Europe moves towards Dynamic Spectrum Access

Heikki Kokkinen

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Outline

- DSA Regulation and standardization in Europe
- Spectrum sharing and exclusive licenses compared
- European spectrum management systems of Fairspectrum
- Conclusions

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DSA Regulation and standardization in Europe

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ITU-R

- ## Regulatory tools to support enhanced shared use of the spectrum

ITU-R, "Working Document toward PDNR SM.[REGULATORY_TOOLS]." International Telecommunication Union Radiocommunication sector, 2016, ITU-R Document 1B/123-E Annex 20, https://www.itu.int/md/R15-WP1B-C-0123/en

European Commission

- "The proposed Code facilitates spectrum sharing in 5G networks, and promotes end-user access to Wi-Fi-based connectivity"

EC, "Communication from the Commission to the Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society.", European Commission, COM (2016) 587 final, 2016,

https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-587-EN-F1-1.PDF

- "The potential for spectrum sharing, including under licence-exempt use, should be maximised as it generally supports innovation and market entry"

EC, "5G action plan from EC. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. European Commission. COM(2016) 588 final", 2016 http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17131

ETSI

- ## LSA 2.3 GHz

ETSI, "System Architecture and High Level Procedures for operation of Licensed Shared Access (LSA) in the 2300 MHz-2400 MHz band.", ETSI TS 103 235 v.1.1.1, 2015, http://www.etsi.org/deliver/etsi_ts/103200_103299/103235/01.01.01_60/ts_103235v010101p.pdf

- ## White Space Devices

ETSI, "White Space Devices (WSD); Wireless Access Systems operating in the 470 MHz to 790 MHz frequency band; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive. ETSI EN 301 598 v1.1.1.". 2014

- ## Feasibility Study on temporary spectrum access for local high-quality wireless network

ETSI DTR/RRS-0148. Work Item. Feasibility Study on temporary spectrum access for local high-quality wireless network. https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=50966

ECC of CEPT

- Technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and PMSE

ECC, "Technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and PMSE.", CEPT Report 58", 2015,
http://www.erodocdb.dk/doks/filedownload.aspx?fileid=4204&fileurl=http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP058.PDF

- Operational guidelines for spectrum sharing to support the implementation of the current ECC framework in the 3600-3800 MHz range

ECC Report 254. Operational guidelines for spectrum sharing to support the implementation of the current ECC framework in the 3600-3800 MHz range. Approved 18 November 2016.
http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP254.PDF

- National LSA systems: ES, IT, FR, FI, NL

ECC, "Information on national LSA Implementation", 2017, http://www.cept.org/ecc/topics/lsa-implementation

Ofcom UK

- ## Ofcom TVWS

Ofcom. Statutory Instruments 2015, No. 2066. Electronic Communications. The Wireless Telegraphy (White Space Devices) (Exemption) Regulations 2015 18th December 2015.

http://www.legislation.gov.uk/uksi/2015/2066/pdfs/uksi_20152066_en.pdf

Spectrum sharing and exclusive licenses compared

Improve communication services of citizens

Opening spectrum resources increases competition and business-drive to innovate and improve services

Dedicated own spectrum resources guarantee Quality of Service and availability

Sharing

License

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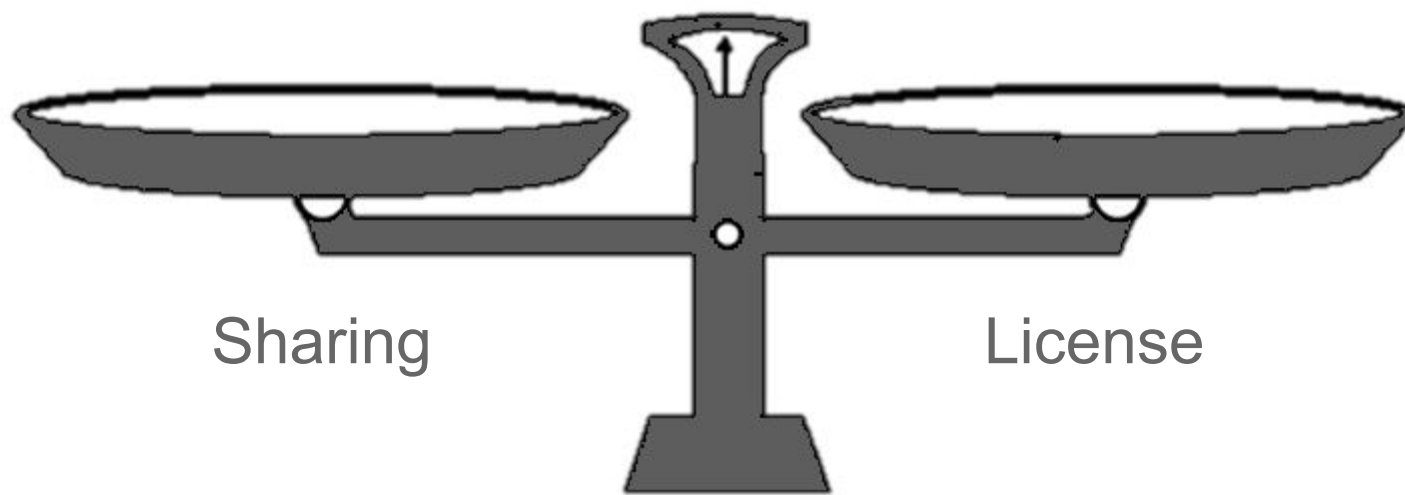
Decrease end user cost

Spectrum sharing increases supply of services leading to decreased costs

Larger number of service providers means duplicated investments, leading to increased costs

