



Atacama Large Millimeter Array

ALMA-SW-NNNN

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Glossary

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Software Glossary

Glossary

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This glossary defines those terms (single words or phrases) concerning Software Engineering, Telescope Control and Interferometry. The meaning of each term is explained, focusing on its usage in the context of documentation. Entries are arranged alphabetically.

1.1 Abbreviations and Acronyms

Many documents employ abbreviations and acronyms to refer concisely to an item after it has been introduced. The following list is aimed to help the reader in recalling the extended meaning of each short expression.

ABM	Antenna Bus Master, a real-time computer located at the antenna that is responsible for the control and monitor of all hardware devices at the antenna. There is an identical copy of this computer at every antenna, each running identical software.
ACA	Atacama Compact Array, an array of about 12 x 7-m dishes with baselines up to 50-m that has been proposed as an enhancement to the main ALMA facility. It is intended to enhance the fidelity of images produced by ALMA by filling in the so-called “short spacings” in the <i>uv</i> -plane.
ACC	Array Control Computer, the computer located at the central control area and responsible for coordinating all instrument activities.
ACE	Adaptive Communication Environment, an open-source, object-oriented (OO), C++ framework that implements core design patterns for concurrent communication software across a range of OS platforms. (http://www.cs.wustl.edu/~schmidt/ACE.html)
ACK	“Acknowledge” The bit in transmitted CAN frames that is set by a successful receiver of the frame.
ACS	ALMA Common Software, middleware located between the application (on top) and other commercial and shared software over the operating systems. It implements the ALMA Container-Component model to support distributed development and run-time deployment of components, supplying as well services such as messaging, logging, error and alarm handling, configuration database. It provides many of these services by wrapping an underlying CORBA implementation, thus simplifying the application developer’s view of these services.
ACU	Antenna Control Unit, the system provided by the antenna manufacturer through which the antenna is monitored and controlled. The primary access to the ACU is through a CAN bus.
AIPS++	Astronomical Information Processing System “++”, a package that supplies post-processing software for calibration, editing, image formation, image enhancement, and analysis of images and other data streams. The AIPS++ Group, a team of astronomers and programmers, funded by an international consortium of observatories, under the leadership of NRAO developed the package until 2003, at which point the consortium was dissolved. (http://aips2.nrao.edu/docs/aips++.html)
ALMA	Atacama Large Millimeter Array, a connected interferometer telescope array operating in the millimeter and submillimeter wavelength range, and consisting of 64 antennas each 12-meters in diameter. It will be located on the Chajnantor altiplano in Chile, at an altitude of about 5000m. (http://www.alma.nrao.edu)
AMS	Antenna Mount System, the software system that controls the movement of the antenna elevation and azimuth axes. The AMS receives commands from the high-level control system and implements them by directly interacting the ACU.
ANKA	ANKA (Angström Quelle Karlsruhe) is a synchrotron radiation source being constructed in southwestern Germany. It will be controlled using software from the KGB project. (http://www.fzk.de/anka/english/welcome.html)
API	Application Programming Interface, the “the specific method prescribed by a computer operating system or by an application program by which a programmer writing an application program can make requests of the operating system or another application.” [Win2000.com Website]
ARTM	Array Real Time Machine, a real-time computer located at the central control area and responsible for the control and monitor of certain hardware (LO reference generation, fiber optic control, etc.) located only at the array center. Its function may be combined with that of the ACC or CCC.
ATM	Asynchronous Transfer Mode, a <i>cell relay</i> technology designed for high-speed transfer of data, voice and video across networks. It supports data transfer rates from 1.544 Mbps to

