Android Performance Bundle

Performance on Android

Mobile game revenue to pass console, PC for first time

Arjun Kharpal | @ArjunKharpal
Friday, 22 Apr 2016 | 5:54 AM ET
CNBC

BusinessTechnology phones Overtake Computers as Top E-Commerce Traffic Source

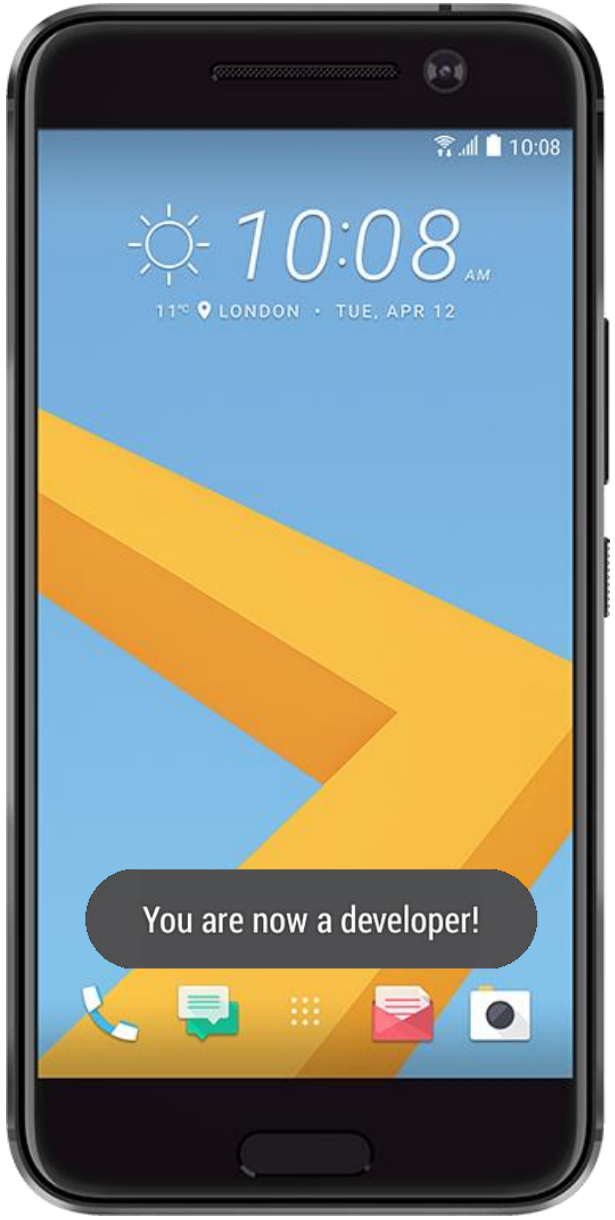
Smartphones Overtake Computers as Top E-Commerce Traffic Source

BUSINESS INSIDER TECH INSIDER

Smartphone And Tablet Revenue Is Bigger Than The Entire Consumer Electronics Market

Measuring is crucial!

1. **Automated UI Testing**

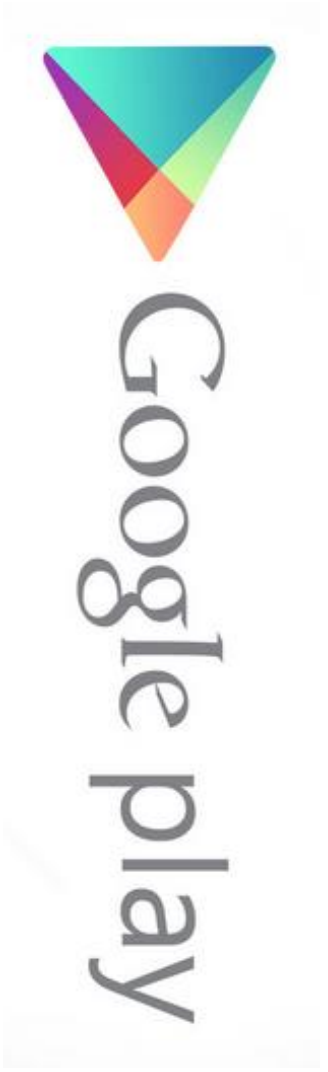


Measuring is crucial!

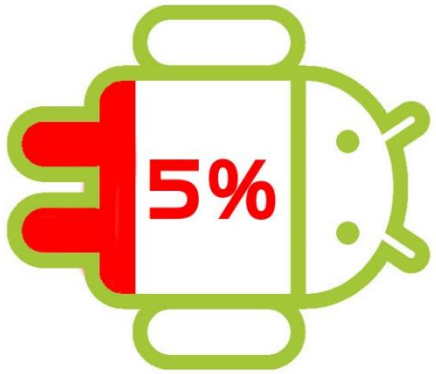
1. Automated UI Testing
2. **Real world benchmarking of phones**

Measuring is crucial!

1. Automated UI Testing
2. Real world benchmarking of phones
3. **Benchmarking in the app store**



Performance on Android



Energy leak

GUI Lagging

Memory Bloating

Performance on Android

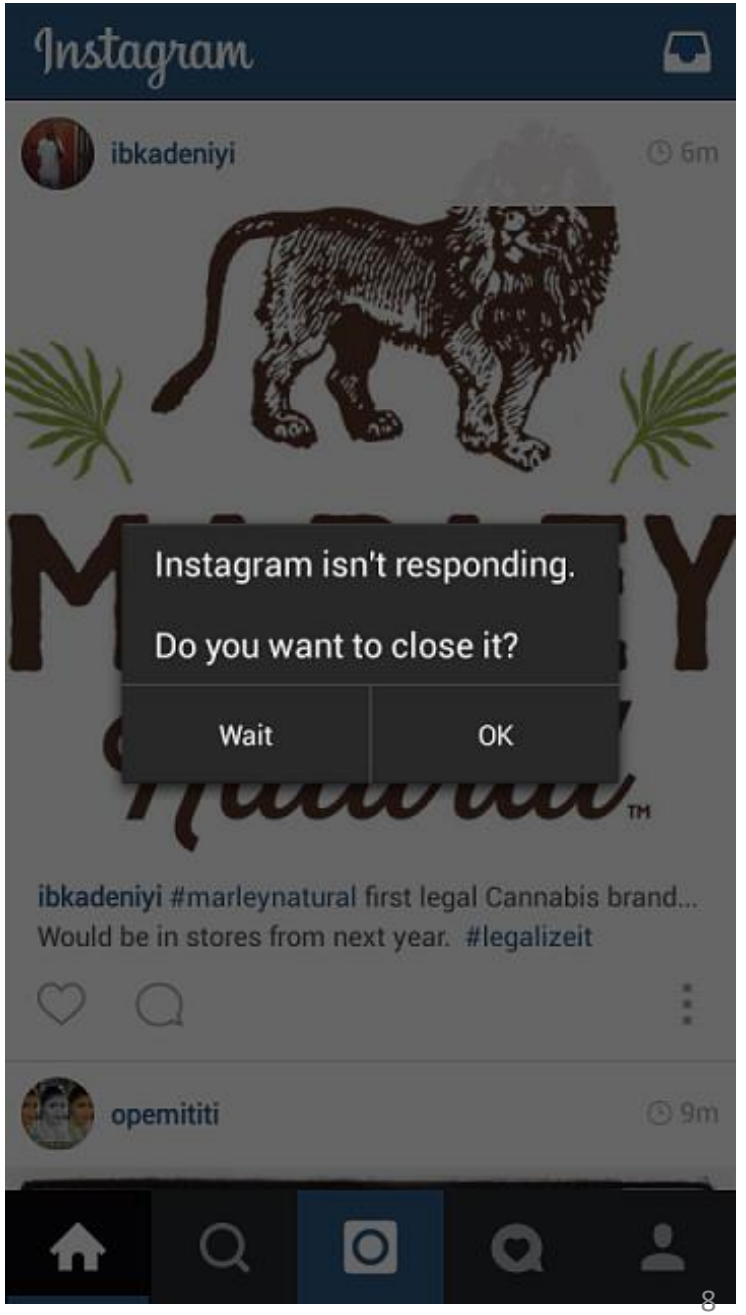
Energy leak

GUI Lagging

Memory Bloating

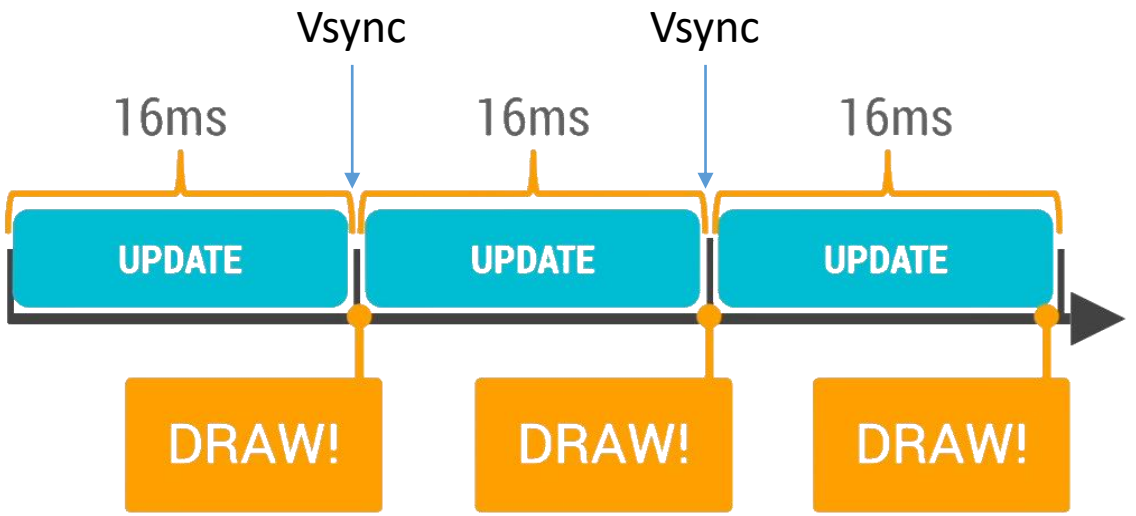
What does GUI lagging mean?

- „App not responding“



What does GUI lagging mean?

- „Janky“ frames
  - 60 fps Framerate
  - = 16-ms-per-frame



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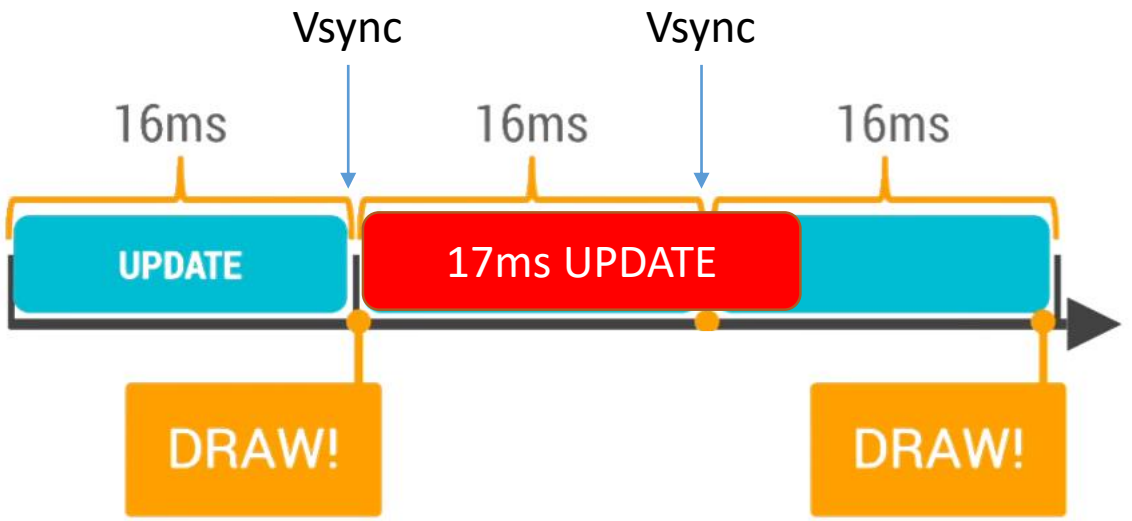
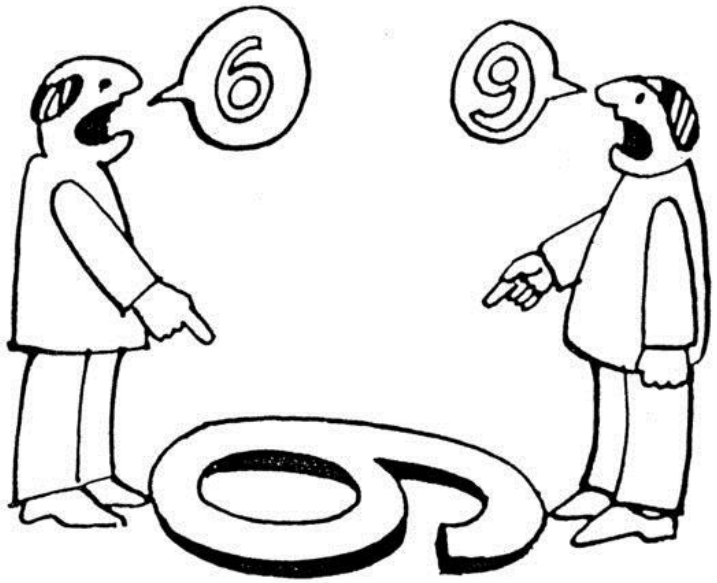
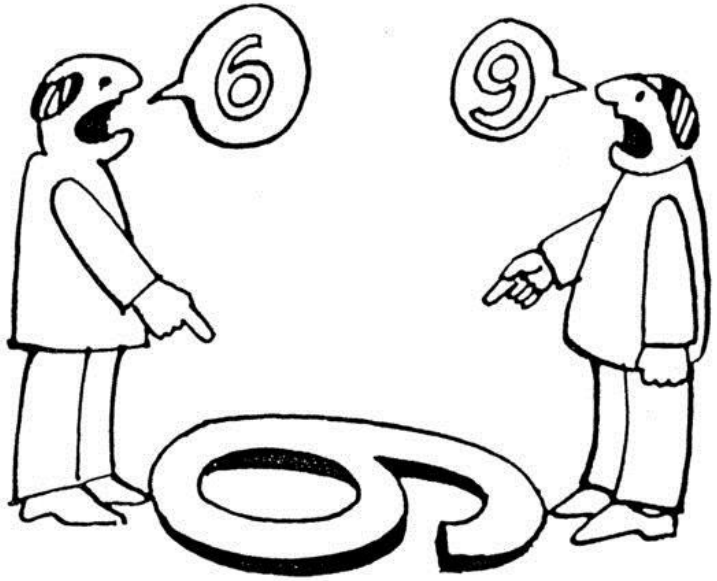


