Interfaces DATA-COM - status

R. de los Reyes
on behalf of Data Management WP

CTA » DATA

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External Interfaces

External Interfaces
ICD DATA-COM
ICD DATA-xSTs
ICD DATA-ACTL

The Interface Management Plan describing methodology to be able to define CTA Product interfaces i.e. interfaces between CTA Products (Level 1 of PBS).

Interface Manual

ICD DATA-COM

Interface responsibles:

- N. Serre (Project Office)
- M. Gaug (COM-CCF)
- R. de los Reyes (DATA)

This interface manage all the tasks and responsabilities concerning the implementation of the Calibration methods corresponding to the DATA Products:

- Array calibration
- Atmosphere calibration

ICD DATA-xSTs

This interface is currently under definition.

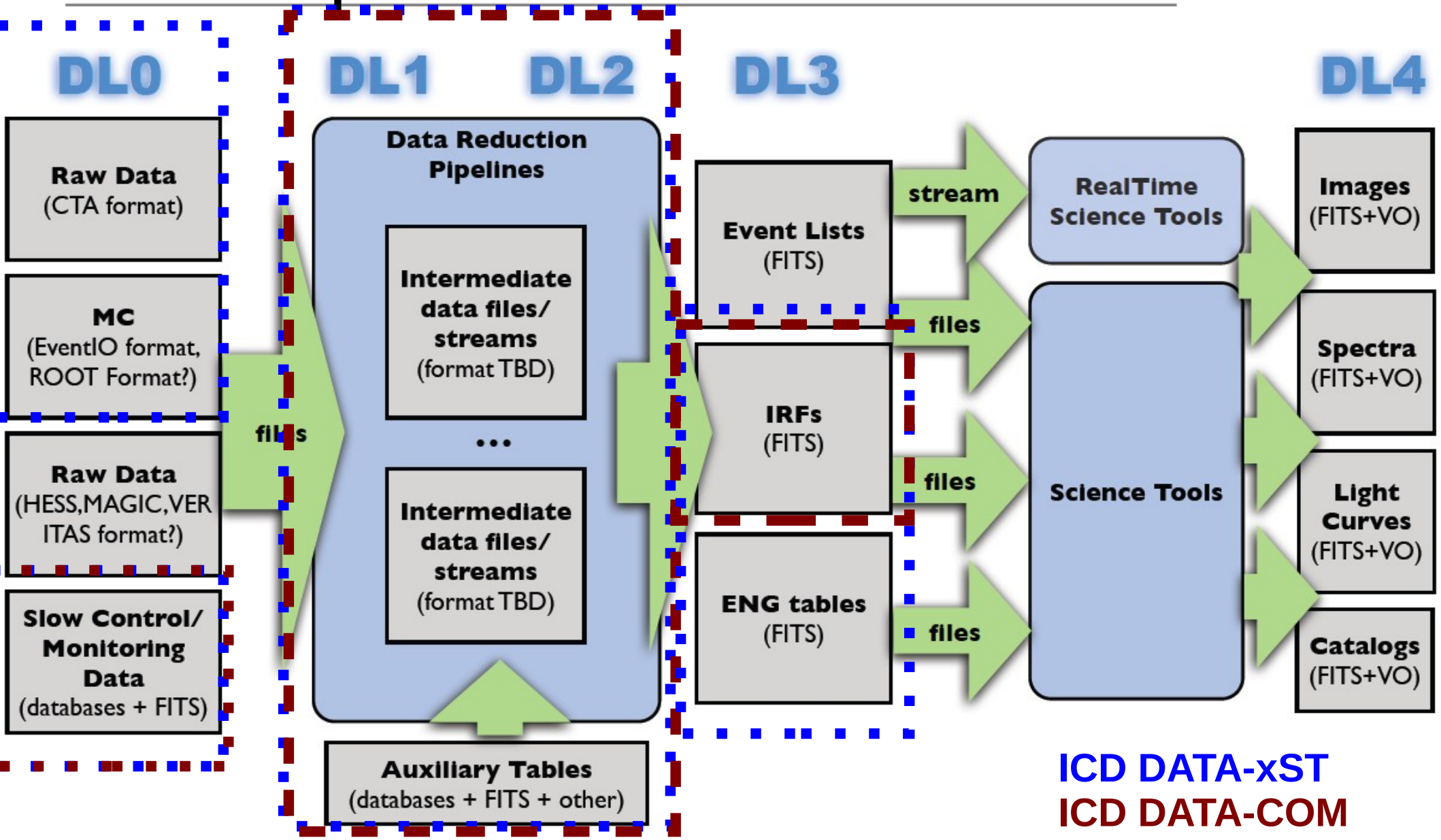
Interface responsibles:

