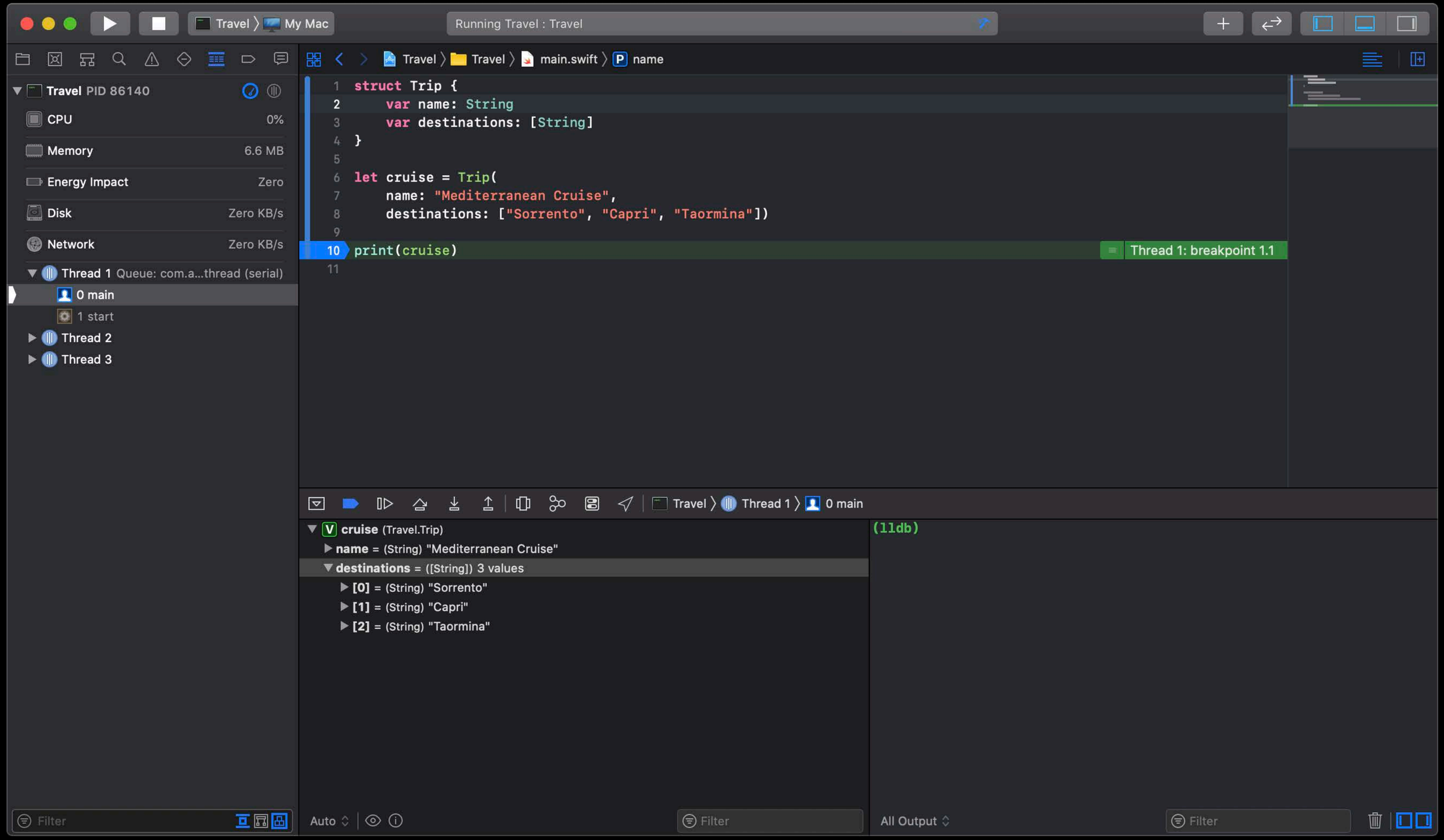
#WWDC19

LLDB: Beyond “po”

