Software System Architectures (NSWI130)

What is software architecture

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Faculty of Mathematics and Physics

Charles University in Prague

Running example

https://data.gov.cz


5 ★ OPEN DATA
Tim Berners-Lee, the inventor of the Web and Linked Data initiator, suggested a 5-star deployment scheme for Open Data. Here, we give examples for each step of the stars and explain costs and benefits that come along with it.
OL
OL RE
OL RE OF
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OL RE OF URI LD
PDF
XLS
CSV
RDF
LOD
RDF
OPEN DATA
HTML
5

Dataset

University	Headquarters	Rector
...	...	...
...	...	...

Teacher	Personal Number	Email
...	...	...
...	...	...

Number of paid health insurance benefits by district

Czech Social Security Administration

Number of payments made per month for employees and self-employed persons with health insurance by district

health insurance | districts | statistics | paid benefits

Dataset Theme
Health

Dataset Theme
health insurance

Spatial coverage
Czechia

Temporal coverage
2015-01-01 - 2020-06-30

Documentation
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Contact point
Ing. Jiří Šunka

Frequency
quarterly

Number of paid health insurance benefits by district
CSV

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Number of paid health insurance benefits by district
RDF TriG

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Dataset

Name	Headquarters	Rector
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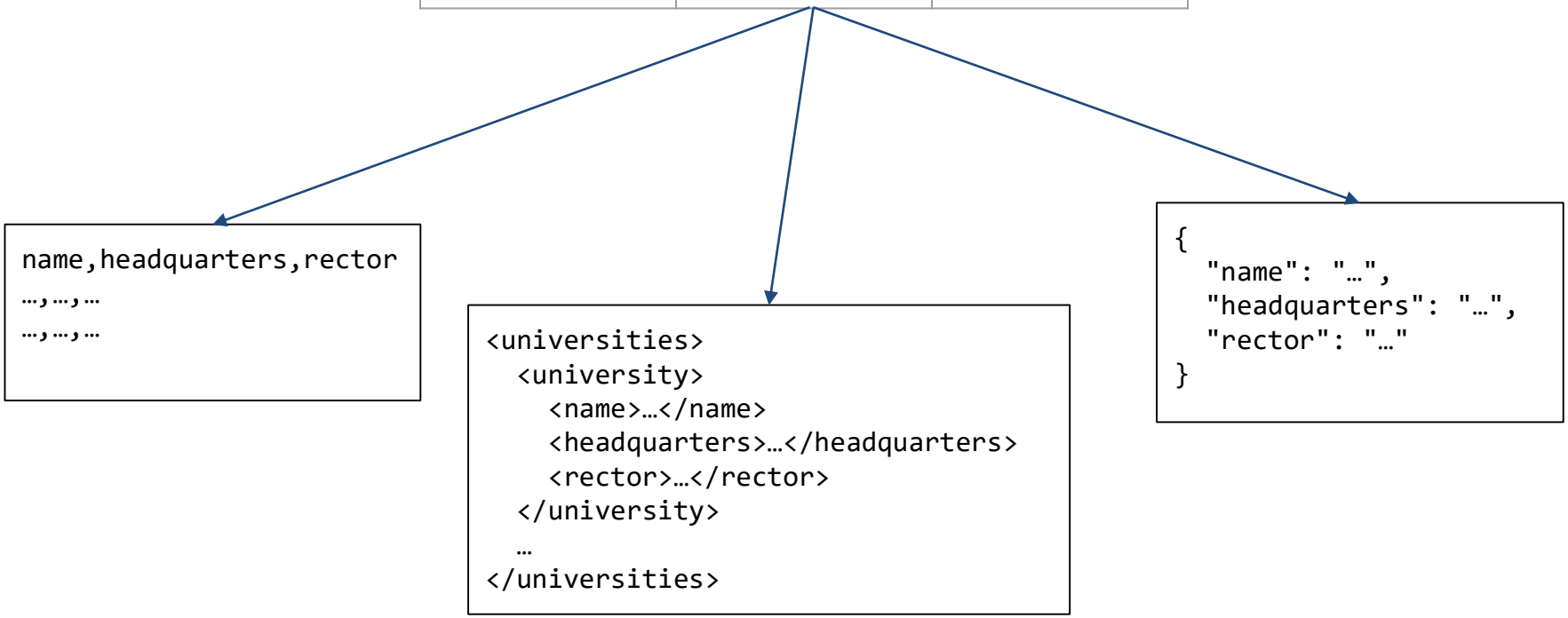
…	…	…



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…,…,…
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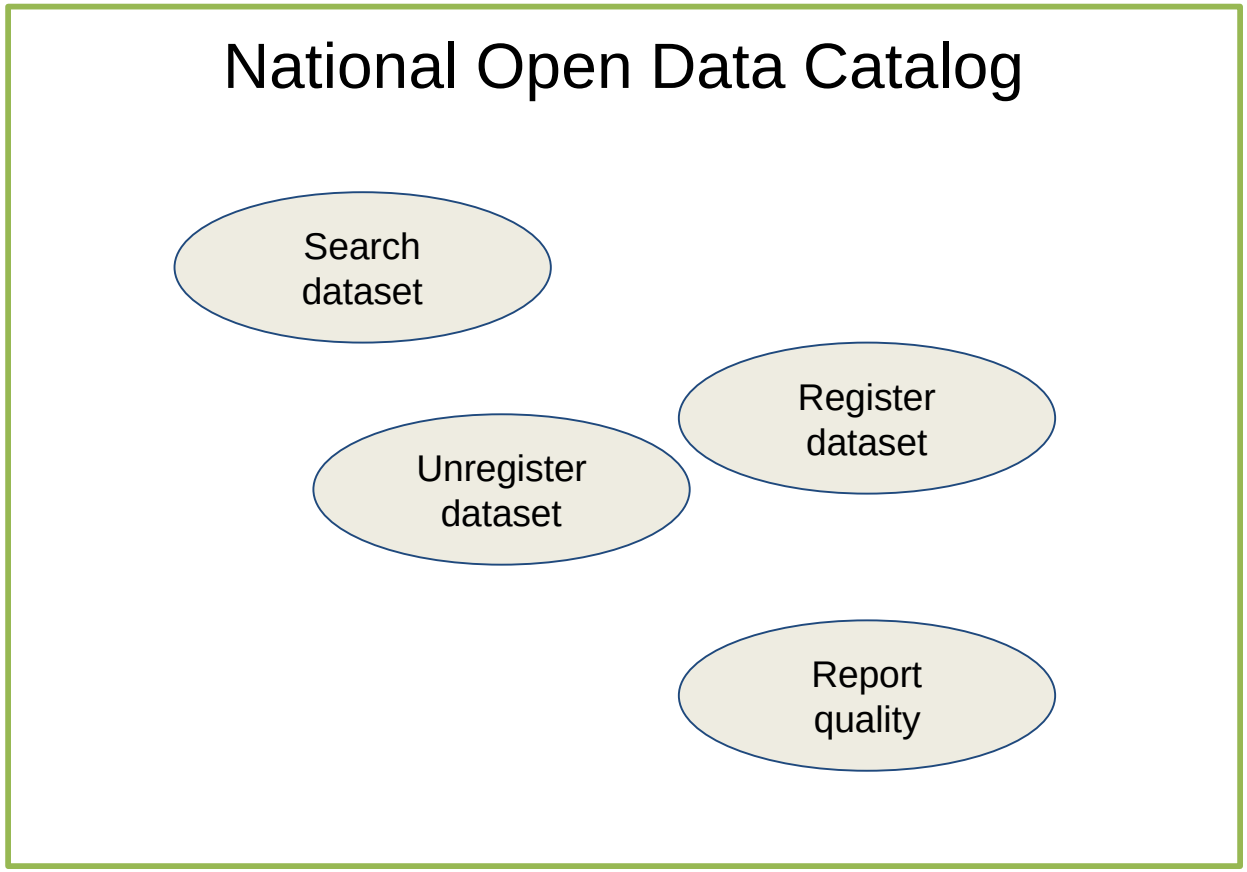
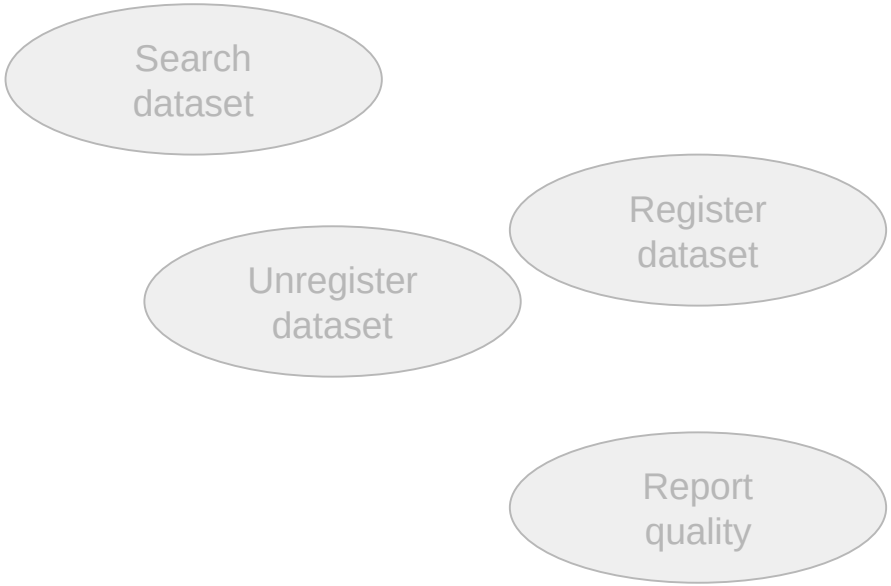
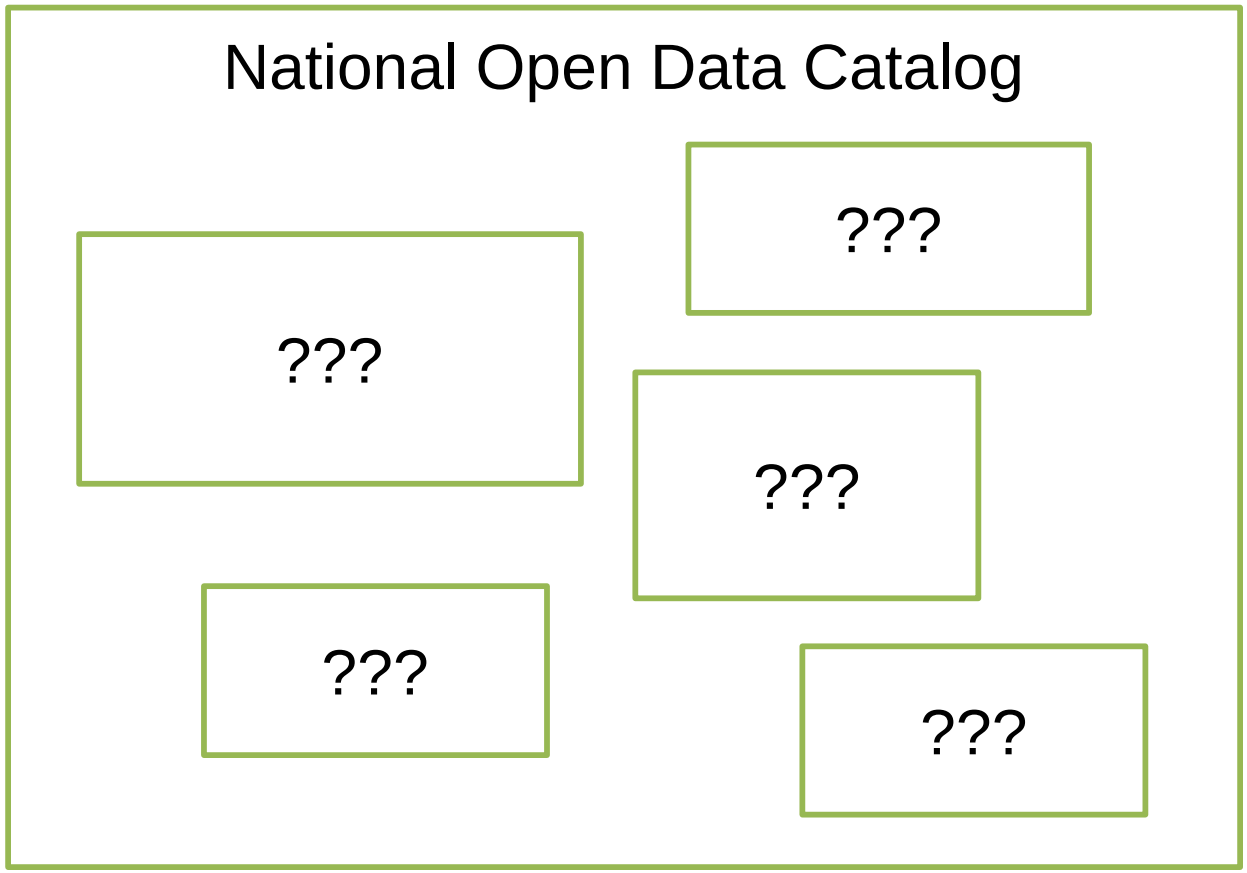

