

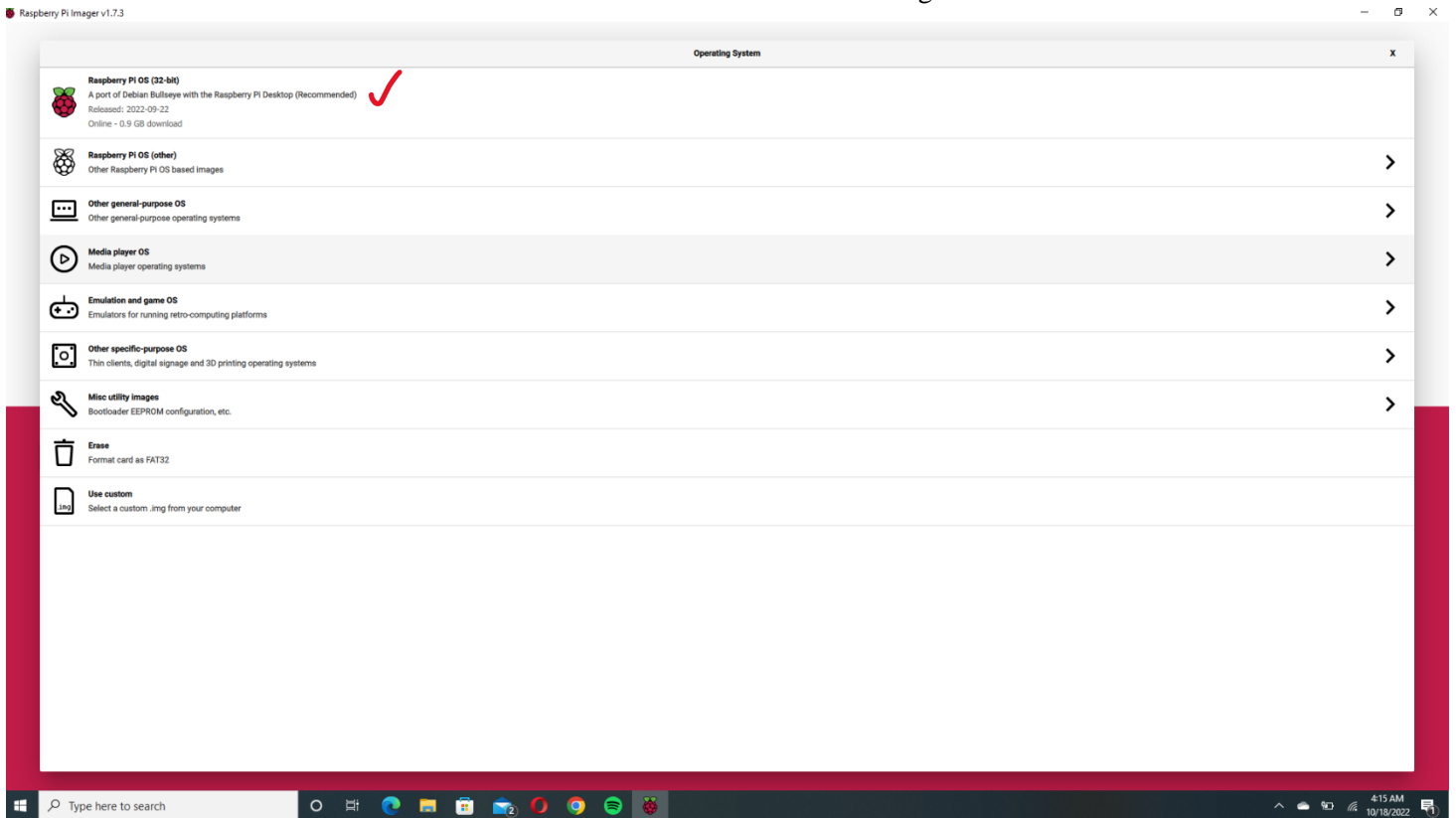
# DTN & ION software installation instructions

