

# Silicon Sandbox: Mastering Mac virtualisation for Jamf workflows



**Rob Potvin**  
Senior Consulting Engineer  
@Jamf

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# 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

Apple silicon

macOS

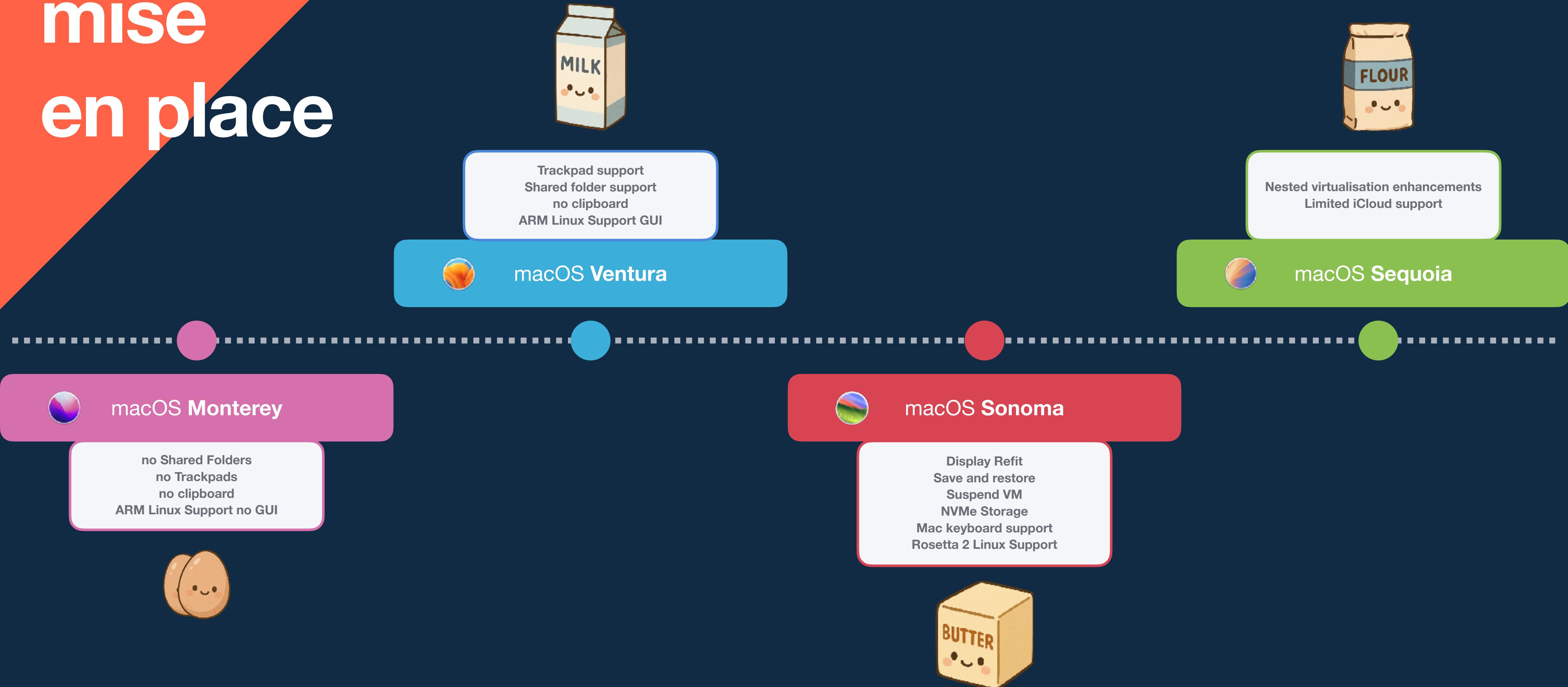
Virtualisation framework

Hypervisor framework

macOS kernel

Hardware

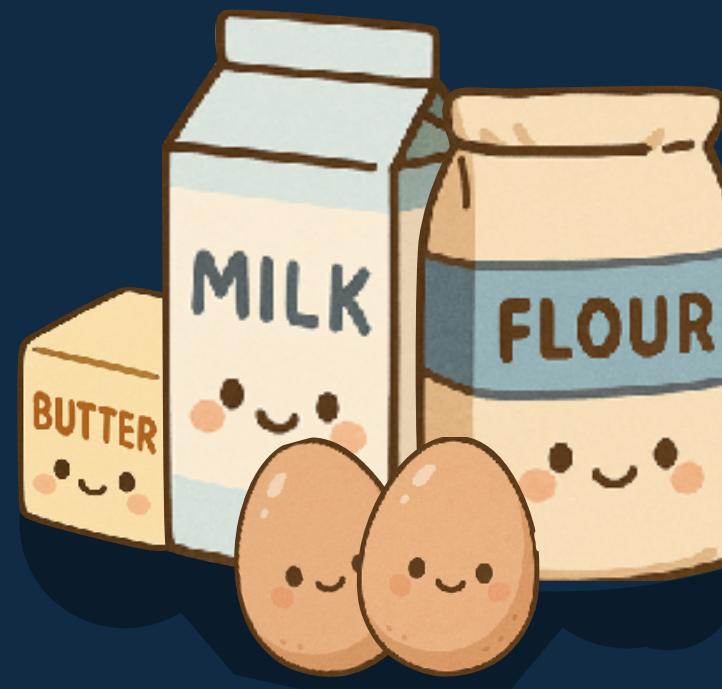
# mise en place



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

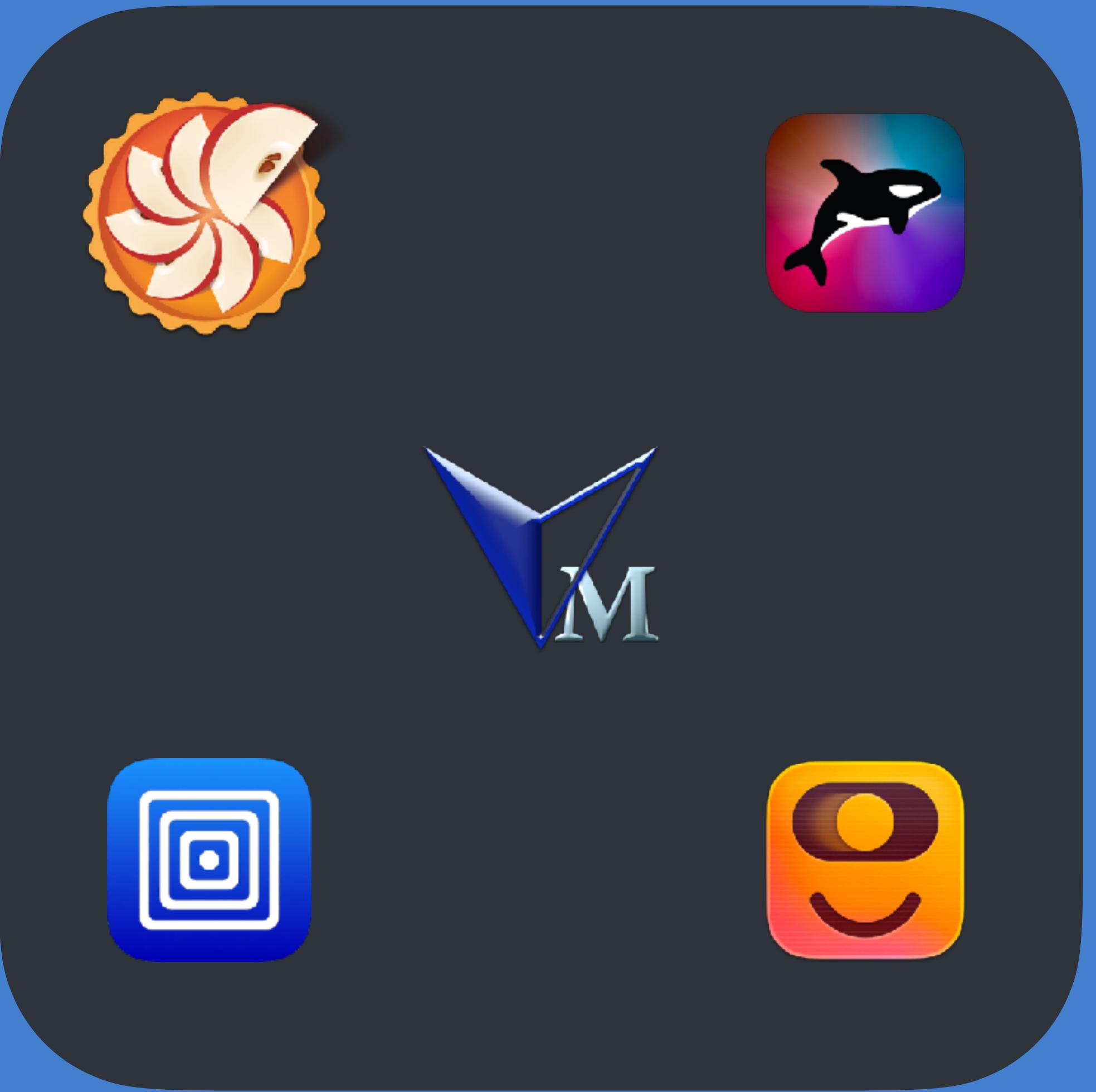
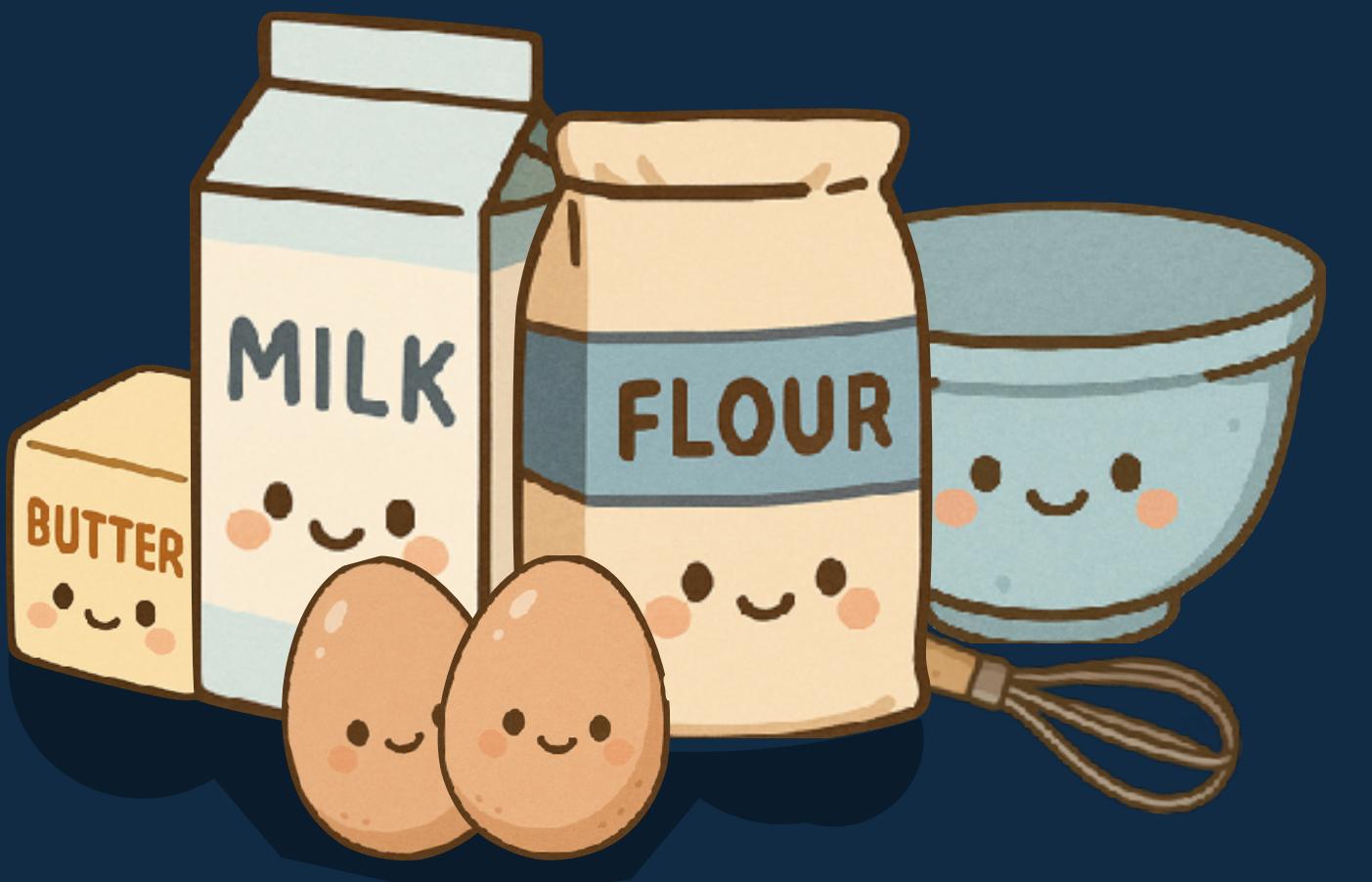
- No Appstore
- No Apps & Books
- No TouchID
- No Automated Enrollment
- Limited iCloud Support\*
- Limited Mouse / Trackpad / Keyboard