Sharing

License

Coherent

Fairspectrum
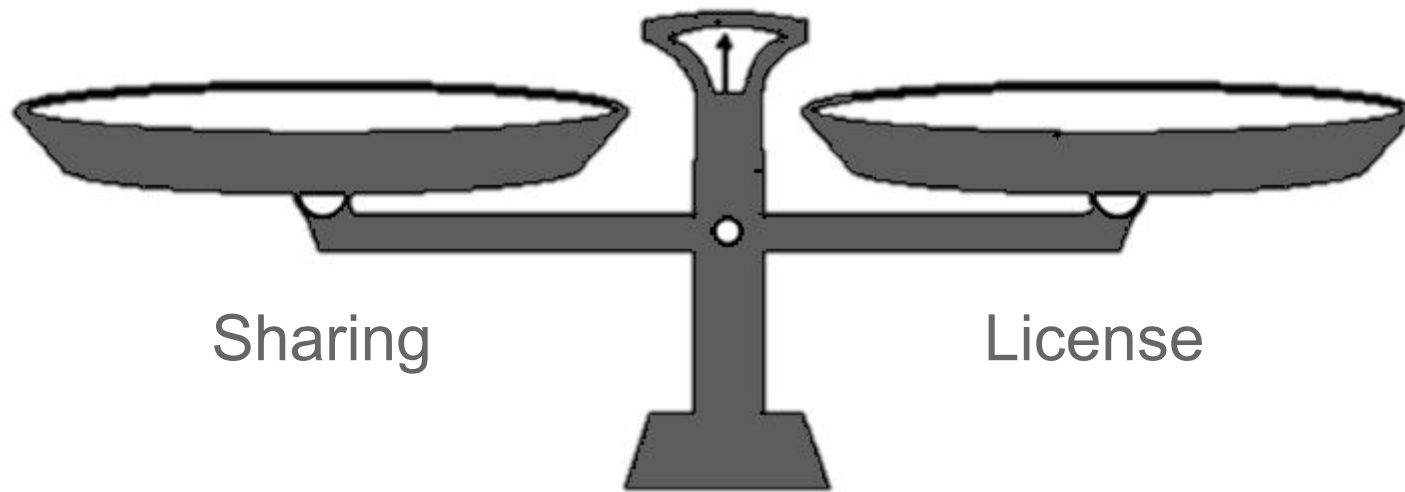
Increase infrastructure investments vs. competition

Removing or decreasing obstacles opens an opportunity to a larger number of potential investors

Barrier of entry against competitors is required to attract investments

Sharing

License

Coherent

Fairspectrum
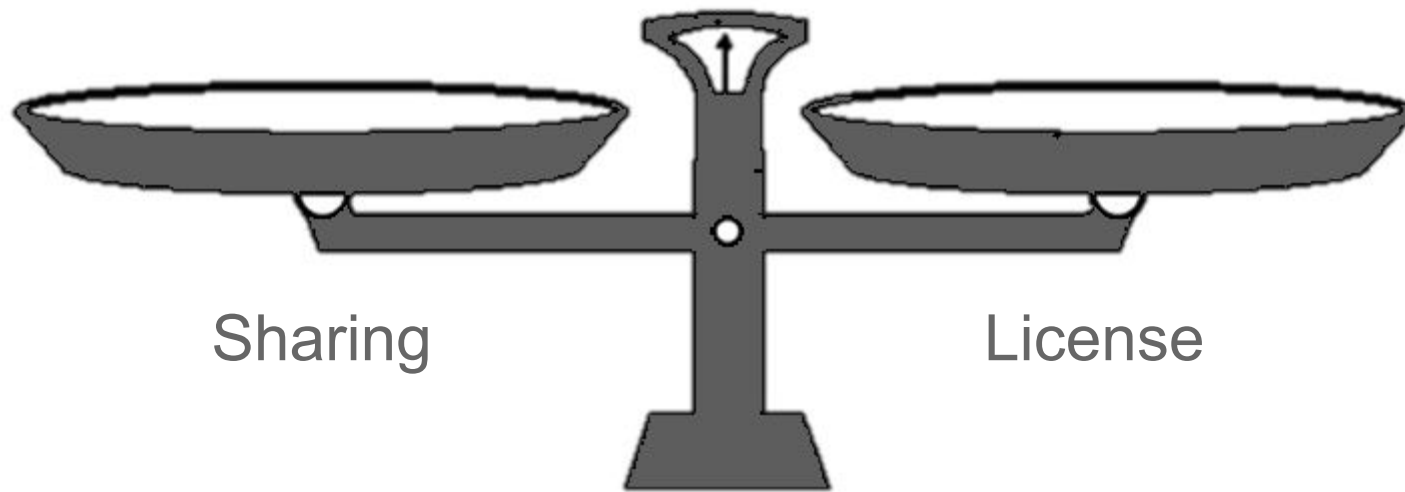
Increase spectral efficiency

Allowing other systems to use under-utilised spectrum resources increases spectral efficiency

Multiple incompatible systems using the same resource waste more than one optimized system

Sharing

License

Coherent

Fairspectrum
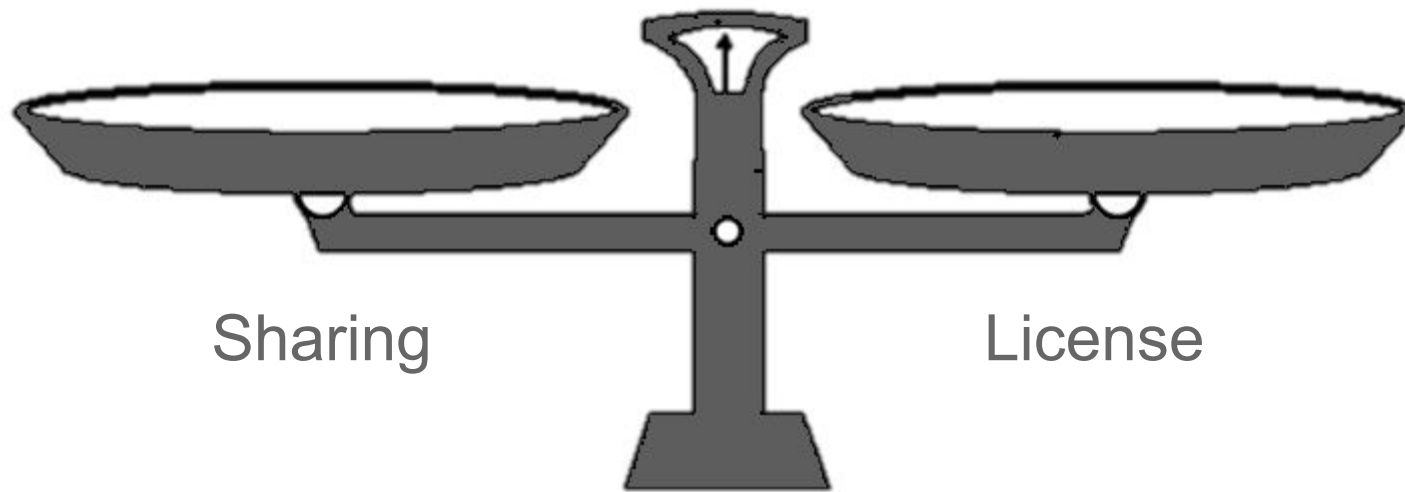
Bring money to government

Increased sharing potentially decreases the auction value of spectrum. The government can collect a larger portion by taxing higher revenues and profits.

