

DARPA-BAA-16-47: Collaborative Intelligent Radio Networks

Frequently Asked Questions

Q1: When will proposers to DARPA-BAA-16-47 be informed of award selections? Is it early enough to apply to the Open Track and complete the hurdles if not selected?

A1: DARPA intends to inform DARPA-BAA-16-47 proposal submitters of their proposal selection status by mid-October 2016. Those not selected will be eligible to apply to the Open Track prior to the Open Track registration closing on November 22, 2016 and also prior to Threshold Hurdles being released on November 1st, 2016.

Q2: NSF has also publicized an opportunity for funding participation in SC2 (see: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf16114). How does this opportunity relate to DARPA's opportunity (DARPA-BAA-16-47)? Should teams respond to one or both?

A2: The NSF opportunity is a "team sponsorship" opportunity for Open Track teams (specifically US Universities). As such, this opportunity is mutually exclusive to DARPA-BAA-16-47 (successful proposers under DARPA-BAA-16-47 may not also propose to NSF-16-114, and vice-versa). Like all external team sponsorship opportunities (be they corporate or government sponsorship), it is outside of DARPA's cognizance. DARPA supports sponsorship of Open Track teams, however specific questions about this opportunity should be directed to the NSF.

Q3: DARPA indicates the X310 will likely be the software defined radio provided for use in Colosseum. What daughter card will be paired with the X310?

A3: DARPA plans on using the ~~WBX~~ **UBX** daughter card. All specifications related to the Common Radio Node (CRN) are provided for planning purposes, but are tentative until publication of the SC2 System Specification Document.

Q4: If the cost of the planned work exceeds the FFP award amount and additional funding will be committed to successfully execute the proposed work, should the additional funding commitment be listed explicitly in the proposal?

A4: Cost sharing information is irrelevant to a FFP contract. Therefore, listing potential additional funding should not be reflected in the proposal.

Q5: In order to attend the Preliminary or Championship Events I will need a passport or visa. How long before the events will I have to acquire a passport or visa?

A5: All dates for the competition are posted on our Events page. The field of competitors is set once the Entrance Hurdles for the phase close.

Q6: What types of waveforms are expected for the competition?

A6: There is no restriction on what waveforms may be used in the competition. All waveforms which are technically feasible given the constraints of the Standard Radio Node and Colosseum are valid. Bandwidth limitations are scenario dependent. The maximum possible bandwidth is set by the technical specifications of the RF environment emulator. These specifications have not yet been finalized, but it is expected that 100MHz is the maximum bandwidth that will be supported.

A full specification of the testbed technical details will be contained in the SC2 System Specification Document, which will be made available to all participants on the SC2 website at a later date.

Q7: Does wireless IP traffic enter the radio network solely through the gateway node?

A7: No. Each radio in Colosseum is instrumented to be both a source and destination of IP data traffic.

Q8: Are there any limitations on allowed radio topologies?

A8: No. Radio networks may use any topology they wish to transfer wireless IP traffic among their constituent nodes.

Q9: How do I submit questions about SC2?

A9: Submit questions to DARPA at sc2@darpa.mil

Q10: Is the Colosseum an over the air test environment or wired channel simulator?

A10: Colosseum is an RF lab that uses a wireless channel emulator to emulate time-varying wireless channel conditions between all radio nodes. There are no physical antennas used in Colosseum.

Q11: Where can I learn more technical details about the Standard Radio Node?

A11: Details of the configuration of the SRN will be published in the SC2 System Specification Document, which will be made available on the SC2 website at a later date. DARPA intends for the SRN to be comprised of an Ettus Research X310 software defined radio and a Dell R630 server with dual Intel Xeon processors and an NVIDIA GPU. This information is provided for planning purposes only and is subject to change pending release of the SC2 System Specification Document.

Q12: My proposal includes techniques that require the use of hardware other than the Standard Radio Node. Will I be allowed to provide my own hardware?

A12: No. All performers must use the same Standard Radio Node configuration.

Q13: Will the Standard Radio Node use an internal oscillator or a high performance external oscillator?

