

Commission
Innovation and
Networks
Executive
Agency (INEA)

Connecting Europe Facility

WP3 Report:

Technical acceptance protocol and report for the testing and validation of the eGAFOR system prototype

Reporting milestone: M3.2 31/05/2021

1. INFORMATION ON THE ACTION		
Grant Agreement Nº	INEA/CEF/TRAN/M2016/1352262	
Action number	2016-EU-TMC-0075-S	
Action title	eGAFOR	

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2. INFORMATION ON THE PROGRESS OF THE ACTION

Overview of progress in the reporting period

The overview should include a description of the actual progress in the reporting period, referring to the main issues, milestones and events that affected progress.

Work package 3 - WP3 Definition of the scope of the eGAFOR

(As defined in the Grant Agreement, Annex I, paragraph I.4.2)

The aim of this Activity is the development of a system for the eGAFOR in agreement with the MET experts of the other project partners. The system will be built by the IBL. This Work Package is strongly interdependent with WP 2, because the eGAFOR prototype depends on the outputs provided by WP2 – eGAFOR list of requirements and the eGAFOR story.

Deliverables:

- D3.1 Technical acceptance protocol and report on eGAFOR prototype
- D3.2 Technical acceptance protocol and report for the testing and validation of the eGAFOR system prototype

Meetings:

F2F meeting, Bratislava, 20/08/2019

F2F meeting, Bratislava, 22/10/2019

F2F meeting, Bratislava, 09/01/2020

Joint WP4 F2F training, Bratislava, 26/02/2020

F2F meeting, Bratislava, 27/02/2020

Online review meeting, 19/11/2020

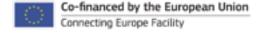
Online review meeting, 10/12/2020

Online final meeting, 17/05/2021

Milestones:

M3.1 eGAFOR prototype system production





M3.2 Testing and validation of the prototype

Date of reaching milestone:

M3.1 27/02/2020 M3.2 17/05/2021

Short overview of the progress:

During the years 2019, 2020 and beginning of the year 2021 IBL was implementing the prototype of eGAFOR solution based on the WP2 reports and technical specifications.

Before the M3.1 milestone, development progress was presented during the F2F meetings at IBL premises in Bratislava:

At the first WP3 review meeting IBL presented layout and basic concepts of the prototype of eGAFOR Editor and collected comments, suggestions from the partners. Requirements were modified and few new ones were added.

During the second WP3 review meeting IBL presented the interface of the eGAFOR Editor prototype with the main functions. Very fruitful discussion during the meeting resulted in an update of the technical requirements.

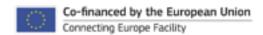
During the third WP3 review meeting IBL presented very advanced polygon drawing, editing and basic collaboration features. During the meeting participants tested the prototype on the environment provided by IBL. As a result of the meeting additional requirements were created and updated.

At the final WP3 review meeting the eGAFOR Editor prototype was tested against functional requirements by all partners participating in the meeting and the acceptance protocol was prepared and approved. The protocol was prepared with noting that the development of the prototype will continue during the rest of the year 2020. After the fruitful discussions, few requirements were modified and updated.

During the joint WP3/WP4 training IBL and WP4 leader trained forecasters from MET partner organisation how to use the eGAFOR Editor prototype, how to create, update and issue forecasts and how to collaboratively forecast.

During the rest of the WP3 period, implementation was focused on the connection of the eGAFOR Editor prototype with the final backend service, improvements of the backend / middleware. Unfinished must / should requirements were implemented and multiple improvements based on the user feedback were implemented too. eGAFOR Viewer prototype was fully redesigned and implemented according to the functional requirements. eGAFOR Administration part was implemented as well.





After the M3.1 milestone, due to the COVID-19 pandemic, only the online meetings were organised to review prototype development progress. Useful feedback was obtained from the partners during the meetings and functionality was modified accordingly.

IBL prepared testing environment for partners at the beginning of the year 2021 and regularly provided new updates there. Functionality was discussed regularly via ad-hoc phone calls and discussion over the IBL Slack channels.

