

Строим масштабируемую инфраструктуру для запуска мобильных UI тестов

Евгений Мацюк

Давайте знакомиться

Давайте знакомиться

- Как много тестов?
 - <300
 - >300 && <1000
 - 1000+
- Как часто вы запускаете UI тесты?
 - каждую ночь
 - каждый PR
 - каждый commit

Обо мне

15+ лет в Software Engineering

Android GDE

5+ лет в Mobile Tests Tooling

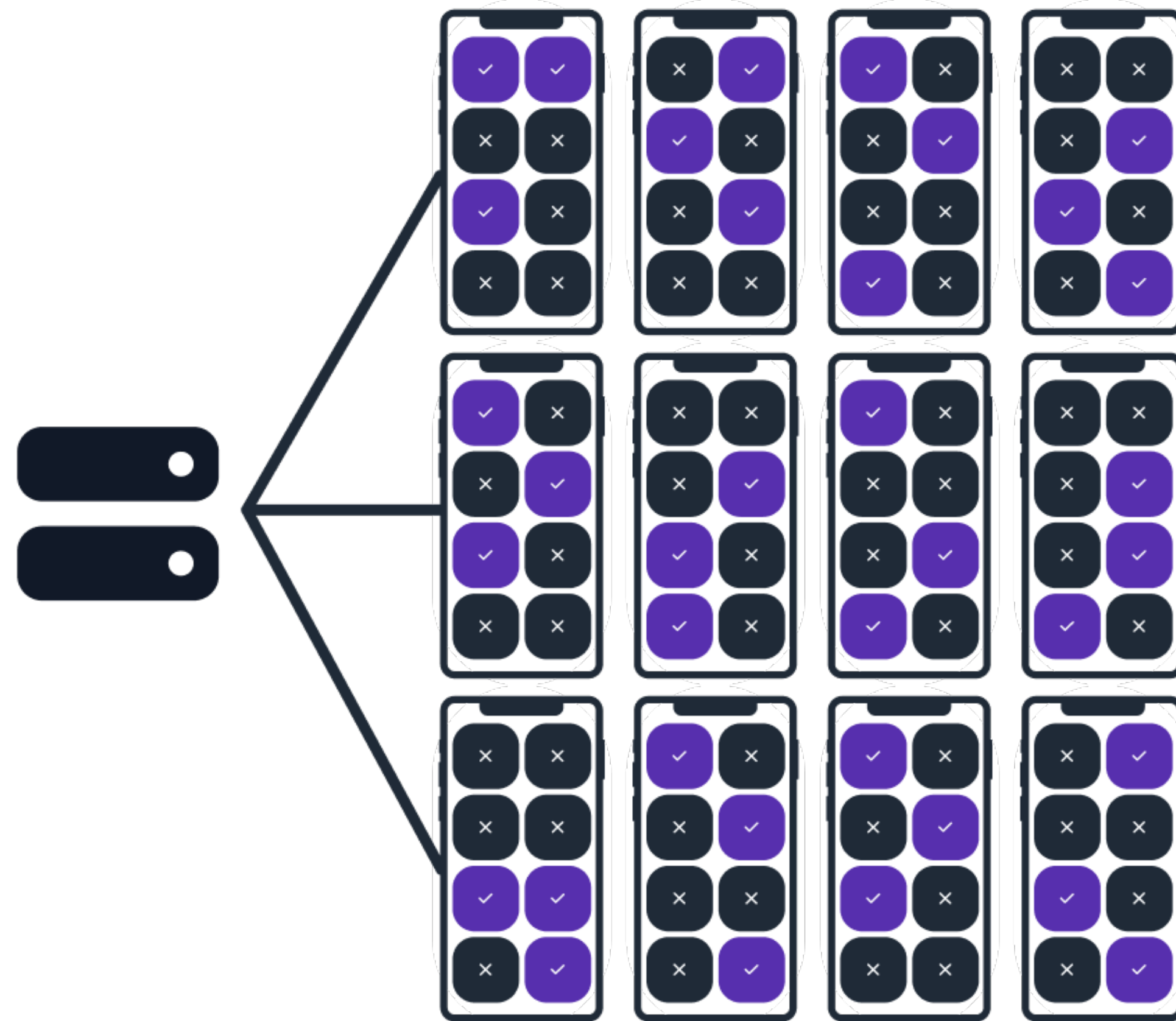


Kaspresso





Marathon
Cloud





Почему нам нужны UI тесты?

Почему нам нужны UI тесты?

- “Это моя работа”
- Короткие релизные циклы
- Счастливые пользователи
- Счастливая команда

Что такое UI Testing?

Что такое UI Testing?

Writing

Kaspresso

Espresso

Maestro

UI Automator

Barista

Appium

Where to run

Real device

Emulator

Docker container

Backend

Real network

Mock network

Running

Orchestrator

Marathon

Flank

Spoon

Android JUnit Runner

Reports/Analytics

JUnit

Grafana

Allure

Influx DB

Hardware Infrastructure

In-House server

AWS

Azure

Kubernetes

Docker

Helm

Что такое UI Testing?



Alexey Bykov

Where and how to run UI tests?



Evgenii Matsiuk

Autotests on Android. The entire picture

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Что такое UI Testing?

Writing

Native

Espresso

UI Automator

Wrappers over native

Kaspresso

Barista

CrossPlatform

Maestro

Appium

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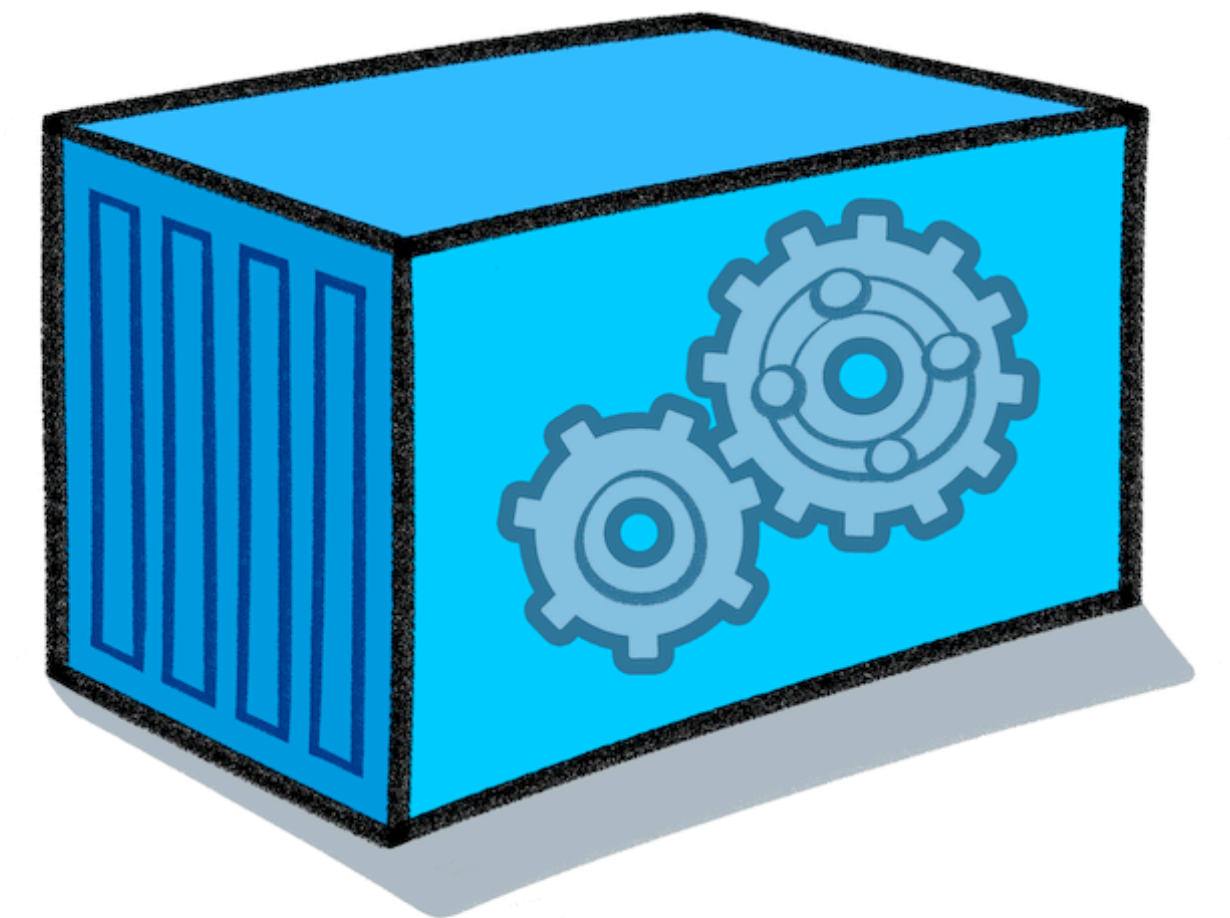
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Что такое UI Testing?

Running

Google

Orchestrator

Android JUnit
Runner

OSS

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Spoon

Marathon

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Hardware Infrastructure

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Что такое UI Testing?

Hardware Infrastructure

Hardware

In-House server

Azure

AWS

Tools

Kubernetes

Helm

Docker

Что такое UI Testing?

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Что такое UI Test Infrastructure?



Let's build the Simple UI Test Infrastructure

Simple UI Test Infrastructure

Job #1



Simple UI Test Infrastructure

Job #1



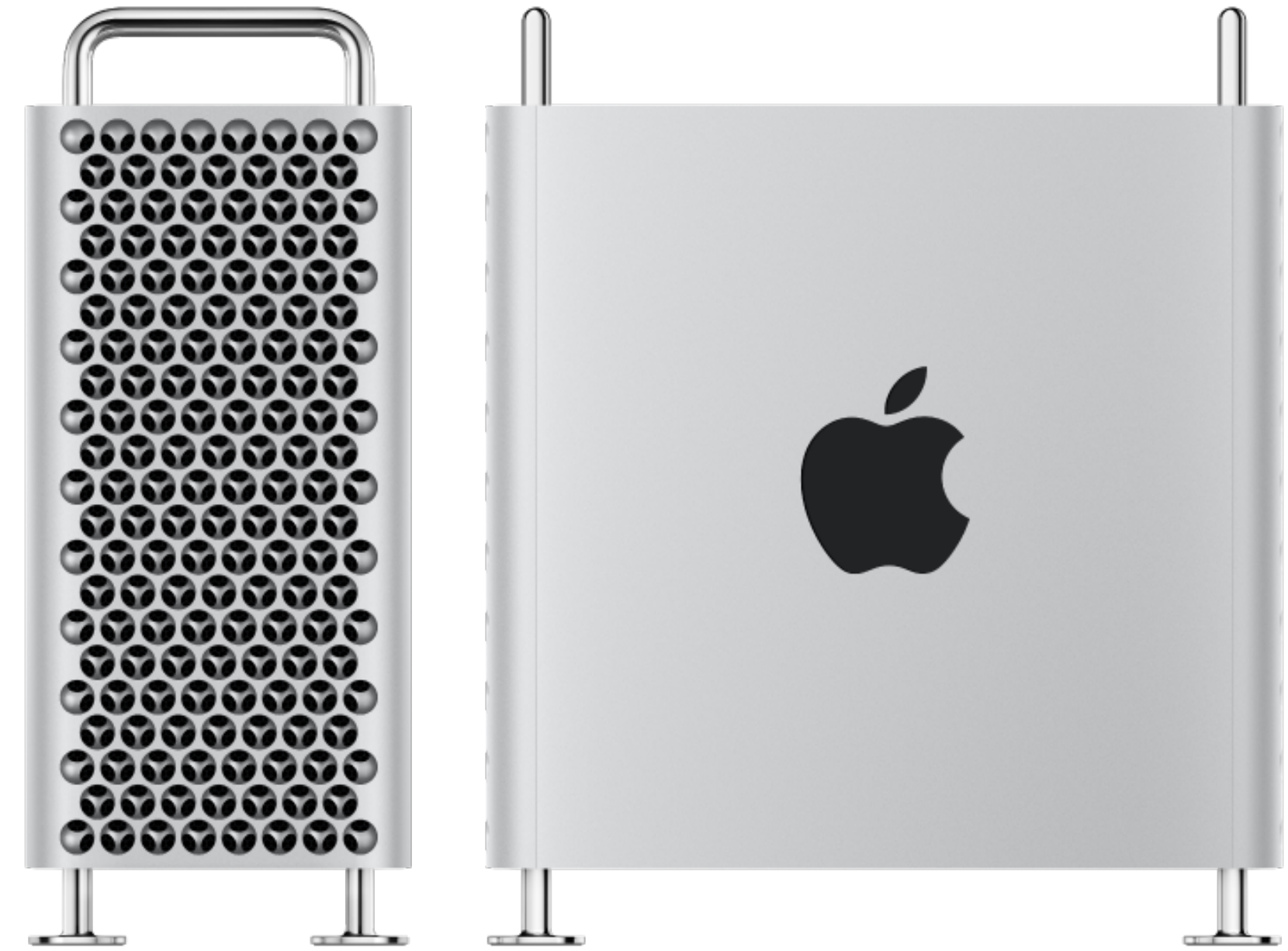
Queue

Simple UI Test Infrastructure

Job #1



Queue



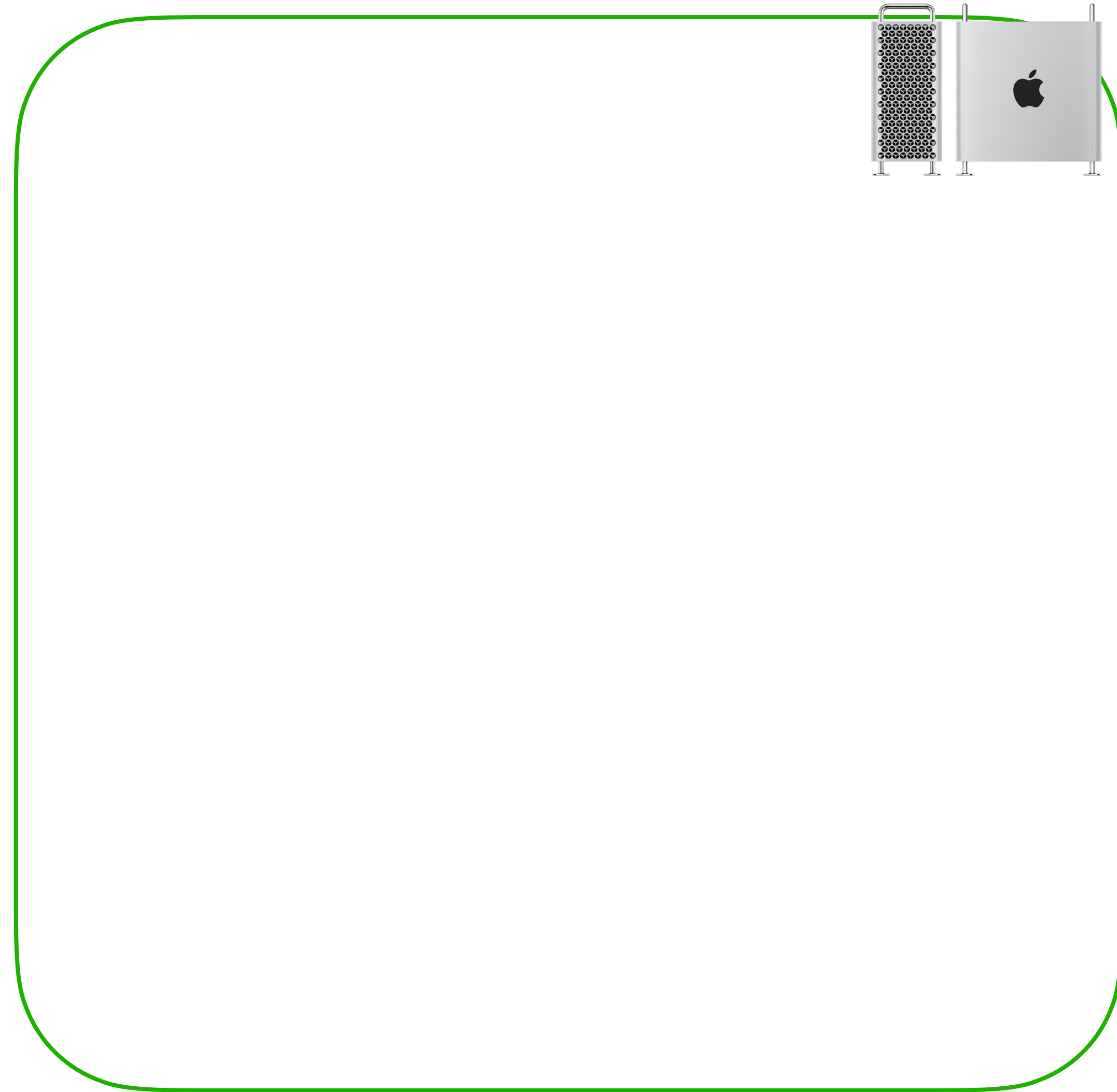
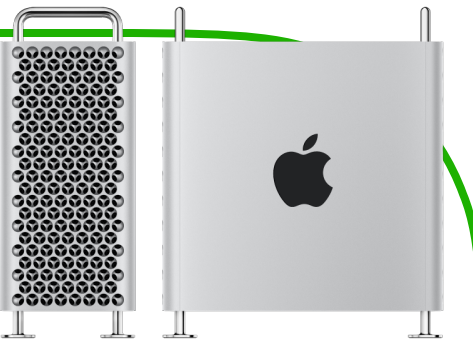
Single host

