



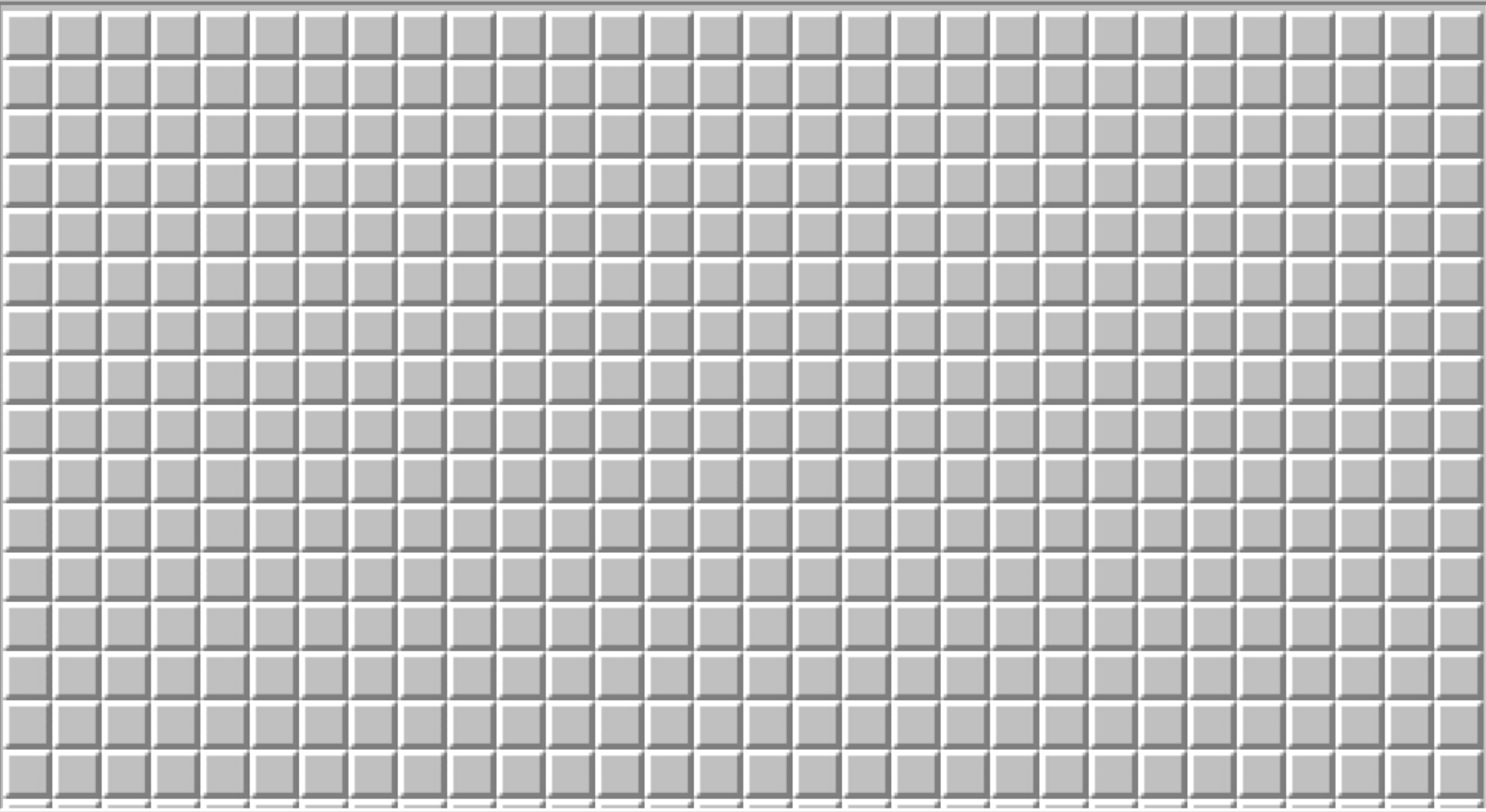
Measuring Performance

Igor Mandrigin, Opera

An overview of...

