

OECD FF

TV White Space Devices ...and beyond!

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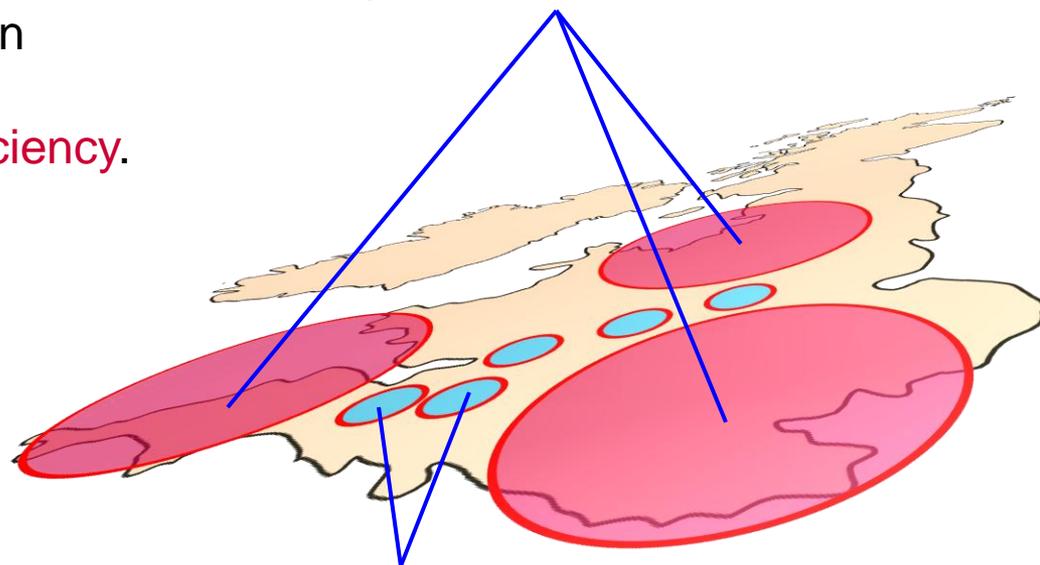
Outline

- What are TV white spaces?
- Services and applications they might be used for
- Ofcom's decision to allow TV white space devices in the UK
- And beyond... How devices might need to access radio-spectrum in the future

TV white spaces

- “White spaces” refer to geographical **areas** where the radio spectrum is **not used** by the **licensee** (because to do so would cause interference to the licensee’s services elsewhere).
- 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.

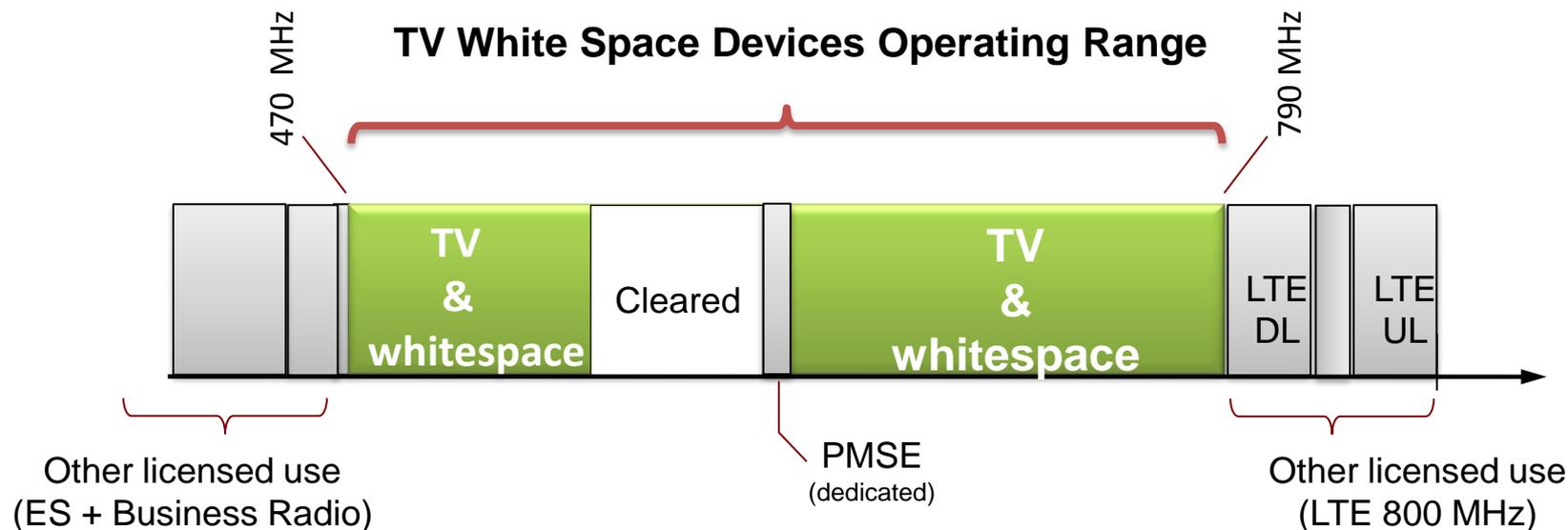
High power TV broadcasts using the same frequency need to leave spaces between their coverage areas to avoid interference.



