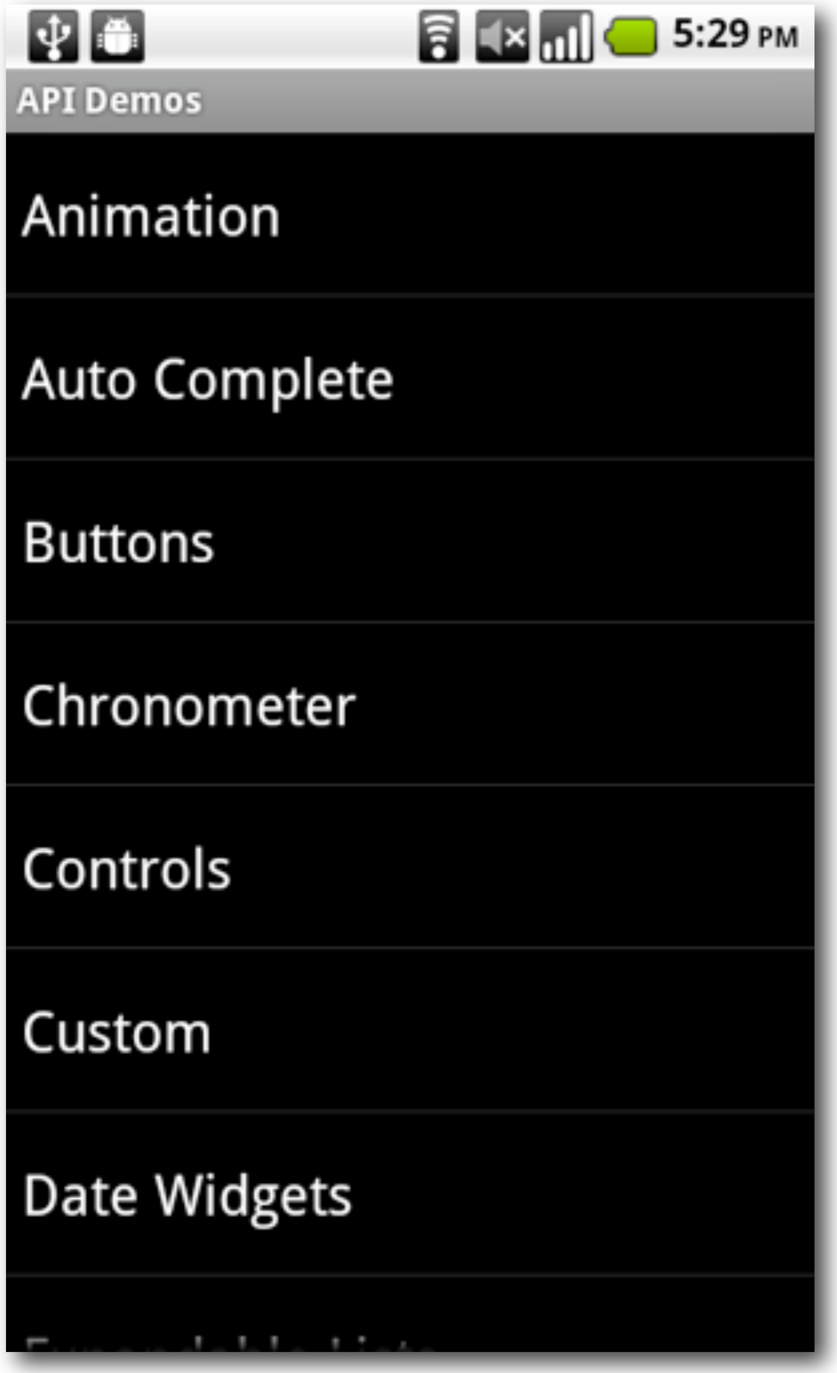
Google™ 10 I O

The World of List View

Romain Guy and Adam Powell
May 19, 2010

View live notes and ask questions about this session on Wave

http://bit.ly/9zozBR



5:29 PM

API Demos

Animation

Auto Complete

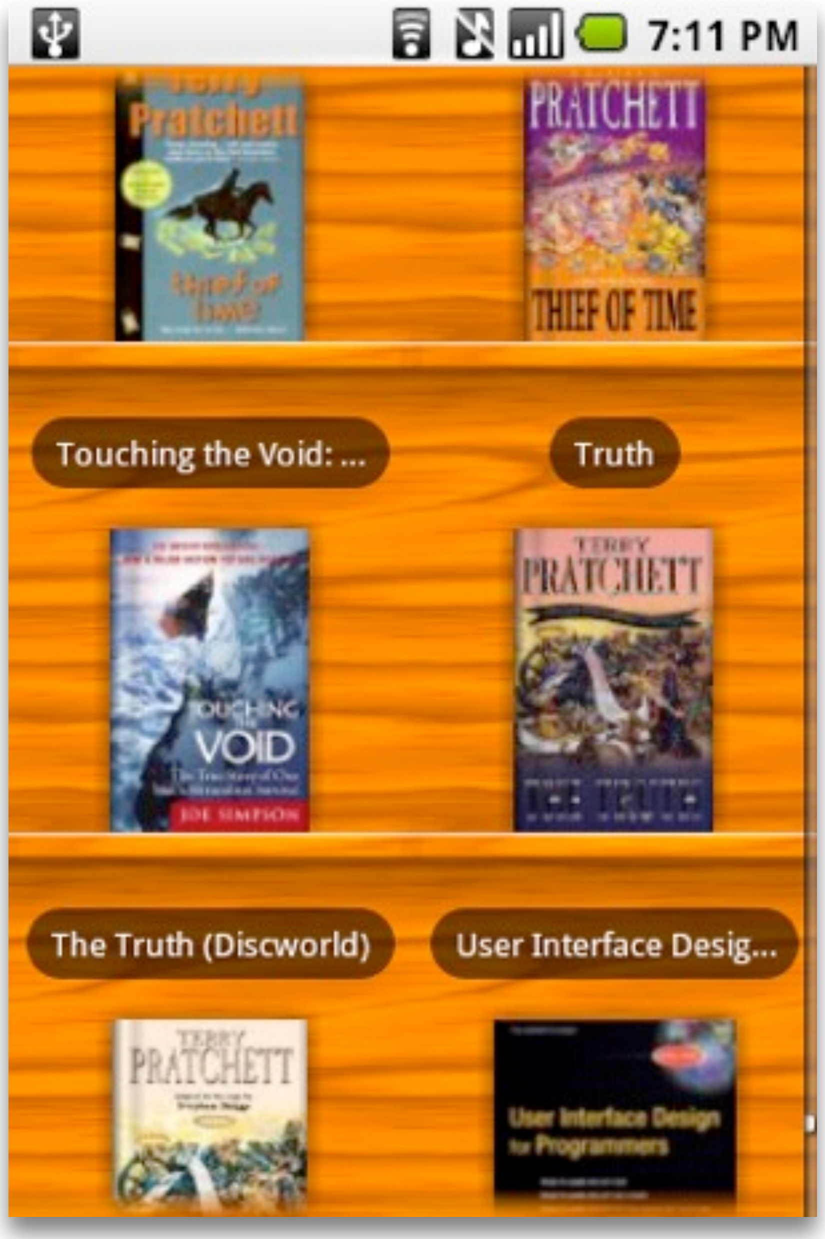
Buttons

Chronometer

Controls

Custom

Date Widgets



Agenda

- Virtualization and adapters
- Item properties
- Headers and footers
- List selectors
- Other features
- Gotchas and don’ts

