



Android Profiler

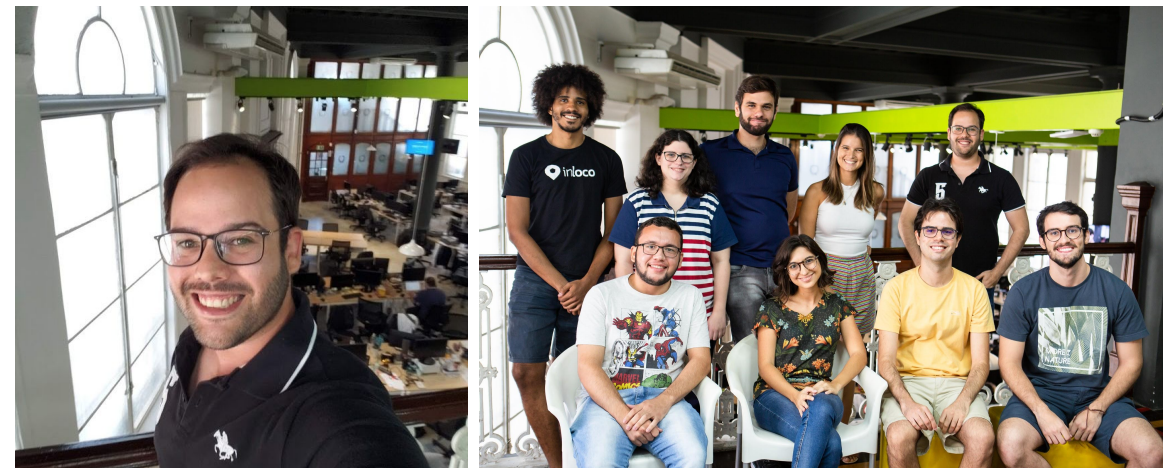
Identificando problemas de performance

Pedro Atanásio

Mini bio

Engenheiro de Software na In Loco

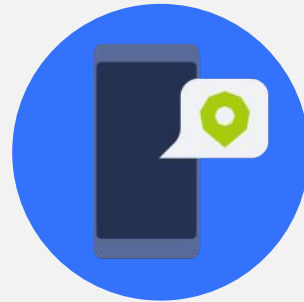
*Formado em Engenharia da Computação
pelo Centro de Informática da Universidade
Federal de Pernambuco*



Quem somos?



60 MM
usuários únicos
em nossa base



16 TB
de dados colhidos
diariamente



1.5 BI
visitas
registradas
mensalmente



+25MM
endereços
mapeados no
mundo





Performance


O que é performance?



App abre rápido!

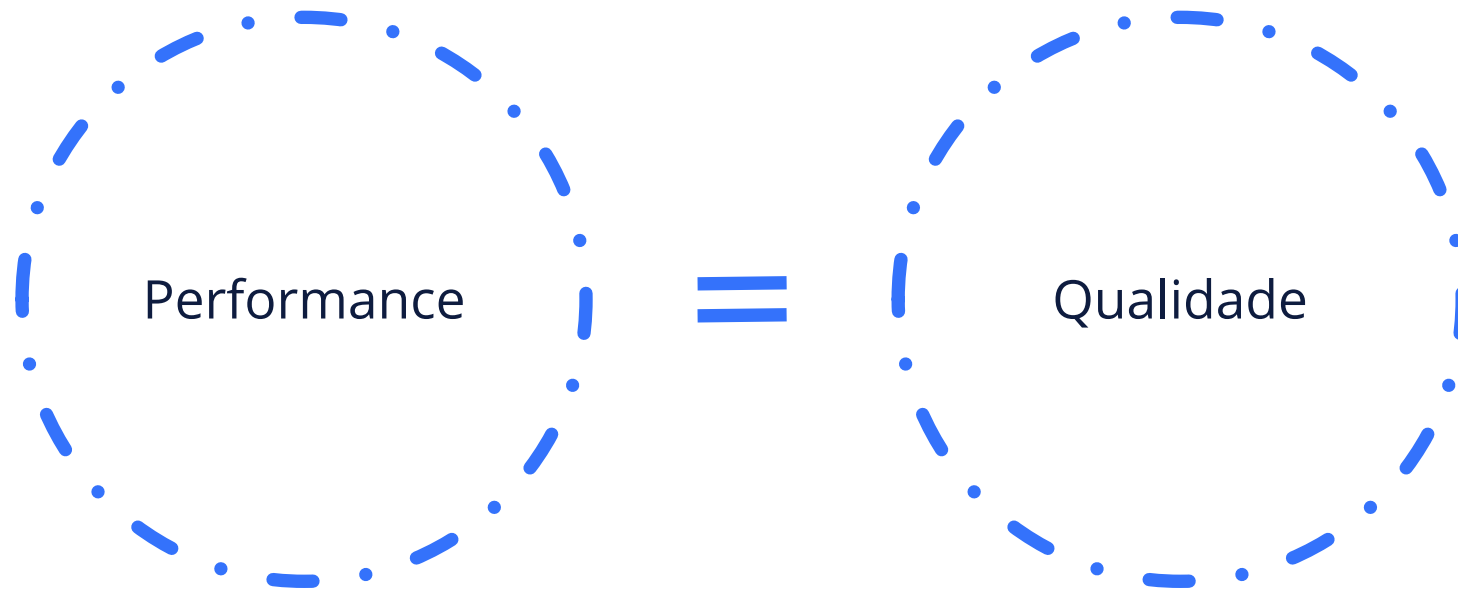


App não trava!



