Darknet and Social Network Monitoring

Introduction to Challenges, Concepts and Data Mining of the Deep Web

CIRCL
Computer Incident
Response Center
Luxembourg

Alexandre Dulaunoy
alexandre.dulaunoy@circl.lu

Aurelien Thirion
aurelien.thirion@circl.lu

Jean-Louis Huynen
jean-louis.huynen@circl.lu

info@circl.lu

October 15, 2021

CIRCL
Computer Incident
Response Center
Luxembourg

- The Computer Incident Response Center Luxembourg (CIRCL) is a government-driven initiative designed to provide a systematic response facility to computer security threats and incidents.
- CIRCL is the CERT for the private sector, communes and non-governmental entities in Luxembourg.

CIRCL Missions 1/2

- Provide a **systematic response** facility to ICT-incidents;
- Support national ICT users to **recover quickly and efficiently** from security incidents;
- **Minimize ICT incident-based losses**, theft of information and disruption of services for the private sector;

CIRCL Missions 2/2

- Gather information related to incident handling to better **prepare future incidents** management and provide optimized protection for systems and data;
- **Coordinate communication** among national and international incident response teams during security emergencies and to help prevent future incidents;
- Provide a security related **alert and warning system** for organisations in Luxembourg and abroad;
- Foster **knowledge and information** exchange in cybersecurity **lead the development of MISP project**;

Links

- AIL project: `https://github.com/ail-project`
- AIL framework: `https://github.com/ail-project/ail-framework`
- Training materials: `https://github.com/ail-project/ail-training`
- Online chat: `https://gitter.im/ail-project/community`

Ethics in Information Security and Cybersecurity

- The materials and tools presented can open a significant numbers of questions regarding ethics;
- Our researches and tools are there for education, supporting the public good and improve incident response;
- We ask all users and participants to **follow ethical principles and act professionaly**[1].

[1] https://www.acm.org/code-of-ethics
https://www.first.org/global/sigs/ethics/ethics-first

Privacy, AIL and GDPR (PII) - An Ethical Question

- Many modules in AIL can process personal data and even special categories of data as defined in GDPR (Art. 9).
- The data controller is often the operator of the AIL framework (limited to the organisation) and has to define **legal grounds for processing personal data**.
- To help users of AIL framework, a document is available which describe points of AIL in regards to the regulation[2].

[2] https://www.circl.lu/assets/files/information-leaks-analysis-and-gdpr.pdf

Objectives

Our objectives

- Provide a quick overview to darknet, deep web, collection and cyber threat intelligence lifecycle;
- Review different **collection mechanisms** and **sources**;
- Some practical examples of criminal activities and their use of modern technologies;
- Show the benefits of developing open source tools to monitor web pages, pastes, forums and hidden services;
- Quick introduction to the open source AIL project;

Introduction

Concepts - Deep Web

- **Deep Web** is the part of World Wide Web not indexed or directly accessible by standard web search-engines;
- This can be content hidden from **crawlers** by requiring a specific access and this can includes private social media, password-protected forums or content protected by different measures such as paywalls or specific security interface to access the information;
- A large portion of content accessible via Internet is part of the deep web[3].

[3] also called invisible web, hidden web or non-indexed web

Concepts - darknet

- **Darknet** is an overlay network running on top of Internet requiring specific software to access the network and its services;
- Tor, I2P and Freenet are the most commonly used ones. Many are used for hidden services access and some for proxy access to the Internet;
- There are **legitimate use-cases** for such network but also many **illegal or criminal usage**.

Collection and Sources

- Collection (mainly OSINT[4] or covert/clandestine sources) is the act of gathering manually or automatically data from different sources;
- **Determining and maintaining the sources**:
  - Hidden services (on Tor) such as forums, market places, chatrooms, public site[5]...
  - Social network (e.g. Twitter) from Twitter[6] to Instagram.
  - Chat and discussion forum from Discord, Telegram[7] and private hidden one on Tor or other overlay networks.
  - News and security reports[8].

[4] public or open source sources

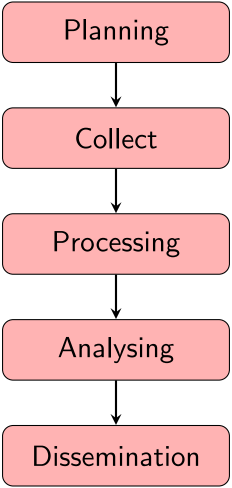
[5] `https://github.com/ail-project/ail-splash-manager`

