SYNERGY

BD4OPEM

This project has received funding from the **European Union's Horizon 2020 Research** and **Innovation programme** under Grant Agreement No **872734**

Digitising and transforming European industry and services: digital innovation hubs and platforms

Alignment for Data Week Session

Daniel Brandt, project manager Sustainable Innovation.

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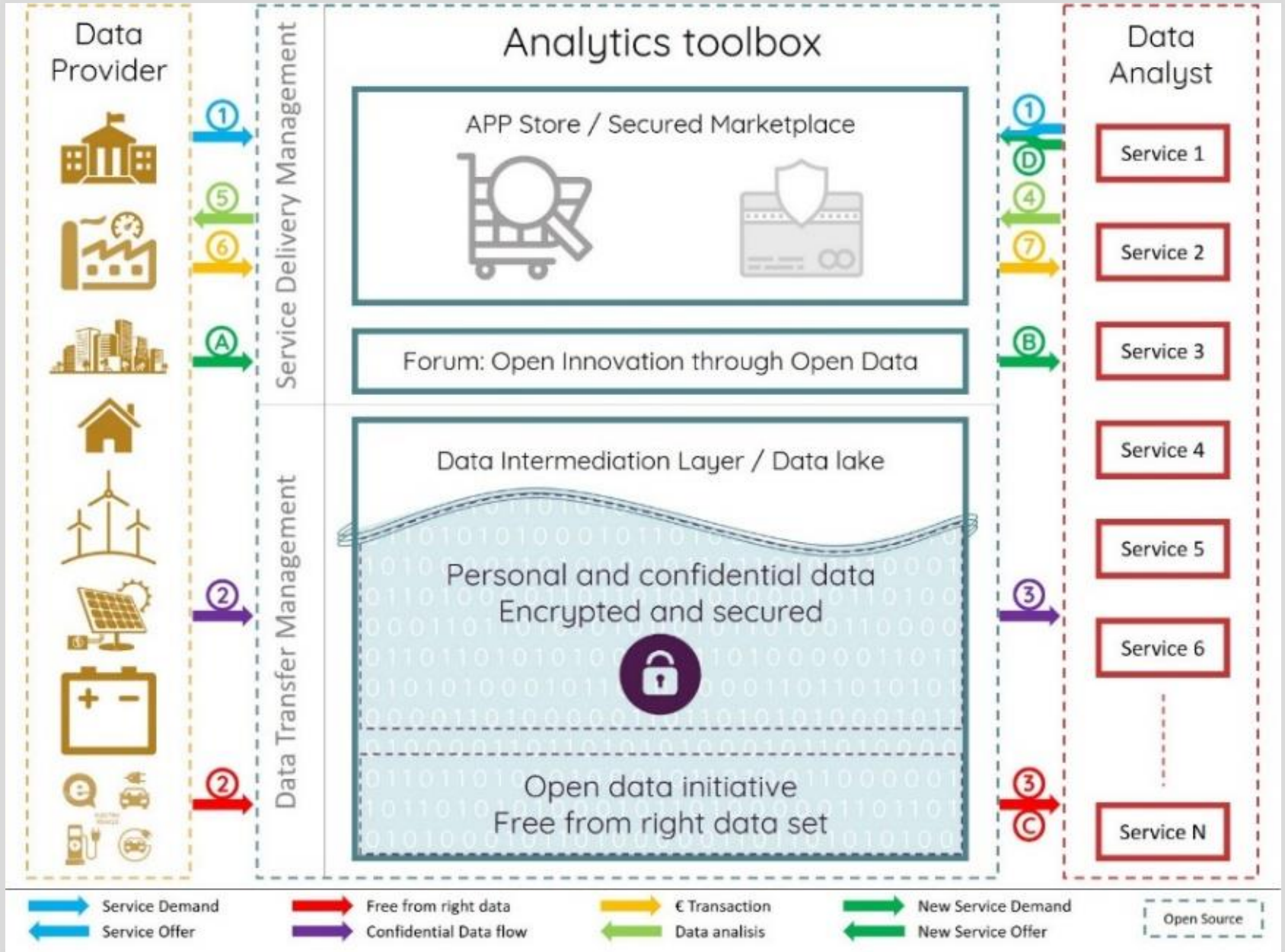

