CEASEFIRE

Introduction

The EC-funded R&D project **Ceasefire**, a 3-year Horizon Europe Innovation Action launched in October 2022, has been designed to improve the crime-fighting ability of European nations using modern technology. It brings together 21 expert partners from across Europe, including industrial partners, Law Enforcement Agencies (LEAs) and research universities or institutions, while focusing on combatting *firearms trafficking*. Ceasefire is coordinated by the *Centre for Research and Technology – Hellas* (CERTH, Greece).

Among other activities, the project is building a system that hosts and interconnects various **digital tools**, based on state-of-the-art Artificial Intelligence (AI) and Information & Communication Technologies (ICT). Developed to address the 5 Ceasefire use-cases, these tools aim to automate and streamline the work of LEA officers in the firearms trafficking domain.

Training LEA officers on cutting-edge technologies

On April 18th, 2024, Ceasefire successfully completed its **2nd online training session "Ceasefire Tools & Use Cases Demonstration - Part A"**. This virtual session, led by project partner IANUS, marked a pivotal step forward in our mission to equip LEAs with innovative tools and expertise, developed through the Ceasefire initiative.

The training aimed to delve deeper into the functionalities and applications of Ceasefire's advanced tools. It was the first part of a two-part series, focused on demonstrating the practical use of Ceasefire tools based on real-world scenarios identified within the project.

Participants gained insights into the functionalities and impact of Ceasefire's advanced tools in real law enforcement scenarios. Sessions covered topics such as real-time systematic firearms incident and intelligence information collection, on-the-spot firearm seizure registration, firearms purchase on dark web marketplaces, and mail order and courier service firearms trafficking detection using scanning technologies. Attendees also had the opportunity to provide feedback on tool functionality and performance, guided by questions selected by technical partners.

Nearly 50 attendees took part in the training session, with over half representing various LEAs across Europe. This session marked the first instance where external individuals from outside the Ceasefire consortium could participate in a training activity. Consequently, 10 end-users from the extended Ceasefire Community also joined, enabling them to engage with our technical partners and provide valuable feedback to enhance Ceasefire tools and training activities. Attendees gained a practical understanding of integrating Ceasefire tools into operational frameworks through guided exploration led by technical partners.

The 2nd online training session marked another milestone in the project's collective efforts to combat firearms trafficking and organized crime. The active participation and engagement of attendees underscored the value and relevance of **Ceasefire's advanced digital tools** in addressing contemporary law enforcement challenges.

Ceasefire tool for use-case #1:

Real-time Systematic Firearms Incident and Intelligence Information Collection and Exchange.

Modern communications/transportation technologies and legal loopholes allow trafficking networks to disperse across many countries and cross over from the physical to the virtual world, or vice versa. This situation has made it more difficult for LEAs to identify and prosecute the criminal rings involved, due to the lack of a common intelligence picture.

The relevant digital tool developed within Ceasefire, led by project partner UCSC,is intended to enhance the intelligence picture on firearms trafficking at a pan-European level, thus providing support for intelligence-led activities. It automatically retrieves periodically information from open sources, i.e., on-line news articles, and analyses them using advanced AI, such as **Natural Language Processing** methods for *Named Entity Recognition*, which identify and classify named entities in unstructured text. The related results are displayed as soon as the news is available. This tool provides: i) a near-real time overview of the firearm incidents in Europe, ii) an analysis of the firearm incidents, risk indicators and red flags, as well as iii) the possibility to exchange strategic intelligence on firearm incidents. It supports various firearms-related incidents, such as seizures, homicides, shootings, and robberies, thus significantly facilitating the work of LEA officers.
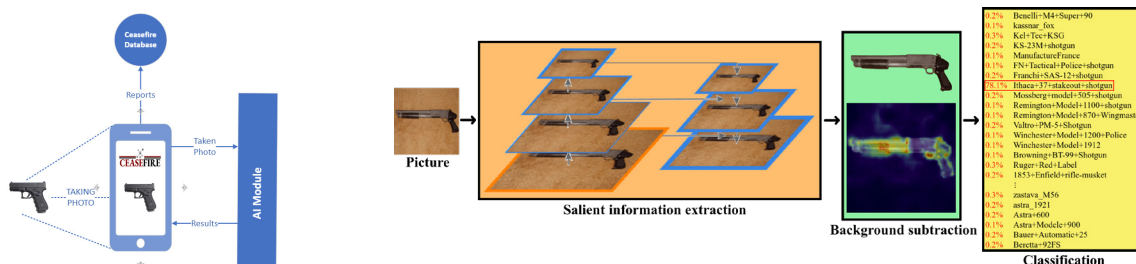
Ceasefire tool for use-case #2:

On-the-Spot Firearm Seizure Registration and Reporting.

Criminals tend to remove or alter serial numbers in weapons they use. Along with the extremely high diversity in firearms appearance and the lack of relevant expertise by many crime scene police investigators, accurate identification of a seized weapon may prove difficult. This may result in failure to register/collect proper data on seized firearms and hinder the unraveling of the illicit trafficking network where they originated from.