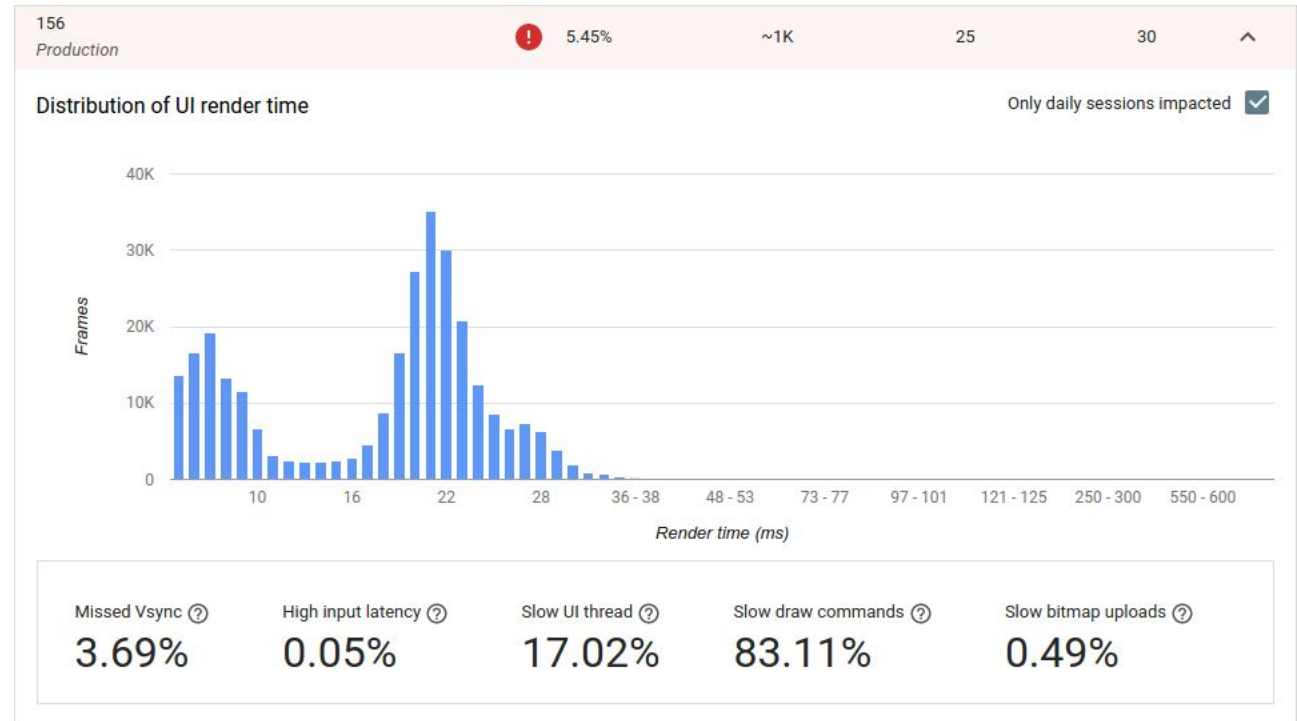
App não detona
minha bateria!

O que é performance?



Android Vitals

- Taxa de crashes
- Taxa de ANRs
- Ativações excessivas
- Tempo de inicialização
- Renderização lenta
- E outras....



Como melhorar?