# Choosing Our Ingredients

## Virtualisation Pantry



jamf



# 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.*

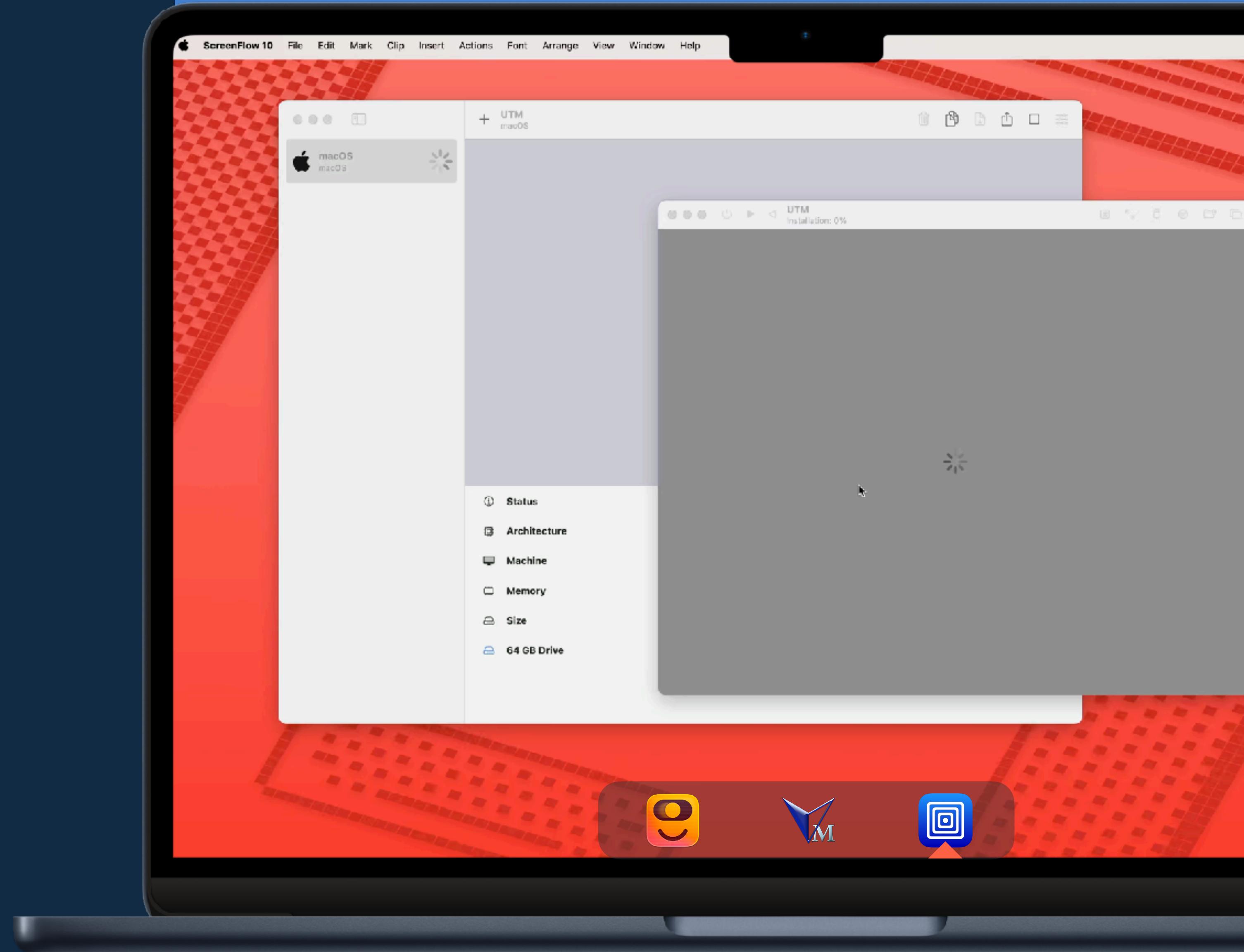


# Orka Desktop

*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**





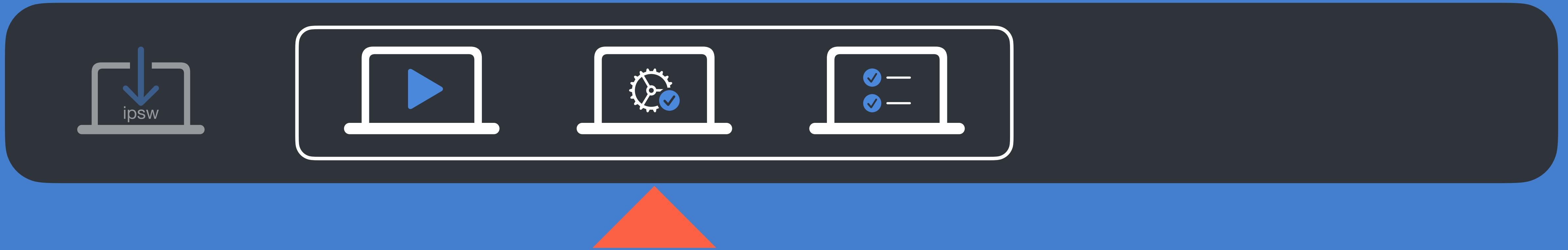
# Traditional VM Managers

*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.*

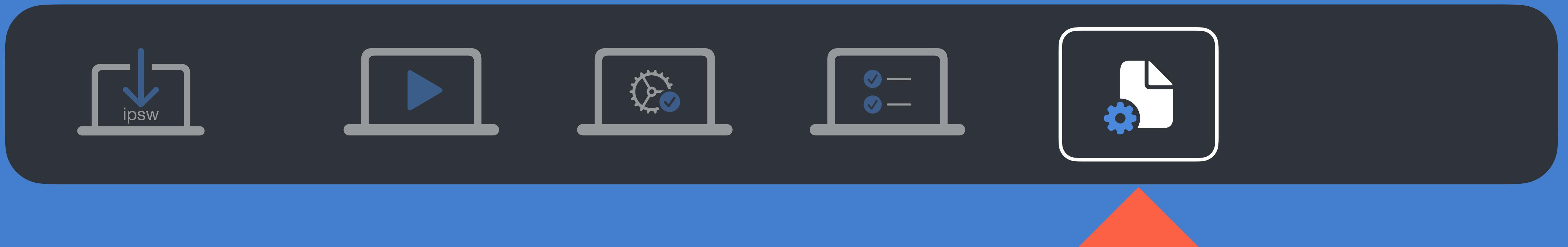
**Restore**



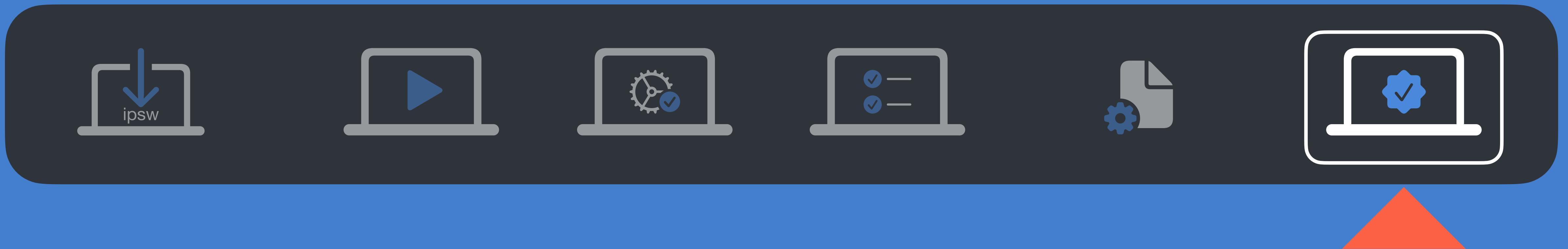
## Apple Setup Assistant

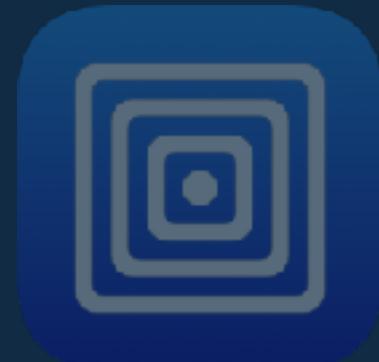


## Enrollment



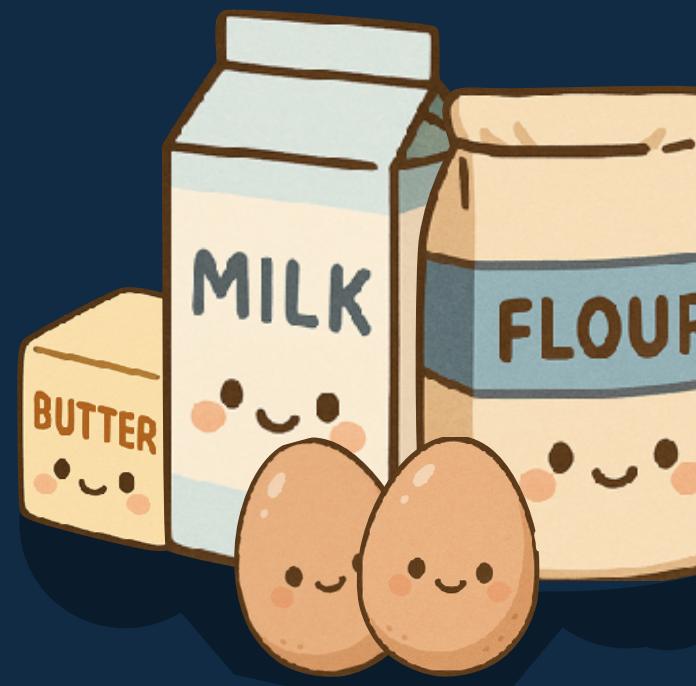
## Testing





# 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`



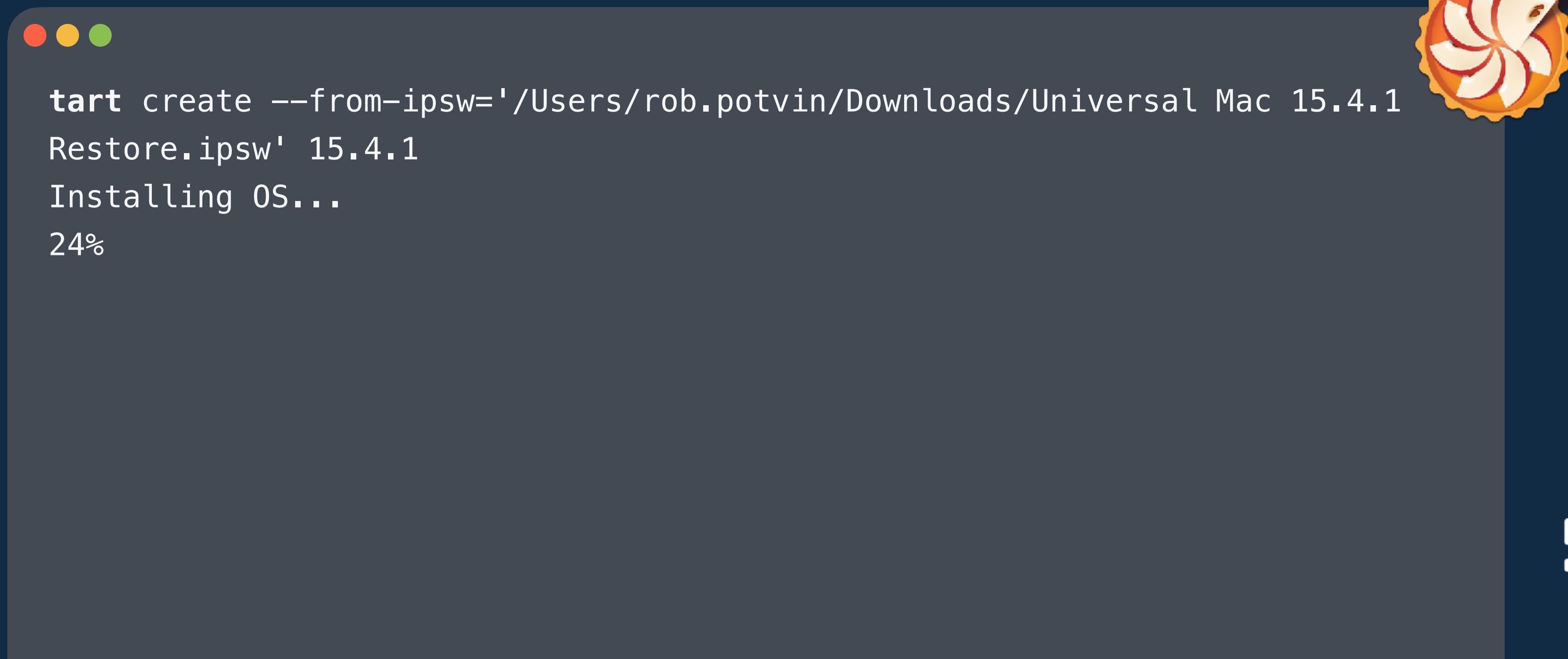
# Tart Ingredients

## Part cmd, part app

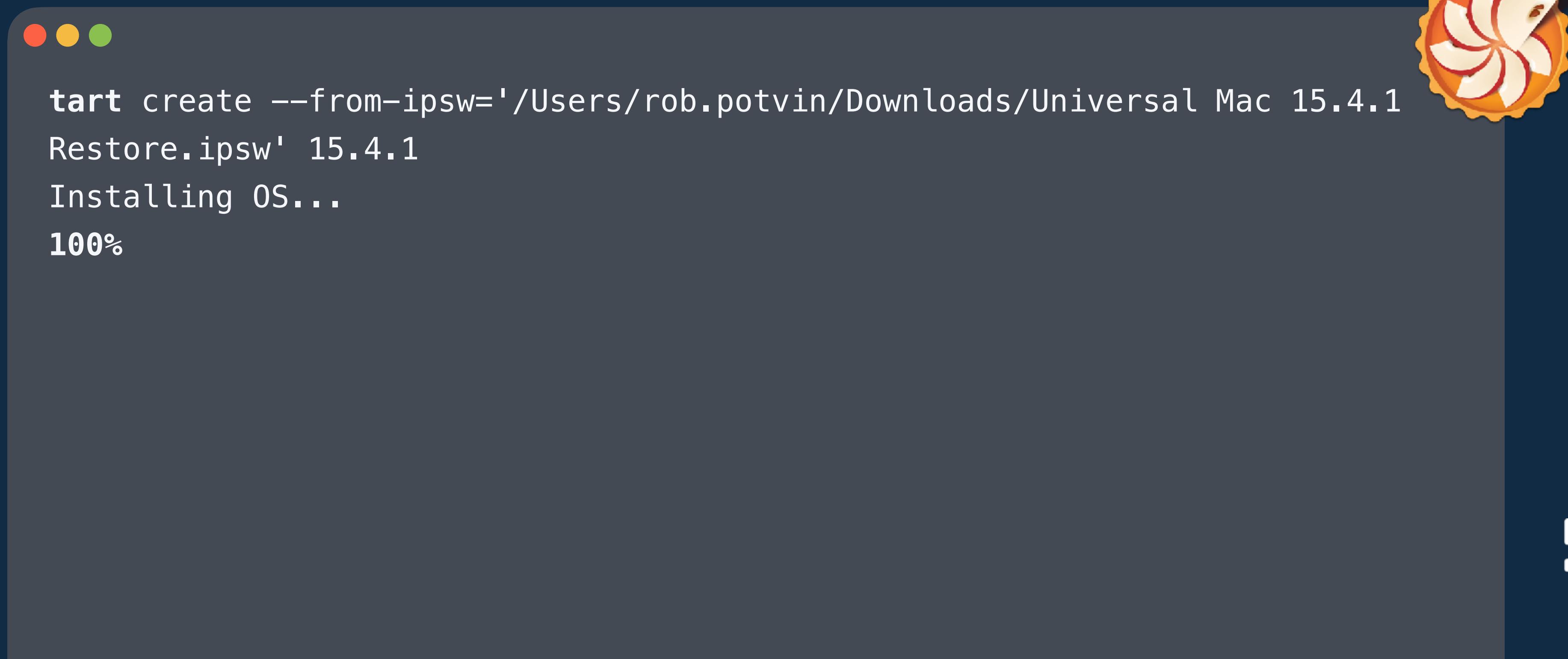
- Build from IPSW
- Easy Clone / Easy Import / Export
- Pull / Push VM images to / from OCI registry



