



S²MARTS

PROJECT TALX

Transparent Accessibility • Live Exchange

FOR

Project 22-02: Dynamic Spectrum Management @ B5G Tactical Edge

4 April 2022 at 11:00AM EST

About the Q&A

Q&A Review Process

1. Questions can be submitted two ways:
 - By visiting www.slido.com on any device and entering the event code **#B5G**
 - By scanning the QR code shown on any slide
2. Questions will then be captured and shared with the audience in real time

Join via web
at www.slido.com
using the event code

#B5G

or scan the QR code
using your smartphone



Speaking Today

- **Brooke Pyne** | Director of S²MARTS
- **Tony Kestranek** | Deputy Director of S²MARTS
- **Jalen Rollins** | S²MARTS Collaboration Coordinator
- **Dr. Sumit Roy** | Director, OUSD R&E, Innovate B5G (IB5G)
- **Vincent Horne** | IB5G SETA Support
- **Scot Hawkins** | NSWC Crane 5G Chief Engineer
- **Stanley Raispis** | NSWC Crane 5G Program Lead

Interested in submitting a question?
Go to [slido.com](https://www.slido.com) and enter the following event code:

#B5G



Webinar Agenda

Project 22-02: Dynamic Spectrum Management @ B5G Tactical Edge

Rules of Engagement

Project Discussion

Q&A Open Exchange via Slido.com

Interested in submitting a question?
Go to [slido.com](https://www.slido.com) and enter the following event code:

#B5G



Rules of Engagement

- Remember the intent
- Not intended to vet your specific solution
- Primarily a programmatic/technical conversation
- Any discrepancies? Documentation takes precedence
- Time permitting, all questions will be answered

Interested in submitting a question?
Go to [slido.com](https://www.slido.com) and enter the following event code:

#B5G



Project 22-02: Dynamic Spectrum Management @ B5G Tactical Edge

Dr. Sumit Roy

Director, OUSD R&E, Innovate B5G (IB5G)

Vincent Horne

IB5G SETA Support

Dr. Scot Hawkins

NSWC Crane 5G Chief Engineer

Stanley Raispis

NSWC Crane 5G Program Lead

Shaun Davis

S2MARTS Program Manager, NSWC Crane

Anna Gates

S2MARTS PM Team, NSWC Crane

Eric Hendrix

S2MARTS PM Team, NSWC Crane

Erin Wittmer

Agreements Officer, NSWC Crane

David Harrell

Agreements Specialist, NSWC Crane

Thomas Morrissey

Associate Counsel, NSWC Crane



Opening Comments

Dr. Sumit Roy
Director OUSD R&E, IB5G



Project Discussion

Mr. Vincent Horne
IB5G SETA Support



5G Experimentation Background

- The purpose of this research & experiments is to enable exploration and development of technologies in the 5G mid band (3 GHz) that enable a higher level of fidelity and performance over existing Dynamic Spectrum Management systems. The DoD sees this as a priority and is hopeful that future approaches to dynamic access will exploit the flexibility offered by 5G systems to achieve these goals.

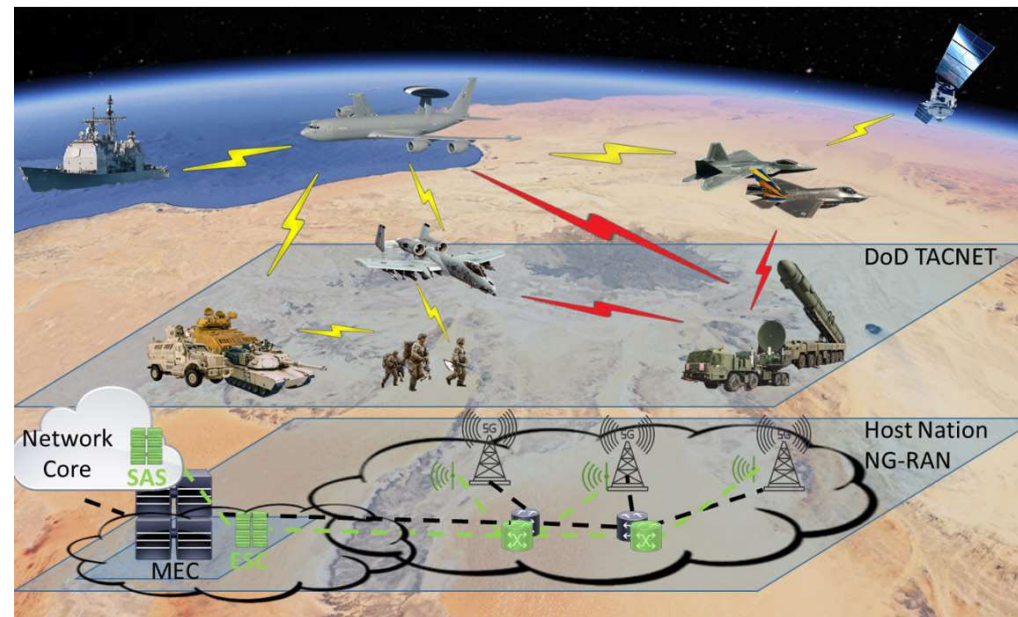


Fig. 1: DoD Tactical Network Operations with 5G Radio Access Network (RAN) Infrastructure



