Dutch Enterprise Data Lake

Fishing in clear water

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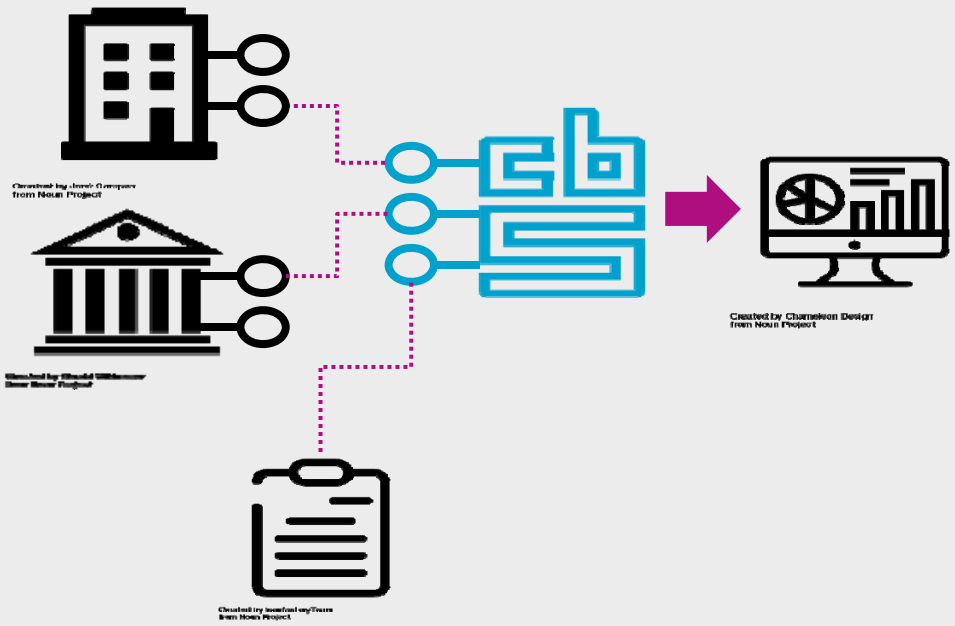
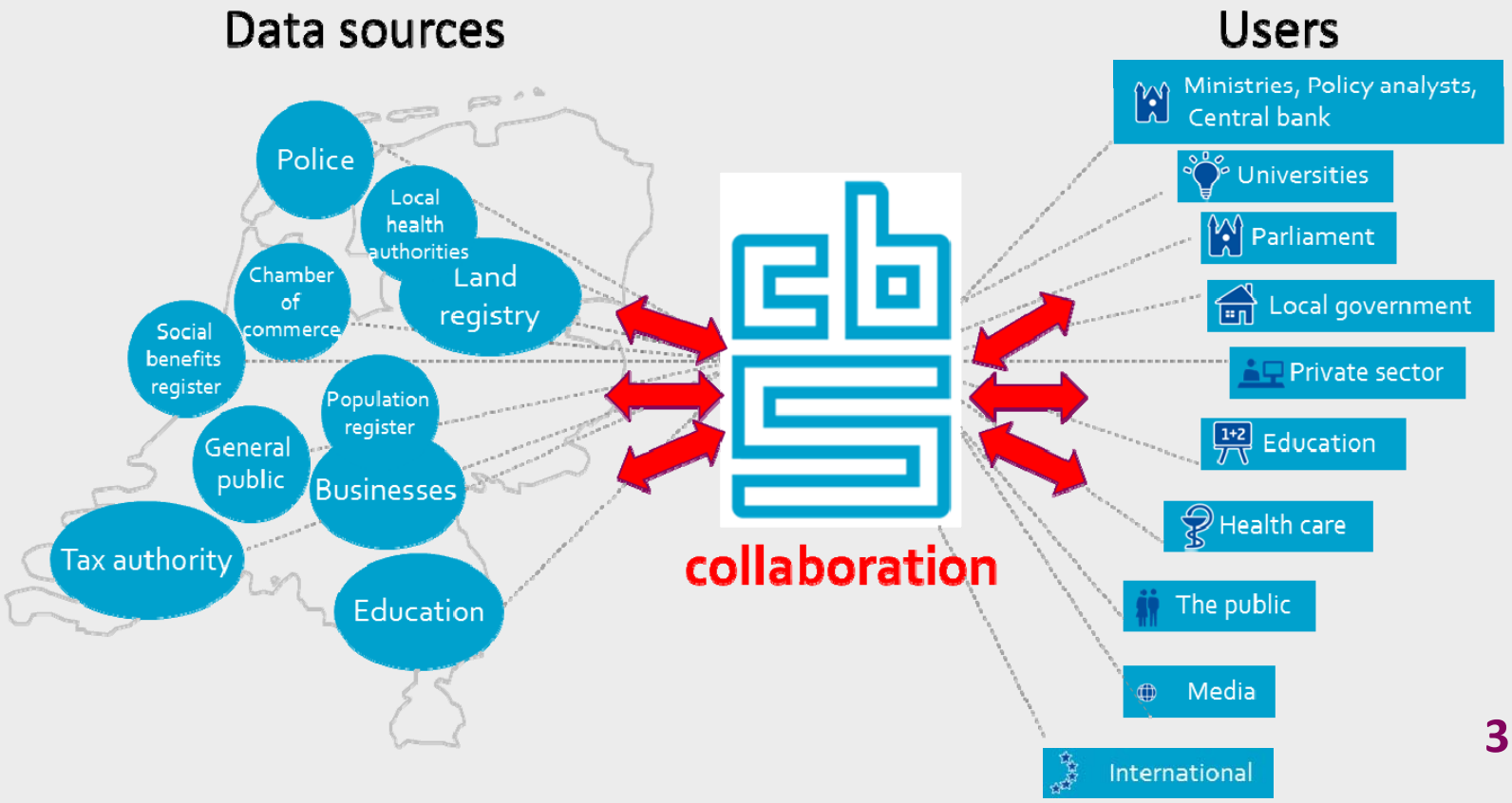
voor de Statistiek

