Product Vision: Trust Display

■-■-■- BlockchainBoys -■-■-■–

May 11, 2017

Table 1: Because this document is publicly available, the student numbers are not specified.

Student Name	**NetID**
Yinghao Dai	yinghaodai
Max van Deursen	mvandeursen
Geert Habben Janssen	ghabbenjansen
Bram van den Heuvel	bramvandenheuv
Ruben Keulemans	rkeulemans
Tim Speelman	tspeelman1

Abstract

We describe our vision of a new product, a Trust Display embedded in Tribler, which helps understand the Tribler network and its policies. Users who contribute to the network, by means of uploading, are considered to be trustworthy. The main purpose of the product is making the complex Tribler network insightful for the average user. As a consequence, users understand how their actions influence the network and may possibly change their behaviour. The Trust Display is an interactive network visualization which displays the nodes in the network and the interactions between them over time. Various new and existing visual cues are combined to make a comprehensible visualization of the network. We test our product iteratively and verify its effectiveness through extensive user testing.

Contents

1 Introduction

1.1 Tribler and Blockchain trust

Tribler (Pouwelse, 2008) is an open-source BitTorrent client for anonymous peer-to-peer file sharing. It is fully decentralized, protecting its users against censorship, lawyer based attacks and government control. Like many decentralized systems, it suffers from a problem known as the Tragedy of the Commons. As described by Hardin (1968), individual users of a shared unregulated resource may act only in their self-interest, posing a threat to the existence of the resource. In the context of file sharing, the resource is kept alive by users uploading their files. Users who do not contribute are called free-riders. In order to protect the resource, systems must find a way to identify them and deny service.

Since Tribler users are anonymous and creating a new identity is virtually free, identifying free-riders is more difficult. Tribler uses MultiChain (Norberhuis, 2015) to capture interactions between users. This establishes the notion of reputation of a peer in the network. Although users cannot directly tamper with these interactions, it is susceptible to Sybil attacks. In this attack a user creates a set of fake identities, and fakes transactions between them, to improve his own reputation. In an attempt to detect these attacks, Otte (2016) has implemented the algorithms Net-Flow and Temporal PageRank into Tribler. Based on the aforementioned technologies, the Tribler software determines a trust level of peers. A peer is considered trustworthy if it has contributed sufficiently. Based on this trust level the software grants or denies service to the peer.

1.2 Trust Display

As most of the Tribler users are unaware of these technologies, they may not understand why their service is being (partially) denied. This may leave them frustrated, and abandon the software instead of improving their contribution to the network.

This gap between the Tribler software and the person using it must be bridged. To this end we develop a Trust Display that shows users exactly what is going on around them, what their reputation is, how that came to be and how they can improve it.

Tribler is an active research project and the trust policy is not yet fully functioning. Nevertheless, we build our product on the assumption this works, in order to be future proof.

1.3 Time frame and budget

The time frame in which the final product (including all documentation) must be delivered is 8 weeks. There are 6 team members each delivering 10 ECTS (Onderwijs en Studentzaken, 2017). The total budget can be calculated as follows: 6 * 10 * 28 = 1680 hours.

1.4 Document structure

In this document we establish our vision of the Trust Display. In section 2 we take a thorough look at project, process and product related stakeholders to fully understand their investment. We then introduce three groups of target customers and their background in section 3 and further elaborate on their individual needs in section 4. When stakeholders, target customers and their needs are fully understood, we answer their needs in section 5. In section 6 we conclude by comparing the now established vision to existing solutions and show how our product adds significant value to the Tribler project.

2 Stakeholder Analysis

There are two main stakeholders in this project. They represent opposing forces. The Product Owner wants to have as much features implemented as possible and the Scrum Master is interested in high quality- and tested code only. The stakeholders are described in detail below:

2.1 Project and Process related stakeholders

This category of stakeholders is interested in good progress of the project resulting in a suitable final product. To accomplish this the they assist the development team.

- Martijn Gribnau is the Software Engineering Teaching Assistant. He is the Scrum Master of the team. His responsibility is helping the team members deliver high quality code and adjusting the developing process where needed. Together with Stefan he meets the team once a week.
- The developer team consists of six second-year students of the Computer Science Bachelor at the TU Delft. Their main interests are learning how to run and successfully complete a software project, furthermore they learn about Blockchain technology. In addition they hope to pass the course.

2.2 Product related stakeholders

This stakeholders are involved with the final product only. They are interested in the different aspects of the delivered product.

- Dr. J. Pouwelse is associate professor at the faculty of Electrical Engineering, Mathematics and Computer Science at the Delft University of Technology. He is has founded the Tribler project in 2001[1] and has since coordinated its development. Our product helps explaining Dr. Pouwelse's cause to the end-users, which results in a larger and more understanding user base.
- Stefan Hugtenburg is the Context Teaching Assistant. He is the representative of Dr. Pouwelse and must make sure his interests are satisfied. Therefore he has the role of Product Owner. He meets with the developer team on a weekly basis. In reporting to Pouwelse he benefits from clear documentation provided by the team.
- Martijn de Vos is responsible for the Tribler codebase. He monitors the quality (i.e. documentation, complexity, testability) of submitted code. To merge our product into the Tribler repository at the end of the project his needs must be taken into account.
- The Tribler team[2] is responsible for the development of Tribler product. They have a clear vision about the future of their software and the features within. The final product must be a representative part of this vision so it can satisfactorily be merged into Tribler.
- Tribler users are using this software for various reasons including anonymous and therefore censorship free data transmission, built-in search for torrents, live streaming content before it finishes downloading and more. They want a coherent, working program and consider stopping usage otherwise, thereby losing their stake in the network. New features adding value for them are desired.

