

ACADA for the CTA Observatory

Array Control And Data Acquisition for the
Cherenkov Telescope Array Observatory

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for the CTAO ACADA working group

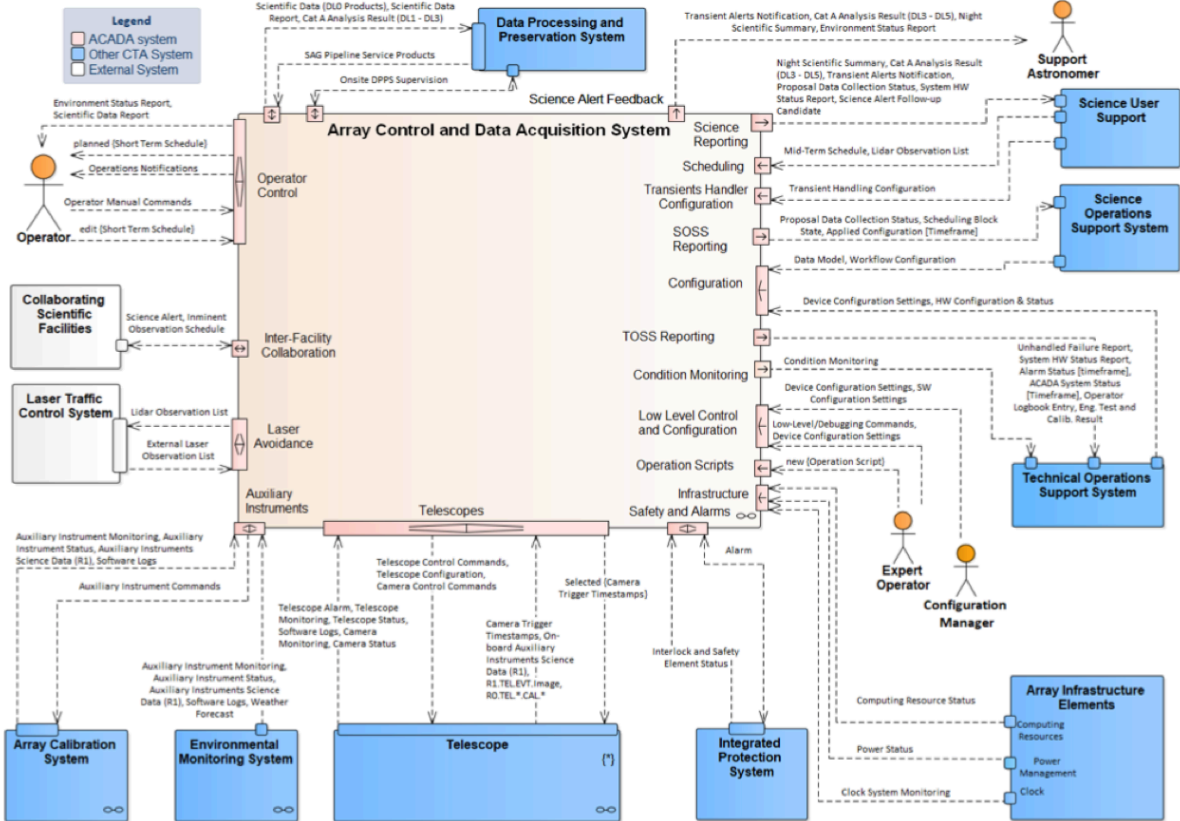
Supervisory Control and Data Acquisition system of each CTA installation

- Comprises all software responsible for supervision of all systems on-site
 - Telescopes
 - Cherenkov Cameras
 - Calibration systems
 - Environment monitoring
- Composed of a number of sub-systems
 - Resources Manager
 - Central Control
 - Array Data Handler
 - Human Machine Interface
 - Science Alert Generation pipeline
 - Short-term Scheduler
 - Transients Handler
 - Monitoring & Logging
 - Array Alarm System

