Feasibility Study of the IEEE 802.19.1 TVWS Coexistence Protocol

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Abstract

• This contribution introduces the results of a feasibility study of the IEEE 802.19.1 TVWS coexistence protocol
Outline

- Evaluation system
- Scenario 1
  - Information service
  - 802.11 in TVWS with 5 MHz bandwidth
- Scenario 2
  - Management service
  - 802.11 in TVWS with 5 MHz and 10 MHz bandwidth
Evaluation system

Key components

- CM GUI
- CM
- CDIS
- TV WS DB
- AP + CE
- STA
- CE GUI
Evaluation system

TVWS DB client
Evaluation system
CDIS MIB
Evaluation system

CM GUI
Evaluation system

CE GUI
Evaluation system
802.11 in TVWS AP and STA
Scenario 1

- This scenario evaluates IEEE 802.19.1 coexistence protocol for 802.11 in TVWS with 5 MHz bandwidth WSOs
- Three 802.11 networks are deployed each having one access point and one station
- Each 802.11 network has frequency band of 5 MHz and three available channels
  - 728-734 MHz
  - 734-740 MHz
  - 740-746 MHz
Scenario 1

- All three networks are served by one CM
- All three networks are subscribed to information service
Scenario 1
Scenario 1

1. Access point 1 and station 1 start operation
2. Access point 2 and station 2 start operation
3. Access point 3 and station 3 start operation
4. Access point 1 and station 1 join IEEE 802.19.1 coexistence system
5. Access point 2 and station 2 join IEEE 802.19.1 coexistence system
6. Access point 3 and station 3 join IEEE 802.19.1 coexistence system
Scenario 1

Before joining IEEE 802.19.1 coexistence system
Scenario 1

After joining IEEE 802.19.1 coexistence system
Scenario 2

- This scenario evaluates IEEE 802.19.1 coexistence protocol for 802.11 in TVWS with 5 MHz and 10 MHz bandwidth WSOs
- Three 802.11 5 MHz networks are deployed each having one access point and one station
  - Networks 1, 2, and 3
- Two 802.11 10 MHz networks are deployed each having one access point and one station
  - Networks 4 and 5
Scenario 2

- **Available frequency bands**
  - Network 1 (5 MHz)
    - 728-734 MHz
    - 746-752 MHz
  - Network 2 (5 MHz)
    - 734-740 MHz
    - 746-752 MHz
  - Network 3 (5 MHz)
    - 746-752 MHz
  - Network 4 (10 MHz)
    - 728-734 MHz
    - 734-740 MHz
    - 740-746 MHz
  - Network 5 (10 MHz)
    - 728-734 MHz
    - 734-740 MHz
    - 740-746 MHz
Scenario 2

- Networks 1, 2, and 3 are served by CM 1
- Networks 4 and 5 are served by CM 2
- All networks are subscribed to management service
Scenario 2

1. Access point 1 and station 1 join IEEE 802.19.1 coexistence system and start operation
2. Access point 2 and station 2 join IEEE 802.19.1 coexistence system and start operation
3. Access point 3 and station 3 join IEEE 802.19.1 coexistence system and start operation
4. Access point 4 and station 4 join IEEE 802.19.1 coexistence system and start operation
5. Access point 5 and station 5 join IEEE 802.19.1 coexistence system and start operation
Scenario 2

No CM to CM communication
Scenario 2
CM to CM communication
Conclusions

- This contribution has presented the results of the feasibility study of the IEEE 802.19.1 TVWS coexistence protocol in different scenarios
  - Independently operating WSOs
    - 802.11 in TVWS with 5 MHz bandwidth
  - Dissimilar WSOs
    - 802.11 in TVWS with 5 MHz bandwidth
    - 802.11 in TVWS with 10 MHz bandwidth
Conclusions

• Most of the IEEE 802.19.1 procedures have been implemented and verified including
  – Authentication
  – Subscription
  – Registration
  – Providing coexistence report and coexistence set information
  – Obtaining available channel list
  – Sharing coexistence set information
  – Measurement
  – Reconfiguration
  – Coexistence set element reconfiguration
Conclusions

- Most part of the IEEE 802.19.1 reference model has been implemented and verified including:
  - Key part of the COEX_MEDIA_SAP
  - COEX_TR_SAP
    - Entities are remote
    - TCP/IP has been used
  - CXPM driver
Conclusions

• **Both coexistence services have been tested**
  – Information service
  – Management service

• **Both algorithms have been tested**
  – Discovery algorithm
  – Coexistence decision making algorithm
    • Exclusive channel use
    • Sharing with the same type of network