Guide for Applicants

1st Open Call

Extension of the Virtual Object Stack (VOStack) and development of Virtual Objects (VOs), composite Virtual Objects (cVOs) and Digital Twins (DTs)

Submission starts on 1 November 2023 at 9:00 (CET, Brussels Time)

Deadline is on the 10 January 2024 at 17:00 (CET, Brussels Time)

V1, 27/10/2023

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the European Commission can be held responsible for them. NEPHELE has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101070487.
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## Terms and abbreviations

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<tr>
<th>EC</th>
<th>European Commission</th>
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<tr>
<td>FSTP</td>
<td>Financial Support to Third Parties</td>
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<td>VO</td>
<td>Virtual Object</td>
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<td>cVO</td>
<td>Composite Virtual Object</td>
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<td>DT</td>
<td>Digital Twin</td>
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<tr>
<td>IoT</td>
<td>Internet of Things</td>
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<tr>
<th>TRL</th>
<th>As per European Commission <a href="#">definition</a>, there are 9 possible levels of technology readiness.</th>
</tr>
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<tbody>
<tr>
<td>TRL 1</td>
<td>basic principles observed,</td>
</tr>
<tr>
<td>TRL 2</td>
<td>technology concept formulated,</td>
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<tr>
<td>TRL 3</td>
<td>experimental proof of concept,</td>
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<td>TRL 4</td>
<td>technology validated in a lab,</td>
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<tr>
<td>TRL 5</td>
<td>technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies),</td>
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<tr>
<td>TRL 6</td>
<td>technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies),</td>
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<td>TRL 7</td>
<td>the system prototype demonstration in operational environment,</td>
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<tr>
<td>TRL 8</td>
<td>system complete and qualified, and</td>
</tr>
<tr>
<td>TRL 9</td>
<td>actual system proven in an operational environment (competitive manufacturing in the case of key enabling technologies; or in space).</td>
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<th>FAQ</th>
<th>Frequently Asked Questions</th>
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1. Basic info about NEPHELE

NEPHELE is a Research and Innovation Action project funded by the Horizon Europe programme under the topic "Future European platforms for the Edge: Meta Operating Systems". The project's vision is to enable the efficient, reliable and secure end-to-end orchestration of hyper-distributed applications over programmable infrastructure that is spanning across the compute continuum from Cloud-to-Edge-to-IoT, removing existing openness and interoperability barriers in the convergence of IoT technologies against cloud and edge computing orchestration platforms, and introducing automation and decentralized intelligence mechanisms powered by 5G and distributed AI technologies.

The main goal of NEPHELE is to design and build a virtual object software stack (VOStack) that will tackle IoT interoperability and convergence challenges in the compute continuum and develop synergetic orchestration mechanisms that can manage distributed applications in the continuum. See more info about the project here: https://nephele-project.eu/

In order to achieve the project’s goals, NEPHELE will distribute up to €1,49M among SMEs/Mid-caps that will be selected through 2 Open Calls:

- **1st Open Call** - Extension of the Virtual Object Stack (VOStack) and development of Virtual Objects (VOs), composite Virtual Objects (cVOs) and Digital Twins (DTs) - targeting up to 8 SMEs/Mid-caps to develop Virtual Objects, composite Virtual Objects (including the Digital Twin concept), and generic IoT enablers in accordance with the provided software stack.
- **2nd Open Call** - Use Cases development and NEPHELE approach validation - targeting up to 8 SMEs/Mid-caps to develop use cases and validate the NEPHELE architectural approach & synergetic meta-orchestration framework.

This Guide for Applicants contains relevant information to understand how to successfully take part in the 1st Open Call.

2. What do we offer?

The 1st Open Call of NEPHELE will distribute **up to €608 000** among **up to 8 SMEs/Mid-caps to develop VOs, cVOs (including the concept of DTs) and Generic/Backend functions that can be considered as extensions of the provided software stack (VOStack).**
The selected SMEs/Mid-caps will benefit from the 1st Open Call in a number of ways, namely by:

1. Participating in a 6-month-long support programme;
2. Receiving a fixed lump sum of up to €76 000 per entity;
3. Receiving technical mentoring during the support programme.

