Otto-Friedrich-Universität Bamberg

First thoughts on an architectural set-up of open and distributed internet search

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Outline

- Use Cases and Requirements
- Data Lakes as an Example
- Conclusions

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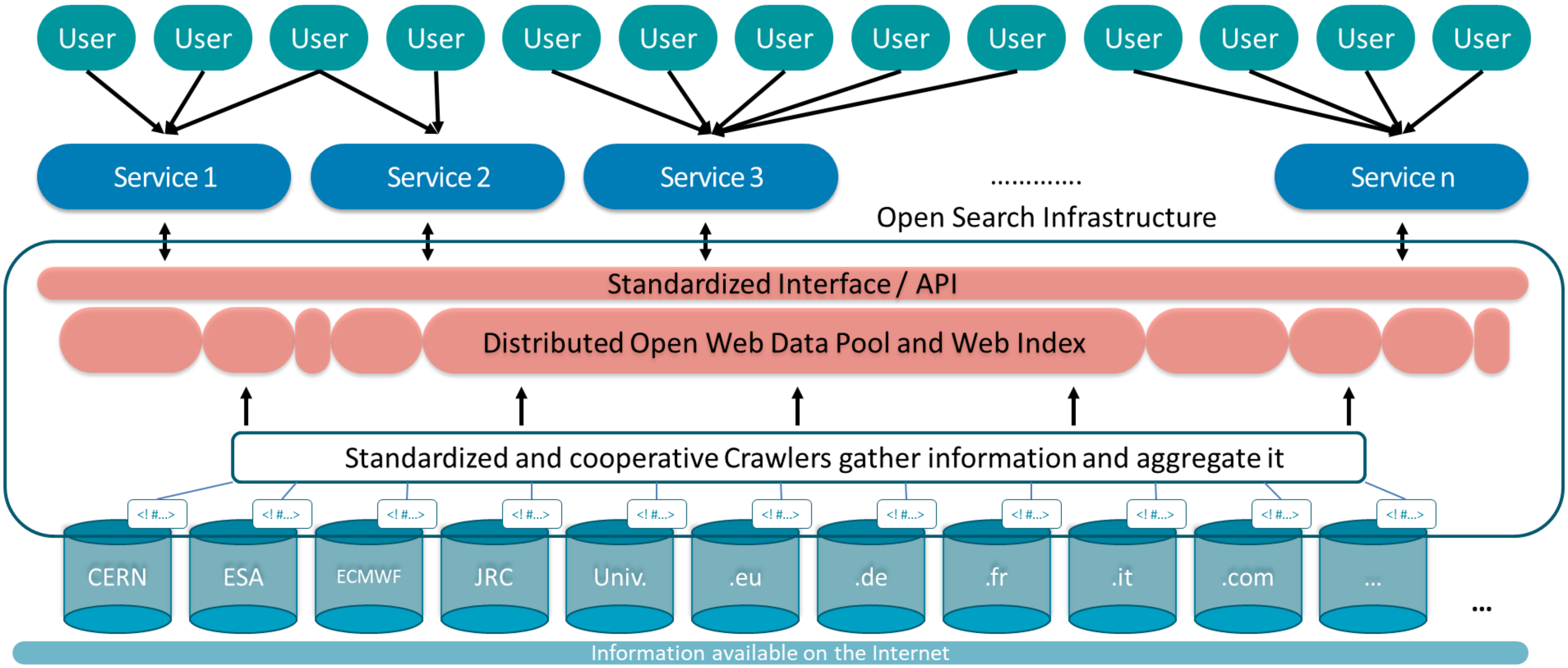
Open and distributed Internet search in Europe

We need to connect our data spaces, computing spaces and web spaces... for setting up a joint Open Web Data Pool and Web Index in Europe


