Open Source Handhelds

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Competa Conference Center
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Welcome, Handheld Fans!

Introduction

What?

- NOT Sony PSP or Nintendo DS
- Devices designed with open development in mind (Pandora, Caanoo, etc.)

Who?

- Retro computing/gaming nut
- User and developer of open source software
- Ported some stuff to Pandora
- Sr. UNIX Engineer at Competa

Introduction

- History
- ARM
- Operating Systems
- Software
- Packaging
- Development
- The Future
- Questions

History

2001

- Game Park (Korea)
- 133 MHz ARM920T
- 8 MB RAM
- 3.5” TFT 320x240
- SmartMedia storage

Game Park GP32

2005

- GPH ≠ Game Park
- 200 MHz ARM920T
  200 MHz ARM940T
- 64 MB RAM
- 3.5” 320x240 touch screen
- SD card storage

GPH GP2X

2009

- Dingoo Digital Technology Company Ltd. (China)
- 336 MHz MIPS
- 32 MB RAM
- 2.8” 320x240 LCD
- MiniSD storage

Dingoo A320

2009

- GPH's second handheld
- 533 MHz ARM9
  3D Acceleration
- 64 MB RAM
- 2.8” 320x240 AMOLED
- SD/SDHC storage

GP2X Wiz

2010
(±2 months)

- Open Pandora Team
- 600 MHz ARM Cortex-A8
  110 MHz PowerVR SGX 530
  430 MHz DSP
- 256 MB RAM
- 4.3” 800X480 touch screen
- Dual SD/SDHC storage
- Built-in WiFi & Bluetooth
- €330

Pandora

Pandora image from openpandora.org used under the Creative Commons Attribution 1.0 license

2010

- Specs similar to GP2X Wiz
- 128 MB RAM
- Analogue stick
- Accelerometer
- 3.5” 320x240 LCD
- Optional WiFi (USB)
- €125

GPH Caanoo

ARM

Photo of ARM Holdings premises by Yesme used under the Creative Commons Attribution-Share Alike 2.0 Generic license

ARM

1981

Acorn BBC Micro

6502 CPU

1981

Acorn Business Computer (ABC) Project

- To compete with the IBM PC
- Required extra processors to complement the 6502
- New architecture required
- Berkeley RISC Project

ARM

1983-1985	Acorn RISC Machine: ARM1, ARM2
1990	Spin-off: Advanced RISC Machines Ltd.
1998	ARM Ltd. / ARM Holdings plc. floated
2005	1.6 billion cores licensed
2008	10 billion cores shipped

