



Interface Management Plan

| Originator | Checker | Approver |
|-------------------------------------|----------------------|-------------------|
| Natalia Serre Victor Diez Blanco | Christopher Townsley | Project Committee |

Key Words

interfaces; product interfaces; interface database; N² diagram; block diagram

List of Abbreviations

| | |
|--|------------------------------------|
| CTA Cherenkov Telescope Array | TDR Technical Design Report |
| WP Work Package | PO Project Office |
| PBS Product Breakdown Structure | |

History

- 1.0 2014-07-21 First draft.
- 1.1 2014-10-15 Version submitted to Project Committee for comment.
- 1.2 2014-11-26 Version as approved by Christopher Townsley on behalf of Project Committee.

Distribution Open

1 Introduction

1.1 Purpose of the document

The purpose of the present Interface Management Plan is to:

- describe the process of identifying and characterising interfaces;
- describe the process of the approval of interfaces;
- define roles and responsibilities in identifying, characterising and approving interfaces.

All the parameters that define each interface will be considered specifications (level-I) and shall be included in the baseline design of the involved parties.

1.2 Scope of the document

The present document addresses Product interfaces, i.e. interfaces between CTA Products (level 1 of PBS), for example ACTL-xST, INFRA-xST, etc. External interfaces between CTA and the outside world, e.g. connection to the grid, are at the moment beyond its scope.

This Interface Management Plan will apply to all phases of the CTA Project, although it may develop. The owner of this document is CTA PO Interface Engineer.

Some sections of the document may also be made applicable to Product-internal interfaces at the option of the corresponding WP, but without being included in the central CTA interface database (described in Section 4). All WPs are expected to have, and follow, their own internal interface management system and plan, but they may copy/refer to and adapt that outlined in this document for their own purposes.

2 Process for identifying and characterising interfaces

2.1 Identification of top-level interfaces: CTA Project Office

For all interfaces related purposes, the CTA Project Office will be represented by the CTA PO Interface Engineer.

The CTA PO will put forward a list of top level interfaces that need to be characterised. Interfaces are divided into three types:

- Logical: all interfaces related to online data transfer (control and monitoring, alerts, event data, data products, etc). An example of this type of interface is the control of the telescope drives (logical interface between ACTL and the xSTs).
- Responsibility interface (physical or software): it defines who is responsible for building, maintaining, etc. a physical element or who is responsible for writing, maintaining etc. a certain piece of software (or firmware, etc). It also describes the characteristics of the ‘exposed’ interface at

each side. Examples of this type of interface are the cabling for the data network (physical interface between INFRA and ACTL) and the responsibilities around writing software for the All Sky Camera (interface between DATA and COM).

- **Information-Only:** one side of the interface needs information from the other as an input to its design. The main purpose of the interface characterisation is describing this flow of information. An example of this type of interface is the control room within the operations building (information interface between INFRA and ACTL). This type of interface only needs to be defined if the information is not contained in the corresponding TDRs.

Top level interfaces are presented as a block diagram and two N² diagrams (overall and detailed versions). These can be found in the Interface Management page within the Systems Engineering site on SharePoint ¹. They will be maintained and updated according to need by the PO Interface Engineer.

An N² diagram is used to show all possible intersections between top level CTA Products. An empty version is shown in Figure 1. The overall N² diagram on SharePoint, shows ‘Y’ (Yes) when CTA PO has identified an interface between two Products and ‘N/A’ (Not Applicable) when there is no identified interface between them. The CTA Project Office is also responsible for defining, if needed, the leading party at a certain interface. This is also noted in brackets in the overall N² diagram. The leading party role will be assigned mainly on the basis of standardisation and commonality of components. This means that if a party needs to provide a set of components and it is more cost effective over the lifetime of the Observatory to do so in a standardised manner, this party is the Leading Party. Nevertheless the Project Office can decide on a party being leading based on other criteria as circumstances demand.

