



# Reportnet Architecture

## An Overview

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# 1. Introduction

## 1.1 Background

The European Environment Agency (EEA) has developed an IT infrastructure for supporting and improving the environmental data and information flows, called Reportnet (<https://www.eionet.europa.eu/reportnet>). Reportnet was initially developed for the reporting in the European Information and Observation Network (Eionet, <http://www.eionet.europa.eu>) network. However, Reportnet is increasingly also hosting some of the reporting tasks of DG Environment and other regional and international organisations (e.g. United Nations Economic Commission for Europe, UNECE). The open system permits deliveries to various national, regional and international organisations in a very transparent way. Reportnet aim to improve the harmonisation and standardisation of the management of all Eionet dataflows by covering all activities inside them.

The development of Reportnet started in 2000 and it has been operational since 2002. The Reportnet project was initially positioned as being part of the Common Interest Projects in the context of the IDABC programme managed by the European Commission (<http://ec.europa.eu/idabc/>). The IDABC programme has since been superseded by the ISA<sup>2</sup> Programme (<https://ec.europa.eu/isa2>), which has developed the European Interoperability Framework (EIF, <https://ec.europa.eu/isa2/eif/en>) and the European Interoperability Reference Architecture (<https://ec.europa.eu/isa2/solutions/eira/en>). Both EIF and EIRA are increasingly relevant frameworks for Reportnet, as interoperability is becoming more and more important for Reportnet. Using the EIF classification, Reportnet can be positioned on the Semantic and Technology interoperability layers, whereas the Eionet network would be on the Organisational Interoperability layer governing and managing Reportnet.

## 1.2 Purpose and structure of this document

The purpose of this document is to provide an overview of the architecture and functionalities of the Reportnet IT systems and how they support the required reporting processes in environmental reporting. For a structured and coherent representation of this rather complex topic, the document will be structured according to the architectural layers in the ArchiMate enterprise architecture modelling language. ArchiMate is a widely-used open standard also promoted and used by ISA<sup>2</sup> in EIF and EIRA.

The structure of the document is as follows:

**Section 1 (Introduction)** provides the background to Reportnet and to this document.

**Section 2 (Motivation for Reportnet)** provides the main drivers, goals and requirements for Reportnet.

**Section 3 (Business Architecture Layer)** provides an overview of the roles, actors, key concepts and reporting processes Reportnet as a suite of IT tools is designed to support.

**Section 4 (Application Architecture Layer)** provides a high-level description of the Reportnet application architecture. It lists the main Application Services and Components which make up the Reportnet suite of applications.

**Section 5 (Technology Architecture Layer)** describes the implementation technologies that have been used for implementing the application services and components in



Reportnet. It also describes the current server and deployment setup, which is utilising virtualisation and containerisation.

**Section 6 (Implementation and migration)** describes the software development methodology and future plans for improving Reportnet applications.

**Sections 7-16** – provide more detailed descriptions of the main Reportnet applications.

### 1.3 Intended Audience and Reading Suggestions

This document is meant to serve as an introductory overview for both thematic and technical IT experts working with Reportnet (e.g. project managers, environmental experts, IT developers and architects). This document can also be useful for other interested readers who want to understand the key principles and processes behind Reportnet and the way in which it has been implemented.

### 1.4 Definitions, Acronyms, and Abbreviations

EEA	European Environment agency
Eionet	European Environment Information and Observation Network
IDABC	Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens. (IDABC has been closed, and the work continues in the ISA <sup>2</sup> programme).
ISA <sup>2</sup>	Interoperability solutions for public administrations, businesses and citizens.
EIF	European Interoperability Framework
EIRA	European Interoperability Reference Architecture
ArchiMate	An open standard Enterprise Architecture Modeling Language. Promoted by ISA2 programme.
ETC	European Topic Centre
NRC	National Reference Centre
NFP	National Focal Point
EUR-Lex	A service on the official website of the European Union. It provides legal texts of the union.
Eurostat	Statistical Office of the European Communities

### 1.5 References

Eionet	<a href="http://www.eionet.europa.eu/about/">http://www.eionet.europa.eu/about/</a>
IDABC programme	<a href="http://ec.europa.eu/idabc/">http://ec.europa.eu/idabc/</a>
ISA <sup>2</sup> Programme	<a href="https://ec.europa.eu/isa2">https://ec.europa.eu/isa2</a>
European Interoperability Framework	<a href="https://ec.europa.eu/isa2/eif_en">https://ec.europa.eu/isa2/eif_en</a>
ArchiMate	<a href="http://www.opengroup.org/subjectareas/enterprise/archimate-overview">http://www.opengroup.org/subjectareas/enterprise/archimate-overview</a>
Reportnet documents	<a href="https://svn.eionet.europa.eu/repositories/Reportnet/docs">https://svn.eionet.europa.eu/repositories/Reportnet/docs</a>



## 2. Motivation for Reportnet

### 2.1 Drivers and Goals

Since the establishment of the Eionet network, it has been observed that the reporting burden which member countries have towards international organisations, including EEA, steadily increase. This is caused by an increasing number of legal and moral obligations on which countries should respond in impending deadlines. Earlier practices in environmental reporting with limited harmonisation between different dataflows, has resulted countries delivering the same data to different organisations with different exchange formats. Similar working practices lead to the reality that if member countries do not share data, methodologies, tools and experience between each other, the overall reporting system will be inefficient and wasteful.

The main objective of the Reportnet IT systems is to overcome those drawbacks and reduce the effort needed for producing environmental data by increasing the efficiency and productivity for the reporters and other stakeholders.

### 2.2 Main requirements

The above goals set for Reportnet, can be achieved by providing a set of common tools and a technical infrastructure for defining, collecting, transferring, editing, analysing and streamlining environmental data. The Reportnet architecture is required to provide a framework of data standards, applications and interoperability mechanisms that enable information exchange and sharing within and between information systems.

Although development of an IT platform to fulfil these requirements is complicated, proper use of modern information technologies, standards and methods (e.g. web-based applications, cloud computing, XML, RDF and Agile/Lean methodologies) has provided an appropriate foundation for achieving this. The following sections of this document describes these aspects in more detail.



## 3. Business Architecture Layer

### 3.1 Roles and actors

The main organisational body when it comes to environmental reporting in the context of Reportnet is the **European Environment Information and Observation Network (Eionet)**, which is a partnership network of the **European Environment Agency (EEA)** and its member and cooperating countries. It consists of the EEA itself, six **European Topic Centres (ETCs)** and a network of around 1000 experts from 39 countries in up to 400 national bodies dealing with environmental information. These experts are **the National Focal Points (NFPs)** and the **National Reference Centres (NRCs)**.

#### 3.1.1 European Environment Agency

The European Environment Agency (EEA) is an agency of the European Union whose task is to provide sound, independent information on the environment. The EEA's mandate is to help the Community and member countries make informed decisions about improving the environment, and to coordinate the European environment information and observation network (Eionet).

#### 3.1.2 European Topic Centres

The European Topic Centres (ETCs) are centres of thematic expertise contracted by the EEA to undertake specific tasks identified in the EEA work programme. Naturally the ETCs play an important role in the data reporting process, often with a strong emphasis on the quality analysis of delivered data.

#### 3.1.3 National Focal Points

The National Focal Points (NFPs) are the main contact points for the EEA in the member countries. They are in charge of cooperation with the EEA and the ETCs and organise the national coordination of activities. NFPs maintain and develop the national network and coordinate requests and deliveries between the national and the EU level. In terms of Eionet dataflows, NFPs sometimes submit the requested data, acting hence as the national data provider. However, the actual delivery of data is often delegated to the National Reference Centres (NRCs).

#### 3.1.4 National Reference Centres

National Reference Centres (NRCs) are nationally appointed experts, which are providers of environmental data to the European and international level. Like NFPs, the activities of NRCs are funded by member countries. NRCs are established in specific environmental areas.

#### 3.1.5 Business reporters

Some data is delivered by businesses. E.g. Ozone Depleting Substances and Fluorinated Gases dataflows. The latter has over a thousand reporting companies. These communities are managed via a dedicated information system or a special branch in the Eionet directory.



### 3.1.6 European Commission (DG Environment and others)

Reportnet is increasingly supporting non-Eionet dataflows. For these dataflows, the coordination happens between different DGs in the European Commission and EEA.

## 3.2 *Business Objects (i.e. key concepts)*

In order to assess whether environment policies on both national and international level are working efficiently in practice, data and information are collected by the member states, reported and analysed at the EU level. In this section, the key terms and concepts that are important for understanding this reporting process are described. The definitions are taken from the EEA glossary and other EEA official documents.

### 3.2.1 Reporting obligation

Reporting obligation is a legal text defining the requirements that Member States should follow aiming to report environmental data in order to meet the international legal and moral obligations relevant to the European level. It represents the requirements to provide information agreed between countries and international bodies such as the EEA or other international conventions. Reporting obligations provide the basis for most environmental information flows.

