INVITATION TO TENDER

ECMWF/ITT/2024/363

Establishment of a
Framework Contract for Software Development Services

Volume II:

Specification of Requirements

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1. Background

1.1. Introduction

This Invitation to Tender (ITT) has been prepared by the European Centre for Medium-Range Weather Forecasts, (governed by its Convention and associated Protocol on Privileges and Immunities which came into force on 1 November 1975, and was amended on 6 June 2010) ("ECMWF") for the purposes of obtaining proposals from Tenderers for the provision of software development and related services.

1.2. Software Development Needs at ECMWF

ECMWF has long been at the forefront of global weather prediction and atmospheric research. Our journey began over four decades ago, marked by a commitment to harnessing cutting-edge computational techniques and models to advance the science of meteorology. Historically, the focus of our software development efforts has been on creating and maintaining robust, high-performance computing systems and software solutions tailored to the specialized needs of atmospheric and climate modelling. This in-house expertise has enabled us to make significant contributions to weather forecasting accuracy and climate change research.

In recent years, the landscape of software development at ECMWF has evolved dramatically. The increasing complexity of meteorological models, coupled with the surge in data volumes from new satellite systems and increase of model resolution, has necessitated a more diverse and agile approach to software development. Our current needs encompass not only the continuous refinement of forecasting models but also the integration of these models with a growing array of data sources and the development of novel post-processing pipelines to handle our high-throughput data streams. Additionally, the push towards novel weather prediction models, based on Machine Learning has brought to the fore the necessity for advancements in data analytics and integration with our software suite.

Looking towards the future, ECMWF is poised to embark on a new phase of innovation and expansion. The burgeoning field of environmental data science presents unprecedented opportunities for enhancing forecast accuracy and developing new services. To fully capitalize on these opportunities, we recognize the need to augment our in-house capabilities by subcontracting certain software developments to external companies.

The objective of this new procurement process is to foster a symbiotic relationship with the software industry, wherein external expertise complements and enhances the existing skills of our dedicated team. This strategic collaboration is expected to lead to a significant uptick in productivity and a reduction in the time-to-solution for new products and services. By leveraging external expertise, we aim to stay at the cutting edge of technological advancements, ensuring that ECMWF continues to provide world-class services in weather forecasting and climate analysis.

2. Scope of the ITT

2.1. Objective

This ITT is expected to result in the setting up of a framework contract with a number of suppliers across a number of service areas as specified in Section 3, with the ultimate purpose of securing the best value for money in the provision of software development and related services. The suppliers admitted onto the framework will be invited to compete for future purchases of services as per procedures described in Section 2.3. The initial framework will be for three years with the possibility of extension for a further two years.

The framework will be used for ECMWF's core activities run by various Sections within the Forecasts or Computing Departments at ECMWF, as well as for various other activities ECMWF undertakes, including the

projects funded by the European Union (EU), such as [Copernicus and Destination Earth](#)[1]. Future purchases undertaken for EU-funded projects shall be subject to additional requirements and conditions as detailed in Section 3.6, as well as to specific terms and conditions of contract as detailed in Section 3.7.2.

The framework awards (i.e. inclusion of suppliers onto the framework) are subject to approval by ECMWF's governing body, its Council, which meets in June 2024, so framework contracts with selected suppliers cannot be signed before mid-July 2024.

ECMWF may reopen the competition at a later date to add additional suppliers to the framework on the same conditions or to expand the service areas in accordance with ECMWF requirements.

In addition, this ITT intends to place orders for three specific projects (Lots) described in Annex 1, Annex 2 and Annex 3. The orders for these Lots will be placed with those suppliers who obtain the highest score in the evaluation of the respective Lot and which have also been selected for the framework. The contracts for these Lots are expected to be awarded in July-August 2024.

Suppliers may submit Tenders for inclusion onto the framework without bidding to supply any of the Lots.

2.2. Important aspects of this ITT

- Tenders are welcomed from suppliers based in any country. In particular, ECMWF seeks a strong representation of EU Member States, as well as of Copernicus participating states (in accordance with the conditions laid down in the EU's [Space Programme Regulation](#)[2]) and of Digital Europe Programme [Associated Countries](#)[3].
- Whilst Section 3 contains a list of service areas, Tenderers do not need to be able to deliver all of those areas in order to be considered for the framework.
- For future purchases all suppliers accepted under a specific service area of the framework will generally be invited to tender via a further competition for the respective work. Note that due to the nature of some of the ECMWF projects (see above), certain future purchases may be subject to specific administrative/legal conditions and/or restrictions (e.g. eligibility to receive funding). Such conditions shall be explicitly specified in the respective further competition documentation and the respective further competition shall be conducted among those suppliers which comply with, or are not affected by, such conditions.
- Suppliers on the framework which are invited to participate in a further competition for future purchases are not obliged to tender.
- Inclusion of a supplier in the framework does not automatically guarantee an award of work.
- Each future further competition will have its own evaluation criteria, although the main award criterion is likely to be based on highest-scoring response on a combination of factors, such as quality of resources deployed for the specific work, technical solution, including management and implementation approach, proposed and price. Prior performance on the previous contracts with ECMWF (e.g. timely delivery, successful acceptance etc.) will also be considered when awarding the contract resulting from a future further competition.

2.3. Future purchases process

During the lifetime of the framework arrangement ECMWF will make further purchases of services. Orders to be issued by ECMWF under the framework will vary in size, delivery time and complexity required.

For orders with an estimated total value exceeding £50,000 (or €57,000), ECMWF will generally carry out a further competition among selected suppliers on the framework. The suppliers under the relevant service

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[1] https://www.ecmwf.int/en/about/what-we-do/environmental-services-and-future-vision
[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2021.170.01.0069.01.ENG&toc=OJ%3AL%3A2021%3A170%3AFULL
[3] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/digital/guidance/list-3rd-country-participation_digital_en.pdf

area will be invited to respond to these further competitions, which shall follow a simplified Request for Quote or Request for Proposal format. Evaluation criteria for these further competitions will be advertised as part of the competition, along with any specific administrative/legal conditions and/or restrictions.

For orders with an estimated value up to £50,000 (or €57,000), ECMWF envisages to place direct orders among the selected suppliers on the framework in accordance with the requirements of the work and a supplier's suitability for the work assignment. In these cases, ECMWF will identify priority requirements for the work (delivery time, budget, complexity etc.) and will judge a supplier's suitability for the work based on some or all of the following:

- Supplier track record and experience;
- Specialist expertise;
- Price and value for money;
- Supplier capacity and past performance;
- Approach to project management;
- Time scales for delivery;
- Eligibility and acceptance of specific terms and conditions.

ECMWF may choose to run further competitions as well for orders with an estimated value up to £50,000 (or €57,000).

For any future purchase, ECMWF reserves the right to negotiate directly with one or more suppliers, depending on the particular requirements to be met. The most appropriate method for any future purchase will be selected to meet deadlines whilst still adhering to ECMWF's tendering requirements.