## Installation process for Pi OS

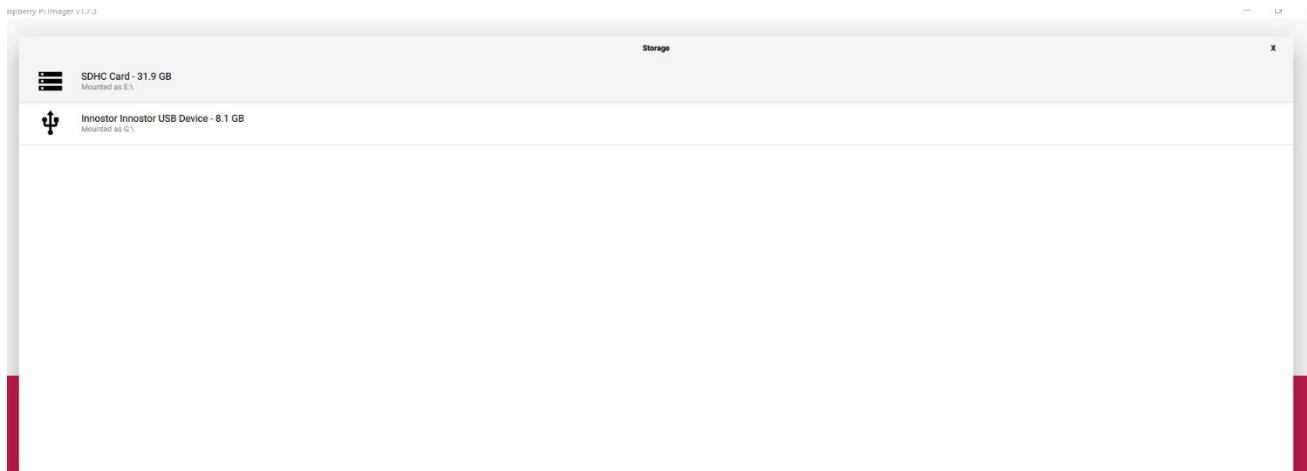
For this process you will need to go to <https://www.raspberrypi.com/software/> and download the raspberry pi imager. Once the program is downloaded and running in your PC please insert the SD card that you desire to use to install the software.

## Installing the Operative System

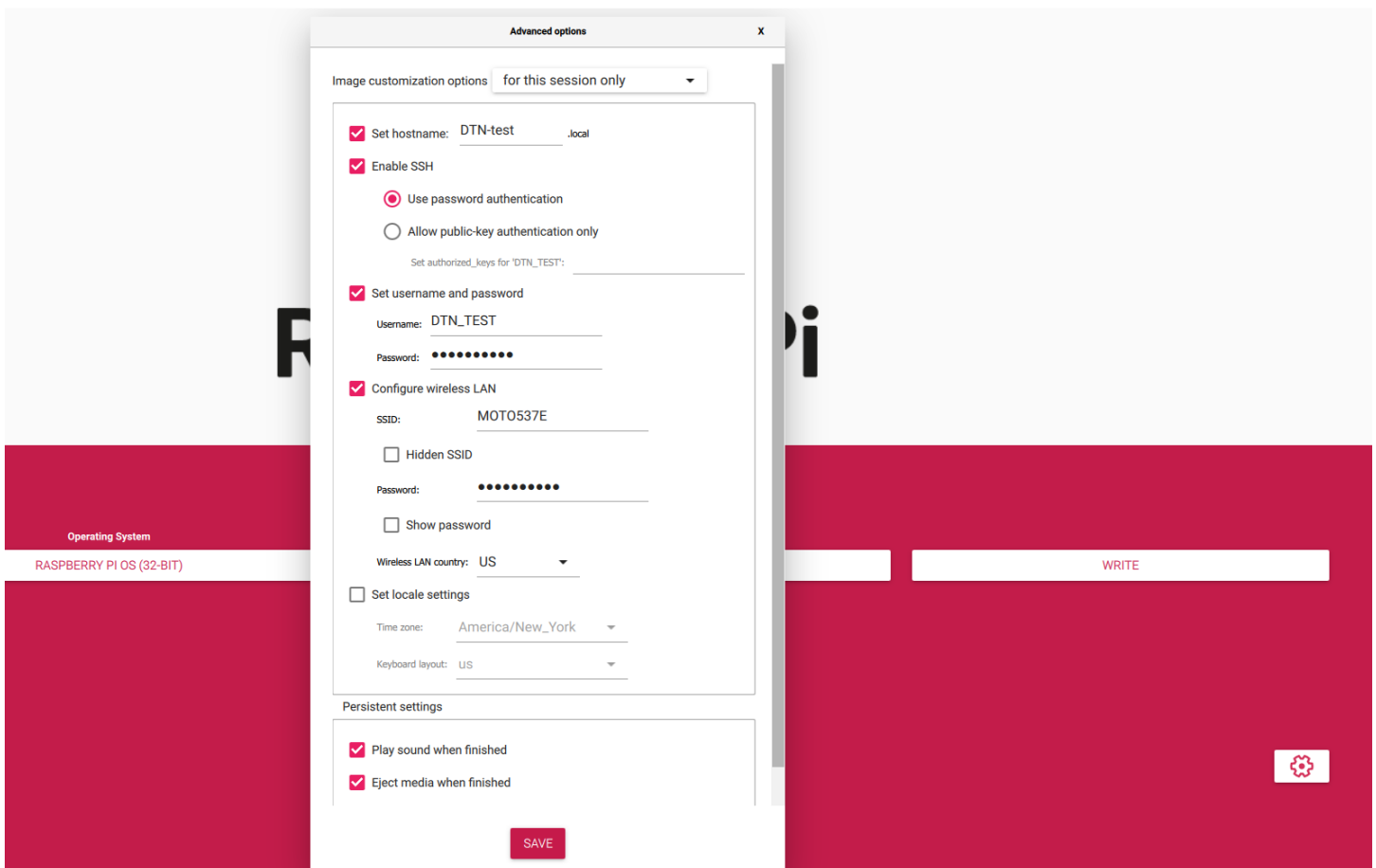
1. Run the “Raspberry Pi Imager”, click on CHOOSE OS and select the first option as shown in the image below.



