HiSea Deliverable 4.2

HiSea Frontend drafts

Work Package Number: 4

Work Package Title: Service Design and Cloud Computing

HISea Project Information	
Project full title	High-Resolution Copernicus-Based Information Services at Sea for Ports and Aquaculture
Project acronym	HiSea
Grant agreement number	821934
Project coordinator	Dr. Ghada El Serafy
Project start date and duration	1st January 2019, 30 months
Project website	https://hiseaproject.com/

Deliverable Information	
Work package number	4
Work package title	Service Design and Cloud Computing
Deliverable number	4.2
Deliverable title	HiSea frontend drafts

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

Description	The service frontend (e.g. desktop, web, mobile) is a key component of any service. Through the frontend users have access to the service. Therefore, the level of acceptance of the service by the user is closely related with the service's capacity to properly answer to the user's questions and to use the service effectively. In this context the frontend is a critical service component that must be developed in close cooperation with potential users to ensure that the required functionalities are integrated and that the information is delivered in the most comprehensive way (e.g. content, formats, design, etc.). This task will be focused on preparing some service mock-ups (e.g. web and mobile clients) to enable an informed exchange of ideas with different potential users that lead to a first draft of the service's user interface (UI).
Lead beneficiary	Hidromod
Lead Author(s)	Pedro Galvão
Contributor(s)	Sandra Gaytan Aguilar, Philippe Bryère, Anna Spinosa
Revision number	6
Revision Date	30/10/2019
Status (Final (F), Draft (D), Revised Draft (RV))	F
Dissemination level (Public (PU), Restricted to other program participants (PP), Restricted to a group specified by the consortium (RE), Confidential for consortium members only (CO))	PU

Document History			
Revision	**Date**	**Modification**	**Author**
0.1	16/10/2019	Create structure and text editing	Pedro Galvão
0.2	22/10/2019	Text update and comments	Sandra Gaytan
0.3	24/10/2019	Text update and comments	Philippe Bryère
0.4	25/10/2019	Text update and comments	Anna Spinosa
0.5	28/10/2019	Addressing comments	Pedro Galvão
0.6	29/10/2019	Review and edit	Bracha Ehrman

Approvals				
	Name	**Organisation**	**Date**	**Signature (initials)**
Coordinator	Dr. Ghada El Serafy	Deltares	31/10/2019	GES
WP Leaders	Adélio Silva	Hidromod	31/10/2019	AS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

Table of Contents

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

Tables

Figures

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

1 Executive Summary

The service frontend (e.g., desktop, web, mobile) is a crucial component of any service. Since through the frontend, users have access to the service. For this reason, the level of acceptance of the service is closely related to its capability to adequately answer the user's questions and to provide what the user needs in terms of interface design and effectiveness. In this context, the frontend is a critical service component that must be developed in close cooperation with potential users to ensure that it integrates the required functionalities, delivering information in a comprehensive way (e.g., content, formats, design, etc.). This deliverable focuses on the preparation ofg some service mock-ups, such as web and mobile clients, to enable an informed exchange of ideas with different potential users, creating a first draft of the user interface (UI), namely, how the HiSea services will look to the end user. Section 2 of this document, describes user interface options, while section 3 of this document lists examples of data visualization components, and applications that could be used to finalize the platform interface with the consortium partners.

2 User interface options

When designing user interfaces for systems such as for the HiSea platform, usually two paths can be followed:

1- Create a dashboard-like interface where users can integrate and match the existing data to solve their problems.
2- Create a focused interface, completely tailored to specific user needs.

Advantages and disadvantages can be found in both approaches.

Dashboard interfaces offset some of the user interface definition to the user. They require highly engaged users that are willing to spend time with the system to create something like a focused interface for their specific needs. On the other hand, this type of interface provides far more flexibility than “closed applications.”

Focused interfaces have much less versatility, but if done correctly, don’t require much effort from new users, improving adoption. On the other hand, after the final version is released, no further new display options are available.

