Persistent Identifiers

Handles and B2HANDLE

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Outline

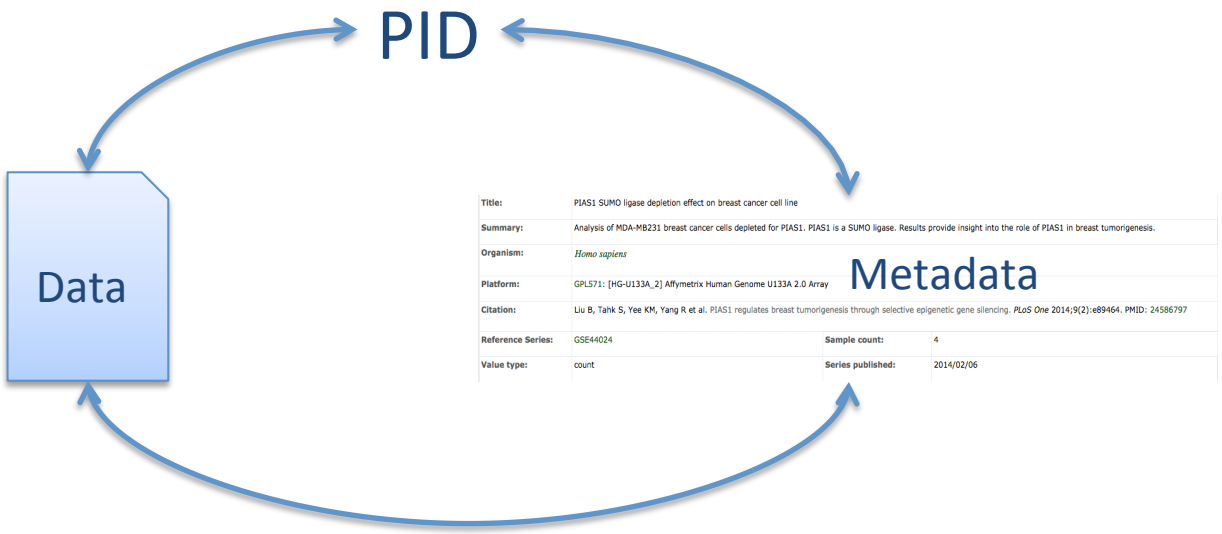
- Why PIDs?
- What are PIDs?
- Use cases
- PID providers and systems

- The Handle system
  - The handle resolution system
  - The relation between Handle and ePIC
  - Hands-on tutorial

What do we want from data?

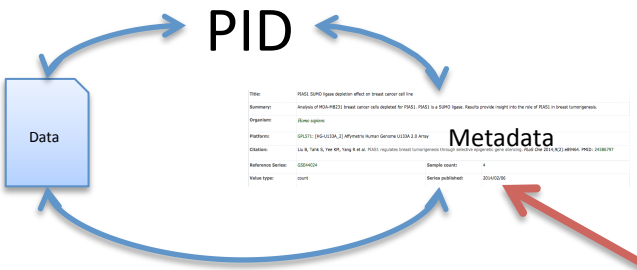
- **Findable** – Easy to find by both humans and computer systems → Metadata
- **Accessible** – Stored for long term, accessed and/or downloaded with well-defined license and access
- **Interoperable** – Ready to be combined with other datasets by humans as well as computer systems;
- **Reusable** – Ready to be used for future research and to be processed further using computational methods.
- http://www.datafairport.org/

What do we need?

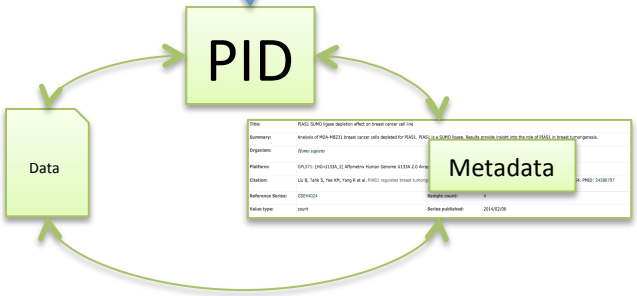


- Persistent Identifier: reference and identify object, either metadata or data object
- Synchronise PID, Data and Metadata during creation, maintenance, update and deletion of a digital object!

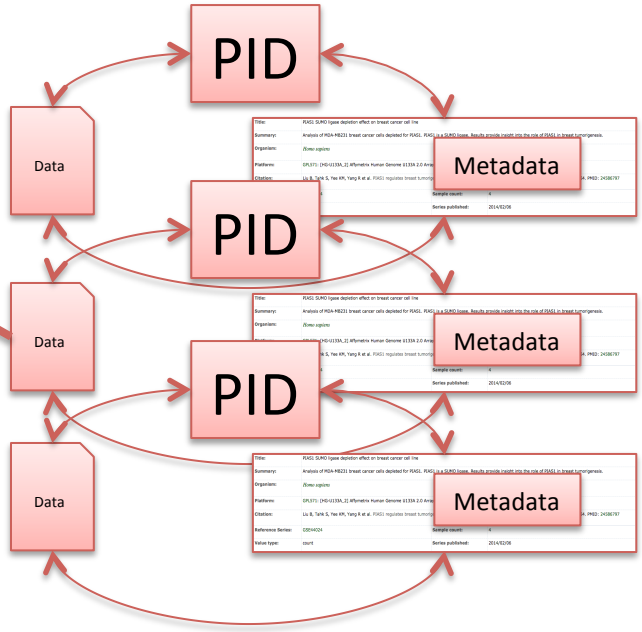
What do we need?



