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Contract

UDA performance and scalability assessment

Technical Specifcation for the assessment of UDA performance and scalability

Approval Process			
	Name	*Action*	*Affiliation*
Author	**Abadie L.**	**06 Feb 2018:signed**	**IO/DG/COO/SCOD/CSD/CDC**
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Reviewers	**Park M.**	**07 Feb 2018:recommended**	**IO/DG/COO/SCOD/CSD/CDC**
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Document Security: Internal Use *RO: Wallander Anders*			
Read Access	**LG: PDR review panel, LG: CODAC team, AD: ITER, AD: IO_Director-General, AD: EMAB, AD: OBS - CODAC Section (CDC), AD: OBS - Plant Control and Instrumentation Section (PCI), AD: Auditors, AD: ITER Management Assessor, project administrator, RO**		

Change Log			
UDA performance and scalability assessment (VPZPWE)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v1.0	Signed	15 Jan 2018	
v1.1	Signed	29 Jan 2018	add a new task to cover the MongoDB plugin development
v1.2	Signed	30 Jan 2018	wrong file was uploaded
v1.3	Approved	06 Feb 2018	change due date in deliverables

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1 PURPOSE

This document is the technical specification for a call for expertise (CFE) to assess the ITER UDA system on an existing tokamak.

2 SCOPE

The aim of this CFE is to assess UDA system on an existing tokamak. It aims at investigating the coverage, scalability and performance of UDA system. The main objective is to quantify the performance of UDA system and assess its completeness on "existing tokamaks" respective to the ITER needs. It also verifies the scalability of UDA systems. This task will be split into 3 sub-tasks as mentioned below:

- Sub-task 1: Develop a MongoDB plugin for indexing data
- Sub-task 2: Performance of UDA system from local and remote site with an incrementing number of clients. Verify that there is no data loss.
- Sub-task 3: Scalability tests by identifying any loading limits, bottlenecks and breaking points. Determine Scalability of the Indexer with many files and variables.

Note that ITER will not provide any hardware to execute the tests. It will be the responsibility to the company to provide necessary hardware infrastructure, configuration and monitoring.

3 DEFINITIONS

The following acronyms are used in this document

API	Application Programmable Interface
CODAC	Control, Data Access and Communications
N/A	Not Applicable
PON	Plant Operation Network
DAN	Data Archiving Network
SDN	Synchronous Data Network

4 REFERENCES

[RD1] UDA User Manual

[RD2] CODAC DDD (3ZHL96)

[RD3] HDF5

[RD4] SEQA-45 Software Engineering and Quality Assurance for CODAC

[RD5] CODAC Core System Tests (3ZHL96)

[RD6] CODAC C/C++ SDSD (A2FRVX v2.0)

This call for expertise is scheduled to be launched April 2018. T0 is the starting date. The total duration of this call for expertise shall not be longer **9** (nine) months from its formal signature date by both parties.

5 WORK DESCRIPTION

Overall IO Technical Responsible Officer: Lana Abadie

5.1 Introduction

ITER CODAC is the integrated control, data access and communication system for the ITER facility. One of the tasks of CODAC is to archive all data produced by the ITER Plants and to allow local and remote data access from the archiving system [RD1].
In its lifetime ITER will create large amount of data. These data include raw data, processed data and metadata. This data will be accessed from multiple clients concurrently located both at ITER and outside ITER.
In this technical specification, We will focus on the data access part.

5.2 Sub-Task 1 Develop a MongoDB for indexing and pulse data

Liaison and Resource Tracking Officer
IO-RO: Lana Abadie
Description
Develop a MongoDB plugin

- Get familiar with CCS and uda code (mainly m-uda-index-lib,m-uda-indexer,m-pulse-lib, m-uda-index -db)
- Propose a model for MongoDB
- Database schema creation
- Develop of mongodb C++ plugins for following sources (m-uda-index-lib,m-uda-indexer,m-pulse-lib)
- Documentation and bug fixes
- Source and documentation in SVN and IDM
- Test (basic unit test)

- The hardware will have to be set-up in advance for all the sub-tasks:
  - Latest CCS version installed
  - Access to source code and SVN

This task shall be performed using CCS v6.0.

