

30th Meeting**Kazan, 6th – 9th December 2011****Date issued: 30 November 2011****Source: United Kingdom****Subject: UK Contribution to “EC Workshop on “Software Defined Radio and Cognitive Radio standardization”**

Password protection required? (Y/N)

Summary:

UK would like to submit the attached set of slides which were presented to a workshop that was organised by the European Commission on “**Software Defined Radio and Cognitive Radio standardisation**”. The slide set gives an update on UK activities regarding the possible introduction of White Space Devices in the 470 - 790MHz through the use of Geo-Location databases. It also gives some views on what areas the UK think needs to be addressed going forward with regards standardisation activities.

Proposal:

To note for Information

Background:

*EC Workshop on software defined radio
and cognitive radio standardization, Ispra, Italy*

Framework for regulation and standardisation of white space devices in the UHF TV band

Professor Reza Karimi
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17 November 2011

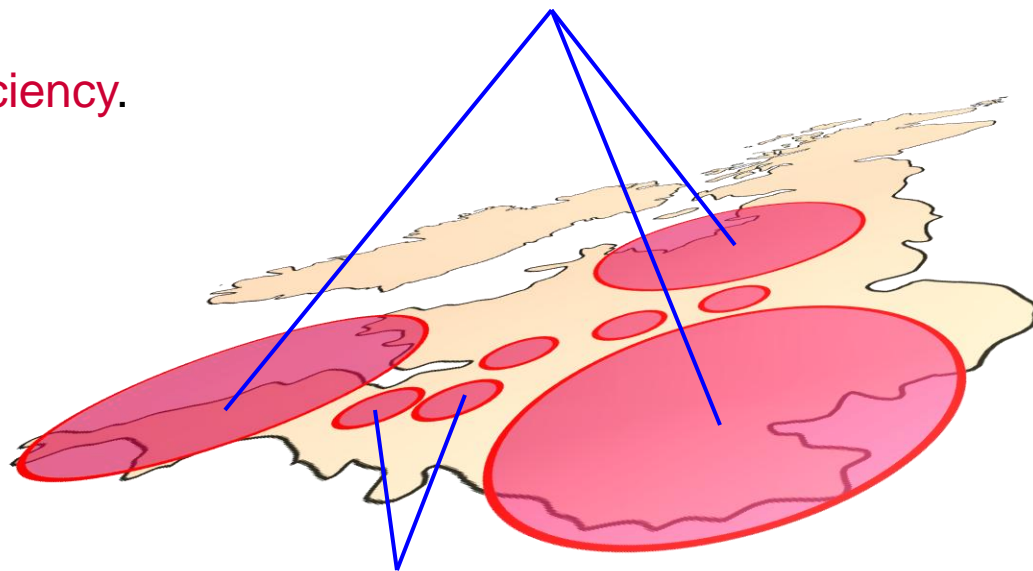
Outline

- What are TV white spaces?
- Services and applications
- Ofcom's position
- White space database: the technology
- Regulation and standardisation in Europe
- Conclusions

TV white spaces

- “White spaces” refer to geographical **areas** where the radio spectrum is **not used** by the **licensee**.
- White space spectrum can be potentially accessed by users **other** than the licensee, resulting in
 - increased overall spectrum **efficiency**.
 - innovative **new** services.
- **Protection** of the incumbent licensee(s) is paramount.