Analysed data



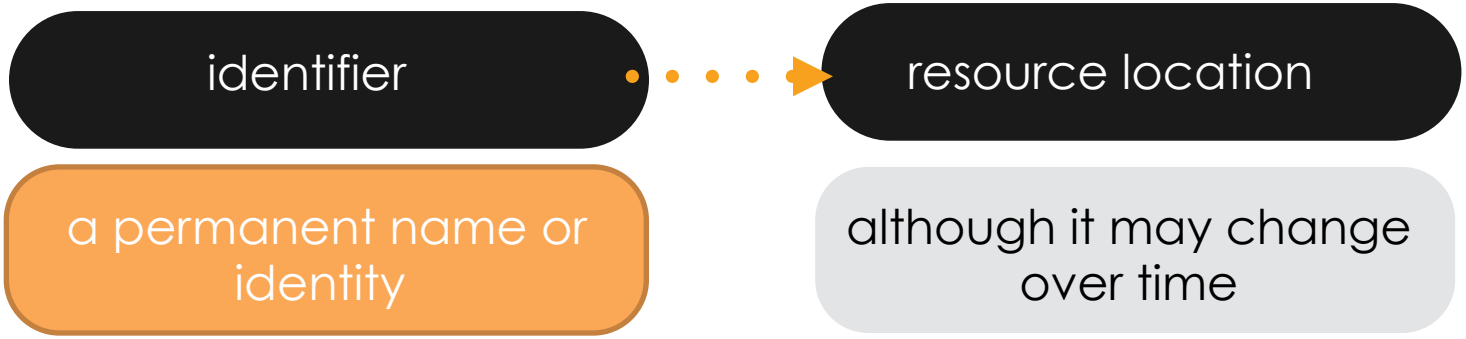
Published data



Raw data

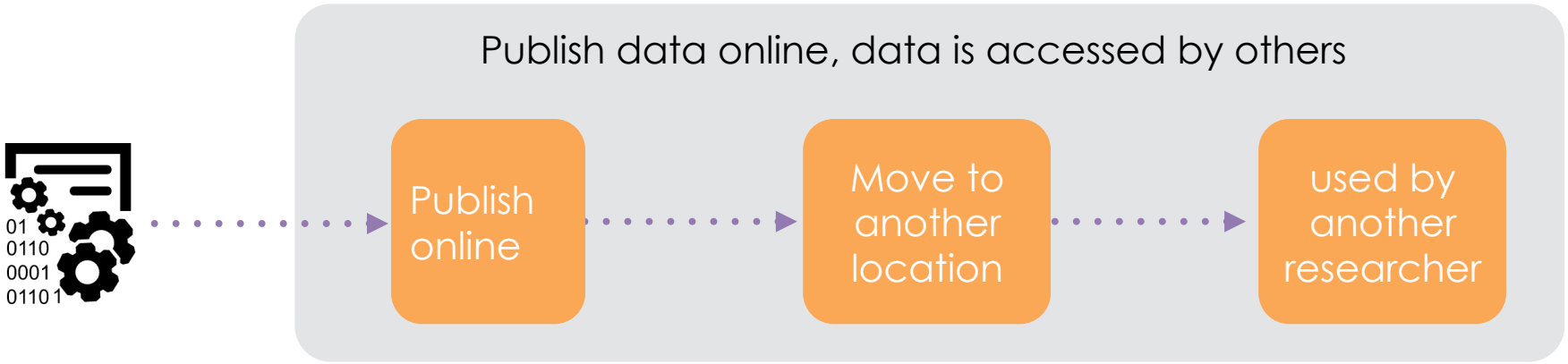
What do we know about Persistent Identifiers?

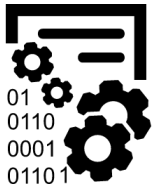
- A Persistent Identifier (PID) is an identifier that is effectively permanently assigned to a resource.



- Pointers to data resources
- Globally unique
- Exist infinitely long (the PID, not necessarily the data)

