Talk About Android

Hironobu SUZUKI
School of Network and Information
Senshu University

ANDROID

open source project

How will you shape it?

Get the source code »

What is Android

- The first complete, open, and free mobile platform
  - the Open Handset Alliance
  - Open Source
    - http://source.android.com/
    - http://code.google.com/p/android/downloads/list
- Platform
  - ... means it involves much things

What is "open"

```
$ mkdir mydroid

$ cd mydroid

$ repo init -u \
git://android.git.kernel.org/platform/manifest.git

$ repo sync
```

Hardware Independent

- Features
  - Application framework
  - Dalvik virtual machine
  - Integrated browser
  - Optimized graphics
  - SQLite
  - Media support
  - Rich development environment

Hardware Dependent

- Features
  - GSM Telephony
  - Bluetooth, EDGE, 3G, and WiFi
  - Camera, GPS, compass, and accelerometer

APPLICATIONS

Home	Contacts	Phone	Browser	...

APPLICATION FRAMEWORK

Activity Manager	Window Manager	Content Providers	View System
Package Manager	Telephony Manager	Resource Manager	Location Manager	Notification Manager

LIBRARIES

Surface Manager	Media Framework	SQLite
OpenGL	ES	FreeType	WebKit
SGL	SSL	libc

ANDROID RUNTIME

Core Libraries

Dalvik Virtual Machine

LINUX KERNEL
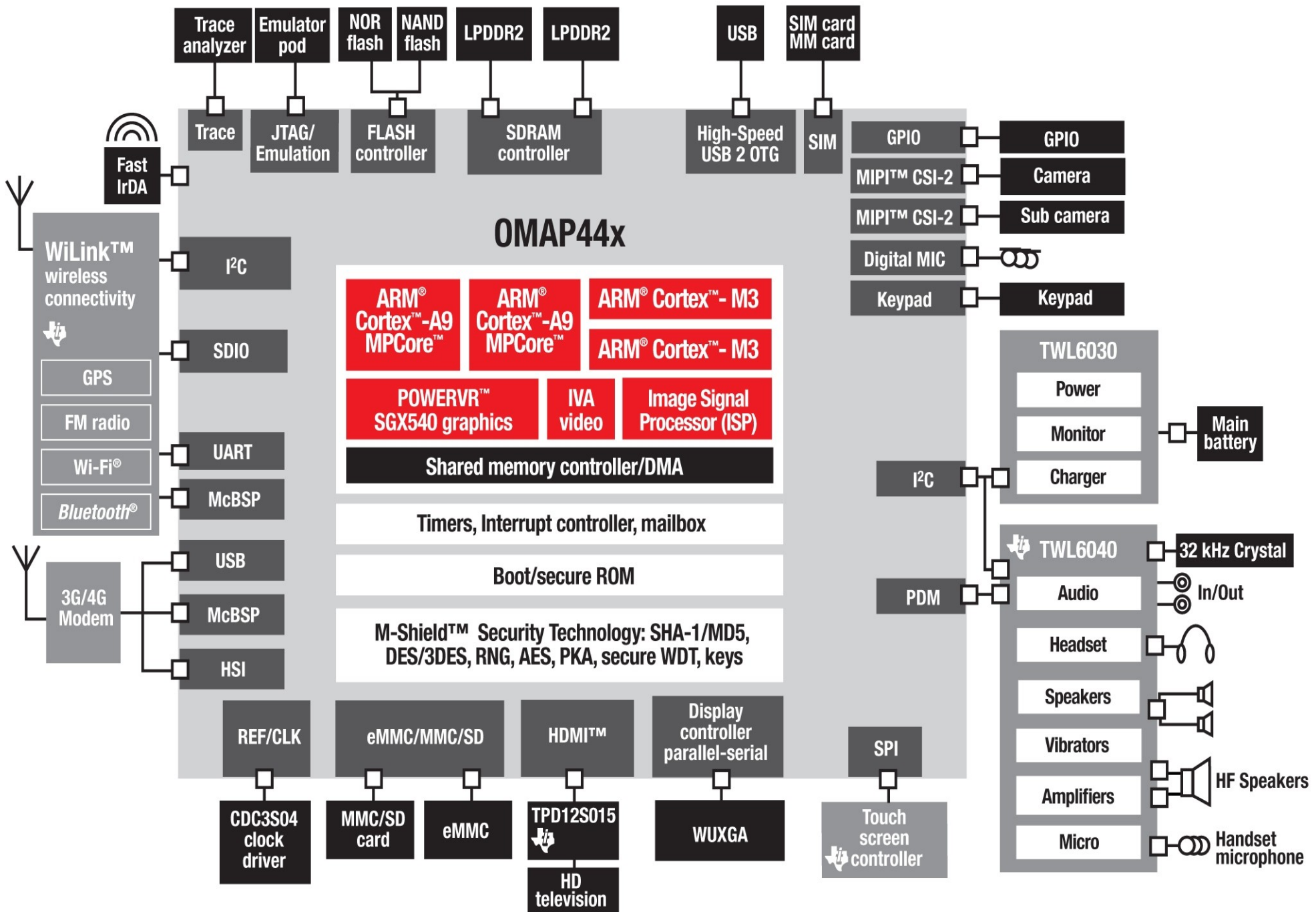
Display Driver	Camera Driver	Flash Memory Driver	Binder (IPC) Driver
Keypad Driver	WiFi Driver	Audio Drivers	Power Management

