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**Advanced Tools for fighting Online illegal trafficking**

**D4.2 – System Specification**

|  |  |
| --- | --- |
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Definitions, Acronyms and Abbreviations

|  |  |
| --- | --- |
| **ACRONYMS / ABBREVIATIONS** | **DESCRIPTION** |
| DMP | Data Management Plan |
| FAIR | Findable, Accessible, Interoperable and Reusable |
| LEA | Law Enforcement Agency |
| ORD | Open Research Data |
| OSINT | Open-Source INTelligence |

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# Executive Summary

In.

# Introduction

## Overview

The aim of ANITA is to develop a novel investigation system for analysing heterogeneous online and offline resources for illegal trafficking activities, through the combination of big data analytics, deep/dark web analysis, blockchain technology, capturing, modelling, inferring, processing and storing knowledge in human understandable forms, incorporation of human perception/cognition principles in the system processing pipelines and transferring of domain knowledge/expertise from the expert users to the novice ones. To achieve this, ANITA will deliver an automatic, large-scale, user-driven, cognitive system for the efficient detection, tracking, monitoring and eventual prevention of the illegal online trafficking activities (including the popular trends related to: a) counterfeit/falsified medicine, drugs and NPS, b) weapons and firearms, and c) terrorism funding). This covers all aspects ranging from Surface-Web/Deep-Web/Dark-Nets source discovery/analysis to sophisticated Big Data analytics and high-level semantic reasoning services. Particular attention will be given on collecting knowledge for the application domain and re-using it for training new/novice officers.

In this document, a high-level logical view of the ANITA system is presented and the key structural requirements are identified. Each of the ANITA modules is analysed in terms of its functionality and the responsibilities it must deliver. The deliverable assumes that the reader is familiar with the User Requirements (*Deliverable D4.1*).

This document will also cover key non-functional requirements such as efficiency, interoperability, security and privacy and ethics (?). It will present a detailed analysis of how the user requirements are satisfied by the Functional Requirements gathered in this document and provide the reader with a clear understanding of how the ANITA platform will transition user needs to delivered features. Finally, the deliverable will present validation criteria to be employed in determining the quality of delivery of the final ANITA platform.

The outcome of this work is the definition of system-level requirements that will be used as input for the design of the overall system architecture. The timeline of the task resulting to this deliverable expands from the 1st until the 9th Month of the project.

## Context Framework

ANITA will implement a complex investigation system that will integrate several tools or modules. Any component or tool that will produce explicit functionality and will be integrated in the ANITA framework will be called *Module*. This term will be used from this point onwards. For the purposes of the project, a total number of 33 modules have been identified. Technical work packages (WP5-WP9) will be responsible for the development of those modules. In Table XX, the ANITA modules are listed according to the WP they belong to.

|  |  |
| --- | --- |
|  | **Data sources and stream analysis (WP5)** |
| 1 | Machine Learning Risk Assessment module |
| 2 | Black markets discovery and monitoring |
| 3 | Crawler for Surface web |
| 4 | Block-chain analysis for illicit activity discovering |
| 5 | Construction of source network and filtering |
|  | **Big Data analysis and analytics (WP6)** |
| 6 | Multilingual text analysis module |
| 7 | Object recognition module |
| 8 | Concept detection module |
| 9 | Event detection module |
| 10 | Multilingual automated translation module |
| 11 | Multilingual speech to text module |
| 12 | Topic Modelling System |
| 13 | Word Frequency Analysis module |
| 14 | Video and Image Indexing module |
|  | **Knowledge generation and reasoning (WP7)** |
| 15 | Knowledge modelling module |
| 16 | Black markets and illegal shops and products tracking module |
| 17 | Criminal network reconstruction module |
| 18 | Knowledge search and retrieval module |
| 19 | Knowledge based browsing module |
| 20 | Knowledge acquisition from deep neural networks |
|  | **Integration of human factor in the analysis loop (WP8)** |
| 21 | Implicit and explicit user capturing framework |
| 22 | Adaptive user modelling module |
| 23 | Conscious and subconscious user feedback module |
| 24 | Knowledge transfer module |
|  | **Novel applications for LEAs and system Integration (WP9)** |
| 25 | Source monitoring module |
| 26 | Knowledge management module |
| 27 | Graph exploration module |
| 28 | Import of new evidence module |
| 29 | Suggestion validation module |
| 30 | Visual analytics module |
| 31 | Chain of evidence module |
| 32 | Chain of custody module |
| 33 | Export module |

Overall, the objectives of WP4 can be summarized below:

1. To study and specify the user requirements;
2. To define Use Cases and user scenarios;
3. To study and specify the system level requirements;
4. To provide the system specification of the ANITA infrastructure that will be able to fulfil existing and future users’ demands;
5. To design the overall system architecture, based on the system requirements.

While objectives 1 and 2 are addressed in Deliverable D4.1 (Requirements, use cases and scenarios) and 5 is within the scope of D4.3 (System architecture), the objectives 3 and 4 are relevant to this deliverable. The role of System Specification is two-fold: i) to facilitate the transition from the User Requirements to the System Architecture by elucidating the non-functional requirements and constraints that the architecture must consider and accommodate in the overall design and ii) to clearly identify the functional requirements that individual module contributors should satisfy to enable a sophisticated, co-operative sequence of analysis flows.

The process and objectives of the investigations are summarized in Figure XX.



Gathering of the functional requirements has been accomplished with the collaborative effort of all technical partners. D4.2 will not only a list of requirements but it aims to expose the complete path from use case scenario to the technical objectives of each module.

The process followed is presented below in Figure 2.



## Relation to other documents (+reading guide)

Deliverables needed as input

Gives input to other deliverables (all technical):

Mapping of paragraphs of this documents with Project tasks and Modules!!

## Structure of the deliverable

The deliverable is structured as reported below:

**Chapter 2 – sss** – ssss.

# Methodology

This section describes the methodology that has been adopted in order to realise the system specification of ANITA. It describes the system development lifecycle of the project, the process for acquisition of the requirements, a brief description of the use cases and the basic workflows for each use case, as well as a mapping of the user requirements to the system requirements.

## Requirements engineering

The main objective of this deliverable is to define a set of requirements to describe the ANITA system functionalities as a whole and for each individual module. All technical partners have contributed to specification of individual modules. These specifications describe what the system or modules must do in order to be effective and fully address the user requirements.

The System Development Lifecycle (SDLC) of ANITA involves the following phases:

1. Requirements Acquisition
2. System Specification
3. Architectural Design
4. Detailed Design
5. System Implementation
6. System Integration

Requirement Acquisition and System Specification constitute important parts for the effective development of ANITA system. Requirements Engineering (RE) occurs after the definition of the high-level user requirements (i.e. User Needs) and prior to the explicit system design phase. However, in a complex system like ANITA, it is expected that the requirement definition will not be covered by a sequential approach and, therefore, it is expected that more requirement analysis iterations will be required throughout the system development process.

The requirements will be used, during the system implementation phase, to enable the functionality of system, as well as for testing individual modules. During the last development phases of ANITA, the technical requirements will be used to direct the validation testing process, which answers the question of whether the developed system satisfies the stakeholders’ needs.

The System Development Lifecycle (SDLC) of ANITA is depicted in Figure X. It is important to stress the association of the actual project phases with the project monitoring and validation phases, which is achieved by introducing certain Validation Indicators (VI). The Validation Indicators are defined at the same point as the requirements. Therefore, a specific Validation Indicator is assigned to each requirement. This way, the progress of each phase can be quantified and validated. The definition of the Validation Indicators for each measurable requirement is produced in this deliverable. Section XX examines the details of how ANITA will be validated (validation will take place in Task 9.6 - System Validation).



## Negotiating requirements

The main stakeholders of ANITA are the six end-users of the consortium, i.e. KWPG, AoC, CAST, NPN, GDCOC and LPV. Τhe design and development efforts within ANITA will try to satisfy their needs that have been analytically documented in Deliverable 4.1. At the requirements phase, all partners needed to make a contribution, in order to make evident the impact of ANITA and its innovative features. Producing innovative ideas, expressing them as requirements and linking them to the user needs generated by the stakeholders is a challenging task and a way to achieve this is through a creative technique in the requirement acquisition process. Within ANITA, three workshops have been organised between technical partners and end-users during the first six months of the project:

1. ANITA Kick-off Meeting (Rome, May 2018);
2. 2nd ANITA General Assembly (‘s-Hertogenbosch, July 2018);
3. 3rd ANITA General Assembly & First end-user meeting (Belgrade, October 2018).

These workshops have been considered as an opportunity to collect and produce draft requirements. The primary output of the workshops was a set of Use Case specifications and scenarios that were presented in Deliverable D4.1. The Use Case specifications were the medium that triggered new requirements and ideas that resulted from negotiations between all partners participating during the workshops.

## Use Case driven requirements specification

ANITA has been developed using a scenario-based approach. This means that the starting point for setting the boundaries of the system was the description of the scenarios involved. Scenario identification and description took place at the first phase of the methodology (the user requirements phase) and its conclusion drove a clear definition of the system’s goals, actors and requirements which in turn drove the development of the project and demonstrated the final results of ANITA. It is of high importance that a use case scenario should be well-defined and complete in order to cope (in conjunction with the environment) with all the necessary information to allow the extraction of concrete end users’ goals and requirements. It is worth mentioning that the cases described in this document originate in real events and real challenges faced by law enforcement authorities. Hence, they are not artificially created but carefully drafted in conjunction with the project end users to ensure a broad and useful functionality of the final ANITA system.

A clear description of ANITA Use Cases and scenarios is available in *Deliverable D4.1 – Requirements, use cases and user scenarios*. The focus of this document is to describe how these scenarios will be implemented in the context of ANITA framework by utilising the ANITA modules. In order to have a graphical representation of how the ANITA modules interact, specific flow diagrams have been designed for each use case. These flow diagrams have been created after close collaboration between technical partners and LEA users of the ANITA consortium. Feedback from LEA users (AoC, KWPG, NPN, GDCOC, LPV and DSTL) was particularly important to create valid flow diagrams.

### Use Case 1: Drugs, Medicine, NPS

In Figure X, the flow diagram of UC1 is depicted. The column at the left side of the diagram entitled *Novel Applications* contains those modules that allow direct interaction with the user, while the rest of the modules are running in the back-end.

More specifically, the user can interact with the ANITA system in order to fulfil multiple actions:

* Import evidence to the system to be analysed (*Evidence Import*).
* Monitor data gathering process from multiple sources (*Source monitoring and data gathering*)
* Monitor/manage the knowledge management process (*Knowledge management*)
* Query, browse, search and retrieve relevant content (*Browsing search and retrieval*)
* Visualise the relevant content (*Advanced big data visual analytics*)
* Provide feedback to the retrieved results implicitly or explicitly (*Implicit and explicit user feedback capturing*)
* Transfer knowledge to new officers (*Knowledge transfer to new officers*)
* Export evidence in a way appropriate for the court (*Chain of custody and evidence export*)

UC1 deals with illegal trafficking of counterfeit/falsified medicine, drugs and NPS. According to the description in Section 2.2 of Deliverable D4.1, this case covers several sub-cases related to buying drugs from a Dark market using cryptocurrency, semi-legal business selling NPS, e-mail spam messages offering falsified medicine, person-to-person drugs delivery and delivery of drugs to a PO address.

