

Silicon Sandbox: Mastering Mac virtualisation for Jamf workflows



Rob Potvin

Senior Consulting Engineer
@Jamf

Silicon Sandbox: Mastering Mac virtualisation for Jamf workflows



Rob Potvin

Senior Consulting Engineer
@Jamf

Recipe

Preheating the **Oven**

Choosing Our **Ingredients**

Measuring and **Prepping**

Mixing the **Batter**

Baking and **Sharing**

The Taste **Test**

Serving **Suggestions**

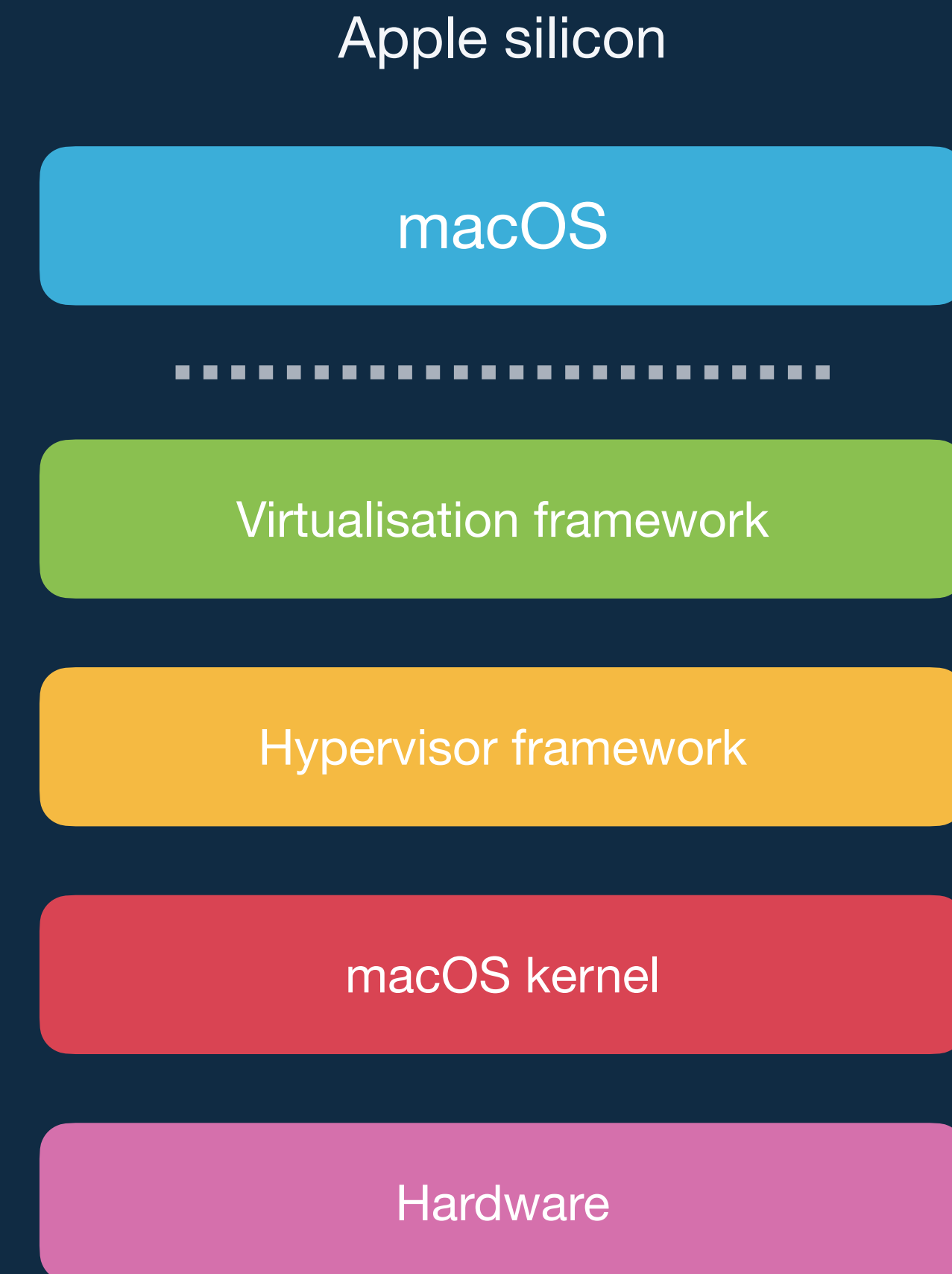


Preheating the Oven

**Warming Up with Apple's
Virtualisation Framework**

What is this Virtual Machine

- A fully functional macOS environment running inside another macOS machine (host) on Apple Silicon
- VMs are created and launched using the Apple Virtualisation Framework
- Free, built into the OS



mise en place



Trackpad support
Shared folder support
no clipboard
ARM Linux Support GUI



macOS Ventura



Nested virtualisation enhancements
Limited iCloud support



macOS Sequoia



macOS Monterey

no Shared Folders
no Trackpads
no clipboard
ARM Linux Support no GUI



macOS Sonoma

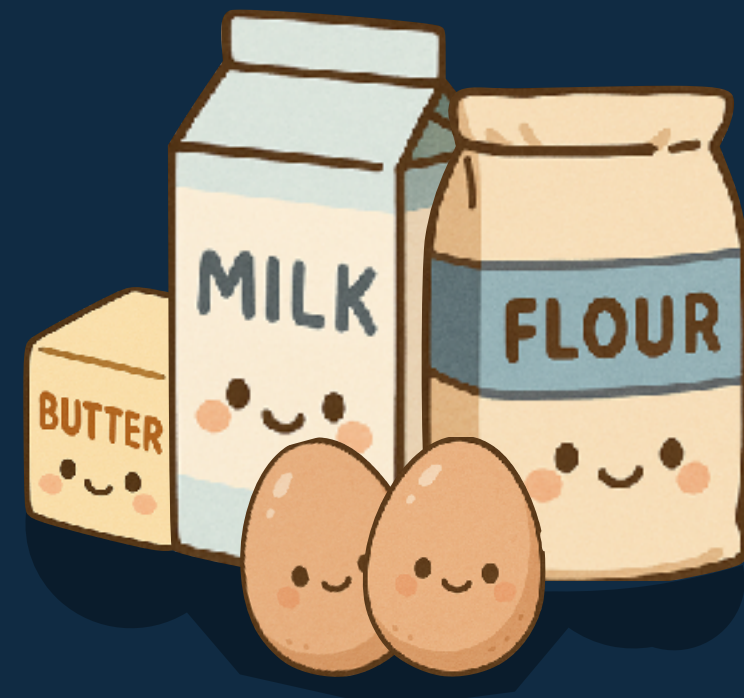
Display Refit
Save and restore
Suspend VM
NVMe Storage
Mac keyboard support
Rosetta 2 Linux Support



Half-Baked Recipe: What's Missing from the Mix

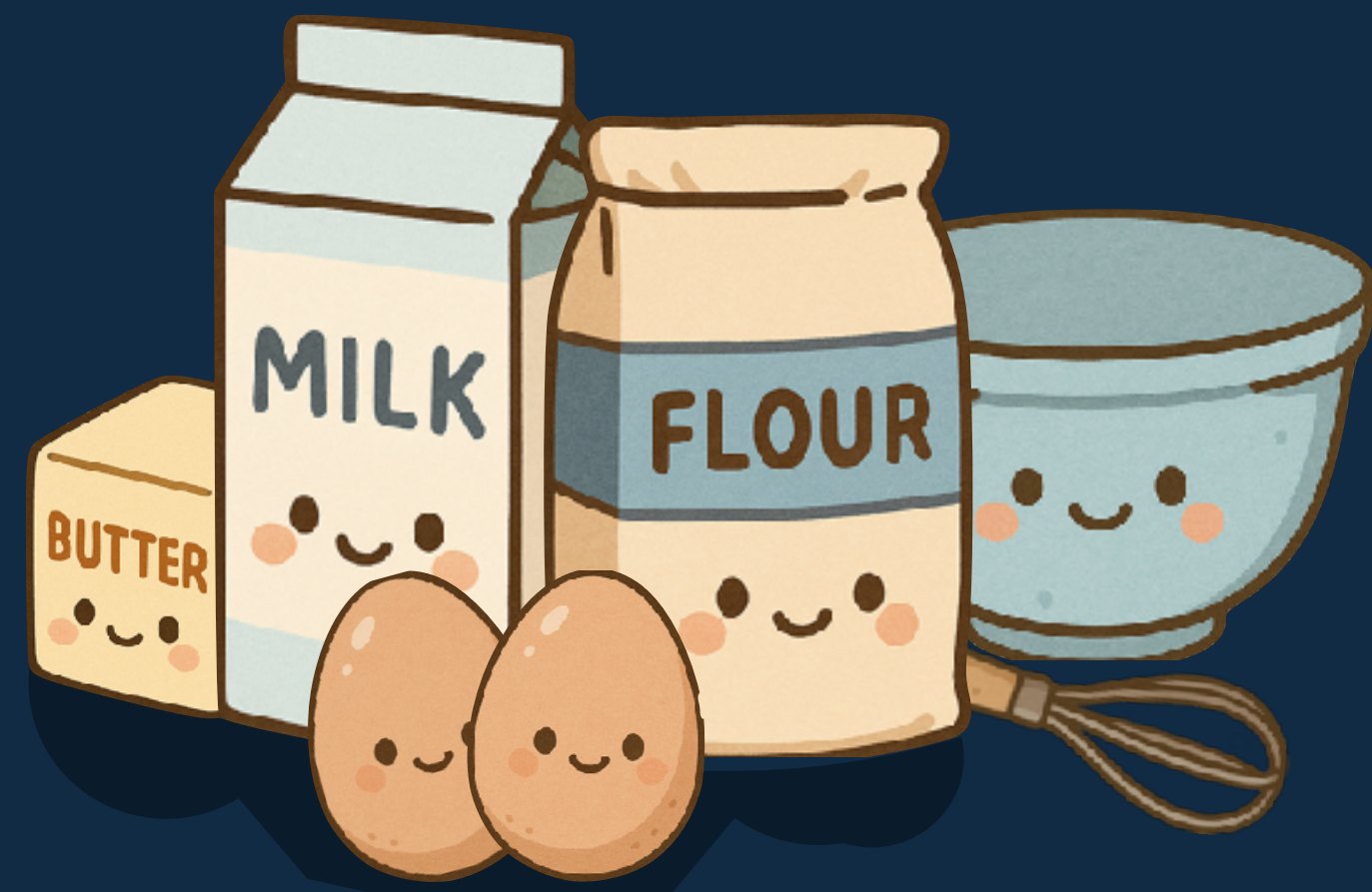
- No Appstore
- No Apps & Books
- No TouchID
- No Automated Enrollment
- Limited iCloud Support*
- Limited Mouse / Trackpad / Keyboard





Choosing Our Ingredients

Virtualisation Pantry





VirtualBuddy

VirtualBuddy can virtualize macOS 12 and later on Apple Silicon, with the goal of offering features that are useful to developers who need to test their apps on multiple versions of macOS.



Viable

*Viable uses lightweight virtualisation in macOS Monterey 12.4 or later to build, install and run macOS virtual machines (VMs) on Apple silicon Macs. Has a cool little sister app **Vimy** with a linux variant called **Livable**.*



UTM

UTM is a full featured system emulator and virtual machine host for iOS and macOS. It is based off of QEMU. In short, it allows you to run Windows, Linux, and more on your Mac, iPhone, and iPad.