- N. Serre (PO)
- R. de los Reyes (DATA)
- TBD (xSTs)

This interface will manage all the tasks and responsabilities concerning the implementation of the Calibration methods corresponding to the DATA Products:

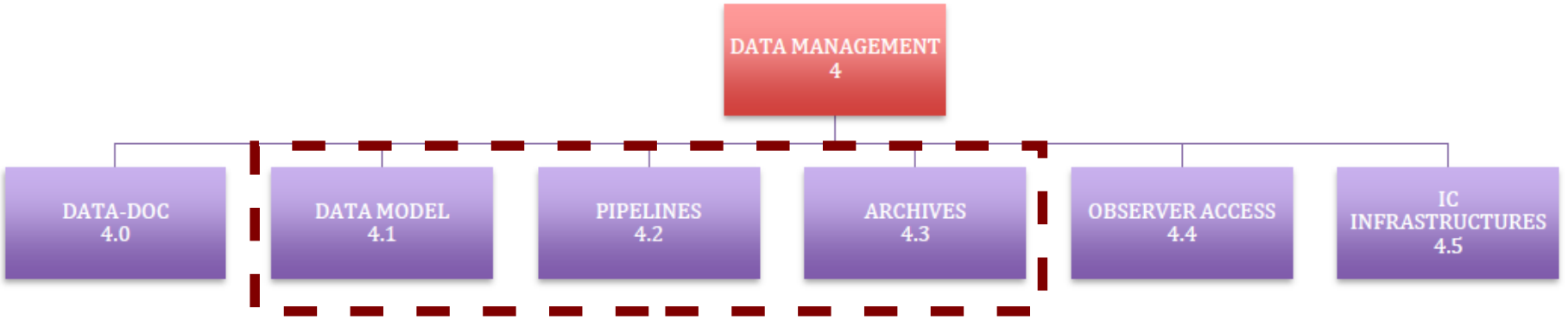
- Camera calibration
- Pointing calibration

General view of Pipelines and Data Levels



ICD DATA-xST
ICD DATA-COM

With whom you will interact (so far)?



- **Data Model**: data structure, metadata, IRF definition,...
- **Pipelines and IC infrastructures**: implementation of Calibration methods
  - Calibration Pipeline
  - MC production pipeline
  - On-line/On-site (definition of level A/levelB)
- **Archives**: database, data archive,...
- **Observer access**: data access to different data reduction levels.

Interface example (e.g. ICD DATA-COM)

Responsables + Information

age Permissions | Approve/Reject
te Item
age | Actions

Interface: I-DATA-COM-0006 Cherenkov Transparency Coeffi (CTC)

I-DATA-COM-0001: COM subsystem version: 1.0	
Information provided by:	
Name	WP sub-project
R. de los Reyes	COM-CCF
J.L. Contreras A. Carossi R. de los Reyes	DATA (DM) DATA (ARCH) DATA (PIPE-Cal)

Table 1: List of DATA-COM interfaces

1.1 Description of Data Interface

I-DATA-COM-0006: CTC	
Data Interface: CTC	
Description	Cherenkov Transparency Coefficient for atmospheric transmission characterization
Operation/information level	Per Telescope

