05. Debugging

YOU'LL BE DOING A LOT OF THIS

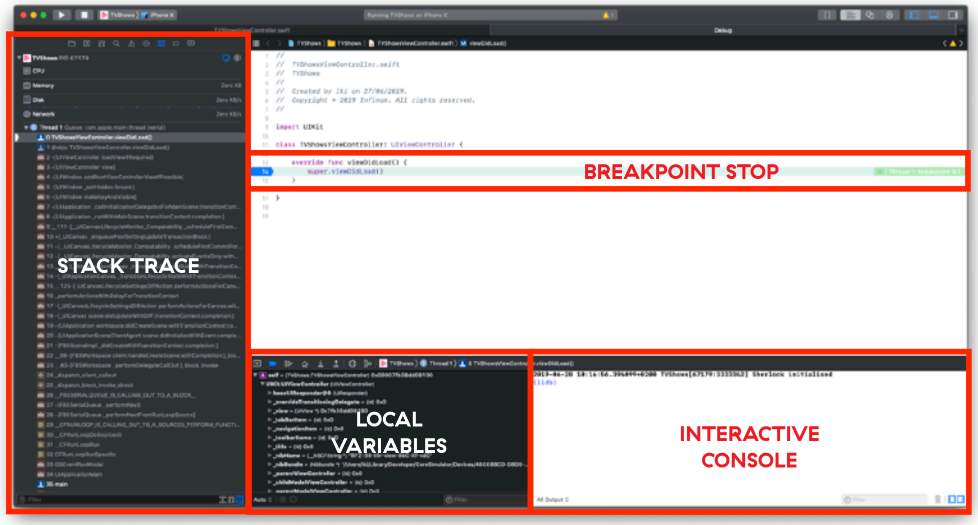
Programming is 90% debugging.

- some developer

01

Breakpoints

Breakpoint stop



```
//
//  TVShowsViewController.swift
//  TVShows
//
//  Created by Iki on 27/06/2019.
//  Copyright © 2019 Infinum. All rights reserved.
//

import UIKit

class TVShowsViewController: UIViewController {

    override func viewDidLoad() {
        super.viewDidLoad()
    }

}
```

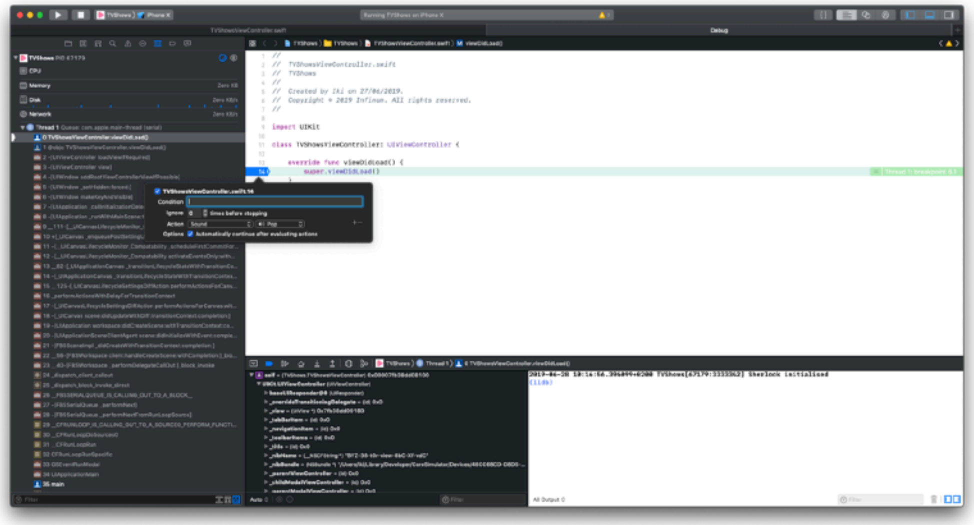
```
2019-06-28 10:16:56.396899+0200 TVShows[47179:3333362] Sherlock initialized
(lldb)
```

neverstop

- Breakpoints stop the execution of the program without executing the line they are at
- Blue things in Xcode
- Can be added to stop on a certain event or a certain line of code
- Can be shared with other users
- Can be modified to stop on the certain event
- Can be modified to continue execution automatically