1. Apple's "Instruments".
2. How to measure UI responsiveness.
3. How to measure startup time.
4. Performance Monitoring

Your decisions to optimize
should be *based on data*.



Pitfalls of premature optimization

1. It is hard to find the issues.
2. Every performance optimization makes code more complex.

1. Instruments

Choose a profiling template for: imbp > All Processes

Standard

Custom

Recent

Filter



Blank



Activity Monitor



Allocations



Automation



Cocoa Layout



Core Animation



Core Data



Counters



Energy Log



File Activity



GPU Driver



Leaks



Metal System
Trace



Network



OpenGL ES
Analysis



System Trace



System Usage



Time Profiler



Time Profiler

Performs low-overhead time-based sampling of processes running on the system's CPUs.

Open an Existing File...

Cancel

Choose

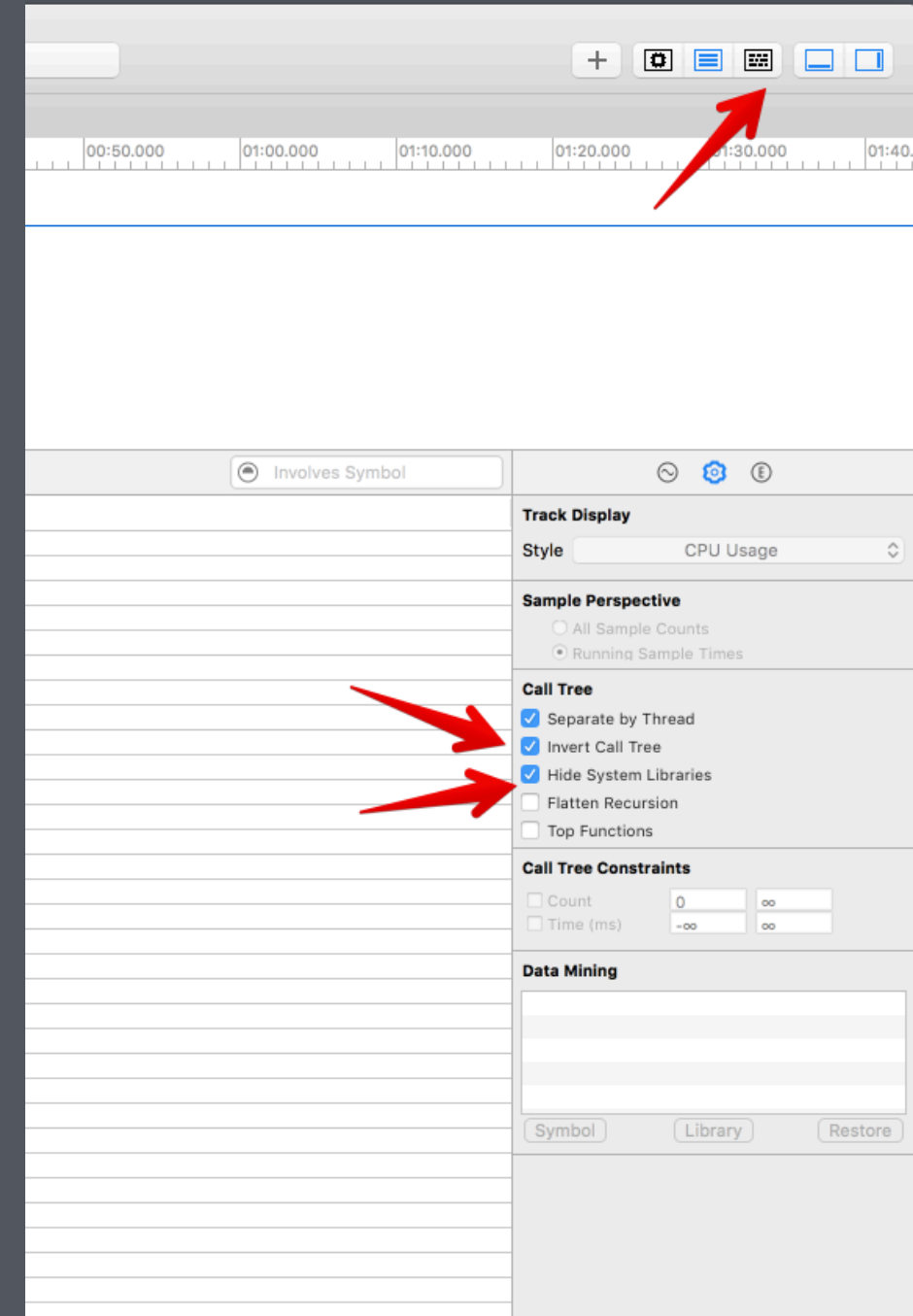
Time Profiler instrument

1. Release builds.
2. Device, not simulator.

WWDC 412 (2015)

WWDC 418 (2014)

WWDC 309 (2010)



Choose a profiling template for: imbp > All Processes

Standard

Custom

Recent

Filter



Blank



Activity Monitor



Allocations



Automation



Cocoa Layout



Core Animation



Core Data



Counters



Energy Log



File Activity



GPU Driver



Leaks



Core Animation

This template measures application graphics performance as well as CPU usage of a process via time profiling.