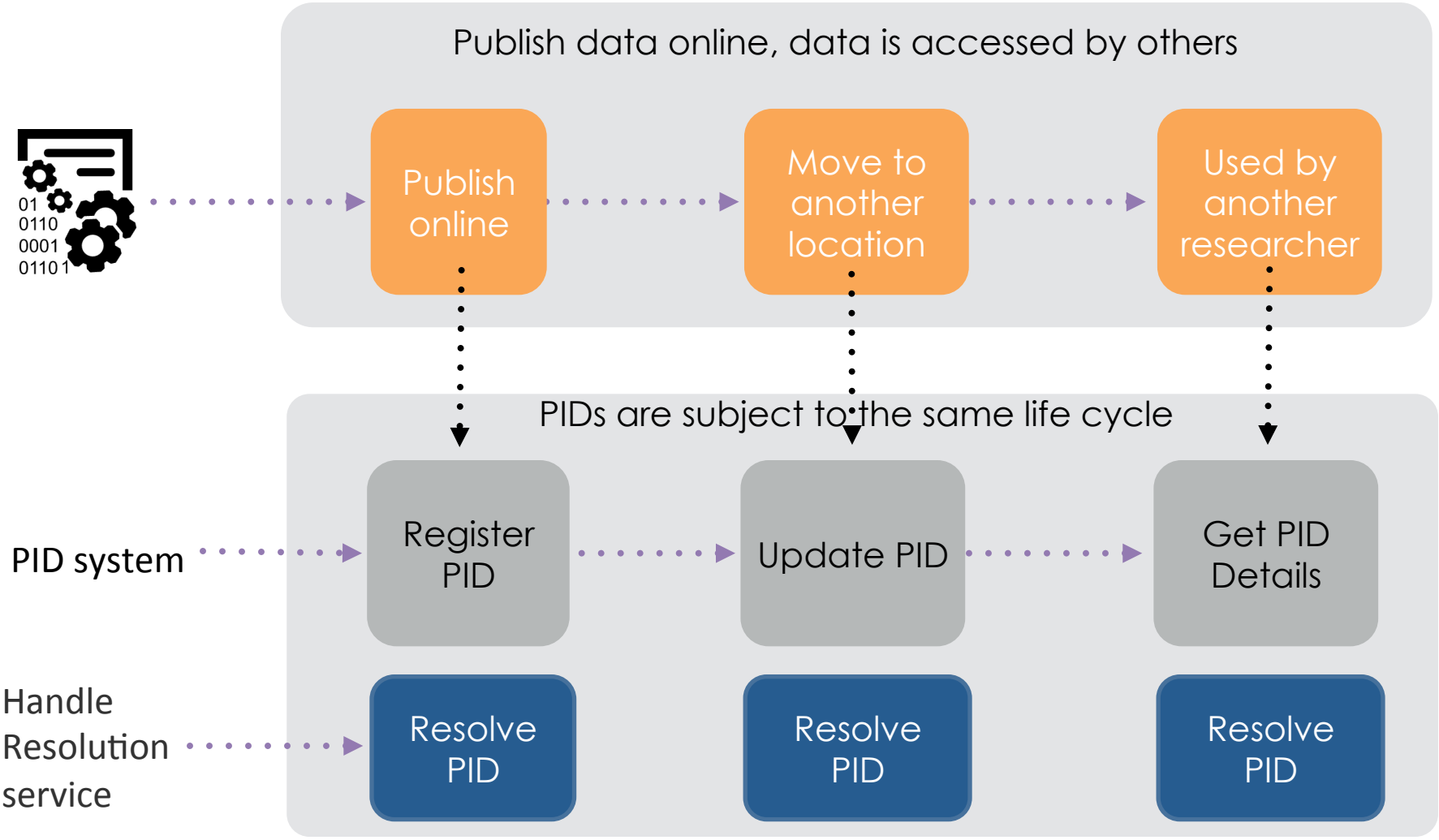
Simple data life cycle, linearised





- Published online: http://www.test.com/test.html
- Other users may cite, access, re-use this url
- Relocate the resource at http://www.example.com/
- Other users are not informed -> 404

Data Life Cycle with PID system



Advantages and Disadvantages

Pro:

- Static reference,
  even if data moves or changes
- Network of persistent links
  Data – metadata relations
  Provenance chains

Con:

- Extra effort
  - What to identify?
  - Coordination across organisations and people
- Organisational discipline to ensure persistence

Use cases

Use Case 1: Digital repositories

- PIDs point to landing page of the digital repository showing metadata
- "Real" data can be downloaded from this page with another link
- E.g. B2SHARE, 4.TU Datacentrum
- PID