Prevenir



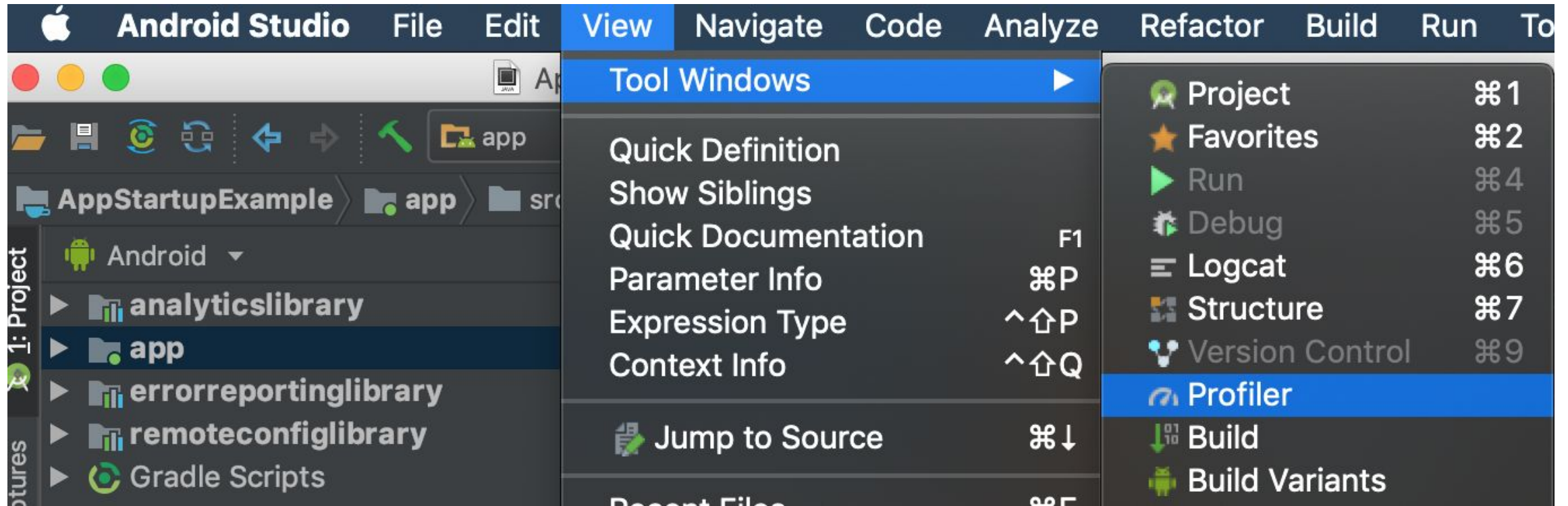
Medir



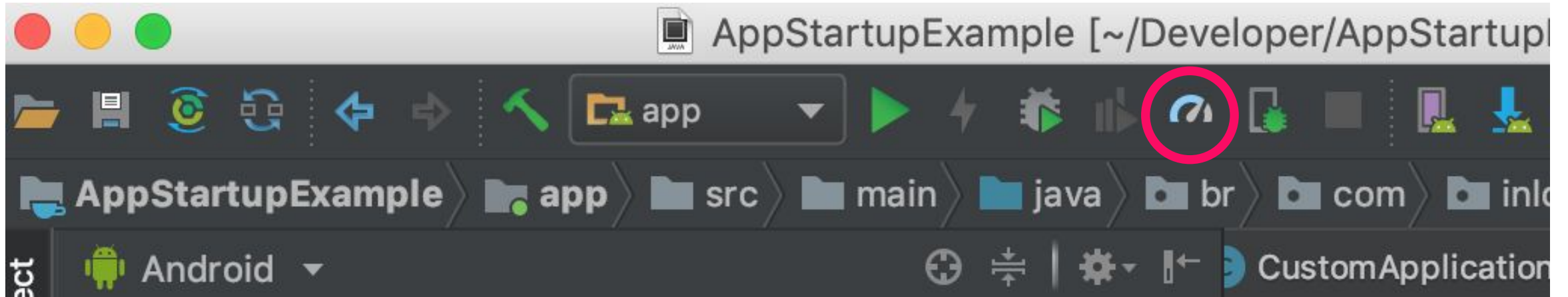
Agir



Android Profiler



Android Profiler



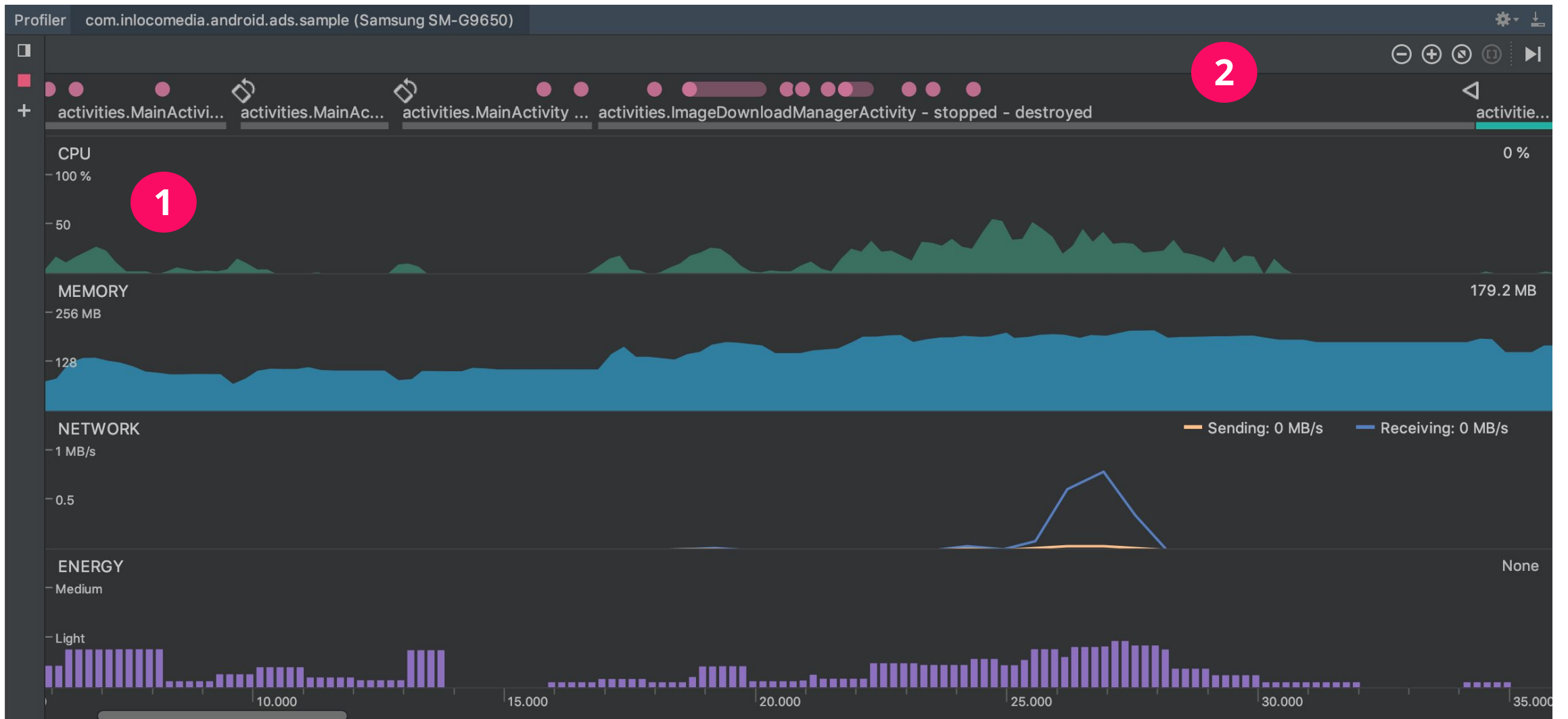
Android Profiler

The screenshot displays the Android Studio Profiler interface for a Samsung SM-G9650 device. The top section shows the project structure and the source code for MainActivity.java, with the line `MainActivity.this.startActivity(intent);` highlighted. Below the code, the Profiler tracks the lifecycle of activities: MainActivity, DetailActivity, and MainActivity (stopped - saved). The main chart area shows four metrics over a 30-second period:

- CPU:** 0% usage.
- MEMORY:** 64.4 MB usage.
- NETWORK:** 32 KB/s, with 0 KB/s for both sending and receiving.
- ENERGY:** Medium usage, indicated by purple bars at the bottom.

The bottom status bar shows the Gradle build finished in 7 s 498 ms (2 minutes ago) and the system time as 24:6.