Open an Existing File...

Cancel

Choose

Core Animation instrument

1. Release builds.
2. Device, not simulator.

Rendering Pipeline! (WWDC 419)

Choose a profiling template for: imbp > All Processes

Standard

Custom

Recent

Filter



Blank



Activity Monitor



Allocations



Automation



Cocoa Layout



Core Animation



Core Data



Counters



Energy Log



File Activity



GPU Driver



Leaks



Allocations

Tracks a process' anonymous virtual memory and heap, providing class names and optionally retain/release histories for objects.

Open an Existing File...

Cancel

Choose

Allocations instrument

1. Profile Debug builds.
2. You can use Simulator.

WWDC 418 (Generational analysis)

Recap

- 3 instruments to use: Time Profiler, Allocations, CoreAnimation
- Watch WWDC videos:
 - 309 (2010)
 - 418 (2014)
 - 419 (2014)
 - 412 (2015)

2. Responsiveness

How free is your main queue?

```
auto gq = dispatch_get_global_queue(DISPATCH_QUEUE_PRIORITY_BACKGROUND, 0);
auto uiq = dispatch_get_main_queue();

dispatch_async(gq) {
    // request the thumbnail
    dispatch_async(uiq) {
        // update the UI
        dispatch_async(gq) {
            // get full-res image
            dispatch_async(gq) {
                // update the UI
            }
        }
    }
}
```