National Open Data Catalog
Search dataset
Register dataset
Unregister dataset
Report quality

National Open Data Catalog




National Open Data Catalog
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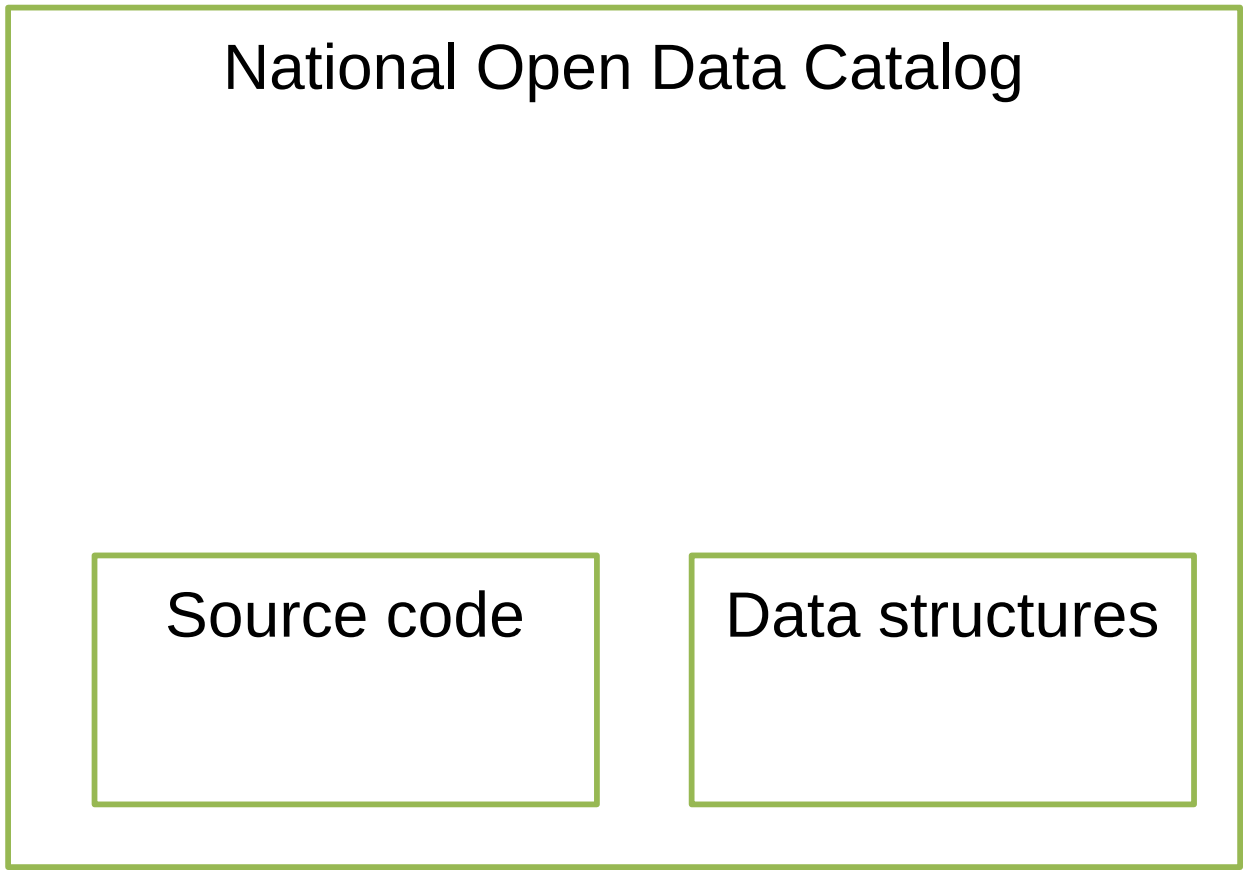
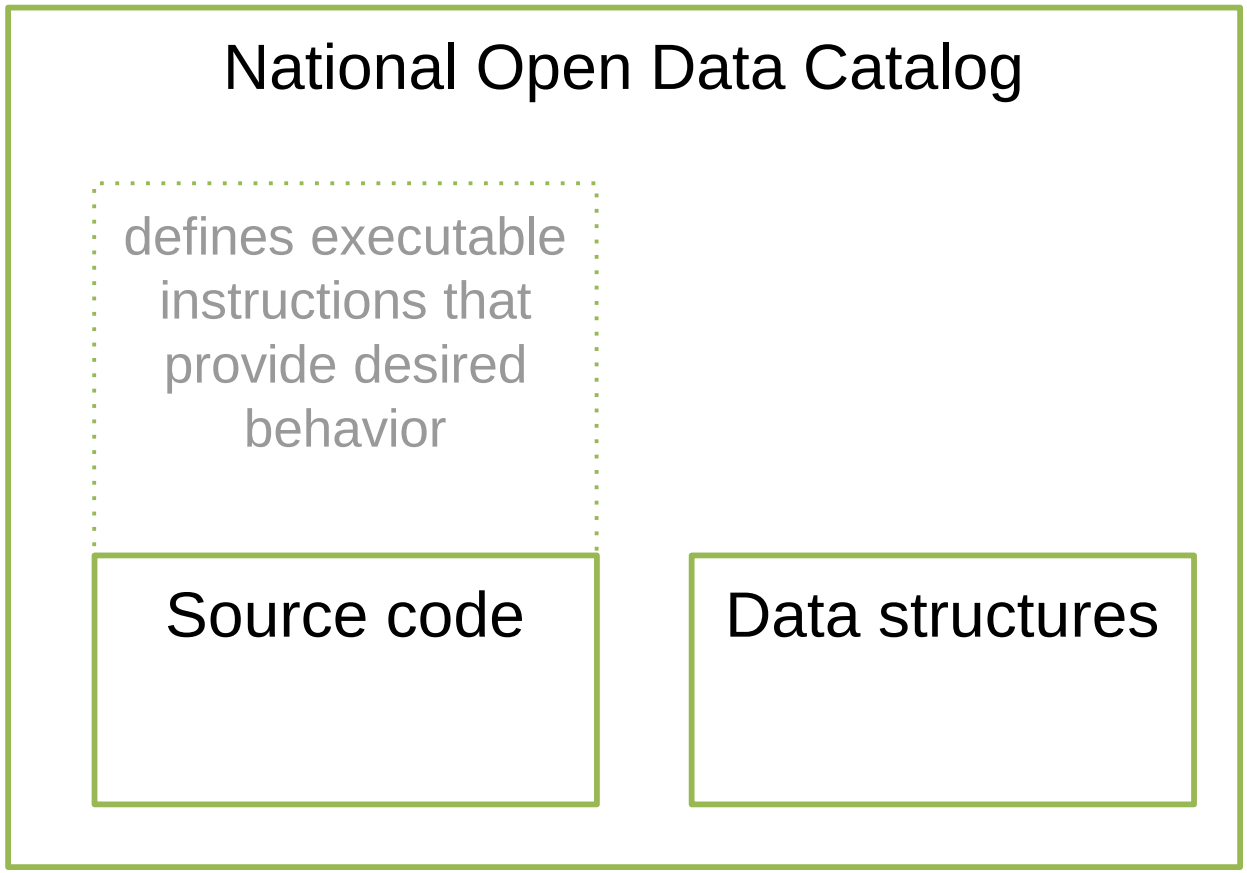
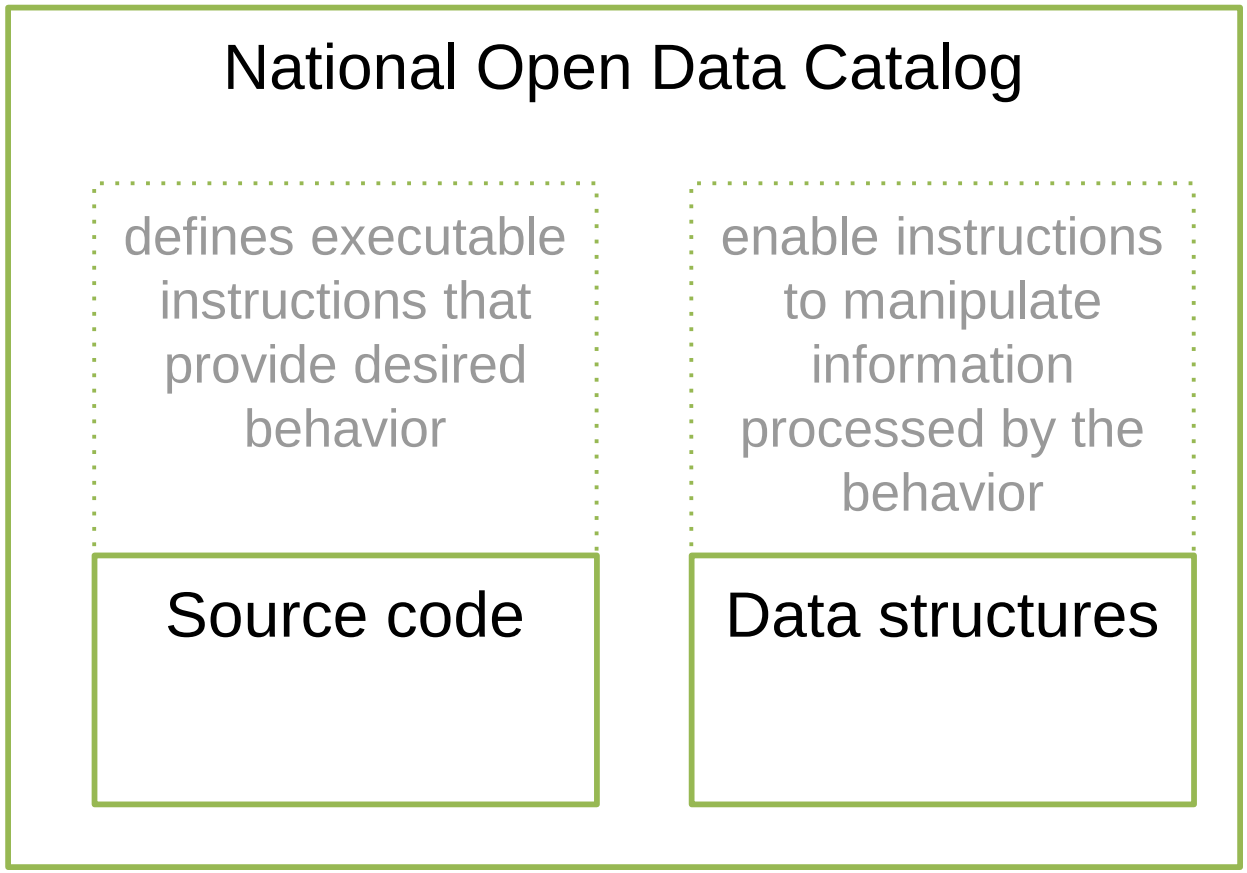
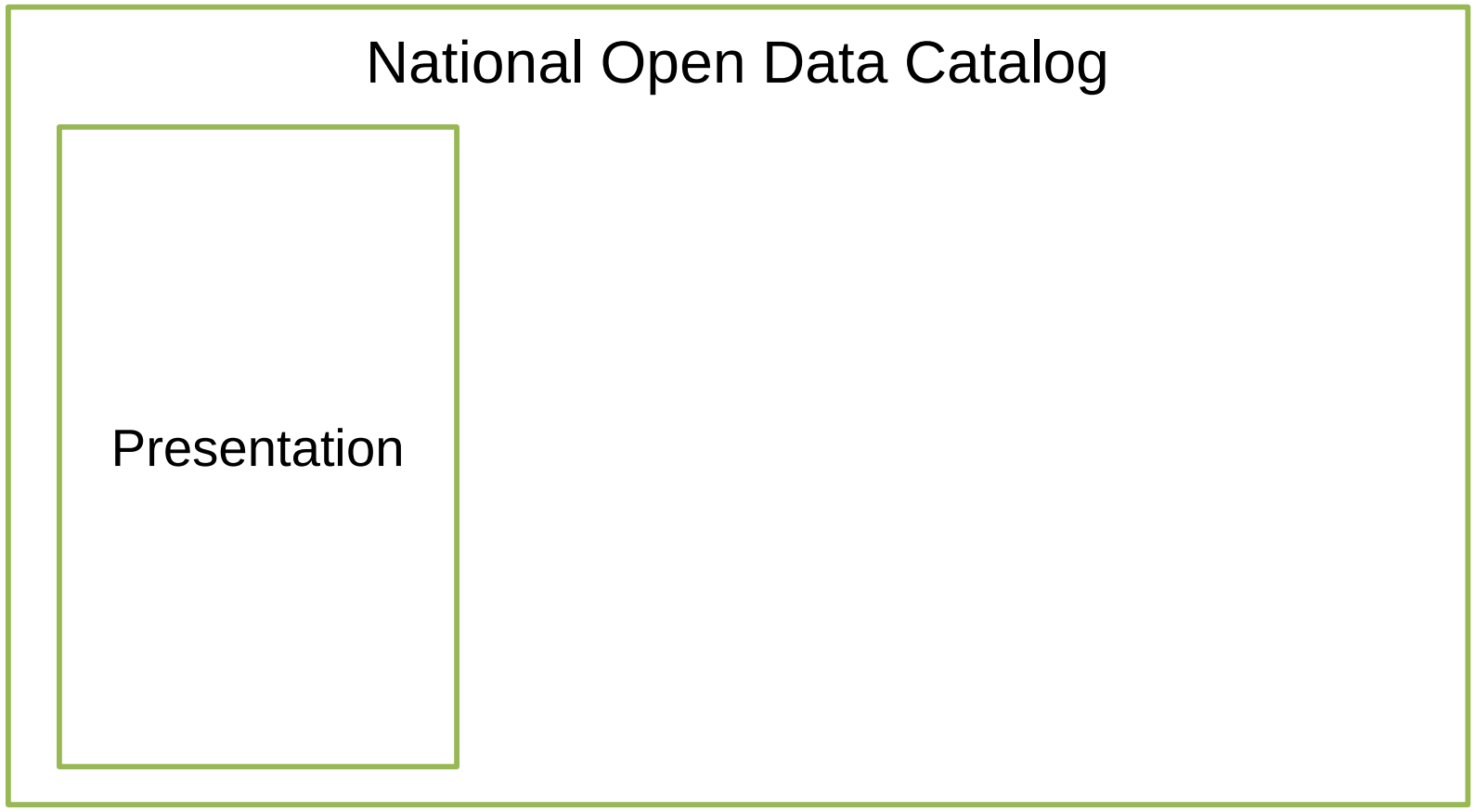

National Open Data Catalog
Source code
Data structures

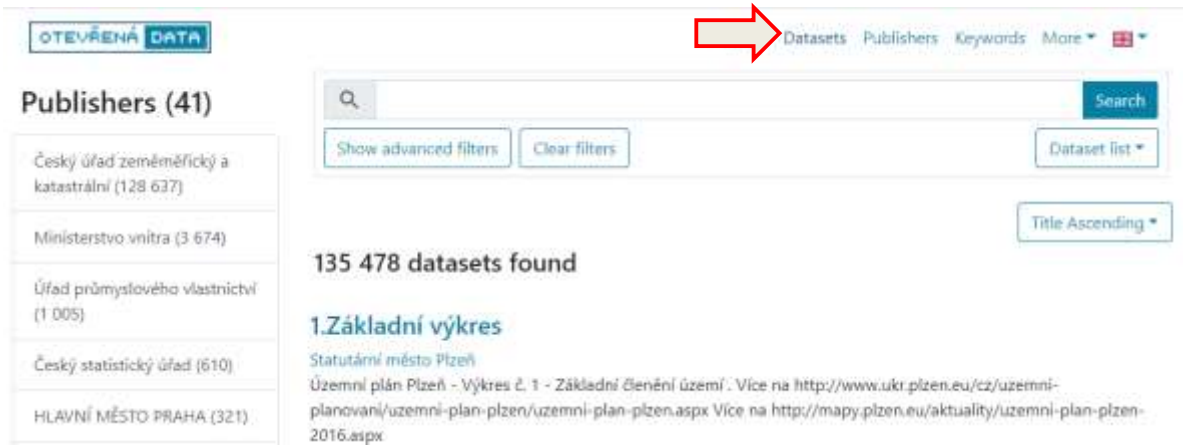

National Open Data Catalog
defines executable instructions that provide desired behavior
Source code
Data structures

