



**ALMA Project**  
**Technical Specifications for**  
**the Initial Purchase of**  
**Oracle Licenses and for**  
**Support and Maintenance**  
**of Oracle Software**

Doc # : COMP-70.02.00.30-001-A-RFP  
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**ACRONYMS & DEFINITIONS**

ALMA	Atacama Large Millimeter/Submillimeter Array
ALMA AOS	Array Operations Site (Llano de Chajnantor)
ALMA OSF	Operations Support Facility (San Pedro, Chile)
ALMA SCO	Santiago Central Office (Santiago, Chile)
ARC	ALMA Regional Center
ATF	ALMA Test Facility (Socorro, U.S.)
CPU	Central Processing Unit A quad-core CPU is a chip-level device containing four independent microprocessors
ESO	European Organisation for Astronomical Research in the Southern Hemisphere
NAOJ	National Astronomical Observatory of Japan
NRAO	National Radio Astronomy Observatory
NGAS	Next Generation Archive System
Oracle RAC	Oracle Real Application Cluster
RAID	Redundant Array of Independent/Inexpensive Disks
STE	Standard Test Environment
XML	Extensible Markup Language

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## 1 Purpose and Scope

This document provides the technical specification for the establishing of a frame contract for the purchase of Oracle licenses and for support and maintenance of Oracle software, namely:

- Licenses for operating a production environment at multiple sites in Chile, the U.S., Japan, and Germany,
- licenses for operating test and development environments,
- technical support and software maintenance

for a five years period starting in 2008 at all the sites of the ALMA Project, namely


- at the ALMA OSF and the ALMA SCO in Chile,
- at the NRAO in the U.S. (Socorro, NM and Charlottesville, VA),
- at the NAOJ in Japan (Mitaka), and
- at the ESO Headquarters in Germany (Garching, Munich).

## 2 Overview

ESO is the intergovernmental European Organisation for Astronomical Research in the Southern Hemisphere. On behalf of its thirteen member states ESO operates a suite of the world's most advanced ground-based astronomical telescopes located at the La Silla Paranal Observatory in the Atacama Desert in Chile. The ESO Headquarters are situated in Garching near Munich, Germany.

The Atacama Large Millimeter/Submillimeter Array (ALMA) project is a partnership between Europe, Japan and North America in cooperation with the Republic of Chile. ALMA is funded in Europe by ESO, in Japan by the National Institutes of Natural Sciences in cooperation with the Academia Sinica in Taiwan and in North America by the U.S. National Science Foundation in cooperation with the National Research Council of Canada. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of Japan by the National Astronomical Observatory of Japan (NAOJ) and on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc.

ALMA is located on the high-altitude Llano de Chajnantor (5000 m elevation), east of the village of San Pedro de Atacama in Chile. ALMA's location in the Atacama Desert is one of the highest, driest places on Earth, making it ideal for astronomical research at millimeter/submillimeter wavelengths, which are absorbed by atmospheric moisture. When completed (in 2011), ALMA will be the largest and most capable imaging array of millimeter/submillimeter telescopes in the world.

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No ALMA Archive computers will be located at the high Array Operations Site (AOS). In Chile Archive computers will be located at the ALMA Operations Support Facility (OSF) and at the Santiago Central Office (SCO) in Santiago, as explained in detail later. Also the ALMA Regional Centers (ARC) located in the U.S., Japan, and Germany will host Archive computers that will basically be clones of the Archive computers at the SCO.

In addition there will be Archive computers for test and development located at the various sites in the U.S., in Japan, and in Germany.

### **3 Planned Oracle Database Environment (production)**

The purpose of the ALMA archiving subsystem is to provide services for persistent archiving and retrieval of observational data, observation descriptors, images and technical and environmental data (configuration, monitoring, and logging). A variety of different types of data needs to be supported, which can be grouped into the following categories:

- Bulk data: Observational data and images.
- Metadata: All kinds of data entities describing observations and the bulk data. This kind of data will be formatted in XML.
- TMC data: Configuration, monitoring and logging data.
- Miscellaneous science support data.
- Shift logs.

