Ministerie van Economische Zaken

International developments in the regulation of Cognitive Radio

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6 maart 2014

Problems in spectrum management

1. All frequencies are allocated and assigned, but not all frequencies are used
   - New applications have to go to higher frequencies
   - "old" applications have a large part of the most attractive pieces of spectrum
2. Slow response to changes in market and technology
   - Build-in resistance to change

✓ Need for more sharing of spectrum

✓ Cognitive Radio technology can help to improve sharing and to get more dynamic spectrum access

European focus on spectrum sharing

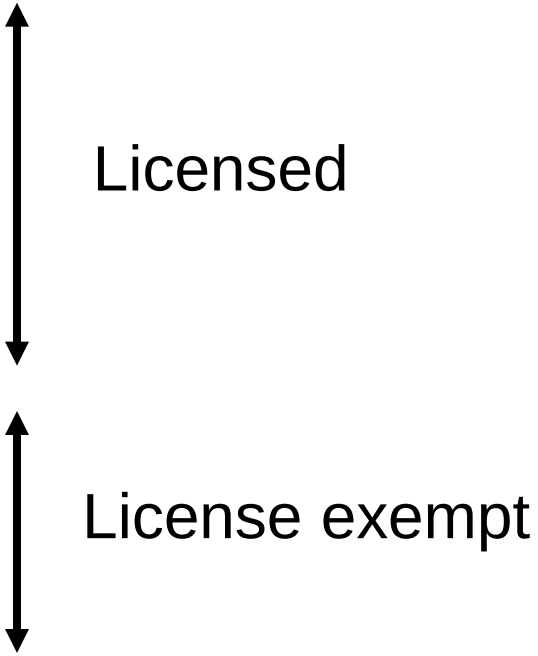
- European Radio Spectrum Policy Program
  - *Ensure that at least 1200 MHz spectrum are identified to address increasing demand for wireless data traffic; and assessing the need for additional harmonised spectrum bands;*
  - ***Fostering different modes of spectrum sharing*** *in Europe, to ensure efficient use of spectrum and to increase spectrum access opportunities for wireless innovation;*

- Commission communication "Promoting the shared use of radio spectrum resources in the international market (sept. 2012)

- RSPG Opinion on Licensed Shared Access (nov. 2013)

Dynamic spectrum sharing

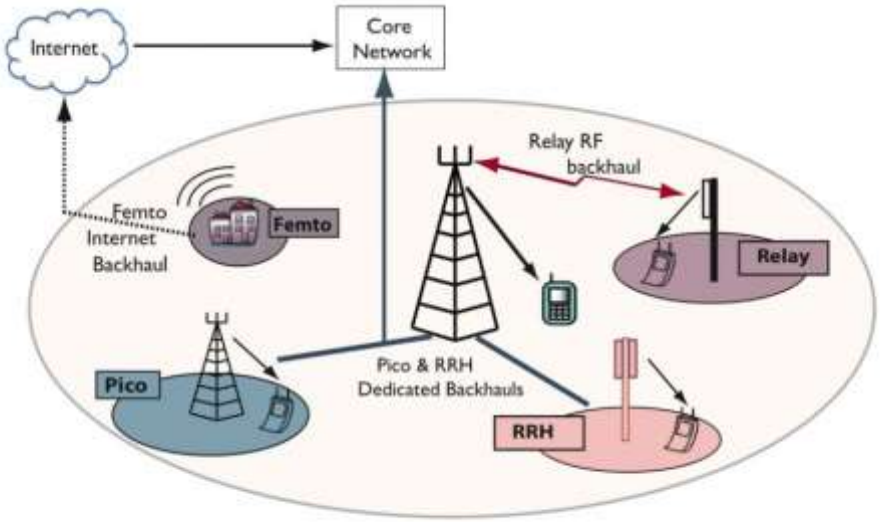
- Flexible operator
- Spectrum pool
- Licensed Shared Access
- White space access
- Unlicensed spectrum pool

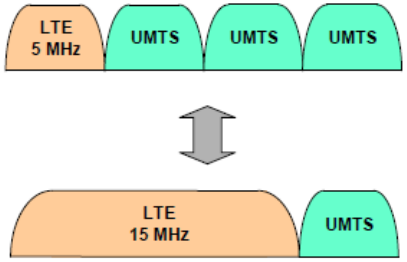


Flexible (mobile) operator

- Optimize radio resource management
- Gradual and dynamic introduction of a new radio interface
- Coverage and capacity improvement through the use of relays
- Self configuration and self-optimization of femto cells
- Multi mode coexistence