	622 Mbps. Through LAN Emulation (LANE), ATM works with existing Ethernet and token ring networks.
AU	Astronomical Unit, the average distance from the Earth to the Sun, <i>i.e.</i> , 149,597,870 kilometers.
AUI	Attachment Unit Interface, a 15-pin connector used with an Ethernet interface.
AZ	Azimuth, the horizontal angle measured clockwise (as viewed from above) from an arbitrary reference direction in the horizon coordinate system. For ALMA the reference point (zero azimuth) is defined as due north.
CAN	Controller Area Network, a serial multi-drop bus originally developed by Bosch for automotive applications. In ALMA it is used to connect the ABM to most hardware devices located at the antenna. It will also be used with the correlator and in other places.
CASE	Computer Aided Software Engineering
CCC	Correlator Control Computer, a real-time computer located at the central control area and responsible for the control and monitor of the correlator.
CCD	Charge Coupled Device; in ALMA this is the digital camera located on the antenna and used for optical imaging. It is a data producer, and is also known as the Video Camera.
CDP	Central Data Processor, a PC-cluster which obtains raw lags from the correlator and performs digitization corrections, windowing, FFTs, and atmospheric phase corrections.
CDR	Critical Design Review; although in many projects this is synonymous with a "Final" Design Review, the (somewhat) Agile software methodology adopted for ALMA has redefined this to have an <i>incremental</i> meaning: for a CDR, developers present the design for the functionality to be implemented in the subsequent incremental release..
CLIC	The Continuum and Line Interferometer Calibration is a program for the calibration of data from the IRAM mm-interferometer at Plateau de Bure.
CLOB	Character L arge O bject, a character string of indeterminate length.
CMM	Configuration M odule M anager, a configuration control system used for software development for the VLT and for ALMA (during Phase 1 of the project).
COCOS	A commercial distributed system being developed by KGB to control devices at a petrol station, e.g. credit card readers, tank gauges, and point-of-sale applications. It will run on a number of LAN connected PCs using the PharLap RTOS or WinNT OS. It is a generalization and evolution of the ANKA system.
CORBA	Common Object Request Broker Architecture, an emerging open distributed object computing infrastructure being standardized by OMG. CORBA automates many common network programming tasks such as object registration, location, and activation; request de-multiplexing; framing and error-handling; parameter marshalling and de-marshalling; and operation dispatching.
CPU	"Central Processing Unit"
DAO	Data Access Object, a software object based on a pattern that 1) separates a data resource's client interface from its data access mechanisms; and 2) adapts a specific data resource's access API [see this glossary] to a generic client interface. The DAO pattern allows data access mechanisms to change independently of the code that uses the data.
DBMS	"Data Base Management System"
DRP	Data Reduction Package (examples from radio astronomy include AIPS, AIPS++, MIRIAD, GILDAS, GIPSY).
DRUI	Data Reduction User Interface
EL	Elevation, the vertical angle measured upward from the horizon in the horizon coordinate system.
ESO	"European Southern Observatory" ESO and other agencies are building ALMA. (http://www.eso.org)
FDS	Fast Data Switch or Fast Data Store (depending upon which technology is eventually adopted for ALMA).
FITS	"Flexible Image Transport Format" FITS is the data format most commonly used within the astronomy community. FITS is primarily designed to store scientific data sets consisting of multidimensional arrays (1-D spectra, 2-D images or 3-D data cubes) and 2-dimensional tables containing rows and columns of data. (http://fits.gsfc.nasa.gov/)
FPDP	"Front Panel Data Port" A high-speed 32-bit parallel synchronous interface whereby VME boards are interconnected using ribbon cables routed across the front panels. It is the VITA-17 standard.
FPGA	Field Programmable Gate Array
FTE	Full-time equivalent (1 FTE = 1 staff year)

