Open Sourcing Proprietary Application
Case Study: KIRI Website

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Abstract—KIRI, a previously closed source project, is a web-based public transport navigation application that serves Bandung and other cities in Indonesia. It was originally made for commercial purpose, but relatively unsuccessful. Rather than shutting it down, we transformed KIRI to an open source project. In this paper we explain such process of transformation.

First, we identified technical infrastructures required by an open source project by literature review. Then, we surveyed various existing open source projects in Indonesia in terms of their completeness in technical infrastructure. Based on findings from literature review and survey, we converted KIRI into an open source project.

Finally, we checked final result of this transformation, to ensure everything worked well. There were some problems found after conversion, and had been fixed accordingly. Further research is needed to see if the open sourced KIRI can attract community participation.

Keywords—open source; Indonesia; navigation; public transport

I. INTRODUCTION

KIRI (as depicted in Error! Reference source not found.) is a website that provides navigation between two geographical points in Indonesia using public transport. It currently serves angkots (public minibuses) navigation in the city of Bandung, as well as TransJakarta and Commuterline in DKI Jakarta province. Its advantage over similar service like Google Maps or Moovit is its ability to take angkot’s characteristic of being able to let passengers board and alight at any point of the road instead of strictly at bus stops.

Fig 1. Screenshot of KIRI

Historically, KIRI started as an entrepreneurial startup project, with the hope of being able to monetarily independent as a company. It has been pitched to and won various mentoring and seed funding competitions, such as Mandiri Young Technopreneur 2012, BlackBerry Business Plan Competition 2012, and Telkom Group’s Indigo Incubator 2013. For the past three months (at the time of this paper’s writing), it has roughly 1,500 pageviews from 500 users according to Google Analytics measurement. As it was designed and built for business, source code of KIRI consequently must be protected and remained closed source.

Despite stable user base and promising future (just like any other startups), KIRI was unsuccessful in terms of making money. We argue that most of public transport users in Indonesia have low or medium income, and paying for such service is too much for them. Hence, we decided to convert KIRI project into an open source software that has the following impacts to this project:

- opens up donation based funding, rather than commercial
- allow publications of KIRI’s internal algorithms
- its assets must be modified such that it meets general open source software requirements and best practices
II. LITERATURE REVIEW

According to [4], open source projects are typically built on top by the following technical infrastructure:

- Website that is customized for those who want to participate in the project (as opposed to website for those who want to use the output of the project).
- Mailing Lists / Message Forum (usually not present for small projects, and can be replaced with email feature of a bug tracker system).
- Version Control to monitor and control changes of project files, including the project source code, documentation, and website.
- Bug Tracker to track and monitor bugs as well as feature requests, one-time tasks, or unsolicited patches. More formally known as issue tracker (as now it tracks more than just bugs).
- IRC / Real-Time Chat Systems where users and developers can raise questions and get answers instantly.
- Wiki, documentation website that can be contributed by various entities. Wiki is regarded as the easiest channel for people who wants to contribute.
- Q&A Forums, an advanced form of FAQ (Frequently Asked Questions) page that has real-time updates.
- Translation Infrastructure, useful for contributors who wants to translate the project into different languages, whether for the documentation, software interface, error messages, etc.
- Social Networking Services such as Twitter or Google+ channel. Rarely used, except for community needs.

III. RESEARCH METHODOLOGY

This research aims to convert the existing KIRI project into a proper open source project in terms of technical architecture. First, we will review the current architecture of KIRI. Then, we will study three open source projects that are made in or related to Indonesia. Finally, we will map the components of KIRI into the technical architecture as described in [4], potentially creating new ones that were not available before.

After conversion, we will review and check all KIRI services to ensure that they are working properly.

IV. ARCHITECTURE OF KIRI

KIRI is composed of several components, as depicted in Error! Reference source not found.:

**Tirtayasa**\(^1\) is the frontend of KIRI, responsible for user interactions through web browser as well as RESTful APIs [3]. It also helps converting user inputted place names into latitude and longitude format in EPSG: 4326 system [1] (with help of Google Maps service). Tirtayasa is built using PHP and CodeIgniter Framework. However, in calculating the navigation route, it delegates the job to another component called NewMenjangan.