Agenda

- Virtualization and adapters
- Item properties
- Headers and footers
- List selectors
- Other features
- Gotchas and don’ts

Virtualization

- Problem: large data sets
  - Memory
  - Performance
- Solution
  - Populate on demand
  - Recycle views to reduce object churn

Adapters

- Terminology
  - index: Child views
  - position: Data in Adapter
  - id: Unique identifier for data
- Stable IDs
  - hasStableIds() == true
  - An ID always refers to the same value
  - Helps ListView

Adapters

- getView(int position, View convertView, ViewGroup parent)
  - Full data presentation control
  - Optimization
  - Shoot yourself in the foot (and the face)

getView

Opportunities for optimization

- ListView is smart
- convertView
  - Supplied by ListView
  - Matches item types
  - Reuse it

getView

The Slow Way

```java
public View getView(int position, View convertView, ViewGroup parent) {
    View item = mInflater.inflate(R.layout.list_item_icon_text, null);

    ((TextView) item.findViewById(R.id.text)).setText(DATA[position]);
    ((ImageView) item.findViewById(R.id.icon)).setImageBitmap(
            (position & 1) == 1 ? mIcon1 : mIcon2);

    return item;
}
```

getView

The Right Way

```java
public View getView(int position, View convertView, ViewGroup parent) {
    if (convertView == null) {
        convertView = mInflater.inflate(R.layout.item, parent, false);
    }

    ((TextView) convertView.findViewById(R.id.text)).setText(DATA[position]);
    ((ImageView) convertView.findViewById(R.id.icon)).setImageBitmap(
            (position & 1) == 1 ? mIcon1 : mIcon2);

    return convertView;
}
```

getView
The Fast Way

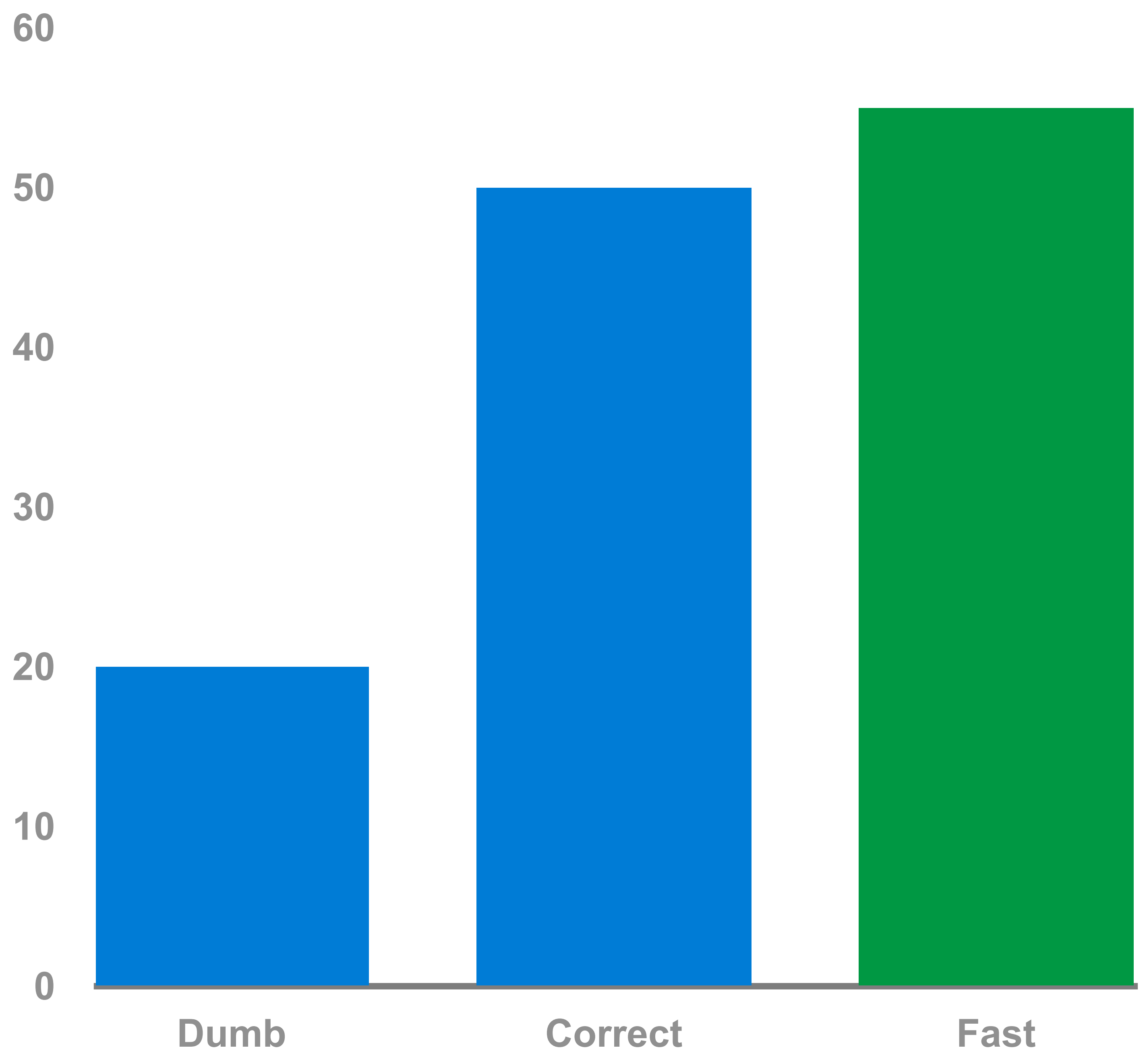
```
static class ViewHolder {
    TextView text;
    ImageView icon;
}
```

getView

The Fast Way

```
public View getView(int position, View convertView, ViewGroup parent) {
    ViewHolder holder;

    if (convertView == null) {
        convertView = mInflater.inflate(R.layout.list_item_icon_text,
                parent, false);
        holder = new ViewHolder();
        holder.text = (TextView) convertView.findViewById(R.id.text);
        holder.icon = (ImageView) convertView.findViewById(R.id.icon);

        convertView.setTag(holder);
    } else {
        holder = (ViewHolder) convertView.getTag();
    }

    holder.text.setText(DATA[position]);
    holder.icon.setImageBitmap((position & 1) == 1 ? mIcon1 : mIcon2);

    return convertView;
}
```

getView



List of 10,000 items, Nexus One device

Adapters

How to shoot yourself in the foot

- Local view cache
- Accessing views from the adapter
- Change convertView's **structure**
- Assumptions about getView calls

