Construction Project

Interface Control Document
for
ACADA – Generic Telescope Control

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Change Log

Issue	Revision	Date	Section/Page affected	Reason/ Remarks / Initiation Documents
1	a	2018-11-30	all	New document
1	b	2018-12-05	all	Adapted to template
1	c	2018-12-18	all	Adapt based on feedback of C. Montanari and D. Melkumyan.
1	d	2019-01-08	all	Adapted comments based on the review by E. Antolini
1	e	2019-08-20	all	Implement feedback by Telescope and Camera teams
1	f	2019-10-29	all	Implement LST comments. Update fig 1.
2	a	2019-11-22	all	General revision update according to updated state machine. Trim the appendix II
2	b	2019-11-28	all	Few typos fixed
2	c	2019-12-09	Cover page	Add signature fields for interface actors
2	d	2020-01-14	Up to section 3.1	Address inconsistencies, updated approver list.
2	e	2020-02-03	All	Update document to align with updated state machine
2	f	2020-03-19	All	Feedback from LST, NectarCam, FlashCam and SST added.
2	g	2020-04-24	All	Further feedback by LST
2	h	2020-04-30	Ads	Added AD6

2	i	2021-03-03	• ACADA PDR RIX 40231 Replace "EquatorialDirection" with "SkyEquatorialTarget" at TelescopeStatusData • Change the type of SBs and OBs from String to to unsigned Long Long	ACADA PDR, R1 data model discussions.
2	j	2021-12-21	• Added I-265 • Edited I-260. • Removed CAM_POINTINGASSIST from I-510. • Updated the SB and OB ID to long long on ACADA-TEL-I-150 and ACADA-TEL-I-550, to make them compliant with the SB Data Model.	Adapted pointingassist-related interface element to updated generic telescope state machine (CTA-SPE-ACD-000000-0001 2g).
2	k	2022-08-08	• Added ACADA-TEL-I-121, -122, -221, -222, -321, -322 • In “ACADA-TEL-I-220, replace “this operation must finish within 3 minutes” with “This operation must finish by the “requiredReadyTime” • Fix typo in ACADA-TEL-I-560 and ACADA-TEL-I-570 to indicate the declination goes from -90 to 90 deg. • Update cover page to correct signature matrix. • Updated references from SVN to gitlab, and to the new Redmine location.	CTA-CRE-SEI-000000-0002_V3

2	l	2023-04-26	• In " ACADA-TEL-I-080" replace "Note that the trajectory contains a vector of Ra-Dec coordinates according to the current epoch the instants of those epochs." with "Note that the trajectory is a vector, with each vector element comprising an astronomical coordinate and a timestamp. The astronomical coordinate is in the ICRS (implying J2000); the timestamps are TAI seconds since 1970-01-01T00:00:00.0 (POSIX). The array element is expected to interpolate the vector elements in time to generate astronomical coordinates with sufficient time resolution"	CTA-CRE-SEI-000000-0002 2023-03-02

List of Contributors

Name	**Organization**	**Contribution**
Igor Oya	CTA PO	The document and current version of the interface
Chiara Montanari	CTA PO	Interface overall process management
Gino Tosti	CTA PO	Earlier version of interface file, description and concept
Elisa Antolini, N. Whyborn	CTA PO	Revision of the document
K. Tegel	CTA PO	Safety Aspects
U. Schwanke, P. Wagner, M. Barcelo, F. Wegner, V. Sliusar, R. Walter, E. Lyard, I. Vovk, K. Noda, T. Le Flour, A. Fiasson, O. Blanch, P. Sizun, M. Heller, R. White, and more.	MST, NectarCam, FashCam, SST-1M, LST, SST, …	Discussions, corrections, remarks.

List of ICD actors

Actor	Role	Agreed date and signature
I. Oya	ACADA Coordinator	
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Table of Contents

List of Acronyms

CTA	Cherenkov Telescope Array
ACS	Alma Common Software
LST	Large Sized Telescope
MST	Medium Sized Telescope
SST	Small Sized Telescope
CORBA	Common Object Request Broker Architecture
ACADA	Array Control and Data Acquisition
ICD	Interface Control Document
TCS	Telescope Control System

1 Purpose and Scope

1.1 Purpose

This document specifies the requirements of interface describing the control and supervision of the Array Control and Data Acquisition (ACADA) System to any CTA Telescope.

1.2 Scope

This ICD describes the interface between the Array Control and Data Acquisition (ACADA) System (the source system) and a CTA Telescope (the target system).

The purpose of the ICD is to define the design of the interface(s) ensuring compatibility among involved interface ends by specifying form, fit, and function.

The ICD is managed by the CTAO Interface Manager (or their delegates) and represents an agreement between the relevant actors. The actors in this ICD are shown at the beginning of this document.

The ICD is used:

1. to document the interface definition,
2. to control the evolution of the interface,
3. to document the design solutions to be adhered to, for a particular interface,
4. as one of the means to ensure that the supplier design (and subsequent implementation) are consistent with the interface requirements,
5. as one of the means to ensure that the designs (and subsequent implementation) of the participating interface ends are compatible.

This Interface Control Document (ICD) documents and tracks the necessary information required to effectively define the ACADA to Telescope interface for controlling and supervising the latter, as well as any rules for communicating with them in order to give the development team guidance on architecture of the system to be developed.

The purpose of this ICD is also to clearly communicate all possible inputs and outputs from the system for all potential actions whether they are internal to the system or transparent to system users.

Its intended audience is the Systems Engineering personnel, ACADA and telescope development teams, and stakeholders interested in interfacing with the system.

2 Applicable and Reference Documents

2.1 Applicable Documents

- [AD1] CTA Architecture Document v1.0 14.04.2018
- [AD2] Generic Telescope Use Cases, Doc. No. CTA-TRE-SEI-000000-0015 Issue 2, Rev i, 4.12.2019.
- [AD3] CTA Telescope State Machine, Doc. No. CTA-SPE-TEL-000000-0001, Issue 2, Rev h, 2021-11-11
- [AD4] Common Telescope Requirements, Jama
- [AD5] Common On-Site Requirements
- [AD6] CTA On-site Data Centre ACS Deployment Specification (*in prep.*)

2.2 Reference Documents

- [RD1] Alma Common Software. G. Chiozzi, et al, “CORBA-based Common Software for the ALMA project”, in Proc SPIE 4848, 43, 2002. doi: 10.1117/12.461036
- [RD2] CORBA IDL data types. https://www.corba.org/omg_idl.htm
- [RD3] ACS Basic Control Interface Specification, Gasper Tkacik et al, Revision: 2.5.3, 2005-09-08
- [RD4] ACADA System Architecture Doc. No. CTA-TRE-COM-303000 0001, Issue 2, Rev.: i, 2022-01-14
- [RD5] ACS Error System, revision 4.1 2007-03-30
- [RD6] Erich Gamma, Richard Helm, Ralph Johnson, John M. Vlissides (1995). Design Patterns: Elements of Reusable Object-Oriented Software. Addison-Wesley. ISBN 0-201-63361-2.
- [RD7] IDL files at the CTA gitlab: https://gitlab.cta-observatory.org/cta-computing/common/acada-array-elements/telescope-icd
- [RD8] ACS Supported BACI Types. M. Plesko et al, Rev.1.4, 2005-03-17.

3 Interface Requirement specification

3.1 Overview

A CTA Telescope is a system composed by both a Camera and a Structure functional unit, each composed of hardware and software, and both coordinated by a Telescope Manager component (See Figure 1).

The Telescope Manager is responsible of managing the Telescope system as a whole. It operates by delegating to Camera and Structure sub-systems the execution of associated operations.

ACADA commands the Telescope Manager (via the Resource Manager and Central Control). The ACADA supervises the Telescope operations and observes any state change on it. Internally, the Telescope Manager interfaces with a Structure and a Camera Manager, which then coordinate all the software and hardware operations within their respective functional units. Under the Technical mode, the Telescope Manager grants ACADA access to several additional operations that only affect Camera and Structure operations and that are not available in other states (i.e., the Telescope Manager behaves as a proxy of the Telescope and Camera Manager).

Beyond the control interface specified in this document, direct monitoring interfaces between Camera and Structure components and ACADA exist. Also, there are interfaces between Camera and ACADA for the Camera data transfer from the former to the latter, and Camera trigger (timestamps) notification to the central trigger within ACADA and confirmation back to the Camera. These interfaces are outside the scope of this ICD and specified in their corresponding ICDs.

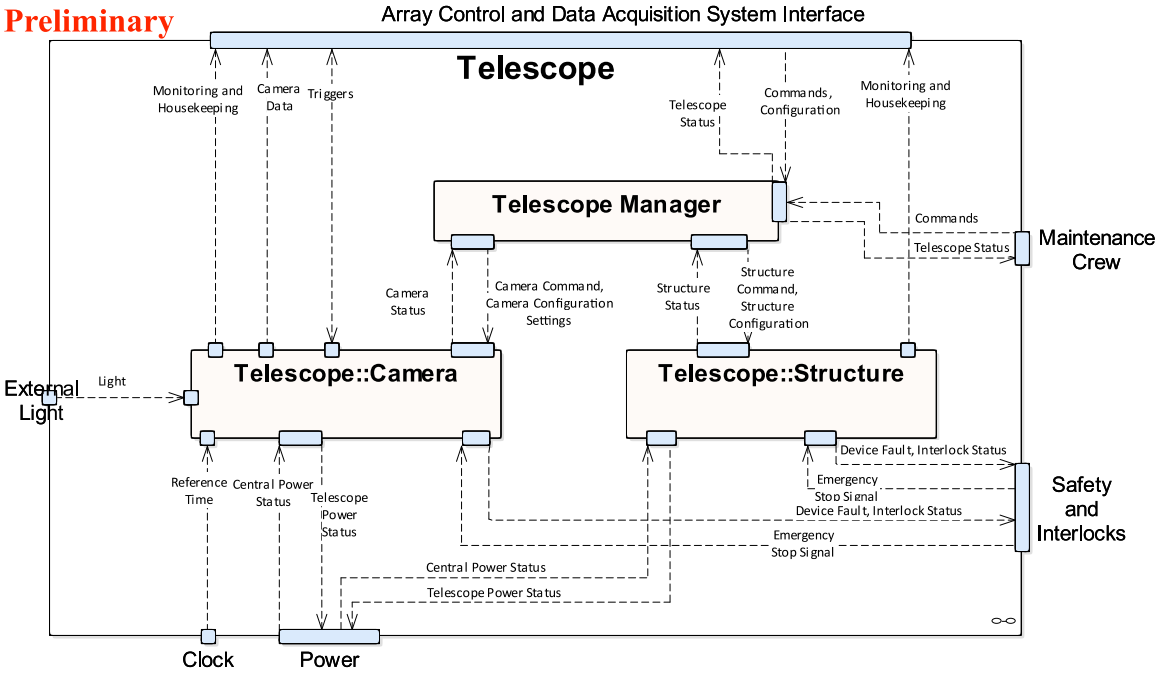

Figure 1: Decomposition of a CTA Telescope in functional units. See [AD4] for notation description and further details.

This ICD specifies the interface requirements the ACADA and Telescope Control System must meet.

This interface is a software interface, and thus it describes:

- the concept of operations for the interface,
- defines the message structure and protocols that govern the interchange of data,
- and identifies the communication paths along which the project team expects data to flow.

For each interface, the ICD provides the following information:

- A description of the data exchange format and protocol for exchange
- A description of the interface
- Assumptions where appropriate
- Estimated size and frequency of data exchange

3.2 Assumptions

The ACADA to Telescope control interface is based on the ALMA Common software control framework. [RD1].

The ACADA subsystem affected is the Resource Manager and Central Control, and in the telescope control system is the Telescope Manager [AD1].