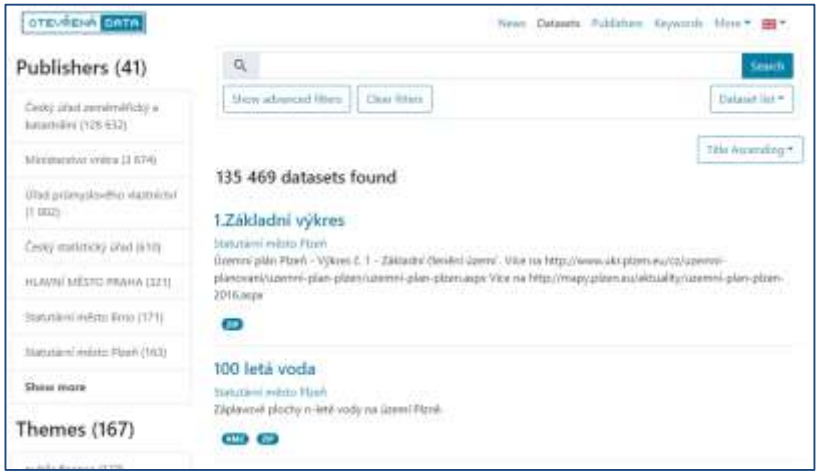

National Open Data Catalog
defines executable instructions that provide desired behavior
enable instructions to manipulate information processed by the behavior
Source code
Data structures

