目录

主流调试器：LLDB

- 最新版本：`v1.2.0`
- 更新时间：`20231025`

简介

介绍主流的调试器LLDB。先是LLDB概览；再详细介绍LLDB的命令，包括LLDB的命令概览和LLDB的各个命令；LLDB命令概览包括cheat sheet和help语法；LLDB常用命令包括image，以及image中的image lookup、image list、image dump等，且给出了详细的例子和help语法；然后是register、expression和其中的p和po，；然后介绍了其中的、memory和memory read及其中的help语法、disassemble、thread、frame、breakpoint、watchpoint、以及调试控制相关的命令，包括run、continue、next和nexti、step和stepi、jump、finish、exit等，且都给出help语法和用法举例；然后再整理出相关心得，包括命令的缩写、Xcode中的lld，包括自动补全和查看函数调用堆栈、iOS逆向、LLVM等等。最后给出相关的文档和资料。

源码+浏览+下载

本书的各种源码、在线浏览地址、多种格式文件下载如下：

HonKit源码

- crifan/popular_debugger_lldb: 主流调试器：LLDB

如何使用此HonKit源码去生成发布为电子书

详见：crifan/honkit_template: demo how to use crifan honkit template and demo

在线浏览

- 主流调试器：LLDB book.crifan.org
- 主流调试器：LLDB crifan.github.io

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- 主流调试器：LLDB Mobi

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鸣谢

感谢我的老婆**陈雪**的包容理解和悉心照料，才使得我 `crifan` 有更多精力去专注技术专研和整理归纳出这些电子书和技术教程，特此鸣谢。

其他

作者的其他电子书

本人 `crifan` 还写了其他 `150+` 本电子书教程，感兴趣可移步至：

crifan/crifan_ebook_readme: Crifan的电子书的使用说明

关于作者

关于作者更多介绍，详见：

关于CrifanLi李茂 – 在路上

LLDB概览

TODO：

- 【已解决】XCode和lldb调试常见用法和调试心得

背景

- 主流常见 `调试器 = debugger`
  - GNU 的 GDB
  - (开源项目 `LLVM` 中的) LLDB
- iOS端
  - Apple的 `Xcode` 的**内置调试器**
    - 之前： `GDB`
    - 现在(`Xcode 5+`)： `LLDB`
- Android端
  - Android内置的调试器
    - 之前： `GDB`
    - 现在： `LLDB`

LLDB

- `LLDB`
  - 名称：常写成小写的 `lldb`
  - 是什么：一个下一代的、高性能的 `开源调试器`
  - 说明
    - 和LLVM关系
      - 属于（更大的，开源的） `LLVM` 项目的 `一部分` =其中 `一个模块`
        - 所以LLDB也是开源的
      - 常搭配 `LLVM` 的其他模块一起使用
        - `expression parser = 解释器` ： `Clang`
        - `disassembler = 反汇编器` ： `LLVM disassembler`
    - 和Xcode关系
      - 是Xcode内置的调试器：之前是GDB，现在是LLDB
  - 特点
    - 支持调试语言
      - Xcode中的LLDB
        - 支持调试 `C` 、 `Objective-C` 、 `C++`
        - 支持运行平台：桌面端 `macOS` 、移动端 `iOS` （设备和模拟器）
    - 支持众多平台： `macOS` 、 `iOS` 、 `Linux` 、 `FreeBSD` 、 `NetBSD` 、 `Windows`

Features matrix [4]

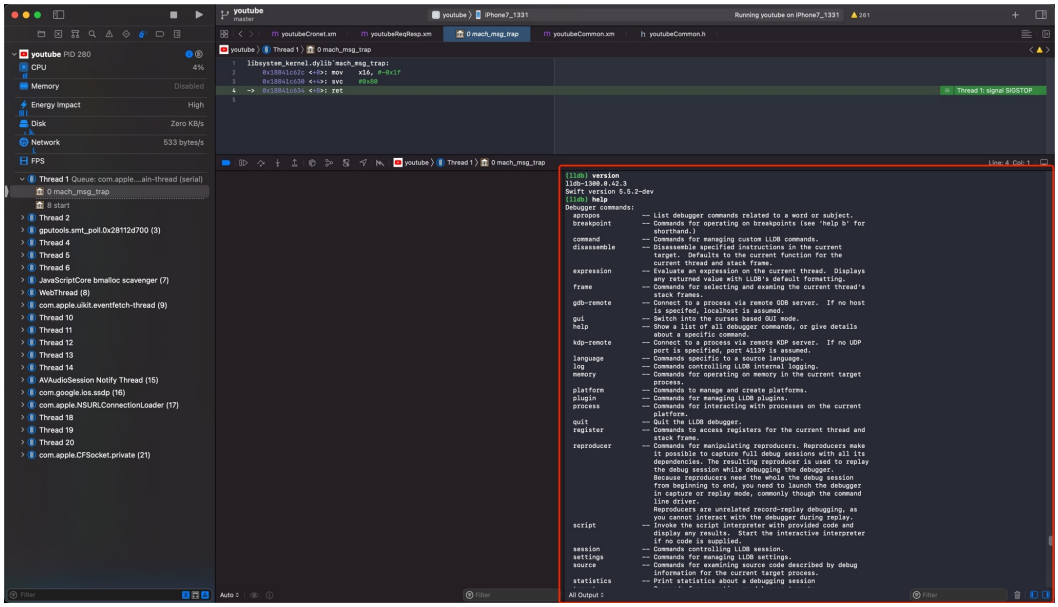
Feature	FreeBSD	Linux	macOS	Windows
Backtracing	✓	✓	✓	✓
Breakpoints	✓	✓	✓	✓
C++11:	✓	✓	✓	?
Command-line lldb tool	✓	✓	✓	✓
Core file debugging	✓	✓	✓	✓
Debugserver (remote debugging)	Not ported	Not ported	✓	Not ported
Disassembly	✓	✓	✓	✓
Expression evaluation	?	Works with some bugs	✓	Works with some bugs
JIT debugging	?	Symbolic debugging only	Untested	✘
Objective-C 2.0:	?	N/A	✓	N/A

    - 支持 `REPL` 、 `C++` 和 `Python` 插件
      - 注： `REPL` = `Read-Eval-Print Loop` = 交互式解释器
- 此处
  - 主要使用场景
    - iOS逆向时，用 `LLDB` 调试 `ObjC` 的相关内容

LLDB的位置和版本

Mac

- Mac中的lldb
  - 二进制
    - Mac自带的： `/usr/bin/lldb`
    - Xcode中的： `/Applications/Xcode.app/Contents/Developer/usr/bin/lldb`
  - 集成进XCode
    - 位置：内嵌在Xcode中的（一般是右下角的）调试区域的控制台



Mac自带的lldb

```
crifan@licrifandeMacBook-Pro~ ~~ which lldb
/usr/bin/lldb
 crifan@licrifandeMacBook-Pro~ ~~ ll /usr/bin/lldb
-rwxr-xr-x  1 root  wheel   134K  1  1  2020 /usr/bin/lldb

crifan@licrifandeMacBook-Pro~ ~~ /usr/bin/lldb --version
lldb-1300.0.42.3
Swift version 5.5.2-dev
```

Xcode中的lldb

```
 crifan@licrifandeMacBook-Pro~ ~~ ll /Applications/Xcode.app/Contents/Developer/usr/bin
/lldb
-rwxr-xr-x  1 crifan  staff   828K 12 15  2021 /Applications/Xcode.app/Contents/Develop
er/usr/bin/lldb

 crifan@licrifandeMacBook-Pro~ ~~ /Applications/Xcode.app/Contents/Developer/usr/bin/ll
db --version
lldb-1300.0.42.3
Swift version 5.5.2-dev
```

如何用LLDB调试程序

关于如何用LLDB去调试具体的程序，详见：

- 用LLDB调试iOS程序
  - lldb+debugserver · iOS逆向开发：动态调试
- 用LLDB调试Android程序
  - lldb调试安卓 · Android逆向：动态调试

LLDB命令

LLDB命令概览

TODO：

【整理】lldb的语法和用法

lldb的cheat sheet

lldb的 `cheat sheet` =小抄=手册：

lldb cheat sheet

Execution Commands

start lld (prefix with xcrun on os x)
```
>lldb [program.app]
>lldb -- program.app arg1
```

load program
```
>file program.app
```

run program
```
>process launch [-- args]
>run [args]
```

set arguments
```
>settings set target.run-args 1
```

launch process in new terminal
```
>process launch --tty -- <args>
```

set env variables
```
>settings set target.env-vars DEBUG=1
```

remove env variables
```
>settings remove target.env-vars DEBUG
```

show program arguments
```
>settings show target.run-args
```

set env variable and run
```
>process launch -v DEBUG=1
```

attach to process by PID
```
>process attach --pid 123
```

attach to process by name
```
>process attach --name a.out [--waitfor]
```

attach to remote gdb on eorgadd
```
>gdb-remote eorgadd:8000
```

attach to gdb server on localhost
```
>gdb-remote 8000
```

attach to remote Darwin kernel in kdp mode
```
>kdp-remote eorgadd
```

source level single step
```
>thread step-in
>step
>s
```

source level setop over
```
>thread step-over
>next
>n
```

instruction level single step
```
>thread step-inst
```

```
>si
```

instruction level single step over
```
>thread step-inst-over
>ni
```

step out of the currently selected frame
```
>thread step-out
>finish
```

Return from currently frame, with return value
```
>thread return [RETURN EXPRESSION]
```

Backtrace and disassemble every time you stop
```
>target stop-hook add
>bt
>disassemble --pc
>DONE
```

run until line 12 or end of frame
```
>thread until 12
```

Breakpoint Commands

set breakpoint at all functions named main
```
>breakpoint set --name main
>br s -n main
>b main
```

set breakpoint in file test.c line 12
```
>breakpoint set --file test.c --line 12
>br s -f test.c -l 12
>b test.c:12
```

set breakpoint at all C++ methods with name main
```
>breakpoint set --method main
>br s -M main
```

set breakpoint at ObjC function
```
>breakpoint set --name "-[NSString stringWithFormat:]"
>b -[NSString stringWithFormat:]
```

set breakpoint at all ObjC functions whose selector is count
```
>breakpoint set --selector count
>br s -S count
```

set breakpoint by regular expression function name
```
>breakpoint set --func-regex print.*
```

ensure that breakpoints by file and line work (c/cpp/objc)
```
>settings set target.inline-breakpoint-strategy always
```

```
>br s -f foo.c -l 12
```

set a breakpoint by regular expression on source file contents
```
>breakpoint set --source-pattern regular-expression --file SourceFile
>br s -p regular-expression -f file
```

set conditional breakpoint
```
>breakpoint set --name foo --condition '(int)strcmp(y,"hello") == 0'
>br s -n foo -c '(int)strcmp(y,"hello") == 0'
```

list breakpoints
```
>breakpoint list
>br l
```

delete a breakpoint
```
>breakpoint delete 1
>br del 1
```

Watchpoint Commands

set watchpoint on variable when written to
```
>watchpoint set variable global_var
>wa s v global_var
```

set watchpoint on memory of pointer size
```
>watchpoint set expression --
0x123456
>wa s e -- 0x123456
```

set watchpoint on memory of custom size
```
> watchpoint set expression -x
byte_size -- 0x123456
> wa s e -x byte_size -- 0x123456
```

set a condition on a watchpoint
```
>watch set var global
>watchpoint modify -c '(global==5)'
```

list watchpoints
```
>watchpoint list
>watch l
```

delete a watchpoint
```
>watchpoint delete 1
>watch del 1
```

Examining Variables

show arguments and local variables
```
>frame variable
>fr v
```

show local variables
```
>frame variable --no-args
>fr v -a
```

show contents of variable bar
```
>frame variable bar
>fr v bar
>p bar
```

show contents of var bar formatted as hex
```
>frame variable --format x bar
>fr v -f x bar
```

show contents of global variable baz
```
>target variable baz
>ta v baz
```

show global/static variables in current file
```
>target variable
>ta v
```

show argc and argv every time you stop
```
>target stop-hook add --one-liner "frame variable argc argv"
>ta st a -o "fr v argc argv"
>display argc
>display argv
```

display argc and argv when stopping in main
```
>target stop-hook add --name main --one-liner "frame variable argc argv"
>ta st a -n main -o "fr v argc argv"
```

display *this when in class MyClass
```
>target stop-hook add --classname MyClass --one-liner "frame variable *this"
>ta st a -c MyClass -o "fr v *this"
```

Evaluating Expressions

evaluate expression (print alias possible as well)
```
>expr (int) printf ("Print nine: %d.", 4 + 5)
>print (int) printf ("Print nine: %d.", 4 + 5)
```

using a convenience variable
```
>expr unsigned int $foo = 5
```

print the ObjC description of an object
```
>expr -o -- [SomeClass returnAnObject]
>po [SomeClass returnAnObject]
```

print dynamic type of expression result
```
>expr -d 1 -- [SomeClass returnAnObject]
>expr -d 1 –someCPPObjectPtrOrReference
```

set dynamic type printing as default
```
>settings set target.prefer-dynamic run-target
```

calling a function with a breakpoint
```
>expr -i 0 --function_with_a_breakpoint()
```

calling a function that crashes
```
expr -u 0 -- function_which_crashes()
```

Examining Thread State

show backtrace (current thread)
```
>thread backtrace
>bt
```

show backtrace for all threads
```
>thread backtrace all
>bt all
```

backtrace the first 5 frames of current thread
```
>thread backtrace -c 5
>bt 5 (lldb-169 and later)
>bt –c 5 (lldb-168 and later)
```

select a different stack frame by index
```
>frame select 12
>fr s 12
>f 12
```

show frame information
```
>frame info
```

select stack frame the called current frame
```
>up
>frame select --relative=1
```

select stack frame that is called by current frame
```
>down
>frame select --relative=-1
>fr s -r-1
```

select different frame using relative offset
```
>frame select --relative 2
>fr s -r2
>frame select --relative -3
>fr s -r-3
```

show general purpose registers
```
>register read
```

write 123 to register rax
```
>register write rax 123
```

skip 8 bytes using with program counter
```
>register write pc `$pc+8`
```

show general purpose registers as signed decimal
```
>register read --format i
>re r -f i
>register read/d
```

show all registers in all register threads
```
>register read --all
>re r -a
```

show registers rax, rsp, rbp
```
register read rax rsp rbp
```

show register rax with binary format
```
>register read --format binary rax
```

read memory from 0xbffff3c0 and show 4 hex uint32_t values
```
>memory read --size 4 --format x --count 4 0xbffff3c0
>me r -s4 -fx -c4 0xbffff3c0
>x -s4 -fx -c4 0xbffff3c0
>memory read/4xw 0xbffff3c0
>x/4xw 0xbffff3c0
>memory read --gdb-format 4xw 0xbffff3c0
```

read memory starting at the expression "argv[0]"
```
>memory read `argv[0]`
>memory read --size `sizeof(int)` `argv[0]`
```

read 512 bytes from address 0xbffff3c0 and save results to a local file
```
>memory read --outfile /tmp/mem.txt --count 512 0xbffff3c0
>me r -o/tmp/mem.txt -c512 0xbffff3c0
>x/512bx -o/tmp/mem.txt 0xbffff3c0
```

save binary memory data starting at 0x1000 and ending at 0x2000 to file
```
>memory read --outfile /tmp/mem.bin --binary 0x1000 0x2000
>me r -o /tmp/mem.bin -b 0x1000 0x2000
```

get information about specific heap allocation (Mac OS X only)
```
>command script import lldb.macosx.heap
>process launch --environment MallocStackLogging=1 -- [ARGS]
>malloc_info --stack-history 0x10010d680
```

get information about specific heap allocation and cast result to dynamic type that can be deduced (Mac OS X only)
```
>command script import lldb.macosx.heap
>malloc_info --type 0x10010d680
```

find all heap blocks that contain pointer specified by an expression EXPR (Mac OS X only)
```
>command script import lldb.macosx.heap
>ptr_refs EXPR
```

find all heap blocks that contain a C string anywhere in the block (Mac OS X only)
```
>command script import lldb.macosx.heap
>cstr_refs CSTRING
```

disassemble current function for current frame
```
>disassemble –frame
>di -f
```

disassemble any functions named main
```
>disassemble --name main
>di -n main
```

disassemble address range
```
>disassemble --start-address 0x1eb8 --end-address 0x1ec3
>di -s 0x1eb8 -e 0x1ec3
```

disassemble 20 instructions from start address
```
>disassemble --start-address 0x1eb8 --count 20
>di -s 0x1eb8 -c 20
```

show mixed source and disassembly for the current function
```
>disassemble --frame –mixed
>di -f -m
```

disassemble the current function for the current frame and show the opcode bytes
```
>disassemble --frame –bytes
>di -f -b
```

disassemble the current source line for the current frame
```
>disassemble --line
>di -l
```

Executable and Shared Library Query Commands

list the main executable and all dependent shared libraries
```
>image list
```

look up information for a raw address in the executable or any shared libraries
```
>image lookup --address 0x1ec4
>im loo -a 0x1ec4
```

look up functions matching a regular expression in a binary
```
>image lookup -r -n <FUNC_REGEX> (debug symbols)
>image lookup -r -s <FUNC_REGEX> (non-debug syms)
```

find full source line information
```
>image lookup -v --address 0x1ec4 (Look for entryline)
```

look up information for an address in a.out only
```
>image lookup --address 0x1ec4 a.out
>im loo -a 0x1ec4 a.out
```

look up information for a type Pointer by name
```
>image lookup --type Point
>im loo -t Point
```

dump all sections from the main executable and any shared libraries
```
>image dump sections
```

dump all sections in the a.out module
```
>image dump sections a.out
```

dump all symbols from the main executable and any shared libraries
```
>image dump symtab
```

dump all symbols in a.out and liba.so
```
>image dump symtab a.out liba.so
```

Miscellaneous

echo text to the screen
```
>script print "Here is some text"
```

remap source file pathnames for the debug session (e.g. if program was built on another PC)
```
>settings set target.source-map /buildbot/path /my/path
```

lldb的help

lldb的help：显示所有命令的帮助信息

```
(lldb) help
Debugger commands:
  apropos           -- List debugger commands related to a word or subject.
  breakpoint        -- Commands for operating on breakpoints (see 'help b' for
                       shorthand.)
  command           -- Commands for managing custom LLDB commands.
  disassemble       -- Disassemble specified instructions in the current
                       target.  Defaults to the current function for the
                       current thread and stack frame.
  expression        -- Evaluate an expression on the current thread.  Displays
                       any returned value with LLDB's default formatting.
  frame             -- Commands for selecting and examing the current thread's
                       stack frames.
  gdb-remote        -- Connect to a process via remote GDB server.  If no host
                       is specifed, localhost is assumed.
  gui               -- Switch into the curses based GUI mode.
  help              -- Show a list of all debugger commands, or give details
                       about a specific command.
  kdp-remote        -- Connect to a process via remote KDP server.  If no UDP
                       port is specified, port 41139 is assumed.
  language          -- Commands specific to a source language.
  log               -- Commands controlling LLDB internal logging.
  memory            -- Commands for operating on memory in the current target
                       process.
  platform          -- Commands to manage and create platforms.
  plugin            -- Commands for managing LLDB plugins.
  process           -- Commands for interacting with processes on the current
                       platform.
  quit              -- Quit the LLDB debugger.
  register          -- Commands to access registers for the current thread and
                       stack frame.
  reproducer        -- Commands for manipulating reproducers. Reproducers make
                       it possible to capture full debug sessions with all its
                       dependencies. The resulting reproducer is used to replay
                       the debug session while debugging the debugger.
                       Because reproducers need the whole the debug session
                       from beginning to end, you need to launch the debugger
                       in capture or replay mode, commonly though the command
                       line driver.
                       Reproducers are unrelated record-replay debugging, as
                       you cannot interact with the debugger during replay.
  script            -- Invoke the script interpreter with provided code and
                       display any results.  Start the interactive interpreter
                       if no code is supplied.
  session           -- Commands controlling LLDB session.
  settings          -- Commands for managing LLDB settings.
  source            -- Commands for examining source code described by debug
                       information for the current target process.
  statistics        -- Print statistics about a debugging session
```

```
  target            -- Commands for operating on debugger targets.
  thread            -- Commands for operating on one or more threads in the
                       current process.
  trace             -- Commands for loading and using processor trace
                       information.
  type              -- Commands for operating on the type system.
  version           -- Show the LLDB debugger version.
  watchpoint        -- Commands for operating on watchpoints.
Current command abbreviations (type 'help command alias' for more info):
  add-dsym  -- Add a debug symbol file to one of the target's current modules
               by specifying a path to a debug symbols file or by using the
               options to specify a module.
  attach    -- Attach to process by ID or name.
  b         -- Set a breakpoint using one of several shorthand formats.
  bt        -- Show the current thread's call stack.  Any numeric argument
               displays at most that many frames.  The argument 'all' displays
               all threads.  Use 'settings set frame-format' to customize the
               printing of individual frames and 'settings set thread-format'
               to customize the thread header.
  c         -- Continue execution of all threads in the current process.
  call      -- Evaluate an expression on the current thread.  Displays any
               returned value with LLDB's default formatting.
  continue  -- Continue execution of all threads in the current process.
  detach    -- Detach from the current target process.
  di        -- Disassemble specified instructions in the current target.
               Defaults to the current function for the current thread and
               stack frame.
  dis       -- Disassemble specified instructions in the current target.
               Defaults to the current function for the current thread and
               stack frame.
  display   -- Evaluate an expression at every stop (see 'help target
               stop-hook'.)
  down      -- Select a newer stack frame.  Defaults to moving one frame, a
               numeric argument can specify an arbitrary number.
  env       -- Shorthand for viewing and setting environment variables.
  exit      -- Quit the LLDB debugger.
  f         -- Select the current stack frame by index from within the current
               thread (see 'thread backtrace'.)
  file      -- Create a target using the argument as the main executable.
  finish    -- Finish executing the current stack frame and stop after
               returning.  Defaults to current thread unless specified.
  history   -- Dump the history of commands in this session.
               Commands in the history list can be run again using "!<INDEX>".
               "!-<OFFSET>" will re-run the command that is <OFFSET> commands
               from the end of the list (counting the current command).
  image     -- Commands for accessing information for one or more target
               modules.
  j         -- Set the program counter to a new address.
  jump      -- Set the program counter to a new address.
  kill      -- Terminate the current target process.
  l         -- List relevant source code using one of several shorthand formats.
  list      -- List relevant source code using one of several shorthand formats.
  n         -- Source level single step, stepping over calls.  Defaults to
               current thread unless specified.
  next      -- Source level single step, stepping over calls.  Defaults to
               current thread unless specified.
```

```
nexti      -- Instruction level single step, stepping over calls.  Defaults to
              current thread unless specified.
ni         -- Instruction level single step, stepping over calls.  Defaults to
              current thread unless specified.
p          -- Evaluate an expression on the current thread.  Displays any
              returned value with LLDB's default formatting.
parray     -- parray <COUNT> <EXPRESSION> -- lldb will evaluate EXPRESSION to
              get a typed-pointer-to-an-array in memory, and will display
              COUNT elements of that type from the array.
po         -- Evaluate an expression on the current thread.  Displays any
              returned value with formatting controlled by the type's author.
poarray    -- poarray <COUNT> <EXPRESSION> -- lldb will evaluate EXPRESSION to
              get the address of an array of COUNT objects in memory, and will
              call po on them.
print      -- Evaluate an expression on the current thread.  Displays any
              returned value with LLDB's default formatting.
q          -- Quit the LLDB debugger.
r          -- Launch the executable in the debugger.
rbreak     -- Sets a breakpoint or set of breakpoints in the executable.
re         -- Commands to access registers for the current thread and stack
              frame.
repl       -- Evaluate an expression on the current thread.  Displays any
              returned value with LLDB's default formatting.
run        -- Launch the executable in the debugger.
s          -- Source level single step, stepping into calls.  Defaults to
              current thread unless specified.
shell      -- Run a shell command on the host.
si         -- Instruction level single step, stepping into calls.  Defaults to
              current thread unless specified.
sif        -- Step through the current block, stopping if you step directly
              into a function whose name matches the TargetFunctionName.
step       -- Source level single step, stepping into calls.  Defaults to
              current thread unless specified.
stepi      -- Instruction level single step, stepping into calls.  Defaults to
              current thread unless specified.
t          -- Change the currently selected thread.
tbreak     -- Set a one-shot breakpoint using one of several shorthand formats.
undisplay  -- Stop displaying expression at every stop (specified by stop-hook
              index.)
up         -- Select an older stack frame.  Defaults to moving one frame, a
              numeric argument can specify an arbitrary number.
v          -- Show variables for the current stack frame. Defaults to all
              arguments and local variables in scope. Names of argument,
              local, file static and file global variables can be specified.
              Children of aggregate variables can be specified such as
              'var- child.x'.  The -> and [] operators in 'frame variable' do
              not invoke operator overloads if they exist, but directly access
              the specified element.  If you want to trigger operator
              overloads use the expression command to print the variable
              instead.
              It is worth noting that except for overloaded operators, when
              printing local variables 'expr local_var' and 'frame var
              local_var' produce the same results.  However, 'frame variable'
              is more efficient, since it uses debug information and memory
              reads directly, rather than parsing and evaluating an
              expression, which may even involve JITing and running code in
```

```
                the target program.
  var         -- Show variables for the current stack frame. Defaults to all
                arguments and local variables in scope. Names of argument,
                local, file static and file global variables can be specified.
                Children of aggregate variables can be specified such as
                'var- child.x'.  The -> and [] operators in 'frame variable' do
                not invoke operator overloads if they exist, but directly access
                the specified element.  If you want to trigger operator
                overloads use the expression command to print the variable
                instead.
                It is worth noting that except for overloaded operators, when
                printing local variables 'expr local_var' and 'frame var
                local_var' produce the same results.  However, 'frame variable'
                is more efficient, since it uses debug information and memory
                reads directly, rather than parsing and evaluating an
                expression, which may even involve JITing and running code in
                the target program.
  vo          -- Show variables for the current stack frame. Defaults to all
                arguments and local variables in scope. Names of argument,
                local, file static and file global variables can be specified.
                Children of aggregate variables can be specified such as
                'var- child.x'.  The -> and [] operators in 'frame variable' do
                not invoke operator overloads if they exist, but directly access
                the specified element.  If you want to trigger operator
                overloads use the expression command to print the variable
                instead.
                It is worth noting that except for overloaded operators, when
                printing local variables 'expr local_var' and 'frame var
                local_var' produce the same results.  However, 'frame variable'
                is more efficient, since it uses debug information and memory
                reads directly, rather than parsing and evaluating an
                expression, which may even involve JITing and running code in
                the target program.
  x           -- Read from the memory of the current target process.
For more information on any command, type 'help <command-name>'.
```

lldb的help的用法解释

单个命令=子命令

单个命令的语法，可以用：

```
help <command name>
```

举例：

- `help register`

```
(lldb) help register
Commands to access registers for the current thread and stack frame.

Syntax: register [read write] ...
```

```
The following subcommands are supported:

      read  -- Dump the contents of one or more register values from the
               current frame.  If no register is specified, dumps them all.
      write -- Modify a single register value.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

- `help memory`

```
(lldb) help memory
Commands for operating on memory in the current target process.