The objectives of police are focused on tracing all crypto-currency transactions that have illegal behaviour, in order to find helpful information about other suspects that are connected with the case. In particular, the police try to discover the real individuals behind the Dark Nets, as well as discovering new transactions in the predefined structures that have been detected. More specifically, the police should be able to detect the owners from the Dark Web sites that sell ‘opioids’, the owners of the enterprises that trade NPS and drugs on the edge of the law, and to detect individuals that make trade of medicines and pills relevant to sexual performance. To address this, links among persons should be identified, while the level of interaction among them should be identified.

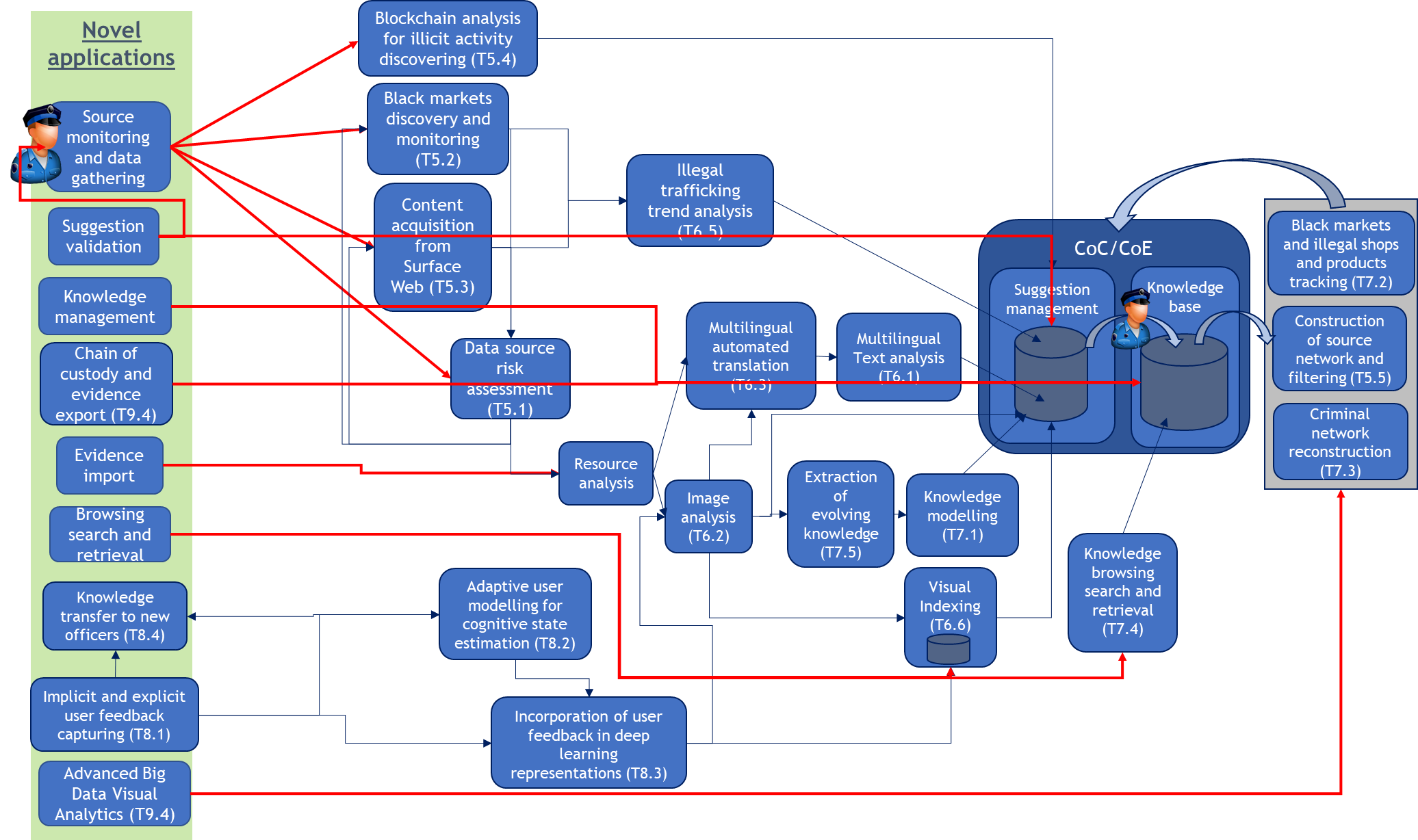
The basic steps of the workflow in UC1 are described below. In Figure X, the workflow focusing only on the back-end modules is presented.

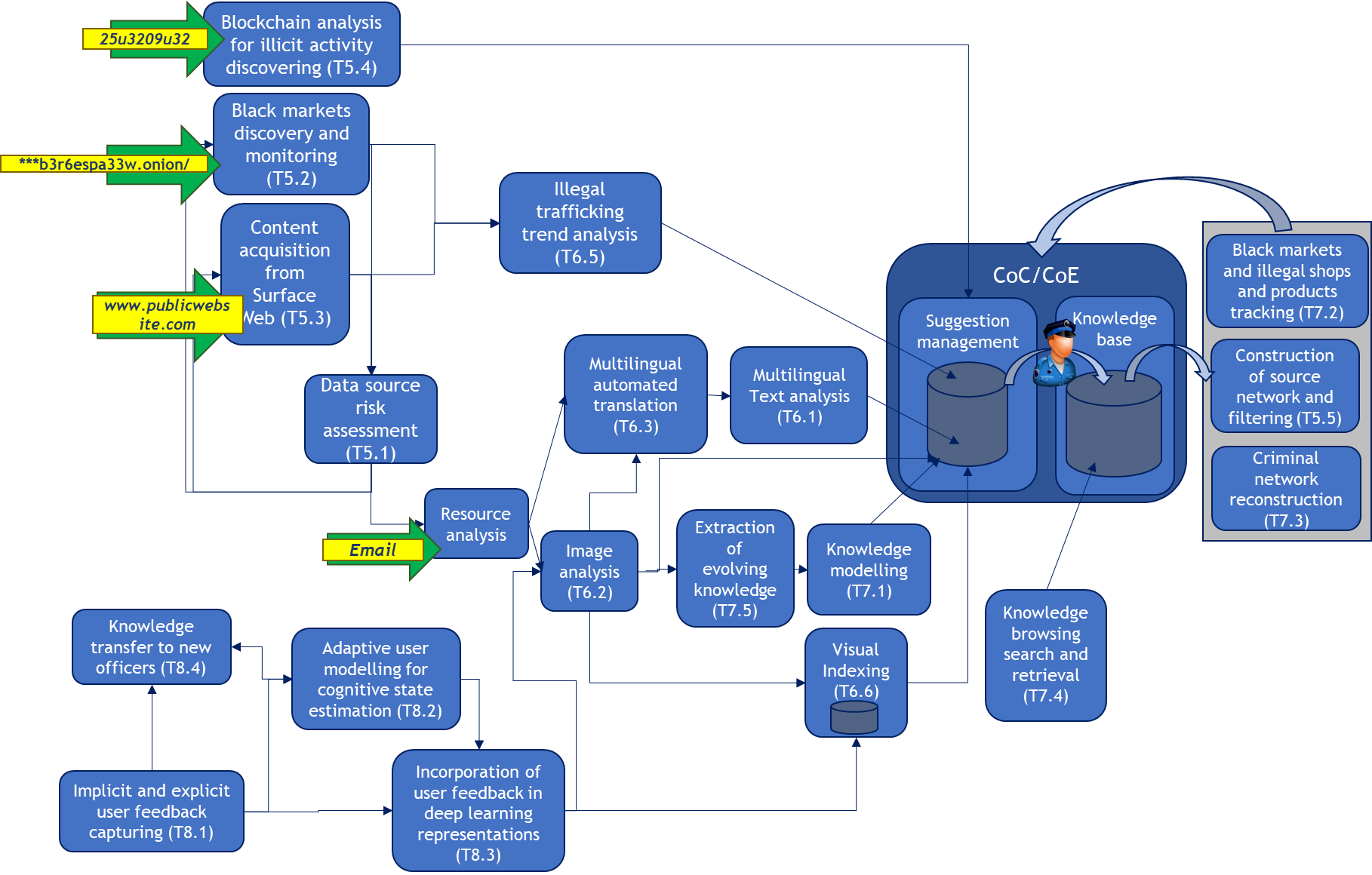
The input to the system may include the following data:

* E-mails of users which buy NPS and drugs from Dark Nets such as ([janedoe@jane.com](mailto:janedoe@jane.com))
* Known marketplaces of Dark Nets that sell drugs and NPS
* The browsing history of the buyer’s computer that has been seized
* Nicknames of the buyer and seller (“Smithsopioids”, “DoeJane”)
* The website that the suspect uses to sell the NPS (www.odczynnikichemiczne.net.pl)
* A list of NPS substances that are used to make drugs
* E-mail messages with full headers
* Images of the NPS or drugs in various file formats (.png, .jpeg, .gif)
* Logos/addresses of the involved firms
* Slang phrases that the peers used while selling the drugs
* Facebook accounts of the drug dealers that were arrested
* Data of crypto-currency transactions (with most of them being Bitcoin) that were found on drug dealer’s personal computer
* Open source data that were obtained from online search engines such as “Duckduckgo” and “carrot2search”, when given as search query terms the personal data of the drug dealer that were collected during his house research.

Large-scale information that has been collected form Dark and Shallow Web, using *Black markets discovery and monitoring* and *Content acquisition from Surface Web* modules, after a *Data source risk assessment* step, is further analysed using visual (*Image analysis* and *Visual indexing*) and textual (*Multilingual automated translation* and *Multilingual text analysis*) processing modules. *Illegal trafficking and trend analysis* may also be performed in the data. *Visual indexing* modulewill enable fast retrieval of relevant visual content, such as detection of fake advertisements in large scale databases as well as detecting wallet addresses that are hidden from large-scale visual content. The role of *Knowledge Base* is to provide a set of ontologies to model all crime aspects, including events, suspicious and illegal activities, threats, persons and organisations. The *Knowledge base* will provide services such as *Knowledge browsing search and retrieval* that allows searching for similar visual and textual content that has been uploaded on social media accounts, emails and personal sites in order to identify other persons or organisations, which are relevant to a specific case. The Knowledge base can be continuously updated by exploiting the results of the analysis modules, through *Extraction of evolving knowledge* and *Knowledge modelling* modules.

An important part of the process is the role of user feedback, which can be added to the system either explicitly or implicitly (capturing user’s interaction with the system), through the *Implicit and explicit user feedback capturing* module. This user feedback will be used in several ways: i) to improve the existing analysis modules through the Incorporation of user feedback in deep learning representations; ii) to transfer knowledge to new officers (*Knowledge transfer to new officers* module).





### Use Case 2: Weapons

In Figure X and Figure X, the flow diagram of UC2 is depicted, either with or without showing the “*Novel applications*” panel, respectively. Apart from some slight differences (e.g. some modules may be more useful in UC1 than in UC2), UC2 workflow is similar to UC1, in terms of modules interaction.

UC2 deals with weapons trafficking. According to the description in Section 2.3 of Deliverable D4.1, this case covers several scenarios related to cyberspace weapon trafficking and online arms/weapons commerce.