Trace
JTAG/Emulation
FLASH controller
SDRAM controller
High-Speed USB 2 OTG
SIM

GPIO | GPIO
MIPI™ CSI-2 | Camera
MIPI™ CSI-2 | Sub camera
Digital MIC
Keypad | Keypad

Fast IrDA

WiLink™ wireless connectivity

I²C

GPS
FM radio
Wi-Fi®
Bluetooth®

SDIO

UART

McBSP

3G/4G Modem

USB

McBSP

HSI

OMAP44x

ARM® Cortex™-A9 MPCore™
ARM® Cortex™-A9 MPCore™
ARM® Cortex™- M3
ARM® Cortex™- M3

POWERVR™ SGX540 graphics
IVA video
Image Signal Processor (ISP)

Shared memory controller/DMA

Timers, Interrupt controller, mailbox

Boot/secure ROM

M-Shield™ Security Technology: SHA-1/MD5, DES/3DES, RNG, AES, PKA, secure WDT, keys

TWL6030
Power
Monitor
Charger

Main battery

I²C

PDM

TWL6040
32 kHz Crystal
Audio | In/Out
Headset
Speakers
Vibrators
Amplifiers | HF Speakers
Micro | Handset microphone

REF/CLK
eMMC/MMC/SD
HDMI™
Display controller parallel-serial
SPI

CDC3S04 clock driver
MMC/SD card
eMMC
TPD12S015
WUXGA
Touch screen controller

HD television
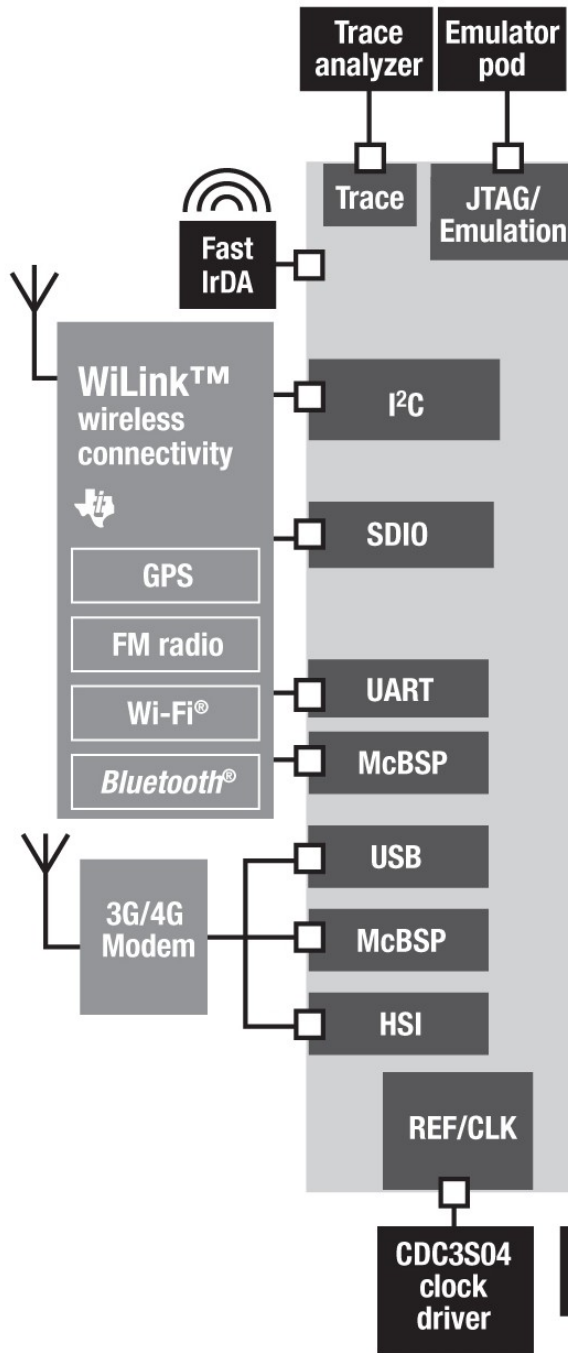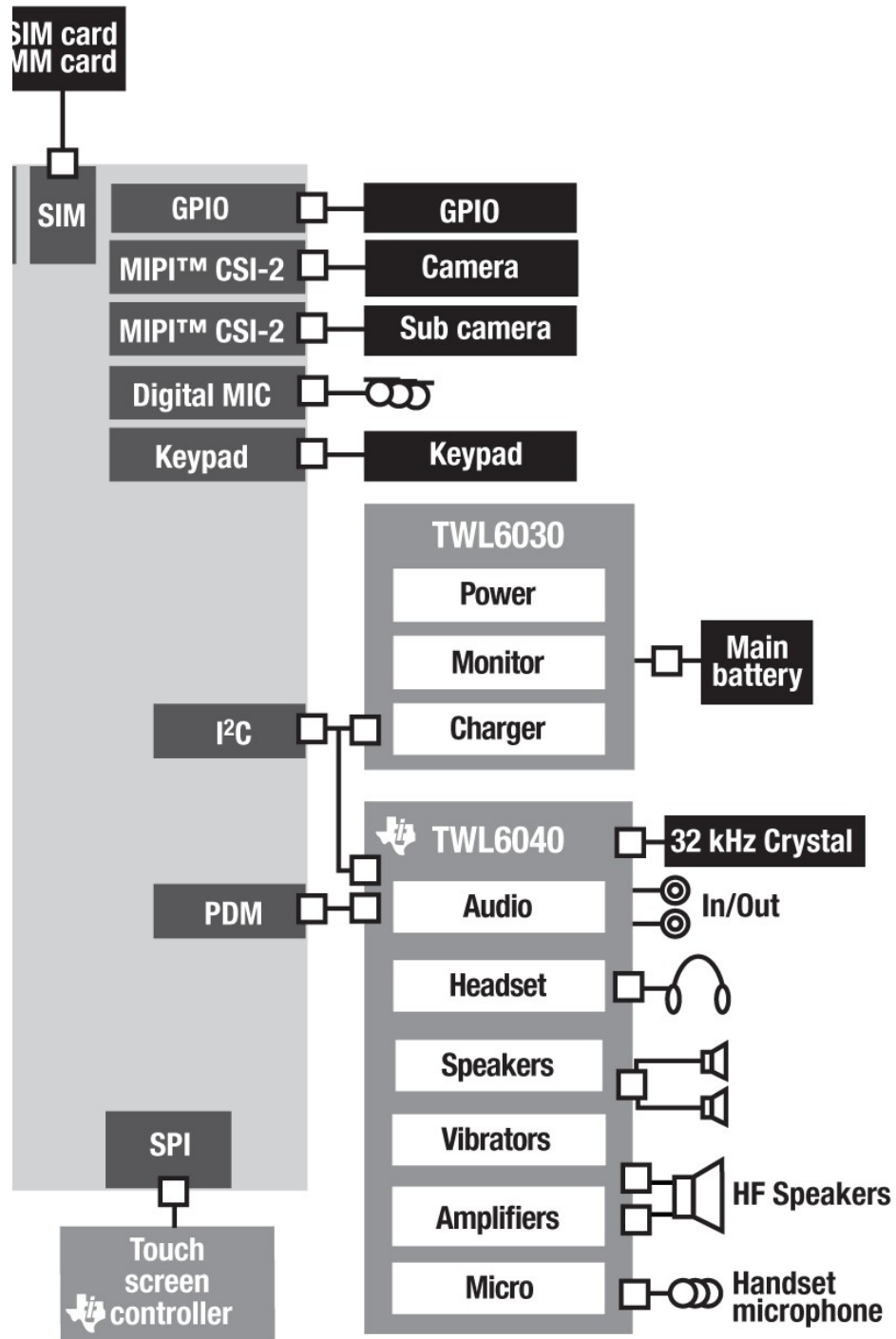
12mm x 12mm x 0.4mm

