

Headquarters Supreme Allied Commander Transformation Norfolk Virginia



REQUEST FOR INNOVATIVE PARTICIPATION (RFIP) RFIP-ACT-SACT-24-106

This document contains a Request for Innovative Participation (RFIP) Call for Industry/Academia collaboration regarding the Innovation Challenge 2024/Fall (IC-24/Fall) calling for solutions (applications, systems, tools, concepts etc.) that can support solution development for NATO. Industry/Academia wishing to respond to this RFIP should read this document carefully and follow the guidance for responding.

General Information	
Request For Information No.	RFIP-ACT-SACT 24-106
Project Title	Innovation Challenge 2024/Fall: Resilient adaptive networks for communication and control systems
Deadline for submission	5 November 2024 23:00 UTC
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SECTION I - INTRODUCTION

- 1.1 **Summary.** HQ SACT is issuing this Request for Innovative Participation (RFIP) announcement in order to facilitate collaboration between the HQ SACT Innovation Branch and Industry/Academia regarding solutions¹. The purpose of this RFIP is to request representatives from Industry/Academia to submit solutions (either existing and/or under development) to the scenario presented within **Annex I** to participate in the NATO Innovation Challenge 2024/Fall (IC-24/Fall). All submissions must conform to this RFIP.

A Selection Committee of representatives from HQ SACT, advisors from the IC-24/Fall Partners² and other relevant experts invited by HQ SACT will select up to **10 solutions** submitted by Industry/Academia. The selected solutions will participate in the IC-24/Fall *Pitch Day* projected to be 20 November 2024. Participation in the *Pitch Day* will be either on-site, in LONDON (UNITED KINGDOM), or online. An Advisory Panel of representatives from HQ SACT, the IC-24/Fall partners and other relevant experts invited by HQ SACT will assess which solution(s) best responds the scenario presented in **Annex I**. The final selection of the IC-24/Fall winners will be done by a board of representatives from HQ SACT, advisors out the IC-24/Fall Partners and other relevant experts invited by HQ SACT.

The nature of this event will be **discovery only**. The event is not intended to solicit any type of contracts. However, relevant solutions could potentially support development of future concepts, doctrine, STANAGs, user requirements, capability development, functional demonstrator etc.

- 12 **Dates.** The event, and timelines of IC-24/Fall, is described in Section III. It will take place leading up to 20 November 2024, with the IC-24/Fall *Pitch Day* taking place online and on-site on 20 November 2024. This RFIP will also be posted on the NATO ACT Innovation Hub website (<https://innovationhub-act.org/innovation-challenges/>).
- 13 **Disclaimer.** This is a Request for Innovative Participation (RFIP) **ONLY**. In no way does the RFIP constitute a current Request for Proposal (RFP) or a commitment to issue a future RFP. HQ SACT has not committed nor intends to commit to procure any product(s)/solution(s) described herein, and the release of this RFIP shall not be construed as a commitment, nor an authorization to incur cost for which reimbursement will be required or sought after. Further, respondents are advised that HQ SACT will not pay for any information or administrative costs incurred in *responding* to this RFIP. HQ SACT will not pay any costs associated with participating in the IC24/Fall. The costs for responding to this RFIP and participating in the IC-24/Fall shall be borne solely by the responding party. Not responding to this RFIP does not preclude participation in any subsequent RFP if issued in the future.

SECTION II BACKGROUND

2.1 HQ SACT Framework for collaborative Interaction (FFCI).

- 2.1.1 HQ SACT has implemented a Framework for Collaborative Interaction (FFCI) to increase opportunities for Industry/Academia to contribute to HQ SACT capability development efforts through collaborative work. These collaborations enable HQ SACT, and NATO to benefit from Industry/Academia models, advice, capabilities and experience in the course of work. In addition to the benefits HQ SACT gains from such projects, the collaborative effort will provide Industry/Academia with an improved

¹ In this RFIP, the term “solutions” refers to applications, tools, systems concepts or devices.

² UK MOD – Old Dominion partners - etc.

understanding of developmental challenges to be addressed by HQ SACT, and NATO's capability requirements and the associated issues. Potential collaborative projects are on specific topics that are of mutual interest to both parties, but shall be restricted to collaborations in non-procurement areas. Several mechanisms have been already developed to support the initiation of collaborative projects between Industry/Academia and HQ SACT ranging from informal information exchanges, workshops, and studies to more extensive collaboration on research and experimentation.