# Measuring and Prepping Getting to Know Tart



# Measuring and Prepping Getting to Know Tart



# 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



# 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
```



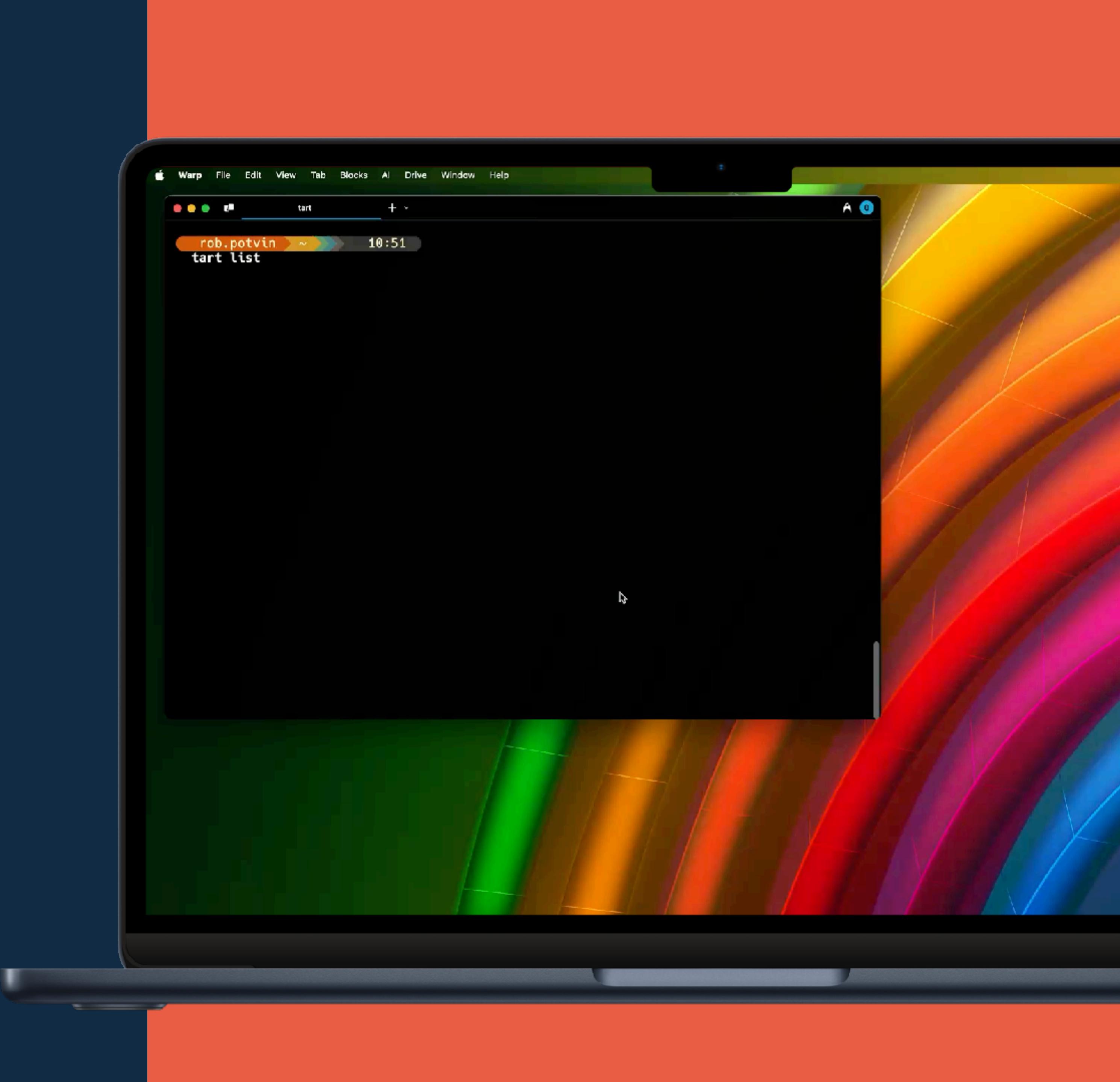
# Great but where is the Instant Cake Mix?