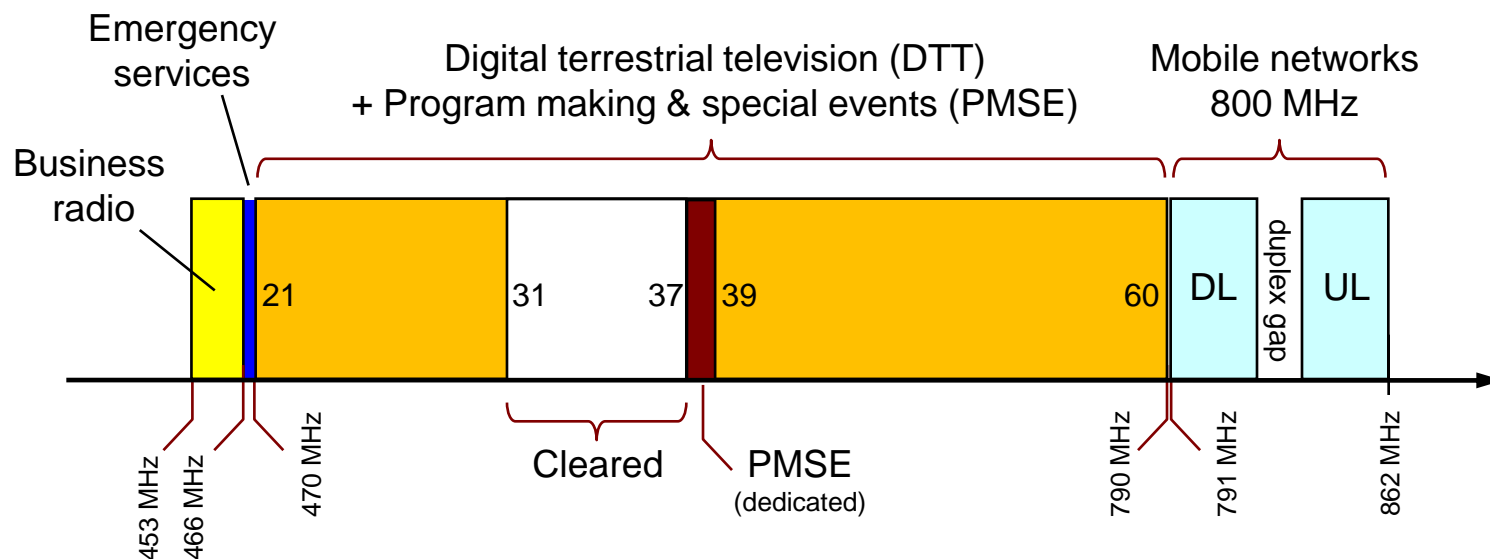
High power TV broadcasts using the same frequency need to leave spaces between their coverage areas to avoid interference.



These frequencies can be used in the “white spaces” in between by lower-power devices.

The UHF TV band and licensed services in the UK

- Access to the UHF TV band by white space devices (WSDs) would be subject to the protection of incumbent licensees.



- We should not forget cross-border obligations.

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WSD applications: Enhanced Wi-Fi

- What is it?
 - Wi-Fi devices operating in TV white spaces, **as well as** the existing allocations at 2.4 and 5 GHz.
- Why is TV white space spectrum attractive?
 - Popularity of Wi-Fi could lead to **congestion** and poor performance for devices at 2.4 GHz.
 - Perception that Wi-Fi operating at 5 GHz has **poor range**.



WSD applications: Rural broadband

- What is it?
 - Using TV white spaces to provide a wireless **broadband** connection to rural areas.
- Why is TV white space spectrum attractive?
 - A **cost-effective** means to provide broadband to areas that would be too expensive to serve by other means.

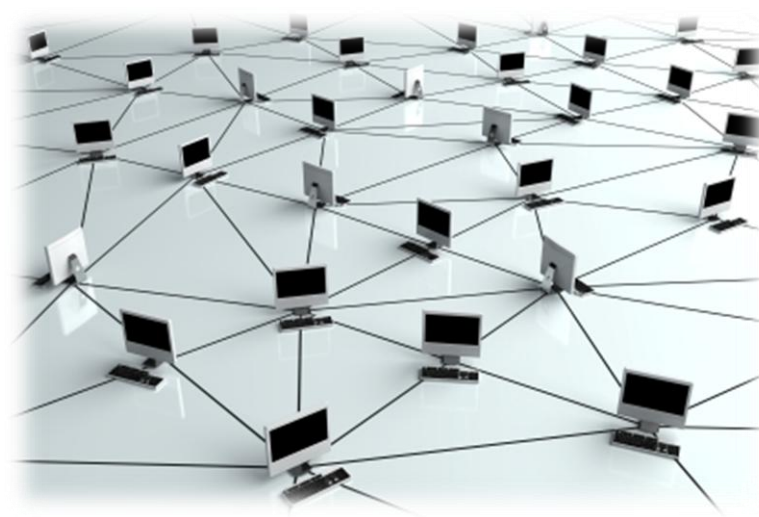


Photos courtesy of BT

WSD applications: Machine-to-machine communications (M2M)

- What is it?
 - Data connections between **sensors** and devices used for **telemetry** or remote **monitoring**.