Thus, a Ceasefire tool is being developed planned to assist LEAs in their duties concerning firearms seizures at a crime scene. It consists in a mobile application that can automatically identify the main characteristics (e.g., brand, model, caliber, location of the serial number, etc.) of a seized firearm on the spot, based on a photograph taken by the mobile device. The application is primarily designed for LEA officers and helps them recognize more reliably and more accurately seized weapons. The application interacts with the central Ceasefire system database, by generating and sending relevant reports to it for further cross-analysis.

The mobile application, developed by project partner ITTI, is powered by an advanced AI back-end prepared by project partner INPT. The AI relies on state-of-the-art *Deep Neural Networks* for **computer vision** that have been trained to recognize firearms in input images. Modelled after the human brain at an abstract level, they automatically analyze their inputs and classify them accordingly.

Ceasefire tool for use-case #3:
Firearms Purchase on Dark Web Marketplaces
# &
Ceasefire tool for use-case #5:
3D-Printed Firearm Blueprints Distribution

The growing number of seizures of 3D-printed firearms suggests that the on-line availability of blueprints for additive manufacturing of weapons is increasing. Many such user communities have emerged in social media and Web forums/blogs. Meanwhile, cryptomarkets allow for multiple vendors to sell goods in an illegal e-shop (e.g., in the Dark Web), while buyers compare alternatives and purchase firearms anonymously via cryptocurrency payments.

Under the coordination of project partner CERTH, Ceasefire develops a set of interrelated tools for facilitating detection and monitoring of Dark Web transactions involving firearms, as well as identification and monitoring of user discussions about firearm modification/purchase/usage, or distribution of blueprints for 3D-printed firearms in Web forums. Thus, the LEA user can benefit from automatic analysis of suspicious images, where objects related to firearms trafficking are recognized, as wells as automatic analysis of textual snippets in Dark Web marketplaces and Web forums. Such an analysis is able to identify named entities, decipher the underlying purpose or motive behind a user's message, or classify relevance and suspiciousness of conversations. Finally, the project's relevant digital tools allow automatic analysis and recognition of patterns or correlations related to illicit firearms trafficking within cryptocurrency transaction graphs, in order to flag suspicious transactions based on predefined rules.

To handle the vast volumes of data, these tools rely on state-of-the-art AI methods for **computer vision**, **Natural Language Processing** and **graph analytics**, while configurable and AI-assisted **Web crawlers** allow easy and targeted retrieval of data relevant to firearms trafficking from on-line sources, including both the Dark and Surface Web.
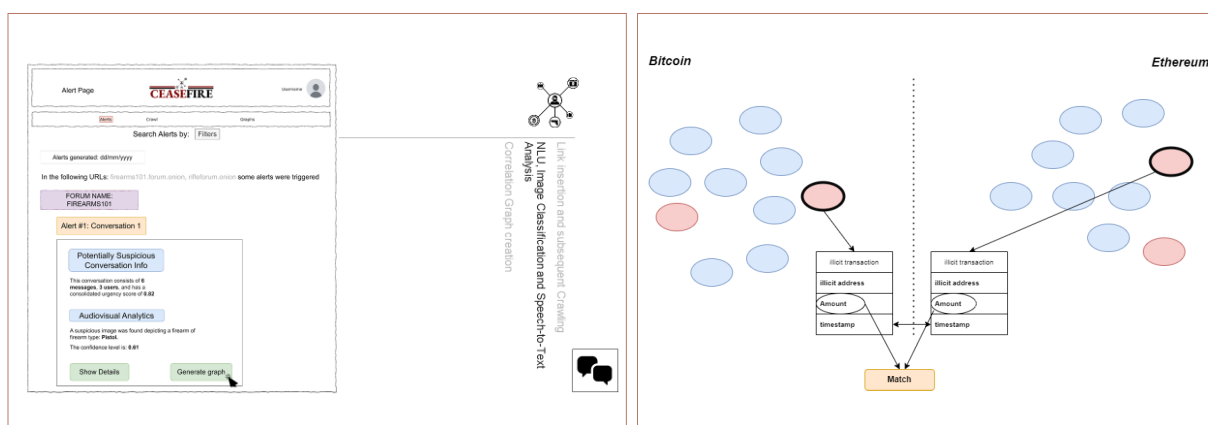
Ceasefire tool for use-case #4:

Firearms Purchase on Dark Web Marketplaces

Traffickers may use licit courier/post services, by exploiting the lack of harmonization in the legal frameworks of EU Member States and concealing firearms, ammunition or firearm components within legally mailed parcels.