OMAP44x

ARM® Cortex™-A9 MPCore™

ARM® Cortex™-A9 MPCore™

ARM® Cortex™- M3

ARM® Cortex™- M3

POWERVR™ SGX540 graphics

IVA video

Image Signal Processor (ISP)

Shared memory controller/DMA

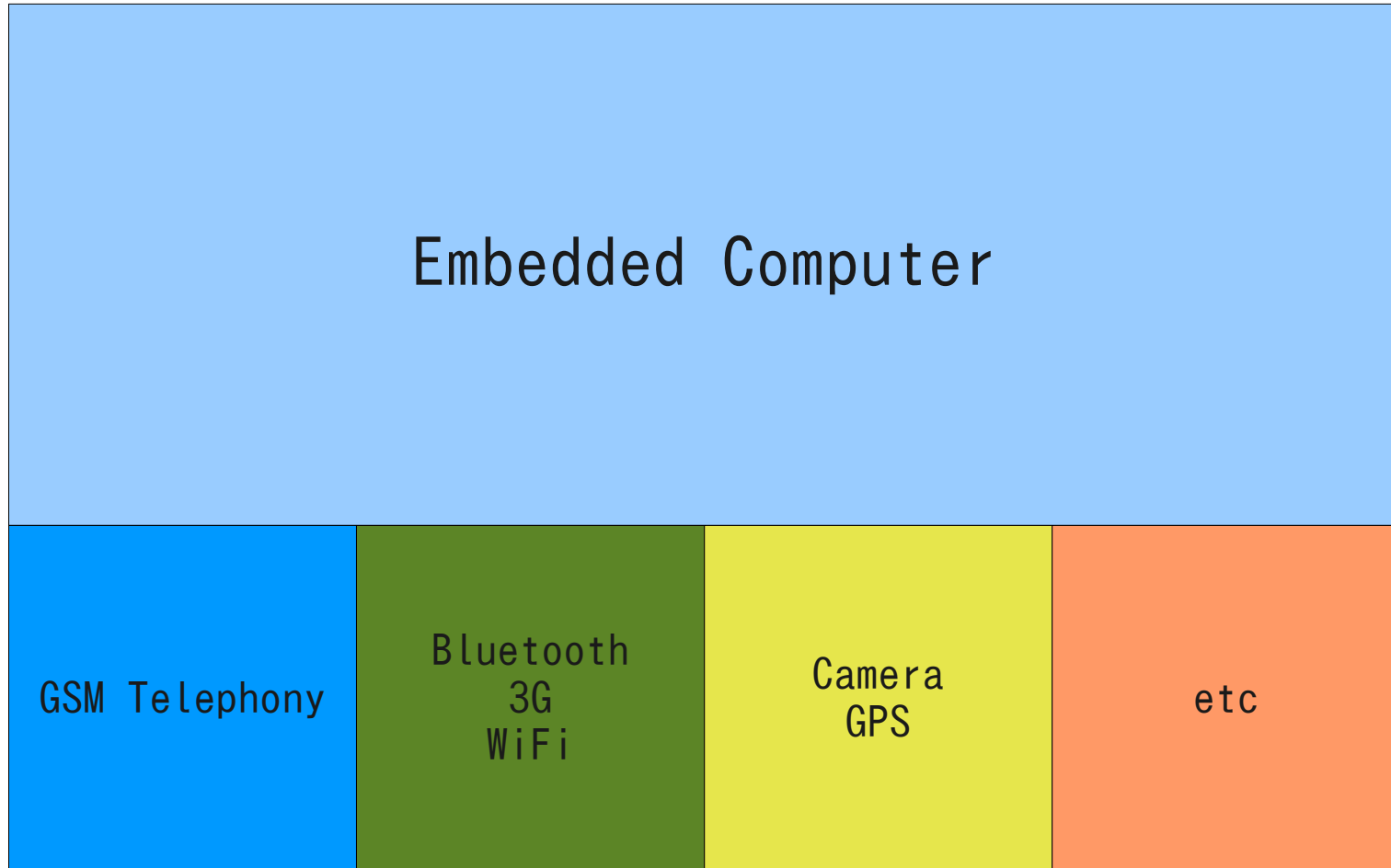**Timers, Interrupt controller, mailbox**

