

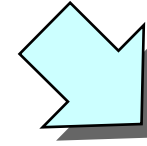


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... **T** ... Systems

How to manage and satisfy all the increasing spectrum requirements from the market ?



Better spectrum sharing – by new technologies ?

- Cognitive Radio
- Dynamic Frequency Selection
- Listen before Transmit
- UWB
- Co-operative Networks
- ...

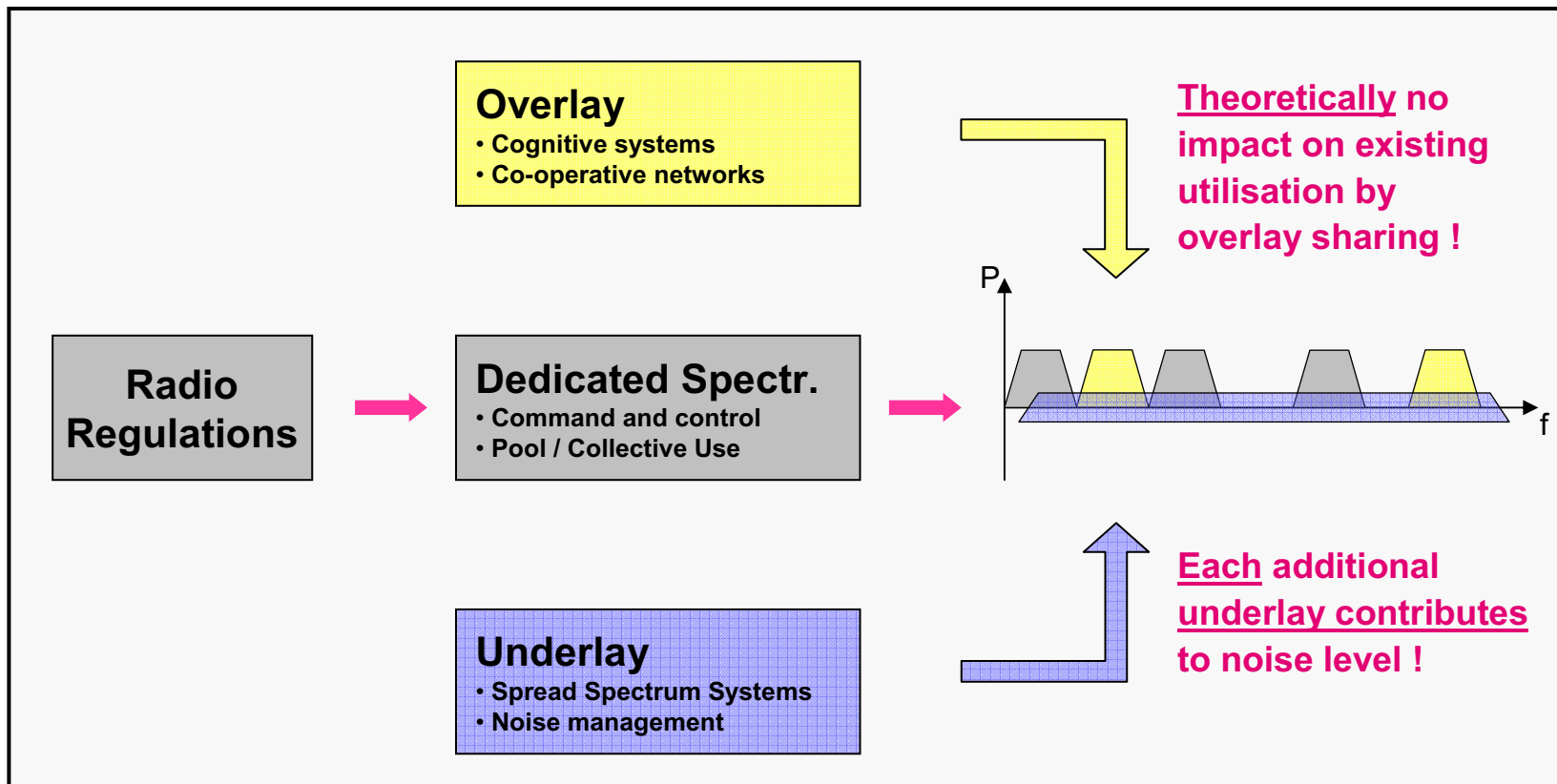
Better regulation by new innovative regulatory procedures?

- Secondary Trading
- Collective Use
- Unlicensed Use
- Spectrum “Property”
- Auctioning
- Spectrum Usage Rights
- ...

