

## Questions and Answers #1 RFI-ACT-SACT-23-29

### NATO's Requirement for Testing the Implementation and Performance of 5G Over Non-Terrestrial Networks (NTN).

| Category                    | Question   | Response   |
|-----------------------------|--|--|
| <b>General Requirements</b> | Can you advise the expected amount of users/devices to use the network and to be simultaneously connected          | Please make some logical assumptions for your response based on a very low number of devices planned for the eventual demonstration.   |
|                             | Is there any Expected DL/UL Thp? Latency   | The implementation must be proven to work over the chosen orbit (GEO, MEO, LEO) and consider latency issues and how to address them (see Reference A.). For example, a LEO based service had a latency of 50-80 Ms (not using 5G over NTN) in a recent test with NATO. |
|                             | Is any kind of Core redundancy required/expected   | This depends on the mission and your implementation options. For the demo, this may not be necessary.  |
|                             | Any available/expected spectrum to be used   | Again, this depends on the orbit that is chosen for your implementation strategy. For the planned demo, we may use NATO's GEO Military SATCOM space segment.   |
|                             | For the Satellite licencing, will NATO be procuring the VSAT licence to run the demo in-country                    | The details on the demo are not yet available or planned. This RFI is about informing ourselves on potential implementation strategies.  |
|                             | Expected delivery/build timeline to be on life in October for the testing phase.                                   | We do not have those details yet.  |
| <b>Devices</b>              | Who is providing the devices   | NATO will buy or lease required devices and networking equipment, but the RFI is not about the demo.   |
|                             | Will NATO be providing the Satellite terminals?<br>Do you have an existing preferred list of equipment             | It depends on the "solution" we will test.<br>No list yet.   |
|                             | Can you advise a device model / manufacturer you might use in order to check spectrum compatibility / capabilities | Not at this time – The NATO Communications and Information Agency will need to support this demo, but have not been involved at this stage.  |

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| <b>Use Case 1</b> | <b>In regards of use case 1 (Mobile / On-The-Move (OTM) Connectivity):</b>   |  |
|                   | What kind of services do you need to access and are real-time services to be included  | Demo will not use live/real-time data. The type of Information Exchange Requirements (IERs) have not been discussed for OTM and may not be part of the initial demo. However, JCHAT and situational awareness tools (real-time operational picture) are good examples.   |
|                   | What data rates are expected/needed for each service   | Again, this depends on the orbit. LEO is providing data rates never seen before and NATO is interested in the “maximum” data rates available per orbit (down and up link speeds) to evaluate our requirement vs what is available.<br><br>Recent tests with a LEO based provider (not 5G over NTN) provided in the order of 300 Mbps down link rates and 50 Mbps up link rates for internet based traffic. |
| <b>Use Case 2</b> | PTT services, VoNR or no matter the voice approach   | The best description I can provide is that NATO wants to test 5G cellular services provided via a Mobile Network Operator and a “Satellite based Cell Tower” directly to a 5G enabled device e.g. 5G Smart Phone.  |
|                   | That means/are they asking for private-public network interoperability   | At this time, NATO might be interested in a demonstration but I am not authorized to make any other type of commitments.   |
|                   | Vodafone would like to involve NATO in tests of 5G Direct-to-handset (from Cell Towers in Space). As Vodafone is already involved in testing across the NATO territory of Spain, would the option of NATO involvement in this upcoming schedule there, be considered as an alternative to Germany (Wessel) or the Netherlands (Brunssum) |  |
| <b>Use Case 3</b> | Suggests that you are requiring private-public network interoperability - please confirm   | Yes.   |
|                   | What data rates are expected/needed for each service   | See answer above (UC1). Very little discussion on actual IERs and required data rates has taken place.   |
|                   | We understand that there are existing IoT devices; is there further roll out required, and could that be in the scope of a follow up RFP   | Probably, however unsighted on this topic.   |

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| <b>Use Case 4</b> | Advice on the expected amount of IoT devices connected  | No idea at this time.  |
|                   | Any IoT devices expected payload (Data traffic volume)  | No idea at this time.  |
|                   | Is there an opportunity to extend the full submission deadline beyond 5:00 pm EDT 30 April, 2023. Easter tends to be a busy holiday period which may effect resources available | Yes, given October demonstration/testing could be delayed into 2024, we could extend the deadline to 15 May, 2023 if required. |