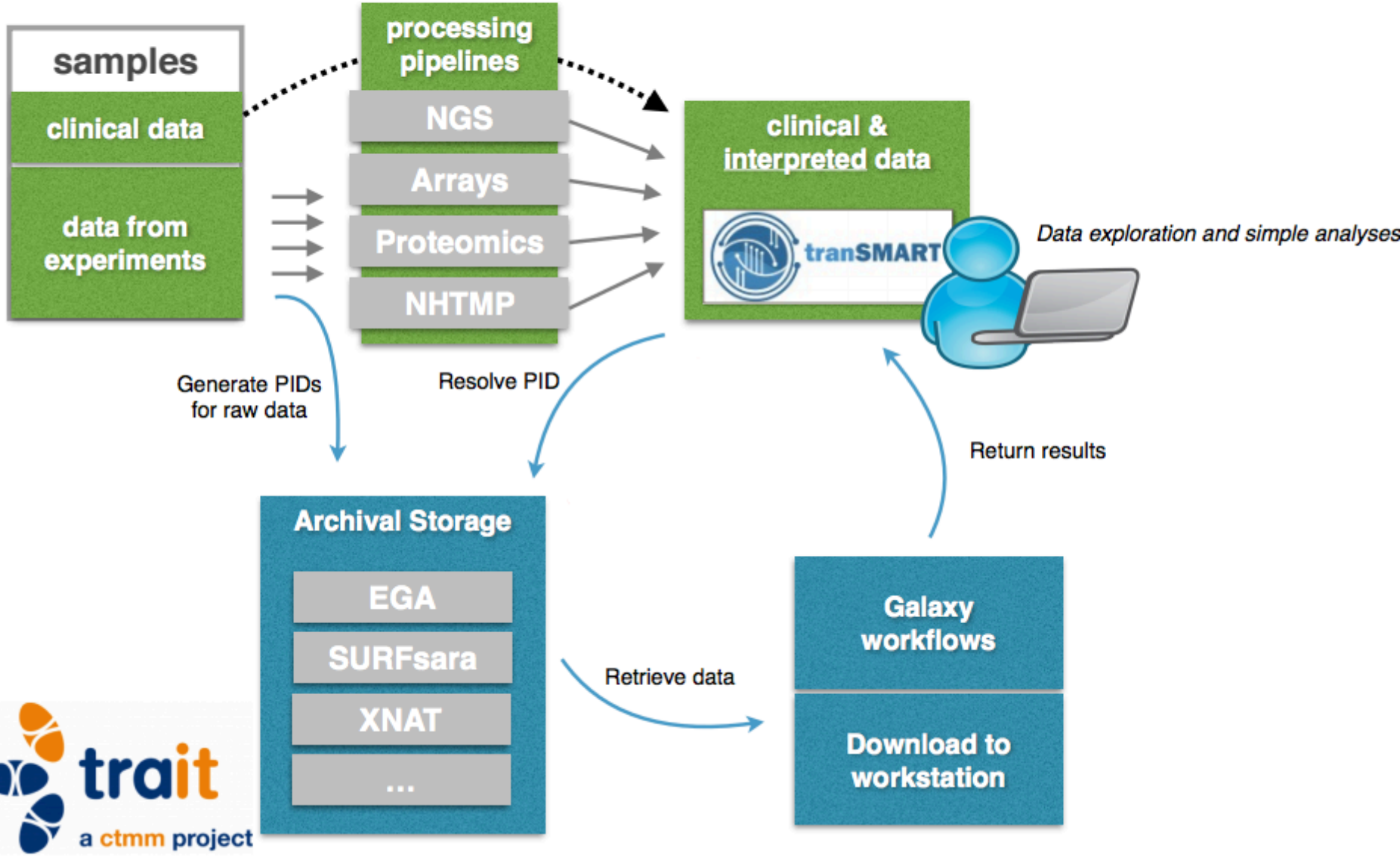
http://hdl.handle.net/11304/3265434c-4b34-11e4-81ac-dcbd1b51435e

resolves to landing page

https://b2share.eudat.eu/records/feafb12e810c489b9e878949c6c35345

Use case 2:
TraIT distritibuted data infrastructure

Molecular profiling dataflow in TraIT



TraIT data ontology

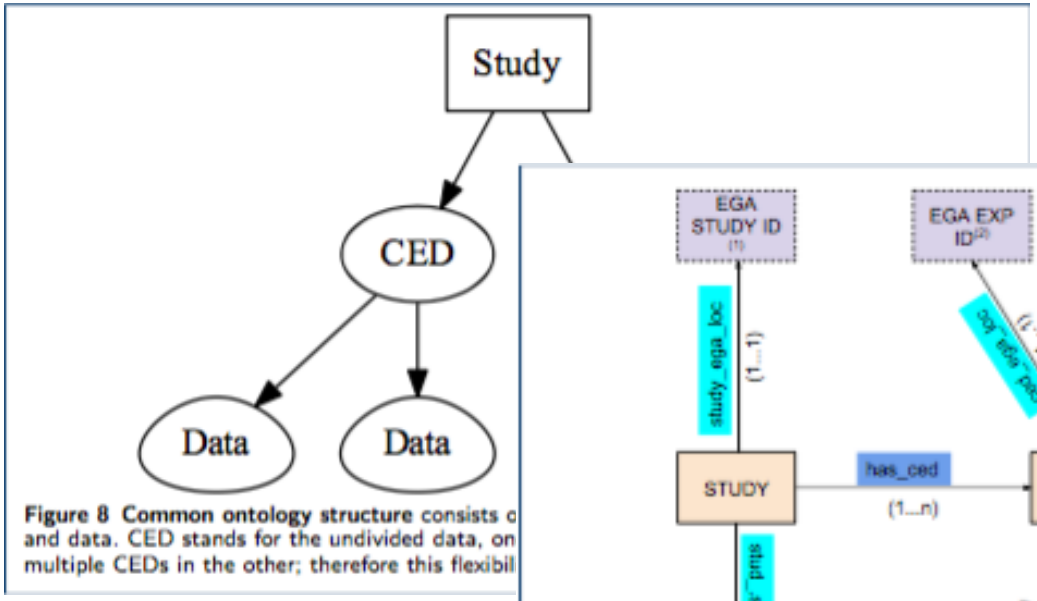


Figure 8 Common ontology structure consists o
and data. CED stands for the undivided data, on
multiple CEDs in the other; therefore this flexibil

