Homework 2 - A Study on Privacy-centered Web Browsers

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***Abstract*—This paper is a summary of 2 privacy-centered web browsers, which are Tor and Brave. In addition, this paper also includes a comparison of the privacy preserving features of these browsers.**

I. Privacy-Centered Browsers

A. Tor

Built on the Firefox platform, the Tor Browser is a privacy-focused web browser designed to enhance user anonymity on the web. My motivation for choosing this browser is that it provides a secure and private browsing experience by routing all the internet traffic through its Tor network. This network is a series of nodes that are run by volunteers, which makes it difficult to track the activities of the users. These nodes encrypt and anonymize the traffic by pushing user data through multiple relays, making it very challenging for anyone to track a person's internet activity. This browser includes a variety of features such as a built-in ad blocker, HTTPS Everywhere, NoScript integration or script control, and regular updates to enhance the security of the browser [1]. All in all, this browser ois prefect for people seeking a secure online privacy, especially in places where anonymity is a concern.

B. Brave

Built on the Chromium platform, the Brave Browser is a privacy-focused web browser that stands out ofr its robust ad and tracker blocking features. My motivation for choosing this browser is its utilization of "shields" to reduce users' exposure to online tracking, which enhances overall privacy. This browser gives the users the power to control their privacy settings, which enables them to block scripts, fingerprinting, and other tracking methods. With the automatic enforcement of HTTPS and the option to use the Tor network, this browser is versatile and can be used by anyone seeking a secure and private browsing experience. Its unique Basic Attention Token (BAT) system also allows users to opt in to view ads and earn tokens, which is a great incentive for people to use this browser [2]. Respecting advertising and earning tokens for viewing ads is an unique feature that makes this browser stand out from the rest.

II. Privacy-Preserving Features

A. Tor's Privacy-Preserving Features

Tor's privacy-preserving features include the following [3]:

- **Tor Network:** The Tor network is a series of nodes that are run by volunteers, which makes it difficult to track the activities of the users. These nodes encrypt and anonymize the traffic by pushing user data through multiple relays, making it very challenging for anyone to track a person's internet activity. In fact, Tor is short for "The Onion Router", which refers to the layers of encryption that are used to anonymize the traffic.
- **HTTPS Everywhere:** This feature ensures that the user's connection to the website is secure by encrypting the traffic. This is especially useful when the user is browsing on a public network.
- **NoScript Integration:** This feature allows the user to control the scripts that are allowed to run on the browser. This is useful for blocking malicious scripts that can be used to track the user's activity.
- **Regular Updates:** This feature ensures that the browser is up-to-date with the latest security patches, which enhances the security of the browser.
- **Built-in Ad Blocker:** This feature blocks ads and trackers, which enhances the user's privacy. This is especially useful for blocking malicious ads that can be used to track the user's activity.
- **Tor Circuit:** This feature allows the user to view the relays that are used to anonymize the traffic. This is useful for understanding how the Tor network works.

B. Brave's Privacy-Preserving Features

Brave's privacy-preserving features include the following [4]:

- **Shields:** This feature allows the user to control their privacy settings, which enables them to block scripts, fingerprinting, and other tracking methods. This is useful for blocking malicious scripts that can be used to track the user's activity.
- **Tor Network:** This feature allows the user to use the Tor network to enhance their privacy. This is useful for people seeking a secure and private browsing experience.
- **Automatic HTTPS Enforcement:** This feature makes sure that the user's connection to the website is secure by encrypting the traffic.