[1] Retrieved May 11, 2017, from `https://www.tribler.org/about.html`
[2] Retrieved May 11, 2017, from `https://www.tribler.org/TriblerTeam/`

3 Target customers

Since the product is an extension of Tribler, its users are existing Tribler users. Our goal is to offer existing users a new feature that enhances their Tribler experience. By adding value to the Tribler project it may attract new users, but this is not our main focus. The target customers are:

- Existing Tribler users are affected by the trust mechanism, which is currently under development by the Tribler team. Their own reputation affects their download speed and their upload is only shared with trusted peers. This is a healthy thing for the overall system but may have a negative impact on the user experience. These users would benefit from a means of learning about the current status of their reputation, the causes for this and what they can do about it.
- Researchers. This group is interested in investigating the Tribler network. Research can be done at various network aspects, e.g. how user actions influence the actions of other users, the influence of policies such as (Capota et all., 2013) etc.
- Potential Tribler users. They are new to the concept of anonymous downloading of Torrents and use e.g. BitTorrent (www.bittorrent.com) at this time. Their interest can be raised by explaining the concept of the Tribler network and its advantages and disadvantages.

4 Customer needs

The different groups of target customers have both shared and specific needs. The main shared need is getting insight in the mechanism and structure of the network. Specific needs for every target customer group are layed out below.

Existing Tribler users

Current users need to understand how they obtained their current reputation and how this reputation affects their download speed. Moreover, they need to understand how to improve this reputation. Users only contribute to the network once it is in their short-term interest (Hardin, 1968).

This understanding is furthered by allowing these users to gain insight into the network of their peers. This is done by showing, for example, the calculated reputation of a node in the network, relations between nodes. The users are then able to compare these different reputations. Communities of users can be identified by showing clusters and their aggregate reputation in the network. This shows that free-riding leads to isolation. Showing changes over time helps the users recognise the cause and affect underlying their reputation and thereby their download speeds.

Potential Tribler users

New users can now understand that Tribler offers fairness in online downloading where other products don't, and how Tribler achieves this. This may in turn lead to an increased popularity of Tribler.

Researchers

Researchers can explore the network using visual tools. These visual tools provide insight into the network and allow comparison between different policies and their effects. The network structure can be explored its quality understood by detecting clusters and free-riders.

5 Product attributes

It is clear that a visualization of the Tribler network is the main and most important customer need. The MoSCoW method (Clegg, 1994) is used to prioritize the product attributes originating from the customer needs.

Must have

- users gain insight into the trust-mechanism through a visualization of the network, which includes:
  - a graph in 2-dimensions representing the local network of peers.
  - a focus node, which initially represents the current.
  - the direct neighbors of focus node, representing the peers it shares data with.
  - the data exchange between nodes.
  - the overall reputation of a node.
  - regular (10 min.) updating of the data.
  - interactive exploration of the network by focusing on different nodes.
- tested with actual Tribler users to verify if their needs are fulfilled.

Should have

- visual cues that allow the user to identify clusters.
- real-time (30 sec) updating of the trust display.

Could have

- replay/history functionality to show the development of the network over time.
- cues to help the user identify free-riders.
- three-dimensional space representation of and navigation through the network to make the graph more clear in case of a large dataset.
- nodes and edges can be filtered on certain metrics.
- a user tour to explain the meaning of and interaction with the visualization.
- a playground mode with dummy data which allows the users to tweak data exchange and policy parameters to observe the effects it has on the reputation of nodes.

Won't have

- influence on the actual policy parameters e.g. credit mining.

6 Unique selling points

Our product can be considered an extension upon results expected from an ongoing research project. As Dr. Pouwelse puts it, this "has never been done before", so there are no competitors in this area. There is an existing trust window in Tribler, this window shows your uploaded versus your downloaded data per time unit. The existing trust window (figure 1) is minimal in explaining the user's reputation, using text and a single line graph of the individual history. In contrast, our solution uses a visualization of the network to explain this. This approach is not only more informing, it is also more engaging.