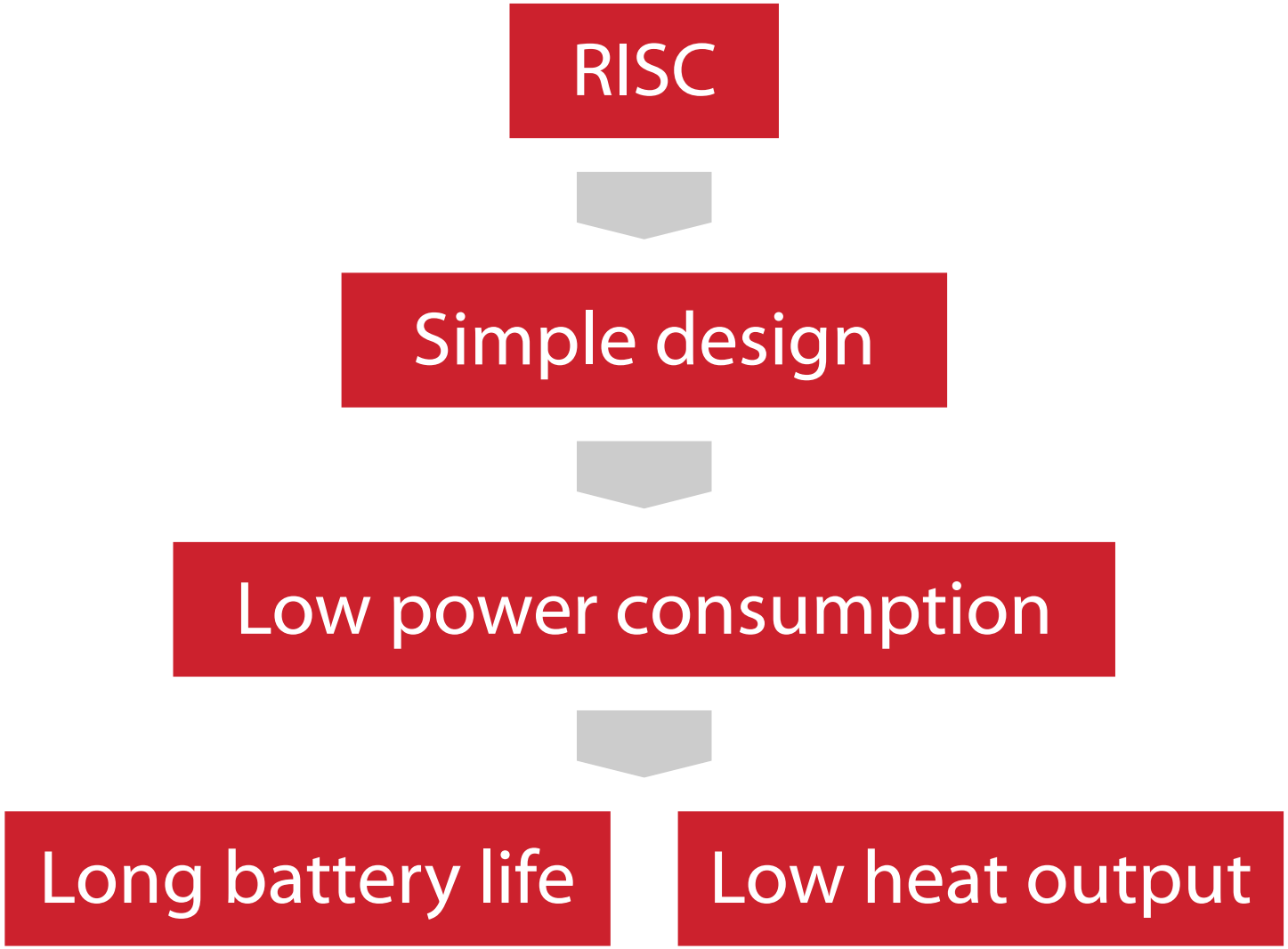
2011

15,000,000,000 cores in the wild

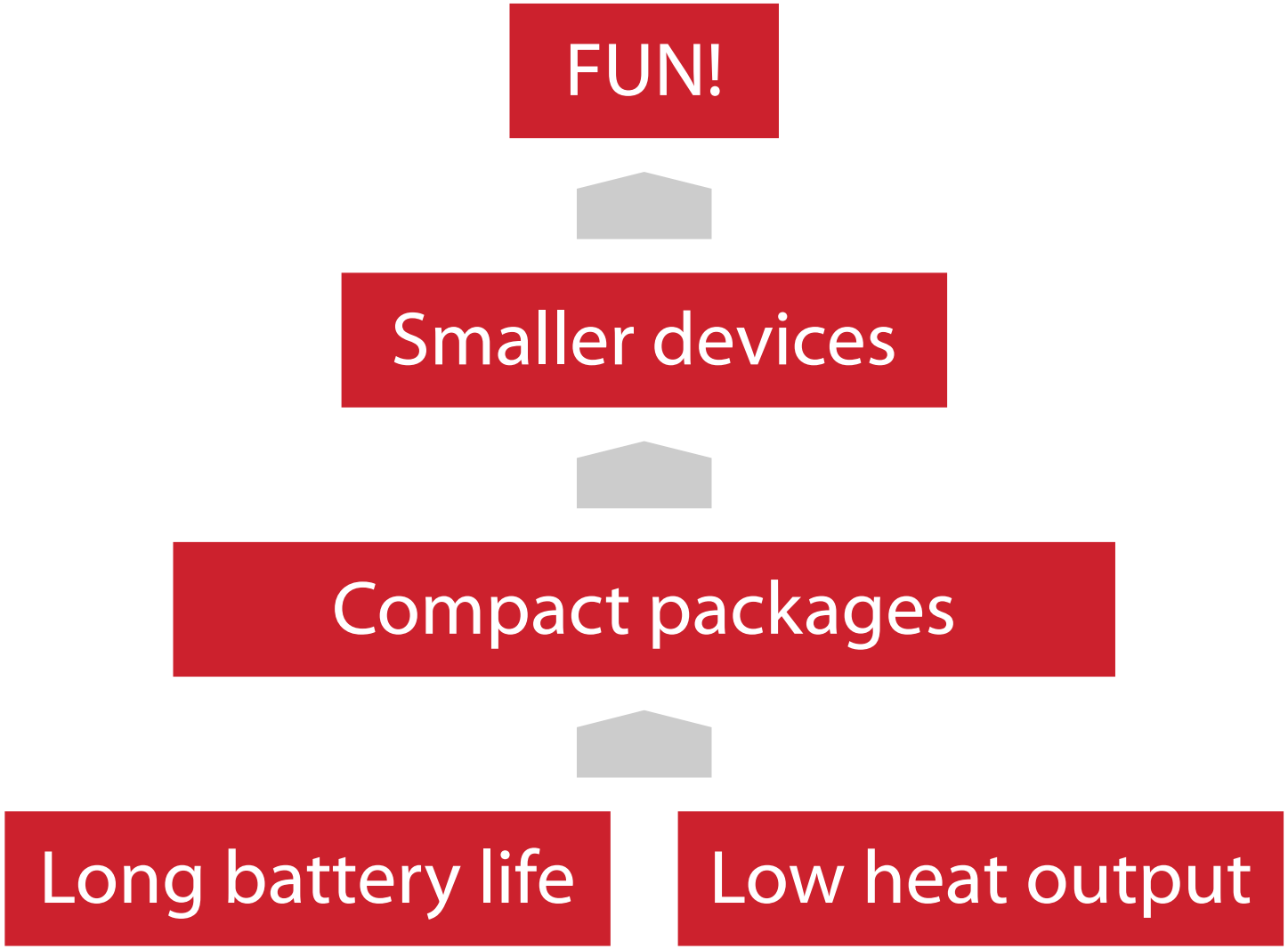
- 98% of all cell phones
- MP3 players
- Routers
- Hard drives
- Handheld consoles

ARM

Why ARM?


RISC
Simple design
Low power consumption
Long battery life
Low heat output

Why ARM?


FUN!
Smaller devices
Compact packages
Long battery life
Low heat output

System on Chip (SoC)

ARM

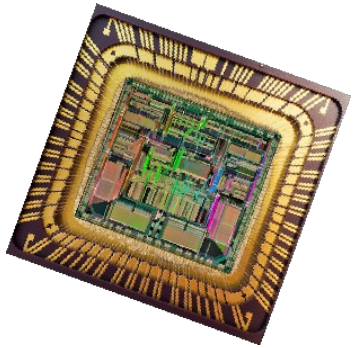
Smaller devices

Compact packages

System on Chip (SoC)

ARM

Microcontrollers on steroids!



CPU Cores

Flash Memory

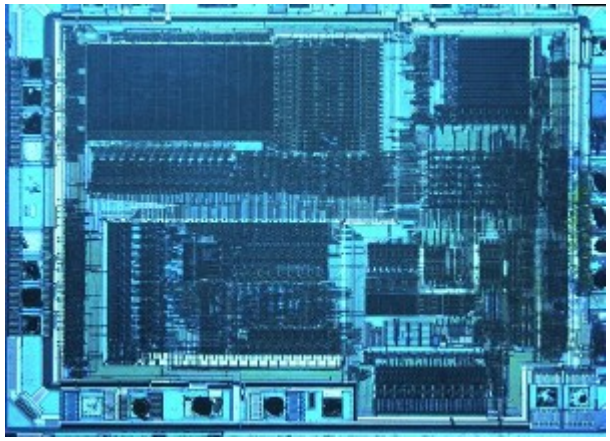
Peripherals

Motorola CPU core by Gregg M. Erickson used under the Creative Commons Attribution 3.0 Unported license.

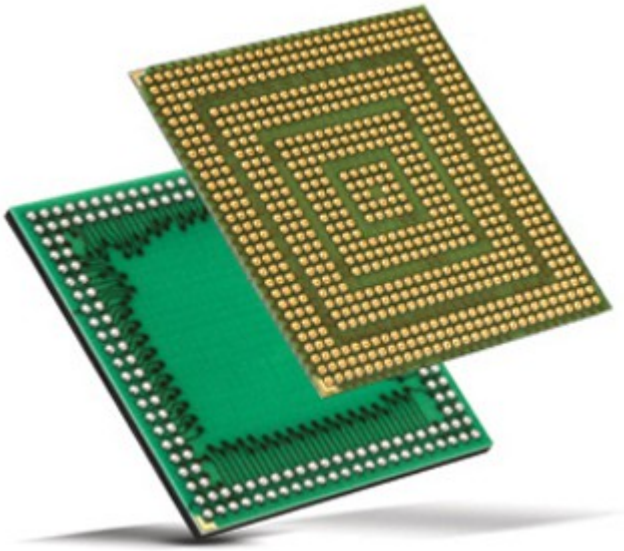
System on Chip (SoC)

ARM

What about RAM?



On-die
RAM



Package-on-Package
(BGA PoP)

Microchip PIC16F84A image courtesy of microblog.routed.net
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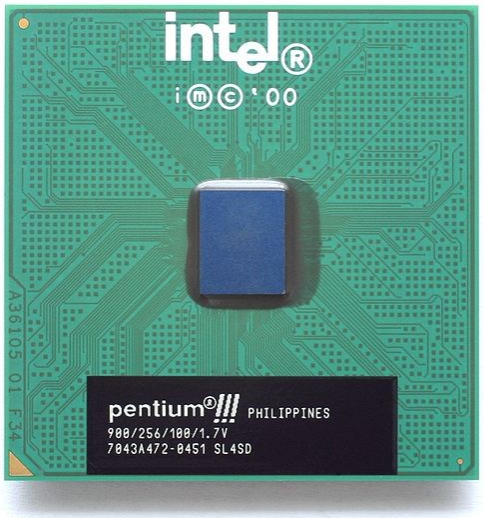
The Megahertz Myth

ARM

500 MHz = 500 MHz

The Megahertz Myth



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ARM

500 MHz **500 MHz**

Intel Pentium III Coppermine image by Konstantin Lanzet used under the Creative Commons Attribution-Share Alike 3.0 Unported license.