Android Profiler

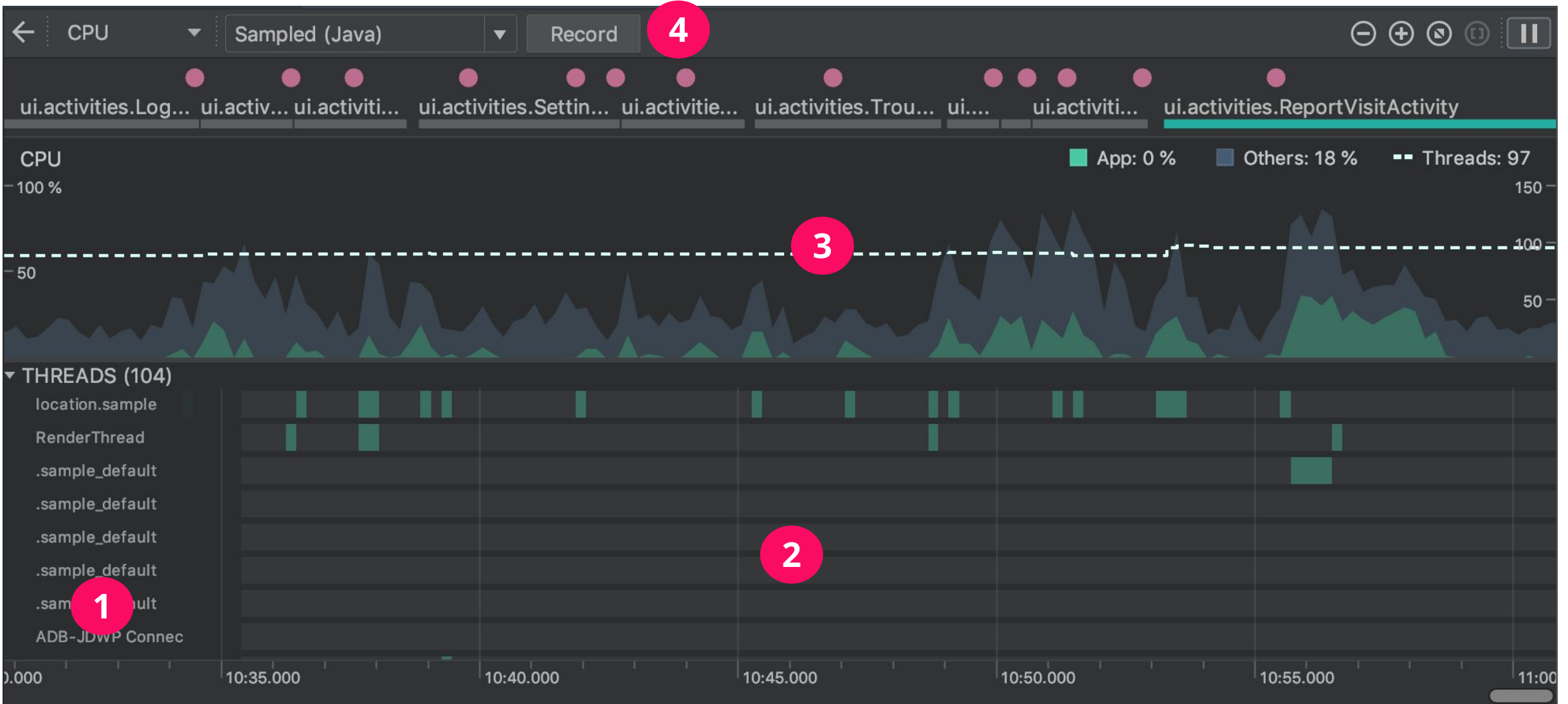


Timeline Unificada





Profiler de CPU



CPU

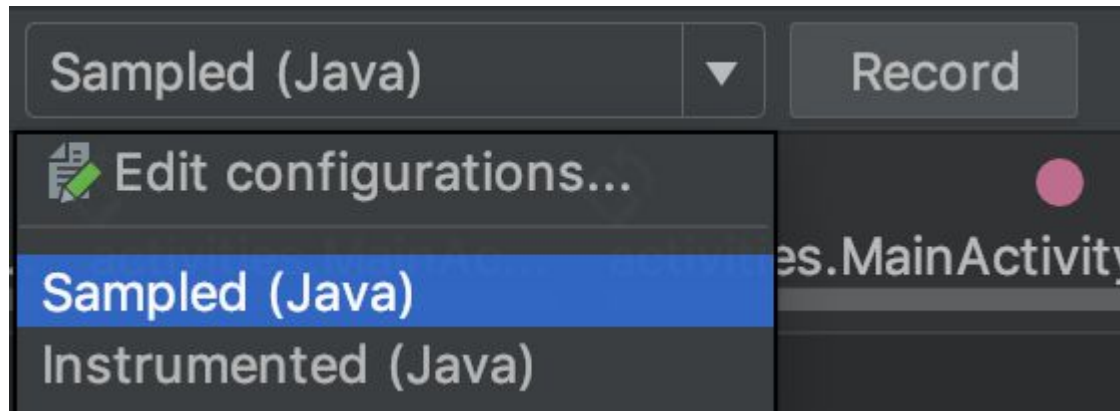


Method Tracing

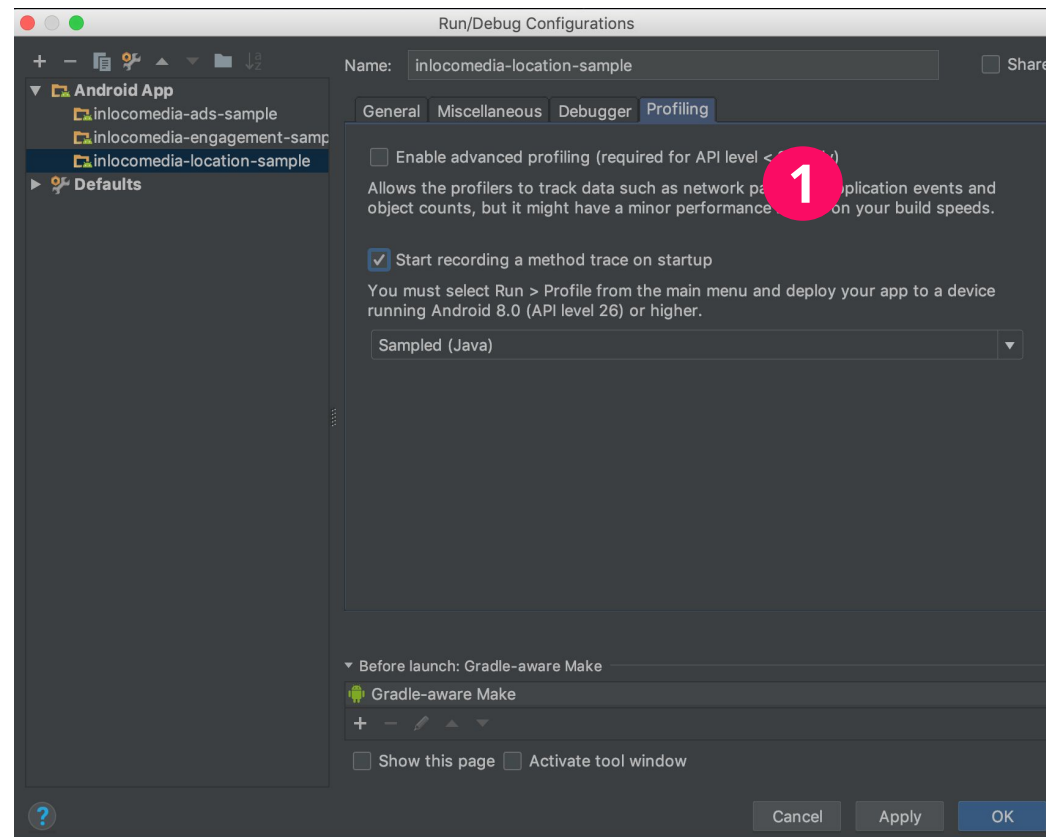
Call Chart	Flame Chart	Top Down	Bottom Up
br.com.Inloco.appstartupexample.CustomApplication.onCreate			
br.com.Inloco.remoteconfiglibrary.RemoteConfigLibrary.init			
c.a.t.p.s.n.h.HttpURLConnection\$.connect	com.android.tools.profiler.support.network.httpurl.HttpURLConnection\$.getInputStream		
c.a.t.p.s.n.h.T.connect	com.android.tools.profiler.support.network.httpurl.TrackedHttpURLConnection.getInputStream		
c.a.o.l.h.HttpURLConnectionImpl.connect	com.android.okhttp.internal.huc.HttpURLConnectionImpl.getInputStream		
c.a.o.l.h.D.connect	com.android.okhttp.internal.huc.DelegatingHttpURLConnection.getInputStream		
c.a.o.l.h.HttpURLConnectionImpl.connect	com.android.okhttp.internal.huc.HttpURLConnectionImpl.getInputStream		
c.a.o.l.h.HttpURLConnectionImpl.execute	com.android.okhttp.internal.huc.HttpURLConnectionImpl.getResponse		
c.a.o.internal.http.HttpEngine.sendRequest	c.a.o.l.huc.HttpURLConnectionImpl.execute	com.android.okhttp.internal.huc.HttpURLConnectionImpl.getResponse	
c.a.o.internal.http.HttpEngine.connect	c.a.o.l.http.HttpEngine.readResponse	c.a.okhttp.internal.http.HttpEngine.sendRequest	
c.a.o.l.http.StreamAllocation.newStream	c.a.o.l.h.HttpEngine.readNetworkResponse	c.a.okhttp.internal.http.HttpEngine.connect	