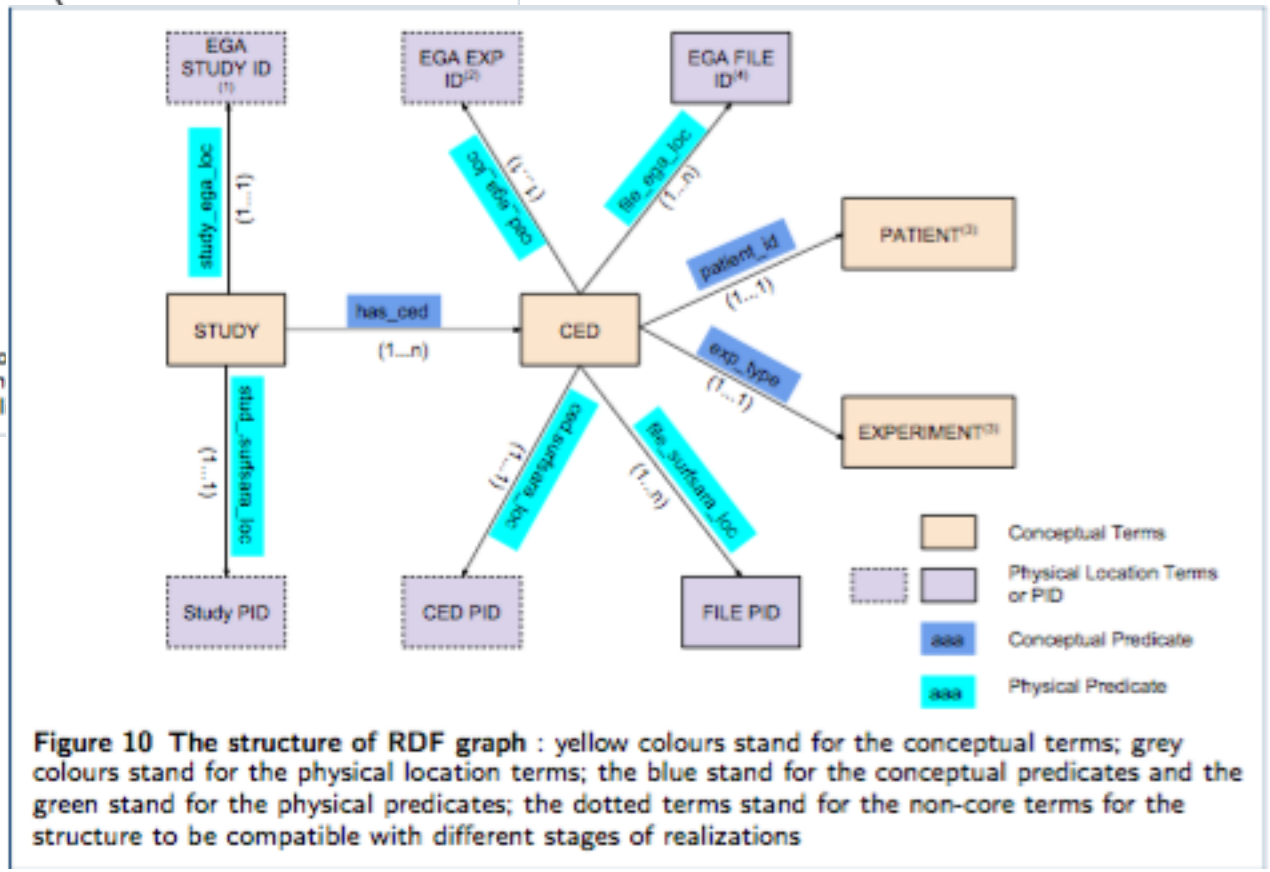
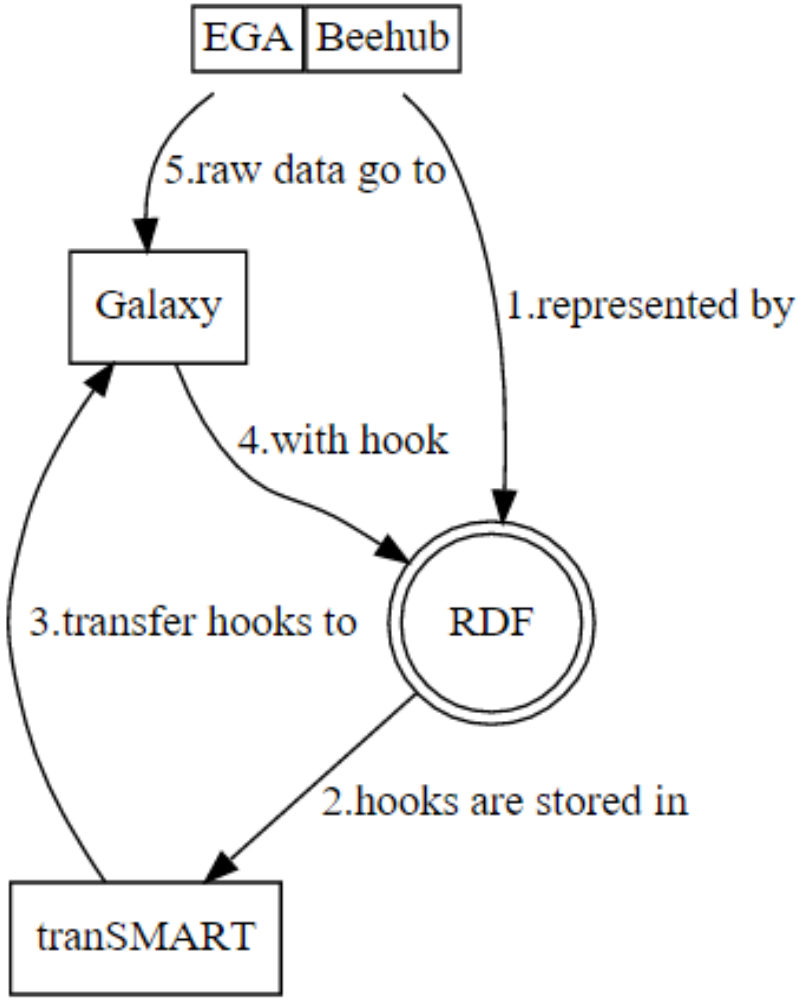