- 2.1.2 Since 2017, HQ SACT has conducted Innovation Challenges; these are informative and exploratory events focused mainly on the application of new technologies. The collaborative interaction sought for the IC-24/Fall is focused on Industry/Academia's RFIP responses and willingness to share knowledge, expertise, and products/solutions with NATO and national representatives participating (see scenarios at Annex I).

SECTION III - DESCRIPTION OF THE IC-24/Fall

3.1 Background.

The HQ SACT Innovation Hub is the main organizer of the IC-24/Fall. The HQ SACT Innovation Hub also coordinates the NATO Innovation Network, federating national entities in order to leverage open innovation.

3.2 Planned activities. The IC-24/Fall will consist of:

a. Initial Selection Phase: The selection will be announced on 7 November 2024. Finalists will be contacted directly via email by the project coordinator in charge of the challenge, and the announcement will be published on the IC-24/Fall Webpage on the HQ SACT innovation hub website (<https://innovationhub-act.org/innovation-challenges/>). The selected submissions will be invited to make a presentation either live in person or virtually online on the *Pitch Day*. Any costs associated with presenting remains the sole responsibility of the Industry/Academia providing the submission.

b. Final selection phase: On the *Pitch Day*, the winners of the IC-24/Fall will be selected by a Board comprised of HQ SACT representatives and partners invited by HQ SACT and announced as part of the *Pitch Day* program. All information provided in response (abstracts, supporting materials, and, if selected for *Pitch Day*, in the presentations) will be releasable to the public. Only abstract submissions selected for presentation at IC-24/Fall *Pitch Day* will be showcased in the public domain.

- 3.3 **Expected benefits.** Through this collaboration, HQ SACT offers Industry/Academia an opportunity to gain awareness about the particularities of the Innovation Challenges in NATO and in Partner Nations. It will be an opportunity to engage with HQ SACT Innovation Hub and other participants within a framework of a community of interest focused on the development of innovative solutions based on new technologies in support of the NATO Innovation Process.

3.4 Monetary Awards

- 3.4.1 HQ SACT presents three levels of monetary awards for the top three winners of the IC-24/Fall:

a. 1st place: \$5,000 USD

- b. 2nd place: \$2,500 USD
 - c. 3rd place: \$1,000 USD
- 3.4.2 The monetary award is presented in the form of 1st/2nd/3rd place recipients of the HQ SACT Innovation Challenge 2024/Fall. The presentation of the award does not alter the relationship between HQ SACT and the participants. The monetary award is presented to eligible industry or academia entries, who have complied with the terms and conditions defined for the challenge. The recipient is responsible for the proper recording and reporting of the monetary award to the appropriate tax authorities and the payment of any associated taxes.
- 3.4.3 Monetary awards will be paid to the recipient in the form of Electronic Funds Transfer in US dollars.

SECTION IV - REQUESTED INFORMATION

- 4.1 **Intent.** The intent of this RFIP is to call for formal collaboration with Industry/Academia in order to present solutions based on new technologies that can support the improvement of the NATO Innovation Process. These solutions should be applicable in a federated information environment and should be interoperable by design. Additionally, they should be intuitive, requiring none or very limited training at the end-user level. Solutions are sought at different levels of development, from the “advanced concept development stage” through “customizable applications” available commercial off-the-shelf. Solutions may address some of the challenges described in the scenario presented in Annex I, associated to one or more of the following **areas of interest**:

- Dynamic Network Topologies
- Cybersecurity and Attack Resilience
- Internet of Things (IoT) Scalability
- Simulation and Visualization
- Network Optimization with Preferred Attachment

The inherent discovery nature of the IC-24/Fall allows for novel approaches to these challenges.

4.2 **Responses to the RFIP.**

In response to the RFIP, please submit an abstract (**4500 characters maximum, space not included**) describing the solution idea and answering the criteria. Based on this submission and the eventual file attached, an IC-24/Fall Selection Committee will select up to **10** abstracts to be presented at the Innovation Challenge *Pitch Day*. In the event that the scores result in a tie (between the 10th and 11th place), the 11th finalist will be permitted to participate in the Pitch Day before the final jury. The response to this RFIP should be submitted through the webform accessible on the NATO ACT innovation hub website (<https://innovationhub-act.org/innovation-challenges/>) with the following information:

- a. The name of the participant(s)/representative(s) (specify either Industry or Academia)
- b. The name of the proposed solution and which area(s) of interest it addresses
- c. Name(s) of participant’s representative(s) (new individuals cannot be appointed after pre-selection)

The abstract shall include:

- a. Limited to 4500 characters max text document, space not included.
- b. Max 5 graphics, pictures or slides.
- c. Eventual file attached to the submission

NOTE: All information provided in response to this RFIP has to be releasable to the public.

