Resen-core

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The core docker image used by resen. It builds upon a standard Ubuntu Linux image and comes preinstalled with a stack of commonly used geospace libraries and software packages. A list of all the packages installed in this version of resen-core can be found here: *Python Packages Available in Resen-core*.

CHAPTER 1

Source Code

The source code can be found in the *GitHub* repository resen-core.

CHAPTER 2

Contents

2.1 Usage

Specific versions of resen-core are available through resen. When creating a bucket the user is asked to select a specific resen-core version to base their bucket on.

2.1.1 Tutorials

Tutorials in form of jupyter notebooks can be found in the folder *tutorials* of the resen_core *GitHub* repository.

2.2 Python Packages Available in Resen-core

This version of resen-core includes two python virtual environments, py27 based on python2.7 and py36 based on python3.6. Below are the packages available in those virtual environments.

2.2.1 Python Packages included

Table 1: py36 environment packages

Package	Version	Application	Source
aacgmv2	2.6.0	AACGM magnetic coordinate system	https://pypi.org/project/aacgmv2/
apexpy	1.0.3	Apex magnetic coordinate system	https://pypi.org/project/apexpy/
astropy	3.2.1	Packages for use in astronomy	https://www.astropy.org/
basemap	1.2.0	Mapping	https://matplotlib.org/basemap/
bokeh	2.0.2	Interactive visualization library	https://bokeh.pydata.org/en/latest/
cartopy	0.18.0	Mapping	https://scitools.org.uk/cartopy/docs/latest/
h5py	2.10.0	HDF5 binary data format	https://www.h5py.org/
madrigalweb	3.1.12	Accessing the Madrigal database	http://cedar.openmadrigal.org/docs/name/rr_python.html
mangopy	0.1	MANGO data analysis	https://github.com/astib/MANGO
matplotlib	3.2.1	Basic plotting	https://matplotlib.org/
netcdf4	1.5.3	netCDF4 data format	https://unidata.github.io/netcdf4-python/netCDF4/index.html
numpy	1.18.4	Numerical array handling	http://www.numpy.org/
pandas	1.0.3	Data analysis	https://pandas.pydata.org/
plasmapy	0.3.1	Package for plasma research	https://www.plasmapy.org/
pydarn	1.0.0.1	Library for data visualization of SuperDARN data.	https://pydarn.readthedocs.io/en/master/
pyglow	0.0.0	Upper atmosphere climatological models	https://github.com/timduly4/pyglow
pymongo	3.10.1	Tools for working with MongoDB	https://api.mongodb.com/python/current/
scipy	1.4.1	Advanced mathematical operations	https://www.scipy.org/
sgp4	2.8	Propagation of satellite TLEs	https://pypi.org/project/sgp4/
spacepy	0.2.1	Data analysis tools for space-based datasets	https://pythonhosted.org/SpacePy/
sqlalchemy	1.3.17	Database tool kit	https://www.sqlalchemy.org/
sympy	1.5.1	Symbolic computation	https://www.sympy.org/en/index.html
tables	3.6.1	HDF5 binary data format	https://pypi.org/project/tables/
viresclient	0.6.1	Interface to access ESA's Swarm data and models	https://pypi.org/project/viresclient/
visuamisr	2.0.3	Read and visualize AMISR data	https://github.com/asreimer/visuamisr

