Supporting **I**mplementation of **M**aritime Spatial Planning in the **Celt**ic Seas

Component 1: Supporting Implementation of MSP

Sub-component 1.2.2: Data and Information Requirements for MSP

Deliverable 7: Data Management Guidance Document

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Acronyms

AAMP: Agence des Aires Marines Protégées

AFB: Agence Française de la Biodiversité (previously AAMP)

ArcSDE: Spatial Database Engine (produced and marketed by Esri)

CSW: Catalogue service for the web

CRS: Coordinate Reference System

DG Mare: Directorate General for Maritime Affairs and Fisheries

EMODnet: European Marine Observation and Data Network

FTL: Future Tense Texture

GIS: Geographic Information System

GML: Geography Markup Language

HTTP: HyperText Transfer Protocol

IHO: International Hydrographic Organisation

INSPIRE: Infrastructure for spatial information in Europe

ISO: International Organisation for Standardisation

KML: Keyhole Markup Language

MMO: Marine Management Organisation

MPA : Marine protected area

MSDI: Marine Spatial Data Infrastructure

MSP: Maritime Spatial Planning

OGC: Open geospatial Consortium

OSPAR: OSLO-Paris Convention (for protection and conservation of North-East Atlantic)

PHP: Hypertext Preprocessor

SDI: Spatial Data Infrastructure

SLD: Styled Layer Descriptor

SDP: SIMCelt Data Portal

Shom: French public establishment in charge of description and forecasting of ocean, from littoral to offshore

SIMCelt: Supporting Implementation of Maritime Spatial Planning in the Celtic Seas

SLD: Style Layer Descriptor

SOAP: Simple Object Access Protocol

UKHO: United Kingdom Hydrographic Office

URL: Uniform Resource Locator

WCS: Web Coverage Service

WFS: Web Feature Service

WMS: Web Map Service

WMTS: Web Map Tile Service

WPS: Web processing service

XML: Extensible Markup Language

About SIMCelt

SIMCelt - Supporting Implementation of Maritime Spatial Planning in the Celtic Seas is a two-year €1.8 million project co-financed by DG Mare and focussed on promoting the development of transnational cooperation to support the implementation of EU Directive 2014/89/EU in the Celtic Seas. Led by University College Cork, the project consortium comprises both planners and researchers from seven partner institutes representing a mix of governmental authorities and academic institutes from Ireland, France and the UK. This consortium is particularly interested in developing meaningful cooperation between neighbouring Member States to support implementation of spatially coherent plans across transboundary zones of the Celtic Seas, building on previous work and leveraging new opportunities to identify and share best practice on technical, scientific and social aspects of transboundary MSP.

Introduction

The implementation of Maritime Spatial Planning (MSP), defined in the MSP Directive 2014/89/EU requires high quality maritime spatial data and information. Data sharing is favoured by Maritime Spatial Data Infrastructures (MSDI). This type of infrastructure improves access to data and provides information on the MSP policies implemented in the neighbouring countries. MSDIs contribute to enable access to data and information. It is a basis for discussion and exchange and promotes cross-border cooperation.

Regarding environmental data, the INSPIRE Directive was published in 2007 by the European Commission in order to create a European Spatial Data Infrastructure to ensure interoperability between databases and to facilitate geographic data dissemination, availability and use. It provides standards and protocols to exchange data and metadata across Europe. MSP is taking advantage of this conducive environment as over the last few years the amount of available datasets has been constantly increasing, published by national producers as well as European projects (e.g. EMODnet). Despite this fact, some key data and information are not accessible yet. There is therefore a need to pursue the effort on data sharing, as well as providing clear information on data through INSPIRE metadata.

In this European framework, technical requirements for data and information to implement MSP in a transboundary context, especially regarding interoperability, are investigated, including in the Celtic seas under SIMCELT project. The “Data and Information Requirements for MSP” component, led by Shom, is a technical study to identify, analyse and address technical challenges and gaps in data and information, encountered when displaying and disseminating relevant Maritime Spatial Planning data on both sides of maritime boundary. This component involves marine planners and experts of Geospatial data, working together in SIMCelt Task Group on Data. To achieve these objectives, not only data and information requirements for MSP were examined, but also the actual situation of Marine Spatial Data Infrastructures in order to determine optimisation possibilities. A special interest will be given on interoperability regarding metadata, data and portals, and Web Services availability for transboundary MSP. This study led to produce two main deliverables:

- Deliverable 4 - Analysis of Data Needs and Existing Gaps – Specifically Relating to Transboundary Working ;
- Deliverable 7- Data Management Guidance Document.

The Deliverable 4 describes the state of current data needs and gaps linked to MSP in a transboundary context. It is based on an inventory of datasets selected because they met a series of technical requirements identified by the Task Group on Data, particularly regarding interoperability. Therefore the objective is not to realise an exhaustive data collection, but to point out the relevant datasets in order to give an overview of the data situation in the Celtic Seas in terms of availability and interoperability. This panorama allows highlighting the main challenges and opportunities linked to transboundary data interoperability.

The second deliverable, called “Data Management Guidance Document” is the subject of this report. It aims to build up on SIMCelt experience by sharing technical knowledge and processes required to set up and manage a data portal like SIMCelt demonstrator. The idea is to allow users to set up software components to develop SDI using open-source tools. Therefore the Data Management Guidance Document describes SIMCelt data portal infrastructure and its administration procedures. It focuses on challenges encountered and solutions to overcome them.

This document is divided into three parts. Firstly, the description of the data portal demonstrator architecture and its major functionalities are described. Then the different processes implemented to build this infrastructure are detailed. Finally, an analysis of gaps and possible solutions to overcome them will be provided.

Part 1. SIMCelt Data Portal

1. Objectives

As part of SIMCelt project, Shom was in charge of setting up a data portal as a demonstrator to share transboundary MSP Knowledge on the Celtic seas. It is also a decision support tool designed for different audiences:

- GIS experts or data experts to experiment datasets interoperability and to address needs and gaps ;
- All the stakeholders involved in the MSP to display and to use datasets in transboundary context.

In order to improve the browsing experience for such a diverse audience, a specific effort was made on visual appearance to build up a portal as user-friendly as possible.

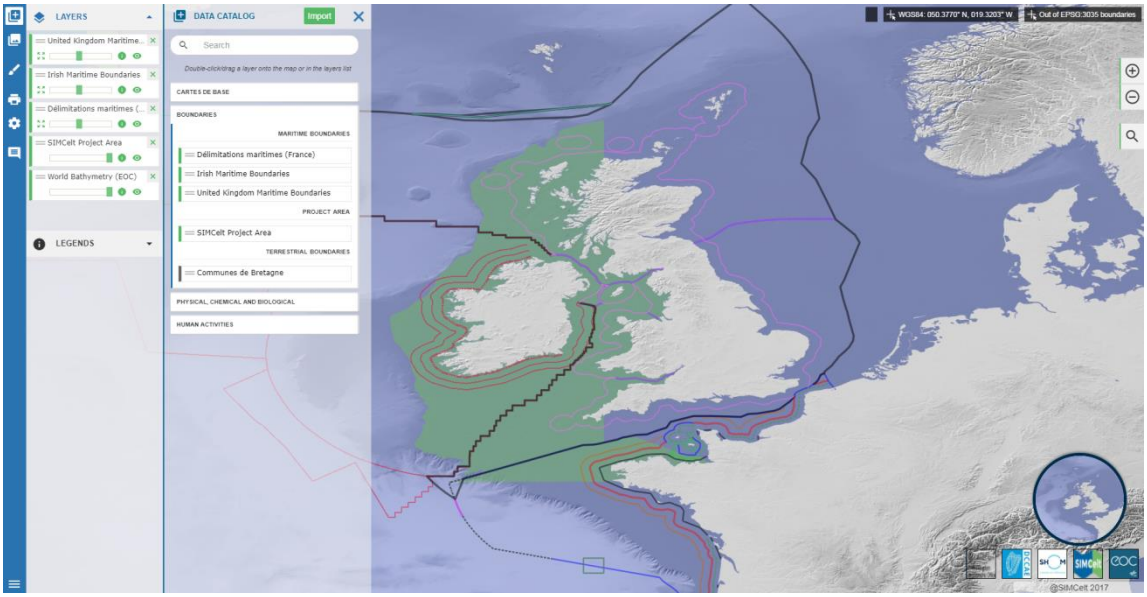


Figure 1: SIMCelt Data Portal

SDP is also meant to serve as a technical environment dedicated to identifying data gaps and possible solutions to solve them in support of the "Data and Information Requirements for MSP" Component. It is used to experiment and improve interoperability between datasets coming from different producers or countries, provided through various protocols or formats, represented with different symbologies, and containing heterogeneous attribute information. There are therefore no intentions either to constitute an exhaustive data catalogue or to maintain the portal after the end of SIMCelt project.

Another guiding idea when building SIMCelt Data portal was to ensure that an organisation willing to replicate it would be able to. In order to achieve this goal, only components either under open-source licenses or already developed through other european projects were used. If it was the occasion to sometimes add new functionalities to these existing tools, no new developments from scratch have been led during SIMCelt project.

Last but not least, a choice was made to build the portal data catalogue by focusing on INSPIRE

web services. This brings several benefits:

- Data is stored by the producer. It avoids unnecessary duplication and lowers the administration processes ;
- Latest available data are always displayed, without any additional manipulation.

The following figure explains the concepts developed by this portal demonstrator and the associated technical answers.

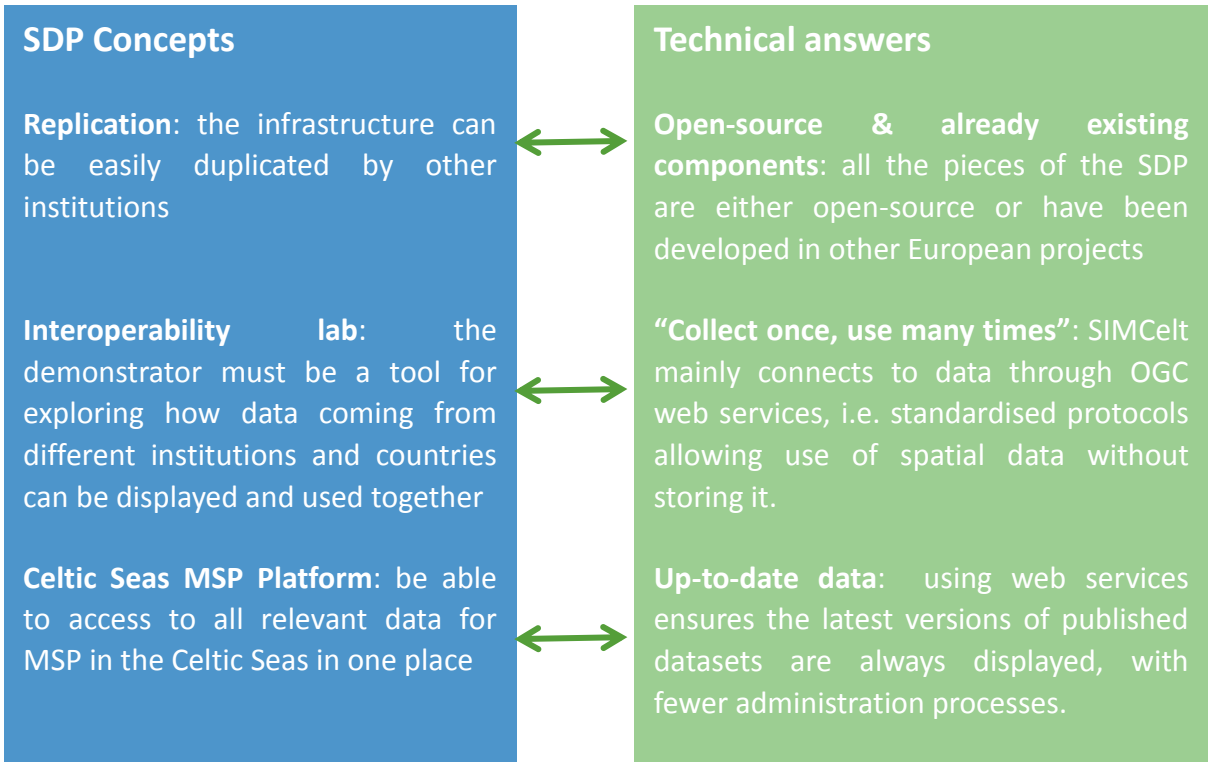


Figure 2: SIMCelt Data Portal Concepts and Answers

2. Architecture

SIMCelt Data Portal is based on a spatial data infrastructure (SDI). This SDI is made up of four components.