4.3 Evaluation of Solutions and Selection Process. A Selection Committee will be convened to analyze and evaluate the responses to the RFIP and select which submissions will be presented/demonstrated at IC-24/Fall. The Selection Committee will assess each response according to the following criteria:

4.3.1 Evaluation: The response to this RFIP should reflect a solution that addresses at least one of the areas of interest presented at paragraph 4.1.

Submissions will specifically be evaluated and scored against the below criteria:

- User-friendliness:
 - Configuration
 - Input of strategies
 - Visualization of runs and cockpit showing results and relevant features
- Portability of the simulation
- Scalability: storage and computation limits. An estimate of algorithmic complexity will be appreciated

4.3.2 Priority: The Selection Committee retains the right to prioritize the answers to RFIP based on the relevance and diversity of the solutions, on the proposed demonstration method, and the complexity of the challenges addressed. Additionally, ensuring a balanced representation of both Industry/Academia will be part of the prioritization process.

4.3.3 Status: Only submissions by Industry/Academia (involving individual team members) headquartered, nationalized and/or located in NATO member countries will be considered for IC-24/Fall.

4.4 Terms applicable to this RFIP: The participating Industry/Academia agree IC- 24/Fall may without any limitation or further compensation use the participant's name as well as voice and/or likeness of its representative(s) in any and all media for the purpose of advertising and promoting the HQ SACT Innovation Challenge, and any associated programs. Furthermore, the participant(s) grants HQ SACT and the IC- 24/Fall the right to take photographs and videos of the submission in connection with the challenge and grants the right to HQ SACT Innovation Challenge to use and publish the photographs and videos with or without the participant's name for any lawful purpose including but not limited to publicity, illustration, advertising, and internet/social media content. Additionally, the participant(s) agree that the IC- 24/Fall and thus HQ SACT may demonstrate the operation and functionality of the submission (but may not modify or publicize the source code) in connection with advertising and promoting the IC- 24/Fall and subsequent events organized by HQ SACT.

- a. The participating Industry/Academia represents and warrants no contractual or other obligations that would:
 - (i) Prevent the participant from granting the right of use provided here and/or
 - (ii) Prevent the participant from claiming Intellectual Property ownership rights in materials or inventions created by the participant and incorporated into the submission
- b. Representation and Warranties: The participating Industry/Academia represents and warrants that:
 - (i) The participant(s) is the original author of the submitted contributions

- (ii) The participant(s) acknowledges, the submission will not infringe on any third party's copyright, patent, trademark, trade secret, right of publicity or property or any other right
 - (iii) The submission is not the subject of any actual or threatened litigation or claim
 - (iv) The submission will not be obscene, offensive, libelous, pornographic, threatening, abusive, or otherwise objectionable
 - (v) The submission will not contain any content that is illegal, would constitute or encourage a criminal offense, or would otherwise give rise to liability or violate any law.
- c. The participating Industry/Academia agree to grant IC- 24/Fall (and thus HQ SACT), a non-exclusive, use of the submission as necessary to conduct the IC- 24/Fall and for internal evaluation purposes by HQ SACT:
 - (i) In any Intellectual Property incorporated into the submission
 - (ii) In Intellectual Property that is needed to operate or use the submission
 - (iii) In Intellectual Property covering other materials or inventions that are incorporated into the submission
 - (iv) And /or in Intellectual Property that is needed to operate or use the submission
- d. Furthermore, participants acknowledge and agree that the submission is submitted in a non-confidential basis. The IC- 24/Fall (and thus HQ SACT) shall have no obligation to prevent the disclosure or otherwise treat as confidential such submission. Also, to the extent that the submission includes publication of information or content on the NATO ACT innovation hub website (<https://innovationhub-act.org/innovation-challenges/>).
- e. By responding to this RFIP and participating in the IC- 24/Fall it is constituted Industry/Academia acknowledge and agree that the IC- 24/Fall will receive many entries and submissions in connection with this RFIP. As such, other participants' entries and submissions may be similar or identical in theme, idea, format, or other respects to the submission. By responding to this RFIP, the participating Industry/Academia waives any, and all, past, present or future claims against HQ SACT and the IC- 24/Fall relating to such similarities, or asserting that any compensation is due in connection with the submission.
- f. Limitation of Liability: In no event shall the HQ SACT or the IC- 24/Fall be liable for incidental, exemplary or punitive damages arising out of or in connection with the IC- 24/Fall, Industry/Academia participation, or the submission. If a participant has a dispute with any participant in the IC- 24/Fall or any other third party, the participating Industry/Academia release HQ SACT and the IC- 24/Fall from any and all claims, demands and damages, (actual and consequential) of every kind and nature arising out of or in any way connected with such disputes.
- g. Release and Indemnification: by responding to this RFIP and participating in the 24/Fall, Industry/Academia agree, on behalf of that participant and the heirs, executors and administrators, to release and hold harmless the 24/Fall (and thus HQ SACT) from any claim, liability, damage, litigation, illness, injury or death that may occur, directly or indirectly, whether caused by negligence or not, from participating in the 24/Fall. This includes any entry (submission) submitted by the participating Industry/Academia.