User
User
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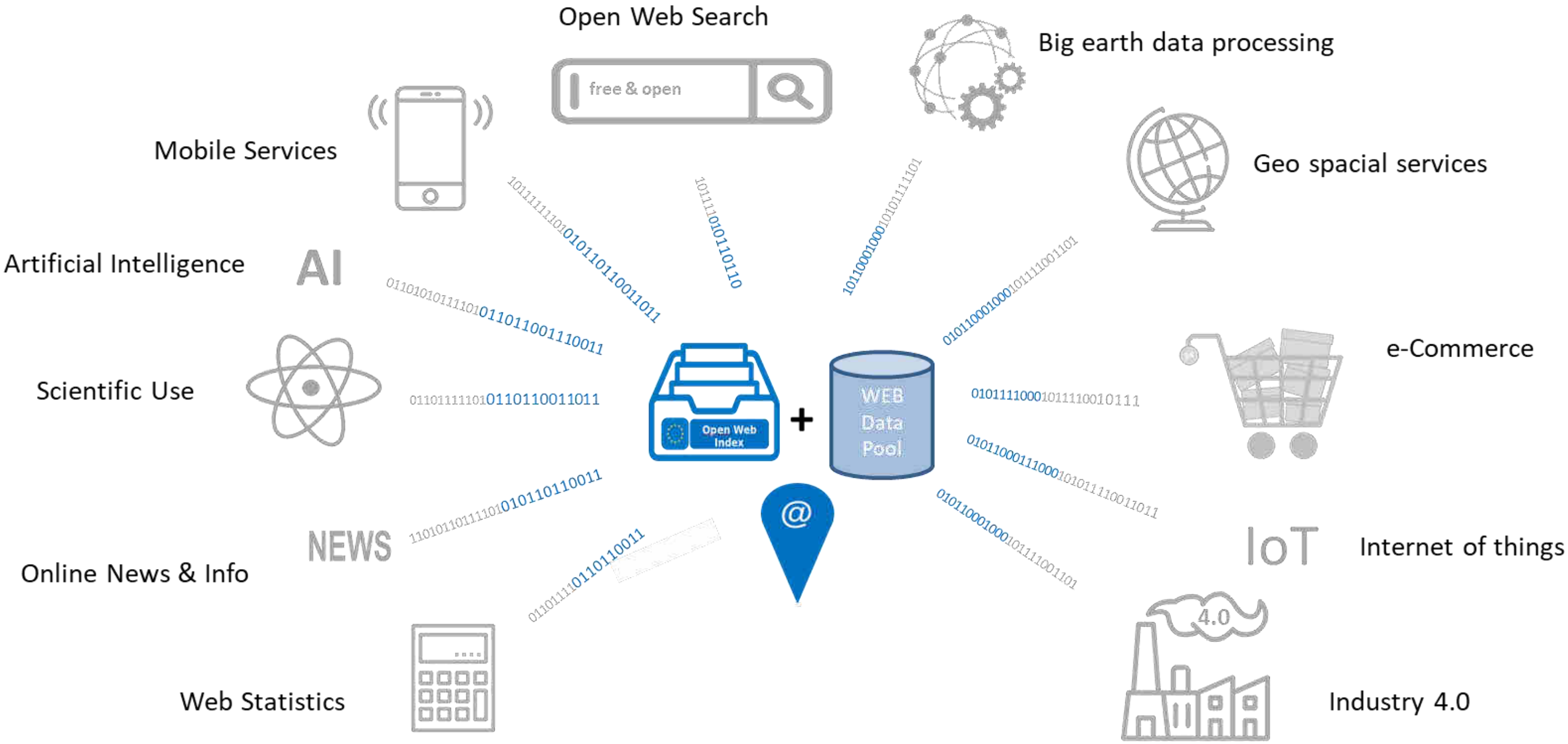
Service 1
Service 2
Service 3
....
Service n
Open Search Infrastructure
Standardized Interface / API
Distributed Open Web Data Pool and Web Index
Standardized and cooperative Crawlers gather information and aggregate it
<! #...>
CERN
ESA
ECMWF
JRC
Univ.
.eu
.de
.fr
.it
.com
...
...
Information available on the Internet

Access to the Index or in addition to the "Raw Data"?

https://opensearchfoundation.org/

Basis for a variety of information services

- An **Open Web Data Pool and Web Index**, as a fundamental and indispensable basis for a large variety of public and private information services.

