#WWDC18

Creating Custom Instruments

Instruments 10

Session 410

Chad Woolf, Performance Tools Engineer
Kacper Harasim, Performance Tools Engineer

Why create custom instruments

Architecture

Getting started

Intermediate

Advanced

Best practices

Why create custom instruments

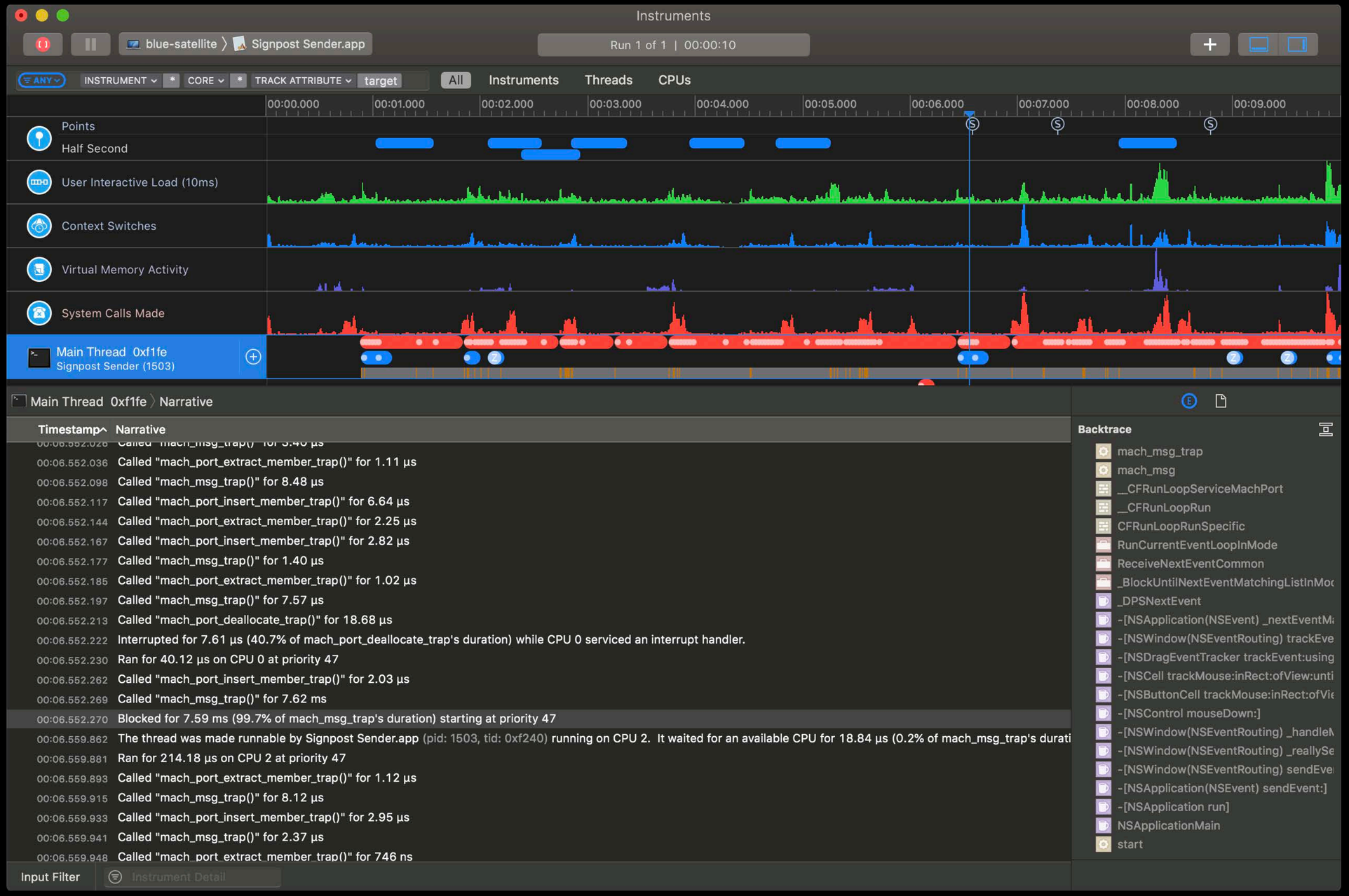
Architecture

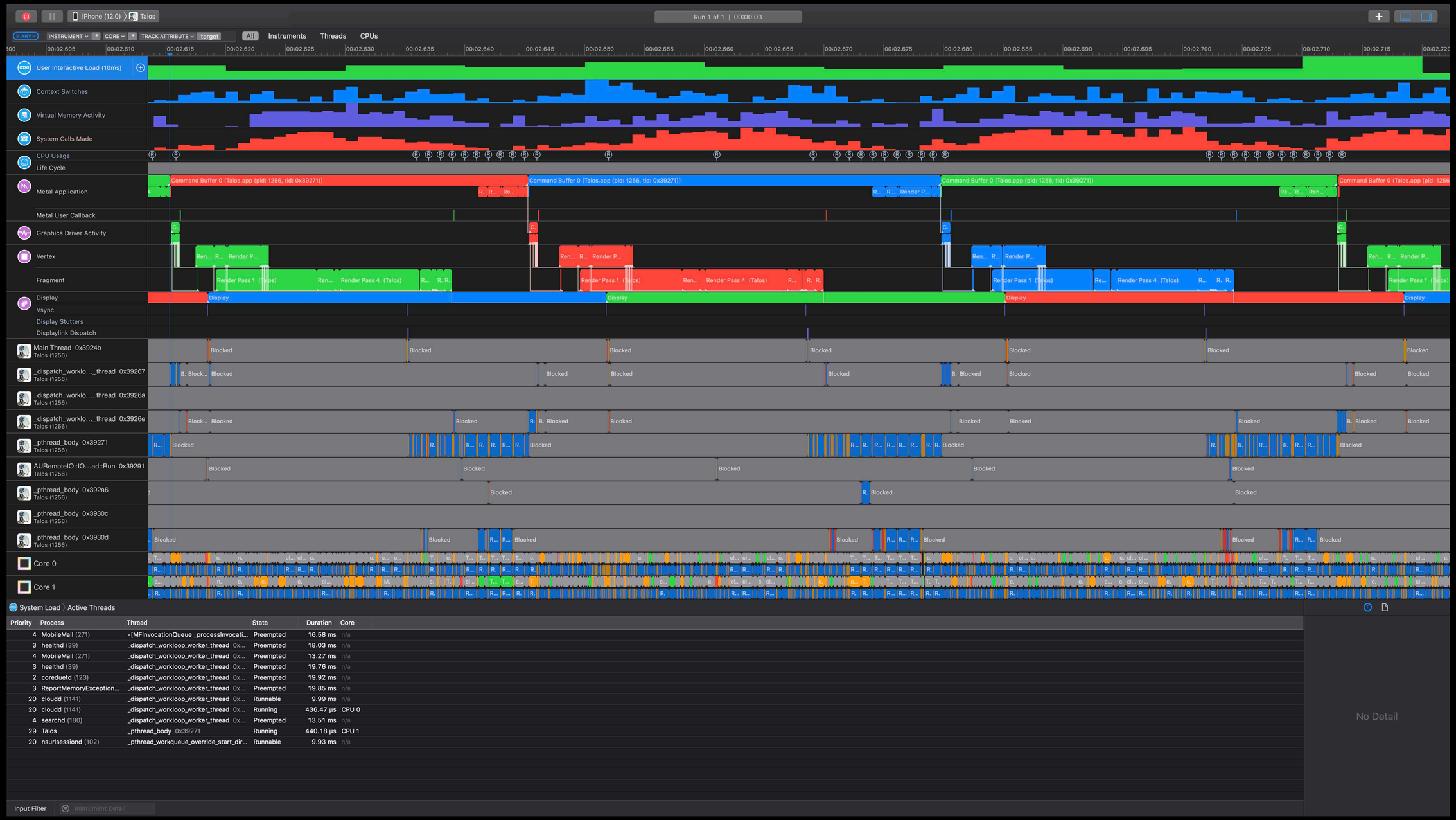
Getting started

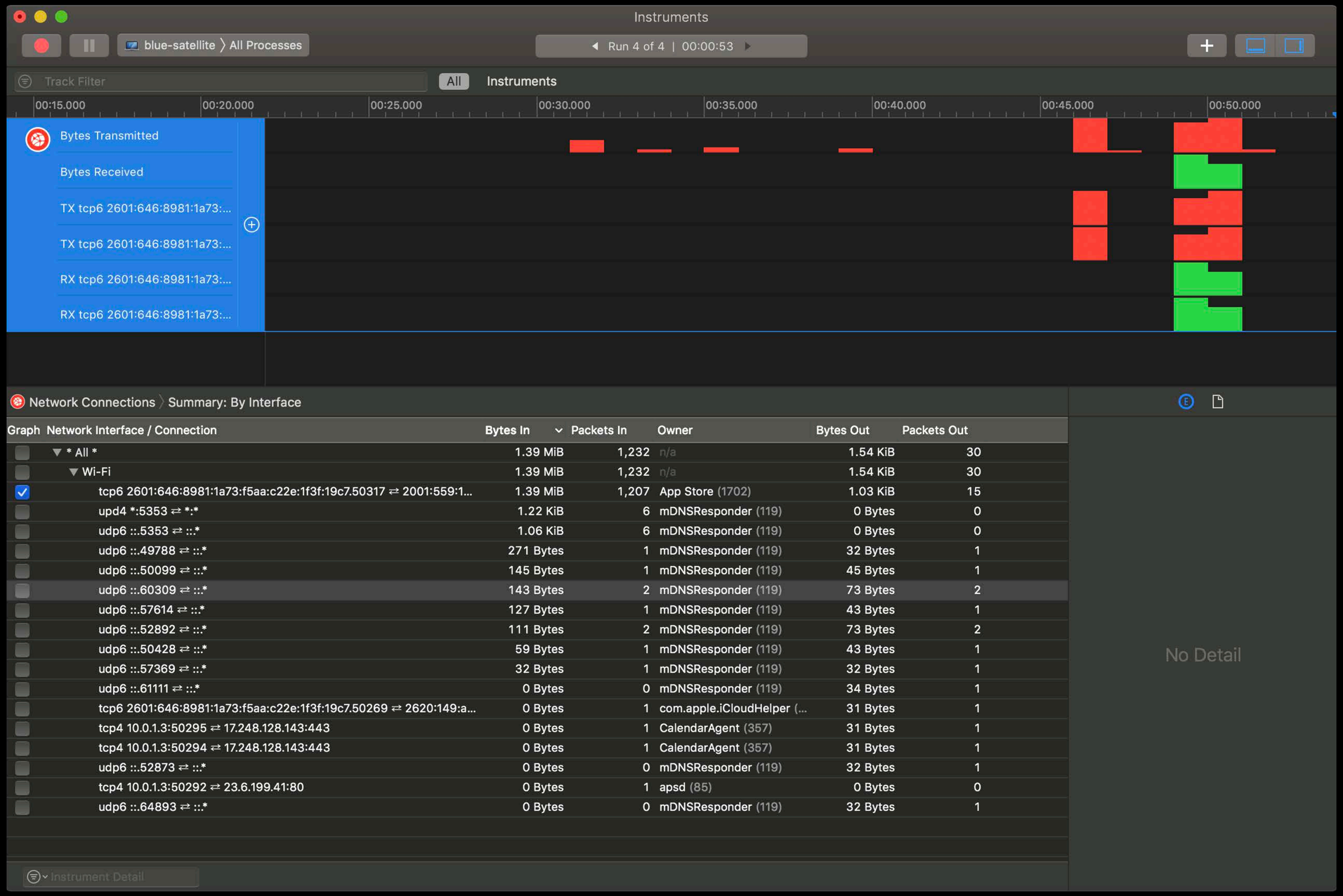
Intermediate

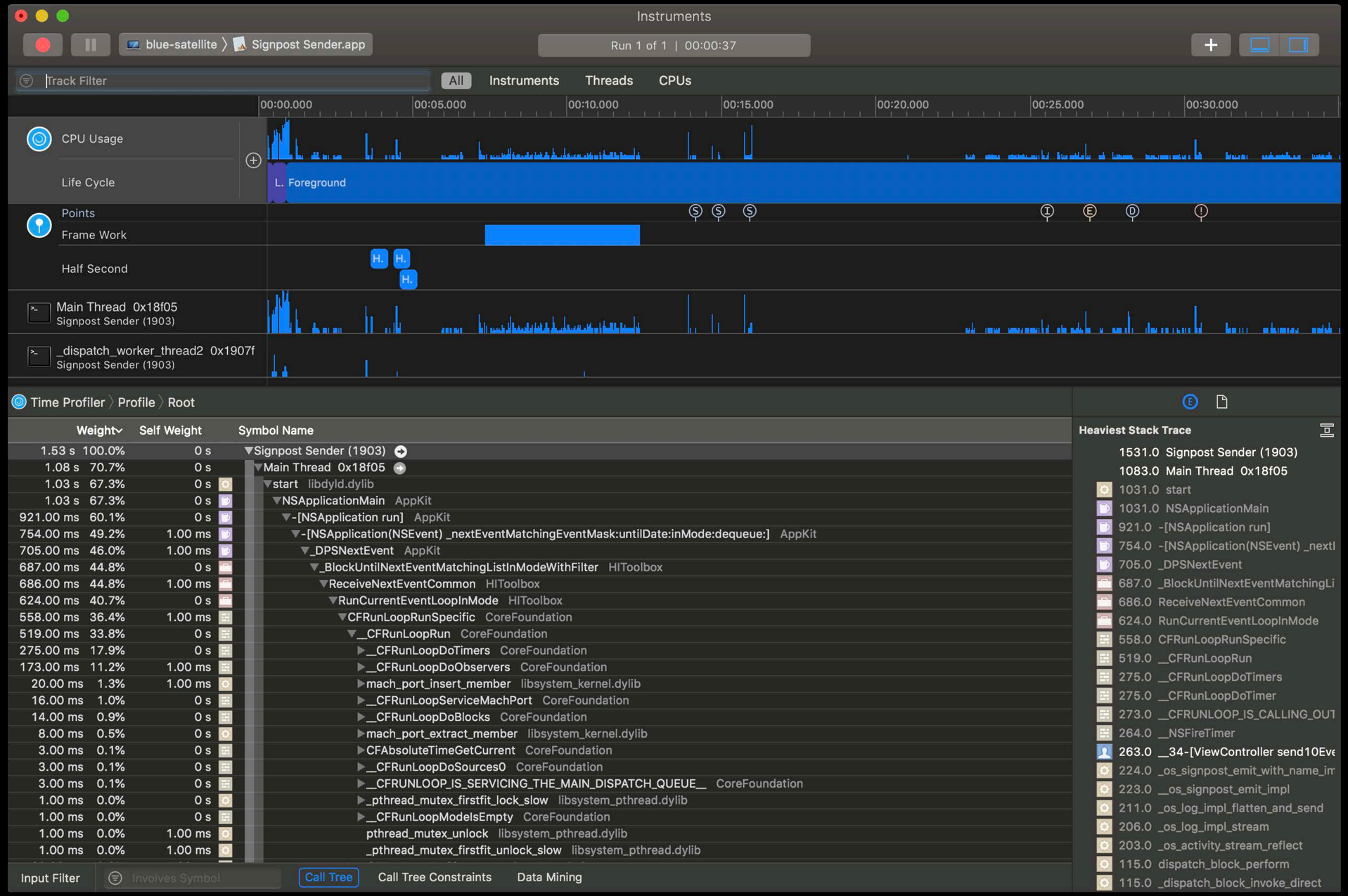
Advanced

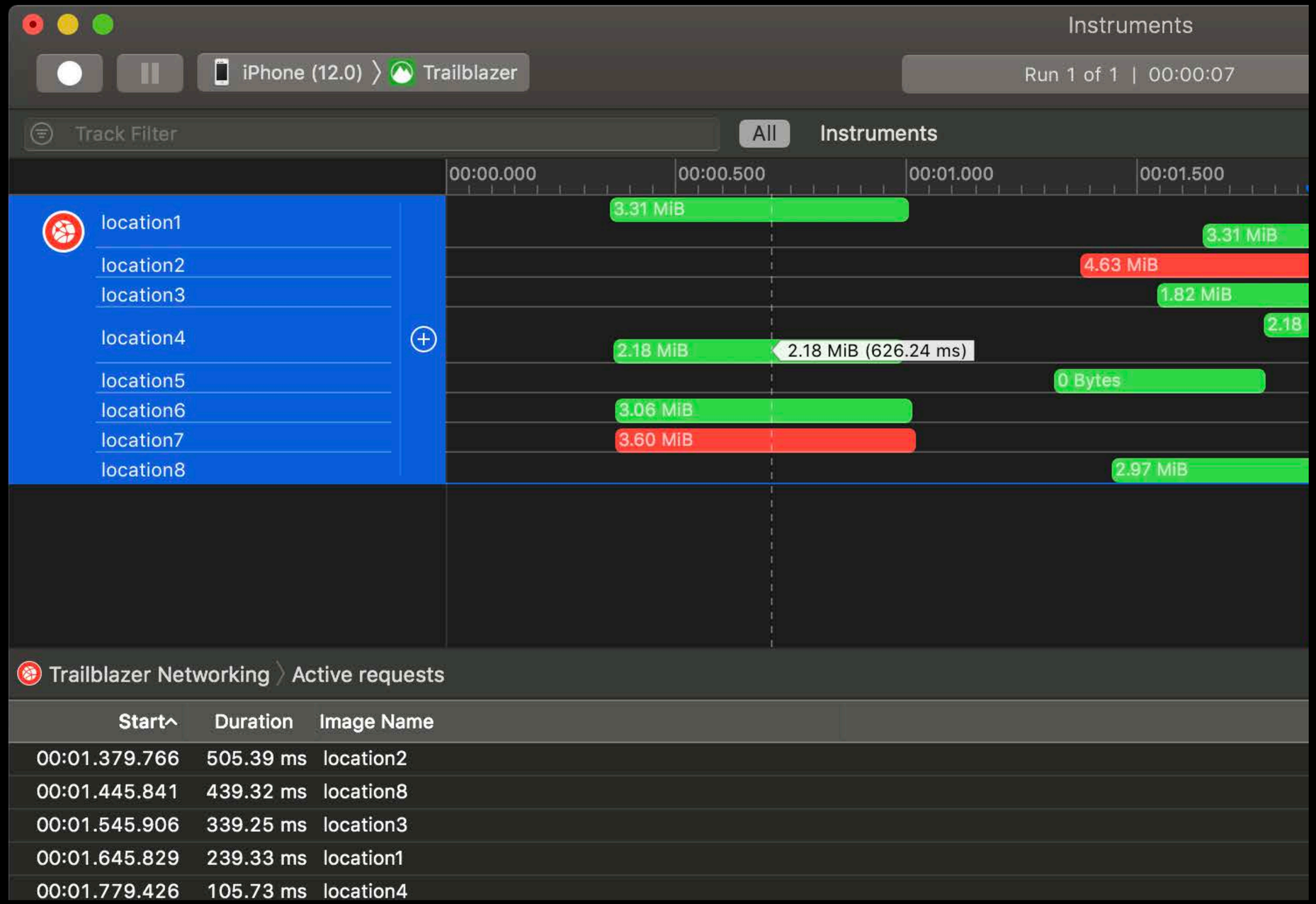
Best practices

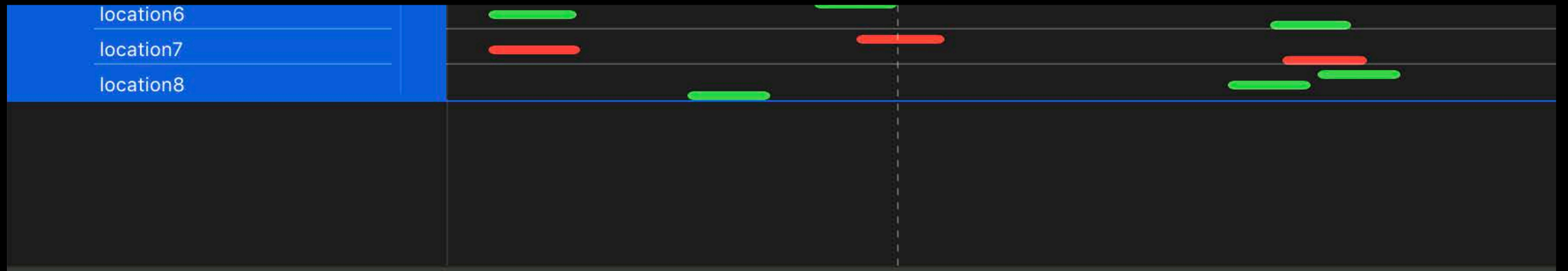

Instruments
blue-satellite
Signpost Sender.app
Run 1 of 1 | 00:00:10
INSTRUMENT
CORE
TRACK ATTRIBUTE
target
All
Instruments
Threads
CPUs
00:00.000
00:01.000
00:02.000
00:03.000
00:04.000
00:05.000
00:06.000
00:07.000
00:08.000
00:09.000
Points
Half Second
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
Main Thread 0xf1fe
Signpost Sender (1503)
Main Thread 0xf1fe
Narrative
Timestamp
Narrative
00:06.552.036 Called "mach_port_extract_member_trap()" for 1.11 µs
00:06.552.098 Called "mach_msg_trap()" for 8.48 µs
00:06.552.117 Called "mach_port_insert_member_trap()" for 6.64 µs
00:06.552.144 Called "mach_port_extract_member_trap()" for 2.25 µs
00:06.552.167 Called "mach_port_insert_member_trap()" for 2.82 µs
00:06.552.177 Called "mach_msg_trap()" for 1.40 µs
00:06.552.185 Called "mach_port_extract_member_trap()" for 1.02 µs
00:06.552.197 Called "mach_msg_trap()" for 7.57 µs
00:06.552.213 Called "mach_port_deallocate_trap()" for 18.68 µs
00:06.552.222 Interrupted for 7.61 µs (40.7% of mach_port_deallocate_trap's duration) while CPU 0 serviced an interrupt handler.
00:06.552.230 Ran for 40.12 µs on CPU 0 at priority 47
00:06.552.262 Called "mach_port_insert_member_trap()" for 2.03 µs
00:06.552.269 Called "mach_msg_trap()" for 7.62 ms
00:06.552.270 Blocked for 7.59 ms (99.7% of mach_msg_trap's duration) starting at priority 47
00:06.559.862 The thread was made runnable by Signpost Sender.app (pid: 1503, tid: 0xf240) running on CPU 2. It waited for an available CPU for 18.84 µs (0.2% of mach_msg_trap's durati
00:06.559.881 Ran for 214.18 µs on CPU 2 at priority 47
00:06.559.893 Called "mach_port_extract_member_trap()" for 1.12 µs
00:06.559.915 Called "mach_msg_trap()" for 8.12 µs
00:06.559.933 Called "mach_port_insert_member_trap()" for 2.95 µs
00:06.559.941 Called "mach_msg_trap()" for 2.37 µs
Backtrace
mach_msg_trap
mach_msg
__CFRunLoopServiceMachPort
__CFRunLoopRun
CFRunLoopRunSpecific
RunCurrentEventLoopInMode
ReceiveNextEventCommon
_DPSNextEvent
-[NSApplication(NSEvent) sendEvent:]
-[NSApplication run]
NSApplicationMain
start
Input Filter
Instrument Detail


iPhone (12.0) 〉 Talos
Run 1 of 1 | 00:00:03
INSTRUMENT
CORE
TRACK ATTRIBUTE
target
All
Instruments
Threads
CPUs
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
CPU Usage
Life Cycle
Metal Application
Metal User Callback
Graphics Driver Activity
Vertex
Fragment
Display
Vsync
Display Stutters
Displaylink Dispatch
Main Thread 0x3924b
Talos (1256)
_dispatch_worklo..._thread 0x39267
_dispatch_worklo..._thread 0x3926a
_dispatch_worklo..._thread 0x3926e
_pthread_body 0x39271
AURemoteIO::IO...ad::Run 0x39291
_pthread_body 0x392a6
_pthread_body 0x3930c
_pthread_body 0x3930d
Core 0
Core 1
System Load 〉 Active Threads
Priority Process Thread State Duration Core
4 MobileMail (271) -[MFInvocationQueue _processInvocati... Preempted 16.58 ms n/a
3 healthd (39) _dispatch_workloop_worker_thread 0x... Preempted 18.03 ms n/a
4 MobileMail (271) _dispatch_workloop_worker_thread 0x... Preempted 13.27 ms n/a
3 healthd (39) _dispatch_workloop_worker_thread 0x... Preempted 19.76 ms n/a
2 coreduetd (123) _dispatch_workloop_worker_thread 0x... Preempted 19.92 ms n/a
3 ReportMemoryException... _dispatch_workloop_worker_thread 0x... Preempted 19.85 ms n/a
20 cloudd (1141) _dispatch_workloop_worker_thread 0x... Runnable 9.99 ms n/a
20 cloudd (1141) _dispatch_workloop_worker_thread 0x... Running 436.47 µs CPU 0
4 searchd (180) _dispatch_workloop_worker_thread 0x... Preempted 13.51 ms n/a
29 Talos _pthread_body 0x39271 Running 440.18 µs CPU 1
20 nsurlsessiond (102) _pthread_workqueue_override_start_dir... Runnable 9.93 ms n/a
No Detail
Input Filter
Instrument Detail


Instruments
blue-satellite 〉All Processes
Run 4 of 4 | 00:00:53
Track Filter
All
Instruments
00:15.000
00:20.000
00:25.000
00:30.000
00:35.000
00:40.000
00:45.000
00:50.000
Bytes Transmitted
Bytes Received
TX tcp6 2601:646:8981:1a73:...
TX tcp6 2601:646:8981:1a73:...
RX tcp6 2601:646:8981:1a73:...
RX tcp6 2601:646:8981:1a73:...
Network Connections 〉Summary: By Interface
Graph Network Interface / Connection Bytes In Packets In Owner Bytes Out Packets Out
* All * 1.39 MiB 1,232 n/a 1.54 KiB 30
Wi-Fi 1.39 MiB 1,232 n/a 1.54 KiB 30
tcp6 2601:646:8981:1a73:f5aa:c22e:1f3f:19c7.50317 ⇄ 2001:559:1... 1.39 MiB 1,207 App Store (1702) 1.03 KiB 15
upd4 *:5353 ⇄ *:* 1.22 KiB 6 mDNSResponder (119) 0 Bytes 0
udp6 ::.5353 ⇄ ::.* 1.06 KiB 6 mDNSResponder (119) 0 Bytes 0
udp6 ::.49788 ⇄ ::.* 271 Bytes 1 mDNSResponder (119) 32 Bytes 1
udp6 ::.50099 ⇄ ::.* 145 Bytes 1 mDNSResponder (119) 45 Bytes 1
udp6 ::.60309 ⇄ ::.* 143 Bytes 2 mDNSResponder (119) 73 Bytes 2
udp6 ::.57614 ⇄ ::.* 127 Bytes 1 mDNSResponder (119) 43 Bytes 1
udp6 ::.52892 ⇄ ::.* 111 Bytes 2 mDNSResponder (119) 73 Bytes 2
udp6 ::.50428 ⇄ ::.* 59 Bytes 1 mDNSResponder (119) 43 Bytes 1
udp6 ::.57369 ⇄ ::.* 32 Bytes 1 mDNSResponder (119) 32 Bytes 1
udp6 ::.61111 ⇄ ::.* 0 Bytes 0 mDNSResponder (119) 34 Bytes 1
tcp6 2601:646:8981:1a73:f5aa:c22e:1f3f:19c7.50269 ⇄ 2620:149:a... 0 Bytes 1 com.apple.iCloudHelper (... 31 Bytes 1
tcp4 10.0.1.3:50295 ⇄ 17.248.128.143:443 0 Bytes 1 CalendarAgent (357) 31 Bytes 1
tcp4 10.0.1.3:50294 ⇄ 17.248.128.143:443 0 Bytes 1 CalendarAgent (357) 31 Bytes 1
udp6 ::.52873 ⇄ ::.* 0 Bytes 0 mDNSResponder (119) 32 Bytes 1
tcp4 10.0.1.3:50292 ⇄ 23.6.199.41:80 0 Bytes 1 apsd (85) 0 Bytes 0
udp6 ::.64893 ⇄ ::.* 0 Bytes 0 mDNSResponder (119) 32 Bytes 1
No Detail
Instrument Detail


Instruments
blue-satellite
Signpost Sender.app
Run 1 of 1 | 00:00:37
Track Filter
All
Instruments
Threads
CPUs
00:00.000
00:05.000
00:10.000
00:15.000
00:20.000
00:25.000
00:30.000
CPU Usage
Life Cycle
L. Foreground
Points
Frame Work
Half Second
Main Thread 0x18f05
Signpost Sender (1903)
_dispatch_worker_thread2 0x1907f
Signpost Sender (1903)
Time Profiler
Profile
Root
Weight
Self Weight
Symbol Name
1.53 s 100.0% 0 s Signpost Sender (1903)
1.08 s 70.7% 0 s Main Thread 0x18f05
1.03 s 67.3% 0 s start libdyld.dylib
1.03 s 67.3% 0 s NSApplicationMain AppKit
921.00 ms 60.1% 0 s -[NSApplication run] AppKit
754.00 ms 49.2% 1.00 ms -[NSApplication(NSEvent) _nextEventMatchingEventMask:untilDate:inMode:dequeue:] AppKit
705.00 ms 46.0% 1.00 ms _DPSNextEvent AppKit
687.00 ms 44.8% 0 s _BlockUntilNextEventMatchingListInModeWithFilter HIToolbox
686.00 ms 44.8% 1.00 ms ReceiveNextEventCommon HIToolbox
624.00 ms 40.7% 0 s RunCurrentEventLoopInMode HIToolbox
558.00 ms 36.4% 1.00 ms CFRunLoopRunSpecific CoreFoundation
519.00 ms 33.8% 0 s __CFRunLoopRun CoreFoundation
275.00 ms 17.9% 0 s __CFRunLoopDoTimers CoreFoundation
173.00 ms 11.2% 1.00 ms __CFRunLoopDoObservers CoreFoundation
20.00 ms 1.3% 1.00 ms mach_port_insert_member libsystem_kernel.dylib
16.00 ms 1.0% 0 s __CFRunLoopServiceMachPort CoreFoundation
14.00 ms 0.9% 0 s __CFRunLoopDoBlocks CoreFoundation
8.00 ms 0.5% 0 s mach_port_extract_member libsystem_kernel.dylib
3.00 ms 0.1% 0 s CFAbsoluteTimeGetCurrent CoreFoundation
3.00 ms 0.1% 0 s __CFRunLoopDoSources0 CoreFoundation
3.00 ms 0.1% 0 s __CFRUNLOOP_IS_SERVICING_THE_MAIN_DISPATCH_QUEUE__ CoreFoundation
1.00 ms 0.0% 0 s _pthread_mutex_firstfit_lock_slow libsystem_pthread.dylib
1.00 ms 0.0% 0 s __CFRunLoopModeIsEmpty CoreFoundation
1.00 ms 0.0% 1.00 ms pthread_mutex_unlock libsystem_pthread.dylib
1.00 ms 0.0% 1.00 ms _pthread_mutex_firstfit_unlock_slow libsystem_pthread.dylib
Input Filter
Involves Symbol
Call Tree
Call Tree Constraints
Data Mining
Heaviest Stack Trace
1531.0 Signpost Sender (1903)
1083.0 Main Thread 0x18f05
1031.0 start
1031.0 NSApplicationMain
921.0 -[NSApplication run]
754.0 -[NSApplication(NSEvent) _nextI
705.0 _DPSNextEvent
687.0 _BlockUntilNextEventMatchingLi
686.0 ReceiveNextEventCommon
624.0 RunCurrentEventLoopInMode
558.0 CFRunLoopRunSpecific
519.0 __CFRunLoopRun
275.0 __CFRunLoopDoTimers
275.0 __CFRunLoopDoTimer
273.0 __CFRUNLOOP_IS_CALLING_OUT
264.0 __NSFireTimer
263.0 __34-[ViewController send10Eve
224.0 _os_signpost_emit_with_name_im
223.0 __os_signpost_emit_impl
211.0 _os_log_impl_flatten_and_send
206.0 _os_log_impl_stream
203.0 _os_activity_stream_reflect
115.0 dispatch_block_perform
115.0 _dispatch_block_invoke_direct


Instruments
iPhone (12.0) 〉 Trailblazer
Run 1 of 1 | 00:00:07
Track Filter
All
Instruments
00:00.000
00:00.500
00:01.000
00:01.500
location1
location2
location3
location4
location5
location6
location7
location8
3.31 MiB
3.31 MiB
4.63 MiB
1.82 MiB
2.18
2.18 MiB
2.18 MiB (626.24 ms)
0 Bytes
3.06 MiB
3.60 MiB
2.97 MiB
Trailblazer Networking 〉 Active requests
Start
Duration
Image Name
00:01.379.766 505.39 ms location2
00:01.445.841 439.32 ms location8
00:01.545.906 339.25 ms location3
00:01.645.829 239.33 ms location1
00:01.779.426 105.73 ms location4



Trailblazer Networking 〉 Narrative

Timestamp	Description
00:06.037.270	Duplicated requested detected made by object: 0x10908d800. It requested location6, while having another request for location2 already running.
00:06.120.501	Duplicated requested detected made by object: 0x104801800. It requested location7, while having another request for location8 already running.
00:06.225.804	Duplicated requested detected made by object: 0x109011400. It requested location5, while having another request for location3 already running.
00:06.303.212	Duplicated requested detected made by object: 0x109065c00. It requested location2, while having another request for location1 already running.
00:06.386.450	Duplicated requested detected made by object: 0x10905d600. It requested location8, while having another request for location4 already running.
00:06.503.195	Duplicated requested detected made by object: 0x10908d800. It requested location3, while having another request for location6 already running.