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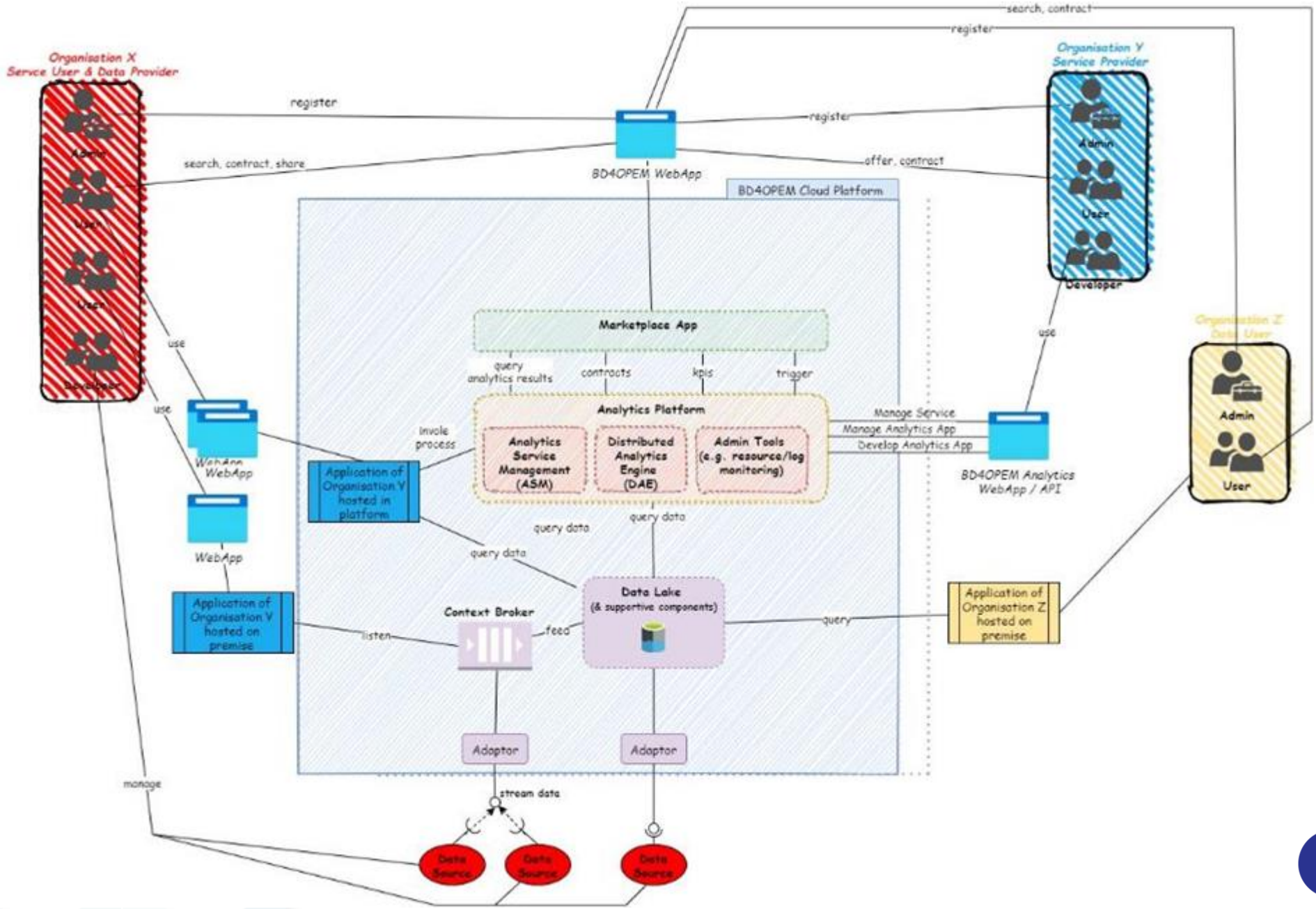
