Hybrid Provision of Energy based on Reliability and Resiliency by Integration of Dc Equipment

Work Package WP5

Open and secure ICT for modular resilient optimized hybrid grid

Deliverable D5.5

Open reliability information database

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List of Abbreviations

AC	Alternating Current
ACDC	Alternating Current/Direct Current
AIT	Austrian Instutute of Technology
CB	Circuit breaker
CERN	European Organization for Nuclear Research
CSV	Comma seperated values
DC	Direct Current
DCDC	Direct Current/Direct Current
DCMU	Digital calibration and Measurement unit
FCC	Future Circular Collider - Cern
GA	Grant Agreement
ICT	Information and Communication Technology
LVDC	Low Voltage Direct Current
MTBF	Mean Time between Failures
MVDC	Medium Voltage Direct Current
RCCB	Residual current circuit breaker
RCD	Residual current device
REST	Representational State Transfer
VARC	VSC Assisted Resonant Current
VI	Vacuum Interrupter
WP	Work Package

Executive Summary

Analysing and predicting system performance and availability depends largely upon reliability and maintenance data. Attaining statistically credible data can require observations from several years of operations. Fortunately, this data collection process can be quickened if this data is shared within the community of organisations in the same working domain.

The goal of this task is to develop an open reliability information system to provide a common platform for storing and sharing reliability information on components in the area of energy management. The work is accompanied by a prototyping activity that shall prove the concept and create a foundation for gathering reliability information about selected key systems. A special care is taken to ensure technical efficiency and meeting the legal and administrative constraints emerging from cooperation with industrial partners and regulatory bodies.

The open reliability information systems focuses on industrial infrastructures in large scale facilities. The shared data will consist of system and subsystem reliability and maintenance statistics, information on system structure and operation conditions as well as estimation on data quality. The data will be used in quantitative reliability and availability assessments. The stored data and intended use differ from traditional maintenance databases that are used for storing individual equipment failure events.

The development of an open reliability database started in the context of the Future Circular Collider - Cern (FCC) research project, where a platform for sharing reliability information played a big role in the area of accelerator technology and this community did not have a platform yet. However, successful examples of this concept exist in oil, nuclear and wind power industries and this existing knowledge shall be used to benefit this project. This knowledge includes OREDA, EIReDA, SPARTA and WInD-Pool projects and ISO 6527, ISO 14224 and ISO/TR 12489 standards (see Figure 1).

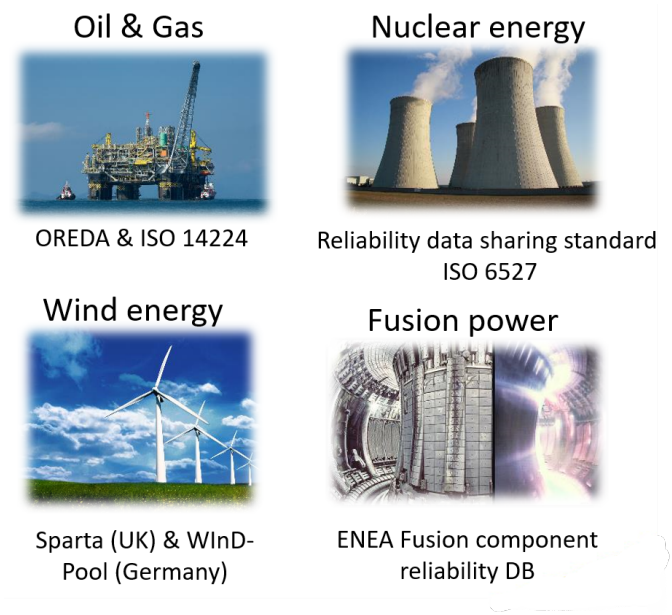

Figure 1: Examples of sharing reliability information in industry.

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1 Introduction

1.1 Purpose and Scope of the Document

This document describes the concepts, descriptions, and results from Task 5.5, concerning an open reliability database in HYPERRIDE. Several statements in the proposal and the Grant Agreement (GA) point to the content of this task (*HYPERRIDE Grant Agreement*, 2020):

Starting already with the project title "**HY**BRID **P**ROVISION OF **E**NERGY BASED ON **R**E-LIABILITY AND RESILIENCY VIA **I**NTEGRATION OF **D**C **E**QUIPMENT" the term "reliability" aspect is addressed.

Objective 3 in the "HYPERRIDE Grant Agreement" (page 6) focuses on **Fault management and Cybersecurity** as enabling technologies in the area of infrastructure projects and energy management (*HYPERRIDE Grant Agreement*, 2020).

In the Section "1.3.2 HYPERRIDE enabling technologies and main ideas" ITEM 13 decribes:

Converters interactions and system level stability

Operation of a large number of power electronic converters in close proximity, with different control loops and bandwidths, may lead to unwanted interactions and possible system level instabilities. This is equally true for both Alternating Current (AC) and Direct Current (DC) systems, and requires special attention during design phase, but also measurements and performs verification on a real system. There are many methods developed over the years that rely on the injection of controlled frequency content in the network and measurement of the frequency response, from where system characteristics can be determined. Yet, for a dynamic system, such as hybrid AC-DC micro grids, measurements need to be performed quickly and at various places. Work Package (WP)6 will demonstrate a flexible and efficient approach to perform system identification in hybrid systems.

In the Section "2.1.1 Expected impacts with respect to work programme and call description" the improvements of Mean Time between Failures (MTBF) and the reduction of long term costs are expected results by improvement of system availability by simulation and optimisation of redundancy and maintenance cycles, based on shared knowledge of reliability characteristics of system components.

This report describes the concept of a prototype, how such an open reliability database can be constructed, and how this database can be configured.

The 1st prototype concept was developed in the context of acceleration equipment in cooperation with European Organization for Nuclear Research (CERN). In this HYPERRIDE project, the design should be tested also in the environment of energy management networks, especially in the context of Alternating Current/Direct Current (ACDC) and Direct Current/Direct Current (DCDC) networks.

1.2 Structure of the Document

This report has the following structure: Following the executive summary and the introduction, Section 2 gives an overview of the proposed concept whereas the planned project realisation is discussed in Section 3. Corresponding actors and roles, uses cases and use context as well as the logical model are described in the following Sections 4 to 6. The user as well as the service interfaces are covered by Sections 7 and 8. The repot is concluded in Section 9 by the

summary and main findings. Finally, details about the logical model as well as the proposed REST API are shown in Appendix A and Appendix B.

2 General Concept

The goal of this task is to develop an open reliability information database to provide a common platform for storing and sharing component reliability information.

This task is based on activities, which were started in the ARIES project for accelerator components. The shared data will consist of system and subsystem reliability and maintenance statistics, information on system structure and operation conditions, as well as estimation on data quality. The data will be used in quantitative reliability and availability assessments. Successful examples of such concept exist in oil, nuclear and wind power industries and this existing knowledge shall be used.

This Logical Model of a database describes the proposed database structure for the ARIES Information system.

Most of the terms, concepts and definitions are taken from the European Standard EN ISO 14224 (*EN ISO 14224 – Petroleum, petrochemical and natural gas industries – Collection and exchange of reliability and maintenance data for equipment*, 2016), a standard developed for collecting and exchanging of reliability and maintenance data for equipment.

Specific concepts for the oil industry are removed and a more general approach for structuring of organisations and installations are introduced.

2.1 Reliability Analysis

The term reliability is part of our everyday language, especially when speaking about the functionality of a product. A very reliable product is a product that fulfils its function at all times and under all operating conditions (Bertsche, 2008).

As we know in practical life this can not always be provided. Systems have a limited life time and during their life time we have to invest in maintenance actions and there is always a probability of failures in technical systems.

The improvement of availability will always enlarge the capital costs for design and maintenance, but on the other side reduce the cost for unexpected events and interruptions (life cycle operation costs) (see Figure 2). Reliability analysis tries to observe systems and the probabilities of failures events of components or installation parts. If we know the frequency of failures (or probabilities) we can invest on the one side in the improvement of technical parts and in the environmental conditions in which components have to work.

On the other side we can provide constructive measures to provide redundancy and self-diagnostic elements to be able to live with imperfect components. Intelligent monitoring can assist to detect failure patterns and switch the process between redundant system parts.

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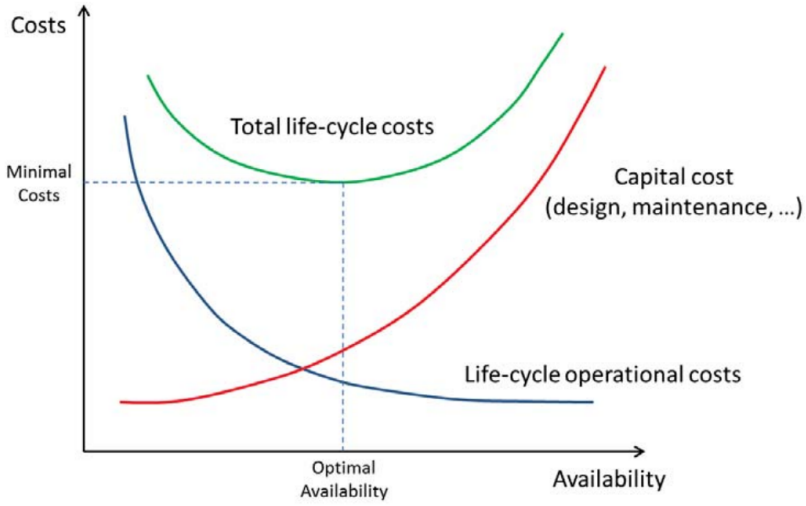


Figure 2: Availablity and Costs.

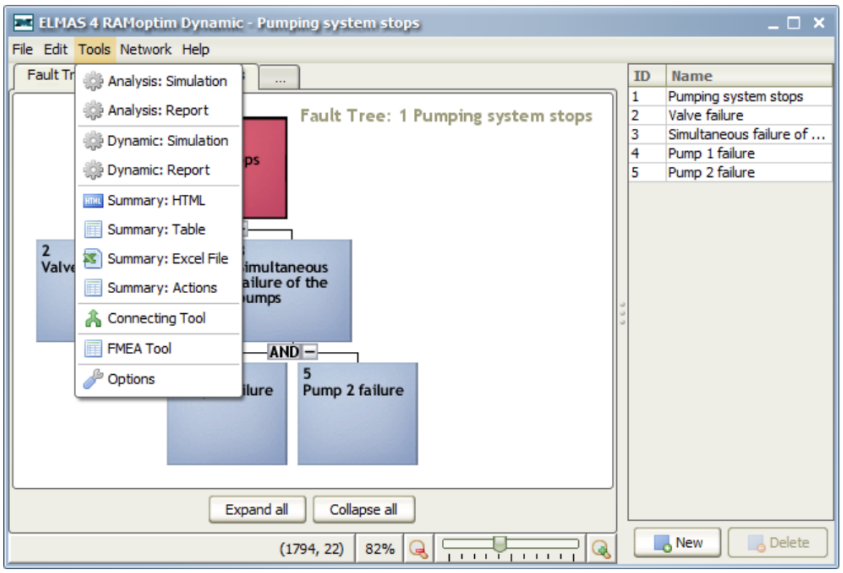


Figure 3: Analysis Tool ELMAS (Ramentor).

If we want to provide a high level of reliability as needed in nuclear power stations, in oil and gas extracting stations, in wind parks, in accelerator facilities like the one that is planned for the upcoming 100km accelerator ring in CERN (CERN, 2017), and of course also for energy supply equipment we have to invest into a good design of the whole system to provide an overall robust and reliably complete system.

Simulation techniques (Ramentor, 2011), like Figure 3, have been developed for the simulation of large complex systems to detect weak points of failures and for the calculation of the probability of failures of the complete systems. With the help of such a system the robustness and reliability of complex systems can be optimised to the limits of the requirements and available budgets. Such simulation tools allow the planning of redundancies of connected components, the calculation of overall reliability probabilities and the estimation of optimized maintenance cycles. The needed input for such a simulation step is the knowledge of reliability of the single

components, which should be collected by this reliability database.

Reliability Information Systems, like sketched in Figure 4, can help to collect and manage reliability and cost information on systems and components.

2.2 Reliability of Components

Besides the existing tools and techniques, as described in (Frank Müller, 2018), for simulation it is needed to have knowledge about the used components, sub components and maintainable items. These are needed inputs for simulations and design.

The focus of this HYPERRIDE task is to collect knowledge regarding the reliability and failure frequency of components, which constitute the complete complex energy management system.

In some cases, failure information already exists in handbooks, like in military handbooks such as (*Military standard MIL-STD-1629A*, 1980) or in handbooks of different component providers. But, in many cases, especially in research and prototyping areas, new complex components are designed for new usage areas. In most of the cases, you will not find existing information on these components.

It is necessary to collect this failure and reliability information inside the projects and during the lifetime of systems. This is an important task, which is already implemented in industrial installations for many years, as they know very well that they can improve their installations and reduce down-times and costs with this knowledge.

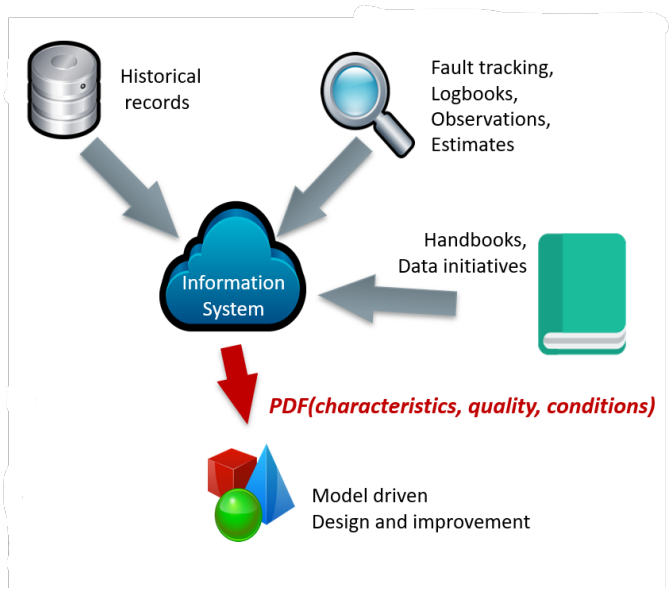


Figure 4: Reliability Information Systems.

Several standards have been developed in which terms and methods were documented and specified, how information systems for reliability information can be implemented and how key factors for development can be calculated.

In this project, we have decided to build our implementation upon the suggestions and definitions of the ISO standard 14224 (*EN ISO 14224 – Petroleum, petrochemical and natural gas*

industries – Collection and exchange of reliability and maintenance data for equipment, 2016), which was developed for Petroleum, petrochemical and natural gas industries for collection and exchange of reliability and maintenance data of equipment.

The general concept of this standard is independent of the applied industry sector, a lot of configuration tables facilitate the adaption to the used sector. In HYPERRIDE, we will focus on the sector of energy management and provide some examples that show how this concept can be used.

The starting step for this ”Open reliability database” was done in the area of accelerator physics and in the context of the FCC in the ARIES project (CERN, 2017). Besides the scientific aspects of finding new particles, this topic is needed as an enabling technology, as down-times for such huge equipment (100km) lead to very expensive and time demanding interruptions.

2.3 The Concept of an Open Reliability Database

Reliability information systems are very often used in a closed industrial sector for one specific use case. The idea in this approach was to design an open environment for storing of failure and maintenance information on components across the borders of companies or organisations.

The expected advantages of this approach are:

- Organisations can use an infrastructure for fault tracking and maintenance management and can avoid investments in application development.
- Organisations using similar components can share information on reliability characteristics an a statistical level without offering internal details.
- By sharing information, the statistics on components can use an extended data set and provide therefore a better prediction on the real behaviour.

The principal requirement for this concept is:

Share as much as possible common characteristics and key factors, but hide all private aspects of the organisations, their equipment and internal business activities.

2.4 Statistical Concepts

This section describes the principal of failure statistics in a very compressed form. For detailed information on statistics and methods, please find more details in special literature like (Bertsche, 2008), (Frank Müller, 2018) or in other appropriate sources.

Failure Events occur in practice not in an exact predictable way, we can only look for statistical information, what is the expected interval for failure events.

2.4.1 Statistical Definitions

Reliability is the probability that a product or component does not fail during a defined period of time under given functional and environmental conditions (see Figure 5).

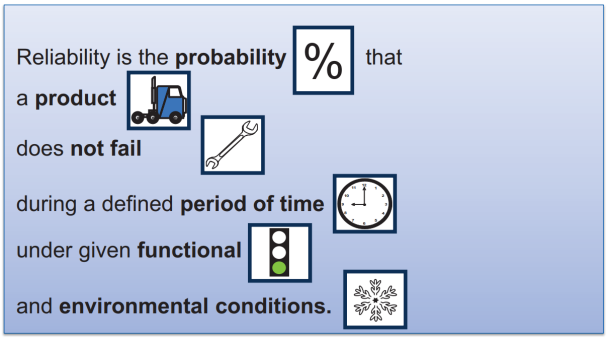


Figure 5: Definition of Reliability.

We assume the probabilities of failure are statistical distributions around a MTBF (see Figure 6).

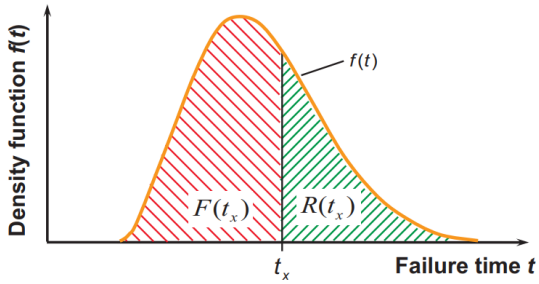


Figure 6: Density function.

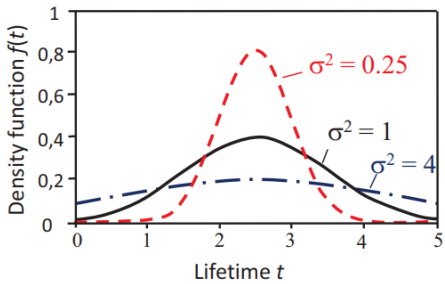
For a limited number of failure events we can find some characteristic values which are:

- Empirical **arithmetic mean value** t_m with failure times $t_1, t_2, \ldots, t_n$

$$t_m = \frac{t_1 + t_2 + t_3 + \cdots + t_n}{n} = \frac{1}{n}\sum_{i=1}^{n} t_i \tag{1}$$

- σ^2 describes the mean deviation from the arithmetic mean

$$\sigma^2 = \frac{1}{n-1}\sum_{i=1}^{n}(t_i - t_m)^2 \tag{2}$$



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- The empirical standard deviation σ is obtained as the root of the variance

$$\sigma = \sqrt{\sigma^2} \tag{3}$$

- The failure rate defines defines the number of failures for a set of components at a given time

$$\lambda(t) = \frac{Numberoffailures}{Totalnumberoftimeintact} = \frac{f(t)}{\tau(t)} \tag{4}$$

2.4.2 Estimation Procedure According OREDA-2002 Handbook

The OREDA-2002 ((*EN ISO 14224 – Petroleum, petrochemical and natural gas industries – Collection and exchange of reliability and maintenance data for equipment*, 2016)) handbook describes average failure rate estimates together with repair time estimates for a limited set of failure and maintenance data for a limited set of components.

In the first step, we assume that the components are homogeneous.

The failure rate function tells us how likely it is that an item that has survived up to time t, will fail during the next unit of time. If the item is deteriorating, this likelihood will increase with the age t. A person who has reached the age of 95 years will obviously have a higher probability of dying during the next year than someone who is 20 years old. The failure rate function will therefore usually be a function of the time or age of the item.