Why create custom instruments

Architecture

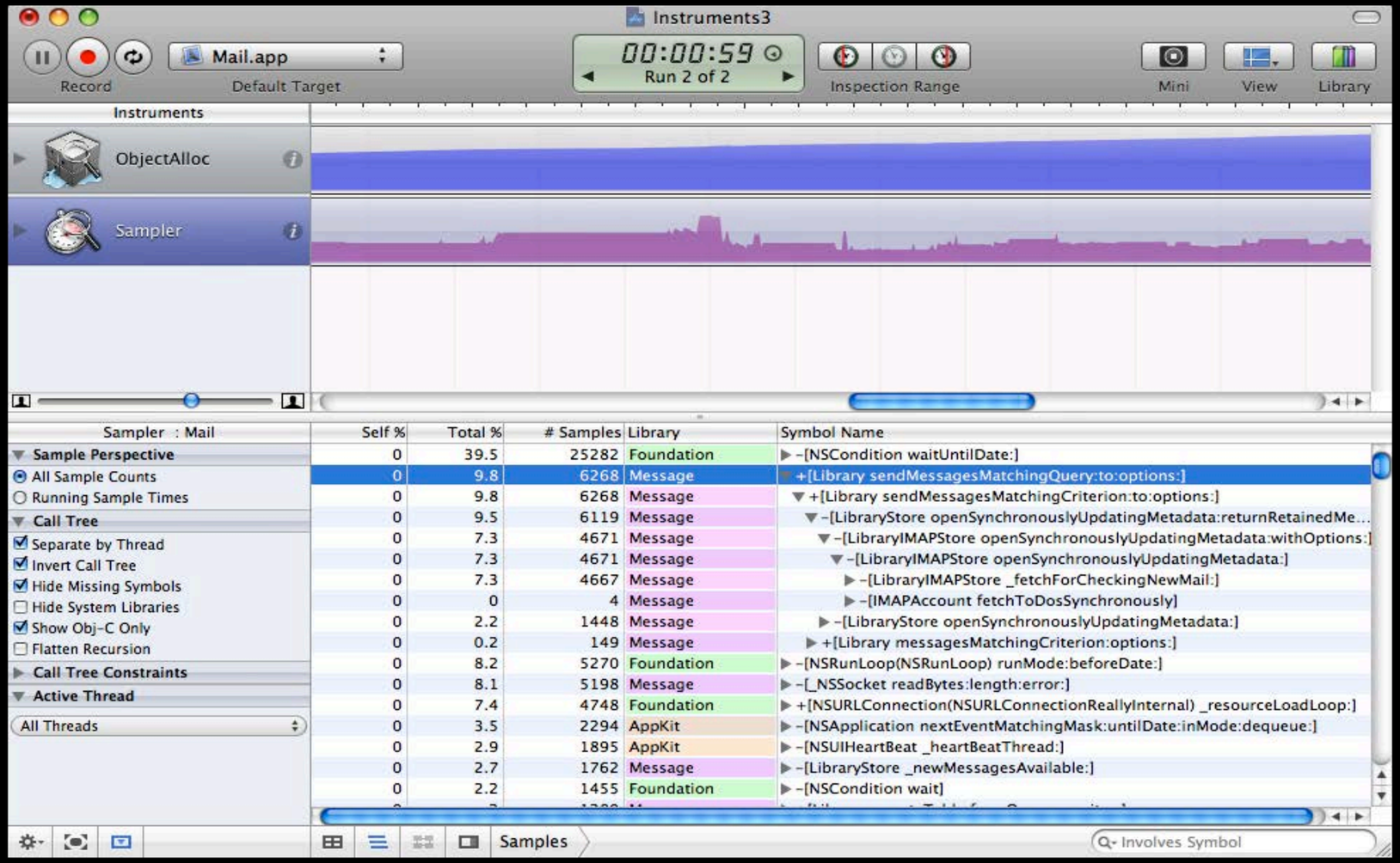
Getting started

Intermediate

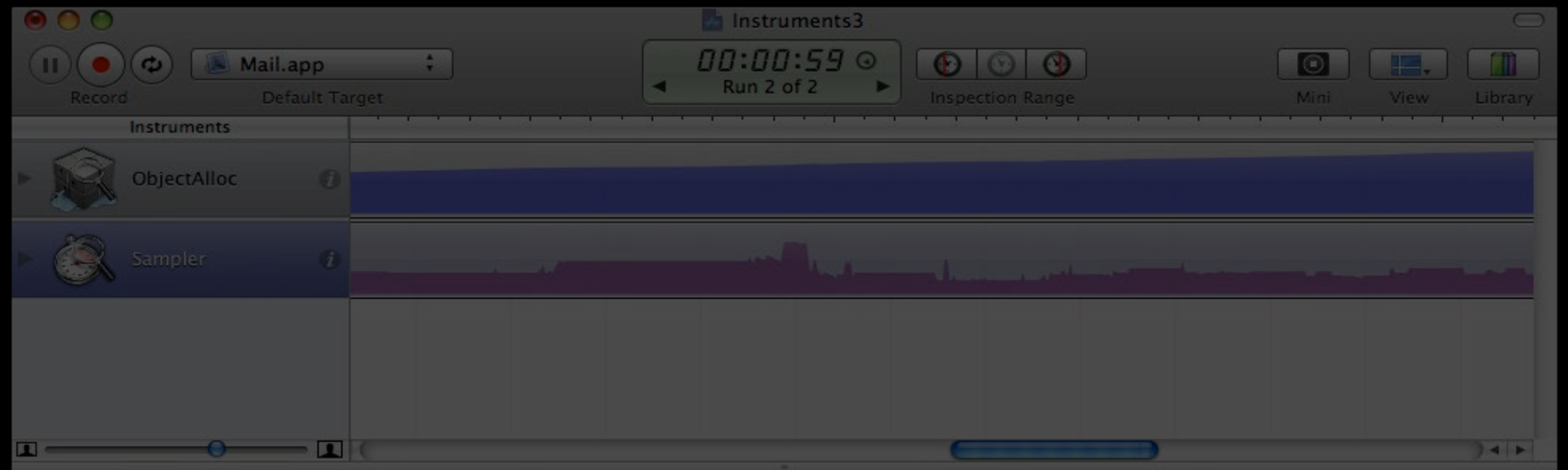
Advanced

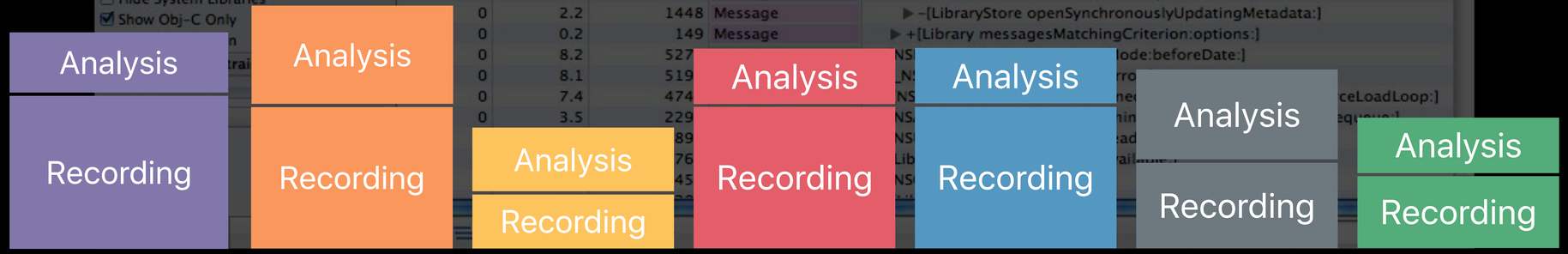
Best practices

In the Beginning…

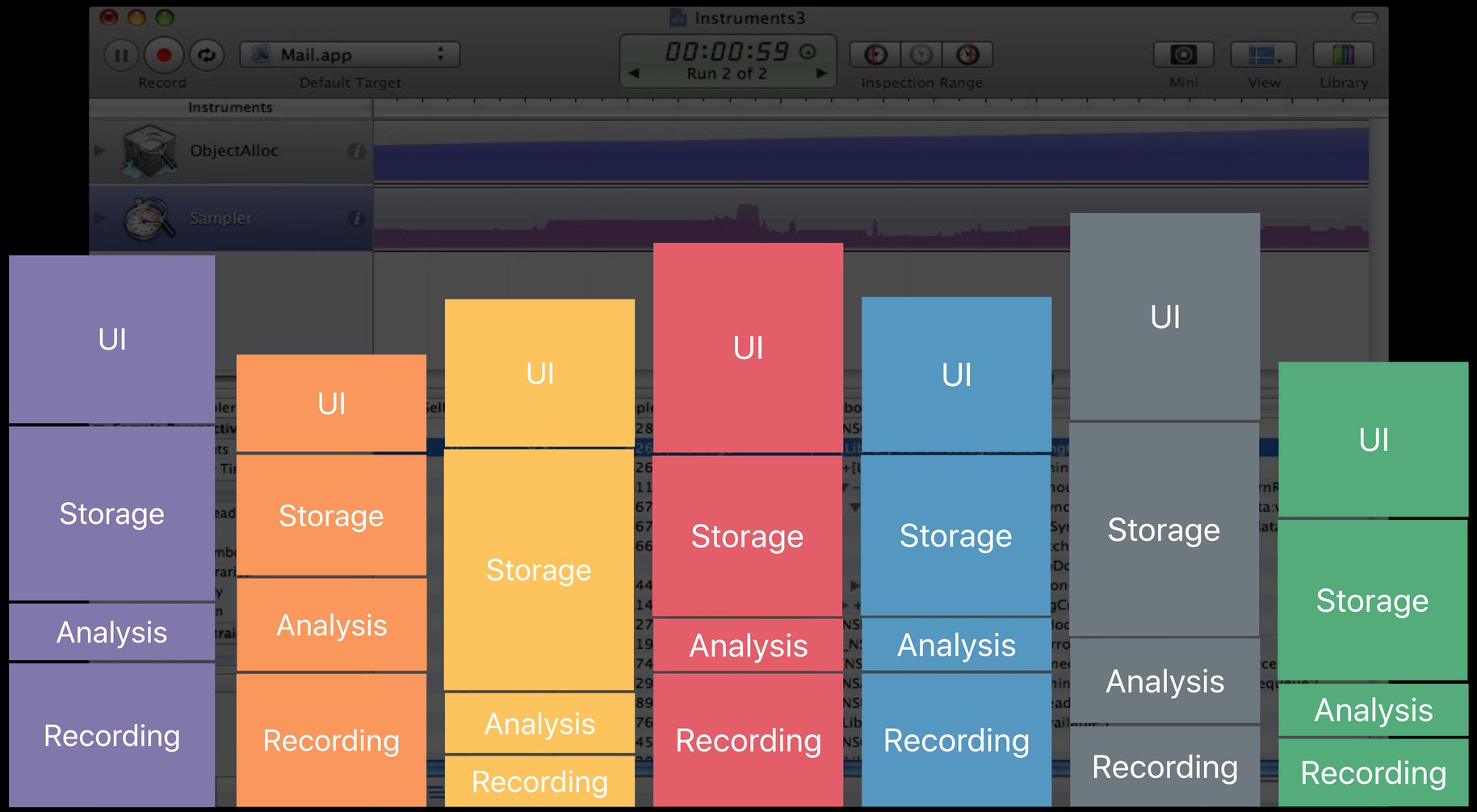


In the Beginning...

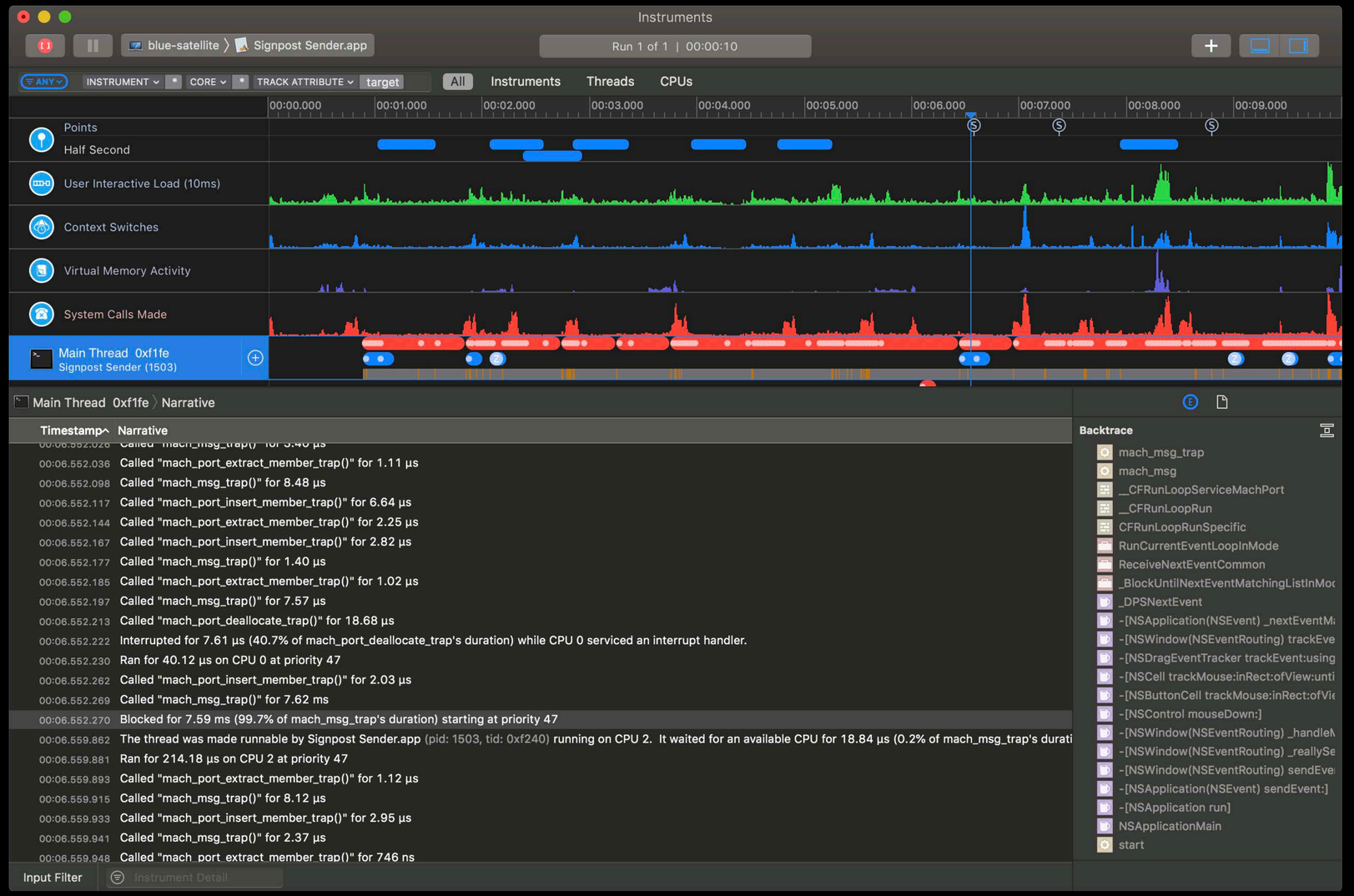




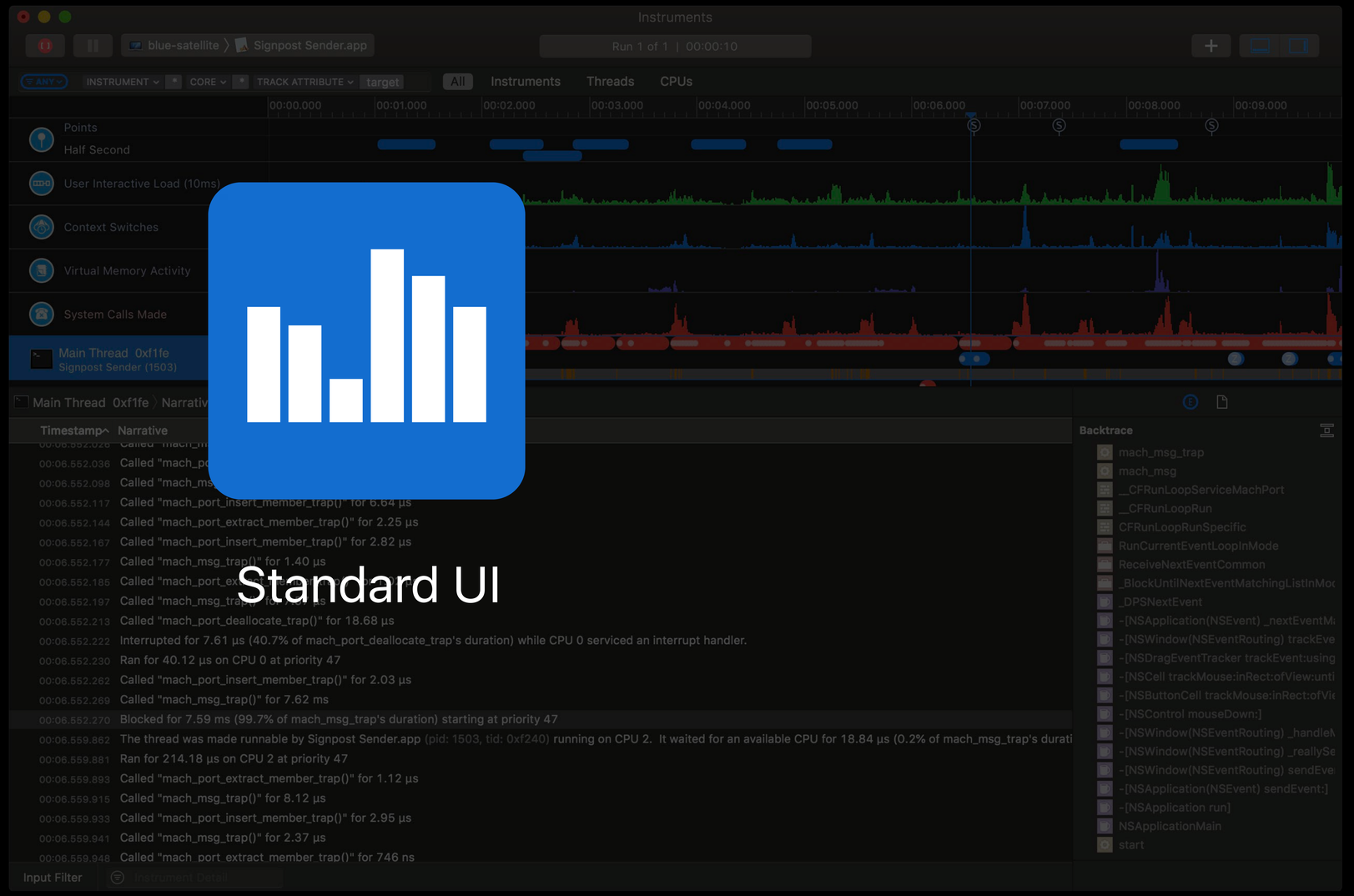
In the Beginning...



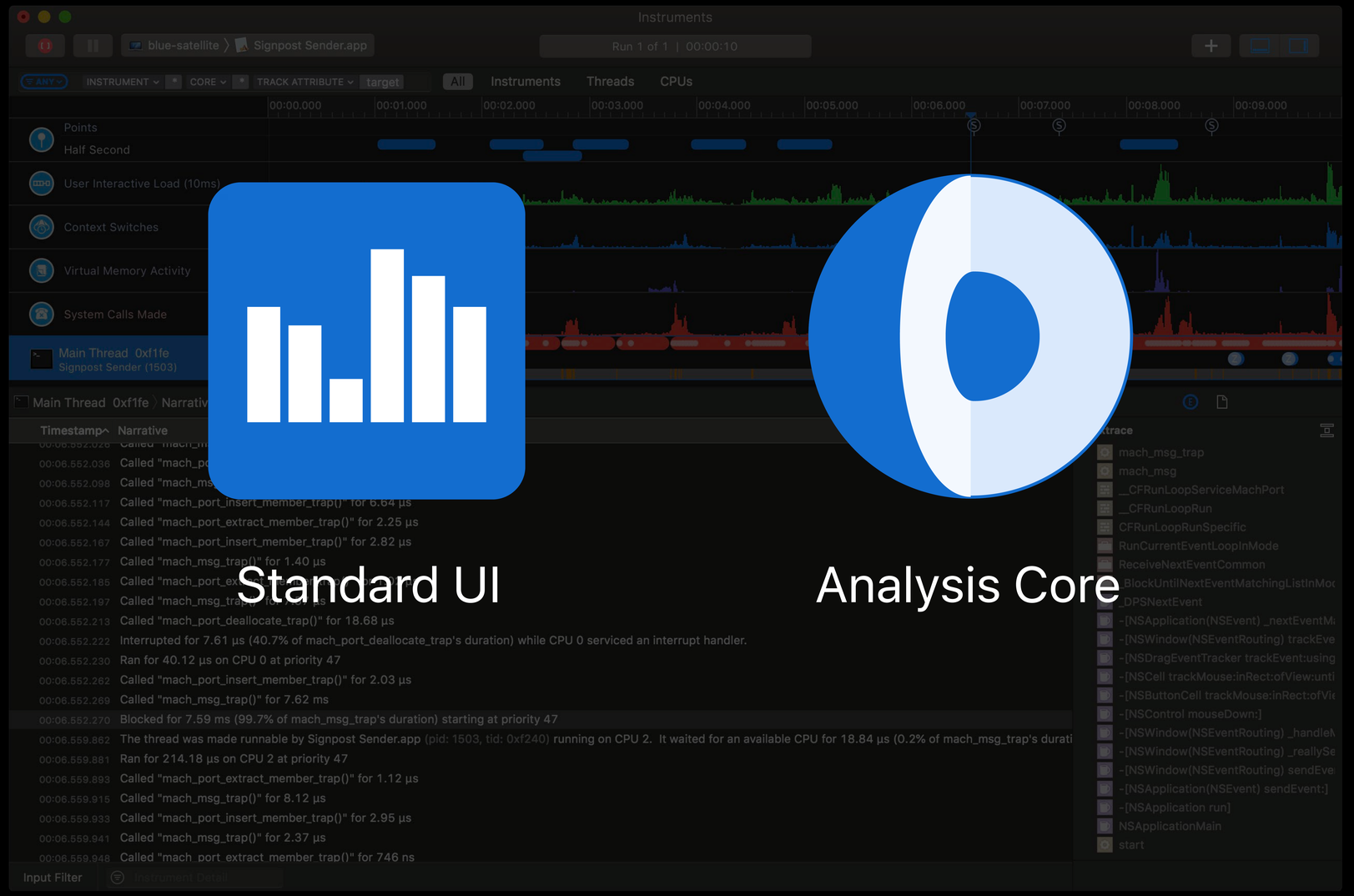
Today

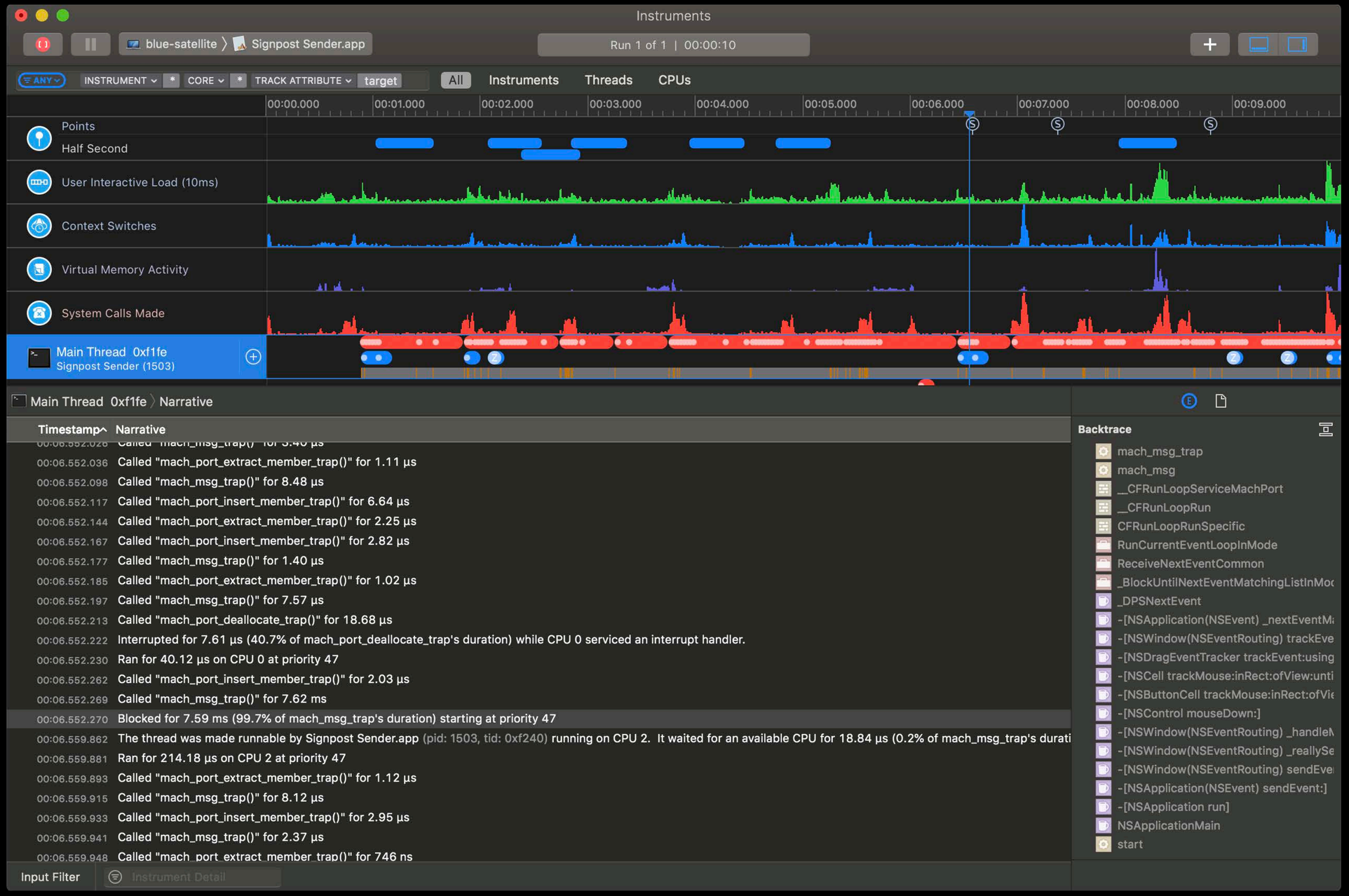

Instruments
blue-satellite 〉 Signpost Sender.app
Run 1 of 1 | 00:00:10
INSTRUMENT
CORE
TRACK ATTRIBUTE
target
All
Instruments
Threads
CPUs
00:00.000
00:01.000
00:02.000
00:03.000
00:04.000
00:05.000
00:06.000
00:07.000
00:08.000
00:09.000
Points
Half Second
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
Main Thread 0xf1fe
Signpost Sender (1503)
Main Thread 0xf1fe 〉 Narrative
Timestamp
Narrative
00:06.552.036 Called "mach_port_extract_member_trap()" for 1.11 µs
00:06.552.098 Called "mach_msg_trap()" for 8.48 µs
00:06.552.117 Called "mach_port_insert_member_trap()" for 6.64 µs
00:06.552.144 Called "mach_port_extract_member_trap()" for 2.25 µs
00:06.552.167 Called "mach_port_insert_member_trap()" for 2.82 µs
00:06.552.177 Called "mach_msg_trap()" for 1.40 µs
00:06.552.185 Called "mach_port_extract_member_trap()" for 1.02 µs
00:06.552.197 Called "mach_msg_trap()" for 7.57 µs
00:06.552.213 Called "mach_port_deallocate_trap()" for 18.68 µs
00:06.552.222 Interrupted for 7.61 µs (40.7% of mach_port_deallocate_trap's duration) while CPU 0 serviced an interrupt handler.
00:06.552.230 Ran for 40.12 µs on CPU 0 at priority 47
00:06.552.262 Called "mach_port_insert_member_trap()" for 2.03 µs
00:06.552.269 Called "mach_msg_trap()" for 7.62 ms
00:06.552.270 Blocked for 7.59 ms (99.7% of mach_msg_trap's duration) starting at priority 47
00:06.559.862 The thread was made runnable by Signpost Sender.app (pid: 1503, tid: 0xf240) running on CPU 2. It waited for an available CPU for 18.84 µs (0.2% of mach_msg_trap's durati
00:06.559.881 Ran for 214.18 µs on CPU 2 at priority 47
00:06.559.893 Called "mach_port_extract_member_trap()" for 1.12 µs
00:06.559.915 Called "mach_msg_trap()" for 8.12 µs
00:06.559.933 Called "mach_port_insert_member_trap()" for 2.95 µs
00:06.559.941 Called "mach_msg_trap()" for 2.37 µs
00:06.559.948 Called "mach_port_extract_member_trap()" for 746 ns
Backtrace
mach_msg_trap
mach_msg
__CFRunLoopServiceMachPort
__CFRunLoopRun
CFRunLoopRunSpecific
RunCurrentEventLoopInMode
ReceiveNextEventCommon
_DPSNextEvent
-[NSApplication(NSEvent) sendEvent:]
-[NSApplication run]
NSApplicationMain
start
Input Filter
Instrument Detail

