

Final Report to



SeTES, a Self-Teaching Expert System for the
analysis, design and prediction of gas
production from unconventional resources

USER GUIDE

07122-23.FINAL_USER GUIDE

November 24, 2011

PI: George J. Moridis (gjmoridis@lbl.gov)

Co-PIs: Matthew T. Reagan (LBNL), Thomas A. Blasingame (TAMU), Michael Nikolaou (UH)

Authors of the User Guide: Heidi A. Kuzma, Ralph A. Santos, Matthew T. Reagan

Lawrence Berkeley National Laboratory

1 Cyclotron Rd., Berkeley, CA 94720

(510) 486-4746

SeTES software

SeTES is a Self-Teaching Expert System designed and implemented by Lawrence Berkeley National Laboratory (LBNL) to assist in the discovery and recovery of Unconventional Gas Resources (UGS), particularly natural gas in shales. A full description of the SeTES system is given in the SeTES Final Report. The purpose of this guide is to aid a user getting to, setting up or otherwise exploring the system.

The SeTES software is currently available as an alpha-release. Alpha software is software in which all the features of the software are fully designed and at least partially implemented. The product itself is stable and complete enough for internal release within the organization which is sponsoring development of the software. Occasionally alpha-software is released or demonstrated as a preview to potential customers. As alpha-software, there are still a number of bugs in SeTES as well as modules, features which have been developed for the system but are not yet integrated. Users are strongly cautioned that the software is undergoing continuous upgrades and modifications. The most recent versions of the software are held in repositories which are described in this document.

A beta release was originally scheduled for mid-November 2011. Due to issues with getting the finite-difference modeling module to run remotely on a cloud server, this release has been delayed until mid-December 2011. At this time the SeTES software will be stable and ready enough to undergo the first of many rounds of user testing before its public debut scheduled for 2012. The beta-release website will be accessible at the following urls:

www.SeTES4UGR.org

www.SeTES4ShaleGas.org

Current software formats

The SeTES software is available in two formats:

1. Over internet as a website,
2. As a stand-alone package run through a simulated server on a single PC.

Directions for accessing the software in both formats are contained in this User Guide.

Accessing SeTES through the web

Supported Browsers

Before accessing SeTES through the web, it is necessary to have an internet browser installed on your computer.

It is best to access SeTES using the free Firefox browser available from

<http://www.mozilla.org/en-US/firefox/new/>

(The SeTES development team uses the Firefox browser because it is stable on a number of operating systems including Windows 7, Mac, Linux)

SeTES also works using the Google Chrome browser available from

<http://www.google.com/chrome>

We do not recommend using Windows Internet Explorer.

Getting to SeTES

SeTES can be accessed by typing one of the two urls (web addresses) below into the address box of your internet browser (Firefox or Chrome):

We recommend using the following url;

<http://50.57.69.112:8080/>

This leads to an instance of SeTES which is hosted by the commercial web-hosting service www.rackspace.com. The account is held and maintained by the SeTES team at LBNL and the version of the software at this location is constantly being updated. Because Rackspace has an enormous amount of computational power at its disposal, the website hosted here tends to be faster and more reliable than instances of it elsewhere .

It is prohibitively expensive to for LBNL to buy and maintain a server with enough computational capacity to handle more than a few SeTES users at a time which is why we closed our original LBNL server in favor of a more flexible, cloud-hosted system.

We have also registered the following commercial domain names where the beta distribution of the software and eventually the website will reside:

<http://www.setes4shalegas.org>

<http://www.setes4ugr.org>

User Name and Password

Once the appropriate url has been entered into a browser, you may be prompted for a user name and password before the SeTES homepage appears. The appropriate user name and password are:

Username: setes

Password: setes\$234

This initial username and password is intended simply to keep members of the general public who may have stumbled across the site from accessing the alpha-system. It will be removed in the following months.

After entering the initial username and password, you should have access to the SeTES Homepage which displays general information about the site and how to use it. This page is currently under intensive development, with links and new information being added daily.

A version of this Homepage will be made available to the general public along with the beta-release of the full software with links for people who are interested in beta-testing the system. At this point, it will be possible to find SeTES by doing a google search for it.

