European Weather Cloud

Invitation to Pre-Qualify (ItPQ)

4th February 2021

V1.6

ECMWF

General Note Concerning This Presentation

- Please note the following:
  - This presentation is based exclusively on the text of the ItPQ as amended by **written** responses to clarification requests
  - Some slides have been hidden for brevity - this should not be taken to mean that their content (i.e. the corresponding section of the ItPQ) is of less importance
  - Where slides have been hidden as a group, a summary slide may have been inserted - again, this should not be taken to mean that the content is of less importance
  - In all cases of ambiguity, the ItPQ as amended by **written** responses to clarification requests shall be authoritative
  - **Please note that whilst attendees may raise questions using the chat facility during the presentation, these will generally be responded to through the portal over the next few days**

Chapter 1 - Instructions for Responder

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The Purpose of the ItPQ

- To state ECMWF's requirements for a Collaboratively Delivered and Operated Production Grade On-Premises OpenStack Cloud Environment

- To solicit responses from the widest possible range of potential suppliers who are able to meet those requirements

- To use those responses to draw up a shortlist of potential suppliers who will be invited to tender for the planned follow-up Invitation to Tender (ItT)

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Simplified Compliance Process

- **In recognition of:**
    - the scale of this requirement,
    - of the work involved in responding to it, and
    - the fact that such work will not be compensated,

- **ECMWF has simplified the compliance process for this stage only.**

- **Any subsequent ItT will be conducted under the normal ECMWF rules for such procedures.**

- **The simplified process to be used at this stage will be described further later in this presentation and is described in full in the ItPQ document.**

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Architecture & Design Guidance

- ECMWF is not looking for **detailed** architectures or designs at this stage,

- Though in some cases **high-level** architectures and designs are called for.

- There will be no commitment on the part of responders.

- Responses will, however, assist ECMWF in understanding the market and available solutions and in supporting its decision to tender and in what form for certain aspects of the European Weather Cloud.

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Introduction to the European Weather Cloud

- The European Weather Cloud will deliver data access and cloud-based processing capabilities for the European Meteorological Infrastructure (EMI) and its users.

- The EMI comprises ECMWF, EUMETSAT, and the National Meteorological Services of their respective Member States.

- As the EMI collects more detailed and frequent weather and climate observations and develops enhanced prediction capabilities and services, it is increasingly facing challenges to provide sufficient infrastructure to store, manage and process very large datasets.

- …. technological progress offers new possibilities to enable harmonised on-line access to data across large data centres that have been joined together by high-speed wide-area networks.

- Working on data in the cloud enables new types of capabilities, including running software close to the data, rather than downloading vast amounts of data locally and needing a local infrastructure to process it.

- ECMWF and EUMETSAT hold an ever-growing data store for meteorological applications and so they have started the pilot phase of the "European Weather Cloud" to make it easier to work on weather and climate big-data in a cloud-based infrastructure.

- The pilot phase also endeavours to develop the set of terms and conditions for operation and use of such an infrastructure, and for joining a federation of meteorological data centres.

- The aim is to maximise the value generated by Member State investments, rationalise the usage of data access infrastructure and related developments, and foster new forms of data-driven collaboration across the EMI and users of meteorological data.

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Chapter 2 - Background to this ItPQ

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Background to this ItPQ - 1

- There is a substantial archive of historical data that is used on a regular basis – this accounts for more than 300 PB of near-line and on-line storage held in the ECMWF data centre.

- Each day, raw data is acquired from many sensors worldwide, and production processed data is generated by the centres High-Performance Computers (HPCs), and this is disseminated to Member States and Partners as well as being added to the archive. Typically, this adds approximately ~35TB of new data each day.

- The data is subsequently applied to many different challenging areas of meteorology and climatology research requiring substantial compute resources and generating still more data that needs to be archived for future reference.

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Background to this ItPQ - 2

- Typically, public cloud offerings are best suited to application areas where the amount of data to be stored in the cloud is limited to terabytes and where the data can be cropped and/or taken off-line on an automated schedule to save money. Furthermore, they are best suited to situations where the data, once stored in the cloud, is processed in the cloud and the results that are shipped off-cloud are much smaller, saving on network egress costs.

