LINUX ON THE ACER ASPIRE HYBRID TABLET

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NOTE

This is a rebuild of a talk I did for OCLUG in August of 2017. That was prior to changing the name to Linux-Ottawa. The slides are not on the website and I can't find the pdf of the talk, however I did locate the original source. I have converted it to my current talk format and assuming it all goes well, this will be posted back to the Linux-Ottawa site.

ABOUT THIS TALK

I've been looking for what I should loosely call a disposable computer for a while, and I just can't do the Windows thing. It runs pretty contrary to my "normal way of doing things". I need something that can run Linux, handle some abuse, provide the basics of what I want, and not be a recycled 32bit laptop with big batteries, etc.

I don't know if this is it yet, but it hits enough checkboxes to get a test run.

WHAT HARDWARE VERSION DID I PICK?

That is a great question, one that I would be very willing to answer if I actually knew. This was an idle purchase, simply because it was sufficiently cheap so that I wouldn't care if I bricked it.

The reason for the mystery is that the box went to recycling the day after I bought it. It was a final sale item, so no returns and you would expect there to be a model number somewhere right?

That appears to be a mystery. I can get the BIOS version, I can get the processor model and speed, I just can't precisely identify it.

There is a number on the bottom, however it doesn't seem to match the serial numbers of SNID, so I suspect it is the part number for the keyboard

WHAT IS THE ACER ASPIRE SWITCH?

From the Acer website (yes, they are still making them):

Figure 1. Acer Aspire Switch 10

Hardware:

- 64bit Intel Z3735F Quadcore @ 1,33GHz

- 2GB RAM

- 10.1" WXGA 1200x800 IPS Display (Shared Memory)

- 32GB eMMC (my version)

A LITTLE MORE INFO

There are multiple models. This is an older one with limited specs. I have not yet pried off the back to see if I can upgrade the eMMC, but you never know. It also comes with a slightly thicker keyboard that has a HDD in it. As far as I can tell, they call it a Switch because the screen pops off and can be reversed into a tablet.

It has a microphone, stereo speakers, volume controls, micro SD card slot, HDMI output, mini USB, and a headphone jack. Of course, there is the detachable/reversible keyboard that also houses a full sized USB port. This will be handy later. Just to be complete, it comes with an AC adapter/charger.

GETTING STARTED

That is a great way of saying there was no documentation beyond a piece of paper that told me to plug it in and which button was the power button.

I wasn't too worried, how hard could it be to get into the BIOS?

It turns out that F2 will get you in there, or the power button and the volume up button will do if the keyboard is not attached.

Seems simple enough, boot and go.

Not so much. Figuring out how to make changes was difficult. According to everything I have read, this was designed to run windows 8.1. Period.

THE SURFACE PRO 4 WAS EASY

In comparison that is.

I found a few references and followed along. It all sort of worked as described. This little beast has more variations that I care to discuss. There are many places to find information, just not very good information.

The first thing that this little gem has going for it is a 32bit UEFI and a 64bit processor. There are not that many current 32bit distributions with UEFI available any more. I was resigned to having to either find a full 32bit system that supported UEFI, or find out how to boot 32bit and then switch to a 64bit OS.

Grub is (and will be) your friend here.

SALVATION

Is a fictional town in Texas.

A little more searching and I ran across something called the Acerium Project which has bundled a 4.8.4 kernel ostensibly with all the right things enabled, as well as a 32bit grub loader. The instructions are very simple, although you need to trust the author with his bootable image. I wasn't too concerned, as this is a cheap toy for testing with, so if it turns out to be something else, then I can just erase it. This was my easy ticket to getting started.

SIMPLE INSTRUCTIONS:

The live image is based on Ubuntu 16.10 (Yakkety Yak)

- Before installation, update the BIOS to version 1.20

- Download Aceruim Live USB image

- Extract the image into your downloads directory

- Prep a USB stick with a big fat32 partition (set the type to ef00)

- Mount it somewhere convenient

- Copy the files you unpacked to it

- Insert into the USB slot on the keyboard

- Boot the USB installer

REMEMBER THE BIOS?

Revisit and enable the menu system to give you a boot device menu

Once you get it started, it takes a moment to come up. This is a lot slower than anything I currently use, although it sure beats the old 386 lattitude I still have knocking around somewhere as a PIC programmer.

The GRUB menu comes up. You can install or run it live and then install. I was brave and installed. The menu item should have said "Abandon hope all ye who enter here."

THE STEPS DON'T QUITE MATCH

Yeah, for a guide written by the person who created the installer, it was not too much fun. Some of that might be the different hardware versions, so I'll be nice. At least he wrote a guide.

Actually, everything worked except creating the boot and installing the bootloader, which failed with an error and the system rebooted. Hard to correct it at that point. I tried twice and get the same result.

DISK PARTITIONING

There is a list of partitions (next slide) that is recommended. I tried to make areasonable match, but either I'm too unfamiliar with the tool or he set the numbers differently in the image I'm using. I suspect this may be why it didn't work properly. I should take the installer info apart to see why. Of course at that point, using something a little lighter than Ubuntu might happen as well.

THE SUGGESTED DISK LAYOUT

Remember, this is a 64GB disk, I have a 32GB one.

```
Model: MMC HCG8e (sd/mmc)
Disk /dev/mmcblk1: 62,5GB
Sector size (logical/physical): 512B / 512B
Partition Table: gpt
disc Flags:

Number Start End Size File System Name Flags
1 1049kB 120MB 118MB fat32 boot, esp
2 120MB 58,1GB 58,0GB btrfs
3 58,1GB 58,2GB 80,7MB non-fs bios_grub
4 58,2GB 62,5GB 4344MB linux-swap (v1)
```

Pay attention to partition flags.

LUCKILY THERE ARE OTHER GUIDES

I found a gist that described a different process for the install, which also mantioned the process I was following and that the author of the gist couldn't get success with. I read through it and decided that a hybrid approach might work.

BOOTING FAILS.

As I said earlier, the installer fails to finish the job. The piece that would make this all work does not work as expected.

Following along with the gist I located, it is pretty much the same thing, but this time do not use the GUI installer by clicking on it, but rather open a terminal and issue the command `ubiquity --no-bootloader`, like this:

- The laptop should automatically boot into GRUB

- In the GRUB menu choose "Try Ubuntu without installing"

- Open the terminal and run ubiquity –no-bootloader to start the installer

- When prompted, select "Something else" to manually partition the drive

- Add a root (ext4, "/") and swap (swap, "swap") partition

- Finish the installation and hope for the best

SEEING IF IT ALL WORKS

Reboot. Just let the laptop automatically boot from the USB. When in GRUB, press C to open a command line. Run the following commands:

```
set root=(hd1,gpt5)
linux /vmlinux root=/dev/mmcblk0p5
initrd /initrd.img
boot
```

If it doesn't work, try with /dev/mmcblk1p5 and/or remove the SD card.

You can run live and look at the disk. This turned out to be informative.

IT DIDN'T WORK!

Here is where we talk about subvolumes, command lines, and the joy of discovery

The end result is this:

- linux /@/boot/vmlinuz-4.8.4.efi.signed root=UUID=955fdc72-76b3-4e7f-a840-e9aef635e1cf ro rootflags=subvol=@

- initrd /@/boot/initrd.img-4.8.4

PERMANENTLY INSTALLING GRUB

We can't use the USB GRUB to boot forever, so let's install GRUB properly.

Open the terminal and run the following commands:

```
sudo apt-get install grub-efi-ia32 grub-efi-ia32-bin
mkdir /boot/efi # if the dir already exists, skip the mount command
sudo mount /dev/mmcblk0p1 /boot/efi
grub-install --target=i386-efi --efi-directory=/boot/efi/
```

AND IF THAT DOESN'T WORK

Assuming there is an internet connection. I did portions on a different system and copied over the results.

```
# Get build dependencies
sudo apt-get install autoconf
# Get the GRUB source
git clone git://git.savannah.gnu.org/grub.git
# Compile 32-bit UEFI GRUB
cd grub/
./autogen.sh
./configure --with-platform=efi --target=i386
# Install GRUB
sudo grub-install --target=i386-efi --efi-directory=/boot/efi/
```

FINISHING IT UP

Adding GRUB to the bootloader

Reboot the laptop and press F12 to go into the boot menu. If you see an option called "ubuntu" and it works, you can skip this part.

- Go into BIOS Under "Boot" set "Secure boot" to enabled

- Press F10 to save changes and reboot

- Go into BIOS again Under "Security", click "Add trusted executable"

- Navigate to the boot area and select grubia32.efi

- Enter the name for the bootloader entry and press OK

- Press F10 to save changes and reboot

FINISHING IT UP

Go into BIOS for the last time

- Under "Boot" set "Secure boot" to disabled

- Press F10 to save changes and reboot

BACK TO ACERIUM

In order to get the wireless working, you need the onboard chip firmware.
Acer has the rtl8723bs firmware available as a download for pretty much all
of the models. There is a github spot for it as well, shown in the next slides

The instructions are:

1. Extract the archive and copy all files to /lib/firmware/rtlwifi

2. Use kernel module r8723bs,

3. Add to /etc/modules load r8723bs

4. Load from console `# sudo modprobe r8723bs`

DO IT YOURSELF

If you don't have a USB Wi-Fi card, you can clone/download the repo on your PC and transfer it with a flash drive. Then open a terminal in the folder and run the last 2 commands.

```
# Clone the driver repo
git clone https://github.com/hadess/rtl8723bs
# Build and install the driver
cd rtl8723bs
make
sudo make install
sudo modprobe r8723bs
```

SCREEN ROTATION

As a bonus, there is a script available, also on github to rotate the screen from portrait mode to landscape and back. According to the author, the tricky bit was getting the touch-screen, touch-pad and mouse axes all properly inverted. With the help of the Onboard keyboard (standard Ubuntu) it makes a really nice portrait-mode tablet, now.

NOT YET TESTED

- MicroSD card

- MicroHDMI (although it seems to understand that there are multiple displays possible)

- Mini USB port

SO WHAT DOESN'T WORK YET?

- Sound, I have not spent time on this yet

- Microphone, same reason

- Camera, apparently nobody has it working at this point

- Autorotate, never really saw a reason to make it happen yet.

- Auto brightness control. The backlight stays on at full strength which eats the battery

FUTURE ITEMS

- See if I can upgrade the storage, not a high priority, as we have USB devices

- Test a powered USB hub and different devices

- Test the external display port

- Use it as a laptop replacement for short trips

- See how well it handles an external HDD (spinning rust and SSD)

SUMMARY

All said and done, this is very usable in its current form. Pretty much everything I'd want to use works with little adjustment.

REFERENCES

- The Acerium Project (No longer working - 2024)

- Ubuntu on Acer Aspire Switch 10

- Ubuntu Forums: grub2 getting confused about btrfs root subvolume

- GRUB and BTRFS