



# A tool on Privacy Enhancing Technologies (PETs) knowledge management and maturity assessment

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## Table of Contents

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<b>Executive Summary</b>	<b>4</b>
<b>1. Introduction</b>	<b>5</b>
<b>2. The PETs assessment tool: an overview</b>	<b>6</b>
<b>3. Open challenges</b>	<b>8</b>
Challenge 1 - Finding a hosting organization for the tool	8
Challenge 2 - Dissemination and promotion	8
Challenge 3 - Content generation and trust building.	8
Challenge 4 - Continuous improvement.	8
<b>4. Dissemination support roadmap</b>	<b>9</b>
<b>4.1 Dissemination process</b>	<b>9</b>
<b>4.2 Target groups</b>	<b>10</b>
<b>4.3 Dissemination channels</b>	<b>11</b>
4.3.1 Landing page	11
4.3.2 Newsletter	12
4.3.3 Data privacy and IT security conferences and meetups	12
4.3.4 Technological news blogs and websites	13
4.3.5 R&D projects	13
4.3.6 Targeted email campaigns and direct communication	13
4.3.7 Social media	14
4.3.8 Wikipedia	14
<b>5. Conclusions and recommendations</b>	<b>16</b>

## Executive Summary

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This document aims at providing an overview of the ENISA's online Privacy Enhancing Technologies (PETs) maturity assessment tool and its current status of implementation. The tool is a direct continuation of past ENISA studies, aiming at developing a methodology that allows to compare different PETs with regard to their maturity, i.e., their technology readiness and their quality concerning the provided privacy notion. The document provides brief information about the tool itself and the challenges identified by the development team to release a solution ready for scaling and showcasing within the global data privacy community.

A test platform for the tool is temporarily available under the IP address: <http://94.23.106.129/>.

Following the tool's development and update, the following four open challenges are identified: a) finding a hosting organization for the tool/platform, b) dissemination and promotion, c) content generation and trust building, d) continuous improvement. Meeting these challenges is an important success factor for the tool. Nevertheless, a committed hosting organization is the most critical resource to be found, as it will define the final tool's identity and will stimulate further development of the tool.

Executing an appropriate dissemination strategy is also essential for the success of the PETs maturity assessment tool and its sustainability in a longer term. Essentially the purpose of dissemination and promotion is to raise awareness about the existence of the PETs maturity assessment tool and encourage potential users to try the tool (preferably to create own user account and generate content). The formation of an online community that is able to maintain the repository of PETs assessments and to support collaborative maturity assessment process provided by the ENISA methodology is crucial for the successful tool's existence. The usefulness of the developed tool depends crucially on the content (PET assessments) generated by its active users.

To this end, the report makes the following recommendations to relevant stakeholders:

*Policy makers and regulators (e.g. Data Protection Authorities) should promote the use of the tool as an online repository of PETs assessments, in the context of the practical implementation of the principle of data protection by design.*

*The research community in the fields of privacy and security engineering should support the PETs assessment tool by actively participating as assessors and users of the platform, as well as encouraging its further use.*

*The research community, the European Commission, as well as EU institutions in the fields of security and privacy should engage in the further enhancement of the platform, both in terms of technical characteristics, as well as content and usability.*

ENISA will aim at further contributing in this area by supporting relevant activities and co-operating with the main stakeholders in the field.

## 1. Introduction

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Despite the apparent availability of knowledge about different privacy enhancing methods, tools and technologies, it is still hard to select the most appropriate one. It is even harder to compare and justify which solution is the best for a particular problem, IT environment or user advancement level. Therefore, there is a need for standardisation and centralisation of Privacy Enhancing Technologies (PET) knowledge, as well as for a widely-accepted methodology for the evaluation of such technologies. The common adoption of the PETs maturity assessment methodology and a unified way to describe a particular PET would improve the situation significantly.

For these reasons, in 2015 ENISA developed a comprehensive methodology<sup>1</sup> for PETs maturity assessment. Under this study, the following recommendation was made:

*“A community portal should be established that is used to publish tools and their assessment results. The European Commission should facilitate the forming of the portal”.*

Following this recommendation, ENISA started in 2016 the development of a web application prototype, called the “PET maturity assessment online repository”. This tool aims at providing an IT service which will facilitate the formation of community that is able to maintain a repository of PETs assessments and a tool that will support maturity assessment methodology by implementing step-by-step collaborative process. The core functionality of the tool, enabling the assessment process and community building, was implemented by the end of 2016.