Davide Italiano, Software Engineer
Jonas Devlieghere, Software Engineer


Travel 〉 My Mac
Running Travel : Travel
Travel 〉 Travel 〉 main.swift 〉 name
Travel PID 86140
CPU 0%
Memory 6.6 MB
Energy Impact Zero
Disk Zero KB/s
Network Zero KB/s
Thread 1 Queue: com.a...thread (serial)
0 main
1 start
Thread 2
Thread 3
1 struct Trip {
2 var name: String
3 var destinations: [String]
4 }
5
6 let cruise = Trip(
7 name: "Mediterranean Cruise",
8 destinations: ["Sorrento", "Capri", "Taormina"])
9
10 print(cruise)
11
Thread 1: breakpoint 1.1
Travel 〉 Thread 1 〉 0 main
cruise (Travel.Trip)
name = (String) "Mediterranean Cruise"
destinations = ([String]) 3 values
[0] = (String) "Sorrento"
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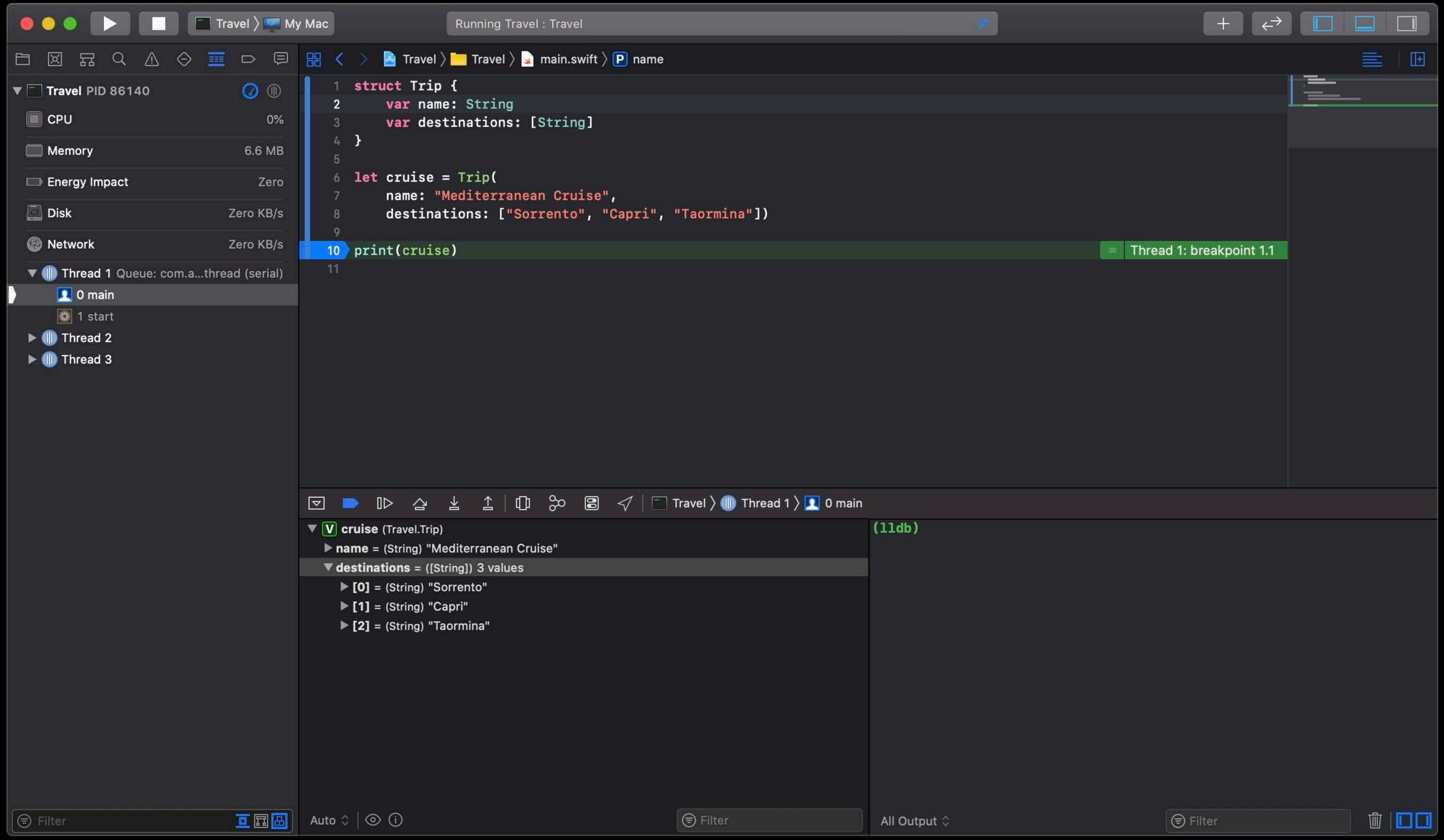
[2] = (String) "Taormina"
(lldb)
Filter
Auto
Filter
All Output
Filter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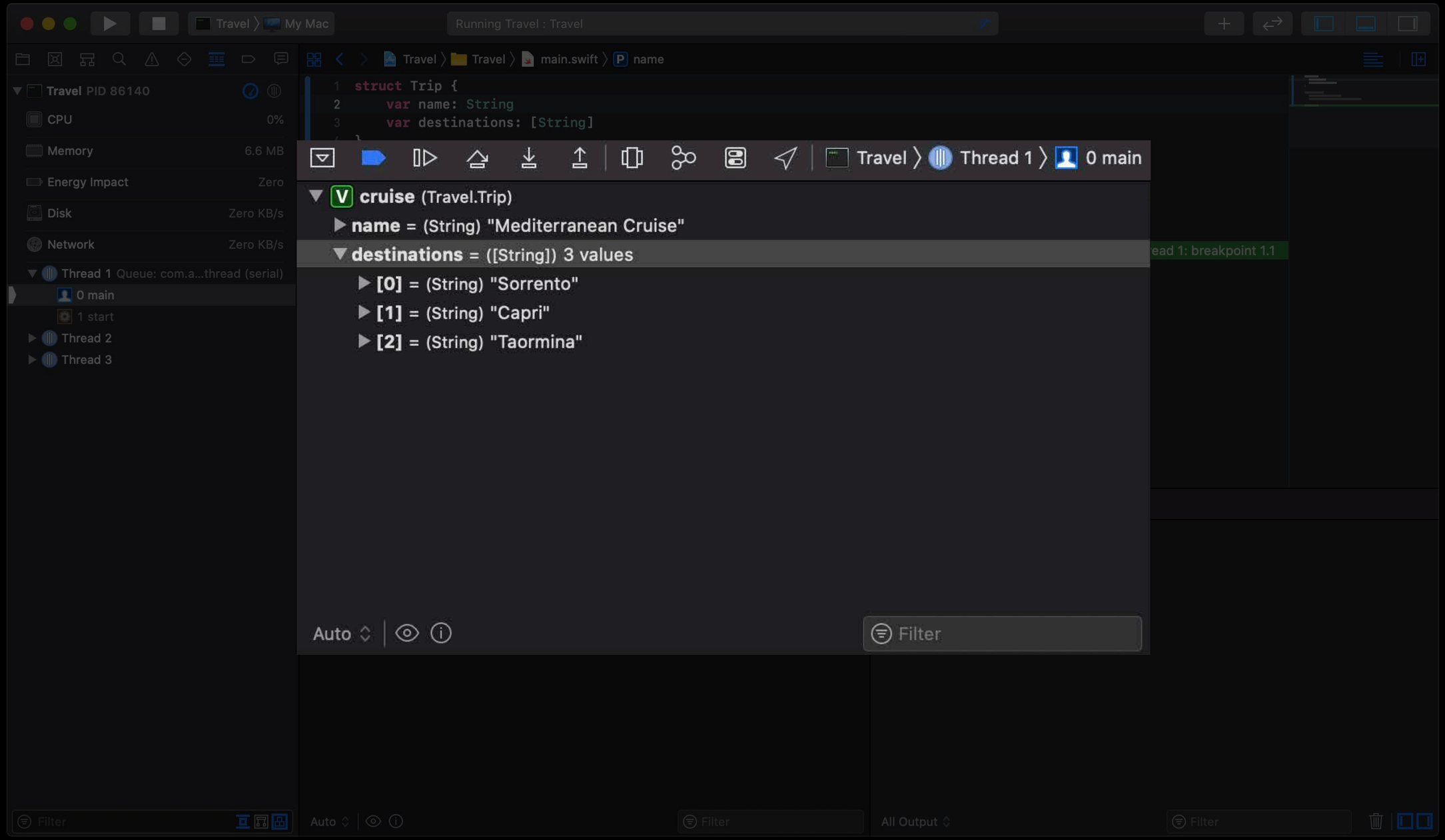
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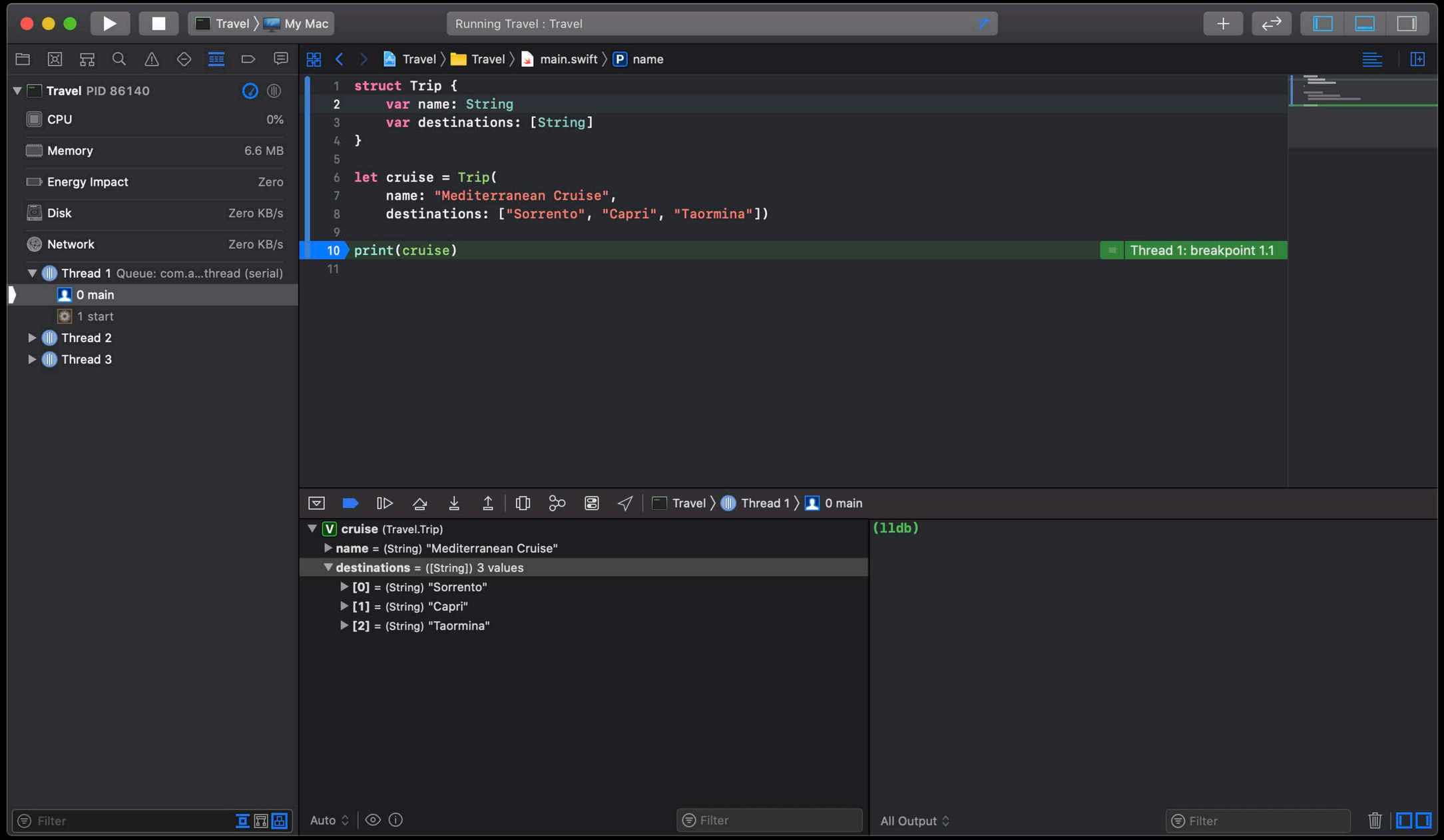
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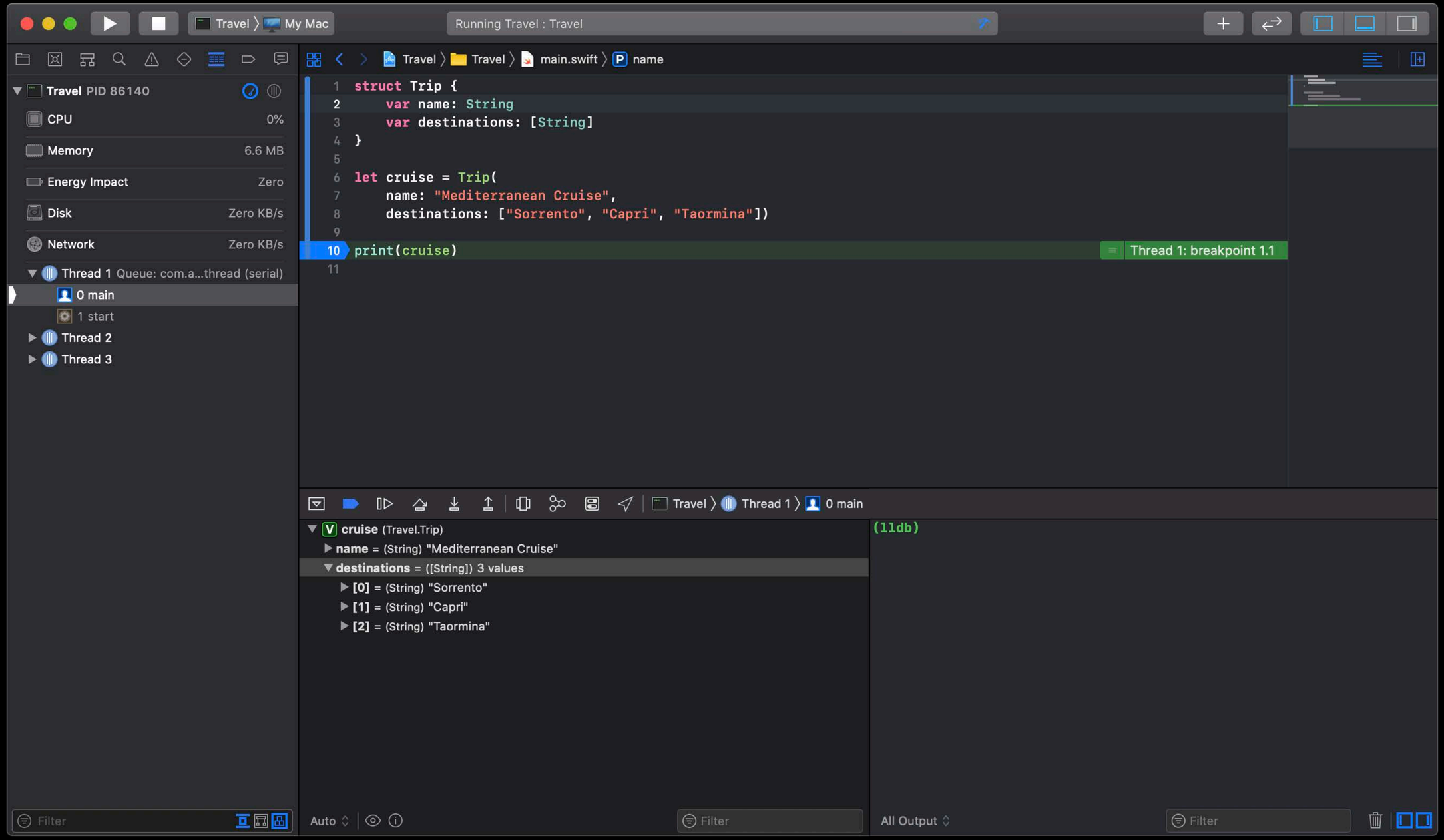
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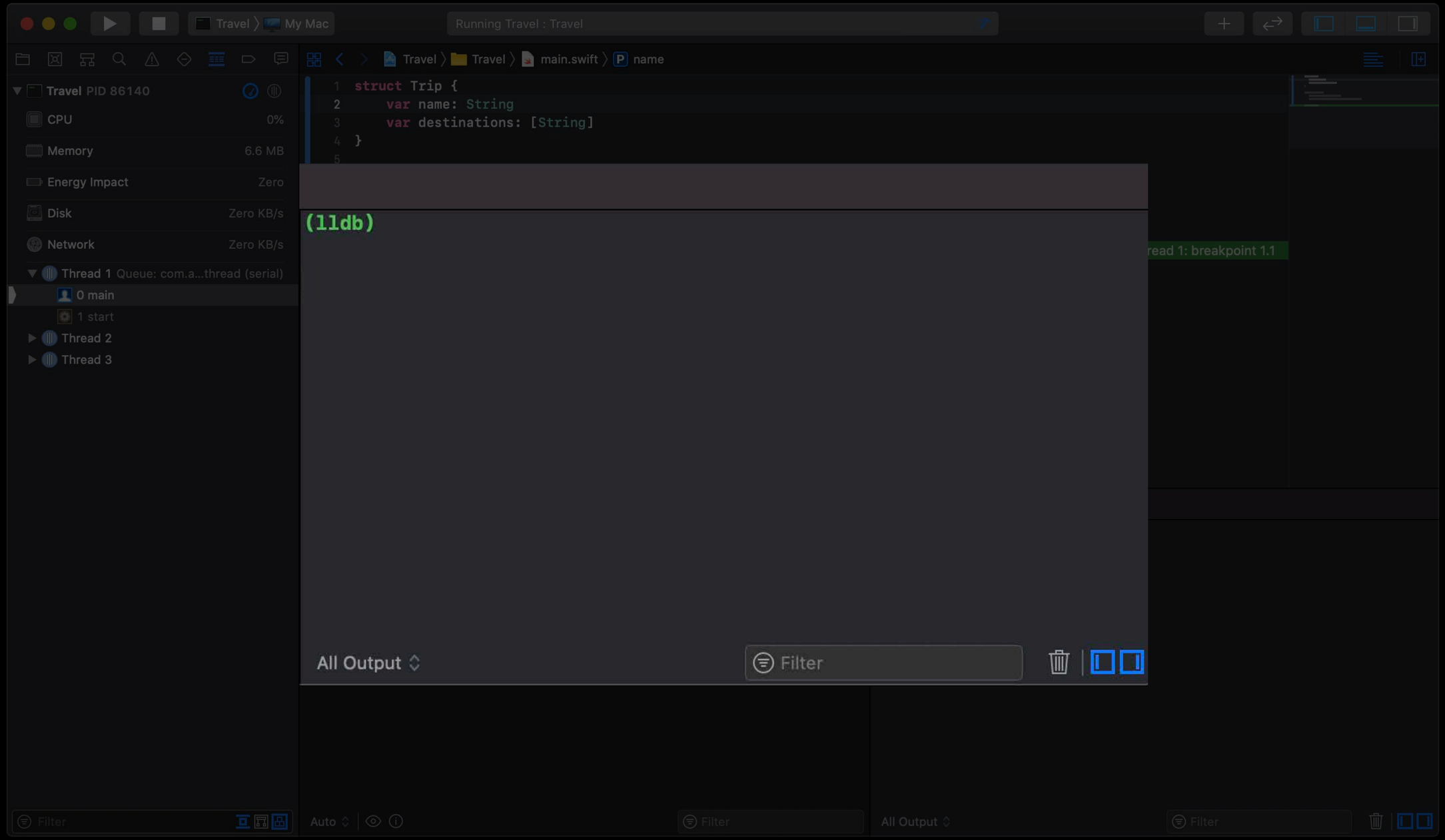
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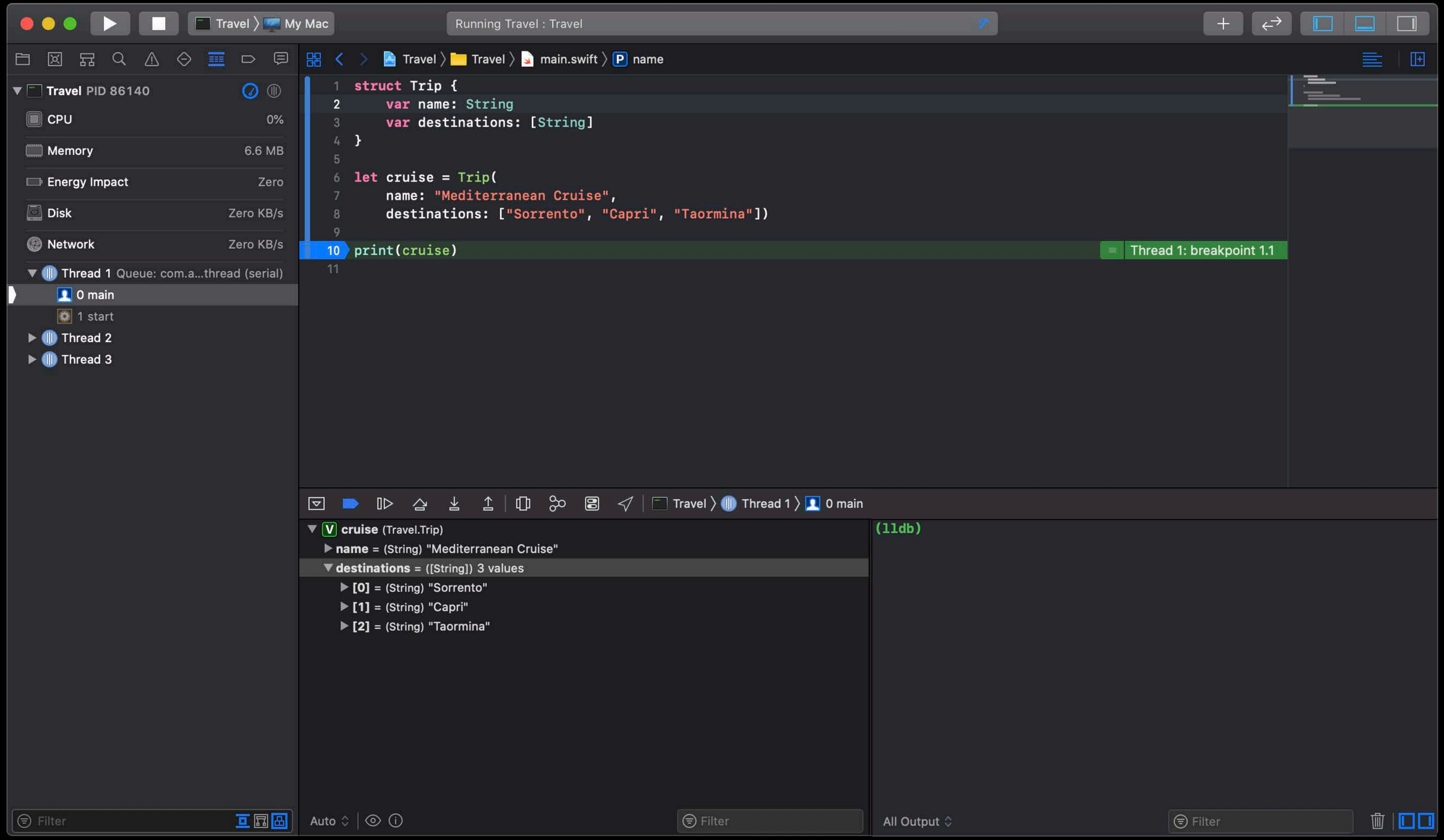
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```

