Naming REST API – brief introduction

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Introduction

This document will give brief introduction to redesigned Naming REST API. First set of sections gives background information to work being done and next set of sections attempts to give more practical information such as how to use Naming REST API, what data that is sent and received and what it means together with some questions and answers.

This document will mention database and storage but is not about it. Its focus is on REST API.

Noteworthy

- It's test versions of both application and its database. Information shouldn't be relied upon.

- Currently

    - REST API with Swagger UI

    - No authentication/authorization implemented. Intention going forward is to have same division of possibilities as in current Naming, i.e. visitor / user / administrator.

    - No ordinary UI available

    - Json format used for data that is sent and received

Background

It's been noticed that there is more and more focus on ability to service other applications, systems, services with information and act as a microservice. This means more focus on REST API. Current Naming has some possibilities to serve information. However its implementation (database and application) has very strong boundaries to what is possible. Another reason for redesign of Naming and REST API, which is perhaps even more important, is maintainability. This includes having better foundation for future with better ability to support implementation of Naming convention.

Thus, modernization means refactoring of database and application. This modernization is required for better understanding, maintainability and ability to handle requests and possibilities for Naming.

Brief background on database

Current Naming

- 2 tables used to store device names. One (1) handles uuids for device names while other (2) handles all else for device names. Device name also known as ESS name.

- 2 tables used to store name parts. One (3) handles uuids while other (4) handles all else for name parts. This table (4) handles all three levels of System structure and all three levels of Device structure through recursive references.

  ○ System structure – System group, System, Subsystem

  ○ Device structure – Discipline, Device group, Device type

- *tables in current Naming do neither correspond to data in real world nor to data that is stored. In practice, data need to be interpreted in several steps to objects and then stored in caches before usage*

Refactored Naming

- 1 table for ESS name

- 1 table per System structure level – System group, System, Subsystem (3 tables)

- 1 table per Device structure level – Discipline, Device group, Device type (3 tables)

- *tables in refactored database correspond to data in real world and to data that is stored. This helps understanding and maintainability of database and application.*

Comparison between refactored and current Naming tool

- names   <--->   ESS names
- structures   <--->   System structure, Device structure

Concepts & Terminology

Concepts & Terminology are summarized below with *text in italic*.

The application is commonly referred to as *Naming, Naming tool, Naming convention tool*. It is a web application that includes a REST API for read purposes and it is connected to a database for storage of names and structures. Naming is the most common way to refer to both application and system as a whole.

In the process of refactoring, the application is split into a backend part and a frontend part, known as *Naming backend* and *Naming frontend*.

The purpose of Naming

> *Handle Naming of ESS wide physical and logical devices according to ESS Naming Convention*

What is a Name?

ESS Name	System structure	Device structure
	Which part of the facility does the device provide service to?	*What kind of service does the device provide?*
Must refer to System structure	*1 System Group*	*1 Discipline*
May refer to Device structure	*2 System*	*2 Device Group*
May have index for instance	*3 Subsystem*	*3 Device Type*

System structure and Device structure are hierarchies with 3 levels each. A 3rd level entry refers to 2nd level entry that refers to 1st level entry. A name must refer to System structure (arbitrary level) and may refer to Device structure (level 3). If Device structure is referred to, then index is to be set.

An entry, for name and structure, has a common set of attributes such as uuid, name, mnemonic, description, comment, when requested and by whom, when processed and by whom, etc.

Each entry is identified by its universal identifier, also known as uuid. It is the common denominator to keep track of an entry through its lifecycle, e.g. when the entry is created, updated, deleted. An entry usually has another attribute called *mnemonic* which is a short name that is to be unique in its namespace. This attribute is called *mnemonic* for an entry in System structure or Device structure. For a names entry, this attribute is called *index*.

In addition, there is an attribute called name equivalence or mnemonic equivalence. This is derived from name or mnemonic by taking similar-looking characters into account and helps to ensure that name and mnemonic is unique within its namespace.