3.2.1 Constraints

- Hardware and software environment: Both the ACADA and the high-level Telescope Control System are running under the same ACS instance and deployed in the same computer cluster, according to [AD6].
- The control interface uses standard ACS commands [RD3].
- Errors in the commands are reported as ACS (CORBA) exceptions [RD5].

3.2.2 Functional Allocation

The functions addressed in this interface are described in the [AD2], Generic Telescope Use Cases document. Specifically, this interface implements the following functions described in the telescope interface:

- Change telescope states according to [AD3], go to Ready, Standby, Observing etc. Note that those transitions managed by the own telescope such as execute init are not listed in this document, since they are not managed by ACADA.
- Monitor the state of the telescope.
- Point telescopes to horizontal and celestial coordinates

- Requesting loading a particular configuration for the observations. *This ICD does not specify how the Telescope loads its configuration from the central configuration database offered by ACADA. In what follows it should be assumed that the telescope knows how to retrieve the configuration settings from the central database. Another ICD will specify this kind of transaction.*
- Request Telescope Camera to take data
- Start pointing monitoring activities.
- Supervise the completion of all the commands submitted above, and to report when any error is raised with them.

3.2.3 Extension of the interface

Any CTA telescope must implement its interface with ACADA as described in this document. Specific telescopes may have special control interfaces with the ACADA if that telescope requires special non-generic operations that other telescopes do not have. Such a special interface shall be documented and agreed upon as an extension of this document. By default, ACADA will use the generic telescope interface as described in this document.

The following naming scheme shall be used when creating new special operation and properties beyond the generic interface:

- Operation/Methods and parameters: camelCase naming scheme, use exception instead of return codes.
- Properties: camelCase

3.2.4 Data Transfer

Data are transmitted via CORBA calls, which are implemented using the Alma Common Software (ACS) framework.

The Telescope Manager exposes a CORBA interface and the Resource Manager and Central Control is the client of that interface.

Data is transferred as arguments and return types of these CORBA calls.

Data structures are defined as CORBA IDL structures, ACS providing standard means to encode and decode these data into C++, Java and Python structures. Details on the used data structures is specified below.

3.2.5 Transactions

The following transaction types are supported:

- Synchronous methods (*sync* method hereafter). These are methods that block the operation until completed. Any problem in the operation is reported as an Exception (see exception list below). Sync calls should achieve the goal within less than 10 seconds and are blocking with configurable timeout.
- Asynchronous method (*async* method hereafter). These are non-blocking methods that report the progress and outcome via a call-back mechanism. The maximum rate the Telescope should report progress in these type of transactions is 1 Hz. These methods have two mechanisms to report errors:
    - via a direct triggering after command submission of an exception,

immediately before the asynchronous operation,

- and within the callback mechanism completion.

- ACS BACI properties, which represents properties of the system such as the state and sensors. These properties expose Synchronous and Asynchronous operations. The usual monitoring rate of those properties is up to about 1 Hz.

See [RD3] for further details

3.2.6 Security and Integrity

Integrity of the operation is handled via the following mechanisms:

- Error/Exception handling, which can be triggered when a command sent by the ACADA does not succeed. It is responsibility of the telescope to raise the adequate exception according to the definition, and the responsibility of ACADA to handle the reported error.
- Supervision. The ACADA supervision is based on a supervision tree with control ticket hierarchy. As such the Telescope manager is a leaf node of such a tree and must implemented the relevant operations. This includes a pinging mechanism that allows the two ends to infer whether the other element becomes unavailable. See [RD4] for more details.

Security aspects are not addressed in this document.

3.3 Interface specification

This section specifies all elements of the ACADA to Telescope Control interface.
Table 1 summarizes the elements of the interface, the relevant B level requirements that each element is addressing, and the relevant applicable documents.

The relevant level B requirements are stored in Jama [AD4, AD5], we report them in the Appendix I as well.

In Table 2 is also report the changes of “names” for some elements from the level B requirements in Jama

Table 1: Summary of the ACADA to Telescope Control Interface

Interface ID	Interface Name	Associated Requirement	Applicable

			Document
ACADA-TEL-I-010	Go To Initialized	B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-020	Go To Standby	B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795. B-ONSITE-0150	[AD3]
ACADA-TEL-I-030	Go To Ready	B-TEL-0420, B-ONSITE-0620, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-040	Start Observing	B-ONSITE-0620, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-050	Cancel Transition	B-ONSITE-0800, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-070	Go To Sky Target	B-TEL-0200, B-TEL-0070, B-TEL-0260, B-ONSITE-0790, B-ONSITE-0795	TC-UC-0011, TC-UC-0012, [AD3]
ACADA-TEL-I-080	Go To Proper Motion Target	B-TEL-0200, B-TEL-0070, B-TEL-0260, B-ONSITE-0790, B-ONSITE-0795	
ACADA-TEL-I-090	Go To Fixed Position	B-TEL-0070, B-TEL-0260, B-ONSITE-0790, B-ONSITE-0795	TC-UC-0010, [AD3]
ACADA-TEL-I-100	Stop Motion	B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-110	Apply Offset	B-ONSITE-0620, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-120	Configure Telescope	B-ONSITE-0780, B-TEL-0420, B-TEL-0710, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-121	Configure Telescope Sky Target	B-ONSITE-0780, B-TEL-0420, B-TEL-0710, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-122	Configure Telescope Horizon Direction	B-ONSITE-0780, B-TEL-0420, B-TEL-0710, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-130	Telescope State Property	ONSITE-0620, B-ONSITE-0760, B-ONSITE-0760	[AD3]
ACADA-TEL-I-140	Go To Technical	B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-150	Set Scheduling Block Id	B-ONSITE-0780	
ACADA-TEL-I-160	Get Telescope Status Data	B-TEL-0440	[AD1], [AD2]
Technical State Methods (Technical Interface) for Camera			
ACADA-TEL-I-200	Put Camera to Initialized	B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-1740.	[AD3]
ACADA-TEL-I-205	Warmup Camera		[AD3]
ACADA-TEL-I-210	Put Camera to Standby		[AD3]
ACADA-TEL-I-220	Configure Camera	B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]

ACADA-TEL-I-221	Configure Camera Sky Target	B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-222	Configure Camera Horizon Direction	B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-230	Put Camera to Ready		[AD3]
ACADA-TEL-I-240	Get Camera Configuration ID	B-ONSITE-0780	[AD3]
ACADA-TEL-I-250	Observe with Camera		[AD3]
ACADA-TEL-I-260	Enable Pointing Measurement Operations Assistance	B-ONSITE-0790, B-ONSITE-0795	[AD2] (TC-UC-0035)
ACADA-TEL-I-265	Disable Pointing Measurement Operations Assistance	B-ONSITE-0790, B-ONSITE-0795	[AD2] (TC-UC-0035)
ACADA-TEL-I-270	Calibrate Camera	B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-280	Cancel Camera Calibration		
ACADA-TEL-I-290	Get Camera State		[AD3]
Technical State Methods (Technical Interface) for Structure			
ACADA-TEL-I-300	Put Structure To Inititalized	B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-0750.	[AD3]
ACADA-TEL-I-310	Put Structure To Standby	B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-0710	[AD3]
ACADA-TEL-I-320	Configure Structure	B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-321	Configure Structure Sky Target	B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-322	Configure Structure Horizon Direction	B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795	[AD3]
ACADA-TEL-I-330	Put Structure To Ready	B-TEL-0420, B-ONSITE-0620, B-ONSITE-0150, B-ONSITE-0790, B-ONSITE-0795, B-TEL-0720	[AD3]
ACADA-TEL-I-340	Get Structure Configuration ID	B-ONSITE-0780	
ACADA-TEL-I-350	Align Optics	B-ONSITE-0790, B-ONSITE-0795	[AD2], [AD3]
ACADA-TEL-I-360	Cancel Align Optics		
ACADA-TEL-I-370	Take Telescope Pointing Measurement	B-ONSITE-0790, B-ONSITE-0795	[AD2], [AD3]
ACADA-TEL-I-380	Cancel Telescope Pointing Measurement		

ACADA-TEL-I-390	Get Structure State		[AD3]
Supervision Operations			
ACADA-TEL-I-400	Heartbeat	B-ONSITE-0210	

Table 2: Name changes with respect to level B requirements in Jama

old name in jama	**new name in documents**
Safe State	On.Initialized State
Engineering State	Maintenance State

3.4 Telescope Manager Control Interface Elements

See files *the Appendix II* for the implementation of this interface in CORBA IDL format.

ACADA-TEL-I-010	**Go To Initialialized**	
Description		
Puts the Telescope to the Initialized state		
Type		
ACS async call		
Command/variable		
goToInitialized()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	Callback descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx DeviceBusyEx HardwareErrorEx TimeoutEx OsErrorEx	if the command is requested in any state that is not Standby, or Technical. if a device inside the telescope is required for the operation but it is busy if the command fails due to a hardware error if was a timeout within the telescope if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This operation starts the transition to the Initialized state and will report the progress to the client until it is finished. It can only be requested when the Telescope is in the Standby, or Technical states. For the Technical to Initialized transition, both Structure and Camera must be in the Initialized state. Note: The transition Off --> Initialized (via initializing), is an operation internally managed by the Telescope and triggered via a manual switch.		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-I-020	**Go To Standby**	
Description		
Puts the element to the Standby state		
Type		
ACS async call		
Command/variable		
goToStandby ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	Callback Descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any state that is not Ready, Technical or Initialized	
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
At least twice every observing night		
Behavior identification and limitations of use		
This command starts putting the telescope into the Standby state, reporting the progress to the client until it is finished. Can only be triggered when the element is in the Ready, Technical or Initialized states. For the Technical --> Standby, both Structure and Camera must be in the Structure.Standby and Camera.Standby state**.**		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795. B-ONSITE-0150, [AD3]		