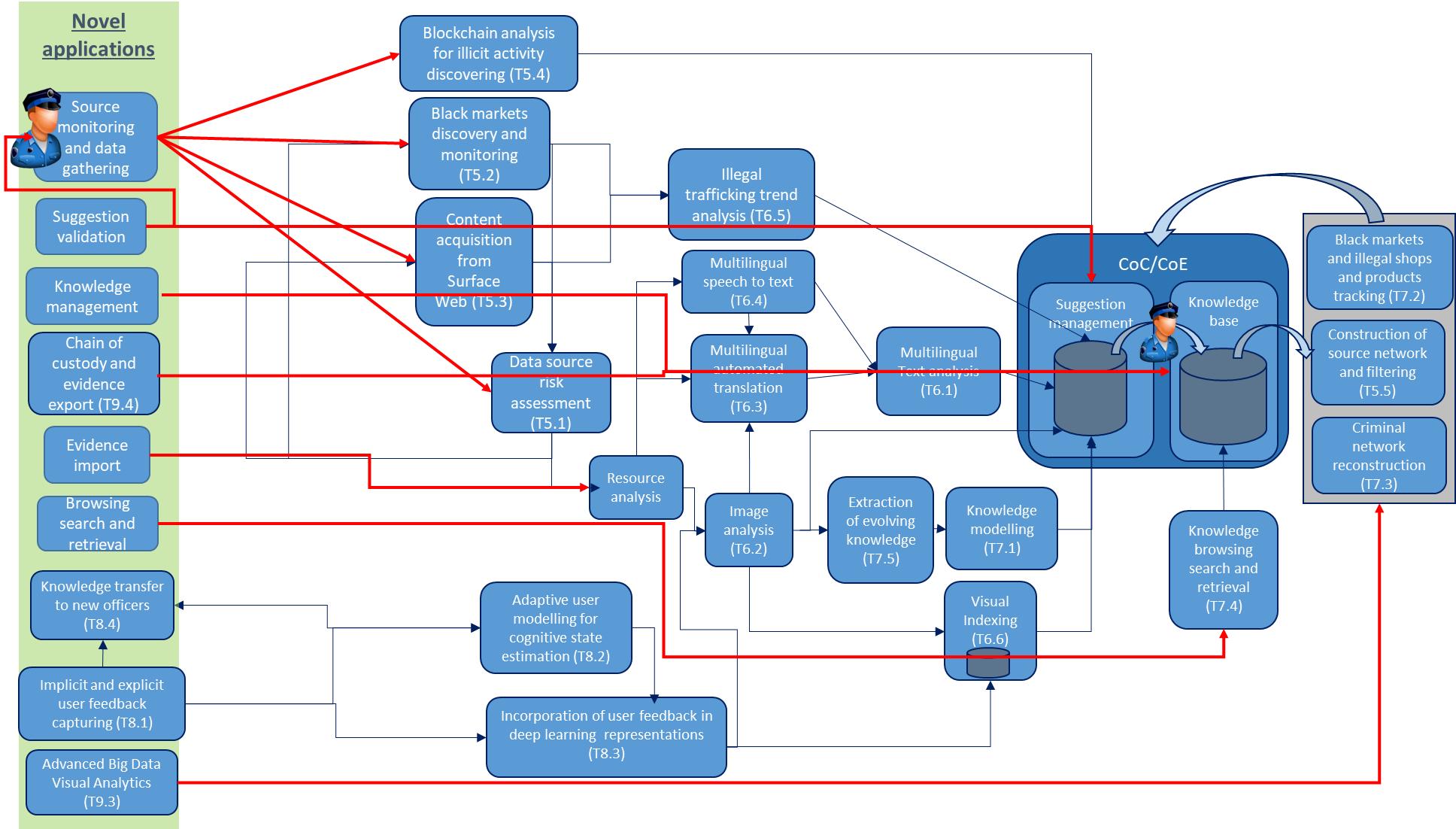
The objectives of police are focused on finding influencers and searching for political and other people related to weapon trafficking crimes. To address this, the investigators perform multi-modal (audio, video, text) analysis, in order to find weapon explanation speeches and online markets of Dark Web sites that sell weapons. In particular, the officers aim at identifying people or objects from images, finding similar images or textual information, and extracting correlations among them, in order to create a profile of a team or an individual that sells weapons and firearms. Moreover, police aim to detect similar content that is published on the Web, in order to spot similar sites that sell parts of weapons. In particular, the detection of parts of guns is needed. Additionally, detection of visual content that could be suspicious (e.g. a picture of a gun in a personal computer) could also be helpful. On the other hand, the detection of concealed objects would be helpful. Frauds, were mock-ups are presented as legal objects, need to be detected (e.g. bullets can be presented as shells).

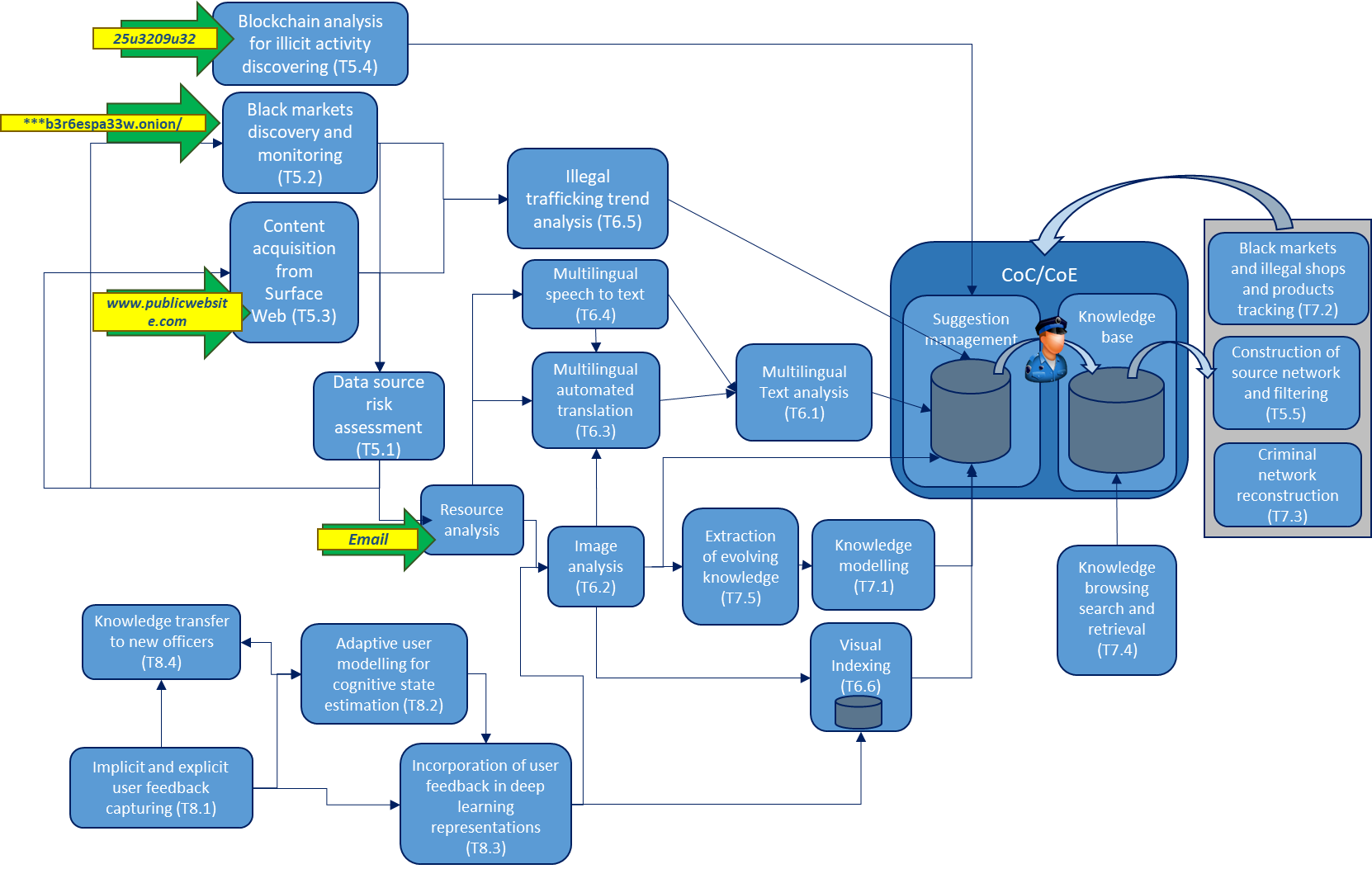
The input to the system may include the following data:

* IP addresses of websites that advertise weapon commerce via Dark Web or sites where the seller sells the weapons and the ammunition
* Social media profiles of the users, which post content (textual, audio, video) in order to explain the functionality of the weapons/firearms
* List of URLs that sell weapons and firearms on Dark Web that have been revealed from a detailed analysis of the offenders’ computers (already solved investigations)
* Images and phrases that are depicted on advertisements of weapons and firearms
* Pictures of real weapons and ammunition that have been found in suspect’s computer
* Documents that have been forged in the buyer’s house
* Social media profiles of a persons posing with a gun
* The list of the addresses that the different parts of the weapon have been delivered.

The above input is acquired in ANITA system in a similar way as in UC1. The *Image analysis* module will be responsible for automatically detecting potentially useful information, such as objects (weapons, firearms), concepts and events (e.g. showing how to use a weapon etc.), detection of weapon advertising or even detect people in photos posing with a gun in order to further search for the user profile. Additionally, the management of huge amounts of textual information is critical. *Multilingual automatic translation* and *Multilingual text analysis* will be used for searching for phrases that are used among the sellers and buyers, and mining private messages are shared on the Dark Web, translation into several languages (that can be used for communication). Moreover, *Multilingual speech to text* functionality, in order to make available the analysis of audio data from speech and then transcription to text supporting multiple languages, is often needed. Finally, the police aim to find the location of the photos that are uploaded on the Web. To this end, a combination of *Knowledge modelling* and *Image analysis* modules could be applied, in order to recognize the exact places where a picture is captured. Therefore, *Image analysis* could help by focusing on elements that lie in the background.

The rest of functionalities related to knowledge modelling and browsing, and user feedback are similar to UC1 and have been described in the previous subsection.





### Use Case 3

## User requirements mapping

In Table X below, we present the linkage between each of the three Use Cases described above and the low-level functional requirements (Section 3). With ‘Y’, we indicate that the specific functional requirement is leveraged by the Use Case.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Module | Functional Requirement | UC1 SC1 | UC2 SC1 | UC2 SC2 | UC3 SC1 | UC3 SC2 |
| Data sources and stream analysis | | | | | | |
| Machine Learning Risk Assessment module | Predict risks and vulnerabilities | Y | Y | Y |  |  |
| Input data sources | Y | Y | Y |  |  |
| Input data types | Y | Y | Y |  |  |
| Black markets discovery and monitoring module |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Crawler for Surface web |  |  |  |  |  |  |
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|  |  |  |  |  |  |
| Blockchain analysis |  |  |  |  |  |  |
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| Construction of source network and filtering |  |  |  |  |  |  |
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| Big Data analysis and analytics | | | | | | |
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| Knowledge generation and reasoning | | | | | | |
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| Integration of human factor in the analysis loop | | | | | | |
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| Applications, visualisation and evidence export | | | | | | |
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# Functional Requirements

Within ANITA,.

high-level functional view of the ANITA platform with the core analysis modules

## System level requirements

TBC (CERTH+ENG)

## Data sources and stream analysis

### Data source risk assessment in the Surface Web, Deep Web and Dark Nets (TIU-JADS, AIT)

This task will provide guidelines and baselines for the further development, refinement, and evaluation of the actual data-source risk assessment module, to be worked-out in the scope of T6.5. The requirements fleshed out in the scope of the following text refer to that module.