Edit breakpoint

Right-click on the blue breakpoint indicator



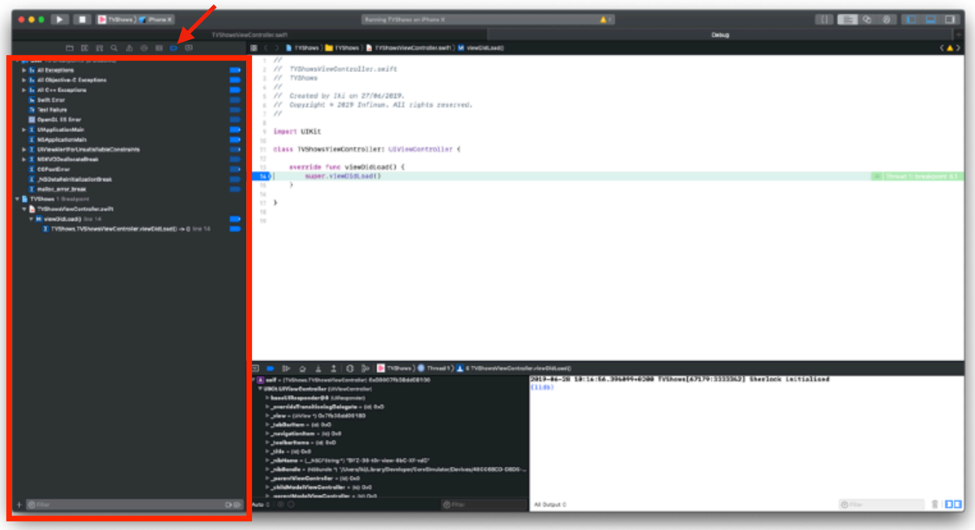
```
//
//  TVShowsViewController.swift
//  TVShows
//
//  Created by Iki on 27/04/2019.
//  Copyright © 2019 Infinum. All rights reserved.
//

import UIKit

class TVShowsViewController: UIViewController {

    override func viewDidLoad() {
        super.viewDidLoad()
    }
```

TVShowsViewController.swift:14
Condition:
Ignore: 0 times before stopping
Action: Sound — Pop
Options: ✓ Automatically continue after evaluating actions

neverstop

- Right click on it
- Here we said that we want to play a sound, and then continue execution
- Go crazy ;)

Browse all breakpoints



All Exceptions
All Objective-C Exceptions
All C++ Exceptions
Swift Error
Test Failure
OpenGL ES Error
UIApplicationMain
NSApplicationMain
UIViewAlertForUnsatisfiableConstraints
NSKVODeallocateBreak
CGPostError
_NSDataReinitializationBreak
malloc_error_break
TVShows 1 Breakpoint
TVShowsViewController.swift
viewDidLoad() line 14
TVShows.TVShowsViewController.viewDidLoad() -> () line 14

```
//
//  TVShowsViewController.swift
//  TVShows
//
//  Created by Iki on 27/06/2019.
//  Copyright © 2019 Infinum. All rights reserved.
//

import UIKit

class TVShowsViewController: UIViewController {

    override func viewDidLoad() {
        super.viewDidLoad()
    }

}
```

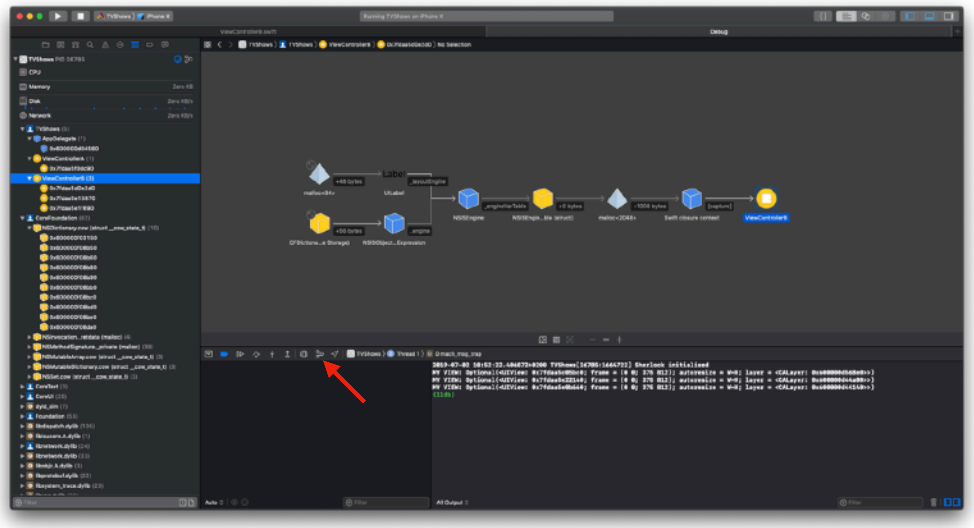
```
2019-06-28 10:14:56.396899+0200 TVShows[67179:3333362] Sherlock initialized
(lldb)
```

