

An Exploration into the Dark Web

Chin Wei Xyan

School of Computing,
Asia Pacific University of Technology
and Innovation (APU)
Kuala Lumpur, Malaysia
weixyan17@gmail.com

Justin Lim Zhi Wei

School of Computing,
Asia Pacific University of Technology
and Innovation (APU)
Kuala Lumpur, Malaysia
justinlim1999@yahoo.com

Julia Juremi

School of Computing,
Asia Pacific University of Technology
and Innovation (APU)
Kuala Lumpur, Malaysia
julia.juremi@staffemail.apu.edu.my

Abstract— This document introduces the concept World Wide Web and its three layers known as the Surface Web, the Deep Web and the Dark Web. Since this paper is entitled: *An Exploration into the Dark Web, the concepts and the way the Dark Web works are closely examined. The features of the Dark Web are presented with its advantages and disadvantages in the society. The usage of the Dark Web is explained through the methods of surfing and the undergoing activities that occur.*

Keywords—World Wide Web, Surface Web, Deep Web, Dark Web, TOR, The Hidden Wiki, Duck Duck Go, Not Evil, Onion Routing, anonymity, cybercrime

I. INTRODUCTION

The World Wide Web (WWW), or in another common term the Web, is an information system in which Uniform Resource Locators (URLs) are used for identifying web resources such as documents, videos and pictures (Tobin, 2012). These URLs (such as <https://www.google.com/>) can be accessed over the Internet, and they are sometimes interlinked by hypertext, a display of texts that refers to other information that can be accessed immediately (TechTerms, n.d.). To access the web resources, a software application known as a web browser is used to access the web resources, whereas a web server is used for the publication of web resources. All of these include the transfer of web resources through the Hypertext Transfer Protocol (HTTP), which is the base for the communication of data in the World Wide Web.

II. LAYERS OF WORLD WIDE WEB

The World Wide Web is a made up of three layers, namely the Surface Web, the Deep Web and the Dark Web. The layers of the Word Wide Web can be represented with an iceberg (as shown in the Figure 1 below) where the Surface Web represents the tip of the iceberg, the Deep Web as the remaining part of the iceberg that is submerged in the water, and the Dark Web as the deepest and the bottommost part of the iceberg.

A. Surface Web

The Surface Web (known as Indexed Web, Indexable Web, Wide Web, Visible Web or Lightnet) is the part of the web that are publicly searchable using standard Internet browsers such as Microsoft Edge, Mozilla Firefox and Google Chrome (CISO Platform, 2019). Generally, web users use the Surface Web to read news online, purchase goods and services on the online platforms (such as Amazon and eBay) and visit

any of the websites available (such as blogs). The Surface Web only covers 10% of the World Wide Web (PinkHatTech, 2017). This portion of the web is indexed by web search engines that carry out web search, and it is constantly being monitored by the government across the world.

B. Deep Web

The Deep Web, also known as invisible web and hidden web, is the portion of the web whereby the search engine indexing is not done on its web contents, which means that it only contains non-indexed contents. As opposed to the Surface Web, the web resources in the Deep Web are hidden behind the HTTP forms.

The Deep Web is used for accessing web mail, restricted medical records, private or restricted social-media profiles and pages, performing online banking and viewing some websites, online newspapers and magazines where user registration, payment or subscription is required for viewing the contents. Direct URLs or Internet Protocol (IP) addresses (such as 8.8.4.4) are used to locate and access the resources in the Deep Web; however, a password or other security log-in will be required for accessing the content of the Deep Web.

C. Dark Web

The Dark Web is the subset of the Deep Web that is intentionally kept hidden and inaccessible to the public web browsers (Quinney, 2016). It exists behind multiple encryption layers in the darknets, in which specific authorization, configurations, or software are required for access this portion of the web. The Dark Web consists of a small part of the relatively bigger Deep Web. Similarly, the contents of the Dark Web are unindexed, and additionally layered with encryptions.



Fig. 1. The diagrammatic representation of the Surface Web, Deep Web and Dark Web (Sciuto, 2020)

III. OVERVIEW OF DARK WEB

A. Features of the Dark Web

The Dark Web contains Darknet forums, marketplaces, services and websites that are accessible through a peer-to-peer, overlay networks that incorporate methods of anonymization and sophisticated encryption technologies. Users, who intend to access the Dark Web, are required to implement specific technology or to know an insider.

The Dark Web has its own search engine called *The Hidden Wiki* where the links to actual dark web resources are provided. It needs to be accessed via special browsers (which will later be discussed). This part of the web is frequently associated with illegitimate businesses and contents. However, not all the websites and marketplaces found in the Dark Web are illegal, as there are some legal websites whose sources such as whistleblowing leaks are only available through the Dark Web browsers.