It is anticipated that the expenditure over the first three years of the framework will be of the order of €8M, which will be monitored and reviewed at regular intervals. There is no specific budget allocation to individual service areas. Note that whilst it is envisaged that all suppliers who have been accepted onto the framework as a result of this ITT will have the opportunity to quote for future purchases during the lifetime of this arrangement, there is no guarantee as to the volume of purchases to be offered.

2.4. Evaluation Method and Selection Criteria

For inclusion on the framework under a specific service area, Tenders will be evaluated based on the evaluation criteria and weights shown in the table below.

Evaluation criteria	Weight
Tenderer's Credentials - Financial standing and Legal organisation - Track record and references - Accreditations, certifications, quality assurance processes and management systems	25%
Quality of Proposal - Technical competence and expertise in relevant programming languages, frameworks, technologies etc. - Qualifications and experience of proposed resources - Innovation and problem-solving capabilities - Training and documentation	30%
Management and Organisation of Work - Approach to project management and project delivery methodologies - Support and maintenance services, software updates/upgrades, bug fixes etc. - Scalability, flexibility and resilience - Reporting and hand-over mechanisms	25%

Rates and Pricing Mechanism
   - Competitiveness of rates for proposed resources/profiles
   - Appropriateness of pricing mechanism proposed
   - Transparency and clarity in pricing
	20%

Table 1: Evaluation Criteria

Tenderers must achieve a mark of at least satisfactory (i.e. 60%) for each high level criterion to be invited onto the framework under a specific service area. Although the evaluation criteria have weightings to reflect their relative importance, these weightings do not alter the minimum score required for each criterion. Instead, they guide the comprehensive assessment of Tenders, ensuring that areas of greater importance have a correspondingly larger impact on the overall qualitative evaluation.

Assessment and scoring of the "Tenderer's Credentials" criterion will be based on the information provided by Tenderers in Volume IIIA.

Assessment and scoring of the "Quality of Proposal" and "Management and Organisation of Work" criteria will be based on the responses of Tenderers to the requirements described in Section 3 of this document and presented by Tenderers in Volume IIIB. Each response will be scored individually for each service area applied for.

For the evaluation of the price element of the "Rates and Pricing Mechanism" criterion, the rates quoted by Tenderers will be pooled according to categories/profiles specified in Volume IIIB and each pool of rates will be given a score relative to other Tenders and the current market conditions. This process will take place for each service area. The proposed pricing mechanisms and their transparency and clarity will be assessed and scored based on their suitability and appropriateness.

This evaluation process will select a number of suppliers for each service area with whom ECMWF will enter into contracts as part of the framework. The number of suppliers to be accepted under a service area will depend on the quality and suitability of responses, capacities of the suppliers and ECMWF needs in those service areas. Successful Tenderers may be included in one or more service areas. Acceptance into one service area does not necessarily imply acceptance to any other. ECMWF will inform each Tenderer for which service area(s) they have been accepted onto the framework.

Following notification of the result of your Tender you may request feedback on the evaluation from ECMWF.

The contracts for the Lots described in Annex 1, Annex 2 and Annex 3 will be awarded to the Tenderers which have passed the criteria for inclusion onto the framework and obtained the highest score in the evaluation of the respective Lot.

3. Specification of Requirements

3.1. General Requirements

ECMWF's software generally interacts with very large volumes of data and is used in a 24/7 production environment. To this end, the following aspects of any code development are essential:

- Maintainability
- Error reporting
- Performance and scalability
- Test coverage
- Documentation

There will also need to be a handover process to ensure that ECMWF has the knowledge to maintain any developments submitted.

3.2. Service Areas

ECMWF has identified a number of service areas where technical developments will be required, along with examples of specific jobs/works envisaged under each service area. These are described in Table 2 below. The descriptions are not exhaustive, and Tenderers do not need to be able to deliver all of the service areas listed in order to be considered for the framework. As part of their response, Tenderers should indicate in the tables in Volume IIIB, the service areas that they do have experience of delivering and are willing to be considered for.

Service Areas	Examples of specific jobs/works
Code development infrastructure This service area relates to the infrastructure that supports software development, ensures code quality and automates routine processes.	• GitHub, CI, CMake/build systems • software packaging and deployment • software testing • development of observability and usage metrics
Code refactoring This service area relates to changing an existing code base for purposes including improved maintainability and modernisation. Functionality would generally be unaltered.	• within one language or from one language to another • code reorganisation within or between code bases
Data handling and storage This service area relates to all software infrastructure and services handling and making available meteorological and other data throughout ECMWF's workflows. Geospatial, observational (and other) data are described using a domain-specific language, which is leveraged for data routing, indexing, storage, access and processing. This particularly includes a focus on the efficient use of heterogenous and novel underlying storage technologies, I/O optimisation and efficient access to data for Machine Learning.	• earth system model data • observation data • geospatial data • I/O optimization • semantic access to data
Data processing This services area relates to the implementation of new pre/post-processing applications, but also to the adaptation of existing pre/post-processing components from new technologies. The pre/post-processing software should aim for scalability, robustness and modularity, to be allowed to be used in different contexts, including operational workflows.	• pre/post-processing applications • data processing at scale • numerical analysis, e.g. linear algebra, optimisation for GPU • scientific library development • scientific data analysis
Frontend and interface development This services area relates to design, development, testing and deployment of user interface and frontend applications to our software and services. It includes to adopt modern development libraries and follow interoperability standards such as OGC for frontend to backend communication.	• e.g. Web front-end, e.g. REACT • OGC-style interfaces (interoperability) • interface testing

Database design and implementation
This service area relates to evaluation, design, implementation, optimisation, and development of
	• evaluation of database solutions based on:
	  ○ requirements (e.g. CAP, relational/non-relational, distribution)
	  ○ usage patterns (e.g. read/write load),

procedures for robust database deployment.	○ Performance • design of robust deployment, upgrade and backup processes • optimisation of database usage and deployment • improving observability of database deployments
Task workflows The service area relates to the design and the implementation of complex tasks workflows.	• design and implement computer task workflows • scalable workflows that consider software and hardware architectures
Training material and documentation This service area relates to both the creative and technical aspects of software documentation. It includes creating new material from scratch and working with existing material to make it more accessible, for instance by changing the format or hosting platform.	• creation of material for end users (training courses, examples, documentation) • conversion of existing material between formats/platforms (e.g. Confluence to Read The Docs)
AI/ML workflows and data management This service area relates to all the components dealing with ML workflows. This includes the development of workflows for ML, the data management of ML training datasets but also the optimisation of tasks on GPUs to directly process the ML outputs.	• development and optimisation of workflows / dataflows for ML • data management and handling for data set preparation for Learning process • GPU kernels and optimisation • GPU networking and distribution • management of trained models and training datasets (e.g. database/web portal) • development of interactive interfaces to the models and to the learning process
Service infrastructure This service area encompasses the tools, practices, and methodologies used to support the continuous delivery and availability of services deployed on various types of infrastructure.	• design of configuration management and continuous reconfiguration systems, as well as robust procedures for configuration upgrades. • design of continuous integration testing systems across a variety of infrastructures. • design of advanced resilience testing of distributed services, including network partition, server failures and high load scenarios. • design of monitoring and observability systems, including logging processes, dashboards and alert processes.
Software and service security This service area relates to the analysis of software and services to detect security vulnerabilities, and the strengthening of their security.	• penetration testing of services • code scanning for vulnerabilities (e.g. buffer overflows) • identification of unencrypted sensitive data in software and services • fixing or advising on identified issues