neverstop

- All your breakpoint are saved, and as you can see it
- “User” section will make this available in all projects
- “TVShow” section will only be for this project
- You can turn on/off breakpoints without removing them

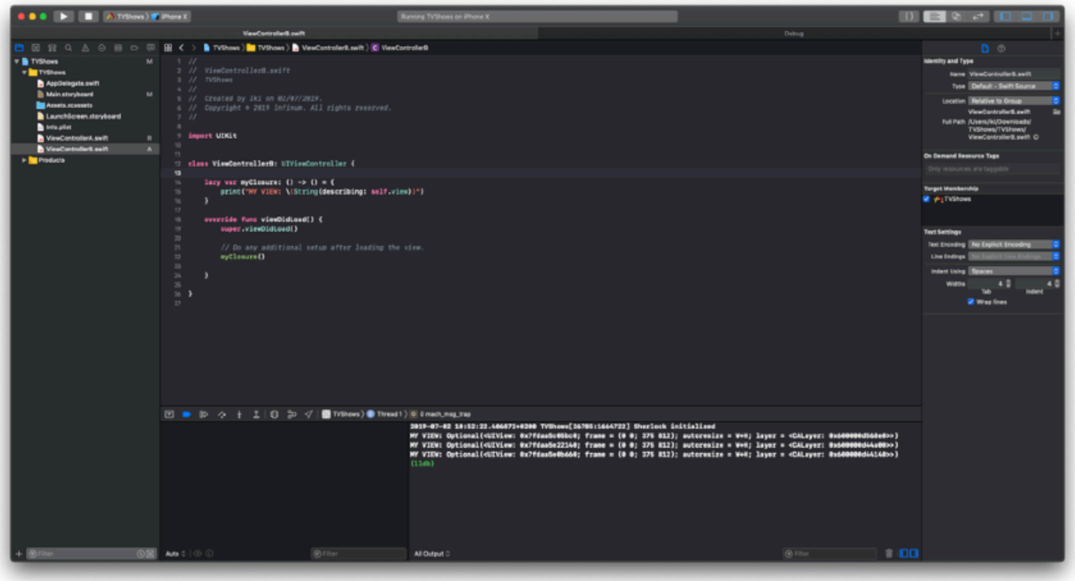
Memory debugging

Debug memory graph



neverstop

- Very very useful, you can see the current state of your memory graph, very easy to catch memory leaks or retain cycles
- On the left side, you can see your objects and system objects
- So let's say you have two screens, and you go back and forth between them, if your view controller count is going up every time, something is not right