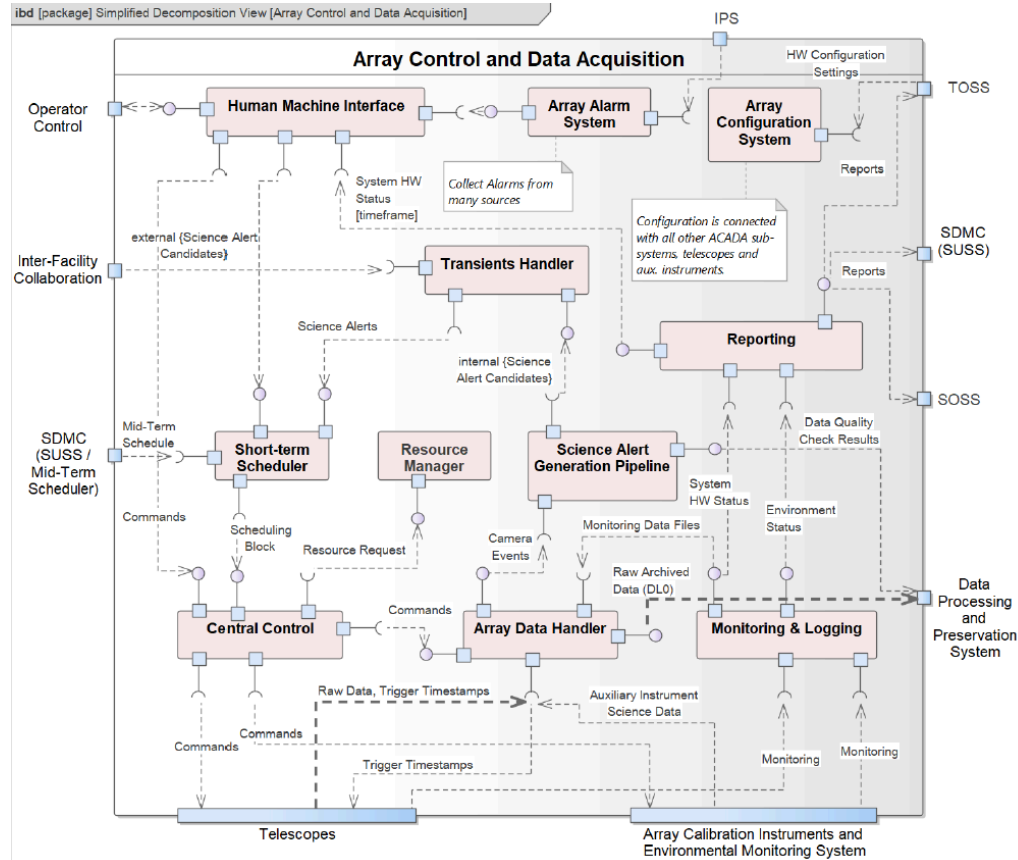
ACADA - Context