### 3.2.2 Legal Instrument

The legal instrument is the legal basis for one or more reporting obligations. Each reporting obligation must be derived from one legal instrument. The legal instruments mostly represent a set of official documents of the EU that are usually published on the EUR-Lex but other kinds of legal instruments may be included such as various international conventions.

### 3.2.3 Dataflow

The dataflow projects deal with the analysis and description of obligations into, within and out of the EEA Reporting System, i.e. dataflow modelling. It focuses on organisational aspects of reporting, delivery formats, and how the data is to be processed into a data set. It covers deliveries from countries (NFPs and NRCs), via ETCs and international organisations (Eurostat, OECD, FAO, etc.) to the EEA repositories of data used in the reporting process.

### 3.2.4 Data set

The data sets contain aggregated environmental data at European level. They cover at least the 28 EU Member States, but in many cases, a pan-European coverage of 52 countries is available. Graphs and maps can be generated from the data sets. Information about the source of each data set and its geographical and temporal coverage is attached. In the Reportnet system, a dataset is a collection of tables containing the reported data. Usually datasets are provided in the form of MS Access databases or MS Excel files. They are subject to certain dataflows and obliged to be reported by Reportnet players according to current legislation. A data set is normally produced in the Common Work Space. Publishing it makes it a data product.



### 3.2.5 Data product

After the data in a dataflow is collected via Reportnet, it is then used to create different kinds of data products (including data sets, maps, indicators and graphs). The data products are published in the EEA data service: <https://www.eea.europa.eu/data-and-maps>.



### 3.3 Business Processes

#### 3.3.1 Overview

Figure 1 shows a high-level overview of the business process the Reportnet platform enables and supports. As seen from the figure, the reporting process consists of several sub-processes, which are shortly explained in the following subsections.



Figure 1. The overall reporting process, which Reportnet supports

#### 3.3.2 Define reporting requirements

In a larger view, this activity can be seen as the long process of drafting the legal directives and implementing regulations, although from the perspective of Reportnet it is rather about transferring these legal texts into concrete specifications that can be implemented in the different Reportnet components to facilitate the reporting.

Responsible for transferring this information, often laid out in an implementing regulation or directive, into concrete specifications that can be implemented in Reportnet is the EEA in co-operation with the relevant ETC and European Commission Directorate-General.

The main questions that this activity needs to provide answers for are:

1. Who needs to report?
2. When is the report due?
3. To whom should it be reported?
4. Who are the reporters nominated to facilitate the actual reporting?
5. What is the specification of the information to report, looking at the fields and their potential values? What reference data should be used for code lists?
6. What is the process to ensure high quality reports? Where in the reporting workflow does quality control need to take place, and what is the definition of those rules?

The main Reportnet modules supporting this step are the Reporting Obligations Database, the Data Dictionary and the Eionet Directory.

#### 3.3.3 Implement delivery mechanism

With the requirements defined, the next step is to implement those in the respective Reportnet components. Reportnet is agnostic to the format of the information delivered in the sense it allows delivery in any file format. When the contents of the reports have to be automatically processed, for example to perform quality control or to produce a European dataset, the underlying format needs to be XML though. While exchanging information in XML-format is a widely used practice, the nature of the reporting obligation and the capability of the reporting entities can sometimes lead to that supplementary tools are provided for the practical reporting. Such tools commonly provided are web questionnaires and Excel templates. Abstracted away from the reporter is the fact that these tools themselves, or using a conversion service, generate the XML required.



Given most reporting obligations consist of structured information that should be automatically processed, the first task is often to design an XML-schema. This schema has a dual use, for the reporting entity it provides a detailed specification of the data to report, and in Reportnet it allows for assessing that the reports delivered follow the specification. Next other activities follow; the data model definition for the European dataset, reference data code-lists are produced, an eventual supplementary reporting tool is produced, a reporting workflow to steer the reporter through the process is set up, quality control rules are implemented and set to run at desired stages of the workflow, and finally a guidance document for the reporting is produced.

Stakeholders involved in this step are mainly the EEA business- and IT project managers, the ETC, and EEA contractors for IT. The main Reportnet modules supporting this step are the Data Dictionary, the Central Data Repository and the QA and conversion service.

### 3.3.4 Collect & quality control data

As soon as the reporting opens, the reporters can begin deliver their data. The general procedure is that, following the steps in the reporting guide, they take their prepared delivery, access the Central Data Repository Reportnet component, upload their data and submit it to the EEA. Upon submitting the data, the automatic quality control is initiated, and the reporter is then presented with feedback from the tests.

Depending on the outcome, either the reporter can finish their delivery successfully, or in case of quality issues, restart the workflow by uploading a corrected delivery. With the different reporting obligations having different needs, this workflow can be customised to a large extent. Common variations are on the quality level threshold for accepting a delivery, and inserting a manual feedback step where the ETC can review the delivery more carefully before the reporter can finish the reporting.

Stakeholders involved in this step are mainly the NRCs and NFPs performing the reporting, the EEA project manager and the ETC overseeing the process and quality control. Questions arising from the reporters are handled by the Eionet helpdesk or a specialised helpdesk for the reporting obligation. The main Reportnet modules supporting this step are the Central Data Repository and the QA and conversion service.

### 3.3.5 Create European dataset

If the previous steps in the reporting process have been successfully completed, there will be a delivery of data, with the quality level mandated, from each country uploaded and available on Reportnet. Due to the transparent nature of Reportnet, these deliveries are generally available for all interested parties unless the reporter has explicitly chosen to make it hidden, except to the required stakeholders. Still, most assessments and information products produced from these deliveries are built upon a dataset containing an aggregation of the deliveries into a European dataset, which also is a product of its own. Therefore the main task in this process step is collecting the respective delivery in Reportnet and transforming those into a database.

Stakeholders involved in this step are mainly the EEA IT-department in co-operation with its contractors. The main Reportnet components supporting this step are Central Data Repository and the Common Workspace.



### 3.3.6 Create and disseminate data products

In a closer look, this activity is in fact many activities spread over time that originates from the availability of high quality data dataset produced by the reporting process outlined above. In the immediate perspective, one of the key products is the analysis of the data, often provided by the EEA and its ETCs, for the institution having requested the reporting obligation. Other products that follow could be policy evaluation reports, indicators, maps and data visualisations.

As indicated in the diagram Figure 1: Reporting process, the creation and dissemination of the diverse set of products that are built upon these datasets is not part of the Reportnet platform. Instead, a variety of tools is used depending on the type of product to be produced. Generally, and unless it contains restricted information, the product is published on the EEA data service.



## 4. Application Architecture Layer

### 4.1 Overview

The Application architecture layer defines the Reportnet IT system in terms of application services and components, and Data Objects. It is a logical view, which shows what the systems do, how they work and the role of each part of the system. It presents the main interrelation between the components, where components implement a certain functionality, which is exposed to the rest of the architecture through one or more interfaces.

### 4.2 Application Components and Services

This section describes an overview of the application components and services in Reportnet. More details are described in the dedicated sections for each application component towards the end of this document (e.g. section 7 describes ROD).

#### 4.2.1 Reportnet Application Components

- **Reporting Obligations Database (ROD)** - Enables storing, searching, browsing and updating reporting obligations;
- **Data Dictionary (DD)** - Defines datasets and stores definitions of its data elements, their attributes, their data types, allowable values, and relationships between other elements
- **Central Data Repository (CDR)** - Uploads, downloads, versioning, approvals and sealing of official datasets, packaging for delivery, and tagging with meta-information;
- **Business Data Repository (BDR)** - A sibling application to CDR based on the same application technology product. BDR is used for reporting by commercial businesses instead of national authorities;
- **Web Questionnaires (WebQ)** - provides the reporters with a user-friendly web questionnaire for filling out the information requested by the reporting obligation.
- **Quality Assurance and Conversion service (XMLCONV)** - provides the reporting workflow with services for quality control and conversion of reports between different formats (e.g. XML to Excel).
- **Eionet Directory** - Allow user authentication, security services, getting contact information, and routing of workflow processes
- **Unified Notification System (UNS)** - Enables Eionet members to receive notifications about specific events
- **Data service** - Provides a central place for storing and merging reported deliveries which belongs to the same reporting obligations into one dataset;
- **Content Registry (CR)** - Enables the searching by meta-data information fields in reporting products in the Eionet;



### 4.3 Data Objects

This section describes the main Data Objects implemented in the Reportnet applications and how they relate to the Business Objects described section 3.2.