Partners started with regular testing issuance of forecasts after 1 March 2021, including the Joint level workshop, where the pre-operational use of prototype has been tested and validated. All the reported issues were implemented by IBL.

Final testing of the prototype was held on 14 May 2021. During the final meeting on 17 May 2021, all partners participating in the meeting reviewed the requirements and the acceptance protocol was prepared.

Report on eGAFOR prototype

During the project implementation, it was found that original requirements were not sufficient to provide the best possible product for end users (general aviation pilots) on one hand, and to enable forecasters to enter huge amounts of data into the system in a limited time on the other hand. Therefore, a completely new system of entering meteorological data via polygons and translating that meteorological forecast into impact forecast for end users was invented. This new solution required additional development in Action 3.

The eGAFOR Editor Prototype and eGAFOR Viewer Prototype are Web Applications developed within the TypeScript, Angular and Leaflet technologies. The middleware is running on the node.js technology and the back-end services are implemented in the IBL Visual Weather product.

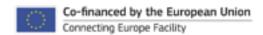
Drawing and editing of polygons complied to requirements, collaboration was fully functional, the prototype allowed simultaneous drawing and collaborative editing of phenomena polygons. eGAFOR Editor implementation included real-time showing of impact on eGAFOR routes while drawing phenomena polygons.

User credentials and login mechanism implementation was fully implemented, with enabled national level managers and user individual forecaster accounts in the Editor. In the eGAFOR Viewer authentication was implemented using the Google Authentication SSO.

Chat features were implemented, partners were allowed to send direct messages and global chat for all partners was available.

eGAFOR Viewer was fully implemented, including 30-days archive of previous forecasts.





The GeoJSON export functionality was implemented.

The backend service for the eGAFOR Editor -- IBL Visual Weather features were extended to allow proper manipulation of all the objects (features, routes) needed for the eGAFOR Editor and to provide all the required services.

Administration portal was implemented as a part of the eGAFOR Editor portal, allowing creation, modification and removal of users (based on privileges) and defining national forecast exceptions.

Offline documentation was prepared, available via IBL Confluence portal or as a PDF export. Online documentation will be available during the operational phase.

Technical acceptance protocol

The protocol is attached as the Appendix 1 of this report.

Conclusion

All the partners actively participated in all activities and tasks scheduled in the Project. Implementation of the eGAFOR prototype progressed very well and discussion during the F2F meetings resulted in very useful extensions / updates of technical requirements collected in the WP2. Due to the complexity of the requirements and addition of the completely new system of entering meteorological data via polygons the development period was extended and continued after the M3.1 milestone.

eGAFOR Editor Prototype and eGAFOR Viewer Prototype successfully demonstrate all the must eGAFOR requirements defined by project and all other requirements needed for operational issuance of eGAFOR forecasts and usage of the eGAFOR product by GA pilots. The activity objectives were fulfilled and realisation of the eGAFOR Prototype implementation was demonstrated.







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WP3 Report:

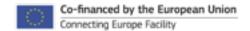
Technical acceptance protocol and report for the testing and validation of the eGAFOR system prototype

Reporting milestone: M3.1 31/05/2021

Appendix 1: Technical Acceptance Protocol

1. INFORMATION ON THE ACTION			
Grant Agreement No	INEA/CEF/TRAN/M2016/1352262		
Action number	2016-EU-TMC-0075-S		
Action title	eGAFOR		





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2 Acceptance preparation

2.1 Time schedule

Acceptance testing will be held by all partners on 14 May 2020.

