Remote iOS Device Server

Scaling iOS testing

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Hello, my name is

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Agenda

1. Introduction
2. Parallel tests on iOS
3. Device Server
4. Results & next steps
5. Tips & Tricks — how to apply it at your scale
6. Recap

Introduction

Our automation stack

- calabash-ios
- cucumber-ruby
- ruby
- WebDriverAgent
- parallel_cucumber

What we had

- 1300+ end-to-end tests
- 35+ hours of cpu-time
- 1.5 hours wall-clock time
- 10+ Pull Requests per day to the app repo
- 30+ Test runs per day
- Extra projects on the same infrastructure
- 1500+ cpu-time hours per day

What we want

- Increase trust in automation
- Fast and reliable feedback

What we want

- 30 minutes wall-clock
- Stability
- Scalability
- Easy maintenance and development
- Simulators & physical devices

How to get there

- Delete ⅔ of tests

Questions?

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But really

- Filter tests based on change set, coverage, components
- Speed up and stabilise tests
- Heavily parallelise test runs
- Provide scalable infrastructure to run tests

Parallel tests on iOS

Test parallelisation

$1300_{\text{tests}} / 1_{\text{simulator}} = 40_{\text{hours}}$

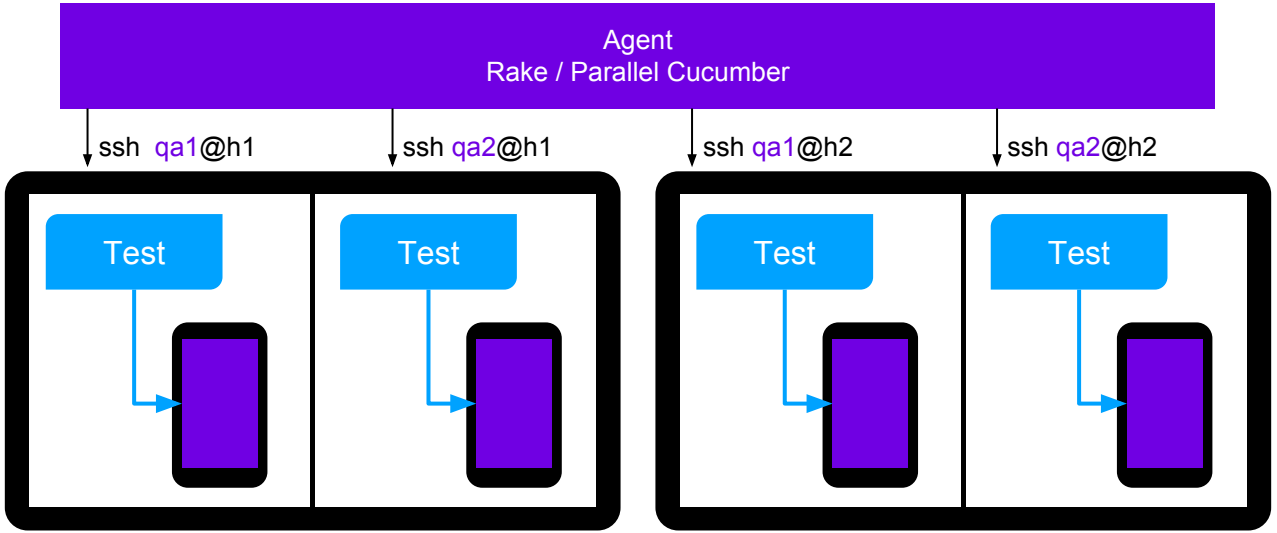
$1300_{\text{tests}} / X_{\text{simulators}} = 0.5_{\text{hours}}$

$X = 80_{\text{simulators}}$

Options

- 3rd party cloud
  - SauceLabs / TestObject
  - Xamarin Test Cloud
  - AWS Device Farm
- In-house