- ECMWF does not have such a usage profile. It requires High-Performance Computers (HPCs) to fulfil its core mission, the HPCs generate substantial amounts of data on a daily basis, and that has to be stored and disseminated to downstream users with minimum cost and maximum efficiency.

- Accordingly, ECMWF has heavily favoured the use of **on-premises private OpenStack cloud technology** to date so as to maximise networking performance, minimise networking costs, and minimise long-term data storage costs.

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Background to this ItPQ - 3

- …., in turn, (this) presents challenges including such considerations as skillset acquisition, equipment procurement, capacity planning, service resilience and service security.

- Given the above context, and to recap from Section 1.1, the purpose of the ItPQ is:
  - To state ECMWF's requirements for a Collaboratively Delivered and Operated Production Grade On-Premises OpenStack Cloud Environment
  - To solicit responses from the widest possible range of potential suppliers who are able to meet those requirements
  - To use those responses to draw up a shortlist of potential suppliers who will be invited to tender for the planned follow-up Invitation to Tender (ItT)

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Chapter 3 - ECMWF Current Capabilities

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ECMWF's Current Cloud Capabilities - 1

- ECMWF hosts in its Reading Data Centre the following on-premises OpenStack cloud systems:
  - The Climate Data Store (CDS) / Atmospheric Data Store (ADS)
  - The WEkEO Data & Information Access Service (DIAS)
  - The pilot European Weather Cloud (pEWC)

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ECMWF's Current Cloud Capabilities - 2

- The Climate and Atmosphere Data Stores are European Union initiatives under the auspices of the Copernicus Programme. Development and operation of these services were awarded to ECMWF by the EU in 2015 and have been operational within the ECMWF Reading Data Centre since 2017. They are a highly-visible Internet-facing pair of services with some 30,000 registered users and growing. **Further details in the ItPQ document. Scale shown below.**

OpenStack - Type of Resource	Amount of Resource
Servers	104
Cores	5424
Memory	19,200 GB
NIC Speed	Multiples of bonded 25Gb
Ceph - Type of Resource	Amount of Resource
Hard Disk (usable)	7,007 TB
Solid-State Disk (usable)	480 TB
NIC Speed	Multiples of bonded 25 Gb

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ECMWF's Current Cloud Capabilities - 3

As part of the European Union's Copernicus Programme, ECMWF, together with EUMETSAT and Mercator Ocean International, have joined forces to implement a Data and Information Access Services (DIAS) Platform called WEkEO.

WEkEO is a distributed cloud-computing infrastructure used to process and make the data generated by the Copernicus Environmental Services (CMEMS, CAMS, C3S and CLMS) accessible to users.

WEkEO also provides privileged access to derived products from these services and to all satellite data from the Copernicus Sentinel satellites operated by EUMETSAT and ESA.

Further details in the ItPQ document.

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ECMWF's Current Cloud Capabilities - 4

The pilot European Weather Cloud is a joint initiative between ECMWF and EUMETSTAT sponsored by their respective Member States. The principal objectives of this initiative are to:

- deliver general-purpose compute resources (virtual machines, GPU-accelerated virtual machines, and orchestrated containers) as close *networking-wise* to the data archives as possible but accessible from anywhere on the Internet (for authorised evaluators only at this stage),

- act as a proof-of-concept on which use cases can be implemented and investigated and from which better decisions can be made about how to deliver a fit-for-purpose, value-for-money production-scale European Weather Cloud,

- act as a Morpheus test-bed for establishing ways of enhancing and simplifying the user experience when interacting with OpenStack, and

- inform decision-makers on the scale and complexity of the challenge of delivering such systems and thereby to assess how best to configure future manpower and other resources for operating such a production-scale system.

Further details in the ItPQ document. Scale shown below.