#### 4.3.1 Reporting Obligation

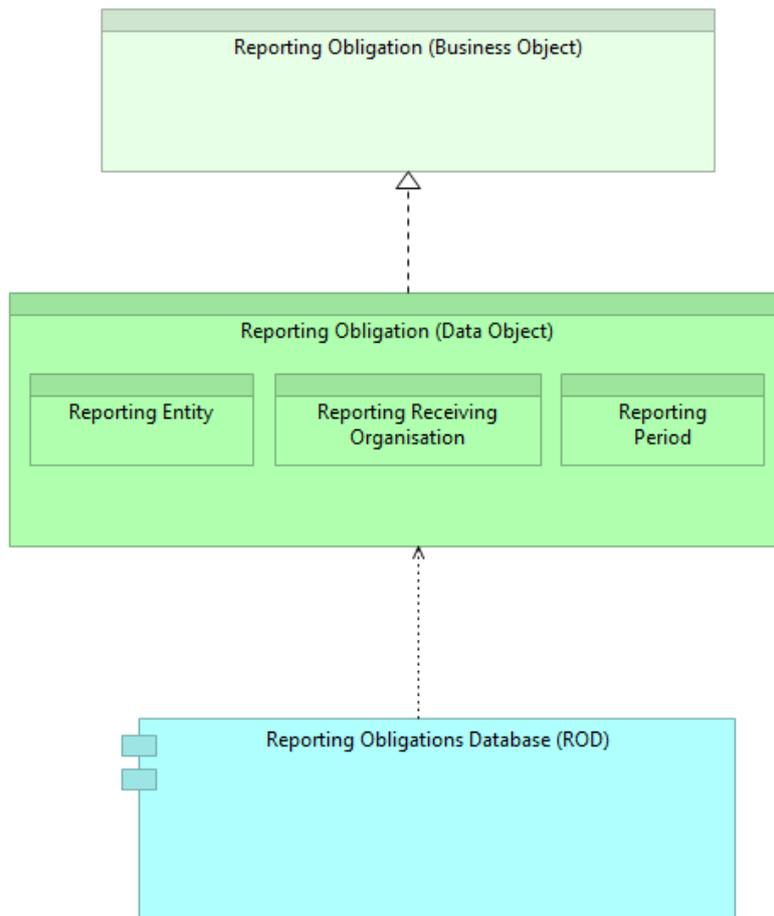


Figure 2 Realization of the Business Object "Reporting Obligation" as Data Objects.

For a given Reporting Obligation, a **Reporting Entity** (e.g. Finland) is the organisation or authority who is obliged to report data to the **Reporting Receiving Organisation** (e.g. EEA or DG Environment). **Reporting Period** defines the frequency of the data reporting (e.g. annual, bi-annual, continuous, etc.).



### 4.3.2 Dataflow

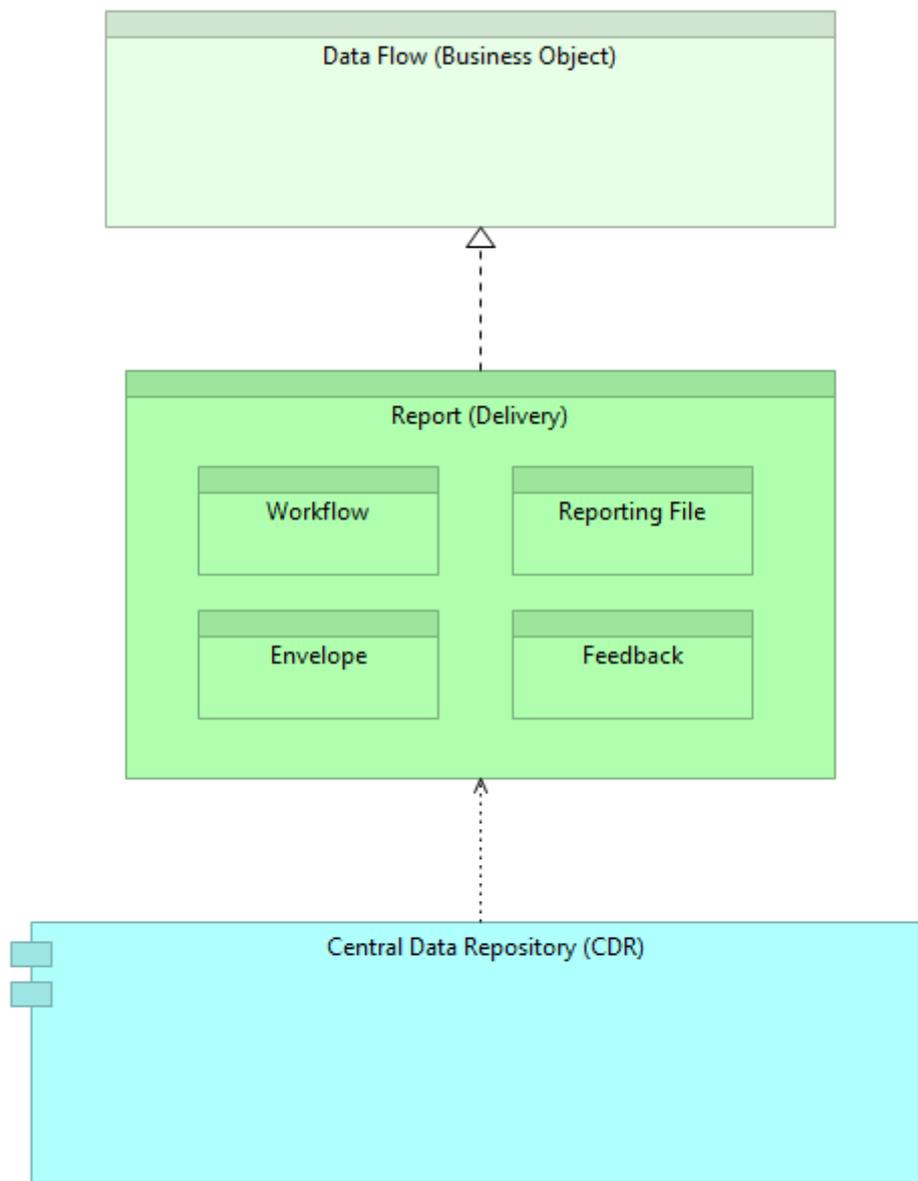


Figure 3 Realization of the Business Object "Dataflow" as Data Objects.

A **Report** (or Delivery) is made according to a specified **Workflow** that defines the steps in which the reporting is made for that Dataflow. The actual reporting data resides in a number of **Reporting Files**, which are collected in an **Envelope** (a kind of folder). The Envelope may contain both automatic and manual **Feedback** relating to the quality of the data.