Boot/secure ROM

M-Shield™ Security Technology: SHA-1/MD5, DES/3DES, RNG, AES, PKA, secure WDT, keys

TI OMAP 4 Mobile Applications Platform

- Dual-core : ARM Cortex-A9 MPCore

- IVA 3 : full HD 1080p

- Image Signal Processor : 20M pixel

- IPOWERVR SGX540 : graphics

- M-Shield : security

Simplified Hardware Layer Model

Embedded Computer

GSM Telephony

Bluetooth
3G
WiFi

Camera
GPS

etc

Embedded Linux System

- Embedded Linux System

  - Task Schedule

    - Select schedule type for embedded

  - File System

    - Yaffs2

  - I/O Scheduler

    - Deadline & NOOP

  - IPC

    - Binder with new anonymous shared memory

linux/drivers/android directory

- alarm.c
- logger.c
- ram_console.c
- binder.c
- power.c
- timed_gpio.c

- Alarm time and clock things
- Quick and during I/O operation
- New IPC
- Less power
- Timed GPIO driver

Java VM

- Dalvik virtual machine
  - register-based architecture
    - Slim
    - No JIT complier
    - 32-bit (simplified)
      - cf. parrot VM
  - Named by Dan Bornstein
    - Village in Iceland

Libraries

- SQLite
  - SQL for store and retrieve
    - http://www.sqlite.org/famous.html
- OpenSSL
  - Connection using secure channels
- Webkit
  - Http protocol connections
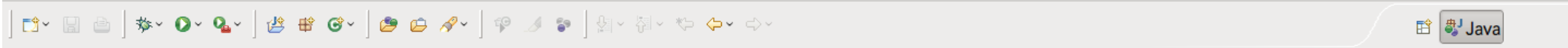- OpenGL
  - Serious graphics

Application Frame Work

- Android Java SDK

  - Forest of classes

- A user application is running under Java VM

  - One application, one VM

    - cf. Write once, run everywhere

Developer's Environment

- Android Emulator
- Eclipse plugin Android SDK
  - Eclipse : GANYMEDE

Android Emulator (5554)

11:45 AM

uc.h2np.net: システム環境を考えてみ...