High spectrum auction prices direct the investment from network infrastructure to generic government costs.

Sharing

License

Coherent

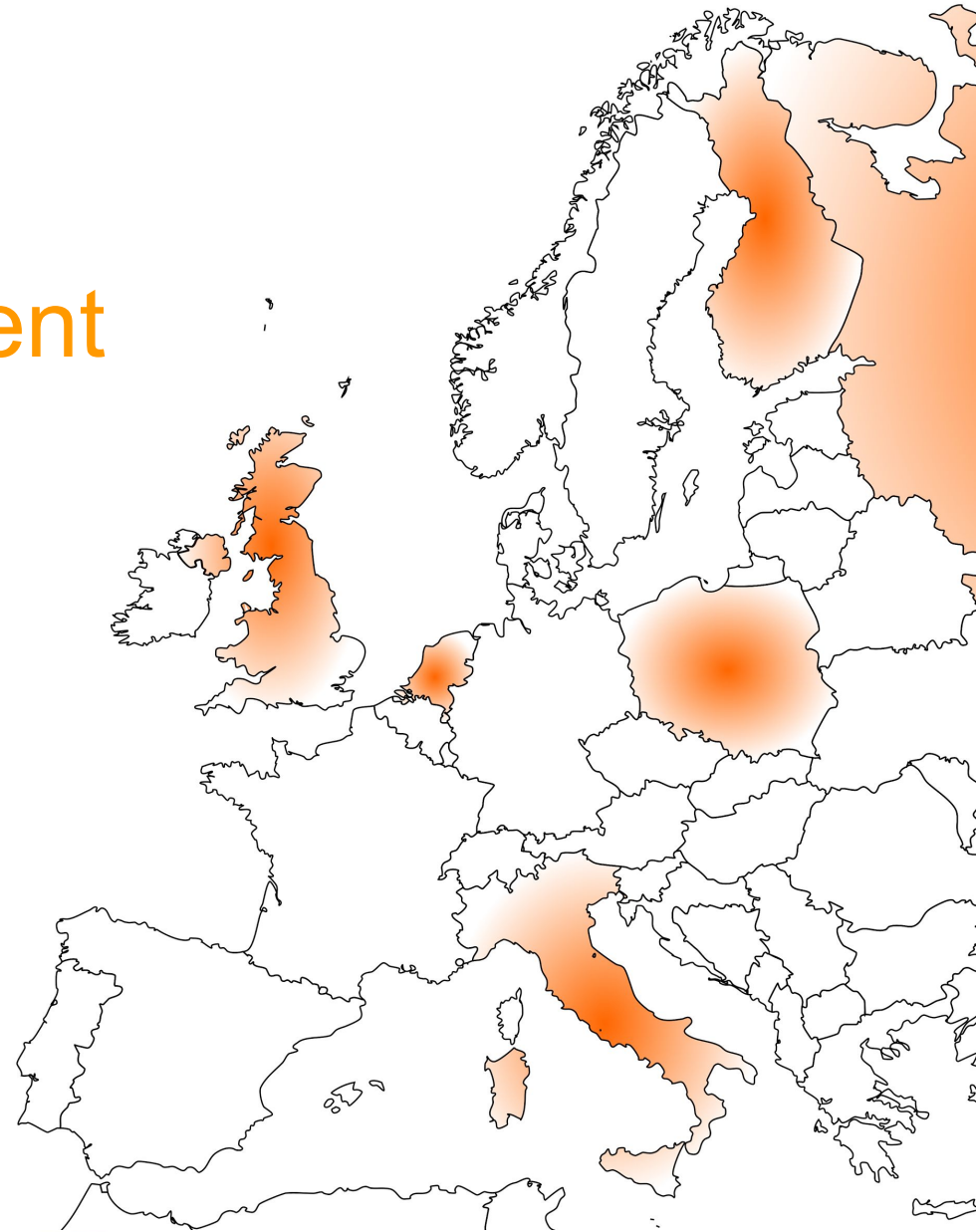Fairspectrum
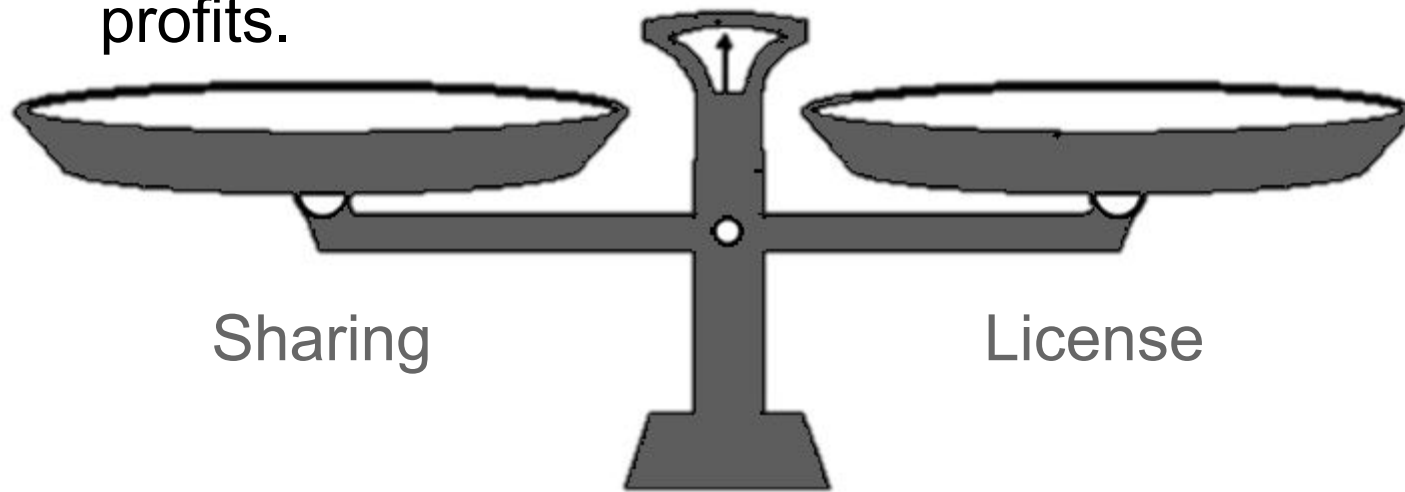
Dynamic spectrum market