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    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) po cruise
▿ Trip
  - name : "Mediterranean Cruise"
  ▿ destinations : 3 elements
    - 0 : "Sorrento"
    - 1 : "Capri"
    - 2 : "Taormina"
```

```
struct Trip {
    var name: String
    var destinations: [String]
}
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

extension Trip: CustomDebugStringConvertible {
    var debugDescription: String { "Trip description" }
}
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
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extension Trip: CustomDebugStringConvertible {
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```
(lldb) po cruise
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  - name : "Mediterranean Cruise"
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```
(lldb) po cruise
▿ Trip description
  - name : "Mediterranean Cruise"
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    - 0 : "Sorrento"
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```

```
struct Trip {
    var name: String
    var destinations: [String]
}

extension Trip: CustomReflectable {
    …
}
```

```
(lldb) po cruise
▿ Trip description
  - name : "Mediterranean Cruise"
  ▿ destinations : 3 elements
    - 0 : "Sorrento"
    - 1 : "Capri"
    - 2 : "Taormina"
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

extension Trip: CustomReflectable {
    …
}
```

```
(lldb) po cruise
▿ Trip description
  - name : "Mediterranean Cruise"
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    - 0 : "Sorrento"
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struct Trip {
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```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) po cruise.name.uppercased()
"MEDITERRANEAN CRUISE"
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) po cruise.name.uppercased()
"MEDITERRANEAN CRUISE"
(lldb) po cruise.destinations.sorted()
▿ 3 elements
  - 0 : "Capri"
  - 1 : "Sorrento"
  - 2 : "Taormina"
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
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    destinations: ["Sorrento", "Capri", "Taormina"])
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```
(lldb)
```

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```

```
(lldb) expression --object-description -- cruise
"Mediterranean Cruise"
(lldb)
```

```
struct Trip {
    var name: String
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}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) expression --object-description -- cruise
"Mediterranean Cruise"
(lldb) command alias my_po expression --object-description
(lldb)
```

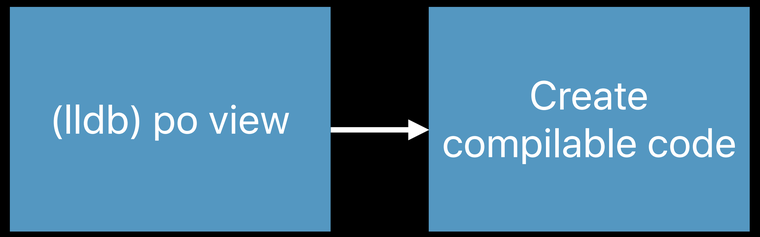
```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) expression --object-description -- cruise
"Mediterranean Cruise"
(lldb) command alias my_po expression --object-description
(lldb) my_po cruise
"Mediterranean Cruise"
```

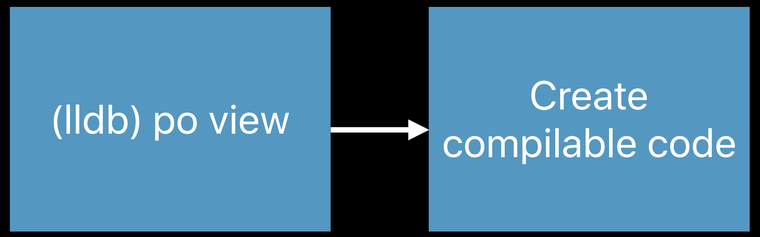
“po” Under the Hood

(lldb) po view

“po” Under the Hood

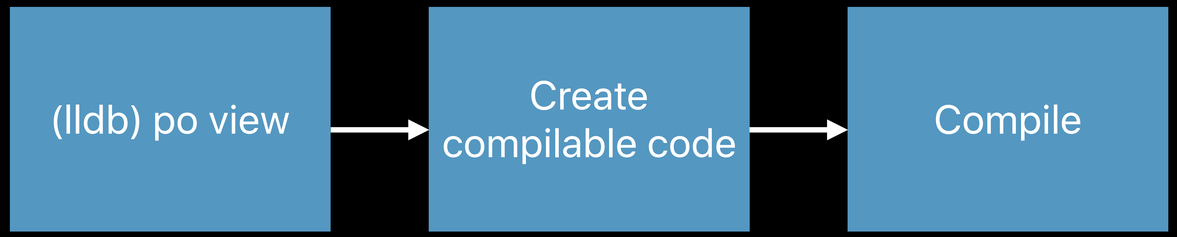


“po” Under the Hood

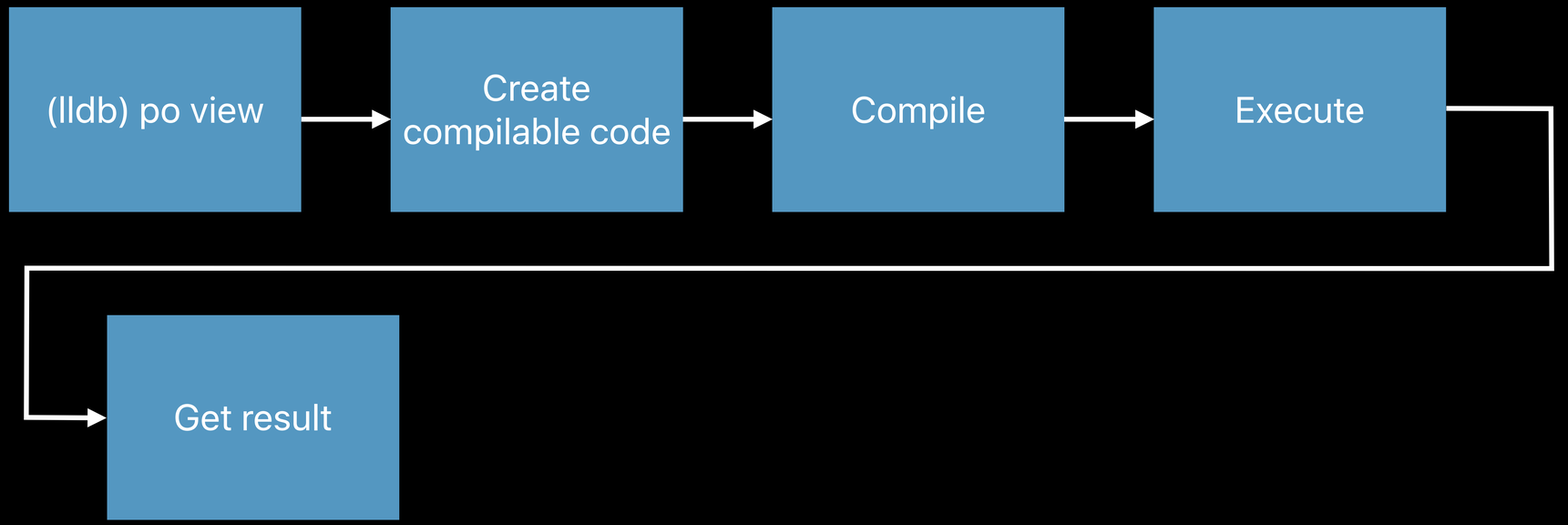



```
func __lldb_expr() {
    __lldb_res = view
}
```