Simple UI Test Infrastructure

Job #1

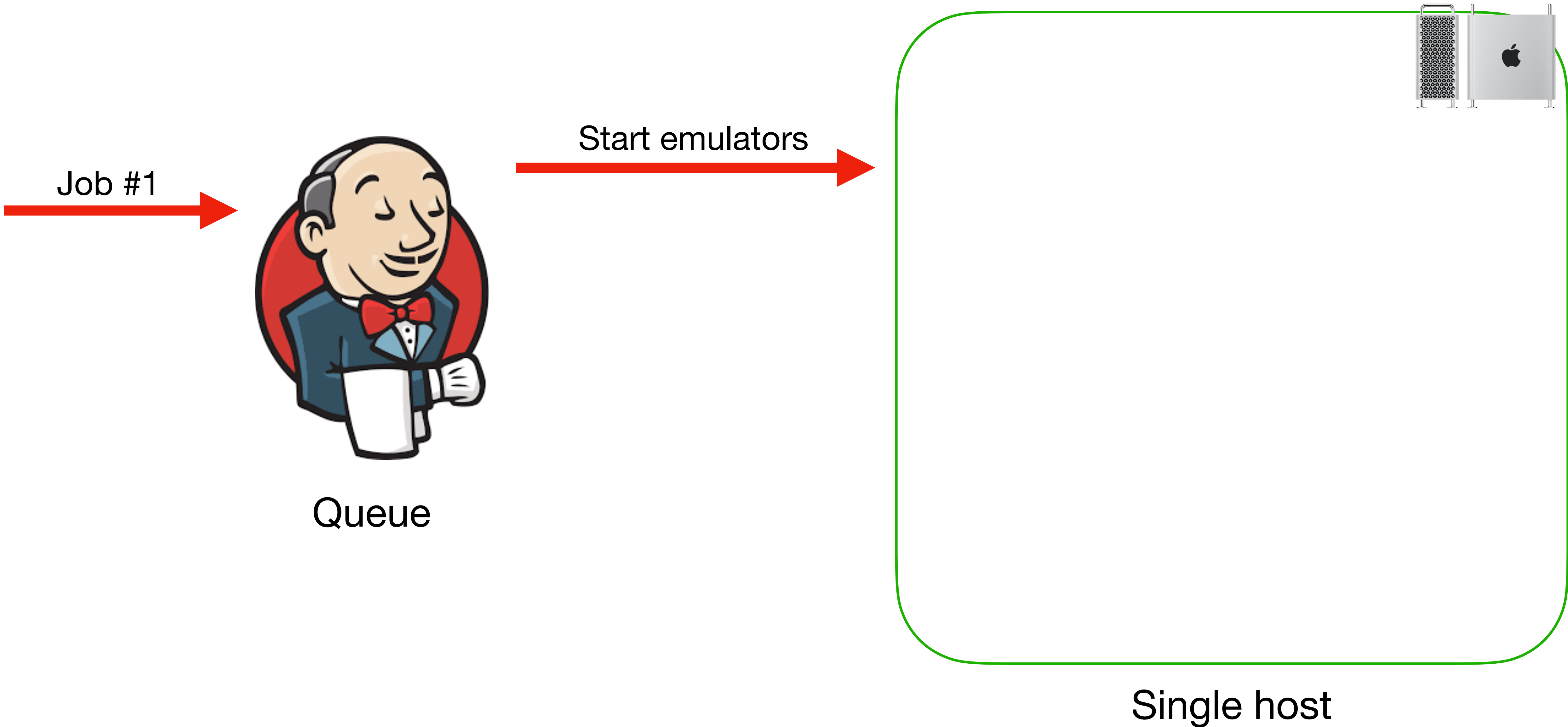


Queue



Single host

Simple UI Test Infrastructure



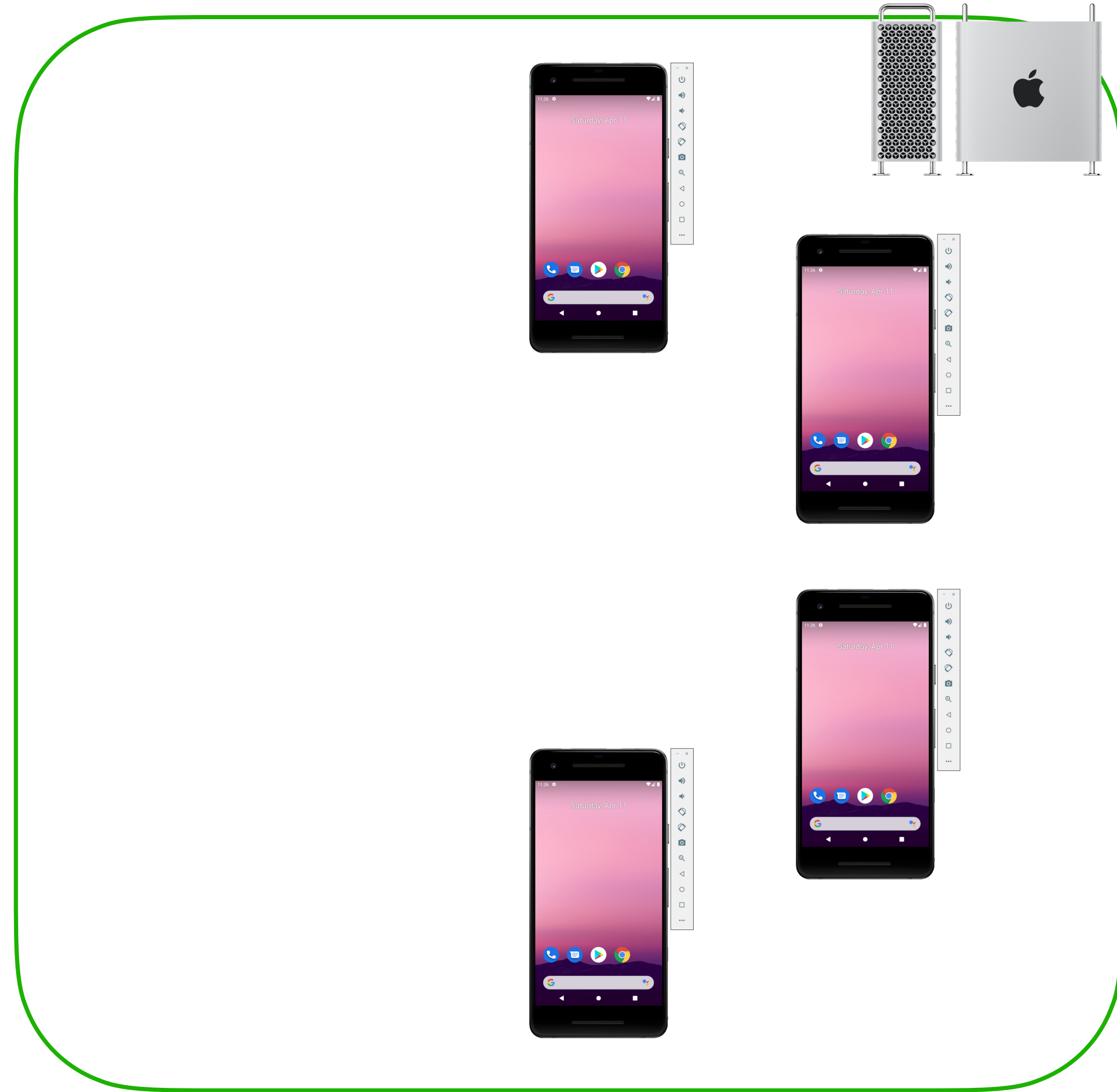
Simple UI Test Infrastructure

Job #1



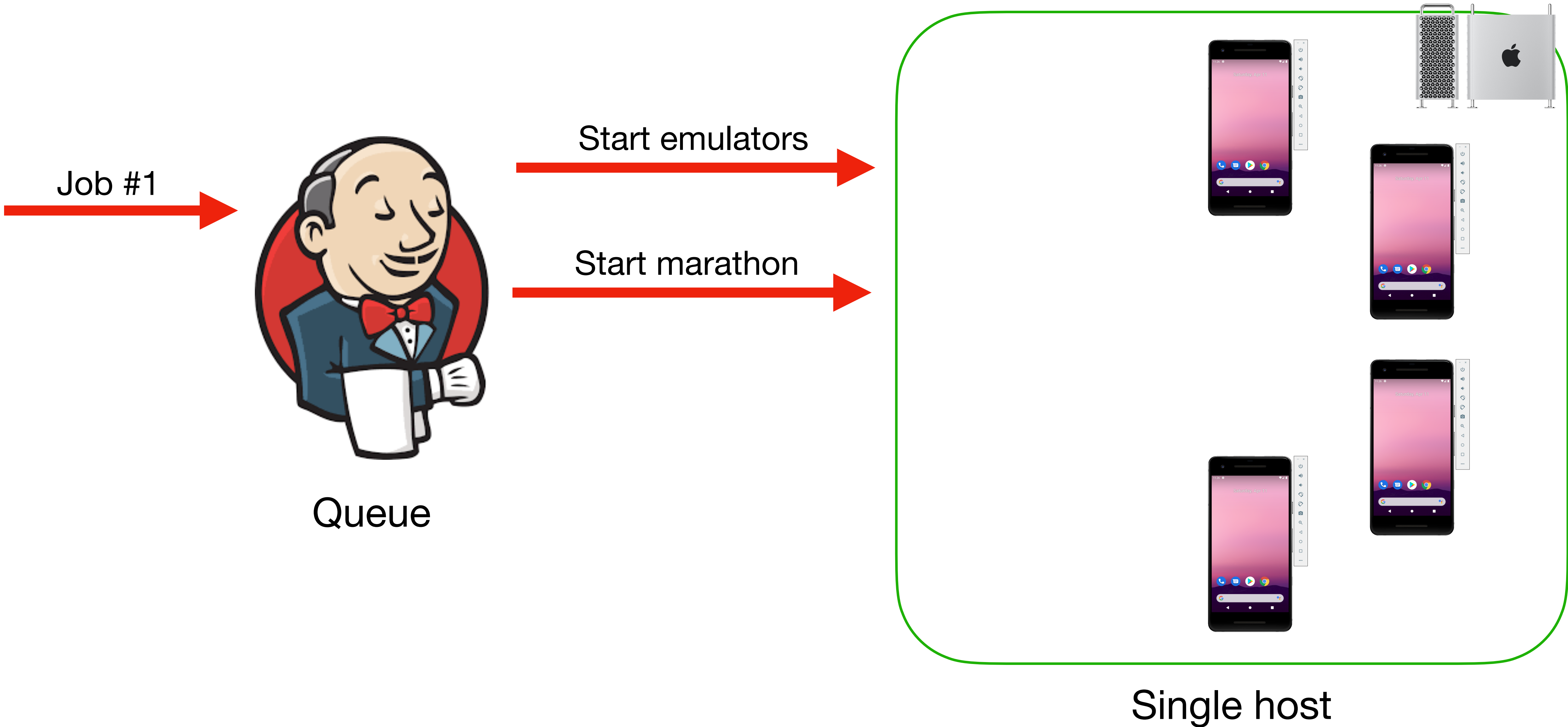
Queue

Start emulators

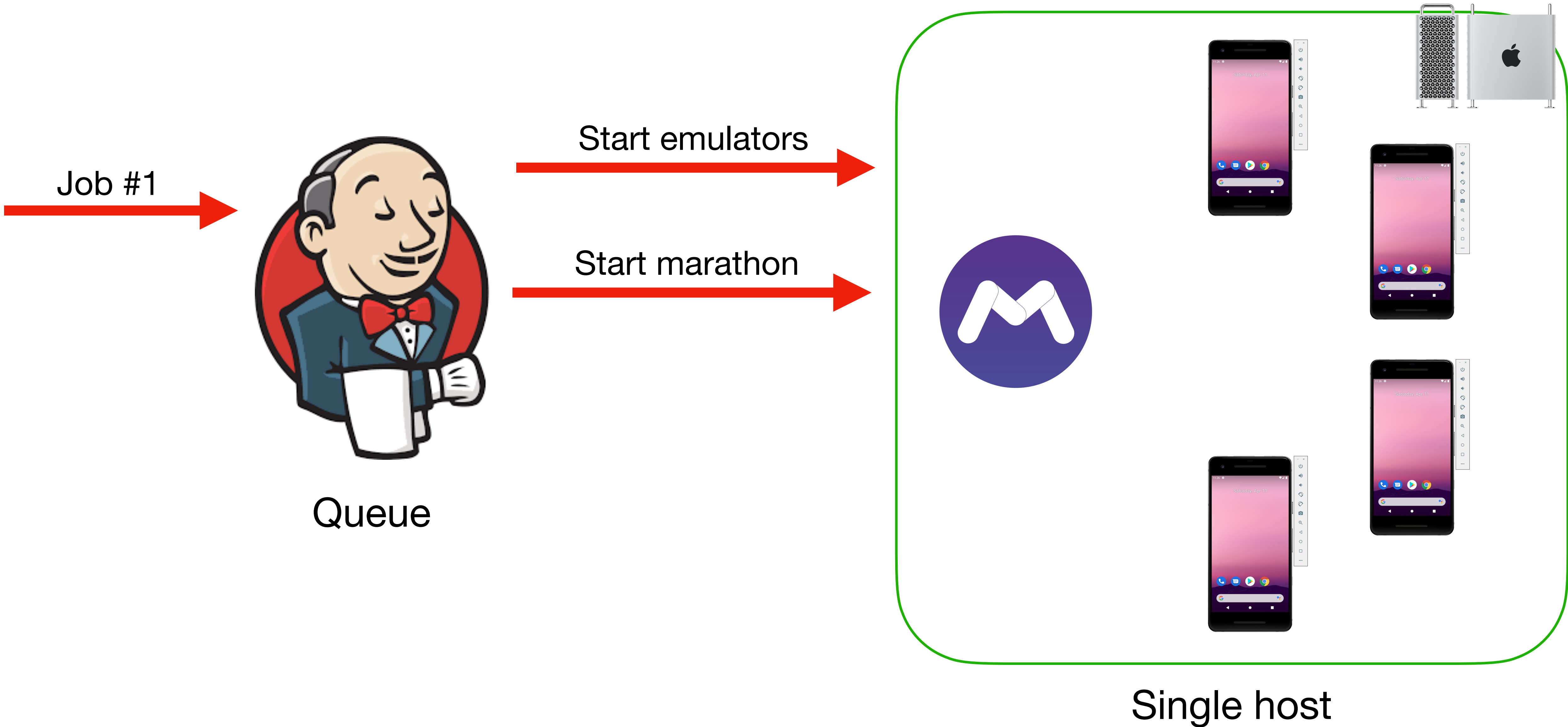


Single host

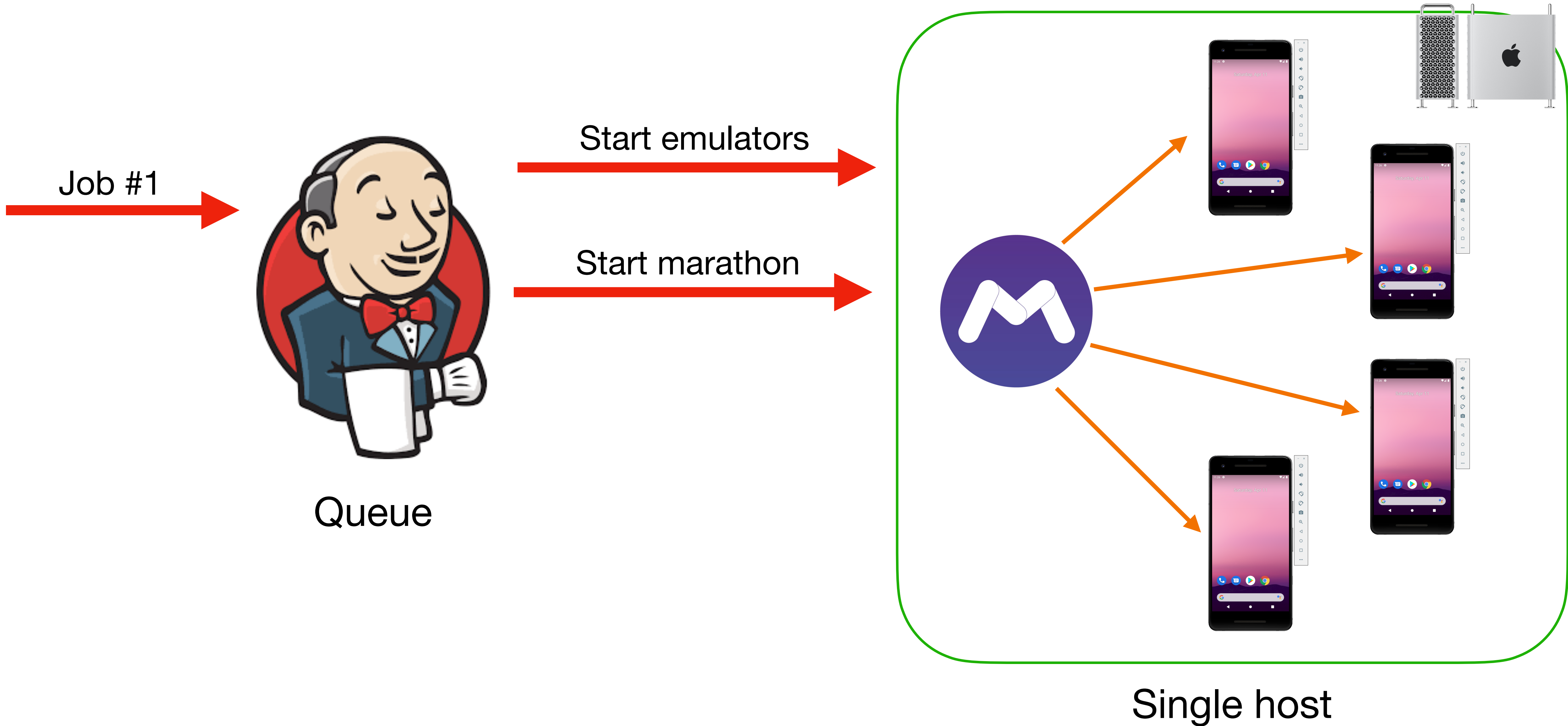
Simple UI Test Infrastructure



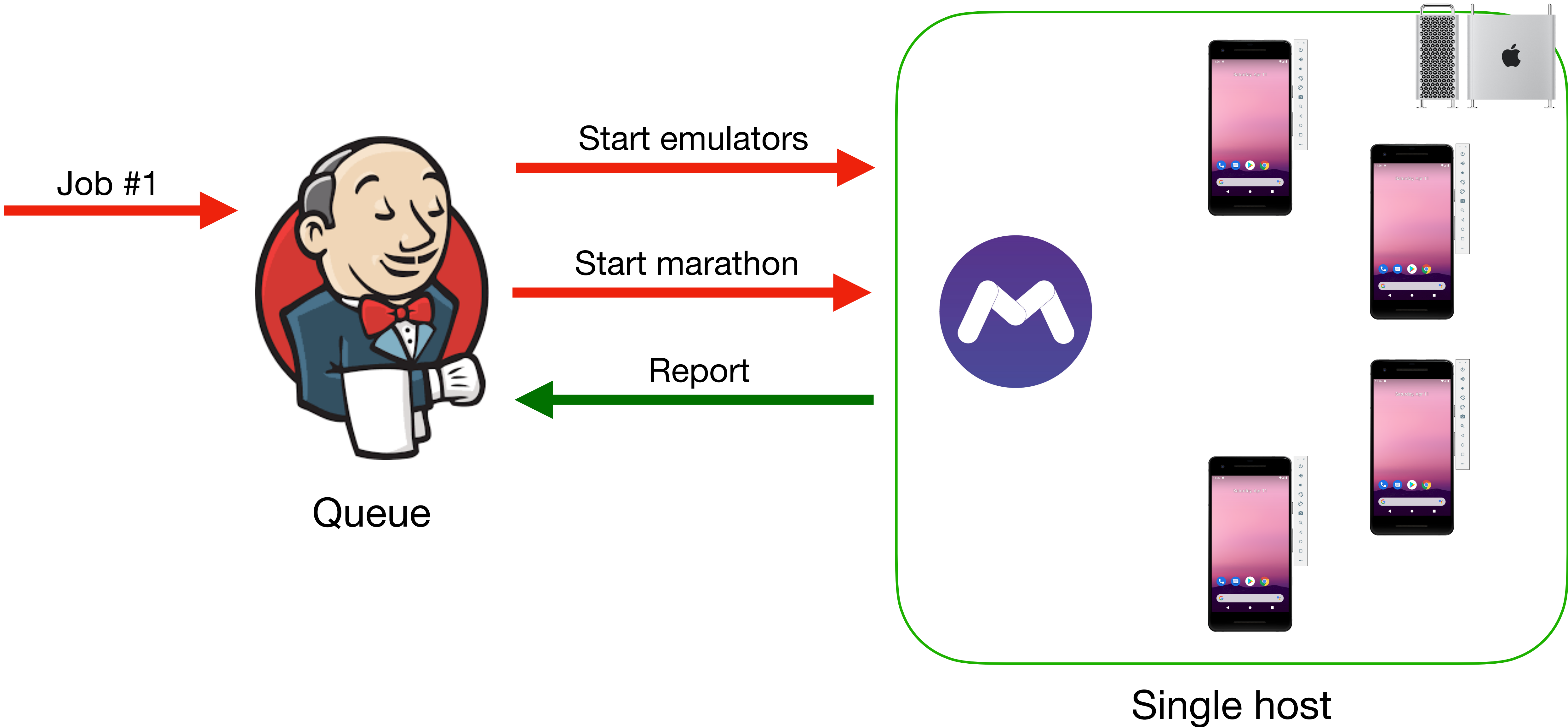
Simple UI Test Infrastructure



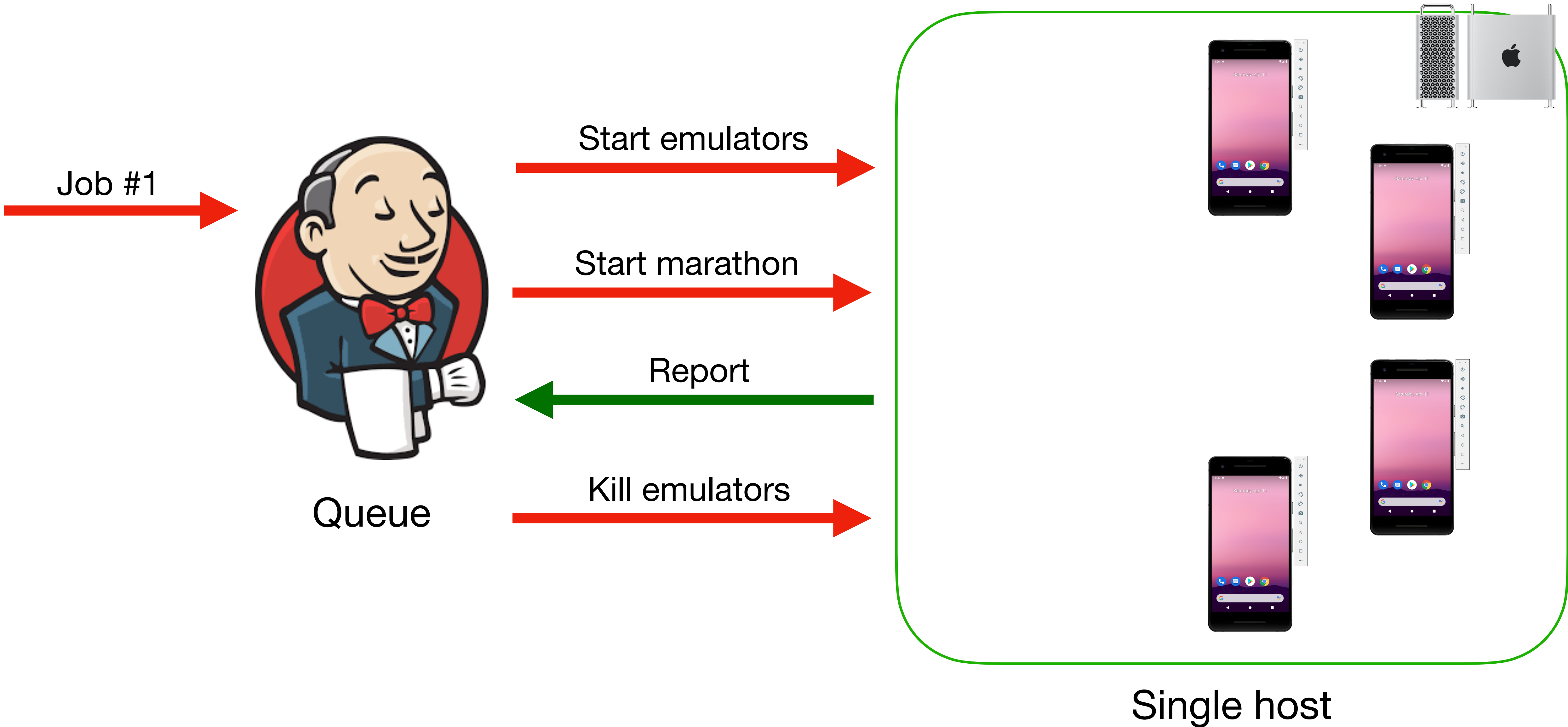
Simple UI Test Infrastructure



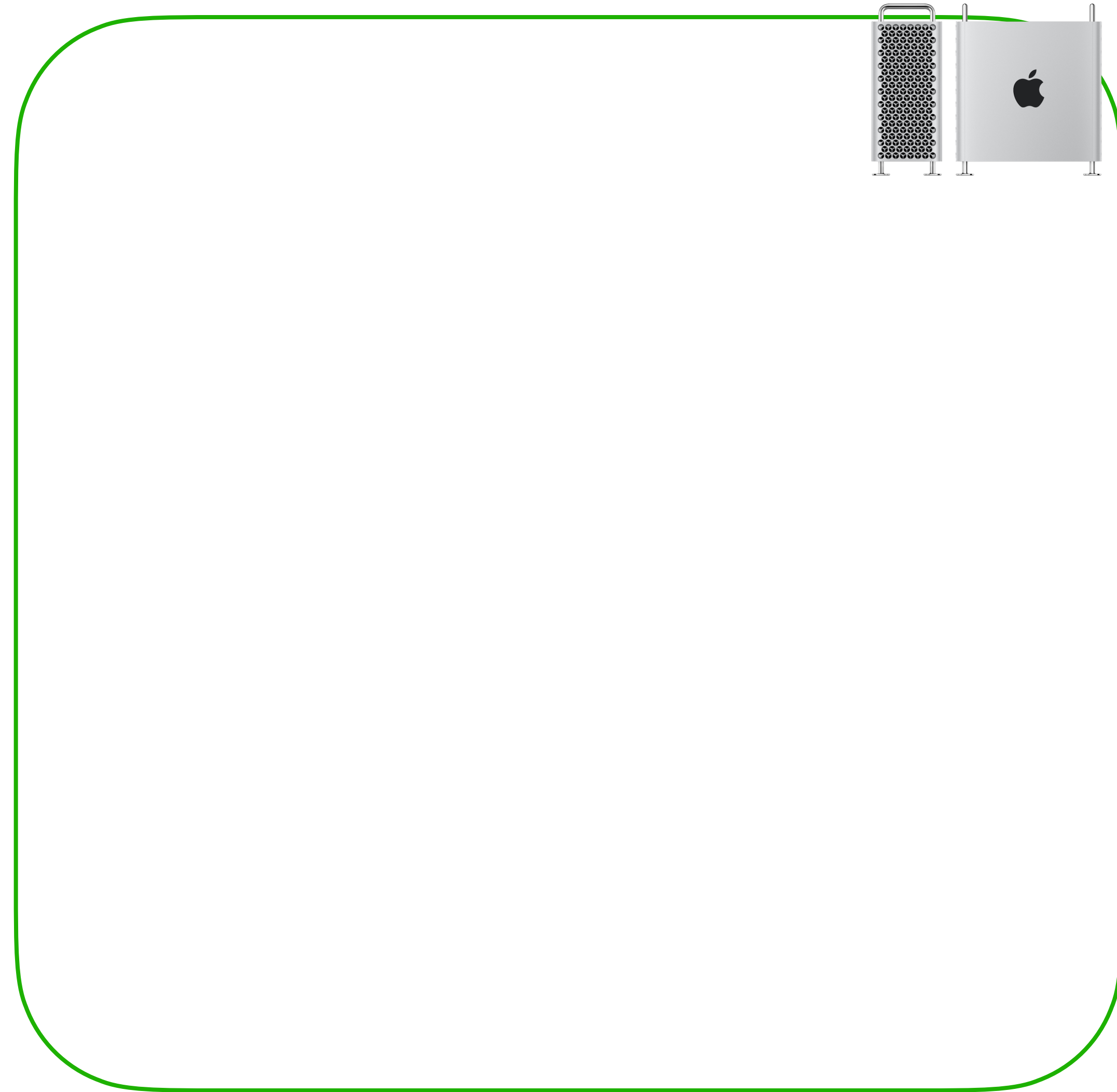
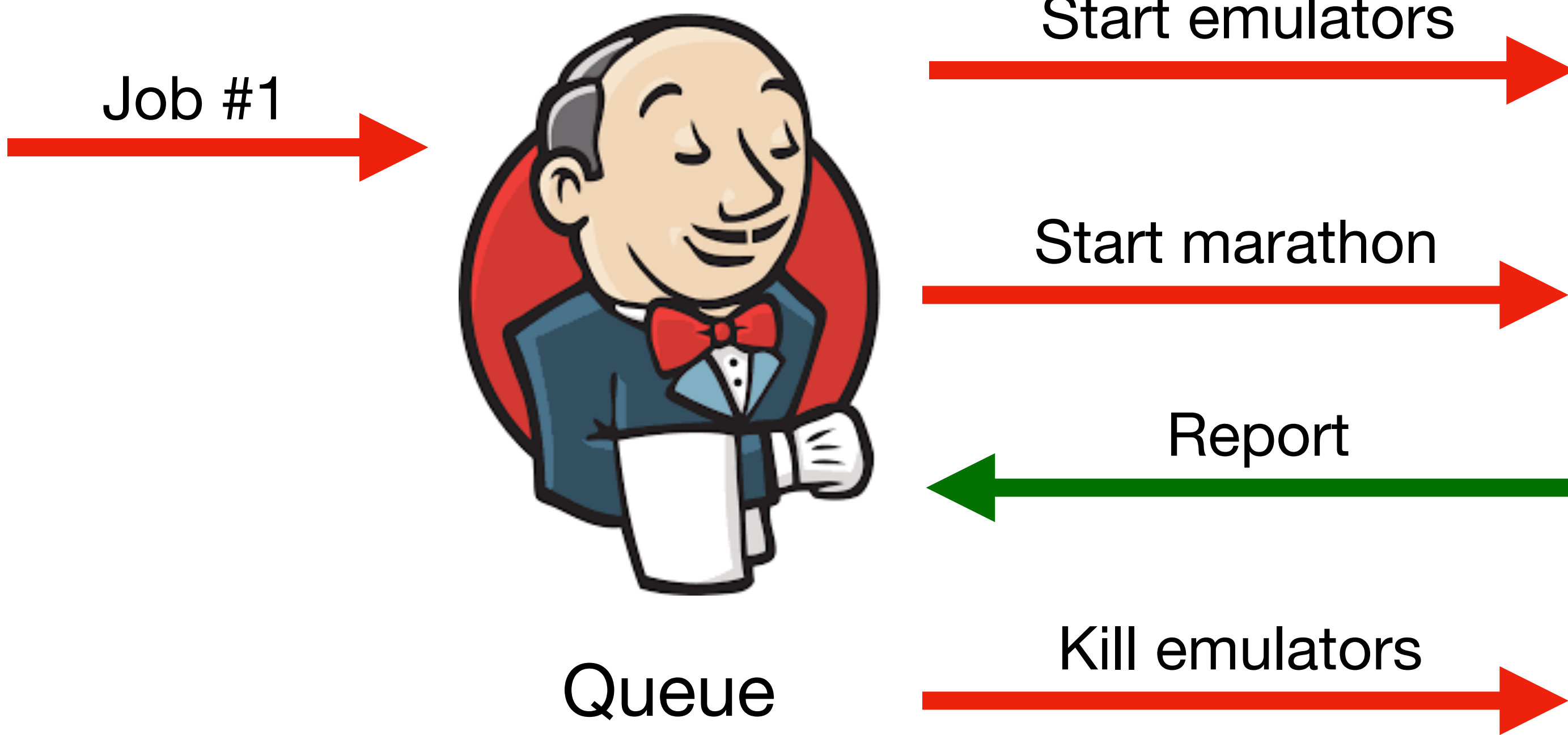
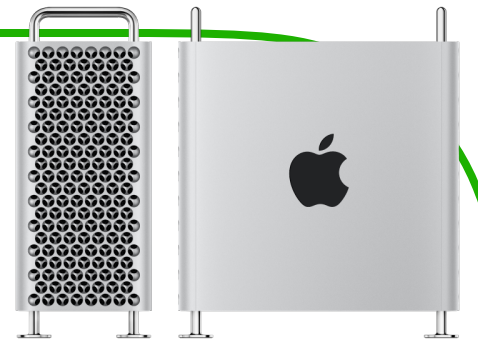
Simple UI Test Infrastructure