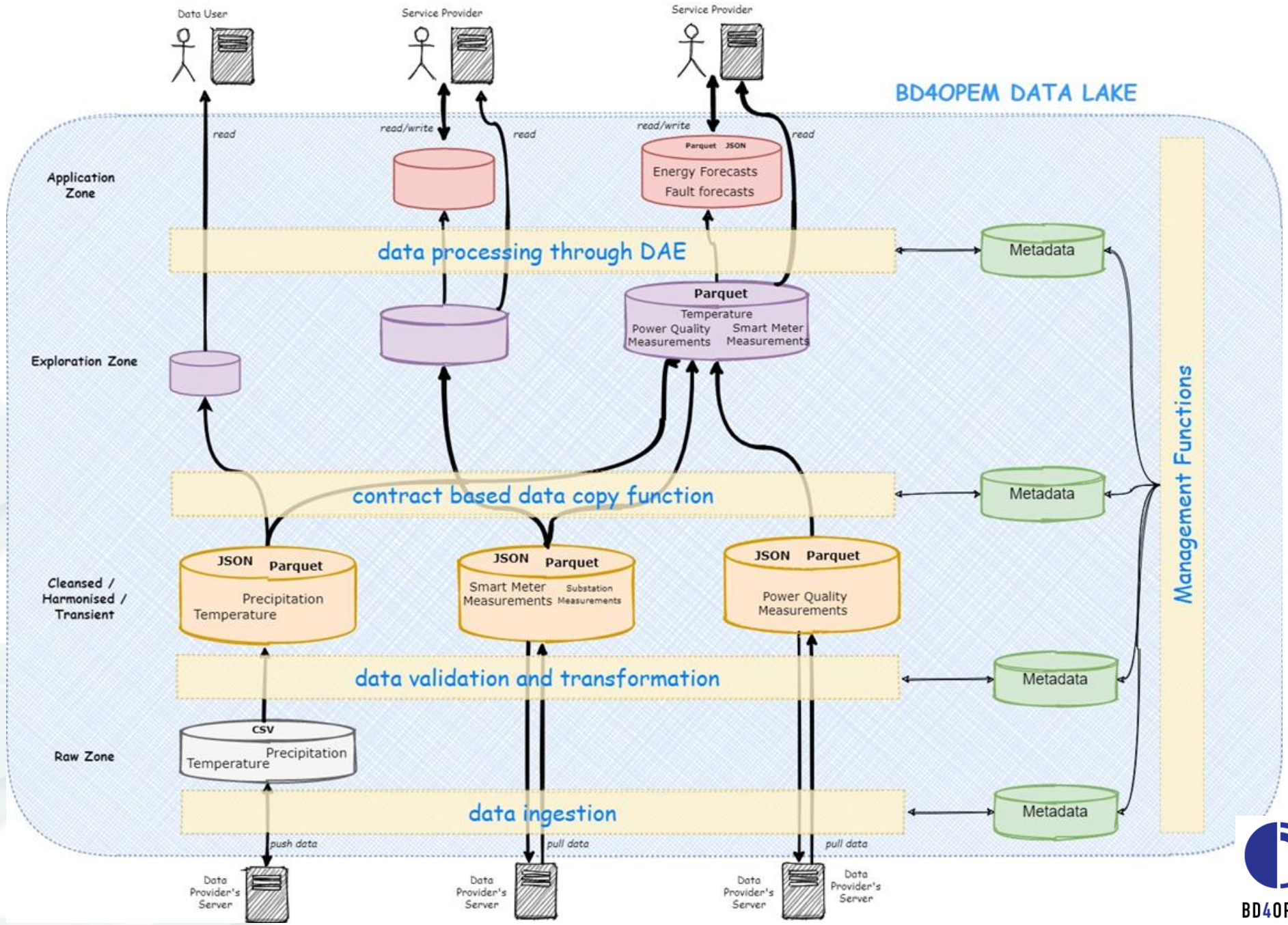
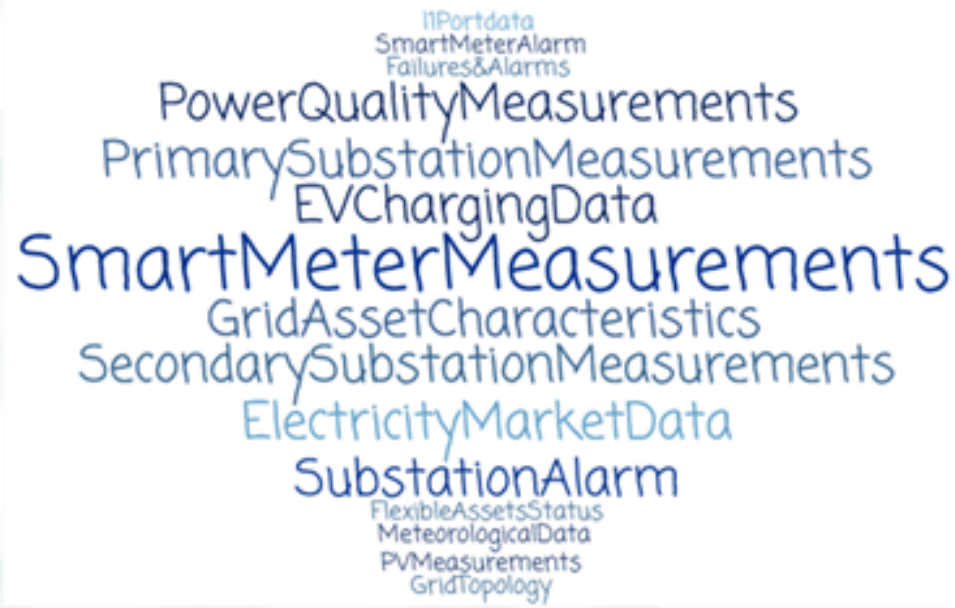