Applications are welcome from the **1st of November 2023 at 9:00 (CET)** until the **10th of January 2024 at 17:00 (CET)** at https://nephele-1st-open-call.fundingbox.com/.

### 3. Admissibility and Eligibility Criteria

We will check the admissibility and eligibility of all proposals submitted before the deadline (the 10th of January 2024 at 17:00 CET) via our online application form: https://nephele-1st-open-call.fundingbox.com/. All the admissibility and eligibility criteria are listed in this section of this Guide for Applicants. The projects that do not comply with those criteria will be excluded and marked as ineligible.

We will check the admissibility and eligibility criteria based on the information provided in your application **during the whole evaluation process**.

#### 3.1 Who are we looking for?

We are looking for single Industrial\(^1\) SMEs\(^2\) (including startups) and Mid-caps\(^3\) registered as legal entities no later than at the end date of the NEPHELE 1st Open Call (no later than 10 Jan 2024) in the following countries:

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1. An industrial entity is considered to be any type of SME or Mid-cap that covers the expertise and experience criteria described in Section 3.2.
2. An SME will be considered as such if it complies with the European Commission’s Recommendation 2003/361/EC. As a summary, the criteria defining an SME are:
   - Headcount in Annual Work Unit (AWU) less than 250;
   - Annual turnover less or equal to €50 million OR annual balance sheet total less or equal to €43 million.

Note that the figures of partners and linked enterprises should also be considered as stated in the SME user guide. For detailed information check EU recommendation: https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

3. Middle-capitalization company’ or ‘Midcap’ means an enterprise that is not an SME and that has up to 3 000 employees, knowing that the staff headcount is calculated in accordance with Articles 3 to 6 of the Annex to Commission Recommendation 2003/361/EC:
The SMEs and Mid-caps must demonstrate expertise and experience in at least one of the technical areas described in Section 3.2.

The applicants who are subject to EU restrictive measures under Article 29 of the Treaty on the European Union (TEU) and Article 215 of the Treaty on the Functioning of the EU (TFEU) are not eligible to participate in this open call.

The NEPHELE Partners are not eligible to act as applicants and CANNOT be involved in the grantees' projects, neither their affiliates nor employees or permanent collaborators.

3.2 What types of activities can be funded?

Participants have to address the scope of the 1st Open Call, that is to develop a set of Virtual Objects (VOs), composite Virtual Objects (cVOs) and Digital Twins (DTs), as well as extensions in the software stack (VOStack) in the form of generic Functions. The aim is to integrate these components into the NEPHELE ecosystem and adopt the NEPHELE architecture (see Annex 1). The provided software and its documentation have to be made available as open source and offered as part of the NEPHELE ecosystem.

The proposals must address at least one of the focus areas listed below (see Annex 2):

- Development of VOs and optionally cVOs along with a set of generic or device-specific functions based on VOStack.
- Development of Digital Twins based on the cVO concept.
- Development of VO network and/or security management mechanisms for the VOStack.
- Development of semantic interoperability mechanisms (e.g., from W3C WoT to NGSI-LD, from W3C WoT to OMA LwM2M and vice-versa) for the VOStack.

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4 Following the Council Implementing Decision (EU) 2022/2506, as of 16th December 2022, no legal commitments can be signed with Hungarian public interest trusts established under Hungarian Act IX of 2021 or any entity they maintain. Affected entities may continue to apply to calls for proposals. However, in case the Council measures are not lifted, such entities are not eligible to participate in the NEPHELE 1st open call. In case of consortium, co-applicants will be invited to remove or replace that entity. Tasks and budget may be redistributed accordingly.

5 AC as of (27.10.2023): Albania, Armenia, Bosnia and Herzegovina, Faroe Islands, Georgia, Iceland, Israel, Kosovo, Moldova, Montenegro, North Macedonia, Norway, Serbia, Turkey, Tunisia, Ukraine, for the most up-to-date list please see first part of this document. For the avoidance of doubt, New Zealand is not eligible in this open call.

