Android 3.0 Honeycomb

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What is Android?

"Android is not a specification, or a distribution in the traditional Linux sense. It's not a collection of replaceable components. Android is a chunk of software that you port to a device."

By: Dan Morrill (on Android compatibility)

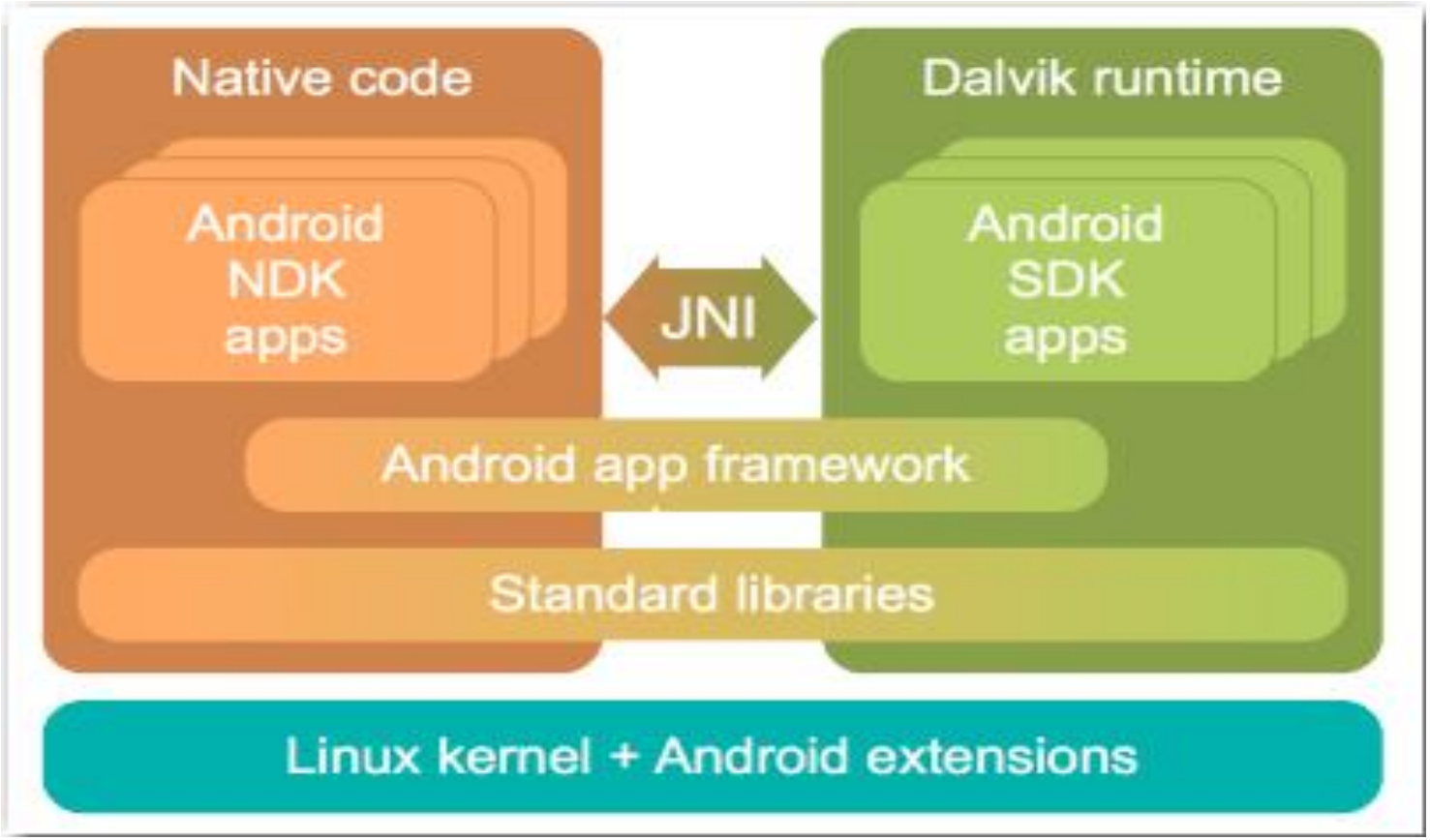
" Android OS as a **software stack**. Each layer of the stack groups together several programs that support specific operating system functions."

By: Google

Android History

- Android Inc. founded, October 2003
- Android Inc. acquired by Google, August 2005
- Open Handset Alliance, November 2007
  - Develop open standards for mobile devices
- Android Market, August 2008
  - online software store by Google for Android devices
- Licensing, October 2008
  - Available as free software/open source license
- First Commercially available phone running Android OS- HTC Dream, October 2008
- Versions of Android, (Sep 2008(FROYO) to Feb 2011(Gingerbread, Honeycomb))

Android Architecture(top level view)