ACADA-TEL-I-030	**Go To Ready**	
Description		
Puts the element to the Ready state		
Type		
ACS async call		
Command/variable		
goToReady ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc Instant requiredReadyTime	callback descriptor time in TAI seconds since 1970-01-01T00:00:00.0 when the ACADA is expecting the telescope be ready to start Observing	Can only be in the future of the current instant, and a maximum of 90 minutes in the future.
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
IllegalParameterErrorEx	if the required time is not correct	
InvalidRequestEx	if the command is requested in any state that is not Observing	
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal synchronous command fails to an OS error	
Estimated frequency of the exchange		
About once every hour during the night		
Behavior identification and limitations of use		
This command requests the element to go into the Ready state, reporting the progress to the client until it is finished. Can only be triggered when the element is in the Observing state, and it will keep the previously loaded configuration. For the transition Standby --> Ready, use the configure command.		
References		
B-TEL-0420, B-ONSITE-0620, B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-I-040	**Start Observing**	
Description		
Starts the Observing operation.		
Type		
ACS async call		
Command/variable		
startObserving ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc Duration duration	callback descriptor Duration of Observation in TAI seconds	 Positive value
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
IllegalParameterErrorEx InvalidRequestEx DeviceBusyEx HardwareErrorEx TimeoutEx OsErrorEx	if the required duration is not correct if the command is requested in any state that is not Ready if a device inside the telescope is required for the operation but it is busy if the command fails due to a hardware error if was a timeout within the telescope if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
About once every hour during the night		
Behavior identification and limitations of use		
This operation is used by ACADA to request to handle the time of starting the Camera observations, when the *startObservingWhenArriving* flag in the *goToSkyTarget()* operation is set to false (otherwise the start of the observations is automatically handled by the Telescope manager when the target is close enough, see *goToSkyTarget()*). When the Telescope Manager receives this command, it will trigger a request to the Camera Manager to start the observations and set the global State of the Telescope as well as for the Structure to Observing. The telescope will report to the client when the observation time is done and go back to the Ready state spontaneously. Can only be triggered when the element is in the Ready state.		
References		
B-ONSITE-0620, B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-I-050	**Cancel Transition**	
Description		
Cancels an ongoing transition, returning the Telescope to the state before the transition		
Type		
ACS sync call		
Command/variable		
cancelTransition()		
Parameters	**Description and Units**	Limitations
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested when no transition is happening, or with certain transitions (see docs)	
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This operation can be called (except for the cases expressed below) while a transition from one state to another is ongoing, then the transition to the new state will be stopped, and the element will return to the previous state as fast as possible. This operation cannot be triggered via the Telescope Manager public interface while the Telescope Manager is in the following transitions: • Ready → Standby • Observing → Ready • Any state → Fault • Off ←→ Maintenance • Off ←→ On. Note: The Telescope Manager goes from machine state OFF to ON upon entering into the ON state the operational state goes to INITIALIZING and then INITIALIZED. • From and to Technical transitions cannot be cancelled (these transitions are instantaneous). Note: If this command is triggered when the Telescope is in the technical state and any or both Structure and Camera are under a transition, all these transitions are cancelled.		
References		
B-ONSITE-0800, B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-I-070	**Go to Sky Target**	
Description		
Points telescope to given celestial coordinates and starts tracking as soon as it arrives.		
Type		
ACS async call		
Command/variable		
goToSkyTarget ()		
Parameters	**Description and Units**	Limitations
SkyEquatorialTarget target	SkyEquatorialTarget (see ACADA-TEL-I-660)	Should be reachable in the sky
Duration duration	Duration of Observation in TAI seconds	Must be positive
Boolean isUrgent	If true movement is done in the fastest possible way	
Boolean startObservingWhenArriving	if true triggers transition to observing when close to target	
ACS::CBvoid cb	callback	
ACS::CBDescIn desc	descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
IllegalParameterErrorEx	if illegal coordinates are issued in the command	
InvalidRequestEx	if the command is requested in any state that is not Ready	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy	
TimeoutEx	if there was a timeout configuring the telescope.	
AsynchronousFailureEx	if an internal Asynchronous call fails.	
OsErrorEx .	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Once Every hour		
Behavior identification and limitations of use		
The telescope will start moving upon receiving this command and start tracking the target on arrival to the position. If startObservingWhenArriving is TRUE then the Camera will start Observing right in the moment the target position enters in the field of view (a configurable tolerance for the distance at which data taking should be start will be set[1]) i.e. before the Structure is Tracking, and the state of the Telescope as a whole will be Observing. If startObservingWhenArriving is FALSE then the state of the whole telescope is Ready, structure is in the Observing.Tracking state and the Camera is in the Ready state. This command can only be issued when the Telescope is in the Ready state, or if the telescope is in the Technical State and Structure is in the Ready state (see below). If the Telescope is in the Technical State (and Structure in the Ready state) this command only affects the Structure. In that case, no commands will be sent to the Camera Manager from the Telescope Manager, and no Camera observation will be triggered. If isUrgent is TRUE, the repositioning is performed in the fastest possible trajectory irrespective the expected duration of the observation (see B-TEL-0260). Note that it may not be possible to perform the whole expected observation duration without applying a re-slewing in order to avoid end-switches, however the tracking time should be at least 10 minutes.		
References		
B-TEL-0200, B-TEL-0070, B-TEL-0260, B-ONSITE-0790, B-ONSITE-0795, TC-UC-0011, TC-UC-0012, [AD3]		

[1] It is assumed that this is static configuration loaded at system startup, and not part of this interface.

ACADA-TEL-I-080	Go To Proper Motion Target
Description	
Commands telescope to follow a target by providing a trajectory in celestial coordinates.	
Type	
ACS async call	
Command/variable	
goToProperMotionTarget ()	

Parameters	**Description and Units**	Limitations
SkyEquatorialTrajectory trajectory	The Ra Dec position for every s. at a given epoch where Telescope must be pointing to (see data structure SkyEquatorialTrajectory below)	Should be reachable in the sky and cover the duration
Duration duration	Duration of Observation in TAI seconds	Must be positive
Boolean startObservingWhenArriving	if true triggers transition to observing when close to target	
Boolean isUrgent	if true movement is performed in the fastest possible trajectory irrespective the expected duration of the observation.	
ACS::CBvoid cb	callback	
ACS::CBDescIn desc	descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
IllegalParameterErrorEx	if illegal coordinates are issued in the command	
InvalidRequestEx	if the command is requested in any state that is not Ready	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy	
TimeoutEx	if there was a timeout configuring the telescope.	
AsynchronousFailureEx	if an internal Asynchronouscall fails.	
OsErrorEx .	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasional – not usual type of observation		
Behavior identification and limitations of use		
The telescope repositions and then starts to follow a target on arrival at the first valid position of the trajectory. If startObservingWhenArriving is TRUE then the Camera will start Observing right at the moment the target position enters in the field of view (a configurable tolerance for the distance at which data taking should be started will be set). This means that the Camera start to observe while the Structure is still slewing, the Telescope transitions to the Observing state spontaneously. If startObservingWhenArriving is FALSE then the state of the whole telescope is Ready, Structure is Observing-Tracking and the Camera is Ready. If isUrgent flag is TRUE, the repositioning is performed in the fastest possible trajectory irrespective the expected duration of the observation (see B-TEL-0260). Note that it may not be possible to perform the whole expected observation duration without applying a re-slewing in order to avoid end-switches, however the tracking time should be at least 10 minutes. This command can only be issued when the Telescope is in the Ready state, or if the telescope is in the Technical State and Structure is in the Ready state. If the Telescope is in the Technical State (and Structure in the Ready state) this command only affects the Structure. In that case, no commands will be sent to the Camera Manager from the Structure Manager, and no Camera observation will be triggered. **Note that the trajectory is a vector, with each vector element comprising an astronomical coordinate and a timestamp. The astronomical coordinate is in the ICRS (implying J2000); the timestamps are TAI seconds since 1970-01-01T00:00:00.0 (POSIX). The array element is expected to interpolate the vector elements in time to generate astronomical coordinates with sufficient time resolution**		
References		
B-TEL-0200, B-TEL-0070, B-TEL-0260, B-ONSITE-0790, B-ONSITE-0795, TC-UC-0011, TC-UC-0012, [AD3]		

ACADA-TEL-I-090	**Go To Fixed Position**	
Description		
Points the telescopes towards a fixed Alt-Az position and stays there.		
Type		
ACS async call		
Command/variable		
goToFixedPosition ()		
Parameters	**Description and Units**	Limitations
HorizonDirection position Duration duration Boolean startObservingWhenArriving ACS::CBvoid cb ACS::CBDescIn desc	(see data structure below) Duration of Observation in TAI seconds if true triggers transition to observing when close to target callback descriptor	Should be reachable in the sky Must be positive
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
IllegalParameterErrorEx InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if illegal coordinate values are issued in the command if the command is requested in any state that is not Ready if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronouscall fails. if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
From a few times per a night to once every few weeks.		
Behavior identification and limitations of use		
The telescope will start moving upon receiving this command and stop pointing the target direction when arriving to the position. If startObservingWhenArriving is TRUE then the Camera will start Observing right in the moment the target position enters in the field of view (a configurable tolerance for the distance at which data taking should started will be set), and the state of the Telescope as a whole will be Observing. If startObservingWhenArriving is FALSE then the state of the whole telescope is Ready, Structure is Observing-Tracking and the Camera is in the Ready state. When the duration time is done the Telescope goes back to the Ready state. This command can only be issued when the Telescope is in the Ready state, or if the telescope is in the Technical State and Structure is in the Ready state (see below). If the Telescope is in the Technical State (and Structure in the Ready state) this command only affects the Structure. In that case, no commands will be sent to the Camera Manager from the Structure Manager, and no Camera observation will be triggered.		
References		
B-TEL-0070, B-TEL-0260, , B-ONSITE-0790, B-ONSITE-0795, TC-UC-0010, [AD3]		

ACADA-TEL-I-100	**Stop Motion**	
Description		
Cancel the current motion and stop telescope movement.		
Type		
ACS async call		
Command/variable		
stopMotion ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc		
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested when the Structure is not moving	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy	
TimeoutEx	if there was a timeout configuring the telescope.	
AsynchronousFailureEx	if an internal Asynchronouscall fails.	
OsErrorEx .	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
Only applicable in the Observing(tracking) or Ready(slewing) states, the Structure will go to the Ready state.		
References		
B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-I-110	**Apply Offset**	
Description		
Applies an offset in celestial coordinates to given position without stopping the Observation operations.		
Type		
ACS async call		
Command/variable		
applyOffset()		
Parameters	**Description and Units**	Limitations
raOffset decOffset ACS::CBvoid cb ACS::CBDescIn desc	distance in right ascension in degrees distance in declination in degrees callback descriptor	From -30/cos(dec) to +30/cos(dec) From -30 to +30
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
IllegalParameterErrorEx InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if illegal coordinates are issued in the command if the command is requested in any state that is not Observing, or when RA and DEC offset are legal but cannot be applied at the same time at the given target position if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Once Every 10 – 30 minutes		
Behavior identification and limitations of use		
This command will trigger the telescope to immediately “offset”, i.e., to move the Structure to a new position, while Camera acquisition continues. This operation can only happen while in Telescope.Observing state.		
References		
B-ONSITE-0620, B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-I-120	**Configure Telescope**
Description	
Configures the Telescope so it is ready for observations.	
Type	
ACS async call	
Command/variable	
configure ()	
Parameters	
String cameraConfigId String structureConfigId InstantrequiredReadyTime ACS::CBvoid cb ACS::CBDescIn desc	the ID of the configuration that the Camera should load the ID of the configuration that the Structure should load time in TAI seconds since 1970-01-01T00:00:00.0 when the ACADA is expecting the telescope be ready to start Observing the callback to which the method will report the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
IllegalParameterErrorEx InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if an illegal parameter is issued in the command if the command is requested in any state that is not Standby or Ready if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The telescope receives the Camera configuration ID and then asks the ACADA configuration database the configuration data that is referenced in that ID. Upon receiving the configuration data, the Telescope initiates the configuration operation for both the structure and the Camera elements. The telescope Manager will decide, according to the "requiredReadyTime" parameter, if internal Camera and Structure calibrations (e.g. mirror alignment) can be performed. The telescope will inform ACADA when all the configuration activities are done by reporting the callback is done. At the end of this operation the Telescope must be in the Ready state, and the telescope will wait for further commands from ACADA. This operation can only be started in the Telescope Standby or Ready states, and will trigger a transition to the Ready state and request Structure and Camera to make a configure operation.	
References	
B-ONSITE-0780, B-TEL-0420, B-TEL-0710, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, [AD3]	

ACADA-TEL-I-121	**Configure Telescope Sky Target**
Description	
Configures the Telescope so it is ready for observations.	
Type	
ACS async call	
Command/variable	
configureSkyTarget ()	
Parameters	
SkyEquatorialTarget target	Approximate pointing direction for the next SB as an SkyEquatorialTarget (see ACADA-TEL-I-660)
String cameraConfigId	the ID of the configuration that the Camera should load
String structureConfigId	the ID of the configuration that the Structure should load
InstantrequiredReadyTime	time in TAI seconds since 1970-01-01T00:00:00.0 when the ACADA is expecting the telescope be ready to start Observing
ACS::CBvoid cb	the callback to which the method will report
ACS::CBDescIn desc	the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
IllegalParameterErrorEx	if an illegal parameter is issued in the command
InvalidRequestEx	if the command is requested in any state that is not Standby or Ready
HardwareErrorEx	if the command fails due to a hardware error
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy
TimeoutEx	if there was a timeout configuring the telescope.
AsynchronousFailureEx	if an internal Asynchronous call fails.
OsErrorEx .	if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The telescope receives the Camera configuration ID and Structure configuration ID and then asks the ACADA configuration database the configuration data that is referenced in that ID. The telescope slews and repositions itself so it points to the direction indicated in the target parameter and performs the calibration operations required to bring the Telescope to the Ready state. Upon receiving the configuration data, the Telescope initiates the configuration operation for both the structure and the Camera elements. The telescope Manager will decide, according to the "requiredReadyTime" parameter, if internal Camera and Structure calibrations (e.g. mirror alignment, camera electronics calibrations) can be performed. The telescope will inform ACADA when all the configuration activities are done by reporting the callback is done. At the end of this operation the Telescope must be in the Ready state, the Structure in the Observing state (tracking), the Camera in the Ready state, and the telescope will wait for further commands from ACADA while tracking. This operation can only be started in the Telescope Standby or Ready states, and will trigger a transition to the Ready state and request Structure and Camera to make a configure operation.	
References	
B-ONSITE-0780, B-TEL-0420, B-TEL-0710, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, **[AD3]**	