National Open Data Catalog


National Open Data Catalog
Presentation

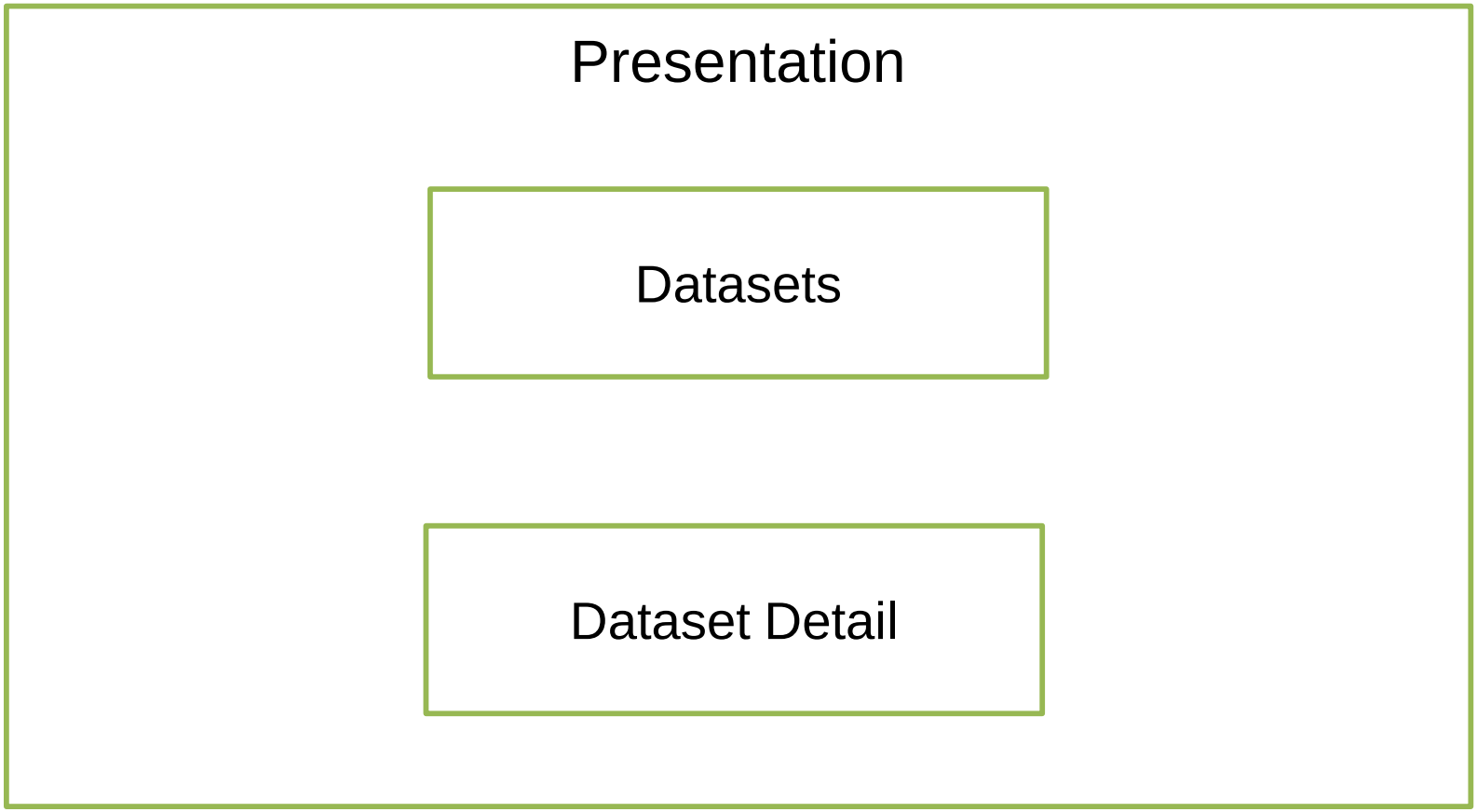
Presentation

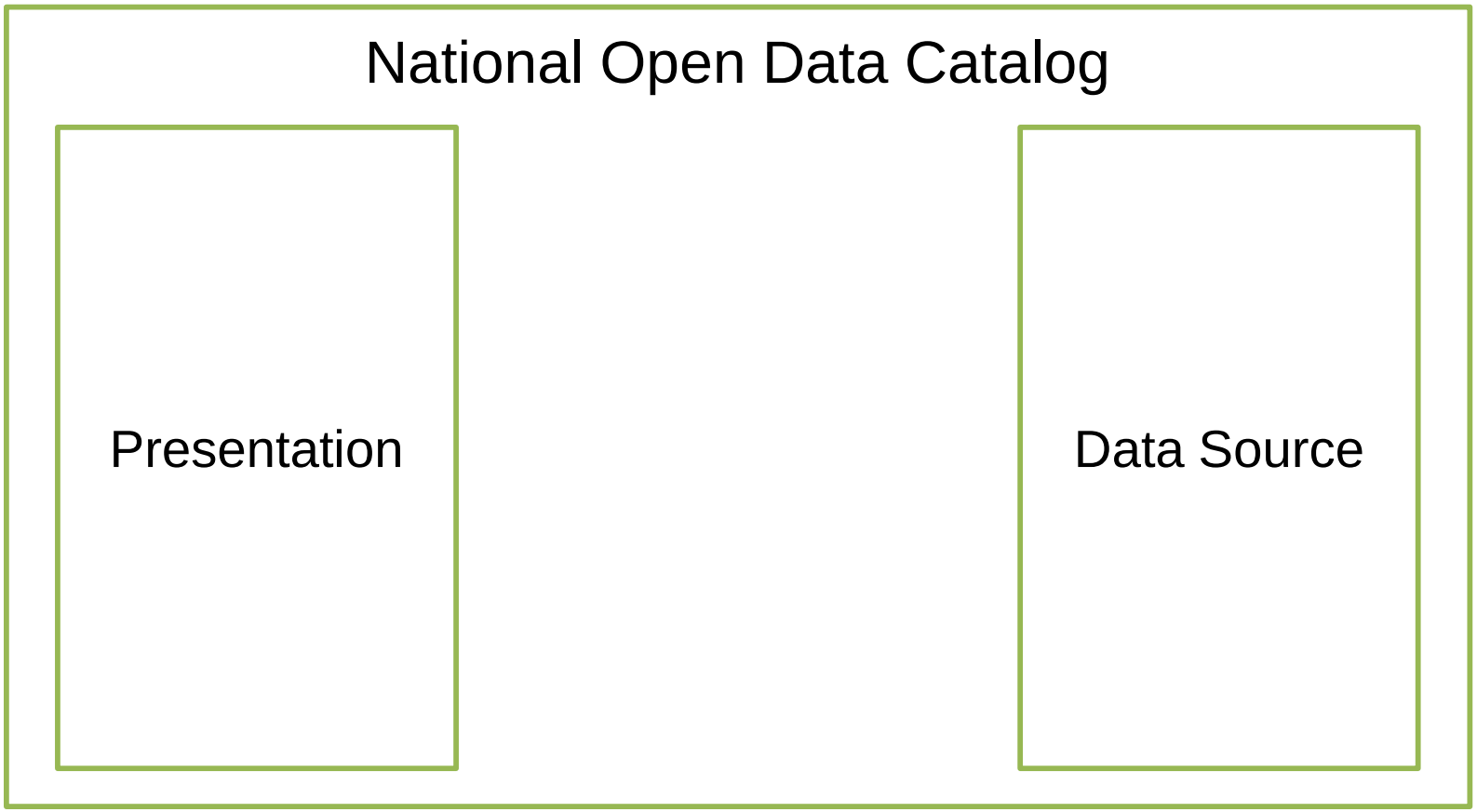




Action

Application data


Presentation
Datasets
