Title: FCC R&O on 3.65GHz and the Contention Based Protocol

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Purpose:

PART 90 – PRIVATE LAND MOBILE RADIO SERVICES - Subpart Z – 3650 MHz

- Requirement for a Coexistence protocol
  - **802.16h fits the definition**
    - A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate
  - **The term "contention-based" protocol is too suggestive of a particular solution and is NOT technology neutral:**
    - FCC should change the name to "coexistence protocol"
- Introduces a "Base-Station" data base
  - Neighborhood Base Stations may be identified
  - Adding an IP identifier (as BS007@winet.com) will enable dynamic radio resource sharing, using BS to BS communication.
  - Service providers are identified
- Includes obligation of the licensees to collaborate and avoid harmful interference
  - Using the same coexistence protocol may satisfy this obligation

QoS

- 802.16: scheduled transmission, guarantees QoS
- CBP: **contention-based** protocol, no QoS guarantee
- QoS means for a Service Provider
  - Some minimum data rate
  - Some max. delay

Clear Channel Assessment before transmissions

- **Incompatible with the scheduled transmissions concept → NOT providing QoS**
- **Destroying the high-spectral efficiency concept**
  - A scheduled interval for transmission shall include time for other transmissions, even if they do not take place
- **Incompatible with directional antennas**
  - Antenna isolation may cause CPE to be hidden from each other
- **Creating interference to neighbor CPE**
  - A CPE may not "see" a foreign Base Station transmission to a neighboring CPE belonging to that network and thus may transmit at times when the neighbor CPE is in Receive state
- **Does not prevents the interference at RECEIVER location**

More on CCA

- 802.11: Clear Channel Assessment is done at transmitter location and the interference is experienced at RECEIVER location
  - 500m distance may introduce between them >100dB isolation
- 802.11a
  - Detects 802.16 at –62dBm!
- 802.11g
  - Does not specify a level for detecting non-802.11 systems

802.16 MAC and Clear Channel Assessment

- Suppose at 802.16 CPE location a neighbor 802.11 device
- START: 802.16 CPE transmits
  - Var. 1: 802.11 device is not transmitting
  - Var. 2: 802.11 was active and its reception may be interfered
  - Next: 802.16 CPE enters receive state
    - 802.11 device starts to transmit
  - Next: 802.16 BS transmits
    - CPE receive at –90dbm
    - If 802.11device is not transmitting but checks the channel for a future transmission
      - Senses silent media due to the low received level
        - CCA does not work
    - If 802.11 device is transmitting
      - **CPE lose the MAP and the scheduling info**
      - 802.16 lose the transmit opportunity
  - Next: 802.16 CPE transmits to request BW (go to START)

Conclusion

- A Contention-Based Protocol prevents 802.16 to work!

FCC feedback

- On a proposed coexistence protocol based on scheduling
  - It is in line with FCC definition, even if is NOT based on contentions
  - The following slides were presented to FCC

Protocol proposal in the context of Part Z – 3.65 GHz

- Starting from the FCC Operators' Base Stations data base
  - Establish the number of operators in a given area
  - Establish the MAC frame division in time
- Establish interferer identification
  - Create a multi-frame, every transmitter having a short slot for its sole transmission
  - Identify the transmitter based on frame number and slot number and/or GPS time
- Establish messages for dynamic radio resource allocation
  - Affect the duration of reserved slots, based on agreement between the networks involved
    - If one network experiences low interference, may let other networks to increase the time in which they work in parallel
    - If one network experiences interference, may ask other networks
      - Specific transmitters to cease the operation in parallel
      - Increase its reservation time and define the new time

Protocol proposal in the context of Part Z – 3.65 GHz, protocol proposal - continuation

- Establish rules of behavior based on:
  - actual traffic load
  - actual interference levels and duration

  - To be a basis for "type approval"
    - Avoid stealing radio resource

Highlights of the proposed protocol

- Technology agnostic
  - The communication between base stations takes place at IP level
    - The IP identifier should be known from the FCC data base
  - Multi-frame definition will be based on a general time-base (seconds)
  - Every network will have its allocation for:
    - High transmitting powers
    - Interference-free reception
  - May accommodate
    - WiMAX systems
    - Bursty systems
    - Mesh systems
- High spectral efficiency and QoS
  - Scheduled approach
  - Suitable for WiMAX applications
- Large cell size
  - Minimization of interference
- Enforces fairness and collaboration

Conclusion

- A Contention Based coexistence is not suitable for 802.16
- FCC agreed with a scheduled approach, based on IP communication
- 802.11 shall collaborate with 802.16 to design a coexistence protocol suitable to our both groups and eventually to other interested wireless groups

Proposed further actions

- Letter to 802.11 SG on 3.65GHz
  - Explain why the CBP is not suitable to 802.16
  - Propose the work structure in 802
    - TG in every interested wireless group
    - JPT (with appropriate non-overlapping meeting scheduling) to coordinate between groups
    - Voting: every WG = 1 vote
  - Make correction to proposed 5 criteria for 802.11TG
    - They claim that no other group have a standard in 3.65GHz
- Letter to FCC
  - Show that the CBP is not suitable to 802.16
  - Ask to change the name to "Coexistence Protocol"
  - Example based on 802.16h approach