6 Please note that the EU Official Journal contains the official list and, in case of conflict, its content prevails over that of the EU Sanctions Map.
To be eligible for funding, the provided solutions and the software development has to be aligned with the provided specifications provided in Annex 1. Furthermore, the initial TRL of the proposals should be at TRL4, and the desired TRL level that the proposed solutions should reach during the support programme is at TRL5.

Applicants are also required to demonstrate expertise and experience in at least one of the following fields:

- IoT technologies: communication protocols (e.g., HTTP, CoAP, MQTT, Web of Things), semantic interoperability, security mechanisms, digital twin development.
- Data analytics: Machine Learning (ML), TinyML, stream processing etc.
- Cloud and edge computing technologies: orchestration mechanisms, microservices-based application development.
- Network management technologies: 5G and beyond, NBIoT, ad-hoc networking, time sensitive networking.

3.3 How to apply?

When applying to NEPHELE’s 1st open call, please also note the following:

- **Be on time and use our system:** Make sure you submit your proposal through the [online form](#) before the deadline (admissibility criterion). If you submit the form correctly, the system will send you a confirmation of your submission. Get in touch with us if it is not the case. It is important for you to know that we will not be evaluating any proposal sent after the deadline and submitted outside the dedicated form.
- **English Language:** your proposal must be written in English in all mandatory parts in order to be eligible. Only parts written in English will be evaluated. If the mandatory parts of the proposal are in any other language, the entire proposal will be rejected (admissibility criterion).
- **Every question deserves your attention:** all mandatory sections - generally marked with an asterisk - of your proposal must be completed (admissibility criterion). The data provided should be actual, true, and complete and should allow assessment of the proposal. Additional material, not specifically requested in the online application form, will not be considered for the evaluation.
- **European Dimension:** Your project should have a clear European Dimension, meaning: 1) contribute towards the next generation of higher-level (meta) operating systems for the smart Internet of Things with strong computing capacity at the smart device, system and edge-level, embedded in a compute continuum from IoT-to-edge-to-cloud; 2) increase European autonomy in data processing required to support future hyper-distributed applications.
- **Be exhaustive and precise:** You have to verify the completeness of the form, as it won’t be possible to add any further information after the deadline. After the proposal is submitted, you will be able to modify the form until the deadline.
- You can submit only **one proposal** in this call. If more than one proposal is identified, only the last proposal which has been submitted in order of time will be evaluated.
- **Conflict of interest:** We will take into consideration the existence of potential conflict of interest among you and one or more Consortium partners. Consortium partners, their affiliated entities, employees and permanent collaborators cannot take part in the NEPHELE support programme. All cases of potential conflict of interest will be assessed case by case.
• **Healthy finances and a clean sheet are a must:** We don’t accept entities that are under liquidation or are an enterprise under difficulty according to the Commission Regulation No 651/2014, art. 2.18, or that are excluded from the possibility of obtaining EU funding under the provisions of both national and EU law, or by a decision of both national or EU authority. We also don’t accept entities that are meeting national regulations regarding bankruptcy.

• **It is your proposal:** Your project should be based on your original work or, if the project is not based on your original work, your right to use the IPR must be clearly defined (you must have a licence agreement or the IPR must be transferred to you from somebody who created the work). In particular, any work related to the implementation of the project described in the application may not violate the IPR of third parties, and the IPR to the application project may not be the subject of a dispute or proceedings for infringement of third party IPR.

• Acceptance of the open call rules: to apply for this open call you have to accept its rules and regulations detailed in this Guide for Applicants.

### 4. How will we evaluate your proposal?

Our evaluation process is transparent, fair and equal to all our participants. We will evaluate your project in four phases as shown below.

![Evaluation process diagram](image-url)

Figure 1 Evaluation process
4.1 First Admissibility and Eligibility Check

After the closure of the open call, we will review the proposal to ensure it meets the admissibility and eligibility conditions outlined in Section 3. This assessment will be based on the statements provided in your proposal.

