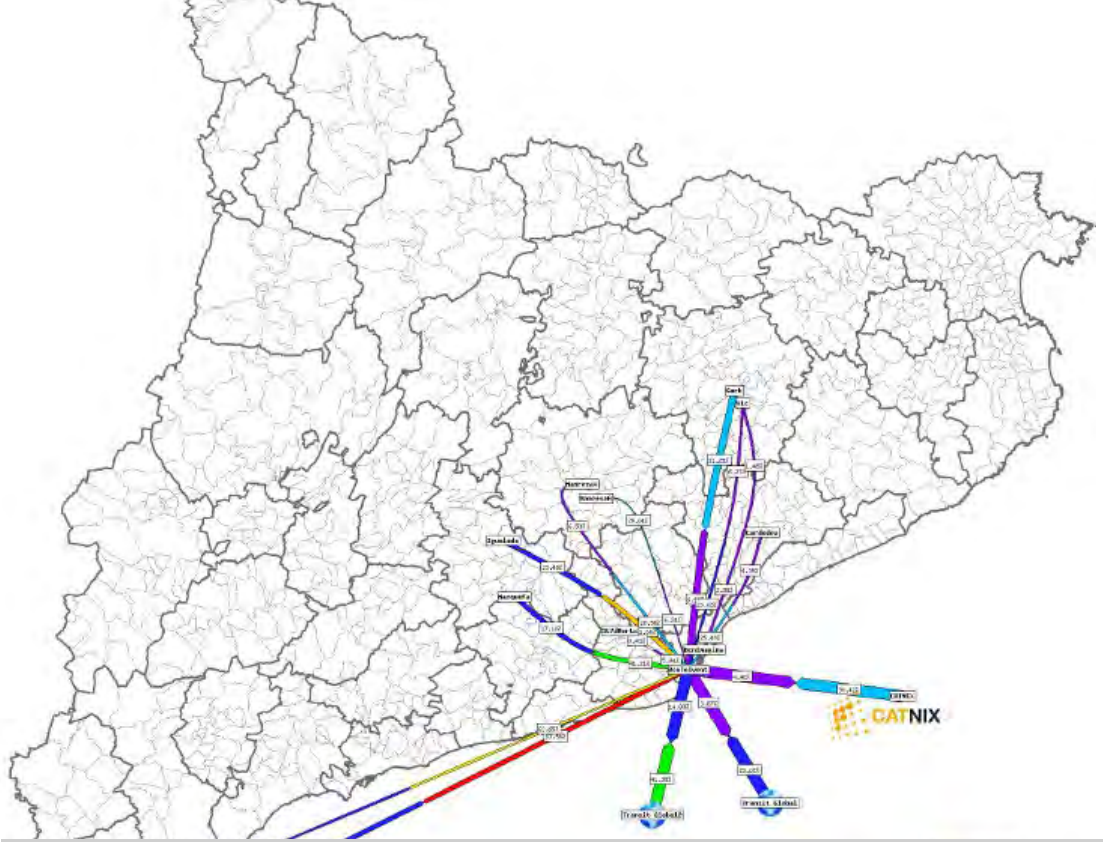
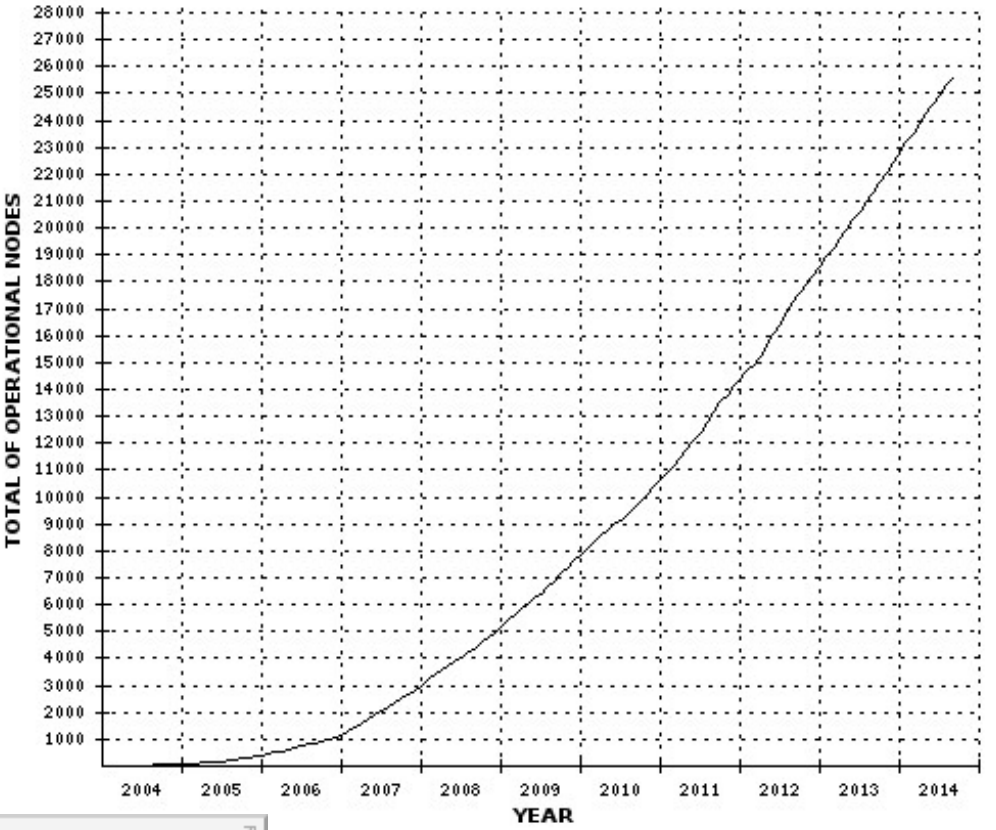
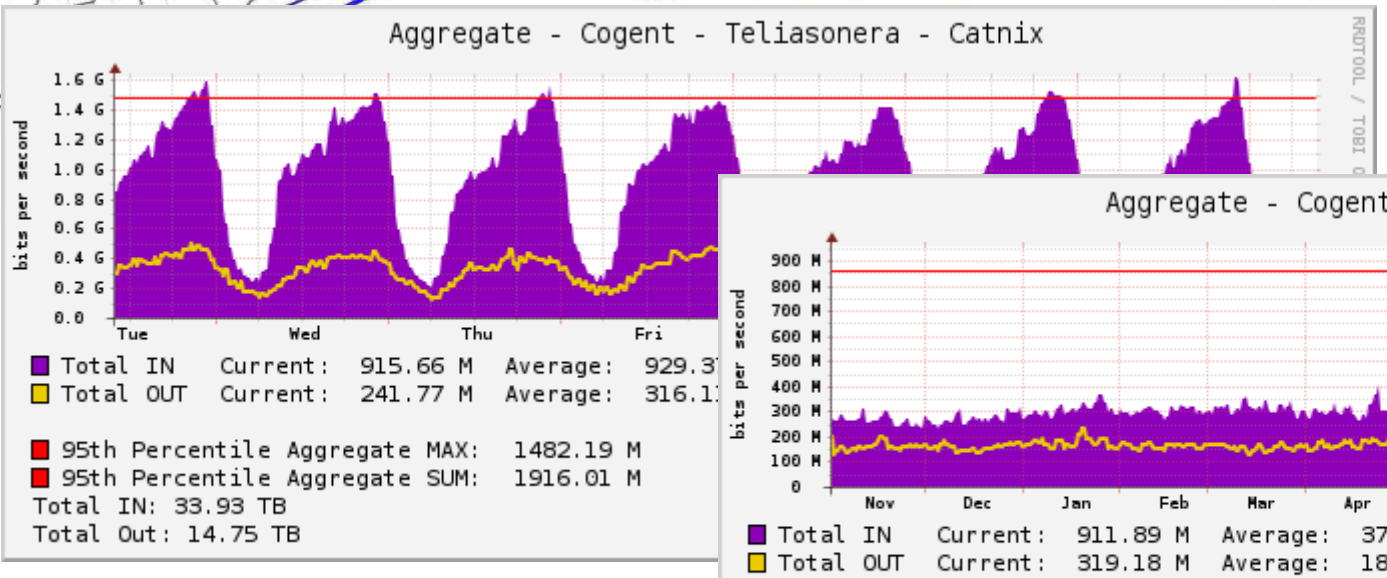
Aragón
Lleida
Salamanca
Segovia
Madrid
Teruel
Cuenca
Castelló de la Plana
Cáceres
Extremadura
Castilla-La Mancha
Ciudad Real
Albacete
Córdoba
Jaén
Región de Murcia
Lorca
Cartagena
Huelva
Andalucía
Granada
Almería
Jerez de la Frontera
Cádiz
Málaga
Gibraltar