Adapters

Handling data changes

- notifyDataSetChanged()
  - New or updated data
- notifyDataSetInvalidated()
  - No more data available

Adapters

Handling different view types

- Built-in item types
- getItemViewType
  - Type of View for a given position
  - Used to provide the right convertView
- getViewTypeCount
  - How many types to expect

Adapters

Handling slow data sources

- Adapter modifications on the UI thread
- Fetching data can happen anywhere
- Request data on another thread
- Commit adapter changes on the UI thread
- **Call notifyDataSetChanged()**

Agenda

- Virtualization and adapters
- Item properties
- Headers and footers
- List selectors
- Other features
- Gotchas and don’ts

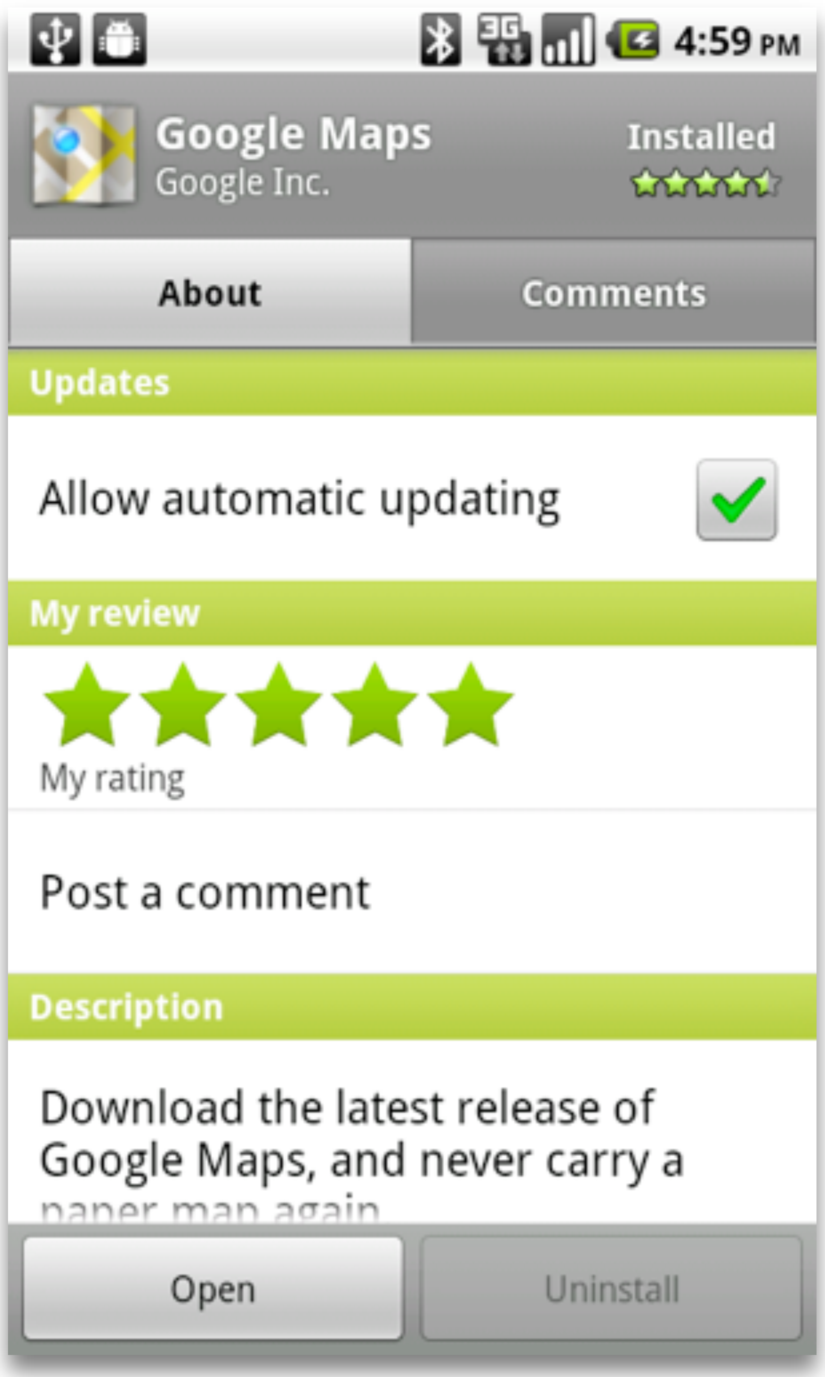
Item properties

Enabled or disabled

- Enabled
  - Item can be selected, clicked
- Disabled
  - Section dividers/headers within content

