HP-Mini Ubuntu Setup Notes

2017 April 2

Enable SSH

http://ubuntuhandbook.org/index.php/2016/04/enable-ssh-ubuntu-16-04-lts/

```
sudo apt-get install openssh-server
sudo service ssh status
```

Optionally you may change some settings by editing the configuration file:

```
sudo nano /etc/ssh/sshd_config
```

```
sudo service ssh restart
```

Bluetooth/BLE USB - Broadcom BCM20702

Recommended reading:

Ubuntu/linux Daemon (bluetoothd is a daemon, also referred to as a "service")
https://en.wikipedia.org/wiki/Daemon_(computing)

D-Bus Desktop Bus inter-process communiction (daemons, marshalling)
https://en.wikipedia.org/wiki/D-Bus

References:

https://learn.adafruit.com/install-bluez-on-the-raspberry-pi/installation
https://software.intel.com/en-us/java-for-bluetooth-le-apps
http://www.elinux.org/RPi_Bluetooth_LE
http://fam-haugk.de/starting-with-bluetooth-le-on-the-raspberry-pi
http://www.bluez.org/download/
http://www.linuxfromscratch.org/blfs/view/8.0/general/bluez.html

Scan for USB devices plugged-in:

```
~$ lsusb
Bus 001 Device 004: ID 058f:6387 Alcor Micro Corp. Flash Drive
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 005 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 004 Device 002: ID 0a5c:21e8 Broadcom Corp. BCM20702A0 Bluetooth 4.0
Bus 004 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 003 Device 002: ID 045e:0040 Microsoft Corp. Wheel Mouse Optical
Bus 003 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 002 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
```

Check current version of BlueZ

```
:~$ dpkg --status bluez
Package: bluez
Status: install ok installed
Priority: optional
Section: admin
Installed-Size: 4155
Maintainer: Ubuntu Developers <ubuntu-devel-discuss@lists.ubuntu.com>
Architecture: i386
Multi-Arch: foreign
Version: 5.37-0ubuntu5
Replaces: bluez-alsa, bluez-audio (<= 3.36-3), bluez-input, bluez-network, bluez-
serial, bluez-utils (<= 3.36-3), udev (<< 170-1)
Depends: libc6 (>= 2.15), libdbus-1-3 (>= 1.9.14), libglib2.0-0 (>= 2.31.8),
```

```
libreadline6 (>= 6.0), libudev1 (>= 196), init-system-helpers (>= 1.18~), lsb-base
(>= 4.1+Debian11ubuntu7), kmod, udev (>= 170-1), dbus
Breaks: udev (<< 170-1)
.
.
.
```

The Bluetooth Daemon:
http://manpages.ubuntu.com/manpages/xenial/man8/bluetoothd.8.html

```
~$ bluetoothd --version
5.37
```

Post version 5.00:

```
~$ bluetoothctl --version
5.37
```

Remove any old version (this clobbers hcitool, and apparently Ubuntu System Settings, is --purge really necessary?)

```
~$ sudo apt-get --purge remove bluez
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  apg cups-pk-helper gkbd-capplet libgeonames0 libgnome-bluetooth13 libgnomekbd8
  libtimezonemap-data libtimezonemap1 signon-keyring-extension ubuntu-system-
service
  unity-control-center-faces
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED:
  bluez* gnome-bluetooth* gnome-user-share* indicator-bluetooth* pulseaudio-module-
bluetooth*
  ubuntu-desktop* unity-control-center* unity-control-center-signon*
0 upgraded, 0 newly installed, 8 to remove and 0 not upgraded.
After this operation, 11.4 MB disk space will be freed.
Do you want to continue? [Y/n] Y
(Reading database ... 210950 files and directories currently installed.)
Removing pulseaudio-module-bluetooth (1:8.0-0ubuntu3.2) ...
.
.
.
Processing triggers for dbus (1.10.6-1ubuntu3.3) …
```

Also?

```
~$ sudo apt autoremove
```

Get latest Ubuntu updates:

```
~$ sudo apt-get update
Hit:1 http://ppa.launchpad.net/webupd8team/java/ubuntu xenial InRelease
.
.
.
Fetched 1,291 kB in 6s (209 kB/s)
Reading package lists... Done
```

Install the following (note this is a single command-line):

```
~$ sudo apt-get install -y libusb-dev libdbus-1-dev libglib2.0-dev libudev-dev
libical-dev libreadline-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
```

```
The following packages were automatically installed and are no longer required:
  apg cups-pk-helper gkbd-capplet libgeonames0 libgnome-bluetooth13 libgnomekbd8
  libtimezonemap-data libtimezonemap1 signon-keyring-extension ubuntu-system-
service
  unity-control-center-faces
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
.
.
.
Setting up libreadline-dev:i386 (6.3-8ubuntu2) ...
Setting up libusb-dev (2:0.1.12-28) ...
Processing triggers for libc-bin (2.23-0ubuntu5) …
```

3-Apr - try fixing System Settings now, then download/install BlueZ...

```
~$ sudo apt-get install unity-control-center

Verify System Settings... works again.
systemctl stop bluetooth
systemctl disable bluetooty
Power-off, remove BLE dongle, Power-on
```

Go to home directory:

```
~$ cd ~
```

Get latest BlueZ version (Note: check www.bluez.org/download/):

```
~$ wget https://www.kernel.org/pub/linux/bluetooth/bluez-5.44.tar.gz
Resolving www.kernel.org (www.kernel.org)... 147.75.196.57, 2604:1380:1:3600::3
Connecting to www.kernel.org (www.kernel.org)|147.75.196.57|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2520783 (2.4M) [application/x-gzip]
Saving to: 'bluez-5.44.tar.gz'

bluez-5.44.tar.gz       100%[=============================>]   2.40M   353KB/s
in 10s

2017-03-18 10:39:02 (239 KB/s) - 'bluez-5.44.tar.gz' saved [2520783/2520783]
```

