Trường Đại học Bách Khoa Hà Nội
Hanoi University of Science and Technology

Lập trình ứng dụng Adroid

Android Application Programming

IT 3660

Trường Đại học Bách Khoa Hà Nội
Hanoi University of Science and Technology

Android Introduction

Chapter 1

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Content

1. Overview of Android
2. Android Platform Architecture
3. OHA (Open Handset Alliance)
4. Android Development Environment

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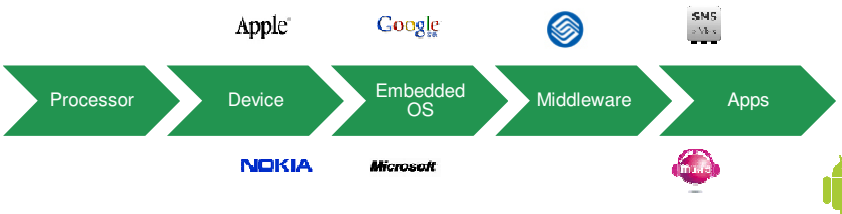
Introduction

- Today's applications are increasingly mobile
- Computers are no longer confined to desks and laps but instead live in our pockets and hands
- Mobile device may take the place of PC in future
- OS plays a vital part
- Android is one of today's most popular platforms



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Introduction

Google/Samsung Galaxy Nexus

Galaxy Tablet

Android-Powered Microwave

Apple Google

Processor → Device → Embedded OS → Middleware → Apps

NOKIA Microsoft

Introduction

❖ **What is Android?**

- A software platform and operating system for mobile devices
- Based on the Linux kernel
- Developed by Google and later the Open Handset Alliance (OHA)
- Android is based on JAVA and its applications are developed in JAVA
- Unveiling of the Android platform was announced on 5 November 2007 with the founding of OHA

What is Android?

"Android is a software stack for mobile devices that includes an operating system, middleware and key applications"

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Brief History - Android

- 2005
  - Google acquires startup Android Inc. to start Android platform
  - Work on Dalvik VM begins
- 2007
  - Open Handset Alliance announced
  - Early look at SDK
- 2008
  - Google sponsors 1st Android Developer Challenge
  - T-Mobile G1 announced
  - SDK 1.0 released
  - Android released open source (Apache License)
  - Android Dev Phone 1 released

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Brief History cont.

- 2009
  - SDK 1.5 (Cupcake)
    - New soft keyboard with “autocomplete” feature
  - SDK 1.6 (Donut)
    - Support Wide VGA
  - SDK 2.0/2.0.1/2.1 (Eclair)
    - Revamped UI, browser
- 2010
  - SDK 2.2 (Froyo)
    - Flash support, tethering
  - SDK 2.3 (Gingerbread)
    - UI update, system-wide copy-paste

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Brief History cont.

- 2011
  - SDK 3.0/3.1/3.2 (Honeycomb) for tablets only
    - New UI for tablets, support multi-core processors
  - SDK 4.0/4.0.1/4.0.2/4.0.3 (Ice Cream Sandwich)
    - Changes to the UI, Voice input, NFC
- 2012: SDK 4.1 (Jelly Bean)


Cupcake
Android 1.5


Donut
Android 1.6


Eclair
Android 2.0/2.1


Froyo
Android 2.2


Ice cream Sandwich
Android 4.0+


Honeycomb
Android 3.0.3

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- 1.0 Astro
- 1.1 Bender
- 1.5 *Cupcake*
- 1.6 *Donut*
- 2.0/2.1 *Eclair*
- 2.2 *Froyo*
- 2.3 *Gingerbread*
- 3.x *Honeycomb*
- 4.0 *Ice Cream Sandwich*
- 4.1 *Jelly Bean*

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Android versions

Version	Release date	API level	Distribution (02 August 2012)
4.1.x *Jelly Bean*	10-Jul-12	16	0.80%
4.0.x *Ice Cream Sandwich*	19-Oct-11	14-15	15.90%
3.x.x *Honeycomb*	22-Feb-11	13-Nov	2.30%
2.3.x *Gingerbread*	6-Dec-10	10-Sep	60.60%
2.2 *Froyo*	20-May-10	8	15.50%
2.0, 2.1 *Eclair*	26-Oct-09	7	4.20%
1.6 *Donut*	15-Sep-09	4	0.50%
1.5 *Cupcake*	30-Apr-09	3	0.20%