Item properties

Enabled or disabled



4:59 PM

Google Maps
Google Inc.
Installed

Updates

Allow automatic updating ✓

My review

My rating

Post a comment

Description

Download the latest release of Google Maps, and never carry a paper map again

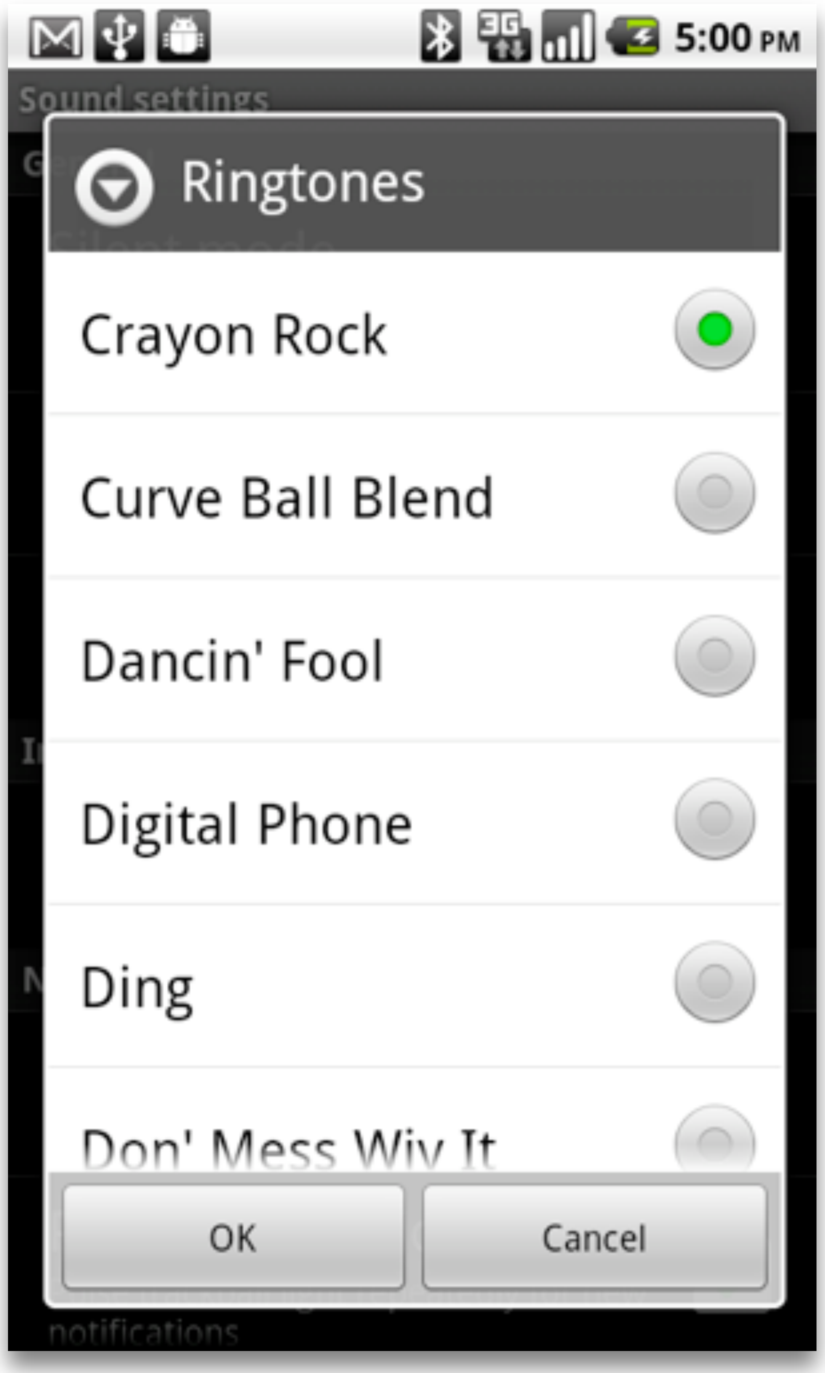
Item properties

Choice mode

- Single choice mode (radio buttons)
- Multiple choice mode (checked items)
- What is selected?
  - Single choice mode
    - getCheckedItemPosition()
  - Multiple choice mode
    - getCheckedItemPositions()
  - Stable IDs make life easier when positions can change
    - getCheckedItemIds()

Item properties

Choice mode


5:00 PM

Sound settings

Ringtones

Crayon Rock [✓]

