Freescale XServer Video Driver User's Guide

Contents

1 EXA Driver

XServer video driver is designed to help XServer to render desktop onto a screen. It manages the display driver, and provides rendering acceleration and other display features, such as rotation and multiple display methods. Freescale video driver implements XServer's EXcellent Architecture (EXA).

1.1 EXA driver options

These options are used in the configuration file `/etc/X11/xorg.conf`:

```
Section "Device"
    Identifier  "i.MX Accelerated Framebuffer Device"
    Driver      "vivante"
    Option      "fbdev"       "/dev/fb1"
    Option      "vivante_fbdev" "/dev/fb1"
    Option      "SyncDraw"  "false"
EndSection
```

Option	Meaning	Default Value	Comment
ShadowFB	Whether to enable the shadow frame buffer (FB).	False	*Deprecated technology.* It rotates the FB. If it is enabled, acceleration is disabled.
Rotate	Rotation of FB.	<null>	*Deprecated technology.* It can be CW/CCW/ UD. If it is set to one of these values, Shadow FB is automatically enabled. Rotation cannot change after XServer is started.
NoAccel	Disables EXA acceleration.	False	If it is set to **True**, the EXA functions are not accelerated by the GPU.
VivCacheMem	Pixmap created by GPU is generally cacheable.	True	Normal Pixmaps are created cacheable. Special Pixmaps used for EGL are still non-cacheable.
SyncDraw	Wait for the GPU to complete for every single drawing.	False	This will affect the performance if it is set to **True**.

1.2 24 bpp pixmap

The GPU can only accelerate a 16 bpp or 32 bpp pixmap. For a 24 bpp screen, a 32 bpp buffer is actually reserved.

1.3 Shared pixmap extension

The Shared Pixmap Extensio (SHM) pixmap will be described in next release.

1.4 How to disable XRandR

For an embedded device that does not support XRandR (for which the memory can be reduced), set "gEnableXRandR" to **False** in vivante_fbdev_driver.c.

1.5 Cursor

Freescale hardware IPU does not provide a hardware cursor.

1.6 DRI

DRI is designed to accelerate OpenGL rendering. It enables the GPU direct render to the on-screen buffer. Due to the lack of hard cursor support, and because often the window location is not well aligned, the GPU cannot render to screen directly. Therefore, DRI is not fully used.

DRI is supported in this video driver. No DRI2 or DRI3 is supported.

1.7 Tearing

XServer (and early Microsoft Windows) does not support double buffering for the screen. There will be a copy from off-screen buffer to target on-screen area (or direct rendering to on-screen). The operation cannot be completed in the blank time of the display, and the IPU cannot provide an ideal VSYNC signal. Therefore, there will be tearing.

To remove tearing, a GLES compositor is needed. This tearing free feature will be described in next release.

2 XRandR

This video driver supports XRandR.

The X Resize, Rotate and Reflect Extension (RandR) is an X Window System extension, which allows clients to dynamically resize, rotate, and reflect the root window of a screen (http://en.wikipedia.org/wiki/Xrandr).

2.1 Useful commands

If the display supports multiple resolution types, use the following commands for a query:

root@imx6qsabresd:~# xrandr

```
Screen 0: minimum 240 x 240, current 1920 x 1080, maximum 8192 x 8192
DISP3 BG connected 1920x1080+0+0 (normal left inverted right x axis y axis) 0mm x 0mm
   S:1920x1080p-50   50.0*
   S:1920x1080p-60   60.0
   S:1280x720p-50    50.0
   S:1280x720p-60    60.0
   S:720x576p-50     50.0
   S:720x480p-60     59.9
   V:640x480p-60     60.0
   S:640x480p-60     59.9
```

- Change the resolution:

  root@imx6qsabresd:~# xrandr -s 1920x1080
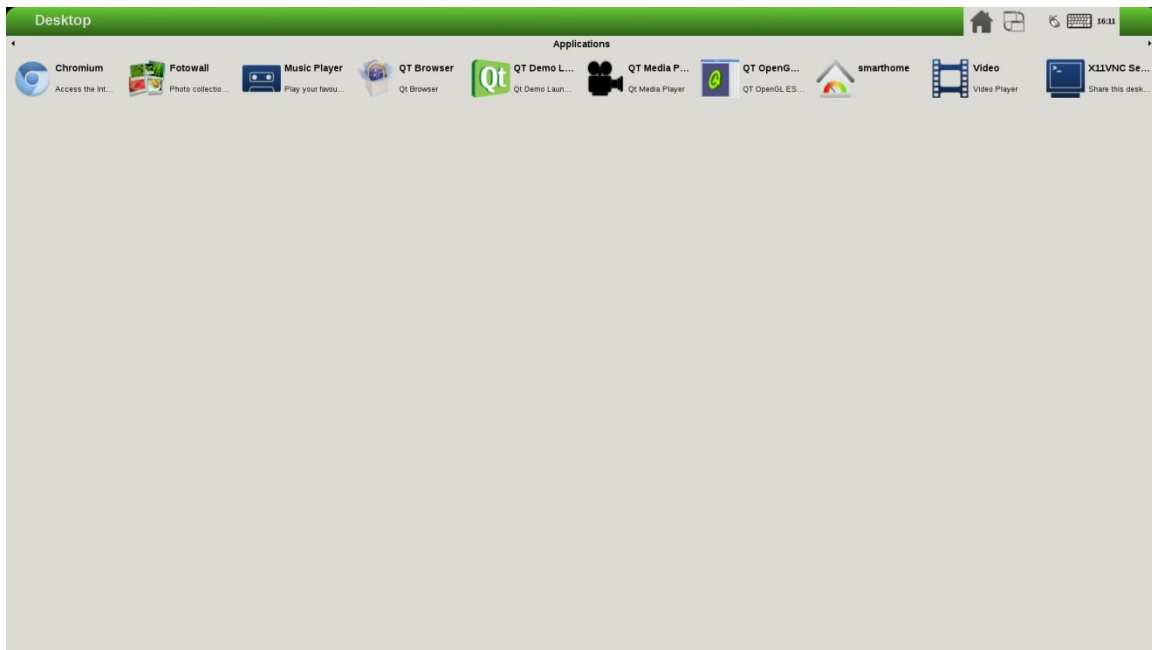
- Rotate the screen:

root@imx6qsabresd:~# xrandr -o left:

root@imx6qsabresd:~# xrandr -o right:

- Reflect the screen:

root@imx6qsabresd:~# xrandr -x
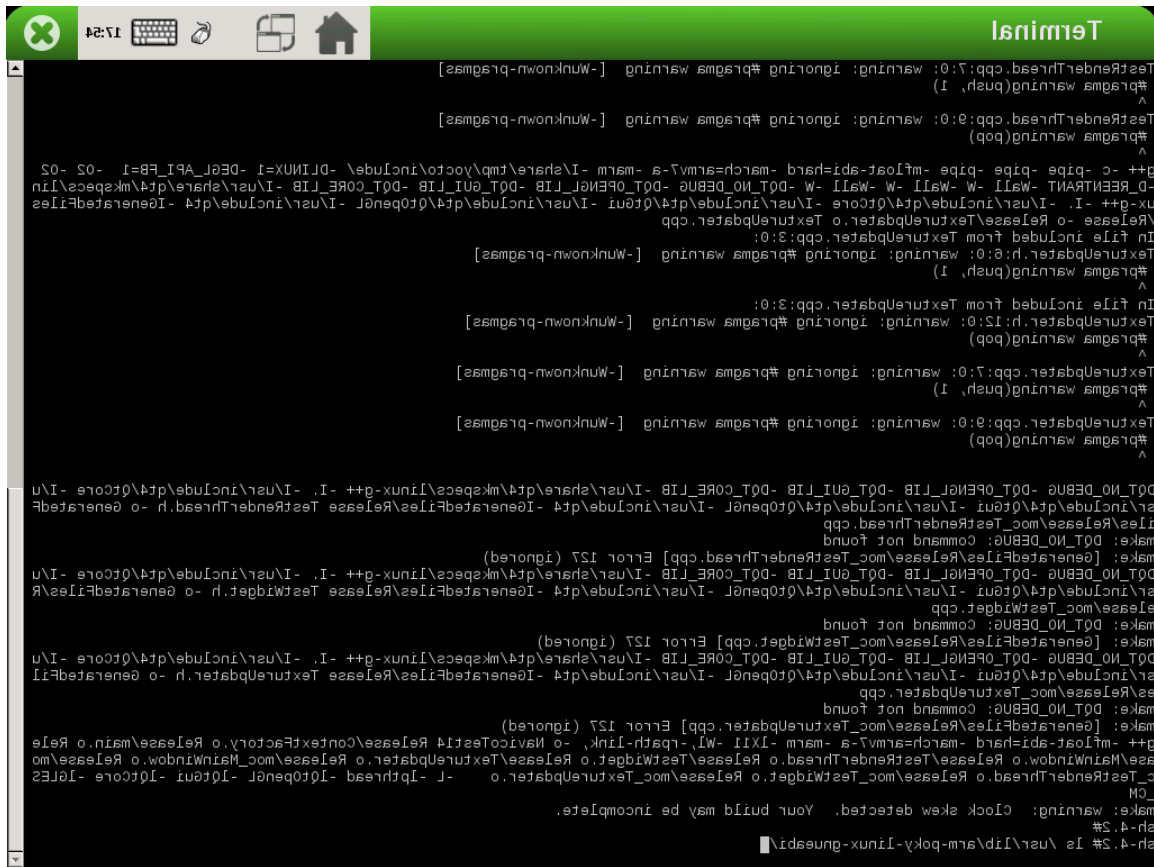
- Restore to normal state:

root@imx6qsabresd:~# xrandr -o normal:

2.2 Rendering the desktop on overlay

/dev/fb1 is the overlay device on the same screen as /dev/fb0; and /dev/fb3 is the overlay of /dev/fb2. Use xorg.conf to specify fb1 or fb3:

```
Section "Device"
    Identifier  "i.MX Accelerated Framebuffer Device"
    Driver      "vivante"
    Option      "fbdev"       "/dev/fb1"
    Option      "vivante_fbdev" "/dev/fb1"
EndSection
```

After rebooting the system, the desktop will be rendered on the overlay:
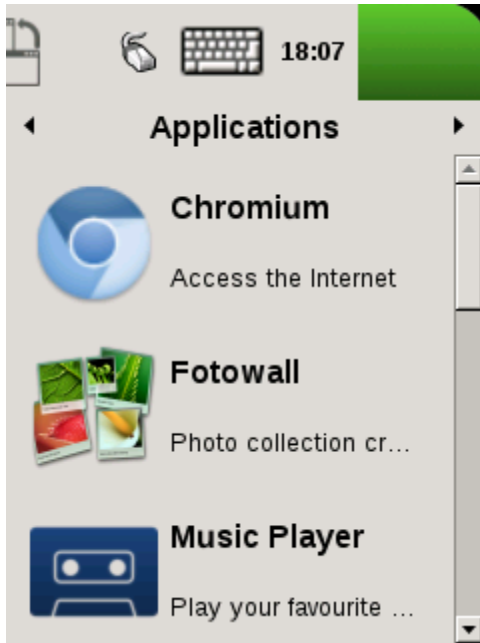
If the size is too small (240x240), XRandR can be used to define a new mode.

1. Get the output name:

root@imx6qsabresd:~# xrandr
```
Screen 0: minimum 240 x 240, current 240 x 320, maximum 8192 x 8192
DISP4 FG connected 240x320+0+0 (normal left inverted right x axis y axis) 0mm x 0mm
   U:240x320p-60   60.0*
```

2. Define a new mode:

root@imx6qsabresd:~# xrandr --newmode "640x480R" 23.50 **640** 688 720 800 **480** 483 487 494 +hsync -vsync

3. Add the newly created mode:

root@imx6qsabresd:~# xrandr --addmode "DISP4 FG" 640x480R

4. Check the modes:

root@imx6qsabresd:~# xrandr
```
Screen 0: minimum 240 x 240, current 240 x 320, maximum 8192 x 8192
DISP4 FG connected 240x320+0+0 (normal left inverted right x axis y axis) 0mm x 0mm
   U:240x320p-60   60.0*
   640x480R        59.5
```

5. Switch to a new mode:

root@imx6qsabresd:~# xrandr -s 640x480

Note:

- The overlay size cannot exceed the display size. For example, if LVDS is 1024x768, the overlay size cannot be larger than this.

- Timings for overlay are meaningless, but wrong timings may damage your display, so be careful when creating a new display mode for your display.

- If fb3 is used, fb2 must be enabled. Otherwise, fb3 is invisible.

2.3 Process of selecting the HDMI default resolution

The process of selecting the HDMI default resolution is as follows:

1. Set the user preferred mode (must be within the initial size).

2. Set the display preferred mode (must be within the initial size).

3. Check the aspect (if not found, use 4:3. Find the biggest resolution within the initial size for the aspect ratio).

4. Check the first mode.

Initial size: initial FB virtual size or configured maximum size.

To specify the user preferred mode, add the option "PreferredMode" or "modes".

2.4 Performance

The performance will decrease in the case of screen rotation or mirroring.

2.5 Memory consumption

The video driver supports a maximum of 1920x1080@32bpp. To support rotation, a shadow buffer is reserved, so the total memory consumption is 16 MB (1920x1080x4x2).

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