**NewMenjangan**\(^2\) is a Java-based HTTP service that takes two coordinates as origin and destination, and outputs the best navigation route between those two coordinates using public transport. When the service is started, it loads all tracks and constructs a big graph based on those tracks. When NewMenjangan receives navigation query request, it calculates the result using slightly modified Dijkstra’s shortest path algorithm, that uses Heap data structure to speed up the process [2].

Fig 2. KIRI Architecture (before open-sourced)

**BukitJarian**\(^3\) is KIRI app frontend that is directed to software developers who wants to use the KIRI RESTful API. In this frontend, developers can register for an API key that they can use to request navigation services to the KIRI engine (via Tirtayasa).

Documentation of KIRI API for web service is hosted on BitBucket\(^4\), providing information for developers who wants to use the RESTful API as well as to use the dashboard to request an API key.

KIRI also has a Wordpress-powered website\(^5\) that mostly serves general information about KIRI, such as “About Us” page, legal matters and feedback form.

V. EXISTING OPEN SOURCE PROJECTS IN INDONESIA

There are several open source projects that the author has found been created in Indonesia.

- **Kawal Pemilu 2014** [5] is a project initiated by Ainun Najib to help citizens verify the

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1. \(\text{http://kiri.travel}\)
2. \(\text{http://newmenjangan.cloudapp.net, now obsolete}\)
3. \(\text{http://tirtayasa.travel}\)
4. \(\text{http://bitbucket.org/projectkiri/kiri_api/wiki/Home, now obsolete}\)
5. \(\text{http://static.kiri.travel, now obsolete}\)
authenticity of Indonesia’s presidential election in 2014, by using the open data that was provided by Komisi Pemilihan Umum (General Election Commission). The usage of this web-based application has been studied from the data openness and social-politic point of view, for example in [6] and [7].

- InaSAFE [8] is a disaster mitigation application, and a product of cooperation between Badan Nasional Penanggulangan Bencana (National Board for Disaster Management), Australian government, and World Bank. From the open source point of view, this project is very mature and has been presented in the 4th International Symposium on Earthquake and Disaster Mitigation 2014 [9].

- Finally, SLiMS (Senayan Library Management System) [10] is a library management system application that has been used in various university libraries in Indonesia.

We analyzed those three open source projects, and summarized the findings in Error! Reference source not found.. While Kawal Pemilu 2014 has the most discussions in academic community due to its success, it is a one-time project that was built by a small team and has the source code released freely. We didn’t see much open source activities after the election has ended. Among three, InaSAFE was the most mature in terms of open source quality. It has more than 40 contributors and more than 2,000 issues. SLiMS was not very popular as the other two, but it was vastly used by many libraries in Indonesia and abroad, as claimed by its main contributors [11].

Table 1. Comparison of Open Source Projects in Indonesia

<table>
<thead>
<tr>
<th>Elements</th>
<th>Kawal Pemilu</th>
<th>InaSAFE</th>
<th>SLiMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web Site (for contributors)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mailing Lists / Message Forum</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Version Control</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bug Tracker</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IRC / Real-Time Chat Systems</td>
<td>No</td>
<td>Yes (Gitter)</td>
<td>No</td>
</tr>
<tr>
<td>Wiki</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Q&amp;A Forums</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Translation Infrastructure</td>
<td>No</td>
<td>Yes (Transifex)</td>
<td>No</td>
</tr>
<tr>
<td>Social Networking Services</td>
<td>Facebook</td>
<td>No</td>
<td>Facebook, Twitter</td>
</tr>
</tbody>
</table>

Table 2. KIRI Open Source Statistics

<table>
<thead>
<tr>
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<th>KIRI</th>
</tr>
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<tbody>
<tr>
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<td>Q&amp;A Forums</td>
<td>No</td>
</tr>
<tr>
<td>Translation Infrastructure</td>
<td>No</td>
</tr>
<tr>
<td>Social Networking Services</td>
<td>Facebook and Twitter (not actively maintained)</td>
</tr>
</tbody>
</table>

VI. OPEN SOURCING KIRI

A. Technical Infrastructure

Based on recommendation from [4], we transformed components of KIRI into several technical infrastructures, summarized in Error! Reference source not found., and explained in the following subsections.

1) Website

Website that provides general information, including new section of information for contributors, is hosted in the following URL: https://projectkiri.github.io. It is a one-page website that contains all information needed. Thanks to the fact that it is backed by the GitHub Pages platform, source code of this website is also open and versioned.
Due to the nature of GitHub Pages platform, it is not possible to create a bilingual general information website. Hence, the website is written in universal language, i.e. English.

