GSoC'14: Improving PyBOMBS

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March 22, 2014

1 Contact Information

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2 Background Information

2.1 Education

I am a master student in the Department of Electronic Engineering, Tsinghua University, Beijing, China. I major in wireless communications, and software defined radio is among my research interests. I have published one paper about software defined radio implementation upon OpenBTS [1]. I lead current lab research projects on software defined radio, and maintain the project wiki.

2.2 Past experience with GNU Radio

I have been using GNU Radio along with USRP, and on the discuss-gnuradio mailing list since two years ago. I used it to build a MIMO precoding system for my bachelor thesis.[1]I submitted several bug reports and contributed one patch on the list. I was not active for some time due to lab research focus shift, but I always keep an eye on the GNU Radio updates. I'm really excited about the new features in recent versions of GNU Radio, and glad to see more and more third-party open source modules about more interfacing devices, advanced signal processing techniques, and modern wireless systems.

2.3 Past experience with Other Open Source Projects

Besides GNU Radio, I take part in quite a few open source projects. I am an active Fedora contributor. For now I regularly do translations, chair IRC meetings, and organize offline events. I would like to have some packaging

[1]The thesis is in Chinese and available at `http://cloud.alick.me/public.php?service=files&t=0a67a7f2d09a1b4385dc85018d487918`.

work, such as packaging GNU Radio related projects in the near future. I am also an active member of TUNA, the open source league in Tsinghua. I serve as a maintainer of the open source mirror site in campus, a mentor for league newcomers, and an organizer and host of various events. Recently I also work on ThuThesis, a LaTeX thesis template for Tsinghua University as well as my personal projects on Github.

3 Project Information

PyBOMBS (Python Build Overlay Managed Bundle System) is the new install management system for GNU Radio which can resolve the dependencies and install out-of-tree GNU Radio projects. It provides a central, easy to use tool to prepare the software defined radio development platform. Although it is in early stage and not feature complete, I think PyBOMBS has great potential to integrate the whole GNU Radio ecosystem and lower the barrier to newcomers. That's why I want to make it better through this GSoC project and future contributions.

4 Suggested Improvements

Below are a list of possible improvements suggested by the community and my understanding to the points:

- *Develop documentation and tutorials:* Well-written documentation and tutorials about the usage of PyBOMBS system can make it easier for out-of-tree project developers to get along with PyBOMBS. We also need up to date documentations of API, coding style for PyBOMBS developers to contribute easily.
- *More full featured GUI:* Currently the GUI just displays all available applications and all installed applications. More operations should be supported, and a search function is necessary concerning scalability. Besides the UI can be much improved.
- *Improve app store:* To better present the out-of-tree projects, we need include metadata (author information, description, dependencies) and present them in the GUI. Automatic metadata extraction is appreciated. User rating will be a good plus.
- *Integrate with CGRAN:* We have CGRAN[2] to host out-of-tree GNU Radio projects for quite some time. But its usage is not quite satisfactory. A nice integration between CGRAN and PyBOMBS can encourage usage of CGRAN, forming a better ecosystem. For example, required metadata field can be enforced when submitting projects to CGRAN. Besides, CGRAN might be the most suitable platform for user rating data as well as automatic building and testing.
- *Test on additional operating systems and software configurations:* Testing is good. More tests will improve the code quality of PyBOMBS. It can also

[2] `https://www.cgran.org/`

help to find bugs in out-of-tree projects. Currently PyBOMBS is mainly tested on Fedora, Ubuntu, and Debian, but it is necessary to ensure other distribution users can use it free of error.

- *Develop automated test build systems:* We want to use automated tests to validate the working state of development branches of all packages, the compatibility of out-of-tree projects with new GNU Radio releases. The result could be used in app store, and exported to the CGRAN website.
- *Core refinements:* For example, the distribution package handling code is better to be abstracted and unified to accommodate more distributions. We also need to handle the options of complex projects. The solution might be similar to the Gentoo's USE flag.
- *Multiple version coexistence:* Currently different out-of-tree projects have different compatibility levels with GNU Radio. Since GNU Radio recently has quite a few API upgrades, some projects choose to use different develop branches to be compatible with different versions of GNU Radio. Therefore it is likely an end user will need to have multiple versions of GNU Radio installed, and use different versions with different out-of-tree projects. To address the issue, the implementation of virtualenv for Python and rvm for Ruby can hopefully give some guidance.