```
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
```



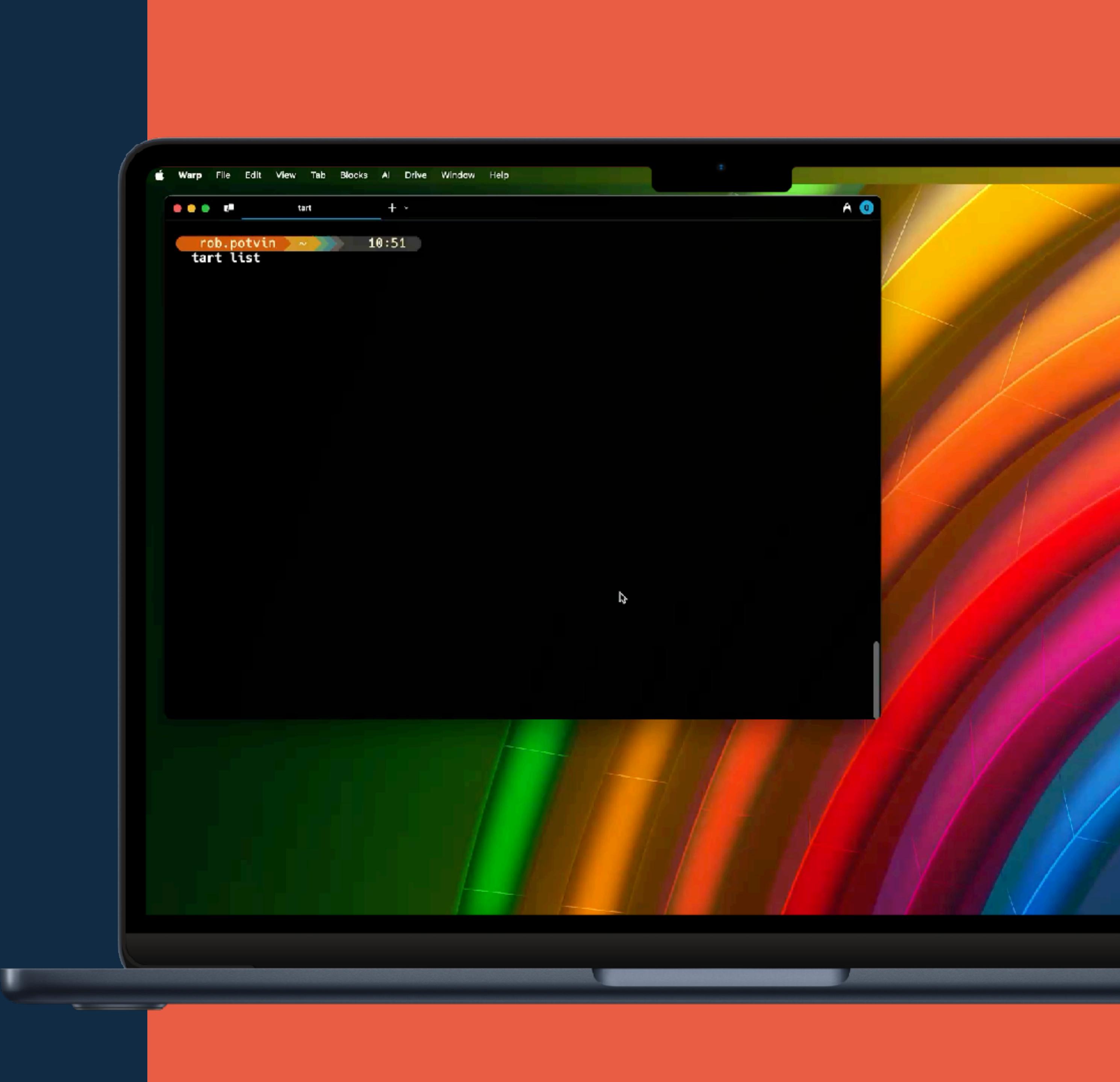
# New Clone Running in tart

- 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?

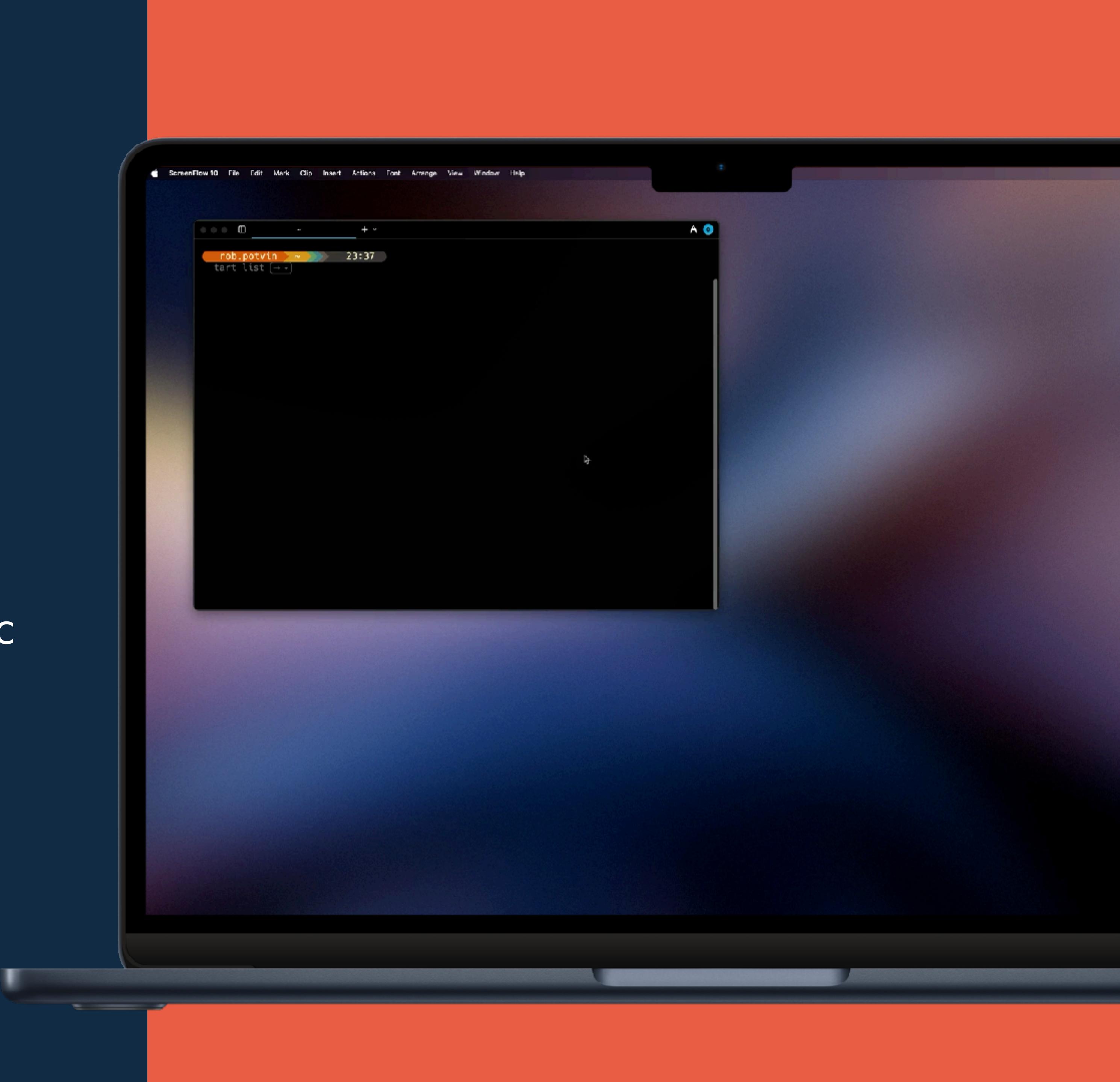
- One OCI macOS image hosted
- Many clones, many enrollments
- Easy to create new serial numbers
  - `tart set --random-serial --random-mac`

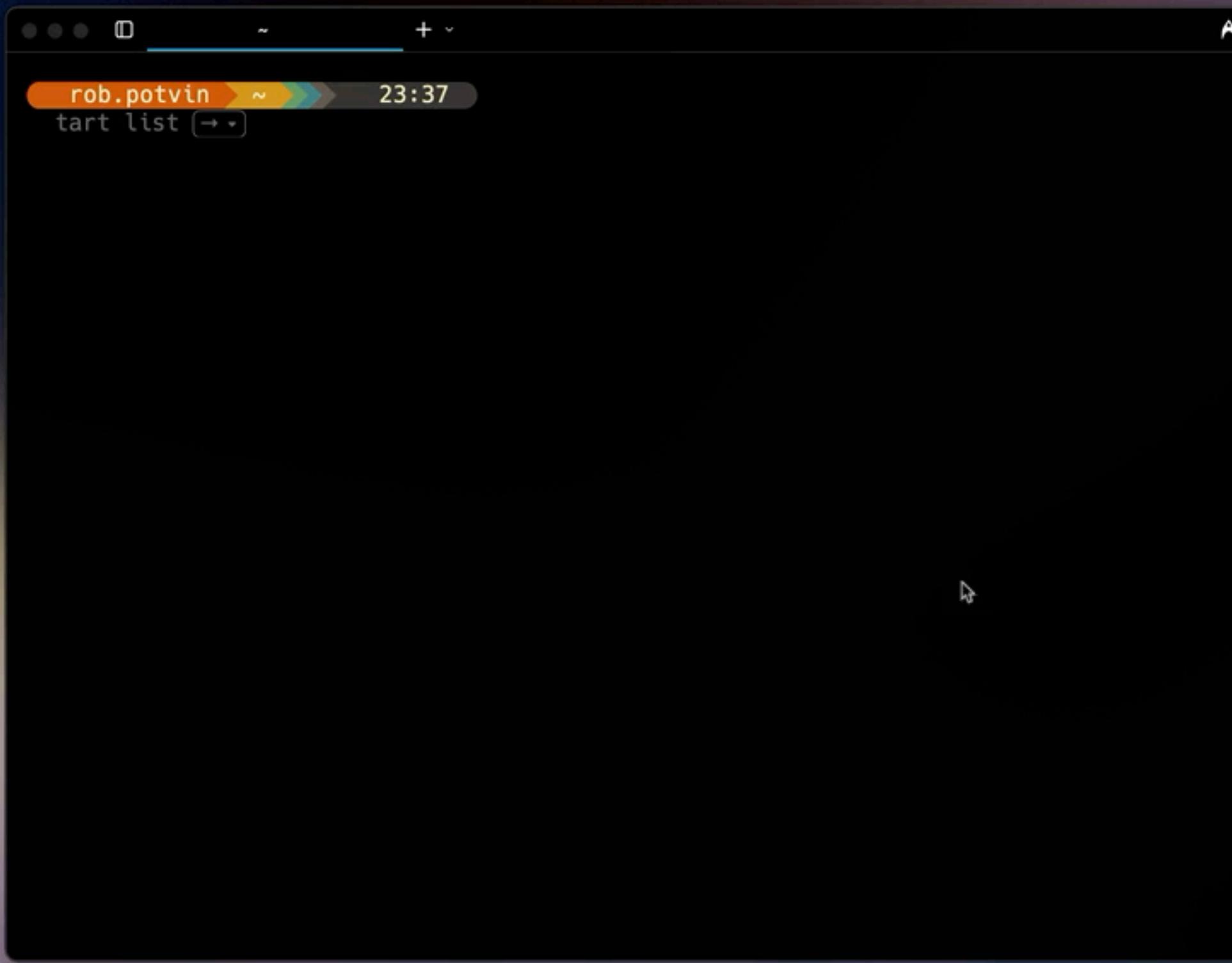


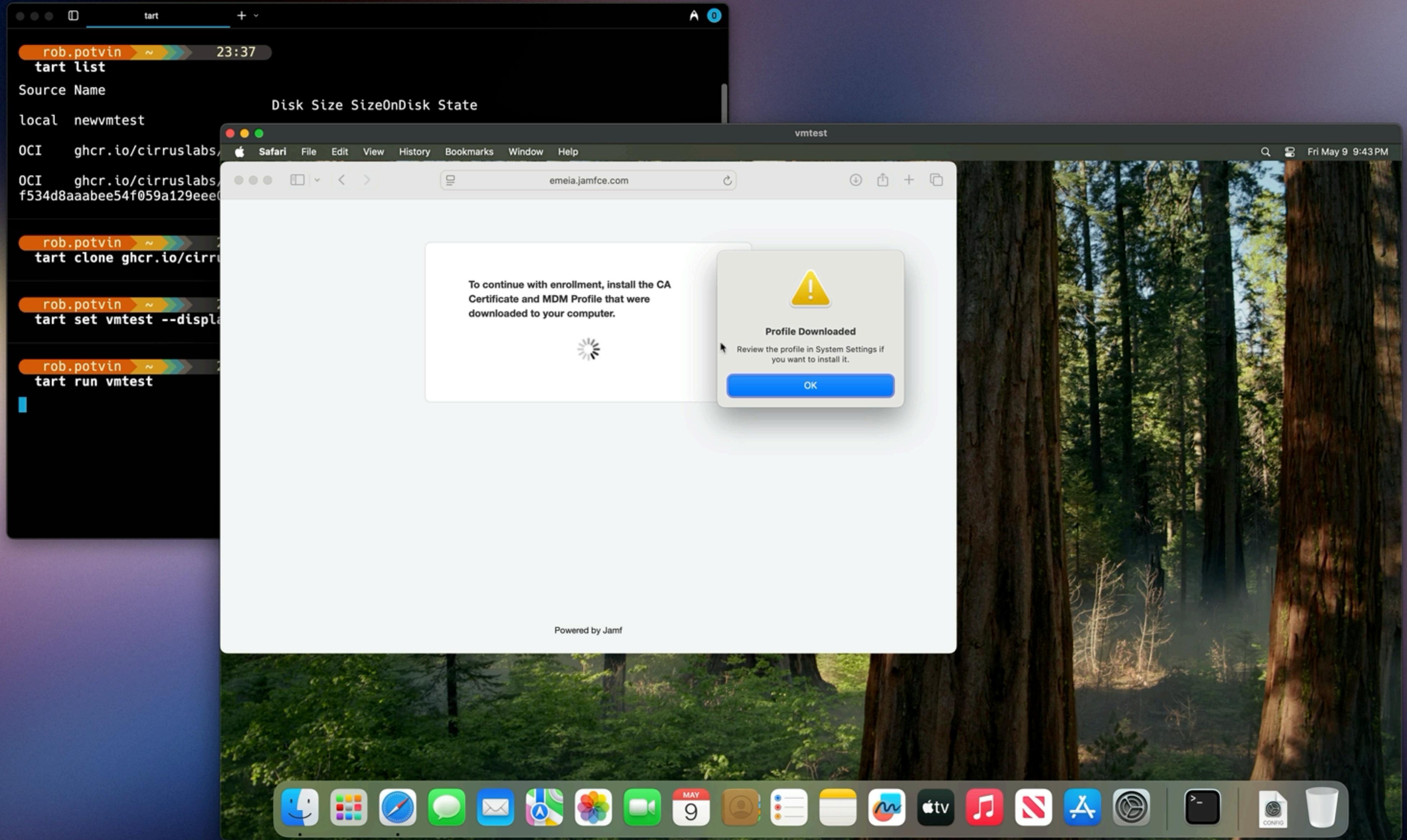
# Enroll the VM

## Up and running

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

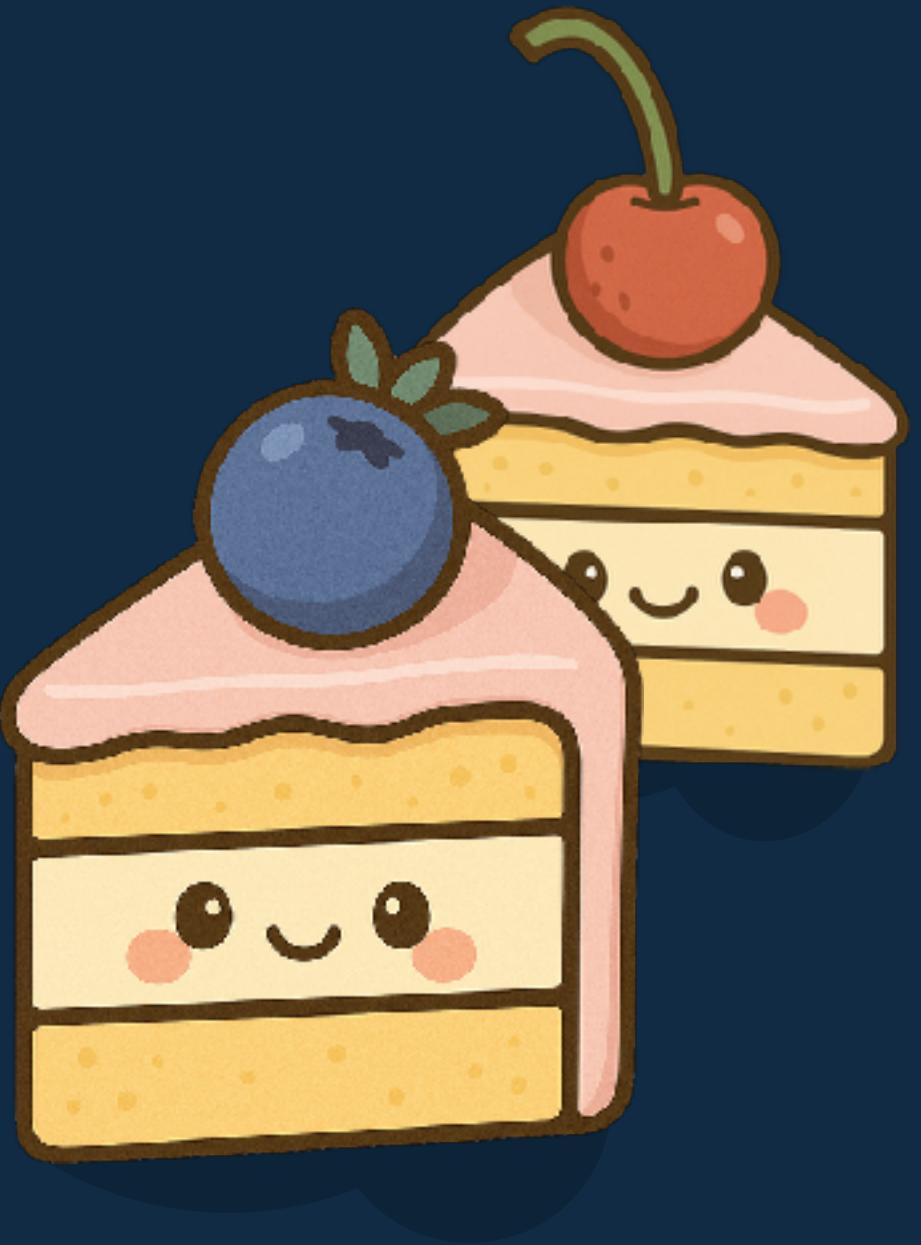






# Enrolled the VM Could it be faster?

- 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

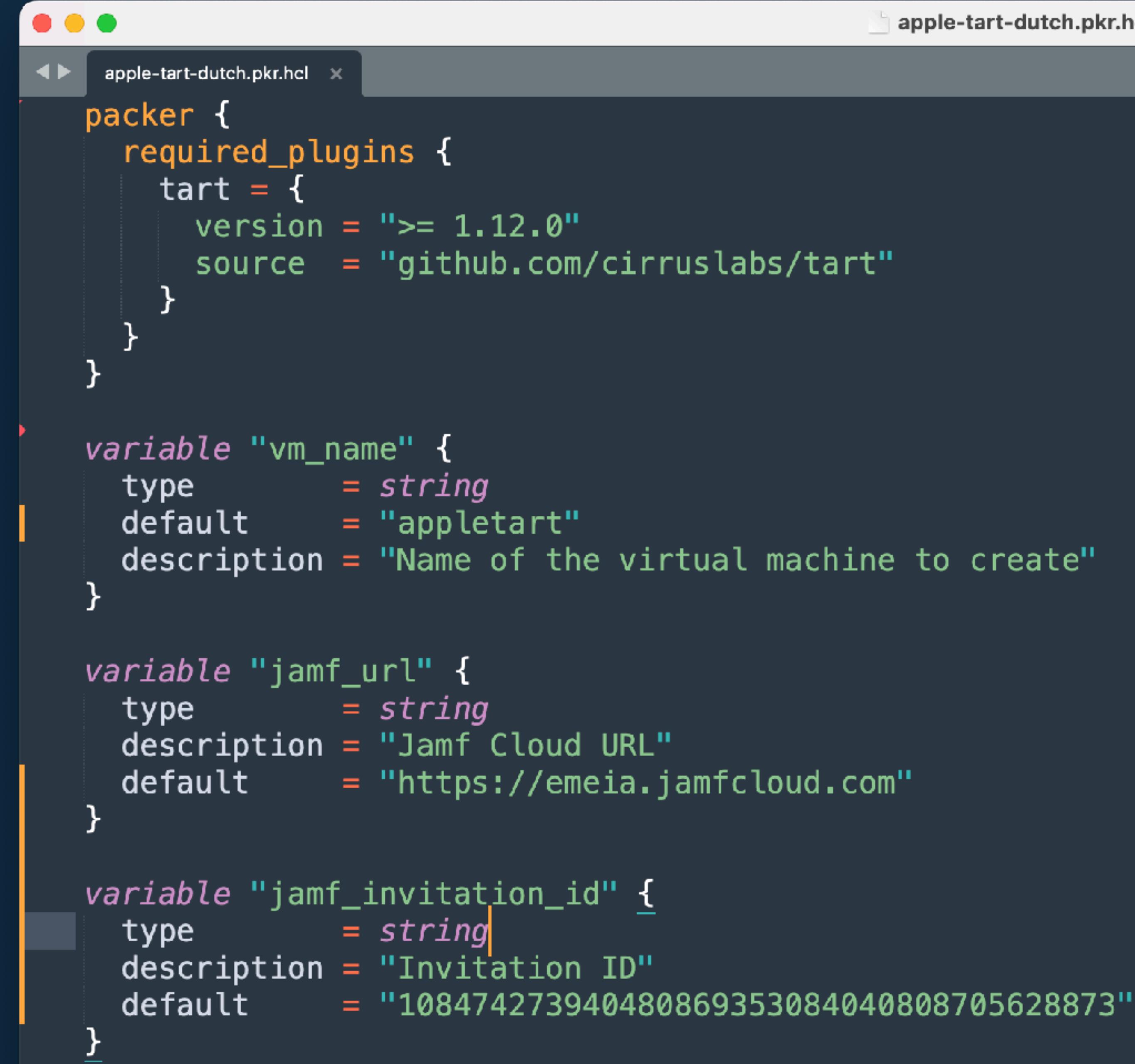


# Enrollment Ingredient Prepping Jamf Pro

- 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



A screenshot of a terminal window titled "apple-tart-dutch.pkr.hcl". The window displays a Packer configuration file with syntax highlighting. The code defines required plugins, variables for VM name, Jamf URL, and invitation ID, and specifies the tart plugin version and source.