Inputs to be provided by IO:

1. Support for using CCS (incl. UDA installation and configuration)
2. HDF5 files can be provided as long as there are possibilities to share them.
3. Background information

Milestones and deliverables from the Contractor

Deliverables	Description	Milestone
D1.1	- Successful installation of CCS6 - Full understanding of indexer, index-lib and pulse-lib - Final version of the code in SVN (indexer, index-lib, index-db and pulse-lib) - All source codes to port to MongoDB committed in SVN - Documentation about the MongoDB model	Start : T0 Duration : 2 months

	- Unit tests	

5.3 Sub-Task 2 Performance of UDA system

Liaison and Resource Tracking Officer
IO-RO: Lana Abadie
Description

- Check that data access performance according to the following criteria:
  - Data access of DAN [RD2], SDN [RD2] and PON [RD2] data over different period ti me. For DAN and SDN, shot will vary from 1mn to 1hour. Regarding PON data (cont inuous data), it will be from 5mn to 1 year of data. Retrieval of decimated data (main ly for plotting) and the full data (for some analysis) will need to be performed
  - Number of simultaneous clients will be from 1 to 10.
  - Location of clients will be local and remote
  - Assess the performance results with existing solution in Tokamak (usually MDS+)
  - Compare PostgreSQL vs MongoDB implementation
- The hardware will have to be set-up in advance for all the sub-tasks:
  - 1 UDA server
  - 1 UDA indexer database (PostgreSQL and MongoDB)
  - 1 UDA caching server
  - Archiving repository (min. 50TB), split into 2 parts (local storage directly attached to UDA server and use of shared filesystem like GPFS)
  - Many UDA clients (from 1…10) – (Windows, Linux and eventually MAC), preferably Python client to be used. If Windows Matlab is available, it can also be used.
  - Existing data from tokamaks (to allow comparison)

This task shall be performed using CCS v6.0.

Inputs to be provided by IO:

1. Support for using CCS (incl. UDA installation and configuration)
2. HDF5 [RD3] files can be provided as long as there are possibilities to share them.
3. To be discussed, conversion of local data archived can be also provided by ITER is there is a simple API. This solution will allow a better comparison of data in terms of completeness and performance assessment.
4. Background information

Milestones and deliverables from the Contractor

Deliverables	Description	Milestone
D2.1	- Successful hardware set-up for all the sub-t asks - A first draft evaluation report describing the result of the performance tests (in terms of n	Start : T0+2months Duration : **3**months

	umber of client, size of data to be retrieved and location of the client) - All source codes required to make the repor t have to be included in SVN	
D2.2	- Final version of the report which include comments and feedback from reviewers. Some extra tests can be required to clarify some results - All source codes required to make the repor t have to be included in SVN	Start : T0+2months Duration : **6**months

5.4 Sub-Task 3 Scalability and limits assessment

Liaison and Resource Tracking Officer
IO-RO: Lana Abadie

Description
The main objective of the sub-task is to try to assess the limits of the system, including scalability.
UDA system consists of many modules. One of the critical points of UDA system is the indexer database.
One of the tests is to assess if PostgreSQL is the right technology and if the standard database partitioning will be enough to ensure scalability. Comparison with the developed MongoDB plugin will need to be carried out
Another test would be to have multiple UDA servers running in parallel and assess the scalability (mainly if there is a need to replicate the UDA indexer database and caching server).
Comparison with other infrastructure will be a plus.
Assess if the current system will be able to cope with First Plasma needs.
This task shall be performed using CCS 6.0.
The hardware required for this sub-task besides the one mentioned in the previous sub-task:

- 4 UDA servers
- 1 UDA indexer database with partitioning scheme.
- 1 UDA caching server
- Archiving repository (min. 50TB), split into 2 parts (local storage directly attached to UDA ser ver and use of shared filesystem like GPFS)
- Many UDA clients (from 1…100) – (Windows, Linux and eventually MAC), preferably Python client to be used.

Inputs to be provided by IO

1. Background information
2. Support for UDA system and CCS
3. Test to be run with at least 1 million files for indexer database
4. UDA servers from 1 to 5.
5. UDA clients from 1 to 100 – Python UDA client shall be used for this test.

Milestones and deliverables from the Contractor

Deliverables Id	Description	Milestone
D3.1	Scalability report of the UDA indexer database and UDA server. The report shall also specify the limits of the system. Recommendations for upgrade in regard of successful achievement of first plasma. Recommendations on set-ups for MongoDB if it turns out to outperform PostgreSQL - All source codes required to make the r eport have to be included in SVN	Start : T0 +**3** months Duration: 5months

6 RESPONSIBILITIES

N/A

7 LIST OF DELIVERABLES AND DUE DATES

The deliverables and due dates for this Call for expertise is summarized below:

Sub-tasks	Deliverables	Due date (End of)	Estimated approve date
Sub-task1	D1.1	T0	T0+2months+3 weeks
Sub-task 2 Performance of UDA system	D2.1	T0+5months	T0+5 months +3 weeks
	D2.2	T0+8months	T0+8months+3 weeks

Sub-task 3 Scalability and limits assessment	D 3.1	T0+8 months	T0+8 months + 3weeks

8 ACCEPTANCE CRITERIA

The following criteria shall be the basis of the acceptance of the successful accomplishment of the Work

8.1 Delivery date criteria

On-time delivery of deliverables according the dates defined in Section 7.