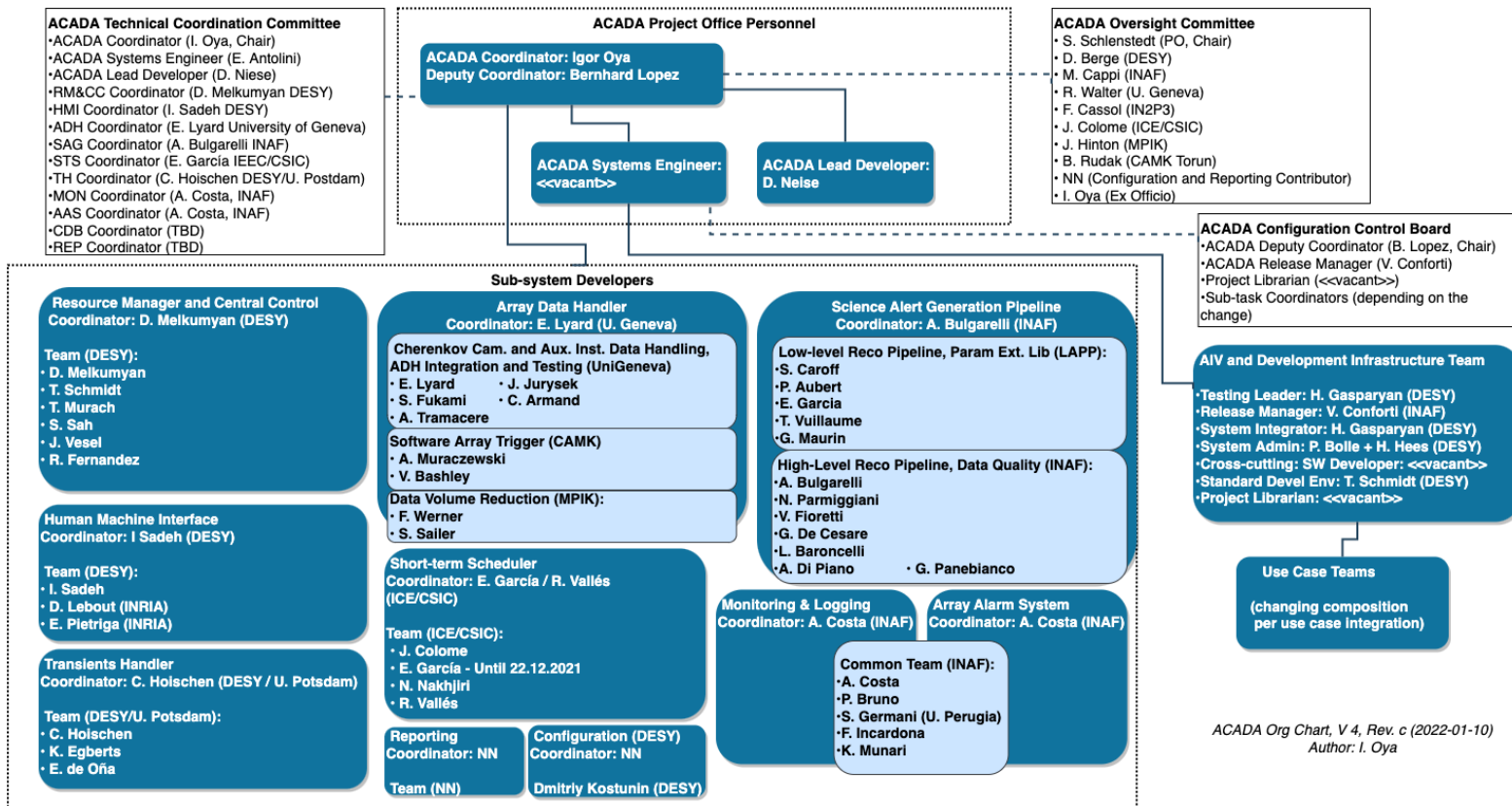
bdd [package] Context Model [ACADA Context]