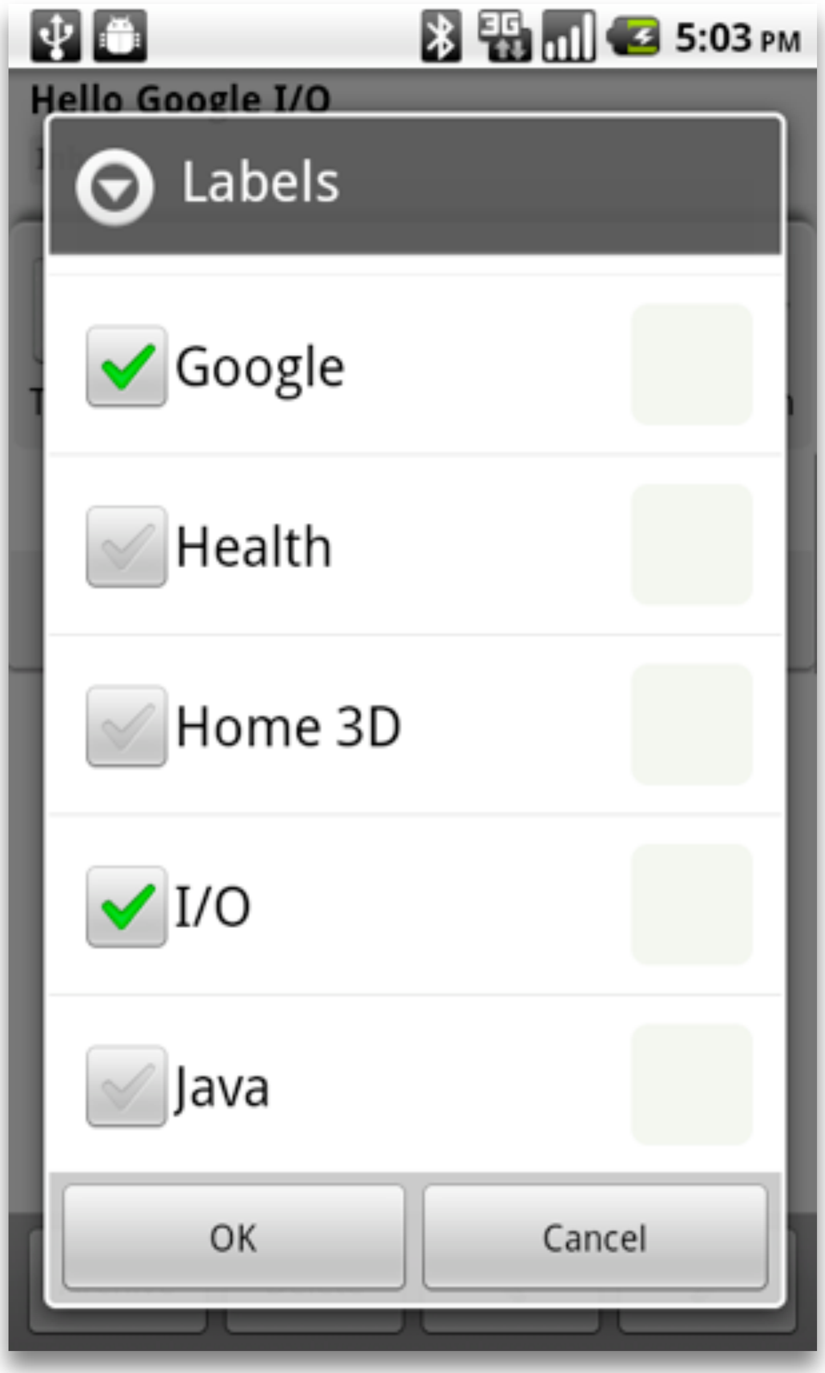
Curve Ball Blend

Dancin' Fool

Digital Phone

Ding

Don' Mess Wiv It


5:03 PM

Hello Google I/O

Labels

[✓] Google

Health

Home 3D

[✓] I/O

Java

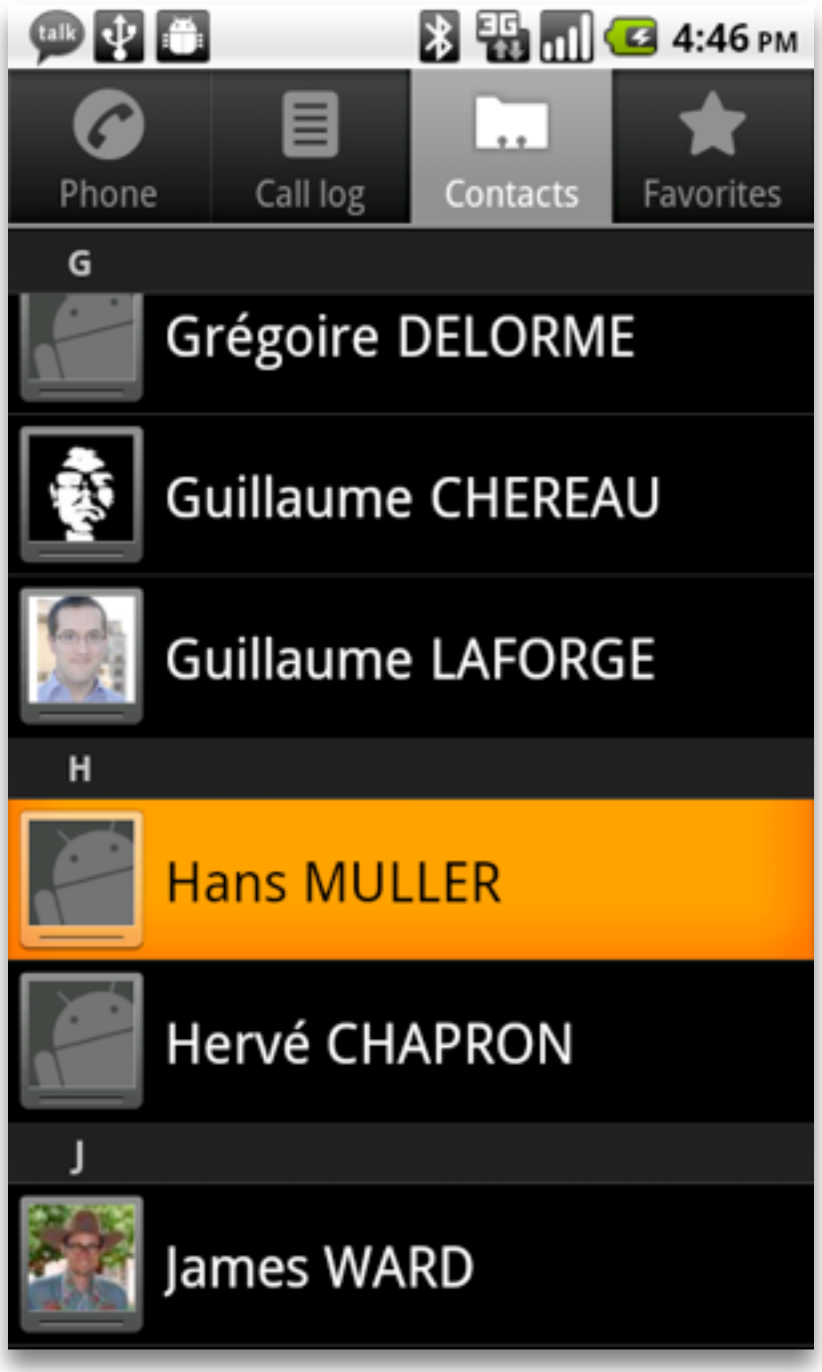
Item properties

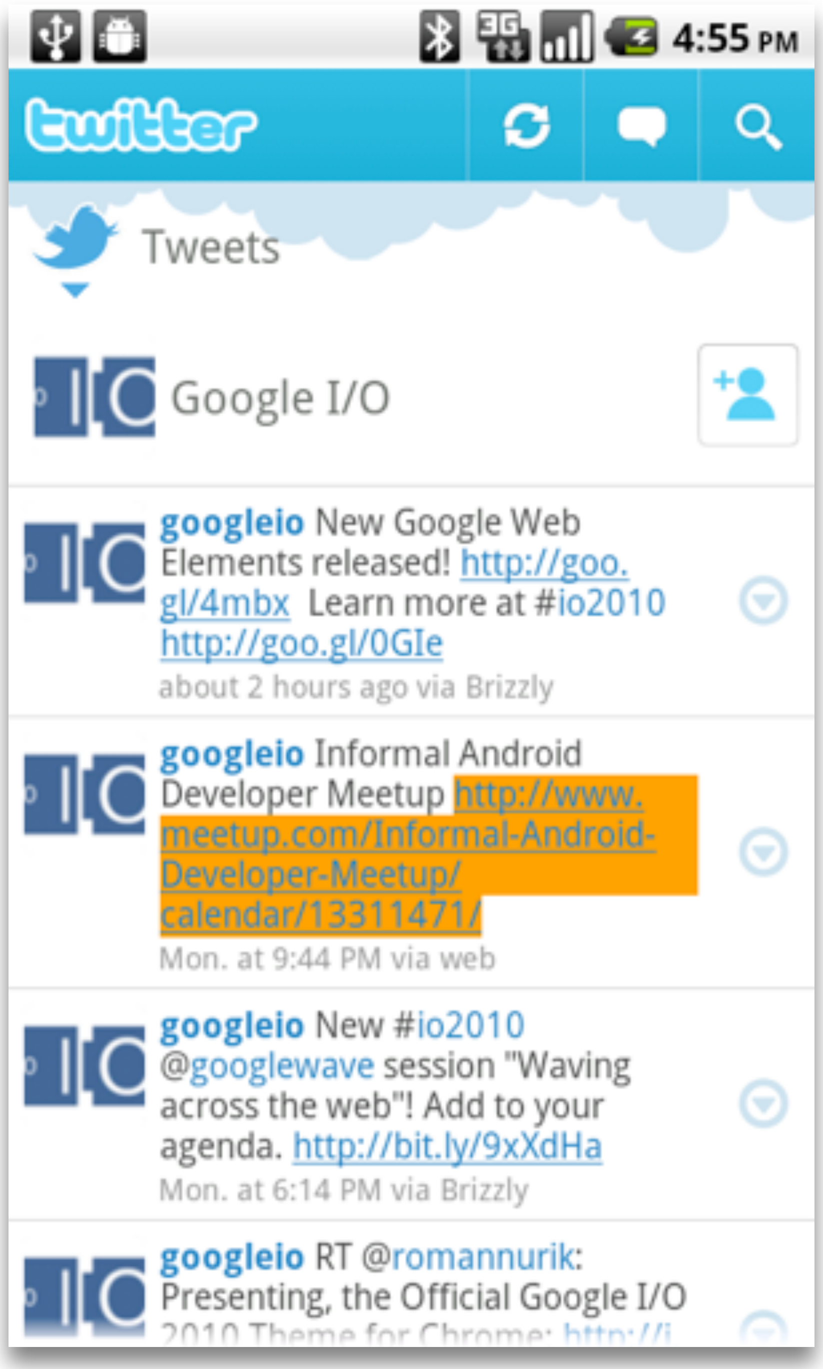
Focusable

- setItemsCanFocus(boolean itemsCanFocus)
- Do list items focus as a whole? (false)
- Or can views within list items have focus? (true)

Item properties

Focusable





googleio New Google Web Elements released! http://goo.gl/4mbx Learn more at #io2010 http://goo.gl/0GIe
about 2 hours ago via Brizzly

googleio Informal Android Developer Meetup http://www.meetup.com/Informal-Android-Developer-Meetup/calendar/13311471/
Mon. at 9:44 PM via web