Dataset Detail


National Open Data Catalog
Presentation
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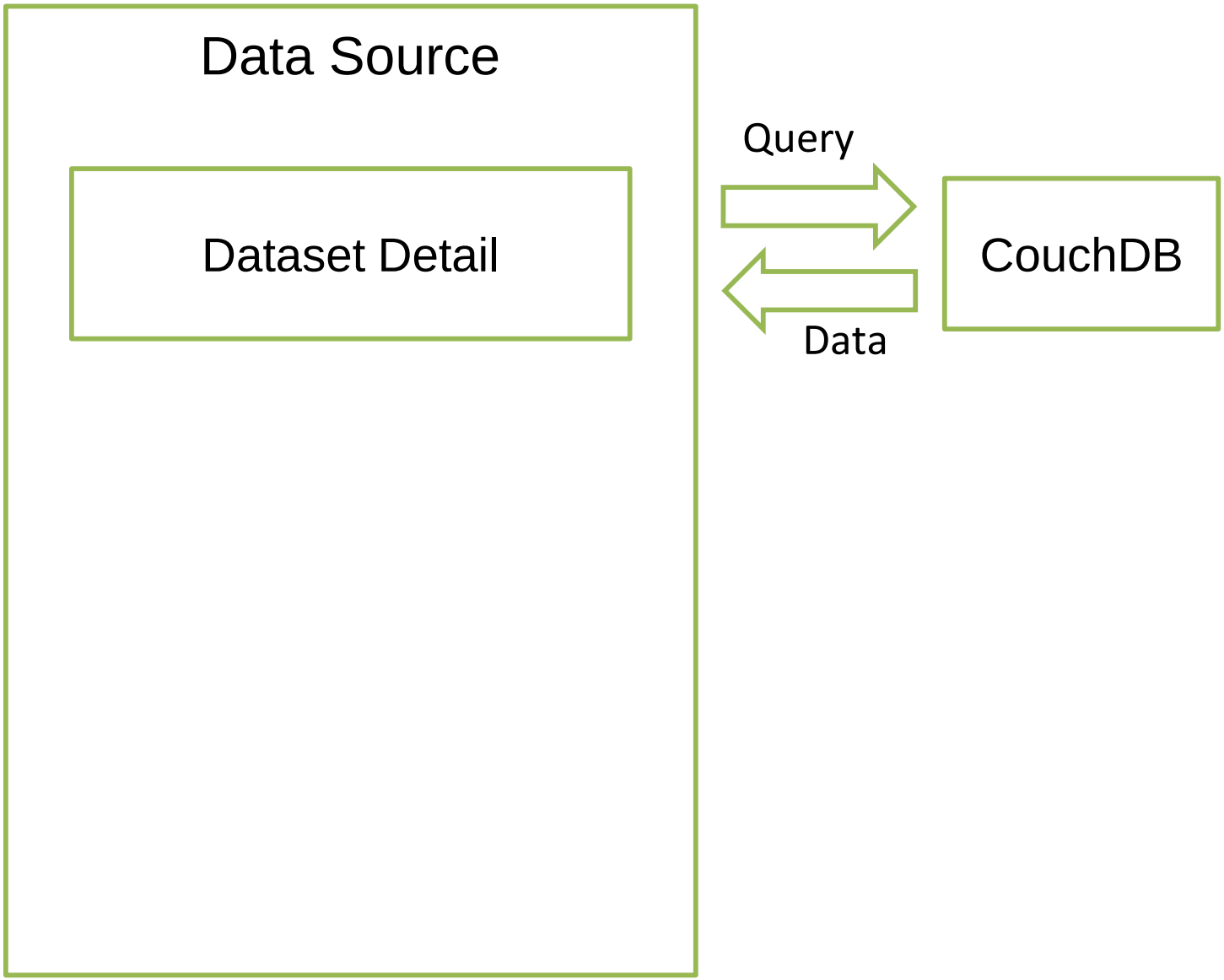
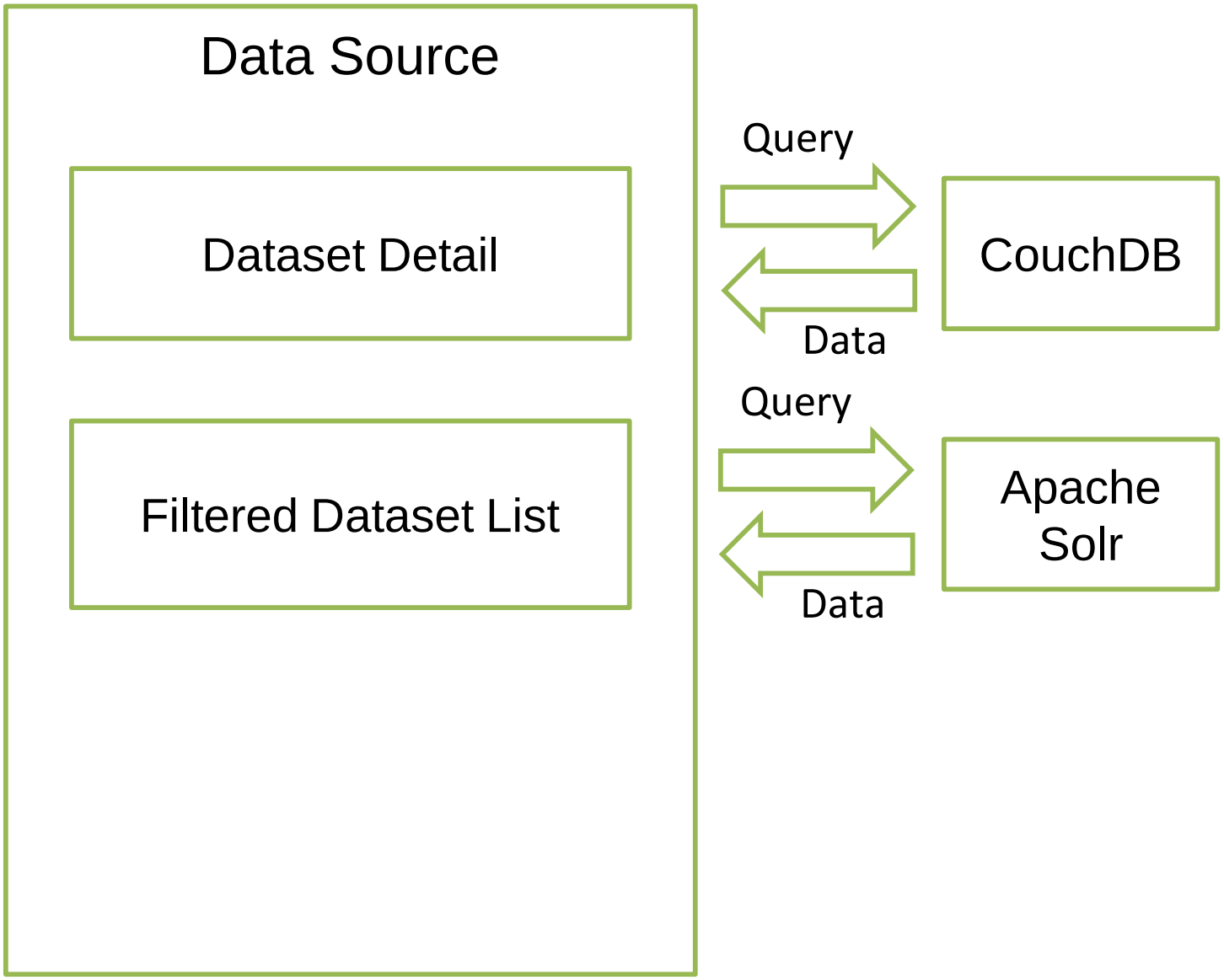
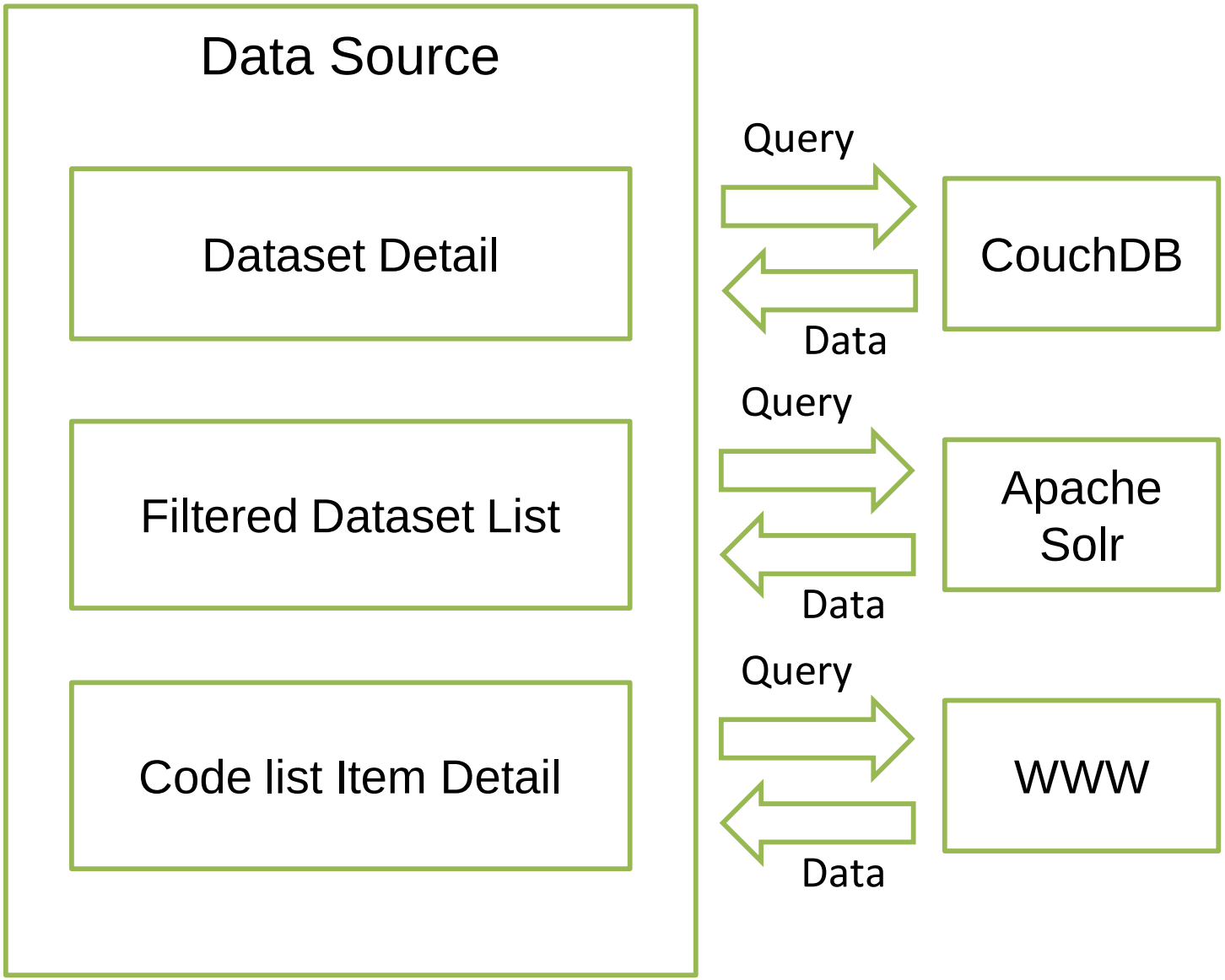

