





What's New in Android

Chet Haase
Romain Guy
Dan Sandler
Android Framework Engineers





What's New in Android 4.1 Jelly Bean

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So What is New, Anyway?

- Performance
- Framework features
- Graphics and media
- Google Play
- SDK and tools
- Notifications



Now, with More Butter!

- VSync'd drawing and animations
 - New Choreographer and TimeAnimator classes
- Streaming input
- Faster invalidation and drawing
- Triple buffering as needed

"For Butter or Worse": Thursday @ 2:45



Widgets & Wallpapers

- Widgets in third party launchers
 - `AppWidgetManager.ACTION_APPWIDGET_BIND`
- Widgets can respond to size changes
 - `AppWidgetProvider.onAppWidgetExtrasChanged()`
- Landscape and portrait layouts for remote views
- Memory limit for remote views
 - Function of screen size
- `GridLayout` and `ViewStub` remoteable
- New intent for viewing app wallpapers
 - `ACTION_CHANGE_LIVE_WALLPAPER`



Animation Goodies

- ViewPropertyAnimator
- LayoutTransition



1: `view.animate().alpha(0);`

2:

3: `view.animate().translationX(500);`

4:

5: `view.animate().alpha(0).translationX(500);`



```
view.animate().rotationY(180).withLayer();
```



```
view.animate().rotationY(180).withLayer();
```



```
view.animate().translationX(0).withStartAction(new Runnable() {  
    public void run() {  
        view.setTranslationX(-view.getWidth());  
    }  
});
```

```
view.animate().alpha(0).withEndAction(new Runnable() {  
    public void run() {  
        parent.removeView(view);  
    }  
});
```




```
view.animate().translationX(0).withStartAction(new Runnable() {  
    public void run() {  
        view.setTranslationX(-view.getWidth());  
    }  
});
```

```
view.animate().alpha(0).withEndAction(new Runnable() {  
    public void run() {  
        parent.removeView(view);  
    }  
});
```



```
LayoutTransition t = new LayoutTransition();  
t.enableTransitionType(LayoutTransition.CHANGING);  
container.setLayoutTransition(t);
```



```
LayoutTransition t = new LayoutTransition();  
t.enableTransitionType(LayoutTransition.CHANGING);  
container.setLayoutTransition(t);
```



Framework tidbits

- Improved TextView
 - Non-editable TextViews use less memory
 - Increased performance for long text
- Support for styled text in ClipData
- Better system-wide memory management
 - `ActivityManager.getMyMemoryState()`
 - `ComponentCallbacks2.TRIM_*`
- From Android 4.0 ICS in case you missed them
 - GridLayout
 - TextureView
- Database query cancellation
 - Cursors, ContentProviders and Loaders



```
signal = new CancellationSignal();
signal.setOnCancelListener(new OnCancelListener() {
    @Override
    public void onCancel() {
        // Cancelled contacts query
    }
});
```

```
Cursor c = r.query(ContactsContract.Contacts.CONTENT_URI,
    null, null, null, null, signal);
```

```
signal.cancel();
```



```
signal = new CancellationSignal();
signal.setOnCancelListener(new OnCancelListener() {
    @Override
    public void onCancel() {
        // Cancelled contacts query
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Cursor c = r.query(ContactsContract.Contacts.CONTENT_URI,
    null, null, null, null, signal);
```

```
signal.cancel();
```



Activity animations

- More control over animations when starting activities
 - `android.app.ActivityOptions`
 - Enables new 'zoom' animations







Demo

```
ActivityOptions opts;  
opts = ActivityOptions.makeScaleUpAnimation(view,  
    0, 0, view.getWidth(), view.getHeight());  
  
startActivity(myIntent, opts.toBundle());
```



```
ActivityOptions opts;  
opts = ActivityOptions.makeScaleUpAnimation(view,  
    0, 0, view.getWidth(), view.getHeight());  
  
startActivity(myIntent, opts.toBundle());
```



```
ActivityOptions opts;  
opts = ActivityOptions.makeScaleUpAnimation(view,  
    0, 0, view.getWidth(), view.getHeight());  
  
startActivity(myIntent, opts.toBundle());
```



Navigation

- New TaskStackBuilder
 - Helps you create synthetic task stacks
- Automatic 'up' navigation for activities
- Available in the support library



```
<activity
  android:name=".app.ContentActivity"
  android:label="Content"
  android:parentActivityName=".app.HomeActivity">

  <!-- ... -->

</activity>
```



```
<activity
  android:name=".app.ContentActivity"
  android:label="Content"
  android:parentActivityName=".app.HomeActivity">
  <!-- ... -->
</activity>
```



```
TaskStackBuilder.create(this)
    .addParentStack(ContentActivity.class)
    .addNextIntent(new Intent(this, ContentActivity.class))
    .putExtra(ContentActivity.EXTRA_TEXT, "From Notification")
    .startActivities();
```



```
TaskStackBuilder.create(this)
    .addParentStack(ContentActivity.class)
    .addNextIntent(new Intent(this, ContentActivity.class))
    .putExtra(ContentActivity.EXTRA_TEXT, "From Notification")
    .startActivities();
```



Aligning XML Attributes and Java properties

- More consistent and toolable APIs
- For example:

Before

Added

View

scrollbarSize

```
public void setScrollbarSize(int);  
public int getScrollbarSize();
```

ImageView

maxWidth

```
public void setMaxWidth();
```

```
public int getMaxWidth();
```



Internationalization



Internationalization

- New locales and fonts
 - Arabic
 - Hebrew
- Improved support for right-to-left text
 - TextView
 - EditText
 - StaticLayout, etc.
 - Canvas
- Performance improvements with RTL text





Accessibility

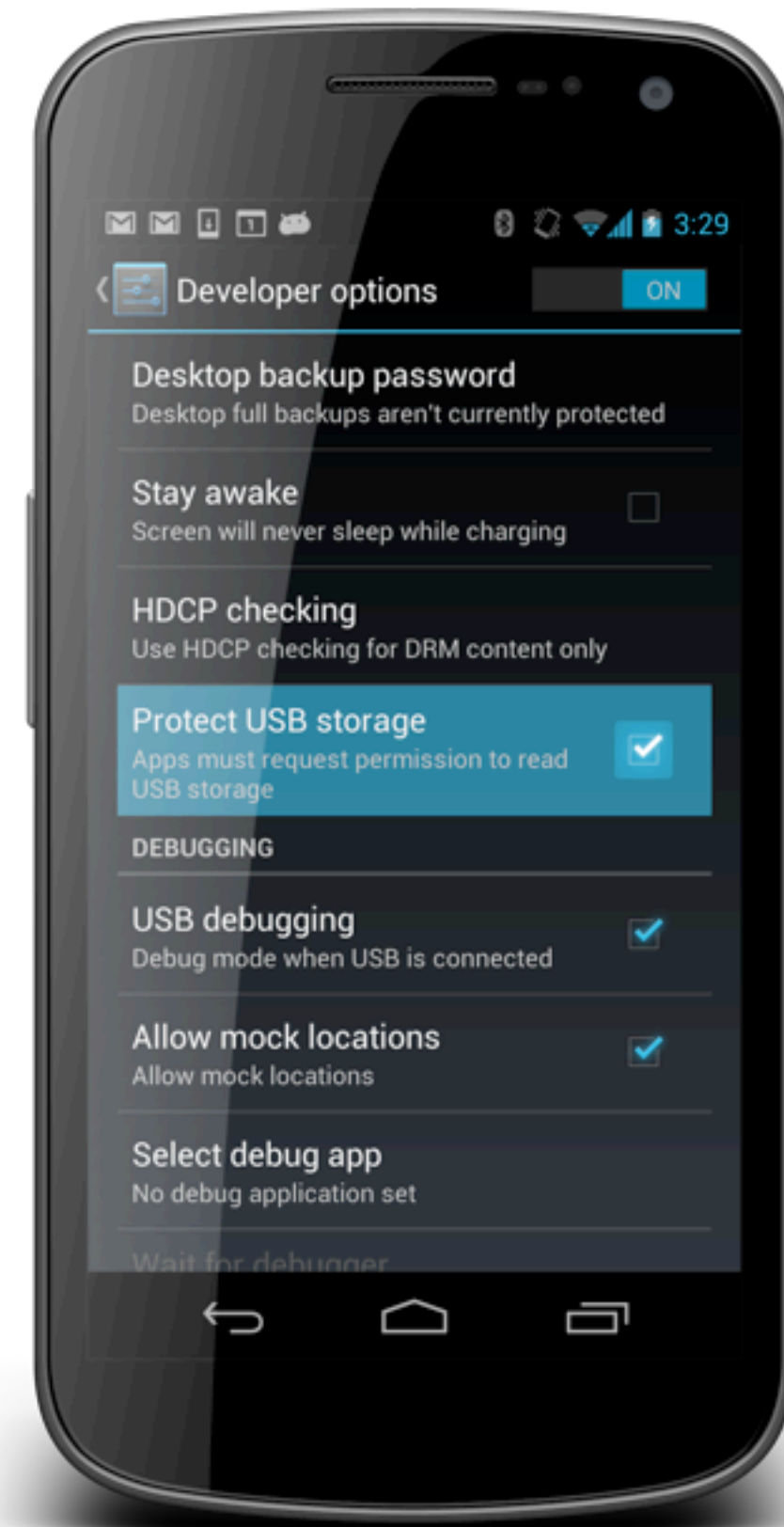
- Gesture-based traversal of all onscreen elements
 - `AccessibilityService.GESTURE_SWIPE_UP`, `GESTURE_SWIPE_DOWN`, ...
 - Including navigation buttons
 - `AccessibilityService.GLOBAL_ACTION_HOME`, `BACK`, `RECENTS`, `NOTIFICATIONS`
- Double-tap activates current element
- Text reading by word, line, or paragraph
- Just works for standard views
 - `View.setImportantForAccessibility()` for special cases
- Custom views with semantic structure
 - Override `View.getAccessibilityNodeProvider()`
- Support library

“Making Android Apps Accessible”: Wednesday @ 5:15



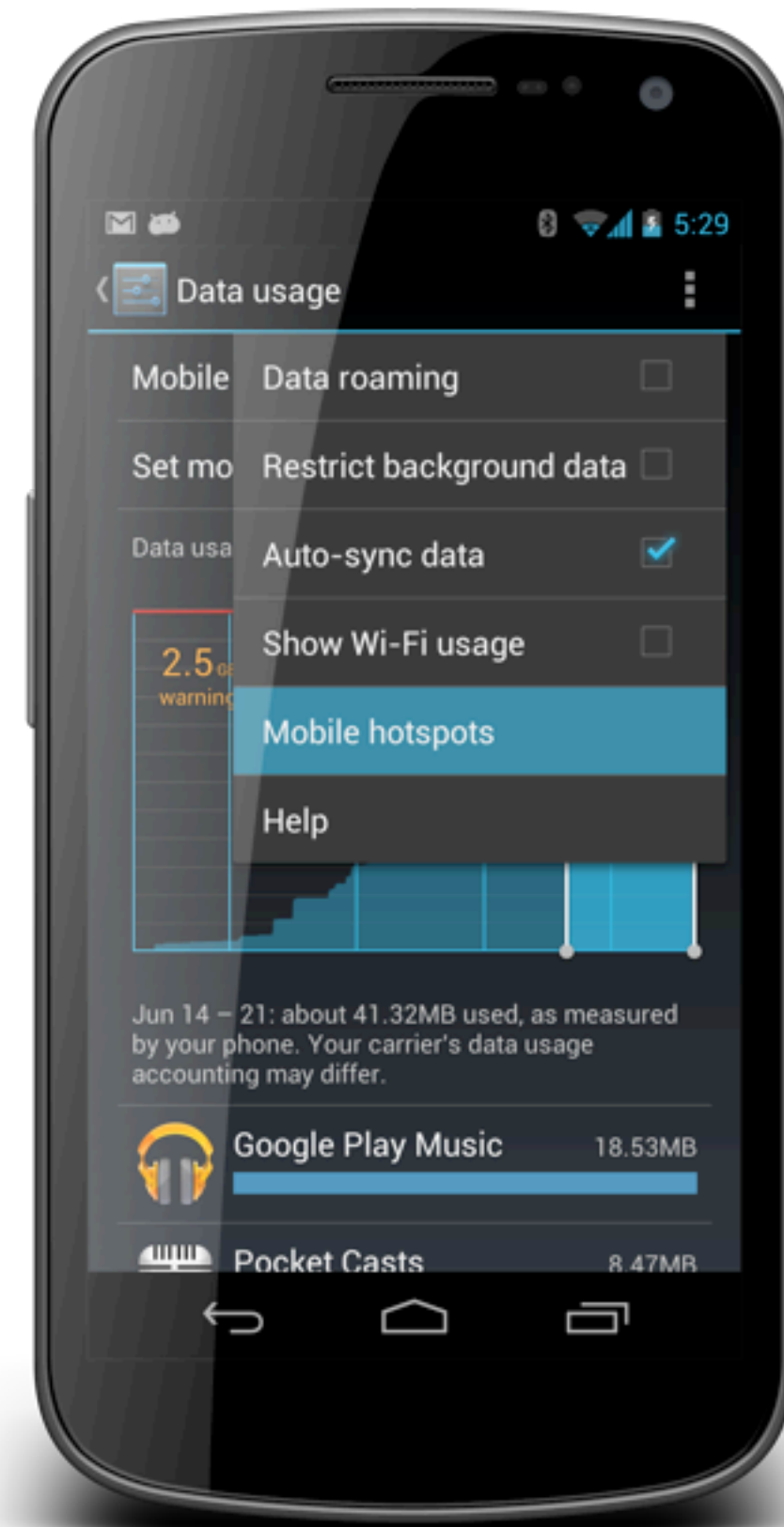
External Storage Access

`android.permission.READ_EXTERNAL_STORAGE`



Limiting Costly Downloads

`ConnectivityManager.isActiveNetworkMetered()`



RenderScript Compute

- Support for NEON instructions
 - Use new `#pragma rs_fp_relaxed`
- Texture sampling, like you would do from a fragment shader on a GPU
 - `rsSample()`
- Debugging on x86 emulator and x86 devices!
- Multiple `root()`-style kernels in a single file

“Doing More with Less”: Thursday @ 4



Media

- API access to low-level codec data
- See “Media Codec APIs in Android Jellybean”

“Media Codec APIs in Android Jelly Bean”: Today @ 4



Audio Latency Improvements

- Latency improvements for
 - OpenSL
 - soundpool
 - tone generator
- Significant improvements in warm latency for some devices
 - Device-dependent
- More to come



NFC

- Large payloads over Bluetooth
 - Move files with a tap
- Tap-to-pair for Bluetooth headsets and speakers