Resales rights of spectrum resources enable dynamic spectrum market and more efficient use

Dynamic spectrum market assumes dynamic changes. Infrastructure investments are not dynamic. Dynamic market is more realistic on service level, e.g. MVNO.
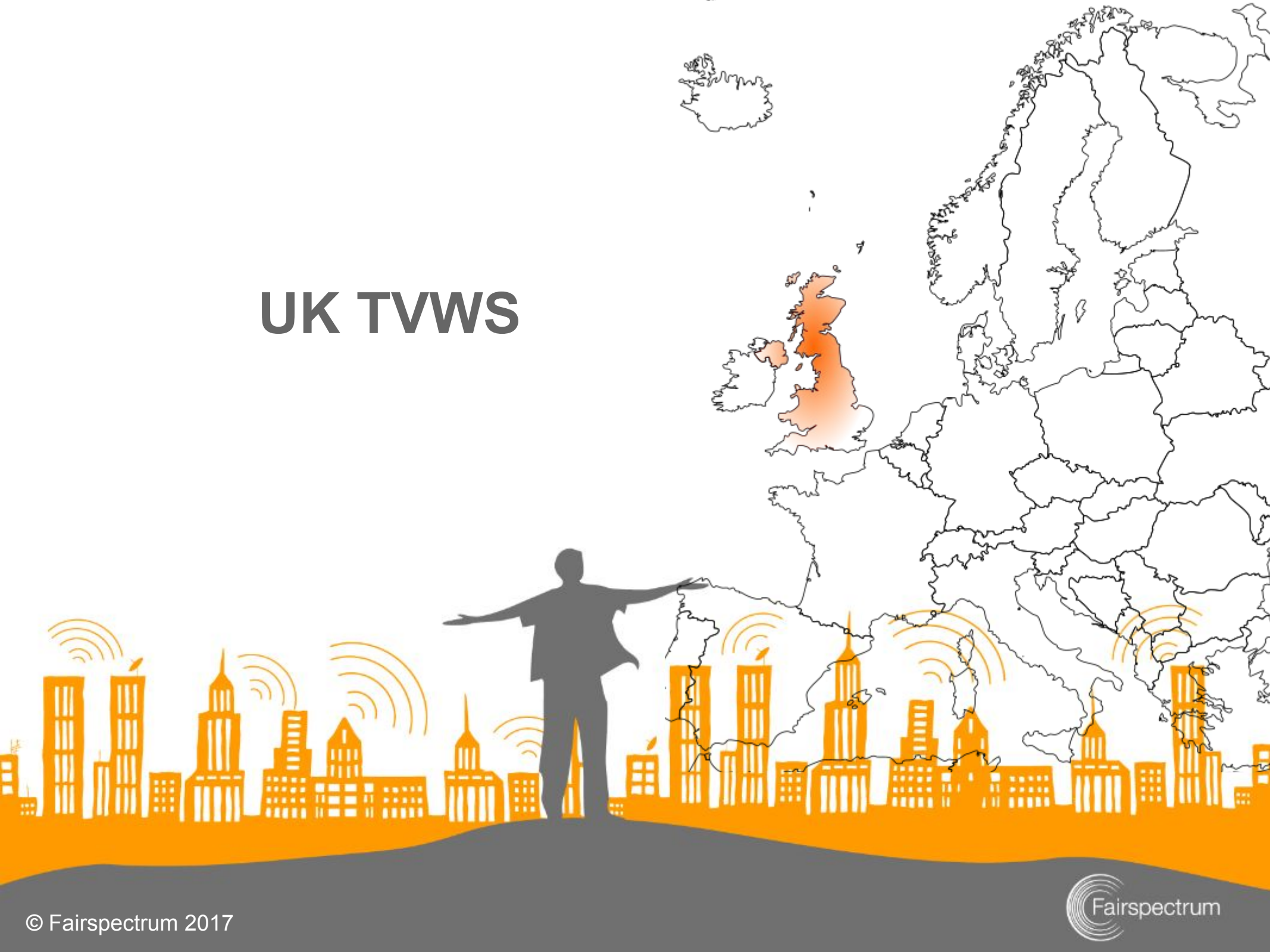
Sharing   License
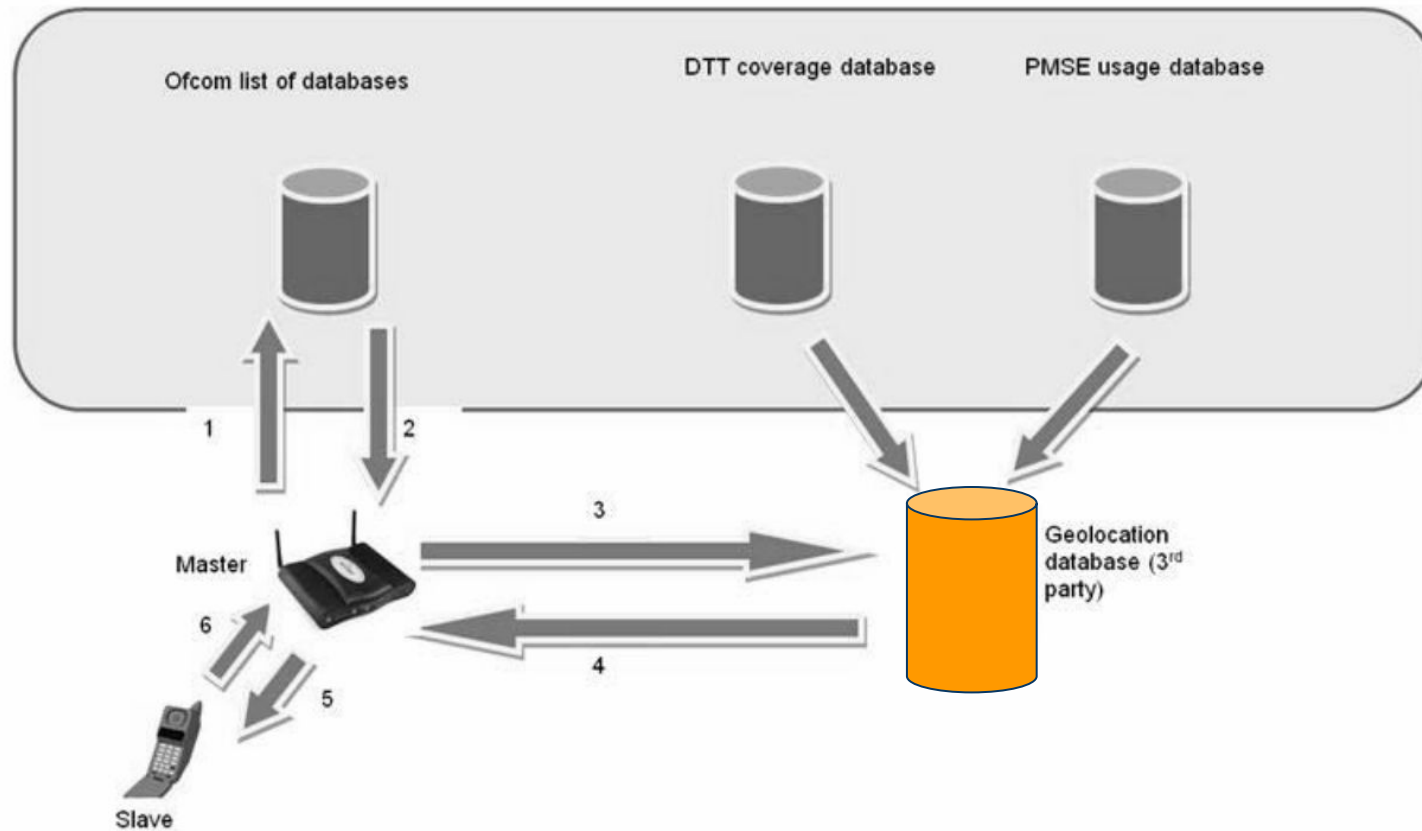
Coherent
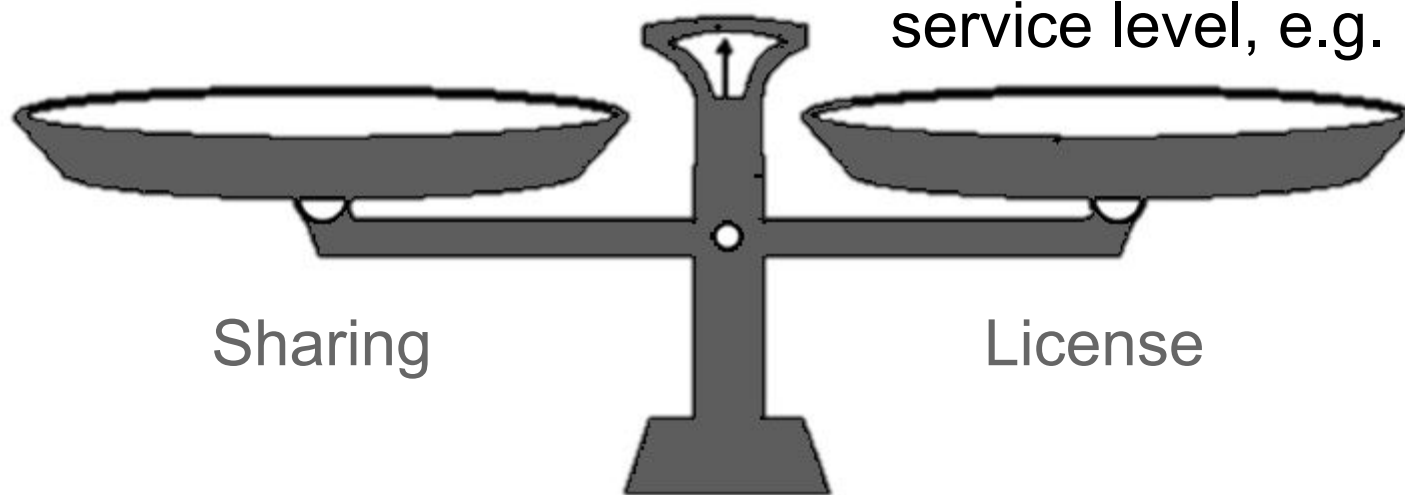
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Spectrum Management