In an exact modelling, we would have this time dependency of failure rate, which in real life looks like a "bath curve" with a higher failure rate in the burn-in phase and higher rate in the wear-out phase. In the useful life time, the failure rate is assumed to be constant. The application proposed in this deliverable handles only the normal life time and ignores burn-in and wear-out phases of components.

$$\lambda(t) = \lambda \tag{5}$$

The mean time to failure, MTBF, may be calculated as

$$MTBF = \frac{1}{\lambda} \tag{6}$$

When we have failure data from identical items that have been operating under the same operational and environmental conditions, we have a so-called homogeneous sample. The only data we need to estimate the failure rate – λ in this case – are the observed number of failures, n, and the aggregated time in service, τ.

The estimator of λ is given by:

$$\lambda' = \frac{NumberOfFailures}{AggregatedTimeInService} = \frac{n}{\tau} \tag{7}$$

The aggregated time in service, τ, may be measured either as calendar time or operating time.

This approach is valid for following situations:

- Failure times for a specified number of items, with the same failure rate λ are available.
- Date (several failures) is available for *o*ne item for a period of time, and the failure rate λ is constant during this time.
- A combination of the two above situations. This is the typically situation for our environment.

With n failures during an aggregated time in service
tau the uncertainty intervals for the failure rates can be given as a 90% confidence interval by

$$(\frac{1}{2\tau} z_{0.95,2n}, \frac{1}{2\tau} z_{0.05,2(n+1)}), \tag{8}$$

where $z_{0.95,\nu}$ and $z_{0.95,\nu}$ denote the upper 95% and 5% percentiles, respectively, Of the χ^2 distribution with χ degrees of freedom.

In most cases we do not have a homogeneous sample of data. The aggregated data for an item may come from different installations with different operational and environmental conditions, or we may wish to present an "average" failure rate estimate for slightly different items. In these situations we may decide to merge several more or less homogeneous samples, into what we call a multi-sample.

In this cases the estimation will be performed in an advanced way.

The main focus on this advanced calculation mode lies in a sophisticated correction of the uncertainty intervals, which has to be expanded in consequence of the homogeneity of the samples.

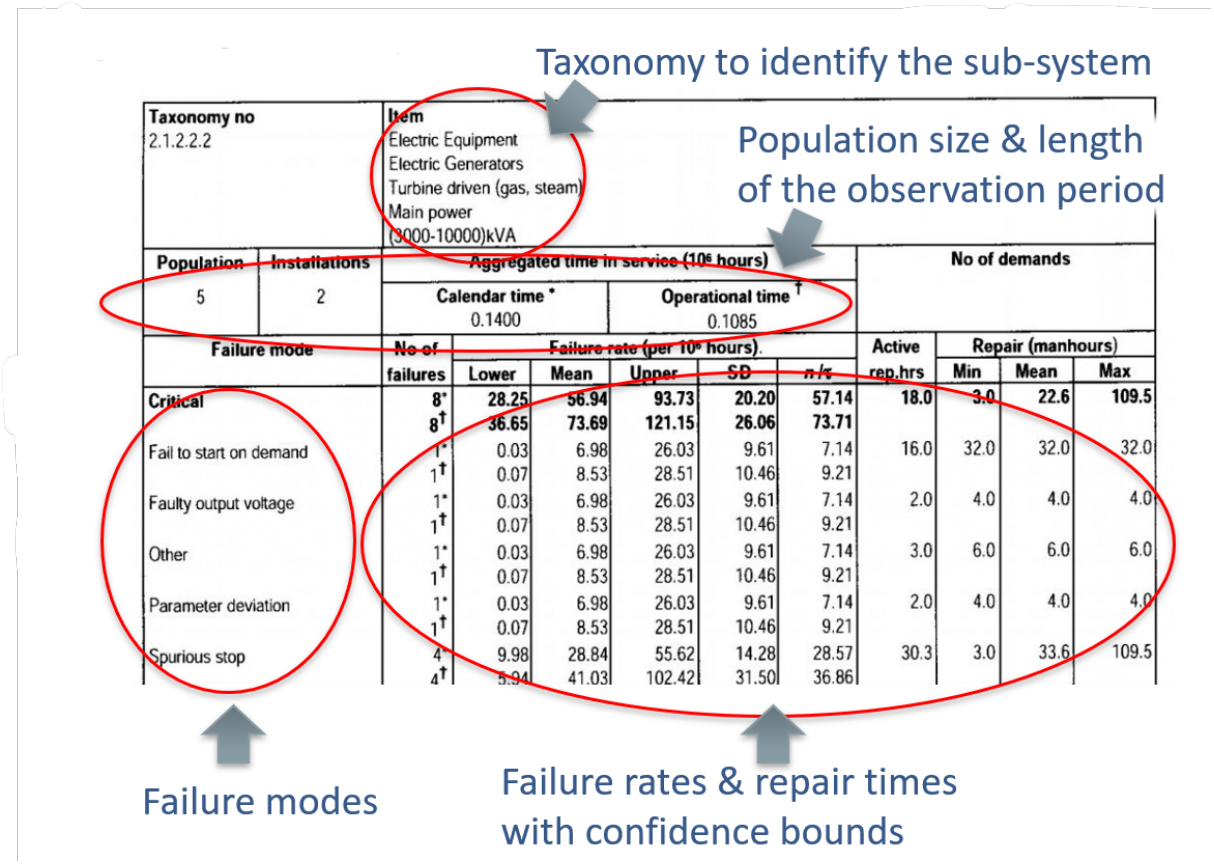
2.5 Expected Result

The expected results of data collection are statistical data on groups of components with the same or similar characteristics working in comparable environmental characteristics.

The statistics are calculated over all components (Equipment units) collected by all participating partners, excluding such components, which are marked as "private" by the owning organisation. Figure 7 shows the structure of such a result set:

- The ordering concept of such statistics is the taxonomy of Equipment classes (here: Taxonomy to identify the subsystem). The administrator of the system establishes this structure or catalogue of components in the preparation phase. In the next section, we will see how this structure is proposed for the work context of the project HYPERRIDE.
- The section "Population size & length of the observation period" contains the sum of components and the sum of spend calendar and operation time over all components, which are included in the statistic. The greater the number of included components, the better the statistic.
- The categories "Failure modes" lists all failure modes, which acquired in the observed period.
- The matrix area lists all the statistical results for each failure mode separately. This includes:

- Number of failures.
- Failures rates, including lower and upper bounds of confidence, as well over calendar time, as also over operation time.
- Sum of repair hours and costs an persons needed.



Taxonomy no	Item
2.1.2.2.2	Electric Equipment Electric Generators Turbine driven (gas, steam) Main power (3000-10000)kVA

Population	Installations	Aggregated time in service (10^6 hours)		No of demands
		Calendar time *	Operational time †	
5	2	0.1400	0.1085	

Failure mode	No of failures	Failure rate (per 10^6 hours)					Active rep.hrs	Repair (manhours)		
		Lower	Mean	Upper	SD	n/τ		Min	Mean	Max
Critical	**8***	**28.25**	**56.94**	**93.73**	**20.20**	**57.14**	**18.0**	**3.0**	**22.6**	**109.5**
	8†	**36.65**	**73.69**	**121.15**	**26.06**	**73.71**				
Fail to start on demand	1*	0.03	6.98	26.03	9.61	7.14	16.0	32.0	32.0	32.0
	1†	0.07	8.53	28.51	10.46	9.21				
Faulty output voltage	1*	0.03	6.98	26.03	9.61	7.14	2.0	4.0	4.0	4.0
	1†	0.07	8.53	28.51	10.46	9.21				
Other	1*	0.03	6.98	26.03	9.61	7.14	3.0	6.0	6.0	6.0
	1†	0.07	8.53	28.51	10.46	9.21				
Parameter deviation	1*	0.03	6.98	26.03	9.61	7.14	2.0	4.0	4.0	4.0
	1†	0.07	8.53	28.51	10.46	9.21				
Spurious stop	4*	9.98	28.84	55.62	14.28	28.57	30.3	3.0	33.6	109.5
	4†	5.94	41.03	102.42	31.50	36.86				

Figure 7: Example of the outcome of the reliability database.

3 HYPERRIDE Implementation

The most important point of ARIES implementation in the HYPERRIDE project is the testing of the concept of an Open Reliability Databases in the field of Energy management, especially in the context of ACDC or DCDC applications.

- In this task the software system and missing calculation components have been implemented and optimised.
- The catalogue of components has been elaborated for this context.
- Typically, components of all partners in this project have been modelled and implemented for this system.
- Partners should be enabled as organisations and users to the database.
- Maintenance and reliability data will be collected for components, as much as possible.

3.1 The Catalogue of Components

In the original documentation of OREDA (*EN ISO 14224 – Petroleum, petrochemical and natural gas industries – Collection and exchange of reliability and maintenance data for equipment*, 2016) a fixed hierarchy of taxonomy levels were described. This fixed hierarchy was very practical and adapted to the areas of the application addressed. For the design of an “Open Reliability Database" we wanted to design the top levels of the hierarchy more flexibly as an open design-able hierarchy of “Equipment classes”.

Figure 8 illustrates this adaption and the the changes in the proposed implementation.

The organisation of the catalogue is done by an hierarchy of Equipment classes (class, subclasses, subsubclasses, etc.). At the end leafs of this tree an exact description of an “Equipment Type” can be added. The depth of the hierarchy is not generally defined and can be as deep as needed.

The hierarchy for locations, where a real component is placed, can be defined by the hierarchy Organisation → Installation → Location (including sub-locations).

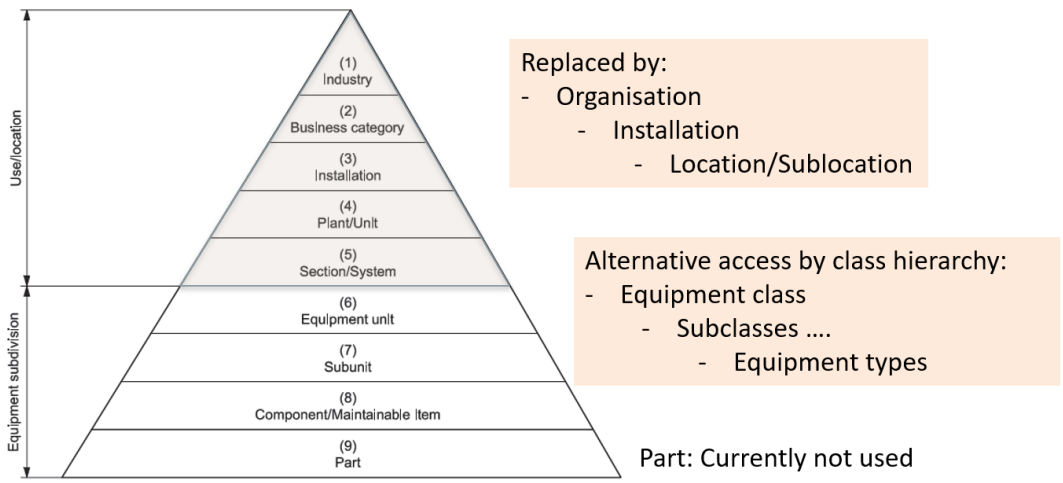


Figure 8: Model for describing the structure of a catalogue.

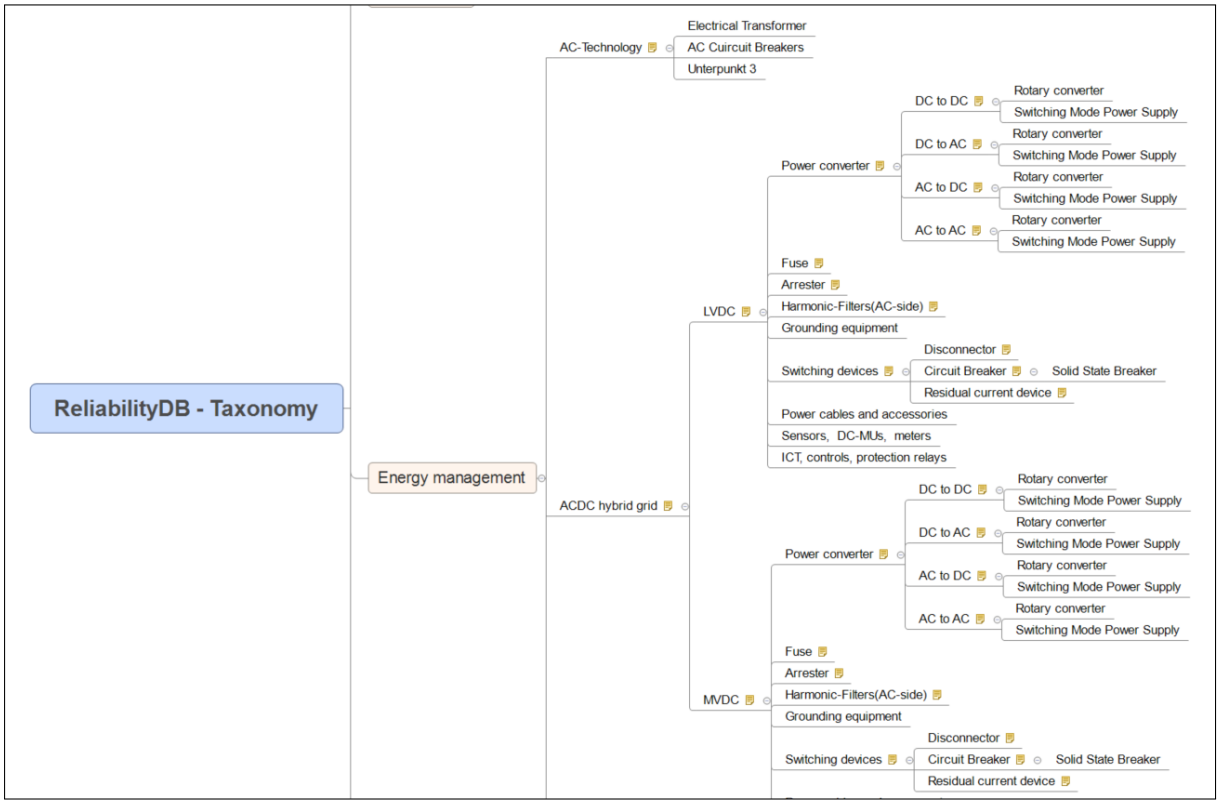


Figure 9: Class hierarchy for electrical energy management systems.

For HYPERRIDE, we have found the following hierarchy of classes, which comes from the structure of a HYPERRIDE Deliverable D2.3 (see Figure 9).

The first level of classes divides between main industry sectors:

- Building industry,
- Chemical industry,
- Oil drilling,
- Wind power,
- **Energy management techniques**,
- Accelerator technology.

In the following discussion we will focus only on “Energy management techniques”.

For “Energy management techniques” the 2nd level is:

- AC-grids: this includes all sub-classes from classical AC grid technology.
- **AC-DC hybrid grids**: this includes all sub-classes for mixed AC DC technology.
- DC-grids: this includes all sub-classes for pure DC technology.

We focus further on ACDC hybrid grids.

The proposed an installed hierarchy is as follows:

- Low Voltage Direct Current (LVDC) - Low voltage range (0-1500 V) [D2.3, Capt. 2.2],

Due to voltage limits in existing standards (e.g. IEC 60900), the majority of installations are built below and close to 1500 V in bipolar configuration, e.g. ±700 V or ±750 V. (Willems et al., 2017) propose 350 V as a base voltage with the possibility to stack up to 1400 V with ±350 V= or 700 V as a first step. Recommended nominal LVDC distribution voltage levels [V]:

- 350 V DC,
- 700 V DC,
- ±350/700 V DC,
- ±700/1400 V DC.

- MVDC - Medium voltage range (>1500 V-35 kV) [D2.3, Capt. 2.1]

  The Institute of Electrical and Electronics Engineers (IEEE) Standard 1709-2010 ("IEEE Recommended Practice for 1 kV to 35 kV Medium-Voltage DC Power Systems on Ships", 2010) provides recommended voltage levels of 1.5 kV, 3 kV, 6 kV, 12 kV, 18 kV, 24 kV, or 30 kV.

Inside of the **LVDC class** the following sub-structure is proposed:

- Power converter[1]:

  Power conversion is the process of converting electric energy from one form to another. A power converter is an electrical or electro-mechanical device for converting electrical energy. A power converter can convert alternating current (AC) into direct current (DC) and vice versa; change the voltage or frequency of the current or do some combination of these. The power converter can be as simple as a transformer or it can be a far more complex system, such as resonant converter. The term can also refer to a class of electrical machinery that is used to convert one frequency of alternating current into another. Power conversion systems often incorporate redundancy and voltage regulation.

  - DC to DC - Converter from DC to DC, different voltage levels (2 directions),
  - DC to AC - Converters from DC to AC,
  - AC to DC - Converters from DC to AC,
  - AC to AC - Converter from AC to AC, different voltage levels, maybe different frequencies (2 directions).

- Fuse[2]:

  A fuse is an electrical safety device that operates to provide over current protection of an electrical circuit. Its essential component is a metal wire or strip that melts when too much current flows through it, thereby stopping or interrupting the current. It is a sacrificial device; once a fuse has operated it is an open circuit, and must be replaced or rewired, depending on its type.

- Arrester:

  Arresters are components protecting components against too high voltage.

- Harmonic-Filters(AC-side):

[1] https://en.wikipedia.org/wiki/Electric_power_conversion
[2] https://en.wikipedia.org/wiki/Fuse_(electrical)

An AC power conditioner is the typical power conditioner that provides “clean" AC power to sensitive electrical equipment.

- Grounding equipment,
- Switching devices:

  A switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another.

  - Disconnector[3]:

    A disconnector, disconnect switch or isolator switch is used to ensure that an electrical circuit is completely de-energized for service or maintenance.

  - Circuit Breaker[4]:

    A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit. Its basic function is to interrupt current flow after a fault is detected. Unlike a fuse, which operates once and then must be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation:

    * Solid State Breaker,
    * Vacuum Circuit Breaker,
    * Air Circuit Breaker,
    * SF6 Circuit Breaker.

  - Residual current device[5]:

    A Residual current device (RCD) or Residual current circuit breaker (RCCB) is a device that quickly breaks an electrical circuit to prevent serious harm from an ongoing electric shock. Injury may still occur in some cases, for example, if a human falls after receiving a shock or if the person touches both conductors at the same time.

- Power cables and accessories,
- Sensors, Digital calibration and Measurement unit (DCMU), meters,
- Information and Communication Technology (ICT), controls, protection relays.

The substructure of **Medium Voltage Direct Current (MVDC)** looks like the structure of LVDC (Section 3.1).

3.2 Meta Model of Components – Equipment Types

For each group of similar components with the same structure of characteristics a description (=metamodel) has to be provided. In the context of OREDA, this metamodel is also called “Equipment Type”, as defined in Section 9.

[3] https://en.wikipedia.org/wiki/Disconnector
[4] https://en.wikipedia.org/wiki/Circuit_breaker
[5] https://en.wikipedia.org/wiki/Residual-current_device

An Equipment Type defines particular features of the design which is significantly different from the other design(s) within the same equipment class.

Attributes of the Equipment Type definitions are:

- Name and description.
- Classification in an hierarchy of Equipment Classes (catalogue).
- Boundary definitions - description of the boundaries and sub-units in an easy understandable picture.