Program Themes

Proposal must include design of the (near) RT-RIC that hosts a new application layer (xAPPs) to demonstrate:

- Real-time database (time, frequency, space, and bandwidth)
 - Maintain available resources
 - Determination of 'spectrum slices'
 - Allocation of 'spectrum slices'

- AI/ML Driven spectrum resource allocation algorithms
 - Demonstrate cognitive operations
 - cognizant of performance vs resiliency trade-offs
 - Perform in congested/contested EW environment

Themes	Current	Objective
1. Sensing Architectures for Federal/Commercial 5G Spectrum Sharing	Unidirectional sharing: 5G systems react to presence of Federal incumbent	Progress towards true 'bi-directional' sharing regime, while preserving information integrity
2. Edge Compute/Networking Solutions for Low Latency/High Reliability fine-grained Spectrum sharing	Largely pre-planned spectrum decisions with little operational flexibility	Novel Controller Algorithms and Applications stack design for dynamic operations

Table 1: Major Proposal Components



Key Research Objectives

Existing DSM Systems

1. Independent Environmental Sensors
2. No Edge Computing
3. Unidirectional Reactive System
4. Large Loop Times: > 60 s to adapt
5. Sufficient for Slow Moving Radar Systems
6. Adapts in Frequency Only
7. Frequency changes in channel or band
8. No integration with RT-RIC
9. No information shared across networks

INNOVATE

Research Objectives

1. Independent and/or In-Situ Sensors
2. Multi-Access Edge Computing
3. Bidirectional Cooperative Systems
4. Small Loop Times: < 1 s to adapt
5. Sufficient for Fast Moving Airborne Systems
6. Adapts in Frequency, Time, &/or Space
7. Frequency changes potentially in sub-band, channel, or band
8. Must include (near) RT-RIC integration
9. Information may be shared across participating networks



Key Research Objectives Cont.

System Parameters/Components	Current (CBRS)	Objective
<u>Latency Sensitivity</u> <ul style="list-style-type: none"> • Environmental Sensing Capability (ESC): Latency of incumbent detection with associated reliability • Database/Compute System: 5G Channel Evacuation Time 	<p>60 Seconds</p> <p>240 Seconds</p>	<p><1 Second</p> <p>< 5 Seconds</p>
<u>Novel Extensions</u> <ul style="list-style-type: none"> • Bi-Directional Sharing 		<p>Define information interfaces to enable Federal system operation to adapt to 5G/B5G presence; minimize coordination zones subject to performance metrics</p>
<u>Future Network Components</u> <ul style="list-style-type: none"> • RT-RIC Design • Network Slicing • O-RAN/RAN Sharing • Multi-Access Edge Compute • AI/ML Approaches 		<p>Define new DSM architecture, demonstrate fine-grained sharing while at Operational Tempo</p>

Table 2: Key Research Objectives



Phase I Description (Design & Refine)

Phase I: Develop and refine hardware (HW) and software (SW) architecture concepts for dynamic spectrum sharing.

- Initial Study & Design Iteration
- Duration: 12 months
- Spectrum sensornet + in-situ processing
- Real-time information sharing between Federal/commercial networks
- Softwarized + virtualized 5G network enabled spectrum allocation
- Design is to be finalized for Phase II via comprehensive model-based analysis & simulation, resulting in full-system Key Performance Indicators (KPIs)



Phase II Description (Build & Demo)

Phase II: Build and Demonstrate Initial Prototype

- Duration: 12 Months
- DSM control application(s) and related algorithms for managing spectrum resources.
- Evaluate performance for a Dynamic Spectrum Access (DSA) xApp for SDN-RAN Controller
- Demonstrate, in a laboratory environment, benefits of dynamic slicing augmented DSA in congested and contested EW environment



Phase III Description (At Scale Proto Demo)

Phase III: At Scale Prototype Demonstration

- Down selected Vendor(s)
- Duration: 12 Months
- Requirements TBD (6 months after Phase II Start)
- Transition their SW/HW prototype to a specified DOD, or other Federal, testbed infrastructure for at scale prototype demonstration



