

South Africa heading for dynamic spectrum management

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South Africa's Council for Scientific and Industrial Research (CSIR) has developed and certified a geolocation spectrum database, with the country moving towards making its spectrum management more dynamic.

The database is able to predict TV broadcasting strength distribution and, based on that, predict availability of the unused TV channels for local re-use

South Africa is the 25th-largest country in the world by land area. It has wide open rural areas with low population density – areas where people need improved access to telecommunications. The South African government is driving various initiatives to address the connectivity needs. Television White Spaces (TVWS) technology development and trials is an initiative where unused TV spectrum is reused on a secondary basis.

TVWS technology uses ultra-high frequency (UHF) spectrum and can penetrate the vegetation and long distances characteristic of rural areas, which traditionally lag behind more commercially attractive urban areas. The technology is a bridge towards fully dynamic spectrum management and 5G. The ability to manage spectrum dynamically should significantly improve the utilization and availability of spectrum, especially in rural areas, as well as improve the competitiveness of small and medium sized businesses focused on communications services.

The Council for Scientific and Industrial Research (CSIR) South Africa has developed and is advancing a patented geolocation spectrum database (GLSD). The database is able to predict TV broadcasting strength distribution and, based on that, predict availability of the unused TV channels for local re-use. The GLSD is among only a dozen such databases in the world and has been certified by the UK spectrum regulator Ofcom for commercial operation in the UK.

The CSIR has also co-run several TVWS trials in locations including Cape Town and Limpopo. The trial run in Cape Town in 2013 has provided Internet connectivity to 10 local schools and set a precedent in successfully communicating over the TV channels immediately adjacent to those used for TV broadcasting – without interference – for TVWS links over distances of up to 7 km. No interference was caused.

The trials provided Internet connection speeds of up to 12 Mbps for more than 16,000 students and teachers. Recent outdoor tests run by the CSIR in Pretoria showed that connectivity speeds as high as 54 Mbps of median throughput are achievable over distances of 4 km in urban conditions, setting a new milestone in TVWS communications.

In addition to technical advances, the South African spectrum regulator ICASA (Independent Communications Authority of South Africa) is seriously considering the introduction of a regulatory framework to promote dynamic spectrum management and enable commercial usage of TVWS in South Africa. With support from the CSIR, the University of Pretoria and Witwatersrand University, ICASA published a discussion document last year on “Dynamic and Opportunistic Spectrum Management”.

After considering the responses, the regulator published its findings in June this year. It is anticipated that this will be followed by a position paper, possibly leading to the new regulatory framework. ICASA's findings document states: “In parallel to developing the required positions, the Authority will support further studies on these topics identified in the discussion document as well as the additional topics proposed by the respondents.”

South African organisations also actively support other TVWS initiatives in Africa. This includes cooperation on TVWS with Ghana and Botswana. In Ghana there has been a trial connecting 10 schools while in Botswana, long term cooperation has been established between the Botswana Institute for Technology Research and Innovation (BITRI) and the CSIR. BITRI is interested in building its own television white spaces (TVWS) experimental network, as well as establishing Botswana's own national geo-location database, and has requested the CSIR to assist with the design and deployment of Botswana's TVWS network test-bed.

Furthering the research aspects of TVWS and dynamic spectrum access, the University of Pretoria cooperated with US partners from the Institute for Cognitive Networking (iCON) earlier this year to organise

a 5G and cognitive networking workshop and summer school. It was held at the University of Pretoria in July and attracted over 100 participants, both from South Africa and from other countries. •

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