8.2 Report and Document Review criteria

Reports as deliverables shall be stored in the ITER Organization's document management system by the Contractor for acceptance. A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered documents. The Approver can name one or more Reviewers(s) in the area of the report's expertise. The Reviewer(s) can ask modifications to the report in which case the Contractor must submit a new version. The acceptance of the document by the Approver is an acceptance criterion.

8.3 Software delivery criteria

Software source code shall be delivered in the ITER Organizations software repository (SVN) by the Contractor for acceptance. A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered software source code. The acceptance is based on successful execution of Test Plans and, optionally, code review. The acceptance of the software source code by the Approver is an acceptance criterion.

9 SPECIFIC REQUIREMENTS AND CONDITIONS

The recommendations that are described in the CODAC Software Engineering and Quality Assurance document [RD4] shall apply to the deliverables. Test plans and test reports have to be recorded in the dedicated area [RD5].
In particular, the CODAC C/C++ rules and recommendations, as defined the CODAC C/C++ SDSD document [RD6] shall apply to the deliverables, incl. monthly delivery of the source to IO version control repository as well as support for packaging of the runtime deliverables in the form of RPM, as per section 2.8
of [RD6].

10 WORK MONITORING / MEETING SCHEDULE

Risks, issues and progress shall be regularly monitored by means of Progress Meetings and/or formal exchange of documents transmitted by emails which provide detailed progress.
Progress Meetings will be called by the ITER Organization, once per month, to review the progress of the work, the technical problems, the interfaces and the planning.

The main purpose of the monthly Progress Meetings is to allow the ITER Organization and the Contractor Technical Responsible Officers to:

- Allow early detection and correction of issues that may cause delays;
- Review the completed and planned activities and asses the progress made;
- Permit fast and consensual resolution of unexpected problems;
- Clarify doubts and prevent misinterpretations of the specifications.

In addition to the monthly Progress Meetings, if necessary, the ITER Organization and/or the Contractor may request additional Progress Meetings to address specific issues to be resolved.

For all Progress Meetings, the minutes of the meeting shall be drafted by the Contractor within five (5) working days following the meeting. The ITER Organization will review the draft version or the minutes within five (5) working days after the issuing date by the Contractor.

Every month, the Contractor shall submit to ITER Organization a Monthly Progress Report to be issued five (5) working days before the Monthly Progress meeting so that the report can be reviewed prior to, and discussed at this Meeting.

The Monthly Progress Report shall illustrate the progress against the baseline work plan and indicate variances that should be used for trending. Performance indicators suitable to measure the progress of the work as compared to the approved work plan shall also be reported in the Monthly Progress Report.

On request and by agreement, meetings will be organized by videoconference. The Contractor shall facilitate proper tools for the videoconference in accordance with the Associated Framework Contract.

11 DELIVERY TIME BREAKDOWN

The table below defines bundles of deliverables with dates and cost. This defines the invoice breakdown.

Deliverables	Estimated approved dates	Cost
D1.1,D2.1	End of (T0+3 months) +3 weeks	50%
D1.1, D2.2	End of (T0+8) months +3 weeks	50%

12 QUALITY ASSURANCE (QA) REQUIREMENTS

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.
The general requirements are detailed in ITER Procurement Quality Requirements (ITER_D_22MFG4).
Prior to commencement of the task, a Quality Plan must be submitted for IO approval giving evidence of the above and describing the organisation for this task; 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 (see Procurement Requirements for Producing a Quality Plan (ITER_D_22MFMW)).
Documentation developed as the result of this task shall be retained by the performer of the task or the DA organization 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, in accordance with Quality Assurance for ITER Safety Codes (ITER_D_258LKL).

13 CAD DESIGN REQUIREMENTS (IF APPLICABLE)

NOT APPLICABLE FOR THIS RFQ

For the contracts where CAD design tasks are involved, the following shall apply:
The Supplier shall provide a Design Plan to be approved by the IO. Such plan shall identify all design activities and design deliverables to be provided by the Contractor as part of the contract.
The Supplier shall ensure that all designs, CAD data and drawings delivered to IO comply with the Procedure for the Usage of the ITER CAD Manual (2F6FTX), and with the Procedure for the Management of CAD Work & CAD Data (Models and Drawings 2DWU2M).
The reference scheme is for the Supplier to work in a fully synchronous manner on the ITER CAD platform (see detailed information about synchronous collaboration in the ITER GNJX6A - Specification for CAD data production in ITER Contracts.). This implies the usage of the CAD software versions as indicated in CAD Manual 07 - CAD Fact Sheet (249WUL) and the connection to one of the ITER project CAD data-bases. Any deviation against this requirement shall be defined in a Design Collaboration Implementation Form (DCIF) prepared and approved by DO and included in the call-for-tender package. Any cost or labour resulting from a deviation or non-conformance of the Supplier with regards to the CAD collaboration requirement shall be incurred by the Supplier.

14 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 th e 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 p urposes are also subject to a supervision 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.