

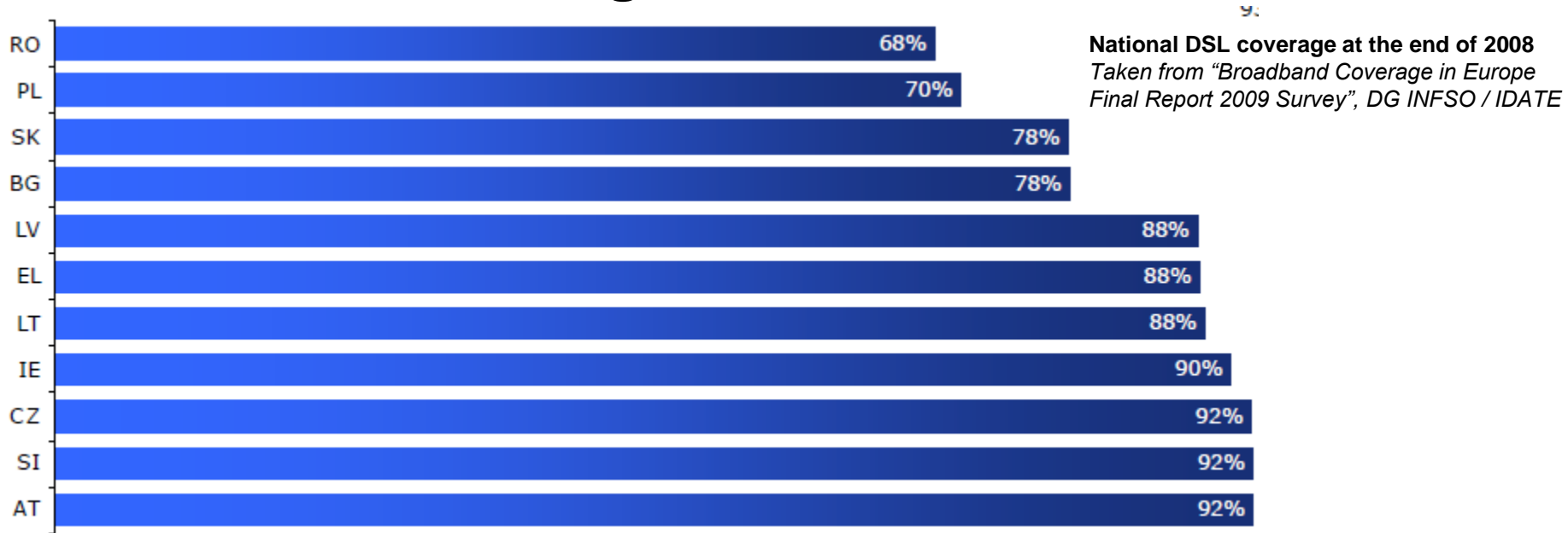
Making the Most of Available Spectrum

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Brussels
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Digital Agenda 2020: The Challenge

- Broadband for All by 2013
- 30 Mbps everywhere by 2020
- But big gaps currently exist even in basic broadband coverage...