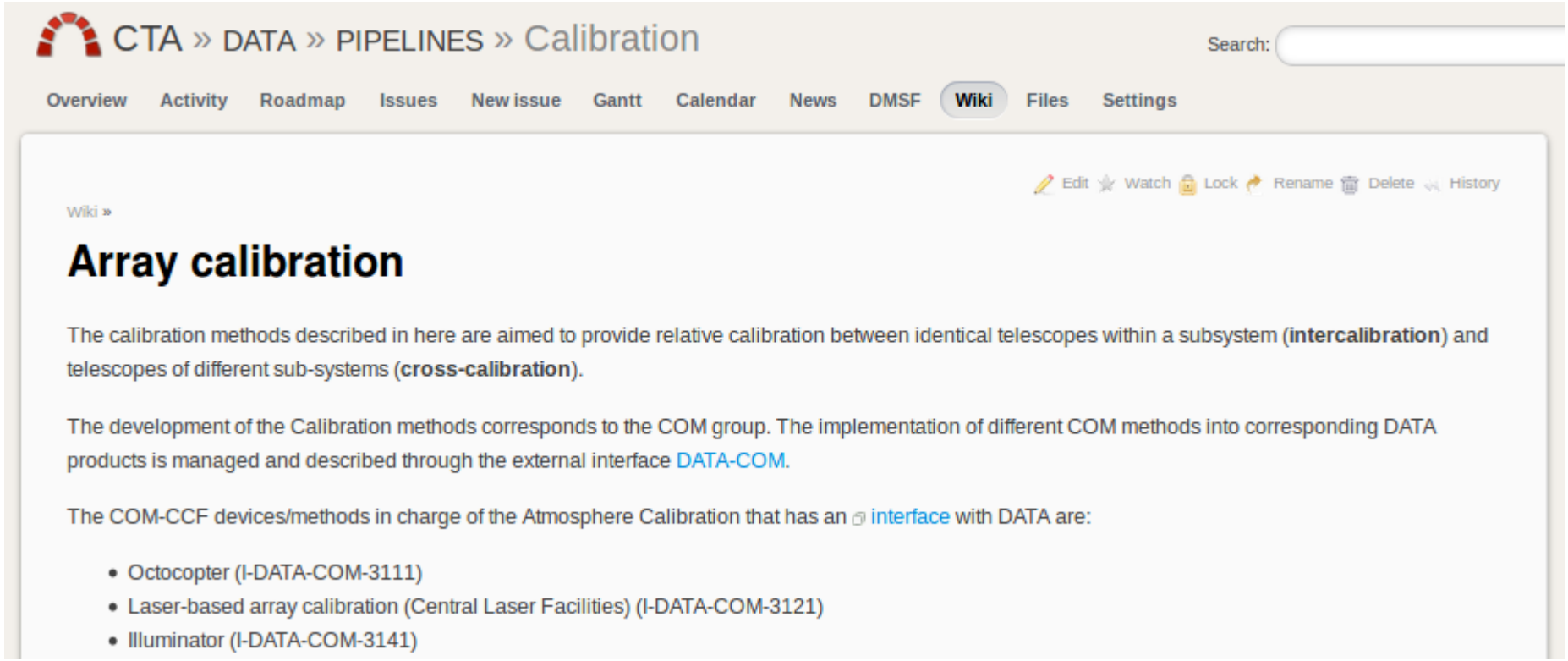
https://portal.cta-observatory.org/WG/Central%20Systems%20Engineering/Lists/Interface%20Database/List%20of%20items%20no%20detail.aspx

ICD tasks
(e.g. DATA-COM)

DATA WP involved

- COM-CCF pre-production phase:
  - *Receive feedback from CCF (during the CCF pre-production phase)* → DM, ARCH, MC(?)
  - *Integrate results* → DM, ARCH, MC(?)
- COM-CCF production phase:
  - *Construct data infrastructure* → DM, ARCH
  - *Integrate CCF device* → internal DATA interfaces
  - *Implementation of algorithms* → PIPE-CAL
  - *Integrate algorithms* → PIPE-CAL
  - *Test algorithms on partial array* → PIPE-CAL

Calibration information now in Redmine



CTA » DATA » PIPELINES » Calibration

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Array calibration

The calibration methods described in here are aimed to provide relative calibration between identical telescopes within a subsystem (**intercalibration**) and telescopes of different sub-systems (**cross-calibration**).