B. Advantages

- Maintains privacy of users as the anonymization methods are implemented in the Dark Web (Bloomenthal, 2020).
- Enables the freedom of speech because the activities in the Dark Web are difficult to be tracked.
- Provides a private channel for the communication of undercover police as it provides a good amount of anonymity to the users

C. Disadvantages

- Provides platforms for the criminals to commit crimes such as human trafficking and hiring assassins.
- Contains illegal marketplaces for the selling and purchasing of illegal items such as certain drugs and ammunition.
- There are risks of users being vulnerable to becoming victims of hacking when surfing the Dark Web
- Contains explicit and illegal information such as pornography that are not safe for children.

IV. SURFING THE DARK WEB

A. The TOR Browser

The TOR browser is a web browser for the use of surfing the Deep and Dark Web. The main difference from TOR when comparing to other existing web browsers is the continuous usage of onion routing (as shown in Figure 2). In simple terms, onion routing routes the request of the user's webpage through multiple proxy servers that are operated by volunteers around the globe.

There are thousands of volunteers that are willing to make this possible, resulting in the user's IP address being rendered as unidentifiable and untraceable (Guccione, 2020).

However, this means that when browsing through the Dark Web, its processes are painfully slow. Browsing through social media, loading videos and even images will take a lot longer than using the Clearnet.

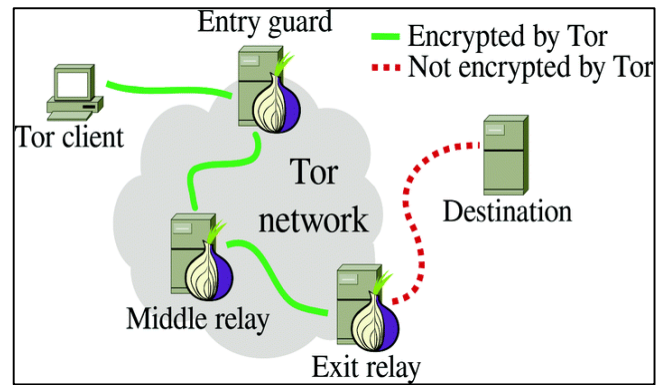


Fig. 2. The diagrammatic representation of Onion Routing through TOR Browser (Nedelitcheva, Vila and Marinova, 2019)

B. Dark Web Search Engines

Since the Dark Web requires the usage of “.onion”, which is considered as a top-level domain, search engines such as Google Chrome and Microsoft Edge would not work. Hence, special search engines are required to browse the Dark Web as they will display “.onion” links. These search engines tend to prioritize anonymity as well, not collecting any personal information while using it (Marks, 2020).

1) Duck Duck Go



Fig. 3. The diagrammatic representation of Duck Duck Go.

DuckDuckGo is widely used as a search engine in the Dark Web. It displays both Clearnet and onion URLs. It emphasizes on the searchers' privacy, avoiding filter bubble of personalized search results.

2) The Hidden Wiki

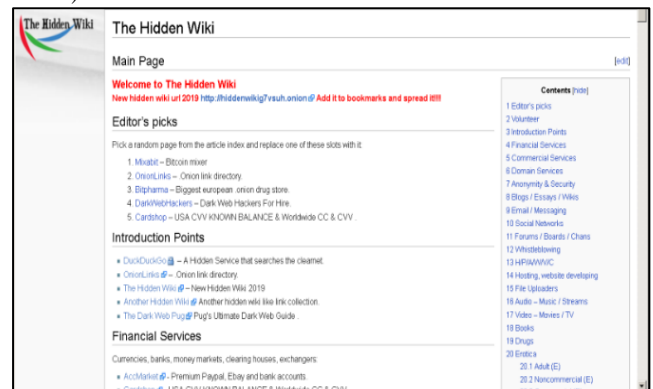


Fig. 4. The diagrammatic representation of the Hidden Wiki

The Hidden Wiki is the Wikipedia of the Dark Web. It consists of a wide collection of links based on categories and explains in detail on terminologies. It is also widely used as a form of link directories for users. Similar to Wikipedia, it is a community-based, hence anyone, who has registered, can edit it.

3) *not Evil*

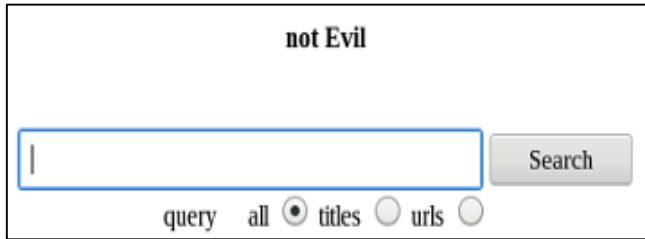


Fig. 5. The diagrammatic representation of the not Evil

Unlike Duck Duck Go, not Evil is a search engine used only in the Dark Web and only displays onion URLs. No Clearnet results are displayed here, hence it is notoriously used as method of browsing illicit content.

V. ACTIVITIES OF THE DARK WEB

A. *Criminal Activities in the Dark Web*

The dark web is notorious for its criminal activities. A study done by Moore and Rid in 2016 showed that out of 5,205 live websites, 2723 of them contain illicit contents, which is a shocking percentage of 52%. Hence it is without a doubt that in today's era, these numbers have not shifted downwards as there still has not been any movement to take down these websites. Illicit contents such as contents that are related to drugs, hitman for hire, hackers for hire and even illegal pornography can be found with a click of a button.

