When it's better to ask forgiveness than get permission

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Designing attribution mechanisms for smartphone resources

Asking for permission:

Angry Birds Rio

ROVIO MOBILE LTD.

Accept & download

Storage

NEW: Modify/delete USB storage contents

Phone calls

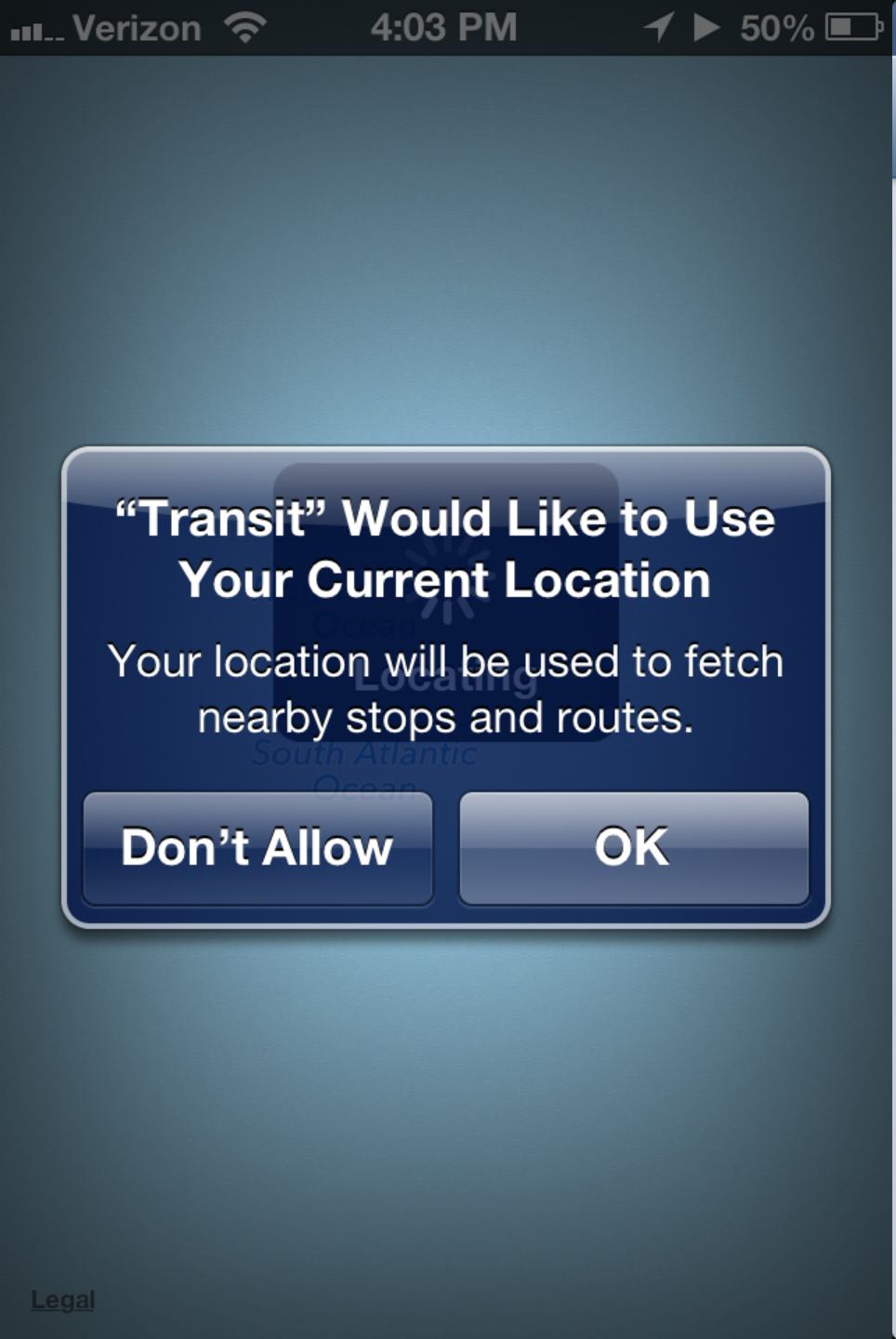
NEW: Read phone state and identity

Network communication

Full Internet access

Your location

NEW: Coarse (network-based) location


Verizon
4:03 PM
50%
"Transit" Would Like to Use Your Current Location
Your location will be used to fetch nearby stops and routes.
Don't Allow
OK
Legal


Verizon
4:05 PM
49%
Privacy
Location Services
Location Services
ON
Location Services uses GPS along with crowd-sourced Wi-Fi hotspot and cell tower locations to determine your approximate location.
Camera
ON
Chrome
ON
Compass
ON
Dropbox
OFF
Facebook
OFF
Flipboard
OFF

"To avoid devaluing the warnings, we recommend that permissions without clear risks should not be shown to users. … Warnings that do not convey real risks teach the user that all warnings are unimportant."