The development of the Calibration methods corresponds to the COM group. The implementation of different COM methods into corresponding DATA products is managed and described through the external interface DATA-COM.

The COM-CCF devices/methods in charge of the Atmosphere Calibration that has an interface with DATA are:

- Octocopter (I-DATA-COM-3111)
- Laser-based array calibration (Central Laser Facilities) (I-DATA-COM-3121)
- Illuminator (I-DATA-COM-3141)

The different tasks performed by the Calibration Pipelines can be grouped in:

- integrate CCF device: internal DATA interfaces through which Pipelines will receive the data structures (I/O libraries) and DB structure from Data Model and Archive to be able to access the data when building the calibration modules or the rest of the Calibration Pipelines.
- implementation of algorithms: construction of the calibration modules
- integrate algorithms: integration of the calibration modules into the Calibration Pipeline (more critical for those which input is mainly the EVT or CAL events).
- test algorithms on partial array: those algorithms that depend on the number of telescopes have to be tested during the deployment of the telescopes on-site

Atmosphere calibration

The calibration methods described in here are aimed to provide calibration of the atmosphere above the CTA0. This will be achieved using different atmosphere monitoring devices and methods. A detailed description of them together with the error budget expected for each of them within the CTA Calibration Strategy is documented in (https://portal.cta-observatory.org/recordscentre/Records/COM/COM-CCF/CTA_Calibration.pdf : COM-CCF/140616)

The development of the Calibration methods corresponds to the COM group. The implementation of different COM methods into corresponding DATA products is managed and described through the external interface DATA-COM.

The COM-CCF devices/methods in charge of the Atmosphere Calibration that has an interface with DATA are:

- Raman LIDARS (I-DATA-COM-3001)
- All-Sky-Camera (ASC) (I-DATA-COM-3011)

The different tasks performed by the Calibration Pipelines can be grouped in:

- integrate CCF device: internal DATA interfaces through which Pipelines will receive the data structures (I/O libraries) and DB structure from Data Model and Archive to be able to access the data when building the calibration modules or the rest of the Calibration Pipelines.
- implementation of algorithms: construction of the calibration modules
- integrate algorithms: integration of the calibration modules into the Calibration Pipeline (more critical for those which input is mainly the EVT or CAL events).
- test algorithms on partial array: those algorithms that depend on the number of telescopes have to be tested during the deployment of the telescopes on-site

The list of tasks (links between brackets) that will be performed through the listed interfaces are:

- Implementation of algorithms:
  - *CTC (#8546)*
  - *Data selection using atmospheric parameters*
  - *Data correction*
  - *ARCADE LIDAR*

Proposal 1: per Tasks (ICD DATA-COM)

Managing of interfaces tasks in **Redmine**

CTA » DATA » PIPELINES » Calibration

Search: » Calibration

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Task #8546

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Implementation of CTC algorithms for atmospheric calibration

« Previous | 1 of 2 | Next »

Added by de los Reyes Raquel 7 months ago. Updated 13 days ago.

Status:	Assigned	Start date:	08/01/2016
Priority:	Normal	Due date:	06/02/2017
Assigned To:	de los Reyes Raquel	% Done:	0%
Category:	Atmosphere Calibration	Estimated time:	475.00 hours
Target version:	-	Spent time:	

CCF WBS

Camera/Pointing/Array/Atmosphere Calibration

Description

I-DATA-COM-3201

Quote

Subtasks Add

Related issues Add

Follows (30 days) COM - Task #8529: Develop CTC algorithms for atmospheric calibration	New	06/01/2015	07/01/2016

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Assigned issues (open only)
All issues (open only)

