Guide to use of Interfaces in Reference Architectures

**Purpose**: to provide examples of how to work with Interface objects in NRA.

**Audience**: creators of reference architecture

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# What is an Interface

An interface is a point of interaction between two systems, entities, or components, facilitating communication and functionality. In different contexts, the term can have specific meanings:

* **User Interface (UI)**: The space where interactions between humans and machines occur. This includes graphical elements like buttons, icons, and menus in software applications.
* **Programming Interface**: In software development, an interface defines a set of methods or functions that a class or system must implement, enabling different software components to interact.
* **Hardware Interface**: The physical and logical connections between different hardware components, such as USB ports or network interfaces.

In FRAME the interface is specified by analysis of **communications requirements** of physical link and identification of **related standards** and the **way it shall** be used.

## Communications Requirements analysis

An Analysis of the Physical Data Flows to identify the characteristics of the physical links that will carry the data, e.g.

* What: type of data, expected size, etc.
* When: how often, latency
* Required Bandwidth: maximum expected
* Required Security and Other Constraints
* Link Type: wireless or wireline

Since this could be different per functional dataflow, this analysis is performed for each functional dataflow of the physical dataflow. Resulting information is the maximum of each analysed functional dataflow.

**NOTE**: Sometimes even the functional dataflow is too generic and needs to be broken down into parts that have different needs.

### Mode of Data Transfer

* **Sound**: Examples include pedestrian signals.
* **Vision**: Includes data displayed on computer screens.
* **Tactile**: Involves touch-based interfaces like buttons and touch screens.
* **Hard Copy**: Physical documents such as timetables.
* **Physical**: Includes tokens and smart cards.
* **Sensor/Transducer**: Devices like loop detectors and IR presence indicators.
* **Wire Line**: Data transfer via wired connections like Ethernet.
* **Wireless**: Data transfer via wireless methods such as FM radio and WiFi.

### Types of Data to be Transferred

* **Raw Data**: Includes basic data types such as numbers, characters, XML, and EDIFACT.
* **Image**: Encompasses digital pictures and video motion.
* **Human-Machine Interaction**: Covers data types like voice, audio, and display information.
* **Physical**: Involves data related to movement and state, such as weather conditions, road surface status, and personal data.

### Quantity of Data in Each Item

* **Bits, Kb, Mb**: Specifies the size of data items in bits, kilobits, or megabits.

### Waiting Time Permitted

* **Time between data creation and data use**: The allowable delay from when data is generated to when it is utilized.
* **Time interval between transmissions**: The permissible gap between consecutive data transmissions.
* **Time before a new value is required**: The maximum time allowed before an updated data value is needed.

### Message frequency

* **seconds, minutes, hours, months, years**: Specifies the frequency with which the data items are generated. The message generation is periodical.
* **event driven:** for irregular time intervals, when message is generated only on occurrence of a triggering event (that user does not have control over).
* **on request**: the message is generated on user request only (e.g. event in control of the user)

### Security Level

* **None**: Public information with no security requirements.
* **Low**: Data that requires protection against unauthorized changes and identification before use.
* **Medium**: ???
* **High**: Data that needs to be protected against unauthorized reading, often using encryption.

# Interface description

Apart from the communications requirement

## Interface name

* **Title**: Provide a concise, specific name for the interface, usually by referring to objects connected via the interface.
* **Example**: Content Consumer - Data Management Module

## Classification:

* **Type**: Clearly classify the specification into one of the defined types (User Interface, Programming Interface or Hardware Interface)
* **Example**: Programming Interface

## Description

* **Short description**: provide a short description of the interface.
* **Contextual Use**: Describe how the interface is used in the context of the ITS Service. Include a paragraph or more of text.
* **Example**:
  + **Short description**: This interface is used for the interaction of the content consumer and metadata management module.
  + **Contextual Use**: MobilityDCAT-AP is a formal metadata specification for mobility data portals as an extension of DCAT-AP. A metadata specification (as any data specification) contains a model with definitions of the syntax and semantics for various data elements, and on how these data elements relate to each other. This way, mobilityDCAT-AP provides precise and unambiguous metadata designations for any mobility-related data offerings, facilitating harmonised, platform-independent metadata descriptions in both human-readable and machine-readable formats.

## Source of description?

* **Related documents**: Provide the full name of the document where in the interface specified and a hyperlink to the text.
* **Example**: Documents: <https://napcore.eu/activity-wg2-interoperability-and-level-of-service-of-naps/>

## Communications Requirements

* **Technical values**: Provide information about the analysed communication requirements. As per 1.1 Communications Requirements analysis.
* **Example**: see the figure bellow

Obsah obrázku text, snímek obrazovky, číslo, Písmo

Popis byl vytvořen automaticky

Figure 1 Example of Communication Requirements

## Example Interface Entries

### Content Consumer - Metadata Management Module

**Type**: Use interface

**Short description**: This interface is used for the interaction of the content consumer and metadata management module.

**Contextual Use**: MobilityDCAT-AP is a formal metadata specification for mobility data portals as an extension of DCAT-AP. A metadata specification (as any data specification) contains a model with definitions of the syntax and semantics for various data elements, and on how these data elements relate to each other. This way, mobilityDCAT-AP provides precise and unambiguous metadata designations for any mobility-related data offerings, facilitating harmonised, platform-independent metadata descriptions in both human-readable and machine-readable formats.

**Related documents**: ---

=== Communications Requirements ===

As a guideline for minimum expectation the following values can be used

**Data type**:

* Raw data

**max bytes per message**

* up to 500 kBytes per request

**maximum delay [s]**

* system response time below 100ms (independent from user internet connection)
* delay for submitting request: 0.5s

**message interval**

* On occurrence

**security level**

* level high (authorization by the system, encrypted data transfer on system side)

### Examples of interface definitions from E-FRAME project

Obsah obrázku text, Písmo, číslo, snímek obrazovky

Popis byl vytvořen automatickyObsah obrázku text, snímek obrazovky, číslo, dokument

Popis byl vytvořen automatickyObsah obrázku text, snímek obrazovky, Písmo, číslo

Popis byl vytvořen automatickyObsah obrázku text, diagram, Plán, snímek obrazovky

Popis byl vytvořen automatickyObsah obrázku text, snímek obrazovky, diagram, Paralelní

Popis byl vytvořen automatickyObsah obrázku text, snímek obrazovky, Písmo, číslo

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