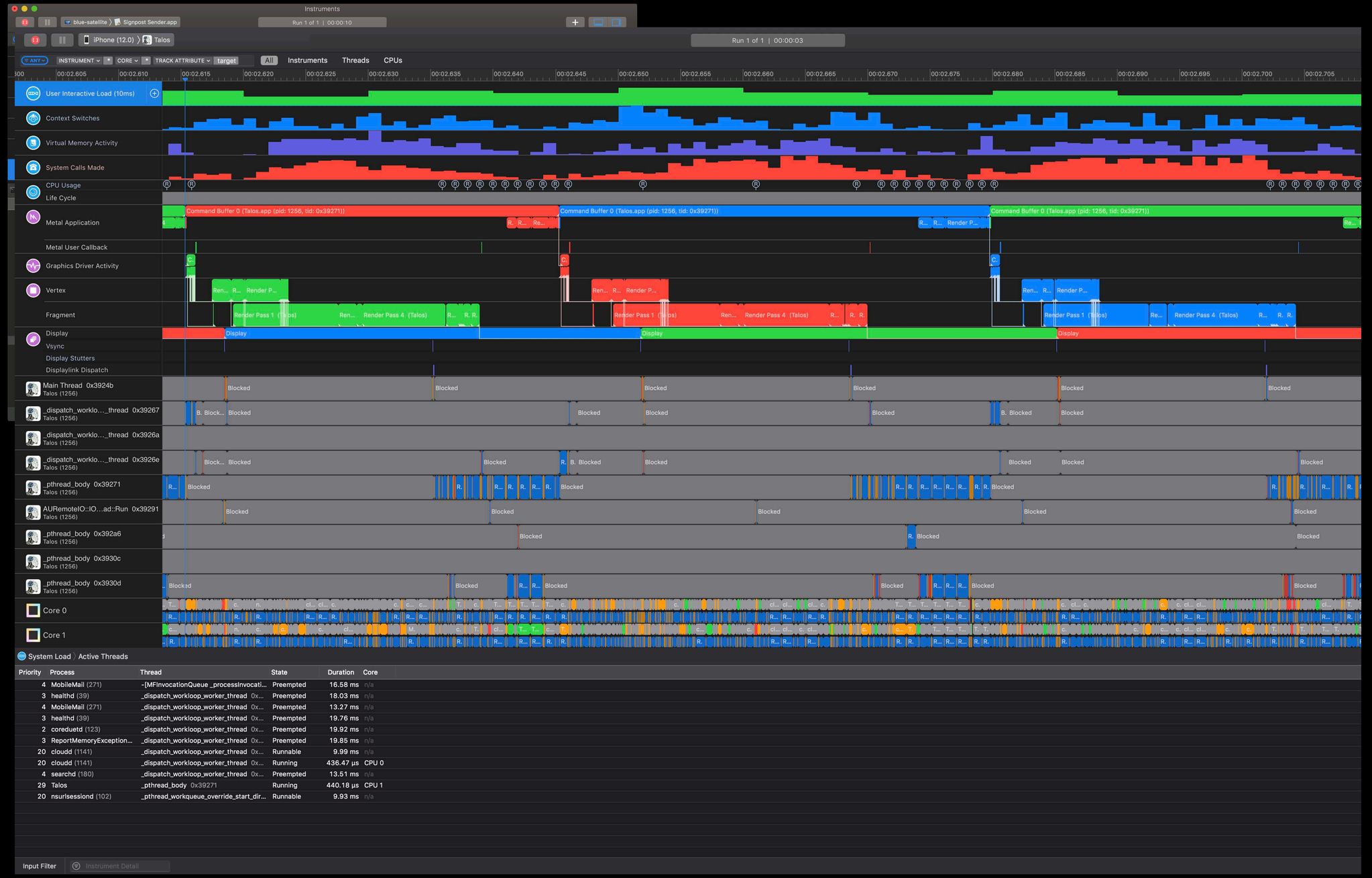
Today

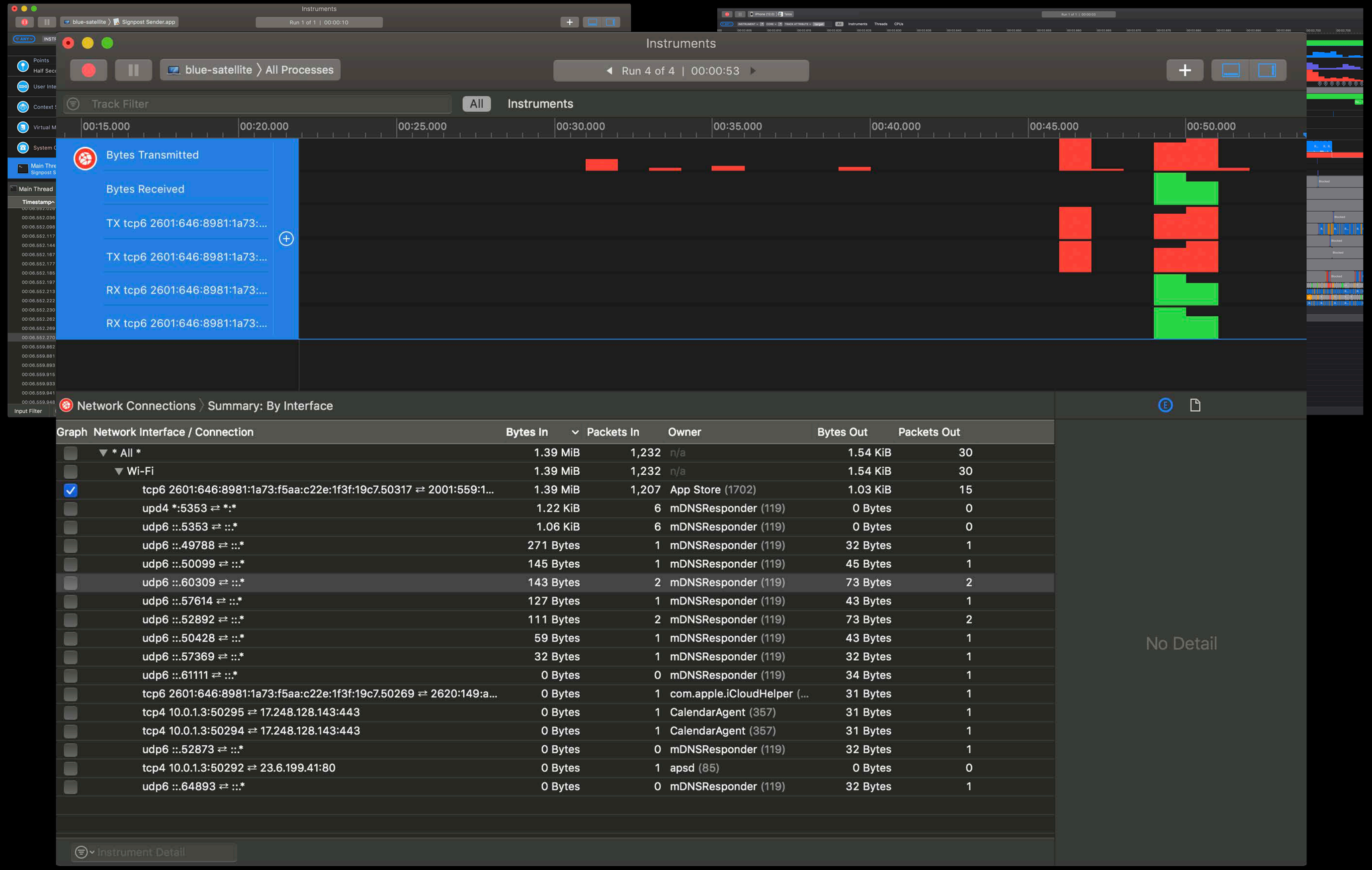

Instruments
blue-satellite 〉 Signpost Sender.app
Run 1 of 1 | 00:00:10
INSTRUMENT
CORE
TRACK ATTRIBUTE
target
All
Instruments
Threads
CPUs
00:00.000
00:01.000
00:02.000
00:03.000
00:04.000
00:05.000
00:06.000
00:07.000
00:08.000
00:09.000
Points
Half Second
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
Main Thread 0xf1fe
Signpost Sender (1503)
Main Thread 0xf1fe 〉 Narrativ
Timestamp
Narrative
00:06.552.036 Called "mach_po
00:06.552.098 Called "mach_ms
00:06.552.117 Called "mach_port_insert_member_trap()" for 6.64 µs
00:06.552.144 Called "mach_port_extract_member_trap()" for 2.25 µs
00:06.552.167 Called "mach_port_insert_member_trap()" for 2.82 µs
00:06.552.177 Called "mach_msg_trap()" for 1.40 µs
00:06.552.185 Called "mach_port_ex
00:06.552.197 Called "mach_msg_tra
00:06.552.213 Called "mach_port_deallocate_trap()" for 18.68 µs
00:06.552.222 Interrupted for 7.61 µs (40.7% of mach_port_deallocate_trap's duration) while CPU 0 serviced an interrupt handler.
00:06.552.230 Ran for 40.12 µs on CPU 0 at priority 47
00:06.552.262 Called "mach_port_insert_member_trap()" for 2.03 µs
00:06.552.269 Called "mach_msg_trap()" for 7.62 ms
00:06.552.270 Blocked for 7.59 ms (99.7% of mach_msg_trap's duration) starting at priority 47
00:06.559.862 The thread was made runnable by Signpost Sender.app (pid: 1503, tid: 0xf240) running on CPU 2. It waited for an available CPU for 18.84 µs (0.2% of mach_msg_trap's durati
00:06.559.881 Ran for 214.18 µs on CPU 2 at priority 47
00:06.559.893 Called "mach_port_extract_member_trap()" for 1.12 µs
00:06.559.915 Called "mach_msg_trap()" for 8.12 µs
00:06.559.933 Called "mach_port_insert_member_trap()" for 2.95 µs
00:06.559.941 Called "mach_msg_trap()" for 2.37 µs
00:06.559.948 Called "mach_port_extract_member_trap()" for 746 ns
Input Filter
Instrument Detail
Backtrace
mach_msg_trap
mach_msg
__CFRunLoopServiceMachPort
__CFRunLoopRun
CFRunLoopRunSpecific
RunCurrentEventLoopInMode
ReceiveNextEventCommon
_BlockUntilNextEventMatchingListInMo
_DPSNextEvent
-[NSApplication(NSEvent) _nextEventM
-[NSWindow(NSEventRouting) trackEve
-[NSDragEventTracker trackEvent:using
-[NSCell trackMouse:inRect:ofView:unti
-[NSButtonCell trackMouse:inRect:ofVi
-[NSControl mouseDown:]
-[NSWindow(NSEventRouting) _handleM
-[NSWindow(NSEventRouting) _reallySe
-[NSWindow(NSEventRouting) sendEve
-[NSApplication(NSEvent) sendEvent:]
-[NSApplication run]
NSApplicationMain
start
Standard UI

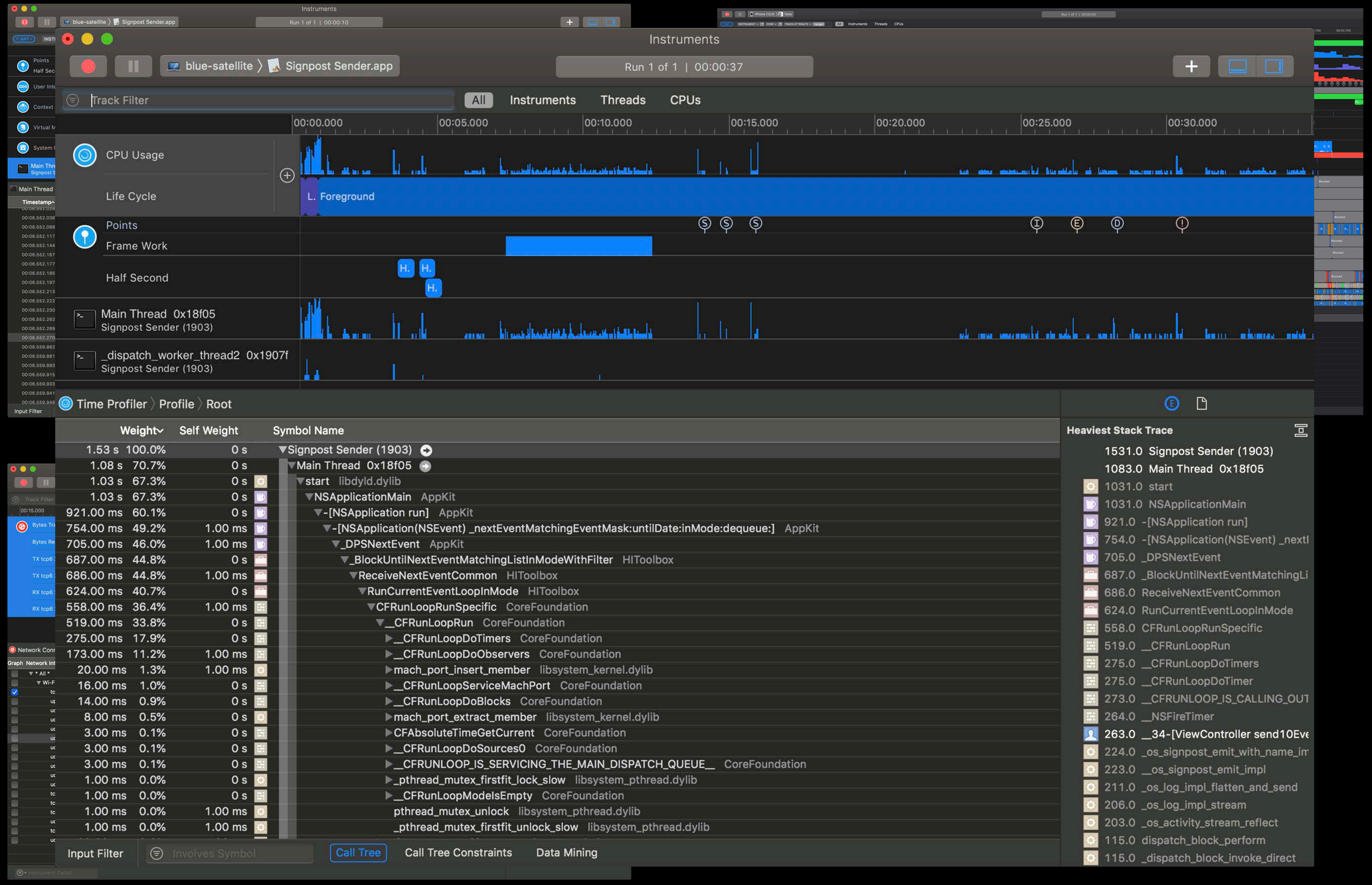
Today

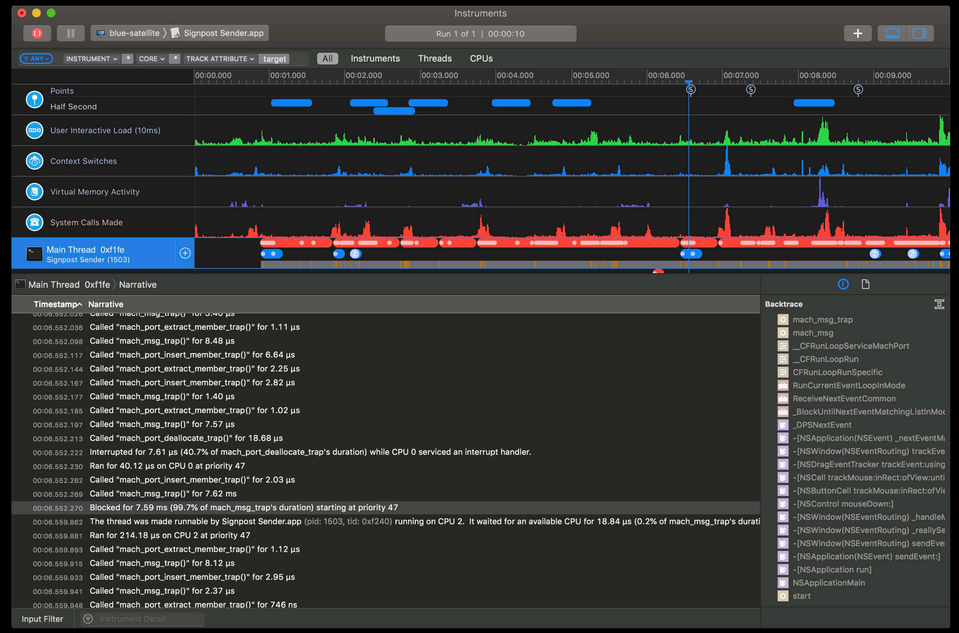

Instruments
blue-satellite 〉 Signpost Sender.app
Run 1 of 1 | 00:00:10
INSTRUMENT
CORE
TRACK ATTRIBUTE
target
All
Instruments
Threads
CPUs
Points
Half Second
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
Main Thread 0xf1fe
Signpost Sender (1503)
Timestamp
Narrative
Called "mach_port_insert_member_trap()" for 6.64 µs
Called "mach_port_extract_member_trap()" for 2.25 µs
Called "mach_port_insert_member_trap()" for 2.82 µs
Called "mach_msg_trap()" for 1.40 µs
Called "mach_port_deallocate_trap()" for 18.68 µs
Interrupted for 7.61 µs (40.7% of mach_port_deallocate_trap's duration) while CPU 0 serviced an interrupt handler.
Ran for 40.12 µs on CPU 0 at priority 47
Called "mach_port_insert_member_trap()" for 2.03 µs
Called "mach_msg_trap()" for 7.62 ms
Blocked for 7.59 ms (99.7% of mach_msg_trap's duration) starting at priority 47
The thread was made runnable by Signpost Sender.app (pid: 1503, tid: 0xf240) running on CPU 2. It waited for an available CPU for 18.84 µs (0.2% of mach_msg_trap's durati
Ran for 214.18 µs on CPU 2 at priority 47
Called "mach_port_extract_member_trap()" for 1.12 µs
Called "mach_msg_trap()" for 8.12 µs
Called "mach_port_insert_member_trap()" for 2.95 µs
Called "mach_msg_trap()" for 2.37 µs
Input Filter
mach_msg_trap
mach_msg
__CFRunLoopServiceMachPort
__CFRunLoopRun
CFRunLoopRunSpecific
RunCurrentEventLoopInMode
ReceiveNextEventCommon
_DPSNextEvent
-[NSApplication run]
NSApplicationMain
start
Standard UI
Analysis Core

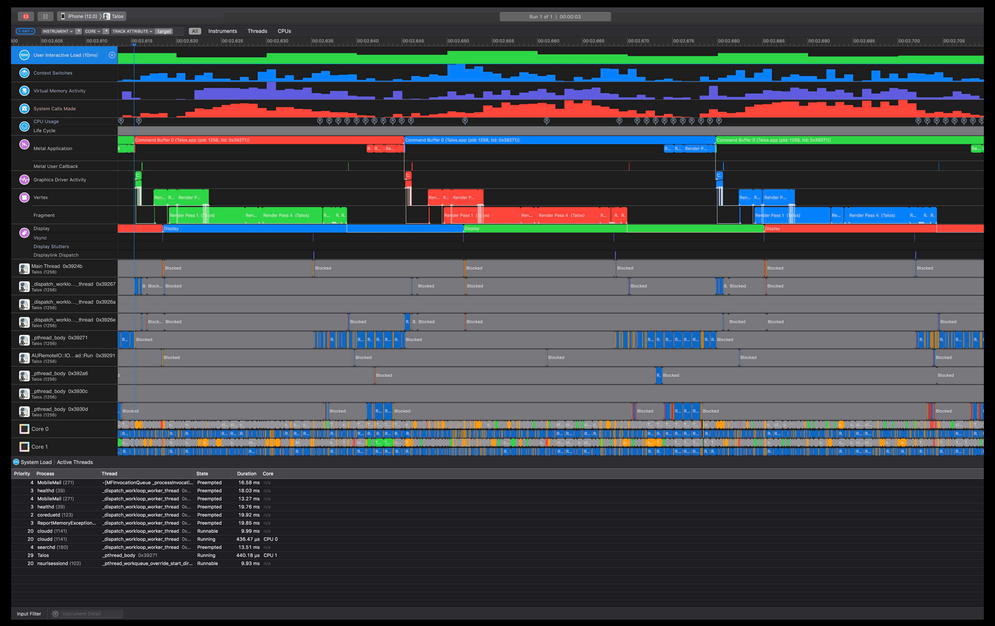

Instruments
blue-satellite
Signpost Sender.app
Run 1 of 1 | 00:00:10
INSTRUMENT
CORE
TRACK ATTRIBUTE
target
All
Instruments
Threads
CPUs
00:00.000
00:01.000
00:02.000
00:03.000
00:04.000
00:05.000
00:06.000
00:07.000
00:08.000
00:09.000
Points
Half Second
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
Main Thread 0xf1fe
Signpost Sender (1503)
Main Thread 0xf1fe
Narrative
Timestamp
Narrative
00:06.552.036 Called "mach_port_extract_member_trap()" for 1.11 µs
00:06.552.098 Called "mach_msg_trap()" for 8.48 µs
00:06.552.117 Called "mach_port_insert_member_trap()" for 6.64 µs
00:06.552.144 Called "mach_port_extract_member_trap()" for 2.25 µs
00:06.552.167 Called "mach_port_insert_member_trap()" for 2.82 µs
00:06.552.177 Called "mach_msg_trap()" for 1.40 µs
00:06.552.185 Called "mach_port_extract_member_trap()" for 1.02 µs
00:06.552.197 Called "mach_msg_trap()" for 7.57 µs
00:06.552.213 Called "mach_port_deallocate_trap()" for 18.68 µs
00:06.552.222 Interrupted for 7.61 µs (40.7% of mach_port_deallocate_trap's duration) while CPU 0 serviced an interrupt handler.
00:06.552.230 Ran for 40.12 µs on CPU 0 at priority 47
00:06.552.262 Called "mach_port_insert_member_trap()" for 2.03 µs
00:06.552.269 Called "mach_msg_trap()" for 7.62 ms
00:06.552.270 Blocked for 7.59 ms (99.7% of mach_msg_trap's duration) starting at priority 47
00:06.559.862 The thread was made runnable by Signpost Sender.app (pid: 1503, tid: 0xf240) running on CPU 2. It waited for an available CPU for 18.84 µs (0.2% of mach_msg_trap's durati
00:06.559.881 Ran for 214.18 µs on CPU 2 at priority 47
00:06.559.893 Called "mach_port_extract_member_trap()" for 1.12 µs
00:06.559.915 Called "mach_msg_trap()" for 8.12 µs
00:06.559.933 Called "mach_port_insert_member_trap()" for 2.95 µs
00:06.559.941 Called "mach_msg_trap()" for 2.37 µs
Backtrace
mach_msg_trap
mach_msg
__CFRunLoopServiceMachPort
__CFRunLoopRun
CFRunLoopRunSpecific
RunCurrentEventLoopInMode
ReceiveNextEventCommon
_DPSNextEvent
-[NSApplication(NSEvent) sendEvent:]
-[NSApplication run]
NSApplicationMain
start
Input Filter
Instrument Detail

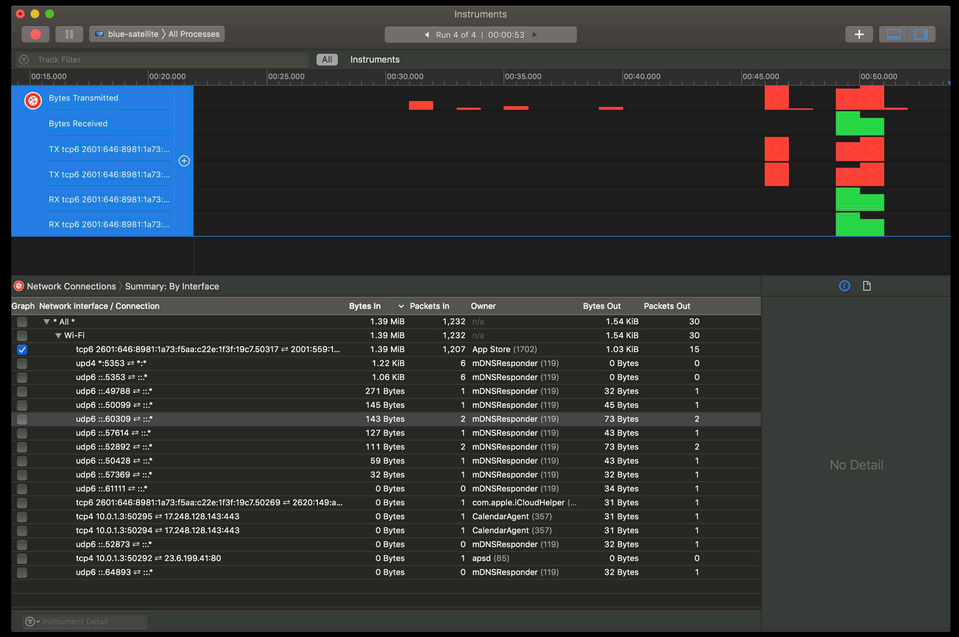

Instruments
blue-satellite 〉 Signpost Sender.app
Run 1 of 1 | 00:00:10
iPhone (12.0) 〉 Talos
Run 1 of 1 | 00:00:03
INSTRUMENT
CORE
TRACK ATTRIBUTE
target
All
Instruments
Threads
CPUs
00:02.605
00:02.610
00:02.615
00:02.620
00:02.625
00:02.630
00:02.635
00:02.640
00:02.645
00:02.650
00:02.655
00:02.660
00:02.665
00:02.670
00:02.675
00:02.680
00:02.685
00:02.690
00:02.695
00:02.700
00:02.705
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
CPU Usage
Life Cycle
Metal Application
Metal User Callback
Graphics Driver Activity
Vertex
Fragment
Display
Vsync
Display Stutters
Displaylink Dispatch
Command Buffer 0 (Talos.app (pid: 1256, tid: 0x39271))
Render Pass 1 (Talos)
Render Pass 4 (Talos)
Display
Main Thread 0x3924b
Talos (1256)
_dispatch_worklo..._thread 0x39267
_dispatch_worklo..._thread 0x3926a
_dispatch_worklo..._thread 0x3926e
_pthread_body 0x39271
AURemoteIO::IO...ad::Run 0x39291
_pthread_body 0x392a6
_pthread_body 0x3930c
_pthread_body 0x3930d
Blocked
Core 0
Core 1
System Load 〉 Active Threads
Priority
Process
Thread
State
Duration
Core
4 MobileMail (271) -[MFInvocationQueue _processInvocati... Preempted 16.58 ms n/a
3 healthd (39) _dispatch_workloop_worker_thread 0x... Preempted 18.03 ms n/a
4 MobileMail (271) _dispatch_workloop_worker_thread 0x... Preempted 13.27 ms n/a
3 healthd (39) _dispatch_workloop_worker_thread 0x... Preempted 19.76 ms n/a
2 coreduetd (123) _dispatch_workloop_worker_thread 0x... Preempted 19.92 ms n/a
3 ReportMemoryException... _dispatch_workloop_worker_thread 0x... Preempted 19.85 ms n/a
20 cloudd (1141) _dispatch_workloop_worker_thread 0x... Runnable 9.99 ms n/a
20 cloudd (1141) _dispatch_workloop_worker_thread 0x... Running 436.47 µs CPU 0
4 searchd (180) _dispatch_workloop_worker_thread 0x... Preempted 13.51 ms n/a
29 Talos _pthread_body 0x39271 Running 440.18 µs CPU 1
20 nsurlsessiond (102) _pthread_workqueue_override_start_dir... Runnable 9.93 ms n/a
Input Filter
Instrument Detail

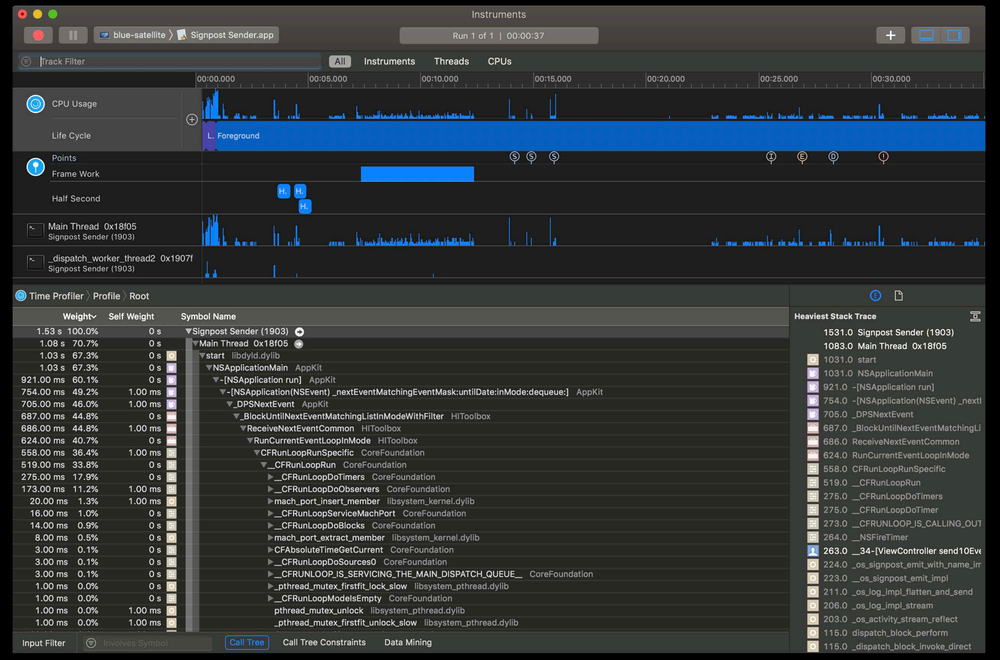

Instruments
blue-satellite 〉All Processes
Run 4 of 4 | 00:00:53
Track Filter
All
Instruments
00:15.000
00:20.000
00:25.000
00:30.000
00:35.000
00:40.000
00:45.000
00:50.000
Bytes Transmitted
Bytes Received
TX tcp6 2601:646:8981:1a73:...
TX tcp6 2601:646:8981:1a73:...
RX tcp6 2601:646:8981:1a73:...
RX tcp6 2601:646:8981:1a73:...
Network Connections 〉Summary: By Interface
Graph Network Interface / Connection Bytes In Packets In Owner Bytes Out Packets Out
* All * 1.39 MiB 1,232 n/a 1.54 KiB 30
Wi-Fi 1.39 MiB 1,232 n/a 1.54 KiB 30
tcp6 2601:646:8981:1a73:f5aa:c22e:1f3f:19c7.50317 ⇄ 2001:559:1... 1.39 MiB 1,207 App Store (1702) 1.03 KiB 15
upd4 *:5353 ⇄ *:* 1.22 KiB 6 mDNSResponder (119) 0 Bytes 0
udp6 ::.5353 ⇄ ::.* 1.06 KiB 6 mDNSResponder (119) 0 Bytes 0
udp6 ::.49788 ⇄ ::.* 271 Bytes 1 mDNSResponder (119) 32 Bytes 1
udp6 ::.50099 ⇄ ::.* 145 Bytes 1 mDNSResponder (119) 45 Bytes 1
udp6 ::.60309 ⇄ ::.* 143 Bytes 2 mDNSResponder (119) 73 Bytes 2
udp6 ::.57614 ⇄ ::.* 127 Bytes 1 mDNSResponder (119) 43 Bytes 1
udp6 ::.52892 ⇄ ::.* 111 Bytes 2 mDNSResponder (119) 73 Bytes 2
udp6 ::.50428 ⇄ ::.* 59 Bytes 1 mDNSResponder (119) 43 Bytes 1
udp6 ::.57369 ⇄ ::.* 32 Bytes 1 mDNSResponder (119) 32 Bytes 1
udp6 ::.61111 ⇄ ::.* 0 Bytes 0 mDNSResponder (119) 34 Bytes 1
tcp6 2601:646:8981:1a73:f5aa:c22e:1f3f:19c7.50269 ⇄ 2620:149:a... 0 Bytes 1 com.apple.iCloudHelper (... 31 Bytes 1
tcp4 10.0.1.3:50295 ⇄ 17.248.128.143:443 0 Bytes 1 CalendarAgent (357) 31 Bytes 1
tcp4 10.0.1.3:50294 ⇄ 17.248.128.143:443 0 Bytes 1 CalendarAgent (357) 31 Bytes 1
udp6 ::.52873 ⇄ ::.* 0 Bytes 0 mDNSResponder (119) 32 Bytes 1
tcp4 10.0.1.3:50292 ⇄ 23.6.199.41:80 0 Bytes 1 apsd (85) 0 Bytes 0
udp6 ::.64893 ⇄ ::.* 0 Bytes 0 mDNSResponder (119) 32 Bytes 1
No Detail
Instrument Detail


Instruments
blue-satellite 〉 Signpost Sender.app
Run 1 of 1 | 00:00:37
Track Filter
All
Instruments
Threads
CPUs
00:00.000
00:05.000
00:10.000
00:15.000
00:20.000
00:25.000
00:30.000
CPU Usage
Life Cycle
L. Foreground
Points
Frame Work
Half Second
Main Thread 0x18f05
Signpost Sender (1903)
_dispatch_worker_thread2 0x1907f
Signpost Sender (1903)
Time Profiler 〉 Profile 〉 Root
Weight
Self Weight
Symbol Name
1.53 s 100.0% 0 s Signpost Sender (1903)
1.08 s 70.7% 0 s Main Thread 0x18f05
1.03 s 67.3% 0 s start libdyld.dylib
1.03 s 67.3% 0 s NSApplicationMain AppKit
921.00 ms 60.1% 0 s -[NSApplication run] AppKit
754.00 ms 49.2% 1.00 ms -[NSApplication(NSEvent) _nextEventMatchingEventMask:untilDate:inMode:dequeue:] AppKit
705.00 ms 46.0% 1.00 ms _DPSNextEvent AppKit
687.00 ms 44.8% 0 s _BlockUntilNextEventMatchingListInModeWithFilter HIToolbox
686.00 ms 44.8% 1.00 ms ReceiveNextEventCommon HIToolbox
624.00 ms 40.7% 0 s RunCurrentEventLoopInMode HIToolbox
558.00 ms 36.4% 1.00 ms CFRunLoopRunSpecific CoreFoundation
519.00 ms 33.8% 0 s __CFRunLoopRun CoreFoundation
275.00 ms 17.9% 0 s __CFRunLoopDoTimers CoreFoundation
173.00 ms 11.2% 1.00 ms __CFRunLoopDoObservers CoreFoundation
20.00 ms 1.3% 1.00 ms mach_port_insert_member libsystem_kernel.dylib
16.00 ms 1.0% 0 s __CFRunLoopServiceMachPort CoreFoundation
14.00 ms 0.9% 0 s __CFRunLoopDoBlocks CoreFoundation
8.00 ms 0.5% 0 s mach_port_extract_member libsystem_kernel.dylib
3.00 ms 0.1% 0 s CFAbsoluteTimeGetCurrent CoreFoundation
3.00 ms 0.1% 0 s __CFRunLoopDoSources0 CoreFoundation
3.00 ms 0.1% 0 s __CFRUNLOOP_IS_SERVICING_THE_MAIN_DISPATCH_QUEUE__ CoreFoundation
1.00 ms 0.0% 0 s _pthread_mutex_firstfit_lock_slow libsystem_pthread.dylib
1.00 ms 0.0% 0 s __CFRunLoopModeIsEmpty CoreFoundation
1.00 ms 0.0% 1.00 ms pthread_mutex_unlock libsystem_pthread.dylib
1.00 ms 0.0% 1.00 ms _pthread_mutex_firstfit_unlock_slow libsystem_pthread.dylib
Heaviest Stack Trace
1531.0 Signpost Sender (1903)
1083.0 Main Thread 0x18f05
1031.0 start
1031.0 NSApplicationMain
921.0 -[NSApplication run]
754.0 -[NSApplication(NSEvent) _nextl
705.0 _DPSNextEvent
687.0 _BlockUntilNextEventMatchingLi
686.0 ReceiveNextEventCommon
624.0 RunCurrentEventLoopInMode
558.0 CFRunLoopRunSpecific
519.0 __CFRunLoopRun
275.0 __CFRunLoopDoTimers
275.0 __CFRunLoopDoTimer
273.0 __CFRUNLOOP_IS_CALLING_OUT
264.0 __NSFireTimer
263.0 __34-[ViewController send10Eve
224.0 _os_signpost_emit_with_name_im
223.0 __os_signpost_emit_impl
211.0 _os_log_impl_flatten_and_send
206.0 _os_log_impl_stream
203.0 _os_activity_stream_reflect
115.0 dispatch_block_perform
115.0 _dispatch_block_invoke_direct
Input Filter
Involves Symbol
Call Tree
Call Tree Constraints
Data Mining