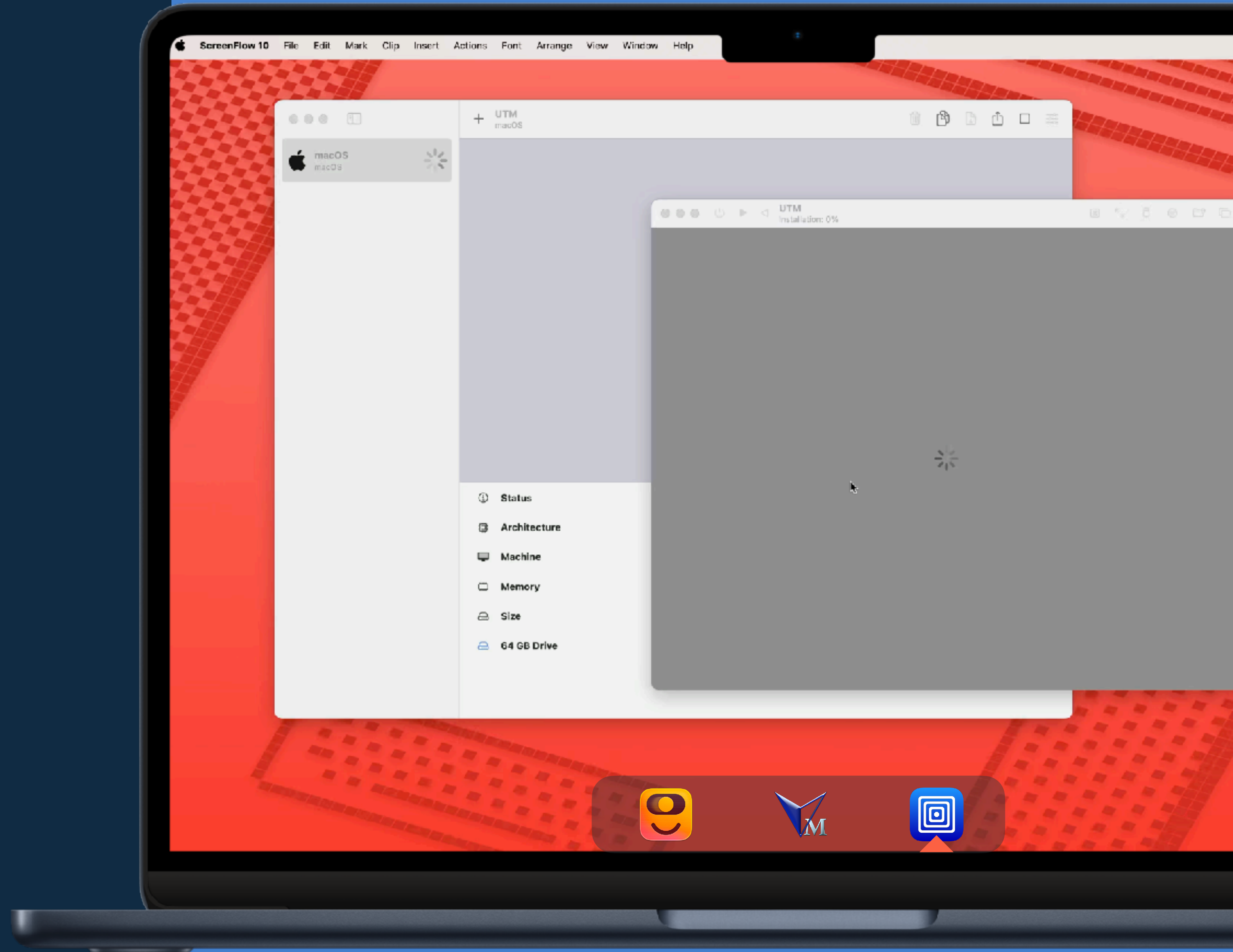


Orka Desktop

An easy desktop virtualization program that allows you to create and manage macOS virtual machines locally with an easy-to-use GUI.

Building a VM

- Install from **IPSW**
- Run through **Setup Assistant**
- **Enroll** Device
- **Use** once and delete

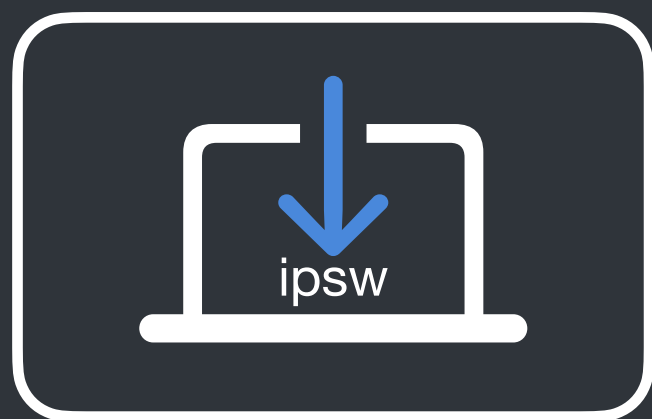




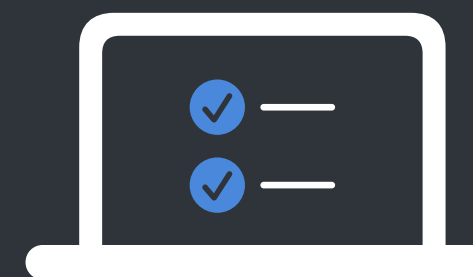
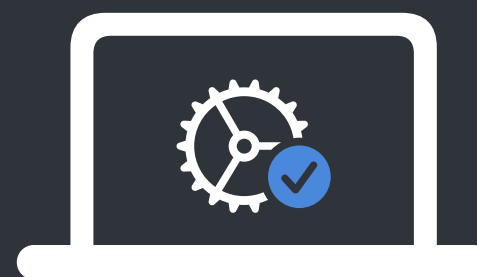
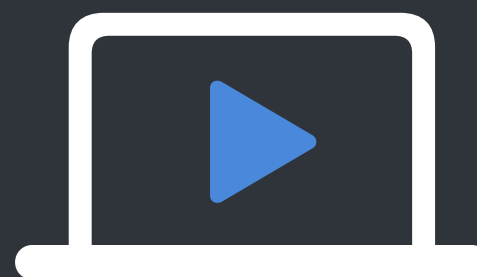
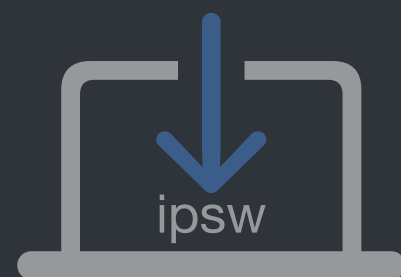
Traditional VM Managers

Where 'instant deployment' means 'grab a coffee first', click through the setup assistant. Many ingredients, many steps and then and only then will you be ready for enrollment.

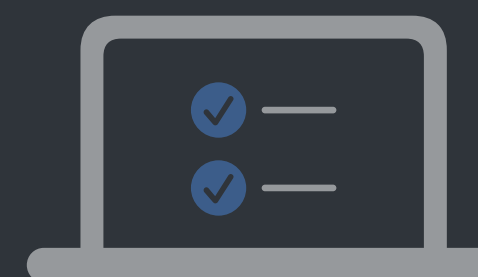
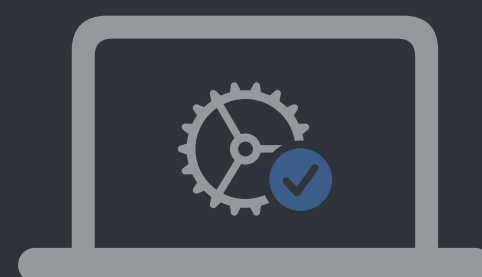
Restore



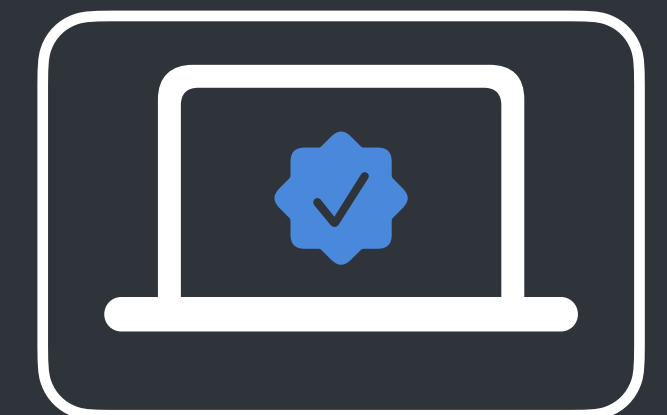
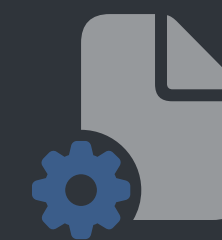
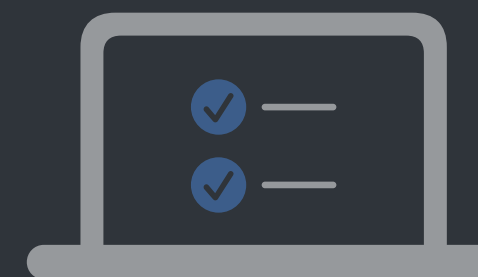
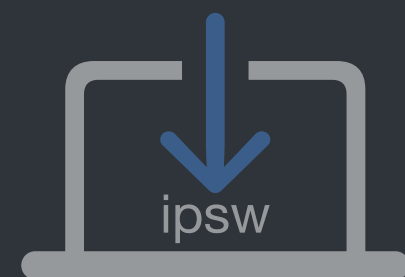
Apple Setup Assistant



Enrollment



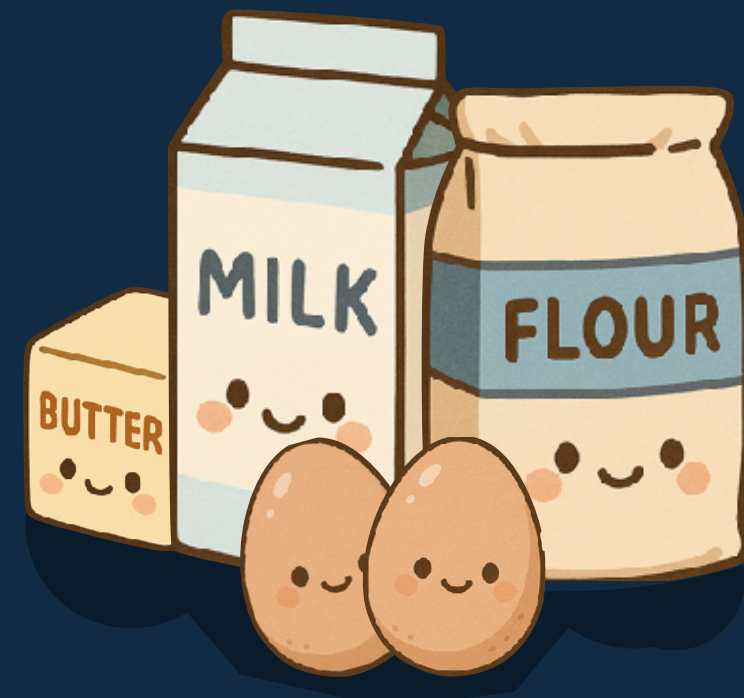
Testing





tart

*Tart is like your ingredients pre-mixed for virtualisation-
think of it as your secret recipe for baking up quick,
fresh, isolated macOS environments right from the
command line.*



Measuring and Prepping: Getting to Know Tart



Tart Bake-Off

Pre-Mixed, Ready in Minutes

- ◉ Command Line Tool
- ◉ Tart.app for output
- ◉ Install via homebrew
 - `brew install cirruslabs/cli/tart`
- ◉ `tart.run`



Tart Ingredients

Part cmd, part app

- Build from IPSW
- Easy Clone / Easy Import / Export
- Pull / Push VM images to / from OCI registry



Measuring and Prepping

Getting to Know Tart



```
tart create --from-ipsw='/Users/rob.potvin/Downloads/Universal Mac 15.4.1  
Restore.ipsw' 15.4.1  
Installing OS...  
24%
```



Measuring and Prepping

Getting to Know Tart



```
tart create --from-ipsw='/Users/rob.potvin/Downloads/Universal Mac 15.4.1  
Restore.ipsw' 15.4.1  
Installing OS...  
100%
```



Measuring and Prepping

Getting to Know Tart



```
tart list
Source Name
Disk Size SizeOnDisk State
local 15.4.1
50 19 19 stopped
```

Measuring and Prepping Getting to Know Tart



```
tart clone 15.4.1 newtest
```



Measuring and Prepping

Getting to Know Tart



```
tart list
Source Name
Disk Size SizeOnDisk State
local 15.4.1
50 19 19 stopped
local newtest
50 19 19 stopped
```

Great but where is the Instant Cake Mix?



```
tart pull ghcr.io/cirruslabs/macos-sequoia-vanilla:latest  
pulling ghcr.io/cirruslabs/macos-sequoia-vanilla:latest...  
pulling manifest...  
pulling disk (21.3 GB compressed)...  
100%
```



Great but where is the
Instant Cake Mix?

```
tart clone ghcr.io/cirruslabs/macos-sequoia-vanilla:latest newvmtest
```



Great but where is the Instant Cake Mix?

