Summary

Tor Browser (desktop and mobile) is an easy-to-use browser that routes traffic through the Tor network and occupies a unique position the privacy ecosystem. No other browser offers the end-to-end anonymization, security, censorship circumvention, tracking prevention, and privacy features provided in Tor Browser.

Because Tor Browser is built on Mozilla Firefox, when new Firefox ESRs (Extended Support Releases) are released, the Tor Browser team must evaluate changes to Firefox, weigh their privacy and anonymity implications, and modify or disable features that may compromise our users.

Thanks to DIAL OSC and funds from this grant, we were able to pay for some Project Manager time to manage this ESR transition project as well as partly cover the costs of a Tor Browser developer to work on this project. Typically this kind of “dirty job” is covered by general operating funds, and we are very grateful for DIAL OSC’s Catalytic Grants and their focus on supporting work that is traditionally neglected by other funders in this space.

The objective of this project was to complete a successful ESR transition for Tor Browser at the same time that Mozilla released their latest stable Firefox ESR version: ESR 68.2.0, which was due on the 22nd October 2019. Tor Browser 9.0, based on ESR 68.2.0, was successfully released on that same date, ensuring that all Tor Browser users benefited from the same improvements to this latest ESR version on both desktop and mobile.

Accomplishments

We originally kicked off this project in late June 2019 by starting the process of rebasing updater patches. This is a continuous effort which happens throughout the project to ensure any changes that Mozilla makes to the Firefox updater are also included in the Tor Browser updater.

In July, the whole team met in person during Tor Project’s summer development meeting, one of two bi-annual meetings for our organization, in Stockholm, Sweden. This was a good opportunity to organise the required work to successfully complete the transition, assign tasks to different team members, and build our roadmap and work plan for the following months.

In August, the team started ensuring the toolchains were working for all platforms (Android, Linux, macOS and Windows). These toolchains change from one Firefox ESR version to the next, and during every ESR transition, we need to make sure that we are still able to build Tor Browser on all platforms with these new toolchains. Additionally, in order to ensure identical results every time Tor Browser is built, we need to ensure that others can reproduce our builds. This is very important to allow verification that no vulnerabilities or backdoors have been introduced during the Browser build process.

In September 2019, we released our first alpha release based on Firefox ESR68, Tor Browser 9.0a6. As such, this release contained several important changes, including the rebasing of our Firefox patches and toolchain updates. We also undertook the important and time consuming task of reviewing all new code introduced in Firefox ESR68. This review includes reviewing any new features, bugs fixed by Mozilla and any code relating to network activity initiated or allowed.

1 https://reproducible-builds.org
2 https://blog.torproject.org/new-release-tor-browser-90a6
by Firefox ESR68 to ensure that the anonymity and privacy of our users is not compromised by any changes in the new ESR.

October 2019 was a busy month for releases: we pushed both the second³ and third⁴ alpha releases based on Firefox ESR68, and then our first stable release, Tor Browser 9.0,⁵ on the 22nd October.

For the remainder of our project we will continue investigating issues related to build reproducibility as, although we are able to get two matching builds, sometimes our builds are not identical. We will also continue rebasing patches from the ESR68 series.

Challenges

One challenge we experienced in this project is creating reproducible builds during the September alpha release. With this initial build, we still had not achieved build reproducibility on all platforms, only macOS. It is very important⁶ for us to be able to confirm reproducible builds in order to provide secure, verifiable, byte-for-byte versions of Tor Browser. Reproducible builds demonstrate the integrity of our binaries and protect the build process from compromise.

In October, we fixed all outstanding reproducible build issues for 32bit Linux, Windows, and Android in time for our stable release. Although the release build is bit for bit reproducible and we managed to get two matching builds, we have one remaining challenge to achieve consistent reproducibility as we occasionally get builds that differ, in particular for Linux i686 and macOS bundles. We will continue to work on this issue throughout the remainder of this project.

In order to fix this issue, we will need to first reproduce non-matching builds and compare them for differences. By analyzing the differences we can deduce at which point in the build the differences are introduced and research alternative options that we can configure for the build tools in order to ensure consistent results each time. This is a highly time consuming and important job.

Tangible Results

Tor Browser alpha releases based on ESR68

- First release, September 5 2019
- Second release, October 1 2019
- Third release, October 15 2019

Tor Browser stable release based on ESR68 2.0

- First release, October 22 2019
- Second release, November 5 2019
- Third release planned for early December 2019

Added new and improved existing features

**Improved the Onboarding experience.** Now, features included in new releases include a visually engaging step-by-step walk through upon first launch of Tor Browser after an update. The intention is to better introduce users to changes from release to release. Tor Browser has ³https://blog.torproject.org/new-release-tor-browser-90a7 ⁴https://blog.torproject.org/new-release-tor-browser-90a8 ⁵https://blog.torproject.org/new-release-tor-browser-90 ⁶https://reproducible-builds.org
unique UI as compared to other browsers, including Firefox, and it is important to notify users about new features in a simple, easy-to-follow manner.

**Tor Browser 9.0 Onboarding experience**

*Integrated Torbutton directly into Tor Browser.* Torbutton is a feature that started as a browser extension almost a decade ago and has had a long history alongside Tor Browser. As part of this ESR68 transition, we migrated the functions provided within Torbutton into their own distinct features in Tor Browser:

- Moved Tor settings into its own section within the browser preferences.
- Moved New Identity to the browser toolbar.
- Moved New Circuit to the url bar and hamburger menu.
*Updated Tor Launcher.* Tor Launcher visualizes Tor Browser’s progress in connecting to the Tor network upon the browser’s launch. We updated it to be compatible with ESR68.

*Integrated Tor bridge settings into the Firefox preference menu.* Users who live in places where Tor is censored can use bridges to circumvent that censorship and connect to the network. In our user feedback collection, users have often expressed confusion about how and where to access bridge settings. This update is meant to help censored users more easily configure bridges and connect to Tor.
Implemented Letterboxing. To prevent fingerprinting the screen dimensions when users maximise their Browser window, Tor Browser 9 ships with a fingerprinting defense called Letterboxing, a technique developed by Mozilla and presented earlier this year. This feature works by adding white margins to a browser window so that the window is as close as possible to the desired size whilst grouping users in a number of screen size buckets that prevent them from being singled out from their screen dimensions.

Additional Reports and Materials

You can find an additional report of our Tor Browser 9.0 release on our blog: https://blog.torproject.org/new-release-tor-browser-90