A13: DARPA intends to provide the Standard Radio Node with an external clock reference. Performers cannot rely upon the clock reference for phase coherence between radio nodes. This information is provided for planning purposes only and is subject to change pending release of the SC2 System Specification Document.

Q14: When I navigate to the BAA submission website, my browser says "Your connection is not private" or shows a broken lock symbolizing an unsecure website. What should I do?

A14: Secure DOD websites require the use of a DOD Certificate. This certificate can be downloaded at <http://dodpki.c3pki.chamb.disa.mil/rootca.html>
Please note that these certificates are not available for Chrome browsers. Chrome browsers will also show unsecure connections on DOD sites using SHA-1 encryption, which are accepted by other browsers.

Q15: If my application is accepted for the proposal track, may I use this funding to pay for my degree program?

A15: All proposers must include a cost breakdown as part of their Cost Proposal included with their submission. The Cost Proposal is reviewed to ensure all costs are properly allocable to the contract. In accordance with FAR Part 31, in order to be allocable, the cost must be incurred specifically for the contract.

Q16: What kinds of path loss behavior will we see in the testbed?

A16: There will be a variety of scenarios incorporating a range of path loss behavior from rural to urban environments, including both geographic model based and stochastic effects. Path loss models will contain both small scale and large scale effects.

Q17: Are we expected to provide an entire disk image including operating system? Or is there an assumption of operating system that we are supposed to provide user-space code for? Or something else?

A17: Specific requirements and procedures will be described in the System Specification document at a later date.

Q18: What does posting to website mean?

A18: All documents providing guidance for competitors will be available at www.SpectrumCollaborationChallenge.com

Q19: Is ITAR-controlled software acceptable?

A19: DARPA currently expects that Colosseum will not be certified to store or execute ITAR restricted code.

Q20: Is MIMO enabled (allowed) in the SRN nodes during competition? Is it a requirement?

A20: MIMO is enabled and allowed during competition. Colosseum currently is designed to support 2 TX and 2 RX antennas (2x2 MIMO) per SRN. It is up to the CIRN designers whether to exploit it.

Q21: Could you please clarify what information is routed over a wired channel and what over the wireless network regarding the following sentence in the BAA? "While any two networks will be able to collaborate over a wired channel, the information to be shared, and the resulting decisions, must be distributed throughout the networks wirelessly."

A21: Only one node per CIRN will be connected to the wired collaboration channel. That is the gateway node. You may need to wirelessly route information between the gateway node and other nodes in your CIRN.

Q22: Is buying hardware for test and development allowed as part of the cost bid for proposals? Is it required?

A22: Proposers may budget for hardware purchases in the proposal. GFE beyond remote access to Colosseum is not anticipated. Therefore, as described in the Rules document section 2.3, proposers will benefit from establishing their own small-scale dedicated development environment.

Q23: When we submit proposal costing, we bid for all 3 phases and submit project plans for those, correct?

A23: Yes. It is recommended that the SOW should be developed so that each Phase of the program is separately defined and aligned with the competitive events described in Section I of DARPA-BAA-16-47, "Funding Opportunity Description," and the SC2 Rules Document. See Section I.G of DARPA-BAA-16-47 for a list of milestones and deliverables to be included in the SOW.

Q24: Can a team use NI USRP-RIOs, which are basically the same as the USRP X310 that DARPA expects to utilize.

A24: For competitions, no. Your software will run in the DARPA provided Colosseum testbed which is expected to have X310s. For development in your own lab, you may use any hardware desired.

Q25: Will the entire competition be in an emulated RF environment and not Over The Air?

A25: Yes.

Q26: What will the entrance hurdles consist of?

A26: A draft of the Entrance Hurdle problems will be released by 1 September.

Q27: Will the X310 FPGA code be made available without purchasing a license?

A27: Yes. The Ettus X310 FPGA HDL source is available under a free and open source license from Ettus's github repository.

Q28: The documents say Open Track teams will have the same access to government-supplied resources as Proposal Track teams. If a team doesn't pass the hurdles can they still participate in an Event just without this same access?

A28: No. The Events can only support a limited number of competitors due to limited hardware capacity.

Q29: Would there be flexibility in altering the team composition (adding or dropping) as needs rise for proposal track team? If yes, do we then need to build that flexibility into the cost proposal?