```
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



The screenshot shows a terminal window titled "apple-tart-enrollment-url.pkr.hcl". The window contains a block of HCL (HashiCorp Configuration Language) code used for building a virtual machine. The code defines a source block for "tart-cli" named "tart" with various configuration parameters like IP address, VM name, CPU count, memory, disk size, and SSH settings. It also includes a series of keyboard input sequences ("boot\_command") to automate the setup process, such as selecting the English language and creating a Mac account. The terminal interface has a dark theme with syntax highlighting for the code.

```
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<leftShiftOn><tab><leftShiftOff><spacebar>",
    # Transfer Your Data to This Mac
    "<wait10s><tab><tab><tab><spacebar><tab><tab><spacebar>",
    # Written and Spoken Languages
    "<wait10s><leftShiftOn><tab><leftShiftOff><spacebar>",
    # Accessibility
    "<wait10s><leftShiftOn><tab><leftShiftOff><spacebar>",
    # Data & Privacy
    "<wait10s><leftShiftOn><tab><leftShiftOff><spacebar>",
    # Create a Mac Account
    "<wait10s>Managed via Tart<tab>admin<tab>admin<tab>admin<tab><spacebar><tab><tab><spacebar>",
    # Enable Voice Over
    "<wait120s><leftAltOn><f5><leftAltOff>",
    # Sign In with Your Apple ID
  ]
}
```

# Packer Build



The screenshot shows a terminal window titled "apple-tart-enrollment-url.pkr.hcl". The window contains a Packer configuration file. The configuration includes a temporary workaround for a Virtualization.Framework issue, keeping the recovery partition, and enabling passwordless sudo, auto-login, and Safari automation. The code uses HCL syntax and includes inline shell commands for provisioning.

```
// 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 au
  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
"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",
  ]
}

}
```

# Packer Build

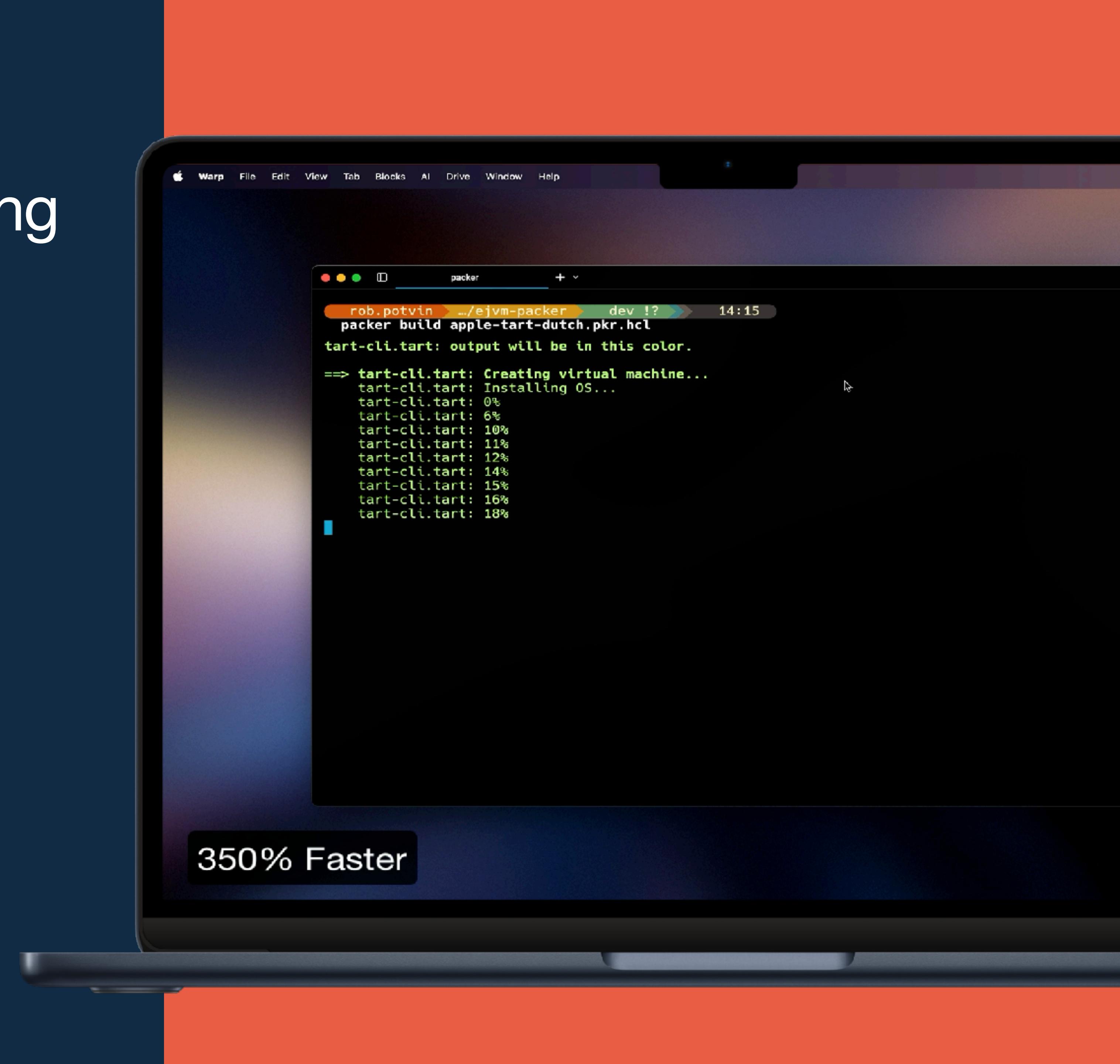


```
apple-tart-enrollment-profile.pkr.hcl
```

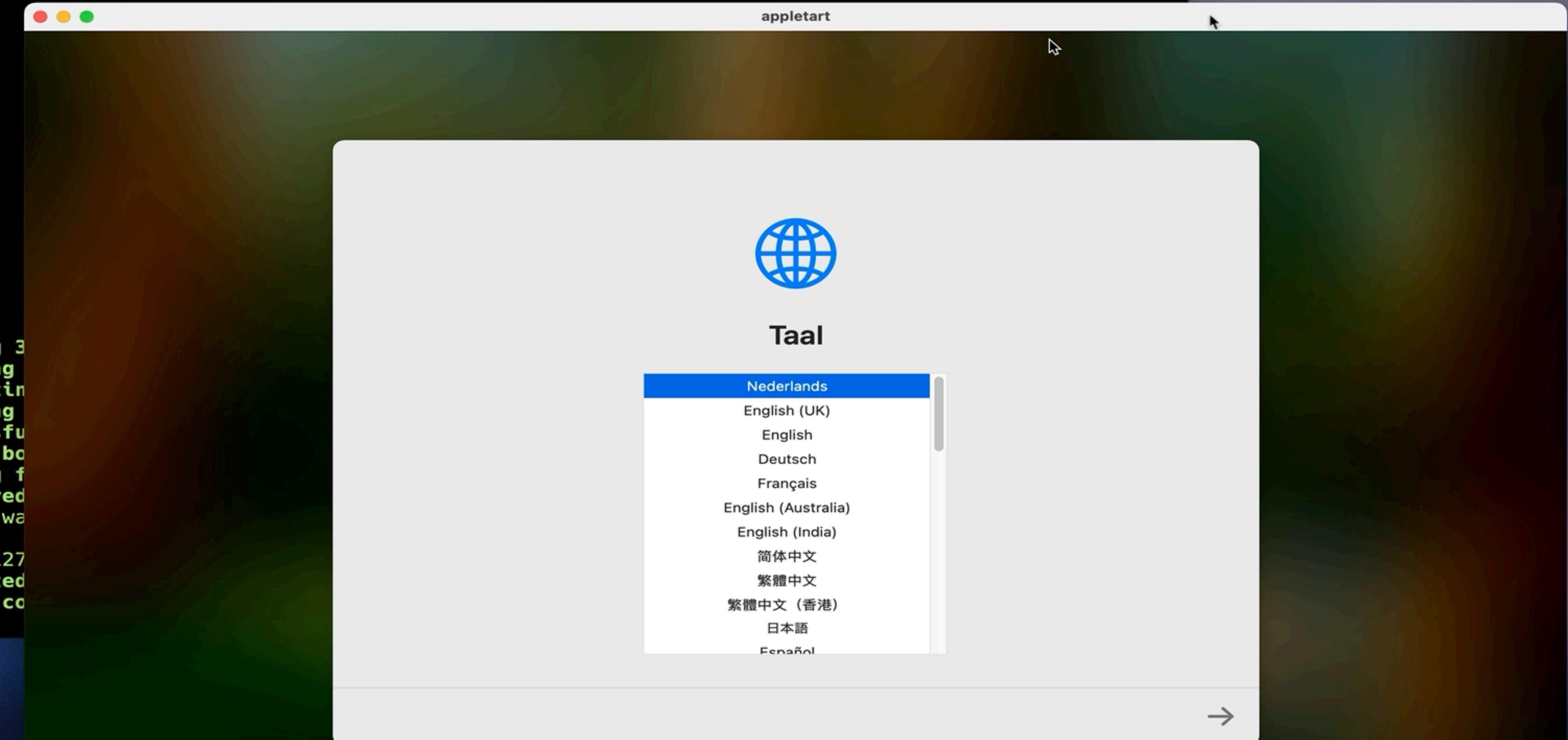
```
provisioner "shell" {
  inline = [
    // Create MDM enrollment profile
    "cat << EOF > ~/Desktop/mdm_enroll.mobileconfig",
    "<?xml version=\"1.0\" encoding=\"UTF-8\"?>",
    "<!DOCTYPE plist PUBLIC \"-//Apple//DTD PLIST 1.0//EN\" \"http://www.apple.com/DTDs/PLIST_1.0.dtd\"",
    "<plist version=\"1.0\">",
    "  <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: Inspecting  
==> tart-cli.tart: Starting  
==> tart-cli.tart: Successful  
==> 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
```



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 + ~

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 +

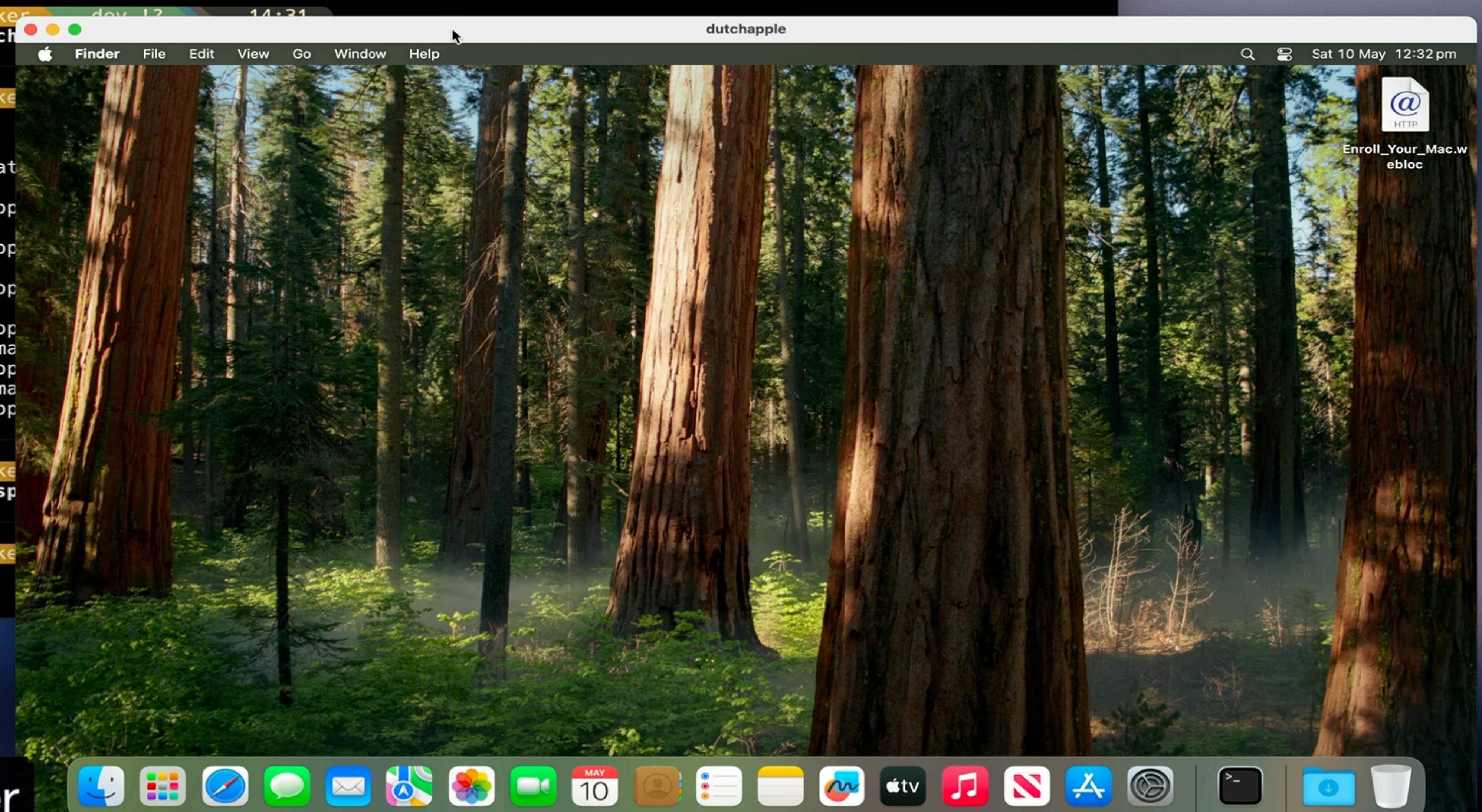
```
==> Wait completed after 16 minutes 643 milliseconds  
==> Builds finished. The artifacts of successful builds are:  
--> tart-cli.tart: appletart
```