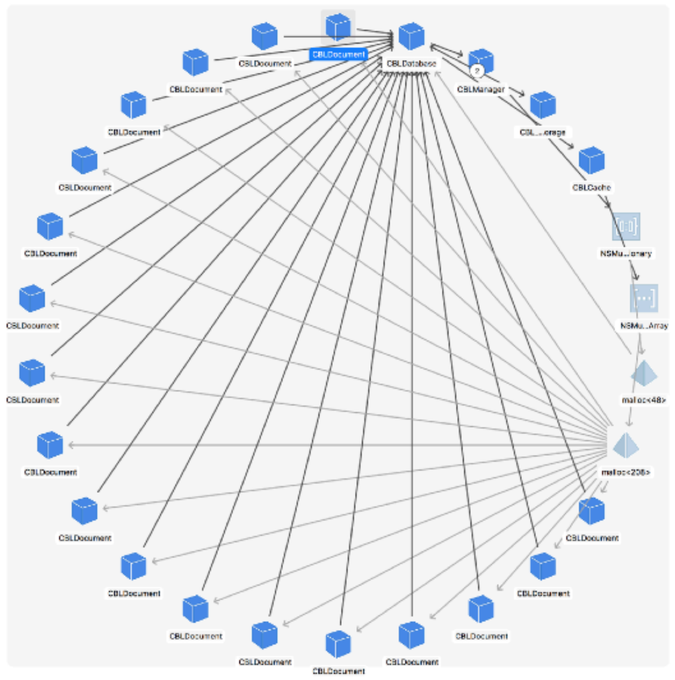


```swift
//
//  ViewController8.swift
//  TVShows
//
//  Created by Iki on 02/07/2019.
//  Copyright © 2019 Infinum. All rights reserved.
//

import UIKit


class ViewController8: UIViewController {

    lazy var myClosure: () -> () = {
        print("MY VIEW: \(String(describing: self.view))")
    }

    override func viewDidLoad() {
        super.viewDidLoad()

        // Do any additional setup after loading the view.
        myClosure()

    }

}
```

```
2019-07-02 10:52:22.406873+0200 TVShows[36706:1664722] Sherlock initialised
MY VIEW: Optional(<UIView: 0x7fdaa5c05bc0; frame = (0 0; 375 812); autoresize = W+H; layer = <CALayer: 0x600000d568e0>>)
MY VIEW: Optional(<UIView: 0x7fdaa5e22140; frame = (0 0; 375 812); autoresize = W+H; layer = <CALayer: 0x600000d44a00>>)
MY VIEW: Optional(<UIView: 0x7fdaa5e0b660; frame = (0 0; 375 812); autoresize = W+H; layer = <CALayer: 0x600000d44140>>)
(lldb)
```

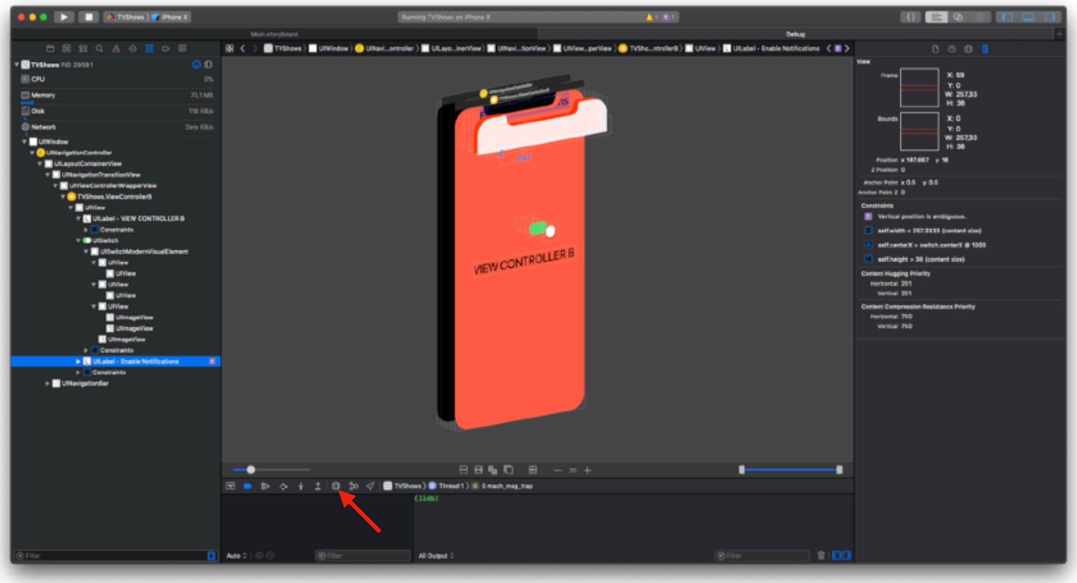
neverstop

- So what did I do?
- I have strongly captured `self.view` inside the `myClosure`
- We will talk about this more
    - we can fix this, by applying `weak` attribute to self.