A. P. Felt, E. Ha, S. Egelman, A. Haney, E. Chin, D. Wagner. *Android Permissions: User Attention, Comprehension, and Behavior.* Symposium On Usable Privacy and Security (SOUPS), 2012.

Existing mechanisms habituate the user.

Too many unnecessary user interactions

All permission warnings more likely to be overlooked.

Low Risk & Reversible:

55% of permissions.

(Felt et al., *How to Ask For Permission*, HotSec '12)

Why not use mechanisms that don't habituate the user?

Automatically grant permissions that are low risk and reversible

...but allow the user to attribute behavior.

Attribution

vs.

Explicit Consent


4G
4:00


4:00
EBER
www.justinbiebermusic.com

Send texts, destroy data

VS

Turn on flash

Change volume

Vibrate

To limit habituation, when possible:

Let apps use resources

Help users fix misbehavior.

Are Attribution Mechanisms Effective?

Online survey (n=189) to answer:

- Are users aware of existing attribution mechanisms?
- Do users know how to attribute misbehavior today?

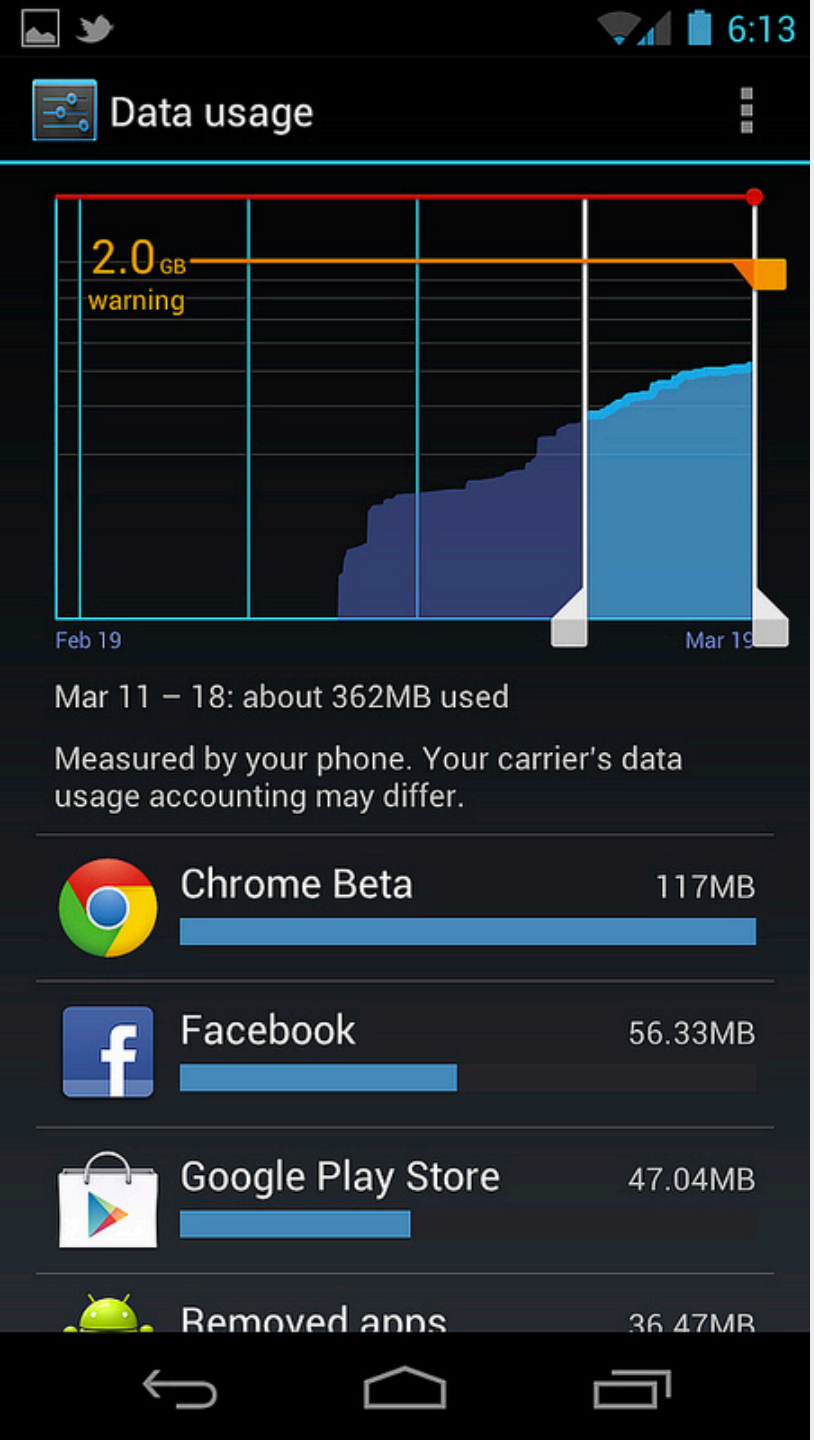
6:13

Data usage

Mar 11 – 18: about 362MB used

Measured by your phone. Your carrier's data usage accounting may differ.

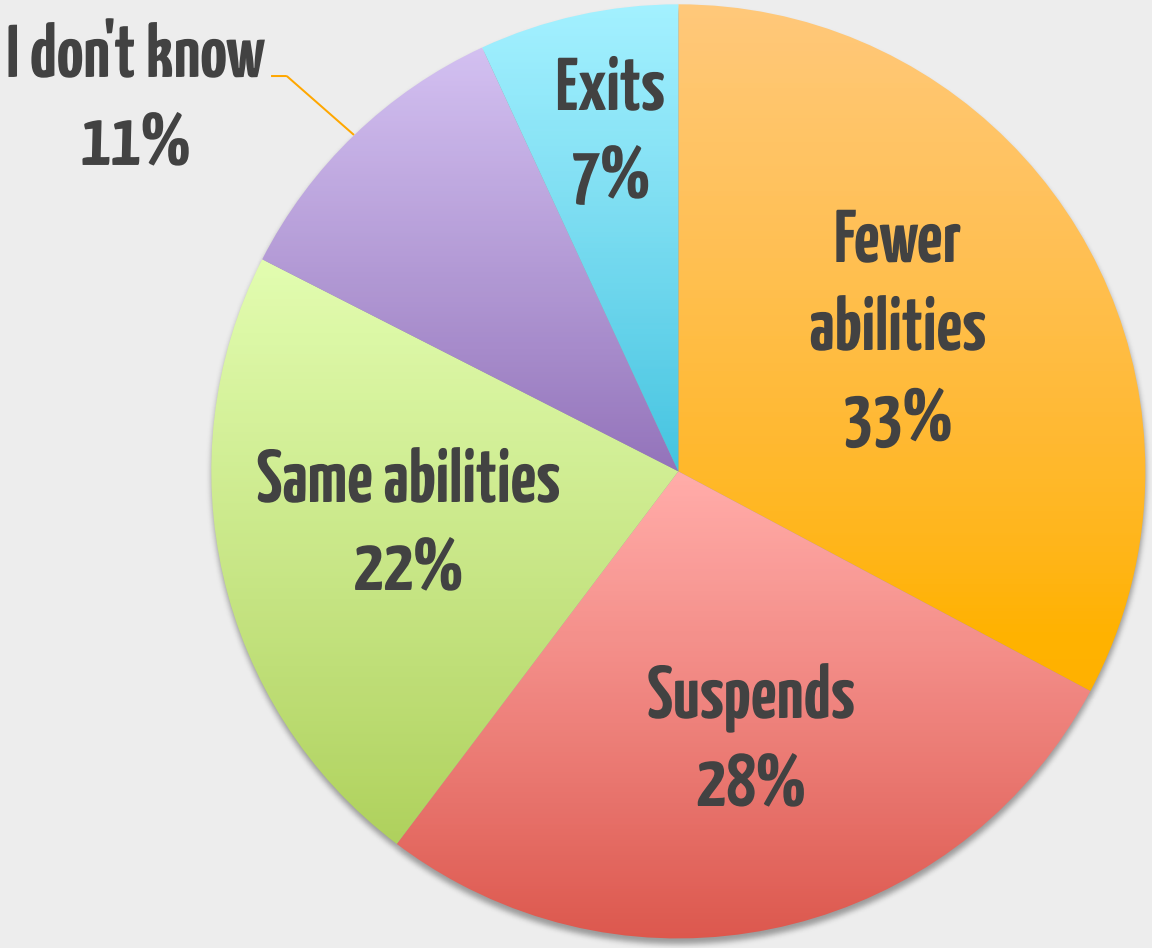
Chrome Beta	117MB
Facebook	56.33MB
Google Play Store	47.04MB
Removed apps	36.47MB