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ECMWF's Current Cloud Capabilities - 5

Example Use Cases:

- Forecast and climatology of cloud cover for Energy & Spatial sectors

- Comparison of forecast and scatterometer derived surface wind

- Assessment of bias correction schemes for assimilation of radiance data

- Forecast data post-processing & Web Services using OGC standards

- Forecast data preparation for local RMI dispersion model

- Host climate explorer web application

- Mesoscale convective System tracking

- Nowcasting Collaborative Platform

- Meteosat Collaborative Platform

- Forecast data processing

- Storm surge model

- European Summer of Weather Code

- Radar data portal

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ECMWF's Current Cloud Capabilities - 6

Pilot European Weather Cloud Scale

OpenStack - Type of Resource	Amount of Resource
Servers	44
Cores	2920
Memory	21,000 GB
GPUs (NVIDIA TESLA V100 VOLTA architecture).	On 5x2 compute servers
NIC Speed	Multiples of bonded 25Gb
Ceph – Type of Resource	Amount of Resource
OSD Servers	23
Hard Disk (raw)	668 TB
Solid-State Disk (raw)	251 TB
NIC Speed	Multiples of bonded 25 Gb

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ECMWF's Capability Goal

- **ECMWF now wishes to extend its capacity for delivering on-premises OpenStack cloud computing technology at high-scale, fully production-ready, and supportable 24x365. In addition, it wishes to ensure that all workflows starting from a cloud's specification (i.e. servers, storage and networking) and ending in a running cloud are as automated as possible.**

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Chapter 4 - Mandatory High-Level Req's

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Summary of MHLRs - 1

- **MHLR #1 - OpenStack API Compliant & On-Premises**

- **MHLR #2 - 3 9s Unplanned Downtime**

- **MHLR #3 - 3 9s Planned Downtime**

- **MHLR #4 - Two 9s Disaster Recovery**

- **MHLR #5 - Repeatably Deployable Automation**

- **MHLR #6 - Repeatably Deployable Offline**

- **MHLR #7 - Scalability**

- **MHLR #8 - Modern Networking**

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Summary of MHLRs - 2

- **MHLR #9 - Hardware Flavours**

- **MHLR #10 - Storage Flavours**

- **MHLR #11 - Software Defined Networking**

- **MHLR #12 - Data Centre Issues**

- **MHLR #13 - *Metal Management***

- **MHLR #14 - Logistics**

- **MHLR #15 - Support**

- **MHLR #16 - Regulatory & Compliance**

- **MHLR #17 - Segmentable & Ring Fenced**

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Summary of MHLRs - 3

- **MHLR #18 - High-Integrity Data Storage**

- **MHLR #19 - Resilient to Environment Failures**

- **MHLR #20 - Secure by Default**

- **MHLR #21 - Monitoring & Alerting**

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Chapter 5 - Technical Req's

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Summary of TRs - 1

- **TR #1 - O/S Distribution & Deployment**
  - TR #1a - Deployment with Triple-O
  - TR #1b - Deployment with Kolla-Ansible
  - TR #1c - Deployment with OpenStack-Ansible
  - TR #1d - Other Strong Candidates

- **TR #2 - Ceph Distribution & Deployment**

- **TR #3 - K8s Distribution & Deployment**

- **TR #4 - Containerisation using OpenShift (OPTION)**

- **TR #5 - Operations & Maintenance**

- **TR #6 - Training**

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Summary of TRs - 2

- **TR #7 - Documentation**

- **TR #8 - Testing, Failures, Fault Analysis …**

- **TR #9 - Resource Accounting & Charging**

- **TR #10 - Full Automation & DevOps**

- **TR #11 - Ring-Fencing**

- **TR #12 - Cloud Efficiency**

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Chapter 6 - Indicative Pricing

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Indicative Pricing

- Responders will (…..) be required to provide indicative pricing as called for under various sections of (the ItPQ) document.

- They will also be required to give an overall indicative price.

- They should be aware that price will carry a significant weight during any subsequent ItT evaluation

General Approach to Pricing

ECMWF wishes to gain a better understanding of the relative costs of the various options open to it. For example:

- Should equipment be leased or purchased?

- What balance of manpower between on-payroll, consultant and supplier services is most appropriate?

- What are the best logistics options consistent with maintaining a production quality service?

The exact scale of the production environment is not yet known and so unit pricing is an appropriate approach.