Unzip downloaded file:

```
~$ tar xvf bluez-5.44.tar.gz
bluez-5.44/
bluez-5.44/Makefile.plugins
bluez-5.44/emulator/
.
.
.
bluez-5.44/test/sap_client.py
bluez-5.44/test/test-thermometer
bluez-5.44/test/simple-player
```

Change to unzipped directory:

```
~$ cd bluez-5.44

~/bluez-5.44$ export LDFLAGS=-lrt

Note: all one line
~/bluez-5.44$ ./configure --prefix=/usr --sysconfdir=/etc --localstatedir=/var
--enable-library -disable-systemd
checking for a BSD-compatible install... /usr/bin/install -c
checking whether build environment is sane... yes
```

```
checking for a thread-safe mkdir -p... /bin/mkdir -p
checking for gawk... no
checking for mawk... mawk
checking whether make sets $(MAKE)... yes
.
.
.
config.status: creating config.h
config.status: executing depfiles commands
config.status: executing libtool commands
```

Make it

```
~$ make
  GEN      lib/bluetooth/bluetooth.h
  GEN      lib/bluetooth/hci.h
  GEN      lib/bluetooth/hci_lib.h
  GEN      lib/bluetooth/sco.h
.
.
.
  CC       tools/hid2hci.o
  CCLD     tools/hid2hci
  GEN      tools/97-hid2hci.rules
```

Before make install, if bluetooth USB is plugged-in, check if daemon is active, stop bluetooth if it is, disable the daemon and remove the dongle.

```
~/bluez-5.44$ sudo systemctl status bluetooth
```

https://www.digitalocean.com/community/tutorials/how-to-use-systemctl-to-manage-systemd-services-and-units

```
If running, stop it now
~/bluez-5.44$ sudo systemctl stop bluetooth

I think 'disable' persists, preventing auto enable of bluetooth on next power-on
~/bluez-5.44$ sudo systemctl disable bluetooth

~/bluez-5.44$ cd /var/lib/bluetooth
Remove any directories found there belonging to the bluetooth USB adapter as
identified by its MAC ID
~/var/lib/bluetooth$ ls -la
total 12
drwxr-xr-x  3 root root 4096 Apr  1 08:35 .
drwxr-xr-x 68 root root 4096 Mar 30 13:47 ..
drwx------  2 root root 4096 Apr  1 08:35 5C:F3:70:7F:1E:56
~/var/lib/bluetooth$ sudo -s
~/var/lib/bluetooth# rm -r *
Verify the directory is empty
~/var/lib/bluetooth$ ls -la
~/var/lib/bluetooth# exit
```

Power-down, remove bluetooth USB (if installed), Power-up

```
~$ cd bluez-5.44

~/bluez-5.44$ sudo make install
make --no-print-directory install-am
 /bin/mkdir -p '/usr/lib'
 /bin/bash ./libtool   --mode=install /usr/bin/install -c   lib/libbluetooth.la
.
.
.
id2hci.1 '/usr/share/man/man1'
 /bin/mkdir -p '/usr/share/man/man8'
```

```
 /usr/bin/install -c -m 644 src/bluetoothd.8 '/usr/share/man/man8'
 /bin/mkdir -p '/usr/lib/pkgconfig'
 /usr/bin/install -c -m 644 lib/bluez.pc '/usr/lib/pkgconfig'
 /bin/mkdir -p '/lib/udev/rules.d'
 /usr/bin/install -c -m 644 tools/97-hid2hci.rules '/lib/udev/rules.d'
 /bin/mkdir -p '/lib/udev'
  /bin/bash ./libtool   --mode=install /usr/bin/install -c tools/hid2hci
'/lib/udev'
libtool: install: /usr/bin/install -c tools/hid2hci /lib/udev/hid2hci
```

NOTE: It looks though the bluez-5.44 installer puts bluetoothd in /usr/libexec/bluetooth and it should be run from there (31-Mar)

```
~/bluez-5.44$ sudo cp ./src/bluetoothd /usr/local/bin/
```

3-Apr after deleting bluez-5.44 and re-running make + make install, the following files were updated and didn't need to be copied.

```
~/bluez-5.44$ sudo cp ./tools/bluemoon /usr/bin
~/bluez-5.44$ sudo cp ./client/bluetoothctl /usr/bin
```

NOTE: bluetooth.service went missing... so adding this: (29-mar)

```
~/bluez-5.44$ sudo cp ./src/bluetooth.service /lib/systemd/system/
```

