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Radio Spectrum and Technical Standards Advisory Committee

SSAC Paper 2/2013 :
The use of white space spectrum (II)

Office of the Communications Authority

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Background

- At the Radio Spectrum Advisory Committee (RSAC) meeting held in March 2009, RSAC paper 4/2009 introduced the technological and regulatory development of white space spectrum in Europe, US and UK

- At the RSAC meeting held in March 2012, Microsoft was invited to share its experience about its field trial of white space technology conducted at Cambridge of the UK

- This paper gives an update on the latest development on the use of white space spectrum in the US, UK and Singapore

White Space Spectrum

- White space spectrum refers to unused broadcasting spectrum at individual locations which could be made available for other applications, such as wireless broadband Internet access

- A device that can make use of the white space spectrum is often termed as white space device ("WSD")

White Space Standard

- IEEE 802.22
  - IEEE published the 802.22-2011 standard for Cognitive Wireless Regional Area Networks (RAN) in July 2011
  - the 802.22-2011 specifies the air interface for equipment operating in the TV bands with maximum data rate up to 22 Mbps

White Space Technology (1)

Two techniques developed for WSD

- Sensing technique: in order to avoid interference to broadcasting services, WSD detects white space spectrum in its current location before it can use it

- Geolocation technique : a real time database would be established storing the locations and emission characteristics of broadcasting transmitters. WSD must first query the database that returns the frequencies they can use at its current location

White Space Technology (2)

- Challenges of sensing technique
  - uncertainty on white space channel due to fading and/or shadowing of broadcast signal
  - uncertainty on interference limit due to unknown aggregate interference (e.g. unknown number and locations of WSD broadcast receivers)
- In the US, FCC has removed in September 2010 the mandatory sensing requirement of WSD

White Space Technology (3)

- Geolocation technique
  - WSD can only use white space channels specified by the database
  - WSD shall re-check the database regularly for available channels
  - Database can block newly occupied channels to prevent further WSD access
- Considered to be a viable technique for large scale deployment of WSD

Developments in the US (1)

- Regulatory Framework
  - FCC approved the unlicensed use of white space spectrum for wireless applications and devices in November 2008
  - FCC approved a final set of rules for unlicensed access to white space in September 2010
- Technology
  - FCC decided that WSD must use geolocation technique
- Commercial Application
  - An operator has deployed a commercial network in Wilmington community in January 2012

Developments in the US (2)

The commercial network has the following features

- In January 2012, Spectrum Bridge, Inc. launched the white space network in the City of Wilmington, North Carolina

- The WSD operates under the control of a FCC approved database

- The white space network provides additional wireless bandwidth for video security surveillance application at the gardens, parks and traffic surveillance in Wilmington

Developments in the UK (1)

- Regulatory framework under development
  - In February 2009, Ofcom issued a consultation paper on cognitive access using white space spectrum
  - In November 2012, Ofcom issued a consultation paper on WSD requirements on the regulatory framework for using the WSD in the UHF broadcasting band. The consultation ended on 10 January 2013. Ofcom is considering the way forward
- Technology
  - Ofcom issued a statement in September 2011 stipulating that WSD must use geolocation technique

Developments in the UK (2)

Field trial

- A trial conducted over June 2011 - April 2012

- The trial installed 11 base stations in Cambridge area based on geolocation technique

- Low output power prototype base stations (125 mW)

- Mobile coverage around 400 meter

- Two applications successfully tested:

  – Rural link as alternative to DSL/fibre

  – Wireless backhaul of a WiFi hotspot in city centre

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Developments in Singapore (1)

- Regulatory framework under development
  - IDA will issue a consultation to seek views from the industry by mid 2013
- Field trial
  - Starting March 2011, several trials have been conducted under the project Cognitive Radio Venues ("CRAVE")
    - Kranji Carpark (Singapore / Malaysian Coast)
    - Marina South Pier (Singapore / Indonesia Coast)
    - Opposite Beauty World (near broadcast tower)
    - Cairnhill Carpark (Dense urban environment)
    - Science Park II (In-building environment)
  - In September 2012, a commercial pilot project was launched

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Developments in Singapore (2)

The pilot project has the following features:

- Broadband wireless application at Singapore island golf and country club which is surrounded by dense vegetation and reflective water surfaces

- Wireless Internet for marine application for ships in shore near Changi area

- Smart grid metering application to remotely control and manage the utility meters in National University of Singapore

White Space Applications (1)

- Rural broadband
  - To provide last mile Internet access in rural areas

    e.g. the trial in Cambridge of the UK

- Hot-spot coverage
  - To provide communications in hot-spots similar to Wi-Fi technology used in public areas

    e.g. the trial conducted in Singapore

White Space Applications (2)

- Machine-to-machine communications
  - To provide communications between devices for purposes of control and remote monitoring of electricity meters

    e.g. Trial in National University of Singapore for Smart metering

- Wireless Surveillance System
  - To provide video surveillance and traffic monitoring

    e.g. Video surveillance application in Wilmington

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Way Forward

- At present, the WSD products are still in the early stage of commercialization

- OFCA will continue to monitor the overseas development in the use of white space spectrum as well as the development of technical standards for WSD

Thank You !