CUSTOM QUERIES

open by priority and category

WATCHERS (0) Add

ICD tasks
(e.g. DATA-COM)

DATA WP involved

- COM-CCF pre-production phase:
  - *Receive feedback from CCF (during the CCF pre-production phase)* → DM, ARCH, MC(?)
  - *Integrate results* → DM, ARCH, MC(?)
- COM-CCF production phase:
  - *Construct data infrastructure* → DM, ARCH
  - *Integrate CCF device* → internal DATA interfaces
  - *Implementation of algorithms* → PIPE-CAL
  - *Integrate algorithms* → PIPE-CAL
  - *Test algorithms on partial array* → PIPE-CAL

Proposal 1: per Tasks (ICD DATA-COM)

Managing of interfaces tasks in **Redmine**

CTA » DATA » PIPELINES » Calibration

Search: » Calibration

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Camera/Pointing/Array/Atmosphere Calibration

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open by priority and category

WATCHERS (0) Add

Proposal 2: per Interface (ICD DATA-COM)

Managing of interfaces tasks in **Redmine**

Task #8546

Edit Log

Implementation of CTC algorithms for atmospheric calibration

Added by de los Reyes Raquel 11 months ago. Updated about 20 hours ago.

Status:	Assigned	Start date:	04/01/2017
Priority:	Normal	Due date:	04/01/2020
Assigned To:	-	% Done:	0%
Category:	Atmosphere Calibration	Estimated time:	1267.00 hours
Target version:	-	Spent time:	-

Description Quote

I-DATA-COM-3201

Subtasks Add

Task #11108: Integrate algorithms and results in DATA	Assigned		
Task #11109: Test algorithms on partial array	Assigned		

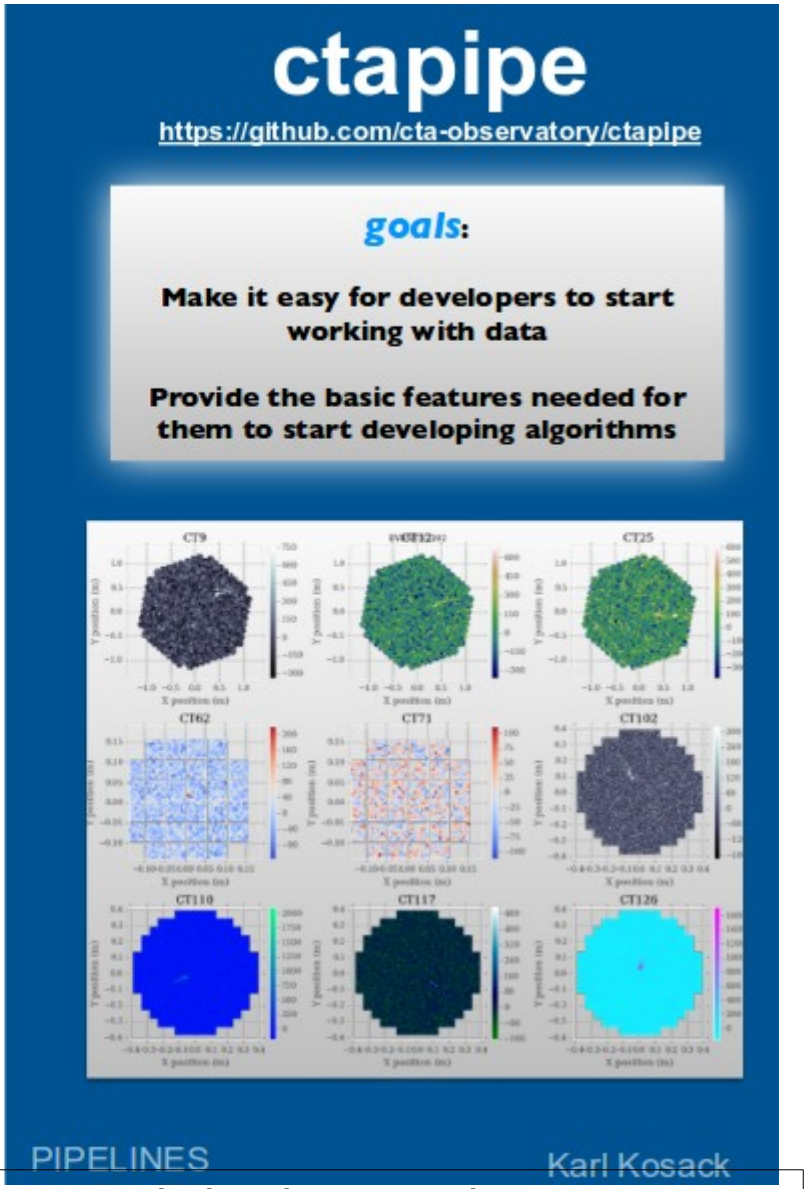
Tasks (ICD DATA-COM)