Figure 10 The structure of RDF graph : yellow colours stand for the conceptual terms; grey colours stand for the physical location terms; the blue stand for the conceptual predicates and the green stand for the physical predicates; the dotted terms stand for the non-core terms for the structure to be compatible with different stages of realizations

TraIT data infrastructure



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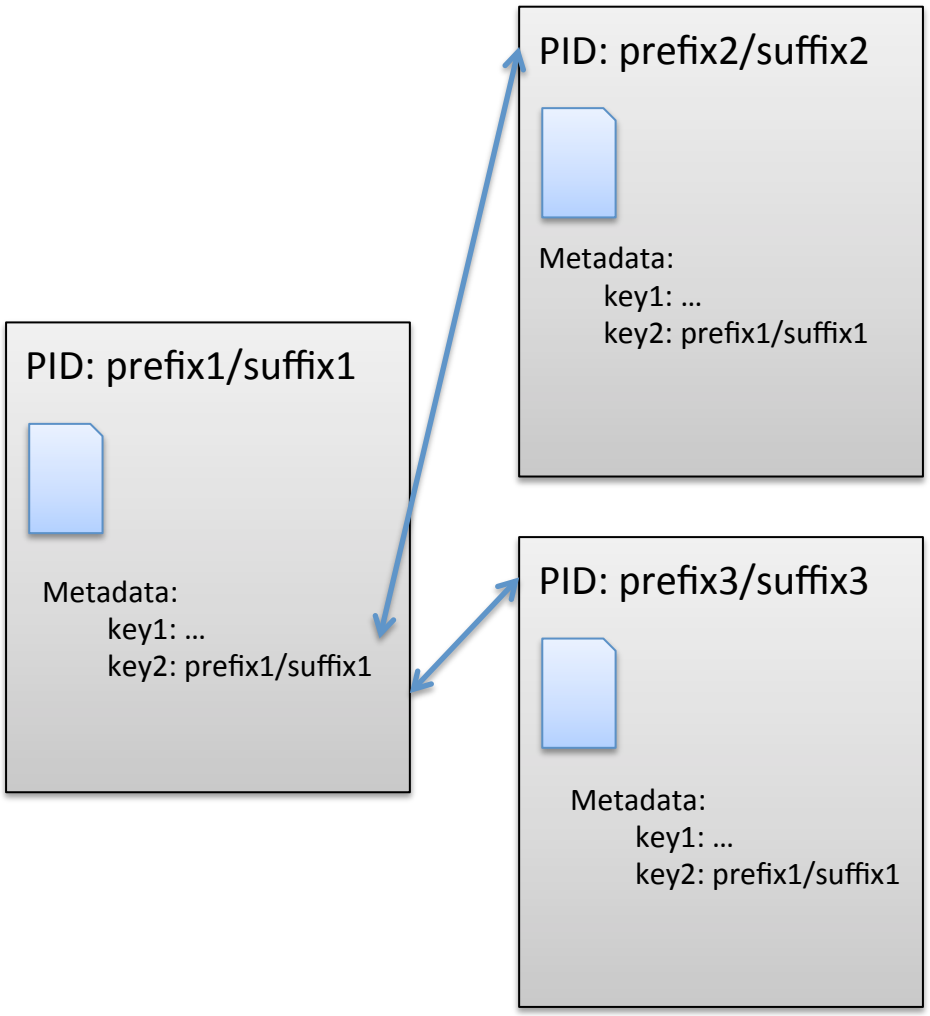
Use case 3: Modeling Relationships



- Use tightly coupled metadata
- Part of/has part relationships
- Model cohort-patient relationship
- Model patient-samples relationship

Which metadata to store with the PID and which in en extra catalogue ?

Use Case 4: Enabling workflows

- Execute program hidden behind a PID
- Way to refer to workflows → reproducibility

```
In [16]: prefix = "841"

In [17]: suffix = "/5f6fb451-5841-11e4-9665-14109fe83170"

In [18]: ec.getValueFromHandle(prefix, "URL", suffix)
Out[18]: '/Users/christines/PIDs/helloWorld.py'

In [19]: pid = subprocess.Popen([sys.executable, ec.getValueFromHandle(prefix, "URL", suffix)])

In [20]: Hello World!
```

PID systems

Resolultion and the PID pattern

Handle

PID: 21.T12995/B2SAFE-B2STAGE

Resolver: http://hdl.handle.net/

Doi

PID: 10.2189/asqu.2005.50.3.329

Resolver: http://dx.doi.org/

Ark

PID: ark:/13030/tf5p30086k

Resolver: https://nbn-resolving.org/

Exercise

- Resolve the PIDs
- What happens if you resolve a PID with a foreign resolver?