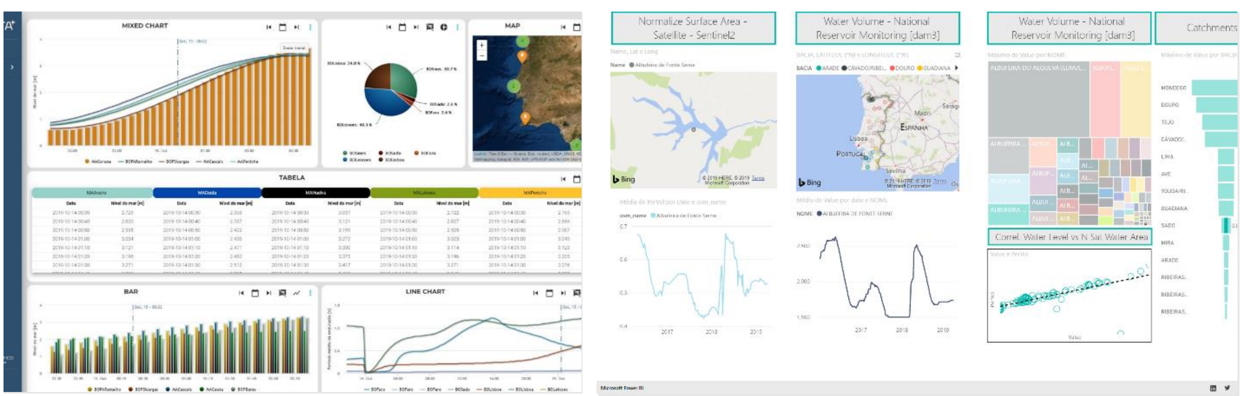


Figure 1: Dashboard examples

Figure 1 shows examples of two dashboard-like interfaces, AquaSafe, and PowerBi. In both cases, users start with an empty canvas and are free to add User Interface (UI) components from a component library (charts, maps, etc.). Each component must be configured to access data which is stored on the backend.

Another example of those dashboards is FEWS showed in Figure 2. Delft-FEWS provides import modules that allow data to be imported from a variety of external sources such as web services, external databases and many different file formats. These data include for example time series obtained from telemetry

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 821934

systems, as well as water quality sample data, meteorological forecast data, radar data and numerical weather predictions

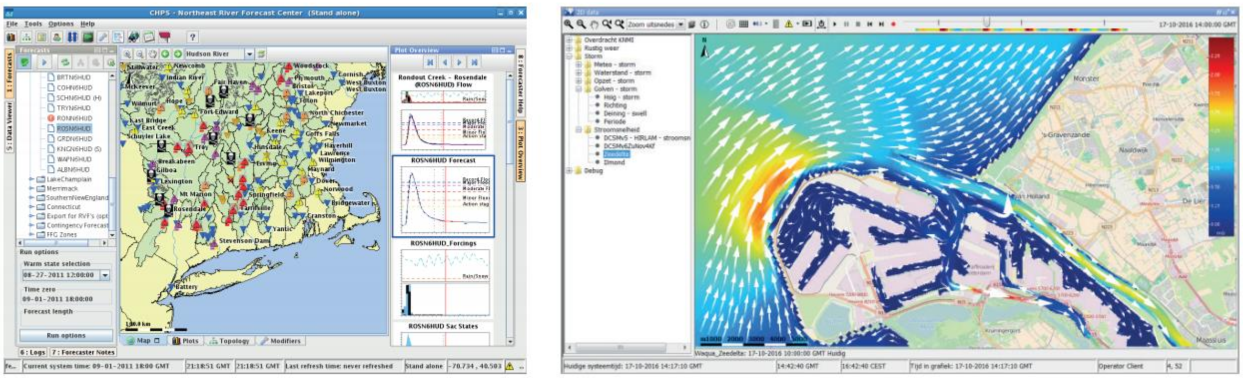


Figure 2: Delft-FEWS Dashboard

Only the number of available UI components limits the final information displayed to the user. The architecture of the application allows adding new elements to the library without significant changes to the interface.

When developing this sort of application, it is essential to have a curated catalogue of data to facilitate the discovery of data by the user.