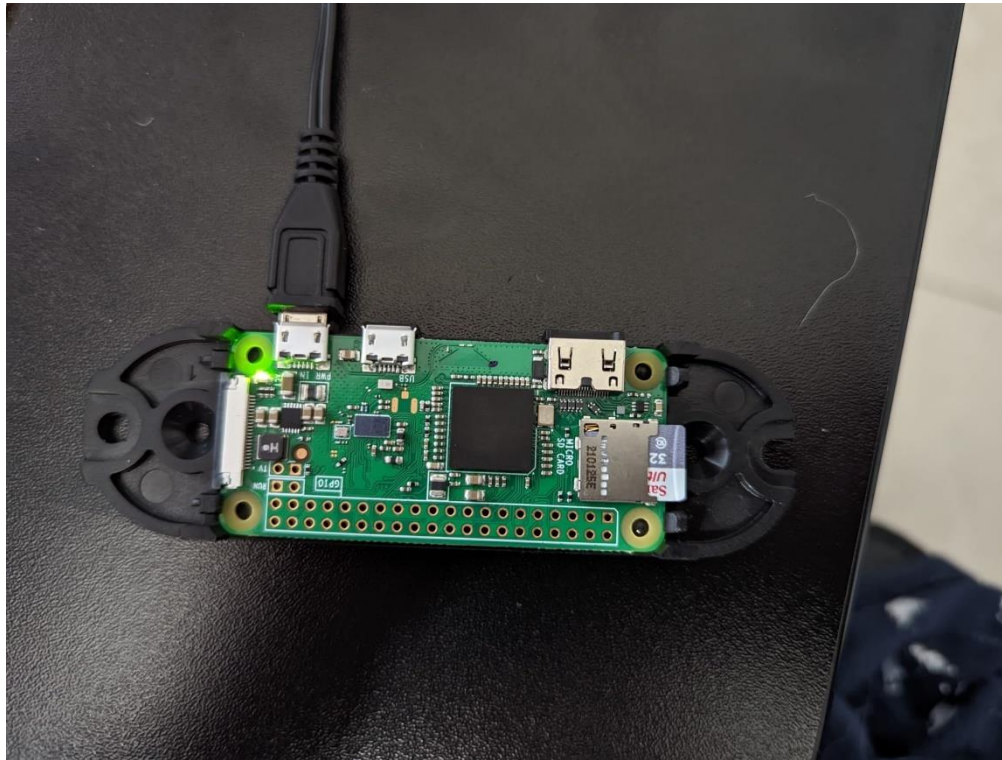
## 2. Select the microSD card where you want to install the Operative System



## 3. Click the configuration button and fill the required information. Make sure that the option "Enable SSH" is ON and set it up as "use password authentication"; The credentials entered here are the ones that will be used to login to the machine later through SSH.



- Click on “WRITE” and wait until the process is completed. Once the process is done take the microSD and insert it on the raspberry pi, connect the raspberry pi to the power and wait until it has a solid green light.