73% of Android 4+ users found this.

(95%CI: [58%, 85%])

What happens to apps in the background?



Users don’t understand background apps.

Attribution mechanisms make explicit what app was responsible.

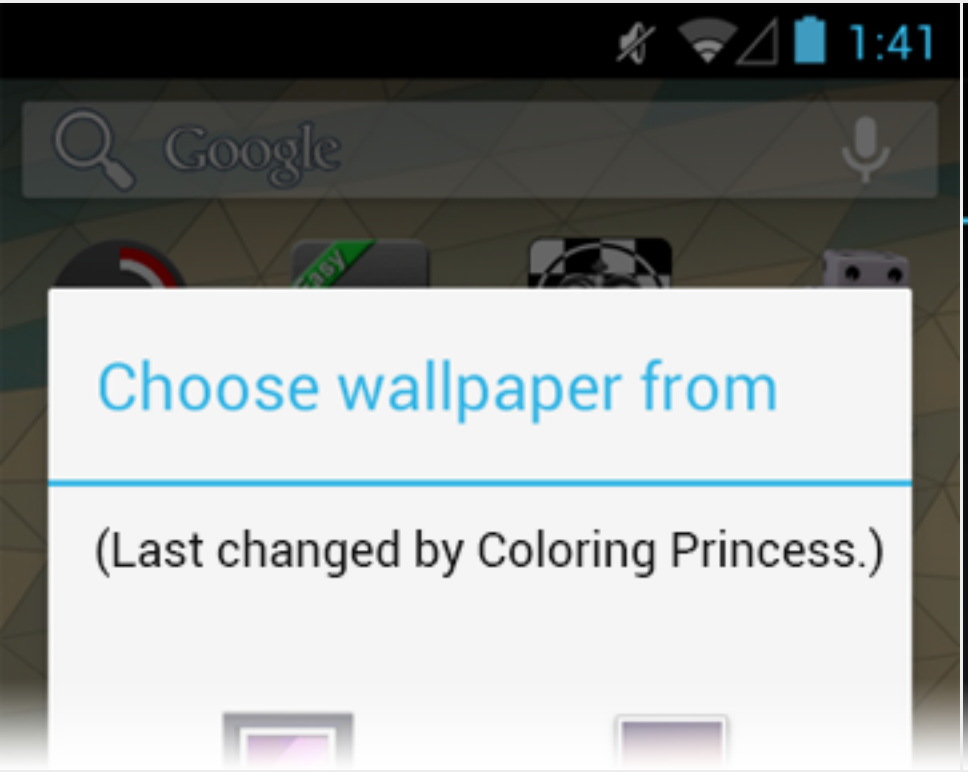
New attribution mechanisms

Two Types

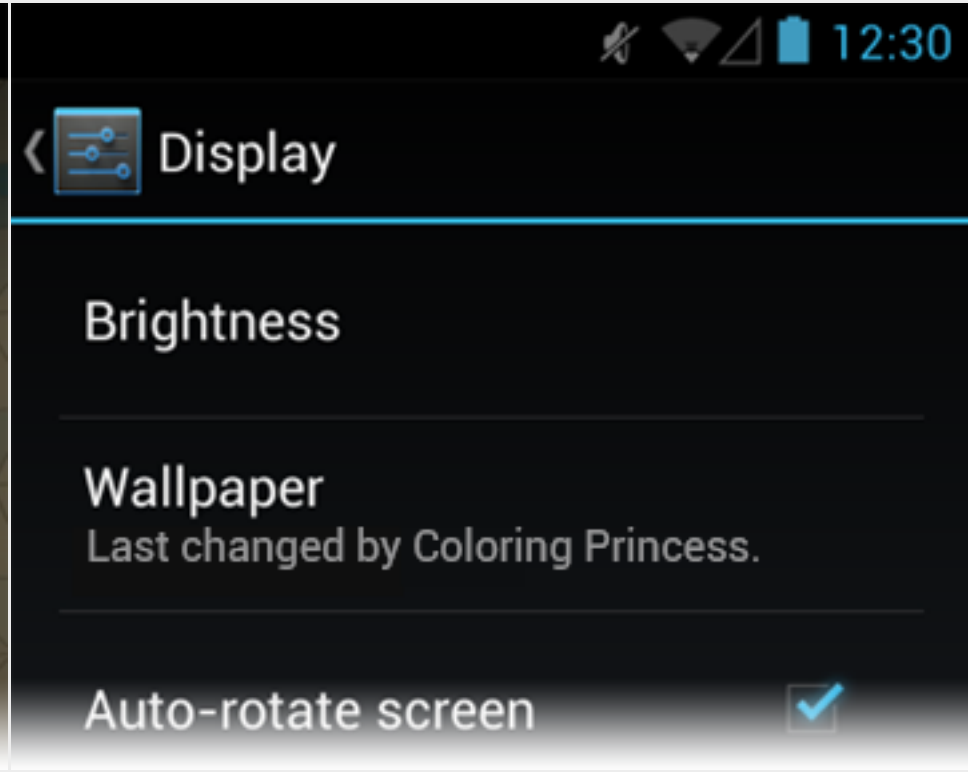
Provenance of settings changes

Notifications of ongoing annoyances

Annotate with provenance of current wallpaper setting

