

Spectrum Collaboration Challenge

Phase 3 Frequently Asked Questions (FAQ)

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Revision 2



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Revision Summary

Section	Revision	Description	Date
Q41-Q46 Q7	2	New Revised	4/15/19
Q1 – Q40	Initial	Carryovers from Phase 2	2/1/19

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

Q46: If an Individual Mandate's PTs are met for 10 consecutive MPs with no gate violations (and the SSP is 10 seconds), are points awarded in the 10th MP or the 11th MP?

A46: Points are awarded in the 10th MP.

Q45: Will the measurement periods in the final 15 seconds of a match, after the traffic generator has stopped sending traffic, be scored or unscored?

A45: Unscored.

Q44: What is the minimum time spacing between 2 subsequent bursts in a file transfer?

A44: There is no guaranteed minimum time.

Q43: For SCE, will the Ensemble Threshold (ET) ever be set to zero?

A43: No.

Q42: For SCE, what is the maximum IP packet size?

A42: 1500 bytes.

Q41: For SCE, will any scenarios require multi-hop routing?

A41: No SCE scenarios are designed with this objective in mind. However, the ability to "close" a radio link depends heavily on the specific radio design including parameters such as the modulation and error correction type, the baud rate used, and the bandwidth of any digital filters. As such, DARPA cannot guarantee that all radio links can be closed.

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. Compliance is determined using the CIL Compliance Tool available at: <https://gitlab.com/darpa-sc2-phase3/CIL/tree/master/tools>.

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:

SNR	Aggregate data rate achieved	Per packet latency achieved
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 outlined 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.
- 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.