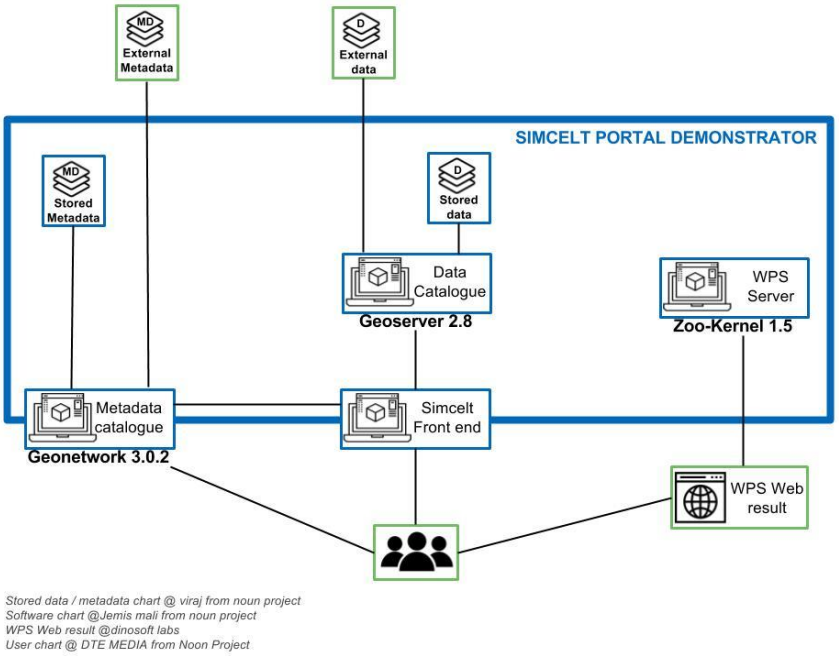


Figure 3: SDP technical infrastructure

- **The metadata catalogue**: The metadata catalogue is used for the publication of information on data like its producers or date of creation. The open-source application Geonetwork 3.0.2 has been chosen in SIMCelt project. SIMCelt metadata catalogue gathers metadata records associated with all the datasets relevant for MSP in the Celtic Seas which are INSPIRE compliant. Although it hosts some metadata records locally, the major part is harvested from external catalogues.
- **The geospatial data server**: this component allows publishing geographical data on the web through OGC protocols. If in most cases, its vocation is to spread data (either vector or raster) stored on a local server, it was used in a different way in SIMCelt project. Experimentations were led to make this tool act as an intermediate between producers' data infrastructures and SIMCelt Map Viewer, by directly connecting to the partners' web services. The Open-source software Geoserver 2.8 is used for this task.

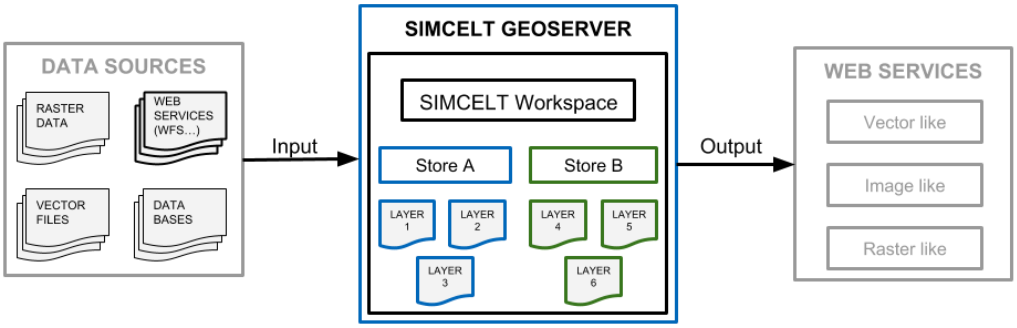


Figure 4: Geoserver Harvesting Process

The harvesting concept

The harvesting concept can be summarised as “collect once, use many times”. Metadata available in SIMCELT catalogue are created either in SIMCelt Geonetwork or in external catalogues.

Indeed, as illustrated on Figure 5, metadata catalogues can communicate with each other; SIMCelt Data Portal can gather and disseminate metadata from external catalogues. External metadata can be grouped in virtual nodes. SIMCELT Demonstrator can request these nodes to harvest, and then disseminate external metadata. If necessary, only one part of external catalogue node can be harvested: SIMCelt administrator can filter metadata harvested from a node: For example, the http://services.data.shom.fr/geonetwork/ node counts 88 parent metadata and above 20000 metadata. If the request is “all the data from this node where the title of the metadata like “cable”, 2 metadata are harvested.

SIMCelt metadata can be gathered into one or many nodes in order to be harvested by external metadata or consulted by external users.

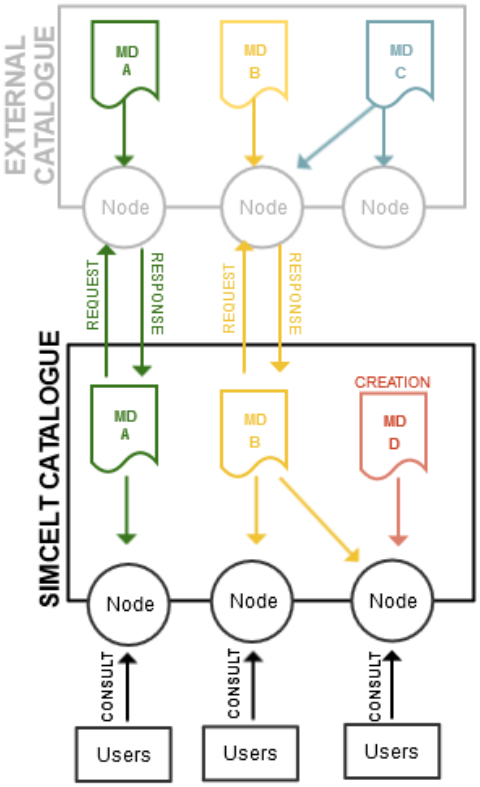


Figure 5: Metadata Harvesting Concept

- **Map Viewer (front end):** It is the main access point to SIMCelt Data Portal. It is an interactive mapping application connected to the metadata catalogue and to the geospatial data server. It allows displaying selected data together on a map. It also has some specific features like a preconfigured map catalogue, drawing tools and time series. The Map Viewer is developed by a private subcontractor, based on the viewer previously used in EMODnet Coastal Mapping project. Its use is described in the part two of this document for information. The detailed technical elements are specific to this map viewer. Therefore, the process implementation has to be adapted according to the viewer used.

- **Web Processing Service (WPS) Server:** This component is dedicated to publish tools as Web Services. In this way, it is possible to use those tools directly from a web browser or any GIS desktop application able to read WPS protocol (such as QGis).

3. Interface and Functionalities

SIMCelt Data portal interface has been thought out to leave to the map as much space as possible, in order to improve user comfort. It includes basic features from geoportals like navigation tools as well as more advanced tools. The scheme below details different components of this interface.

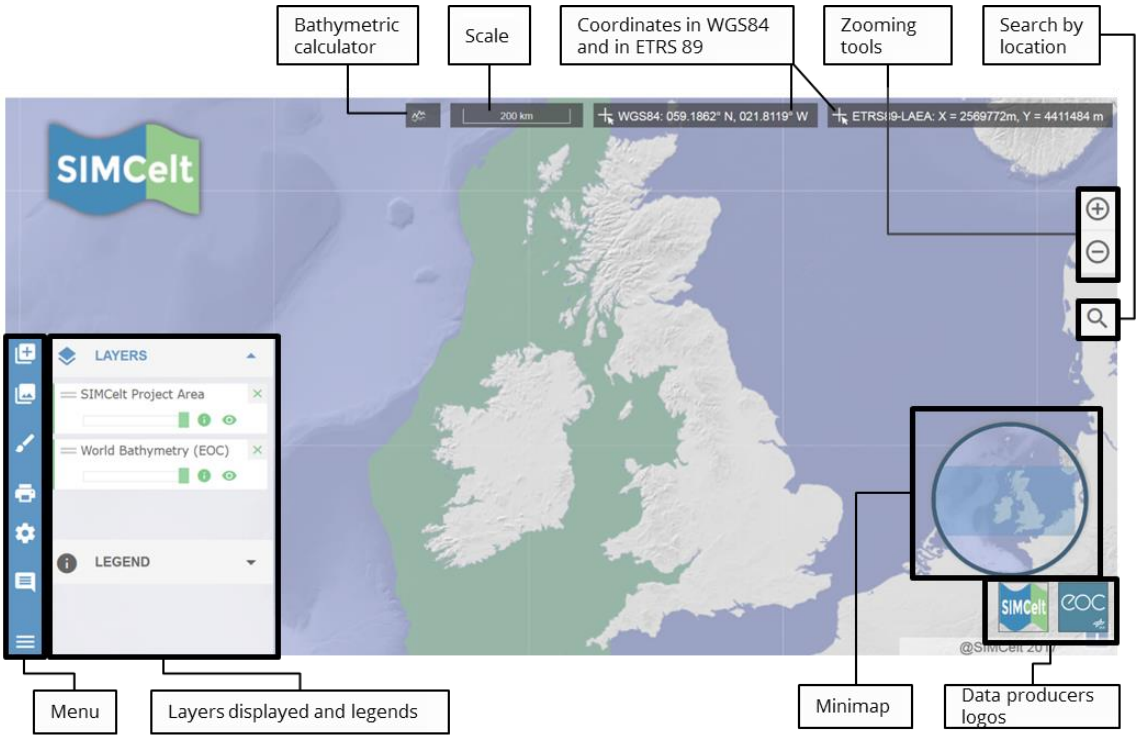


Figure 6: SIMCelt Data Portal Interface

A number of specific features are dedicated to displaying of spatial maritime data in a cross-border area, as the map catalogue. The table below summarises the main user functionalities of SIMCelt portal.

	Basic features: Map navigation, consult data and metadata, export a map, customisation (projection, language, interface)
	Responsive design: Most of the SDP functionalities are optimised to be displayed in different types of devices (computer, phone…)
	Data catalogue: all the datasets available on the SDP, organised by category. A search box can be used to filter datasets by name. WMS / WFS / KML layers can be imported in the SDP.
	Map Catalogue: set of pre-configured maps (with selected layers, zoom level and geographic extent) on a specific subject or areas.
	SIMCelt dashboard: hideable panel with information like help for navigation and last updates on the SDP.

	Time series: tool for exploring datasets varying over time (see schema below). 
	**Drawing tools:** set of tools for adding custom graphic objects to the map. The drawing can be exported / imported in KML format and printed as a PDF document.
	**Search by location:** search box for locating a place by entering its name.
	**Bathymetry calculator:** Calculate automatically bathymetric depth by moving the navigation cursor on the map.

Table 1: SIMCelt Data portal Main Functionalities

4. Technical Requirements

The data catalogue constituted in SDP is mostly based on the data selection from the Analysis of Data Needs and Gaps Report (Deliverable 4). This list of datasets organised by category and sub-category are available in appendix. Each dataset has been first examined independently according to a set of technical criteria. Then all the datasets belonging to the same category have been studied together, in order to keep the best available datasets.

Below are the technical criteria used to select the datasets integrated in SIMCelt Data Portal.

- Only spatial datasets **relevant for the MSP in a transboundary context** have been considered ;
- When possible chosen datasets **cover the whole project area** or at least either Ireland, France and the United Kingdom. The goal was to ensure a minimal level of consistency across the project area ;
- **partners data** were favoured because they could beneficiate of time commitment for data harmonisation ;
- Priority was given to **datasets needed for Case studies** to support work in these regions ;
- SIMCelt data demonstrator uses as much **official data** as possible ;
- Priority was given to **datasets that are OGC and INSPIRE compliant** regarding particularly **metadata** format and contents. Data must also be available in **Web Services** because these do not require storage, guarantee access to the most up-to-date version, and avoid duplicating the maintenance work done by the data producer.
- In terms of **data licensing,** SIMCelt inventory distinguishes open, shared and closed datasets. As far as possible open data was favoured.

4.1. Inspire compliance

The harmonisation of exchange protocols at European scale facilitates the implementation of the Web Services. Indeed, the INSPIRE Directive 2007/2/EC issued on March 14th, 2007 established an Infrastructure for Spatial Information in the European community in order to favour the protection of the environment.

This Directive requires public authorities to publish their geographical environmental data and services on the Web and to share them. The objective is to favour dissemination, availability, quality, accessibility, use and reuse of geographical data and services at European scale. The INSPIRE directive aims to organise the data opening and the availability by relying on the infrastructures of the Member States so that users and decision-makers can easily have access to reliable geographical information.

The INSPIRE Directive builds on several principles:

- Geographic data must be collected once (to avoid duplication and storage) and be provided and updated by the competent authority.
- It must be possible to combine easily information from heterogeneous source and disseminate them.
- The information collected by public authority that are within the INSPIRE Directive framework must be shared to all other public bodies.
- Geographical information must be available for an extensive use.
- It must be easy to know what information is available, what needs it can meet and under what conditions they can be acquired and used.

As a result, public data producers have to produce as much as possible data and services that respect these principles, which is referred to as INSPIRE compliant data.

Therefore, in this Directive and regarding Data and Information Requirements for MSP component, the main elements that influence the data selected in the inventory are metadata and discovery, displaying and download services. The interest brings especially on the Web Services technology.

4.1.1. Metadata

The INSPIRE Directive aims to ensure the interoperability between databases. Inspire compliance of metadata involves standardisation of datasets and services description.

Metadata aims to describe datasets associated producer, date of production, access constraints and how were they created and why…Metadata interest is to ensure the reliability and the good use of data. Completed metadata improves the referencing and therefore the sharing of the datasets.

Guidelines have been prepared to support public authorities in the establishment of the directive. These documents explain how to write metadata and how to manage metadata catalogues. Indeed, the directive relies on ISO standards (ISO 19115 and ISO 19139) for metadata elaboration of data and services. The requirements concern both the container and the contents of the metadata records.

4.1.2. OGC Web Services

What is it about?

A Web Service is a protocol dedicated to exchanging data between heterogeneous computer systems and applications. Data is prepared in a standardised format in order to be understandable by the receiving system and read on the fly. This way of sharing and accessing data brings several advantages:

- enhanced interoperability,
- Possibility to always access to the most up-to-date data

As far as spatial data is concerned, specific interoperable web services have been adopted, supported by the Open Geospatial Consortium (OGC). They allow the exchange of data, metadata and processes. In the European Union, the Inspire directive sets OGC web services as the standard for sharing geographic data.

Why focusing on web services?

"**Collect once, use many":** There are plenty of MSP data producers at different scales (from local to world scale). But how to ensure that data used in the portal is the latest available version and has not been transformed? Web Services follow the paradigm "collect once, use many".