Logging into the system

To log into the analysis pages of the system it is necessary to set up an account. Currently, accounts are set up by contacting the SeTES web administrator, Ralph Santos, by email at ralfarama@yahoo.com. It is also possible to log in using a pre-tested demo account. The username and password for this account are:

Username: demo@lbl.gov

Password: demo234

Analysis Environment

Once you have logged into the system, the analysis pages will come up. The mode of analysis and the function of each of the analysis tabs is described both on the SeTES homepages and in the SeTES final report. Because the system is under construction, one or more of the analysis tabs may not be working at any time until deployment of the Beta version.

If you are interested in a preview of a particular tab, please contact Heidi Kuzma at hkuzma@eastdonnerresearch.com or by telephone at 530-277-1283.

Installing SeTES as a stand-alone package

The SeTES disk image provided with this report contains an image of the entire SeTES system, complete with the operating system and software exactly as they are installed both on the LBL server and on the cloud instance of SeTES as they were on August 31, 2011. Directions in this document explain how to get and update to current versions of SeTES. Installing a stand-alone version of SeTES is quite complicated and not recommended except for advanced users who are comfortable with virtual machines, linux and github. The SeTES team will be happy to guide you through the process upon request.

In order to access SeTES on the disk image, it is necessary to set up a virtual environment in which a virtual “server” can communicate with a virtual “client” or web-browser. Quite literally, the disk image runs as a separate “Virtual Machine” on the user’s computer. In order to do so, Virtual Machine software must be installed on the user’s computer. We recommend using one of the following packages:.

The first is VMware Workstation 8 which can be purchased directly from the manufacturer for \$199 (www.vmware.com). We strongly recommend using this package as we have found that it simplifies SeTES setup. The other package that can be used is VirtualBox (www.VirtualBox.org). Virtual Box is free.

The following directions are for a system in which VMware Workstation 8 has been purchased and installed. For setup directions under Virtual Box, please contact Ralph Santos directly. The Virtual Box software tends to undergo changes and we do not currently have a good set of directions for installing SeTES under the new version. It is possible, however, and we will make every effort to accommodate a user who would like to do so.

The SeTES disk image will only run on laptops with a high end CPU which contains a graphics accelerator. For a list of CPUs capable of running SeTES, see the following link:

Installing SeTES under VMware

- 1) Copy the SeTES disk image (filename) into a directory on your computer
- 2) Download and install VMware Workstation 8 on your computer.
- 3) Open VMWare
- 4) Under the File menu, choose the option to “create a new VM. (VM stands for Virtual Machine).
- 5) When asked to insert and installation disk, choose to continue without an installation disk.
- 6) Choose the option to use an existing virtual disk
- 7) The next option will ask whether you wish to copy the “*.vmdk” file or use it directly. Make which ever choice you prefer. If you copy the file, then all subsequent changes to the file will be made on the copy, which leaves the original file intact should you need to re-install. If you choose to copy, you’ll be asked to give the copy a new name.
- 8) Start funning the new VM to boot the server.

You’ll need to log in to the VM as root to find out the IP address assigned to the virtual machine by the VM software.

9) Log in to the VM using the following:

Username: root

Password: 5ete5@dm1n

10) You should now see a window running linux operating system inside of the virtual machine on your screen.

11) Open a command window

12) Type the command "ipconfig -a". You'll see a paragraph that begins with "eth0" and has the words "inet addr:" followed by four numbers separated by periods, like the following:

```
eth1    Link encap:Ethernet HWaddr ##:##:##:##:##:##  
        inet addr:172.16.35.143 Bcast:172.16.35.255 Mask:255.255.255.0  
(...and so on...)
```

In this example, the address to use is "172.16.35.143".

13) Record this address.

14) Open your internet browser. To access the website, put the following address into your Web browser (the web browser need not necessarily be running on the virtual box, it could be running in windows or on you mac operating system)

15) Type the IP address into the address line of the browser. For example, type

<http://172.16.35.143:8080/>

16) You should now see SeTES running in the browser.

Getting Updates to SeTES via Github

For the foreseeable future, SeTES is constantly under development and the SeTES version contained on the disk image is already out of date. The SeTES team keeps a current version of all of the code accessible to team members through the commercial software repository Github (www.github.com).