ACADA-TEL-I-122	**Configure Telescope Horizon Direction**
Description	
Configures the Telescope so it is ready for observations.	
Type	
ACS async call	
Command/variable	
configureHorizonDirection ()	
Parameters	
HorizonDirection direction	Approximate pointing direction for the next SB as an HorizonDirection (see ACADA-TEL-I-590)
String cameraConfigId	the ID of the configuration that the Camera should load
String structureConfigId	the ID of the configuration that the Structure should load
InstantrequiredReadyTime	time in TAI seconds since 1970-01-01T00:00:00.0 when the ACADA is expecting the telescope be ready to start Observing
ACS::CBvoid cb	the callback to which the method will report
ACS::CBDescIn desc	the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
IllegalParameterErrorEx	if an illegal parameter is issued in the command
InvalidRequestEx	if the command is requested in any state that is not Standby or Ready
HardwareErrorEx	if the command fails due to a hardware error
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy
TimeoutEx	if there was a timeout configuring the telescope.
AsynchronousFailureEx	if an internal Asynchronous call fails.
OsErrorEx .	if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The telescope receives the Camera configuration ID and Structure configuration ID and then asks the ACADA configuration database the configuration data that is referenced in that ID. The telescope slews and repositions itself so it points to the direction indicated in the direction parameter and performs the calibration operations required to bring the Telescope to the Ready state. Upon receiving the configuration data, the Telescope initiates the configuration operation for both the structure and the Camera elements. The telescope Manager will decide, according to the "requiredReadyTime" parameter, if internal Camera and Structure calibrations (e.g. mirror alignment, camera electronics calibrations) can be performed. The telescope will inform ACADA when all the configuration activities are done by reporting the callback is done. At the end of this operation the Telescope must be in the Ready state, the Structure in the Ready state, the Camera in the Ready state, and the telescope will wait for further commands from ACADA. This operation can only be started in the Telescope Standby or Ready states, and will trigger a transition to the Ready state and request Structure and Camera to make a configure operation.	
References	
B-ONSITE-0780, B-TEL-0420, B-TEL-0710, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, **[AD3]**	

ACADA-TEL-I-130	**Telescope State Property**	
Description		
The state of the Telescope Manager		
Type		
ACS property		
Command/variable		
ROArrayElementState state		
Parameters	**Description and Units**	Limitations
Returns		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
Estimated frequency of the exchange		
At about 1Hz		
Behavior identification and limitations of use		
Should be available at any state		
References		
ONSITE-0620, B-ONSITE-0760, B-ONSITE-0760, [AD3]		

ACADA-TEL-I-140	**Go To Technical**	
Description		
Puts the telescope under the Technical state		
Type		
ACS sync call		
Command/variable		
goToTechnical ()		
Parameters	**Description and Units**	Limitations
None		
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any state that is not Initialized or Standby	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy	
TimeoutEx	if there was a timeout configuring the telescope.	
AsynchronousFailureEx	if an internal Asynchronous call fails.	
OsErrorEx .	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Once Every few nights		
Behavior identification and limitations of use		
Telescope Manager will immediately go into the Technical state, while individual elements Camera and Structure Managers will retain their original state. The operation can only be triggered in the Initialized and Standby states. Under the technical state, specific Camera and Structure operations are enabled in the Telescope Manager interface.		
References		
B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-I-150	**Set Scheduling Block ID**	
Description		
Specifies the Scheduling Block ID for the next Observation operation		
Type		
ACS sync call		
Command/variable		
setSbId ()		
Parameters	**Description and Units**	Limitations
unsigned Long Long sbId	the ID of the Scheduling Block associated to the next observation	Must use a valid Scheduling Block ID format (TBD)
unsigned Long Long obsId	the ID of the first Observation Block of the Scheduling Block	Must use a valid Observation Block ID format (TBD)
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
IllegalParameterErrorEx InvalidRequestEx	If an illegal SB or OB ID is issued in the command if the command is requested in any state that is not Ready	
Estimated frequency of the exchange		
Once every hour		
Behavior identification and limitations of use		
The Telescope registers the next SB ID and the ID of the first OB of the SB. This will be used for logging purposes internally in the Telescope Manager. Can only be requested when the Telescope is in the Ready state.		
References		
B-ONSITE-0780		

ACADA-TEL-I-160	**Get Telescope Status Data**	
Description		
Returns the basic telescope status information		
Type		
ACS sync call		
Command/variable		
GetTelescopeStatusData ()		
Parameters		
Returns		
TelescopeStatusData		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
Estimated frequency of the exchange		
Every few seconds		
Behavior identification and limitations of use		
The Telescope feeds and returns the status data of the Telescope (see below ACADA-TEL-I-650). This operation can be called any time, and the Telescope manager should be able to return the status always. When a field of the TelescopeStatusData structure is not defined for the current Telescope state (e.g. sbId in the Initialized state), the field should be returned empty.		
References		
B-TEL-0440, **[AD1]**, [AD2], See TelescopeStatusData data structure		

3.5 Specific Camera Operations

These are operations only affecting Camera, which are accessible to ACADA from the Telescope Manager only in the technical mode. In the other states, these methods will be rejected.

ACADA-TEL-I-200	**Put Camera to Initialized**	
Description		
Puts the Camera to the Initialized state.		
Type		
ACS async call		
Command/variable		
putCameraToInitialized()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	callback descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Camera state that is not Standby, and Telescope state not Technical	
DeviceBusyEx	if a device inside the Telescope is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This operation starts the transition to the Initialized Camera state and will report the progress to the client until it is finished. It can only be requested when the Camera is in the Standby state, and when the Telescope Manager is in the Technical state. Note: The transition Off --> Initialized (via initializing), cannot be triggered by any client and it is internally managed. The transition should be triggered by a manual switch, beyond the reach of this interface. The operation should finish within 5 minutes.		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, [AD3]		

ACADA-TEL-ICD-205 Warmup Camera	
Description	
Warms up the Camera.	
Type	
ACS async call	
Command/variable	
warmUpCamera ()	
Parameters	
ACS::CBvoid cb ACS::CBDescIn desc	the callback to which the method will report the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if the command is requested when the Camera is not is not On or Standby if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
Once every observing night.	
Behavior identification and limitations of use	
It requests the Camera to warmup itself. If the Camera is in the Initialized state, this command starts the transition to the Standby.WarmingUp state. When the Camera is warmed up, it will go spontaneously to the Camera.Standby.Idle state. This operation can be started only in: • Camera.Initialized state, which will trigger a transition to the Camera.Standby state. • Camera.PointingAssist state, which will trigger a transition to the Camera.Standby[WarmingUp, StandbyPointingAssitOn] state.	
References	
B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, [AD3]	

ACADA-TEL-I-210	**Put Camera To Standby**	
Description		
Put the Camera to the Standby state.		
Type		
ACS async call		
Command/variable		
putCameraToStandby ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	callback descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Camera state that is not Ready, and Telescope state Technical	
DeviceBusyEx	if a device inside the Camera is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This command starts putting the Camera into the Standby state from the Ready state, reporting the progress to the client until it is finished. Can only be triggered when the Camera is in the Ready state. To go to Standby state from the Initialized State, warmUpCamera() should be used		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-1710, [AD3]		

ACADA-TEL-I-220	**Configure Camera**
Description	
Configures the Camera so it is ready for Observations.	
Type	
ACS async call	
Command/variable	
configureCamera()	
Parameters	
String cameraConfigId Instant requiredReadyTime ACS::CBvoid cb ACS::CBDescIn desc	the ID of the configuration that the Camera should load TAI seconds since 1970-01-01T00:00:00.0 (POSIX) when the ACADA is expecting the telescope be ready to start Observing the callback to which the method will report the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
IllegalParameterErrorEx InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if an illegal parameter is issued in the command if the command is requested in any state that is not Standby y or Ready if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The Camera receives the Camera configuration ID and then asks the ACADA configuration database for the configuration data item that is referenced in that ID. The Camera initiates the configuration operation according to those configuration setting. The Camera will inform the Telescope Manager when all the configuration activities are done. This operation must finish by the requiredReadyTime, and at the end of this operation the Camera must be in the Ready state. See [AD2, AD3] for further details. This operation can only be started in Camera Standby or Ready states, the Telescope Manager in Technical state. When triggered in the Ready state, it will trigger a re-configuring operation.	
References	
B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, [AD3]	

ACADA-TEL-I-221	**Configure Camera Sky Target**
Description	
Configures the Camera so it is ready for Observations.	
Type	
ACS async call	
Command/variable	
configureCameraSkyTarget()	
Parameters	
SkyEquatorialTarget target	Approximate pointing direction for the next SB as an SkyEquatorialTarget (see ACADA-TEL-I-660)
String cameraConfigId	the ID of the configuration that the Camera should load
Instant requiredReadyTime	TAI seconds since 1970-01-01T00:00:00.0 (POSIX) when the ACADA is expecting the telescope be ready to start Observing
ACS::CBvoid cb	the callback to which the method will report
ACS::CBDescIn desc	the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
IllegalParameterErrorEx	if an illegal parameter is issued in the command
InvalidRequestEx	if the command is requested in any state that is not Standby y or Ready
HardwareErrorEx	if the command fails due to a hardware error
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy
TimeoutEx	if there was a timeout configuring the telescope.
AsynchronousFailureEx	if an internal Asynchronous call fails.
OsErrorEx .	if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The Camera receives the Camera configuration ID and then asks the ACADA configuration database for the configuration data item that is referenced in that ID. The Camera initiates the configuration operation according to the configuration data and the target information. The Camera will inform the Telescope Manager when all the configuration activities are done. This operation must finish by the requiredReadyTime, and at the end of this operation the Camera must be in the Ready state. See [AD2, AD3] for further details. This operation can only be started in Camera Standby or Ready states, the Telescope Manager in Technical state. When triggered in the Ready state, it will trigger a re-configuring operation..	
References	
B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, **[AD3]**	

ACADA-TEL-I-222	**Configure Camera Horizon Direction**
Description	
Configures the Camera so it is ready for Observations.	
Type	
ACS async call	
Command/variable	
configureCameraHorizonDirection ()	
Parameters	
HorizonDirection direction String cameraConfigId Instant requiredReadyTime ACS::CBvoid cb ACS::CBDescIn desc	Approximate pointing direction for the next SB as an HorizonDirection (see ACADA-TEL-I-590) the ID of the configuration that the Camera should load TAI seconds since 1970-01-01T00:00:00.0 (POSIX) when the ACADA is expecting the telescope be ready to start Observing the callback to which the method will report the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
IllegalParameterErrorEx InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if an illegal parameter is issued in the command if the command is requested in any state that is not Standby y or Ready if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The Camera receives the Camera configuration ID and then asks the ACADA configuration database for the configuration data item that is referenced in that ID. The Camera initiates the configuration operation according to the configuration data and the target information. The Camera will inform the Telescope Manager when all the configuration activities are done. This operation must finish by the requiredReadyTime, and at the end of this operation the Camera must be in the Ready state. See [AD2, AD3] for further details. This operation can only be started in Camera Standby or Ready states, the Telescope Manager in Technical state. When triggered in the Ready state, it will trigger a re-configuring operation.	
References	
B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, **[AD3]**	