TABLE I. THE DIAGRAMMATIC REPRESENTATION OF THE ANNUAL REVENUES OF CYBERCRIME IN 2018 (DR. MCGUIRE, 2018).

Crime	Annual Revenues*
Illicit, illegal online markets	\$860 billion
Trade secret, IP theft	\$500 billion
Data trading**	\$160 billion
Crimeware/CaaS (Cybercrime-as-a-Service)	\$1.6 billion
Ransomware***	\$1 billion
Total Generated by Cybercrime	\$1.5 trillion

The reasons behind this is due to the overwhelming market behind it. As shown in Table 1, cybercrime revenues are said to have reached 1.5 trillion dollars in 2018. It is said that dark web listings that could bring potential harm to enterprises have also risen by 20% since 2016 (Guccione, 2020). This brings us to believe that the entire economy of a country could shift solely from the illicit activities that are done

through the Dark Web. Not only that, Dark Web is also a platform for social interaction.

B. *Social Interaction in the Dark Web*

There are multiple ways of communicating and connecting with other anonymous users in the Dark Web. It is advised that users take precautions when interacting with others in the dark web as their intentions may not be ethical.

1) *Group Chat*

Group chats such as Random Chat are used to connect with random users of the Dark Web. The users may opt for a one-on-one chat or to be part of a random group chat of strangers.

2) *Forums*

Much like the Clearnet, forums in the Dark Web are categorized based on topics. Darkway is an example of a forum that is used widely in the Dark Web. It focuses on Dark-Web issues such as dramas, arrests, and the Dark Web market.

3) *E-mails*

The Dark Web has its own separate e-mail providers. This is to maintain the anonymous use in the Dark Web. E-mail providers such as Protonmail and Torbox are widely used as a method of registering accounts in the Dark Web.

ACKNOWLEDGMENT

We, Chin Wei Xyan and Justin Lim Zhi Wei, would like to extend our thanks to our *Advanced Cyber Security* lecturer, Dr Julia binti Juremi for giving us the opportunity to write this paper. She has also guided us in the concepts of the Dark Web which inspired us to produce this documentation about the Dark Web. Not only that, she has introduced the university publication platform to us which allowed us to plan on writing this paper to be published.

REFERENCES

- [1] A. Bloomenthal, (2020) *Dark Web* [Online]. Available from: <https://www.investopedia.com/terms/d/dark-web.asp#:~:text=Using%20the%20dark%20web%20often,to%20keep%20medical%20conditions%20private>. [Accessed: 5th July 2020]
- [2] CISO Platform (2019) *Understanding Surface Web, Dark Web, Deep Web and Darknet*. [Online]. Available from: <https://www.cisoplatform.com/profiles/blogs/understanding-surface-web-dark-web-deep-web-and-darknet> [Accessed: 5th July 2020]
- [3] Dr. McGuire, M. (2018) *Into the Web of Profit* [Online]. London, UK: Bromium, Inc. Available from: https://www.bromium.com/wp-content/uploads/2018/05/Into-the-Web-of-Profit_Bromium.pdf [Accessed: 6th July 2020]
- [4] Guccione, D. (2020) *What is the dark web? How to access it and what you'll find* [Online]. Available from: <https://www.csoonline.com/article/3249765/what-is-the-dark-web-how-to-access-it-and-what-youll-find.html> [Accessed: 6th July 2020]
- [5] Marks, T. (2020) *Websites on the Dark Web Worth Visiting* [Online]. Available from: <https://vpnoverview.com/privacy/anonymous-browsing/dark-web-websites-worth-visiting/> [Accessed: 6th July 2020]
- [6] Moore, D. and Rid, T. (2016) *Cryptopolitik and the Darknet. Survival: Global Politics and Strategy*. [Online]. 58 (1). pp. 7-38. Available from:

- <https://www.tandfonline.com/doi/full/10.1080/00396338.2016.1142085> [Accessed: 6th July 2020]
- [7] PinkHatTech (2017) *What is the difference between the Surface Web, The Deep Web and the Dark Web?* [Online]. Available from: <https://www.pinkhattech.com/2017/12/04/what-is-the-difference-between-the-surface-web-the-deep-web-and-the-dark-web/> [Accessed: 5th July 2020]
- [8] Quinney, A. (2016) *Surface web vs deep web vs dark web* [Online]. Available from: <https://www.servicecare.org.uk/news/surface-web-vs-deep-web-vs-dark-web-61792715468#> [Accessed: 5th July 2020]
- [9] Scuito, A. (2020) *The dark web* [Online]. Available from: <https://www.idareact.org/the-dark-web/> [Accessed: 5th July 2020]
- [10] TechTerms (n.d.) *Hypertext*. [Online]. Available from: <https://techterms.com/definition/hypertext> [Accessed: 5th July 2020]
- [11] Tobin, J. (2012) *Great Projects: The Epic Story of the Building of America, from the Taming of the Mississippi to the Invention of the Internet*. New York: Simon and Schuster.