“Up Close and Personal: NFC and Android Beam”: Thursday @ 4

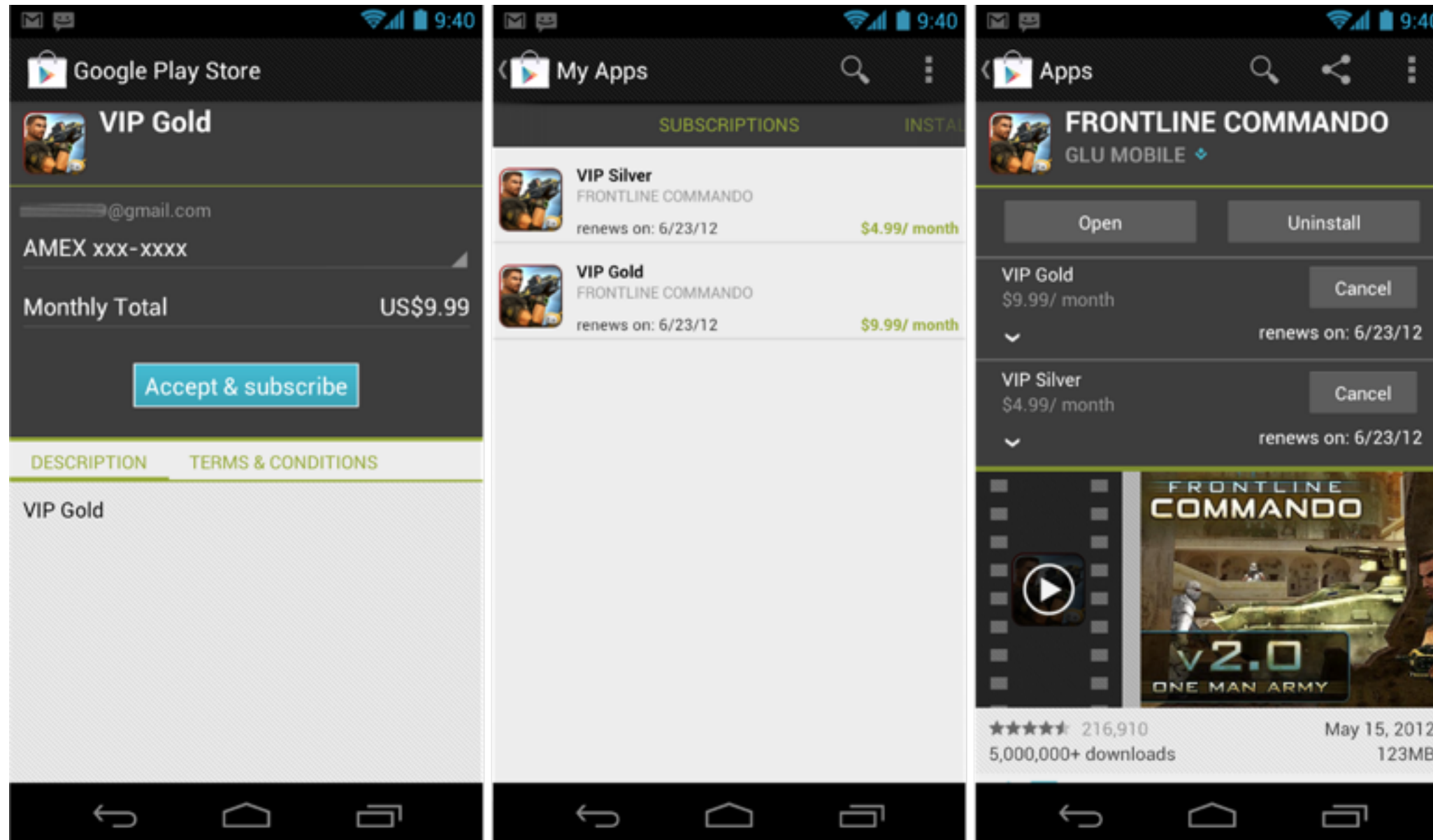


Google Play

Respond to user comments

The screenshot displays the 'Application Comments' section of the Google Play Android Developer Console. At the top, the Google Play logo and 'ANDROID DEVELOPER CONSOLE' are visible. The 'Application' section shows a version 1.0 icon, version name '1.0', version code '1000', and localization to 'default'. A star rating summary shows 1 five-star review, 1 four-star review, and 0 reviews for 3, 2, and 1 star ratings. The 'Reviews' section includes filter options for Language (All languages), Rating (5 stars), App version (All Versions), and Device (+ Add a filter). A review from 'Ellie' on Wednesday, June 6, 2012, at 16:14, for Version 1.0, reads: 'It's pretty cool I installed this app and it's pretty good. But I'd like to see more options for how to share my results with my friends.' Below the review is a text area for a reply with the text: 'Thanks for your feedback. We just published a new version yesterday with more ways to share. You can now share via email or your favorite social networks. Check it out and let us know what you think!'. The character count is 199 of 350. 'Update reply' and 'Cancel' buttons are at the bottom.





Google Play

In-app subscriptions

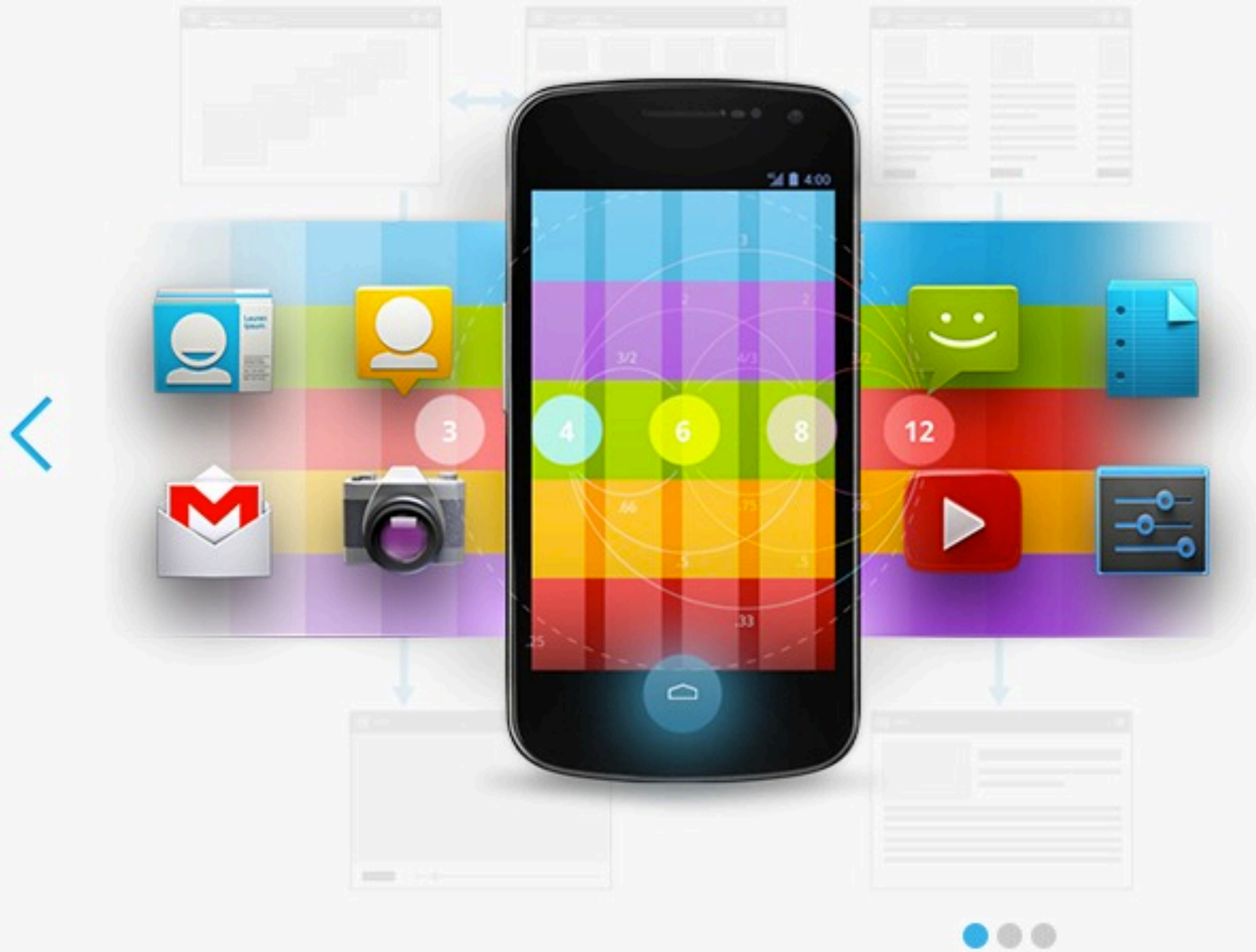


And more...

- New seller countries
- Team access to the Android Developer Console
- Sales reports
- Android Expansion Files
 - APK up to 50 MB
 - Expansions files up to 4 GB
- Optimized APK updates
- Unlocked devices available on Play

"Android Apps in Google Play": Today @ 1:30





Make your Android apps look great

New templates in the design guide make it easier than ever to design apps that are beautiful and easy to use.

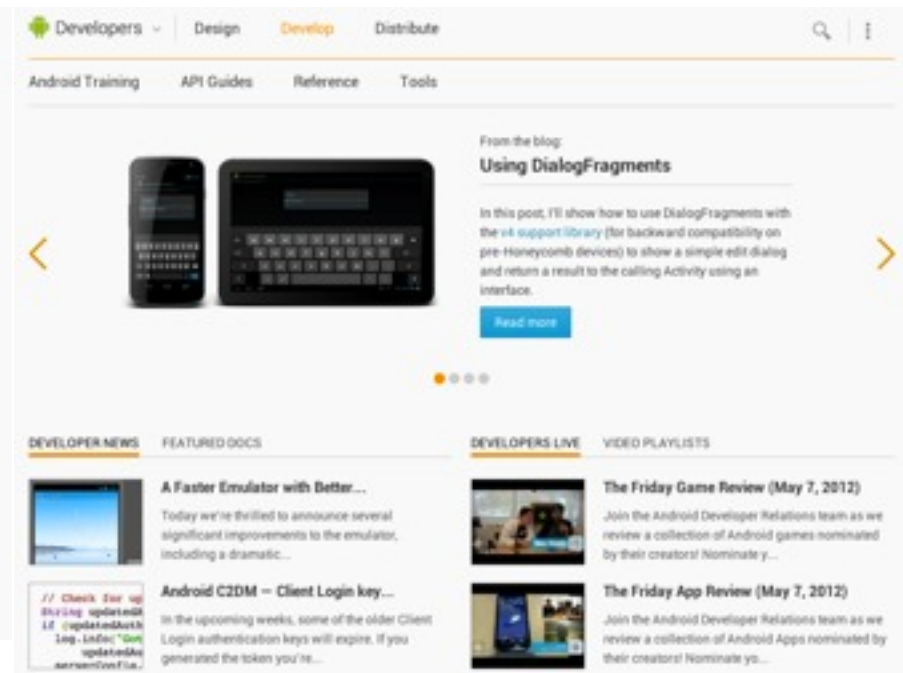
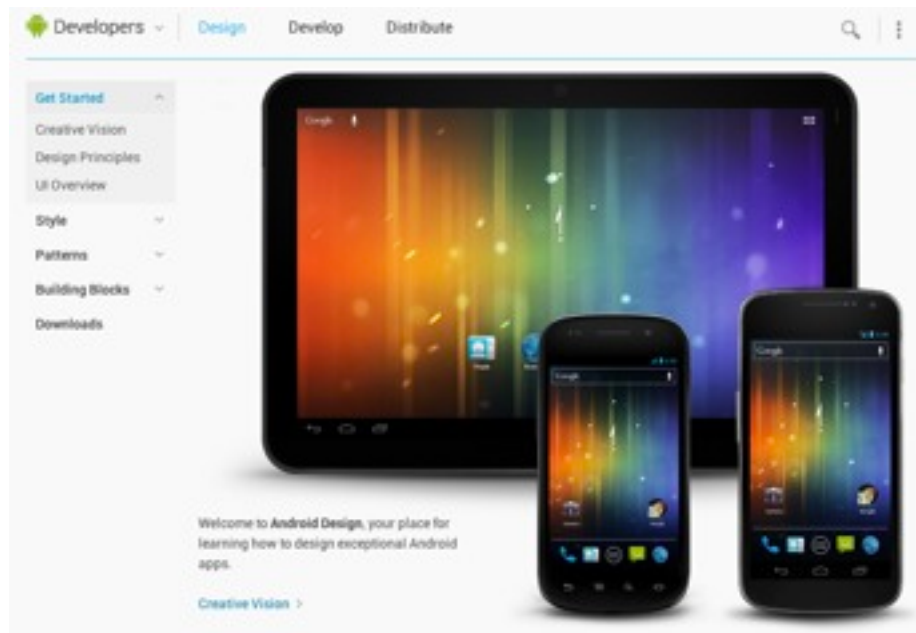
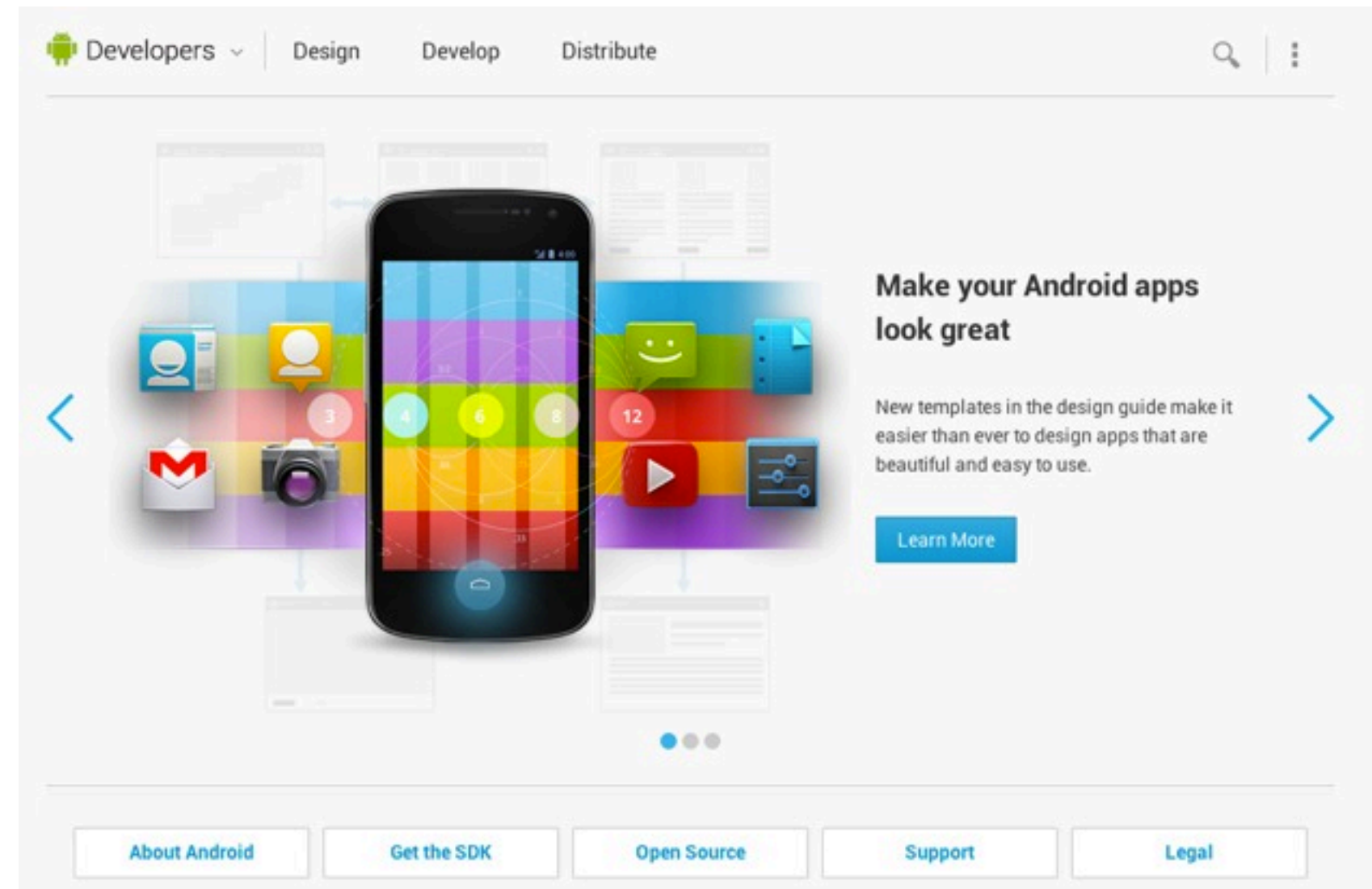
[Learn More](#)

developer.android.com

Design

Develop

Distribute



Tools

- Emulator with x86 virtualization
 - Android 2.3
 - Android 4.0
- GPU support for the emulator
 - With Android 4.0.3+
 - Supports OpenGL ES 1.x and 2.x
 - Supports hardware accelerated applications
- Sensor and multitouch support through physical Android devices



Tools

- New tool: lint
- New tool: Tracer for OpenGL ES
- New tool: Device Monitor
- New tool: System Trace



ADT

- Integration with new tools
 - lint, Tracer for OpenGL ES, etc.
- Application templates
- Improved NDK support
 - Build
 - Debug
- Improved layout editor
 - New property sheet
- Numerous UI and performance improvements

“What’s New in Android Developers’ Tools”: Thursday @ 11:45



Notifications in 4.1



Notifications in 4.1



Android Notifications

API 1–15

audioStreamType	sound
contentIntent	tickerText
contentView	vibrate
defaults	when
deleteIntent	fullScreenIntent (9)
flags	largeIcon (11)
icon	tickerView (11)
iconLevel	
ledARGB	
ledOffMS	
ledOnMS	
number	