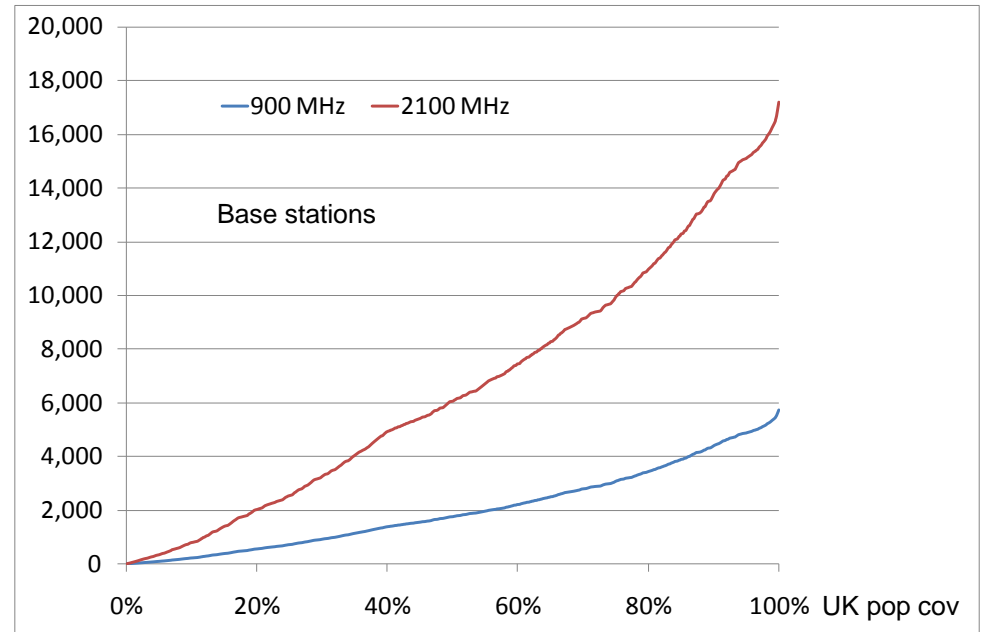
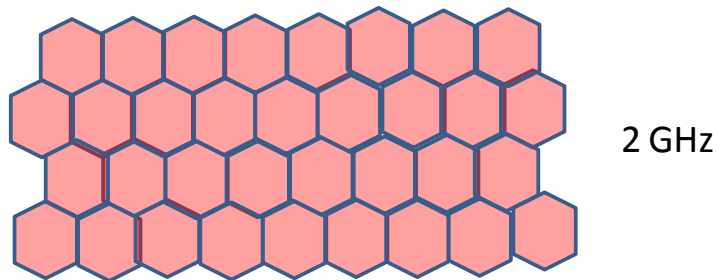
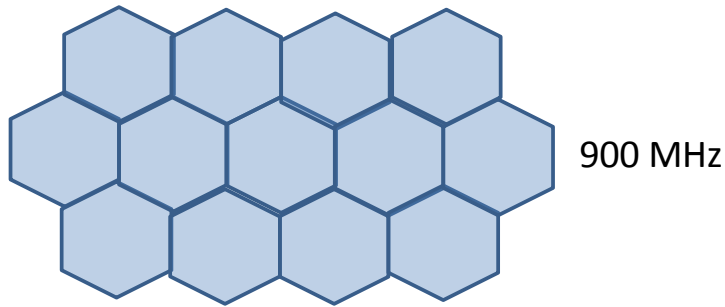


How can Spectrum help?

- Wireless can provide a fast and cost-effective way to expand rural broadband coverage
- **But...**
 - Requires sufficient spectrum in the right frequency range
 - Efficient use of available spectrum
 - Appropriate technology and network configuration to optimise coverage, speed and throughput

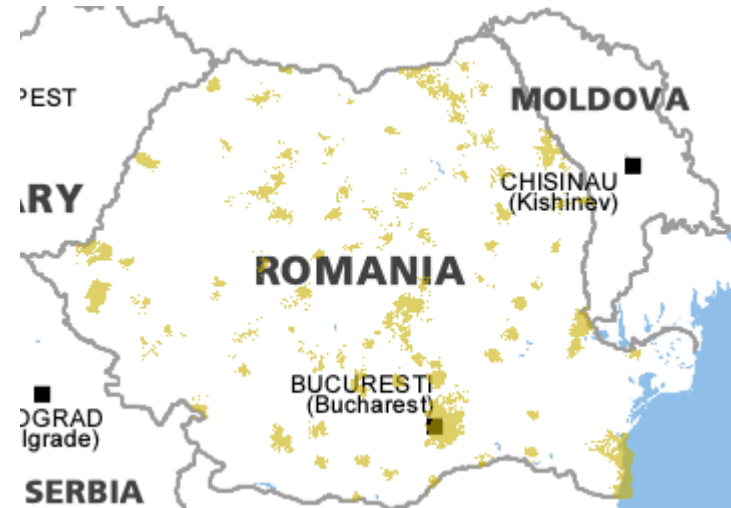
Not all spectrum is equal...especially when it comes to Coverage

Higher frequencies = more base stations = more cost



Hence 3G coverage has tended to lag behind established 2G voice networks

e.g. Romania 2G voice (900 MHz) and 3G data coverage (2 GHz)



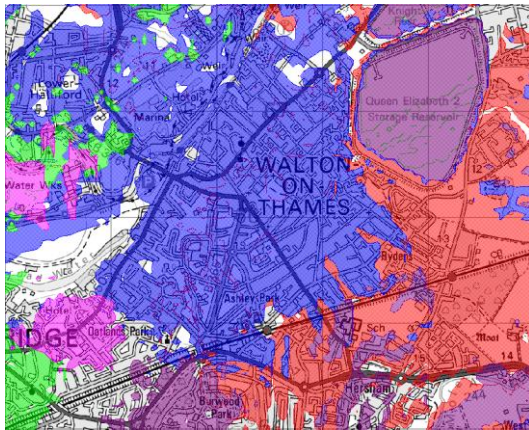
Source: GSM Association. Maps relate to Cosmote 2G network and Orange 3G network (March 2011)