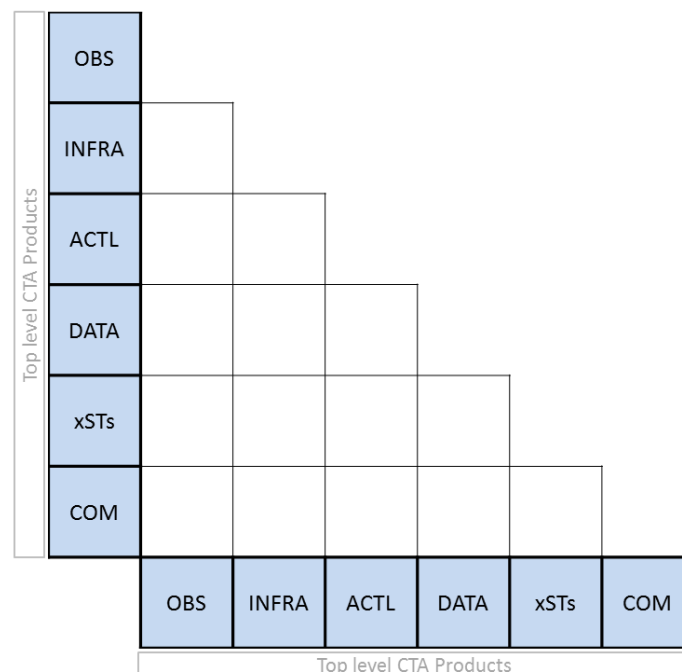


Figure 1: An N² diagram is used to show all possible intersections between top level CTA Products. Overall and detailed versions of the N² diagram can be found in the Interface Management page within the Systems Engineering site on SharePoint.

¹CTA project extranet site

2.2 Lists of interfaces between Products: WP's systems engineers

Once the top level interfaces are identified, the items at those interfaces need to be listed. This process will be launched and coordinated by CTA PO, however, for each identified interface, the Products' systems engineers will be responsible for carrying it out as follows:

- The Product systems engineers will provide a list of interfaces to/from their Product to all parties (PO and other Product). They may do so using the Interface Database on SharePoint under a 'preliminary' label.
- The leading party systems engineer will gather all lists and will drive the iterative process of agreeing on them. If there is no leading party, the Products' systems engineers will be equally responsible for gathering all lists and reaching an agreement on them.
- Once agreement is reached that these are valid interfaces by all parties, unique labels will be assigned to each interface (specification reference), these being:
I-[PBS acronym of one of the Product_i]-[PBS acronym of one of the Product_j]-[XXXX], so that:
 - I: indication that this is a level-i specification
 - Product _i: the one appearing first in the CTA PBS
 - Product _j: the other Product at the end of the interface
 - [XXXX] :4 digit number

The list of elements at the interface between two given CTA Products will be flexible, taking into account each specification needs to be verifiable. It may also need to be adaptable to reflect the reality of how different CTA WPs are organised.

2.3 Interface characterisation. WP's systems engineers

The process of characterising an item at the interface between two CTA Products shall consist of: the item's description, the context in which the interface exists, the definition of the responsibilities around it, the associated flow of information (list of parameters), and safety considerations, if applicable. Already agreed on templates for interface characterisation can be found in the SharePoint interface database (Section 4).

Interface characterisation depends on the type of interface. If one item can be characterised as more than one type of interface i.e. one item has both logical and physical interfacing aspects that need to be described, all aspects must be addressed within the item's description. The characterisation process is likely to be the result of extensive iterations between the parties involved, so it is recommended that the discussions involve only few relevant engineers from both interacting systems. The Product systems engineers are responsible for launching and coordinating this part of the process. They shall:

- designate the relevant engineers for characterising every interface;
- coordinate the discussions and report about them to the CTA PO;
- define the list of relevant parameters to fully characterise the item at the interface;

- enter the relevant information into the interface database in SharePoint (Section 4).

Within the characterisation process, the CTA PO interface engineer will work to ensure that:

- the process moves forward;
- all relevant characterisation aspects are addressed;
- there is consistency across the whole process;
- the process timeline is aligned with the CTA global schedule.