CATNIX


TOTAL OF OPERATIONAL NODES
28000
27000
26000
25000
24000
23000
22000
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
YEAR


Aggregate - Cogent - Teliasonera - Catnix
bits per second
1.6 G
1.4 G
1.2 G
1.0 G
0.8 G
0.6 G
0.4 G
0.2 G
0.0
Tue
Wed
Thu
Fri
Total IN Current: 915.66 M Average: 929.3
Total OUT Current: 241.77 M Average: 316.1
95th Percentile Aggregate MAX: 1482.19 M
95th Percentile Aggregate SUM: 1916.01 M
Total IN: 33.93 TB
Total Out: 14.75 TB
RRDTOOL / TOBI

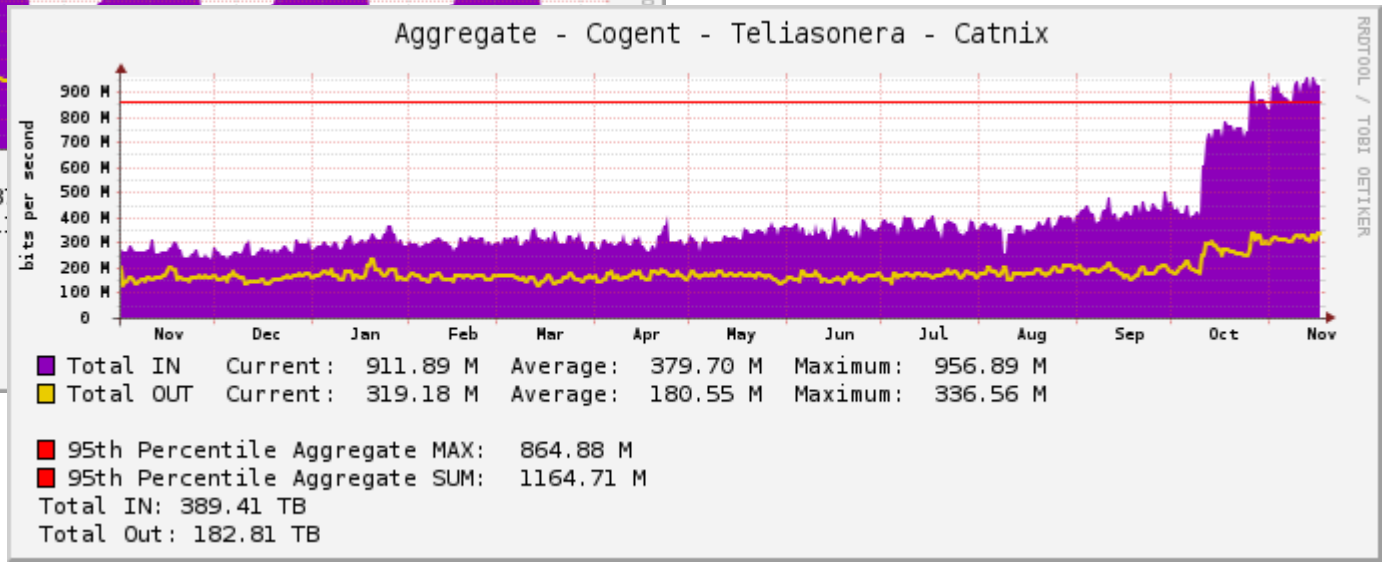
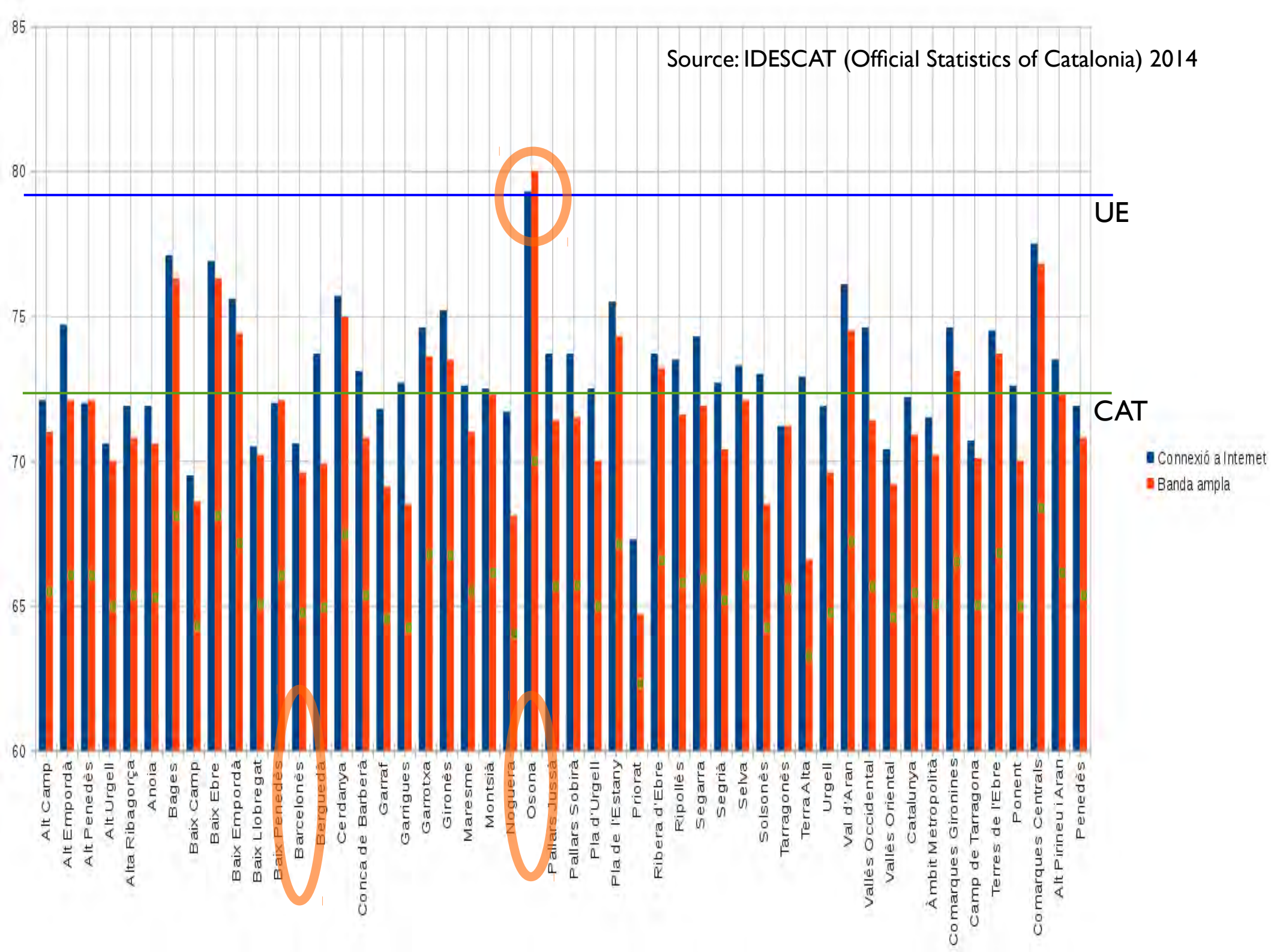