2.2 Hardware Infrastructure

Tested Editor Systems	Amazon EC2 instance (m5a.xlarge)
Tested Viewer Systems	Amazon EC2 instance (m5a.xlarge)

2.3 Software Infrastructure

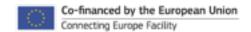
Operating System	Ubuntu 20.04.2 LTS
Software Version	Online Weather 5.4.0-m9-20210514-2 Visual Weather 6.3
	Visual Weather 6.5

2.4 SAT Hardware details

Virtual server hosted on Amazon EC2:

- 4 vCPUs 2.6 GHz
- 16 GB RAM
- 50 GB ESB SSD

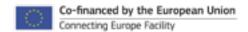




3 Technical Requirements

Req ID	Category	Requirement summary	MoSCoW	Result
1.01	Login and system	System shall consist of: - admin part, - registered users (forecasters) part - guest (user) part	must	Yes
		There will be 4 categories of user accounts on www.egafor.eu: - free: all users - registered users pilots: allowed to modify some settings - registered forecasters		
1.02	Login and system	- admin users	must	Yes
1.03	Login and system	Users will have different level of user rights	must	Yes
		There will be 2 categories of administration: - user administration		
1.04	Login and system	- route network administration	must	Yes
1.05	Login and system	All forecasters shall have individual accounts	should	Yes





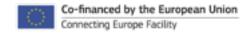
1.06	Login and system	Password level security is applicable. Password should contain at least 10 characters of which should be at least one uppercase, lowercase, number and special character	should	Yes
1.07	Login and system	Users will be able to stay logged-in on a same device ("Remember me" option)	should	Yes
1.08	Login and system	Each registered forecaster and registered pilot will have her/his settings saved	must	Partly
1.09	Login and system	Forecasters from the same METSP will form a group. Each group is responsible for forecasts in corresponding FIR	should	Yes
1.10	Login and system	Groups will have same default and shared settings	would	No
1.11	Login and system	Only members of a dedicated group will be able to issue an eGAFOR forecast to the corresponding country.	must	Yes
1.12	Login and system	if possible, all actions will have mouse options and keyboard shortcuts	should	Yes
1.13	Login and system - GDPR	The supplier (manufacturer) has adopted information system security policy	should	Yes





		Manufacturer can document the phases of the application development:		
		- data model,		
		- implemented security measures (security concept),		
		- system testing,		
		- change management,		
		- configuration management,		
		- backup storage and control over backup storage (for "cloud" services),		
	Login and system -	- the method of ensuring business continuity (for		
1.14	GDPR	"cloud" services)	should	Yes
1.15	Login and system - GDPR	A safe way of communication when exchanging information is agreed with the supplier (e.g. through a dedicated help-desk system or encrypted mail messages)	should	Yes
		The system collects a minimum set of personal data		
	Login and system -	that have a clearly defined purpose and are not delivered to other locations/recipients who are not		
1.16	GDPR	required for processing purposes.	should	Yes
1.17	Login and system - GDPR	The categories of personal data that can be saved in the application system are listed.	should	Yes
1.18	Login and system - GDPR	Users can change their own passwords (and preferably other personal information as well)	should	Yes
1.19	Login and system - GDPR	Data in the database can be encrypted (at least applicable for user passwords)	should	Yes





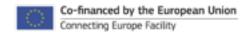
1.20	Login and system - GDPR	The personal data search functionality is enabled per user (respondent)	should	Yes
1.21	Login and system - GDPR	Users (respondents) personal data can be obtained from the system in a structured, machine-readable form	should	Yes
1.22	Login and system - GDPR	Audit logs of user data changes are enabled	should	Yes
1.23	Login and system - GDPR	Group based access to personal data is enabled	should	Yes
1.24	Login and system - GDPR	The system allows for automatic deletion i.e. archiving of data according to a defined time of retention	should	Yes
1.25	Login and system - GDPR	Data link with the system in encrypted (https protocol for web services)	should	Yes
1.26	Login and system	Issuing schedule per country	should	Yes
2.01	Forecast production	MET elements shall be inserted in system as polygons	must	Yes
2.02	Forecast production	Common properties of all polygons shall be MET element, probability class (PC) and time property	must	Yes