Data is published from the producer database. It can be used and reused remotely at the same time by several clients/users. Users can gain access to this data by a Web Service protocol (WMS, WFS). If a change occurs in the producer database, data sent by Web Service protocol will also change.

- In a transboundary context, Web Services bring the following advantages:
- To improve interoperability by facilitate the dissemination, availability use, reuse of information
- To ensure that the most up-to-date published datasets are being used
- To improve the skills sharing and collaborative work
- To avoid storing data in each user server / computer. Only Web Services Requests are stored

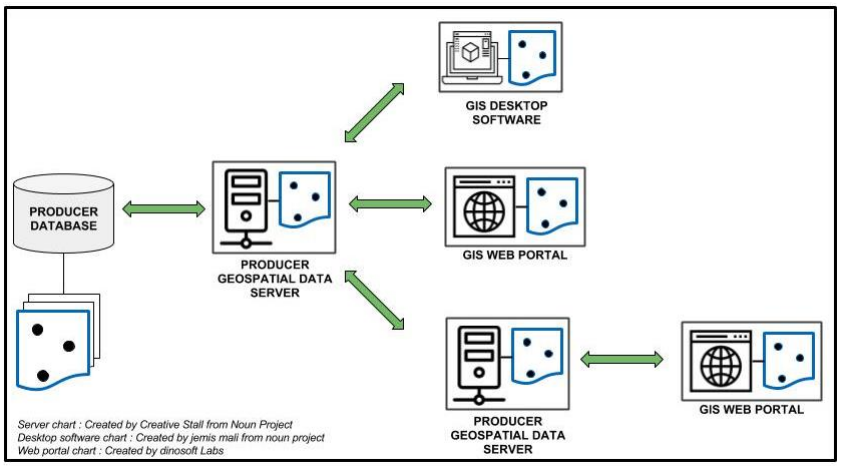


Figure 7: Collect Once, Use Many Times

How does it work?

OGC web services allow exchanging data through HTTP protocol. In practice, a client will send to the server an URL containing the request to the server, in order to get back a response. This response will usually be structured in XML format, but can also be an image output for example. Every web service comprises a GetCapabilities operation, which will inform on the requests that can be sent to the server.

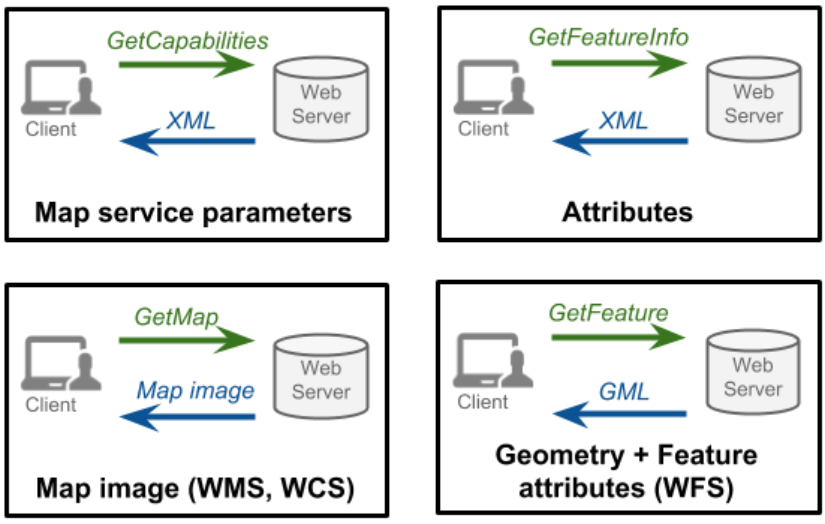


Figure 8: Web Services requests (examples)

A Web Services Typology

In geomatics, Web Services are normalised because they use XML and HTTP standards to exchange data according to international and standardised protocols of the Open Geospatial Consortium (OGC). Indeed, the syntax of the requests and responses needs to be consistent and thoroughly described. The Web services represent an efficient and fast way of sharing.

According to specifications of the OGC, the web services can belong to three categories that are either data services or metadata services or processing services.

Indeed, OGC has produced a series of specifications for GIS web services named in the format "Web ___ Service" either for simple map display or to manipulate geographical objects or for remote processing.

The web services provide data from several data stores like vector (shapefile, ArcSDE…) and raster (Geotiff, JPG or PNG…).

The present paragraph gathers Web Services into 3 categories:

- Data Web Services
- Metadata Web services
- Processes Web Services

4.1.2.1. Data Web Services

The most commonly encountered data Web Services (WMS, WFS, WCS and WMTS) are represented below:

- Web Feature Service (WFS): WFS corresponds to the download service for vector datasets in INSPIRE terminology. It gives access to the whole features of a dataset, including the attribute table. The standard format for downloading data is the GML (Geography Markup Language), which is a variation of XML dedicated to geographical datasets, but it is also possible to select other output formats.

- Web Coverage Service (WCS): WCS is similar to WFS, but is specific for raster datasets (e.g. elevation data). As such, it provides features like multi-band support.

- Web Map Service (WMS): WMS is a service for displaying geographic data. Requested datasets are returned as a georeferenced map. WMS requests allow to set many parameters such as extent, display style, or coordinates reference system. In some cases it is also possible to get the feature information by clicking on an object on the map.

- Web Map Tile Service (WMTS): WMTS is similar to WMS, with one major difference: it generates the response by using tiles. This enhances the display speed but reduces flexibility and does not allow as many operations on data than WMS.

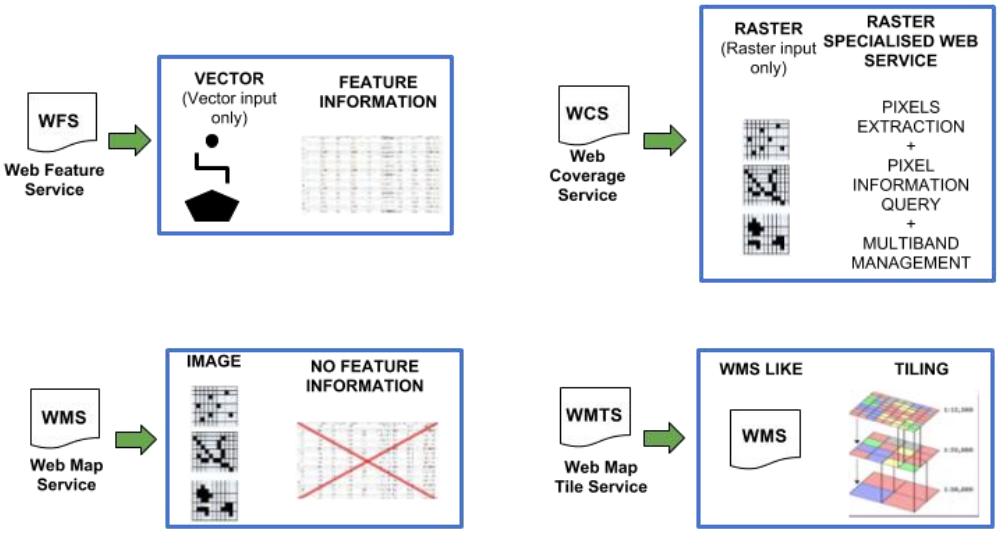


Figure 9: Data Web Services

4.1.2.2. Metadata Web Services

The Catalogue Service for the Web is a web service dedicated to metadata publication. It allows a metadata catalogue to be harvested by another catalogue or application. Harvesting can be done on all the metadata records present in the catalogue, or based on research criteria (title, keyword, etc.). CSW also offers the possibility to directly manage metadata (add, delete, etc.).

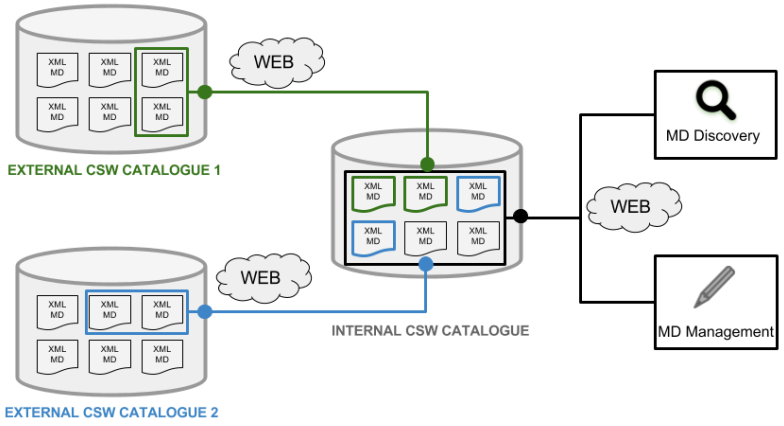


Figure 10: Catalogue Service for the Web

4.1.2.3. Processes Web Services

WPS is the OGC standard for sharing processes. It is thus possible to execute tools directly on the server, and then to download the result of the process. Input data can also be a WFS or a WCS request.

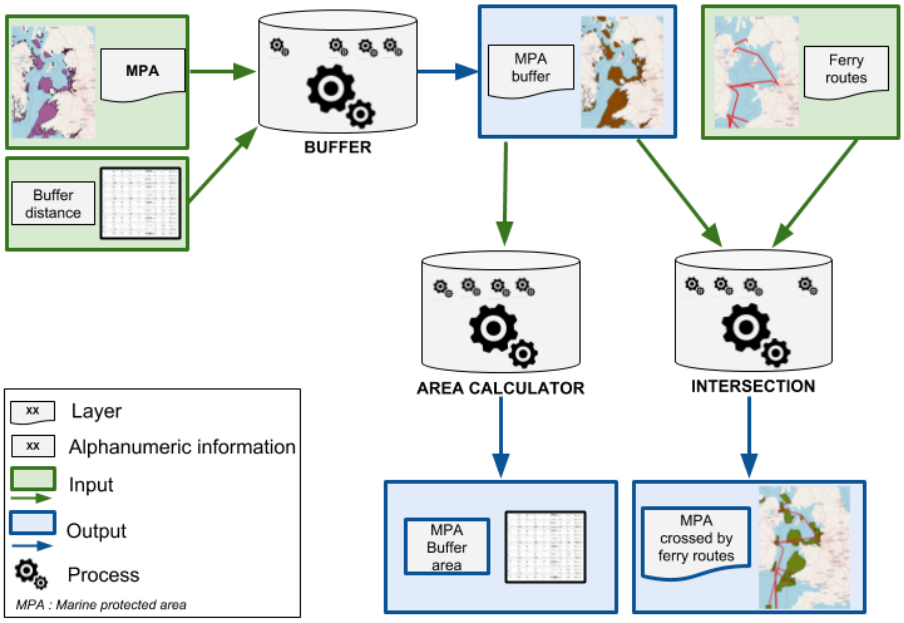


Figure 11: Web Processing Services

4.2. Licenses

A data licence is meant to protect the intellectual property of a dataset, by defining rules to set how a third-party can make use of it. For example, one may be authorised to publish a dataset on a map, but must cite the producer in the sources, and must request approval for putting it on a web portal. Usually, several elements are defined by a data licence, such as:

- Data usage and distribution
- Data modification
- Commercial and non-commercial exploitation
- Attribution (acknowledging the data source)

The combination of rules applied to these elements leads to a wide range of existing data licenses, from the most permissive to the most restrictive. In order to improve readability, the licenses on data encountered during SIMCelt project were classified into 3 categories: Open data, shared data and closed data.

4.2.1. Open licenses

Open licenses constitute the most permissive kind in terms of user rights. They were mainly brought by the open source movement, and the idea that data and software should be available for everyone, with the only constraint to cite the origin of data. In practical terms, a user is free to:

- copy, publish, distribute and transmit the Information;
- adapt the Information;
- exploit the Information commercially and non-commercially for example, by combining it with other Information, or by including it in your own product or application.

A user must:

- Acknowledge the data source by including the statement specified by the provider.

Data published under open licenses include several benefits, especially in the public sector:

- It increases its reusability;
- More data openly available means more possibilities to develop innovations;
- Efficiency in public action can be drastically improved by sharing data between organisations;
- Open data brings transparency, and can favour citizens understanding and involvement.

The European Union has been supporting open data in the public sector since 2003 and the Directive 2003/98/EC on the re-use of public sector information, updated in 2013. Most Member States provide to public organisations their own open licence, like the “Licence Ouverte” in France, or the “Open Government Licence” in the United Kingdom.

4.2.2. Shared licenses

Shared licenses include all the licence types with more restrictions than open data licenses, but still authorising to use data in the scope of SIMCelt. This comprises a wide range of licenses, from ones similar to open data but preventing commercial use to others only specifically shared to SIMCelt project.

4.2.3. Closed licenses

Finally, some datasets encountered during SIMCelt project could have been of great interest, but licence restrictions prevented from using them. It is the case for example for a lot of data concerning fishing activity in France.

Part 2. SIMCelt Data Portal Administration Processes

This second part of this document describes the general organisation and the administration processes for three main components of the architecture: GeoNetwork, GeoServer and the Map Viewer. The aim is to share the technical knowledge and processes required to build up a portal demonstrator, using open tools as far as possible. The description of administrative processes demonstrates the user requirements and steps to set up an SDI using free tools and an existing viewer. Only the viewer is not an open source. This document part focuses on technical problems encountered and solutions to overcome them.

The SDP management processes are presented in the form of technical sheets. They detail the methodology and the tools used. When needed, the sheets focus on gaps and the possible solutions to overcome them. The guide for reading the technical sheet is described below.

1. Geonetwork

One challenge of the SIMCelt is to experiment with the metadata harvesting process in the SIMCelt Metadata Catalogue. The open-source catalogue application used is Geonetwork.

The first steps are the creation of a new user (TS1.) and a new group (TS2.). Each user is assigned a profile defining what tasks he can perform on the system or on metadata records. A group of users corresponds to logical units within an organization with specific privileges, like for example data thematic.