Simple UI Test Infrastructure

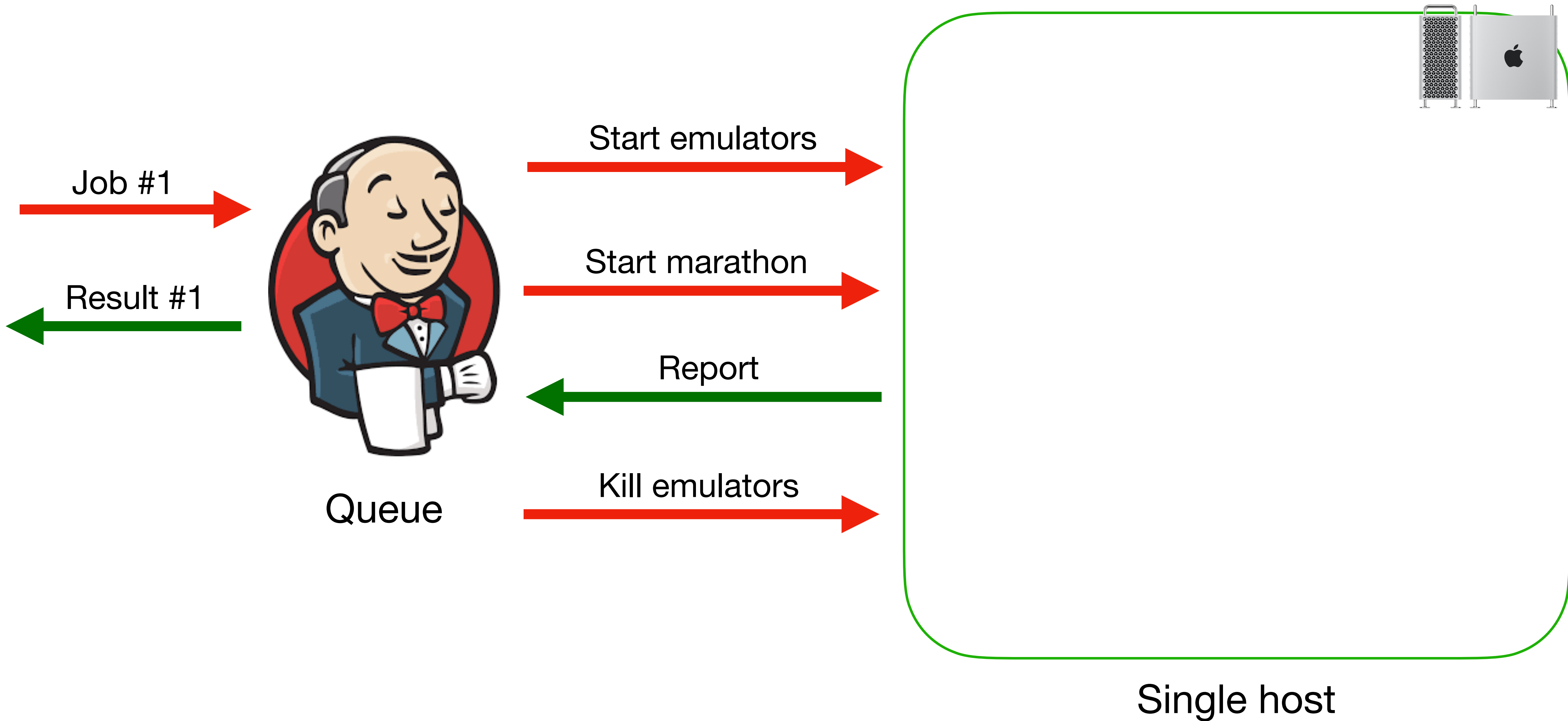


Simple UI Test Infrastructure



Single host

Simple UI Test Infrastructure



Simple UI Test Infrastructure

Ограничения системы

- Малое количество тестов
- Ограниченное количество ранов
- Толерантность к нестабильности

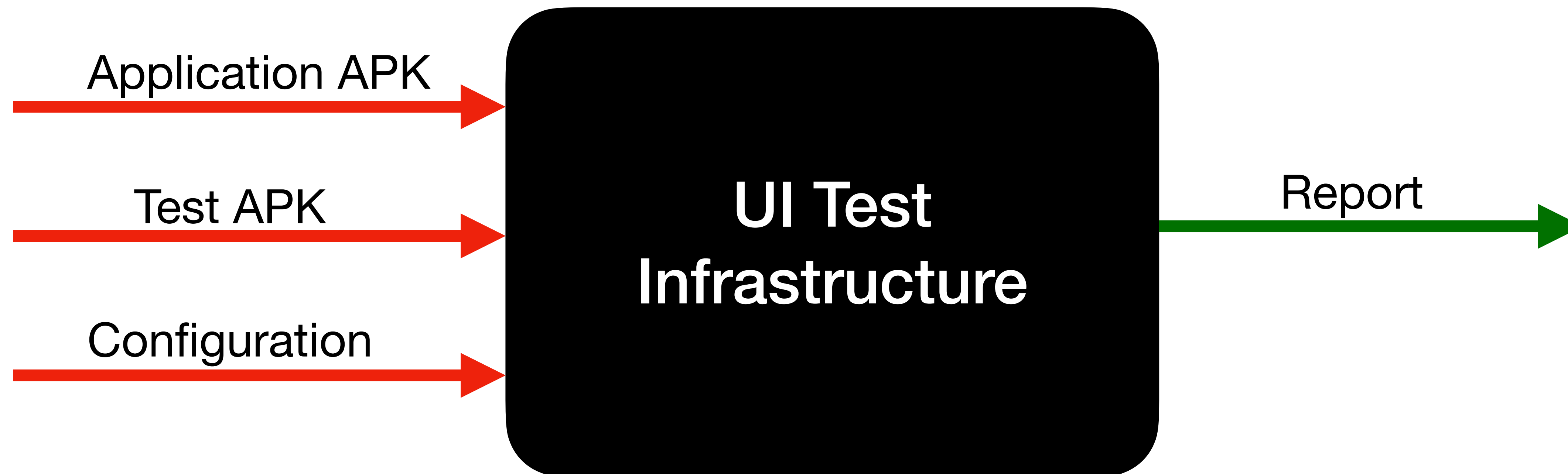
Simple UI Test Infrastructure

Что нужно сделать, если ХОТИМ:

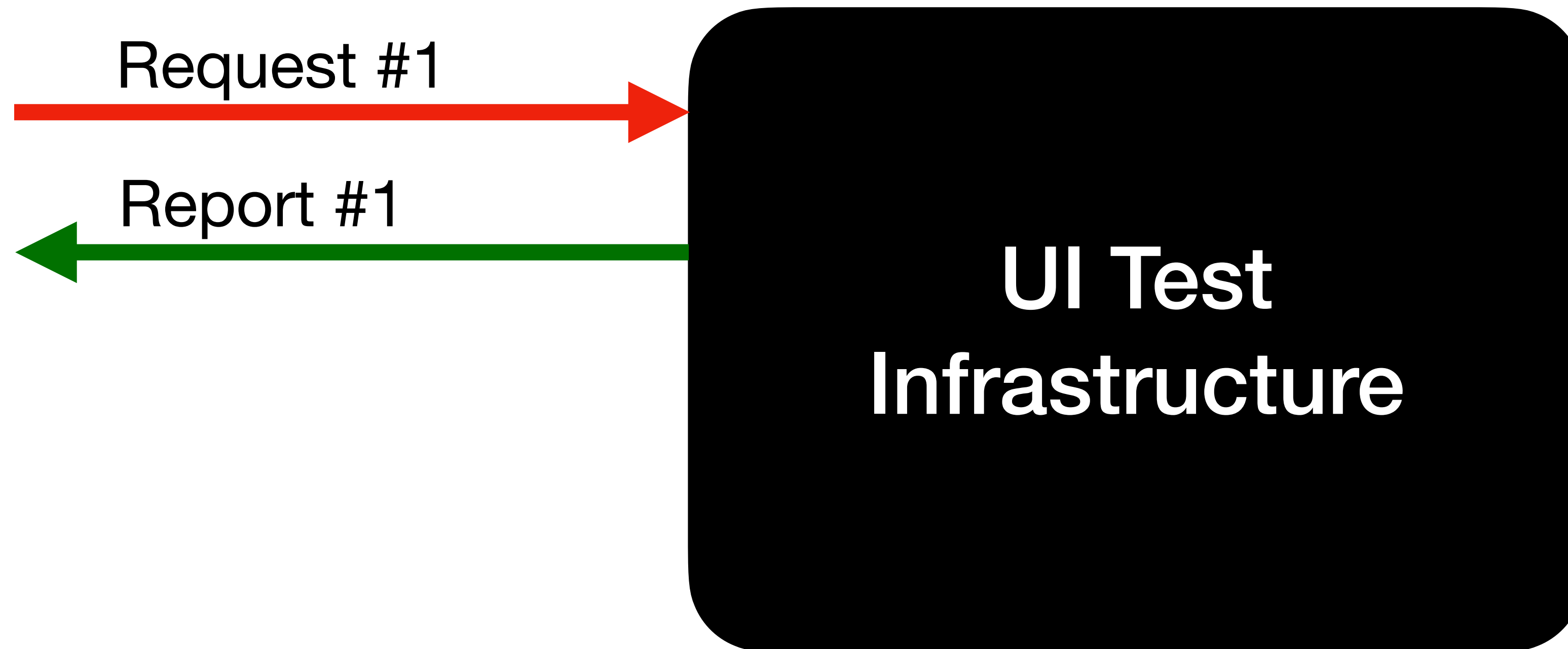
- Запускать больше тестов
- На каждый PR (отлавливать баги как можно раньше)
- С 0 багов, вызванных Инфраструктурой

Путь к Scalable Infrastructure

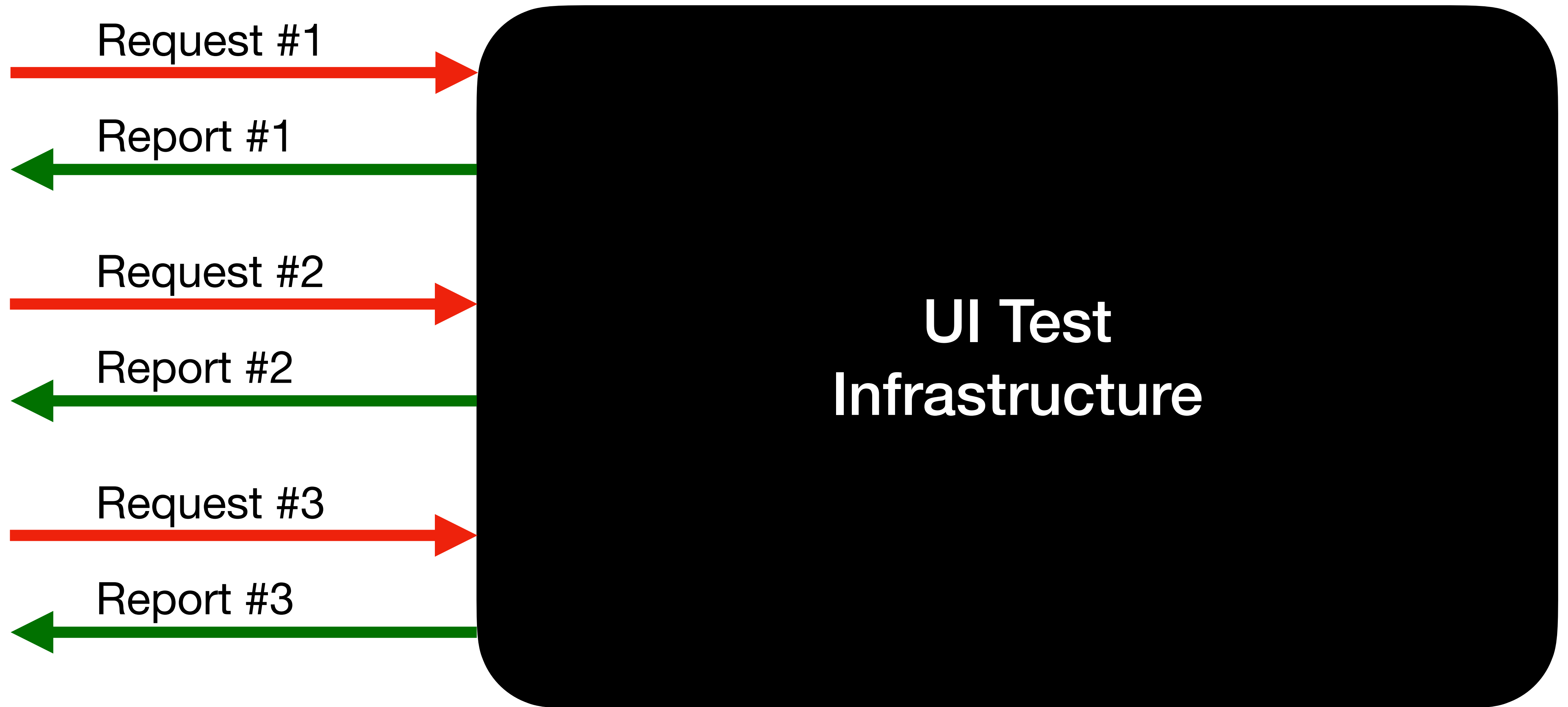
Путь к Scalable Infrastructure



Путь к Scalable Infrastructure

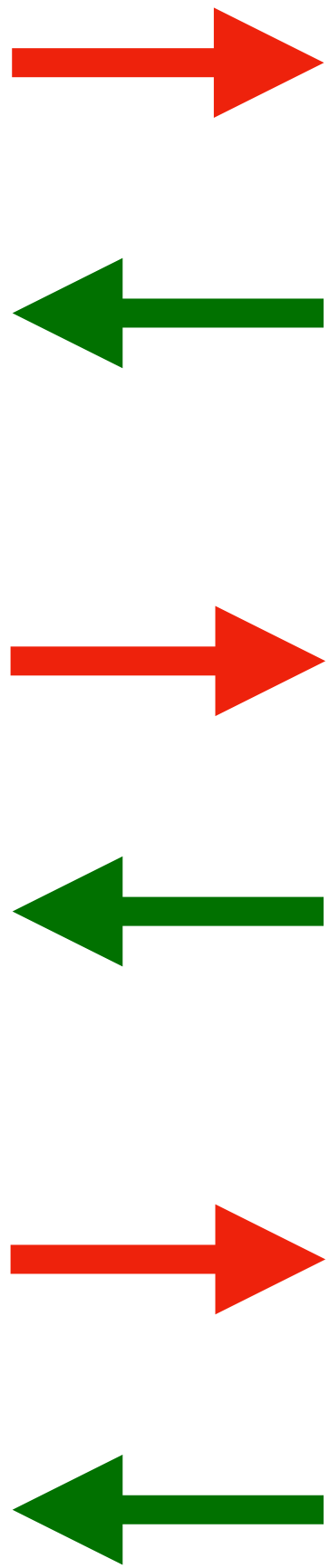


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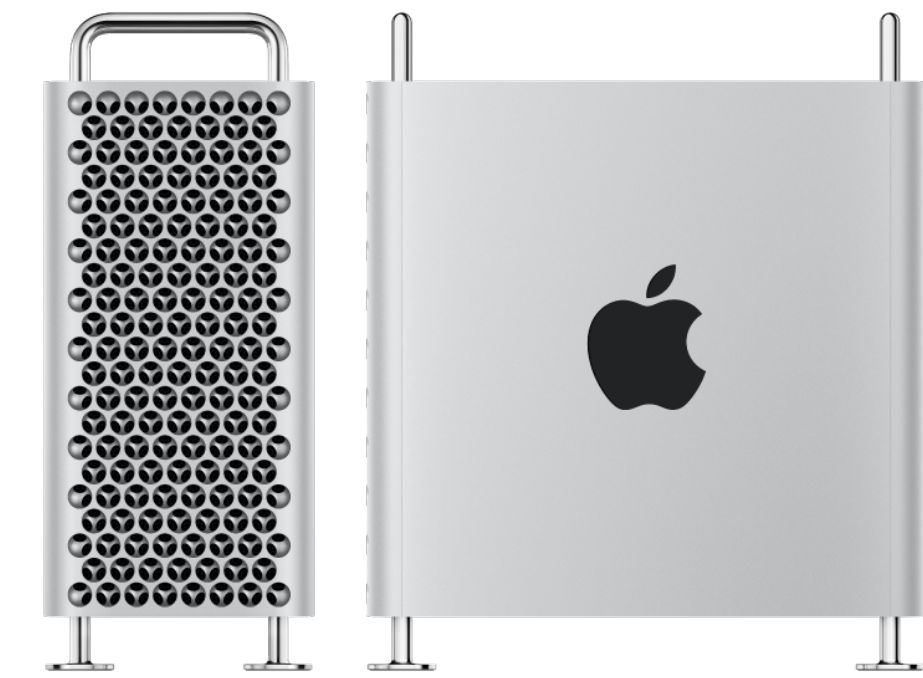
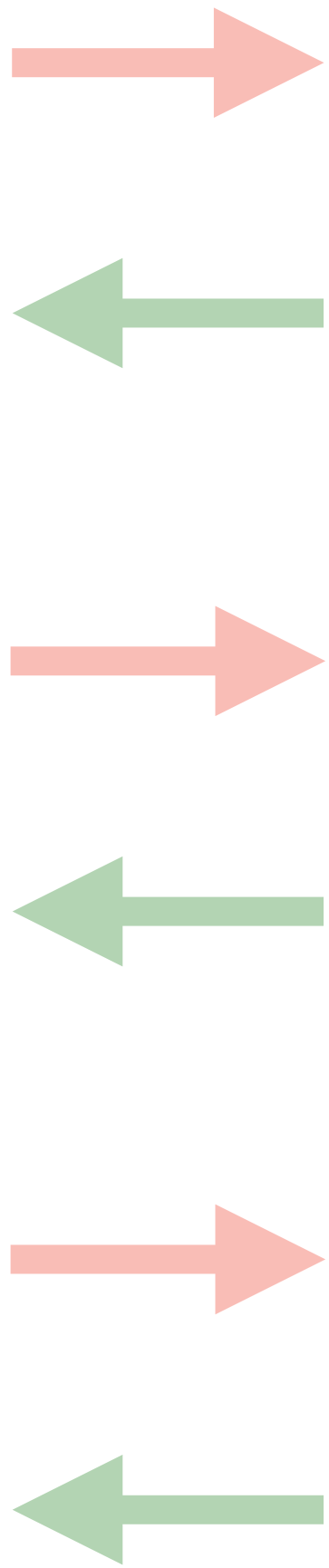
Путь к Scalable Infrastructure

UI Test Infrastructure



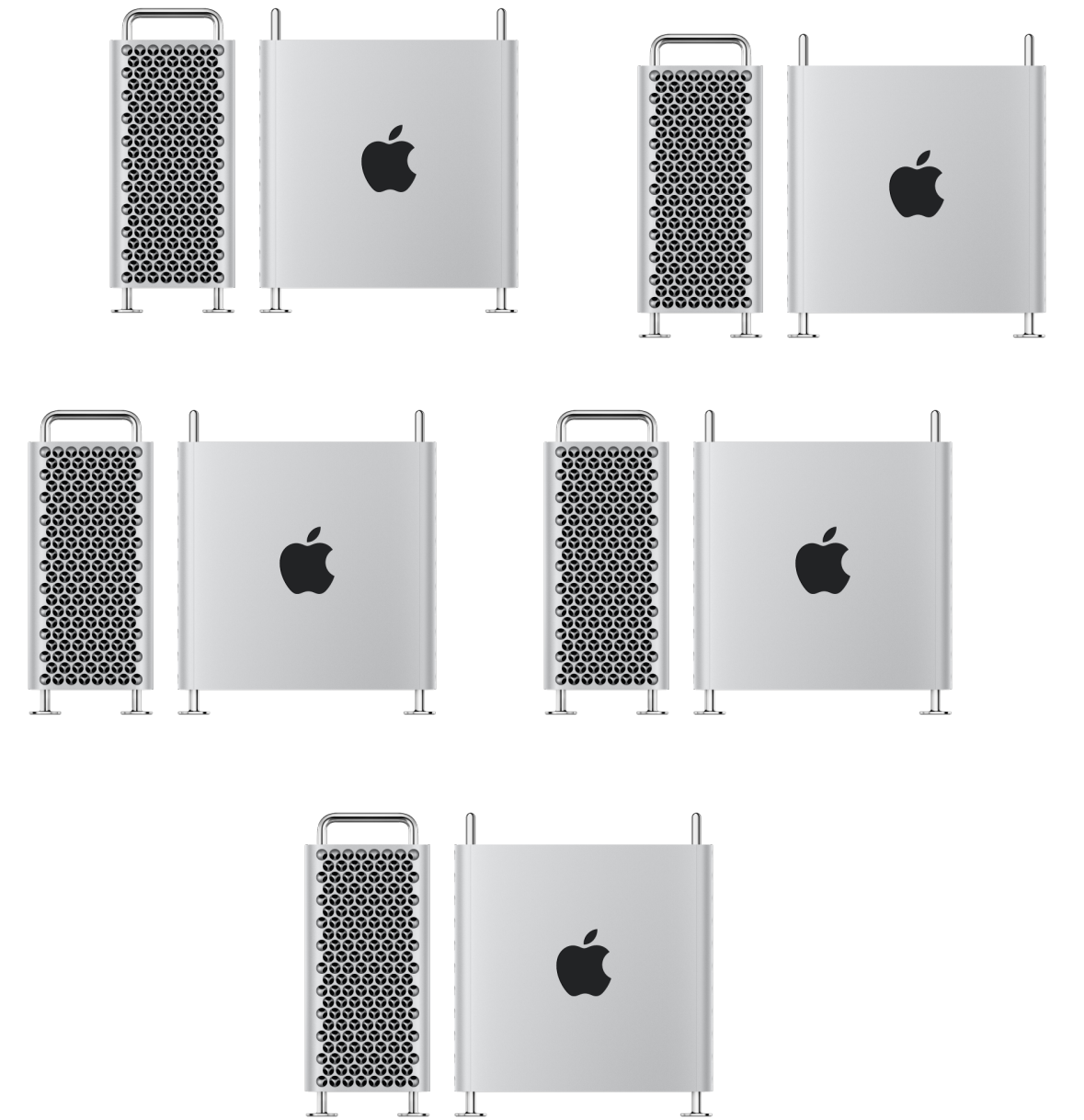
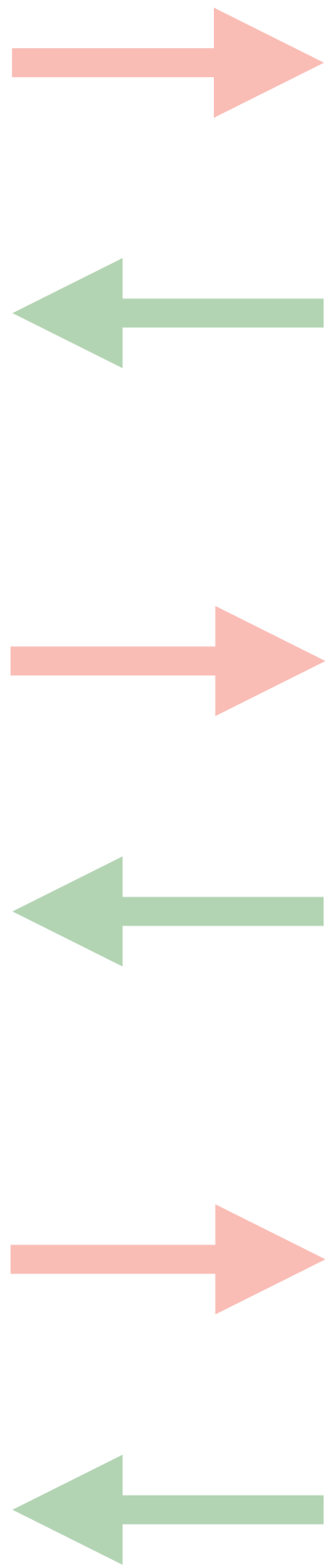
Путь к Scalable Infrastructure