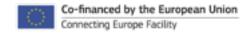
2.03	Forecast production	Additionally, Clouds polygon shall have properties "Upper boundary of the uncertainty zone" (UB) and "Lower boundary of the uncertainty zone" (LB) * UZ LB and UB shall use 100ft steps * UZ max spread is 30% of cloud base AMSL, but not less than 300ft	must	Yes
2.04	Forecast production	Additionally, Visibility polygon shall have Visibility class (VC) property. Visibility classes will be: - less than 1,5 km - between 1,5 and 5 km - between 5 and 8 km	must	Yes
2.05	Forecast production	Additionally, Turbulence polygon shall have Severity class (SC) property and vertical distribution property. Severity classes will be: - MOD - SEV	must	Yes
2.06	Forecast production	Vertical distribution of the Turbulence will be inserted as lower and upper boundary in ft	must	Yes





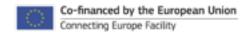
2.07	Forecast production	Additionally, Cumulonimbus Clouds polygon shall have Distribution class (DC) property. Distribution classes will be: - ISOL - OCNL - EMBD/FRQ/SQL	must	Yes
2.08	Forecast production	Polygons can not contain holes	should	Yes
2.09	Forecast production	Polygons must be closed (all points have to be connected)	must	Yes
2.10	Forecast production	Polygons can be open (all points do not have to be connected) when created on edge of the FIR or attached to other polygon	would	No
2.11	Forecast production	Points of the polygon can be snapped to the nearest point of other polygon. In that way two polygons can share at least a part of one edge.	should	Yes
2.12	Forecast production	Polygons for the same MET element can overlap if differ in characteristics. If there are 2 polygons overlapping with the same characteristics, they should be auto-merged into one.	should	No





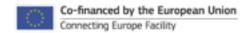
2.13	Forecast production	Copying polygons will be enabled. Use cases for this functionality: - when in time-centric mode, polygons can be copied in one time-interval and then pasted in second - polygon can be copied, pasted and properties of the polygon can be changed (see 2.18 - 2.20)		Yes
2.14	Forecast production	Option for importing polygons from previous interval in time-centric-mode. If the previous time interval is in the previous eGAFOR forecast, polygons can also be imported.	should	Yes
2.15	Forecast production	Imported and/or copied polygons can be edited spatially	should	Yes
2.16	Forecast production	Imported and/or copied polygons can be edited by MET properties	should	Yes
2.17	Forecast production	Imported and/or copied polygons can be edited by probability classes	must	Yes
2.18	Forecast production	Active polygon can be deleted at once	should	Yes
2.19	Forecast production	Polygons can be modified by adding or removing points. Added points can be moved.	should	Yes
2.20	Forecast production	Polygons can be selected and dragged	should	Yes





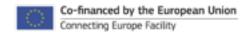
2.21	Forecast production	Polygons can be saved as favorites	should	Yes, partly
2.22	Forecast production	Before creating a polygon, MET element is selected	should	Yes
2.23	Forecast production	MET element can be changed while creating polygon or when finished	should	Yes
2.24	Forecast production	Polygon will be created by series of left-clicks. With double left-click after second point (the third point and beyond), polygon will be closed and will automatically connect with the first point of the polygon	should	Yes
2.25	Forecast production	After the creation of polygon, table appears with all properties to enter or select	should	Yes
2.26	Forecast production	when polygon is drawn for selected phenomena, forecaster will select severity and probability by clicking in the impact table (except for CLD)	should	Yes
2.27	Forecast production	For CLD, forecaster selects the range of uncertainty zone by 'click-drag' or 'click-click' on the altitude slider (in feet), or inserts values in boxes	should	Yes
2.28	Forecast production	Points will be added to a polygon by single left-click on the polygon's edge. The appearance of the cursor will be changed when on the polygon's edge.	should	Yes
2.29	Forecast production	There should be easy way to delete a control point from a selected polygon	should	Yes





2.30	Forecast production	When right click on area within the active polygon, drop down list of functionalities appears	should	Yes
		Functionalities available on right-click menu within polygon: Delete Copy Paste (one the same place)		
	Forecast	Drag		
2.31	production	Save as Favorite	should	Yes
2.32	Forecast production	There will be favorites toolbar and favorites can be saved to, selected from or deleted from the toolbar.	should	Partly
2.33	Forecast production	Default background layer will be light orography, but each forecaster will be able to choose her/his default background layer. Default overlapped layer will be FIRs.	could	Yes
2.34	Forecast production	Available background layers: - route network - airports, cities - plain background (without orography but with FIRs)	could	Partly