Android Notifications

API 1–15

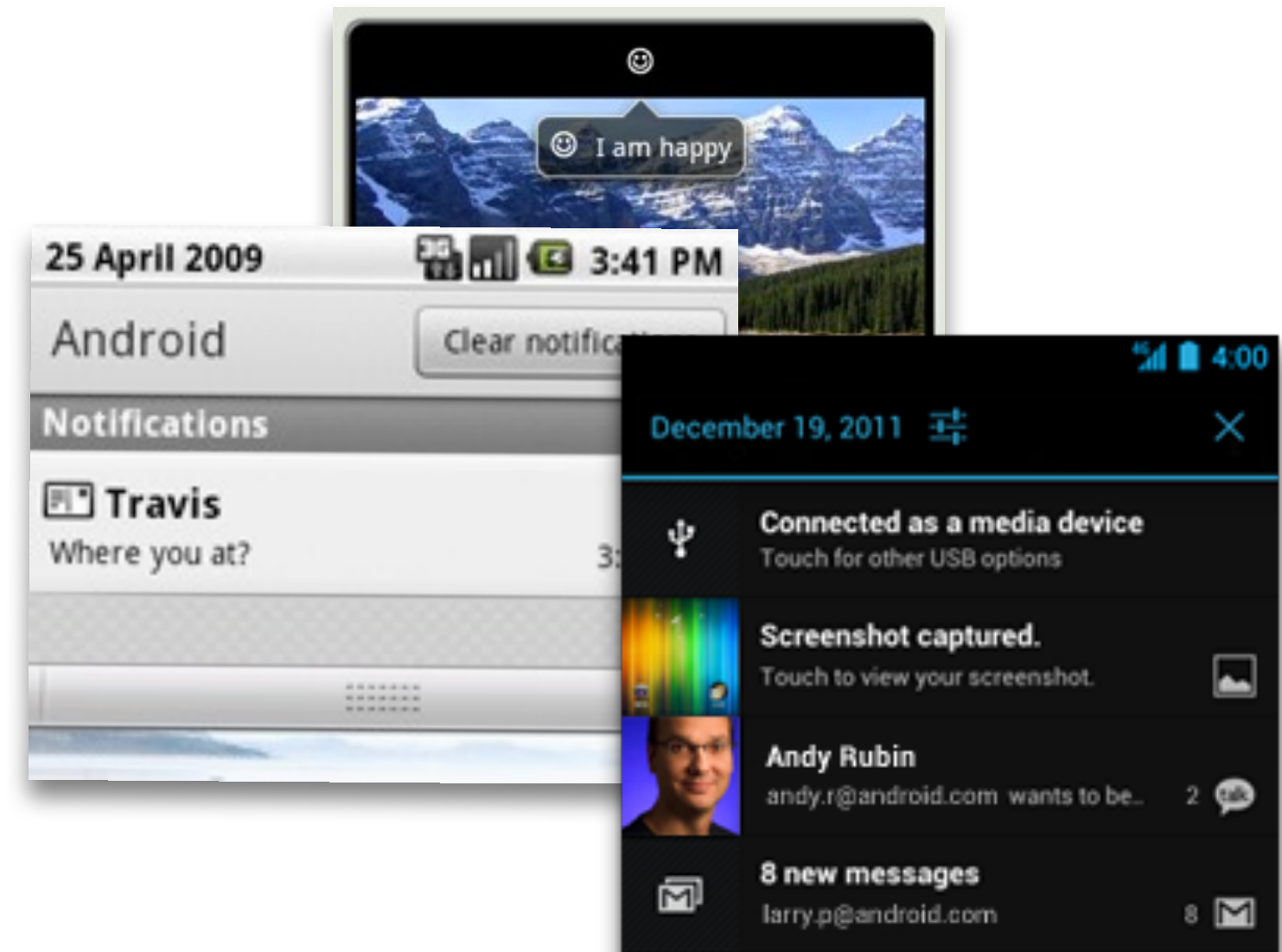
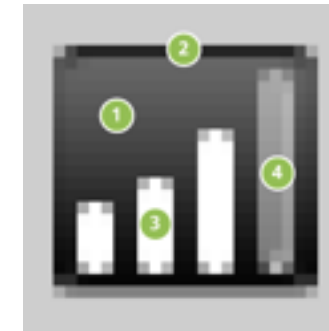
audioStreamType sound
contentIntent tickerText
contentView vibrate
defaults when
deleteIntent fullScreenIntent (9)
flags largeIcon (11)
icon tickerView (11)
iconLevel
ledARGB
ledOffMS
ledOnMS
number



Android Notifications

API 1–15

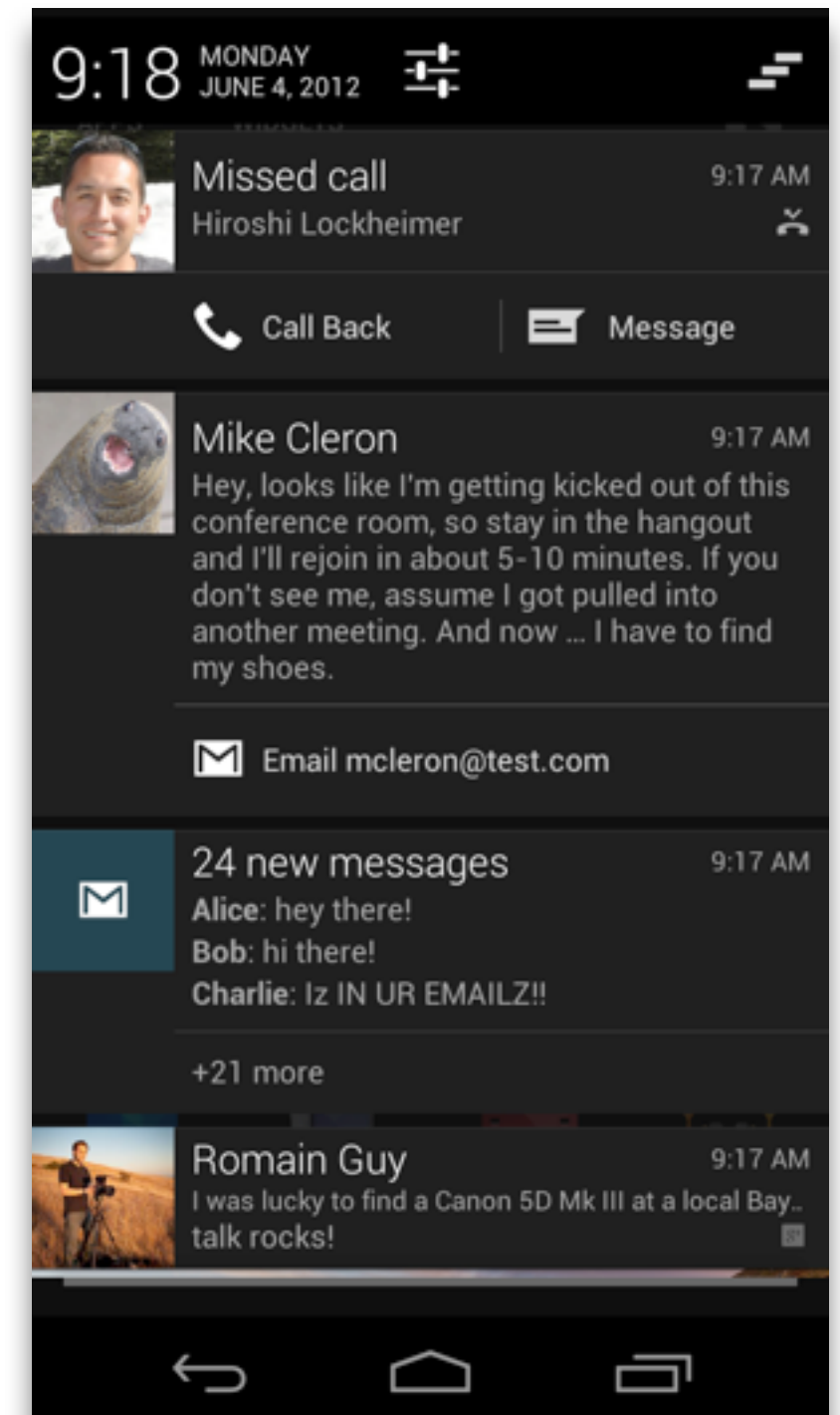
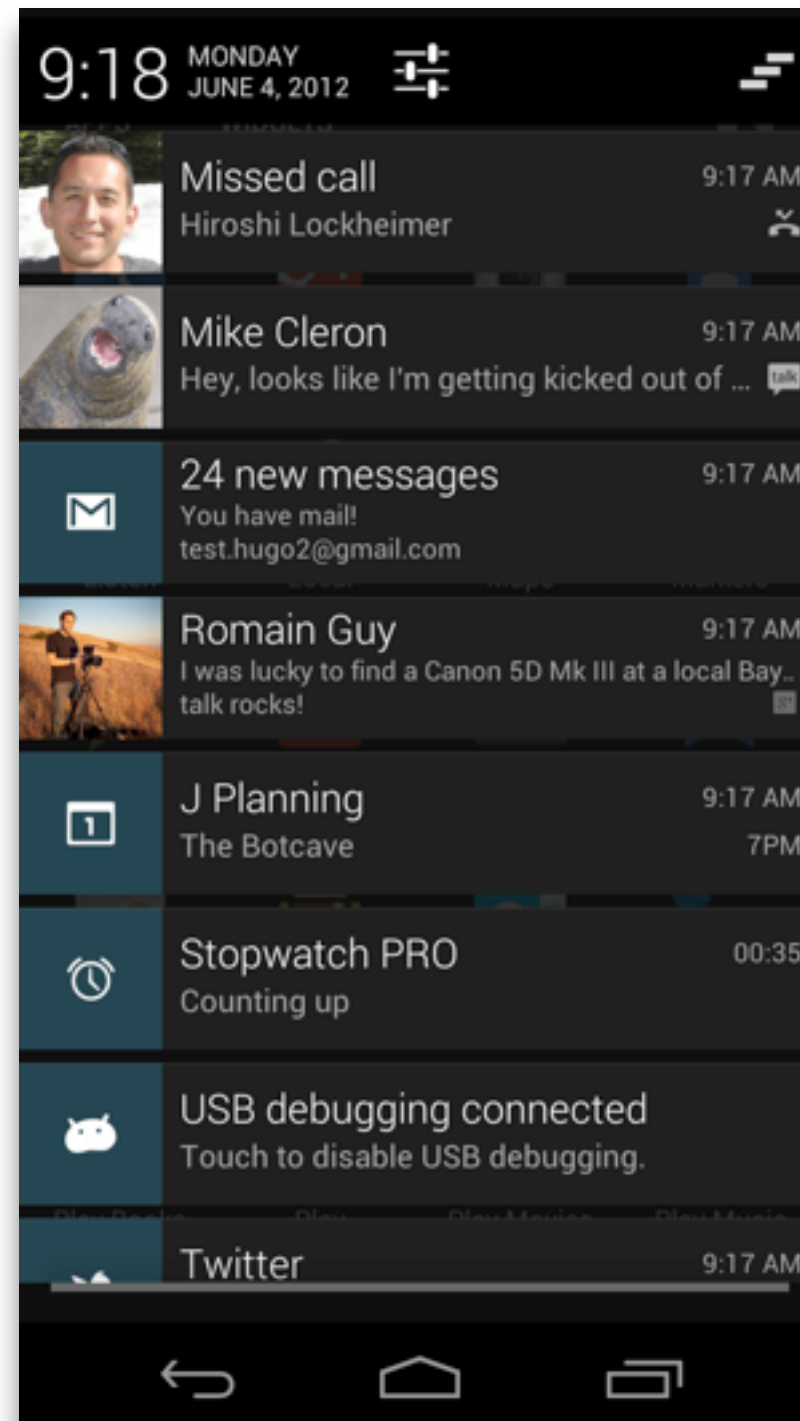
audioStreamType sound
contentIntent tickerText
contentView vibrate
defaults when
deleteIntent fullScreenIntent (9)
flags largeIcon (11)
icon tickerView (11)
iconLevel
ledARGB
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Android Notifications

API 16: Jelly Bean

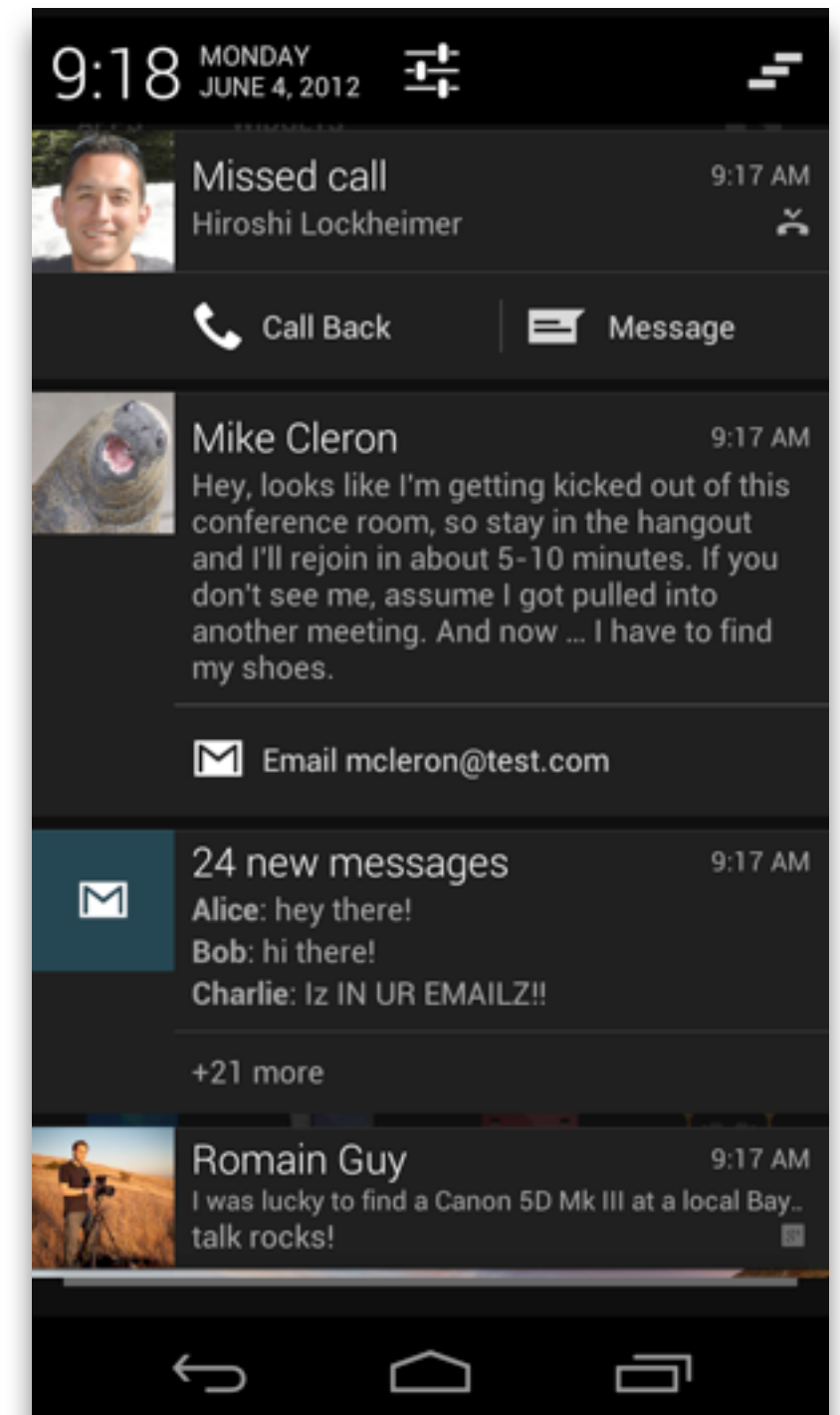
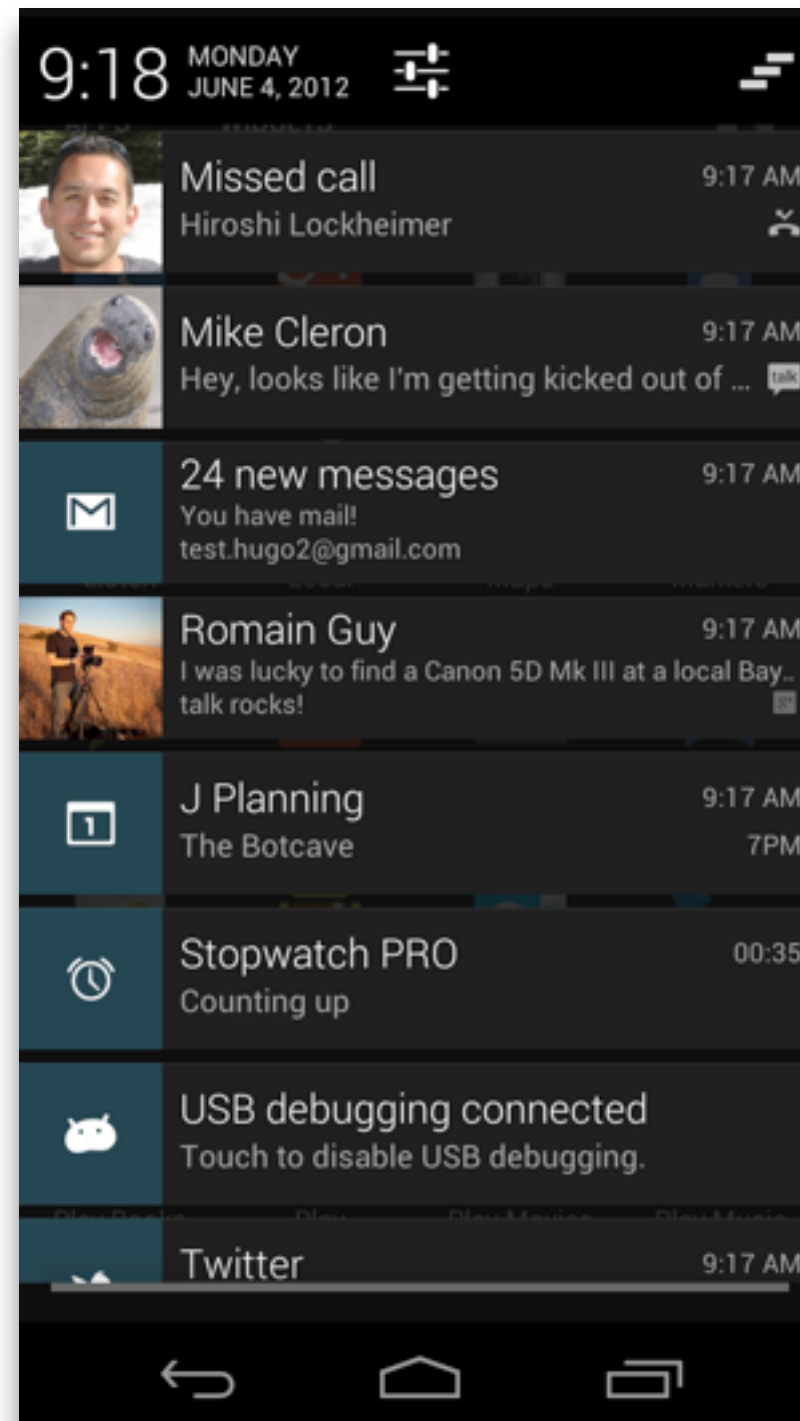
audioStreamType	sound
contentIntent	tickerText
contentView	vibrate
defaults	when
deleteIntent	fullScreenIntent
flags	largeIcon
icon	tickerView
iconLevel	bigContentView
ledARGB	priority
ledOffMS	
ledOnMS	
number	



