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pretty Easy privacy (pEp): Mapping of Privacy Rating
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Abstract

In many Opportunistic Security scenarios end-to-end encryption is automatized for Internet users. In addition, it is often required to provide the users with easy means to carry out authentication.

Depending on several factors, each communication channel to different peers may have a different Privacy Status, e.g., unencrypted, encrypted and encrypted as well as authenticated. Even each message from/to a single peer may have a different Privacy Status.

To display the actual Privacy Status to the user, this document defines a Privacy Rating scheme and its mapping to a traffic-light semantics. A Privacy Status is defined on a per-message basis as well as on a per-identity basis. The traffic-light semantics (as color rating) allows for a clear and easily understandable presentation to the user in order to optimize the User Experience (UX).

This rating system is most beneficial to Opportunistic Security scenarios and is already implemented in several applications of pretty Easy privacy (pEp).

Status of This Memo

This Internet-Draft will expire on January 3, 2019.

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1. Introduction

In many Opportunistic Security [RFC7435] scenarios end-to-end encryption is automatized for Internet users. In addition, it is often required to provide the users with easy means to carry out authentication.

Depending on several factors, each communication channel to different identities may have a different Privacy Status, e.g.

- unreliable
- encrypted
- encrypted and authenticated
- mistrusted

Even each message from or to a single peer may have a different Privacy Status.

To display the actual Privacy Status to the user, this document defines a Privacy Rating scheme and its mapping to a traffic-light semantics, i.e., a mapping to different color codes as used in a traffic-light:

- red
- yellow
- green
- no color (or gray)

Note: While "yellow" color is used in the context of traffic-lights (e.g., in North America), in other parts of the world (e.g., the UK) this is generally referred to as "orange" or "amber" lights. For the scope of this document, "yellow", "amber", and "orange" refer to the same semantics.

A Privacy Status is defined on a per-message basis as well as on a per-identity basis. The traffic-light semantics (as color rating) allows for a clear and easily understandable presentation to the user in order to optimize the User Experience (UX). To serve also (color-)blind Internet users or those using monochrome displays, the traffic light color semantics may also be presented by simple texts and symbols for signaling the corresponding Privacy Status.

The proposed definitions are already implemented and used in applications of pretty Easy privacy (pEp) [I-D.birk-pep]. This document is targeted to applications based on the pEp framework and Opportunistic Security [RFC7435]. However, it may be also used in other applications as suitable.

Note: The pEp [I-D.birk-pep] framework proposes to automatize the use of end-to-end encryption for Internet users of email and other messaging applications and introduces methods to easily allow authentication.

2. Terms

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

- Handshake: The process when Alice - e.g., in-person or via phone - contacts Bob to verify Trustwords (or by fallback: fingerprints) is called handshake. [I-D.marques-pep-handshake]

- Trustwords: A scalar-to-word representation of 16-bit numbers (0 to 65535) to natural language words. When doing a handshake, peers are shown combined Trustwords of both public keys involved to ease the comparison. [I-D.birk-pep-trustwords]

- Trust on First Use (TOFU): cf. [RFC7435]

- Man-in-the-middle attack (MITM): cf. [RFC4949]

3. Per-Message Privacy Rating

3.1. Rating Codes

To rate messages (cf. also Appendix A.1), the following 13 Rating codes are defined as scalar values (decimal):

Rating code	Rating label
-3	under attack
-2	broken
-1	mistrust
0	undefined
1	cannot decrypt
2	have no key
3	unencrypted
4	unencrypted for some
5	unreliable
6	reliable
7	trusted
8	trusted and anonymized
9	fully anonymous

3.2. Color Codes

For an Internet user to understand what the available Privacy Status is, the following colors (traffic-light semantics) are defined:

Color code	Color label
-1	red
0	no color
1	yellow
2	green

3.3. Surjective Mapping of Rating Codes into Color Codes

Corresponding User Experience (UX) implementations use a surjective mapping of the Rating Codes into the Color Codes (in traffic light semantics) as follows:

Rating codes	Color code	(Color label)
-3 to -1	-1	(red)
0 to 5	0	(no color)
6	1	(yellow)
7 to 9	2	(green)

This mapping is used in current pEp implementations to signal the Privacy Status (cf. Section 6.2).

3.4. Semantics of Color and Rating Codes

3.4.1. Red

The red color MUST only be used in three cases:

- Rating code -3: A man-in-the-middle (MITM) attack could be detected.
- Rating code -2: The message was tempered with.
- Rating code -1: The user explicitly states he mistrusts a peer, e.g., because a Handshake [I-D.marques-pep-handshake] mismatched or when the user learns the communication partner was attacked and might have gotten the corresponding secret key leaked.

3.4.2. No Color

No specific (or a gray color) MUST be shown in the following cases:

- Rating code 0: A message can be rendered, but the encryption status is not clear, i.e., undefined
- Rating code 1: A message cannot be decrypted (because of an error not covered by rating code 2 below).

- Rating code 2: No key is available to decrypt a message (because it was encrypted with a public key for which no secret key could be found).