3 Approval of interfaces

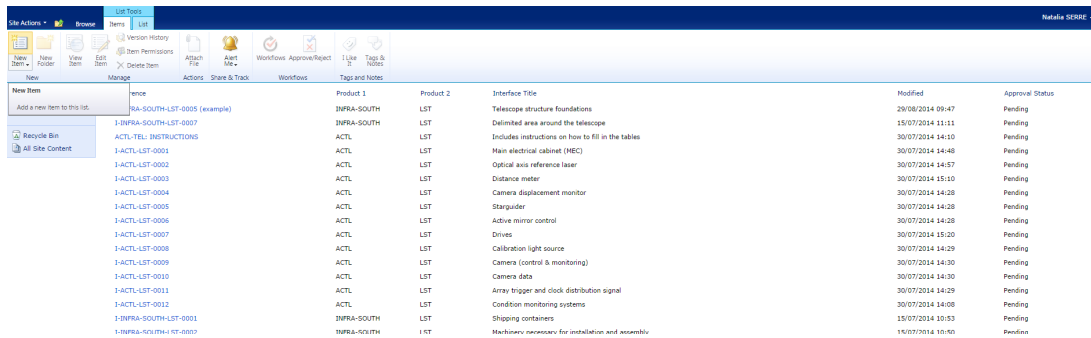
An interface shall be approved once all parties directly involved have approved both its existence and its characterisation. The WP systems engineers will indicate they have approved their own side of the interface, and once approval is gained from all parties, the CTA PO interface engineer will change the interface approval status to Approved, involving the Project Committee. Until an interface is approved, it will be considered strictly as a working document and no information on its characterisation will be considered fact.

4 Implementation of the Interface Control Database (ICD) on SharePoint

All processes described above will be implemented in the Interface Control Database (ICD) on SharePoint. The ICD is a repository that contains all the parameters that characterise all top level interfaces. It is accessible to all CTA members. The database can be found following the link above (within CTA Project/Systems Engineering). The CTA PO owns the database and is responsible for maintaining it.

The process of adding a new item to the list and stating its approval is the following:

- Click on 'New Item' (Figure 2)
- Input the level-i specification reference (according to the acronym in 2.2) (Figure 3)
- Specify Product_i and Product_j in their order of appearance within the CTA top level PBS (Figure 3);
- Choose the interface title so it makes reference to the specific item at the interface of both Products (Figure 3);
- Fill in the 'Explanation' field: include the **names** of the relevant responsible people, a mention to the leading party if applicable, and all aspects of interface characterisation (Figure 3);
- Write a Note on change: brief explanation of how the item has been modified (Figure 3);
- Click on 'Save' (Figure 3);
- In order to state approval, the approving side's systems engineer must clearly state it on the field Note on change by writing the following: "I approve this interface characterisation".



| Name | Product 1 | Product 2 | Interface Title | Modified | Approval Status |
|---------------------------------|------------|-----------|--|------------------|-----------------|
| 1-3WPA-SOUTH-LST-0005 (example) | 1WPA-SOUTH | LST | Telescope structure foundations | 26/08/2014 09:47 | Pending |
| 1-3WPA-SOUTH-LST-0007 | 1WPA-SOUTH | LST | Defined area around the telescope | 15/07/2014 11:11 | Pending |
| 1-3ACTL-TEL-INSTRUCTIONS | ACTL | LST | Includes instructions on how to fill in the tables | 30/07/2014 14:50 | Pending |
| 1-3ACTL-LST-0001 | ACTL | LST | Main electrical cabinet (MEC) | 30/07/2014 14:48 | Pending |
| 1-3ACTL-LST-0002 | ACTL | LST | Optical axis reference laser | 30/07/2014 14:57 | Pending |
| 1-3ACTL-LST-0003 | ACTL | LST | Distance meter | 30/07/2014 15:10 | Pending |
| 1-3ACTL-LST-0004 | ACTL | LST | Camera displacement monitor | 30/07/2014 14:28 | Pending |
| 1-3ACTL-LST-0005 | ACTL | LST | Starfinder | 30/07/2014 14:28 | Pending |
| 1-3ACTL-LST-0006 | ACTL | LST | Active mirror control | 30/07/2014 14:28 | Pending |
| 1-3ACTL-LST-0007 | ACTL | LST | Drives | 30/07/2014 15:50 | Pending |
| 1-3ACTL-LST-0008 | ACTL | LST | Calibration light source | 30/07/2014 14:29 | Pending |
| 1-3ACTL-LST-0009 | ACTL | LST | Camera (control & monitoring) | 30/07/2014 14:30 | Pending |
| 1-3ACTL-LST-0010 | ACTL | LST | Camera data | 30/07/2014 14:30 | Pending |
| 1-3ACTL-LST-0011 | ACTL | LST | Array trigger and clock distribution signal | 30/07/2014 14:29 | Pending |
| 1-3ACTL-LST-0012 | ACTL | LST | Condition monitoring systems | 30/07/2014 14:08 | Pending |
| 1-3WPA-SOUTH-LST-0001 | 1WPA-SOUTH | LST | Shipping containers | 15/07/2014 10:53 | Pending |
| 1-3WPA-SOUTH-LST-0002 | 1WPA-SOUTH | LST | Workflows necessary for installation and assembly | 15/07/2014 10:50 | Pending |