- UK TVWS
- Netherlands PMSE 2.3 GHz
- Russia 700 MHz LSA
- Poland 3.5 GHz
- Italy 2.3 GHz LSA
- Finland
  - 2.3 GHz LSA
  - 3.5 GHz CBRS

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UK TVWS

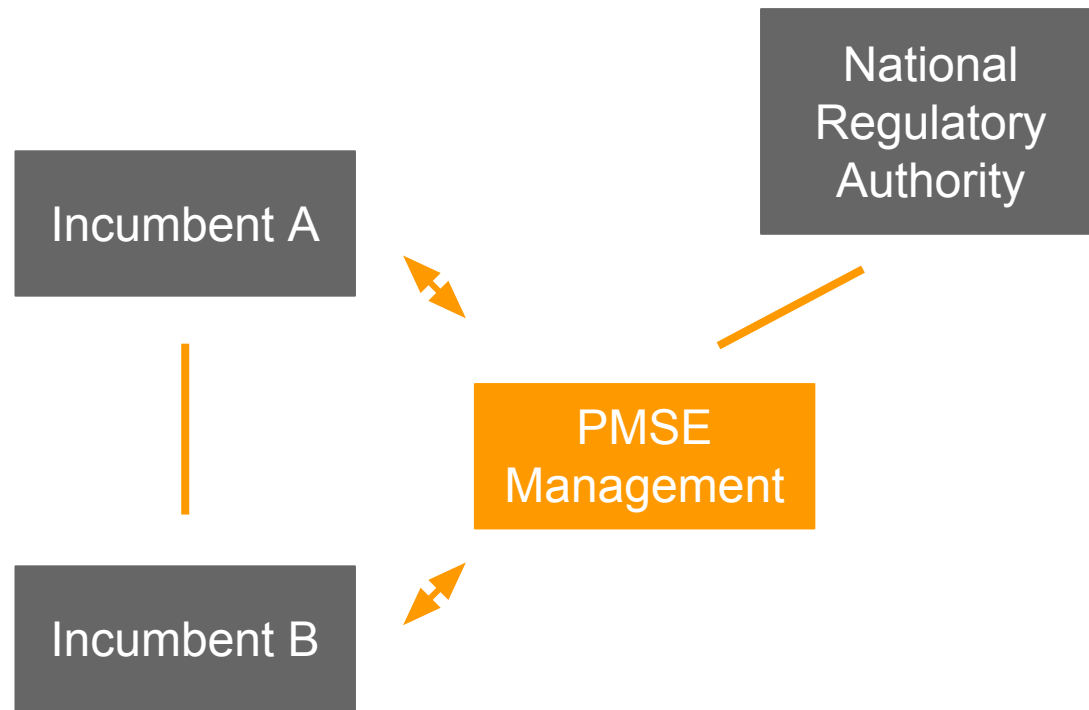# TVWS geolocation database

fsgbdb.com

WSD Manager

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WSD Manager

Register a new WSD

Info: WSD count:

Action			Organization	Licence ID	WSD Name	Serial Number	Manufacturer ID	Model ID	Category	Latitude	Longitude
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More									
Edit	Delete	More	Strathclyde	Free	strath_3	test_strath_3	cwsc	virtual-003	Slave	58.97366	-2.860328

PMSE Netherlands

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PMSE Management System

PMSE Netherlands

Licensee

- New reservation

- My reservations

- Reservations and blockings

- Change profile

- Documentation

LSA Russia

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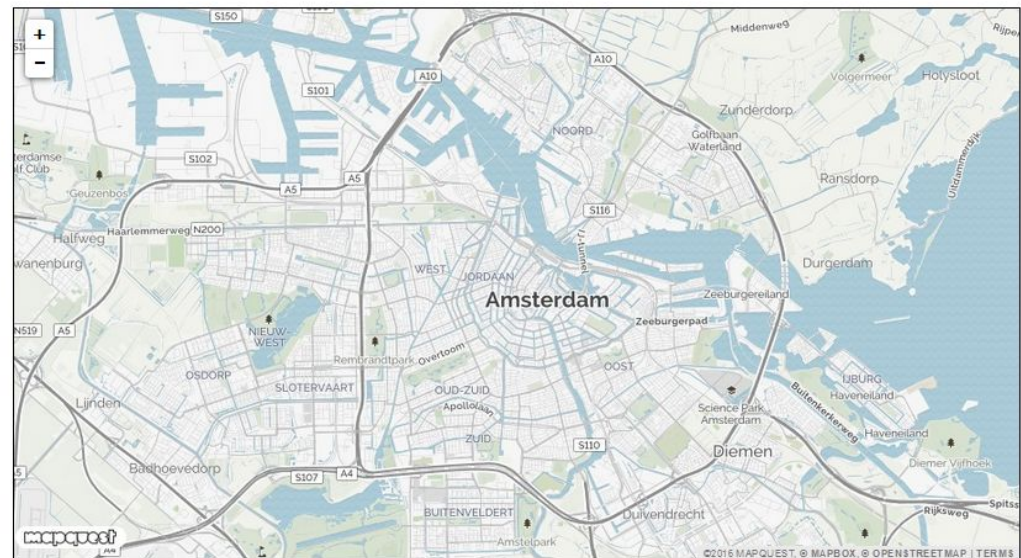
LSA Repository and Controller

LSA Repository

```
Type 'help' for help.

Version: 2016.06.16
2016.09.22 - 12:42:53
repository=#

repository=#

repository=# help
1 = Read datasets and send notifications
2 = Get resources

repository=# 1
Sending Notification command

repository=#
```
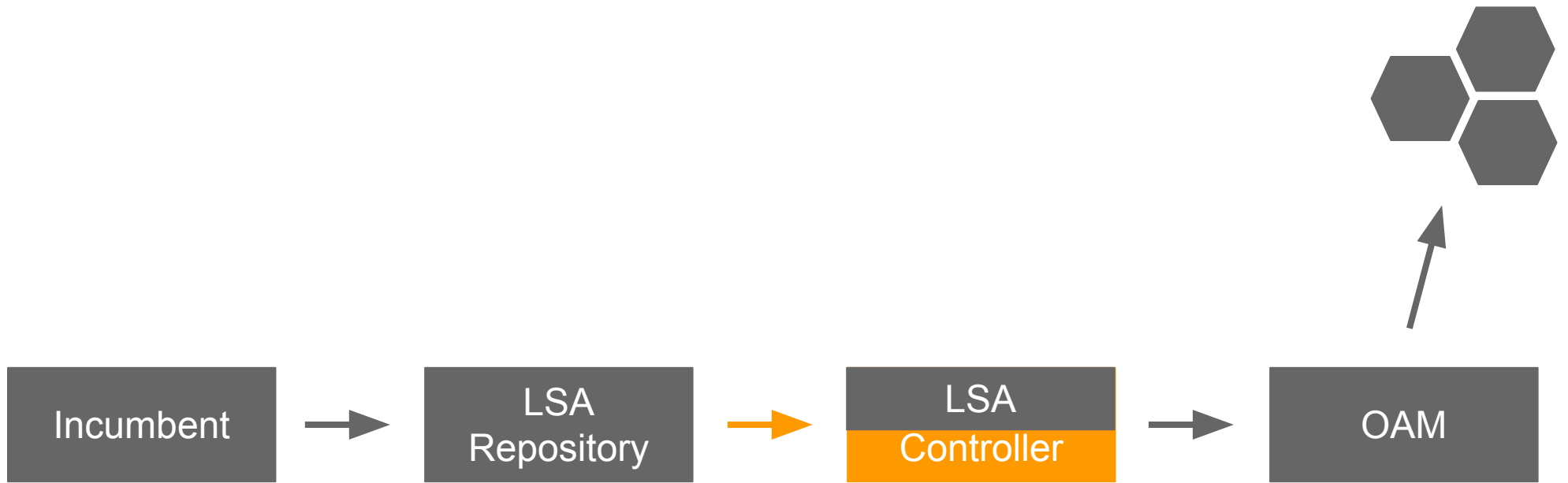
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LSA Italy

