openEuler RISC-V 已经幸福地跑在了 LicheePi 4A 上

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Click to add title

- LicheePi 4A?
- What we have done?
- Future?

LicheePi 4A

- CPU: TH1520 (C910*4)
- GPU: Imagination BXE-4-64
- Dual 1G Network
- 4*USB Type-A+1*USB Type-C
- NPU on board & PoE Support
- RAM: 8/16 GB
- Storage: 32/128 GB eMMC
- On board Wi-Fi 6 + BT 5
- ......

Goal

- Step 1: openEuler 23.09 RISC-V official support
- Step 2: GPU support
- Step 3: openEuler RISC-V + ROS2

Base packages

- Require fixed versions
  - Version mismatch?
- What if user perform an upgrade?

CI

- All boards shared a rootfs
- Find a solution!

Kernel

- T-Head have their own repo
- Work smarter, not harder

GPU support

- Fixed DDK version
- Blobs?!
- Xorg

GPU support

- Fixed DDK version
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```
→ lsmod
Module                     Size  Used by
pvrsrvkm                8433664  22
dwc3                    1949696  0
roles                     40960  1 dwc3
galcore                 3108864  0
dwc3_thead                36864  0
aic8800_bsp              471040  0
```

GPU supp

- Fixed DDK ver
- Blobs?!
- Xorg

```
→ pvr_memory_test
Profiling 4MB block-size transfer (512 times, 2048MB) using 4K-aligned (12) buffer
------------------- Start tests (+ Memcpy) -------------------

Loop count = 512

CPU(ZeroPg)        -> CPU(ZeroPg)        started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 0.195347271 seconds = 10483.9Mbytes/sec

CPU(ZeroPg)        -> CPU(Cached)        started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 0.190287502 seconds = 10762.7Mbytes/sec

CPU(Cached)        -> CPU(Cached)        started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 0.579957357 seconds = 3531.3Mbytes/sec

CPU(Cached)        -> DEV(Cached)        started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 0.563427872 seconds = 3634.9Mbytes/sec

CPU(Cached)        -> DEV(Cached) + Flush started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 0.711747010 seconds = 2877.4Mbytes/sec

DEV(Cached)        -> CPU(Cached)        started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 0.561854042 seconds = 3645.1Mbytes/sec

CPU(Cached)        -> DEV(Write-Combined)  started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 3.723888353 seconds = 550.0Mbytes/sec

DEV(Write-Combined) -> CPU(Cached)        started: Moving 512 blocks of 4194304 bytes = 2048Mbytes per test
        took 3.852990196 seconds = 531.5Mbytes/sec

-------------------- End tests --------------------

Profiling 4MB block-size transfer (16 times, 64MB) using 4K-aligned (12) buffer
------------------- Start tests (+ Memcpy) -------------------

Loop count = 16

CPU(ZeroPg)        -> CPU(ZeroPg)        started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.11465252 seconds = 5582.1Mbytes/sec

CPU(ZeroPg)        -> CPU(Cached)        started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.6503143 seconds = 9841.4Mbytes/sec

CPU(Cached)        -> CPU(Cached)        started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.17710056 seconds = 3613.8Mbytes/sec

CPU(Cached)        -> DEV(Cached)        started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.18853082 seconds = 3394.7Mbytes/sec

CPU(Cached)        -> DEV(Cached) + Flush started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.28096619 seconds = 2277.9Mbytes/sec

DEV(Cached)        -> CPU(Cached)        started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.23336181 seconds = 2742.5Mbytes/sec

CPU(Cached)        -> DEV(Write-Combined)  started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.118172603 seconds = 541.6Mbytes/sec

DEV(Write-Combined) -> CPU(Cached)        started: Moving 16 blocks of 4194304 bytes = 64Mbytes per test
        took 0.120572989 seconds = 530.8Mbytes/sec

-------------------- End tests --------------------
```

```
  Size  Used by
8433664  22
1949696   0
  40960   1 dwc3
3108864   0
  36864   0
 471040   0
```

