Spectrum Collaboration Challenge (SC2)

www.SpectrumCollaborationChallenge.com

Rules, revision 2

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Document Change Summary

Section	Description	Date
4.1.2	Extended Form Registration Deadline	10/17/2016
1.3	Program structure clarification	9/8/18
2.1	CIRN requirement update	
3.1.2	Scoring description update	
3, 3.2.1, 3.2.2, 3.2.3	PE2, SCE updates	
2.2, 2.3, 3.1.1, 3.2.1, 3.3, 4.1.2, 7, 7.1, 8	Editorial cleanup	

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1 Introduction

1.1 Vision

Under the authority of 10 U.S.C. § 2374a to stimulate innovations using prize competition, the Defense Advanced Research Projects Agency (DARPA) Spectrum Collaboration Challenge (SC2) will use a series of tournament events to spur development of next-generation wireless networks which make more effective use of the RF spectrum. These networks will be capable of intelligently optimizing the spectrum by collaborating with, and learning from, the other systems that occupy the spectrum with them. In competitive events across three phases, teams will be asked to devise machine learning based strategies that allow their Collaborative Intelligent Radio (CIR) network to autonomously communicate without preplanning or knowledge of the other networks. The winning team will be able to consistently find techniques which optimize not just their own wireless throughput but the total throughput of all radio networks in the spectrum.

1.2 Overview

Across the nation and around the world, the wireless revolution is fueling a voracious demand for access to the radio frequency (RF) spectrum. In the civilian sector, consumer devices from smartphones to wearable fitness recorders to smart kitchen appliances are competing for bandwidth. In the military there is growing reliance on unmanned platforms, from underwater sensors to satellites, and a push for broadband connectivity for every member of every Service. All told, some 50 billion wireless devices are projected to be vying for access to mobile communications networks within the next few years. And by 2030, the demand for wireless access could be 250 times what it is today.

Managing this increasing demand, while combating what appears to be a looming scarcity of RF spectrum is a serious problem for our nation, both militarily and economically.

Today's approach, which is nearly a century old, isolates wireless systems by dividing the spectrum into exclusively licensed bands, which are allocated over large, geographically defined regions. This approach rations access to the spectrum in exchange for the guarantee of interference-free communication. However, it is human-driven and not adaptive to the dynamics of supply and demand. At any given time, many allocated bands are unused by licensees while other bands are overwhelmed, thus squandering the spectrum's enormous capacity and unnecessarily creating conditions of scarcity. This also poses potential security risks for the military, creating the impression of reliable and unfettered access to the spectrum while in actuality creating a well-defined target for adversaries wishing to disrupt wireless operations.

Small pockets of unlicensed bands where spectrum is used freely today hint at the viability of a new norm of "shared spectrum." In 2015 close to half of the global internet traffic was carried by WiFi within these unlicensed bands. Unlike licensed bands, these systems avoid interfering with their neighbors using simple sense-and-avoid techniques. But, in our dense and diverse spectrum future, these simple strategies won't work. To harvest the full capacity out of the RF spectrum, we need to abandon these simple avoidance and isolation techniques. Future radios will need to lose their isolation safety net and bring greater intelligence to bear to avoid interference while maximizing utility. These radios will need to be able to collaborate directly with their peers to derive stable and satisfactory communications for all.

That is the goal of DARPA's Spectrum Collaboration Challenge (SC2) in which competitors will reimagine and develop a new wireless paradigm of collaborative, local, real-time decision-making. Without strict frequency allocations, radio networks will autonomously collaborate to sense the local RF landscape, reason about how to avoid interference, and exploit opportunities to achieve efficient use of the available spectrum. This new breed of collaborative intelligent radio networks could give rise to a rich spectral ecosystem able to accommodate an enormous diversity of communicating devices while operating 100 to 1,000 times more efficiently than today's wireless networks.

In SC2, the performance of autonomous systems will be evaluated through a round-robin tournament-style competition. Taking advantage of recent advances in artificial intelligence (AI) and machine learning, and the expanding capacities of software-defined radios, SC2 teams will tackle the challenges that stand in the way of realizing truly efficient and adaptive use of the spectrum. Ultimately this competition aims not only to challenge innovators in academia and business to produce breakthroughs in collaborative AI, but also to catalyze the creation of a new paradigm that can help usher in a new era of spectrum abundance.

1.3 Program Structure

SC2 will consist of 3 phases, each culminating in a tournament event. Phases 1 and 2 will end with a Preliminary Event (PE1, PE2) and Phase 3 will conclude with the SC2 Championship Event (SCE). Each phase lasts approximately one year. The results of each event will be used to determine winners of prizes and awards.