rob.potvin ➤ .../ejvm-packer dev 1.2 14:31  
tart clone appletart dutchapple

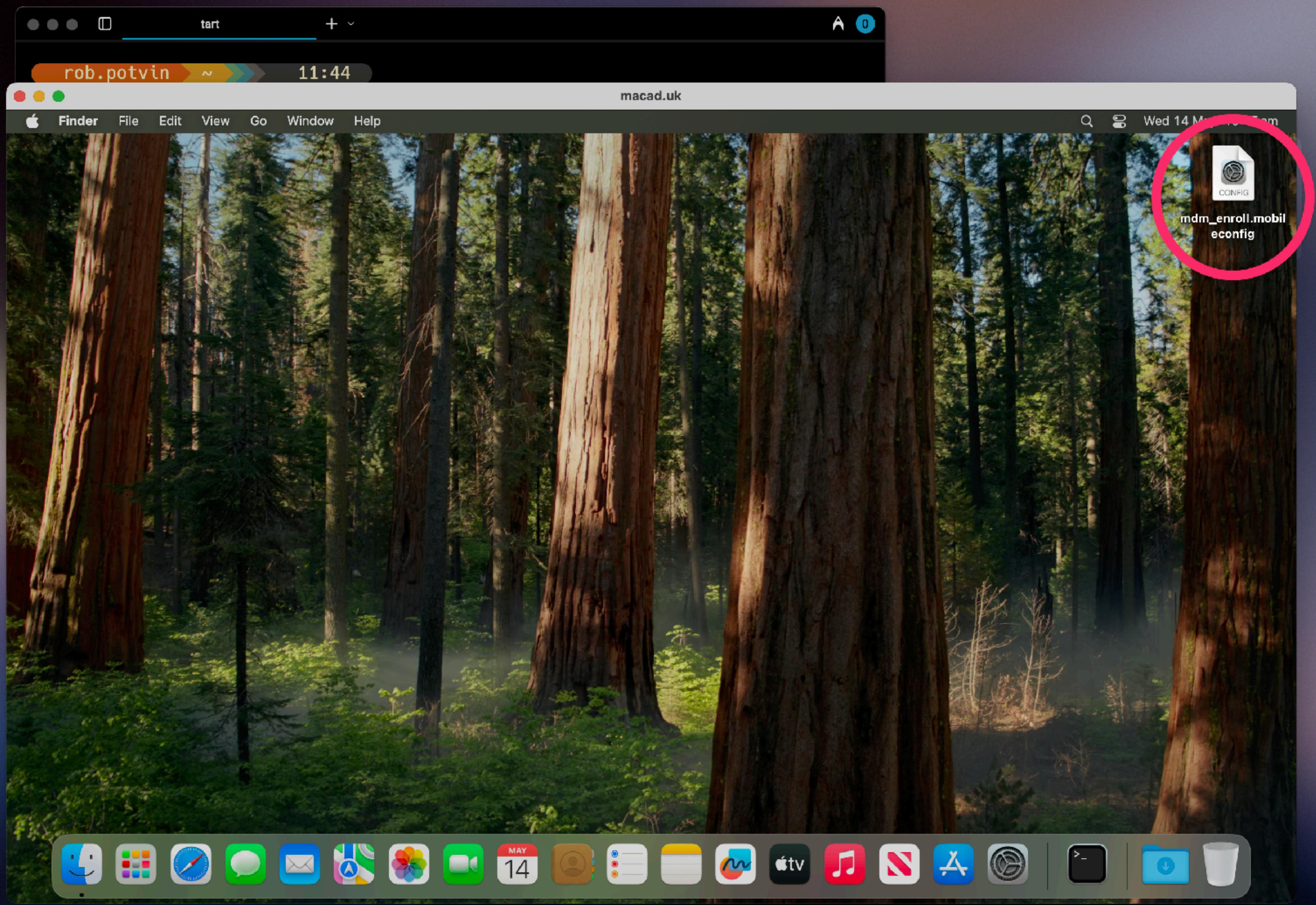
Finder File Edit View Go Window Help dutchapple

rob.potvin ➤ .../ejvm-packer  
tart list

Source Name	Disk	Size	SizeOnDisk	Stat
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/maven	50	24	24	stop
OCI ghcr.io/cirruslabs/maven	13	50	24	24
				stop

rob.potvin ➤ .../ejvm-packer  
tart set dutchapple --displayrob.potvin ➤ .../ejvm-packer  
tart run dutchapple

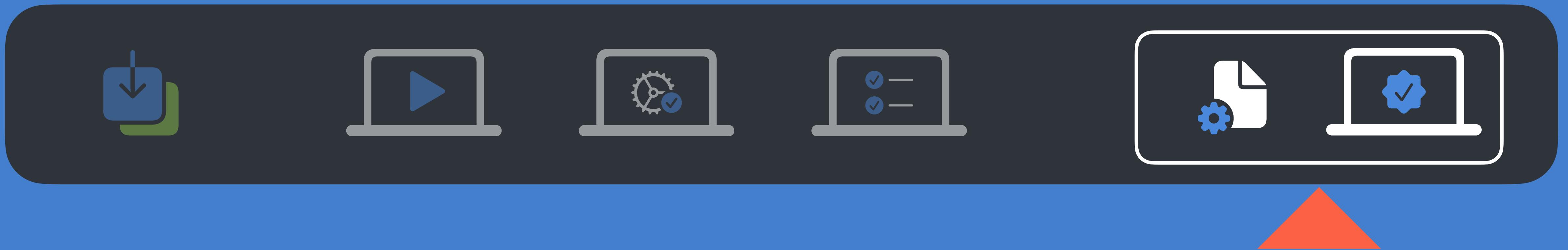
350% Faster



**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





Amazon ECR

github.com

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)

Search by repository substring

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

C View push commands Delete Actions Create repository



Amazon ECR

Personal Search [Option+S] AWS GitHub.com

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)

<input type="checkbox"/>	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	<input type="checkbox"/> Copy URI	<input type="checkbox"/> sha256:f0fc1ce6a85aa38...	-

View push commands

# 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**

macad.uk Personal

Full Jamf Pro  

## Computers : Smart Computer Groups

# All Managed Clients

Computer Group Criteria Reports

AND/OR	CRITERIA	OPERATOR	VALUE		
	Operating System	not like	server	 	
and	Application Title	is not	Server.app	 	
and	Model	is not	VirtualMac2,1	 	

+ Add

AND/OR CRITERIA OPERATOR VALUE

Operating System not like server

Application Title is not Server.app

Model is not VirtualMac2,1

macad.uk  
Personal

1 match Begins with Q vm < > Done

Full Jamf Pro 1

Pro

Computers : Smart Computer Groups

← Apple Silicon - VMs

Computer Group Criteria Reports

AND/OR CRITERIA OPERATOR VALUE

Model like VirtualMac2,1 ... Delete

+ Add

...

Criteria

Operator

Value

Model

like

VirtualMac2,1

...

Delete

+ Add

AND/OR

CRITERIA

OPERATOR

VALUE

Model

like

VirtualMac2,1

...

Delete

+ Add

macad.uk Personal

Pro

Computers : Smart Computer Groups

## Apple Silicon - VMs

Computer Group Criteria Reports  Show in Jamf Pro Dashboard

Display Name  
Display name for the smart computer group  
**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  
Site to add the smart computer group to  
**None**