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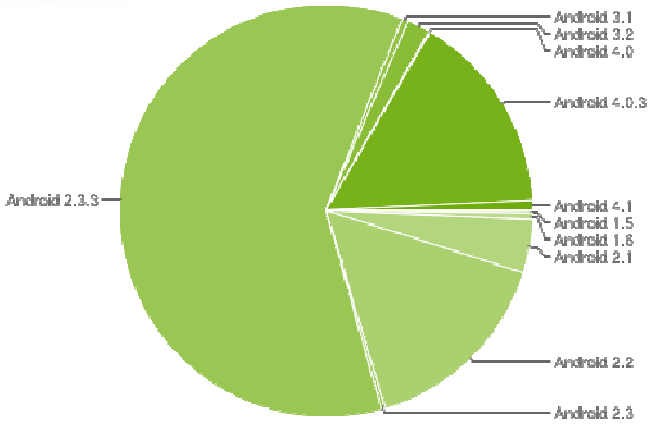
Distribution of Devices



Data collected during a 14-day period ending on August 28, 2012

http://developer.android.com/resources/dashboard/platform-versions.html

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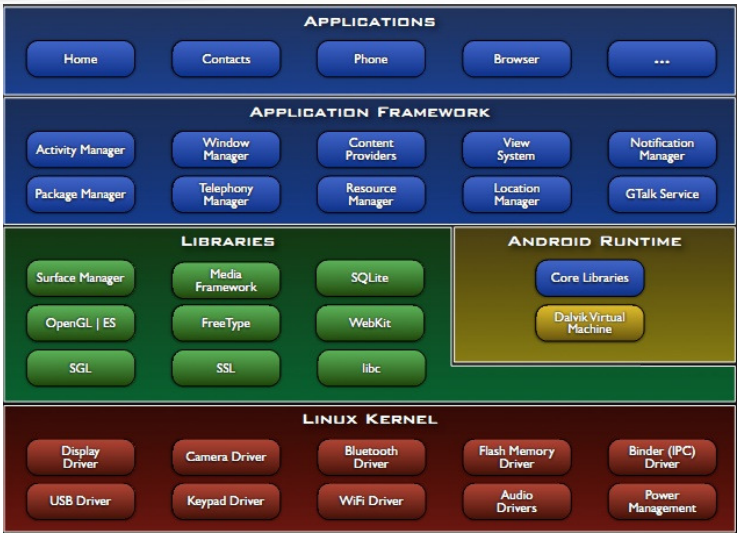
Android Platform Architecture



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Linux Kernel

- The kernel on which Android is based on
- Contains all the low level device drivers for the various hardware components of an Android device
- Acts as an abstraction layer between the hardware and the rest of the software stack

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Libraries

- Run in system background
- Using C/C++ Language
- Contain all the code that provides the main features of an Android OS.
  - E.g:
    - SQLite => database support
    - Webkit => web browsing functionalities…

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Core Libraries

- ✓ **System C library,** the standard C system library, tuned for embedded Linux-based devices
- ✓ **Media Libraries,** support playback and recording of many popular audio and video formats, as well as image files, including MPEG4, H.264, MP3, AAC, AMR, JPG, and PNG
- ✓ **Surface Manager,** manages access to the display subsystem and seamlessly composites 2D and 3D graphic layers from multiple applications
- ✓ **WebKit,** a modern web browser engine which powers both the Android browser and an embeddable web view
- ✓ **SGL**, the underlying 2D graphics engine
- ✓ **3D libraries,** an implementation based on OpenGL ES 1.0 APIs
- ✓ **FreeType** , bitmap and vector font rendering
- ✓ **SQLite** , a powerful and lightweight relational database engine

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Andoid Runtime

- **The core of Android platform**
- Java core Libraries
  - Enable developers to write apps using Java programming language.
- Dalvik Virtual Machine
  - The optimized JVM for android mobile devices
  - Executes files in the Dalvik Executable (.dex) format

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Application Framework

- Simplify the reuse of components:

=> Exposes the various capabilities of the Android OS to application developers so that they can make use of them in thier applications

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Application Framework (cont.)