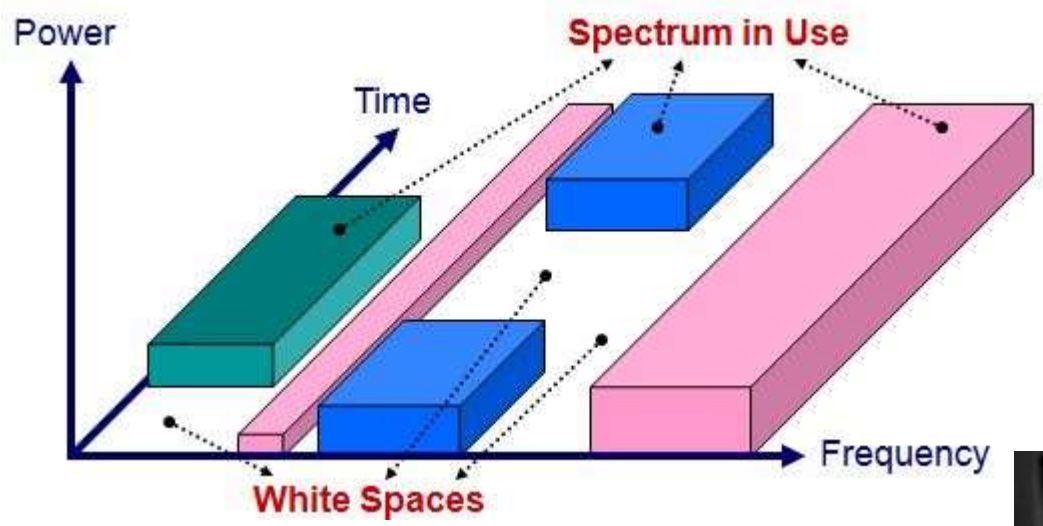
Flexible (mobile) operator (2)

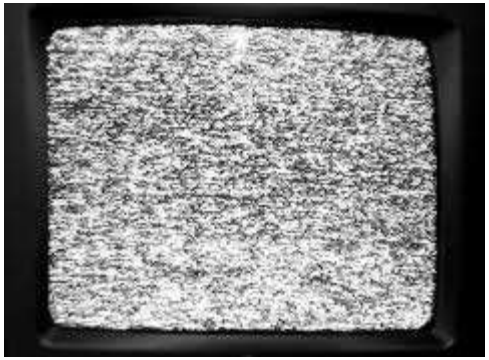




- Covered in the standardization arena (3GPP, ETSI)
- Regulatory requirement: technology neutral licenses

