**Resource Sharing Plan**

**What resources will be shared?**

* **Software.** The source code, binary executables, and documentation for the software implemented in Aim 1 will be made publicly available under an open source license (e.g., the GNU Public License version 3.0 for ITK-SNAP). The main components of this software include:
  + Graphical user interface to ITK-Lung functionality. The GUI functionality will be built into ITK-SNAP, a cross-platform (Windows, MacOS, Linux) open source tool (http://itksnap.org). Like all of ITK-SNAP, this functionality will be written in C++. It will include new GUI components for image registration, including algorithm initialization and visualization of processed results, [and new layers for interfacing with script-based pipeline software.]
  + ITK filters and stand-alone programs for ITK-Lung functionality. The core algorithms for registration and segmentation from Aim 1 will be implemented as Insight Toolkit (ITK) filters and contributed to ITK. They will also be wrapped into small stand-alone command-line programs. This will facilitate the use of these algorithms by the developers of other image analysis software and local pipelines.
  + Main ITK-Lung package. The main functionality described in Aim 1 will be made available as a stand-alone open source software package modeled after our existing publicly distributed software from PICSL. It will provide functionality for interactive and batch processing of lung imaging datasets. HPC cluster support will be developed for the Linux operating system and will interface with the Open Grid Scheduler (OGS, formerly Sun Grid Engine) for batch job scheduling for use at Penn. SLURM-based cluster support will also be developed and tested at UVa. Both offerings will consist of scripts that execute command-line C++ programs implementing batch-based core lung image processing tasks. It will interface with our existing open source software packages ANTs (http://www.picsl.upenn.edu/ANTs) and Convert3D (itksnap.org/c3d) for image registration and general image processing.
  + XNAT?? pipelines. Pipelines for executing ITK-Lung functionality from XNAT will be developed. These pipelines will be written using a combination of Java, XML and Python code and will act as wrappers for the ITK-Lung package. These pipelines will allow ITK-Lung to be used on existing XNAT installations.
* **Data packages.** For each multi-atlas library described in Aim 1 and the evaluation studies presented in Aim 2, we will publicly share data packages. Atlas data packages will consist of completely anonymized image data in NIFTI format, manual segmentations, meta-data, and derived information. Publishing atlas packages allows users to apply joint label fusion based segmentation without having to provide their own labeled data. Atlas packages will be modeled after the format used in our existing publicly available atlas package for hippocampal subfield segmentation (http://www.picsl.upenn.edu/ASHS), with some extensions, such as the use of XML to describe package contents, software version compatibility, parameters, etc. For each use case/evaluation study in Aim 2, example datasets and example usage will be provided, allowing users to test out the ITK-Lung atlas and software packages on their own.
* **Documentation.** Documentation of different levels of the software (source code, ITK-SNAP based GUI, pipelines), atlas packages, and use case studies will be provided to the community. Video tutorials recorded with desktop-screen-capture software will be used to illustrate the ITK-Lung GUI application, which allows new users to get started quickly. ITK-SNAP already has web-based documentation, and we will update it with new functionality as it is developed. The ITK filters and XNAT pipelines will be documented according to their respective conventions. The ITK-Lung package will offer a wiki-based manual covering different deployment options and advanced usage. The source code for all components will be extensively commented, as is the practice for all publicly distributed software from PICSL.
* **Protocols.** Protocols used for the acquisition, annotation, and processing of the CT and MRI atlas data will be documented and shared with the community. Both imaging and anatomical segmentation protocols will be documented and published.

**How will the resources be shared?**

* **Source code.** Source code will be managed by the code versioning system Git (http://git-scm.com) and shared on public repositories such as sourceforge.net (currently used for most of our software) or github.com. Everyone will be able to download the code and branch her own versions of the project. We will welcome patches and contributions from external users, which will go through an approval process before being accepted into the main code branch. The use of public resources such as SourceForge helps ensure that even after the funding for this project is over, the software will remain in the public domain, and provides avenues for community-based maintenance and future development.
* **Binary programs.** Binary executables will be made available for the front-end interactive (ITK-Lung GUI) and the stand-alone back-end programs. We already have a sophisticated build system in place at PICSL for ITK-SNAP and ANTs that performs nightly builds and testing, and uploads the binary packages to the file area on sourceforge.net. These binary packages come with a system-specific installer, allowing easy installation on MacOS and Windows. In addition to the nightly builds, we will provide regular numbered releases of all software components. Our build system consists of several Windows and Linux virtual machines installed on a single MacOS server, each using the cross-platform CMake and CTest utilities. The results of nightly builds are submitted to a web-based CDash dashboard, allowing developers quick access to compilation and testing results on multiple platforms.
* **ITK-Lung package.** The main ITK-Lung package, which will consist of scripts rather than compiled code, will have regular numbered releases, which will be uploaded to the sourceforge.net area as a compressed “tarball” archive. Install/update scripts will be provided that download/update the needed binaries of ANTs and Convert3D from their respective repositories.
* **XNAT pipelines.** Pipelines for interfacing XNAT with ITK-Lung will be versioned using Git and published to the XNAT Marketplace (http://marketplace.xnat.org/).
* **Data packages.** Data packages will be published on XXXXX, making them available to both users of ITK-Lung and the general lung imaging community.
* **Documentation and protocols.** Video documentation will be uploaded to YouTube. Wiki-based documentation will be hosted on sourceforge.net, and modeled after our wiki-based itksnap.org website.
* **Training.** We will hold twice yearly outreach and training activities at scientific meetings targeted at the pulmonary imaging community. By hosting informational booths and tutorial workshops, we will promote our products and offer hands-on training and discussion with both users and developers. We also plan to take advantage of our extensive partner network of investigators to further our dissemination goals. Moreover, we will report our findings as conference presenters at these and other meetings. We will also offer more focused activities via hands-on workshops for users and hackathons for developers as we have done on a regular basis for our ITK-SNAP and ANTs software.