WINNF NSS Round Table Discussions: for 26 June 2024:

Perspectives from Verizon

- Spectrum Sharing is not a Panacea
- Spectrum Sharing is Band Specific
- In-Radio Sensing is not broadly practical
- Tailored Sharing Solutions make most sense

Verizon is the largest single CBRS band deployer

Good experiences with CBRS Band despite complexities and costs

Over 65000 LTE 4G / 5G CBSD Radios

Largest PAL deployer: 557 PALs in 157 Counties: many radios deployed

Use of SDL / SUL: Secondary Channel: avoids channel availability issues (control channel on other licensed band)

Whisper Zone issue: sensing radio (ESC) must also be protected from interference

Part 96 Rules: WINNF interfaces, SASs, and ESC solution works

Spectrum Sharing not a Panacea

Sharing comes with costs: Complexity, Expense, Efficiency, Time to Deploy, Deployment Burdens

Spectrum clearing is always more efficient for the resultant users

Sharing mechanisms are complex and take time to develop

Mechanisms must be tailored to the requirements

Verizon's CBRS SAS & ESC experience

SAS performs the control work

Sensing deliberately separated into ESC network(s): made deployments feasible

- **deployers can deploy existing 3GPP standardized equipment**
- **no complex radio air interface changes**
- **centralized & compartmentalized within ESC**
- **separate requirements & testing & certification**
- **Whisper Zone Issue (orthogonal by area or by synchronization)**

ESC sensors are pointed out to sea:

- **not all radios need to sense**
- **gain & pointing & siting can be optimized for purpose**
- **no TDD synchronization attempted (done by area)**

Lessons Learned from Part 96 CBRS & WINNF experiences

CBRS: Centralized SAS Control: • Positive control & security, • Aggregate calculations, • Multi-Tier protections, • Multi-User Types (power levels, air interfaces, use cases, Tiers), • Multi-Informer (ESC, IIC, databases), • One Model / Change of Model, • Certifications and Testing

CBRS: Registration: • Known Radio Parameters, • Known User Identity, • CPI Control

CBRS: Centralized Sensing: ESC: • Dedicated ESC Radios, • No User / Deployer / OEM burden, • Central Certification, • Limited Whisper Zones, • Asynchronous, • Air Interface independent

WINNF: Standardization: IP Based protocols SAS-to-CBSD radio: • One Eco-system, • One test regime, • One Learning

Proposed: In-Radio ‘ESC type’ sensing & Autonomous radios

Concept: perform ESC Sensing functions within ‘6G’ LTE Radio

Would require major changes to LTE TDD:

- Besides DL (base station downlink transmit) interval, and
- UL (base station uplink reception) interval, and now add:
- SI (base station sensing interval): periodic, all UL & DL stopped
- SI must be synchronized across whole network and all other ‘LTE’ deployers

Would cannibalize some amount of network capacity:

- depending upon PoD requirements, sensitivity, latency, time to respond
- may be too large a burden
- not a trivial addition to the air interface

Deployment practicalities:

- cost of radios
- size of arrays and downtilting
- burden of cost and capacity burdens
- integration testing and certification and security: waveforms
- massive synchronization requirements: across all air interfaces and networks

Sharing functionality

There is no generic solution

Proposed autonomous In-Radio solutions are not simpler

Depends upon Band, Incumbent & New Entrant(s) and Use Cases

Problem set must be well defined first

Solution must be tailored around the protection criteria: spectral, spatial, temporal, PoD, interference criteria