Aggregate - Cogent - Teliasonera - Catnix
bits per second
900 M
800 M
700 M
600 M
500 M
400 M
300 M
200 M
100 M
0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Total IN Current: 911.89 M Average: 379.70 M Maximum: 956.89 M
Total OUT Current: 319.18 M Average: 180.55 M Maximum: 336.56 M
95th Percentile Aggregate MAX: 864.88 M
95th Percentile Aggregate SUM: 1164.71 M
Total IN: 389.41 TB
Total Out: 182.81 TB
RRDTOOL / TOBI OETIKER

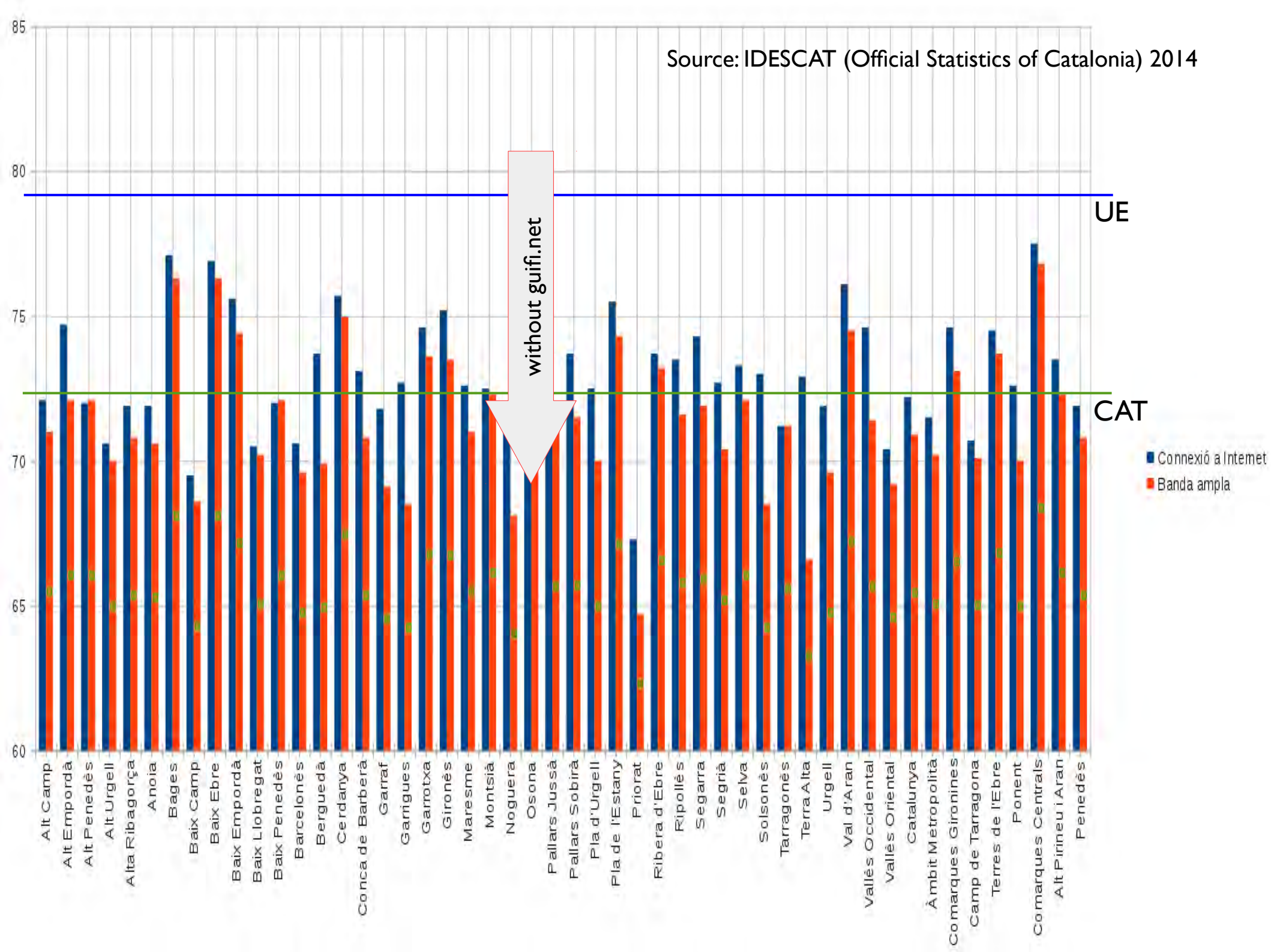
Table 2: guifi.net CAPEX estimation (Sep. 2014)