- Why is white space spectrum attractive?
 - A more **cost-effective** network for M2M communications compared to using **cellular** networks.
 - Additional range afforded by TV white spaces is attractive to reach devices deep **inside** buildings



Significant stakeholder interest in TV white spaces

- Industry **interest** in developing **WSDs** and deploying services is **growing**.
- There is also the potential for a market in **related** services (e.g., white space databases, **WSDBs**).
- Trials of prototype WSDs and WSDBs are on-going in the UK:
 - Rural broadband in Scotland.
 - A range of services in Cambridge.

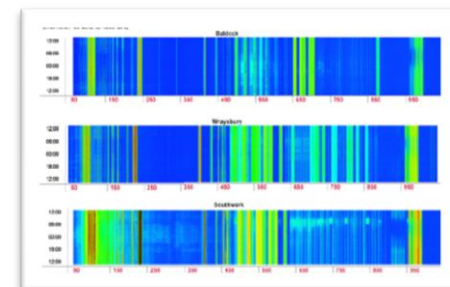


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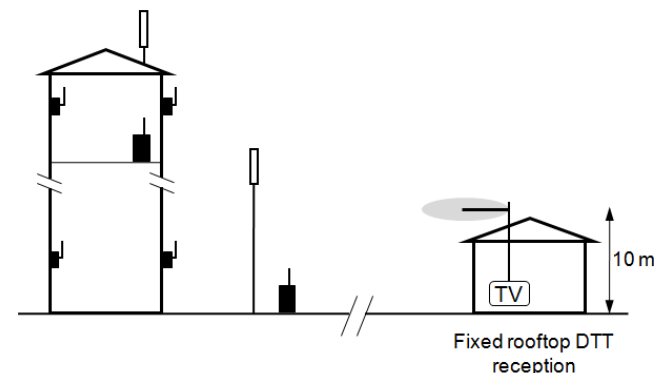
Enabling access to TV white spaces

- We have decided to proceed with enabling access to TV white spaces for the following reasons:
 - We have a **duty** to secure **optimum** use of the spectrum. Spectrum in white spaces is (by definition) **unused**.
 - We have a **duty** to **remove barriers** to innovation.
 - Access to TV white spaces is a **stepping stone** for future access to white spaces in **other bands**. This may satisfy some of the huge demand for spectrum for wireless data applications.
 - Internet and computing **technologies** have advanced to the extent that **dynamic** and **opportunistic** spectrum sharing is becoming technically **viable**. This can result in increased efficiencies in spectrum use. Access to TV white spaces is a good **test-case**.



But there are challenges

- The **protection** of incumbent licensees is paramount. We are confident that this can be achieved via white space databases (**WSDBs**).
- No-one currently knows the precise **amount** and **quality** of white space spectrum. These depend on the **degree** of protection afforded to the incumbent licensees.
- Harmonised **standards** for the realisation of **regulatory requirements** for WSDs are crucial. Some aspects of standardisation will not have been encountered before.
- Will access to TV white spaces be a **success** story?
Only time will tell.
Industry appears keen to proceed despite uncertainties.



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The path towards access to TV white spaces

Ofcom's consultations

White space access should be allowed in principle and be **licence exempt**, provided no interference is caused to licensed services.

Initial views on **white space database** ownership, information exchange between databases and WSDs.