Table 2: Service Areas

3.3. Supplier Profile

3.3.1. General Credentials

Tenderers must provide information about their legal organisation as requested in Section 1 of Volume IIIA and other forms comprising this ITT. Tenderers should also attach a copy of their official Company

Registration Document showing the name of the Legal Entity, the registered office address and the registration number given to it by the national authorities. If the Tenderer is a subsidiary, they should provide complete and accurate information on their shareholding and full details of its parent organisations up to and including the ultimate parent organisation.

Tenderers must provide financial data on their organisation for the past three financial years as requested in Section 2 of Volume IIIA to enable ECMWF to evaluate their financial status. ECMWF may request documentary evidence at any stage of the process, e.g. latest audited financial statements (profit and loss account, balance sheet etc.). There is no minimum requirement for yearly turnover for being considered for the framework, however, if a Tenderer is accepted onto the framework, this information may be considered when framework holders are invited to respond to further competitions for future purchases.

As part of their response in Section 5 of Volume IIIA, Tenderers should list any industry-relevant accreditations and certifications they hold, demonstrating their commitment to quality and professional standards. This includes, but is not limited to, certifications related to quality management systems (e.g. ISO 9001), information security management systems (e.g. ISO/IEC 27001), and any other relevant standards. Tenderers should also describe their quality assurance processes and management systems in place to ensure the highest quality of deliverables. Details should be provided on how these systems are implemented and maintained, along with any external audits or reviews that are conducted to validate their effectiveness.

3.3.2. Track Record and References

Using the format presented in Section 4 of Volume IIIA, Tenderers should demonstrate their experience and record of actual performance or accomplishments in previous projects/contracts under each service area in Table 2 they wish to be considered for. This should include project/contract objectives, challenges faced, solutions implemented and outcomes achieved. These projects/contracts should have preferably been carried out in the last 5 years and should desirably demonstrate the involvement of the team which would be engaged on the ECMWF contract. A project/contract example can be used for more than one service area if it adequately demonstrates the required expertise and experience.

ECMWF may seek references from one or all of the customers or may request documentary evidence at any stage of the process. Tenderers should provide a contact name and contact details for each customer who can be consulted by ECMWF to verify the quality of the work undertaken by the Tenderer. Such consultations may take place at any time after receipt of Tenders.

3.4. Technical Capability and Resources

Tenderers should demonstrate extensive knowledge and proficiency in relevant programming languages, frameworks and technologies applicable to the various service areas they have experience/expertise with and wish to be considered for. This includes providing evidence of their capability to leverage such technologies in delivering cutting-edge software solutions.

For each service area they wish to be considered for, Tenderers shall describe the resources they plan to allocate or source, highlighting their relevant past experience, qualifications and certifications possessed. Tenderers should insert CVs for all key personnel they propose to use. Key personnel are individuals who contribute to the development or execution of work under a contract in a substantive, measurable way, i.e. their absence from the contract team would be expected to impact the approved scope of the contract. The format of the CV must be in accordance with the Commission Recommendation on a common European format for curriculum vitae, available at: http://europass.cedefop.europa.eu/en/documents/curriculum-vitae. The provision of the following information about the key personnel is not mandatory: home address, telephone number, email address or other contact details, gender, date of birth and nationality.

ECMWF will require the Tenderer to offer a dedicated account manager responsible for the contract and for any other related administrative matters in the implementation of the framework contract. Tenderers are requested to explain their approach to managing the overall framework contract, if selected, as well as

individual orders awarded as result of further competitions for future purchases and how this would be implemented.

Innovation and problem-solving capabilities will be evaluated based on the Tenderers' approach to devising creative solutions that enhance project value, efficiency, and effectiveness. Tenderers should provide examples from previous projects where their innovation and problem-solving capabilities were demonstrated, for example putting forward a superior technology or algorithm than what their clients had proposed, or providing a maintainable solution for an unexpected problem.

A strong emphasis will be placed on the Tenderers' commitment to providing comprehensive training and documentation for any technical solution developed such that ECMWF staff may take over its future development and maintenance, and, where appropriate, end users can find the information they need to make use of the developed software or service. ECMWF maintains technical documentation on Atlassian Confluence pages, while user-facing documentation would normally be published on Read The Docs. Depending on the number of ECMWF staff that will require training on the developed system and the depth of knowledge to be communicated, typical training formats could scale from a single video call with a presentation, to an in-person training session at an ECMWF office. Tenderers should describe their approach on how they handle these aspects when delivering projects.

3.5. Management and Organisation of Work

3.5.1. Working Methodology

Tenderers should describe their project management and delivery methodologies, explaining how these approaches will be applied to ensure the successful delivery of future projects/contracts. This description should include their strategies for risk management, scope control, timeline adherence, and resource allocation.

For each project, ECMWF may prescribe some details of the work modality. One that ECMWF has successfully used in recent years is an agile one, where work is split into well-specified Work Packages of typically 2 months each. A detailed description of Work Package 1 is provided upfront, together with a technical description of the general direction of work. Subsequent Work Packages are defined based on needs, upon successful delivery of work under the preceding Work Package. At the end of each Work Package, ECMWF evaluates the work and provides feedback to the contractor. This evaluation includes the decision on whether to continue or end the work and terminate the contract.

3.5.2. Support and Maintenance Services

Tenderers should describe the support and maintenance service they will provide as part of a project/contract, including their policies on software updates, upgrades, error reporting and bug fixing. Details on the availability (e.g., 24/7, business hours), response times, and escalation procedures should be included to demonstrate their commitment to ongoing support.

3.5.3. Scalability, Flexibility and Resilience

Tenderers should demonstrate their capability to scale resources and adjust project/contract scopes in response to evolving project/contract needs. This includes providing examples from previous projects where flexibility and scalability were successfully managed, reflecting their ability to adapt to changing requirements. Tenderers should also explain how they would provide resilience in the presence of changes to resources allocated to a project.

3.5.4. Reporting and Hand-over Mechanisms

Tenderers should detail their mechanisms for reporting project/contract progress, including the frequency and format of reports. This should encompass the level of detail provided, the tools used for reporting, and how these mechanisms facilitate transparent and effective communication between the contractor and

ECMWF throughout the project lifecycle. Typically, ECMWF would keep track of progress via a combination of regular meetings/calls and written summaries on internal Atlassian Confluence pages. For some projects, development-related discussion may be best had on either GitHub or JIRA tickets for traceability.