Fairspectrum
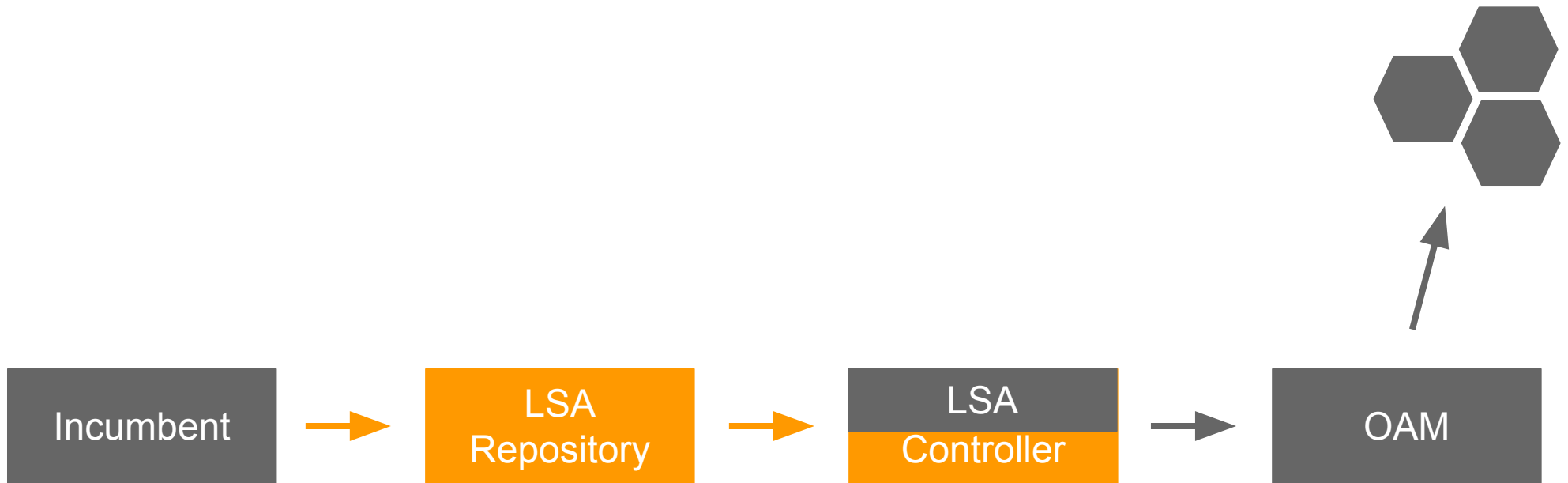
LSA Controller

Incumbent → LSA Repository → LSA Controller → OAM

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LSA and CBRS Finland

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LSA Repository and Controller

Incumbent → LSA Repository → LSA Controller → OAM

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CBRS system
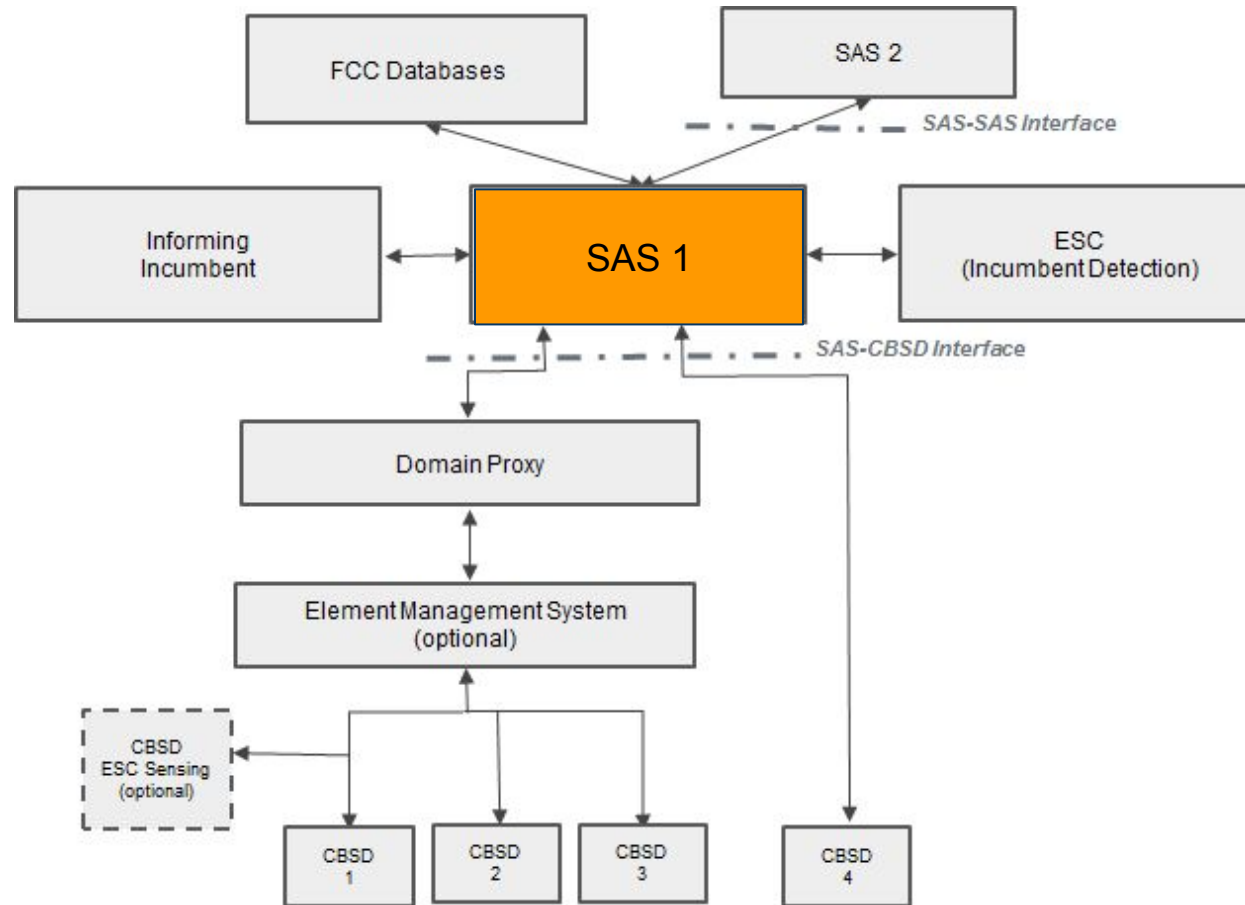
Poland