c.a.o.l.h.S.findHealthyConnection	c.a.o.l.h.H.readResponseHeaders	c.a.o.internal.http.StreamAllocation.newStream	
c.a.o.l.h.StreamAllocation.findConnection	c.a.o.l.http.Http1xStream.readResponse	c.a.o.l.h.S.findHealthyConnection	
c.a.o.internal.io.RealConnection.connect	c.a.o.o.R.readUtf8LineStrict	c.a.o.l.http.StreamAllocation.findConnection	
c.a.o.l.io.RealConnection.connectSocket	c.a.okhttp.okio.RealBufferedSource.indexOf	c.a.okhttp.internal.io.RealConnection.connect	
c.a.o.l.io.RealConnection.connectTls	c.a.okhttp.okio.RealBufferedSource.indexOf	c.a.o.internal.io.RealConnection.connectTls	
c.a.o.c.C.startHandshake	c.android.okhttp.okio.AsyncTimeout\$2.read	connectSo...	c.a.o.l.io.RealConnection.connectTls
c.a.o.conscrypt.SslWrapper.doHandshake	com.android.okhttp.okio.Okio\$2.read	j.n.S.connect	c.a.o.c.C.startHandshake
c.a.o.c.NativeCrypto.SSL_do_handshake	c.a.o.c.C.read	j.n.S.connect	c.a.o.c.C.startHandshake
	verifyCertific...	c.android.org.conscrypt.SslWrapper.read	j.n.A.connect
	checkServer...	c.a.org.conscrypt.NativeCrypto.SSL_read	connectTo...
	checkServer...		doConnect
	checkServ...		socketCon...
	getTruste...		l.l.l.connect

Method Tracing

- **Tipos**
 - **Sampled**
 - **Instrumented**



Method Tracing



Caso prático

- Tempo de cold startup maior que 5 segundos é considerado ruim pelo Android Vitals
- Tempo que o app demora iniciar do zero
- Demora excessiva em iniciar prejudica a experiência do usuário
- Percebemos pelo Vitals que estamos demorando mais que 5 segundos em algumas situações