Power-down, insert bluetooth USB dongle, Power-up

```
~$ cd ~
~$ systemctl status bluetooth
● bluetooth.service - Bluetooth service
   Loaded: loaded (/lib/systemd/system/bluetooth.service; disabled; vendor preset:
enabled)
   Active: inactive (dead)
     Docs: man:bluetoothd(8)

~$ systemctl enable bluetooth
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-unit-files ===
Authentication is required to manage system service or unit files.
Authenticating as: neil,,, (neil)
Password:
==== AUTHENTICATION COMPLETE ===
Created symlink from /etc/systemd/system/dbus-org.bluez.service to
/lib/systemd/system/bluetooth.service.
Created symlink from /etc/systemd/system/bluetooth.target.wants/bluetooth.service
to /lib/systemd/system/bluetooth.service.
==== AUTHENTICATING FOR org.freedesktop.systemd1.reload-daemon ===
Authentication is required to reload the systemd state.
Authenticating as: neil,,, (neil)
Password:
==== AUTHENTICATION COMPLETE ===

~$ systemctl start bluetooth
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-units ===
Authentication is required to start 'bluetooth.service'.
Authenticating as: neil,,, (neil)
Password:
==== AUTHENTICATION COMPLETE ===

~$ systemctl status bluetooth
● bluetooth.service - Bluetooth service
   Loaded: loaded (/lib/systemd/system/bluetooth.service; enabled; vendor preset:
enabled)
   Active: active (running) since Sat 2017-04-01 08:35:45 CDT; 18s ago
     Docs: man:bluetoothd(8)
```

```
 Main PID: 2129 (bluetoothd)
   Status: "Running"
   CGroup: /system.slice/bluetooth.service
           └─2129 /usr/libexec/bluetooth/bluetoothd

Apr 01 08:35:45 HP-Mini systemd[1]: Starting Bluetooth service...
Apr 01 08:35:45 HP-Mini bluetoothd[2129]: Bluetooth daemon 5.44
Apr 01 08:35:45 HP-Mini systemd[1]: Started Bluetooth service.
Apr 01 08:35:45 HP-Mini bluetoothd[2129]: Starting SDP server
Apr 01 08:35:45 HP-Mini bluetoothd[2129]: Bluetooth management interface 1.10
initialized
```

BlueZ-5.44 had deprecated many of the bluetooth tools (hciconfig, hcitool, etc) used previously, bluetoothctl has for the most part, replaced them.

https://wiki.archlinux.org/index.php/bluetooth

```
~$ bluetoothctl
[NEW] Controller 5C:F3:70:7F:1E:56 HP-Mini [default]
[bluetooth]# scan on
Failed to start discovery: org.bluez.Error.NotReady
[bluetooth]# list
Controller 5C:F3:70:7F:1E:56 HP-Mini [default]
[bluetooth]# power on
[CHG] Controller 5C:F3:70:7F:1E:56 Class: 0x00010c
Changing power on succeeded
[CHG] Controller 5C:F3:70:7F:1E:56 Powered: yes
[bluetooth]# scan on
Discovery started
[CHG] Controller 5C:F3:70:7F:1E:56 Discovering: yes
[NEW] Device F4:F5:D8:62:4A:EF F4-F5-D8-62-4A-EF
[NEW] Device 00:A0:50:30:FA:98 BLE_Finder
[bluetooth]# scan off
[CHG] Device 00:A0:50:30:FA:98 RSSI is nil
[CHG] Device F4:F5:D8:62:4A:EF RSSI is nil
Discovery stopped
[CHG] Controller 5C:F3:70:7F:1E:56 Discovering: no
[bluetooth]# connect 00:A0:50:30:FA:98
Attempting to connect to 00:A0:50:30:FA:98
[CHG] Device 00:A0:50:30:FA:98 Connected: yes
Connection successful
[NEW] Primary Service
        /org/bluez/hci0/dev_00_A0_50_30_FA_98/service0008
        00001801-0000-1000-8000-00805f9b34fb
        Generic Attribute Profile
[NEW] Characteristic
        /org/bluez/hci0/dev_00_A0_50_30_FA_98/service0008/char0009
        00002a05-0000-1000-8000-00805f9b34fb
        Service Changed
[NEW] Descriptor
        /org/bluez/hci0/dev_00_A0_50_30_FA_98/service0008/char0009/desc000b
        00002902-0000-1000-8000-00805f9b34fb
        Client Characteristic Configuration
[NEW] Primary Service
        /org/bluez/hci0/dev_00_A0_50_30_FA_98/service000c
        00001802-0000-1000-8000-00805f9b34fb
        Immediate Alert
[NEW] Characteristic
        /org/bluez/hci0/dev_00_A0_50_30_FA_98/service000c/char000d
        00002a06-0000-1000-8000-00805f9b34fb
        Alert Level
[CHG] Device 00:A0:50:30:FA:98 UUIDs: 00001800-0000-1000-8000-00805f9b34fb
```

```
[CHG] Device 00:A0:50:30:FA:98 UUIDs: 00001801-0000-1000-8000-00805f9b34fb
[CHG] Device 00:A0:50:30:FA:98 UUIDs: 00001802-0000-1000-8000-00805f9b34fb
[CHG] Device 00:A0:50:30:FA:98 ServicesResolved: yes
[BLE_Finder]# info 00:A0:50:30:FA:98
Device 00:A0:50:30:FA:98
        Name: BLE_Finder
        Alias: BLE_Finder
        Appearance: 0x0200
        Paired: no
        Trusted: no
        Blocked: no
        Connected: yes
        LegacyPairing: no
        UUID: Generic Access Profile    (00001800-0000-1000-8000-00805f9b34fb)
        UUID: Generic Attribute Profile (00001801-0000-1000-8000-00805f9b34fb)
        UUID: Immediate Alert           (00001802-0000-1000-8000-00805f9b34fb)
[BLE_Finder]# disconnect 00:A0:50:30:FA:98
[BLE_Finder]# quit
```

Power-down & power-up

NOTE: The following may only be necessary with a “headless” system like Raspbian... Ubuntu's GUI appears to power-up the bluetooth by default.