History View Clone Delete Edit

Computers

Inventory

Search Inventory

Search Volume Content

Licensed Software

Content Management

Policies

Configuration Profiles

Software Updates

Restricted Software

Mac Apps

Patch Management

eBooks

Groups

Smart Computer Groups

Static Computer Groups

# 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



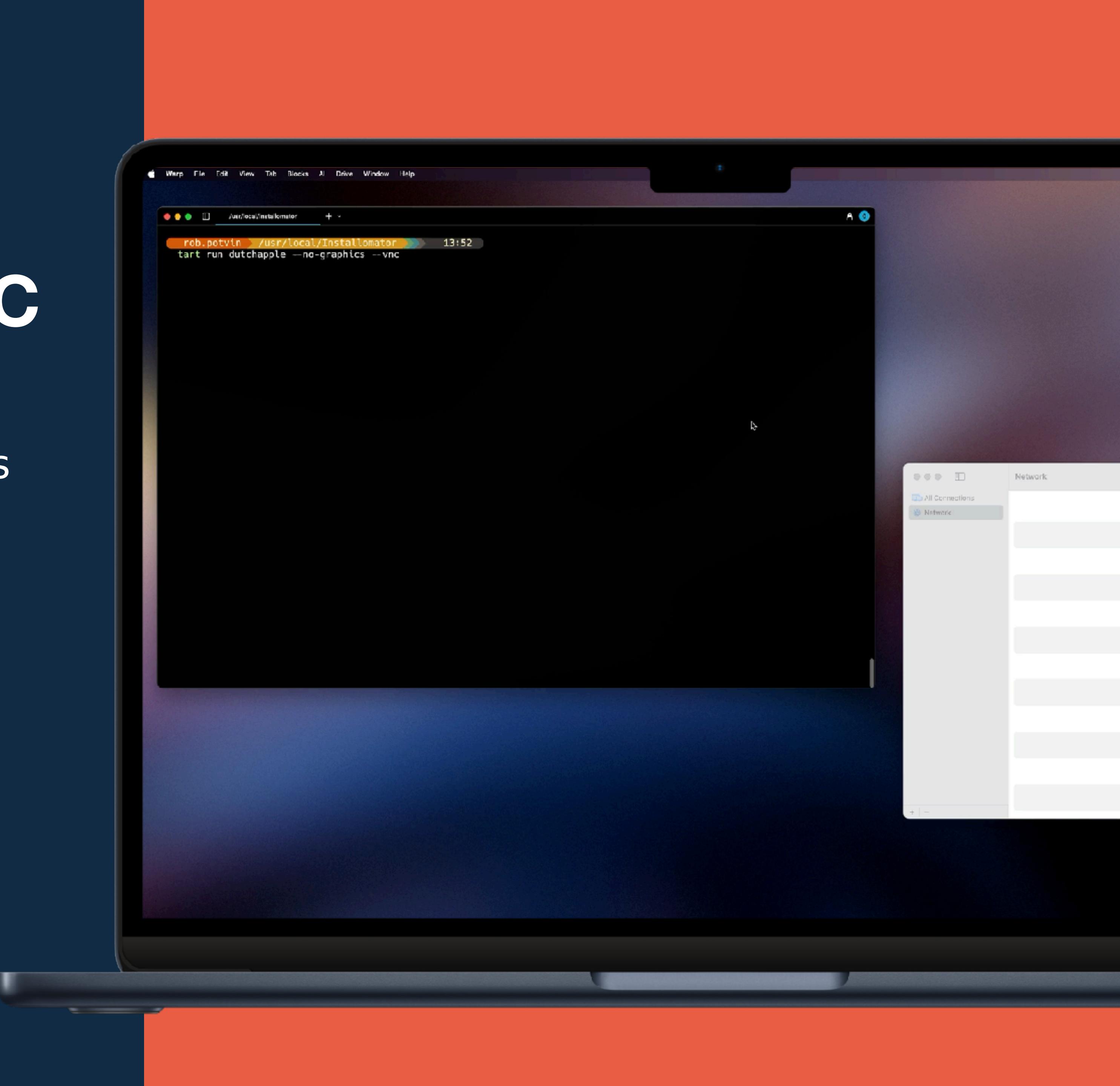
# We Knead That Clipboard – Enter VNC

- ▶ `tart run --vnc --no-graphics`

Starts headless with vnc

- ▶ `tart run --vnc-experimental`

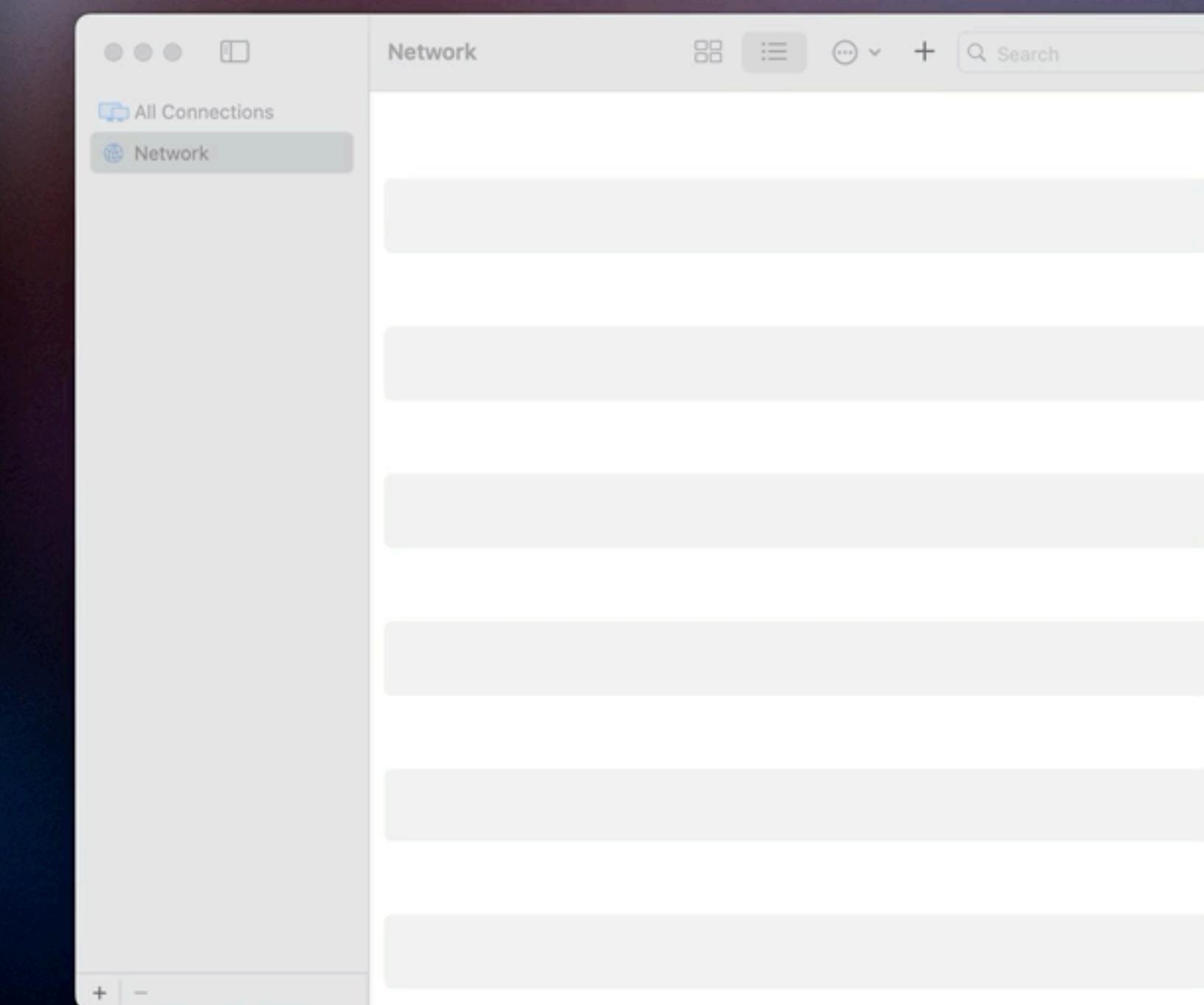
Tool for recovery partition



/usr/local/Installomator +

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

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

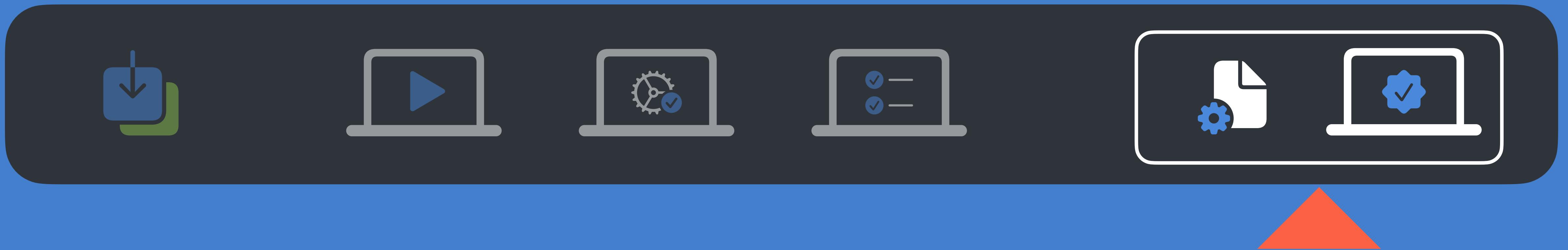




# Serving Suggestions: **Takeaways for the Modern Mac**

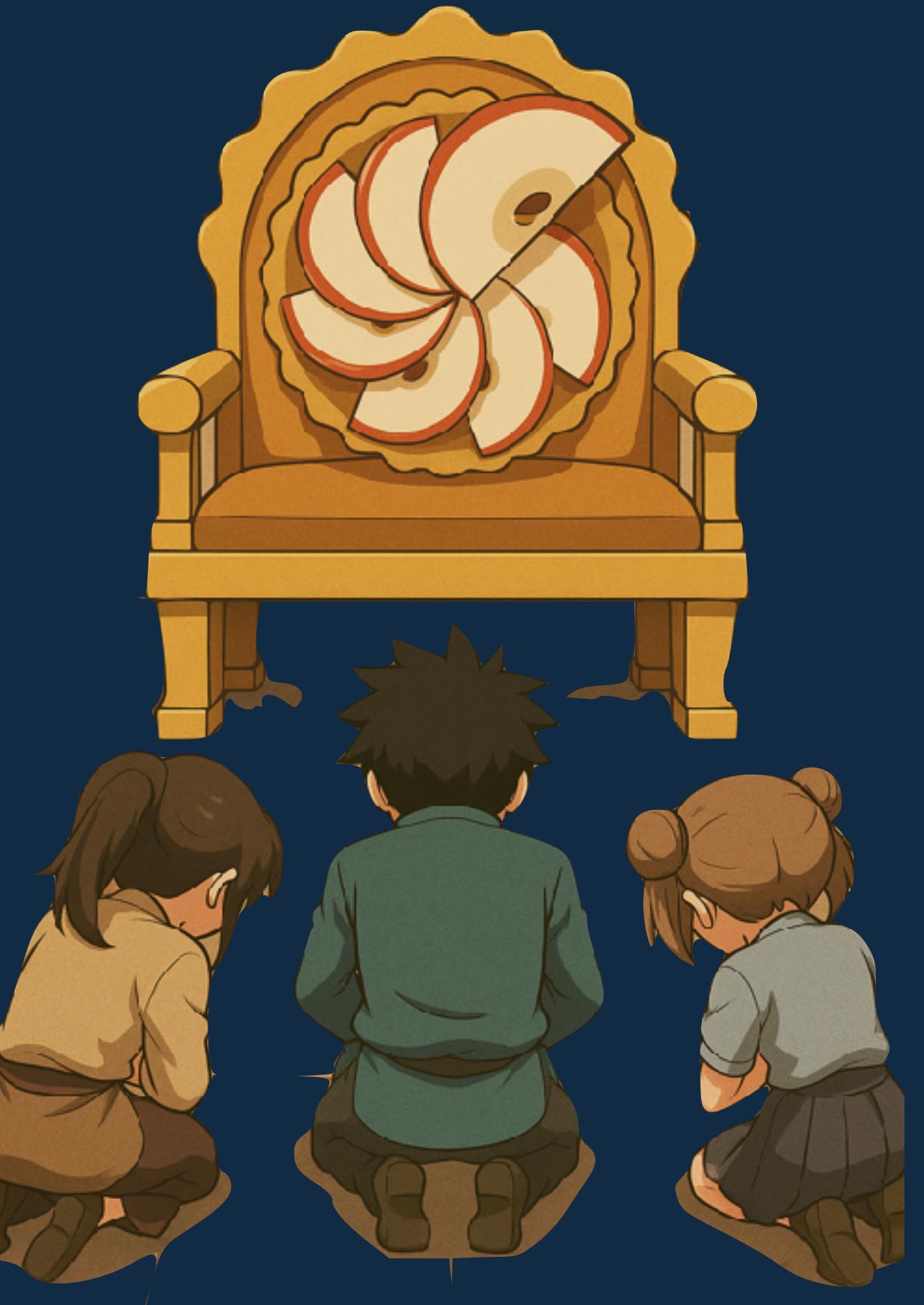
## **Admin Baker**

## Testing



# Cooling on the Rack: Your Workflow in a Nutshell

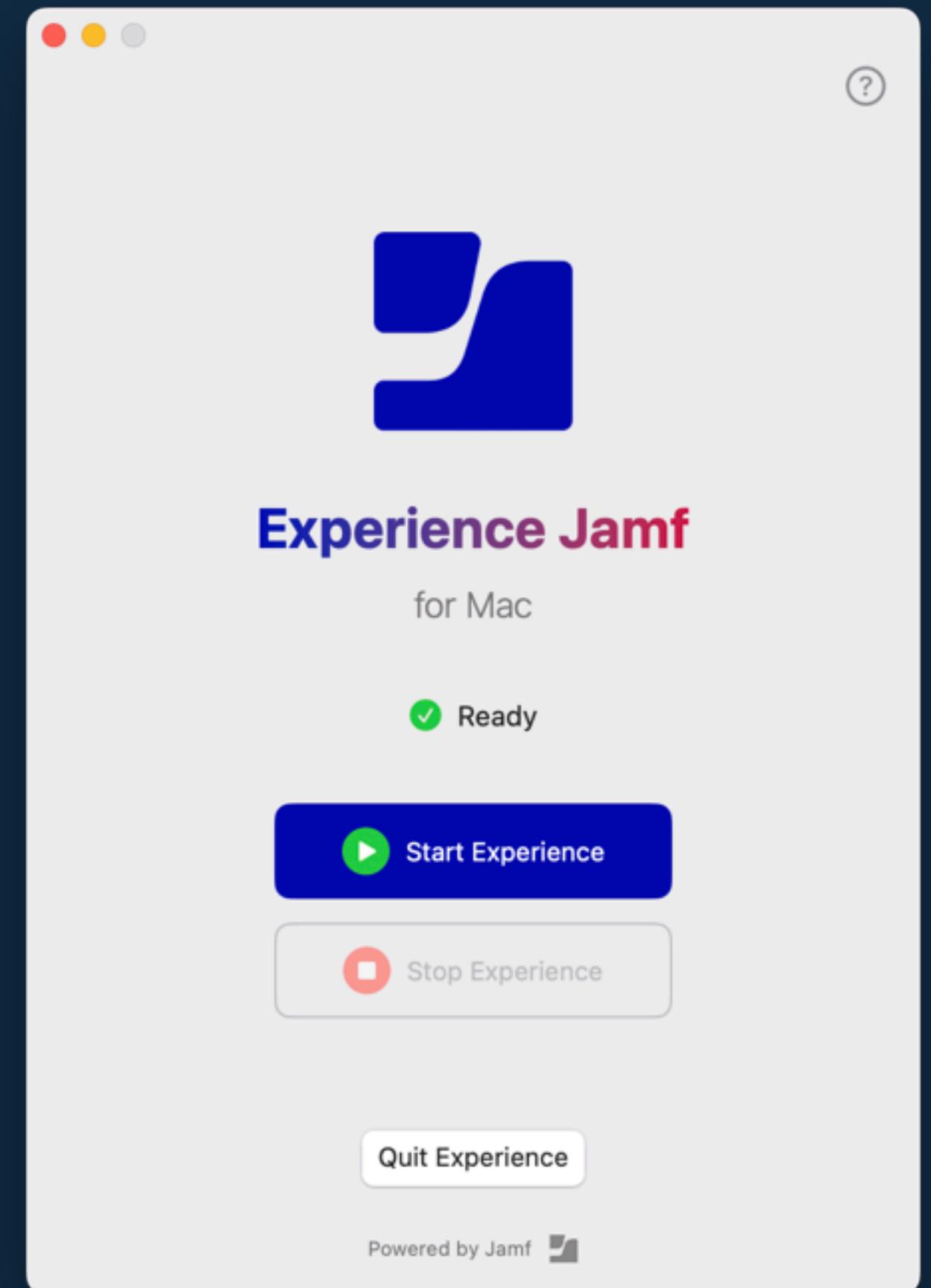
- tart is awesome
- CI/CD - but for macadmins
- VMs are disposable
- Test workflows
- Use Self Service Onboarding or Setup Manager
- This is just the start with tart