3.6. Special Requirements for EU-funded Projects

The following special requirements shall apply to all Tenderers which wish to be considered for future purchases undertaken for EU-funded projects as part of this framework contract. Such Tenderers are required to provide responses to questions included in Section 6 of Volume IIIA. Note that further competitions for future purchases undertaken for EU-funded projects may require suppliers to complete and submit additional information and/or documents, which shall be explicitly specified in the respective further competition documentation.

3.6.1. Eligibility Conditions

3.6.1.1. Eligibility Conditions applicable to Copernicus Programme

According to the Contribution Agreement between the European Union and ECMWF, participation in calls for tenders shall preferably be open to entities established in Member States of the European Union and to entities established in Copernicus participating states in accordance with the conditions laid down in the EU's Space Programme Regulation[4].

It is currently ECMWF's expectation that, in practice, entities established in other States may exceptionally be eligible and subject to specific scientific or other requirements (as specified in the tender documents) as well as express prior approval by an EU Procurement Board. This applies to both prime and sub-contractors. Accordingly, ECMWF is required to reserve the right to exclude ineligible persons or entities from tenders at any point in time. All Tenderers as well as their sub-contractors must meet all eligibility criteria throughout the whole duration of the procurement exercise as well as their prospective contracts.

Switzerland (CH) was eligible for the first phase of the Copernicus Programme between 2014 and 2020. This has changed. For the avoidance of doubt, please note that, at present, CH is neither an EU Member State nor is it participating in the EU Space Programme. Thus, CH is currently considered a non-contributing country for the second phase of the Copernicus Programme (2021-2027).

During 2021-2023 the United Kingdom (UK) was also considered a non-contributing country for the second phase of the Copernicus Programme. However, on 4 December 2023 the UK and the European Commission signed an agreement finalising the UK's association to the Copernicus Programme (as well as to Horizon Europe). For the avoidance of doubt, from 1 January 2024 the UK is therefore eligible to benefit from Copernicus services and products in the same way as other participating countries. UK entities will have the same rights as entities from EU or other associated countries to bid for Copernicus contracts, both as prime and sub-contractors.

The UK is committing to participate in Copernicus for the remainder of the current multi-annual financial framework (2021-2027).

3.6.1.2. Eligibility Conditions applicable to Destination Earth Initiative

According to the Contribution Agreement between the European Union and ECMWF, generally, entities, including contractors, mentioned in Article 18 of the EU's Regulation 2021/694[5] establishing the Digital Europe Programme shall be eligible for participation in procurement activities, including calls for tenders and contracts. In addition, if Article 18.4 of the said Regulation is applicable accordingly as per the Digital Europe work programme of a given Phase, only entities, including contractors, established in Member States of the

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[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2021.170.01.0069.01.ENG&toc=OJ%3AL%3A2021%3A170%3AFULL
[5] https://eur-lex.europa.eu/eli/reg/2021/694/oj

European Union and in Associated Countries (see link here[6]) shall be eligible for participation in procurement activities. For this ITT, Article 18.4 does not apply as outlined in the Digital Europe Work Programme 2023-2024 (Annex I to C(2023)8620 final – see link here[7]). This applies to both prime and sub-contractors. Accordingly, ECMWF is required to reserve the right to exclude ineligible persons or entities from tenders at any point in time. All Tenderers as well as their sub-contractors must meet all eligibility criteria throughout the whole duration of the procurement exercise as well as their prospective contracts.

3.6.2. Early Detection and Exclusion System (EDES) Database

The purpose of the EDES is the protection of the European Union's financial interests. In particular, the EDES ensures:

- the early detection of persons or entities, which pose a risk to the Union's financial interests;
- the exclusion of persons or entities from receiving Union's funds (Article 135(1) of the Financial Regulation);
- the imposition of a financial penalty on a recipient (Article 138 of the Financial Regulation);
- the publication, in the most severe cases, on the Commission's internet site of information related to the exclusion and where applicable the financial penalty, in order to reinforce their deterrent effect (Articles 140 of the Financial Regulation).

The ECMWF makes use of the EDES to verify whether individuals or organisations are suitable entities to receive funding from the EU.

The grounds for exclusion are listed under article 136(1) of the EU Financial Regulation. They include:

- bankruptcy and insolvency situations;
- non-payment of taxes or social security contributions;
- grave professional misconduct;
- fraud, corruption, participation in a criminal organisation etc.;
- serious breach of contract.

3.6.3. EU Restrictive Measures

Restrictive measures (sanctions) are the tool in the EU's common foreign and security policy (CFSP), through which the EU can intervene where necessary to prevent conflict or respond to emerging or current crises.

The obligation to ensure compliance with the EU restrictive measures applies:

- to the EU institutions and bodies and to all EU contracting partners;
- not only at the initial distribution of funds but also down to the level of final beneficiary.

ECMWF, as the entrusted entity for the implementation of the Copernicus Atmosphere Monitoring Service, of the Copernicus Climate Change Service and of the Destination Earth initiative, must ensure that there is no detection of a recommended Tenderer (and any partners thereof) or grant applicant, co-applicants, affiliated entities in the list of EU restrictive measures, before signing a contract. Likewise, grant beneficiaries and contractors must ensure that there is no detection of subcontractors, natural persons (including recipients of financial support to third parties), in the lists of EU restrictive measures. This requirement is specifically detailed in clause 2.1.4, and clauses 2.9.2.2 (ii) and 2.9.5 of the Framework Agreement for Copernicus Services and in clause 2.1.5, and clauses 2.9.2.2 (ii) and 2.9.5 of the Agreement for Destination Earth Services.

As a minimum, using the www.sanctionsmap.eu website, Tenderers must undertake the following checks for themselves, their subcontractors (if any), or any other third parties involved in delivering products, goods or

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[6] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/digital/guidance/list-3rd-country-participation_digital_en.pdf
[7] https://ec.europa.eu/newsroom/dae/redirection/document/100740

services to Copernicus or Destination Earth, as well as for the persons who have powers of representation, decision-making or control in all these organisations:

- Country check (country of registration of bidding organisation / holding company);
- Organisation / Holding company check (using search function);
- Individual check (using search function).

3.6.4. EU Conditionality Measures

Conditionality measures are additional protections for the EU budget when breaches of the rule of law principles affect or risk affecting EU financial interests introduced in 2021.

Conditionality measures may be put in place in the context of the general regime of conditionality for the protection of the EU budget established by Regulation (EU, Euratom) 2020/2092[8] of the European Parliament and of the Council of 16 December 2020 on a general regime of conditionality for the protection of the Union budget.

This conditionality regime allows the EU to take measures – for example suspension of payments, suspension of implementation, termination or prohibitions on entering into new legal commitments with concerned entities – to protect the EU budget.

ECMWF, as an entrusted entity for the implementation of the Copernicus Atmosphere Monitoring Service, of the Copernicus Climate Change Service and of the Destination Earth initiative, is required to ensure conditionality measures are duly applied vis-à-vis concerned entities.