NSI 2.0 National Statistical Systems

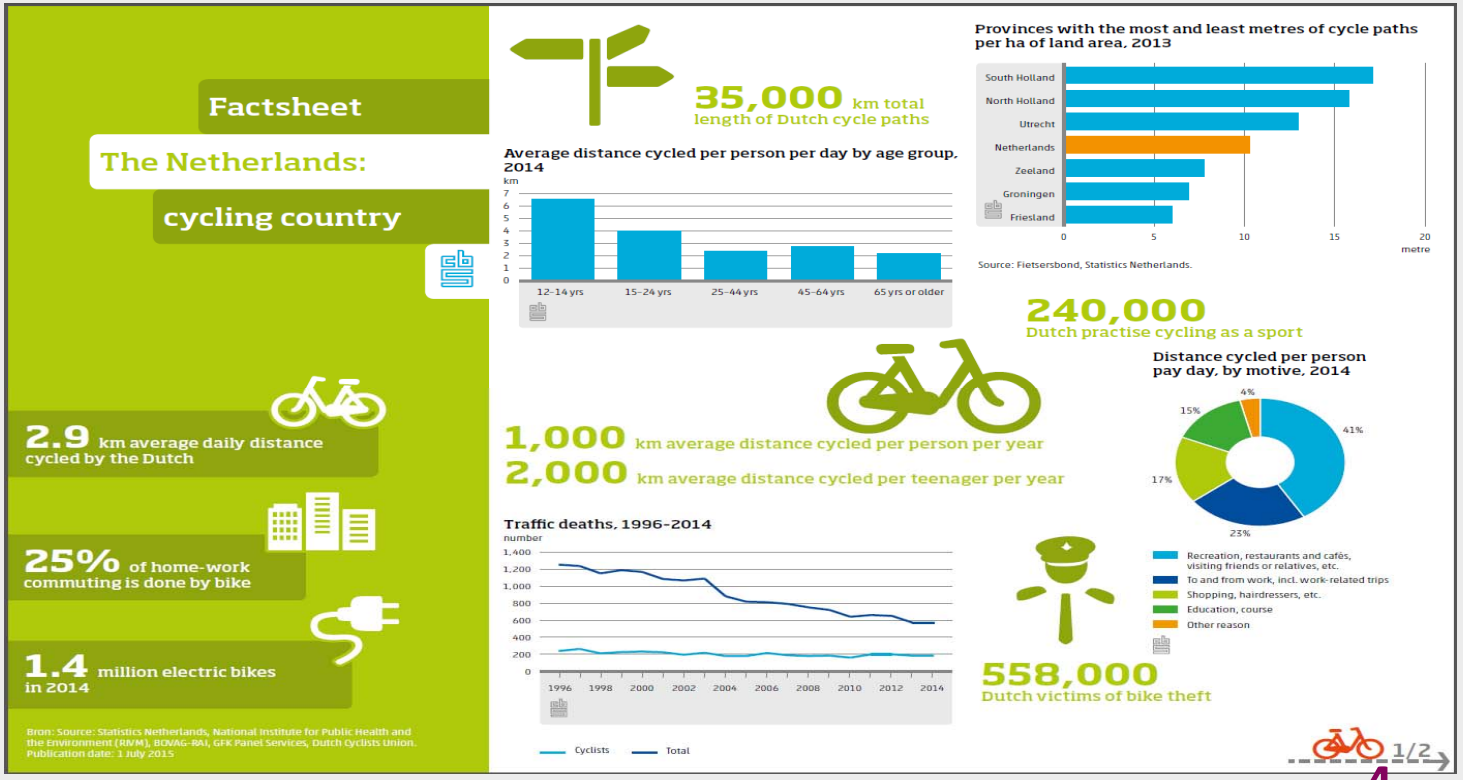


- We make data available in an integrated, flexible and controlled manner
- We offer a platform for collaboration between authorities

Relations


Data sources
Police
Local health authorities
Chamber of commerce
Land registry
Social benefits register
Population register
General public
Businesses
Tax authority
Education
collaboration
Users
Ministries, Policy analysts, Central bank
Universities
Parliament
Local government
Private sector
Education
Health care
The public
Media
International

Phenomena


Factsheet
The Netherlands:
cycling country
2.9 km average daily distance cycled by the Dutch
25% of home-work commuting is done by bike
1.4 million electric bikes in 2014
Bron: Source: Statistics Netherlands, National Institute for Public Health and the Environment (RIVM), BOVAG-RAI, GFK Panel Services, Dutch Cyclists Union.
Publication date: 1 July 2015
35,000 km total length of Dutch cycle paths
Average distance cycled per person per day by age group, 2014
km
12-14 yrs
15-24 yrs
25-44 yrs
45-64 yrs
65 yrs or older
1,000 km average distance cycled per person per year
2,000 km average distance cycled per teenager per year
Traffic deaths, 1996-2014
number
Cyclists
Total
Provinces with the most and least metres of cycle paths per ha of land area, 2013
South Holland
North Holland
Utrecht
Netherlands
Zeeland
Groningen
Friesland
metre
Source: Fietsersbond, Statistics Netherlands.
240,000 Dutch practise cycling as a sport
Distance cycled per person pay day, by motive, 2014
41%
23%
17%
15%
4%
Recreation, restaurants and cafés, visiting friends or relatives, etc.
To and from work, incl. work-related trips
Shopping, hairdressers, etc.
Education, course
Other reason
558,000 Dutch victims of bike theft
1/2