Once the ALMA site is fully operational (from 2012 onwards) the bulk data is estimated to have a size of 0.5 TeraBytes per day; it will be stored in a proprietary next generation archive system (NGAS) developed by ESO's data management division. The remainder of the types of data listed above will be stored in a relational database system (Oracle); its size is expected to be around 15% of the bulk data size.

The vast majority of the data will be produced at the AOS/OSF, only the science support data will be maintained by the ALMA SCO site, however access to the Archive data (bulk and relational) will be via web interfaces to the SCO and the ALMA Regional Centers. The OSF itself will not be accessible from the outside world except for maintenance and administration tasks. To make the (OSF) data available at the SCO and the ARCs in a timely fashion bulk data will be propagated periodically by exchanging disk storage; the relational data will be propagated continuously by means of Oracle Streams Replication. To ensure the availability of the system at the OSF and to safeguard the data Oracle advanced technology like Real Application Clusters (RAC), Data Guard, and Streams Replication will be used.

All Oracle databases planned for the ALMA Archive production environment will be installed on servers equipped with 2 quad-core<sup>1</sup> CPU running Linux x86 Red Hat Enterprise (an exception are those servers that will be used for antenna verification; they'll have 2 single-core CPU each).

Figure 1 gives a graphical overview on the servers planned for production and on the Oracle licenses that will be needed.

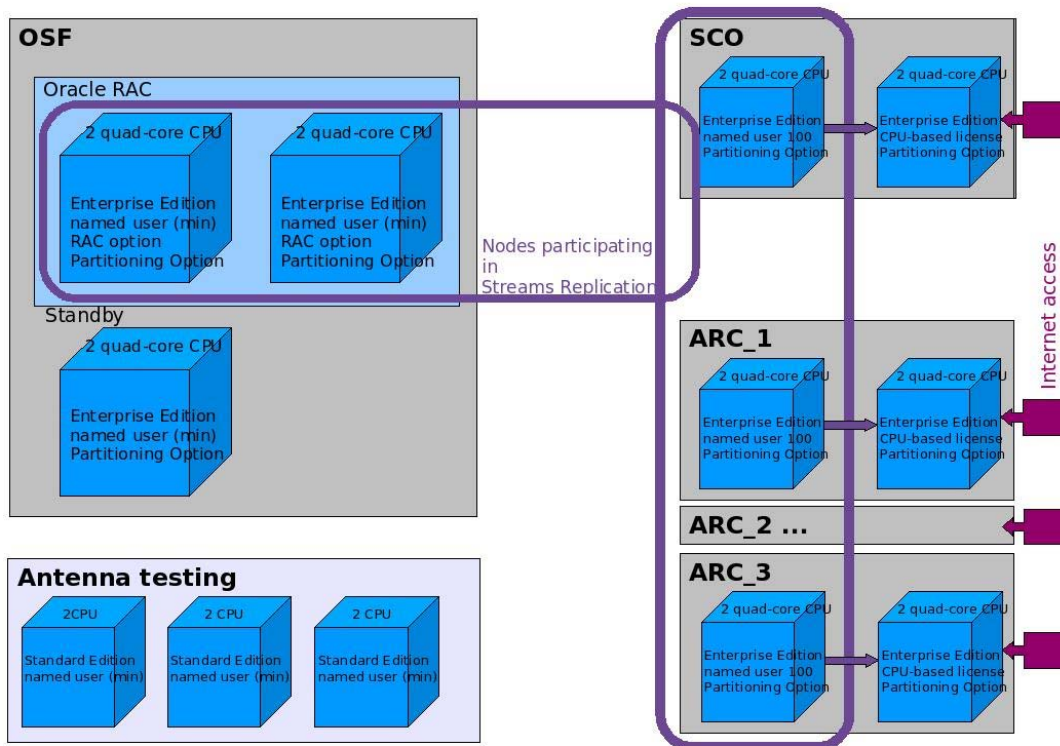



Figure 1: ALMA Archive database setup (production)

### 3.1 Operations Support Facility (OSF), Chile

At the OSF data coming from all major ALMA subsystems will be entered into the Archive database. As described above this data mainly consists of XML data describing the bulk data produced by the antennas/the correlator and TMC data, which includes system configuration, monitoring, and logging data.