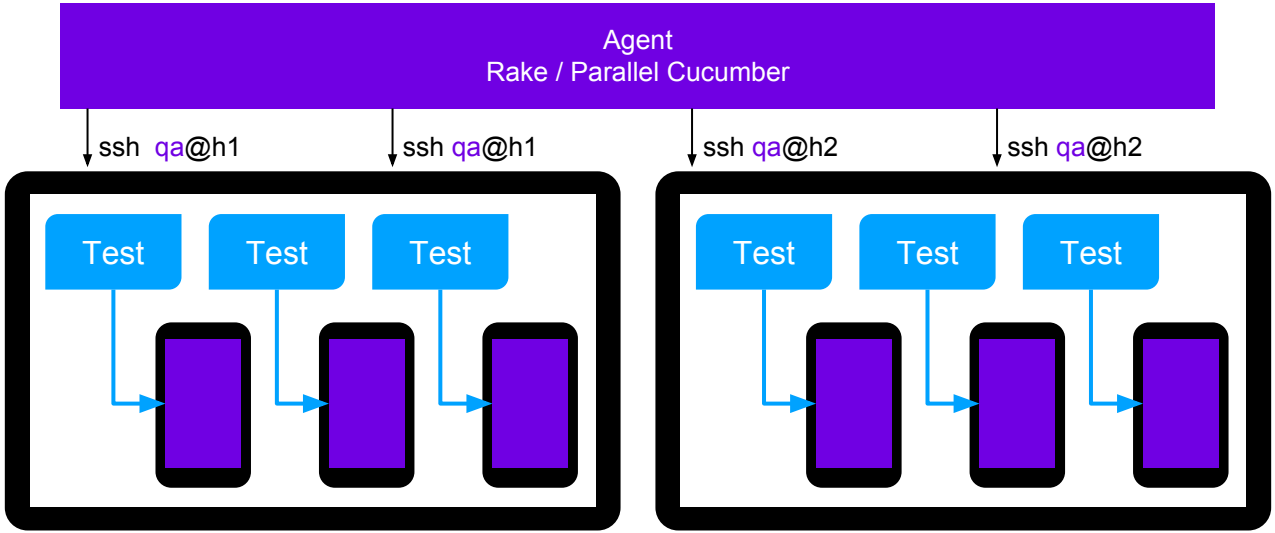
Multiple users, simulator per user



macOS,
Xcode,
Ruby,
…

[iOS Calabash in parallel on one host](#) by Tim Baverstock

Single user, multiple simulators



macOS,
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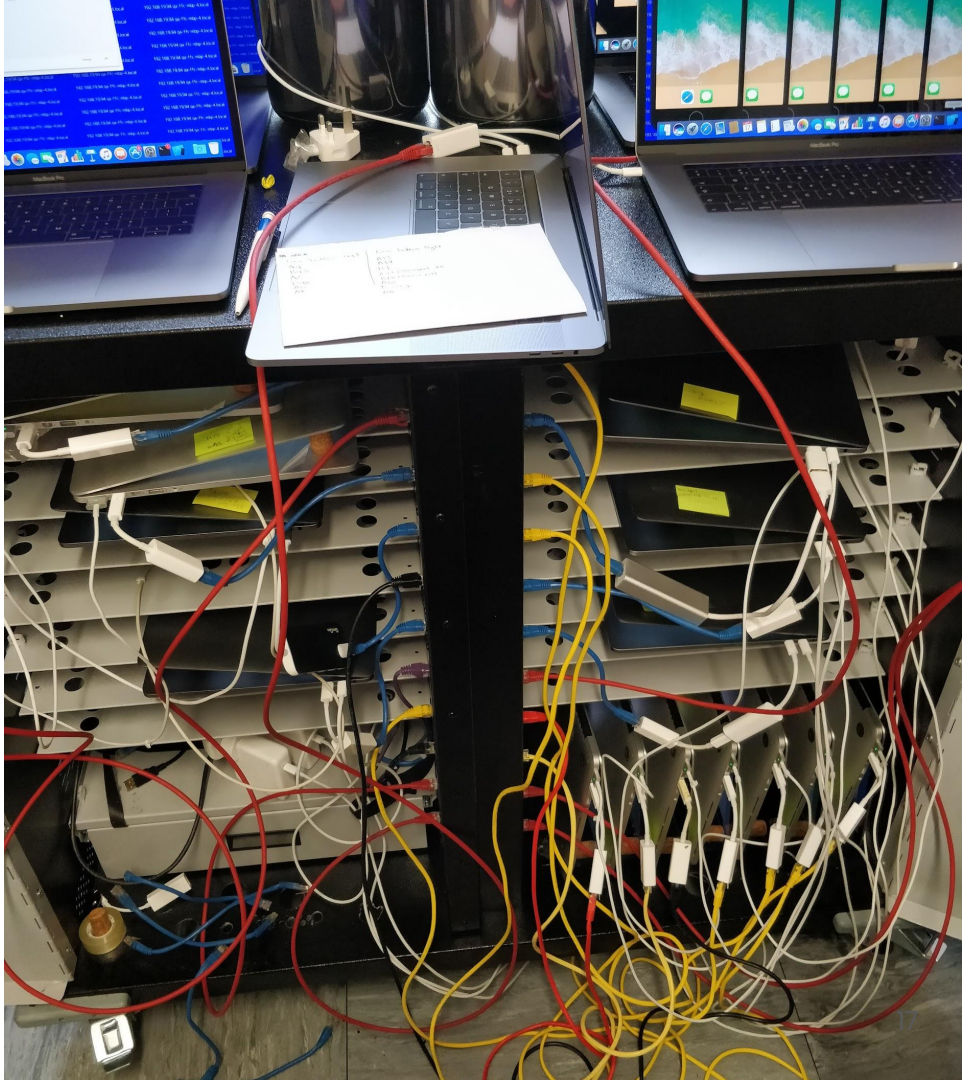
Ruby,
…