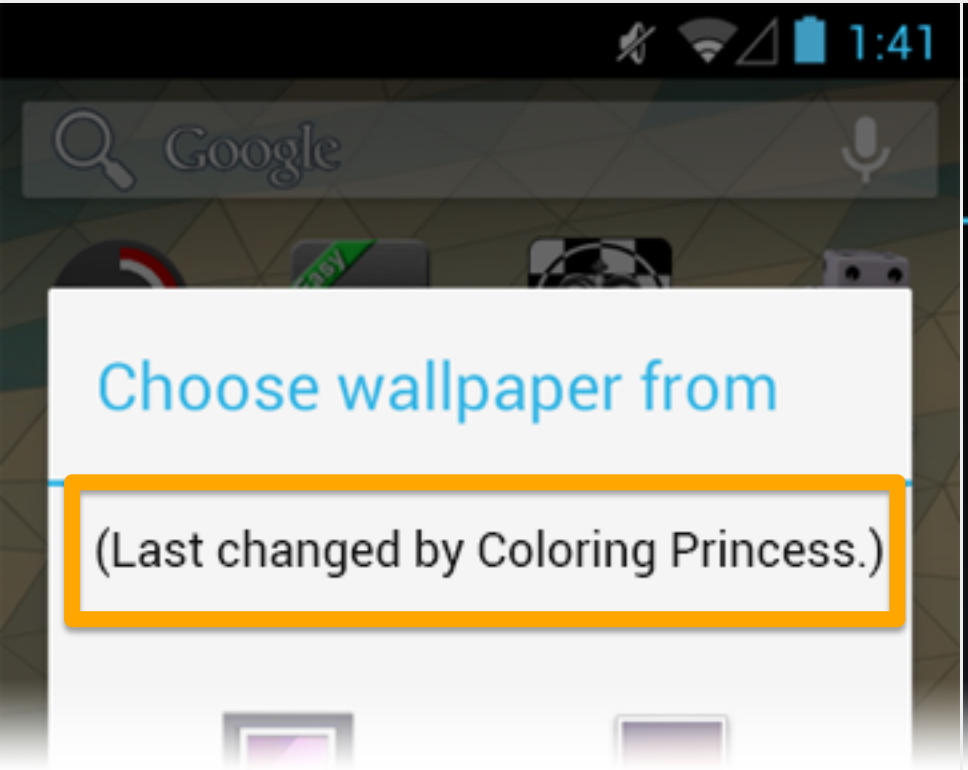


Desktop Chooser

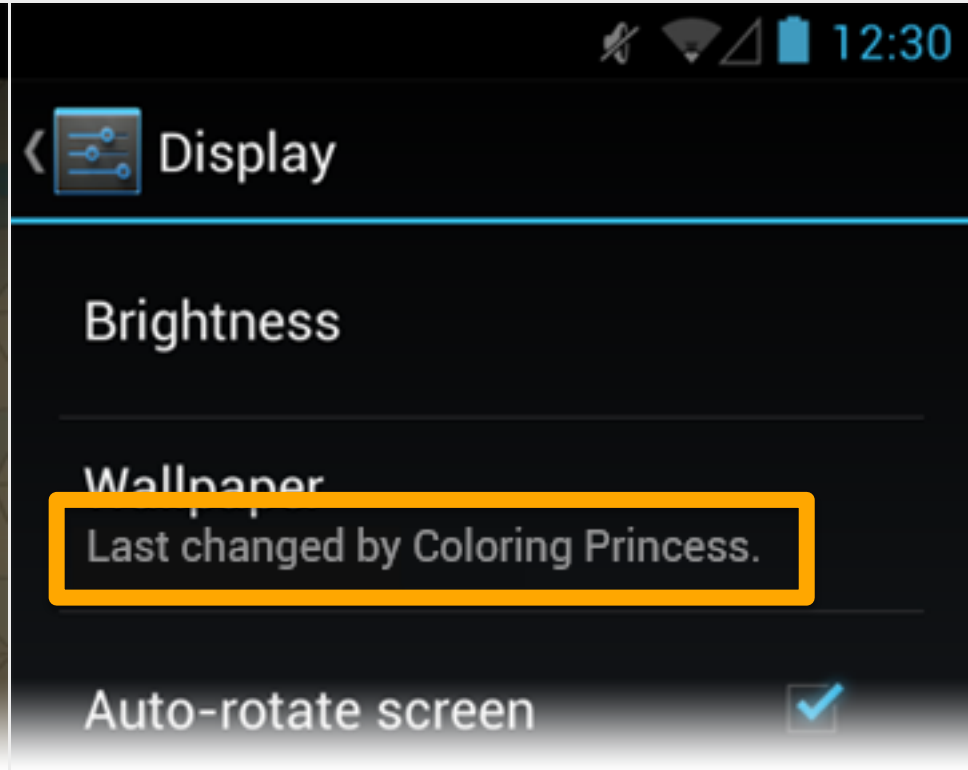


Display Settings

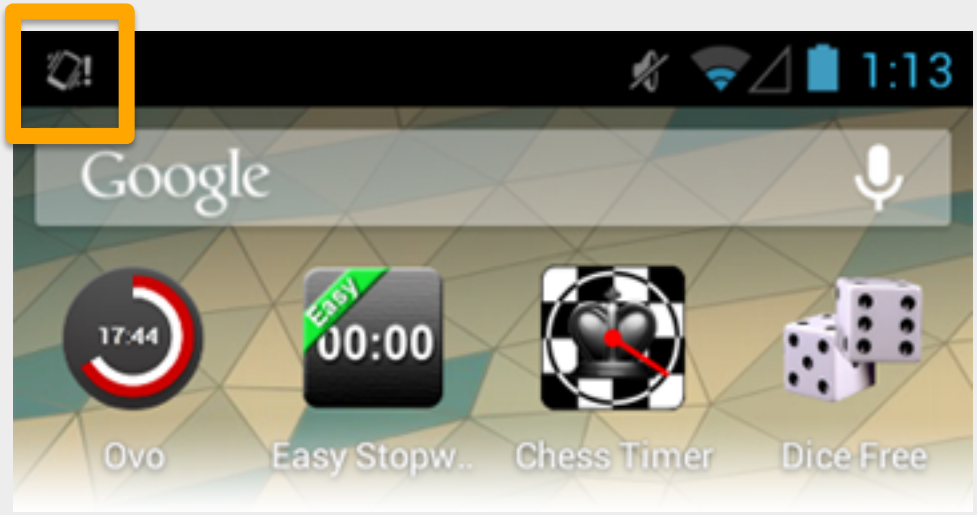
Annotate with provenance of current wallpaper setting