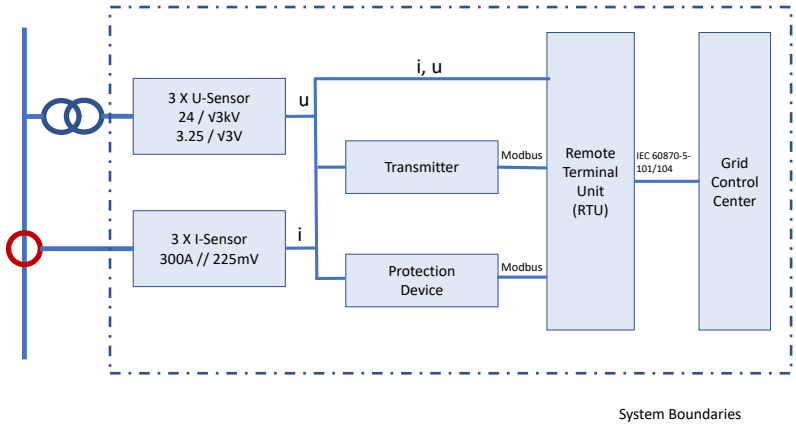


Figure 10: Boundary definition of an equipment type.

- Value List or Taxonomies for failure and operation states, which should be associated with this Equipment Type. Default Taxonomies are available and can be selected, new Taxonomies can be defined. It is also possible to enable only a subset of states.

  The following taxonomies can be defined:

  - Operating States,
  - Failure Modes,
  - Failure Impacts,
  - Failure Mechanisms,
  - Failure Causes,
  - Detection Methods,
  - Operation Conditions,
  - Environmental Conditions (two different dimensions are support, like temperature and radiation).

  It is also support to inherit attributes of the Equipment Type from a parent definition of an Equipment Type.

- Definition of the internal structure of a component, divided in Sub units and Maintainable items.

- Definition of additional Equipment Type specific parameters. A list of parameters can be specified as a template. The real values for the additional parameters should be provided during the the definition of installed equipment units.

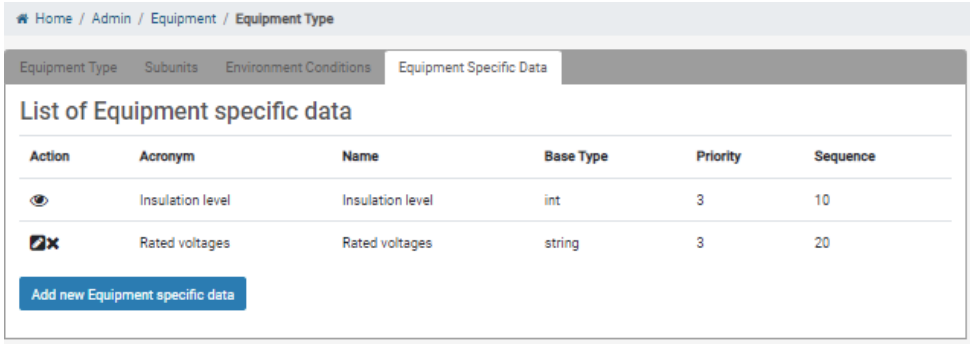


Figure 11: Equipment specific data of equipment type.

3.2.1 Example 1 Type MV7000 DAB Converter

The MV7000 DAB Converter (by RWTH Aachen) is an isolated bidirectional medium voltage DC/DC converter. Its maximum power rating is 5 MW at 5 kV. The midpoint of the converter is high impedance grounded and provides therefore an output voltage of +- 2.5 kV. Controlling of the converter is done by several communication interfaces like Ethernet or CAN bus[6].

First we bring an overview on this type by a schematic picture, showing the structure of this component including subunits and the list of maintainable items.

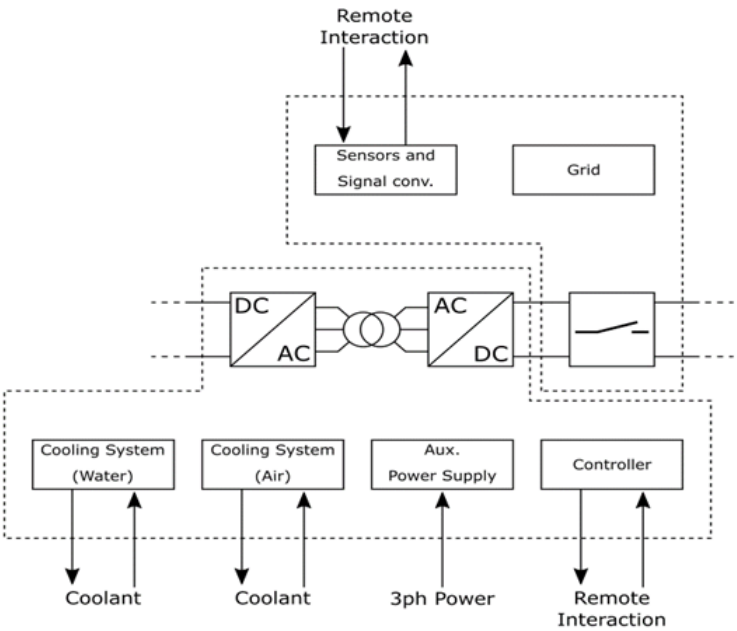


Figure 12: Boundary definition for MV7000 DAB Converter.

[6] https://www.can-cia.org/can-knowledge/can/can-history/

The dotted lines around the component define the boundary of this component. Only reliability data from inside of bounding box are of relevance for this equipment type.

So we can describe each sub unit of the component and encounter the maintainable items, which are part of the sub units.

Subunit	Power Electronics	Cooling system (Water)	Cooling system (Air)	Aux. Power Supply	Controller
Maintainable items	Semiconductors Power Supply Bleeding Resistors Cabinet fans Transformer	Pumps Heat exchanger Piping Valves Deionisation Sensors	Fan Heat exchanger Piping	Batteries Fans UPS Controller Power Electronics	Controllers Cabinet AC

Table 1: Equipment type subunits and items for MV7000 DAB Converter.

This structure has to be implemented in database.

As a consequence each failure event and maintenance activity can be linked to a sub unit or a maintainable item.

In the further step it is also possible to get statistics on sub units or maintainable items.

The following task is to define a list of describing attributes or parameters for this equipment type (equipment specific data).

I our example this parameters are:

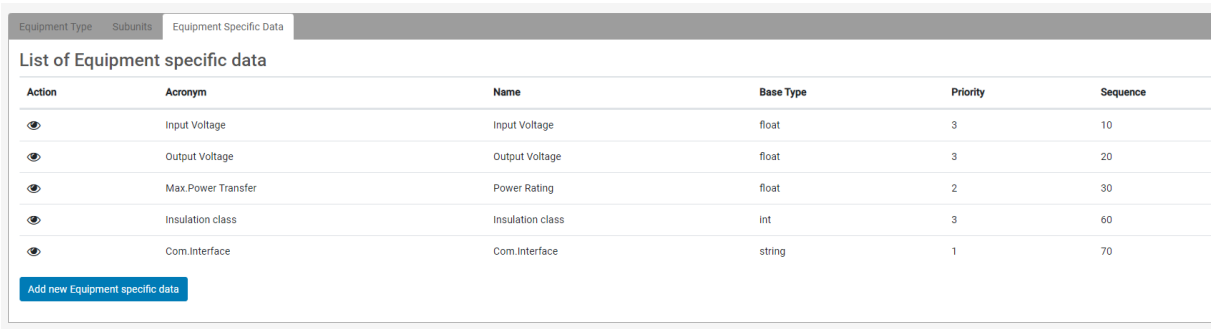


Figure 13: Equipment specific data for MV7000 DAB Converter.

3.2.2 Example 2 Type VARC Breaker

SCiBreak's concept, VSC Assisted Resonant Current (VARC) Circuit breaker (CB) uses a mechanical Vacuum Interrupter (VI) together with auxiliary circuitry that creates a current zero-crossing in the internal arc during contact separation. This is a known principle with the following characteristics:

- a mechanical interrupter is used to conduct the load current in normal closed conditions, making losses almost negligible.
- auxiliary circuit superposes a current pulse through the arc in the switch, causing the current through the switch to cross zero.

- the mechanical interrupter itself executes the interruption when the current through it approaches zero.

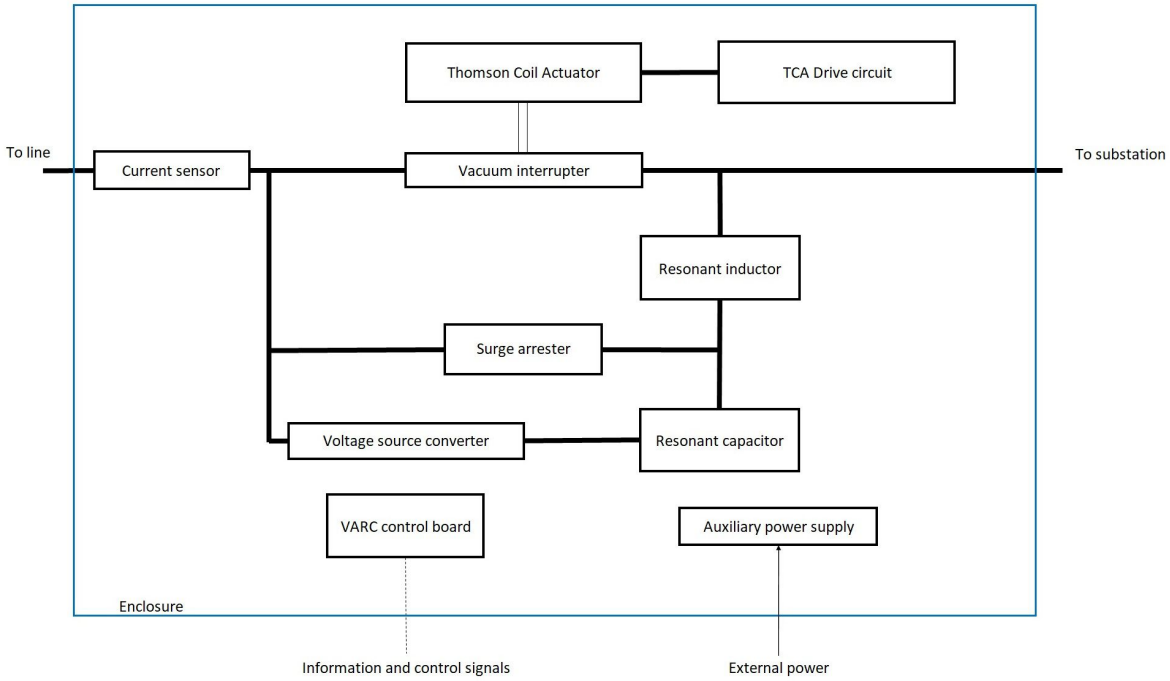


Figure 14: Equipment specific data for VARC breaker.

3.2.3 Role for Defining Equipment Types

Defining the hierarchy of Equipment classes and Equipment Types is a responsible task, because at this stage the structure of the catalogue and the hierarchy of type definition will be designed. This structure will be seen and must be used by all participants of the reliability database. This task is restricted to a special permission or role with the name ”Equipment Type Editor”.

This role can be granted from an administrator to an user of ARIES to be able to extend the structure.

3.3 The Components Itself – Equipment Units

3.3.1 Installations and Locations

Having defined the structure for components in Equipment Types it is possible to insert physically existing and installed components. Each participating partner organisation can define its logic for structuring their installations and locations, where the component is installed.

The general organisation is like this:

- Organisation 1 (e.g. AIT.)
  - Installation 1.1 (e.g. Giefinggasse)

    - Location 1.1.1 (e.g. House 2)
      - Sublocation 1.1.1a (e.g. Laboratory a)
      - Sublocation 1.1.1b (e.g. Out door field b)
    - Location 1.1.2 (e.g. House 4)
  - Installation 1.2 (e.g. Seibersdorf)
  - Installation 1.n (e.g. Tulln)
- Organisation 2 (eg. ASM TERNI SPA)
- Organisation n (eg. ZELISKO)

Each new component, which should be member of the database, has to be installed to one location Figure 15

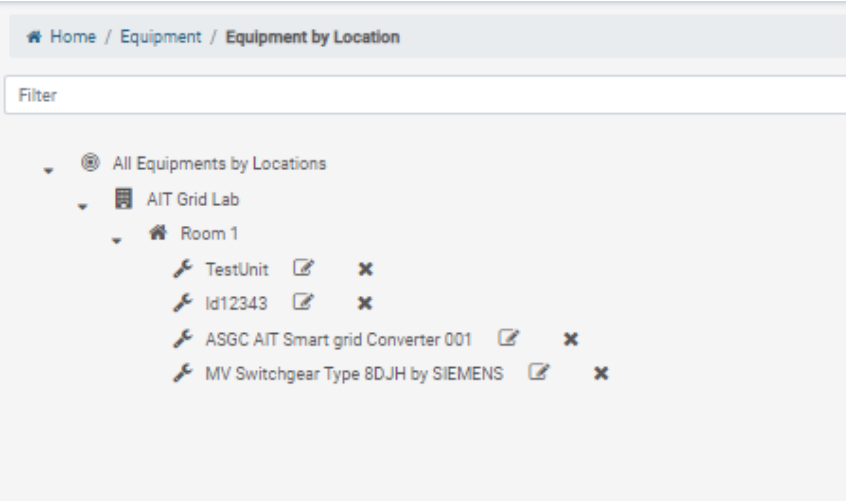


Figure 15: Installation of components (Equipment units) at one location.

3.3.2 The Equipment Unit

The information on an installed component is defined by the structures of an Equipment Unit.

An Equipment Unit contains the following information (see Figure 16):

- Reference to the Equipment Type, which defines the structure of this unit.
- Reference to the location, at which this component is installed.
- An identification name and a description, a manufacturer name and model name, an installation number.
- The list of Equipment specific parameters as planned in Equipment Type.
- The list of failure events.
- The list of maintenance data.
- The list of Operation times.

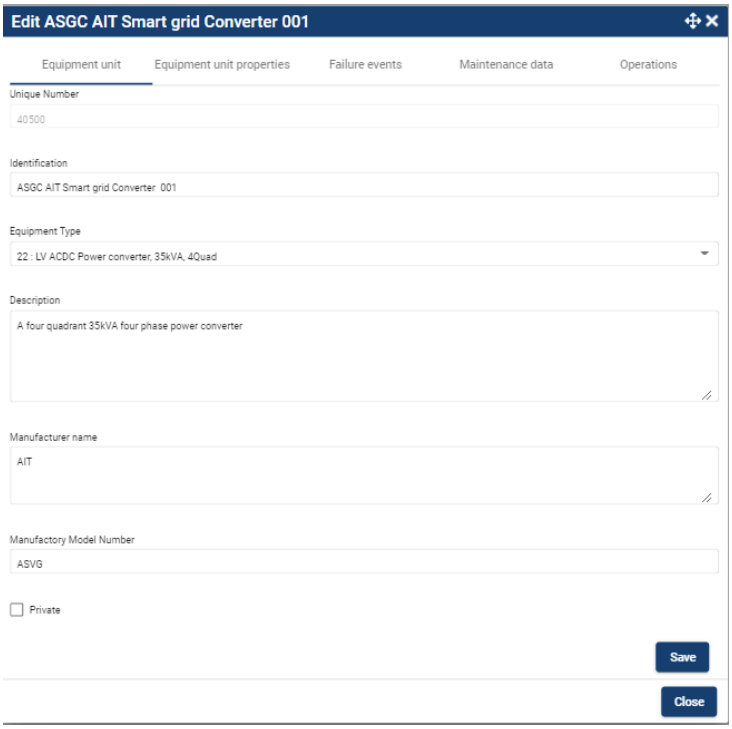


Figure 16: Parameters for equipment unit.

All general parameters can be inserted in the first page (see Figure 16).

The list of equipment specific data can be defined in the second tab page, one line for each parameter (see Figure 17).

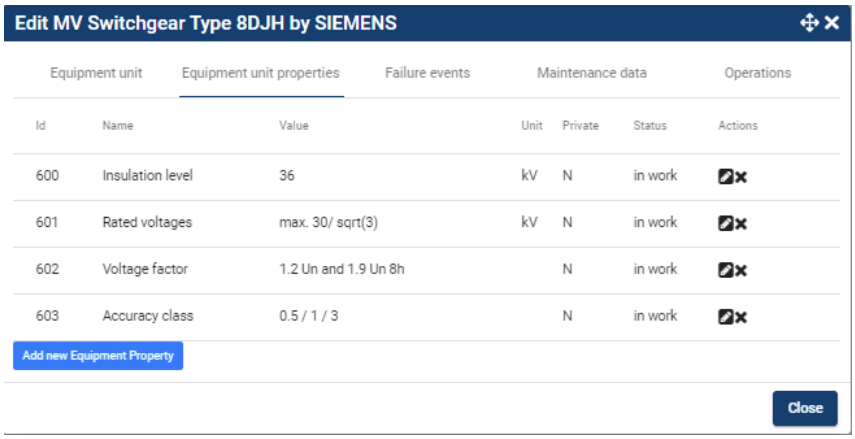


Figure 17: Equipment specific parameters.

3.3.3 Failure Events

During the operation times of a component several data should be collected. For collecting reliability data for calculating statistics we need to know information about the failure events that occurred during operation times.

These data records can be provided with the function "Add a new failure event" (see Figure 18).

As describing parameters for the event all conditions and states can be added, according to the definitions in Equipment Type.

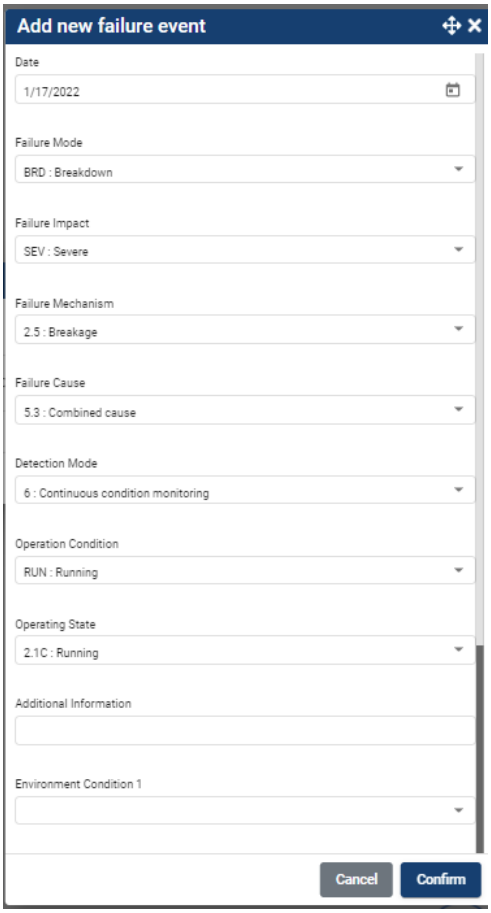


Figure 18: Add a new Failure Event.

Failure event data records, joined to the Equipment Unit, contain following data fields:

- Failure date,
- Failure mode (break down, delayed operation, ...),
- Failure impact (minor, moderate, severe,..),
- Failure mechanism (electric failure, instrument failure, ...),
- Failure cause (design, fabrication, ...),
- Detection mechanism (monitoring, inspection, ...),
- Operating state (startup, running, ..),
- Operating phase (unplanned downtime, hot standby, ...),
- Additional textual information,
- Environmental conditions (temperature >300℃, high radiation level),
- Affected Sub units and maintainable items.

Each of the state variables are defined in an taxonomy and can be adapted in the Equipment Type.