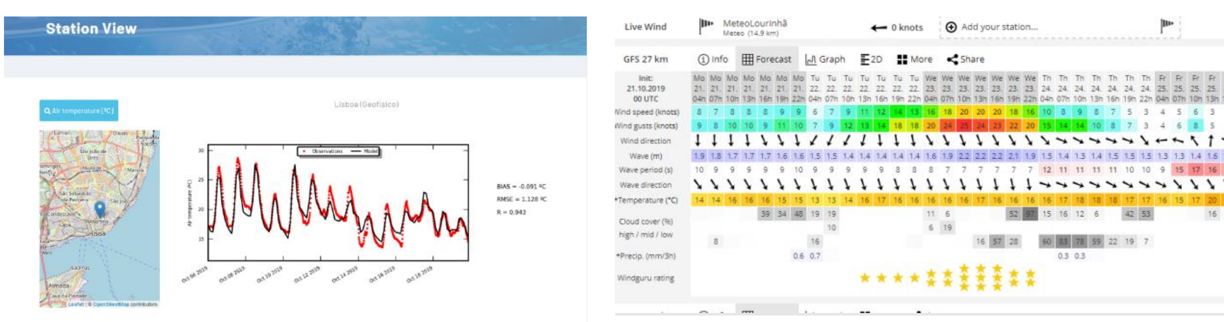


Figure 3: Example of closed interface

Figure 3: Example of closed interface

displays examples of closed interfaces, an Hidromod interface showing the comparison of observation with forecast for several parameters and stations, and the popular Windguru. There is no option for the user to expand on these interfaces, for instance, to display both the table and a map of locations.

This limitation of the closed interface does not indicated a lack of interaction with the end user. In both types of user interfaces options users can modify the location where data is displayed. This closed

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

interface is usually easier to be implemented. However, user requirements must be very well defined. Changes along the project may lead to rewriting of a large portion of the codebase which is extremely inefficient.

Another problem associated with fixed interfaces is its low transferability to other potential clients if the interfaces are too specific to the current case study.

Fortunately, the technology for developing custom user interfaces has been improving with free, open-source toolkits of both controls and styles. The back-end of HiSea is designed to host data and data treatment processes in an agnostic way. It can accommodate both user interface paradigms.

With the flexibility of the backend and the cost of implementing custom interfaces in mind, a “Closed interface” designed in collaboration with the case study partners is the the advised option..

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 821934

3 User requirement / Example Applications

The HiSea project is aiming to provide services for two marine activities: ports and aquaculture. On June 10th, 2019, the Valenciaport Foundation (VPort), a partner of the HiSea project, hosted a workshop at the facilities of the Port Authority of Valencia to gather user requirements for the application of HiSea for the port domain.

Selonda, an aquaculture partner in the project, held a similar workshop for the aquaculture sector on June 27-28, 2019, in Greece. Deliverable D2.1: Initial Report on the users feedback is a detailed report of these meetings.

3.1 Draft Interfaces for Port applications

Table 21 describes the requirements for port applications. Moreover, more detailed information is included in D3.6 Report on technical requirements for the service platform

Table 1: Port application requirements

Id	Application domain	Detail	Goal / Requirement
1	Area control and monitoring	Water quality	Facilitate regulation compliance
			Continuous measurements
			Identify areas with specific water parameters.
			Facilitate regulation compliance
			Continuous measurements
		Material transport (sediments)	Internal and external port waters
2	Early warning systems	Water quality and Oil spills	Identify oil spills
			Personalized alarms for abnormal water quality parameters
3	Modeling	Water trajectory models	Foresee oil and other contaminant spill movements.
		Identify the location of contaminating sources	After contamination is detected, perform reverse tracking to its source location.
		Forecasting Water quality parameters	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

For application domains 1 and 2, a drill-down interface is a good UI pattern. The initial interaction with the user should consist of simple indicators or gauges (street-sign with simple colors, red, green orange). When an alarm is activated, drill-down interfaces allow the user to examine the problem in greater detail. Argans-F has demonstrated both floating debris, and spill detection using satellite images as examples (Figure 4).

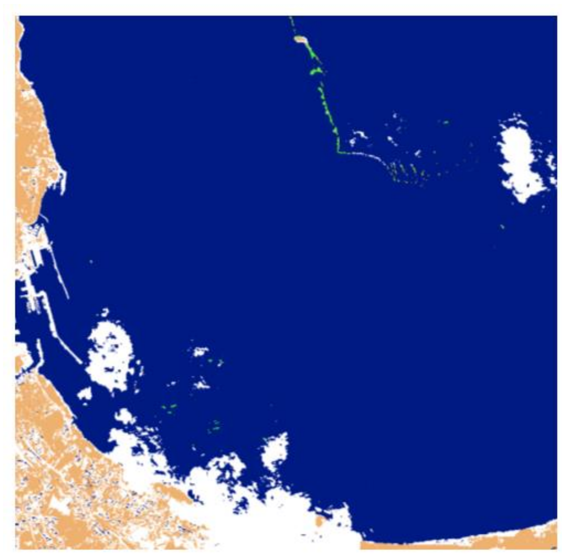


Figure 4: Floating debris detection (green, yellow, and red) with Sentinel-2 Argans "ML Processor."

