Sensor systems as e-seals for curtain-sided transport — customs requirements and future priorities (PEN-CP-2022-ER8)

Background and context

Seals are commonly used by customs and commercial operators to secure cargo from theft and reveal tampering. There are many types of mechanical, conventional seals on the market that have been used for decades to protect the integrity of the goods and reveal potential loss of integrity. Today, many seals not only provide physical protection and evidence against tampering but also feature advanced capabilities, such as automatic alarms as well as geolocation, tracking and identification of cargo units (e-seals or smart seals).

Of all types of transport, smart seals are most common in containerized transport and less common in curtain-sided trailers (tautliners). Ironically, a lot of transport takes place in these curtain-sided trailers, which are relatively time-consuming to seal for commercial operators as well as customs.

Recent developments have seen the implementation of advanced capabilities in sensors embedded in the truck, container and even attached to the cargo. As with e-seals, integrity or tracking is of relevance but increasingly, additional sensors are used to accommodate for specific needs of the commercial operators involved. The use of embedded sensors in combination with or, as a matter of perspective, even in place of classical (e-)seals, holds great potential for customs and commercial operators. In particular, they may offer an avenue to improve efficiency of customs and commercial operations in curtain-sided trailer transport in the times of growing trade volumes and constrained customs resources (see Annex 1 for more information on "how customs see the use of e-seals")

Scope and goals

The study should summarize the key needs and requirements customs practitioners have for sensor systems as e-seals on the market or close to the market (TRL 8 and higher). The analysis should also list development priorities for next-generation e-seals from the customs standpoint. To collect this information, PEN-CP will organize kick-off interviews and a mid-term workshop with customs experts.

Note: Technology Readiness Level 8 (TRL) is defined as "system complete and qualified".

Project tasks

The main tasks to be carried out are the following ones:

- Interview 2-3 Customs experts to get the first understanding of the role and legal context of sensor systems as e-seals in customs operations (PEN-CP organizes the contacts)
- Exchange information with Expert Report 7 (= Electronic seals for curtain sided transport — State-of-play & market review)
- Organise a mid-term technical workshop with customs practitioners to finalize and validate the user requirements on sensor systems (PEN-CP arranges the workshop participants)
- Write your findings in a report
- Present your work to PEN-CP Customs partners in our monthly online meeting (= Penday)

Report structure

- Chapter 1. Study overview and methodology
- Chapter 2. Customs needs, requirements, constraints and problems regarding e-seals on the market or close to the market (TRL 8 and higher)
- Chapter 3. Development priorities for next-generation e-seals from the customs standpoint

Report length and language

Target 12-16 pages (no page limit with annexes); in English

Applicants and application process

You can apply either as a natural person or as a legal entity (registered company with a VAT ID). In case you are a team of two natural persons, please identify clearly who is the main contact person for contractual purposes. It is also important to note that the call is announced in public and is open for anyone knowledgeable on the topic to apply. We may also approach potential experts by email.

The application process consists of following three steps:

- Step 1: Applicant expresses his/her interest by sending an email to pen-cp-arttic@eurtd.com AND pen-cp@cross-border.org
- Step 2: Applicant receives credentials by email (from PEN-CP) enabling the proposal submission directly on the project portal
- Step 3: Applicant submits the proposal (both technical and CV -sections)

Documents to submit

Submit the following documents as part of your proposal here:

1. Technical proposal (max 2 pages)

- Describe the methodology you will use to achieve the goal for the assignment
- List the activities you plan to conduct during the assignment
- Detail the main risks and limitations you foresee with the assignment, including a brief risk mitigation plan

2. CVs of 1-2 experts who will carry out the work, highlighting their past experiences on similar topics.

Evaluation criteria and points (max 100 points)

- Criterion 1: The quality of the methodology, project work and risk plan = max 60 points
- Criterion 2: The relevant past experience of the 1-2 experts included in the proposal = max 40 points
- Minimum threshold to be considered for selection: Criterion 1 = min 35 points; Criterion 2 = min 25 points

Evaluation and contract signing process

- Step 1: Evaluation of all applications by scoring and ranking them.
- Step 2: Selection of the applicant with the highest score and initiation of the contractual process.
- Step 3: Communication with the non-selected applications of the evaluation results.
- Step 4: Contracting with the selected applicant.