CBLDocument
CBLDatabase
CBLManager
CBL...orage
CBLCache
NSMu...ionary
NSMu...Array
malloc<48>
malloc<208>

03

View debugging



neverstop

- As you can see we are missing a LABEL here, and if you look more carefully, on the right, we can see that the Y coordinate is offscreen
- For any serious debugging, you probably want to use tool called REVEAL or SHERLOCK
    - with them you can also do “live” editing, without the need to restart the app

04

Console and friends

The console

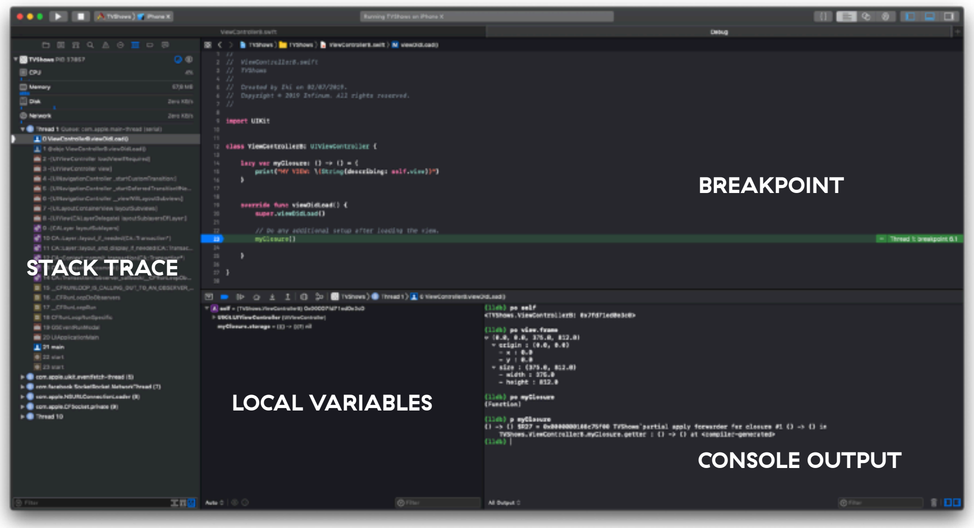
```
2019-06-28 10:16:56.396099+0200 TVShows[67179:3333362] Sherlock initialized
(lldb)
```

- standard output (logs to system …)
- possible security risk
- interactive (can run expressions)
- LLDB (debugger)

neverstop

- If you use `print` this will be visible even on the production, you don’t want to do that :)
    - There were cases where developers would log private stuff to console and then later on forgot to remove

- Most of the logging will go to standard output, meaning you can inspect it either from Xcode or from the Console application on the Mac



```
//
//  ViewController8.swift
//  TVShows
//
//  Created by Zki on 02/07/2019.
//  Copyright © 2019 Infinum. All rights reserved.
//

import UIKit


class ViewController8: UIViewController {

    lazy var myClosure: () -> () = {
        print("MY VIEW: \(String(describing: self.view))")
    }


    override func viewDidLoad() {
        super.viewDidLoad()

        // Do any additional setup after loading the view.
        myClosure()

    }

}
```

```
(lldb) po self
<TVShows.ViewController8: 0x7fd71ed0e3c0>

(lldb) po view.frame
▿ (0.0, 0.0, 375.0, 812.0)
  ▿ origin : (0.0, 0.0)
    - x : 0.0
    - y : 0.0
  ▿ size : (375.0, 812.0)
    - width : 375.0
    - height : 812.0

(lldb) po myClosure
(Function)

(lldb) p myClosure
() -> () $R27 = 0x0000000108c75f00 TVShows`partial apply forwarder for closure #1 () -> () in
    TVShows.ViewController8.myClosure.getter : () -> () at <compiler-generated>
(lldb)
```

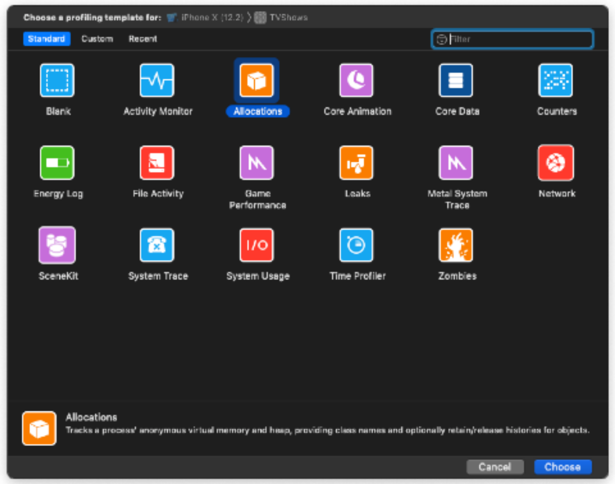
neverstop

- Program execution stopped on breakpoint
- As we said before
  - you can interact with debugger `LLDB` from console output.
  - example:
    - p [(CALayer *)[[[[UIApplication sharedApplication] windows] objectAtIndex:0] layer] setSpeed:.1f]
    - will slow animation on your hardware phone