Geoserver catalogue can be populated with 3 different metadata inputs:

- Harvested from an external metadata catalogue (TS3.)
- Imported from an XML file (TS4.)
- Created in the local Geoserver (TS5.).

Then the metadata catalogue is harvestable by external catalogues using the Catalogue Service for the Web. Additional nodes – virtual CSW - can be set by filtering the CSW catalogue (TS6.).

The following chart illustrates the harvesting process with reference to technical sheets associated with each action.

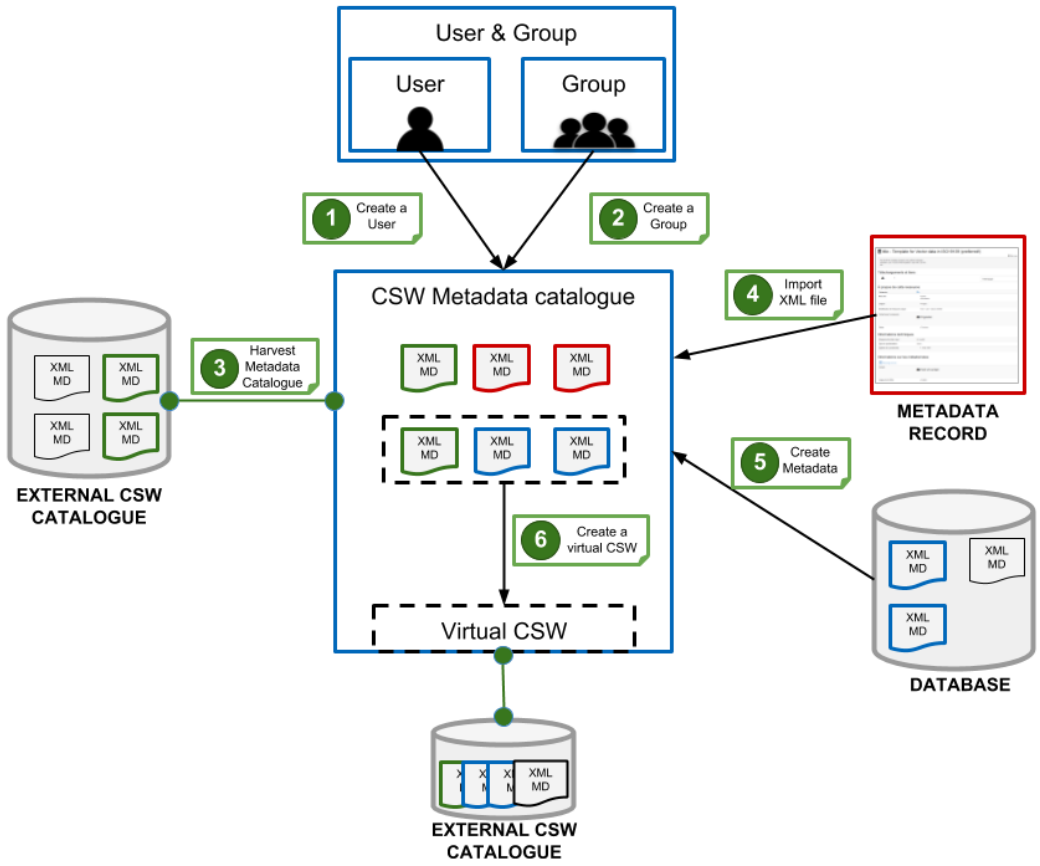


Figure 12: Geonetwork Processes

How to read the technical sheets

- Technical sheet components

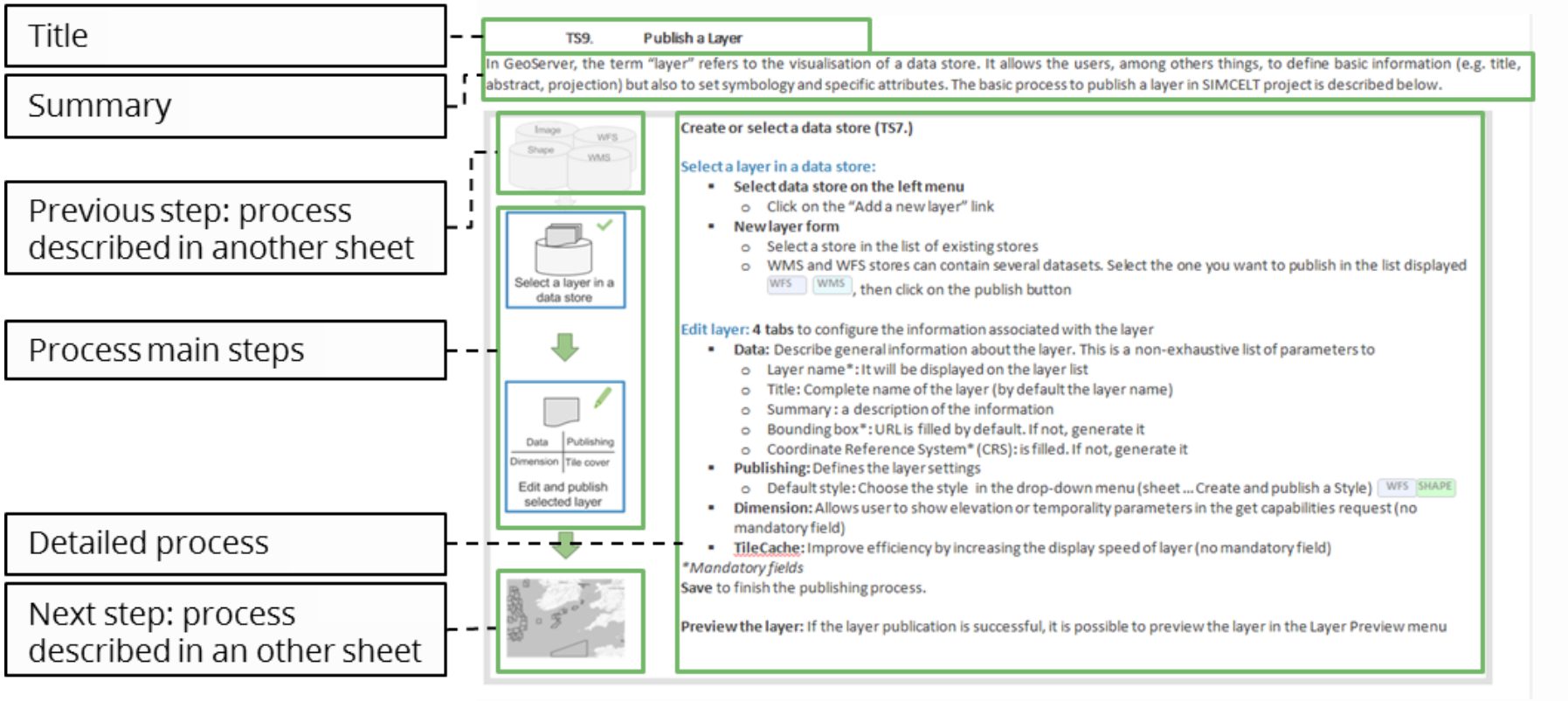


Figure 13: Technical Sheet Components

- Action icons

In the conceptual scheme of technical sheets, several icons are represented. They represent the main actions of the process described in the sheet. They are gathered in the list below with their meaning in the frame of this document.

ICON	ACTION	ICON	ACTION
	Add a new object		Associate objects
	Edit object parameters		Test a process
	Upload a file		Launch a process
	Publish an object		Preview a layer
	Enable an object		

Table 2: Technical Sheets Action Icons

- Tags

In processes, some parameters do not affect all data formats. For example, the action to choose a style is only possible for the Web Feature Service and Shapefiles. Therefore to help users, when necessary, tags are used in technical sheets. A tag mentions the specific data format for which the step is required or relevant. The four tags presents in this document are:

WMS : Web Map Service

WFS : Web Feature Service

SHAP : Shapefile

TIFF : Geotiff

TS1. Create a group

A Group can contain one or more users with different profiles. A group of users correspond to logical units within an organization for example data thematic. Access privileges can be set per metadata record and also per Group. Privileges can relate to visibility of the Metadata (Publish), data Download, Interactive Map access and display of the record.

Add a new group

- Select the administration button in the menu
- Select users and group menu
- Add new group

Edit the new group parameters :

Customise the new group parameters: This is a non-exhaustive list of parameters to describe:

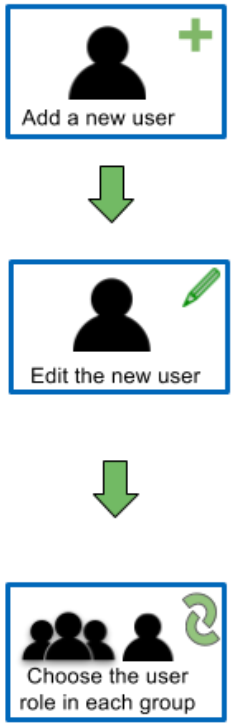
- Fill the name*
- Summary description
- Category: default category assigned to listings
- Email* to receive feedback on data download about resources that are part of group

Save to finish the process

Choose the user role in each group

TS2. Create a user

The User concept is related to Group concept because a User can be part of one or more Groups and a user can have different roles in different groups. A role or User Profiles defines what tasks the user can perform on the system or on specific metadata records.



Add a new user

- Select the administration button in the menu
- Select users and group menu
- Add new user

Edit the new user parameters

Customise the new user parameters: This is a non-exhaustive list of parameters to describe:

- User name: name to use for identification
- Password, name, surname, organisation, address

Choose the user role in each group

A profile set permission given to user in a group.

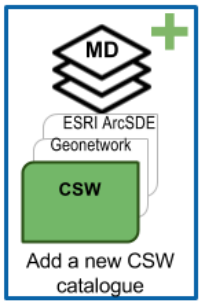
- Registered User: he has more access privileges than non-authenticated Guest users like right to download protected data
- Editor: the editor works on metadata like creating/editing/ delete data within the own group
- Content Reviewer: The content reviewer allows to give final clearance on the metadata publication on the Intranet and/or on the Internet
- User Administrator: is the administrator of his/her own group with the privileges like creating or to change users profiles creating editing deleting data
- Administrator: special privileges that give access to all available functions like
  - full rights for creating a new group or users
  - rights to change users/groups profiles
  - full rights for creating, editing, deleting new old metadata
  - perform system administration and configuration tasks

  The Administrator Role is not related to a Group

Save to finish the process

TS3. Harvest a CSW Metadata Catalogue

Harvesting is the process of collecting metadata from a remote source and storing it locally in GeoNetwork for a faster search. The process can be configured to launch automatically at regular intervals. It is possible to harvest multiple metadata catalogue types. This sheet details a Catalogue Service for the Web (CSW) metadata catalogue harvesting process. It is an Open Geospatial Consortium (OGC) standard that allows interaction with one or more resource catalogues. The basic process to harvest a CSW metadata catalogue in SIMCELT project is described below.



Add a new CSW metadata

- Click on the admin Console button at the top of the page 

- Click on the Harvesting menu button 

- Choose to harvest from OGC CSW 2.0.2

Complete the harvesting form

This is a non-exhaustive list of parameters to describe in the harvesting form

- **Node name and logo***: This is a short description of the remote site. It will be shown in the harvesting main page as the name for this instance of the CSW harvester.
- **Group***: A group of users correspond to logical units within an organisation. Populate the group if it already exists. If the group doesn't exist, administrator has to create it first.
- **Service URL***: The GetCapabilities URL of the CSW server to be harvested. (eg. http://services.data.shom.fr/geonetwork/srv/fre/csw-produits).
- **Search filter**: It is possible to filter metadata. If no filter is applied, Geonetwork will harvest all the metadata from the input node.
- **Frequency**: This parameter is used to set up an automatic harvesting at regular intervals.

Save parameters 

**Mandatory fields*

Launch the harvesting 

If the harvesting process runs successfully, the number of metadata records will be displayed in the log part of the harvesting form. This step can be more or less long depending on the number of harvested metadata records and conditions of access to the internet.

TS4. Import a metadata record from XML files

In case metadata external metadata exists in XMS or MEF format but cannot be gathered using CSW file import can be used in Geonetwork. In this technical sheet, it will detail only the process to import an XML files.

Upload a new XML file

- Click on the Contribute menu button at the top of the page
- Click on the "Import new records" button

Edit the form for import sheet

This is not an exhaustive list of parameters and options to import metadata record

- **Source* :** Choose the source of the file – there are 3 possibilities
  - **Upload a file from your computer :**
    Select the file : click on the button "select a file" to select the XML in our computer
    Specify the file format XML or ZIP/MEF
  - **Copy /paste:** Paste the XML code in the dedicated space as "Metadata contents"
  - **Import a set of files** from a folder on the server
    Indicate the directory in which the files are located and specify the file format XML or ZIP/MEF
- **Type of record*** : indicated the type of sheet :
  - **Metadata :** use when loading a normal metadata record
  - **Template:** use when loading a metadata record that will be used as a template to build a new record
  - **Directory entry:** use when loading a set of metadata record
- **Record identifier processing***: to manage potential clashes between ID of metadata records already present in the catalogue and new metadata records
  - **None:** the new ID is left unchanged. If a record already exists with the same ID, an error message will send.
  - **Overwrite metadata with same UUID**: any existing metadata record in the catalogue with the same ID as the new record will be replaced with the metadata record you are loading.
  - **Generate UUID for inserted metadata:** create new a ID for the new metadata records
- **Assign to a Group :** to select a user group in the list to assign to the imported metadata

**Mandatory fields*

Launch the import and check the result

TS5. Create a Metadata Record

Several SIMCelt metadata associated with dataset can neither be imported not be gathered form external metadata catalogue. In these cases, users can also create a new metadata record.