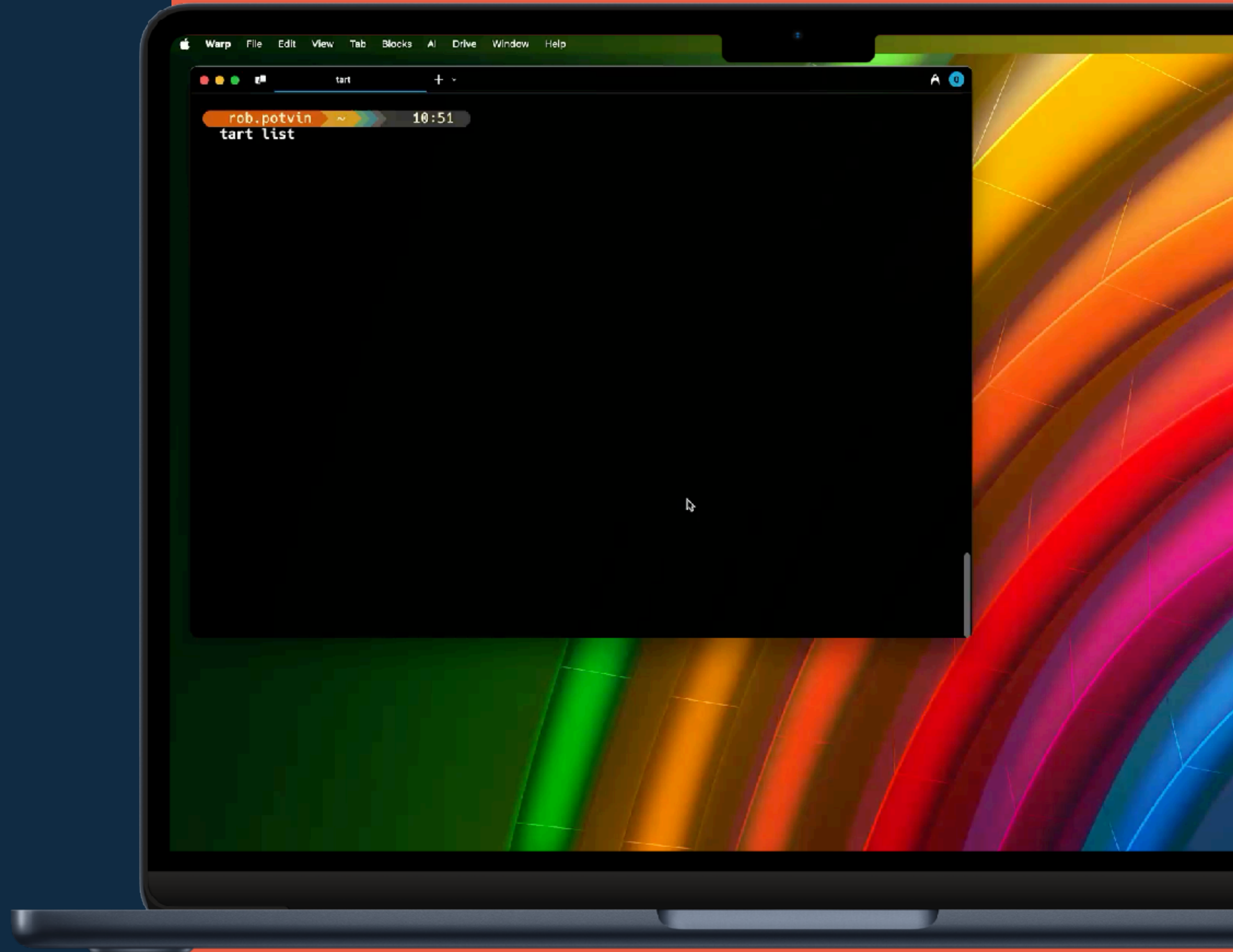


```
tart list
Source Name
      Disk Size SizeOnDisk State
local  newvmtest
      50    19    19      stopped
OCI    ghcr.io/cirruslabs/macos-sequoia-vanilla:latest
      50    24    24      stopped
```



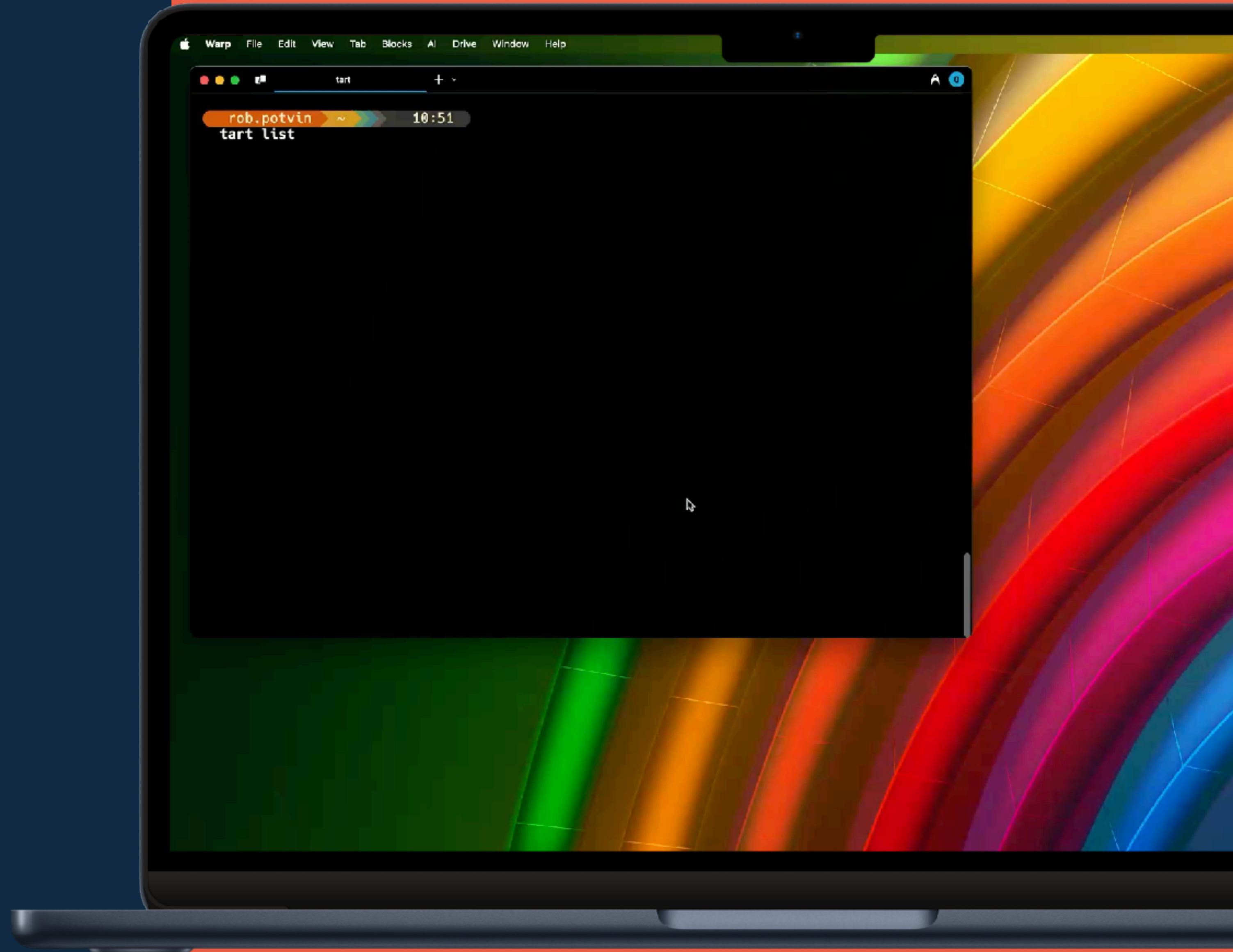
New Clone Running in tart

- ▶ Instant cake mix is **instant**
- ▶ Using the **tart set** command
- ▶ `--display-refit`
- ▶ Launches in 20-30 seconds
- ▶ Simple clone from the image downloaded from the **OCI server**



New Clone Running in tart

- ▶ Instant cake mix is **instant**
- ▶ Using the **tart set** command
- ▶ `--display-refit`
- ▶ Launches in 20-30 seconds
- ▶ Simple clone from the image downloaded from the **OCI server**



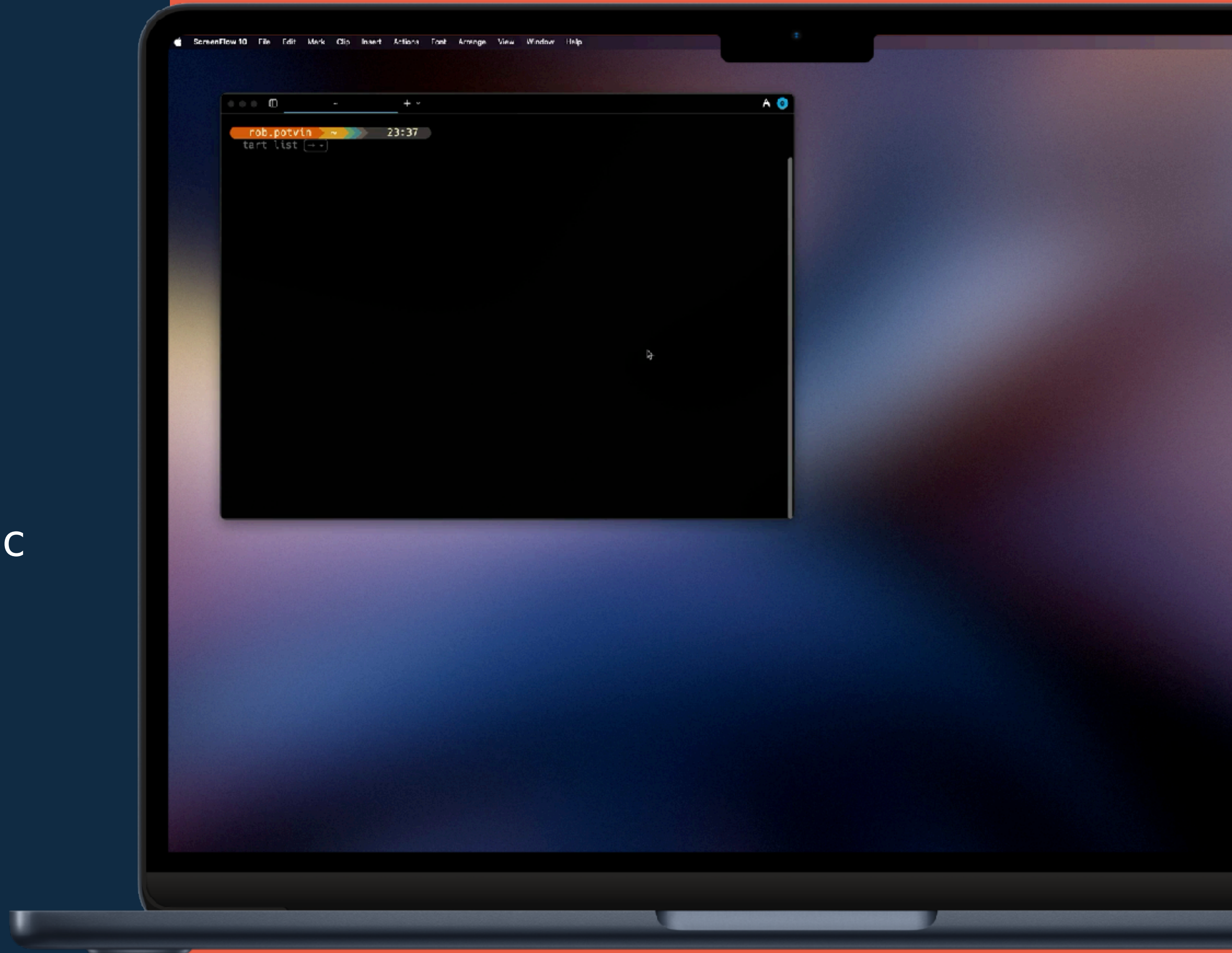
What do you think about Our **Instant Cake Mix**?