How to measure fluency?



How to measure fluency?



FPS

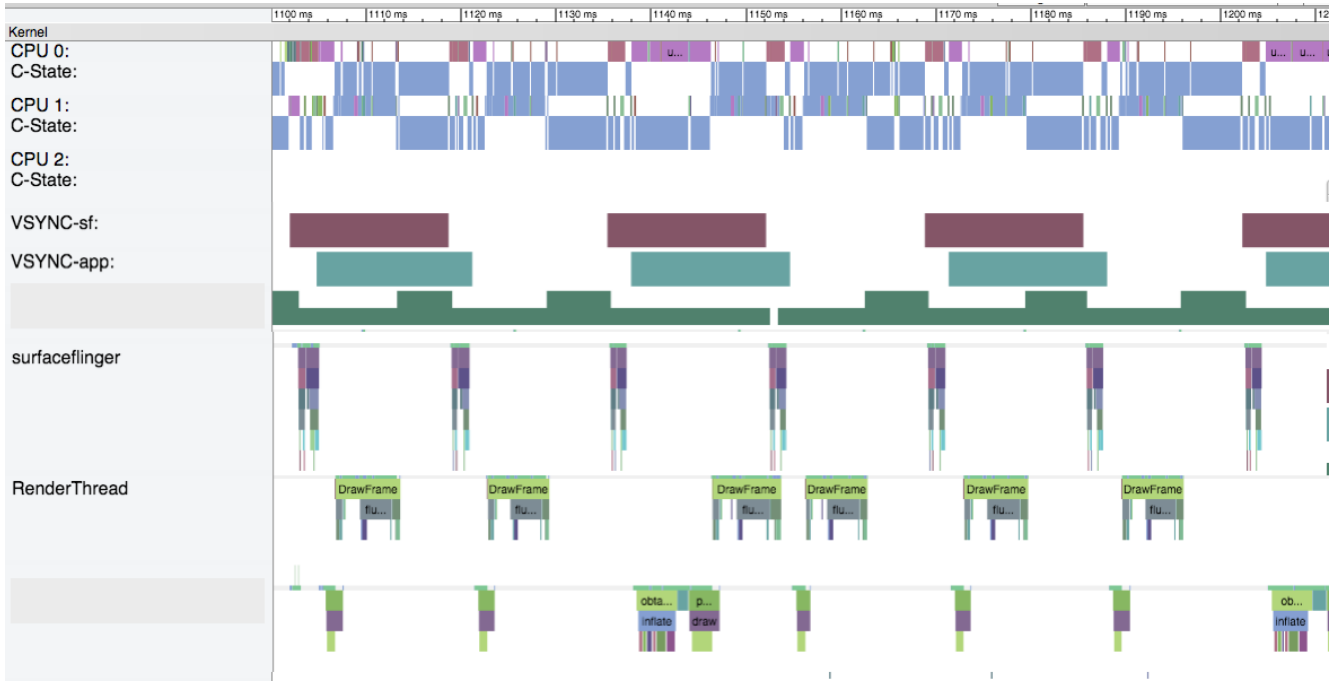
Rendering time

Issued frames

“Analyzing GUI Running Fluency for Android Apps“

State Key Lab of Computer Science, Institute of Software, Chinese Academy of Sciences
Beijing, China