[iOS Parallel Automation: run faster than fast] by Viktar Karanevich
[Turning iOS End to End Testing up to 11] by Lawrence Lomax

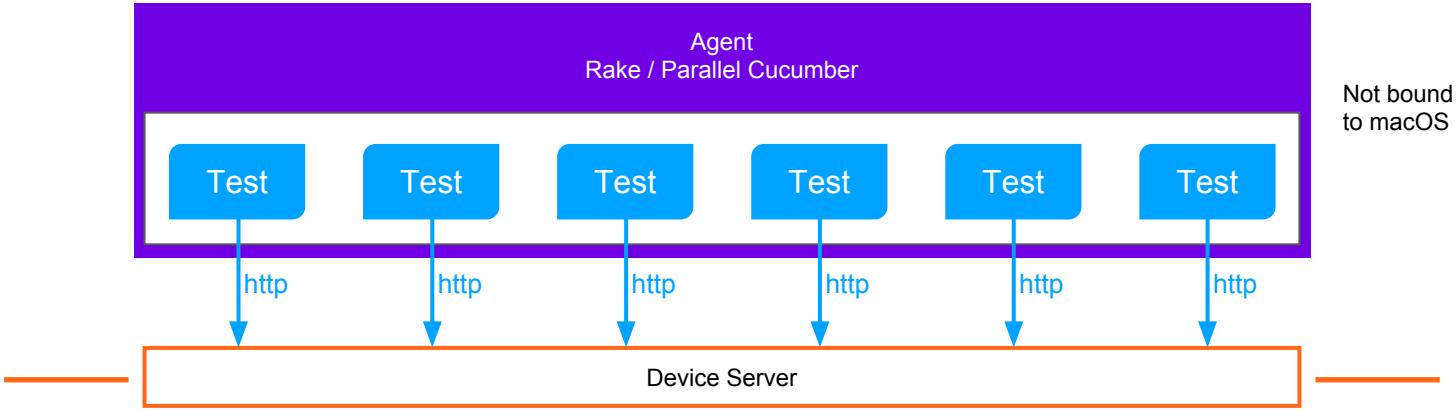


Issues with current model

- Tight coupling of test code and infrastructure
- Hard to scale
- Tests are bound to simulator host machine
- Too easy to mess with simulator internals
- No sharing of resources between test jobs on CI