GILDAS	The Grenoble Image and Line Data Analysis Software, a collection of software developed by the Observatoire de Grenoble and IRAM, oriented towards radioastronomical applications.
GPS	"Global Positioning System" GPS is a satellite-based radio navigation system developed and operated by the U.S. Department of Defense (DOD). Important to ALMA is that the system permits users to determine the time with high precision and accuracy.
GUI	Graphical User Interface
HLA	High-Level Analysis, the global activity within the ALMA software development project that includes requirements analysis and overall system architecture and design.
HST	Hubble Space Telescope
HW	Hardware
ICD	Interface Control Document: A document specifying a software or hardware interface.
IDL	"Interface Definition Language" IDL is part of the CORBA standard and permits interfaces to objects to be defined independent of an object's implementation. IDL is used as input to an IDL compiler that produces source code that can be compiled and linked with an object implementation and its clients.
IF	"Intermediate Frequency"
IOP	"Internet Inter-ORB Protocol" IOP is part of the CORBA standard and is an object-oriented protocol that makes it possible for distributed programs written in different programming languages to communicate over the Internet.
IPT	Integrated Product Team, the designation given to each of the groups responsible for the design and construction of major ALMA subsystems, e.g., Computing, Front Ends, Antenna, Calibration.
IRAM	"Institut de RadioAstronomie Millimétrique" (French) IRAM and other agencies are building ALMA. (http://iram.fr/)
ISO	International Organization for Standardization ISO is a voluntary, non-treaty organization founded in 1946, responsible for creating international standards in many areas, including computers and communications. Its members are the national standards organizations of 89 countries, including the American National Standards Institute. The term "ISO" is not actually an acronym; rather it is a pun on the Greek prefix "iso-", meaning "same".
KGB	"Kontrol Gruppe für Beschleuniger" (German) The KGB project is working to provide software used to control remote hardware over a network. It part of the Jozef Stefan Institute in Ljubljana, Slovenia. The first application of the system is ANKA. (http://kgb.ijs.si/KGB/)
LAN	"Local Area Network" A network which is geographically limited, typically to a 1 km radius. Ethernet and FDDI are examples of standard LANs.
LO	"Local Oscillator"
LST	Local Sidereal Time; an astronomical object will transit (cross the meridian) when its Right Ascension equals the LST, assuming that the object is above the horizon.
LTA	Long Term Accumulator
M&C	"Monitor and Control"
MIRIAD	M ultichannel I mage R econstruction, I mage A nalysis and D isplay, a toolbox in the form of an environment with a large set of moderate-sized programs which perform individual tasks, involving calibration, mapping, deconvolution and image analysis of interferometric data. (http://bima.astro.umd.edu/miriad/intro.html)
MPG	Max-Planck-Gesellschaft (German) Max-Planck-Society (http://www.mpg.de)
MPIfR	Max-Planck-Institut fuer Radioastronomie (German) Max-Planck-Institute for Radio Astronomy (http://www.mpifr-bonn.mpg.de)
N/A	"Not Applicable"
NRAO	"National Radio Astronomy Observatory" NRAO and other agencies are building ALMA. (http://www.nrao.edu/)
OCL	"Object Constraint Language" A modeling language that is part of the UML. It is used to specify all kinds of constraints, pre- and post-conditions, guards, etc. over the objects in the different models. (http://www-4.ibm.com/software/ad/standards/ocl.html)
OMG	"Object Management Group" The OMG was founded as a consortium in 1989 to promote the adoption of standards for managing distributed objects. It is the developer of the CORBA standard. (http://www.omg.org/)
OO	"Object Oriented" Object-oriented programming (OOP) refers to a type of programming that combines data structures with functions to create re-usable objects.
ORB	"Object Request Broker" The ORB is the part of the CORBA specification that manages the