#### Machine Learning Risk Assessment module

***Machine Learning Risk Assessment module - predict risks and vulnerabilities***

|  |  |
| --- | --- |
| Requirement No | REQ-x (leave empty; to be defined after all requirements for all modules are fixed) |
| Requirement ID | REQ-MLRA-1 |
| Description | Α Machine-Learning (ML) approach which combines classification and regression shall be used in order to make a risk and vulnerability assessment. The ML approach should be able to predict (using appropriate training set) risks and vulnerabilities using known indicators from the state of the art. |
| Type | Functional |
| Fit Criterion | Experimental Prototyping, Empirical Research |
| Use Case & Scenario | UC1-SC1, UC2-SC1 SC2 |
| Source partner | TIU-JADS, AIT |
| Last Update | 12/12/2018 |

***Machine Learning Risk Assessment module - input data sources***

|  |  |
| --- | --- |
| Requirement No | REQ-x (leave empty; to be defined after all requirements for all modules are fixed) |
| Requirement ID | REQ-MLRA-2 |
| Description | Machine Learning will receive the necessary data from the tasks 5.3 and 5.2 from the rest of ANITA technical baseline. Further data is assumed to be obtained from other sources of data produced or elaborated as part of remaining tasks. The data will be in CSV or JSON format. |
| Type | Functional |
| Fit Criterion | Experimental Prototyping, Empirical Research, API Modelling |
| Use Case & Scenario | UC1-SC1, UC2-SC1 SC2 |
| Source partner | TIU-JADS, AIT |
| Last Update | 12/12/2018 |

***Machine Learning Risk Assessment module - input data types***

|  |  |
| --- | --- |
| Requirement No | REQ-x (leave empty; to be defined after all requirements for all modules are fixed) |
| Requirement ID | REQ-MLRA-3 |
| Description | The data received from the other tasks will contain links, type of attacks, type of risks, the type of data retrieved after the attack, and all the general information in order to make the ML approach working properly, matching as much as possible all of the data specified as part of T5.1. |
| Type | Functional |
| Fit Criterion | API Modelling |
| Use Case & Scenario | UC1-SC1, UC2-SC1 SC2 |
| Source partner | TIU-JADS, AIT |
| Last Update | 12/12/2018 |

### Black markets discovery and monitoring (AIT, ENG)

@AIT, ENG: define T5.2 modules and requirements

#### Black markets discovery and monitoring module – Keep updates in chronological order

Requirement ID: the ID should follow the following structure: REQ-BMDM-1,

where “REQ” stands for requirement

“BMDM” stands for Black Markets Discovery and Monitoring

and 1 denotes that this is the first requirement of this specific module.

|  |  |
| --- | --- |
| Requirement No | REQ-x |
| Requirement ID | REQ-BMDM-1 |
| Description | The module should keep updates in chronological order from the discovered content when changes are made in the online content |
| Type | Functional |
| Fit Criterion | How specific requirement is achieved |
| Use Case & Scenario | e.g. UC1-SC1, … |
| Source partner | e.g. AIT |
| Last Update | 18/11/2018 |

#### <Module\_Name> - <Requirement\_Name>

### Content acquisition from Surface Web and pre-processing (EXPSYS, ENG)

The goal of this task is to acquire contents both from open sources on Surface Web, like RSS, Social Networks (Twitter, Facebook), Web, Blogs and from local sources like files in the most common formats (i.e.: pdf, word, excel, power point, mail etc.) stored in folders or repositories. Heterogeneous resources (image, video, text) will be extracted from contents acquired by the targeted sources. The adopted approach will also include a preliminary study for selecting relevant data sources to be monitored for intercepting illegal trafficking activities. Specific taxonomies will be defined for supporting contents pre-processing.

#### Crawler for Surface web

***Crawler for Surface web - crawl Social Networks***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-SWC-1 |
| **Description** | This module **should** acquire contents from Twitter and Facebook |
| **Type** | Functional |
| **Fit Criterion** | Successfully retrieve content from Twitter and Facebook |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

***Crawler for Surface web - crawl URLs in Surface Web***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-SWC-2 |
| **Description** | This module **should** crawl URLs in the Surface Web |
| **Type** | Functional |
| **Fit Criterion** | Successfully retrieve content from configured URL |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

***Crawler for Surface web - acquire content from local sources***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-SWC-3 |
| **Description** | This module **should** acquire contents from local sources |
| **Type** | Functional |
| **Fit Criterion** | Successfully retrieve content from local sources like files in the most common formats (i.e.: pdf, word, excel, power point, mail etc.) |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

### Blockchain analysis for illicit activity discovering (AIT)

@AIT: define T5.4 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Construction of source network and filtering (AIT, ENG, EXPSYS)

@AIT, ENG, ECPSYS: define T5.5 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

## Big Data analysis and analytics

### Multilingual text analysis (EXPSYS, ENG)

The goal of this task is content categorization and entities extraction. The categorization process will be implemented according to taxonomies that will be specifically defined around the online illegal trafficking domain. The engine will be enriched with capabilities to extract advanced information, like temporal references and relationships among the extracted entities. Stylometric analysis (a.k.a. writeprint) will be also included in order to support illegal trafficking clustering.

#### Multilingual text Analysis - Categorization

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-MTA-1 |
| **Description** | This module **should** collect textual documents according to specifically defined taxonomy related to the online illegal trafficking domain |
| **Type** | Functional |
| **Fit Criterion** | Successfull categorization of textual documents according to taxonomy |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

#### Multilingual text Analysis - Entities Extraction

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-MTA-2 |
| **Description** | This module **should** recognize People, Organizations and Places specifically defined around the online illegal trafficking domain |
| **Type** | Functional |
| **Fit Criterion** | Successfull recognition of standard entities (People, Organizations and Places) |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

#### Multilingual text Analysis - Stylometric analysis

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-MTA-3 |
| **Description** | Given a set of at least X documents by an author, the system **should** be able to tag a new document as likely being written by the same author |
| **Type** | Functional |
| **Fit Criterion** | The service performs a stylometric analysis of the document with estimated similarity to known author(s). |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

### Image and video analysis (CERTH)

@CERTH: define T6.2 modules and requirements

#### Object recognition

The goal is to locate and identify the real-world objects that may be presented in the visual medium. ANITA aims at introducing effective and time-efficient generic object localization and recognition methods, exploiting multiple-level contextual information in a complementary way to global and local visual information. For achieving this, multiple-level contextual information is going to be exploited, in complementary way to global and local visual features. The latter will be realized by the design and implementation of appropriate probabilistic and kernel-based algorithms, which will be further reinforced by ensemble learning techniques.

***Object recognition – Detect and recognise relevant objects***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-ORM-1 |
| **Description** | This module **must** detect and recognise relevant objects in image and video content |
| **Type** | Functional |
| **Fit Criterion** | Demonstrated ability of the module to detect objects under various circumstances (i.e. rotation, scaling and partially occluded images). |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1, UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 06/12/2018 |

***Object recognition – Output Content***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-ORM-2 |
| **Description** | The output of the Object detection module **must** be ROI, a bounding box and utf-8 data |
| **Type** | Functional |
| **Fit Criterion** | The requirement shall be met if a ROI, a bounding box and utf-8 encoded data is provided as output from this module. |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1, UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 06/12/2018 |

#### Concept detection

The objective is to robustly detect a wide range of high-level semantic entities that are included in the visual medium. These entities may correspond to many different levels of semantic granularity or abstraction, e.g. ranging from specific object types to individual scene categories. In particular, ANITA will develop a large-scale visual-based semantic concept detection framework, taking significantly into account the respective scalability issues that are expected to be present in the domain of illegal trafficking-related activities.

***Concept detection – Detect and recognise concepts***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-CDRM-1 |
| **Description** | The Concept Detection and Recognition Module **should** detect and recognize concepts that are present in the domain of illegal trafficking-related activities |
| **Type** | Functional |
| **Fit Criterion** | The requirement shall be met if the module can detect concepts and classify image/video input as a specific concept category. |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1, UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 06/12/2018 |

***Concept detection – Produce hierarchical concept structure***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-CDRM-2 |
| **Description** | The Concept Detection and Recognition Module **must** produce as output a concept library that can will be utilized from Event Detection module. |
| **Type** | Functional |
| **Fit Criterion** | The requirement shall be met if the module produces a hierarchical structure of concepts (library) that can be used for event detection based on multiple concepts. |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1, UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 06/12/2018 |

#### Event detection

This aims to deliver a service to identify both high-level as well as primitive semantic events related to the activities of the depicted individuals. ANITA will concentrate on the implementation and training of classifiers for static images (i.e. one-shot event detection).

***Event detection – Detect particular events***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-EDM-1 |
| **Description** | Given a video, this module **should** detect particular (pre-defined) semantic events, related to the illegal trafficking content in analysis, and retrieve only the desired part of the video for each detected concept |
| **Type** | Functional |
| **Fit Criterion** | The output will be a sorted timeline of the video highlighting the enclosing frames, the corresponding concept label and a confidence value for each detected concept. |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1, UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 06/12/2018 |

### Multilingual automated translation (SYSTRAN)

@SYSTRAN: define T6.3 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

**Functional**

Should be able to translate a given text or document into another language defined by the user. Any of the input languages should be able to be translated into English (and vice versa).

Should utilise state-of-the-art machine learning (Deep Learning) technologies to have improved performance, better translation quality and fluidity

Should be able to handle terminology

Should be able to automatically identify the language of a given text (support of more than 60 languages).

**Non-functional**

translation services can easily be integrated into any third-party application (e.g. using the SOAP protocol or any REST architecture)

### Multilingual speech to text (SYSTRAN)

@SYSTRAN: define T6.4 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

**Functional**

Shall be able to transcript an audio file into text.

Shall be able to support multiple audio formats (audio/x-wav, audio/WAVE, audio/wav, audio/L8, audio/L16, audio/PCMA)

More than 10 languages and more than 20 dialects to be supported. (English: USA, UK, Canada, Australia, South Africa, US Broadcast - French: Canada, Europe - German - Portuguese: Brazil, Europe - Spanish: Mexico, USA, Spain, Columbia, Argentina, Chile, Guatemala - Catalan - Hebrew - Italian - Japanese - Korean - Arabic: World, Gulf - Mandarin: China, Taiwan - Cantonese: Hong Kong – Dutch)

**Non-Functional**

Shall be able to use different operating modes according to speed, accuracy and hardware requirements.

### Illegal trafficking trend analysis (TIU-JADS, CERTH)

this section is an extract, continued from the baselines and basic requirements previously defined in the scope of T5.1 (see Sec. 3.2.1).