Further requirements with respect to conditionality measures are detailed in Clauses 1.2, 2.1.2.1(vii), 2.1.5, 2.9.2.2 (ii), 2.9.5, 4.1.3 (xi), 5.3.1.1 (iv), 5.4.2.10, 5.5.2.1 (vi) and (xvi) of the Framework Agreement for Copernicus Services and in Clauses 1.2, 2.1.2.1 (vii), 2.1.6, 2.9.2.2 (ii), 2.9.5, 4.1.2 (xi), 5.4.1.1 (iv), 5.4.1.5, 5.5.2.10, 5.6.2.1(vi) and (xvi) of the Agreement for Destination Earth Services.

3.7. Other Requirements

3.7.1. Price

3.7.1.1. Rates

Using the format/tables provided in Volume IIIB, Tenderers should indicate their daily rate for the provision of services. Such rate shall be inclusive of all the charges, disbursements, fees and other ancillary costs, all direct and indirect taxes, duties, pension, medical or social security contributions which may be payable in relation to the provision of services, however exclusive of VAT. Should the rates be different for different service areas Tenderers wish to be considered for, they should indicate such in their response. Should the rates be different for different staff proposed, Tenderers should indicate such in their response.

The rates shall be firm and fixed and quoted either in Euro (€) or in Pound Sterling (£). For the purposes of comparison for this ITT or for any further competition for future purchases, rates and/or prices will be converted into a single currency at a conversion rate to be established as the average ECB exchange rate for the calendar month prior to the closing date of this ITT or of a further competition for future purchases.

These rates will be a cap on those that Tenderers will use to quote for specific projects (Lots) in the future, and so must include any applicable mark-up. The rates should be fixed minimum for the first year of the framework contract.

3.7.1.2. Pricing Mechanism

Tenderers should provide a comprehensive and transparent description of their pricing mechanism.

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[8] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.LI.2020.433.01.0001.01.ENG&toc=OJ:L:2020:433I:TOC

Tenderers should explain the mechanism that will be used to derive the prices when they are invited to quote for specific projects (Lots) in further competitions for future purchases, e.g. discount levels offered depending on the size, span or (reduced) complexity of a specific project, incentives or value-added services offered that could enhance their proposal's cost-effectiveness. This should also include a description of how they will ensure that future Lots are delivered within quoted prices and demonstrate the Tenderer's ability to meet project financial commitments. Tenderers should also specify the mark-up that they would apply to any goods and/or services that they would procure from a third party as part of a project (e.g. licences)

Tenderers should explain any conditions that could trigger adjustments of the rates over time after the initial year of the framework contract, including mechanisms for dealing with inflation, currency fluctuations or changes in market conditions.

Depending on the funding stream of specific projects (Lots), ECMWF may require suppliers to provide quotes in a specific currency (i.e. Euro (€) or Pound Sterling (£)), which may differ from a supplier's preferred currency. Respectively, for those Lots the Contractor's invoices shall be submitted in the specified currency and payments by ECMWF to the Contractor shall be made in the same specified currency. Such a requirement shall be explicitly specified in the Lot documentation issued at that time. Tenderers should confirm their willingness to accept any of the currencies when this is requested in a Lot, as well as should explain the currency conversion mechanism they will apply to ensure that ECMWF is still obtaining good value for money in cases when such currency differs from the supplier's preferred currency. The explanation should detail how currency fluctuations would be managed to mitigate financial risk and ensure fairness in pricing.

3.7.1.3. VAT Exemption

ECMWF is an international intergovernmental organisation exempted from VAT on substantial purchases within the scope of its official activities in its host countries (United Kingdom, Italy, Germany), its other Member States and certain Co-operating States. Consequently, ECMWF in such circumstances is not liable for VAT. Further information may be found in the "VAT Guidance Note for Suppliers" document published at the ECMWF Suppliers webpage[9].

3.7.2. Terms and Conditions of Contract

3.7.2.1. Framework Contract

The terms and conditions for the Framework Contracts to be signed with selected suppliers as a result of this ITT are provided as part of Volume IVA of the ITT documentation. As these are for a framework, all selected suppliers will be engaged on the same terms and conditions. Tenderers are requested to confirm their acceptance of the terms and conditions by checking the corresponding box in Section 7 of Volume IIIA.

Please note that as a result of ECMWF's immunity from jurisdiction, any contract, including any sub-contract and any ensuing contract between ECMWF and a third party (e.g. maintenance/support agreements), resulting from this ITT must contain an arbitration clause which is offered by ECMWF to all contracting parties. Tenderers are requested to explicitly confirm their willingness and ability to comply with this requirement and describe their approach in ensuring that such contracts comply with the above requirement. Further information may be found at https://www.ecmwf.int/en/about/suppliers in the documents under "ECMWF's status: Arbitration and VAT".

3.7.2.2. Agreements for Future Purchases

Depending on the budget source, agreements for future purchases will be subject to different arrangements, as follows:

- Requirements funded from ECMWF's core budget shall be subject to the terms and conditions of the existing (signed) Framework Contract. ECMWF shall issue a Purchase Order which shall constitute a

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[9] https://www.ecmwf.int/sites/default/files/medialibrary/2022-06/ECMWF_VAT_guidance_note_for_suppliers.pdf

supplement to the signed Framework Contract, along with ECMWF's Request for Proposal issued as part of the future purchase process and the accepted Proposal of the selected supplier.

- Requirements funded from Copernicus Programme or Destination Earth Initiative budgets shall be subject to the terms and conditions of contract applicable to the respective funding stream, i.e. the Framework Agreement for Copernicus Services (Volume IVB of the ITT documentation) or the Agreement for Destination Earth Services (Volume IVC of the ITT documentation). Such agreements shall be awarded to those framework suppliers which fully comply with the special provisions specified under Section 3.6 above and which have accepted the respective terms and conditions of contract. These terms and conditions are provided as part of Volume IV of the ITT documentation. Tenderers are requested to confirm their acceptance of the respective terms and conditions by checking the corresponding boxes in Section 7 of Volume IIIA.

Further competitions for future purchases shall explicitly specify the respective funding stream and hence the terms and conditions applicable to the resulting contract.

4. Format of the Tender response

4.1. Presentation and Order of the Tender

The Tender response shall be presented as separate documents, which are to be uploaded to the respective question on the eProcurement Portal, as follows:

- Completed Volume IIIA (Template for Tenderers – Administrative Information);
- Completed Volume IIIB (Template for Tenderers – Response to Specification of Requirements);
- Attachments and Annexes, as requested in the Volume III documents.

Note that for any information that has been provided as part of the Tender, but not specifically requested by ECMWF, then ECMWF shall, at its sole discretion, decide whether to utilise that further information within its evaluation process.