```
→ head -n 50 /var/log/Xorg.0.log
[    15.076]
X.Org X Server 1.21.1.7
X Protocol Version 11, Revision 0
[    15.076] Current Operating System: Linux openeuler-riscv64 5.10.113 #1 SMP PREEMPT Mon Nov 20 04:44:14 UTC 2023 riscv64
[    15.076] Kernel command line: root=/dev/mmcblk0p3 console=ttyS0,115200 rootwait rw earlycon clk_ignore_unused loglevel=7 eth= rootrwoptions=rw,noatime rootrwreset=yes
[    15.076] Build ID: xorg-x11-server 21.1.7-1.oe2309
[    15.076] Current version of pixman: 0.42.2
[    15.077]    Before reporting problems, check http://wiki.x.org
 to make sure that you have the latest version.
[    15.077] Markers: (--) probed, (**) from config file, (==) default setting,
 (++) from command line, (!!) notice, (II) informational,
 (WW) warning, (EE) error, (NI) not implemented, (??) unknown.
[    15.077] (==) Log file: "/var/log/Xorg.0.log", Time: Mon Sep 18 08:00:10 2023
[    15.089] (==) Using system config directory "/usr/share/X11/xorg.conf.d"
[    15.091] (==) No Layout section.  Using the first Screen section.
[    15.091] (==) No screen section available. Using defaults.
[    15.091] (**) |-->Screen "Default Screen Section" (0)
[    15.091] (**) |    |-->Monitor "<default monitor>"
[    15.093] (==) No monitor specified for screen "Default Screen Section".
 Using a default monitor configuration.
[    15.093] (==) Automatically adding devices
[    15.093] (==) Automatically enabling devices
[    15.093] (==) Automatically adding GPU devices
[    15.093] (==) Automatically binding GPU devices
[    15.093] (==) Max clients allowed: 256, resource mask: 0x1fffff
[    15.093] (==) FontPath set to:
 catalogue:/etc/X11/fontpath.d,
 built-ins
[    15.093] (==) ModulePath set to "/usr/lib64/xorg/modules"
[    15.093] (II) The server relies on udev to provide the list of input devices.
 If no devices become available, reconfigure udev or disable AutoAddDevices.
[    15.093] (II) Loader magic: 0x2ad7466008
[    15.093] (II) Module ABI versions:
[    15.093]    X.Org ANSI C Emulation: 0.4
[    15.093]    X.Org Video Driver: 25.2
[    15.093]    X.Org XInput driver : 24.4
[    15.094]    X.Org Server Extension : 10.0
[    15.096] (++) using VT number 1

