

Technical Specifications (In-Cash Procurement)

**Data archiving and Data Handling system framework
contract to support FP related plant ommissioning
activities**

FWC to be placed for data handling and data archiving system

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1 Scope

The Controls Division (CD) of the ITER Organization (IO) provides and manages Data Archiving and data access and its utilities of the ITER data. The objective of this Call for Tender is to select qualified companies/consortia with extensive experience in the required fields of work, proven records of accomplishment in the implementation, exploitation and maintenance of Data Archiving, Data access and its utilities. Two framework contracts may be awarded following the scope split in two lots:

- Lot 1 : development and maintenance of the data access layer and the data archiving system
- Lot 2: development of graphical utilities to view and interact with the data

Candidates are free to apply for one or for both lots. The Framework Contract(s) will be running during the commissioning phases of various plant systems for the period 2021-2026. It is thus essential that the awarded companies(s) are able to work in agile mode. The Framework Contract(s) will consist of two lots and will be implemented by the means of Task Orders relative to a lot in order to execute the specific services.

2 Contract Basis and Execution

The Data handling and data archiving system services will be procured via Framework Contract(s). Following contract(s) award, Task Orders will be issued for the implementation of the applications. All Task Orders to be executed under the contract(s) are on a deliverable basis. The ITER Organization will award the Framework Contract(s) for a total period of 5 years. This period will be split in a firm period of 4 years and an optional period of one year. It is envisaged that the first Task Order will commence in May 2021. The option for each contract may or may not be released at the IO's sole discretion.

3 Tentative Schedule of this Call for Tender

The indicative Call for Tender milestones are:

Call for Nomination	June 2020
Pre-Qualification launch	August 2020
Call for Tender launch	November 2020
Award of the Contract	February 2021
First Task Order	May 2021

4 Context

CODAC as shown in Figure 4-1 is responsible for controlling and acquiring data from the roughly 200 plant systems. The plant systems will be gradually integrated during the commissioning phase. The main networks of interest in this contract are the archiving of data coming from DAN (Data Archiving Network) and SDN (Synchronous Data Network).