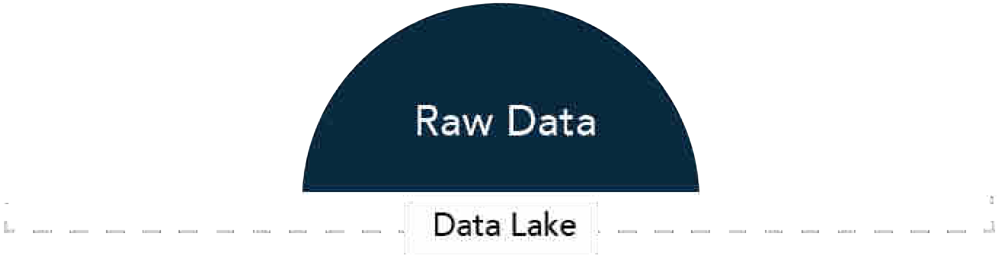


The application scenarios require “Structured Data”?

https://opensearchfoundation.org/

Data Lake Layers and Consumption Patterns

- Enterprise Data Lake Architecture: What to Consider When Designing
  [Cloud Technology Partners, Sudi Bhattacharya, Neal Matthews
  https://www.cloudtp.com/doppler/how-to-guide-architecture-patterns-to-consider-when-designing-an-enterprise-data-lake/]



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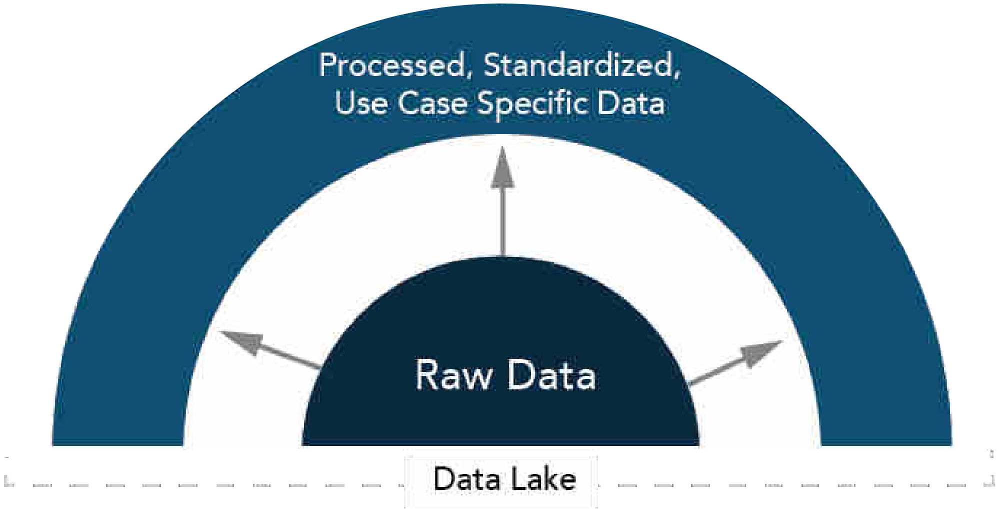