	interaction between clients and servers. The specification defines the architecture of interfaces and services that must be provided by the ORB.
OS	“Operating System”
OSF	Operations Support Facility for ALMA. The operations of the observatory will be run from here (to be situated near San Pedro de Atacama in Chile).
OTC	Observing Time Committee, generic term for the panel that will review ALMA observing proposals and award (or recommend the awarding of) observing time on ALMA.
OSI	“Open Systems Interconnection” The 7-layer ISO standard for how messages are transmitted between two points in a network.
OTF	“On-The-Fly” An observing mode where the antenna motion follows a specified Pattern without stopping. At the same time the antenna actual and commanded positions are recorded. The position data are later used in the calibration of the science data.
OVRO	“Owens Valley Radio Observatory” (http://www.ovro.caltech.edu/)
PDR	“Preliminary Design Review” A design review that occurs before the CDR.
PI	Principal Investigator
PPC	“PowerPC” A range of processors developed by an alliance of Apple, IBM and Motorola. For ALMA it is the processor embedded on a SBC.
RDBMS	“Relational Data Base Management System”
RF	"Radio Frequency"
RFP	“Request for Proposal”
RPC	“Remote Procedure Call” A protocol used by a program to request a service from a program located in another computer in a network. RPC uses the client/server model.
RR	Readiness Review
RT	Real-Time
RTR	“Remote Transmission Request” A type of CAN frame requesting transmission of a particular frame.
R0-5	Major software release followed by its number. These releases are intended to be delivered yearly until ALMA Interim Operations begin.
SB	Scheduling Block
SBC	“Single Board Computer” A complete computer system on a single board. For ALMA this generally means a computer board mounted in a VME chassis.
SI	“Système International d'unités” (French) The international system of units of measurement.
SLALIB	“Subprogram Library A”: a software library used by writers of positional-astronomy applications. (http://star-www.rl.ac.uk/star/docs/sun67.htx/sun67.html)
SMA	Submillimeter Array, an aperture synthesis radio telescope in Hawaii, operating in the submillimeter wavelength range. It is a collaborative project of the Smithsonian Astrophysical Observatory and the Academia Sinica Institute of Astronomy & Astrophysics of Taiwan .
SNMP	“Simple Network Management Protocol” A protocol governing network management and the monitoring of network devices and their functions. It is generally used with TCP/IP networks.
SQL	Structured Query Language, a standard for expressing queries for relational database systems.
SRS	“Software Requirements Specification”
SSL0	"Signed Sum of Local Oscillators" The effective total LO frequency. For the sum a negative sign indicates a reversal of the signal spectrum that occurs when the mixer output is from the lower sideband.
SSR	Science Software Requirements: this prefix is applied both to the requirements document itself and to the committee within the Computing IPT that is responsible for them.
SW	Software
TAI	“International Atomic Time” TAI is a laboratory timescale. Though TAI shares the same second as UTC, UTC noticeably separates the two timescales in epoch because of the build-up of leap seconds. At the time of this writing UTC lags about half a minute behind TAI.
TAO	The ACE ORB (http://www.cs.wustl.edu/~schmidt/TAO.html)
TBC	“To Be Confirmed”
TBD	“To Be Determined”
TE	Timing Event, an array-wide highly-accurate 48 ms timing signal which is used to synchronize distributed hardware and computers.
TCL	“Tool Command Language” An interpreted script language developed by Dr. John Ousterhout at the University of California, Berkeley, and now developed and maintained by

	Scriptics (http://www.scriptics.com/resource/)
TPOINT	Telescope Pointing Analysis System An interactive modeling tool that analyses pointing observations to discover and measure telescope mechanical misalignments and flexures. (http://www.tpsoft.demon.co.uk)
UML	“Unified Modeling Language” The UML is a language for specifying, constructing, visualizing, and documenting the artifacts of a software-intensive system.
URI	“Uniform Resource Identifier” The generic set of all names/addresses that are short strings that refer to resources. (http://www.w3.org/addressing)
URL	“Uniform Resource Locator” The set of URI schemes that has explicit instructions on how to access the resource, typically a web page, on the internet. (http://www.w3.org/addressing)
UTC	“Universal Time Coordinated” UTC is the basis of civil timekeeping. Most time zones differ from UTC by an integer number of hours, though a few differ by $n+0.5$ hours. The UTC second is the same as the TAI second. In the long term, UTC keeps in step with the Sun. It compensates for the slight variations in the Earth's rotation by occasionally introducing a leap second.
UV	Visibilities, the cross-correlation values provided by each antenna pair in an aperture synthesis array. The acronym comes from the designations attached to two of the coordinate axes in which the antenna baselines are described, <i>u</i> and <i>v</i> .
VLA	Very Large Array, a 27-antenna aperture synthesis radio telescope operated by NRAO on the plains of Augustin, New Mexico, USA, operating in the wavelength range 0.7-400 cm.
VLT	Very Large Telescope, a complex of 4 8-meter optical/infrared telescopes operated by ESO on Cerro Paranal, Chile. (http://www.eso.org/projects/vlt/)
VO	Virtual Observatory, a “virtual sky,” based on the enormous collection of astronomical data sets existing throughout the world. Its development is ongoing through separate and coordinated initiatives in North America, Europe and Asia.
VME	“Versa Module Europa” VME is a computer backplane bus system which makes use of the Eurocard standard. It is defined by the IEEE 1014-1987 standard.
WAN	“Wide Area Network” A data communications network usually constructed with serial lines, extending over distances greater than one kilometer.
WBS	Work Breakdown Structure, a construct for managing project tasks.
WS	Workstation
WSRT	Westerbork Synthesis Radio Telescope, an aperture synthesis radio telescope in the Netherlands, operating in the wavelength range 6-150 cm.
XML	The eXtensible Markup Language (http://www.w3.org/XML/)