<sup>1</sup> Initially processors will be quad-core. If within the three years multi-core processors containing more than four cores become standard then upgrades may be considered.

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The ALMA Archive database is a core component; its availability is crucial to all subsystems, downtime cannot be tolerated during on-going observations as it might result in loss of valuable observational data or metadata.

The ALMA Archive System will be installed on an **Oracle RAC** environment consisting of two Linux servers in the beginning with the option of adding servers later if needed for performance reasons. A third server will act as a physical standby instance using **Oracle Data Guard**. The **Partitioning Option** will be needed for the RAC environment as well as for the standby server.

The data held at the SCO and the ARCs (see below) will be a copy of the data produced/collected at the OSF. **Oracle Streams Replication** will be used to propagate data from the OSF to the SCO and the ARCs.


Three additional servers will be used for storing data related to antenna testing procedures, which might produce proprietary data to be kept separate. These will be independent stand-alone servers not participating in the RAC or Replication environment. The OSF environment will be located behind a firewall; database access is limited to ALMA subsystems and ALMA operator access; thus a minimum number of Oracle Enterprise Edition named user licenses will be required.

### 3.2 Santiago Central Office (SCO), Chile

There will be two servers at the SCO hosting Oracle databases. A back-end server that will participate in the **Streams Replication** environment and hold a copy of the data collected at the OSF. It will also be the defining node for science support related data. Access to this server will be limited, 100 Oracle Enterprise Edition named-user licenses will suffice. The second server will be the front-end server allowing internet access; CPU-based licenses will be needed. Both servers will need the **Partitioning Option**.

### 3.3 ALMA Regional Centers (ARC)

There will be three ARCs, located in the U.S., Japan, and Germany. They will have the same setup and thus the same license requirements as the SCO: there will be a back-end server participating in the Streams Replication between the SCO and the ARCs and a front-end server allowing internet access.

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## **4 Planned Oracle Database Environment (test and development)**

### **4.1 Test Environments (STE)<sup>2</sup>**

Four standard test environments are foreseen (Socorro, Charlottesville, Mitaka, Garching); for a limited time period there will be an additional STE located at the ALMA test facility (ATF) in Socorro. Each will have one server (2 single-core CPU) hosting an Oracle database. Either dedicated development licenses like the Oracle Internet Development Suite or a minimum number of Oracle Standard Edition named-user licenses should be sufficient for standard STEs.

### **4.2 Enhanced Test Environment (enhanced STE)**

One STE (located in Garching) will be maintained matching the OSF setup very closely, to better support remote maintenance. This enhanced STE will consist of three servers (2 quad-core CPU each), two of them configured as a RAC, the third playing the role of the standby server as well as a replication node. Again, either dedicated development licenses or a minimum number of Oracle Enterprise Edition named-user licenses will be needed plus RAC and Partitioning option.

### **4.3 Development Environment**

Also in Garching a development environment will be installed. It will be used to setup and test RAC, multimaster replication procedures and switchover/failover scenarios and the interaction between the three. It has the same license requirements as the enhanced STE.

## **5 Scope of Supply**

### **5.1 Procurement of Oracle Licenses**


New Oracle Licenses will be needed for:

- setting up the ALMA Archive Databases at the operational sites at the OSF and the SCO in Chile,
- providing the ARCs with full ALMA Archive Database environments,

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<sup>2</sup> The majority of STE servers already exist with single-core CPUs. Servers that will be purchased as of now will be equipped with quad-core CPUs, which currently are the standard. As stated before, if within the three years multi-core processors containing more than four cores become standard then upgrades may be considered.



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- operating multiple test and development sites in the U.S., in Japan, and at ESO Headquarters in Germany.

ESO intends to sign a contract that shall be valid for a period of 5 years starting in May 2008 and cover all licenses needed for the ALMA Archive database environments.

Maintenance and Support for existing development licenses that are currently being used will expire in 2008. ESO intends to purchase 6 Internet Development Suite licenses within the end of 2008 under the new contract (see Table 6.1- bottom row) and then pay maintenance for them under the new contract conditions starting in January 2009.