Figure 2: In order to add an item on the interface database on SharePoint, click on ‘New Item’.

Examples of partially filled in items can be seen in Figures 4 and 5.

The Note on change field enable changes to be tracked: every time a change is made, the version number is increased by an integer and the SharePoint user who made the change is identified. This helps version control. An example of this can be seen in Figure 6. Moreover, the full version history may be viewed by clicking on ‘Version history’ (Figure 7), where a complete view of all previous versions may be found, as well as changes (Figure 8). The item also shows the approval status. Once all parties’ systems engineers have stated their approval of their side of the interface, the PO will change the final approval status from ‘Pending’ to ‘Approved’. As can be seen in Figure 9, below the field Note on change the Approval status of the interface is shown (in this case still ‘Pending’).

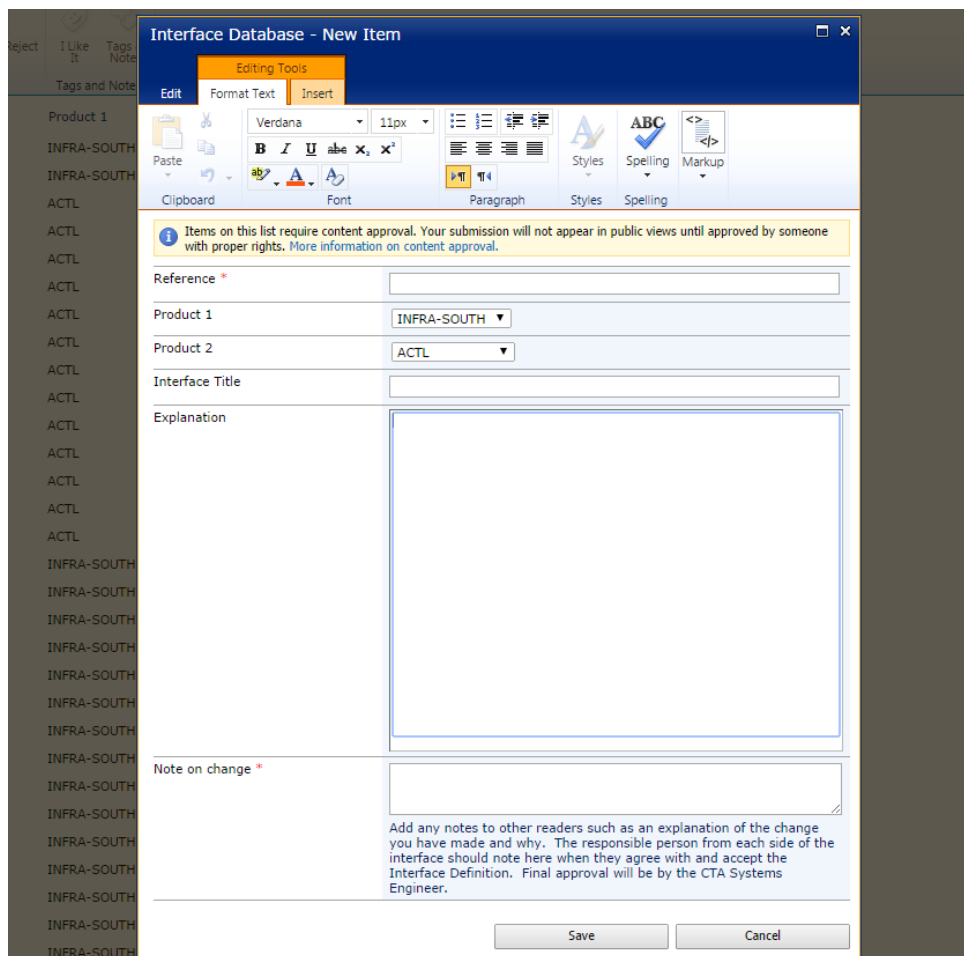


Figure 3: Fields that need to be filled in in order to add a new item on the interface database on SharePoint: Reference (level-i specification reference), both Products in their order of appearance within the CTA top level PBS (select from a scroll-down list), the interface title, the Explanation (interface characterisation) and a Note on change. Finally click on ‘Save’.

Interface Database - I-INFRA-SOUTH-LST-0004

View

Version History Alert Me
 Manage Permissions Approve/Reject
 Edit Item Delete Item
 Manage Actions

Reference: I-INFRA-SOUTH-LST-0004

Product 1: INFRA-SOUTH

Product 2: LST

Interface Title: Area around the telescope

Explanation

[1.1.1 Description of the item](#)