1.2 Definitions

From observing program to correlator dump:

- An *observing program* is a set of *observing sessions*,
- an *observing session* is a set of time-contiguous *scheduling blocks*,
- a *scheduling block* is an un-interruptible set of *scans*,
- a *scan* is a set of *observations*,
- an *observation* is a set of *integrations*,
- and, an *integration* is a set of *dumps*.

actor	<i>Actors</i> are used when writing <i>use cases</i> . Actors are a role of an entity external to the system, and can be humans, machines, or devices. Actors are divided into primary and secondary. A <i>primary actor</i> is one having a goal requiring the assistance of the system, while a <i>secondary actor</i> is one from which the system needs assistance to satisfy its goal. (see <i>The Unified Modeling Language Reference Manual</i> , Rumbaugh, Jacobson, and Booch, p.144)
alarm	<i>Alarms</i> are asynchronous anomalous conditions discovered by the system.
array	The entire set of all ALMA antennas.
attribute	Changeable data associated with a device <i>property</i> . Attributes are writable and readable. Examples are values used to determine whether a new property value is valid (normally done with limits). Attributes are set to their default value upon Enable Device.
boresight	The actual orientation of the axis of symmetry of the main reflector with respect to established local coordinates (zenith direction and nominal azimuth zero).
CAN ID	The CAN message identification. A 29 bit identifier transmitted at the start of a CAN frame which also determines the frame's priority
characteristic	Non-changeable (static) data associated with a device <i>property</i> . Characteristics differ from <i>attributes</i> in that they read-only and rarely change (are compiled in). Examples of characteristics are the property's default values, print format and human-readable descriptions.
command	An expression that can be input to a computer system or a software module to initiate an action or affect the execution of a function.
component	A software element that exposes its services through a published interface and explicitly declares its dependencies on other components and services, can be deployed independently, is coarse-grained, requires a run-time environment, and is remotely accessible.
container	The software element that provides the runtime environment for a component, manages its lifecycle, and mediates access to its service interface.
control point	The smallest atomic quantity used when setting a hardware value. <i>Control points</i> are writable and readable; the read returns the last value written. Control points are implemented as <i>properties</i> . An example control point would be used to set a voltage using a Digital to Analog Converter (DAC).
data set	All data belonging to a particular <i>observation block</i> including UV data, astronomical information (sources, coordinates, frequencies, etc.), raw observing and reduction scripts, system data, logs, warnings, environmental data, etc.
delay tracking	The continuous adjustment of the instrumental delay to match the geometric delay as a source is tracked.
delay tracking center	The direction on the sky for which the total delay to each antenna is a constant. When the compensating delay is implemented after a down conversion (the usual case in radio interferometers) a fringe results that is a function of the down conversion local oscillator frequency. By changing the phase of this local oscillator (with the fringe rotator), the fringes may be reduced in frequency or stopped, as desired by the correlation system. Any errors in the total delay due to transmission or compensating delay imprecision result in a phase shift to the visibilities that is a function of IF frequency.
device	A <i>device</i> generally corresponds to the model of a physical device, for example, a receiver. It is a software concept used for control, and is a collection of <i>properties</i> . Devices are implemented as <i>distributed objects</i> .
distributed object	System components with which other components need to interact. In particular, the control system uses <i>distributed objects</i> to represent <i>devices</i> . Distributed objects are the smallest directly addressable entities in the system, and are generally composed