An Analogy…

ARM

ARM

Yet Another Terrible Car Analogy

Aston Martin DB9

?

470 BHP = 470 BHP

0-100 km/h: 4.6 sec.

Top speed: 305 km/h

ARM

Yet Another Terrible Car Analogy

Aston Martin DB9

470 BHP

0-100 km/h: 4.6 sec.

Top speed: 305 km/h

Cargo volume: 197 litres

=

Scania R124

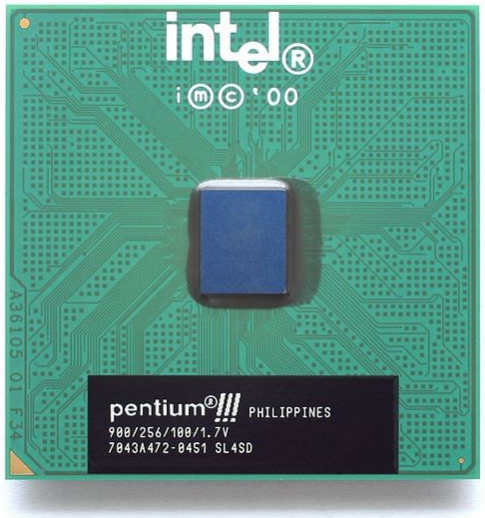
470 BHP

0-100 km/h: ~30 mins.

Top speed: yawn...

Cargo volume: 1 MBL

The Megahertz Myth



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ARM

500 MHz

500 MHz

- Instruction set (CISC vs. RISC)
- Power consumption vs. scale
- Memory bandwidth / cache
- Internal structure and buses

Intel Pentium III Coppermine image by Konstantin Lanzet used under the Creative Commons Attribution-Share Alike 3.0 Unported license.

ARM

The Megahertz Myth

ARM

Pandora

≠

Caanoo

500 MHz

500 MHz

- ~~Instruction set (CISC vs. RISC)~~
- Power consumption vs. scale
- Memory bandwidth / cache
- ~~Internal structure and buses~~

Pandora image from openpandora.org used under the Creative Commons Attribution 1.0 license

Software

Software

Operating System

XFCE

?

SDL
Simple Directmedia Layer

OpenGL|ES

Software

Emulators

NINTENDO 64

Dreamcast™

SUPER NINTENDO ENTERTAINMENT SYSTEM

SEGA MEGA DRIVE

Nintendo ENTERTAINMENT SYSTEM

Master System™

Software

Emulators

Software

Games

Open Source

- Anything for Linux (performance allowing)
- Some porting required

Homebrew

- Not always open source
- Author often ports to new devices

Commercial

- FunGP (GPH)
- Pandora App Store

Software

Games

SuperTux (Pandora, GPL)

Software

Games

Cave Story (GP2X, GINGE)

Software

Games

Monkey Island Series (ScummVM)

Software

Games

Quake 3 (Pandora)

Software

Games

Redemption (Caanoo)

Software

Applications

Multimedia

Audio	Audacious Deadbeef Exaile Ommpc	Built-in player
Video	MPlayer (X) VLC	Built-in player MPlayer (SDL)

Software

Applications

Internet

WWW	Aurora Chromium Firefox/Fennec Midori (OS)	CWB Links
Mail	Claws	?