PID systems and issuing authorities

- **URN:NBN (DANS, resolved via archival resource key (ARK))**
  - Policies: PID is persistent and the data it is dereferenced to
  - Wants to be independent from transfer protocols
    → Currently all identifiers start with *http*
    Might change in the future

- **DOI (4TU.datacentrum)**
  - Policies: PID is persistent, data not
  - Well accepted amongst researchers
  - Based on the handle system
  - Datacite, Crossref are prefix issuing authorities

- **Both:**
  - PIDs **point to a landing page**, not the file itself
  - User needs to provide **a minimum set of metadata**
  - Taylored towards the needs of repositories

PID systems and issuing authorities

- **ePIC (European PID consortium)**
  - Policies: PID is persistent, data is not
  - PIDs can point to anything
  - Based on the handle system
  - Handle prefix issuing authority

- **DONA foundation (www.dona.net)**
  - Maintains global handle registry
  - Partners:
    - CNRI (developer of the handle system)
    - GDWG (main partner in ePIC)
    - International DOI foundation (IDF)

The Handle system

- Pure technology!
- Metadata: You can create your **own keyword-value pairs** and store them with the PID

- Policies: **Do it yourself**!

  handles can point to anything

  handles can also be removed, they are not per se persistent

  …

  → Great flexibility for adjusting the system towards your own needs

  → You have to implememnt everything on your own

  → You have to think even more carefully about how you want to facilitate data management

For whom?

- PIDs allow to make a **distinction between data users and data managers**
  - Data users get a PID and can directly access the data, or the metadata stored with the PID
  - Pipelines can programmatically access the metadata and start specific applications

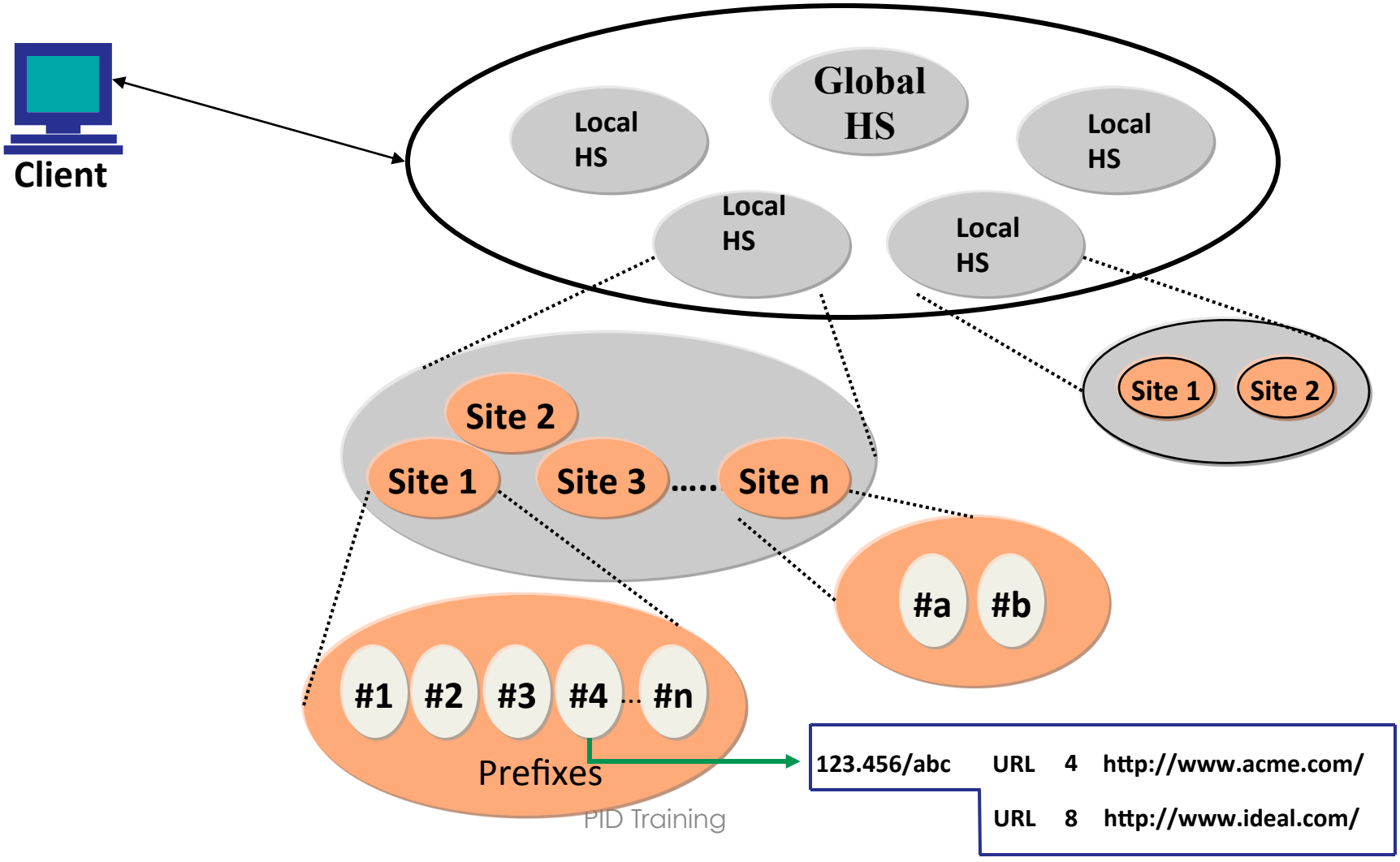
- Requires some serious thoughts about **data organisation** and developing the **code to put data policies into practice**, including code **maintenance**