Romanian networks are currently expanding coverage with re-farmed 900 MHz spectrum – Vodafone already at 90% after one year

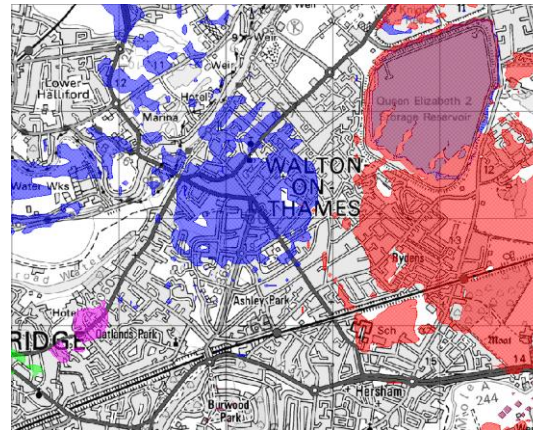
Coverage Quality is also affected by frequency

Predicted coverage from 3G network base stations in Walton-on-Thames, UK

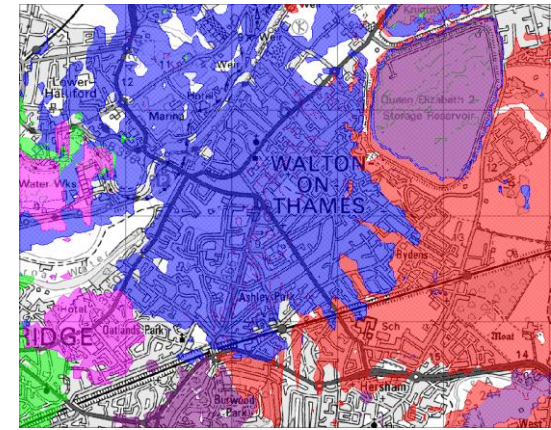
2 GHz OUTDOOR