Mnemonic equivalence

> *o, O, 0   considered same from equivalence point-of-view*
>
> *i, I, l, L, 1   considered same from equivalence point-of-view*
>
> *leading 0 numerical characters removed*

Uniqueness of an entry

> *Each entry has a unique uuid that acts as key in its line of history. This applies for both name and structure entries.*
>
> *An entry in names, System structure, Device structure must have attributes such that it is unique in its namespace at any given time. This is achieved with proper values for mnemonic and index.*
>
> *Namespace for a name entry is all valid names.*
>
> *Namespace for structure entry is its hierarchy.*

Rules for names and structures

> Structures
>
> > *System, Subsystem, Discipline, Device Type must have mnemonic.*
> >
> > *System Group may have mnemonic.*
> >
> > *Device Group must not have mnemonic.*

ESS Name	*=*	*System Group*				
		System Group	*+*	*Device Type*	*+*	*Index*
		System				
		System	*+*	*Device Type*	*+*	*Index*
		Subsystem				
		Subsystem	*+*	*Device Type*	*+*	*Index*

Visualization – names and structures

Acc

Acc:RFS-PrlTap-054

A2T

A2T:RFS-PrlTap-054

A2T-010PRL

A2T-010PRL:RFS-PrlTap-054
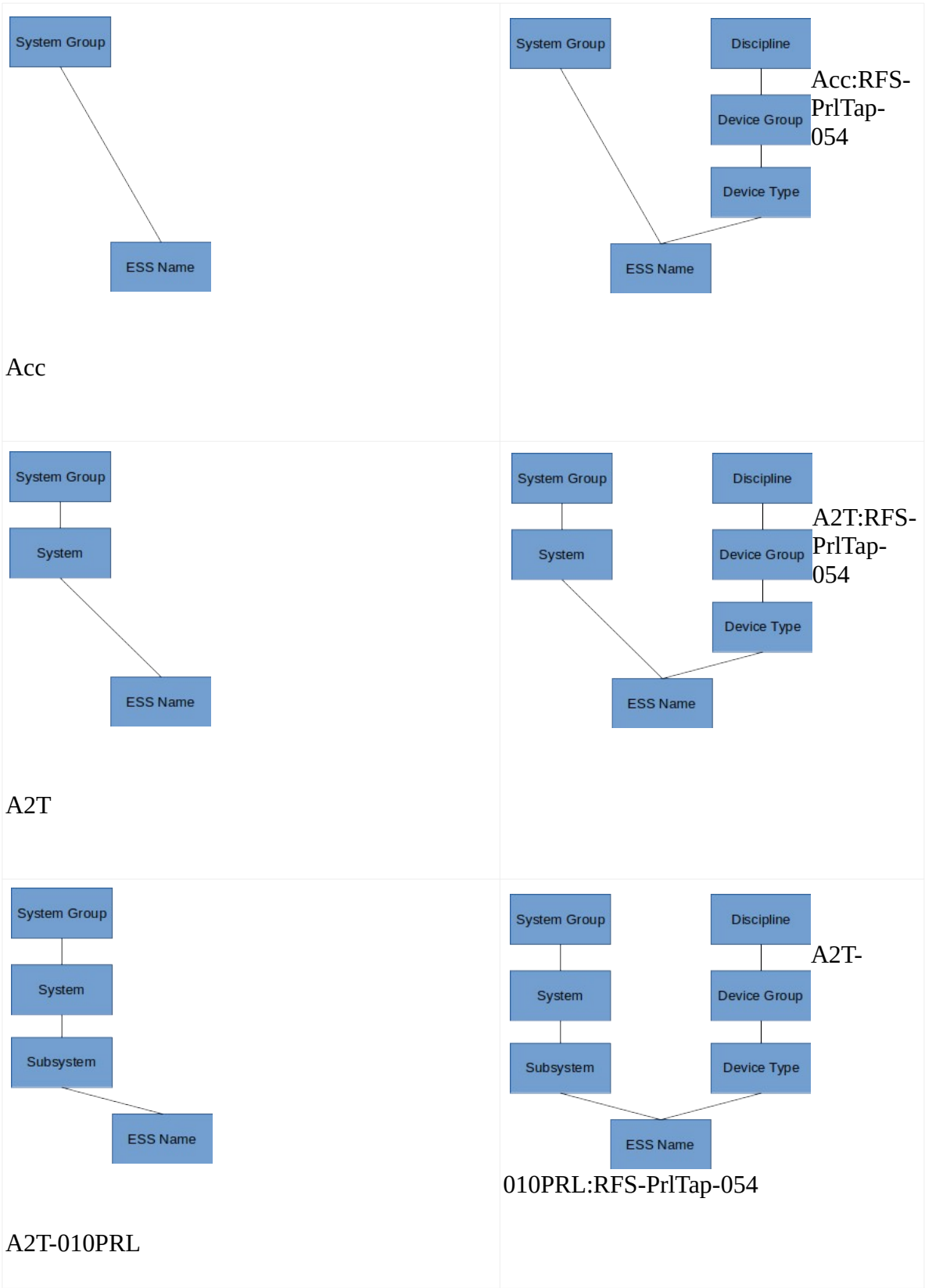
Lifecycle for names and structures