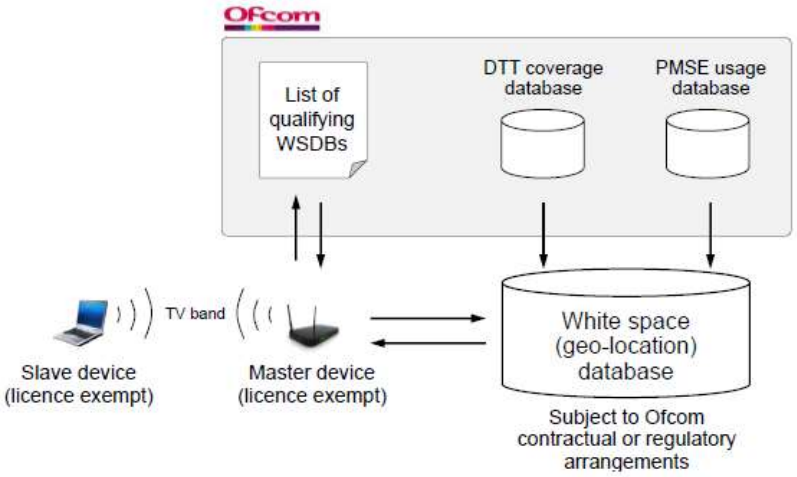
Opportunistic access of TV White spaces



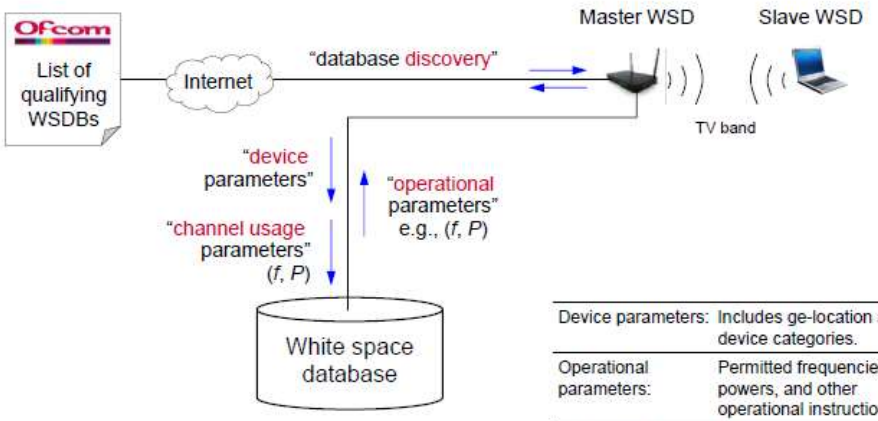


Opportunistic access

- Ofcom's sharing arrangement



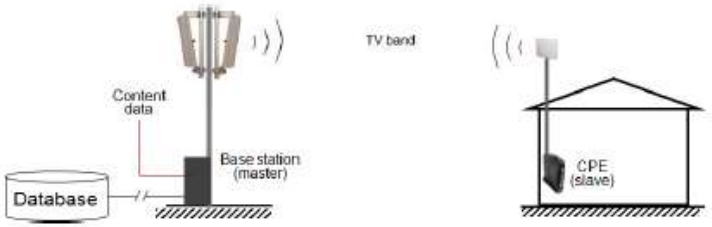
Practical implementation of TV WSD



Device parameters:	Includes ge-location and device categories.
Operational parameters:	Permitted frequencies and powers, and other operational instructions.
Channel usage parameters:	Used frequencies and powers.

Use cases for WSD

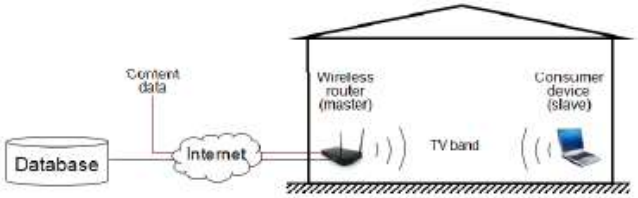
- Use cases include:
  - Rural broadband
  - Hot-spot coverage
  - In-home broadband
  - In-home multi-media
  - Machine-to-machine



Rural broadband
or utility meter reading (machine-to-machine).

- Main driver:

  Favourable propagation characteristics of radio waves in the UHF TV band, and their ability to penetrate deep inside buildings.



In-home broadband, in-home multi-media distribution,
or indoor public hot-spot coverage.

Ofcom

Is there a use case for TV WSDs?