Instruments
blue-satellite 〉Signpost Sender.app
Run 1 of 1 | 00:00:10
All
Instruments
Threads
CPUs
Points
Half Second
User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
Main Thread 0xf1fe
Signpost Sender (1503)
Main Thread 0xf1fe 〉Narrative
Timestamp
Narrative
Backtrace
Called "mach_port_extract_member_trap()" for 1.11 µs
Called "mach_msg_trap()" for 8.48 µs
Called "mach_port_insert_member_trap()" for 6.64 µs
Called "mach_port_extract_member_trap()" for 2.25 µs
Called "mach_port_insert_member_trap()" for 2.82 µs
Called "mach_msg_trap()" for 1.40 µs
Called "mach_port_extract_member_trap()" for 1.02 µs
Called "mach_msg_trap()" for 7.57 µs
Called "mach_port_deallocate_trap()" for 18.68 µs
Interrupted for 7.61 µs (40.7% of mach_port_deallocate_trap's duration) while CPU 0 serviced an interrupt handler.
Ran for 40.12 µs on CPU 0 at priority 47
Called "mach_port_insert_member_trap()" for 2.03 µs
Called "mach_msg_trap()" for 7.62 ms
Blocked for 7.59 ms (99.7% of mach_msg_trap's duration) starting at priority 47
The thread was made runnable by Signpost Sender.app (pid: 1503, tid: 0xf240) running on CPU 2. It waited for an available CPU for 18.84 µs (0.2% of mach_msg_trap's durati
Ran for 214.18 µs on CPU 2 at priority 47
Called "mach_port_extract_member_trap()" for 1.12 µs
Called "mach_msg_trap()" for 8.12 µs
Called "mach_port_insert_member_trap()" for 2.95 µs
Called "mach_msg_trap()" for 2.37 µs
Called "mach_port_extract_member_trap()" for 746 ns
mach_msg_trap
mach_msg
__CFRunLoopServiceMachPort
__CFRunLoopRun
CFRunLoopRunSpecific
RunCurrentEventLoopInMode
ReceiveNextEventCommon
_BlockUntilNextEventMatchingListInMo
_DPSNextEvent
-[NSApplication(NSEvent) _nextEventM
-[NSWindow(NSEventRouting) trackEve
-[NSDragEventTracker trackEvent:using
-[NSCell trackMouse:inRect:ofView:unti
-[NSButtonCell trackMouse:inRect:ofVi
-[NSControl mouseDown:]
-[NSWindow(NSEventRouting) _handleN
-[NSWindow(NSEventRouting) _reallySe
-[NSWindow(NSEventRouting) sendEve
-[NSApplication(NSEvent) sendEvent:]
-[NSApplication run]
NSApplicationMain
start
Input Filter
Instrument Detail

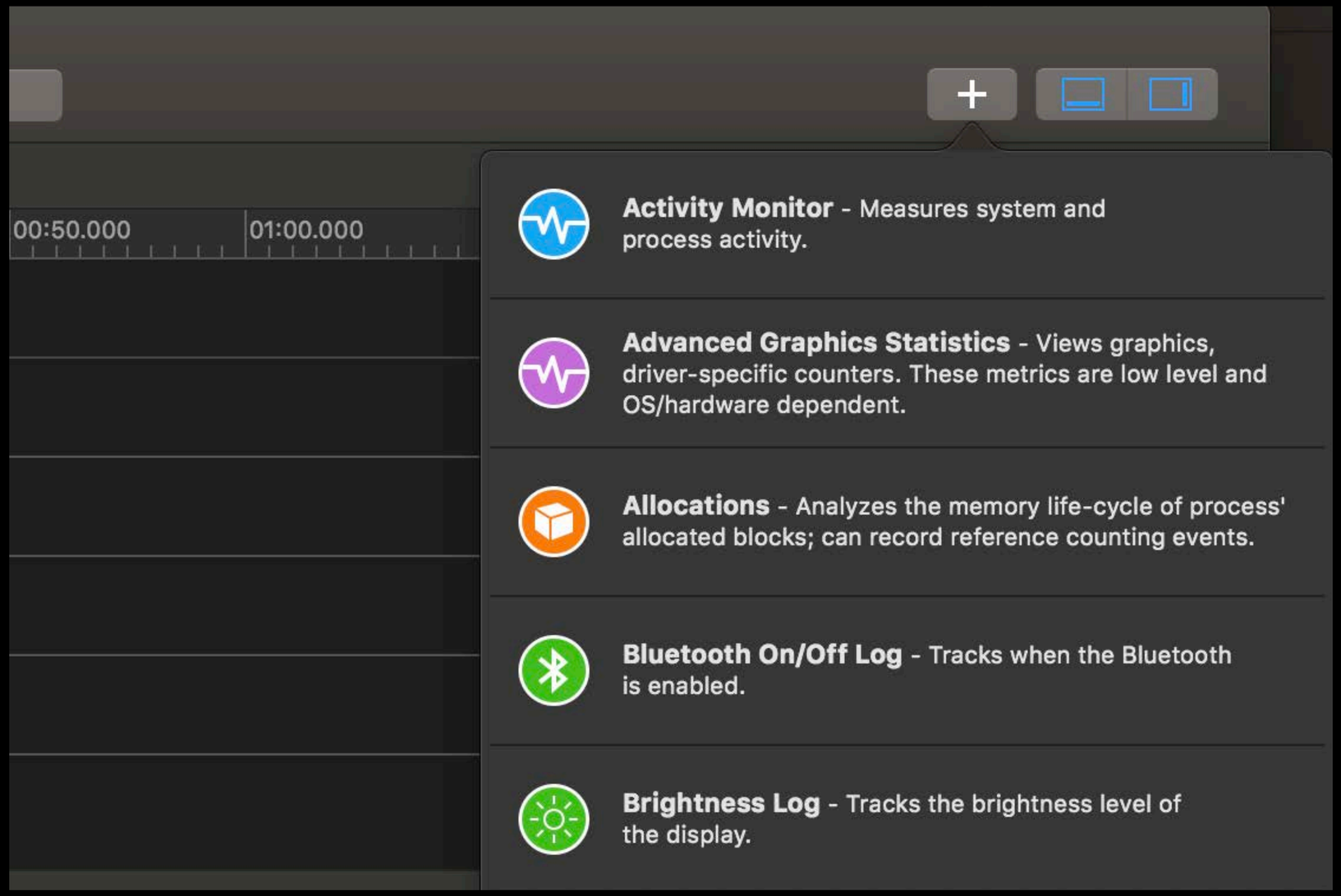

User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made
CPU Usage
Life Cycle
Metal Application
Graphics Driver Activity
Vertex
Fragment
Display
Core 0
Core 1
System Load / Active Threads


Instruments
blue-satellite 〉All Processes
Run 4 of 4 | 00:00:53
Track Filter
All
Instruments
Bytes Transmitted
Bytes Received
TX tcp6 2601:646:8981:1a73:...
TX tcp6 2601:646:8981:1a73:...
RX tcp6 2601:646:8981:1a73:...
RX tcp6 2601:646:8981:1a73:...
Network Connections 〉Summary: By Interface
Graph
Network Interface / Connection
Bytes In
Packets In
Owner
Bytes Out
Packets Out
* All *
Wi-Fi
tcp6 2601:646:8981:1a73:f5aa:c22e:1f3f:19c7.50317 ⇄ 2001:559:1...
upd4 *:5353 ⇄ *:*
upd6 ::.5353 ⇄ ::.*
upd6 ::.49788 ⇄ ::.*
upd6 ::.50099 ⇄ ::.*
upd6 ::.60309 ⇄ ::.*
upd6 ::.57614 ⇄ ::.*
upd6 ::.52892 ⇄ ::.*
upd6 ::.50428 ⇄ ::.*
upd6 ::.57369 ⇄ ::.*
upd6 ::.61111 ⇄ ::.*
tcp6 2601:646:8981:1a73:f5aa:c22e:1f3f:19c7.50269 ⇄ 2620:149:a...
tcp4 10.0.1.3:50295 ⇄ 17.248.128.143:443
tcp4 10.0.1.3:50294 ⇄ 17.248.128.143:443
upd6 ::.52873 ⇄ ::.*
tcp4 10.0.1.3:50292 ⇄ 23.6.199.41:80
upd6 ::.64893 ⇄ ::.*
No Detail
Instrument Detail

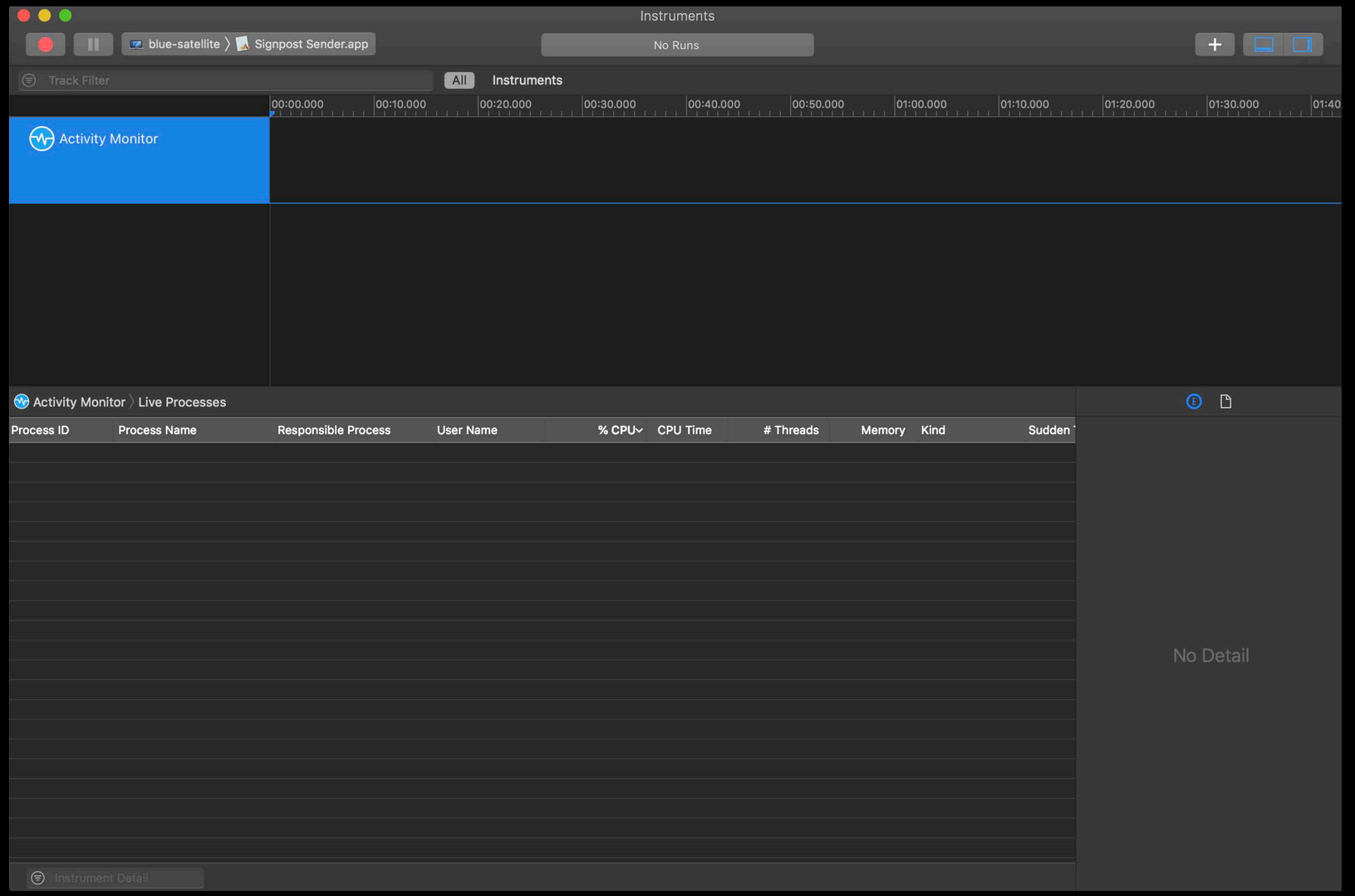

Instruments
blue-satellite 〉Signpost Sender.app
Run 1 of 1 | 00:00:37
Track Filter
All
Instruments
Threads
CPUs
CPU Usage
Life Cycle
Foreground
Points
Frame Work
Half Second
Main Thread 0x18f05
Signpost Sender (1903)
_dispatch_worker_thread2 0x1907f
Signpost Sender (1903)
Time Profiler 〉Profile 〉Root
Weight
Self Weight
Symbol Name
1.53 s 100.0% 0 s Signpost Sender (1903)
1.08 s 70.7% 0 s Main Thread 0x18f05
1.03 s 67.3% 0 s start libdyld.dylib
1.03 s 67.3% 0 s NSApplicationMain AppKit
921.00 ms 60.1% 0 s -[NSApplication run] AppKit
754.00 ms 49.2% 1.00 ms -[NSApplication(NSEvent) _nextEventMatchingEventMask:untilDate:inMode:dequeue:] AppKit
705.00 ms 46.0% 1.00 ms _DPSNextEvent AppKit
687.00 ms 44.8% 0 s _BlockUntilNextEventMatchingListInModeWithFilter HIToolbox
686.00 ms 44.8% 1.00 ms ReceiveNextEventCommon HIToolbox
624.00 ms 40.7% 0 s RunCurrentEventLoopInMode HIToolbox
558.00 ms 36.4% 1.00 ms CFRunLoopRunSpecific CoreFoundation
519.00 ms 33.8% 0 s __CFRunLoopRun CoreFoundation
275.00 ms 17.9% 0 s __CFRunLoopDoTimers CoreFoundation
173.00 ms 11.2% 1.00 ms __CFRunLoopDoObservers CoreFoundation
20.00 ms 1.3% 1.00 ms mach_port_insert_member libsystem_kernel.dylib
16.00 ms 1.0% 0 s __CFRunLoopServiceMachPort CoreFoundation
14.00 ms 0.9% 0 s __CFRunLoopDoBlocks CoreFoundation
8.00 ms 0.5% 0 s mach_port_extract_member libsystem_kernel.dylib
3.00 ms 0.1% 0 s CFAbsoluteTimeGetCurrent CoreFoundation
3.00 ms 0.1% 0 s __CFRunLoopDoSources0 CoreFoundation
3.00 ms 0.1% 0 s __CFRUNLOOP_IS_SERVICING_THE_MAIN_DISPATCH_QUEUE__ CoreFoundation
1.00 ms 0.0% 0 s _pthread_mutex_firstfit_lock_slow libsystem_pthread.dylib
1.00 ms 0.0% 0 s __CFRunLoopModeIsEmpty CoreFoundation
1.00 ms 0.0% 1.00 ms pthread_mutex_unlock libsystem_pthread.dylib
1.00 ms 0.0% 1.00 ms _pthread_mutex_firstfit_unlock_slow libsystem_pthread.dylib
Heaviest Stack Trace
1531.0 Signpost Sender (1903)
1083.0 Main Thread 0x18f05
1031.0 start
1031.0 NSApplicationMain
921.0 -[NSApplication run]
754.0 -[NSApplication(NSEvent) _nextE
705.0 _DPSNextEvent
687.0 _BlockUntilNextEventMatchingLi
686.0 ReceiveNextEventCommon
624.0 RunCurrentEventLoopInMode
558.0 CFRunLoopRunSpecific
519.0 __CFRunLoopRun
275.0 __CFRunLoopDoTimers
275.0 __CFRunLoopDoTimer
273.0 __CFRUNLOOP_IS_CALLING_OUT
264.0 __NSFireTimer
263.0 __34-[ViewController send10Ev
224.0 _os_signpost_emit_with_name_im
223.0 __os_signpost_emit_impl
211.0 _os_log_impl_flatten_and_send
206.0 _os_log_impl_stream
203.0 _os_activity_stream_reflect
115.0 dispatch_block_perform
115.0 _dispatch_block_invoke_direct
Input Filter
Involves Symbol
Call Tree
Call Tree Constraints
Data Mining


Precise control over
font, text style, &
paragraph settings
Measuring tools
• Text spacing
• Alignment
• Grid tool
XCODE

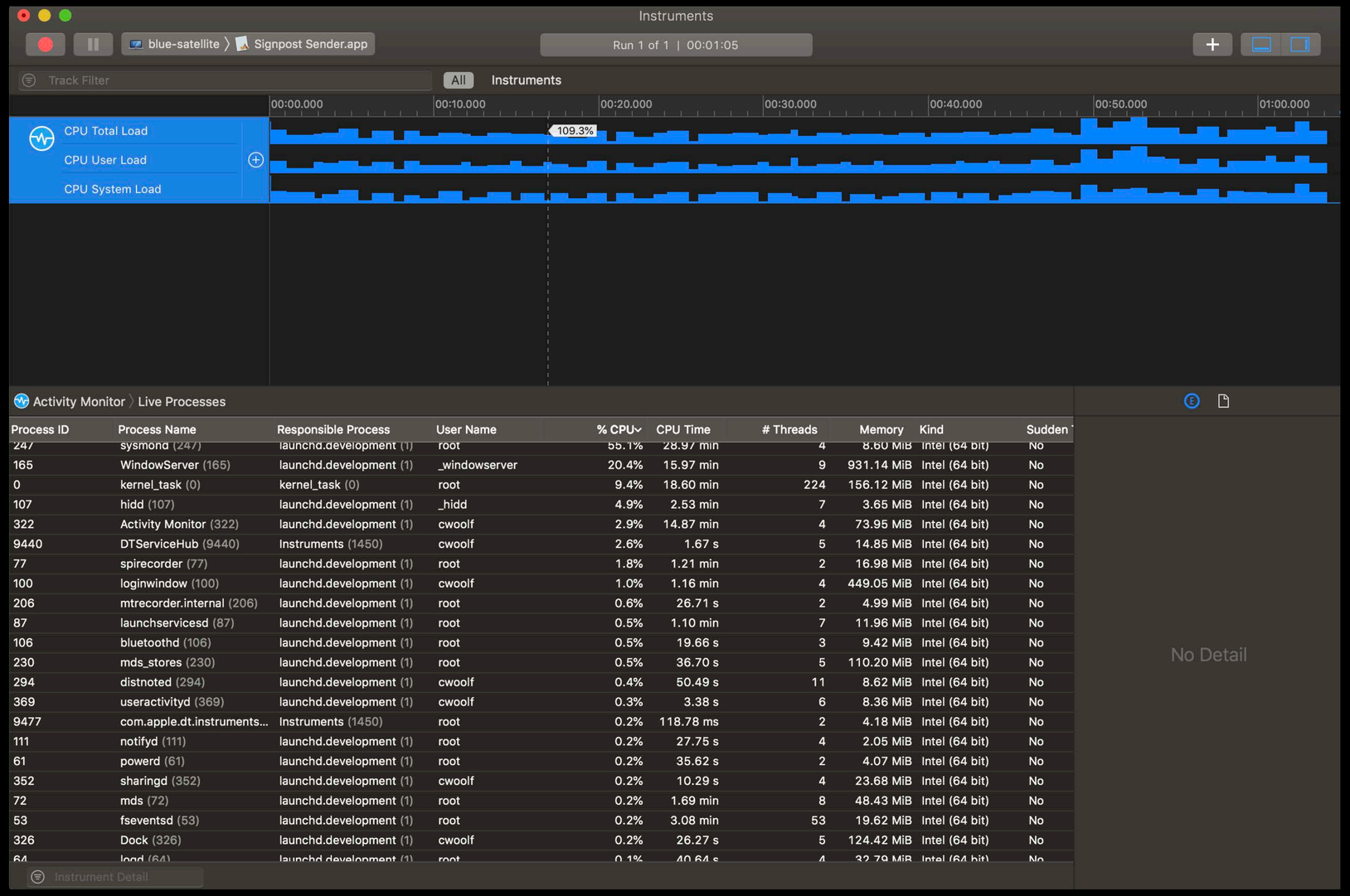
Instruments



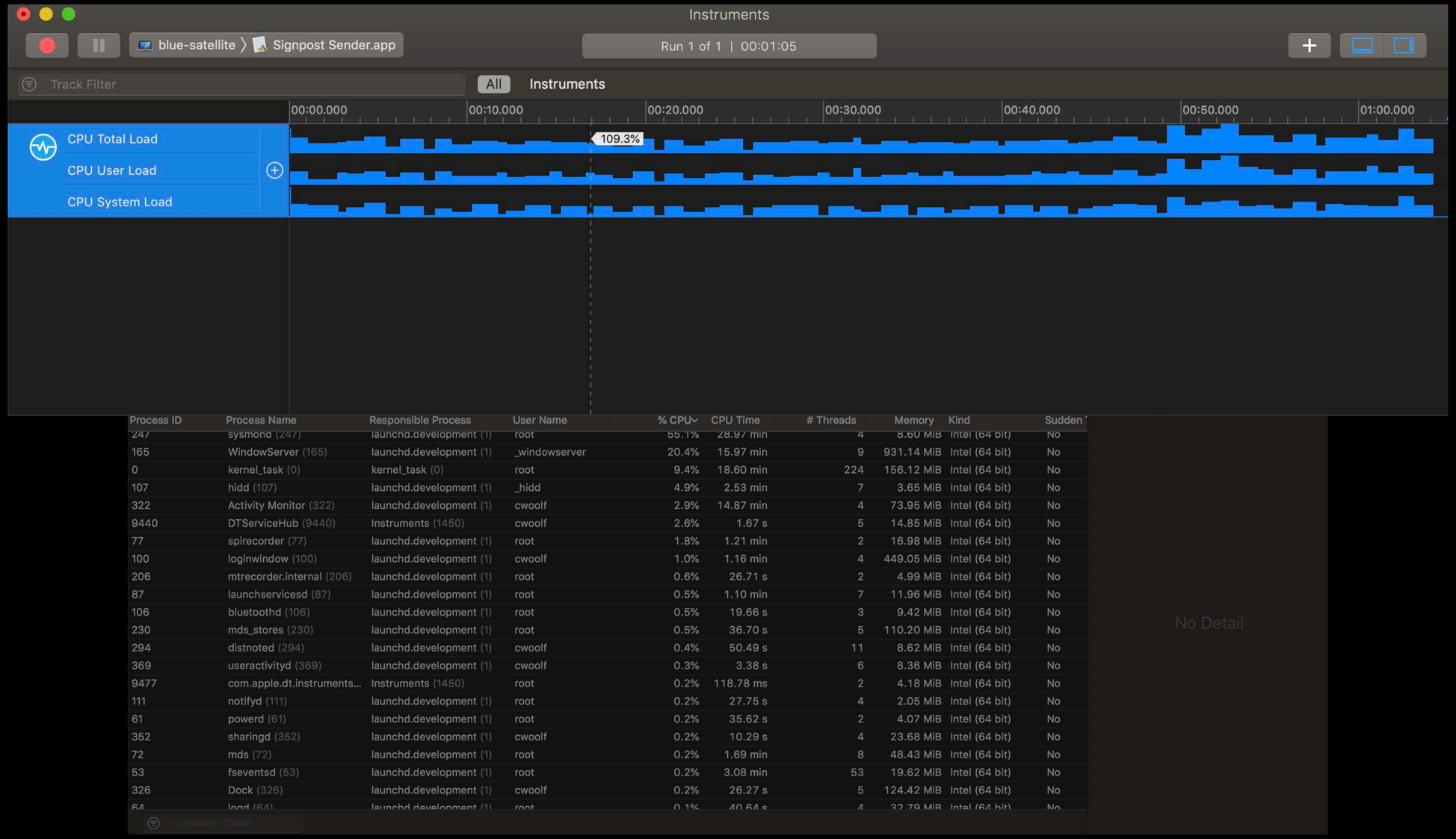
Instruments



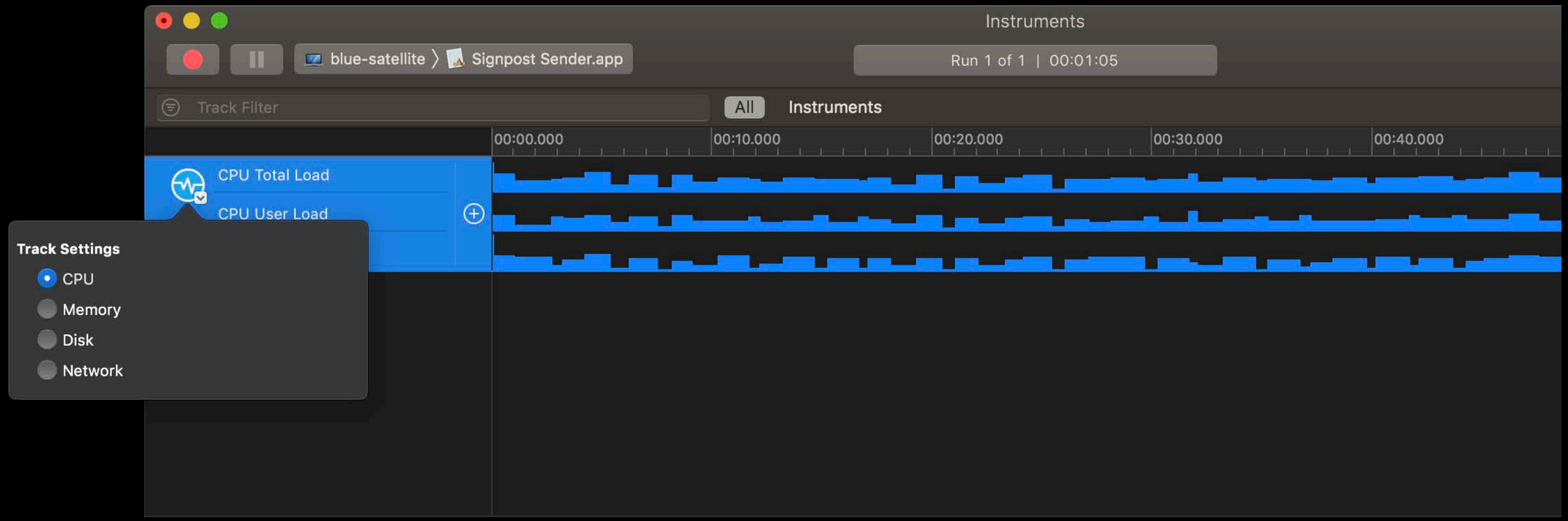
Instruments



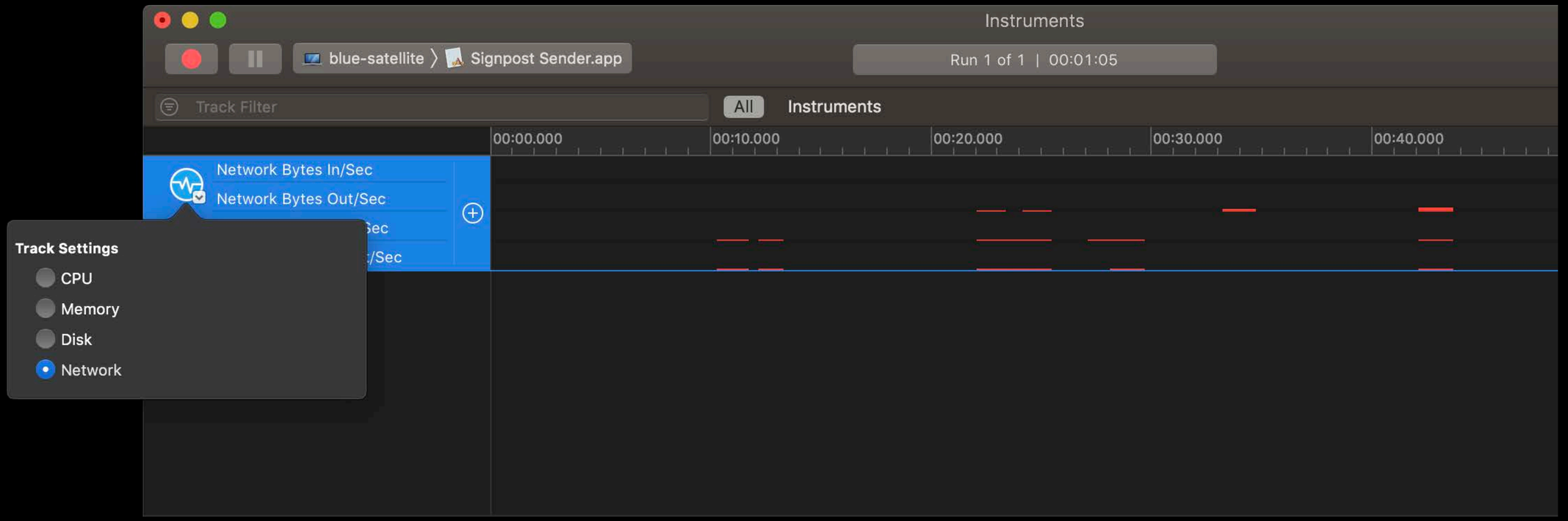
Instruments



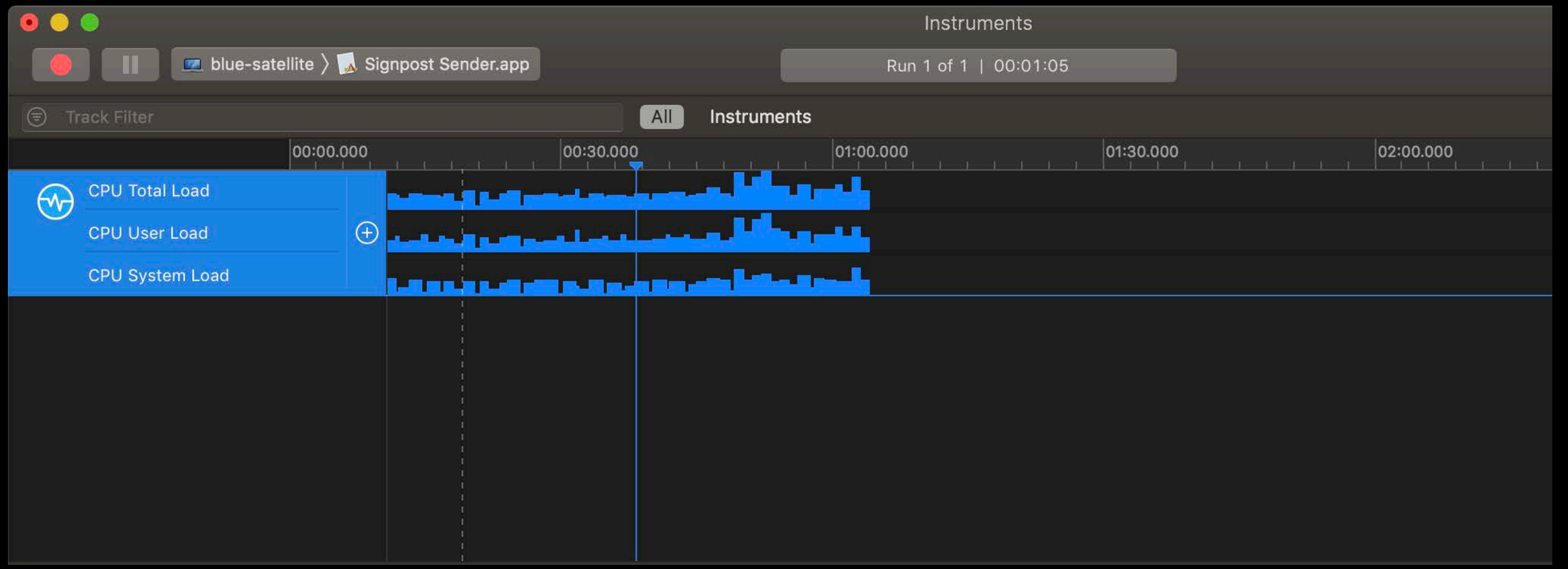
Graphs


Instruments
blue-satellite
Signpost Sender.app
Run 1 of 1 | 00:01:05
Track Filter
All
Instruments
00:00.000
00:10.000
00:20.000
00:30.000
00:40.000
CPU Total Load
CPU User Load
Track Settings
CPU
Memory
Disk
Network