		MET polygons will be transparent and colored:		
		CLD - green VIS - yellow		
		TURB - light blue		
		CB - red		
2 35	Forecast production	FZPP - violet	should	Yes
2.00	production	1 ZI I - VIOIGE	Silouid	163
	Forecast	Active polygon will be clearly distinguishable from		
2.36	production	other polygons.	must	Yes
	Forecast	There should be an option for hiding polygons of		
2.37	production	selected MET phenomenon	should	Yes
		When a polygon with corresponding properties is		
	Forecast	finished, forecaster will finish it by clicking anywhere		
2.38	production	outside polygon	should	Yes
		On the side of the screen there will be a list of		
		created polygons within respective FIR. Information		
		about MET element, country acronym - all affected FIRs), severity will be listed for each polygon.		
		Polygons will be named. When hovering over the		
2 39	Forecast production	list, a polygon over which's name in the list is cursor will be indicated.	should	Yes
2.00	p. oddottoll	The state of the s	o. routu	
0.40	Forecast	L'alada da da a la como de la fa		
2.40	production	Linked polygon points	would	No
	Forecast			
2.41	production	Multiple polygon selection	should	Yes





2.42	Forecast production	Phenomena centric polygon creation	should	Yes
2.43	Forecast production	Undo functionality	would	Yes
2.44	Forecast production	Forecast selection dialog	must	Yes
		List of logged users with activity indicator can be visible to all logged users		
3.01	Collaborative forecasting	Status of a country in the chat list should be: editing, done, review needed.	should	Partly
3.02	Collaborative forecasting	Chat box will be available with options "to all" and direct (to country) messages.	should	Yes
3.03	Collaborative forecasting	When a direct message is received, sound alert and pop up activates.	should	No
3.04	Collaborative forecasting	Polygons can be extended outside FIR borders (not clipped on borders)	should	Yes
3.05	Collaborative forecasting	When polygon stretches across FIR borders, points on junctures of polygon and FIR borders will automatically appear	could	Yes





3.06	Collaborative forecasting	When a polygon is closed it becomes visible to other forecasters. If the polygon is activated again it remains visible to others and it is visible to others that the polygon is being edited. Any changes done during polygon editing are propagated immediately and visible to others.	should	Yes
3.07	Collaborative forecasting	When forecaster is finished with collaborative forecasting, (s)he marks forecast as "Ready for issuing"	must	Yes
3.08	Collaborative forecasting	eGAFOR is automatically issued at issuing time. If some country did not mark forecast as "Ready for issuing", its area will be greyed out in Public User Interface until the forecast is finished.	must	Yes
3.09	Collaborative forecasting	Five minutes before issuing time a notification appears that issuing time is approaching with minutes and seconds left	should	Yes
3.10	Collaborative forecasting	When eGAFOR update is issued, alert affected neighboring AORs	should	No
3.11	Collaborative forecasting	When polygon is updated and this polygon belongs to a country which is already marked as "Ready for issuing") the system shall reset this mark and alert forecaster for that country that such an event happened.	should	Yes
4.01	Export	eGAFOR system shall have capability for eGAFOR product export into VisualWeather Feature Editor	must	Yes





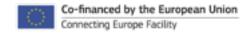
		following components of eGAFOR product shall be exported: - impact forecast on routes in time intervals		
4.02	Export	- forecasted polygons with corresponding PC and other properties	should	Yes
4.03	Export	Export will be in XML format using schema based on IWXXM	should	No
4.04	Export	Export will be in GeoJSON	should	Yes
		web page www.egafor.eu shall be optimized for mobile and desktop devices		
5.01	Interface		must	Yes
	The appearance and behaviour of Public User	web page should use Responsive Web Design		
5.02	Interface		must	Yes
	and behaviour of	for mobile devices initial display shall be geolocated eGAFOR route network ~200x400 km, if user permits geolocation facility in the browser		
5.03	Interface	3	should	Yes
	and behaviour of	for desktop devices initial display will be eGAFOR route network zoomed on country from which is web site accessed		
5.04	Interface		would	Yes