### 4.3.3 Data Set

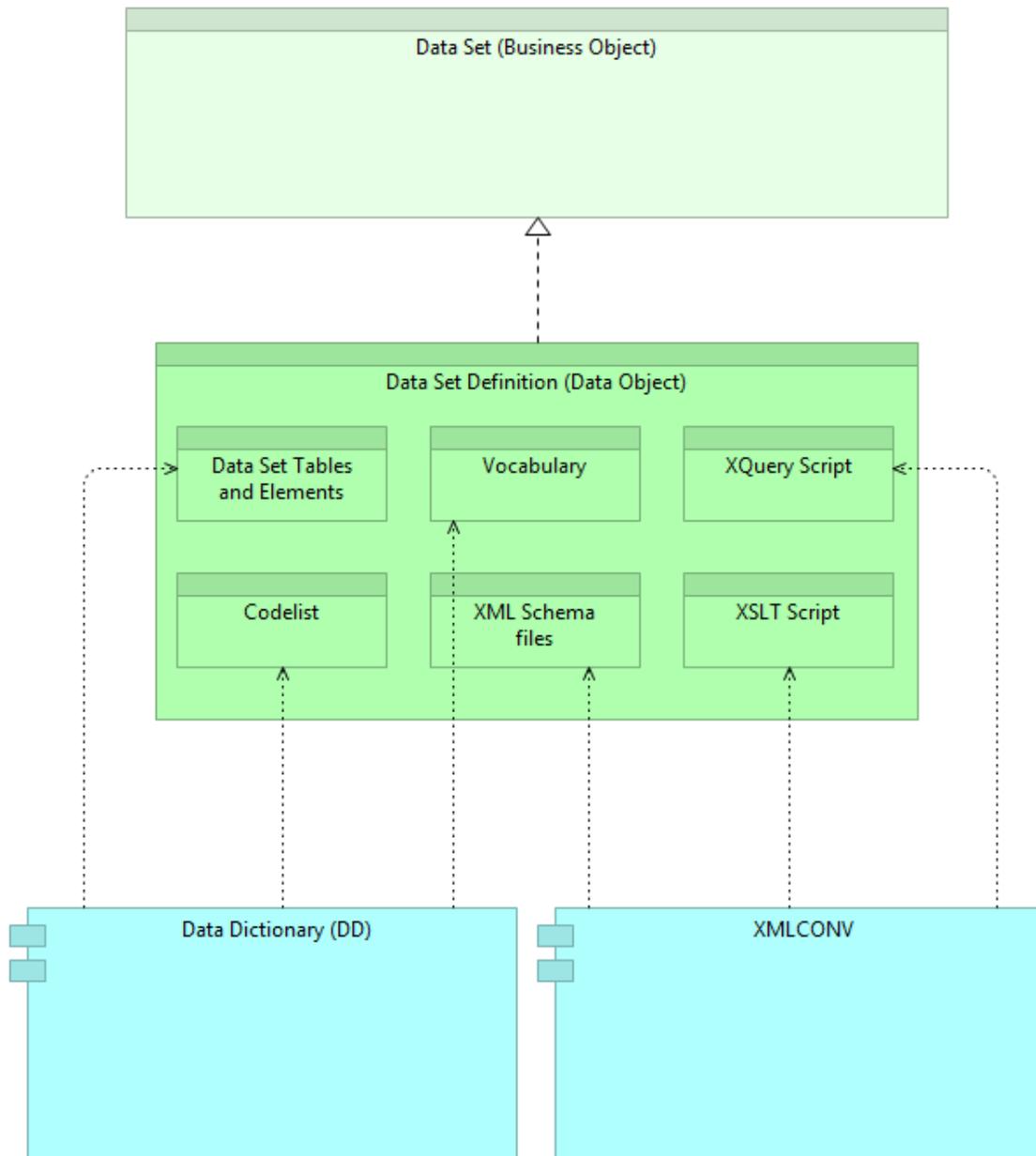


Figure 4 Realization of the Business Object "Data Set" as Data Objects.

The **Data Set Definition** is made up of **Data Set Table** and **Data Set Element** definitions. Reference data is specified using **Vocabularies** and **Code lists**, which can be shared between several Dataflows. The Data definitions can be exported to **XML Schema files**, which provide the technical data format specification for the reporting data. **XSLT Scripts** are used for data format conversions, whereas **XQuery scripts** define data quality rules, which the delivered reporting files shall adhere to. The XQuery scripts can be programmatically executed to provide automated Quality Control of the data.



## 4.4 Interaction between Reportnet Applications

Application integration between Reportnet components is supported by the set of standardised communication protocols. This section shows an overview of the most important interactions between the Reportnet components. For more details, see the specific sub-sections for each Reportnet application in sections 7 to **Error! Reference source not found.**

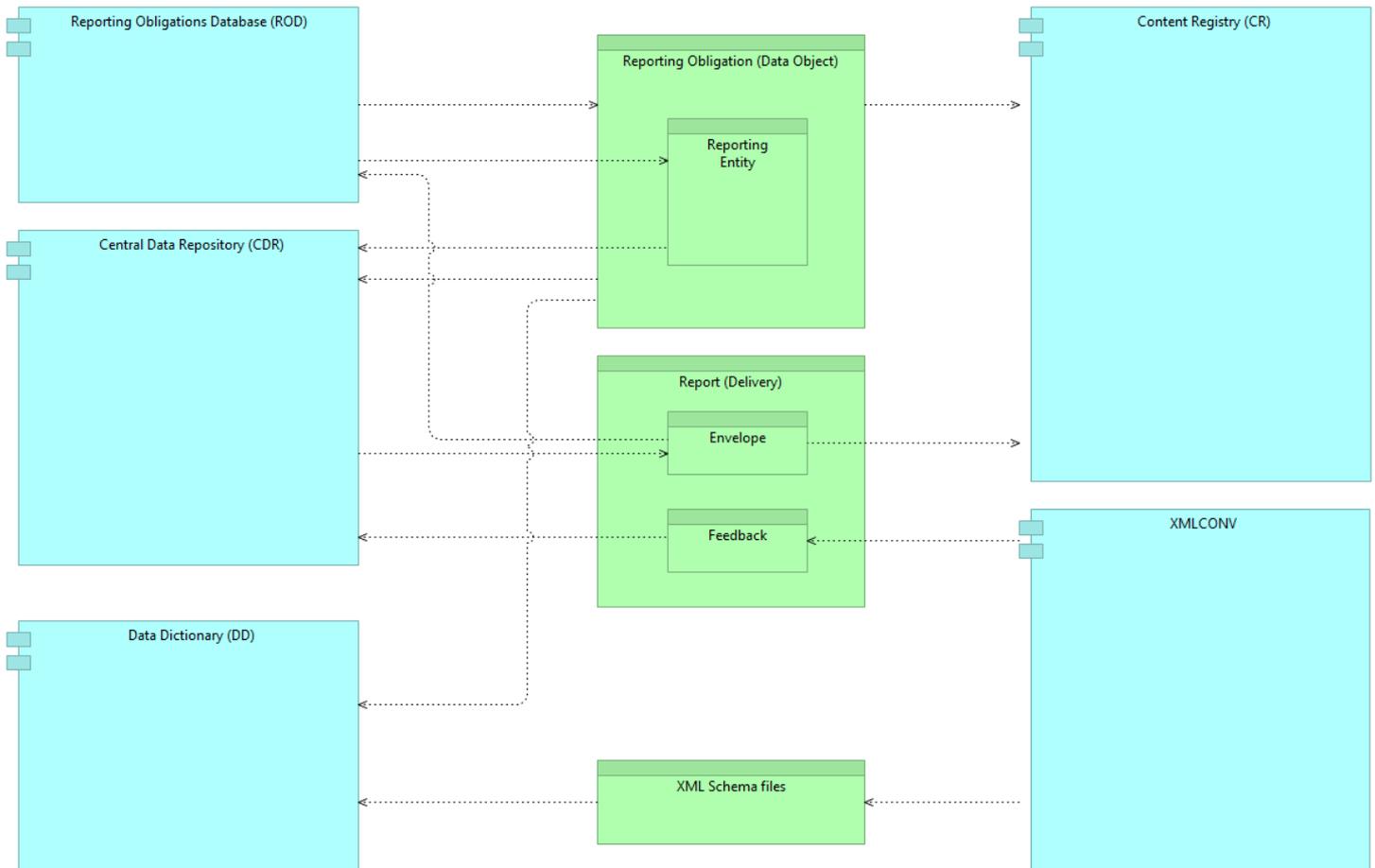


Figure 5 Interaction of the main Data Objects between the Reportnet applications.

## 4.5 Generic Reportnet Use Cases

In order to clarify the role of each Reportnet application component and how they work together, this section describes generic use cases that demonstrate the use of the components in the various process stages (see section 3.3) in a dataflow project.

### 4.5.1 Define reporting requirements



#### 4.5.1.1 *Use Case: Publish the reporting obligation and reporting guidelines for the dataflow in ROD*

EEA exports the published obligation on the ROD website with specified parameters such as Legislative instruments on which this obligation is based on, countries that should respond to this obligation, organisation for which the data set should be delivered and the time frequency of reporting. Additionally, detailed guidelines for the data reporting are published.

#### 4.5.1.2 *Use Case: Use Data Dictionary to define the data model and the data set*

Data definers define the dataset in data dictionary in accordance with the reporting obligation for the dataflow. This will be done by defining data tables with attributes that belongs to the created dataset, following ISO 11179 standard for describing data elements. The data dictionary component will automatically generate an XML Schema and an Excel template for this data set thereby providing ability for automatic data quality assessment. Detailed guidelines that would explain how templates should be populated is also provided.

#### 4.5.1.3 *Use Case: Create a data model by hand with other tools and store it in Data Dictionary*

For some dataflows the dataset is defined outside of Reportnet (e.g. if the dataflow uses INSPIRE specifications). In these cases, Data Dictionary is simply used as a storage for the specifications and XML Schema files.

## 4.5.2 Create the delivery mechanism

#### 4.5.2.1 *Use Case: use MS-Excel or MS-Access templates from Data Dictionary*

Data suppliers choose the method of delivering national data to central repository. They may use web questionnaires created in step 2 or download an empty template from data dictionary in form of excel file that is created in first step.

#### 4.5.2.2 *Use Case: create and use Webforms*

Webforms are web-based questionnaires, which provide a user-friendly way to fill out the national data and store it in an envelope in CDR. The Webforms system takes care of transforming the data into the proper XML format.

#### 4.5.2.3 *Use Case: use desktop-based or web-based DEM tools*

Before the use of Webforms was started in Reportnet, a number of so-called Data Exchange Module (DEM) tools were used for the same purpose. These DEM tools are small applications created for specific dataflows that enable reporters to report data that can be stored in a CDR envelope. However, increasingly the DEM tools are being phased out and replaced by Webforms.

#### 4.5.2.4 *Use Case: utilise system-to-system delivery*

Automatic system-to-system reporting is currently not supported by Reportnet. However, in the future, according to the INSPIRE directive, Reportnet will be developed towards enabling automatic system-to-system communication between Reportnet and national repositories via standard web APIs.

## 4.5.3 Collect & quality control data

#### 4.5.3.1 *Use case: write conversion scripts with XSLT*

XSLT scripts are written for any required data format conversions.