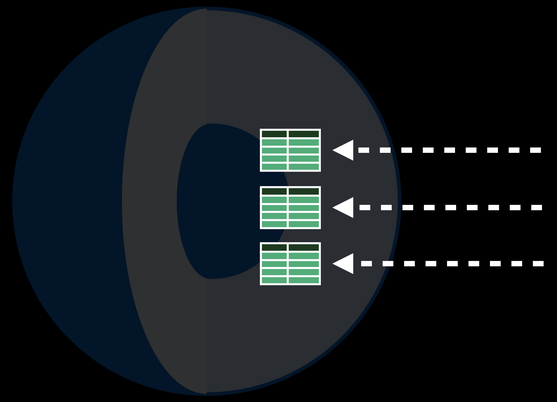
Graphs


Instruments
blue-satellite
Signpost Sender.app
Run 1 of 1 | 00:01:05
Track Filter
All
Instruments
00:00.000
00:10.000
00:20.000
00:30.000
00:40.000
Network Bytes In/Sec
Network Bytes Out/Sec
Track Settings
CPU
Memory
Disk
Network

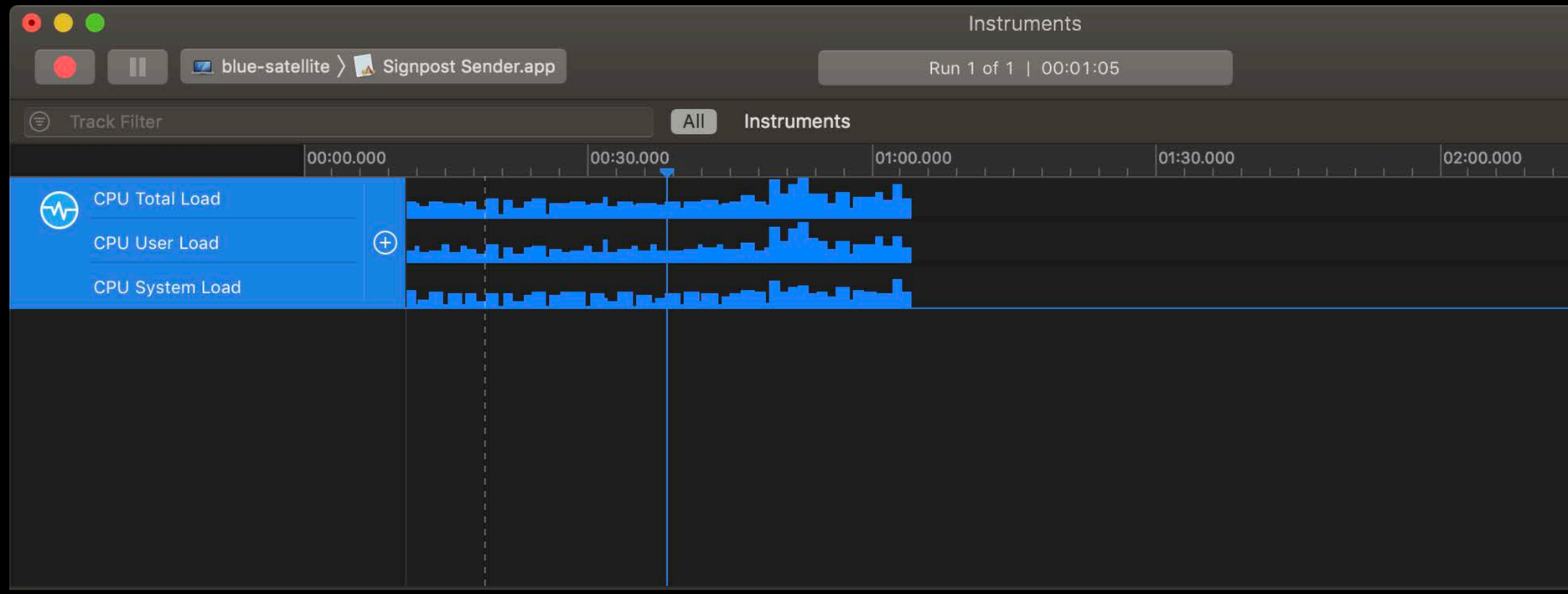
Graphs


Instruments
blue-satellite
Signpost Sender.app
Run 1 of 1 | 00:01:05
Track Filter
All
Instruments
00:00.000
00:30.000
01:00.000
01:30.000
02:00.000
CPU Total Load
CPU User Load
CPU System Load

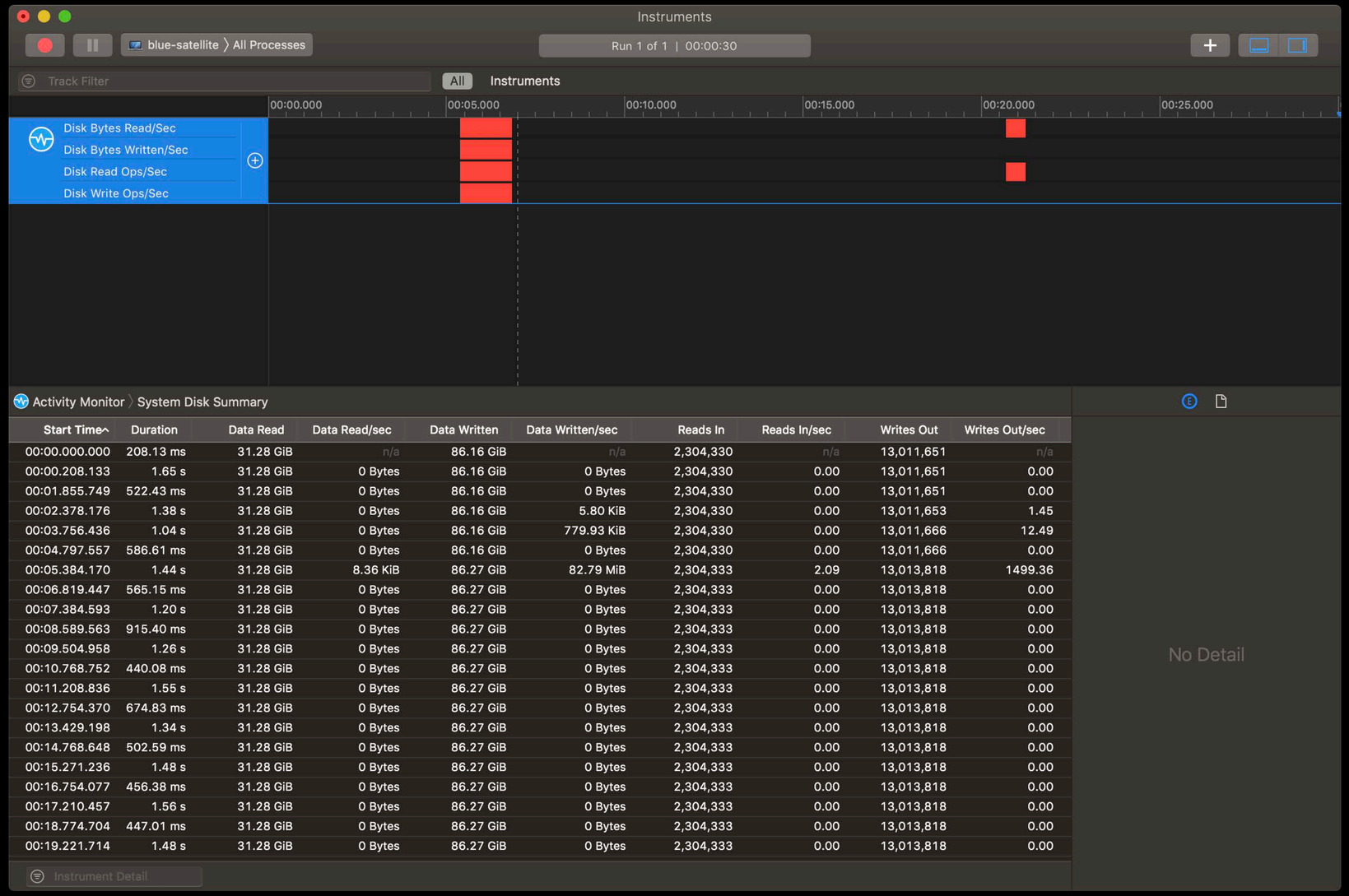
Graphs



Analysis Core

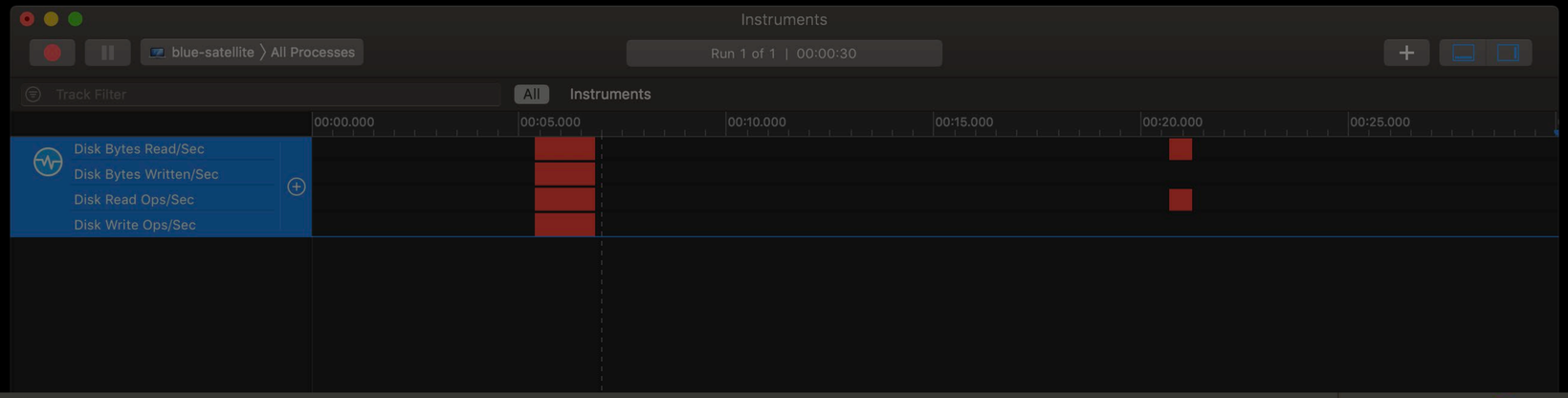


Detail Views



Start Time	Duration	Data Read	Data Read/sec	Data Written	Data Written/sec	Reads In	Reads In/sec	Writes Out	Writes Out/sec
00:00.000.000	208.13 ms	31.28 GiB	n/a	86.16 GiB	n/a	2,304,330	n/a	13,011,651	n/a
00:00.208.133	1.65 s	31.28 GiB	0 Bytes	86.16 GiB	0 Bytes	2,304,330	0.00	13,011,651	0.00
00:01.855.749	522.43 ms	31.28 GiB	0 Bytes	86.16 GiB	0 Bytes	2,304,330	0.00	13,011,651	0.00
00:02.378.176	1.38 s	31.28 GiB	0 Bytes	86.16 GiB	5.80 KiB	2,304,330	0.00	13,011,653	1.45
00:03.756.436	1.04 s	31.28 GiB	0 Bytes	86.16 GiB	779.93 KiB	2,304,330	0.00	13,011,666	12.49
00:04.797.557	586.61 ms	31.28 GiB	0 Bytes	86.16 GiB	0 Bytes	2,304,330	0.00	13,011,666	0.00
00:05.384.170	1.44 s	31.28 GiB	8.36 KiB	86.27 GiB	82.79 MiB	2,304,333	2.09	13,013,818	1499.36
00:06.819.447	565.15 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:07.384.593	1.20 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:08.589.563	915.40 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:09.504.958	1.26 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:10.768.752	440.08 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:11.208.836	1.55 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:12.754.370	674.83 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:13.429.198	1.34 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:14.768.648	502.59 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:15.271.236	1.48 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:16.754.077	456.38 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:17.210.457	1.56 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:18.774.704	447.01 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:19.221.714	1.48 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00

Detail Views



Activity Monitor 〉System Disk Summary

Start Time	Duration	Data Read	Data Read/sec	Data Written	Data Written/sec	Reads In	Reads In/sec	Writes Out	Writes Out/sec
00:00.000.000	208.13 ms	31.28 GiB	n/a	86.16 GiB	n/a	2,304,330	n/a	13,011,651	n/a
00:00.208.133	1.65 s	31.28 GiB	0 Bytes	86.16 GiB	0 Bytes	2,304,330	0.00	13,011,651	0.00
00:01.855.749	522.43 ms	31.28 GiB	0 Bytes	86.16 GiB	0 Bytes	2,304,330	0.00	13,011,651	0.00
00:02.378.176	1.38 s	31.28 GiB	0 Bytes	86.16 GiB	5.80 KiB	2,304,330	0.00	13,011,653	1.45
00:03.756.436	1.04 s	31.28 GiB	0 Bytes	86.16 GiB	779.93 KiB	2,304,330	0.00	13,011,666	12.49
00:04.797.557	586.61 ms	31.28 GiB	0 Bytes	86.16 GiB	0 Bytes	2,304,330	0.00	13,011,666	0.00
00:05.384.170	1.44 s	31.28 GiB	8.36 KiB	86.27 GiB	82.79 MiB	2,304,333	2.09	13,013,818	1499.36
00:06.819.447	565.15 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:07.384.593	1.20 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:08.589.563	915.40 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:09.504.958	1.26 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:10.768.752	440.08 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:11.208.836	1.55 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:12.754.370	674.83 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:13.429.198	1.34 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:14.768.648	502.59 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:15.271.236	1.48 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:16.754.077	456.38 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:17.210.457	1.56 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:18.774.704	447.01 ms	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00
00:19.221.714	1.48 s	31.28 GiB	0 Bytes	86.27 GiB	0 Bytes	2,304,333	0.00	13,013,818	0.00

Instrument Detail

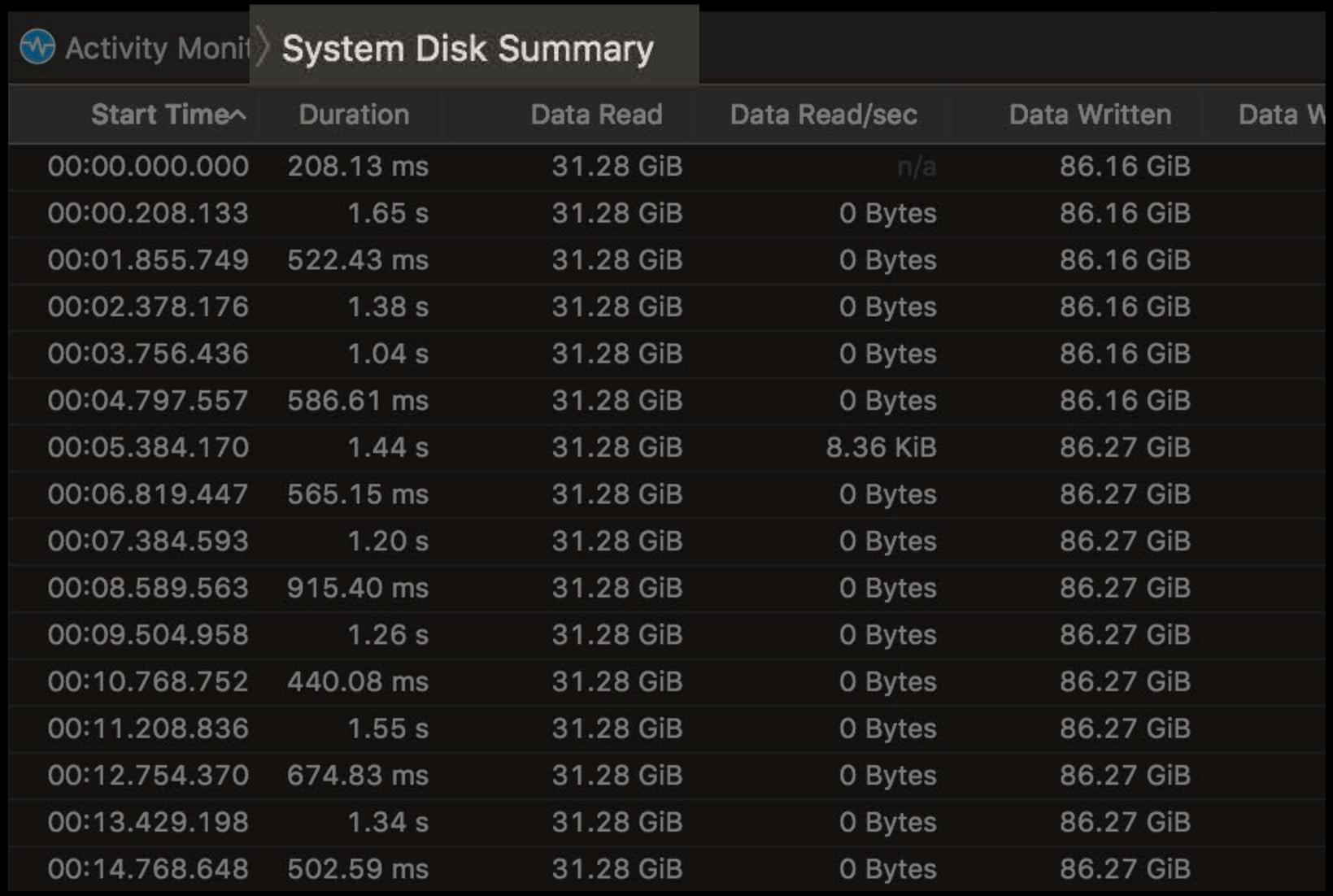
No Detail

Detail Views

Activity Monitor 〉 System Disk Summary

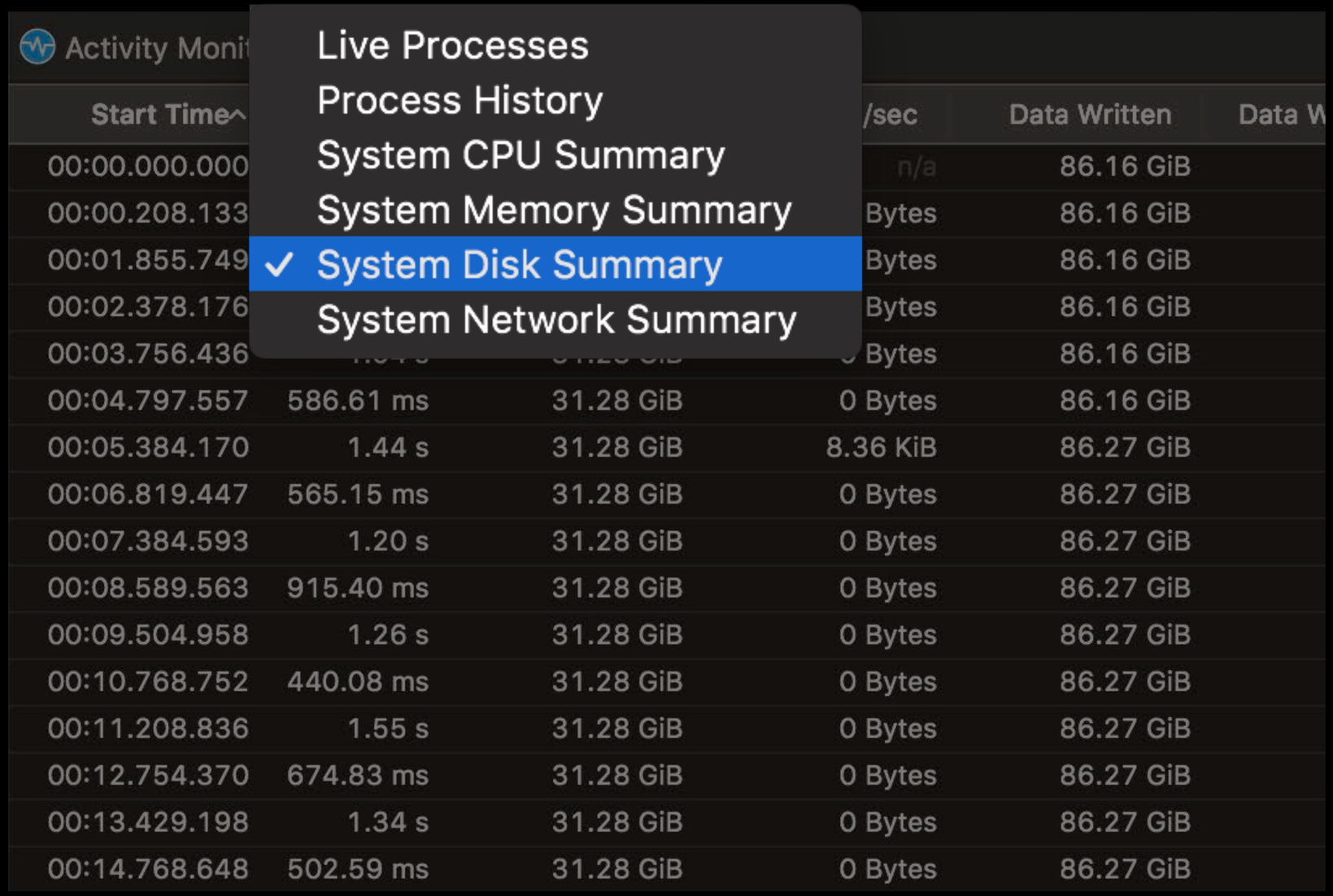
Start Time	Duration	Data Read	Data Read/sec	Data Written	Data W
00:00.000.000	208.13 ms	31.28 GiB	n/a	86.16 GiB	
00:00.208.133	1.65 s	31.28 GiB	0 Bytes	86.16 GiB	
00:01.855.749	522.43 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:02.378.176	1.38 s	31.28 GiB	0 Bytes	86.16 GiB	
00:03.756.436	1.04 s	31.28 GiB	0 Bytes	86.16 GiB	
00:04.797.557	586.61 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:05.384.170	1.44 s	31.28 GiB	8.36 KiB	86.27 GiB	
00:06.819.447	565.15 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:07.384.593	1.20 s	31.28 GiB	0 Bytes	86.27 GiB	
00:08.589.563	915.40 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:09.504.958	1.26 s	31.28 GiB	0 Bytes	86.27 GiB	
00:10.768.752	440.08 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:11.208.836	1.55 s	31.28 GiB	0 Bytes	86.27 GiB	
00:12.754.370	674.83 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:13.429.198	1.34 s	31.28 GiB	0 Bytes	86.27 GiB	
00:14.768.648	502.59 ms	31.28 GiB	0 Bytes	86.27 GiB	

Detail Views



Start Time	Duration	Data Read	Data Read/sec	Data Written	Data W
00:00.000.000	208.13 ms	31.28 GiB	n/a	86.16 GiB	
00:00.208.133	1.65 s	31.28 GiB	0 Bytes	86.16 GiB	
00:01.855.749	522.43 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:02.378.176	1.38 s	31.28 GiB	0 Bytes	86.16 GiB	
00:03.756.436	1.04 s	31.28 GiB	0 Bytes	86.16 GiB	
00:04.797.557	586.61 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:05.384.170	1.44 s	31.28 GiB	8.36 KiB	86.27 GiB	
00:06.819.447	565.15 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:07.384.593	1.20 s	31.28 GiB	0 Bytes	86.27 GiB	
00:08.589.563	915.40 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:09.504.958	1.26 s	31.28 GiB	0 Bytes	86.27 GiB	
00:10.768.752	440.08 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:11.208.836	1.55 s	31.28 GiB	0 Bytes	86.27 GiB	
00:12.754.370	674.83 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:13.429.198	1.34 s	31.28 GiB	0 Bytes	86.27 GiB	
00:14.768.648	502.59 ms	31.28 GiB	0 Bytes	86.27 GiB	

Detail Views

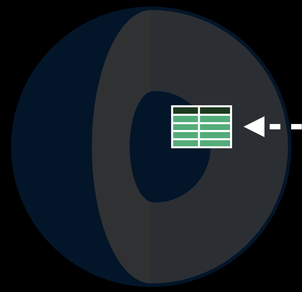


Detail Views

Activity Monitor 〉 System Disk Summary

Start Time	Duration	Data Read	Data Read/sec	Data Written	Data W
00:00.000.000	208.13 ms	31.28 GiB	n/a	86.16 GiB	
00:00.208.133	1.65 s	31.28 GiB	0 Bytes	86.16 GiB	
00:01.855.749	522.43 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:02.378.176	1.38 s	31.28 GiB	0 Bytes	86.16 GiB	
00:03.756.436	1.04 s	31.28 GiB	0 Bytes	86.16 GiB	
00:04.797.557	586.61 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:05.384.170	1.44 s	31.28 GiB	8.36 KiB	86.27 GiB	
00:06.819.447	565.15 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:07.384.593	1.20 s	31.28 GiB	0 Bytes	86.27 GiB	
00:08.589.563	915.40 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:09.504.958	1.26 s	31.28 GiB	0 Bytes	86.27 GiB	
00:10.768.752	440.08 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:11.208.836	1.55 s	31.28 GiB	0 Bytes	86.27 GiB	
00:12.754.370	674.83 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:13.429.198	1.34 s	31.28 GiB	0 Bytes	86.27 GiB	
00:14.768.648	502.59 ms	31.28 GiB	0 Bytes	86.27 GiB	

Detail Views

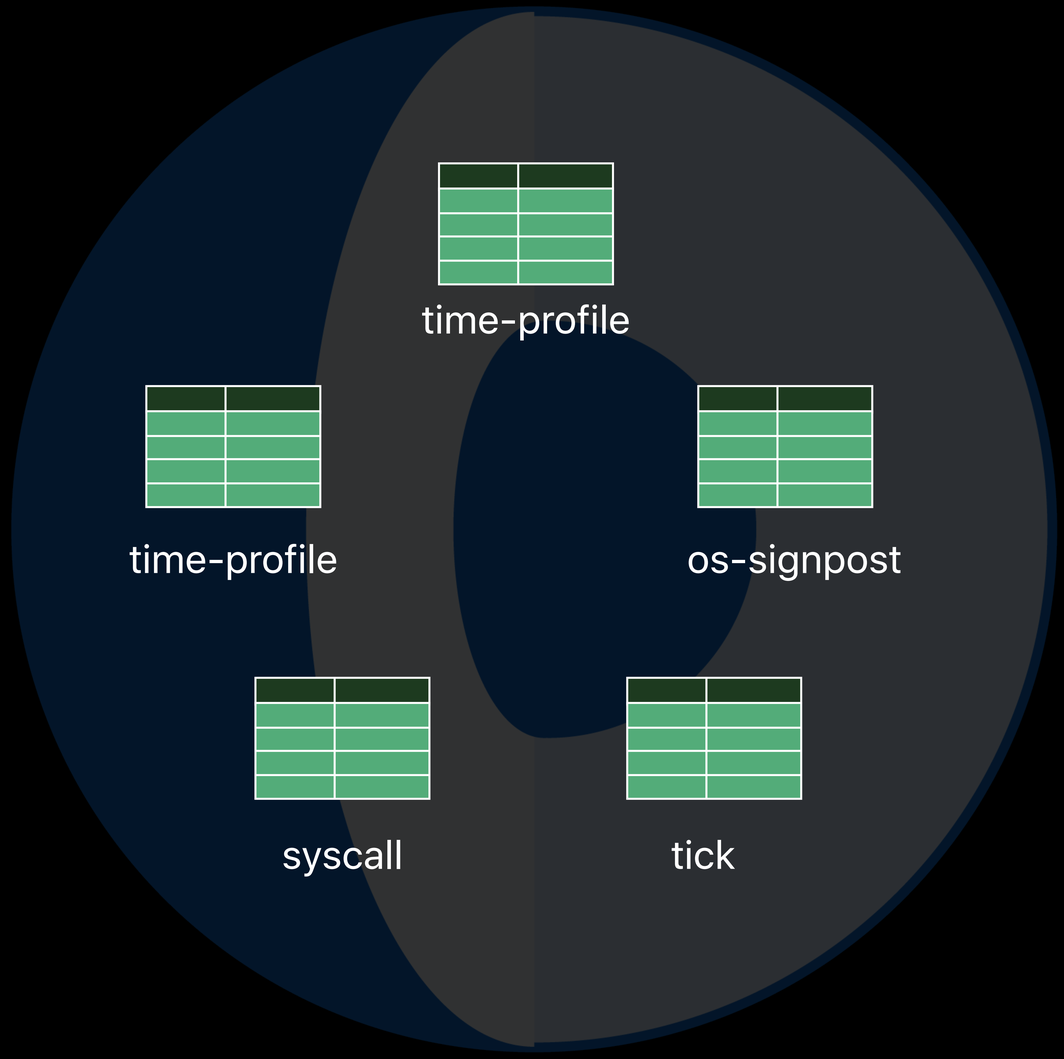


Analysis Core

Activity Monitor 〉 System Disk Summary

Start Time	Duration	Data Read	Data Read/sec	Data Written	Data W
00:00.000.000	208.13 ms	31.28 GiB	n/a	86.16 GiB	
00:00.208.133	1.65 s	31.28 GiB	0 Bytes	86.16 GiB	
00:01.855.749	522.43 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:02.378.176	1.38 s	31.28 GiB	0 Bytes	86.16 GiB	
00:03.756.436	1.04 s	31.28 GiB	0 Bytes	86.16 GiB	
00:04.797.557	586.61 ms	31.28 GiB	0 Bytes	86.16 GiB	
00:05.384.170	1.44 s	31.28 GiB	8.36 KiB	86.27 GiB	
00:06.819.447	565.15 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:07.384.593	1.20 s	31.28 GiB	0 Bytes	86.27 GiB	
00:08.589.563	915.40 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:09.504.958	1.26 s	31.28 GiB	0 Bytes	86.27 GiB	
00:10.768.752	440.08 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:11.208.836	1.55 s	31.28 GiB	0 Bytes	86.27 GiB	
00:12.754.370	674.83 ms	31.28 GiB	0 Bytes	86.27 GiB	
00:13.429.198	1.34 s	31.28 GiB	0 Bytes	86.27 GiB	
00:14.768.648	502.59 ms	31.28 GiB	0 Bytes	86.27 GiB	

Analysis Core

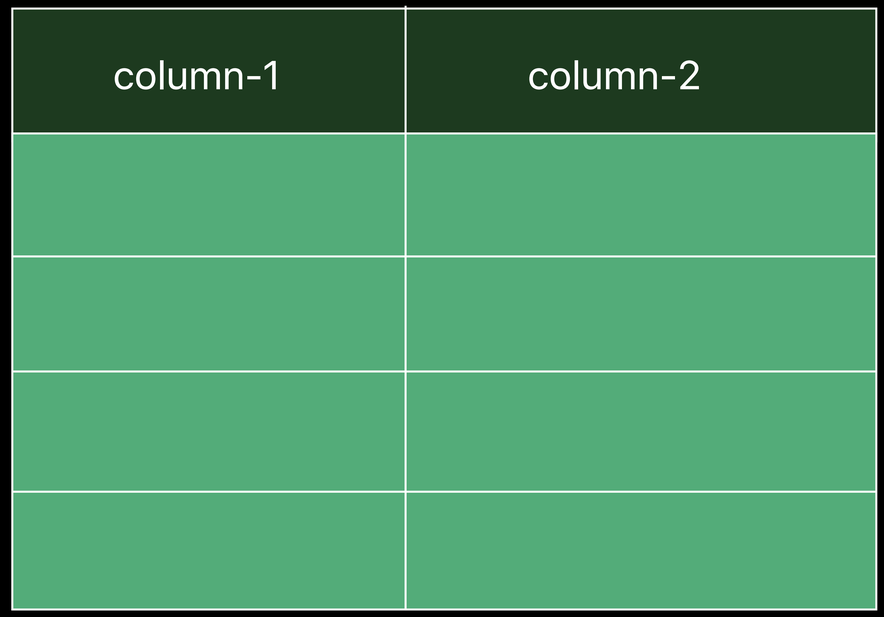


Tables

Tables

Schema

- Columns
- Types



schema

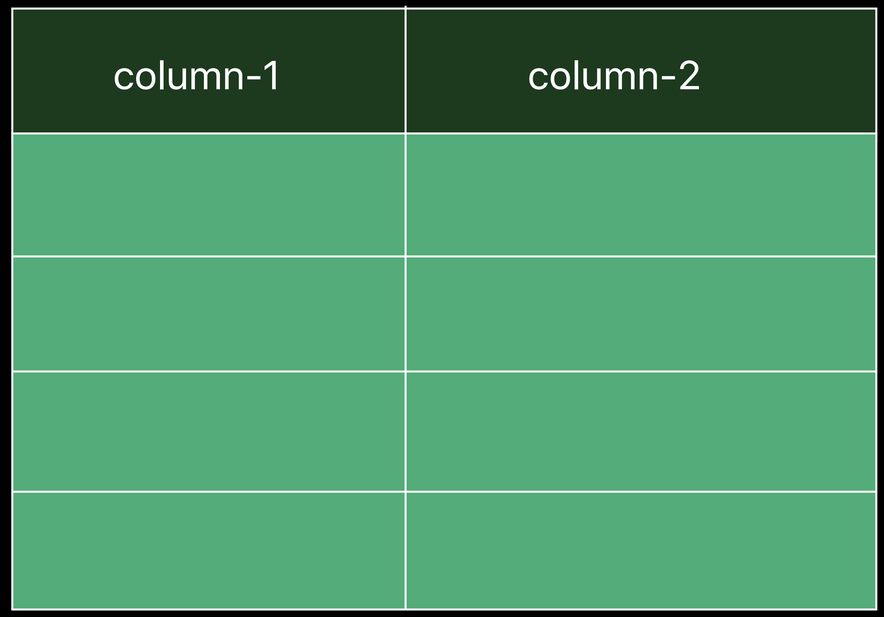
Tables

Schema

- Columns
- Types

Attributes

- Key/value
- Content



schema

{attribute=value,...}

Tick Schema

tick

Synthetic Clock Tick

Note: Used to provide modelers with a fixed reference in time for modeling per-tick statistics