For application domain 2, the trajectory of oil spills, the user must select the suspected location of the discharge and type of oil or contaminant. The geospatial character of the requested feature recommends a GIS-centred interface (Figure 5)..

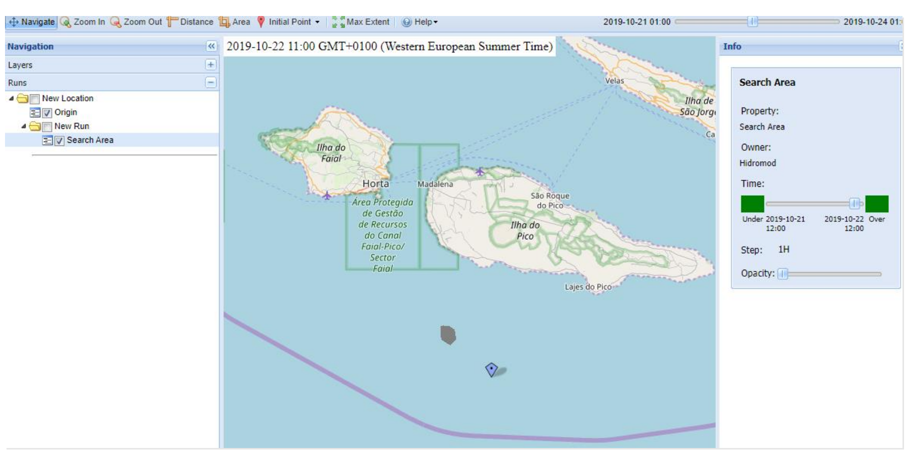


Figure 5: Hidromod online tool to model oil spill trajectories

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

A Wizzard type interface will simplify the application of the model to non-specialists (Figure 6).

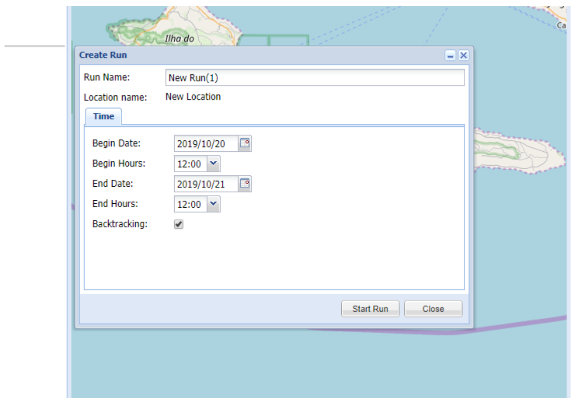


Figure 6: Wizzard interface, select the simulation period, oil type, etc.

3.2 Draft Interfaces for Aquacultures

The requirements gathered at the Aquaculture workshop were:

Table 2: Aquaculture application requirements

Id	Application Domain	Detail	Goal/ requirements
1	Water quality for aquaculture	Water quality revolves around water temperature and oxygen. Currents and winds are good indicators of oxygen renewal	Hight resolution Historical data Forecast and alerts Correlate to feeding levels
2	Harvesting with vessels	Winds and currents determine the timing of harvesting using ships. Forecasting winds and currents would allow scheduling this activity so that the weather conditions would not negatively affect the supply chain	Schedule harvesting.

For both application domains, the met-ocean parameters should collapse into a discrete indicator scale, so the user can immediately evaluate the situation. A map interface would display multiple indexes simultaneously. Otherwise, a simple gauge can can present the current status.