3.3.4 Maintenance Activities

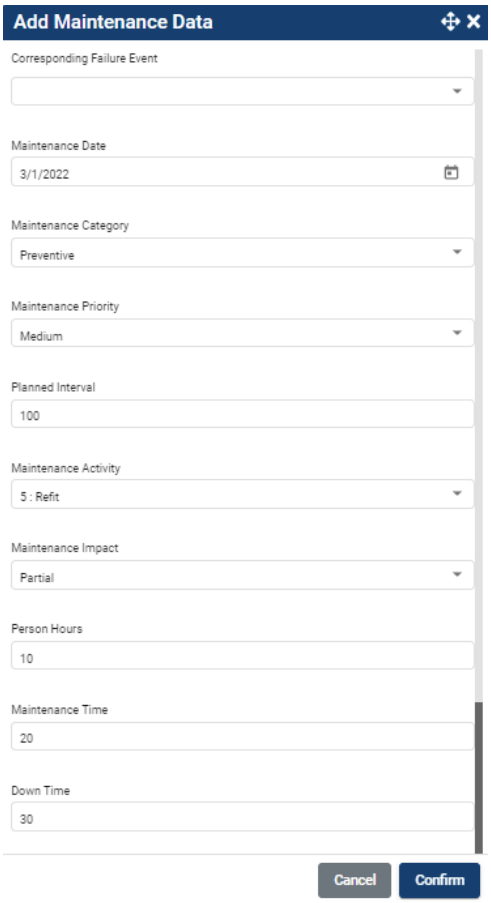


Figure 19: Add a new maintenance activity.

Additional to the failure events data to the maintenance and repair activity can be provided (see Figure 19).

Maintenance data records, joined to the Equipment Unit, contain the following data fields:

- Reference to an event record, if maintenance was triggered by an failure event.
- Maintenance date.
- Maintenance category (corrective, preventive).
- Maintenance priority (low, medium, high).
- Planned interval of maintenance in days.
- Maintenance activity (replace, repair, modify, etc.).
- Impact (zero, partial, total).
- Total maintenance person hours.

- Time duration for active maintenance work done.
- Time duration during which an item is in down state (hours).
- Additional textual info.
- Affected Sub units and maintainable items.

Maintenance data are also used for calculating statistics and influence the costs and time of availability.

3.3.5 Operation Time

Last the operation time table contains the overall duration of operation Figure 20.

It contains following data fields:

- Environmental condition of operation.
- Start date of operation.
- End date of operation.
- Initial commissioning date.
- Start date of current service.
- Surveillance time in h (calculated).
- Operational time in h (calculated/measured).
- Number of periodic test demands during surveillance period as applicable.

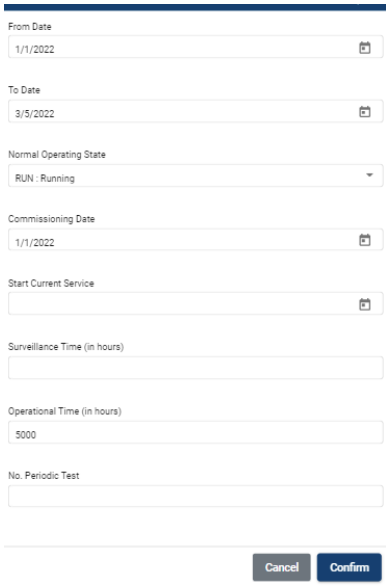


Figure 20: Add Operation times.

3.4 Reliability Hand Books – Equipment Groups

In many cases, reliability information already exists in the form of handbooks and or third party databases.

It is possible to import such data sources also in this database.

In this case, we have no knowledge about a place of installation or an installed unit. In the ARIES database we are able to import data into so called "Equipment Groups" as a collection of similar components knowing only the final statistic.

Equipment Groups are also inserted into the Hierarchy of Equipment classes and Equipment Types.

4 Actors and Roles

4.1 Groups

This section defines the group of actors and roles in the open reliability information system. Actors describe usage categories in the system. The concept of “Actors" is used in the same sense as the concept ROLE is used in a Role Based Access Control (RBAC) context. Concrete users can get the right of one or more Actors/roles by authentication process. As depicted in Figure 21 the different actors have different notations and the role is used to identify the level of exchange like filtering of data according to the organisation.

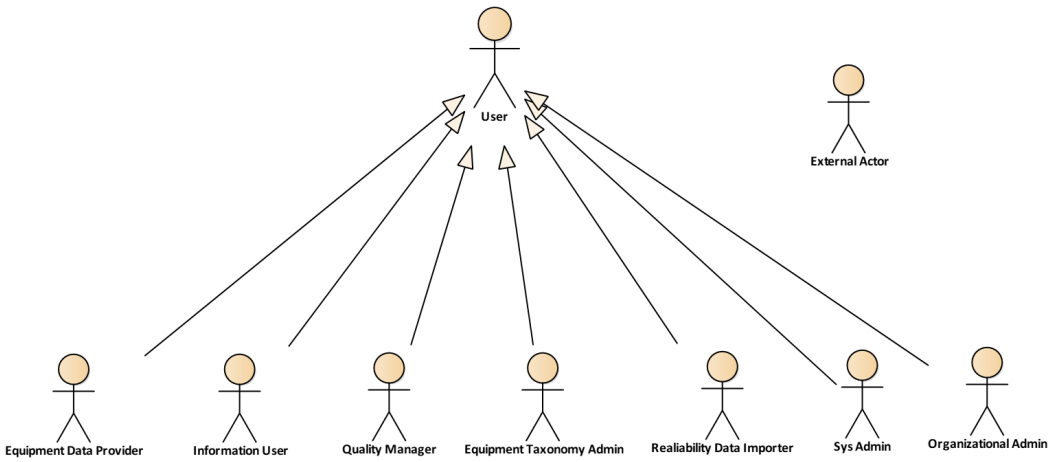


Figure 21: Actors and roles.

In the following the actors and roles are described in a narrative way.

Equipment Data Provider
*I*mplemented as: PROVIDER

Equipment Data Providers deliver equipment group data or equipment unit data to the prepared Equipment Taxonomy structure. Equipment data are always associated to the organisation of the Provider. The provider can classify data as:

- private (is visible only to the members of this organisation),
- public (is visible to all information users).

Only members of the owning organisation are allowed to update the information.

Information User
*I*mplemented as: USER

Consumes statistical information provided by the ARIES system for a single Equipment Group or a single Equipment Unit under the following restrictions:

- Raw data (event data) is only accessible by member of owning organisation,
- Equipment Unit Data is only accessible by members of owning organisation,
- Statistical data are only accessible, if they marked as public or if they are grouped in bigger context and there is no way to associate them to one specific company.

Quality Manager
/mplemented as: QM

The Quality Manager annotates data quality information to provided components. It should be able to annotate an attribute, an equipment Unit, an Equipment Group or statistical records. Different levels of confidentiality of information should be distinguished:

- in work,
- released,
- obsolete.

Different versions of data with different status can exist concurrently, but only one record is allowed with the status "released" is allowed. This is the "official" version.

Equipment Taxonomy Admin
/mplemented as: TAXO

The Equipment Taxonomy Admin is responsible for administration of the taxonomy system. They can insert or modify the terms, concepts and relations between concepts. Taxonomies will be provided for:

- building up the hierarchy of equipment classes and equipment types,
- providing description of equipment types,
- providing information for sub unit and the list of maintainable units,
- providing taxonomies for environmental conditions,
- providing taxonomies for operational conditions,
- providing taxonomies for fault categories.

Reliability Data Importer
/mplemented as: IMPORTER

Reliability Data Importer can import event data or statistical reliability data from different sources, like logs from error logging systems or from other sources. This includes also manually collected error events. Error events have to reference an equipment unit, which already have to exist at the time of import.

System Administrator
/mplemented as: SYS_ADMIN

General system admin. This user is responsible for general administration of security tasks and for user administration. The System Administrator is also responsible for general administration tasks like backup, logging, auditing, etc.

Organisational Admin
/mplemented as: ORG_ADMIN

Administration of the users of one specific organisation.

bf External Actor

External actor with no login to the ARIES system, but with access to public data.

bf Administrator of Equipment Types
/mplemented as: EQTYPE ADMIN

This user is allowed to define and change the structure of Equipment Types. This includes the editing of the meta information models for similar groups of components. Component data have to match to this structure.

4.2 System Boundaries

The following Figure 22 represents the system boundaries and the interaction of actors with the information system. Exemplified shown is the interaction of the equipment data provider, the information user and the reliability data importer with the system and the interfaces to external systems e.g. the Asset & Maintenance Management Platform (InforEAM) or the Accelerator Fault Tracking (AFT) which could serve as a potential external data source.

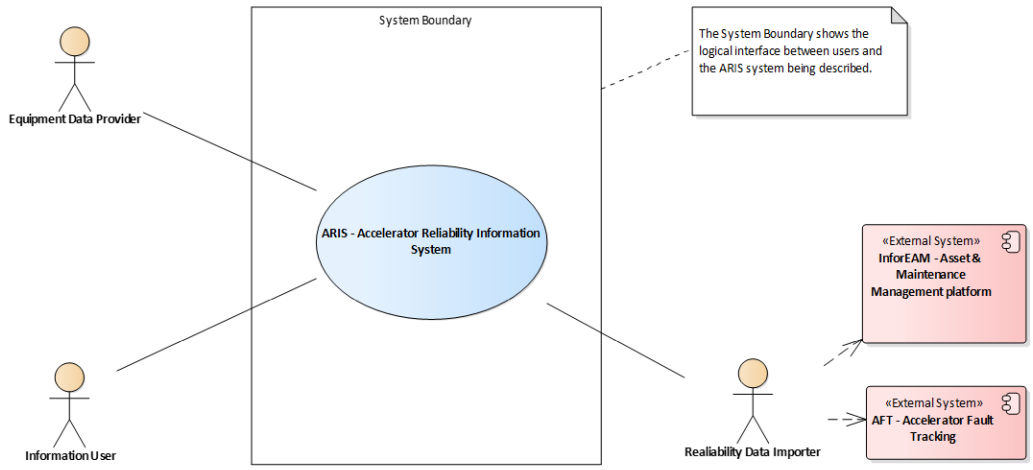


Figure 22: Information system and interaction with actors and external systems.

ARIES - Accelerator Reliability Information System includes all functions for administration, inserting and retrieving reliability statistic information.

AFT - Accelerator Fault Tracking: Failure data and fault tracking. Data from this system may be imported to the ARIES system.

Asset & Maintenance Management platform: Data from this system may be imported to the ARIES system.

5 Use Cases and Use Context

The use cases and the use context are divided in three categories of usage:

- Operational usage,
- User administration usage,
- Other administration usage.

5.1 Operational Usage

Describes the usage for the main purpose of the information system. This includes inserting and retrieving of data. The following Figure 23 shows the Use Cases for the Equipment Data Provider. On the one hand the actor is able to insert and edit equipment units and equipment groups and on the other hand the actor is able to change the privacy settings for these data.

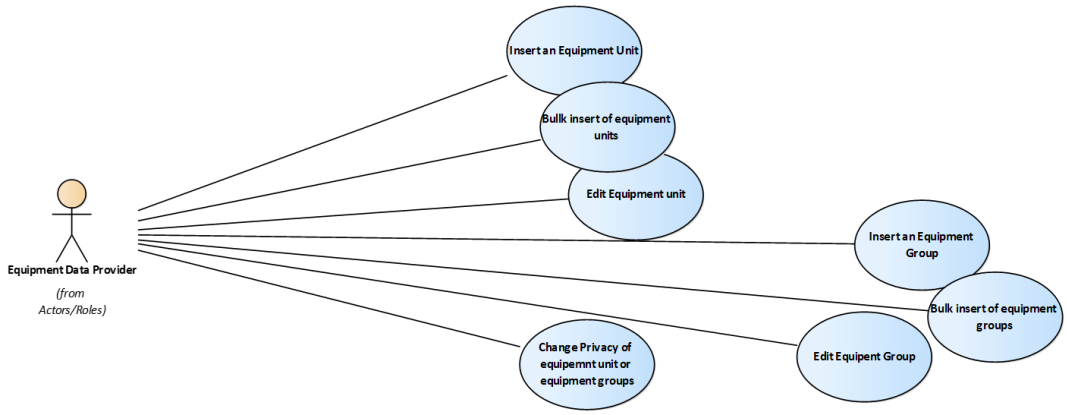


Figure 23: Use Case diagram for the Equipment Data Provider.

These Use Cases are described in the following section.

Insert an Equipment Unit

Equipment Units can be inserted into the reliability information system including all kinds of reliability, availability and maintainability data. The data will get the ownership of the importer. As Import format at least Comma seperated values (CSV) should be supported.

Bulk insert of equipment units

A bulk list of component items should be supported to be inserted into the ARIES system. All data will get the ownership of the importers organization. As Import format at least CSV should be supported.

Bulk insert of equipment groups

A bulk list of equipment groups should be supported to be inserted into the ARIES system. All data will get the ownership of the importers organization. As Import format at least CSV should be supported.

Insert an Equipment Group

Equipment Group can be inserted into the reliability information system including all kinds of reliability, availability and maintainability data. The data will get the ownership of the importer. As Import format at least CSV should be supported.

Edit Equipment Group

After inserting equipment groups it is possible to edit its attributes and statistical information only by a member of the organization, which owns this equipment unit

Change Privacy of equipment unit or equipment groups

It is possible for the Owner (all members of the creators' organization) to change the privacy settings of an equipment unit or an equipment group.

The Use Cases of the Information User are depicted in Figure 24. The Information User is able to search for and use equipment item and equipment group data. This actor can also give feedback on the usability.

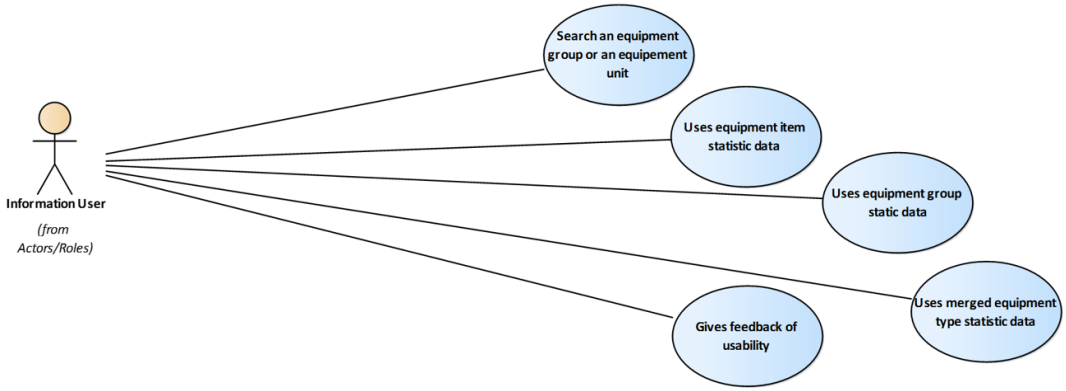


Figure 24: Use Case diagram for the Information User.

Search an equipment group or an equipment unit

By the help of the taxonomy the catalogue of equipment types can be used for searching one specific equipment group or unit. For all information user the full taxonomy and the full list of equipment types is readable for lookup. Also the attributes of the equipment groups is seen public. Uses equipment item statistic data Statistical data for an equipment item is only visible, if the user is of the organisation of the owner, or if the privacy flag of the unit is marked as "public".

Uses equipment group static data

Statistical data for an equipment group is only visible, if the user is of the organisation of the owner, or if the privacy flag of the unit is marked as "public".

Uses merged equipment type statistic data

Uses equipment type statistic data means, that you merge statistic information of different equipment items and/or equipment groups.

Merging of data is allowed under following conditions:

- Equipment item data and/or equipment group data are marked as public,
- Equipment item data and/or equipment group data are of the ownership of the users organisation,

- Equipment item data and/or equipment group data are marked as private, but it is not possible to identify the origin of the data in the result, because they come from more then one organisation.

Gives feedback of usability

Component data can be assessed according to their usability. This feedback can influence the search characteristics for component lookup in later queries.

The Quality Manager annotates (Figure 25) data quality information to provided components.

Figure 25: Use Case diagram for the Quality Manager.

Add quality annotation for contribution

Component data can be validated according specific rules in the information system. Components of higher scores will be presented with higher priority. At least the following status should be supported:

- unchecked raw data,
- checked raw data,
- unchecked statistical data,
- checked statistical data.

5.2 User Administration Usage

The following Figure 26 shows the Use Case diagrams for the registration and administration of actors and roles.

Authenticate to ARIES System

Login, Logout to the ARIES system.

Administration of user, organisations and roles

General administration of users, organisations and roles.

Grants and Revoke of roles for global administration

The possibility of granting or declining the access for a specific actor.

Grants local roles to organisation users

Grants local roles to organisation users.

Confirms registration request

The Organisational Admin gets request from new registered users and accepts or rejects these requests.

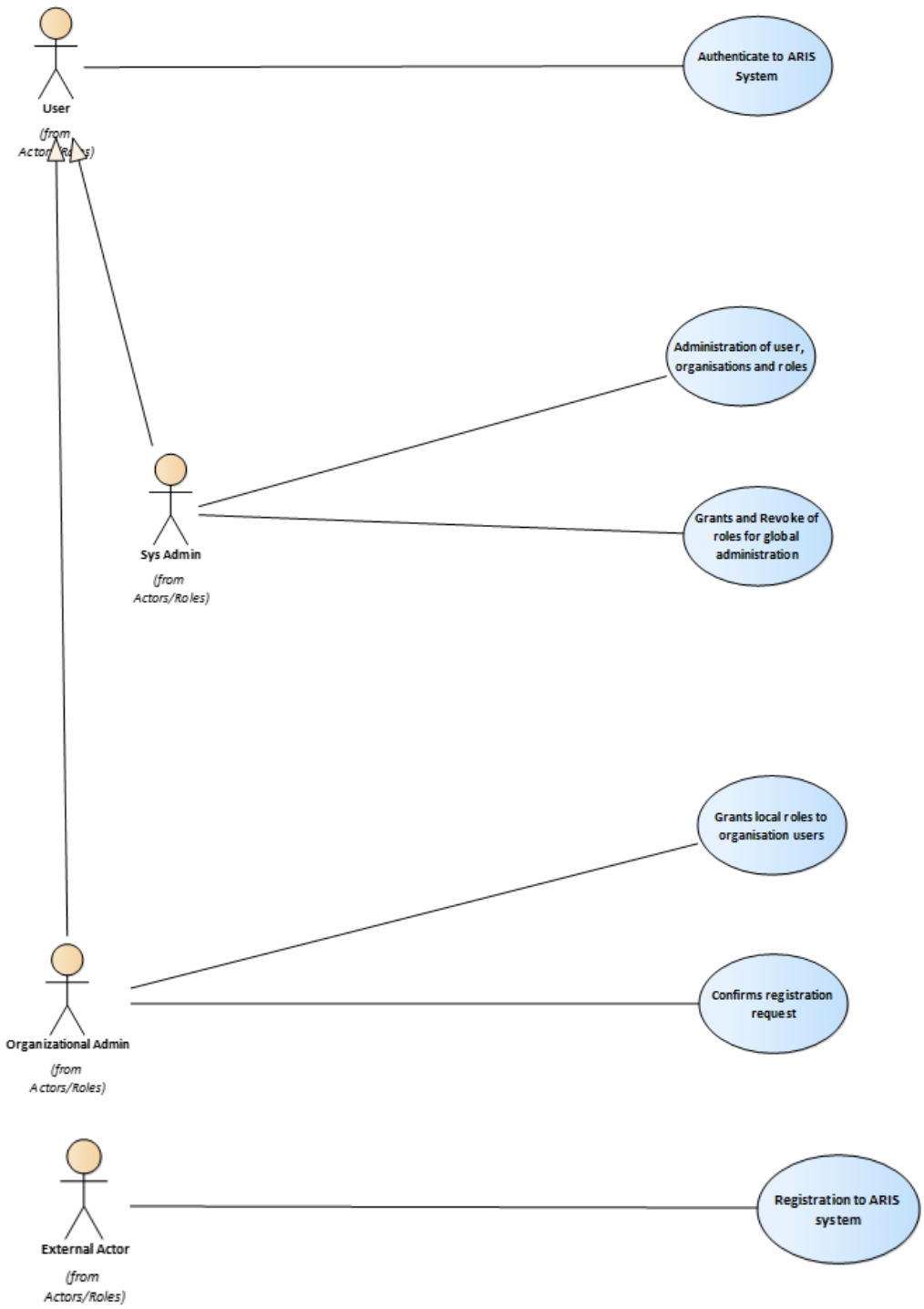


Figure 26: Use Case diagram for the administration of actors within the system.