| <b>RFI Reference</b> | <b>Questions</b>  | <b>NATO Response</b>  |
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| Cover page           | <p>The project title is “Request for industry input to NATO’s Requirement for Testing the Implementation and Performance of 5G Over Non-Terrestrial Networks (NTN).”</p> <p>As per paragraph §10, do you confirm that this RFI is only about suggesting technical requirements to NATO for testing the implementation and the performance of 5G NTN?</p> <p>Do you expect by the way at this stage, first propositions of contributions to the potential NATO 5G-Technology Demonstration by supplying end-to-end solutions or building blocks, service capacity, or professional services?</p> | As per paragraph §10, I confirm that this RFI is only about suggesting technical requirements and implementation strategies to NATO for testing the implementation and the performance of 5G NTN?                                 |
| 2.2                  | The RFI aims <i>“To assess and evaluate potential implementation strategies and technical requirements/architectures for 5G technologies, networks and services over NTNs that may be demonstrated during a NATO 5G-Technology demonstration in late October 2023.”</i>   | NATO simply wants to evaluate potential implementation strategies and technical architectures that will be used to develop a technical architecture in a future planned 5G Over NTN demonstration using NATO’s Signal Battalions. |

| RFI Reference | Questions  | NATO Response   |
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|               | <ul style="list-style-type: none"> <li>- Does it mean “<i>To assess and evaluate potential implementation strategies and technical requirements/architectures for 5G technologies, networks and services over NTN</i>” <u>for future use by the forces</u>, and some of them “may be demonstrated in late October 2023”?</li> <li>- Or does it mean “<i>To assess and evaluate potential implementation strategies and technical requirements/architectures for 5G technologies, networks and services over NTN</i>” <u>that will be available in 2023</u>, for a potential demonstration in late October 2023?</li> </ul> |   |
| 2.3           | <p>It reads in the RFI that NATO plans to implement 5G over a NTN (SATCOM) during a NATO 5G-Technology Demonstration event later in 2023 in a “<i>location which will be in Europe, most likely in Germany (Wessel) or the Netherlands (Brunssum)</i>”. Would another location in a NATO country in Europe be possible?</p>  | <p>The availability of a NATO Signal Battalion somewhere in Europe will be a key deciding factor.</p>                       |
| 2.3           | <p>Does NATO plan to have a single one demonstrator to cover all targeted use cases, or to build several demonstrators to address separately each use cases?</p>   | <p>Our approach has not yet been decided at this stage.</p>   |
| 2.3           | <p><b>When</b> approximately <b>NATO would request possible participation</b> from the industry to the NATO 5G-Technology Demonstration?</p>   | <p>Once we know what needs to be “acquired” (services and equipment) NATO will follow the required contracting process.</p> |

| RFI Reference | Questions   | NATO Response  |
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| 2.3           | How NATO will define the criteria for the selection of the demonstration set-up?  | Cannot specify at this time.   |
| 2.3           | Can NATO clarify the final destination of the various equipment used to support the demonstration?  | Cannot specify at this time.   |
| 2.3           | For the set-up of the 5G NTN technology demonstration, <b>does NATO plans to provide a financial support</b> to the proponent consortium? Would there be restrictions on the <b>type of expenses (e.g. efforts, logistics, travels ...) covered by this financial support?</b>  | Cannot specify at this time.   |
| 10            | Notwithstanding <i>“HQ SACT has not made a commitment to procure any of the items described herein, and release of this RFI shall not be construed as such a commitment”</i> , will HQ SACT, or NATO organization, potentially issue after this RFI, an RFP concerning the development of demonstrators or the provision of equipment or services to NATO for the NATO 5G-Technology Demonstration? | HQ SACT has not made a commitment to procure any of the items described herein, and release of this RFI shall not be construed as such a commitment. |
| 10            | Could you please clarify if NATO SACT plans any follow-up after the 5G NTN demonstration phase?   | Like any capability NATO wishes to acquire, the process/procedures according to the NATO Common-Funded Delivery Governance Model will be followed.   |
| 11            | For RFI-ACT-SACT-23-29, with regards to the text <i>“HQ SACT will follow non-disclosure principles and possibly conclude an NDA with any companies to protect submitted information from further disclosure.”</i> What is the process of concluding an NDA?   |  |

| RFI Reference | Question  | NATO Response  |
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| 2.3 Use Cases | Section 2.3 states that "During a NATO 5G-Technology Demonstration event in [October] 2023, NATO plans to implement 5G over NTN (SATCOM)" using the detailed use-cases outlined in Table 1. Will the Government please clarify how/when the potential 5G technologies, networks, and services will be solicited for participation in this demonstration?  | The demonstration event is a follow-on to this RFI and is currently planned for late 2023 but may slip to 2024. NATO will acquire or lease required <u>services and networking equipment</u> using the NATO contracting process. |
| 2.3 Use Cases | Table 1 use cases closely match those of the Telecom Infra Project (TIP) consortia's Non-Terrestrial Connectivity Solutions (NTCS) project group. This group has been developing common, vendor-agnostic requirements for OpenRAN based, NTN-compatible gNB and software backend (SMO/RIC) that can be referenced by government and commercial satellite network operators in solicitations and procurements. They will be developing testing & compliance as well. To promote standardization and encourage vendor implementation of NTN-ready solutions, we recommend that the Government consider including TIP's requirements artefacts and standards as part of any future RFP/demonstration for this project. | Thank you for this information and NATO will definitely consider this recommendation.  |
| 2.4           | Examples of Expected Operational Architecture Views - Level 1 (OV-1) Figures 1, 2, and 3 depict the components involved in the user / data plane of 5G NTN  | Thank you for your recommendations. The results of the RFI will be shared with NATO's SATCOM service provider, the NATO Communications and Information Agency who will also be involved in                                       |