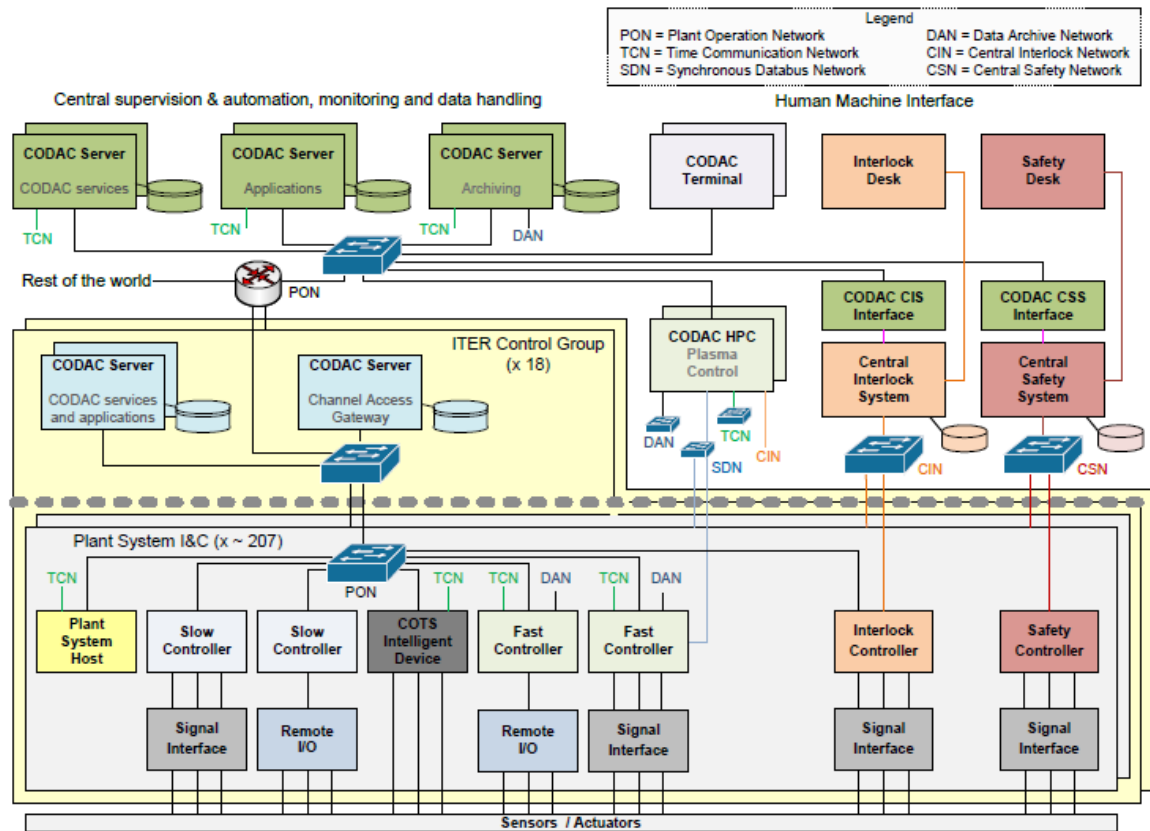


Figure 4-1. Physical architecture of CODAC

Figure 4-2 gives an outline of the current architecture of the data archiving and data handling system. Data transmitting over PON (Plant Operating Network), SDN and DAN are archived in HDF5 files. UDA (Unified Data Access) allows accessing the data transparently irrespective of the network origin. It is a modular architecture based on plugins. The UDA client exists in C/C++/Python/Java and Matlab.