Optional Attributes

frequency	`[1-9]+[0-9]*`	Frequency at which this tick data should be generated in this table

Columns

time

Title	Timestamp
Engineering Type	sample-time

*from the Instrument Inspector's "Schemas" tab

Tick Schema

tick

Synthetic Clock Tick

Note: Used to provide modelers with a fixed reference in time for modeling per-tick statistics

Optional Attributes

frequency	`[1-9]+[0-9]*`	Frequency at which this tick data should be generated in this table

Columns

time

Title	Timestamp
Engineering Type	sample-time

*from the Instrument Inspector's "Schemas" tab

Tick Schema

tick

Synthetic Clock Tick

Note: Used to provide modelers with a fixed reference in time for modeling per-tick statistics

Optional Attributes

frequency	`[1-9]+[0-9]*`	Frequency at which this tick data should be generated in this table

Columns

`time`

Title	Timestamp
Engineering Type	sample-time

*from the Instrument Inspector's "Schemas" tab

Why create custom instruments

Architecture

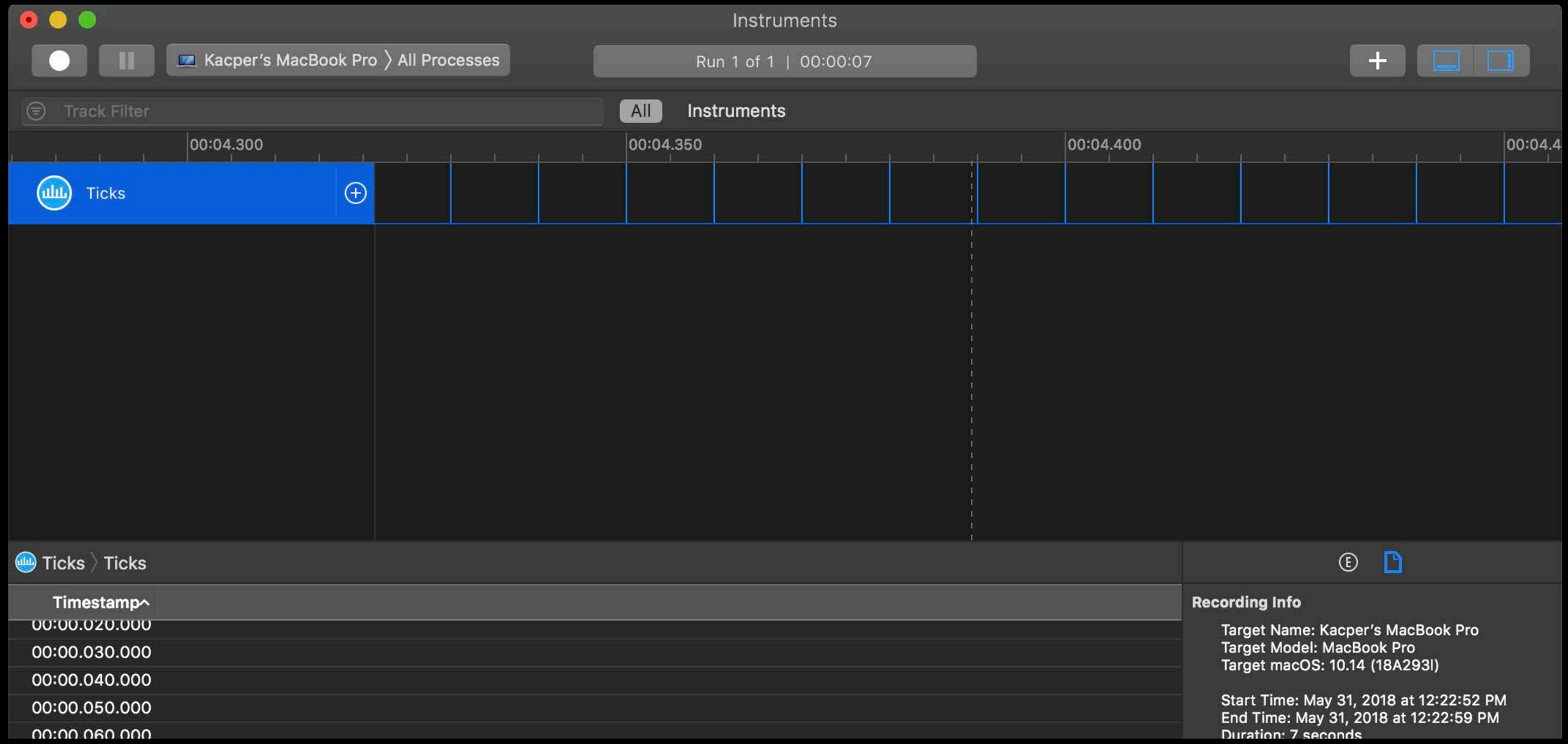
Getting started

Intermediate

Advanced

Best practices

Tick Instrument

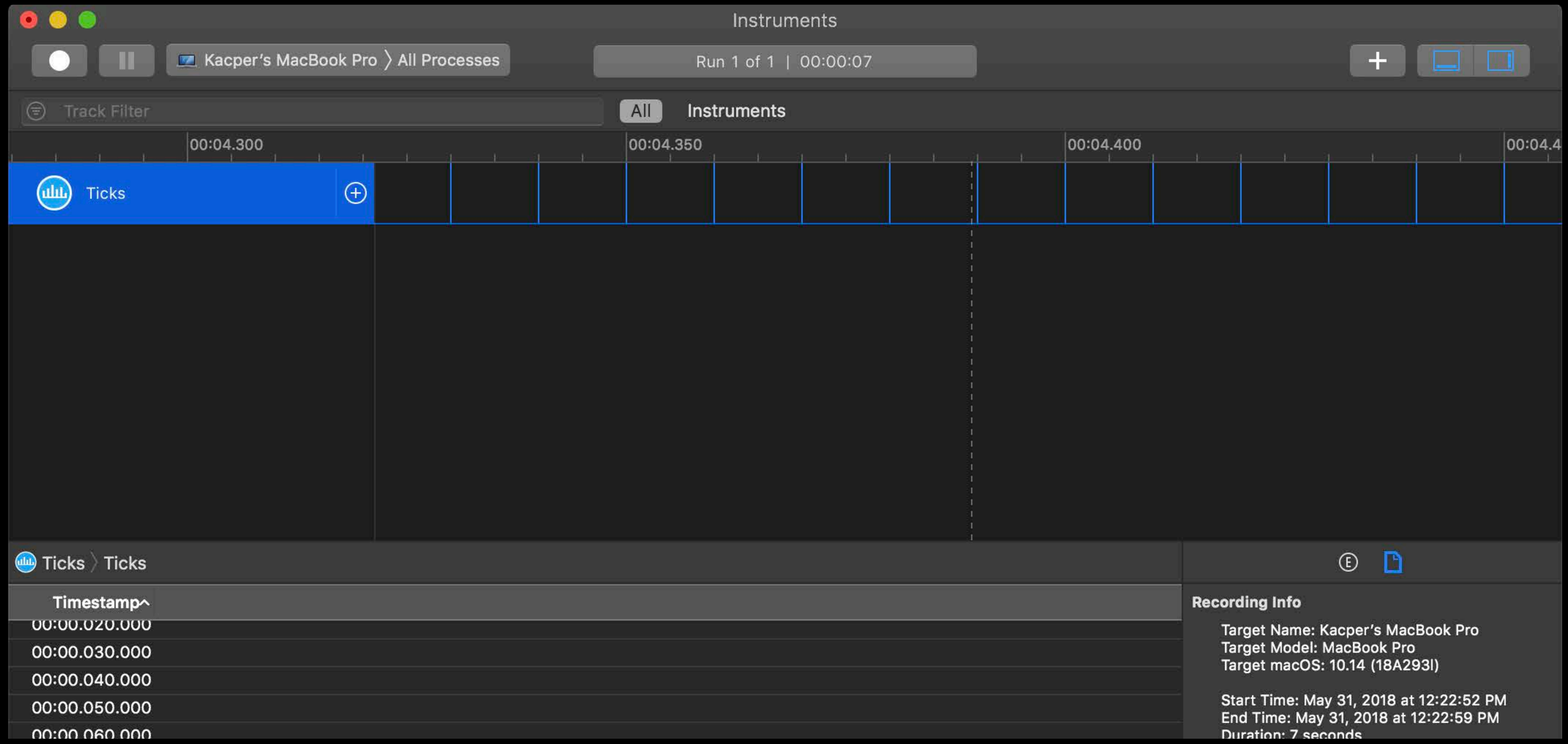


Demo

Getting started with custom instruments

Kacper Harasim, Performance Tools Engineer

Tick Instrument



Why create custom instruments

Architecture

Getting started

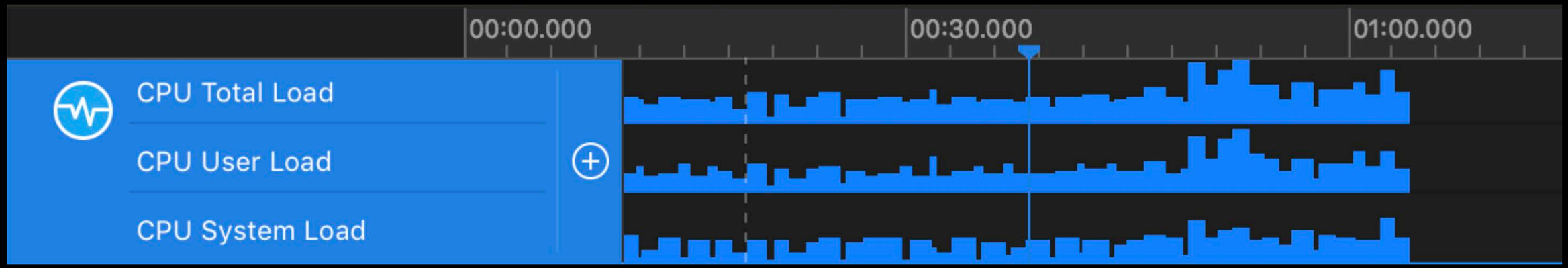
Intermediate

Advanced

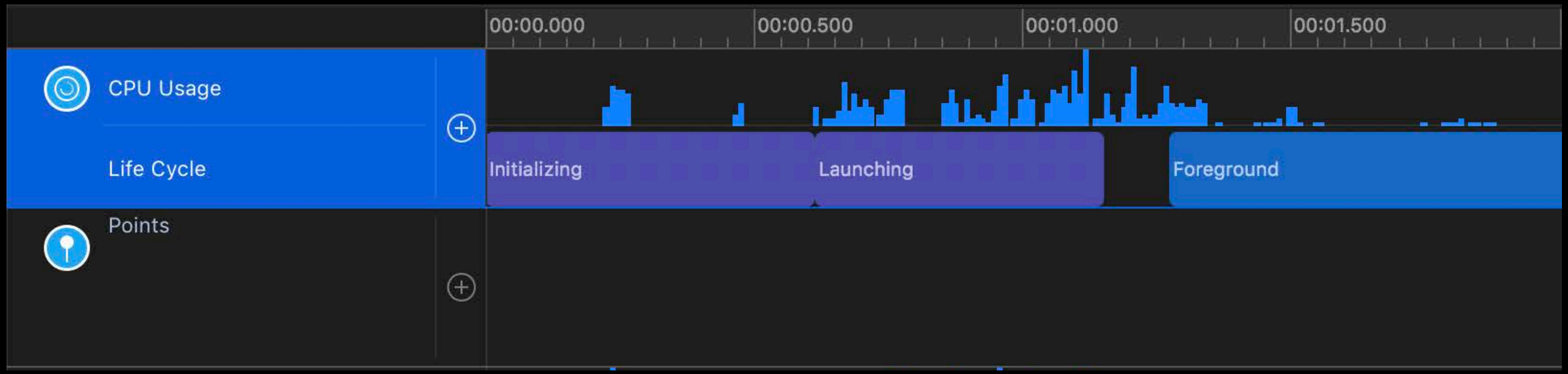
Best practices

Graph Lanes

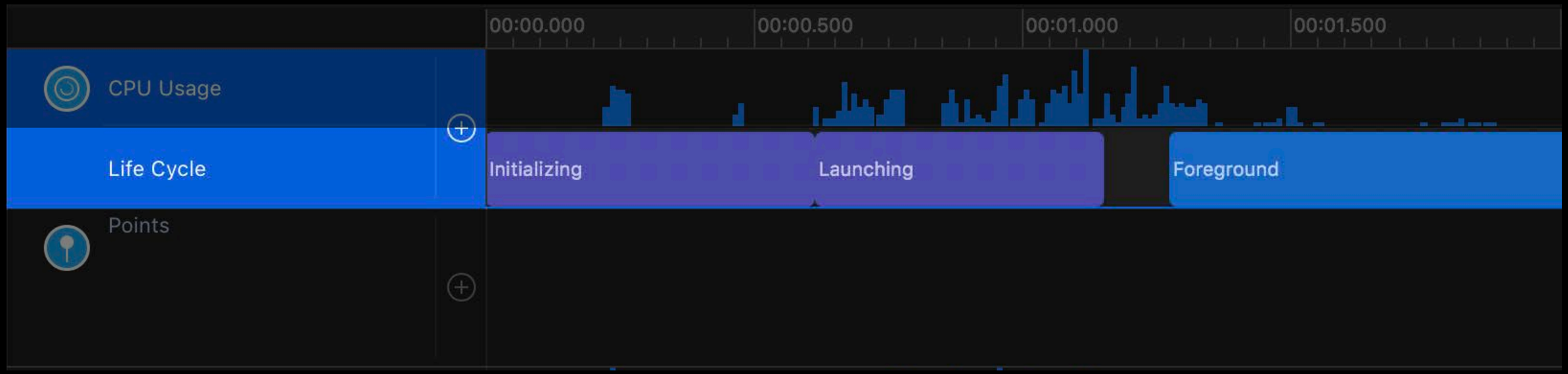
Plot


00:00.000
00:30.000
01:00.000
CPU Total Load
CPU User Load
CPU System Load

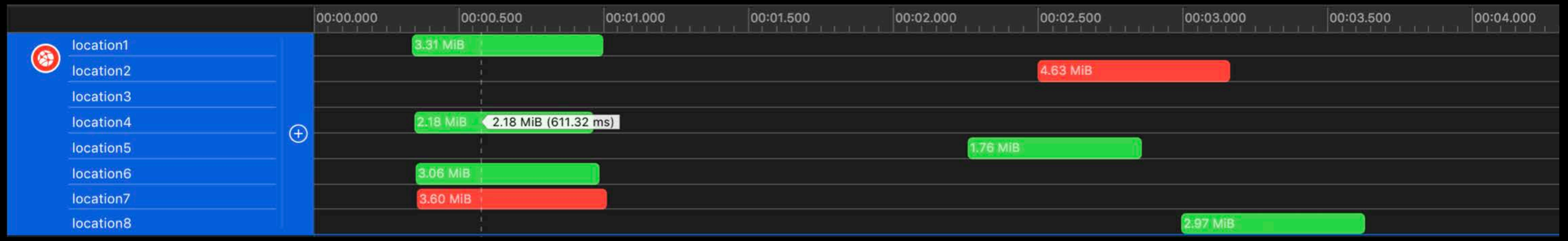
Automatic Treatment



Automatic Treatment



Plot Template



Histogram


User Interactive Load (10ms)
Context Switches
Virtual Memory Activity
System Calls Made

Details

Details

Details

List

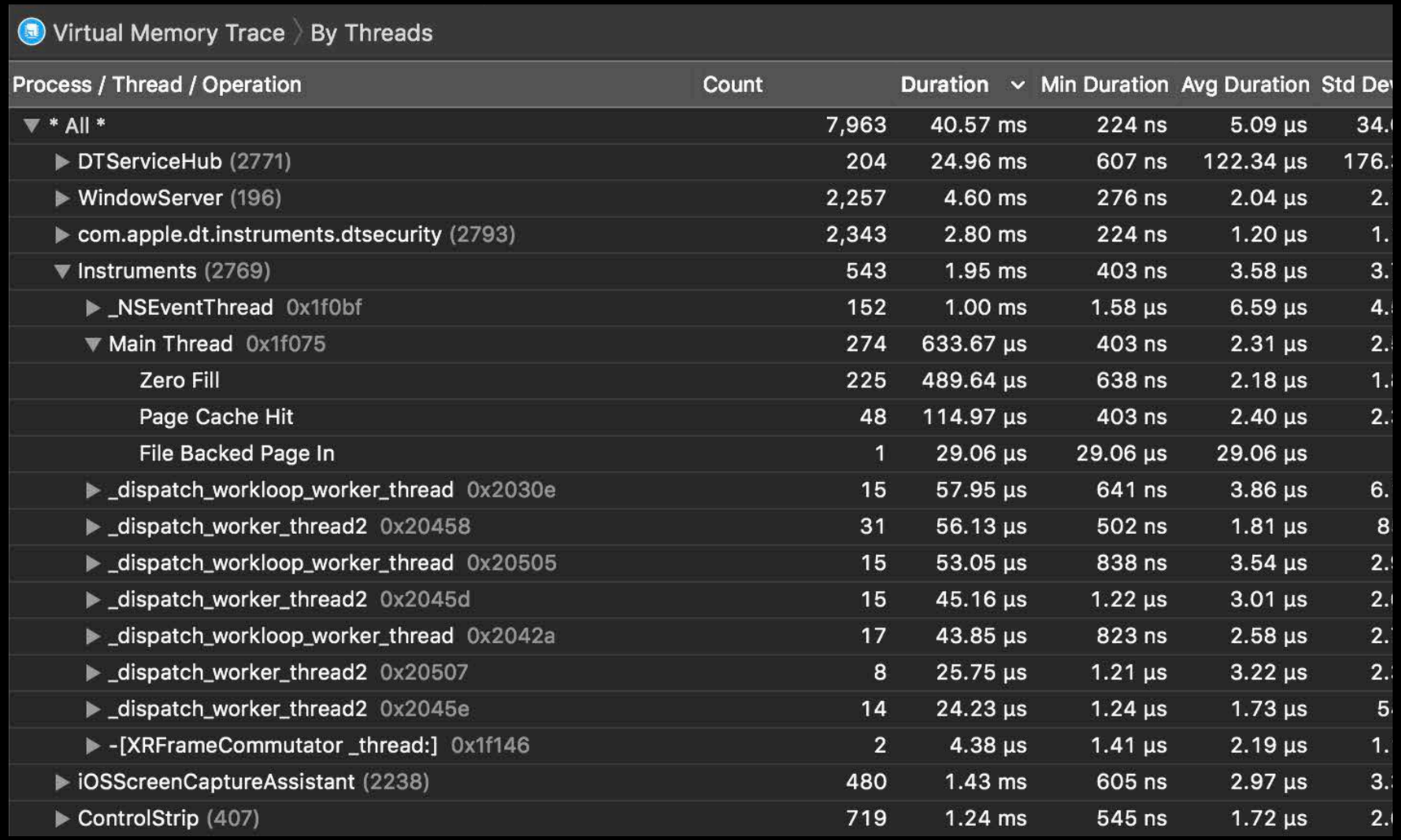
Trailblazer Networking 〉 List: Downloads

Start	Duration	Request status	Image Name
00:00.343.097	653.58 ms	Completed	location1
00:00.351.160	611.32 ms	Completed	location4
00:00.353.497	630.95 ms	Completed	location6
00:00.356.595	653.57 ms	Completed	location7
00:02.259.096	598.03 ms	Completed	location5
00:02.499.287	661.65 ms	Completed	location2
00:02.998.827	627.58 ms	Completed	location8
00:08.349.227	612.49 ms	Completed	location3

Details

List

Aggregation



Aggregation

Virtual Memory Trace 〉 By Threads

Process / Thread / Operation	Count	Duration	Min Duration	Avg Duration	Std De
▼ * All *	7,963	40.57 ms	224 ns	5.09 µs	34.
▶ DTServiceHub (2771)	204	24.96 ms	607 ns	122.34 µs	176.
▶ WindowServer (196)	2,257	4.60 ms	276 ns	2.04 µs	2.
▶ com.apple.dt.instruments.dtsecurity (2793)	2,343	2.80 ms	224 ns	1.20 µs	1.
▼ Instruments (2769)	543	1.95 ms	403 ns	3.58 µs	3.
▶ _NSEventThread 0x1f0bf	152	1.00 ms	1.58 µs	6.59 µs	4.
▼ Main Thread 0x1f075	274	633.67 µs	403 ns	2.31 µs	2.
Zero Fill	225	489.64 µs	638 ns	2.18 µs	1.
Page Cache Hit	48	114.97 µs	403 ns	2.40 µs	2.
File Backed Page In	1	29.06 µs	29.06 µs	29.06 µs	
▶ _dispatch_workloop_worker_thread 0x2030e	15	57.95 µs	641 ns	3.86 µs	6.
▶ _dispatch_worker_thread2 0x20458	31	56.13 µs	502 ns	1.81 µs	8
▶ _dispatch_workloop_worker_thread 0x20505	15	53.05 µs	838 ns	3.54 µs	2.
▶ _dispatch_worker_thread2 0x2045d	15	45.16 µs	1.22 µs	3.01 µs	2.
▶ _dispatch_workloop_worker_thread 0x2042a	17	43.85 µs	823 ns	2.58 µs	2.
▶ _dispatch_worker_thread2 0x20507	8	25.75 µs	1.21 µs	3.22 µs	2.
▶ _dispatch_worker_thread2 0x2045e	14	24.23 µs	1.24 µs	1.73 µs	5.
▶ -[XRFrameCommutator _thread:] 0x1f146	2	4.38 µs	1.41 µs	2.19 µs	1.
▶ iOSScreenCaptureAssistant (2238)	480	1.43 ms	605 ns	2.97 µs	3.
▶ ControlStrip (407)	719	1.24 ms	545 ns	1.72 µs	2.

Aggregation

Columns are functions

Virtual Memory Trace 〉 By Threads

Process / Thread / Operation	Count	Duration	Min Duration	Avg Duration	Std De
▼ * All *	7,963	40.57 ms	224 ns	5.09 µs	34.
▶ DTServiceHub (2771)	204	24.96 ms	607 ns	122.34 µs	176.
▶ WindowServer (196)	2,257	4.60 ms	276 ns	2.04 µs	2.
▶ com.apple.dt.instruments.dtsecurity (2793)	2,343	2.80 ms	224 ns	1.20 µs	1.
▼ Instruments (2769)	543	1.95 ms	403 ns	3.58 µs	3.
▶ _NSEventThread 0x1f0bf	152	1.00 ms	1.58 µs	6.59 µs	4.
▼ Main Thread 0x1f075	274	633.67 µs	403 ns	2.31 µs	2.
Zero Fill	225	489.64 µs	638 ns	2.18 µs	1.
Page Cache Hit	48	114.97 µs	403 ns	2.40 µs	2.
File Backed Page In	1	29.06 µs	29.06 µs	29.06 µs	
▶ _dispatch_workloop_worker_thread 0x2030e	15	57.95 µs	641 ns	3.86 µs	6.
▶ _dispatch_worker_thread2 0x20458	31	56.13 µs	502 ns	1.81 µs	8
▶ _dispatch_workloop_worker_thread 0x20505	15	53.05 µs	838 ns	3.54 µs	2.
▶ _dispatch_worker_thread2 0x2045d	15	45.16 µs	1.22 µs	3.01 µs	2.
▶ _dispatch_workloop_worker_thread 0x2042a	17	43.85 µs	823 ns	2.58 µs	2.
▶ _dispatch_worker_thread2 0x20507	8	25.75 µs	1.21 µs	3.22 µs	2.
▶ _dispatch_worker_thread2 0x2045e	14	24.23 µs	1.24 µs	1.73 µs	5.
▶ -[XRFrameCommutator _thread:] 0x1f146	2	4.38 µs	1.41 µs	2.19 µs	1.
▶ iOSScreenCaptureAssistant (2238)	480	1.43 ms	605 ns	2.97 µs	3.
▶ ControlStrip (407)	719	1.24 ms	545 ns	1.72 µs	2.

Aggregation

Columns are functions

- sum

Virtual Memory Trace 〉 By Threads

Process / Thread / Operation	Count	Duration	Min Duration	Avg Duration	Std De
▼ * All *	7,963	40.57 ms	224 ns	5.09 µs	34.
▶ DTServiceHub (2771)	204	24.96 ms	607 ns	122.34 µs	176.
▶ WindowServer (196)	2,257	4.60 ms	276 ns	2.04 µs	2.
▶ com.apple.dt.instruments.dtsecurity (2793)	2,343	2.80 ms	224 ns	1.20 µs	1.
▼ Instruments (2769)	543	1.95 ms	403 ns	3.58 µs	3.
▶ _NSEventThread 0x1f0bf	152	1.00 ms	1.58 µs	6.59 µs	4.
▼ Main Thread 0x1f075	274	633.67 µs	403 ns	2.31 µs	2.
Zero Fill	225	489.64 µs	638 ns	2.18 µs	1.
Page Cache Hit	48	114.97 µs	403 ns	2.40 µs	2.
File Backed Page In	1	29.06 µs	29.06 µs	29.06 µs	
▶ _dispatch_workloop_worker_thread 0x2030e	15	57.95 µs	641 ns	3.86 µs	6.
▶ _dispatch_worker_thread2 0x20458	31	56.13 µs	502 ns	1.81 µs	8
▶ _dispatch_workloop_worker_thread 0x20505	15	53.05 µs	838 ns	3.54 µs	2.
▶ _dispatch_worker_thread2 0x2045d	15	45.16 µs	1.22 µs	3.01 µs	2.
▶ _dispatch_workloop_worker_thread 0x2042a	17	43.85 µs	823 ns	2.58 µs	2.
▶ _dispatch_worker_thread2 0x20507	8	25.75 µs	1.21 µs	3.22 µs	2.
▶ _dispatch_worker_thread2 0x2045e	14	24.23 µs	1.24 µs	1.73 µs	5.
▶ -[XRFrameCommutator _thread:] 0x1f146	2	4.38 µs	1.41 µs	2.19 µs	1.
▶ iOSScreenCaptureAssistant (2238)	480	1.43 ms	605 ns	2.97 µs	3.
▶ ControlStrip (407)	719	1.24 ms	545 ns	1.72 µs	2.

Aggregation

Columns are functions

- sum
- average

Virtual Memory Trace 〉 By Threads

Process / Thread / Operation	Count	Duration	Min Duration	Avg Duration	Std De
▼ * All *	7,963	40.57 ms	224 ns	5.09 µs	34.
▶ DTServiceHub (2771)	204	24.96 ms	607 ns	122.34 µs	176.
▶ WindowServer (196)	2,257	4.60 ms	276 ns	2.04 µs	2.
▶ com.apple.dt.instruments.dtsecurity (2793)	2,343	2.80 ms	224 ns	1.20 µs	1.
▼ Instruments (2769)	543	1.95 ms	403 ns	3.58 µs	3.
▶ _NSEventThread 0x1f0bf	152	1.00 ms	1.58 µs	6.59 µs	4.
▼ Main Thread 0x1f075	274	633.67 µs	403 ns	2.31 µs	2.
Zero Fill	225	489.64 µs	638 ns	2.18 µs	1.
Page Cache Hit	48	114.97 µs	403 ns	2.40 µs	2.
File Backed Page In	1	29.06 µs	29.06 µs	29.06 µs	
▶ _dispatch_workloop_worker_thread 0x2030e	15	57.95 µs	641 ns	3.86 µs	6.
▶ _dispatch_worker_thread2 0x20458	31	56.13 µs	502 ns	1.81 µs	8
▶ _dispatch_workloop_worker_thread 0x20505	15	53.05 µs	838 ns	3.54 µs	2.
▶ _dispatch_worker_thread2 0x2045d	15	45.16 µs	1.22 µs	3.01 µs	2.
▶ _dispatch_workloop_worker_thread 0x2042a	17	43.85 µs	823 ns	2.58 µs	2.
▶ _dispatch_worker_thread2 0x20507	8	25.75 µs	1.21 µs	3.22 µs	2.
▶ _dispatch_worker_thread2 0x2045e	14	24.23 µs	1.24 µs	1.73 µs	5.
▶ -[XRFrameCommutator _thread:] 0x1f146	2	4.38 µs	1.41 µs	2.19 µs	1.
▶ iOSScreenCaptureAssistant (2238)	480	1.43 ms	605 ns	2.97 µs	3.
▶ ControlStrip (407)	719	1.24 ms	545 ns	1.72 µs	2.

Aggregation

Columns are functions

- sum
- average
- count

Virtual Memory Trace 〉 By Threads

Process / Thread / Operation	Count	Duration	Min Duration	Avg Duration	Std De
▼ * All *	7,963	40.57 ms	224 ns	5.09 µs	34.
▶ DTServiceHub (2771)	204	24.96 ms	607 ns	122.34 µs	176.
▶ WindowServer (196)	2,257	4.60 ms	276 ns	2.04 µs	2.
▶ com.apple.dt.instruments.dtsecurity (2793)	2,343	2.80 ms	224 ns	1.20 µs	1.
▼ Instruments (2769)	543	1.95 ms	403 ns	3.58 µs	3.
▶ _NSEventThread 0x1f0bf	152	1.00 ms	1.58 µs	6.59 µs	4.
▼ Main Thread 0x1f075	274	633.67 µs	403 ns	2.31 µs	2.
Zero Fill	225	489.64 µs	638 ns	2.18 µs	1.
Page Cache Hit	48	114.97 µs	403 ns	2.40 µs	2.
File Backed Page In	1	29.06 µs	29.06 µs	29.06 µs	
▶ _dispatch_workloop_worker_thread 0x2030e	15	57.95 µs	641 ns	3.86 µs	6.
▶ _dispatch_worker_thread2 0x20458	31	56.13 µs	502 ns	1.81 µs	8
▶ _dispatch_workloop_worker_thread 0x20505	15	53.05 µs	838 ns	3.54 µs	2.
▶ _dispatch_worker_thread2 0x2045d	15	45.16 µs	1.22 µs	3.01 µs	2.
▶ _dispatch_workloop_worker_thread 0x2042a	17	43.85 µs	823 ns	2.58 µs	2.
▶ _dispatch_worker_thread2 0x20507	8	25.75 µs	1.21 µs	3.22 µs	2.
▶ _dispatch_worker_thread2 0x2045e	14	24.23 µs	1.24 µs	1.73 µs	5.
▶ -[XRFrameCommutator _thread:] 0x1f146	2	4.38 µs	1.41 µs	2.19 µs	1.
▶ iOSScreenCaptureAssistant (2238)	480	1.43 ms	605 ns	2.97 µs	3.
▶ ControlStrip (407)	719	1.24 ms	545 ns	1.72 µs	2.

Aggregation

Columns are functions

- sum
- average
- count
- More...

