

Italian WiMAX Observatory presentation

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Agenda

Real case comparative 2.5 Ghz and 3.5 Ghz

Conclusions and future challenges

LTE vs Mobile WiMAX

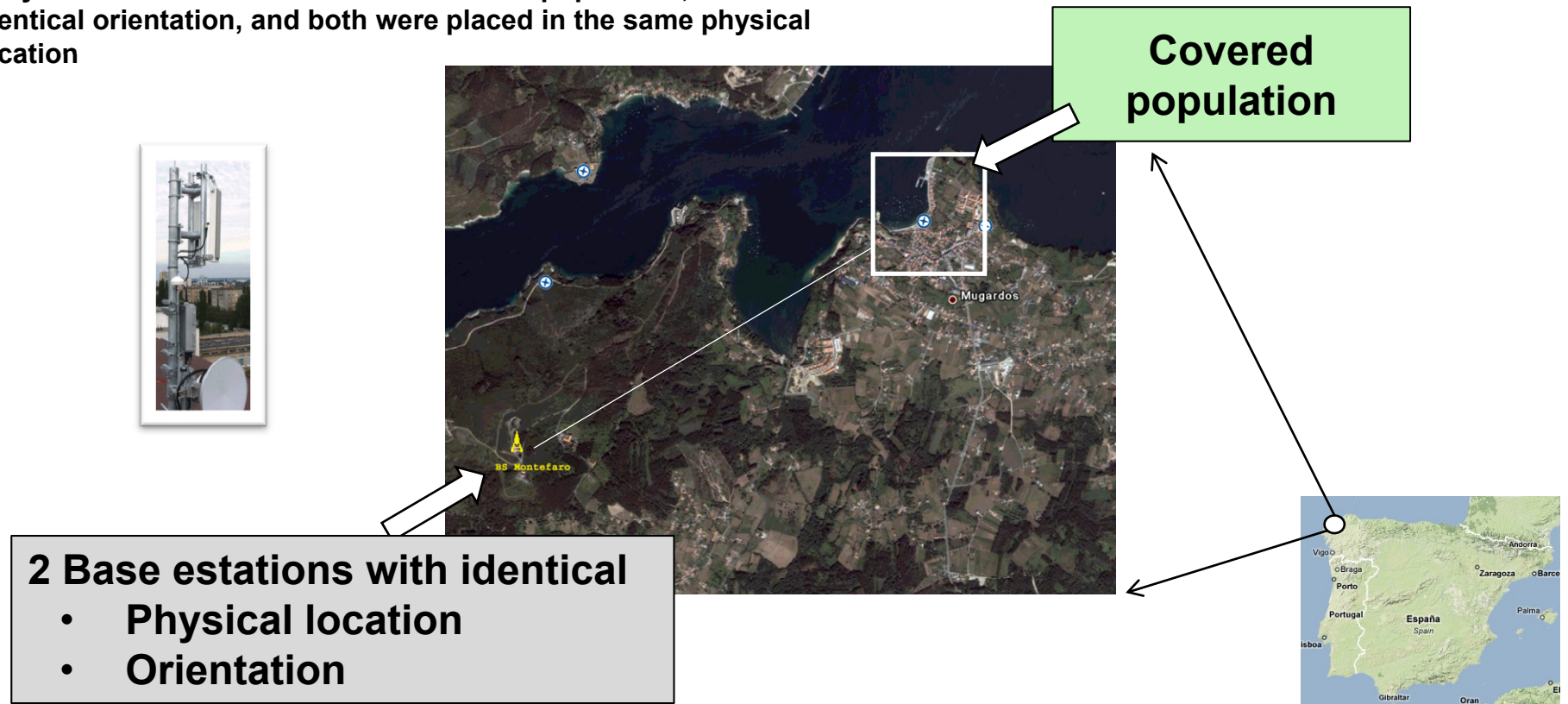
Competences of Codium

Annex

Our hands on experience of 2.5 Ghz vs 3.5 Ghz shows ...

Real case comparative 2.5 Ghz and 3.5 Ghz

- One of the clearest opportunities we have had to analyze the coverage of identical base stations transmitting in the 2,5 Ghz and in the 3,5Ghz is shown below
- They were both oriented towards the same population, had the identical orientation, and both were placed in the same physical location
- The population covered was in north west of Spain
- It was a small town

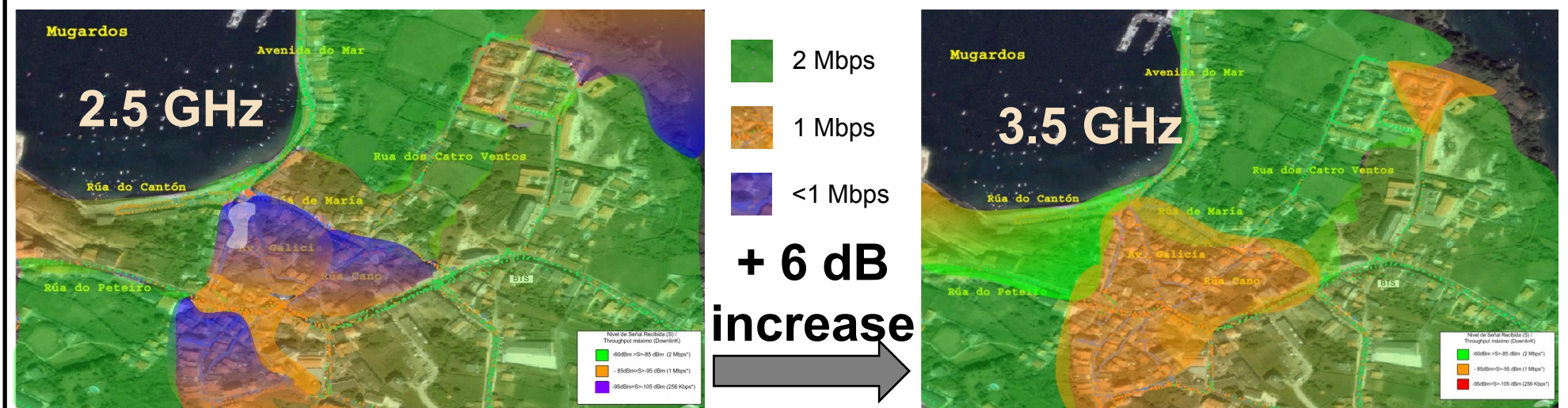


... that using 3,5 Ghz will lead to 30% more BS in rural or semi urban geotypes, but no difference in urban geotypes

Real case comparative 2.5 Ghz and 3.5 Ghz

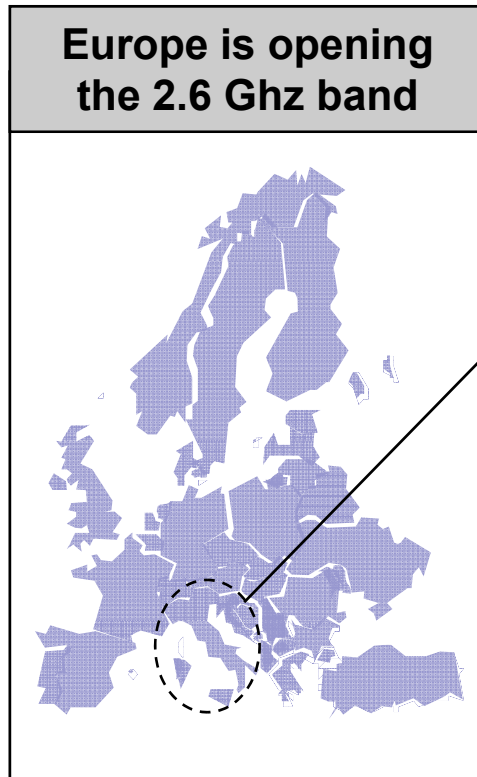
- We adjusted the RF power to obtain a similar coverage for a 2 Mbps bandwidth
- What we found out is that we needed a power increase of +6dB to get the same coverage
- Applying RF empirical laws, and our experience on the field ,we assume that this increase in power demands at least 30% more Base Stations in 3,5 Ghz than in 2.5 Ghz in rural or semiurban deployments to obtain the same coverage quality
- We don´t think this “rule of thumb” applies to urban environments where capacity and not geographic reach is the main challenge

Map of areas of data speed (in Mbps) coverage



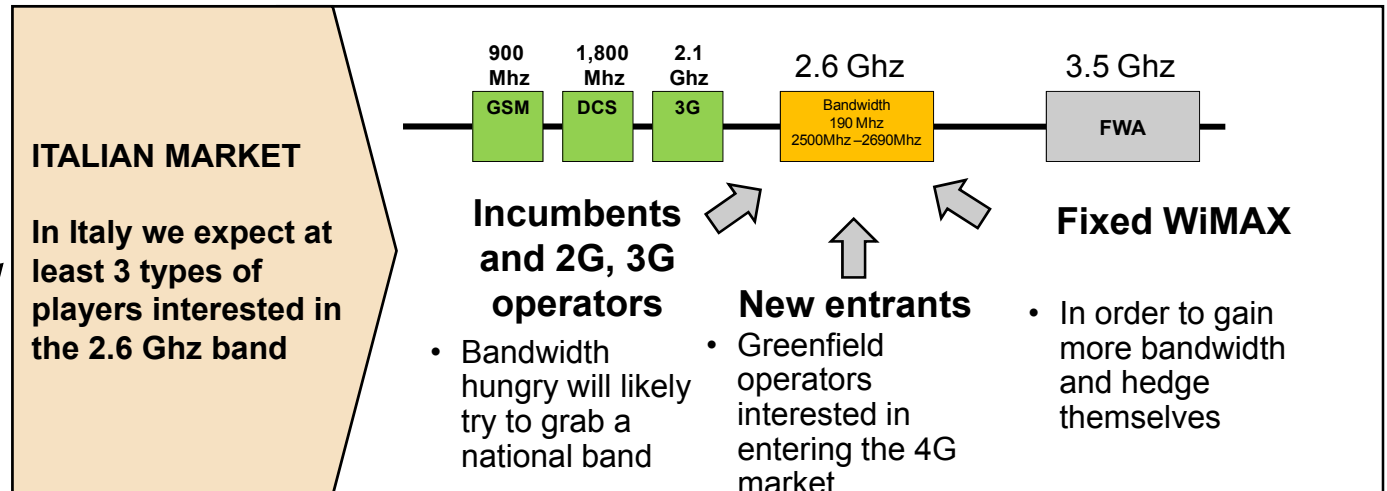
In some scenarios 2.6 Ghz might be a better investment than 3.5Ghz and will probably attract more players to the market ...

Conclusions and future challenges



Europe is opening the 2.6 Ghz band

- The European Union is forcing the opening of the 2.6 Ghz band in all European countries to cope with future demand and allow for technical innovation



Technical view

- 2.6 Ghz is LTE compatible
- Mobile WiMAX in 2.6 Ghz has a better industrial critical mass and ecosystem in B.S. and terminals than 3.5 Ghz
- 2.5 Ghz propagates better in rural and semi-urban geotypes and therefore needs less CAPEX in these places

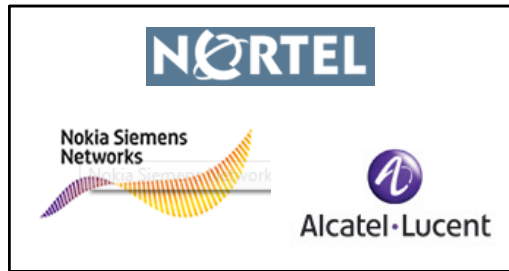
Comercial view

- The use of different bands / technologies should be seamless for end user
- Spectrum is a scarce resource and pricing should reflect this through bandwidth management & pay-per-use
- New services will create new needs and ARPU increase