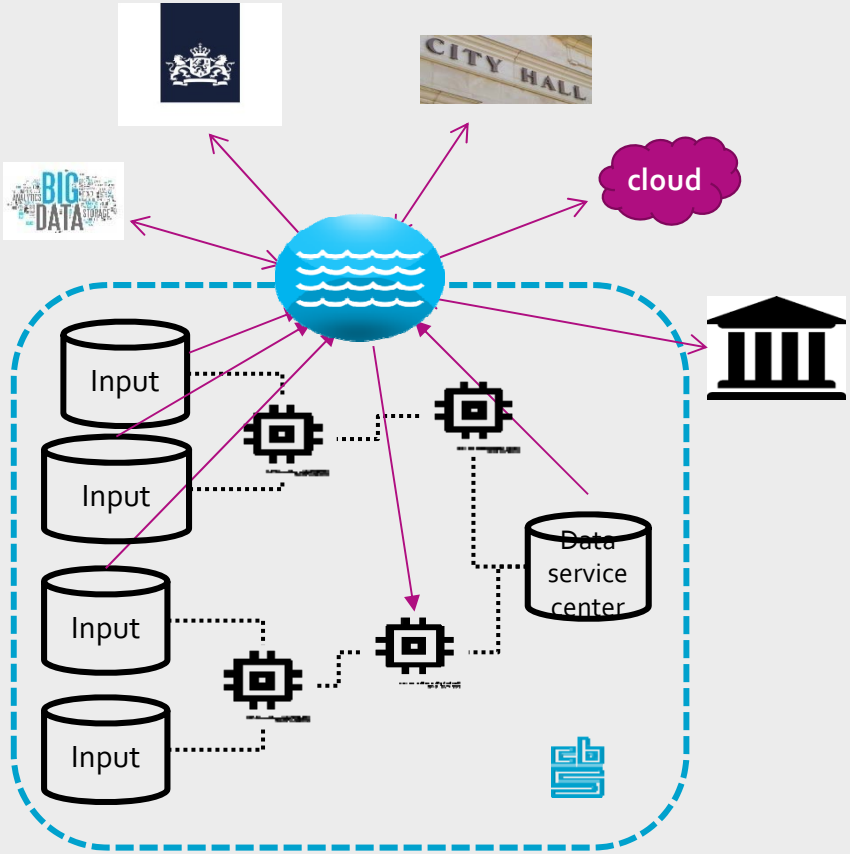
Great Ambitions…

… Sustainable Development Goals

- Economy
- Education
- Energy
- Environment
- Finance
- Fire & Emergency Response
- Governance
- Health
- Recreation
- Safety
- Shelter
- Solid Waste
- Telecommunications
- Transportation
- Urban Planning
- Wastewater
- Water & Sanitation

...but also great Challenges

Connecting data… Data lake ?



- Always recent data
- Distributed Data
- Sensitive Data

Information security and Acces management are very Important!

Stakeholders

End-users

- Internal CBS
- External
  - Data access, Re-use of data and designs
  - Coupling & Combining
  - Efficiency & flexibility

Source owners

- What happens with the data?
- Authorisation & Security

Sponsors

ternal (CIO, Controller) → Business Case?

- External (Ministries, Governmental bodies, private parties)

(security)custodians and other environment

- Legal mandate, ethical concerns

Strategic Agenda – Vision on Info Serv

 # Towards a state-of-the-art data and information infrastructure

Make data better accessible to statisticians; implement a data lake

CBS Data Lake definition:

*"A concept to ensure that next to a **decoupling** of input, processing and output, also the demand for **flexibility** and **coherence** is satisfied thereby guaranteeing that the information needs of the statistical producer and statistical user are fulfilled as as possible without the interference of methodology and IT support".*

A Data lake is a…..?

TechTarget: A data lake is a **storage repository** that holds a vast amount of **raw data** in its native format until it is needed….each data element in a lake is assigned a

CBS Data lake; confined to **statistical data.** These data describe economic and social **phenomena** and have therefore a **structure** concerning the content and a **semantic meaning.** It is a **logical data warehouse**, integrating data sources in real time, **without data duplication, regardless structure, technology or location**.

er: A data lake is a **collection of storage es** of various data assets additional to the ng data sources…in a **near-exact/exact** f the **source format**. The purpose is to an **unrefined view** of data to only the most **skilled** analysts to help them **explore** their refinement and analyse techniques **ndent** of any of the **system-of-record compromises** that may exist in a traditional analytic data store.