Registration to ARIES system

Allows registration for an organisation.

5.3 Other Administration Usage

The following Figure 27, Figure 28 and Figure 29 are showing the Use Cases for the administrative usage like importing data or administration of the structure of the taxonomy of the system.

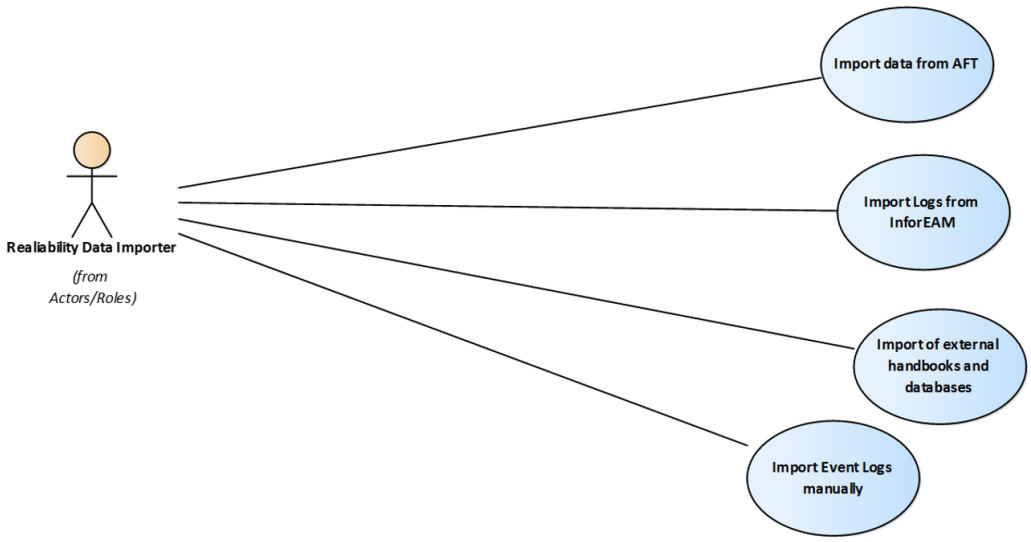


Figure 27: Use Case diagram for the Reliability Data Importer.

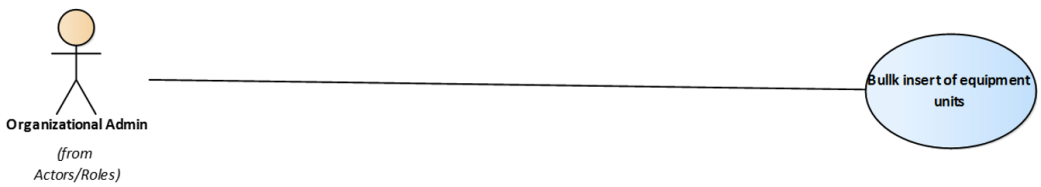


Figure 28: Use Case diagram for the Organisational Admin.

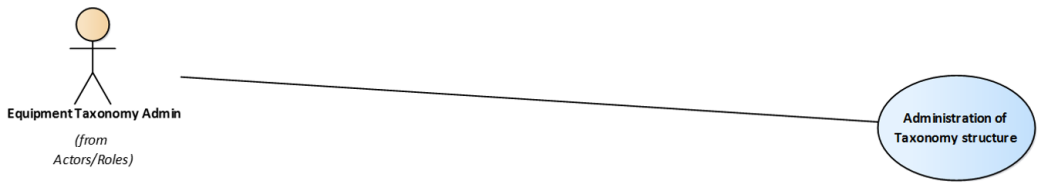


Figure 29: Use Case diagram for the Equipment Taxonomy Admin.

Import data from AFT

Import failure data from fault tracking. As Import format JSON[7] and XML[8] should be supported.

[7] https://www.json.org/json-it.html
[8] https://en.wikipedia.org/wiki/XML

Import of external handbooks and databases

For statistical calculations data from external sources like handbooks and databases are needed. This could include MIL handbooks, but also international standards.

Import Event Logs manually

It should be possible to import error logs, which came from a manually collected log. The import format should be the CSV format, the content should be defined latter.

Bulk insert of equipment units A bulk list of component items should be supported to be inserted into the ARIES system. All data will get the ownership of the importers organisation. As Import format at least CSV should be supported.

Administration of Taxonomy structure Components are structured in a taxonomy. This admin is allowed to change fields in the hierarchy of the taxonomy and to define new component types.

6 Logical Model

This Logical Model of database describes the proposed database structure for the ARIES Information system.

Most of the terms, concepts and definitions are taken from the European Standard EN ISO 14224, a standard developed for collecting and exchanging of reliability and maintenance data for Equipment.

Specific concepts for oil industry are removed an a more general approach for structuring of organisations and installations are introduced.

The detailed description of the tables can be found in Appendix A: Logical Model.

6.1 Model Equipment Structure

This package (Figure 30) includes all tables needed for structuring the organisations and installations in a generic way and to define the structure for the equipment classes, equipment types and the instances of them.

The used terms are inherited from the standard EN ISO 14224 as far as possible.

6.2 Model Failure and Maintenance

Tables for historical storage of failure event data and maintenance activities (see Figure 31).

The concept of this tables is derived from EN ISO 14224.

6.3 Model User Administration Structure

The tables in this package defines all organisations, their users and their roles.

It is assumed, that a central administration of users exists as well as an distributed local administration at the site of the participating organisations. (see Figure 32)

6.4 Model Taxonomy Tables

These tables support the definition of context dependent taxonomies for status, failure modes, environmental condition and failure causes. (see Figure 33)

Besides the definition of general lists of taxonomy items this list can be reduced to subsets in the context of equipment types.

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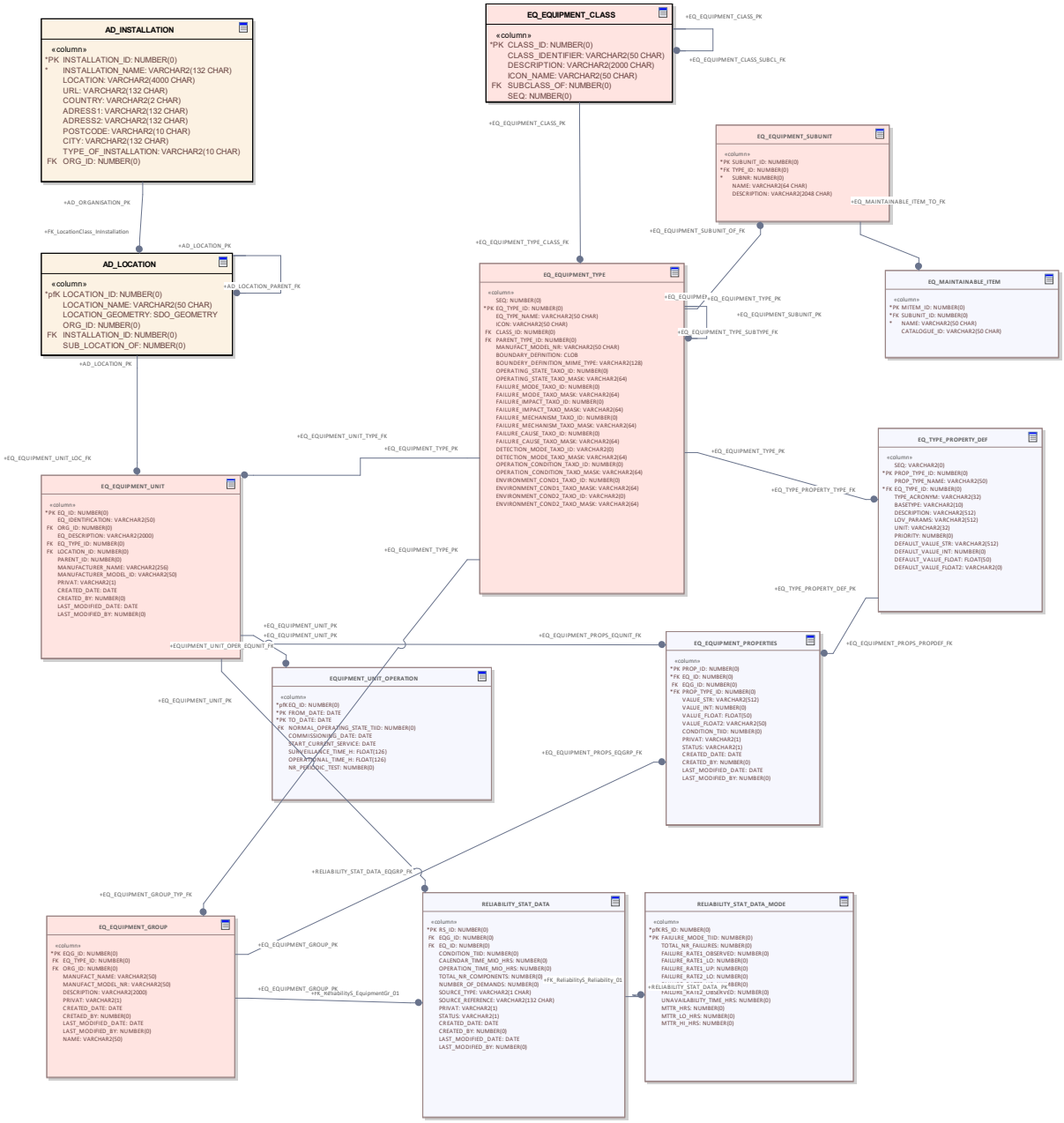

Figure 30: Model Equipment structure.

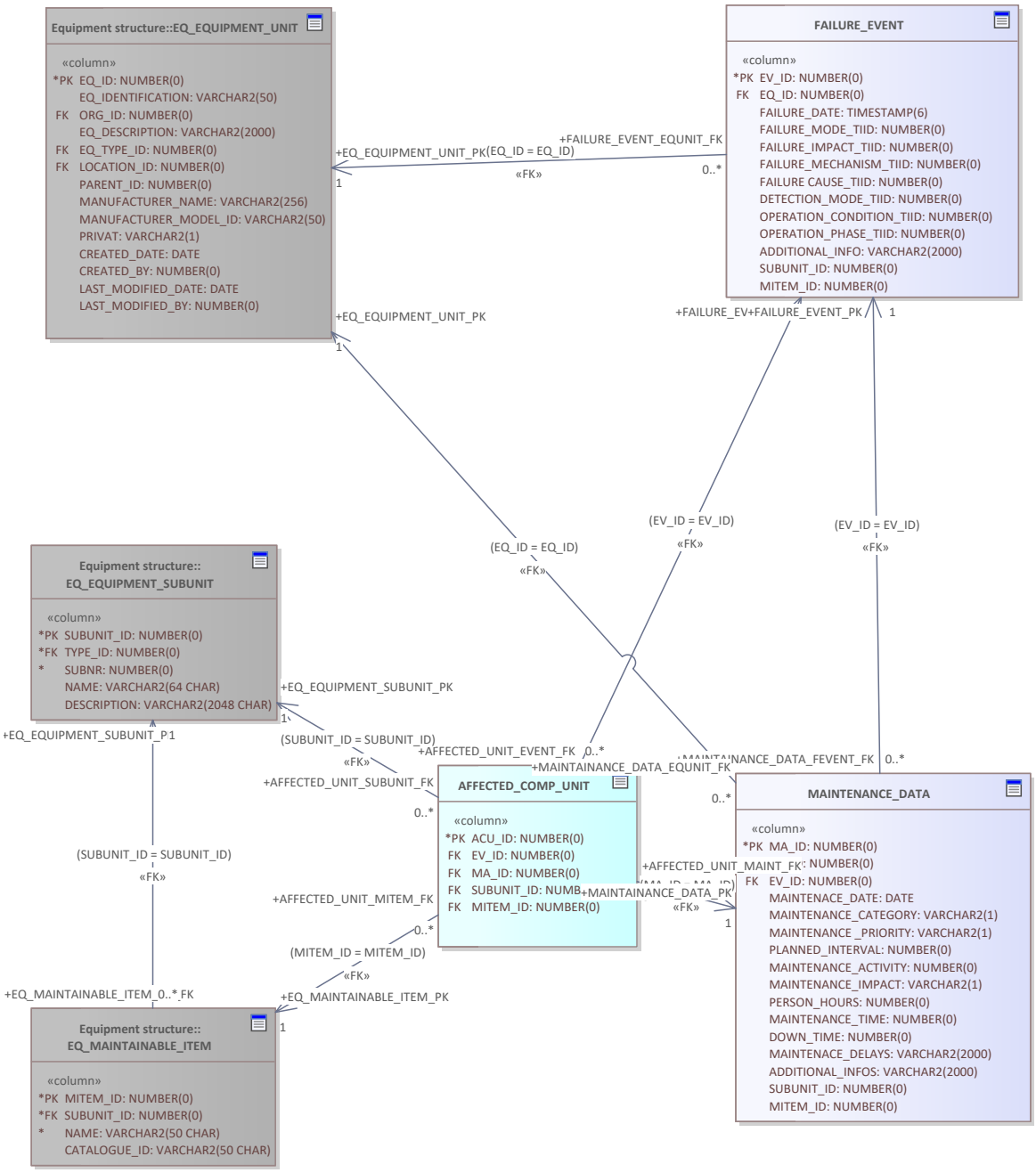

Figure 31: Model Failure and Maintenance.

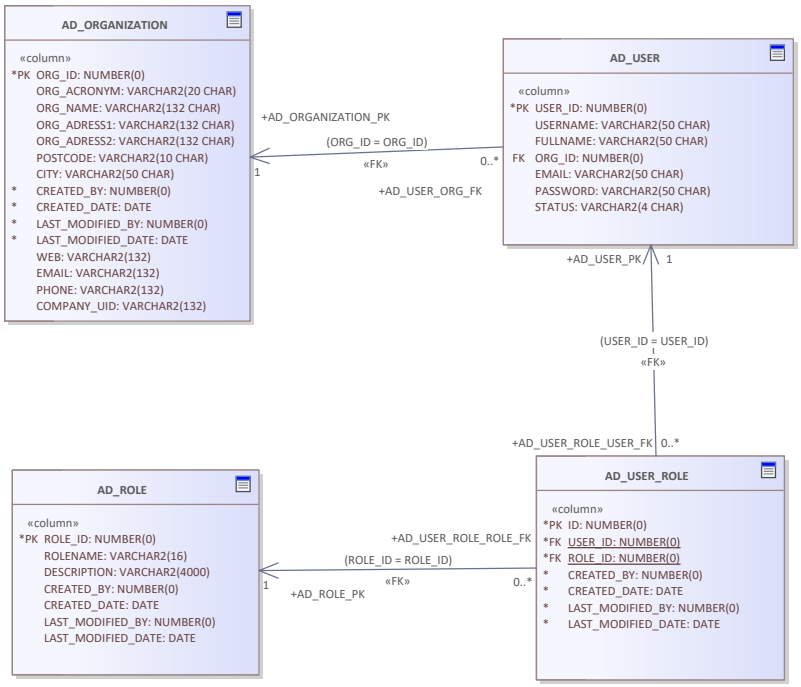

Figure 32: Model User Administration structure.

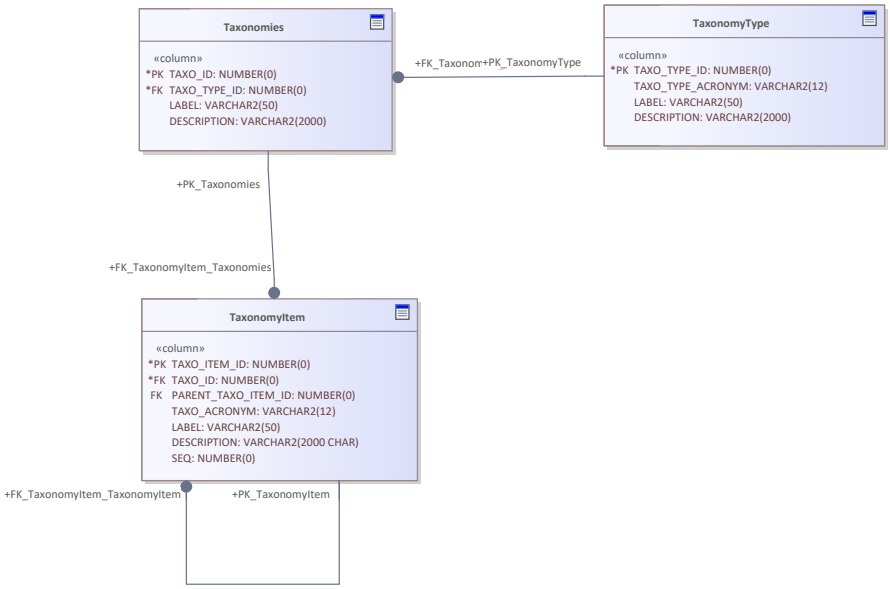

Figure 33: Model Taxonomy Tables.

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7 User Interface – Online ARIES Application

The Open Reliability Database is implemented at Austrian Instutute of Technology (AIT) site as an open accessible service consisting of the following components:

- An Oracle database
- An Tomcat application server offering all functions as Representational State Transfer (REST) services
- An Angular client application, which is accessible by modern Browsers like Google Chrome or Microsoft Edge.

The application client can be started with the url: https://service.ait.ac.at/aries.

A swagger interface for testing the service API is available at: https://service.ait.ac.at/aries_service/swagger/index.html

User Accounts can be ordered by the AIT project team.

