

# **Spectrum Collaboration Challenge**

## Phase 3 Frequently Asked Questions (FAQ)

February 1, 2019

Revision 1



---

**Defense Advanced Research Projects Agency**  
675 North Randolph Street  
Arlington, VA 22203



## Revision Summary

Section	Revision	Description	Date
Q1 – Q40	Initial		2/1/19

## DARPA Spectrum Collaboration Challenge (SC2) Phase 2 Frequently Asked Questions

### **Q40: Will all teams admitted to Phase 3 participate in SCE?**

A40: No, only 10 teams will be admitted into SCE, based on a ranked “play-in” round to take place coincident with Scrimmage 6.

### **Q39: How is a Measurement Period (MP) scored if the total data offered to a radio in the MP is less than the specified *min\_throughput\_bps* Performance Threshold (PT)?**

A39: During such a MP, the *min\_throughput\_bps* PT is reduced to match the offered data.

### **Q38: Are Measurement Periods (MPs) defined by the integer portion of the transmit time recorded in the .drc logs?**

A38: No. The start of the first 1-second-long measurement period is defined by the match start time reported by Colosseum. Packets are attributed to 1-second-long MPs according to their sent timestamp relative to the match start time.

### **Q37: In order to measure throughput performance per Q6, is the TRPR tool used?**

A37: No. DARPA has developed custom tools which calculate throughput using logs produced by MGEN.

### **Q36: In order to measure throughput performance per Q6, how often is throughput calculated?**

A36: Throughput is computed each Measurement Period (MP) as defined in the SCE Scoring Procedures document.

### **Q35: Is there a complete list of all scenario bandwidths a CIRN will be asked to support for SCE?**

A35: A CIRN may need support all of the following scenario bandwidths for SCE: 5 MHz, 8 MHz, 10 MHz, 20 MHz, 25 MHz, 40 MHz.

**Q34: For SCE, What is the maximum total throughput requested of a single node?**

A34: 25 Mbps.

**Q33: What is the maximum value for *max\_latency\_s*?**

A33: There is no upper bound on *max\_latency\_s*.

**Q32: Can file transfers overlap such that a new packet burst occurs before *file\_transfer\_deadline\_s* has elapsed from the previous burst?**

A32: Yes.

**Q31: For SCE, what is the maximum number of flows for a node to handle simultaneously?**

A31: There is no upper bound on the number of flows a node may be requested to handle.

**Q30: For SCE, to receive credit for packet delivery, must packets be delivered in-order?**

A30: No.

**Q29: For SCE, will two transmit and two receive antennas be available in all matches?**

A29: Yes.

**Q28: For SCE, will the same *mandated\_outcomes.json* file be supplied to all nodes within a network?**

A28: Yes.

**Q27: For SCE, will all IP traffic flows have a corresponding mandated outcome?**

A27: Yes.

**Q26: Per Q6, is it acceptable if a CIRN submission meets the specified total throughput, but fails to deliver all flows?**

A26: Yes.

**Q25: Will all scored IP-traffic flows use port numbers greater or equal to 5000?**

A25: Yes.

**Q24: For SCE, if the IP traffic flow persists across stage boundaries, can steady state period (SSP) times be met across stage boundaries?**

A24: Yes.

**Q23: When *scenario\_center\_frequency* in *environment.json* changes during a match, does this value supersede the value of *center\_frequency* set in *colosseum\_config.ini*?**

A23: Yes.

**Q22: For SCE, is the parameter *goal\_set* in *mandated\_outcomes.json* relevant to the score?**

A22: This parameter is used only by the visualization engine and has no bearing on the score.

**Q21: For SCE, will IP traffic flows include TCP traffic?**

A21: No.

**Q20: For SCE, will IP traffic flows include fragmented packets?**

A20: No.

**Q19: For SCE, how will file transfers be modeled?**

A19: File transfers are modeled as a short burst of UDP packets whose aggregate payload is equal to the original file size.

**Q18: Per the SC2 Phase 3 Scoring Procedures, what denotes the start of the earliest Measurement Period (MP) in a match?**

A18: The earliest time that demarks the start of a Measurement Period is the official scenario start time provided by Colosseum in the match metadata.

**Q17: Is a successfully delivered packet scored during the Measurement Period (MP) in which it originated, or the MP in which it was delivered?**

A17: The originating MP.

**Q16: For SCE, what is the minimum expected value for *max\_latency\_s* per the SC2 Phase 3 Scoring Procedures, Section 3.2 Individual Mandates?**

A16: 100ms.