Organisation X
Service User & Data Provider
Admin
User
User
Developer
register
search, contract, share
BD4OPEM WebApp
search, contract
register
Organisation Y
Service Provider
Admin
User
Developer
register
offer, contract
BD4OPEM Cloud Platform
Marketplace App
query analytics results
contracts
kpis
trigger
Analytics Platform
Analytics Service Management (ASM)
Distributed Analytics Engine (DAE)
Admin Tools (e.g. resource/log monitoring)
invole process
Application of Organisation Y hosted in platform
query data
query data
query data
Manage Service
Manage Analytics App
Develop Analytics App
BD4OPEM Analytics WebApp / API
use
use
use
WebApp
WebApp
Application of Organisation X hosted on premise
Context Broker
listen
feed
Data Lake
(& supportive components)
query
Application of Organisation Z hosted on premise
Organisation Z
Data User
Admin
User
Adaptor
Adaptor
manage
stream data
Data Source
Data Source
Data Source


Data User
Service Provider
Service Provider
BD4OPEM DATA LAKE
read
read/write
read
read/write
read
Parquet JSON
Energy Forecasts
Fault forecasts
Application Zone
data processing through DAE
Metadata
Parquet
Temperature
Power Quality Measurements
Smart Meter Measurements
Exploration Zone
contract based data copy function
Metadata
JSON Parquet
Precipitation
Temperature
JSON Parquet
Smart Meter Measurements
Substation Measurements
JSON Parquet
Power Quality Measurements
Cleansed / Harmonised / Transient
data validation and transformation
Metadata
CSV
Temperature
Precipitation
Raw Zone
data ingestion
Metadata
Management Functions
push data
pull data
pull data
Data Provider's Server
Data Provider's Server
Data Provider's Server
Data Provider's Server

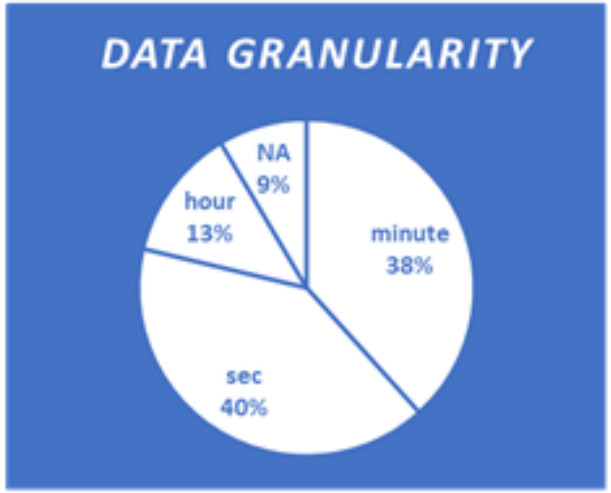
[Project] Platforms, Tools and Solutions Overview