Up to 30 teams may be selected to participate in the collaborative competition. Due to technical limitations, funding, or other reasons, DARPA, at its discretion, may choose to accept fewer or more teams to compete.

DARPA intends to fund the best performing teams (up to ten) in the amount of $750K at the end of PE1 and PE2. A total of **$3.75 million** in prizes will be awarded at the SCE as follows:

SC2 Championship Event Prizes	
1st Place	$2,000,000
2nd Place	$1,000,000
3rd Place	$750,000

2   Competition Objective

The goal of the SC2 program is to catalyze the development of wireless radio networks that can intelligently collaborate to manage and optimize use of the spectrum without prior knowledge of each other's operating characteristics. To accomplish this objective, participants in the SC2 will design and build a wireless radio network of 5-20 collaborative intelligent radios (CIR) using a standard software defined radio and host computer, specified by DARPA (see Section 2.2).

2.1   Collaborative Intelligent Radio Network

Each team will design algorithms in software and/or firmware to create a Collaborative Intelligent Radio (CIR) node. A radio network will consist of multiple instantiations of the CIR design. The design must therefore be scalable and able to instantiate a network of arbitrary size. The network should be capable of collaborating with other previously unknown radio networks and adapting its communication scheme to optimize aggregate wireless spectrum usage across all networks (i.e., the *ensemble*).

Each radio in the network will be required to transmit and receive wireless IP traffic within their own network. IP traffic will be provided by the testbed infrastructure. One radio in each network will be designated as a gateway. This radio has both a wired and a wireless interface. The wired interface can be used to collaborate with the gateway nodes of other teams' networks. The protocol specification by which collaborative information is exchanged will be developed and codified via the Collaborative Intelligent Radio Network Interaction Language (CIL) Council, whose membership includes a voting representative from every eligible team.

To effectively tackle the SC2 problem, it is expected that CIR designs will need to address the following core capabilities.

Reconfigurable Radio – To effectively operate across all environments, and with any conceivable ensemble, it is expected that a CIR network will require a multitude of radio communication techniques between which it is able to dynamically switch. Techniques potentially include changing temporal, spatial, spectral, waveform, protocol, or other aspects of the communication waveform dynamically.

RF Environment Understanding – CIRs must be able to recognize and identify previously known and newly learned wireless networks and characterize their behavior from noisy over-the-air observations.

Reasoning – CIRs must reason how to modify a communication strategy based on the current understanding of the environment, taking care to consider what the ramifications of selecting an action may have on the other networks.

Contextualization – To react quickly to new scenarios, CIRs must leverage previously learned knowledge and apply it to new situations to rapidly learn new strategies, without having to learn from "scratch."

Collaboration – Collaboration is not free. It reduces available resources for communicating. CIRs must learn the value of information sharing to maximize ensemble performance by learning which coordination messages and information are most valuable to which other teams and contribute toward maximizing ensemble efficiency.

2.2   Standard Radio Node (SRN)

Each team will implement their CIR algorithms on the Standard Radio Node consisting of a commercial-off-the-shelf software defined radio coupled with a host processing computer. DARPA intends for the SRN to be comprised of an Ettus Research X310 software define radio and a Dell R630 server with dual Intel Xeon processors and an NVIDIA GPU. Each team will be permitted to distribute its processing across the field programmable gate array (FPGA), the general purpose processor (GPP), and graphical processing unit (GPU).

Final specification of the SRN can be found in the SC2 System Specification Document.

2.3   The Colosseum: The Collaborative-Competition Testbed

DARPA will be developing a SC2 Collaboration lab that will contain up to 128 standard radio node resources. Participants may remotely access these resources to test their networks at larger scales than they could otherwise. The test resources available are limited and shared by all teams in the competition. Teams may augment testing resources with their own small-scale dedicated development environment, for which they are soley responsible.

Conducting the SC2 competitive tournaments requires a testbed that provides the ability to emulate real-world, dynamic, RF environments with full controllability and repeatability, at scale. To achieve this, DARPA is developing a testbed called the Colosseum. Colosseum is comprised of the largest-of-its-kind RF channel emulator, numerous SRNs, and other support functions (such as IP traffic generation, RF interference & incumbents, etc).