During this initial stage, the eligibility criteria will be cross-referenced against the declaration of honour and self-declarations included in the application form. Subsequently, throughout the evaluation process (including the final formal check), the above criteria will be thoroughly verified.

The proposals that do not comply with the above-mentioned criteria will be excluded.

4.2 In/Out of scope screening

To maximise the impact within the framework of NEPHELE, it is crucial that all proposals align with the European Dimension and the scope of the activities. Additionally, applicants must have the necessary expertise and experience in specific technical fields related to NEPHELE. For this reason, the Selection Committee will review and assess the following aspects of your proposal:

- The scope - the objectives of the proposal must fit within the scope of the project, as described in this guide in Section 3.2.
- The European Dimension - the project should have a European dimension, as described in this guide in Section 3.3.
- Expertise and experience in the defined technical fields, as per Section 3.2.

Proposals that do not comply with any of the aspects described above will be rejected. Proposals that fully comply with all the specified aspects will proceed to the experts’ evaluation phase.

We will inform you about the results of the in/out scope screening.
4.3 External Evaluation

In this phase, each project will be evaluated by two external and independent evaluators from the IoT, edge/cloud computing, Artificial Intelligence (AI) and network management fields. Your project will be evaluated within the following awarding criteria:

**EXCELLENCE** will evaluate:

- **Ambition.** The applicants have to demonstrate to what extent the proposed Third Party Project contributes to the project scope, have a European dimension and are beyond the State of the Art. The Third Party Project has to describe the innovative approach behind it (e.g. ground-breaking objectives, novel concepts and approaches, new products, services or business and organisational models). Development Projects have to demonstrate the innovative approach behind the VOs, cVOs, DTs & IoT enablers (functions) proposed and how they will contribute to bring the NEPHELE Platform beyond the State of the Art.

- **Innovation:** applicants should provide information about the level of innovation within their market and about the degree of differentiation that this project will bring.

- **Soundness of the approach** and credibility of the proposed methodology.

**IMPACT** will analyse:

- **Market opportunity:** The applicants have to demonstrate a clear idea of what they want to do and whether the new/improved product has market potential, e.g. because it solves a problem for a specific target customer. Development Projects have to demonstrate how the proposed developments can contribute to the validation and extension of VOStack.

- **Commercial Strategy and Scalability:** The applicants have to demonstrate the level of scalability of the new/improved product meaning by not addressing a specific problem but able to be commercialised to solve a structural problem in a specific sector/process/etc. Development Projects have to demonstrate the willingness to sign a commercial agreement with the NEPHELE Platform to contribute to the extension of VOStack once integrated.

- **Environmental and social impact:** The applicants have to demonstrate the project contribution towards environmental, social and economic impacts to contribute to sustainable development, Green Deal and other European policies.

**IMPLEMENTATION** will consider:

- **Team:** The applicants have to demonstrate their management and leadership qualities, their ability to take a concept from ideas to market, their capacity to carry through their ideas and understand the dynamics of the market they are trying to tap into. The team should be a cross-functional team, with a strong background and skills base and taking into account its gender balance. The technical capabilities of the applicants for the developments to be done has to be clearly explained.
• **Resources.** Demonstrate the quality and effectiveness of the resources assigned in order to get the objectives/deliverables proposed.

The evaluators will score each award criterion on a scale from 0 to 5:

- 0 = Proposal fails to address the criterion or cannot be assessed due to missing or incomplete information
- 1 = Poor – criterion is inadequately addressed or there are serious inherent weaknesses
- 2 = Fair – proposal broadly addresses the criterion, but there are significant weaknesses
- 3 = Good – proposal addresses the criterion well, but a number of shortcomings are present
- 4 = Very good – proposal addresses the criterion very well, but a small number of shortcomings are present
- 5 = Excellent – proposal successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

Each evaluator will produce an Individual Evaluation Report. The threshold for individual criteria will be 3. The overall threshold, applying to the sum of the three individual scores, will be 10. The final score will be calculated as an average of the individual assessments provided by the Evaluators.