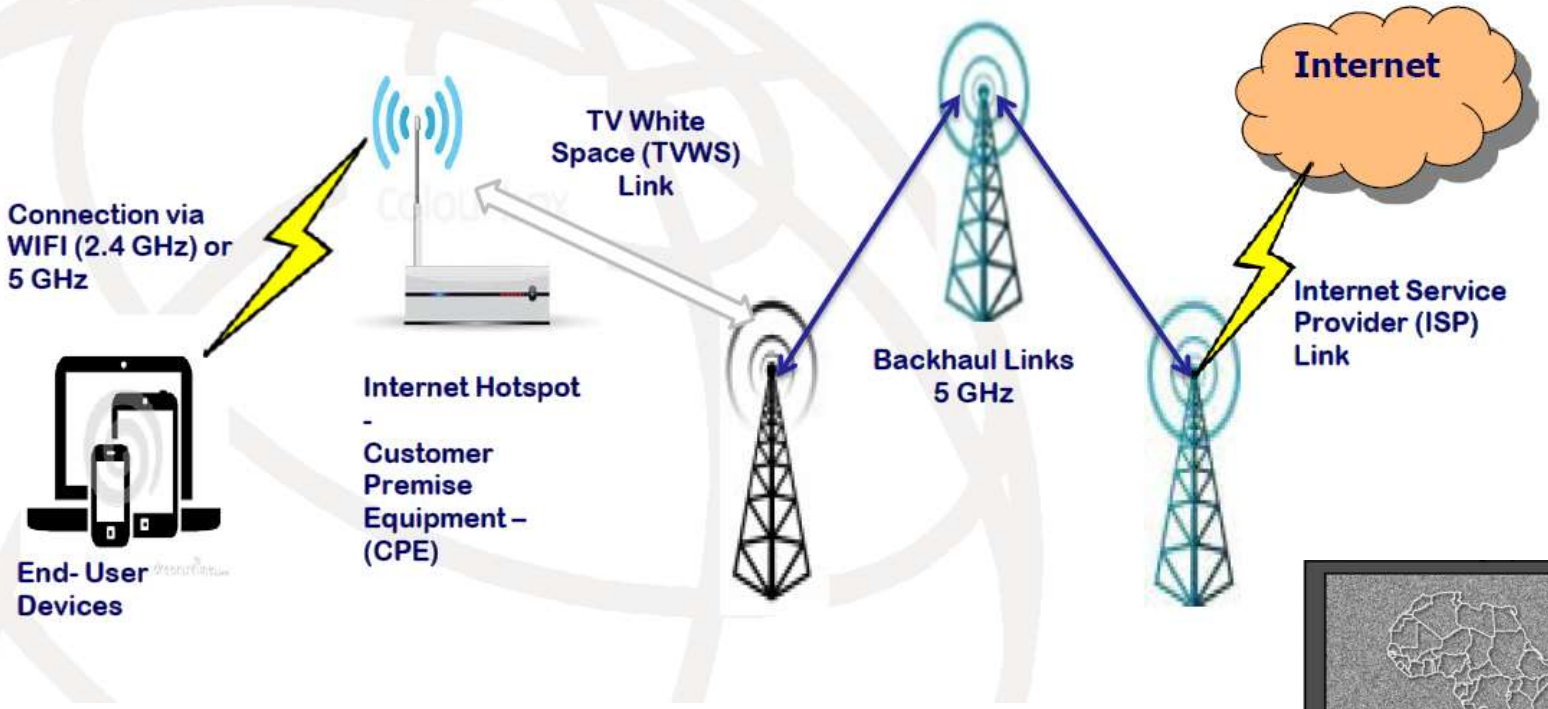
- Tight broadcasting planning in (continental) Europe
- Growing pressure on broadcasting spectrum
  - Digital dividend (800 MHz band)
  - Release of 700 MHz band
- White spaces heavily used for opportunistic access by wireless microphones

470 MHz

694 MHz (now: 790)

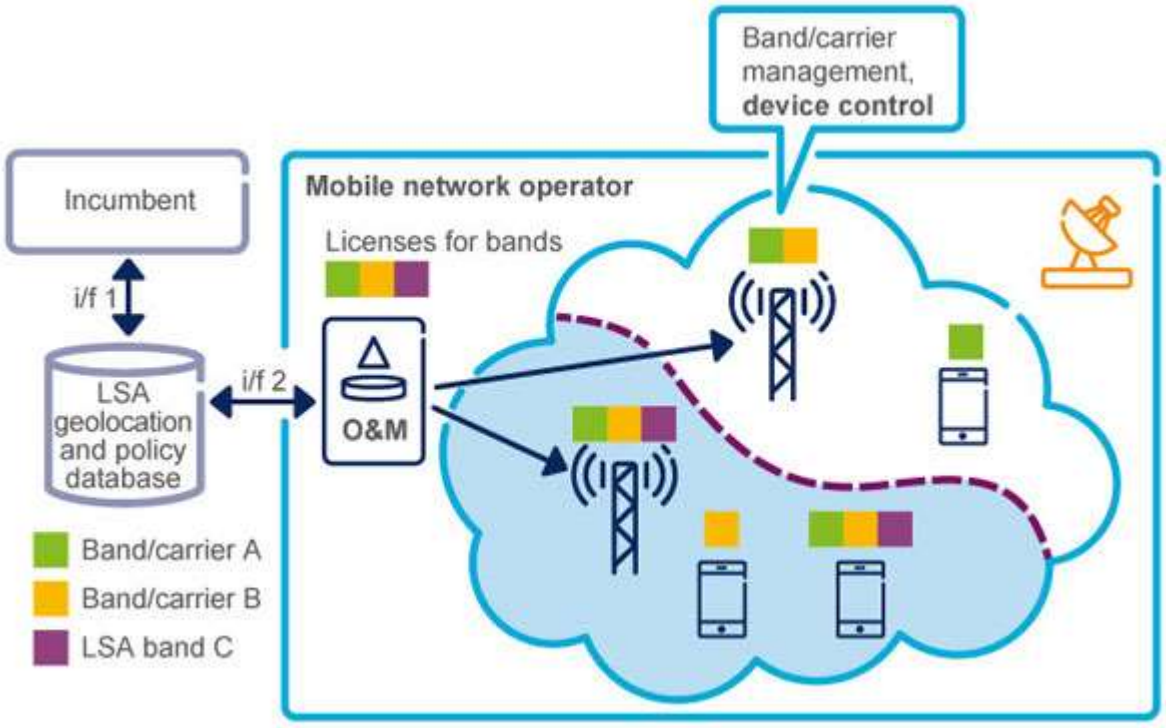
- How much capacity can be made available?
- Is there enough demand in places where there is capacity and vice versa?