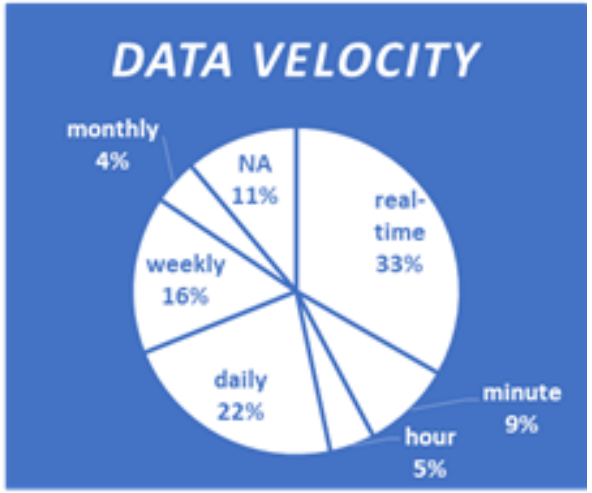
Daily Volumes ~k GB/Day

Annual Volumes ~ TB/Year



DATA DIVERSITY – 25 DIFFERENT DATA TYPES





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Real-life Demonstration & Usage Metrics (demo sites, demo cases, platform usage metrics, interesting facts)

- Service developer, SME
  - Data from many different systems are individually available, but to get interoperability of the data into a single service has been quite difficult.
  - One of the main activities was to identify all the data sources and be able to gather all that data in a joint dataset that is integrated into a dedicated database that services [that is developing] can use.
  - Different departments within a DSO (or corporate group) are trying to embrace the digital revolution but develop their own respective systems to improve their activities.
    - For e.g. a customer database for invoicing, and another database for managing the grid network, both using smart meter data but with no connection between them.

BD4OPEM has been an opportunity to gather all datasets in the same place and try to give the same type of data structure across different geographies, (so that voltage data in Spain is the same as in Slovenia).

Real-life Demonstration & Usage Metrics (demo sites, demo cases, platform usage metrics, interesting facts)

Academic service developer

- It has been very useful to have the point of view of the pilot sites to ensure that the services that are being developed have relevance for the pilot sites.
- Good to have different pilot sites for one service (with different data), to learn how the service should be developed to deal with different data types, and from different countries to ensure that models are usable in different contexts.

Real-life Demonstration & Usage Metrics (demo sites, demo cases, platform usage metrics, interesting facts)

- DSO Pilot site:
  - Besides the data that the company uses on a regular basis (Smart meter data for invoicing e.g.), other types of data have been hard to get at a good quality.
    - Transformer data such as supervisor data that is not even recorded or managed in a good manner.
      - "Data that is not a part of the core business is much less obvious to record or keep with good quality."

Lessons learned from BD4OPEM:

Data is **very** important, it is worth putting time and effort into storing and managing data that is currently not being used for anything particular, but that can be of use in the future.

- "Can only act on what you have and what you know"

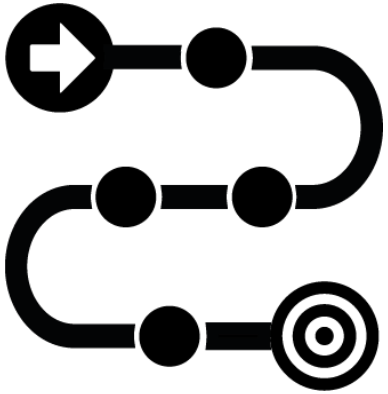
Data Sharing-driven Business Value (Applications Delivered in [BD4OPEM], focusing on the data sharing involved)

Business **actors**:

- Data providers
- Data analysts (algorithm developers and service developers)
- Service users
- Marketplace operator

- Business **value** from data-driven services focused on

Monitoring

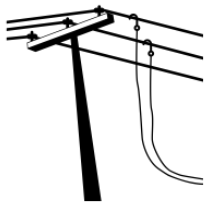


Operation and maintenance

Planning

Data Sharing-driven Business Value (Applications Delivered in [BD4OPEM], focusing on the data sharing involved)

Category	Service in BD4OPEM
Operation and Maintenance	S1.1 Topology
	S1.2 Observability
	S1.3 Predictive maintenance in electrical power systems
	S2.1 Measurement errors detection
	S3.1 Grid distrurbance simulations
	S3.2 Impact study PV, EV & new loads
Fraud Detection	S4.1 Inconsistences in energy balance and power-voltage
	S4.2 Fraud patterns detection
Flexibility and Demand Response	S5.1 Flexibility Forecast
	S5.2 Flexibility aggregated services for BRPs
	S5.3 Flexibility aggregated services for DSOs
	S5.4 EV to Grid
Smart houses, buildings and industries	S6.1 Energy management at household or at community level
	S6.2 Demand estimation
Trading	S7.1 P2P trading
Planning	S8.1 Asset and investment planning
	S8.2 Asset estimation optimization for microgrids
Monitoring	S9.1 Grid KPIs