4.2. Volume IIIA

Volume IIIA (Template for Tenderers – Administrative Information), which can be found under the ITT Online Questionnaire, should be completed for the following information:

- Details about the Tenderer's organisation:
  Information on the legal, commercial or professional status of the Tenderer, as well as contact details of the person who can be contacted by ECMWF in relation to the Tender. The Tenderer should also attach a copy of the official Company Registration Document and provide complete and accurate information on the Tenderer's shareholding structure and, if applicable, full details of its parent organisations up to and including the ultimate parent organisation.

- Economic and Financial Capacity:
  Financial information on the Tenderer's organisation to enable ECMWF to evaluate their financial status.

- Staff Resources:
  General information about the Tenderer's staff resources.

- Experience and References:
  Information to demonstrate the Tenderer's experience and record of actual performance or accomplishments in previous projects/contracts under each service area they wish to be considered for.

- Additional Questions:

A set of questions which seek either information or confirmation from the Tenderer.

- Special Requirements for EU-funded Projects:
  A set of special requirements applicable to all Tenderers which wish to be considered for future purchases undertaken for EU-funded projects as part of this framework contract.

- Terms and Conditions:
  Tenderer's confirmation of acceptance of Framework Contract terms and conditions and of terms and conditions applicable to future purchases funded by the European Union.

4.3. Volume IIIB

Volume IIIB (Template for Tenderers – Response to Specification of Requirements), which can be found under the ITT Online Questionnaire, shall contain the Tenderer's response to the requirements specified in Volume II. The document lists the requirements and provides a structure for the Tenderer's response. This is the minimum information requested; Tenderers can provide any additional information or documents as necessary. Some of the requirements make reference to various sections in Volume II and do not provide the full description of the requirement; Tenderers are advised to formulate their response based on the description of the requirement provided in the respective section of Volume II and touch upon all the elements described or requested therein.

Annex 1 of Volume IIIB provides a generic structure for the Tenderer's response to the Lots tendered as part of this procurement exercise (cf. Annex 1, Annex 2 and Annex 3). As part of a response to a specific Lot, Tenderers may be required to complete and submit additional documents (forms, templates etc.). Such requirement shall be explicitly specified in the documentation for the respective Lot.

ECMWF seeks focused responses, rather than responses which include a significant amount of standard marketing material. If you wish to include marketing material in your proposal documentation set, it should be provided as discrete documents and limited to only marketing material which is directly relevant to the response and marked as "Marketing Material", however ECMWF may, at its sole discretion, not evaluate any such marketing material.

Annex 1   Lot 1 – Web Front End Work

For the work specified in this Annex, if you would be able and interested in supplying it, please provide your response using the format in Annex 1 of Volume IIIB.

Budget source: Core.

Background Information

ECMWF develops and offers an extensive set of internal and user facing web applications and services in the context of its core business. These services cover a wide range of functionality in all steps of ECMWF's business activity. Some examples of those services include web based access to its binary data, access to its graphical products, navigate the content of its data archive, edit and configure data dissemination requirements and a web based tool to run experimental versions of ECMWF's forecast model. Those web services and many others are widely used by ECMWF's staff, Member and Cooperating states, Commercial customers as well as wider community as part of their workflows.

A web application consists of 2 main components; a front end application which runs on the client's browser and a backend component which provides necessary data and metadata to the front end application through well-defined API end-points. Backend components of those services are developed, maintained and deployed by ECMWF web services team. The work defined in this document covers the front end component of the web applications.

Objective and Scope

ECMWF seeks consultancy to work on and support ECMWF staff with front end development, maintenance and deployment of its various web services and applications. Some of those services are already in production whilst others are in a development phase, and ECMWF would like to ensure that front end development, maintenance and modernisation of those services are continuously achieved and satisfy the requirements of its customers.

The work includes the development and maintenance of front end web applications in ECMWF's core business area, adopting industry best practices and standards. For seamless continuation of existing work and to keep the consistency of the current look and feel, ECMWF expects the following:

- Proficiency in Javascript's React library and typescript which existing services are based on,
- Maintenance of existing front end code which is based on Javascript React and typescript,
- Experience on containerisation specifically on Docker technology and good experience with NX build system
- Participation on requirement analysis, development, deployment of future front end developments
- Provide guidance and support to various other front end developments

Specific Tasks and Deliverables for Work Package 1

- Maintain and extend ECMWF's Data Services applications including dissemination requirements editor, data shopping chart (PRC),
- Maintain and extend ECMWF's graphical products applications (Opencharts)
- Coordinate and participate on IFSHub front end developments
- Maintain and extend ECMWF's applications' templates

Description of Future Work Packages

Future work packages would continue this work.

Modality of Work

ECMWF envisages the following modality of work:

- Work will be split into Work Packages, each lasting 3 months. A detailed description of Work Package 1 is provided above. Subsequent Work Packages will be defined based on needs, upon successful delivery of work (i.e. acceptance of Deliverables) under the preceding Work Package.
- Each Work Package period shall be broken into six periods of 2-weeks sprints. Prolonged holiday periods shall be accounted for when establishing the duration of each Work Package and/or sprints. Contractors may be required to report on the time/resource allocation at the end of each work package.
- ECMWF will provide staff to follow the work and provide feedback and advice if/when needed. At the end of each Work Package ECMWF will evaluate the work and provide feedback to the contractor. The evaluation will include the decision on whether to continue or end the work and terminate the contract.
- Once a subsequent Work Package is defined, the contractor shall submit a quote, including the expected number of working days for each resource type and applying the daily rates agreed in the contract. Work on any subsequent Work Package shall commence only upon ECMWF's acceptance of the respective quote
- ECMWF may require occasional physical visits to our offices in Reading or Bonn, as agreed at the start of each work package, however all communication including sprint planning can be facilitated entirely virtually.
- Over the course of the contract, ECMWF expects at least 75% time commitment from the contractor (i.e. 30 to 40 working days of work for each Work Package).

Evaluation method and criteria

Responses for this work will be evaluated based on the criteria and weights shown in the table below:

Evaluation criteria	Weight
Track Record	15%
Quality of Resources	25%
Technical Solution Proposed	25%
Management and Implementation	15%
Price	20%

Contract timeline

ECMWF intends to award a contract for a period of 12 months starting in July 2024, with a possibility of extension, up to a maximum of 3 further years. Depending on the evaluation of each Work Package, ECMWF reserves the right to end the work and terminate the contract.

Annex 2   Lot 2 – Enhance Portability of Verification Software

For the work specified in this Annex, if you would be able and interested in supplying it, please provide your response using the format in Annex 1 of Volume IIIB.

Budget source: Destination Earth.

Background Information

The Quaver forecast verification system currently runs on ECMWF's HPC infrastructure and several specialised database servers in Bologna. It is used to compute verification scores of the ECMWF medium-range forecasting system.

To be applied on Destination Earth workflows, Quaver requires increased flexibility and portability to lift its ties to the HPC infrastructure and other internal servers in the ECMWF data centre. As currently the only storage type for both (a) internal Quaver data and (b) input observations is a PostgreSQL database run on servers accessible only within ECMWF data centre, it was identified as one of the main components that require refactoring.