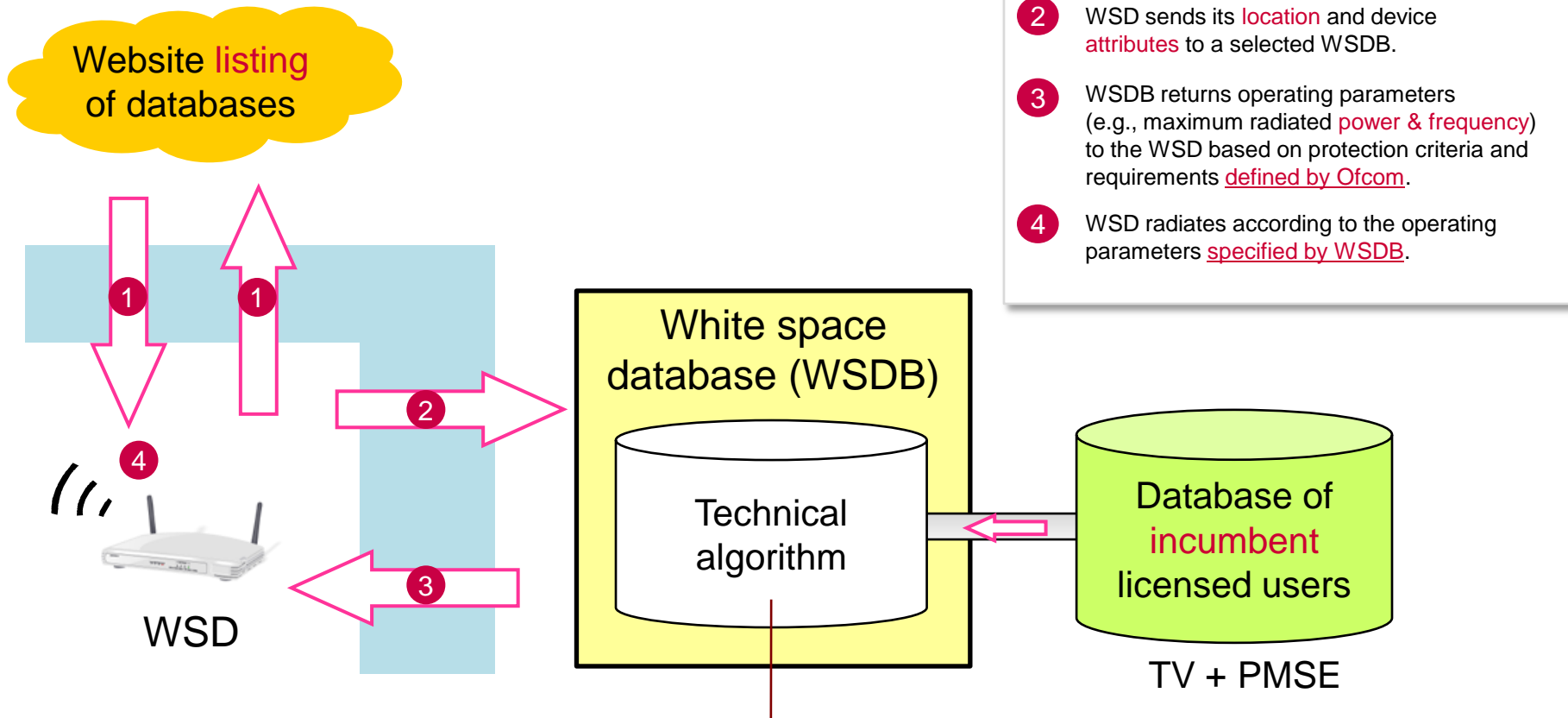


Autonomous vs. database-assisted.

Geolocation was the most promising way for a WSD to gain access to spectrum in the short-medium term. **Sensing** is also an option in the **longer-term**.

Initial views on approach to making WSDs licence exempt, high-level **requirements on databases** and database providers.

Database-assisted access to white spaces



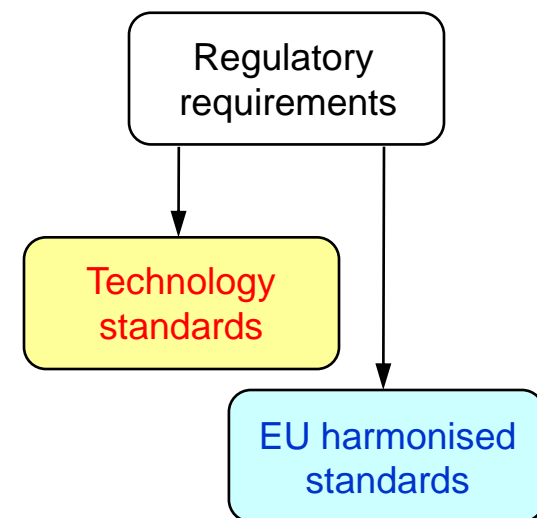
Identifies available TV channels and computes maximum permitted WSD power (algorithm specified by the national administration).