However, the success of the PETs assessment tool required an additional effort, in particular in the area of maximising the tool’s usability (by bug fixing, adding new and updating existing functionalities), as well as in the promotion of the platform within the community of already envisaged target users as well as a more general public. For this reason, the second major release of the tool was provided in November 2017.

This report accompanies the second release of the PETs assessment tool and provides a brief overview of its main functionalities, as well as its challenges and proposed dissemination activities for further enhancement and adoption.

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<sup>1</sup> [www.enisa.europa.eu/publications/pets](http://www.enisa.europa.eu/publications/pets)

## 2. The PETs assessment tool: an overview

In 2016, ENISA, in co-operation with the Polish technological company ITTI, developed a prototype of a web application supporting ENISA’s PETs assessment methodology<sup>2</sup> – the PET maturity assessment online tool. The tool provides a service that facilitates the formation of an expert community, which can perform PETs maturity assessments according to the methodological approach proposed by ENISA. The tool supports performance and publication of PET assessments and their results in a structured and searchable fashion. The agile development approach used for the project has resulted in a fully functional tool.

In particular, the first major tool’s release (November 2016) provided the following main functionalities:

- setup personal account enabling access to content management features;
- browse the repository of conducted PETs maturity assessments;
- get a detailed PET assessment report;
- manage the assessment process as an assessor (including definition of the target of assessment and initial readiness assessment, board of experts’ management, consensus validation and final report preparation);
- manage invitations to join the assessments process;
- contribute the assessment as an expert by using dedicated feedback questionnaire.

Fig. 1 Example of PETs maturity assessments repository

Maturity level	PET name	Type	Status	Start date	End date	Assessor	Rating
PRODUCT ++	VPN Priv Plus	Executable	Completed	2017/08/31	2017/09/30	Keith Fowler	★★★★★ (5.0/5)
PROTOTYPE 0	Priavate SSH	Plugin	Completed	2017/09/01	2017/11/01	Helen Valdez	☆☆☆☆☆ (0.0/5)
NOT DEFINED	Secure ID	Script	Ongoing	2017/09/02	2017/09/30	Frank Wong	★★★★☆ (3.0/5)
RESEARCH +	Hide Your IP	Script	Completed	2017/09/12	2017/10/05	Helen Valdez	★★★★☆ (3.0/5)
PRODUCT +	EasyVPN	Plugin	Completed	2017/08/31	2017/10/05	Judith Vargas	★★★☆☆ (2.0/5)
PILOT +	Finger Print	Hardware	Completed	2017/08/31	2017/11/20	Judith Vargas	★★☆☆☆ (1.0/5)
NOT DEFINED	Enhance Priv	Script	Unsuccessful	2017/09/22	2017/11/20	Helen Valdez	★★★★★ (5.0/5)
IDEA ++	EncryptMe	Plugin	Completed	2017/09/22	2017/11/20	Frank Wong	★★★★★ (5.0/5)

After the first release, it was noticed that the future success of the tool required additional effort. In particular, this effort should be put in the area of maximising its usability (by bugs fixing, adding new and updating existing functionalities) and in the area of the platform promotion within the community of already envisaged target users as well as a more general public. For this reason, starting from May 2017, the tool’s development and promotion activities were continued.

<sup>2</sup> [www.enisa.europa.eu/publications/pets](http://www.enisa.europa.eu/publications/pets)

The project team focused on the development of the following additional features, extending initial scope of the solution:

- perform an advanced repository search;
- advance user profile management;
- endorse user profile skills and knowledge;
- get recommended experts for a specific assessment based on their overall rank and experience;
- compare selected PETs assessments.

**Fig. 2 Example of an assessment Board of Experts automatic recommendations**

**Step 3: Select Board of Experts**  
 Invite PET portal users to join the assessment and provide their expertise. Manage your board of experts.