Enable automatic power-on (main.conf didn't exist after 5.44 install...)

```
~$ cd ~/bluez-5.44
~/bluez-5.44$ sudo mkdir /etc/bluetooth
~/bluez-5.44$ sudo cp ./src/main.conf /etc/bluetooth/
~/bluez-5.44$ sudo nano /etc/bluetooth/main.conf
```

Change:

```
# AutoEnable defines option to enable all controllers when they are found.
# This includes adapters present on start as well as adapters that are plugged
# in later on. Defaults to 'false'.
#AutoEnable=false
```

To:

```
AutoEnable=true
```

Ctrl-O, [Enter], Ctrl-X

STOP HERE! (1-Apr)

At this point the bluetooth should be functional with both the TinyB command-line examples and IntelliJ. Hold off attempting to restore the Ubuntu System Settings... until bluetooth connectivity has been confirmed and multiple power-off/power-on iterations indicate it is stable.

Restore Ubuntu System Settings:

NOTE: This restores a bunch of stuff removed by **sudo apt-get --purge remove bluez**

```
The following has already been done with the remove bluez
sudo apt-get remove unity-control-center
sudo apt autoremove

Just to be safe, let's shutdown bluetooth
~$ sudo systemctl stop bluetooth
~$ systemctl status bluetooth
● bluetooth.service - Bluetooth service
   Loaded: loaded (/lib/systemd/system/bluetooth.service; enabled; vendor preset:
enabled)
   Active: inactive (dead) since Fri 2017-03-31 11:48:08 CDT; 5s ago
     Docs: man:bluetoothd(8)
```

~~ Process: 855 ExecStart=/usr/libexec/bluetooth/bluetoothd (code=exited, status=0/SUCCESS)~~
~~ Main PID: 855 (code=exited, status=0/SUCCESS)~~
~~   Status: "Quitting"~~

~~Mar 31 09:57:47 HP-Mini systemd[1]: Starting Bluetooth service...~~
~~Mar 31 09:57:48 HP-Mini bluetoothd[855]: Bluetooth daemon 5.44~~
~~Mar 31 09:57:48 HP-Mini bluetoothd[855]: Starting SDP server~~
~~Mar 31 09:57:48 HP-Mini bluetoothd[855]: Bluetooth management interface 1.10 initialized~~
~~Mar 31 09:57:48 HP-Mini systemd[1]: Started Bluetooth service.~~
~~Mar 31 11:48:08 HP-Mini bluetoothd[855]: Terminating~~
~~Mar 31 11:48:08 HP-Mini systemd[1]: Stopping Bluetooth service...~~
~~Mar 31 11:48:08 HP-Mini systemd[1]: Stopped Bluetooth service.~~
~~~$ **sudo systemctl disable bluetooth**~~
~~Removed symlink /etc/systemd/system/bluetooth.target.wants/bluetooth.service.~~
~~Removed symlink /etc/systemd/system/dbus-org.bluez.service.~~
~~~$ **sudo apt-get install unity-control-center**~~
~~Reading package lists... Done~~
~~Building dependency tree~~
~~Reading state information... Done~~
~~The following additional packages will be installed:~~
~~ apg bluez cups-pk-helper gkbd-capplet gnome-bluetooth gnome-user-share indicator-bluetooth libgeonames0~~
~~ libgnome-bluetooth13 libgnomekbd8 libtimezonemap-data libtimezonemap1 ubuntu-system-service~~
~~ unity-control-center-faces~~
~~Suggested packages:~~
~~ apache2-bin libapache2-mod-dnssd~~
~~The following NEW packages will be installed:~~
~~ apg bluez cups-pk-helper gkbd-capplet gnome-bluetooth gnome-user-share indicator-bluetooth libgeonames0~~
~~ libgnome-bluetooth13 libgnomekbd8 libtimezonemap-data libtimezonemap1 ubuntu-system-service~~
~~ unity-control-center unity-control-center-faces~~
~~0 upgraded, 15 newly installed, 0 to remove and 0 not upgraded.~~
~~Need to get 0 B/5,073 kB of archives.~~
~~After this operation, 19.1 MB of additional disk space will be used.~~
~~Do you want to continue? [Y/n]~~
~~Selecting previously unselected package apg.~~
~~(Reading database ... 210847 files and directories currently installed.)~~
~~Preparing to unpack .../apg_2.2.3.dfsg.1-2ubuntu1_i386.deb ...~~
~~Unpacking apg (2.2.3.dfsg.1-2ubuntu1) ...~~
~~Selecting previously unselected package bluez.~~
~~Preparing to unpack .../bluez_5.37-0ubuntu5_i386.deb ...~~
~~Unpacking bluez (5.37-0ubuntu5) ...~~
~~Selecting previously unselected package libgnomekbd8:i386.~~
~~Preparing to unpack .../libgnomekbd8_3.6.0-1ubuntu2_i386.deb ...~~
~~Unpacking libgnomekbd8:i386 (3.6.0-1ubuntu2) ...~~
~~Selecting previously unselected package gkbd-capplet.~~
~~Preparing to unpack .../gkbd-capplet_3.6.0-1ubuntu2_i386.deb ...~~
~~Unpacking gkbd-capplet (3.6.0-1ubuntu2) ...~~
~~Selecting previously unselected package libgnome-bluetooth13:i386.~~
~~Preparing to unpack .../libgnome-bluetooth13_3.18.2-1ubuntu2_i386.deb ...~~
~~Unpacking libgnome-bluetooth13:i386 (3.18.2-1ubuntu2) ...~~
~~Selecting previously unselected package gnome-bluetooth.~~
~~Preparing to unpack .../gnome-bluetooth_3.18.2-1ubuntu2_i386.deb ...~~
~~Unpacking gnome-bluetooth (3.18.2-1ubuntu2) ...~~
~~Selecting previously unselected package gnome-user-share.~~
~~Preparing to unpack .../gnome-user-share_3.14.2-2ubuntu4_i386.deb ...~~
~~Unpacking gnome-user-share (3.14.2-2ubuntu4) ...~~
~~Selecting previously unselected package libgeonames0:i386.~~
~~Preparing to unpack .../libgeonames0_0.2+16.04.20160321-0ubuntu1_i386.deb ...~~