Android Notifications

API 16: Jelly Bean

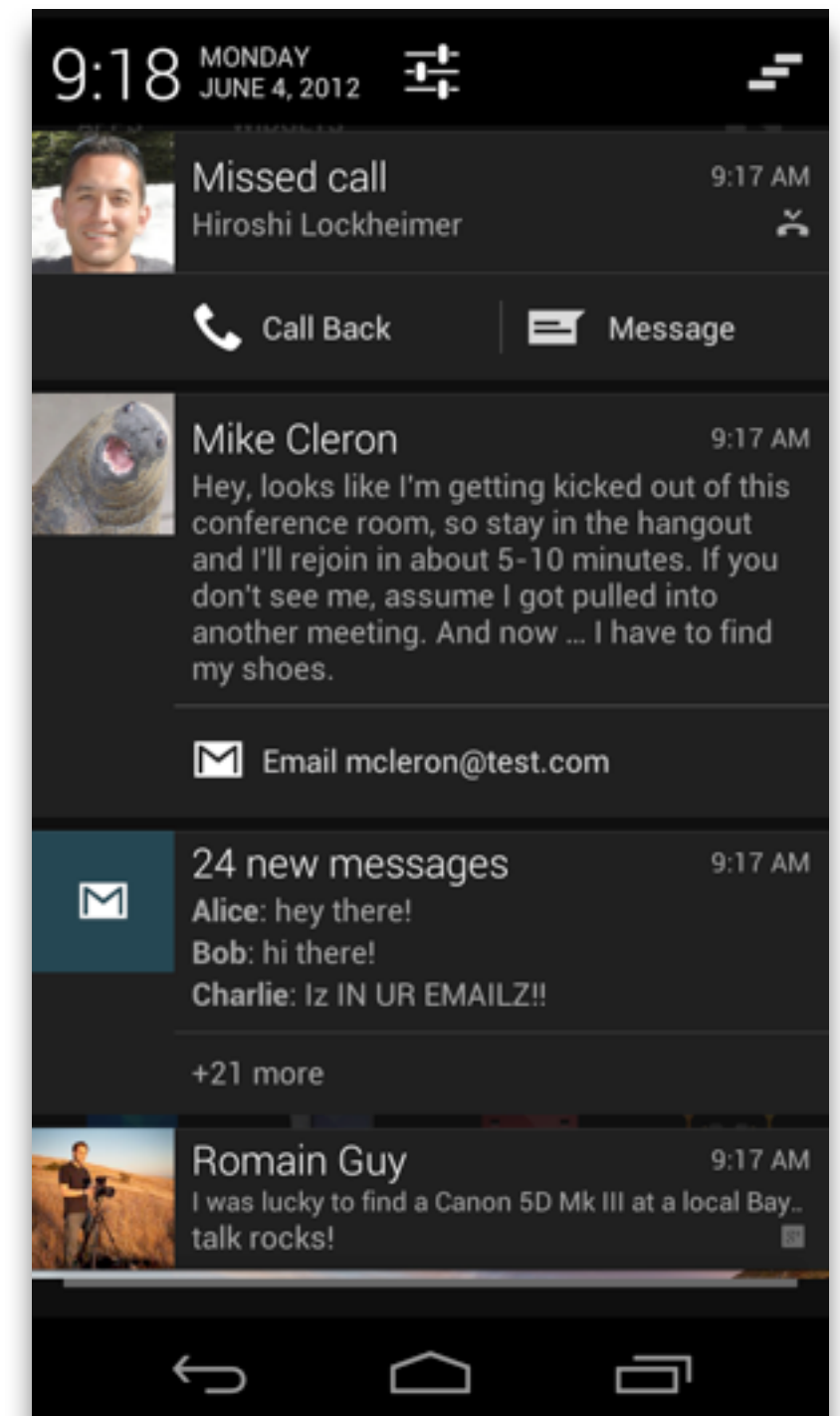
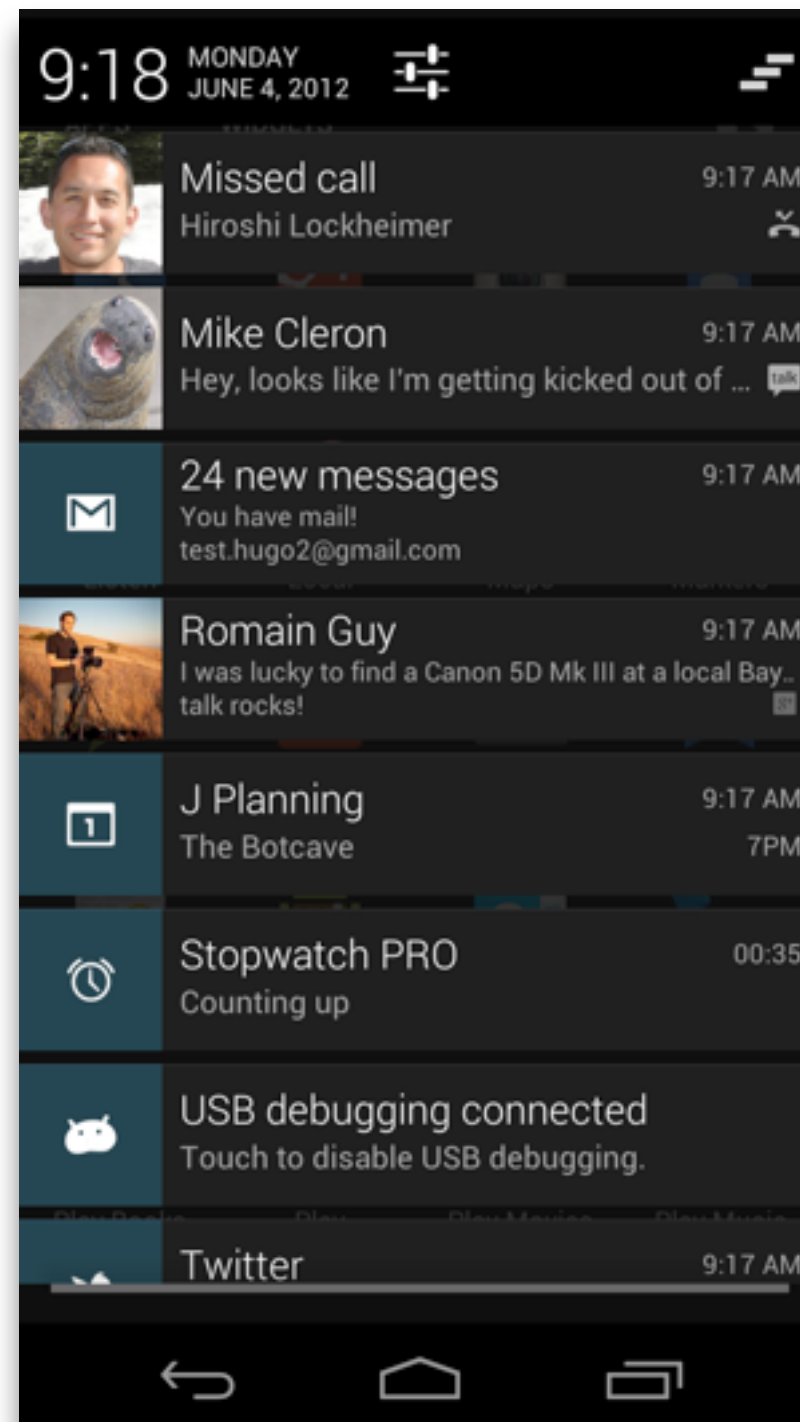
audioStreamType	sound
contentIntent	tickerText
contentView	vibrate
defaults	when
deleteIntent	fullScreenIntent
flags	largeIcon
icon	tickerView
iconLevel	bigContentView
ledARGB	priority
ledOffMS	
ledOnMS	
number	



Android Notifications

API 16: Jelly Bean

audioStreamType	sound
contentIntent	tickerText
contentView	vibrate
defaults	when
deleteIntent	fullScreenIntent
flags	largeIcon
icon	tickerView
iconLevel	bigContentView
ledARGB	priority
ledOffMS	
ledOnMS	
number	



NO NEW ICON GUIDELINES.



NO NEW ICON GUIDELINES.

(WAIT FOR APPLAUSE)



priority



IMPORTANT!!1!

Notification.`priority`

Notification.Builder.`setPriority(int)`

PRIORITY_MAX	= 2
PRIORITY_HIGH	= 1
PRIORITY_DEFAULT	= 0
PRIORITY_LOW	= -1
PRIORITY_MIN	= -2



This field is a **hint** to the System UI

It helps the system manage the user's attention

by exposing the intended **urgency** of your Notification
your notification may change **position** or **appearance** depending on its priority

You can finally stop using FLAG_ONGOING to sort to the top

Use **higher** priorities, SystemUI will do the rest

You can now create notifications that do not appear in the status bar

Use `PRIORITY_MIN` to tell System UI to **hide** your icon, but **show** you in the expanded panel

Use this for “opportunistic” notifications: **attention not required**



Priority buckets



MAX

very urgent/active tasks

incoming calls
turn-by-turn directions
emergency alerts

HIGH – DEFAULT – LOW

most notifications go here

important emails
SMS/chat
“widgets”
everything else
(and all pre-JB notifications)

junk mail
chatty apps

MIN

opportunistic

expired events
suggestions
detailed status
app promos



When in doubt, **PRIORITY_DEFAULT**.



bigContentView



It's kind of a big deal



The first major new feature in Notifications since 1.0



The first major new feature in Notifications since 1.0

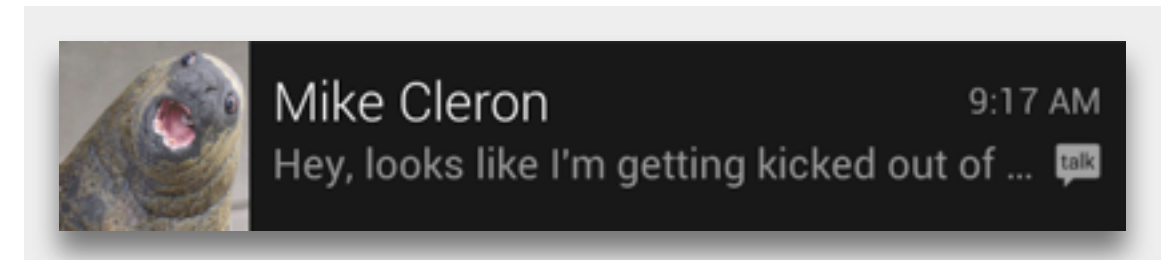
contentView: still the same as before

64dp tall ("1U")

created for you by Notification.Builder

includes your icon, contentTitle, contentText, when, number, ...

or, as always, roll your own RemoteViews



The first major new feature in Notifications since 1.0

contentView: still the same as before

64dp tall ("1U")

created for you by Notification.Builder

includes your icon, contentTitle, contentText, when, number, ...

or, as always, roll your own RemoteViews

bigContentView: like contentView, but...bigger

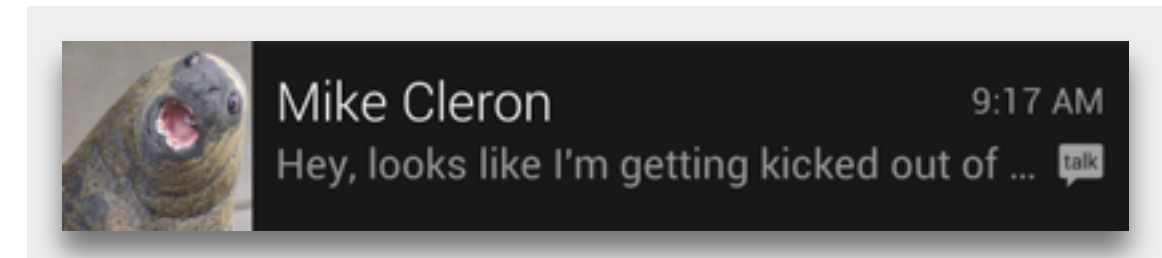
up to 256dp tall ("4U")

a **big canvas** for text, photos, lists of messages, you name it

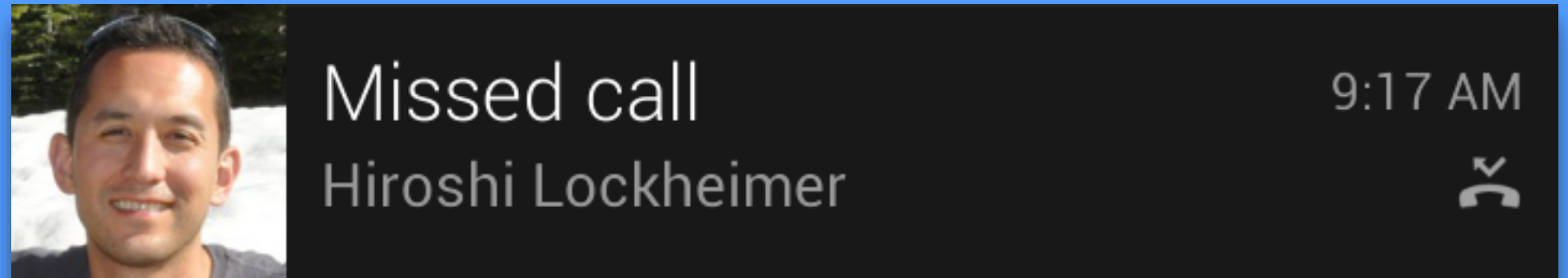
The platform is here to help

New platform APIs to make great-looking big notifications

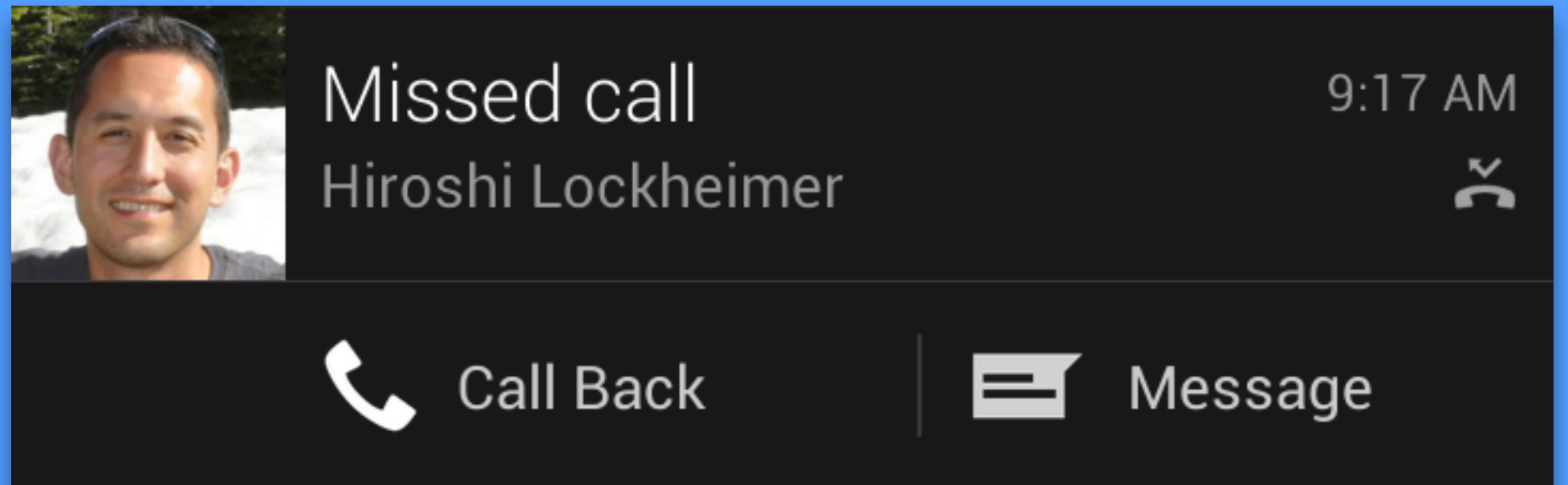
or, as always, roll your own RemoteViews



Actions



Actions



A notification card for a missed call. The card has a dark background and is divided into two sections. The top section contains a profile picture of a man, the text "Missed call", the name "Hiroshi Lockheimer", and the time "9:17 AM" with a small call icon. The bottom section contains two action buttons: "Call Back" with a call icon and "Message" with a message icon.