White Space Device setup in Kenia



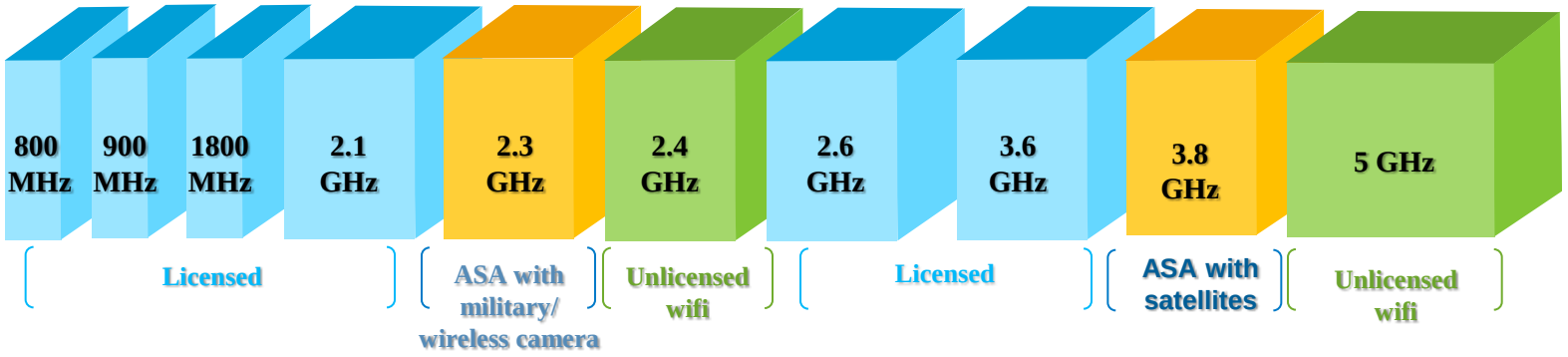
- Comparable experiments in other African countries

Licensed Shared Access



Background and justification

- Based on industry proposal for *Authorised Shared Access* (ASA)
  - Unlock access to additional frequency bands for mobile broadband
  - Bands identified for IMT but in use by other service(s)



- Concept extended as ***Licensed Shared Access*** (LSA)
  - Potential for application to other services in addition to Mobile broadband
  - General analysis to be carried out by ECC/FM53 in parallel with RSPG
  - ECC/FM52

Definition of LSA

- *A regulatory approach aiming to facilitate the **introduction of** radiocommunication systems operated by **a limited number of licensees** under an individual licensing regime **in a frequency band already assigned** or expected to be assigned **to one or more incumbent users**. Under the Licensed Shared Access (LSA) approach, the additional users are authorised to use the spectrum (or part of the spectrum) **in accordance with sharing rules** included in their rights of use of spectrum, thereby **allowing all** the authorized **users**, including incumbents, **to provide a certain Quality of Service** (QoS).*

Scope of LSA

- LSA aim to facilitate the introduction in a frequency band of **new users**, which require a certain level of **guarantee** in terms of **spectrum access**, while **maintaining incumbent services** in the band.

- **LSA licensees and incumbents** operate **different applications** and are subject to **different regulatory constraints**. They would each have **exclusive individual access** to a portion of spectrum at a given location and time.