ACADA - Architecture



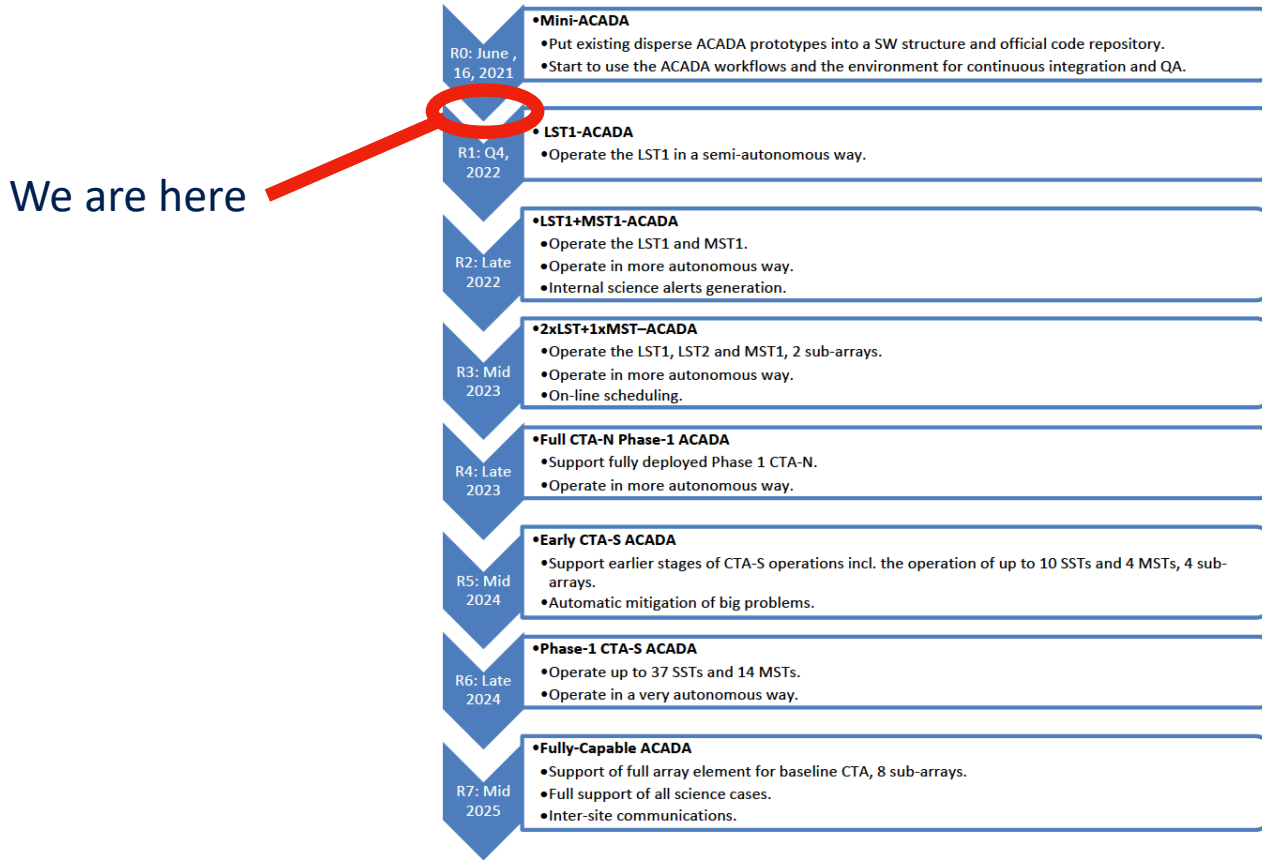
ACADA - Organigram



ACADA will be developed in iterative and incremental steps, i.e. releases

- Release 0 - June 2021
 - Assess the status and suitability of existing prototypes
 - Put the integrated development strategy to test
 - Fulfil most simple requirements, a.k.a. low hanging fruits
 - Start working as a team
- Release 1 - Q4 2022
 - Refine detailed designs of all subsystems
 - Finalise internal and external interfaces
 - Be ready to start integration tests on LST1 as early as March 2022

ACADA - Release plan



Done !

On-track

Schedule for future releases will be updated to fit overall project schedule and available labor force