Argans-F "mini-websites" have an attractive interface for the display of historical and current data from satellite images. Once a user selects the desired location on a map, he obtains a chart with the variation for a chosen parameter along multiple years.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

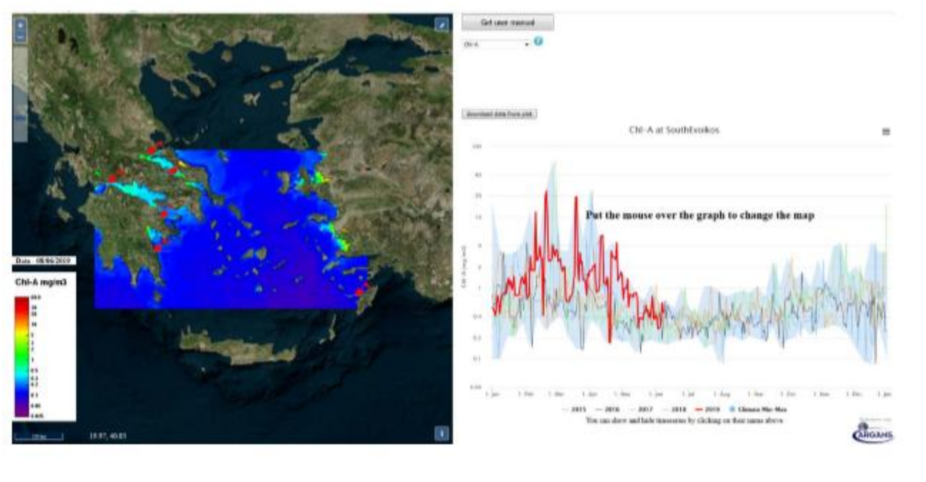


Figure 7: Argans-F SELONDA mini-website – Chlorophyll-a from ACRI-ST at a resolution of 1km

Intecmar[1] has an application with a good UI pattern for *Application Domain 2*. Perceguru (http://mapas.intecmar.gal/perceguru/) helps fishers access the safety condition to catch goose barnacles on the Galician coastline (Figure 8).

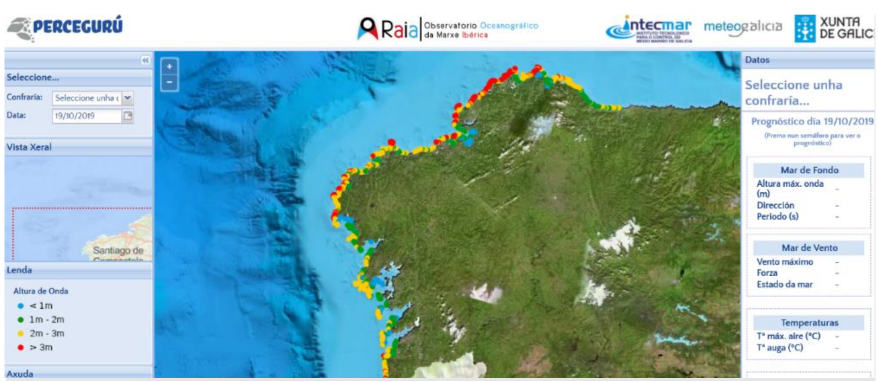
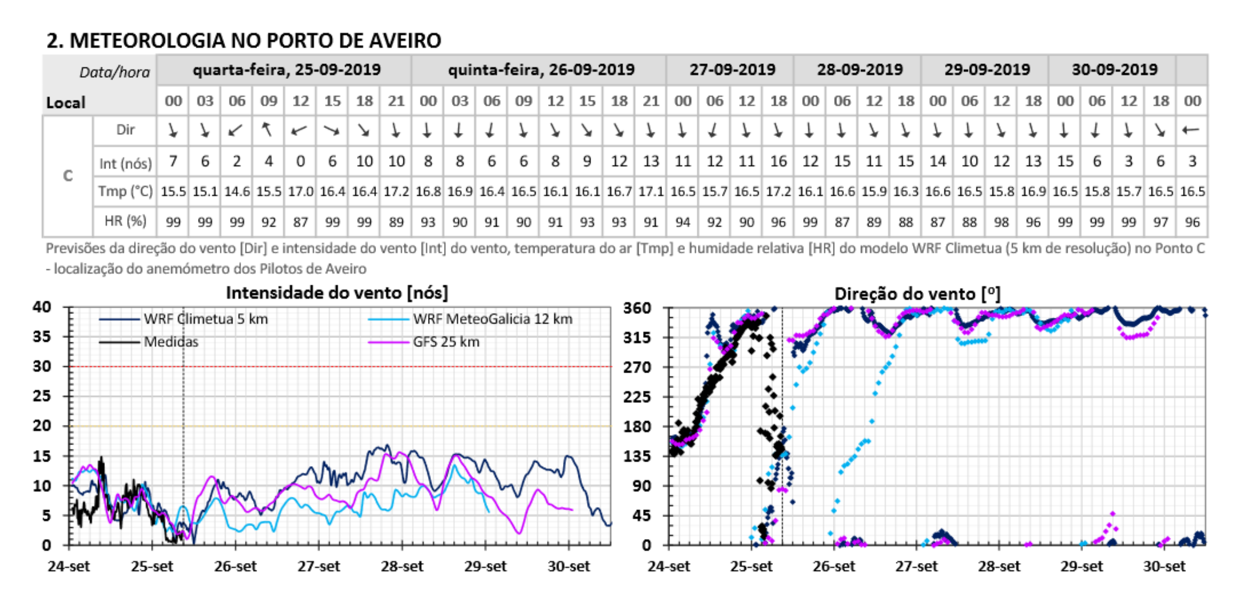