New Model

New model


Agent
Rake / Parallel Cucumber
Test
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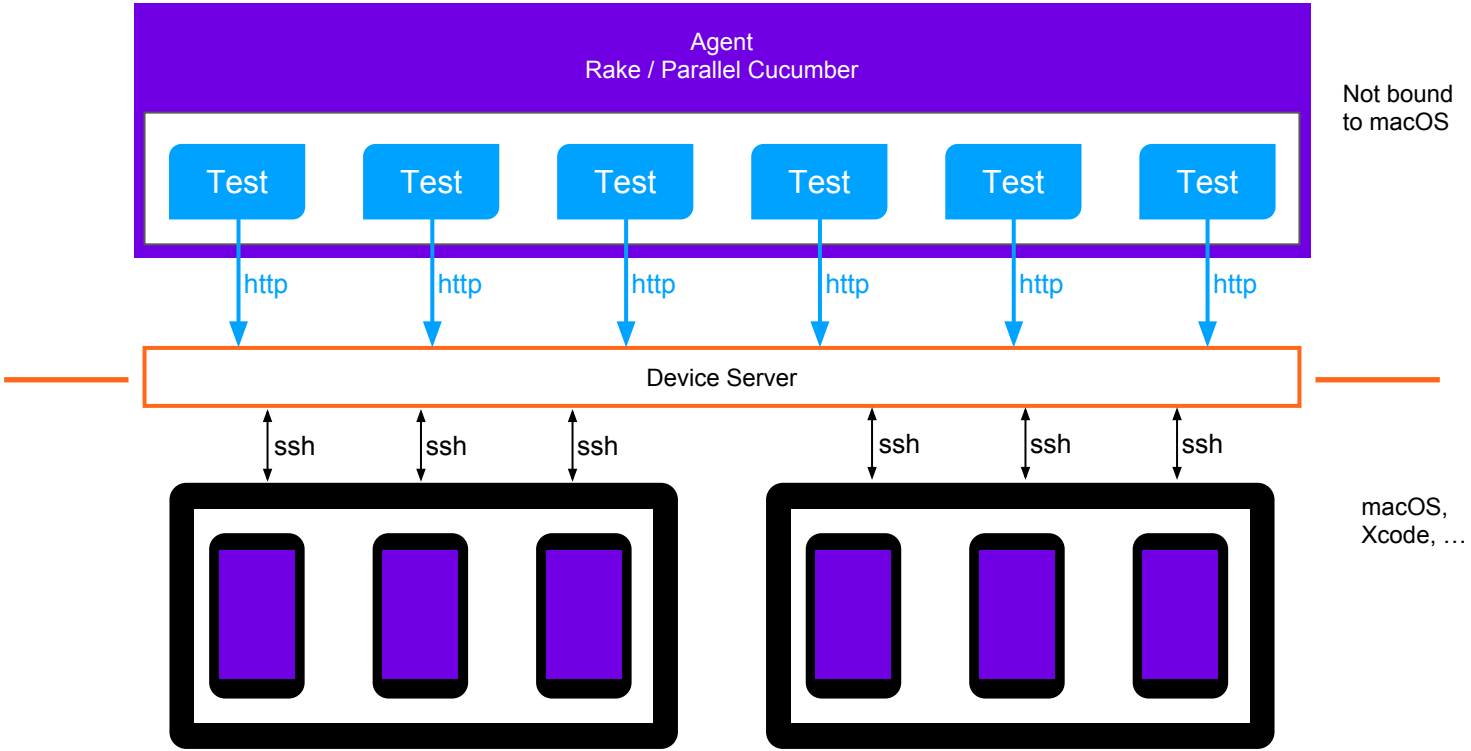
Device Server
Not bound
to macOS

New model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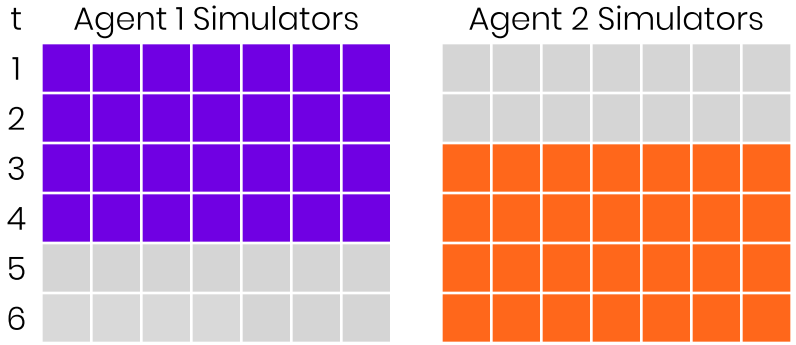
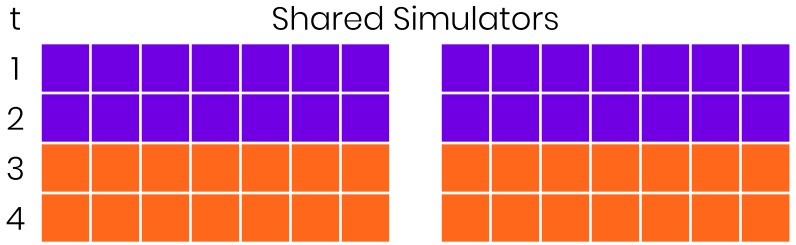
to macOS
macOS,
Xcode, …