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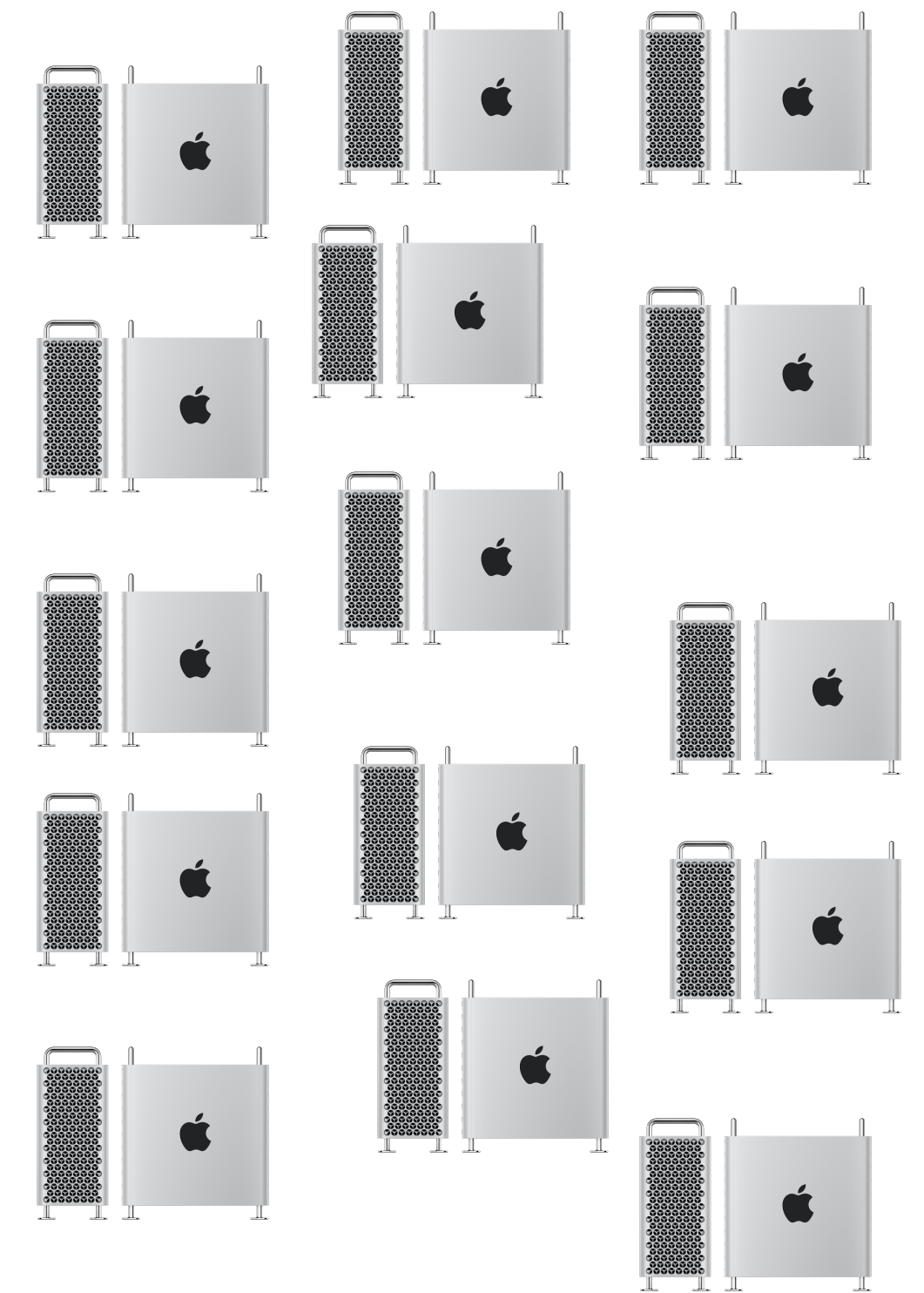
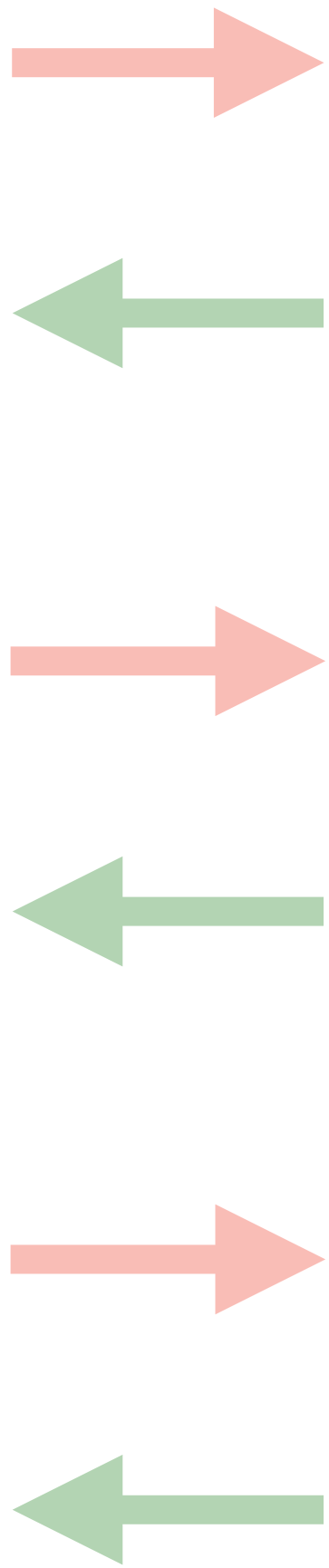
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UI Test Infrastructure



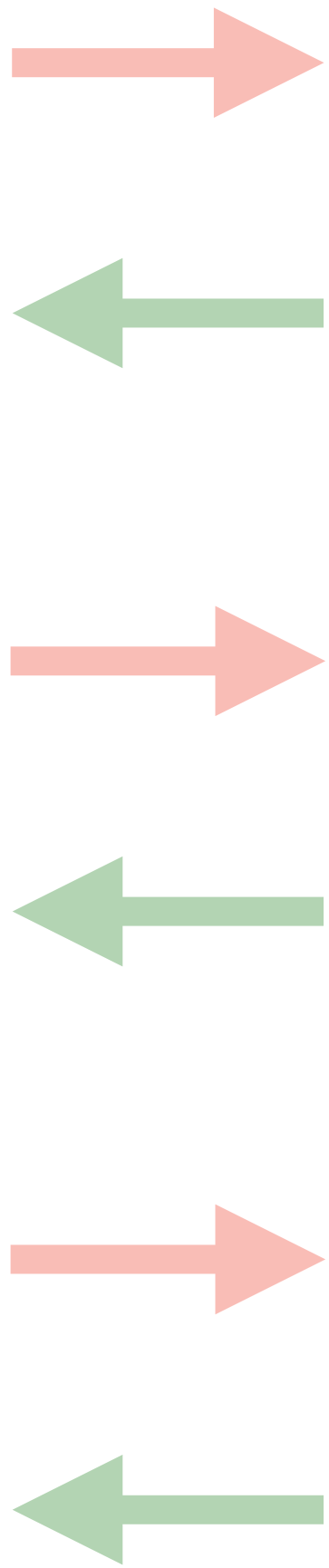
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UI Test Infrastructure

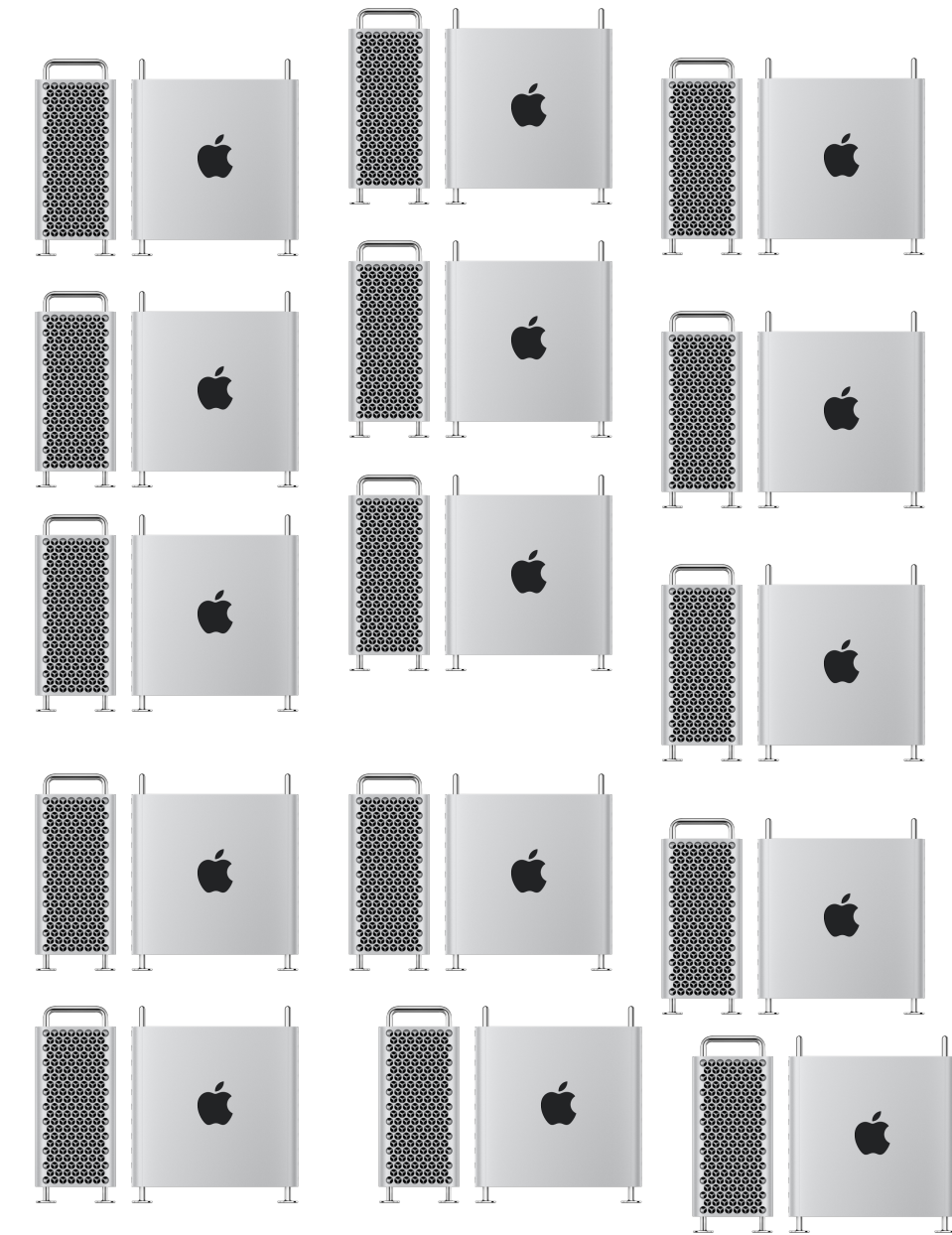


Путь к Scalable Infrastructure

UI Test Infrastructure



Hardware

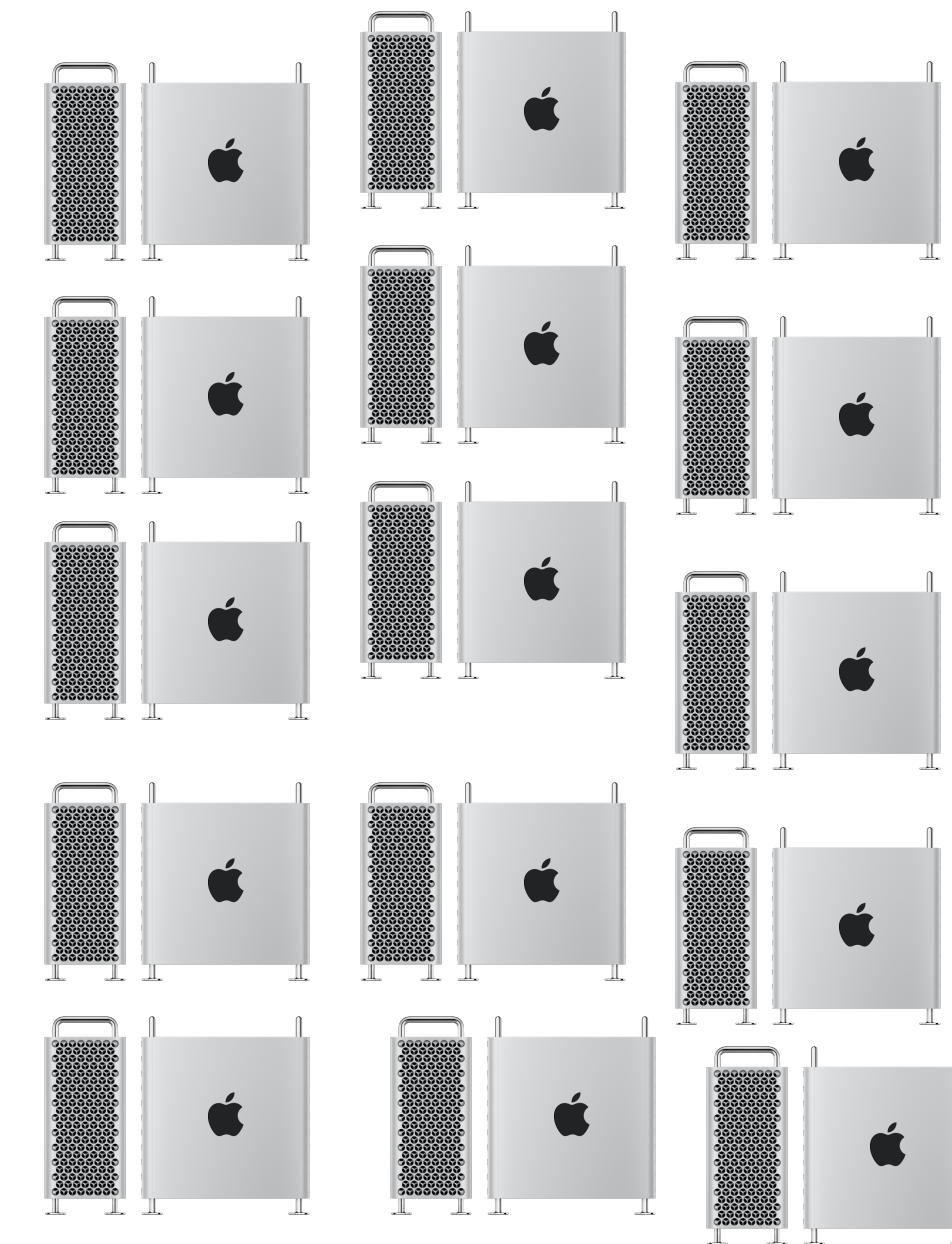


Путь к Scalable Infrastructure

UI Test Infrastructure

Orchestrator

Hardware

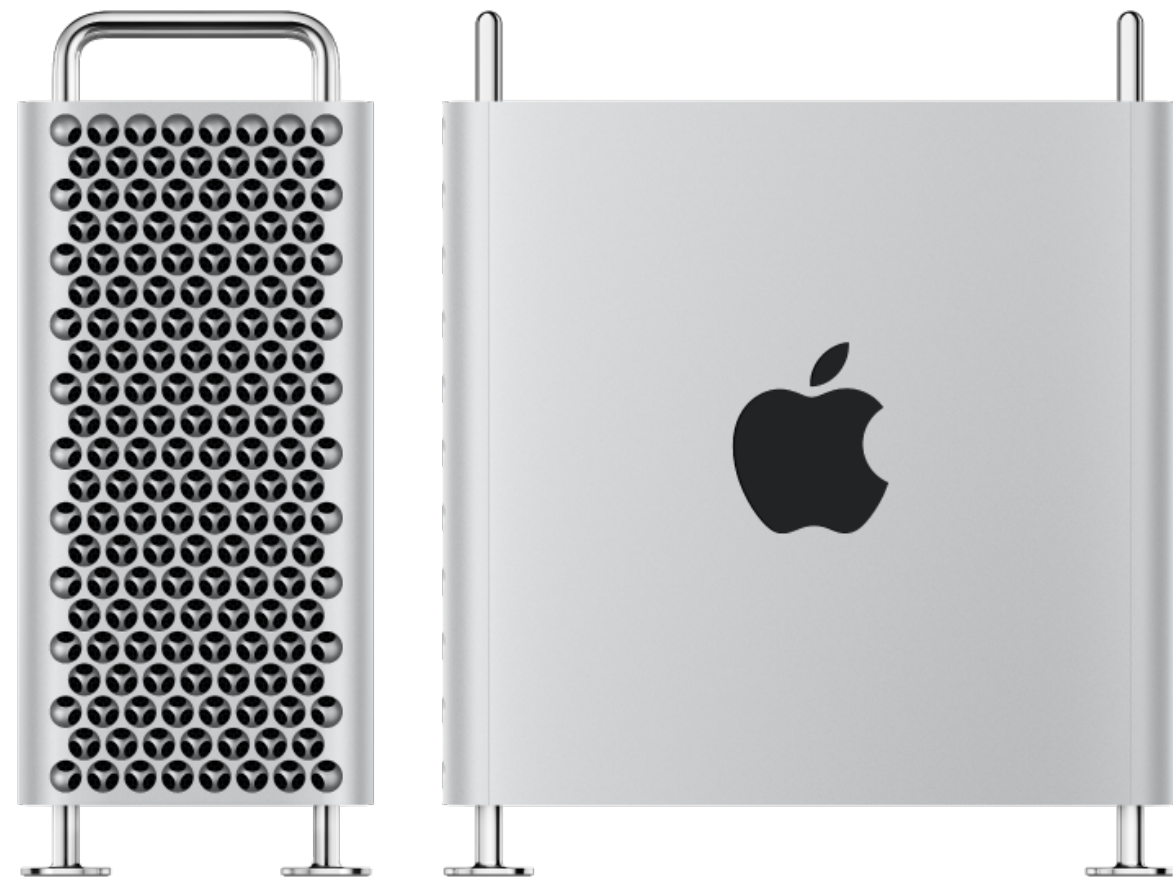
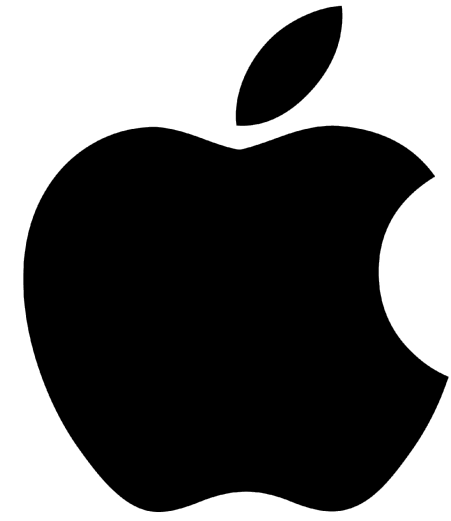