		Quantity [u.]	Estimated average cost [€/u.]	Total [€]
	WiFi node	25,500	250	6,375,000
	OF node	100	250	150,000
	PoPIX	12	2,750	33,000
Commons				**6,558,000**
	PoPIX	12	2,750	33,000
Interconnection				**33,000**
TOTAL				**6,591,000**

Table 3: guifi.net OPEX estimation (Sep. 2014)

		Quantity [u.]	Estimated average cost [€/u./month]	Total [€/month]
	WiFi node	25,500	8	204,000
	OF node	100	8	800
	PoPIX	12	300	3,600
Commons				**208,400**
	Proxies	100	60	6,000
	PoPIX	12	300	3,600
	CATNIX	1	600	600
	Uplink	2	1,000	2,000
	Colo Bar	1	1,500	1,500
	Colo Vic	1	200	200
	RIPE-NCC	1	150	150
	Provi.	1	4,000	4,000
	admin.	1	1,500	1,500
	techn.	1	1,500	1,500
	Insura.	1	70	70
Interconnection				**11,050**
TOTAL				**228,650**


Source: IDESCAT (Official Statistics of Catalonia) 2014
UE
CAT
Connexió a Internet
Banda ampla
85
80
75
70
65
60
Alt Camp
Alt Empordà
Alt Penedès
Alt Urgell
Alta Ribagorça
Anoia
Bages
Baix Camp
Baix Ebre
Baix Empordà
Baix Llobregat
Baix Penedès
Barcelonès
Berguedà
Cerdanya
Conca de Barberà
Garraf
Garrigues
Garrotxa
Gironès
Maresme
Montsià
Noguera
Osona
Pallars Jussà
Pallars Sobirà
Pla d'Urgell
Pla de l'Estany
Priorat
Ribera d'Ebre
Ripollès
Segarra
Segrià
Selva
Solsonès
Tarragonès
Terra Alta
Urgell
Val d'Aran
Vallès Occidental
Vallès Oriental
Catalunya
Àmbit Metropolità
Comarques Gironines
Camp de Tarragona
Terres de l'Ebre
Ponent
Comarques Centrals
Alt Pirineu i Aran
Penedès


Source: IDESCAT (Official Statistics of Catalonia) 2014
85
80
75
70
65
60
UE
CAT
without guifi.net
Connexió a Internet
Banda ampla
Alt Camp
Alt Empordà
Alt Penedès
Alt Urgell
Alta Ribagorça
Anoia
Bages
Baix Camp
Baix Ebre
Baix Empordà
Baix Llobregat
Baix Penedès
Barcelonès
Berguedà
Cerdanya
Conca de Barberà
Garraf
Garrigues
Garrotxa
Gironès
Maresme
Montsià
Noguera
Osona
Pallars Jussà
Pallars Sobirà
Pla d'Urgell
Pla de l'Estany
Priorat
Ribera d'Ebre
Ripollès
Segarra
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Àmbit Metropolità
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Camp de Tarragona
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Ponent
Comarques Centrals
Alt Pirineu i Aran
Penedès

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Economic Model & Sustainability

Expenses
Income

Type	Shared?	Business mainstream	Speculative?
Proprietary	No. Reseller	Infrastructure + Services	Yes. Sometimes a stronger driver than the business mainstream
Commons	Always	Services	**NO**

TCO over 12 years

	Service specs	Setup	Initial fee	Duration	Final fee	**TCO 12 years**
Movistar ES	100/10	0€	53,58€	1 year	65,68€	**10.889,03€**
Orange FR	200/50	299€	39,9€	0	39,9€	**6.168,92€**
guifi.net CAT	Max.(1G Sym.)	300€	53,00€	5 year	24,2€	**6.093,60€**

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Commons Governance

Based on "FONN Compact"

- **Users free to choose services & providers**
- **Concurrency of services & providers**

  operating on he same infrastructure
  - Providing services & contents
  - Building & Maintaining infrastructure

How?