A29: You should write your cost proposal to be as realistic and accurate as possible. If you plan to alter team composition, that should be reflected in your proposal.

Q30: What is the difference between 'a government provided non-collaborative radio network' and 'a government provided CIR network'?

A30: An example of a non-collaborative radio network would be an incumbent that is unwilling or unable to significantly alter its behavior due to the behavior of other radio networks. A government provided CIR network may have the capability to react to the presence or behavior of performer CIR networks.

Q31: Will a recording of the webinar from day 1 and day 2 (rather than just the slides) be available after the event?

A31: No.

Q32: Will submitted code be released to public?

A32: DARPA will not release code developed by open track teams to the public. DARPA will not make any claim for IP rights on code developed by open track teams. For proposal track teams, potential code release and rights will be in accordance with the terms and conditions of your contract.

Q33: Does submitted code need to be open source?

A33: No.

Q34: Will the collaboration channel include any predefined concepts of auctions or incentive mechanisms to promote collaborative spectrum use?

A34: DARPA will not dictate any particular use of the collaboration channel. All use of the collaboration channel is to be defined by the performers together.

Q35: Given the standard node is the proposed Ettus USRP, is our power level limited to the base output of the USRP, or are amplifiers allowed, and if so at what maximum power level?

A35: Power levels are limited to the base output of the USRP. However, this is not a constraint. Colosseum controls signal power loss between nodes and will model the amplifier (and antenna) gains specified by the scenario.

Q36: Will competitors be required to access remote servers? Will competitors be disqualified if (through no fault of their own) there are connection problems?

A36: Competing in the challenge will require accessing the Colosseum testbed remotely over the Internet. However, no real-time connection is required during competitions. Competitors will upload final software images in advance of the competition.

Q37: You are encouraging collaboration, yet competition tends to cause proprietary strategies. How are we scored on collaboration vs competition? An architectural idea that has to be shared may become more important than speed of adaptability, will that be accounted for?

A37: There is no collaboration between teams at design time. Each team builds their CIRN in isolation and may use proprietary strategies. During the competition, CIRNs must autonomously collaborate with each other. The protocol enabling that collaboration will be developed in an open forum with participation from all the teams.

Q38: Should we assume the Colosseum is a Faraday Cage? Can we take advantage of services like GPS or propagation beacons if available?

A38: The Colosseum is a wired channel emulator. SRN antenna ports will be wired into the Colosseum channel emulator. There will be NO physical antennas. There is no capability to receive external signals like GPS.

Q39: Scrimmages were discussed in the first Spectrum Challenge but never realized because teams were afraid of revealing their tricks outside of competition. How will you incentivize participation in scrimmages this time?

A39: Participation in the scrimmages is optional. The scoring structure of SC2 is different than the original Spectrum Challenge. Successful teams will need to collaborate and collaboration requires interacting with other teams. Scrimmages are the only opportunity to practice prior to competitions.

Q40: Can we assume that inter-team information sharing occurs during matches and that it happens only through the gateway?

A40: Yes.

Q41: Will antenna characteristics such as operating bandwidth, beamwidth, and rotatability be either detectable or provided?

A41: Antenna pattern models will be disclosed in advance and emulated by Colosseum.

Q42: In the real world, some information about the operating band is known in advance such as allocations, which provide information about spectrum users and their characteristics. Can this information be programmed into the CIRN software, or looked up in real time as part of this competition?

A42: Information about some incumbents will be provided ahead of time. Others will only be disclosed during the competition. Your CIRN will be provided training time with these incumbents as part of the tournaments.

Q43: Can collaboration between teams mean that you accept and transmit another teams' data packet because your network has better connection with intended recipient?

A43: It is not anticipated that CIRNS designed by different teams will use compatible waveforms, therefore it is unlikely that another team will be able to forward your information.

Q44: Can a node from one competitor's network attempt to join another competitor's network?

A44: It is not anticipated that CIRNs designed by different teams will use compatible waveforms, therefore it is unlikely that an attempt to join another team's network would be successful.

Q45: DARPA has talked about the importance of cross team collaboration for the competition. What about collaboration between the nodes of one team's network?