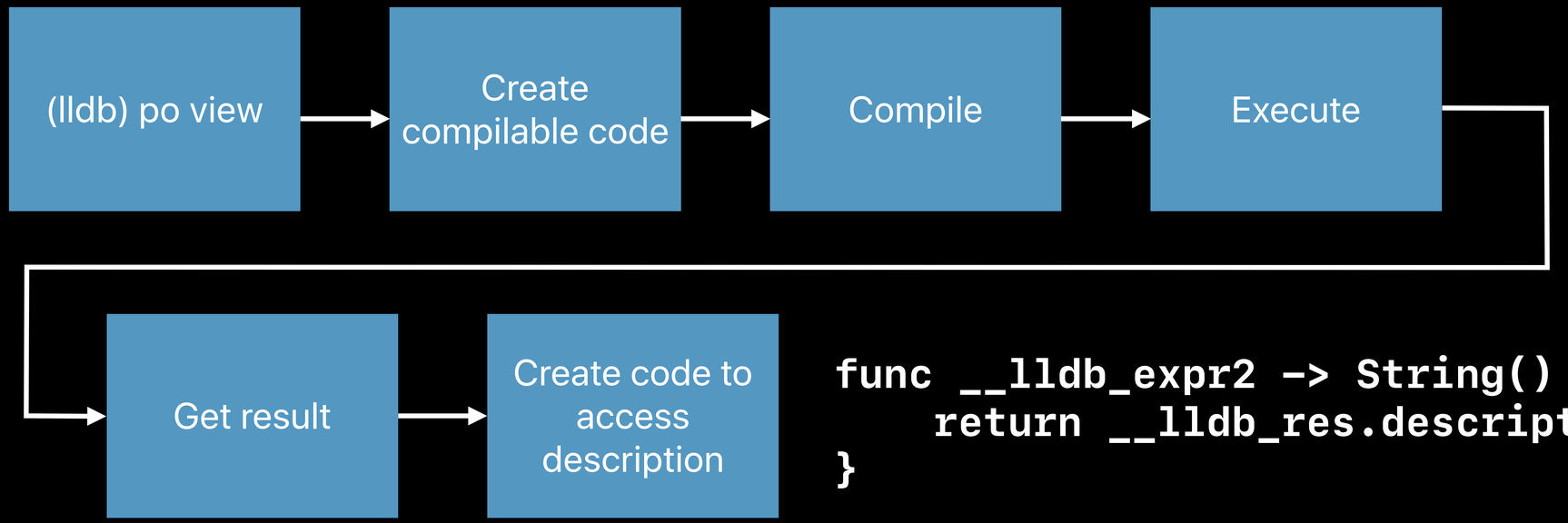
“po” Under the Hood



“po” Under the Hood

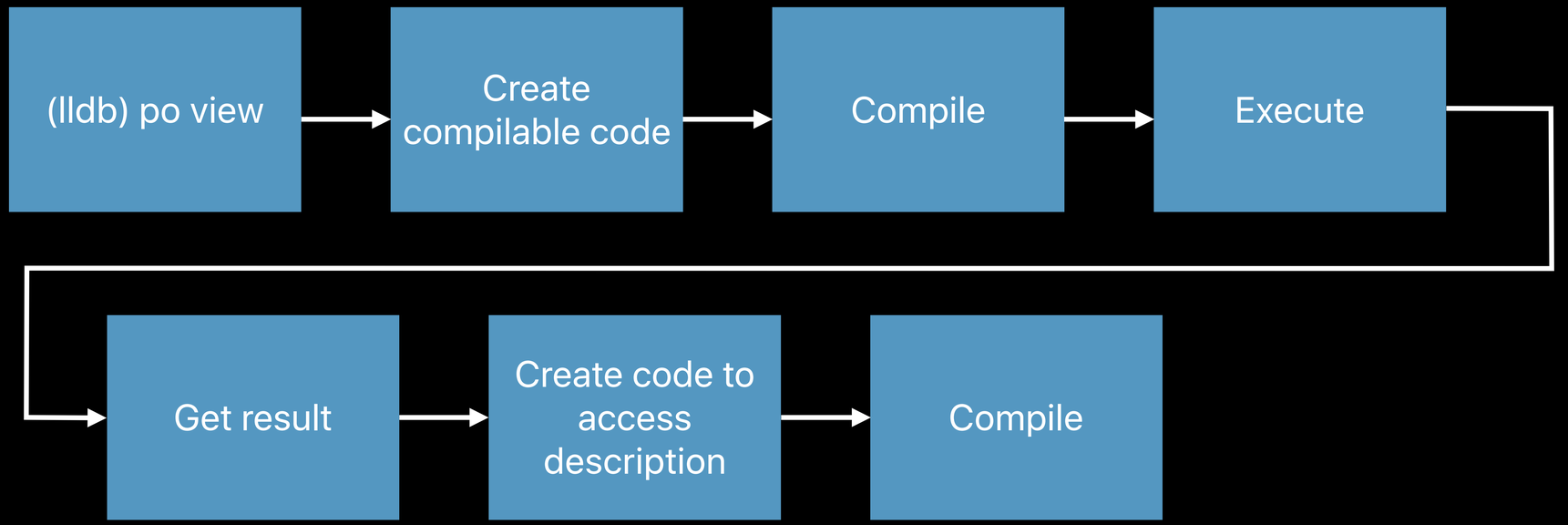


“po” Under the Hood




```
func __lldb_expr2 -> String() {
    return __lldb_res.description
}
```

“po” Under the Hood



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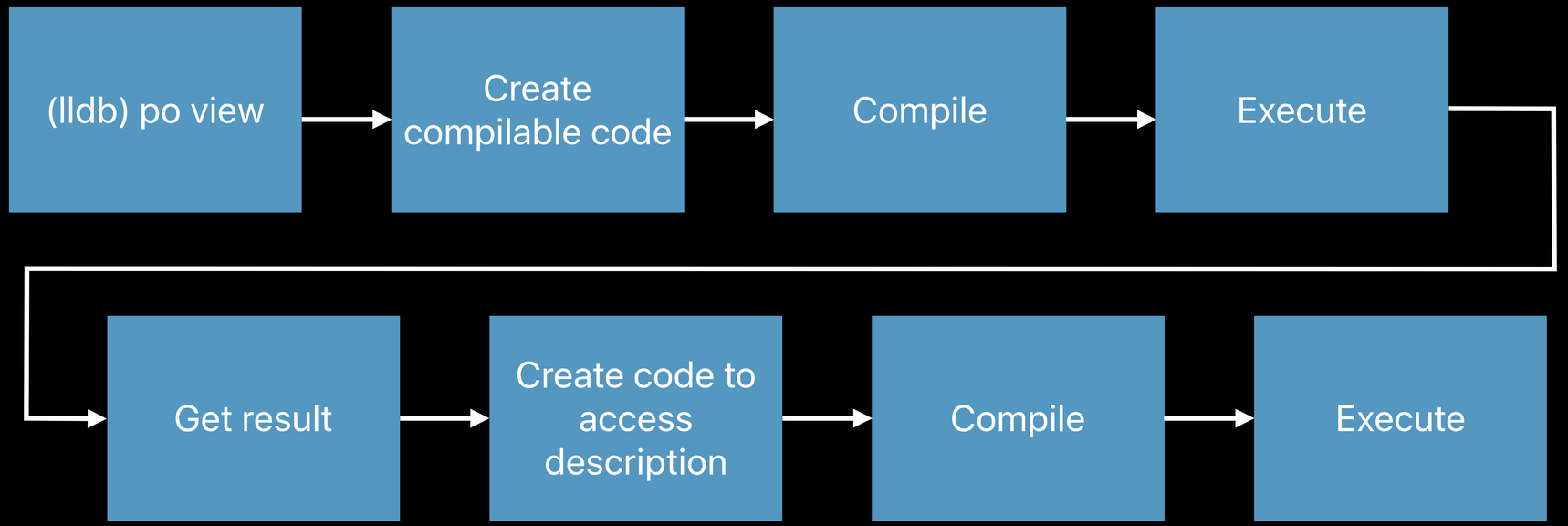

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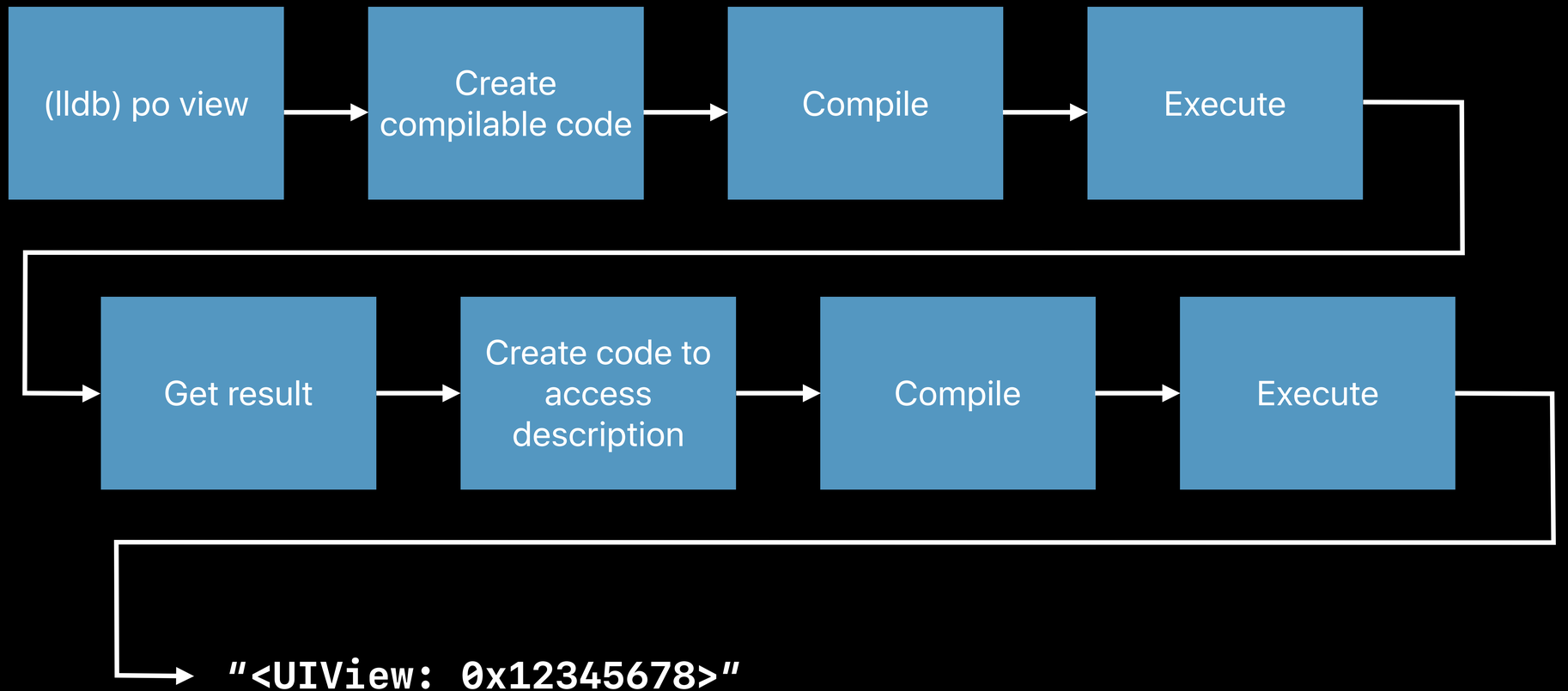