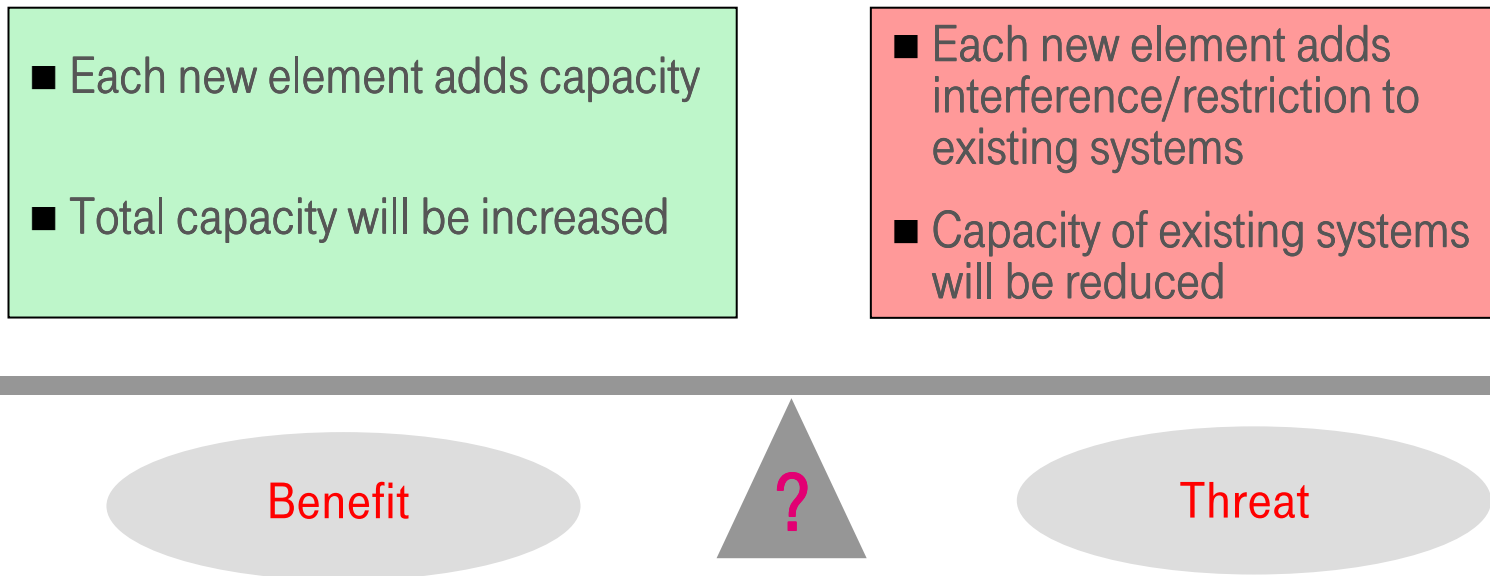
The Regulatory Environment for future Mobile Multimedia Services

Dynamic Spectrum Use and Usability Operators View

The general technical sharing concept



The trade-offs regarding overlay/underlay sharing



More efficient use of spectrum is not for free !
It will cause additional burden to the existing user.

The technical limitation of efficiency in a spectrum portion

Shannons Law:

Maximum error-free capacity for a bandwidth limited channel in the presence of noise:

$$C = W \log_2 (1 + S / N)$$

C = channel capacity in bps

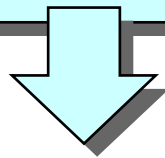
W = bandwidth in Hertz

S/N = signal-to-noise ratio

What about “technology neutrality” and “service neutrality” regarding sharing?

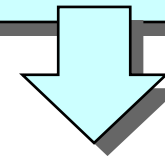
Technology Neutrality

... implies that any technology has to be technically compatible at the band edges



Service Neutrality

... means that services may be provided in any band designated as long as efficient use of spectrum is not endangered



TN and SN introduce more flexibility for spectrum users but generate some uncertainties regarding sharing!

More efficient use of spectrum by better regulation ?

- By more flexible distribution of rights for spectrum access
- By more flexible conditions for use of spectrum

Recommendations from an operators view:

- Careful introduction of any new measure required !
- No discrimination of existing users !
- Don't change the rules during "the game" !

The Regulatory Environment for future Mobile Multimedia Services

Dynamic Spectrum Use and Usability Operators View

Recommendations from an operators view (cont.):

- Any new measures should first concentrate on bands which are not efficiently used presently and in the near future.
- Exclude bands for mass market services (e. g. cellular mobile services via GSM, UMTS/IMT-2000 bands).
- Regulators have to keep in charge of interference management
- Use ex-ante regulation for interference management not ex-post !

The Regulatory Environment for future Mobile Multimedia Services

Dynamic Spectrum Use and Usability Operators View

Most important factor for all market players is confidence in the restructuring process !

Too much threat will hinder the development of the new regulatory framework !

Create a climate of confidence !!!!

- ➔ Focus on voluntary measures (e.g. sec. trading)
- ➔ Use careful trial and error methods
- ➔ Take care of existing user rights, investments & competition situation
- ➔ Early involvement of users/operators!!



An Example of efficient use of spectrum !

A GSM Network in Germany:

- 30 Mio customers (of 82 Mio Population)
- > 20,000 Base Stations
- 100 % pop coverage
- Great variety of Voice and Data services, VAS, etc.
- More than 20 Mio calls (mo) per day
- More than 1 Bill SMS per month

➔ All that in 35 MHz of Spectrum !!!



Thank you for your attention

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