- Management through Redmine tasks:
  - Status: **New**, **Assigned**, In Progress, Closed,...
  - Priority: Low, **Normal**, High, Urgent, Immediate.
  - Assigned To: **<empty>/person**
- CCF has priority → "Assigned" + <empty>
- Lack of CCF men-power: DATA will help → "New" + <empty> → EoI.

Implementation (Pipelines v0.1)

initial skeleton of PIPE framework

- initial prototype done in < 1 week
  - leverage existing projects like AstroPy!
  - follow development examples from large open scientific packages
- C.Deil, K.K., J.Jacquemier
  - Quick-start to get up and running
  - initial package structure
  - build, test, distribution system
  - repository + example data (auto download)
  - documentation system
  - config system for tools
  - visualization tools (camera, etc)
  - *interactive* development / usage
  - hooks to include Cython or C/C++ code if needed
- Initial code to provide tools to develop algorithms:
  - read *EventIO* data files (e.g. prod2) with **pyhessioxxx** package
  - generate fake camera data
  - display and manipulate cameras, data
  - calc image parameters
  - basics of coord-transform system
  - development examples



- basic MC calibration functions nearly implemented → p.e.

Implementation
(Pipelines V0.1)

- Read Prod2 and 3 MC (hessio)
- Basic MC calibration functions available soon → p.e. camera images.

- CTA framework ready:
  - Atmosphere Calibration.
  - Array Calibration (soon)

Conclusions

- All Calibration information is now available in **Redmine**.
- Interfaces defined in sharepoint: interfaces **tasks** managed through Redmine → included a.s.a.p.
  - General → **give feedback** to DATA about hardware.
  - Data Model/Archive → **construct data structure** and storage (headers, DB, metadata, MC,...).
  - Pipelines → **implementation of algorithms** (on-site and/or off-site).
  - General → **test the DATA integration**.
- **DATA-COM** (Array and Atmosphere calibration) ready for its activation.

Backup slides

News on ICDs (DATA-xST)

- DATA-xST: definition of interfaces
  - Based on **Camera/Pointing Calibration Guidelines** → currently under edition.

CCF Camera Calibration Guidelines

- Based on the DATA-xST proposed interfaces
- **Aim**: minimize the number of different calibration methods.
- Recommendation: baseline calibration method proposed by CCF
- Input from Cameras:
  - Methods feasibility
  - Other possibilities
- Discussion with Cameras @ CCF meeting (Barcelona)

→ the best approach: different/same groups do not contact the Telescopes asking the same issues.

How we will do this?: ICD DATA-xST (1st draft)