#### Topic Modelling System

***Topic Modelling System – discover the topics from a collection of documents***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-TMS-1 |
| **Description** | The Topic Modelling System is a statistical model to discover the topics from a collection of documents. In the ANITA context, the approach will uncover hidden structure in a collection of texts describing online sources. A document target will contain different topics in different proportions, the topics produced by topic modelling techniques have to be a cluster of similar words matching the indicators defined in T5.1. |
| **Type** | Functional |
| **Fit Criterion** | Topic Modelling, Feature Engineering |
| **Use Case & Scenario** | UC1-SC1, UC2-SC1 SC2 |
| **Source Partner** | TIU-JADS |
| **Last Update** | 6/12/2018 |

***Topic Modelling System – generate JSON or CSV file formats***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-TMS-2 |
| **Description** | The Topic Modelling System will generate JSON or CSV file formats consistent with the results of the statistical analysis and further analysis which will waterfall from T6.5. The JSON or CSV file contains the number of different topics from the dataset and a list of most salient terms. |
| **Type** | Functional |
| **Fit Criterion** | Exploratory Prototying |
| **Use Case & Scenario** | UC1-SC1, UC2-SC1 SC2 |
| **Source Partner** | TIU-JADS |
| **Last Update** | 6/12/2018 |

***Topic Modelling System – use Latent Dirichlet Allocation (LDA) as statistical modelling technique***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-TMS-3 |
| **Description** | The Topic Modelling System will use Latent Dirichlet Allocation (LDA) as statistical modelling technique. LDA is a method for fitting topic modelling, it uses the document as a collection of topics, and each topic as a collection of words. This create the overlap among documents in terms of content. The Topic Modelling System will use lemmatization before applying LDA in order to preprocess the text to analyze. The lemmatization process is in charge of reduce any given word to its base form thereby reducing multiple forms of a word to a single word. |
| **Type** | Functional |
| **Fit Criterion** | Exploratory Prototying |
| **Use Case & Scenario** | UC1-SC1, UC2-SC1 SC2 |
| **Source Partner** | TIU-JADS |
| **Last Update** | 6/12/2018 |

#### Word Frequency Analysis module

***Word Frequency Analysis module – create statistics on word frequency from a given dataset***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** | REQ-WFA-1 |
| **Description** | The Word Frequency Analysis tool is in charge of create statistics on word frequency from a given dataset. The tool will first lemmatize the test in order to reduce any given word to its base form, then will plot a bar chart with the results of the analysis. |
| **Type** | Functional |
| **Fit Criterion** | Exploratory Prototying |
| **Use Case & Scenario** | UC1-SC1, UC2-SC1 SC2 |
| **Source Partner** | TIU-JADS |
| **Last Update** | 12/12/2018 |

### Visual Indexing (CERTH)

@ **CERTH**: define T6.6 modules and requirements

#### Video and Image Indexing module

***Video and Image Indexing module - Binary descriptor extraction***

|  |  |
| --- | --- |
| **Description** | The Video and Image Indexing Module shall convert images or video streams to binary descriptors |
| **Type** | Functional |
| **Fit Criterion** | The requirement **shall** be met if binary code describing certain video streams or an image which is extracted from video frames or image respectively |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1,UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 6/12/2018 |

***Video and Image Indexing module – Search and preview similar videos and images***

|  |  |
| --- | --- |
| **Description** | The Video and Image Indexing Module shall search and preview similar videos and images |
| **Type** | Functional |
| **Fit Criterion** | The requirement **shall** be met if the retrieved images or videos are relevant to query input |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1,UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 6/12/2018 |

***Video and Image Indexing module – Exploit detected objects***

|  |  |
| --- | --- |
| **Description** | The Video and Image Indexing Module shall process video and images taking into account the objects that have been detected from object detection requirement XX |
| **Type** | Functional |
| **Fit Criterion** | Retrieve similar visual content and enable multi-label search |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1,UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 6/12/2018 |

***Video and Image Indexing module – Update binary conversion process***

|  |  |
| --- | --- |
| **Description** | The Video and Image Indexing Module shall process video and images and update the binary conversion process, when is necessary. |
| **Type** | Functional |
| **Fit Criterion** | The mapping of the visual content to a lower-dimensional space should be updated when the database is enriched with new content. |
| **Source Partner** | CERTH |
| **Last Update** | 6/12/2018 |

## Knowledge generation and reasoning

### Knowledge modelling for illegal trafficking (EXPSYS, ENG)

This task will focus on knowledge modelling for illegal trafficking. A proper set of ontologies will be defined in order to model all crime aspects including events, suspicious and illegal activities, threats, people, organisations, places, black-markets and illegal shops, products and their relationships. The defined ontologies will constitute the starting point for the definition of inference and reasoning rules and mechanisms that will be developed.

#### Knowledge modelling - model all crime aspects

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-KMM-1 |
| **Description** | ANITA **MUST** be able to model all crime aspects including events, suspicious and illegal activities, threats, people, organisations, places, black-markets and illegal shops, products and their relationships |
| **Type** | Functional |
| **Fit Criterion** | In ANITA users have to be provided with a functional and supportive access to the knowledge stored into the system. For this reason, to facilitate such an access, all activities, entities and events related to illegal trafficking must be represented in a suitable way. Moreover, the use of common taxonomies, ontologies and metadata enable analysis modules to represent their outcomes in a unified way, which facilitates integration and reasoning processes. |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

### Black markets and illegal shops and products tracking (EXPSYS, ENG, AIT)

This task aims at delivering inference and reasoning services to analyse relevant information extracted in order to discover, correlate and track the evolution of black markets, illegal shops and products involved in illegal trafficking activities.

#### Black markets and illegal shops and products tracking - Inference and reasoning

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-BMISPT-1 |
| **Description** | ANITA **MUST** provide automatic tools for inference and reasoning in order to analyse and merge information extracted by analysis modules into complex events. |
| **Type** | Functional |
| **Fit Criterion** | Low level events extracted by analysis modules are reasoned with and used to infer higher level complex events. |
| **Use Case & Scenario** | UC1-SC1 |
| **Source Partner** | EXPSYS |

### Reasoning mechanisms for criminal network reconstruction (ENG, EXPSYS, AIT)

This task aims at delivering a module that will use reasoning mechanisms to merge and fuse information coming from multiple sources and analysis results with stored knowledge, in order to produce suggestions on new knowledge related to potential relationships among individuals, groups, events and resources. Involvement of users in network reconstruction is also considered, in terms of creation and deletion of nodes and relationships into the network.

#### Criminal network reconstruction – Node creation

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-1 |
| **Description** | ANITA **MUST** allow users to create a new node into the criminal network. |
| **Type** | Functional |
| **Fit Criterion** | Reconstruction of criminal network has to include information coming from user prior knowledge. To this end, ANITA must provide users with the possibility to add new nodes to the network. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Node type selection

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-2 |
| **Description** | ANITA **MUST** allow users to choose the type of a node during its creation. |
| **Type** | Functional |
| **Fit Criterion** | Nodes of the criminal network can have different types (person, group, event, etc.). Thus, ANITA must provide users with the possibility to select the type of a new node when it is created. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Node deletion

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-3 |
| **Description** | ANITA **MUST** allow users to delete a node from the criminal network. |
| **Type** | Functional |
| **Fit Criterion** | When no more useful, users must be able to delete a node. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Relationship creation

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-4 |
| **Description** | ANITA **MUST** allow users to create a new relationship between two nodes into the criminal network. |
| **Type** | Functional |
| **Fit Criterion** | Reconstruction of criminal network has to include information coming from user prior knowledge. To this end, ANITA must provide users with the possibility to add a new relationship between two nodes to the network. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Relationship type selection

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-5 |
| **Description** | ANITA **MUST** allow users to choose the type of a relationship during its creation. |
| **Type** | Functional |
| **Fit Criterion** | Relationships of the criminal network can have different types, based on the types of the nodes involved. Thus, ANITA must provide users with the possibility to choose the type of a new relationship when it is created. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Relationship deletion

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-6 |
| **Description** | ANITA **MUST** allow users to delete a relationship from the criminal network. |
| **Type** | Functional |
| **Fit Criterion** | When no more useful, users must be able to delete a relationship. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Produce suggestions on discovered relationships

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-7 |
| **Description** | ANITA **MUST** produce suggestions about discovered potential relationships among people, groups, events and resources through automatic reasoning mechanisms. |
| **Type** | Functional |
| **Fit Criterion** | Results from analyses, information related to sources of interest and previous knowledge will be used and merged to provide suggestions about discovered potential relationships among actors (people and groups), events and resources. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Produce suggestions on new crawling sessions

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-8 |
| **Description** | ANITA **SHOULD** suggest user new crawling sessions when information to reconstruct the criminal network is missing. |
| **Type** | Functional |
| **Fit Criterion** | Lack of information could lead to a partial reconstruction of the criminal network. ANITA should then provide suggestions to user on what to search and crawl in order to complete or confute previous reconstructions. Involvement of user in the decision is essential in order to allow users to have always the last decision in the processing loop. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

#### Criminal network reconstruction – Produce suggestions on new analysis sessions

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-CNR-9 |
| **Description** | ANITA **SHOULD** suggest to users new analysis sessions on stored resources when information to reconstruct the criminal network is missing. |
| **Type** | Functional |
| **Fit Criterion** | Lack of information could lead to a partial reconstruction of the criminal network. ANITA should then provide suggestions to user on which analyses should be done on available resources in order to complete or confute previous reconstructions. Involvement of user in the decision is essential in order to allow users to have always the last decision in the processing loop. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |

### Knowledge-based browsing, search and retrieval (ENG)

This task will develop advanced semantically based service for search and retrieval of information stored into ANITA system.

#### Search and retrieval – Search by user query

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-SRM-1 |
| **Description** | ANITA **MUST** provide capability of searching stored contents starting from a user query. |
| **Type** | Functional |
| **Fit Criterion** | Users must have the possibility to search stored contents starting from a query. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Search and retrieval – Default order of search results

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-SRM-2 |
| **Description** | ANITA **MUST** order search results by query matching score by default. |
| **Type** | Functional |
| **Fit Criterion** | Results must be shown to users in an ordered way according to a criterion. In ANITA, the default criterion is the query matching score. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Search and retrieval – Additional order criteria of search results

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-SRM-3 |
| **Description** | ANITA **SHOULD** provide the possibility of selecting an alternative order criterion for search results (date, alphabetic, etc.). |
| **Type** | Functional |
| **Fit Criterion** | Based on attributes that will be part of a search result, ANITA should allow users to order the search result according to criteria different from the default one. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Search and retrieval – Search results filter by type

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-SRM-4 |
| **Description** | ANITA **SHOULD** provide the possibility of filter search results by one type. |
| **Type** | Functional |
| **Fit Criterion** | Results can be of different types, according to those supported by ANITA (texts, images, videos, audio files, etc.). Users should be able to select which type of results to visualize. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Browsing – Stored content read

|  |  |
| --- | --- |
| **Requirement No** | REQ- XX |
| **Requirement Id** | REQ-KBM-1 |
| **Description** | ANITA **MUST** provide users with the possibility to read stored contents. |
| **Type** | Functional |
| **Fit Criterion** | Users must be able to read contents (texts, images, audios, videos, information of different nature) that are stored into ANITA system. |
| **Use Case & Scenario** | UC1 – UC2 – UC3 |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### <Module\_Name> - <Requirement\_Name>

### Extraction of evolving knowledge from deep neural network representations (CERTH)

@ CERTH: define T7.5 modules and requirements

#### Knowledge acquisition from deep neural networks

***Knowledge acquisition from deep neural networks – Infer new and evolving knowledge***

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement ID** | REQ-KADNN-1 |
| **Description** | ANITA MUST be able to infer new and evolving knowledge from trained deep neural networks. |
| **Type** | Functional |
| **Fit criterion** | Successfully formally represent knowledge in the form of hierarchical or non-hierarchical logical axioms, extracted from data interrelations as they are embodied in deep neural networks; the latter should be trained in the premises of ANITA and in relation to its use cases. |
| **UC & scenario** | All |
| **Source partner** | CERTH |
| **Last update** | 04/12/2018 |

***Knowledge acquisition from deep neural networks – Validate and refine data-driven knowledge***

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement ID** | REQ-KADNN-2 |
| **Description** | ANITA’s data-driven knowledge MUST be validated and verified. |
| **Type** | Functional |
| **Fit criterion** | Successfully validate the produced knowledge’s consistency through relevant reasoning services. Successfully verify the produced knowledge’s soundness against ‘golden standard’ knowledge base(s) and/or in relation to particular tasks within ANITA’s scenarios. |
| **UC & scenario** | All |
| **Source partner** | CERTH |
| **Last update** | 04/12/2018 |

## Integration of human factor in the analysis loop

### Implicit and explicit user feedback capturing (IBEC, CERTH)

@IBEC, CERTH: define T8.1 modules and requirements

#### Implicit and explicit user capturing framework

The goal is to capture in a reliable way the implicit and explicit user’s response (gaze patterns, pupil response, head/body posture, facial expressions, clicks, electrodermal activity) while he/she is interacting with the ANITA system. For achieving this, we will design and implement a modular sensing architecture capable to acquire, time-synchronize and store the signals from different sources that will be used in the definition of the user model.