Desktop Chooser

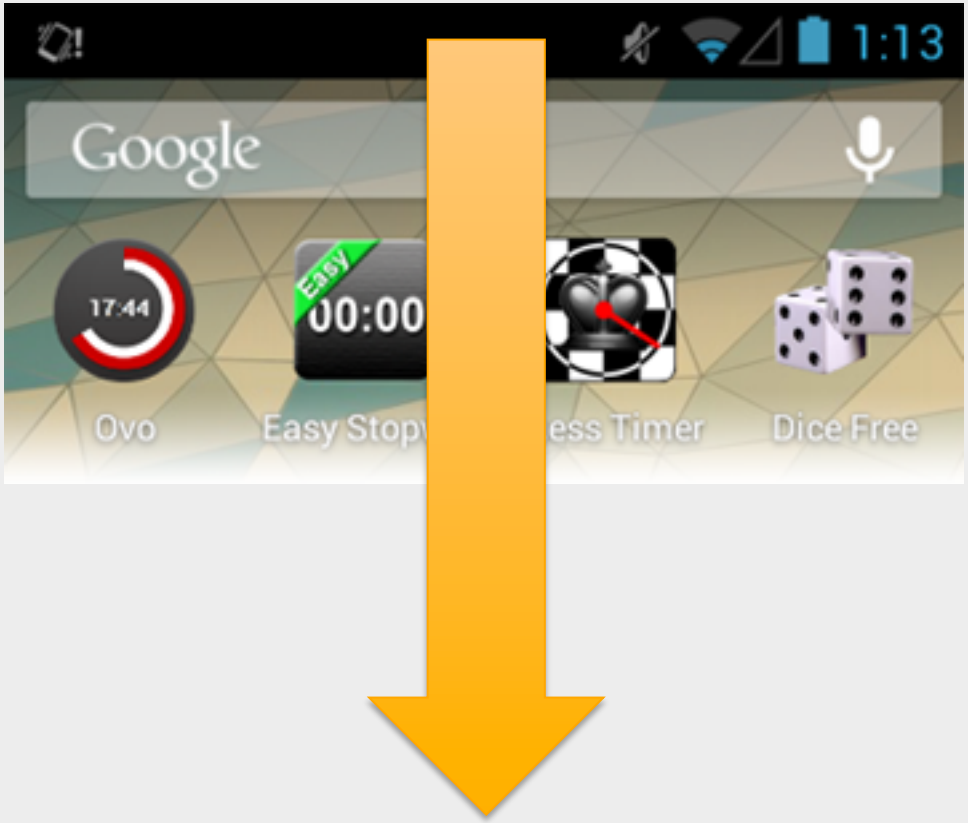


Display Settings



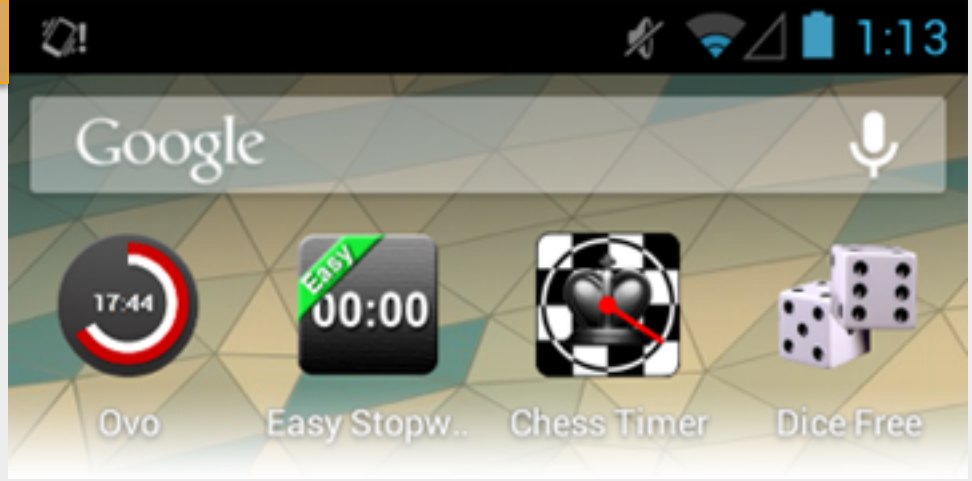
Notification

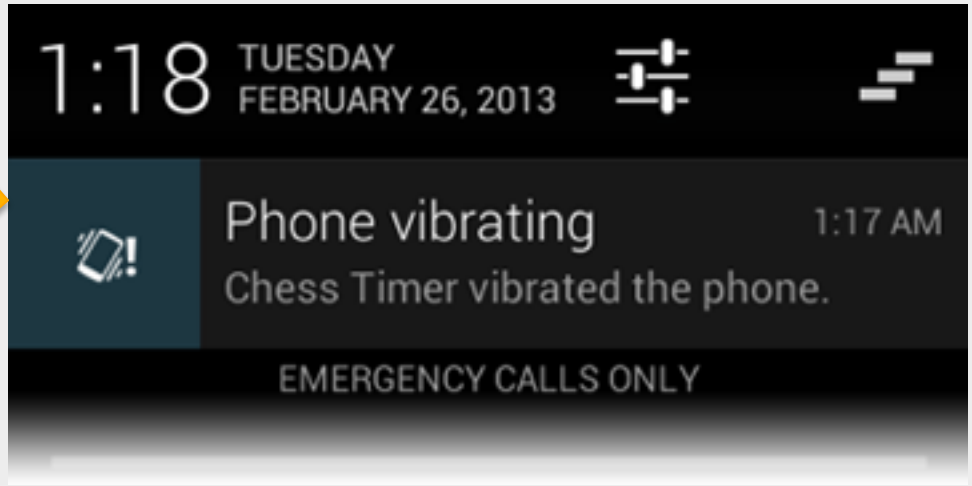
of ongoing behavior



Notification

of ongoing behavior





Notification

of ongoing behavior

Laboratory Experiment

76 Android users from Craigslist

(68% male, ages 19-59)

EXPERIMENTAL GROUP	=	NEW MECHANISMS
CONTROL GROUP	=	STATUS QUO

Methodology

Will participants identify the correct app that is causing an undesirable misbehavior?

- When given attribution mechanisms?
- When there are multiple apps running that all have the ability to cause the misbehavior?

Methodology

Asked participants to evaluate several apps that we had installed on provided phones

- Subterfuge to get several apps running in the background to create ambiguity
- Modified Android to add new attribution mechanisms

①

Play with and review timer apps.

①

Play with and review timer apps.

bzzzz bzzzz

bzzzz bzzzz

ozzz bzzz

②

Explain vibration, repeat the misbehavior, and ask:

"Which app just vibrated the phone?"

①

Play with and review timer apps.

②

Vibration triggered covertly.

③

Explain vibration, repeat vibration, and ask to attribute misbehavior.


4G
4:00


4:00
EBER
www.justinbiebermusic.com

①

Play with and review drawing apps.

②

Bieber triggered covertly.

③