Technical Summary

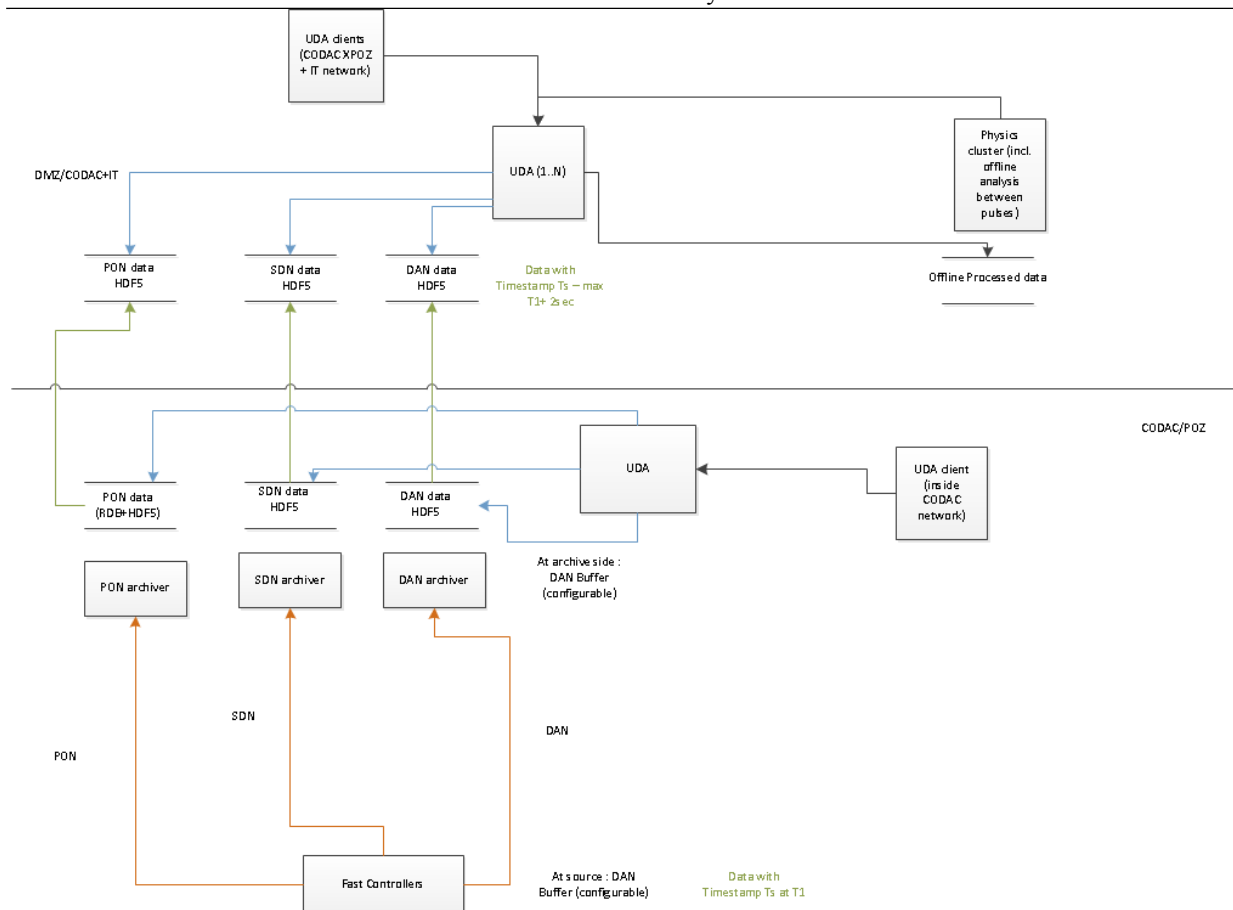


Figure 4-2. Current architecture of the data access and data archiving system

5 Scope of work

In this section, we describe the expected work for the two lots.

5.1 Lot 1 Maintenance and extension of the data access layer and data archiving system

The scope of the contract requested for lot 1 covers the software maintenance of the data archiving and data access system. This includes:

- **Preventive maintenance**
- Identify unknown defects and fix those selected.
- **Corrective maintenance**
- Diagnose an issue, resolve it and verify the resolution.
- **Perfective maintenance**
- Specify, implement and test/verify improvements.
- **Adaptive maintenance**
- Adapt code to changes in dependency software, e.g. operating system.

QA and the improvement of testability will be an important aspect across all parts of this work, focusing on the improvement of scripted/automated software testing (unit tests as well as integrated testing).

The software modules to be maintained in this contract are as follows:

- **DAN module running on the fast controller:** it is a C library highly critical responsible for evacuating the data to the archiving system. Performance, Backward compatibility and high reliability are one of the keys of this library

- **DAN archiver system:** C/C++ application responsible to archive the data coming from the DAN network. Expected data rate are up to 2GB/sec for first Plasma. It writes HDF5 files.
- **SDN archiver system :** C/C++ application responsible to archive the data coming from the SDN network. Expected data rate are up to 10KHz for first Plasma. It writes HDF5 files.
- **UDA ecosystem:** various modules in C/C++ which allows transparent data access of DAN, SDN and PON (Plant Operation network) data. The large volume of data (around one PB expected until First Plasma and decent performance to retrieve data are the main challenges. Improvement of the metadata to ease the search is a key aspect. It also includes changes on the UDA core level to cope with performance issues if any and support users' request if needed.
- **Streamers (PON and SDN):** C++ code, which streams data from EPICS and SDN to a unidirectional protocol mainly to serve real-time viewer and web application.
- **Miscellaneous :** punctual contributions to integrate products to UDA ecosystem such as PVA archiver.

It is also expected extension (new development) of the modules quoted above to cover diagnostics needs.

5.2 Lot 2: utilities and data visualisation development

The scope of the contract requested for lot 2 covers the development of GUIs (Graphical User Interface) to allow browsing large dataset and seamless interaction. As the operation and scientists' team are the main stakeholders, it is essential to have a very good quality code and code coverage. The development shall be modular and based on a customized plotting library to allow scientists to develop his/her own GUI and to allow the GUI to be used with any tokamak data.