Virtual Memory Trace 〉 By Threads

Process / Thread / Operation	Count	Duration	Min Duration	Avg Duration	Std De
▼ * All *	7,963	40.57 ms	224 ns	5.09 µs	34.
▶ DTServiceHub (2771)	204	24.96 ms	607 ns	122.34 µs	176.
▶ WindowServer (196)	2,257	4.60 ms	276 ns	2.04 µs	2.
▶ com.apple.dt.instruments.dtsecurity (2793)	2,343	2.80 ms	224 ns	1.20 µs	1.
▼ Instruments (2769)	543	1.95 ms	403 ns	3.58 µs	3.
▶ _NSEventThread 0x1f0bf	152	1.00 ms	1.58 µs	6.59 µs	4.
▼ Main Thread 0x1f075	274	633.67 µs	403 ns	2.31 µs	2.
Zero Fill	225	489.64 µs	638 ns	2.18 µs	1.
Page Cache Hit	48	114.97 µs	403 ns	2.40 µs	2.
File Backed Page In	1	29.06 µs	29.06 µs	29.06 µs	
▶ _dispatch_workloop_worker_thread 0x2030e	15	57.95 µs	641 ns	3.86 µs	6.
▶ _dispatch_worker_thread2 0x20458	31	56.13 µs	502 ns	1.81 µs	8
▶ _dispatch_workloop_worker_thread 0x20505	15	53.05 µs	838 ns	3.54 µs	2.
▶ _dispatch_worker_thread2 0x2045d	15	45.16 µs	1.22 µs	3.01 µs	2.
▶ _dispatch_workloop_worker_thread 0x2042a	17	43.85 µs	823 ns	2.58 µs	2.
▶ _dispatch_worker_thread2 0x20507	8	25.75 µs	1.21 µs	3.22 µs	2.
▶ _dispatch_worker_thread2 0x2045e	14	24.23 µs	1.24 µs	1.73 µs	5.
▶ -[XRFrameCommutator _thread:] 0x1f146	2	4.38 µs	1.41 µs	2.19 µs	1.
▶ iOSScreenCaptureAssistant (2238)	480	1.43 ms	605 ns	2.97 µs	3.
▶ ControlStrip (407)	719	1.24 ms	545 ns	1.72 µs	2.

Aggregation

Columns are functions

- sum
- average
- count
- More...

Hierarchy

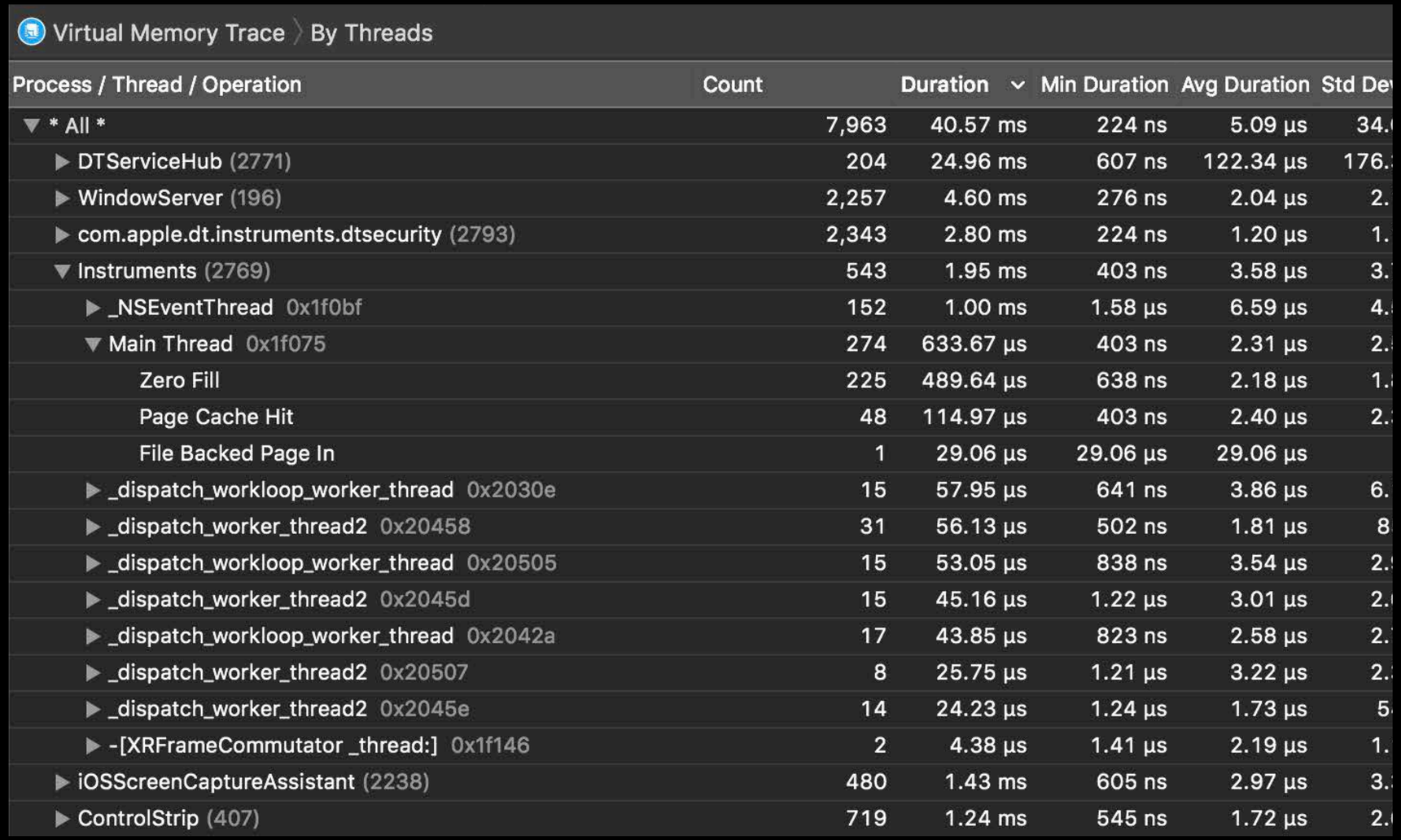
Virtual Memory Trace 〉 By Threads

Process / Thread / Operation	Count	Duration	Min Duration	Avg Duration	Std De
▼ * All *	7,963	40.57 ms	224 ns	5.09 µs	34.
▶ DTServiceHub (2771)	204	24.96 ms	607 ns	122.34 µs	176.
▶ WindowServer (196)	2,257	4.60 ms	276 ns	2.04 µs	2.
▶ com.apple.dt.instruments.dtsecurity (2793)	2,343	2.80 ms	224 ns	1.20 µs	1.
▼ Instruments (2769)	543	1.95 ms	403 ns	3.58 µs	3.
▶ _NSEventThread 0x1f0bf	152	1.00 ms	1.58 µs	6.59 µs	4.
▼ Main Thread 0x1f075	274	633.67 µs	403 ns	2.31 µs	2.
Zero Fill	225	489.64 µs	638 ns	2.18 µs	1.
Page Cache Hit	48	114.97 µs	403 ns	2.40 µs	2.
File Backed Page In	1	29.06 µs	29.06 µs	29.06 µs	
▶ _dispatch_workloop_worker_thread 0x2030e	15	57.95 µs	641 ns	3.86 µs	6.
▶ _dispatch_worker_thread2 0x20458	31	56.13 µs	502 ns	1.81 µs	8
▶ _dispatch_workloop_worker_thread 0x20505	15	53.05 µs	838 ns	3.54 µs	2.
▶ _dispatch_worker_thread2 0x2045d	15	45.16 µs	1.22 µs	3.01 µs	2.
▶ _dispatch_workloop_worker_thread 0x2042a	17	43.85 µs	823 ns	2.58 µs	2.
▶ _dispatch_worker_thread2 0x20507	8	25.75 µs	1.21 µs	3.22 µs	2.
▶ _dispatch_worker_thread2 0x2045e	14	24.23 µs	1.24 µs	1.73 µs	5.
▶ -[XRFrameCommutator _thread:] 0x1f146	2	4.38 µs	1.41 µs	2.19 µs	1.
▶ iOSScreenCaptureAssistant (2238)	480	1.43 ms	605 ns	2.97 µs	3.
▶ ControlStrip (407)	719	1.24 ms	545 ns	1.72 µs	2.

Details

List

Aggregation

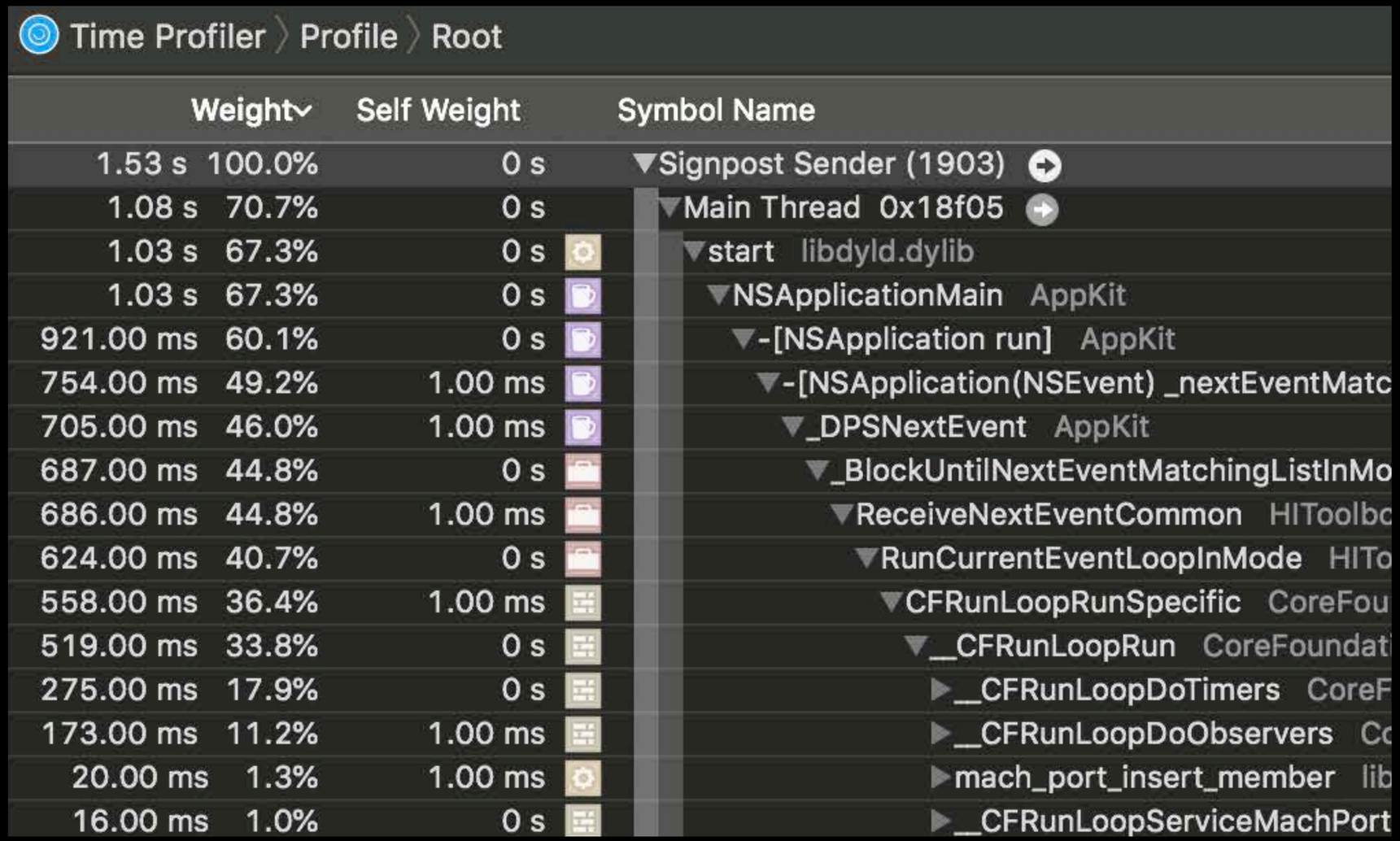


Details

List

Aggregation

Call Tree



Details

- List
- Aggregation
- Call Tree
- Narrative

Main Thread 0x1f075 〉 Narrative

Timestamp	Narrative
00:00.007.645	Called "mach_port_extract_member_trap()" for 1.27 µs
00:00.007.656	Called "mk_timer_arm()" for 826 ns
00:00.007.693	Called "mach_msg_trap()" for 845 ns
00:00.007.700	Called "mach_port_insert_member_trap()" for 2.00 µs
00:00.007.704	Called "mach_msg_trap()" for 8.64 ms
00:00.007.705	Blocked for 8.63 ms (99.9% of mach_msg_trap's duration) starting at priority 0
00:00.016.339	The thread was made runnable by Instruments (pid: 2769, tid: 0x1f0bf) running on CPU 4. It waited for an
00:00.016.341	Ran for 30.41 µs on CPU 6 at priority 47
00:00.016.353	Called "mach_port_extract_member_trap()" for 1.15 µs
00:00.016.359	Called "bsdthread_ctl()" for 888 ns
00:00.016.368	Called "bsdthread_ctl()" for 895 ns
00:00.016.372	Interrupted for 220 ns while CPU 6 serviced an interrupt handler.
00:00.016.372	Ran for 24.35 µs on CPU 6 at priority 47
00:00.016.374	Called "bsdthread_ctl()" for 459 ns
00:00.016.391	Called "psynch_mutexwait()" for 17.05 µs
00:00.016.396	Blocked for 1.88 µs (11.0% of psynch_mutexwait's duration) starting at priority 47
00:00.016.398	The thread was made runnable by Instruments (pid: 2769, tid: 0x1f0bf) running on CPU 4. It waited for an
00:00.016.403	Ran for 369.32 µs on CPU 6 at priority 47

Details

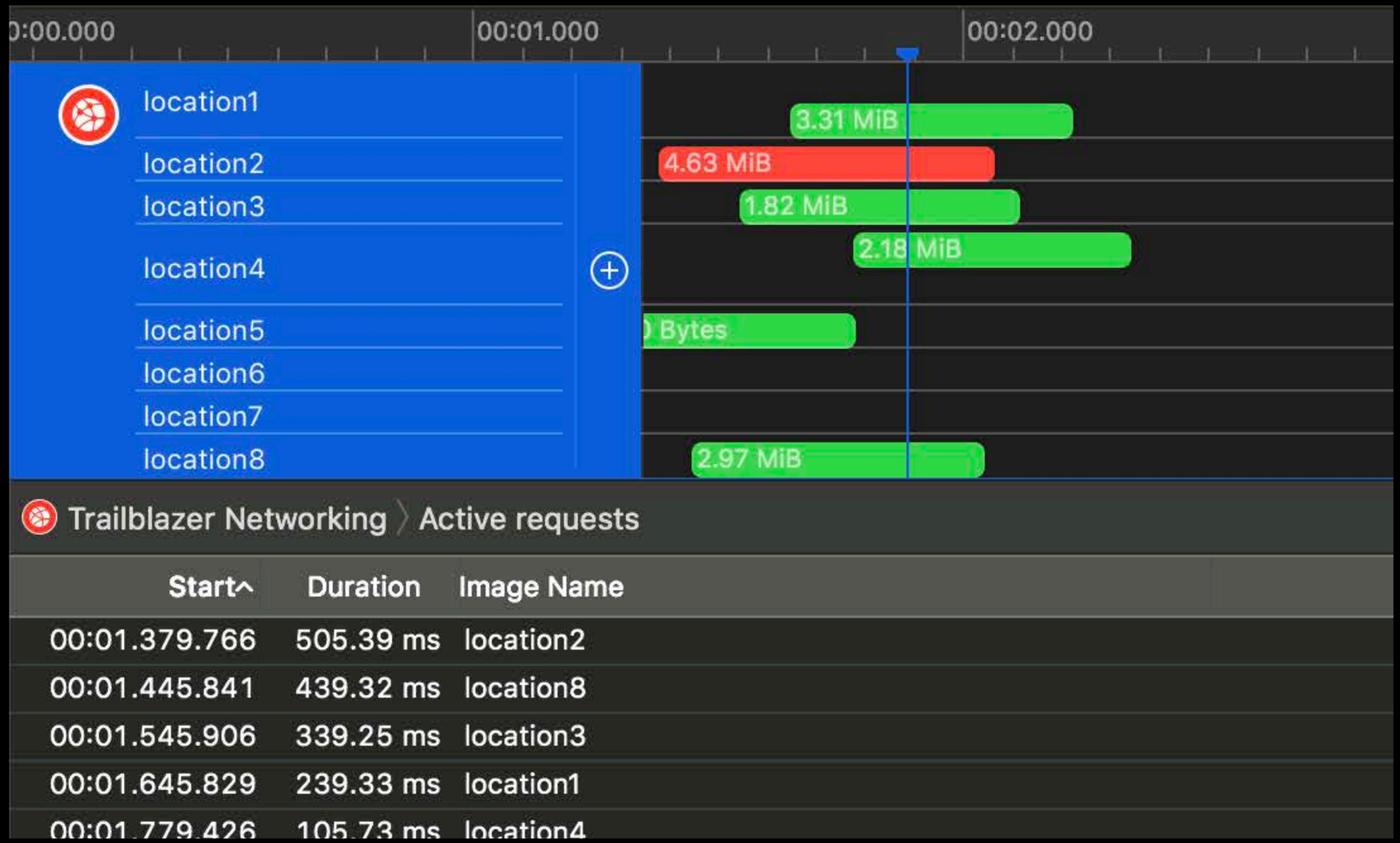
List

Aggregation

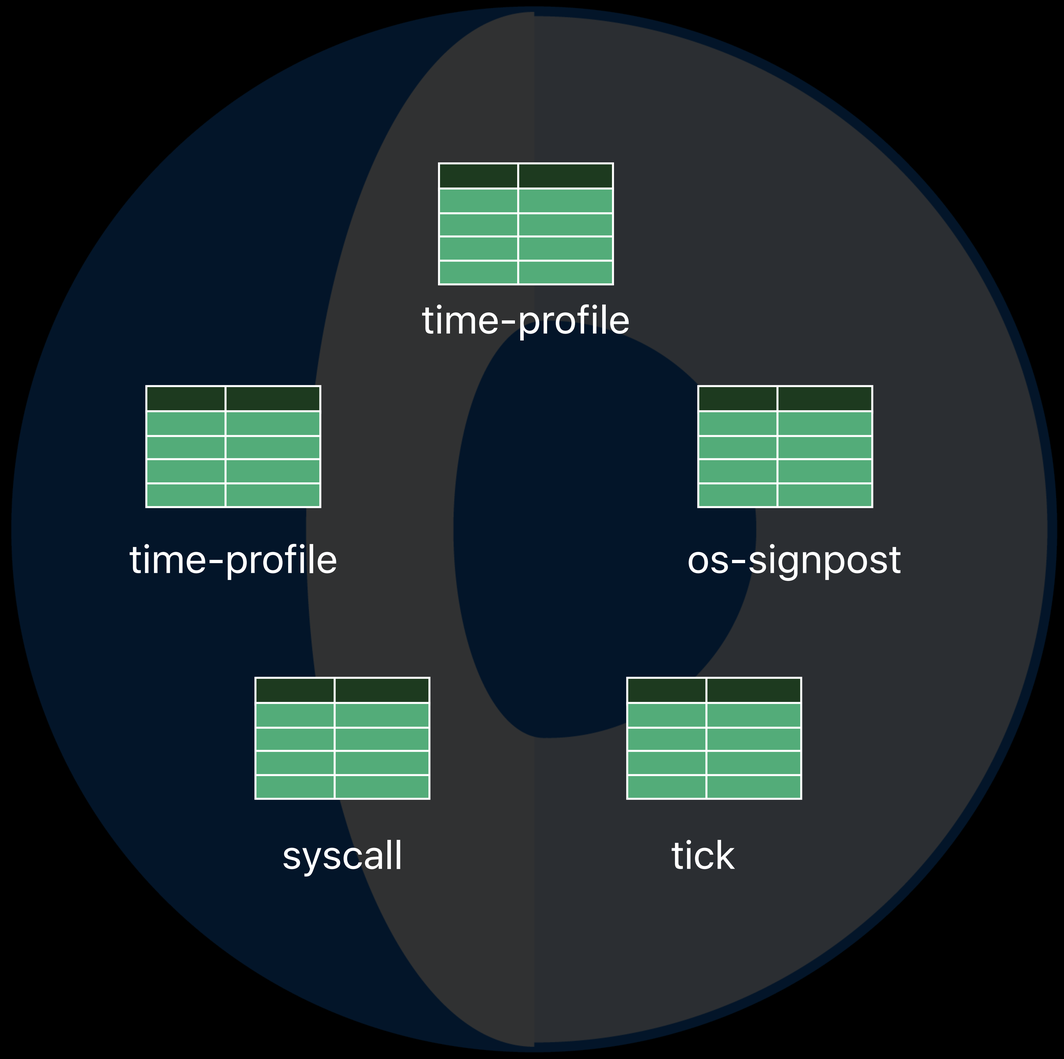
Call Tree

Narrative

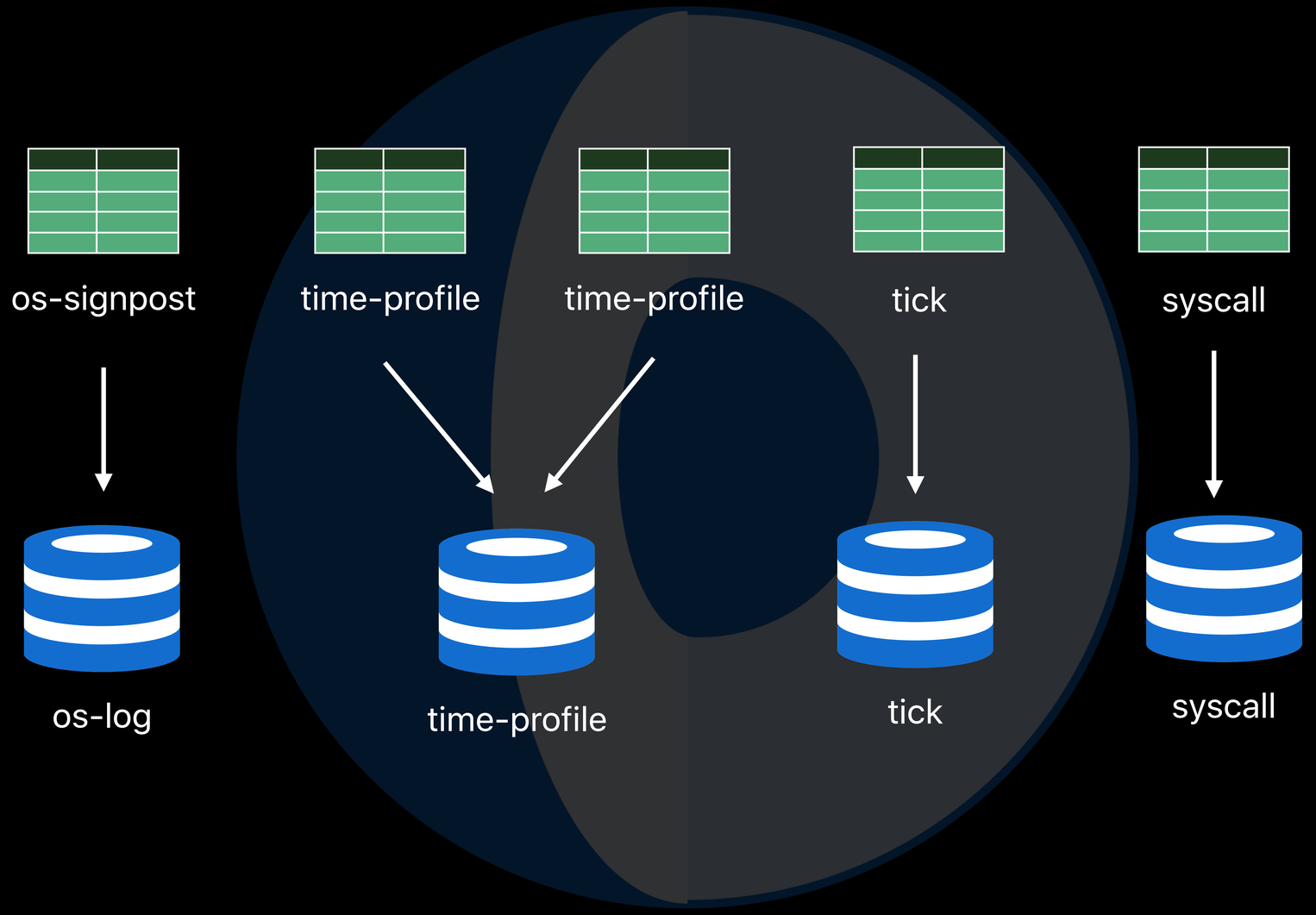
Time Slice



Analysis Core



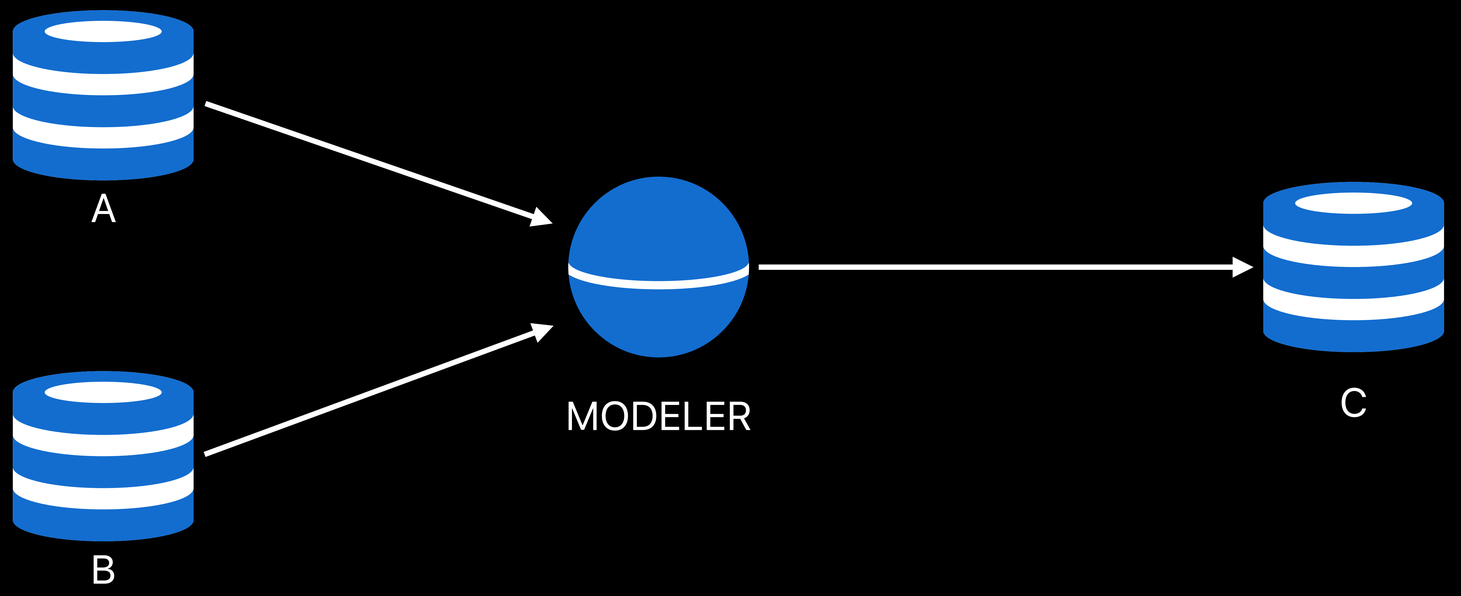
Step 1: Reduce



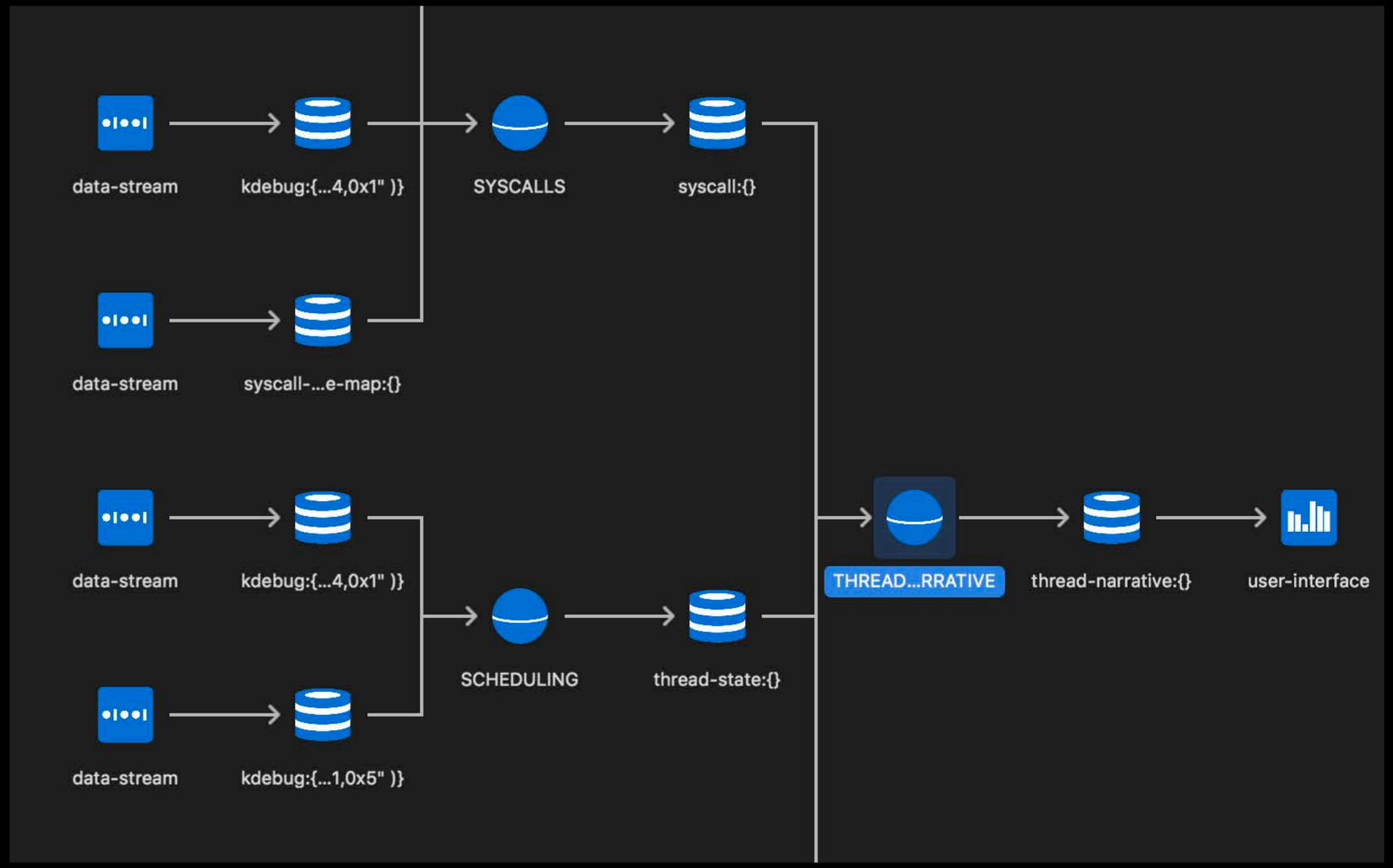
Step 2: Search

Step 2: Search

Step 2: Search



Step 3: Optimize



Binding Solution

Binding Solution

Trace-wide

Binding Solution

Trace-wide

Minimizes recording impact

Schemas

Schemas

100+ schemas already

Schemas

100+ schemas already

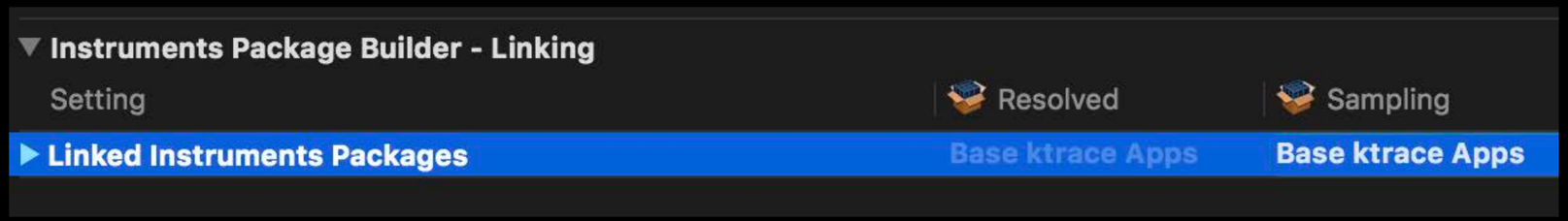
Contained in packages

Schemas

100+ schemas already

Contained in packages

Link build setting



Schemas

100+ schemas already

Contained in packages

Link build setting

Building blocks

Modelers

Modelers

`<modeler>`

Modelers

`<modeler>`

`<point-schema>`

Modelers

`<modeler>`

`<point-schema>`

`<interval-schema>`

Modelers

`<modeler>`

`<point-schema>`

`<interval-schema>`

Required inputs

Modelers

`<modeler>`

`<point-schema>`

`<interval-schema>`

Required inputs

Expert systems

Modelers

`<modeler>`

`<point-schema>`

`<interval-schema>`

Required inputs

Expert systems

CLIPS

Modelers

`<modeler>`

`<point-schema>`

`<interval-schema>`

Required inputs

Expert systems

CLIPS

Advanced

However...