Create a new metadata record

- Select Add a new record button in the contribute section
- You can create a metadata from a new dataset, a feature catalogue, a map, a service and other.
- Choose a metadata template among pre-existing or created templates (TS…?), then a group associated with the new metadata record.
- Push the “Create” button to finish the metadata creation process

Edit the new metadata record

Customise in each category metadata fields: A metadata is composed of mandatory (“*” in the metadata sheet) and optional fields, aggregated into entity. This is a non-exhaustive list of entity to describe in the new metadata record form following the pre-existed template for vector data in ISO19139. Users can twist between simple and full view using the 👁 button at the top-right of the interface

- Identification info: This section is used to uniquely identify the data. It notably includes the title, contact information, date of the data.
- Spatial representation info: This package describes the mechanism used to represent spatial information.
- Distribution information: Distribution information and process to acquire the datasets.
- Data quality info: This entity provides information about the quality, the sources and the production process of the datasets.
- Reference System Information: Information about spatial and temporal referenced system used in the dataset
- Metadata: This package is used to uniquely identify and describe the metadata.

Save the metadata record to finish the process

Metadata record compliancy is evaluated in a window at the right of the interface.

Preview the metadata record

TS6. Create a virtual Catalogue Service for the Web (CSW)

A CSW gathers all the datasets of a catalogue. It can be composed of several virtual CSW. The virtual CSW is an harvesting node that is a filter set by the administrator on the catalogue CSW (e.g. thematic, metadata type). Using a virtual CSW reduces the harvesting time and improve datasets organisation.

Harvest a CSW Metadata Catalogue (TS3.) and/or import metadata records from XML files (TS6.)

Enable the CSW

- Select the administration button in the menu and then select the CSW button in the parameters menu
- **Enable***: This option allows opening the CSW services. If it is disabled, other catalogues cannot connect to the node using CSW protocol.
- Inserted metadata is public: If this option is checked, all the metadata inserted by CSW will be public.
- Save the CSW process

Create a new virtual CSW

- Select the administration button in the menu then select the parameters menu
- Open virtual CSW menu and click on new virtual CSW

Edit a new virtual CSW

- **Name***: fill the name of this virtual CSW. The format is mandatory as: csw-servicename, where servicename refers to the thematic or the subject of this virtual CSW.
- **Description** : fill a short description of this catalogue
- **Filter(s)***: to create a virtual CSW it is necessary to fill at least a filter of research.
  - Select the filter type: it refers to the title, the keywords or the summary in the metadata record…
  - Write the keyword associated at this filter
  - Specify whether the filter should contain or not contain the keyword
  - Click on this button + to add a new filter. It is mandatory to guarantee the record of the previous filter

  Explicit query *section can be used to filter the CSW catalogue using manual request.*
- Save to finish the publishing process.

Test the virtual CSW

Click on CSW test menu and select the CSW to test, then choose a request and send it :

- csw-GetCapabilities. If an answer is returned with the global description then the virtual CSW working
- csw-GetRecord | no filter : The <csw: SearchResults numberOfRecordsMatched> parameters returns the number of records included in this virtual CSW.

2. Geoserver

The SIMCelt technical challenge consists of testing the harvesting and publishing process focusing on WebServices input in Geoserver.

The following chart illustrates the data publication process in Geoserver, referring to corresponding technical sheets.

The creation of a workspace is a necessary first step to organise elements like a store or dataset. Then, “create a store” and “publish a layer” technical sheets describe publication process. WFS or Shape like datasets publication requires style management. The technical sheet 11 “create and publish a style” describes the process implying the generation of an SLD file and its association with one / several layers.

In case an attribute table is associated with a published dataset, the GetFeatureInfo request can be customised using an FTL file as described in the technical sheet 13. SIMCelt project provides the opportunity to test the publication of raster temporal layers using Geoserver (data sheet 12: “publish a temporal layer). Then, the Data sheet 10 “publish a layer group” explains the process to gather and organise layers in a hierarchical structure using layer groups.

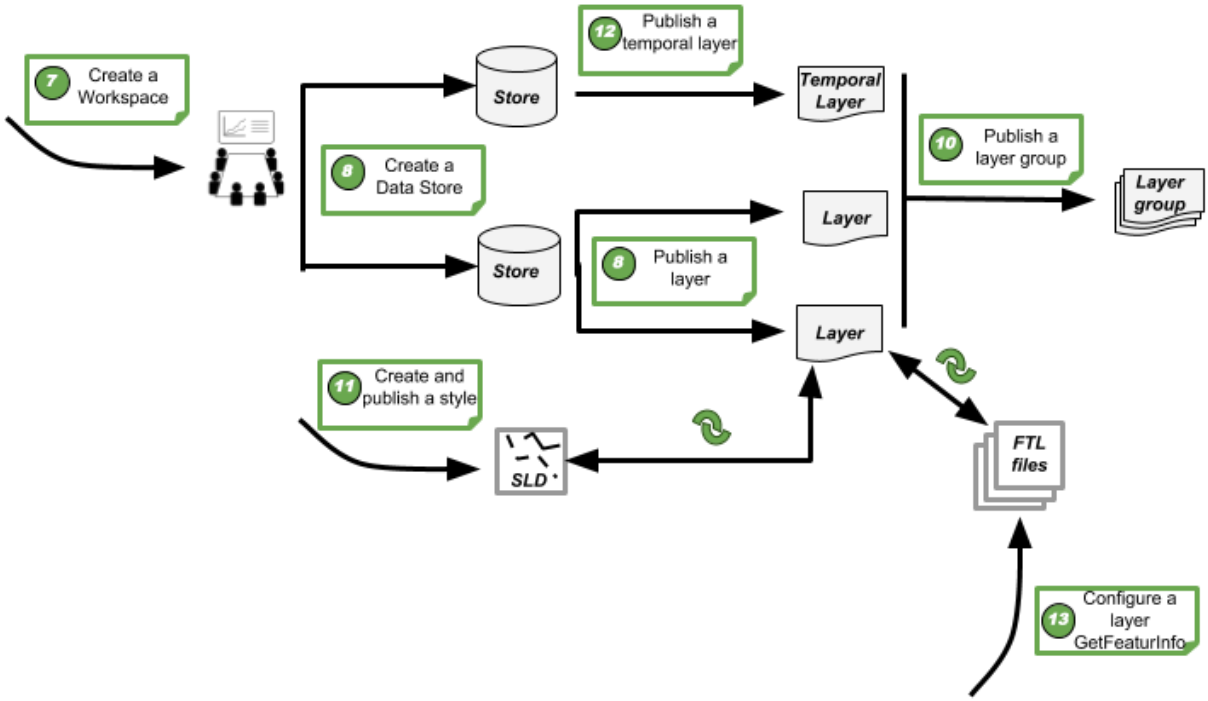


Figure 14: Geoserver Processes

TS7. Create a Workspace

This section describes how to view and configure workspaces. A workspace is a space or directory used to organise elements like store or datasets. In GeoServer, a workspace is often used to group similar layers together or to separate 2 layers with the same name but belong to different workspaces.

Add a new workspace

- Select the Workspace button in the menu
- Add a new workspace or choose an existing workspace in the list

Edit a new workspace

- Edit an existing workspace
  - Fill the workspace name
  - Fill the namespace URI (Uniform Resource Identifier)
  - Fill the character set: UTF-8
- Or add a new workspace
  - Select the Add new workspace button
  - Fill the namespace, it is a name describing the project
  - Inform URL: it is the URL associated with this project. It allows a quick and direct access to this workspace.

To finish save the process

Go to store menu to create or choose an existing store (TS8)

TS8. Create a data store

A data store is a connection to a data source, either from a file (e.g. Shape, GeoTIFF…) or Web Services (e.g. WMS, WFS). It is assigned to a workspace; and connects to a data source (e.g. Shape, WFS, WMS or GeoTIFF). The basic process to create a data store in SIMCELT project is described below.

Upload data on the server

Upload TIFF or SHAPE files in the appropriate folder of Geoserver server. TIFF SHAP

Add a new data store

Select “Store” on the left menu, then click on “Add a new store“

Then select which data store to add; 4 kinds of stores are mainly used in SIMCelt project :

- Web Feature Server WFS
- WMS (Web Map Service) WMS
- Shapefile SHAP
- Geotiff TIFF

Edit the data store parameters

This is a non-exhaustive list of parameters to describe in the Edit menu

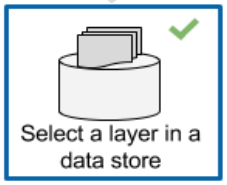
- **Workspace***: The store is assigned to the selected workspace
- **Data Source Name***: The store name as listed on the view page
- **Description**: A description is then displayed in the administration interface
- **Get Capabilities URL***: This URL returns WebServices parameters and available d WFS s WMS
- **URL / Shapefile location***: File location on Geoserver se TIFF SHAP
- **Enabled** (Activated by default): Enable or disable access to the store, along with all layers defined for it.

**Mandatory fields*

Save the store edits.

TS9. Publish a Layer

In GeoServer, the term "layer" refers to the visualisation of a data store. It allows the users, among others things, to define basic information (e.g. title, abstract, projection) but also to set symbology and specific attributes. The basic process to publish a layer in SIMCELT project is described below.



Create or select a data store (TS7.)

Select a layer in a data store

- **Select data store on the left menu**
  - Click on the "Add a new layer" link
- **New layer form**
  - Select a store in the list of existing stores
  - WMS and WFS stores can contain several datasets. Select the one you want to publish in the list displayed WFS WMS, then click on the publish button

Edit layer

4 tabs to configure the information associated with the layer

- **Data:** Describe general information about the layer. This is a non-exhaustive list of parameters to
  - Layer name*: It will be displayed on the layer list
  - Title: Complete name of the layer (by default the layer name)
  - Summary : a description of the information
  - Bounding box*: URL is filled by default. If not, generate it
  - Coordinate Reference System* (CRS): is filled. If not, generate it
- **Publishing:** Defines the layer settings
  - Default style: Choose the style in the drop-down menu (sheet … Create and publish a Style) WFS SHAPE
- **Dimension:** Allows user to show elevation or temporality parameters in the get capabilities request (no mandatory field)
- **TileCache:** Improve efficiency by increasing the display speed of layer (no mandatory field)

**Mandatory fields*

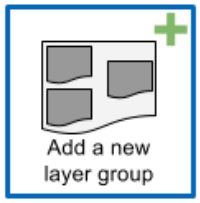
Save to finish the publishing process.

Preview the layer

If the layer publication is successful, it is possible to preview the layer in the Layer Preview menu

TS10. Publish a Layer Group

"A layer group is a container in which layers and other layer groups can be organized in a hierarchical structure. A layer group can refer to a single name in "WMS requests" (user manual 2.13). One layer group can be composed of several layers with different bounds and projections.



Add a new layer group

- Select "layer group" button on the menu on the left
- Choose to add a new layer group

Edit the layer group parameters

This is a non-exhaustive list of parameters to describe:

Data

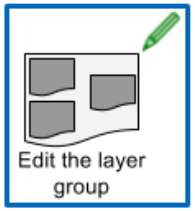
- Name*: The Name of the layer group
- Working space: A layer group within a workspace cannot contain resources from other workspace
- Mode:*: The administrator can choose between 4 layer group mode: Single, Named tree, container tree, earth observation tree. Only the single mode has been used in SIMCelt portal. The layer group is exposed as a single layer with a name, acting as an alias for a list of layers. The layers are still showing up as top level entries in the WMS capabilities document (Geoserver usual manual)
- Bounds*: Bounding box can be generated from the layers used or from a SRC file. The bounding box generation requires firstly layers to be selected.
- Layers*: A layer group can be composed of one or several layers. The order of the layers can be changed for an optimal displaying.

Publishing: Define the layer group setting

TileCache: Improve efficiency by increasing the display speed of the layer group (no mandatory field)

**Mandatory fields*

Save to finish the publishing process



Preview the layer group

If the layer group publication is successful, it is possible to preview the layer

TS11. Create and Publish a Style (SLD) SHAPE WFS

The integration of hard data (shape, Postgis) and WFS flow requires style management. In GeoServer, styling is accomplished using a markup language called Styled Layer Descriptor, or SLD for short. SLD is an XML-based markup. This page provides an introduction to the capabilities of SLD and how it works within GeoServer. A complete description of SLD concept is available on the Geoserver official Web page (http://docs.geoserver.org/latest/en/user/styling/sld/introduction.html)

Create a new SLD file

There are 3 ways to generate a SLD file.

- **Write the SLD Use a text editor that support XML format (e.g. notepad++).** This method requires a well-knowledge of SLD syntax and a lot of time. On the other hand, this is the best way to use the language in its full extent.
- **Generate a SLD file in a GIS software (e.g. QGIS)**
  - Open the file / flow in the GIS Software
  - Change the file / flow style
  - Export the style in SLD

This method doesn't require a well-knowledge of SLD syntax. On the other hand, this feature is not available on all software. In case it is, compatibility gaps can occur.