Top 7 goals from end-user perspective

1. Enable **more phenomenon based output** (a phenomenon is a striking event that you want to explain)
2. Enable **more current and coherent statistics**
3. Stimulate the **re-use** of data
4. **Accelerate** the statistical **processes**
5. **Grow** and **stimulate** the **access** to a large number of **existing and new data sources**
6. **Provide faster response and output** to requests from external clients
7. **Accelerate the design process** around collecting and storing data

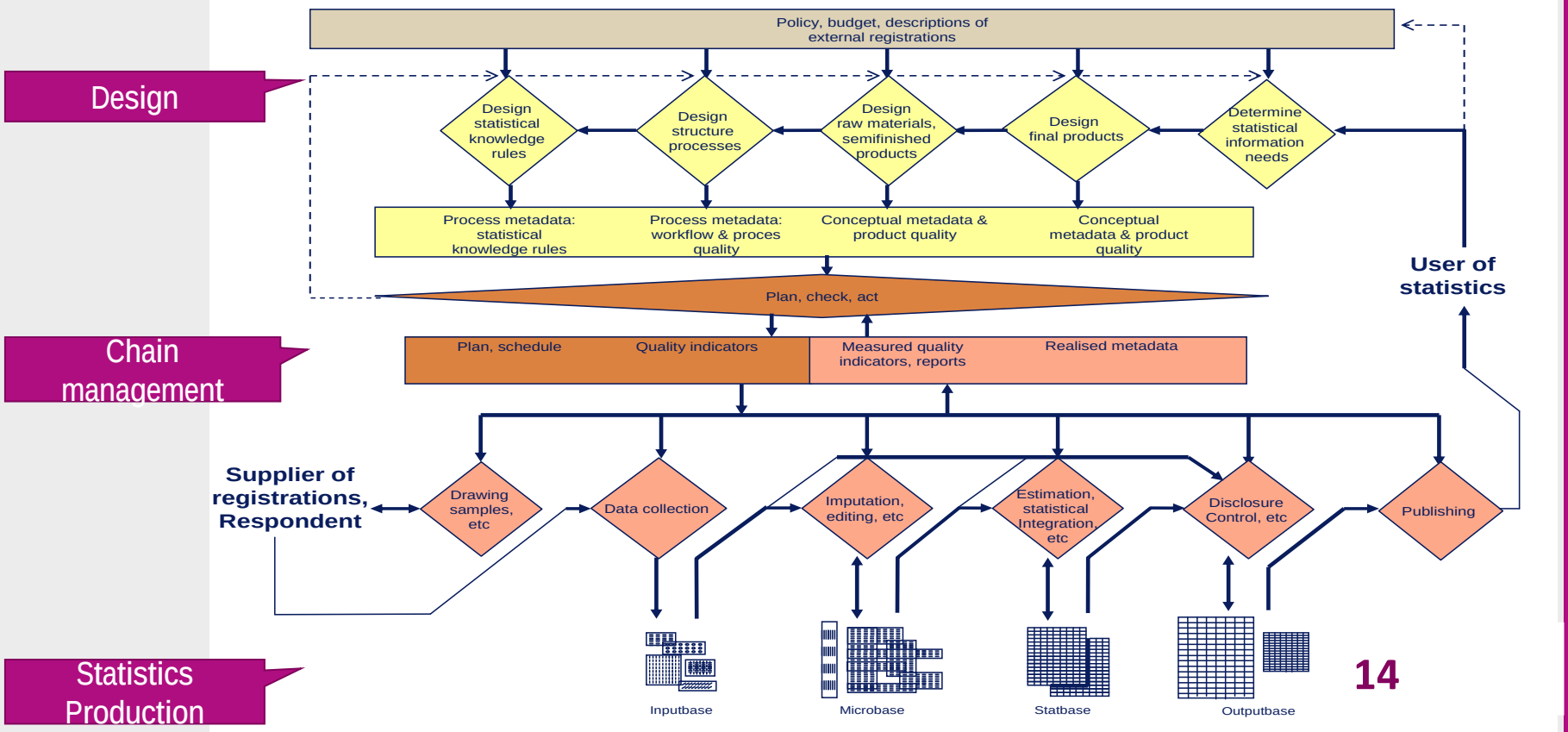
How to get there?