Syntax: memory <subcommand> [<subcommand-options>]

The following subcommands are supported:

      find    -- Find a value in the memory of the current target process.
      history -- Print recorded stack traces for allocation/deallocation events
                 associated with an address.
      read    -- Read from the memory of the current target process.
      region  -- Get information on the memory region containing an address in
                 the current target process.
      write   -- Write to the memory of the current target process.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

单个命令的子命令=单个命令的参数

而命令的子命令的语法，也是前面加上help：

```
help <command> <subcommand>
```

举例：

- `help memory read`

常用命令

image

TODO：

- 【已解决】lldb命令使用心得：image

- image核心子命令
  - image lookup
  - image list
  - image dump

image命令语法

```
(lldb) help image
Commands for accessing information for one or more target modules.

Syntax: image

'image' is an abbreviation for 'target modules'
(lldb) help target modules
Commands for accessing information for one or more target modules.

Syntax: target modules <sub-command> ...

The following subcommands are supported:

      add          -- Add a new module to the current target's modules.
      dump         -- Commands for dumping information about one or more target
                      modules.
      list         -- List current executable and dependent shared library
                      images.
      load         -- Set the load addresses for one or more sections in a
                      target module.
      lookup       -- Look up information within executable and dependent
                      shared library images.
      search-paths -- Commands for managing module search paths for a target.
      show-unwind  -- Show synthesized unwind instructions for a function.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

image lookup

- `image lookup` 的典型写法举例
  - `-a`

```
image lookup -a 0x114fb69c4

image lookup -v -a 0x112d57730
image lookup -va 0x0000000195d31f14
im loo -va 0xa916260182319ea0

image lookup -a 0x00000000009e8000+0x0000001008f83b8
```

  - `-n`

```
image lookup -n statfs
image lookup -n ___lldb_unnamed_symbol2575$$akd
image lookup -n "+[UMUserManager sharedManager]"

image lookup -name getInt

image lookup -r -n objc_msgSend
image lookup -r -n accountsWithAccountType
image lookup -r -n "accountsWithAccountType:"
image lookup -rn initWithURL
image lookup -rn "AADeviceInfo"
image lookup -rn "setValue:forHTTPHeaderField:"
image lookup -rn "AADeviceInfo udid"
im loo -rn SetRequestPriority

image lookup -vn ___lldb_unnamed_symbol2575$$akd
image lookup -vn "-[AALoginAccountRequest urlRequest]"
image lookup -vn "-[AKAppleIDAuthenticationContextManager shouldContinueWithAut
henticationResults:error:forContextID:completion:]"
image lookup -vn "+[AADeviceInfo(Deprecated) udid]"
image lookup -vn "+[AADeviceInfo udid]"
image lookup -vn "-[AADeviceInfo udid]"

image lookup -vrn "AADeviceInfo udid"
```

  - `-s`

```
image lookup -s statfs

image lookup -r -s objc_msgSend
image lookup -r -s statfs
image lookup -r -s handlePressGesture
image lookup -r -s _nextButtonSelected
image lookup -r -s "authenticationContext"
```

```
image lookup -vs SecTrustEvaluateFastAsync
image lookup -vs "AADeviceInfo"
image lookup -vs "___lldb_unnamed_symbol972"

image lookup -v -s SSLHandshake
```

- `-t`

```
image lookup -type Person
image lookup -type NSObject
```

- `image lookup` 的主要参数
  - 根据不同类型去搜
    - address=地址
      - `-a <address-expression>` = `--address <address-expression>`
        - 作用：Lookup an address in one or more target modules
    - name=名称
      - `-n <function-or-symbol>` = `--name <function-or-symbol>`
        - 作用：Lookup a function or symbol by **name** in one or more target modules
          - searches **debug** symbols
    - symbol=符号
      - `-s <symbol>` = `--symbol <symbol>`
        - 作用：Lookup a symbol by name in the **symbol** tables in one or more target modules
          - searches **non-debug** symbols
    - type=类型
      - `-t <name>` = `--type <name>`
        - 作用：Lookup a type by name in the debug symbols in one or more target modules
  - 其他辅助参数
    - 输出详细信息
      - `-v` = `--verbose`
        - 作用：Enable verbose lookup information
    - 以正则表达式的方式去搜
      - `-r` = `--regex`
        - 作用：The `<name>` argument for name lookups are regular expressions.

以及：

- lldb支持命令的缩写
  - 常见的缩写
    - `image` -> `img` 、 `im`
    - `lookup` -> `loo`
- lldb支持字母合在一起
  - `-v -a` -> `-va`
  - `-r -n` -> `-rn`

所以就有多种常见写法：

- 基本参数的写法
  - `image lookup -a` == `im loo -a`
  - `image lookup -n` == `im loo -n`
  - `image lookup -s` == `im loo -s`
- 如果加上 `-v`，则是：
  - `image lookup -v -a` == `im loo -v -a`
    - == `image lookup -va` == `im loo -va`
  - `image lookup -v -n` == `im loo -v -n`
    - == `image lookup -vn` == `im loo -vn`
  - `image lookup -v -s` == `im loo -v -s`
    - == `image lookup -vs` == `im loo -vs`
- 如果加上 `-r`，则是：
  - `image lookup -r -n` == `im loo -r -n`
    - == `image lookup -rn` == `im loo -rn`
  - `image lookup -r -s` == `im loo -r -s`
    - == `image lookup -rs` == `im loo -rs`

image lookup的高级用法

限定在某个二进制Module内部查找

`lldb` 中 `image lookup` 的基本用法：

```
image lookup -a 0x1000
```

如果要限定在某个 `二进制文件` = `库` = `模块` = `Module` 中的话，语法是：

```
image lookup -a 0x1000 a.out
```

- 其中 `a.out` 是二进制文件名

举例

AppleAccount

```
im loo -rn didReceiveData AppleAccount
```

- 参数说明
  - `AppleAccount` 文件（此处调试时的路径是）
    - `/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount`
- 完整输出

```
(lldb) im loo -rn didReceiveData AppleAccount
3 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000192f4cf34] (AppleAccount.__TEXT.__text + 1000)
        Summary: AppleAccount`-[_AAURLSessionDelegate URLSession:dataTask:didReceiveData:]        Address: AppleAccount[0x0000000192f4cff4] (AppleAccount.__TEXT.__text + 1192)
        Summary: AppleAccount`-[AAURLSession URLSession:dataTask:didReceiveData:]
      Address: AppleAccount[0x0000000192f83d88] (AppleAccount.__TEXT.__text + 225852)
        Summary: AppleAccount`-[AARequester connection:didReceiveData:]
```

AppleStoreCore

```
image lookup -rn initialize AppleStoreCore
```

- 完整输出

```
(lldb) image lookup -rn initialize AppleStoreCore
3 matches found in /Users/crifan/Library/Developer/Xcode/DerivedData/Jolly-fbcdzphrbokcgxhejxlslydrdyaa/Build/Products/Debug-iphoneos/Jolly.app/Frameworks/AppleStoreCore.framework/AppleStoreCore:
        Address: AppleStoreCore[0x000000000049a6bc] (AppleStoreCore.__TEXT.__text + 4807496)
        Summary: AppleStoreCore`initializeAvailabilityCheck        Address: AppleStoreCore[0x000000000049a6c4] (AppleStoreCore.__TEXT.__text + 4807504)
        Summary: AppleStoreCore`_initializeAvailabilityCheck        Address: AppleStoreCore[0x00000000000a8010] (AppleStoreCore.__TEXT.__text + 668828)
        Summary: AppleStoreCore`static AppleStoreCore.User.initialize() -> ()
(lldb) image lookup -rs initialize AppleStoreCore
4 symbols match the regular expression 'initialize' in /Users/crifan/Library/Developer/Xcode/DerivedData/Jolly-fbcdzphrbokcgxhejxlslydrdyaa/Build/Products/Debug-iphoneos/Jolly.app/Frameworks/AppleStoreCore.framework/AppleStoreCore:
        Address: AppleStoreCore[0x000000000049a6bc] (AppleStoreCore.__TEXT.__text + 4807496)
        Summary: AppleStoreCore`initializeAvailabilityCheck        Address: AppleStoreCore[0x000000000049a6c4] (AppleStoreCore.__TEXT.__text + 4807504)
        Summary: AppleStoreCore`_initializeAvailabilityCheck        Address: AppleStoreCore[0x00000000004d0430] (AppleStoreCore.__TEXT.__stubs + 11844)
        Summary: AppleStoreCore`symbol stub for: swift_deallocUninitializedObject
      Address: AppleStoreCore[0x00000000000a8010] (AppleStoreCore.__TEXT.__text + 668828)
        Summary: AppleStoreCore`static AppleStoreCore.User.initialize() -> ()
```

image lookup的举例

image lookup的单命令举例

`image lookup -a`

lldb官网示例

```
(lldb) image lookup --address 0x100000aa3
      Address: a.out[0x0000000100000aa3] (a.out.__TEXT.__text + 131)
      Summary: a.out`main + 67 at main.c:13

(lldb) image lookup -a 0x1000
      Address: a.out[0x0000000000001000] (a.out.__PAGEZERO + 4096)

      Address: libsystem_c.dylib[0x0000000000001000] (libsystem_c.dylib.__TEXT.__text +
928)
      Summary: libsystem_c.dylib`mcount + 9

      Address: libsystem_dnssd.dylib[0x0000000000001000] (libsystem_dnssd.dylib.__TEXT.
__text + 456)
      Summary: libsystem_dnssd.dylib`ConvertHeaderBytes + 38

      Address: libsystem_kernel.dylib[0x0000000000001000] (libsystem_kernel.dylib.__TEX
T.__text + 1116)
      Summary: libsystem_kernel.dylib`clock_get_time + 102

(lldb) image lookup -a 0x1000 a.out
      Address: a.out[0x0000000000001000] (a.out.__PAGEZERO + 4096)

(lldb) image lookup --address 0x100123aa3
      Address: a.out[0x0000000100000aa3] (a.out.__TEXT.__text + 131)
      Summary: a.out`main + 67 at main.c:13
```

AwemeCore相关

```
(lldb) image lookup -a 0x114fb69c4
      Address: AwemeCore[0x000000001009a9c4] (AwemeCore.__BD_TEXT.__text + 175598020)
      Summary: AwemeCore`___lldb_unnamed_symbol1674948$$AwemeCore
(lldb) image lookup -a 0x10aed1514
      Address: AwemeCore[0x0000000005fb5514] (AwemeCore.__BD_TEXT.__text + 6886676)
      Summary: AwemeCore`___lldb_unnamed_symbol49294$$AwemeCore
(lldb) image lookup -a 0x10ad33da0
      Address: AwemeCore[0x0000000005e17da0] (AwemeCore.__BD_TEXT.__text + 5193120)
      Summary: AwemeCore`___lldb_unnamed_symbol36558$$AwemeCore

(lldb) image lookup -a 0x10a7125c4
      Address: AwemeCore[0x0000000005a3a5c4] (AwemeCore.__BD_TEXT.__text + 1140164)
      Summary: AwemeCore`___lldb_unnamed_symbol6381$$AwemeCore

(lldb) image lookup -a 0x11427c178
```

```
      Address: AwemeCore[0x000000000fa14178] (AwemeCore.__BD_TEXT.__text + 168755576)
      Summary: AwemeCore`___lldb_unnamed_symbol1588524$$AwemeCore

(lldb) image lookup -a 0x1128fc41c
      Address: AwemeCore[0x000000000fa1441c] (AwemeCore.__BD_TEXT.__text + 168756252)
      Summary: AwemeCore`___lldb_unnamed_symbol1588526$$AwemeCore
```

Apple Store相关

AppleAccountUI

```
(lldb) image lookup -a 0x1af6922fc
      Address: AppleAccountUI[0x00000001ae0222fc] (AppleAccountUI.__TEXT.__text + 475404
)
      Summary: AppleAccountUI`-[AAUISignInViewController _attemptAuthenticationWithCont
ext:].cold.1
```

StoreKitUI

```
(lldb) image lookup -a 0x00000001b0b30578
      Address: StoreKitUI[0x00000001ae9f0578] (StoreKitUI.__TEXT.__objc_methlist + 2432)

      Summary: StoreKitUI`_OBJC_$_CLASS_METHODS_SKUIImageCollectionViewCell + 16
```

YouTube相关

YouTube

```
(lldb) image lookup -a 0x0000000105163494
      Address: YouTube[0x00000001003db494] (YouTube.__TEXT.__text + 4013856)
      Summary: YouTube`___lldb_unnamed_symbol22084$$YouTube + 164
```

Module_Framework

```
(lldb) image lookup -a 0x00000001063d9850
      Address: Module_Framework[0x000000000194d850] (Module_Framework.__TEXT.__text + 2
6515536)
      Summary: Module_Framework`___lldb_unnamed_symbol15681$$Module_Framework + 376
(lldb) image lookup -a 0x00000001063d8d34
      Address: Module_Framework[0x000000000194cd34] (Module_Framework.__TEXT.__text + 2
6512692)
      Summary: Module_Framework`___lldb_unnamed_symbol15676$$Module_Framework + 80
(lldb) image lookup -a 0x000000010888211c
      Address: Module_Framework[0x0000000003df611c] (Module_Framework.__TEXT.__text + 6
4954652)
      Summary: Module_Framework`___lldb_unnamed_symbol170908$$Module_Framework + 52
(lldb) image lookup -a 0x0000000108884064
      Address: Module_Framework[0x0000000003df8064] (Module_Framework.__TEXT.__text + 6
```

```
4962660)
      Summary: Module_Framework`___lldb_unnamed_symbol171000$$Module_Framework + 28
(lldb) image lookup -a 0x0000000108388e4c
      Address: Module_Framework[0x00000000038fce4c] (Module_Framework.__TEXT.__text + 5
9739724)
      Summary: Module_Framework`___lldb_unnamed_symbol110205$$Module_Framework + 40
(lldb) image lookup -a 0x00000001063d999c
      Address: Module_Framework[0x000000000194d99c] (Module_Framework.__TEXT.__text + 2
6515868)
      Summary: Module_Framework`-[HAMCronetDataLoadTask startWithDelegate:delegateQueue:
]_block_block + 36

(lldb) image lookup -a 0x1062d4298
      Address: Module_Framework[0x0000000003e84298] (Module_Framework.__TEXT.__stubs +
29856)
      Summary: Module_Framework`symbol stub for: objc_msgSend

(lldb) image lookup -a 0x103a97ed4
      Address: Module_Framework[0x0000000000f8fed4] (Module_Framework.__TEXT.__text + 1
6301780)
      Summary: Module_Framework`-[MLHAMQueuePlayerSegmentList updatePeriodCurrentTimeFo
rSegment:]_block

(lldb) image lookup -a 0x108806a08
      Address: Module_Framework[0x000000000198aa08] (Module_Framework.__TEXT.__text + 2
6765832)
      Summary: Module_Framework`-[HAMPlayerInternal pause]

(lldb) im loo -a 0x000000010916 94a4
      Address: Module_Framework[0x0000000003df94a4] (Module_Framework.__TEXT.__text + 6
4967844)
      Summary: Module_Framework`___lldb_unnamed_symbol171165$$Module_Framework
```

`-a` 找不到的例子

另外，通过 `-a` 也有找不到的

比如：

进入：跳板汇编代码后

```
->  0x112925950: adrp   x16, 70002
    0x112925954: ldr    x16, [x16, #0xb30]
    0x112925958: br     x16
    0x11292595c: adrp   x16, 70002
    0x112925960: ldr    x16, [x16, #0xb38]
    0x112925964: br     x16
    0x112925968: adrp   x16, 70002
    0x11292596c: ldr    x16, [x16, #0xb40]
```

去查找：`0x112925950`

```
(lldb) image lookup -a 0x112925950
```

```
      Address: AwemeCore[0x000000001147d950] (AwemeCore.__BD_TEXT.__stubs + 28440)
      Summary:
```

就是：找不到的。

其他找不到的例子：

```
(lldb) image lookup -a 0x114af2380
      Address: AwemeCore[0x000000001147a380] (AwemeCore.__BD_TEXT.__stubs + 14664)
      Summary:
```

`-a` 找出是 `data` 的例子

```
(lldb) image lookup -a 0x00000001f2468c6a
      Address: AppleAccountUI[0x00000001f0328c6a] (AppleAccountUI.__DATA_DIRTY.__objc_d
ata + 242)
      Summary: (void *)0x73e800000001f246
```

先 `_shortMethodDescription` 再用 `-a` 查找函数地址，可以找到Class函数

对于 `_shortMethodDescription` 查看到的函数地址：

```
  + (id) awe_userRecommendImageNamed:(id)arg1; (0x114d06fcc)
  + (id) awe_userRecommendImageNamed:(id)arg1 compatibleWithTraitCollection:(id)arg2; (
0x114d06fdc)
```

用 `-a` 去查找对应地址，可以找到，对应的 `Class` 级别的函数：

```
(lldb) image lookup -a 0x114d06fcc
      Address: AwemeCore[0x000000000fffefcc] (AwemeCore.__BD_TEXT.__text + 174960588)
      Summary: AwemeCore`+[UIImage(AWEUserRecommend) awe_userRecommendImageNamed:]
(lldb) image lookup -a 0x114d06fdc
      Address: AwemeCore[0x000000000fffefdc] (AwemeCore.__BD_TEXT.__text + 174960604)
      Summary: AwemeCore`+[UIImage(AWEUserRecommend) awe_userRecommendImageNamed:compat
ibleWithTraitCollection:]
```

其他

```
(lldb) image lookup -a 0x1021a4ab0
      Address: libsubstrate.dylib[0x0000000000014ab0] (libsubstrate.dylib.__TEXT.__stub
s + 516)
      Summary: libsubstrate.dylib`symbol stub for: _dyld_get_all_image_infos

(lldb) image lookup -a 0x0000000105c636fc
      Address: substitute-inserter.dylib[0x00000000000076fc] (substitute-inserter.dylib
.__TEXT.__text + 11384)
      Summary: substitute-inserter.dylib`___lldb_unnamed_symbol6$$substitute-inserter.d
```

```
ylib + 3536
```

image lookup -n == image lookup -name

getInt

```
(lldb) image lookup -name getInt
1 match found in /Users/liu_david/Library/Developer/Xcode/DerivedData/TestWeak-egnzdbnd
wsiikvcheqmcxvkqnwbw/Build/Products/Debug/TestWeak:
        Address: TestWeak[0x0000000100001a70] (TestWeak.__TEXT.__text + 48)
        Summary: TestWeak`-[Person getInt] at main.m:29
1 match found in /usr/lib/libicucore.A.dylib:
        Address: libicucore.A.dylib[0x000000000003b046] (libicucore.A.dylib.__TEXT.__te
xt + 239078)
        Summary: libicucore.A.dylib`icu::ResourceBundle::getInt(UErrorCode) const
1 match found in /System/Library/Frameworks/Security.framework/Versions/A/Security:
        Address: Security[0x000000000012260e] (Security.__TEXT.__text + 1184206)
        Summary: Security`Security::Context::getInt(unsigned int, int) const
1 match found in /System/Library/Frameworks/SceneKit.framework/Versions/A/SceneKit:
        Address: SceneKit[0x0000000000024f396] (SceneKit.__TEXT.__text + 2414070)
        Summary: SceneKit`getInt(std::__1::basic_string<char, std::__1::char_traits<char
>, std::__1::allocator<char> > const&, std::__1::basic_string<char, std::__1::char_trai
ts<char>, std::__1::allocator<char> >&, int&, bool, bool)
1 match found in /usr/lib/libTelephonyUtilDynamic.dylib:
        Address: libTelephonyUtilDynamic.dylib[0x0000000000012e10] (libTelephonyUtilDyn
amic.dylib.__TEXT.__text + 69904)
        Summary: libTelephonyUtilDynamic.dylib`ctu::cf::map_adapter::getInt(__CFString
const*, int) const
1 match found in /System/Library/PrivateFrameworks/CorePrediction.framework/Versions/A/
CorePrediction:
        Address: CorePrediction[0x00000000000475c4] (CorePrediction.__TEXT.__text + 286
980)
        Summary: CorePrediction`-[CPMLEvalutionResult getInt]
```

transformOtherModelToSuit:

```
(lldb) image lookup -n transformOtherModelToSuit:
1 match found in /Users/crifan/Library/Developer/Xcode/DerivedData/DiDi-cwpbvvyvqmeijmc
jnneothzuthsy/Build/Products/Debug-iphonesimulator/DiDi.app/DiDi:
        Address: DiDi[0x0000000100293d60] (DiDi.__TEXT.__text + 2693664)
        Summary: DiDi`+[FW_BetFunction transformOtherModelToSuit:] at FW_BetFunction.m:
107
```

___lldb_unnamed_symbol2575$$akd

```
(lldb) image lookup -n ___lldb_unnamed_symbol2575$$akd
1 match found in /System/Library/PrivateFrameworks/AuthKit.framework/akd:
        Address: akd[0x00000001000a0460] (akd.__TEXT.__text + 639120)
        Summary: akd`___lldb_unnamed_symbol2575$$akd
```

"+[UMUserManager sharedManager]"

```
(lldb) image lookup -n "+[UMUserManager sharedManager]"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/UserManagement.framework/UserManagement:
        Address: UserManagement[0x000000019ffdb3e4] (UserManagement.__TEXT.__text + 1896
)
        Summary: UserManagement`+[UMUserManager sharedManager]
```

`image lookup -r -n` == `image lookup -rn` == `im loo -rn`

objc_msgSend

```
(lldb) image lookup -r -n objc_msgSend
7 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.7 (17H35)
/Symbols/usr/lib/libobjc.A.dylib:
        Address: libobjc.A.dylib[0x00000001801b7e60] (libobjc.A.dylib.__TEXT.__text + 2
816)
        Summary: libobjc.A.dylib`_objc_msgSend_uncached        Address: libobjc.A.dylib[
0x00000001801b7b20] (libobjc.A.dylib.__TEXT.__text + 1984)
        Summary: libobjc.A.dylib`objc_msgSend        Address: libobjc.A.dylib[0x0000000
1801b7ce0] (libobjc.A.dylib.__TEXT.__text + 2432)
        Summary: libobjc.A.dylib`objc_msgSendSuper        Address: libobjc.A.dylib[0x00
000001801b7d60] (libobjc.A.dylib.__TEXT.__text + 2560)
        Summary: libobjc.A.dylib`objc_msgSendSuper2        Address: libobjc.A.dylib[0x0
0000001801b8080] (libobjc.A.dylib.__TEXT.__text + 3360)
        Summary: libobjc.A.dylib`objc_msgSendSuper2_debug        Address: libobjc.A.dyl
ib[0x00000001801b8060] (libobjc.A.dylib.__TEXT.__text + 3328)
        Summary: libobjc.A.dylib`objc_msgSend_debug        Address: libobjc.A.dylib[0x0
0000001801b8040] (libobjc.A.dylib.__TEXT.__text + 3296)
        Summary: libobjc.A.dylib`objc_msgSend_noarg
2 matches found in /Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjoxbki
bsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/libcycript.dylib:
        Address: libcycript.dylib[0x0000000000069cb8] (libcycript.dylib.__TEXT.__text +
416952)
        Summary: libcycript.dylib`$objc_msgSend(OpaqueJSContext const*, OpaqueJSValue*,
 OpaqueJSValue*, unsigned long, OpaqueJSValue const* const*, OpaqueJSValue const**)
    Address: libcycript.dylib[0x000000000006d318] (libcycript.dylib.__TEXT.__text + 430
872)
        Summary: libcycript.dylib`$objc_msgSend(OpaqueJSContext const*, OpaqueJSValue*,
 OpaqueJSValue*, unsigned long, OpaqueJSValue const* const*)
```

accountsWithAccountType

```
(lldb) image lookup -r -n accountsWithAccountType
```

```
44 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/Frameworks/Accounts.framework/Accounts:
        Address: Accounts[0x0000000181af486c] (Accounts.__TEXT.__text + 26736)
        Summary: Accounts`-[ACAccountStore accountsWithAccountTypeIdentifiers:preloaded
Properties:error:]        Address: Accounts[0x0000000181af5fbc] (Accounts.__TEXT.__text
 + 32704)
        Summary: Accounts`__79-[ACAccountStore accountsWithAccountTypeIdentifiers:prelo
adedProperties:error:]_block_invoke        Address: Accounts[0x0000000181af6e08] (Accou
nts.__TEXT.__text + 36364)
        Summary: Accounts`__79-[ACAccountStore accountsWithAccountTypeIdentifiers:prelo
adedProperties:error:]_block_invoke_2        Address: Accounts[0x0000000181af9328] (Acc
ounts.__TEXT.__text + 45868)
        Summary: Accounts`__56-[ACAccountStore accountsWithAccountType:options:error:]_
block_invoke_2        Address: Accounts[0x0000000181afb2cc] (Accounts.__TEXT.__text + 5
3968)
        Summary: Accounts`-[ACAccountStore accountsWithAccountType:]        Address: Ac
counts[0x0000000181afb944] (Accounts.__TEXT.__text + 55
...
```

找到了太多的结果。

"accountsWithAccountType:"

所以故意用 `"accountsWithAccountType:"` 缩小范围：

```
(lldb) image lookup -r -n "accountsWithAccountType:"
27 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/Frameworks/Accounts.framework/Accounts:
        Address: Accounts[0x0000000181af9328] (Accounts.__TEXT.__text + 45868)
        Summary: Accounts`__56-[ACAccountStore accountsWithAccountType:options:error:]_
block_invoke_2        Address: Accounts[0x0000000181afb2cc] (Accounts.__TEXT.__text + 5
3968)
        Summary: Accounts`-[ACAccountStore accountsWithAccountType:]        Address: Ac
counts[0x0000000181afc3bc] (Accounts.__TEXT.__text + 58304)
        Summary: Accounts`-[ACAccountStore accountsWithAccountType:options:completion:]
        Address: Accounts[0x0000000181afcb30] (Accounts.__TEXT.__text + 60212)
        Summary: Accounts`__42-[ACAccountStore accountsWithAccountType:]_block_invoke
     Address: Accounts[0x0000000181afcbb0] (Accounts.__TEXT.__text + 60340)
        Summary: Accounts`-[ACAccountStore accountsWithAccountType:options:error:]
   Address: Accounts[0x0000000181afd1bc] (Accounts.__TEXT.__text + 61888)
        Summary: Accounts`__56-[ACAccountStore accountsWithAccountType:options:error:]_
block_invoke        Address: Accounts[0x0000000181afd474] (Accounts.__TEXT.__text + 625
84)
        Summary: Accounts`__61-[ACAccountStore accountsWithAccountType:options:completi
on:]_block_invoke_2        Address: Accounts[0x0000000181b001ac] (Accounts.__TEXT.__tex
t + 74160)
        Summary: Accounts`__61-[ACAccountStore accountsWithAccountType:options:completi
on:]_block_invoke        Address: Accounts[0x0000000181b00a28] (Accounts.__TEXT.__text
+ 76332)
        Summary: Accounts`__42-[ACAccountStore accountsWithAccountType:]_block_invoke_2
        Address: Accounts[0x0000000181b064f0] (Accounts.__TEXT.__text + 99572)
        Summary: Accounts`__42-[ACAccountStore accountsWithAccountType:]_block_invoke.1
70        Address: Accounts[0x0000000181b0653c] (Accounts.__TEXT.__text + 99648)
```

```
        Summary: Accounts`__56-[ACAccountStore accountsWithAccountType:options:error:]_
block_invoke.179        Address: Accounts[0x0000000181b06598] (Accounts.__TEXT.__text +
99740)
        Summary: Accounts`-[ACAccountStore accountsWithAccountType:completion:]
Address: Accounts[0x0000000181b068bc] (Accounts.__TEXT.__text + 100544)
        Summary: Accounts`__53-[ACAccountStore accountsWithAccountType:completion:]_blo
ck_invoke        Address: Accounts[0x0000000181b069b8] (Accounts.__TEXT.__text + 100796)

        Summary: Accounts`__53-[ACAccountStore accountsWithAccountType:completion:]_blo
ck_invoke_2        Address: Accounts[0x0000000181b06b70] (Accounts.__TEXT.__text + 1012
36)
        Summary: Accounts`__53-[ACAccountStore accountsWithAccountType:completion:]_blo
ck_invoke.182        Address: Accounts[0x0000000181b06c10] (Accounts.__TEXT.__text + 10
1396)
        Summary: Accounts`__53-[ACAccountStore accountsWithAccountType:completion:]_blo
ck_invoke_2.183        Address: Accounts[0x0000000181b06da4] (Accounts.__TEXT.__text +
101800)
        Summary: Accounts`__53-[ACAccountStore accountsWithAccountType:completion:]_blo
ck_invoke.186        Address: Accounts[0x0000000181b06e08] (Accounts.__TEXT.__text + 10
1900)
        Summary: Accounts`__61-[ACAccountStore accountsWithAccountType:options:completi
on:]_block_invoke.187        Address: Accounts[0x0000000181b06eb4] (Accounts.__TEXT.__t
ext + 102072)
        Summary: Accounts`__61-[ACAccountStore accountsWithAccountType:options:completi
on:]_block_invoke_2.188        Address: Accounts[0x0000000181b07048] (Accounts.__TEXT._
_text + 102476)
        Summary: Accounts`__61-[ACAccountStore accountsWithAccountType:options:completi
on:]_block_invoke.191        Address: Accounts[0x0000000181b4b90c] (Accounts.__TEXT.__t
ext + 383248)
        Summary: Accounts`-[ACAccountStore accountsWithAccountType:].cold.1        Addr
ess: Accounts[0x0000000181b4b968] (Accounts.__TEXT.__text + 383340)
        Summary: Accounts`__42-[ACAccountStore accountsWithAccountType:]_block_invoke_2
.cold.1        Address: Accounts[0x0000000181b4b9c4] (Accounts.__TEXT.__text + 383432)
        Summary: Accounts`__42-[ACAccountStore accountsWithAccountType:]_block_invoke.1
70.cold.1        Address: Accounts[0x0000000181b4b9f8] (Accounts.__TEXT.__text + 383484)

        Summary: Accounts`__56-[ACAccountStore accountsWithAccountType:options:error:]_
block_invoke_2.cold.1        Address: Accounts[0x0000000181b4ba60] (Accounts.__TEXT.__t
ext + 383588)
        Summary: Accounts`-[ACAccountStore accountsWithAccountType:completion:].cold.1
       Address: Accounts[0x0000000181b4babc] (Accounts.__TEXT.__text + 383680)
        Summary: Accounts`__53-[ACAccountStore accountsWithAccountType:completion:]_blo
ck_invoke_2.183.cold.1        Address: Accounts[0x0000000181b4bb18] (Accounts.__TEXT.__
text + 383772)
        Summary: Accounts`__61-[ACAccountStore accountsWithAccountType:options:completi
on:]_block_invoke_2.188.cold.1
4 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/PrivateFrameworks/ContactsFoundation.framework/ContactsF
oundation:
        Address: ContactsFoundation[0x000000018cd42fb4] (ContactsFoundation.__TEXT.__te
xt + 455316)
        Summary: ContactsFoundation`-[_CNACAccountStoreBasedProvider accountsWithAccoun
tType:]        Address: ContactsFoundation[0x000000018cd43704] (ContactsFoundation.__TE
XT.__text + 457188)
        Summary: ContactsFoundation`-[_CNACAccountStaticProvider accountsWithAccountTyp
e:]        Address: ContactsFoundation[0x000000018cd43830] (ContactsFoundation.__TEXT._
```