**Recommended users**  
 Choose from top 10 specialists in selected PET domains:

[Search for more users.](#)

<input type="checkbox"/>	User	Contributions	Status	
<input checked="" type="checkbox"/>	 Frank Wong	★ 100 <small>rank: experienced    endorsements</small>	4 <small>as expert</small>	3 <small>as assessor</small>
<input type="checkbox"/>	 Helen Valdez	★ 90 <small>rank: experienced    endorsements</small>	4 <small>as expert</small>	2 <small>as assessor</small>
<input type="checkbox"/>	 Keith Fowler	★ 88 <small>rank: experienced    endorsements</small>	4 <small>as expert</small>	2 <small>as assessor</small>

Since end of November 2017, the tool is ready for public release and dissemination activities. While the target audience consists mainly of policy makers and developers, the project team strive to validate the result with the global research community on privacy and security engineering.

### 3. Open challenges

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To evaluate and update the PETs maturity assessment tool, a wide community of active users is needed. Hence, the next step is to build and maintain an online community for PETs maturity assessments. The project team reached out to the PETs community to be early adopters in this process and help to test the tool.

There are number of open challenges within the scope of the current tool's development and promotion activities. The following ones are the most decisive success factors:

#### **Challenge 1 - Finding a hosting organization for the tool**

Finding a hosting organization for the tool bears a rather high burden. On one hand, this organization needs to be a neutral player or a consortium of players which in sum can be considered neutral. On the other hand, the host needs to assume ownership of the platform to ensure continuous maintenance and further development.

#### **Challenge 2 - Dissemination and promotion**

In order to benefit from the network effect, users with different motivations need to benefit from the platform. Essentially the purpose of dissemination and promotion is to raise awareness about the existence of the PETs maturity assessment online tool and encourage potential users to try the tool. The dissemination process is also crucial for finding potential candidates for the tool's host. To build a community and sustain the PETs maturity assessment tool, dissemination and promotion activities should be subordinated to the following sequence: find a host, maximize contributors to generate more content (PETs maturity assessments), attract viewers and convert them into active contributors.

#### **Challenge 3 - Content generation and trust building.**

The methodology is demanding for the experts and assessors, who will perform the assessment for each PET. It is important to explore trust building and incentive mechanisms for these groups. The PETs maturity assessment tool gives online mechanisms for performing the collaborative process of maturity assessments according to the ENISA's methodology. However, the tool itself is not providing a value to its users. It is the content (essentially PETs maturity assessments) which is providing the main value. For this reason, the content should be considered as a critical resource in the community building process. The more valuable content is available, the more users will be attracted to try the tool, join the community and finally provide new content. This cycle is typical for all online platform-like solutions and is also applicable for the PETs maturity assessment tool. However, the content quantity (number of PETs assessments stored in the repository) is not enough to ensure the tool's sustainability and community growth. The content characteristics like quality, diversity and validity should also be considered.

#### **Challenge 4 - Continuous improvement.**

Especially in the initial phase, the methodology needs to be scrutinized with regard to its results. Further, new technologies might require adjustment of the methodology or the tool itself. Once the tool is established and recognisable within the data privacy domain and first early adopters are acquired, there is a need to sustain existing users' engagement and maintain new users' flow. The continuous improvement is crucial for this process. Critical errors should be fixed as soon as possible, while other requests (minor software bugs fixes or new features) should be prioritised and implemented accordingly.

## 4. Dissemination support roadmap

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### 4.1 Dissemination process

Dissemination is the process of spreading the information about the PET maturity assessment tool to all stakeholders and to the wider audience (data privacy organisations and individual experts). Dissemination is essential for the success of the PETs maturity assessment tool and its sustainability in a longer term. Essentially the purpose of dissemination and promotion is to raise awareness about the existence of the PETs maturity assessment online tool and to encourage potential users to try the tool (preferably to create their own user account). For this reason, the tool host (and/or ENISA) should promote the solution and maximise its visibility within the data privacy domain and overall new technologies space. The dissemination process is also crucial for finding potential candidates for the future tool's host.