Ties will be solved using the following criteria. The criteria in order of priority are:

1. The highest score in the Excellence section.
2. Gender balance among the personnel responsible for carrying out the activities.
3. The highest score in the Implementation section.

All proposals obtaining a score above the threshold, will pass to the next phase.

In cases where there is significant divergence between the evaluators' scoring, experts will convene to establish a unified position on the evaluated proposals. If no consensus is reached, a third evaluator will be included to provide an extra evaluation.

Please note that we need time to process through all the proposals in this phase, so you probably won’t hear back for a while.

### 4.4 Consensus Meeting

The Selection Committee formed by National Technical University of Athens, Siemens, ATOS, Institut National de Recherche en Informatique et Automatique, GEIE ERCIM and Fundingbox Accelerator Sp Zoo will decide by consensus (minimum ⅔ of the votes) the 'List
of Finalists’ and the ‘Reserve List’. Two external evaluators will be invited to participate in the Consensus Meeting in an advisory capacity.

The discussion will be based on the ranking obtained as a result of the External Evaluation. Whilst normally the highest ranked proposals will be selected for funding, the Selection Committee might have fair reasons for objecting to a specific third party, like the alignment with NEPHELE’s goals and scope, the ability to achieve the highest impact possible, commercial competition, as well as the existence of significant ethical concerns or a potential conflict of interest. In this case, the choice may pass to the next-ranked proposal.⁷

The exact number of proposals approved will be decided based on the overall quality of the proposals.

4.5 What's next? Subgrant Agreement Preparation and Signature

Before you get started with the NEPHELE support programme, you need to sign the Subgrant Agreement with the NEPHELE Consortium.

Prior to signing the Agreement, you should provide documents regarding your formal status. The NEPHELE Consortium will verify them to prove your eligibility (for the details please check our Frequently Asked Questions document that is available on the open call website). Please do it within the deadlines that will be communicated to you. If you fail to deliver the requested documents on time, without clear and reasonable justification, we will exclude you from the further formal assessment and you will be replaced with the company from the Reserve List.

5. Our Support Programme and payment arrangements

Once your eligibility has been confirmed following the formal status check and the Subgrant Agreement signed, you will become an official beneficiary of the NEPHELE support programme, which will last up to 6 months. The programme consists of three stages, see Table 1 below.

⁷ Please note that this is not a closed list of reasons.
For the sake of simplicity and transparency, the Financial Support will be paid against specific deliverables/ upon achievement of certain milestones or KPIs (which will be included in the 'Individual Mentoring Plan' annexed to the SGA), and based on the results of Milestone Review.

As a beneficiary, you will receive a funding as follows:

<table>
<thead>
<tr>
<th>Stage No and Name</th>
<th>Stage duration</th>
<th>Deliverable</th>
<th>Delivery month</th>
<th>Lump sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1: Individual Mentoring Plan (IMP) and Inception</td>
<td>1 month</td>
<td>IMP and proof of concept (implementation plan)</td>
<td>End of Stage 1</td>
<td>Up to €9 000</td>
</tr>
<tr>
<td>Stage 2: Development</td>
<td>3 months</td>
<td>Prototype release</td>
<td>End of Stage 2</td>
<td>Up to €44 000</td>
</tr>
<tr>
<td>Stage 3: Release</td>
<td>2 months</td>
<td>MVP release</td>
<td>End of Stage 3</td>
<td>Up to €23 000</td>
</tr>
<tr>
<td>Total:</td>
<td>6 months</td>
<td>-</td>
<td>-</td>
<td>Up to €76 000</td>
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Table 1 Stages and payment schedule

Milestone review process

At the end of each stage, an exhaustive review process will be implemented consisting of the following evaluation criteria:

- Deliverables’ quality;
- Technical performance indicators;
- Deadline Compliance.

Each criterion will be scored by Technical Mentors from 0 to 10 and the weight of each of these criteria, in the final score, will be as follow:

- Deliverable quality (30%).
- Technical performance indicators (60%).
- Deadline Compliance (10%).