#### 4.5.3.2 *Use case: write QC scripts in XQuery*

Data definers set up set the relevant quality rules regarding this dataset to be used for verification of that the data sent by member countries are correct, complete and precise.

#### 4.5.3.3 *Use case: configure workflow and envelope structures in CDR for the dataflow*

Data suppliers create an envelope in the central repository (CDR) in order to fill out the metadata about this envelope such as reporting obligation name, envelope name and period of time, which is covered in this envelope.

#### 4.5.3.4 *Use case: Execute the quality control scripts on the reported data*

After reported data are stored in the envelope on the central repository (CDR) the system performs automatic quality assurance and provides the feedback to data supplier which contains the result of quality control of data. Additional feedback may also be provided at a later date to national experts by ETC.

#### 4.5.3.5 *Release the reported data for post processing and publication*

After the delivery has passed the quality control, it is released for the public and for post processing in the EEA Common Workspace environment.

### 4.5.4 Create European dataset

For this activity, there are no use cases in Reportnet, as the work is supported by the Common Workspace environment in EEA.

### 4.5.5 Create and disseminate data products

For this activity, there are no use cases in Reportnet, as the data set is published as a data product, in the EEA Data service (<https://www.eea.europa.eu/data-and-maps/>).

However, Reportnet provides the possibility for users of the data products to follow the data sources all the way back to a country's deliveries.



## 5. Technology Architecture Layer

### 5.1 Introduction

Reportnet Technology infrastructure is mostly based on custom developed Open Source products. This section describes the main technology services and components utilised in Reportnet.

### 5.2 Technology Services and Components

#### 5.2.1 The Extensible Markup Language (XML)

XML is recommended by the W3C consortium to be used as a general-purpose markup language in order to create special-purpose markup languages. XML is capable of describing many different kinds of data. In other words: XML is a way of describing data and an XML file can contain the data too, as in a database. It is a simplified subset of the Standard Generalized Markup Language (SGML). Its primary purpose is to facilitate the sharing of data across different systems, particularly systems connected via the Internet.

#### 5.2.2 XML Schema

XML Schema is published as a W3C Recommendation in May 2001, is one of several XML schema languages. It was the first separate schema language for XML to achieve Recommendation status by the W3C. Like all XML schema languages, XML Schema can be used to express a schema: a set of rules to which an XML document must conform in order to be considered 'valid' according to that schema. However, unlike most other schema languages, XML Schema was also designed with the intent of validation resulting in a collection of information adhering to specific data types, which can be useful in the development of XML document processing software, but which has also provoked criticism.

#### 5.2.3 The Resource Description Framework (RDF)

RDF is a language for representing information about resources in the World Wide Web. It is particularly intended for representing metadata about Web resources, such as the title, author, and modification date of a Web page, copyright and licensing information about a Web document, or the availability schedule for some shared resource.

#### 5.2.4 XQuery

XQuery is a standardized language for combining documents, databases and Web pages. It is the language for querying XML data. XQuery for XML is like SQL for databases. In Reportnet XQuery is used to create automatic quality checks to make sure that the incoming data conforms to the required data model specifications. The automatic quality checks reduce the need for manual data quality work in the post processing phase.



### 5.2.5 Java

Most of the Reportnet applications are implemented with the Java programming language. They are web-based applications following a standard MVC (Model-View-Controller) pattern utilising either the Stripes or Spring web frameworks.

### 5.2.6 Zope and Python

Currently, the CDR application is implemented with the Zope Content Management System. Zope is an open source application server for building content management systems, intranets, portals, and custom applications. Zope is written in Python, a highly productive, object-oriented scripting language.

### 5.2.7 Apache Tomcat

Tomcat is a web container developed by the Apache Software Foundation. Tomcat implements the servlet and the Java Server Pages (JSP) specifications from Sun Microsystems, providing an environment for Java code to run in cooperation with a web server. It adds tools for configuration and management but can also be configured by editing configuration files that are normally XML-formatted. Because Tomcat includes its own HTTP server internally, it is also considered as a standalone web server.

### 5.2.8 MySQL

MySQL is the database technology of choice for Reportnet. It is a widely-used open source relational database management system.

### 5.2.9 OpenLink Virtuoso

For Content Registry, the database layer is implemented with the OpenLink Virtuoso product. It provides an efficient structured database for RDF triplet storage.

### 5.2.10 RESTful APIs

The main application integration approach in Reportnet is RESTful APIs. It is a widely-used standard approach to provide system-to-system interoperability using Web protocols. All new application interfaces in Reportnet applications are being developed using the REST approach.

### 5.2.11 XML-RPC

For some older interfaces, the XML-RPC protocol is still used. XML-RPC is a remote procedure call protocol, which uses XML to encode its calls and HTTP as a transport mechanism. XML-RPC is still used, but it is gradually being replaced by RESTful APIs, which are more suitable for Web-based applications.



### 5.2.12 Docker and Rancher

Docker is an open source container platform, which has been used for deploying Reportnet applications since 2015. Using containers, everything required to make a piece of software run is packaged into isolated containers. Unlike Virtual Machines, containers do not bundle a full operating system - only libraries and settings required to make the software work are needed. This makes for efficient, lightweight, self-contained systems and guarantees that software will always run the same, regardless of where it is deployed.

Rancher is a complete container management platform that makes it easy to deploy and run containers in production on any infrastructure. Running containers in production can be hard. There is a wide variety of technologies to integrate and manage, and new tools are emerging every day. Rancher makes it easier to manage all aspects of running containers.



## 6. Implementation and migration

### 6.1 *Software development principles*

Reportnet software development has been based on two main principles:

- Open Source
- Modularity

Open source development enables code reuse, protection of investment, peer review and real competition for the tendering of development by making available all information and tools inside Reportnet.

Modularity means that a large portion of the development effort is spent on writing general-purpose components based on data and technology standards that can be re-used throughout the main application, rather than on domain-specific functionality of the application's features. The system can be easily modified or extended. Changes to an individual module can be made without affecting functionality of other modules.

### 6.2 *Reportnet 2.0*

In 2017 EEA has initiated a modernisation project called Reportnet 2.0. The project is initially planned for 3 years (2017-2019), and will deliver improvements to the Reportnet applications in the areas of performance, stability and security. Some of the technologies will be modernised and new application components and services will be developed.

As the project proceeds, this document will be kept up to date to reflect any significant architectural changes and enhancements.



## 7. Reporting Obligations Database (ROD)

### 7.1 Definition

The [Reporting Obligations Database](http://rod.eionet.europa.eu) (<http://rod.eionet.europa.eu>) holds information on legal and moral environmental reporting obligations that countries have agreed to in the framework of EU legislation, regional and international bodies. It is maintained by the EEA and makes information on the around 400 reporting obligations available to the relevant stakeholders, providing them with easy access to information on who needs to report what, when and to whom.

The screenshot shows the EIONET Reporting Obligations Database (ROD) interface. The main heading is 'Reporting obligations [Climate Change]'. Below this is a search filter with dropdown menus for 'Country' (Any country or territory), 'Issue' (Climate Change), and 'Organisation' (Any organisation). There is a 'GO' button and a checkbox for 'Include terminated obligations'. Below the search filter, it states '29 items found, displaying all items. 1'. A table lists the reporting obligations with columns for 'Reporting obligation', 'Legislative instrument', 'Report to', and 'Deadline'.

Reporting obligation	Legislative instrument	Report to	Deadline
<a href="#">Application of the Emissions Trading Directive 2003/87/EC (Article 21)</a>	<a href="#">Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC</a>	<a href="#">Commission</a>	2017-06-30
<a href="#">Approximated greenhouse gas inventories</a>	<a href="#">Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC</a>	<a href="#">Commission</a>	2017-07-31
<a href="#">Biennial reports and national communications</a>	<a href="#">Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC</a>	<a href="#">Commission</a>	2018-01-01
<a href="#">CBD reporting</a>	<a href="#">Convention on the protection of the Black Sea against pollution 1992</a>	<a href="#">BSC</a>	2017-08-01

Figure 6: Reporting Obligations Database

ROD holds obligations for institutions such as UNECE (e.g. CLRTAP), UNEP/MAP (i.e. Barcelona Convention), other relevant conventions (e.g. CBD, UNFCCC), Eurostat, OECD, as well as the EEA itself (e.g. WISE-SoE). Reporting obligations contain links to the official documents describing how the obligations are to be fulfilled.



## 7.2 Application Components and Services

### 7.2.1 Application Services

- Creating, updating, searching, browsing and sorting reporting obligations.
- Classification of legal instruments based on Eur-lex
- Notifications regarding approaching deadlines
- Provide framework for analysing overlapping obligations
- Provide detailed reports about obligations in “EA Core set of indicators”, “Eionet priority dataflows” and overlapping obligations.
- Enables classifying obligations according to the DSPIR framework. DSPIR stands for Driving forces, Pressures, States, Impacts and Responses. Particularly useful for policy-makers, DSPIR builds on the existing OECD model and offers a basis for analysing the inter-related factors that impact on the environment.