ACADA in Switzerland

The Array Data Handler - UNIGE / ETHZ

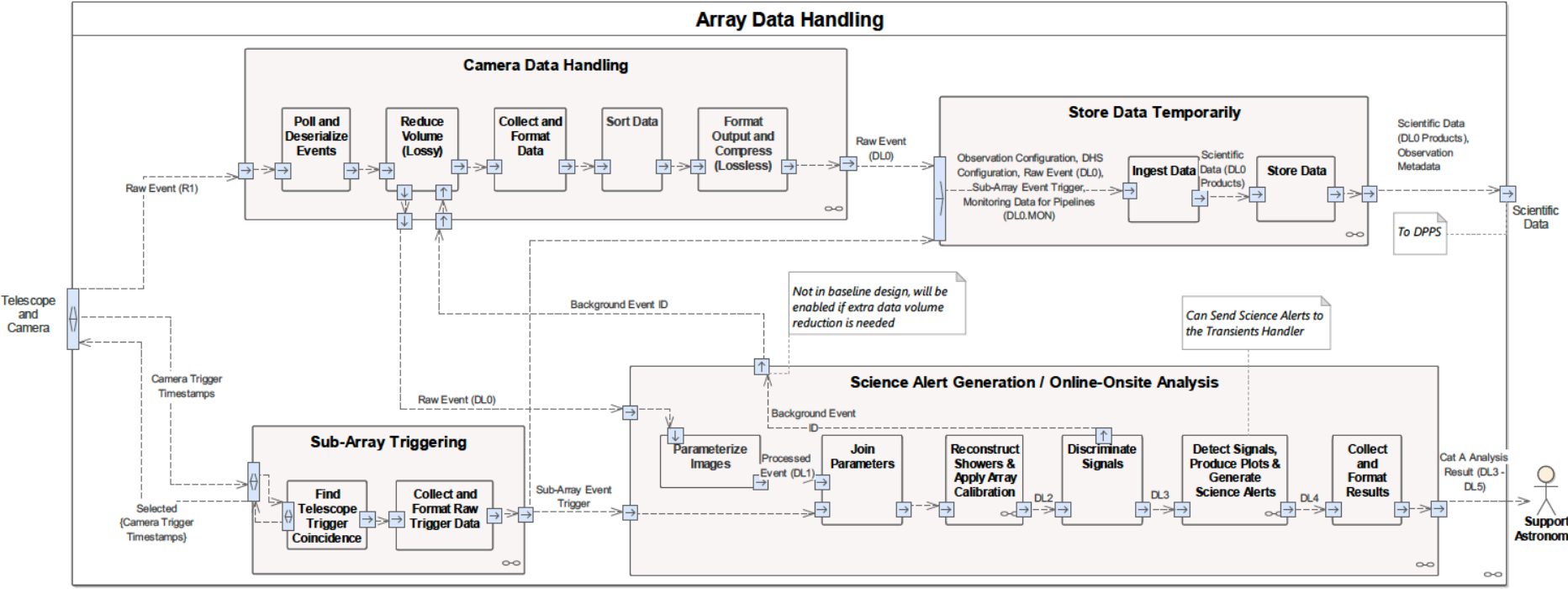
ACADA - ADH Introduction



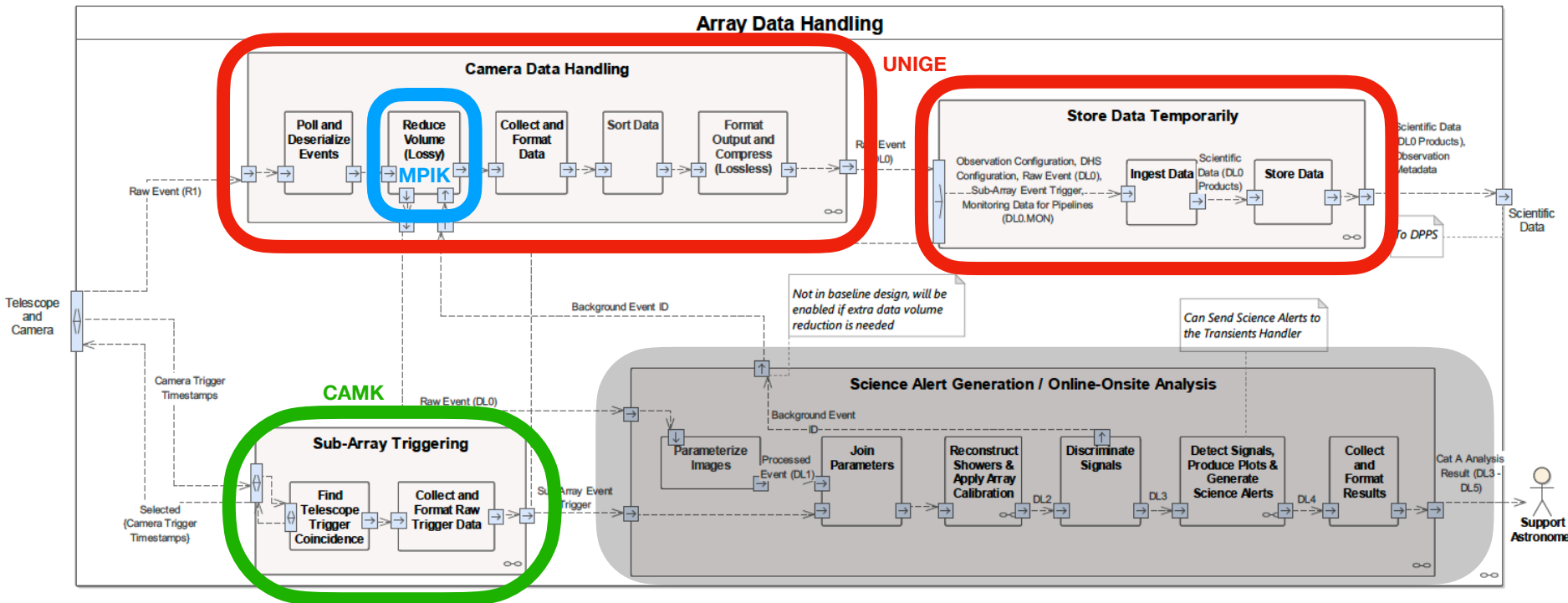
Handle stream of data from the array instrumentation

- Scope includes:
 - Cherenkov cameras data
 - Data Volume Reduction
 - Array-level trigger
 - Auxiliary data from telescopes, calibration and environment monitoring devices
 - Temporary storage of data until DPPS takes over
- Approx. 80 level-C requirements
 - ~50% to be implemented for the upcoming release
 - Verification strategy under review by testing leader
- International collaboration
 - 4 institutes: UNIGE (CH), ETHZ (CH), MPIK (GE), CAMK (PL)
 - 10 individuals