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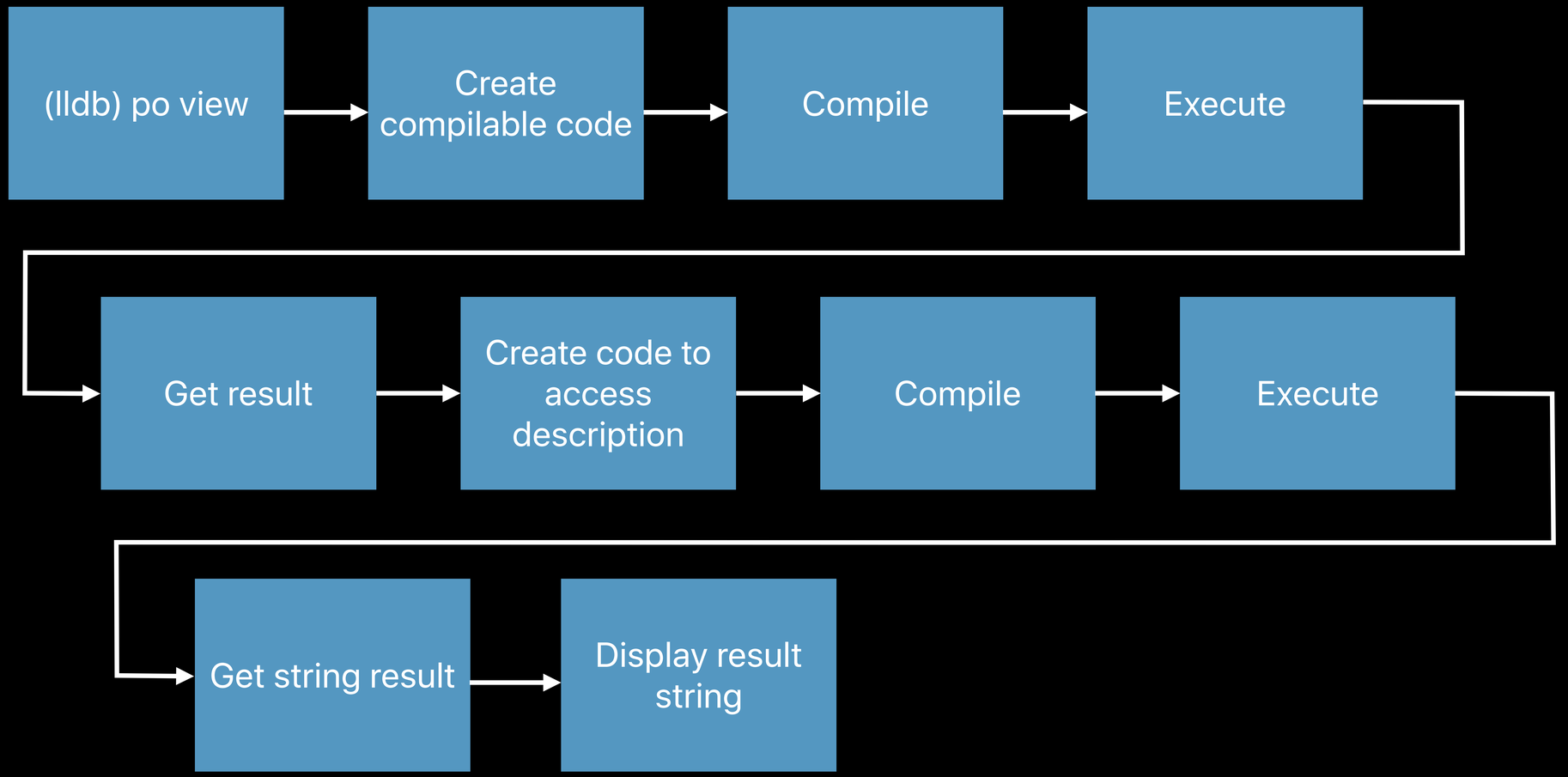

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struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

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struct Trip {
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let cruise = Trip(
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```
(lldb) p cruise
```

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let cruise = Trip(
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```

```
(lldb) p cruise
(Travel.Trip) $R0 = {
  name = "Mediterranean Cruise"
  destinations = 3 values {
    [0] = "Sorrento"
    [1] = "Capri"
    [2] = "Taormina"
  }
}
```

```
struct Trip {
    var name: String
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    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) p $R0.destinations
([String]) $R1 = 3 values {
  [0] = "Sorrento"
  [1] = "Capri"
  [2] = "Taormina"
}
(lldb)
```

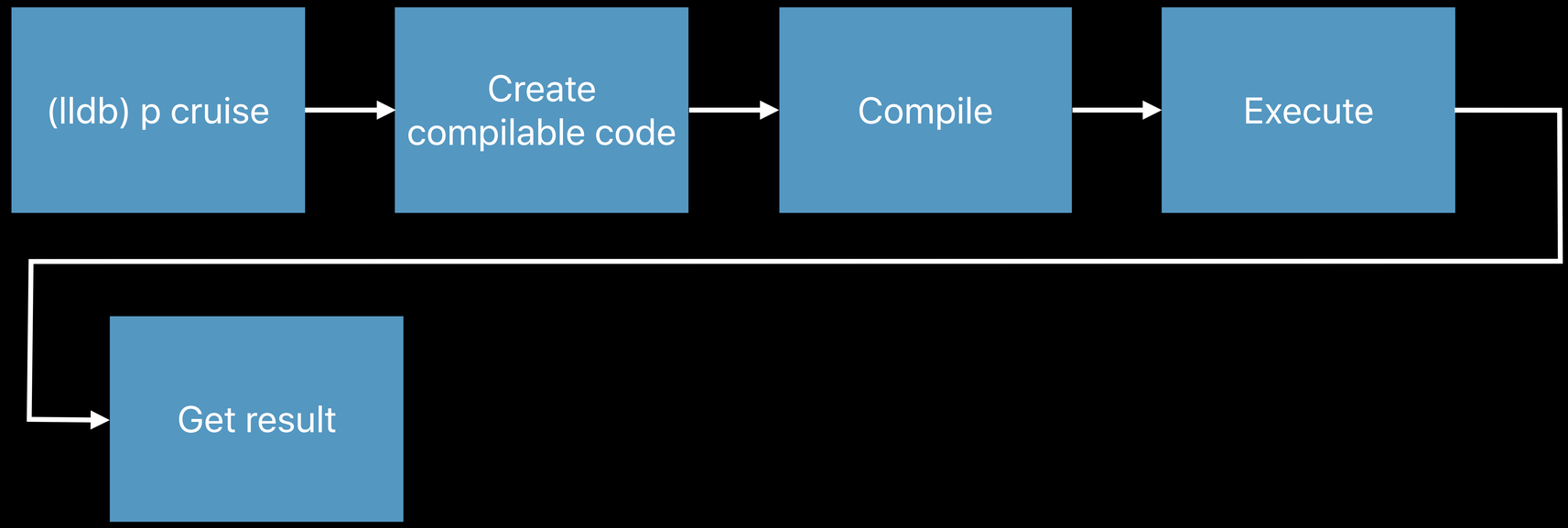
```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) p $R0.destinations
([String]) $R1 = 3 values {
  [0] = "Sorrento"
  [1] = "Capri"
  [2] = "Taormina"
}
(lldb) expression $R0.name
(String) $R2 = "Mediterranean Cruise”
```

“p” Under the Hood

(lldb) p cruise

“p” Under the Hood



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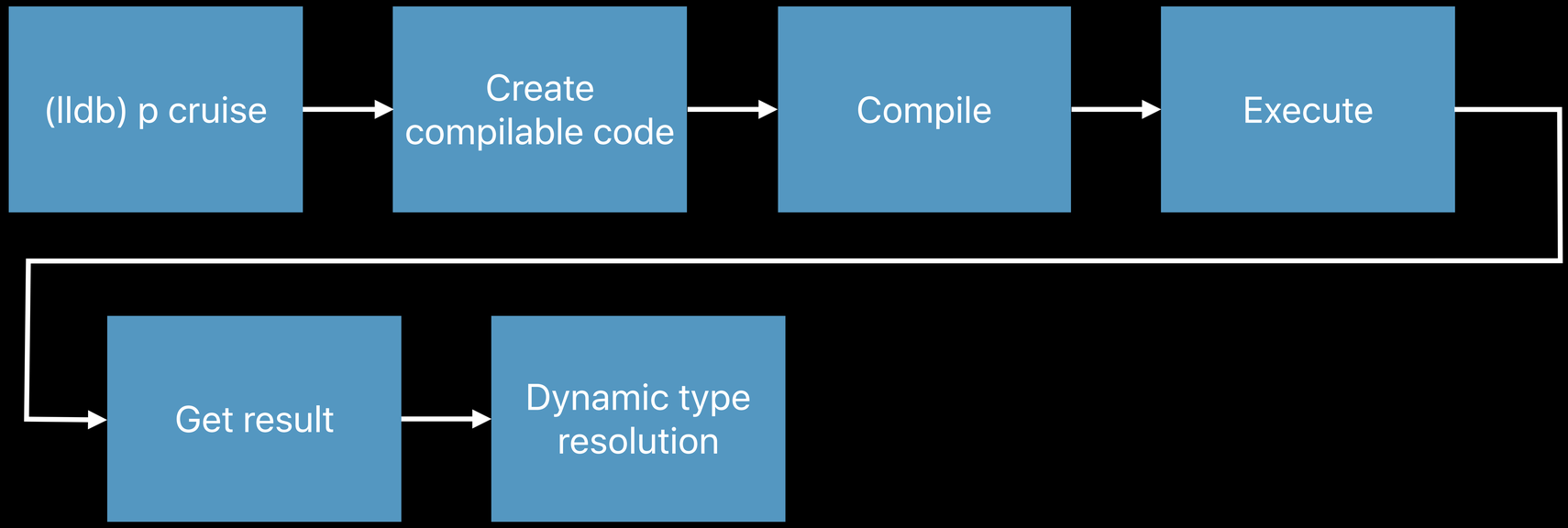

```
protocol Activity {}
struct Trip: Activity {
    var name: String
    var destinations: [String]
}

let cruise: Activity = Trip(…)
```

```
(lldb)
```

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struct Trip: Activity {
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```swift
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```

```
(lldb) p cruise
(Travel.Trip) $R0 = {
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(lldb)
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struct Trip: Activity {
    var name: String
    var destinations: [String]
}

let cruise: Activity = Trip(…)
```

```
(lldb) p cruise.name
error: <EXPR>:3:8: error: value of type 'Activity' has no member 'name'
(lldb)
```

```
protocol Activity {}
struct Trip: Activity {
    var name: String
    var destinations: [String]
}

let cruise: Activity = Trip(…)
let name = cruise.name                    Value of type 'Activity' has no member 'name'
```

```
(lldb) p cruise.name
error: <EXPR>:3:8: error: value of type 'Activity' has no member 'name'
(lldb)
```