The Ceasefire system incorporates a tool for supporting customs officers who perform X-ray scanning of parcels at border crossings and inland post offices that handle international post shipments. The tool automatically detects illicit exchange of firearms performed through post and courier services by analyzing the X-ray scan images of mailed parcels. A desktop application with a friendly Graphical User Interface (GUI) performs on-demand detection of firearms, firearm components and ammunition on X-ray images taken by the scanner machine, while the customs officer is able to optionally edit and submit the generated reports to the central Ceasefire system database, for facilitating further cross-analysis.
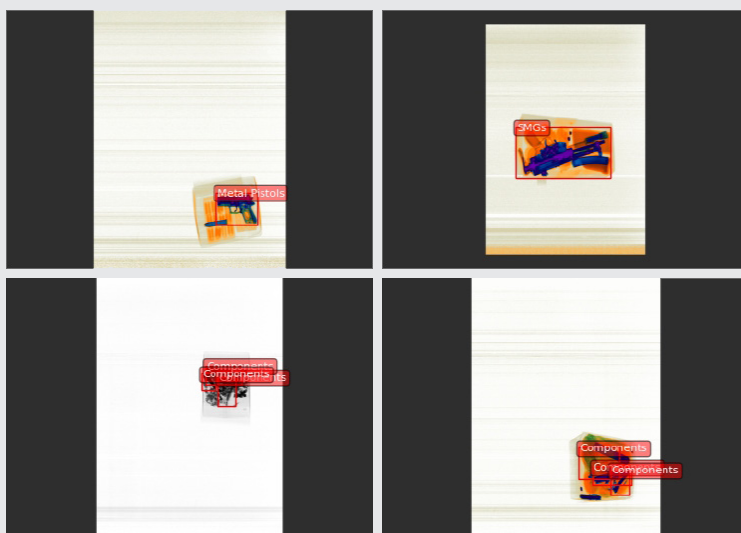
The desktop application, developed by project partner ITTI, is powered by an advanced AI backend prepared by project partner HUA. The AI relies on state-of-the-art *Deep Neural Networks* for **computer vision** that have been trained to detect firearms, firearm parts or ammunition in input images. The object detector automatically classifies and localizes on the X-ray image any suspicious object that is visible.
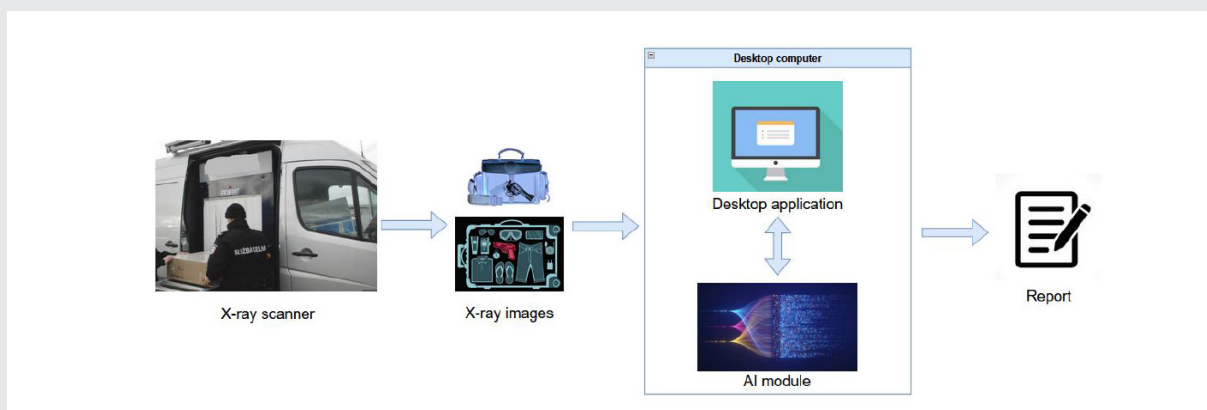
The future

An initial version of the Ceasefire system, including the majority of its digital tools, has already been implemented and successfully demonstrated to the LEA users that participate in the consortium. During the remainder of the project's lifetime, deepening the integration of the system components and incorporating technical improvements will proceed hand-in-hand with complementary project activities, such as end-user training, policy recommendations drafting, legal/ethical monitoring, societal impact analysis, innovation management, results exploitation planning, coordination with external stakeholders, and pilot studies.

Ceasefire links

The CEASEFIRE dissemination channels will host regular updates regarding the project:

CEASEFIRE Web site:
https://ceasefire-project.eu/

CEASEFIRE LinkedIn:
https://www.linkedin.com/company/ceasefireproject/

CEASEFIRE Facebook:
https://www.facebook.com/people/Ceasefire-Project/100089862614779/

CEASEFIRE X/Twitter:
https://twitter.com/CeasefireHE

Any relevant stakeholder (LEAs, security-related EU/national/international bodies and initiatives, related EC-funded research projects, SMEs active in security products/services, etc.) are welcome to join the CEASEFIRE community, in order to receive regular updates, news and invitations from the wider security ecosystem!

You can subscribe easily at https://ceasefire-project.eu/community/. All personal information are kept internally within Ceasefire, adhering to the highest privacy standards.