- ✓ **Activity Manager,** manages the lifecycle of applications and provides a common navigation backstack
- ✓ **Notification Manager,** enables all applications to display custom alerts in the status bar
- ✓ **Resource Manager**, providing access to non-code resources such as localized strings, graphics, and layout files
- ✓ **Content Providers,** access data from other applications (such as Contacts), or to share their own data
- ✓ **Views,** used to build an application, including lists, grids, text boxes, buttons, and even an embeddable web browser

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Applications

- A set of core applications shipped with Android platform
  - an email client, SMS program, calendar, maps, browser, contacts, and others
- All written in Java
- Any applications that you write are located at this layer

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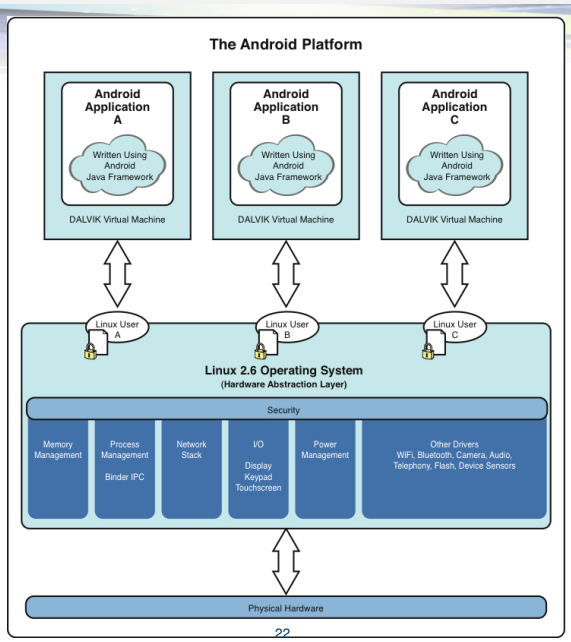
Android Architecture



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OHA – Open Handset Alliance

- What is the Open Handset Alliance (OHA)?
  - → It's a consortium of several companies

http://www.openhandsetalliance.com/oha_members.html

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Handset Manufacturers

Mobile Operators

Software

open handset alliance

Semiconductor

Commercialization

OHA – Open Handset Alliance

- OHA(Open Handset Alliance) is a group of 71 technology and mobile companies, including Google, Intel, Dell, HTC and China Mobile…
- OHA's aim :
  - accelerate innovation in mobile phones
  - offer consumers a richer, less expensive, and better mobile experience
- OHA developed Android™, the first complete, open, and free mobile platform
- OHA was initially called up by Google, and Google is the 'captain'

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Android Phones

HTC G1, Droid, Tattoo

Motorola Droid (X)

Sony Ericsson

Suno S880

Samsung Galaxy

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Android Phones


HTC G1

Samsung i7500


HTC Hero


Motorola Cliq


Sony X10


HTC Magic


Samsung Moment


Motorola Droid


HTC Tattoo

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Android Tablets


Velocity Micro Cruz


Gome FlyTouch


Acer beTouch


Dawa D7


Toshiba Android SmartBook


Cisco Android Tablet

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Mobile Devices

Advantages (as compared to fixed devices)

- ✓ Always with the user
- ✓ Typically have Internet access
- ✓ Typically GPS enabled
- ✓ Typically have accelerometer & compass
- ✓ Most have cameras & microphones
- ✓ Many apps are free or low-cost

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Mobile Devices

Disadvantages

- ✓ Limited screen size
- ✓ Limited battery life
- ✓ Limited processor speed
- ✓ Limited and sometimes slow network access
- ✓ Limited or awkward input: soft keyboard, phone keypad, touch screen, or stylus
- ✓ Limited web browser functionality
- ✓ Range of platforms & configurations across devices

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Mobile Applications

- What are they?
  - Any application that runs on a mobile device
- Types
  - Web apps: run in a web browser
    - HTML, JavaScript, Flash, server-side components, etc.
  - Native: compiled binaries for the device
    - Often make use of web services

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Development Environment

- IDE – Eclipse
- Eclipse plug-in - ADT
- Software Development Kit (SDK)
- Android Emulator
- Debugger

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Setup Android SDK

- Download Android SDK and extract the zip file to an arbitrary folder
  - http://developer.android.com/sdk/index.html
  - E.g.: extract to C:\
  - The SDK will be used by ADT in eclipse