DSM System Performance Focus Areas

Minimum Set of System Performance Key Performance Indicators (KPI's):

- In Spectrum Sharing Scenarios:
 - ESC latency of Incumbent Detection shall meet a threshold requirement of < 1 second
 - Time for 5G System RAN to Vacate the band and/or channel, shall meet a threshold requirement of < 5 seconds
 - Efficiency of signaling/processing across the bi-directional sharing interface(s)
- In Adversarial/EW Scenarios (under various attack scenarios and various User Equipment (UE) activities):
 - 5G System Capacity with DSM system enabled vs disabled
 - 5G System Accessibility with DSM system enabled vs disabled
 - 5G System Retain-ability with DSM system enabled vs disabled
- System specific KPI's:
 - Size, Weight, and Power (SWaP) burden(s) of the DSM system HW
 - Size, processing burden/latency, and power consumption of the DSM system SW



Budget and Awards

- Anticipated Budget
 - \$ 15,000,000 total
- The estimated budget is anticipated to be split among the three phases with \$6,000,000 anticipated for Phase I, \$6,000,000 anticipated for Phase II, and \$3,000,000 anticipated for Phase III.
- This value represents what is currently available for the subject project at the time of RFS release. This value is subject to change and is being provided for planning purposes only.
- Respondents are encouraged to clearly explain how much of their solution can be developed for the advertised amount. Capabilities or project phases that will require additional funding beyond the project budget must be identified as such.
- Anticipated Number of Awards
 - The Government intends to award at least one (1) Other Transaction Agreement on a fixed-price basis as a result of this RFS.
 - The Government also reserves the right to execute fewer awards than anticipated, select aspects of a proposal for award, or not select any of the solutions proposed. The Government will collaborate with prospective awardees prior to finalizing the award.
 - Partial responses addressing only a subset of the project's overall objectives are not permitted for this effort.



Security and Restrictions

- Awardees/Prototype Level Performers are not required to possess an active facility clearance to perform in support of the subject project. Respondents are restricted to domestic, United States based companies only.
 - Security level for up to Controlled Unclassified Information is all that is required.
 - No classified data may be submitted with the proposals.
- Compliance with International Traffic in Arms Regulation (22 C.F.R. §§ 120-130) is required at time of proposal submission.
- Cyber Security Workforce (CSWF) Qualifications and Reporting Tasking outlined in this RFS may require personnel to perform Cyber IT/Cybersecurity functions, therefore shall meet the requirements of DoD Manual 8570.01M Cyber Security Certifications and Requirements (<https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodm/857001m.pdf?ver=2017-04-17-134634-203>).
 - The Performer shall ensure that personnel who are categorized as working within the DoD IA workforce meet the appropriate requirements of DoD Manual 8570.01M. The performer shall provide a list of all personnel assigned with personnel performing Cyber IT/Cybersecurity functions as a part of the monthly Performer's Monthly Status Report (Deliverable identified in Section 5 above).
- By submitting a response, respondents shall certify whether covered telecommunications equipment or services will or will not be included as a part of its offered products or services to the Government in the performance of this effort. RFS Attachment 2 includes additional detail regarding the representation which must be signed and returned with any submissions.

Questions & Answers

- Today's topics will be captured in the Q&A posting on S2MARTS.org
- Reminder: Any changes will be publicized via RFS modification
- Submit questions using www.slido.com.
Event Code is: **#B5G**

Interested in submitting a question?
Go to slido.com and enter the following event code:

#B5G



QUESTION 1

What is meant by “5G System Accessibility” and “5G System Retainability”? What technical metrics are used to characterize them (availability, link range, etc.)?

Accessibility is a cellular engineering system Key Performance Indicator (KPI), and refers to the ability of the UE/gNB to obtain services from the 5G system within a defined geographic area, and includes the combined performance of all mechanisms needed to provide such service, including but not limited to: synchronization, authentication, random access, paging, RRC connection setup, and Enhanced Radio Access Bearer (E-RAB) call setup; whereas the failure of any of these mechanisms can cause the service(s) to be inaccessible.

Retainability is a cellular engineering system KPI, and refers to the ability of the UE/gNB to retain the E-RAB once it has been successfully established from the 5G system within a defined geographic area, for the desired duration.

As the RFS states these KPI's shall be compared in testing between the DSM capability being enabled vs disabled, these comparisons are independent of coverage and measure the improvement of two critical aspects of the system performance when DSM is enabled.

Interested in submitting a question?
Go to [slido.com](https://www.slido.com) and enter the following event code:

#B5G



QUESTION 2

Please define "bi-directional sharing" in the context it is referenced throughout the RFS document. Is this the downlink/uplink spectrum? Is this control of operations from master-client architecture? What is meant by bi-directional near real time?

