Dynamic Spectrum Access Networks and 5G for Affordable Broadband in Under-Served Regions

Moderator: Fisseha Mekuria, CSIR, South Africa.
Panelists: Apurva Mody, White Space Alliance; Oliver Holland, Kings College; Peter Flynn, ViaSat; Preston Marshall, Google.
Spectrum Sharing & 5G for Affordable Broadband
(Lead Panel Paper)

F Mekuria, PhD.

CSIR Meraka Institute
Pretoria 0001, South Africa.
Mobile Wireless Standards : Iceberg Ahead!

- The mobile revolution, > 7 Billion Subs.
  Broadband as a basic necessity for all.
  • ~ 21 % Broadband Connectivity in Africa (ITU)!

- 1000x Increase in Traffic by ~2020!
  - Internet of things (IOT) & the 50 Billion Devices for M2M connectivity
  - Increased number of broadband Subscribers + Devices: Smart phones & Tablets
  - Need for more

Spectrum $\alpha$ Network Capacity
Increasing Wireless Network Capacity

Network Capacity = Spectral Efficiency × Amount of Spectrum × Number of Base Stations
A Model-Based Approach to Spectrum Sharing & Dynamic Spectrum Management (Augmented with Spectrum Sensing !)
Fixed Wireless TVWS Base Station: *Network trial in Western Cape Results:*

- Connected 10 schools some already had ADSL connectivity
- Served over 16000 students with 4Mbps (average) ~ 16 Mbps peak
- Operated for over 2 years without causing any interference to TV broadcasting

TVWS network for M2M & IoT

TVWS Network:
- Ghana, Accra – GTUC
- Botswana, BITRI
A Heatmap of TV White Space Channel Availability for South Africa
International Certification UK OFCOM
Setting a Global Dynamic Spectrum Standard

Contributing to Development of the Tools, Standards & Policy
for Global Dynamic Spectrum Access & Sharing
in Future Wireless Networks
• Contributions to 5G Standardization for Rural 5G and connecting the Next Billion with Affordable Broadband : IEEE Com Society, Dec. 2015,

• WSDBs beyond the TV Band and Co-existence with LTE/5G standards: 2 PhDs


• Organizing a 5G & DSA Forum at IEEE Dyspan 2017!
Smart Networks Provided by 5G for M2M & IoTs
Spectrum Sharing & DSA regulation Challenges

- Driven by National Development Plans: BB ⇔ GDP
- A desire to harness and effectively utilize National Spectrum Resources.
- Resource Constrained Telecom Regulatory Authorities.
- Roadblocks by Short-term Thinking:
  - TV Broadcasters & Mobile Network Operators
- White Space Spectrum Identification, Co-existence & Regulatory Toolbox Maturity! ~ CSIR GLSD ~ Ofcom/FCC
- Developing Draft DSA Regulations:
  - Ghana
  - South Africa
  - Botswana, Malawi, ….
Smart Use of Spectrum Resources for Affordable Broadband: E-EDU, E-Health, Smart-Grids,... Applications,

Enabling Affordable Broadband Access to all South African Municipalities Using N-GLSD & TVWS Networks
Conclusion

- Spectrum Sharing, Interference mitigation & Co-existence tools & enabling regulation for White Space Networks!
- Defining a 4th leg for 5G: based on spectrum sharing and affordable broadband? The Emerging Economy Context!
- Smart Spectrum Sharing & Network R&D to contribute to ITU 5G Vision and standards (ITU IMT2020, 3/5GPP Release 15, WRC-19,...).
- Smart DSA Networks and Regulation to enable IoT/M2M?
- Forming a 5G R&D forum now to Contribute to the 5G Standard and improve impact of 5G in Emerging Economies.
- How can Emerging Economies Benefit from the 5G Digital Transformational Impact: New Industry, Job creation,...
It is in our hands to make a difference!

...............N. Mandela.

Thank You!
fmekuria@csir.co.za