Agentschap Telecom

- Part of Ministry of Economic Affairs (Ministerie van EZ)
- 240 employees, founded in 1927 (being part from the dutch PTT organisation)
- Location Groningen/Amersfoort
- >98.000 licenses and registrations yearly

- Our mission: To secure the availability of a reliable and modern telecommunication in and for the Netherlands

- Our tasks:
  - Arrange and negotiate frequencies internationally
  - Divide frequencies nationally (licences, and licenses exempt)
  - Monitor the efficient and safe use of frequencies and electrical equipments, including enforcement
Our scope of work
Stakeholders and policy

For BV Nederland, we care for...

More room for innovation and economic growth

Flexibility

License exempt wherever possible
Frequencies

- Frequencies are a natural resource
- Electromagnetic fields are one of the four fundamental powers of nature
- Frequencies are not scarce

- *It is always there*
- *After using it’s as clean as before*
- *It is everywhere available, and in the complete bandwidth*
- *The more cellular the network is, ‘the more is spectrum available’ without harmful interference*

- Scarcity is man-made
Men and technology

M: Materials, earth,

Plants

Animals

E: Cosmos, higher energy, the all, etc

People

Technology

Anything invented and created by men, to make things easier, nicer, faster, efficient,..

Conscious behavior

Knowing why you are doing what you are doing

E=M
Theme 1: Society

• People want more safety and objective information, at the same time people do want have less regulations.

Seemingly conflicting standpoints: more safety but less government
Theme 2: Shared use

There is an increasing interest for shared spectrum usage, but todays regulations and traditional actors (the incumbents) are holding up.

Shared usage?

Most: Yes we should start immediately, let us share. Incumbents: we have paid for spectrum, so.. Even if we would be positive, should one expect us just to just write off assets?

How to create win/win?
Theme 3: Decentralization

Now the current is decentralization, we have moved from ‘point to point’ to ‘many to many’ and in extreme rapid manner!

1. Electronic equipment everywhere
2. New nomadic infrastructures
3. Mobile use and M2M rapidly growing
4. Software defines the machine, and can “change” locally

But also: Internet en freedom, demonstration and liberation
   - Arab spring?
   - Maidan / Ukraine?
   - Yellow umbrella’s / Hongkong?
   —
Theme 4: Globalisation

Telecom is becoming a global business
Devices need to have global harmonized standards
EU law and regulations becoming much more important

ECC/CEPT
ETSI
CIE
ITU, IEEE

Playing on two chessboards: The Hague and Brussels

Digital agenda EU
What’s happening in spectrum

- Increasing demand spectrum
- Economy is more and more depending on telecom
- Fast technological developments
- Harmonisation and “refarming” slow
Law and regulation getting complex
Ostrom and Williamson

• Nobel prize winners Ostrom and Williamson (Delft, 2010, Conference on the Economics of infrastructure,)

• A system will grow, until the transactions costs keeping the system intact, are higher than the benefits the people will receive from the system.

• The best way of organizing sustainable and lasting maintenance of a system to be done by the ones who have the strongest ownership, i.e. the locals users.
For the regulators a challenge

- Higher complexity in regulations means..
  - More time-consuming work, more international meetings
  - Higher costs
  And likely.. still to slow for industry?

- Innovation necessary
  - License exempt (already ongoing)
  - Small cells techniques
  - Shared use / LSA
  - Self sensing technology
  - Dynamic frequency issuing (incl database)
  - Mobilizing the creative and social conscious human behavior

https://www.youtube.com/watch?v=M1Q-EbX6dso
Why is cognitive radio important

- CR contributes to an efficient spectrum management:
  - Unused parts of spectrum can be (re-) utilized (when primary user is not using them temporary)
  - Bandwidth can be assigned dynamically
  - Economical and societal benefits can be increased

- It fits the way society and technology changes: decentralization

- It ‘rocks’ the classical pattern which is leading to an increasing complexity in regulating and enforcement

- It is new and innovative
Cognitive radio = Smart radio

Dynamic use of the spectrum

A wireless transceiver which adjust its radio spec's automatically to its network, the environment and the user's need, based on interaction with it's surrounding.

Three CR types

- Database (central)
- Beacons (local support)
- Self-sensing (decentralized)
Classical pattern is missing conscious behavior

- Classical pattern of network thinking is top down and central.
- When the QOS degrades more of the same (i.e. antennas and capacity) will be added
- It doesn’t start with the smallest level of intelligence
- Doesn’t take into account (social) intelligence of the users and their devices

Network scenarios is already an improvement:
What to do next?

- The Netherlands is (soon) amongst the countries with;
  - Highest coverage 3G and 4G
  - Highest degree of fixed cable to the home
  - Highest penetration of devices (apparatuur as e.g. smartphones) in society
  - Highest internet acceptance
  - Highest (general) level of educated people

**Fixed**
- 100% of the Dutch households and industry has access to basic internet
- 95% has access via fixed networks to so-called superfast internet (>100 Mbps)
- Comparison EU: average has 97% access to basic internet and circa 62% access to superfast internet

**Mobile**
- NL has 3G coverage of 99%, and LTE > 90%
- Comparison EU: EU-average is 3G 97% and LTE 59%
Developments are awaiting new (smart) applications

- From big antennes to small antennes
- Point to point; Fixed
- Point to many; FM, GPS, GSM, LTE, Wifi fixed
- Many to point; M2M, GSM, LTE,
- Many to many; Mesh, nomadic, crowd network
  Wifi in the devices

CR, Database, Self sensing
New network philosophy?

- Start small
  - Individuals, and conscious behavior
  - Devices (with CR)
  - Work up from scratch /zero power
  - De-tune/re-route asap when interference with neighbors
  - Use network scenarios for the mainframe (as on slide 17)

- Include social behavior of people in business model (see ‘ziggo’)
- Make visible what happens, including (societal) benefits e.g.:
  - less ‘spilling’ of spectrum, of energy, less radiation, lower costs, less disturbances, better coverage, more free spectrum usage
- Combine people’s knowledge with the right usage of technology
5G the ‘service & device’-network?

Pre-designed for known places  Mesh network for unknown spots

Cognitive radio as the base technology on devices
CR & Responsibility to manage spectrum yourself

Technology within the context of conscious and responsible behavior

- Switch on/off the CR part of the device, ie on only when really needed
- Define the transmission service you need (data, voice, video, latency allowed..)
- Sense ‘free’ spectrum
- Do not disturb others (re-route/switch off)
- Take always the ‘nearest’ offload for the right transmission

- Safeguarded crucial public services (e.g police, ambulance) being backboned (redundancy) by exclusive licenses and/or networks
CR & The future small cell?

- Will we soon reach the smallest data offload
- I.e. the office or house room

- Visual light communication (VLC)
  - Nearby light spectrum
  - Spectrum at Terahertz
  - No interference next-door
  - You are self in direct control
  - License exempt spectrum
  - Li-fi
Will NL be the first testing and marketing real CR?

- Agentschap Telecom has a generous experiment policy.
- Experts who are willing to support.
- Knowledge about international developments.

'We can not innovate frequencies, but we can innovate the way we use them.'

- Don’t hesitate to contact us!

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Thanks for your attention

Questions?