Type of Interface: Information-only
(to be completed)

[1.1.2 Responsibility definition](#)

| Activity | | Details | Responsible group | Deliverables (if any) | Status (fully defined/undefined) | Deadline for definition (in the form of a date or in the form of a dependency) | Applicable Requirement(s) (if any) |
|----------|--------------|---------|-------------------|-----------------------|----------------------------------|--|------------------------------------|
| WBS code | WBS activity | | | | | | |
| | | | | | | | |
| | | | | | | | |

[1.1.3 Flow of information at the Interface](#)

| Parameters | Pertinent groups | Value |
|--|------------------|-------|
| Extension of the "free of flammable material" area | S | |
| Extension of the paved/gravelled/flattened area | I,M,D | |
| Flatness | I,M,D | |
| Paved/Gravelled | I,M,D | |

[1.1.4 Safet Risks at the Interface](#)
(to be completed)

Figure 4: INFRA-LST item at the interface (example)

□ ×
Interface Database - I-ACTL-LST-0002

View

| | | |
|--|---|---|
| <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"> Edit Item </div> <div style="display: flex; align-items: center;"> Delete Item </div> </div> <p style="text-align: center; margin-top: 5px;">Manage</p> | <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"> Version History </div> <div style="display: flex; align-items: center;"> Manage Permissions </div> </div> <p style="text-align: center; margin-top: 5px;">Manage</p> | <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"> Alert Me </div> <div style="display: flex; align-items: center;"> Approve/Reject </div> </div> <p style="text-align: center; margin-top: 5px;">Actions</p> |
|--|---|---|