To build a community and sustain the PETs maturity assessment tool, dissemination and promotion activities should be subordinated to the following sequence:

1. Find a target hosting organization for the tool;
2. (optionally) Adjust the tool's visual identity to the target hosting organisation;
3. Setup dissemination channels (e.g. Twitter, Facebook accounts);
4. Find and invite early adopters and beta testers (e.g. through LinkedIn, conferences);
5. Generate initial content (PET assessments) through early adopters and beta testers;
6. Get feedback from early adopters and beta testers to identify and correct critical issues;
7. Start wide, public dissemination activities (Facebook and email campaigns);
8. Maximise a number of active contributors to generate more content (PET maturity assessments);
9. Attract passive viewers and convert them into active contributors.

The following general dissemination channels should be considered for building the community:

- publications,
- data privacy and security conferences and workshops,
- collaborative events,
- PETs maturity assessment tool's host and ENISA official websites,
- PETs maturity assessment tool's host and ENISA social media channels,
- dedicated, new social media channels (PET maturity assessment tool Twitter, Facebook profiles),
- forums and other data privacy experts' online spaces,
- direct communication (e.g. newsletters).

Dissemination requires a clear strategy explaining how the visibility of the tool will be maximized. For this reason, a set of promotional materials (flyers, posters, online banners etc.) should be produced. An important part of such materials is the tool's visual identity. The developers of the tool have prepared initial visual identity (colour scheme, logo etc.), however it is up to ENISA and the future tool's host to decide about the final shape of the tool's look and feel (e.g. incorporating of the tool into organisation brand). The brand loyalty is critical for efficient dissemination, therefore its activities should be preceded by decisions regarding visual identity (at least on a general level of tool's naming, basic trademarks). Moreover, for the online tool a brand recognition is also based on domain name. ENISA or the tool's host should decide about the domain where the tool will be always available on the Internet. The domain name is transferable, regardless the actual tool's hosting server address and location, therefore it should be fixed as soon as possible for

dissemination and promotion purposes. Setting the domain name for the PETs maturity assessment online tool is important for the efficient dissemination and promotion.

Sample of performance indicators for dissemination and promotion:

- total number of homepage visits,
- total number of new sessions (unique users),
- total number of registered accounts,
- average time of using the tool by registered users,
- bounce rate (percentage of users leaving before further exploring the tool),
- total number of social media feeds/re-feeds, followers etc.

First dissemination activities have already been conducted. The PETs maturity assessment tool was presented during APF2016 (Annual Privacy Forum 2016), 7-8 September 2016 in am Main, Germany. Moreover, EU H2020 TRUESSEC project was engaged in order to find a potential co-operation space between both initiatives. It is essential that a target hosting organization is selected as soon as possible and that early adopters generate initial, verified content. All other dissemination activities should be subordinated to the execution of these two.

## 4.2 Target groups

Stakeholders, relevant institutions, organisations, and individuals who are the target of dissemination and promotion activities can be classified according to the level of commitment:

- **host** – an organisation which is responsible for hosting and maintenance of the PET maturity assessment tool and its content (conducted PET maturity assessments, online community of users etc.),
- **contributor** - an organisation, an individual professional or enthusiast who is a data privacy domain expert, actively involved in content generation as an assessor or a member of the board of experts for a specific PET maturity assessment(s),
- **viewer** - an organisation, an individual professional or enthusiast who is passively consuming collected content (conducted PET maturity assessments) or is a random user encountering the tool on the Internet.

Under ENISA's 2016 work on the PETs assessment tool, a comprehensive study of such potential stakeholders was performed. This study concludes that 125 organizations related to privacy and personal data protection could potentially contribute to this area. It is recommended to contact directly these organizations, in order to check whether they are interested in the PETs maturity assessment co-operation after project finalization.

### 4.3 Dissemination channels

The following table summarises the different dissemination mechanisms and tools that are considered for the PETs assessment tool.