Missed call
Hiroshi Lockheimer
9:17 AM

Call Back | Message



Actions

Add up to 3 buttons

Can be used with any notification

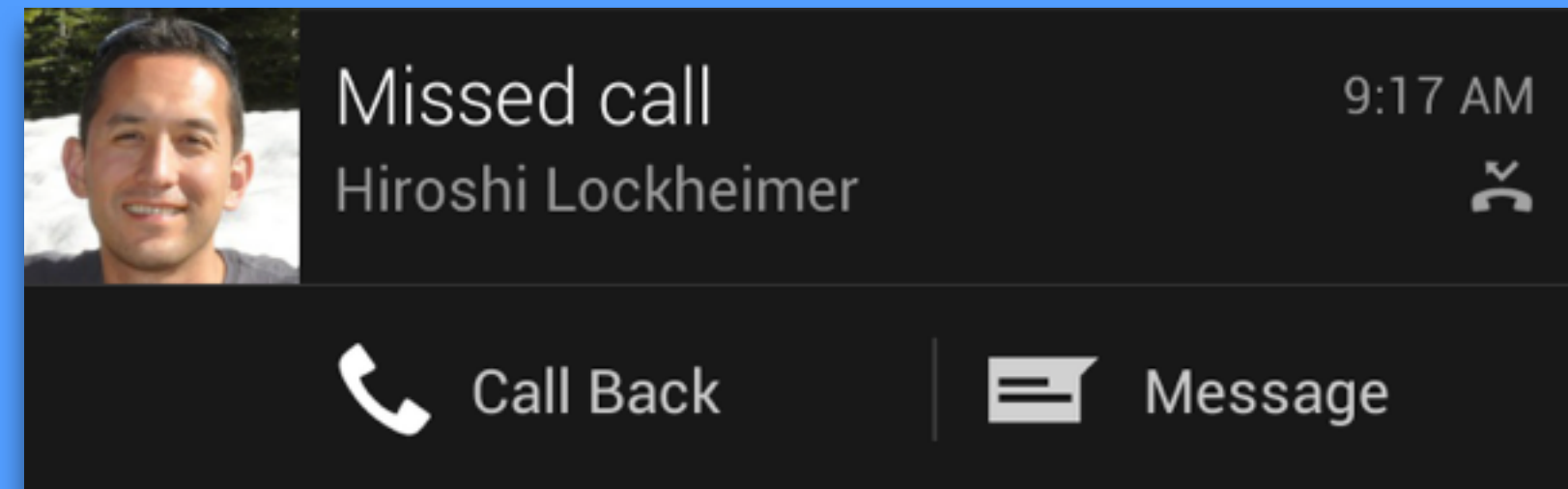
Get things done *right there*

Uses

1. Visit a different activity than the click handler (`contentIntent`)
2. Take some action in the background

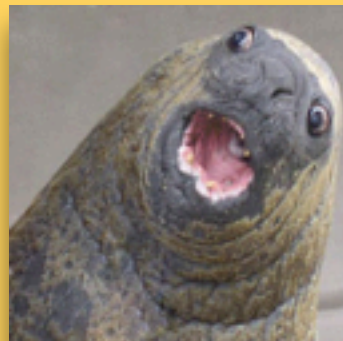
Protip

To show that an action has been taken, set the intent to `null` and re-`notify()`



```
new Notification.Builder(this)
    .setContentTitle("Missed call")
    .setContentText("Hiroshi Lockheimer")
    .setLargeIcon(bitmap)
    .setSmallIcon(R.drawable.missed_call)
    .setPriority(
        Notification.PRIORITY_HIGH)
    .setContentIntent(callLogIntent)
    .addAction(R.drawable.call,
        "Call Back", callMeMaybe)
    .addAction(R.drawable.text,
        "Message", sendSms)
    .build();
```





Mike Cleron

9:17 AM

Hey, looks like I'm getting kicked out of this conference room, so stay in the hangout

BigTextStyle



BigTextStyle



Mike Cleron

9:17 AM

Hey, looks like I'm getting kicked out of this conference room, so stay in the hangout and I'll rejoin in about 5-10 minutes. If you don't see me, assume I got pulled into another meeting. And now ... I have to find my shoes.



Email mcleron@test.com



BigTextStyle

A big multi-line TextView

Let your message run free*!

Users may be able to get everything they need from the notification

Actions are a force multiplier

Triage and act without visiting the app

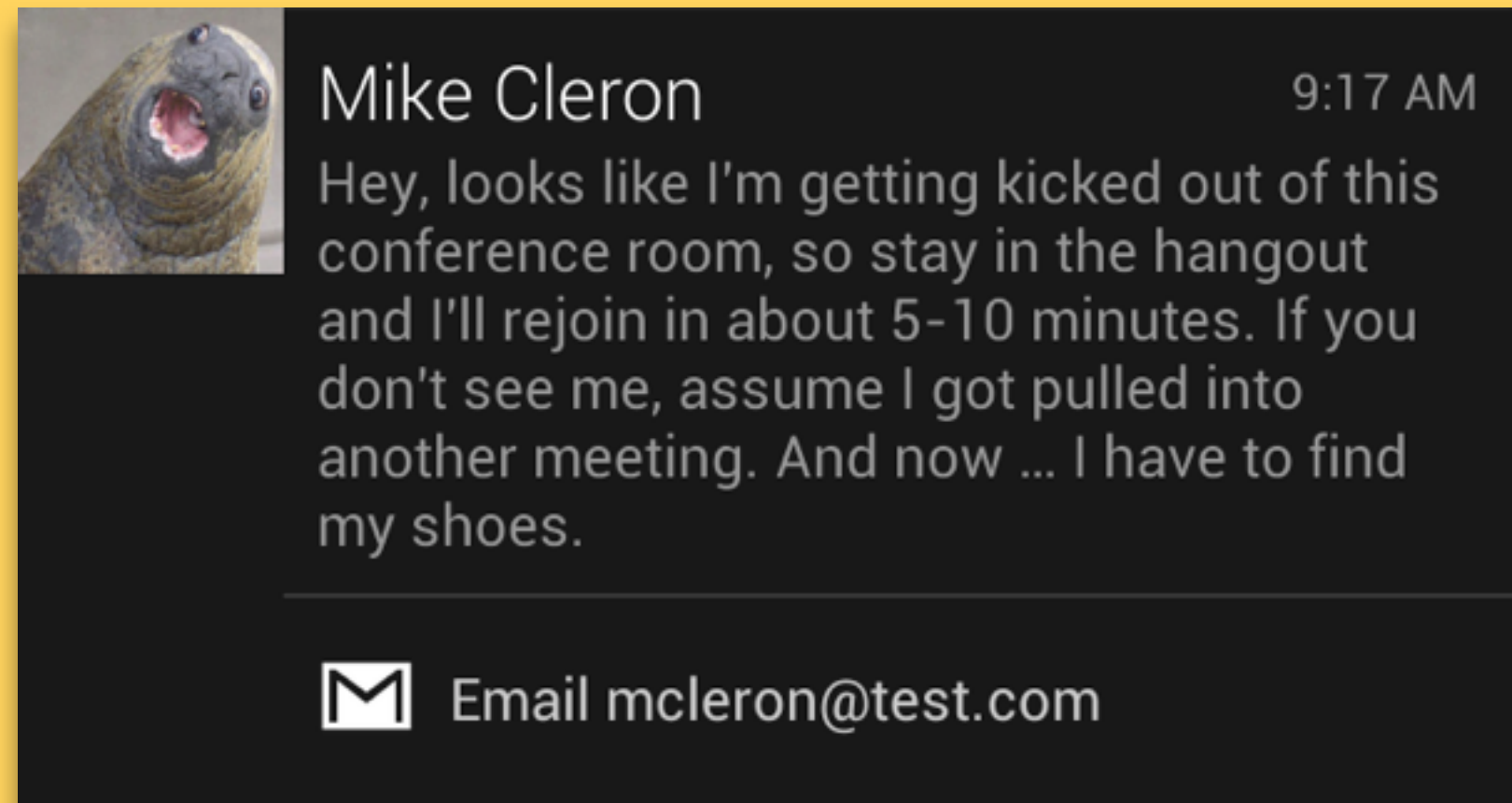
Protips

You can use the same string for `contentText` and `bigText` (but probably not for the ticker)

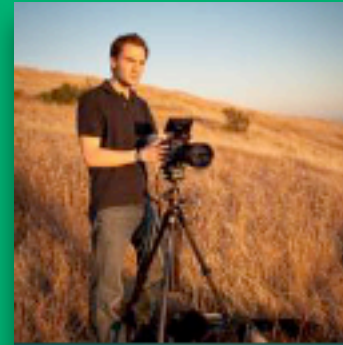
Styles and newlines are OK, but exercise taste



* up to the 4U size limit of expandable notifications



```
new Notification.Builder(this)
    .setSmallIcon(...)
    .setLargeIcon(...)
    .setContentTitle(senderName)
    .setTicker(tickerText)
    .addAction(...)
    .setContentText(msgText)
    .setStyle(
        new Notification.BigTextStyle()
            .bigText(msgText))
    .build();
```



Romain Guy

1:52 PM

Romain Guy shared with you: Rainbow..



BigPictureStyle



BigPictureStyle

Romain Guy

1:52 PM

Romain Guy shared with you: Rainbow..

+1 this post | reshare



BigPictureStyle

Pretty sure this one is obvious

Great for showcasing visual content

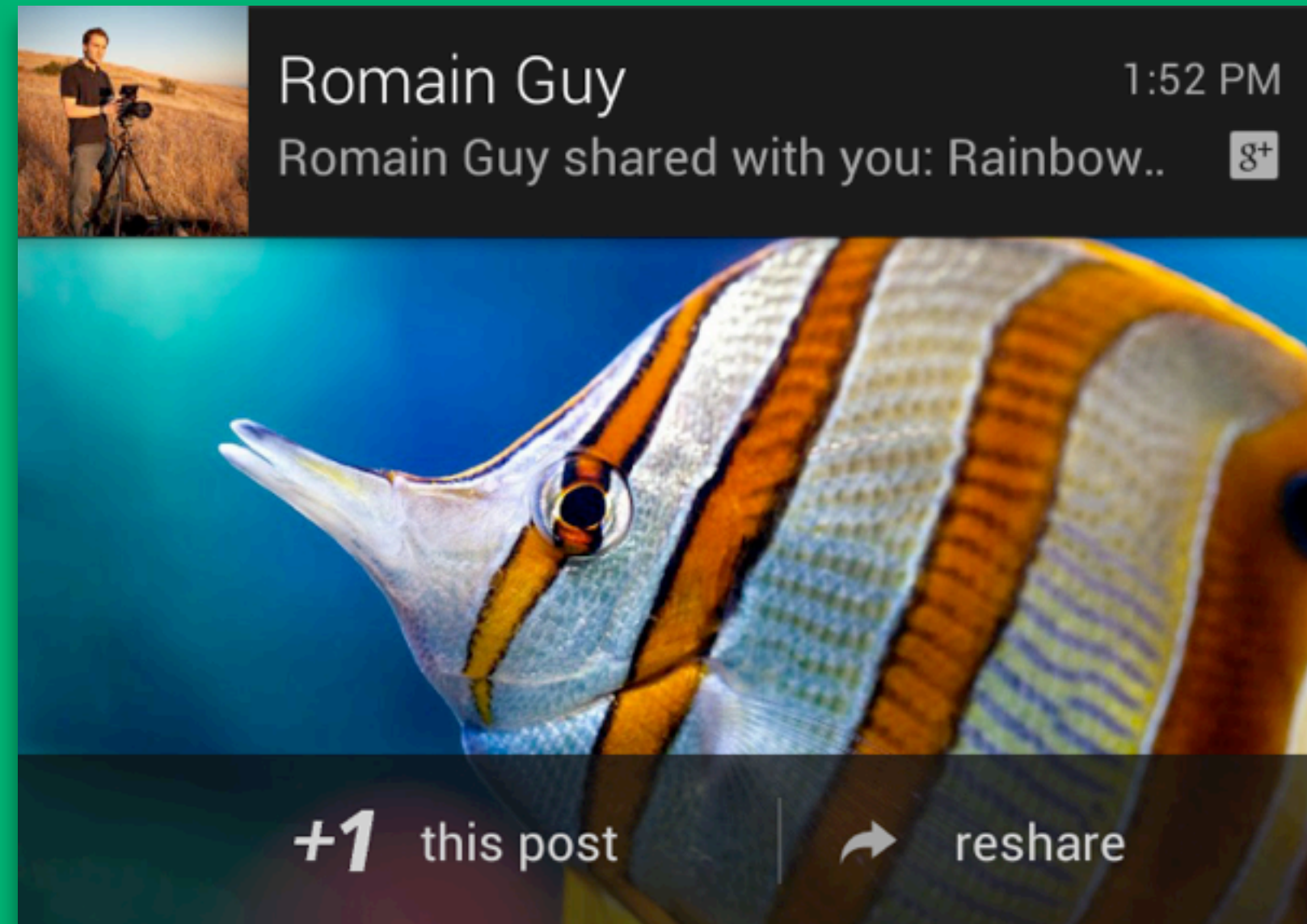
Supply your own Bitmap

The image will be `centerCropped`

Protips

Images should be $\leq 450dp$ wide, $\sim 2:1$ aspect

Bitmaps outside these bounds will just be wasting RAM (and possibly exceeding Binder IPC limits)



```
new Notification.Builder(this)
...
.setStyle(
    new Notification.BigPictureStyle()
        .bigPicture(photoBits))
.build();
```



InboxStyle



InboxStyle



3 new messages

11:52 AM

Alice: Meet for lunch?