2 GHz INDOOR

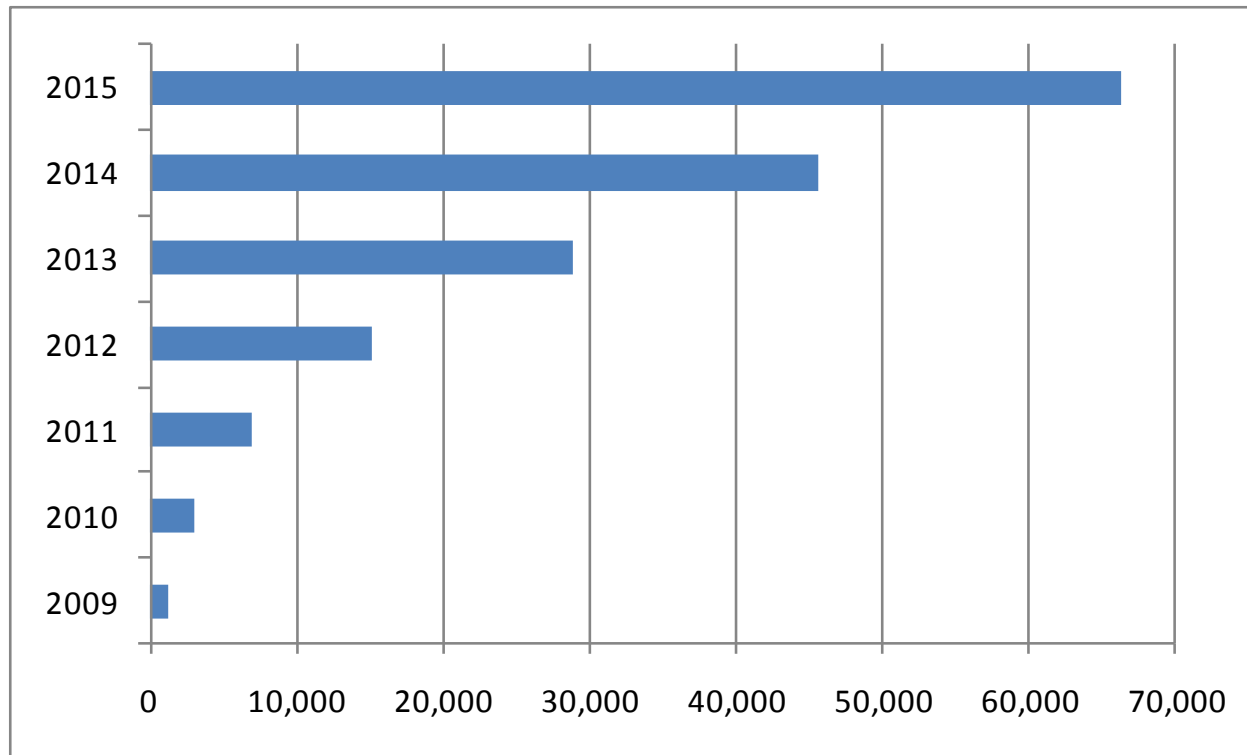


900 MHz INDOOR



Access to lower frequencies provides significantly better indoor coverage without need for more base stations

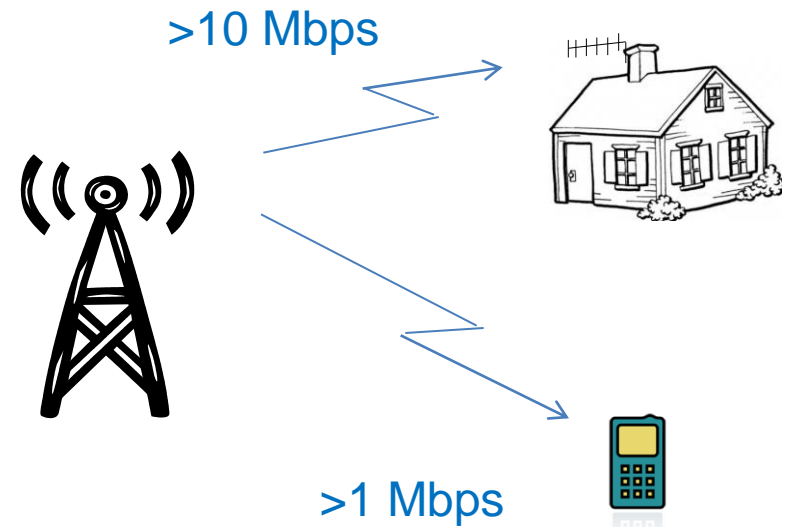
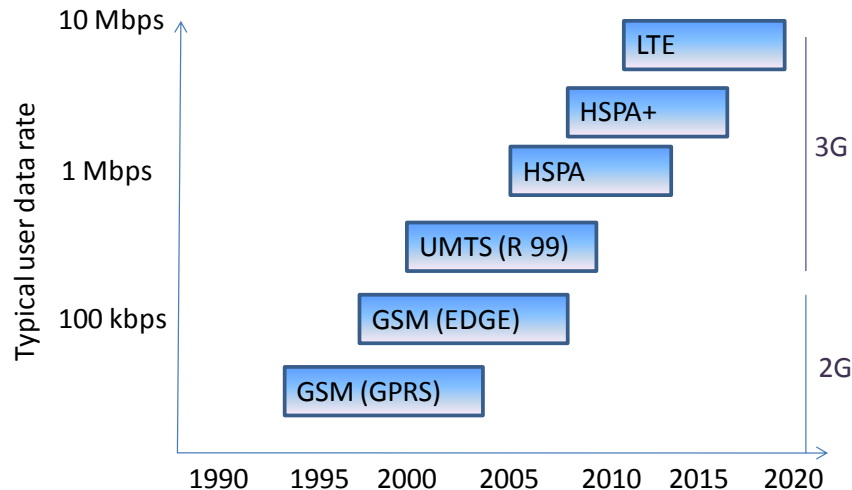
Also need enough network capacity to meet future traffic demand...