- **Generate first the SLD file using a GIS software, then customize it using a text editor**

Add a new SLD file in Geoserver

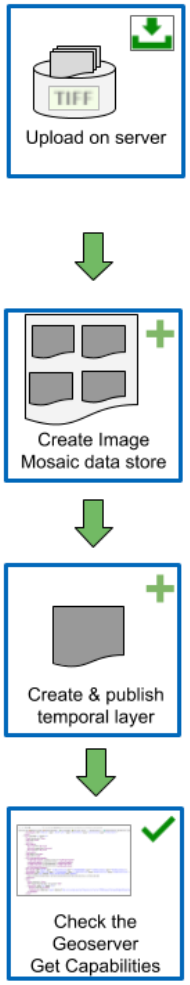
- Select "Styles" on the left menu, then click on "Add a new style"
- Past the SLD in the style editor box or load a SLD file
- Fill at least the name and the store associated with the style in creation
- Click on validate to check syntax errors
- Click on the "apply" button

Associate the SLD file to a layer

One style can be associated with several layers

TS12. Publish a Temporal Layer

In SIMCelt Map Viewer, it is possible to navigate into time aware datasets. In order to activate this feature on raster datasets (such as maritime traffic), it is needed to create a temporal image mosaic in Geoserver. The whole tutorial is available here: http://docs.geoserver.org/latest/en/user/services/wms/time.html



Store data on the server

- Name all the raster files in the same way: name_YYYYMMDD.
- Upload them on the server, in a dedicated folder (called in this sheet DATA_DIR)
- Create in DATA_DIR a file called indexer.properties
- Add the following lines in indexer.properties:

```
TimeAttribute=time
Schema=*the_geom:Polygon,location:String,time:java.util.Date
PropertyCollectors=TimestampFileNameExtractorSPI[timeregex](time)
```

When creating an image mosaic, Geoserver generates a shapefile. This code adds an additional attribute for storing time values

- Create in DATA_DIR a file called timeregex.properties. This file defines how the date is written in the file names
  - Add the following line in timeregex.properties:

```
regex=[0-9]{8}
```

It means that the date is written with 8 digits between 0 and 9

Create an Image Mosaic data store

- select “stores” in the left menu, then click on the “Add new store” link
- Select the Image Mosaic Data Store
- Main parameters to fill in:
  - Data source name: name of the image mosaic
  - URL: path to the data folder

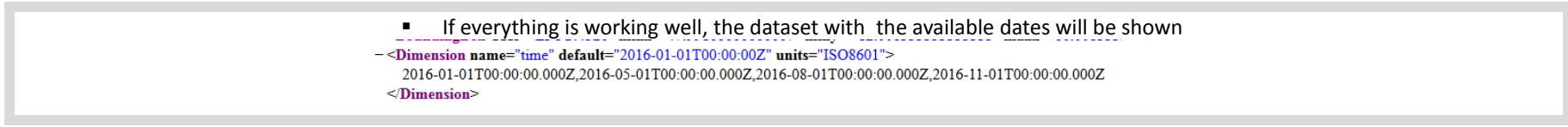
Create a layer using the mosaic data store

- select “layers” in the left menu, then click on the “Add a new resource” link
- Select the mosaic data store in the drop-down menu an click on “publish”
- See TS9 – Publish a layer for the main configuration details. The only specificity is on the “Dimensions” tab:
  - Time: tick the “enabled” checkbox
  - Presentation: choose “list”

Check the Geoserver GetCapabilities document

- In a web browser, connect to the Geoserver GetCapabilities address (for SIMCelt: http://services.data.simcelt.eu/geoserver/ows?service=wms&version=1.3.0&request=GetCapabilities)

- If everything is working well, the dataset with the available dates will be shown



TS13. Configure a Layer GetFeatureInfo

With Geoserver, clicking on a feature allows to get additional information. By default, it displays the attribute table, but it is also possible to configure it to present information in a different way. The whole tutorial is available here: http://docs.geoserver.org/latest/en/user/tutorials/GetFeatureInfo/index.html

TS9. Publish a layer on the GeoServer (TS9)

Create the FTL files associated with the dataset

- On Geoserver, each GetFeatureInfo is composed of 3 files. Those files are written in FreeMarker, which syntax is very close to HTML. The main difference is that with FreeMarker it is possible to use conditions and loops, and thus to create different displays for each feature.
- The 3 files to create are:
  - **Header.ftl**: Contains the <head> markup, and the styles definition
  - **Content.ftl**: The core of the GFI. It is where the display will be customised,
  - **Footer.ftl**: just closes the page
- Add the files to the server, in the Geoserver directory: workspaces/*workspace_name*/*store_name*/*layer_name*
- Examples of codes for the 3 files are given below

Check if the GetFeatureInfo is running

- In the Layer Preview menu, click on the OpenLayers link on the right dataset line. An interactive map should open in a new tab.
- Click on a feature on the map. The new GetFeatureInfo should be displayed under the map

Example of "header.ftl"

```
<html>
  <head>
    <style type="text/css">
      h2 {
        color: #006494;
      }
    </style>
  </head>
  <body>
```

Example of "content.ftl"

```
    <div>
      <#list features as feature>
        <ul>
          <li>Country: ${feature.COUNTRY.value}</li>
        </ul>
        <div>
          <#list feature.attributes as attribute>
            <#if attribute.value == "Yes">
              <div>
                <img src="finfish/${attribute.name}.jpg" /><br />
                ${attribute.name}
              </div>
            </#if>
          </#list>
        </div>
      </#list>
    </div>
```

Loop over the layer

Value of COUNTRY attribute

Condition on an attribute value

Name of an attribute

Example of "footer.ftl"

```
  </body>
</html>
```

3. Map Viewer

Data and metadata publication on Geonetwork and Geoserver describes in the first and second paragraph constitute the primary processes to their publication on SIMCELT Map Viewer. Then the implementation of metadata and datasets in the data portal illustrator contains 2 processes: Add a layer in the XML file (data sheet 14) and implement a context in the data viewer (data sheet 15).

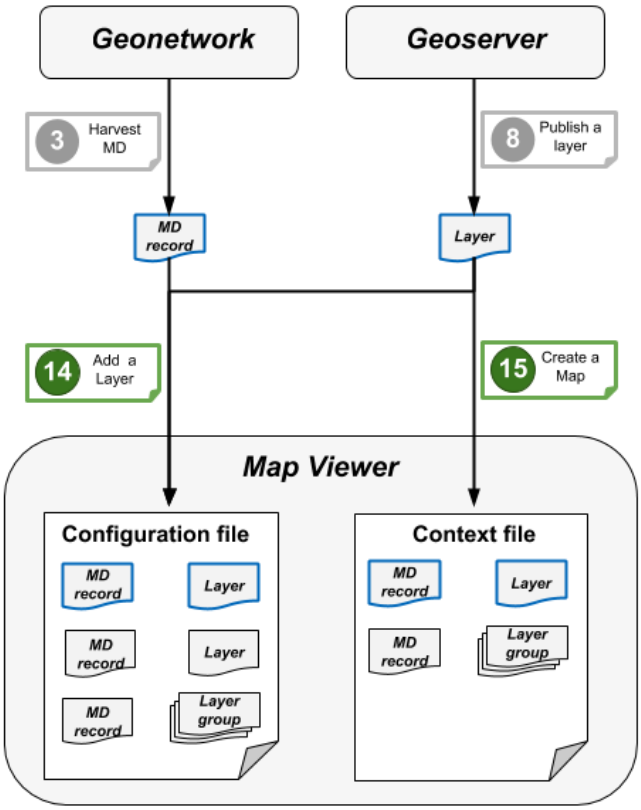
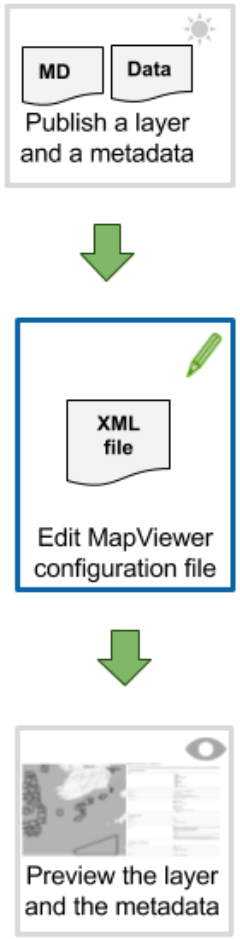


Figure 15: Map Viewer Processes

TS14. Add a Layer to the Map Viewer

Adding a layer to the map viewer refers to the operation of making a Web Service coming from SIMCelt Geoserver available with the associated metadata on SDP. This action is realised by manually editing an XML configuration file.



Publish a layer on the GeoServer (TS9)
Harvest a CSW Metadata Catalogue(TS3)

Edit the data catalogue configuration file (CONFIG/simcelt.xml)
Open the XML configuration file. Simcelt.xml is the file used by the map viewer to generate the data catalogue.
Add a new item to the layer list in the xml

- Add the code provided next page to simcelt.xml (after a </Layer>)Add the code provided next page to simcelt.xml (after a </Layer>)
- Main parameters to configure:
  - <Name>: Layer name in SIMCelt Geoserver (usually under the format *workspace:layer_name*)
  - <Title>: Name displayed in the data catalogue
  - <simsp:Category>: Category in the data catalogue. Index parameter is used to set the order of categories
  - <simsp:Metadatas><simsp:URL>:Link to the metadata associated to the dataset
  - <simsp:LegendUrls>: For WMS datasets, it is necessary to provide a legend in an image file. For other types, this markup is not needed. WMS
  - <OnlineResource>: link to the legend image (uploaded on the server)
  - <simsp:Originators>: Information about the data producer.
    - <simsp:Logo>: link to the originator's logo
    - <simsp:URL>:link to the originator's website

⚠ *The markups are case-sensitive*
Upload simcelt.xml on the server

Preview the layer
If the layer publication is successful, it is possible to add the layer to the map in the Map Viewer

Example of code to insert to simcelt.xml

```
<Layer queryable="true" hidden="false">
  <Server service="OGC:WMS" version="1.3.0">
    <OnlineResource xlink:type="simple" xlink:href="http://wxs-simsp-eu.shom.as8677.net:80/geoserver/ows"/>
  </Server>
  <Name>simcelt:french_maritime_boundaries</Name>
  <Title>Délimitations maritimes (France)</Title>
  <Abstract>abstract content</Abstract>
  <Extension>
    <simsp:Layer>
      <simsp:Category index="3">Boundaries#Maritime Boundaries</simsp:Category>
      <simsp:Downloadable>false</simsp:Downloadable>
      <simsp:Metadatas>
        <simsp:Metadata identifier="BDML_DELMAR.xml">
          <simsp:URL>
            http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/metadata/BDML_DELMAR.xml
          </simsp:URL>
        </simsp:Metadata>
      </simsp:Metadatas>
      <simsp:Opacity>1.0</simsp:Opacity>
      <simsp:LegendUrl>
        <OnlineResource xlink:href="http://services.data.simcelt.eu/legends/legendes/delmar3.png" xlink:type="simple"/>
      </simsp:LegendUrl>
      <simsp:Originators>
        <simsp:Originator Name="SHOM">
          <simsp:Logo>http://services.data.simcelt.eu/static/logo/SHOM/SHOM.gif</simsp:Logo>
          <simsp:URL>http://www.shom.fr/</simsp:URL>
        </simsp:Originator>
      </simsp:Originators>
    </simsp:Layer>
  </Extension>
</Layer>
```

TS15. Create a Map

Administrators can provide to users custom maps: preconfigured visualisations on a specific spatial extent, with some layers already loaded. Creating a map is done by creating a definition XML file associated with an image, and by adding it in the map catalogue definition file.

Add a layer to the map viewer (3.2.1)

Add a new Map

In the folder SIMSP_CONTEXT/CONTEXTS/, create a new document named context_name.xml)

- Example: fishing.xml. It will be the file defining the layers to be viewed on the predefined map.

In context_name.xml, add the selected layers

- Add the following lines to context_name.xml:
- Main parameters to configure:
  - <BoundingBox>: coordinates to set the initial map extent
  - <Layer>: copy a whole <Layer> block from the data catalogue file (simcelt.xml) for each layer needed on the map

⚠ *The markups are case-sensitive*

Add a screenshot of the map

- Place the image in the folder SIMSP_CONTEXT/IMAGES
- The image will be used as an illustration in the Map Catalogue.
- Images must be on the format 350x85

Update the file SIMSP_CONTEXT/context_catalog.json

- Add the following lines to the file (just before the last square bracket):
- Items description:
  - title: map name displayed in the map catalogue (in French and English)
  - description: few lines to describe the map (in French and English)
  - image: name of the screenshot
  - file name of the map configuration file

Example of context_name.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ViewContext xmlns:simsp="http://www.simsp.eu/context" xmlns:sld="http://www.opengis.net/sld"
xmlns="http://www.opengis.net/context" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" version="1.1.0" id="simsp_context" xsi:schemaLocation="http://www.opengis.net/context http://wxs-simsp-
eu.shom.as8677.net/schema/context/1.1.0/context.xsd http://www.simsp.eu/context http://wxs-simsp-
eu.shom.as8677.net/schema/simspcontext/1.4.0/context.xsd">
  <General>
    <BoundingBox minx="-2032737.45768780331" miny="5172066.08227026463" maxx="315408.051232811296" maxy="6333908.91220494360"
SRS="EPSG:3857"/>
    <Title>French Maritime Boundaries</Title>
  </General>
  <LayerList>
    <Layer queryable="true" hidden="false">
      <Server service="OGC:WMS" version="1.3.0">
        <OnlineResource xlink:type="simple" xlink:href="http://wxs-simsp-eu.shom.as8677.net:80/geoserver/ows"/>
      </Server>
      <Name>simcelt:SIMCelt_Project_area</Name>
      <Title>SIMCelt Project Area</Title>
      <Abstract>abstract content</Abstract>
      <Extension>
        <simsp:Layer>
          <simsp:Category index="2">Boundaries#Project Area</simsp:Category>
          <simsp:Downloadable>false</simsp:Downloadable>
          <simsp:Metadatas>
            <simsp:Metadata identifier="LIM.xml">
              <simsp:URL>http://wxs-simsp-eu.shom.as8677.net/geonetwork/srv/fre/catalog.search#/metadata/LIM.xml</simsp:URL>
            </simsp:Metadata>
          </simsp:Metadatas>
          <simsp:Opacity>1.0</simsp:Opacity>
          <simsp:Originators>
            <simsp:Originator Name="SIMCelt">
              <simsp:Logo>http://wxs-simsp-eu.shom.as8677.net/static/logo/simcelt/simcelt.png</simsp:Logo>
              <simsp:URL>http://www.simcelt.eu/</simsp:URL>
            </simsp:Originator>
          </simsp:Originators>
        </simsp:Layer>
      </Extension>
    </Layer>
  </LayerList>
</ViewContext>
```

Contexts_catalog.json – code to add