- Enterprise Data lake Project for a new architecture; **data oriented**

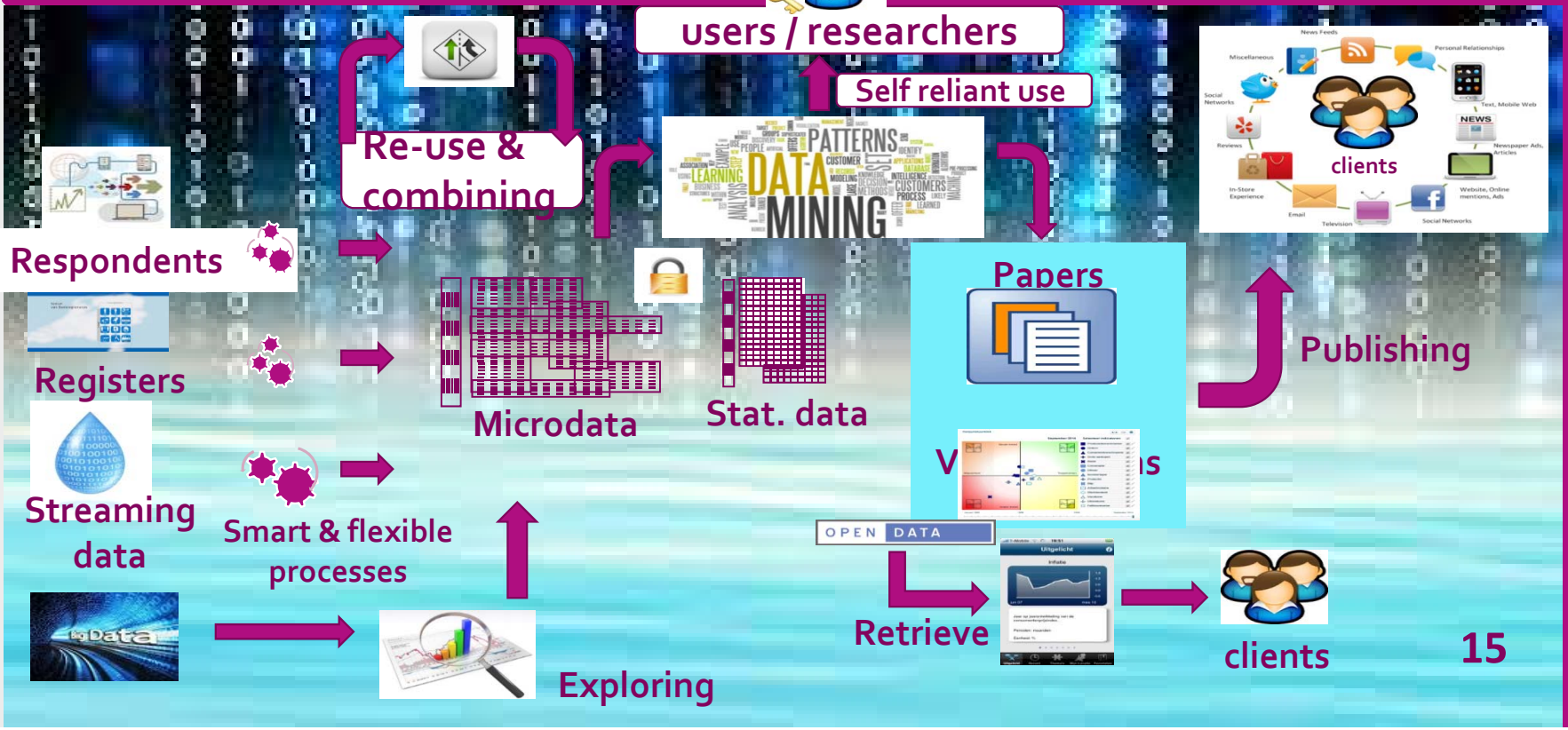
- Focus on **end user goals**;
  - 5 Better accessibility of available datasets
  - 1 Dealing with many data sources, many formats
  - 7 Faster, phenomenon based reporting

- Data Lake project consist of **three pillars**:
  - **Metadata** repository (technical & conceptual)
  - **Data Virtualisation** as technology to provide single data platform
  - **Security** and **Authorisation** to prevent data sets from unauthorized use

BA..... from proces oriented



… to a data oriented approach

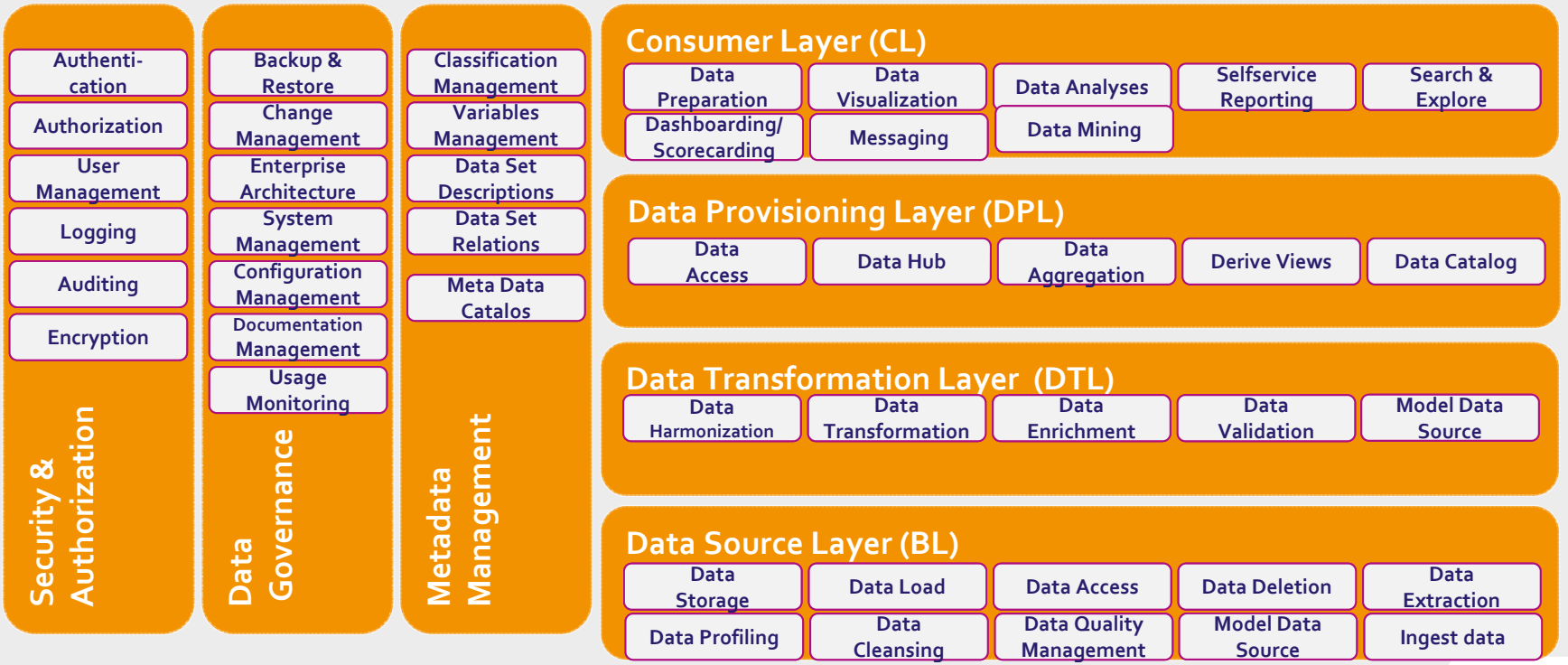


Key Capabilities

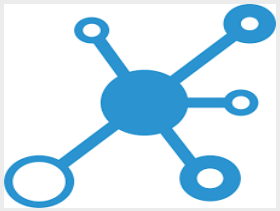
Ability to:

- ✓ Discover, access and understand
- ✓ Load, store, model, retrieve
- ✓ Transform, harmonize, integrate
- ✓ Access, derive, catalogue
- ✓ Use (prepare, visualise, analyse…)
- ✓ Manage as an asset
- ✓ Secure

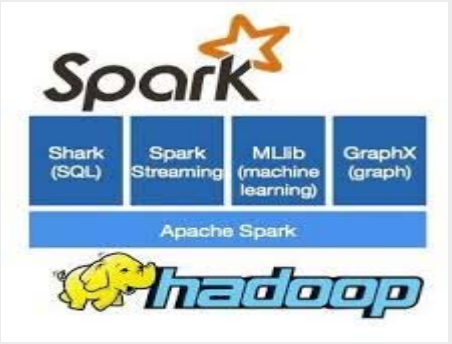
Capability Groups



Key Building Blocks



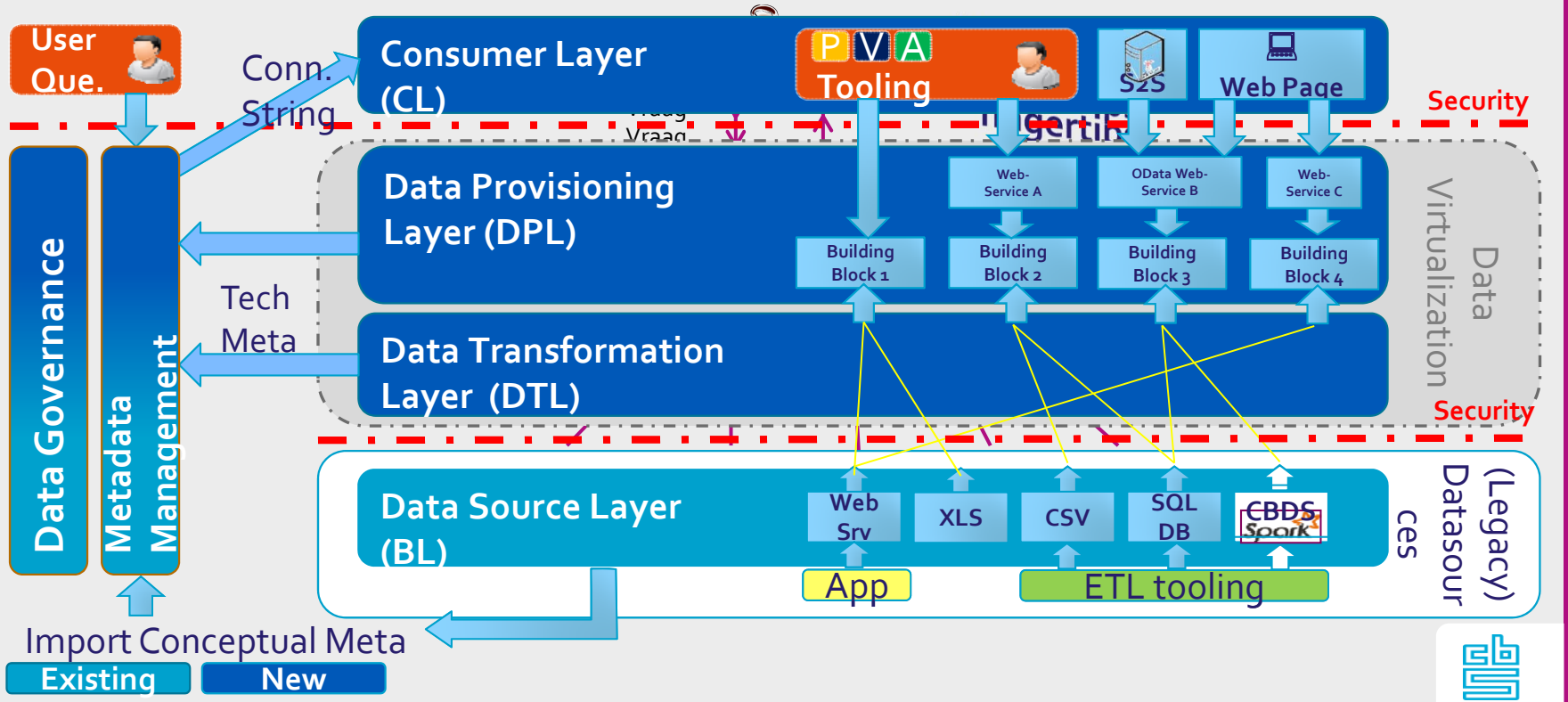
- ✓ Metadata Model
- ✓ Semantic Technology
- ✓ Data Virtualisation
- ✓ Big Data Platform
- ✓ Self-Service BI / workflow orchestration



What does the Data lake offer?