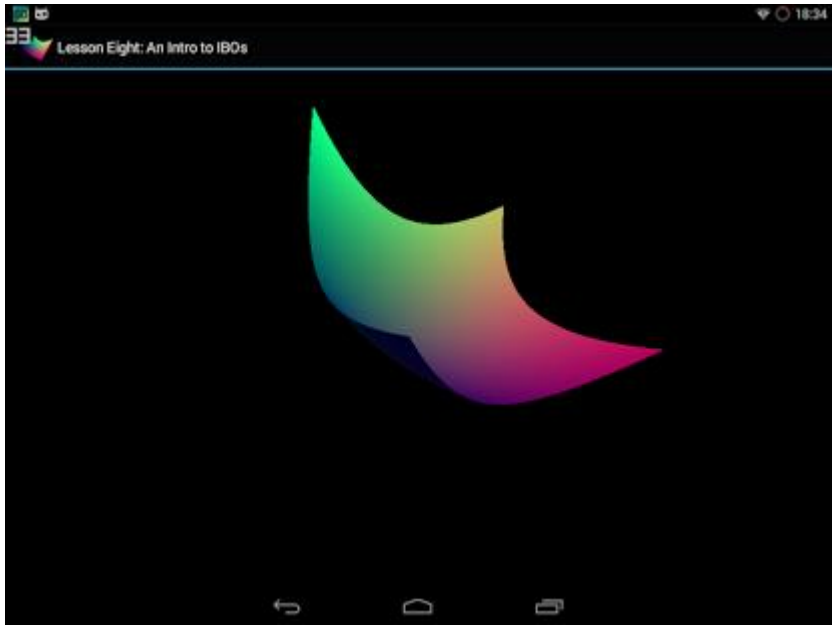
Existing tools



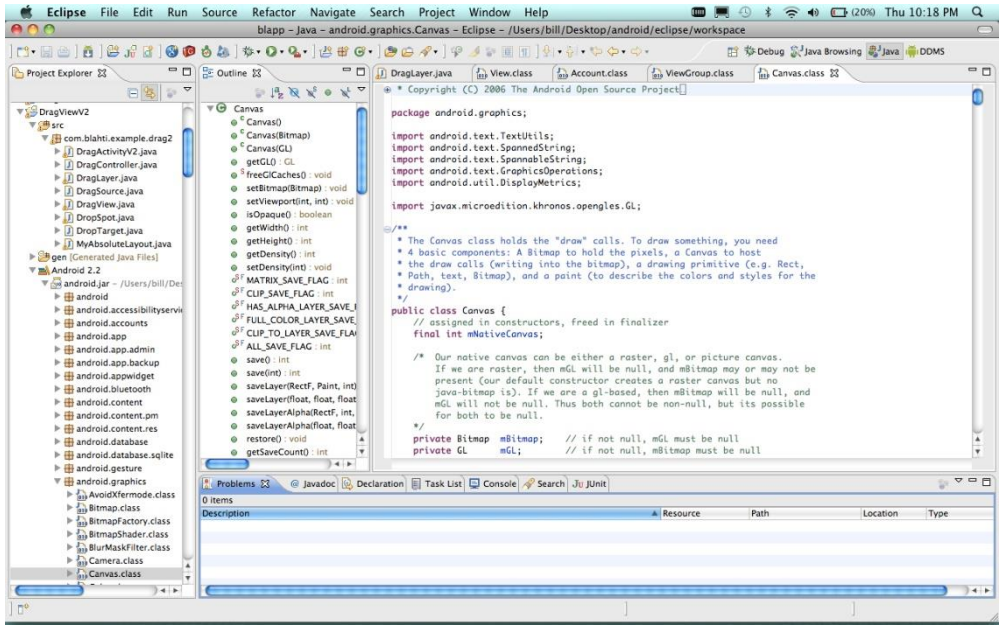
Android Systrace

Profile GPU Rendering

Existing tools

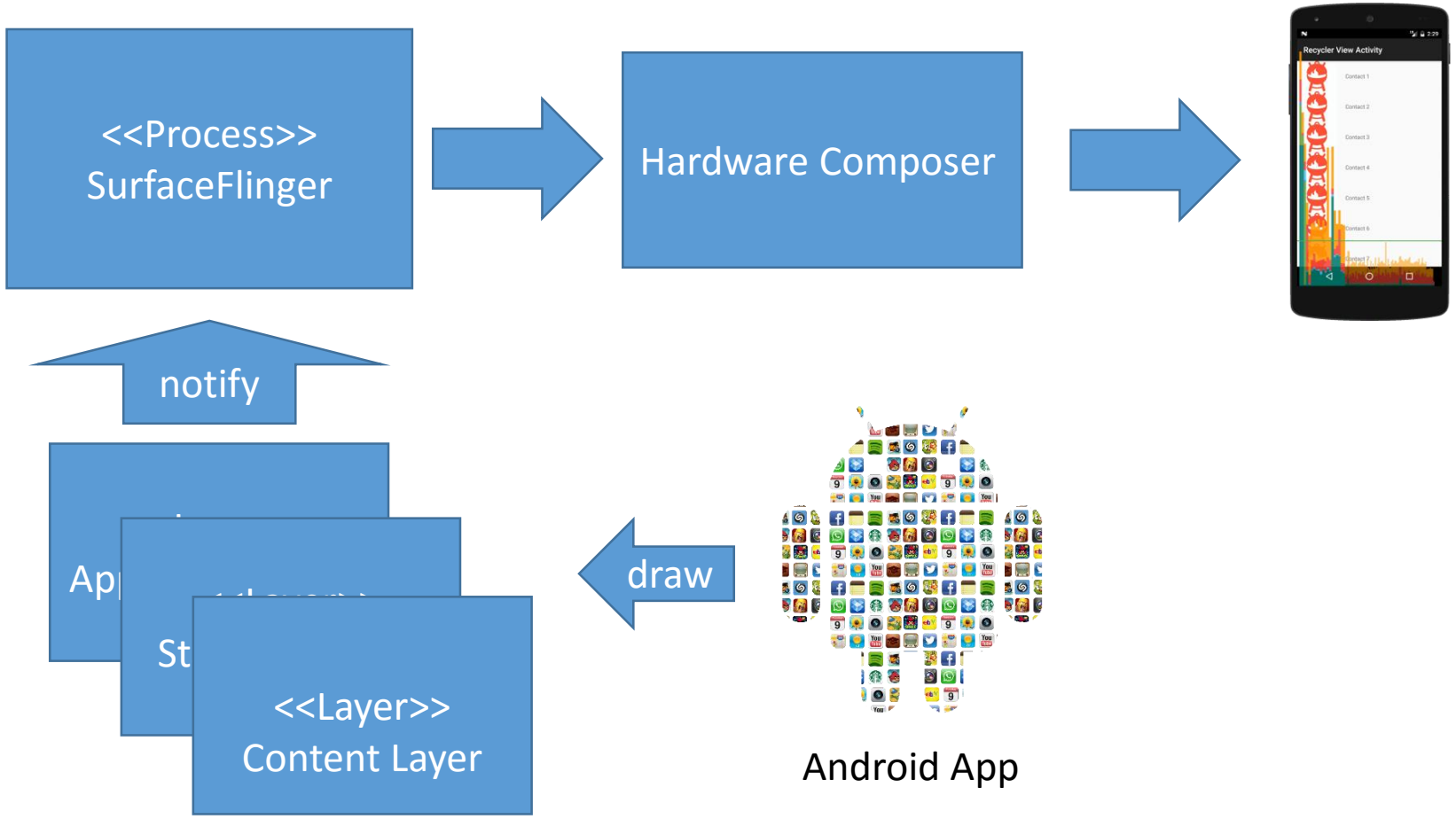


FPS Meter

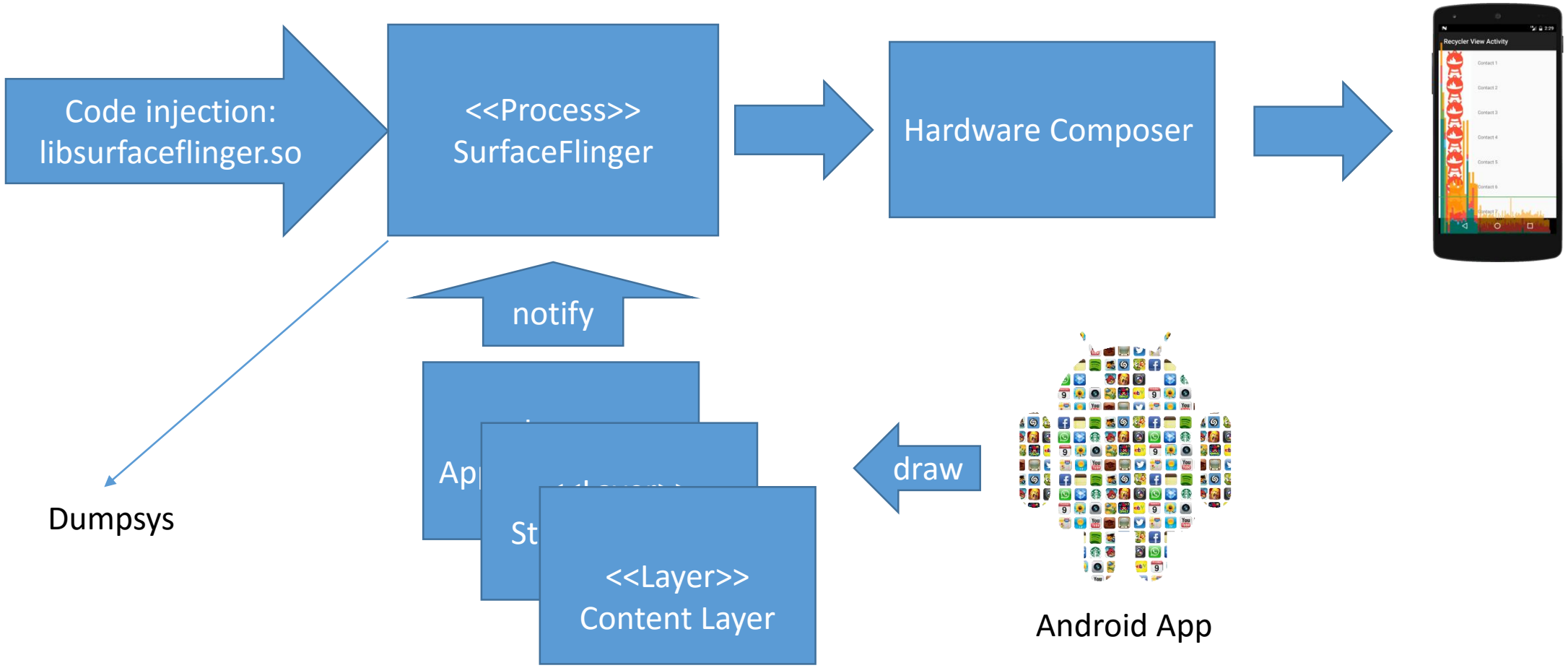


Instrument the source code

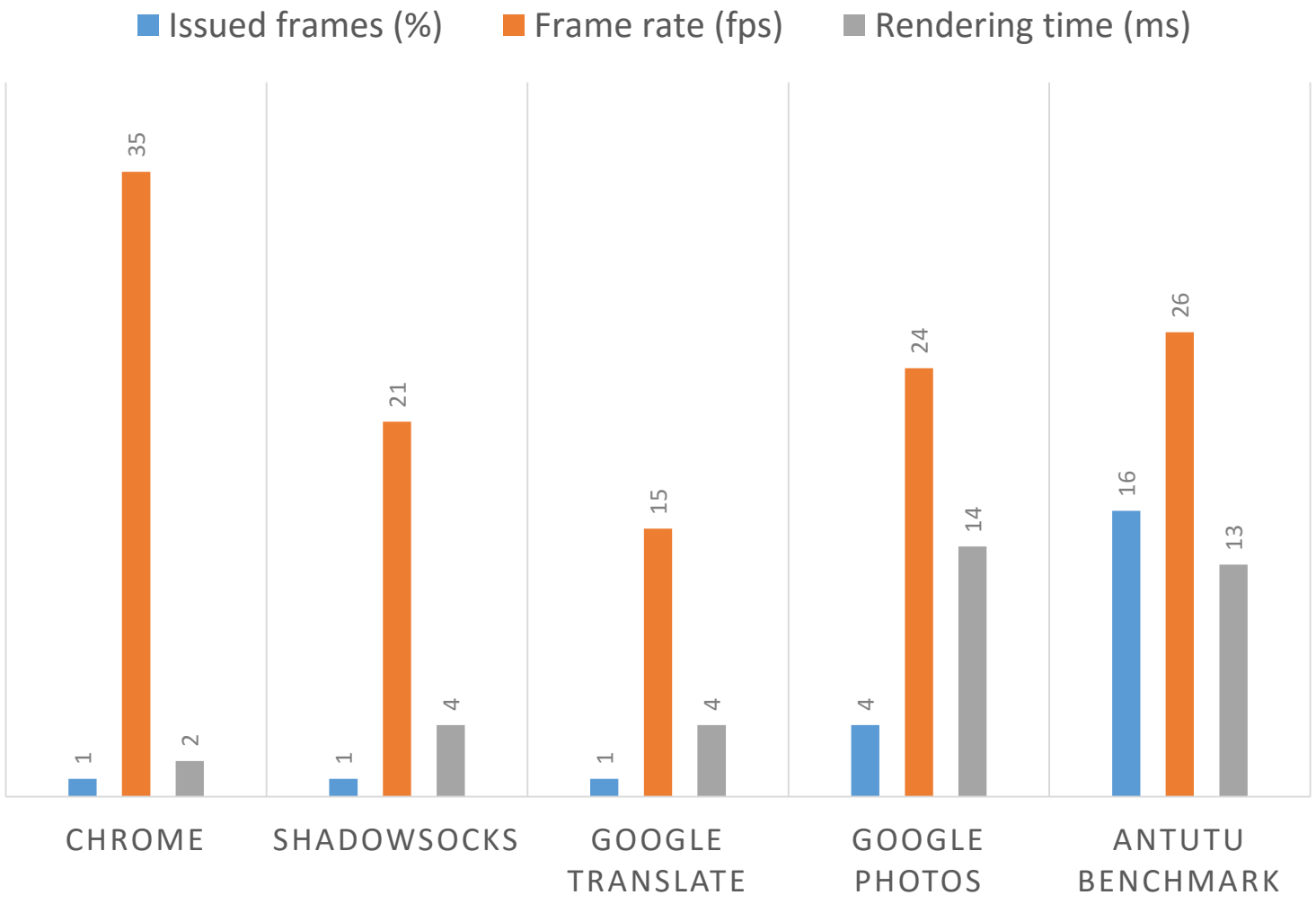
ARFluency - Implementation



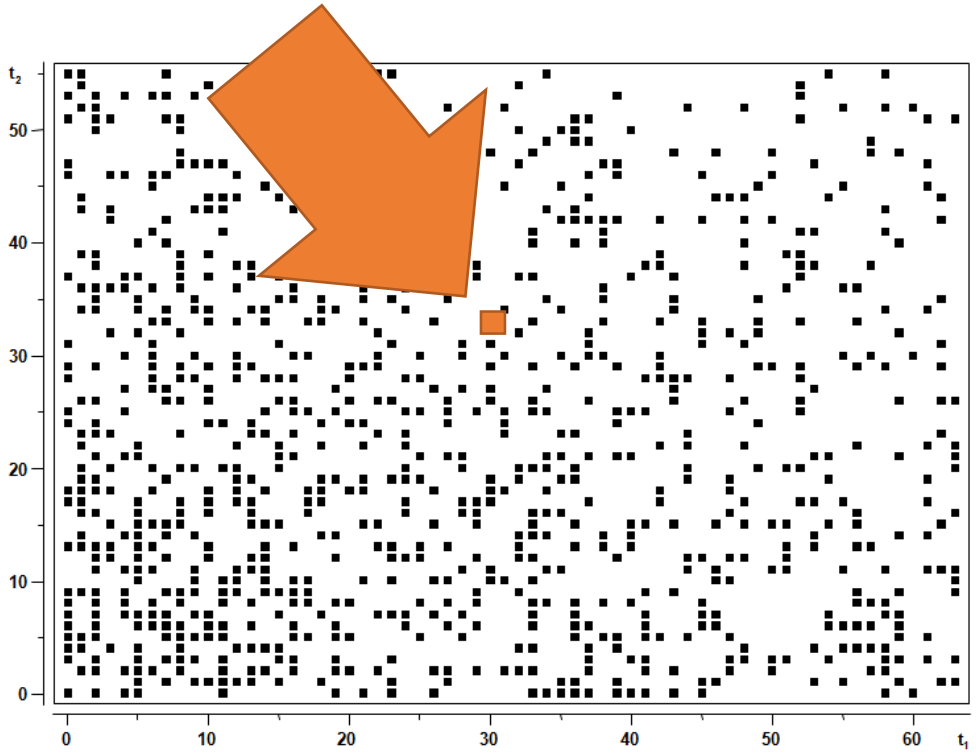
ARFluency - Implementation



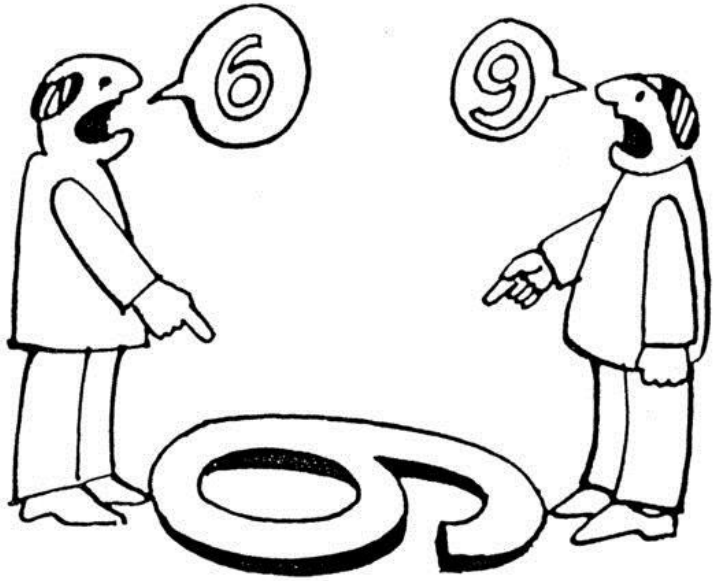
Experiments



Critique



Different perspectives



Many device configurations

Many device configurations

Many device configurations

Android is unpredictable

Android is unpredictable

“Mining Test Repositories for Automatic Detection of UI Performance Regressions in Android Apps“

13th International Conference on Mining Software Repositories (MSR'16), May 2016, Austin, Texas, United States. IEEE, 2016, Proceedings of the 13th International Conference on Mining Software Repositories.