A45: Intra-network collaboration is expected to be incorporated into the design of your CIRN.

Q46: Is it possible that nodes will move during a match?

A46: The scenarios will include motion of the radio nodes.

Q47: How will the initial baseline of the collaboration protocol be determined - who provides input?

A47: DARPA will specify the initial collaboration protocol to be built upon by the teams.

Q48: Will there be a forum for participants to discuss the evolving versions of the collaboration protocol and argue for merits of different approaches to take?

A48: Yes. The government will provide a DARPA-administered forum to facilitate discussions on the evolving collaboration protocol.

Q49: Will CIRNS be given their current score or other networks' scores during the competition so they can adapt online?

A49: Scores will not be given to CIRNs during the event.

Q50: Is collaboration without communication (e.g. using game theory and/or other handshaking mechanisms) a possibility?

A50: Yes.

Q51: Will a list of information day attendees be made available for teaming purposes?

A51: No. However, DARPA intends has established an online site to support those interested to find teammates.

Q52: Will a strawman collaboration protocol be provided as a basis for proposals due 9/2?

A52: No.

Q53: Since other teams' performance is part of the scoring metric, how will DARPA differentiate poor design (by others) from poor collaboration (by my submission)? Both will lead to poor performance by the other team.

A53: Through a round-robin tournament. Poor collaboration will systematically reduce your score, while poor design by another other team will only reduce your score in a fraction of matches.

Q54: Is there an implied wired connection to all SRNs (not just the gateway node) for injection of IP traffic?

A54: Yes. However teams may not use it for communicating data.

Q55: Will match scores be normalized in such a way that no one scenario has more value to the competition than another?

A55: Details of the scoring function are TBD.

Q56: In the competitions, will there be Monte Carlo runs in which the same ensemble of CIRNs is executed under the same controlled stimuli and scenario?

A56: No.

Q57: Will the IP traffic plan be known to the SRNs in advance?

A57: No.

Q58: Will SRNs be given GPS like localization information?

A58: SRNs will receive localization information periodically throughout the match. The information's accuracy will reflect modeled conditions in the scenario. For example, localization data provided to indoor nodes may be incorrect if GPS is the localization source in that scenario.

Q59: During the competition, can we (humans) provide control input to our nodes?

A59: No. They must be fully autonomous.

Q60: What is the rationale for the Internet gateway?

A60: To enable CIRNs to collaborate with the other networks in the ensemble without mandating a common over the air communications protocol.

Q61: How long will the packets be?

A61: Packets will model canonical traffic types. The packet sizes will be variable and appropriate to the traffic class.

Q62: How will we differentiate incumbents from jammers or other participants?

A62: That is a capability you must build into your networks. Your CIRN will have the opportunity to train ahead of time with any radio network designated as an incumbent.

Q63: Will the gateway node be able to exchange information with incumbents?

A63: No.

Q64: Will incumbents have a protocol to ask for the channel or warn that they are planning to transmit? Will incumbents use fixed spectrum access footprints?

A64: Incumbents will behave in a way similar to today's radio spectrum users.

Q65: How soon after funding will teams have private (non-scrimmage) access to the Colosseum (or something like it) for remote testing?

A65: The availability schedule for Colosseum is TBD.

Q66: Please clarify the definition of "coexistence" that must be met to achieve the 12 July 2017 milestone specified in DARPA-BAA-16-47 section II.I.G.1 page 11.

A66: Coexistence with a non collaborative radio network consists of avoiding harmful interference to that network. Coexistence with the government provided Challenge Bot consists of interacting with it via the collaboration protocol so that both networks achieve a performance level TBD.

Q67: May one organization enter multiple teams in the competition?

A67: No. Teams must be distinct in membership and financial interests.

Q68: Can members of a university faculty participate in different competitor teams? Can students at a university participate in different competitor teams?

A68: No. Teams must be distinct and not collude. Faculty members are presumed to have a financial interest in the university as a whole, while students are presumed to share information freely with others at their university.

Q69: Is the requirement that one person can only belong to one team applicable to administrative/consulting roles as well as technical contributors.

A69: The requirement applies to all members of the team.

Q70: May teams add or change members as the competition evolves through the phases?