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Standardisation is key

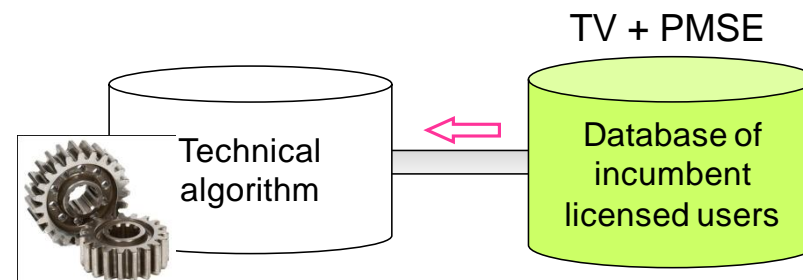
- Standardisation is important for three reasons:
 - To achieve **economies** of scale.
 - To allow for the **roaming** of WSDs across borders.
 - To enable a common **European** market.
- But **what** is it exactly that needs to be standardised?
- And **where** should these be standardised?
- Important to draw clear **distinction** between:
 - European harmonised standards
Defined by organisations such as **ETSI**, required as a reference for compliance with the essential requirements of the **R&TTE Directive**, for placing products on the European market.
 - Technology standards
Defined by organisations such as IEEE, 3GPP, Weightless SIG, IETF.



What does not need to be standardised

The following do not need to be standardised:

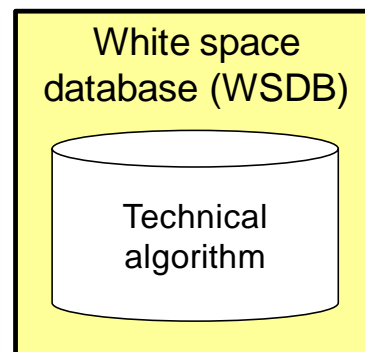
- The WSDB **technical algorithm** which specifies the available TV channels and the maximum permitted WSD power.
 - The algorithm and its parameter values can be **country-specific** in order to reflect the national **administrations'** (often widely different) **circumstances**. The afforded **flexibility** is a key benefit of WSDBs.
- The **interface** between the WSDB and **incumbent licensees' databases**.
 - The interface can be **country-specific**. This will be inevitable given that **TV** and **PMSE** are **planned** and managed differently in different countries, and access to their databases is subject to different constraints.



What does not need to be standardised

The following do not need to be standardised:

- The **accreditation** of the data base provider
 - This can be **country-specific** and consists of the technical and legal **requirements** that a **WSDB** provider must **adhere** to in order to be **approved** by administrations to provide services to WSDs.



Technology standardisation (1)

The following needs to be standardised:

- WSD **radio interface** (over the UHF TV spectrum).
 - **Technology** standards may be specified by organisations such as IEEE, 3GPP, Weightless SIG, and others (including ETSI itself).
 - Examples:
 - PHY layer modulation and coding.
 - MAC layer protocols (e.g., CSMA/CA, frequency-hopping).

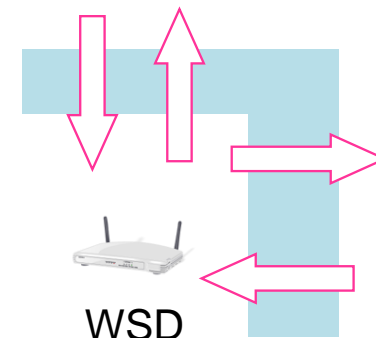


WSD

Technology standardisation (2)

The following needs to be standardised:

- The communication **protocols** between the **WSD** – **WSDB** and **WSD** – **WSDB-listing**.
 - **Technology** standards may be specified by organisations such as IETF PAWS. These should account for regulatory requirements (as recommended by CEPT).
 - Examples:
 - ❑ Parameters exchanged between WSD and WSDB or WSDB-listing.
 - ❑ Format of the parameters.
 - ❑ Protocol stack for the communication of the parameters.
 - ❑ Security protocols.