8 Service Interface – ARIES Restservice

In the following sections the service interface is outlined with the following information:

Version: 1.0.0 Base URL: /aries_service/rest

This ARIES Restservice delivers Rest functionality for ARIES background services

AriesDB Organization Resource

Method	Path	Description
GET	/organizations	Get list of all organizations
POST	/organizations	Inserts a new organization
PUT	/organizations/{orgId}	Updates a new organization
DELETE	/organizations/{orgId}	Delete an organization

AriesDB User Resource

Method	Path	Description
GET	/users	Get list of all users
GET	/users/login	Get info of current Aries user
PUT	/users/login	Update info of current Aries user
PUT	/users/login/password	Set Password of current Aries user
GET	/users/{userId}	Get info of another user
PUT	/users/{userId}	Insert or Update info of another Aries user
PUT	/users/{userId}/password	Set Password of another Aries user
PUT	/users/{userId}/role/grant	Grant role access to another local user
PUT	/users/{userId}/role/revoke	Grant role access to another local user

AriesDB Taxonomy Resource

Method	Path	Description
POST	/taxonomies	Creates a new Taxonomy entry
GET	/taxonomies/items	Gets list of all taxonomy items without structure
GET	/taxonomies/type	Get list of all taxonomy types
GET	/taxonomies/type/{typeId}	Get list of all taxonomies of a type
GET	/taxonomies/{id}	Gets a taxonomy with the item hierarchy
PUT	/taxonomies/{id}	Updates a Taxonomy entry
DELETE	/taxonomies/{id}	Deletes a Taxonomy entry
POST	/taxonomies/{id}/items	Creates a new Taxonomy item
PUT	/taxonomies/{id}/items/{itemId}	Updates a Taxonomy entry
DELETE	/taxonomies/{id}/items/{itemId}	Deletes a Taxonomy entry
GET	/taxonomies/{id}/type/{typeId}	Gets a taxonomy with the item hierarchy

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AriesDB Installation Resource

Method	Path	Description
GET	/installations	Get list of all installations
POST	/installations	Inserts a new installation
GET	/installations/organization/{orgId}	Get list of all installations of one Organization
PUT	/installations/{installationId}	Updates an installation
DELETE	/installations/{installationId}	Deletes an installation

AriesDB EquipmentClass Resource

Method	Path	Description
GET	/classes	Get list of all equipmentClasses
POST	/classes	Inserts a new equipmentClass
PUT	/classes/{classId}	Updates a equipmentClass
DELETE	/classes/	Get list of all locations of one Organization
PUT	/locations/{locationId}	Updates a location
DELETE	/locations/{locationId}	Deletes a location

AriesDB EquipmentType Resource

Method	Path	Description
GET	/types	Get list of all Equipment Types
POST	/types	Inserts a new Equipment Type
GET	/types/{typeId}	Get one selected Equipment Type
PUT	/types/{typeId}	Updates an Equipment Type
DELETE	/types/{typeId}	Deletes an Equipment Type
POST	/types/{typeId}/properties	Inserts an Property Definition to an Equipment Type
PUT	/types/{typeId}/properties/{propId}	Update an Property Definition for an Equipment Type
DELETE	/types/{typeId}/properties/{propId}	Deletes an Property Definition for an Equipment Type
POST	/types/{typeId}/subunits	Inserts a Subunit to an Equipment Type
PUT	/types/{typeId}/subunits/{subunitId}	Updates a Subunit for an Equipment Type
DELETE	/types/{typeId}/subunits/{subunitId}	Deletes a Subunit for an Equipment Type
POST	/types/{typeId}/subunits/{subunitId} /mitem	Inserts a Maintainable Item to an Equipment Type
PUT	/types/{typeId}/subunits/{subunitId} /mitem/{mitemId}	Update a Maintainable Item for an Equipment Type
DELETE	/types/{typeId}/subunits/{subunitId} /mitem/{mitemId}	Deletes a Maintainable Item for an Equipment Type

AriesDB EquipmentUnit Resource

Method	Path	Description
GET	/equnit	Get list of all own Equipment units
POST	/equnit	Inserts a new Equipment Unit
GET	/equnit/location={locationId}	Gets all EquipmentUnits of one specific Location
GET	/equnit/name/{identification}	Get one selected EquipmentUnit by Identification
GET	/equnit/org={orgId}	Get list of Equipment units of other organizations
GET	/equnit/type={typeId}	Get one selected Equipment Type
GET	/equnit/{eqId}	Get all Equipment units for one Equipment Type
PUT	/equnit/{eqId}	Update an Property for an Equipment Unit
DELETE	/equnit/{eqId}	Deletes an Equipment Unit
POST	/equnit/{eqId}/operations	Inserts an EquipmentUnitOperation to an EquipmentUnit
PUT	/equnit/{eqId}/operations/{operId}	Updates an Equipment Unit
DELETE	/equnit/{eqId}/operations/{operId}	Delete an EquipmentUnitOperation from an EquipmentUnit
POST	/equnit/{eqId}/properties	Inserts an Property to an Equipment Unit
PUT	/equnit/{eqId}/properties/{propId}	Update an Property for an Equipment Unit
DELETE	/equnit/{eqId}/properties/{propId}	Delete an Property for an Equipment Unit

AriesDB EquipmentGroup Resource

Method	Path	Description
GET	/eqgroup	Get list of all own Equipment groups
POST	/eqgroup	Inserts a new equipmentGroup
GET	/eqgroup/org={orgId}	Get list of global Equipment groups of other Organisations
GET	/eqgroup/type={typeId}	Get one selected own Equipment groups
GET	/eqgroup/{eqId}	Get one selected own Equipment groups
PUT	/eqgroup/{eqId}	Updates an Equipment Unit
DELETE	/eqgroup/{eqId}	Deletes an Equipment Group
POST	/eqgroup/{eqId}/properties	Inserts an Property Definition to an Equipment group
PUT	/eqgroup/{eqId}/properties/{propId}	Update an Property Definition for an Equipment Group
DELETE	/eqgroup/{eqId}/properties/{propId}	Deletes an Property for an Equipment Group

AriesDB Reliability Statistic Resource

Method	Path	Description
GET	/statistic/type/{typeId}	Calculates and returns statistics for an equipment type on the fly

AriesDB Failure Resource

Method	Path	Description
PUT	/failure/affectedCompUnit/{acuId}	Update an affected component unit for failure
DELETE	/failure/affectedCompUnit/{acuId}	Delete an affected component unit for Failure
POST	/failure/affectedCompUnit/{eventId}	Inserts a new affected comp unit for an failure event
POST	/failure/full/{eqId}	Inserts a new Failure Event to Equipment Unit (in one step)
GET	/failure/{eqId}	Get list of all own Equipment units
POST	/failure/{eqId}	Inserts a new Failure Event to Equipment Unit (basic functionality)
PUT	/failure/{eventId}	Updates a failure event
DELETE	/failure/{eventId}	Deletes a location

AriesDB Maintenance Resource

Method	Path	Description
PUT	/maintenance/affectedCompUnit /{acuId}	Updates an affected component unit for Maintenance
DELETE	/maintenance/affectedCompUnit /{acuId}	Deletes an affected component unit for Maintenance
POST	/maintenance/affectedCompUnit /{maintenanceId}	Inserts a new affected comp unit to an maintenance activity
POST	/maintenance/full/{eqId}	Inserts a new maintenance entry to Equipment Unit (normal)
GET	/maintenance/{eqId}	Get list of all maintenance activities of one equipment units
POST	/maintenance/{eqId}	Inserts a new maintenance entry to Equipment Unit (normal)

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9 Conclusions

The reliability data sharing concept has worked and provided value in various industries successfully.

In the following phase of the HYPERRIDE project, data on components of partners should be collected in the demonstration sites.

The challenge of such databases is not primarily the construction of the database, but more the personnel resources needed to collect the reliability data.

In industrial sectors where the risk of interruption of operations or the costs are very high such databases are well-established. This approach should encourage also other industry sectors or bigger research projects to participate in sharing experiences on reliability by co-collection of reliability information. This should help all members of the cooperation to benefit from better reliability statistics and facilitates a better design of large applications.

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Appendix A: Logical Model

A.1 Logical Model

This Logical Model of database describes the proposed database structure for the ARIES Information system.

Most of the terms, concepts and definitions are taken from the European Standard EN ISO 14224, a standard developed for collecting and exchanging of reliability and maintenance data for Equipment.

Specific concepts for oil industry are removed an a more general approach for structuring of organizations and installations are introduced.

A.2 Equipment Structure

This package includes all tables needed for structuring the organizations and installations in a generic way and to define the structure for the equipment classes, equipment types and the instances of them.

The used terms are inherited from the standard EN ISO 14224 as far as possible.

Table AD_INSTALLATION

An "installation" defines the location or project of all the equipment, which is needed for performing a specific task at any location. An installation will be managed by an "organization", which is responsible for all tasks an data inside of an "installation"

Attributes

Name	Type	Length	Description
INSTALLATION_ID	NUMBER	0	Unique ID of an Installation (eg.: HIT)
INSTALLATION_NAME	VARCHAR2	132	Long name of an installation
LOCATION	VARCHAR2	4000	Location of a installation in WKT Format (WGS64)
URL	VARCHAR2	132	URL of official web address of this installation
COUNTRY	VARCHAR2	2	International code for the country
ADRESS1	VARCHAR2	132	
ADRESS2	VARCHAR2	132	
POSTCODE	VARCHAR2	10	
CITY	VARCHAR2	132	Name of the City corresponding to the postal code
TYPE_OF_INSTALLATION	VARCHAR2	10	
ORG_ID	NUMBER	0	Reference to owning Organisation

Table AD_LOCATION

Definition of different locations for one installation

Attributes

Table AD_ORGANIZATION

An organization is the legal structure responsible for several "installations", and having employees (users) for doing the work for maintaining the data for reliability items. One or more or-

Name	Type	Length	Description
LOCATION_ID	NUMBER	0	Unique ID for the class of location
LOCATION_NAME	VARCHAR2	50	
LOCATION_GEOMETRY	SDO_GEOMETRY		
ORG_ID	NUMBER	0	
INSTALLATION_ID	NUMBER	0	
SUB_LOCATION_OF	NUMBER	0	

ganizational admins are responsible for managing users for the organization, the organization users are responsible for providing and consuming information from the ARIS system.

Attributes

Name	Type	Length	Description
ORG_ID	NUMBER	0	Automatic unique ID of the organization
ORG_ACRONYM	VARCHAR2	20	Acronym for this organization
ORG_NAME	VARCHAR2	132	Full name of the organization
ORG_ADRESS1	VARCHAR2	132	
ORG_ADRESS2	VARCHAR2	132	
POSTCODE	VARCHAR2	10	
CITY	VARCHAR2	50	
CREATED_BY	NUMBER	0	
CREATED_DATE	DATE		
LAST_MODIFIED_BY	NUMBER	0	
LAST_MODIFIED_DATE	DATE		
WEB	VARCHAR2	132	Web address for this organization
EMAIL	VARCHAR2	132	Email address of a contact person
PHONE	VARCHAR2	132	Phone number of a contact person
COMPANY_UID	VARCHAR2	132	Unique ID of the company or organization

Table EQ_ENVIRONMENTAL_CONDITION

Defines relevant taxonomies for environmental or operational conditions Obsolete: This information is moved to EQ-EQUIPMENT-TYPE

Attributes

Name	Type	Length	Description
COND_ID	NUMBER	0	Unique Condition Id
EQ_TYPE_ID	NUMBER	0	Reference to the EquipmentType, for which this conditions are defined
CONDITION_TAXO_ID	NUMBER	0	Id of a taxonomy for different distinguishable environmental or operational conditions
COND_NAME	VARCHAR2	50	Name of the condition
DESCRIPTION	VARCHAR2	4000	Description for this environmental condition

Table EQ_EQUIPMENT_CLASS

Classification of equipment units

ISO 14224: Class of similar type of equipment units (e.g. all pumps)

Attributes

Table EQ_EQUIPMENT_GROUP

Defines a group (family) of Equipment units of one EquipmentType. It is similar to a data sheet for one specific product, independent of the number of installations and the place of installations.

Name	Type	Length	Description
CLASS_ID	NUMBER	0	Unique ID of an equipment class
CLASS_IDENTIFIER	VARCHAR2	50	Short unique name of the class (english term)
DESCRIPTION	VARCHAR2	2000	Conceptual description of this class. Explains what the concepts of the members of this class are.
ICON_NAME	VARCHAR2	50	
SUBCLASS_OF	NUMBER	0	If not null: Subclass of another class
SEQ	NUMBER	0	

Attributes

Name	Type	Length	Description
EQG_ID	NUMBER	0	Unique ID of the Equipment Group
EQ_TYPE_ID	NUMBER	0	Reference to the EquipmentType The EquipmentGroup is the implementation of a EquipmentType
ORG_ID	NUMBER	0	Reference to the owner organization of this entry The owner organization can change the access rights to this entry.
MANUFACT_NAME	VARCHAR2	50	Name of the manuufacturer
MANUFACT_MODEL_NR	VARCHAR2	50	Model number of the Equipment entity addressing this EquipmentGroup uniquely.
DESCRIPTION	VARCHAR2	2000	Description of this EquipmentGroup
PRIVAT	VARCHAR2	1	
CREATED_DATE	DATE		
CRETAED_BY	NUMBER	0	
LAST_MODIFIED_DATE	DATE		
LAST_MODIFIED_BY	NUMBER	0	
NAME	VARCHAR2	50	Name of Equipment Group

Table EQ_EQUIPMENT_PROPERTIES

Lists all defined properties of an Equipment Unit.

Attributes

Name	Type	Length	Description
PROP_ID	NUMBER	0	Automatic unique property ID
EQ_ID	NUMBER	0	Reference to the corresponding Equipment Unit
EQG_ID	NUMBER	0	ID of the EquipmentGroup, to which this property is associated
PROP_TYPE_ID	NUMBER	0	Reference to the property Type
VALUE_STR	VARCHAR2	512	Value as String
VALUE_INT	NUMBER	0	Value as Integer
VALUE_FLOAT	FLOAT	50	Value as Float
VALUE_FLOAT2	VARCHAR2	50	Alternate number for "range" type.
CONDITION_TIID	NUMBER	0	ID of the taxonomy Item of a specific condition (if distinguished)
PRIVAT	VARCHAR2	1	Privacy indication as default for each instance - Y for privat for the owning organization - empty or N: for public to all other organizations
STATUS	VARCHAR2	1	Quality status of record Key Data Quality Flag 0 No quality control 1 Good value 2 Probably good value 3 Probably bad value 4 Bad value 5 Missing value
CREATED_DATE	DATE		Date of creation of record
CREATED_BY	NUMBER	0	User ID of creating user
LAST_MODIFIED_DATE	DATE		Date of last modification
LAST_MODIFIED_BY	NUMBER	0	User ID of last modification

Table EQ_EQUIPMENT_SUBUNIT

List of the SubUnits of an Equipment Type, which fulfill important and specific aspects for an equipment unit

Attributes

Name	Type	Length	Description
SUBUNIT_ID	NUMBER	0	Autogenerated unique ID of SUB-Unit
TYPE_ID	NUMBER	0	Type ID of an equipment type, to which this Subunit belongs
SUBNR	NUMBER	0	Subnumber for an equipment type
NAME	VARCHAR2	64	Short identifier of an Sub unit
DESCRIPTION	VARCHAR2	2048	Description of the function of this sub unit

Table EQ_EQUIPMENT_TYPE

This describes general properties of one type of an equipment, which are common to all instances (items) if an equipment.

Equipment items inherit all properties of the EquipmentType.

ISO 14224: Particular features of the design which is significantly different from other design(s) within the same equipment class.

Attributes

Name	Type	Length	Description
SEQ	NUMBER	0	sort criteria
EQ_TYPE_ID	NUMBER	0	Unique ID for this Equipment Type
EQ_TYPE_NAME	VARCHAR2	50	Unique Name of the equipment type (english)
ICON	VARCHAR2	50	Symbolic picture for an equipment type
CLASS_ID	NUMBER	0	Reference to the class, to which this equipment type is mainly associated
PARENT_TYPE_ID	NUMBER	0	Link to the parent type, from which this type is derived. Parameter/Properties with the same name will be overloaded by local definition, all other will be inherited.
MANUFACT_MODEL_NR	VARCHAR2	50	Manufacturer's model designation
BOUNDARY_DEFINITION	CLOB		Boundary Definition as included DOCUMENT (MS-WORD) This includes also a drawing of the system boundaries.
BOUNDERY_DEFINITION_MIME_TYPE	VARCHAR2	128	
OPERATING_STATE_TAXO_ID	NUMBER	0	ID of the taxonomy for the valid operating states or modes
OPERATING_STATE_TAXO_MASK	VARCHAR2	64	Mask of deactivated items; Format: nn;nn;nn
FAILURE_MODE_TAXO_ID	NUMBER	0	Id of a Taxonomy of valid Failure modes
FAILURE_MODE_TAXO_MASK	VARCHAR2	64	
FAILURE_IMPACT_TAXO_ID	NUMBER	0	
FAILURE_IMPACT_TAXO_MASK	VARCHAR2	64	
FAILURE_MECHANISM_TAXO_ID	NUMBER	0	
FAILURE_MECHANISM_TAXO_MASK	VARCHAR2	64	
FAILURE_CAUSE_TAXO_ID	NUMBER	0	
FAILURE_CAUSE_TAXO_MASK	VARCHAR2	64	
DETECTION_MODE_TAXO_ID	VARCHAR2	0	
DETECTION_MODE_TAXO_MASK	VARCHAR2	64	
OPERATION_CONDITION_TAXO_ID	NUMBER	0	
OPERATION_CONDITION_TAXO_MASK	VARCHAR2	64	
ENVIRONMENT_COND1_TAXO_ID	NUMBER	0	
ENVIRONMENT_COND1_TAXO_MASK	VARCHAR2	64	
ENVIRONMENT_COND2_TAXO_ID	VARCHAR2	0	
ENVIRONMENT_COND2_TAXO_MASK	VARCHAR2	64	

Table EQ_EQUIPMENT_UNIT

Defines a specific instance of an equipment in an installation.

ISO14224: specific equipment within an equipment class as defined by its boundaries.

Attributes

Name	Type	Length	Description
EQ_ID	NUMBER	0	automatic Unique ID of this equipment unit
EQ_IDENTIFICATION	VARCHAR2	50	unique (in the scope of an organization) identification of an item (e.g. serial number)
ORG_ID	NUMBER	0	reference to the organization managing this item
EQ_DESCRIPTION	VARCHAR2	2000	Description of this item
EQ_TYPE_ID	NUMBER	0	
LOCATION_ID	NUMBER	0	
PARENT_ID	NUMBER	0	ID of an Equipment Unit, to which this unit should be associated.
MANUFACTURER_NAME	VARCHAR2	256	Name of the Manufacturer
MANUFACTURER_MODEL_ID	VARCHAR2	50	Designation of model given by Manufacturer
PRIVAT	VARCHAR2	1	Privacy indication: - Y for privat for the owning organization - empty or N: for public to all other organizations
CREATED_DATE	DATE		Date, when this record is created
CREATED_BY	NUMBER	0	ID of user, who created this record.
LAST_MODIFIED_DATE	DATE		
LAST_MODIFIED_BY	NUMBER	0	ID of user for last modification

Table EQ_MAINTAINABLE_ITEM

List of maintainable Items in a Sub unit

Attributes

Name	Type	Length	Description
MITEM_ID	NUMBER	0	Autogenerated unique ID
SUBUNIT_ID	NUMBER	0	ID of SubUnit
NAME	VARCHAR2	50	Name of the maintainable item
CATALOGUE_ID	VARCHAR2	50	Reference to an organizational list of maintainble parts in a catalogue

Table EQ_TYPE_PROPERTY_DEF

Defines all supported Properties by name, id and type for the scope of a specific Equipment Type.

Attributes

Name	Type	Length	Description
SEQ	VARCHAR2	0	
PROP_TYPE_ID	NUMBER	0	
PROP_TYPE_NAME	VARCHAR2	50	Name of this Type. The name will be used for resolving "Overloading" of attributes, which means, that Properties of a subclass will overload definitions of a superclass, if they both have the same TYPE-NAME.
EQ_TYPE_ID	NUMBER	0	Equipment Type-ID
TYPE_ACRONYM	VARCHAR2	32	
BASETYPE	VARCHAR2	10	BASE TYPE Definition - int - float - string
DESCRIPTION	VARCHAR2	512	Description an meaning of this property
LOV_PARAMS	VARCHAR2	512	List of values definition
UNIT	VARCHAR2	32	
PRIORITY	NUMBER	0	HIGH: compulsory data; MEDIUM: highly desirable data (coverage > 85perc); LOW: desirable data (coverage > 50perc)
DEFAULT_VALUE_STR	VARCHAR2	512	Default value for String
DEFAULT_VALUE_INT	NUMBER	0	Default value for number
DEFAULT_VALUE_FLOAT	FLOAT	50	Default value for float value 1
DEFAULT_VALUE_FLOAT2	VARCHAR2	0	Default value for float value 2

Table EQUIPMENT_UNIT_OPERATION

This table includes operational date in normal use. The table is organized in a historical way.