CADA-TEL-I-230	**Put Camera To Ready**	
Description		
Puts the Camera to the Ready state.		
Type		
ACS async call		
Command/variable		
putCameraToReady ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	callback descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Camera state that is not Ready, and Telescope state is not Technical	
DeviceBusyEx	if a device inside the Camera is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This command requests the Camera to go into the Ready state, reporting the progress to the client until it is finished. Can only be triggered when the Camera is in the Observing state, and it will keep the previously loaded configuration. For the transition Standby --> Ready or to reconfigure Camera, the configureCamera() command should be used. The operation should finish within 3 minutes.		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-1710, [AD3]		

ACADA-TEL-I-240	**Get Camera Configuration ID**
Description	
Returns the current Camera configuration ID under use	
Type	
ACS sync call	
Command/variable	
getCameraConfigId()	
Parameters	
Returns	
String	the current Camera configuration ID, or “none” if no configuration is set.
Exceptions (all at arrayelementinterfaceexceptions namespace)	
.	
Estimated frequency of the exchange	
Occasionally	
Behavior identification and limitations of use	
References	
B-ONSITE-0780, [AD3]	

ACADA-TEL-I-250	**Observe with Camera**
Description	
Starts the Observing operation with the Camera.	
Type	
ACS async call	
Command/variable	
observeWithCamera()	
Parameters	
Duration duration_ ACS::CBvoid cb ACS::CBDescIn desc	the duration of the observations in TAI seconds the callback to which the method will report the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
IllegalParameterEx InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	If the required time is not correct if the command is requested in any Camera state that is not Ready, and any Telescope Manager state that it not Technical if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
Occassional	
Behavior identification and limitations of use	
This operation is used by ACADA to request to handle the time of start of the Camera observations. The Camera will go to the Observing State. The telescope Manager will report to the client when the observation time is done, and Camera will go back to the Ready state spontaneously (transition managed by the Telescope Manager). Can only be triggered when the Camera is in the Ready state, and Telescope Manager is in Technical state.	
References	
B-TEL-1720, B-ONSITE-0780, B-ONSITE-0780, B-ONSITE-0790, B-ONSITE-0795, [AD3]	

ACADA-TEL-I-260	**Enable Pointing Measurement Operations Assistance**	
Description		
Prepares the Camera system for pointing monitoring exposures e.g. "set target mode"		
Type		
ACS async call		
Command/variable		
enablePointingAssist ()		
Parameters	**Description and Units**	Limitations
None		
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Camera state that is not Initialized, Standby, or Ready	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the Camera is busy	
TimeoutEx	if there was a timeout inside the Camera.	
AsynchronousFailureEx	if an internal Asynchronous call fails.	
OsErrorEx .	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Depending on the telescope type, once every few nights or less.		
Behavior identification and limitations of use		
When this command is received, the Camera prepares itself to support Telescope pointing monitoring measurements (e.g. TPoints). The specific implementation may vary from telescope to telescope type, e.g. for a certain particular telescope type it would mean to prepare a target (“go to target mode”) in which projecting the reflected image from a star. This operation is usually managed by the Telescope manager and can only be triggered when the Camera is in the Initialized, Standby.PointingAssistOff, or Ready states. Depending on the starting state, the following transitions happen: • If the telescope is in the Initialized State, the Camera starts a transition to the PointingAssist state • If the camera is In the Standby.PointingAssistOff State, the camera initiates a transition to the Standby.PointingAssistOn State. • If the camera is in the Ready state, the camera initiates a transition to the Standby[Idle, PointingAssistOn State]. See [AD3] for more details.		
References		
B-ONSITE-0790, B-ONSITE-0795, [AD3], TC-UC-0035		

ACADA-TEL-I-265	**Disable Pointing Measurement Operations Assistance**	
Description		
Disables the Camera system readiness for pointing monitoring exposures		
Type		
ACS async call		
Command/variable		
disablePointingAssist ()		
Parameters	**Description and Units**	Limitations
None		
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Camera state that is not PointingAssist or Standby	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the Camera is busy	
TimeoutEx	if there was a timeout inside the Camera.	
AsynchronousFailureEx	if an internal Asynchronous call fails.	
OsErrorEx .	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Depending on the telescope type, once every few nights or less.		
Behavior identification and limitations of use		
Disables the pointing assistance mode. This operation is usually managed by the Telescope manager and can only be triggered when the Camera is in the PointingAssist, or Standby.PointingAssistOn states. Depending on the starting state, the following transitions happen: • If the telescope is in the PointingAssist State, the Camera starts a transition to the Initialized state • If the camera is In the Standby.PointingAssistOn State, the camera initiates a transition to the Standby.PointingAssistOff State. See [AD3] for more details		
References		
B-ONSITE-0790, B-ONSITE-0795, [AD3], TC-UC-0035		

ACADA-TEL-I-270	**Calibrate Camera**
Description	
Start a standalone Camera calibration operation.	
Type	
ACS async call	
Command/variable	
calibrateCamera()	
Parameters	
ACS::CBvoid cb ACS::CBDescIn desc	the callback to which the method will report the descriptor of the Callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if the command is requested in any state that is not Ready if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The Camera performs an internal calibration activity. The type of calibration is specified via the command configure () (see ACADA-TEL-I-220). This operation can only be started in Camera Ready state. Note: This command assumes Camera Flat-Fielding operation is a type of calibration and can be selected according to the ID, and that the Camera can decide to open or close its lids if this particular calibration operation requires it.	
References	
B-ONSITE-0790, B-ONSITE-0795, Ref to Camera Calibration Time Constraints, for each type [AD3]	

ACADA-TEL-I-280	**Cancel Camera Calibration**
Description	
Cancel an on-going Camera flat-fielding or calibration operation.	
Type	
ACS sync call	
Command/variable	
cancelCameraCalibration()	
Parameters	
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if the command is requested in any state that is not calibrating if the command fails due to a hardware error if a device inside the Camera is required for the operation but it is busy if there was a timeout in the telescope. If an internal Asynchronous call fails. If an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
About once every hour	
Behavior identification and limitations of use	
The Camera cancels an ongoing an internal flat-fielding or calibration activity. This operation can only be started if such an operation is happening.	
References	
B-ONSITE-0790, B-ONSITE-0795	

ACADA-TEL-I-290	**Get Camera State**
Description	
Returns the current Camera state.	
Type	
ACS sync call	
Command/variable	
getCameraState()	
Parameters	
Returns	
CameraState	The state of the Camera Manager
Exceptions (all at arrayelementinterfaceexceptions namespace)	
Estimated frequency of the exchange	
Very occasional	
Behavior identification and limitations of use	
Should work at any state of the Telescope Manager	
References	
[AD3]	

3.6 Specific Structure Operations

These are operations only affecting the Structure, which are accessible to ACADA from the Telescope Manager only in the technical mode. In the other states, these methods will be rejected.

ACADA-TEL-I-300	**Put Structure To Initialized**	
Description		
Puts the Structure to the Initialized state.		
Type		
ACS async call		
Command/variable		
putStructureToInitialized()		
Parameters	**Description and Units**	Limitations
ACS::Cbvoid cb ACS::CBDescIn desc	callback descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Structure state that is not Standby, and Telescope state is not Technical	
DeviceBusyEx	if a device inside the Telescope is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This operation starts the transition to the Initilized Structure state and will report the progress to the client until it is finished. It can only be requested when the Structure is in the Standby state, and the Telescope state is Technical. Note: The transition Off → Initialized (via initializing), cannot be triggered by any client and it is internally managed. The transition should be triggered via other means that are beyond this interface. The operation should finish within 4 minutes.		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-0750 [AD3]		

ACADA-TEL-I-310	**Put Structure to Standby**	
Description		
Put the Structure to the Standby state.		
Type		
ACS async call		
Command/variable		
putStructureToStandby ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	callback descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Structure state that is not Ready, and Telescope state is not Technical	
DeviceBusyEx	if a device inside the Structure is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This command requests the Structure to go to the Standby state, reporting the progress to the client until it is finished. Can only be triggered when the Structure is in the Ready or Initialized state, and the Telescope Manager state is Technical. The operation should finish within 30 minutes.		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-1710, [AD3]		

ACADA-TEL-I-320	**Configure Structure**
Description	
Configures the Structure so it is ready for Observations.	
Type	
ACS async call	
Command/variable	
configureStructure()	
Parameters	
String structureConfigId Instant requiredReadyTime ACS::CBvoid cb ACS::CBDescIn desc	the ID of the configuration that the Structure should load TAI seconds since 1970-01-01T00:00:00.0 (POSIX) when the ACADA is expecting the Structure be ready to start Observing the callback to which the method will report the descriptor of the callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if the command is requested in any state that is not Standby or Ready, and the Telescope Manager state is not Technical if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
Ocassionally	
Behavior identification and limitations of use	
The Structure initiates the configuration operation, retrieving any required configuration data from the ACADA Configuration database. The Structure will inform the Telescope Manager when all the configuration activities are done. At the end of this operation the Structure must be in the Ready state. See [AD2, AD3] for further details. This operation can only be started when the Structure is in the Standby or Ready states, and the Telescope Manager is in the Technical state. If the command is requested in the Ready state, it will trigger a re-configuration.	
References	
B-ONSITE-0780, [AD3]	

ACADA-TEL-I-321	**Configure Structure Sky Target**
Description	
Configures the Structure so it is ready for Observations.	
Type	
ACS async call	
Command/variable	
configureStructureSkyTarget()	
Parameters	
SkyEquatorialTarget target	Approximate pointing direction for the next SB as an SkyEquatorialTarget (see ACADA-TEL-I-660)
String structureConfigId	the ID of the configuration that the Structure should load
Instant requiredReadyTime	TAI seconds since 1970-01-01T00:00:00.0 (POSIX) when the ACADA is expecting the Structure be ready to start Observing
ACS::CBvoid cb	the callback to which the method will report
ACS::CBDescIn desc	the descriptor of the callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
InvalidRequestEx	if the command is requested in any state that is not Standby or Ready, and the Telescope Manager state is not Technical
HardwareErrorEx	if the command fails due to a hardware error
DeviceBusyEx	if a device inside the telescope is required for the operation but it is busy
TimeoutEx	if there was a timeout configuring the telescope.
AsynchronousFailureEx	if an internal Asynchronous call fails.
OsErrorEx .	if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
Ocassionally	
Behavior identification and limitations of use	
The Structure receives the Structure configuration ID and then asks the ACADA configuration database for the configuration data item that is referenced in that ID. The Structure initiates the configuration operation according to the configuration data and the target information. The Structure will inform the Telescope Manager when all the configuration activities are done. At the end of this operation the Structure must be in the Observing (Tracking) state. See [AD2, AD3] for further details. This operation can only be started when the Structure is in the Standby or Ready states, and the Telescope Manager is in the Technical state. If the command is requested in the Ready state, it will trigger a re-configuration.	
References	
B-ONSITE-0780, **[AD3]**	

ACADA-TEL-I-322	**Configure Structure Horizon Direction**
Description	
Configures the Structure so it is ready for Observations.	
Type	
ACS async call	
Command/variable	
configureStructureHorizonDirection ()	
Parameters	
HorizonDirection direction String structureConfigId Instant requiredReadyTime ACS::CBvoid cb ACS::CBDescIn desc	Approximate pointing direction for the next SB as an HorizonDirection (see ACADA-TEL-I-590) the ID of the configuration that the Structure should load TAI seconds since 1970-01-01T00:00:00.0 (POSIX) when the ACADA is expecting the Structure be ready to start Observing the callback to which the method will report the descriptor of the callback
Returns	
Void	
Exceptions (all at arrayelementinterfaceexceptions namespace)	
InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx .	if the command is requested in any state that is not Standby or Ready, and the Telescope Manager state is not Technical if the command fails due to a hardware error if a device inside the telescope is required for the operation but it is busy if there was a timeout configuring the telescope. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error
Estimated frequency of the exchange	
Ocassionally	
Behavior identification and limitations of use	
The Structure receives the Structure configuration ID and then asks the ACADA configuration database for the configuration data item that is referenced in that ID. The Structure initiates the configuration operation, retrieving any required configuration data from the ACADA Configuration database. The Structure initiates the configuration operation according to the configuration data and the target information. The Structure will inform the Telescope Manager when all the configuration activities are done. At the end of this operation the Structure must be in the Ready state. See [AD2, AD3] for further details. This operation can only be started when the Structure is in the Standby or Ready states, and the Telescope Manager is in the Technical state. If the command is requested in the Ready state, it will trigger a re-configuration.	
References	
B-ONSITE-0780, **[AD3]**	