Hardware



android

Hardware



Hardware



- 2-3 (до 6) simulators на 1 mac-mini

Hardware



android

Hardware



android



In-House Servers

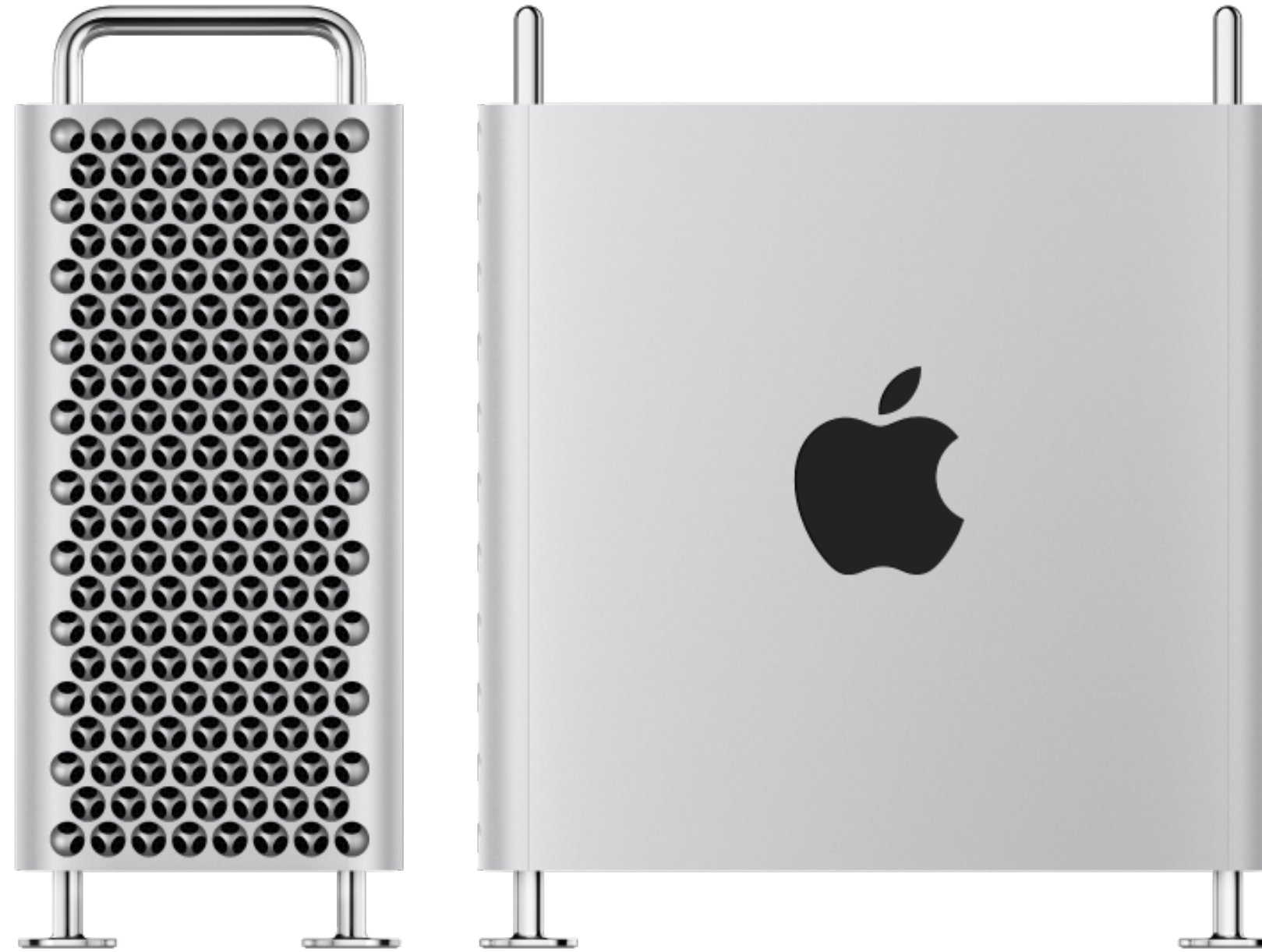


Cloud servers

Hardware



android
In-House
Servers

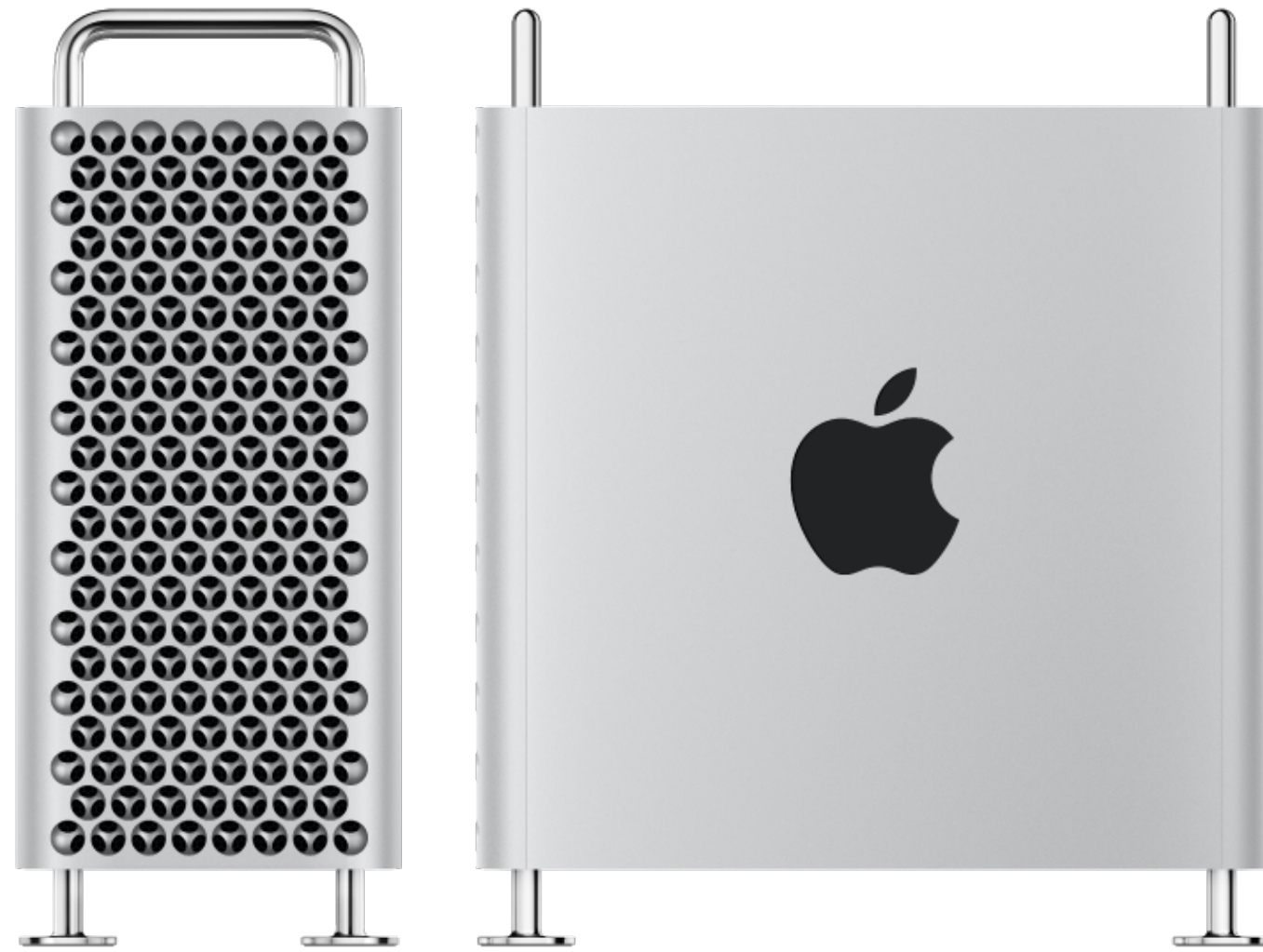


Apple?

Hardware



android
In-House
Servers



Apple?



docker



Hardware



android
In-House
Servers



Linux server?

Hardware



android
In-House
Servers



Linux server?

VS



Desktop machine

Hardware



android In-House Servers

| Configuration name | Number of emulators | Cores per emulator | Memory per emulator | Approximate price of one emulator |
|--|---------------------|--------------------|---------------------|-----------------------------------|
| Server 2 x Intel Xeon Gold 6240R CPU = 48c/ 96t 188GB RAM | 32-40 | 2.4 - 3 | 4 | 700-600 \$ (2019 г.) |
| Game Desktop without GPU AMD Ryzen 7 2700X 8c/16t 32 GB | 4 | 3.5-4 | 4 | 170 \$ (2018 г.) |
| Game Desktop AMD Ryzen 7 2700X 8c/16t 32 GB RX570 8GB | 8 | 2 | 4 | 100 \$ (2018 г.) |
| Game Desktop NG AMD Ryzen 9 5900X 12c/24t 64 Gb RAM WX 3200 | 14 | 1.7 | 4.5 | 150 \$ (2019 г.) |

Hardware



android
In-House
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Hardware



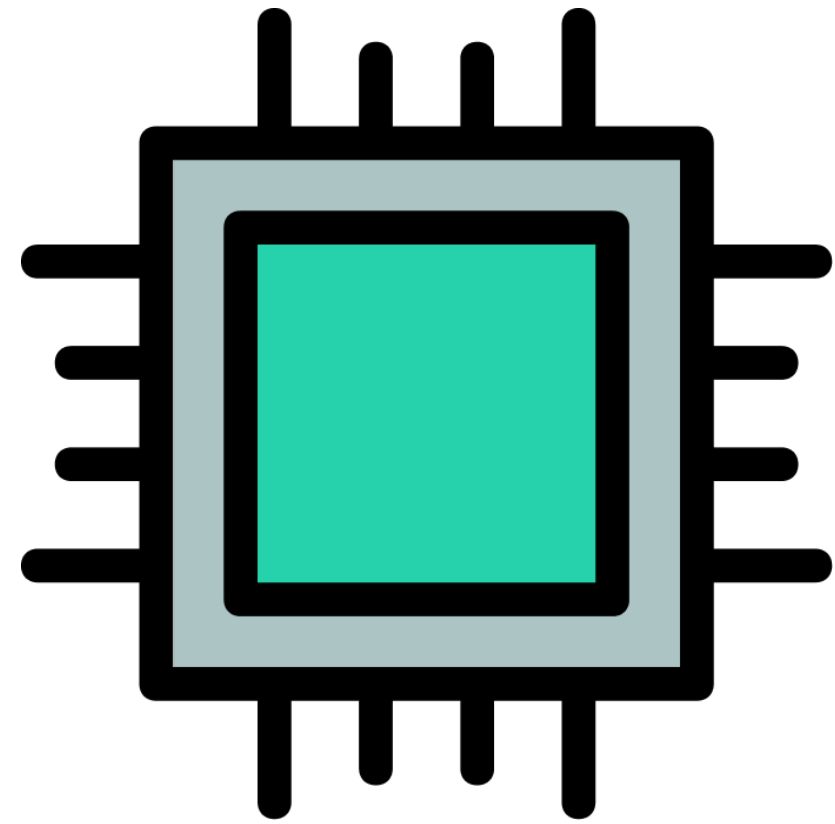
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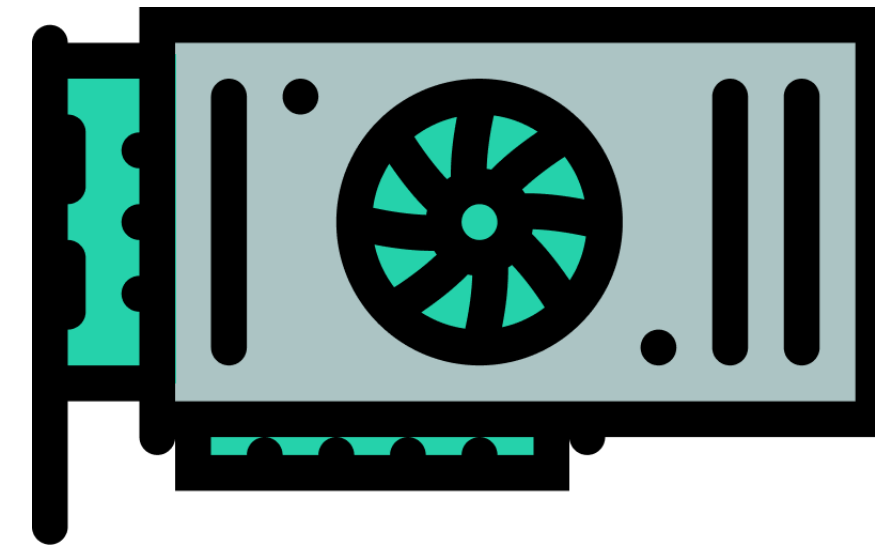
Hardware



android
In-House
Servers



Rendering via **CPU**

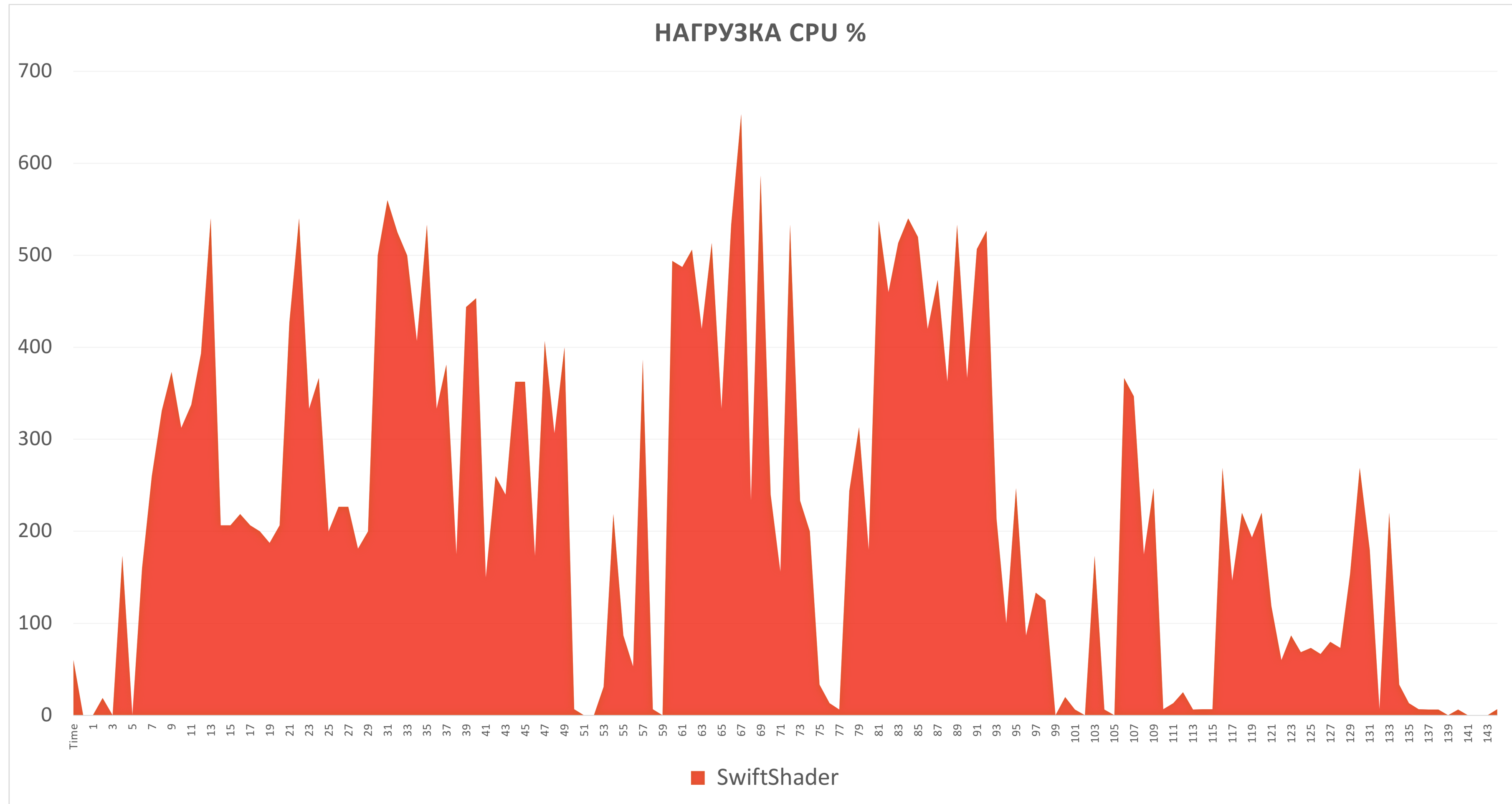
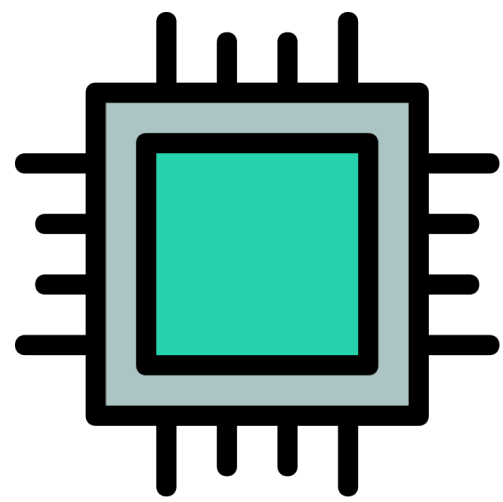


Rendering via **GPU**

Hardware



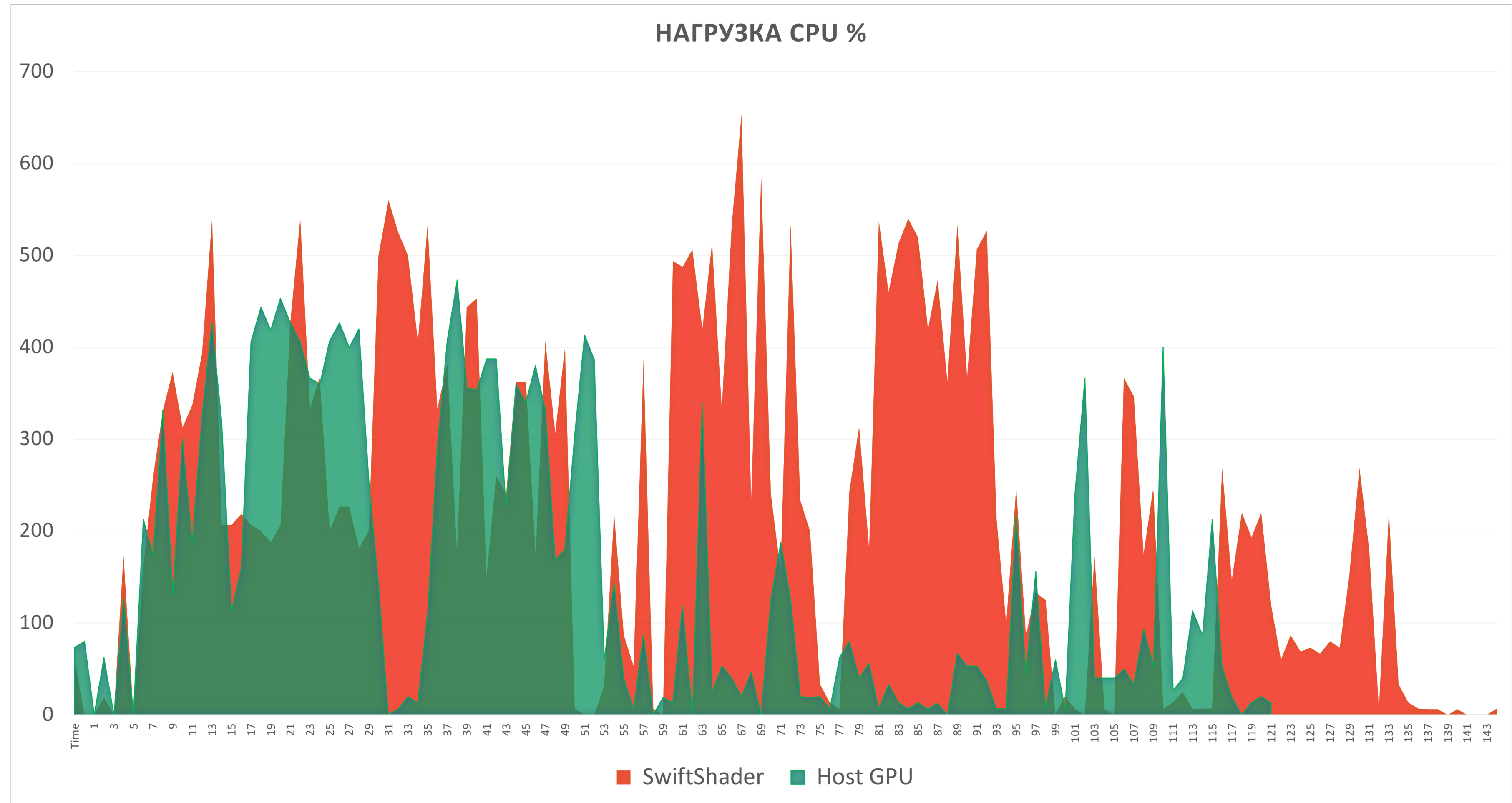
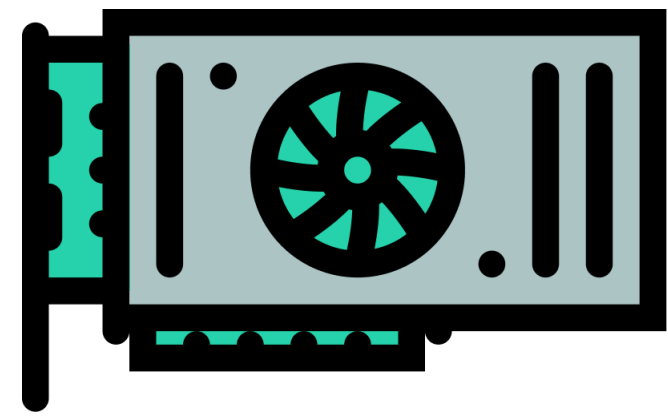
android
In-House
Servers



Hardware



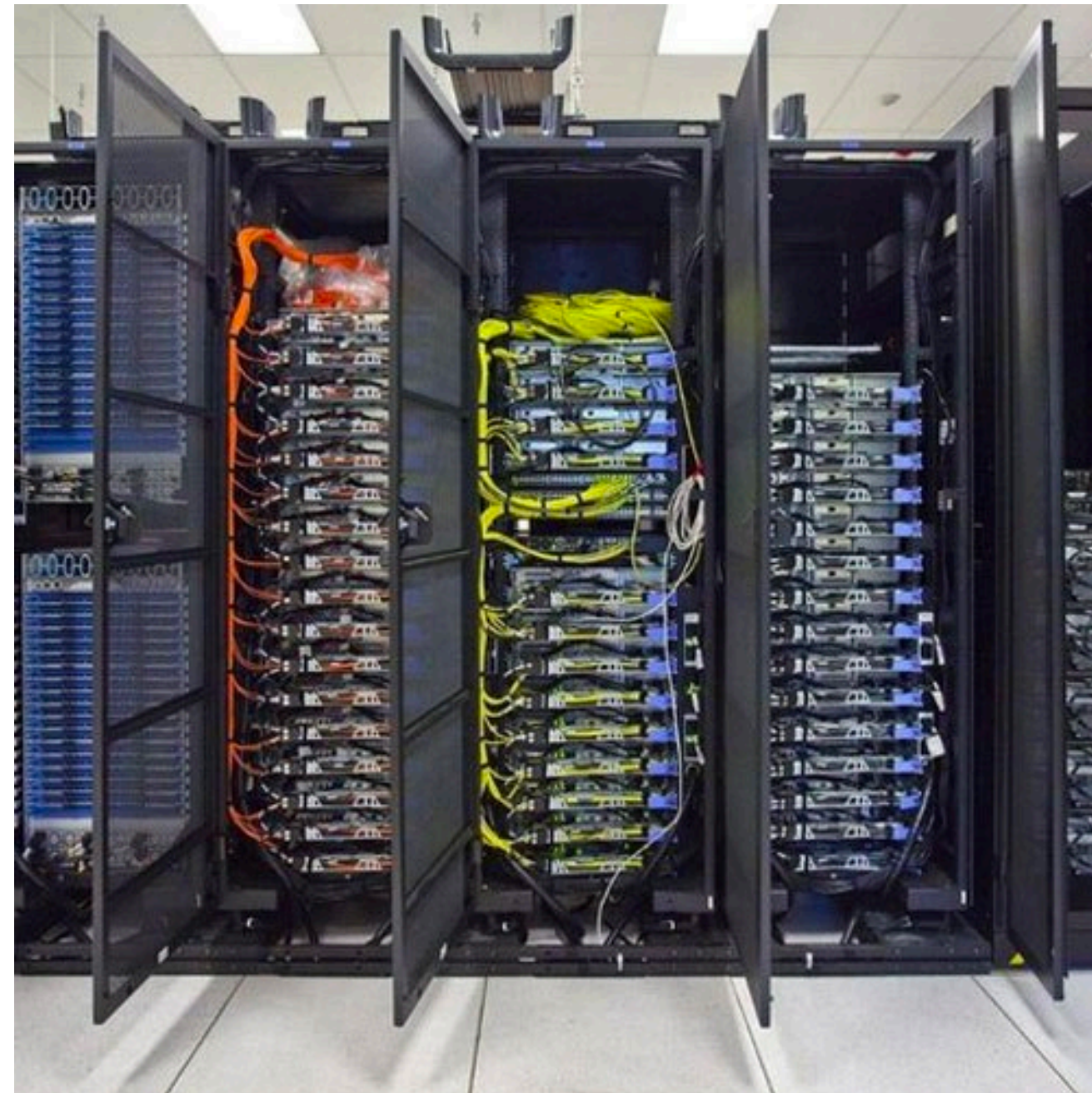
android
In-House
Servers



Hardware



android
In-House
Servers



CPU Frequency = **2.40 GHz**



CPU Frequency = **3.7 GHz**

Hardware



android
In-House
Servers



Sergey Pavlov

How We Ran Android UI Autotests on 20 Gaming Desktops,
and Why We Liked It

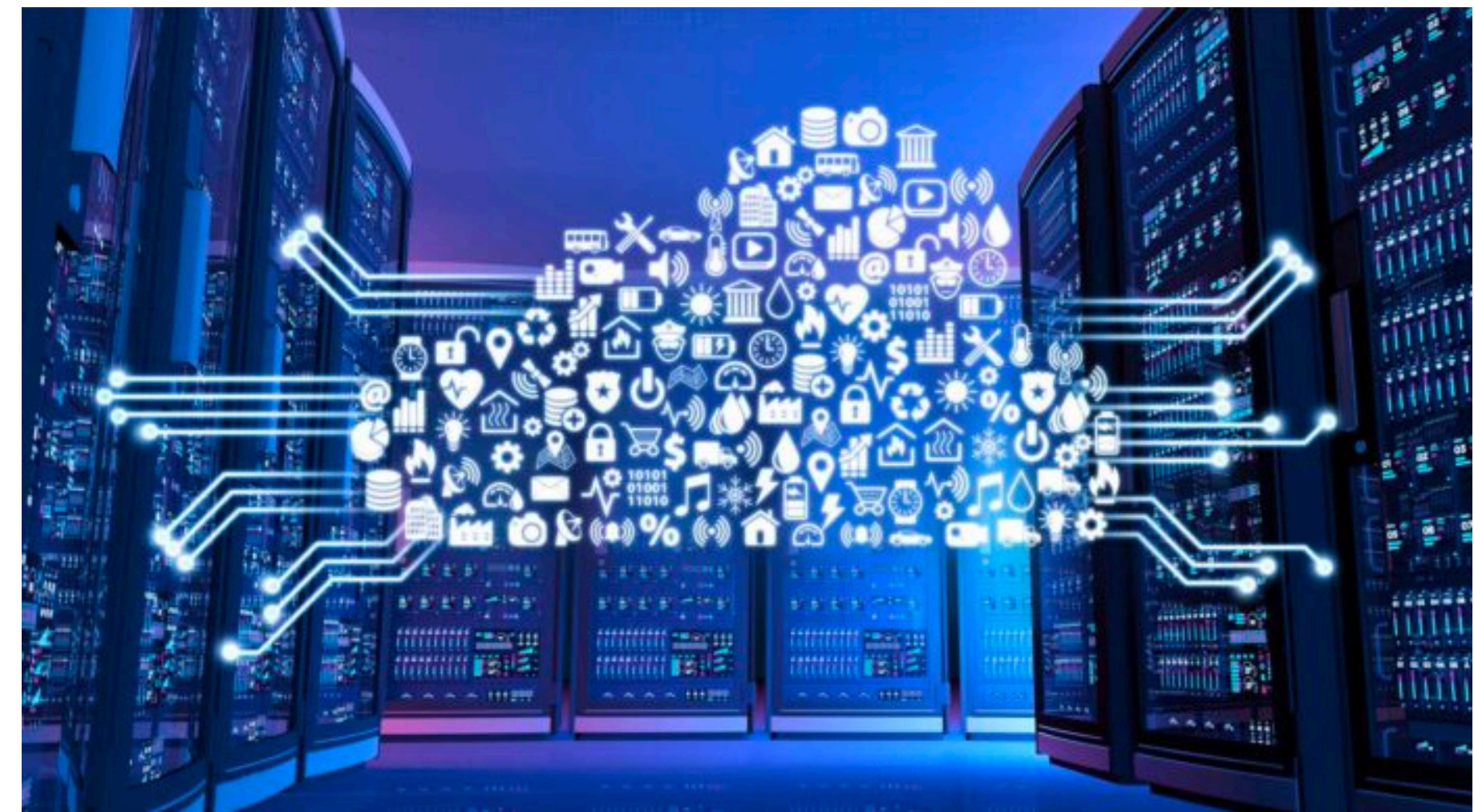
Hardware



android



In-House Servers



Cloud Servers

Hardware



android
Cloud
Servers



Virtual Machine



Bare Metal

Hardware



android

**Cloud
Servers**

**Virtual
Machine**

Host

Hardware



android

**Cloud
Servers**

**Virtual
Machine**

Host

Linux core

Hardware



android

**Cloud
Servers**

**Virtual
Machine**

Host

Hypervisor (KVM)