Attributes

Name	Type	Length	Description
EQ_ID	NUMBER	0	ID of equipment unit
FROM_DATE	DATE		Validity start date (Default: 0-Date of Oracle DATE type)
TO_DATE	DATE		Validity end date (Default: 2099-12-31)
NORMAL_OPERATING_STATE_TIID	NUMBER	0	ID of state of normal operation (Running / StandBy/...) (Link to Taxonomy Item ID (TIID)
COMMISSIONING_DATE	DATE		Initial commissioning date
START_CURRENT_SERVICE	DATE		Start date of current service
SURVEILLANCE_TIME_H	FLOAT	126	Surveillance time in h (calculated)
OPERATIONAL_TIME_H	FLOAT	126	Operational time in h (measured/calculated)
NR_PERIODIC_TEST	NUMBER	0	Number of periodic test demands during the surveillance period as applicable

Table RELIABILITY_STAT_DATA

Reliability statistical information as defined in ISO 6527-1982

Attributes

Name	Type	Length	Description
RS_ID	NUMBER	0	Unique ID
EQG_ID	NUMBER	0	Reference to an equipmentGroup
EQ_ID	NUMBER	0	Reference to an EquipmentUnit
CONDITION_TIID	NUMBER	0	optional selection of one specific condition (environmental or operational)
CALENDAR_TIME_MIO_HRS	NUMBER	0	Time of installation in 1Mio hours
OPERATION_TIME_MIO_HRS	NUMBER	0	operation time expressed in millions of hours
TOTAL_NR_COMPONENTS	NUMBER	0	total number of components or units
NUMBER_OF_DEMANDS	NUMBER	0	Number of demands
SOURCE_TYPE	VARCHAR2	1	Source Type of failure rate Failure rate is: 'O' .. observed during operations 'L' .. literature 'E' .. expert opinion
SOURCE_REFERENCE	VARCHAR2	132	Reference info to source of information like: Reference to literature, System of operation
PRIVAT	VARCHAR2	1	
STATUS	VARCHAR2	1	Key Data Quality Flag 0 No quality control 1 Good value 2 Probably good value 3 Probably bad value 4 Bad value 5 Missing value
CREATED_DATE	DATE		Date of creation of this record
CREATED_BY	NUMBER	0	ID of user created this record
LAST_MODIFIED_DATE	DATE		Date of last update
LAST_MODIFIED_BY	NUMBER	0	user of last update

Table RELIABILITY_STAT_DATA_MODE

Statistical data for each failure mode

Attributes

FailureAndMaintenance

Tables for historical storage of failure event data nd maintenance activities.

The concept of this tables is derived from EN ISO 14224.

Name	Type	Length	Description
RS_ID	NUMBER	0	Reference to ReliabilityStatiscData Root record
FAIULRE_MODE_TIID	NUMBER	0	Id of a failure mode item
TOTAL_NR_FAILURES	NUMBER	0	Total number of failures
FAILURE_RATE1_OBSERVED	NUMBER	0	Failure rate observed in relation to operational time
FAILURE_RATE1_LO	NUMBER	0	Failure rate (lower limit) in relation to operational time
FAILURE_RATE1_UP	NUMBER	0	Failure rate (upper limit) in relation to operational time
FAILURE_RATE2_LO	NUMBER	0	Failure rate (lower limit) in relation to calendar time
FAILURE_RATE2_UP	NUMBER	0	Failure rate (upper limit) in relation to calendar time
FAILURE_RATE2_OBSERVED	NUMBER	0	Failure rate observed in relation to calendar time
UNAVAILABILITY_TIME_HRS	NUMBER	0	average unavailability time expressed in hours.
MTTR_HRS	NUMBER	0	Mean time to repair in hours (observed)
MTTR_LO_HRS	NUMBER	0	Mean time to repair in hours (lower limit)
MTTR_HI_HRS	NUMBER	0	Mean time to repair in hours (upper limit)

Table AFFECTED_COMP_UNIT

Table, which contains all affected component units by a failure event or by a maintenance action

Attributes

Name	Type	Length	Description
ACU_ID	NUMBER	0	Unique ID
EV_ID	NUMBER	0	Reference to a failure event
MA_ID	NUMBER	0	Reference to an maintenace activity record
SUBUNIT_ID	NUMBER	0	Reference to a subunit
MITEM_ID	NUMBER	0	

Table FAILURE_EVENT

Table of all occured events

Attributes

Name	Type	Length	Description
EV_ID	NUMBER	0	Unique ID of an failure event
EQ_ID	NUMBER	0	Reference to an equipement unit
FAILURE_DATE	TIMESTAMP	6	Time stamp of a failure event
FAILURE_MODE_TIID	NUMBER	0	Link to an taxonomy item (TIID) of corresponding failure mode taxonomy
FAILURE_IMPACT_TIID	NUMBER	0	Failure impact on plant operations Qualitative and quantitative failure consequence categorization (-> C.1.10)
FAILURE_MECHANISM_TIID	NUMBER	0	The physical, chemical or other process which had led to the failure (->Table B.2)
FAILURE CAUSE_TIID	NUMBER	0	The circumstances during design, manufacture or use which had led to the failure (see Table B.3)
DETECTION_MODE_TIID	NUMBER	0	Taxonomy item ID of Detection Methode (see Table B.4)
OPERATION_CONDITION_TIID	NUMBER	0	Taxonomy item id of "Operation state"
OPERATION_PHASE_TIID	NUMBER	0	Taxonomy ID of Operational phase
ADDITIONAL_INFO	VARCHAR2	2000	Additional information as free text Give more datails, if available, on the circumstances leading to the failure: failure of redundant units, failure causes, etc.
SUBUNIT_ID	NUMBER	0	ID of affected Subunit
MITEM_ID	NUMBER	0	ID of affected Maintanable Item

Table MAINTENANCE_DATA

Table of Maintenance events. Maintenance is carryied out for the following reasons: - to correct a failure (corrective Maintenance) - as a planned and normal periodic action to prevent failure from occurring (preventive maintenance)

Attributes

Name	Type	Length	Description
MA_ID	NUMBER	0	Unique generated ID for a Maintenance Activity
EQ_ID	NUMBER	0	Reference to the equipment record
EV_ID	NUMBER	0	Reference to the corresponding failure event (not for preventive maintenance)
MAINTENACE_DATE	DATE		
MAINTENANCE_CATEGORY	VARCHAR2	1	Main category (C..Corrective, P..Preventive)
MAINTENANCE _PRIORITY	VARCHAR2	1	Priority of maintenance H..High, M..Medium, L..Low
PLANNED_INTERVAL	NUMBER	0	Planned interval of maintenance (in days)
MAINTENANCE_ACTIVITY	NUMBER	0	Code of maintenace activity (see Table B.5) Replace, Repair, Modify,....
MAINTENANCE_IMPACT	VARCHAR2	1	Z..Zero, P..Partial, T..Total
PERSON_HOURS	NUMBER	0	Total maintenance person-hours
MAINTENANCE_TIME	NUMBER	0	Time duration for active maintenance work being done on the equipment (Hours)
DOWN_TIME	NUMBER	0	Time duration during which an item is in down state (Hours)
MAINTENACE_DELAYS	VARCHAR2	2000	Prologed down time causes
ADDITIONAL_INFOS	VARCHAR2	2000	Give more details, if available, on the maintenance action and resources used.
SUBUNIT_ID	NUMBER	0	ID of affected Subunit
MITEM_ID	NUMBER	0	ID of affected maintainable item

User structure

The tables in this package defines all organizations, their users and their roles.

It is assumed, that exists a central administration of users as well as an distributed local administration at the site of the participating organizations.

« Tables have to be designed»

Table AD_ROLE

defines usage rights to the system - data provider - admin ....

Attributes

Name	Type	Length	Description
ROLE_ID	NUMBER	0	Unique ID of the role
ROLENAME	VARCHAR2	16	Short name of the Role
DESCRIPTION	VARCHAR2	4000	Description of the role
CREATED_BY	NUMBER	0	
CREATED_DATE	DATE		
LAST_MODIFIED_BY	NUMBER	0	
LAST_MODIFIED_DATE	DATE		

Table AD_USER

Describes one user and associate this user to an organization

Attributes

Table AD_USER_ROLE

This defines, which user implements which role or which users has which rights

Name	Type	Length	Description
USER_ID	NUMBER	0	
USERNAME	VARCHAR2	50	
FULLNAME	VARCHAR2	50	
ORG_ID	NUMBER	0	Reference to the Organization this user belongs
EMAIL	VARCHAR2	50	email address for this user
PASSWORD	VARCHAR2	50	
STATUS	VARCHAR2	4	Status of the user Login info: - AKT Aktive account - LOCK Locked account - DAKT Deaktivated account

Attributes

Name	Type	Length	Description
ID	NUMBER	0	
USER_ID	NUMBER	0	Reference to the User
ROLE_ID	NUMBER	0	Reference to the Role
CREATED_BY	NUMBER	0	
CREATED_DATE	DATE		
LAST_MODIFIED_BY	NUMBER	0	
LAST_MODIFIED_DATE	DATE		

Reference tables

Table Taxonomies

Table contains different taxonomies of different semantics.

Attributes

Name	Type	Length	Description
TAXO_ID	NUMBER	0	Unique ID for the taxonomy
TAXO_TYPE_ID	NUMBER	0	Identifies different types of taxonomies (like OPERATING-STATE, ERROR-MODES, etc)
LABEL	VARCHAR2	50	Short Label identifying this Taxonomy
DESCRIPTION	VARCHAR2	2000	Description for this taxonomy

Table TaxonomyItem

Table contains all items of a specific taxonomy

Attributes

Name	Type	Length	Description
TAXO_ITEM_ID	NUMBER	0	Unique ID of a taxonomy item
TAXO_ID	NUMBER	0	ID OF the taxonomy
PARENT_TAXO_ITEM_ID	NUMBER	0	Link to the ID of the parent item of this taxonomy. Root Taxonomy items have NULL.
TAXO_ACRONYM	VARCHAR2	12	Optional acronym for this taxonomy item
LABEL	VARCHAR2	50	Short label for this taxonomy item
DESCRIPTION	VARCHAR2	2000	Description for this taxonomy item
SEQ	NUMBER	0	Field to used for sorting

Table TaxonomyType

Identifies different types of taxonomies (like Operating states, failure modes, ...)

Attributes

Name	Type	Length	Description
TAXO_TYPE_ID	NUMBER	0	Unique ID of taxonomy Type
TAXO_TYPE_ACRONYM	VARCHAR2	12	Short acronym for this taxonomy type (OPSTAT for operating states)
LABEL	VARCHAR2	50	Short label for Taxonomy type
DESCRIPTION	VARCHAR2	2000	Description for this Taxonomy Type

Appendix B: REST API

ARIES Restservice

Overview

This ARIES Restservice delivers Rest functionality for ARIES background services

Version information

Version: 1.0.0

URI scheme

BasePath: /api

Tags

- AriesDB EquipmentClass resource
- AriesDB EquipmentGroup resource
- AriesDB EquipmentType resource
- AriesDB EquipmentUnit resource
- AriesDB Failure resource
- AriesDB Installation resource
- AriesDB Location resource
- AriesDB Maintenance resource
- AriesDB Organization resource
- AriesDB Reliability Statistic resource
- AriesDB Service resource: This is a RestFul interface for ARIES application. Further information at: www.ait.ac.at
- AriesDB Taxonomy resource
- AriesDB User resource

Paths

Get list of all equipmentClasses

GET /classes

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentClass array
401	Unauthorize access	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentClass resource

Inserts a new equipmentClass

POST /classes

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New EquipmentClass	true	EquipmentClass	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
401	Unauthorized accesss	No Content
404	Parent EquipmentClassId not exists	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentClass resource

Delete an equipmentClass

DELETE /classes/classId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	classId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	EquipmentClassId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentClass resource

Updates a equipmentClass

PUT /classes/classId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update EquipmentClass	true	EquipmentClass	
PathParameter	classId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	EquipmentClassId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentClass resource

Get list of all own Equipment groups

GET /eqgroup

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit array
403	Unauthorize access	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Inserts a new equipmentGroup

POST /eqgroup

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New EquipmentGroup	true	EquipmentGroup	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Taxonomy does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Get list of global Equipment groups of other Organisations

GET /eqgroup/org=orgId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	orgId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit array
403	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Gets all EquipmentGroups of one specific Equipment type

GET /eqgroup/type=typeId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit array
403	Unauthorize access	No Content
404	Equipment type not found	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Get one selected own Equipment groups

GET /eqgroup/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentGroupFull
403	Unauthorize access	No Content
404	Equipment type not found	No Content
405	Not allowed to access remote EquipmentGroups	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Deletes an Equipment Group

DELETE /eqgroup/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	EquipmentGroupId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Updates a Equipment Group

PUT /eqgroup/eqId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update EquipmentGroup	true	EquipmentUnit	
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	Taxonomy does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Inserts an Property Definition to an Equipment group

POST /eqgroup/eqId/properties

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Property	true	EquipmentProperty	
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Taxonomy id does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Deletes an Property for an Equipment Group

DELETE /eqgroup/eqId/properties/propId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	
PathParameter	propId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	ID not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Update an Property Definition for an Equipment Group

PUT /eqgroup/eqId/properties/propId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update a property for an Equipment Type	true	EquipmentProperty	
PathParameter	eqId		true	integer (int64)	
PathParameter	propId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	Taxonomy id does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentGroup resource

Get list of all own Equipment units

GET /equnit

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit array
403	Unauthorize access	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Inserts a new Equipment Unit

POST /equnit

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New EquipmentUnit	true	EquipmentUnit	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Taxonomy does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Gets all EquipmentUnits of one specific Location

GET /equnit/location=locationId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	locationId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit array
403	Unauthorize access	No Content
404	Equipment units not found	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Get one selected EquipmentUnit by Identification

GET /equnit/name/identification

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	identification		true	string	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit
403	Unauthorize access	No Content
404	Equipment type not found	No Content
405	Not allowed to access remote Equpment Units	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Get list of Equipment units of other organizations

GET /equnit/org=orgId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	orgId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit array
403	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Get all Equipment units for one Equipment Type

GET /equnit/type=typeId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnit array
403	Unauthorize access	No Content
404	Equipment type not found	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Get one selected own Equipment unit

GET /equnit/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentUnitFull
403	Unauthorize access	No Content
404	Equipment type not found	No Content
405	Not allowed to access remote EquipmentUnits	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Deletes an Equipment Unit

DELETE /equnit/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	EquipmentUnitId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Updates an Equipment Unit

PUT /equnit/eqId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update EquipmentUnit	true	EquipmentUnit	
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	Taxonomy does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Inserts an EquipmentUnitOperation to an EquipmentUnit

POST /equnit/eqId/operations

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Subunit	true	EquipmentOperation	
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	ID not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Delete an EquipmentUnitOperation from an EquipmentUnit

DELETE /equnit/eqId/operations/operId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	
PathParameter	operId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	ID not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Updates an EquipmentUnitOperation of an EquipmentUnit

PUT /equnit/eqId/operations/operId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update a Subunit for an Equipment Type	true	EquipmentOperation	
PathParameter	eqId		true	integer (int64)	
PathParameter	operId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	ID not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Inserts an Property to an Equipment Unit

POST /equnit/eqId/properties

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Property	true	EquipmentProperty	
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Taxonomy id does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Delete an Property for an Equipment Unit

DELETE /equnit/eqId/properties/propId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	
PathParameter	propId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	ID not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Update an Property for an Equipment Unit

PUT /equnit/eqId/properties/propId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update a property for an Equipment Type	true	EquipmentProperty	
PathParameter	eqId		true	integer (int64)	
PathParameter	propId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
403	Unauthorized accesss	No Content
404	Taxonomy id does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentUnit resource

Delete an affected component unit for Failure

DELETE /failure/affectedCompUnit/acuId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	acuId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	LocationId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Update an affected component unit for failure

PUT /failure/affectedCompUnit/acuId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	affectedUnit	true	AffectedUnit	
PathParameter	acuId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Input parameter is missing	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Inserts a new affected comp unit for an failure event

POST /failure/affectedCompUnit/eventId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eventId		true	integer (int64)	
BodyParameter	body	affectedUnit	true	AffectedUnit	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Input parameter is missing	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Inserts a new Failure Event to Equipment Unit (in one step)

POST /failure/full/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	
BodyParameter	body	failureEvent	true	FailureEventInp	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Taxonomy item does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Get list of all failures of one equipment units

GET /failure/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	FailureEvnt array
403	Unauthorize access	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Inserts a new Failure Event to Equipment Unit (basic functionality)

POST /failure/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	
BodyParameter	body	failureEvent	true	FailureEvnt	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Input parameter is missing	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Deletes an location

DELETE /failure/eventId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eventId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	LocationId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Updates a failure event

PUT /failure/eventId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	failureEvent	true	FailureEvnt	
PathParameter	eventId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Input parameter is missing	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Failure resource

Get list of all installations

GET /installations

Responses

HTTP Code	Description	Schema
200	successful operation	Installation array
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB Installation resource

Inserts a new installation

POST /installations

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Installation	true	Installation	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
401	Unauthorized insert for other organzations	No Content
404	OrganizationId not exists	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Installation resource

Get list of all installations of one Organization

GET /installations/organization/orgId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	orgId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	Installation array
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB Installation resource

Deletes an installation

DELETE /installations/installationId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	installationId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	InstallationId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Installation resource

Updates an installation

PUT /installations/installationId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update Installation	true	Installation	
PathParameter	installationId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	InstallationId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Installation resource

Get list of all locations

GET /locations

Responses

HTTP Code	Description	Schema
200	successful operation	Location array
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB Location resource

Inserts a new location

POST /locations

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Location	true	Location	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
401	Unauthorized insert for other organzations	No Content
404	Parent LocationId not exists	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Location resource

Get list of all locations of one Organization

GET /locations/organization/orgId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	orgId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	Location array
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB Location resource

Deletes a location

DELETE /locations/locationId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	locationId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	LocationId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Location resource

Updates a location

PUT /locations/locationId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update Location	true	Location	
PathParameter	locationId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	OrganizationId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Location resource

Deletes an affected component unit for Maintenance

DELETE /maintenance/affectedCompUnit/acuId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	acuId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	LocationId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Maintenance resource

Updates an affected component unit for Maintenance

PUT /maintenance/affectedCompUnit/acuId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	affectedUnit	true	AffectedUnit	
PathParameter	acuId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Input parameter is missing	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Maintenance resource

Inserts a new affected comp unit to an maintenance activity

POST /maintenance/affectedCompUnit/maintenanceId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	maintenanceId		true	integer (int64)	
BodyParameter	body	affectedUnit	true	AffectedUnit	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Input parameter is missing	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Maintenance resource

Inserts a new maintenance entry to Equipment Unit (acronyms)

POST /maintenance/full/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	
BodyParameter	body	maintenance	true	MaintenanceInp	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Taxonomy item does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Maintenance resource

Get list of all maintenance activities of one equipment units

GET /maintenance/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	Maintenance array
403	Unauthorize access	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB Maintenance resource

Inserts a new maintenance entry to Equipment Unit (normal)

POST /maintenance/eqId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	eqId		true	integer (int64)	
BodyParameter	body	maintenance	true	Maintenance	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
403	Unauthorized accesss	No Content
404	Taxonomy item does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Maintenance resource

Get list of all organizations

GET /organizations

Responses

HTTP Code	Description	Schema
200	successful operation	Organization array
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB Organization resource

Inserts a new organization

POST /organizations

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Organization	true	Organization	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
404	Taxonomy type id not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Organization resource

Delete an organization

DELETE /organizations/orgId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	orgId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
404	Organization id not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Organization resource

Updates a new organization

PUT /organizations/orgId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update Organization	true	Organization	
PathParameter	orgId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
404	Organization id not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Organization resource

Get version of ARIES.at

GET /service

Description

:hardbreaks: Returns current version of ARIES.at

Responses

HTTP Code	Description	Schema
200	successful operation	string
500	Internal server error mit Fehlermeldungstext	No Content

Produces

- text/plain

Tags

- AriesDB Service resource

Calculates and returns statistics for an equipment type on the fly

GET /statistic/type/typeId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	ReliabilityData array
401	Unauthorize access	No Content
405	TypeId not found	No Content

Produces

- application/json

Tags

- AriesDB Reliability Statistic resource

Creates a new Taxonomy entry

POST /taxonomies

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Taxonomy	true	TaxonomyDef	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
404	Taxonomy type id not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Gets list of all taxonomy items without structure