New model

- Separation of concerns
- Well-defined interface
- Cheaper test environments
- Easy sharing of resources between test jobs on CI

Why move? Sharing



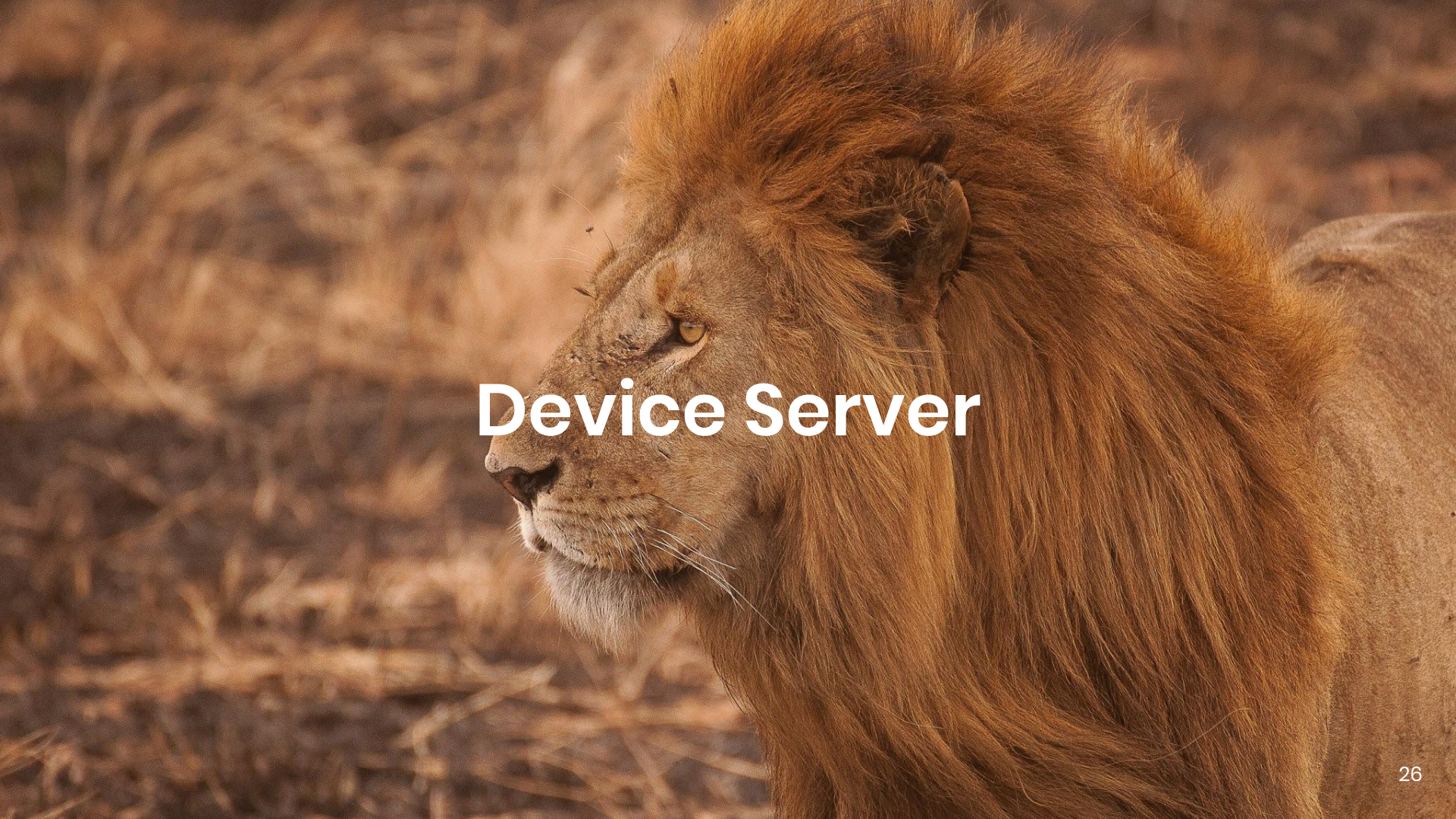


More reasons to move

- Black boxing
- No more messing with internals
- No more xcrun simctl, fbsimctl, idevice*
- Easier updates

Why not Selenium Grid?