“Mining Test Repositories for Automatic Detection of UI Performance Regressions in Android Apps“

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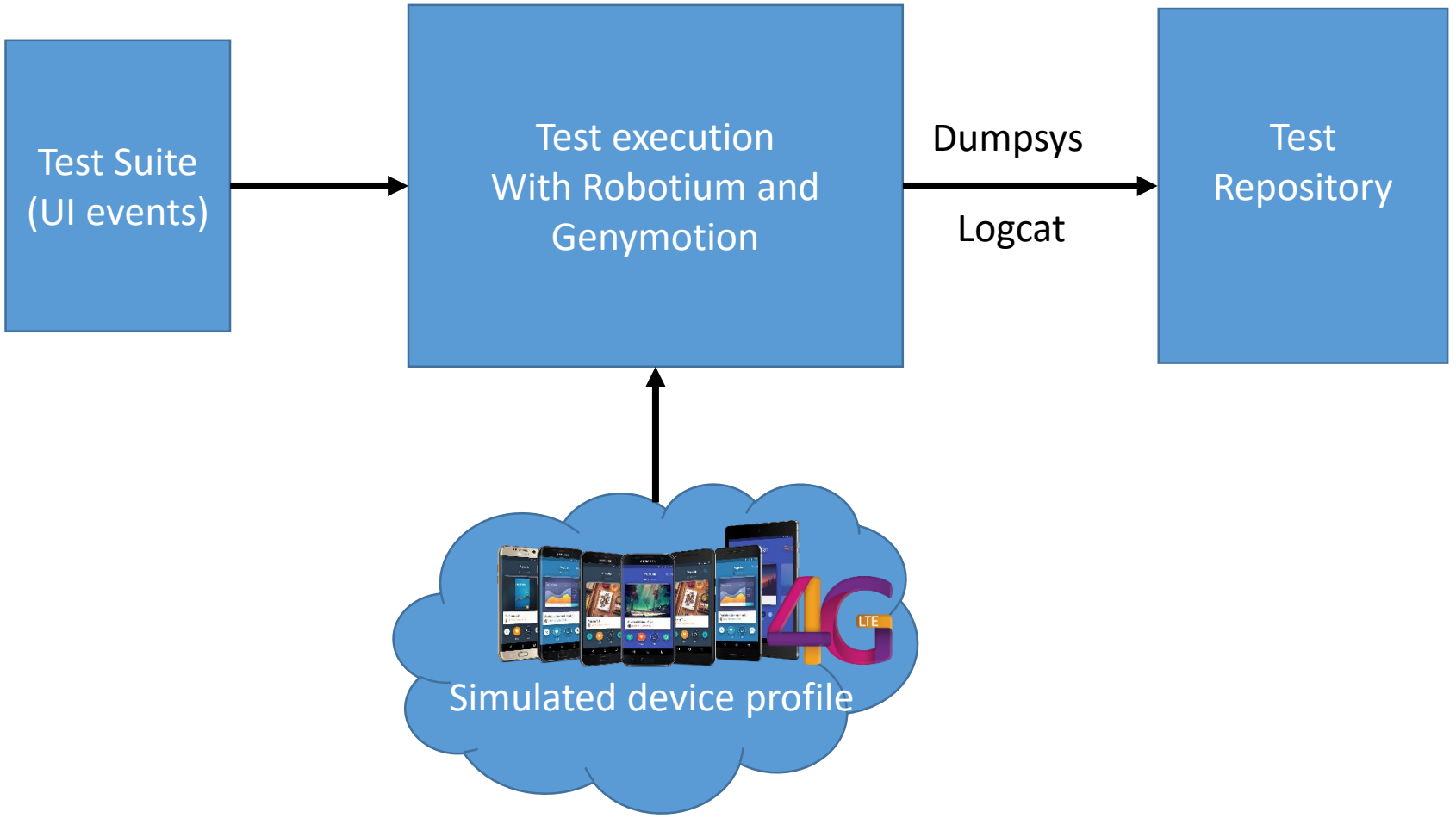
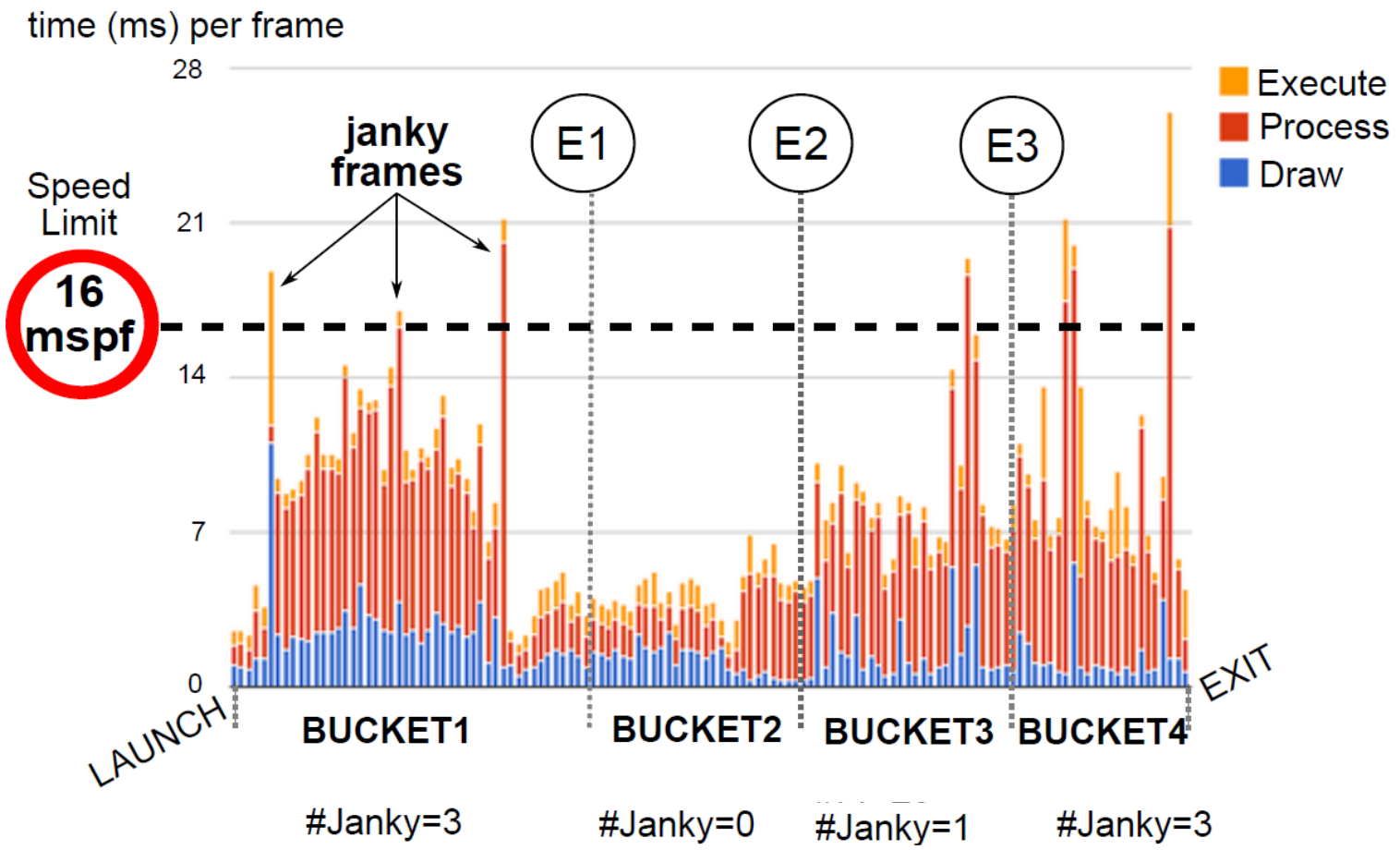
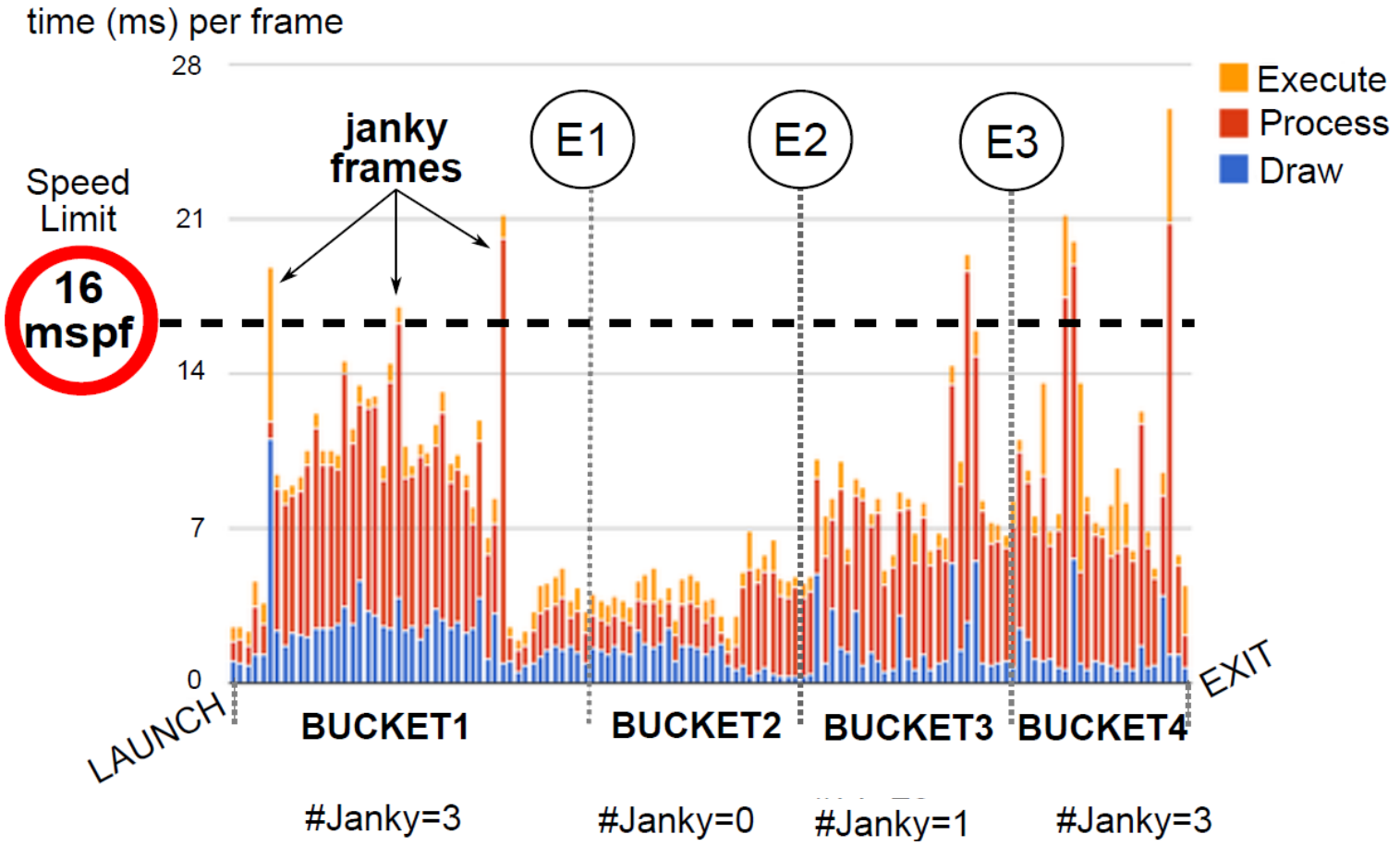
Automated Testing