- **Metadatamodel** that describes statistical data in a formal and exact way to map any statistical dataset to model represented as a graph and use meta to find data (including ranking)
- **Metadata management system** to manage and harvest technical & conceptual metadata
- **Data Governance and Security model** for managing and securing (shared) virtual datasets
- **Virtualisation** to decouple Data Source Layer from Consumer Layer and create virtual datasets / virtual views in order to retrieve, combine and process data without moving or copying data
- **Front end** that is user-friendly and self-supporting by making use of a Data Preparation Tool

Data Architecture Layers

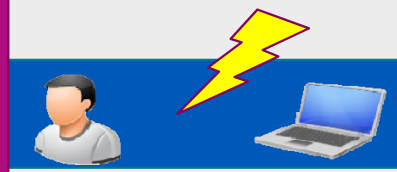


supply | demand


Yeah great
but how about the
Statistical Business
Register ???

From…

Clients;
- At a set time, specifically designed and with a set content (inflexible)
- More “custom fit” datasets needed
- Have limited opportunities to create datasets themselves
- Increasing demand for SBR derived datasets



Systems;
- Retrieve SBR data periodically
- Inflexible
- Not all data used
- Custom fit datasets made “by hand”

SBR Process-environment;
- Complex, heavy knowledge on content **and** techn ique needed
- Technically direct coupled to statistical production processes → effect on stability of total process
- Not “in rest” → **Live Register**
- Snapshots and frozen frames in same system and from same system to clients

SBR

(Legac y) Databa

To:

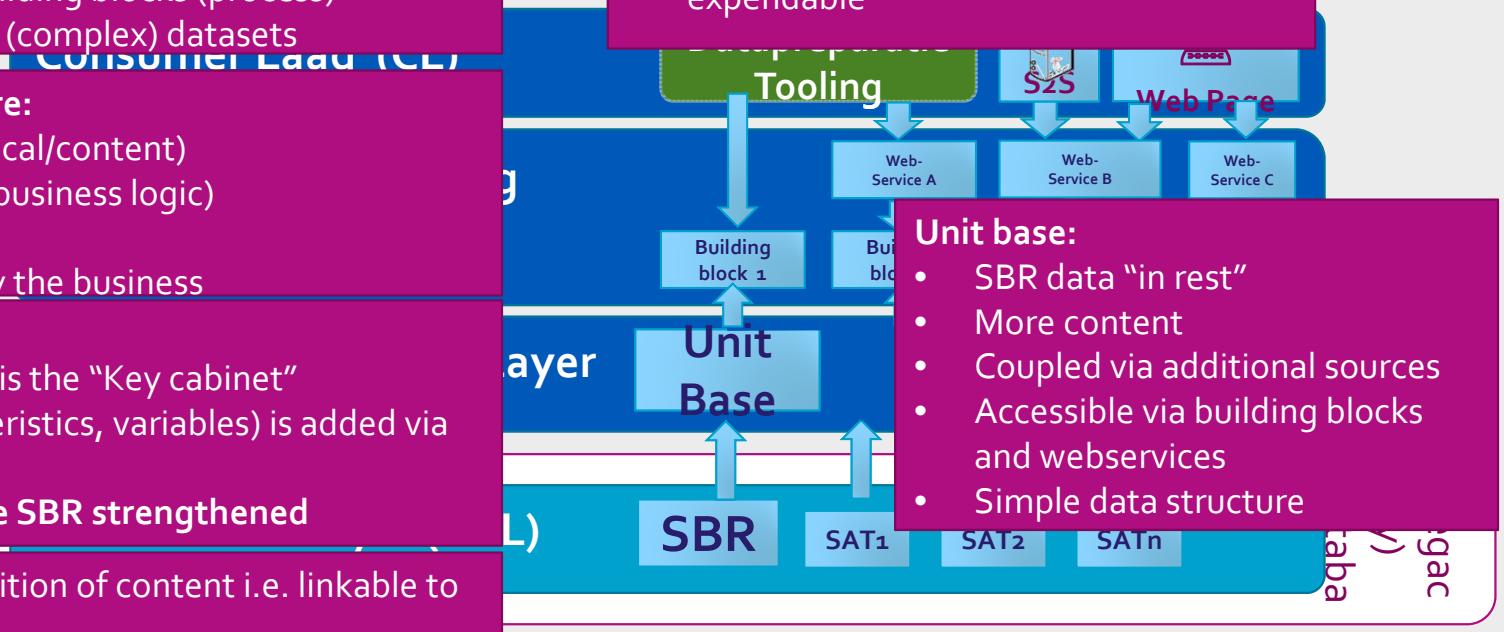
Data preparation tooling:
- Easy use of building blocks (process)
- Easy access to (complex) datasets

Building blocks are:
- Simple (technical/content)
- Coordinated (business logic)
- "On demand"
- Expandable by the business

DTL:
- The Unit base is the "Key cabinet"
- Data (characteristics, variables) is added via the satellites
- **Backbone role SBR strengthened**