A70: Yes. However, adding a member who previously participated in another team may raise collusion concerns so long as both teams remain a participant. DARPA will make case by case judgments. In general, a person who had access to member-private information of one team in a Phase should not join another team prior to the competition at the end of that Phase. If a team splits, the child teams will face close scrutiny even in the next phase. If a person leaves one organization and joins another that is competing in SC2, that person must be removed as a member of the former organization's SC2 team (that is, lose access to members' only information) prior to the date of joining the new organization, even if they do not join the new organization's SC2 team.

Q71: What constraints are envisioned on "collaboration" via the Collaboration Network?

A71: The collaboration network will model an internet. Latency and bandwidth available over this connection will reflect realistic conditions for such a network in commercial and/or military settings. In the case of military scenarios with tactical internets, it may have high latency and packet loss along with constrained bandwidth.

Q72: Will the RF environment change? E.g., will a modeled building go away (e.g., it was bombed or fell post-disaster) or will learned point-to-point propagation characteristics be expected to persist throughout a match?

A72: Point-to-point propagation characteristics will persist throughout a match. However, nodes may move.

Q73: How is interference to incumbents measured?

A73: Interference will be measured as a reduction in goodput or other quality of service metrics.

Q74: Are kamikaze nodes allowed? (e.g., sacrifice one low priority node to take down another network while remainder of own network operates normally). Are networks allowed to punish and reward each other by jamming or helping each other? (Tit-for-tat...) Are contestants allowed to lie via the collaboration protocol? Can a competitor choose to use an incumbent waveform for its PHY?

A74: Yes. The scoring algorithm is meant to discourage actions that harm other networks' performance, but these actions are not expressly prohibited.

Q75: Will contestants have access to data from previous scrimmages / games to facilitate learning each others' strategies?

A75: Teams may keep and use data from any prior scrimmage or tournament they participated in.

Q76: Will the contestants know how long a competition will continue? (big difference in finite and infinite horizon effects on willingness to collaborate)

A76: No information about match duration will be provided to CIRNs at the start of a match.

Q77: Can gateway nodes be assumed to be stationary since they have a wired backhaul?

A77: No. Despite the use of the term "wired network" in the BAA and Rules documents, the modeled internet connection for the collaboration network may be wireless.

Q78: If multiple teams use the same approach when designing their CIRNs because they draw on the same public information, does that constitute collusion?

A78: No, as long as the teams use the same approach by chance.

Q79: Will a firm bidding in BAA 48 as a subcontractor be allowed to propose for BAA 47 either as a prime or sub?

A79: Proposing to both BAAs is allowed. An organization may receive an award under only one, regardless of role.

Q80: Is achieving low power consumption an evaluation criterion for proposed CIRN approaches?

A80: Proposals will be evaluated as stated in DARPA-BAA-16-47.

Q81: The scoring metric does not show a measure of power cost. Are we to assume SRN can use all the power they want according to what the HW can source?

A81: Yes, SRNs may use all available hardware power.

Q82: Can we choose which of our network nodes is the gateway?

A82: No.

Q83: Does scoring begin at the beginning of a round, or only after the 1st change?

A83: Scoring begins at the beginning.

Q84: Will out of order packet delivery be allowed?

A84: Yes, although the score earned for packets delivered after the latency specified for that traffic class will be reduced.

Q85: Can teams control the location of any of their nodes?

A85: No.

Q86: Are the incumbents only radio communication systems or could they be other users such as radar?

A86: All incumbents will be communication systems.

Q87: Can we count on sufficiently dense node locations to support redundant paths through the network?

A87: No.

Q88: Will the scoring function be fixed over the Phase? Will it be fixed over the duration of SC2?

A88: The scoring function will be subject to change. The final scoring metric for each competition will be released 2 months prior to that event.

Q89: Will the TCP/IP traffic be modeled using the complete TCP algorithm, including congestion management?

A89: Scenarios are TBD and will be developed as part of DARPA-BAA-16-48.

Q90: Will we be told the higher level structure of the information exchange between the nodes? (file transfer, video streams, etc)

A90: Yes. The mechanism is TBD.