~~Unpacking libgeonames0:i386 (0.2+16.04.20160321-0ubuntu1) ...~~
~~Selecting previously unselected package libtimezonemap-data.~~
~~Preparing to unpack .../libtimezonemap-data_0.4.5_all.deb ...~~
~~Unpacking libtimezonemap-data (0.4.5) ...~~
~~Selecting previously unselected package libtimezonemap1:i386.~~
~~Preparing to unpack .../libtimezonemap1_0.4.5_i386.deb ...~~
~~Unpacking libtimezonemap1:i386 (0.4.5) ...~~
~~Selecting previously unselected package ubuntu-system-service.~~
~~Preparing to unpack .../ubuntu-system-service_0.3_all.deb ...~~
~~Unpacking ubuntu-system-service (0.3) ...~~
~~Selecting previously unselected package indicator-bluetooth.~~
~~Preparing to unpack .../indicator-bluetooth_0.0.6+16.04.20160526-0ubuntu1_i386.deb ...~~
~~Unpacking indicator-bluetooth (0.0.6+16.04.20160526-0ubuntu1) ...~~
~~Selecting previously unselected package unity-control-center.~~
~~Preparing to unpack .../unity-control-center_15.04.0+16.04.20160705-0ubuntu1_i386.deb ...~~
~~Unpacking unity-control-center (15.04.0+16.04.20160705-0ubuntu1) ...~~
~~Selecting previously unselected package unity-control-center-faces.~~
~~Preparing to unpack .../unity-control-center-faces_15.04.0+16.04.20160705-0ubuntu1_all.deb ...~~
~~Unpacking unity-control-center-faces (15.04.0+16.04.20160705-0ubuntu1) ...~~
~~Selecting previously unselected package cups-pk-helper.~~
~~Preparing to unpack .../cups-pk-helper_0.2.5-2ubuntu2_i386.deb ...~~
~~Unpacking cups-pk-helper (0.2.5-2ubuntu2) ...~~
~~Processing triggers for man-db (2.7.5-1) ...~~
~~Processing triggers for systemd (229-4ubuntu16) ...~~
~~Processing triggers for ureadahead (0.100.0-19) ...~~
~~ureadahead will be reprofiled on next reboot~~
~~Processing triggers for dbus (1.10.6-1ubuntu3.3) ...~~
~~Processing triggers for libc-bin (2.23-0ubuntu7) ...~~
~~Processing triggers for bamfdaemon (0.5.3~bzr0+16.04.20160824-0ubuntu1) ...~~
~~Rebuilding /usr/share/applications/bamf-2.index...~~
~~Processing triggers for gnome-menus (3.13.3-6ubuntu3.1) ...~~
~~Processing triggers for desktop-file-utils (0.22-1ubuntu5.1) ...~~
~~Processing triggers for mime-support (3.59ubuntu1) ...~~
~~Processing triggers for hicolor-icon-theme (0.15-0ubuntu1) ...~~
~~Processing triggers for gconf2 (3.2.6-3ubuntu6) ...~~
~~Processing triggers for libglib2.0-0:i386 (2.48.2-0ubuntu1) ...~~
~~Setting up apg (2.2.3.dfsg.1-2ubuntu1) ...~~
~~Setting up bluez (5.37-0ubuntu5) ...~~

~~Configuration file '/etc/bluetooth/main.conf'~~
~~ ==> File on system created by you or by a script.~~
~~ ==> File also in package provided by package maintainer.~~
~~   What would you like to do about it ? Your options are:~~
~~   Y or I : install the package maintainer's version~~
~~   N or O : keep your currently installed version~~
~~   D   : show the differences between the versions~~
~~   Z   : start a shell to examine the situation~~
~~ The default action is to keep your current version.~~
~~*** main.conf (Y/I/N/O/D/Z) [default=N] ?~~ **Y**

~~Configuration file '/etc/dbus-1/system.d/bluetooth.conf'~~
~~ ==> File on system created by you or by a script.~~
~~ ==> File also in package provided by package maintainer.~~
~~   What would you like to do about it ? Your options are:~~
~~   Y or I : install the package maintainer's version~~
~~   N or O : keep your currently installed version~~
~~   D   : show the differences between the versions~~
~~   Z   : start a shell to examine the situation~~
~~ The default action is to keep your current version.~~
~~*** bluetooth.conf (Y/I/N/O/D/Z) [default=N] ?~~ **N**

Installing new version of config file /etc/dbus-1/system.d/bluetooth.conf ...
Setting up libtimezonemap-data (0.4.5) ...
Setting up libgnomekbd8:i386 (3.6.0-1ubuntu2) ...
Setting up gnome-bluetooth (3.18.2-1ubuntu2) ...
Setting up libtimezonemap1:i386 (0.4.5) ...
Setting up gkbd-capplet (3.6.0-1ubuntu2) ...
Setting up gnome-user-share (3.14.2-2ubuntu4) ...
Setting up indicator-bluetooth (0.0.6+16.04.20160526-0ubuntu1) ...
Setting up unity-control-center (15.04.0+16.04.20160705-0ubuntu1) ...
Processing triggers for libc-bin (2.23-0ubuntu7) ...
Processing triggers for dbus (1.10.6-1ubuntu3.3) ...
Processing triggers for systemd (229-4ubuntu16) ...
Processing triggers for ureadahead (0.100.0-19) ...
ureadahead will be reprofiled on next reboot

Power-down...

This restores the System Settings, but it FUBARs bluetooth!!!
~$ systemctl status bluetooth
● bluetooth.service - Bluetooth service
   Loaded: loaded (/lib/systemd/system/bluetooth.service; enabled; vendor preset: enabled)
   Active: active (running) since Fri 2017-03-31 12:17:03 CDT; 9min ago
     Docs: man:bluetoothd(8)
 Main PID: 871 (bluetoothd)
   Status: "Running"
   CGroup: /system.slice/bluetooth.service
           └─871 /usr/lib/bluetooth/bluetoothd

Mar 31 12:17:03 HP-Mini bluetoothd[871]: Not enough free handles to register service
Mar 31 12:17:03 HP-Mini bluetoothd[871]: Not enough free handles to register service
Mar 31 12:17:03 HP-Mini systemd[1]: Started Bluetooth service.
Mar 31 12:17:03 HP-Mini bluetoothd[871]: Not enough free handles to register service
Mar 31 12:17:03 HP-Mini bluetoothd[871]: Current Time Service could not be registered
Mar 31 12:17:03 HP-Mini bluetoothd[871]: gatt time server: Input/output error (5)
Mar 31 12:17:03 HP-Mini bluetoothd[871]: Not enough free handles to register service
Mar 31 12:17:03 HP-Mini bluetoothd[871]: Not enough free handles to register service
Mar 31 12:17:03 HP-Mini bluetoothd[871]: Sap driver initialization failed.
Mar 31 12:17:03 HP-Mini bluetoothd[871]: sap-server: Operation not permitted (1)

Installing Oracle Java JDK-8

https://www.digitalocean.com/community/tutorials/how-to-install-java-with-apt-get-on-ubuntu-16-04

Oracle Java JDK-8 is not automatically installed in Ubuntu. TinyB will need it before it can be installed.

```
~$ sudo add-apt-repository ppa:webupd8team/java
~$ sudo apt-get update

~$ sudo apt-get install oracle-java8-installer

~$ sudo update-alternatives --config java
There is 1 choice for the alternative java (providing /usr/bin/java).

  Selection    Path                                            Priority   Status
------------------------------------------------------------
  0            /usr/lib/jvm/java-8-oracle/jre/bin/java   1081      auto mode
* 1            /usr/lib/jvm/java-8-oracle/jre/bin/java   1081      manual mode

Press <enter> to keep the current choice[*], or type selection number:
```

For now, leave it in manual, but ensure the java-8-oracle path is selected.

Verify the JDK8 variables have been set correctly:

```
~$ echo $JAVA_HOME
/usr/lib/jvm/java-8-oracle
```

Or:

```
:~$ printenv | grep java
DERBY_HOME=/usr/lib/jvm/java-8-oracle/db
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin:/usr/lib/jvm/java-8-oracle/bin:/usr/lib/jvm/java-8-oracle/db/bin:/usr/lib/jvm/java-8-oracle/jre/bin
JAVA_HOME=/usr/lib/jvm/java-8-oracle
J2SDKDIR=/usr/lib/jvm/java-8-oracle
J2REDIR=/usr/lib/jvm/java-8-oracle/jre
```

NOTE: When installing on Raspberry Pi, Michael Haugk set the following variables, observe the path is for an ARM platform!

```
export JAVA_HOME=/usr/lib/jvm/jdk-8-oracle-arm32-vfp-hflt
export JAVA_AWT_LIBRARY=/usr/lib/jvm/jdk-8-oracle-arm32-vfp-hflt/jre/lib/arm/libawt.so
export JAVA_JVM_LIBRARY=/usr/lib/jvm/jdk-8-oracle-arm32-vfp-hflt/jre/lib/arm/server/libjvm.so
export JAVA_INCLUDE_PATH=/usr/lib/jvm/jdk-8-oracle-arm32-vfp-hflt/include
export JAVA_INCLUDE_PATH2=/usr/lib/jvm/jdk-8-oracle-arm32-vfp-hflt/include/linux
export JAVA_AWT_INCLUDE_PATH=/usr/lib/jvm/jdk-8-oracle-arm32-vfp-hflt/include
```

Installing CMAKE

```
cmake --version

sudo apt-get --purge autoremove cmake

sudo apt-get install build-essential

cd ~

wget https://cmake.org/files/v3.7/cmake-3.7.2.tar.gz

tar xvf cmake-3.7.2.tar.gz

cd cmake-3.7.2

./configure

make

sudo make install

hash -r
```

Installing TinyB

https://github.com/intel-iot-devkit/tinyb/

TinyB uses Doxygen which in not installed by default on Ubuntu.

http://www.tutorialspoint.com/articles/how-to-install-doxygen-on-ubuntu

```
~$ cd ~

~$ sudo apt-get install doxygen
```

Also need to install git:

```
~$ sudo apt-get update
~$ sudo apt-get install git

cd ~

~$ git clone https://github.com/intel-iot-devkit/tinyb.git

cd tinyb
mkdir build
cd build

~/tinyb/build$ cmake -DBUILDJAVA=ON ..
INFO - libtinyb Version 0.5.0-8-g6e580f4
-- JNI_INCLUDE_DIRS=/usr/lib/jvm/java-8-oracle/include;/usr/lib/jvm/java-8-
oracle/include/linux;/usr/lib/jvm/java-8-oracle/include
-- JNI_LIBRARIES=/usr/lib/jvm/java-8-
oracle/jre/lib/i386/libjawt.so;/usr/lib/jvm/java-8-
oracle/jre/lib/i386/client/libjvm.so
-- Found Doxygen: /usr/bin/doxygen (found version "1.8.11")
-- Configuring done
-- Generating done
-- Build files have been written to: /home/neil/tinyb/build

~/tinyb/build$ make
Scanning dependencies of target tinybjar
[  2%] Building Java objects for tinybjar.jar
Note: /home/neil/tinyb/java/BluetoothManager.java uses unchecked or unsafe
operations.
Note: Recompile with -Xlint:unchecked for details.
[  4%] Generating CmakeFiles/tinybjar.dir/java_class_filelist
.
.
.
Scanning dependencies of target uuid
[ 98%] Building CXX object examples/CMakeFiles/uuid.dir/uuid.cpp.o
[100%] Linking CXX executable uuid
[100%] Built target uuid
```

Login as super-user to run make install

```
~/tinyb/build$ sudo -s

~/tinyb/build# make install
Generating JNI headers..
[  6%] Built target tinybjar
[ 32%] Built target tinyb
.
.
.
-- Installing: /usr/local/lib/libtinyb.so.0.5.0-8-g6e580f4.0.5.0-8-g6e580f4.0.5.0-
8-g6e580f4
```

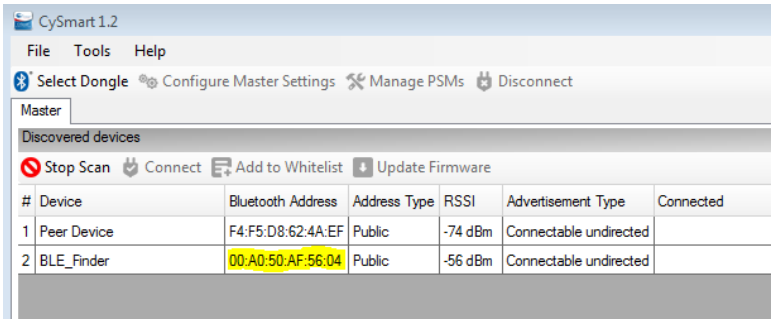
```
-- Installing: /usr/local/lib/libtinyb.so.0.5.0-8-g6e580f4
-- Installing: /usr/local/lib/libtinyb.so
```

Generate the documentation:

```
make doc
```

```
~/tinyb/build# exit
exit
```

A Cypress PSoC-4 BLE configured with a “Find Me” Profile was used to test the TinyB install. The Cypress CySmart1.2 shows the module's address as:



00:A0:50:AF:56:04
00:A0:50:30:FA:98

2017-04-14 add environment variable

```
~$ sudo nano /etc/environment
```

Add following at end of file:

```
LD_LIBRARY_PATH=”/usr/local/lib”
```

```
Ctrl-O, [Enter], Ctrl-X
```

Note: Must restart Ubuntu for new variable to take effect

Run TinyB “C” example (runs until aborted with Ctrl-C):

```
cd ~/tinyb/build
~/tinyb/build$ ./examples/hellotinyb 00:A0:50:AF:56:04
terminate called after throwing an instance of 'tinyb::BluetoothException'
  what():  GDBus.Error:org.bluez.Error.NotReady: Resource Not Ready
Aborted (core dumped)
```

If GDBus error occurs, try enabling?

```
~/tinyb/build$ sudo hciconfig hci0 up
```

```
~/tinyb/build$ sudo ./examples/hellotinyb 00:A0:50:AF:56:04
SStarted = true
Discovered devices:
Class = BluetoothDevice Path = /org/bluez/hci0/dev_00_A0_50_AF_56_04 Name =
BLE_Finder Connected = 1
Stopped = true
Discovered services:
```

```
^C
~/tinyb/build#
```

Run Java example:

```
cd ~/tinyb/build

~/tinyb/build$ sudo -s
~/tinyb/build#

~/tinyb/build# export LD_LIBRARY_PATH=/usr/local/lib

~/tinyb/build# java -cp examples/java/HelloTinyB.jar:/usr/local/lib/java/tinyb.jar
HelloTinyB 00:A0:50:AF:56:04
The discovery started: true
Address = 00:A0:50:AF:56:04 Name = BLE_Finder Connected = true
Discovery could not be stopped.
Found device: Address = 00:A0:50:AF:56:04 Name = BLE_Finder Connected = true
Sensor with the provided address connected
Services exposed by device:

^C

~/tinyb/build# exit
exit
```

http://stackoverflow.com/questions/30808453/bluez-5-30-d-bus-gatt-api-simply-discover-and-connect-to-a-ble-device-in-c

https://github.com/labapart/gattlib/

https://git.kernel.org/pub/scm/bluetooth/bluez.git/tree/

https://github.com/intel-iot-devkit/tinyb/blob/master/examples/java/HelloTinyB.java

Install Tomcat/TomEE

These instructions do not "install" Apache Tomcat & TomEE, rather they are downloaded as archive files and manually launched (in root) using a startup script. To actually install as an protected autostart deamon refer to the following link:
https://www.digitalocean.com/community/tutorials/how-to-install-apache-tomcat-8-on-ubuntu-16-04

```
~$ cd /opt
```

NOTE: The "Mavenized" releases are used in these instructions (whatever that means...)
https://tomcat.apache.org/tomcat-7.0-doc/maven-jars.html

```
opt/$ sudo wget
http://repo2.maven.org/maven2/org/apache/tomcat/tomcat/7.0.76/tomcat-7.0.76.tar.gz
```

Extract the Tomcat files from the archive

```
opt/$ sudo tar xvf tomcat-7.0.76.tar.gz
```

Rename the containing folder to something easier to use

```
sudo mv apache-tomcat-7.0.76 tomcat
```

Edit Tomcat/TomEE Management configuration /opt/tomee/conf/tomcat-users.xml

```
opt/$ cd /opt/tomcat/conf
opt/tomcat/conf$ sudo nano tomcat-users.xml
```

FROM:

```
<role rolename="tomcat"/>
<role rolename="role1"/>
<user username="tomcat" password="<must-be-changed>" roles="tomcat"/>
<user username="both" password="<must-be-changed>" roles="tomcat,role1"/>
<user username="role1" password="<must-be-changed>" roles="role1"/>
```

TO:

Note: Removing comments around role & user tags, also advisable to change username & password from example below:

```
<role rolename="manager-gui" />
<user username="tomcat" password="tomcat" roles="manager-gui" />
```

CTRL-o [Enter] CTRL-x

Also edit /opt/tomee/webapps/manager/META-INF/context.xml

```
~/ cd /opt/tomcat/webapps/manager/META-INF
/opt/tomcat/webapps/manager/META-INF$ sudo nano context.xml
```

FROM:

```
<Context antiResourceLocking="false" privileged="true" >
  <Valve className="org.apache.catalina.valves.RemoteAddrValve"
         allow="127\.\d+\.\d+\.\d+|::1|0:0:0:0:0:0:0:1" />
</Context>
```

TO:

```
<Context antiResourceLocking="false" privileged="true" >
  <Valve className="org.apache.catalina.valves.RemoteAddrValve"
         allow="^.*$" />
</Context>
```

CTRL-o [Enter] CTRL-x

Launch TomEE:

```
~$ sudo /opt/tomcat/bin/startup.sh
Using CATALINA_BASE:   /opt/tomcat
```

```
Using CATALINA_HOME:   /opt/tomcat
Using CATALINA_TMPDIR: /opt/tomcat/temp
Using JRE_HOME:        /usr/lib/jvm/java-8-oracle
Using CLASSPATH:       /opt/tomcat/bin/bootstrap.jar:/opt/tomcat/bin/tomcat-
juli.jar
Tomcat started.
```

Install IntelliJ Community

https://www.jetbrains.com/help/idea/2017.1/installing-and-launching.html#d922418e245

Warning: A new instance should not be extracted over the existing one! The target folder must be empty.

```
~$ sudo tar -xzf ideaIC-2016.3.5-no-jdk.tar.gz -C /opt/

cd /opt/idea-IC-163.13906.18/bin
```

The following must be executed in the Ubuntu GUI Terminal app:

```
~$ sudo ./idea.sh

Follow the Wizard instructions
```

In the IntelliJ GUI, select Run → Edit Configurations... and set JRE: to /etc/java-8-oracle

Deploying .war files to Tomcat

https://tomcat.apache.org/tomcat-7.0-doc/setup.html

https://idodevjobs.wordpress.com/2016/01/31/intellij-idea-community-edition-tips-and-tricks-part-i-debugging-applications/

https://dzone.com/articles/headless-setup-java-project

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>
    <groupId>com.fortney</groupId>
    <artifactId>firstMavenTomcat</artifactId>
    <packaging>war</packaging>
    <version>1.0-SNAPSHOT</version>
    <dependencies>
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>3.8.1</version>
            <scope>test</scope>
        </dependency>
    </dependencies>
    <build>
        <finalName>firstMavenTomcat</finalName>
        <plugins>
            <plugin>
                <groupId>org.apache.tomcat.maven</groupId>
                <artifactId>tomcat7-maven-plugin</artifactId>
                <version>2.2</version>
            </plugin>
        </plugins>
    </build>
</project>
```

To add a Native C++ .so library

In IntelliJ type Shift-Ctrl-Alt-S to bring up Project Structure page, select Libraries, click on “+” to add https://imagej.net/Developing_using_native_libraries

Appendix

Bluetoothctl Commands:

```
Available commands:
  list                        List available controllers
  show [ctrl]                 Controller information
  select <ctrl>               Select default controller
  devices                     List available devices
  paired-devices              List paired devices
  power <on/off>              Set controller power
  pairable <on/off>           Set controller pairable mode
  discoverable <on/off>       Set controller discoverable mode
  agent <on/off/capability>  Enable/disable agent with given capability
  default-agent               Set agent as the default one
  set-scan-filter-uuids [uuid1 uuid2 ...] Set scan filter uuids
  set-scan-filter-rssi [rssi] Set scan filter rssi, and clears pathloss
  set-scan-filter-pathloss [pathloss] Set scan filter pathloss, and clears rssi
  set-scan-filter-transport [transport] Set scan filter transport
  set-scan-filter-clear       Clears discovery filter.
  scan <on/off>               Scan for devices
  info [dev]                  Device information
  pair [dev]                  Pair with device
  trust [dev]                 Trust device
  untrust [dev]               Untrust device
  block [dev]                 Block device
  unblock [dev]               Unblock device
  remove <dev>                Remove device
  connect <dev>               Connect device
  disconnect [dev]            Disconnect device
  list-attributes [dev]       List attributes
  select-attribute <attribute> Select attribute
  attribute-info [attribute] Select attribute
  read                        Read attribute value
  write <data=[xx xx ...]>    Write attribute value
  notify <on/off>             Notify attribute value
  register-profile <UUID ...> Register profile to connect
  unregister-profile          Unregister profile
  version                     Display version
  quit                        Quit program
```

Troubleshooting

https://wiki.ubuntu.com/DebuggingBluetooth
https://github.com/intel-iot-devkit/tinyb/blob/master/TROUBLESHOOTING.md