Introduction to Android

CSG250 Wireless Networks
Fall, 2008
Outline

- Overview of Android
- Programming basics
- Tools & Tricks
- An example
- Q&A
Android Overview

- Advanced operating system
- Complete software stack for fast development (mashups)
- Open platform
- Open source
- Equal opportunities
Customization
Application and Activities

- Activity
- Activity
- ContentProvider
- Service
- Process

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- Process

APK Package
APK Package
Architecture of Android
# Application Building Blocks

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activities</strong></td>
<td>An Activity is a discrete chunk of functionality. It’s typically corresponding to a set of UIs and logics.</td>
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<tr>
<td>Views &amp; Widgets</td>
<td>A View is an object that knows how to draw itself to the screen. Android user interfaces are comprised of trees of Views.</td>
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<tr>
<td>Intents</td>
<td>Set and respond to notifications or status changes. Can wake up your app.</td>
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<tr>
<td>Services</td>
<td>Faceless task that runs in the background</td>
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<tr>
<td>ContentProvider</td>
<td>Enable applications to share data</td>
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<tr>
<td>Notification</td>
<td>Enables all applications to display custom alerts in the status bar</td>
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</table>
Mobile Application Paradigm

- Be energy efficient
- Use less RAM
- Always save the state
- Avoid Cancel button
- Minimize certain operations: memory transfers, division, modulus
public class Activity extends ApplicationContext {

    protected void onCreate();
    protected void onStart();
    protected void onRestart();
    protected void onResume();
    protected void onPause();
    protected void onStop();
    protected void onDestroy();

}
Data Access

- Preferences
  Store and retrieve key/value pairs of primitive data types

- Files
  Access files on the device or on a removable storage medium

- Database (SQLite3)

- Content Providers
  Read/write other applications’ private data

- Network & Web services
  - Google Data APIs, Calendars, Document, Finance, Picasa ...
  - Amazon S3
  - Flickr
  - ...

...
Security Model

- Application signing
  - Self-signed certificates. No need to be signed by a certificate authority

- Independent user ID for each Android package (.apk) file
  - Persistent storages can be set to private, world readable, or world writeable

- Applications are running in separate processes.
  - Explicitly declare the permissions for additional capabilities
  - Inter-process communications. (Binder)
Developing Environment

Java IDE

Android SDK suite

- Eclipse Plugin
- Libraries
- Emulator
- Tools
  - Dalvik Debug Monitor Service (ddms)
  - Android Debug Bridge (adb)
  - Android Asset Packaging Tool (aapt)
  - Traceview
  - Hierarchy Viewer
  - ...

NetBeans
Project Structure

/project/AndroidManifest.xml
  /src
  /bin
  /res/drawable
    /layout
    /raw
    /values
  /assets
Define UI in XML

```xml
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
              android:layout_width="wrap_content"
              android:layout_height="wrap_content"
              android:orientation="vertical">

    <TextView android:id="@+id/dateDisplay"
              android:layout_width="wrap_content"
              android:layout_height="wrap_content"
              android:text="@string/date_widgets_example_dateDisplay_text" />

    <Button android:id="@+id/pickDate"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="@string/date_widgets_example_pickDate_text" />

    <Button android:id="@+id/pickTime"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="@string/date_widgets_example_pickTime_text" />

</LinearLayout>
```
Develop with Eclipse Plugin

Select a wizard

New Android Project
Creates a new Android Project resource.

Project name: HelloAndroid

Contents
- Create new project in workspace
- Create project from existing source
- Use default location

Location: /Volumes/Home/android project/HelloAndroid

Properties
- Package name: com.android.hello
- Activity name: HelloAndroid
- Application name: Hello, Android
Debug with Eclipse Plugin
Hierarchy Viewer
Useful Commands

- emulator
  - emulator -wipe_data
    folder: {home}/.android/
  - emulator -sdcard <file>

- adb (Android debug bridge)
  - adb install <.apk file>
  - adb uninstall
  - adb push/pull
  - adb shell
Resources

- API demos
- Google groups [http://groups.google.com/group/android-developers](http://groups.google.com/group/android-developers)
- Communities e.g. [http://www.anddev.org/](http://www.anddev.org/)
- YouTube
References

- Some of the contents and images are used from others’ work.
- [http://sites.google.com/site/io/an-introduction-to-android](http://sites.google.com/site/io/an-introduction-to-android)
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