[    15.096] (II) systemd-logind: logind integration requires -keeptty and -keeptty was not provided, disabling logind integration
[    15.100] (II) xfree86: Adding drm device (/dev/dri/card0)
[    15.100] (II) Platform probe for /sys/devices/platform/display-subsystem/drm/card0
[    15.125] (II) xfree86: Adding drm device (/dev/dri/card1)
[    15.126] (II) Platform probe for /sys/devices/platform/soc/ffecc80000.gc620/drm/card1
[    15.126] (II) xfree86: Adding drm device (/dev/dri/card2)
[    15.126] (II) Platform probe for /sys/devices/platform/soc/ffef400000.gpu/drm/card2
[    15.127] (II) no primary bus or device found
[    15.127]    falling back to /sys/devices/platform/display-subsystem/drm/card0
[    15.127] (II) LoadModule: "glx"
[    15.130] (II) Loading /usr/lib64/xorg/modules/extensions/libglx.so
```

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      to make sure that you ha
[    15.077] Markers: (--
      (++) from command line,
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[    15.077] (==) Log file
[    15.089] (==) Using sy
[    15.091] (==) No Layou
[    15.091] (==) No scre
[    15.091] (**) |-->Scr
[    15.091] (**) |   |--
[    15.093] (==) No moni
      Using a default monitor
[    15.093] (==) Automat
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[    15.093] (==) Max cli
[    15.093] (==) FontPat
      catalogue:/etc/X11/font
      built-ins
[    15.093] (==) ModulePa
[    15.093] (II) The ser
      If no devices become ava
[    15.093] (II) Loader
[    15.093] (II) Module
[    15.093]    X.Org ANSI
[    15.093]    X.Org Vide
[    15.093]    X.Org XInp
[    15.094]    X.Org Serv
[    15.096] (++) using V
```

```
→ sed -n 60,80p /var/log/Xorg.0.log
[    15.182]    compiled for 1.21.1.7, module version = 1.21.1
[    15.182]    Module class: X.Org Video Driver
[    15.182]    ABI class: X.Org Video Driver, version 25.2
[    15.182] (II) LoadModule: "fbdev"
[    15.183] (WW) Warning, couldn't open module fbdev
[    15.183] (EE) Failed to load module "fbdev" (module does not exist, 0)
[    15.183] (II) modesetting: Driver for Modesetting Kernel Drivers: kms
[    15.208] (II) modeset(0): using drv /dev/dri/card0
[    15.209] (II) modeset(0): Creating default Display subsection in Screen section
      "Default Screen Section" for depth/fbbpp 24/32
[    15.209] (==) modeset(0): Depth 24, (==) framebuffer bpp 32
[    15.209] (==) modeset(0): RGB weight 888
[    15.209] (==) modeset(0): Default visual is TrueColor
[    15.209] (II) Loading sub module "glamoregl"
[    15.209] (II) LoadModule: "glamoregl"
[    15.209] (II) Loading /usr/lib64/xorg/modules/libglamoregl.so
[    15.246] (II) Module glamoregl: vendor="X.Org Foundation"
[    15.246]    compiled for 1.21.1.7, module version = 1.0.1
[    15.246]    ABI class: X.Org ANSI C Emulation, version 0.4
[    15.555] (II) modeset(0): glamor X acceleration enabled on PowerVR B-Series BXM-4-64
[    15.556] (II) modeset(0): glamor initialized
```

```
[    15.096] (II) systemd-
[    15.100] (II) xfree86: Adding drm device (/dev/dri/card0)
[    15.100] (II) Platform probe for /sys/devices/platform/display-subsystem/drm/card0
[    15.125] (II) xfree86: Adding drm device (/dev/dri/card1)
[    15.126] (II) Platform probe for /sys/devices/platform/soc/ffecc80000.gc620/drm/card1
[    15.126] (II) xfree86: Adding drm device (/dev/dri/card2)
[    15.126] (II) Platform probe for /sys/devices/platform/soc/ffef400000.gpu/drm/card2
[    15.127] (II) no primary bus or device found
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[    15.127] (II) LoadModule: "glx"
[    15.130] (II) Loading /usr/lib64/xorg/modules/extensions/libglx.so
```
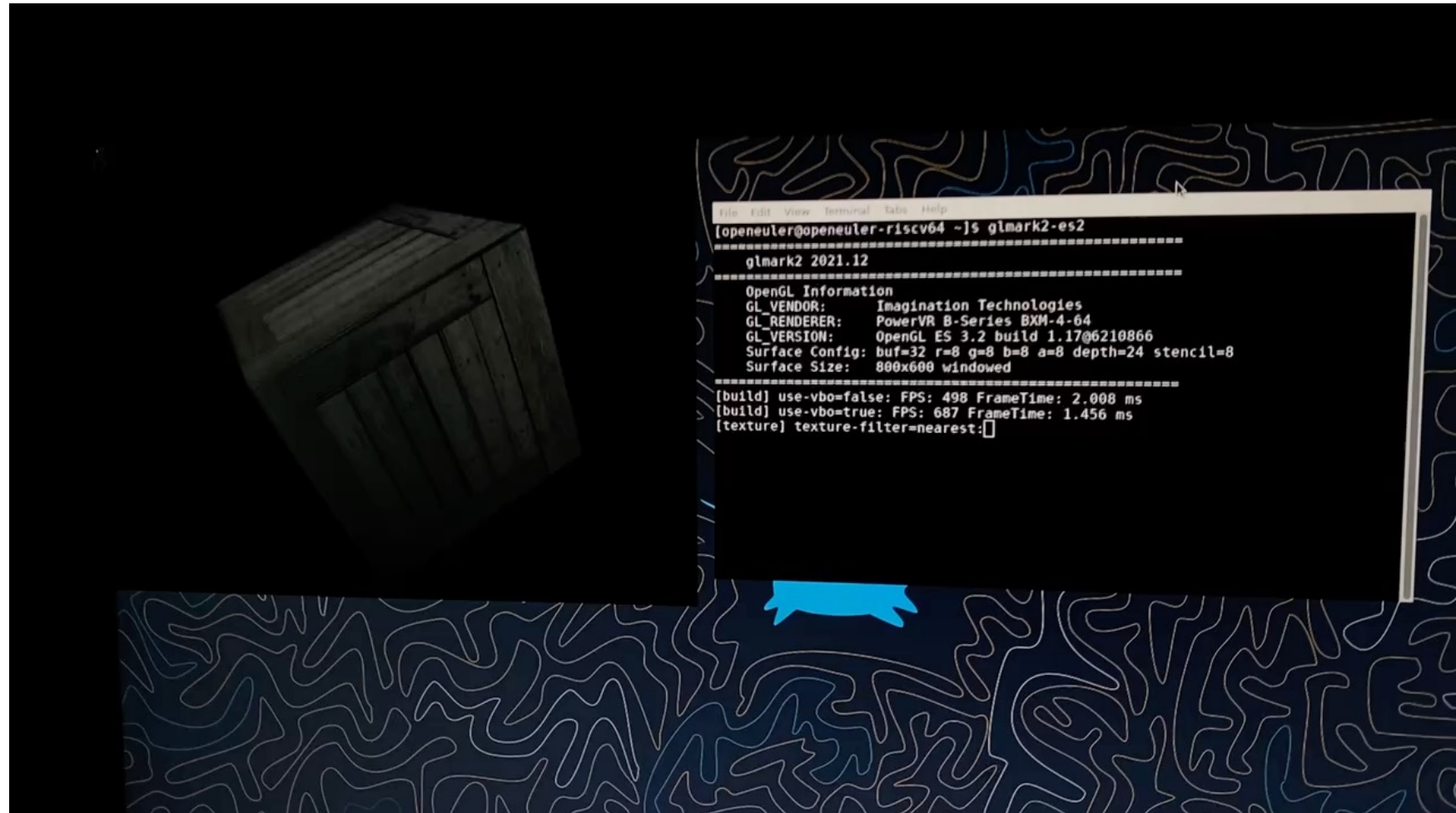
Testing Environment

- DDE: xfce
- Bootup and run!

Testing Environment

- DDE: xfce
- Bootup and run!

ROS

- Alternative solution of the Raspberry Pi
- More use case for LicheePi 4A

WIP

- Multimedia encoding & decode support
- VPU support

Thanks