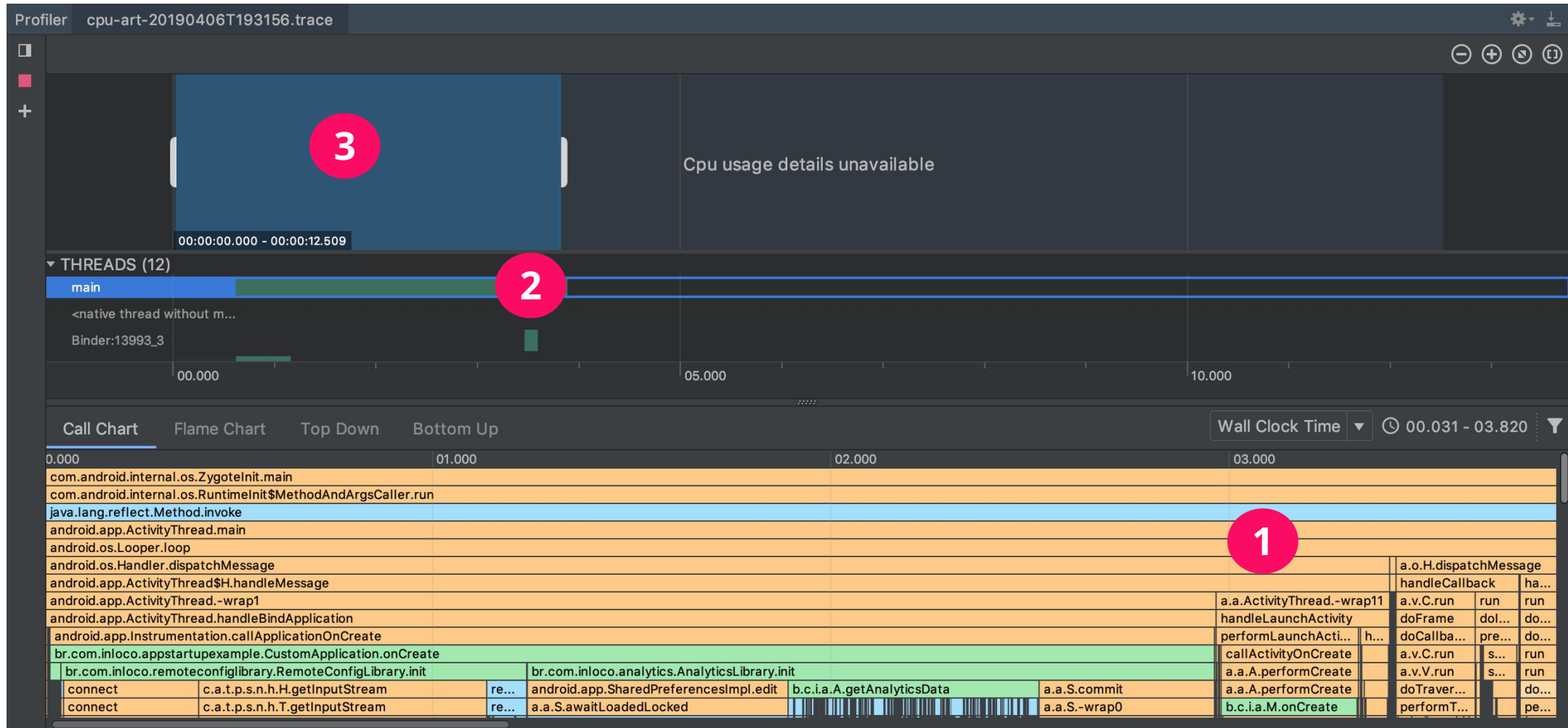


5 segundos

```
public class CustomApplication extends Application {
    @Override
    public void onCreate() {
        super.onCreate();

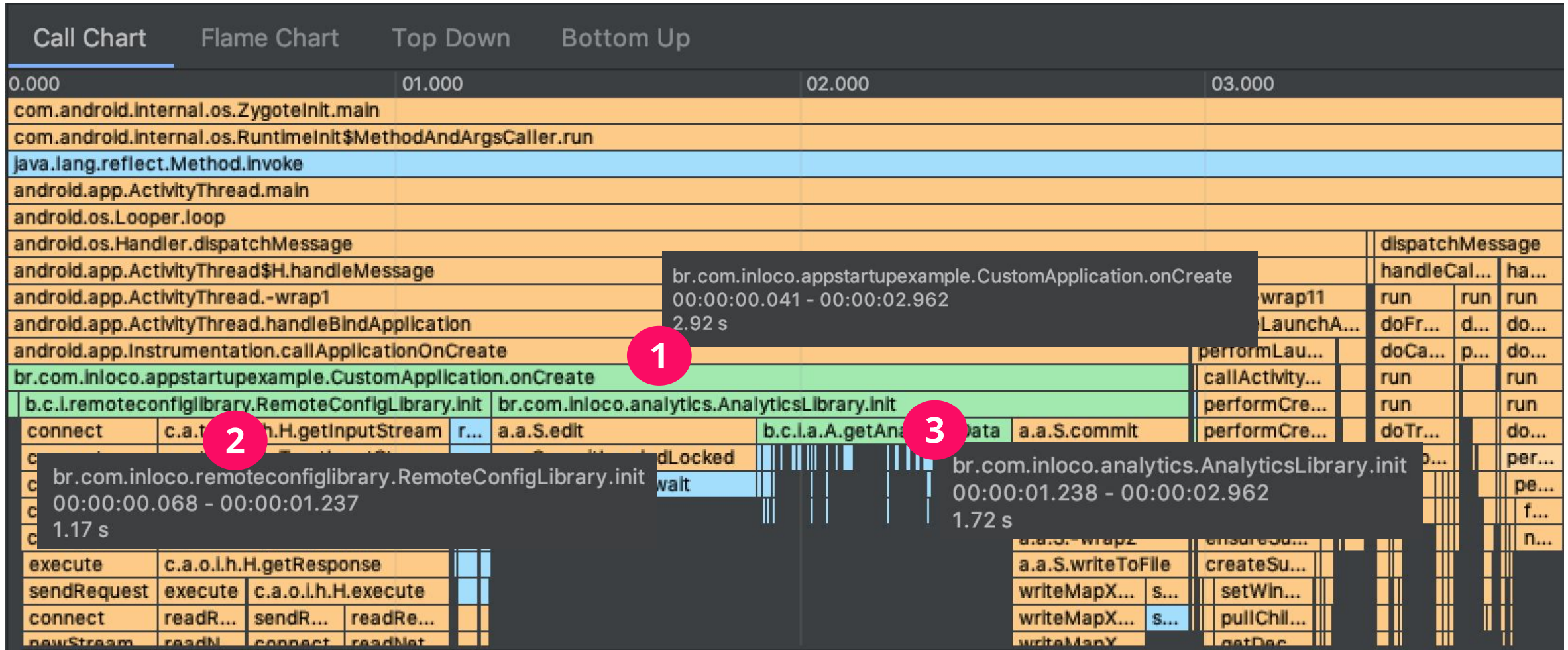
        ErrorReportingLibrary.init();
        RemoteConfigLibrary.init();
        AnalyticsLibrary.init( context: this);
        LocationLibrary.init();
        DatabaseLibrary.init();
        PushSDK.init();
        AdsSDK.init();
    }
}
```

Application.onCreate()