Architecture: LINUX kernel

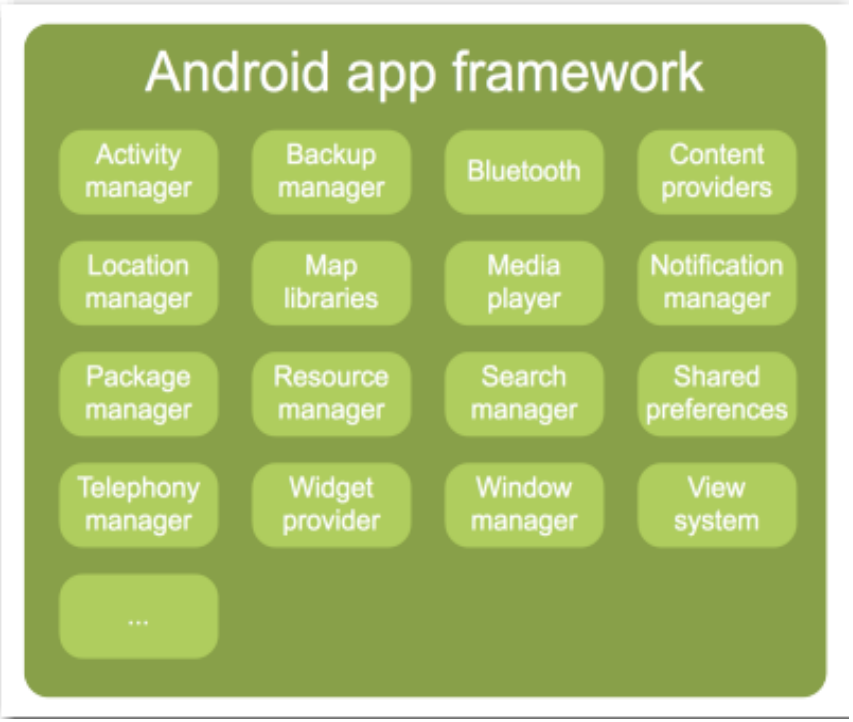
- Underneath everything is a reasonably up-to-date **Linux kernel** (2.6.35 Android Gingerbread), with some power-saving extensions.
- Cannot be called as Linux DISTRO- no support for libraries and shells and editors and GUIs and programming frameworks.
- Includes drivers for Camera, display, Flash memory, Binder(IPC), Wi-Fi, keypad, Audio, Power management.

Architecture: DALVIK Virtual Machine

- Contains whole bunch of basic runtime essentials.
- All the standard APIs that are used to create Android apps are defined in terms of Dalvik classes and interfaces and objects and methods. some of them are thin layers of Dalvik code over native implementations.
- Dalvik based apps: Dialer, Contacts, Calendar, Gmail and Chat
- JNI protocol --to call back and forth between Dalvik and native code.

Architecture: Android app Framework

- Includes programs that manage the phone's basic functions like resource allocation, telephone applications, switching between processes or programs and keeping track of the phone's physical location
- Configured GNU/LINUX box from Google.
- All Activities and Services in an application run in a single process(linux) by default.
- An activity is a encapsulation of a particular operation.