| Reference | I-ACTL-LST-0002 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|--|---|--|------|------|---------------|--------------|------------------|---------------|----------------------|--|--|------|------|-------------|-----------|------------|--|-----------|------------|---|-----------|----------|---------------------------------------|-------------|--|------|-------------|---------------|---|-------------------|---|---------|--|------|-------------|-----------------|------------------------|
| Product 1 | ACTL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Product 2 | LST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Interface Title | Optical axis reference laser | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Explanation | <p>Header</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th colspan="2">Information provided by:</th> </tr> <tr> <th>Name</th> <th>Role</th> </tr> </thead> <tbody> <tr> <td>Eric Chabanne</td> <td>LST engineer</td> </tr> <tr> <td>Thierry Le Flour</td> <td>ACTL engineer</td> </tr> </tbody> </table> <p>Telescope subsystem description</p> <p>The OARL function is to provide a reference direction, representing the optical axis of the telescope, to be used by the Camera Displacement Monitor (CDM), Active Mirror Controller (AMC) and Star guider, as parts of Calibration box.</p> <p>Applicable Use-Cases</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th colspan="3">Applicable Use-Cases</th> </tr> <tr> <th>Code</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>UC-OARL-1</td> <td>Get Status</td> <td>Get the status of the Optical Axis Reference Laser</td> </tr> <tr> <td>UC-OARL-2</td> <td>Initialize</td> <td>Initialize Optical Axis Reference Laser for operation</td> </tr> <tr> <td>UC-OARL-3</td> <td>Shutdown</td> <td>Shutdown Optical Axis Reference Laser</td> </tr> </tbody> </table> <p>Data exchange</p> <p>Overview</p> <p>This section contains a table listing all the Data Points and Methods for a given interface:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th colspan="2">Data Points</th> </tr> <tr> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>OARL_StatusDP</td> <td>Current status of the OARL (Available, Busy, Error...).</td> </tr> <tr> <td>OARL_ErrorValueDP</td> <td>Error value returned by OARL control system</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Methods</th> </tr> <tr> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>OARLSwitchOnOff</td> <td>Switch ON/OFF the OARL</td> </tr> </tbody> </table> | Information provided by: | | Name | Role | Eric Chabanne | LST engineer | Thierry Le Flour | ACTL engineer | Applicable Use-Cases | | | Code | Name | Description | UC-OARL-1 | Get Status | Get the status of the Optical Axis Reference Laser | UC-OARL-2 | Initialize | Initialize Optical Axis Reference Laser for operation | UC-OARL-3 | Shutdown | Shutdown Optical Axis Reference Laser | Data Points | | Name | Description | OARL_StatusDP | Current status of the OARL (Available, Busy, Error...). | OARL_ErrorValueDP | Error value returned by OARL control system | Methods | | Name | Description | OARLSwitchOnOff | Switch ON/OFF the OARL |
| Information provided by: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Name | Role | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eric Chabanne | LST engineer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thierry Le Flour | ACTL engineer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Applicable Use-Cases | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Code | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UC-OARL-1 | Get Status | Get the status of the Optical Axis Reference Laser | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UC-OARL-2 | Initialize | Initialize Optical Axis Reference Laser for operation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UC-OARL-3 | Shutdown | Shutdown Optical Axis Reference Laser | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Data Points | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OARL_StatusDP | Current status of the OARL (Available, Busy, Error...). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OARL_ErrorValueDP | Error value returned by OARL control system | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Methods | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OARLSwitchOnOff | Switch ON/OFF the OARL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Figure 5: ACTL-LST item at the interface (example)

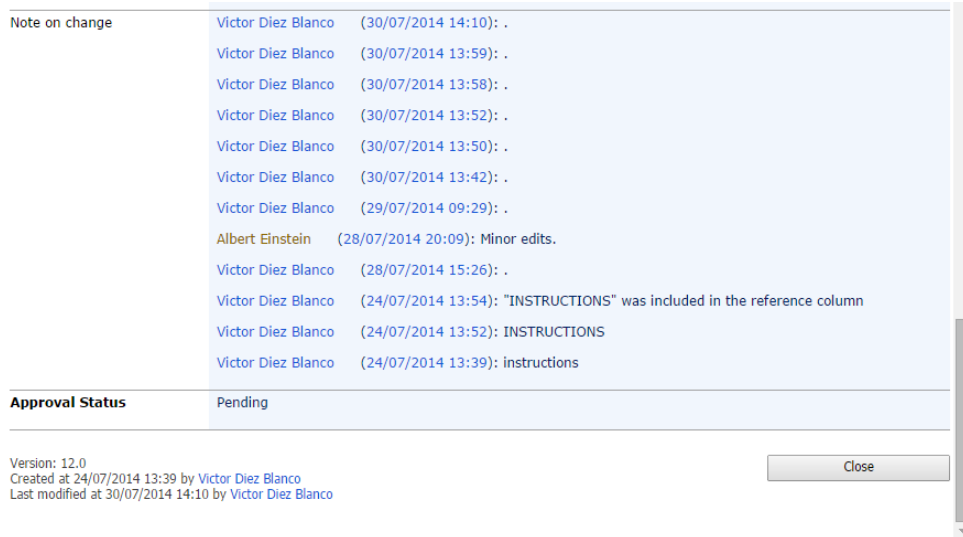


Figure 6: Version control and authors of changes. When change is made, the version number is increased by an integer and the SharePoint user who made the change is identified.