Automatic Modelers

Automatic Modelers

```
<os-signpost-interval-schema>
```

Automatic Modelers

`<os-signpost-interval-schema>`

Defines a schema

Automatic Modelers

`<os-signpost-interval-schema>`

Defines a schema

Generates a modeler

Automatic Modelers

`<os-signpost-interval-schema>`

Defines a schema

Generates a modeler

Capture metadata

Automatic Modelers

`<os-signpost-interval-schema>`

Defines a schema

Generates a modeler

Capture metadata

Expressions

```
os_signpost(.begin, log: parsingLog, name: "Parsing", "Parsing started SIZE:%ld", data.count)
// Decode the JSON we just downloaded
let result = try jsonDecoder.decode(Trail.self, from: data)
os_signpost(.end, log: parsingLog, name: "Parsing", "Parsing finished")
```

```
os_signpost(.begin, log: parsingLog, name: "Parsing", "Parsing started SIZE:%ld", data.count)
// Decode the JSON we just downloaded
let result = try jsonDecoder.decode(Trail.self, from: data)
os_signpost(.end, log: parsingLog, name: "Parsing", "Parsing finished")
```

```
os_signpost(.begin, log: parsingLog, name: "Parsing", "Parsing started SIZE:%ld", data.count)
// Decode the JSON we just downloaded
let result = try jsonDecoder.decode(Trail.self, from: data)
os_signpost(.end, log: parsingLog, name: "Parsing", "Parsing finished")
```

```
os_signpost(.begin, log: parsingLog, name: "Parsing", "Parsing started SIZE:%ld", data.count)
// Decode the JSON we just downloaded
let result = try jsonDecoder.decode(Trail.self, from: data)
os_signpost(.end, log: parsingLog, name: "Parsing", "Parsing finished")
```

```
<os-signpost-interval-schema>
    <id>json-parse</id>
    <title>Image Download</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Networking"</category>
    <name>”Parsing"</name>

    <start-pattern>
        <message>"Parsing started SIZE:" ?data-size</message>
    </start-pattern>

    <column>
        <mnemonic>data-size</mnemonic>
        <title>JSON Data Size</title>
        <type>size-in-bytes</type>
        <expression>?data-size</expression>
    </column>
</os-signpost-interval-schema>
```

```
<os-signpost-interval-schema>
    <id>json-parse</id>
    <title>Image Download</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Networking"</category>
    <name>”Parsing"</name>

    <start-pattern>
        <message>"Parsing started SIZE:" ?data-size</message>
    </start-pattern>

    <column>
        <mnemonic>data-size</mnemonic>
        <title>JSON Data Size</title>
        <type>size-in-bytes</type>
        <expression>?data-size</expression>
    </column>
</os-signpost-interval-schema>
```

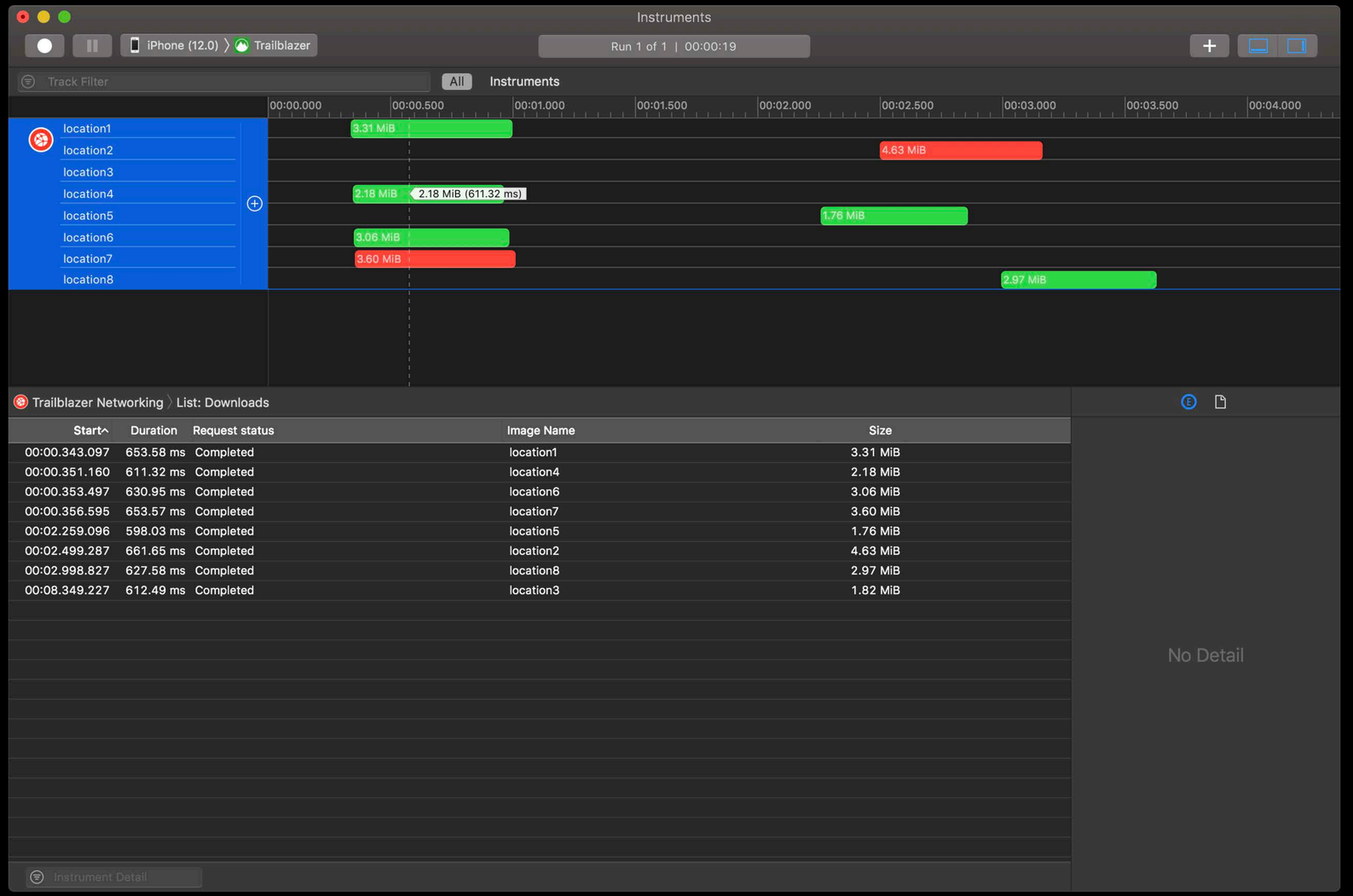
```
<os-signpost-interval-schema>
    <id>json-parse</id>
    <title>Image Download</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Networking"</category>
    <name>”Parsing"</name>

    <start-pattern>
        <message>"Parsing started SIZE:" ?data-size</message>
    </start-pattern>

    <column>
        <mnemonic>data-size</mnemonic>
        <title>JSON Data Size</title>
        <type>size-in-bytes</type>
        <expression>?data-size</expression>
    </column>
</os-signpost-interval-schema>
```

```
<os-signpost-interval-schema>
    <id>json-parse</id>
    <title>Image Download</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Networking"</category>
    <name>”Parsing"</name>

    <start-pattern>
        <message>"Parsing started SIZE:" ?data-size</message>
    </start-pattern>

    <column>
        <mnemonic>data-size</mnemonic>
        <title>JSON Data Size</title>
        <type>size-in-bytes</type>
        <expression>?data-size</expression>
    </column>
</os-signpost-interval-schema>
```

```
<os-signpost-interval-schema>
    <id>json-parse</id>
    <title>Image Download</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Networking"</category>
    <name>”Parsing"</name>

    <start-pattern>
        <message>"Parsing started SIZE:" ?data-size</message>
    </start-pattern>

    <column>
        <mnemonic>data-size</mnemonic>
        <title>JSON Data Size</title>
        <type>size-in-bytes</type>
        <expression>?data-size</expression>
    </column>
</os-signpost-interval-schema>
```

```
<os-signpost-interval-schema>
    <id>json-parse</id>
    <title>Image Download</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Networking"</category>
    <name>”Parsing"</name>

    <start-pattern>
        <message>"Parsing started SIZE:" ?data-size</message>
    </start-pattern>

    <column>
        <mnemonic>data-size</mnemonic>
        <title>JSON Data Size</title>
        <type>size-in-bytes</type>
        <expression>?data-size</expression>
    </column>
</os-signpost-interval-schema>
```

Trailblazer Networking

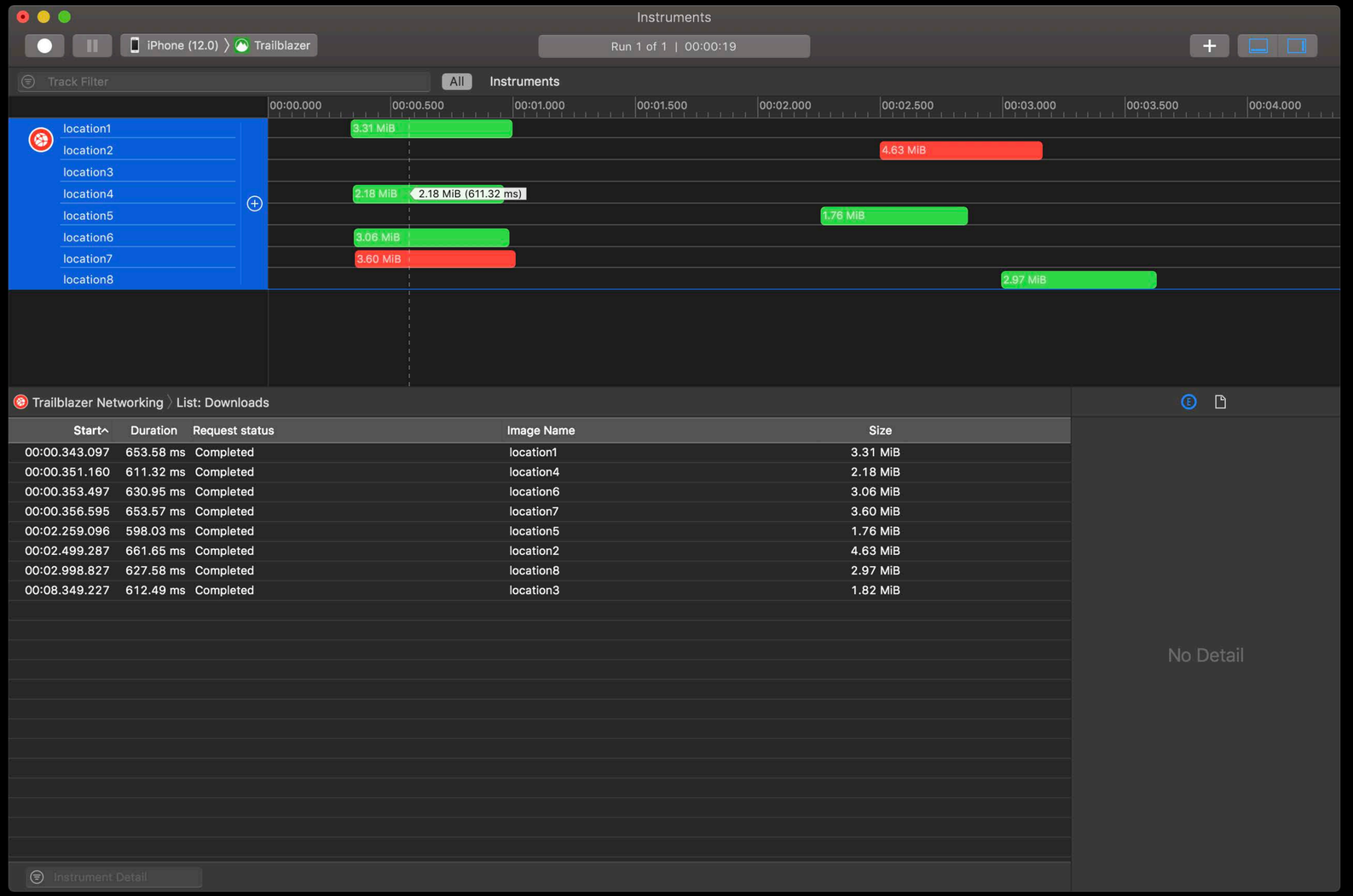


Demo

Intermediate-level instruments

Kacper Harasim, Performance Tools Engineer

Trailblazer Networking



Why create custom instruments

Architecture

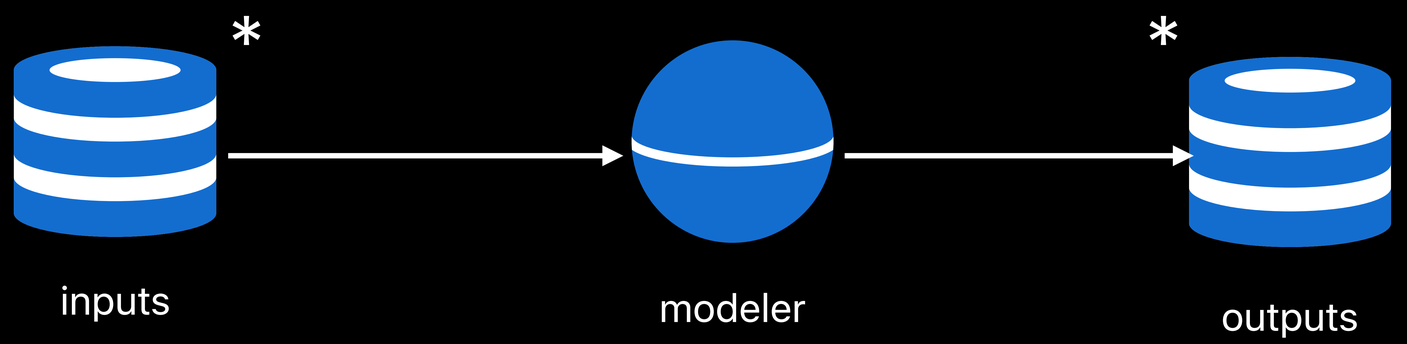
Getting started

Intermediate

Advanced

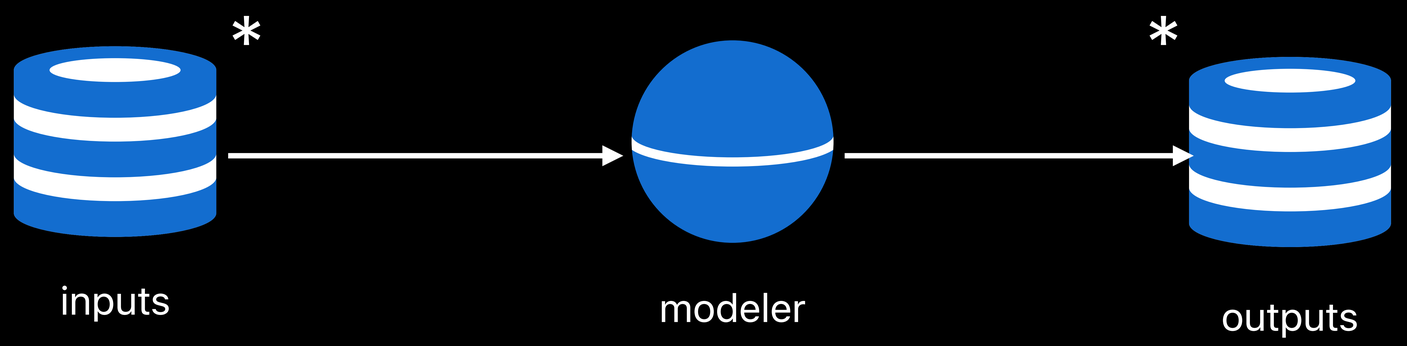
Best practices

Modelers



Modelers

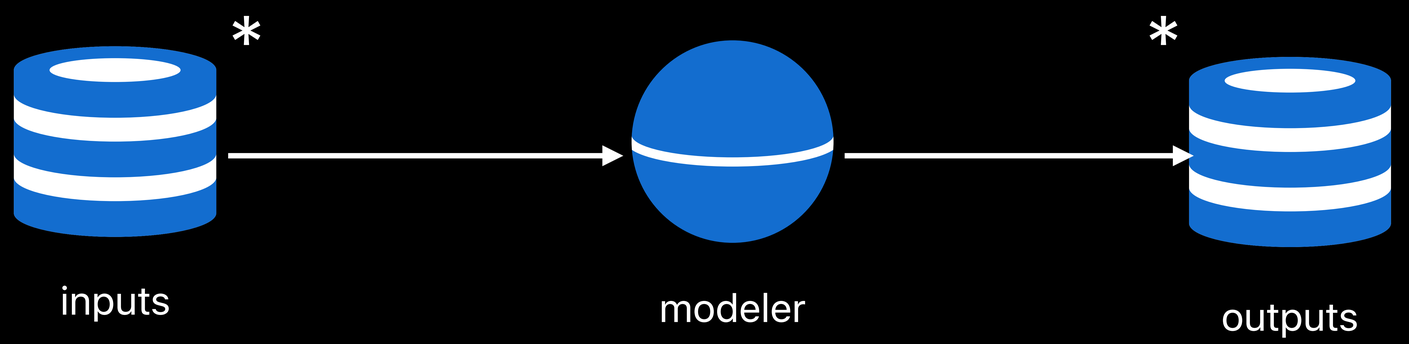
Time ordered



Modelers

Time ordered

Working memory

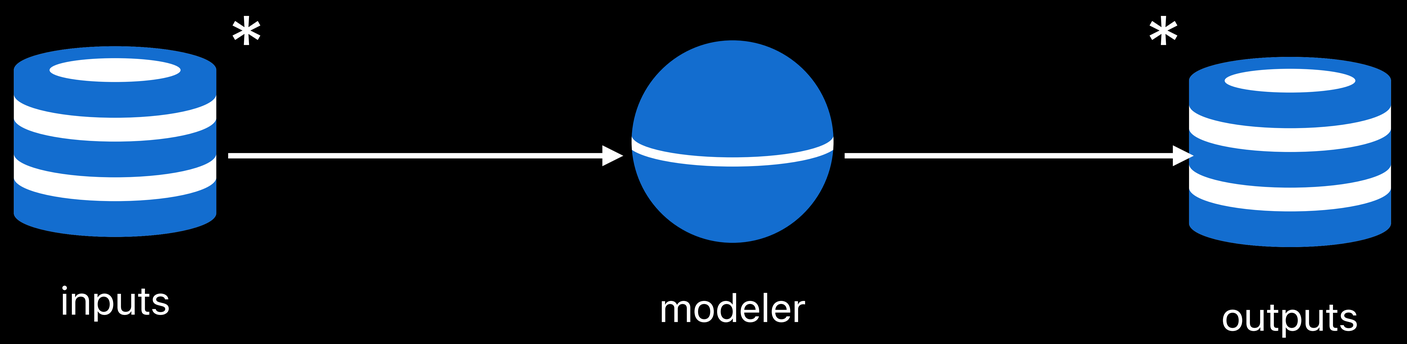


Modelers

Time ordered

Working memory

Inference



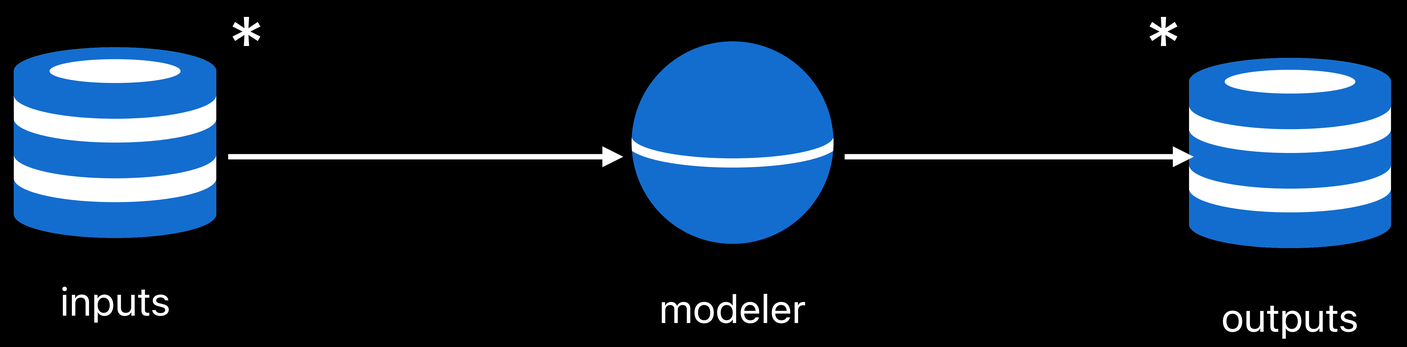
Modelers

Time ordered

Working memory

Inference

Output



Example

Example

playing-with-matches

```
<os-signpost-interval-schema>
    <id>playing-with-matches</id>
    <title>Playing with Matches</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Advisory"</category>
    <name>"Playing with Matches"</name>
```

Example

playing-with-matches

```
<os-signpost-interval-schema>
    <id>playing-with-matches</id>
    <title>Playing with Matches</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Advisory"</category>
    <name>"Playing with Matches"</name>
```

app-on-fire

```
<os-signpost-interval-schema>
    <id>app-on-fire</id>
    <title>Application on Fire!</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Advisory"</category>
    <name>"On Fire"</name>
```

Example

playing-with-matches

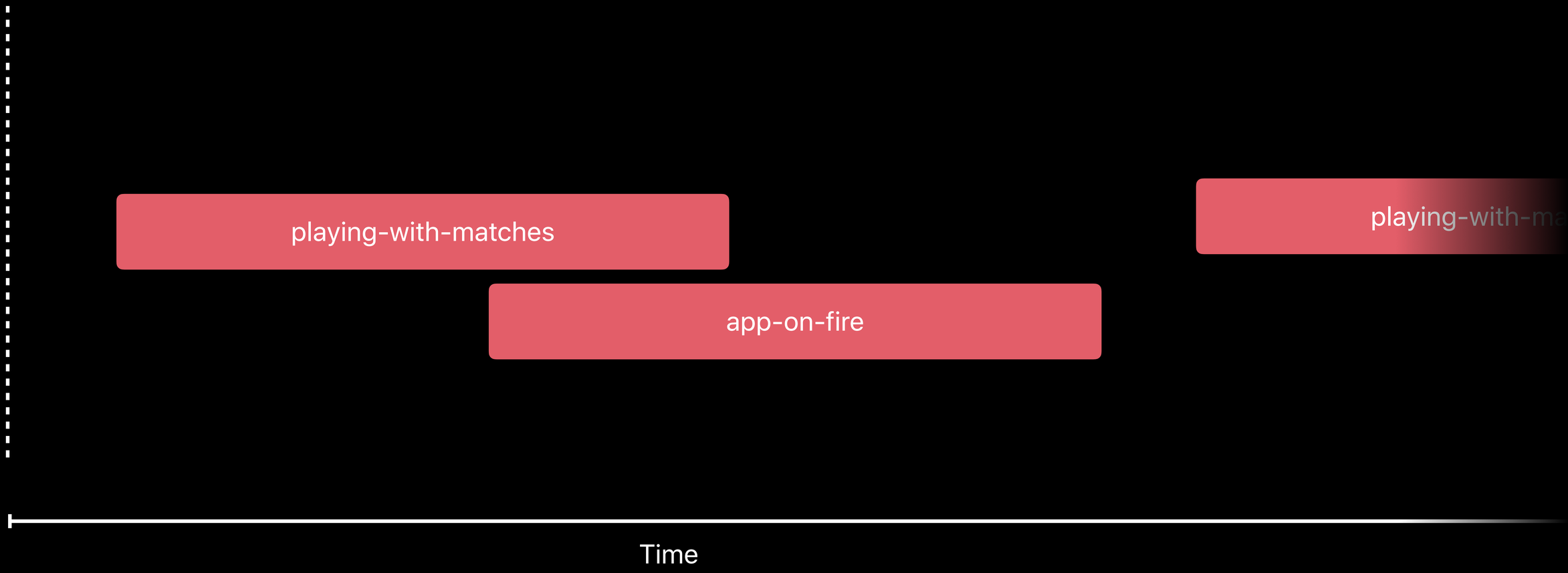
```
<os-signpost-interval-schema>
    <id>playing-with-matches</id>
    <title>Playing with Matches</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Advisory"</category>
    <name>"Playing with Matches"</name>
```

app-on-fire

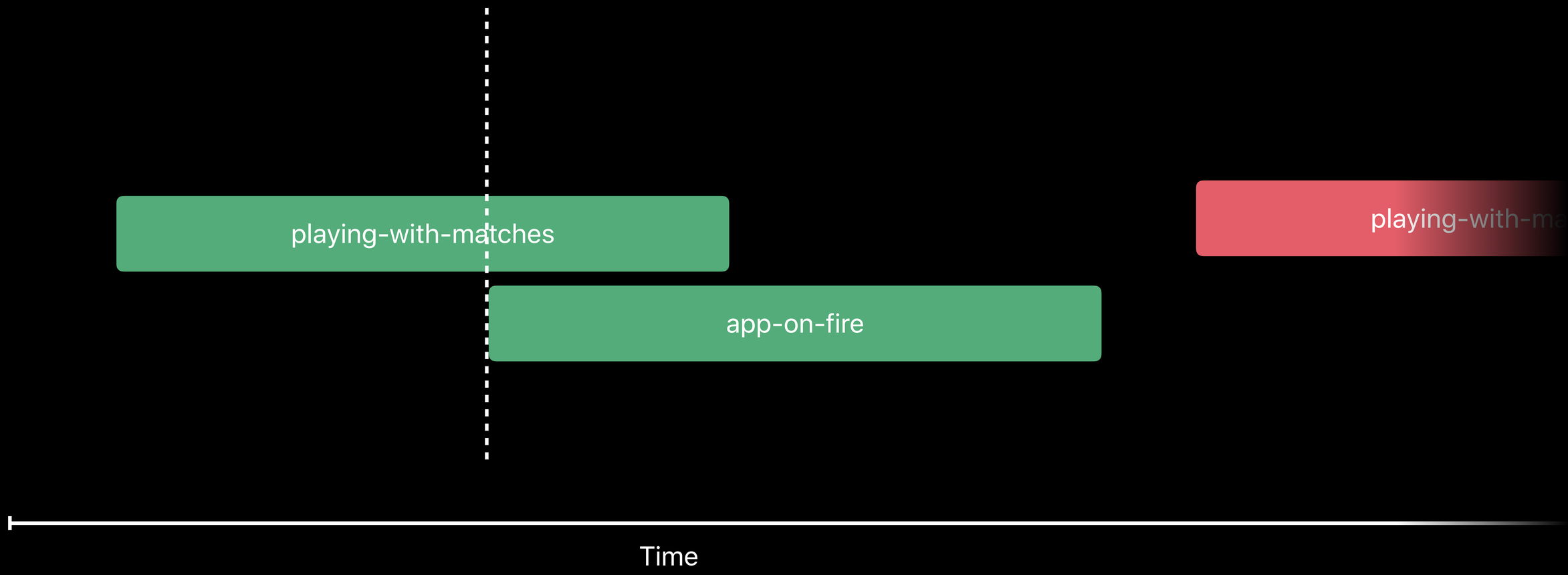
```
<os-signpost-interval-schema>
    <id>app-on-fire</id>
    <title>Application on Fire!</title>

    <subsystem>"com.apple.trailblazer"</subsystem>
    <category>"Advisory"</category>
    <name>"On Fire"</name>
```

started-a-fire

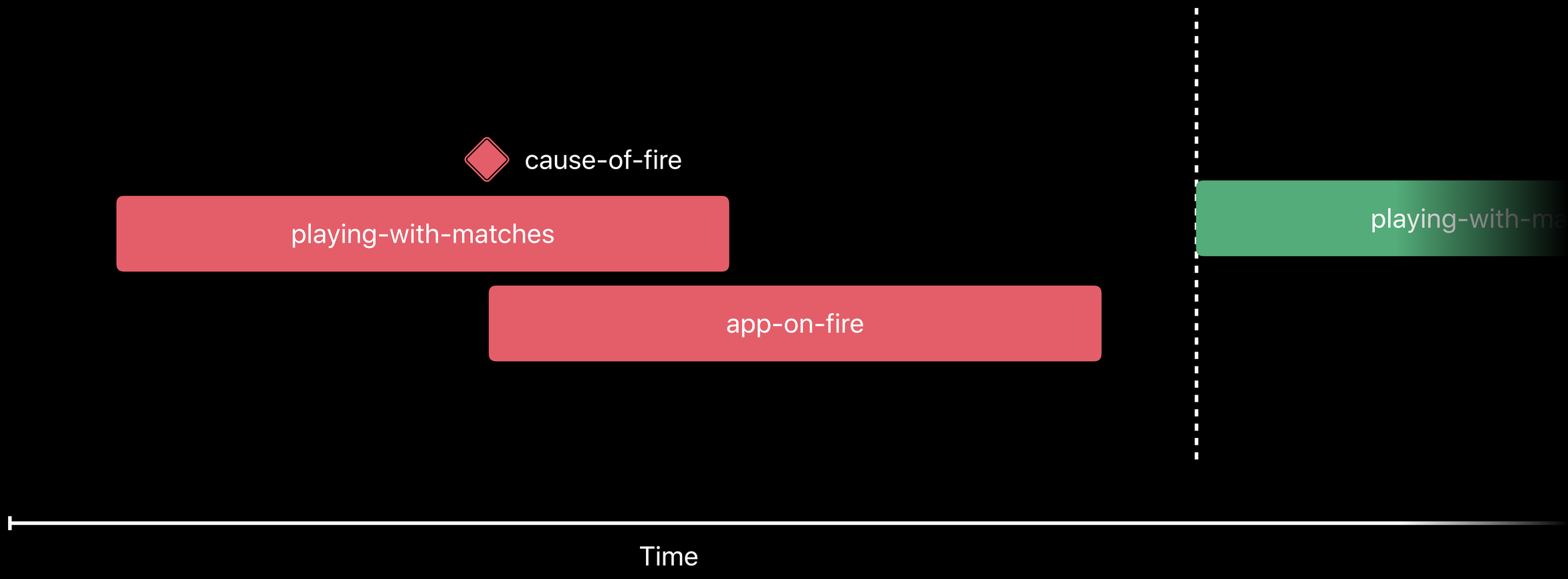
```
<point-schema>
    <id>started-a-fire</id>
    <title>Object started a fire!</title>
```


playing-with-matches
app-on-fire
playing-with-ma
Time


playing-with-matches
app-on-fire
playing-with-ma
Time


playing-with-matches
app-on-fire
playing-with-ma
Time


cause-of-fire
playing-with-matches
app-on-fire
playing-with-ma
Time


cause-of-fire
playing-with-matches
app-on-fire
playing-with-ma
Time

Clock

Current input timestamp

Input facts must intersect

Coincidence

Production System

Production System

Facts

Production System

Facts

LHS => RHS

Production System

Facts

LHS => RHS

Pattern

Production System

Facts

LHS => RHS

Pattern

Actions

Facts

Facts

Input table

Facts

Input table

Assertions

Facts

Input table

Assertions

Template

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

Modules

Modules

```
MODELER::
```

Modules

`MODELER::`

`RECORDER::`

Modules

`MODELER::`

`RECORDER::`

Group rules

Modules

`MODELER::`

`RECORDER::`

Group rules

Orders execution

Logical Support

Logical Support

Inference

Logical Support

Inference

Automatically retracts assertions

Logical Support

Inference

Automatically retracts assertions

Limits working memory bloat

```
(defrule MODELER::found-cause
    (playing-with-matches (start-time ?t1) (who ?object))
    (app-on-fire (start-time ?t2))
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (logical (playing-with-matches (start-time ?t1) (who ?object))
             (app-on-fire (start-time ?t2))
    )
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (logical (playing-with-matches (start-time ?t1) (who ?object))
             (app-on-fire (start-time ?t2))
    )
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

```
(defrule MODELER::found-cause
    (logical (playing-with-matches (start-time ?t1) (who ?object))
             (app-on-fire (start-time ?t2))
    )
    (test (< ?t1 ?t2))
    =>
    (assert (cause-of-fire (who ?object)))
)
(defrule RECORDER::record-cause
    (app-on-fire (start-time ?start))
    (cause-of-fire (who ?object))
    (table (table-id ?t) (side append))
    (table-attribute (table-id ?t) (has schema started-a-fire))
    =>
    (create-row ?t)
    (set-column time ?start)
    (set-column who ?object)
)
```

Demo

Advanced instruments

Kacper Harasim, Performance Tools Engineer

Why create custom instruments

Architecture

Getting started

Intermediate

Advanced

Best practices

Write more than one instrument

Immediate mode is hard

Last 5s mode is the most efficient

More Information

https://developer.apple.com/wwdc18/410

Measuring Performance Using Logging		WWDC 2018
Custom Instruments Lab	Technology Lab 8	Thursday 3:00PM


WWDC18