In order to access and download the latest version of SeTES, you must first create a free public collaborator account at Github. You must then request to be added to the list of SeTES collaborators by emailing either Heidi Kuzma or Ralph Santos. We will add your name to the list of people who are allowed to either pull or push changes to SeTES. (Pushed changes must be to a unique branch).

Using git is quite complicated. This report does not attempt to cover it in detail. Excellent documentation is available through the github website. Alternatively, either Ralph Santos or Heidi Kuzma will be happy to walk you through the process.

The Github project is called seTES. To completely update your installation of SeTES, it is necessary to pull the following three repositories (setes-app, setes-python, setes-fortran). All of the repositories are described below along with highlights of their contents

seTES/setes-app

Corresponds to directory /opt/apache2/sites/setes-test

This directory tree contains all of the code for the website except the python and fortran underlying the modules. The following directories are of specific interest

`/opt/apache2/sites/setes-test/apps/frontend/templates` : contains templates for commercial pages and module tabs. These can be modified to change content such as text and static images.

`/opt/apache2/sites/setes-test/data/schema/` : contains the schema for the setes database

`/opt/apache2/sites/setes-test/file-store/`: contains raw data files such as production records and geophysical files

`/opt/apache2/sites/setes-test/results-store/`: temporary repository for figures and files output by modules during a particular user session.

`/opt/apache2/sites/setes-test/web/`: contains `index.php` which sets up the website, cascading style sheets, `json` definitions, `popups` contains text for popups. `Runner.php` is a utility the development team uses to set up an artificial session and test modules.

Full documentation for all of the directories is being written.

seTES/setes-expert

corresponds to directory /opt/expert/setes-test/python

This directory contains the python necessary to run the SeTES modules. Pulling the master branch for this directory will update all of the modules. The structure of the python is as follows:

`Expert.py`: base class for the modules.

`Expert[module_name].py`: such as `ExpertBIDecline`, contains the python for each specific module.

`mplfigures.py`: plotting subroutines

`es_modules.py`: common subroutines used in multiple modules

`DB.py`, `well.py`, `user.py` ... etc: object classes used in multiple modules.

seTES/setes-fortran

/opt/expert/setes-test/fortran

This directory tree contains the fortran which is called upon by python modules. Each fortran program as well as associated input file templates and executable files is stored in a an

appropriately-named directory. Documentation for the various programs and how to compile them within the SeTES system is (or will be) included in each directory

seTES/setes-devtools

This repository does not contain a SeTES directory. Instead, it contains tools that are used in the development and installation of SeTES. Highlights of this repository include

/goose_analysis/ : *goose_analysis.py* is a utility to set-up and run a test user session from the command line. This is used to develop and test the integration of new modules in the system, as well as test modules individually.

/prettyjson/ : *prettyjson.py* is a utility to parse the json output of a session set up from *goose_analysis.py* into a format that is more easily read by a developer, including the display of figures.

/setes_stackbuild/ : contains the component necessary to build or re-build SeTES from scratch. Note: if you are running SeTES from the disk image, it is not necessary to rebuild the system in order to update, simply to gitpull the three directories mentioned above.

Makefile : top-level makefile.

Future of SeTES

LBL is committed to updating, maintaining and continuing to develop SeTES through a Beta-Release (scheduled for December, 2011) and a public release in 2012. In addition to a cloud version of the website which will be hosted by a third party, we maintain two servers at LBL, one of which hosts a back-up version of the website accessible over the internet. The other is used as a code repository, accessible only to SeTES staff which contains a backup of the current code for SeTES, also available through github, as well as historic versions of the site.

New disk images are being made periodically and stored on the LBL second server. These can be made available through the SeTES staff. Approximate download time for a disk image is about 13 hours so we generally will burn and send a DVD to interested parties.

Contact Information

Please do not hesitate to contact any of the people listed below for further directions or information

PI: Matthew Reagan mtreagan@lbl.gov

Project lead: Heidi Kuzma, hkuzma@EastDonnerResearch.com

Web administrator: Ralph Santos ralfarama@yahoo.com