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

TV Whitespace devices – operating frequencies

- Access to the UHF TV band by white space devices (**WSDs**) would be subject to the protection of incumbent licensees (mostly **DTT**).
- TV white space devices are **location aware**. They check with a **central database** what frequencies are safe to use in their location.
- Estimates that 100MHz and more is available in many areas of the UK.



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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**.
 - Potentially facilitates outdoor or “metro” coverage



WSD applications: Rural broadband

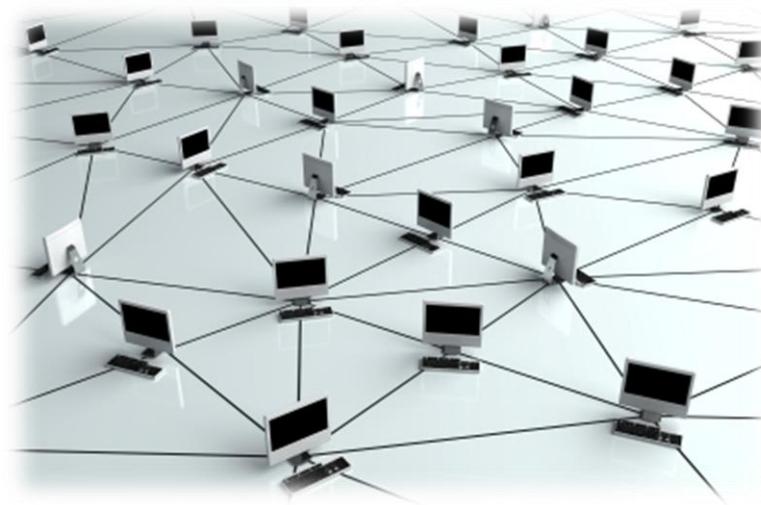
- What is it?
 - Using TV white spaces to provide a wireless **broadband** connection to rural areas.
- Why is TV white space spectrum attractive?
 - A **cost-effective** means to provide broadband to areas that would be too expensive to serve by other means.



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**.
Connecting everyday objects to the internet
- 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 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.

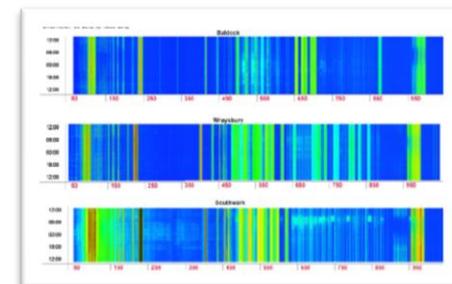


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Enabling access to TV white spaces

- We have decided to proceed with enabling access to TV white spaces for the following reasons:
 - Short term
 - 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.
 - Longer term
 - 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**. Access to TV white spaces is a good test-case.