Figure 8: Perceguru displays a safety index for goose barnacles fisheries

Selecting a single location displays the forecast of the index along with the parameters that are used to calculate that index. A parameter table is an excellent example of a UI pattern to convey such information (Figure 9).

[1] Instituto Tecnológico para el Control del Medio Marino de Galicia

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934



2. METEOROLOGIA NO PORTO DE AVEIRO

Data/hora		quarta-feira, 25-09-2019								quinta-feira, 26-09-2019							
Local		00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21
C	Dir	↘	↘	↙	↖	↙	↘	↘	↓	↓	↓	↓	↓	↘	↘	↘	↓
	Int (nós)	7	6	2	4	0	6	10	10	8	8	6	6	8	9	12	13
	Tmp (°C)	15.5	15.1	14.6	15.5	17.0	16.4	16.4	17.2	16.8	16.9	16.4	16.5	16.1	16.1	16.7	17.1
	HR (%)	99	99	99	92	87	99	99	89	93	90	91	90	91	93	93	91

Data/hora		27-09-2019				28-09-2019				29-09-2019				30-09-2019				
Local		00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00
C	Dir	↓	↓	↓	↘	↓	↓	↘	↘	↓	↓	↘	↘	↓	↓	↓	↘	←
	Int (nós)	11	12	11	16	12	15	11	15	14	10	12	13	15	6	3	6	3
	Tmp (°C)	16.5	15.7	16.5	17.2	16.1	16.6	15.9	16.3	16.6	16.5	15.8	16.9	16.5	15.8	15.7	16.5	16.5
	HR (%)	94	92	90	96	99	87	89	88	87	88	98	96	99	99	99	97	96

Previsões da direção do vento [Dir] e intensidade do vento [Int] do vento, temperatura do ar [Tmp] e humidade relativa [HR] do modelo WRF Climetua (5 km de resolução) no Ponto C - localização do anemómetro dos Pilotos de Aveiro

Figure 9: Met-Ocean information summarized in table-format

3.3 User interface components

The previous UI patterns are composed of Maps, Charts, Gauges, and Tables.

This section enumerates some UI toolkits that implement such components. All enumerated kits are open source and free to use.

3.4 Maps

Two common toolkits for implementing interactive maps in web environments are Open Layers and Leaflet. Both are opensource and have open APIs that enable adding layers, drawing on the canvas, taking coordinates, etc. Both are WMS and WMST compliant making it easy to add dynamic model layers to map.

Name	Website	License
Open Layers	https://openlayers.org/	BSD 2-Clause License
Leaflet	https://leafletjs.com/	BSD 2-Clause License

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934

3.5 Charts

There is a large number of chart toolkits. The following were used successfully in the past for UI development by members of the consortium

Name	Website	License
ECHARTS	https://echarts.apache.org	Apache License 2.0
Tau Charts	https://taucharts.com/	Apache License 2.0
CHART.JS	https://www.chartjs.org/	MIT

All have support for HTML5 canvas and SVG rendering for performance and can create the most chart types (scatter, line, pie, bar, etc.)

3.6 Gauges

For representing gauges on webpages the following libraries are recommended:

Name	Website	License
Canvas Gauges	https://canvas-gauges.com/	MIT
Tau Charts	https://justgage.com/	MIT

The rendering performance for gauges is less intensive than for charts since they use fewer data points.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821934