- Go to “This PC” and check the external devices connected your computer, you should be able to see that the name of the microSD card has now changed to “boot”.
- Login to your modem and check with devices are connected to the network, you should see the just created “Raspberry pi” device connected in your network.

## Access

2.4 GHz

5 GHz

### List of Connected Devices

MAC Address	Time Connected	Signal Strength(dBm)	IP Address	Host Name	Mode	Speed(Kbps)
B8:27:EB:B2:95:78	0d 0h 0m	-35	192.168.0.22	DTN-test	802.11n	58500
92:4F:B1:8A:C3:1F	0d 0h 22m	-33	192. [REDACTED]	-S7	802.11n	6000
00:E9:3A:39:DD:C8	0d 1h 55m	-59	192. [REDACTED]	1700	802.11n	1000
D0:05:2A:62:3A:92	0d 4h 12m	-46			802.11n	1000
FA:AF:0C:EB:F7:4A	0d 4h 58m	-63	192. [REDACTED]		802.11n	1000
68:14:01:96:96:85	1d 6h 23m	-67	192. [REDACTED]	9685	802.11n	5500
B4:C9:B9:B5:7D:2D	6d 14h 7m	-43	192. [REDACTED]	F37	802.11n	72222

## Getting Connected to the Raspberry Pi.

You will need to use a tool such as Putty or a linux virtual machine for ease, in my case im going to be using my own linux virtual machine to connect to the raspberry pi.

1. Connect to the machine using SSH, the credentials are the ones that you set up on the installation process.

I. ssh DTN\_TEST@192.168.0.22



```
[X]-[w1nz4c4r@w1nz4c4r-DTN2]-[~]
$ssh DTN_TEST@192.168.0.22
DTN_TEST@192.168.0.22's password:
Linux DTN-test 5.15.61+ #1579 Fri Aug 26 11:08:59 BST 2022 armv6l

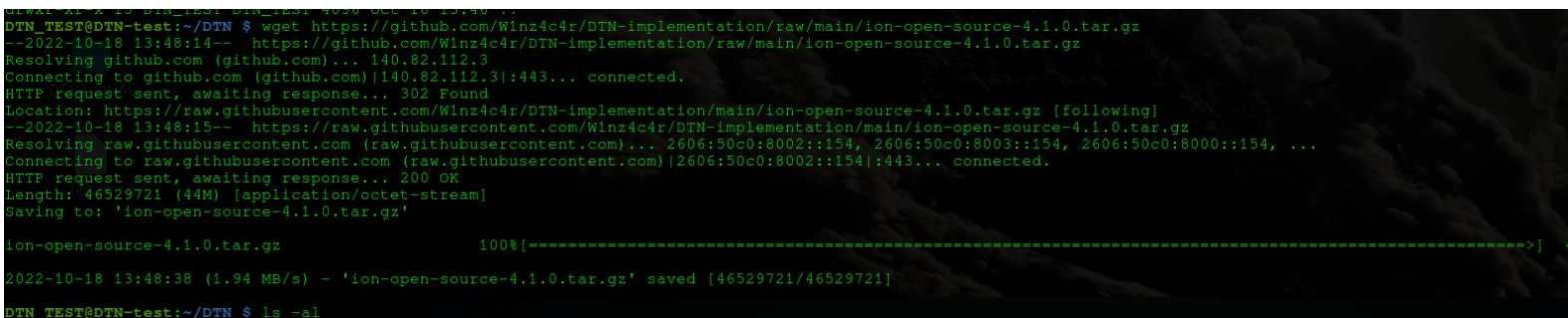
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Oct 18 10:56:57 2022 from 192.168.0.37
DTN_TEST@DTN-test:~ $
```

## DTN and ION installation process.

All the installation steps and file can also be found at <https://github.com/W1nz4c4r/DTN-implementation>

