# DARPA Spectrum Collaboration Challenge (SC2) Dataset collected from Scrimmages 4 and 5

Abu Shafin Mohammad Mahdee Jameel, Ahmed P. Mohamed, Aly El Gamal

March 12, 2021

## About the Database

This database contains the logged data from simulated scrimmage runs over a collaborative intelligent radio network in the DARPA Colosseum RF emulator for Spectrum challenge 2. As a competitor in DARPA SC2, in every match that we participated in during the last two scrimmages preceding the final event - namely Scrimmages 4 and 5 -, we constantly collected data from the 10 nodes in our Collaborative Intelligent Radio Network (CIRN). These scrimmage runs simulated a variety of real life scenarios. Following are a list of scenarios present in the scrimmages:

1. Alleys of Austin,

2. Passive Incumbent,

3. A Slice of Life,

4. Payline,

5. Jammers,

6. Wildfire,

7. Trash Compactor,

8. Nowhere to Run Baby,

9. Active Incumbent,

10. Temperature Rising,

11. -50dBFS Test,

12. -70dBFS Test,

13. -90dBFS Test,

14. SCE Qualification

# Description of the Files

Under each scrimmage, there is a folder containing the scrimmage data. Inside that folder, subfolders represent data collected for each team, and for each team there are a number of matches. Each match takes place in a specific environment, and the log for these matches are contained in a sqlite database file called full.db. These full.db files contain data from different software radio nodes. From the 53 tables present in a full.db file, only 16 columns from 4 tables are used for analysis. These are consolidated in a separate small database, where there is a single pickle file for the whole scrimmage.

# Description of full.db

Each full.db contains 53 tables,r ecording all the information we collect from 10 nodes throughout a match. Data from only 6 tables are used in the frame error prediction analysis. Following is a description of these tables:

## 0.1 Tables that contain data for frame error detection

### 0.1.1 Frame

The Frame table contains a frame sequence number, the source of that frame, the destination of the frame, and the following data:

1. ID of the specific channel used (information about channel frequency and modulation)

2. Send and Receive time

3. No of transmitted samples, blocks and symbol sequence ID

4. Receiver Gain

5. Information about the time spread

### 0.1.2 FrameRx

The FrameRx table contains a unique frame ID, whether the frame transmission was successful or not , and the following data:

1. SNR during frame transmission, and PSD of the received frame

2. Receive time

3. Noise variance

### 0.1.3 MCSDecisionEvent

The MCSDecisionEvent table a MCS update ID and the following data:

1. Modulation and Coding Scheme (MCS) of the transmission

2. Noise variance

3. Source and transmission node

4. Symbol sequence ID

5. Receive time and information about the time spread

The keying combinations are BPSK, QPSK, and 5 variants of QAM. Then there is different code rates possible for each case, resulting in a total of 52 possible combinations for the MCS.

### 0.1.4 PSDUpdateEvent

The PSDUpdateEvent table contains a PSD update ID ID and the following data:

1. The PSD

2. Source node

3. Symbol sequence ID

4. Time of PSD measurement, receive time and information about the time spread

The PSD value is contained in a 4096 byte CIL message.

### 0.1.5 ChannelAlloc

The ChannelAlloc table contains a channel allocation ID and the following data:

1. A 29 byte encoded message active channel allocations

2. The ID for OFDM parameter update event

3. Source node

4. Receive time and information about the time spread

The channel value is contained in a 29 byte CIL message.

### 0.1.6 ChannelAllocUpdate

The ChannelAllocUpdate table contains a channel allocation update ID and the following data:

1. A 14 byte encoded message about the channel allocation update

2. The ID for OFDM parameter update event

3. Source node

4. Receive time and information about the time spread

## 0.2 Other Tables

1. AchievedIMsUpdate

2. lowTrackerStateUpdateEvent

3. BlockRx

4. BuildInfo

5. FrameDetect

6. BurstSendEvent

7. C2APIEvent

8. GPSEvent

9. CCPacketEvent

10. IncumbentAttenuationUpdateEvent

11. InvalidFrameHeader

12. ChannelEstimationEvent

13. MandatedOutcomeUpdate

14. CoDelDelay

15. CoDelState

16. ModulationEvent

17. CollabCILRx

18. NetworkMap

19. CollabCILTx

20. NewFlow

21. CollabConnectionAttempt

22. CollabError

23. ReceivedARQFeedbackEvent

24. CollabPeerEvent

25. RouteDecision

26. CollabServerRx

27. RoutingTableUpdate

28. CollabServerTx

29. ScenarioInfo

30. CollabStateChange

31. ScheduleUpdate

32. ColosseumRate

33. Segment

34. DecisionEngineStep

35. SegmentRx

36. Doomsday

37. Start

38. EnvironmentUpdateEvent

39. SynchronizationEvent

40. FlowQueuePop

41. Text

42. FlowQueuePush

43. UHDAsyncEvent

44. FlowQueueResendEvent

45. UHDMsgEvent

46. FlowTrackerIMEvent

47. Waveform

# The consolidated small database

This database is present as a single pickle file for a single scrimmage, incorporating all teams and matches. Inside the file, data for each specific edge is present in a separate block. A block contains two separate lists. The first list contains data about whether the transmission for a frame was successful or not.

The second list contains the following data for each frame:

1. SNR

2. Modulation Coding Scheme

3. Center Frequency

4. Bandwidth

5. PSD

The data is not normalized. Scrimmage 4 contains 35 matches while Scrimmage 5 contains 100 matches in total.