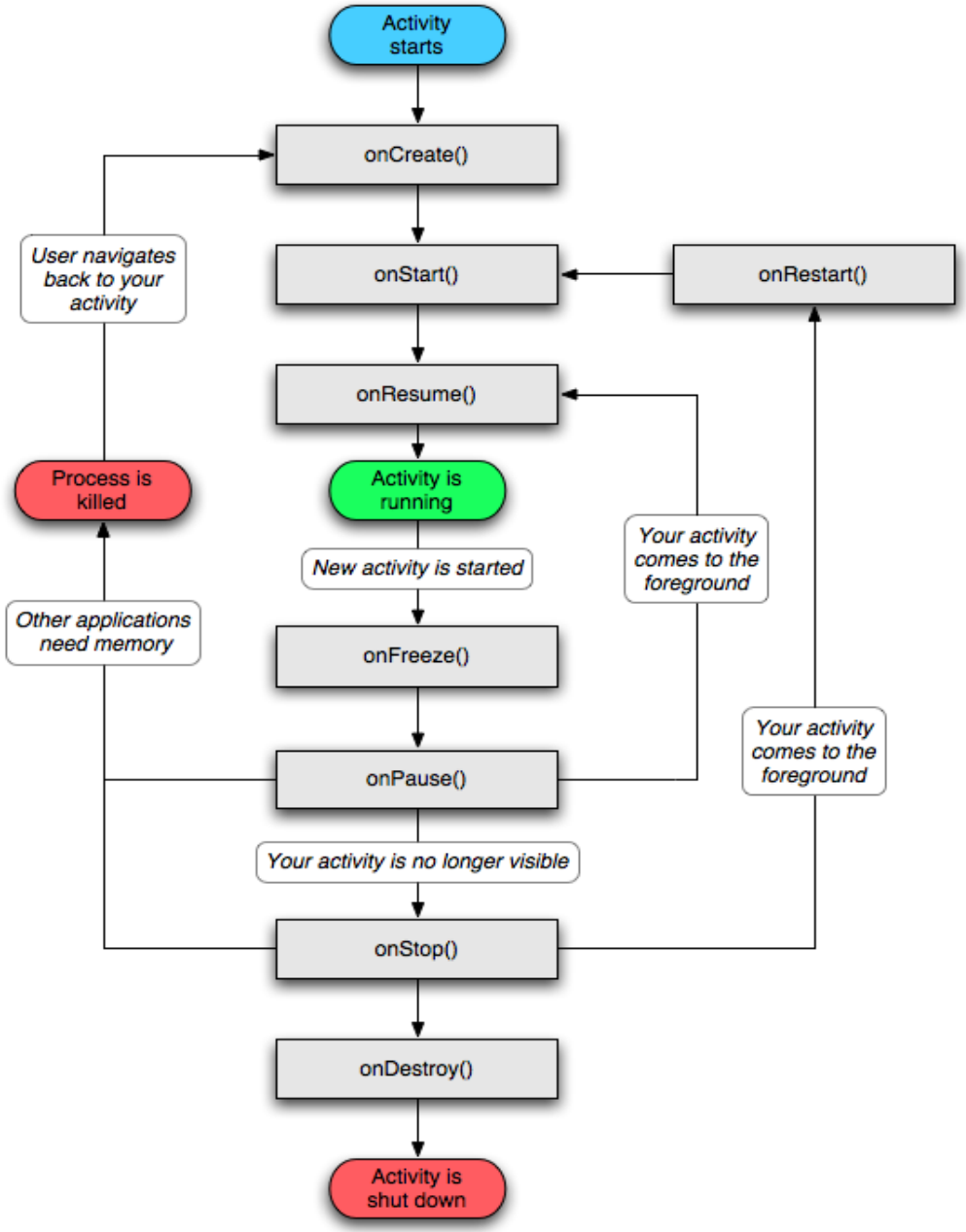


Architecture: Process Lifecycle

- A process is started for a given user ID when needed
  1. Binding to a Service
  2. Binding to a ContentProvider
  3. Starting an Activity
  4. Firing an IntentReceiver
- Remains running until killed by the system

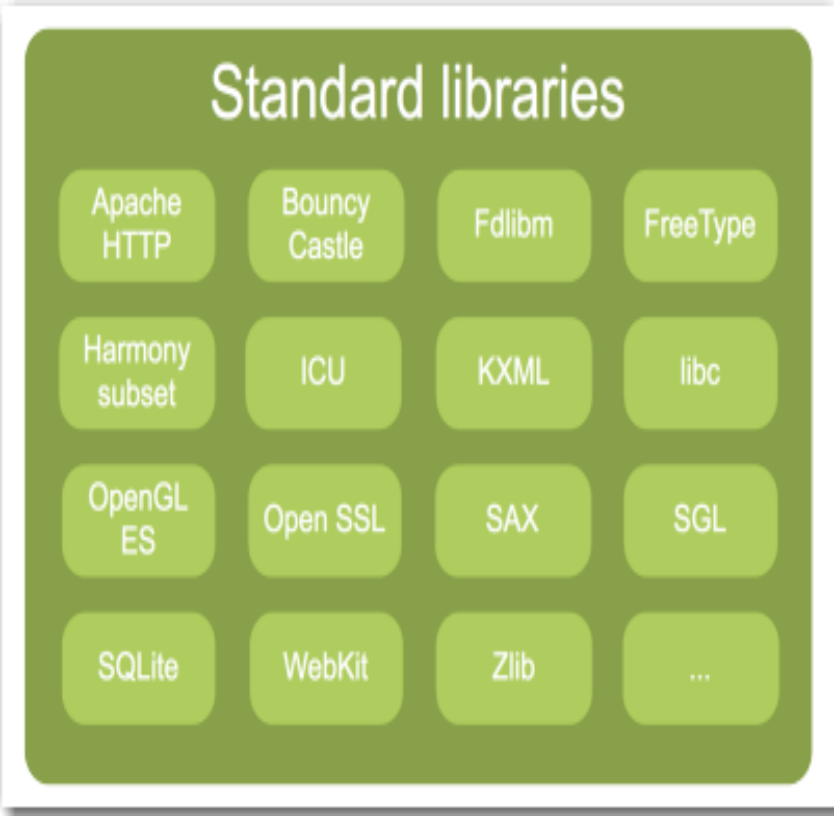
Architecture: Activity Lifecycle

- Activities have several states
- Lifecycle methods are called on transitions
- You typically don't need to use them all, but they are there
- Starting up: onCreate(), onStart(), onResume().
- Normal: onFreeze(), onPause()
- Shutting down: onStop(), onDestroy()



Architecture: Libraries

- set of instructions that tell the device how to handle different kinds of data
- Excludes AWT and Swing and O MG CORBA; all superfluous for apps using the Android framework.
- game developers typically want to code in C/C++ and use Android NDk



Architecture: Android Essentials

- **What's In an App?**
  - An Android app lives in what's called an APK, which is simply a ZIP file, with a particular internal file layout that allows it to be run in place, without unpacking. APK package contains .dex files (compiled byte code files called Dalvik executable), resource files, etc.
- **AndroidManifest.xml File**
  - It describes the components of the application — the activities, services, broadcast receivers, and content providers that the application is composed of
  - Declares permissions, linked libraries and minimum level of the Android API that the application requires.