本文 ノート 編集 履歴

システム環境を考えてみる

（ 第三章 から転送 ）

目次 [非表示]
1 環境を考えてみる
2 携帯からスーパーコンピューターまで
3 GNU/Linuxの何を学ぶべきなのか
　3.1 ざっくりリストアップしてみる
4 ログイン
　4.1 新たなユーザアカウントを加える場合
5 コマンドを動かす
6 ファイルを参照する
7 グラフィカルなデスクトップ環境
8 脚注

ナビゲーション
■ メインページ
■ 最近の出来事
■ 最近更新したページ
■ おまかせ表示
■ ヘルプ

検索

表示　検索

ツールボックス
■ リンク元
■ リンク先の更新状況
■ アップロード
■ 特別ページ
■ 印刷用バージョン
■ この版への固定リンク

環境を考えてみる

もしubuntu、Fedora、 KNOPPIX、あるいはVine
トップ向けGNU/Linuxを使っているのでしたら、
パソコンと変わらないでしょう。Webブラウザ、
プレゼンテーション、あるいはメールを出すにし
MacOS Xの上で提供されているのと同じようなア
イート(Application suite) OpenOffice があります

「オペレーティングシステムとは
何か」のページで説明した通り、
カーネルと、その上にあるミドル
ウェア、そしてアプリケーション
は独立した存在です。ミドルウェ

MENU

1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
A S D F G H J K L DEL
Z X C V B N M .
ALT SYM @ / , ALT

File   Edit   Source   Refactor   Navigate   Search   Project   Run   Window   Help

Java

Package   **Hierarchy**   **NoteEditor.java**

My First Lesson
  src
    com.example.android.notepad
      NoteEditor.java
      NotePad.java
      NotePadProvider.java
      NotesList.java
      R.java
      TitleEditor.java
    Android Library
    assets
    res
    AndroidManifest.xml
    sample_note.png
    sample_notepad.png
  Snake

```java
 * Copyright (C) 2007 Google Inc.

package com.example.android.notepad;

import com.example.android.notepad.NotePad.Notes;

/**
 * A generic activity for editing a note in a database.  This can be used
 * either to simply view a note {@link Intent#ACTION_VIEW}, view and edit a note
 * {@link Intent#ACTION_EDIT}, or create a new note {@link Intent#ACTION_INSERT}.
 */
public class NoteEditor extends Activity {
    private static final String TAG = "Notes";

    /**
     * Standard projection for the interesting columns of a normal note.
     */
    private static final String[] PROJECTION = new String[] {
            Notes._ID, // 0
            Notes.NOTE, // 1
    };
    /** The index of the note column */
    private static final int COLUMN_INDEX_NOTE = 1;

    // This is our state data that is stored when freezing.
    private static final String ORIGINAL_CONTENT = "origContent";

    // Identifiers for our menu items.
    private static final int REVERT_ID = Menu.FIRST;
```

Task List

Find: Al

Uncategorized

Out   **Pro**

Property Value
Info
  deri false
  edit true
  last 2008年10月
  link false
  loca /home/hiro

Console

Android

com.example.android.notepad - My First Lesson/src

Why Java

- Original idea
  - By James Gosling
  - For Embedded system
  - Write one, run anywhere

