Repurposing Gadgets

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Agenda

- Introduction
- Gadgets and Ideas
- Tools and Utilities
- Tinkering
Introduction
Hello, I am Daniel :-)

Work and education
- IT security and computer science
- software engineer
- infrastructure and web
- apps, UIs, ecommerce

Open Source contributions
- hardware and firmware
- operating systems
- software distributions
- reverse engineering
Gadgets and Ideas
Wireless Storages

... are just networked devices with storage

old ideas

- MCU running a small application, sometimes RTOS
- SoC, Arm or MIPS, running Linux
- built-in SD card reader

new ideas

- access point for devices in your NoT (Network of Things)
- MQTT broker for controlling things, e.g., via SUSI AI
Network Video Recorders (NVRs)

old ideas
- essentially storage with more connectors
  - USB, HDMI, ethernet
  - built-in network switch
  - analog video input
- SoC, mostly Arm, running Linux

new ideas
- little general purpose computer with web browser
- home theatre / movie player
IP cameras

Essentially, these are just camera sensors attached to some SoC that is running Linux, with Wi-Fi and/or ethernet modules and often SD card readers.

They typically feature two motors to rotate and tilt, sometimes a speaker and a microphone for two-way audio communication.

OpenIPC project - https://openipc.org/
Tools and Utilities
Hardware

- network cables and switch
- wireless access point
- SPI flash programmer
- USB serial converter
- dupont wires and probes
- soldering equipment
- screwdrivers
u-root

A universal root filesystem

- many small tools
- all open, meant for studying and understanding
- easily portable
- written in Go

https://u-root.org/
u-root Graphics
centre

- DHCP server
- TFTP server
- simple binary, written in Go
- easy to run on your laptop

https://github.com/Harvey-OS/go/tree/main/cmd/centre
Tinkering
IP Camera Teardown
NVRs from inside
PSLab as a Logic Analyzer
Adding Missing Components
u-root on a Wireless Storage

root@airdisk:~# chroot mipsle/ /bin/sh
//# ls -l
Exception: exec: "ls": executable file not found in $PATH
[ttty], line 1: ls -l
//# paths=/sbin $@paths
//# ls -l
drwxr-xr-x 1001 1001 0 Sep 15 20:26 bbin
drwxr-xr-x 1001 1001 0 Sep 15 20:18 bin
drwxr-xr-x 1001 1001 0 Apr 22 18:02 dev
drwxr-xr-x 1001 1001 0 Sep 15 20:18 etc
Lrwxrwxrwx root 0 9 Sep 15 20:18 init -> bbin/init
drwxr-xr-x 1001 1001 0 Apr 22 18:02 lib64
drwx------ root 0 0 Sep 15 19:50 root
drwxr-xr-x 1001 1001 0 Apr 22 18:02 tcz
drwxrwxrwx 1001 1001 0 Apr 22 18:02 tmp
drwxr-xr-x 1001 1001 0 Apr 22 18:02 ubin
drwxr-xr-x 1001 1001 0 Apr 22 18:02 usr
drwxr-xr-x 1001 1001 0 Apr 22 18:02 var
//# cat /etc(147,122),(852,899)
nameserver 8.8.8.8
//# uname -a
Linux airdisk 3.10.14+ #2 Tue Sep 15 20:03:49 CST 2015 mips (none)
//# }
u-root on an NVR
Thanks! Questions?
Extras
Fun

astronaut protocol
SanDisk Media Drive disco