Method tracing



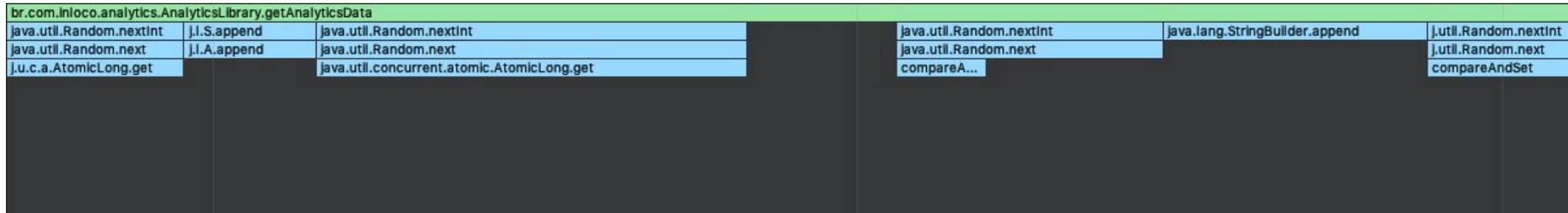
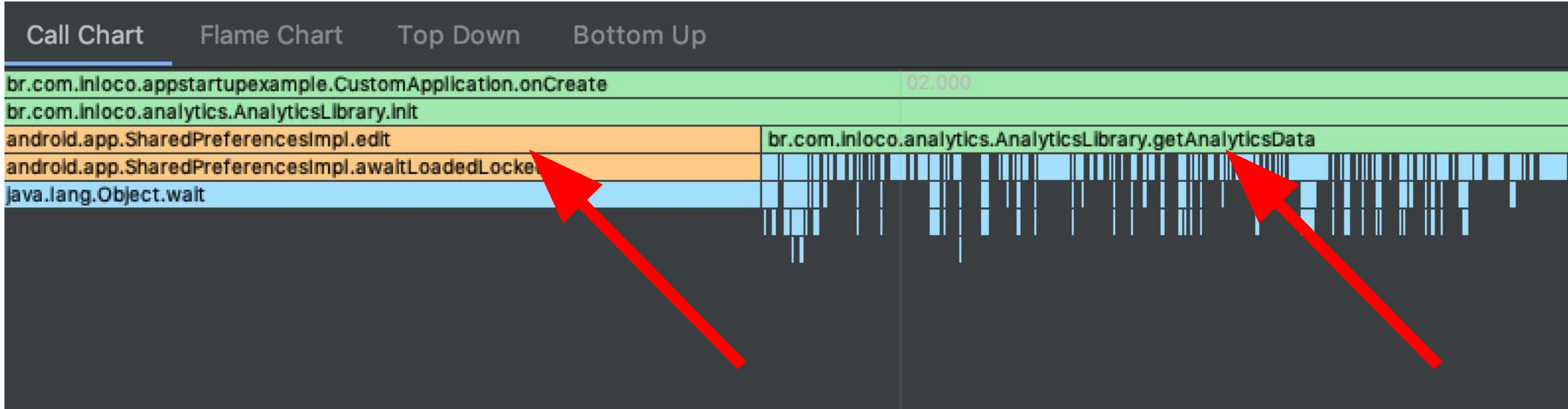


Method tracing



Call Chart	Flame Chart	Top Down	Bottom Up
br.com.inloco.appstartupexample.CustomApplication.onCreate			
br.com.inloco.remoteconfiglibrary.RemoteConfigLibrary.init			
c.a.t.p.s.n.h.HttpURLConnection\$.connect	com.android.tools.profiler.support.network.httpurl.HttpURLConnection\$.getInputStream		
c.a.t.p.s.n.h.T.connect	com.android.tools.profiler.support.network.httpurl.TrackedURLConnection.getInputStream		
c.a.o.l.h.HttpURLConnectionImpl.connect	com.android.okhttp.internal.huc.HttpURLConnectionImpl.getInputStream		
c.a.o.l.h.D.connect	com.android.okhttp.internal.huc.DelegatingURLConnection.getInputStream		
c.a.o.l.h.HttpURLConnectionImpl.connect	com.android.okhttp.internal.huc.HttpURLConnectionImpl.getInputStream		
c.a.o.l.h.HttpURLConnectionImpl.execute	com.android.okhttp.internal.huc.HttpURLConnectionImpl.getResponse		
c.a.o.internal.http.HttpEngine.sendRequest	c.a.o.l.huc.HttpURLConnectionImpl.execute	com.android.okhttp.internal.huc.HttpURLConnectionImpl.execute	
c.a.o.internal.http.HttpEngine.connect	c.a.o.l.http.HttpEngine.readResponse	c.a.okhttp.internal.http.HttpEngine.sendRequest	
c.a.o.l.http.StreamAllocation.newStream	c.a.o.l.h.HttpEngine.readNetworkResponse	c.a.okhttp.internal.http.HttpEngine.connect	
c.a.o.l.h.S.findHealthyConnection	c.a.o.l.h.H.readResponseHeaders	c.a.o.internal.http.StreamAllocation.newStream	
c.a.o.l.h.StreamAllocation.findConnection	c.a.o.l.http.Http1xStream.readResponse	c.a.o.l.h.S.findHealthyConnection	
c.a.o.internal.io.RealConnection.connect	c.a.o.o.R.readUtf8LineStrict	c.a.o.l.http.StreamAllocation.findConnection	
c.a.o.l.io.RealConnection.connectSocket	c.a.okhttp.okio.RealBufferedSource.indexOf	c.a.okhttp.internal.io.RealConnection.connect	
c.a.o.l.io.RealConnection.connectTls	c.a.okhttp.okio.RealBufferedSource.indexOf	c.a.o.internal.io.RealConnection.connectSocket	
c.a.o.c.C.startHandshake	c.android.okhttp.okio.AsyncTimeout\$2.read	connectSo...	c.a.o.l.l...
c.a.o.conscrypt.SslWrapper.doHandshake	com.android.okhttp.okio.Okio\$2.read	j.n.S.connect	c.a.o.c. 00:00:00.635 - 00:00:00.238.93 ms
c.a.o.c.NativeCrypto.SSL_do_handshake	c.a.o.c.C.read	j.n.S.connect	c.a.o.c. 238.93 ms
	verifyCertific...	c.android.org.conscrypt.SslWrapper.read	j.n.A.connect
	checkServer...	c.a.org.conscrypt.NativeCrypto.SSL_read	connectTo...
	checkServer...		doConnect
	checkServ...		socketCon...
	getTruste...		l.l.l.connect

Method tracing



Method tracing



O que fazer?