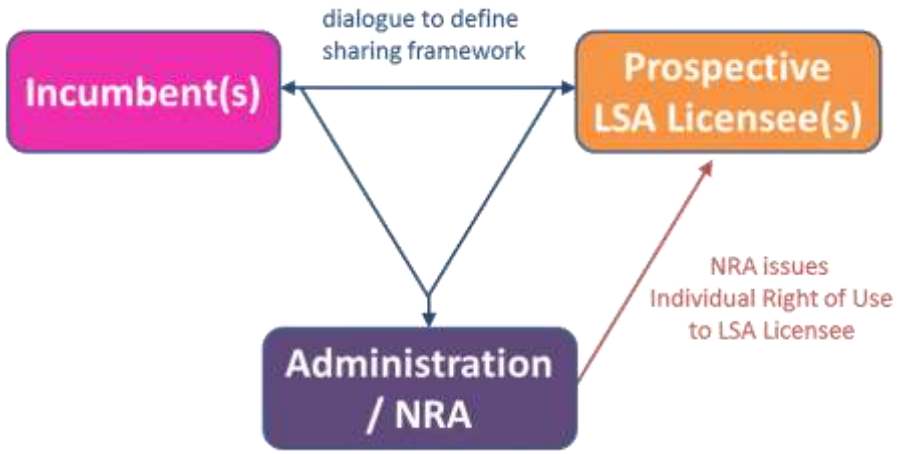
- The first practical use case of LSA will be to provide access to additional spectrum for **mobile broadband services** (**MFCN**)

  ◊first LSA band proposed is 2.3 – 2.4 GHz band

LSA sharing framework

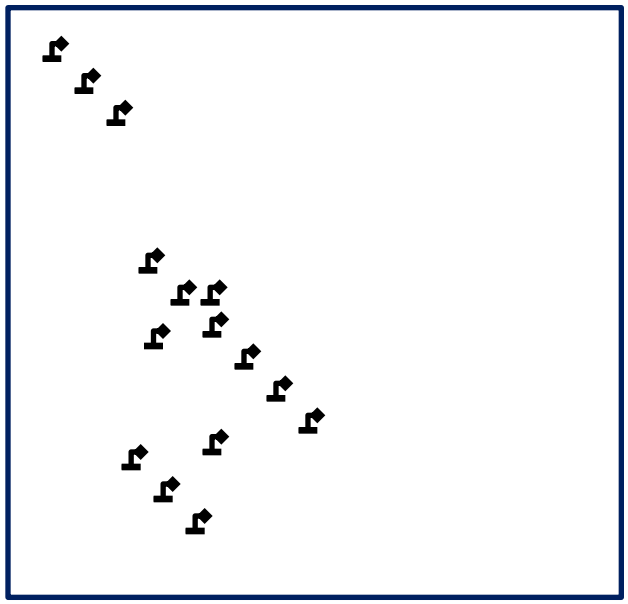
- LSA‘s spectrum sharing framework can be adapted to incumbents‘ characteristics

- The definition of the sharing framework is under the responsibility of the administration