- Rating code 3: A message is received or sent out unencrypted (because it was received unencrypted or there's no public key to encrypt a message to a recipient).

- Rating code 4: A message is sent out unencrypted for some of the recipients of a group (because there's at least one recipient in the group whose public key is not available to the sender).

- Rating code 5: A message is encrypted, but cryptographic parameters (e.g., the cryptographic method employed or key length) are insufficient.

3.4.3. Yellow

- Rating code 6: Whenever a message can be encrypted or decrypted with sufficient cryptographic parameters, it's considered reliable. It is mapped into the yellow color code.

3.4.4. Green

- Rating code 7: A message is mapped into the green color code only if a pEp handshake [I-D.marques-pep-handshake] was successfully carried out.

By consequence that means, that the pEp propositions don't strictly follow the TOFU (cf. [RFC7435]) approach, in order to avoid signaling trust without peers verifying their channel first.

In current pEp implementations (cf. Section 6) only rating code 7 is achieved.

The rating codes 8 and 9 are reserved for future use in pEp implementations which also secure meta-data (rating code 8), by using a peer-to-peer framework like GNUnet [GNUnet], and/or allow for fully anonymous communications (rating code 9), where sender and receiver don't know each other, but trust between the endpoints could be established nevertheless.

4. Per-Identity Privacy Rating

The same Color Codes (red, no color, yellow and green) as for messages (cf. Section 3.2) MUST be applied for identities (peers), so that a user can easily understand, which identities private communication is possible with.

The green color code MUST be applied to an identity whom the pEp handshake [I-D.marques-pep-handshake] was successfully carried out with.

The yellow color code MUST be set whenever a public key could be obtained to securely encrypt messages to an identity, although a MITM attack cannot be excluded.

The no color code MUST be used for the case that no public key is available to engage in private communications with an identity.

The red color code MUST only be used when an identity is marked as mistrusted.

[[It's not yet clear if there are proper cases where it makes sense to set an identity automatically to the red color code, as it appears to be difficult to detect attacks (e.g., secret key leakage) at the other endpoint with certainty.]]

5. Security Considerations

[[TODO]]

6. Implementation Status

6.1. Introduction

This section records the status of known implementations of the protocol defined by this specification at the time of posting of this Internet-Draft, and is based on a proposal described in [RFC7942]. The description of implementations in this section is intended to assist the IETF in its decision processes in progressing drafts to RFCs. Please note that the listing of any individual implementation here does not imply endorsement by the IETF. Furthermore, no effort has been spent to verify the information presented here that was supplied by IETF contributors. This is not intended as, and must not be construed to be, a catalog of available implementations or their features. Readers are advised to note that other implementations may exist.

According to [RFC7942], "[...] this will allow reviewers and working groups to assign due consideration to documents that have the benefit of running code, which may serve as evidence of valuable experimentation and feedback that have made the implemented protocols more mature. It is up to the individual working groups to use this information as they see fit."

6.2. Running Code

In pEp for email contexts, pEp rating codes are already implemented for the following platforms:

- Android, in pEp for Android - release [SRC.pepforandroid]
- Enigmail, in the Enigmail/pEp mode - release used for new Enigmail users of version 2.0 [SRC.enigmailpep]
- iOS, in pEp for iOS - not yet released [SRC.pepforios]
- Outlook, in pEp for Outlook - commercial release [SRC.pepforoutlook]

7. Acknowledgments

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8. References

8.1. Normative References

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[SRC.pepforoutlook]
"Source code for pEp for Outlook", July 2018, <https://pep-security.lu/dev/repos/pEp_for_Outlook/>.

Appendix A. Excerpts from the pEp Reference Implementation

This section provides excerpts of the running code from the pEp reference implementation pEp engine (C99 programming language).

A.1. pEp rating

From the reference implementation by the pEp foundation, src/message_api.h:

```
typedef enum _PEP_rating {
    PEP_rating_undefined = 0,
    PEP_rating_cannot_decrypt,
    PEP_rating_have_no_key,
    PEP_rating_unencrypted,
    PEP_rating_unencrypted_for_some,
    PEP_rating_unreliable,
    PEP_rating_reliable,
    PEP_rating_trusted,
    PEP_rating_trusted_and_anonymized,
    PEP_rating_fully_anonymous,

    PEP_rating_mistrust = -1,
    PEP_rating_b0rken = -2,
    PEP_rating_under_attack = -3
} PEP_rating;
```

Appendix B. Document Changelog

[[RFC Editor: This section is to be removed before publication]]

- draft-birk-pep-rating-00:
  - Initial version

Appendix C. Open Issues

[[RFC Editor: This section should be empty and is to be removed before publication]]

- Better explain usage of Color Codes in Per-Identity Privacy Rating
- Decide whether rating code scalars 6 and 7-9 should be raised to leave space for future extensions
- Add Security Considerations
- Add more source code excerpts to Appendix

- Add rating codes for secure cryptographic methods and parameters and reference them

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