An entry for names is valid when it is created and saved. It does not go through an approval process. The entry may be modified multiple times. When entry is deleted, it has reached its end-of-life and may no longer be modified. A special case is if entry is considered legacy. This is the case if a parent is deleted. Then entry will remain but may no longer be modified except deleted. Any change may be done by user. The term legacy is introduced in the latest Naming convention.

An entry for System structure and Device structure needs to go through an approval process for any change. This includes create, modify, delete changes for an entry. The entry may be modified multiple times. When entry is deleted, it has reached its end-of-life and may no longer be modified. Any change is proposed by user and approved by administrator. A user may cancel request for change. An administrator may approve or reject request for change.

The whereabouts in the lifecycle for names and structures is handled with attributes status, latest and deleted. When an entry is deleted (names) or deleted and approved (structures), it has reached its end-of-line.

A change for an entry is handled such that a new entry is created. When the new entry is approved, attribute latest is set to true. Attribute latest for earlier entry is set to false. For any line of uuid, there may be zero or one entry with latest set to true.

Default behavior

> *Default behavior for Naming is to handle valid entries. Therefore old values are excluded unless history requested. This means that old values can not be browsed but must be requested. Latest entry in line of uuid is available for browsing.*

Examples

> Purpose of examples is to show lifecycle of names and structures. Therefore some columns are not shown, e.g. references to parents. A name has references to parents in System structure and Device structure. A structure entry has reference to a parent.

> In addition, examples contain information from both user side and storage side.

> Names

id	uuid	name	description	status	latest	deleted
1	a	A2T-010PRL:RFS-PRLTap-052	comment	APPROVED	false	false
2	a	A2T-010PRL:RFS-PRLTap-053	comment	APPROVED	false	false
3	a	A2T-010PRL:RFS-PRLTap-054	comment	APPROVED	true	false
4	b	A2T-010PRL	comment 1	APPROVED	false	false
5	b	A2T-010PRL	comment 2	APPROVED	true	true
6	c	A2T	comment	APPROVED	true	false

Structures   -   e.g. System

id	uuid	mnemonic	description	status	latest	deleted
1	m	A0T	comment	PENDING	false	false
2	n	A1T	comment	PENDING	false	false
3	n	A1T	comment	APPROVED	true	false
4	o	A2T	comment	PENDING	false	false
5	o	A2T	comment	APPROVED	true	false
6	o	A3T	comment	PENDING	false	false
7	o	A3T	comment	CANCELLED	false	false
8	p	A4T	comment	PENDING	false	false
9	p	A4T	comment	APPROVED	false	false
10	p	A5T	comment	PENDING	false	false
11	p	A5T	comment	REJECTED	false	false
12	p	A5T	comment a	PENDING	false	false
13	p	A5T	comment a	APPROVED	true	false
14	q	A6T	comment	PENDING	false	false
15	q	A6T	comment	APPROVED	true	false
16	q	A6T	comment	PENDING	false	true
17	q	A6T	comment	REJECTED	false	true
18	r	A7T	comment	PENDING	false	false
19	r	A7T	comment	APPROVED	false	false
20	r	A7T	comment	PENDING	false	true
21	r	A7T	comment	APPROVED	true	true

Each time a modification is requested or processed, it will result in a new entry.

Each time a modification is processed (Structure), it will result in a new entry.

There is approval process for Structure but there is no approval process for Name.

When a modification is approved, its status attribute till be set to APPROVED and latest attribute set to true. For any given line of uuid, there may be 0 or 1 entry with latest attribute set to true. Latest attribute indicate if entry is latest and approved in its line of uuid.

An entry with attribute deleted set to true that has been APPROVED has reached its end-of-line.

Rows with gray background color are considered history and are excluded unless history is requested. Rows become history when there is a more recent entry with status APPROVED and latest set to true. History for an entry may be requested through its uuid.

The lifecycle for names and structures are handled with attributes status, latest, deleted as shown in examples above.

status – APPROVED, CANCELLED, REJECTED, PENDING

latest – true, false

deleted – true, false

The lifecycle may be simplified for easier handling, in particular for when information is read.