2. Create a folder in where you are going to save all the DTN/Bundle protocol files
3. download the ion.tar  
- wget <https://github.com/W1nz4c4r/DTN-implementation/raw/main/ion-open-source-4.1.0.tar.gz>



```
DTN_TEST@DTN-test:~/DTN $ wget https://github.com/W1nz4c4r/DTN-implementation/raw/main/ion-open-source-4.1.0.tar.gz
--2022-10-18 13:48:14-- https://github.com/W1nz4c4r/DTN-implementation/raw/main/ion-open-source-4.1.0.tar.gz
Resolving github.com (github.com)... 140.82.112.3
Connecting to github.com (github.com)|140.82.112.3|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://raw.githubusercontent.com/W1nz4c4r/DTN-implementation/main/ion-open-source-4.1.0.tar.gz [following]
--2022-10-18 13:48:15-- https://raw.githubusercontent.com/W1nz4c4r/DTN-implementation/main/ion-open-source-4.1.0.tar.gz
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 2606:50c0:8002::154, 2606:50c0:8003::154, 2606:50c0:8000::154, ...
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|2606:50c0:8002::154|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 46529721 (44M) [application/octet-stream]
Saving to: 'ion-open-source-4.1.0.tar.gz'

ion-open-source-4.1.0.tar.gz      100%[=====] 4
2022-10-18 13:48:38 (1.94 MB/s) - 'ion-open-source-4.1.0.tar.gz' saved [46529721/46529721]

DTN_TEST@DTN-test:~/DTN $ ls -al
```

4. Unzip the .tar file

- tar -xf ion-open-source-4.1.0.tar.gz

```
DTN_TEST@DTN-test:~/DTN $ tar -xf ion-open-source-4.1.0.tar.gz
DTN_TEST@DTN-test:~/DTN $ ls -la
total 45452
drwxr-xr-x  3 DTN_TEST DTN_TEST    4096 Oct 18 13:52 .
drwxr-xr-x 15 DTN_TEST DTN_TEST    4096 Oct 18 13:46 ..
drwxr-xr-x 27 DTN_TEST DTN_TEST    4096 May 31 2021 ion-open-source-4.1.0
-rw-r--r--  1 DTN_TEST DTN_TEST 46529721 Oct 18 13:48 ion-open-source-4.1.0.tar.gz
DTN_TEST@DTN-test:~/DTN $
```

5. cd ion-open-source-4.1.0

6. autoheader

- I. If it shows the error *“-bash: autoheader: command not found”* please follow this steps:

```
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ autoheader
-bash: autoheader: command not found
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $
```

- i. sudo apt update
- ii. sudo apt install autoconf

```
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ sudo apt install autoconf
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  libfuse2
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  automake autotools-dev libsigsegv2 m4
Suggested packages:
  autoconf-archive gnu-standards autoconf-doc libtool gettext m4-doc
The following NEW packages will be installed:
  autoconf automake autotools-dev libsigsegv2 m4
0 upgraded, 5 newly installed, 0 to remove and 0 not upgraded.
Need to get 1424 kB of archives.
After this operation, 4307 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

- iii. sudo localectl set-locales LANG=en\_IN.UTF-8
- iv. sudo reboot
- v. wait for one or two minutes while the Raspberry reboot. Connect again with ssh and go to the folder you where previously on.

## vi. Autoheader

7. Aclocal
8. Autoconf
9. Automake

```
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ aclocal
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ autoconf
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ automake
Makefile.am:485: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:488: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:491: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:685: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:688: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:691: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:825: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:828: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:1146: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:1149: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:1152: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:1724: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:1727: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2006: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2009: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2012: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2483: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2486: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2489: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2709: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2712: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2789: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2792: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2795: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2934: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2937: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:2940: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3032: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3035: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3112: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3115: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3118: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3219: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3222: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3225: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3318: warning: '%'-style pattern rules are a GNU make extension
Makefile.am:3480: warning: ':='-style assignments are not portable
Makefile.am:3480: warning: filter %.1 %.3 %.5,$(man_MANS: non-POSIX variable name
Makefile.am:3480: (probably a GNU make extension)
Makefile.am:3482: warning: ':='-style assignments are not portable
Makefile.am:3482: warning: patsubst %,%.ps,$(justmans: non-POSIX variable name
Makefile.am:3482: (probably a GNU make extension)
Makefile.am:3483: warning: ':='-style assignments are not portable
Makefile.am:3483: warning: sort $(filter %.1.ps,$(mans_as_ps: non-POSIX variable name
Makefile.am:3483: (probably a GNU make extension)
Makefile.am:3484: warning: ':='-style assignments are not portable
Makefile.am:3484: warning: sort $(filter %.3.ps,$(mans_as_ps: non-POSIX variable name
Makefile.am:3484: (probably a GNU make extension)
Makefile.am:3485: warning: ':='-style assignments are not portable
Makefile.am:3485: warning: sort $(filter %.5.ps,$(mans_as_ps: non-POSIX variable name
Makefile.am:3485: (probably a GNU make extension)
Makefile.am:3486: warning: ':='-style assignments are not portable
Makefile.am:3489: warning: '%'-style pattern rules are a GNU make extension
```

10. ./configure CFLAGS='-O0 -ggdb3' CPPFLAGS='-O0 -ggdb3' CXXFLAGS='-O0 -ggdb3'