### 7.3 Users

- The EEA thematic experts who are involved in environmental reporting enabling them to add content and update the database.
- People involved in environmental policy development who are gathering information about an environmental issue (what information is reported where?); They also try to reduce overlapping by searching for duplication of datasets between obligations.
- Country representatives who are involved in environmental reporting (when is reporting due and what do I need to do?);
- People involved in environmental reporting from the perspective of the international organisations receiving and making use of the data.

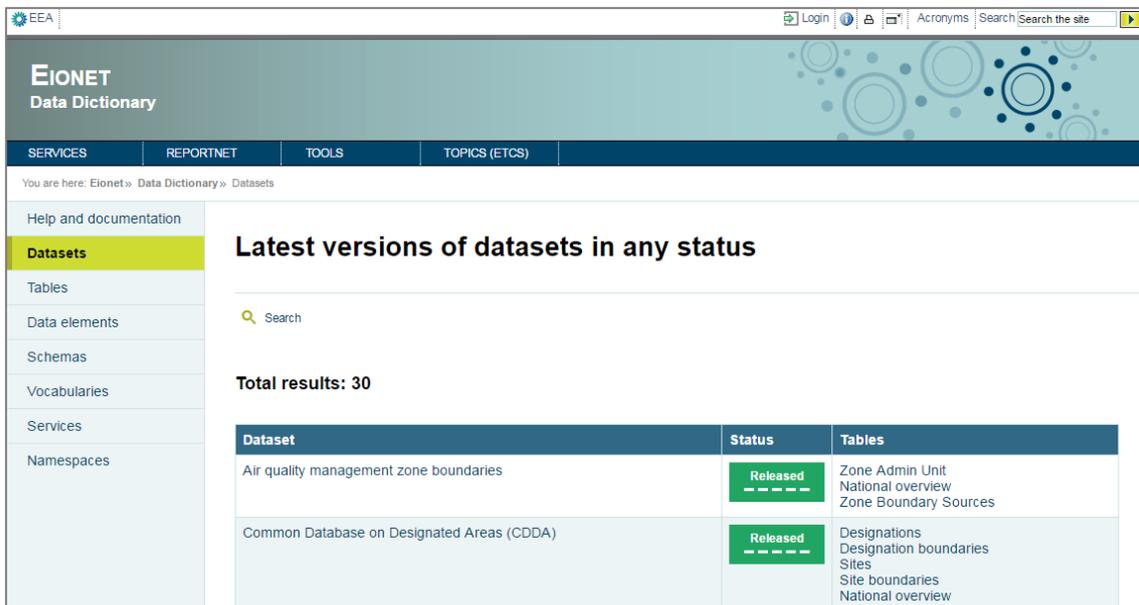
### 7.4 Interaction with other components

ROD refers to the data definition of a reporting obligation in the Data Dictionary. It uses ACL mechanism and LDAP server from Network Directory (ND) for user authorisation and authentication. Status of deliveries is retrieved from the Content Registry. Provides an RDF channel that contains data about changes in reporting obligations to the Content Registry for harvesting. There is a separate web page where users may subscribe to UNS where statements in the UNS filter are derived from sets of obligation’s metadata.

## 8. Data Dictionary (DD)

### 8.1 Definition

The [Data Dictionary](http://dd.eionet.europa.eu) (<http://dd.eionet.europa.eu>) supports the production and publishing of detailed specifications for the data to be submitted under the different reporting obligations. In more detail, this includes the specification of fields and data types in different tables that make up datasets, and also the reference data set as allowed values for fields. Such reference data can be common vocabularies like the Eurostat NUTS codes, or more specific ones like E-PRTR activities. The possibility to re-use vocabularies across different dataflows is one of ways that DD and Reportnet can support the harmonisation of dataflows.



The screenshot shows the EIONET Data Dictionary interface. The main heading is "Latest versions of datasets in any status". Below this is a search bar and a "Total results: 30" indicator. A table lists two datasets:

Dataset	Status	Tables
Air quality management zone boundaries	Released	Zone Admin Unit National overview Zone Boundary Sources
Common Database on Designated Areas (CDDA)	Released	Designations Designation boundaries Sites Site boundaries National overview

Figure 7: Data Dictionary

With the data specifications defined in DD, it can automatically produce XML-schemas and data reporting templates, for example in Excel-format. Data Dictionary follows the common standards, technologies and recommendations in data semantics field as much as concrete business needs make it possible. The main standard of those is ISO 11179.

### 8.2 Application Components and Services

#### 8.2.1 Application Services

- Possibility to specify dataset definitions by fields and data types in tables
- Definition of the reference data set as allowed values for fields (e.g. common vocabularies that can be reused between dataflows)
- Provide countries with detailed specifications of what to produce and report, on a website as well as in PDF documents for download
- Provide data reporters with Excel templates to facilitate reporting;



- Provide definitions of parameters as input for technical quality control and automated validation of the reported data
- Provide to the people using the reported data by various countries with a single point of reference for obtaining information about the specifications;
- Enables importing new dataset specifications to DD using the MS Access import tool.

### 8.3 Users

- Data Reporters download from the Data Dictionary web site Excel templates and guidelines in PDF format for particular dataflow.
- Data Definers create and update data definitions for reporting obligations according to rules specified in the ISO 11179 standard.
- Administrators maintain the functions in DD that the other two user groups are using.

### 8.4 Interaction with other components

Data Dictionary uses the conversion services to generate template files (MS Excel, MS Access) from data definition file – XML Schema. It refers to ROD obligations that use particular definition from DD. There is a separate web page where users may subscribe to UNS where statements in the UNS filter are derived from set of elements in data definition. It uses ACL mechanism and LDAP server from Network Directory for user authorisation and authentication.



## 9. Central Data Repository (CDR)

### 9.1 Definition

The [Central Data Repository](http://cdr.eionet.europa.eu) (<http://cdr.eionet.europa.eu>) is the main component the reporter will interact with during their reporting process. It provides a web interface for guiding the reporter through the reporting workflow, with key steps such as uploading files and presenting quality control feedback. Due to the different characteristics of the different reporting obligations, as previously mentioned, a tailored workflow can be configured for each. These workflow configurations often refer to how and when quality control and formal acceptance is done. Since many reporting obligations require the reporter to provide more than one file, each delivery is organised into a folder (“envelope”). These folders are further organised in parent folders (“collections”), that builds up a structure from the delivery to the reporting obligation, and at the top to the country.

The screenshot shows the EIONET Central Data Repository interface. The main content area displays details for an envelope titled "Emission Trading Directive 2003/87/EC Article 21\_SE delivery 2016". The interface includes a navigation menu on the left with sections for "Services" (Search by obligation, Search XML files, Search for feedback, Global worklist, Notifications, Help) and "Account Services" (Lost my password, Note). The main content area has tabs for "Overview", "History", and "Data quality". The "Overview" tab is active, showing a description of the envelope, its obligations, period (2015 - Whole Year), coverage (Sweden), reported date (30 Jun 2016 21:42), and status (Envelope is complete). A note section below the description states: "If you want to stay updated about events in this envelope [Subscribe to receive notifications](#) for this country and the current dataflow(s).". At the bottom, there is a table of files in the envelope and a feedback section with two entries: "AutomaticQA result for file se.xml: EUTS Article 21 version 1.1 (Posted automatically on 30 Jun 2016)" and "AutomaticQA result for file se.xml: XML Schema validation (Posted automatically on 30 Jun 2016)".

Figure 8: Central Data Repository

Besides supporting the reporting process itself, CDR also acts as a catalogue of data and reports delivered by the countries and related metadata. The catalogue can be the reports are made available to the institution having requested the reporting obligation (e.g. EEA, DG Environment, UNECE, UNEP/MAP), but also to the public. Services helpful to these users include search functionality to find reports based on parameters such as country and reporting obligation, as well as automatic conversions of the reports into different formats for easier viewing (e.g. Excel). Under some reporting obligations, the designated reporting entities are not the countries themselves, but instead different companies that need to report directly, e.g. companies reporting on their production and import/export of ozone depleting substances. Due to issues around competitive advantages and similar factors, such reporting is often confidential in nature. CDR therefore have a sibling component called Business Data Repository (BDR), which is designed to meet these demands for confidentiality. For more details about BDR, see the next section below. Moreover, there is also another sibling component to CDR, called the Mediterranean Data Repository (MDR), which is used by environmental reporting by North African countries.



## 9.2 *Application Components and Services*

### 9.2.1 *Application Services*

- Organises, uploads, downloads, versioning, and tagging of deliveries
- Performs quality assurance and validation of deliveries if they are in XML format
- Enables easy retrieval by end users in their appropriate formats
- Give opportunity to data suppliers to fix issues therefore ensuring that stakeholders will always have access to accurate and reliable information.