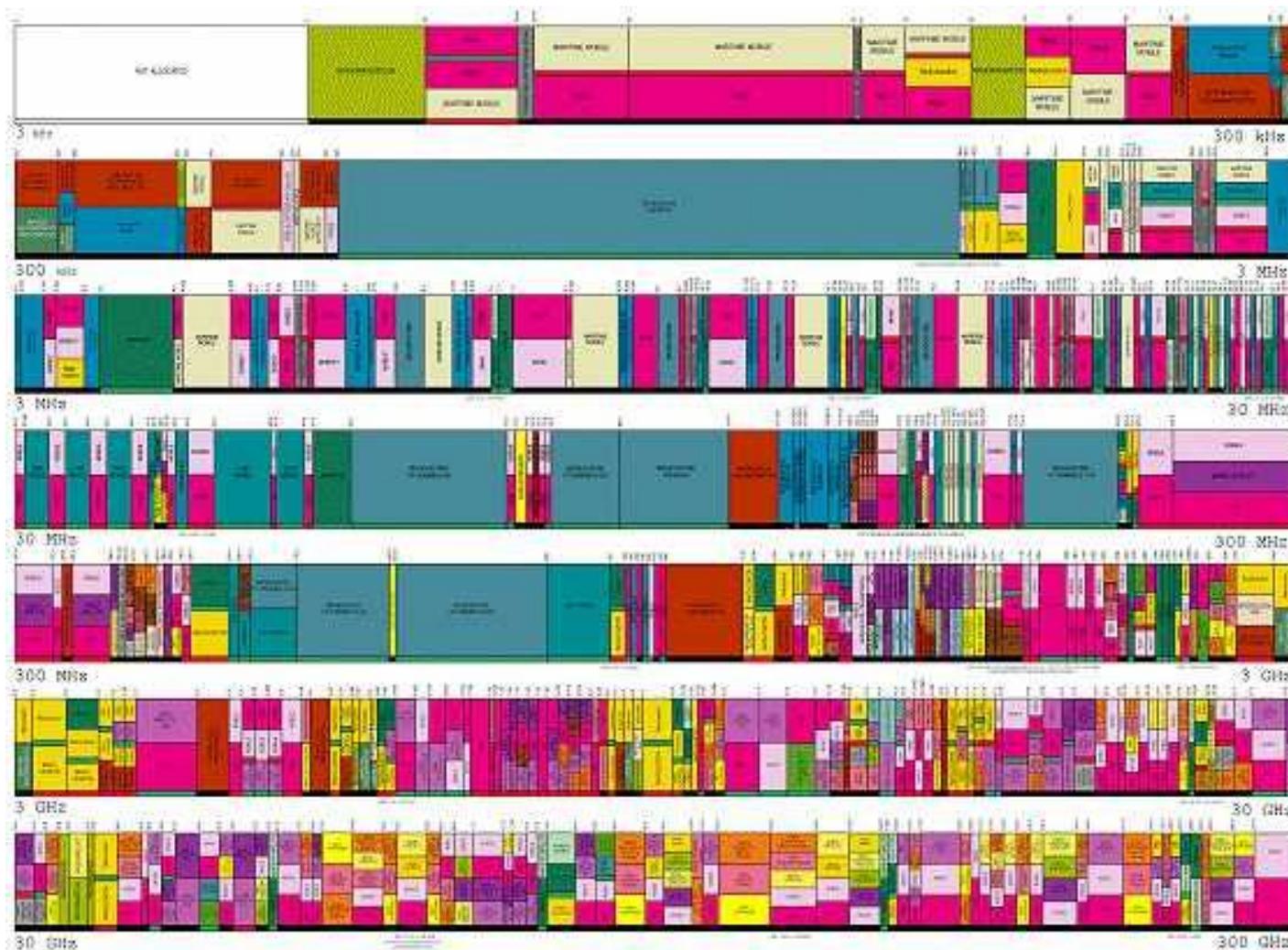


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