European harmonised standardisation (1)

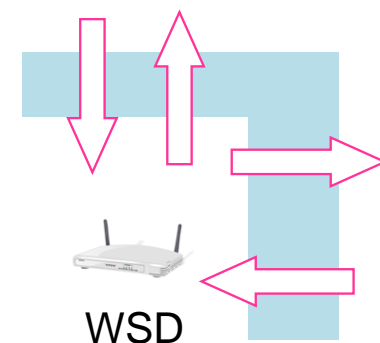
- As a baseline, the **ETSI** harmonised standard (EN) might be similar to **EN 300 328** for the 2.4 GHz band.
- This would include **radio** technical specifications and related **conformance** tests.
- Examples of what the EN would specify:
 - ❑ WSD frequency accuracy and stability.
 - ❑ WSD spectrum emission mask.
 - ❑ WSD spurious emission levels (transmitter and receiver).
 - ❑ Politeness rules (not to be confused with polite protocols).



WSD

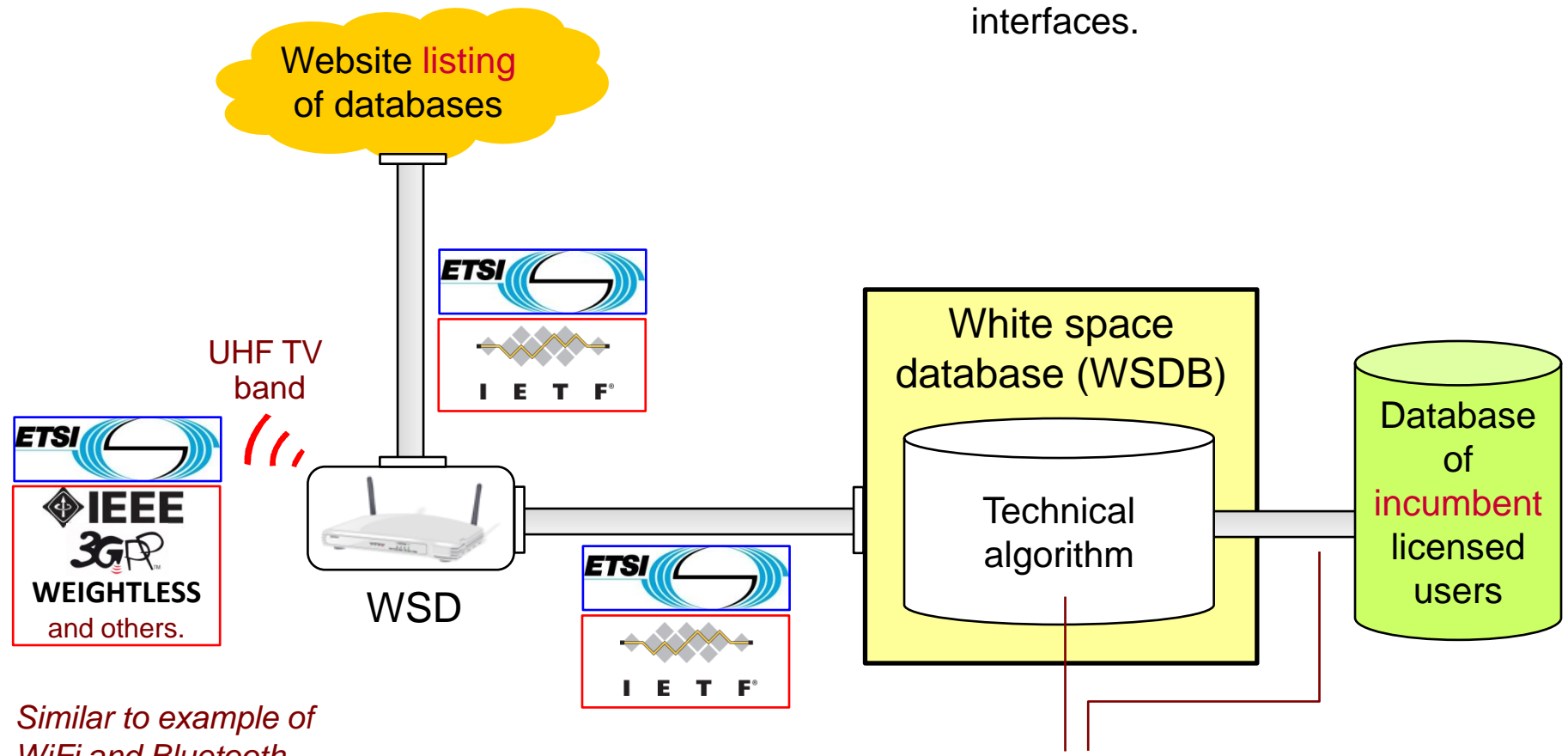
European harmonised standardisation (2)