Linux core

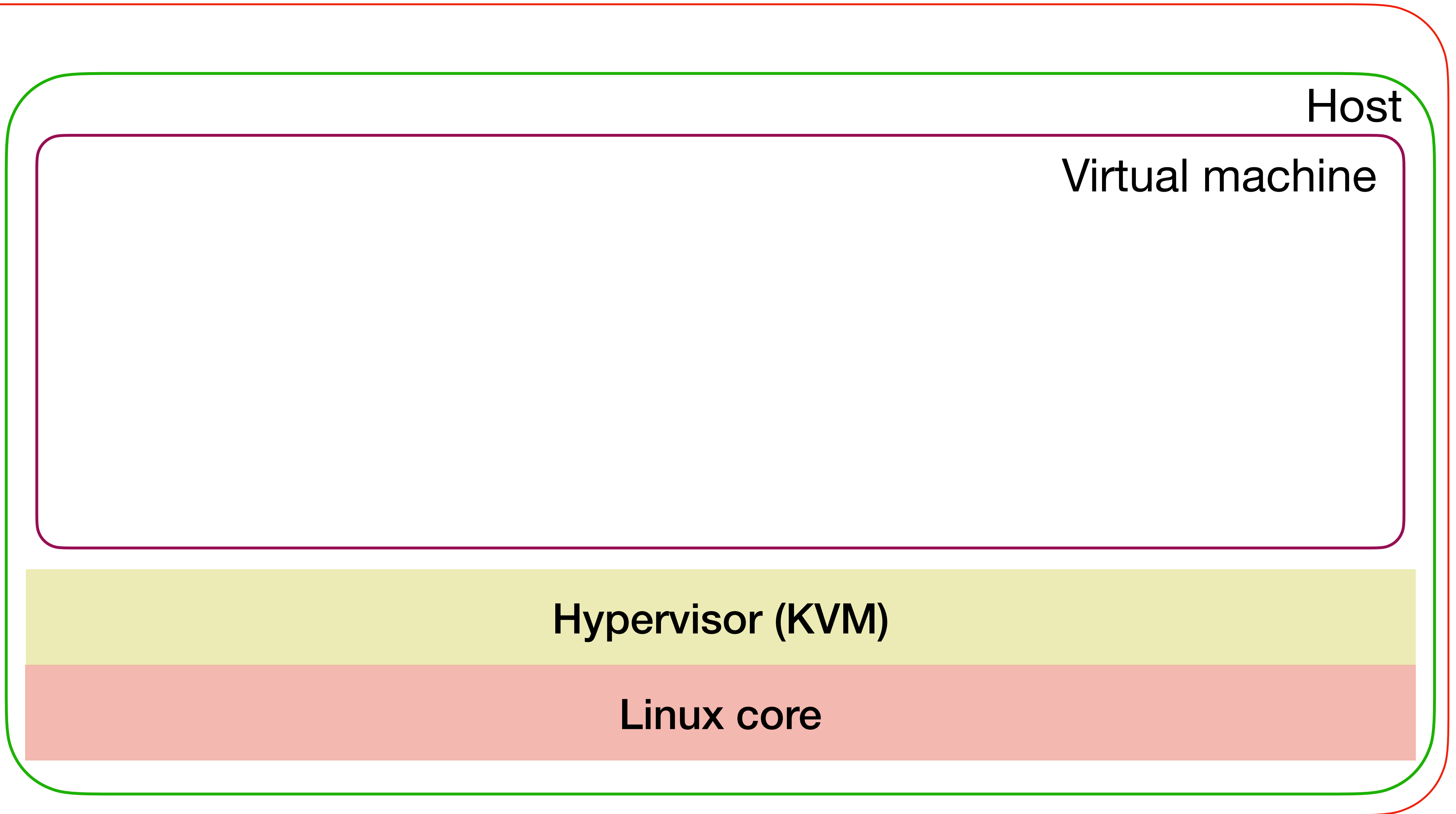
Hardware



android

**Cloud
Servers**

**Virtual
Machine**



Host

Virtual machine

Hypervisor (KVM)

Linux core

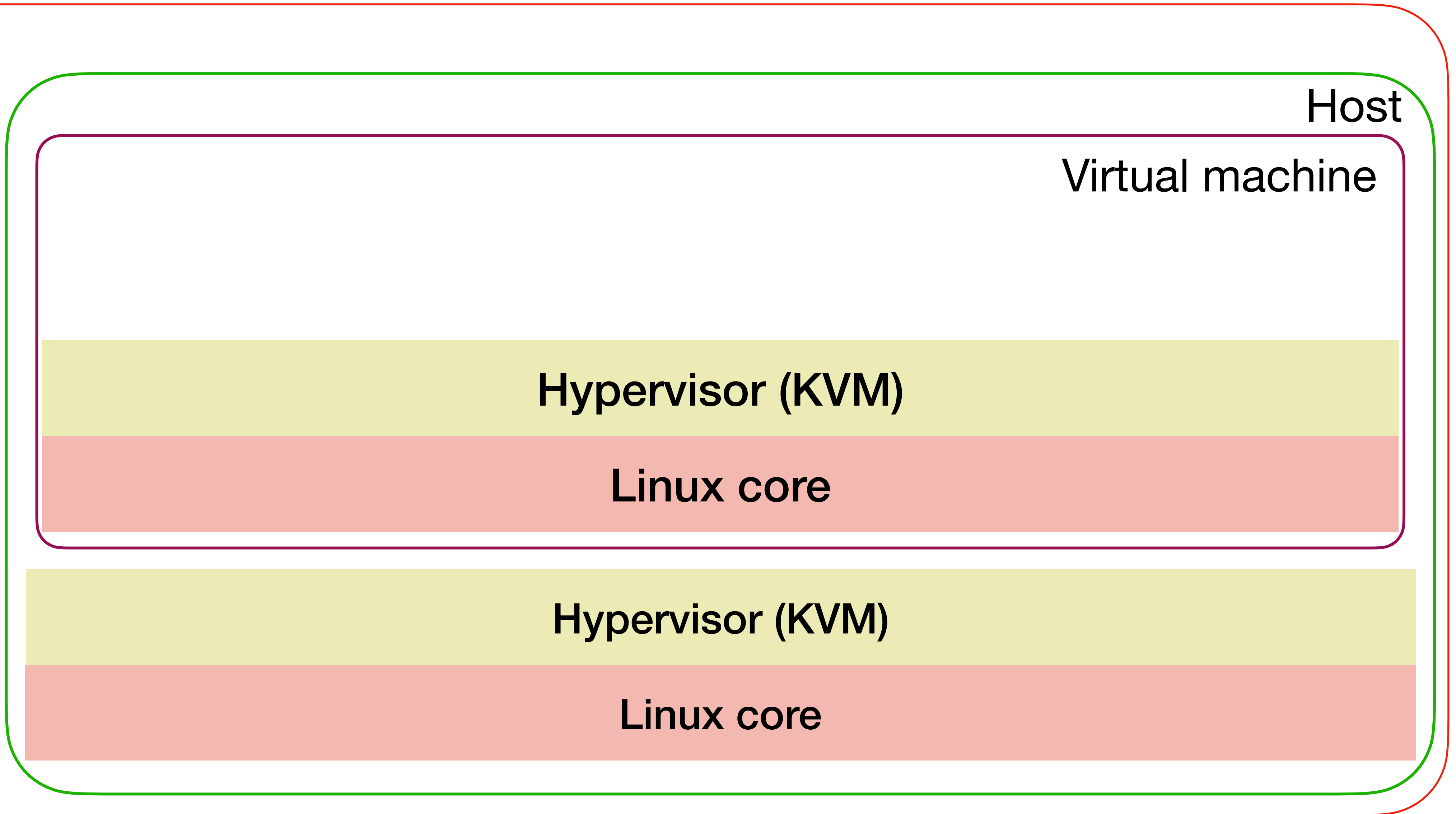
Hardware



android

**Cloud
Servers**

**Virtual
Machine**



Host

Virtual machine

Hypervisor (KVM)

Linux core

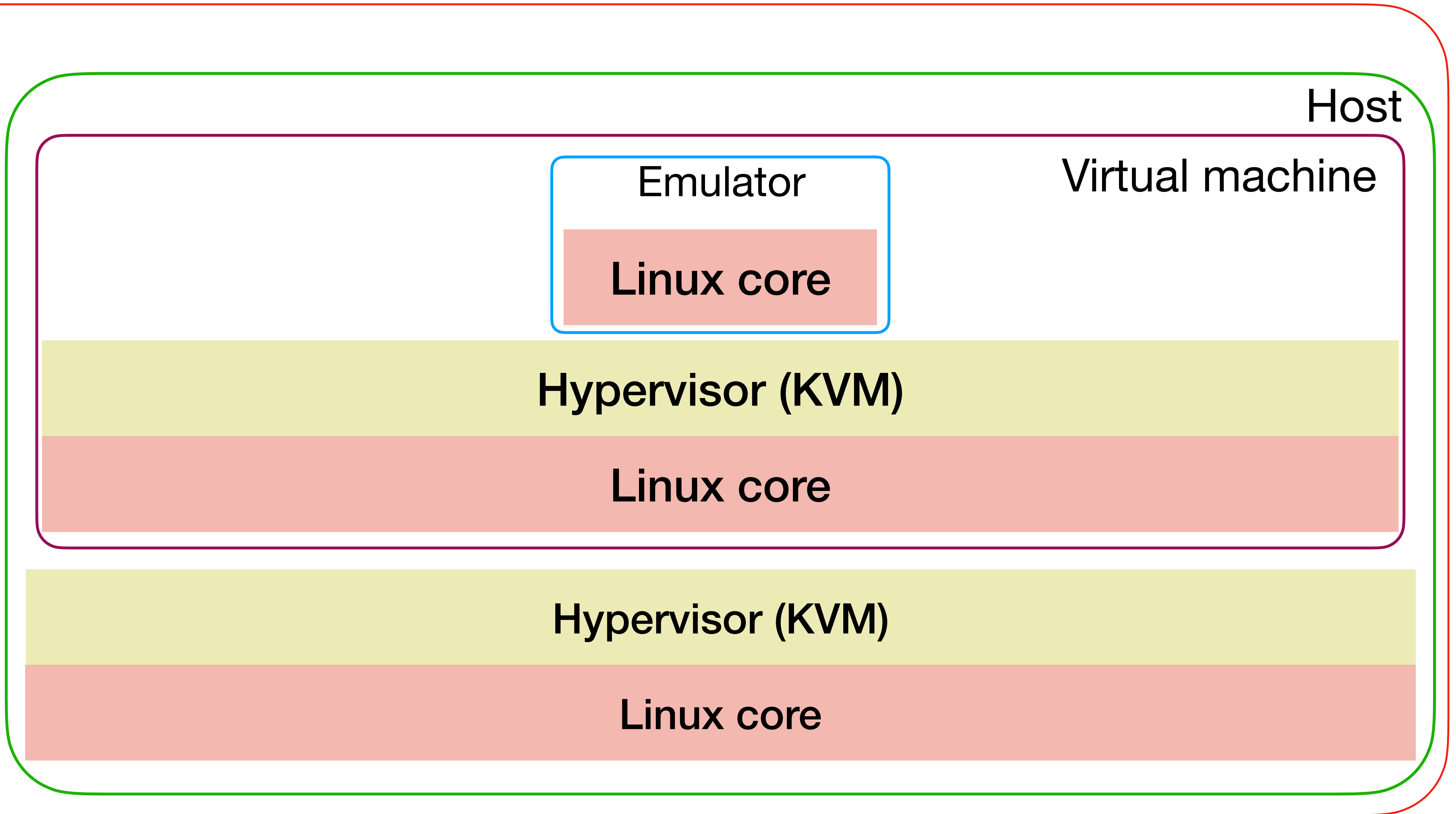
Hypervisor (KVM)

Linux core

Hardware



android
Cloud
Servers
Virtual
Machine



Hardware



android
Cloud
Servers



Virtual Machine



Bare Metal

Hardware



android

**Cloud
Servers**

**Bare
Metal**

- Поддержка KVM
- Поддержка on-demand
- Поддержка адекватных SLA по масштабированию и тд
- Дороже и реже

Hardware



android
Cloud
Servers



Virtual Machine



Bare Metal

Hardware



android



In-House Servers



Cloud Servers

Hardware



android

In-House Servers

- Свое
- Дешевле
- Полная поддержка (disk, memory, cpu) и мониторинг
- Подготовка эксплуатации (ДЦ, питание, сеть)
- Отложенное масштабирование

Cloud Servers

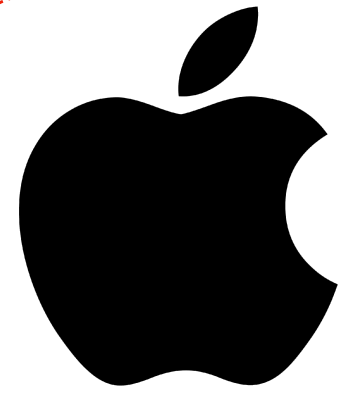
- Нет недостатков In-House Servers
- Почти мгновенное масштабирование
- Дороже

Hardware



android

Hardware

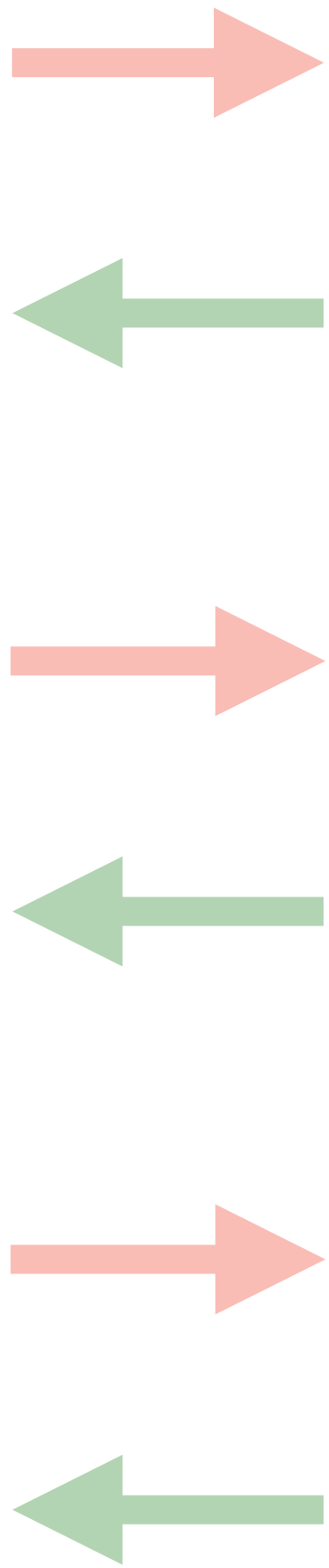


Путь к Scalable Infrastructure

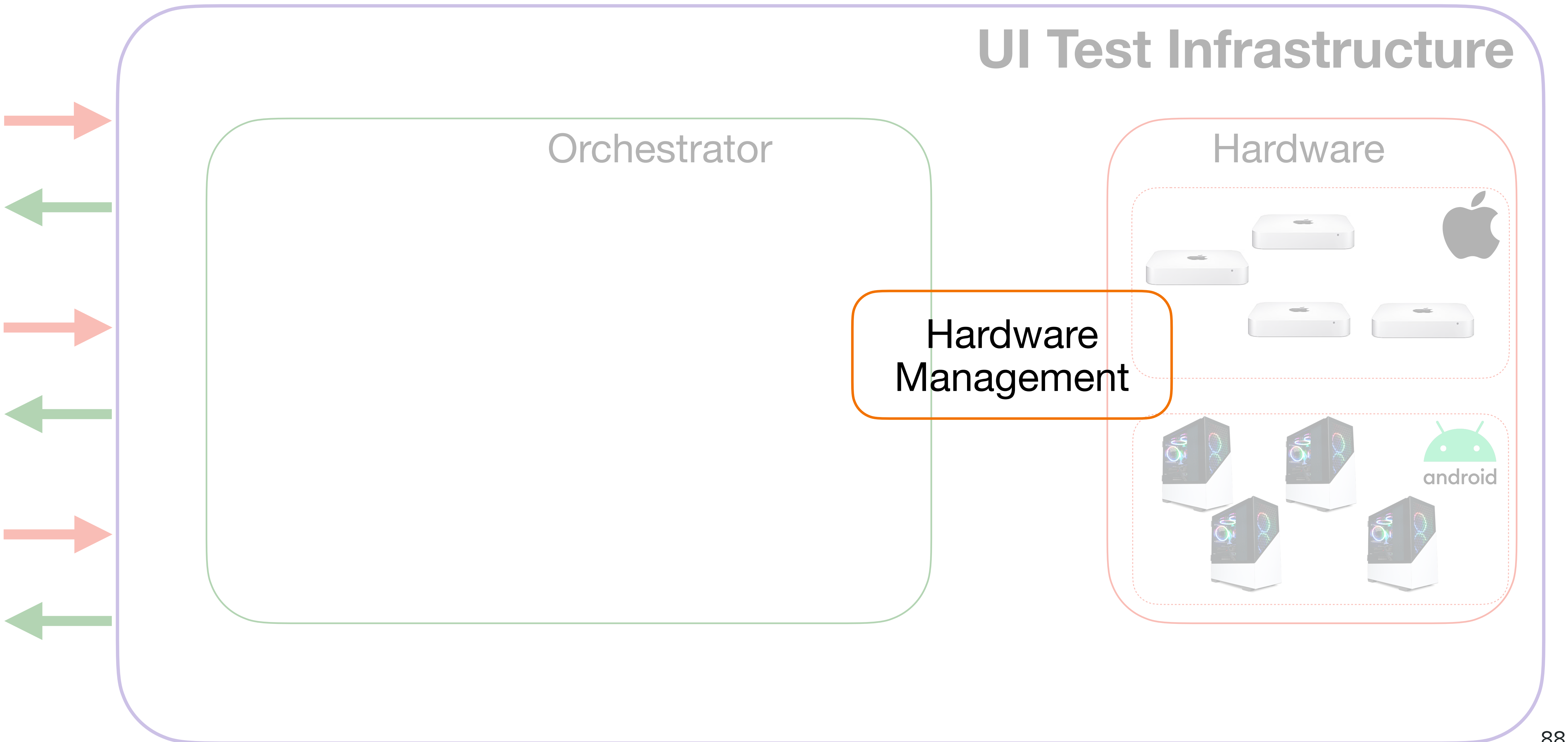
UI Test Infrastructure

Orchestrator

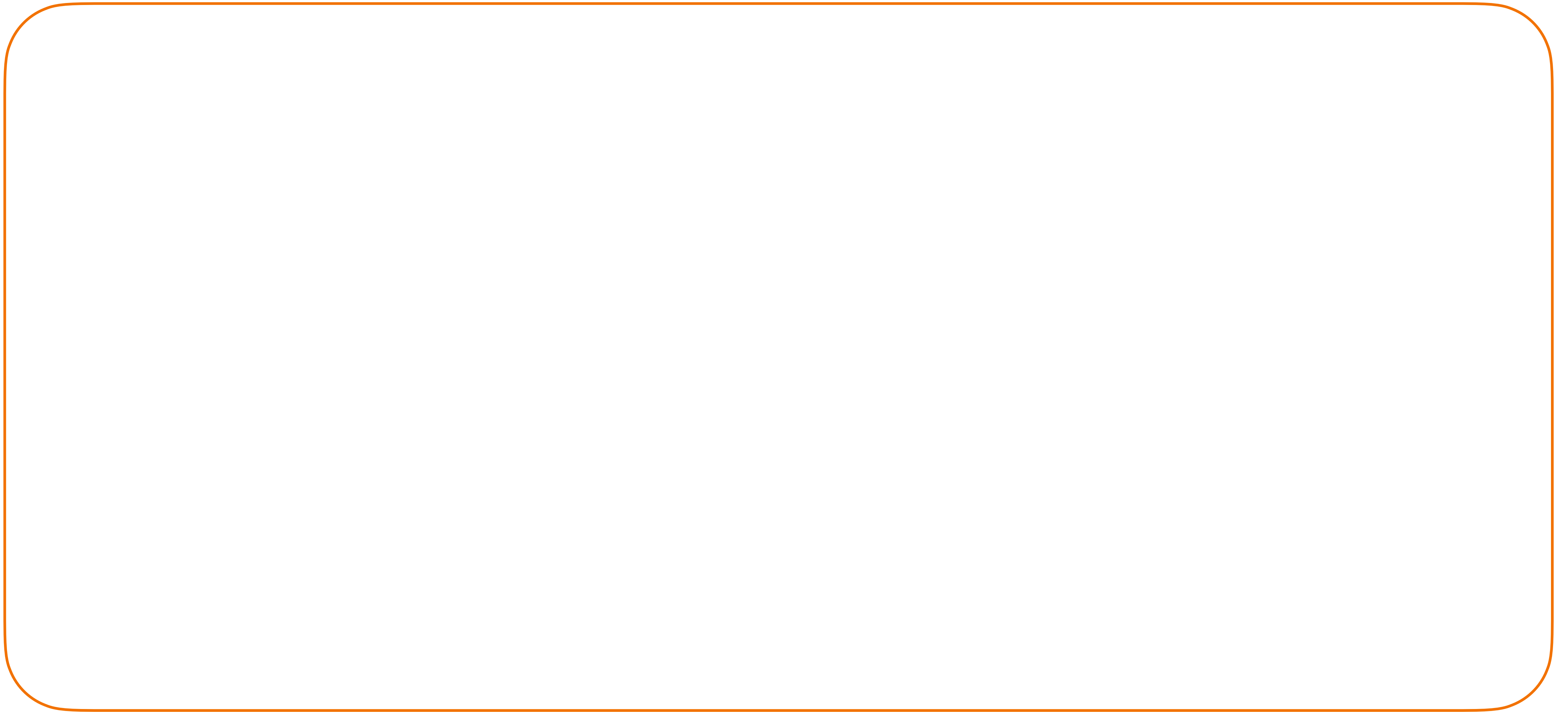
Hardware



Путь к Scalable Infrastructure



Hardware Management



Hardware Management



android

Hardware Management



Isolation and Containerisation



Orchestration



Hardware Management



android

Hardware Management



Isolation and Containerisation



Orchestration



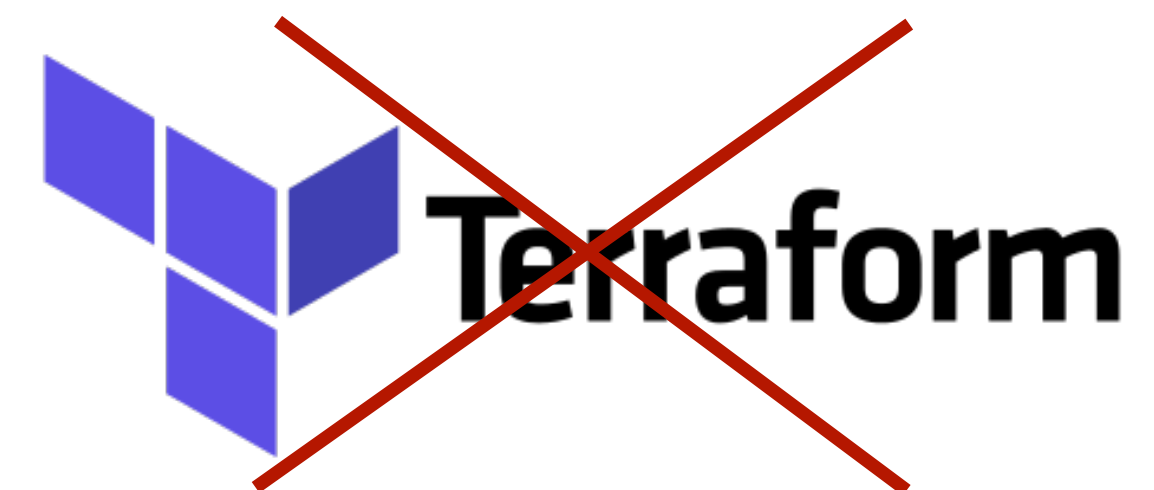
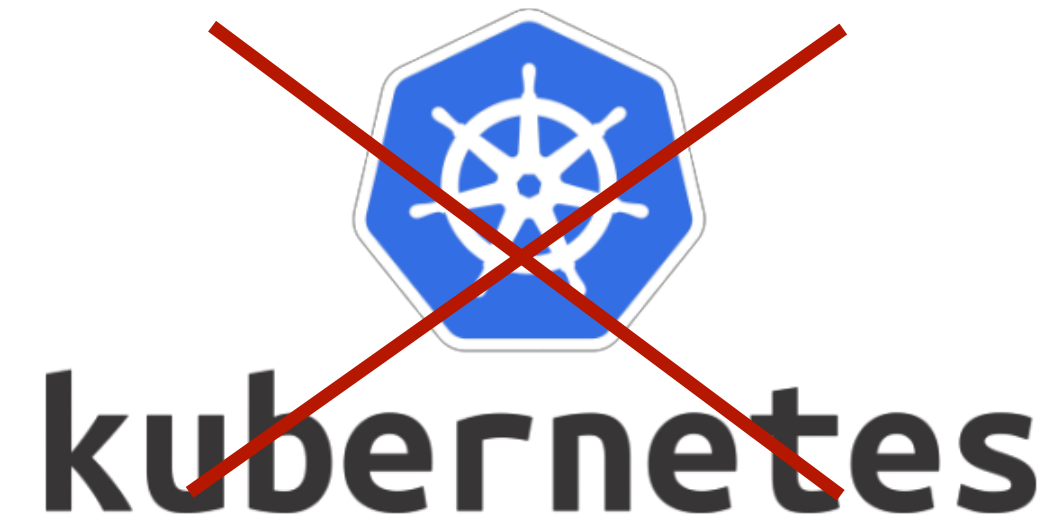
Hardware Management