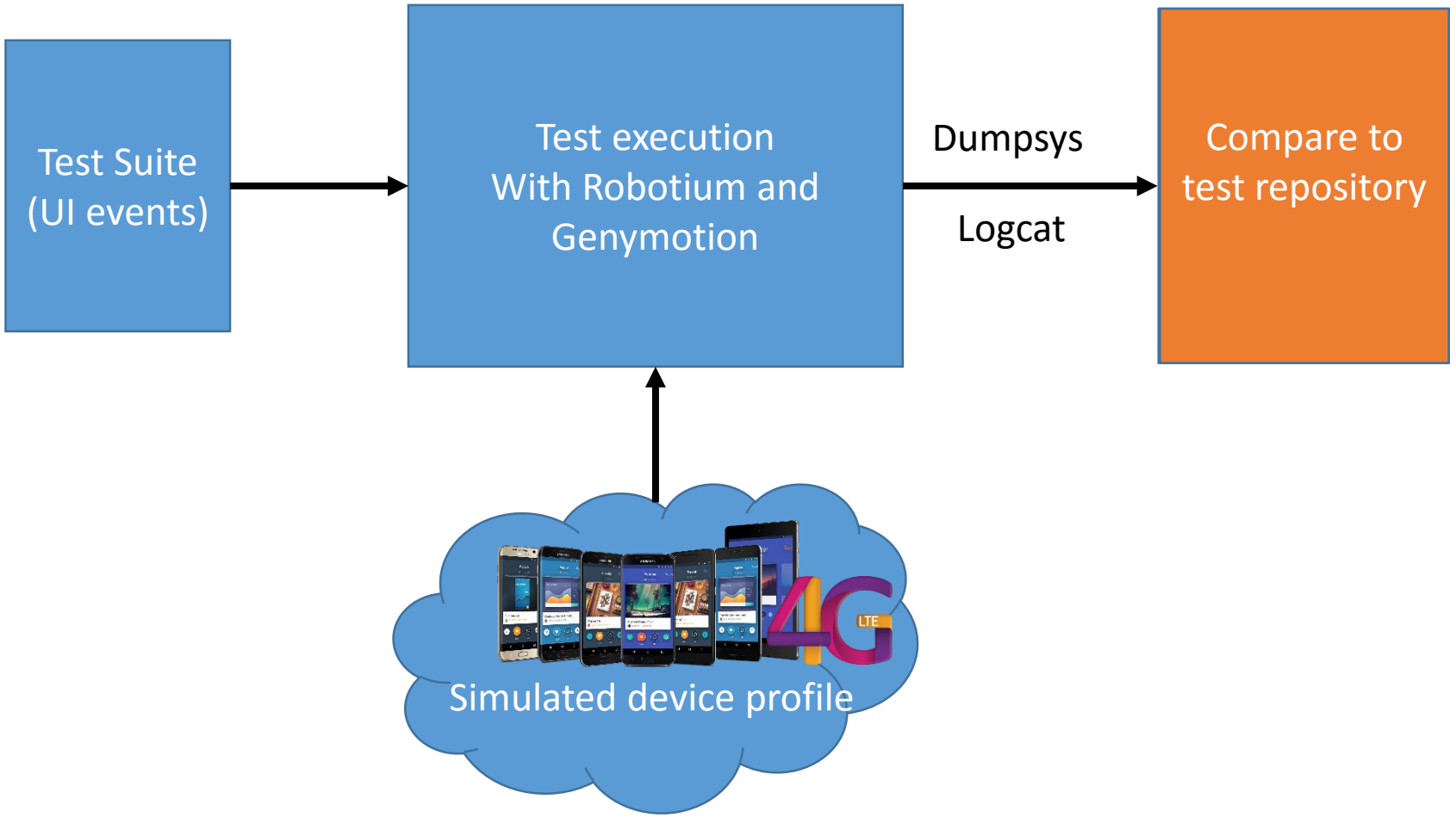



time (ms) per frame
28
21
14
7
0
Speed Limit
16 mspf
janky frames
E1
E2
E3
Execute
Process
Draw
LAUNCH
BUCKET1
BUCKET2
BUCKET3
BUCKET4
EXIT
#Janky=3
#Janky=0
#Janky=1
#Janky=3



[v1, 4.1, samsung, S3, x86, wifi]

Automated Testing



Finding similar configurations

[v1; 4:1; samsung; S3; x86; wifi]

Finding similar configurations

[v1; 4:1; samsung; S3; x86; wifi]
[v1:2; 4:1; samsung; S3; x86; wifi]

Finding similar configurations

[v1; 4:1; samsung; S3; x86; wifi]
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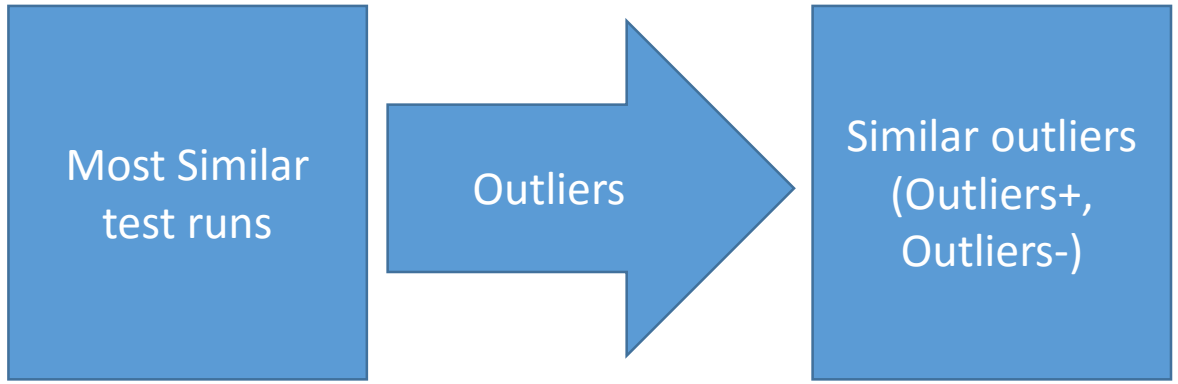
Finding similar configurations

[v1; 4:1; samsung; S3; x86; wifi]
[v1:2; 4:1; samsung; S3; x86; wifi]
[v1:1; 4:1; samsung; S3; x86; wifi]
[v1; 4:2; samsung; S3; x86; wifi]
[v1:2; 4:1; samsung; S3; x86; 4G]

Finding outliers



Association Rule Mining

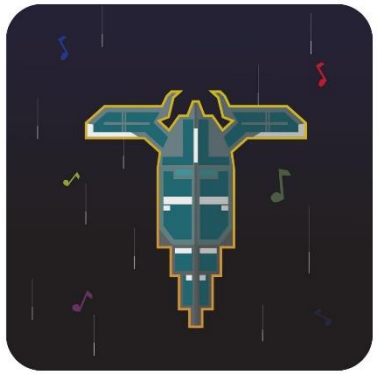
V5.0.0 => Outlier-

Wifi => Outlier+

Evaluation

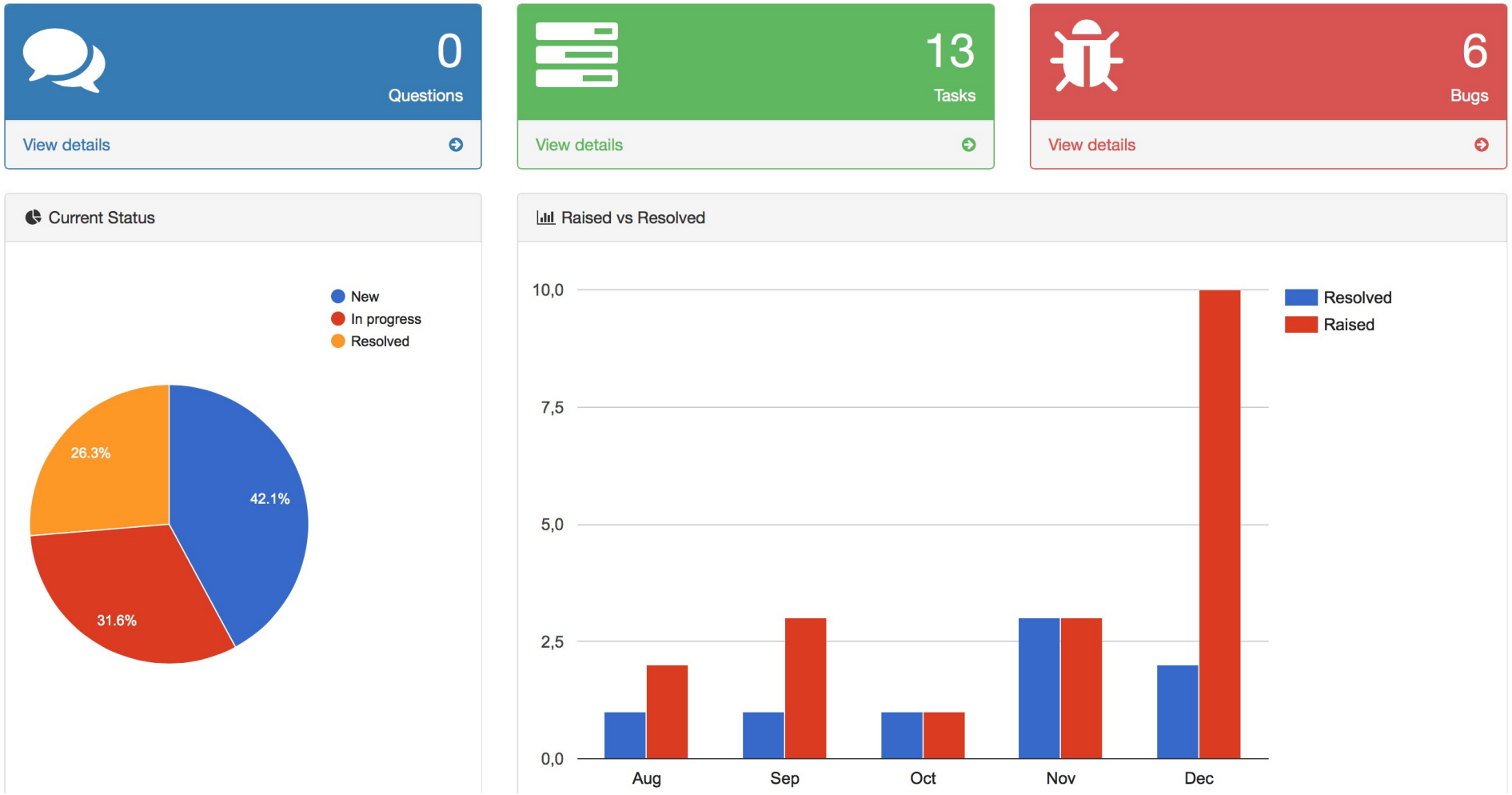
Exo-Player

Space Blaster



K-9 Mail client

Evaluation


0
Questions
View details
13
Tasks
View details
6
Bugs
View details
Current Status
New
In progress
Resolved
26.3%
42.1%
31.6%
Raised vs Resolved
10,0
7,5
5,0
2,5
0,0
Aug
Sep
Oct
Nov
Dec
Resolved
Raised