```
protocol Activity {}
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    var destinations: [String]
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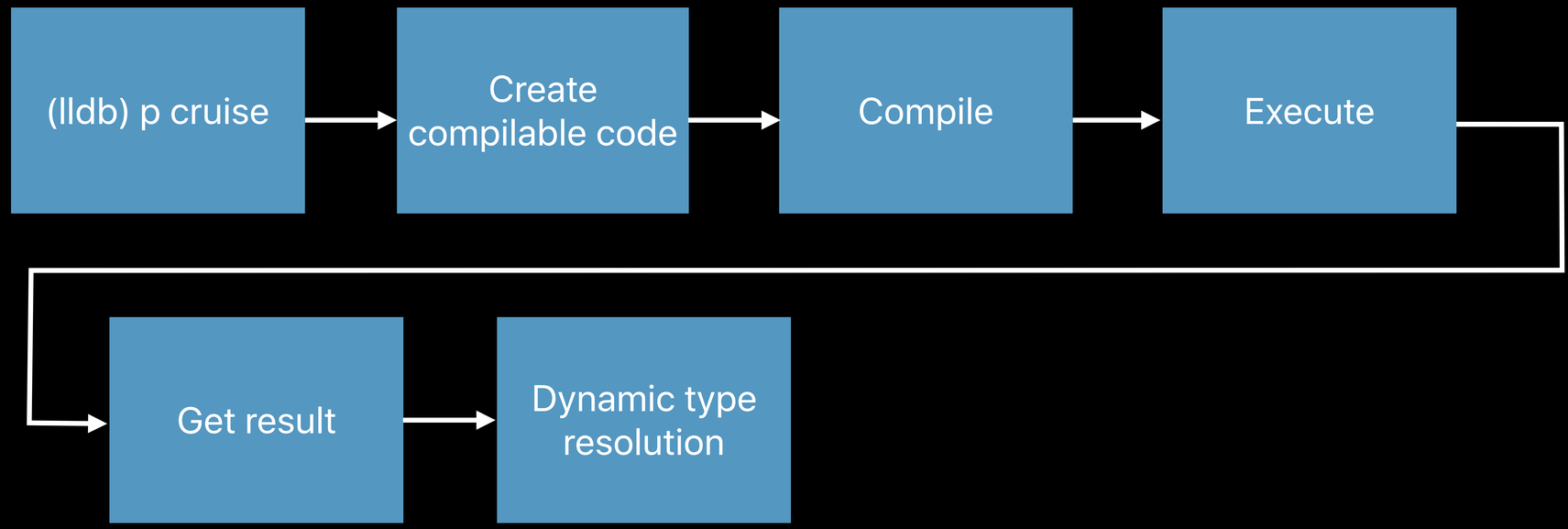
let cruise: Activity = Trip(…)
let name = cruise.name                    Value of type 'Activity' has no member 'name'
```

```
(lldb) p cruise.name
error: <EXPR>:3:8: error: value of type 'Activity' has no member 'name'
(lldb) p (cruise as! Trip).name
(String) $R0 = "Mediterranean Cruise"
```

“p” Under the Hood



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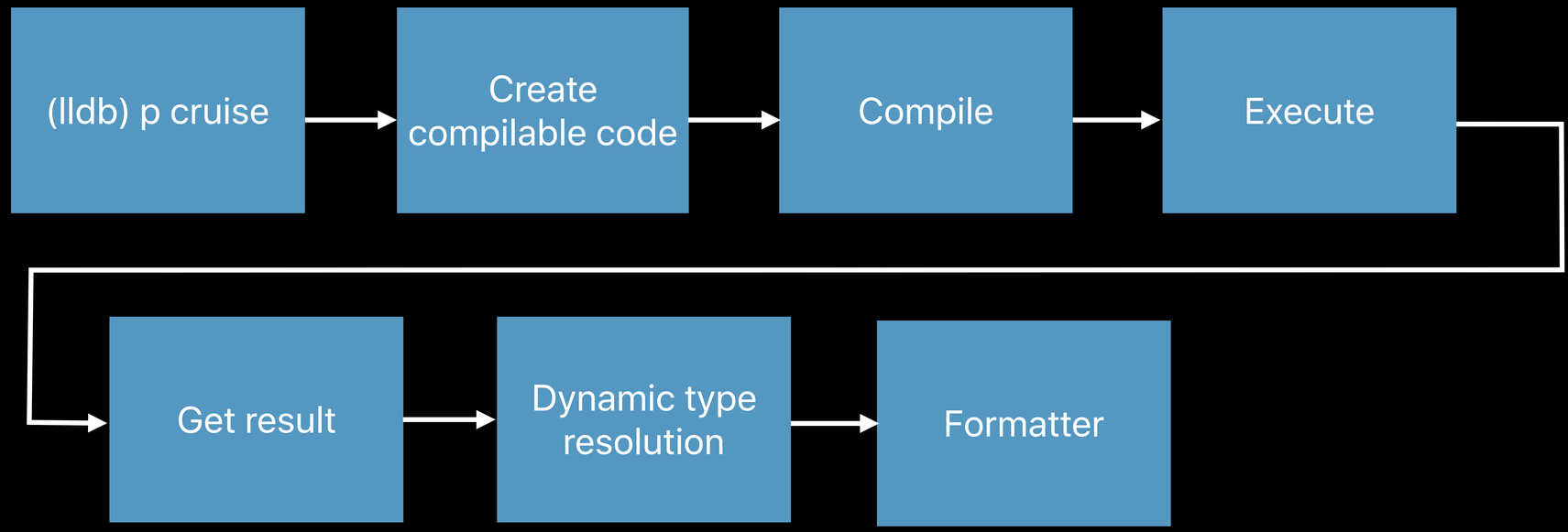

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let cruise = Trip(
    name: "Mediterranean Cruise",
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```

```
(lldb) expression --raw -- cruise.name
(Swift.String) $R0 = {
  _guts = {
    _object = {
      _countAndFlagsBits = {
        _value = 7305804402515733574
      }
      …
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) expression --raw -- cruise.name
(Swift.String) $R0 = {
  _guts = {
    _object = {
      _countAndFlagsBits = {
        _value = 7305804402515733574
      }
      …
(lldb) p cruise.name
(String) $R1 = "Mediterranean Cruise"
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) v cruise
(Travel.Trip) $R0 = {
  name = "Mediterranean Cruise"
  destinations = 3 values {
    [0] = "Sorrento"
    [1] = "Capri"
    [2] = "Taormina"
  }
}
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) frame variable cruise
(Travel.Trip) $R0 = {
  name = "Mediterranean Cruise"
  destinations = 3 values {
    [0] = "Sorrento"
    [1] = "Capri"
    [2] = "Taormina"
  }
}
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) v cruise.name
(String) cruise.name = "Mediterranean Cruise"
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) v cruise.name
(String) cruise.name = "Mediterranean Cruise"
(lldb) p cruise.name.isEmpty()
(Bool) $R2 = false
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) v cruise.name
(String) cruise.name = "Mediterranean Cruise"
(lldb) p cruise.name.isEmpty()
(Bool) $R2 = false
(lldb) po cruise.name.count
8
```

“v” Under the Hood

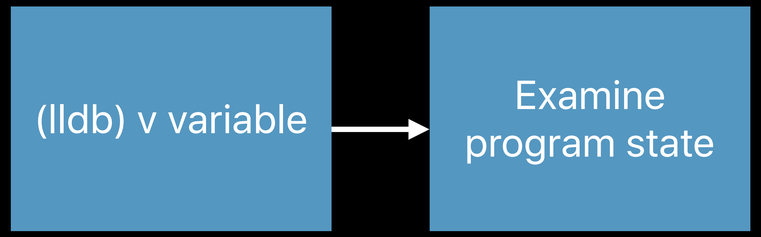
(lldb) v variable

“v” Under the Hood

(lldb) v variable

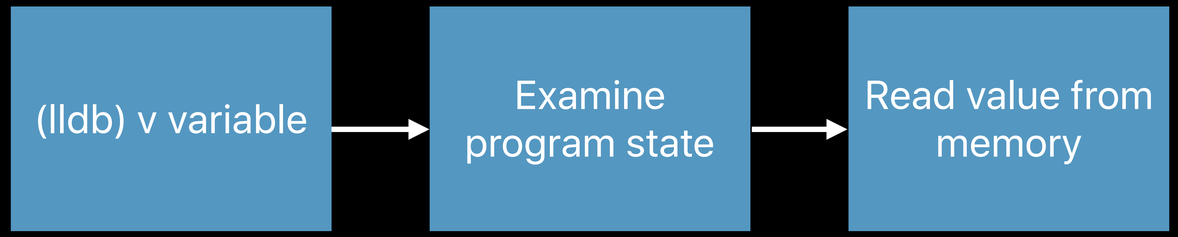
```
(lldb) v variable
```

“v” Under the Hood



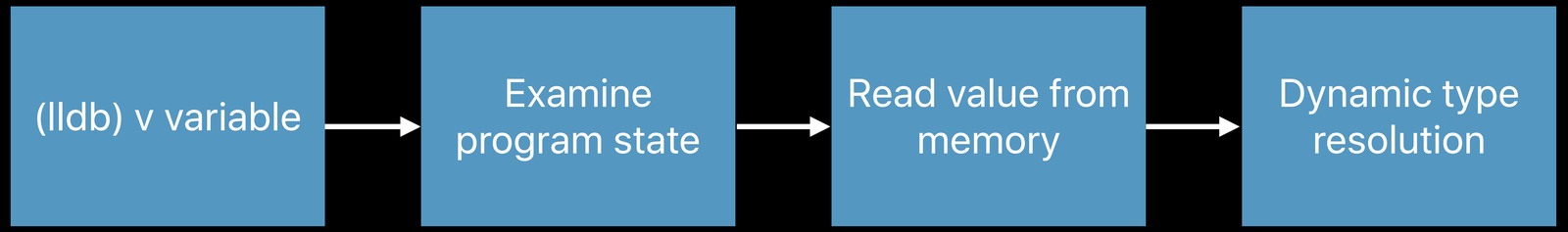

```
(lldb) v variable
```

“v” Under the Hood



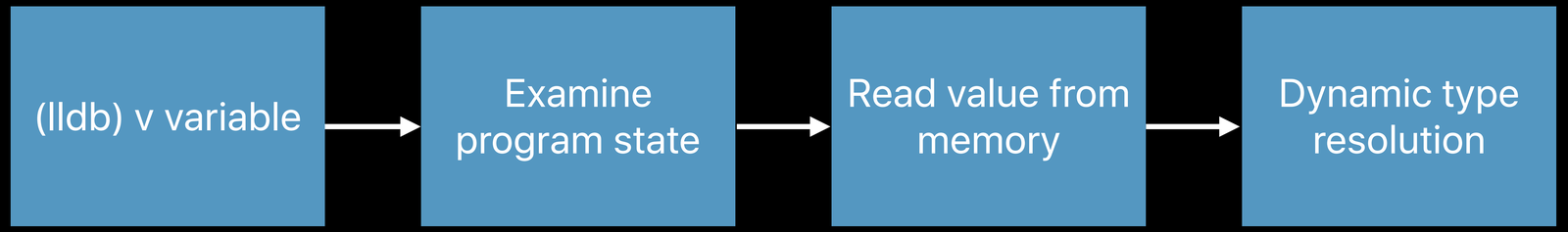

```
(lldb) v variable
```

“v” Under the Hood



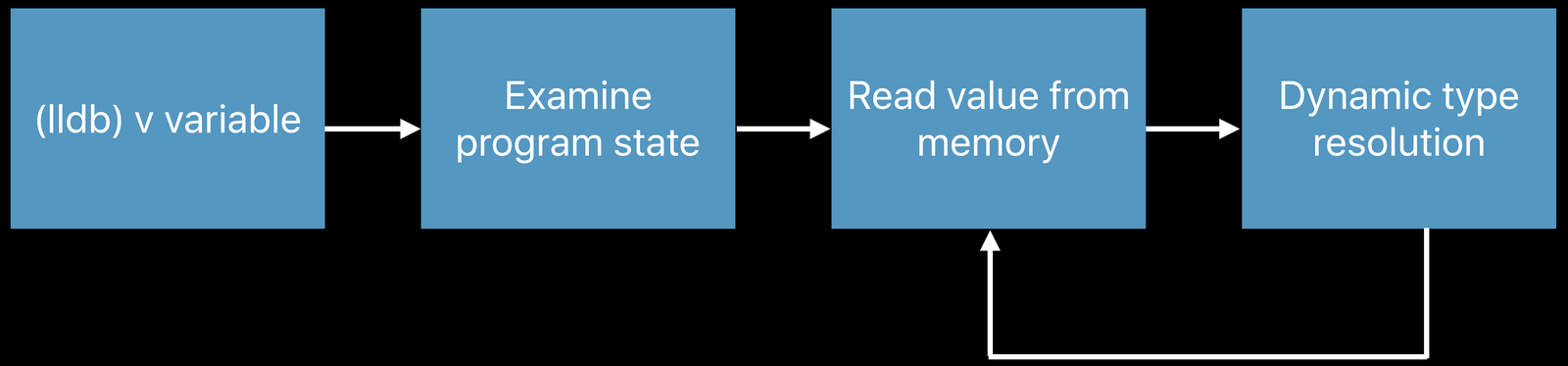