```
_text + 457488)
        Summary: ContactsFoundation`__54-[_CNACAccountStaticProvider accountsWithAccoun
tType:]_block_invoke        Address: ContactsFoundation[0x000000018cd43e08] (ContactsFo
undation.__TEXT.__text + 458984)
        Summary: ContactsFoundation`-[CNACAccountProvider accountsWithAccountType:]
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000192fa0604] (AppleAccount.__TEXT.__text + 342712)
        Summary: AppleAccount`-[ACAccountStore(AppleID) accountsWithAccountType:appleID:
]
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/AppleMediaServices.framework/AppleMediaS
ervices:
        Address: AppleMediaServices[0x000000018452d3ac] (AppleMediaServices.__TEXT.__te
xt + 67172)
        Summary: AppleMediaServices`-[ACAccountStore(AppleMediaServices_Project) _ams_a
ccountsWithAccountType:options:error:]
2 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/PrivateFrameworks/CalendarFoundation.framework/CalendarF
oundation:
        Address: CalendarFoundation[0x0000000199fc36d4] (CalendarFoundation.__TEXT.__te
xt + 44404)
        Summary: CalendarFoundation`+[CalAccountsProvider _accountsWithAccountType:inSt
ore:error:]        Address: CalendarFoundation[0x0000000199fc3954] (CalendarFoundation.
__TEXT.__text + 45044)
        Summary: CalendarFoundation`__62+[CalAccountsProvider _accountsWithAccountType:
inStore:error:]_block_invoke
13 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/PrivateFrameworks/AccountsDaemon.framework/AccountsDaemo
n:
        Address: AccountsDaemon[0x00000001a57a1f4c] (AccountsDaemon.__TEXT.__text + 172
68)
        Summary: AccountsDaemon`-[ACDAccountStoreFilter accountsWithAccountType:options
:completion:]        Address: AccountsDaemon[0x00000001a57a287c] (AccountsDaemon.__TEXT
.__text + 19620)
        Summary: AccountsDaemon`__68-[ACDAccountStoreFilter accountsWithAccountType:opt
ions:completion:]_block_invoke        Address: AccountsDaemon[0x00000001a57a3e88] (Acco
untsDaemon.__TEXT.__text + 25264)
        Summary: AccountsDaemon`-[ACDAccountStore accountsWithAccountType:options:compl
etion:]        Address: AccountsDaemon[0x00000001a57a48a0] (AccountsDaemon.__TEXT.__tex
t + 27848)
        Summary: AccountsDaemon`-[ACDAccountStoreFilter accountsWithAccountType:handler:
]        Address: AccountsDaemon[0x00000001a57a5504] (AccountsDaemon.__TEXT.__text + 31
020)
        Summary: AccountsDaemon`__58-[ACDAccountStore _accountsWithAccountType:options:
error:]_block_invoke        Address: AccountsDaemon[0x00000001a57a5b18] (AccountsDaemon
.__TEXT.__text + 32576)
        Summary: AccountsDaemon`-[ACDAccountStore _accountsWithAccountType:options:erro
r:]        Address: AccountsDaemon[0x00000001a57a7988] (AccountsDaemon.__TEXT.__text +
40368)
        Summary: AccountsDaemon`__57-[ACDAccountStoreFilter accountsWithAccountType:han
dler:]_block_invoke        Address: AccountsDaemon[0x00000001a57a8294] (AccountsDaemon.
__TEXT.__text + 42684)
        Summary: AccountsDaemon`-[ACDAccountStore accountsWithAccountType:handler:]
    Address: AccountsDaemon[0x00000001a5824660] (AccountsDaemon.__TEXT.__text + 551560)
        Summary: AccountsDaemon`-[ACDAccountStore accountsWithAccountType:options:compl
```

```
etion:].cold.1        Address: AccountsDaemon[0x00000001a58246c4] (AccountsDaemon.__TEX
T.__text + 551660)
        Summary: AccountsDaemon`-[ACDAccountStore accountsWithAccountType:options:compl
etion:].cold.2        Address: AccountsDaemon[0x00000001a5824728] (AccountsDaemon.__TEX
T.__text + 551760)
        Summary: AccountsDaemon`__58-[ACDAccountStore _accountsWithAccountType:options:
error:]_block_invoke.cold.1        Address: AccountsDaemon[0x00000001a5829e98] (Account
sDaemon.__TEXT.__text + 574144)
        Summary: AccountsDaemon`-[ACDAccountStoreFilter accountsWithAccountType:handler:
].cold.1        Address: AccountsDaemon[0x00000001a5829f5c] (AccountsDaemon.__TEXT.__te
xt + 574340)
        Summary: AccountsDaemon`-[ACDAccountStoreFilter accountsWithAccountType:options
:completion:].cold.1
```

"accountTypeWithIdentifier:handler:"

```
(lldb) image lookup -r -n "accountTypeWithIdentifier:handler:"
4 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/PrivateFrameworks/AccountsDaemon.framework/AccountsDaemo
n:
        Address: AccountsDaemon[0x00000001a57a009c] (AccountsDaemon.__TEXT.__text + 9412
)
        Summary: AccountsDaemon`-[ACDAccountStoreFilter accountTypeWithIdentifier:handl
er:]        Address: AccountsDaemon[0x00000001a57a33a0] (AccountsDaemon.__TEXT.__text +
22472)
        Summary: AccountsDaemon`-[ACDAccountStore accountTypeWithIdentifier:handler:]
      Address: AccountsDaemon[0x00000001a57a7604] (AccountsDaemon.__TEXT.__text + 39468)

        Summary: AccountsDaemon`__53-[ACDAccountStore accountTypeWithIdentifier:handler:
]_block_invoke        Address: AccountsDaemon[0x00000001a5824208] (AccountsDaemon.__TEX
T.__text + 550448)
        Summary: AccountsDaemon`__53-[ACDAccountStore accountTypeWithIdentifier:handler:
]_block_invoke.cold.1
```

initWithURL

```
(lldb) image lookup -rn initWithURL
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/Frameworks/Accounts.framework/Accounts:
        Address: Accounts[0x0000000181b406b0] (Accounts.__TEXT.__text + 337588)
        Summary: Accounts`-[ACProtobufURL(Helpers) initWithURL:]
16 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/Frameworks/Foundation.framework/Foundation:
        Address: Foundation[0x0000000181bb3af0] (Foundation.__TEXT.__text + 295120)
        Summary: Foundation`-[NSConcreteFileHandle initWithURL:flags:createMode:error:]
        Address:
...
```

SetRequestPriority

```
(lldb) im loo -rn SetRequestPriority
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/Frameworks/CFNetwork.framework/CFNetwork:
        Address: CFNetwork[0x0000000180b87c34] (CFNetwork.__TEXT.__text + 150228)
        Summary: CFNetwork`CFURLRequestSetRequestPriority
```

didReceiveData

```
(lldb) im loo -rn didReceiveData
...
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/ProtocolBuffer.framework/ProtocolBuffer:
        Address: ProtocolBuffer[0x000000019a32da74] (ProtocolBuffer.__TEXT.__text + 792
88)
        Summary: ProtocolBuffer`-[PBSessionRequester URLSession:dataTask:didReceiveData:
]
2 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/usr/lib/libTelephonyUtilDynamic.dylib:
...
2 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/Frameworks/Network.framework/Network:
        Address: Network[0x0000000198ecb61c] (Network.__TEXT.__text + 1297828)
        Summary: Network`__90-[NWURLSessionDelegateWrapper dataTask:didReceiveData:comp
lete:metrics:completionHandler:]_block_invoke        Address: Network[0x0000000198ecb744
] (Network.__TEXT.__text + 1298124)
        Summary: Network`__90-[NWURLSessionDelegateWrapper dataTask:didReceiveData:comp
lete:metrics:completionHandler:]_block_invoke_2
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/UIKitCore.framework/UIKitCore:
...
        Address: AppleMediaServices[0x00000001845330e4] (AppleMediaServices.__TEXT.__te
xt + 91036)
        Summary: AppleMediaServices`-[AMSURLSession URLSession:dataTask:didReceiveData:]
        Address: AppleMediaServices[0x000000018491c054] (AppleMediaServices.__TEXT.__te
xt + 4190988)
        Summary: AppleMediaServices`-[AMSCURLSessionDelegate URLSession:dataTask:didRec
eiveData:]
3 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/PrivateFrameworks/AuthKit.framework/AuthKit:
        Address: AuthKit[0x0000000192ea6fd8] (AuthKit.__TEXT.__text + 99748)
        Summary: AuthKit`-[AKURLSession URLSession:dataTask:didReceiveData:]        Add
ress: AuthKit[0x0000000192f0d750] (AuthKit.__TEXT.__text + 519452)
        Summary: AuthKit`-[AKURLSession URLSession:dataTask:didReceiveData:].cold.1
    Address: AuthKit[0x0000000192f0d784] (AuthKit.__TEXT.__text + 519504)
        Summary: AuthKit`-[AKURLSession URLSession:dataTask:didReceiveData:].cold.2
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/AppleIDAuthSupport.framework/AppleIDAuth
Support:
        Address: AppleIDAuthSupport[0x00000001b675a090] (AppleIDAuthSupport.__TEXT.__te
xt + 6184)
        Summary: AppleIDAuthSupport`-[AIASSession URLSession:dataTask:didReceiveData:]
```

```
3 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000192f4cf34] (AppleAccount.__TEXT.__text + 1000)
        Summary: AppleAccount`-[_AAURLSessionDelegate URLSession:dataTask:didReceiveDat
a:]        Address: AppleAccount[0x0000000192f4cff4] (AppleAccount.__TEXT.__text + 1192)

        Summary: AppleAccount`-[AAURLSession URLSession:dataTask:didReceiveData:]
  Address: AppleAccount[0x0000000192f83d88] (AppleAccount.__TEXT.__text + 225852)
        Summary: AppleAccount`-[AARequester connection:didReceiveData:]
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/Frameworks/LinkPresentation.framework/LinkPresentation:
...
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/GameCenterUI.framework/GameCenterUI:
        Address: GameCenterUI[0x000000019b06c5d4] (GameCenterUI.__TEXT.__text + 1058120)

        Summary: GameCenterUI`-[GKMatchmakerViewController match:didReceiveData:fromRem
otePlayer:]
```

"_proxiedAppBundleID"

```
(lldb) image lookup -r -n "_proxiedAppBundleID"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/PrivateFrameworks/AuthKit.framework/AuthKit:
        Address: AuthKit[0x0000000192effbd8] (AuthKit.__TEXT.__text + 463268)
        Summary: AuthKit`-[AKAppleIDAuthenticationContext _proxiedAppBundleID]
```

"setValue:forHTTPHeaderField:"

```
(lldb) image lookup -rn "setValue:forHTTPHeaderField:"
9 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)
/Symbols/System/Library/PrivateFrameworks/StoreServices.framework/StoreServices:
        Address: StoreServices[0x00000001921ae43c] (StoreServices.__TEXT.__text + 139100
)
        Summary: StoreServices`-[SSURLBagContext setValue:forHTTPHeaderField:]        A
ddress: StoreServices[0x0000000192214c3c] (StoreServices.__TEXT.__text + 558940)
        Summary: StoreServices`-[SSMutableAuthenticationContext setValue:forHTTPHeaderF
ield:]        Address: StoreServices[0x000000019224fe9c] (StoreServices.__TEXT.__text +
801212)
        Summary: StoreServices`-[SSMutableURLRequestProperties setValue:forHTTPHeaderFi
eld:]        Address: StoreServices[0x000000019224ff54] (StoreServices.__TEXT.__text +
801396)
        Summary: StoreServices`__61-[SSMutableURLRequestProperties setValue:forHTTPHead
erField:]_block_invoke        Address: StoreServices[0x000000019226d5e0] (StoreServices
.__TEXT.__text + 921856)
        Summary: StoreServices`-[SSVPlaybackLeaseRequest setValue:forHTTPHeaderField:]
       Address: StoreServices[0x00000001922e1f04] (StoreServices.__TEXT.__text + 1399332
)
        Summary: StoreServices`-[SSVAccountLessPlaybackOperation setValue:forHTTPHeader
Field:]        Address: StoreServices[0x00000001922e1fc8] (StoreServices.__TEXT.__text
+ 1399528)
```

```
        Summary: StoreServices`__63-[SSVAccountLessPlaybackOperation setValue:forHTTPHe
aderField:]_block_invoke        Address: StoreServices[0x00000001922f7034] (StoreServic
es.__TEXT.__text + 1485652)
        Summary: StoreServices`-[SSVPlatformRequestOperation setValue:forHTTPHeaderFiel
d:]        Address: StoreServices[0x00000001922f70f8] (StoreServices.__TEXT.__text + 14
85848)
        Summary: StoreServices`__59-[SSVPlatformRequestOperation setValue:forHTTPHeader
Field:]_block_invoke
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/iTunesCloud.framework/iTunesCloud:
        Address: iTunesCloud[0x0000000196363a5c] (iTunesCloud.__TEXT.__text + 760432)
        Summary: iTunesCloud`-[ICMediaAssetDownloadRequest setValue:forHTTPHeaderField:]

2 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)
/Symbols/System/Library/PrivateFrameworks/iTunesStoreUI.framework/iTunesStoreUI:
        Address: iTunesStoreUI[0x00000001aeb1b414] (iTunesStoreUI.__TEXT.__text + 388832
)
        Summary: iTunesStoreUI`-[SUScriptXMLHTTPStoreRequest setValue:forHTTPHeaderFiel
d:]        Address: iTunesStoreUI[0x00000001aeb53644] (iTunesStoreUI.__TEXT.__text + 61
8768)
        Summary: iTunesStoreUI`-[SUScriptXMLHTTPRequest setValue:forHTTPHeaderField:]
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/Osprey.framework/Osprey:
        Address: Osprey[0x00000001bb1f2e2c] (Osprey.__TEXT.__text + 67092)
        Summary: Osprey`-[OspreyMutableRequest setValue:forHTTPHeaderField:]
```

"libobjc"

```
(lldb) image lookup -rn "libobjc"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/Symbolication.framework/Symbolication:
        Address: Symbolication[0x000000019825ff50] (Symbolication.__TEXT.__text + 358032
)
        Summary: Symbolication`-[VMUObjectIdentifier libobjcSymbolOwner]
```

"AADeviceInfo udid"

```
(lldb) image lookup -rn "AADeviceInfo udid"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000191e0d970] (AppleAccount.__TEXT.__text + 173384)
        Summary: AppleAccount`-[AADeviceInfo udid]
```

"AADeviceInfo"

```
(lldb) image lookup -rn "AADeviceInfo"
46 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346
)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
  Address: AppleAccount[0x0000000191de77d4] (AppleAccount.__TEXT.__text + 17324)
```

```
  Summary: AppleAccount`+[AADeviceInfo isInternalBuild]       Address: AppleAccount[0x
0000000191e0d764] (AppleAccount.__TEXT.__text + 172860)
  Summary: AppleAccount`+[AADeviceInfo currentInfo]       Address: AppleAccount[0x0000
000191e0d7a4] (AppleAccount.__TEXT.__text + 172924)
  Summary: AppleAccount`__27+[AADeviceInfo currentInfo]_block_invoke       Address: Ap
pleAccount[0x0000000191e0d7d0] (AppleAccount.__TEXT.__text + 172968)
  Summary: AppleAccount`+[AADeviceInfo locationServicesRestricted]       Address: Appl
eAccount[0x0000000191e0d830] (AppleAccount.__TEXT.__text + 173064)
  Summary: AppleAccount`-[AADeviceInfo deviceInfoDictionary]       Address: AppleAccou
nt[0x0000000191e0d950] (AppleAccount.__TEXT.__text + 173352)
  Summary: AppleAccount`-[AADeviceInfo osVersion]       Address: AppleAccount[0x000000
0191e0d970] (AppleAccount.__TEXT.__text + 173384)
  Summary: AppleAccount`-[AADeviceInfo udid]       Address: AppleAccount[0x0000000191e
0d990] (AppleAccount.__TEXT.__text + 173416)
  Summary: AppleAccount`-[AADeviceInfo serialNumber]       Address: AppleAccount[0x000
0000191e0d9b0] (AppleAccount.__TEXT.__text + 173448)
  Summary: AppleAccount`-[AADeviceInfo wifiMacAddress]       Address: AppleAccount[0x0
000000191e0d9d0] (AppleAccount.__TEXT.__text + 173480)
  Summary: AppleAccount`-[AADeviceInfo bluetoothMacAddress]       Address: AppleAccount
[0x0000000191e0d9f0] (AppleAccount.__TEXT.__text + 173512)
  Summary: AppleAccount`-[AADeviceInfo productVersion]       Address: AppleAccount[0x0
000000191e0da10] (AppleAccount.__TEXT.__text + 173544)
  Summary: AppleAccount`-[AADeviceInfo productType]       Address: AppleAccount[0x0000
000191e0da30] (AppleAccount.__TEXT.__text + 173576)
  Summary: AppleAccount`-[AADeviceInfo deviceName]       Address: AppleAccount[0x00000
00191e0da50] (AppleAccount.__TEXT.__text + 173608)
  Summary: AppleAccount`-[AADeviceInfo deviceColor]       Address: AppleAccount[0x0000
000191e0da70] (AppleAccount.__TEXT.__text + 173640)
  Summary: AppleAccount`-[AADeviceInfo deviceEnclosureColor]       Address: AppleAccou
nt[0x0000000191e0da90] (AppleAccount.__TEXT.__text + 173672)
  Summary: AppleAccount`-[AADeviceInfo deviceCoverGlassColor]       Address: AppleAcco
unt[0x0000000191e0dab0] (AppleAccount.__TEXT.__text + 173704)
  Summary: AppleAccount`-[AADeviceInfo deviceHousingColor]       Address: AppleAccount[
0x0000000191e0dad0] (AppleAccount.__TEXT.__text + 173736)
  Summary: AppleAccount`-[AADeviceInfo deviceBackingColor]       Address: AppleAccount[
0x0000000191e0daf0] (AppleAccount.__TEXT.__text + 173768)
  Summary: AppleAccount`-[AADeviceInfo hasCellularCapability]       Address: AppleAcco
unt[0x0000000191e0db24] (AppleAccount.__TEXT.__text + 173820)
  Summary: AppleAccount`-[AADeviceInfo mobileEquipmentIdentifier]       Address: Apple
Account[0x0000000191e0db44] (AppleAccount.__TEXT.__text + 173852)
  Summary: AppleAccount`-[AADeviceInfo internationalMobileEquipmentIdentity]       Add
ress: AppleAccount[0x0000000191e0db64] (AppleAccount.__TEXT.__text + 173884)
  Summary: AppleAccount`-[AADeviceInfo storageCapacity]       Address: AppleAccount[0x
0000000191e0dbc0] (AppleAccount.__TEXT.__text + 173976)
  Summary: AppleAccount`-[AADeviceInfo osName]       Address: AppleAccount[0x000000019
1e0dc30] (AppleAccount.__TEXT.__text + 174088)
  Summary: AppleAccount`-[AADeviceInfo buildVersion]       Address: AppleAccount[0x000
0000191e0dca0] (AppleAccount.__TEXT.__text + 174200)
  Summary: AppleAccount`-[AADeviceInfo regionCode]       Address: AppleAccount[0x00000
00191e0dca4] (AppleAccount.__TEXT.__text + 174204)
  Summary: AppleAccount`-[AADeviceInfo apnsToken]       Address: AppleAccount[0x000000
0191e0dd08] (AppleAccount.__TEXT.__text + 174304)
  Summary: AppleAccount`-[AADeviceInfo deviceClass]       Address: AppleAccount[0x0000
000191e0dd28] (AppleAccount.__TEXT.__text + 174336)
  Summary: AppleAccount`-[AADeviceInfo modelNumber]       Address: AppleAccount[0x0000
000191e0dd48] (AppleAccount.__TEXT.__text + 174368)
```

```
  Summary: AppleAccount`-[AADeviceInfo chipIdentifier]       Address: AppleAccount[0x0
000000191e0dd68] (AppleAccount.__TEXT.__text + 174400)
  Summary: AppleAccount`-[AADeviceInfo uniqueChipIdentifier]       Address: AppleAccou
nt[0x0000000191e0dd88] (AppleAccount.__TEXT.__text + 174432)
  Summary: AppleAccount`-[AADeviceInfo appleIDClientIdentifier]       Address: AppleAc
count[0x0000000191e0e07c] (AppleAccount.__TEXT.__text + 175188)
  Summary: AppleAccount`-[AADeviceInfo clientInfoHeader]       Address: AppleAccount[0
x0000000191e0e360] (AppleAccount.__TEXT.__text + 175928)
  Summary: AppleAccount`-[AADeviceInfo userAgentHeader]       Address: AppleAccount[0x
0000000191e0e428] (AppleAccount.__TEXT.__text + 176128)
  Summary: AppleAccount`__31+[AADeviceInfo isInternalBuild]_block_invoke       Address
: AppleAccount[0x0000000191e0e44c] (AppleAccount.__TEXT.__text + 176164)
  Summary: AppleAccount`+[AADeviceInfo isMultiUserMode]       Address: AppleAccount[0x
0000000191e0e48c] (AppleAccount.__TEXT.__text + 176228)
  Summary: AppleAccount`__31+[AADeviceInfo isMultiUserMode]_block_invoke       Address
: AppleAccount[0x0000000191e0e50c] (AppleAccount.__TEXT.__text + 176356)
  Summary: AppleAccount`+[AADeviceInfo hasiCloudSignOutRestriction]       Address: App
leAccount[0x0000000191e0e514] (AppleAccount.__TEXT.__text + 176364)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) infoDictionary]       Address: Appl
eAccount[0x0000000191e0e558] (AppleAccount.__TEXT.__text + 176432)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) udid]       Address: AppleAccount[0
x0000000191e0e59c] (AppleAccount.__TEXT.__text + 176500)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) osVersion]       Address: AppleAcco
unt[0x0000000191e0e5e0] (AppleAccount.__TEXT.__text + 176568)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) serialNumber]       Address: AppleA
ccount[0x0000000191e0e624] (AppleAccount.__TEXT.__text + 176636)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) apnsToken]       Address: AppleAcco
unt[0x0000000191e0e668] (AppleAccount.__TEXT.__text + 176704)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) appleIDClientIdentifier]       Addr
ess: AppleAccount[0x0000000191e0e6ac] (AppleAccount.__TEXT.__text + 176772)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) clientInfoHeader]       Address: Ap
pleAccount[0x0000000191e0e6f0] (AppleAccount.__TEXT.__text + 176840)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) userAgentHeader]       Address: App
leAccount[0x0000000191e0e734] (AppleAccount.__TEXT.__text + 176908)
  Summary: AppleAccount`+[AADeviceInfo(Deprecated) productVersion]
```

"authenticateWithContext:"

```
(lldb) image lookup -rn "authenticateWithContext:"
9 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)
/Symbols/System/Library/PrivateFrameworks/AuthKit.framework/AuthKit:
  Address: AuthKit[0x0000000191d3c2f8] (AuthKit.__TEXT.__text + 42196)
  Summary: AuthKit`-[AKAppleIDAuthenticationController authenticateWithContext:completi
on:]       Address: AuthKit[0x0000000191d3c864] (AuthKit.__TEXT.__text + 43584)
  Summary: AuthKit`__72-[AKAppleIDAuthenticationController authenticateWithContext:comp
letion:]_block_invoke       Address: AuthKit[0x0000000191d3cab4] (AuthKit.__TEXT.__tex
t + 44176)
  Summary: AuthKit`__72-[AKAppleIDAuthenticationController authenticateWithContext:comp
letion:]_block_invoke.148       Address: AuthKit[0x0000000191d3cb8c] (AuthKit.__TEXT.__
_text + 44392)
  Summary: AuthKit`__72-[AKAppleIDAuthenticationController authenticateWithContext:comp
letion:]_block_invoke.158       Address: AuthKit[0x0000000191d83278] (AuthKit.__TEXT.__
_text + 332884)
```

```
  Summary: AuthKit`-[AKAuthHandlerImpl reauthenticateWithContext:completion:]        Ad
dress: AuthKit[0x0000000191d83314] (AuthKit.__TEXT.__text + 333040)
  Summary: AuthKit`__58-[AKAuthHandlerImpl reauthenticateWithContext:completion:]_block
_invoke        Address: AuthKit[0x0000000191d83330] (AuthKit.__TEXT.__text + 333068)
  Summary: AuthKit`-[AKAuthHandlerImpl reauthenticateWithContext:completionWithResults:]
       Address: AuthKit[0x0000000191da41b4] (AuthKit.__TEXT.__text + 467856)
  Summary: AuthKit`-[AKAppleIDAuthenticationController authenticateWithContext:completi
on:].cold.1        Address: AuthKit[0x0000000191da41e0] (AuthKit.__TEXT.__text + 467900)

  Summary: AuthKit`-[AKAppleIDAuthenticationController authenticateWithContext:completi
on:].cold.2
3 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)
/Symbols/System/Library/PrivateFrameworks/AuthKitUI.framework/AuthKitUI:
  Address: AuthKitUI[0x00000001c4e5a714] (AuthKitUI.__TEXT.__text + 95384)
  Summary: AuthKitUI`-[AKBaseSignInViewController _authenticateWithContext:]        Add
ress: AuthKitUI[0x00000001c4e5a814] (AuthKitUI.__TEXT.__text + 95640)
  Summary: AuthKitUI`__55-[AKBaseSignInViewController _authenticateWithContext:]_block_
invoke        Address: AuthKitUI[0x00000001c4e5a8dc] (AuthKitUI.__TEXT.__text + 95840)
  Summary: AuthKitUI`__55-[AKBaseSignInViewController _authenticateWithContext:]_block_
invoke_2
3 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)
/Symbols/System/Library/PrivateFrameworks/iTunesStore.framework/iTunesStore:
  Address: iTunesStore[0x00000001b9403104] (iTunesStore.__TEXT.__text + 251036)
  Summary: iTunesStore`-[ISStoreURLOperation _authenticateWithContext:error:]        Ad
dress: iTunesStore[0x00000001b94038e4] (iTunesStore.__TEXT.__text + 253052)
  Summary: iTunesStore`__54-[ISStoreURLOperation _authenticateWithContext:error:]_block
_invoke        Address: iTunesStore[0x00000001b94041ac] (iTunesStore.__TEXT.__text + 25
5300)
  Summary: iTunesStore`__54-[ISStoreURLOperation _authenticateWithContext:error:]_block
_invoke.680
```

`image lookup -s`

statfs

```
(lldb) image lookup -s statfs
1 symbols match 'statfs' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.
3.1 (17D50)/Symbols/usr/lib/dyld:
        Address: dyld[0x000000000004c324] (dyld.__TEXT.__text + 308004)
        Summary: dyld`statfs64
1 symbols match 'statfs' in /Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fsw
cidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCore.
framework/AwemeCore:
...
```

`image lookup -r -s`

objc_msgSend

```
(lldb) image lookup -r -s objc_msgSend
```

```
3 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCore.framework/AwemeCore:
        Address: AwemeCore[0x000000001147d8fc] (AwemeCore.__BD_TEXT.__stubs + 28356)
        Summary: AwemeCore`symbol stub for: objc_msgSend        Address: AwemeCore[0x0000000001147d908] (AwemeCore.__BD_TEXT.__stubs + 28368)
        Summary: AwemeCore`symbol stub for: objc_msgSendSuper        Address: AwemeCore[0x000000001147d914] (AwemeCore.__BD_TEXT.__stubs + 28380)
        Summary: AwemeCore`symbol stub for: objc_msgSendSuper2
3 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/System/Library/Frameworks/Foundation.framework/Foundation:
        Address: Foundation[0x00000001809b9850] (Foundation.__TEXT.__stubs + 11736)
        Summary: Foundation`symbol stub for: objc_msgSend        Address: Foundation[0x00000001809b985c] (Foundation.__TEXT.__stubs + 11748)
        Summary: Foundation`symbol stub for: objc_msgSendSuper        Address: Foundation[0x00000001809b9868] (Foundation.__TEXT.__stubs + 11760)
        Summary: Foundation`symbol stub for: objc_msgSendSuper2
7 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/usr/lib/libobjc.A.dylib:
        Address: libobjc.A.dylib[0x00000001801b7e60] (libobjc.A.dylib.__TEXT.__text + 2816)
        Summary: libobjc.A.dylib`_objc_msgSend_uncached        Address: libobjc.A.dylib[0x00000001801b7b20] (libobjc.A.dylib.__TEXT.__text + 1984)
        Summary: libobjc.A.dylib`objc_msgSend        Address: libobjc.A.dylib[0x00000001801b7ce0] (libobjc.A.dylib.__TEXT.__text + 2432)
        Summary: libobjc.A.dylib`objc_msgSendSuper        Address: libobjc.A.dylib[0x000001801b7d60] (libobjc.A.dylib.__TEXT.__text + 2560)
        Summary: libobjc.A.dylib`objc_msgSendSuper2        Address: libobjc.A.dylib[0x0000001801b8080] (libobjc.A.dylib.__TEXT.__text + 3360)
        Summary: libobjc.A.dylib`objc_msgSendSuper2_debug        Address: libobjc.A.dylib[0x00000001801b8060] (libobjc.A.dylib.__TEXT.__text + 3328)
        Summary: libobjc.A.dylib`objc_msgSend_debug        Address: libobjc.A.dylib[0x0000001801b8040] (libobjc.A.dylib.__TEXT.__text + 3296)
        Summary: libobjc.A.dylib`objc_msgSend_noarg
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/usr/lib/swift/libswiftCore.dylib:
        Address: libswiftCore.dylib[0x000000018dc77d54] (libswiftCore.dylib.__TEXT.__stubs + 1188)
        Summary: libswiftCore.dylib`symbol stub for: objc_msgSend        Address: libswiftCore.dylib[0x000000018dc77d60] (libswiftCore.dylib.__TEXT.__stubs + 1200)
        Summary: libswiftCore.dylib`symbol stub for: objc_msgSendSuper2
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/libAwemeDylib.dylib:
        Address: libAwemeDylib.dylib[0x00000000002ced4] (libAwemeDylib.dylib.__TEXT.__stubs + 1296)
        Summary: libAwemeDylib.dylib`symbol stub for: objc_msgSend        Address: libAwemeDylib.dylib[0x00000000002cee0] (libAwemeDylib.dylib.__TEXT.__stubs + 1308)
        Summary: libAwemeDylib.dylib`symbol stub for: objc_msgSendSuper2
...
...
...
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/VolcEngineRTC.framework/VolcEngineRTC:
```