Software

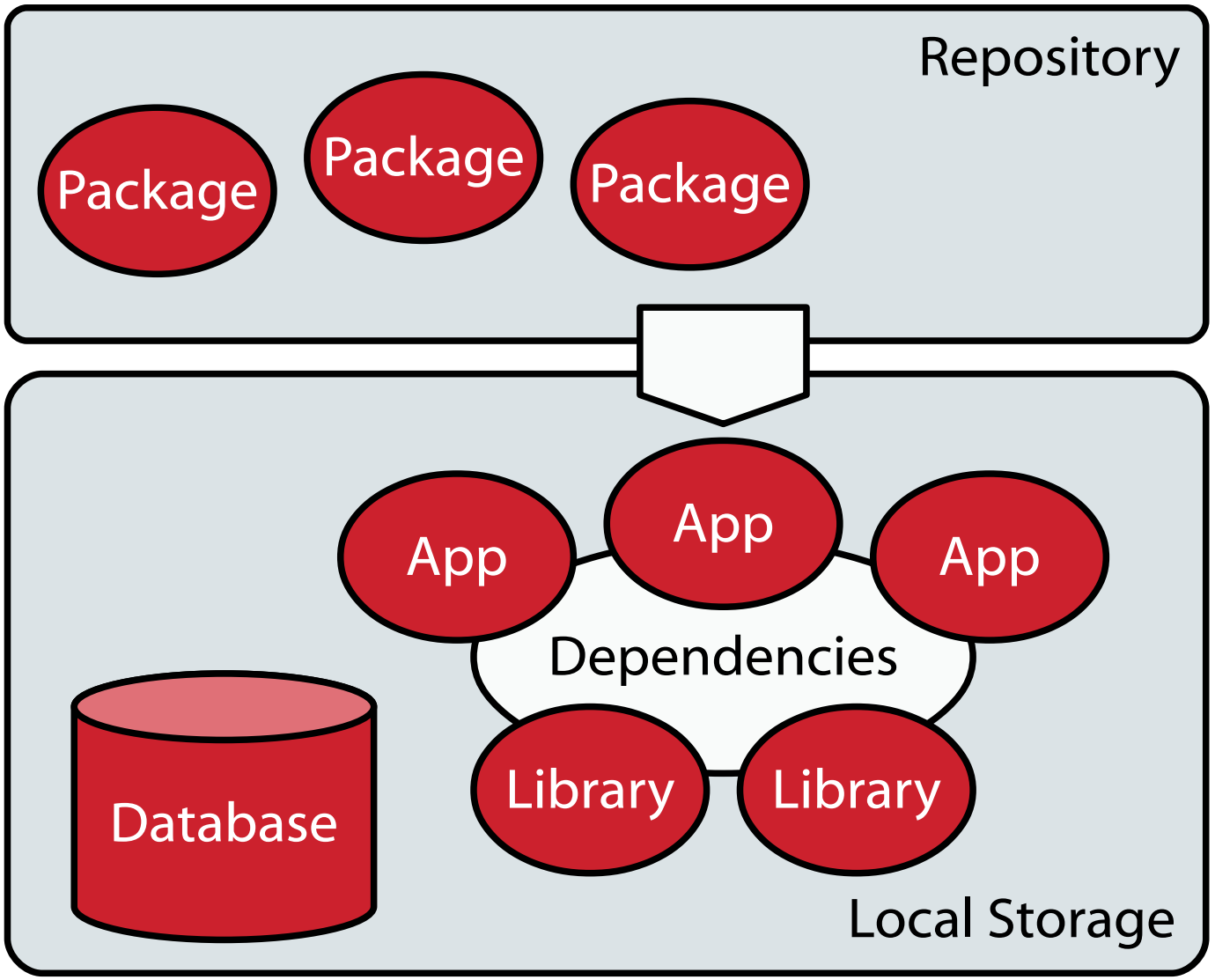
Applications

Productivity

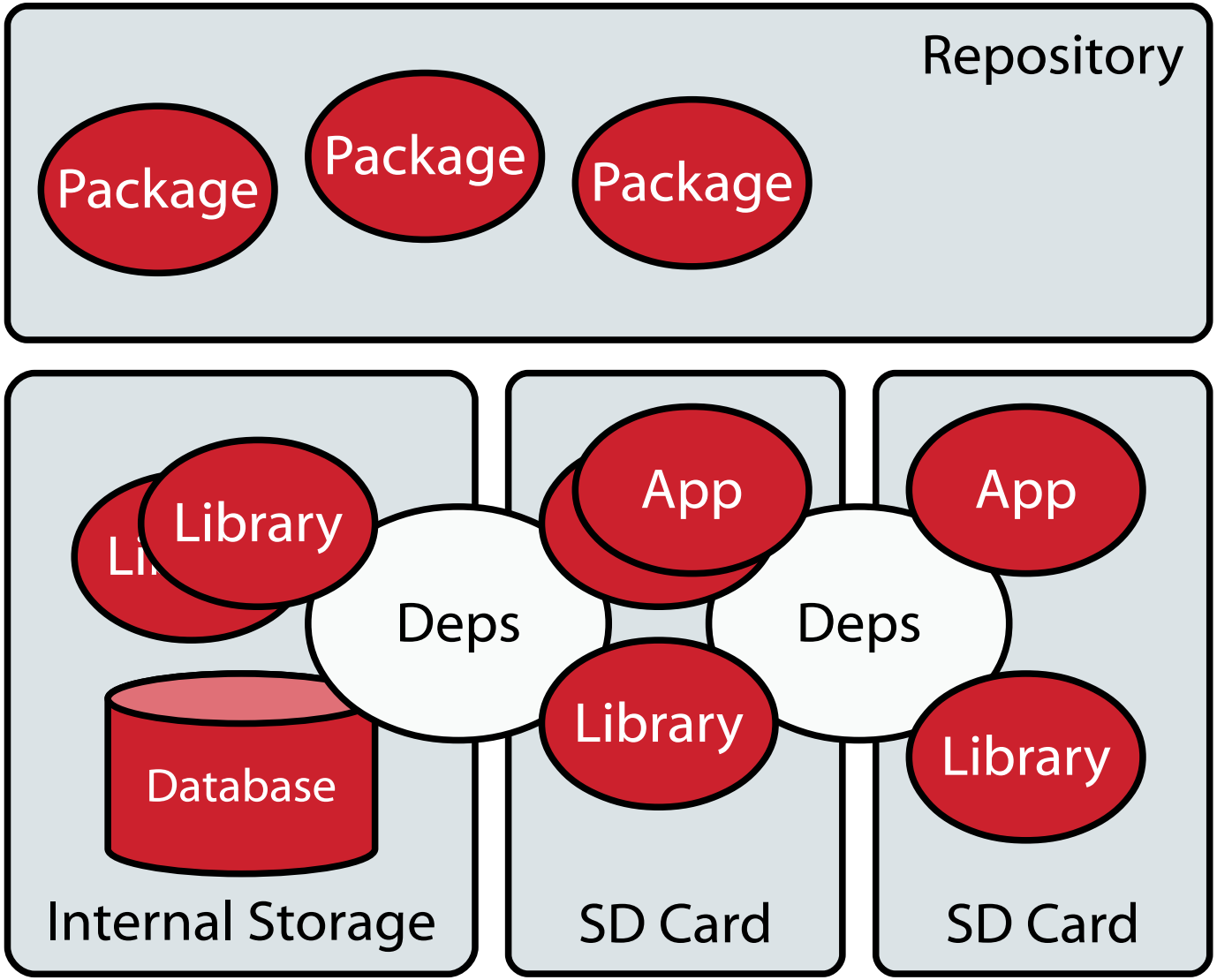
Office	Abiword Gnumeric OpenOffice	Write
Graphics	GIMP GRAFX2 mtPaint	GRAFX2