05

Instruments

Instruments - CMD + I



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

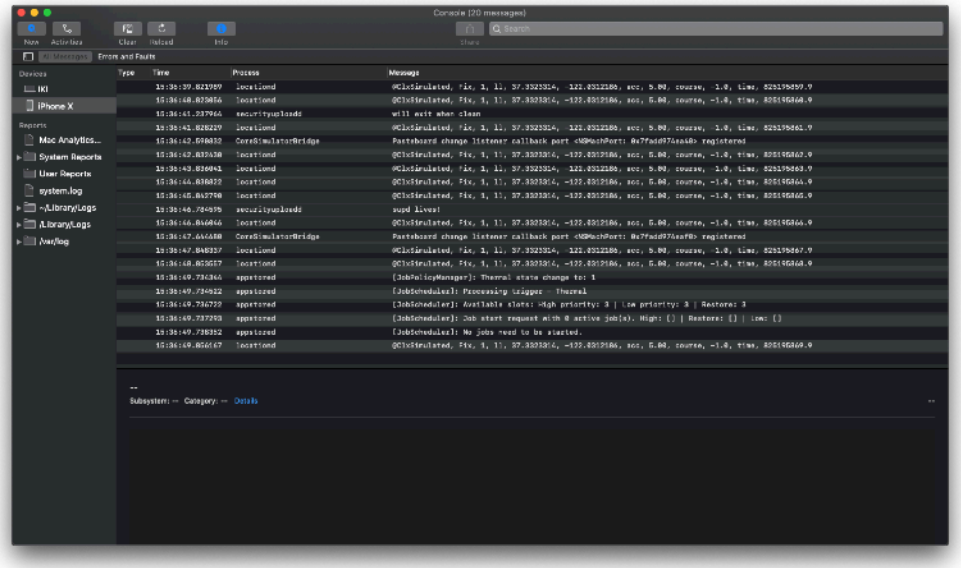
- The real profiling ;)
- You should use this from time to time, just to be sure your app is lean
- But of course, you don't want to optimise too early!
- You should almost always use real device for profiling!

06

Console

neverstop

Console application



```
Type  Time             Process              Message
      15:36:39.821989  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195859.9
      15:36:40.823056  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195860.9
      15:36:41.237966  securityuploadd      will exit when clean
      15:36:41.828229  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195861.9
      15:36:42.598832  CoreSimulatorBridge  Pasteboard change listener callback port <NSMachPort: 0x7fadd974aa60> registered
      15:36:42.832438  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195862.9
      15:36:43.836041  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195863.9
      15:36:44.838822  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195864.9
      15:36:45.842798  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195865.9
      15:36:46.784595  securityuploadd      supd lives!
      15:36:46.846046  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195866.9
      15:36:47.644680  CoreSimulatorBridge  Pasteboard change listener callback port <NSMachPort: 0x7fadd974aaf0> registered
      15:36:47.848337  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195867.9
      15:36:48.853557  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195868.9
      15:36:49.734344  appstored            [JobPolicyManager]: Thermal state change to: 1
      15:36:49.734522  appstored            [JobScheduler]: Processing trigger - Thermal
      15:36:49.736722  appstored            [JobScheduler]: Available slots: High priority: 3 | Low priority: 3 | Restore: 3
      15:36:49.737293  appstored            [JobScheduler]: Job start request with 0 active job(s). High: () | Restore: () | Low: ()
      15:36:49.738352  appstored            [JobScheduler]: No jobs need to be started.
      15:36:49.856167  locationd            @ClxSimulated, Fix, 1, 11, 37.3323314, -122.0312186, acc, 5.00, course, -1.0, time, 825195869.9

--
Subsystem: --  Category: --  Details
```

neverstop

- You would use this when you want to debug release version of the application, or when you want to see system log

Appendix

Additional info

- Debugging Swift code with LLDB
- Apple - Debugging