```
        Address: VolcEngineRTC[0x000000000098b35c] (VolcEngineRTC.__BD_TEXT.__stubs + 6
360)
        Summary: VolcEngineRTC`symbol stub for: objc_msgSend        Address: VolcEngine
RTC[0x0000000000098b368] (VolcEngineRTC.__BD_TEXT.__stubs + 6372)
        Summary: VolcEngineRTC`symbol stub for: objc_msgSendSuper2
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
r/Xcode/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aw
eme.app/Frameworks/byteaudio.framework/byteaudio:
        Address: byteaudio[0x00000000001a353c] (byteaudio.__TEXT.__stubs + 2700)
        Summary: byteaudio`symbol stub for: objc_msgSend        Address: byteaudio[0x00
000000001a3548] (byteaudio.__TEXT.__stubs + 2712)
        Summary: byteaudio`symbol stub for: objc_msgSendSuper2
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
r/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/System/Library/Frameworks/ARKit.framewor
k/ARKit:
        Address: ARKit[0x000000019c696678] (ARKit.__TEXT.__stubs + 7488)
        Summary: ARKit`symbol stub for: objc_msgSend        Address: ARKit[0x000000019c
696684] (ARKit.__TEXT.__stubs + 7500)
        Summary: ARKit`symbol stub for: objc_msgSendSuper2
...
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
r/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/System/Library/PrivateFrameworks/QuickLo
okSupport.framework/QuickLookSupport:
        Address: QuickLookSupport[0x00000001b2c55850] (QuickLookSupport.__TEXT.__stubs
+ 1824)
        Summary: QuickLookSupport`symbol stub for: objc_msgSend        Address: QuickLo
okSupport[0x00000001b2c5585c] (QuickLookSupport.__TEXT.__stubs + 1836)
        Summary: QuickLookSupport`symbol stub for: objc_msgSendSuper2
4 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
r/Xcode/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aw
eme.app/Frameworks/libcycript.dylib:
        Address: libcycript.dylib[0x0000000000069cb8] (libcycript.dylib.__TEXT.__text +
416952)
        Summary: libcycript.dylib`$objc_msgSend(OpaqueJSContext const*, OpaqueJSValue*,
 OpaqueJSValue*, unsigned long, OpaqueJSValue const* const*, OpaqueJSValue const**)
    Address: libcycript.dylib[0x000000000006d318] (libcycript.dylib.__TEXT.__text + 430
872)
        Summary: libcycript.dylib`$objc_msgSend(OpaqueJSContext const*, OpaqueJSValue*,
 OpaqueJSValue*, unsigned long, OpaqueJSValue const* const*)        Address: libcycript
.dylib[0x00000000000788a0] (libcycript.dylib.__TEXT.__stubs + 2208)
        Summary: libcycript.dylib`symbol stub for: objc_msgSend        Address: libcycr
ipt.dylib[0x00000000000788ac] (libcycript.dylib.__TEXT.__stubs + 2220)
        Summary: libcycript.dylib`symbol stub for: objc_msgSendSuper2
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
r/Xcode/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aw
eme.app/Frameworks/RevealServer.framework/RevealServer:
        Address: RevealServer[0x0000000000056734] (RevealServer.__TEXT.__stubs + 2484)
        Summary: RevealServer`symbol stub for: objc_msgSend        Address: RevealServer
[0x0000000000056740] (RevealServer.__TEXT.__stubs + 2496)
        Summary: RevealServer`symbol stub for: objc_msgSendSuper2
1 symbols match the regular expression 'objc_msgSend' in /Library/MobileSubstrate/Dynam
icLibraries/MuJiaBaiHuoTweak.dylib:
        Address: MuJiaBaiHuoTweak.dylib[0x0000000000015d54] (MuJiaBaiHuoTweak.dylib.__T
EXT.__stubs + 480)
        Summary: MuJiaBaiHuoTweak.dylib`symbol stub for: objc_msgSend
2 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
```

```
r/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/System/Library/PrivateFrameworks/AppSSOC
ore.framework/AppSSOCore:
        Address: AppSSOCore[0x00000001b909b7f8] (AppSSOCore.__TEXT.__stubs + 576)
        Summary: AppSSOCore`symbol stub for: objc_msgSend        Address: AppSSOCore[0x
00000001b909b804] (AppSSOCore.__TEXT.__stubs + 588)
        Summary: AppSSOCore`symbol stub for: objc_msgSendSuper2
1 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
r/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/usr/lib/libusrtcp.dylib:
        Address: libusrtcp.dylib[0x00000001857ffb18] (libusrtcp.dylib.__TEXT.__stubs +
1944)
        Summary: libusrtcp.dylib`symbol stub for: objc_msgSendSuper2
1 symbols match the regular expression 'objc_msgSend' in /Users/crifan/Library/Develope
r/Xcode/iOS DeviceSupport/13.7 (17H35)/Symbols/usr/lib/libboringssl.dylib:
        Address: libboringssl.dylib[0x00000001853f8710] (libboringssl.dylib.__TEXT.__st
ubs + 2676)
        Summary: libboringssl.dylib`symbol stub for: objc_msgSendSuper2
```

handlePressGesture

```
(lldb) image lookup -r -s handlePressGesture
5 symbols match the regular expression 'handlePressGesture' in /Users/crifan/Library/De
veloper/Xcode/iOS DeviceSupport/15.0 (19A346)/Symbols/System/Library/PrivateFrameworks/
UIKitCore.framework/UIKitCore:
    Address: UIKitCore[0x0000000182e04cac] (UIKitCore.__TEXT.__text + 7638380)
        Summary: UIKitCore`-[_UIButtonBarButtonVisualProviderIOS _handlePressGesture:]
    Address: UIKitCore[0x0000000183060acc] (UIKitCore.__TEXT.__text + 10111884)
        Summary: UIKitCore`-[_UIPressClickInteractionDriver _handlePressGesture:]
    Address: UIKitCore[0x0000000183060b70] (UIKitCore.__TEXT.__text + 10112048)
        Summary: UIKitCore`__54-[_UIPressClickInteractionDriver _handlePressGesture:]_b
lock_invoke
    Address: UIKitCore[0x0000000183192f80] (UIKitCore.__TEXT.__text + 11366464)
        Summary: UIKitCore`-[_UIPointerInteractionHoverDriver _handlePressGesture:]
    Address: UIKitCore[0x000000018332fc64] (UIKitCore.__TEXT.__text + 13057316)
        Summary: UIKitCore`-[UIBandSelectionInteraction _handlePressGesture:]
2 symbols match the regular expression 'handlePressGesture' in /Users/crifan/Library/De
veloper/Xcode/iOS DeviceSupport/15.0 (19A346)/Symbols/System/Library/PrivateFrameworks/
CameraEditKit.framework/CameraEditKit:
    Address: CameraEditKit[0x00000001c57d46b4] (CameraEditKit.__TEXT.__text + 54112)
        Summary: CameraEditKit`-[CEKWheelScrubberView _handlePressGesture:]
    Address: CameraEditKit[0x00000001c57e8320] (CameraEditKit.__TEXT.__text + 135116)
        Summary: CameraEditKit`-[CEKLightingControl _handlePressGesture:]
```

_nextButtonSelected

```
(lldb) image lookup -r -s _nextButtonSelected
3 symbols match the regular expression '_nextButtonSelected' in /Users/crifan/Library/D
eveloper/Xcode/iOS DeviceSupport/15.0 (19A346)/Symbols/System/Library/PrivateFrameworks
/AppleAccountUI.framework/AppleAccountUI:
        Address: AppleAccountUI[0x00000001b0f8b978] (AppleAccountUI.__TEXT.__text + 695
92)
        Summary: AppleAccountUI`-[AAUISignInViewController _nextButtonSelected:]
```

```
...
```

_performAuthenticationForAccount

```
(lldb) image lookup -r -s _performAuthenticationForAccount
3 symbols match the regular expression '_performAuthenticationForAccount' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccountUI.framework/AppleAccountUI:
        Address: AppleAccountUI[0x00000001b0fcc8d8] (AppleAccountUI.__TEXT.__text + 335672)
        Summary: AppleAccountUI`-[AAUISignInController _performAuthenticationForAccount:serviceType:inViewController:completion:]        Address: AppleAccountUI[0x00000001b0fccda4] (AppleAccountUI.__TEXT.__text + 336900)
        Summary: AppleAccountUI`__97-[AAUISignInController _performAuthenticationForAccount:serviceType:inViewController:completion:]_block_invoke        Address: AppleAccountUI[0x00000001b0fcce8c] (AppleAccountUI.__TEXT.__text + 337132)
        Summary: AppleAccountUI`__97-[AAUISignInController _performAuthenticationForAccount:serviceType:inViewController:completion:]_block_invoke_2
```

authenticationContext

```
(lldb) image lookup -r -s "authenticationContext"
1 symbols match the regular expression 'authenticationContext' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/PrivateFrameworks/AppleAccountUI.framework/AppleAccountUI:
        Address: AppleAccountUI[0x00000001adfbe228] (AppleAccountUI.__TEXT.__text + 65592)
        Summary: AppleAccountUI`-[AAUISignInViewController authenticationContext]
...
2 symbols match the regular expression 'authenticationContext' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/PrivateFrameworks/AppleMediaServices.framework/AppleMediaServices:
        Address: AppleMediaServices[0x00000001848bc000] (AppleMediaServices.__TEXT.__text + 3797688)
        Summary: AppleMediaServices`+[AMSPaymentSheetTask _authenticationContextForRequest:]        Address: AppleMediaServices[0x00000001848c0d24] (AppleMediaServices.__TEXT.__text + 3817436)
        Summary: AppleMediaServices`-[AMSPaymentSheetTask authenticationContext]
2 symbols match the regular expression 'authenticationContext' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/PrivateFrameworks/AuthKit.framework/AuthKit:
        Address: AuthKit[0x0000000192ee8440] (AuthKit.__TEXT.__text + 367116)
        Summary: AuthKit`-[AKAuthHandlerImpl buildReauthenticationContextFromContext:error:]        Address: AuthKit[0x0000000192f14e50] (AuthKit.__TEXT.__text + 549916)
        Summary: AuthKit`-[AKAuthHandlerImpl buildReauthenticationContextFromContext:error:].cold.1
...
12 symbols match the regular expression 'authenticationContext' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/PrivateFrameworks/iTunesStore.framework/iTunesStore:
        Address: iTunesStore[0x00000001b6c89c58] (iTunesStore.__TEXT.__text + 110356)
        Summary: iTunesStore`-[ISURLOperation authenticationContext]        Address: iT
```

```
unesStore[0x00000001b6ca3ee4] (iTunesStore.__TEXT.__text + 217504)
        Summary: iTunesStore`-[ISDataProvider authenticationContext]        Address: iT
unesStore[0x00000001b6cbb05c] (iTunesStore.__TEXT.__text + 312088)
        Summary: iTunesStore`-[ISStoreAuthenticateOperation authenticationContext]
   Address: iTunesStore[0x00000001b6cc1e38] (iTunesStore.__TEXT.__text + 340212)
        Summary: iTunesStore`-[ISQRCodeDialog initWithDialogDictionary:authenticationCo
ntext:]        Address: iTunesStore[0x00000001b6cc4494] (iTunesStore.__TEXT.__text + 35
0032)
        Summary: iTunesStore`-[ISDialog initWithDialogDictionary:authenticationContext:]
        Address: iTunesStore[0x00000001b6cc762c] (iTunesStore.__TEXT.__text + 362728)
        Summary: iTunesStore`-[ISDialog authenticationContext]        Address: iTunesSt
ore[0x00000001b6cce2e8] (iTunesStore.__TEXT.__text + 390564)
        Summary: iTunesStore`-[ISServerAuthenticationOperation authenticationContext]
      Address: iTunesStore[0x00000001d861aab4] (iTunesStore.__DATA.__objc_ivar + 780)
        Summary: iTunesStore`ISStoreAuthenticateOperation._authenticationContext
 Address: iTunesStore[0x00000001d861ab5c] (iTunesStore.__DATA.__objc_ivar + 948)
        Summary: iTunesStore`ISDialog._authenticationContext        Address: iTunesStore
[0x00000001d861ac54] (iTunesStore.__DATA.__objc_ivar + 1196)
        Summary: iTunesStore`ISServerAuthenticationOperation._authenticationContext
    Address: iTunesStore[0x00000001d861a8a4] (iTunesStore.__DATA.__objc_ivar + 252)
        Summary: iTunesStore`ISDataProvider._authenticationContext        Address: iTun
esStore[0x00000001d861a870] (iTunesStore.__DATA.__objc_ivar + 200)
        Summary: iTunesStore`ISURLOperation._authenticationContext
15 symbols match the regular expression 'authenticationContext' in /Users/crifan/Librar
y/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/PrivateF
rameworks/iTunesStoreUI.framework/iTunesStoreUI:
        Address: iTunesStoreUI[0x00000001ab93300c] (iTunesStoreUI.__TEXT.__text + 40536)

        Summary: iTunesStoreUI`-[SUScriptInterface authenticationContext]        Addres
s: iTunesStoreUI[0x00000001ab95d8a8] (iTunesStoreUI.__TEXT.__text + 214772)
        Summary: iTunesStoreUI`-[SUStorePageViewController authenticationContext]
  Address: iTunesStoreUI[0x00000001ab974b14] (iTunesStoreUI.__TEXT.__text + 309600)
        Summary: iTunesStoreUI`-[SUWebViewController authenticationContext]        Addr
ess: iTunesStoreUI[0x00000001ab98df6c] (iTunesStoreUI.__TEXT.__text + 413112)
        Summary: iTunesStoreUI`-[SUScriptXMLHTTPStoreRequest authenticationContext]
    Address: iTunesStoreUI[0x00000001aba03ce4] (iTunesStoreUI.__TEXT.__text + 895792)
        Summary: iTunesStoreUI`-[SUWebViewManager authenticationContext]        Address
: iTunesStoreUI[0x00000001aba3fef8] (iTunesStoreUI.__TEXT.__text + 1142084)
        Summary: iTunesStoreUI`-[SUXMLHTTPStoreRequestOperation authenticationContext]
       Address: iTunesStoreUI[0x00000001aba54544] (iTunesStoreUI.__TEXT.__text + 1225616
)
        Summary: iTunesStoreUI`-[SUAddiTunesPassOperation authenticationContext]
 Address: iTunesStoreUI[0x00000001d81062f8] (iTunesStoreUI.__DATA.__objc_ivar + 1088)
        Summary: iTunesStoreUI`SUWebViewController._authenticationContext        Addres
s: iTunesStoreUI[0x00000001d8106514] (iTunesStoreUI.__DATA.__objc_ivar + 1628)
        Summary: iTunesStoreUI`SUScriptXMLHTTPStoreRequest._authenticationContext
  Address: iTunesStoreUI[0x00000001d81065c8] (iTunesStoreUI.__DATA.__objc_ivar + 1808)
        Summary: iTunesStoreUI`SUScriptAppleIdAuthenticationOperation._authenticationCo
ntext        Address: iTunesStoreUI[0x00000001d81069f4] (iTunesStoreUI.__DATA.__objc_iv
ar + 2876)
        Summary: iTunesStoreUI`SUWebViewManager._authenticationContext        Address:
iTunesStoreUI[0x00000001d8106f64] (iTunesStoreUI.__DATA.__objc_ivar + 4268)
        Summary: iTunesStoreUI`SUXMLHTTPStoreRequestOperation._authenticationContext
     Address: iTunesStoreUI[0x00000001d81070f4] (iTunesStoreUI.__DATA.__objc_ivar + 4668
)
        Summary: iTunesStoreUI`SUAddiTunesPassOperation._authenticationContext        A
```

```
ddress: iTunesStoreUI[0x00000001d8106698] (iTunesStoreUI.__DATA.__objc_ivar + 2016)
        Summary: iTunesStoreUI`SUScriptAuthenticationOperation._authenticationContext
      Address: iTunesStoreUI[0x00000001d8105f28] (iTunesStoreUI.__DATA.__objc_ivar + 112
)
        Summary: iTunesStoreUI`SUScriptInterface._authenticationContext
```

`image lookup -va` == `im loo -va`

Apple Store相关

akd

```
(lldb) image lookup -va 0x10461c710
      Address: akd[0x00000001000bc710] (akd.__TEXT.__stubs + 2028)
      Summary: akd`symbol stub for: voucher_mach_msg_set
       Module: file = "/System/Library/PrivateFrameworks/AuthKit.framework/akd", arch =
"arm64"
       Symbol: id = {0x0000023b}, range = [0x000000010461c710-0x000000010461c71c), name=
"voucher_mach_msg_set"
```

AppleAccount

```
(lldb) image lookup -va 0x0000000195d31f14
      Address: AppleAccount[0x0000000191e59f14] (AppleAccount.__TEXT.__text + 486124)
      Summary: AppleAccount`-[AALoginAccountRequest urlRequest] + 300
       Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19
A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount", ar
ch = "arm64"
       Symbol: id = {0x00000b24}, range = [0x0000000195d31de8-0x0000000195d320f0), name=
"-[AALoginAccountRequest urlRequest]"

(lldb) image lookup -va 0x0000000195cbcd20
      Address: AppleAccount[0x0000000191de4d20] (AppleAccount.__TEXT.__text + 6392)
      Summary: AppleAccount`__51-[AARequest performRequestWithSession:withHandler:]_blo
ck_invoke + 100
       Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19
A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount", ar
ch = "arm64"
       Symbol: id = {0x0000001c}, range = [0x0000000195cbccbc-0x0000000195cbcfe0), mang
led="__51-[AARequest performRequestWithSession:withHandler:]_block_invoke"
```

AppleAccountUI

```
(lldb) image lookup -va 0x1b1750550
      Address: AppleAccountUI[0x00000001b0f8c550] (AppleAccountUI.__TEXT.__text + 72624)

      Summary: AppleAccountUI`__62-[AAUISignInViewController _attemptAuthenticationWith
Context:]_block_invoke
```

```
      Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19
A346)/Symbols/System/Library/PrivateFrameworks/AppleAccountUI.framework/AppleAccountUI"
, arch = "arm64"
      Symbol: id = {0x0000017c}, range = [0x00000001b1750550-0x00000001b1750624), mang
led="__62-[AAUISignInViewController _attemptAuthenticationWithContext:]_block_invoke"
```

AuthKit

```
(lldb) image lookup -va 0x0000000194509de8
      Address: AuthKit[0x0000000192e99de8] (AuthKit.__TEXT.__text + 46004)
      Summary: AuthKit`-[AKAppleIDAuthenticationController authenticateWithContext:comp
letion:] + 724
      Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19
B74) arm64e/Symbols/System/Library/PrivateFrameworks/AuthKit.framework/AuthKit", arch =
"arm64e"
      Symbol: id = {0x00000111}, range = [0x0000000194509b14-0x000000019450a0e0), name=
"-[AKAppleIDAuthenticationController authenticateWithContext:completion:]"
```

AwemeCore

```
(lldb) image lookup -v -a 0x112d57730
      Address: AwemeCore[0x0000000010047730] (AwemeCore.__BD_TEXT.__text + 175257392)
      Summary: AwemeCore`___lldb_unnamed_symbol1653310$$AwemeCore
      Module: file = "/Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjo
xbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCore.frame
work/AwemeCore", arch = "arm64"
      Symbol: id = {0x001e5c5c}, range = [0x0000000112d57730-0x0000000112d57a28), name=
"___lldb_unnamed_symbol1653310$$AwemeCore"


(lldb) image lookup -v -a 0x116d51950
      Address: AwemeCore[0x000000001147d950] (AwemeCore.__BD_TEXT.__stubs + 28440)
      Summary:
      Module: file = "/Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjo
xbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCore.frame
work/AwemeCore", arch = "arm64"
```

CFNetwork

```
(lldb) im loo -va 0xa916260182319ea0
      Address: CFNetwork[0x0000000180dedea0] (CFNetwork.__TEXT.__text + 2665792)
      Summary: CFNetwork`___lldb_unnamed_symbol12486$$CFNetwork
      Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19
B74) arm64e/Symbols/System/Library/Frameworks/CFNetwork.framework/CFNetwork", arch = "a
rm64e"
      Symbol: id = {0x00003a5a}, range = [0x0000000182319ea0-0x0000000182319f94), name=
"___lldb_unnamed_symbol12486$$CFNetwork"
```

`image lookup -vs`

SecTrustEvaluateFastAsync

```
(lldb) image lookup -vs SecTrustEvaluateFastAsync
1 symbols match 'SecTrustEvaluateFastAsync' in /Users/crifan/Library/Developer/Xcode/iO
S DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/Frameworks/Security.framewor
k/Security:
        Address: Security[0x0000000189226304] (Security.__TEXT.__text + 944572)
        Summary: Security`SecTrustEvaluateFastAsync
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/Security.framework/Security", arch = "a
rm64e"
         Symbol: id = {0x000020a1}, range = [0x000000018b40a304-0x000000018b40a3b0), na
me="SecTrustEvaluateFastAsync"
```

AADeviceInfo

```
(lldb) image lookup -vs "AADeviceInfo"
2 symbols match 'AADeviceInfo' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSuppo
rt/15.0 (19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleA
ccount:
        Address: AppleAccount[0x00000001f032e1d8] (AppleAccount.__DATA_DIRTY.__objc_dat
a + 800)
        Summary: (void *)0x00000001f4206200: AADeviceInfo
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount",
arch = "arm64"
         Symbol: id = {0x00001876}, range = [0x00000001f42061d8-0x00000001f4206200), na
me="AADeviceInfo", mangled="OBJC_CLASS_$_AADeviceInfo"

        Address: AppleAccount[0x00000001f032e200] (AppleAccount.__DATA_DIRTY.__objc_dat
a + 840)
        Summary: (void *)0x00000001f3fff1e0: NSObject
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount",
arch = "arm64"
         Symbol: id = {0x0000195f}, range = [0x00000001f4206200-0x00000001f4206228), na
me="AADeviceInfo", mangled="OBJC_METACLASS_$_AADeviceInfo"
```

___lldb_unnamed_symbol972

```
(lldb) image lookup -vs "___lldb_unnamed_symbol972"
1 symbols match '___lldb_unnamed_symbol972' in /cores/dyld:
        Address: dyld[0x000000000002d558] (dyld.__TEXT.__text + 181592)
        Summary: dyld`dyld3::OverflowSafeArray<dyld4::PrebuiltObjC::ObjCOptimizerImage:
:ObjCObject, 4294967295ul>::push_back(dyld4::PrebuiltObjC::ObjCOptimizerImage::ObjCObje
ct const&)
         Module: file = "/cores/dyld", arch = "arm64"
         Symbol: id = {0x000003cc}, range = [0x0000000102d71558-0x0000000102d7165c), na
```

```
me="dyld3::OverflowSafeArray<dyld4::PrebuiltObjC::ObjCOptimizerImage::ObjCObject, 42949
67295ul>::push_back(dyld4::PrebuiltObjC::ObjCOptimizerImage::ObjCObject const&)", mangl
ed="_ZN5dyld317OverflowSafeArrayIN5dyld412PrebuiltObjC18ObjCOptimizerImage10ObjCObjectE
Lm4294967295EE9push_backERKS4_"


...


1 symbols match '___lldb_unnamed_symbol972' in /Users/crifan/Library/Developer/Xcode/iO
S DeviceSupport/15.0 (19A346)/Symbols/usr/lib/libMobileGestalt.dylib:
        Address: libMobileGestalt.dylib[0x00000001908f6c40] (libMobileGestalt.dylib.__T
EXT.__text + 90176)
        Summary: libMobileGestalt.dylib`___lldb_unnamed_symbol972
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/usr/lib/libMobileGestalt.dylib", arch = "arm64"
         Symbol: id = {0x000003cc}, range = [0x0000000194db6c40-0x0000000194db76e4), na
me="___lldb_unnamed_symbol972"
...
```

`image lookup -vn`

___lldb_unnamed_symbol2575$$akd

```
(lldb) image lookup -vn ___lldb_unnamed_symbol2575$$akd
1 match found in /System/Library/PrivateFrameworks/AuthKit.framework/akd:
        Address: akd[0x00000001000a0460] (akd.__TEXT.__text + 639120)
        Summary: akd`___lldb_unnamed_symbol2575$$akd
         Module: file = "/System/Library/PrivateFrameworks/AuthKit.framework/akd", arch
= "arm64"
         Symbol: id = {0x00000c53}, range = [0x00000001021f8460-0x00000001021fa928), na
me="___lldb_unnamed_symbol2575$$akd"
```

"-[AALoginAccountRequest urlRequest]"

```
(lldb) image lookup -vn "-[AALoginAccountRequest urlRequest]"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000191e59de8] (AppleAccount.__TEXT.__text + 485824)
        Summary: AppleAccount`-[AALoginAccountRequest urlRequest]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount",
arch = "arm64"
         Symbol: id = {0x00000b24}, range = [0x0000000195d31de8-0x0000000195d320f0), na
me="-[AALoginAccountRequest urlRequest]"
```

"-[AKAppleIDAuthenticationContextManager shouldContinueWithAuthenticationResults:error:forContextID:completion:]"

```
(lldb) image lookup -vn "-[AKAppleIDAuthenticationContextManager shouldContinueWithAuth
enticationResults:error:forContextID:completion:]"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/AuthKit.framework/AuthKit:
        Address: AuthKit[0x0000000191d4b66c] (AuthKit.__TEXT.__text + 104520)
        Summary: AuthKit`-[AKAppleIDAuthenticationContextManager shouldContinueWithAuth
enticationResults:error:forContextID:completion:]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AuthKit.framework/AuthKit", arch = "ar
m64"
         Symbol: id = {0x0000025a}, range = [0x000000019250f66c-0x000000019250fd18), na
me="-[AKAppleIDAuthenticationContextManager shouldContinueWithAuthenticationResults:err
or:forContextID:completion:]"
```

"+[AADeviceInfo(Deprecated) udid]"

```
(lldb) image lookup -vn "+[AADeviceInfo(Deprecated) udid]"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000191e0e558] (AppleAccount.__TEXT.__text + 176432)
        Summary: AppleAccount`+[AADeviceInfo(Deprecated) udid]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount",
arch = "arm64"
         Symbol: id = {0x00000473}, range = [0x0000000195ce6558-0x0000000195ce659c), na
me="+[AADeviceInfo(Deprecated) udid]"
```

"-[AADeviceInfo udid]"

```
(lldb) image lookup -vn "-[AADeviceInfo udid]"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000191e0d970] (AppleAccount.__TEXT.__text + 173384)
        Summary: AppleAccount`-[AADeviceInfo udid]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount",
arch = "arm64"
         Symbol: id = {0x00000453}, range = [0x0000000197599970-0x0000000197599990), na
me="-[AADeviceInfo udid]"


(lldb) image lookup -vn "+[AADeviceInfo udid]"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000191e0e558] (AppleAccount.__TEXT.__text + 176432)
        Summary: AppleAccount`+[AADeviceInfo(Deprecated) udid]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount",
arch = "arm64"
         Symbol: id = {0x00000473}, range = [0x000000019759a558-0x000000019759a59c), na
me="+[AADeviceInfo(Deprecated) udid]"
```

image lookup -vrn

AppleAccount

```
(lldb) image lookup -vrn "AADeviceInfo udid"
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (19A346)/
Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount:
        Address: AppleAccount[0x0000000191e0d970] (AppleAccount.__TEXT.__text + 173384)
        Summary: AppleAccount`-[AADeviceInfo udid]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.0 (
19A346)/Symbols/System/Library/PrivateFrameworks/AppleAccount.framework/AppleAccount",
arch = "arm64"
         Symbol: id = {0x00000453}, range = [0x0000000195ce5970-0x0000000195ce5990), na
me="-[AADeviceInfo udid]"
```

image lookup -type == im loo -t

ZJJPerson

```
(lldb) image lookup -t ZJJPerson
Best match found in
    /Users/zhaojing/Library/Developer/CoreSimulator/Devices/ED430020-74C1-4FF3-A595-492C4A714F41/data/Containers/
    Bundle/Application/256675C0-DE3A-400B-9431-079A890A6255/ZJJAllModule_Example.app/ZJJAllModule_Example:
id = {0x7fffffff0004bcbe}, name = "ZJJPerson", byte-size = 24, decl = ZJJPerson.h:13, compiler_type =
    "@interface ZJJPerson : NSObject{
    NSString * _name;
    NSInteger _age;
}
@property(nonatomic, readwrite, getter = name, setter = setName:) NSString *name;
@property(nonatomic, assign, readwrite, getter = age, setter = setAge:) NSInteger age;
@end"

(lldb)
```


Person

```
(lldb) image lookup -type Person
Best match found in /Users/liu_david/Library/Developer/Xcode/DerivedData/TestWeak-egnzd
bndwsiikvcheqmcxvkqnwbw/Build/Products/Debug/TestWeak:
id = {0x10000002b}, name = "Person", byte-size = 24, decl = main.m:12, compiler_type =
"@interface Person : NSObject{
    BOOL _isMan;
    short _age;
    NSString * _name;
}
@property(nonatomic, copy, readwrite, getter = name, setter = setName:) NSString *name;
@property(nonatomic, assign, readwrite, getter = age, setter = setAge:) short age;
@property(nonatomic, assign, readwrite, getter = isMan, setter = setIsMan:) BOOL isMan;
@end"


(lldb) image lookup -type NSObject
Best match found in /Users/liu_david/Library/Developer/Xcode/DerivedData/TestWeak-egnzd
bndwsiikvcheqmcxvkqnwbw/Build/Products/Debug/TestWeak:
id = {0x7fffffff000002e8}, name = "NSObject", byte-size = 8, decl = NSObject.h:53, comp
iler_type = "@interface NSObject{
```

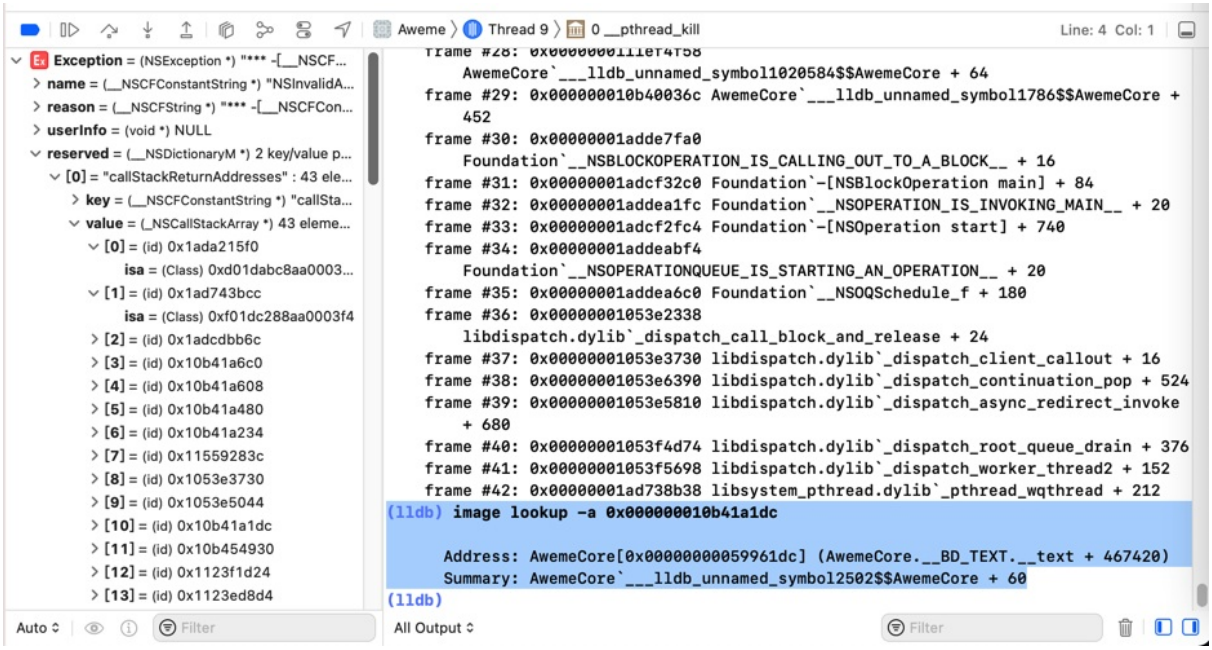
```
    Class isa;
}
@end"