	of <i>properties</i> .
dump	The acquisition of data from the correlator corresponding to a dump time (see below).
dump time	The smallest interval of time for which a set of correlated data can be accumulated and output from the correlator.
engineer	A person who uses scientific knowledge to solve practical problems. For ALMA an engineer's principle assignment will be to build and maintain the hardware.
error	<i>Errors</i> occur as the result of <i>command</i> failure, for example, when a <i>property</i> is set. Usually they are a response to writing an inappropriate value or a hardware problem, but they can be any error condition that can be reported in the return of an operation.
fringe rotator	A mechanism to introduce a time-varying phase shift into the local oscillator signal to reduce the frequency of the oscillations of the correlator output. <i>Fringe rotation</i> allows the correlator output (whose amplitude is proportional to visibility amplitude) to be sampled at a lower rate. The fringe rotation is chosen so the fringe frequency for a point source located at the fringe stopping center would be reduced to zero (or very nearly zero). Usually the <i>fringe-stopping center</i> and the delay-tracking center coincide; both then are called the visibility phase tracking center.
function	A defined objective or characteristic action of a system or component.
functional requirement	A requirement that specifies a function that a system or component must be able to perform.
functional specification	A document that specifies the functions that a system or component must perform.
integration	A set of <i>dumps</i> , all identical in configuration (except for the antenna motion and some others), that is accumulated and forms the basic recorded unit.
interactive command	An <i>interactive command</i> can be used to specify table parameters for the next observation, start the next observation, cancel the current observation, etc.
lag	The integrated product of two digitized signals, one delayed in time with respect to the other. If the two signals are from the same source, then it is an 'auto-correlation product', while if the signals are from different sources, then it is a 'cross-correlation product.'
mode	A condition in which a system, subsystem, or component may exist. Normally it comprises a set of possible states.
module	A relatively large subdivision of the implementation items in a software <i>package</i> . In most cases a software package corresponds to a single software module, but complex software packages can be split across more software modules. A software <i>module</i> is handled as a single configuration control unit and follows a standardized directory structure. Software modules correspond to components in UML terminology.
monitor point	The smallest atomic quantity read from hardware. <i>Monitor points</i> are always read-only. The read produces the actual value of a hardware measurement. Monitor points are implemented as <i>properties</i> . An example monitor point would return the reading from a module's temperature probe.
observation	A set of <i>integrations</i> while the antennas complete an elemental pattern across the source, and possibly while frequency switching, nutator switching, etc.
observation block	Obsolete synonym for <i>scheduling block</i>
observation table	The hierarchical set of parameters that define the current <i>observation</i> .
observer	The person who prepared, or is otherwise responsible for an approved <i>observing program</i> . The <i>observer</i> is usually an astronomer.
observing program	The set of Scheduling Blocks and ancillary information necessary to completely specify the parameters needed to perform the portion of an observing proposal that has received Phase 1 approval.
observing script	The procedural representation of a scheduling block. It may contain loops and conditional tests using environmental parameters, calibration pipeline results, and current scheduling status.
observing session	A time-contiguous set of <i>scheduling blocks</i> in the same <i>observing program</i> . Note that sessions are defined <i>post facto</i> , as the scheduler only schedules <i>scheduling blocks</i> .
observing tool	A GUI tool used by astronomers to prepare observations. The <i>observing tool</i> can produce an observing proposal as well as an <i>observing program</i> , either for dynamic scheduling (service mode) or for direct execution (interactive mode).
operational mode	The mode of a system, subsystem, or component that is installed in its intended