Architecture: Application Fundamentals

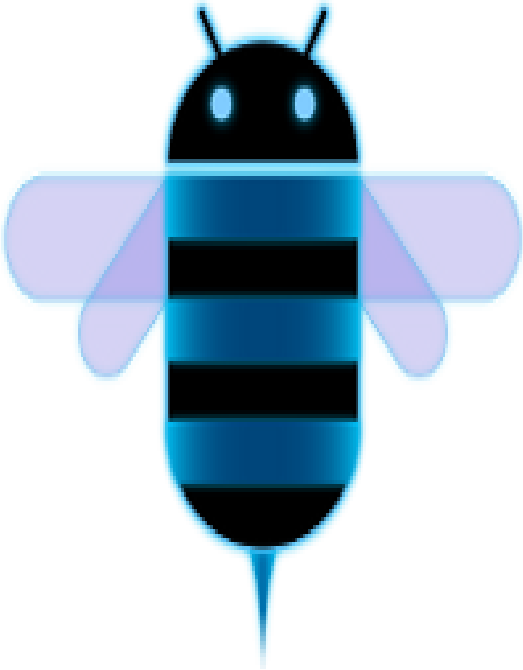
- Activities
  - application presentation layer
- Services
  - invisible components, update data sources, visible activities, trigger notifications
  - perform regular processing even when app is not active or invisible
- Content Providers
  - shareable data store
- Intents
  - message passing framework
  - broadcast messages system wide, for an action to be performed
- Broadcast receivers
  - consume intent broadcasts
  - lets app listen for intents matching a specific criteria like location
- Notifications
  - Toast notification
  - Status Bar Notification
  - Dialog notification

Android Version History

Version	Release Date	Linux kernel	Prominent Updates
1.0/1.1	9 Feb, 09	2.6.23	Multiple resolved issues, API changes, Maps adds details and reviews, Marquee layouts
1.5 (CUPCAKE)	30 April, 09	2.6.27	UI mode, camcorder mode, Youtube, bluetooth support, Animated screen transitions
1.6 (DONUT)	15 Sep, 09	2.6.29	interfaces, voice search, CDAM, WVGA screen
2.0/2.1(ECLAIR)	26 Oct, 09	2.6.29	Optimized hardware, HTML5 support, digital zoom, bluetooth 2.1
2.2 (FROYO)	20 May, 10	2.6.32	Performance, JIT support, USB tethering and Wi-Fi hotspot functionality, Adobe Flash support
2.3(GINGERBREAD)	6 Dec, 10	2.6.35	VOIP telephony, copy–paste functionalities, Concurrent garbage collection, Switched from YAFFS to the ext4

ANDROID 3.0 (HONEYCOMB)

- SDK released on 22 February 2011
- This is a tablet-only release of Android
- The first device featuring this version, the Motorola Xoom tablet, was released on February 24, 2011



Android 3.0: Platform Technologies

- **Storage**
  - ext4 file system support to enable onboard eMMC storage
  - FUSE file system to support MTP devices
  - USB host mode support to support keyboards and USB hubs
  - Support for MTP/PTP
- **Linux kernel**
  - Upgraded to version 2.6.36

Android 3.0: Platform Technologies

- **Dalvik VM**
  - New code to support and optimize for SMP
  - Various improvements to the JIT infrastructure
  - Garbage collector improvements:
    - Tuned for SMP
    - Support for larger heap sizes
    - Unified handling for bitmaps and byte buffers
- **Dalvik Core Libraries**
  - New, much faster implementation of NIO (modern I/O library)
  - Improved exception messages
  - Correctness and performance fixes throughout

Android 3.0: Built In applications

The system image included in the downloadable platform provides these built-in applications:

API demos
Browser
Clock
Calendar
Contacts
Custom locale
Dev tools
Downloads
Email
Gallery
Gesture builder
Messaging
Camera
Music
Search
Settings
Spare parts
Speech recorder
Widget preview

ANDROID 3.0: New features

- The Android 3.0 platform introduces many new and exciting features for users and developers.
  - New User features
  - New Developer features

Android 3.0: New User Features

1. **New UI designed from the ground up for tablets**
   - specifically optimized for devices with larger screen sizes, particularly tablets
   - introduces a brand new, truly virtual and “holographic” UI design, as well as an elegant, content-focused interaction model.
   - New UI brings fresh paradigms for interaction, navigation, and customization and makes them available to all applications — even those built for earlier versions of the platform
   - able to use an extended set of UI objects, powerful graphics, and media capabilities to engage users in new ways

Android 3.0: New User Features

1.1 **System Bar, for global status and notifications**

- Across the system and in all applications, users have quick access to notifications, system status, and soft navigation buttons in a System Bar
- Available at the bottom of screen