Table 2: py27 environment packages

Package	Version	Application	Source
aacgmv2	2.5.2	AACGM magnetic coordinate system	https://pypi.org/project/aacgmv2/
apexpy	1.0.3	Apex magnetic coordinate system	https://pypi.org/project/apexpy/
astropy	2.0.14	Packages for use in astronomy	https://www.astropy.org/
basemap	1.2.0	Mapping	https://matplotlib.org/basemap/
bokeh	1.0.4	Interactive visualization library	https://bokeh.pydata.org/en/latest/
cartopy	0.17.0	Mapping	https://scitools.org.uk/cartopy/docs/latest/
davitpy	0.8	SuperDARN data analysis	http://davit.ece.vt.edu/davitpy/
h5py	2.9.0	HDF5 binary data format	https://www.h5py.org/
madrigalweb	3.1.10	Accessing the Madrigal database	http://cedar.openmadrigal.org/docs/name/rr_python.html
mangopy	0.1	MANGO data analysis	https://github.com/astib/MANGO
matplotlib	2.2.4	Basic plotting	https://matplotlib.org/
netcdf4	1.4.3	netCDF4 data format	https://unidata.github.io/netcdf4-python/netCDF4/index.html
numpy	1.16.2	Numerical array handling	http://www.numpy.org/
pandas	0.24.2	Data analysis	https://pandas.pydata.org/
pyglow	0.0.0	Upper atmosphere climatological models	https://github.com/timduly4/pyglow
pymongo	3.7.2	Tools for working with MongoDB	https://api.mongodb.com/python/current/
scipy	1.2.1	Advanced mathematical operations	https://www.scipy.org/
sciunit2	0.4.post3.dev0+g5073526	Package computational experiments for reproducability	https://sciunit.run/
sgp4	1.4	Propagation of satellite TLEs	https://pypi.org/project/sgp4/
spacepy	0.2.1	Data analysis tools for space-based datasets	https://pythonhosted.org/SpacePy/
sqlalchemy	1.3.1	Database tool kit	https://www.sqlalchemy.org/
sympy	1.1	Symbolic computation	https://www.sympy.org/en/index.html
tables	3.5.1	HDF5 binary data format	https://pypi.org/project/tables/
visuamisr	2.0.3	Read and visualize AMISR data	https://github.com/asreimer/visuamisr

2.3 Notes for Developers

Notes to create, build, and test resen-core images.

2.3.1 Resen-core images

Alternatively to accessing resen-cores images through resen, the images can be pulled from earchcubeingeo on dockerhub (this is how resen obtains the selected resen-core image). Once the resen-core image has been pulled into the user's system it will be readily available and not require downloading in the future. To pull a resen-core image from earchcubeingeo the following docker command can be used:

```
$ docker pull earthcubeingeo/resen-core:2020.1.0
```

After issuing the command, docker starts downloading the layers contained in the image. When the process finishes the image will be available in the user's system:

```
$ docker images
```

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```
REPOSITORY                  TAG                 IMAGE ID            CREATED
↪   SIZE
earthcubeingeo/resen-core   2020.1.0            b1f1c9013924        1 day ago
↪   5.25GB
```

2.3.2 Building a resen-core image

The sources for building a resen-core image are in the resen_core *GitHub* repository. The *Dockerfile* for the resen-core image can be found inside the resen-core folder in the repository. To build the image from the resen-core folder run:

```
$ docker build -t resen/testing .
```

After a successful build, which can take some time, the newly created image should be available in the user's docker list:

```
$ docker images

REPOSITORY      TAG         IMAGE ID            CREATED             SIZE
resen/testing   latest      5431trew4r12     2 hours ago         5.38GB
```

Resen-base

The resen-core images are based on the resen-base docker image, whos *Dockerfile* is located inside the resen-base folder in the resen_core *GitHub* repository. The resen-base image is in turn based on the ubuntu:18.04 docker image found in ubuntu Docker Official Images.

resen-core Dockerfile helpers

Resen-core uses additonal files (helpers) that are called as part of the instructions in the *Dockerfile* The helpers are located inside the folder resen-core/resources/helpers:

```
- install_CDF.sh
- setup_basemap.sh
- setup_py27_env.sh
- setup_py36_env.sh
```

2.3.3 Using a resen-core image without the resen tool

There might be times when there is the need to use a resen-core image without the resen tool, e.g. when a new image is being created and has not been integrated in the resen tool. To proceed you need docker installed in your system and enough resources allocated for compilation. The following command will start jupyter lab based on the resen-core image that was pulled previously , i.e. earthcubeingeo/resen-core:2019.1.0

```
$ docker run --name a_container_name  -it -p XXXX:XXXX earthcubeingeo/resen-core:2020.
↪1.0 /bin/bash -c 'source ~/envs/py36/bin/activate && jupyter lab --no-browser --ip␣
↪0.0.0.0 --port XXXX --NotebookApp.token=SOMETOKENWORD --KernelSpecManager.ensure_
↪native_kernel=False'
```

where *XXXX* is the port to be used for *jupyterlab*.

2.4 Changelog

2.4.1 2020.1.0 (2020-06-15)

- Add plasmapy, pydarn, viresclient
- Add visuamisr to py27 and py36 setup scripts
- Removed davitpy, was deprecated by developers
- Update py36 packages with latest versions
- Add %pylab widget capability
- Add citation helper utility
- Updated resen-base, tracking ubuntu 18.04:20200403 image

2.4.2 2019.1.0 (2019-10-24)

- Initial release.