#### Implicit and explicit user capturing framework - Capture implicit and explicit user responses

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement Id** | REQ-IEUFC-1 |
| **Description** | The module should be able to capture physiological measures of the user and the explicit interactions with the system (e.g. mouse clicks, key presses) |
| **Type** | Functional |
| **Fit Criterion** | Development of a framework to acquire, stream and record the signals towards a software that centralizes them synchronized for their usage. |
| **Use Case & Scenario** | UC1, UC2, UC3 |
| **Source Partner** | IBEC |
| **Last Update** | 10/12/2018 |

### Adaptive user modelling for cognitive states estimation (IBEC)

@IBEC: define T8.2 modules and requirements

The goal is to transform the low-level primitives acquired through the sensing framework into more abstract, high level descriptions of user’s cognitive/affective states and performance. For achieving this, we will develop a model of the user which estimates his current state.

#### Adaptive user modelling – Estimate user cognitive/affective states and performance

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement Id** | REQ-AUMCSE-1 |
| **Description** | The module should be able to Infer high-level descriptions of user cognitive and affective states (i.e., workload, frustration, arousal, engagement, stress, confidence) using low-level primitives (EDR, gaze patterns, pupil size, facial expressions, task related actions) while the user interacts with the system |
| **Type** | Functional |
| **Fit Criterion** | A set of algorithms to obtain metrics that transform the acquired low-level primitives (i.e., raw signals) into high-level descriptions of cognitive/affective states (I.e., attention, engagement, confusion, drowsiness, workload, arousal, frustration, stress). |
| **Use Case & Scenario** | UC1, UC2, UC3 |
| **Source Partner** | IBEC |
| **Last Update** | 10/12/2018 |

### Incorporation of conscious and subconscious user feedback in deep learning representations (CERTH, EXPSYS, IBEC, SYSTRAN)

@ **CERTH, EXPSYS, IBEC, SYSTRAN**: define T8.3 modules and requirements

#### Conscious and subconscious user feedback

***Conscious and subconscious user feedback – Model explicit and implicit human responses***

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-CSUF-1 |
| **Description** | The module should be able to model explicit and implicit human responses (captured signals) in appropriate representations that can be exploited by deep learning architectures. |
| **Type** | Functional |
| **Fit Criterion** | A set of representations (e.g. heatmaps, sequences, distance embeddings) should be generated. |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Conscious and subconscious user feedback – enhance deep learning models for image retrieval***

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-CSUF-2 |
| **Description** | The module should be able to use the appropriate representation (Req. as defined above) and enhance deep learning based models for image retrieval. |
| **Type** | Functional |
| **Fit Criterion** | The requirement shall be met if the model used for image retrieval is able to return improved results |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Conscious and subconscious user feedback – enhance deep learning models for object detection***

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-CSUF-3 |
| **Description** | The module should be able to use the appropriate representation (Req. as defined above) and enhance deep learning based models for object detection. |
| **Type** | Functional |
| **Fit Criterion** | The requirement shall be met if the model used for object detection is able to return improved results |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

**SYSTRAN**

**Functional**

Shall be able to retrieve end-user feedbacks on translation quality. Allow end-user to document feedback within a structured form and propose a new translation or a new dictionary candidate. The system shall be able to exploit user feedbacks to update dictionaries or translation memories.

### Knowledge transfer to new officers (IBEC, CERTH)

@ **IBEC, CERTH**: define T8.4 modules and requirements

#### Knowledge transfer - Tutoring system

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-KTM-1 |
| **Description** | The module should be able to provide appropriate training material to the novice user that is tailored to his capabilities and current cognitive state based on the model inferred. |
| **Type** | Functional |
| **Fit Criterion** | The requirement shall be met if the learning gain of the user is improved |
| **Use Case & Scenario** | ALL |
| **Source Partner** | IBEC |
| **Last Update** | 12/12/2018 |

## Applications, visualisation and evidence export

### Applications for illegal trafficking (ENG)

ANITA system will be equipped with applications that will facilitate the work of LEAs in illegal trafficking domain. The need of some applications have been elicited from use cases and below some requirements have been reported. It is worth noting that some applications will be subject to changes due to the end user feedback that will be received throughout the project.

#### Source monitoring – Add new source to monitor

#### Source monitoring – Remove source to monitor

#### Source monitoring – Select end time of monitoring

#### Source monitoring – See crawled resources

#### Knowledge management – Read stored information

#### Knowledge management – Add new information

#### Knowledge management – Update stored information

#### Knowledge management – Remove stored information

#### Graph exploration

#### Import of new evidence

#### Suggestion validation

### Big data visual analytics (ENG, IBEC)

A visual analytics module will be integrated into ANITA to represent trends of online illegal trafficking crimes.

#### Visual Analytics – Visualization of analytics on stored information

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-VA-1 |
| **Description** | ANITA **MUST** include tool for the visualization of analytics on stored information. |
| **Type** | Functional |
| **Fit Criterion** | Analytics on large amounts of information will be shown according to indicators that end users will indicate as relevant in the context of illegal trafficking domain. |
| **Use Case & Scenario** | ALL |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

### Chain of custody and evidence export (ENG)

In order to use stored resources in court, ANITA must trace the Chain of Evidence (CoE) and the Chain of Custody (CoC) for each resource. Moreover, when a resource has to be exported, the export must also include its CoE/CoC.

#### Chain of Evidence – Digital mark of new stored resource

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-COE-1 |
| **Description** | ANITA **MUST** digitally mark each new resource to store. |
| **Type** | Functional |
| **Fit Criterion** | A digital mark (like hash value) must be computed for a new stored resource, in order to prove successively that the resource has not been altered from its acquisition into ANITA system. |
| **Use Case & Scenario** | ALL |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Chain of Evidence – Verification of resource originality when exported

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-COE-2 |
| **Description** | ANITA **MUST** verify the originality of the resource when it is exported. |
| **Type** | Functional |
| **Fit Criterion** | When a resource is exported, ANITA must recalculate the digital mark and compare it with that calculated at the resource acquisition time, in order to avoid exporting corrupted resources. |
| **Use Case & Scenario** | ALL |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Chain of Evidence – Scheduled verification of resource originality

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-COE-3 |
| **Description** | ANITA **SHOULD** verify the originality of stored resources at scheduled time. |
| **Type** | Functional |
| **Fit Criterion** | Since resources might be corrupted at any time, it is of vital importance to detect these resources before proceeding in their analysis. Thus, for each stored resource, ANITA should calculate periodically the digital mark and compare it with that calculated at the resource acquisition time, in order to detect corrupted resources. |
| **Use Case & Scenario** | ALL |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Chain of Evidence – Alert when corrupted resource is found

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-COE-4 |
| **Description** | ANITA **MUST** alert users when a corrupted resource is detected |
| **Type** | Functional |
| **Fit Criterion** | Since a corrupted resource can mislead user investigations, ANITA has to alert users when a resource has been manipulated, so that users can decide if delete it or not. |
| **Use Case & Scenario** | ALL |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Chain of Custody – Track user accesses on resources

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-COC-1 |
| **Description** | ANITA **MUST** maintain the history of all accesses of users to a stored resource |
| **Type** | Functional |
| **Fit Criterion** | ANITA must track actions performed by users on each stored resource. |
| **Use Case & Scenario** | ALL |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

#### Export module – Resource export

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** | REQ-EEM-1 |
| **Description** | ANITA **MUST** include an export functionality to export a stored resource with all its CoE and CoC |
| **Type** | Functional |
| **Fit Criterion** | In order to make a resource usable in court, a resource will be exported from ANITA together with its chain of evidence (to prove its originality and non-alteration) and its chain of custody (to know which users accessed the resource). |
| **Use Case & Scenario** | ALL |
| **Source Partner** | ENG |
| **Last Update** | 11/01/2019 |

# Non-Functional Requirements

Within ANITA,

## Non-functional requirements classification

## System level requirements

TBC (CERTH+ENG)

## Data sources and stream analysis

### Data source risk assessment in the Surface Web, Deep Web and Dark Nets (TIU-JADS, AIT)

As previously described, T5.1 does not amount to a tool. The baseline requirements below are fleshed out in the scope of T6.5, which is directly responsible for applying the results of T5.1 in the scope of risk assessment and trend analysis.

#### <Performance> - <Time for Analysis>

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The whole operation in order to analyze the risks and the vulnerabilities of a website from the Surface, Deep or Dark web will last among five and thirty minutes depending on the size of the website to analyze. |
| **Type** | Non Functional |
| **Fit Criterion** | Threshold |
| **Use Case & Scenario** | UC1-SC1, UC2-SC1 SC2 |
| **Source Partner** | TIU-JADS, AIT |
| **Last Update** | 12/12/2018 |

#### <Throughput> - <Percentage of Data covered>

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The Reachability of Internet, the portion of the surface, deep and dark web, reached from our tool will be estimated in 50% in one day. |
| **Type** | Non Functional |
| **Fit Criterion** | Throughput |
| **Use Case & Scenario** | UC1-SC1, UC2-SC1 SC2 |
| **Source Partner** | TIU-JADS, AIT |
| **Last Update** | 12/12/2018 |

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The system will cover up to 50% of each use case scenario. We will analyze and make a risk assessment for all the scenario from the use case. |
| **Type** | Non Functional |
| **Fit Criterion** | Throughput |
| **Use Case & Scenario** | UC1-SC1, UC2-SC1 SC2 |
| **Source Partner** | TIU-JADS, AIT |
| **Last Update** | 12/12/2018 |

### Black markets discovery and monitoring (AIT, ENG)

@AIT, ENG: define T5.2 modules and requirements

#### Black markets discovery and monitoring module – Keep updates in chronological order

#### <Module\_Name> - <Requirement\_Name>

### Content acquisition from Surface Web and pre-processing (EXPSYS, ENG)

It is important that we equip ANITA with a means to remove and expunge content gathered after a configurable period. Each item of evidence has an optional expiry date. If an item does not become part of an official investigation after a defined period of time (system configurable) then it is removed from ALL data stores. The expiry date associated with an item of evidence will be recorded in the Content Store. A periodic task will examine the Content Store for items that have surpassed their expiry date. It will then orchestrate removal of the item and its artefacts from the Content Store, the Knowledge Base and the cached content in the Source Index database.