Data Source
Dataset Detail
Query
Data
CouchDB


Data Source
Dataset Detail
Filtered Dataset List
Query
Data
CouchDB
Query
Data
Apache Solr


Data Source
Dataset Detail
Filtered Dataset List
Code list Item Detail
Query
Data
CouchDB
Query
Data
Apache Solr
Query
Data
WWW

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Not protected Sui generis db rights	application/trig
No personal data Personal data	

http://publications.europa.eu/resource/authority/eurovoc/3512

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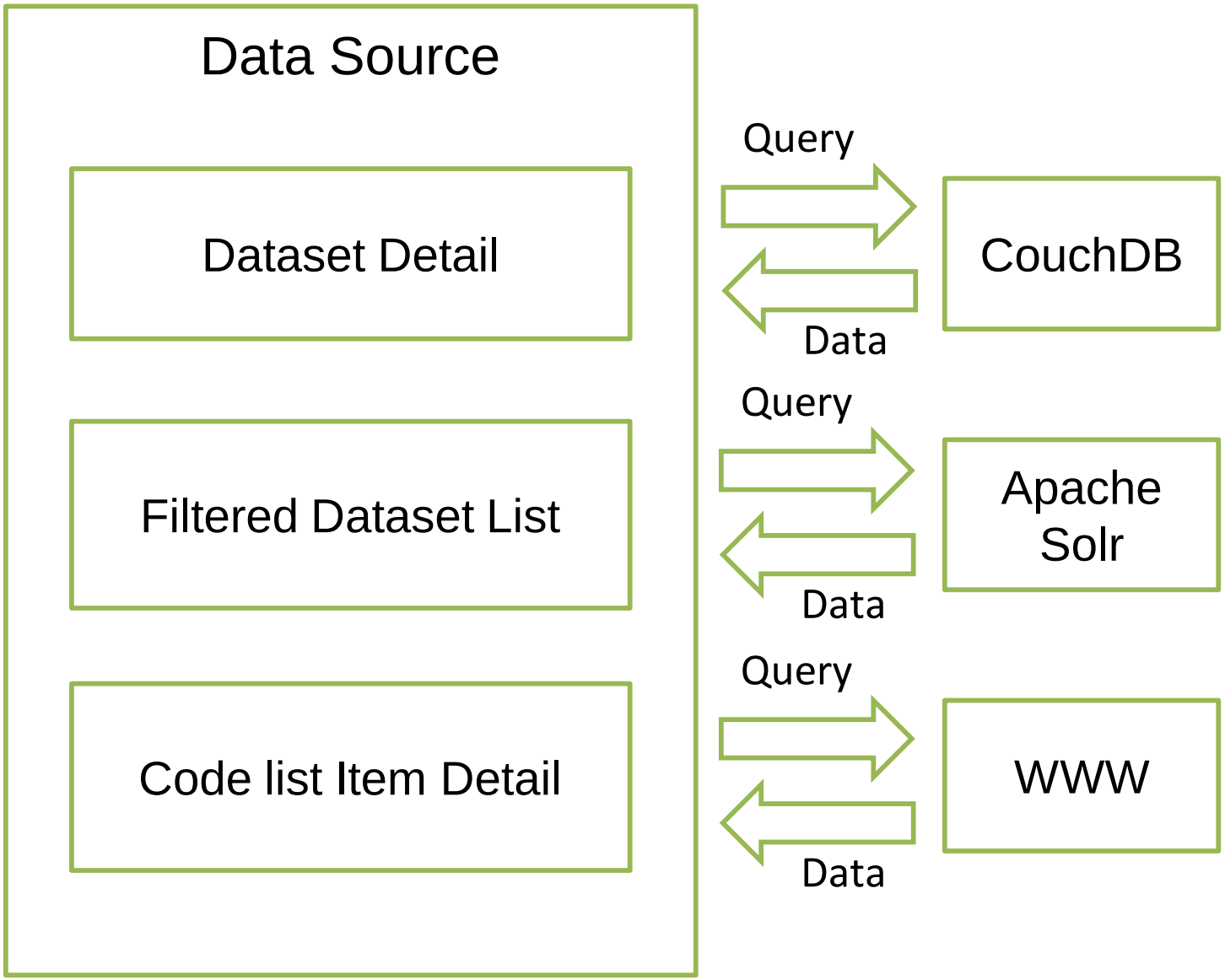
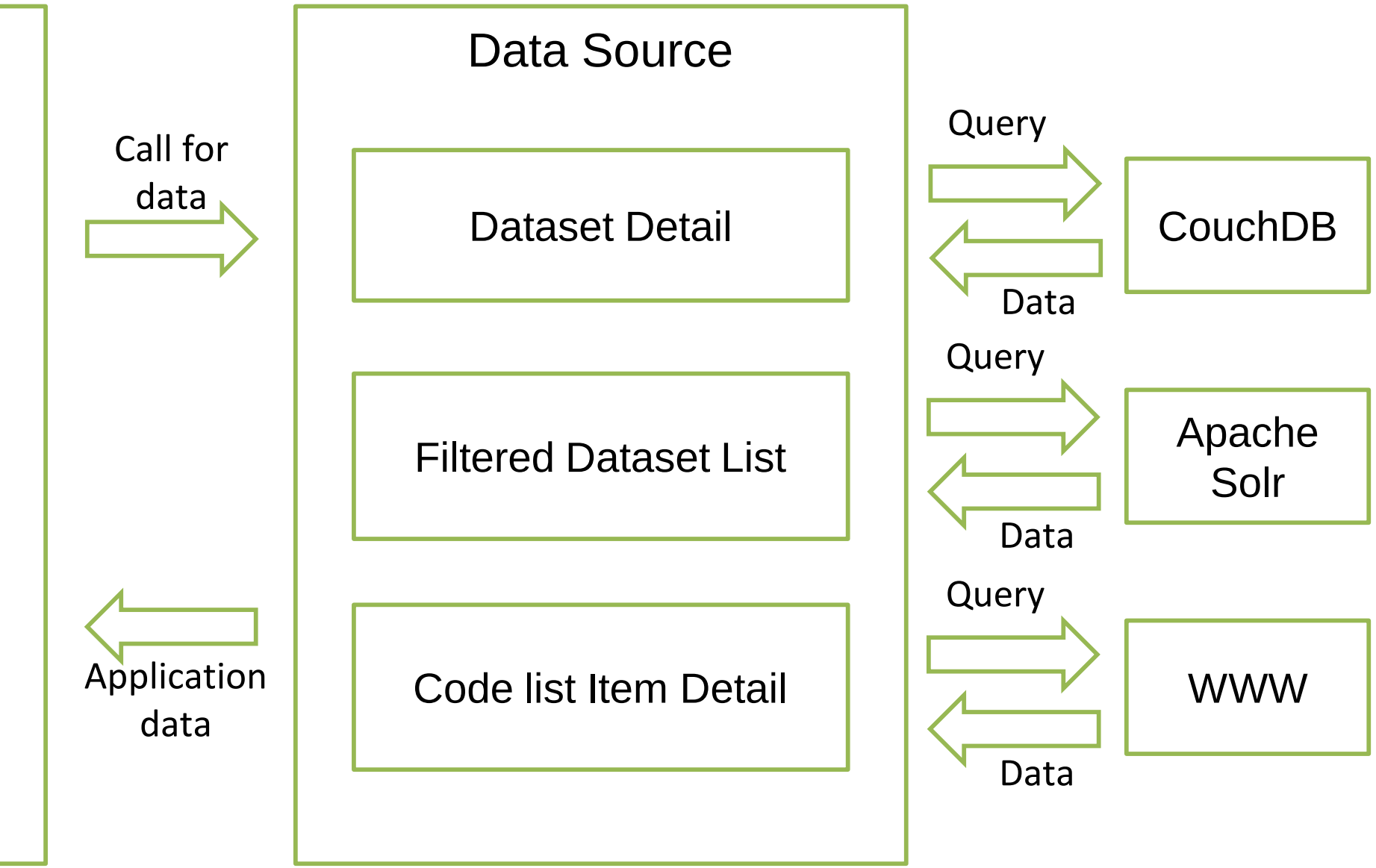