Bob: Key exchange

Colin: yaa tsi tsup ari dik ari dull an dik ari...

test.hugo2@gmail.com

3



InboxStyle

Great for any kind of list

New messages

Headlines

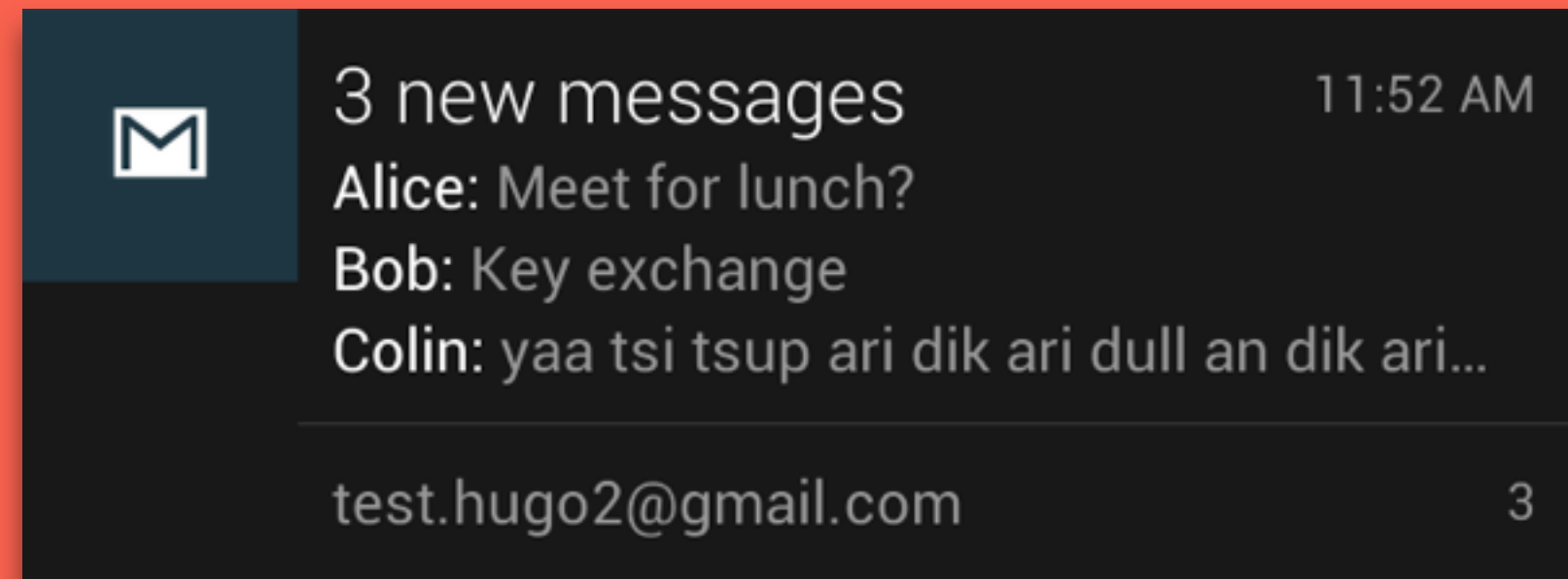
Agenda

Batched notifications

Protips

Use styled text to emphasize content and add visual structure

Use `setSummaryText()` to append info such as account name or "+ 5 more"

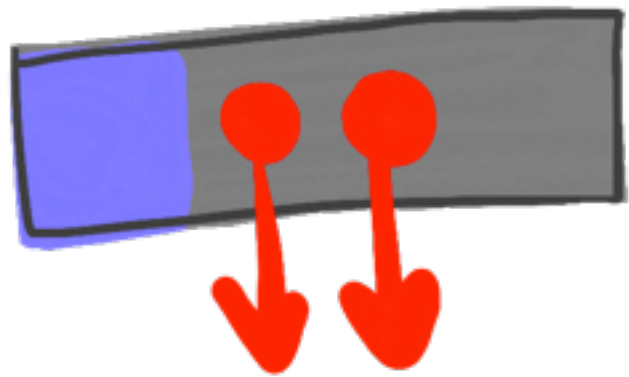


```
new Notification.Builder(this)
    .setContentTitle("3 new messages")
    .setContentText("You have mail!")
    .setSubText("test.hugo2@gmail.com")
    .setNumber(3)
    .setSmallIcon(R.drawable.email))
    .setStyle(
        new Notification.InboxStyle()
            .addLine(styledLine1)
            .addLine(styledLine2)
            .addLine(styledLine3))
    .build();
```

Magical incantations



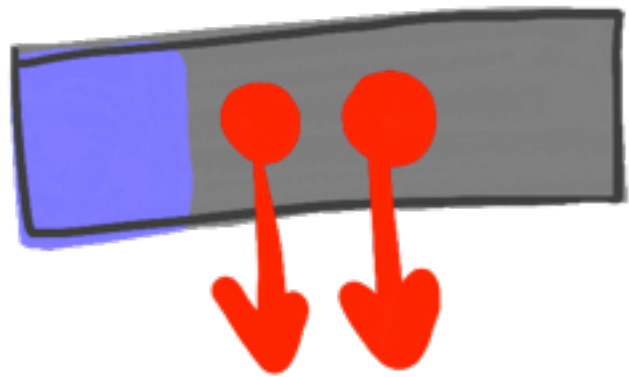
Magical incantations



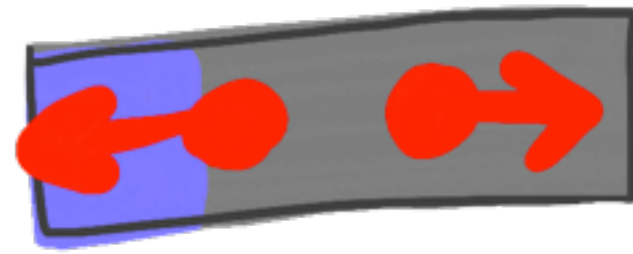
Pulldown



Magical incantations



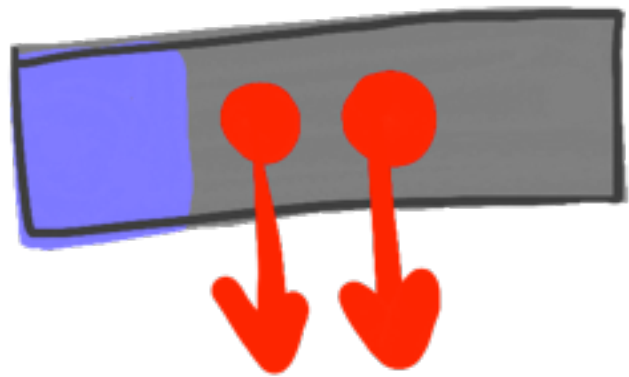
Pulldown



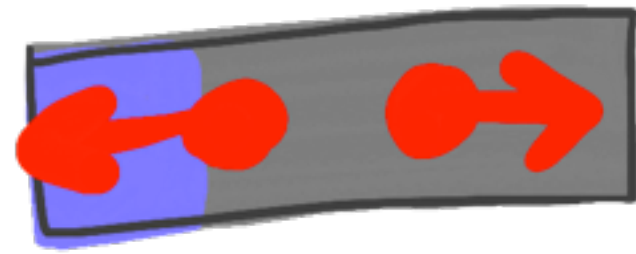
Spread



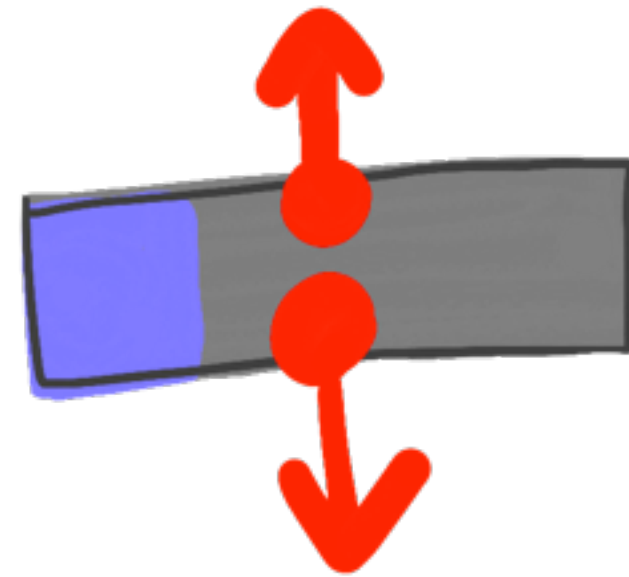
Magical incantations



Pulldown



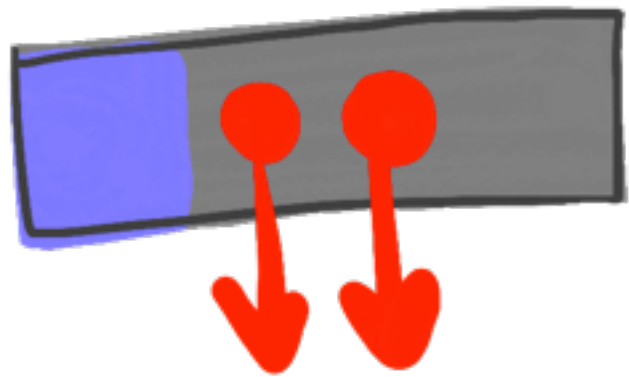
Spread



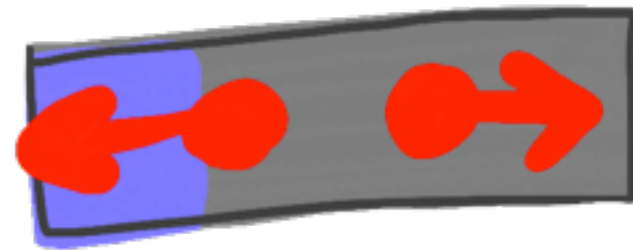
Stretch



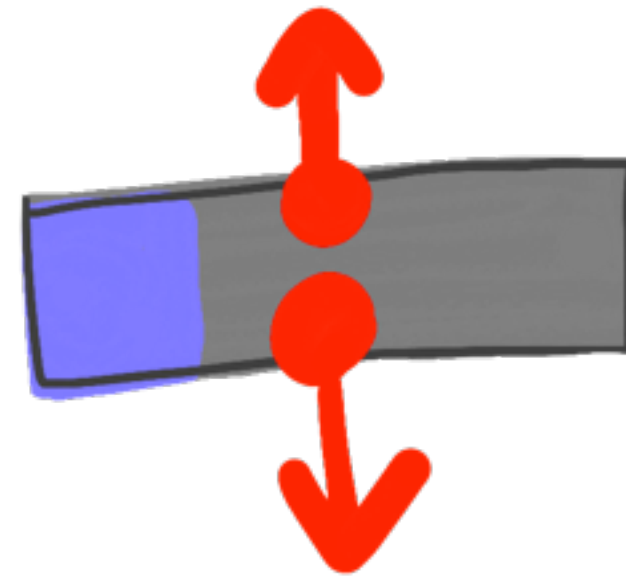
Magical incantations



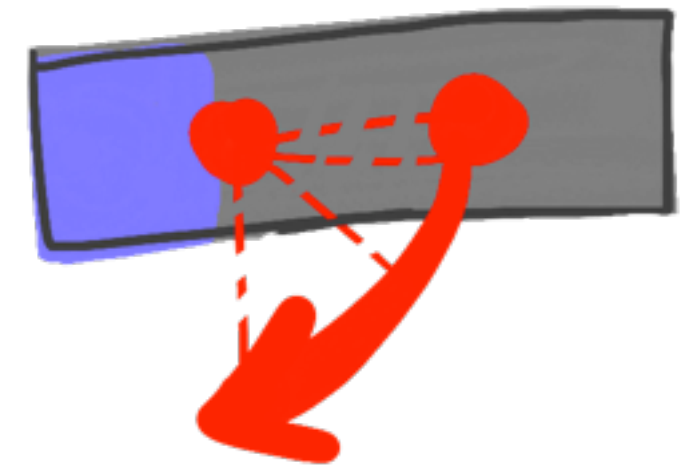
Pulldown



Spread



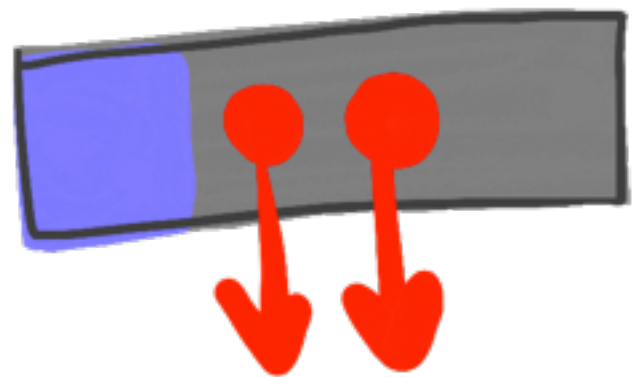
Stretch



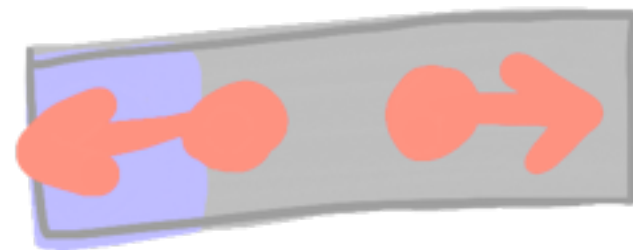
The Screwdriver



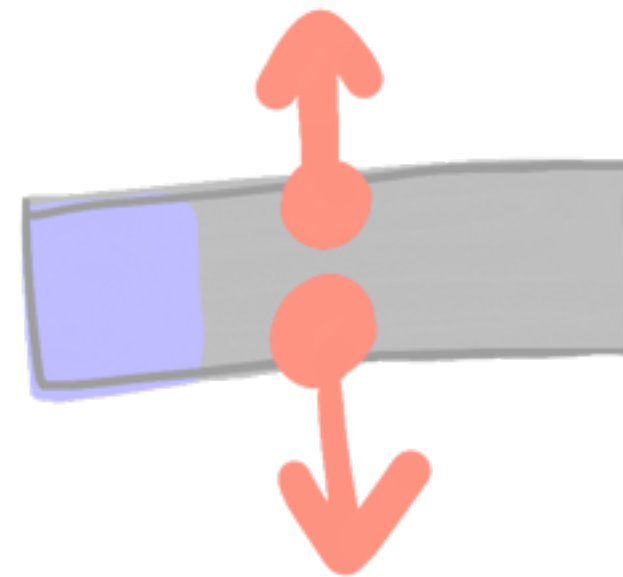
Magical incantations



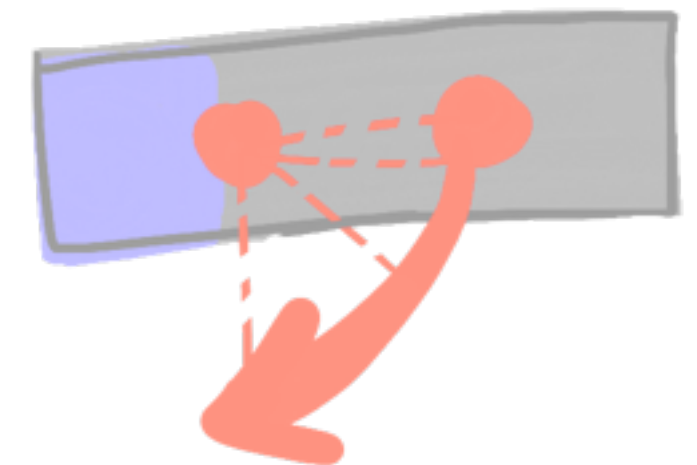
Pulldown



Spread



Stretch



The Screwdriver

Spring-loaded

We expand the topmost notification by default

If it's got a bigContentView

Users who don't know about the gestures will still benefit from the feature

The system will sort notifications first by priority, then time

Therefore: more details about the most important stuff, automatically

Protip: swipe the top notification away

The next one will **pop up** and automatically expand



Accountability

Users can now long-press a notification to discover **which package posted it**

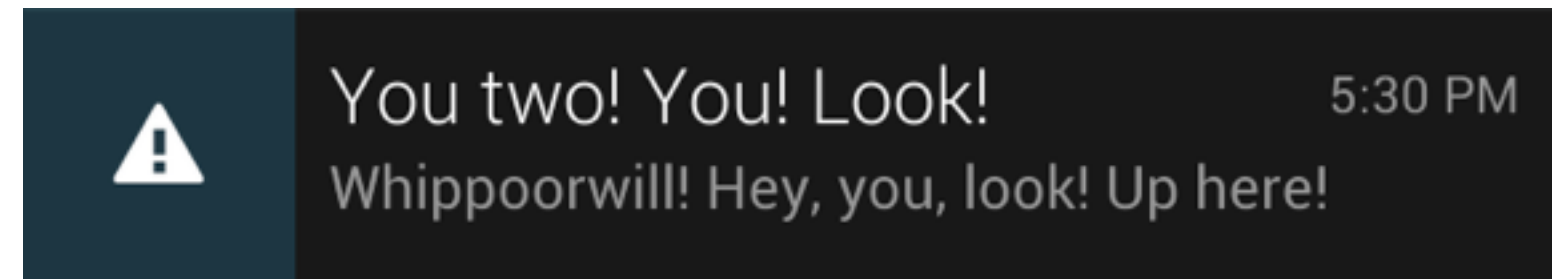
Takes you to the App Info activity in Settings