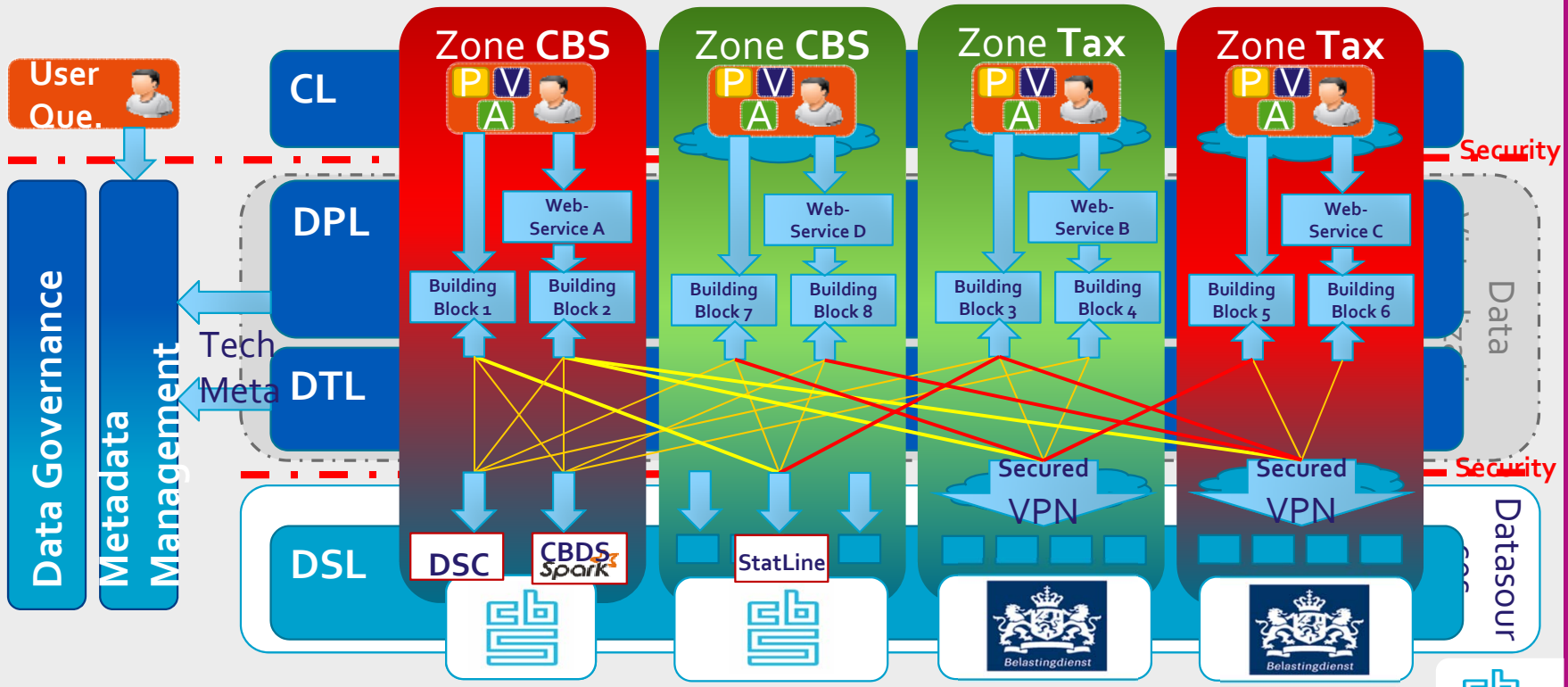
- Unlimited addition of content i.e. linkable to Unit Base
- Outside SBR (system)
- **SBR as a core of SU, not complicated by surplus data**

- Systems coupled via webservices
- Data "on demand"
- Webservices easy adjustable and expendable



Unit base:
- SBR data "in rest"
- More content
- Coupled via additional sources
- Accessible via building blocks and webservices
- Simple data structure

Statistics Netherlands: national data hub



Restricted | Open

CL=Consumer Layer | DPL=Data Provisioning Layer
DTL=Data Transformation Layer | DSL=Data Source Layer

P = Data Prep | V = Data Visualization | A = Data Analytics

supply | demand

Recommendations

- Check whether your **strategy** is in line with your plans (v.v.)
- Start **experimenting with Data Virtualization** in an early stage
- Build a culture that **embraces change** and **communicate** your plans as often as possible

Thank You!

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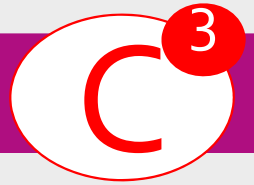
Data protection

- Privacy is guaranteed (confidentiality required by law)
- All staff are required to sign declaration of secrecy
- Data on individual persons are immediately separated from names and addresses
- Under the law, data may only be used for statistical purposes
- No other institution may claim access to data collected by

Data Virtualisation in a nutshell

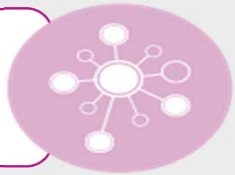


Connect

- **Connect** disparate data from any CBS source (DSC, Big Data, Cloud, Filesystem) or location

Combine

- Define (statistic) data transformations and **combinations** that meet the business needs.



Consume

- Deliver data services in real-time to the CBS data **consuming** platforms or tools.

What do we want to achieve with the Data Lake

Data Lake project – work in progress

Status	Topic	Description
Finished	4-layers Data Architecture	Possibility to decouple Data Source Layer from Consumer Layer and create virtual datasets / virtual views. Web Service interface implemented for business register EHB project demonstrated that architecture delivers benefits
Finished	Metadata Model	Develop Model that describes statistical data in formal and exact way. In theory it is possible to map any statistical dataset to model represented as a graph and use meta to find data (including ranking)
Finished	PoC Data Virtual	Successfully connected Denodo to Documentum Database (DSC) / improved query possibility & performance boost
In Progress	PoC Metadata	Implement metadata model in PoolParty semantic web platform, harvest technical & conceptual metadata and provide URL to DV platform
In progress	Connect Data Sources	Expand number of Data Sources to improve usability of test platform. Perform stress tests
Scope defi	PoC Multi-Zone DV	Use Data Lake as a research platform for distributed data. Implement secure infrastructure
	Data Governance and Secur	Define Data Governance for managing and securing virtual datasets