- One OCI macOS image hosted
- Many clones, many enrollments
- Easy to create new serial numbers
 - `tart set --random-serial --random-mac`



Enroll the VM Up and running

- Cloning a new VM
- Using the **tart set** command
- `--random-serial --random-mac`
- **Enrollment** with User Initiated Enrollment



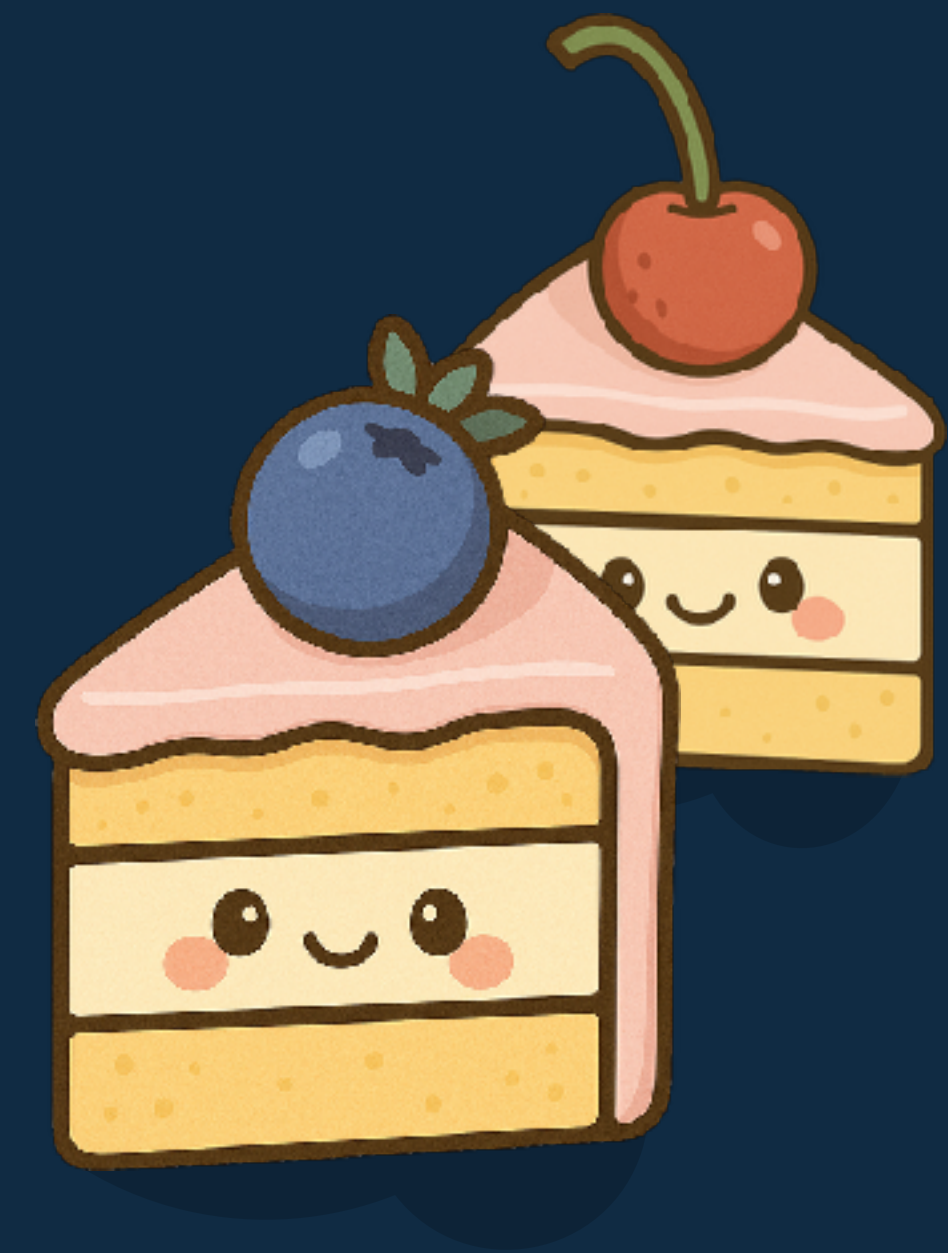


A screenshot of a Mac desktop. The background is a wallpaper of a forest with tall trees. In the foreground, a Safari browser window is open, displaying the website 'emeia.jamf.com'. The browser's address bar shows the URL. A system dialog box is overlaid on the browser window, titled 'Profile Downloaded'. It contains a yellow warning icon, the text 'Profile Downloaded', and a sub-message: 'Review the profile in System Settings if you want to install it.' Below the message is a blue 'OK' button. The Safari window also shows a message: 'To continue with enrollment, install the CA Certificate and MDM Profile that were downloaded to your computer.' with a loading spinner. The dock at the bottom of the screen contains various application icons, including Finder, Launchpad, Safari, Messages, Mail, App Store, Photos, Video, Calendar, Contacts, Notes, Reminders, Music, TV, Podcasts, and System Settings. The top of the screen shows the menu bar with 'Safari' and other standard menu items, and the system status bar on the right shows the date and time: 'Fri May 9 9:43 PM'.

Enrolled the VM

Could it be faster?

- ◉ Clone from OCI
- ◉ Easy to create new unique VMs for enrollment
- ◉ `tart set --random-serial --random-mac`
- ◉ Enrollment is a bit slow
- ◉ Could it be custom?





Mixing the Batter: Crafting Custom Images with Packer

Key Ingredient

Packer, just a tablespoon

- Packer lets you create identical machine images from a single source template.
- Used a lot in CI/CD
- Easy install with homebrew
 - `brew tap hashicorp/tap`
 - `brew install hashicorp/tap/packer`
- Simple template to create a macOS VM



Enrollment Ingredient

Prepping Jamf Pro

- Create an enrollment invitation in Jamf Pro
- Set the limits on that invitation
- Add to enrollment URL - right to MDM
 - [https://name.jamfcloud.com/enroll?invitation=\[id\]](https://name.jamfcloud.com/enroll?invitation=[id])
- Keep you ID safe



Packer Build



```
apple-tart-dutch.pkr.hcl
packer {
  required_plugins {
    tart = {
      version = ">= 1.12.0"
      source  = "github.com/cirruslabs/tart"
    }
  }
}

variable "vm_name" {
  type        = string
  default     = "appletart"
  description = "Name of the virtual machine to create"
}

variable "jamf_url" {
  type        = string
  description = "Jamf Cloud URL"
  default     = "https://emeia.jamfcloud.com"
}

variable "jamf_invitation_id" {
  type        = string
  description = "Invitation ID"
  default     = "108474273940480869353084040808705628873"
}
```

Packer Build



```
apple-tart-enrollment-url.pkr.hcl
```

```
}

source "tart-cli" "tart" {
  from_ipsw      = var.ipsw_url
  vm_name        = var.vm_name
  cpu_count      = 4
  memory_gb      = 8
  disk_size_gb   = 50
  ssh_password   = "admin"
  ssh_username   = "admin"
  ssh_timeout    = "300s"
  boot_command = [
    # hello, hola, bonjour, etc.
    "<wait60s><spacebar>",
    # Language: most of the times we have a list of "English"[1], "English (UK)", etc. with
    # "English" language already selected. If we type "english", it'll cause us to switch
    # to the "English (UK)", which is not what we want. To solve this, we switch to some other
    # language first, e.g. "Italiano" and then switch back to "English". We'll then jump to the
    # first entry in a list of "english"-prefixed items, which will be "English".
    #
    # [1]: should be named "English (US)", but oh well 🙄
    "<wait30s>italiano<esc>english<enter>",
    # Select Your Country or Region
    "<wait30s>united states<leftShift0n><tab><leftShift0ff><spacebar>",
    # Transfer Your Data to This Mac
    "<wait10s><tab><tab><tab><spacebar><tab><tab><spacebar>",
    # Written and Spoken Languages
    "<wait10s><leftShift0n><tab><leftShift0ff><spacebar>",
    # Accessibility
    "<wait10s><leftShift0n><tab><leftShift0ff><spacebar>",
    # Data & Privacy
    "<wait10s><leftShift0n><tab><leftShift0ff><spacebar>",
    # Create a Mac Account
    "<wait10s>Managed via Tart<tab>admin<tab>admin<tab>admin<tab><tab><spacebar><tab><tab><spacebar>",
    # Enable Voice Over
    "<wait120s><leftAlt0n><f5><leftAlt0ff>",
    # Sign In with Your Apple ID
  ]
}
```

```
INSERT MODE, Line 1, Column 1
```

```
main Spaces: 2 HCL
```

Packer Build



```
apple-tart-enrollment-url.pkr.hcl  UNREGISTERED

// A (hopefully) temporary workaround for Virtualization.Framework's
// installation process not fully finishing in a timely manner
create_grace_time = "30s"

// Keep the recovery partition, otherwise it's not possible to "softwareupdate"
recovery_partition = "keep"
}

build {
  sources = ["source.tart-cli.tart"]

  # Enable passwordless sudo, auto-login, disable screensaver, prevent sleep, enable safari auto
  provisioner "shell" {
    inline = [
      "set -euxo pipefail",
      // Enable passwordless sudo
      "echo admin | sudo -S sh -c \"mkdir -p /etc/sudoers.d; echo 'admin ALL=(ALL) NOPASSWD: /'",
      // Enable auto-login
      //
      // See https://github.com/xfreebird/kcpassword for details.
      "echo '00000000: 1ced 3f4a bcbc ba2c caca 4e82' | sudo xxd -r - /etc/kcpassword",
      "sudo defaults write /Library/Preferences/com.apple.loginwindow autoLoginUser admin",
      // Disable screensaver at login screen
      "sudo defaults write /Library/Preferences/com.apple.screensaver loginWindowIdleTime 0",
      // Disable screensaver for admin user
      "defaults -currentHost write com.apple.screensaver idleTime 0",
      // Prevent the VM from sleeping
      "sudo systemsetup -setsleep Off 2>/dev/null",
      // Launch Safari to populate the defaults
      "/Applications/Safari.app/Contents/MacOS/Safari &",
      "SAFARI_PID=$!",
      "disown",
      "sleep 30",
      "kill -9 $SAFARI_PID",
      // Enable Safari's remote automation
      "sudo safaridriver --enable".
    ]
  }
}
```

Packer Build



```
apple-tart-enrollment-url.pkr.hcl
// Enable Safari & Remote Desktop
"sudo safaridriver --enable",
// Disable screen lock
//
// Note that this only works if the user is logged-in,
// i.e. not on login screen.
"sysadminctl -screenLock off -password admin",
]
}

# Disable spotlight
provisioner "shell" {
  inline = [
    "set -euxo pipefail",
    "echo 'Disabling spotlight...'",
    "sudo mdutil -a -i off",
  ]
}

# Create a webloc file on the desktop for Jamf Pro enrollment
provisioner "shell" {
  inline = [
    "set -euxo pipefail",
    "cat << EOF > ~/Desktop/Enroll_Your_Mac.webloc",
    "<?xml version='1.0' encoding='UTF-8'?>",
    "<plist version='1.0'>",
    "<dict>",
    "  <key>URL</key>",
    "  <string>${var.jamf_url}/enroll?invitation=${var.jamf_invitation_id}</string>",
    "</dict>",
    "</plist>",
    "EOF",
  ]
}
}
```

