

Experimental Objects

Requirements for the RQI Experiment

Description

Domain

Currently, the selected requirements are derived from the requirements specification on the Mars Express ASPERA-3 Processing and Archiving Facility (APAF) [2] taken from the PuRE data set [1].

Context

This summary is a concise version of the project description and objectives of the original specification [2]. Practitioners will be presented with this summary to (a) understand the context and (b) have a chance to fill the gaps produced by the passive voice sentences.

The **ASPERA-3 Processing and Archiving Facility (APAF)** is a data system responsible for processing telemetry (i.e., sensor data) of the ASPERA-3 instrument package, which was flown to Mars on the Mars Express mission in 2003. ASPERA-3 contains several different sensors that measure the particles, neutral atoms, and fields in the near Martian environment. The APAF data system provides data processing algorithms to support the ASPERA-3 science team in data analysis. It consists of a data processing unit, interfaces to various databases, a web-based front-end, and a dedicated logger for maintenance purposes.

Requirements

Warmup Objects

As a measure to ensure equal acclimatization to the experimental task, a warmup object will precede the experimental objects. The results from the warmup object will not be used in the statistical evaluation.

Requirement 0

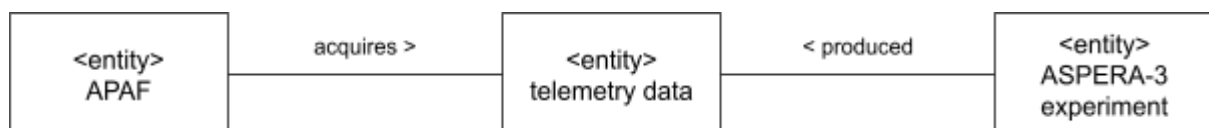
This requirement does not contain any of the two defects under investigation (neither passive voice nor vague pronoun).

Formulation

#	Requirement
1	The APAF system shall acquire from ESOC the telemetry data of the ASPERA-3 Experiment and Mars Express Orbit/Attitude.
2	The APAF system shall acquire the telemetry data produced by the ASPERA-3 experiment.

Source: APAF-FR-01

Expected solution



Experimental Objects

Requirement 1

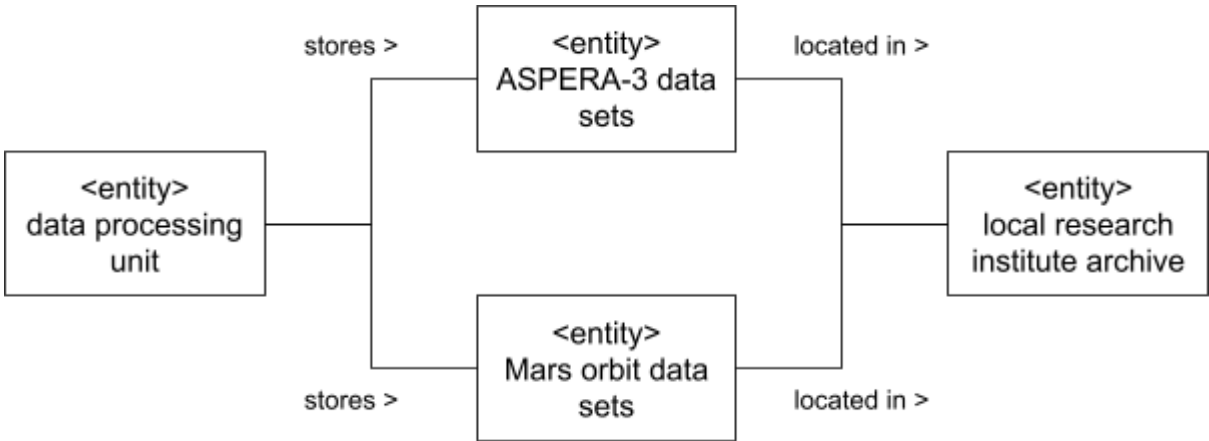
This requirement does not contain any of the two defects under investigation (neither passive voice nor vague pronoun).

Formulation

#	Requirement
1	The ASPERA-3 and MEX OA IDFS data sets shall be stored on a local SwRI archive.
2	The data processing unit shall store the ASPERA-3 and Mars orbit data sets on a local research institute archive.