**Q15: For SCE, must all packets in a flow with a mandated outcome which specifies only a *file\_transfer\_deadline\_s* performance threshold (PT) be delivered to achieve the Individual Mandate (IM)?**

A15: Yes.

**Q14: Will DARPA release a script or other executable scoring “program” which computes a match’s score per the SC2 Phase 3 Scoring Procedures?**

A14: No.

**Q13: For SCE, what is the required number of nodes in a CIRN?**

A13: 10.

**Q12: Is the field *hold\_time* in MandatedOutcomes.json equivalent to the Steady State Period (SSP) in the SC2 Phase 3 Scoring Procedures?**

A12: Yes

**Q11: Can we rely on the flow ids in the mandated outcome JSON file matching the destination port number of the packets for SCE?**

A11: Yes.

**Q10: Is a CIRN permitted to transmit messages over the collaboration network identifying itself as an incumbent or a different team?**

A10: No.

**Q9: For SCE, will any scored matches disable the collaboration network?**

A9: No.

**Q8: Are competitors wholly responsible for selecting all USRP settings, such as amplifier gain?**

A8: Yes, each team's CIRN software is responsible for configuring all USRP settings. For convenience, a list of recommended USRP settings has been provided by the USRP hardware manufacturer (National Instruments) and is available at the following location:

<https://sc2colosseum.freshdesk.com/support/solutions/articles/22000220403-optimizing-srn-usrp-performance>

**Q7: Per Section 3.2.1 of the SC2 Rules Document, what non-performance related criteria must my CIRN achieve in order to qualify to participate in SCE?**

A7: In order for a submitted CIRN design to qualify to participate in SCE, the CIRN must be compliant with the CIRN Interaction Language (CIL). Non-compliant submissions may be deemed ineligible.

**Q6: Per Section 3.2.1 of the SC2 Rules Document, what throughput performance must my CIRN achieve in order to qualify to participate in SCE?**

A6: In order for a submitted CIRN design to qualify to participate in SCE, the 10-node CIRN must achieve the following specified aggregate data rates and latencies, using a 10MHz bandwidth, under the specified conditions:

<b>SNR</b>	<b>Aggregate data rate achieved</b>	<b>Per packet latency achieved</b>
5 dB	5 Mb/s	1.00 sec
10 dB	10 Mb/s	0.75 sec
15 dB	15 Mb/s	0.50 sec
20 dB	20 Mb/s	0.37 sec

This criteria will be tested in the following configuration:

- Each SNR condition will last 2 minutes
- The aggregate data rate must be consistently achieved over any consecutive 60 second period within the allotted 2 minutes per SNR
- The RF conditions will present the same approximate SNR between all nodes of the network

- UDP traffic given to each node will be sufficient to meet the required objective
- Every node in the network will be given the same offered load of data to transmit
- SNR given assumes a 10MHz bandwidth

Submissions which transmit outside the 10MHz of bandwidth (per the criteria outlaid in the SCE Scoring Procedures Document) may be deemed ineligible.

**Q5: During SCE, what is the maximum available frequency bandwidth a CIRN may transmit over without incurring a penalty for transmitting on a disallowed frequency?**

A5: 40 MHz.

**Q4: For SCE, what center frequency range will SRNs use?**

A4: 900 MHz - 1100 MHz.

**Q3: Will our CIRN be told how long a match will last?**

A3: No. Information about match duration will not be provided to CIRNs.

**Q2: May teams add or change members as the competition evolves through the phases?**

A2: Yes, with the following restrictions:

- 1) A team may remove members at any point in the competition at the sole discretion of the team.
- 2) A team may add wholly new members at any point at the sole discretion of the team. Wholly new members are those that have not previously participated on any SC2 team.
- 3) A team may only add new team members who previously participated on another SC2 team under one of the following conditions:
  - The new team member participated as a member of another team in a previous phase of SC2, and has not participated in the current phase.
  - The new team member participated as a member of another team in a previous phase, and is changing teams during the allowed grace period, January 1 – March 31 of the next phase.
  - The new team member participated as a member of another team which has formally disbanded or otherwise withdrawn from the competition.
- 4) Teams may not add team members who currently or previously participated as part of the SC2 DARPA team.
- 5) All team membership changes must be registered with DARPA SC2 Team via email to [sc2@darpa.mil](mailto:sc2@darpa.mil).

6) The registered team lead is the only person authorized to make membership changes.

**Q1: During the competition, can we (humans) provide control input to our nodes?**

A1: No. CIRNs must be fully autonomous.