Data Source
Dataset Detail
Filtered Dataset List
Code list Item Detail
Query
Data
CouchDB
Query
Data
Apache Solr
Query
Data
WWW


Data Source
Call for data
Dataset Detail
Filtered Dataset List
Code list Item Detail
Application data
Query
Data
CouchDB
Query
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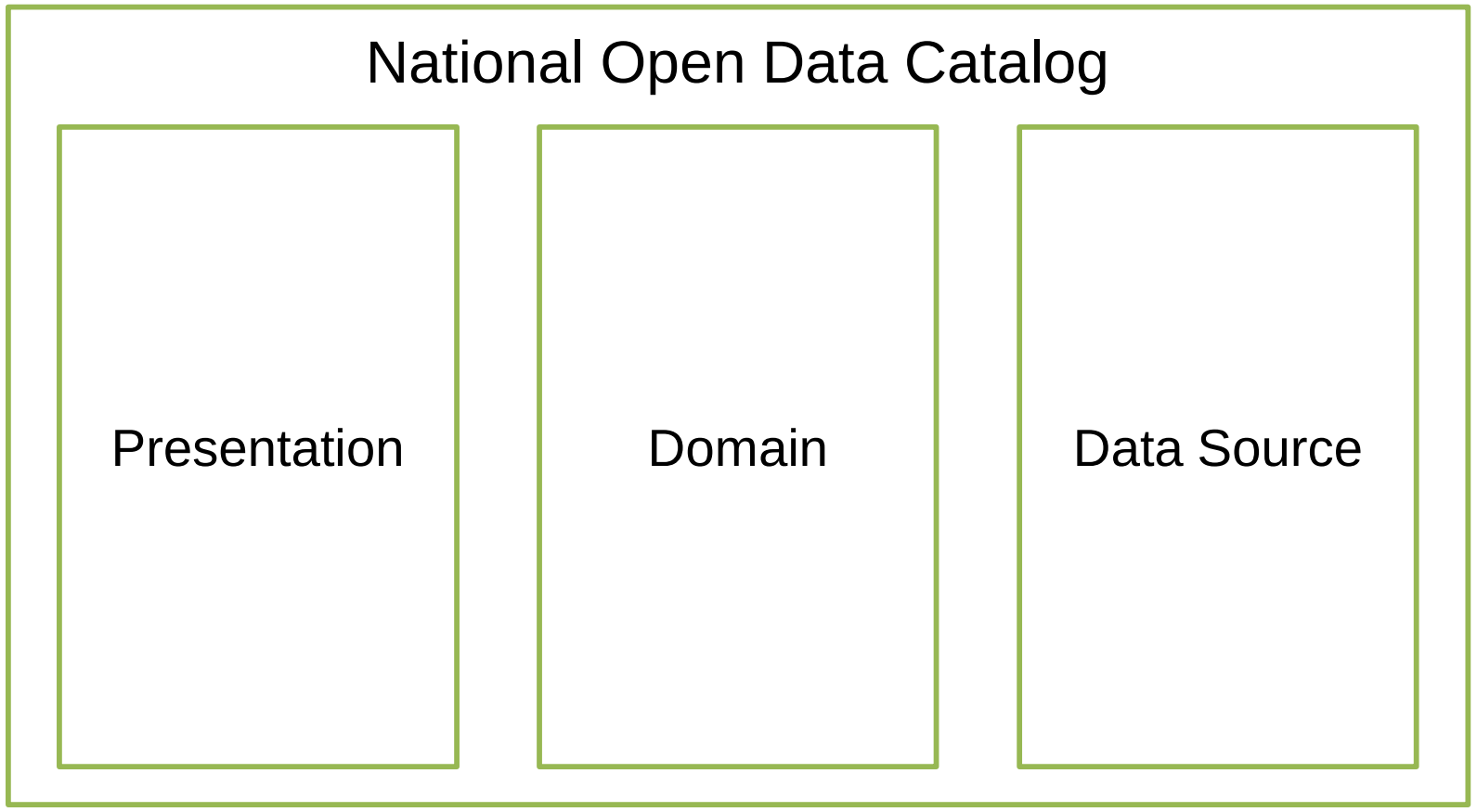
Apache Solr
Query
Data
WWW


National Open Data Catalog
Presentation
Domain
Data Source

Bilance meziokresní vyjížďky do zaměstnání podle výsledků sčítání 2011 !

Český statistický úřad

Datová sada obsahuje statistické údaje o počtu vyjíždějících osob za jednotlivé okresy a Hlavní město Prahu, jejichž pracoviště bylo v rozhodný okamžik sčítání (26. 3. 2011) v jiné obci než byla obec obvyklého pobytu. Jedná se tedy o vyjížďku mezi okresy České republiky, včetně vyjížďky do Hlavního města Prahy a do zahraničí.