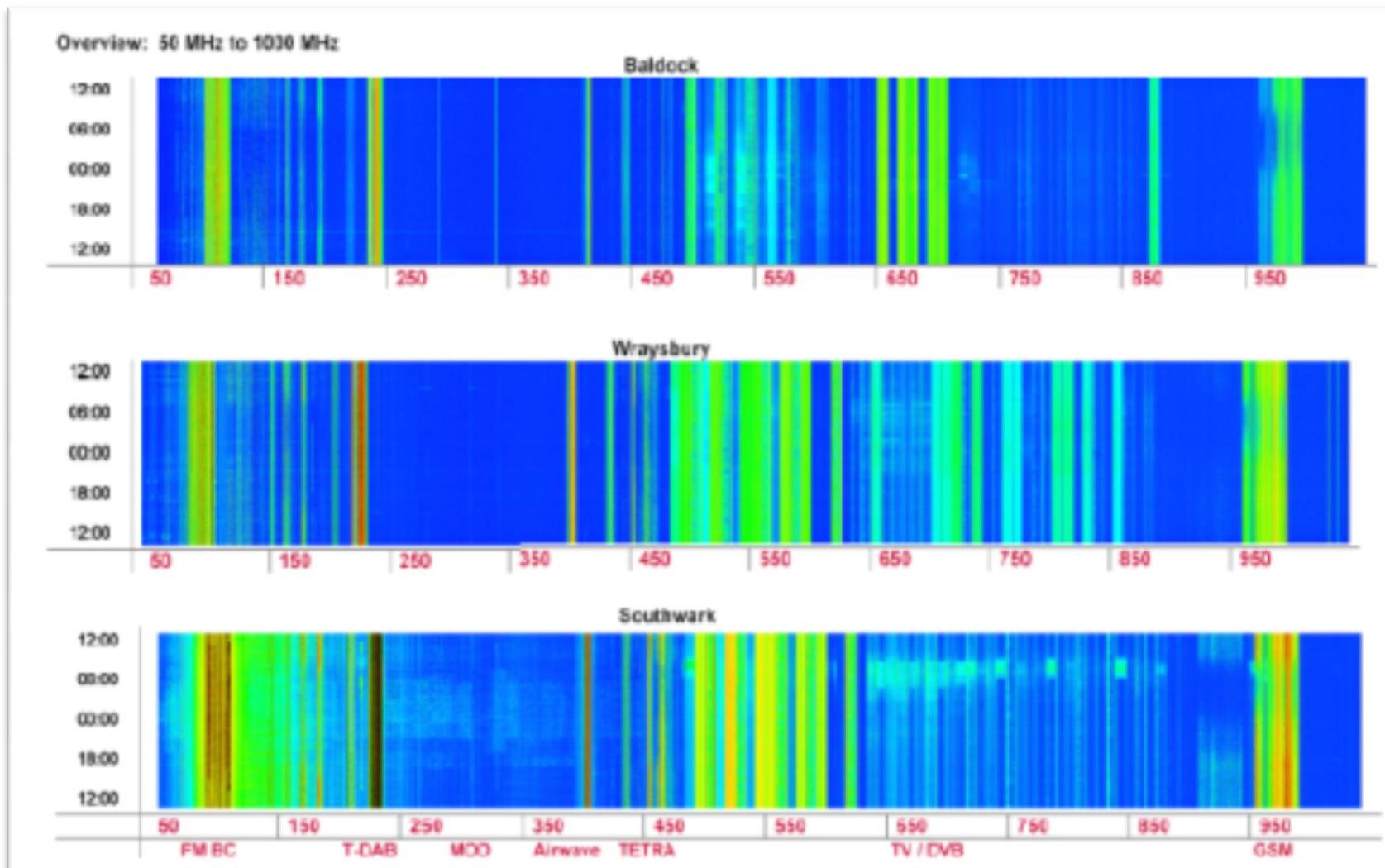
Radio spectrum Supply and Demand

Much of the spectrum is allocated and licensed ...