- Inicializar as bibliotecas de maneira assíncrona
- Lazy initialization
- Procurar alternativas



Os outros profilers

The screenshot displays the Android Studio Memory Profiler interface. At the top, the 'MEMORY' tab is selected, showing a memory usage graph for 'MainActivity'. The graph includes a legend for Graphics (4.7 MB), Stack (0.1 MB), Code (9.6 MB), and Others (1.7 MB). A dashed line indicates 'Allocated: 200278' bytes. A red circle with the number '1' is placed over the graph area.

Below the graph, the 'Live Allocation' section is set to 'app heap' and 'Arrange by class'. A table lists various classes with their allocation and deallocation statistics. A red circle with the number '2' is placed over the 'String (java.lang)' row.

Class Name	Allo...	Deallo...	Total ...	Shallo...
String (java.lang)	264,802	500,382	2,500	20,114,1
long[]	985	1	1,063	776,112
HeapCharBuffer (java.nio)	809	864	354	16,992
Object[] (java.lang)	498	37	631	29,680
Class (java.lang)	435	0	576	460,692
Rect (android.graphics)	365	0	389	9,336
int[]	342	2	379	35,608
char[]	315	26	294	37,865,3
ArrayList (java.util)	207	0	283	6,488
WindowConfiguration (android.app)	152	0	165	6,552

On the right side, the 'Instance View' shows a list of 'String' instances. A red circle with the number '3' is placed over one of the instances.

Below the instance view, the 'Allocation Call Stack' shows the sequence of method calls that led to the allocation. A red circle with the number '4' is placed over the 'handleMessage:532, InputMethodManager (android.view.inputmethod)' entry.

Memória



← NETWORK ▾
⊖ ⊕ ⏪ ⏩

activities.ImageDownloadManagerActivity

RADIO — WIFI — HIGH — LOW

NETWORK

Receiving: 0 MB/s Sending: 0 MB/s Connections: 2

1

Connection View Thread View 02:07.185 - 02:12.657

Name	Size	Type	Status	Time	Timeline
Monument Valley Overloo...	0 B	ima...	200	58...	
One Wheel.jpg	173...	ima...	200	63...	
Open Sky.jpg	132...	ima...	200	678...	
Moving Rock.jpg	0 B				
Napali Coast.jpg	43...	ima...	200	615...	
Orange Sunset.jpg	68...	ima...	200	1 s ...	
Orchid.jpg	68...	ima...	200	567...	
Over there.jpg	0 B	ima...	200	704...	
Rainbow.jpg	114...	ima...	200	1 s ...	
Rice Fields.jpg	103...	ima...	200	1 s ...	

2

Overview
Response
Request
Call Stack
✕

3

Request One Wheel.jpg

Method GET

Status 200

Dimension 1024 x 682

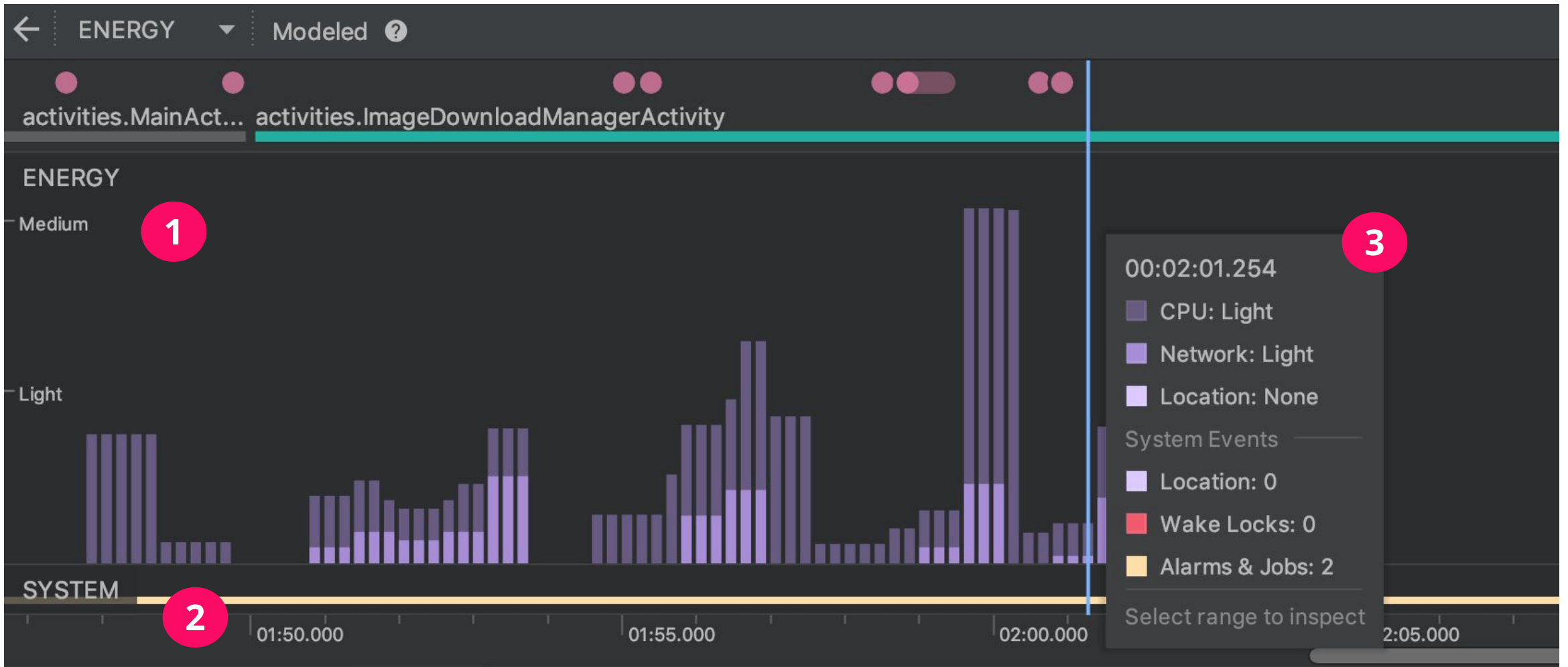
Content type image/jpeg

Size 173.13 KB

Initiating thread InLocoMediaThreadPools_LimitedBackground Pool-3...

URL <https://lh6.googleusercontent.com/-wdGrP5PMmJQ/U Rqu5PZvn7I/AAAAAAAAAbs/m0abEcdPXe4/s1024/One%252520Wheel.jpg>

Rede



Energia



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