```
,
{
"title": {
   "en": "Marine Protected Areas in SIMCelt Project Area",
   "fr": "Les aires marines protégées dans la zone de projet SIMCelt"
},
"description": {
  "en": "This map highlights the availability and representation of data related to marine protected areas in the Celtic Seas",
  "fr": "Cette carte illustre la disponibilité et la représentation des données concernant les aires marines protégées dans les mers Celtiques"
},
"image": "mpa.png",
"file": "mpa.xml"
}
```

Part 3. Challenges

Setting up a data portal for SIMCelt project provided an opportunity to propose innovations on several points, like the data workflow or the viewer user-friendliness. But this did not happen without encountering several difficulties and challenges. Some difficulties and challenges occurred at a technical level, while others came under organisational concerns or involved issues regarding data.

1. Organisational Challenges

1.1. Gap between initial inventory and actual catalogue

For the initial inventory, issued in December 2016, the web services were tested using a desktop GIS (QGIS). At this time, the subcontractor had not yet delivered the SIMCelt Data Portal. When building the data catalogue on SDP, the basis was the initial inventory. It happened that a large part of web services inventoried before were not running anymore.

Main Reasons

- Change in access URL: The link to the web service GetCapabilities can sometimes be modified, making all the layers harvested on the ancient link become unavailable. This situation can occur, for example, when a structure changes its name.
- Organisations internal policies: sometimes, structures decide to reorganise the layers provided on their geospatial data servers. New layers with different names will replace the old ones. In this case, if a harvesting was set on the old layer names, it will not be working any more. This case was encountered during SIMCelt project with OSPAR datasets.
- Technical reasons: detailed in a further paragraph

Solutions

The main solution to overcome this kind of situation is to have the necessary human resource to keep a constant monitoring activity. Nevertheless maintaining a data catalogue based on web services could be improved by specific tools. It could not be experimented during SIMCelt project, but having a tool for checking web services availability at regular intervals and sending alerts could enhance the monitoring efficiency, and prevent situations like discovering after a while that a service is not running any more. Another way to improve Web Services stability is to reduce the number of SDI involved by gathering directly Web Service from the datasets producer SDI.

1.2. Inspire compliance differences between organisations

Another difficulty encountered during SIMCelt project was the variable state of application of the Inspire Directive between the data producers. While some are pretty well advanced and can provide ISO 19115-19139 metadata and WFS web services, others are not able yet to give access to minimal information regarding their datasets.

Main Reasons

- Lack of means dedicated to INSPIRE implementation: the European directive involves technologies and tools which were not traditionally present in public structures, especially regarding data diffusion. In some cases, no additional means were attributed, neither in financial nor in human resources terms.

Solutions

The overall situation can be improved by using the means deployed in European projects as a support centre for the involved structures to progress on INSPIRE implementation. It could be developed in several actions:

- Technical support for setting up a spatial data infrastructure: When an organisation intends to

build a spatial data infrastructure in order to publish data, it should take advantage of experience gained by participating in European projects such as SIMCelt. The present Data Management Guidance Document is dedicated to provide a synthesis of the experience gathered during SIMCelt Project.

- Providing use of metadata catalogue / geospatial data server for the partners to publish metadata and data: when an organisation does not have the capacity yet to publish its datasets, a provisional solution is to offer access to the project infrastructure in order to temporarily host and spread data and metadata. This can give time to then find a more stable solution for data diffusion.

Warning Point

The current situation created by the British exit from the European Union could have impacts on data interoperability. If the INSPIRE directive has a transposed legislation in the British right, its applicability might become limited.

1.3. Data Licensing

Among the datasets inventoried during SIMCelt first year, and the ones added to the SDP, showed an amazing variety in the licenses used by the different data producers. This situation brings several difficulties:

- No licence available: Some organisations do not provide their data licence policies, or do not make available metadata explaining the usage restrictions on their datasets. For example, no data licence policy could be found regarding datasets used in support of Maritime Spatial Planning in Wales, and available on the Wales Marine Planning Portal or on the Welsh Government WFS server.
- Licenses heterogeneity: There is nearly one different licence policy per producer, and sometimes one producer can have several licence policies depending on the dataset. Inside this ocean of policies, it can become tricky to identify accurately what can one do with a specific dataset.

Possible solutions

The situation is tending to evolve positively because of the increasing amount of data being released under open-source licence. They currently represent around 45% of the datasets inventoried during SIMCelt project. For the other kinds of datasets, a solution would be an agreement between the partners to provide to the project their datasets under a common licence policy. Doing this would clarify the usage possibilities and avoid some misunderstandings. Finally, there is a need of pedagogy towards data producers in order to raise awareness of licenses. Globally, even if a dataset is not shared, there should always be a metadata describing it and indicating the conditions of use.

2. Technical challenges

2.1. Interoperability gaps

During the two years of SIMCelt project, an important work has been done on a large collection of datasets coming from a wide range of producers. It allowed identifying some technical issues linked to interoperability. These issues can be classified into two types: interoperability between software solutions, and interoperability between protocols.

2.1.1. Between software solutions

Some INSPIRE web services can be recognised differently regarding the software used. Prior to the availability of the SIMCelt data portal, all tests during the inventory phase were realised by using QGIS desktop software. When starting to add data on the SDP Geoserver, several differences could be noticed:

- Some WFS could be displayed without problems with QGIS, but generated errors in Geoserver.

For example, all the WFS provided by EMODnet Human activities were in this case.

- Some WMS generated by ArcGIS Servers could only be displayed with a white background in QGIS (Example: WMS from MMO Marine Planning Evidence). This problem vanished when using Geoserver.

Possible Reasons:

Web Service readers may not be coded in the same way between software solutions. The one used in Geoserver in particular may be less tolerant to syntax errors than other tools, so an XML response coming from a web service and containing slight mark-up errors might more easily generate server failures.

Possible Solutions:

The difficulty occurring with EMODnet datasets was solved by directly storing the shapefiles downloaded from EMODnet portal on SIMCelt Geoserver. Despite the fact that it does not correspond to SIMCelt initial principles, it was considered essential to display EMODnet datasets on SIMCelt data portal.

Another possible solution would have been to try updating the Geoserver. Actually SDP runs with Geoserver 2.8, when the last version is the 2.12. This could not be done during SIMCelt because of technological constraints. There was also no certainty that doing this would have solved the issues encountered.

2.1.2. Between protocols

The diversity of protocols can also be a source of issues. As OGC web services are not the only possibilities to share data, communication can become rather difficult when a producer chooses other kinds of protocols to release data. For example, a part of the datasets published by MMO through the Marine Planning Evidence portal is only available through SOAP (Simple Access Object Protocol), and hence was not connectable to SIMCelt Geoserver.

Even when using the same standards, some difficulties can come from the differences of protocol versions. For example, WMS 1.3.0 introduced a major change in comparison to WMS 1.1.1: in 1.1.1, a layer coordinates are declared in the following order: xmin, ymin, xmax, ymax. In the 1.3.0 version, it is inverted for some coordinate reference systems such as WGS84 (EPSG 4326). This modification can lead to the situation of failing requests because of not putting coordinates in the right order.

2.2. Displaying non-geographical information on a portal

One challenge when trying to display data on an interactive map is to be able to deal with non-geographical information. For example, when working with station measuring water salinity relies at least as much in the salinity value over time as in the station location. If Geoserver allows using the information present in a dataset attribute table when querying a feature, it does not natively give the possibility to integrate external data sources.

Solution:

A solution experimented during SIMCelt project was to integrate an iframe in the GetFeatureInfo in order to display an external webpage. Below is an example of geological cores representation in SIMCelt Data Portal, by linking the GetFeatureInfo to a PHP script querying a database in order to generate a chart.

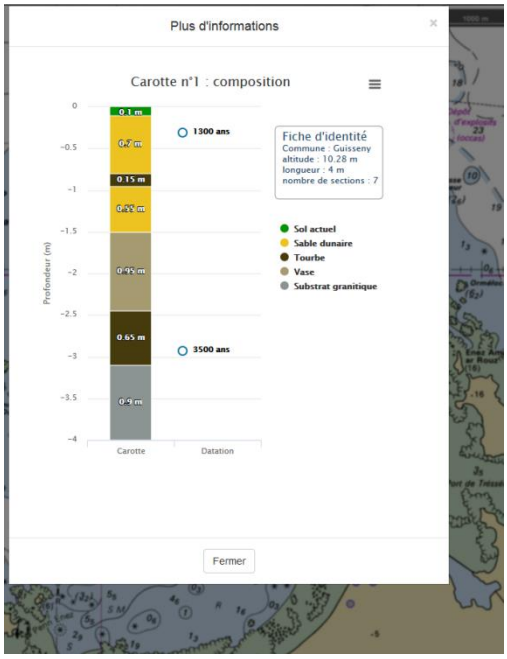


Figure 16: Example of GetFeatureInfo from WebPage

This type of feature can open many possibilities to give added value to data, by giving access not only to the attribute table linked to the geographical dataset, but also to any type of content like images, PDFs, databases, etc. It can also enhance data understanding by using graphical representations. This process is particularly adapted for time series.

2.3. Lack of technical documentation

SIMCelt Data Portal comprises some of the most widely used open-source software solutions among SDI. However, the way of exploiting them is quite unusual. In most cases, these tools are dedicated to emitting web services based on data stored locally. With SIMCelt SDI, the major part of datasets is directly hosted in the data producers' infrastructures, as explained in the SIMCelt Data Portal description (part 1). If the tools utilised provide (at least partly) the functionalities that apply to these processes, the documentation to use them and to understand the errors that potentially arise is scarce, when interpreting the logs from Geoserver or Geonetwork advanced knowledge in computer engineering is needed to allow them to be fully understood. Even on specialised forums, questions linked to geographical web services often remain unanswered.

Solution:

The present document constitutes of an attempt to fill the gap of lacking documentation by sharing the experience of building an SDI in SIMCelt project, and explaining the troubles encountered and the solutions explored.

3. Data Challenges

3.1. Symbology harmonisation

When displaying datasets from different sources but related to the same topic on a transboundary area, adopting a common symbology becomes a major benefit to aid understanding. However, several difficulties subsequently arise:

- Choosing the common symbology to use can sometimes be very difficult, especially when different standards are in use at the same time. Taking the example of maritime limits, two major standards are in use: one is at an international scale and is supported by the International Hydrographic Organisation (IHO), and the other is brought by the INSPIRE Directive and is applied at a European scale.

- Some of the data in SIMCelt project was only available in WMS. In this case, no style modification is possible.

Solutions

Being able to access WFS services allows an easier style management, as a common stylesheet can be applied at the harvesting SDI level instead of the producer's SDI. Convergences between the existing standards for individual data categories would also solve some difficulties.

3.2. Data selection among multiple sources

It is sometimes very difficult to identify the best data source for a given category, especially when several official producers provide inconsistent informationfor the same area. Considering the example of submarine cables and pipelines, the main sources are Shom, UKHO, and KIS-ORCA project. In each of these databases, it is possible to find cables not present in the others. The same cable or pipeline can also have diverging geometries in the different sources, as well as different attribute information. And since all the sources are official, it is not really possible to keep one and not the others.

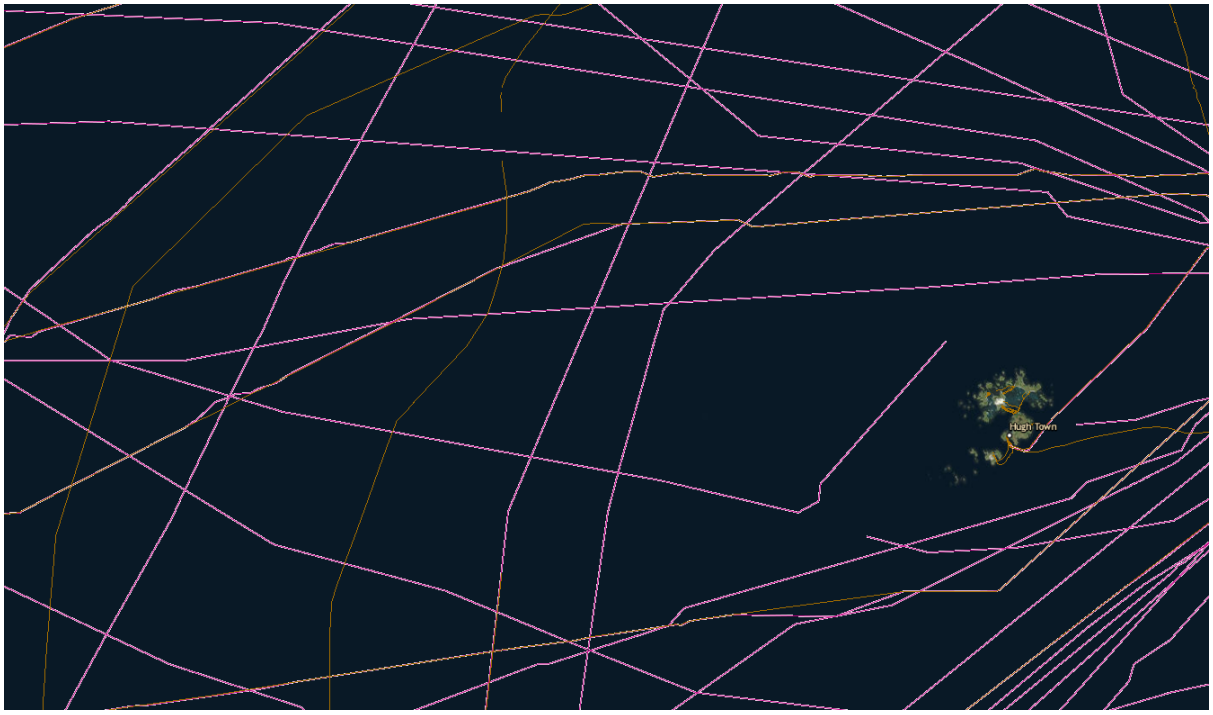


Figure 17: Cables comparison between Shom and UKHO

Conclusion

The setting up and management of a MSDI demonstrator to share MSP knowledge on the Celtic Seas proved to be an ideal means to explore data interoperability across a transboundary area. It especially allowed validating the core principles supporting SDP. Among them, the use of web services directly harvested from the data producers' SDI tends to be the most efficient way to collect data from partner infrastructures. It also benefits from an evolving context, thanks to the INSPIRE directive. Nevertheless, when building SDP, many challenges have been encountered, and some solutions to overcome them are proposed.

