Linux on the GO!

Camden Bruce

A bit about me

- PINE64 Community manager
- Student at EIT in Hawke’s Bay
- I love Linux on mobile devices


Kotlin


PINE64
PINE64

What is Linux on mobile?

- Running a mainline kernel on your phone
- Using a downstream Android kernel with Libhybris/Halium compatbility layer

Why should you be interested?

- Better privacy (at least on the software side)
- Exceed your phones planned lifetime
- Powerful software in your pocket, natively! No chroot or VM bull on Android
- SSH terminal or Swiss Army Knife on the go
- Secondary phone with less distractions

Mainline Linux approach

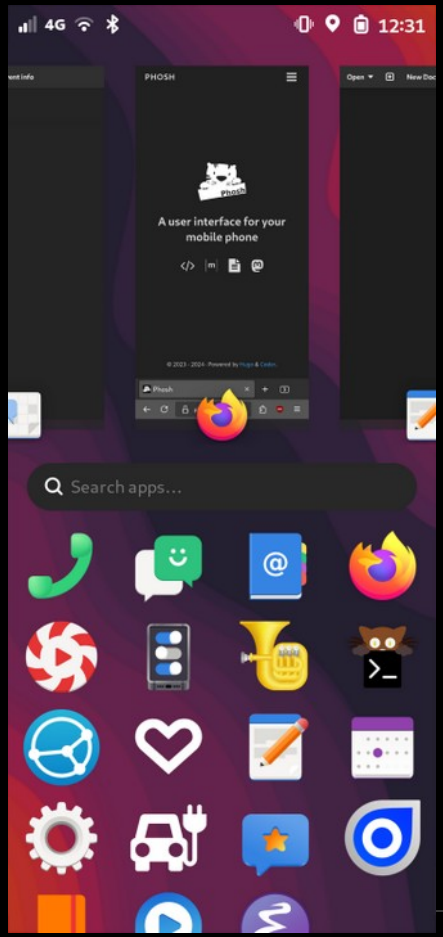
- An up to date kernel compiled using gcc
- Must rewrite drivers
- New kernel features
- Better for long term sustainability
- More effort

Mainline mobile distros

- PostmarketOS
- Mobian
- OpenSUSE
- Fedora
- DanctNIX (Arch)
- ALL OF THEM

PostmarketOS

- Where a majority of mainline Linux mobile work happens
- Robust build system (pmbootstrap)
- Better porting process
- Support for all devices running Linux
- Tonnes of user interface choices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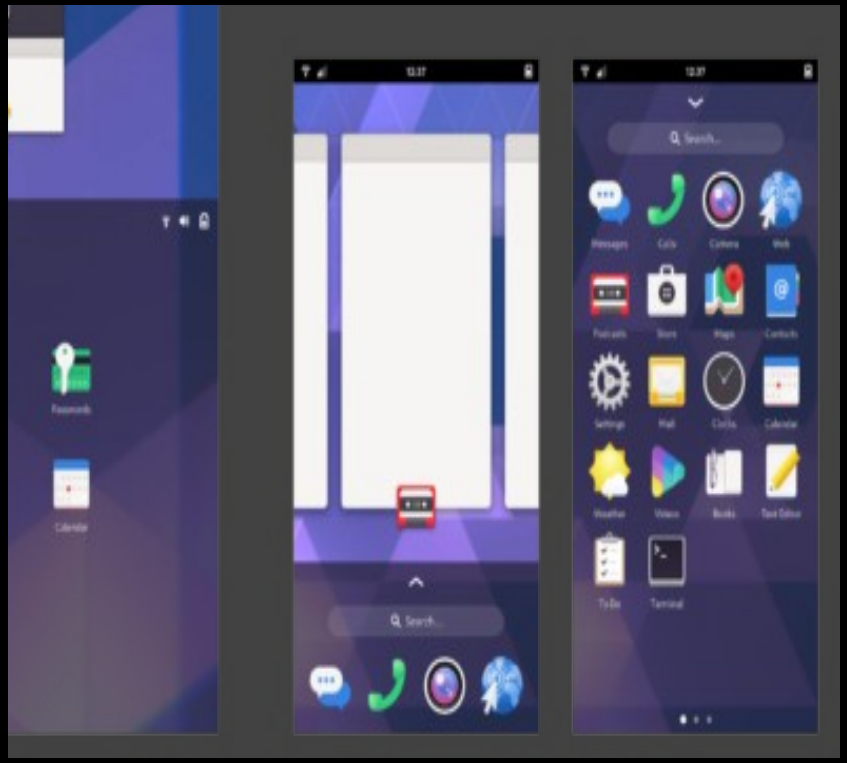
Community Design

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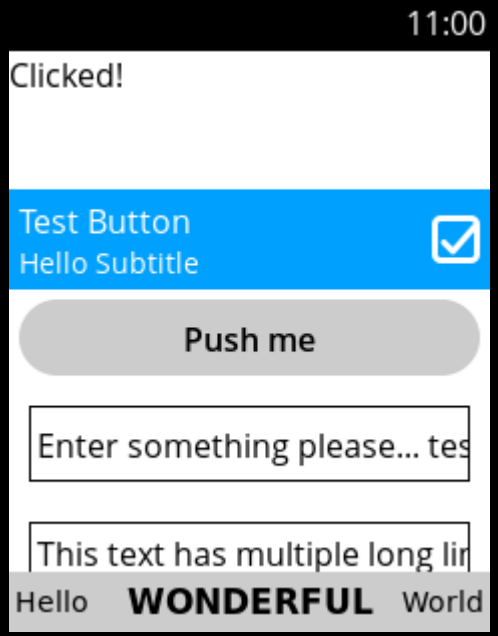
SXMO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Clicked!
Test Button
Hello Subtitle
Push me
Enter something please... tes
This text has multiple long lir
Hello WONDERFUL World


08:11

Libhybris approach

- Uses a compatibility layer
- Frustrating hardware features like call audio routing, camera support and fingerprint are less trivial to implement
- Overall usability is way better.
- Relies on a downstream Android kernel forever.

Distros using Libhybris

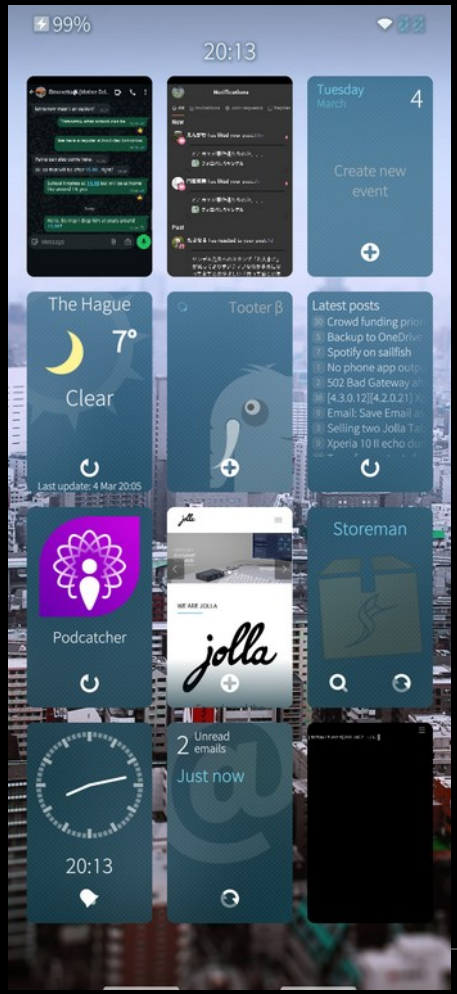
- Ubuntu Touch
- Sailfish
- LuneOS/Open WebOS/PalmOS
- Droidian (Mobian with Libhybris)
- AGAIN, ANYTHING IF YOU TRY HARD ENOUGH

Sailfish

- Started by a group of former Nokia developers
- Oldest still running mobile Linux project (Since 2012!)
- Most usable and mature
- Intuitive gesture based UI written in QT

Ubuntu Touch

- Discontinued by Canonical, rescued by the community
- The most modern mobile Linux platform
- Relies on an old compositor (Mir) which can be quite limiting.
- Polished, reliable and fun to use interface
- Convergence >:)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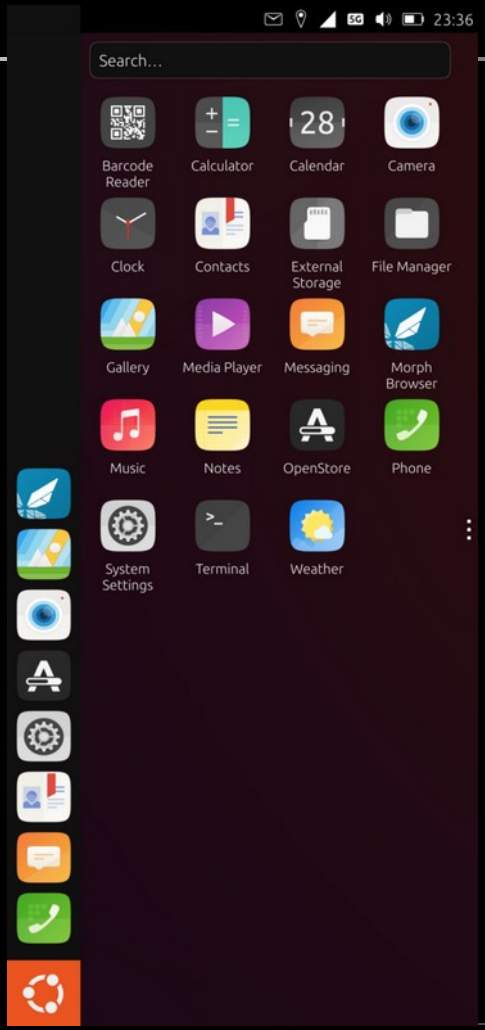
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Media Player
Messaging
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Music
Notes
OpenStore
Phone
System Settings
Terminal
Weather


SAMSUNG

Hardware

Android phones:

- OnePlus 6
- Google Pixel 3a
- Fairphone(s)
- SHIFT SHIFT6mq
- Xiaomi Poco F1

Linux (first) phones

- PinePhone
- Librem 5
- Jolla
- FuriPhone


NEVER
SETTLE


Tuesday, May 7 | 68 °F


6.36"
jolla


FAIRPHONE
FAIRPHONE


sh¹ft
sh¹ft


Search...
Phone
Phonebook

I’m interested which one should I get?

- It’s not that simple
- Android first devices are typically faster and cheaper
- Active maintainership
- Depends what you want out of the device
- Forever quirks

The current state of Linux phones

- The PinePhone Pro is dead, long live the PinePhone
- A few mainline ports have cameras working
- Every device needs their own call audio routing config (and it’s not reliable)
- Not all software will work on a small screen, but a lot do now!
- VoLTE is a problem for both mainline and Libhybris
-

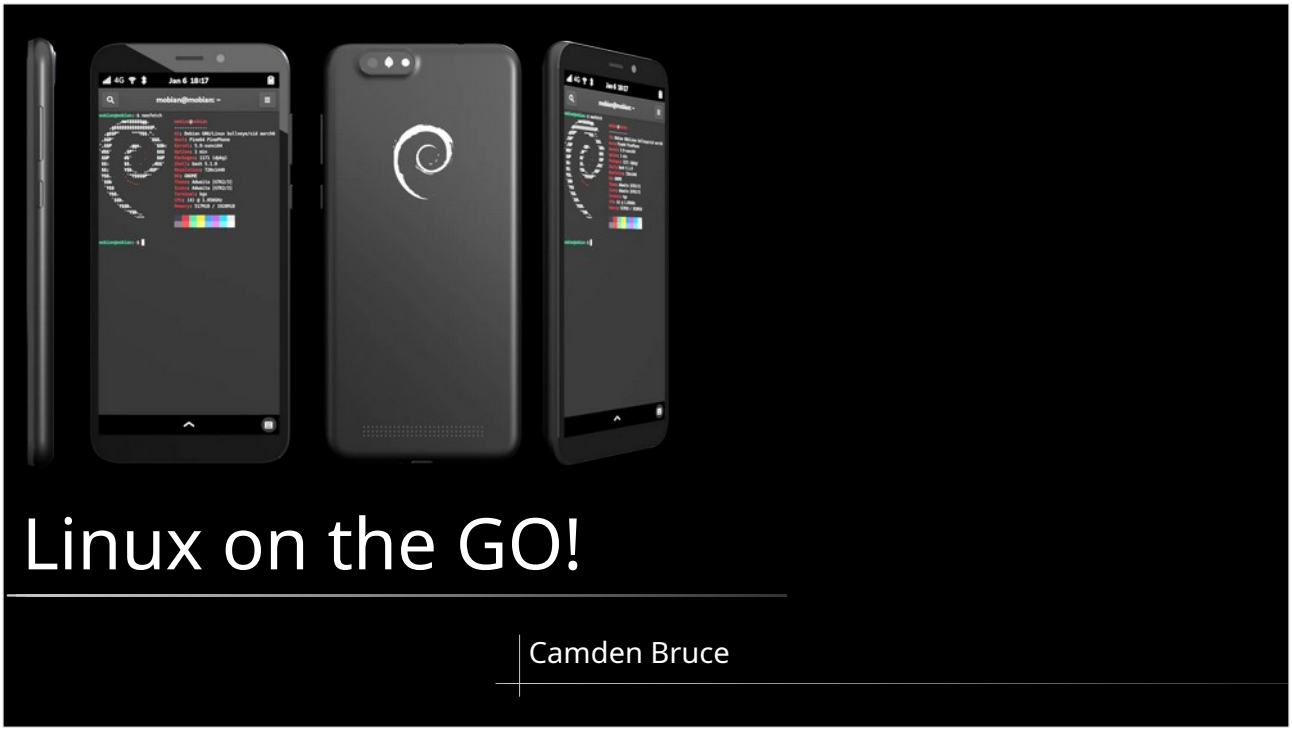
What this means in terms of usability

- Battery life won’t be as good
- Don’t expect some hardware to work in mainline (sensors, camera, fingerprint)
- Expect GPS to only rely on satellites
- You can’t trust a mainline port to wake up your phone if you get a call (depends on the port)

Thanks for listening

- There are two ways of running Linux on your phone (each with their own benefits and drawbacks)
  - Mobile devices are quirky :|
- If you want a daily drivable device use Sailfish or Ubuntu Touch
  - (But do try mainline, it’s super cool)
  - PINE64 forevaaaahhh

DEMO TIME



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Why should you be interested?

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- Exceed your phones planned lifetime
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1. There are less (or none at all) services that can track you all the time because they’re just not there. You’re vulnerable in a different way now though, having unlocked your bootloader. Anyone can just flash your phone or access your files (unless you encrypt your storage).

2. Beat up planned obsolescence.

3. Bring an entire Linux machine with you on the go with all the software you use or wish you could use properly.

4. Use it as a portable SSH terminal or as a way to recover your other devices.

5. Or if you’re using something more reliable you can use Linux on a secondary phone if you don’t wish to be distracted.

Mainline Linux approach

- An up to date kernel compiled using gcc
- Must rewrite drivers
- New kernel features
- Better for long term sustainability
- More effort

1. Downstream Android kernels have many security flaws as older phones are still using Linux 4.xx. Though newer devices and vendors are under pressure to keep their kernels up to date these days.

2. Since the Android kernel is compiled using Bionic, Android drivers will not work on mainline. Developers must rewrite drivers for GCC.

3. New filesystems, more optimisation improvements, better security, etc.

4. Long term, keeping a device up to date allows it to be used for longer and more secure rather than relying on a 5-10+ year old kernel.

5. Things like GPS, hardware acceleration, camera, fingerprint, call audio routing are all individual to the vendor and phone. Fingerprint is likely to never work using mainline, camera is very difficult and call

Mainline mobile distros

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If you set up a rootfs with the right software, partition layout, the kernel and uboot you can boot any distro you want.

PostmarketOS

- Where a majority of mainline Linux mobile work happens
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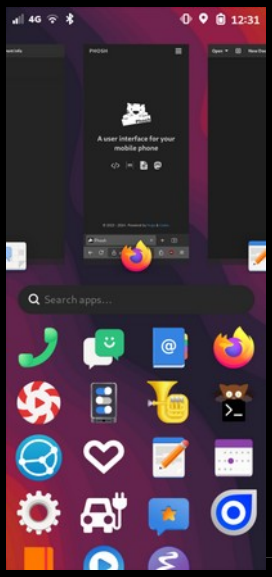
PostmarketOS is Alpine based.

1. PostmarketOS is a mobile Linux project that has some of the best talent in the community all in one place. A majority of the mainline Linux ports target PostmarketOS as it has a robust porting and maintenance process.

2. Pmbootstrap creates a chroot where it builds everything required to build an image from scratch including the kernel if there is no package available.

3. PostmarketOS has a great porting process where you can edit config files for what packages your device may depend on (such as already available drivers and firmware). You can also specifiy patches to apply which you drop into the devices config folder.

4. If it runs Linux it can be ported to PostmarketOS* . Phones, Chromebooks, SBCs, Android Wear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A user interface for your mobile phone
Search apps…


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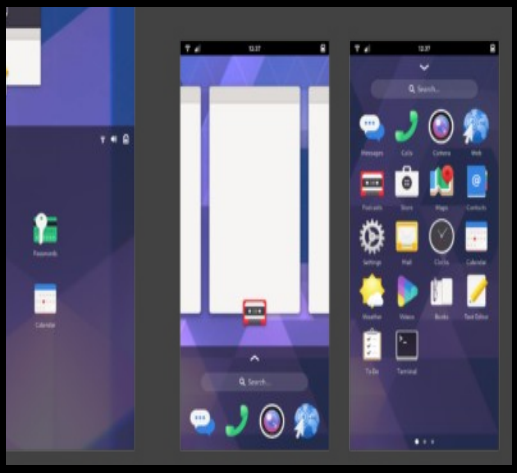


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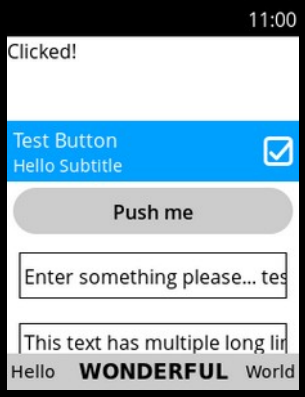
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1. To run Bionic compiled Android drivers and libraries on a Libc/Musl Linux system. Android uses a different compiler and libraries to what we use on the desktop. So it can be easier to use libhybris to more easily get hardware working on Linux.

2. Since software and drivers don’t require to be completely rewritten, hardware such as fingerprint is able to communicate with it’s encryption chip and will function correctly.

3. Since more of the hardware functions as intended, the end result is almost always more usable as a daily driver than a mainline port.

4. As a consequence, this means that the port will rely on the vendors Android kernel forever.

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1. After Meego was shelved for Windows phone a group of former Nokia employees from Finland founded Jolla. The user interface is very similar to their final version of Meego (Harmattan). On the way they hired the libhybris maintainer to develop their first hardware product J1. Nowadays though they also focus on Sony Xperia phones for official ports.

2. They are the longest running mobile Linux project (besides Android).

3. Since Jolla have had so long to perfect their experience, it has not changed at all for many years so there are very little bugs people experience (at least to do with the UI). This makes it robust and reliable for daily usage. Most problems stem from vendor firmware issues.

4. The user interface focuses on easy to use gestures that are intuitive and fun to use. It is written in QT

Ubuntu Touch

- Discontinued by Canonical, rescued by the community
- The most modern mobile Linux platform
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1. Canonical had ambitous plans to enter the phone market with their own mobile operating system based on Ubuntu. Unfortunately their kickstater did not reach its goal and the project was discontinued. But the community rescued and continued maintaining the project under the Ubports name.

2. Ubuntu Touch is far newer than Sailfish in terms of user interface and underlying technology. Both use QT as it’s UI framework but Ubuntu Touch is capable of using more standard Linux software including packaging for Snap and Wine.

3. One of the downsides of being based on Ubuntu is that Canonical made their own init system and compositor. This means nothing was standard and normal Linux software could not run on the user interface. But in turn the performance of Mir was far better than X11 at the time.

4. Such like Sailfish the base experience is very


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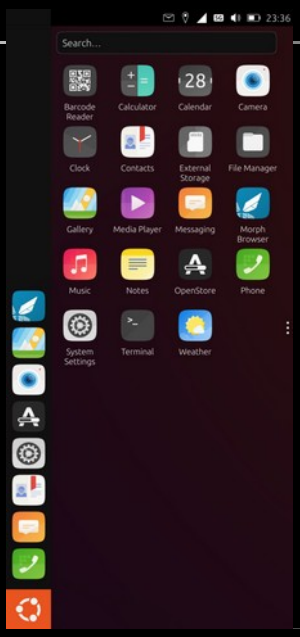
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External Storage
File Manager
Gallery
Media Player
Messaging
Morph Browser
Music
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OpenStore
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System Settings
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Weather


SAMSUNG

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1. N/A

2. Android devices have faster SOCs than the Linux first phones on the market. Qualcomm SOCs are more powerful and have better power efficiency than a Rockchip or NXP SOC. Second hand devices from a few years ago also go down significantly in price. A OnePlus 6 or Pixel 3a is around 150NZD compared to 700 NZD for the PinePhone Pro when it was still available.

3. Make sure that someone is maintaining the Linux port for your device. Be it someone from the project team or a known reputable contributor.

4. If you want a usable device, it’s recommended you try a distro using libhybris like Sailfish or Ubuntu Touch as most of the hardware will work. If you’re interested in running normal Linux software, using your phone as a portable SSH terminal then a mainline distro is probably your best choice.

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1. The PinePhone Pro was discontinued due to a lack of sales, but the outdated Allwinner A64 PinePhone persists in production. It is surprising considering that GTK4 discontinued graphics acceleration using the OpenGLES version the PinePhone uses.

2. OnePlus 6, Pixel 3a, the Nothing Phone (1) and the Fairphones among others.

3. For example, the OnePlus 6 has a pipewire profile for changing to the earpiece speaker when receiving a call. This is somewhat unreliable in my experience.

4. Thanks to libadwaita and the kde apps framework many of their applications will scale to mobile very well.

5. VoLTE on Linux is very limited currently as the problem is mainly registering the device to be allowed to make calls using VoLTE. This can be

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1. Android is far more efficient than using mainline or Linux with libhybris plopped on top, the best comparison is Sailfish as there is no app memory culling in the background by default (unless you use Sailfish).

2. Sensors like the accelerometer and proximity will not work by default. Drivers must be written. That also goes for the cameras and GPS.

3. Since there is no GLS/MLS (rip MLS, Google/Mozilla Location Services) to help lock a location indoors, a user can only determine their location by satellite.

4. The modem is a black box, you aren’t supposed to know how it works or why. So it’s difficult to command it to wake up the phone when it receives a message as it may get locked up or just flat out fails to wake up the phone. Only the PinePhone has custom modem firmware.

Thanks for listening

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