Evaluation

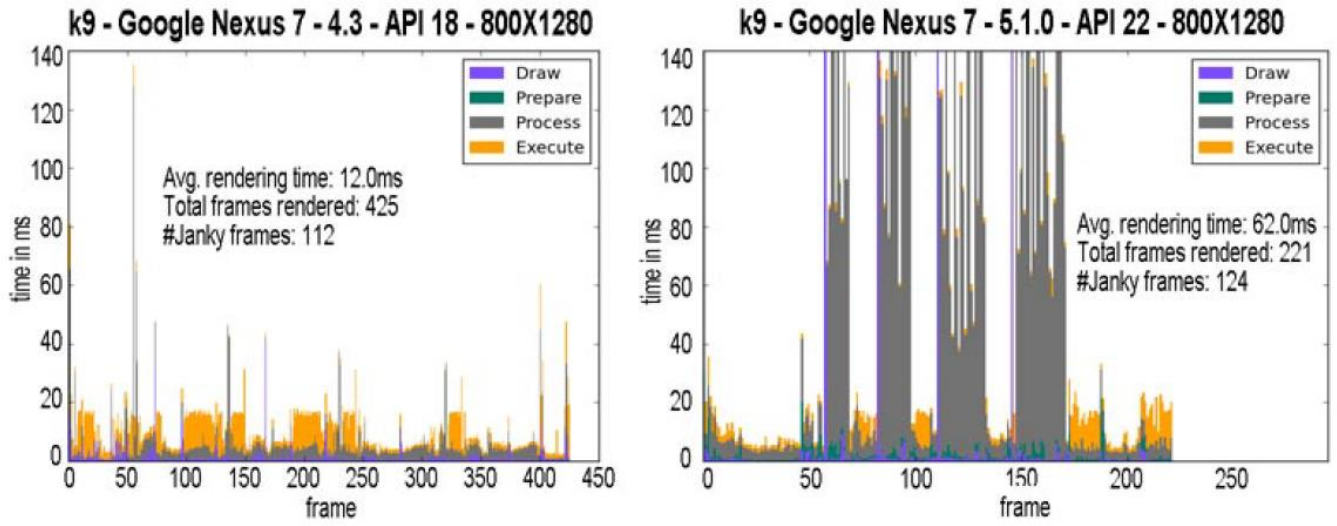
Device Lab

SDKs: 4.*

Upgraded Device Lab

SDKs: 5.*, 6.0.0

Experiment - Performance Degradation



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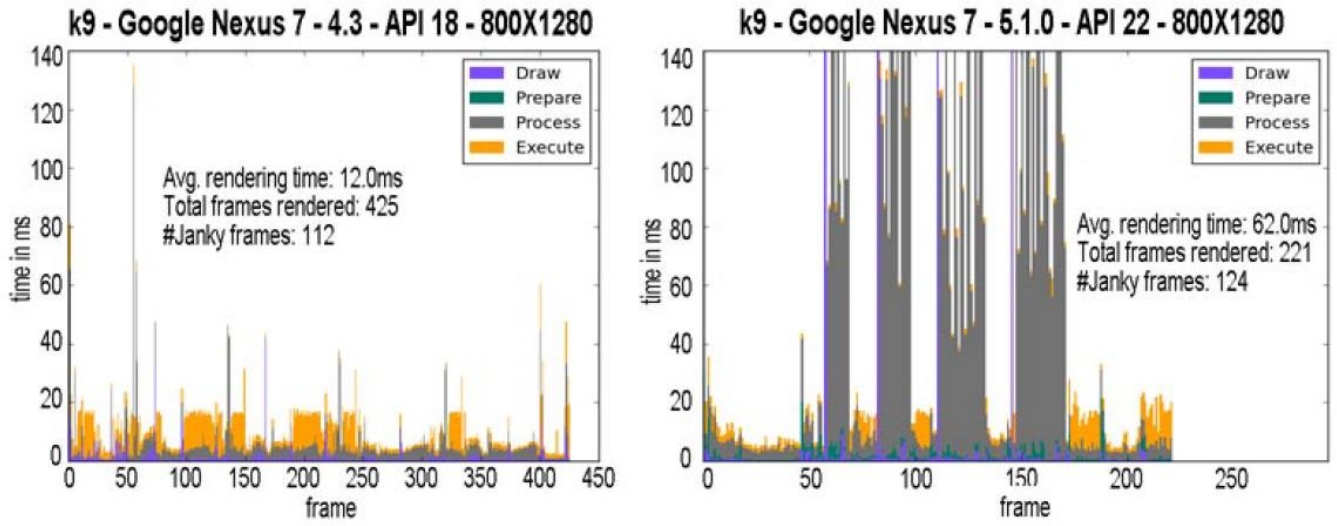
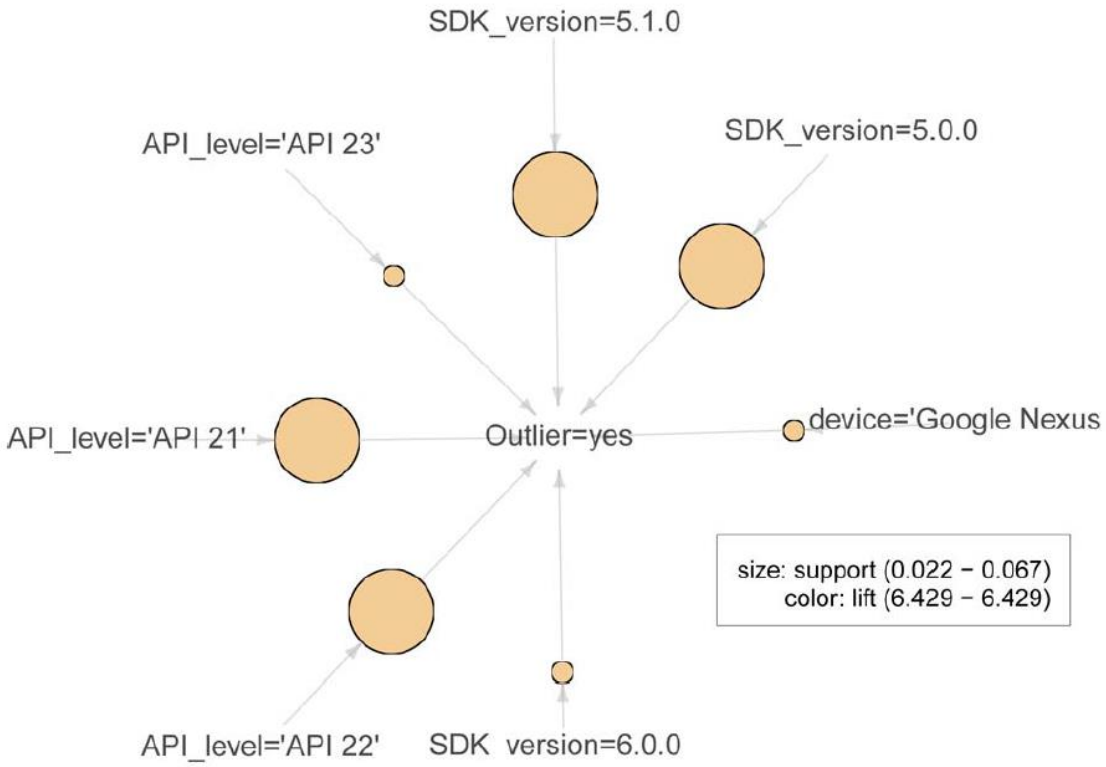
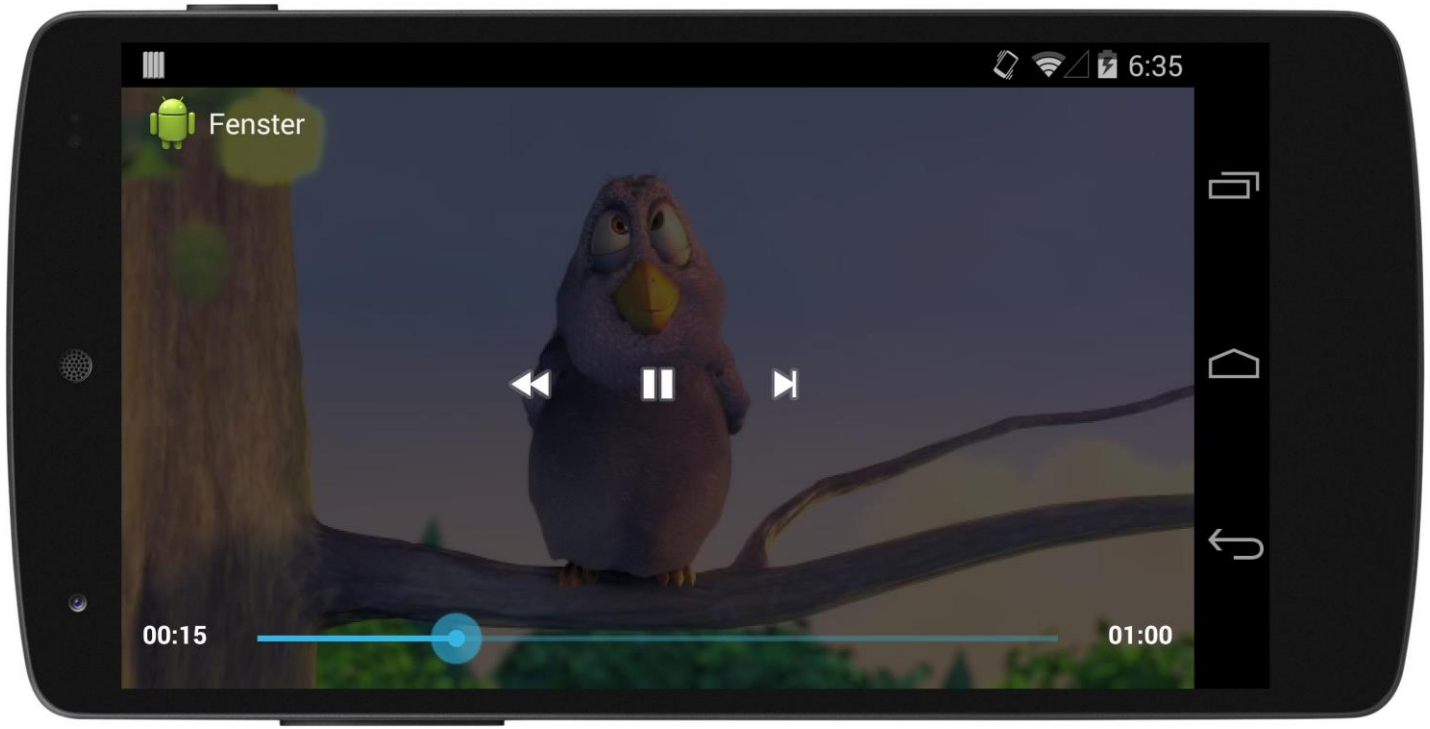


10/10

Experiment – Context isolation



Experiment – UI Event filtering

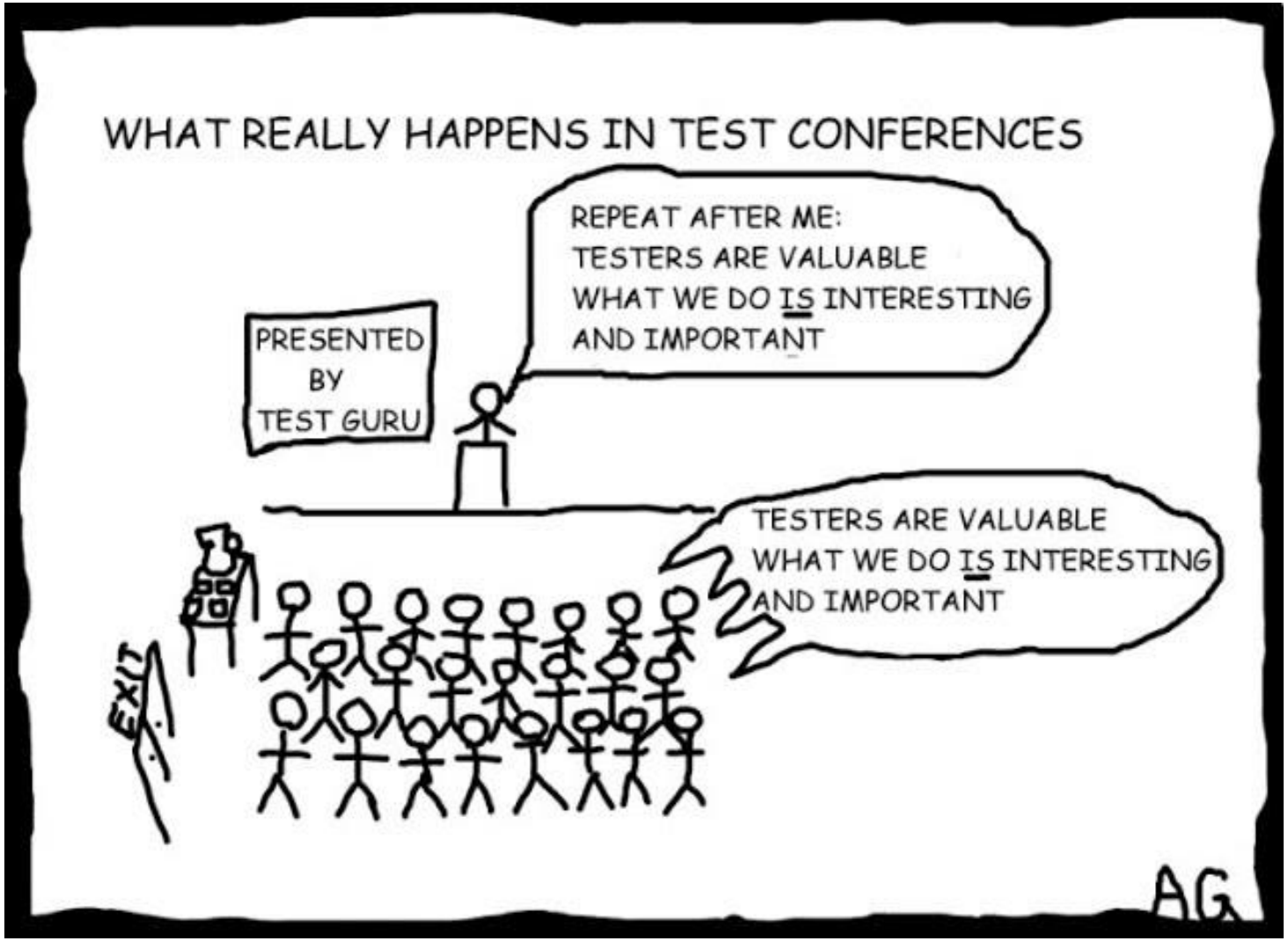


20 Events / 4 Janks

Precision: 53%
Recall: 83%

Critique

What you could do…

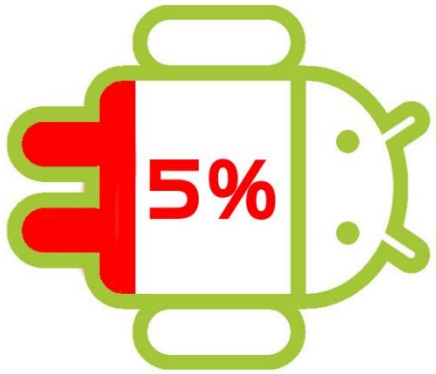

WHAT REALLY HAPPENS IN TEST CONFERENCES
REPEAT AFTER ME:
TESTERS ARE VALUABLE
WHAT WE DO IS INTERESTING
AND IMPORTANT
PRESENTED
BY
TEST GURU
TESTERS ARE VALUABLE
WHAT WE DO IS INTERESTING
AND IMPORTANT
EXIT
AG

“How Developers Detect and Fix Performance Bottlenecks in Android Apps“

Mario Linares-Vásquez, Christopher Vendome, Qi Luo, Denys Poshyvanyk
The College of William and Mary, Williamsburg, VA, USA