1.2 **Action Bar, for application control**

- In every application, users have access to contextual options, navigation, widgets, or other types of content in an Action Bar, displayed at the top of the screen
- The Action Bar is another key touchpoint for users, especially with action items and an overflow dropdown menu, which users frequently access in a similar manner in most applications

Android 3.0: New User Features

1.3 **Customizable Home screens**

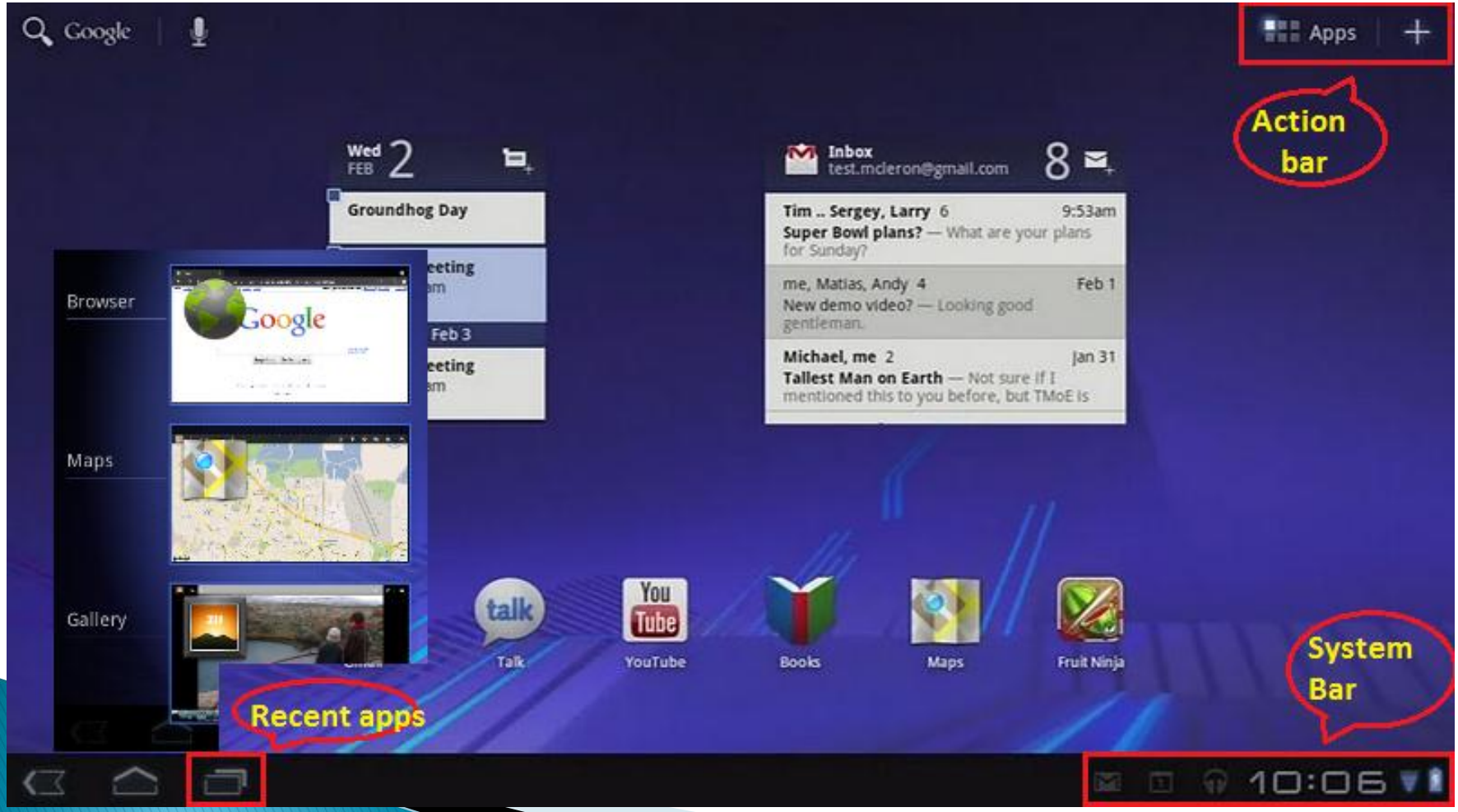
- Five customizable Home screens give users instant access to all parts of the system from any context
- Each screen offers a large grid that maintains spatial arrangement in all orientations
- Each Home screen also offers a familiar launcher for access to all installed applications

1.4 **Recent Apps, for easy visual multitasking**

- Multitasking is a key strength of Android and it is central to the Android 3.0 experience
- As users launch applications to handle various tasks, they can use the Recent Apps list in the System Bar to see the tasks underway and quickly jump from one application context to another.
- To help users rapidly identify the task associated with each app, the list shows a snapshot of its actual state when the user last viewed it.