Data Sharing-driven Business Value (Applications Delivered in [BD4OPEM], focusing on the data sharing involved)

- Service developer, SME
  - Pushed forward the idea of having stand-alone systems that are automatic enough to work on the platform (BD4OPEM Platform), services that require less human “intervention” to get them to work. It means less of data-alignment for every single new customer.
    - Promoted the development of a standardized system that customers must adapt to.

Data Sharing-driven Business Value (Applications Delivered in [BD4OPEM], focusing on the data sharing involved)

Academic service developer

- Without real data it is very hard to develop models that provide realistic results with high quality.
- E.g., fraud Detection - synthetic data doesn’t work in reality. It must be real data, and then changing to real data one might have to change the model or approach which adds more work, and the results might not be as accurate as they should be to have real world impact.
- Gaining access to real data to develop models/services/solutions increases in the credibility of the academic institution as the research is closer to reality.

Data Sharing-driven Business Value (Applications Delivered in [BD4OPEM], focusing on the data sharing involved)

- DSO Pilot site:
  - Selling data, data that is not even being used currently,
  - Solve problems that we do not even know that we have
    - Tailored solutions with service providers
    - Since we didn't use the data, we didn't know, by sharing it, 3rd parties can help detect errors and provide tailors / customized solutions to solve those issues.

Experiences and Lessons Learnt from a Technical Perspective

Challenges – opportunities (lessons learnt)

- **ICT infrastructure and technology** - real-time data not always available from smart meters
- **Data collection and governance** – data sets might not always have sufficient quality to develop data-driven services
- **Data integration and sharing** - the interoperability of data sets and data-driven solutions is key for adopting global solutions
- **Security, privacy and legal issues** – to be guaranteed in any data process

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Experiences and Lessons Learnt from a Technical Perspective

- Service developer, SME
  - Governance of data (who has access to which data, when, and, under which circumstances) is very important.
    - Personal, technical information needs a well-defined governance process, absolutely necessary for platforms like BD4OPEM (or big energy data platforms),

Experiences and Lessons Learnt from a Technical Perspective

Academic service developer

- A lot of time is spent on bureaucracy when trying to access real data. Wastes a lot of time on paperwork that could be spent on doing research
- If there was an open academic dataspace within the EU for researcher to access every different type of energy data, with no metadata (GIS, SM identification etc) it could help to speed up research & development of services.
- It is not easy when different partners bring in their own technologies into a project that they want to continue to develop, but the idea is to develop the “same” service.

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Experiences and Lessons Learnt from a Technical Perspective

- <u>DSO Pilot site:</u>
  - Realized how disorganized the data organization is within the company, also the rest of the companies (DSO, Energy generation, retailer, telecom) within the group.
  - Within EU standards, big differences between different energy companies.
  - Strong process of harmonization is needed in order to develop services, DSOs should come together.
  - Most important is interoperability, the energy sector is not interoperable at all.
  - DSO is like a black box, working on its own, having its own providers, services, software with its respective standards and not connected at all with others. SM in Spain regulated. But energy data from transformers, some excel file, others json file, totally different approaches. "Too many platforms"

  - Harmonization of data is a devious task, to get it into formats that can be used.

    "Don't start building projects if you don't know that you can get good data"

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Experiences and Lessons Learnt from a Technical Perspective

- IT Infrastructure partner.
- Interaction with Azure solution presented difficulties but those were related in its majority to the previous absence of knowledge on this tool. Hence, the learning curve had to be completed before putting it to work.
  - Hence, prior starting a work such like this there is a clear need to evaluate the kind of additional effort that will be required.

- Additional hurdles relate to potential changes in the team working on these activities: one must make sure proper documentation is in place to make the transition as smoothest as possible.

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Project Presentation Contents

- Experiences and Lessons Learnt from a Business/Demo Perspective

  - Through engagement with dozens and dozens of stakeholders, both within and outside of the project – there is a clear need for a big dataspace within the energy sector that can deal with data quality, data governance, data ingestion and data interoperability.