Source: APAF-FR-05

Expected solution



Requirement 2

Passive Voice

This requirement uses a passive voice formulation. The context must specify the omitted entity (i.e., what part of the system is responsible for displaying the data).

Formulation

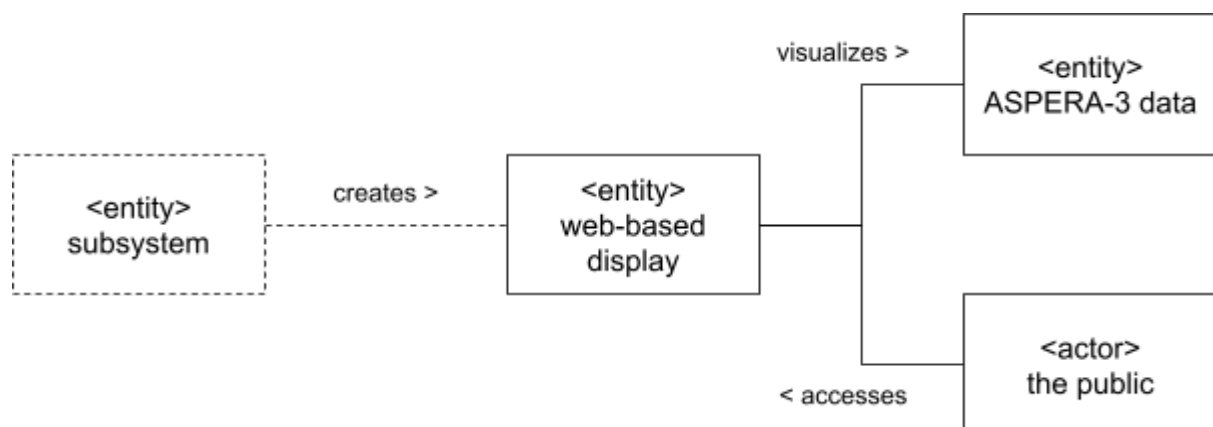
#	Requirement
1	Web-based displays of the most current ASPERA-3 data shall be provided for public view.

Source: APAF-FR-07

Challenges

The use of passive voice (“shall be provided”) omits the actor/entity of the sentence (i.e., the responsible subsystem). Experiment participants may forget this actor/entity in the model.

Expected Solution



Requirement 3

Vague Pronoun

This requirement uses a vague pronoun (it). The pronoun can grammatically refer to multiple noun phrases of the preceding part of the sentence. We must ensure that the relative clause also semantically aligns with all eligible noun phrases.

Formulation

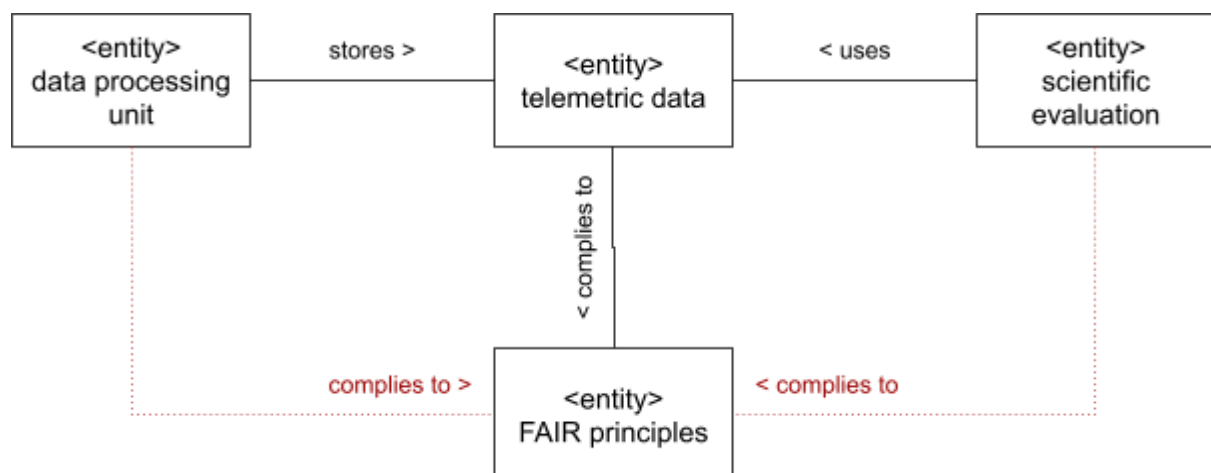
#	Requirement
1	The <i>data processing unit</i> stores <i>telemetric data</i> for <i>scientific evaluation</i> ; therefore, it needs to comply with the FAIR principles of data storage.