485 participants Sept 2015 > 1 year experience

Performance on Android



Energy leak

GUI Lagging

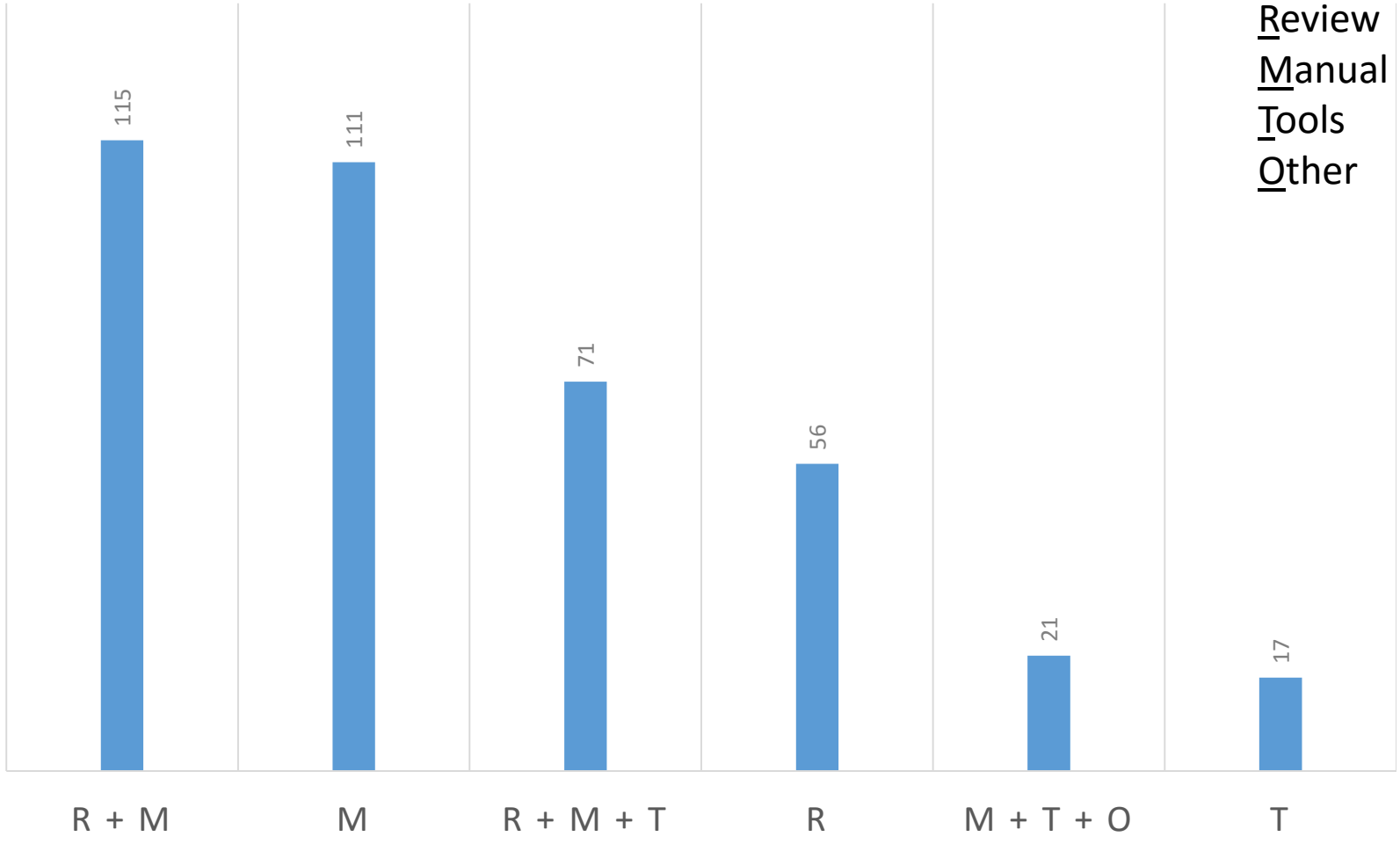
Memory Bloating

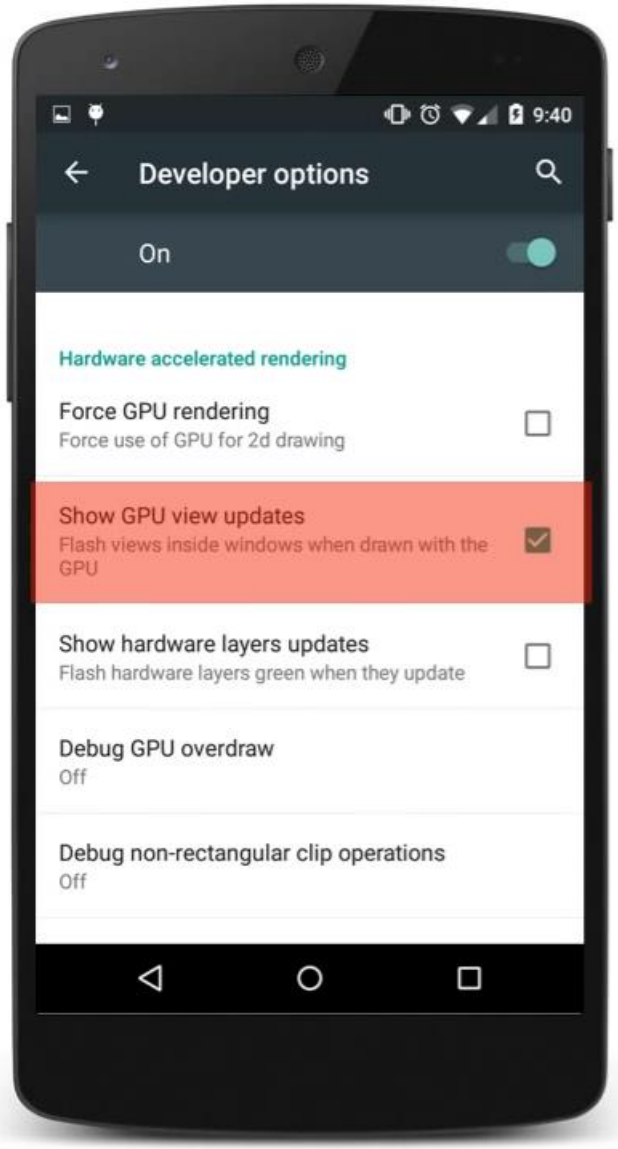
Datacollection

- **381,161** Java projects
- **16,331** potential repositories
- **24,340** contributors
- **628** survey responses
- **485** valid responses

Valid response rate: 2% (out of 24,340 contributors)

Preferred practices for detecting bottlenecks

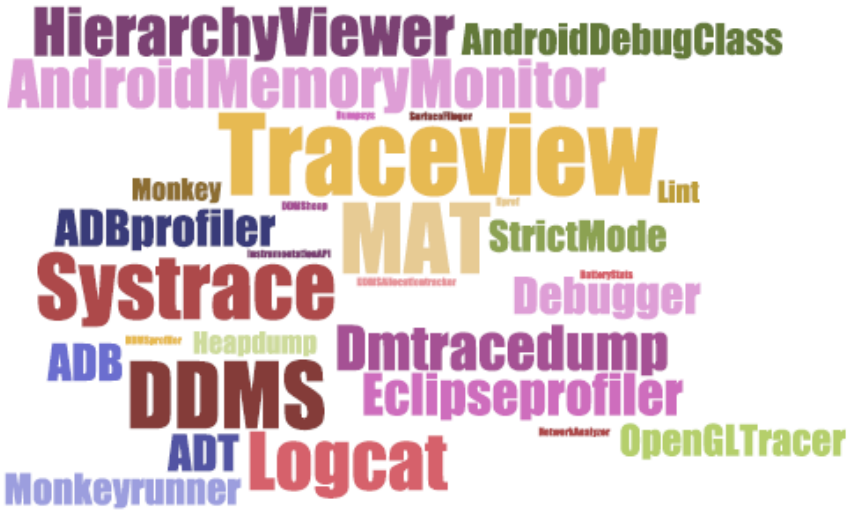



9:40
Developer options
On
Hardware accelerated rendering
Force GPU rendering
Force use of GPU for 2d drawing
Show GPU view updates
Flash views inside windows when drawn with the GPU
Show hardware layers updates
Flash hardware layers green when they update
Debug GPU overdraw
Off
Debug non-rectangular clip operations
Off

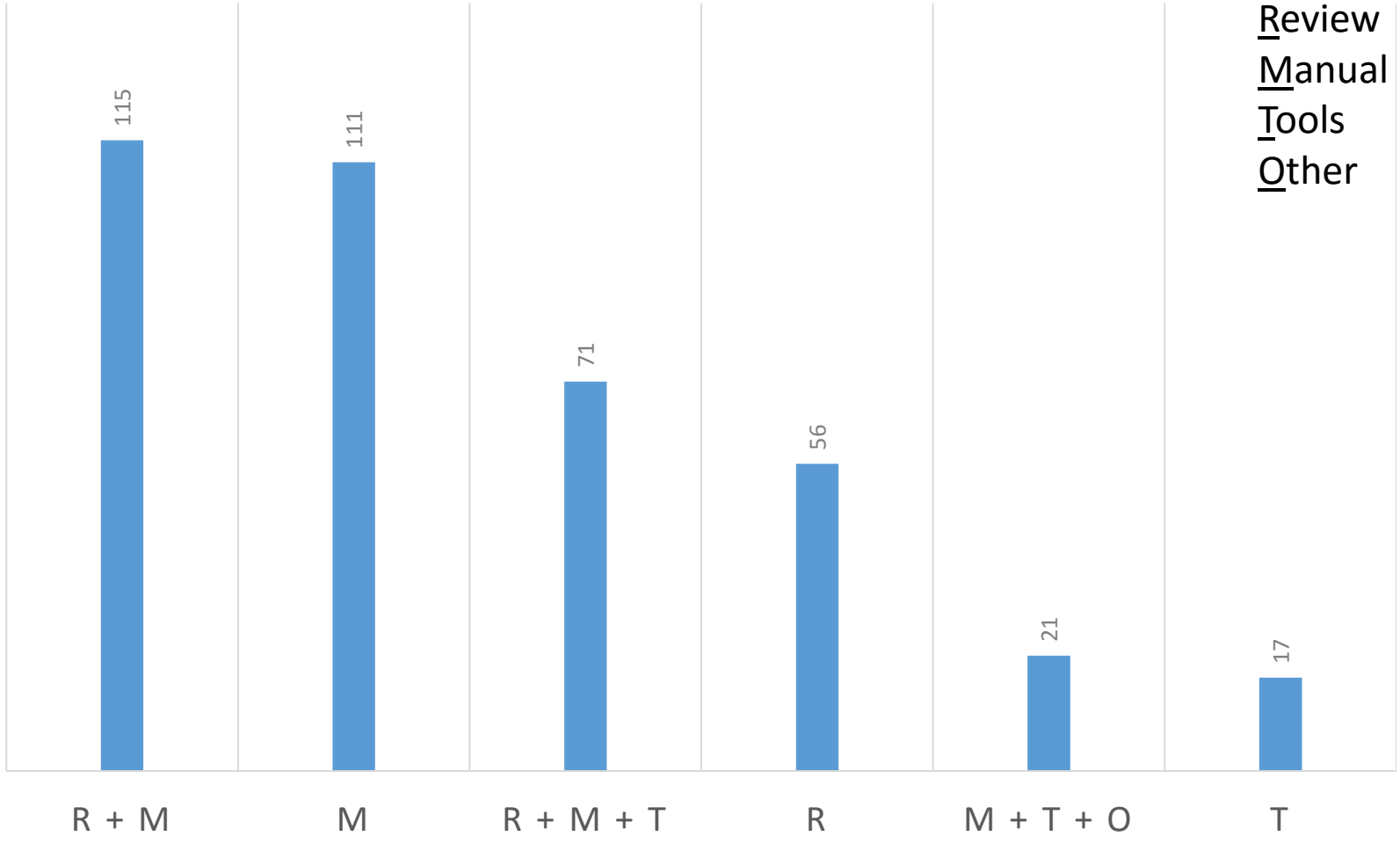

4:34
Chatum Latinum
Chatum Latinum
alex
15 mins ago
Lorem ipsum dolor sit amet, orci nullam cra
joanna
11 mins ago
Omnis aptent magnis suspendisse ipsum, semper egestas magna auctor maecenas
shailen
9 mins ago
eu nibh, rhoncus wisi posuere lacus, ad erat egestas quam, magna ante ultricies sem
alex
8 mins ago
rhoncus wisi posuere lacus, ad erat egestas quam, magna ante ultricies sem lacus
shailen
8 mins ago