Utilities may need to be developed

- To help the end-users in analysing the data.
- As part of data curation process
- Fixing the data (new version): (e.g. issue with time synchronization, which requires recreating some archive files).

6 Specific requirements and conditions

- Strong Experience in C/C++ for lot 1
- Good Experience in C/C++ for lot 2
- Strong Experience in object modelling for lot 1 and lot 2
- Strong Experience with HDF5 for lot 1
- Experience with HDF5 for lot 2
- Strong experience in Python for lot 2
- Good experience in Python for lot 1
- Linux operating system usage, including tools for diagnosing and resolving abnormal behaviour in user code as well as in the system processes and in system configuration (lot 1 and lot 2). Experience with eBPF is a plus.
- Experience with agile development (lot 1 and lot 2)
- Usage of XML technologies in software development (lot 1 and lot 2)
- Software quality control: development and maintenance of scripted/automated test procedures, execution of test procedures, review and production of technical documentation for software products, code reviews; (lot 1 and lot 2)

7 Quality Assurance Requirements

The organization conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.

The general requirements are addressed in ITER Procurement Quality Requirements (ITER_D_22MFG4).

Prior to commencement of the contract, a Quality Plan (QP) should be submitted for IO approval in accordance with Procurement Requirements for Producing a Quality Plan (ITER_D_22MFMW). The QP should describe the organization for the contract; the skill of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities.

All requirements of this Technical Specification and subsequent changes proposed by the Contractor during the execution of the Contract are subject to the Deviation Request process described in Procedure for the management of Deviation Request (ITER_D_2LZJHB). When a non-conformance is identified, the contractor are subject to the Non-conformance Report process describe in Procedure for management of Nonconformities (ITER_D_22F53X).

Documentation developed as the result of the contract should be retained by the performer for a minimum of 5 years and then may be discarded at the direction of the IO. The use of computer software to perform a safety basis task activity such as analysis and/or modelling, etc shall be reviewed and approved by the IO prior to its use, it should fulfil IO document on Working Instruction for the Qualification of ITER safety codes (ITER_D_258LKL).

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8 Safety requirements

ITER is a Nuclear Facility identified in France by the number-INB-174 (“Installation Nucléaire de Base”).

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case, the Suppliers and Subcontractors must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision and surveillance done by the Nuclear Operator.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the contractor shall ensure that a specific management system is implemented for his own activities and for the activities done by any Supplier and Subcontractor following the requirements of the Order 7th February 2012.

9 Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium). All legal persons including all consortium members should be established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be a permanent, legally established grouping or a grouping, which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization. The consortium cannot be modified later without the approval of the ITER Organization.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Bidders' (individual or consortium) must comply with the selection criteria. IO reserves the right to disregard duplicated references and may exclude such legal entities from the tender procedure.

In the event of a consortium, a draft of the Consortium Agreement, or letter of intent and Power of Attorney signed by all the consortium members shall be submitted together with the tender.

On 31 January 2020, the UK left the EU and Euratom with a transition period from 1st February to 31 December 2020 to be used to determine the conditions of their future relationship. Euratom is the ITER Member and the withdrawal of the UK from Euratom leads to the fact that UK is not anymore party to the ITER project.

Until the 31 December 2020, current end date of the transition period, UK entities retain the right to participate in IO procurement procedures.

After the end of the transition period, when the EURATOM Treaty ceases to apply to and in the UK, any UK entities bidding as a prime contractor or consortium partner will be rejected from the IO procurement procedures. UK entities will no longer be recognised as entities of an ITER Member and will no longer have the right to participate in IO procurement procedures, unless the UK has entered into an agreement with EURATOM. Where UK entities can demonstrate a unique and specific competence in a certain field the IO, with approval of the ITER Council, may also allow them to participate in a procurement procedure.

10 Reference

Further information on the ITER Organization procurement can be found at:

<http://www.iter.org/org/team/adm/proc>