Platform	Package	Size
Windows	android-sdk_r20.0.3-windows.zip	90379469 bytes
	installer_r20.0.3-windows.exe (Recommended)	70495456 bytes
Mac OS X (intel)	android-sdk_r20.0.3-macosx.zip	58218455 bytes
Linux (i386)	android-sdk_r20.0.3-linux.tgz	82616305 bytes

SDK: Software Development Kit

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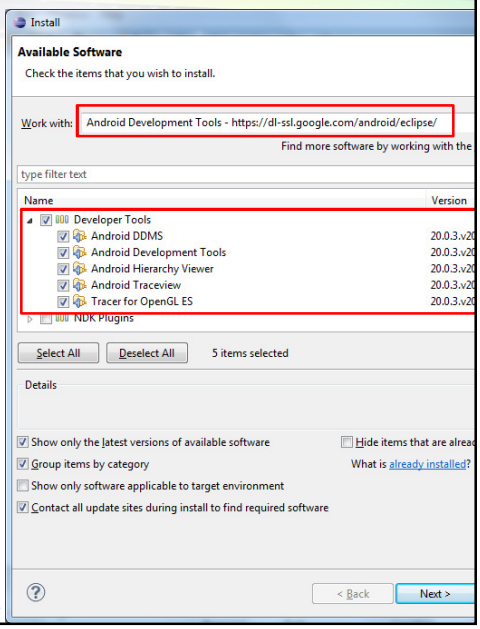
Setup ADT plugin

- Install Eclipse ADT plugin
  - Eclipse must be J2EE edition
  - Update site: https://dl-ssl.google.com/android/eclipse/
  - Install all the plugins in the repository
  - Restart needed after installation

ADT: Android Development Tools



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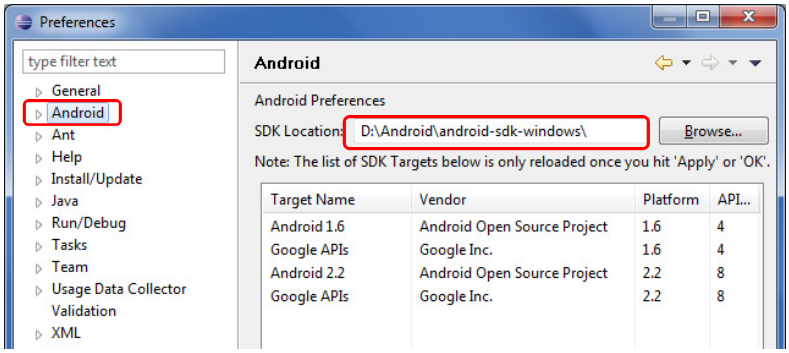
Configure ADT Plugin

- Open eclipse Window->Preferences, select Android
- Setup the SDK location as the folder where you extracted the downloaded SDK zip file



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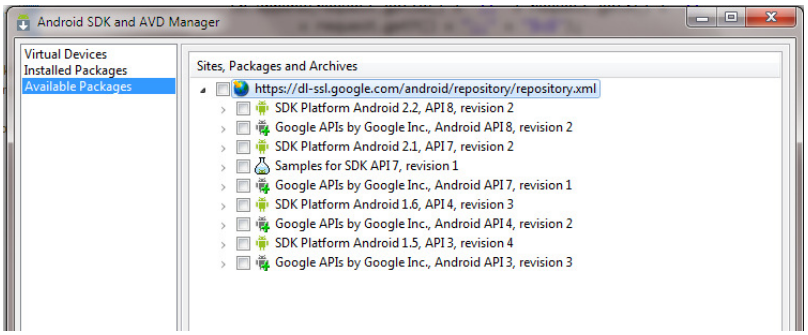
Setup SDK APIs

- Open Window->Android SDK and AVD Manager
- Click *Available Packages* and then choose proper APIs to install, the latest may be the best



ADV: Android Virtual Devices

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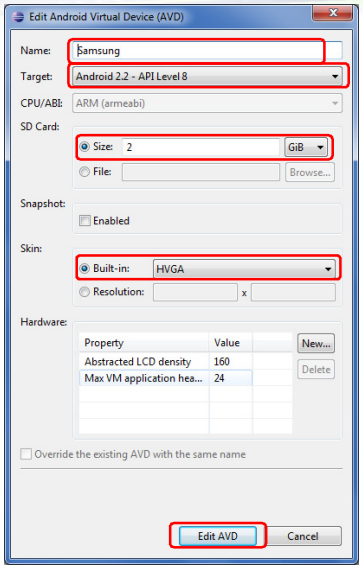
Setup Emulators