(proprietary operators argue that this is not possible...)

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Inspiration

Elinor «Lin» Ostrom (1933-2012)
Political Economist

- **2009 Nobel Prize in Economics 2009**

The whip against the «tragedy of the commons» :-)

Design principles for CPR Institutions

(CPR=Common Pool Resource)

Ostrom identified eight "design principles" of stable local common pool resource management:

1. **Clearly defined boundaries** (effective exclusion of external un-entitled parties);
2. Rules regarding the appropriation and provision of common resources that are **adapted to local conditions**;
3. Collective-choice arrangements that **allow most resource appropriators to participate in the decision-making process;**
4. **Effective monitoring** by monitors who are part of or accountable to the appropriators;
5. A scale of **graduated sanctions** for resource appropriators who violate community rules;
6. Mechanisms of **conflict resolution** that are cheap and of easy access;
7. **Self-determination** of the community recognized by higher-level authorities; and
8. In the case of larger common-pool resources, **organization in the form of multiple layers of nested enterprises**, with small local CPRs at the base level.

These principles have since been slightly modified and expanded to include a number of additional variables believed to affect the success of self-organized governance systems, including **effective communication, internal trust and reciprocity, and the nature of the resource system as a whole**.

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Commons Telecoms Governance

Ensuring Networks as a Commons with CPR Governance:

- Open Network Assets Listings, Open Provisioning & Open Monitoring Apps. 1 4
- Foundation as horizontal Layer in absence of conflicts of interest 2 7 8
  - Localization & delegation, collaborative (regular meetings, web site, mailing lists, social networks...)
- Agreements & Service Level Commitments 2 3
  - FONN Compact (Global) & Specific
- Compensation Systems and Investments Recognition 2 5
- Mediation & Conflict Resolution 6
- Best Practices & anti-corruption 2 5

Key to ensure non-discrimination & ethics in business practices

Compensations & Investment Recognition Mechanisms

CAPEX (new infrastructures)

- Wireless & Fiber
  - Establishing a contribution to the coverage (wireless) / Fiber backbone (Fiber)

OPEX (maintenance & upgrades)

- Wireless
  - Compensations by traffic
- Fiber
  - Compensations by circuit

Transparency & Compensations

Example

Totals mensuals per l'any *2014*

Supplier	gen	feb	mar	abr	mai	jun	jul	ago	set	oct	nov	des	Total
[illegible]	2,688.55	461.91	2,999.11	2,999.42	487.58	3,409.20	5,735.93	-	-	-	-	-	18,781.69
[illegible]	-	-	-	853.05	-	-	-	-	-	-	-	-	853.05
[illegible]	6,990.25	2,606.01	3,416.83	1,590.64	396.80	641.30	-	-	-	-	-	-	15,641.84
[illegible]	326.70	36.30	36.30	-	-	-	-	-	-	-	-	-	399.30
													35,675.89

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Compensation Criteria

Ratings to ensure fair rules for all participants according to commitment and involvement

A.- Fully Committed with Commons

- 100% of their activity/investment goes to Commons
- SLA & Commons rules compliant
- **Criteria: Cost Basis**

B.- Occasional Commitment

- Commitment in a case by case
- Some failures with SLA and Commons rules
- **Criteria: Meet investment rate from «A» participants**

C.- No Commitment, absolutely opportunistic

- Not providing any investment, no SLAs at the Commons. Just to take benefit from the Commons
- **Criteria: Meet investment rate from «A» participants, plus a retention to ensure CAPEX**

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