Colosseum is expected to have the following characteristics:

- Up to 128 SRNs
- 2 to 4 transmit and receive ports per node
- Channel emulation on each RF path
- Signal monitoring on each RF path
- Ability to inject signals or noise into any path
- Controlled flow of IP data traffic into each source node and verification of data delivered by each destination node
- Remote accessibility, scheduling and scripting

Teams competing in SC2 will have exclusive access to remotely use the Colosseum to test their radios in large-scale scenarios, with definable geometries and RF conditions. No other test system of this scale and capability exists today. The government will also facilitate scrimmage events. These events will allow teams to test their networks in the presence of other teams' networks.

Full testbed technical specifications of Colosseum can be found in the SC2 System Specification Document.

3 SC2 Tournament Events

The SC2 will hold three tournament events. All of these events will utilize the Colosseum with gameplay remotely monitored by the audience at an event space. The dates for each of these events are as follows:

Preliminary Event 1 (PE1)	December 13, 2017
Preliminary Event 2 (PE2)	December 12, 2018
SC2 Championship Event (SCE)	October 23, 2019

3.1 Objective of the Tournaments

In each tournament, a team will play multiple round-robin-style matches. Each match is played as a collaborative game that puts multiple teams into the same geographic region and frequency band. The objective of the game is for all teams to successfully deliver their own data while minimizing interference to others. A team scores points for the data it successfully delivers as well as points for data successfully delivered by other teams. Winning the tournament requires a team to consistently score well across all matches when teamed with multiple different CIR networks. A major challenge confronting each team is that there are no prior rules for how to use the shared spectrum environment. Teams must learn successful communication strategies to avoid interference and chaotic uncoordinated behavior.

3.1.1 Match Objectives

In each match, multiple CIR networks are teamed into an *ensemble* and placed within an emulated RF environment in the Colosseum. The objective for each team is to autonomously discover communications strategies that enable the ensemble of radio networks to optimize transmission of wireless traffic from sources to destinations without any prior knowledge of the other teams in the ensemble.

Both within a match, and across matches, a variety of factors will be changed which ensure the robustness of the CIR solutions to operate under realistic, challenging and changing conditions. These factors may include but are not limited to:

- Ensemble composition – the radio networks that comprise your ensemble
- Radio network priority – the relative priority of the radio networks in the ensemble
- Spectrum availability – the amount of spectrum available to be shared by the ensemble
- Geographic laydown – the position of one or more nodes may move throughout a match
- Traffic characteristics – the type of IP traffic and its associated characteristics at both the source and destination
- Incumbents – presence, absence or change of non-collaborative radio (NCR) systems present in the operating band which must be afforded protection
- Collaboration channel characteristics – latency, and throughput of collaboration channel between networks in the ensemble
- RF environment characteristics – the characteristics of the RF environment (e.g., urban vs semi-urban vs rural)

Matches are anticipated to have a 5-30 minute duration. To facilitate protecting incumbent radio systems, incumbents are made available for development use.

To enable networks to collaborate with the other networks in the ensemble, one radio node within each network will be designated as a gateway node. This node will have an air interface and a wired Ethernet connection serving as a direct collaboration channel for communication with other network gateway nodes. The collaboration channel provides a direct means for networks to share potentially valuable information and to strategize with their peers. This team-to-team collaboration effectively takes place over an internet-like network. Latency and bandwidth available over this connection will reflect realistic conditions for such a network in commercial and/or military settings. A predefined, but extensible protocol specification (the CIL) will be commonly available to all teams. This specification will describe how to format information that may be shared with other CIR networks. All teams participating in SC2 will have an opportunity to provide input on the CIL. Each team must abide by the CIL to be eligible for tournament events. Details of the the CIL will be published via the SC2 gitlab repository.

To fully integrate CIR software into the competition infrastructure (Colosseum), teams' CIR solutions must comply with various interfaces and APIs. These allow for automation, visualization and scoring of matches. Information conveyed over these interfaces will not affect match scoring.

As SC2 progresses from phase to phase, the fundamental game play stays the same. However, the match scenarios become increasingly difficult as the number of radios in each network increases, the number of simultaneous networks increases and the type and complexity of the environment changes. The following table summarizes anticipated match properties as the SC2 progresses:

	Phase 1 PE1	Phase 2 PE2	Phase 3 SCE
Number of radios in a network	5	10	20
Number of networks (teams)	3	5	5

3.1.2 Match and Tournament Scoring

The scoring is designed to reward overall optimization of the spectrum. Details of the scoring function can be found in the Scoring Procedures document for each tournament event. To win the tournament, a team must prove they are universally good at optimizing the spectrum, and thus must perform well not just in a single match, but across all matches.