(lldb) im loo -t Person
Best match found in /Users/liu_david/Library/Developer/Xcode/DerivedData/TestWeak-egnzd
bndwsiikvcheqmcxvkqnwbw/Build/Products/Debug/TestWeak:
id = {0x10000002b}, name = "Person", byte-size = 24, decl = main.m:12, compiler_type =
"@interface Person : NSObject{
    BOOL _isMan;
    short _age;
    NSString * _name;
}
@property(nonatomic, copy, readwrite, getter = name, setter = setName:) NSString *name;
@property(nonatomic, assign, readwrite, getter = age, setter = setAge:) short age;
@property(nonatomic, assign, readwrite, getter = isMan, setter = setIsMan:) BOOL isMan;
@end"
```

image lookup的多命令对比举例

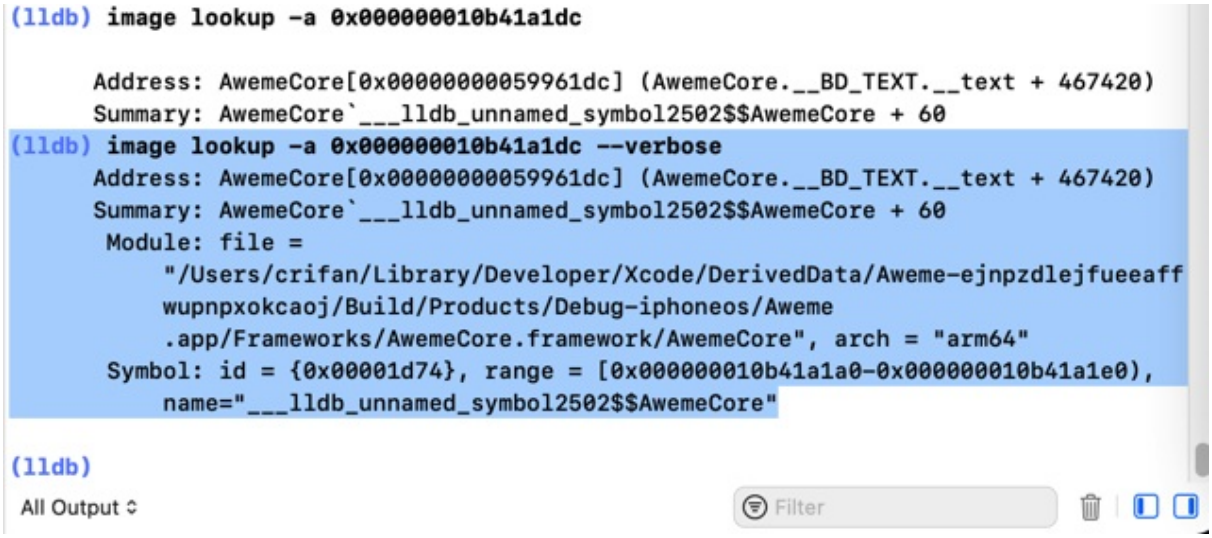
`image lookup -a` vs `image lookup -v -a` == `image lookup -va`

AwemeCore 0x000000010b41a1dc

- 


```
(lldb) image lookup -a 0x000000010b41a1dc
      Address: AwemeCore[0x00000000059961dc] (AwemeCore.__BD_TEXT.__text + 467420)
      Summary: AwemeCore`___lldb_unnamed_symbol2502$$AwemeCore + 60
```

加上verbose，可以输出更加详细的信息：

- 


```
(lldb) image lookup -a 0x000000010b41a1dc --verbose
      Address: AwemeCore[0x00000000059961dc] (AwemeCore.__BD_TEXT.__text + 467420)
      Summary: AwemeCore`___lldb_unnamed_symbol2502$$AwemeCore + 60
```

```
      Module: file = "/Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-ejnpz
dlejfueeaffwupnpxokcaoj/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCor
e.framework/AwemeCore", arch = "arm64"
      Symbol: id = {0x00001d74}, range = [0x000000010b41a1a0-0x000000010b41a1e0), n
ame="___lldb_unnamed_symbol2502$$AwemeCore"
```

AwemeCore 0x10f04f810

```
(lldb) image lookup -a 0x10f04f810
      Address: AwemeCore[0x000000000c587810] (AwemeCore.__BD_TEXT.__text + 113653776)
      Summary: AwemeCore`___lldb_unnamed_symbol1023498$$AwemeCore + 32

(lldb) image lookup -v -a 0x10f04f810
      Address: AwemeCore[0x000000000c587810] (AwemeCore.__BD_TEXT.__text + 113653776)
      Summary: AwemeCore`___lldb_unnamed_symbol1023498$$AwemeCore + 32
       Module: file = "/Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjo
xbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCore.frame
work/AwemeCore", arch = "arm64"
       Symbol: id = {0x0014c028}, range = [0x000000010f04f7f0-0x000000010f04f844), name=
"___lldb_unnamed_symbol1023498$$AwemeCore"
```

Module_Framework 0x0000000107dd18c4

```
(lldb) image lookup -a 0x0000000107dd18c4
      Address: Module_Framework[0x0000000000198d8c4] (Module_Framework.__TEXT.__text + 2
6777796)
      Summary: Module_Framework`-[HAMPlayerInternal setStatus:]_block + 72

(lldb) image lookup -v -a 0x0000000107dd18c4
      Address: Module_Framework[0x0000000000198d8c4] (Module_Framework.__TEXT.__text + 2
6777796)
      Summary: Module_Framework`-[HAMPlayerInternal setStatus:]_block + 72
       Module: file = "/Users/crifan/Library/Developer/Xcode/DerivedData/youtube-haehnt
tylwejqpfqywoxzkyxdyfa/Build/Products/Debug-iphoneos/youtube.app/Frameworks/Module_Fram
ework.framework/Module_Framework", arch = "arm64"
       Symbol: id = {0x0003eee7}, range = [0x0000000107dd187c-0x0000000107dd1904), name=
"-[HAMPlayerInternal setStatus:]_block"
```

akd 0x104B0C460

```
(lldb) image lookup -a 0x104B0C460
      Address: akd[0x00000001000a0460] (akd.__TEXT.__text + 639120)
      Summary: akd`___lldb_unnamed_symbol2575$$akd
(lldb) image lookup -va 0x104B0C460
      Address: akd[0x00000001000a0460] (akd.__TEXT.__text + 639120)
      Summary: akd`___lldb_unnamed_symbol2575$$akd
       Module: file = "/System/Library/PrivateFrameworks/AuthKit.framework/akd", arch =
"arm64"
       Symbol: id = {0x00000c53}, range = [0x0000000104b0c460-0x0000000104b0e928), name=
```

```
"___lldb_unnamed_symbol2575$$akd"
```

AppleStoreCore 0x000000010373d398

```
(lldb) image lookup -a 0x000000010373d398
      Address: AppleStoreCore[0x00000000000a9398] (AppleStoreCore.__TEXT.__text + 673828
)
      Summary: AppleStoreCore`___lldb_unnamed_symbol3027$$AppleStoreCore + 872

(lldb) image lookup -va 0x000000010373d398
      Address: AppleStoreCore[0x00000000000a9398] (AppleStoreCore.__TEXT.__text + 673828
)
      Summary: AppleStoreCore`___lldb_unnamed_symbol3027$$AppleStoreCore + 872
       Module: file = "/Users/crifan/Library/Developer/Xcode/DerivedData/Jolly-fbcdzphr
bokcgxhejxlslydrdyaa/Build/Products/Debug-iphoneos/Jolly.app/Frameworks/AppleStoreCore.
framework/AppleStoreCore", arch = "arm64"
      Symbol: id = {0x000040fa}, range = [0x000000010373d030-0x000000010373d640), name=
"___lldb_unnamed_symbol3027$$AppleStoreCore"
```

`image lookup -vs` vs `image lookup -vn`

Security SSLHandshake

```
(lldb) image lookup -vs SSLHandshake
1 symbols match 'SSLHandshake' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSuppo
rt/15.1 (19B74) arm64e/Symbols/System/Library/Frameworks/Security.framework/Security:
        Address: Security[0x00000001891501c0] (Security.__TEXT.__text + 67704)
        Summary: Security`SSLHandshake
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/Security.framework/Security", arch = "a
rm64e"
         Symbol: id = {0x00001da4}, range = [0x00000018acc01c0-0x00000018acc0320), na
me="SSLHandshake"

(lldb) image lookup -vn SSLHandshake
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/Frameworks/Security.framework/Security:
        Address: Security[0x00000001891501c0] (Security.__TEXT.__text + 67704)
        Summary: Security`SSLHandshake
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/Security.framework/Security", arch = "a
rm64e"
         Symbol: id = {0x00001da4}, range = [0x00000018acc01c0-0x00000018acc0320), na
me="SSLHandshake"
```

Security SecTrustEvaluateFastAsync

```
(lldb) image lookup -vs SecTrustEvaluateFastAsync
```

```
1 symbols match 'SecTrustEvaluateFastAsync' in /Users/crifan/Library/Developer/Xcode/iO
S DeviceSupport/15.1 (19B74) arm64e/Symbols/System/Library/Frameworks/Security.framewor
k/Security:
        Address: Security[0x0000000189226304] (Security.__TEXT.__text + 944572)
        Summary: Security`SecTrustEvaluateFastAsync
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/Security.framework/Security", arch = "a
rm64e"
         Symbol: id = {0x000020a1}, range = [0x00000018b40a304-0x00000018b40a3b0), na
me="SecTrustEvaluateFastAsync"

(lldb) image lookup -vn SecTrustEvaluateFastAsync
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/System/Library/Frameworks/Security.framework/Security:
        Address: Security[0x0000000189226304] (Security.__TEXT.__text + 944572)
        Summary: Security`SecTrustEvaluateFastAsync
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/Security.framework/Security", arch = "a
rm64e"
         Symbol: id = {0x000020a1}, range = [0x00000018b40a304-0x00000018b40a3b0), na
me="SecTrustEvaluateFastAsync"
```

initialize

- 用 `symbol` 找：只找到1个

```
(lldb) image lookup -vs initialize
1 symbols match 'initialize' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport
/15.1 (19B74) arm64e/Symbols/System/Library/Frameworks/WatchConnectivity.framework/Watc
hConnectivity:
        Address: WatchConnectivity[0x00000001bf42bdb8] (WatchConnectivity.__TEXT.__text
 + 123420)
        Summary: WatchConnectivity`initialize
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/WatchConnectivity.framework/WatchConnec
tivity", arch = "arm64e"
         Symbol: id = {0x0000021c}, range = [0x00000001c0507db8-0x00000001c0507e9c), na
me="initialize"
```

- 用 `n = name` 找：找到非常多

此处只列出部分内容：

```
(lldb) image lookup -vn initialize
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74) a
rm64e/Symbols/usr/lib/dyld:
        Address: dyld[0x000000000000afd0] (dyld.__TEXT.__text + 40912)
        Summary: dyld`dyld4::RuntimeState::initialize()
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/usr/lib/dyld", arch = "arm64e"
         Symbol: id = {0x000000c7}, range = [0x00000001032b6fd0-0x00000001032b70bc), na
me="dyld4::RuntimeState::initialize()", mangled="_ZN5dyld412RuntimeState10initializeEv"
```

```
2 matches found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (19B74)
 arm64e/Symbols/System/Library/Frameworks/AVKit.framework/AVKit:
        Address: AVKit[0x000000019a386f48] (AVKit.__TEXT.__text + 330556)
        Summary: AVKit`+[AVChapter initialize]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/AVKit.framework/AVKit", arch = "arm64e"
         Symbol: id = {0x0000063c}, range = [0x000000019b462f48-0x000000019b462fb8), na
me="+[AVChapter initialize]"
        Address: AVKit[0x000000019a41a474] (AVKit.__TEXT.__text + 933992)
        Summary: AVKit`+[AVPlayerController initialize]
         Module: file = "/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/15.1 (
19B74) arm64e/Symbols/System/Library/Frameworks/AVKit.framework/AVKit", arch = "arm64e"
         Symbol: id = {0x00001316}, range = [0x000000019b4f6474-0x000000019b4f6500), na
me="+[AVPlayerController initialize]"
...
1 match found in /Users/crifan/Library/Developer/Xcode/DerivedData/Jolly-fbcdzphrbokcgx
hejxlslydrdyaa/Build/Products/Debug-iphoneos/Jolly.app/Frameworks/RevealServer.framewor
k/RevealServer:
        Address: RevealServer[0x00000000004a9dc] (RevealServer.__TEXT.__text + 277116)
        Summary: RevealServer`+[IBAHTTPConnection initialize]
         Module: file = "/Users/crifan/Library/Developer/Xcode/DerivedData/Jolly-fbcdzp
hrbokcgxhejxlslydrdyaa/Build/Products/Debug-iphoneos/Jolly.app/Frameworks/RevealServer.
framework/RevealServer", arch = "arm64e"
         Symbol: id = {0x00001189}, range = [0x00000001048b69dc-0x00000001048b6a30), na
me="+[IBAHTTPConnection initialize]"
...
```

`image lookup -s` vs `image lookup -n` vs `image lookup -r -s`

statfs

```
(lldb) image lookup -s statfs
1 symbols match 'statfs' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.
3.1 (17D50)/Symbols/usr/lib/dyld:
        Address: dyld[0x00000000004c324] (dyld.__TEXT.__text + 308004)
        Summary: dyld`statfs64
1 symbols match 'statfs' in /Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fsw
cidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCore.
framework/AwemeCore:


1 symbols match 'statfs' in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.
3.1 (17D50)/Symbols/usr/lib/system/libsystem_kernel.dylib:
        Address: libsystem_kernel.dylib[0x000000018028c8c4] (libsystem_kernel.dylib.__T
EXT.__text + 160068)
        Summary: libsystem_kernel.dylib`statfs


(lldb) image lookup -n statfs
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.3.1 (17D50)
/Symbols/usr/lib/dyld:
        Address: dyld[0x00000000004c324] (dyld.__TEXT.__text + 308004)
```

```
        Summary: dyld`statfs64
1 match found in /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.3.1 (17D50)
/Symbols/usr/lib/system/libsystem_kernel.dylib:
        Address: libsystem_kernel.dylib[0x000000018028c8c4] (libsystem_kernel.dylib.__T
EXT.__text + 160068)
        Summary: libsystem_kernel.dylib`statfs



(lldb) image lookup -r -s statfs
4 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/dyld:
        Address: dyld[0x000000000004c0a4] (dyld.__TEXT.__text + 307364)
        Summary: dyld`fstatfs64        Address: dyld[0x000000000004c0a4] (dyld.__TEXT._
_text + 307364)
        Summary: dyld`fstatfs64        Address: dyld[0x000000000004c324] (dyld.__TEXT._
_text + 308004)
        Summary: dyld`statfs64        Address: dyld[0x000000000004c324] (dyld.__TEXT.__
text + 308004)
        Summary: dyld`statfs64
2 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.ap
p/Frameworks/AwemeCore.framework/AwemeCore:
...
2 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/Frameworks/Foundation.framewo
rk/Foundation:
        Address: Foundation[0x00000001809a3160] (Foundation.__TEXT.__stubs + 10188)
        Summary: Foundation`symbol stub for: fstatfs        Address: Foundation[0x00000
001809a3f34] (Foundation.__TEXT.__stubs + 13728)
        Summary: Foundation`symbol stub for: statfs
2 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.ap
p/Frameworks/libAwemeDylib.dylib:
        Address: libAwemeDylib.dylib[0x000000000003896c] (libAwemeDylib.dylib.__TEXT.__
stubs + 1104)
        Summary: libAwemeDylib.dylib`symbol stub for: fstatfs        Address: libAwemeD
ylib.dylib[0x0000000000038ca8] (libAwemeDylib.dylib.__TEXT.__stubs + 1932)
        Summary: libAwemeDylib.dylib`symbol stub for: statfs
2 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/libsqlite3.dylib:
        Address: libsqlite3.dylib[0x0000000182217478] (libsqlite3.dylib.__TEXT.__stubs
+ 744)
        Summary: libsqlite3.dylib`symbol stub for: fstatfs        Address: libsqlite3.d
ylib[0x0000000182217730] (libsqlite3.dylib.__TEXT.__stubs + 1440)
        Summary: libsqlite3.dylib`symbol stub for: statfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/Frameworks/IOKit.framework/Ve
rsions/A/IOKit:
        Address: IOKit[0x0000000181458f9c] (IOKit.__TEXT.__stubs + 5088)
        Summary: IOKit`symbol stub for: statfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/Frameworks/ImageIO.framework/
ImageIO:
        Address: ImageIO[0x0000000180e541ac] (ImageIO.__TEXT.__stubs + 8340)
        Summary: ImageIO`symbol stub for: statfs
```

```
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/Frameworks/SystemConfiguratio
n.framework/SystemConfiguration:
        Address: SystemConfiguration[0x000000018073646c] (SystemConfiguration.__TEXT.__
stubs + 3000)
        Summary: SystemConfiguration`symbol stub for: fstatfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/system/libcopyfile.dylib:
        Address: libcopyfile.dylib[0x00000001a05aa260] (libcopyfile.dylib.__TEXT.__stub
s + 624)
        Summary: libcopyfile.dylib`symbol stub for: fstatfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/system/libremovefile.dylib:
        Address: libremovefile.dylib[0x00000001b5fc0b74] (libremovefile.dylib.__TEXT.__
stubs + 144)
        Summary: libremovefile.dylib`symbol stub for: fstatfs
3 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/system/libsystem_c.dylib:
        Address: libsystem_c.dylib[0x00000001800883a4] (libsystem_c.dylib.__TEXT.__text
 + 4268)
        Summary: libsystem_c.dylib`cvt_statfs_to_statvfs        Address: libsystem_c.dy
lib[0x00000001800fa510] (libsystem_c.dylib.__TEXT.__stubs + 1272)
        Summary: libsystem_c.dylib`symbol stub for: fstatfs        Address: libsystem_c
.dylib[0x00000001800fab10] (libsystem_c.dylib.__TEXT.__stubs + 2808)
        Summary: libsystem_c.dylib`symbol stub for: statfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/system/libsystem_info.dylib:
        Address: libsystem_info.dylib[0x00000001803634ac] (libsystem_info.dylib.__TEXT.
__stubs + 1836)
        Summary: libsystem_info.dylib`symbol stub for: statfs
4 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/system/libsystem_kernel.dylib:
        Address: libsystem_kernel.dylib[0x000000018028b3fc] (libsystem_kernel.dylib.__T
EXT.__text + 154748)
        Summary: libsystem_kernel.dylib`fstatfs        Address: libsystem_kernel.dylib[
0x000000018028b3fc] (libsystem_kernel.dylib.__TEXT.__text + 154748)
        Summary: libsystem_kernel.dylib`fstatfs        Address: libsystem_kernel.dylib[
0x000000018028c8c4] (libsystem_kernel.dylib.__TEXT.__text + 160068)
        Summary: libsystem_kernel.dylib`statfs        Address: libsystem_kernel.dylib[0
x000000018028c8c4] (libsystem_kernel.dylib.__TEXT.__text + 160068)
        Summary: libsystem_kernel.dylib`statfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/libarchive.2.dylib:
        Address: libarchive.2.dylib[0x00000001a027e28c] (libarchive.2.dylib.__TEXT.__st
ubs + 1212)
        Summary: libarchive.2.dylib`symbol stub for: fstatfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/usr/lib/libMobileGestalt.dylib:
        Address: libMobileGestalt.dylib[0x000000018149fd18] (libMobileGestalt.dylib.__T
EXT.__stubs + 2280)
        Summary: libMobileGestalt.dylib`symbol stub for: statfs
...
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/PrivateFrameworks/MobileKeyBa
g.framework/MobileKeyBag:
        Address: MobileKeyBag[0x00000001822554d4] (MobileKeyBag.__TEXT.__stubs + 2460)
```

```
        Summary: MobileKeyBag`symbol stub for: statfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/PrivateFrameworks/APFS.framew
ork/APFS:
        Address: APFS[0x00000001aa73f114] (APFS.__TEXT.__stubs + 948)
        Summary: APFS`symbol stub for: fstatfs
1 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/PrivateFrameworks/ktrace.fram
ework/ktrace:
        Address: ktrace[0x00000001b3d0555c] (ktrace.__TEXT.__stubs + 3552)
        Summary: ktrace`symbol stub for: statfs
...
2 symbols match the regular expression 'statfs' in /Users/crifan/Library/Developer/Xcod
e/iOS DeviceSupport/13.3.1 (17D50)/Symbols/System/Library/PrivateFrameworks/CoreService
sInternal.framework/CoreServicesInternal:
        Address: CoreServicesInternal[0x000000018178fd50] (CoreServicesInternal.__TEXT.
__text + 116648)
        Summary: CoreServicesInternal`GetStatfsByFSID(fsid, statfs*, int)        Addres
s: CoreServicesInternal[0x0000000181798ca8] (CoreServicesInternal.__TEXT.__stubs + 3264)

        Summary: CoreServicesInternal`symbol stub for: statfs
```

image lookup的help

```
(lldb) help image lookup
Look up information within executable and dependent shared library images.

Syntax: target modules lookup <cmd-options> [ <filename> [ <filename> [...]]]

Command Options Usage:
  target modules lookup [-Av] -a <address-expression> [-o <offset> ] [ <filename> [ filen
ame> [...]]]
  target modules lookup [-Arv] -s <symbol> [ <filename> [ <filename> [...]]]
  target modules lookup [-Aiv] -f <filename> [-l <linenum> ] [ <filename> [ <filename> [...
]]]
  target modules lookup [-Airv] -F <function-name> [ <filename> [ <filename> [...]]]
  target modules lookup [-Airv] -n <function-or-symbol> [ <filename> [ <filename> [...]]]
  target modules lookup [-Av] -t <name> [ <filename> [ <filename> [...]]]

       -A ( --all )
            Print all matches, not just the best match, if a best match is
            available.

       -F <function-name> ( --function <function-name> )
            Lookup a function by name in the debug symbols in one or more
            target modules.

       -a <address-expression> ( --address <address-expression> )
            Lookup an address in one or more target modules.

       -f <filename> ( --file <filename> )
            Lookup a file by fullpath or basename in one or more target
            modules.

       -i ( --no-inlines )
            Ignore inline entries (must be used in conjunction with --file or
            --function).

       -l <linenum> ( --line <linenum> )
            Lookup a line number in a file (must be used in conjunction with
            --file).

       -n <function-or-symbol> ( --name <function-or-symbol> )
            Lookup a function or symbol by name in one or more target modules.

       -o <offset> ( --offset <offset> )
            When looking up an address subtract <offset> from any addresses
            before doing the lookup.

       -r ( --regex )
            The <name> argument for name lookups are regular expressions.

       -s <symbol> ( --symbol <symbol> )
            Lookup a symbol by name in the symbol tables in one or more target
            modules.
```

```
        -t <name> ( --type <name> )
             Lookup a type by name in the debug symbols in one or more target
             modules.

        -v ( --verbose )
             Enable verbose lookup information.

      This command takes options and free-form arguments.  If your arguments
      resemble option specifiers (i.e., they start with a - or --), you must use
      ' -- ' between the end of the command options and the beginning of the
      arguments.

'image' is an abbreviation for 'target modules'
```

image list

- 输出加载的镜像image列表

```
image list -o -f
```

- 输出加载的镜像image列表，只输出特定二进制

```
image list -o -f | grep moduleName
```

  - 举例

```
image list -o -f | grep AwemeCore
image list -o -f | grep Module_Framework
```

image list举例

Aweme

```
(lldb) image list -o -f
[  0] 0x0000000004874000 /private/var/containers/Bundle/Application/9AB25481-0AD3-435C-A02E-68F9623535BB/Aweme.app/Aweme(0x0000000104874000)
[  1] 0x0000000104b78000 /Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.4.1 (17E262)/Symbols/usr/lib/dyld
```

- 另外某次的类似例子的截图
  -

- 说明
  - 第一个是app本身的二进制
    - `/private/var/containers/Bundle/Application/9AB25481-0AD3-435C-A02E-68F9623535BB/Aweme.app/Aweme`
      - 此处 `ALSR` 的基地址是：`0x0000000004874000`
- 第二个是 `dyld`
  - `/Users/crifan/Library/Developer/Xcode/iOS DeviceSupport/13.4.1 (17E262)/Symbols/usr/lib/dyld`

AwemeCore

```
(lldb) image list -o -f | grep AwemeCore
[  0] 0x0000000100adc000 /Users/crifan/Library/Developer/Xcode/DerivedData/Aweme-fswcidjoxbkibsdwekuzlsfcdqls/Build/Products/Debug-iphoneos/Aweme.app/Frameworks/AwemeCore.framework/AwemeCore
```

Module_Framework

- 带 `grep` 的

```
(lldb) image list -o -f | grep Module_Framework
```

```
[  0] 0x0000000104238000 /Users/crifan/Library/Developer/Xcode/DerivedData/youtube-dvlf
mmtvybrcdraorwznbwwepoae/Build/Products/Debug-iphoneos/youtube.app/Frameworks/Module_Fr
amework.framework/Module_Framework
```

- 带 `grep` 输出后，继续计算函数地址和查找相关函数

```
(lldb) image list -o -f | grep Module_Framework
[  0] 0x0000000102b50000 /Users/crifan/Library/Developer/Xcode/DerivedData/youtube-dvlf
mmtvybrcdraorwznbwwepoae/Build/Products/Debug-iphoneos/youtube.app/Frameworks/Module_Fr
amework.framework/Module_Framework
(lldb) p/x 0x0000000102b50000 + 0x10470B8
(long) $0 = 0x0000000103b970b8
(lldb) im loo -a 0x0000000103b970b8
      Address: Module_Framework[0x00000000010470b8] (Module_Framework.__TEXT.__text + 1
7051832)
      Summary: Module_Framework`___lldb_unnamed_symbol12565$$Module_Framework
```

image list心得

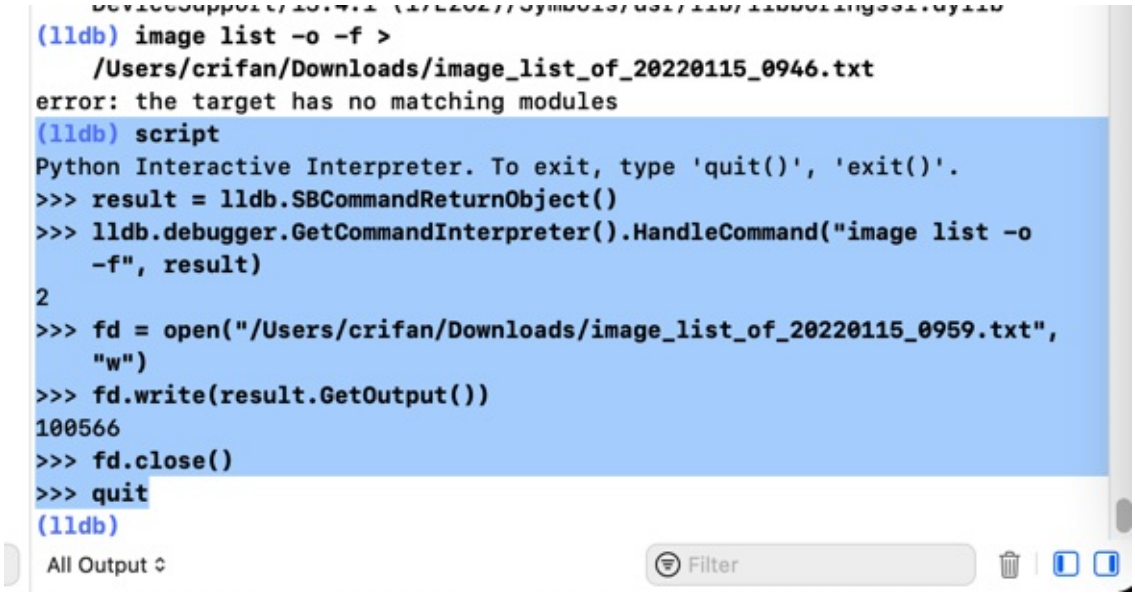
希望把Xcode中lldb中image list输出结果导出到文件

最终方案：lldb中运行script触发python交互环境，用python代码，把命令结果保存到文件中

具体步骤：

具体命令：

```
(lldb) script
Python Interactive Interpreter. To exit, type 'quit()', 'exit()'.
>>> result = lldb.SBCommandReturnObject()
>>> lldb.debugger.GetCommandInterpreter().HandleCommand("image list -o -f", result)
2
>>> fd = open("/Users/crifan/Downloads/image_list_of_20220115_0959.txt", "w")
>>> fd.write(result.GetOutput())
100566
>>> fd.close()
>>> quit
(lldb)
```



输出文件内容：

image list的help语法

```
(lldb) help image list
List current executable and dependent shared library images.

Syntax: target modules list <cmd-options> [<shlib-name> [<shlib-name> [...]]]

Command Options Usage:
  target modules list [-ghou] [-a <address-expression>] [-A[ width ]] [-b[ width ]] [-d[
 width ]] [-f[ width ]] [-m[ width ]] [-p[ none ]] [-r[ width ]] [-s[ width ]] [-S[ wid
th ]] [-t[ width ]] [<shlib-name> [<shlib-name> [...]]]

       -A[ width ] ( --arch [<width>] )
            Display the architecture when listing images.

       -S[ width ] ( --symfile-unique [<width>] )
            Display the symbol file with optional width only if it is different
            from the executable object file.

       -a <address-expression> ( --address <address-expression> )
            Display the image at this address.