INSERT MODE, Line 1, Column 1

main Spaces: 2

Packer Build

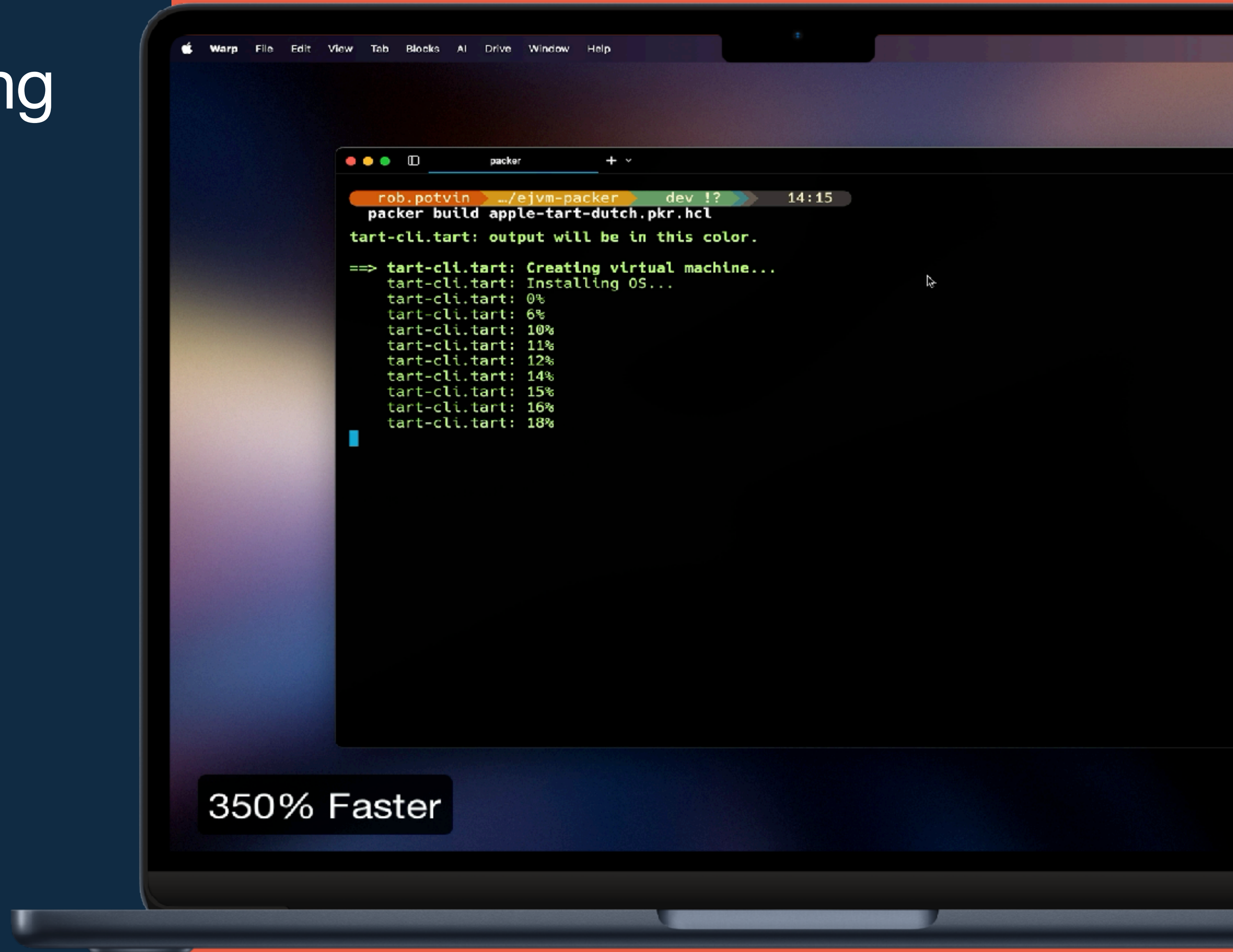


```
apple-tart-enrollment-profile.pkr.hcl

provisioner "shell" {
  inline = [
    // Create MDM enrollment profile
    "cat << EOF > ~/Desktop/mdm_enroll.mobileconfig",
    "<?xml version=\"1.0\" encoding=\"UTF-8\"?>",
    "<!DOCTYPE plist PUBLIC \"-//Apple//DTD PLIST 1.0//EN\" \"http://www.apple.com/DTDs/PropertyList-1.0.dtd\"",
    "<plist version=\"1.0\">",
    "  <dict>",
    "    <key>PayloadUUID</key>",
    "    <string>${local.uuid}</string>",
    "    <key>PayloadOrganization</key>",
    "    <string>JAMF Software</string>",
    "    <key>PayloadVersion</key>",
    "    <integer>1</integer>",
    "    <key>PayloadIdentifier</key>",
    "    <string>${local.uuid}</string>",
    "    <key>PayloadDescription</key>",
    "    <string>MDM Profile for mobile device management</string>",
    "    <key>PayloadType</key>",
    "    <string>Profile Service</string>",
    "    <key>PayloadDisplayName</key>",
    "    <string>MDM Profile</string>",
    "    <key>PayloadContent</key>",
    "    <dict>",
    "      <key>Challenge</key>",
    "      <string>${var.mdm_invitation_id}</string>",
    "      <key>URL</key>",
    "      <string>${var.jamf_url}/enroll/profile</string>",
    "      <key>DeviceAttributes</key>",
    "      <array>",
    "        <string>UDID</string>",
    "        <string>PRODUCT</string>",
    "        <string>SERIAL</string>",
    "        <string>VERSION</string>",
    "        <string>DEVICE_NAME</string>",
    "        <string>COMPROMISED</string>",
    "      </array>",
    "    </dict>",
    "  </dict>",
  ]
}
```


Not-Live Cooking: Baking the Packer Template

- packer / tart installed
- packer init command
- packer fmt command
- packer validate command
- packer build command



```
packer
tart-cli.tart: 40%
tart-cli.tart: 42%
tart-cli.tart: 43%
tart-cli.tart: 44%
tart-cli.tart: 46%
tart-cli.tart: 48%
tart-cli.tart: 49%
tart-cli.tart: 51%
tart-cli.tart: 53%
tart-cli.tart: 55%
tart-cli.tart: 57%
tart-cli.tart: 61%
tart-cli.tart: 64%
tart-cli.tart: 67%
tart-cli.tart: 70%
tart-cli.tart: 73%
tart-cli.tart: 76%
tart-cli.tart: 79%
tart-cli.tart: 82%
tart-cli.tart: 84%
tart-cli.tart: 87%
tart-cli.tart: 90%
tart-cli.tart: 100%
==> tart-cli.tart: Waiting 3
==> tart-cli.tart: Updating
==> tart-cli.tart: Inspectin
==> tart-cli.tart: Starting
==> tart-cli.tart: Successfu
==> tart-cli.tart: Typing bo
==> tart-cli.tart: Waiting f
==> tart-cli.tart: Retrieved
tart-cli.tart: If you wa
-next" to
tart-cli.tart: vnc://127
==> tart-cli.tart: Connected
==> tart-cli.tart: Typing co
```

appletart



Taal

Nederlands

English (UK)

English

Deutsch

Français

English (Australia)

English (India)

简体中文

繁體中文

繁體中文 (香港)

日本語

Español

→

Door gebruik te maken van deze software ga je akkoord met de voorwaarden van de licentieovereenkomst voor de software. Je kunt deze voorwaarden ook lezen op <https://www.apple.com/legal/sla/> (Engelstalig)

350% Faster

~/Git/ejvm-packer

0

tart-cli.tart:
tart-cli.tart: System shutdown time has arrived
==> tart-cli.tart: Waiting for the tart process to exit...
Build 'tart-cli.tart' finished after 16 minutes 642 milliseconds.

==> Wait completed after 16 minutes 643 milliseconds

==> Builds finished. The artifacts of successful builds are:
--> tart-cli.tart: appletart

rob.potvin

.../ejvm-packer

dev !?

14:31

tart clone appletart dutchapple

rob.potvin

.../ejvm-packer

dev !?

14:32

tart list

Source Name
Disk Size SizeOnDisk State
local appletart
50 22 22 stopped
local dutchapple
50 22 22 stopped
local newvmtest
50 24 24 stopped
local vmtest
50 25 25 stopped
OCI ghcr.io/cirruslabs/macos-sequoia-vanilla:latest
50 24 24 stopped
OCI ghcr.io/cirruslabs/macos-sequoia-vanilla@sha256:01123a82f0507f3d005dfe8a0abf8f3d6f534d8aaabee54f059a129eee0706
13 50 24 24 stopped

rob.potvin

.../ejvm-packer

dev !?

14:32

tart set experiencejamf --display-refit --random-mac --random-serial

350% Faster

```
tart
==> Wait completed after 16 minutes 643 milliseconds
==> Builds finished. The artifacts of successful builds are:
--> tart-cli.tart: appletart
```

rob.potvin .../ejvm-packe
tart clone appletart dutch


rob.potvin .../ejvm-packe
tart list

Source	Name	Disk Size	SizeOnDisk	Status
local	appletart	50 22	22	stop
local	dutchapple	50 22	22	stop
local	newvmtest	50 24	24	stop
local	vmtest	50 25	25	stop
OCI	ghcr.io/cirruslabs/ma	50 24	24	stop
OCI	ghcr.io/cirruslabs/ma	13 50	24	stop


rob.potvin .../ejvm-packe
tart set dutchapple --disp

rob.potvin .../ejvm-packe
tart run dutchapple

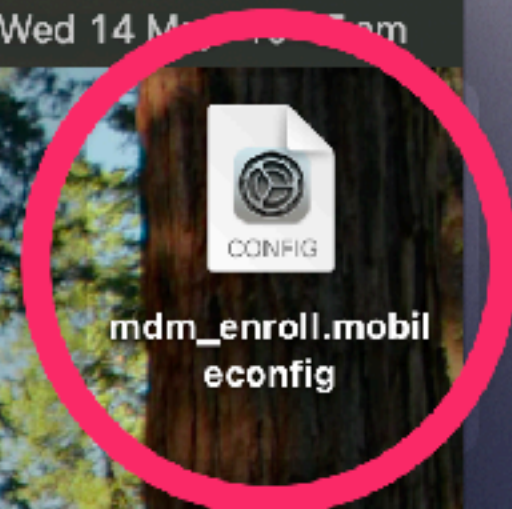
Finder File Edit View Go Window Help



Enroll_Your_Mac.w
ebloc



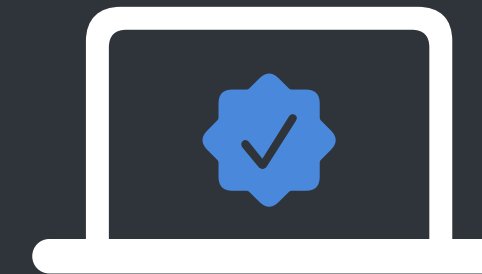
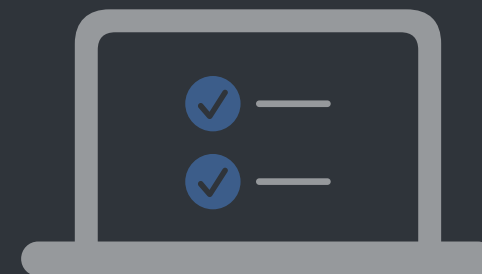
350% Faster

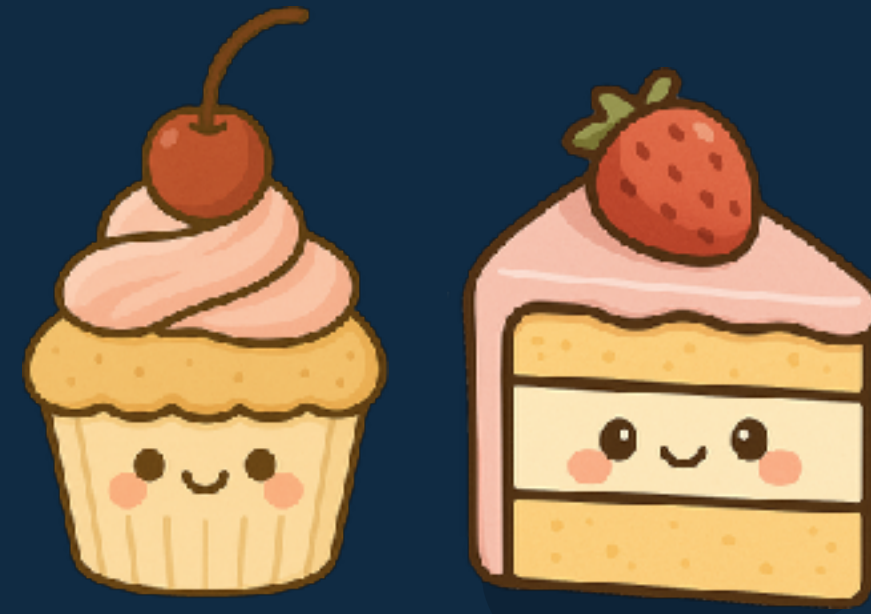


Clone



Testing





Baking and Sharing: Serving Up VMs with OCI Registries

Sharing is caring

Upload the image

- Use custom-baked images for rapid Jamf Pro workflow testing.
- Amazon ECR to host images
- Minimize manual steps
- Tag each image





aws

Search

[Option+S]

Amazon ECR

>

Private registry

>

Repositories

Amazon Elastic Container Registry

<

▼ Private registry

Repositories

Features & Settings

▼ Public registry

Repositories

Settings

ECR public gallery

Amazon ECS

Amazon EKS

Getting started

Documentation

Private repositories (2)

View push commands

Delete

Actions

Create repository

Search by repository substring

Repository name	URI	Created at	Tag immutability	Encryption type
<div><div></div><div>jamf/macaduk</div></div>	<div><div></div><div>106284622126.dkr.ecr.eu-central-1.amazonaws.com/jamf/macaduk</div></div>	May 10, 2025, 21:13:34 (UTC+02)	Mutable	AES-256



aws

Personal

github.com

Search

[Option+S]

Amazon ECR

Private registry

Repositories

jamf/macaduk

Amazon Elastic Container Registry

Private registry

Repositories

Summary

Images

Permissions

Lifecycle Policy

Repository tags

Features & Settings

Public registry

Repositories

Settings

ECR public gallery

Amazon ECS

Amazon EKS

Getting started

Documentation

Images (1)

Search artifacts

Image tag

Artifact type

Pushed at

Size (MB)

Image URI

Digest

Last recorded pull time

<input type="checkbox"/>	latest	Image	May 10, 2025, 21:26:17 (UTC+02)	19699.96	Copy URI	sha256:f0fc1ce6a85aa38...	-
--------------------------	--------	-------	---------------------------------	----------	----------	---------------------------	---

Quick Whip, Fast Bake: Deploying with Tart



```
tart push dutchapple 106284622126.dkr.ecr.eu-central-1.amazonaws.com/jamf/  
macaduk:latest  
pushing dutchapple to 106284622126.dkr.ecr.eu-central-1.amazonaws.com/jamf/  
macaduk:latest...  
pushing config...  
pushing disk... this will take a while...  
100%  
pushing NVRAM...  
pushing manifest for latest...
```

Quick Whip, Fast Bake: Deploying with Tart



```
tart pull 106284622126.dkr.ecr.eu-central-1.amazonaws.com/jamf/  
macaduk:latest
```





The Taste Test:

Rapid MDM Enrollment & Workflow Testing

+ Add

macad.uk
Personal

1 match Begins with vm

Full Jamf Pro

Computers : Smart Computer Groups

← Apple Silicon - VMs

Computer Group Criteria Reports

AND/OR

Model

like

VirtualMac2,1

...