```

DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ ./configure CFLAGS='-O0 -ggdb3' CPPFLAGS='-O0 -ggdb3' CXXFLAGS='-O0 -ggdb3'
checking for a BSD-compatible install... /usr/bin/install -c
checking whether build environment is sane... yes
checking for a thread-safe mkdir -p... /usr/bin/mkdir -p
checking for gawk... no
checking for mawk... mawk
checking whether make sets $(MAKE)... yes
checking whether make supports nested variables... yes
checking for gcc... gcc
checking whether the C compiler works... yes
checking for C compiler default output file name... a.out
checking for suffix of executables...
checking whether we are cross compiling... no
checking for suffix of object files... o
checking whether we are using the GNU C compiler... yes
checking whether gcc accepts -g... yes
checking for gcc option to accept ISO C89... none needed
checking whether gcc understands -c and -o together... yes
checking whether make supports the include directive... yes (GNU style)
checking dependency style of gcc... gcc3
checking for ar... ar
checking the archiver (ar) interface... ar
checking build system type... armv6l-unknown-linux-gnueabi
checking host system type... armv6l-unknown-linux-gnueabi
checking how to print strings... printf
checking for a sed that does not truncate output... /usr/bin/sed
checking for grep that handles long lines and -e... /usr/bin/grep
checking for egrep... /usr/bin/grep -E
checking for fgrep... /usr/bin/grep -F
checking for ld used by gcc... /usr/bin/ld
checking if the linker (/usr/bin/ld) is GNU ld... yes
checking for BSD- or MS-compatible name lister (nm)... /usr/bin/nm -B
checking the name lister (/usr/bin/nm -B) interface... BSD nm
checking whether ln -s works... yes
checking the maximum length of command line arguments... 1572864
checking how to convert armv6l-unknown-linux-gnueabi file names to armv6l-unknown-linux-gnueabi format... func_convert_f
checking how to convert armv6l-unknown-linux-gnueabi file names to toolchain format... func_convert_file_noop
checking for /usr/bin/ld option to reload object files... -r
checking for objdump... objdump
checking how to recognize dependent libraries... pass_all
checking for dltool... no
checking how to associate runtime and link libraries... printf %s\n
checking for archiver @FILE support... @
checking for strip... strip
checking for ranlib... ranlib
checking command to parse /usr/bin/nm -B output from gcc object... ok

```

The following instructions will take some time to finish

11. Make
12. sudo make install
13. sudo ldconfig

If there is no error display the installation of the DTN-ION software has finished successfully

## Installing python3 library (pyion)

this python library pyion will be the in charge of handling all the bundle protocol usage and its all facilitated on pre-defined classes.

1. sudo apt-get install autotools-dev automake python3-dev
2. add the ion folder to the environment
  - a. export ION\_HOME="/your-ion-folder-path"
  - b. you can verify it was correctly adding by entering:
    - echo \$ION\_HOME
 the path of the ion folder should show up

```

DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ pwd
/home/DTN_TEST/DTN/ion-open-source-4.1.0
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ export ION_HOME=/home/DTN_TEST/DTN/ion-open-source-4.1.0
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $ echo $ION_HOME
/home/DTN_TEST/DTN/ion-open-source-4.1.0
DTN_TEST@DTN-test:~/DTN/ion-open-source-4.1.0 $

```

3. git clone --branch v4.1.0 <https://github.com/msancheznet/pyion.git>

```
DTN_TEST@DTN-test:~/DTN $ git clone --branch v4.1.0 https://github.com/msancheznet/pyion.git
Cloning into 'pyion'...
remote: Enumerating objects: 1218, done.
remote: Counting objects: 100% (62/62), done.
remote: Compressing objects: 100% (62/62), done.
remote: Total 1218 (delta 0), reused 0 (delta 0), pack-reused 1156
Receiving objects: 100% (1218/1218), 916.99 KiB | 946.00 KiB/s, done.
Resolving deltas: 100% (832/832), done.
DTN_TEST@DTN-test:~/DTN $
```

4. `cd pyion`
5. `sudo -E python3 setup.py install`

### Installing rlwrap

We will use the program `rlwrap` to run our main DTN code because it will make its navigation a lot smoother

- `sudo apt install rlwrap`