Python Scripts for NIED continuous waveform data requesting and processing

- Author: Dongdong Tian @ USTC
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This is a collection of scripts to request, download and process continuous waveform data avaiable from NIED Hi-net website.

It does not come with any warranties, nor is it guaranteed to work on your computer. The user assumes full responsibility for the use of all scripts. The author is **NOT** responsible for any damage that may follow from correct *or* incorrect use of these scripts.

Dependency

- Python 3.4 (Not work under Python 2; Not Tested under Python 3.3)
- Python third-party modules
  - requests
  - clint
  - docopt
- Hinet win32tools: `catwin32` and `win2sac_32`

How to get

If you use git, just clone this repo to your work directory:

```
git clone https://github.com/seisman/HinetScripts.git
```

You can update this repo using:

```
git pull
```

If you do not use git, just click the "Download ZIP" button on the right.

Before you use it

1. Register on the NIED Hi-net website, so you can access to NIED waveform data;

2. Download win32tools and compile them, make sure binary `catwin32` and `win2sac_32` are in you PATH;
3. Request, download and process data manually at least one time, make sure that you know the whole procedures and limitations of NIED website;
4. Modify configure file `Hinet.cfg` to your needs:

- `User` & `Password`
- `Net` : Network code to request waveform data as default
- `Maxspan`: Maximum record length allowed for one web request
- `catwin32`: Path to `catwin32` supplied by win32tools

4. Run `HinetDoctor.py` to check your configure file;

What is network code?

Each network is represented by a network code. For example, Hi-net network has a code of '0101', while V-net '0105'. You can see the full code list by run `python HinetContRequest.py -h`.

What is Maxspan? And how to choose it?

NIED Hi-net website set a limitation of data size in one request:

1. Record Length < 60 min
2. Number of channels * Record Length <= 12000 min

Just take Hi-net as example, Hi-net network has about 800 station and 24000 channels. According to the limitations, the record length should be no more than 5 minutes long in one web request. So the Maxspan, allowed maximum record length, should be no more than 5 for Hi-net network with all stations selected.

The request script `HinetContRequest.py` helps you break through the limitation. Using this script, you can requst datas with a much longer record length, this script will split the request into multiple sub-request, each has a record length no more than `Maxspan` minutes.

Quick Start

If you want a quick start, just run like this:

```
$ python HinetContRequest.py 2010 10 01 15 00 20 -d 201010010600
$ python rdhinet.py 201010010600
$ python ch2pz.py 201010010600
```

if everything goes right, you will have one cnt file, one channel table file, several SAC files and SAC polezero files in directory.

Scripts

HinetDoctor.py

`HinetDoctor.py` helps you check your configure file, you should run it when you modify `Hinet.cfg`.

1. Is username and password correct?
2. Has Hi-net website been updated?
3. Is catwin32 command in you path and executable?
4. How many station are selected for Hi-net and F-net?
5. Is `Maxspan` in allowed range?

HinetContRequest.py

`HinetContRequest.py` is used to request and download data from Hi-net server.

Usage

```
$ python HinetContRequest.py -h
Request continuous waveform data from NIED Hi-net.

Usage:
    HinetContRequest.py <year> <month> <day> <hour> <min> <span> [options]
    HinetContRequest.py -h

Options:
    -h, --help              Show this help.
    -c CODE --code=CODE     Select code for organization and network.
    -m SPAN --maxspan=SPAN  Max time span for sub-requests
    -d DIR --directory=DIR  Output directory. Default: current directory.
    -o FILE --output=FILE   Output filename.
                            Default: CODE_YYYYMMDDHHMM_SPAN.cnt
    -t FILE --ctable=FILE   Channel table filename. Default: CODE_YYYYMMDD.ch
```

Examples

1. Request data of Hi-net start from 2010-10-01T15:00:00 (JST) with duration of 20 minutes

   ```
   python HinetContRequest.py 2010 10 01 15 00 20
   ```

2. Request data of F-net start from 2010-10-01T15:00:00 (JST) with duration of 20 minutes

   ```
   python HinetContRequest.py 2010 10 01 15 00 20 -c 0103
   ```

3. Request data of Hi-net, with customized output directory and filename

   ```
   python HinetContRequest.py 2010 10 01 15 00 20 -d aaa -o aaa.cnt -t aaa.ch
   ```

4. Request data of Hi-net, use default filename and customized output directory. (**Highly Recommended**)

   ```
   python HinetContRequest.py 2010 10 01 15 00 20 -d 201010010600
   ```

If you run `HinetContRequest.py` in the highly recommender way, you will get a directory `201010010600` with two file inside: `0101_201010011500_20.cnt` and `0101_20101001.ch`.

```
|-- 201010010600
    |-- 0101_201010011500_20.cnt
    `-- 0101_20101001.ch
```

rdhinet.py

`rdhinet.py` is used to extract SAC files from WIN32 file.

Usage

```
Extract SAC data files from NIED Hi-net WIN32 files

Usage:
    rdhinet.py DIRNAME [-C <comps>] [-D <outdir>] [-S <suffix>] [-P <procs>]
    rdhinet.py -h

Options:
    -h          Show this help.
```

```
    -C <comps>  Components to extract, delimited using commas.
                Avaiable components are U, N, E, X, Y et. al.
                Default to extract all components.
    -D <outdir> Output directory for SAC files.
    -S <suffix> Suffix of output SAC files. Default: no suffix.
    -P <procs>  Parallel using multiple processes.
                Set number of CPUs to <procs> if <procs> equals 0. [default: 0]
```

Examples

1. Extract all channels

   ```
   python rdhinet.py 201010010600
   ```

2. Extract NEU components with suffix 'SAC'

   ```
   python rdhinet.py 201010010600 -C U,N,E -S SAC
   ```

In most cases, what you need is only `-C` option.

If you run `python rdhinet.py 201010010600 -C U`, you will get SAC files looks like `N.FRNH.U` under directory `201010010600`.

ch2py.py

`ch2pz.py` is used to extract SAC PZ files from Channel Table file.

Usage

```
$ python ch2pz.py -h
Convert NIED Hi-net Channel Table file to SAC PZ files

Usage:
    ch2pz.py DIRNAME [-C <comps>] [-D <outdir>] [-S <suffix>]

Options:
    -C <comps>    Channel Components to convert. Choose from U,N,E,X,Y et. al.
                  Default to convert all components.
    -D <outdir>   Output directory of SAC PZ files. Use the directory of
                  Channel Table file as default.
    -S <suffix>   Suffix for SAC PZ files. [default: SAC_PZ]
```

Examples

1. Extract all channels

   ```
   python ch2pz.py 201010010600
   ```

2. Extract NEU components

   ```
   python ch2pz.py 201010010600 -C U,N,E
   ```

In most cases, what you need is only `-C` option.

If you run `python ch2pz.py 201010010600 -C U`, you will get SAC PoleZero files looks like `N.FRNH.U.SAC_PZ` under directory `201010010600`.

Attentions

- ch2pz.py only works for components whose input have unit of `m/s`.