DATA-xST interfaces	
Code	Subsystem
I-DATA-xST-0001	Camera Data Model
I-DATA-xST-0002	Engineering Data Model
I-DATA-xST-0003	DL1 Data Model
I-DATA-xST-0004	Data Reduction requirements and design
I-DATA-xST-0101	Pixel waveform integration
I-DATA-xST-0102	Pixel dark baseline
I-DATA-xST-0103	Pixel NSB pedestal
I-DATA-xST-0104	Dependency pixel photo detection efficiency vs wavelength
I-DATA-xST-0105	Dependency pixel photo detection efficiency vs incident angle
I-DATA-xST-0106	Pixel photons conversion efficiency: ADCPe ratio determination
I-DATA-xST-0107	Pixel photons conversion efficiency: ENF determination
I-DATA-xST-0108	Pixel photons conversion efficiency: linearity correction
I-DATA-xST-0109	Pixel photons conversion efficiency: cross-talk correction
I-DATA-xST-0110	Camera intensity flat-fielding correction
I-DATA-xST-0111	Camera timing flat-fielding correction
I-DATA-xST-0112	Camera excluded pixels determination
I-DATA-xST-1001	Camera-optical axis misalignment
I-DATA-xST-1002	Absolute sky-optical axis misalignment
I-DATA-xST-1003	Dual mirror correction
I-DATA-xST-1004	Coma aberrations correction
I-DATA-xST-1005	Optical PSF characterization

le 1: List of DATA-xST interfaces. The first digit refers to the sub-system (0=Cam

Camera & Pointing Calibration Guidelines

Steps to follow on ICDs

- DATA-COM: activation of interfaces → **a.s.a.p.**
  - Definition of tasks and responsible:
    - COM-CCF people priority → assignation in coming months
    - But if you are/have volunteers for any task contact M. Gaug and me.
- DATA-xST: definition of interfaces
  - Based on **Camera/Pointing Calibration Guidelines** → currently under edition.

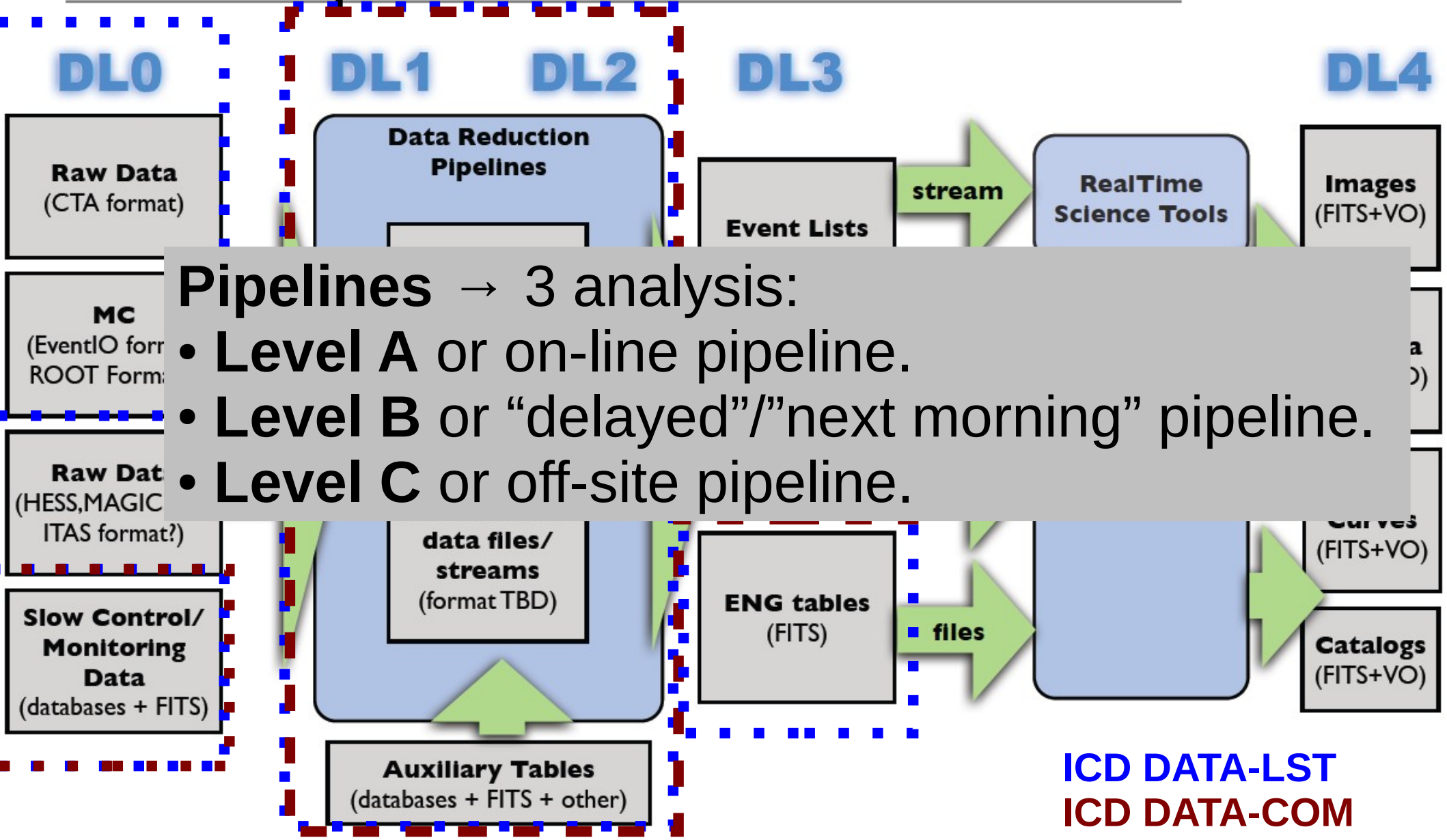
CCF meeting
(October 26th-30th, Barcelona)