The KIRI frontend (i.e. Tirtayasa & BukitJarian) stays hosted in private cloud, and accessible through the existing URL http://kiri.travel. In addition, we also installed SSL certificate to the frontend, hence accessible too from https://kiri.travel.

2) Mailing List
We decided to not create mailing list as of now, since the cost of maintaining it outweighs the benefit.

3) Version Control
Source code of Tirtayasa and NewMenjangan are moved to GitHub, under the "projectkiri" organization. The benefit of using GitHub is that most open source projects are already hosted there, and contributors can easily contribute to this project without much learning.

4) Bug Tracker
We make use of GitHub’s standard issue tracking feature. We ask both users and developers to use this issue tracking system. Though it may take some time for regular user to learn how to use GitHub issue tracking system, it centralizes all feedbacks in one place.

5) Real-Time Chat Systems
We decided to not create real-time chat systems as of now, since the cost of maintaining it outweighs the benefit.

6) Wiki
Wiki is used to provide developer’s documentation. It currently hosts documentation to KIRI API, but may be added with more development topics in the future. The wiki is also versioned.

7) Q&A Forums
We decided to not create Q&A forums as of now, since the cost of maintaining it outweighs the benefit.

8) Translation Infrastructure
Though KIRI is already bilingual (English and Bahasa Indonesia), we decided to not create sophisticated translation infrastructure as of now. Contributors can translate KIRI if they want, using the same method as contributing to the source code.

9) Social Networking Services
Although KIRI has already a Facebook page and a Twitter handle – both not actively maintained –, there is no plan to maintain them seriously, as the cost of maintaining it outweighs the benefit.

B. Architecture
Due to open source technical infrastructure requirements, KIRI now contains more components compared to when it was closed source. However, we also managed to simplify the architecture by making use of GitHub platform to host most of the components (known as “canned hosting” as defined in [4]).

While Tirtayasa, BukitJarian and NewMenjangan stays the same, we moved Developer Documentation and General Information Website into GitHub. In addition, the new components, i.e. source code, wiki and issue tracker are also hosted on GitHub. Diagram of the new architecture is depicted in Error! Reference source not found..

Fig 3. KIRI Architecture (after open-sourced)

VII. RESULT
After conversion, we checked the status of each component, and found the following result:

- **NewMenjangan** There were no significant changes in the code, aside from the fact that it was migrated to a local Virtual Private Server provider. Thanks to this migration, we found a problem that may occur during deployment, hence the code documentation was updated with a troubleshooting guide. The code for NewMenjangan is now available in GitHub.

- **Tirtayasa & BukitJarian** Also due to migration, we found several problems. First, we found a problem caused by file name capitalization. Previously Tirtayasa was hosted in a Windows server, where capitalization does not matter. In a new Linux server, different capitalization in file name caused an error. Secondly, apps that use old KIRI API endpoint (not HTTPS secured) no longer worked. This is because the new API use different path and secured with HTTPS. The server configuration tried to redirect HTTP URIs to HTTPS, and in the process accidentally removed some parameters. Instead of giving a workaround in the server,

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6 https://github.com/projectkiri/
7 https://github.com/projectkiri/NewMenjangan
we decided to update the Android App\(^8\) that we built to support the new endpoint as it is more secure. Tirtayasa & BukriJarian code is now also available in GitHub\(^9\).

- **Developer’s Documentation** there were no significant changes on developer documentation, other than some updates because the existing documentation was written many years back. The documentation is available in GitHub wiki\(^10\).

VIII. CONCLUSION

During the process of transforming KIRI into an open source project, we examined the technical infrastructures required, as well as three relatively popular Indonesian open source projects. InaSAFE was the most mature in terms of contributions, while Kawal Pemilu 2014 was the most researched further.

We successfully transformed KIRI into a proper open source project from technical point of view. The 3rd party environment GitHub (so called `canned hosting`) helped us simplifying the architectures.

The success of this project in terms of community involvement is not yet known at the time of this paper writing, and left as further research.

REFERENCES


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\(^8\) https://github.com/projectkiri/smartpublictransport-as

\(^9\) https://github.com/projectkiri/Tirtayasa

\(^10\) https://github.com/projectkiri/Tirtayasa/wiki