Android 3.0: New User Features

1. New UI designed from the ground up for tablets

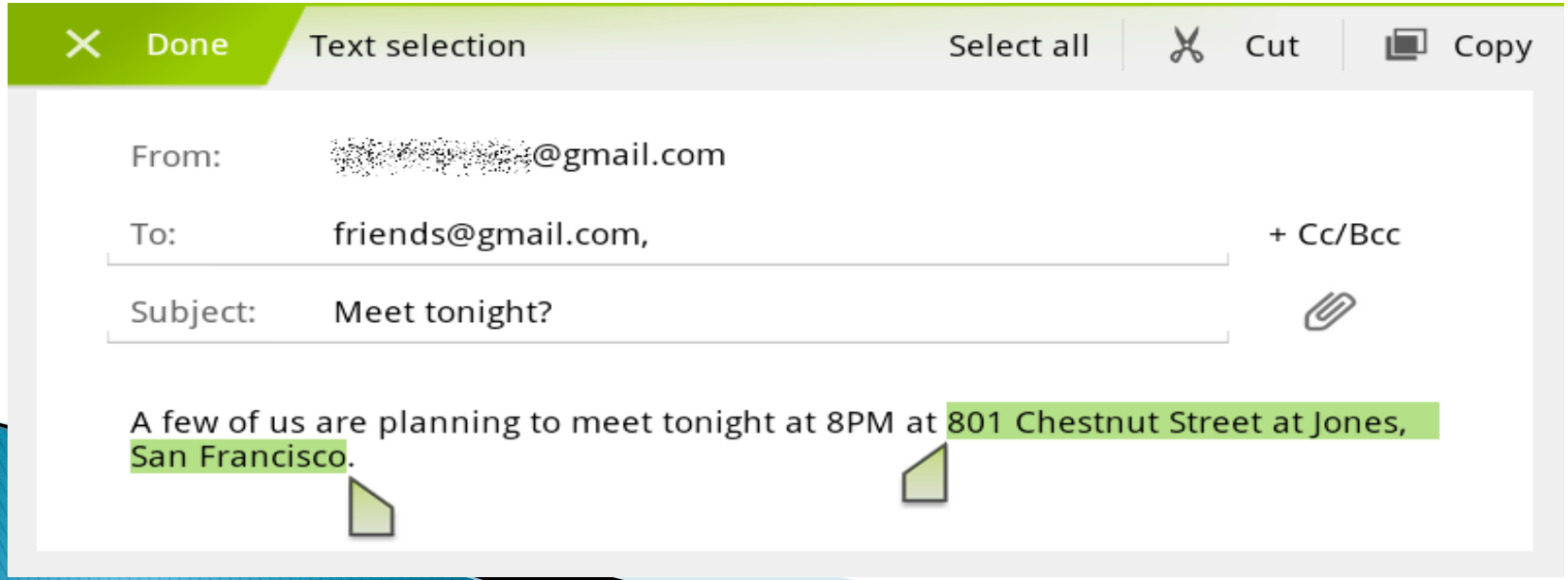


Android 3.0: New User Features

2. **Redesigned keyboard**
   - The keys are reshaped and repositioned for improved targeting, and new keys have been added, such as a Tab key, to provide richer and more efficient text input
   - Users can touch-hold keys to access menus of special characters and switch text/voice input modes from a button in the System Bar
3. **New connectivity options**
   - Built-in support for Media/Picture Transfer Protocol lets users instantly sync media files with a USB-connected camera or desktop computer, without needing to mount a USB mass-storage device
   - can connect full keyboards over either USB or Bluetooth
   - For improved wi-fi connectivity, a new combo scan reduces scan times across bands and filters

Android 3.0: New User Features

4. **Improved text selection, copy and paste**
   - When entering or viewing text, a new UI lets users quickly select a word by press-hold and then adjust the selection area as needed by dragging a set of bounding arrows to new positions
   - Users can then select an action from the Action Bar, such as copy to the clipboard, share, paste, web search, or find



Android 3.0: New User Features

5. **Updated set of standard apps**
   - The Android 3.0 platform includes an updated set of standard applications that are designed for use on larger screen devices. Some of those are:

5.1 Browser

   - The browser includes new features that let users navigate and organize more efficiently.
   - Multiple tabs replace browser windows and a new “incognito” mode allows anonymous browsing.
   - Bookmarks and history are presented and managed in a single unified view.
   - better browsing experience at non-mobile sites through an improved zoom and viewport model, overflow scrolling, support for fixed positioning, and more.

Android 3.0: New User Features

5.2 Camera and Gallery

- The Camera application has been redesigned to take advantage of a larger screen for quick access to exposure, focus, flash, zoom, front-facing camera, and more
- To let users capture scenes in new ways, it adds built-in support for time-lapse video recording
- The Gallery application lets users view albums and other collections in full-screen mode, with easy access to thumbnails for other photos in the collection.

Android 3.0: New User Features

5.3 Contacts

- The Contacts app uses a new two-pane UI and Fast Scroll to let users easily organize and locate contacts.
- The application offers improved formatting of international phone numbers as user types, based on home country and an international number parsing library.
- Contact information is presented in a card-like UI, making it easier for users to read and edit contacts.