Table 1 Dissemination channels

MECHANISMS/ TOOLS	PERFORMANCE INDICATORS
Landing page	<ul style="list-style-type: none"> <li>no. unique and returning visitors</li> <li>time on site</li> <li>user traffic sources (geo distribution)</li> <li>no. authenticated user sessions</li> <li>no. registered users (user accounts)</li> </ul>
Newsletter	<ul style="list-style-type: none"> <li>no. newsletter subscribers</li> <li>no. newsletters sent</li> <li>frequency of newsletters</li> <li>no. returning users after newsletter sending</li> </ul>
Data privacy and IT security conferences and meetups	<ul style="list-style-type: none"> <li>no. of attendees for the tool presentations</li> <li>attendees feedback</li> </ul>
Technological news blogs and websites	<ul style="list-style-type: none"> <li>no. articles and posts with/without promotion</li> <li>no. new visitors and users after article posting</li> </ul>
R&D projects	<ul style="list-style-type: none"> <li>no. external projects (e.g. H2020) involved in dissemination</li> </ul>
Targeted email campaigns and direct communication	<ul style="list-style-type: none"> <li>no. emails sent</li> <li>no. email answers</li> <li>feedback</li> <li>no. new visitors and users after article posting</li> </ul>
Social media	<ul style="list-style-type: none"> <li>no. posts, re-posts, tweets, re-tweets, likes, followers, comments</li> <li>no. new visitors and users after social-media campaigns</li> </ul>
Wikipedia	n/a

It should be noted that an important dissemination platform of the PETs assessment tool is also the EDPS IPEN community<sup>3</sup>, supporting security and privacy engineering.

#### 4.3.1 Landing page

The PET online tool homepage is an official landing page for the PET online maturity assessment tool (until the target host is selected, temporarily available under the IP address: <http://94.23.106.129/>). The landing

<sup>3</sup> [https://edps.europa.eu/data-protection/ipen-internet-privacy-engineering-network\\_en](https://edps.europa.eu/data-protection/ipen-internet-privacy-engineering-network_en)

page aims to provide basic information regarding the tool and encourage users to actively participate. At the time being the landing page of the tool has a fixed content. For frequent news and updates related to the tool, social media channels should be used as they are more responsive and reaching more potential users. Moreover, the landing page is aimed to disseminate information on ENISA's PET maturity assessment methodology by providing a link to the PDF copy of the document. The content of the landing page should be adjusted to the target host's needs by incorporating additional sections and branding.

**Objective:**

- provide brief and clear information on the tool and methodology;
- encourage user to become a member of the tool's community.

**Preconditions:**

- target tool's host is needed to disseminate domain name for the tool instead of the IP address;
- target visual identity (adjusted to the tool's host requirements).

#### 4.3.2 Newsletter

The newsletter could take the form of an email that is sent regularly to the subscribed users, containing news about PET concepts, recently conducted assessments, the tool functionalities updates etc.

**Objective:**

- maintain subscribers' interest in the tool and inform about updates within the PET domain.

**Preconditions:**

- target tool's host is needed for domain email address for sending emails;
- target visual identity (adjusted to the tool's host requirements);
- valid email addresses for subscribers.

#### 4.3.3 Data privacy and IT security conferences and meetups

Data privacy and IT security events for public and private organizations, standardization bodies, individual experts and software developers (e.g. Annual Privacy Forum, Future of Privacy Forum events, Global Privacy Summit, Europe Data Protection Intensive, IAPP Europe Data Protection Congress) are important platforms for disseminating the tool.

**Objective:**

- communicate the tool's availability,
- validate the tool and methodology concepts,
- attract potential tool contributors (both users and future tool developers).

**Preconditions:**

- target visual identity (adjusted to the tool host requirements),
- marketing content (e.g. flyers, presentations, stands, speech),
- valid email addresses for contact.

#### 4.3.4 Technological news blogs and websites

Technological blogs and websites (e.g. TechCrunch, Mashable, Gizmodo, ZDNet) are the fastest way to reach the biggest number of potential users. By publishing articles related to either general PET maturity assessments concept or the tool's implementation, leading web media dedicated to new technological solutions and tech news will increase users flow significantly in a very short time. However, this dissemination channel should be used only after the early adopters' tests and initial content generation. Without having enough verified content (PET assessments) and high reliability level of the tool, raised expectation in a large number of people can cause large barrage of criticism and as a result bad reputation within the community of data privacy experts and organizations.

**Objective:**

- communicate the tool's availability; attract potential tool contributors (both users and future tool developers)

**Preconditions:**

- target visual identity (adjusted to the tool host requirements);
- marketing content (e.g. flyers, presentations, screenshots);
- valid email addresses for contact;
- verified and diverse content (PET assessments);
- well established social media channels;
- high level of solution reliability.