- In addition, the **ETSI** harmonised standard (EN) would be required to specify
 - a) minimum set of **parameters** to be exchanged between WSD, WSDB and WSDB-listing (as recommended by CEPT),
 - b) how a WSD must **generate** (and respond to) the exchanged parameters,
 - c) **conformance** tests in relation to (a) and (b).
- Examples of items that the EN would need to address:
 - ❑ WSD location,
 - ❑ WSD location accuracy,
 - ❑ WSD maximum permitted EIRP,
 - ❑ WSD available TV channels...



Summary

IETF PAWS appears to be the most suitable forum for standardisation of WSD-WSDB and WSD-listing interfaces.



Similar to example of WiFi and Bluetooth in the 2.4 GHz band, but with extras...

Standardisation not needed (flexible and country-specific).

The UK approach for regulation of WSDs

- WSDs need to meet the *essential requirements* of the R&TTE¹ Directive. Compliance with the essential requirements is typically achieved via *conformance* with *European harmonised standards* or norms (ENs).
- In the absence of ENs, we propose to create UK-specific *voluntary national specifications (VNSs)* for the regulation of WSDs.
- The VNSs will include:
 - a) Specification of procedures for WSDs to *select* and *consult*, and interpret *instructions* from a WSDB.
 - b) Conformance *tests* to ensure compliance with the specifications in (a).
- The VNS will *not* specify the *underlying technology* or detailed communications protocols. These will be specified by *technology standardisation* organisations (e.g., IETF PAWS).
- In due course, we will *submit* concepts from our *VNSs* for consideration by *ETSI* for the creation of appropriate ENs.



The UK approach for regulation of WSDBs

- We are currently **not sure** whether the framework of the **R&TTE Directive** applies to **WSDBs** (as it does to WSDs).
- This is because it is not clear whether a WSDB can be interpreted as a “telecommunications terminal equipment”. Consequently, it is not clear whether a EN will eventually be created for WSDBs.
- Given the above **ambiguity**, we do not propose to create a VNS for WSDBs. The **regulatory** requirements for WSDBs in the UK will instead be specified in the form of a “**specifications document**”.
- Operators of WSDBs will be required to comply with these specifications.



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Conclusions

- We have outlined our current **views** on access to TV white spaces, and issues of **regulation** and **standardisation** of white space devices (WSDs) and white space databases (WSDBs).
- We have indicated the **need for standardisation** of the **interface** between a WSD and a WSDB. We have emphasised that the **internal operation** of WSDBs **need not** be standardised.
- We propose to use UK-specific **voluntary national specifications** (VNSs) as a short-term instrument for the regulation of WSDs.
- The UK regulatory requirements for WSDBs will be defined in **separate specifications**.
- We have outlined (at a high level) the **contents** and **scope** of our WSD and WSDB **regulatory requirement** specifications. These will be **technology-agnostic** (do not specify detailed communication protocols).

Next steps

- We will prepare a UK **VNS** for WSDs based on the material presented in these slides. Expected completion: **mid-2012**.
- In the meantime, we will work with the **European Commission** to develop appropriate **mandates** to **ETSI** to create European **harmonized** standards for WSDs.
- We will also support efforts to initiate working items for purposes of creating ETSI standards.
- In due course, we will **submit** concepts from the UK **VNS** for **consideration** by ETSI.
- We will keep **technology** standards organisations such as the IEEE and IETF informed of our **regulatory** requirements (through regular information exchange).
- We will continue to engage with **CEPT** to develop guidance documentation for **ETSI** and others on the elements needed to create **European Harmonisation**.

European effort

- We believe that access to TV white spaces is a **critical test case**
 - in enabling **dynamic** and **opportunistic** spectrum sharing, and
 - for future access to white spaces in **other bands**.
- It is **imperative** that we in Europe **focus** our efforts in solving the **specific** and **well-defined** problems presented by access to TV white spaces.
- Progress in this area will allow increased **technical** and **economic** efficiencies in the use of the radio spectrum.

Thank you!

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