TABLE I
COMPARISON OF PRIVACY-PRESERVING FEATURES

Feature	Tor Browser	Brave Browser
Tor Network	✓	Limited
HTTPS Everywhere	✓	✓
NoScript Integration	✓	✓
Regular Updates	✓	✓
Built-in Ad Blocker	✓	✓
Tor Circuit	✓	✓
Deep Anonymity	✓	
Decentralized Relays	✓	
Government Censorship Resistance	✓	
Shields		✓
Automatic HTTPS Enforcement		✓
Brave Rewards		✓
Brave Search		✓
Brave Today		✓
Brave Firewall + VPN		✓

- **Regular Updates:** Enhances the security of the browser by ensuring that the browser is up-to-date with the latest security patches.
- **Built-in Ad Blocker:** This feature blocks ads and trackers, which enhances the user's privacy. This is especially useful for blocking malicious ads that can be used to track the user's activity.
- **Brave Rewards:** This feature allows the user to opt in to view ads and earn tokens, which is a great incentive for people to use this browser. Respecting advertising and earning tokens for viewing ads is an unique feature that makes this browser stand out from the rest.
- **Brave Search:** This feature allows the user to use the Brave search engine, which is a privacy-preserving search engine that does not track the user's activity. This is useful for people seeking a secure and private browsing experience.
- **Brave Today:** This feature allows the user to view the latest news, which enables users to stay up-to-date with the latest news. This is great for people who want to stay informed about privacy-related news.
- **Brave Firewall + VPN:** This feature allows the user to use the Brave Firewall + VPN, which is a privacy-preserving VPN that does **not** track the user's activity.

III. USER EXPERIENCE

A. Tor's User Experience

Tor's user experience is very similar to that of Firefox, which makes it easy for people to use this browser. The installation of this browser is a very straightforward process and upon opening the browser, the user is greeted with a config wizard that guides users through the setup process. There is a familiar Firefox interface such as the URL bar, bookmarks, and navigation tabs [5]. The default search engine is DuckDuckGo, which is a privacy-preserving search engine that does not track the user's activity. When the browser is launched, the user is connected to the Tor network and this process is very transparent to the user. Browsing speed can sometimes be slow due to the multiple relays that are used to anonymize the traffic. There is still a private browsing mode that allows the user to browse the web without saving any history.

From my own experience, the browser felt very slow and unresponsive at times, and also the user interface was not very appealing. However, the privacy features it offers are very useful. As I am a Safari user, this browser felt very "heavy" as it comes with a lot of features that bloat software. However, this browser is perfect for people seeking a secure and private browsing experience.

B. Brave's User Experience

Installation of the Brave browser is done through its official website and it is available for major operating systems such as Windows, macOS, Linux, Android, and iOS. This setup process is also very straightforward and additionally users can import their bookmarks, history, and passwords from other browsers such as Chrome, Firefox, and Edge. The interface is very similar to that of Chrome, which makes it easy for people to use this browser. There is an "omnibox" that allows the user to search the web or enter a URL. Brave Shields is available from the address bar and it allows users to access the privacy-preserving features of the browser. Since this browser is built on the Chromium platform, it is very fast and responsive [6], and it also supports Chrome extensions. There is also a private browsing mode that allows the user to browse the web without saving any history.

From my own experience, this browser was much faster and more responsive than Tor. Overall, the user interface was very appealing and it felt more polished than Tor. However, it can be confusing to find the privacy-preserving features of the browser as they are hidden in the address bar. This

TABLE II
COMPARISON OF USER EXPERIENCE

Feature	Tor Browser	Brave Browser
Installation	Straightforward	Straightforward
Setup	Straightforward	Straightforward
Interface	Firefox	Chrome
Responsiveness	Slow	Fast
Search Engine	DuckDuckGo	Default
Private Browsing Mode	✓	✓
UI	Unpolished	Polished
Accessability to Privacy Features	Easy	Medium

browser seemed more user friendly than Tor, as there was more emphasis on the user interface.

IV. CONCLUSION

From this homework study, I learned about the privacy-preserving features of Tor and Brave. I also learned about the user experience of these browsers and how they compare to each other. Overall, I think that both of these browsers are great for people seeking a secure and private browsing experience. However, I think that Brave is more user friendly than Tor, as it has a more polished user interface. Utility-wise I think that Tor is better than Brave, as it has better privacy-preserving features such as the Tor network. In conclusion, I think that both of these browsers are great for people seeking a secure and private browsing experience, and it is up to the user to decide which browser is better for them.

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