Source: made-up

Challenge

The use of a vague pronoun (“it”) causes the association starting from the “FAIR principles” can have multiple targets (“system X,” “telemetric data,” or “scientific evaluation”). Participants may connect the association with the wrong entity.

Expected solution



Requirement 4

Passive Voice

Vague Pronoun

This requirement uses both passive voice and an ambiguous pronoun.

Formulation

#	Requirement
1	Every log entry is stored in a <database> and backed up in a <redundant database> if it is annotated by a criticality flag.
2	Every log entry is stored in a document-based database and backed up in a redundant database if it contains a criticality flag.
3	Every Research Object is represented in a JSON-LD format and stored in a document database if it contains a CC license.

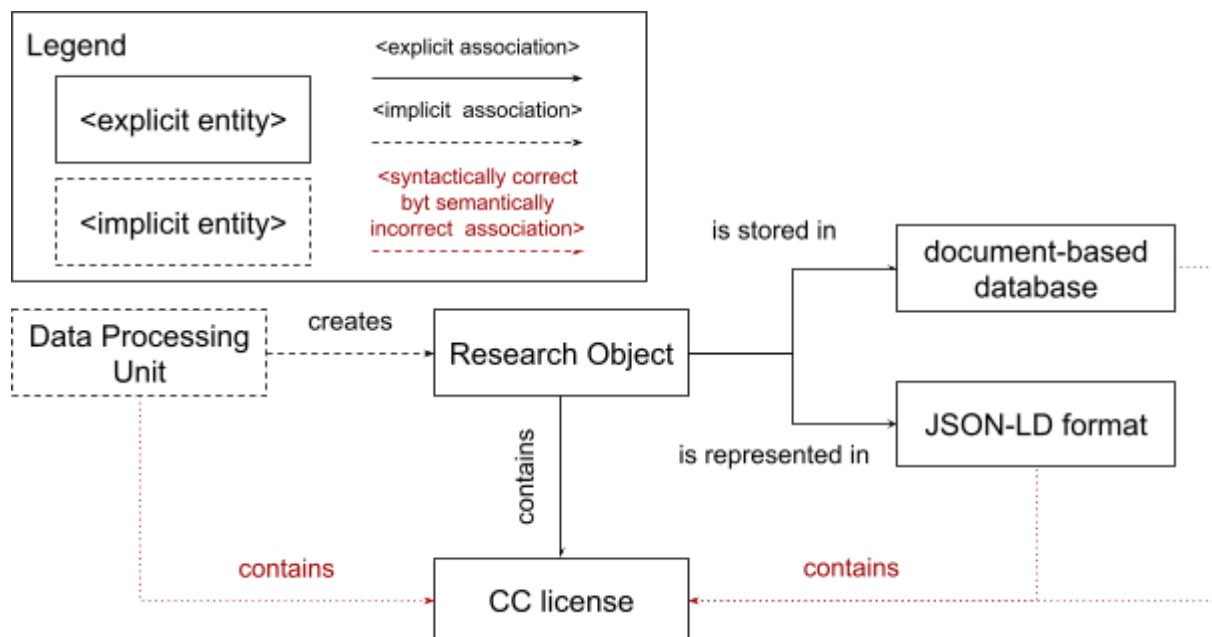
Source: <https://www.researchobject.org/ro-crate/tools/>

Challenge(s)

This requirement contains the following challenges:

- The use of passive voice (“is stored”) omits the actor/entity of the independent clause (the logger). Participants may forget “the logger” in the model.
- The use of an ambiguous pronoun (“it”) causes the association starting from the “criticality flag” can have multiple targets (“log entry,” “database,” “backup database,” or even “logger”). Participants may connect the association with the wrong entity.

Expected solution



References

- [1] Ferrari, A., Spagnolo, G. O., & Gnesi, S. (2017, September). Pure: A dataset of public requirements documents. In *2017 IEEE 25th International Requirements Engineering Conference (RE)* (pp. 502-505). IEEE.
- [2] Jeffers, S. (2001, April). Mars Express ASPERA-3 Processing and Archiving Facility (APAF) Software Requirements Specification.