▼

Delete

+ Add

Static Computer Groups

← Apple Silicon - VMs

Reports

☒ Show in Jamf Pro Dashboard

Apple Silicon - VMs

☐ Send email notification on membership change

When group membership changes, send an email notification to Jamf Pro users with email notifications enabled. An SMTP server must be set up in Jamf Pro for this to work.

Site to add the smart computer group to

None

The Cake's Baked, But the Sprinkles May Slide Off

- Attestation
- Certificates
- Package deployment for VPP
- Anything USB (no mappings to hardware)
- Video (no cameras)
- And all that other stuff



Screen Sharing: Because Every Recipe Needs a Little Copy-Paste

- ◉ Packer template enabled
- ◉ Easy access VM via VNC
- ◉ Run VM headless
- ◉ Clipboard works flawlessly



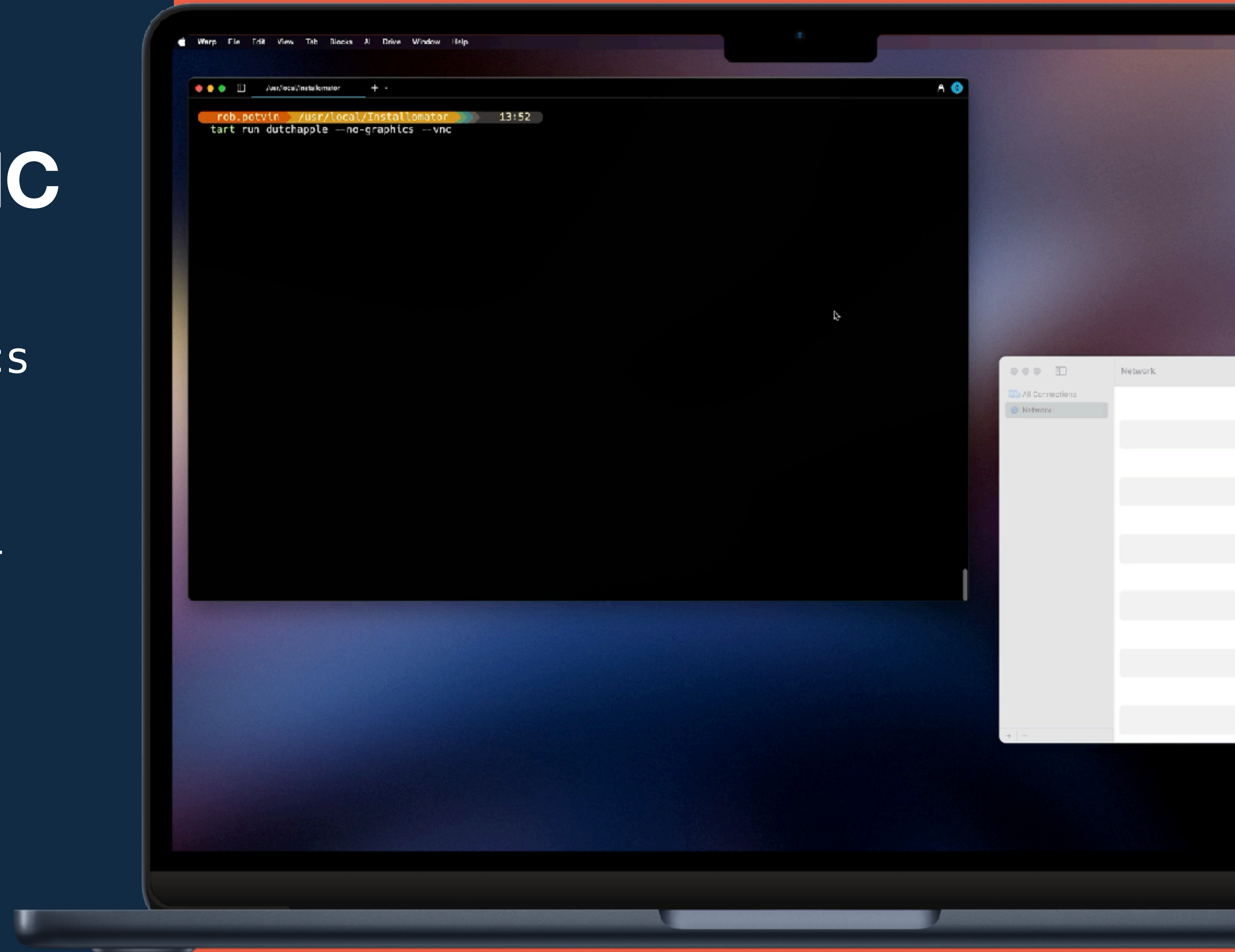
We Knead That Clipboard — Enter VNC

► `tart run --vnc --no-graphics`

Starts headless with vnc

► `tart run --vnc-experimental`

Tool for recovery partition



rob.potvin /usr/local/Installomator 13:52

```
tart run dutchapple --no-graphics --vnc
```

Network

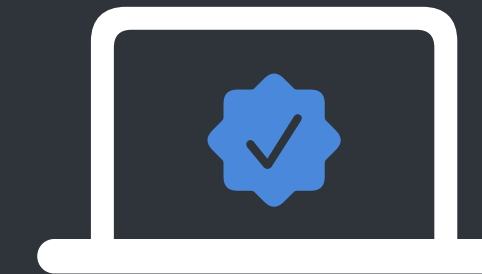
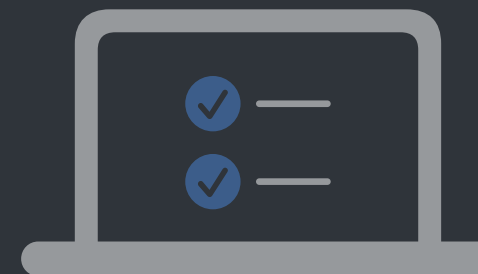
All Connections
Network



Serving Suggestions:

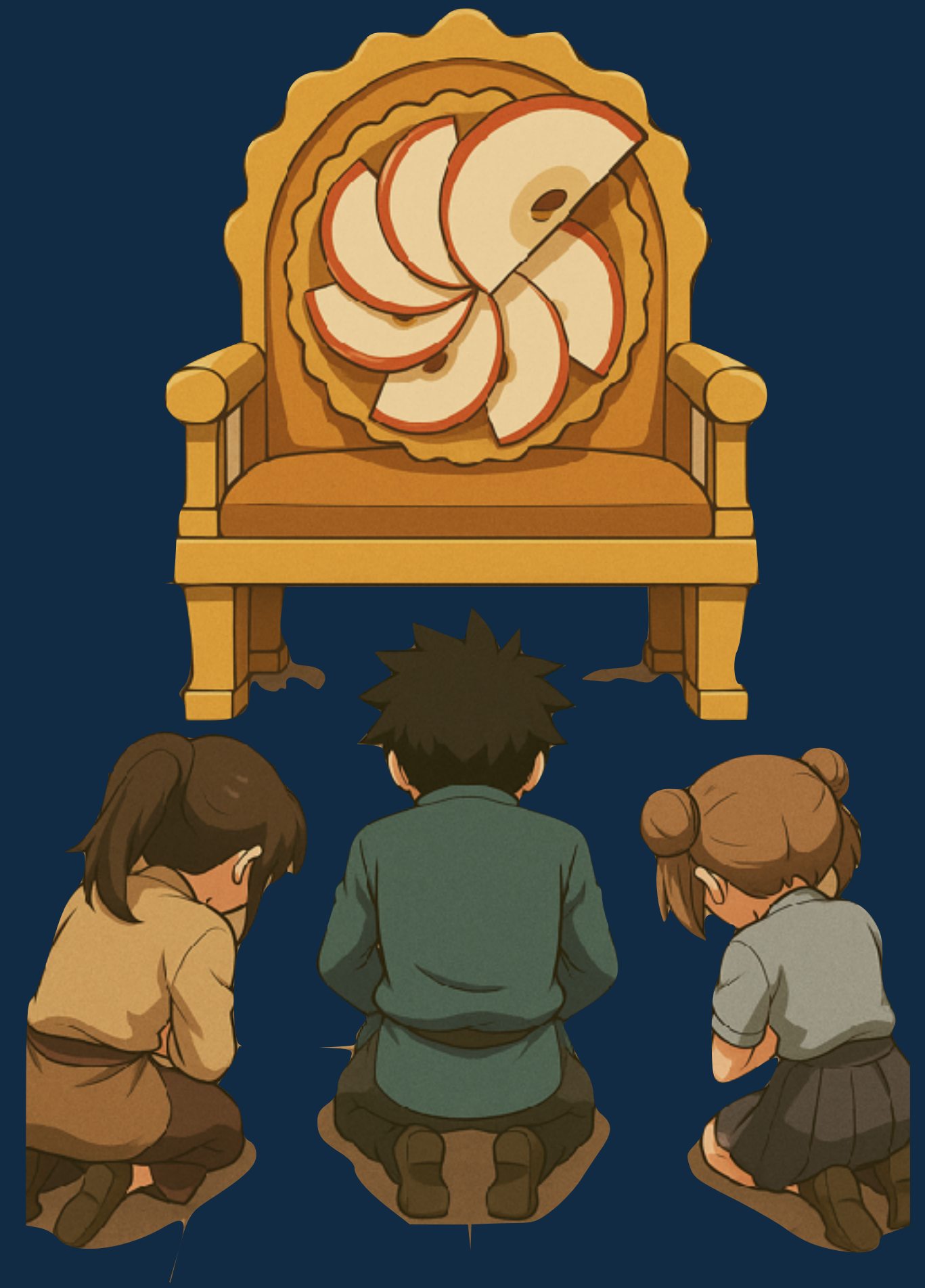
Takeaways for the Modern Mac Admin Baker