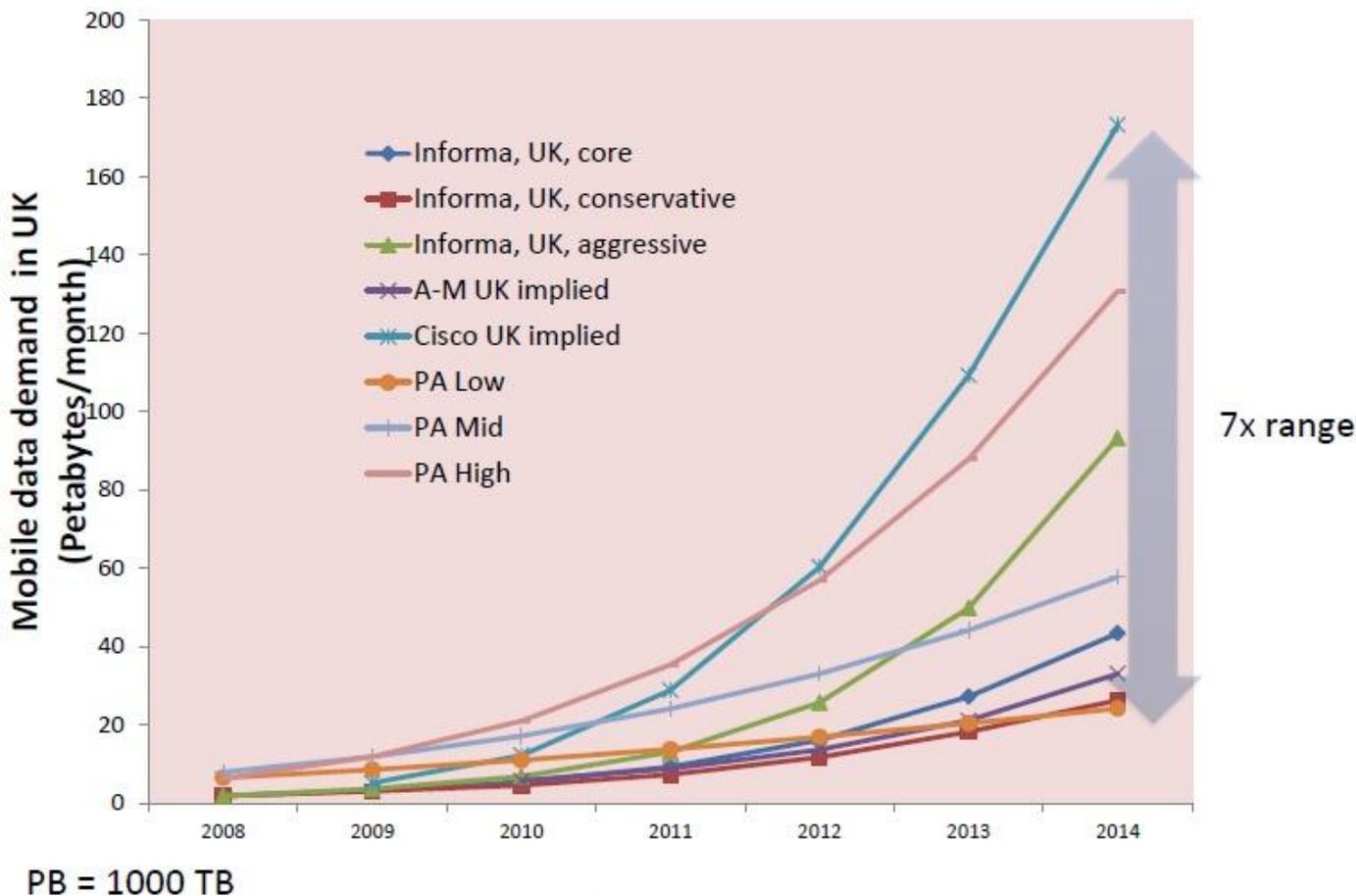
Radio spectrum Supply and Demand

But it is not necessarily all used ...



Radio spectrum Supply and Demand

Predictions suggest huge demand forecast for wireless data applications (but much uncertainty)



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Radio spectrum Supply and Demand

Predictions suggest demand will continue to outstrip supply



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Better dynamic sharing of spectrum may well be a necessity in the long term

- There is huge demand forecast for wireless data applications.
- Suitable radio spectrum is in short supply, and demand is forecast to outstrip that needed:
 - However, this is significantly an **artefact of the historical approach** to spectrum management – **there is much white space**.
 - Opportunistic and dynamic spectrum sharing are technology solutions to unlock the unused spectrum.
- Various technology developments are emerging which enable the radio spectrum to be used much more efficiently in the longer term:
 - Devices are increasingly able to operate over **multiple frequency bands**
 - Devices are able to operate over increasingly **wide frequency bands**
 - Devices are increasingly **sensitive and location aware**
 - Internet and computing technologies now make dynamic and opportunistic spectrum sharing computationally viable.
- Enabling TV white spaces is a **stepping stone** potentially enabling access to white spaces in **other bands**.

Thank you!

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