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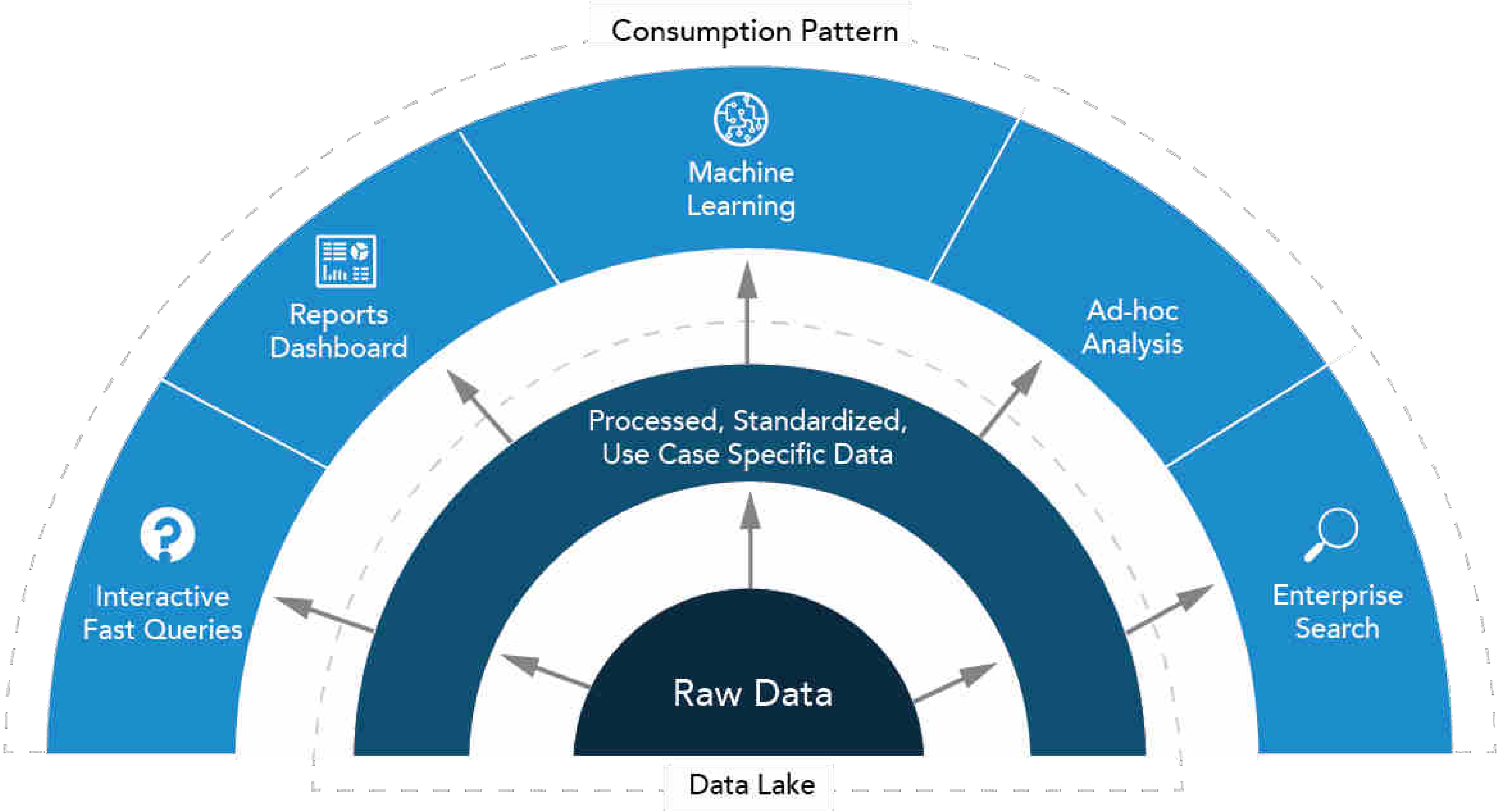