ACADA-TEL-I-330	**Put Structure to Ready**	
Description		
Put the Structure to the Ready state.		
Type		
ACS async call		
Command/variable		
putStructureToReady ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	callback descriptor	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Structure state that is not Observing, and Telescope state Technical	
DeviceBusyEx	if a device inside the Structure is required for the operation but it is busy	
HardwareErrorEx	if the command fails due to a hardware error	
TimeoutEx	if was a timeout within the telescope	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Occasionally		
Behavior identification and limitations of use		
This command requests the Structure to go into the Ready state, reporting the progress to the client until it is finished. Can only be triggered when the Structure is in the Observing state, and it will keep the previously loaded configuration. For the transition Standby --> Ready or to reconfigure Structure, use the configure command. The operation should finish within 3 minutes.		
References		
B-ONSITE-0620, B-TEL-0400, B-ONSITE-0790, B-ONSITE-0795, B-TEL-1720, [AD3]		

ACADA-TEL-I-340	**Get Structure Configuration ID**
Description	
Returns the current Structure configuration ID under use	
Type	
ACS sync call	
Command/variable	
getStructureConfigId()	
Parameters	
Returns	
String	the current Structure configuration ID, ‘r 'none’, if no configuration is set.
Exceptions (all at arrayelementinterfaceexceptions namespace)	
.	
Estimated frequency of the exchange	
Occasionally	
Behavior identification and limitations of use	
References	
B-ONSITE-0780, [AD3]	

ACADA-TEL-I-350	**Align Optics**	
Description		
Performs an alignment of the optical system of the Telescope.		
Type		
ACS async call		
Command/variable		
alignOptics ()		
Parameters	**Description and Units**	Limitations
ACS::CBvoid cb ACS::CBDescIn desc	the callback to which the method will report the descriptor of the Callback	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested in any Structure state that is not Standby or Ready state, or moving, or if the Telescope is not in the Technical state	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the Structure is busy	
TimeoutEx	if there was a timeout inside the Structure	
AsynchronousFailureEx	if an internal Asynchronous call fails.	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Depending on the telescope type, from many times per night to only once every several months.		
Behavior identification and limitations of use		
When this command is received, the Structure performs an alignment of the optics (mirror systems) of the telescope. This operation is usually managed by the Telescope Manager and can only be triggered via this interface when the Telescope is in the Technical state, and when the Structure is in the Standby, Ready or Observing state.		
References		
TC-UC-0054, [AD3]		

ACADA-TEL-I-360	**Cancel Align Optics Operation**	
Description		
Cancels an ongoing optical system alignment.		
Type		
ACS sync call		
Command/variable		
cancelAlignOptics ()		
Parameters	**Description and Units**	Limitations
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested when no alignment operation is taking place.	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the Structure is busy	
TimeoutEx	if there was a timeout inside the Structure	
AsynchronousFailureEx	if an internal Asynchronous call fails.	
OsErrorEx	if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Very occasional, not used in regular operations.		
Behavior identification and limitations of use		
When this command is received, the Structure stops prematurely an ongoing alignment of the optics (mirror systems) of the telescope. Any movement of the optical system will be stopped, potentially ending up in a misaligned system. This operation is usually managed by the Telescope Manager and can only be triggered when the Structure aligning the optics.		
References		
TC-UC-0054, [AD3]		

ACADA-TEL-ICD-370	**Take Telescope Pointing Measurement**	
Description		
Takes a pointing monitoring measurement e.g. with a CCD camera.		
Type		
ACS async call		
Command/variable		
takeTelescopePointingMeasurement()		
Parameters	**Description and Units**	Limitations
string targetName Duration duration ACS::CBvoid cb ACS::CBDescIn desc	name of the target for the pointing measurement (e.g. a star name) the duration in TAI seconds the callback to which the method will report the descriptor of the callback	
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx HardwareErrorEx DeviceBusyEx TimeoutEx AsynchronousFailureEx OsErrorEx	if the command is requested in any state of the Structure that is not in the Observing state, and Telescope is not in the Technical state. if the command fails due to a hardware error if a device inside the Structure is busy if there was a timeout inside the Structure. if an internal Asynchronous call fails. if an internal Synchronous command fails to an OS error	
Estimated frequency of the exchange		
Many times per night during certain nights of the month.		
Behavior identification and limitations of use		
When this command is received, the Structure performs a pointing monitoring measurement (e.g. with an onboard CCD camera). It can only be triggered from this interface when the Structure is in the Observing state, and Telescope Manager in the Technical state.		
References		
TC-UC-0035, [AD3]		

ACADA-TEL-I-380	**Cancel Telescope Pointing Measurement Operation**	
Description		
Cancels an ongoing pointing monitoring measurements operation.		
Type		
ACS sync call		
Command/variable		
cancelTelescopePointingMeasurement()		
Parameters	**Description and Units**	Limitations
Returns		
Void		
Exceptions (all at arrayelementinterfaceexceptions namespace)		
InvalidRequestEx	if the command is requested when the Telescope is not performing a pointing monitoring operation and in the Technical state.	
HardwareErrorEx	if the command fails due to a hardware error	
DeviceBusyEx	if a device inside the Structure is busy	
TimeoutEx	if there was a timeout inside the Structure.	
OsErrorEx	if an internal Asynchronous command fails to an OS error	
Estimated frequency of the exchange		
Very occasional.		
Behavior identification and limitations of use		
When this command is received, the Structure stops prematurely an ongoing pointing measurement operation. This operation is usually managed by the Telescope Manager. It can only be triggered when the telescope it is performing a pointing monitoring operation.		
References		
TC-UC-0035, [AD3]		

ACADA-TEL-I-390	**Get Structure State**
Description	
Returns the current Structure state.	
Type	
ACS sync call	
Command/variable	
getStructureState()	
Parameters	
Returns	
StructureState	The state of the Structure Manager
Exceptions (all at arrayelementinterfaceexceptions namespace)	
Estimated frequency of the exchange	
Very occasional	
Behavior identification and limitations of use	
Should work at any state of the Telescope	
References	
[AD3]	

3.6.1 Supervision operations

ACADA-TEL-I-400	**Heartbeat**
Description	
Indicates to the telescope Manager the presence of the ACADA system	
Type	
ACS(CORBA) variable	
Command/variable	
Heartbeat()	
Parameters	
Returns	
ACSErr::Completion	Outcome of the call, no error if worked properly
Exceptions (all at arrayelementinterfaceexceptions namespace)	
Estimated frequency of the exchange	
At about 1 HZ	
Behavior identification and limitations of use	
This method is intended to be used to indicate to the Telescope Manager the presence of the ACADA system. The telescope will go to a safe state by itself (usually the Initialized State) if it does not receive such a ping after 60 seconds.	
References	
B-ONSITE-0210	

3.7 Data format of the exchanges

3.7.1 Basic ACS types.

The following data types are standards ACS data types [RD3]:

- ACS::CBvoid
- ACS::CBDescIn

Primitive data types (double, string etc.) are standard CORBA IDL data types, see [RD2].

3.7.2 Common structures for the high-level Telescope Control System.

The following CORBA data structures are defined in aecscommon.idl and tcscommon.idl

ACADA-TEL-I-500	**ArrayElementState**
Description	
Global Telescope states, see [AD3]	
Type	
Enumeration	
Parameters	
OFF	Beyond the Telescope Control System reach, entirely without electrical power.
INITIALIZING	Element just transitioned to the ON machine state and is initializing all its internal components in order to arrive at the Initialized state.
INITIALIZED	Element is in a configuration suitable for survival in extreme environmental conditions, minimising the use of power whilst still providing basic status monitoring and maximising the instrument lifetime.
STANDBY	Element is in a state, which is still safe with respect to extreme conditions, but has all components activated, with preparations for Observation initiated. Structure has all internal systems on and is unpark, and Camera is warmed up, but not yet ready for observations (e.g. lids are closed).
READY	Element is prepared for a rapid transition to the Observing State. Internal calibration activities may take place.
OBSERVING	Element is in a state associated with observatory data taking, with configuration dictated by performance requirements. Data are being taken by Camera, Structure is tracking (or pointing to) the target, calibration activities may take place.
FAULT	Element has encountered a serious problem which means it is currently unable to reach one of the standard states or is unable to continue to maintain the current status.
TECHNICAL	A logical state where the Telescope allows ACADA to get an extended interface in order to execute special calibration and testing procedures. This state is only applicable to Telescope and not to Structure or Camera.
MAINTENANCE	Element is in a state designed to perform maintenance activities and is unavailable for scientific operations or any kind of remote control. Monitoring information is still, in general, available for ACADA.
References	
[AD3]	

ACADA-TEL-I-510	CameraState
Description	
Camera Manager states, see [AD3]	
Type	
Enumeration	
Parameters	
CAM_OFF	This is the state that the Telescope Manager can infer when there is no connection to the Local Control System. If an attempt to power up the Camera results in one of its sub-systems not able to be powered up then the Camera will go to the Fault state, via the Initializing state.
CAM_INITIALIZING	Element just transitioned to the ON machine state and is initializing all its internal components in order to arrive at the Initialized state.
CAM_INITIALIZED	Element is in a configuration suitable for survival in extreme environmental conditions, minimising the use of power whilst still providing basic status monitoring and maximising the instrument lifetime.
CAM_POINTINGASSIST	Camera is in a state to support dedicated Telescope pointing monitoring measurements (e.g. TPoints). The specific implementation may vary from telescope to telescope type, e.g. for a certain particular telescope type it would mean to prepare a target in which projecting the reflected image from a star.
CAM_STANDBY_WARMINGUP	The Camera starts immediately the warming-up procedure. The operation can be externally aborted; then the Camera goes to the Initialized state. Otherwise, Camera will self-transition to the Idle sub-state. If the camera is already warmed up when entering in the state, then it goes immediately to the idle sub-state.
CAM_STANDBY_IDLE_POINTINGASSISTON	Camera is warmed up and ready to go to the Ready state. Pointing Assistance is activated: See description of CAM_POINTINGASSIST
CAM_STANDBY_IDLE_POINTINGASSISTOFF	Camera is warmed up and ready to go to the Ready state. Pointing Assistance is deactivated.
CAM_STANDBY_WARMINGUP_POINTINGASSISTON	The Camera starts immediately the warming-up procedure. The operation can be externally aborted; then the Camera goes to the Initialized state. Otherwise, Camera will self-transition to the Idle sub-state. If the camera is already warmed up when entering in the state, then it goes immediately to the idle sub-state. Pointing Assistance is activated: See description of CAM_POINTINGASSIST