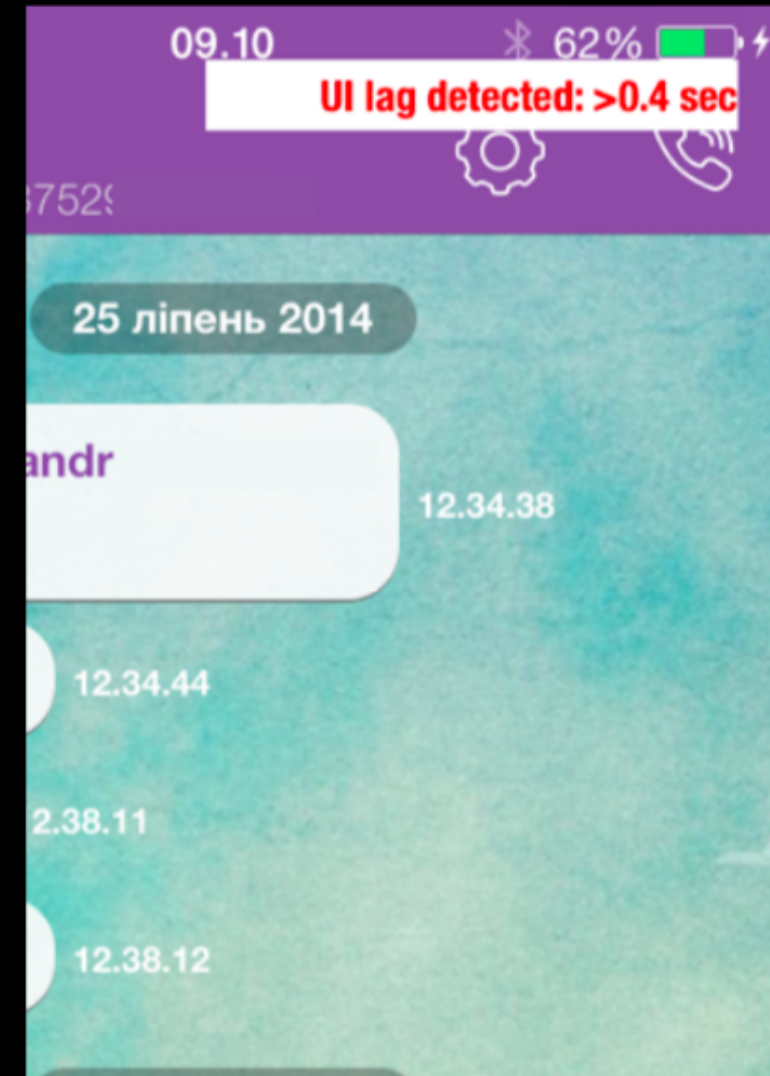


```
auto gq = dispatch_get_global_queue(DISPATCH_QUEUE_PRIORITY_BACKGROUND, 0);
auto uiq = dispatch_get_main_queue();

dispatch_async(gq) {
    // request the thumbnail
    dispatch_async(uiq) {
        // update the UI
        dispatch_async(gq) {
            // get full-res image
            dispatch_async(uiq) {
                // update the UI
            }
        }
    }
}
```

Main thread profiler

- UI events are handled in main thread so it should be responsible
- Every 0.1 sec run a block on main thread queue.
- If block execution is delayed, dump backtrace in log and show notification in UI



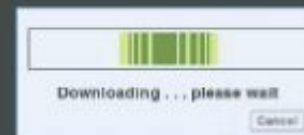
Copyrighted Material



Designing and Engineering Time



The Psychology of Time Perception in Software



Steven C. Seow, Ph.D.

Copyrighted Material

Recap

- Keep your main queue responsive.
- Async code is hard and fragile. Be pragmatic.

3. Startup time

Starting up: 4 phases

```
(int)main(int argc, char *argv[])
```

- [AppDelegate application:
didFinishLaunchingWithOptions:]
- [UIViewController loadView]
- [UIViewController viewDidLoad]
- [AppDelegate applicationDidBecomeActive:]



Opera Mini



Mortal Kombat X



windows app in gola

ALL

VIDEOS

NE

Getting Started - The

<https://golang.org> >

Mobile-friendly - Windo

MinGW gcc[†]. No need

installed correctly by se

a simple program, as fo

[Downloads](#) - [How to W](#)

Google equips Go w

platform UI | InfoWo

www.infoworld.com

Mobile-friendly - Mar 3

Development ... Keep u

InfoWorld's Application

allow Go to use GUI ele

WindowsCrossCom

<https://github.com> >

Build windows exe



When is your app fully loaded?

Technical

vs.