Q91: Will the list of competitors by track along with contact info be made available?

A91: Proposal track awards will be disclosed in accordance with normal contracting procedures. Disclosure of contact information for Open Track teams will be up to the team's discretion.

Q92: Is DARPA comfortable with proposals that assert SBIR rights or government purpose rights in general? What about with respect to the Transition evaluation criterion?

A92: Proposals will be evaluated as stated in DARPA-BAA-16-47.

Q93: Will open track participants have access to evolving capabilities/requirements?

A93: DARPA will provide the same information to Open Track and Proposal Track teams.

Q94: Will the SRN architecture/devices be conveyed?

A94: For proposal track teams, anything purchased under a FFP award becomes the property of the performer. Colosseum equipment will be government property and will not be dispersed to teams.

Q95: Will a penalty be charged for excessive latency on all packets, or just priority packets?

A95: All packets.

Q96: Will there be only 2 levels of packet priority?

A96: The number of levels of priority is TBD.

Q97: With respect to proposal tracks, it was stated that teams must rank "high enough" to qualify for the incremental \$750K funding awards at the conclusion of PE1 and PE2. Can the government please clarify the ranking criteria that will determine eligibility for these awards?

A97: Score at the competition event will be the sole means for ranking performance.

Q98: May people who work for DOD contractors or DOD organizations participate in the competition (separately from their employment)? Could they be accused of sharing DOD secured technology?

A98: See DARPA-BAA-16-47 sections III.A and III.D.

Q99: Is there a FPGA in the Standard Radio Node that competitors may modify?

A99: Yes there is, in the radio front end. The System Specification will provide details, but it is expected to be the FPGA in the Ettus Research USRP X310.

Q100: What is the appropriate level of technical detail to include in our proposal to demonstrate technical merit while still abiding by anti-collusion rules?

A100: There are no collusion concerns due to submitting your proposal to DARPA.

Q101: Mobility is a major testing scenario. USRP E310/E312 is designed for mobility. Why not include E310/312 into the testbed rather than X310?

A101: Although Colosseum will model mobility for test scenarios, the SRN hardware will in reality be at a fixed location with wireline power. Low-power mobile-specialized radio hardware is not appropriate.

Q102: On page 9 and second to last paragraph of DARPA-BAA-16-47, it is stated: "Classically, contextualization has been achieved through leveraging prior knowledge of both source and target task in order to build an explicit mapping between them ahead of time." Can you please elaborate on a potential example of source and target task in the context of the spectrum challenge?

A102: A source task would be designing your CIRN to coexist with CSMA-based radios. Then in competition one might encounter a similar radio which uses time for multiplexing, such as TDMA. Coexisting with the TDMA radio would be the target task.

Q103: What are the typical bandwidths associated with incumbent and/or non-collaborative networks?

A103: They will vary.

Q104: Can you list all hardware in the SRN by manufacturer, model and quantity? How much memory /storage do we expect the standard radio node to support? What kinds? Can teams modify/add an OS in the SRN?

A104: Node specifications and programming methods and opportunities will be provided in the System Specification document.

Q105: Will the emulator model coupling between the transmit and receive channels?

A105: Yes. Transmit/receive isolation is not expected to be high enough to enable full-duplex operation.

Q106: In some earlier presentations on SC2, it had been mentioned that the final competition at the end of year 3 would be over-the-air (not using Colosseum). Is this still under consideration?

A106: No.

Q107: After scrimmages and competition events, will the developers have access to the time-tagged, dynamic environment description under which their nodes had been operating?

A107: Details of what information will be released after events is TBD.

Q108: What RF spectrum ranges are available? Will SRNs be able to autotune across bands?

A108: Colosseum can model the propagation characteristics of any desired operating frequency. The operating frequency will change from match to match, as specified by the scenario. SRNs will transmit and receive up to 100 MHz bandwidth at a center frequency that is the same no matter what operating frequency is modeled by Colosseum during that match.

Q109: Can an individual apply for NSF funding without University or College affiliation? Can an individual apply for NSF funding on the basis of affiliation at a University Extension or Community College?

A109: Refer to NSF grant guidelines or contact the NSF program manager listed in the Competitor Information Day slide deck.