[6] `https://github.com/ail-project/ail-feeder-twitter`

[7] `https://github.com/ail-project/ail-feeder-telegram`

[8] `https://github.com/ail-project/ail-feeder-atom-rss`

Lifecycle of collection and analysis


Planning

Collect

Processing

Analysing

Dissemination

Collecting, processing and analysing content - web pages

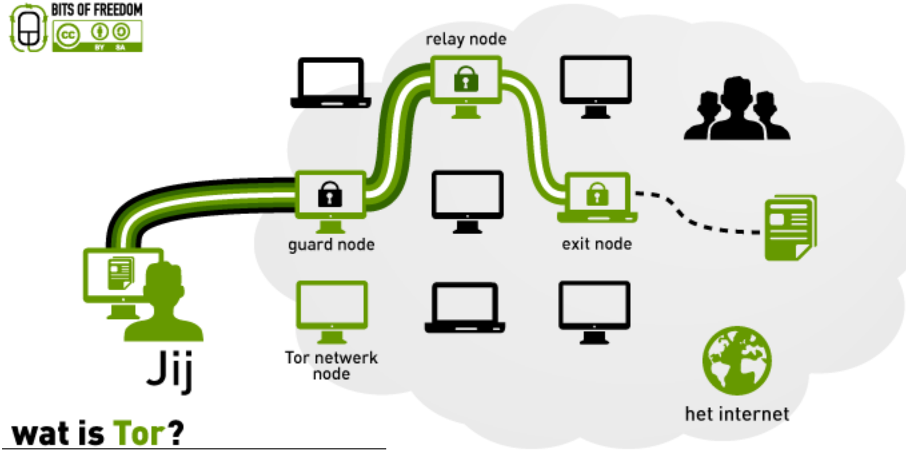
- Building a search engine on the web is a challenging task because:
  - it has to crawl webpages,
  - it has to to make sense of **unstructured data**,
  - it has to **index** these data,
  - it has to provide a way to retrieve data and structure data (e.g. correlation).
- Doing so on Tor is even more challenging because:
  - services don't always want to be found,
  - parts of the dataset have to be discarded.
- in each case, it requires a lot of bandwidth, storage and computing power.

Demo of analysed content

Tor - a detailed overview of an overlay network

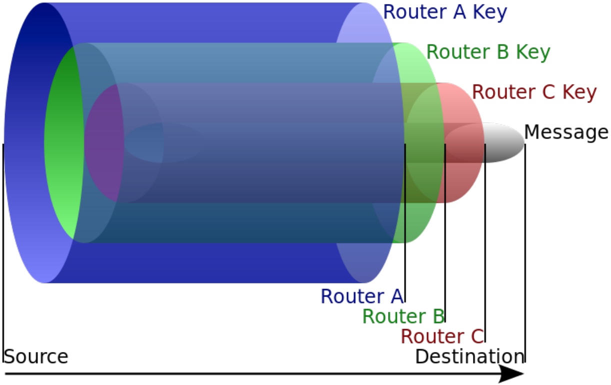
Concepts - tor[9]

- tor makes use of **onion routing** to obfuscate user identify,



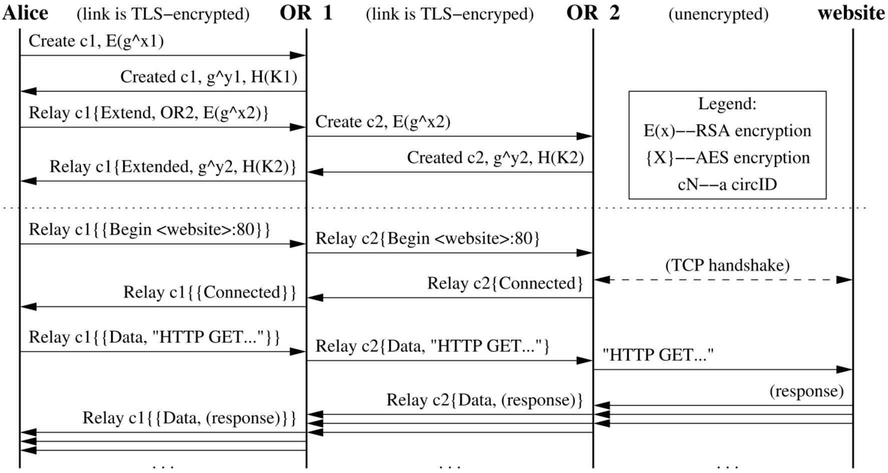
[9] license: Bits of Freedom CC BY-SA 3.0

Concepts - tor[10]



[10] license: Harrison Neal CC BY-SA 3.0

Concepts - tor[11]



[11] license: Roger Dingledine, Nick Mathewson, Paul Syverson CC BY 3.0

Concepts - tor

- tor provide hidden services: addresses in **.onion**,
- one can only reach such service when one knows its address,
- hidden services' information are stored in a **Distributed Hash Table**,
- these are really interesting for attackers as:
  - these are anonymous,
  - these can be provided through NATs,
  - these can be moved easily.