  - As for the services developed within BD4OPEM, there is certainly a need for them as confirmed both by pilot sites and stakeholders. A lot of them are developed both within R&I Action projects and by everything from startups to global corporations.

  The main conclusion from business perspective is that “Data cleaning” (as described previously) is where the money is. It is the single most common pain that all stakeholders have expressed.

  It takes a massive amount of time to gather, store, sort, manage, share and use big data from all stakeholders involved in the energy grid.

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Discussion

- **Data harmonization and standardization** is essential for a fluent communication between Data Providers and Service Providers and permits generalization.

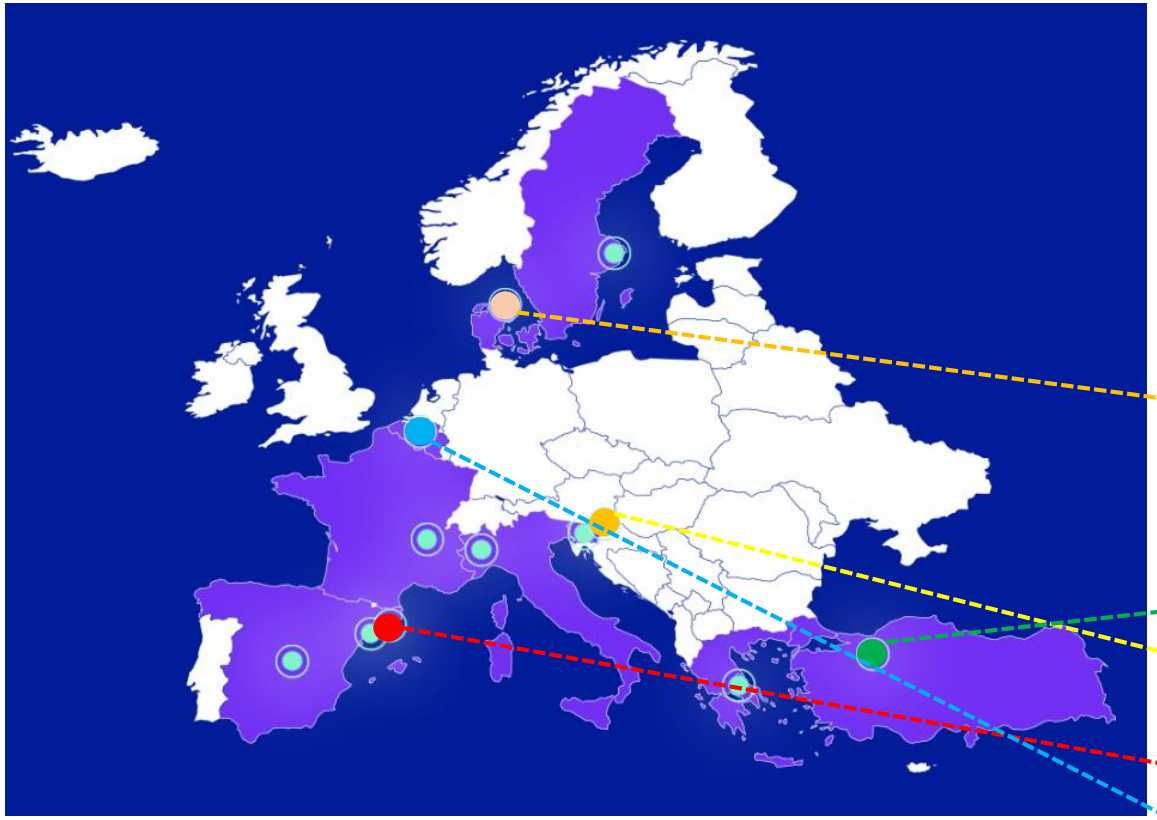
- Investing resources in **data cleansing and preprocessing** techniques improves data quality and, consequently, Energy Services performance.

- Through **big data processing and analysis tools**, the services can use and analyze large volumes of data in an adequate processing time. This enables some energy services to make real-time data-driven decisions.

- **Data-driven services development** benefits from **heterogeneous data sources** from **different countries**, as it boosts its performance.

- Services development driven by actual data from the pilot sites (Data Providers), paves the way for future **implementations**, as the results obtained have been validated in a similar environment to the real one

Consortium



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