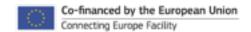
5.05	The appearance and behaviour of Public User Interface	map should always be north-oriented	must	Yes
	and behaviour of	on initial display routes will be colorised according to forecasted impact in current or the closest time interval (whole route coloured according to biggest		
5.06	Interface	impact of any route segment)	must	Yes
	The appearance and behaviour of Public User	on initial display default background map will be terrain		
5.07	Interface		would	Yes
5.08		date and time of the information shall be clearly shown on the screen	should	Yes
3.00	Interface		Siloulu	103
	The appearance and behaviour of Public User	zooming and panning behaviour like Google Maps app		
5.09	Interface		should	Yes
5.10	and behaviour of	time selection: three big buttons representing three intervals (designers to propose solution) with button representing current time activated	should	Yes
		There will be option to switch Route (state) view into MET polygon view and vice versa.		
6.01	and layers		must	Yes





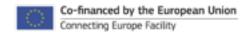
6.02	Public Interface and layers	User	MET polygons will be semitransparent, with borders and colored: CLD - green VIS - yellow TURB - light blue CB - red FZPP - violet	should	Yes
6.03	Public Interface and layers	User	Route view: - impact on routes - pop-ups on routes	should	Yes
6.04	Public Interface and layers		MET view: - black routes - when started all MET polygons appear - possibility to deselect MET elements - pop-ups on polygons - possibility to show terrain colorized according to CLD forecast	should	Partly
6.05	Public Interface and layers		pop-ups on routes: - all MET elements with SC, PC and impact for current time interval - next time interval can be changed on main screen and pop-up remain open with properties changed according to the selected time interval	should	Yes





		pop-ups on polygons:		
		- MET element for current time interval		
		- severity class		
		- probability class		
	Public User	- next time interval can be changed on main screen		
0.00		and pop-up remain open with properties changed		
6.06	and layers	according to the selected time interval	should	Yes
	Public User	orographical cross-section of the route is available		
		for all routes		
6.07	and layers		would	No
	Public User	orographical cross-section of the route with		
0.00		overlapped of MET polygons over route (as lines) is		NI-
6.08	and layers	available	would	No
	Public User	Terrain colorizing:		
	Interface display	- possibility to show terrain colorized according to		
6.09	and layers	CLD forecast	would	No
	User configurable	registered pilots will be able to modify some settings		
	settings on Public			
7.01	User Interface		should	Yes





		modifiable setting Clouds: threshold of "ceiling above the ground" (from 500 ft to XXXX ft, default 1500 ft) The eGAFOR system should subtract ground elevation and 1500 ft (modifiable) from the upper and lower boundary of the uncertainty zone over the area of CLD polygon along the route cross-section and determine the impact on each affected route depending on the relation shown in https://docs.google.com/document/d/1Z9Wlqjj1YgkK-Zh-dgPy1xyNzYVY0i4kxs0nQOdiCig/edit		
7.02		Values on the horizontal axis of the table represent ground elevation + 1500ft (default value modifiable in a certain range by user), values on the vertical axis are probability classes. Cell colors represent impact.	should	Yes
7.03	_	modifiable settings for other MET elements: can be turned off, except RED impact - that can not be turned off. If a MET element defined by a polygon create RED impact on affected routes (routes are those covered by the polygon) according to criteria listed in https://egafor.eu/2018/12/28/definition-of-forecasting -criteria-in-egafor/, the MET element can not be turned of.	should	Yes
7.04	_	polygons in 'advanced view' (for registered pilots) mode should only represent spatially worst impact of forecast phenomena; view weather information by clicking anywhere on the map	should	Yes