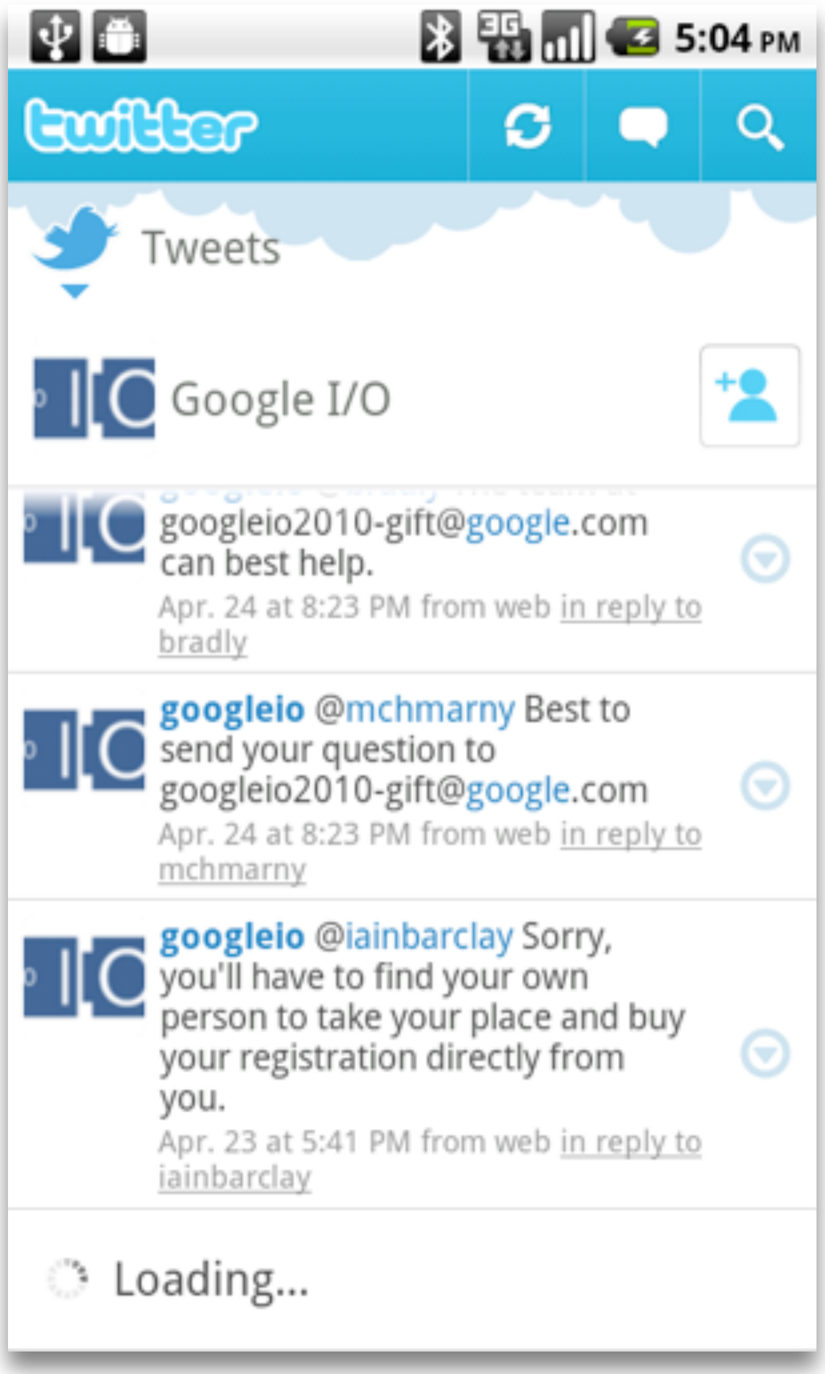
googleio New #io2010 @googlewave session "Waving across the web"! Add to your agenda. http://bit.ly/9xXdHa
Mon. at 6:14 PM via Brizzly

googleio RT @romannurik: Presenting, the Official Google I/O 2010 Theme for Chrome: http://i

Agenda

- Virtualization and adapters
- Item properties
- Headers and footers
- List selectors
- Other features
- Gotchas and don’ts

Headers and footers


5:04 PM

twitter

Tweets

Google I/O

googleio2010-gift@google.com can best help.
Apr. 24 at 8:23 PM from web in reply to bradly

googleio @mchmarny Best to send your question to googleio2010-gift@google.com
Apr. 24 at 8:23 PM from web in reply to mchmarny

googleio @iainbarclay Sorry, you'll have to find your own person to take your place and buy your registration directly from you.
Apr. 23 at 5:41 PM from web in reply to iainbarclay

Loading...

Headers and footers

Fixed

```
<LinearLayout
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:orientation="vertical">

    <LinearLayout
        android:layout_width="fill_parent"
        android:layout_height="wrap_content">
        <!-- ... -->
    </LinearLayout>

    <ListView
        android:id="@+id/list"

        android:layout_width="fill_parent"
        android:layout_height="0dip"
        android:layout_weight="1.0" />

</LinearLayout>
```

Headers and footers

Scrolling

- ListView.addHeaderView()
- ListView.addFooterView()
- Must be called *before* setAdapter()
- isSelectable == Adapter.isEnabled()
  - Sorry, our bad

Headers and footers

Wrapped adapter

```
ListView list = ...;
list.addHeaderView(myHeader);
list.addFooterView(myFooter);
list.setAdapter(myAdapter);

boolean same = list.getAdapter() == myAdapter;
// same == false!
// getAdapter() returns a
// android.widget.HeaderViewListAdapter
```