Tournament scores will be used to determine the placement of teams and declare the winners. Tournament scoring results are the only criteria used to evaluate team performance.

The match and tournament scoring formulas will be published prior to tournament events.

3.2 Tournament Events

3.2.1 Preparing for the Tournament Events

Teams are expected to develop and debug their CIR solutions largely using their own resources. The government will not provide hardware resources for development, however the Colosseum will be available as a remotely-accessible *testing* environment. Time on Colosseum is reserved via a scheduling process.

Teams will also have the opportunity to participate in periodic scrimmage matches hosted on Colosseum. Scrimmages will be scored similarly to the Preliminary Events.

To ensure the participating teams are "tournament ready," teams will be required to submit their code ahead of events to check for stability and achievement of minimal thresholds (such as achievable data rate) such that their involvement in the event does not unduly impact the other teams and so that matches run smoothly to completion. All teams will have to pass these

tests in order to participate in an event. The government will automate this testing of CIR software to ensure that each team's CIR solution is compliant with all necessary interfaces and APIs required by Colosseum.

The government reserves the right to:

- Test the executable radio code prior to an event to evaluate its performance
- Disqualify any team whose code is un-installable, crashes, or is unstable
- Disqualify any team whose radio fails to follow the commands of the Testbed Scripting environment
- Disqualify any team found to be attempting to modify or "hack" the SC2 testbed

3.2.2 Preliminary Events Game Day

The two Preliminary Events will be hosted by Johns Hopkins University Applied Physics Laboratory (JHU/APL) in Laurel, MD. Teams are required to send at least one person to the event to represent them. The Preliminary Events may be streamed or posted to the internet for others to view. Top finishing teams at the PE2 tournament will be invited to the SCE.

3.2.3 Championship Event Game Day

The SCE will take place at GSMA's Mobile World Congress Americas 2019 conference in Los Angeles, CA. The SCE is scheduled to take place on October 23, 2019, and will be free and open to the public. Representatives from all participating teams are required to attend.

3.2.4 Awarding Prizes

Prizes awarded under the SC2 (PE1, PE2 and SCE) will be paid by electronic funds transfer to the bank account specified by the leader of the team determined by DARPA to be the winners of each tournament. If the winner is a team, it is the responsibility of the team leader, not DARPA, to determine the subsequent division of any prize money.

Prizes awarded may be subject to Federal income taxes. DARPA will comply with the Internal Revenue Service withholding and reporting requirements, where applicable. The winner must provide DARPA with an appropriate U.S. taxpayer identification number (TIN) (e.g., social security number, employer identification number, etc.) within 72 hours of the announcement of the prizes. Information on how to obtain a TIN is available on the U.S. Internal Revenue Service website at www.IRS.gov. The winner should consult a tax advisor to ensure that the prize money is handled properly and reported accurately for tax purposes.

3.3 Technical Papers

All PE1, PE2, and SCE prize winners must submit a SC2 Technical Paper to DARPA describing their technical approach, as well as lessons learned during the SC2, in order to claim their prize. The technical papers will be evaluated and approved according to the SC2 Technical Paper

Guidelines which will be published in advance of each tournament event. DARPA will review each technical paper and communicate acceptance of papers to each performer. SC2 Technical Papers are due within 3 weeks of the conclusion of the event.

DARPA does not intend to disclose the technical papers outside the U.S. Government. However, SC2 SCE Technical Papers may be handled by DARPA SC2 support contractors for administrative purposes and/or to assist with technical evaluation. All SC2 support contractors performing this role are bound by appropriate nondisclosure agreements.

4 Participation

A full list of dates and deadlines pertaining to participation in the SC2 can be found on the SC2 website (www.SpectrumCollaborationChallenge.com)

4.1 Participation Tracks

The SC2 provides two tracks for participation: the Proposal Track and the Open Track. Proposal Track teams participate in SC2 through a contract with DARPA, Open Track teams do not. Top performing teams at PE1 and PE2 are eligible to receive funding from DARPA regardless of their participation track, although the mechanism for funding will differ by track. Both tracks are eligible for the prizes at the SCE.

Top-finishing teams in PE1 and PE2 will automatically advance to the next phase of the SC2. If a team fails to place in a Preliminary Event they may requalify to re-enter the next phase and remain an active participant. Entrance Hurdles are specific to each phase, and the difficulty of passing these requirements will grow according to the completity of the technical objectives for the following event.

The characteristics of the two tracks are summarized in the following table.