5 Proposed Work for GSoC

My proposed work items during GSoC period are as follows:

1. *Documentation and tutorials:* I want to begin with enriching the documentation for both PyBOMBS users and developers while I get familiar with it, which should be helpful to the project as well as my understanding of it. I will use Redmine Wiki for user documentation, and Sphinx for API documentation. Besides, a tutorial on the usage of PyBOMBS with a sample out-of tree project shall be created, which servers analogical purpose as GNU Radio's "How to write a block". The documentation will be updated along with the whole development phase.
2. *Abstract package handling code:* I will dive into the code handling binary packages in various Linux distributions (`recipe.py`, `sysutils.py`, etc.), and adopt the object oriented (OO) approach to abstract the code to expose a unified interface. In this way I can potentially add support for more distributions such as Arch and Gentoo with the help of package manager mapping information, for example the Pacman Rosetta.
3. *Improve app store:* I will come up with a list of necessary (or nice to have) metadata for each application and make a specification. Then I will investigate automatic ways of importing metadata from out-of-tree project upstream, for example using Github APIs or mechanisms on CGRAN to get various project information.
4. *Improve the GUI:* I will seek inspiration from GNOME Software[3] and various app stores, and come up with a modern design of the GUI. An in-

[3] `https://live.gnome.org/Design/Apps/Software`

terface of application details and the search functionality will be included. I will implement the design with PyQt4 graphic toolkit. I will focus on client search first (rather than querying remote server) and consider to use cache mechanism to imporve user experience.

5. *Packaging PyBOMBS for Linux distributions:* I will work with package maintainers of major Linux distributions to make PyBOMBS into their package repositories. The main concern is Fedora and Debian, but it is better to be included in Arch Linux and Gentoo as well.

6 Deliverables

The deliverables of my GSoC project will be:

- PyBOMBS documentation and tutorial.
- A unified API handling distribution packaging.
- App metadata specifications.
- A modern good-looking GUI for PyBOMBS.
- PyBOMBS packages in major Linux distributions.

7 Timeline

I will be available from April 21 to August 22 for GSoC project although I have some other work or vacation. I am an organizer of upcoming FUDCon APAC 2014 on May 23–25, so my time for GSoC in starting period might be less. Later in summer I might have at most one week on vacation away from coding and reliable network. But overall I think I can devote my summer time into the project and fulfil my tasks. The tentative agenda is illustrated in Table 1.

Time	Task
04/21 – 04/27	Initial discussion with the mentor
04/28 – 05/18	Get familiar with current code, make simple fixes
05/19 – 05/25	Create a tutorial about common PyBOMBS usage
05/26 – 06/01	Enrich PyBOMBS documentation on wiki pages
06/02 – 06/08	Setup Sphinx and generate API documentation
06/09 – 06/15	Abstract API of distribution package handling code
06/16 – 06/22	Create app metadata specification, investigate automatic metadata extraction ways
06/23 – 06/27	Midterm evaluation submission
06/28 – 07/13	Coding for metadata extraction and importation
07/14 – 07/20	Design modern GUI, start packaging to distributions
07/21 – 08/10	Coding for new GUI with PyQt4
08/11 – 08/22	Code clean-up, documentation updates, distribution packaging confirmation, and final evaluation submission

Table 1: Timeline of the GSoC project.

References

[1] Tao Zhao, Pengkun Yang, Huimin Pan, Ruichen Deng, Sheng Zhou, and Zhisheng Niu. Software defined radio implementation of signaling splitting in Hyper-Cellular network. In *Proceedings of the Second Workshop of Software Radio Implementation Forum (SRIF 2013)*, SRIF '13, pages 81–84, New York, NY, USA, August 2013. ACM. doi:10.1145/2491246.2491258.