The distribution of work among on-payroll, consultant and supplier services is not known and responder's opinions are sought; accordingly, general indications of cost are appropriate.

The level of on-site spares is not known and responder's opinions are sought; accordingly, indicative levels of spares and their associated cost are appropriate.

The indicative pricing sought in this section will be used to:

- validate budget planning within ECMWF and its partners

- compare different market offerings

- compare different technical solutions

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Manpower Types, Amount & Pricing

Responders should indicate the consultant and/or supplier service manpower costs as follows:

- Levels of individual(s)

- Numbers of individual(s)

- Purpose of individual(s) services in the context of the requirements stated in sections 2, 3, 4 & 5

- Likely duration for which individual(s) services will be required as a percentage of full-time

- Level of round-the-clock or on-call cover required

- Urgency with which individual(s) services may need to be called upon

- Most appropriate contracting terms for individual(s)

In addition, any costs arising from the external management of such individual(s) should be indicated, together with the relevant reporting structure.

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Equipment Pricing - 1

ECMWF recognises that different responders may wish to take different approaches to the provision of physical equipment. In particular, it recognises that some may wish to propose a lease arrangement, whereas others may wish to propose outright purchase. Both approaches will be considered. That said, the basic approach to pricing must take account of the uncertain scale (at this time) of the requirement. Accordingly, ECMWF requires pricing to be based on units of resource including at minimum:

- Processing Capacity
    - To be expressed in € / core in such a way that it is clear what constitutes a core. For example, responders may wish to take a well know model of central processing unit (CPU) (either Intel or AMD) as an example and express their definition of cores in terms of such a processor.

- Memory Capacity
    - To be expressed in € / gigabyte. Responders may wish to mix memory of differing speeds and/or densities in which case each speed or density should be separately priced. Variations in performance and/or density are discourage unless there is a clear price differentiation to justify it.

- Hard Disk Drive Capacity
    - To be expressed in € / terabyte. Responders may wish to mix hard disks of differing speeds and/or densities in which case each speed or density should be separately priced. Variations in performance and/or density are discourage unless there is a clear price differentiation to justify it.

- Solid State Drive Capacity
    - To be expressed in € / gigabyte. Responders may wish to mix solid state drives of differing speeds and/or densities in which case each speed or density should be separately priced. Variations in speed and/or density are discouraged unless there is a clear price differentiation to justify it.
    - ***NB: Responders are also advised to keep a clear separation in speed and/or density between top-end Hard Disk Drives and bottom-end Solid State Drives.***

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Equipment Pricing - 2

- Graphics Capacity
  - To be expressed in € / VM-attached-GPU.
  - Examples of acceptable specifications include: NVIDIA A100 TENSOR CORE GPU and AMD Instinct™ MI100 Accelerator
  - Responders may wish to mix differing specifications of GPU and should individually price said mix. Excessive variations in specification are discouraged unless there is a clear price differentiation to justify it.

- Network Switches (Data & Out-of-Band)
  - At this stage, responders are encouraged to absorb the cost of said equipment into the first five pricing categories above.
  - At the eventual ItT stage ECMWF envisages allowing more flexible pricing of such equipment.

- Racks, switchgear and power distribution
  - At this stage, responders are encouraged to absorb the cost of said equipment into the first five pricing categories above.
  - At the eventual ItT stage ECMWF envisages allowing more flexible pricing of such equipment.

- On-line, On-Site and Supply Chain Spare Parts
  - Where it is appropriate to the operational model proposed in 4.3.14, responders are asked to price the recommended levels of spares to be held on-line, on-site and/or readily available within the supply chain. Responders should clearly price as a percentage of the first five pricing categories above.

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Software Pricing

- **Open Source**

ECMWF has a strong preference for constructing all of its cloud environments using open source software, preferably backed-up by an active support community. In all cases though, responders should indicate the licence under which the software is distributed. If possible, responders should estimate the manpower costs of using and supporting said software in an in-house production cloud environment.

- **Community Editions**

Where community editions of products are available for non-profit use, these should be preferred over enterprise editions carrying licensing fees.