- Existing code
- Custom actions
- Flexibility and fast prototyping


Device Server

Tools

Previous

- xcrun simctl
- fbsimctl
- WebDriverAgent
- ideviceinstaller

Current

- fbsimctl
- WebDriverAgent

fbsimctl as a server

```
$ fbsimctl $udid boot -- listen --http 9999 -- shutdown

listen started: Http: 9999 Hid: No stdin: false


$ curl http://localhost:9999/B98A0678-3724-4BF5-9A4C-E84E06DDA1DD/list

{"status":"success","subject":[{"event_type":"discrete","timestamp":1523370322,"subje
ct":{"arch":"x86_64","state":"Shutdown","model":"iPhone 6","name":"iPhone
6","os":"iOS
11.2","udid":"B98A0678-3724-4BF5-9A4C-E84E06DDA1DD"},"event_name":"list"}],"events":[
]}
```

fbsimctl over http – exposed actions

- approve
- clearKeychain
- config
- diagnosticQuery
- diagnostic
- hid
- install
- launch
- list
- listApps
- open
- record
- relaunch
- screenshot
- search
- setLocation
- tap
- terminate
- uninstall
- upload

fbsimctl over http – missing actions

- boot
- create
- delete
- erase
- shutdown
- launch_xctest
- list_device_sets

fbsimctl over http – missing actions

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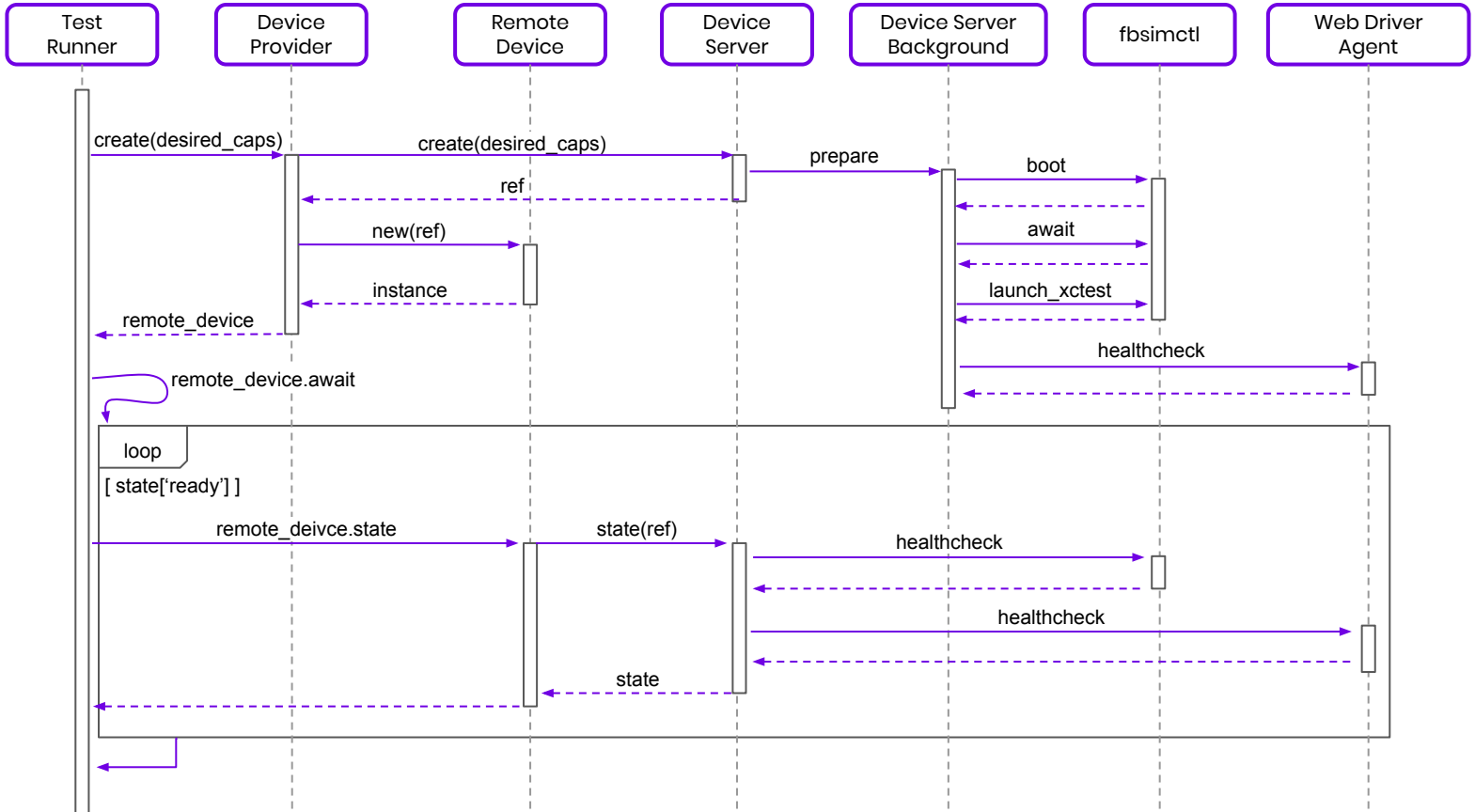
Additional requirements