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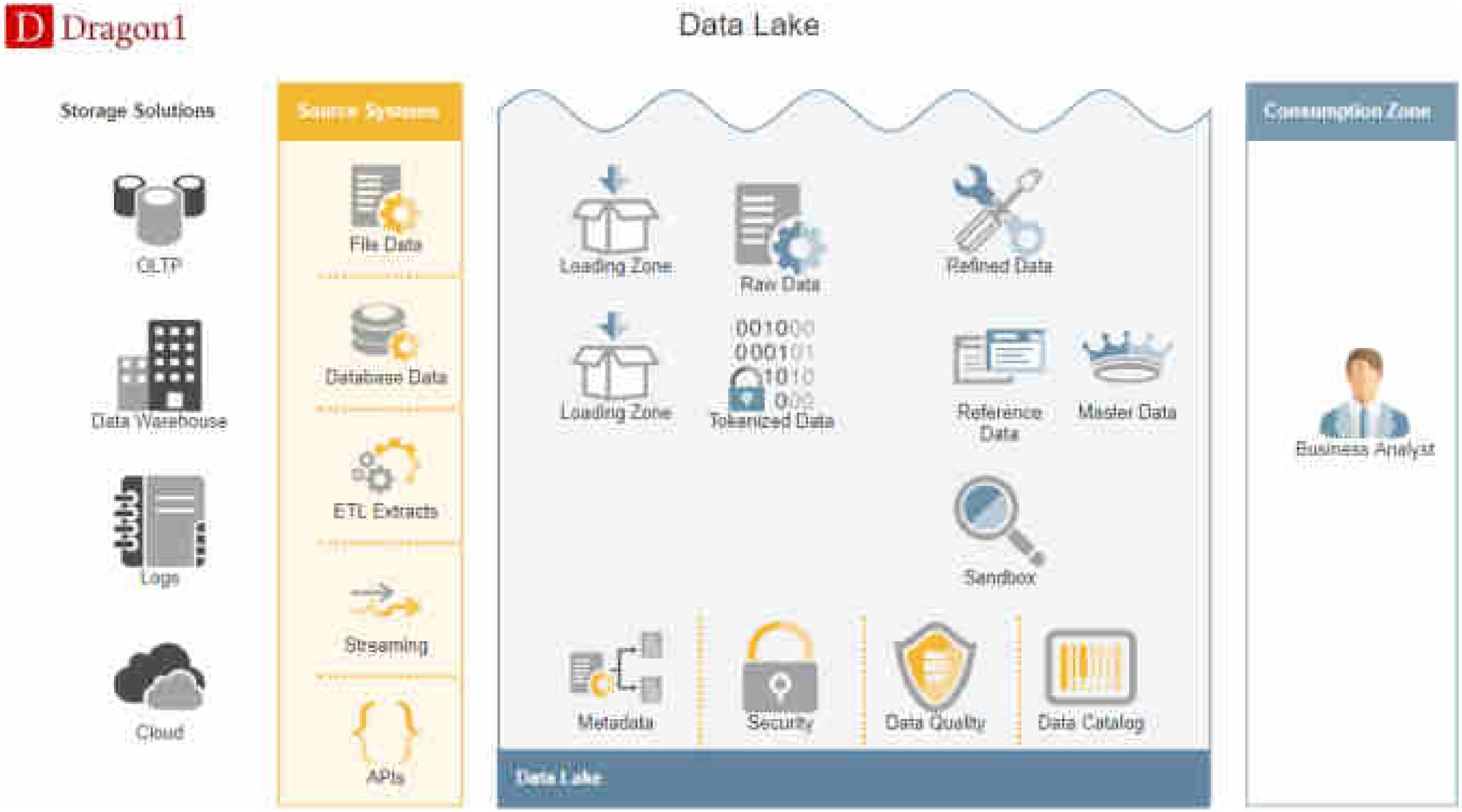
Data Lake Template for Reference Architecture



https://www.dragon1.com/demo/data-lake

Key Benefits Of a Data Lake

1. Scalability
   - storage from disparate sources like multimedia, binary, XML; …
2. High-velocity Data
   - data stream processing and large volumes of historical data
3. Structure
   - unique arena where structure like metadata, speech tagging etc. can be applied on varied datasets
4. Storage
   - iterative and immediate access to the raw data
5. Schema
   - schemaless write and schema-based read