       -b[ width ] ( --basename [<width>] )
            Display the basename with optional width for the image object file.

       -d[ width ] ( --directory [<width>] )
            Display the directory with optional width for the image object
            file.

       -f[ width ] ( --fullpath [<width>] )
            Display the fullpath to the image object file.

       -g ( --global )
            Display the modules from the global module list, not just the
            current target.

       -h ( --header )
            Display the image base address as a load address if debugging, a
            file address otherwise.

       -m[ width ] ( --mod-time [<width>] )
            Display the modification time with optional width of the module.

       -o ( --offset )
            Display the image load address offset from the base file address
            (the slide amount).

       -p[ none ] ( --pointer [<none>] )
            Display the module pointer.

       -r[ width ] ( --ref-count [<width>] )
            Display the reference count if the module is still in the shared
            module cache.
```

```
       -s[ width ] ( --symfile[ width ] )
            Display the fullpath to the image symbol file with optional width.

       -t[ width ] ( --triple[ width ] )
            Display the triple when listing images.

       -u ( --uuid )
            Display the UUID when listing images.

     This command takes options and free-form arguments.  If your arguments
     resemble option specifiers (i.e., they start with a - or --), you must use
     ' -- ' between the end of the command options and the beginning of the
     arguments.

'image' is an abbreviation for 'target modules'
```

image dump

- Dump all sections from the main executable and any shared libraries.

```
image dump sections
```

- Dump all sections in the a.out module

```
image dump sections a.out
```

- Dump all symbols from the main executable and any shared libraries

```
image dump symtab
```

- Dump all symbols in a.out and liba.so

```
image dump symtab a.out liba.so
```

register

TODO：

- 【记录】lldb命令使用心得：register
- 【记录】lldb命令使用心得：register read

---

register举例

```
(lldb) reg r x0 x1 x2 x3
      x0 = 0x000000029e100ea0
      x1 = 0x0000000000000000
      x2 = 0x0000000292566f00
      x3 = 0x0000000289d922e0
```

```
(lldb) reg r x8
      x8 = 0x0000000107e2fef8  Module_Framework`vtable for video_streaming::OnesieReque
stProto + 16
```

register语法

```
(lldb) help register
Commands to access registers for the current thread and stack frame.

Syntax: register [read write] ...

The following subcommands are supported:

      read  -- Dump the contents of one or more register values from the
               current frame.  If no register is specified, dumps them all.
      write -- Modify a single register value.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

register read语法

```
(lldb) help register read
Dump the contents of one or more register values from the current frame.  If no
register is specified, dumps them all.

Syntax: register read <cmd-options> [<register-name> [<register-name> [...]]]

Command Options Usage:
  register read [-A] [-f <format>] [-G <gdb-format>] [-s <index>] [<register-name> [re
gister-name> [...]]]
```

```
  register read [-Aa] [-f <format>] [-G <gdb-format>] [<register-name> [<register-name>
[...]]]

       -A ( --alternate )
            Display register names using the alternate register name if there
            is one.

       -G <gdb-format> ( --gdb-format <gdb-format> )
            Specify a format using a GDB format specifier string.

       -a ( --all )
            Show all register sets.

       -f <format> ( --format <format> )
            Specify a format to be used for display.

       -s <index> ( --set <index> )
            Specify which register sets to dump by index.

     This command takes options and free-form arguments.  If your arguments
     resemble option specifiers (i.e., they start with a - or --), you must use
     ' -- ' between the end of the command options and the beginning of the
     arguments.
```

expression

TODO：

- 【记录】lldb命令使用心得：expression
- 【记录】lldb命令使用心得：p和po
  - 【整理】Xcode中lldb命令对比：po和p

---

p和po

- `p` == `expression --`
- `po` == `expression -O --`

expression语法

```
(lldb) help expression
Evaluate an expression on the current thread.  Displays any returned value with
LLDB's default formatting.  Expects 'raw' input (see 'help raw-input'.)

Syntax: expression <cmd-options> -- <expr>

Command Options Usage:
  expression [-AFLORTgp] [-f <format>] [-G <gdb-format>] [-a <boolean>] [-j <boolean>]
[-X <source-language>] [-v[<description-verbosity>]] [-i <boolean>] [-l <source-languag
e>] [-t <unsigned-integer>] [-u <boolean>] [-d <none>] [-S <boolean>] [-D <count>] [-P
<count>] [-Y[<count>]] [-V <boolean>] [-Z <count>] -- <expr>
  expression [-AFLORTgp] [-a <boolean>] [-j <boolean>] [-X <source-language>] [-i <bool
ean>] [-l <source-language>] [-t <unsigned-integer>] [-u <boolean>] [-d <none>] [-S <bo
olean>] [-D <count>] [-P <count>] [-Y[<count>]] [-V <boolean>] [-Z <count>] -- <expr>
  expression [-r] -- <expr>
  expression <expr>

       -A ( --show-all-children )
            Ignore the upper bound on the number of children to show.

       -D <count> ( --depth <count> )
            Set the max recurse depth when dumping aggregate types (default is
            infinity).

       -F ( --flat )
            Display results in a flat format that uses expression paths for
            each variable or member.

       -G <gdb-format> ( --gdb-format <gdb-format> )
            Specify a format using a GDB format specifier string.

       -L ( --location )
            Show variable location information.
```

```
-O ( --object-description )
     Display using a language-specific description API, if possible.

-P <count> ( --ptr-depth <count> )
     The number of pointers to be traversed when dumping values (default
     is zero).

-R ( --raw-output )
     Don't use formatting options.

-S <boolean> ( --synthetic-type <boolean> )
     Show the object obeying its synthetic provider, if available.

-T ( --show-types )
     Show variable types when dumping values.

-V <boolean> ( --validate <boolean> )
     Show results of type validators.

-X <source-language> ( --apply-fixits <source-language> )
     If true, simple fix-it hints will be automatically applied to the
     expression.

-Y[ count ] ( --no-summary-depth [<count>] )
     Set the depth at which omitting summary information stops (default
     is 1).

-Z <count> ( --element-count <count> )
     Treat the result of the expression as if its type is an array of
     this many values.

-a <boolean> ( --all-threads <boolean> )
     Should we run all threads if the execution doesn't complete on one
     thread.

-d <none> ( --dynamic-type <none> )
     Show the object as its full dynamic type, not its static type, if
     available.
     Values: no-dynamic-values | run-target | no-run-target

-f <format> ( --format <format> )
     Specify a format to be used for display.

-g ( --debug )
     When specified, debug the JIT code by setting a breakpoint on the
     first instruction and forcing breakpoints to not be ignored (-i0)
     and no unwinding to happen on error (-u0).

-i <boolean> ( --ignore-breakpoints <boolean> )
     Ignore breakpoint hits while running expressions

-j <boolean> ( --allow-jit <boolean> )
     Controls whether the expression can fall back to being JITted if
     it's not supported by the interpreter (defaults to true).

-l <source-language> ( --language <source-language> )
```

```
            Specifies the Language to use when parsing the expression.  If not
            set the target.language setting is used.

        -p ( --top-level )
            Interpret the expression as a complete translation unit, without
            injecting it into the local context.  Allows declaration of
            persistent, top-level entities without a $ prefix.

        -r ( --repl )
            Drop into Swift REPL

        -t <unsigned-integer> ( --timeout <unsigned-integer> )
            Timeout value (in microseconds) for running the expression.

        -u <boolean> ( --unwind-on-error <boolean> )
            Clean up program state if the expression causes a crash, or raises
            a signal. Note, unlike gdb hitting a breakpoint is controlled by
            another option (-i).

        -v[ description-verbosity ] ( --description-verbosity=[ description-verbosity ] )

            How verbose should the output of this expression be, if the object
            description is asked for.
            Values: compact | full

Single and multi-line expressions:

    The expression provided on the command line must be a complete expression
    with no newlines.  To evaluate a multi-line expression, hit a return after
    an empty expression, and lldb will enter the multi-line expression editor.
    Hit return on an empty line to end the multi-line expression.

Timeouts:

    If the expression can be evaluated statically (without running code) then
    it will be.  Otherwise, by default the expression will run on the current
    thread with a short timeout: currently .25 seconds.  If it doesn't return
    in that time, the evaluation will be interrupted and resumed with all
    threads running.  You can use the -a option to disable retrying on all
    threads.  You can use the -t option to set a shorter timeout.

User defined variables:

    You can define your own variables for convenience or to be used in
    subsequent expressions.  You define them the same way you would define
    variables in C.  If the first character of your user defined variable is a
    $, then the variable's value will be available in future expressions,
    otherwise it will just be available in the current expression.

Continuing evaluation after a breakpoint:

    If the "-i false" option is used, and execution is interrupted by a
    breakpoint hit, once you are done with your investigation, you can either
    remove the expression execution frames from the stack with "thread return
    -x" or if you are still interested in the expression result you can issue
    the "continue" command and the expression evaluation will complete and the
```

```
    expression result will be available using the "thread.completed-expression"
    key in the thread format.

Examples:

    expr my_struct->a = my_array[3]
    expr -f bin -- (index * 8) + 5
    expr unsigned int $foo = 5
    expr char c[] = \"foo\"; c[0]

     Important Note: Because this command takes 'raw' input, if you use any
     command options you must use ' -- ' between the end of the command options
     and the beginning of the raw input.
```

p

- `p == expression --`

常见p的缩写的语法

- 英文

```
p    //
p/x  //x hex hexadecimal
p/d  //d decimal signed decimal
p/u  //u unsigned decimal
p/o  //o octal
p/t  //t two binary
p/a  //a address
p/c  //c char character
p/f  //f float
p/s  //s string
p/r  //r raw
```

- 中文

```
p    //默认打印十进制
p/x  //以十六进制打印整数
p/d  //以带符号的十进制打印整数
p/u  //以无符号的十进制打印整数
p/o  //以八进制打印整数
p/t  //以二进制打印整数
p/a  //以十六进制打印地址
p/c  //打印字符常量
p/f  //打印浮点数
p/s  //打印字符串
p/r  //格式化打印
```

po

TODO：

- 【整理】iOS逆向心得：当iPhone锁屏时Xcode中lldb的po会卡死
- 【整理】iOS逆向心得：po异常时NSString的字符串无法像char*一样打印出来
- 【整理】iOS逆向调试心得：po不是对象实例但可以看到是哪个类

- `po` == `expression -O --`

po举例

```
(lldb) po $x1
8203662366

(lldb) po (SEL)$x1
"stringByAppendingString:"

(lldb) po $x2
nil

(lldb) po $x3
{(
    executing
)}

(lldb) po $arg3
nil
```

```
(lldb) reg r x1 x2 x3
      x1 = 0x000000010a328d0a
      x2 = 0x0000000281f79160
      x3 = 0x000000016b4b8ea8
(lldb) po 0x000000010a328d0a
4466052362

(lldb) po 0x0000000281f79160
AWELazyRegisterHandler  0x281f79160

(lldb) po 0x000000016b4b8ea8
6095081128
```

memory

TODO：

- 【记录】lldb命令使用心得：memory
- 【记录】lldb命令使用心得：memory read
- 【已解决】iOS逆向：Xcode中lldb从内存中导出二进制数据

---

memory举例

查看内存中的数据

```
(lldb) x/16gx 0x0000000109117438
0x109117438: 0x0000000000000000 0x0000000000000000
0x109117448: 0x00000001052b6a88 0x00000001052b6ad8
0x109117458: 0x000000010521b03c 0x00000001052b5758
0x109117468: 0x00000001052b5850 0x00000001052b5980
0x109117478: 0x00000001052b5ab0 0x00000001052b6638
0x109117488: 0x00000001052b6674 0x000000010521b40c
0x109117498: 0x00000001052b65fc 0x00000001052b6a10
0x1091174a8: 0x00000001052b6a4c 0x00000001052b5a74
```

memory语法

```
(lldb) help memory
Commands for operating on memory in the current target process.

Syntax: memory <subcommand> [<subcommand-options>]

The following subcommands are supported:

      find    -- Find a value in the memory of the current target process.
      history -- Print recorded stack traces for allocation/deallocation events
                 associated with an address.
      read    -- Read from the memory of the current target process.
      region  -- Get information on the memory region containing an address in
                 the current target process.
      write   -- Write to the memory of the current target process.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

memory read

心得

（把内存中某段数据）导出到文件

```
memory read --binary --force --outfile /Users/crifan/dev/tmp/lldb_mem_dump/akd_func2540_arm64e.bin 0x10485d98c 0x1048600dc
```

- 参数解释
  - `--outfile /Users/crifan/dev/tmp/lldb_mem_dump/akd_func2540_arm64e.bin`
    - 注意：此处输出文件路径是PC端（此处Mac端），不是移动端（iPhone端）
  - `--binary`
    - 以二进制格式导出
      - 否则默认以txt文本格式导出
  - `--force`
    - 强制导出大量数据
    - 注：
      - 默认最多只能导出 `1K` = `1024` 个字节
      - 不加此参数，会出现警告

        ```
        error: Normally, 'memory read' will not read over 1024 bytes of data.
        error: Please use --force to override this restriction just once.
        error: or set target.max-memory-read-size if you will often need a large
        r limit.
        ```

      - 如果经常导出（超过 `1K` 的）大量数据，则再去设置：

        ```
        set target.max-memory-read-size
        ```

memory read的help语法

```
(lldb) help memory read
Read from the memory of the current target process.

Syntax: memory read <cmd-options> <address-expression> [<address-expression>]

Command Options Usage:
  memory read [-drd] [-f <format>] [-c <count>] [-G <gdb-format>] [-s <byte-size>] [-l <
number-per-line>] [-o <filename>] <address-expression> [<address-expression>]
  memory read [-dbrd] [-f <format>] [-c <count>] [-s <byte-size>] [-o <filename>] <addr
ess-expression> [<address-expression>]
  memory read [-AFLORTdrd] -t <name> [-f <format>] [-c <count>] [-G <gdb-format>] [-E <
count>] [-o <filename>] [-d <none>] [-S <boolean>] [-D <count>] [-P <count>] [-Y[ count
]] [-V <boolean>] [-Z <count>] <address-expression> [<address-expression>]
  memory read -t <name> [-x <source-language>] <address-expression> [<address-expression
>]

       -A ( --show-all-children )
            Ignore the upper bound on the number of children to show.

       -D <count> ( --depth <count> )
            Set the max recurse depth when dumping aggregate types (default is
            infinity).

       -E <count> ( --offset <count> )
            How many elements of the specified type to skip before starting to
            display data.

       -F ( --flat )
            Display results in a flat format that uses expression paths for
            each variable or member.

       -G <gdb-format> ( --gdb-format <gdb-format> )
            Specify a format using a GDB format specifier string.

       -L ( --location )
            Show variable location information.

       -O ( --object-description )
            Display using a language-specific description API, if possible.

       -P <count> ( --ptr-depth <count> )
            The number of pointers to be traversed when dumping values (default
            is zero).

       -R ( --raw-output )
            Don't use formatting options.

       -S <boolean> ( --synthetic-type <boolean> )
            Show the object obeying its synthetic provider, if available.

       -T ( --show-types )
```

```
            Show variable types when dumping values.

       -V <boolean> ( --validate <boolean> )
            Show results of type validators.

       -Y[<count>] ( --no-summary-depth=[<count>] )
            Set the depth at which omitting summary information stops (default
            is 1).

       -Z <count> ( --element-count <count> )
            Treat the result of the expression as if its type is an array of
            this many values.

       -b ( --binary )
            If true, memory will be saved as binary. If false, the memory is
            saved save as an ASCII dump that uses the format, size, count and
            number per line settings.

       -c <count> ( --count <count> )
            The number of total items to display.

       -d <none> ( --dynamic-type <none> )
            Show the object as its full dynamic type, not its static type, if
            available.
            Values: no-dynamic-values | run-target | no-run-target

       -f <format> ( --format <format> )
            Specify a format to be used for display.

       -l <number-per-line> ( --num-per-line <number-per-line> )
            The number of items per line to display.

       -o <filename> ( --outfile <filename> )
            Specify a path for capturing command output.

       -r ( --force )
            Necessary if reading over target.max-memory-read-size bytes.

       -s <byte-size> ( --size <byte-size> )
            The size in bytes to use when displaying with the selected format.

       -t <name> ( --type <name> )
            The name of a type to view memory as.

       -x <source-language> ( --language <source-language> )
            The language of the type to view memory as.

       -d ( --append-outfile )
            Append to the file specified with '--outfile <path>'.

     This command takes options and free-form arguments.  If your arguments
     resemble option specifiers (i.e., they start with a - or --), you must use
     ' -- ' between the end of the command options and the beginning of the
     arguments.
```

disassemble

TODO：

【记录】lldb命令使用心得：disassemble

- `disassemble` == `dis` == `di`

```
di        -- Disassemble specified instructions in the current target.
             Defaults to the current function for the current thread and
             stack frame.
dis       -- Disassemble specified instructions in the current target.
             Defaults to the current function for the current thread and
             stack frame.
```

disassemble举例

官网的例子

GDB to LLDB command map — The LLDB Debugger (llvm.org)

官网有相关例子：

- Disassemble the current function for the current frame

```
(lldb) disassemble --frame
(lldb) di -f
```

- Disassemble any functions named main

```
(lldb) disassemble --name main
(lldb) di -n main
```

- Disassemble an address range

```
(lldb) disassemble --start-address 0x1eb8 --end-address 0x1ec3
(lldb) di -s 0x1eb8 -e 0x1ec3
```

- Disassemble 20 instructions from a given address

```
(lldb) disassemble --start-address 0x1eb8 --count 20
(lldb) di -s 0x1eb8 -c 20
```

- Show mixed source and disassembly for the current function for the current frame

```
(lldb) disassemble --frame --mixed
(lldb) di -f -m
```

- Disassemble the current function for the current frame and show the opcode bytes

```
(lldb) disassemble --frame --bytes
(lldb) di -f -b
```

- Disassemble the current source line for the current frame

```
(lldb) disassemble --line
(lldb) di -l
```

某次测试的一些命令

- 某次测试的一些命令
  - 如果当前已处于某个函数，则：

```
dis -f == dis = dis -n FunctionName
```

  - 其他常见用法：

```
disassemble == dis = di
dis -n "-[AAUISignInViewController _nextButtonSelected:]"
dis -f
dis --start-address 0x1b30cb978 --end-address 0x1b30cb990
dis --start-address 0x1b30cb978 --count 10
dis --frame --mixed
dis --frame --bytes
dis --line
```

当前frame = 当前函数的 全部汇编代码

```
dis -f
```

- 效果

```
(lldb) dis -f
AppleAccountUI`-[AAUISignInViewController _nextButtonSelected:]:
->  0x1b30cb978 <+0> :  stp    x20, x19, [sp, #-0x20]!
    0x1b30cb97c <+4> :  stp    x29, x30, [sp, #0x10]
    0x1b30cb980 <+8> :  add    x29, sp, #0x10            ; =0x10
    0x1b30cb984 <+12> : mov    x19, x0
    0x1b30cb988 <+16> : adrp   x8, -84407
    0x1b30cb98c <+20> : add    x1, x8, #0xc7a            ; =0xc7a
    0x1b30cb990 <+24> : bl     0x1b2c70578
    0x1b30cb994 <+28> : adrp   x8, -84407
    0x1b30cb998 <+32> : add    x1, x8, #0xc91            ; =0xc91
    0x1b30cb99c <+36> : mov    x0, x19
    0x1b30cb9a0 <+40> : ldp    x29, x30, [sp, #0x10]
    0x1b30cb9a4 <+44> : ldp    x20, x19, [sp], #0x20
    0x1b30cb9a8 <+48> : b      0x1b2c70578
```

指定函数

```
disassemble -n "-[AAUISignInViewController _nextButtonSelected:]"
```

- 效果

```
(lldb) disassemble -n "-[AAUISignInViewController _nextButtonSelected:]"
AppleAccountUI`-[AAUISignInViewController _nextButtonSelected:]:
->  0x1b30cb978 <+0>:  stp    x20, x19, [sp, #-0x20]!
    0x1b30cb97c <+4>:  stp    x29, x30, [sp, #0x10]
    0x1b30cb980 <+8>:  add    x29, sp, #0x10            ; =0x10
    0x1b30cb984 <+12>: mov    x19, x0
    0x1b30cb988 <+16>: adrp   x8, -84407
    0x1b30cb98c <+20>: add    x1, x8, #0xc7a            ; =0xc7a
    0x1b30cb990 <+24>: bl     0x1b2c70578
    0x1b30cb994 <+28>: adrp   x8, -84407
    0x1b30cb998 <+32>: add    x1, x8, #0xc91            ; =0xc91
    0x1b30cb99c <+36>: mov    x0, x19
    0x1b30cb9a0 <+40>: ldp    x29, x30, [sp, #0x10]
    0x1b30cb9a4 <+44>: ldp    x20, x19, [sp], #0x20
    0x1b30cb9a8 <+48>: b      0x1b2c70578
```

  -

指定地址范围

```
disassemble --start-address 0x1b30cb978 --end-address 0x1b30cb990
```

- 参数说明
  - 包括：`start address` =0x1b30cb978
  - 不包括：`end address` =0x1b30cb990
- 输出效果

```
(lldb) disassemble --start-address 0x1b30cb978 --end-address 0x1b30cb990
AppleAccountUI`-[AAUISignInViewController _nextButtonSelected:]:
->  0x1b30cb978 <+0>:  stp    x20, x19, [sp, #-0x20]!
    0x1b30cb97c <+4>:  stp    x29, x30, [sp, #0x10]
    0x1b30cb980 <+8>:  add    x29, sp, #0x10            ; =0x10
```

```
    0x1b30cb984 <+12> : mov    x19, x0
    0x1b30cb988 <+16> : adrp   x8, -84407
    0x1b30cb98c <+20> : add    x1, x8, #0xc7a            ; =0xc7a
```

额外加上行数：

```
disassemble --start-address 0x1b30cb978 --count 10
```

- 输出效果

```
(lldb) disassemble --start-address 0x1b30cb978 --count 10
AppleAccountUI`-[AAUISignInViewController _nextButtonSelected:]:
->  0x1b30cb978 <+0> :  stp    x20, x19, [sp, #-0x20]!
    0x1b30cb97c <+4> :  stp    x29, x30, [sp, #0x10]
    0x1b30cb980 <+8> :  add    x29, sp, #0x10            ; =0x10
    0x1b30cb984 <+12> : mov    x19, x0
    0x1b30cb988 <+16> : adrp   x8, -84407
    0x1b30cb98c <+20> : add    x1, x8, #0xc7a            ; =0xc7a
    0x1b30cb990 <+24> : bl     0x1b2c70578
    0x1b30cb994 <+28> : adrp   x8, -84407
    0x1b30cb998 <+32> : add    x1, x8, #0xc91            ; =0xc91
    0x1b30cb99c <+36> : mov    x0, x19
```

显示opcode

```
disassemble --frame --bytes
```

- 说明
  - 和IDA中设置显示opcode的效果类似：解析后的arm指令前面，显示出对应的二进制数据opcode
- 输出效果

```
(lldb) disassemble --frame --bytes
AppleAccountUI`-[AAUISignInViewController _nextButtonSelected:]:
->  0x1b30cb978 <+0> :  0xa9be4ff4   stp    x20, x19, [sp, #-0x20]!
    0x1b30cb97c <+4> :  0xa9017bfd   stp    x29, x30, [sp, #0x10]
    0x1b30cb980 <+8> :  0x910043fd   add    x29, sp, #0x10            ; =0x10
    0x1b30cb984 <+12> : 0xaa0003f3   mov    x19, x0
    0x1b30cb988 <+16> : 0xb0f5b248   adrp   x8, -84407
    0x1b30cb98c <+20> : 0x9131e901   add    x1, x8, #0xc7a            ; =0xc7a
    0x1b30cb990 <+24> : 0x97ee92fa   bl     0x1b2c70578
    0x1b30cb994 <+28> : 0xb0f5b248   adrp   x8, -84407
    0x1b30cb998 <+32> : 0x91324501   add    x1, x8, #0xc91            ; =0xc91
    0x1b30cb99c <+36> : 0xaa1303e0   mov    x0, x19
    0x1b30cb9a0 <+40> : 0xa9417bfd   ldp    x29, x30, [sp, #0x10]
    0x1b30cb9a4 <+44> : 0xa8c24ff4   ldp    x20, x19, [sp], #0x20
    0x1b30cb9a8 <+48> : 0x17ee92f4   b      0x1b2c70578
```

其他例子

显示某个地址的反汇编

```
disassemble -s 0x000000010916 94a4
```

- 输出效果

```
(lldb) disassemble -s 0x0000000109169 4a4
Module_Framework`___lldb_unnamed_symbol171165$$Module_Framework:
    0x1091694a4 <+0>: ret

Module_Framework`___lldb_unnamed_symbol171166$$Module_Framework:
    0x1091694a8 <+0> : b      0x1091a45ac               ; ___lldb_unnamed_symbol1747
29$$Module_Framework

Module_Framework`___lldb_unnamed_symbol171167$$Module_Framework:
    0x1091694ac <+0> : ldr    x2, [x0, #0x10]
    0x1091694b0 <+4> : br     x2

Module_Framework`___lldb_unnamed_symbol171168$$Module_Framework:
    0x1091694b4 <+0> : ret

Module_Framework`___lldb_unnamed_symbol171169$$Module_Framework:
    0x1091694b8 <+0> : b      0x1091a45ac               ; ___lldb_unnamed_symbol1747
29$$Module_Framework

Module_Framework`___lldb_unnamed_symbol171170$$Module_Framework:
    0x1091694bc <+0> : ldr    x2, [x0, #0x10]
    0x1091694c0 <+4> : br     x2
```

指定显示的行数

- 显示从 函数最开始 算起的 20行代码

```
dis -c 20
```

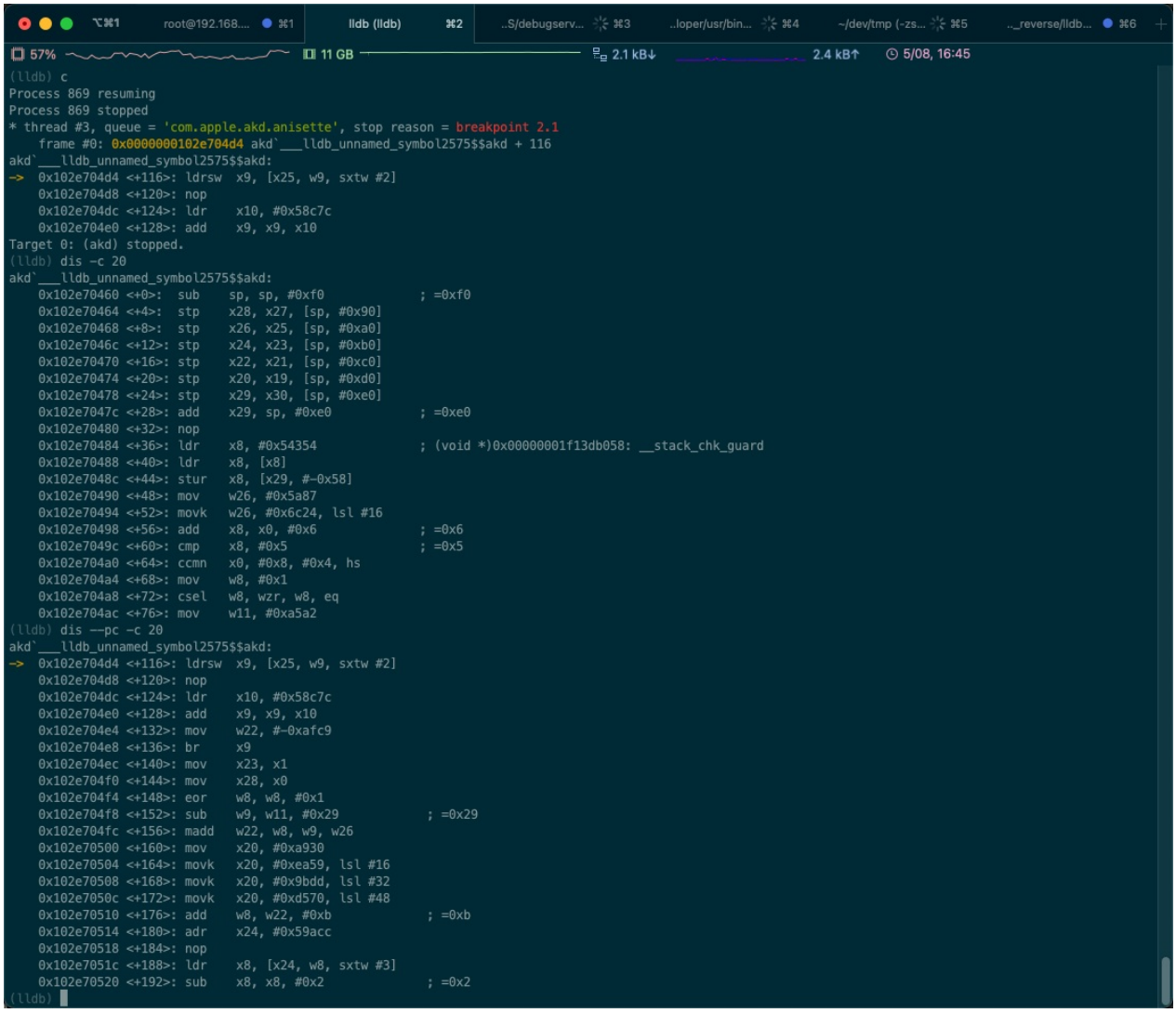
- 显示从 当前PC位置 算起的 20行代码

```
dis --pc -c 20
```

输出效果:

```
(lldb) c
Process 869 resuming
Process 869 stopped
* thread #3, queue = 'com.apple.akd.anisette', stop reason = breakpoint 2.1
    frame #0: 0x0000000102e704d4 akd`___lldb_unnamed_symbol2575$$akd + 116
akd`___lldb_unnamed_symbol2575$$akd:
->  0x102e704d4 <+116>: ldrsw  x9, [x25, w9, sxtw #2]
    0x102e704d8 <+120>: nop
    0x102e704dc <+124>: ldr    x10, #0x58c7c
    0x102e704e0 <+128>: add    x9, x9, x10
Target 0: (akd) stopped.
(lldb) dis -c 20
akd`___lldb_unnamed_symbol2575$$akd:
    0x102e70460 <+0> :  sub    sp, sp, #0xf0             ; =0xf0
```

```
    0x102e70464 <+4>:  stp    x28, x27, [sp, #0x90]
    0x102e70468 <+8>:  stp    x26, x25, [sp, #0xa0]
    0x102e7046c <+12>: stp    x24, x23, [sp, #0xb0]
    0x102e70470 <+16>: stp    x22, x21, [sp, #0xc0]
    0x102e70474 <+20>: stp    x20, x19, [sp, #0xd0]
    0x102e70478 <+24>: stp    x29, x30, [sp, #0xe0]
    0x102e7047c <+28>: add    x29, sp, #0xe0            ; =0xe0
    0x102e70480 <+32>: nop
    0x102e70484 <+36>: ldr    x8, #0x54354              ; (void *)0x00000001f13db058: _
_stack_chk_guard
    0x102e70488 <+40>: ldr    x8, [x8]
    0x102e7048c <+44>: stur   x8, [x29, #-0x58]
    0x102e70490 <+48>: mov    w26, #0x5a87
    0x102e70494 <+52>: movk   w26, #0x6c24, lsl #16
    0x102e70498 <+56>: add    x8, x0, #0x6              ; =0x6
    0x102e7049c <+60>: cmp    x8, #0x5                  ; =0x5
    0x102e704a0 <+64>: ccmn   x0, #0x8, #0x4, hs
    0x102e704a4 <+68>: mov    w8, #0x1
    0x102e704a8 <+72>: csel   w8, wzr, w8, eq
    0x102e704ac <+76>: mov    w11, #0xa5a2
(lldb) dis --pc -c 20
akd`___lldb_unnamed_symbol2575$$akd:
->  0x102e704d4 <+116>: ldrsw  x9, [x25, w9, sxtw #2]
    0x102e704d8 <+120>: nop
    0x102e704dc <+124>: ldr    x10, #0x58c7c
    0x102e704e0 <+128>: add    x9, x9, x10
    0x102e704e4 <+132>: mov    w22, #-0xafc9
    0x102e704e8 <+136>: br     x9
    0x102e704ec <+140>: mov    x23, x1
    0x102e704f0 <+144>: mov    x28, x0
    0x102e704f4 <+148>: eor    w8, w8, #0x1
    0x102e704f8 <+152>: sub    w9, w11, #0x29             ; =0x29
    0x102e704fc <+156>: madd   w22, w8, w9, w26
    0x102e70500 <+160>: mov    x20, #0xa930
    0x102e70504 <+164>: movk   x20, #0xea59, lsl #16
    0x102e70508 <+168>: movk   x20, #0x9bdd, lsl #32
    0x102e7050c <+172>: movk   x20, #0xd570, lsl #48
    0x102e70510 <+176>: add    w8, w22, #0xb              ; =0xb
    0x102e70514 <+180>: adr    x24, #0x59acc
    0x102e70518 <+184>: nop
    0x102e7051c <+188>: ldr    x8, [x24, w8, sxtw #3]
    0x102e70520 <+192>: sub    x8, x8, #0x2               ; =0x2
(lldb)
```



disassemble语法

```
(lldb) help disassemble
Disassemble specified instructions in the current target.  Defaults to the
current function for the current thread and stack frame.