Requirement	Proposal Track	Open Track
Respond to the BAA	Yes	No
Contract funding	Yes	No
Submit Application	No	Yes
Complete Entrance Hurdles	No	Yes
Cash prizes at PE1, PE2 and SCE	SCE only	Yes

4.1.1 Proposal Track

Teams may seek to fund their participation in the SC2 by submitting a proposal that will be evaluated and selected on the basis of their technical merit as stated in the Broad Agency Announcement (BAA). See DARPA-BAA-16-47 (dated 2016-07-19) for details, including Proposal Track deadlines and procedures related to submissions and selections. Proposal Track teams

receiving an award through DARPA-BAA-16-47 (dated 2016-07-19) may not simultaneously participate in the Open Track.

A limited number of proposals will be selected for contract awards under the Proposal Track. The specific number of contract awards is based on available funding and the number of quality proposals received. A team whose proposal is not selected for DARPA funding under the Proposal Track may opt to register under the Open Track.

A Proposal Track team that is eliminated or otherwise withdraws from the Proposal Track after its initial contract award may be eligible to qualify for participation under the Open Track by successfully completing the applicable Entrance Hurdles.

4.1.2 Open Track

Open Track teams have the same eligibility rules as the Proposal Track teams, and have the same access to government-supplied resources and testing opportunities. However, Open Track teams must successfully pass Entrance Hurdles prior to formal acceptance as an Open Track team.

4.1.2.1 Open Track Registration

Teams that choose to participate in SC2 under the Open Track must complete an application.. The application procedure is a two-step process consisting of an initial registration form and an extended application form. The initial registration identifies the team name and a point of contact. Open Track registration closes, and the extended application form must be received by DARPA no later than 12:00 noon (U.S. Eastern Time), 22 November 2016 to participate in Phase 1. Dates for later phases will be announced in the future via the website.

Applications may be withdrawn at any time by emailing the SC2 mailbox (sc2@darpa.mil). All questions regarding eligibility and participation should be directed to the SC2 mailbox.

4.1.2.2 Open Track Entrance Hurdles

Although participation in the SC2 is open to most all interested parties, access to Colosseum requires DARPA to set limits on the number of teams that can participate in any phase of the program. DARPA also needs to ensure that participating teams have the necessary skillset to field competitive CIR solutions that perform properly on the testbed and meet the objectives of the SC2. For Proposal Track teams, this is determined by the quality of their proposals. Open Track participants will be required to achieve a sufficiently high score across a series of hurdles to secure one of the available seats. Entrance Hurdles will evaluate a team's ability to develop software defined radios and demonstrate applicable machine learning techniques. Detailed descriptions of the Entrance Hurdles will be made available via the SC2 website.

Open Track teams may join at any phase of the competition, during which Entrance Hurdles are open.

4.1.2.3 Open Track Prizes

Teams participating in the Open Track are eligible for all prizes issued in the events they participate in. Prize amounts for the Open Track are given in section 1.3. Note that the top finishers are ranked from the combined group of Open and Proposal Track teams.

4.2 Publicity

All teams that participate in the SC2 may be listed on the SC2 website to enable the event to be tracked by interested members of the public. Public information may include performance results from interim testing, results from the Preliminary and Championship Events, and general information updates. The names and photographs of the winners may be posted on the DARPA website and released to the media. Proposal Track team publicity is governed by the terms of DARPA-BAA-16-47. Open Track team publicity is governed by the terms of the application form.

5 Eligibility

The SC2 is open to all individuals, academic institutions, and business entities, subject to the caveats below. Proposal Track teams should see DARPA-BAA-16-47 dated 2016-07-19 for additional eligibility restrictions specific to proposal teams.

An individual or entity shall not be deemed ineligible because the individual or entity used Federal facilities or consulted with Federal employees during a competition if the facilities and employees are made available to all individuals and entities participating in the collaborative-competition on an equitable basis.

All participants under 18 years of age require the authorization by a parent or guardian.

The following individuals and organizations are not eligible to participate in the SC2:

- Individual, organization or sponsor that is named in the Specially Designated Nationals list of the U.S. Department of Treasury.
- Federal employees, including DARPA employees and DARPA support contractors and their spouses, dependents, and household members are not eligible to participate in the Challenge. Federal employees and contractors acting outside the scope of their employment should consult their ethics official and appropriate management before participating in the Challenge.
- Individuals and organizations that are funded by DARPA to support the SC2 including, but is not limited to, any Federally Funded Research and Development Centers and University Affiliated Research Centers (UARCs), or private-sector personnel whose scope of work includes SC2 technical development, infrastructure development or administrative support.