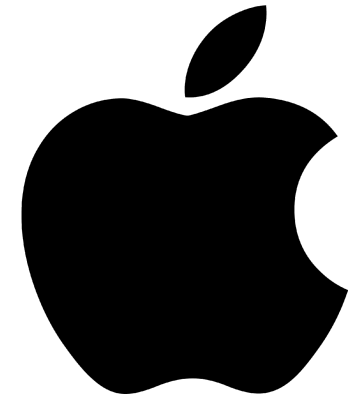
Isolation and Containerisation



Orchestration



Hardware Management



Isolation &
Containerisation

Hardware Management



Isolation &
Containerisation

MacOS Core

Hardware Management



Isolation &
Containerisation

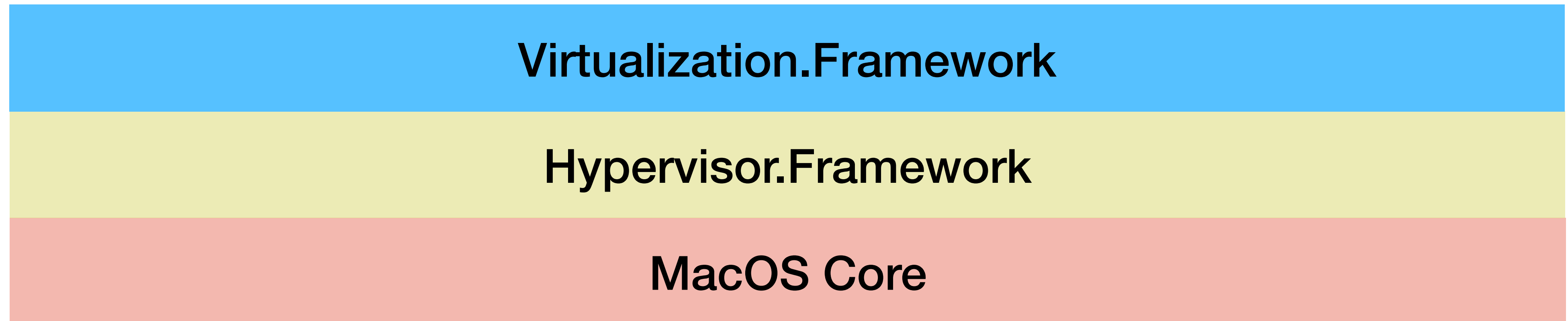
Hypervisor.Framework

MacOS Core

Hardware Management



Isolation &
Containerisation



Hardware Management



Isolation &
Containerisation





Virtualization.Framework

Hardware Management



Isolation &
Containerisation

VirtualMac2,1 vs Mac mini (Late 2020)

| | VirtualMac2,1 | Mac mini (Late 2020) | Difference |
|--------------------------|--|---|------------|
| Single-Core Score | 1716 | 1756 | 97.7% |
| VirtualMac2,1 |  | | |
| Mac mini (Late 2020) | |  | |
| Multi-Core Score | 7335 | 7718 | 95.0% |
| VirtualMac2,1 |  | | |
| Mac mini (Late 2020) | |  | |
| | Geekbench 5.4.5 Tryout | Geekbench 5.4.5 Tryout | |

Virtualization.Framework

Hardware Management



Isolation &
Containerisation

VirtualMac2,1 vs Mac mini (Late 2020)

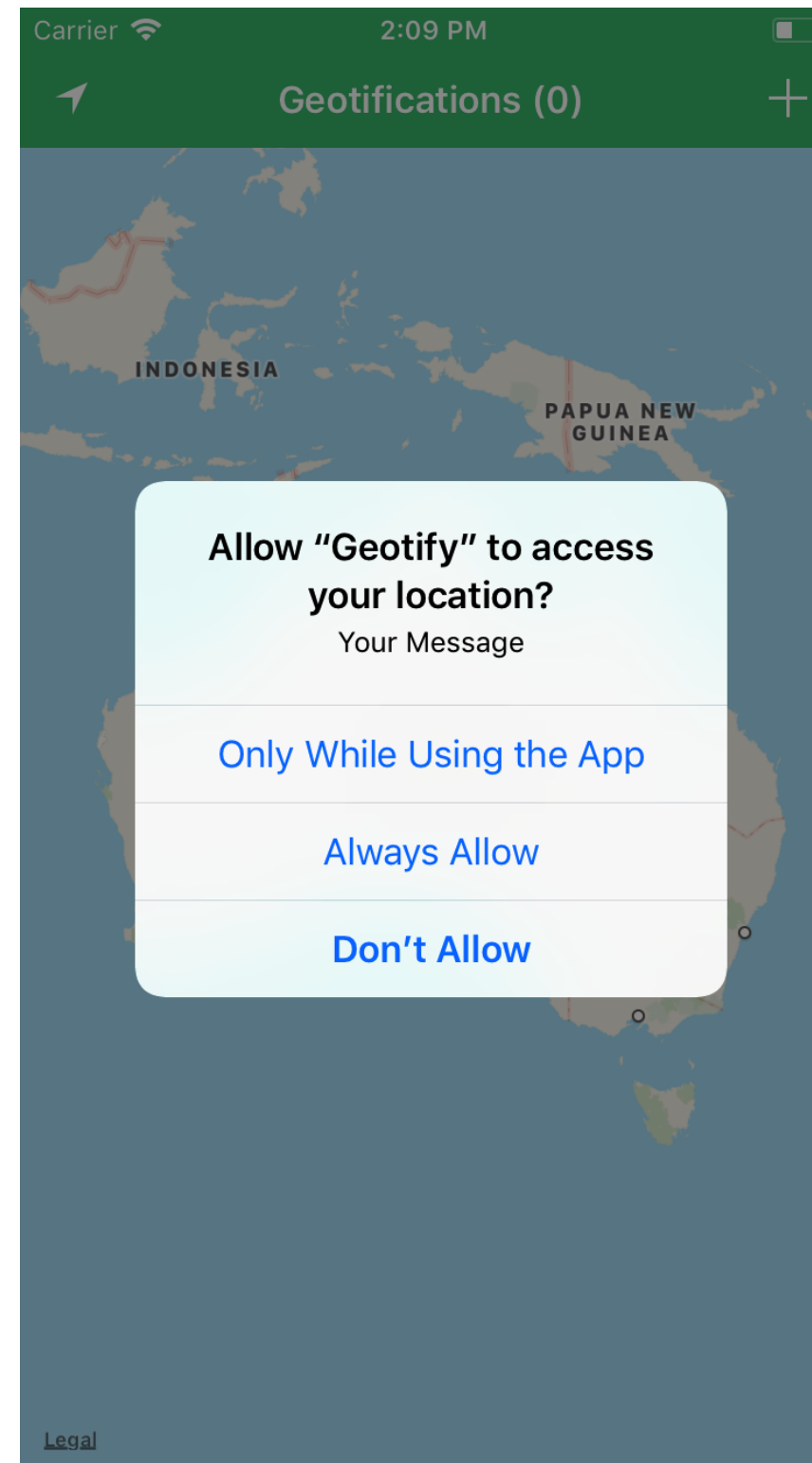
| | VirtualMac2,1 | Mac mini (Late 2020) | Difference |
|--------------------------|------------------------|------------------------|------------|
| Single-Core Score | 1716 | 1756 | 97.7% |
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| Mac mini (Late 2020) | | | |
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| VirtualMac2,1 | | | |
| Mac mini (Late 2020) | | | |
| | Geekbench 5.4.5 Tryout | Geekbench 5.4.5 Tryout | |

Virtualization.Framework

Hardware Management



Isolation &
Containerisation



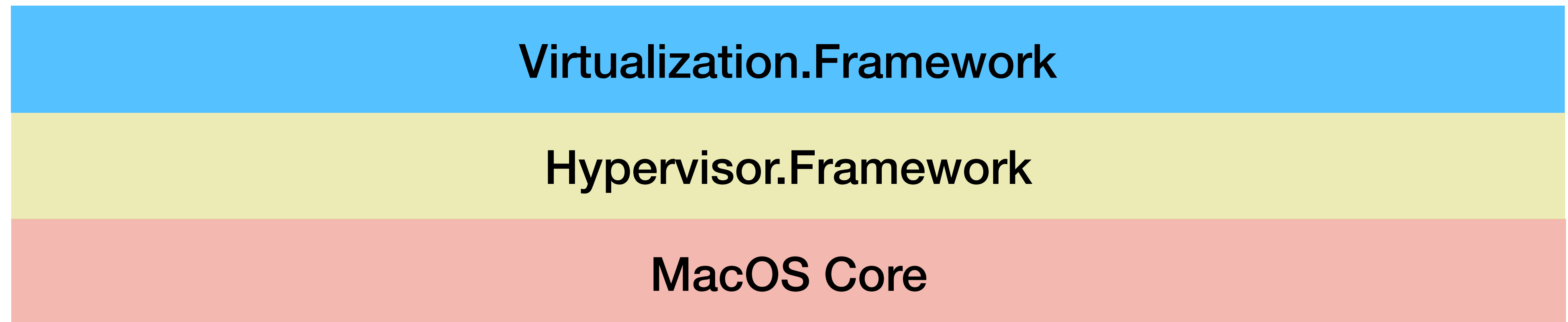
Sonoma + Xcode 15.x.x

Virtualization.Framework

Hardware Management



Isolation &
Containerisation



Hardware Management



Isolation &
Containerisation

CLI/GUI wrappers



Tart



UTM

Virtualization.Framework

Hypervisor.Framework

MacOS Core

Hardware Management



Isolation &
Containerisation



UTM

- OpenSource and Free
- CLI не работает через SSH



Tart

- CLI работает через SSH
- Дополнительные плюшки по network и docker
- Paid Tiers