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|  | <p>communications; but, it omits the operational elements involved in the network service management &amp; orchestration (SMO). SMO and in particular, the Radio Access Network (RAN) Intelligent Controller (RIC) functions of non-geostationary satellite constellations is operationally challenging. We note in Table 1 the explicit mention of LEO satellites; and, as such, we recommend that NATO require vendors to demonstrate solutions that enable the SMO / RIC function for 5G NTN. This ensures NATO receives holistic technologies capable of enabling the stated NATO use cases for 5G Over NTN with non-geostationary satellite constellations.</p> | <p>designing the network architecture for the demonstration.</p> |
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| <b>RFI Reference</b> | <b>Question</b>  | <b>NATO Response</b>   |
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| 2.3 Use Cases        | In Section 2.3 Use Cases, can you define the physical area and user density of “NATO’s Communications and Information Systems Group (NCISG) and one of their Signal Battalions”? To ensure a successful demonstrable solution in Wessel, Germany or Brunssum Netherlands it will be necessary to know the details on the test area and the number of users who will test the capability. | This RFI is not addressing the demonstration, but rather, gaining insight into implementation strategies for a simple low density demonstration. Therefore, make some assumptions for your implementation e.g. some direct end-user devices and 1-2 SATCOM terminals / network communication modules with SATCOM Converging Routers. |
| 2.3 Use Cases        | In Section 2.3 Use Cases, can you provide details on what “NATO’s deployable communication equipment” baseline is and how it will be used in the testing?  | See answer above.  |
| Table 1              | Are all of the use cases in Table 1: NATO Cases for 5G Over NTN expected to all be addressed in the RFI response or can individual use cases be identified for a solution to address?  | You can use any approach you wish. Addressing any of the individual use cases in your RFI response is of benefit to NATO.  |
| Table 1              | In Table 1: NATO Cases for 5G Over NTNs, is the comment “May be implemented via a L-band connection as 100++ kbps” a minimum threshold requirement? Given timeline of October 2023 demonstration, certain existing capabilities are generally less than 100 kbps per user so want to ensure for direct to device (D2D) SATCOM access less than 100 kbps is of interest to NATO HQ SACT.  | 100 Kbps It is not a minimum threshold.  |

| <b>RFI Reference</b> | <b>Question</b>  | <b>NATO Response</b>   |
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| N/A                  | We understand in the current NATO SATCOM infrastructure uses a combination of ViaSat MD1366 and SLM5650B (EBEM modems) and every link between NATO’s SGS’s and TSGT’s or | The network architecture is not defined yet for the demonstration. This will depend on the satellite service provider (could be NATO’s or a commercial provider). Please make your |



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|               | DSGT's has the TRANSEC feature enabled on these circuits as this is an operational requirement. Will this 5G test be performed using TRANSEC FIPS 140-2/3 satellite modems?  | assumptions when providing your response, but TRANSEC features are normally a baseline security requirement for NATO (not sure if we use FIPS 140 or another security specification standard).  |
| 2.3 Use Cases | What are the typical distances between nodes in the stated Use Case scenarios?   | <p>Please make some logical assumptions for local distances between nodes if required.</p> <p>NATO deployed units may be a small tactical land unit composed of one main communication information system (CIS) unit, tents or shelters (static units) housing the command and HQ staff, and some mobile (vehicular or infantry) units supporting potentially several hundred users. The DHQ is expected to be located within a small operational area with a maximum required transmission range of hundreds of meters. In addition, this DHQ needs to have a small electromagnetic (EM) footprint owing to its proximity to the actual battlefield area.<br/> <b>[Reference: International Conference on Military Communications and Information Systems (ICMCIS 2022), Jamming and jamming mitigation for selected 5G military scenarios, Pawel Skokowskia et Al., 2022 (Available online at <a href="http://www.sciencedirect.com">www.sciencedirect.com</a>)</b></p> |
|               | For RFI-ACT-SACT-23-29, with regards to the text "HQ SACT will follow non-disclosure principles and possibly conclude an NDA with any companies to protect submitted information from further disclosure." What is the process of concluding an NDA? | Paragraph 7 "Non-disclosure principles and/or nondisclosure agreement (NDA) with third party company" refers to the possibility of the conclusion of the NDA only with the third party company.   |