```
(lldb) v variable
```

“v” Under the Hood



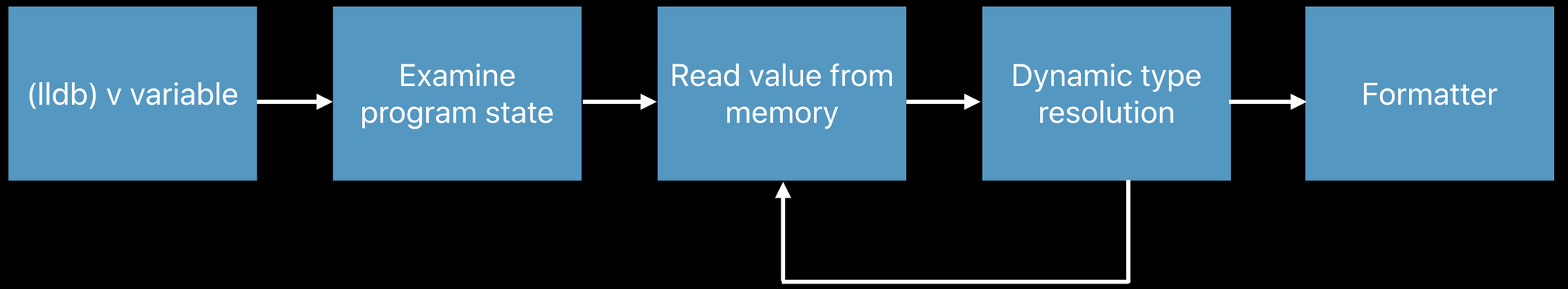

```
(lldb) v variable.field1
```

“v” Under the Hood




```
(lldb) v variable.field1.field2
```

“v” Under the Hood




```
(lldb) v variable.field1.field2
```

```
protocol Activity {}
struct Trip: Activity {
    var name: String
    var destinations: [String]
}

let cruise: Activity = Trip(…)
```

```
(lldb)
```

```
protocol Activity {}
struct Trip: Activity {
    var name: String
    var destinations: [String]
}

let cruise: Activity = Trip(…)
```

```
(lldb) v cruise.name
(String) cruise.name = "Mediterranean Cruise"
```

Displaying Variables

Displaying Variables

	po	p	v
Object description			
Data formatters			

Displaying Variables

	po	p	v
Object description	✓		
Data formatters		✓	✓
Access to the full language	✓	✓	
Iterative dynamic type resolution			✓

Customizing Data Formatters

Jonas Devlieghere

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```swift
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) v cruise.destinations
([String]) cruise.destinations = 3 values {
  [0] = "Sorrento"
  [1] = "Capri"
  [2] = "Taormina"
}
```

Customizing Data Formatters

Filters

String summaries

Synthetic children

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) type filter add Travel.Trip --child name
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) type filter add Travel.Trip --child name
(lldb) v cruise
(Travel.Trip) cruise = (name = "Mediterranean Cruise")
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

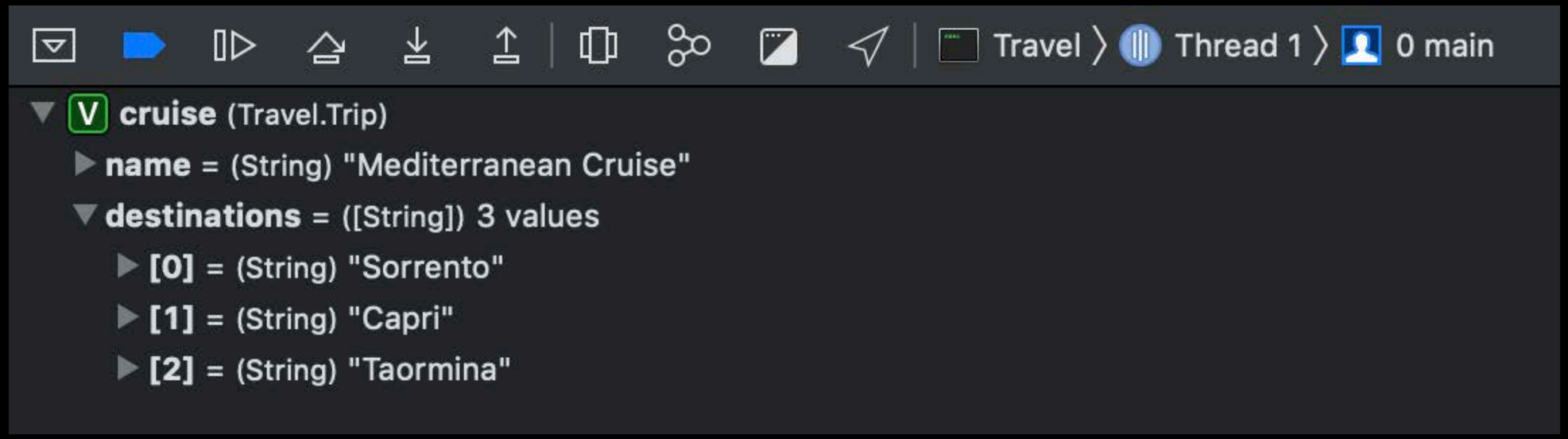
```
(lldb) type filter add Travel.Trip --child name
(lldb) v cruise
(Travel.Trip) cruise = (name = "Mediterranean Cruise")
(lldb) type filter delete Travel.Trip
```

String Summaries

String representation

Displayed in Xcode's variable view

Part of the data formatter



String Summaries

String representation

Displayed in Xcode's variable view

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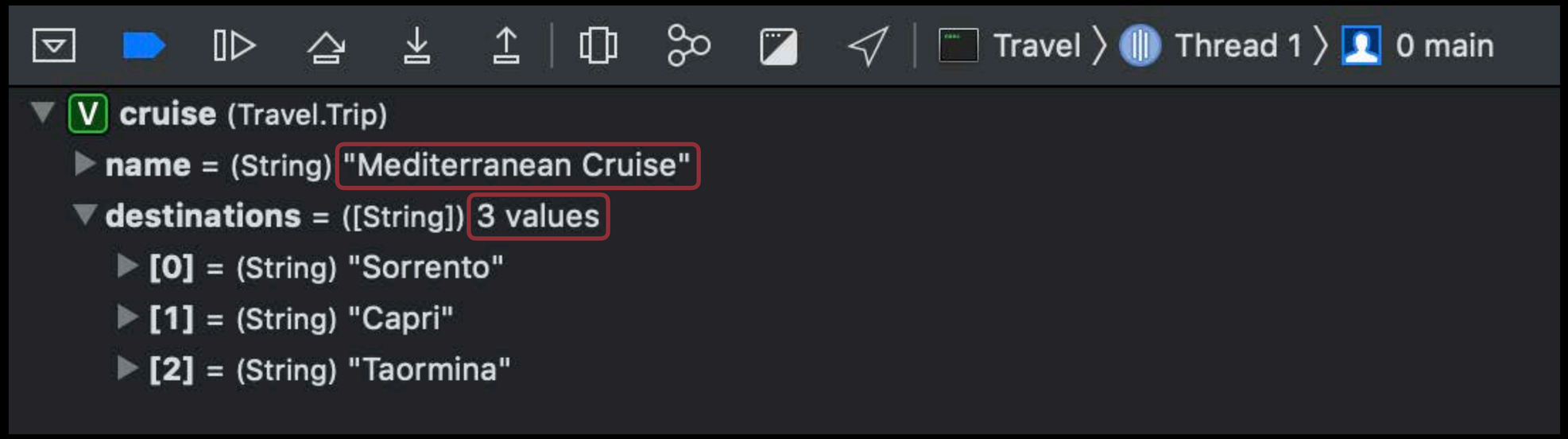

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) type summary add Travel.Trip --summary-string
"${var.name} from ${var.destinations[0]} to ${var.destinations[2]}"
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) type summary add Travel.Trip --summary-string
"${var.name} from ${var.destinations[0]} to ${var.destinations[2]}"
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) type summary add Travel.Trip --summary-string
"${var.name} from ${var.destinations[0]} to ${var.destinations[2]}"
(lldb) v cruise
(Travel.Trip) cruise = "Mediterranean Cruise" from "Sorrento" to "Taormina"
```

Python Formatter

Arbitrary computations with Python

Full access to LLDB's Python API

LLDB Scripting Bridge

LLDB Scripting Bridge

`SBTarget`	Target program running under the debugger

LLDB Scripting Bridge

`SBTarget`	Target program running under the debugger
`SBProcess`	Process associated with the target program

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`SBTarget`	Target program running under the debugger
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LLDB Scripting Bridge

`SBTarget`	Target program running under the debugger
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`SBFrame`	Stack frame associated with a thread

LLDB Scripting Bridge

`SBTarget`	Target program running under the debugger
`SBProcess`	Process associated with the target program
`SBThread`	Thread of execution
`SBFrame`	Stack frame associated with a thread
`SBValue`	Value of a variable, a register, or an expression

NEW

Python 3

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) script
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) script
>>> cruise = lldb.frame.FindVariable("cruise")
>>>
```

```swift
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) script
>>> cruise = lldb.frame.FindVariable("cruise")
>>> print(cruise)
(Travel.Trip) cruise = {
  name = "Mediterranean Cruise"
  destinations = 3 values {
    …
}
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>> destinations = cruise.GetChildMemberWithName("destinations")
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>> destinations = cruise.GetChildMemberWithName("destinations")
>>> print(destinations)
([String]) destinations = 3 values {
  [0] = "Sorrento"
  [1] = "Capri"
  [2] = "Taormina"
}
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>> count = destinations.GetNumChildren()
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>> count = destinations.GetNumChildren()
>>> begin = destinations.GetChildAtIndex(0)
>>> print(begin)
(String) [0] = "Sorrento"
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>> count = destinations.GetNumChildren()
>>> begin = destinations.GetChildAtIndex(0)
>>> print(begin)
(String) [0] = "Sorrento"
>>> end = destinations.GetChildAtIndex(count - 1)
>>> print(end)
(String) [2] = "Taormina"
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>> print("Trip from {} to {}".format(begin, end))
Trip from (String) name = "Sorrento" to (String) name = "Taormina"
>>>
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
>>> print("Trip from {} to {}".format(begin, end))
Trip from (String) name = "Sorrento" to (String) name = "Taormina"
>>> print("Trip from {} to {}".format(begin.GetSummary(), end.GetSummary()))
Trip from "Sorrento" to "Taormina"
```

```
// Trip.py
```

```
// Trip.py
def SummaryProvider(value, _):
```

```
// Trip.py
def SummaryProvider(value, _):
    destinations = value.GetChildMemberWithName("destinations")
    count = destinations.GetNumChildren()
```

```
// Trip.py
def SummaryProvider(value, _):
    destinations = value.GetChildMemberWithName("destinations")
    count = destinations.GetNumChildren()
    if count == 0:
        return "Empty trip"
```

```
// Trip.py
def SummaryProvider(value, _):
    destinations = value.GetChildMemberWithName("destinations")
    count = destinations.GetNumChildren()
    if count == 0:
        return "Empty trip"

    begin = destinations.GetChildAtIndex(0).GetSummary()
    end = destinations.GetChildAtIndex(count - 1).GetSummary()

    return "Trip with {} stops from {} to {}".format(count, begin, end)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) command script import Trip.py
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) command script import Trip.py
(lldb) type summary add Travel.Trip --python-function Trip.SummaryProvider
(lldb)
```