Packaging

Traditional (Linux) Package Management



Package Management On Removable Media



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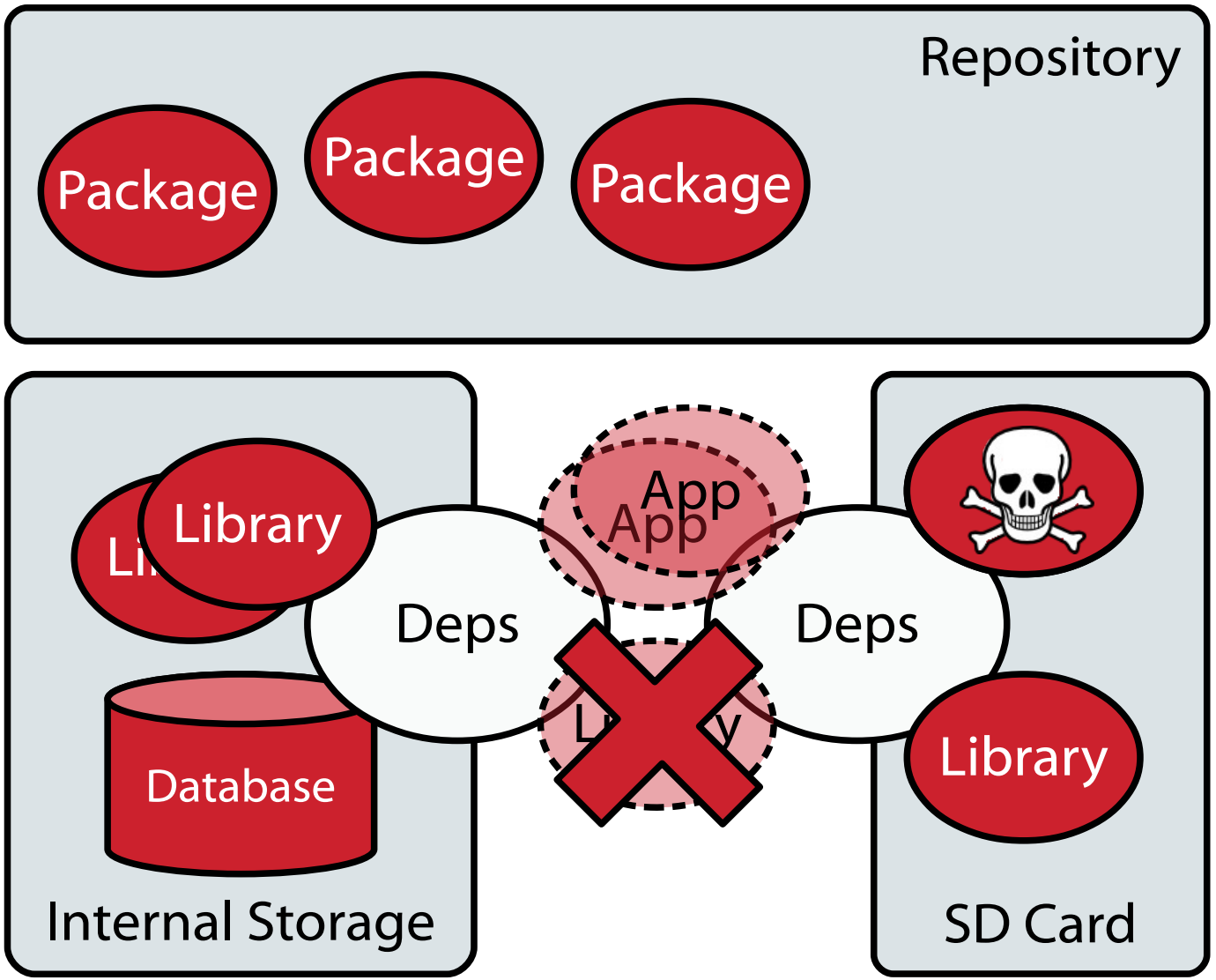
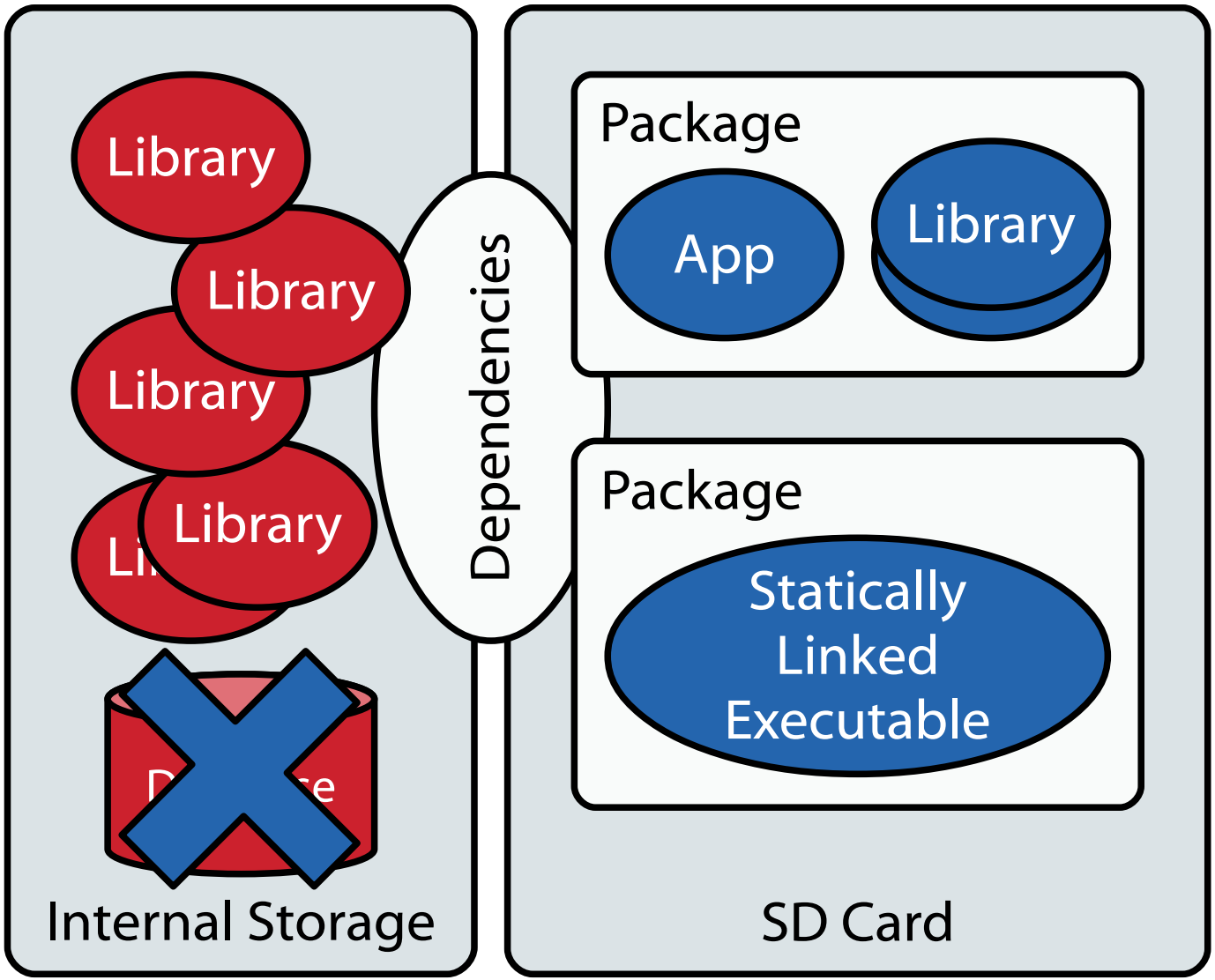
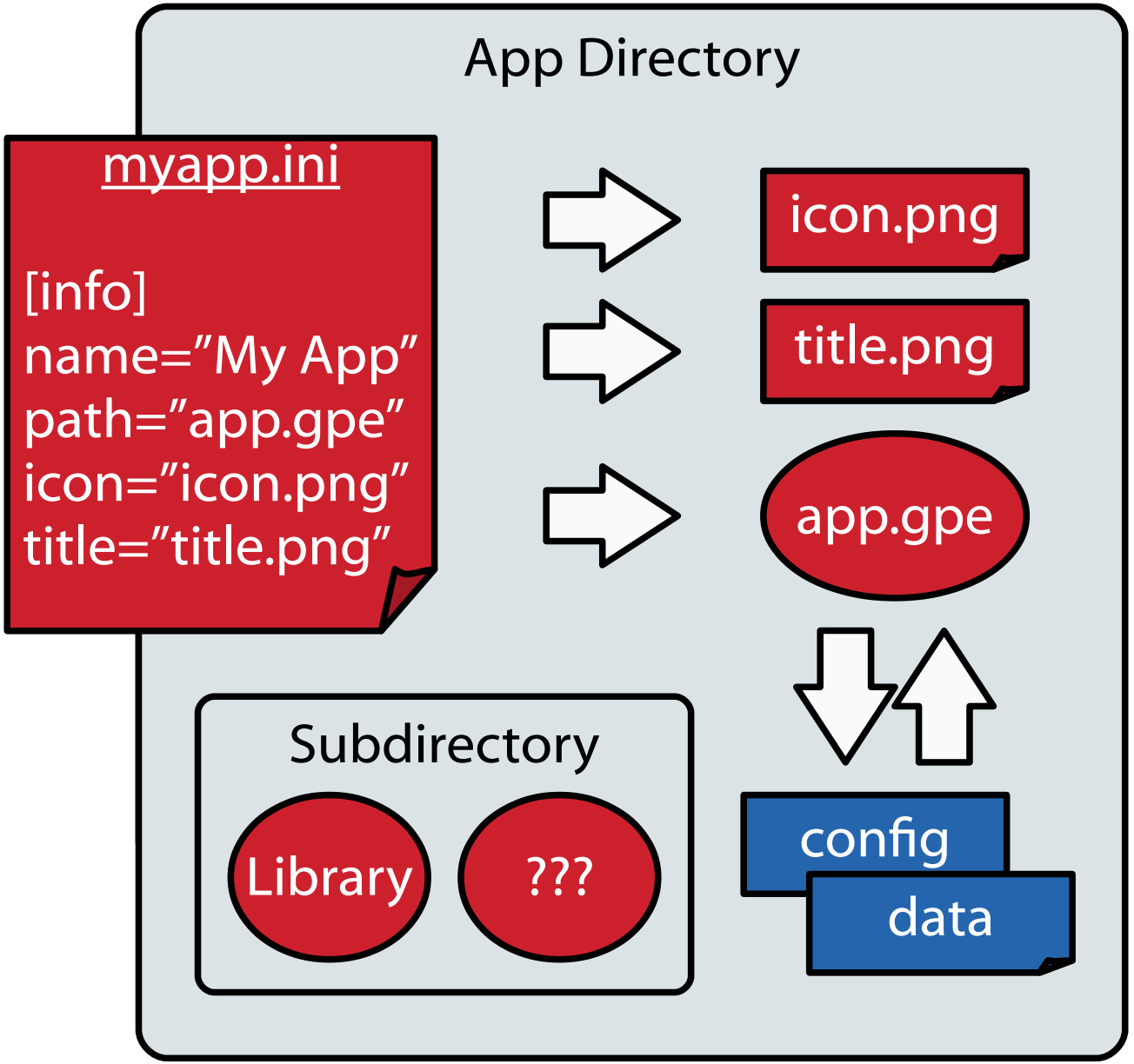