- After SDK APIs installation, click *Virtual Devices*
- Click *new, there will be a dialog*
  - input a name
  - choose a running target and a skin
  - specify the SD card size



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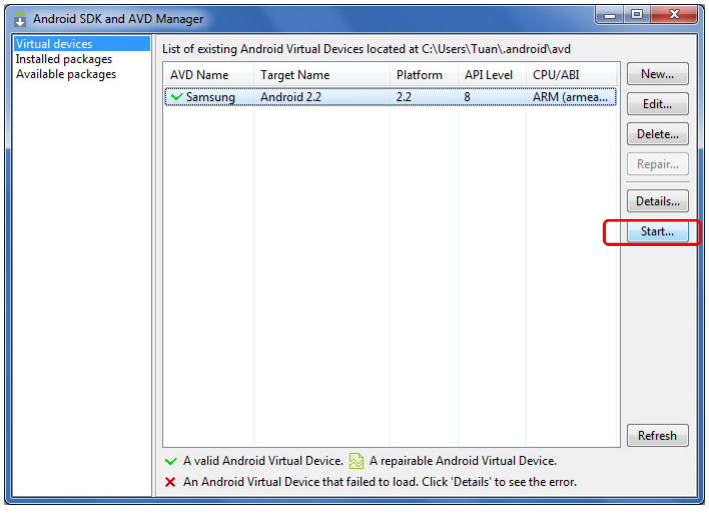
Setup Emulators



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Ready…

- Now you may start the AVD
  - Click start to start the new AVD
  - First start-up may take a very long time

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Android Emulator

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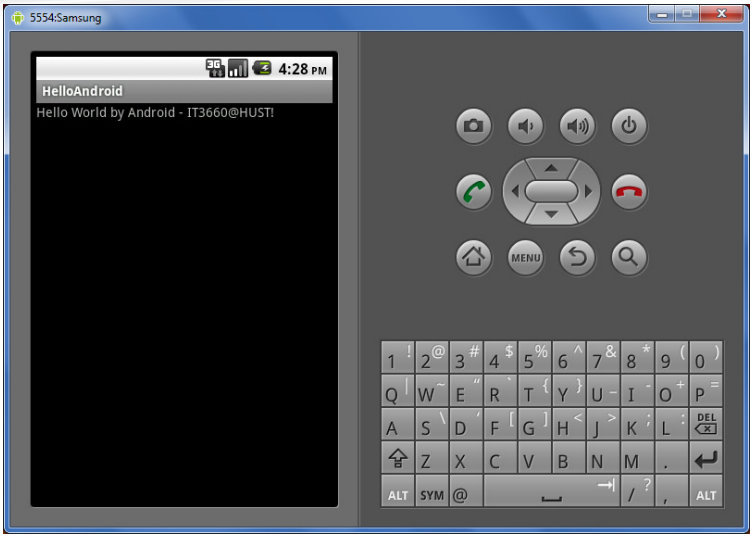
Android Emulator



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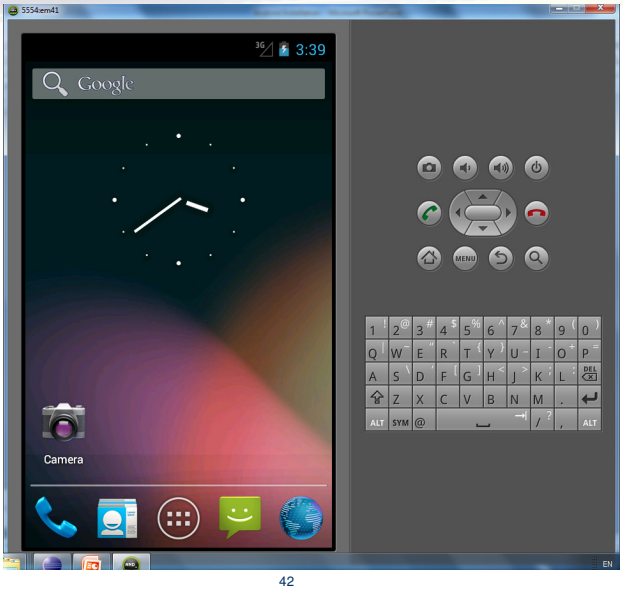
Android Emulator