Why Linux + Java

- Java for mobile had already done
  - To much dependency for cellphone environment
  - Write once, run not so anywhere
- Not Cheap platform
  - Blackberry is not enough
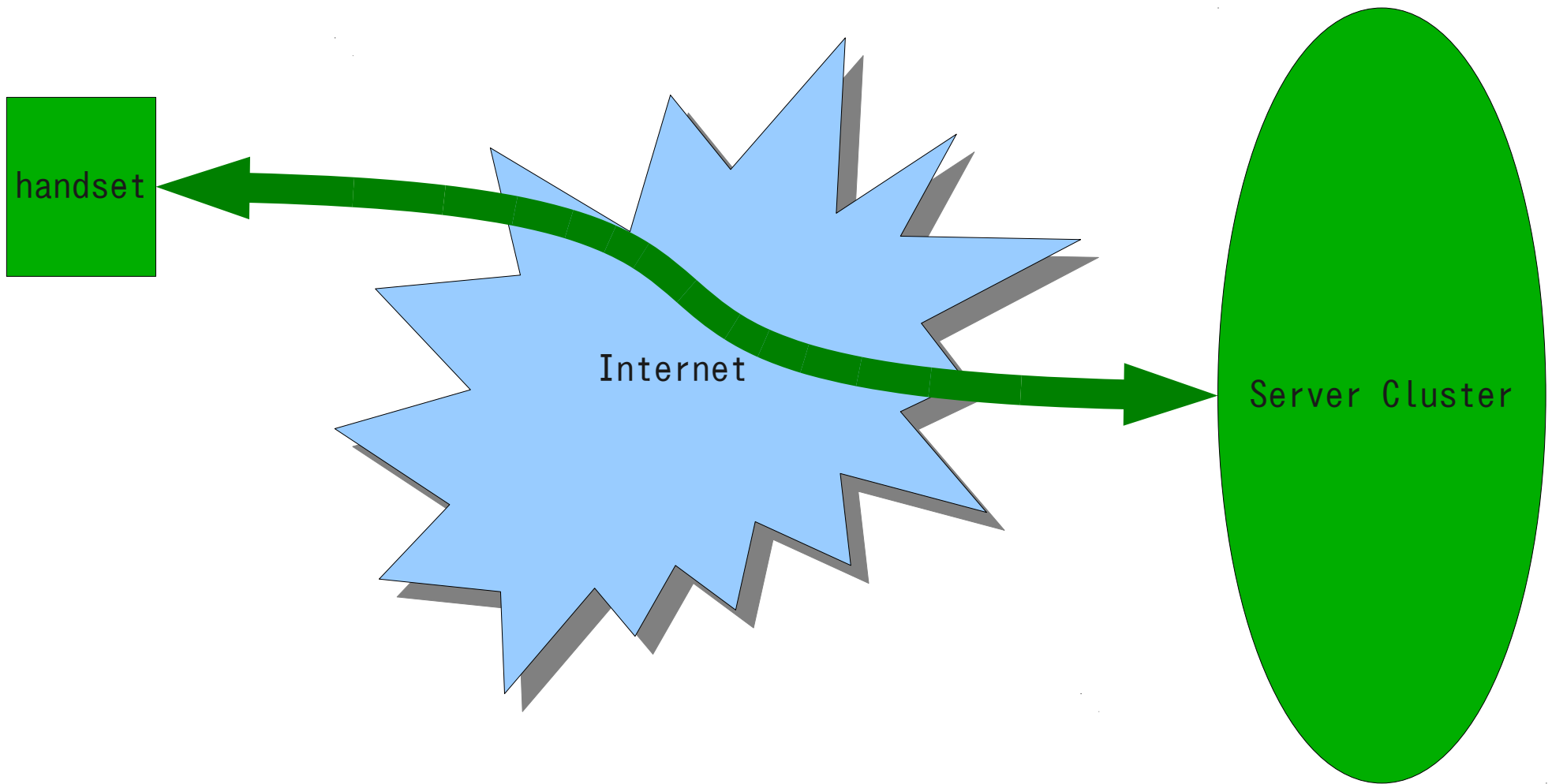 - Beyond Windows Mobile, Symbian
  - Serious computer, serious use

Why Google

- Google knows everything

  – the giant company of search market

- Google Desktop Gadget and Tools

  – Desktop connect to Google's servers

- Handset is new frontier for Google

  – Handset means small mobile computer on your hand, not cellphone

  – Connect to Google's servers

- Go west!!

Why Handset

- Handset is the terminal of cloud computing

handset

Internet

Server Cluster

Why Open Source

- Google is NOT
  - a mobile phone vendor
  - a vendor of consumer product
- Google is
  - a cloud computing service provider
  - the world biggest server farm company
  - making money by user's referring under Internet connections
- more connections, more money
  - more terminals, more connections

Android is

- New interface of cloud computing system

  - A part of definitely huge computer system

- Open Source

  - You can make your applications

  - You can make your own cloud computing system

  - You can do what you want to do

Where am I?

Conclusion

- Android is for all of mobile computing system and so-called Smartphone is one of application of it.

- Computer goes into one-chip.

- Google has been providing not only embedded environment but also software developing platform.

- Open Source means you can do what you want to do by yourself.

Questions?

Acknowledgment

- Some slide materials came from
    - Google, Inc.
    - TI, Inc.