Managing Dependencies On Removable Media



GPH-Style Packages

GPH-Style Packages



GPH-Style Packages

Advantages

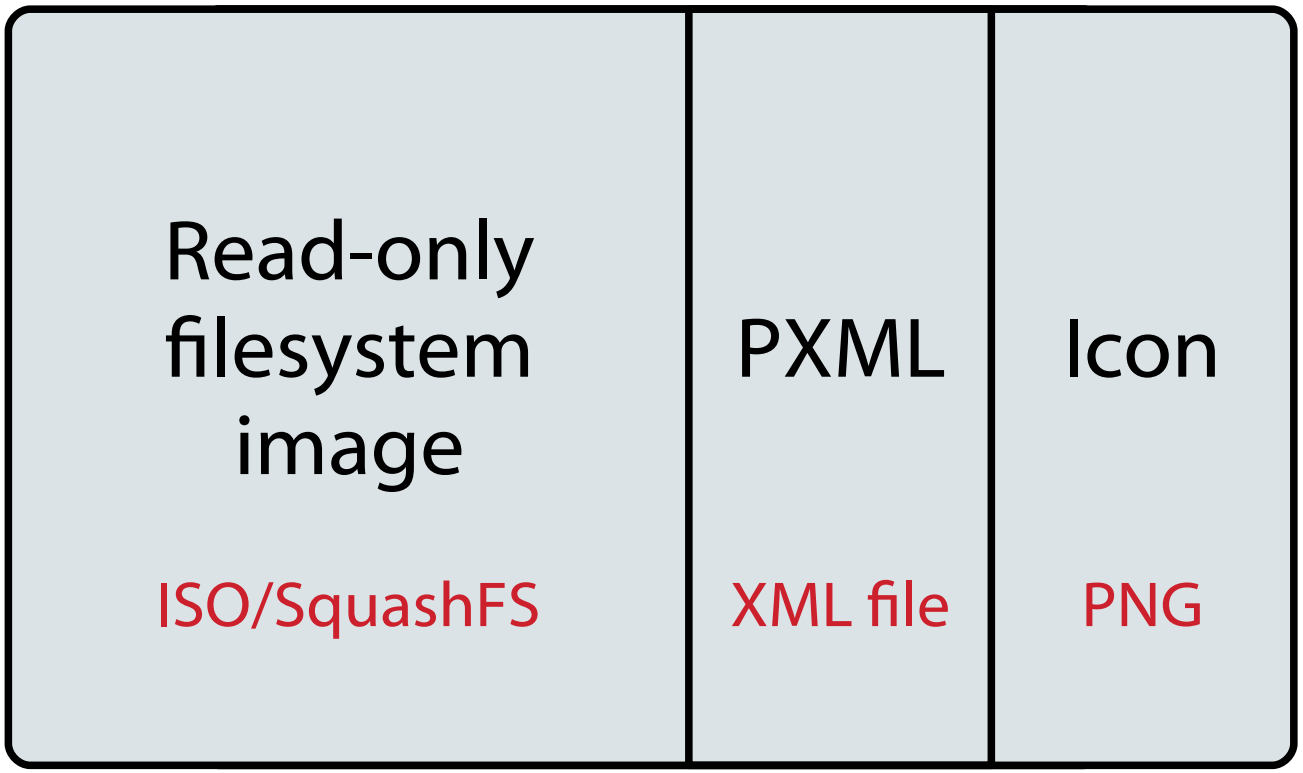
- Easy to make
- Easy to use
- Data stored with application

Disadvantages

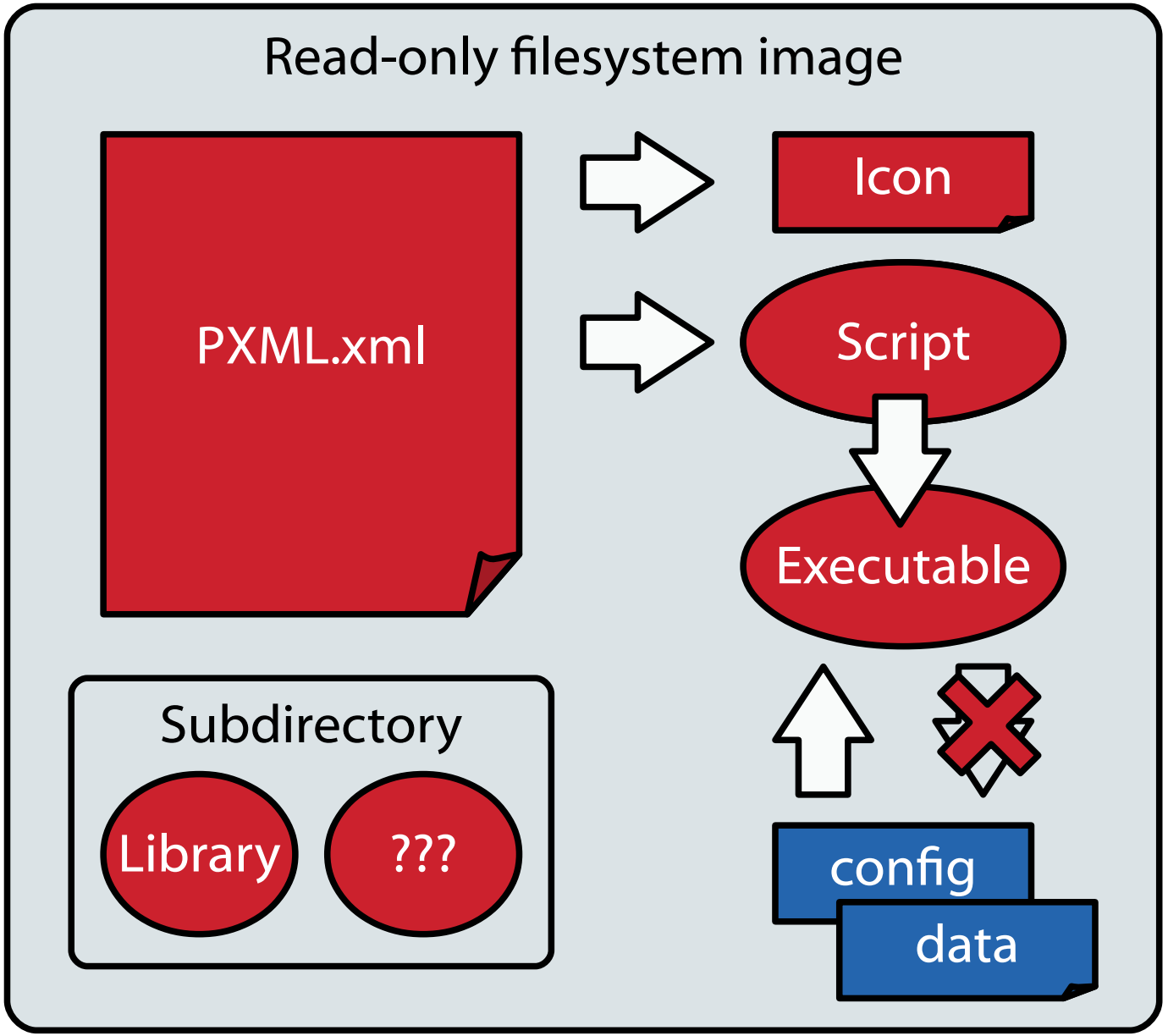
- User must extract (and have tools)
- Limited categories/functionality
- Easy to break/overwrite

