

Building a Multimedia Appliance with Yocto



GUACAMAYO

Tomas Frydrych, sleep(5) ltd

`<tomas@sleepfive.com>`

What and Why?!

Why?

As many a FOSS project, started as an itch to scratch,

- An excuse to order a Raspberry PI,

Building media appliances with Yocto is harder than it should/needs to be!

- Missing/outdated components,
- Specialised session setup,
- Hardware support challenges.

Why Yocto?

What else?

- OpenEmbedded is the best solution for embedded Linux,
 - Mature project, with thriving community,
 - Hi-productivity environment to develop with and under.
- Poky provides stable foundation (QA & releases),
- Guacamayo tracks Poky releases.

Lean, Mean & Clean!

Our Vision

Clean

- Easy to use:
 - Watching a movie is not a complex task,
 - Intricate menu maze to pass time ... not,
- Unobtrusive,
 - Facilitating the experience, not being the 'experience'!
- Objects of desire and unrepentant envy!

Our Vision

Clean

- Consumer expectations have grown greatly in last 6 years,
- FOSS software often lacking behind on the UX front,
- Clean break needed time from time!

Our Vision

Mean

- Decent HW is a commodity,
- But are we getting our money's worth?

=>

- HW accelerated graphics & 3D capabilities vs. X11,
- HW accelerated codecs vs. crappy drivers,
- Video and graphics pipelines not always integrating well.

Our Vision

Lean

- Tailored to the task,
- Not a desktop distro bent and twisted into dubious shape!
- Nobody buys media appliance to browse the web ...

=> Single 'shell' application devices

- No need for WM / Compositor,
- No need for X11, ideally directly on EGL.

Core Components

Core Components

(Above and over Yocto's out-of-the-box experience)

- UPnP MediaServer / MediaRenderer
- Audio & video pipelines,
- Graphics drivers,
- UI shell,
- Session setup & auxiliary utils.

Core Components

UPnP MediaServer and MediaRenderer implementation

- Rygel,
- Maintained by Openismus GmbH (openismus.com),
- DLNA: not certified, but certainly certifiable!

Core Components

Audio & video pipelines

- PulseAudio,
- GStreamer,
- USB Audio.

Core Components

Graphics drivers

- Want zero copy video to OGL rendering,
- In Yocto via various BSP layers,
- Invariably huge PITA,
- Guacamayo: BSP layers as git sub-modules to ease the pain.

Core Components

UI shell

- MediaExplorer (media-explorer.org),
- Nice and clean; even leaner iteration in the works,
- Based on Clutter => can run on pure EGL,
- Themable and customisable.

Core Components

Session setup

- Session scripts for different appliance types,
- Helper utils (watchdog, display configurator),
- Tweaks for X-free deployment (e.g., VT management),
- NTP setup.

Core Components

What's missing

- Web UI,
- AirPlay support.

Basic Appliances

Media Server

What does it take?

- UPnP/DLNA MediaServer,
- (Web-based) UI.

guacamayo-image-mediaserver

- Rygel as UPnP/DLNA MediaServer,
- UI: none!!! (blame Ross Burton)

Audio Player

What does it take?

- UPnP/DLNA MediaRenderer,
- Audio pipeline,
- Configuration UI.

guacamayo-image-audioplayer

- Rygel as UPnP/DLNA MediaRenderer,
- Pulse audio + GStreamer,
- Console-based UI (sub-optimal!).

Media Centre

What does it take?

- Media centre shell,
- Audio & video pipelines; graphics stack,

guacamayo-image-mex

- MediaExplorer,
- PulseAudio + GStreamer,
- Clutter (under pure EGL or legacy X11),
- Missing AirPlay!

Hardware Support

Hardware Support

Raspberry PI

- Quite under-powered, particularly the graphics pipeline,
- The 512MB models capable of running MEX (but no video playback),
- Makes a half decent audioplayer.

Hardware Support

Beaglebone

- No audio/video codec without a cape,
- A possible USB audioplayer.

Hardware Support

Beagleboard

- Graphics good enough to run MEX shell,
- Missing integration between video and GL.

Hardware Support

Pandaboard

- Lack of Yocto support, not much more to say!
- Actually, lot more to say ... shame on you TI!
- Seriously!

Hardware Support

Zotac Zbox ID13 (Intel Atom, i915 graphics)

- Half decent MEX platform,
- Reasonable GLX support in Mesa, not very good EGL,
- => 'legacy' X11 image.

Hardware Support

On the lookout for better hardware!

- Freescale i.mx6 looks promising.

Finally, how to build your own!

Guacamayo audioplayer for Raspberry Pi:

```
$ git clone git://github.com/Guacamayo/meta-guacamayo.git  
$ cd meta-guacamayo  
$ git submodule update --init  
$ source init-build-env  
$ MACHINE=raspberrypi bitbake guacamayo-image-audioplayer
```

Where to Find Us

- `github.com/Guacamayo`
- `#guacamayo` @ Freenode
- `guacamayo-project.org`, `tumblr.guacamayo-project.org`

For commercial support `info@sleepfive.com`.