- Prepare and reset simulators on demand
- Start WebDriverAgent on simulators
- Hide away satisfying desired requirements
- Extra actions
- Pool simulators

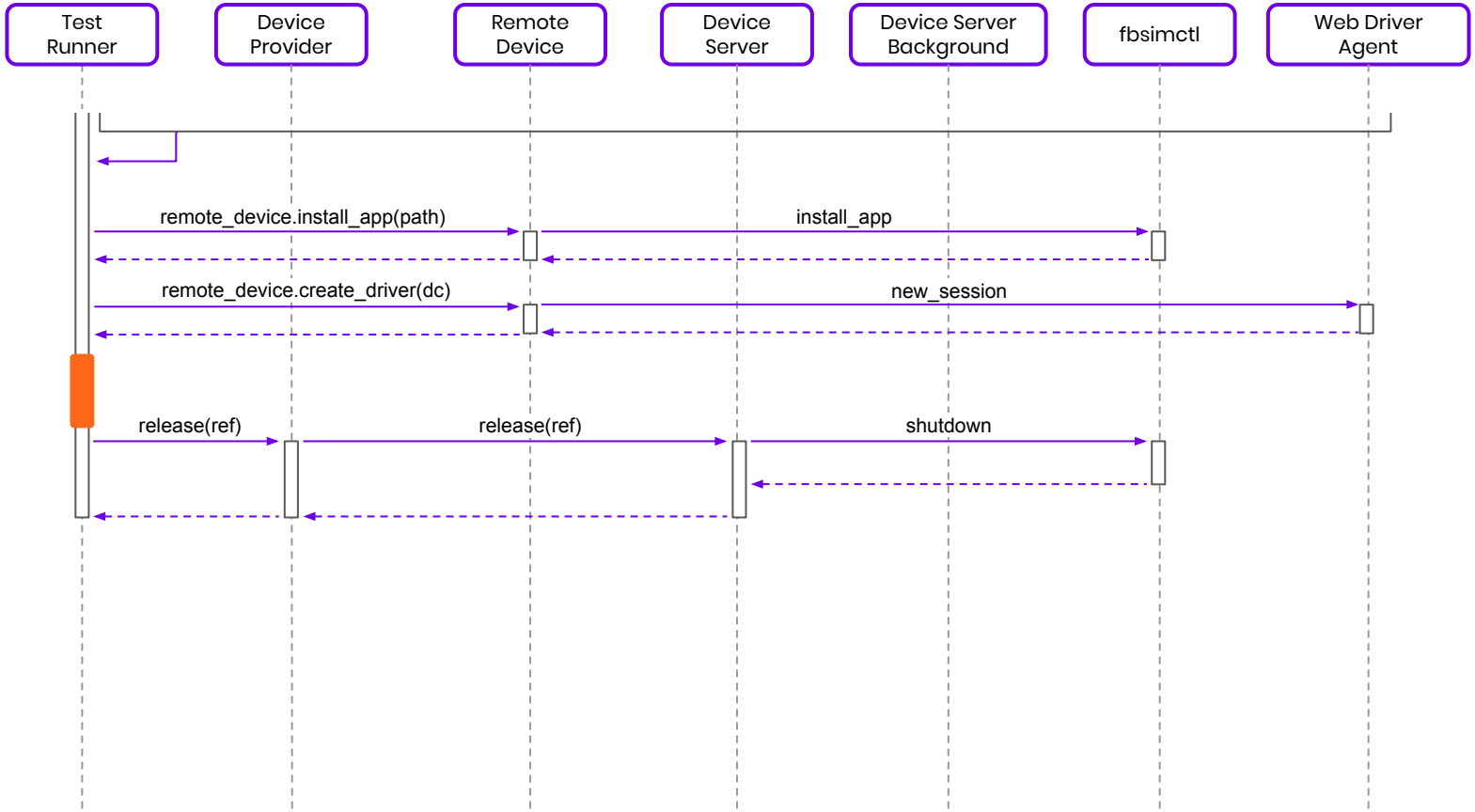
Remote Device API (Subset)

```
class RemoteDevice
  ...
  def reset(timeout: 60); end
  def clear_safari_cookies; end
  ...
  def app_installed?(bundle_id); end
  def create_driver(caps); end
  ...
  def video_acquire; end
  def video_start; end
  def video_stop; end
  def last_crash_log; end
```