Testing



Cooling on the Rack: Your Workflow in a Nutshell

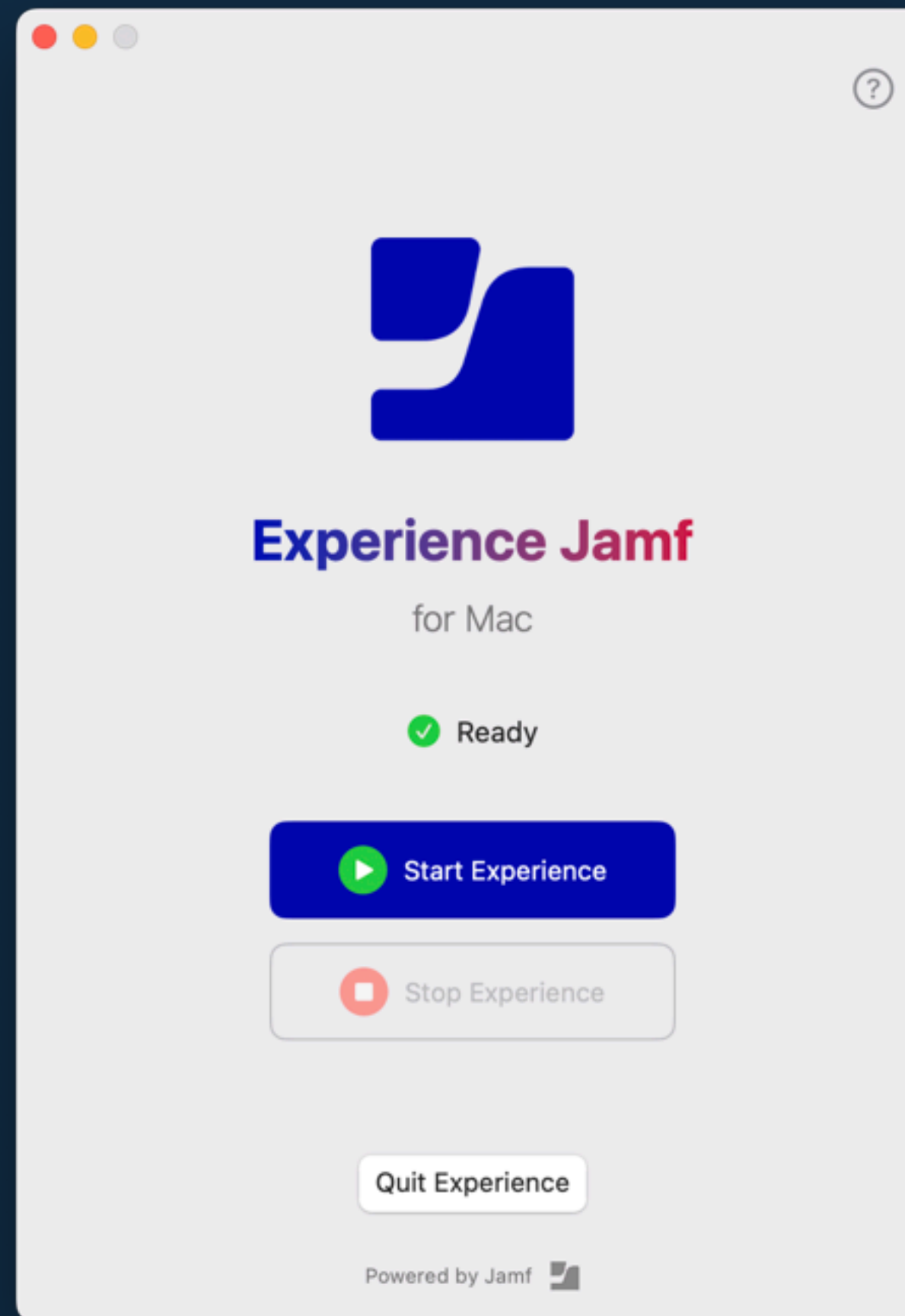
- ◉ tart is awesome
- ◉ CI/CD - but for macadmins
- ◉ VMs are disposable
- ◉ Test workflows
- ◉ Use Self Service Onboarding or Setup Manager
- ◉ This is just the start with tart

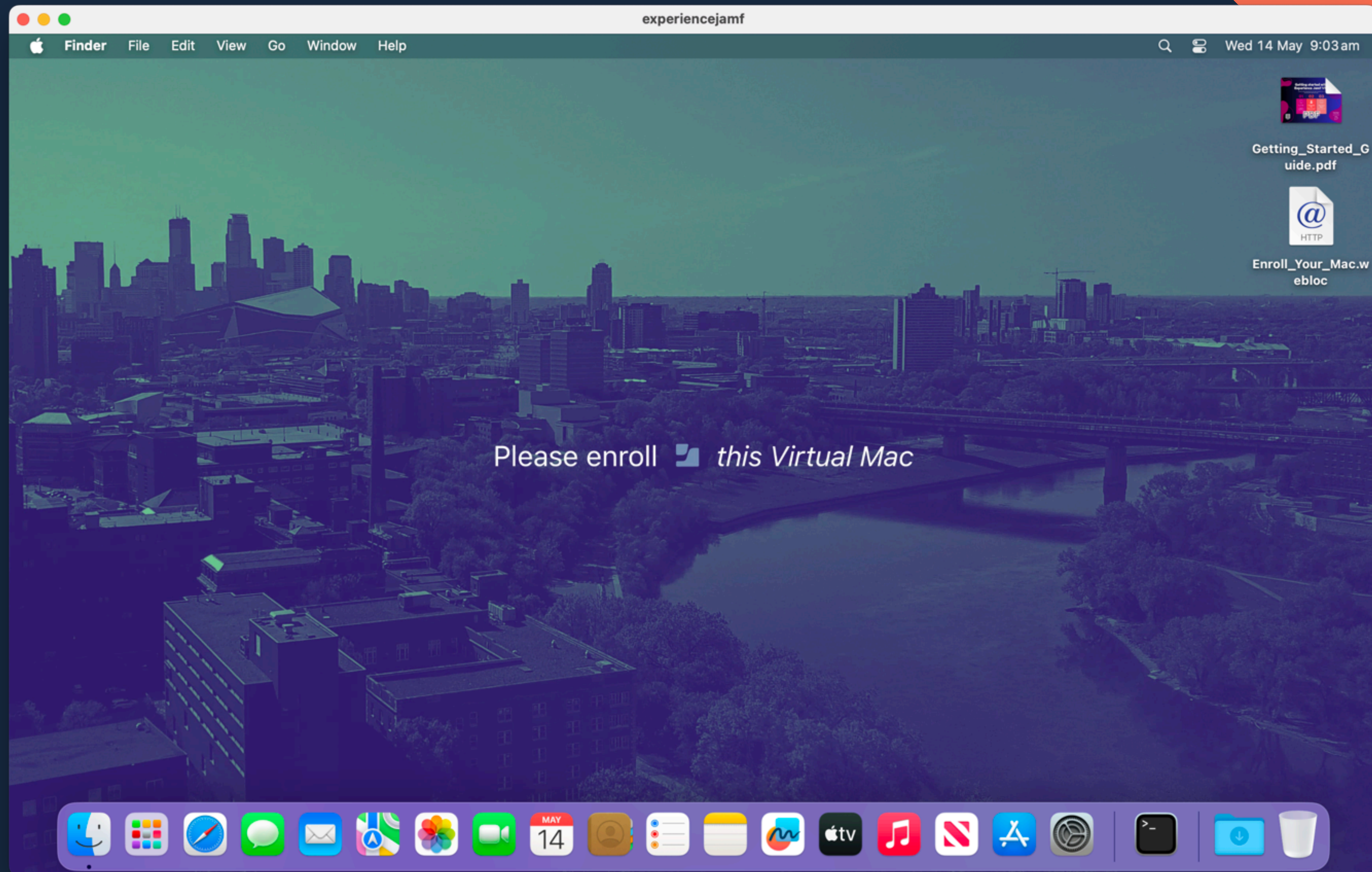


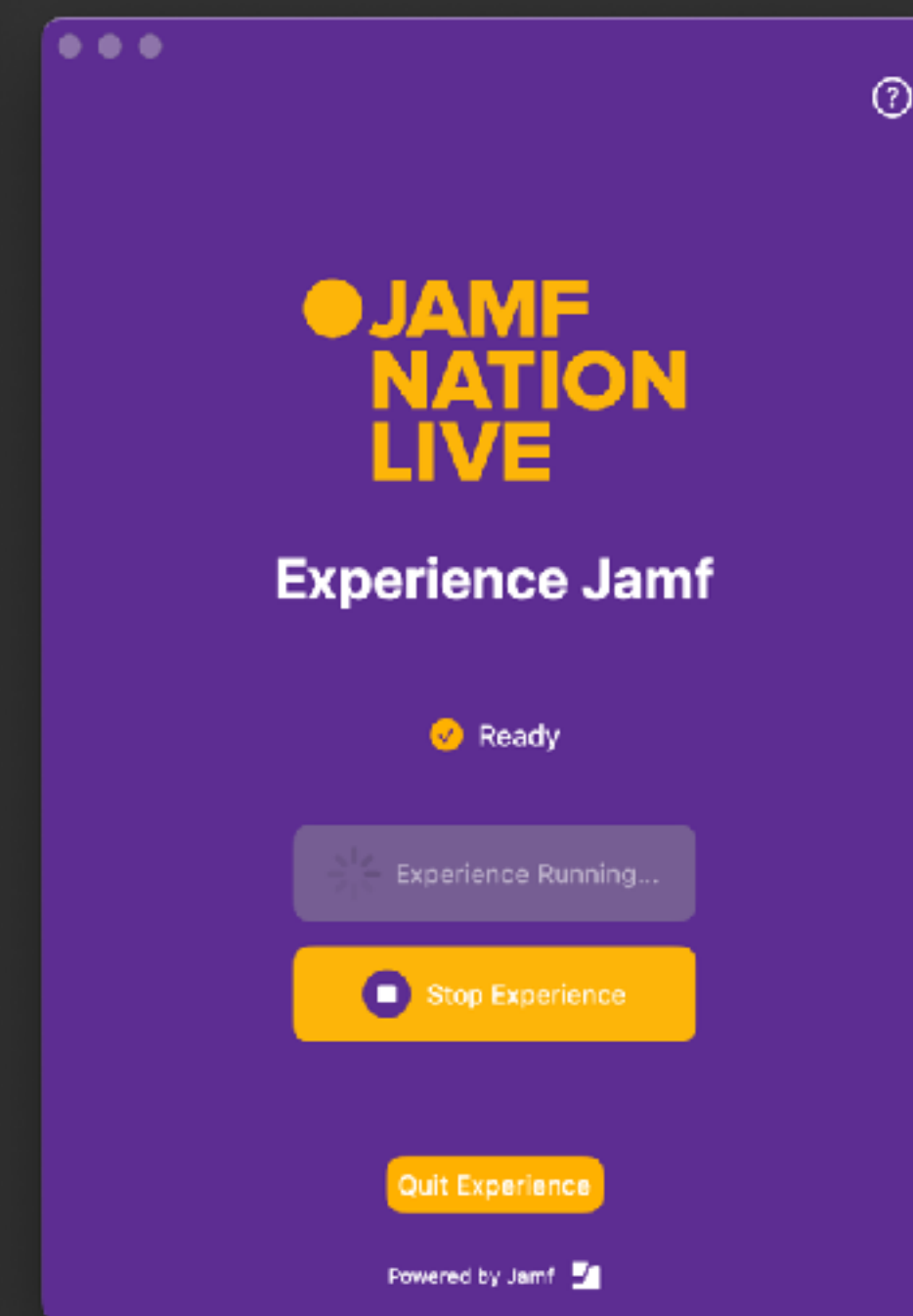
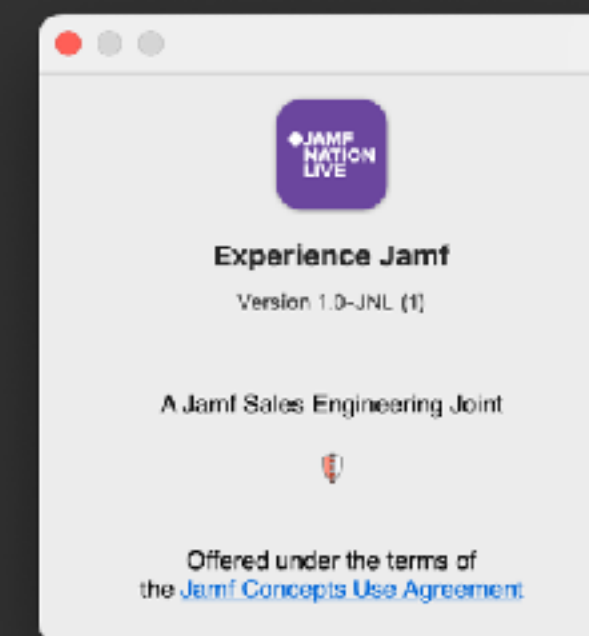
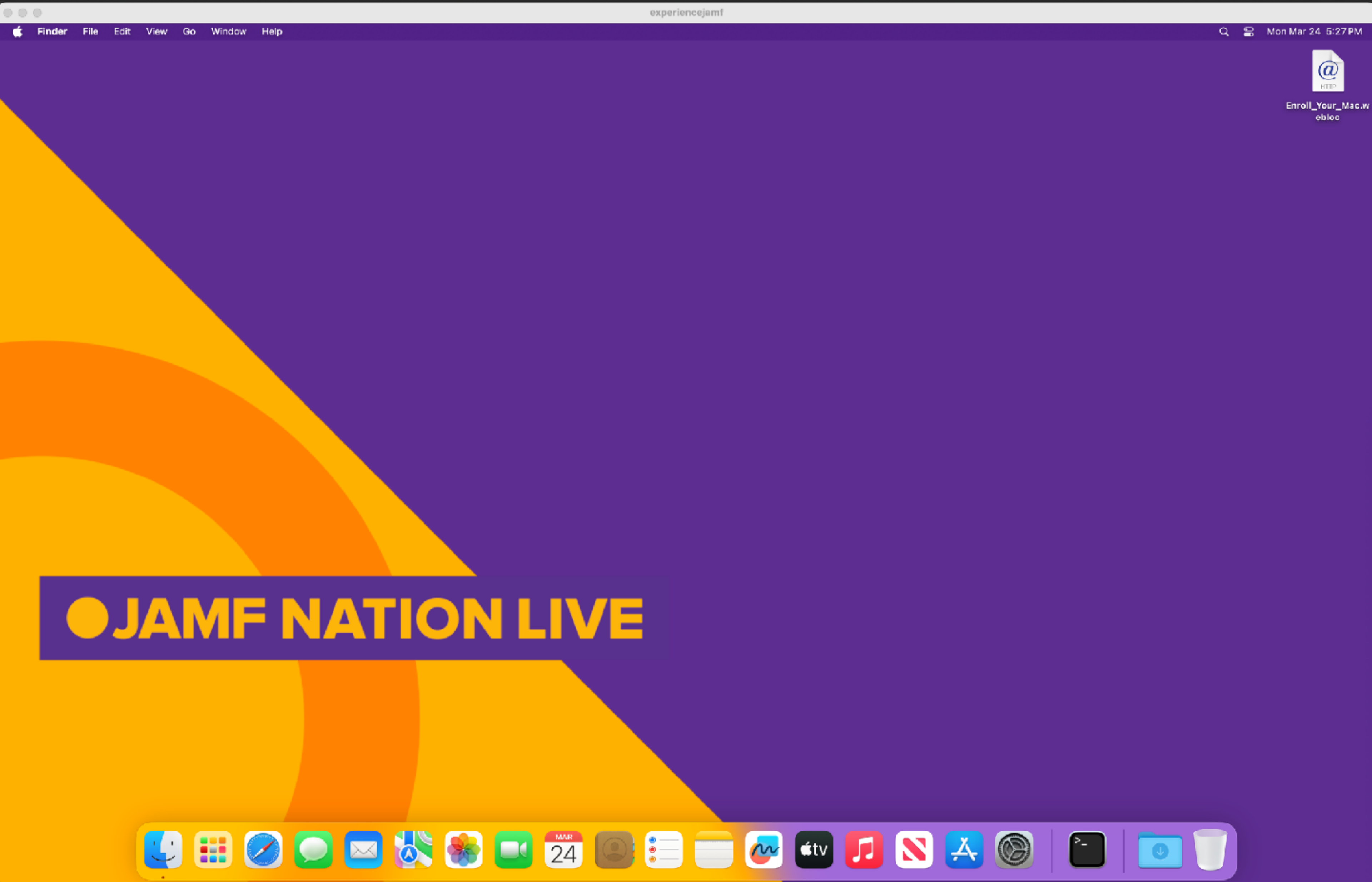
Tart: Peeling Back the Layers to the Good Bits