Q110: Will a single gateway node be able to talk to all other teams in the ensemble, or will there be scenarios in which multiple gateway nodes in a single network can each talk to a different subset of the other teams?

A110: The Collaboration Network will model a realistic internet. If called for in the scenario, Colosseum can model selective link impairments or complete partitioning.

Q111: Will teams be allowed to practice with one another on Colosseum outside of scrimmages or match events?

A111: No

Q112: Can teams program the FPGA on the USRPs on SRNs without physical access to the USRPs?

A112: Yes. Remote programmability of the USRP FPGAs in the SRNs will be an explicitly supported capability.

Q113: Should teams implement hub-and-spoke or multi-hop ad-hoc networks?

A113: No restriction is placed on the topology of CIRNs. Multiple hops may be required. It will be feasible for any node to close the link to the gateway at some nominal throughput under ideal conditions. Ideal conditions are defined as including largescale pathloss (AWGN) but no interferers. Nominal throughput is defined as enough to perform command and control, but not necessarily sufficient to successfully deliver all traffic classes.

Q114: For proposal track competitors, is there extra funding for PE1/PE2/Final Events? if not, what cost planning should be assumed for attending and participating in the PE1/PE2/Final events (duration, travel)?

A114: For budgeting purposes, total travel per event is not expected to exceed 5 days.

Q115: Can an individual or organization sponsor more than one open track team?

A115: Sponsors contribute resources such as materials or funding. Sponsorship of multiple teams, which meets this strict definition is permissible. If the sponsorship role grows to contribute human resources, labor, expertise, advice, etc. or the sponsor will share in any prize money awarded, this violates our definition of a sponsor, the sponsor would be elevated in this case to team member status. In which case you may not be a part of multiple teams. Sponsor rights to IP created by a team would not constitute a financial interest. For guidance in specific circumstances, please contact the SC2 team.

Q116: Are there any current regulatory transmission/ receiving/ communication/ encryption limits that must be obeyed for the solution testing?

A116: The Colosseum is a wired testbed and therefore is not subject to current regulations on over the air communications.

Q117: Does DARPA have a short intro to the competition or a video clip of Day 1 of the Information Days?

A117: DARPA will not be making any footage from the Information Days available. However, please see <https://spectrumcollaborationchallenge.com/documents/> for links to the BAA, rules document, and slides from both Information Days.

Q118: Are non-US entities allowed to participate in SC2?

A118: Non US teams are allowed to participate in SC2. Open Track teams must meet the eligibility requirements specified in the Rules Document Section 5. Proposal Track teams must meet the eligibility requirements in DARPA-BAA-16-47 Section III.

Q119: Will a mobile node in the Colosseum change its location along a continuous path or will it pop up in randomly generated locations?

A119: If a node is moving in a scenario it will move along a continuous path.

Q120: What are the worst case and typical mobility expectations? For example, 90% of traffic is pedestrian (speed 3 km/hr) or vehicular (speed 30 km/hr).

A120: Nodes can vary from stationary to automotive speeds.

Q121: How much information about each open track team will be initially made public before the PE1 competition takes place (team name, point of contact, team members, etc)?

A121: Only team names will be made public by DARPA. Teams may choose to make other information available if they choose.

Q122: On BAA-16-47, page 20, it indicates that the maximum number of pages for Section II of the Technical Volume is 15, and Section II.A is "Table of Contents". Can you confirm that "Table of Contents" is counted into the 15 page limit?

A122: The table of contents is NOT counted in the 15 page limit. A BAA amendment to this effect is forthcoming.

Q123: Is all of the traffic over the collaborative network IP based?

A123: It is anticipated that the collaborative protocol will be IP based.

Q124: Do the number of pages used to list references to papers we cite in the technical proposal count towards the 15 pages?

A124: There is no page limit on section III of proposals.

Q125: Our team will be a mix of individuals from organizations in academia and private industry. Is this allowed? Do we need to specify this in the proposal?

A125: Yes.

Q126: Are there minimal / maximal numbers of SRNs and size of a channel emulator with which DARPA would be comfortable having Proposal Track teams acquire for local development and testing purposes?