Users can then:

uninstall the package, or

disable all notifications from that package

Protip: don't annoy the user



App info

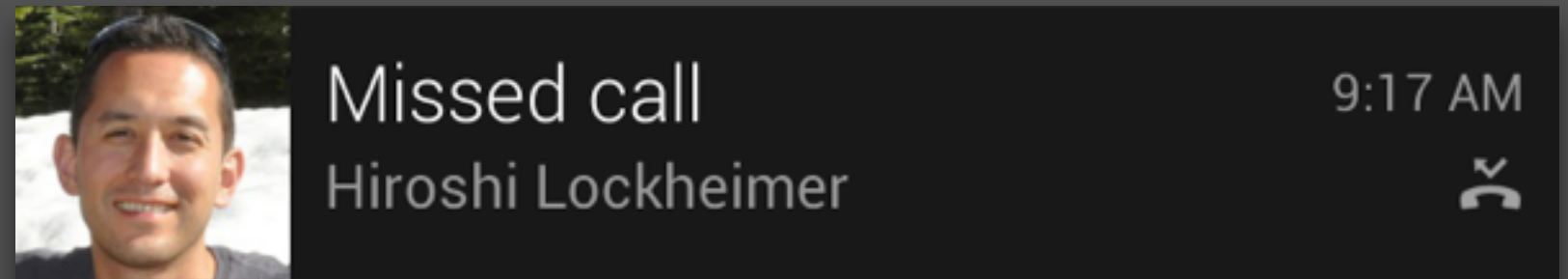




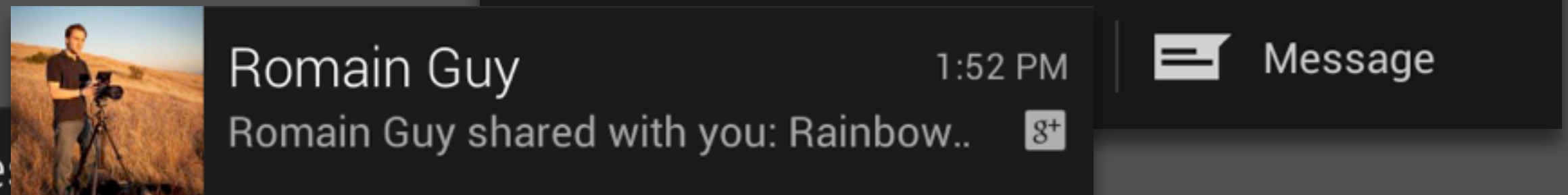
Examples




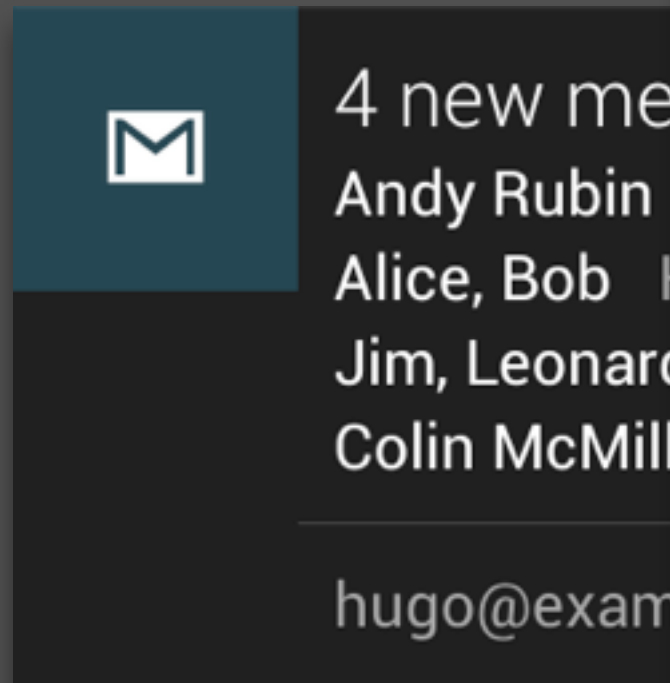
Android & Google



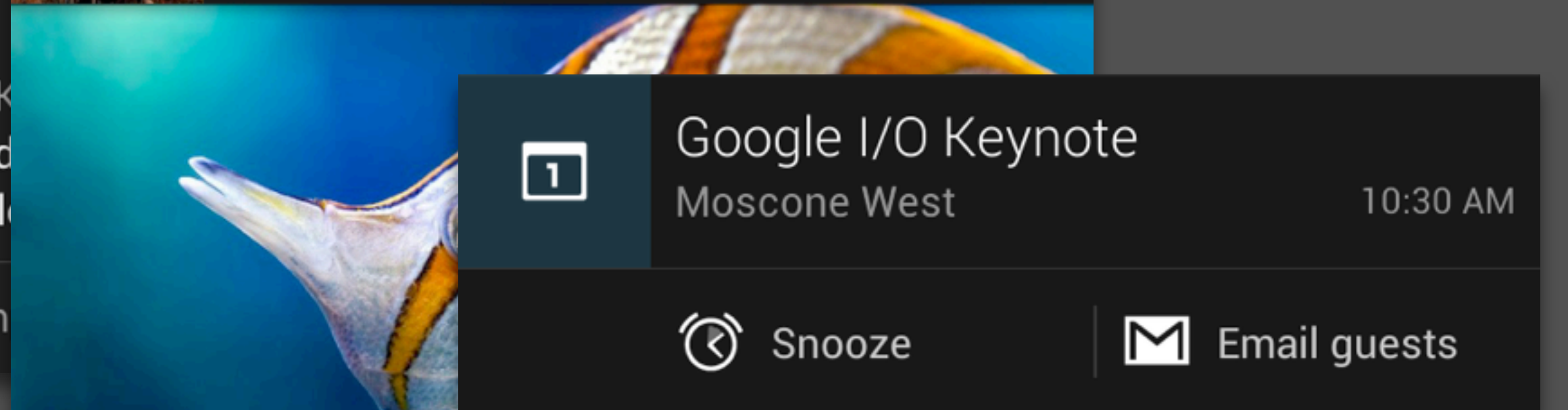
Missed call
Hiroshi Lockheimer
9:17 AM



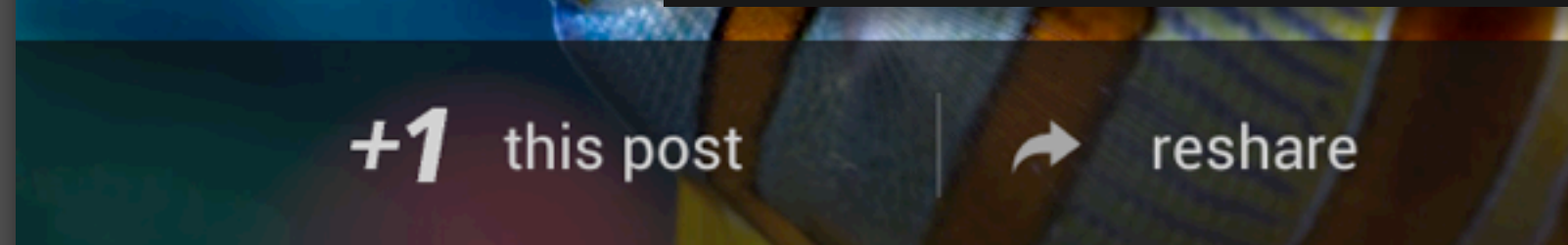
Romain Guy
Romain Guy shared with you: Rainbow..  1:52 PM



4 new messages
Andy Rubin
Alice, Bob K
Jim, Leonard
Colin McMill
hugo@exam



Google I/O Keynote
Moscone West
10:30 AM




+1 this post | reshare

...and more




11:47 WEDNESDAY JUNE 13, 2012



Will Hou 11:47 PM

wants to be your friend


Accept Ignore



Will Hou 12:02 AM

wrote a comment on your check-in at foursquare HQ:
"Oh hai! I heard that long comment is long and it wraps to a second line."
foursquare


11:54 WEDNESDAY JUNE 13, 2012



Ted Powder 11:54 PM

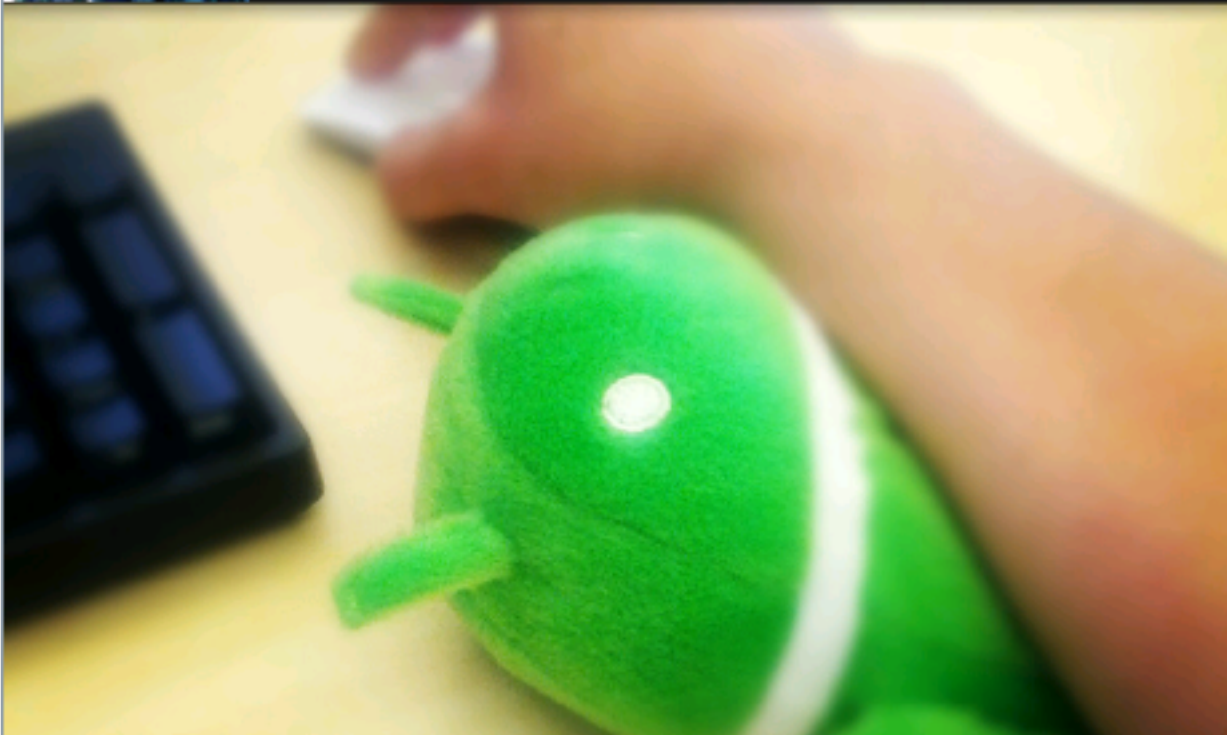
at foursquare HQ

Comment Like



Ted Powder 12:00 AM

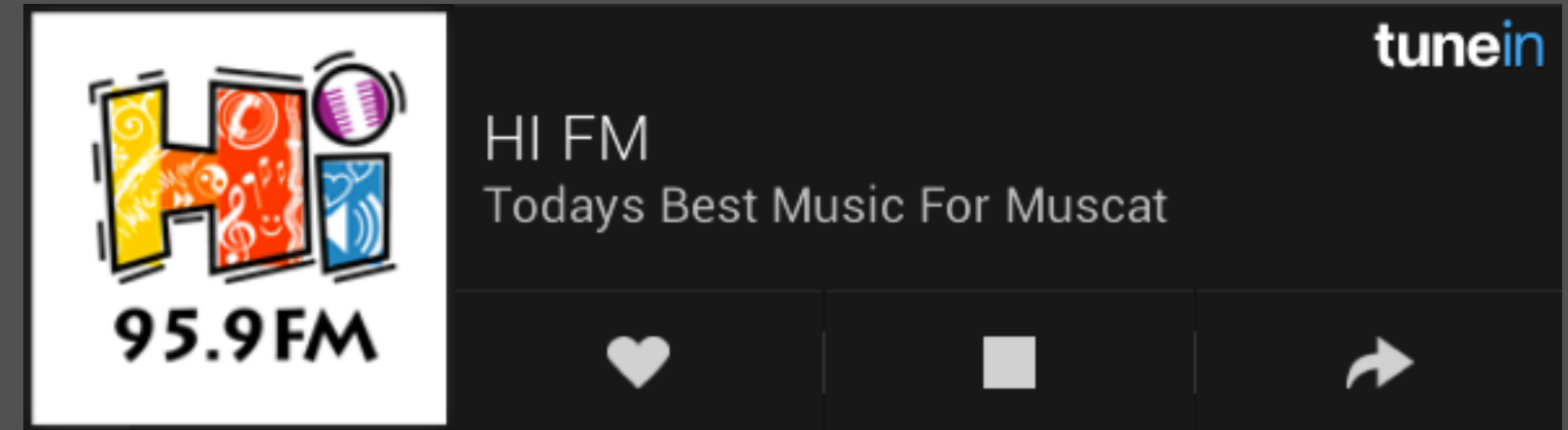
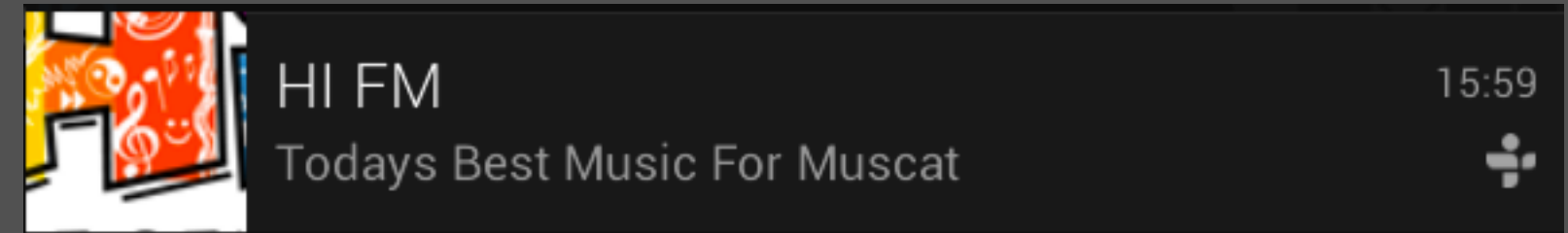
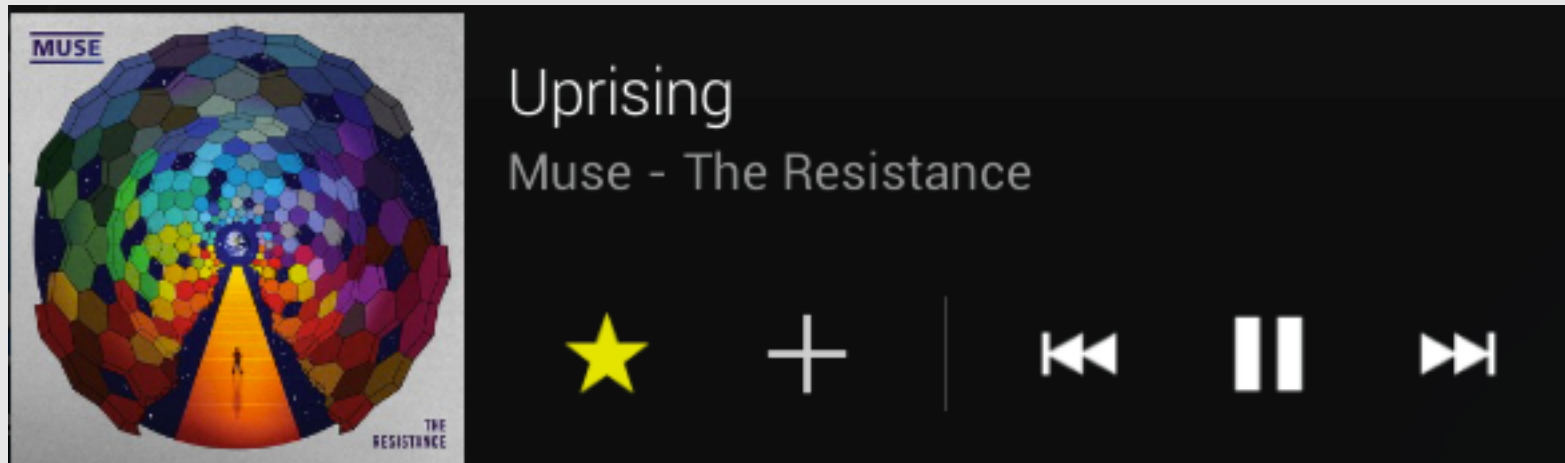
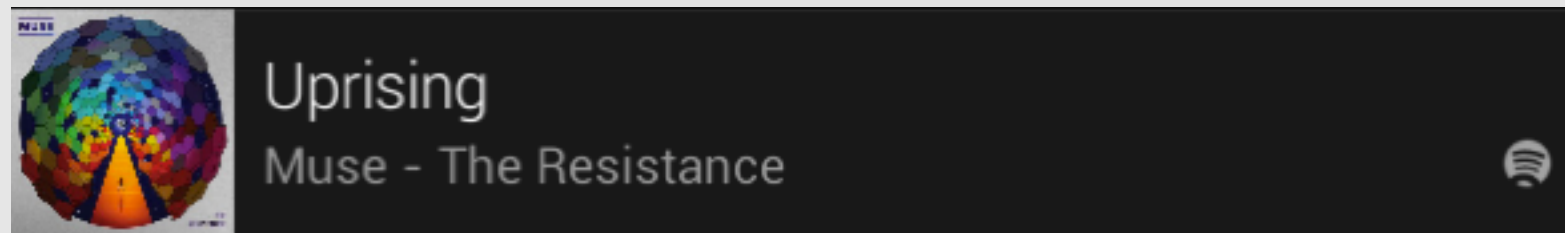
added a photo to his check-in