→ For **bigger research groups or consortia** working in a **distributed data environment**

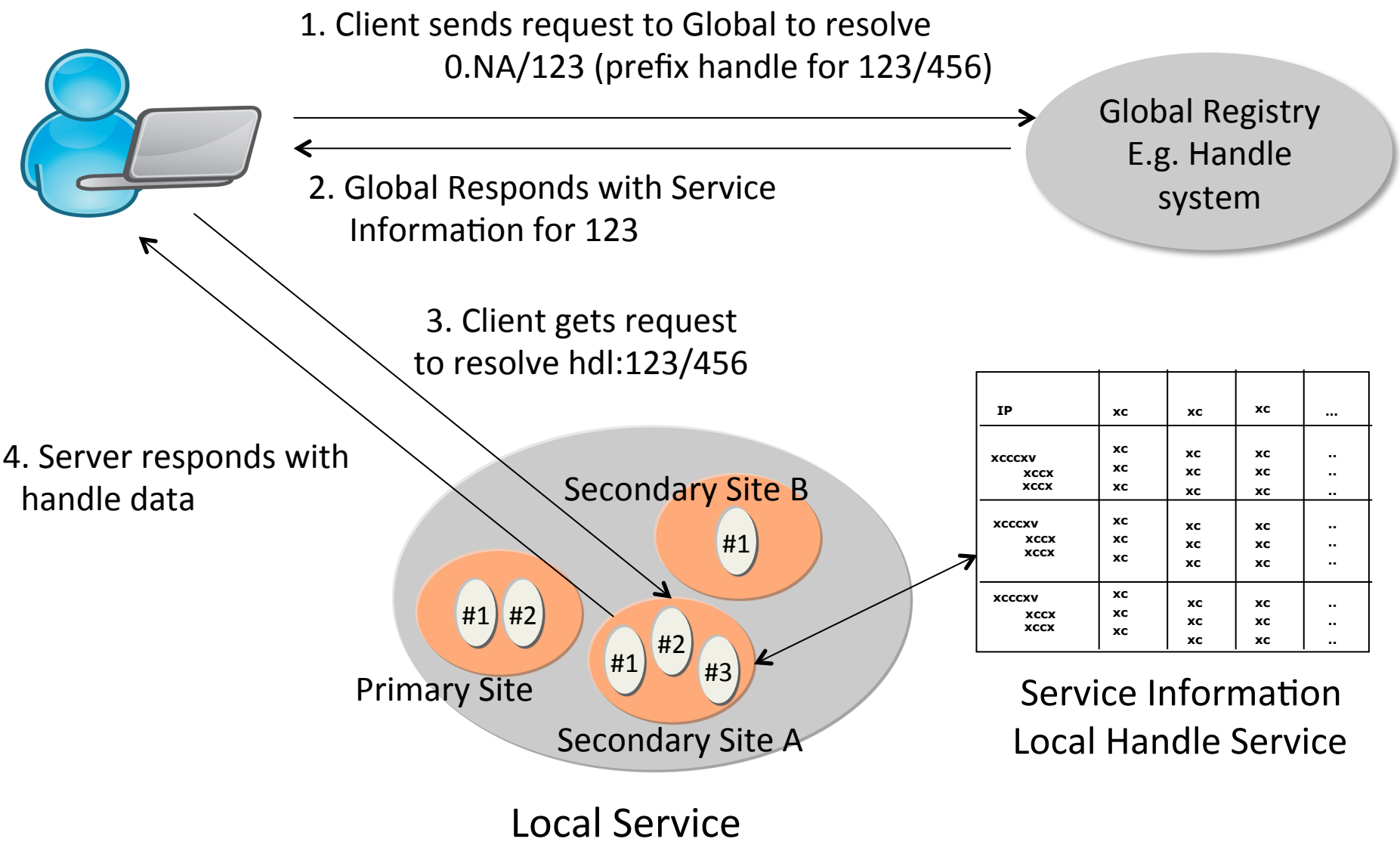
→ For **repositories** who are in need of a host for their PIDs

The Handle system: technical details

Resolution system



Resolving PIDs



Step by Step: Using the HANDLE API

- Register data with a Handle
- GET the details of a Handle
- Modify a Handle record
- Link two files on PID level
- Reverse look-up (not possible via normal Handle API)

Access to training machines and exercises:

http://hdl.handle.net/21.T12995/B2SAFE-B2STAGE

Login/Password: