# Replicant and Android freedom

# Why phone freedom matters? (I)

- Smartphones gather way too much data on you:

    - Non democratic countries.

    - If you want to organize a protest?

    - In which hands should this power be?

    - What happens to the data if a democratic country becomes non-democratic

    - Commercial usage of the Data?

        - Unintended consequences

# Why phone freedom matters? (II)

- smartphones are computers?

    - Yes because they run user-installable applications

    - => they have the same freedom issues

- It's too hard to support a device with proprietary parts in the long run: Cyanogenmod dropped the Nexus one for that exact reason.

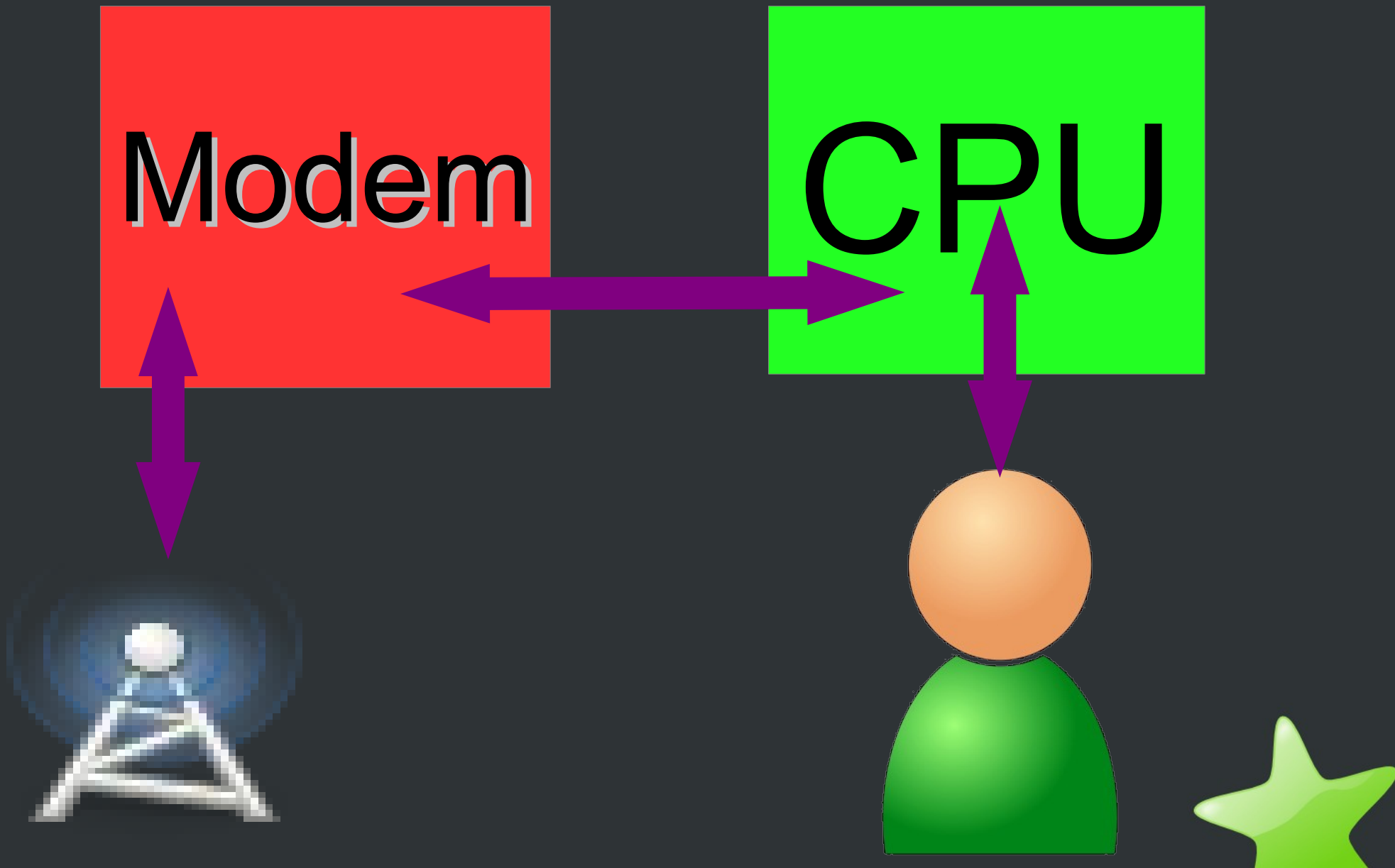- It's Hard to port GNU/Linux on it when there are blobs

# First part

- Introduction to the freedom issues
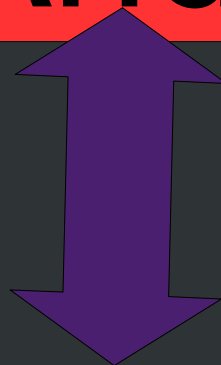
- Solutions

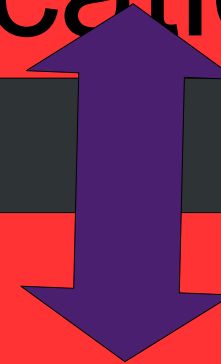# What is a smartphone

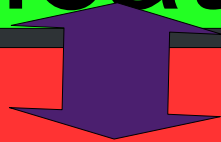# Average Joe user

# Problem
## Average Joe User

**Free software applications**

**Proprietary Applications**

**Android**

**Linux Kernel**

# Advanced User

# Supported devices

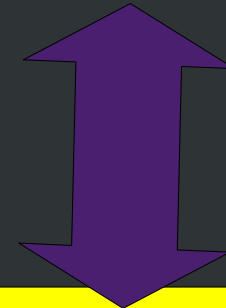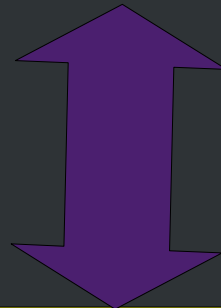- A lot of devices(too much to be listed here) are supported but not all

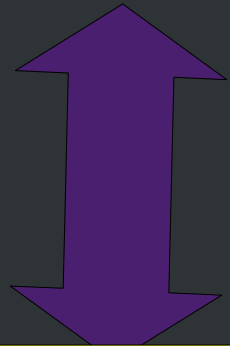# Problem I (AdvancedUser)

| Google Applications( market, youtube etc...) | Proprietary applications | Free software applications |
|:---:|:---:|:---:|

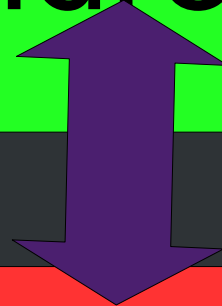Cyanogenmod

# Problem II
## (Advanced user)

Android GUI

Proprietary hardware libraries
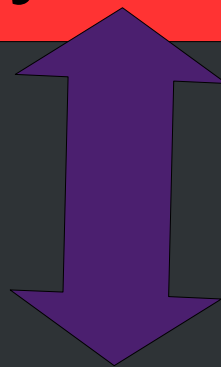
Linux kernel

# Nexus S: Proprietary parts I

- /system/etc/gps.conf

- /system/lib/libpn544_fw.so

- /system/lib/libsecril-client.so

- /system/vendor/bin/gpsd

- /system/vendor/bin/pvrsrvinit

- /system/vendor/etc/gps.xml

- /system/vendor/firmware/bcm4329.hcd

- /system/vendor/firmware/cypress-touchkey.bin

# Nexus S: Proprietary parts II

- /system/vendor/firmware/nvram_net.txt

- /system/vendor/firmware/samsung_mfc_fw.bin

- system/vendor/lib/egl/libEGL_POWERVR_SGX540_120.so

- system/vendor/lib/egl/libGLESv1_CM_POWERVR_SGX540_120.so

- system/vendor/lib/egl/libGLESv2_POWERVR_SGX540_120.so

- /system/vendor/lib/hw/gps.s5pc110.so

# Nexus S: prorpietary parts III

- /system/vendor/lib/hw/gralloc.s5pc110.so

- /system/vendor/lib/libakm.so

- /system/vendor/lib/libglslcompiler.so

- /system/vendor/lib/libIMGegl.so

- /system/vendor/lib/libpvr2d.so

- /system/vendor/lib/libpvrANDROID_WSEGL.so

- /system/vendor/lib/libPVRScopeServices.so

- /system/vendor/lib/libsec-ril.so

# Nexus S: Propriteray parts IV

- /system/vendor/lib/libsrv_init.so

- /system/vendor/lib/libsrv_um.so

- /system/vendor/lib/libusc.so

# User with hardware supported by Replicant

# Supported devices

- HTC Dream

- HTC Magic

- Nexus One

- Nexus S

- Galaxy S

- Galaxy Nexus(Image will be ready soon)

- GTA04(Work in progress)

- Galaxy SII(Work in progress)

# Hardware issues with some replicant devices



MIC

GPS

Modem

Shared memory

CPU

NAND
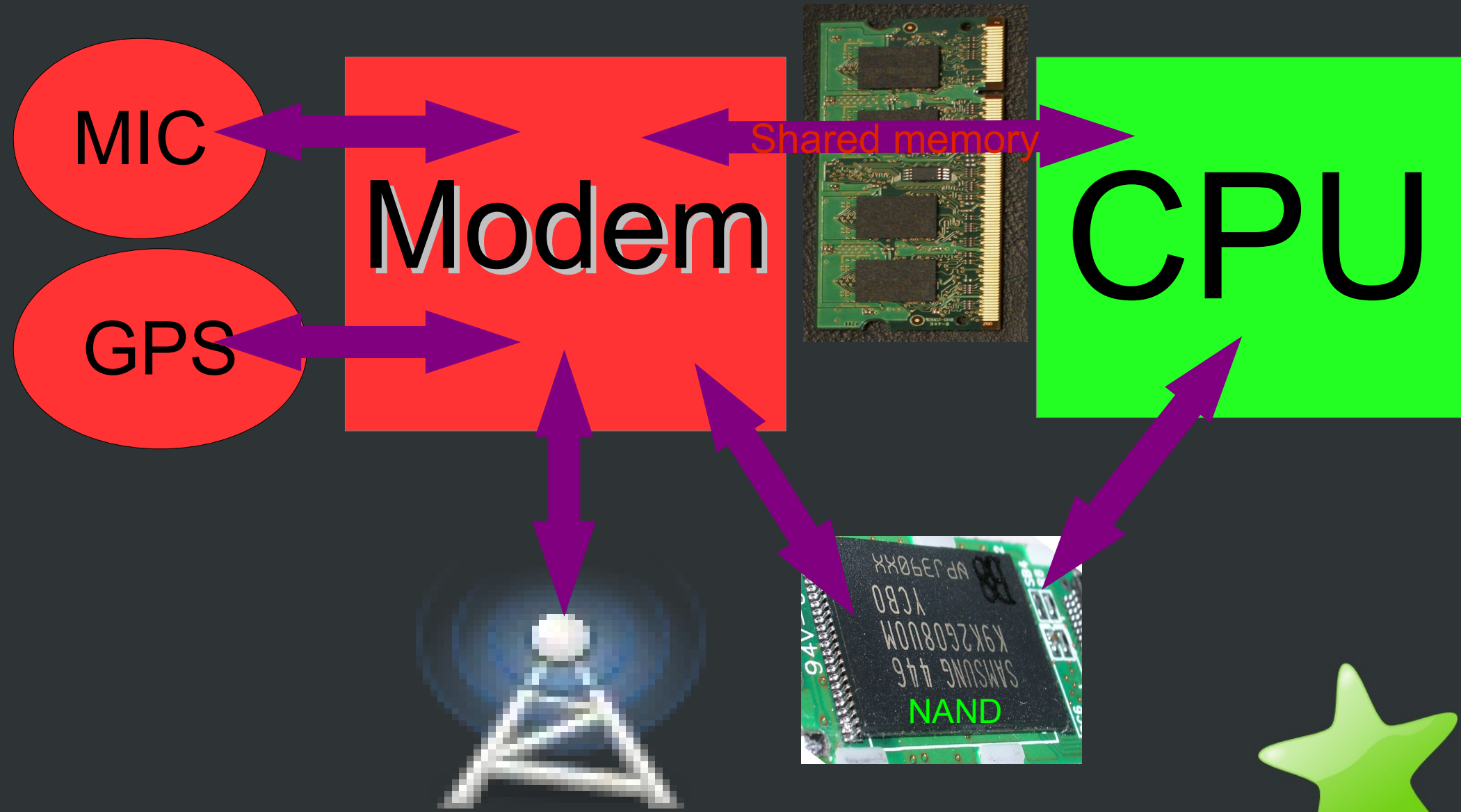
# Solution I

- Install Fdroid to have free software on top of android

- Usefull if your phone is not supported by replicant,cyanogenmod or any other community distribution.

# Solution II

- Install Cyanogenmod(or something similar if cyanogenmod does not support your hardware)

- Do not install Google applications

- Install FDroid instead

- Usefull when your phone is not supported by Replicant or that you depend on something that doesn't work in your phone on Replicant(for instance the GPS on the Nexus S).

# Solution III

- Install Replicant on a supported device

# Solution IV(if posibile)

# References

- http://www.guardian.co.uk/technology/2011/sep/19/android-free-software-stallman

- http://replicant.us/

- http://fdroid.org/

- https://raw.github.com/CyanogenMod/android_device_samsung_crespo/gingerbread-release/extract-files.sh

# Second Part

- The replicant project

# History

- The replicant project started at the time of the HTC Dream, the first Android phone, in order to free android.

- It was founded by:

    - Bradley M. Kuhn: Project setup

    - Aaron Williamson: He tried to do a Free Android market replacement, and a bit of low level work

    - Graziano Sorbaioli : Infrastructure work(website etc...)

    - Me (Denis Carikli(GNUtoo on Internet)) : I did most of the low level work(freeing Android on the htc dream)

- At that time we based our work on AOSP( Android Open source project, the official android source).

# History II

- The touchscreen, display,wifi and bluetooth (requires non-free firmware), rotation triggered trough keyboard sliding worked out of the box already.

- I replaced the non-free audio part simply by replacing the functions in the dlopened non-free acoustic library, by using a test program named playwav2 which was a better version of the playwav test program in the android sources.

- I replaced the non-free ril library(The library that talks to the modem, and that runs on the CPU) by using and improving the reference ril.

# History III

- GPS was reversed(not by me) and I integrated the reversed library

- I solved a long-standing issue where the phone didn't work in the USA at all.

# History IV

- Later we integrated FDroid,switched to cyanogenmod and added new devices

- I ported Replicant to the Nexus one (given by google):

    - 2D graphics accelerations had a nasty bug that had to be solved

    - Audio was easier to fix but required a non-free firmware

    - GPS library was already free(maybe a consequences of the reversing of the htc dream library?)

# HTC Dream caracteristics

- The modem speeks AT over a virtual serial port

- The GPS has NMEA once you activate it.

- The audio is *not* alsa, it's a custom DSP protocol.

- Wifi was non-standard but we didn't care since we had android free software drivers(which required non-free firmware by the way).

# Freedom issues with The qualcomm-based phones

MIC

GPS

Modem

Shared memory

CPU

NAND
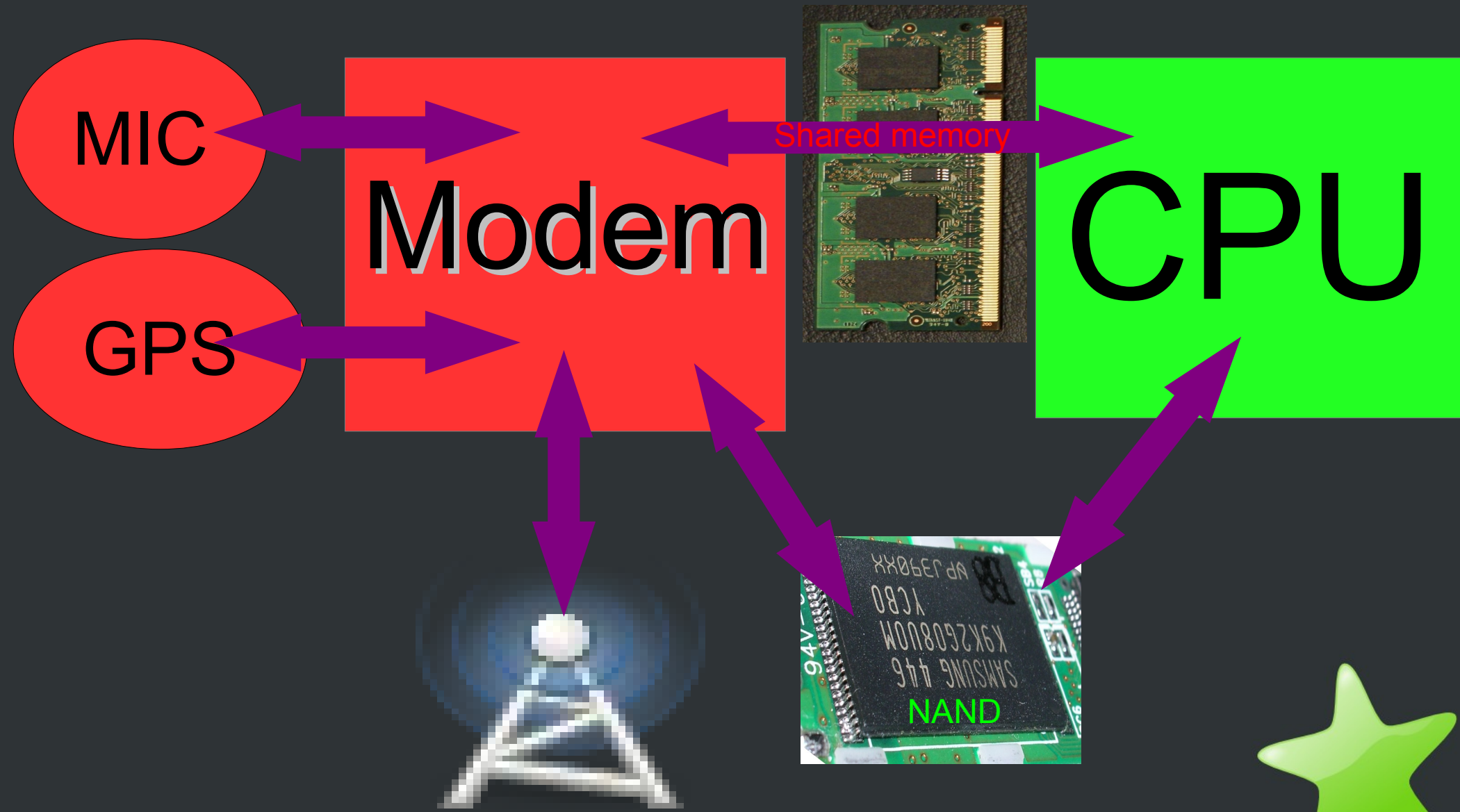
# History IV

- Paul Kocialkowski(paulk) joined the project and added the support for the Nexus S:

    - He made the accelerometer work (it was buggy at the beginning but now it's perfectly stable).

    - After making the modem work, the camera was working too.

    - Only trust the kernel sources(don't trust schematics)

    - Only the GPS(and 3d but that's not strictly necessary) is not working nowadays.
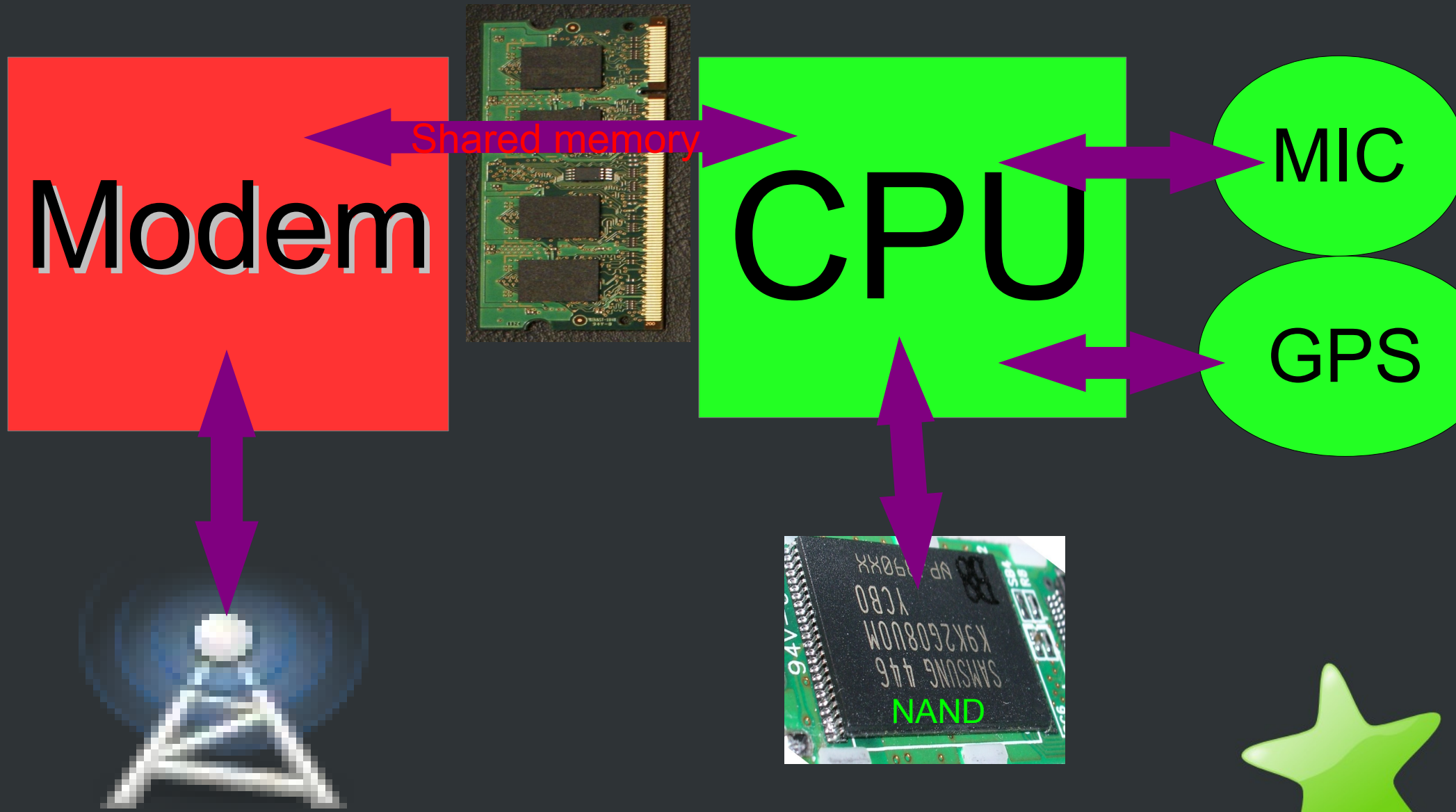
# The Modem

- The big part of the work was to make the Modem work:

    - There was preliminary code for the Samsung H1 GNU/Linux phone.

    - The RIL was very verbose.

    - He shared the work with Simon Busch(who wanted GNU/Linux on his Nexus S).

- The result was libsamsung-ipc(shared between GNU/Linux and Android),samsung ril(for Android) and fsogsmd support(for GNU/Linux part)
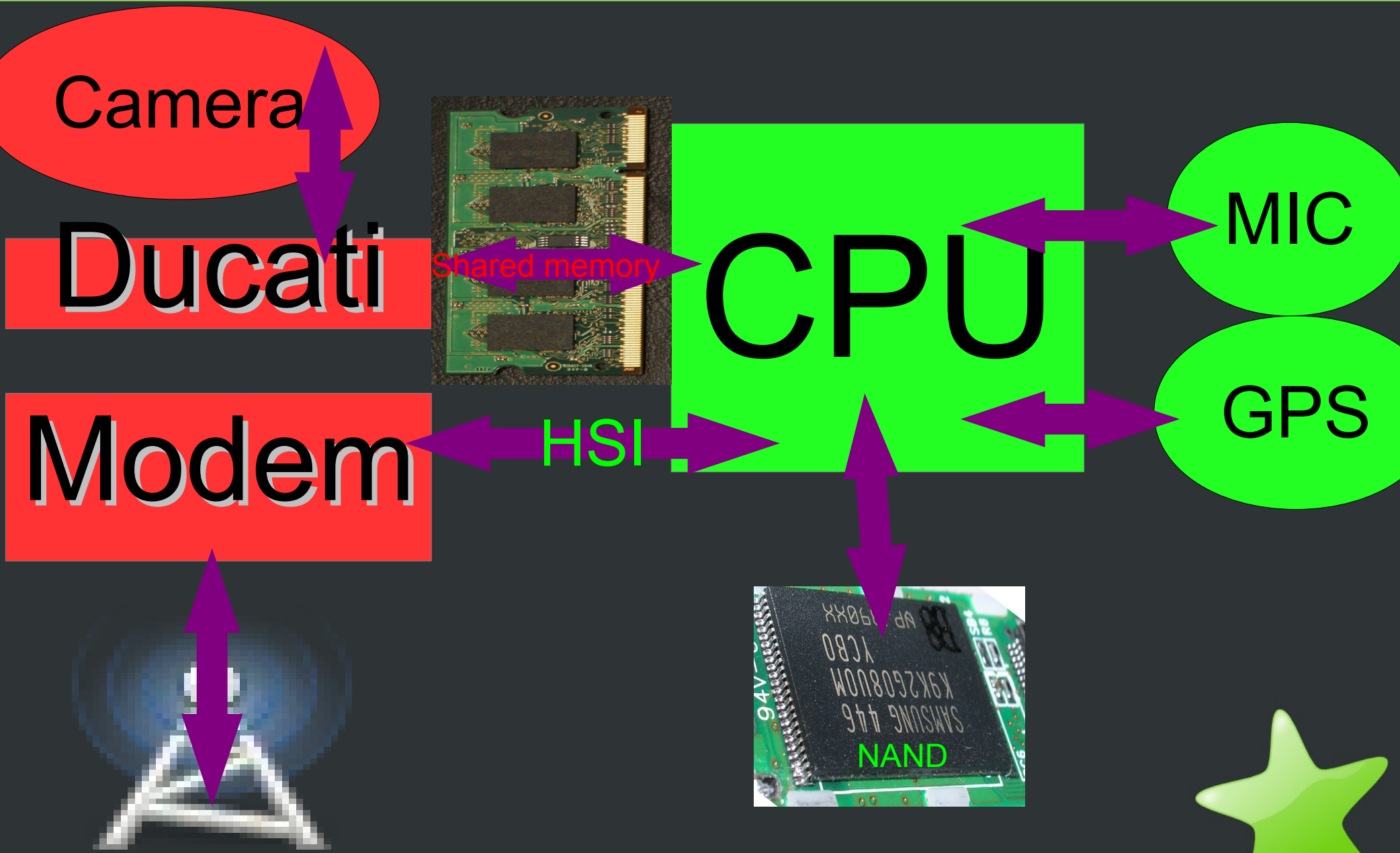
# Nexus S/Galaxy S Hardware

# Newer devices

- The modem work made it easy to add support for:
    - The galaxy S (Added by paulk)
    - The galaxy SII(Added by paulk)
    - The Galaxy Nexus(Added by me)
- A nearly ideal device appeared: the GTA04
    - It has a free bootloader
    - And an Isolated modem
    - The only issues is the non-free Wifi firmware

# Galaxy Nexus Hardware (I)

# Galaxy Nexus Hardware (I)

Camera

Ducati

Modem

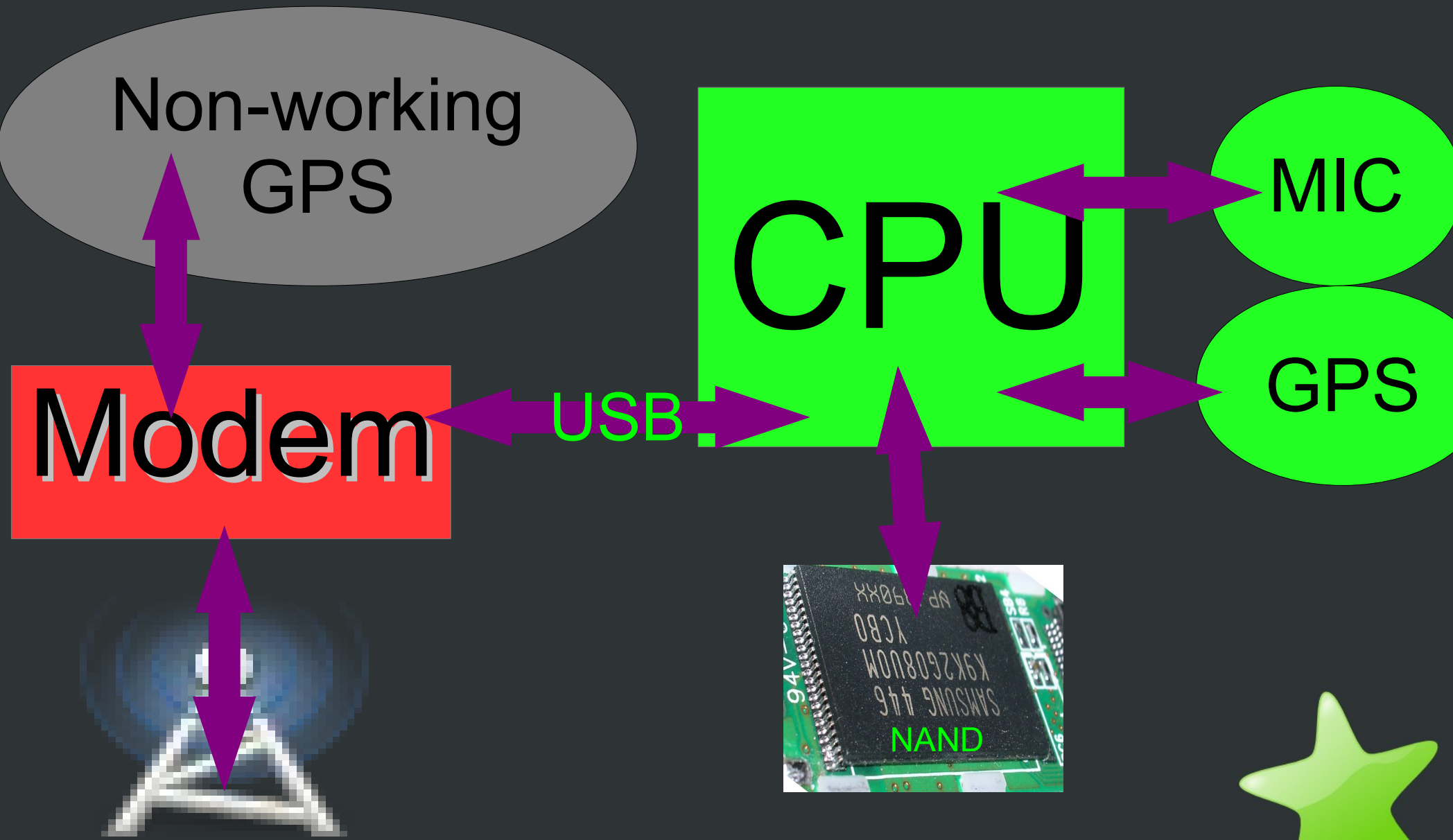Shared memory

HSI

CPU

MIC

GPS

NAND
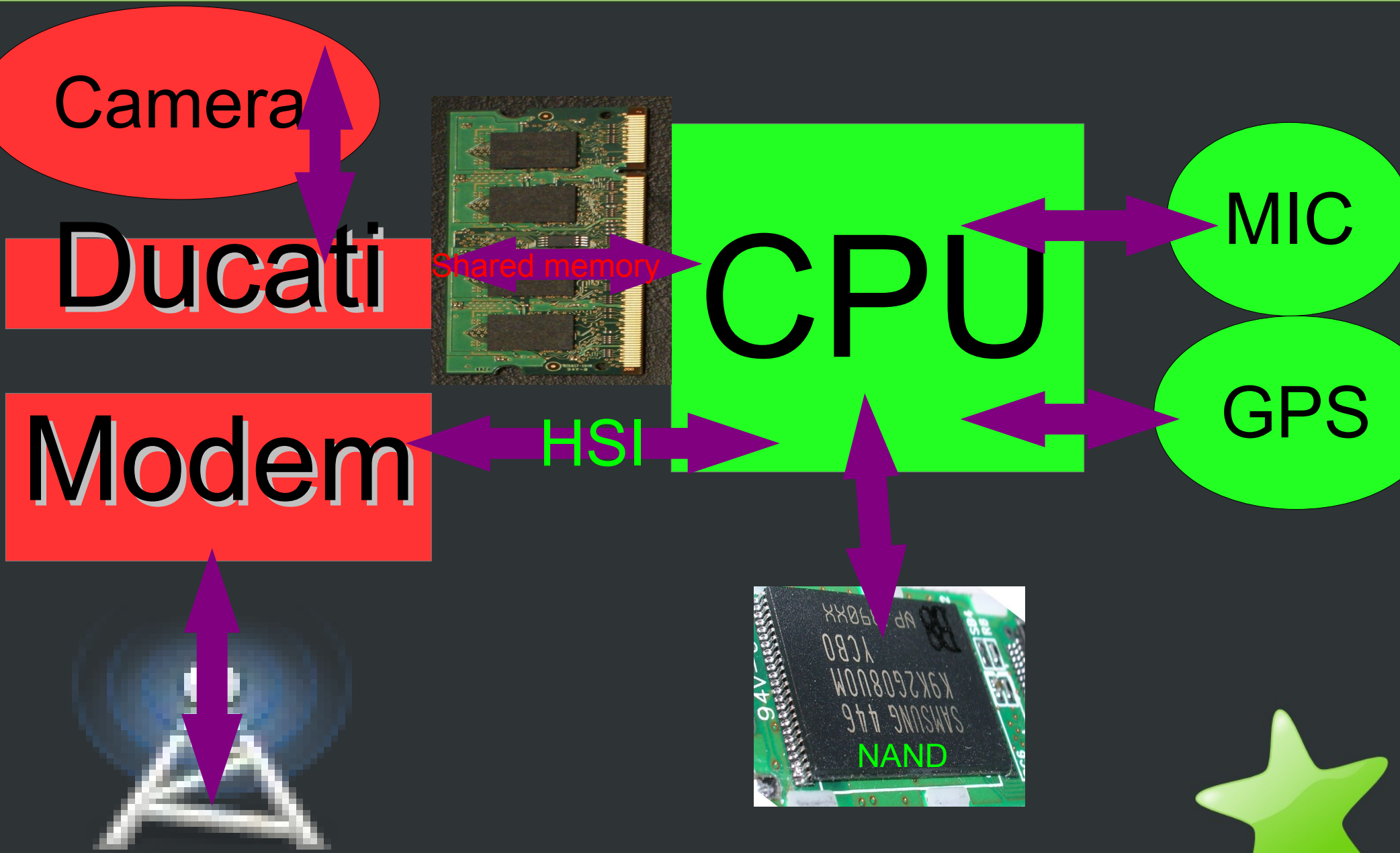
# Galaxy Nexus Hardware (II)

- Same Samsung-ipc modem protocol, different transport.

- New kind of SIRF GPS(doesn't work with the GNU/Linux gpsd)

- Ducati issue and non-standard camera interface.

- Non-free bootloader and firmwares

Non-working GPS

CPU

MIC

GPS

Modem

USB

NAND

# GTA04 hardware (II)

- AT interface over virtual serial port(Physical USB interface)

- NMEA/SIRF GPS

- Alsa Audio

- Made for GNU/Linux in mind(different from Android).

# Replicant caracteristics

- Doesn't ship anything proprietary

- Non-free firmware not even redistributed(but one can install them if he knows how).

- Uses FDroid by default

- Has no 3D accelerations:

  - At each new android release it's said that 3D acceleration is mandatory, until now we always found workarrounds.

  - It's fast enough without 3d acceleration, if you use the right tricks: I don't see the difference on the galaxy Nexus

# Android versions

- 2.2 : HTC Dream, HTC Magic
- 2.3: Nexus one, GTA04, (and Nexus S, Galaxy S)
- 4.0: Nexus S, Galaxy Nexus, Galaxy S, Galaxy SII

# We need you

- We are not enough developers
    - Because of that we cannot support fully all our devices and at the same time add support for many new devices.

- We gather on #replicant on Freenode and we also have a mailing list.

- We can help people wanting to port replicant on their device, by giving them pointers and helping them.

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