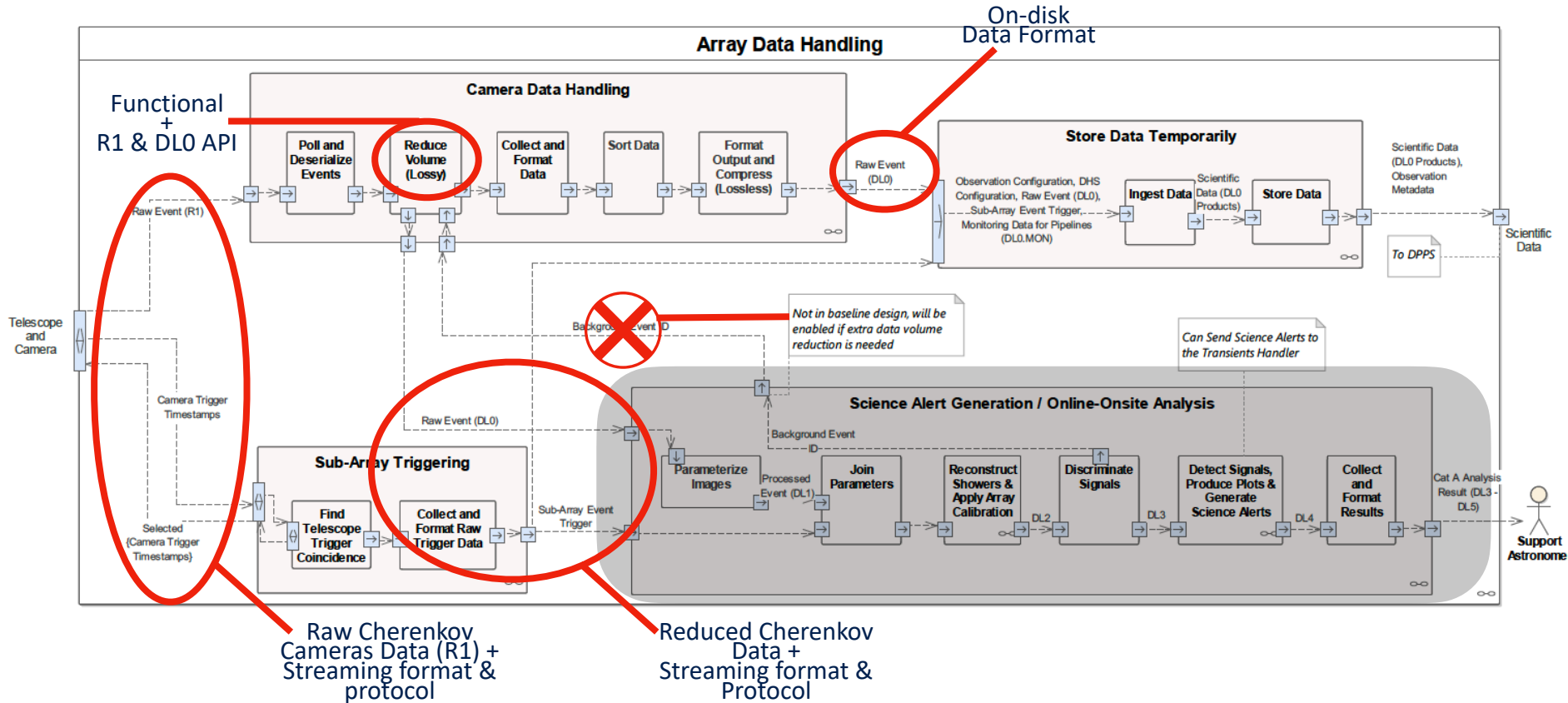
ACADA - Array Data Handler Architecture



ACADA - ADH Consortium



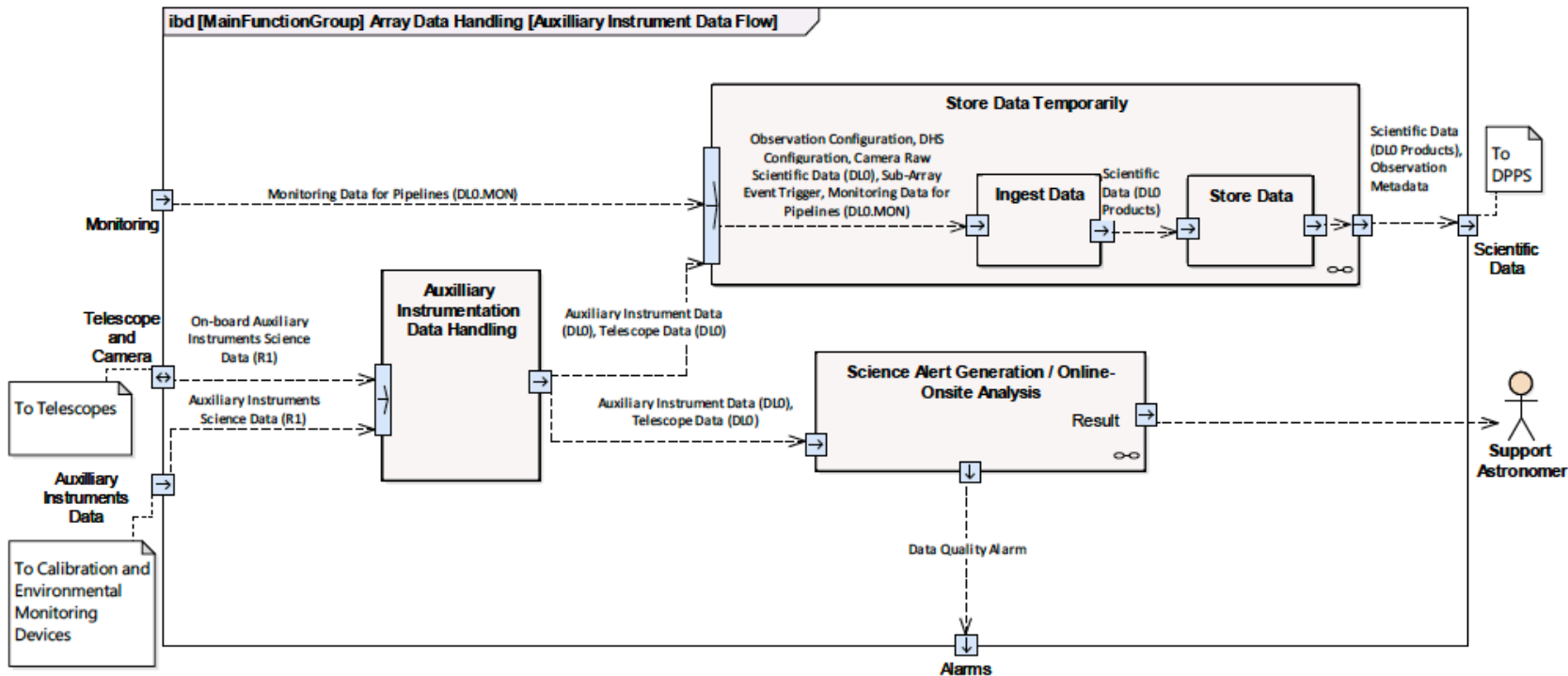
ACADA - ADH Interfaces



Raw Cherenkov Cameras Data (R1) + Streaming format & protocol

Reduced Cherenkov Data + Streaming format & Protocol

ACADA - ADH Auxiliary data handling



ACADA - ADH Current status



Aiming at release 1

- Globally on-track
 - 32 out of 40 tests to be delivered already implemented
 - ~80% of needed functionalities for remaining tests already implemented
 - Implementation of a data-volume-reduction capable data handler ongoing
 - Output format and model not yet defined, but on good tracks
 - Until then, we work under assumptions
 - Legacy ZFitsWriter available in case implementation is delayed
 - Code quality not yet according to specs
 - Legacy code will be adapted only towards the end of the release
- Adjustments will be required to match with released interfaces and updated requirements

ACADA – Development process

Strategy and quality assurance

ACADA - Development process



High quality products necessary to fulfil CTA expectations

- Tough requirements
 - 30+ years maintenance
 - 99% availability
 - Must be operable by a single operator, via the HMI
- Industry best-practice are applicable
 - Central, versioned repository (gitlab)
 - Continuous integration (Jenkins)
 - Coding standards (SonarQube)
 - Code-quality monitoring (Code reviews)
- Validation of architecture design before start of implementation
 - Via Detailed design documents reviews
- Releases done in several mini-releases steps
 - Perform several integration phases
 - Allows to detect and address anomalies early

ACADA - Gitlab



array-control-and-data-acquisition
Project ID: 179

832 Commits 36 Branches 1 Tag 1.1 MB Files 33.2 MB Storage

master array-control-and-data-acquisition History Find file Web IDE Clone

Merge branch 'revert-8889a7db' into 'master' 61de6de
Dominik Neise authored 09/12/2021