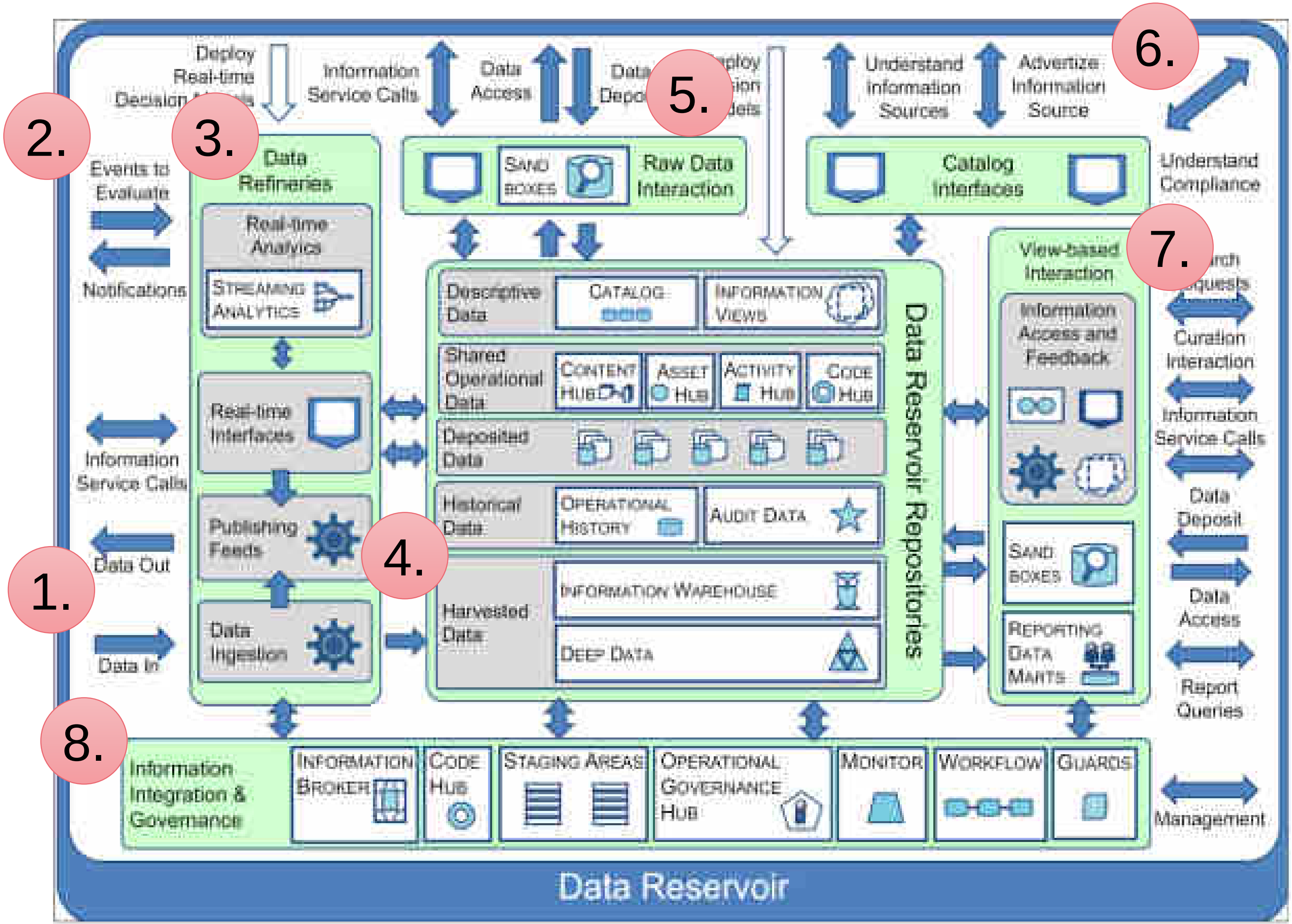
Source: Ajit Singh: *Architecture of Data Lake*, 2019, Data science Foundation,
https://datascience.foundation/sciencewhitepaper/architecture-of-data-lake

Architecture of a Data Lake

- Factors to consider:
  - Data Governance and Security Layer
  - Metadata Layer
  - Information Lifecycle Management Layer
- Tiers to manage data flows :
  - Intake Tier
  - Management Tier
  - Consumption Tier
- What is needed according to the CAP theorem?
  - Consistency
  - Availability
  - Partition tolerance

Source: Ajit Singh: *Architecture of Data Lake*, 2019, Data science Foundation, https://datascience.foundation/sciencewhitepaper/architecture-of-data-lake

Data Reservoir Overview



Source: M. Chessell, F. Scheepers, N. Nguyen, R. van Kessel, R. v.d. Starre: *Governing and Managing Big Data for Analytics and Decision Makers*, Redguides for Business Leaders , 2014, IBM, http://www.redbooks.ibm.com/redpapers/pdfs/redp5120.pdf