Syntax: disassemble [ cmd-options ]

Command Options Usage:
  disassemble [-bmr] -s address-expression [-A arch ] [-C num-lines ] [-e address-
expression ] [-F disassembly-flavor ] [-P plugin ]
  disassemble [-bmr] -s address-expression [-A arch ] [-C num-lines ] [-c num-lines
] [-F disassembly-flavor ] [-P plugin ]
  disassemble [-bmr] [-A arch ] [-C num-lines ] [-c num-lines ] [-F disassembly-fla
vor ] [-n function-name ] [-P plugin ]
  disassemble [-bfmr] [-A arch ] [-C num-lines ] [-c num-lines ] [-F disassembly-fl
avor ] [-P plugin ]
  disassemble [-bmpr] [-A arch ] [-C num-lines ] [-c num-lines ] [-F disassembly-fl
avor ] [-P plugin ]
  disassemble [-blmr] [-A arch ] [-C num-lines ] [-F disassembly-flavor ] [-P plugin
]
  disassemble [-bmr] [-a address-expression ] [-A arch ] [-C num-lines ] [-c num-li
```

```
nes ] [-F disassembly-flavor ] [-P plugin ]

       --force
            Force dissasembly of large functions.

       -A arch ( --arch arch )
            Specify the architecture to use from cross disassembly.

       -C num-lines ( --context num-lines )
            Number of context lines of source to show.

       -F disassembly-flavor ( --flavor disassembly-flavor )
            Name of the disassembly flavor you want to use. Currently the only
            valid options are default, and for Intel architectures, att and
            intel.

       -P plugin ( --plugin plugin )
            Name of the disassembler plugin you want to use.

       -a address-expression ( --address address-expression )
            Disassemble function containing this address.

       -b ( --bytes )
            Show opcode bytes when disassembling.

       -c num-lines ( --count num-lines )
            Number of instructions to display.

       -e address-expression ( --end-address address-expression )
            Address at which to end disassembling.

       -f ( --frame )
            Disassemble from the start of the current frame's function.

       -l ( --line )
            Disassemble the current frame's current source line instructions if
            there is debug line table information, else disassemble around the
            pc.

       -m ( --mixed )
            Enable mixed source and assembly display.

       -n function-name ( --name function-name )
            Disassemble entire contents of the given function name.

       -p ( --pc )
            Disassemble around the current pc.

       -r ( --raw )
            Print raw disassembly with no symbol information.

       -s address-expression ( --start-address address-expression )
            Address at which to start disassembling.
```

thread

TODO：

【记录】lldb命令使用心得：thread

frame

TODO：

- 【记录】lldb命令使用心得：frame

---

breakpoint

TODO:

- 【记录】lldb命令使用心得：breakpoint
- 【已解决】Xcode中lldb中b list不是breakpoint list
- 【未解决】Xcode中无法给下一行将要运行的汇编指令加断点
- 【已解决】XCode中如何给符号断点加上判断条件
- 【未解决】XCode和lldb如何根据函数地址加断点

- 详见独立子教程
  - iOS逆向之动态调试：断点

breakpoint举例

```
breakpoint set -a 函数地址

breakpoint set -a ASLR偏移量 + 静态分析的函数地址

breakpoint set -a （image list -o -f看到的库的加载的起始地址） + （IDA等工具）静态分析的函数地址
```

```
(lldb) breakpoint set -a 0x1102d3348
Breakpoint 54: where = AwemeCore`___lldb_unnamed_symbol1462804$$AwemeCore + 480, address = 0x00000001102d3348
(lldb) breakpoint list
Current breakpoints:
…
54: address = AwemeCore[0x000000000ee2b348], locations = 1, resolved = 1, hit count = 0
  54.1: where = AwemeCore`___lldb_unnamed_symbol1462804$$AwemeCore + 480, address = 0x00000001102d3348, resolved, hit count = 0
```

```
breakpoint set --name foo --condition '(int)strcmp(y,"hello") == 0'
```

==

```
br s -n foo -c '(int)strcmp(y,"hello") == 0'
```

breakpoint语法

```
(lldb) help breakpoint
Commands for operating on breakpoints (see 'help b' for shorthand.)

Syntax: breakpoint <subcommand> [<command-options>]
```

```
The following subcommands are supported:

      clear   -- Delete or disable breakpoints matching the specified source
                 file and line.
      command -- Commands for adding, removing and listing LLDB commands
                 executed when a breakpoint is hit.
      delete  -- Delete the specified breakpoint(s).  If no breakpoints are
                 specified, delete them all.
      disable -- Disable the specified breakpoint(s) without deleting them.  If
                 none are specified, disable all breakpoints.
      enable  -- Enable the specified disabled breakpoint(s). If no breakpoints
                 are specified, enable all of them.
      list    -- List some or all breakpoints at configurable levels of detail.
      modify  -- Modify the options on a breakpoint or set of breakpoints in
                 the executable.  If no breakpoint is specified, acts on the
                 last created breakpoint.  With the exception of -e, -d and -i,
                 passing an empty argument clears the modification.
      name    -- Commands to manage name tags for breakpoints
      read    -- Read and set the breakpoints previously saved to a file with
                 "breakpoint write".
      set     -- Sets a breakpoint or set of breakpoints in the executable.
      write   -- Write the breakpoints listed to a file that can be read in
                 with "breakpoint read".  If given no arguments, writes all
                 breakpoints.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

breakpoint set 语法

```
(lldb) help breakpoint set
Sets a breakpoint or set of breakpoints in the executable.

Syntax: breakpoint set <cmd-options>

Command Options Usage:
  breakpoint set [-DHd] -l <linenum> [-G <boolean>] [-C <command>] [-c <expr>] [-i cou
nt <count>] [-o <boolean>] [-q <queue-name>] [-t <thread-id>] [-x <thread-index>] [-T <thread-
name>] [-R <address>] [-N <breakpoint-name>] [-u <column>] [-f <filename>] [-m <boolean>
] [-s <shlib-name>] [-K <boolean>]
  breakpoint set [-DHd] -a <address-expression> [-G <boolean>] [-C <command>] [-c <expr>
] [-i <count>] [-o <boolean>] [-q <queue-name>] [-t <thread-id>] [-x <thread-index>] [-
T <thread-name>] [-N <breakpoint-name>] [-s <shlib-name>]
  breakpoint set [-DHd] -n <function-name> [-G <boolean>] [-C <command>] [-c <expr>] [-
i <count>] [-o <boolean>] [-q <queue-name>] [-t <thread-id>] [-x <thread-index>] [-T <t
hread-name>] [-R <address>] [-N <breakpoint-name>] [-f <filename>] [-L <source-language>
] [-s <shlib-name>] [-K <boolean>]
  breakpoint set [-DHd] -F <fullname> [-G <boolean>] [-C <command>] [-c <expr>] [-i co
unt <count>] [-o <boolean>] [-q <queue-name>] [-t <thread-id>] [-x <thread-index>] [-T <thread
-name>] [-R <address>] [-N <breakpoint-name>] [-f <filename>] [-L <source-language>] [-
s <shlib-name>] [-K <boolean>]
  breakpoint set [-DHd] -S <selector> [-G <boolean>] [-C <command>] [-c <expr>] [-i co
unt <count>] [-o <boolean>] [-q <queue-name>] [-t <thread-id>] [-x <thread-index>] [-T <thread
-name>] [-R <address>] [-N <breakpoint-name>] [-f <filename>] [-L <source-language>] [-
```

```
s shlib-name ] [-K boolean ]
  breakpoint set [-DHd] -M method [-G boolean ] [-C command ] [-c expr ] [-i count
] [-o boolean ] [-q queue-name ] [-t thread-id ] [-x thread-index ] [-T thread-na
me ] [-R address ] [-N breakpoint-name ] [-f filename ] [-L source-language ] [-s
shlib-name ] [-K boolean ]
  breakpoint set [-DHd] -r regular-expression [-G boolean ] [-C command ] [-c expr
] [-i count ] [-o boolean ] [-q queue-name ] [-t thread-id ] [-x thread-index ] [-
T thread-name ] [-R address ] [-N breakpoint-name ] [-f filename ] [-L source-lang
uage ] [-s shlib-name ] [-K boolean ]
  breakpoint set [-DHd] -b function-name [-G boolean ] [-C command ] [-c expr ] [-
i count ] [-o boolean ] [-q queue-name ] [-t thread-id ] [-x thread-index ] [-T t
hread-name ] [-R address ] [-N breakpoint-name ] [-f filename ] [-L source-language
] [-s shlib-name ] [-K boolean ]
  breakpoint set [-ADHd] -p regular-expression [-G boolean ] [-C command ] [-c expr
] [-i count ] [-o boolean ] [-q queue-name ] [-t thread-id ] [-x thread-index ] [
-T thread-name ] [-N breakpoint-name ] [-f filename ] [-m boolean ] [-s shlib-name
] [-X function-name ]
  breakpoint set [-DHd] -E source-language [-G boolean ] [-C command ] [-c expr ] [
-i count ] [-o boolean ] [-q queue-name ] [-t thread-id ] [-x thread-index ] [-T
thread-name ] [-N breakpoint-name ] [-O type-name ] [-h boolean ] [-w boolean ]
  breakpoint set [-DHd] -P python-class [-k none ] [-v none ] [-G boolean ] [-C c
ommand ] [-c expr ] [-i count ] [-o boolean ] [-q queue-name ] [-t thread-id ] [-x
 thread-index ] [-T thread-name ] [-N breakpoint-name ] [-f filename ] [-s shlib-na
me ]
  breakpoint set [-DHd] -y linespec [-G boolean ] [-C command ] [-c expr ] [-i co
unt ] [-o boolean ] [-q queue-name ] [-t thread-id ] [-x thread-index ] [-T thread
-name ] [-R address ] [-N breakpoint-name ] [-m boolean ] [-s shlib-name ] [-K boo
lean ]

       -A ( --all-files )
            All files are searched for source pattern matches.

       -C command ( --command command )
            A command to run when the breakpoint is hit, can be provided more
            than once, the commands will get run in order left to right.

       -D ( --dummy-breakpoints )
            Act on Dummy breakpoints - i.e. breakpoints set before a file is
            provided, which prime new targets.

       -E source-language ( --language-exception source-language )
            Set the breakpoint on exceptions thrown by the specified language
            (without options, on throw but not catch.)

       -F fullname ( --fullname fullname )
            Set the breakpoint by fully qualified function names. For C++ this
            means namespaces and all arguments, and for Objective-C this means
            a full functionprototype with class and selector.  Can be repeated
            multiple times to make one breakpoint for multiple names.

       -G boolean ( --auto-continue boolean )
            The breakpoint will auto-continue after running its commands.

       -H ( --hardware )
            Require the breakpoint to use hardware breakpoints.
```

```
-K <boolean> ( --skip-prologue <boolean> )
     sKip the prologue if the breakpoint is at the beginning of a
     function. If not set the target.skip-prologue setting is used.

-L <source-language> ( --language <source-language> )
     Specifies the Language to use when interpreting the breakpoint's
     expression (note: currently only implemented for setting
     breakpoints on identifiers). If not set the target.language setting
     is used.

-M <method> ( --method <method> )
     Set the breakpoint by C++ method names.  Can be repeated multiple
     times tomake one breakpoint for multiple methods.

-N <breakpoint-name> ( --breakpoint-name <breakpoint-name> )
     Adds this to the list of names for this breakpoint.

-O <type-name> ( --exception-typename <type-name> )
     The breakpoint will only stop if an exception Object of this type
     is thrown. Can be repeated multiple times to stop for multiple
     object types. If you just specify the type's base name it will
     match against that type in all modules, or you can specify the full
     type name including modules. Other submatches are not supported at
     present.Only supported for Swift at present.

-P <python-class> ( --script-class <python-class> )
     The name of the class that will manage a scripted breakpoint.

-R <address> ( --address-slide <address> )
     Add the specified offset to whatever address(es) the breakpoint
     resolves to. At present this applies the offset directly as given,
     and doesn't try to align it to instruction boundaries.

-S <selector> ( --selector <selector> )
     Set the breakpoint by ObjC selector name. Can be repeated multiple
     times tomake one breakpoint for multiple Selectors.

-T <thread-name> ( --thread-name <thread-name> )
     The breakpoint stops only for the thread whose thread name matches
     this argument.

-X <function-name> ( --source-regexp-function <function-name> )
     When used with '-p' limits the source regex to source contained in
     the namedfunctions.  Can be repeated multiple times.

-a <address-expression> ( --address <address-expression> )
     Set the breakpoint at the specified address.  If the address maps
     uniquely toa particular binary, then the address will be converted
     to a fileaddress, so that the breakpoint will track that
     binary+offset no matter where the binary eventually loads.
     Alternately, if you also specify the module - with the -s option -
     then the address will be treated as a file address in that module,
     and resolved accordingly.  Again, this will allow lldb to track
     that offset on subsequent reloads.  The module need not have been
     loaded at the time you specify this breakpoint, and will get
     resolved when the module is loaded.
```

```
-b <function-name> ( --basename <function-name> )
     Set the breakpoint by function basename (C++ namespaces and
     arguments will beignored).  Can be repeated multiple times to make
     one breakpoint for multiplesymbols.

-c <expr> ( --condition <expr> )
     The breakpoint stops only if this condition expression evaluates to
     true.

-d ( --disable )
     Disable the breakpoint.

-f <filename> ( --file <filename> )
     Specifies the source file in which to set this breakpoint.  Note,
     by default lldb only looks for files that are #included if they use
     the standard include file extensions.  To set breakpoints on
     .c/.cpp/.m/.mm files that are #included, set
     target.inline-breakpoint-strategy to always.

-h <boolean> ( --on-catch <boolean> )
     Set the breakpoint on exception catcH.

-i <count> ( --ignore-count <count> )
     Set the number of times this breakpoint is skipped before stopping.

-k <none> ( --structured-data-key <none> )
     The key for a key/value pair passed to the implementation of a
     scripted breakpoint.  Pairs can be specified more than once.

-l <linenum> ( --line <linenum> )
     Specifies the line number on which to set this breakpoint.

-m <boolean> ( --move-to-nearest-code <boolean> )
     Move breakpoints to nearest code. If not set the
     target.move-to-nearest-codesetting is used.

-n <function-name> ( --name <function-name> )
     Set the breakpoint by function name.  Can be repeated multiple
     times to makeone breakpoint for multiple names

-o <boolean> ( --one-shot <boolean> )
     The breakpoint is deleted the first time it stop causes a stop.

-p <regular-expression> ( --source-pattern-regexp <regular-expression> )
     Set the breakpoint by specifying a regular expression which is
     matched against the source text in a source file or files specified
     with the -f can be specified more than once.  If no source files
     are specified, uses the current default source file.  If you want
     to match against all source files, pass the --all-files option.

-q <queue-name> ( --queue-name <queue-name> )
     The breakpoint stops only for threads in the queue whose name is
     given by this argument.

-r <regular-expression> ( --func-regex <regular-expression> )
```

```
            Set the breakpoint by function name, evaluating a
            regular-expression to find the function name(s).

        -s <shlib-name> ( --shlib <shlib-name> )
            Set the breakpoint only in this shared library.  Can repeat this
            option multiple times to specify multiple shared libraries.

        -t <thread-id> ( --thread-id <thread-id> )
            The breakpoint stops only for the thread whose TID matches this
            argument.

        -u <column> ( --column <column> )
            Specifies the column number on which to set this breakpoint.

        -v <none> ( --structured-data-value <none> )
            The value for the previous key in the pair passed to the
            implementation of a scripted breakpoint.  Pairs can be specified
            more than once.

        -w <boolean> ( --on-throw <boolean> )
            Set the breakpoint on exception throw.

        -x <thread-index> ( --thread-index <thread-index> )
            The breakpoint stops only for the thread whose index matches this
            argument.

        -y <linespec> ( --joint-specifier <linespec> )
            A specifier in the form filename:line[:column] for setting file &
            line breakpoints.
```

watchpoint

TODO：

- 【已解决】Xcode中lldb中如何给watchpoint加上条件判断过滤
- 【已解决】Xcode中lldb的条件watchpoint报错：error user expression indirection requires pointer operand long invalid
- 【已解决】Xcode的lldb中如何监控结构体变量值的变化
- 【未解决】研究YouTube逻辑：监控NSArray的_allTrackRenderers值被改动
- 【未解决】YouTube的HAMPlayerInternal的playerLoop中监控_currentTime变量值变化

---

watchpoint举例

```
(lldb) watchpoint set expr 0x000000011ceb5818
Watchpoint created: Watchpoint 1: addr = 0x11ceb5818 size = 8 state = enabled type = w
    new value: 0
```

触发时打印：

```
Watchpoint 1 hit:
old value: 0
new value: 0
```

关闭所有：

```
(lldb) watchpoint disable
All watchpoints disabled. (4 watchpoints)
```

打开所有：

```
(lldb) watchpoint enable
All watchpoints enabled. (4 watchpoints)
```

watchpoint语法

```
(lldb) help watchpoint
Commands for operating on watchpoints.

Syntax: watchpoint <subcommand> [<command-options>]

The following subcommands are supported:

      command -- Commands for adding, removing and examining LLDB commands
                 executed when the watchpoint is hit (watchpoint 'commands').
```

```
      delete  -- Delete the specified watchpoint(s).  If no watchpoints are
                 specified, delete them all.
      disable -- Disable the specified watchpoint(s) without removing it/them.
                 If no watchpoints are specified, disable them all.
      enable  -- Enable the specified disabled watchpoint(s). If no watchpoints
                 are specified, enable all of them.
      ignore  -- Set ignore count on the specified watchpoint(s).  If no
                 watchpoints are specified, set them all.
      list    -- List all watchpoints at configurable levels of detail.
      modify  -- Modify the options on a watchpoint or set of watchpoints in
                 the executable.  If no watchpoint is specified, act on the
                 last created watchpoint.  Passing an empty argument clears the
                 modification.
      set     -- Commands for setting a watchpoint.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

调试控制

run

continue

next

nexti

step

stepi

jump

finish

exit

LLDB心得

导出结果到文件

lldb调试期间，对于命令：

```
disassemble -f
```

的结果，想要输出/导出到文件，可以：

方法1：`session save`

- 方法1：`session save`
  - 优点：
    - 方便，无需引入额外命令
    - （对部分人是优点）可以把session的所有内容都保存输出到文件
  - 缺点：没有针对性（针对自己想要的特定的代码的输出结果）

不借助外部脚本和命令，直接用：

```
session save /Users/crifan/dev/tmp/sub_1000A0460.txt
```

即可：

把当前会话session == 当前这次lldb的调试，自动启动开始，到现在的输出的内容

都输出到文件中

其中就包括，之前刚已运行的命令的输出结果了。

方法2：用 `lldb` 的（`python`）脚本

- 方法2：用 `lldb` 的（`python`）脚本
  - 缺点：要额外新引入lldb的脚本
  - 优点：可以有针对性的，只输出单个命令的结果到文件
    - 而不用保存当前session的所有内容

比如：

4iar/lldb-write: Write the output of an lldb command to file (github.com)

用法：

先安装：

下载代码

```
git clone https://github.com/4iar/lldb-write.git
```

```
然后去加到lldb启动脚本中：
```

```bash
vi ~/.lldbinit
```

加上：

```
command script import /{change_to_your_path}/lldb-write/write.py
```

重启lldb后，可以看到提示：

```
The "write" command has been loaded and is ready for use.
```

然后即可使用：

```
write /some/path/outputFile.txt yourOriginLldbCommand
```

比如：

```
write /Users/crifan/dev/tmp/lldb_akd_symbol2575_disassemble.txt dis -f
```

即可把当前lldb命令的输出结果，导出到文件中。

同时：当前lldb终端中，仍能正常看到结果。还是很好用的。

命令缩写

lldb命令的缩写：所有命令都支持任意前缀字符的缩写，只要不产生混淆

lldb中的命令，可以缩写

比如：

```
print
```

常见缩写是：

```
p
```

但其实底层逻辑是：

从第一个字母 `p` 到最后一个字母 `t` ，缩写到任意位置都是可以的

前提是，只要不（和其他命令的前缀）产生混淆

举例

print

- `print`
  - `p`
    - 是 `lldb` 专门为 `print` **保留**的 `p` ，所以可以用 `p`
      - 否则按道理，也会和其他 `process` 等命令产生冲突，也不能把 `print` 缩写为 `p`
  - `pr`
    - 和 `process` 的 `pr` 是一样的前缀字符
      - `lldb` 无法确定是哪个，所以就属于会产生**冲突**、**混淆**
      - 所以**不**能用 `pr`
  - `pri`
    - 可以
  - `prin`
    - 可以
  - `print`
    - 可以 所以总体结论就是：
- `print`
  - 可以用特定的缩写： `p`
  - 也可以用其他普通的，不产生冲突的缩写： `pri` 、 `prin` 、 `print`

breakpoint

断点de的命令

```
breakpoint
```

可以缩写/简写为：

```
breakpoin
breakpoi
breakpo
breakp
break
brea
bre
br
```

而不能用：

- `b`
  - 特殊：属于lldb中专门保留的特定的缩写
    - 含义是：以某种特定的格式去添加断点

-》有了上面的缩写逻辑，则普通的：

```
breakpoint list
```

就可以写为：

```
breakpoin list
breakpoi list
breakpo list
breakp list
break list
brea list
bre list
br list
```

都是可以的，都是等价的

子命令也支持缩写

当然命令的子命令，参数，也是同样支持缩写

比如此处

```
br list
```

的 `list` 也可以缩写：

```
br lis
br li
br l
```

只要不产生冲突即可

此处就是 `breakpoint` 的子命令中，上述缩写不会冲突混淆即可。

注：

此处可以用 `help breakpoint` 去查看， `breakpoint` 有哪些子命令

```
(lldb) help breakpoint
Commands for operating on breakpoints (see 'help b' for shorthand.)

Syntax: breakpoint <subcommand> [<command-options>]

The following subcommands are supported:

      clear   -- Delete or disable breakpoints matching the specified source
                 file and line.
      command -- Commands for adding, removing and listing LLDB commands
                 executed when a breakpoint is hit.
      delete  -- Delete the specified breakpoint(s).  If no breakpoints are
                 specified, delete them all.
      disable -- Disable the specified breakpoint(s) without deleting them.  If
                 none are specified, disable all breakpoints.
      enable  -- Enable the specified disabled breakpoint(s). If no breakpoints
                 are specified, enable all of them.
      list    -- List some or all breakpoints at configurable levels of detail.
      modify  -- Modify the options on a breakpoint or set of breakpoints in
                 the executable.  If no breakpoint is specified, acts on the
                 last created breakpoint.  With the exception of -e, -d and -i,
                 passing an empty argument clears the modification.
      name    -- Commands to manage name tags for breakpoints
      read    -- Read and set the breakpoints previously saved to a file with
                 "breakpoint write".
      set     -- Sets a breakpoint or set of breakpoints in the executable.
      write   -- Write the breakpoints listed to a file that can be read in
                 with "breakpoint read".  If given no arguments, writes all
                 breakpoints.