Pandora (PND) Packages

Pandora (PND) Packages



Pandora (PND) Packages



Pandora (PND) Packages

Q: So where do I save my stuff?

A: To the current directory!

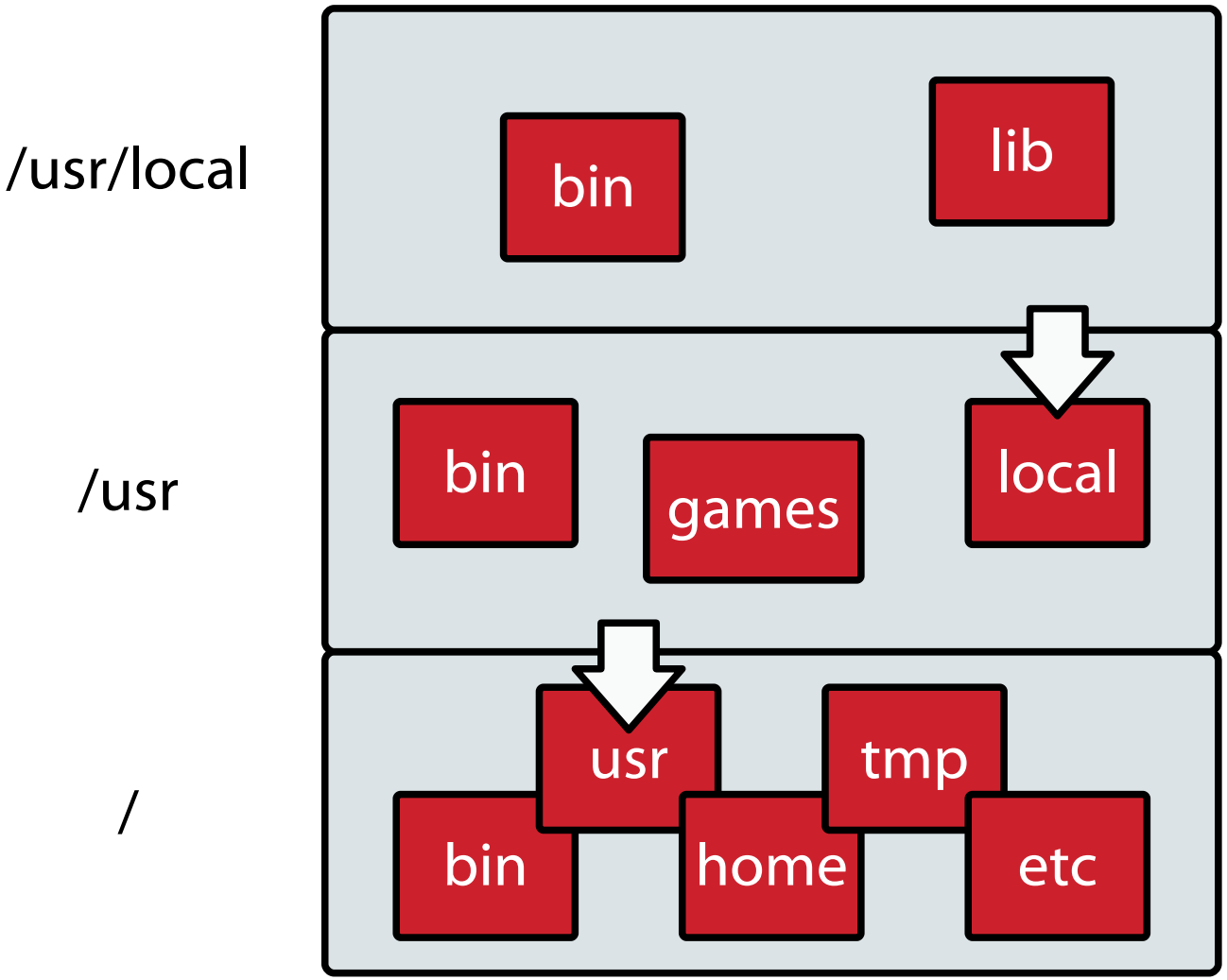
Union FS

+ Allows filesystem mounting over an existing mount point

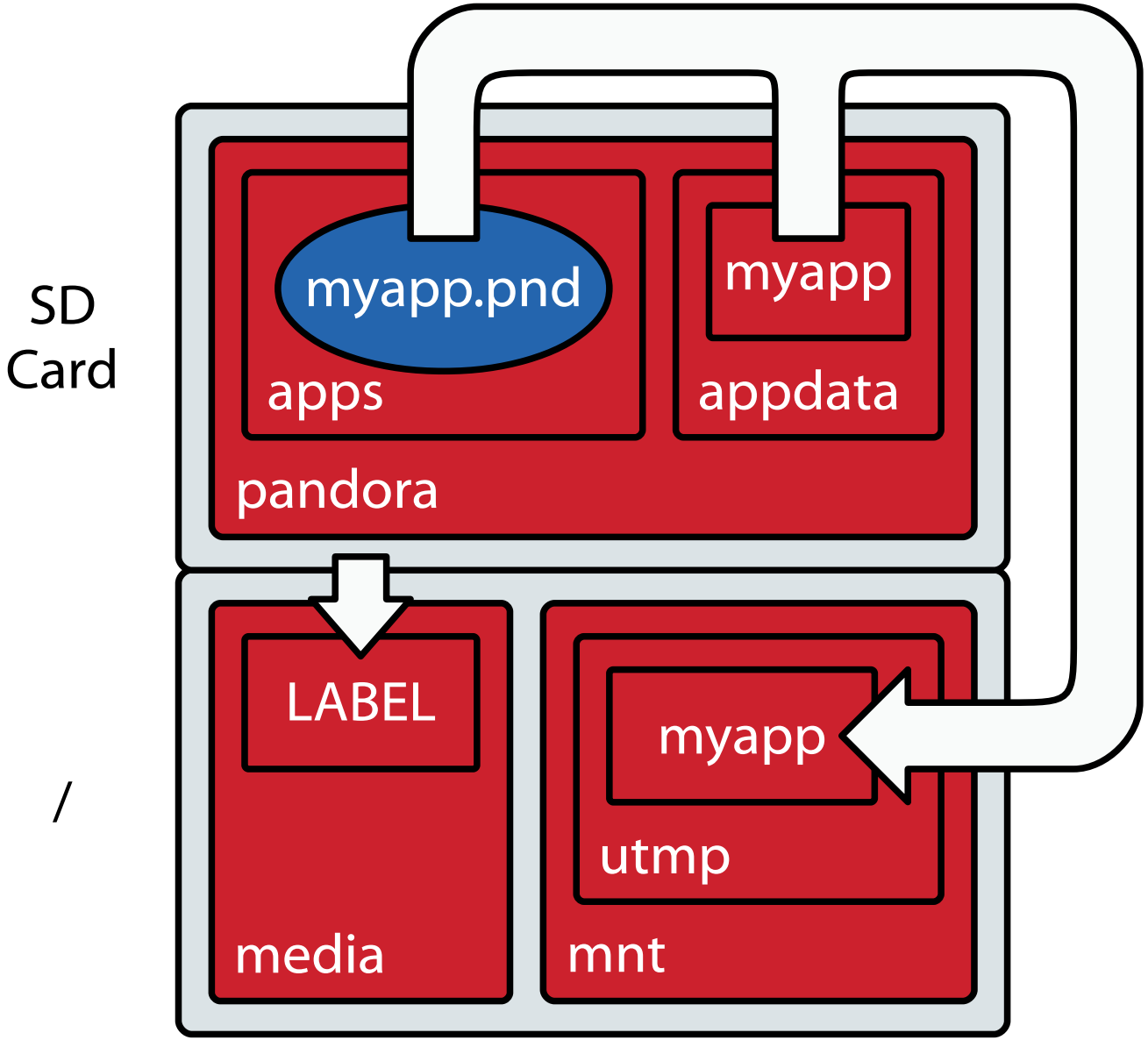
+ Transparent to application

= Current directory appears writable from read only filesystem

UNIX Mount Points



PND Mount Points



Pandora (PND) Packages

Advantages

- Very easy to use
- No extraction required
- Application protected (read-only)
- Data stored centrally
- Advanced features (categories, documentation, versioning, etc.)

Disadvantages

- More difficult to build than ZIP
- Caveats for writable files (e.g. config)

Development

Development