Sčítání lidu domů a bytů | vyjížďka | vyjížďka do zaměstnání

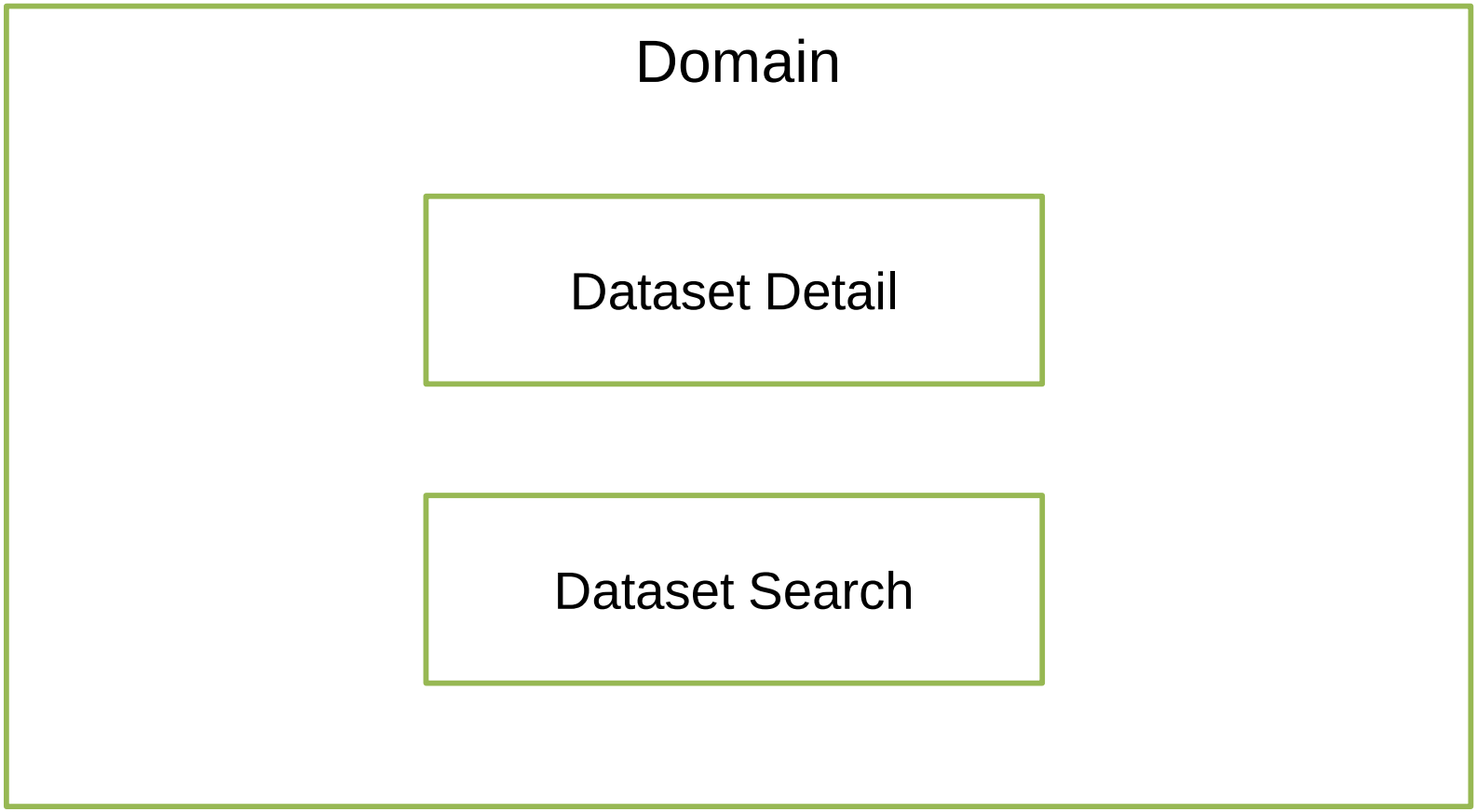
Spatial coverage
Česká republika

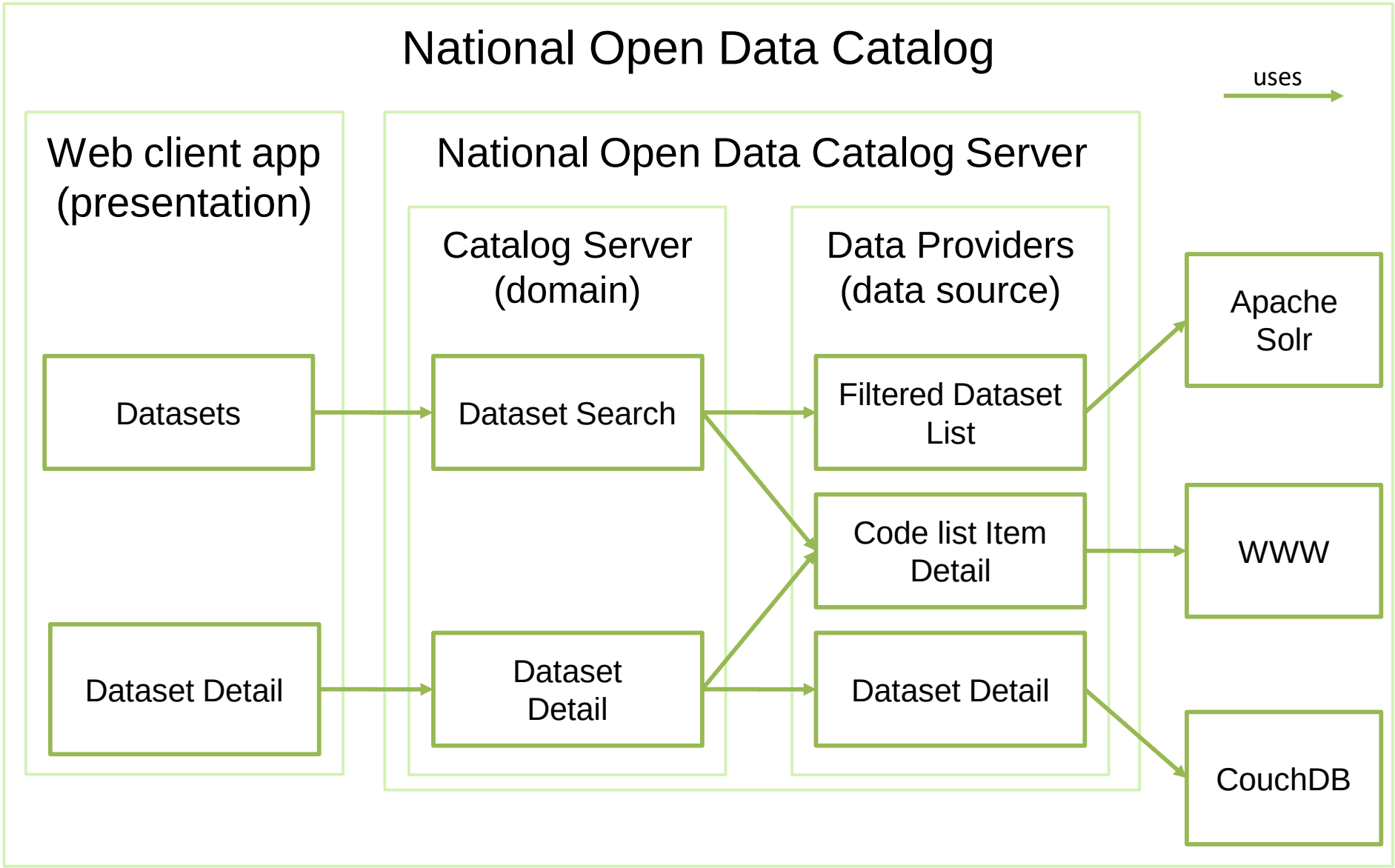
Temporal coverage
2011-03-26 - 2011-03-26

Documentation
Show documentation

Contact point
Český statistický úřad

Frequency
never


Domain
Dataset Detail
Dataset Search


National Open Data Catalog
uses
Web client app (presentation)
National Open Data Catalog Server
Catalog Server (domain)
Data Providers (data source)
Datasets
Dataset Search
Filtered Dataset List
Apache Solr
Code list Item Detail
WWW
Dataset Detail
Dataset Detail
Dataset Detail
CouchDB

What is Software Architecture?

"The software architecture of a system is a set of structures needed to reason about the system, which comprise software elements, relations among them, and properties of both."

-- Bass, Clemens, Kazman, "Software Architecture in Practice, 3rd Edition"

What is Software Architecture

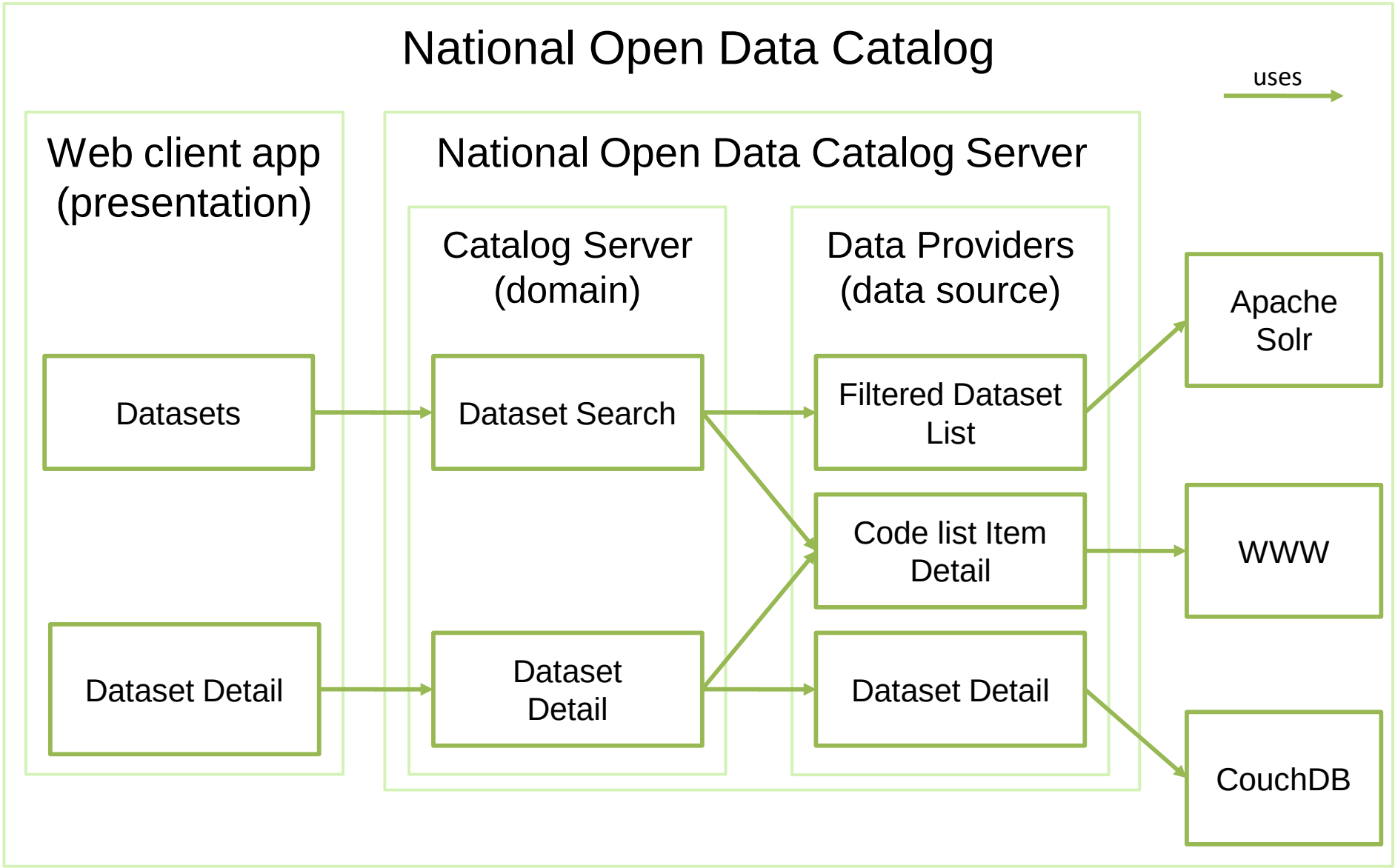
- according to the previous definition, architecture is
  - set of (architectural) software structures
  - abstraction

Architecture = Set of Software Structures

- structure = set of elements held together by relations
- we distinguish three kinds of architectural structures

Kinds of Architectural Structures

- **Modules** = structures which partition system into implementation units
  - assigned specific computational responsibilities
  - the basis of work assignments for programming teams
  - static structures
  - programming code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Dataset Search
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Apache Solr
Code list Item Detail
WWW
Dataset Detail
Dataset Detail
Dataset Detail
CouchDB

Kinds of Architectural Structures

- **Components** = structures which focus on the way the software elements interact with each other at runtime
  - always run-time entities
  - are made up of (compiled form of) programs from various implementation units (= modules)

Kinds of Architectural Structures

- **Allocation** = structures which describe mapping from software structures (modules/components) to the system's environments
  - organizational
  - developmental
  - installation
  - execution

Which Structures are Architectural

- A structure is architectural if it supports reasoning about the systems and the system's properties.

Architecture = Abstraction

- architectural structures describe particular kinds of software elements and relations between them
- architecture omits information about elements that is not useful for reasoning
- we simply cannot deal with all of the complexity of the system at once

System – Architecture

What is the relationship between software system and software architecture?

- Can a system exist without an architecture?
- Can an architecture exist without a system?
- Who creates the system? Who creates the architecture

What are we missing?

Architecture includes Behavior

- behavior of each element is part of the architecture when the knowledge of that behavior is important to reason about the system
- this behavior must be documented as part of the documentation of the architecture

Why software architecture?

- The architecture is a bridge between the business goals and the final resulting system.

Why software architecture?

1. An architecture inhibits or enables system's qualities and enables their early predictions.
2. An architecture allows to reason about and manage changes.
3. An architecture enhances communication among stakeholders.
4. An architecture defines constraints on an implementation.
5. An architecture influences organizational structure.
6. An architecture enables evolutionary prototyping.
7. An architecture helps to improve cost and schedule estimates.
8. An architecture can be created as a transferable, reusable model that forms the heart of a product line.
9. An architecture can be the foundation for training a new team member.

The End

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