... and we expect new markets will surely provision 4G mobile WiMAX devices & systems

Conclusions and future challenges

Access and transmission layer

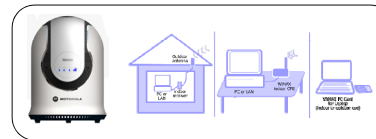


- During the last months we have seen announcements of investment reduction in Mobile WiMAX...
- ...however major manufacturers still keep producing in ever increasing numbers...
- ... and we are seeing Asian's major manufacturers taking the challenge and selling Mobile WiMAX

Device / Terminal layer

- We are seeing that the WiMAX ecosystem is getting cheaper and cheaper
- Most used terminals are CPE, USB Dongles, mobile phones...
- ... although new types of terminals like M2M or WiFi-WiMAX-4G cloud routers will probably boom in the market

PCs fixed-nomads



Laptops-netbooks - "dongles" - machines



Agendas, blackberry, ipods



Public Safety Applications:
Security cameras

Machine to machine

Public Safety Applications:
Alerts & alarms

Agriculture control

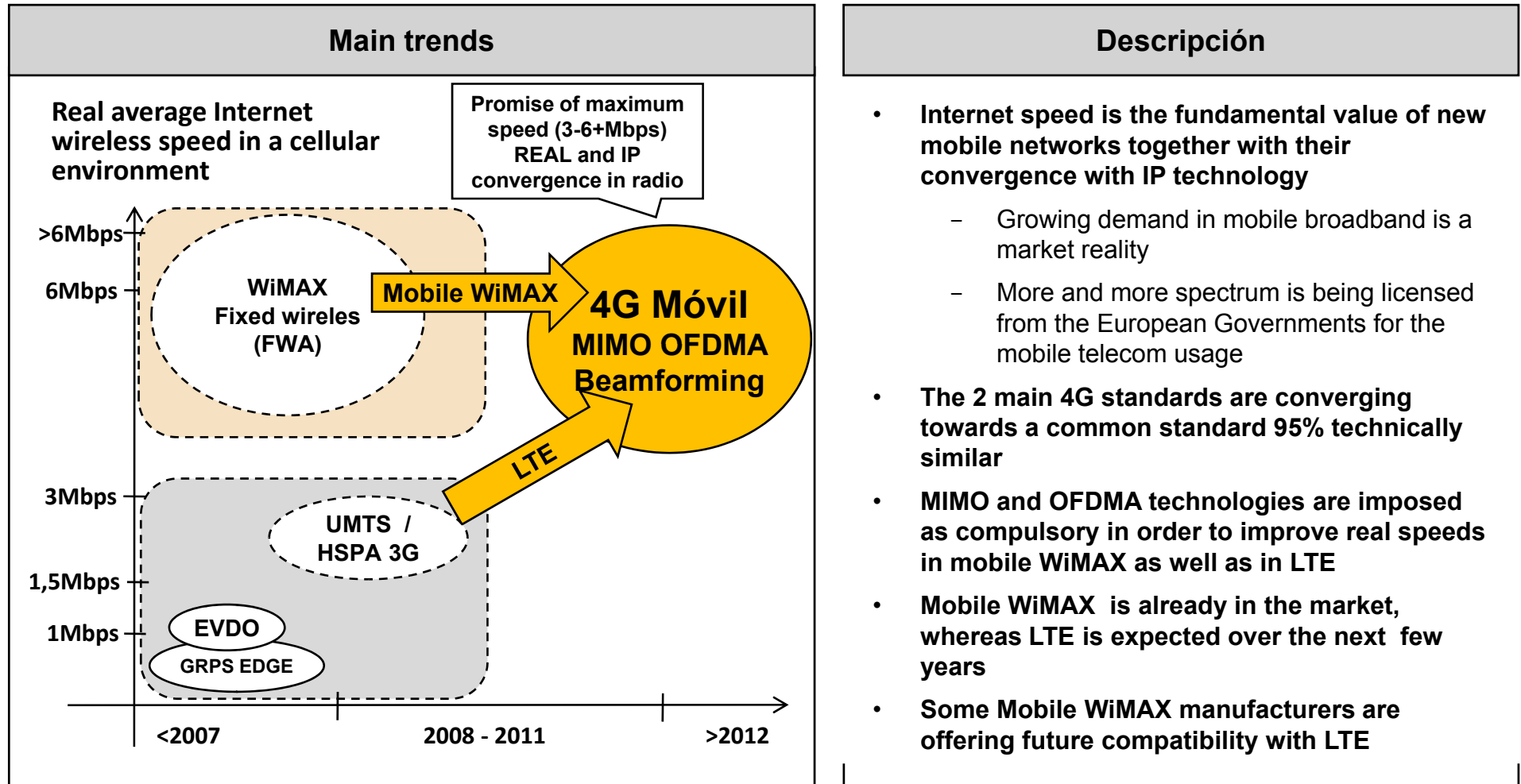
Portable SPOT
WiFi-WiMAX



Intel is manufacturing laptop embedded Mobile Wimax enabled chipsets

We think the 2 leading 4G technologies are: Mobile WiMAX and LTE...

LTE vs mobile WiMAX



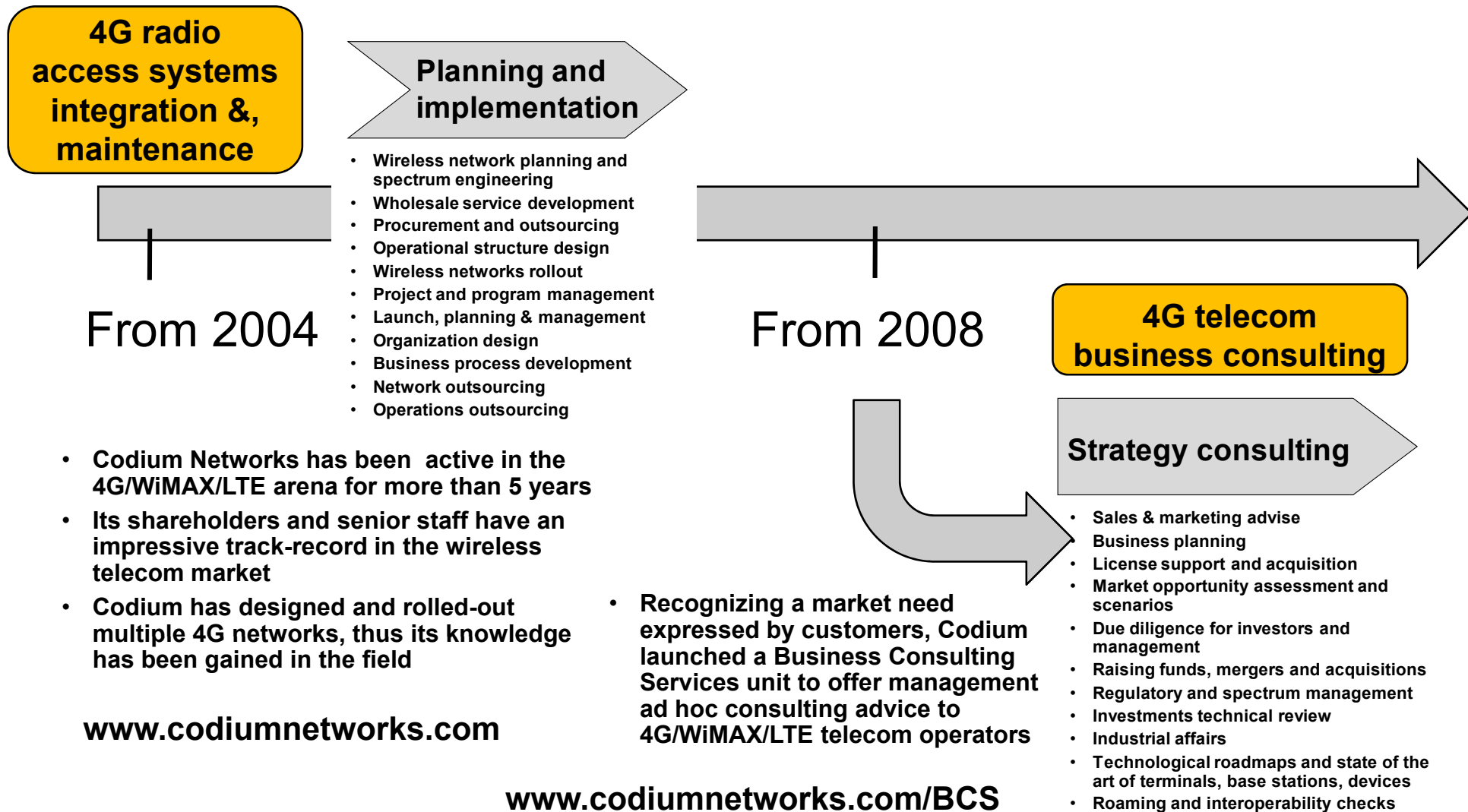
... but it is not clear who will win the race, we think by 2015 a majority of the market could be LTE and a large part Mobile WiMAX