- Step 5: Possibility to contact the unsuccessful applicant (if the contract cannot be closed with the selected applicant for a reason), to suggest contract negotiation (then follow with Step 4)

Dates, contacts and consulting fee

- Call publication date: 20 October 2022
- Deadline for proposal submission: 19 May 2023
- Call results available (expected): 5 June 2023
- Project start date: Latest by 19 June 2023
- Project duration: 2-3 months (to be agreed at the time of contract signature)
- Administrative contact person: Ms. Valerie Mellier, ARTTIC; pen-cp-arttic@eurtd.com
- Consulting fee: 5.900 EUR

Note-1: The official version of the ER8 call text is available at the PEN-CP online platform page: https://pen-cp.sym.place/groups/profile/302707/pen-cp-innovation-instruments-and-innovation-events

Note-2: PEN-CP reserves rights to make updates on the dates listed above, in case no proposal reaches the minimum threshold; also, we may cancel the action, in case no competent service provider is found

Note-3: PEN-CP plans to feed the ER8 outcomes into a set of follow-up PEN-CP innovation instruments, tentatively the following: crowdsourcing ideas; challenge competition; and technology grant

Annex 1. How customs see the use of e-seals

General

Seals are in widespread use with Customs administrations and licensed commercial actors. They protect the integrity of the goods and reveal potential loss of integrity. The main features of the seal are their mechanical strength and their ability to reveal tampering. In order for a seal to be allowed to be used, it has to perform in line with ISO 17712:2013. This ISO standard pertains to physical characteristics and uniqueness of seals.

Placing and removing a seal, including a smart seal, requires manual intervention. Next, any loss of integrity can only be documented in hindsight, with a classical seal. The question arises whether a more efficient way of working can be identified, and how this alternative can be proven to be of value as much as classical ISO 17712:2013 approved seals in revealing loss of integrity. Currently, there is no standard for e-seals or sensor systems without a physical sealing aspect.

Typically, if a seal is removed without agreement or is tampered with, a fine is issued and in extreme cases a criminal investigation is started. The information value of the classical seal thus is as high and the information gathering as robust as required to start these legal activities. A key requirement for any novel concept will be its information value and its robustness. In addition, a reduction in manual interventions is required. A thorough validation of a novel concept against approved seals will be required to underpin future acceptance.

Smart seals/ e-seals

Smart seals or e-seals generally consist of a classical physical seal like a cable or bolt in which a selection of sensors (e.g. for temperature, light, acceleration, sound, humidity, pressure, magnetic field, geo-location, etc.) along with a facility to process the sensor data (microprocessors) derive actionable information and a facility to communicate (2-5G, LTE-M, LoRa, narrow band, etc.) the resulting information to the outside world. Next to this first type of e-seals, another type of seals is developed that permanently monitors a shipment using sensors, sensor data processing and communication as mentioned above but lacks the physical sealing characteristics. This latter type is developed from the

idea that if the derived information shows that a transport is tempered with, the information value is the same as that of a tempered with physical seal.

Smart seals of both types are already in use in logistical chains, mainly with commercial actors out of the need for careful environmentally controlled transport or because of insurance requirements. An e-seal with a purposefully chosen set of sensors, microprocessors and communication tools may also prove its value in protecting the integrity of goods transported under Customs supervision. Real-time alarms on detected tampering can reduce the need for human effort to place and verify seals. This last type of e-seals is the most innovative and exhibits the greatest potential for landmark changes in the field of seals: smarter sealing.