5.4 Email

- The Email application uses a new two-pane UI to make viewing and organizing messages more efficient.
- The app lets users select one or more messages, then select an action from the Action Bar, such as moving them to a folder
- Users can sync attachments for later viewing and keep track of email using a home screen Widget.

Android 3.0: New Developer Features

- The Android 3.0 platform is designed specially to meet the unique needs of applications on devices with larger screen sizes.
- It offers all of the tools developers need to create incredible visual and interaction experiences on these devices. Some of them are:

1) New UI Framework for creating great tablet apps
2) High-performance 2D and 3D graphics
3) Support for multicore processor architectures
4) Rich multimedia and connectivity
5) Enhancements for enterprise
6) Compatibility with existing apps

Android 3.0: New Developer Features

1. **New UI Framework for creating great tablet apps**

1.1 Activity fragments, for greater control of content and design flexibility

- Developers can break the Activities of their applications into subcomponents called Fragments, then combine them in a variety of ways to create a richer, more interactive experience
- Fragments can be added, removed, replaced, and animated inside an Activity dynamically, and they are modular and reusable across multiple Activities
- Fragments also offer an efficient way for developers to write applications that can run properly on both larger screen as well as smaller screen devices

1.2 Redesigned UI widgets

- updated set of UI widgets that developers can use to quickly add new types of content to their applications
- The new UI widgets are redesigned for use on larger screens such as tablets and incorporate the new holographic UI theme
- Several new widget types are available, including a 3D stack, search box, a date/time picker, number picker, calendar, popup menu, and others

Android 3.0: New Developer Features

1.3 Expanded Home screen widgets

- offer fast access to application-specific data directly from the home screen
- Developers can now use more standard UI widget types home screen widgets, including widgets that let users flip through collections of content as 3D stacks, grids, or lists
- Users can interact with the home screen widgets in new ways, such as by using touch gestures to scroll and flip the content displayed in a widget

1.4 Persistent Action Bar

- The platform provides each application with its own instance of the Action Bar at the top of the screen, which the application can use to give the user quick access to contextual options, widgets, status, navigation, and more
- The Action Bar lets developers expose more features of their applications to users in a familiar location, while also unifying the experience of using an application that spans multiple Activities or states

Android 3.0: New Developer Features

1.5 Richer notifications

- they let applications show key updates and status information to users in real time. Android 3.0 extends this capability, letting developers include richer content and control more properties.
- A new builder class lets developers quickly create notifications that include large and small icons, a title, a priority flag, and any properties already available in previous versions. Notifications can offer more types of content by building on the expanded set of UI Widgets that are now available as remote Views

1.6 Multiselect, clipboard, and drag-and-drop

- The platform offers convenient new interaction modes that developers can use.
- For managing collections of items in lists or grids, developers can offer a new multiselect mode that lets users choose multiple items for an action.
- Developers can also use a new system-wide Clipboard to let users easily copy any type of data into and out of their applications.
- Developers can now add drag-and-drop interaction through a DragEvent framework.

Android 3.0: New Developer Features

2. High-performance 2D and 3D graphics

2.1 New animation framework

- The platform includes a flexible new animation framework that lets developers easily animate the properties of UI elements such as Views, Widgets, Fragments or any arbitrary object
- Animations can create fades or movement between states, loop an animated image or an existing animation, change colors, and much more
- Adding animation to UI elements can add visual interest to an application and refine the user experience, to keep users engaged

2.2 Hardware-accelerated 2D graphics

- Android 3.0 offers a new hardware-accelerated OpenGL renderer that gives a performance boost to many common graphics operations for applications running in the framework.
- When the renderer is enabled, most operations in Canvas, Paint, Xfermode, ColorFilter, Shader, and Camera are accelerated.
- Developers can control how hardware-acceleration is applied at every level, from enabling it globally in an application to enabling it in specific Activities and Views inside the application

Android 3.0: New Developer Features

2.3 Renderscript 3D graphics engine

- Renderscript is a runtime 3D framework that provides both an API for building 3D scenes as well as a special, platform-independent shader language for maximum performance
- graphics operations and data processing can be accelerated.
- an ideal way to create high-performance 3D effects for applications, wallpapers, carousels, and more

3. Support for multicore processor architectures

- Android 3.0 is the first version of the platform designed to run on either single or multicore processor architectures
- A variety of changes in the Dalvik VM, Bionic library, and elsewhere add support for symmetric multiprocessing in multicore environments
- These optimizations can benefit all applications, even those that are single-threaded. For example, with two active cores, a single-threaded application might still see a performance boost if the Dalvik garbage collector runs on the second core. The system will arrange for this automatically

Android 3.0: New Developer Features

4. Rich multimedia and connectivity

4.1 HTTP Live streaming

- Applications can now pass an M3U playlist URL to the media framework to begin an HTTP Live streaming session.
- The media framework supports most of the HTTP Live streaming specification, including adaptive bit rate

4.2 Pluggable DRM framework

- Android 3.0 includes an extensible DRM framework that lets applications manage protected content according to a variety of DRM mechanisms that may be available on the device
- For application developers, the framework API offers an consistent, unified API that simplifies the management of protected content, regardless of the underlying DRM engines