- Assumption: **Camera Calibration guidelines ready** for discussion about final baseline methods.
  - Discussion on whether those methods are the same for **level A**, **B** and/or **C** calibration pipelines → **A. Bulgarelli**
- **Definition/discussion** of DATA-xSTs **interfaces** → method developer **responsible** → **R. de los Reyes + G. Maier**
- Start **implementation** of calibration methods (in python?). Ready by **beginning of 2016?**. → **K. Kosack**
- DATA tasks to be maintained in Redmine.

Steps to follow on DATA

- Next DATA deadline(s):
  - **On going**: DM 0.1 (Data Model Prototype 1)
    - First draft of which calibration data will be in which data level.
  - **Q1.2016**:
    - Pipeline software v0.1 (big impact of data reduction and telescope calibration):
      - Possible: implementation of current MC-calibration functions.
      - Unrealistic: implementation of realistic CTA calibration algorithms for tests.
    - Archive software v0.1

General view of Pipelines and Data Levels



Pipelines → 3 analysis:

- **Level A** or on-line pipeline.
- **Level B** or "delayed"/"next morning" pipeline.
- **Level C** or off-site pipeline.

ICD DATA-LST
ICD DATA-COM

Why an ICD with DATA?

- DATA will provide the software for CTAO to do:
  - **CTA data production**: from raw data (DL0) to Science data (DL5).

ICD DATA-LST, ICD DATA-COM → DATA is ready to:

- Store your data.
- Re-produce at any time the calibration results.
- Apply your calibration results to the CTA analysis.

  - Access to all the produced Data levels.

ICD DATA-LST, ICD DATA-COM

What DATA needs?

- Your (Cameras, Pointing, CCF) **feedback/support** for: Data Model, Archive, Validation of final Data Products,....
- **Implementation/support** of Calibration algorithms, according to CCF + *Camera/Pointing Calibration* ***guidelines***.
  - No duplication of tasks with ACTL.
  - Telescopes: common methods are preferred (if possible) → **CCF/DATA**

ICD DATA-LST, ICD DATA-COM

ICD role

- **Not a “physical” interface → information and software development work.**
- **Feedback** to...
  - DATA with hardware information.
  - Telescopes+CCF with DATA products (validation).
- Set up support/implementation **responsibilities** of the Calibration methods.

ICD tasks: proposal

- General → **give feedback** to DATA about hardware.
- Data Model/Archive → **construct data structure** and storage (headers, DB, metadata, MC,...).
- Pipelines → **implementation of algorithms** (on-site and/or off-site).
- General → **test the DATA integration**.
- ...