Hardware Management



Isolation and Containerisation



Tart

Orchestration

Hardware Management

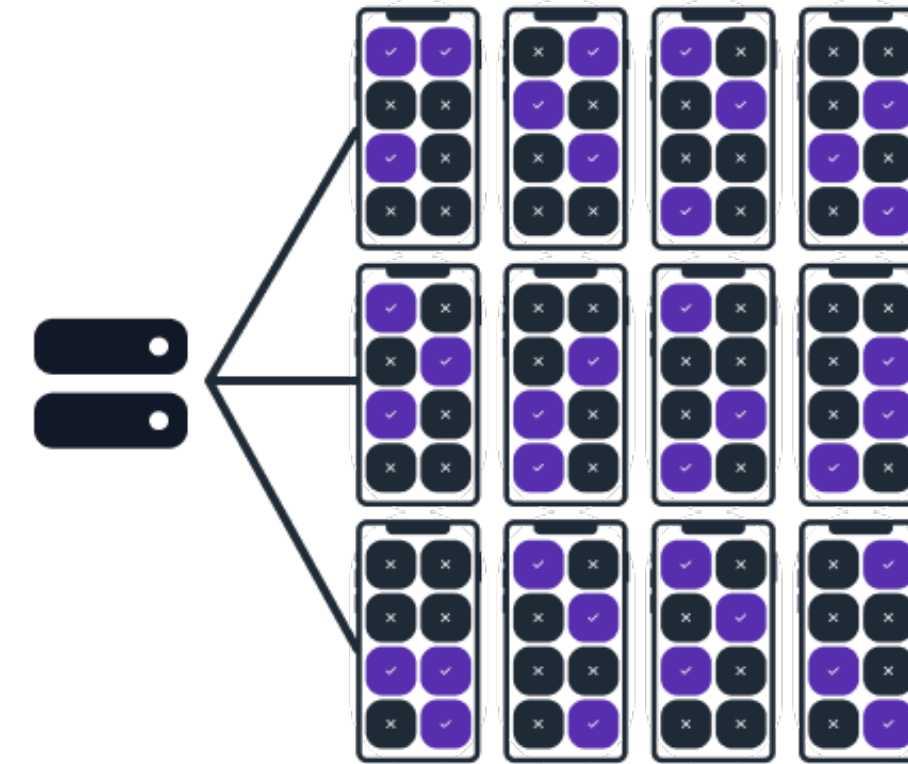


Isolation and Containerisation



Tart

Orchestration



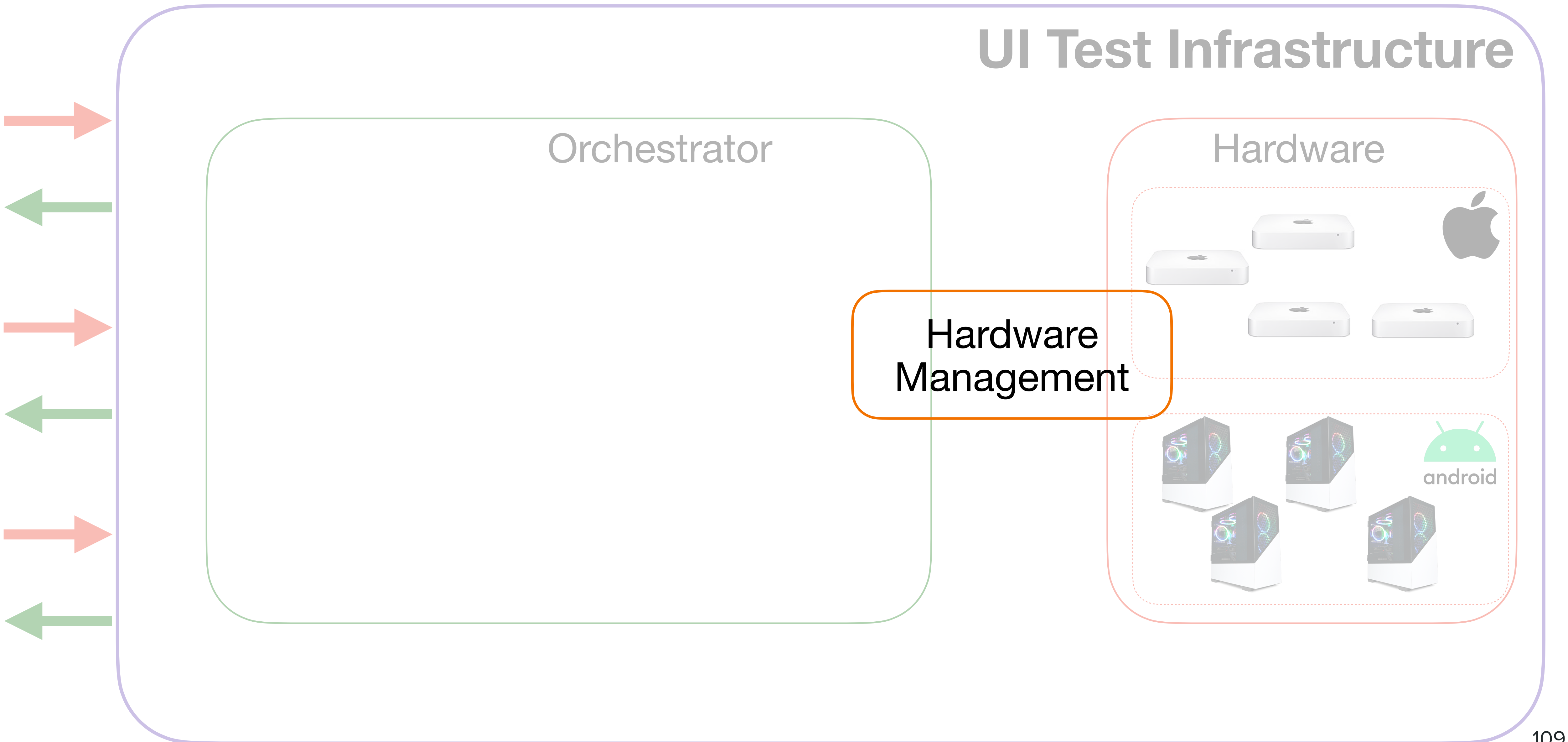
Custom Solution

Hardware Management

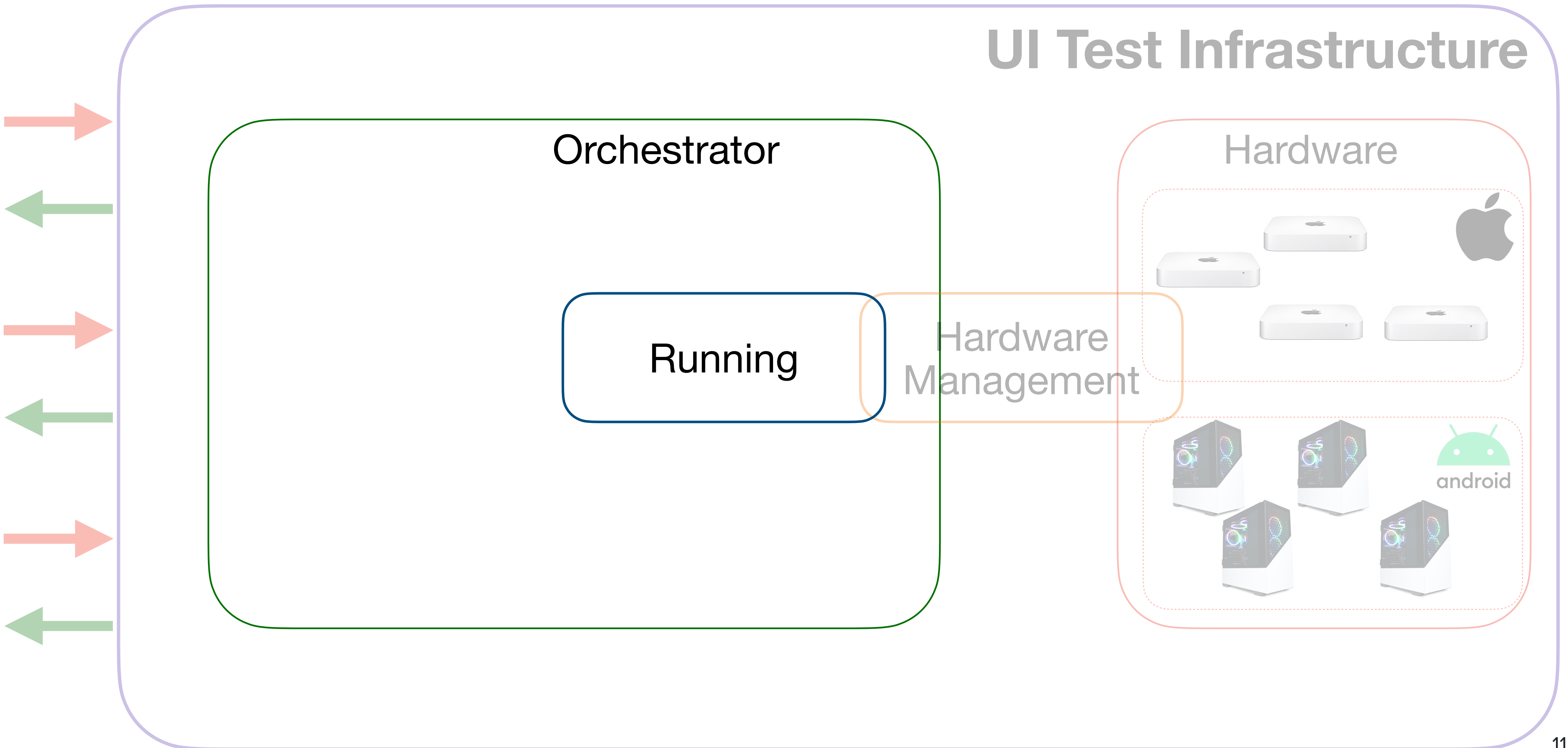


android

Путь к Scalable Infrastructure



Путь к Scalable Infrastructure



Running



Running



android

Running



android

Running



Main Host

Running



Main Host

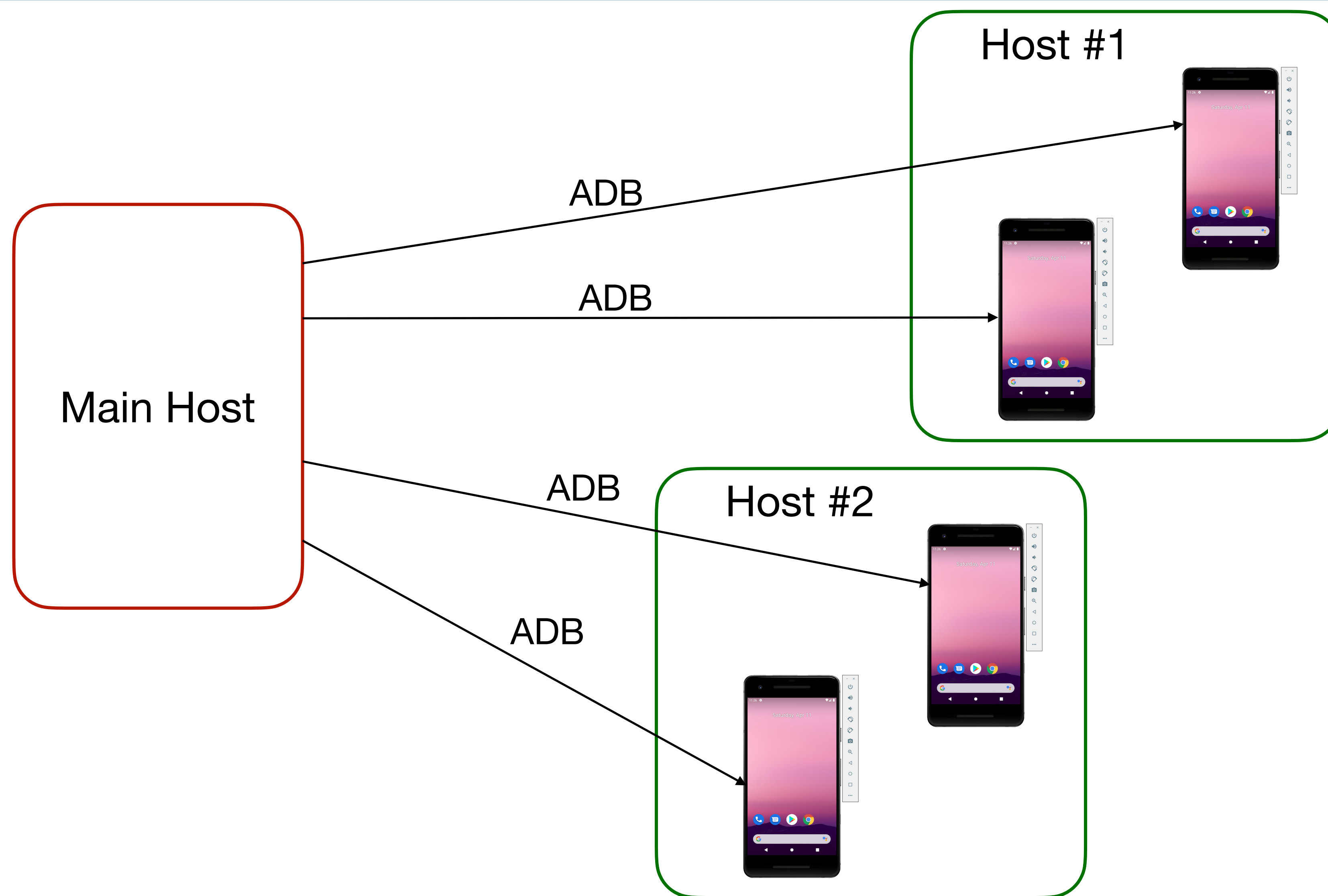
Host #1



Host #2



Running



Running



android

Running



Running



Host #1

Running



Host #1



Xcodebuild

Running



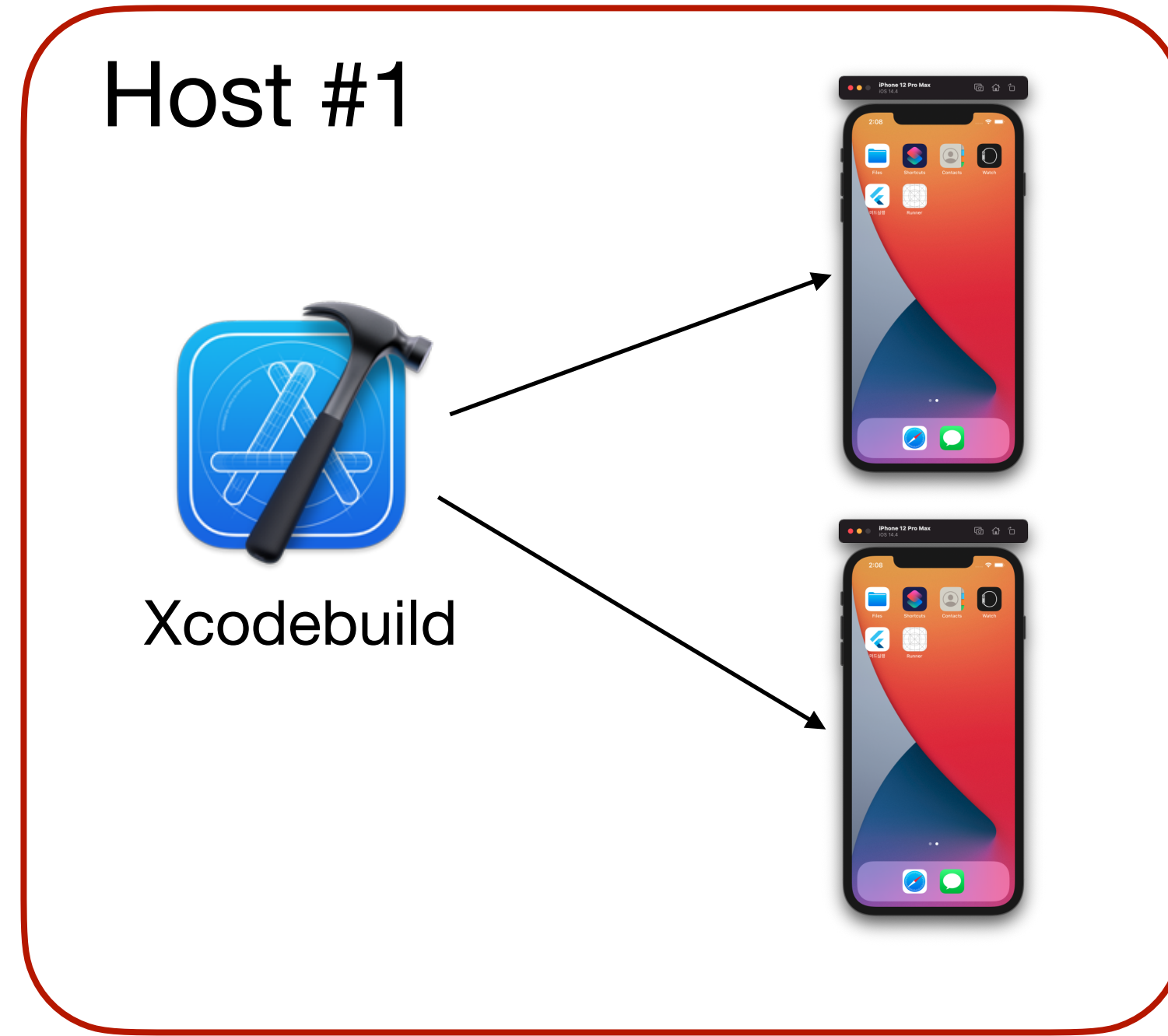
Host #1



Xcodebuild



Running



Running



Host #1



Xcodebuild



Host #2



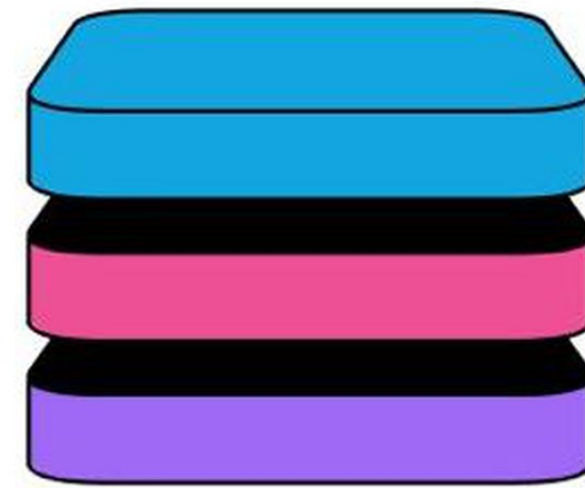
Xcodebuild



Running



Marathon



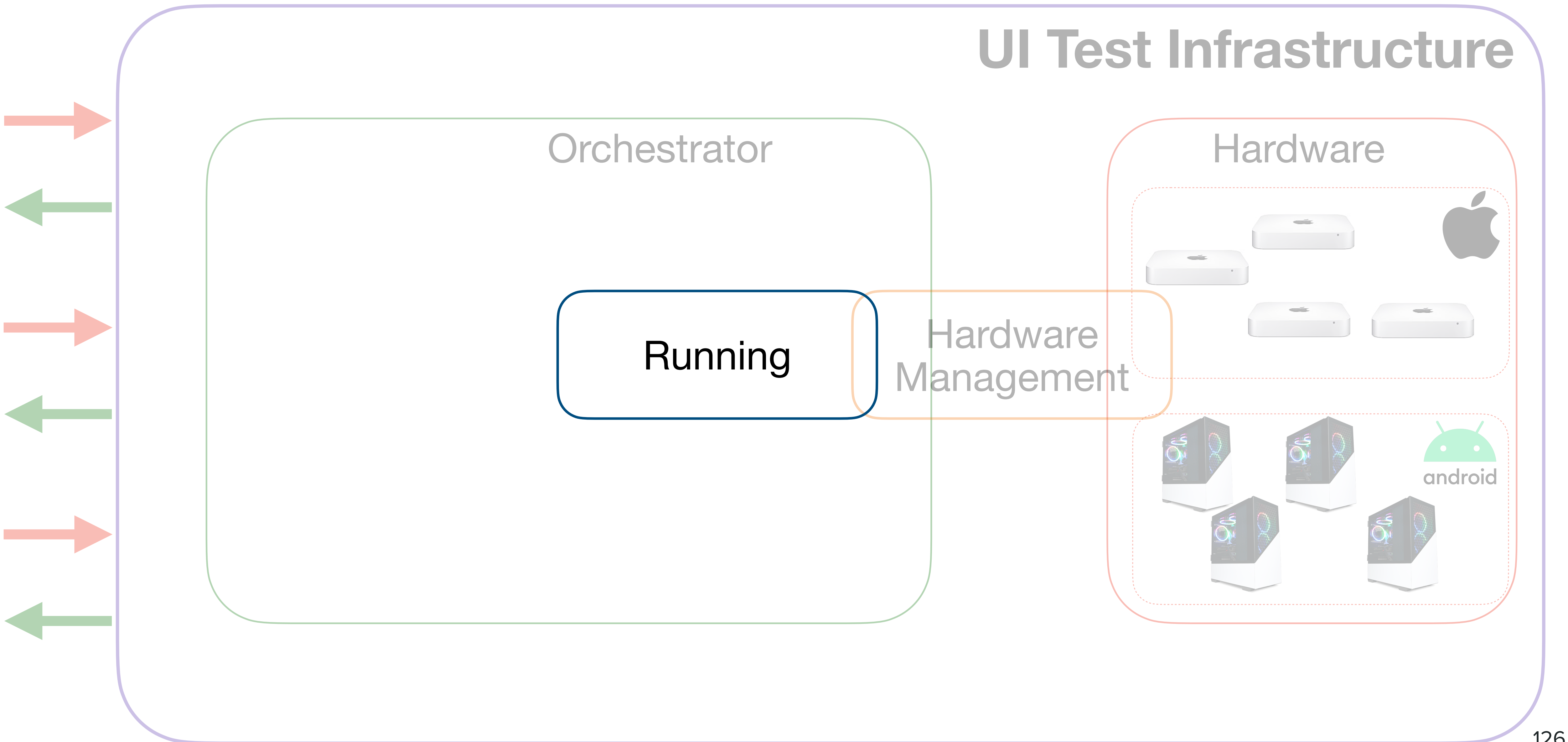
Emcee

Running

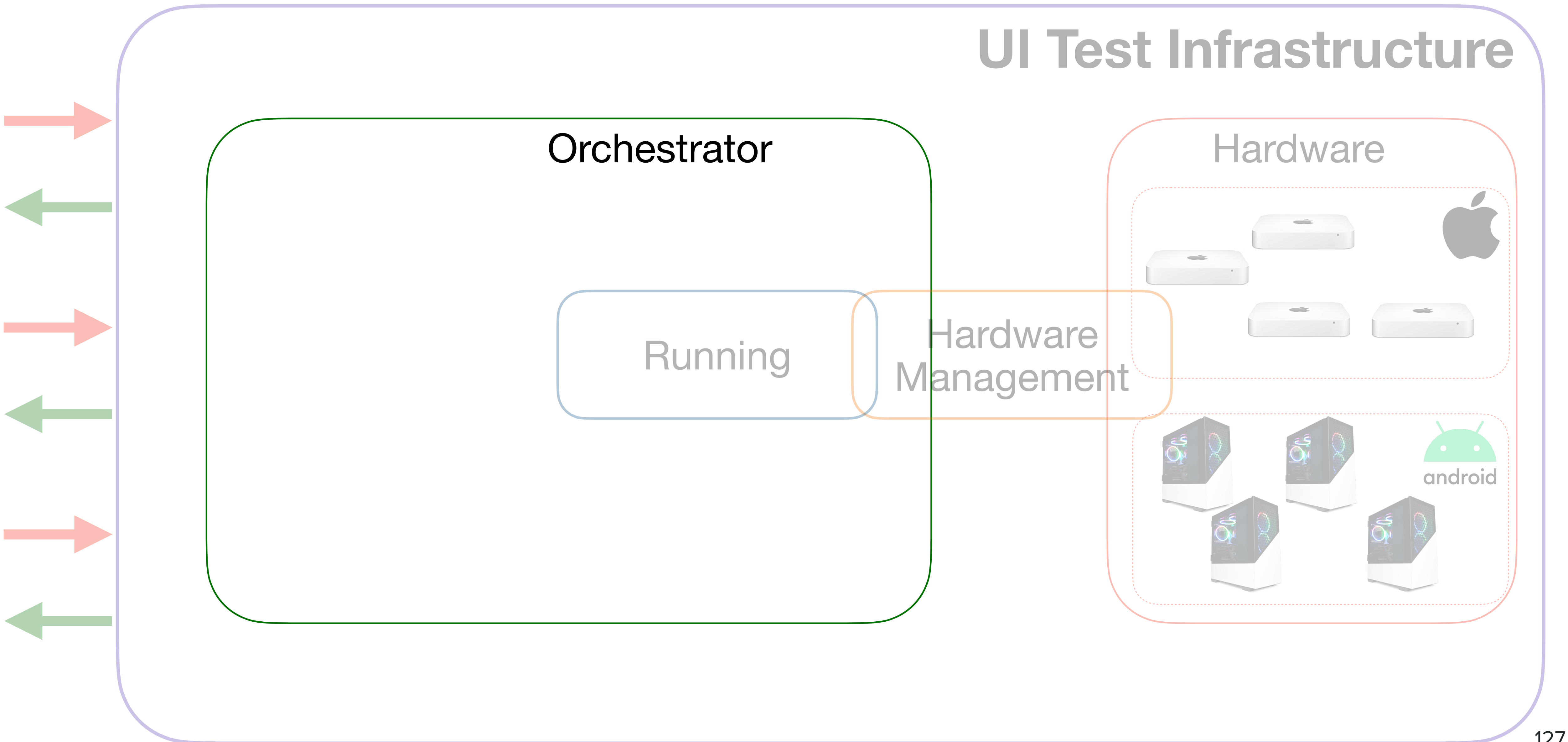


android

Путь к Scalable Infrastructure



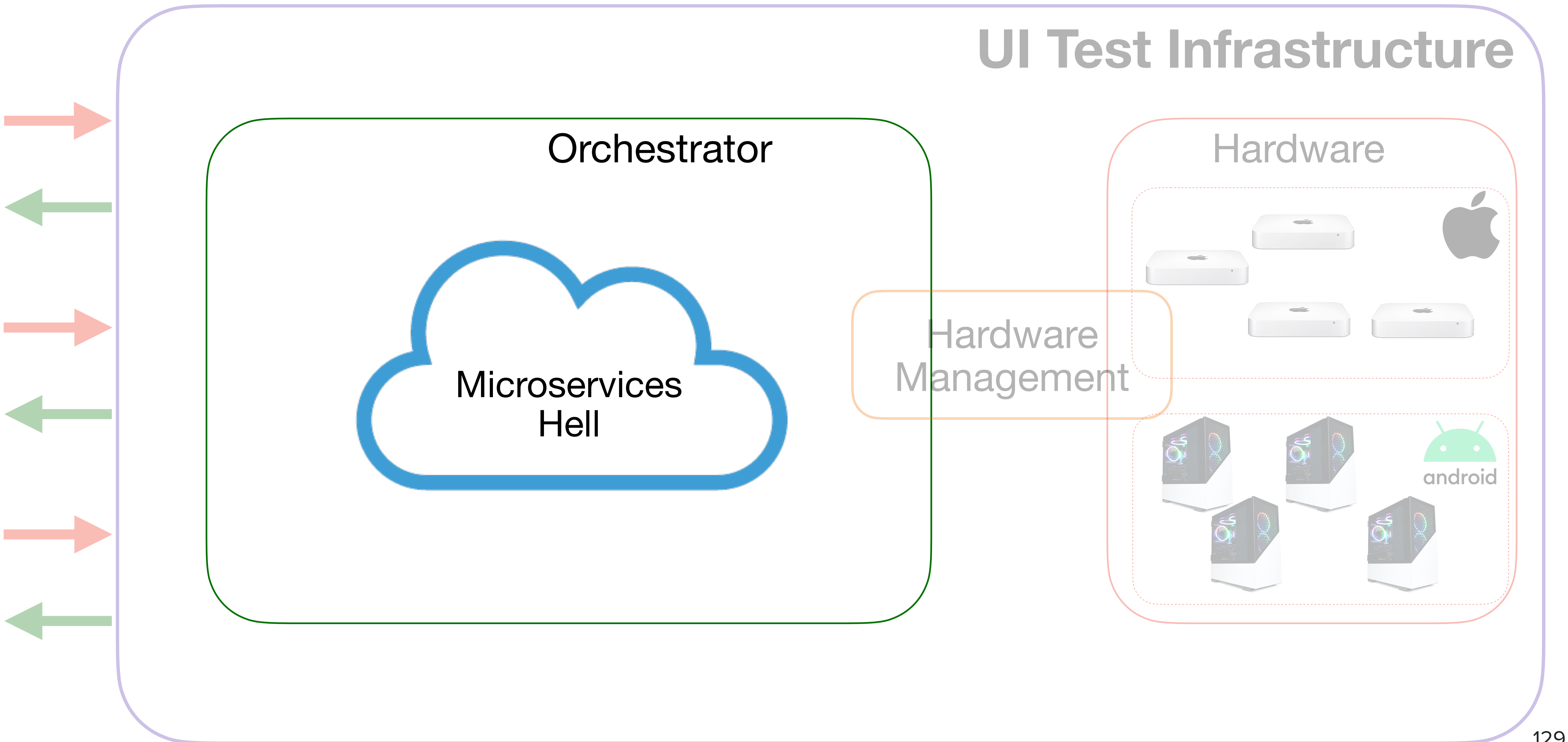
Путь к Scalable Infrastructure



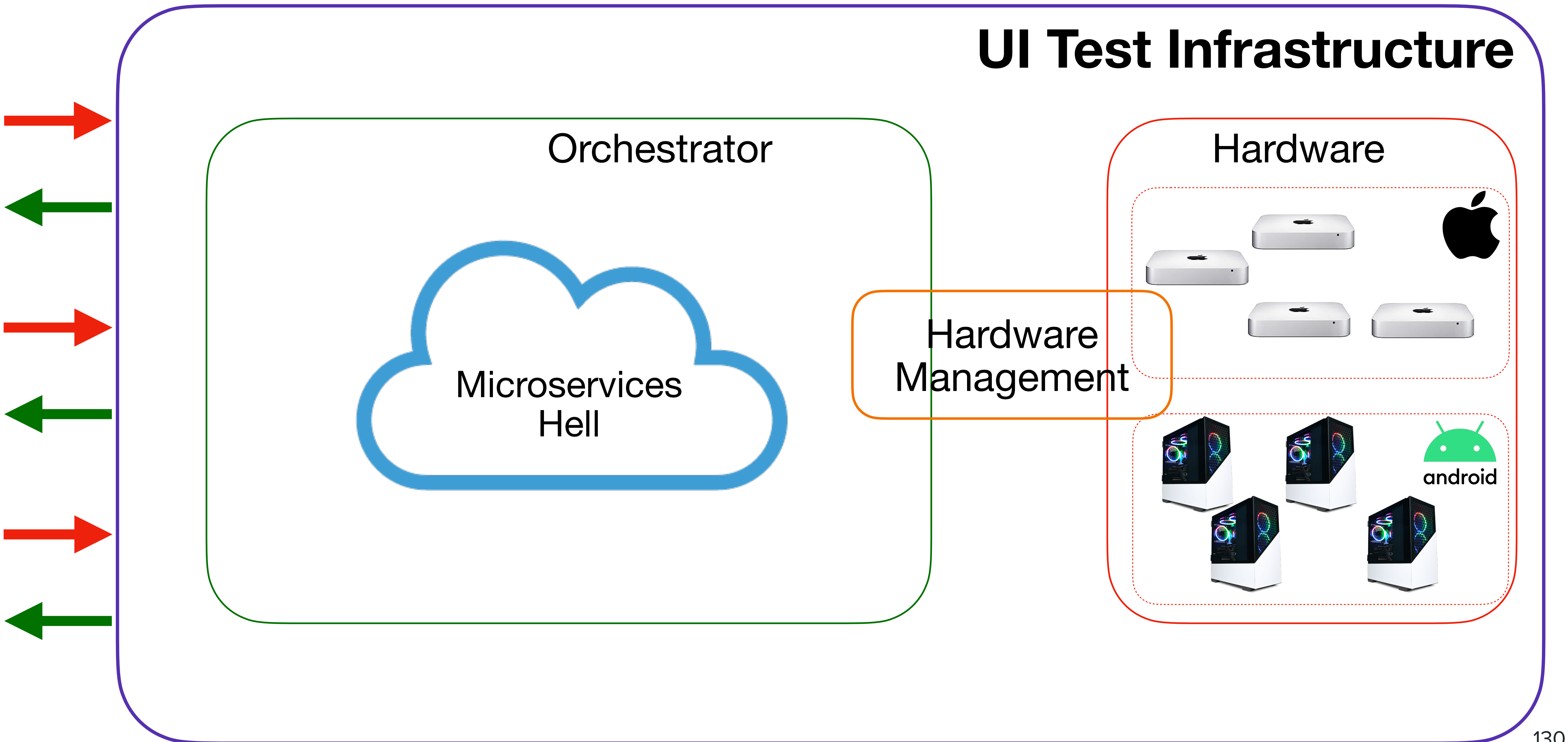
Orchestrator

- Принять запрос от клиента
- Распарсить тесты
- Определить необходимое количество эмуляторов и симуляторов
- Подготовить девайсы
- **Исполнить тесты**
- Сохранить артефакты и всю аналитику
- Подготовить и показать результат

Путь к Scalable Infrastructure



Путь к Scalable Infrastructure



Cloud Solutions

Cloud Solutions

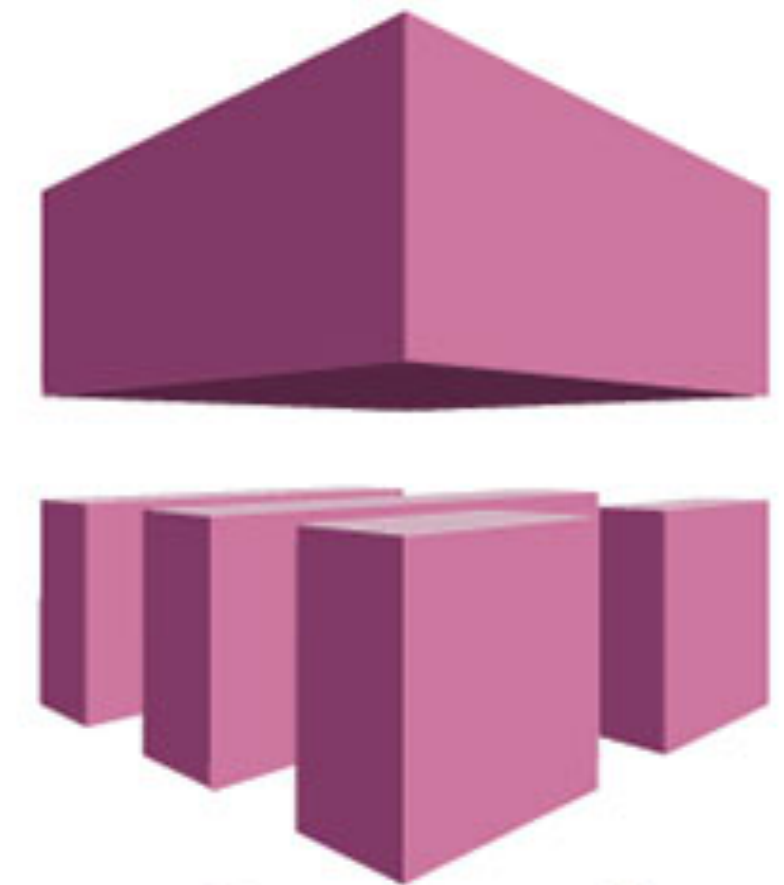


Evgenii Matsiuk

I want to run any number of Android UI tests on each PR.

Your actions? Part I

Cloud Solutions



Q&A

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TG: [@eugene.matsyuk](https://t.me/@eugene.matsyuk)

LinkedIn: [Evgenii Matsiuk](#)