Combinations of status, latest, deleted may be handled by finite set of values

ACTIVE, LEGACY, OBSOLETE, PENDING

ACTIVE	approved, latest = true, deleted = false
LEGACY	entry is ACTIVE but with deleted parent
OBSOLETE	entry is outdated (more recent entry available) or CANCELLED, REJECTED or deleted
PENDING	entry has modification that is requested but not yet processed

A value that is no longer valid corresponds to OBSOLETE.

Note that user needs to set values for attributes status, latest, deleted when an entry is created, modified or deleted.

Expected values for attributes status, latest, deleted when an entry is created, modified or deleted

create – status PENDING, latest false, deleted false

modify – status PENDING, latest false, deleted false

deleted – status PENDING, latest false, deleted true

Vocabulary

Vocabulary below with headlines with *text in italic*.

What	*Description*	*Example*
Names & Structures		
Name	Name for ESS physical and logical device	A2T-010PRL:RFS-PRLTap-054
System structure	Which part of the facility does the device provide service to?	A2T-010PRL
Device structure	What kind of service does the device provide?	Cryo-TT
System group	System structure level 1	Accelerator (Acc)
System	System structure level 2	Accelerator to Target (A2T)
Subsystem	System structure level 3	01 Phase Reference Line (010PRL)
Discipline	Device structure level 1	RF Systems (RFS)
Device group	Device structure level 2	Phase Reference Line
Device type	Device structure level 3	Phase Reference Line Tap (PRLTap)
Concept & Terminology		
ESS Naming Convention	Rules for naming ESS Systems and Devices and Components in EPICS-based control system.	https://chess.esss.lu.se/enovia/link/ESS-0000757/21308.51166.45568.45993/valid
Equivalence	Derived from name or mnemonic by taking similar-looking characters into account and helps to ensure that name and mnemonic is unique within its namespace.	o, O, 0 - considered same from equivalence point-of-view i, I, l, L, 1 - considered same from equivalence point-of-view leading 0 numerical characters removed
Lifecycle of names and structures	The lifecycle of ESS name and structure entries. Each entry has a unique identifier throughout its lifecycle. The lifecycle is governed by attributes status, latest, deleted.	An entry that is deleted and approved may no longer be updated (or revived).
Line of uuid	A collection of ESS name or structure entries that share the same identifier and together make up an entry's history.	
Namespace	Line of uuid from top level to bottom level, for system	

	structure and device structure, respectively. An index or a mnemonic or mnemonic equivalence may exist only once in a namespace for entries that are approved, latest, not deleted. Namespace for a name entry is all valid names. Namespace for a structure entry is its hierarchy.	
Rules for names and structures	System, Subsystem, Discipline, Device Type must have mnemonic. System Group may have mnemonic. Device Group must not have mnemonic.	
REST API methods		
POST	Http request method for create	create
GET	Http request method for read	read, find, search, equivalence, exists
PUT	Http request method for update	update
DELETE	Http request method for delete	delete
PATCH	Http request method for partial update	approve, cancel, request
REST API schemas		
Name element	A collection of fields that represent an ESS name entry (comprehensive). From server to client.	
Name command element	A collection of fields that represent an ESS name entry (minimum). From client to server. Purpose to simplify communication client to server.	
Structure element	A collection of fields that represent an ESS system structure or device structure entry (comprehensive). From server to client.	
Structure command element	A collection of fields that represent an ESS system structure or device structure	

	entry (minimum). From client to server. Purpose to simplify communication client to server.	
REST API fields (sub-selection)		
Index (Instance index)	A string. May be considered mnemonic for a name. To distinguish devices of the same type in the same system. Two different set of rules for index are identified for the *Scientific* and *P&ID* disciplines.	
Mnemonic	A set of characters and numbers to identify an entry in system structure and device structure.	
Mnemonic equivalence	A mnemonic with rules for equivalence applied.	
Status	Status for entry in hierarchy of names and structures	APPROVED, CANCELLED, REJECTED, PENDING
Latest	To show if entry is latest in its line of (uuid) entries.	true, false
Deleted	To show if entry is deleted in its line of (uuid) entries.	true, false
REST API media type		
application/json	Supported	
application/xml	Not supported	
Authentication & authorization		
Authentication	ESS username and password	
Authorization	None (read), User, Administrator	None – Read-only access User – All operations for names. Propose create, update, delete for structure entries + cancel a proposal. Administrator – All operations for names and structures.