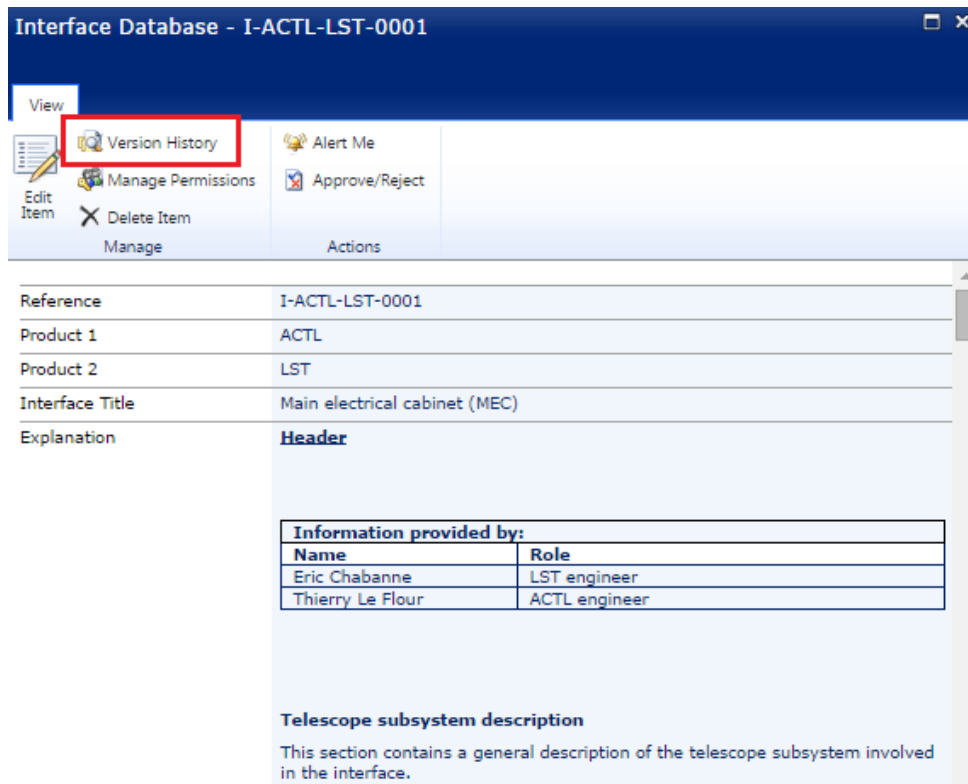


Figure 7: The full version history may be viewed by clicking on ‘Version history’ (1).

Version History ✖

[Delete All Versions](#) | [Delete Draft Versions](#)

| No. ↓ | Modified | Modified By |
|-------|------------------|-------------------------------|
| 15.0 | 30/07/2014 14:48 | Victor Diez Blanco |
| | Reference | I-ACTL-LST-0001 |
| | Product 1 | ACTL |
| | Product 2 | LST |
| | Interface Title | Main electrical cabinet (MEC) |
| | Explanation | Header |

| Information provided by: | |
|--------------------------|---------------|
| Name | Role |
| Eric Chabanne | LST engineer |
| Thierry Le Flour | ACTL engineer |

Telescope subsys...

Note on change .

Approval Status Pending

Figure 8: The full version history may be viewed by clicking on ‘Version history’ (2).

1.1.3 Flow of information at the Interface

| Parameters | Pertinent groups | Value |
|--|------------------|-------|
| Outdoors storage space needed during installation (if applicable) | I | |
| Outdoors storage conditions needed during installation (if applicable) | I | |
| Outdoors storage location during installation (if applicable) | I | |
| Outdoors needed assembly space | I | |
| Outdoors needed assembly space conditions (flatness, dust, paved/gravelled, etc) | I | |
| Outdoors assembly space location | I | |

1.1.4 Safet Risks at the Interface
(to be completed)

Note on change

| | |
|------------------------|---------|
| Approval Status | Pending |
|------------------------|---------|

Version: 1.0
 Created at 15/07/2014 10:58 by Natalia SERRE
 Last modified at 15/07/2014 10:58 by Natalia SERRE

Figure 9: The item also shows the approval status. Once all parties’ systems engineers have stated their approval of their side of the interface, the PO will change the final approval status from ‘Pending’ to ‘Approved’ (in this case it is still ‘Pending’).