An applicant may be an individual competing alone or a team representing an academic institution, business, or group of individuals. Only one application per team should be submitted. For each team, a single individual must be identified as the team leader. This person will serve as the official administrative point of contact for communications with the SC2 staff.

Teams are to be wholly separate entities that do no share members or financial interests. Individuals cannot be members of multiple teams. Teams may have one or more sponsors. Teams may not collaborate or share their technical approaches and solutions with other teams, failure to do so will result in disqualification.

Registration information collected by DARPA will be used solely for the purpose of administering the event. Registration information will not be distributed to any parties outside of DARPA nor released for any other purpose except as noted in this document.

DARPA reserves the right to disqualify a participant whose actions are deemed to violate the spirit of the competition for any reason, including but not limited to, the violation of laws or regulations in the course of participation in SC2.

6   Intellectual Property

DARPA claims no rights to intellectual property developed as a result of participation in the SC2 under the Open Track.

Proposal Track competitiors should refer to DARPA-BAA-16-47 for specific information on intellectual property (IP) licensing related to their participation.

7   Additional Information

Participation in the SC2 will be governed by the Event Participation Agreements . These Agreements will define the boundaries of collaborative competition within each event as well as assign IP rights to data transmitted during each event to DARPA. Acceptance of the Event Participation Agreements is mandatory for participation in the SC2.[1].

Nothing in these rules, including information on the SC2 website and communications by DARPA officials, may be interpreted as authorizing the incurrence of any costs or modifying the

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[1] Trophies will be substituted for cash prizes in the absence of sufficient funds. Proposal Track teams will not receive cash prizes for Preliminary Event 1 and Preliminary Event 2.

statement of work or authorizing work outside the terms and conditions of any existing agreements or contracts with DARPA.

DARPA reserves the right to disqualify an individual or team whose actions are deemed to violate the spirit of the collaborative-competition for any reason, including, but not limited to, the violation of laws or regulations in the course of participation in the SC2. DARPA does not authorize or consent to participants infringing on any U.S. patent or copyright while participating in the SC2.

DARPA may cancel SC2 or modify the SC2 without notice.

The DARPA Director is the final decision authority for all matters concerning the SC2.

By registering and/or participating in the SC2, participants agree to follow these rules and to hold harmless and release the U.S. Government from any and all liability and costs arising from the contestants' participation in the SC2.

The appearance and reference to any person, name, place, film, artwork or any other images that are used in connection with the SC2 does not constitute or imply endorsement by the U.S. Government, Department of Defense or DARPA.

Questions regarding the rules, privacy policy, or other aspects of the SC2 may be directed to sc2@darpa.mil.

7.1   Rule Modifications

This version of the rules is subject to change and may be superseded by later versions. DARPA has the authority to modify and interpret the rules at any time. DARPA will post any modifications to the rules to the SC2 website, and will alert all active registered teams. Interested parties are encouraged to monitor the SC2 website for the latest information.

Requests for rules clarifications, questions about proprietary or sensitive matters, and questions about logistics of the event should be sent to sc2@darpa.mil. DARPA will post responses on the SC2 website (www.SpectrumCollaborationChallenge.com). DARPA will ensure that answers do not give any team an unfair advantage. Teams should expect that their questions and DARPA's responses will be made available to all participating teams.

Decisions by DARPA are final.

8   Scope, and Precedence

This document defines the rules for the SC2. The rules apply to all participants in the SC2. The intent of this document is to inform teams as they prepare their radio networks for the

competitive events. Further documents are planned for publication that will provide details about additional resources that will be provided to the teams to aid their radio development and testing.

DARPA may release additional documents with rules updates, procedures, and other information for teams as needed. These additional documents carry the full authority of the rules in this document. Documents for past phases will be archived and replaced with current phase documents, as applicable.

Additional documents intended to be released include the following:

- SC2 System Specification (Details of the Standard Radio Node and Colosseum)
- SC2 Protocol Specifications (Details of the collaboration protocol, command and control APIs, and visualization APIs)
- SC2 Technical Paper Guidelines
- SC2 Open Track Entrance Hurdles
- SC2 Event Participation Agreement
- SC2 Scoring Procedures
- SC2 Frequently Asked Questions (FAQs)

All documents including this Rules document will be posted and updated on the SC2 website, www.SpectrumCollaborationChallenge.com. All SC2 documents including these Rules should be considered living documents, subject to update and clarification throughout the SC2 program.