#### 4.3.5 R&D projects

Co-operation with different research and development projects undertaken by various organizations (e.g. projects within EU HORIZON 2020 research and innovation framework programme) can provide access to individual experts as well as further dissemination through internal R&D project activities. The innovative nature of such projects allows for testing even without content. Therefore, engaging with R&D projects is especially recommended during early dissemination stage, focused on attracting early adopters, beta testers and initial content generation.

**Objective:**

- communicate the tool's availability; attract potential tool contributors (both users and future tool developers);
- attract potential tool hosting organization;
- get first early adopters and beta testers;
- generate initial content (PET assessments)

**Preconditions:**

- valid email addresses for contact;
- marketing content (e.g. flyers, presentations, tutorials).

#### 4.3.6 Targeted email campaigns and direct communication

Email campaigns are an effective means of direct communication in which standalone content is sent to a targeted set of recipients. The message should contain appropriate content in order to make it different

from typical spam messages from unrecognised senders. Therefore, it is crucial to prepare a personalised content for a specific recipients' segment and treat them as individuals.

**Objective:**

- communicate the tool's availability;
- attract potential tool contributors (both users and future tool developers);
- attract potential tool hosting organization;
- get first early adopters and beta testers;
- generate initial content (PET assessments).

**Preconditions:**

- email addresses of individual experts or organizations potentially interested in contributing the tool;
- valid email addresses for contact;
- marketing content (e.g. flyers, presentations, tutorials).

#### 4.3.7 Social media

Well organised and up-to-date social media (e.g. Facebook, Twitter, LinkedIn) are necessary for any technological solution based on community of users' activity. Clearly a professional channel is preferred over a more generic one, as resources are limited and their use needs to be prioritised. A strong social media presence is an efficient way to showcase the PET maturity assessment tool, maintain relations with existing users and attract potential candidates. For the PET maturity assessment tool it is important to establish social media channels after the target host is selected. The reason for this is that the brand and identity of the tool will be host-dependent. Also, the target domain name of the tool might change depending on the host.

**Objective:**

- communicate the tool's availability;
- attract potential users;
- maintain relations with existing users, followers etc.;
- maintain subscribers' interest in tool and inform about updates within PET domain.

**Preconditions:**

- target tool's host is needed to disseminate domain name for the tool instead of the IP address;
- target visual identity (adjusted to the tool host requirements);
- valid email addresses for contact;
- marketing content (e.g. flyers, presentations, tutorials).

#### 4.3.8 Wikipedia

An entry in the Wikipedia could be created describing the PET maturity assessments online tool and the ENISA PET's maturity assessment methodology. All relevant Wikipedia entries could be updated accordingly e.g. external links section update in [https://en.wikipedia.org/wiki/Privacy-enhancing\\_technologies](https://en.wikipedia.org/wiki/Privacy-enhancing_technologies)

**Objective:**

- communicate on the PET maturity assessment methodology to make it a recognisable and standard approach;

- communicate the tool's availability to make it a recognisable, reference implementation of the PET maturity assessment methodology.

**Preconditions:**

- target tool host is needed otherwise only general information regarding the PET tool and the methodology (e.g. without target link to the online tool) can be published on Wikipedia;
- a verified and approved Wikipedia article/section.

## 5. Conclusions and recommendations

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The PETs maturity assessment tool can facilitate the evaluation of PETs and their subsequent presentation to end users. Still, the tool's greater adoption faces certain challenges, in particular with regard to its permanent hosting, promotion and content generation. This requires engagement and commitment of all relevant stakeholders, including policy makers and regulators, as well as researchers in the field. To this end, the following recommendations can be made:

*Policy makers and regulators (e.g. Data Protection Authorities) should promote the use of the tool as an online repository of PETs assessments, in the context of the practical implementation of the principle of data protection by design.*

*The research community in the fields of privacy and security engineering should support the PETs assessment tool by actively participating as assessors and users of the platform, as well as encouraging its further use.*

*The research community, the European Commission, as well as EU institutions in the fields of security and privacy should engage in the further enhancement of the platform, both in terms of technical characteristics, as well as content and usability.*

ENISA will aim at further contributing in this area by supporting relevant activities and co-operating with the main stakeholders in the field.



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