Device Server model



Device Server model



Results & Next Steps

Results

- 30 → 60 machines hosting simulators
- 1.5 hours → 0.5 hours
- Decoupled tests and infrastructure
- Eased updates
- Simplified test runner

Next Steps

- Open-source
- Remove ssh

Tips & Tricks

Simulators per host

MacBook Pro

4 Cores Intel Core i7 @ 2.8 GHz,

16 GB RAM

6 simulators

£ 2,349.00

1 simulator = £ 391.50

Mac Pro

12 Cores Intel Xeon E5-2697 @ 2.7 GHz,

64 GB RAM

18 simulators (3 VMs × 6 simulators)

£ 5,879.00

1 simulator = £ 326.61

ESXi = £ 0.00

Resetting Simulator

Option 1: Straightforward

```
fbsimctl ${UDID} shutdown -- erase -- boot
```

Full boot ~ 18 seconds

Resetting Simulator

Option 2: Not so straightforward

```
cd $(fbsimctl list_device_sets)
fbsimctl ${UDID} shutdown
rm -rf ${UDID}
cp -rp ${UDID}_BACKUP ${UDID}
fbsimctl ${UDID} boot
```

Full boot ~ 8 seconds

Reset Cookies

```
$ fbsimctl B98A0678-3724-4BF5-9A4C-E84E06DDA1DD list_apps | grep MobileSafari

Bundle Name: MobileSafari | ID: com.apple.mobilesafari | Install Type system | ⤸
Container /Users/qa/Library/Developer/CoreSimulator/Devices/ ⤸
B98A0678-3724-4BF5-9A4C-E84E06DDA1DD/data/Containers/Data/Application/ ⤸
22D18402-3D7B-4F28-88CF-98935328B0FB

$ rm -f /Users/qa/Library/Developer/CoreSimulator/Devices/ ⤸
B98A0678-3724-4BF5-9A4C-E84E06DDA1DD/data/Containers/Data/Application/ ⤸
22D18402-3D7B-4F28-88CF-98935328B0FB/Library/Cookies/Cookies.binarycookies
```

Setting Up Simulator Host

```
# enable on-screen keyboard
defaults write com.apple.iphonesimulator ConnectHardwareKeyboard -bool false

# disable location
defaults write com.apple.iphonesimulator LocationMode "3101"

# turn off chrome
defaults write com.apple.iphonesimulator ShowChrome -bool false

# EnableKeyboardSync
# GraphicsQualityOverride
# OptimizeRenderingForWindowScale
# SlowMotionAnimation
```

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Managing Infrastructure

- 64 hosts to manage + 6 TeamCity agents
- xcversion https://github.com/KrauseFx/xcode-install
- Ansible playbook to update fbsimctl, xcode, deploy configs, etc
- Ansible to remove outdated simulators after updates

Managing Infrastructure

```
# do once on a storage host
xcversion install 9.2 --no-install --no-clean
xcversion simulators --install="iOS 11.0" --no-install

ls ~/Library/Caches/XcodeInstall/

cd ~/Library/Caches/XcodeInstall/
python -m SimpleHTTPServer
```

Managing Infrastructure

```
# repeat for each work host
xcversion install 9.2 --url=http://$host:$port/Xcode_9.2.xip

curl http://$host:$port/com.apple.pkg.iPhoneSimulatorSDK….dmg --output ⤸
     ~/Library/Caches/XcodeInstall/com.apple.pkg.iPhoneSimulatorSDK….dmg
xcversion simulators --install="iOS 11.0"
```

Recap

Stability, reliability, speed

Separation of concerns

Know-Hows

Thank you! Questions?
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