Use cases

To have REST API with ability to have / handle

- healthcheck

- names

    ○ create, read, update, delete (CRUD)

    ○ read – exact match, search

    ○ handle single and multiple entries

- structures

    ○ create, read, update, delete + approve, cancel, reject (CRUD + additional)

    ○ retrieve – exact match, search

    ○ handle single and multiple entries

About searching

Exact match

- Is exact match = no search

Search

- Default behavior is exact match

- No regex

- Two additional characters may be used to help search and may be written anywhere in search string to give regex-like behavior

    ○ _   underscore, 0 or 1 occurrences of any character
    ○ %   percent, any number of any character
    ○ e.g.
       - A2T-010PRL:RFS-PRLTap-054
       - A2T-010PRL:RFS-PRLTap-0_   will not give match
       - A2T-010PRL:RFS-PRLTap-0__   will give match
       - A2T-010PRL:RFS-PRL%   will give match

About data

What is sent to and received from Naming REST API

- a string
- json

Examples

> Name and NameElement
>
>> A2T-010PRL:RFS-PRLTap-054
>
> System structure
>
> - Accelerator
> - Accelerator to Target
> - 01 Phase Reference Line
>
> Device structure
>
> - RF Systems
> - Phase Reference Line
> - Phase Reference Line Tap
>
> Index
>
> - 054
>
> json
>
> - {"uuid":"07bce0ae-0947-47c8-941e-cc76678fd29a","description":null,"status":"APPROVED","latest":true,"deleted":false,"when":"2017-10-20T12:53:27.229+00:00","who":"johannorin","comment":null,"systemgroup":null,"system":null,"subsystem":"c2fce615-ed5d-40f9-8fb5-0b91502536e5","devicetype":"bb1e68a6-e233-4595-ae88-f9186b6760c6","systemstructure":"A2T-010PRL","devicestructure":"RFS-PRLTap","index":"054","name":"A2T-010PRL:RFS-PRLTap-054"}
>
> Rules
>
> - A name must have exactly one system structure parent, either systemgroup or system or subsystem
> - A name may have device structure parent, devicetype

In name above

- subsystem uuid refers to subsystem *01 Phase Reference Line* that in turn refers to system *Accelerator to Target* that in turn refers to system group *Accelerator*

- device type uuid refers to device type *Phase Reference Line Tap* that in turn refers to device group *Phase Reference Line* that in turn refers to discipline *RF Systems*

Since name above was created, implementation of Naming was changed so that description and comment are mandatory.

Structure and StructureElement

Accelerator to Target   A2T

json

- {"uuid":"e67a497c-9c55-4942-97fc-700c8ec56031","description":"The Accelerator to Target Station interface including the dogleg","status":"APPROVED","latest":true,"deleted":false,"when":"2016-07-04T10:06:38.873+00:00","who":"danielpisofernandez","comment":"Approved by Daniel Piso","type":"SYSTEM","parent":"4262e1e7-2444-412e-83d7-aeabf58262c6","name":"Accelerator to Target","mnemonic":"A2T","mnemonicpath":"Acc-A2T","level":2}

Frequently Asked Questions (FAQ)

Topics / questions / answers, no particular order

- Capabilities of REST API
  - All operations in Naming are available in REST API

- Json format used for data that is sent and received
  - Data is provided or received as json, as single entry of arrays of entries,

- Retrieval available with exact match and search. Default for search is exact match but may be adjusted for true search. Regex is not available. There are instead two special characters to use for search and regex-like behavior.
  - _   underscore, 0 or 1 occurrences of any character
  - %   percent, any number of any character

- Retrieval available with abilities

- search on individual fields
- sorting
- pagination

- Index for a name
  - Field is alphanumerical. Existing names usually have index. Values include alphabetical, numerical, alphanumerical. When index is to be set, it is to be set explicitly and not auto-generated.

- Legacy name
  - A legacy name is a name for which one or both parents (System structure, Device structure) have been deleted. In current Naming, a name is deleted when a parent of arbitrary level is deleted. This is not the intention of the latest Naming convention. Instead the name will keep on living when one or both of its parents are deleted but the only change that is possible is deletion. However the name will keep on living until it's explicitly deleted.

- Validation
  - Ability to validate modifying operation before invoḱing modifying operation. Modifying operation internally use same validation.

Reference

Naming convention

- https://chess.esss.lu.se/enovia/link/ESS-0000757/21308.51166.45568.45993/valid