Projected monthly mobile data traffic in Western Europe (Terabytes per Month)
Source: Cisco

Optimising Network Capacity

- Technology and network configuration can greatly influence network performance

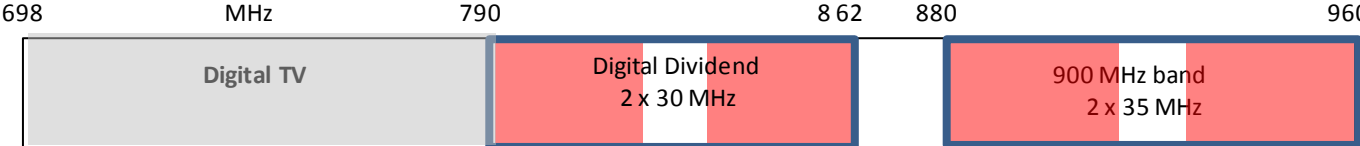


New technology delivers more efficiency - but requires more bandwidth

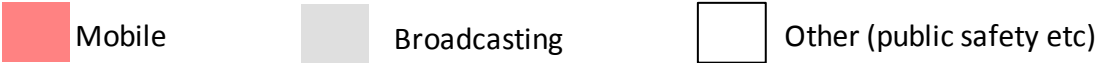
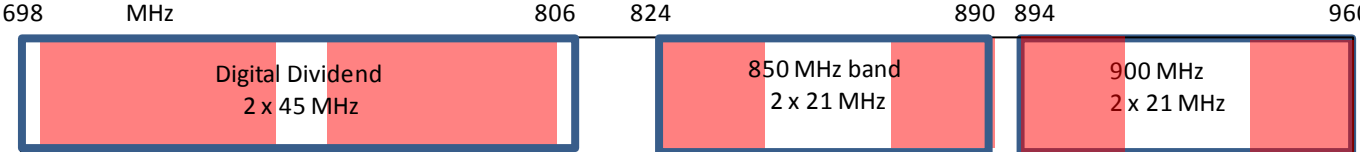
- 2 x 20 MHz per operator required to realise full potential of 4G “LTE” technology
- Implies at least **2 x 80 MHz** to support four operators – ideally below 1 GHz for rural coverage
- Also need to support legacy 2G / 3G devices at least in short to medium term
- Spectrum also sought for public safety and smart grids
- Currently only **2 x 35 MHz** available!

Lack of spectrum may put Europe at a disadvantage

Mobile spectrum in Europe : **2 x 65 MHz** total, including digital dividend



Mobile spectrum in Asia Pacific : **2 x 87 MHz** total

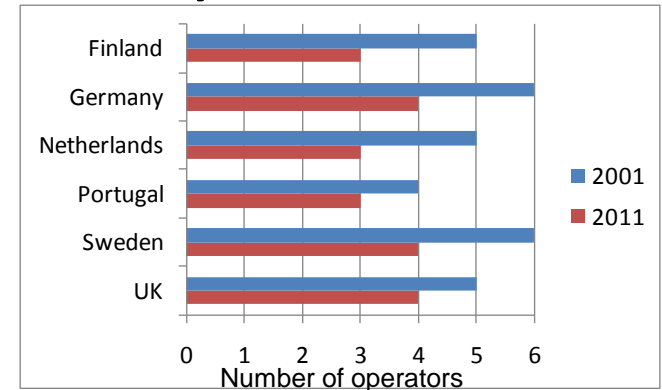


Coping with the spectrum squeeze

- Make optimum use of existing and new technologies
- Identify new opportunities for spectrum release
 - e.g. Extension of digital dividend to 698 MHz
- Avoid excessive fragmentation of existing spectrum
 - Implies greater co-operation between competing networks
 - Promote initiatives like MVNOs to facilitate market entry as alternative to new spectrum licences

Balancing competition and costs

- Too few networks may limit competition
- Too many networks may be economically inefficient
- Market consolidation in Europe and elsewhere suggests optimum number of networks with national coverage is 3 – 4
- Competition can be promoted and network costs reduced through initiatives such as:
 - MVNOs
 - National Roaming
 - Infrastructure sharing
 - Spectrum sharing



Conclusions

- Good rural coverage & capacity depends on access to spectrum below 1 GHz
- Current spectrum is unlikely to be sufficient to meet long term needs (even with the digital dividend)
- Less competition and excessive network costs will lead to higher prices and poorer service
- Initiatives are required from both regulators and operators

Actions Required

- Expedite 900 MHz refarming from 2G to 3G/4G (whilst reappportioning spectrum to address any imbalanced holdings)
- License existing digital dividend and identify further additional spectrum (e.g. 698-790 MHz)
- Adoption of more efficient technologies (HSPA+, LTE)
- Avoid excessive spectrum fragmentation (leading to higher network costs) when awarding network licences
- Encourage greater co-operation between network operators (e.g. infrastructure and spectrum sharing)
- Promote competition through MVNOs and national roaming

Thank You!

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