- **Enterprise Editions**

Enterprise editions will be considered where there is functionality that is of demonstrable value that is not included in the community edition. In such cases, license fees shall be made clear in terms of licensing term, licensing volume and commercial support. Please note that ECMWF has an active Morpheus licence and may choose to continue this arrangement outside of this ItPQ and any subsequent ItT

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PROCUREMENT PROCESS

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ECMWF's approach to Procurement:

- Procurements are run under ECMWF internal procurement regulations.
  - ECMWF procurement regulations are similar to the most recent EU Procurement Directives, but they are not identical

- Procedures follow internationally accepted principles:
  - Transparency and equal treatment
  - Effective competition
  - Best value for money

- Dissemination of information about ECMWF procurement opportunities:
  - ECMWF publishes Prior Information Notices and Contract Notices in the Official Journal of the European Union (OJEU)
  - ECMWF's Suppliers webpage is regularly updated to list the procurement opportunities that are available.

- ECMWF aims to make its procurement opportunities as extensively open as possible, unless the nature of the contract or special circumstances justify an exception. The approach used is tailored to the requirements of the specific procurement exercise.

ECMWF's Processes & eProcurement Portal

- ECMWF uses a variety of means for running its procurements:
  – eProcurement Portal https://procontract.due-north.com or https://procurement.ecmwf.int
  – Publication on Website https://www.ecmwf.int/en/about/suppliers
  – Email to nominated suppliers (response via email)

- No hard copy or postal processes.

- For the eProcurement Portal, guidance for suppliers is available at https://supplierhelp.due-north.com – includes video tutorials describing the key functionalities of the Portal

- ECMWF has also developed a document, providing step-by-step guidance about how to navigate the eProcurement Portal which can be found at the following link:

  https://www.ecmwf.int/en/about/suppliers

ECMWF's Processes & eProcurement Portal

- In order to respond to a procurement opportunity in the portal, suppliers need to:

  - Register on the Portal (the registration process is free and is managed by the Portal provider)

  - Express an interest in an opportunity through the portal (not binding, required to access the opportunity)

  - Start/edit their response

  - Prepare their response by completing and submitting the online questionnaire, where all documents and templates are attached to relevant questions.

  - Portal also provides an option for the suppliers to register an "intent" to respond for an opportunity. Whilst registering an intent is not binding, ECMWF encourages suppliers to inform of their intentions via this option.

  - Once response is completed, suppliers should click "Submit response" button and the status of the response should read "Submitted". Suppliers are advised not to leave their submissions to the to the last minute.

Procurement – European Weather Cloud

- ECMWF launched an open procurement procedure for this exercise:
  - [Prior information notice in OJEU](#) published, along with the publication on ECMWF [web page](#) and [eprocurement portal](#).

- This procurement will be carried out in two stages:
  - Invitation to Prequalify (ItPQ) - Open (current stage)
  - Invitation to tender (ITT) - Restricted to shortlisted suppliers

- **Timetable**
  - Deadline to respond to this ItPQ: 26th February 2021, 15:00 (UK Local Time)
  - Evaluation: April/May 2021
  - ITT issued for shortlisted suppliers: Quarter 2, 2021
  - Negotiation with preferred bidder(s):   Quarter 3, 2021
  - Award of contract by: Quarter 4, 2021

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Evaluation Method & Selection Criteria

- **Track** Record: **20%**

- **Quality of** Response: **80%**

  – Completeness of the response

  – Compliance with mandatory requirements

  – Added value in terms of information/solutions provided

  – Understanding of, and ability to deliver, ECMWF's requirements

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Points to note

- ECMWF is looking to enter into a contract with a single legal entity although elements of the service/offer may be subcontracted.

- All correspondence is conducted via the messaging board of the opportunity on e-Procurement Portal.

- ECMWF has been issuing clarifications on the portal in response to the questions received. We have issued two clarifications until now on 13 and 28 January 2021.

- Suppliers can continue to submit their questions via the portal, but these must be received by ECMWF latest by **15th February 2021, 17:00 hours UK time**.

- During the evaluation period, ECMWF may seek to communicate with suppliers to clarify and expand on their responses.

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The End

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