	environment.
operational requirement	A requirement that is applicable to a system or component that is installed in its intended environment.
operational state	The state of a system, subsystem, or component that is installed in its intended environment.
operator	The person in immediate control of the array. The <i>operator</i> is not usually an astronomer.
package	A major subdivision of a software project that collects a set of associated functions that are designed, developed, and tested together and independently from other packages. Software <i>packages</i> can be recursively defined as containing other software packages.
pattern	An antenna movement that is superimposed on (added to) the tracking of the <i>target</i> . Example <i>patterns</i> are a simple offset, a raster, and a spiral. A pattern is composed of one or more “strokes”.
phase tracking	An adjustment of the LO phase needed because <i>delay tracking</i> is done at the IF and not RF frequency.
phase tracking center	Usually the fringe stopping and the delay tracking centers coincide. When this is the case, both are referred to as the visibility <i>phase tracking center</i> , sometimes called the phase referencing center.
process	A program in execution. It consists of the executable program, the program's data and stack, its program counter, stack pointer and other registers, any support data stored in the database, and all the other information needed to run the program.
property	<i>Properties</i> are the smallest atomic quantities within a <i>distributed object</i> . Properties include real control and monitor points, and they are also virtual (software) variables with features similar to real control and monitor points.
regression test	A test performed on a modified program to instill confidence that changes are correct and have not adversely affected unchanged portions of the program.
scan	A set of <i>observations</i> with a common goal, for example, a pointing scan, a focus scan, or atmospheric amplitude calibrations scan.
scheduling block	An un-interruptible scheduling unit, which may consist of a set of <i>scans</i> and logic to control their execution.
scheduler queue serialization	The prioritized list of <i>scheduling blocks</i> produced by the dynamic scheduler. The byte-stream encoding of a software object that allows it to be saved to persistent storage or transmitted across a network.
software device driver	A collection of subroutines and data that constitutes the software interface to an I/O device.
software life cycle	The period of time that begins when a software product is conceived and ends when the software is no longer used. The software life cycle typically includes concept, requirements, design, implementation, test, installation and checkout, operation and maintenance, and, sometimes, retirement. These phases may overlap or be performed iteratively.
state	The value assumed at a given instant by the variable used by the control software to represent the condition of a <i>system</i> , <i>subsystem</i> , or component. Normally it is a finer specification within a given mode.
status	The set of values of all the parameters (state, numeric read-outs, flags...) that define the condition of a <i>system</i> , <i>subsystem</i> , or component.
stereotype	A UML term for "a new kind of model element defined within the model based on an existing kind of model element". <i>Stereotypes</i> may extend the semantics but not the structure of pre-existing meta-model classes.
stroke	<i>Patterns</i> are composed of a series of separate <i>strokes</i> . For example, when a raster pattern is being performed a stroke is generally a single line in the raster.
subarray	A group of ALMA antennas. More explanation is needed here, as this is one of the most abused terms in radio astronomy.
subsystem	A secondary or subordinate <i>system</i> within a larger <i>system</i> . A <i>hardware</i> subsystem is usually a physical device or a group of physical devices equipped with the control electronics and low level software. A <i>software</i> subsystem consists of a major piece of software functionality that can be largely developed and exercised/tested independently of other parts of the system and that has well-defined external interfaces.
system	A collection of components organized to accomplish a specific function or a set of

	functions. When no further characterized, it is generally used to refer to the whole of a complex piece of equipment made up by heterogeneous parts.
target	The central position being tracked by the antenna's receiver beam. Normally this is a celestial object, but it can be anything able to be specified to the AMS.
timing event	Most ALMA computers and other hardware will receive a precise timing reference signal consisting of a periodic pulse with a period of 48 millisecond. The leading edge of each pulse marks a <i>timing event</i> .
turn	One turn of an antenna axis, or 360 degrees.
use case	A specific way of using the system by performing some part of the functionality. Each <i>use case</i> constitutes a complete course of action initiated by an <i>actor</i> , and it specifies the interaction that takes place between an actor and the <i>system</i> . The collected use cases specify all the existing ways of using the system.