Explain Bieber, repeat Bieber,
and ask to attribute Bieber.

Once people noticed
the misbehavior,

did they blame the right app?

Experimental conditional significantly better for both resources

80.6%

with notifications

30.8%

without notifications

Vibration

(p<0.0005; Fisher's exact test.)

34.3%

with provenance

7.9%

without provenance

Wallpaper

(p<0.006; Fisher's exact test.)

Correctness is correlated with confidence

(Only in the experimental condition!)

Vibration

$\rho = 0.526, p<0.0005$

Wallpaper

$\rho = 0.663, p<0.0005$

But did people notice?

48.7% (37 of 76)
noticed vibration.

Only 18% (13 of 74)
noticed Bieber.

Users need to detect misbehaviors---otherwise they can't use our attribution mechanisms.

30% correctly attributing misbehavior is good! Mechanisms aren't perfect, but good enough to deter bad behaviors:

- Users form opinions based on reviews and word-of-mouth (*Felt et al., SOUPS '12; Egelman, CHI '13*)
- Dissemination requires only a small number of savvy users
- Increased confidence could yield more/better reviews

Make the user deal with
fewer permission requests.

When possible, automatically
give apps permission.

When an app needs forgiveness,
help users fix problems.

It's easier to ask
forgiveness
than it is to get
permission.

—Grace Hopper

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