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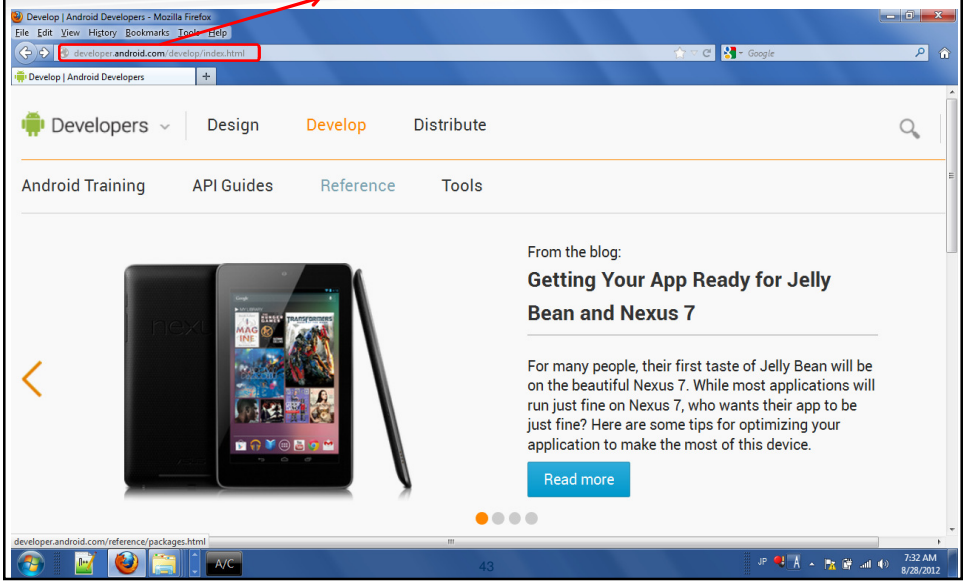
The Android Developer Website

http://developer.android.com/index.html



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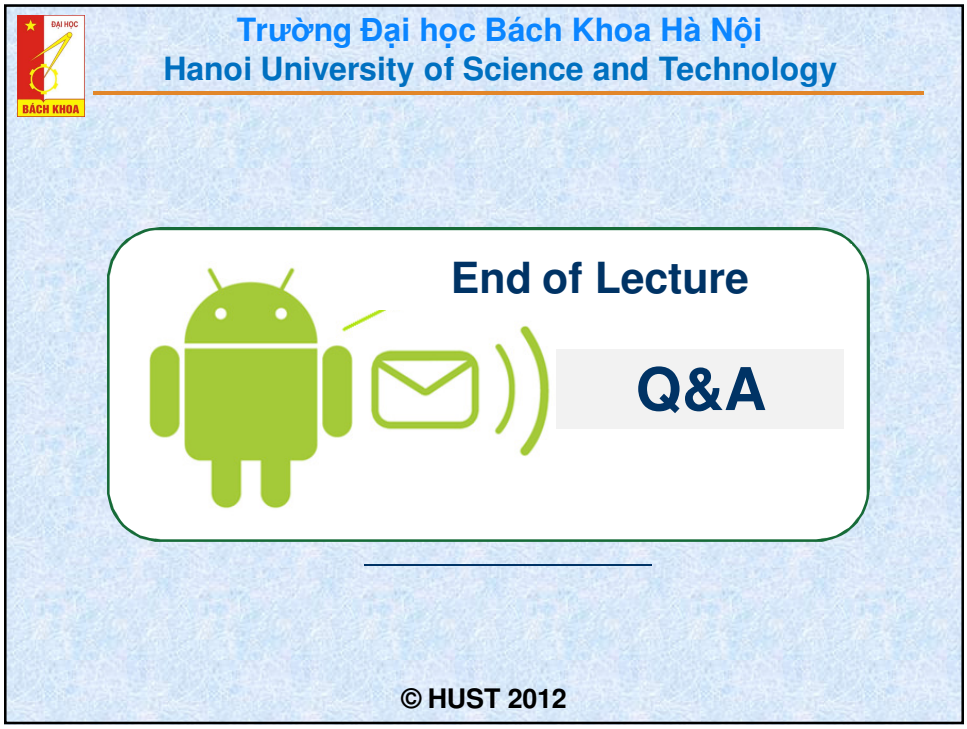
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