Spectrum Management System

Wimax

Fixed links

Spectrum Management

CBRS GAA

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Conclusions

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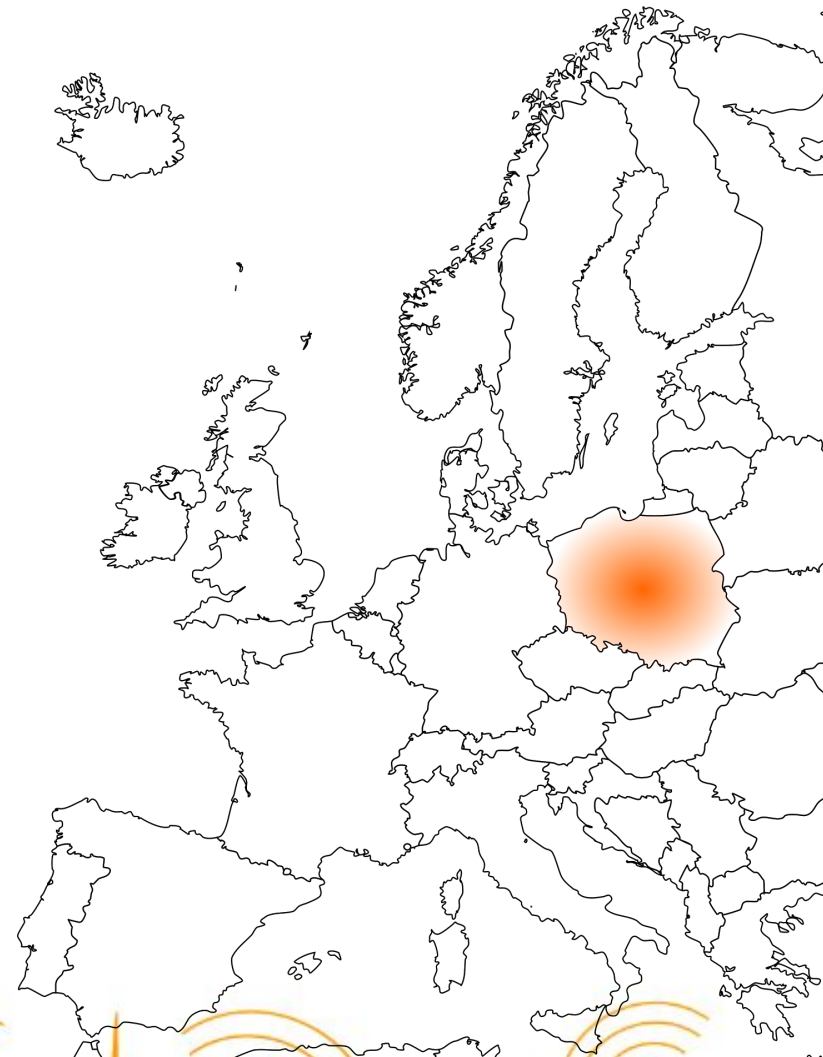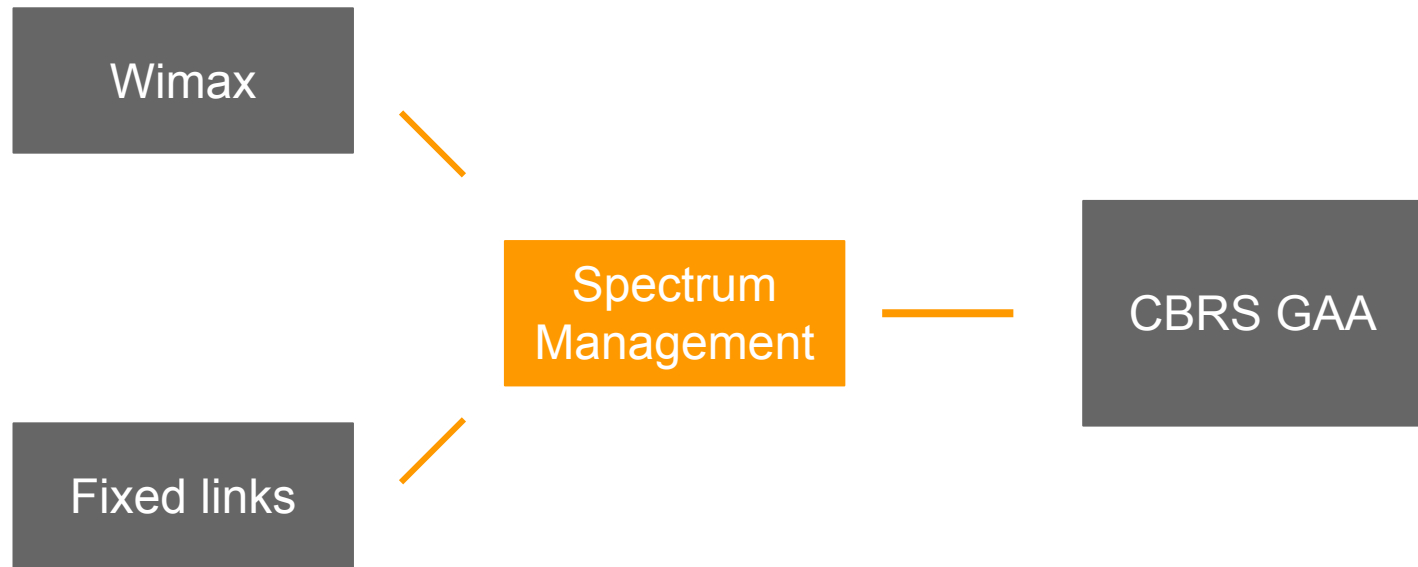
Benefits for stakeholders in DSA

National Regulatory Authority

More efficient use of resources
Automated control
Improved awareness of real use

Incumbent

Avoid spectrum band changes
Maximise lifetime of investments
Spectrum leasing business

DB provider

Business opportunities

Operator

More coverage
More capacity
Targeted spectrum sourcing
New business

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Spectrum management and Dynamic Spectrum Access

Licensing	Interference protection	Priority	Coordination	Sharing
Licensed	Protected	Primary	NRA coordinated	Exclusive
License-exempt	Protected from lower priority users	Co-primary	*Database coordinated*	Static sharing
	Not protected	Secondary	Listen before talk	*Dynamic sharing*
		Unspecified	Uncoordinated	Public access

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Spectrum management and Dynamic Spectrum Access

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	Not protected	Secondary	Listen before talk	*Dynamic sharing*
		Unspecified	Uncoordinated	Public access

Legend:
— Mobile
— CBRS PAL, LSA Licensee
— WiFi

TVWS, LSA, CBRS, Multefire

Licensing	Interference protection	Priority	Coordination	Sharing
Licensed LSA CBRS	Protected LSA CBRS	Primary	NRA coordinated	Exclusive
License-exempt TVWS CBRS MulteFire	Protected from lower priority users LSA CBRS	Co-primary	*Database coordinated* LSA CBRS	Static sharing
	Not protected TVWS CBRS MulteFire	Secondary LSA CBRS TVWS	Listen before talk MulteFire	*Dynamic sharing* LSA CBRS TVWS
		Unspecified MulteFire	Uncoordinated TVWS	Public access MulteFire

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When DSA can help?

- Primary and secondary users share the band and the radio use of the primary changes frequently

- Secondary users are consumers or corporate users, which do not have professional communications staff

- Sharing between co-primary users, which either change their use frequently or which are high in number

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