A126: The purchase of any development hardware should be included with justification in all submitted proposals. The justification should include the why the particular number of resources has been chosen.

Q127: What baseline software do you expect to make available for SRNs, bots, and channel emulation, and over what timeframes?

A127: Documentation on the SRN, bots, and channel emulation will be made available on www.spectrumcollaborationchallenge.com. The schedule of availability will be posted by Nov 1 2016.

Q128: Would DARPA be interested in using proposer owned smaller scale Colosseum setups for scrimmages?

A128: No. For logistical reasons, all scrimmages and competitions will be on DARPA controlled infrastructure.

Q129: We believe the latency requirements have significant impact on the overall design. Can you clarify the intended latency requirement in the scoring function?

A129: The scoring function and included latency requirements are as yet to be determined. DARPA intends for the required latency to derive from existing latency requirements for typical traffic classes.

Q130: I have a solution that I think would be very useful to the competition. Can I share it with the rest of the competitors without breaking DARPA rules?

A130: No, that would constitute collusion.

Q131: Is there funding available to support travel for open track teams?

A131: No specific travel funding will be made available by DARPA for open track teams.

Q132: When will the specification for the standard radio node be available?

A132: DARPA expects to provide the final specification by November 1 2016.

Q133: Where should open track teams send questions?

A133: sc2@darpa.mil

Q134: Will there be requirements defined for out-of-band emissions and EIRP for a given bandwidth that all participants must adhere to? Additionally, will you require spectral flatness – to ensure correct sensing of the channel interference?

A134: No.

Q135: Is the SRN environment Linux or Window based?

A135: The System Specification document will provide final details but it is anticipated that the SRN will be comprised of a Linux host OS running containers provided by competitors.

Q136: Will you have LabVIEW installed on the host machines?

A136: No. Containers submitted by competitors can add any necessary software required by their radio network.

Q137: Will DARPA provide feedback on BAA draft submissions or summaries?

A137: No.

Q138: Is there any restriction on publication? Can we publish parts of our design before the competition provided we don't mention the design is used in spectrum challenge, or do we need to wait till the competition is over before submitting papers describing any parts of our design?

A138: Teams are encouraged to disseminate and publish their work. There is no prior review or restriction by DARPA (except for proposal track groups that are not conducting fundamental research). However, SC2 anti-collusion rules apply. Teams must not disseminate information that would affect competition fairness.

PRIOR to the end of Phase N: Information about Phase N algorithms or design is presumed to affect fairness unless it clearly does not disclose behavioral details of the team's CIRN

AFTER the end of Phase N: Information about the Phase N algorithms or design is presumed NOT to affect fairness

Q139: I have an interest in teaming. How do I join the forum?

A139: See: <https://spectrumcollaborationchallenge.com/teaming-forum-created/>

Q140: Can we propose to DARPA other contracting vehicles such as OTA (Other Transaction Agreement) in lieu of Firm Fixed Price (FFP) Contracts?

A140: Firm Fixed Price Contract is strongly preferred.

Q141: As part of the DARPA-BAA-16-47 submittal, Section I.B is entitled Official transmittal letter. What is required to be in this letter?

A141: Typically, the transmittal letter identifies the BAA number, the proposal by name and, if the proposing organization assigns such numbers, the proposal reference number, and is signed by an authorized individual (an individual authorized to submit proposals to the US Government)

Q142: For the pricing portion of our proposal, for fairness should we be providing list prices to make it easier to compare apples to apples, or should we include any anticipated discounts we anticipate to get from vendors?

A142: You should write your cost proposal to be as realistic and accurate as possible. Vendor quotes should include any discounts the company will receive.

Q143: If our team is based outside the US, can we include costs of travelling to the US in our proposal?

A143: Yes.

Q144: Should faculty members register to submit through the DARPA BAAT or should the faculty member's sponsored research office register and submit the proposal?

A144: The Sponsored research office should submit the proposal.

Q145: If there is already a team from a given academic institution participating in the competition, could a faculty member from that same institution participate on a team comprised of individuals from other institutions?

A145: No. Multiple teams including faculty from the same institution would be considered to share a financial interest and would not be allowed according to the Spectrum Collaboration Challenge Rules Document.