In particular:

- The contract shall establish a fixed discount rate with respect to the applicable Oracle license price list, based on the total volume that ESO commits to purchase (see Purchasing Plan below) and valid for 5 years;
- The supplier should confirm that the same discount rate can be applied to all Oracle Database licenses, should ESO wish to buy additional licenses that are not included in the Purchasing Plan;
- A copy of the present Oracle price list should be attached as a reference.

## 5.2 Purchasing Plan


ESO commits to purchase database products according to one of the two following scenarios, depending on the availability of ALMA partners to delegate purchases to ESO for their ALMA Regional Centers (ARCs). The decision for one of the two scenarios will be made by ESO before contract signature.

Scenario A:

With reference to Table 6.1 in the Appendix

- ESO purchases the licenses given at the row indicated with “OSF” at contract signature (May 2008) and the 6 Internet Development Suite licenses on the bottom row within 1<sup>st</sup> Jan 2009,
- ESO purchases the licenses given at the rows indicated with “Enhanced STE” and “Standard STE” or an equivalent volume within one year from contract signature,
- ESO purchases the licenses given at the row indicated with “ESO test and development” or an equivalent volume within two years from contract signature,
- ESO purchases the licenses given at the row indicated with “SCO” or an equivalent volume within three years from contract signature,
- ESO purchases the licenses given at the row indicated with “ARC” or an equivalent volume within four years from contract signature.

Scenario B:

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Like Scenario A, except in the fourth year ESO would purchase only one third of the number of licenses indicated under ARC, namely one environment for the European ARC.

The two above scenarios are summarized in the following table:

Oracle Licenses Purchasing Plan (*)	Contract Signature	Within 1 <sup>st</sup> year	Within 2 <sup>nd</sup> year	Within 3 <sup>rd</sup> year	Within 4 <sup>th</sup> year
Scenario A	OSF, Development license (the latter before Jan.2009)	Enhanced STE, Standard STE	ESO tests and development	SCO	ARC (licenses for 3 environments)
Scenario B	OSF, Development license (the latter before Jan.2009)	Enhanced STE, Standard STE	ESO tests and development	SCO	ARC (licenses for 1 environment)

(\*) with reference to the Appendix -Table 6.1: Environment names

Important notes:


- ESO purchases can be done also before the given deadlines and their order might be modified according the ALMA project needs, provided the given volume of purchases per year is reached.
- Therefore ESO intends to check and confirm yearly the actual list of licenses to be acquired.

### 5.3 Maintenance and Support

The frame contract shall include Maintenance and Support. This shall be priced as a percentage of the Oracle net license price.

Maintenance shall cover new versions of the software as well as patches to current versions. Additionally 24/7 hotline support via telephone and MetaLink is expected.

The price for maintenance fees should also be indicated and valid for 5 years. Maintenance fees shall be applicable to the actually purchased licenses.

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#### **5.4 Technical Partnership**

It is expected that the selected software provider will also support ESO with respect to technology issues such as:

- being the main information source concerning new technologies and products
- providing technical support and advice with respect to new items
- if needed providing on-site consultancy

Bidders are requested to provide an indication of their capability to be effective on the above mentioned areas.

#### **6 Appendix**



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Environments	Number of environments	Number of servers /	Number of		Enterprise Edition	Enterprise Edition	Standard Edition	Internet Develop	RAC option	Partitioning Option
			# CPU	# Core						
<b>OSF</b>	1									
OSF cluster		2	2	4		25			x	x
OSF standby		1	2	4		25				x
OSF antennae test		3	2	1			25			
<b>SCO (Santiago)</b>	1									
SCO back_end (replication)		1	2	4		25				x
SCO front-end (internet)		1	2	4	x					x
<b>ARC (U.S., Germany, Japan)</b>	3									
ARC back-end		1	2	4		25				x
ARC front-end		1	2	4	x					x
<b>Enhanced STE (Garching)</b>	1									
STE cluster		2	2	4		25			x	
STE standby/replication		1	2	1		25				
<b>Standard STE (Socorro, ATF, Charlottesville, Japan, Garching)</b>	5									
STE server		1	2	1			25			
<b>ESO test and development (Garching)</b>	1									
Test cluster		2	2	2		25			x	x
Test standby/replication		1	2	1		25				x
<b>Development licenses</b>								6		

**Table 6.1 Oracle licenses by server and site**