Bi-directional sharing in the RFS refers to the ability of both systems to adapt to each other (i.e. 'sharing' seen as adaptation occurring on both networks & not only one network), as opposed to the traditional SAS/ESC approach whereby only one system adapts to the other. The bi-directional sharing system may or may not include actual signaling between the two networks; proposals may focus on novel approaches that maximize the performance of both wireless networks in spectrum coexistence scenarios, when compared to the traditional one-way SAS/ESC system.

Interested in submitting a question?
Go to [slido.com](https://www.slido.com) and enter the following event code:

#B5G



QUESTION 3

Equipment/Configuration: Is it acceptable to use equipment that is 3GPP band compliant, however doesn't cover all of the 3.1-3.55 GHz band?

Yes, this is acceptable, provided the supported frequency range of the systems is large and sufficient to demonstrate the novel approaches of the proposed technology(ies), and provided KPI's and system scalability can also be sufficiently demonstrated.

Interested in submitting a question?
Go to [slido.com](https://www.slido.com) and enter the following event code:

#B5G



QUESTION 4

Network Slicing: Network slicing in 5G shares resources between different operators/applications. We assume the term 'spectrum slices' used here is in context similar to CBRS/SAS where 'spectrum slices' are allocated in time, frequency, space, and bandwidth. Is this interpretation correct?

Yes, this interpretation is correct.

Interested in submitting a question?
Go to [slido.com](https://www.slido.com) and enter the following event code:

#B5G





Join via [slido.com](https://www.slido.com) or scan the QR code using your smartphone

#B5G



Closing Reminders

- All Q&A's are publicly available – visit S2MARTS.org
- Proposals are due on **April 29, 2022 at 12:00pm EST.**
- Follow the instructions within the Request for Solutions (RFS)
- Ensure your membership is active
- Engage with other potential partners using [NSTXL Community](#)

Meet your S²MARTS Team



Brooke P.
Vice President
of Consortium
Management

brooke@nstxl.org



Doug C.
S²MARTS
Director

doug@nstxl.org



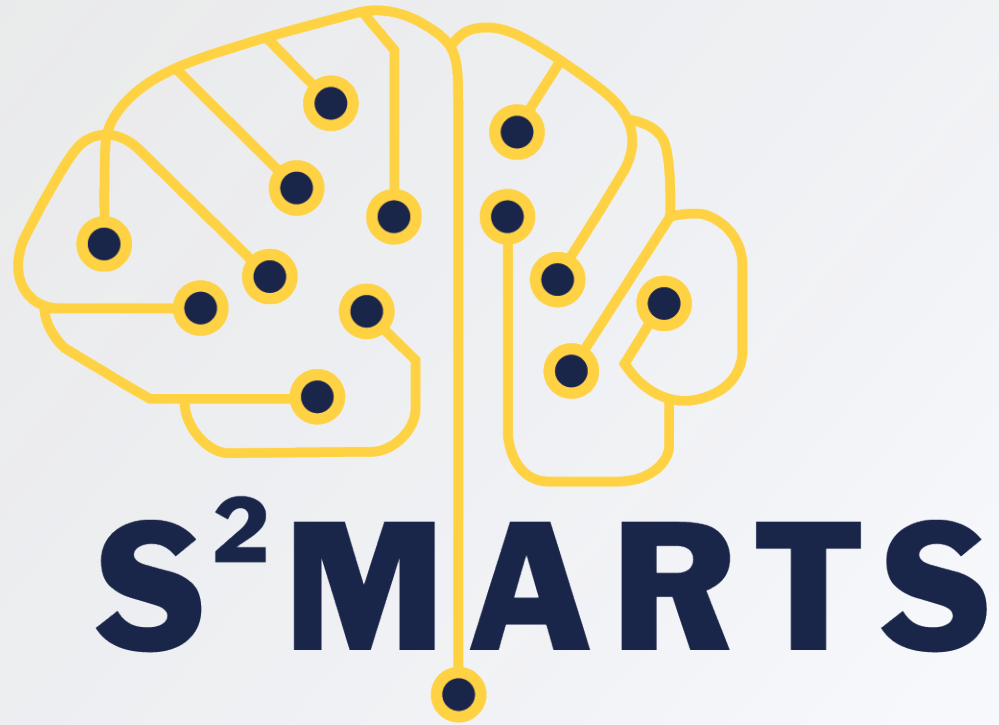
Tony K.
S²MARTS
Deputy Director

tony@nstxl.org



Jalen R.
S²MARTS
Collaboration
Coordinator

jalen@nstxl.org



Thank you for joining!