

Prototyping Mobile Linux Devices

OSCON 2011

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Agenda

- Introduction
- Why?
- Where to begin?
- Engineering aspects
- Example
- Conclusion

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Introduction

- Products begin with a prototype
- A way to test an idea
- Technology have made it more economical
- Building things on a budget
- One off to fill a special need
- Getting what YOU want

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Why Prototype?

- Proof of concept
- Way to show others
- Soliciting funding

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Where to begin?

- Specifications
- Get an idea of what you want
- Use tools
 - ECAD (Electronics CAD)
 - MCAD (Mechanical CAD)
- Simulate to make sure things fit

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Engineering Aspects

- Hardware (Electronics)
- Software
- Mechanical

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Hardware - Traditional

- Traditionally expensive
- Basic SoC with a modern mobile processor like an OMAP3 from TI:
 - As much as \$10K+ per iteration
 - Layout/Board Fab/Assembly
 - Fine traces and multilayer
 - Fine pitched BGAs
 - Component costs

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Hardware - Alternative

Low cost demo boards

- Smaller than old EVM
- Design data often available
- Example: Beagle Board

Current offering of modules

- Handles the complex part
- Simplify the boards you need to make
- Example: LogicPD
- Often very small

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Hardware - Alternative

Add UI components

- touch screen
- sensors (buttons, accel, etc)
- displays, etc.

Connectivity

- WiFi Modules
- 3G Modules
- Bluetooth Module
- Other

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Hardware - Alternative

Power

- Battery
- Charger
- Other power options

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Software

Many UI frameworks available

OpenSource options

- QT
- Android
- MeeGo/Maemo
- X11 (desktop adaptations)
- DirectFB
- Custom Mix

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Software

Android

- Basic port from Silicon makers
- Example: Rowboat for the TI Cortex-A8 devices
- Need to add support for sensors and other elements on your board
- Linux driver
- Android Glue

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Mechanical - Traditional

Injection molding (\$\$\$\$)

- Mold investment
- Time on a molding machine

CNC shop (\$\$)

- Operator time
- Machine time
- Programming

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Mechanical - Alternative

Small CNC machines

- Less automated and slower
- Taig, Sherlines, and far east imports

3D printing

- Low end machine need tweaking
- Rental time from service bureau
- Can produce ABS parts

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Mechanical - Alternative (Con't)

Laser cutting

- Acrylic
- 2D process
- Can stack peices
- Viable for low volume production
- Can do labeling (engraving)

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Other Notes

- Low volume production and prototyping very similar
- Can share techniques
- Modules can be economical in small quantities

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Example - Beagle Tab7

Designed around a Beagle Board

Similar feature to off the shelf device

Compared to a GenTouch7:

- Newer ARM (Cortex-A8 vs ARM11)
- Outdoor visible LCD
- no speaker/microphone
- More buttons

Debuggable

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Conclusions

- Off the shelf modules can be economical means
- Current modules are mechanically sized to make it possible
- Mechanical Prototyping technology allows comparable results.
- Prototyping lessons can be applied to low volume runs

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