foursquare



Spotify




TuneIn



Pulse






pulse ShopBot Brings CNC Machines to Your 10:23 PM



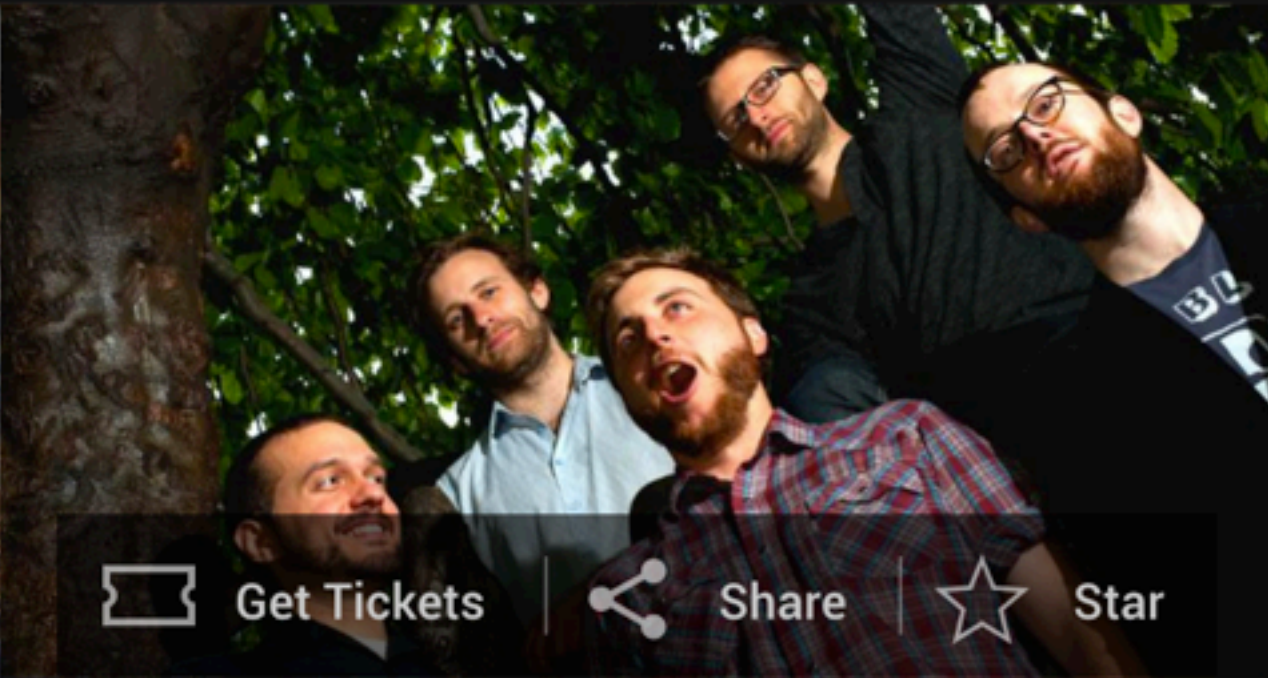
☆ Save 🔗 Share

pulse New Stories in Pulse

 <p>ShopBot Brings CNC Machines to Your Garage (or Your Design Milk</p>	 <p>Building The Next Internet, 250 Times Faster Fast Company</p>	 <p>Skip the Doctor's Office with iPhone Clip-Ons Discovery News</p>
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Monday, 12:54 PM

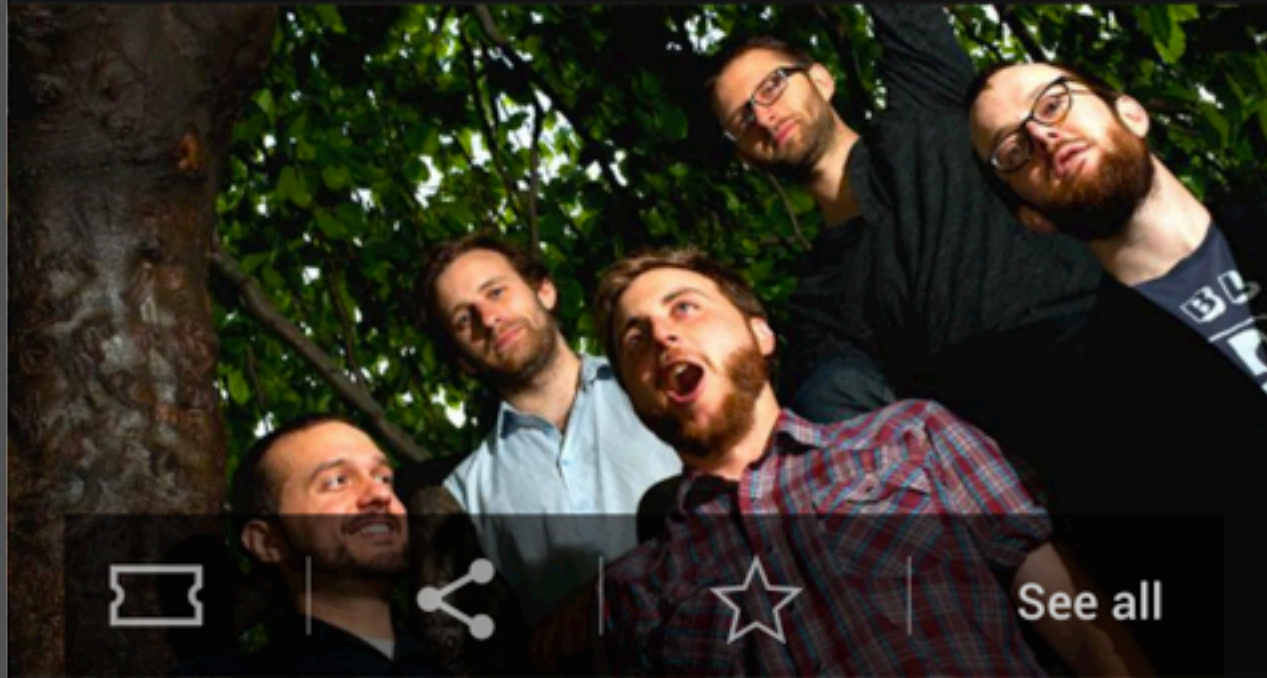
GB Great Elk 12:54 PM
Great Elk are coming to New York, Glasslands on June 10th, 2012 GB



Get Tickets | Share | Star

Monday, 12:54 PM

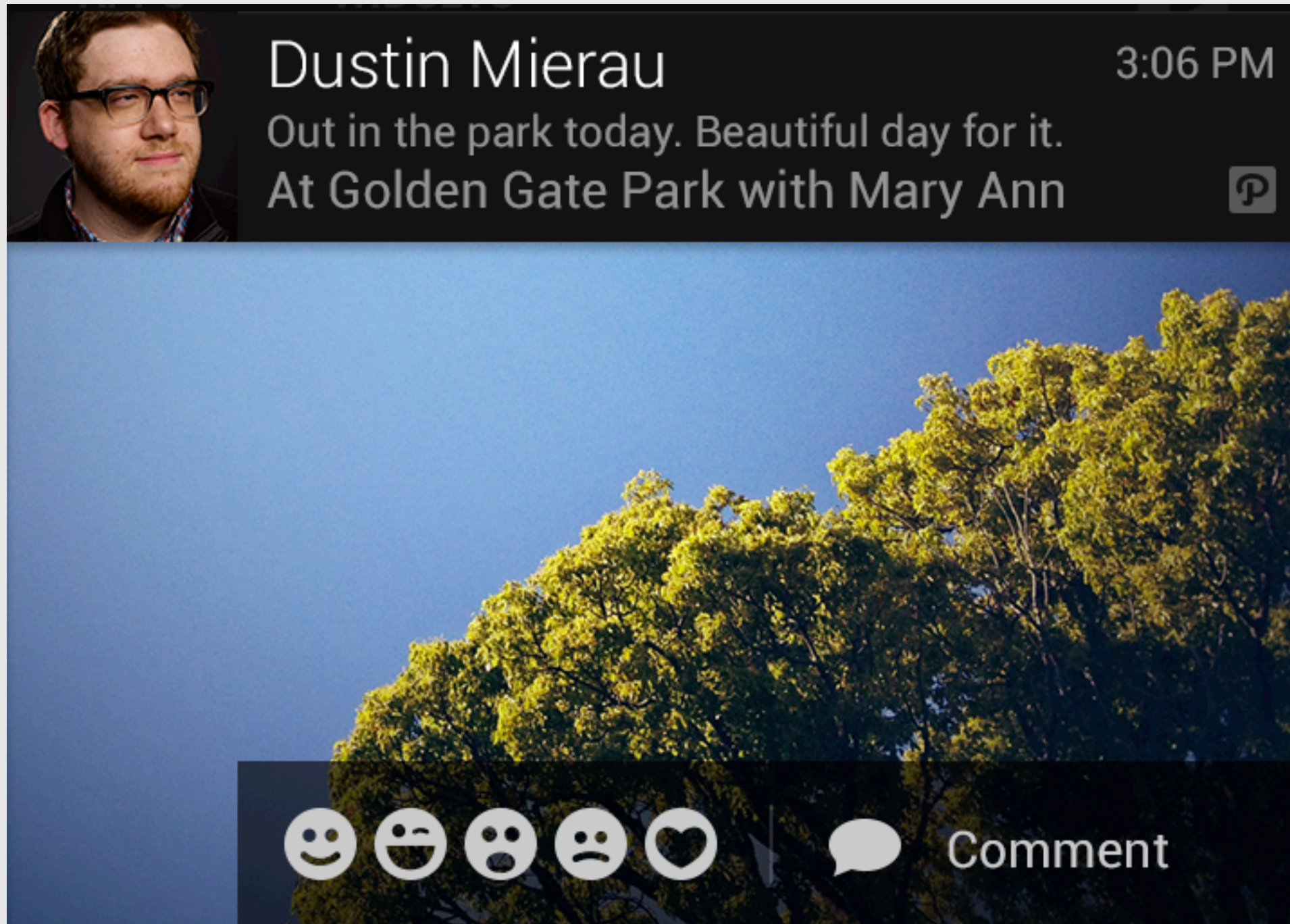
GB 4 upcoming Gigs 12:54 PM
Including Great Elk in New York, Glasslands on June 10th, 2012 GB



Get Tickets | Share | Star | See all

GigBeat





Path



Guess Aditi's clue!

6/3/12



CLICK PLAY
TO LISTEN TO
MY CLUE!



▶ Play Clue!

🕒 Remind Me in 10 Minutes!

Pocket Gems



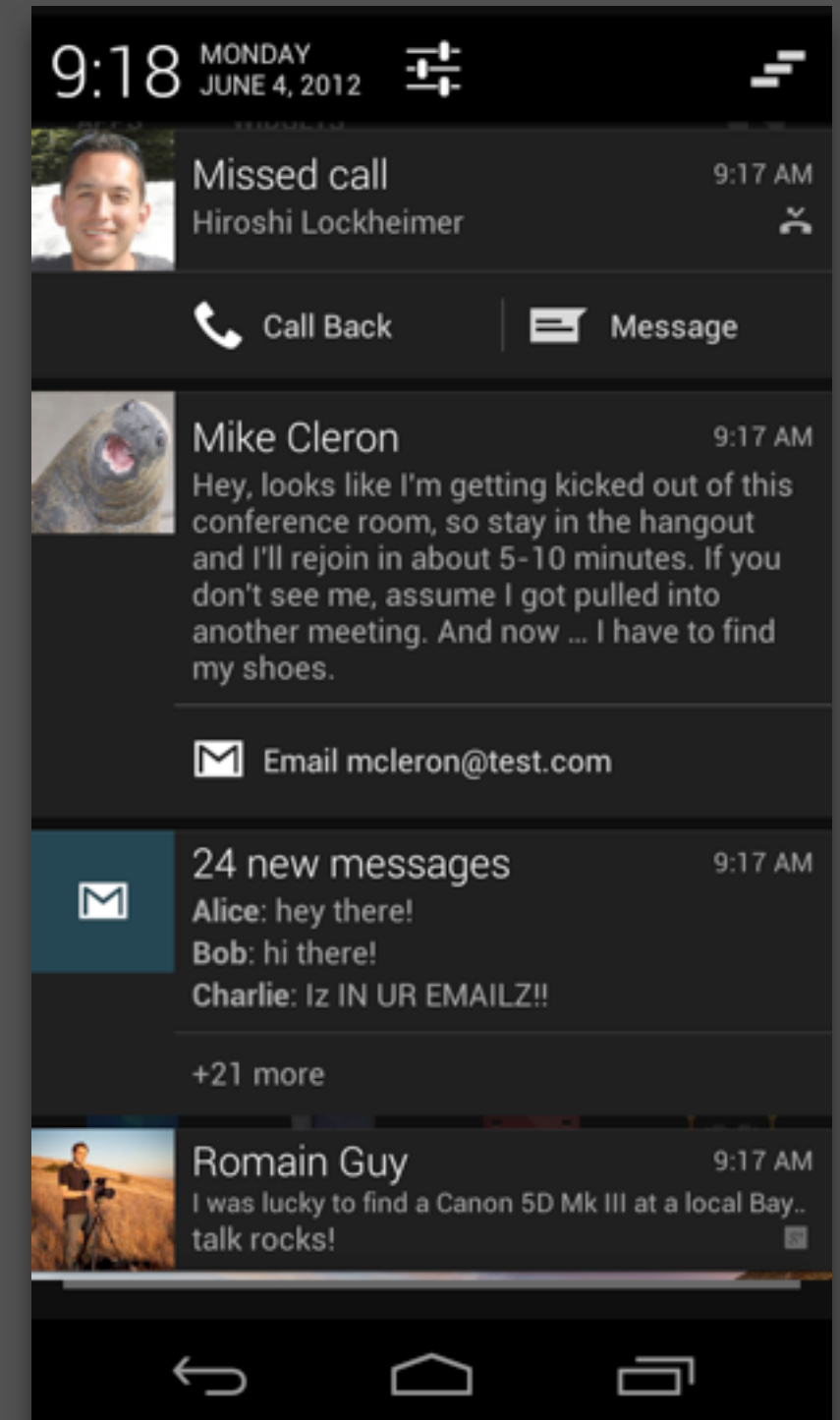
2007

“The idea is to be as unobtrusive as possible, while still showing the user the information you want them to see.”

Notification API documentation
SDK m3-rc20a, November 2007



This is **still true.**



The user's attention is **precious**



Notifications in Jelly Bean: **new tools to manage attention**

priority

show the most urgent things first, not just the most recent

big notifications

give the user more information, effortlessly, on demand

actions

let the user get things done ... and go back to what they were doing



Other Jelly Bean-Related I/O Sessions

- Wednesday 4:00: Media Codecs in Android Jelly Bean
- Wednesday 5:15: Android Fireside Chat
- Wednesday 5:15: Making Android Apps Accessible
- Thursday 11:45 What's New in Android Developers' Tools
- Thursday 2:45: For Butter or Worse: Smoothing Out Performance in Android UIs
- Thursday 4:00: Doing More with Less: Being a Good Android Citizen





Q&A

+Chet Haase @chethaase
+Romain Guy @romainguy
+Daniel Sandler @dsandler

