THE ODYSSEY PLATFORM: A UNIFIED EUROPEAN RESPONSE TO A GLOBAL THREAT

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1. INTRODUCTION

Odyssey is a European funded research project that tackles the problem of analysing crime and ballistics data, taken from disparate heterogeneous ballistic systems, across Europe. The partnership consortium involves 12 members including police representatives from Servizio Polizia Scientifica (DAC) – Italy, West Midlands Police (representing National Ballistic Programme) – UK, An Garda Siochana – Eire, North Yorkshire Police-UK and Europol. The variety of systems in operation across Europe has been brought about through each individual country having the autonomy to choose its own ballistics system. At present there is no interoperable way to analyse ballistics data taken from these systems used in each European country. At present it is not possible to collectively analyse ballistics data extracted from the heterogeneous systems currently in use. The Odyssey platform attempts to resolve these issues by the development of (a) interoperable data and (b) interoperable systems. In addition, the project is also exploiting ontologies semantic reasoning and data mining. This paper intends to provide a brief overview of the Odyssey approach. It begins by providing a overview of the technology and goes on to highlight the shortcomings of the current state of the art in ballistics technologies. The paper concludes with a potential use case scenario that illustrates some of the benefits of the Odyssey platform.

2. THE ODYSSEY PLATFORM
The Odyssey platform will allow police organisations to share gun crime information across the European Union. Odyssey achieves this through taking existing local solutions and integrating the extracted data into a single platform, figure 1

![Diagram illustrating the Odyssey Platform](image)

Figure 1 - Interoperability of data through the platform (Yates et al., 2009)

The data from each ballistic system is loaded into an ontology mapped database, contained within the Odyssey platform, using ETL (Extract, Transform and Load) software. In this structure, the Odyssey platform retains both the common unified schema and the metadata, which is characteristic of each of the different ballistics systems that feed the platform. Through the application of semantic web technologies and data mining techniques, domain experts are able to access the unified data model, which facilitates semantic searching and knowledge inference. The application of data mining techniques are fundamental to the platform, as Odyssey utilises data mining as part of the data transformation process and as part of the data analysis phase. This structure facilitates knowledge modelling, problem extraction and the flexibility required by an interoperable environment (Yates et al., 2009).

The Odyssey platform also provides a semantically enhanced alerting service that will alert users when new data is added to the platform. The alerting service is part of the Odyssey InfoBroker Framework, which facilitates the exchange of information within the platform. Whilst an initial search of the Odyssey platform may not return any results, users are given the option to store an alert that will be triggered when a successful match is generated. More specifically, Odyssey has
the ability to send a notification to the user when a potential match is identified. These notifications are generated using semantic capabilities, situation awareness and ontology enabled situation modelling. Central to the alerting service is user profiling, which is embedded into the Odyssey ontology. The user profiling allows individual users to query ballistics and crime data that is linked to the individual's profile. A user is only able to analyse data and execute the queries that are retained within their stored profile. Odyssey will retain these queries so that an alert can be generated when new correlations are performed, this would usually occur when new data feeds are added to the platform. A user also has the option to 'close a case', which will result in no further information being received. However, whilst the query is no longer visible to the user, Odyssey will retain any cross correlations generated from the new data feeds for future analysis.

3. A NEED FOR ODYSSEY

It is estimated that 59% of weapons in circulation around the world are in civilian possession. In Europe 80% of the population are estimated to own a weapon (Miller et al, n.d.). Whilst the vast majority of these are used to pursue perfectly legal activities a number of these will be used in illegal activity (Miller et al, n.d.). The advent of the European Union in 1993 started to pave the way for the Schengen Area, which ultimately resulted in the abolishing of border controls between twenty one European countries. The relaxing of border controls has allowed people to travel freely between the European countries. Whilst this has made it easier for those travelling for pleasure and commercial reasons, it has also facilitated the free movement of criminals and gun crime across Europe. Consequently, gun crime (ballistics) data, when taken from across Europe, is complex and costly to analyse. One of the problems is that there is no European wide system for analysing ballistics data. This has been brought about by each individual country having the autonomy to purchase its own ballistics system - IBIS and EVOFINDER are examples of the systems currently in use within Europe. Analysing data from the different ballistic systems across
Europe is complex, as there is no central data repository to integrate and store this data (Thomas and Leary, 2009). This is further beset by the fact that each individual system outputs the data in a different format. This is markedly different to United States of America where they've established a National Integrated Ballistics Information Network. This allows each individual region to compare its ballistics data with other regions. The major difference in America is that all states use the same ballistics system supplied by IBIS. Therefore, there is a common standard across all of the ballistic systems, which facilitates the integration of ballistics data (Forensic Technology, 2008).

4. Application Scenario
The following use case scenario is used to illiterate the potential application of the Odyssey platform. It describes a crime scenario without the application of Odyssey and how the same crime would have been solved using Odyssey.

A female was found dead with gunshot wounds to the head in a hotel room in Poland. A night porter heard the sound of gunfire and notified the police. The police attended the scene to find a deceased female on the bathroom floor in a pool of blood. Police struggled to determine a motive for the killing and suspicions were further aroused by the fact that no gun was found at the scene. Evidence was gathered from the hotel room and a bullet was recovered from the victim. Almost a year later a decomposed male's body was discovered, in Italy, by a woman walking her dogs in nearby woods. The woman informed the police who attended the scene and recovered a bullet from the body, again no gun was discovered at the scene of the crime. Six months after the female was found dead in Poland, British police were called to a motorway service station where a firearm weapon had been discovered in a toilet cubical. Subsequently, after test firing the weapon, the British police uploaded the ballistic results into an information system. To date the murders in Poland and Italy remain unsolved and the firearm discovered at a motorway service station remains in the security of the British police force. Figure 2, below depicts the path of the two crimes through to the finding of the gun in the United Kingdom.
Investigating the same crimes using the Odyssey platform could have resulted in a different outcome as the investigation could have gone much further. Through access to Odyssey, the Polish police could have registered an alert request when they loaded their data into the platform. Hence when the Italian and British police uploaded their ballistics data an instant link between all crime scenes was generated. The alerting system then notified Polish, Italian and British police that there was a potential match - Odyssey had discovered a link. British police had also recovered Close Circuit Television footage from the motorway service station and were able to narrow the number of potential suspects. After making some enquiries police managed to link the crimes to one male, who was later arrested for questioning. Through questioning, it eventually transpired that both victims had been romantically linked and were subsequently murdered for their involvement with each other.

5. CONCLUSION

Project Odyssey is concerned with the integration of data extracted from disparate heterogeneous ballistic systems across Europe. When operational the Odyssey platform will allow police organisations to link gun crimes committed not only locally but also in different European Countries. This is important given the reduction in boarder controls that have allowed criminals to travel across Europe to commit gun crimes. This paper provides a brief introduction to project
Odyssey. It provides a brief description of the Odyssey platform and outlines the reasons why Europe needs such technology. The paper concludes with the introduction of a use case scenario, which illustrates the potential use of the Odyssey platform. The Odyssey platform is a structured framework that can be applied to other domains and data sets. Odyssey has the potential to redefine the standards of data exploitation from large disparate heterogeneous database systems.

6. REFERENCES


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7. Keywords

Ballistics

Intelligence

Interoperable Data

Innovation

Security Research FP7
Project Odyssey is an European 7\textsuperscript{th} Framework Programme (Security Research) funded project. Sheffield Hallam University are the project coordinators and Chief Inspector Fortune works closely with the team. This report is to raise awareness of the projects aims and objectives across the EU.

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