GET /taxonomies/items

Responses

HTTP Code	Description	Schema
200	successful operation	TaxonomyItemSimple array

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Get list of all taxonomy types

GET /taxonomies/type

Responses

HTTP Code	Description	Schema
200	successful operation	TaxonomyType array

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Get list of all taxonomies of a type

GET /taxonomies/type/typeId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	TaxonomyDef array
404	Not found	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Gets a taxonomy with the item hierarchy

GET /taxonomies/id

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	id		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	TaxonomyWithItems
404	Not found	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Deletes a Taxonomy entry

DELETE /taxonomies/id

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	id		true	integer (int64)	

Responses

HTTP Code	Description	Schema
404	Taxonomy not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Updates a Taxonomy entry

PUT /taxonomies/id

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Taxonomy update info	true	TaxonomyDef	
PathParameter	id		true	integer (int64)	

Responses

HTTP Code	Description	Schema
404	Taxonomy not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Creates a new Taxonomy item

POST /taxonomies/id/items

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Taxonomy item	true	TaxonomyItem	
PathParameter	id		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
404	Taxonomy type id not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Deletes a Taxonomy item

DELETE /taxonomies/id/items/itemId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	id		true	integer (int64)	
PathParameter	itemId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
404	Taxonomy not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Updates a Taxonomy item

PUT /taxonomies/id/items/itemId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Taxonomy update info	true	TaxonomyItem	
PathParameter	id		true	integer (int64)	
PathParameter	itemId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
404	Taxonomy not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Gets a taxonomy with the item hierarchy filtered for an EquipmentType

GET /taxonomies/id/type/typeId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	id		true	integer (int64)	
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	TaxonomyWithItems
404	Not found	No Content

Produces

- application/json

Tags

- AriesDB Taxonomy resource

Get list of all Equipment Types

GET /types

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentType array
401	Unauthorize access	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Inserts a new Equipment Type

POST /types

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New EquipmentType	true	EquipmentType	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
401	Unauthorized accesss	No Content
404	Taxonomy does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Get one selected Equipment Type

GET /types/typeId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	EquipmentTypeFull
401	Unauthorize access	No Content
404	Equipment type not found	No Content
405	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Deletes an Equipment Type

DELETE /types/typeId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	EquipmentTypeId not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Updates an Equipment Type

PUT /types/typeId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update EquipmentType	true	EquipmentType	
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Taxonomy does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Inserts an Property Definition to an Equipment Type

POST /types/typeId/properties

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Subunit	true	PropertyDefinition	
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
401	Unauthorized accesss	No Content
404	Taxonomy id does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Deletes an Property Definition for an Equipment Type

DELETE /types/typeId/properties/propId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	
PathParameter	propId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Property Definition not of this Equipment Type	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Update an Property Definition for an Equipment Type

PUT /types/typeId/properties/propId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update a Subunit for an Equipment Type	true	PropertyDefinition	
PathParameter	typeId		true	integer (int64)	
PathParameter	propId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Taxonomy id does not exist	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Inserts a Subunit to an Equipment Type

POST /types/typeId/subunits

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Subunit	true	Subunit	
PathParameter	typeId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
401	Unauthorized accesss	No Content
404	Parent EquipmentTypeId not exists	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Deletes a Subunit for an Equipment Type

DELETE /types/typeId/subunits/subunitId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	
PathParameter	subunitId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Equipment Subunit not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Updates a Subunit for an Equipment Type

PUT /types/typeId/subunits/subunitId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update a Subunit for an Equipment Type	true	Subunit	
PathParameter	typeId		true	integer (int64)	
PathParameter	subunitId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Equipment Subunit not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Inserts a Maintainable Item to an Equipment Type

POST /types/typeId/subunits/subunitId/mitem

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New Item	true	MaintainableItem	
PathParameter	typeId		true	integer (int64)	
PathParameter	subunitId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	integer (int64)
401	Unauthorized accesss	No Content
404	Parent Subunit not exists	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Deletes a Maintainable Item for an Equipment Type

DELETE /types/typeId/subunits/subunitId/mitem/mitemId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	typeId		true	integer (int64)	
PathParameter	subunitId		true	integer (int64)	
PathParameter	mitemId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Equipment Subunit not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Update a Maintainable Item for an Equipment Type

PUT /types/typeId/subunits/subunitId/mitem/mitemId

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Update a maintenable item	true	MaintainableItem	
PathParameter	typeId		true	integer (int64)	
PathParameter	subunitId		true	integer (int64)	
PathParameter	mitemId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorized accesss	No Content
404	Maintainable item not found	No Content
500	Internal Server error	No Content

Produces

- application/json

Tags

- AriesDB EquipmentType resource

Get list of all users

GET /users

Responses

HTTP Code	Description	Schema
200	successful operation	User2 array
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB User resource

Get info of current Aries user

GET /users/login

Description

:hardbreaks: Returns Get info of current Aries user

Responses

HTTP Code	Description	Schema
200	successful operation	User
401	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB User resource

Update info of current Aries user

PUT /users/login

Description

:hardbreaks: Updates info of current Aries user

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New User Info	true	UserUpdateRequest	

Responses

HTTP Code	Description	Schema
200	successful operation	User
401	Unauthorize access	No Content

Produces

- application/json

Tags

- AriesDB User resource

Set Password of current Aries user

PUT /users/login/password

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New User Info	true	NewPasswordRequest	

Responses

HTTP Code	Description	Schema
401	Unauthorize access	No Content
405	Old password verification errror	No Content

Produces

- application/json

Tags

- AriesDB User resource

Get list of all users of an organization

GET /users/org/orgId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	orgId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	User2 array
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB User resource

Get info of another user

GET /users/userId

Parameters

Type	Name	Description	Required	Schema	Default
PathParameter	userId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	User
401	Unauthorize access	No Content
405	No right to acces this user	No Content

Produces

- application/json

Tags

- AriesDB User resource

Insert or Update info of another Aries user

PUT /users/userId

Description

:hardbreaks: Creates or updates another Aries user

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	New User Info	true	UserUpdateRequest	
PathParameter	userId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
200	successful operation	User
401	Unauthorize access	No Content
405	invalid organization acronym	No Content

Produces

- application/json

Tags

- AriesDB User resource

Set Password of another Aries user

PUT /users/userId/password

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Verification and set of new password	true	NewPasswordRequest	
PathParameter	userId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorize access	No Content
405	Old password verification errror	No Content

Produces

- application/json

Tags

- AriesDB User resource

Grant role access to another local user

PUT /users/userId/role/grant

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Grant Role	true	string	
PathParameter	userId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorize access	No Content
405	Invalid user Id	No Content

Produces

- application/json

Tags

- AriesDB User resource

Revokes role access to another local user

PUT /users/userId/role/revoke

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	body	Revoke Role	true	string	
PathParameter	userId		true	integer (int64)	

Responses

HTTP Code	Description	Schema
401	Unauthorize access	No Content
405	Invalid user Id	No Content

Produces

- application/json

Tags

- AriesDB User resource

Definitions

AffectedUnit

Name	Description	Required	Schema	Default
acuId		false	integer (int64)	
mitemId		false	integer (int64)	
mitemName		false	string	
subunitId		false	integer (int64)	
subunitName		false	string	

EquipmentClass

Name	Description	Required	Schema	Default
classId		false	integer (int64)	
classIdentifier		false	string	
description		false	string	
iconName		false	string	
seq		false	integer (int64)	
parentId		false	integer (int64)	
children		false	EquipmentClass array	

doi:10.5281/zenodo.6102497

EquipmentGroup

Name	Description	Required	Schema	Default
eqgId		false	integer (int64)	
eqTypeId		false	integer (int64)	
orgId		false	integer (int64)	
name		false	string	
description		false	string	
manufacturerName		false	string	
manufacturerModelId		false	string	
privat		false	string	

EquipmentGroupFull

Name	Description	Required	Schema	Default
eqgId		false	integer (int64)	
eqTypeId		false	integer (int64)	
orgId		false	integer (int64)	
description		false	string	
manufacturerName		false	string	
manufacturerModelId		false	string	
privat		false	string	
equipmentProperties		false	EquipmentProperty array	
reliabilityStatDatas		false	ReliabilityData array	

EquipmentOperation

Name	Description	Required	Schema	Default
id		false	integer (int64)	
eqId		false	integer (int64)	
operatingStateTiid		false	integer (int64)	
environmentCond1Tiid		false	integer (int64)	
environmentCond2Tiid		false	integer (int64)	
fromDate		false	string (date-time)	
toDate		false	string (date-time)	
commissioningDate		false	string (date-time)	
startCurrentService		false	string (date-time)	
surveillanceTimeH		false	number (double)	
operationalTimeH		false	number (double)	
nrPeriodicTest		false	integer (int64)	

EquipmentProperty

Name	Description	Required	Schema	Default
propId		false	integer (int64)	
propDefId		false	integer (int64)	
seq		false	integer (int64)	
label		false	string	
description		false	string	
unit		false	string	
type		false	string	
valueStr		false	string	
valueInt		false	integer (int64)	
valueFloat		false	number (double)	
valueFloat2		false	number (double)	
valueFormated		false	string	
conditionTiid		false	integer (int64)	
privat		false	string	
status		false	string	

EquipmentType

Name	Description	Required	Schema	Default
eqTypeId		false	integer (int64)	
eqTypeName		false	string	
icon		false	string	
classId		false	integer (int64)	
seq		false	integer (int64)	
parentTypeId		false	integer (int64)	
manufactModelNr		false	string	
boundaryDefinition		false	string	
boundaryDefMimeType		false	string	
operatingStateTaxoMask		false	string	
failureModeTaxoId		false	integer (int64)	
failureModeTaxoMask		false	string	
failureImpactTaxoId		false	integer (int64)	
failureImpactTaxoMask		false	string	
failureMechanismTaxoId		false	integer (int64)	
failureMechanismTaxoMask		false	string	
failureCauseTaxoId		false	integer (int64)	
failureCauseTaxoMask		false	string	
detectionModeTaxoId		false	integer (int64)	
detectionModeTaxoMask		false	string	
operationConditionTaxoId		false	integer (int64)	
operationConditionTaxoMask		false	string	
environmentCond1TaxoId		false	integer (int64)	
environmentCond1TaxoMask		false	string	
environmentCond2TaxoId		false	integer (int64)	
environmentCond2TaxoMask		false	string	
operatingStateTaxoId		false	integer (int64)	

EquipmentTypeFull

Name	Description	Required	Schema	Default
eqTypeId		false	integer (int64)	
eqTypeName		false	string	
icon		false	string	
classId		false	integer (int64)	
seq		false	integer (int32)	
parentTypeId		false	integer (int64)	
manufactModelNr		false	string	
boundaryDefMimeType		false	string	
boundaryDefinition		false	string	
operatingStateTaxoId		false	integer (int64)	
operatingStateTaxoMask		false	string	
failureModeTaxoId		false	integer (int64)	
failureModeTaxoMask		false	string	
failureImpactTaxoId		false	integer (int64)	
failureImpactTaxoMask		false	string	
failureMechanismTaxoId		false	integer (int64)	
failureMechanismTaxoMask		false	string	
failureCauseTaxoId		false	integer (int64)	
failureCauseTaxoMask		false	string	
detectionModeTaxoId		false	integer (int64)	
detectionModeTaxoMask		false	string	
operationConditionTaxoId		false	integer (int64)	
operationConditionTaxoMask		false	string	
environmentCond1TaxoId		false	integer (int64)	
environmentCond1TaxoMask		false	string	
environmentCond2TaxoId		false	integer (int64)	
environmentCond2TaxoMask		false	string	
subunits		false	Subunit array	
propertyDefs		false	PropertyDefinition array	

EquipmentUnit

Name	Description	Required	Schema	Default
eqId		false	integer (int64)	
eqTypeId		false	integer (int64)	
orgId		false	integer (int64)	
locationId		false	integer (int64)	
identification		false	string	
description		false	string	
manufacturerName		false	string	
manufacturerModelId		false	string	
parentId		false	integer (int64)	
privat		false	string	

EquipmentUnitFull

Name	Description	Required	Schema	Default
eqId		false	integer (int64)	
eqTypeId		false	integer (int64)	
orgId		false	integer (int64)	
locationId		false	integer (int64)	
identification		false	string	
description		false	string	
manufacturerName		false	string	
manufacturerModelId		false	string	
privat		false	string	
equipmentProperties		false	EquipmentProperty array	
equipmentOperations		false	EquipmentOperation array	
maintenanceDatas		false	Maintenance array	
reliabilityStatDatas		false	ReliabilityData array	
failureEvents		false	FailureEvnt array	

FailureEventInp

Name	Description	Required	Schema	Default
evId		false	integer (int64)	
eqId		false	integer (int64)	
failureDate		false	string (date-time)	
failureMode		false	string	
failureImpact		false	string	
failureMechanism		false	string	
failureCause		false	string	
detectionMethode		false	string	
operatingState		false	string	
operationPhase		false	string	
additionalInfo		false	string	
environmentCond1		false	string	
environmentCond2		false	string	
affectedUnits		false	AffectedUnit array	

FailureEvnt

Name	Description	Required	Schema	Default
evId		false	integer (int64)	
eqId		false	integer (int64)	
failureDate		false	string (date-time)	
failureModeTiid		false	integer (int64)	
failureImpactTiid		false	integer (int64)	
failureMechanismTiid		false	integer (int64)	
failureCauseTiid		false	integer (int64)	
detectionModeTiid		false	integer (int64)	
operatingStateTiid		false	integer (int64)	
operationPhaseTiid		false	integer (int64)	
additionalInfo		false	string	
environmentCond1Tiid		false	integer (int64)	
environmentCond2Tiid		false	integer (int64)	
affectedUnits		false	AffectedUnit array	

Installation

Name	Description	Required	Schema	Default
installationId		false	integer (int64)	
installationName		false	string	
location		false	string	
url		false	string	
country		false	string	
address1		false	string	
address2		false	string	
postcode		false	string	
city		false	string	
typeOfInstallation		false	string	
orgId		false	integer (int64)	

Location

Name	Description	Required	Schema	Default
locationId		false	integer (int64)	
locationName		false	string	
orgId		false	integer (int64)	
installationId		false	integer (int64)	
parentId		false	integer (int64)	
seq		false	integer (int64)	
locationGeometry		false	string	
children		false	Location array	

LovItem

Name	Description	Required	Schema	Default
key		false	string	
meaning		false	string	

MaintainableItem

Name	Description	Required	Schema	Default
mitemId		false	integer (int64)	
subunitId		false	integer (int64)	
name		false	string	
catalogueId		false	string	

Maintenance

Name	Description	Required	Schema	Default
maId		false	integer (int64)	
eqId		false	integer (int64)	
evId		false	integer (int64)	
maintenanceDate		false	string (date-time)	
maintenanceCategory		false	string	
maintenancePriority		false	string	
plannedInterval		false	number (double)	
maintenanceActivityTiid		false	integer (int64)	
maintenanceImpact		false	string	
personHours		false	number (double)	
maintenanceTime		false	number (double)	
downTime		false	number (double)	
maintenanceDelays		false	number (double)	
additionalInfos		false	string	
affectedUnits		false	AffectedUnit array	

MaintenanceInp

Name	Description	Required	Schema	Default
maId		false	integer (int64)	
eqId		false	integer (int64)	
evId		false	integer (int64)	
maintenanceDate		false	string (date-time)	
maintenanceCategory		false	string	
maintenancePriority		false	string	
plannedInterval		false	number (double)	
maintenanceActivityTiid		false	integer (int64)	
maintenanceImpact		false	string	
personHours		false	number (double)	
maintenanceTime		false	number (double)	
downTime		false	number (double)	
maintenanceDelays		false	number (double)	
additionalInfos		false	string	
affectedUnits		false	AffectedUnit array	

NewPasswordRequest

Name	Description	Required	Schema	Default
oldPassword		false	string	
newPassword		false	string	

Organization

Name	Description	Required	Schema	Default
orgId		false	integer (int64)	
orgName		false	string	
orgAcronym		false	string	
city		false	string	
orgAddress1		false	string	
orgAddress2		false	string	
postcode		false	string	

PropertyDefinition

Name	Description	Required	Schema	Default
propTypeId		false	integer (int64)	
typeAcronym		false	string	
propTypeName		false	string	
eqTypeId		false	integer (int64)	
basetype		false	string	
description		false	string	
lovParams		false	LovItem array	
unit		false	string	
defaultValueStr		false	string	
defaultValueInt		false	integer (int64)	
defaultValueFloat		false	number (double)	
defaultValueFloat2		false	number (double)	
priority		false	integer (int64)	
seq		false	integer (int64)	
inherited		false	boolean	false

ReliabilityData

Name	Description	Required	Schema	Default
rsId		false	integer (int64)	
eqId		false	integer (int64)	
eqgId		false	integer (int64)	
environmentCond1Tiid		false	integer (int64)	
environmentCond2Tiid		false	integer (int64)	
calendarTimeMioHrs		false	number (double)	
operationTimeMioHrs		false	number (double)	
totalNrComponents		false	integer (int64)	
numberOfDemands		false	integer (int64)	
privat		false	string	
status		false	string	
sourceType		false	string	
sourceReference		false	string	
reliabilityDataModes		false	ReliabilityDataMode array	

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ReliabilityDataMode

Name	Description	Required	Schema	Default
id		false	integer (int64)	
failureModeTiid		false	integer (int64)	
totalNrFailures		false	integer (int64)	
failureRate1Lo		false	number (double)	
failureRate1Up		false	number (double)	
failureRate1Mean		false	number (double)	
failureRate1SD		false	number (double)	
failureRate1Theta		false	number (double)	
failureRate2Lo		false	number (double)	
failureRate2Up		false	number (double)	
failureRate2Mean		false	number (double)	
failureRate2SD		false	number (double)	
failureRate2Theta		false	number (double)	
unavailabilityTimeHrs		false	number (double)	
mttrHrs		false	number (double)	
mttrLoHrs		false	number (double)	
mttrHiHrs		false	number (double)	

Subunit

Name	Description	Required	Schema	Default
subunitId		false	integer (int64)	
subnr		false	integer (int64)	
name		false	string	
description		false	string	
maintainableItems		false	MaintainableItem array	

TaxonomyDef

Name	Description	Required	Schema	Default
id		false	integer (int64)	
typeId		false	integer (int64)	
typeAcronym		false	string	
typeLabel		false	string	
typeDescription		false	string	
label		false	string	
description		false	string	

TaxonomyItem

Name	Description	Required	Schema	Default
id		false	integer (int64)	
seq		false	integer (int64)	
parentId		false	integer (int64)	
acronym		false	string	
label		false	string	
description		false	string	
children		false	TaxonomyItem array	

TaxonomyItemSimple

Name	Description	Required	Schema	Default
id		false	integer (int64)	
acronym		false	string	
label		false	string	
description		false	string	

TaxonomyType

Name	Description	Required	Schema	Default
typeId		false	integer (int64)	
typeAcronym		false	string	
typeLabel		false	string	
typeDescription		false	string	

TaxonomyWithItems

Name	Description	Required	Schema	Default
id		false	integer (int64)	
typeId		false	integer (int64)	
label		false	string	
description		false	string	
items		false	TaxonomyItem array	

User

Name	Description	Required	Schema	Default
id		false	integer (int64)	
name		false	string	
fullname		false	string	
status		false	string	
geteMail		false	string	
orgAcronym		false	string	
orgId		false	integer (int64)	
roles		false	string array	

User2

Name	Description	Required	Schema	Default
id		false	integer (int64)	
name		false	string	
fullname		false	string	
status		false	string	
geteMail		false	string	
orgAcronym		false	string	
orgId		false	integer (int64)	

UserUpdateRequest

Name	Description	Required	Schema	Default
name		false	string	
fullname		false	string	
status		false	string	
mail		false	string	
orgAcronym		false	string	

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Consortium

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