The threshold to receive payments and to pass on to the next stage is **7 points**:

- **Beneficiaries over threshold** will successfully receive the next payment and continue in the programme.
- **Beneficiaries under threshold** will be invited to leave the programme by their Technical Mentor. If this decision is ratified by the Selection Committee, then they will have to leave the programme and will not receive the payment.

The function of the Selection Committee is to review and validate each Technical Mentor's evaluation proposal, with a special focus on cases where beneficiaries have not met the threshold. The Committee will take into account all possible objective reasons for underperformance, such as external factors that may have influenced the beneficiaries' performance. The Selection Committee will then make the final decision and approve the payments.

**Payment schedule**

As a selected grantee, you will receive a fixed lump sum of up to €76 000. The lump sum funding is a simplified method of settling expenses in projects financed by Horizon Europe funds. As a grantee, you will not be required to present strictly defined accounting documents (e.g. invoices) to prove the costs incurred. However, you will need to demonstrate that the project implementation is in line with the set milestones (i.e. KPIs/Deliverables) see [FAQ, Section 4](#), which will be defined in the Individual Mentoring Plan at the beginning of the programme. We will carefully assess your progress and the quality of your work during the review process, not your accounting. The lump sum method does not exempt you from collecting documentation to confirm the costs under fiscal regulations.

For a more detailed payment schedule please check the [FAQ](#).

### 6. Contact us

**How can we help you?**

If you have any questions regarding the application process, please feel free to email us at nephelehelpdesk@fundingbox.com, or post your questions on the [Helpdesk Space](#). In case of any technical issues or problems, please include the following information in your message:

- Your username, telephone number and your email address;
- Details of the specific problem (error messages you encountered, bugs descriptions, i.e. if a dropdown list isn't working, etc.);
Complaints

If you believe that a mistake has been made after receiving the results of one of the evaluation phases (when foreseen), you may submit a complaint. To do so please email us your complaint in English at nephelehelpdesk@fundingbox.com and include the following information:

- Your contact details, including email address,
- The subject of the complaint,
- Information and evidence regarding the alleged breach.

You have 3 calendar days to submit your complaint, starting from the day after the communication was sent. We will review your complaint within seven calendar days of its receipt. If we need more time to assess your complaint, we will notify you by email of the extension. Please note that we will not review anonymous complaints or complaints with incomplete information.

Please be aware that the evaluation is conducted by experts in the relevant field, and we do not interfere with their assessment. Therefore, we will not evaluate complaints related to the results of the evaluation other than those related to the mistakes in the evaluation of the first eligibility criteria.

7. Last but not least - final provisions

Any matters not covered by this guide will be governed by Polish law and rules related to the Horizon Europe Programme and EU grants. Please take into account that we make our best effort to keep all provided data confidential. However, for the avoidance of doubt, you are solely responsible to indicate your confidential information as such.

Your IPR will remain your property.

For the selected grantees, the Subgrant agreement will include the set of obligations towards the European Commission (for example: promoting the project and giving visibility to the EU funding, maintaining confidentiality, understanding potential controls by the EC/ECA, EPPO and OLAF).
The NEPHELE Consortium might cancel the call at any time, change its provisions or extend it. In such a case we will inform all applicants about such change. Signature of the Subgrant agreement is an initial condition to establish any obligations among applicants and any Consortium partners (with respect to the obligation of confidentiality of the application).

Did not find what you were looking for? You may want to check our Frequently Asked Questions (available on the open call website).

8. Extra hints before you submit your proposal

A proposal takes time and effort and we know it. Here are some few crucial points you should read before submitting your proposal.