For more help on any particular subcommand, type 'help <command> <subcommand>'.
```

其中可见， `breakpoint` 的子命令：

- `clear`
- `command`
- `delete`
- `disable`
- `enable`
- `modify`
- `name`
- `read`
- `set`
- `write`

不会和上面的缩写 `lis` 、 `li` 、 `l` ，有冲突和混淆

-》所以你会看到，很多人常把：

```
breakpoint list
```

写成：

```
br l
```

就是这个目的：

- 尽量用缩写
  - -》减少输入的字符数
    - -》提高调试效率

其他常见缩写

其他常用缩写：

- `expression` -> `e` 、 `exp`
- `breakpoint` = `br` == 特殊写法: `b`
  - `breakpoint set` -> `br s`
  - `breakpoint list` -> `br l`
  - 举例
    - `breakpoint delete 1` -> `br del 1`
    - `breakpoint disable 1` -> `br dis 1`
    - `breakpoint enable 1` -> `br en 1`
    - `breakpoint set --name main` -> `br s -n main` -> `b main`
    - `breakpoint set --name foo --condition '(int)strcmp(y,"hello") == 0'`
      - -> `br s -n foo -c '(int)strcmp(y,"hello") == 0'`
- `disassemble` -> `dis`
  - 举例
    - `disassemble -s 0x1167b1974` -> `dis -s 0x1167b1974`
- `register` -> `reg`
  - `register read` -> `reg r`
    - 举例
      - `register r x0` -> `reg r x0`
- `image` -> `im`
  - `image lookup` = `im loo`
    - 举例
      - `image lookup --address 0x1ec4` -> `im loo -a 0x1ec4`
- `memory` -> `mem`

Xcode中lldb

TODO：

- 【整理】Xcode的lldb调试心得：F7单步进入无名的汇编代码
- 【未解决】XCode和lldb如何根据函数地址加断点
- 【已解决】XCode和lldb调试常见用法和调试心得
- 【已解决】XCode的lldb中如何调试找到当前函数_dyld_get_image_name的返回值
- 【已解决】Xcode调试：lldb中临时变量

此处整理`Xcode`中的`lldb`的一些心得：

支持自动补全

`Xcode` 中 `lldb` 中支持自动补全：

- 输入 `regi` ，自动补全列出： `register`
    -
- 输入 `disa` 自动补全出： `disassemble`
    -
- `register read x` 后的自动补全效果

- `image l` 后的自动补全效果

查看函数调用堆栈

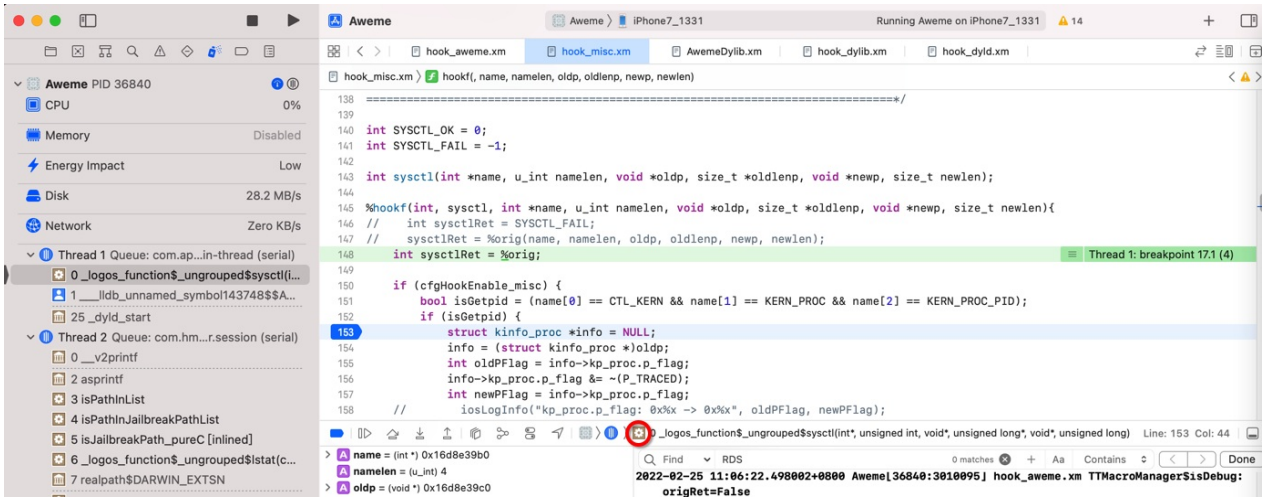
`lldb` 和 `XCode` 中查看 `函数调用堆栈` = `backtrace`：

XCode调试期间，想要查看：函数调用堆栈

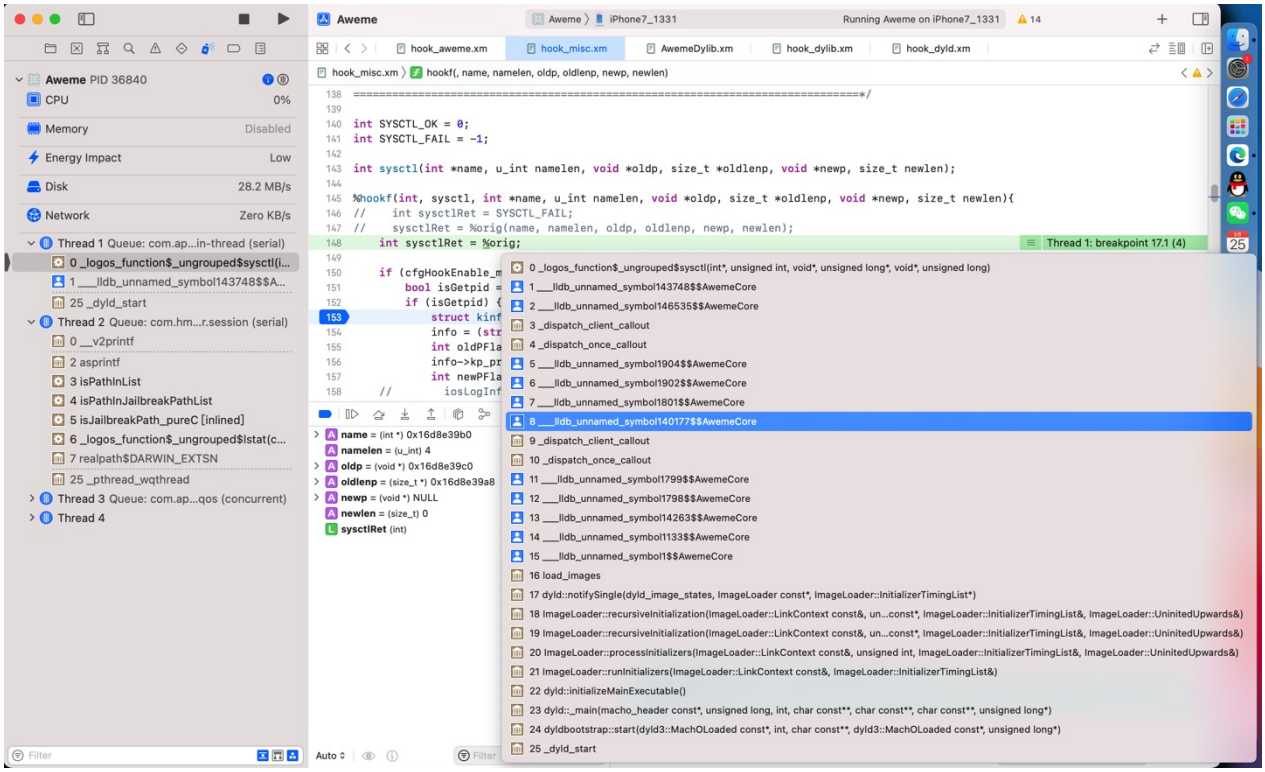
至少有2种方法：

XCode的UI界面中

`XCode` 中，`Command` + `鼠标单击`：



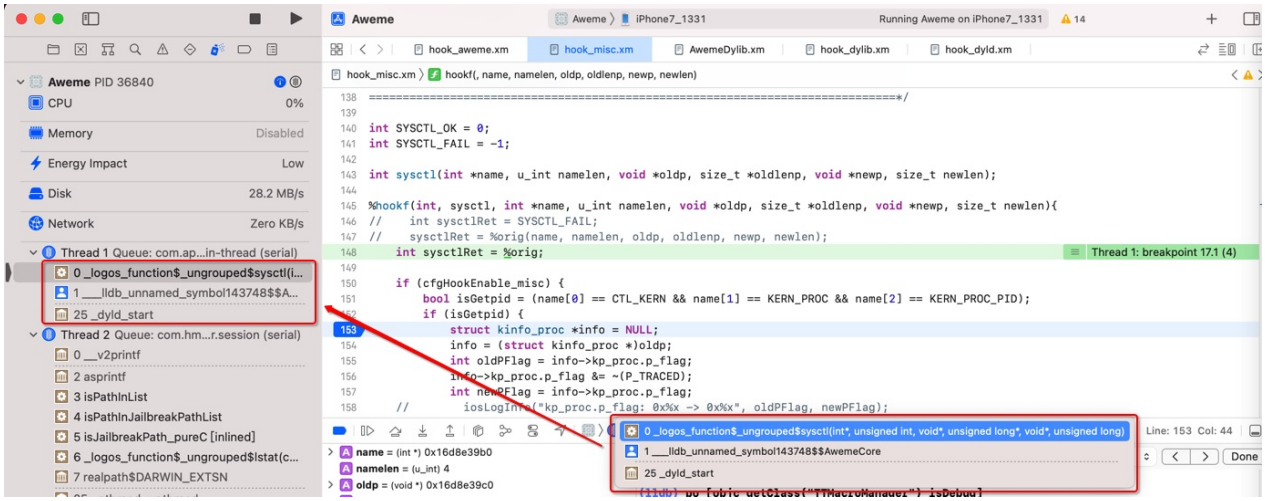
即可看到全部的函数调用堆栈：



注：

直接 `鼠标点击` （不加 `Command` 键），则只显示缩略后的信息：

且和 `Debug Navigator` 中的线程下面的 函数调用堆栈 简略信息 是一致的：



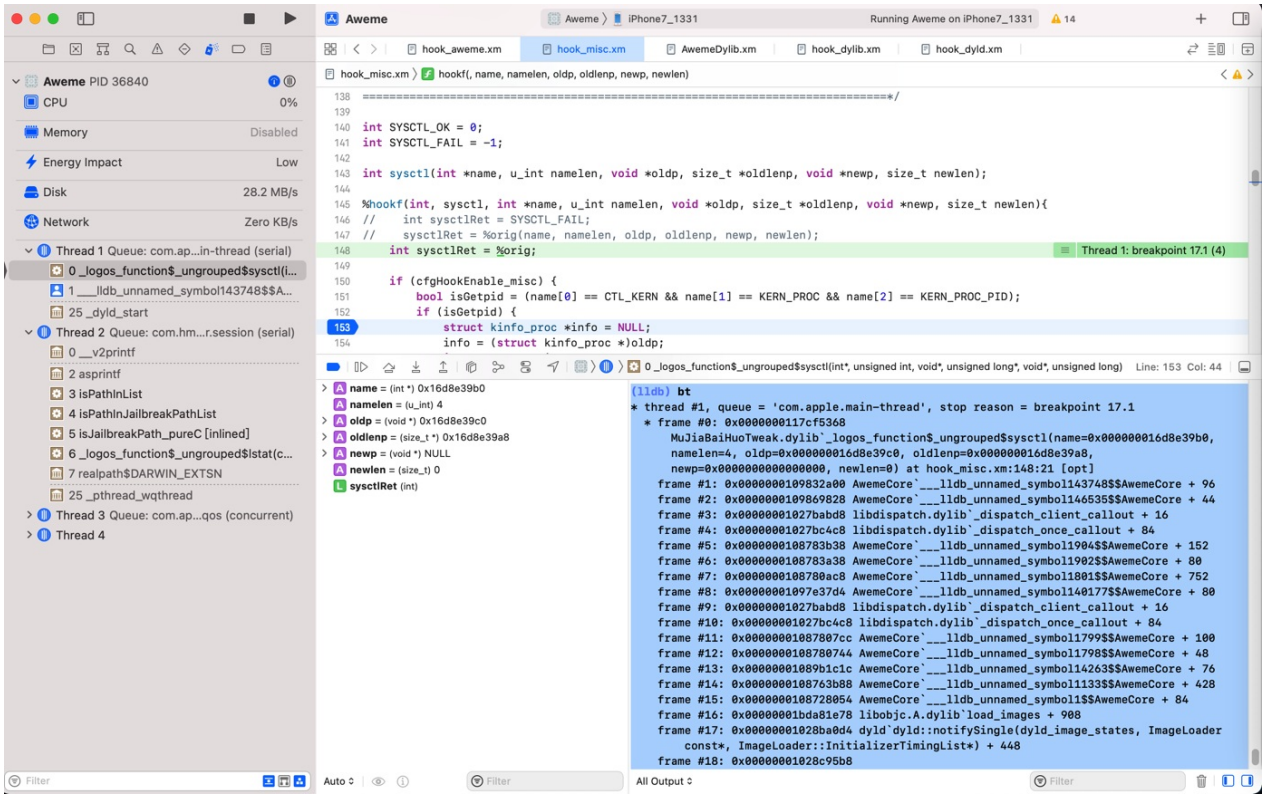
lldb命令bt

- `bt` = `thread backtrace`
  - = `th b`
  - = `th ba`

举例：

```
(lldb) bt
* thread #1, queue = 'com.apple.main-thread', stop reason = breakpoint 17.1
  * frame #0: 0x0000000117cf5368 XxxTweak.dylib`_logos_function$_ungrouped$sysctl(name=0x000000016d8e39b0, namelen=4, oldp=0x000000016d8e39c0, oldlenp=0x000000016d8e39a8, newp=0x0000000000000000, newlen=0) at hook_misc.xm:148:21 [opt]
    frame #1: 0x0000000109832a00 AwemeCore`___lldb_unnamed_symbol143748$$AwemeCore + 96
    frame #2: 0x0000000109869828 AwemeCore`___lldb_unnamed_symbol146535$$AwemeCore + 44
    frame #3: 0x00000001027babd8 libdispatch.dylib`_dispatch_client_callout + 16
    frame #4: 0x00000001027bc4c8 libdispatch.dylib`_dispatch_once_callout + 84
    frame #5: 0x0000000108783b38 AwemeCore`___lldb_unnamed_symbol1904$$AwemeCore + 152
    frame #6: 0x0000000108783a38 AwemeCore`___lldb_unnamed_symbol1902$$AwemeCore + 80
    frame #7: 0x0000000108780ac8 AwemeCore`___lldb_unnamed_symbol1801$$AwemeCore + 752
    frame #8: 0x00000001097e37d4 AwemeCore`___lldb_unnamed_symbol140177$$AwemeCore + 80
    frame #9: 0x00000001027babd8 libdispatch.dylib`_dispatch_client_callout + 16
    frame #10: 0x00000001027bc4c8 libdispatch.dylib`_dispatch_once_callout + 84
    frame #11: 0x00000001087807cc AwemeCore`___lldb_unnamed_symbol1799$$AwemeCore + 100
    frame #12: 0x0000000108780744 AwemeCore`___lldb_unnamed_symbol1798$$AwemeCore + 48
    frame #13: 0x00000001089b1c1c AwemeCore`___lldb_unnamed_symbol14263$$AwemeCore + 76
    frame #14: 0x0000000108763b88 AwemeCore`___lldb_unnamed_symbol1133$$AwemeCore + 428
    frame #15: 0x0000000108728054 AwemeCore`___lldb_unnamed_symbol1$$AwemeCore + 84
    frame #16: 0x00000001bda81e78 libobjc.A.dylib`load_images + 908
    frame #17: 0x00000001028ba0d4 dyld`dyld::notifySingle(dyld_image_states, ImageLoader const*, ImageLoader::InitializerTimingList*) + 448
    frame #18: 0x00000001028c95b8 dyld`ImageLoader::recursiveInitialization(ImageLoader::LinkContext const&, unsigned int, char const*, ImageLoader::InitializerTimingList&, ImageLoader::UninitedUpwards&) + 524
    frame #19: 0x00000001028c953c dyld`ImageLoader::recursiveInitialization(ImageLoader
```

```
: LinkContext const&, unsigned int, char const*, ImageLoader::InitializerTimingList&, I
mageLoader::UninitedUpwards&) + 400
    frame #20: 0x00000001028c8334 dyld`ImageLoader::processInitializers(ImageLoader::Li
nkContext const&, unsigned int, ImageLoader::InitializerTimingList&, ImageLoader::Unini
tedUpwards&) + 184
    frame #21: 0x00000001028c83fc dyld`ImageLoader::runInitializers(ImageLoader::LinkCo
ntext const&, ImageLoader::InitializerTimingList&) + 92
    frame #22: 0x00000001028ba420 dyld`dyld::initializeMainExecutable() + 216
    frame #23: 0x00000001028bedb4 dyld`dyld::_main(macho_header const*, unsigned long,
int, char const**, char const**, char const**, unsigned long*) + 4616
    frame #24: 0x00000001028b9208 dyld`dyldbootstrap::start(dyld3::MachOLoaded const*,
int, char const**, dyld3::MachOLoaded const*, unsigned long*) + 396
    frame #25: 0x00000001028b9038 dyld`_dyld_start + 56
```



iOS逆向

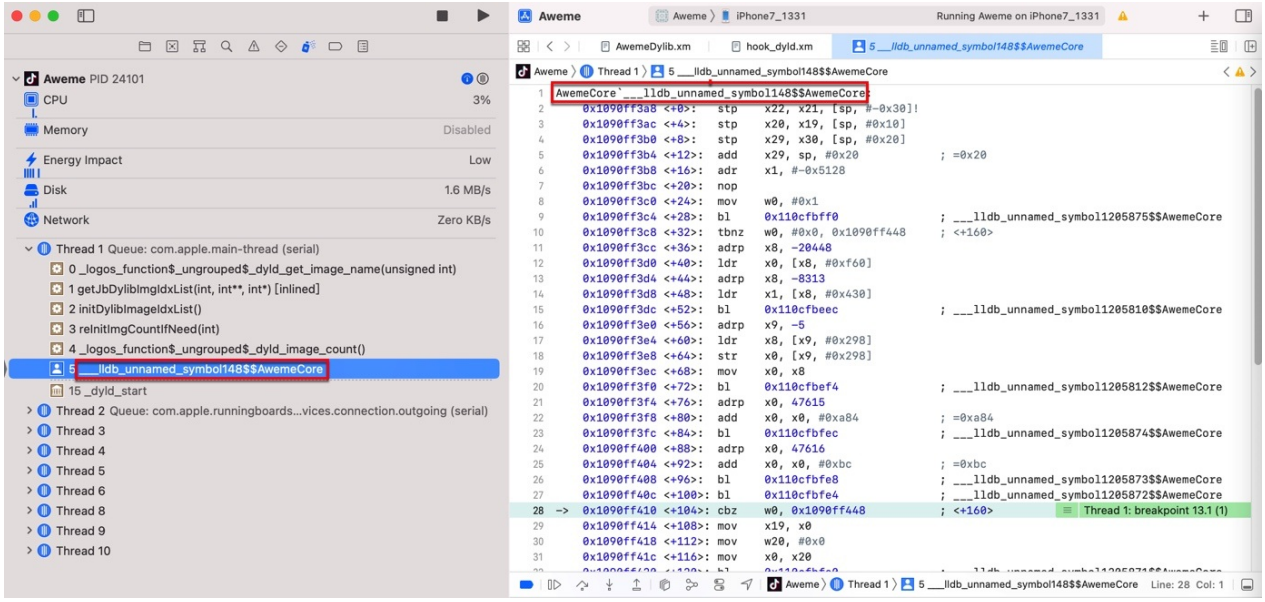
TODO：

- 整理常用的命令和举例
  - image
  - po
  - bt
  - reg
  - 等
- iOS逆向时用LLDB调试iOS中ObjC的对象和相关内容
- 【记录】iOS逆向Xcode调试心得：bl后cmn再b.eq很像是switch case或if else的代码逻辑跳转
- 【未解决】Xcode的lldb调试iOS的ObjC或Swift时如何打印出objc_msgSend第一个参数是什么类的实例
- 【已解决】Xcode的lldb中如何访问类的实例的内部属性值
- 【未解决】Xcode的lldb的po中如何判断对象是否是某个类的实例
- 【已解决】XCode的lldb中如何调试运行iOS的ObjC代码

无名函数

iOS逆向期间，往往可以看到这种函数名：

```
AwemeCore`___lldb_unnamed_symbol148$$AwemeCore
```



其实就是个：`无名函数`

完整的解释是：

- `AwemeCore` ___lldb_unnamed_symbol148$$AwemeCore`
  - `AwemeCore`：函数所属于的（哪个）二进制

        - 注：理论上，同一个函数，可能会出现在多个二进制中
    - `___lldb_unnamed_symbol148$$AwemeCore`
        - 无名函数
            - `___lldb_unnamed_symbol148`：函数名的部分
            - `AwemeCore`：二进制的名字

-》由此可以总结出：

- lldb中的无名函数的命名规则
    - ___lldb_unnamed_symbol**NNN**$$**BinaryName**
        - `___lldb_unnamed_symbol148$$AwemeCore`
            - `NNN = 148`
                - 从1开始编号
            - `BinaryName = AwemeCore`
                - 对应着当前lldb正在调试的二进制是`AwemeCore`

-》

- 知道这个能干什么？
    - 后续去给某个无名函数去加断点时，要注意把函数名写完整了，不要漏写成：
        - `___lldb_unnamed_symbol148`
            - 否则是无法触发断点的
    - 要写成完整的函数名：
        - `___lldb_unnamed_symbol148$$AwemeCore`
            - 才能正常触发断点

chisel

TODO：

- 【记录】用chisel调试iOS的app用法和心得
- 【未解决】YouTube的HAMPlayerInternal的playerLoop中监控_currentTime变量值变化

- `chisel`
  - 是什么：`lldb`的一个插件
  - 用途：主要用于iOS逆向期间辅助调试
  - 主页
    - https://github.com/facebook/chisel
      - facebook/chisel: Chisel is a collection of LLDB commands to assist debugging iOS apps.

LLVM

此处也顺带去整理 `LLDB` 所属的开源项目 `LLVM` 的相关内容：

- `LLVM`
  - = `Low Level Virtual Machine`
  - 是什么=一句话描述
    - 一套用于构建出高度优化的编译器、优化器、运行环境的工具集合的开源项目
      - a toolkit for the construction of highly optimized compilers, optimizers, and runtime environments.
  - 主要包含3个部分
    - `LLVM套件` = `LLVM Suite`
      - 包含各种
        - 工具
          - `汇编器` = `assembler`
          - `反汇编器` = `disassembler`
          - `位码分析器` = `bitcode analyzer`
          - `位码优化器` = `bitcode optimizer`
          - 简单的回归测试
            - 用于测试LLVM工具和Clang前端
        - 库
        - 头文件
    - `Clang` = `Clang前端` = `Clang front end`
      - 是什么：LLVM的内置的原生的 `C` / `C++` / `Objective-C` 编译器
      - 可以把 `C` ，`C++` ，`Objective-C` 和 `Objective-C++` 的代码，编译成 `LLVM bitcode`
        - 然后就可以用LLVM套件去操作此（编译后的）程序了
    - `测试套件` = `Test Suite`
      - 一堆工具的集合
        - 测试LLVM的功能和性能
  - 子项目
    - `LLVM Core` libraries
      - a modern source- and target-independent optimizer, along with code generation support for many popular CPUs
    - `Clang`
      - an `LLVM native` C/C++/Objective-C compiler
    - `LLDB`
      - a great native debugger
        - 基于 `LLVM` 和 `Clang`
    - `libc++` 和 `libc++ ABI`
      - a standard conformant and high-performance implementation of the C++ Standard Library
        - including full support for C++11 and C++14
    - `compiler-rt`
      - provides highly tuned implementations of the low-level code generator

        - `MLIR`
            - a novel approach to building reusable and extensible compiler infrastructure
        - `OpenMP`
            - an OpenMP runtime for use with the OpenMP implementation in Clang
        - `polly`
            - a suite of cache-locality optimizations as well as auto-parallelism and vectorization using a polyhedral model
        - `libclc`
            - implement the OpenCL standard library
        - `klee`
            - implements a "symbolic virtual machine" which uses a theorem prover to try to evaluate all dynamic paths through a program in an effort to find bugs and to prove properties of functions
        - `LLD`
            - a new linker
                - a drop-in replacement for system linkers and runs much faster
    - 资料
        - 官网
            - The LLVM Compiler Infrastructure Project
                - https://llvm.org
        - 快速上手
            - Getting Started with the LLVM System — LLVM 12 documentation
                - https://llvm.org/docs/GettingStarted.html
    - 相关
        - 概念
            - `IR` = `Intermediate Representation` = `中间表示层`

附录

下面列出相关参考资料。

文档

- 官网
  - LLDB Homepage — The LLDB Debugger
    - http://lldb.llvm.org
- 教程
  - Tutorial — The LLDB Debugger
    - https://lldb.llvm.org/use/tutorial.html
- LLDB和GDB命令对比
  - GDB to LLDB command map — The LLDB Debugger
    - https://lldb.llvm.org/use/map.html
      - 背景：由于GDB使用更广泛，所以LLDB为了让从GDB转过来的人，更快上手，而整理了GDB命令到LLDB命令的映射的文档，介绍的很详细，值得参考

参考资料

- 【记录】lldb命令使用心得：image
- 【已解决】lldb命令使用心得：image lookup
- 【记录】lldb命令使用心得：image lookup
- 【已解决】XCode的lldb中把image list输出结果重定向保存到本地文件
- 【已解决】lldb中image中搜索symbol函数名
- 【未解决】研究抖音越狱逻辑：lldb中image查询statfs的函数实现有几个
- 【已解决】iOS逆向：lldb调试时image lookup限定在某个二进制库内搜索
-
- 【已解决】XCode和lldb调试常见用法和调试心得
- 【记录】iOS逆向：lldb中memory和memory read命令的语法help
- 【已解决】lldb子命令：反汇编disassemble
- 【已解决】debugserver+lldb调试arm汇编时输出当前函数的反汇编代码
- 【已解决】lldb调试如何显示整个函数的汇编代码
- 【已解决】lldb中把命令输出结果导出到文件
- 【整理Book】iOS逆向开发：dyld动态库链接器
- 【未解决】iOS逆向Preferences：疑似下一步按钮处理函数_handlePressGesture:
- 【未解决】iOS逆向Apple账号：-[AAUISignInViewController _nextButtonSelected:]
- 【未解决】iOS逆向Apple账号：-[AAUISignInController _performAuthenticationForAccount:serviceType:inViewController:completion:]
- 【未解决】iOS逆向Apple账号：-[AAUISignInController authenticationContext]
- 【未解决】iOS逆向MSFindSymbol报错：dyld missing symbol called
- 【未解决】iOS逆向Apple账号：研究+[AADeviceInfo init]看是否能找到udid生成的逻辑
- 【已解决】iOS逆向：Xcode中给lldb无名函数加断点指定属于哪个库文件
- 【已解决】Unicorn模拟arm64：PC在+4404时报错UC_ERR_MAP
- 【未解决】iOS逆向Apple账号：+[UMUserManager sharedManager]
- 【基本解决】Xcode的lldb中动态调试objc_msgSend第一个参数self是哪个类
- 【未解决】iOS逆向AppleStore：-[ACAccountStore accountsWithAccountType:options:error:]的block函数
- 【未解决】iOS逆向AppleStore：-[__NSXPCInterfaceProxy_ACRemoteAccountStoreProtocol accountTypeWithIdentifier:handler:]
- 【未解决】iOS逆向Apple账号：Xcode调试找不到和没有触发NSURLRequest相关断点
- 【未解决】iOS逆向Apple账号：CFURLRequestSetRequestPriority
- 【已解决】iOS逆向Apple账号：哪个类实现了函数didReceiveData等去获取response的data
- 【规避解决】lldb中给ObjC函数加断点报错：WARNING Unable to resolve breakpoint to any actual locations
- 【记录】iOS逆向Apple账号：objc_alloc_init当是类AADeviceInfo时Xcode调试和hook代码两者函数调用堆栈不同
- 【未解决】iOS逆向Apple账号：debugserver+lldb调试+[AADeviceInfo udid]函数逻辑
- 【已解决】iOS逆向Apple账号：类AADeviceInfo相关
- 【未解决】iOS逆向：通过查看NSXPCConnection的属性值搞清楚目标处理的类是哪个
- 【已解决】iOS逆向：Frida如何hook拦截akd中某个lldb无名函数
- 【未解决】iOS逆向Apple账号：用debugserver+lldb去调试-[AALoginAccountRequest urlRequest]看

断点是否触发

- 【未解决】iOS逆向Apple账号：-[AKAppleIDAuthenticationContextManager shouldContinueWithAuthenticationResults:error:forContextID:completion:]
- 【未解决】iOS逆向Apple账号：debugserver+lldb调试+[AADeviceInfo udid]函数逻辑
- 【已解决】iOS逆向Apple账号：+[AADeviceInfo udid]断点没生效换调试对象Preferences
- 【已解决】Xcode中lldb调试遇到Block类型变量**NSMallocBlock**
- 【已解决】研究抖音关注逻辑：___lldb_unnamed_symbol1462804的<+456>的bl
- 【已解决】研究抖音关注逻辑：___lldb_unnamed_symbol1189326$$AwemeCore
- 【已解决】研究抖音越狱逻辑：获取网络请求返回的响应response
- 【已解决】研究抖音关注逻辑：___lldb_unnamed_symbol1588524$$AwemeCore
- 【已解决】研究抖音关注逻辑：___lldb_unnamed_symbol1588526$$AwemeCore
- 【记录】研究YouTube逻辑：___lldb_unnamed_symbol22084$$YouTube
- 【已解决】研究YouTube逻辑：ctier=A时的 request和response的函数调用顺序
- 【未解决】研究YouTube逻辑：YTPlayerViewController的updateActiveOverlayWithActiveVideoCurrentState中如何获取currentVideoTime并重置当前播放时间
- 【未解决】研究YouTube广告重置时间逻辑：MLHAMQueuePlayerSegmentList的updatePeriodCurrentTimeForSegment的block
- 【未解决】研究YouTube逻辑：HAMPlayerInternal的pause
- 【未解决】iOS逆向：libsubstrate.dylib中找不到_dyld_get_all_image_infos而报错
- 【未解决】YouTube广告重置时间：MLHAMQueuePlayer的failWithError
- 【未解决】iOS的app中的内存：**DATA_DIRTY的**objc_data
- 【未解决】iOS逆向Apple账号：-[AAUISignInViewController _attemptAuthenticationWithContext:]
- 【未解决】用debugserver+lldb去调试寻找间接跳转objc_msgSend的逻辑
- 【已解决】研究抖音关注逻辑：___lldb_unnamed_symbol1653310$$AwemeCore
- 【已解决】研究抖音关注逻辑：___lldb_unnamed_symbol1462862$$AwemeCore
- 【已解决】抖音AwemeCore恢复符号表后导致部分函数显示错乱
- 【已解决】ARM汇编指令：PAC相关指令xpaci
- 【未解决】iOS逆向Apple账号：给iOS 15.1的CFNetwork恢复符号表
- 【未解决】debugserver+lldb调试___lldb_unnamed_symbol2567$$akd函数的真实逻辑
- 【未解决】iOS逆向Apple：arm64的-[AKAppleIDAuthenticationController authenticateWithContext:completion:]
- 【未解决】iOS逆向Apple账号：-[AALoginAccountRequest urlRequest]
- 【已解决】iOS逆向Apple账号：换tweak插件去调试+[AADeviceInfo udid]
- 【已解决】iOS逆向时lldb中添加了ObjC函数的断点却没触发到
- 【记录】研究YouTube逻辑：HAMPlayerInternal的setStatus的block
- 【已解决】iOS逆向akd：找arm64的akd函数sub_1000A0460的断点地址
- 【未解决】iOS逆向AppleStore：___lldb_unnamed_symbol3027$$AppleStoreCore
- 【未解决】iOS逆向AppleStore证书无效：多个SSL函数的断点都没触发到
- 【未解决】Xcode中如何给iOS的Swift函数加断点：AppleStoreCore的User的initialize
- 【已解决】iOS逆向Apple账号：哪个类实现了函数didReceiveData等去获取response的data
- 【未解决】Xcode的lldb中动态调试objc_msgSend第一个参数self是哪个类
-

- lldb调试器知多少 - 掘金 (juejin.cn)
- LLDB调试器使用简介 | 南峰子的技术博客 (southpeak.github.io)
- ObjC 中国 - 与调试器共舞 - LLDB 的华尔兹 (objccn.io)
- GDB to LLDB command map — The LLDB Debugger

- LLDB 调试命令使用指南 - 链滴 (ld246.com)
- LLDB Homepage — The LLDB Debugger (llvm.org)
- Tutorial — The LLDB Debugger (llvm.org)
- LLDB (debugger) - Wikipedia)
- Dancing in the Debugger — A Waltz with LLDB · objc.io
- lldb cheat sheet
- 4iar/lldb-write: Write the output of an lldb command to file (github.com)
- ios - How does the `-n` option to `image lookup` in LLDB operate compared to the `-s` option? - Stack Overflow
- debugging - iOS lldb function lookup - Stack Overflow
- lldb常用命令与调试技巧_ios_iOSer_InfoQ写作社区
- ios - What is ___lldb_unnamed_symbol? - Stack Overflow
- Symbolication — The LLDB Debugger (llvm.org)
- iOS开发之LLDB常用命令 - 简书 (jianshu.com)
- Xcode lldb调试x命令 - 简书 (jianshu.com)
- LLDB调试命令 - 简书 (jianshu.com)
- iOS_Reverse/iOS逆向（三）：强大的断点调试工具.md at master · OPTJoker/iOS_Reverse (github.com)
- iOS 逆向指南：动态分析 - 掘金 (juejin.cn)
- deresz/funcap: IDA Pro script to add some useful runtime info to static analysis (github.com)
- iOS逆向--LLDB调试 - 掘金 (juejin.cn)