LTE vs mobile WiMAX

	Mobile WiMAX	LTE
Time to market	From 2008	From 2011 ??
Data handling	Full IP	Full IP
Voice handling	Challenging	Somewhat challenging
Number and weight of BS manufacturers	Medium	Theoretically High
Actual critical mass	High	Theoretically High
Terminal manufacturers	Medium	Too early
Terminal diversity	Low to medium	Early stages
Helps migrate from legacy networks	No	No

Codium competences: 4G radio access networks integration together with specialized business consulting for 4G operators

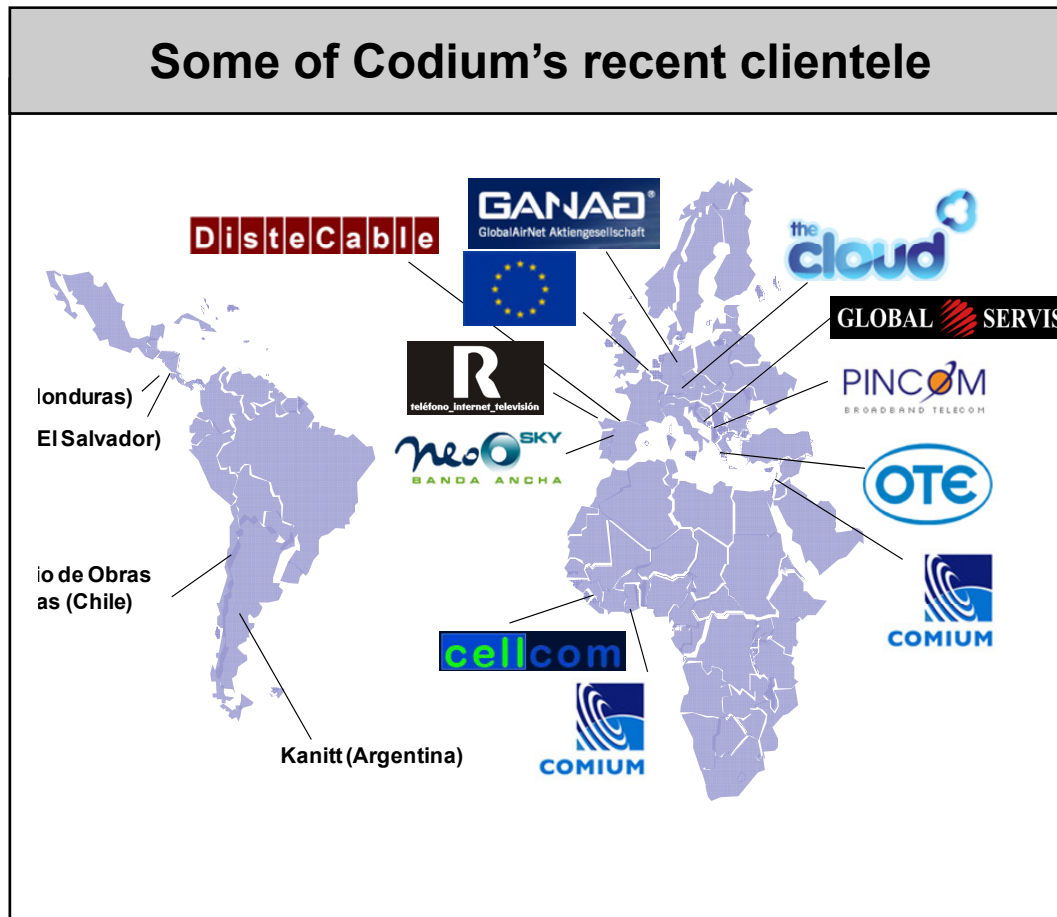
Codium competences



Long experience on the 4G field and the telecom market

Codium competences

Some of Codium's recent clientele



Business service consulting experience



Case study: support to win a license and develop a South European Mobile WiMAX operator

Codium competences



**Consulting project
4 main tasks**

Regulatory advice

Business planning

Spectrum planning

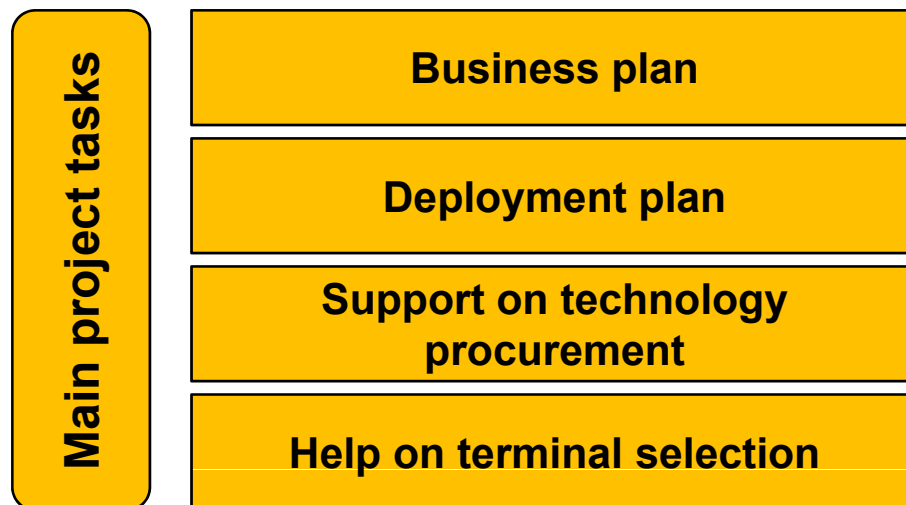
Bid documentation

- We helped in shaping the regulatory strategy for the group and accompanied it to meetings with the regulator in an effort to favorably impress the authorities as to the solidity of the bid
- We developed several business-case scenarios followed by the drafting of the definitive business plan to be used as the business 'base case'
- Among the tasks, we carried out a comprehensive and highly detailed RF Plan which according to the regulator was "head and shoulders" above those of the competition
- We advised the group on writing the bidding document, drafting the main parts and working together with the customer on the final version to be submitted

Case Study: Business planning for the largest Mobile WiMAX project in Southern Europe with >500 BS¹ and 500,000 initial customers

Codium competences

(1) BS: Base Stations



- Developed, based on market estimates, potential revenues, operating costs, CAPEX investments in network
- We designed the BS deployment plan optimizing coverage based on demand, revenue targets and CAPEX restrictions
- Helped selecting the best technology vendor for our customer based on KPIs and benchmarking parameters considered crucial
- We undertook an exhaustive study of the state of the industry vis-à-vis terminal devices to best serve the marketed services of our customer, considering their future evolution, etc.

Annex

La Administración está sacando al mercado más banda ancha móvil y estudia el formato que dará a las licencias y licitación

El mercado de banda ancha móvil > España