Some of the difficulties encountered are technical gaps, partly due to interoperability issues. Despite the progress achieved so far, issues can arise from the interaction between different software solutions or protocols. Even when using the same protocols, the differences in protocol versions can generate errors. Other technical challenges lie in being able to take advantage of all the aspects of data, including non-geographical information. This is essential when dealing with time series. A possible solution is to add a web server to the SDI in order to permit more complex GetFeatureInfo requests.

Other challenges fall under organisational matters. The varying availability of web services is still an issue that can prevent access to data for whole areas or categories on SDP. Even when they are available, the durability of web services constitutes a major difficulty. One of the proposed solutions to overcome these difficulties relies on the support to the partner organisations from the resources of European projects. This has been partly applied during SIMCelt, and could be more intensively exploited in upcoming projects. For the abundance of different data licence policies among data producers, an agreement on a common data licensing at the beginning of a project could allow better use of data from the project partners.

The last kind of challenge encountered is directly linked to data. The most important of these is symbology harmonisation, which is essential when working with data coming from both sides of a boundary. Progressing on this point needs an increased access to Web Feature Services, and a convergence between representation standards on some specific categories.

At a more global scale, SIMCelt project initiated the cooperation around the Celtic Seas between stakeholders involved in marine data management in support of Maritime Spatial Planning. The work undertaken by the data and information requirements for MSP component during more than two years can now provide benefits at several levels. Firstly, this baseline information can be used by marine planners in France, Ireland and the United Kingdom to start taking into account the transboundary context when elaborating national marine plans. Then, at the European level, interactions have to be set with EMODnet project. As the EMODnet harmonised datasets represented one of the major data sources used in SIMCelt, the work of inventory done around the Celtic Seas could be exploited to complete the coverage of EMODnet, especially concerning the human activities topic.

Finally, the SDI architecture built during the SIMCelt project will continue to be updated through other European projects dedicated to MSP: SIMNORAT (North Atlantic), SIMWESTMED (Western Mediterranean) and SEANSE (North Sea). This will provide the opportunity to explore interoperability with other European countries, and to complete the data analysis on several European sea basins. It will also give the opportunity to try solving some of the identified challenges by implementing solutions that were imagined during SIMCelt project but could not be experimented.

Annex 1: List of Sources

category	subcat	Name	Producer	Metadata
Basemaps	Basemaps	Raster Marine	Shom	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Basemaps	Basemaps	World Bathymetry (GEBCO)	Gebco	http://www.gebco.net/data_and_products/gridded_bathymetry_data
Basemaps	Basemaps	OpenStreetMap WMS	OpenStreetMap	https://wiki.openstreetmap.org/wiki/Main_Page
Basemaps	Basemaps	Satellite Imagery (Blue Marble)	NASA	https://earthobservatory.nasa.gov/Features/BlueMarble/
Basemaps	Basemaps	World Bathymetry (EOC)	EOC	http://www.dlr.de/eoc/
Boundaries	Project Area	SIMCelt Project Area	SIMCelt	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Boundaries	Project Area	SIMCelt Project Area Boundaries	SIMCelt	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Boundaries	Project Area	SIMCelt Case Studies Areas	SIMCelt	
Boundaries	Maritime Boundaries	Délimitations maritimes (France)	Shom	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Boundaries	Maritime Boundaries	United Kingdom Maritime Boundaries	UKHO	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Boundaries	Maritime Boundaries	Irish Maritime Boundaries	DCCAE	http://www.isde.ie/#/2175d298-4af2-4ae4-947c-eaca320f4b4c
Boundaries	Terrestrial Boundaries	Communes de Bretagne (France)	OSM	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Boundaries	Terrestrial Boundaries	Local Authorities (Ireland)	CSO	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Boundaries	Terrestrial Boundaries	Electoral Divisions (Ireland)	CSO	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Physical, Chemical and Biological	Physical	EMODnet Bathymetry	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Physical, Chemical and Biological	Physical	World Sediment Map	Shom	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Physical, Chemical and Biological	Physical	Salinity	Shom	http://services.data.shom.fr/geonetwork/srv/fre/catalog.search#/met
Physical, Chemical and Biological	Physical	Temperature	Shom	http://services.data.shom.fr/geonetwork/srv/fre/catalog.search#/met
Physical, Chemical and Biological	Physical	Wave Peak Period	Shom	http://services.data.shom.fr/geonetwork/srv/fre/catalog.search#/met
Physical, Chemical and Biological	Physical	Sea Water Direction	Shom	http://services.data.shom.fr/geonetwork/srv/fre/catalog.search#/met
Physical, Chemical and Biological	Types of Habitats	EUSeaMap 2016 Broadscale predictive habitat map	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Physical, Chemical and Biological	Biological	Grey Seal Pupping Sites	Marine Scotland	http://marine.gov.scot/node/12870
Physical, Chemical and Biological	Biological	Sargassum muticum - Wireweed - August 2012 (Scotland)	SNH	http://marine.gov.scot/maps/173
Physical, Chemical and Biological	Biological	Marine strandings data 2013-2016 (Scotland)	SAC	http://marine.gov.scot/maps/852
Physical, Chemical and Biological	Biological	Wintering Water Birds Average (Scotland)	SNH	http://marine.gov.scot/maps/107
Physical, Chemical and Biological	Biological	Fine scale harbour seal atsea usage	Marine Scotland	http://marine.gov.scot/maps/1446
Physical, Chemical and Biological	Biological	Spiny Dogfish (Squalas acanthias) (Catch Per Unit Effort)	SNH	http://marine.gov.scot/maps/177
Physical, Chemical and Biological	Biological	Sandy Ray (Leucoraja circularis)	SNH	http://marine.gov.scot/maps/165
Physical, Chemical and Biological	Pressures and Impacts	Polychlorinated biphenyls (PCBs) - CB153 in Sediment 2013-2016	Marine Scotland	http://marine.gov.scot/maps/1375
Physical, Chemical and Biological	Pressures and Impacts	Polychlorinated biphenyls (PCBs) - CB153 in Biota 2013-2016	Marine Scotland	http://marine.gov.scot/maps/1363
Physical, Chemical and Biological	Pressures and Impacts	Polychlorinated biphenyls (PCBs) - CB118 in Biota 2013-2016	Marine Scotland	http://marine.gov.scot/maps/1362
Physical, Chemical and Biological	Pressures and Impacts	Polychlorinated biphenyls (PCBs) - CB118 in Sediment 2013-2016	Marine Scotland	http://marine.gov.scot/maps/1374
Physical, Chemical and Biological	Pressures and Impacts	Contaminants in biota in the marine environment	Marine Institute	http://www.isde.ie/#/d555b645-8f84-4c3d-95c5-bb26d9b21e51
Physical, Chemical and Biological	Pressures and Impacts	Contaminants in sediments in the marine environment (IE)	Marine Institute	http://www.isde.ie/#/faaf6b02-ab70-482b-a5dc-779386d07d02
Human Activities	Aquaculture	Finfish and shellfish farms (Scotland)	Marine Scotland	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Aquaculture	Disease Management Areas (Scotland)	Marine Scotland	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Aquaculture	Guidance on the Location of Marine Fish Farms (Scotland)	Marine Scotland	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Aquaculture	EMODnet Finfish farming sites	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Aquaculture	EMODnet Shellfish Production Areas	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Fishing	Biologically Sensitive Area (Ireland)	Marine Institute	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Fishing	Greencastle Codling Protected Area (Ireland)	Marine Institute	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Fishing	Fishing Method All Gears (Ireland)	Marine Institute	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/

category	subcat	Name	Producer	Metadata
Human Activities	Fishing	Crab 2009-2013 amalgamated VMS intensity layer (Scotland)	Marine Scotland	http://marine.gov.scot/maps/769
Human Activities	Fishing	Fishing Activity in the Celtic Seas in 2016	ICES	
Human Activities	Fishing	Scotland - Effort (days) by UK-registered vessels (10m or greater) using active demersal gears	Marine Scotland	http://marine.gov.scot/node/12674
Human Activities	MRE	Atlantic Marine Energy Full Scale Test Site	Marine Institute	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	MRE	EMODnet Wind Farms (point)	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	MRE	EMODnet Ocean Energy Projects Locations	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	MRE	Wind renewable energy sites (Scotland)	Marine Scotland	http://marine.gov.scot/maps/1228
Human Activities	MRE	Wave renewable energy sites (Scotland)	Marine Scotland	http://marine.gov.scot/maps/1226
Human Activities	MRE	Tidal renewable energy sites (Scotland)	Marine Scotland	http://marine.gov.scot/maps/1225
Human Activities	Maritime Transport	Trafic Maritime - 2016	Shom	
Human Activities	Maritime Transport	Average weekly density of all vessel types 2012 - 2015 (Scotland)	MMO	http://marine.gov.scot/maps/1332
Human Activities	Maritime Transport	CIL Navigation Buoy (Ireland)	CIL	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Maritime Transport	CIL Lighthouses (Ireland)	CIL	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Maritime Transport	Ferry Route (IE)	Marine Institute	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Ports	Ports de Bretagne	Région Bretagne	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Ports	EMODnet Major Ports	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Military	Historic munitions disposal sites (Scotland)	Marine Scotland	http://marine.gov.scot/node/12829
Human Activities	Military	EMODnet Dredge dumping munition sites	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Military	Military practice areas (UK)	UKHO	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Defence_dat
Human Activities	Military	Munitions dumping grounds (UK)	UKHO	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Defence_dat
Human Activities	MPA	Designated marine protected areas	Maia	
Human Activities	Raw material Extraction	Irish Sea Marine Aggregate Resource Area (Ireland)	Marine Institute	
Human Activities	Raw material Extraction	EMODnet Aggregate Extraction Locations	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Raw material Extraction	EMODnet Hydrocarbon Extraction Active Licences	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Raw material Extraction	EMODnet Hydrocarbon Extraction Boreholes	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Raw material Extraction	EMODnet Hydrocarbon Extraction Offshore Installations	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Submarine cable	Câbles et conduites	Shom	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Submarine cable	Submarine cables	UKHO	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Cables/Map
Human Activities	Submarine cable	Subsea cables	KIS ORCA	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Cables/Map
Human Activities	Submarine cable	Pipelines	UKHO	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Existing_Infr
Human Activities	Tourism and recreation	Marinas (Ireland)	Marine Institute	http://www.isde.ie/#/faf0b5fd-1a3e-450b-9ce0-7fa3e46c0271
Human Activities	Tourism and recreation	Marinas (UK)	MMO	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Recreation_
Human Activities	Tourism and recreation	Slipways (UK)	MMO	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Recreation_
Human Activities	Underwater Cultural Heritage	Epaves et obstructions (France)	Shom	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Underwater Cultural Heritage	INFOMAR Surveyed Shipwreck (Ireland)	GSI	http://www.isde.ie/#/b9a22ad2-85ad-48aa-adcb-2f2084f0ca4b
Human Activities	Underwater Cultural Heritage	Wrecks (Scotland)	HES	http://marine.gov.scot/maps/577
Human Activities	Underwater Cultural Heritage	Losses (Scotland)	HES	http://marine.gov.scot/maps/118
Human Activities	Underwater Cultural Heritage	World Heritage Sites (Scotland)	HES	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Underwater Cultural Heritage	Historic shipwrecks (UK)	Historic England	http://mmogis.services.defra.gov.uk/arcgis/rest/services/Heritage/Ma
Human Activities	Coastal Defence	Artificialisation du trait de côte du Finistère en 2008 (France)	LETG Geomer	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Coastal Defence	Sondages géologiques en Finistère (France)	LETG Geomer	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Coastal Defence	EMODnet Dredging Locations	EMODnet	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Human Activities	Coastal Defence	Coast protection schemes since 2000 (Scotland)	Marine Scotland	http://marine.gov.scot/maps/198

category	subcat	Name	Producer	Metadata
Human Activities	Coastal Defence	Flood defence schemes since 1961 (Scotland)	Marine Scotland	http://marine.gov.scot/maps/199
Human Activities	Coastal Defence	Managed re-alignment schemes (Scotland)	Marine Scotland	http://marine.gov.scot/maps/200
Spatial Policy	Spatial Policy	Scottish Marine Regions (Scotland)	Marine Scotland	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/
Spatial Policy	Spatial Policy	Local Coastal Partnerships (Scotland)	Marine Scotland	http://services.data.simcelt.eu/geonetwork/srv/eng/catalog.search#/