### 9.3 *Users*

- Visitor, who can browse released reports and download the files.
- A collection administrator, who maintain the hierarchical structure, but who doesn't upload any reports.
- A release-coordinator, who releases an envelope to the public. The public must be confident that they are not downloading an incomplete report, so a release/-revocation is logged in the activity log. Once a report is released, it is no longer possible to upload files. If a mistake is found then the release-status can be revoked.
- A reporter, who reports the data. A reporter can request a report to be released when he is finished.

### 9.4 *Interaction with other components*

CDR depends on two lists that must be retrieved from a different software component: A list of obligations and a list of localities. Both lists are retrieved from ROD via the XML-RPC protocol. Content Registry harvests from CDR a list of envelopes. That list is required by ROD to display the reporting progress of an obligation. There is a separate web page where users may subscribe to UNS where statements in the UNS filter are derived from a set of envelope's metadata. CDR is heavily integrated with other components and uses the conversion, quality assurance and web forms services via a set of XML-RPC or RESTful API calls.



# 10. Business Data Repository (BDR)

## 10.1 Definition

The [Business Data Repository](http://bdr.eionet.europa.eu) (<http://bdr.eionet.europa.eu>) is a sibling application to the CDR and based on the same application technology product. BDR is used for reporting by commercial businesses instead of national authorities. BDR is currently used for companies to fulfil their reporting obligations on trading of [ozone depleting substances \(ODS\)](#), [fluorinated gases \(F-gases\)](#), [cars](#) and [vans](#). Another difference compared to CDR is that BDR has a stricter policy on Data Confidentiality. Only aggregated data will be published, which also contain information on specific substances and uses. Moreover, no information on the content of the report submitted by an individual producer, importer or exporter will be divulged.

Figure 4: Business Data Repository

## 10.2 Application Components and Services

### 10.2.1 Application Services

- Organises, uploads, downloads, versioning, and tagging of deliveries
- Performs quality assurance and validation of deliveries if they are in XML format
- Give opportunity to data suppliers to fix issues therefore ensuring that stakeholders will always have access to accurate and reliable information.



## 10.3 Users

- A collection administrator, who maintain the hierarchical structure, but who doesn't upload any reports.
- A reporter, who reports the data.

## 10.4 Interaction with other components

As BDR has higher requirements for data confidentiality, the interaction with other Reportnet components is minimised. In addition, some Reportnet components have a separate BDR specific instance in order to minimise the risk for accidental leaking of confidential data.

The F-Gas and ODS dataflows synchronise with the ODS application hosted by DG-ENV.

# 11. Web Questionnaires (WebQ)

## 11.1 Definition

The [Web Questionnaires service](http://webforms.eionet.europa.eu) (<http://webforms.eionet.europa.eu>) provides the reporters with a user-friendly web questionnaire for filling out the information requested by the reporting obligation. These questionnaires are seamlessly integrated in the CDR reporting workflow, meaning instead of uploading files, the reporter is transferred to the questionnaire, which the reporter can save and return to later as many times as required. Behind the scenes the questionnaire produces the XML-file directly in the reporter's envelope as requested for further processing (e.g. additional quality control and the production a European dataset).

The screenshot shows the EIONET web interface for a questionnaire. At the top, the EIONET logo and name are visible. Below the header, the current page is identified as 'QUESTIONNAIRE ON THE IMPLEMENTATION OF DIRECTIVE 2003/87/EC'. A breadcrumb trail shows 'Intro', 'Q 1', 'Q 2', 'Q 3', 'Q 4', 'Q 5', 'Q 6', 'Q 7', 'Q 8', 'Q 9', 'Q 10', 'Q 11', 'Q 12', 'Q 13', 'Q 14', and 'Explanatory notes'. The current question is '1. Details of institution submitting the report'. The form contains several input fields: 'Name and department of organisation', 'Name of contact person', 'Job title of contact person', 'Address', 'International telephone number', and 'E-mail'. At the bottom, there are buttons for '< Save', 'Turn validation On', 'Close', 'Print preview', 'Prev', and 'Next'. A language dropdown menu is set to 'English (en)'.

Figure 9: Web Questionnaires service



The Web Questionnaires service also allows for any stakeholder to access the questionnaires directly, without being a nominated reporter and going through the reporting workflow on CDR, then saving the filled in questionnaire on their own computer. This has proven helpful in situations where regional authorities can provide their respective information, which the national reporter then can assemble into the final delivery from the country.

## *11.2 Application Components and Services*

### *11.2.1 Application Services*

- A user-friendly web questionnaire for filling out the information requested by the reporting obligation (integrated to CDR)
- Possibility for a user to save the questionnaire on a local computer
- Merging contents of multiple XML-files into one

## *11.3 Users*

- A nominated reporter, who provides the official reporting the data to CDR.
- Any stakeholder can access the questionnaires directly, without being a nominated reporter and going through the reporting workflow on CDR.

## *11.4 Interaction with other components*

WebQ will use the XML-Schema's that are generated by the Data Dictionary in order to generate the necessary web questionnaires. Web questionnaire also retrieves the element definitions normative description from the DD through the XML-RPC protocol. This way the input received can be validated. WebQ is integrated with CDR, so that the input data is automatically converted to the proper XML format and placed in the relevant CDR envelope.



## 12. Quality Assurance and Conversion service (XMLCONV)

### 12.1 Definition

The [Quality Assessment and Conversion service](http://converters.eionet.europa.eu) (<http://converters.eionet.europa.eu>) provides the reporting workflow with services for quality control and conversion of reports between different formats (e.g. XML to Excel). At its base is a registry that holds all quality control- and conversion scripts and their relation to the respective reporting obligations. In order to execute these scripts it has a number of quality control- and conversion engines built in, but can also call other services to perform the job.

The screenshot shows the EIONET XML Services website. The main content area is titled "Quality Assessment Scripts" and contains a table with two columns: "XML Schema" and "QA scripts".

XML Schema	QA scripts
<a href="#">eper.xsd</a>	VOC Solvents Directive
<a href="http://acm.eionet.europa.eu/schemas/dir199913ec/schema199913.xsd">http://acm.eionet.europa.eu/schemas/dir199913ec/schema199913.xsd</a>	Additional validation on CO2 Emissions - Cars aggregated data (2012)
<a href="http://acm.eionet.europa.eu/schemas/reg2009443ec/cars_aggregated-2012.xsd">http://acm.eionet.europa.eu/schemas/reg2009443ec/cars_aggregated-2012.xsd</a>	Additional validation on CO2 Emissions - Cars aggregated data (2012)
<a href="http://acm.eionet.europa.eu/schemas/reg2009443ec/cars_detailed-2012.xsd">http://acm.eionet.europa.eu/schemas/reg2009443ec/cars_detailed-2012.xsd</a>	Additional validation on CO2 Emissions - Cars detailed data (2012) Statistics and averages on CO2 Emissions - Cars detailed data (2012)
<a href="http://acm.eionet.europa.eu/schemas/reg2009443ec/vans_aggregated-2012.xsd">http://acm.eionet.europa.eu/schemas/reg2009443ec/vans_aggregated-2012.xsd</a>	Additional validation on CO2 Emissions - Vans aggregated data (2012)
<a href="http://acm.eionet.europa.eu/schemas/reg2009443ec/vans_detailed-2012.xsd">http://acm.eionet.europa.eu/schemas/reg2009443ec/vans_detailed-2012.xsd</a>	Additional validation on CO2 Emissions - Vans detailed data (2012) Statistics and averages on CO2 Emissions - Vans detailed data (2012)

Figure 10: Quality Assessment and Conversion service

This component mainly acts as a service that other components call to utilise its services, e.g. during the reporting workflow CDR will call this service to run quality control of the delivery, receive the feedback, and present it to the reporter. So similarly to the Web questionnaires, this service is largely transparent to the reporter, although it has a web user interface where any stakeholder can run a conversion or quality control of a file without being a nominated reporter or going through the reporting workflow on CDR.



## *12.2 Application Components and Services*

### *12.2.1 Application Services*

- Generate conversion stylesheets
- View quality control- and schema validation jobs
- Search conversions for XML-file or schema
- Store and manage (xml) files
- Convert XML into different formats (HTML, Excel, PDF, SQL scripts)
- Convert Excel files (based on generated templates) into XML
- Generate templates for reporting (Excel/Access/ODS)
- Store and publish XML schemas
- Run XML schema validation
- Run quality control XQuery scripts

### *12.3 Users*

- Data definers define quality analysis rules for automatic quality review of each requested data set
- For reporters, in the normal workflow the services are automatically triggered from CDR and thus transparent
- For draft validations, users can use the Web UI to run the QA scripts on their files before uploading them to CDR

### *12.4 Interaction with other components*

CDR will call XMLCONV to run quality control of the delivery, receive the feedback, and present it to the reporter.