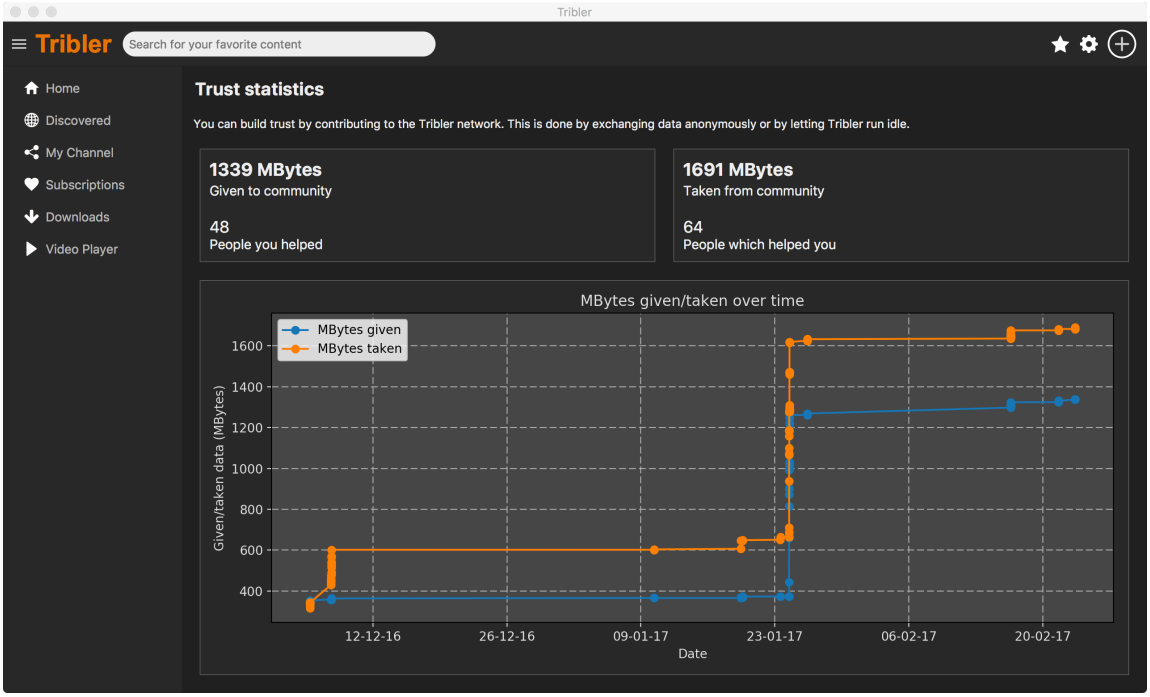

Figure 1: Existing Tribler trust window (Pouwelse, 2017)

The current textual display only shows data of the user itself, not of its neighbors. Our product shows these values for all nodes in the network. Visualizing these numbers (e.g. using color, spacing, visual ordering, line thickness, etc.) allows for easy comparison between nodes.

Furthermore, by providing interaction with this visualization users are triggered to explore and learn. To this end, Yee et al. (2001) developed the radial network layout, which preserves a user's orientation when switching focus on nodes. This work may be used as a basis for visualizing the network. To summarize the unique selling points:

- Visualization (including animation): a network graph provides a more natural representation of the network leading to better understanding and faster lookup of information.
- Interactivity: the user can learn by actively by exploring the network instead of reading text.
- Tribler growth: the above contributes to a better insight into how Tribler works, which results in more uploading, improving the resource and eventually attracting new users.

References

Onderwijs en Studentzaken. (2017). *Credits and assessment at TU Delft.* Retrieved May 11, 2017, from http://studenten.tudelft.nl/en/students/student-life/international-student-guide/academic-life-at-tu-delft/credits-and-assessment-at-tu-delft/

Lee, K. P., Fisher, D., Dhamija, R., Hearst, M. (2001). *Animated Exploration of Dynamic Graphs with Radial Layout.* INFOVIS '01 Proceedings of the IEEE Symposium on Information Visualization, 43.

Pouwelse, J. A., Garbacki, P., Wang, J., Bakker, A., Yang, J., Iosup, A., Epema, D. H. J., Reinders, M., van Steen, M. R., Sips, H. J. (2008). *Tribler: A social-based peer-to-peer system.* Concurrency and computation: Practice and experience, 20(2).

Otte, P. (2016). *Sybil-resistant trust mechanisms in distributed systems.* (Master's thesis, Delft University of Technology, Delft, The Netherlands). Retrieved May 11, 2017, from http://repository.tudelft.nl/islandora/object/uuid\%3A17adc7bd-5c82-4ad5-b1c8-a8b85b23db1f?collection=education.

Capota, M., Andrade N., Pouwelse J., Epema D. (2013). *Investment strategies for credit-based P2P communities.* 21st Euromicro International Conference on Parallel, Distributed, and Network-Based Processing.

Norberhuis, S. D. (2015). *Multichain: A cybercurrency for cooperation.* (Master's thesis, Delft University of Technology, Delft, The Netherlands). Retrieved May 11, 2017, from http://repository.tudelft.nl/islandora/object/uuid:59723e98-ae48-4fac-b258-2df99d11012c?collection=education

Clegg, D. (1994). *Fast-Track: A Rad Approach (Case Method) (1st ed.).* Harlow, United Kingdom: Addison Wesley Longman.

Hardin, G. (1968). *Tragedy of the Commons.* Science 162(3859).

Pouwelse, J. A. (2017). *Current operational implementation to show trust within a Bittorrent client with Tor-like relay protocol.* Retrieved May 11, 2017, from https://github.com/Tribler/tribler/issues/2905