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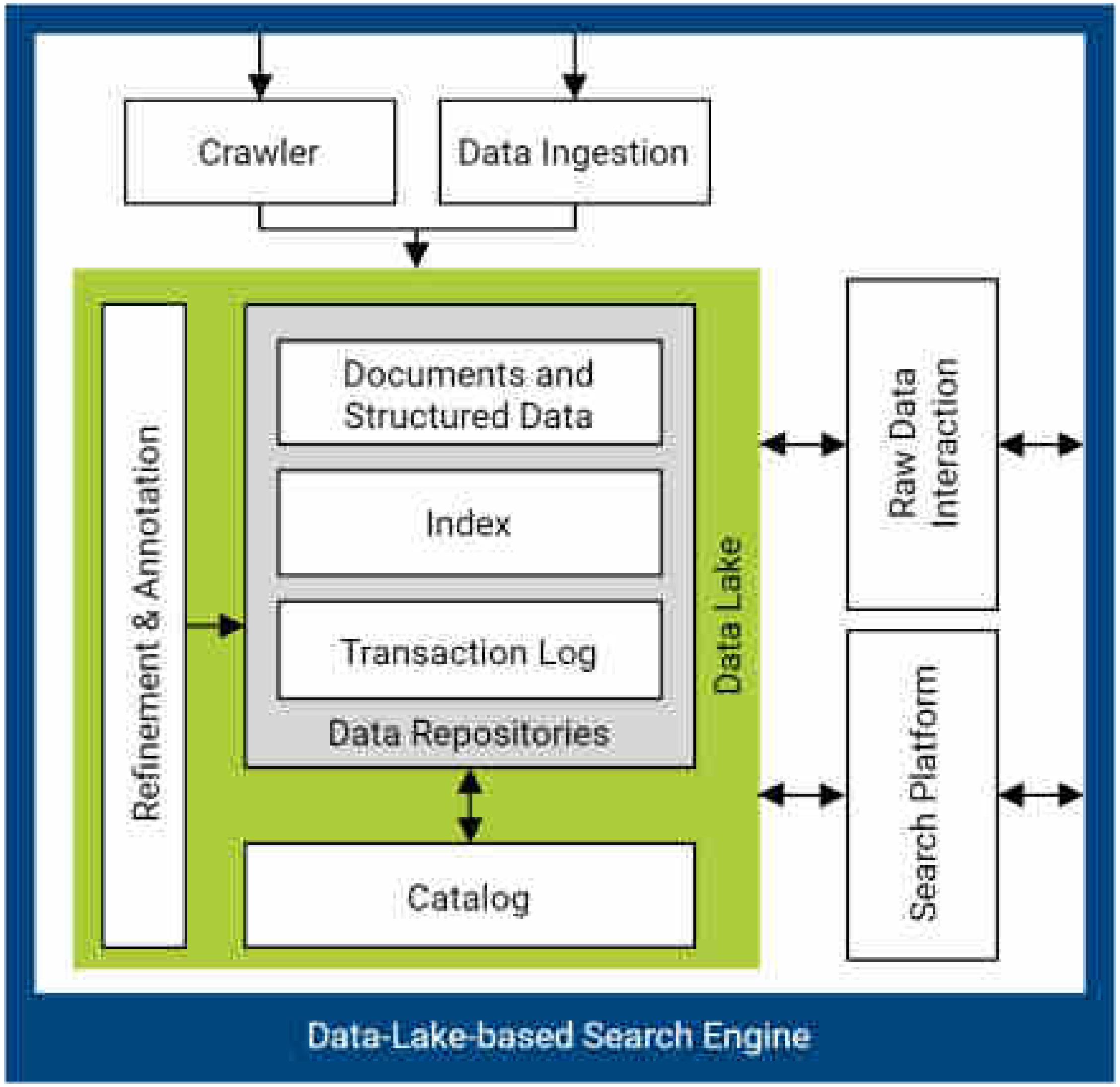
Use a simple architecture to start with

- The Architecture of a Data-Lake-based search engine



Benefits of a clear architecture

- Standardized schemata
- Clear interfaces / APIs
- Well defined functional blocks

⇒ Will attract various players to contribute

⇒ Will allow for adaptation and specialisation in a generic frame

⇒ Will foster the Open Search Idea