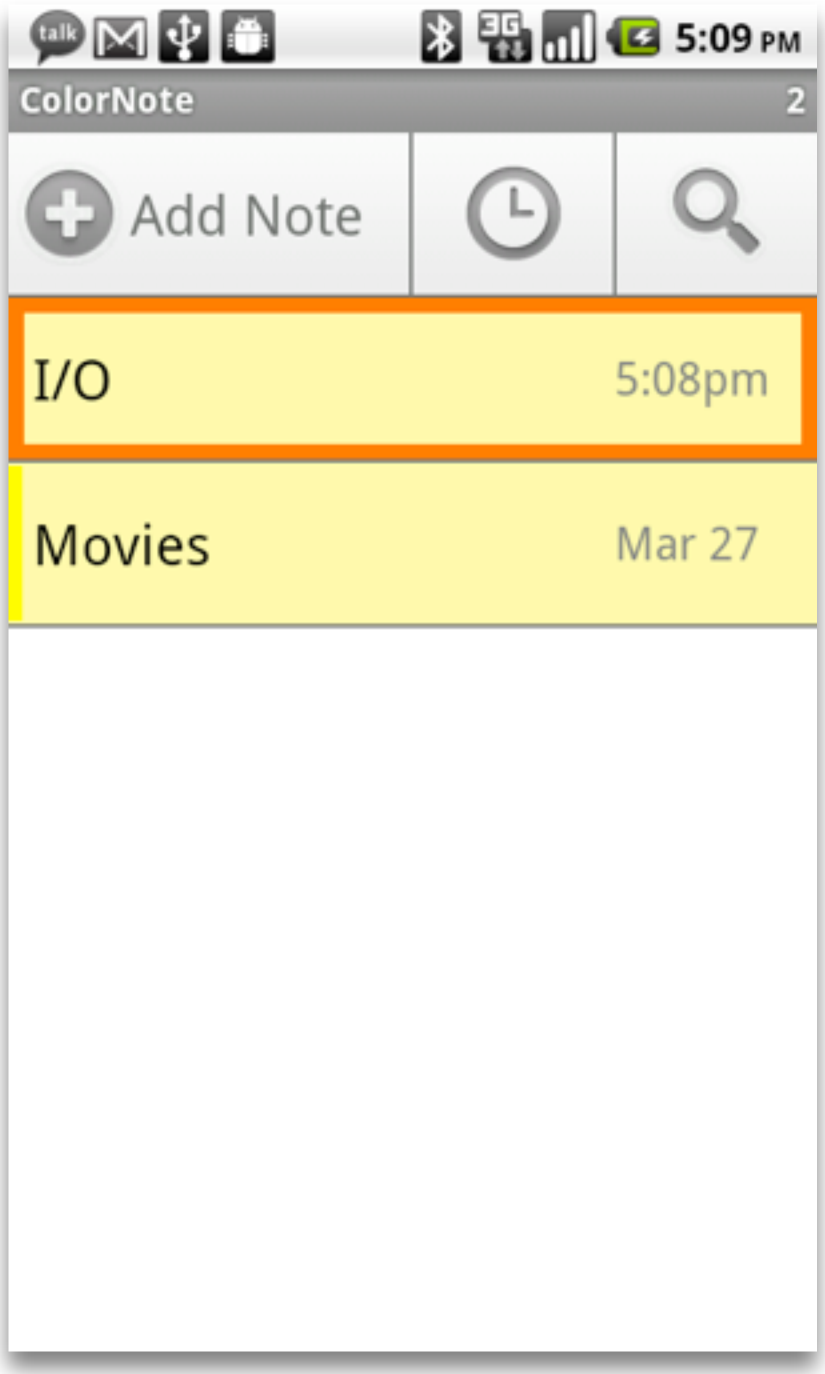
Agenda

- Virtualization and adapters
- Item properties
- Headers and footers
- List selectors
- Other features
- Gotchas and don’ts

List selectors

- Highlights the selected item
- Not shown in touch mode
  - There’s no selection in touch mode!
- Shown behind list items
  - android:drawSelectorOnTop=”true”

List selectors



List selectors

```
<selector>

    <item android:state_window_focused="false"
        android:drawable="@color/transparent" />

    <item android:state_focused="true" android:state_enabled="false"
        android:state_pressed="true"
        android:drawable="@drawable/list_selector_background_disabled" />

    <item android:state_focused="true" android:state_enabled="false"
        android:drawable="@drawable/list_selector_background_disabled" />

    <item android:state_focused="true" android:state_pressed="true"
        android:drawable="@drawable/list_selector_background_transition" />
    <item android:state_focused="false" android:state_pressed="true"
        android:drawable="@drawable/list_selector_background_transition" />

    <item android:state_focused="true"
        android:drawable="@drawable/list_selector_background_focus" />

</selector>
```

List selectors

- If your items are opaque, use a selector drawable:
  - convertView.setBackground(R.drawable.selector)

```
<selector>
    <item android:state_selected="true"
        android:drawable="@color/transparent" />
    <item android:state_selected="false"
        android:drawable="#ff00ff00" />
</selector>
```

Agenda

- Virtualization and adapters
- Item properties
- Headers and footers
- List selectors
- Other features
- Gotchas and don’ts

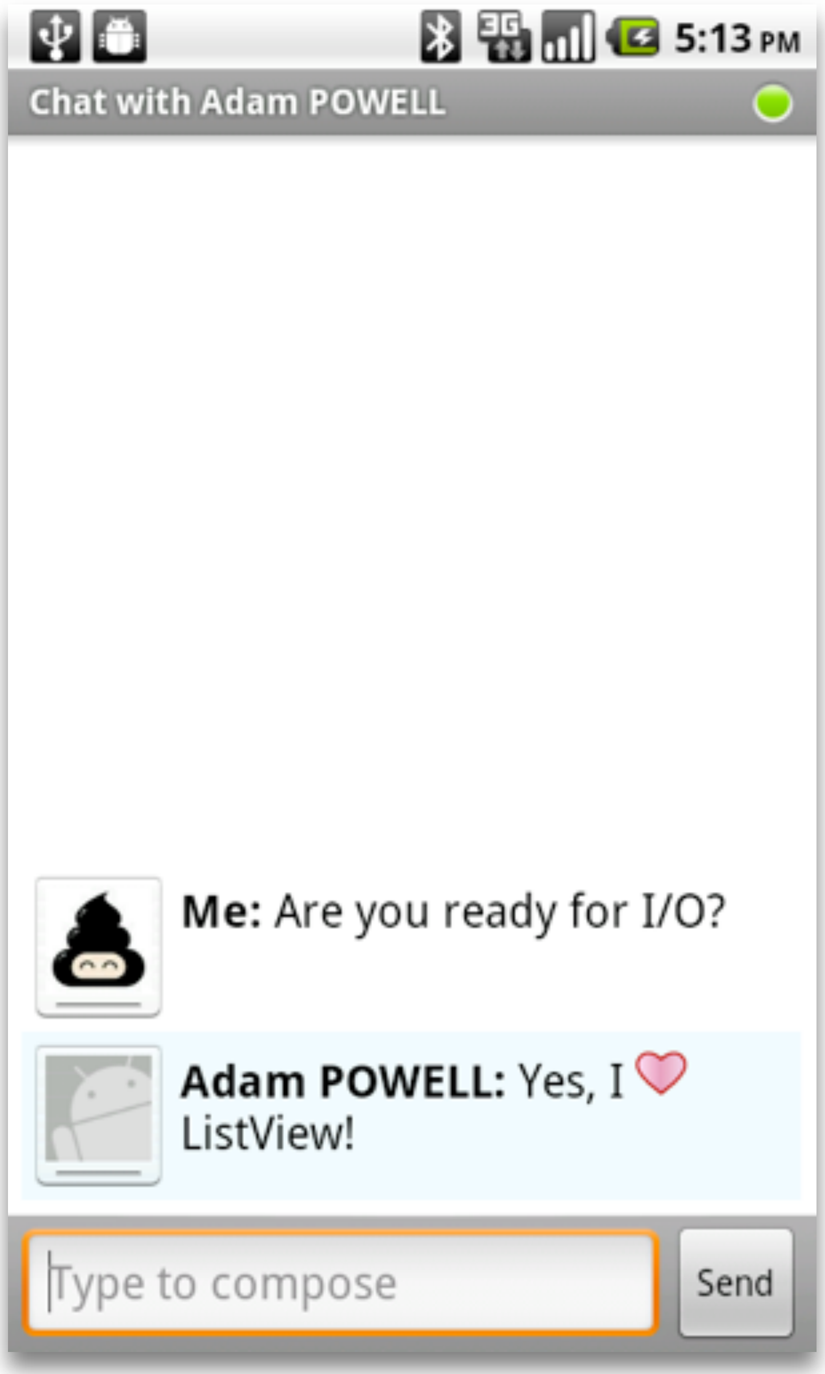
Other features

Transcript and stack from bottom

- android:transcriptMode
  - Behavior of the list when the content changes
  - “disabled”, doesn’t scroll
  - “normal”, scrolls to the bottom if last item is visible
  - “alwaysScroll”, always scrolls to the bottom
- android:stackFromBottom
  - Stack items in reverse order
  - Starts with the last item from the adapter
- Useful for chats
  - Messaging, Talk, IRC, etc.