CAM_STANDBY_WARMINGUP_POINTINGASSISTOFF	The Camera starts immediately the warming-up procedure. The operation can be externally aborted; then the Camera goes to the On state. Otherwise, Camera will self-transition to the Idle sub-state. If the camera is already warmed up when entering in the state, then it goes immediately to the idle sub-state. Pointing Assistance is deactivated.
CAM_READY_IDLE	Camera is warmed up and ready to go to the Observing state.
CAM_READY_CALIBRATING	Camera self-calibrating according to the time budget provided by ACADA for the Ready state, and can also be externally triggered to start internal calibrations.
CAM_OBSERVING	Camera is acquiring data. Depending on the configuration parameters loaded during the ready state, the Camera can be acquiring Cherenkov shower data, dedicated calibration data or shower and interleaved calibration data.
CAM_FAULT_FIXING	Camera is trying self-fix the error.
CAM_FAULT_COULDNOTFIX	Camera could not self-fix the error and needs human intervention to fix the problems.
CAM_MAINTENANCE	The Camera is in a state designed to perform maintenance activities and is unavailable for scientific operations or any kind of remote control.
References	
[AD3]	

ACADA-TEL-I-520	StructureState
Description	
Structure Manager states, see [AD3]	
Type	
Enumeration	
Parameters	
STR_OFF	This is the state that the Telescope Manager can infer when there is no connection to the Local Control System. If an attempt to power up the Structure results in one of its sub-systems not able to be powered up then the Structure will go to the Fault state, via the Initializing state.
STR_INITIALIZING	Structure just transitioned to the On machine state and is initializing all its internal components in order to arrive at the initialized state.
STR_INITIALIZED	Structure is in a configuration suitable for survival in extreme environmental conditions, minimising use of power whilst still providing basic status monitoring and maximising the instrument lifetime.
STR_STANDBY_UN_PARKING	Structure is parking or unparking. When coming from the On state, the Structure starts the unparking procedure, and when done it automatically transition to idle.
STR_STANDBY_IDLE	Already unparked and able to start the transition to “Ready”. Goes to this state if it is already unparked when entering the Standby state.
STR_READY_IDLE	Able to go to the Observing state.
STR_READY_CALIBRATING	Internal telescope calibrations such as when initial mirror alignment for the night happen. Structure cannot be tracking.
STR_READY_SLEWING	Going to another pointing position. Goes to Ready-Idle or to Observing-Tracking automatically when done, , the latter case being when the telescope is instructed to start tracking an Object in the sky upon arrival. Can be cancelled, in that case it goes to the idle sub-state.
STR_OBSERVING_TRACKING	Following a position in the sky.
STR_OBSERVING_OFFSETTING	Moving to a new position in the same field of view. Goes to tracking spontaneously when the operation is finished.
STR_OBSERVING_FIXEDPOSITION	Pointed to a particular fixed position in Alt-Az (e.g. drift scan mode).
STR_FAULT_FIXING	Structure is trying self-fix the error.
STR_FAULT_COULDNOTFIX	Structure could not self-fix the error and needs human intervention to fix the problems.
STR_MAINTENANCE	The Structure is in a state designed to perform maintenance activities and is unavailable for scientific operations or any kind of remote control.
References	
[AD3]	

ACADA-TEL-I-530	Instant
Description	
TAI Instant: TAI seconds since 1970-01-01T00:00:00.0 (POSIX)	
Type	
double	
References	

ACADA-TEL-I-540	Duration
Description	
Duration time in TAI seconds	
Type	
Double	
References	

ACADA-TEL-I-550	TelescopeStatusData	
Description		
A structure collecting most relevant status data of the Telescope		
Type		
Data Structure		
Parameters		
telescopeName	String	The name of the telescope e.g., "M11"
timestamp	Instant	The timestamp of the current status data
cameraConfigID	String	The name of the Camera config ID, if defined
structureConfigID	String	The name of the Structure config ID, if defined
equatorialTarget	SkyEquatorialTarget	Current Ra-Dec as read by the Structure
horizonDirection	HorizonDirection	Current Alt-AZ as read by the Structure
telescopeState	ArrayElementState	The state of the telescope
sbId	unsigned Long Long	ID of the Scheduling Block, if defined
obsId	unsigned Long Long	ID of the Observation Block, if defined
References		
B-TEL-0200		

3.7.3 Common structures for the telescope control system and ACADA structures.

The common astronomical data structures are defined in the files *astrocommon.idl* and *skytarget.idl.*

ACADA-TEL-I-560	SkyEquatorialTarget	
Description		
An equatorial target including coordinates and proper motion parameters		
Type		
Data Structure		
Parameters		
ra	Double	the right ascension of the target in degrees [0, 360]
dec	double	the declination of the target in degrees [-90, +90]
skyFrame	SkyCoordinateReferenceFrame	the reference frame the RA and Dec refer to
Equinox	SkySystemEquinox	Equinox Epoch the RA and Dec refer
raProperMotion	double	the proper motion in right ascension milliarcsecs/yr
decProperMotion	double	the proper motion in declination milliarcsecs/yr
parallax	double	the parallax in milli arcseconds
radialVelocity	double	the radial velocity in Km/sec (positive value means the source is moving away
References		
B-TEL-0200		

ACADA-TEL-I-570	EquatorialDirection	
Description		
An equatorial direction		
Type		
Data Structure		
Parameters		
ra dec	double double	the right ascension of the target in degrees [0, 360] the declination of the target in degrees [-90, +90]
References		
B-TEL-0200		

ACADA-TEL-I-580	SkyEquatorialTrajectory	
Description		
An trajectory in the sky equatorial coordinates		
Type		
Vector of [EquatorialDirection,Time]		
Parameters		
EquatorialDirection Instant	EquatorialDirection double	An equatorial direction TAI seconds since 1970-01-01T00:00:00.0 (POSIX)
References		
B-TEL-0200		

ACADA-TEL-I-590	HorizonDirection	
Description		
A direction in alt-az coordinates		
Type		
Data Structure		
Parameters		
az el	Double Double	The azimuth in degrees [0, 510] degrees, with the central 360 degrees used for standard Observations. 0 is north, goes from 0 to 360 deg through east The elevation of the target in degrees [0, 91], with the range 20-89.2 degrees usable for standard Observations.
References		
B-TEL-0200, B-TEL-0230, B-TEL-0240		

3.8 Error – Exceptions

Error codes apply to ACS Exceptions and async call completions.

See file arrayelementinterfaceexceptions.xml

Name	shortDescription	description
IllegalParameterError	Illegal Parameter Error	A Parameter is outside the valid range
InvalidRequest	Invalid Request	The request is invalid, due to an inadequate state of the telescope for the request.
CdbError	Error Accessing CDB	Unable to complete requested operation due to a problem with the Configuration Database
DeviceBusy	Requested Device Busy	Requested action could not completed; requested device busy
GpsTimeError	GPS time error	Unable to retrieve GPS time or status correctly
Timeout	Operation Timeout	The requested operation timed out
OsError	Operating system error	An operating system error was encountered
AsynchronousFailure	A Failure was reported to the Callback	An asynchronous method report an error to the Callback object
HardwareError	Problem manipulating hardware.	Problem manipulating hardware. description="The hardware has not responded as expected. Perhaps the hardware has failed, the communications link is broken or the software component that manage this hardware is not fully operational
ResourceError	A resource used by this component has generated an error	A Resource (mainly other ACS components) used by this component has generated an error during its acquisition or initialization
References		
Add		

4 Appendix I: Level B requirements applicable for this interface

This interface addresses the following requirements, repeated here from Jama [AD4, AD5] for convenience. In what follows, OES should be understood as ACADA (OES was an earlier name for what now is called ACADA):

- B-TEL-0070 Enable Trigger: Telescopes must initiate a transition of the Camera to the Observing State (enable trigger) as soon as the Structure's pointing direction is within the defined tolerance of the requested Target position.
- B-TEL-0200 Repositioning Requests: The Telescope Structure must respond to repositioning and Tracking requests issued from the ACADA using both Equatorial and Horizon coordinate systems, or a Target Name in cases where Equatorial and Horizon coordinates are inappropriate. Such Targets will be listed in a common database provided.[2]
- B-TEL-0215 Fast Repositioning: If indicated by the use of an urgency flag, the Telescope Structure must slew to the new position using the most direct route and in the fastest possible time within safety constraints.

[2] This interface does not use the part using the Target names, instead is uses the proper motion parameter of the sky-target data structure passed from the ACADA to the telescope.

- B-TEL-0230 Azimuth Range: The Telescope Structure must have a minimum azimuth range of movement of 510 degrees, with the central 360 degrees used for standard Observations.
- B-TEL-0240 Elevation Range: The Telescope Structure must be capable of repointing in the elevation range 0-91 degrees, with the range 20-89.2 degrees usable for standard Observations.
- B-TEL-0260 Range Optimisation: When repositioning, the Telescope Structure must optimise the telescope motion such that it will not approach the end of the azimuth range (requiring a 360 degree adjustment) within the next block of observations (the planned duration of the observation will be sent from OES). An exception is for urgent repositionings, where this is not required and the shortest route to the target position should be taken.
- B-TEL-0400 Parked Position: Telescope Structures must have a reference 'Parked' position, corresponding to the On[3] and Standby states, in which the Structure is mechanically secured and this situation is signaled to the SAS. The Parked position may vary during a year, but must always be fixed for any given 24 hour period.
- B-TEL-0420 Unparked Position: Telescope Structures must have a default position into which they unpark, during transition from Standby to Ready State, and return to prior to parking, at a minimum elevation at which all azimuthal angles are accessible.
- B-TEL-0440 Structure Pointing Information: The Telescope Structure must provide its nominal current pointing direction (in Horizon coordinates) on request from the OES, independently of the Telescope and Camera States.
- B-TEL-0710 Structure Transition Time: On to Standby: The Telescope Structure must transition from the On State to the Standby State in less than 30 minutes
- B-TEL-0720 Structure Transition Time: Standby to Ready: The Telescope Structure must transition from the Standby State to the Ready State in less than 3 minutes
- B-TEL-0730 Structure Transition Time: Ready to Observing: The Telescope Structure must transition from the Ready State to the Observing State in less than 2 minutes. The opposite transition must be possible on the same timescale.
- B-TEL-0740 Structure Transition Time: Return to on: The Telescope Structure must transition from the Observing, Ready or Standby State to the On State in less than 5 minutes.
- B-TEL-0750 Structure Transition Time: Off to On: The Telescope Structure must transition from the Off State to the On state in less than 4 minutes.
- B-TEL-1350 Flat-Fielding: Cameras must include a flat-fielding device or devices which provide pulsed illumination of all Camera pixels with an intensity between 100 and 400 photons per pulse and a time duration in the range 1-10 ns FWHM, at a rate of at least 100 Hz. The mean wavelength of the pulsed light source should lie within 50 nm of the peak of the instrument response convolved with the Reference Cherenkov Spectrum. The pattern of illumination across the full camera field of view must be known at the level of 2%. Locally initiated flat-fielding Events must be

[3] Requirements call “Safe state” what we call “On-Initialized state” here. Replacing “Safe” to “Initialized” is a decision taken at the Systems Engineering team, and requirements are to be updated

flagged as such. Additionally, it must be possible for the ACADA to initiate flat-fielding Event collection.