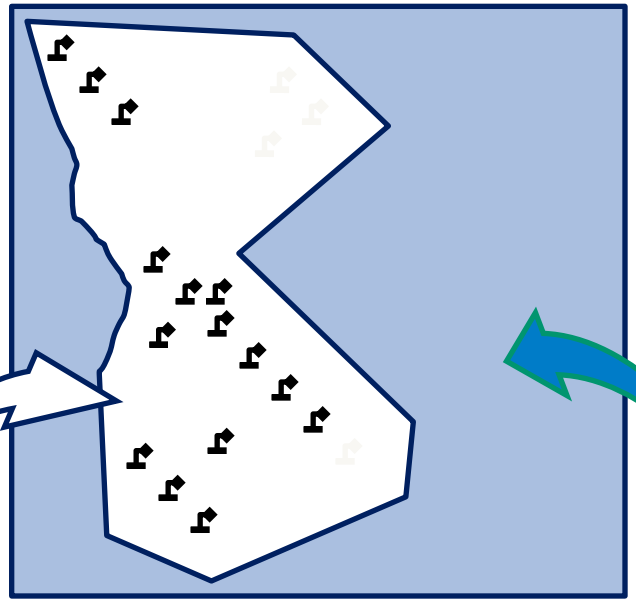


Static sharing arrangement for LSA

Incumbent A



Incumbent A
+ sharing framework



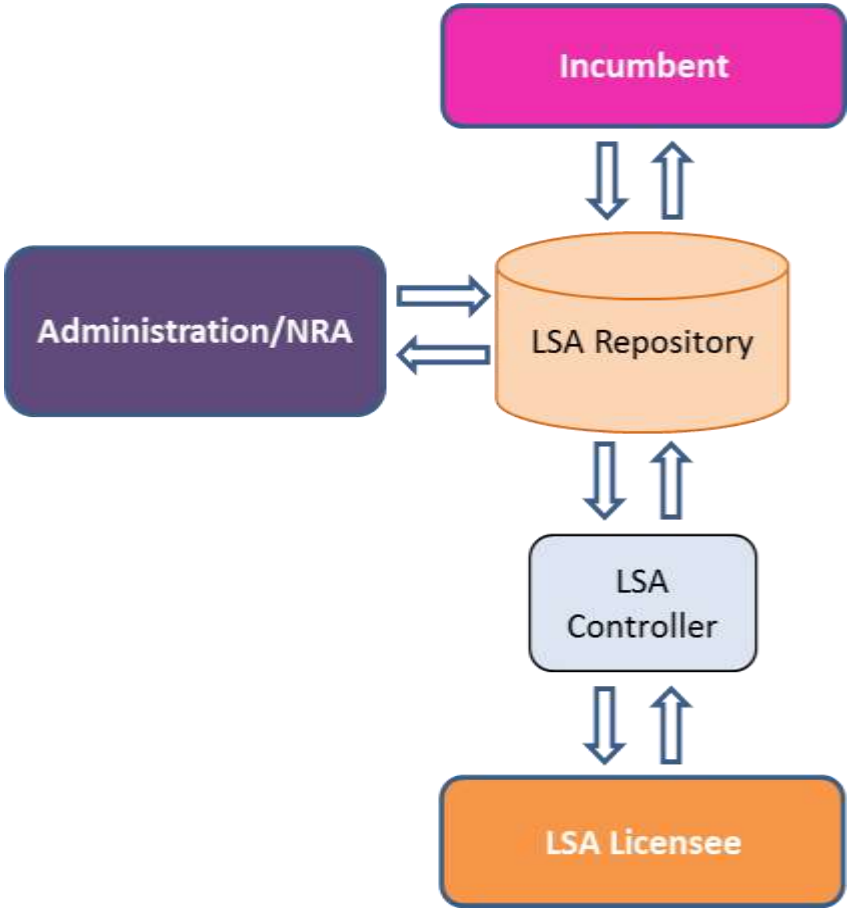
Incumbent stations

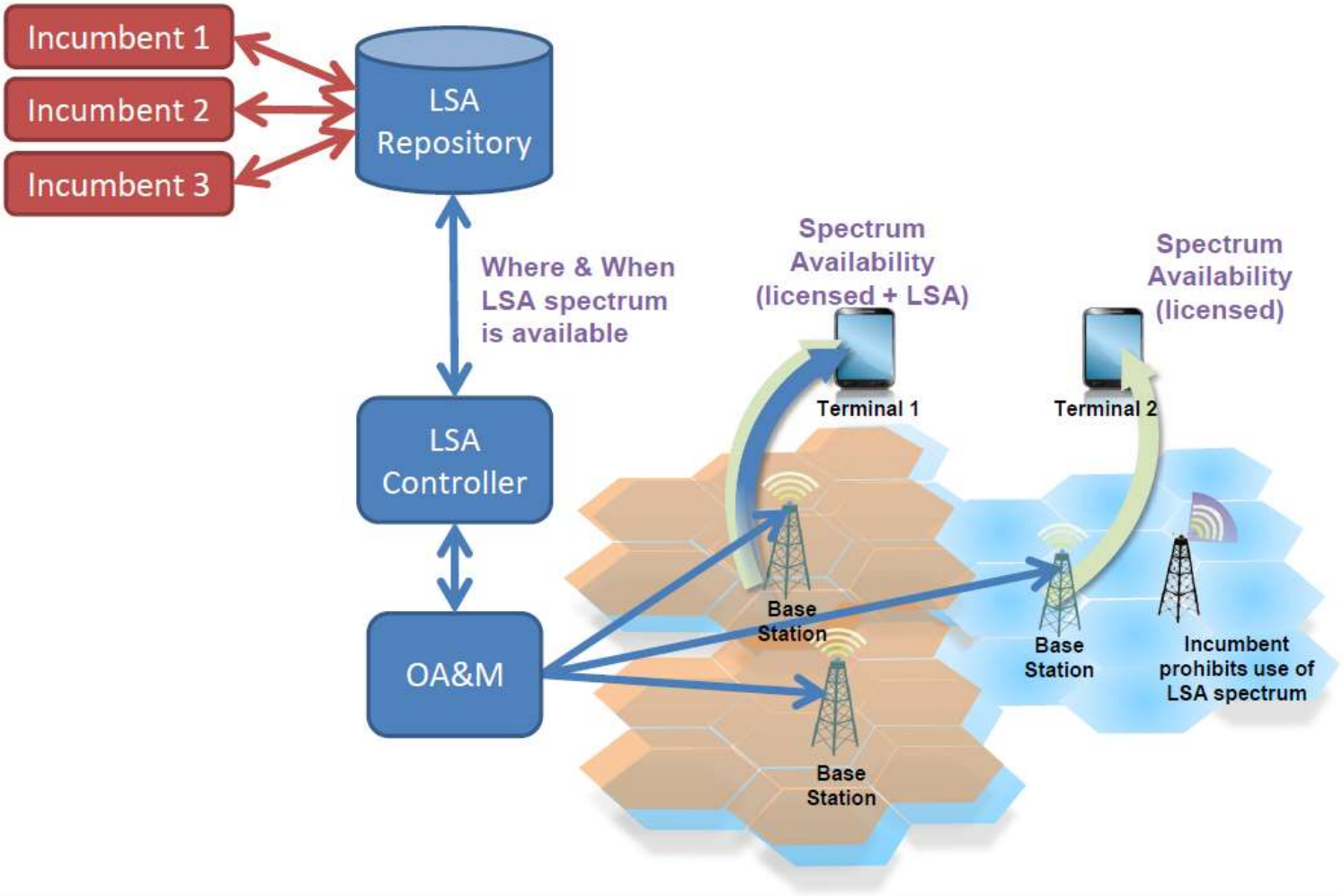
Future stations

Spectrum rights of incumbent A : service allocation(s) limited in accordance with the terms of the "sharing framework".

The "sharing framework" also defines the spectrum that can be made available for alternative usage under LSA.

Dynamic sharing arrangement for LSA




Incumbent 1
Incumbent 2
Incumbent 3
LSA Repository
Where & When LSA spectrum is available
LSA Controller
OA&M
Spectrum Availability (licensed + LSA)
Spectrum Availability (licensed)
Terminal 1
Terminal 2
Base Station
Base Station
Base Station
Incumbent prohibits use of LSA spectrum

More information on LSA

- RSPG Opinion on Licensed Shared Access (nov 2013)
- ECC Report 205 Licensed Shared Access (feb 2014)
- Public consultation:
  - Draft ECC/DEC/(14)BB on Harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for MFCN