User

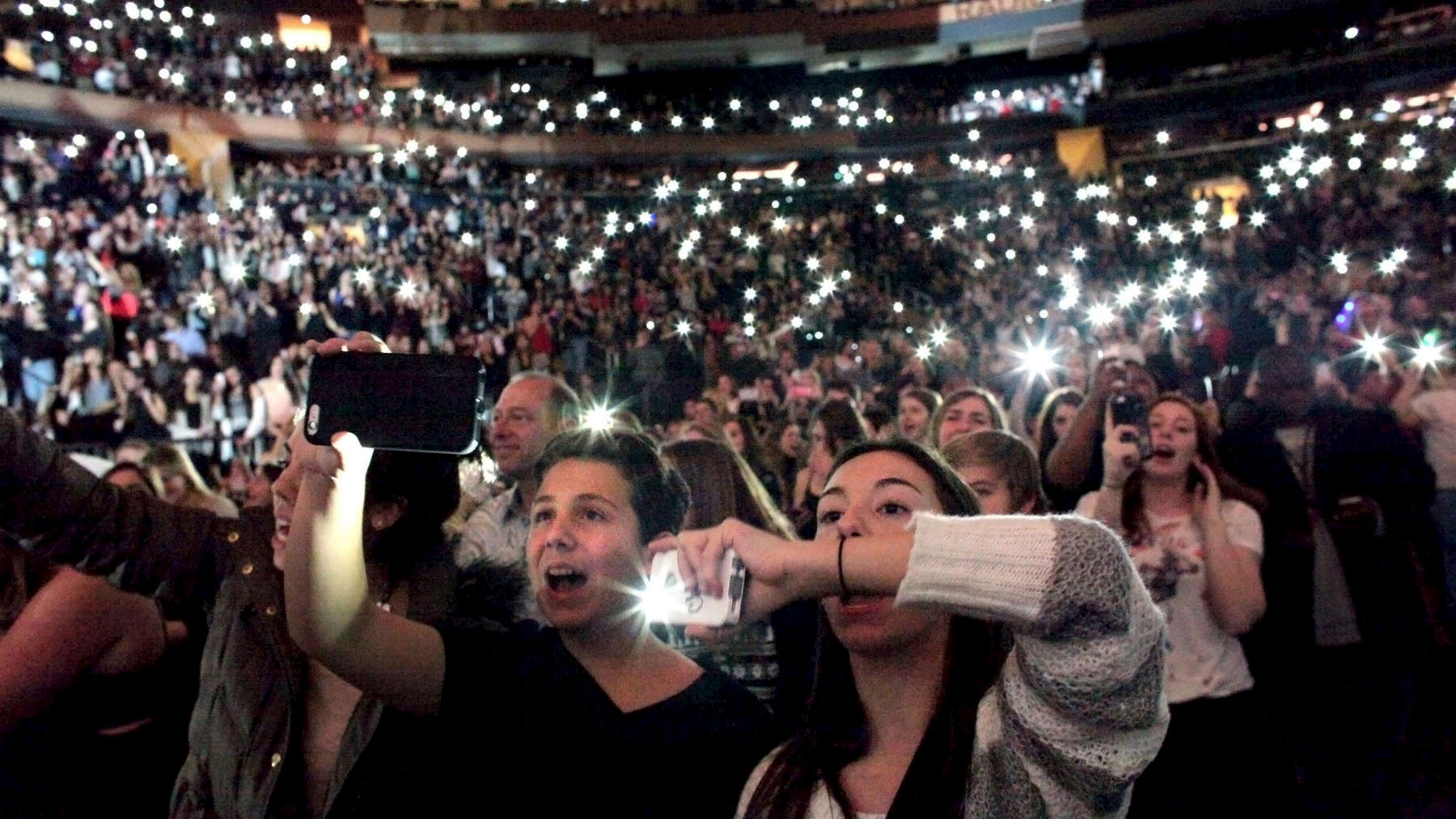


Recap

- Know how the app starts.
- Measure your startup time under pressure.
- Be honest. Measure time until the app is actually *usable*.

4. Monitoring Performance







It is impossible to simulate
everything on-site.



Performance Monitoring

Performance Monitoring

Analytics SDKs

What to report to Analytics?

- Startup time & phases.
- Lengths of the operations when the UI is blocked or unusable.
- Number of memory warnings/FOOMS.

Recap

- It is impossible to simulate everything.
- Report performance metrics to analytics packages.

Conclusions

1. Know instruments.
2. Watch for startup time.
3. Get the data from your audience.

Conclusions

1. Know instruments.
2. Watch for startup time.
3. Get the data from your audience.
4. **Your decisions to optimize should be *based by data*.**





Thank you!

@mandrigin
(twitter, medium)