World's First TV White Space WiFi Prototype Based on IEEE 802.11af Draft Standard Developed

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TOKYO, Oct. 17, 2012 /PRNewswire/ -- The National Institute of Information and Communications Technology (NICT), Japan, has developed the world’s first WiFi prototype in the TV White Space (TVWS) (470 MHz - 710 MHz) based on the IEEE 802.11af draft specification. IEEE 802.11af is currently the only task group (TG) under the IEEE 802.11 working group (WG) for WiFi technologies in the TVWS. The developed system is the first prototype that verifies the physical (PHY) and media access control (MAC) layer design of the draft specification, following the worldwide trend of prompting the TVWS for wireless communication systems.

Background
Recently, many countries are moving to replace the current analog television technology with digital television (DTV). For example, the Federal Communications Commission (FCC) in the United States derived the transition to DTV successfully on June 12, 2009. As a consequence, broadcasters would no longer use some parts of the radio spectrum currently used by analog TV technology. Regulators have undertaken initiatives to open up some of the currently unused broadcast TV spectrum between 54-698 MHz referred to as TV White Space to wireless communication systems. The Office of Communications (Ofcom) in the UK and regulators in many other countries are also following the same trend, encouraging organizations around the world to start efforts to prompt research and standardization activities.

IEEE 802.11af TG was formed in 2009 under IEEE 802.11 WG. The target is to define modifications to both the 802.11 PHY and MAC layers to meet the legal requirements for channel access and coexistence in the TVWS. The 802.11af has been closely following various regulations in order to prompt the WiFi technologies in TVWS worldwide. It is widely considered as one of the most
promising technologies for the TVWS. In September 2012, the 802.11af released its first stable draft standard (Draft 2.0).

NICT is one of the most active contributors and leading parties of the 802.11af.

Achievements
The developed prototype is the world's first WiFi system in TVWS based on the IEEE 802.11af draft standard. It verifies the physical (PHY) and medium access control (MAC) layer design of the draft specification. One of the OFDM PHY modes that take a single 6 MHz TV channel to operate is implemented with transmission power of 20 dBm. The prototype has an interface and co-worked with White Space Data Base (WSDB) developed by NICT and the full MAC specification of the secured protocol is implemented for primary user (licensed TV broadcaster) protections. The prototype also has an interface and co-works with the Registered Location Secure Server (RLSS) that is defined in the 802.11af draft standard to avoid interference with other white space users (secondary users). NICT has developed the RLSS server. It is approved that the primary users and secondary users operating in the co-channels can be sufficiently protected.

Future prospects
There are many benefits of 802.11af systems compared with other current WiFi technologies. Firstly, in view of the fact that 802.11af systems operating the TVWS use frequencies below 1 GHz, it would allow for much longer distances to be achieved. Current WiFi systems use frequencies in the ISM bands -- the lowest band is 2.4 GHz and the signals are easily absorbed. Secondly, by operating in the TVWS, the usable spectrum is much broader than that of ISM bands when efficiently aggregated. Looking at these benefits, it is widely believed that 802.11af systems offer sufficient advantages to enable a broad market.

With the evolution of regulations regarding the TVWS worldwide, it is expected IEEE 802.11af may adapt to those regulation updates and complete the standard by 2014. We are now working on the next revision to implement the full PHY specification and new features come along with the regulatory updates. We are also looking for the opportunities for technical transfer.


Remarks
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