1:24
Chatum Latinum
Chatum Latinum
alex
15 mins ago
Lorem ipsum dolor sit amet, orci nullam cra
joanna
11 mins ago
Omnis aptent magnis suspendisse ipsum, semper egestas magna auctor maecenas
shailen
9 mins ago
eu nibh, rhoncus wisi posuere lacus, ad erat egestas quam, magna ante ultricies sem
alex
8 mins ago
rhoncus wisi posuere lacus, ad erat egestas quam, magna ante ultricies sem lacus
shailen
8 mins ago

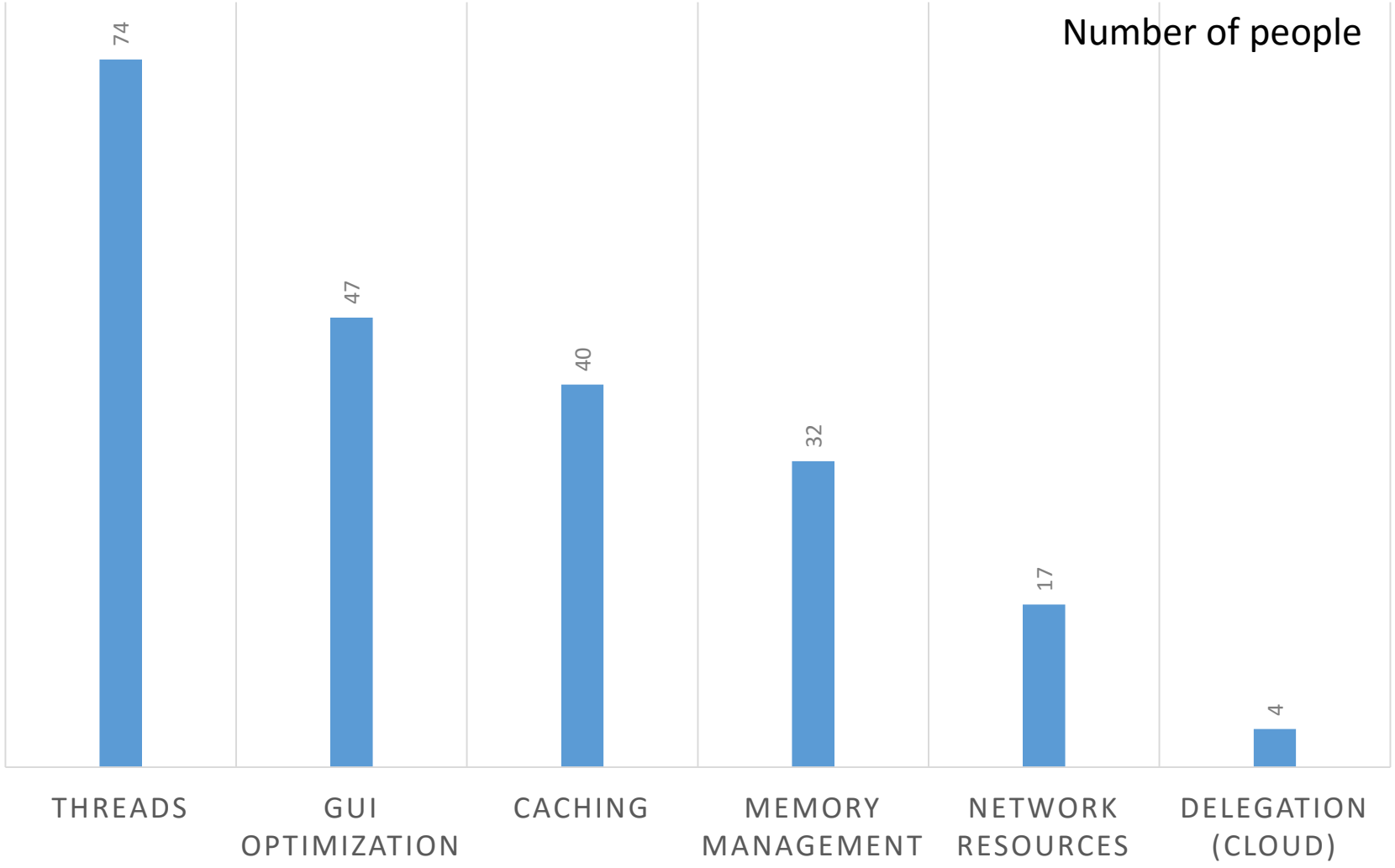
There are many tools available!



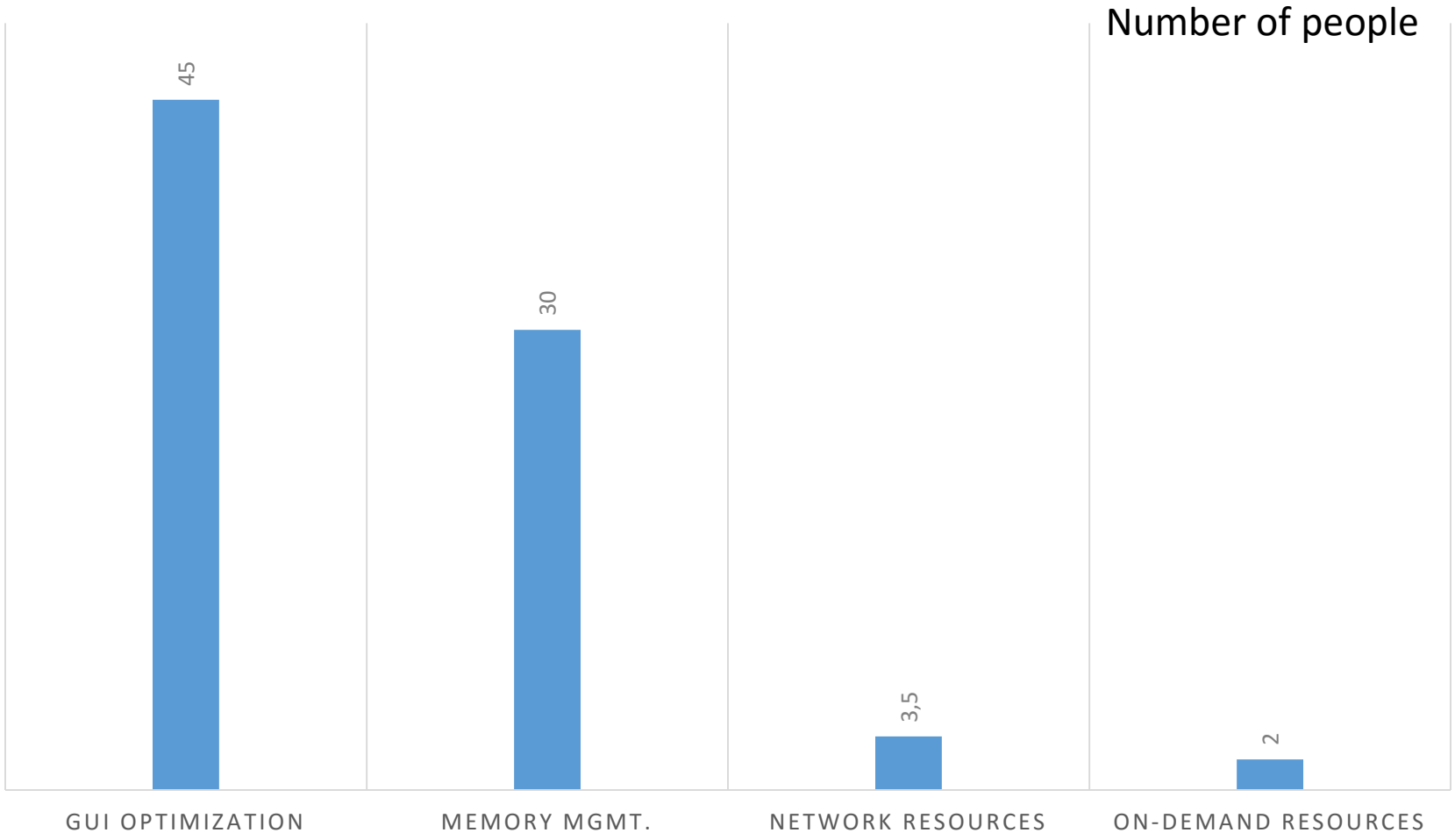
Preferred practices for detecting bottlenecks



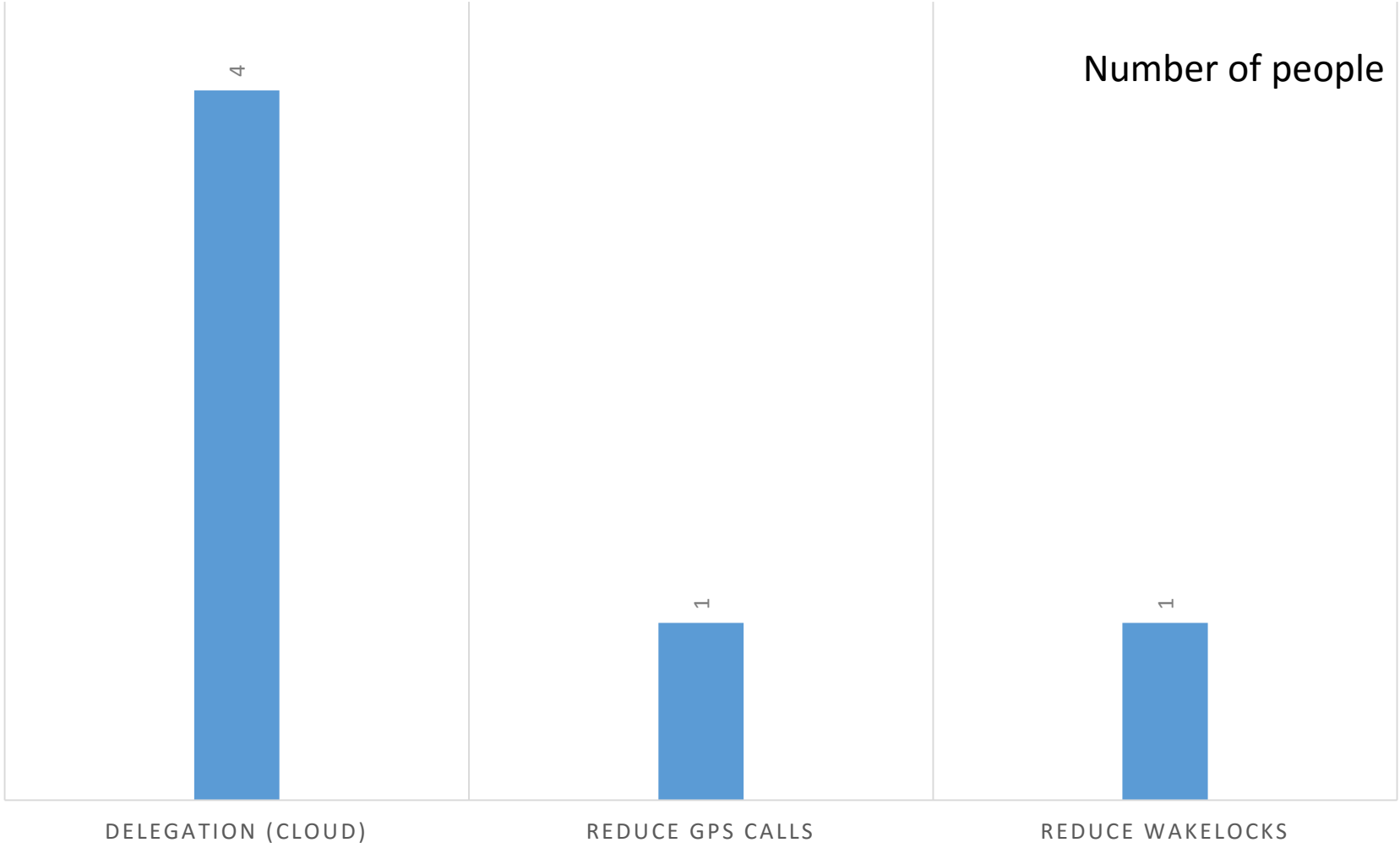
GUI Lagging: Solution Practices



Memory bloat: Solution Practices



Energy leak: Solution Practices



Critique


THEORY


REALITY

Papers & Sources

- **Mining test repositories for automatic detection of UI performance regressions in Android apps**
  María Gómez, Romain Rouvoy, Bram Adams and Lionel Seinturier. MSR 2016.
- **How developers detect and fix performance bottlenecks in Android apps**
  Mario Linares-Vásquez, Christopher Vendome, Qi Luo and Denys Poshyvanyk. ICSME 2015.
- **Analyzing GUI running fluency for Android Apps**
  Tian Huang, Zhenyu Zhang and Xue-Yang Zhu. MSCC 2016.
- **Android developers**
  https://developer.android.com/index.html