***Crawler for Surface web – Content data expiry***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | ANITA **MUST** remove content[[1]](#footnote-1) and all associated analysis once its expiry time has been reached |
| **Type** | Non-functional (Privacy, Maintainability) |
| **Fit Criterion** | The requirement shall be met if content is removed from ANITA within 24 hours after it has expired. Any and all analysis directly derived from the content will also be removed |
| **Use Case & Scenario** | ….. |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Crawler for Surface web – Register with SIF***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Crawlers of the surface web **MUST** register with the ANITA crawling infrastructure to make themselves available for use |
| **Type** | Non-functional ((Interoperability) |
| **Fit Criterion** | New crawlers become available and visible to ANITA web monitoring |
| **Use Case & Scenario** | ….. |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

#### <Module\_Name> - <Requirement\_Name>

### Blockchain analysis for illicit activity discovering (AIT)

@AIT: define T5.4 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Construction of source network and filtering (AIT, ENG, EXPSYS)

@AIT, ENG, ECPSYS: define T5.5 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

## Big Data analysis and analytics

### Multilingual text analysis (EXPSYS, ENG)

#### <Module\_Name> - <Requirement\_Name>

***Multilingual Text Analysis – Standard Service***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The service **MUST** be available as a Web Service. |
| **Type** | Non-functional (interoperability, Maintainability) |
| **Fit Criterion** | Can be run as a Web Service. |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis – Standard Input***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The service **MUST** support JSON input payloads |
| **Type** | Non-functional (interoperability) |
| **Fit Criterion** | The service can be invoked with a JSON formatted input containing the text to be summarized, the length of the summary, and any other complementary data. |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis – Standard Output***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The service **MUST** support JSON output payload. |
| **Type** | Non-functional (interoperability) |
| **Fit Criterion** | The service will output a JSON formatted object containing the summary, the length of the summary and any other complementary data. |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis –Utf-8 format***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The module **MUST** receive in input Plain text encoded in utf-8 format |
| **Type** | Non-functional (interoperability) |
| **Fit Criterion** | The module will successfully accept only UTF-8 encoded text for processing |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis – Max size***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The module **MUST** receive in input a textual file with a maximum size of 100 KB |
| **Type** | Non-functional (interoperability) |
| **Fit Criterion** | The module will successfully accept only textual content items up to 100KB in size |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis – Min size***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Input text for the module **MUST** contain a minimum of 100 characters for best quality of the service |
| **Type** | Non-Functional (Efficiency) |
| **Fit Criterion** | The module will successfully accept textual content exceeding 100 characters in length |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis – Size boundaries***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Input text **SHOULD** be within a size range of 1KB-20KB for real-time analysis |
| **Type** | Non-Functional (Efficiency) |
| **Fit Criterion** | The module will efficiently perform real-time analysis on textual content that is between 1KB and 20KB in size |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis – un-manipulated text***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Input text **MUST** not have been manipulated |
| **Type** | Non-Functional (Interoperability) |
| **Fit Criterion** | The module will exhibit acceptable accuracy on un-encrypted text (Ex. No obfuscation of personal data, data removal, Encryption) |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

***Multilingual Text Analysis – stylometry con***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Regarding the stylometric analysis, the module **MUST** receive in input only English text, multilingual file is not supported |
| **Type** | Non-Functional (Interoperability) |
| **Fit Criterion** | The module works correctly with text in English language |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

### Image and video analysis (CERTH)

@CERTH: define T6.2 modules and requirements

#### Object detection

***Object detection – image and video format***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | The Object detection module must process images/videos conforming to a typical format |
| **Type** | Non-functional (interoperability) |
| **Fit Criterion** | The requirement shall be met if the module successfully processes an image or video presented in a defined format (.png, .jpg, .avi, .mpeg). |
| **Use Case & Scenario** | UC1-SC1, UC2-SC-1,UC2-SC-2, UC3-SC1, UC3-SC2 |
| **Source Partner** | CERTH |
| **Last Update** | 06/12/2018 |

***Object detection – Scalability***

|  |  |
| --- | --- |
| **Constraint No** |  |
| **Constraint Id** |  |
| **Description** | **Scalability** of input data |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module is capable to handle a growing amount of data |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Object detection – Security***

|  |  |
| --- | --- |
| **Constraint No** |  |
| **Constraint Id** |  |
| **Description** | **Security** of personal data. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module does not store personal data such as name. |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Object detection – Reliability***

|  |  |
| --- | --- |
| **Constraint No** |  |
| **Constraint Id** |  |
| **Description** | **Reliability** of the methods. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the proposed methods of the module perform reliably without causing operational malfunctions. |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Object detection – Time efficiency***

|  |  |
| --- | --- |
| **Constraint No** |  |
| **Constraint Id** |  |
| **Description** | **Time-efficient** operations. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module’s operations perform time-efficiently without causing delays to the user. |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Object detection – interoperability***

|  |  |
| --- | --- |
| **Constraint No** |  |
| **Constraint Id** |  |
| **Description** | The detection services MUST be available as Web Services |
| **Type** | Non-Functional (Interoperability, Maintainability) |
| **Fit Criterion** | The service can be run as a Web Service |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

### Multilingual automated translation (SYSTRAN)

@SYSTRAN: define T6.3 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Multilingual speech to text (SYSTRAN)

@SYSTRAN: define T6.4 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Illegal trafficking trend analysis (TIU-JADS, CERTH)

The non-functional requirements for this module were defined as baselines in the scope of T5.1 (see Sec. 4.3.1).

### Visual Indexing (CERTH)

@ **CERTH**: define T6.6 modules and requirements

#### Video and Image Indexing module

***Video and Image Indexing module – Time efficiency***

|  |  |
| --- | --- |
| **Description** | The process of retrieval of similar visual content (both video and image) shall be executed in a short period of time. (Performance) |
| **Type** | Non-Functional |
| **Fit Criterion** | The time-consumption is affected directly from the size of the dataset |
| **Source Partner** | CERTH |
| **Last Update** | 6/12/2018 |

## Knowledge generation and reasoning

### Knowledge modelling for illegal trafficking (EXPSYS, ENG)

#### <Module\_Name> - <Requirement\_Name>

#### Knowledge modelling

***Knowledge modelling – standard***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Ontologies **MUST** be modelled using the main standard |
| **Type** | Non-Functional (Interoperability) |
| **Fit Criterion** | Inputs of inference and reasoning tools must have access to the ontologies |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

### Black markets and illegal shops and products tracking (EXPSYS, ENG, AIT)

#### <Module\_Name> - <Requirement\_Name>

Black markets and illegal shops and products tracking ***– standard***

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Inputs and outputs of inference and reasoning tools **MUST** be represented according to the common taxonomies, ontologies and metadata. |
| **Type** | Non-Functional (Interoperability) |
| **Fit Criterion** | ANITA should be able to discover, correlate and track the evolution of black markets, illegal shops and products involved in illegal trafficking activities |
| **Use Case & Scenario** |  |
| **Source Partner** | EXPSYS |
| **Last Update** | 19/12/2018 |

### Reasoning mechanisms for criminal network reconstruction (ENG, EXPSYS, AIT)

@ ENG, EXPSYS, AIT: define T7.3 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Knowledge-based browsing, search and retrieval (ENG)

@ ENG: define T7.4 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Extraction of evolving knowledge from deep neural network representations (CERTH)

@ CERTH: define T7.5 modules and requirements

#### Knowledge acquisition from deep neural networks - <Requirement\_Name>

***Knowledge acquisition from deep neural networks - Integrity***

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement ID** | REQ-INTEG-XX |
| **Description** | ANITA MUST maintain referential integrity across original data and all  subsequent knowledge produced |
| **Type** | Non-functional (Integrity) |
| **Fit criterion** | ANITA should preserve a linkage between an item of data analysed in deep neural networks and all subsequent patterns and knowledge inferred in relation to that item. |
| **UC & scenario** | All |
| **Source partner** | CERTH |
| **Last update** | 04/12/2018 |

***Knowledge acquisition from deep neural networks - Efficiency***

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement ID** | REQ-EFF-XX |
| **Description** | ANITA SHOULD deliver at least one formal knowledge base, relevant to the project’s use cases, which will be used either as the golden standard to validate data-driven new knowledge or as the baseline knowledge to evolve with novel hypotheses. |
| **Type** | Non-functional (Efficiency) |
| **Fit criterion** | At least one formal knowledge base must be engineered, modelling the domain(s) of ANITA’s use cases. |
| **UC & scenario** | All |
| **Source partner** | ? |
| **Last update** | 04/12/2018 |

***Knowledge acquisition from deep neural networks - Interoperability***

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement ID** | REQ-INT-XX |
| **Description** | Data-driven produced knowledge MUST be re-usable and share-able, at least within ANITA, or even with third-parties (if opted by the consortium). |
| **Type** | Non-functional (Interoperability) |
| **Fit criterion** | Produced knowledge must be represented in accepted and widely used knowledge representation standards, such as propositional logic premises and/or OWL2. |
| **UC & scenario** | All |
| **Source partner** | CERTH |
| **Last update** | 04/12/2018 |

***Knowledge acquisition from deep neural networks - Interoperability***

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement ID** | REQ-INT-XX |
| **Description** | Data-driven produced knowledge MUST represent uncertainty and probability in inferred hypotheses and beliefs. |
| **Type** | Non-functional (Interoperability) |
| **Fit criterion** | Produced knowledge must allow for representation of fuzzy assertion and probabilistic weight modifiers, preferably in accepted KR standards such as Fuzzy OWL2. |
| **UC & scenario** | All |
| **Source partner** | CERTH |
| **Last update** | 04/12/2018 |

***Knowledge acquisition from deep neural networks - Interoperability***

|  |  |
| --- | --- |
| **Requirement No** | REQ-XX |
| **Requirement ID** | REQ-INT-XX |
| **Description** | The metadata to be fed into the deep neural network(s), to be subsequently used for knowledge acquisition, SHOULD be in English. Multilingual resources annotated with English metadata are supported but multilingual annotation is not supported. |
| **Type** | Non-functional (Interoperability) |
| **Fit criterion** | Successfully accept and analyse English metadata. |
| **UC & scenario** | All |
| **Source partner** | ? |
| **Last update** | 04/12/2018 |

## Integration of human factor in the analysis loop

### Implicit and explicit user feedback capturing (IBEC, CERTH)

@IBEC, CERTH: define T8.1 modules and requirements

#### Implicit and explicit user capturing framework - Security

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Security of personal data |
| **Type** | Non-functional |
| **Fit Criterion** | The requirement shall be met if the module does not store data that potentially could identify the person |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 06/12/2018 |

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Time-efficient operations. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module’s operations perform time-efficiently without causing delays to the user. |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 30/11/2018 |

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Non-invasiveness. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module’s does include obtrusive acquisition systems |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 30/11/2018 |

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Reliability of the methods. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the proposed framework performs reliably without causing operational malfunctions. |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 30/11/2018 |