Android 3.0: New Developer Features

4.3 Digital media file transfer

- The platform includes built-in support for Media/Picture Transfer Protocol (MTP/PTP) over USB, which lets users easily transfer any type of media files between devices and to a host computer
- Developers can build on this support, creating applications that let users create or manage media files that they may want to transfer or share across devices

4.4 More types of connectivity

- API support for Bluetooth A2DP and HSP profiles lets applications query Bluetooth profiles for connected devices, audio state, and more, then notify the user
- Applications can also register to receive system broadcasts of pre-defined vendor-specific AT commands, such as Platronics Xevent
- Applications can also take advantage of the platform's new support for full keyboards connected by USB or Bluetooth

Android 3.0: New Developer Features

5. **Enhancements for enterprise**
   - In Android 3.0, developers of device administration applications can support new types of policies, including policies for encrypted storage, password expiration, password history, and password complex characters required
6. **Compatibility with existing apps**
   - Android 3.0 is fully compatible with applications developed for earlier versions of the platform, or for smaller screen sizes
   - Existing applications can seamlessly participate in the new holographic UI theme without code changes, by adding a single attribute in their manifest files
   - The platform emulates the Menu key, which is replaced by the overflow menu in the Action Bar in the new UI.
   - Developers wanting to take fuller advantage of larger screen sizes can also create dedicated layouts and assets for larger screens and add them to their existing applications

Android 3.0: API differences

- 3 New packages are added to android 3.0
  - android.animation
  - android.drm
  - android.renderscript
- 38 packages are changed.

Upgrading or Developing a New App for Android 3.0

1. **Declare the minimum system version**
   - The first thing to do when you upgrade or create a project for Android 3.0 is set your manifest's android:minSdkVersion to "11". This declares that your application uses APIs available in Android 3.0 and greater, so it should not be available to devices running an older version of Android

2. **Use the Action Bar**
   - The Action Bar is a widget for activities that replaces the traditional title bar at the top of the screen.
   - By default, the Action Bar includes the application logo on the left side, followed by the activity title, and access to items from the Options Menu in a drop-down list on the right side
   - You can enable items from the Options Menu to appear directly in the Action Bar as "action items" by adding showAsAction="ifRoom" to specific menu items in your menu resource
   - You can also add navigation features to the Action Bar, such as tabs, and use the application icon to navigate to your application's "home" activity or to navigate "up" the application's activity hierarchy

Upgrading or Developing a New App for Android 3.0

3. **Divide your activities into fragments**
   - You can think of a fragment as a modular section of an activity, which has its own lifecycle, receives its own input events, and which you can add or remove while the activity is running
   - Fragments are an optional component for your activities that allow you to build a multi-pane UI and reuse them in multiple activities
   - For example, a news application can use one fragment to show a list of articles on the left and another fragment to display an article on the right—both fragments appear in one activity, side by side, and each fragment has its own set of lifecycle callback methods and handles its own input events. Thus, instead of using one activity to select an article and another activity to read the article, the user can select an article and read it all within the same activity

4. **Use new animation APIs for transitions**
   - An all-new animation framework allows you to animate arbitrary properties of any object (such as a View, Drawable, Fragment, or anything else)
   - You can define several animation aspects (such as duration, repeat, interpolation, and more) for an object's int, float, and hexadecimal color values

Upgrading or Developing a New App for Android 3.0

5. **Enable hardware acceleration**
   - Android 3.0 adds a hardware-accelerated OpenGL renderer that gives a performance boost to most 2D graphics operations
   - You can enable hardware-accelerated rendering in your application by setting android:hardwareAccelerated="true" in your manifest's <application> element or for individual <activity> elements
   - Hardware acceleration results in smoother animations, smoother scrolling, and overall better performance and response to user interaction
   - When enabled, be sure that you thoroughly test your application on a device that supports hardware acceleration.
6. **Enhance your app widgets**
   - App widgets allow users to access information from your application directly from the Home screen and interact with ongoing services (such as preview their email and control music playback)
   - Android 3.0 enhances these capabilities by enabling collections, created with widgets such as Listview, GridView, and the new StackView. These widgets allow you to create more interactive app widgets, such as one with a scrolling list, and can automatically update their data through a RemoteViewsService

Upgrading or Developing a New App for Android 3.0

7. **Add other new features**
   - Android 3.0 introduces many more APIs that you might find valuable for your application, such as drag and drop APIs, new Bluetooth APIs, a system-wide clipboard framework, a new graphics engine called Renderscript, and more

Conclusion

- The improved graphics as well as the video chat and VOIP integration puts the phone a step ahead of its competition
- Honeycomb apps are miles ahead of their mobile counterparts in terms of both functionality and interface
- Multitasking is greatest strength of Honeycomb
- Complete compatibility with apps developed for older versions of Android
- Significant changes in general apps such as browser, gmail, youtube, music, gallery, camera app, google talk, calendar, books and many more