Other features

Transcript and stack from bottom



Me: Are you ready for I/O?

Adam POWELL: Yes, I ♥ ListView!

Other features

Text filter

- android:textFilterEnabled=”true”
- Adapter must implement Filterable
  - CursorAdapter, ArrayAdapter, etc.
  - Implement getFilter()
- Implement the Filter

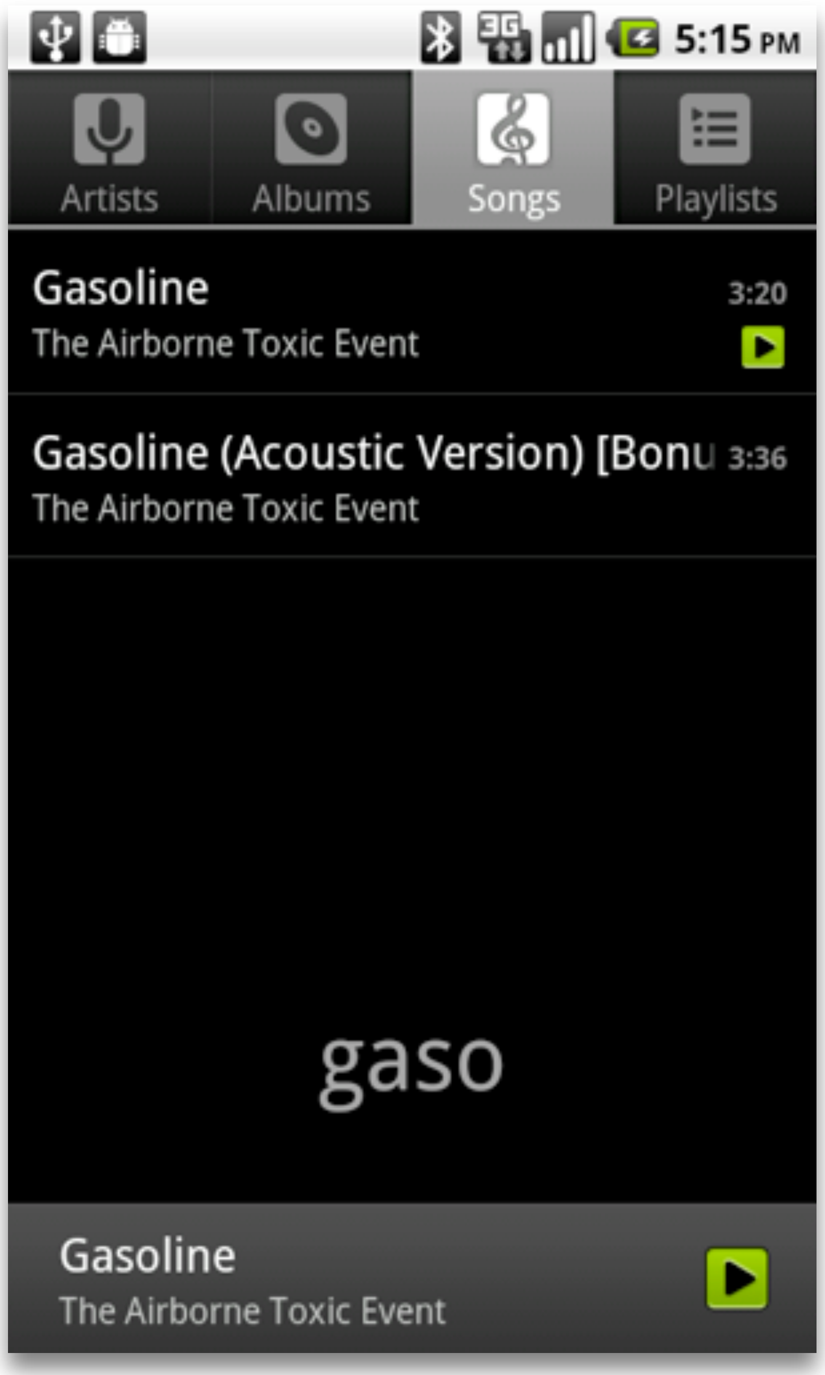
Other features

Text filter

```
// Filters the content of the adapter on a worker thread
protected FilterResults performFiltering(CharSequence prefix)

// Displays the results on the UI thread
protected void publishResults(CharSequence constraint,
        FilterResults results)
```

Other features

Text filter



Gasoline 3:20
The Airborne Toxic Event

Gasoline (Acoustic Version) [Bonu 3:36
The Airborne Toxic Event

gaso

Gasoline
The Airborne Toxic Event

Agenda

- Virtualization and adapters
- Item properties
- Headers and footers
- List selectors
- Other features
- Gotchas and don’ts

Gotcha

My list turns black?!

- Very useful optimization
  - When scrolling views are cached in bitmaps
  - Opaque bitmaps to avoid blending
- Solution
  - android:cacheColorHint=”#00000000”
  - android:cacheColorHint=”@color/myBackgroundColor”

Gotcha

The scrollbar changes size?!

- When views have very different heights
- Smooth scrollbar needs each item's height
  - Too expensive
- Solution
  - android:smoothScrollbar="false"

Don’t!

android:layout_height=”wrap_content”

- ListView is virtualized, remember?
- wrap_content = “as big as my children”
  - ListView supports unevenly sized children
  - Measure thousands of children?
- Android framework cheats
  - Measures only 3 children
  - Still expensive
- Wrong result

Don’t!

ListView inside a ScrollView

- ScrollView scrolls
- ListView scrolls
- Who will scroll?

Don’t!

Cache views in the adapter

- Don’t outsmart ListView
  - ListView assumes ownership of views
- Complex recycling mechanism
  - Numerous optimizations
  - Sometimes we even leave bugs there
- Undead views is the worst case
  - View both in the recycler and on screen

Don't!

Use a ListView when you don't need one!

- ListView...
  - Is for repeating, unbounded data
  - Adds (lots of) complexity
- Will a LinearLayout or ScrollView do the job?

Q&A

View live notes and ask questions about this session on Wave

http://bit.ly/9zozBR

Google™ 10 I O