Languages

- C and C++
- Python (Pygame, distPND)
- Bennu, GLBasic, etc.
- Java
- ARM Assembly

Development

Tool Chains & SDKs

- Based on GCC
- CodeSourcery
- GPH official SDK
- Community SDKs

Development

More in the Workshop...

The Future...

The Future...

OMAP4

- Dual core Cortex-A9
- 1 – 1.5 GHz
- 2x 3D performance of OMAP3

Pandora 2?

More Software!

iReadyGo/RG

- Android-based?
- 1GHz CPU
- 5” 800x480 OLED
- HDMI

Pandora

www.openpandora.org

boards.openpandora.org (forums)

GPH - Caanoo/Wiz

www.fungp.com

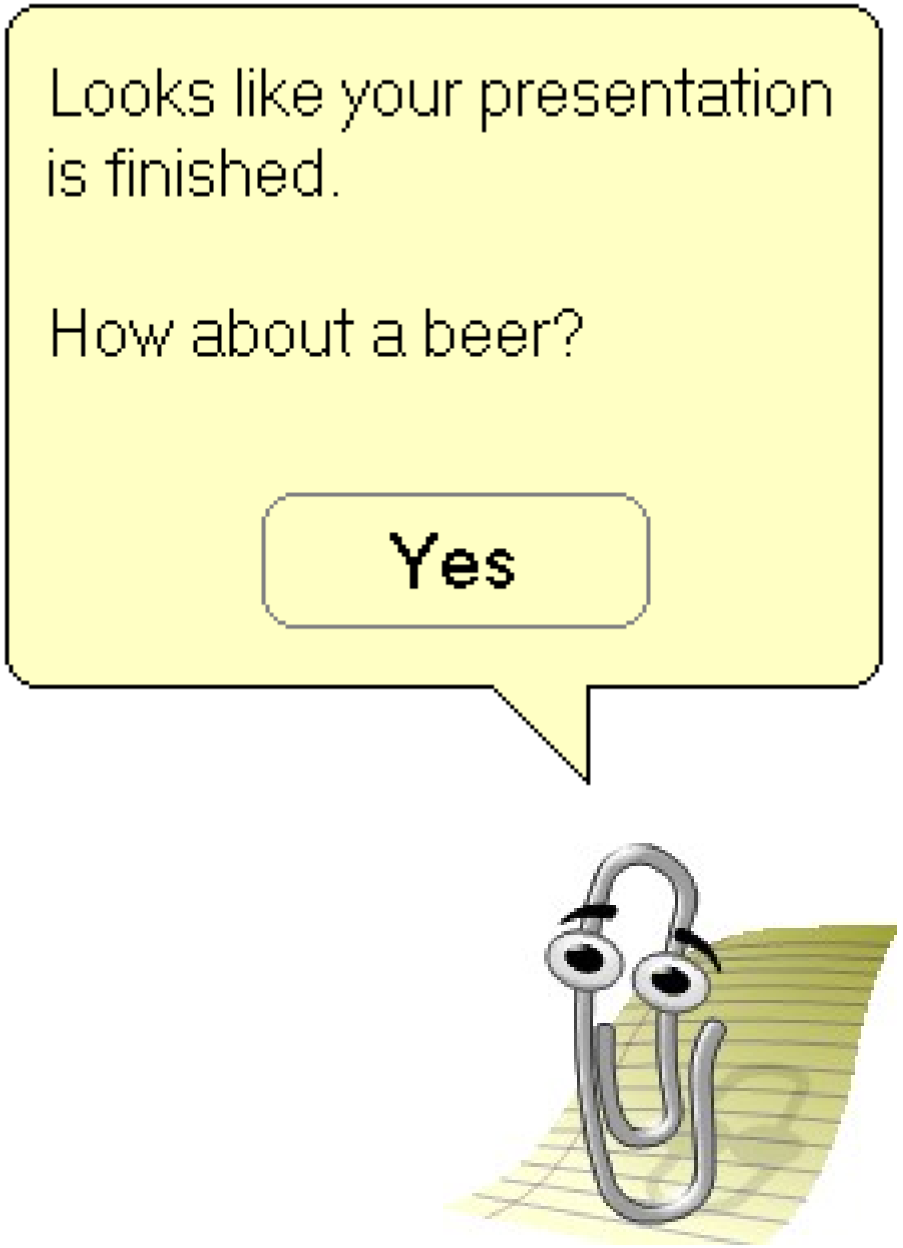
Multi-platform

gp32x.com (news, forums)

More Info

Questions?

Thanks!


Looks like your presentation is finished.
How about a beer?
Yes

Presentation/Slides

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