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Acquisition and storage format |
| **Type** | Non-functional (interoperability) |
| **Fit Criterion** | The requirement shall be met if the framewrok successfully processes and store data in a standard defined format (.csv, .mat, hd5). |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 06/12/2018 |

### Adaptive user modelling for cognitive states estimation (IBEC)

@IBEC: define T8.2 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

|  |  |
| --- | --- |
| **Requirement No** | REQ- XXX |
| **Requirement Id** |  |
| **Description** | Security of personal data |
| **Type** | Non-functional |
| **Fit Criterion** | The requirement shall be met if the module does not store data that potentially could identify the person |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 06/12/2018 |

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Reliability of the methods. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the proposed methods of the module perform reliably without causing operational malfunctions. |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 30/11/2018 |

### Incorporation of conscious and subconscious user feedback in deep learning representations (CERTH, EXPSYS, IBEC, SYSTRAN)

@ **CERTH, EXPSYS, IBEC, SYSTRAN**: define T8.3 modules and requirements

#### Conscious and subconscious user feedback

***Conscious and subconscious user feedback - Security***

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Security of personal data. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module does not store personal data such as name. |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Conscious and subconscious user feedback - Reliability***

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Reliability of the methods. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the proposed methods of the module perform reliably without causing operational malfunctions. |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Conscious and subconscious user feedback – Time efficiency***

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Time-efficient operations. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module’s operations perform time-efficiently without causing delays to the user. |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

***Conscious and subconscious user feedback – Usability***

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Usable user interface. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the end users can become familiar with the user interface and can easily achieve image retrieval in the loop and object detection. |
| **Use Case & Scenario** |  |
| **Source Partner** | CERTH |
| **Last Update** | 30/11/2018 |

### Knowledge transfer to new officers (IBEC, CERTH)

@ **IBEC, CERTH**: define T8.4 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Security of personal data. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the module does not store sensitive personal data |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 30/11/2018 |

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Usable user interface. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the end users can become familiar with the user interface and can easily interact with the proposed tutoring scenarios. |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 30/11/2018 |

|  |  |
| --- | --- |
| **Requirement No** |  |
| **Requirement Id** |  |
| **Description** | Reliability of the methods. |
| **Type** | Non-Functional |
| **Fit Criterion** | The requirement shall be met if the proposed methods of the module perform reliably without causing operational malfunctions. |
| **Use Case & Scenario** |  |
| **Source Partner** | IBEC |
| **Last Update** | 30/11/2018 |

## Applications, visualisation and evidence export

### Applications for illegal trafficking (ENG)

@ENG: define T9.2 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Big data visual analytics (ENG, IBEC)

@ENG, UBEC: define T9.3 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

### Chain of custody and evidence export (ENG)

@ENG: define T9.4 modules and requirements

#### <Module\_Name> - <Requirement\_Name>

# System Validation

The goal of system validation is to explore how the implemented framework will be validated against the defined requirements. The first subsection presents the validation process that has been selected to achieve the aforementioned goal. Then, a description of the applicable Validation Indicators, which will be attached to each requirement, follows. The section concludes by providing the list of identified Validation Indicators in relation to the requirements that they complement.

## Validation Process

A role of scenarios is to explore the impact of changes to ANITA. These can be considered as impact scenarios, where each scenario is a projection of how ANITA will operate in and impact on the environment in which it will be applied. The scenario provides a starting point for a simple impact analysis, which takes place by using a set of predefined questions to ask about different actors and actions in the environment. This way, unforeseen negative impacts in the environment or behaviour can be explored. The impact analysis shall be performed as soon as the requirement acquisition phase is relatively complete, so that accurate projections about ANITA’s impact on the environment can be made. Therefore, such impact analysis will take place only after the application of Use Cases to check that the requirements are complete with respect to the events that they are going to handle. It is important to maintain some trace between changes in the environment resulting from implementation of certain requirements. As a result, during subsequent scenario analysis, if there is a likely negative impact, it is possible to trace the impact back to the original requirement.

Within ANITA, the approach selected to validate the requirements and the development system is by examining the produced prototype in realistic test conditions (WP10 Pilots/demonstration in relevant environments). There are two basic approaches to prototyping: i) *Throwaway* prototyping and ii) *Evolutionary* prototyping. In the former approach, after validating the prototype, it is discarded and the system is developed using other implementation methods. On the contrary, evolutionary prototyping takes place after more considered and careful investigation. In ANITA, more structured ways are used to build the module and system prototypes. The reason for this is that the resulting system, rather than been discarded, forms the heart of the final ANITA framework. Additional requirements and functionality extensions may be added to the system.

In general, scenario generation and usage is interrelated with evolutionary prototyping, which produces working versions of the framework. Combining scenarios and prototyping produces symbiotic effects. That is, without such evolutionary developments, the value of using scenarios would drop significantly and vice versa. Such combination was essential for producing ANITA in a way that can satisfy the end-user needs. The validation process is presented at this point. In this phase of the project, the domain experts (i.e. AoC, KWPG, NPN, GDCOC, LPV and DSTL) of the project have produced a set of scenarios to communicate application knowledge and their system vision to system engineers. Based on these, we developed a requirements specification with which ANITA’s implementation is going to be developed. The proposed scenarios will assist the validation of the module/system implementation and, indirectly the requirements specification. Evaluating versions of the implementation will lead to the detection of misunderstandings between the domain experts and the system functionalities. Equally important, validating the implementation against the initial scenarios will enable the domain experts to validate the scenarios themselves so that missing functionality, over-specifications, errors and even unintended side effects are detected. Revealing such gaps will assist the development process to improve the scenarios or adapt the implementations or specifications to the new detected requirements. This way, an evolutionary systems development process is established and applied to the project development phases. ANITA’s Task 9.6 – System Validation is intended to support this activity.

The ANITA system will be tested by various stakeholders involved in the project – end-users, developers and legal entities. Testing will focus on the validation indicators that are presented in the following sub-section. In essence, the agreement of the produced functionality will be validated against the user needs. ANITA pilots will be established under realistic conditions. As a result, the system and its modules will be validated regarding their utility and usability features because this type of evaluation will be accomplished by real users. Work Package 10 – *Demonstration in relevant environment* is intended to support this activity.

## Validation Indicators

The last phase of Requirements Engineering in a project is the validation of the acquired requirements. Sommerville and Kotonya mention that “(…) the aim of requirements validation is to ‘validate’ the requirements, i.e. check the requirements to certify that they represent an acceptable description of the system which is to be implemented. The process involves system stakeholders, requirements engineers and system designers who analyse requirements for problems, omissions and ambiguities” (Sommerville and Kotonya, 1998). In ANITA, we utilise a set of Validation Indicators that are capable of assessing each requirement that has been produced in the context of this deliverable. Table 15 presents the available Validation Indicator types. Each requirement that has been defined was attached with a certain Validation Indicator. This way, when testing the requirements, in *Task 9.6 – System Validation*, we can produce an informative outcome about the integrity, rationale and satisfaction of each requirement.

Kotonya, Gerald, and Ian Sommerville. Requirements engineering: processes and techniques. Wiley Publishing, 1998.

|  |  |
| --- | --- |
| **Validation Indicator** | **Description** |
| **Yes or No** | A single Boolean value that indicates the satisfaction of the requirement |
| **Short Answer** | The validator must respond with a short answer describing the satisfaction of the requirement |
| **Observation** | The validator must confirm the satisfaction of the requirement from the behaviour of the module/system while using it |
| **Demonstration** | The system engineers must prepare and present a short demonstration of the module/system, in order to conclude whether the requirement has been satisfied |

This section concludes with the Table below, which presents the assessment method that was selected to test each requirement.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **VI No** | **Requirement ID** | **Description** | **Type** | **Assesment Method** |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 | REQ-MLRA-1 | The ML approach should be able to predict (using appropriate training set) risks and vulnerabilities using known indicators from the state of the art. | Functional |  |
|  | REQ-MLRA-2 | Machine Learning will receive the necessary data from the tasks 5.3 and 5.2 from the rest of ANITA technical baseline. The data will be in CSV or JSON format. | Functional |  |
|  | REQ-MLRA-3 | The data received from the other tasks will contain links, type of attacks, type of risks, the type of data retrieved after the attack. | Functional |  |
|  |  |  |  |  |
|  | REQ-BMDM-1 |  |  |  |
|  | REQ-BMDM-Χ? |  |  |  |
|  |  |  |  |  |
|  | REQ-SWC-1 |  |  |  |
|  | REQ-SWC-2 |  |  |  |
|  | REQ-SWC-3 |  |  |  |
|  |  |  |  |  |
|  | REQ-MTA-1 |  |  |  |
|  | REQ-MTA-2 |  |  |  |
|  | REQ-MTA-3 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | REQ-ORM-1 | This module MUST detect and recognise relevant objects in image and video content | Functional | Demonstration |
|  | REQ-ORM-2 | The output of the Object detection module **must** be ROI, a bounding box and utf-8 data | Functional | Yes/No |
|  | REQ-CDRM-1 | The Concept Detection and Recognition Module **should** detect and recognize concepts that are present in the domain of illegal trafficking-related activities | Functional | Short Answer |
|  | REQ-CDRM-2 |  |  |  |
|  | REQ-EDM-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-TMS-1 |  |  |  |
|  | REQ-TMS-2 |  |  |  |
|  | REQ-TMS-3 |  |  |  |
|  |  |  |  |  |
|  | REQ-WFA-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-VIIM-1 | The Video and Image Indexing Module shall process video and images and update the binary conversion process, when is necessary. | Functional | Observation |
|  | REQ-VIIM-2 |  |  |  |
|  | REQ-VIIM-3 |  |  |  |
|  | REQ-VIIM-4 |  |  |  |
|  |  |  |  |  |
|  | REQ-KMM-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-BMISPT-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-CNR-1 |  |  |  |
|  | REQ-CNR-2 |  |  |  |
|  | REQ-CNR-3 |  |  |  |
|  | REQ-CNR-4 |  |  |  |
|  | REQ-CNR-5 |  |  |  |
|  | REQ-CNR-6 |  |  |  |
|  | REQ-CNR-7 |  |  |  |
|  | REQ-CNR-8 |  |  |  |
|  |  |  |  |  |
|  | REQ-SRM-1 |  |  |  |
|  | REQ-SRM-2 |  |  |  |
|  | REQ-SRM-3 |  |  |  |
|  |  |  |  |  |
|  | REQ-KBM-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-KADNN-1 |  |  |  |
|  | REQ-KADNN-2 |  |  |  |
|  |  |  |  |  |
|  | REQ-IEUFC-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-AUMCSE-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-CSUF-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-KTM-1 |  |  |  |
|  |  |  |  |  |
|  | REQ-VA-1 |  |  |  |
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|  | REQ-COE-1 |  |  |  |
|  | REQ-COE-2 |  |  |  |
|  | REQ-COE-3 |  |  |  |
|  | REQ-COE-4 |  |  |  |
|  |  |  |  |  |
|  | REQ-COC-1 |  |  |  |
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|  | REQ-EEM-1 |  |  |  |
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### Applications for illegal trafficking (ENG)

@ENG: define T9.2 modules and requirements

# Conclusions

TBC

1. Where appropriate (Content Store), item is replaced with an empty body and the version number increased rather than being deleted [↑](#footnote-ref-1)