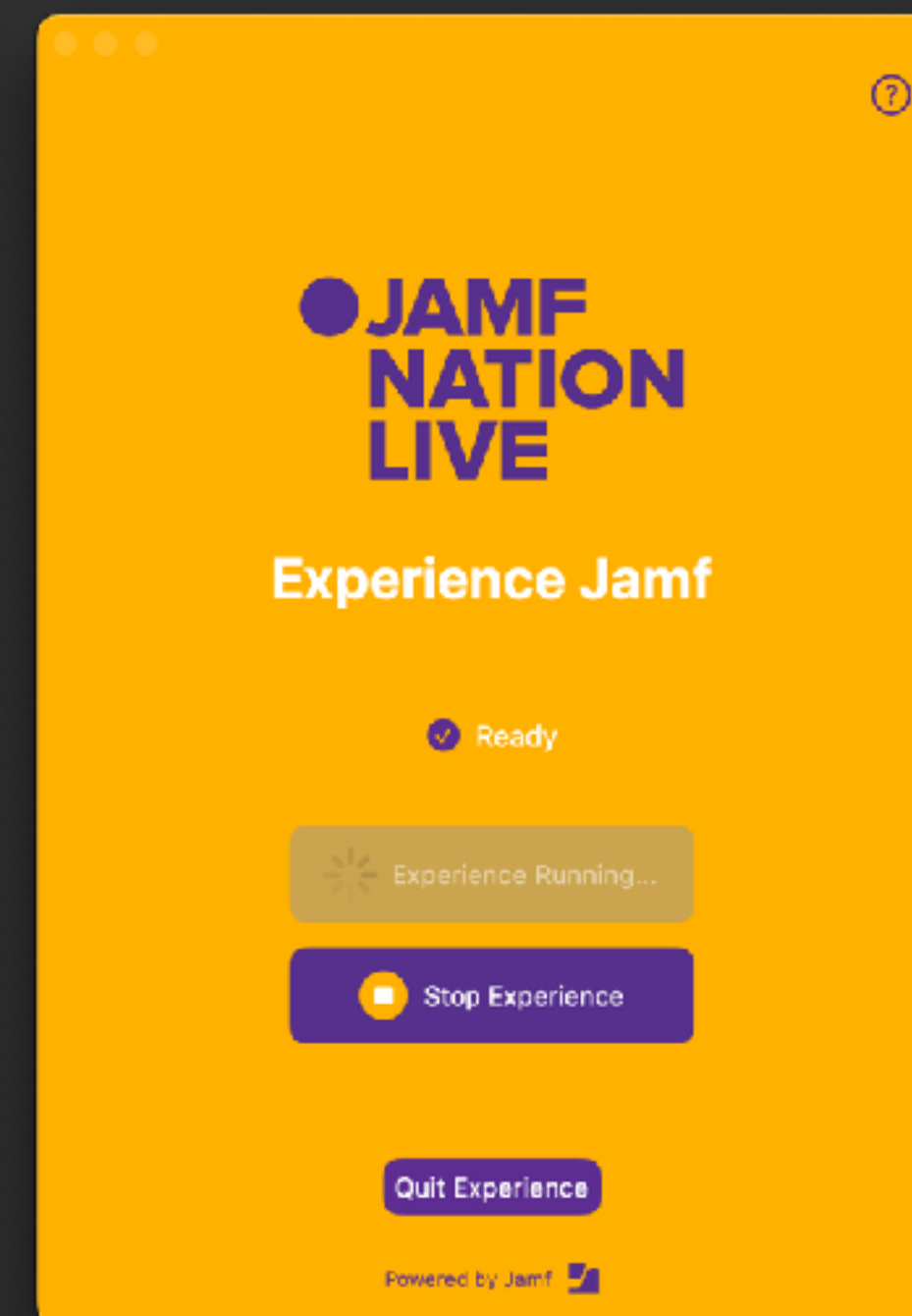
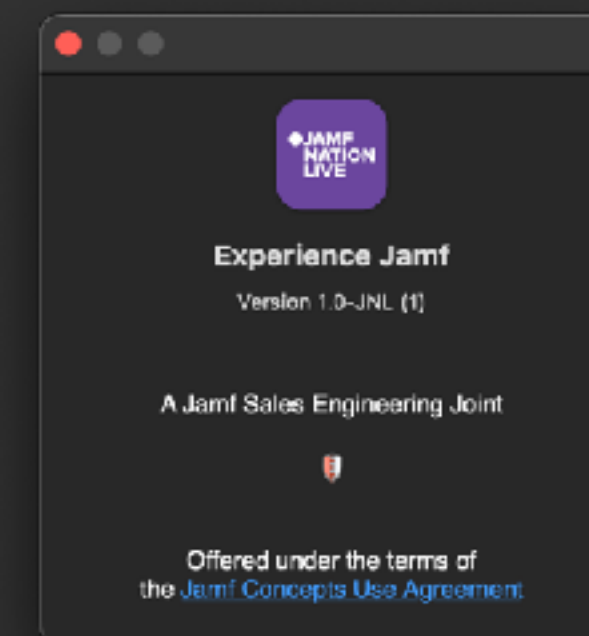
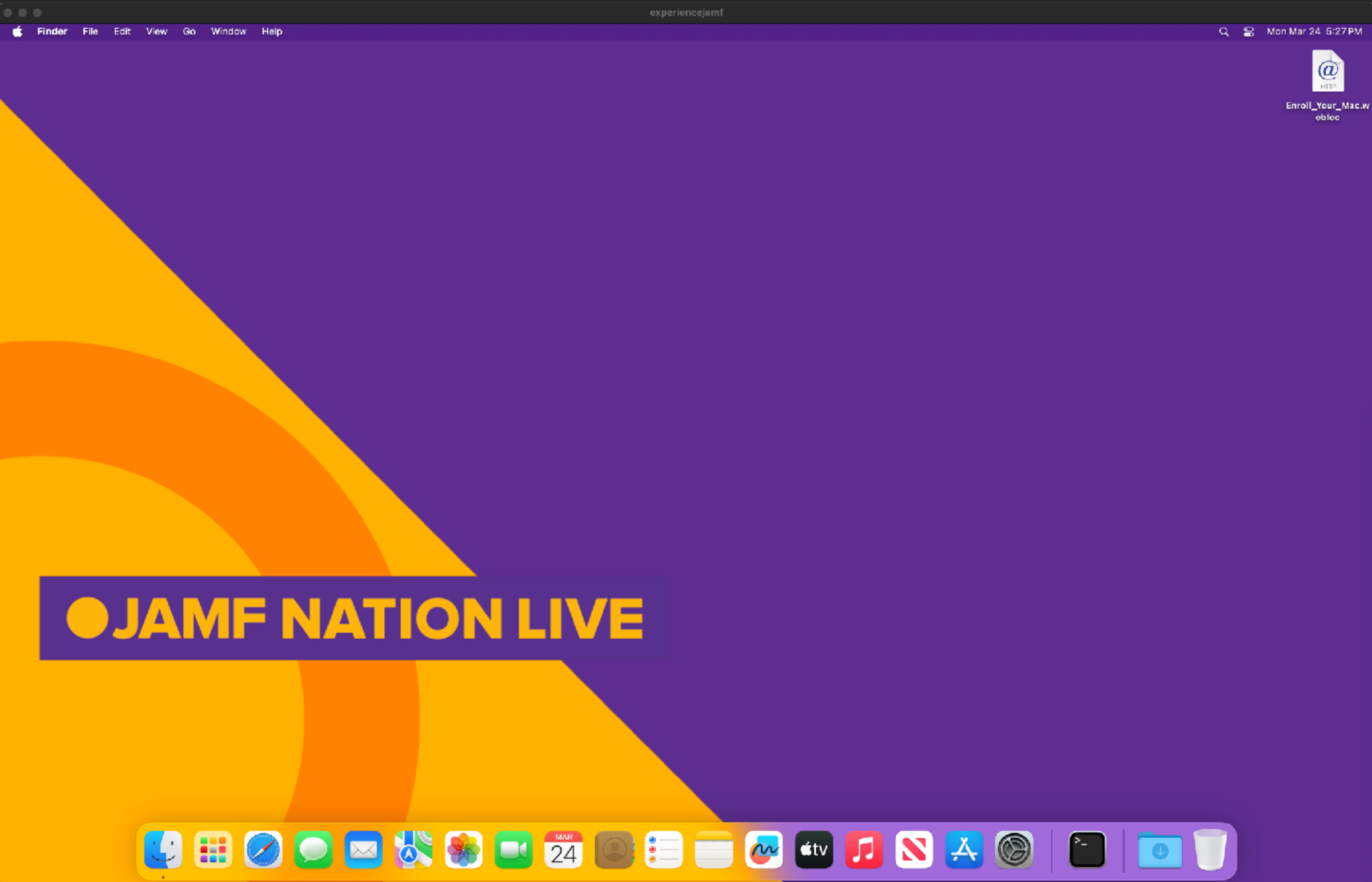
- Using Xcode and SwiftUI with tart
- Using Python flask with tart











Jamf127.0.0.1Open in Work - Jamf

macOS VM Manager

Virtual Machines

Manage your macOS Virtualization Framework VMs

GridList

experiencejamfmacOS UnknownStopped

4CPUs

8GB RAM

30GB Disk

Start

Details

TestmacOS UnknownStopped

4CPUs

8GB RAM

50GB Disk

Start

Details

© 2025 macOS VM Manager - Powered by Tart and Flask

jamf

Leftovers You'll Love: Blog Preview & Handy Resources

- ◉ Cook Book online
 - ◉ motionbug.com
- ◉ Recipes for what you need
- ◉ My daughter hopes that I win this bakeoff



Q&A



Thank You