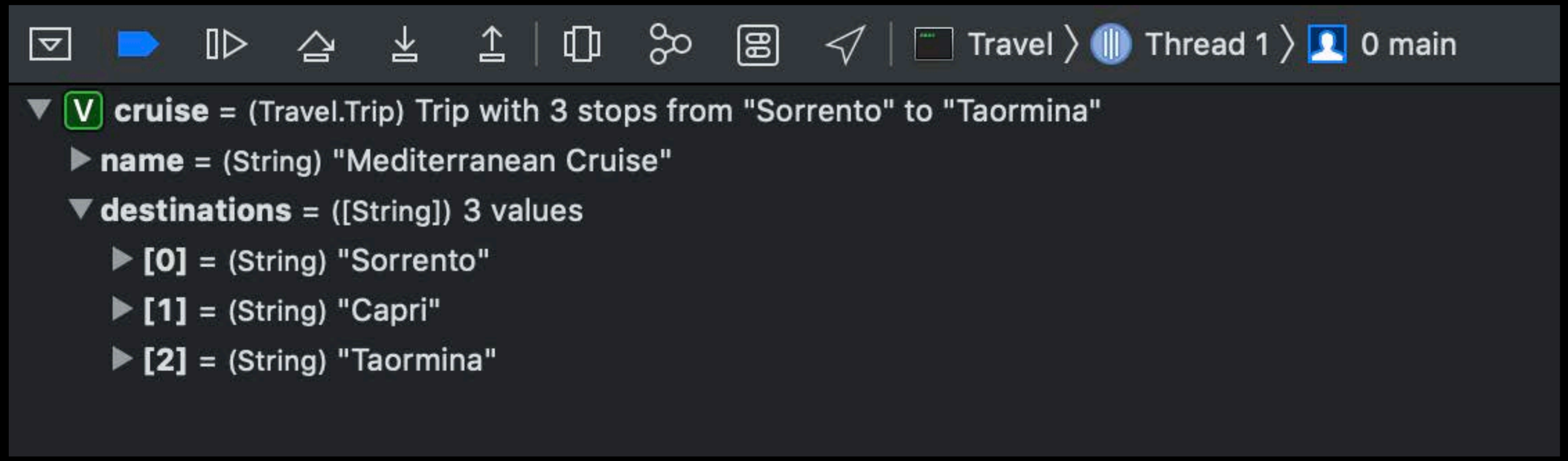
```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) command script import Trip.py
(lldb) type summary add Travel.Trip --python-function Trip.SummaryProvider
(lldb) v cruise
(Travel.Trip) cruise = Trip with 3 stops from "Sorrento" to "Capri"
```

Synthetic Children

Customize children

Full access to LLDB's Python API



Synthetic Children

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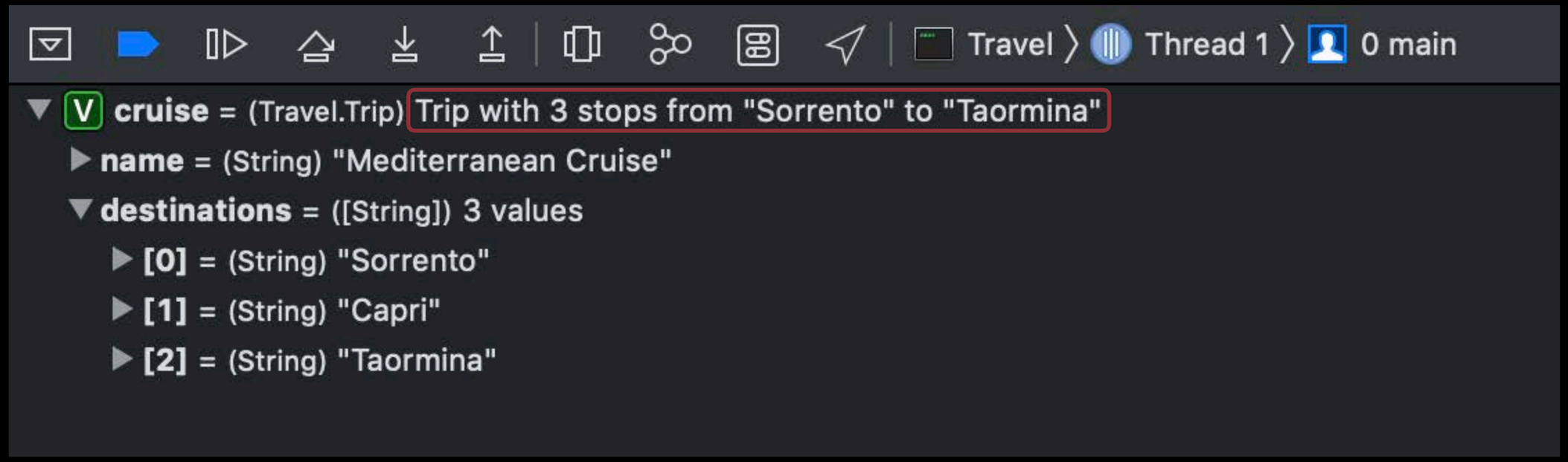
Full access to LLDB's Python API



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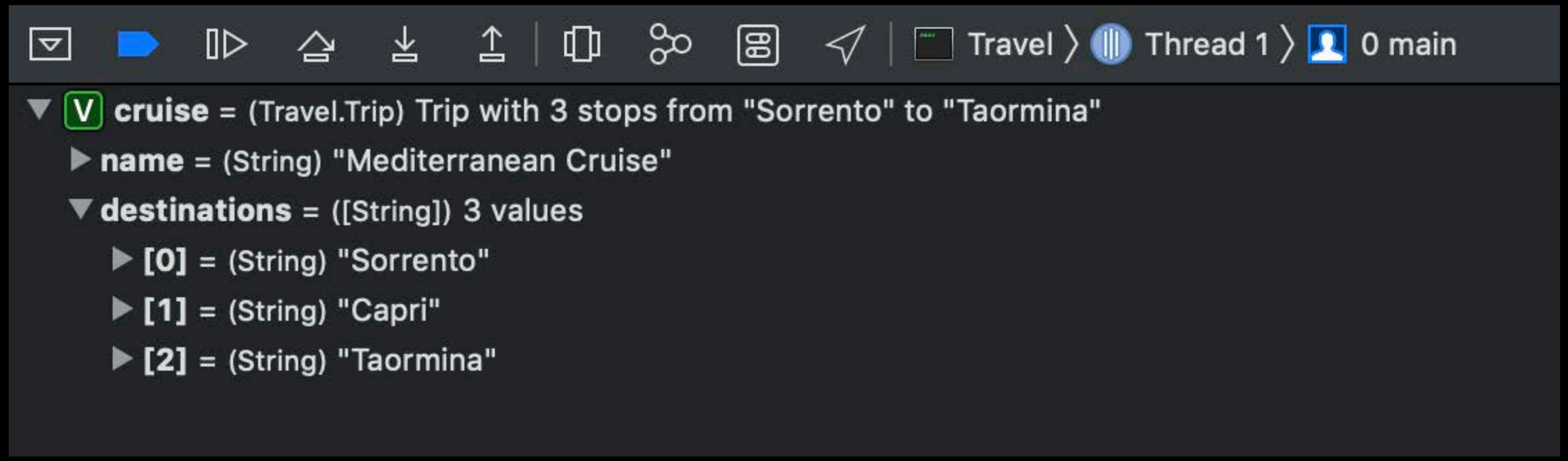
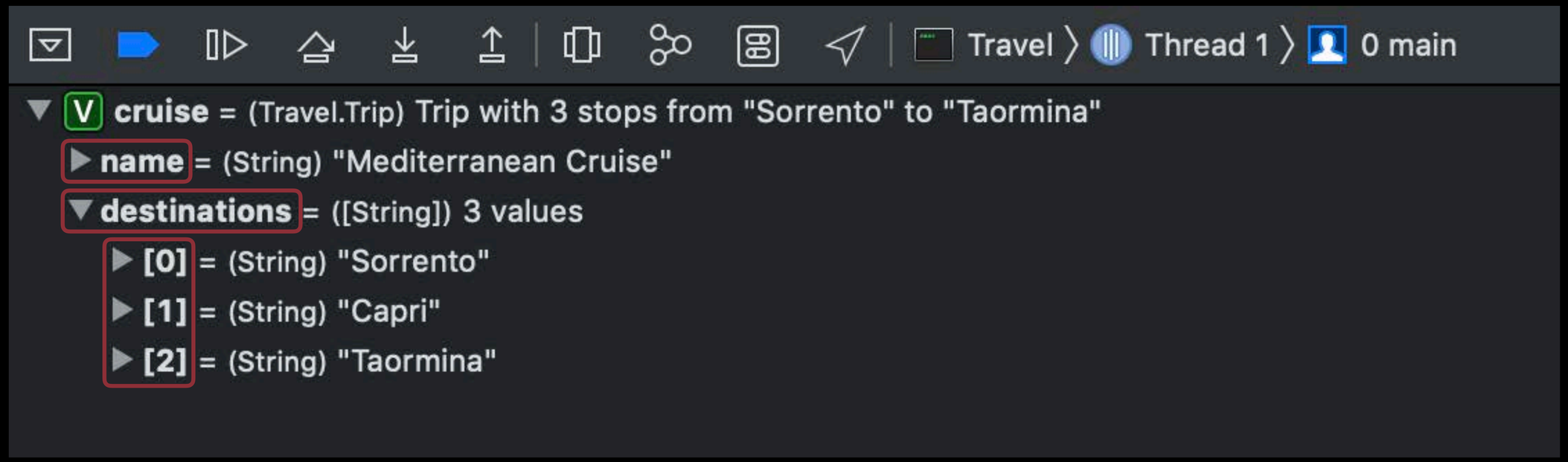


Synthetic Children

Customize children

Full access to LLDB's Python API



```
// Trip.py
class ExampleSyntheticChildrenProvider:
   def __init__(self, value, _):
      …

   def num_children(self):
      …

   def get_child_at_index(self, index):
      …

   def get_child_index(self, name):
      …
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) command script import Trip.py
(lldb)
```

```
struct Trip {
    var name: String
    var destinations: [String]
}

let cruise = Trip(
    name: "Mediterranean Cruise",
    destinations: ["Sorrento", "Capri", "Taormina"])
```

```
(lldb) command script import Trip.py
(lldb) type synthetic add Travel.Trip --python-class Trip.ExampleSyntheticChildrenProvider
```

```
# ~/.lldbinit

# Load Trip.py
command script import Trip.py

# Register Trip summary provider
type summary add Travel.Trip --python-function Trip.SummaryProvider

# Register Trip child provider
type synthetic add Travel.Trip --python-class Trip.ExampleSyntheticChildrenProvider
```

Summary

Use `v`, `p`, and `po` to print variables

Customize data formatters with filter, summaries and synthetic children

Use Python 3 for scripting

More Information

developer.apple.com/wwdc19/429


WWDC19