## 13. Eionet Directory

### 13.1 Definition

The [Eionet Directory](http://directory.eionet.europa.eu) (<http://directory.eionet.europa.eu>) is an authentication mechanism and catalogue that holds all user accounts (“Eionet accounts”) and the roles assigned to each user within the Eionet network. With the Eionet account a user can access different services within Reportnet and other systems. One such example is when a person is nominated to deliver data under a reporting obligation, they will receive an Eionet account (if one doesn’t exist already) and will be assigned the reporter role for this reporting obligation and country in the Eionet Directory. With the account and role set up, the reporter can login to the different Reportnet components (e.g. CDR) in order to perform their task.

The screenshot shows the Eionet Directory web interface. The header includes the EEA logo and navigation links for Login, Acronyms, and Search Eionet. The main navigation bar lists SERVICES, REPORTNET, TOOLS, and TOPICS (ETCS). The breadcrumb trail indicates the current location: Eionet > Roles > reportnet > reportnet-awp.

**Local navigation**

- Helpdesk
- User directory
- Roles
- Organisations
- NFP/Eionet IG
- Mails to NFPs
- SERIS
- Workplan/planner
- Meetings & events
- Core data flows
- AQ Portal

**Find a person**

**Account services**

- I have
- lost my password

**Data flows under the EEA Annual work programme**

Roles pattern (e.g. staff, eionet\*-dk)

Search roles

Use our shortcut forms to enter queries.  
Search by one of the existing predefined queries.

**Sub-roles in Data flows under the EEA Annual work programme** Expand one level Collapse all

Role ID	Role name
<a href="#">reportnet-awp-cdda</a>	Nationally designated areas (CDDA)
<a href="#">reportnet-awp-clc</a>	Corine Land Cover (CLC)
<a href="#">reportnet-awp-wise1</a>	WISE SoE - Emissions (WISE-1)
<a href="#">reportnet-awp-wise3</a>	WISE SoE - Water Quantity (WISE-3)
<a href="#">reportnet-awp-wise4</a>	WISE SoE - Water Quality (WISE-4)
<a href="#">reportnet-awp-wise5</a>	WISE - Spatial Data (WISE-5)
<a href="#">reportnet-awp-wisesoe</a>	WISE State of the Environment

Figure 11: Eionet Directory

Part of each user account is an email address registered, which enables the account to be used also for communication in different forums within the Eionet network, as well as subscribing to notifications on different events from the Unified Notification Service. The directory maps the organisational structure of Eionet by linking national organisations with user accounts and by using the concept of the said roles. For example, there is a role named “Eionet” which contains all official nominated persons in Eionet groups such as NFPs, NRCs, and ETCs etc. The roles also function as mailing lists, with each role having its own email address. For finding out what roles exist and the users manning each role, the Eionet directory provides a search interface where this information can be queried.

The national level of the Eionet network consists first and foremost of a National Focal Point (NFP) who is an expert or group of experts nominated and funded by the country and authorised to be the main contact point for the EEA. The NFPs coordinate the national



networks. The national network inter alia includes the experts or groups of experts in national organisations, which are regular collectors or suppliers of environmental data and information at the national level and/or possess relevant knowledge of specific environmental issues, monitoring or modelling. These experts are nominated and funded by the country to work with the EEA in specific thematic areas particularly those relating to EU policy. In the Eionet context, these thematic experts are the NRCs.

## 13.2 Application Components and Services

### 13.2.1 Application Components

#### **LDAP Service**

The LDAP database contains the account and role information. Most of the Zope/Plone sites authenticate directly to one of the Eionet LDAP servers. They do this by trying to BIND using the user-supplied credentials. In some cases, a lookup is also made to get the user's full name and email address.

#### **CAS Single Sign On**

The [CAS Single Sign On](https://sso.eionet.europa.eu) (<https://sso.eionet.europa.eu>) is a central authentication system ensures that passwords are not sent unencrypted over the Internet.

#### **IDP Shibboleth Identity Provider**

Single sign-on protocol used to link ArcGis online towards EIONET LDAP authentication. (<https://idp.eea.europa.eu/idp/Authn/UserPassword>).

#### **The Eionet roles editor**

Makes it possible to edit users, roles and organisations.

#### **Password reset tool for self-service.**

The NFP/NRC a.k.a. 'Eionet NFP Admin' in `nfp_nrc.py` lets NFP members to add/remove users from NRC roles in the same country.

#### **The Users editor on the Eionet portal**

Makes it possible for users to modify personal information and change their password. It is implemented with the `eea.userseditor` package.

### 13.2.2 Application Services

- Enables easy searching and browsing information about users, roles and groups by different criteria.
- Provides complete role and organisation information, which can be used by other application.
- Allow user authentication.
- Enables user authorisation provided through the appropriate ACL mechanism.
- Provides contact information for all members of the Eionet.
- Enable the creation of mailing list inside common mail clients.

## 13.3 Users

National coordinators maintain the content for members at national level.



### *13.4 Interaction with other components*

Network Directory is called from other components in Reportnet that need to authenticate the users and software components that need information about users and roles stored in Eionet LDAP directory.



## 14. Unified Notification System (UNS)

### 14.1 Definition

The [Unified Notification System](http://uns.eionet.europa.eu) (<http://uns.eionet.europa.eu>) is a notification service where users registered in the Eionet Directory can subscribe to receive notifications for events in Reportnet and other connected systems. Such events might be on approaching deadlines from ROD, that a new report has been delivered in CDR for a certain reporting obligation, or news from the Eionet topic centres.

The screenshot shows the EIONET Unified Notification System interface. The header includes the EEA logo and navigation links like Logout, Online Help, and Acronyms. The main content area displays 'Existing subscriptions list' with a table of subscription details.

Title	Description	Subscription date	Last harvest	Action
<a href="#">CDR Notifications</a>	Instant notifications on release and revoke of envelopes	2016-10-13 13:52	2017-02-24 08:41	

Figure 12: Unified Notification System

### 14.2 Application Components and Services

#### 14.2.1 Application Services

- Harvests events from available channels and store its content in the database
- Generates reports about notification based on different criteria
- Receives events from external applications and store its content in the database
- Sends notifications to subscribers

### 14.3 Users

- All Eionet authorised users may subscribe to channels;
- UNS Administrator, creates updates and delete channels, defines parameters of channels like assigned roles, delivery types , notification templates etc.;
- RPC users create and update PUCH channels and send their events to UNS.

### 14.4 Interaction with other components

UNS authorise users and get their roles and personal data via ACL mechanism and Network Directory. There is a separate web page on CDR, DD and ROD from which users can make subscriptions to channels in UNS along with filters.



# 15. Content Registry (CR)

## 15.1 Definition

The [Content Registry](http://cr.eionet.europa.eu) (http://cr.eionet.europa.eu) is a more advanced search engine for the Eionet content compared to the search interfaces many of the Reportnet components provides themselves. It is more advanced in the sense that it understands what for example a measuring station is, and can then show what measurements it has made. To facilitate this, underneath the surface the Content Registry uses linked data, often seen as a part of what is referred to as the Semantic Web, which is essentially a way to connect data across the web with meaningful relationships.

The screenshot shows the EIONET Content Registry web application. At the top, there is a navigation bar with 'SERVICES', 'REPORTNET', 'TOOLS', and 'TOPICS (ETCS)'. Below this is a search bar with the text 'You are here: Eionet > Content Registry > Type search'. The main content area is titled 'Type search' and includes a search filter set to 'Biology in Lakes - Aggregated data'. There are two dropdown menus for 'Select columns to be displayed' and 'Select filters'. The search results show 1819 matches, displaying 1 to 15. A table of results is visible with columns for Title, AggregationLength, AggregationPeriod, and BQE. A 'MaxValue' filter is currently selected in the dropdown menu.

Title	AggregationLength	AggregationPeriod	BQE
d29794690e2			
d29794690e45			
d29794690e88			
d29794690e131			
d29794690e174			
d29794690e217			
d29794690e260			
d29794690e303		Summer	PP
d29794690e346		Summer	PP

Figure 13: Content Registry



## 15.2 Application Components and Services

### 15.2.1 Application Services

- Harvest xml files in RDF format from repositories such as CDR;
- Store the entire RDF file in the database for future reuse ;
- Enable basic and advanced search by metadata elements via the web interface

### 15.3 Users

- People that supervise the data reporting activities. It allows them to search delivered data sets by date, obligation, and responsible person.
- Administrators configure harvesting scope, that is set of services that will be harvested.

### 15.4 Interaction with other components

All components in the Reportnet may use Content Registry service to get metadata about a particular topic. Content Registry harvest repository of obligations from ROD and repository of reporting deliveries from CDR.

## 16. External services

### 16.1 EU login

Some of the dataflows on BDR authenticates to [EU Login](#). The list of users is maintained by DG-ENV.