  - Draft ECC/REC/(14)04 on Cross-border coordination for MFCN and between MFCN and other systems in the frequency band 2300-2400 MHz
  - Deadline for the comments is 9 April 2014
  - See http://www.cept.org/ecc/tools-and-services/ecc-public-consultation

More information on CRS Policy and Regulation

Cognitive Radio Policy and Regulation

Techno-Economic Studies to Facilitate Dynamic Spectrum Access

Medeisis*, Arturas and* Holland*, Oliver (Eds.)*

POPULAR CONTENT WITHIN THIS PUBLICATION

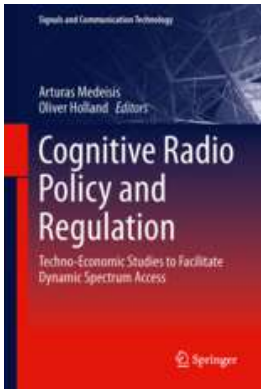
State-of-the-Art in Policy and Regulation of Radio Spectrum
Medeisis, Arturas; Holland, Oliver

Deployment Scenarios for Cognitive Radio
Nardis, Luca; Holland, Oliver

Technical Approaches for Improved Spectrum Sharing
Velez, Fernando J.; Matinmikko, Marja

Economic Aspects of CR Policy and Regulation
Nolan, Keith; Gonçalves, Vânia

Impact Assessment of CR Policy and Regulation
Minervini, Leo Fulvio; Anker, Peter



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