(1) The main internal data product of Quaver are scores, consisting of score value(s) accompanied with about 30 different metadata. These records are currently stored in several centralised PostgreSQL databases ("score databases") hosted by dedicated database servers (internal to the ECMWF data centre). Storage and retrieval of data records is made via a dedicated module in Quaver Python library. The used programming model is quite dated, based on psycopg2 package and will probably need to be rewritten from scratch. Quaver must retain its ability to communicate with the existing score databases, but the new data storage interface must allow for alternative storage types, either site-specific shared storages or even completely user-specific ones. Alternative storage systems which do not require centralised administration could be then employed by Quaver run on systems remote from Bologna data centre.

(2) Pre-processed observations are an essential input to Quaver calculations. Quaver gets observations from a dedicated storage system called STVL, which is accessible only within the Bologna data centre. STVL consists of a PostgreSQL database and Python API. STVL databases have completely different schemas from the score databases (see above), but they are hosted by the same server infrastructure, internal to Bologna data centre.

Objective and Scope

ECMWF seeks consultancy to propose new and alternative data storage solutions, as well as to create a new score database API in Quaver, to enhance portability of the system to external computing centres utilised by Destination Earth workflows. This should be achieved by addressing two main issues:

(1) enhance/enable portability of the Quaver internal storage (the score database) by
· proposing and demonstrating alternative types of data storage, either user-private or site-shared or cloud-based;
· developing a new Quaver data storage interface (Python) supporting both existing PostgreSQL-based storage and the new alternative storage types.

(2) enabling remote access to the STVL observation database by
· either proposing an alternative storage on remote sites which can be populated from the primary STVL database or proposing a new cloud storage for STVL data accessible from any site;
· adapting the existing STVL API (Python) to support new or alternative storage of STVL data.

In general, the process should be first to analyse and understand the current solutions, propose alternative storage solutions, demonstrate their suitability on a small data sample and those agreed on support by the API.

Any required actual data migrations to new storage are not objectives of this call and will be ultimately done by ECMWF.

Specific Tasks and Deliverables for Work Package 1

The first work package will focus on making the contractor familiarised with
- the workflow of a typical use of the Quaver system and its internal dataflow;
    - purpose of the internal database storage system, principles of use and use cases;
    - implementation and structure of the storage system, the score database.
    - the current Python code (ScoreDB) providing access of Quaver to the score database.
- STVL observation storage system, its components, data access paths and requirements.

The contractor will compile a brief analysis of both Quaver and STVL storage solutions and present and discuss it during sprint meetings. More iterations may be needed to achieve sufficient completeness of the analysis. It will then serve as a starting point for the next steps, proposing and implementing new solutions.

Specific Tasks and Deliverables for Work Package 2

The work will focus on proposing suitable alternative solutions and delivering proof-of-concept prototypes.
- For Quaver score database:
    - propose alternative storage solutions to existing score database which would allow Quaver to run outside the ECMWF data centre;
    - develop suitable prototype demonstrating suitability for Quaver dataflow;
    - propose strategy for merging data stored in different storage systems.
- For STVL:
    - propose new storage solution for STVL allowing Quaver and other applications running on remote systems to access the observation data;
    - develop a proof-of-concept model containing a small set of data.

Specific Tasks and Deliverables for Work Package 3

Based on approved solutions proposed in WP2 develop software tools and libraries supporting new storage solutions:
- develop a new Python interface supporting both the new proposed storage solution and the existing Quaver database;
- if applicable, develop support tools allowing score data migration between different score storage;
- adapt the existing software API to support new and current storage taking into account that different datasets could be ultimately stored in different storages.

Modality of Work

ECMWF envisages this work to be split into three work packages:

- Work will be split into Work Packages as described above, each lasting 2 months.
- Each Work Package period shall be broken into four periods of 2-weeks sprints. Prolonged holiday periods shall be accounted for when establishing the duration of each Work Package and/or sprints. Contractors may be required to report on the time/resource allocation at the end of each work package.

- ECMWF will provide staff to follow the work and provide feedback and advice if/when needed. At the end of each Work Package ECMWF will evaluate the work and provide feedback to the contractor.
- ECMWF may require occasional physical visits to our offices in Bonn, as agreed at the start of each work package, however all communication including sprint planning can be facilitated entirely virtually.
- Over the course of the contract, ECMWF expects at least 75% time commitment from the contractor (i.e. 30 to 40 working days of work for each Work Package).

Management and implementation plan

The Tenderer shall provide a detailed implementation plan of proposed activities for the duration of the contract. Deliverables should be consistent with the technical requirements specified hereabove.

The Tenderer is requested to include management and implementation activities within a dedicated work package (WP0). The number of milestones is not prescribed, but they should be designed as markers of demonstrable progress in capabilities development and/or quality of capability delivery to keep progress monitoring manageable.

Adjustments to the proposed implementation plan can be proposed by the successful Tenderer, depending on the needs for the evolution of the technical solution, changed user requirements, or other requirements, but must be agreed to by ECMWF.

As part of the general project management description the Tenderer shall consider the following elements (this is not an exhaustive list):

- Semestrial, annual and final reports shall be provided in accordance with the Volume V Agreement Clause 2.3 and Annex 5.
- A work plan is expected to be agreed at contract negotiation stage for solution delivery within the contracted end date.
- Monthly video-conferencing with ECMWF and a proposal for involvement of ECMWF in major project reviews shall be provided as part of the management plan. The tenderer is responsible for the organisation of such meetings, including provision of minutes.
- If relevant, a list of sub-contractors and details of their contribution, key technical personnel involved in the contract, legal names and addresses shall be provided. The tenderer shall describe how the Volume V Agreement, in particular Clause 2.9, has been communicated to all their sub-contractors.
- The Tenderer shall describe in the Proposal the management of personal data and how this meets the requirements of Clause 2.8 and Annex 6 of Volume V Agreement.

The table below provides the template to be used by the Tenderer to describe the complete list of deliverables, milestones and schedules for this work package. All milestones and deliverables shall be numbered as indicated. All document deliverables shall be periodically updated and versioned as described in the table. Tenderers shall provide preliminary versions of the completed tables as part of their bid.

WP0 Contractual Obligations Template			
#	Nature	Title	Due
D0.y.z-YYYY	Report	Semestrial Implementation Report (Jan-June 202X). This includes a specific Financial Report	15/07/202X
D0.y.z-YYYY	Report	Annual Implementation Report 2023 YYYY being the Year n-1 This includes a specific Financial Report	15/01/202x

D0.y.z	Report	Final Implementation Report	60 days after end of contract
D0.y.z-YYYY	Report	12 month Work Plan YYYY being the Year n+1	within 14 days of contract signature, and on 31st August each year thereafter
D0.y.z-YYYY	Other	Copy of prime contractor's general financial statements and audit report YYYY YYYY being the Year n-1	Annually (no-cost associated)

Evaluation method and criteria

Responses for this work will be evaluated based on the criteria and weights shown in the table below:

Evaluation criteria	Weight
Track Record	15%
Quality of Resources	25%
Technical Solution Proposed	25%
Management and Implementation	15%
Price	20%

Contract timeline

ECMWF intends to award a contract for a period of 6 months starting in September 2024. Depending on the evaluation of each Work Package, ECMWF reserves the right to end the work and terminate the contract.