- 4.5 **Communication and Follow-on.** The answers to RFIP should be submitted through the event webform on the NATO ACT innovation hub website (<https://innovationhub-act.org/innovation-challenges/>). Post-submission, RFIP respondents may be contacted to provide additional information on their proposals/response.
- 4.6 **Questions.** Questions of a technical nature about this RFIP announcement shall be submitted solely to the project coordinators of the challenge listed on page 2. Accordingly, questions shall not contain proprietary and/or classified information.
- 4.7 **Deadline for responding to this RFIP.** 5 November 2024 11:00 PM UTC (Coordinated Universal Time, LONDON UK Time; also 6PM Eastern Standard Time).
- 4.8 **Summary.** This is a RFIP only. The purpose of this RFIP is to request both Industry/Academia to present and demonstrate solutions (either existing and/or under development) based on new technologies that may support the improvement of NATO Innovation Process. HQ SACT has not made a commitment to procure any of the products/solutions described herein, and release of this RFIP shall not be construed as such a commitment, nor as authorization to incur cost for which reimbursement will be required or sought after. It is again re-emphasized that this document is a RFIP, and not a RFP of any kind.

HQ Supreme Allied Commander Transformation
RFIP-ACT-SACT-24-106 **ANNEX I**

Resilient adaptive networks for communication and control systems

Background

Modern warfare relies heavily on communication and control (C2) systems in order to transport data between sensors, decision centers and actuators. Military C2 networks were traditionally rigid in their topology, with predefined network addressing plans.

Increasing cyberwarfare aiming at crippling such networks by incapacitating nodes or edges, either through kinetic (physical destruction) or non-kinetic (DDOS, etc.) effects, emphasizes the need for more adaptive topologies of networks where new edges can be created or deleted, and client-server allocations can change dynamically in time.

Furthermore, increasing use of IoT devices increases dramatically, by several orders of magnitude, the number of nodes and edges in the networks.

A network can be modelled as a graph, and is usually composed of several levels of nested networks. Such a topology, initially inherited from traditional tree-like definitions of C2 networks (cf. Internet topology before diffusion of peer-to-peer concepts), evolves however, when adding edges or nodes, to a tendency for nodes to interact with neighbors of better-connected nodes.

We are interested in such networks, with preferred attachment, as mere random networks are not of interest a priori in the short and mid-term for the intended applications.

Scenario

Develop a simulation of complex adaptive networks, which can start from a tree-like structure but evolve to networks with the preferred attachment property, by creating and/or deleting edges and/or nodes and/or related sub-networks.

An attack is to be simulated by deleting edges or nodes. This will imply some of the sub-networks might be disconnected. Such a disconnected sub-network will have a finite duration of life.

A response is to create new edges or new nodes.

The aim of the simulation is to be able to concatenate several attacks and several responses, and analyze whether some strategies (either of attacks or of responses) lead to destruction or resilience of the global communication network. Such strategies could be based for instance on analysis of the degree distribution or centrality measures.

The outcome of the simulation is not to define a winner or a loser, but to run as long as possible (depending on storage resources and computing power), with various configurations and strategies (predefined, or programmable with a user-friendly intuitive high-level language).

The range of parameters of configurations should be large: number of nodes up to 10^7 (this is a maximal estimation from IoT short term projections adapted to current conflict); number of nested networks up to 10^2 . The duration of a run should exceed 10^4 units of time (one set of attacks or one set of responses possible, but not mandatory, per unit of time).

Attention will also be brought to visualization of the simulation runs, and of the results of a given run or collection of runs (if statistical analysis is used).

Variable parameters that have to be configured before running a simulation:

- number of nodes and edges in the networks,
- number of levels of nested networks,
- number of edges and/or nodes potentially deleted/created during each attack/response iteration,
- duration of life of a disconnected sub-network.

Additional features would be to have edges of different types, modeled by integral weights (in order to simulate direction of edges, or intensity, or some kind of robustness), and an attack would change the weight by a given amount, 0 meaning the edge is deleted.