README CHANGELOG No license. All rights reserved

Name	Last commit	Last update
ACS_log	add ACS_log/ folder	15/06/2021
CDB	use a dedicated th container	04/10/2021
docs	retire dev branch	18/11/2021
jenkins	remove skipped threshold from xunit	15/11/2021
scripts	Merge branch 'master' into 'hmi_load_bal...	12/11/2021
tests	Merge branch 'master' into 'hmi_load_bal...	12/11/2021
aas @ 649e42a0	update to newest AAS and use lite monsto...	16/09/2021
adh @ a4ac74e3	use most recent dev of all subsystems	08/09/2021
cc @ 0433d23e	operation-scripts points to v0.1.0; cc point...	10/06/2021
common @ 782eff45	Resolve "Fix operation-script repo to allow...	10/06/2021
hmi @ 762423a1	update hmi vers	12/11/2021
mon @ 12a04397	use newest MON dev branch	09/09/2021
operation-scripts @ 04178563	use most recent dev of all subsystems	08/09/2021
rm @ 907f1b3b	Resolve "Fix operation-script repo to allow...	10/06/2021

Sub-projects are integrated based on a specific submodule release. Allows integration and sub-project to work at different paces

Validity of current Code-base assessed Via automatic Pipelines (jenkins)

ACADA - Jenkins



[Add description](#)

AAS_MON ADH All CC Common HMI ICD Integration RM SAG STS TH Templates

zInfra

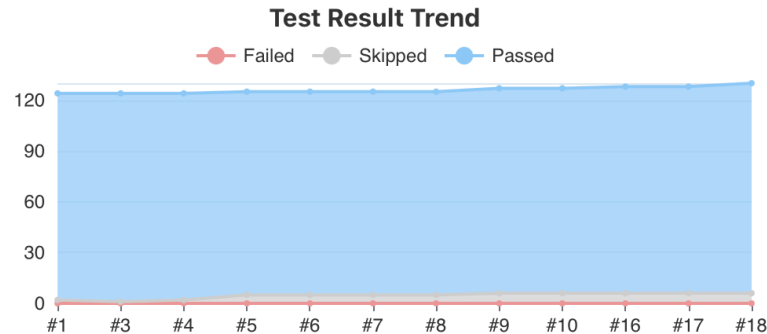
S	W	Name ↓	Last Success	Last Failure	Last Duration	Fav
		ADH_long_tests	23 hr - log	N/A	2.8 sec	
		ADH_nightly_build	1 min 58 sec - log	N/A	0.93 sec	
		ADH_short_tests	5 min 58 sec - log	N/A	0.91 sec	

Icon: S M L [Icon legend](#) [Atom feed for all](#) [Atom feed for failures](#) [Atom feed for just latest builds](#)

Different pipelines for different needs

- quick tests
- Long, complete tests
- Performance tests

Quick overview of tests results



ACADA - SonarQube



My Issues All

Bulk Change

1 / 65 issues 1d effort

Filters

Type

Bug	0
Vulnerability	0
Code Smell	65

Severity

Blocker	0	Minor	17
Critical	17	Info	0
Major	31		

Scope

Resolution

Status

Security Category

Creation Date

Language

Rule

Tag

Directory

File

Assignee

Author

supervisor/adhImpl/ADHSupervisor.py

<input type="checkbox"/>	Rename this parameter "schedulingBikld" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>.	last year	L115	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this parameter "telescopelds" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>.	last year	L115	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this parameter "observationBikld" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>.	6 months ago	L124	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this parameter "observationType" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>.	6 months ago	L125	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this parameter "swatSettings" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>.	6 months ago	L127	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this parameter "timeoutInSeconds" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>.	last year	L150	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this parameter "teld" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>. Why is this an issue?	last year	L164	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this parameter "teld" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>. Why is this an issue?	last year	L179	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment
					convention
<input type="checkbox"/>	Rename this local variable "spaceInBytes" to match the regular expression <code>^[a-z][a-z0-9]*\$</code>.	last year	L215	🔗	🔽
<input type="checkbox"/>	Why is this an issue?				
<input checked="" type="checkbox"/>	Code Smell	Minor	Open	Not assigned	2min effort
					Comment

Main indicators
Available at a glance

Detailed code-analysis
Available for review
Can be either fixed in
Code or discarded as
False positive

ACADA - ADH Summary



Heading towards LST1 handling

- Startup phase is over
 - Release 0 established a collaborative workflow
- Progressing towards Release 1
 - ADH team is now up-to-speed
 - Goals and challenges clearly identified
 - Work is ongoing
- Long-term schedule will be adjusted after Release 1

Thank you for listening