- B-TEL-1710 Camera Transition Time: On to Standby: The Camera must transition from the On State to the Standby State in less than 90 minutes
- B-TEL-1720 Camera Transition Time: Standby to Ready: The Camera must transition from the Standby State to the Ready State in less than 3 minutes
- B-TEL-1730 Camera Transition Time: Ready to Observing: The Camera must transition from the Ready State to the Observing State in less than 30 seconds. The opposite transition must be possible on the same timescale.
- B-TEL-1740 Camera Transition Time: Return to On: The Camera must transition from the Observing, Ready or Standby State to the On State in less than 5 minutes.
- B-TEL-1750 Camera Transition Time: Off to On:The Camera must transition from the Off State to the On state in less than 4 minutes.
- B-ONSITE-0100 Power Control: It must be possible for the System power to be controlled both remotely via the SAS and by a person present at the System location.
- B-ONSITE-0110 Power On: When the system is in Remote Mode it must automatically transition from the Off state to the Safe state when power is provided.
- B-ONSITE-0150 On State Transition: When in remote mode, Systems may not initiate a transition out of the On state into the Standby State unless instructed by the OES.
- B-ONSITE-0210 Automatic Transition: The System must initiate a transition to the On State if communication with ACADA is lost for > 1 minute.
- B-ONSITE-0220 Loss of Clock Connection: When in the Ready or the Observing state, the System must initiate a transition to the Standby State if the connection to the Central Computer Time Synchronisation System is lost for more than >20 minutes.
- B-ONSITE-0620 State Machine: All Systems must implement a state machine compliant with the diagram shown. Notes: New Requirement. Note that a minimum of the following states is expected: Off, On, Ready, Observing/Operational, Fault, Maintenance. Pending addition of state machine diagram.
- B-ONSITE-0630 State Transitions: Transitions between the On, Standby, Ready and Observing states must not require any intervention in the field.
- B-ONSITE-0710 Remote Control: It must be possible to remotely control and monitor the System from the Data Centre using the OES.
- B-ONSITE-0720 Local Control Mode: Systems must implement a local control mode for maintenance and diagnostic purposes, during which remote operation of safety-relevant sub-systems is blocked. ACADA must be informed when the System enters Local Mode: New Requirement. Note that Systems may only return from Local Control Mode to remote mode via a manual switch located at the telescope. Note: since the current state machine constitutes a significant evolution since this requirement was established, we deem it obsolete. Instead, the machine state of “Maintenace” contains an implicit *maintenance mode*, identical to what previously

local mode was.

- B-ONSITE-0730 Local Errors: If the System encounters an error that impacts on proper function/perfomance, this must be reported to the OES. If recovery from the error is possible, the ACADA must be notified again when recovery is complete.
- B-ONSITE-0740 Local Error Recovery: All foreseeable error recovery mechanisms must be attempted automatically. In case recovery fails the System must move automatically to a State that prevents damage to instrumentation.
- B-ONSITE-0750 Alarm Generation: If an error leads to the situation where recovery is not possible and a safe state cannot be reached without human intervention then an Alarm must be raised and the System must enter the Fault State.
- B-ONSITE-0760 State Change Notification: The system must notify the ACADA whenever it changes State.
- B-ONSITE-0770 Problem Notification: The system must inform the ACADA whenever component problems or failure lead to a situation where full performance cannot be met, and provide on request the status of all compromised or problematic LRUs, to support observation and maintenance planning. Such notifications must be categorised in terms of severity.
- B-ONSITE-0780 Configuration Settings: It must be possible for the system to load configuration settings delivered via the ACADA in preparation for a State Transition.
- B-ONSITE-0790 Command Response: The system must respond to commands from the OES, acknowledging receipt of command within 50 ms and with verification of completion of the action (or occurrence of an error) reported within 50 ms of the time of completion or failure.
- B-ONSITE-0795 Command Verification: Commands received by the System must be verified for validity; any commands that exceed safety limits of the System must be rejected and a warning raised.
- B-ONSITE-0800 Transition Interruption: It must be possible for ACADA commands to interrupt transitions between states. When interrupted, the System must return to the original state within the corresponding transition time.

5 Appendix II: Complete CORBA Interface Definition File

A set of CORBA IDL files implementing the specified interface are provided at the CTA gitlab [RD7]. The instructions to obtain and build the code are included in the same location.

We illustrate the package organization and interface dependencies on Figure 2. See inline code documentation for more details.

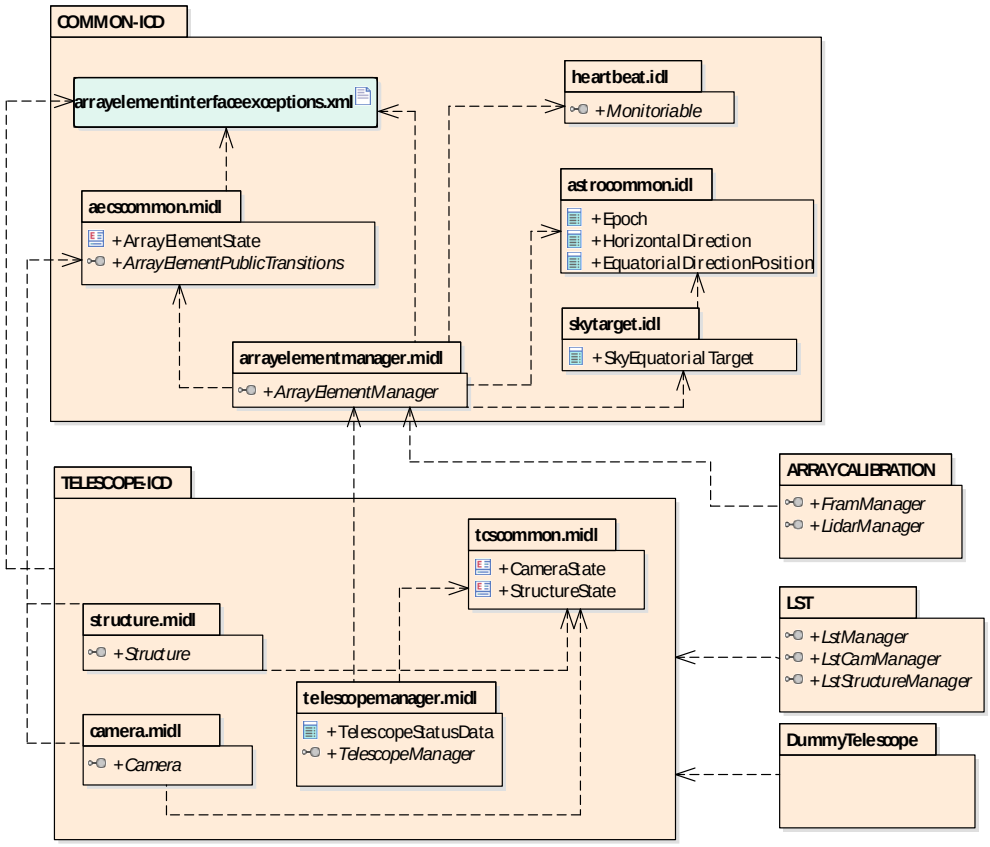

Figure 2: Package organization of the CORBA IDL files in the code repository. In this diagram, we illustrate the dependencies for the concrete example of the LST Manager component – the same would be for MST and SST. Additionally, we illustrate the dependencies of the Manager for other array elements such as the Lidar and the Fram, not yet existing. The diagram uses standard UML notation.

6 Appendix III: Telescope Manager Mock Implementation

A mock implementation is provided to illustrate how to implement the interface from the technical level. It is provided at this location

https://gitlab.cta-observatory.org/cta-computing/common/acada-array-elements/dummy-telescope

The implementation implements a dummy Telescope, Structure and Camera manager using Java ACS. The state machine of the Telescope Manager is implemented following the state pattern (see [RD6]). This implementation illustrates how it is possible to extend the generic interface to add specific special operations that are only needed by a particular telescope type.

A black-box test script implemented in python and usable to verify the implementation of the interface is provided in the test/cta/black_box

More details are provided here: https://redmine.cta-

observatory.org//projects/ctaactl/wiki/Telescope_Control_Interface_

7 Appendix III: Brief description of ACS mechanisms

This section provides a brief description of some ACS mechanisms relevant for this ICD.

7.1 ACS Callbacks.

ACS callbacks used in this interface are to be implemented by extending one of the available ACS base callback class (or Java interface). All callbacks specified in this ICD are of the CBVoid type, meaning that the callback does not return any value while working.

These callbacks will be implemented by the client to the telescope manager (ACADA), for example (in Java) the Central Control in ACADA would implement the following case:

```
package cta.tel.dummytel;

import alma.ACSErr.Completion;

import alma.ACS.CBDescOut;
import alma.ACS.CBvoid;
…

public class MockCallback implements CBvoid {

 /**
  *
  */
 private int timesWorked;//A dummy operation for the callback
 private boolean isDone;

 /**
  * Construct a dummy callback for unit tests. This won't be have any async operation
  *
  * @param services the container services on which this callback will be activated, can be null
  */
 public MockCallback() {
  timesWorked = 0;
  isDone = false;
 }

 /**
  * Invoked by the server while working.
  *
  * (non-Javadoc)
  * @see alma.ACS.CBvoidOperations#working(alma.ACSErr.Completion, alma.ACS.CBDescOut)
  */
 @Override
 public void working(Completion c, CBDescOut desc) {
  // Here some activity could be triggered at client (e.g. progress bar)
  this.timesWorked += 1;
 }

 /**
  * Invoked by the server when the work is done.
  *
  * (non-Javadoc)
```

```
 * @see alma.ACS.CBvoidOperations#done(alma.ACSErr.Completion, alma.ACS.CBDescOut)
 */
@Override
public void done(Completion c, CBDescOut desc) {
 // Here some activity could be triggered at client (e.g. a "done" pop-up)
 isDone = true;
}
```

The client (usually ACADA) transmits via the CORBA asynchronous call the callback object. For example, for the following CORBA call:

```
void doSomeAsyncDummyWork(
        in ACS::CBvoid cb,
        in ACS::CBDescIn desc;
```

To be implemented at the client side as:

```
public void doSomething() {
 MockCallback callback = new MockCallback();
 long normal_timeout = 1000000; //OMG time units, 100s of ns. In this case it it 1s
 long negotiable_timeout = 1000000; //OMG time units, 100s of ns. In this case it it 1s
 CBDescIn callbackDescriptorIn = new CBDescIn(normal_timeout, negotiable_timeout, id_tag);

 …
 server. doSomeAsyncDummyWork(callback, callbackDescriptorIn);
 …
 // Callback completion status and exceptions can be obtained and checked from the callback structure
}
```

The following snippet illustrates how to illustrate in the server side (e.g. Telescope Manager) how to implement the reaction to the callback:

```
**
 * Emulate some work being done.
 *
 * @param callback callback
 * @param callbackDescriptorIn descriptor
 */
public static void doSomeAsyncDummyWork(CBvoid callback, CBDescIn callbackDescriptorIn) {

 //No exceptions happened
 Completion c = CompletionUtil.generateNoErrorCompletion();

 //private long worktimeInMilliSec = 1000;

 //OMG time units, 100s of ns. In this case it it 1s
 Duration expectedDuration = new Duration(worktimeInMilliSec);

 CBDescOut callbackDescriptorOut =
    new CBDescOut(expectedDuration.value, callbackDescriptorIn.id_tag);

 // Some work would come here, while all subsystems are put on
 System.out.println("Do some work");
```

```
  if (worktimeInMilliSec > 0) {
   try {
    Thread.sleep(worktimeInMilliSec);
   } catch (InterruptedException e) {
    callbackDescriptorOut = new CBDescOut(expectedDuration.value,
      callbackDescriptorIn.id_tag);
    AcsJAsynchronousFailureEx acsex = new AcsJAsynchronousFailureEx(e);
    c = CompletionUtil.generateCompletion(acsex);
    callback.done(c, callbackDescriptorOut);
   }
  }
  callback.working(c, callbackDescriptorOut);// The “working” command can be invoked regularly, normally we
would do it at 1 HZ.

  // Work is done, next lines finishes transitions to go to the on state and reports to client.
  expectedDuration = new Duration(0); //OMG time units, 100s of ns. In this case it instant
  callbackDescriptorOut = new CBDescOut(expectedDuration.value, callbackDescriptorIn.id_tag);
  c = CompletionUtil.generateNoErrorCompletion(); //No exceptions happened
  callback.done(c, callbackDescriptorOut);

 }
```

Analogous code can be implemented in C++ and Python at both server and client side.

7.2 ACS BACI properties

Properties are the basic ACS entities that are manipulated by the control system. Two basic flavors of properties exist: RO = read-only (e.g. encoder position, device status) and RW = read-write (e.g. power supply voltage, pointing coordinate). In addition, properties have a certain type - e.g. a double, long, pattern, Enum, string. See [RD8] for further details.