- Is your project in line with what NEPHELE is looking for? You are not sure? You can consult this section and this one.
- Did you present your project in a way that will convince evaluators? Not sure if you did? Go back to this section.
- Is your project fulfilling all eligibility requirements described in the guide? Check again this section.
- Are you sure you are able to cope with our process of the Subgrant agreement signature and payment arrangements for selected proposals? You may want to go over this section.
- Do you need extra help? Contact us

And as a bonus: You can read our R.E.C.I.P.E. for an outstanding European Funding Opportunity application for additional advice. Good luck!
Annex 1: Software repository and documentation

The software release of VOStack is made available at the URL: https://gitlab.eclipse.org/eclipse-research-labs/nephele-project. Details regarding the basic definitions of the VOs and cVOs and the architectural approach followed in VOStack are available at the URL: https://netmode.gitlab.io/vo-wot/index.html. It should be noted that in accordance with the VOStack specifications, we have made available two software implementations. Both implementations adhere to the same principles and core Application Programming Interfaces (APIs), however being aligned with specifications coming from different standardisation groups. These groups regard the W3C Web of Things (WoT) (https://www.w3.org/WoT/) and the Open Mobile Alliance (OMA) Lightweight M2M (LWM2M) (https://omaspecworks.org/what-is-oma-specworks/iot/lightweight-m2m-lwm2m/) specifications.

Specifically, for the implementation that is aligned with the W3C WoT:
- The software repository is available at the URL: https://gitlab.eclipse.org/eclipse-research-labs/nephele-project/vo-wot
- The documentation is available at the URL: https://netmode.gitlab.io/vo-wot/index.html#

For the implementation that is aligned with the OMA LWM2M:
- The software repository and the documentation is available at the URL: https://gitlab.eclipse.org/eclipse-research-labs/nephele-project/vo-lwm2m

In your application, you may select to work based on any of the two provided implementations.
Annex 2: Focus areas

Development of VOs and optionally cVOs along with a set of generic or device-specific functions based on VOStack.

In this focus area, we consider applications where a set of VOs and/or cVOs are developed for IoT devices that are applied in a specific industrial domain (e.g., energy, smart grid, water management, video streaming, robotics). The objective is to develop the appropriate VOs/cVOs to support the provision of the digital counterparts of these devices in accordance with the VOStack, as well as to provide a set of virtual functions that support business logic aspects for the management of the collected IoT data or the management of the IoT devices. Among others, the development of VOs to manage video streams and/or images is envisaged. Such virtual functions can be IoT-domain-specific (e.g., management and analysis of data related to energy consumption) or generic enough (e.g., time series data analysis functions applicable to a wide range of devices, complex event processing functions for management of conflicts by actions targeted to multiple IoT devices).

Development of Digital Twins based on the cVO concept.

In this focus area, we consider applications where a DT is developed to support analysis/simulation/emulation processes over the data collected by the considered IoT devices. The DT has to be developed based on the cVO concept that interacts with one or more VOs and provides advanced data management functionalities, considering context representation and context awareness aspects.

Development of VO network and/or security management mechanisms for the VOStack.

In this focus area, we consider applications where specific mechanisms are going to be developed for enhancing the security and/or network management mechanisms supported by VOStack. For the networking part, among others, mechanisms can be examined for dynamic routing in ad-hoc networks, time-sensitive networking (TSN) functionalities, as well as integration of VOStack with Software-Defined Networking (SDN) mechanisms. For the security part, we consider standardised mechanisms (e.g., EDHOC, ACE-OAuth framework) for the authentication, authorisation and protected communication among the VOs/cVOs and the IoT devices, and the secure exchange of data among the VOs based on the data made...
available in their data store. The development of security mechanisms should be in the Python programming language.

Development of semantic interoperability mechanisms (e.g., from W3C WoT to NGSI-LD, from W3C WoT to OMA LwM2M and vice-versa) for the VOStack.

In this focus area, we consider the development of mechanisms that can support semantic translation of IoT data represented based on different semantic models. Such models include - among others - the W3C WoT specifications, the NGSI-LD specifications, the OMA LWM2M specifications, and the oneM2M specifications. Furthermore, in this focus area, mechanisms that examine the interplay between VOs/cVOs and the IoT devices in terms of execution of Machine Learning (ML) processes and/or semantic data management are considered.
Annex 3: Project’s use cases

NEPHELE will launch four internal use cases in various vertical industries (logistics, smart buildings, emergency, healthcare) to validate, evaluate and demonstrate the innovative characteristics of the proposed architectural approach.

More info on these use cases is available on the project’s main website: https://nephele-project.eu/use-cases.