Annex 3   Lot 3 – ecCharts Data Layer Abstraction

For the work specified in this Annex, if you would be able and interested in supplying it, please provide your response using the format in Annex 1 of Volume IIIB.

Budget source: Core.

Background Information

ECMWF provides various web applications to visualise and explore its data for users. This suite of applications is commonly called *Charts services*, and two of those applications are ecCharts and Opencharts. ecCharts is an interactive web application to explore and visualise ECMWF's data which allows users to interact with its data by offering overlay, zoom and pan functionalities as well as clicking on the maps to generate time-series diagrams. Another application called Opencharts also provides web access to ECMWF's graphical products for the general public and offers a limited interactivity. All products and maps offered as part of those applications are generated on demand requiring a system that can store and retrieve native meteorological fields.

ECMWF's Chart services mainly consist of two parts:
- A user-visible part, front end applications and the components behind it, which perform data retrievals and calculations, and then produce plots for our users
- A data layer, where ECMWF keeps a rolling archive of the data which is shown to the users.

The user-visible part of each Chart service already runs in ECMWF's internal Kubernetes infrastructure, and its porting and deployment to other Kubernetes-based installations is relatively straightforward.

The current Chart services data layer consists of all processes required to make data available to the Chart services. The data layer is common to both applications and is neither easy to deploy or operate in other data centres. Moreover, its implementation is too tightly integrated with the user-visible part of Charts applications and the platform it runs on. ECMWF's data dissemination system and operational suites continuously push data to the Chart services data layer. Once data is pushed to the data layer, they are processed to extract metadata and moved to their final destination. That processing can be handled by 2 components:
- The data index (metadata), currently implemented as a MongoDB database, which maps meteorological parameters to the HTTP locations of the byte streams containing their GRIB messages (GRIB is a WMO standard file format for storing meteorological data)
- The data itself, currently implemented as filesystems exposed as HTTP resources.

The data index contains metadata and the final destination of the data for a given meteorological parameter and could be queried by a set of processes to generate data availability (i.e. all available forecast time steps for a given parameter). It also contains the information to copy data from its location to a temporary working space located in the user-visible part for further processing including computation and plot generation.

There are additional processes running on the data layer for data integrity (activating availability of the data based on given schedule times) and housekeeping (removing data older than expected retention time).

Objective and Scope

ECMWF seeks consultancy to review, analyse and develop an abstraction layer to its Charts services' data layer. This abstraction to the data layer aims to decouple it from the user-visible part of the Charts applications as well as achieving to operate it independently from the platform it runs on. Once this

decoupling is achieved, ECMWF would like to be in a position to experiment with using different data storage and indexing technologies, as well as explore the options to have individual ecCharts instances running by pointing to various Data layers through well defined interfaces. This should be achieved by addressing the issues listed below:

- review and analyse the current state of the existing data layer,
- review and analyse the data layer interfaces to applications' user visible part,
- review and analyse the data layer interfaces to data pushers,
- develop a well-defined HTTP REST API to decouple the current tight integration to the user visible part and the platform it runs on,
- containerise the current system to be ready to be deployed to any platform.

The final development should enable ECMWF to have a working data layer that could:

- be easily deployed to any platform,
- allow us to explore different storage and indexing technologies by using the new interfaces,
- run independent ecCharts instances, pointing to their own particular data layer instances.

Specific Tasks and Deliverables for Work Package 1

The first work package will focus on making the contractor familiarised with the components of the current data layer. The work will focus on identifying the dependencies of the data layer to the user-visible part of the applications and existing infrastructure. This dependency analysis should identify the components that would need to be replaced with the proposed decoupling solution and should involve the analysis of all components of the data layer.

- Analyse and identify current interfaces to make new data available to the data layer (data push interfaces)
- Analyse and identify current interfaces to provide data to user-visible part of the Chart services (data retrieval interfaces)
- Analyse and propose alternatives to existing data storage and data indexing strategy
- Analyse and review all other existing processes that currently run on the data layer (data availability, data activation, data clean-up ...)

The contractor will compile an analysis of Charts services data layer and associated processes, present and discuss during sprint meetings. A dependency analysis will also be created to identify data layer interfaces that would require development work. More iterations may be needed to achieve sufficient completeness of the analysis and identification process.

Description of Future Work Packages

ECMWF envisages the subsequent work packages to proceed as follows:

- Work package 2 would be the design and development stage and heavily rely on the findings in Work Package 1. Expected outcome is to have a working HTTP REST API that could replace the tightly coupled interfaces of the Data layer to user-visible part and platform.
- Work package 3 would test the generality of the API developed in Work Package 2 by using it on top of a prototype alternative storage/indexing implementation. This work package would also develop the containerisation of the data layer for easy and flexible deployment.
- Work package 4 would be testing phase, deployment of the data layer to a platform specified by ECMWF and ready to accept and serve data through newly developed interfaces.

Modality of Work

ECMWF envisages the following modality of work:

- Work will be split into Work Packages, each lasting 2 months. A detailed description of Work Package 1 is provided above, with outlines of the subsequent Work Packages. Subsequent Work Packages will be more fully defined based on needs, upon successful delivery of work (i.e. acceptance of Deliverables) under the preceding Work Package.
- Each Work Package period shall be broken into four periods of 2-weeks sprints. Prolonged holiday periods shall be accounted for when establishing the duration of each Work Package and/or sprints. Contractors may be required to report on the time/resource allocation at the end of each work package.
- ECMWF will provide staff to follow the work and provide feedback and advice if/when needed. At the end of each Work Package ECMWF will evaluate the work and provide feedback to the contractor. The evaluation will include the decision on whether to continue or end the work and terminate the contract.
- Once a subsequent Work Package is defined, the contractor shall submit a quote, including the expected number of working days for each resource type and applying the daily rates agreed in the contract. Work on any subsequent Work Package shall commence only upon ECMWF's acceptance of the respective quote
- ECMWF may require occasional physical visits to our offices in Reading or Bonn, as agreed at the start of each work package, however all communication including sprint planning can be facilitated entirely virtually.
- Over the course of the contract, ECMWF expects at least 75% time commitment from the contractor (i.e. 30 to 40 working days of work for each Work Package).

Evaluation method and criteria

Responses for this work will be evaluated based on the criteria and weights shown in the table below:

Evaluation criteria	Weight
Track Record	15%
Quality of Resources	25%
Technical Solution Proposed	25%
Management and Implementation	15%
Price	20%

Contract timeline

ECMWF intends to award a contract for a period of 8 months starting in July 2024, with a possibility of extension, up to a maximum of 4 further months. Depending on the evaluation of each Work Package, ECMWF reserves the right to end the work and terminate the contract.