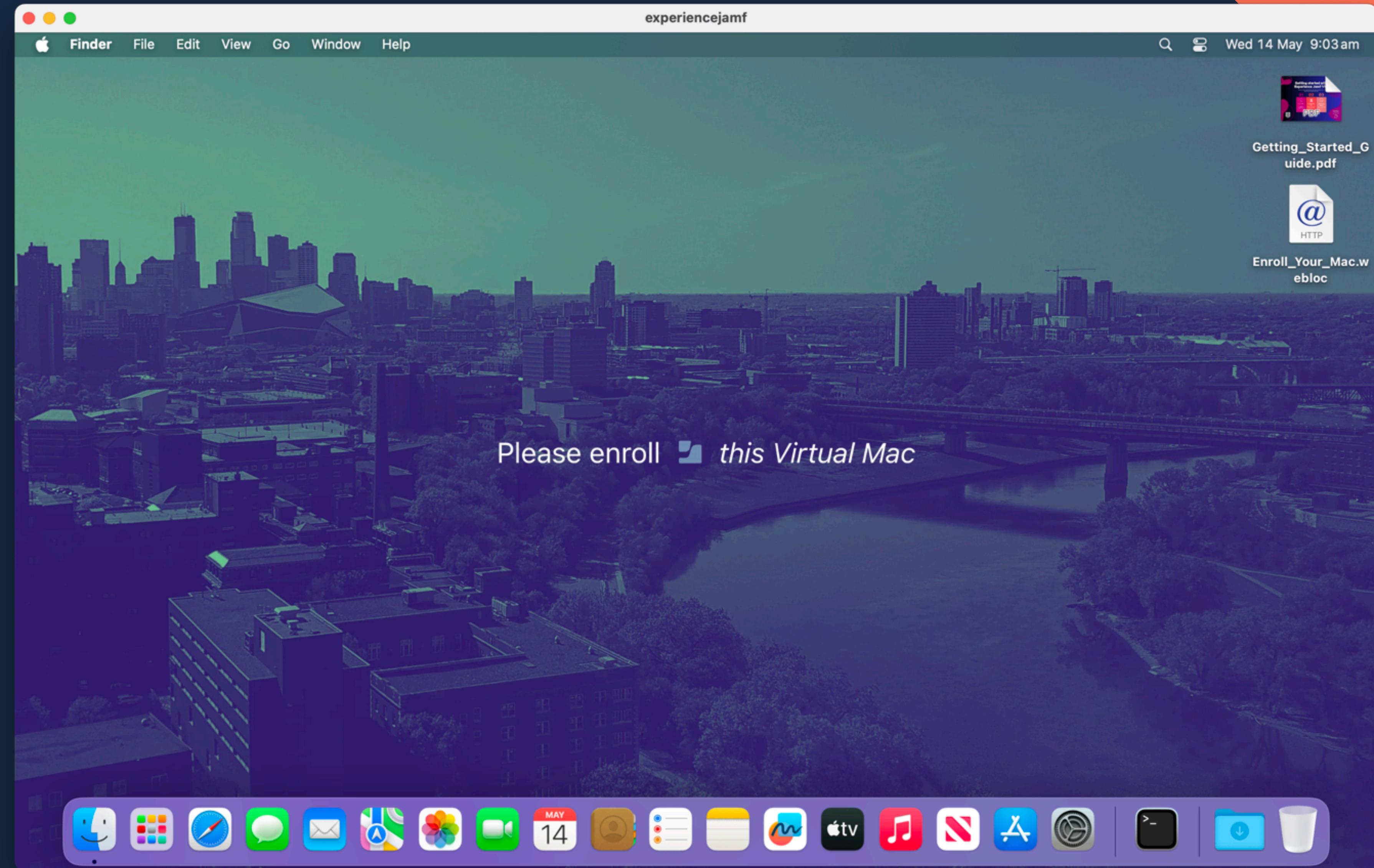


# Tart: Peeling Back the Layers to the Good Bits

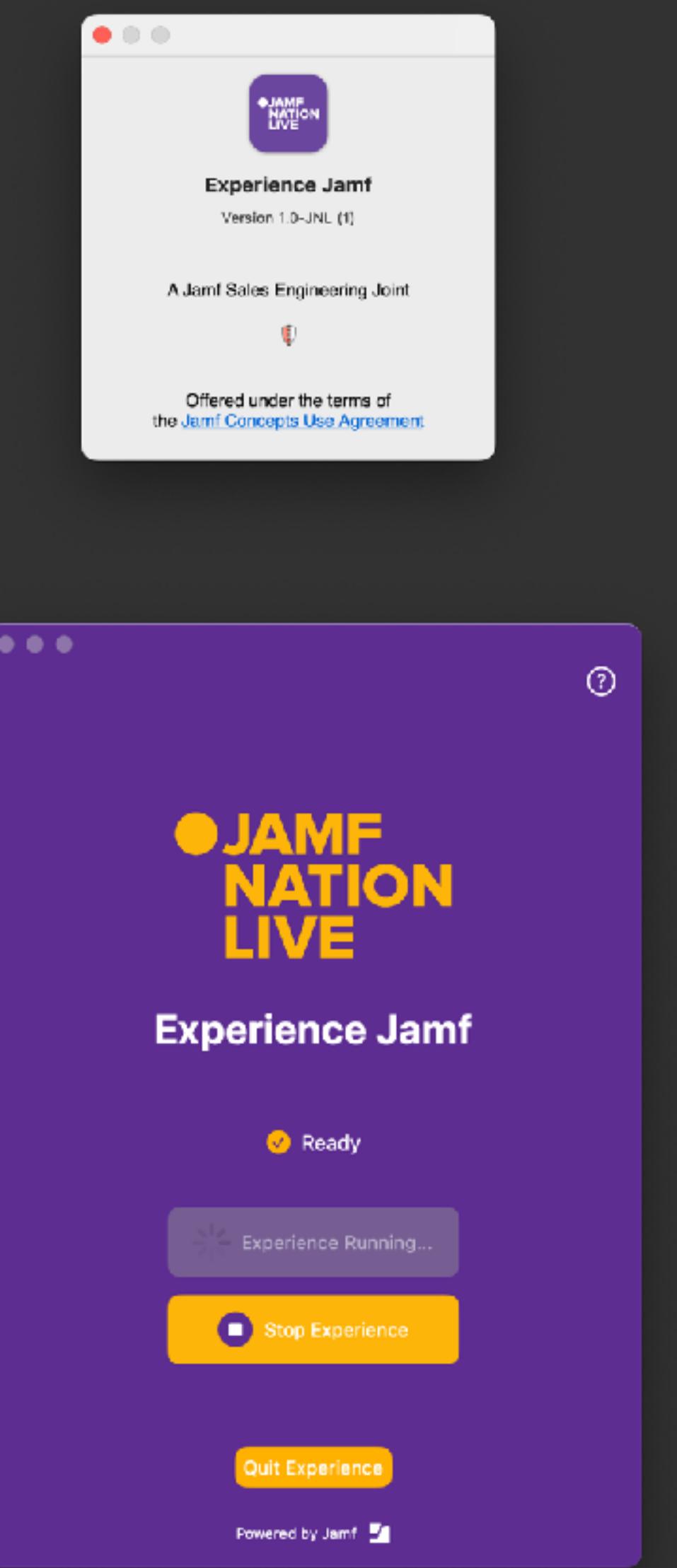
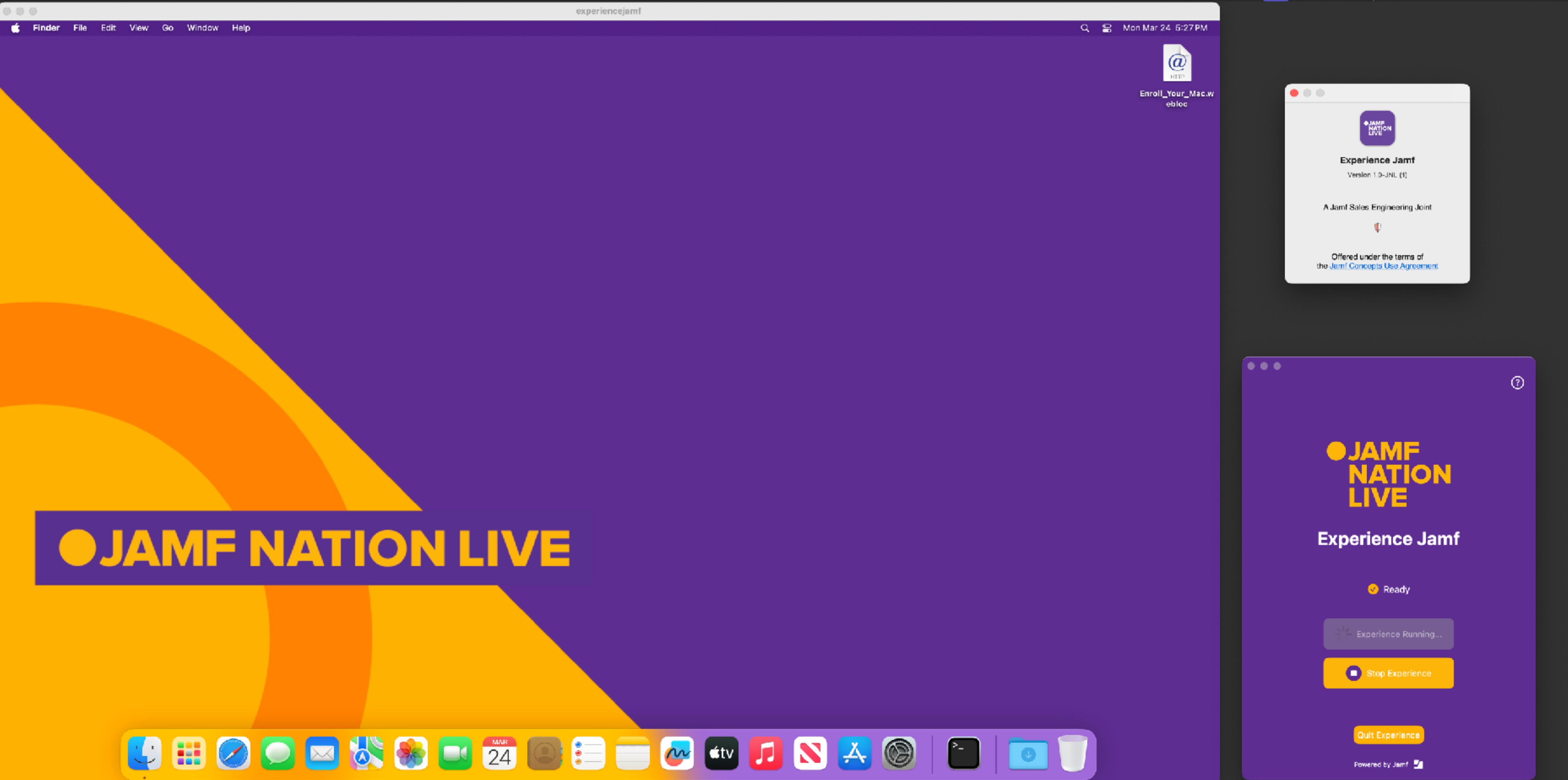
- Using Xcode and SwiftUI with tart
- Using Python flask with tart

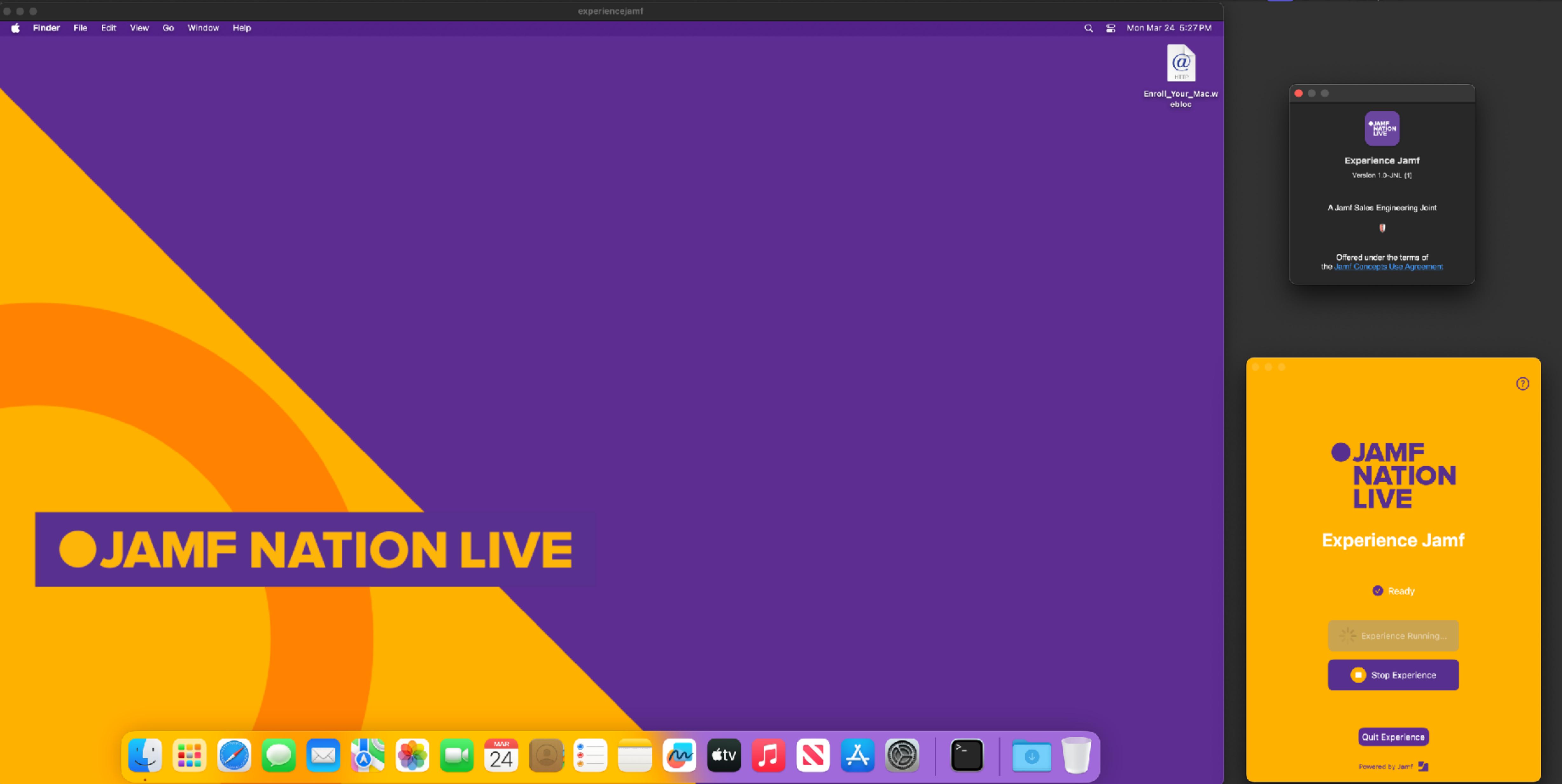


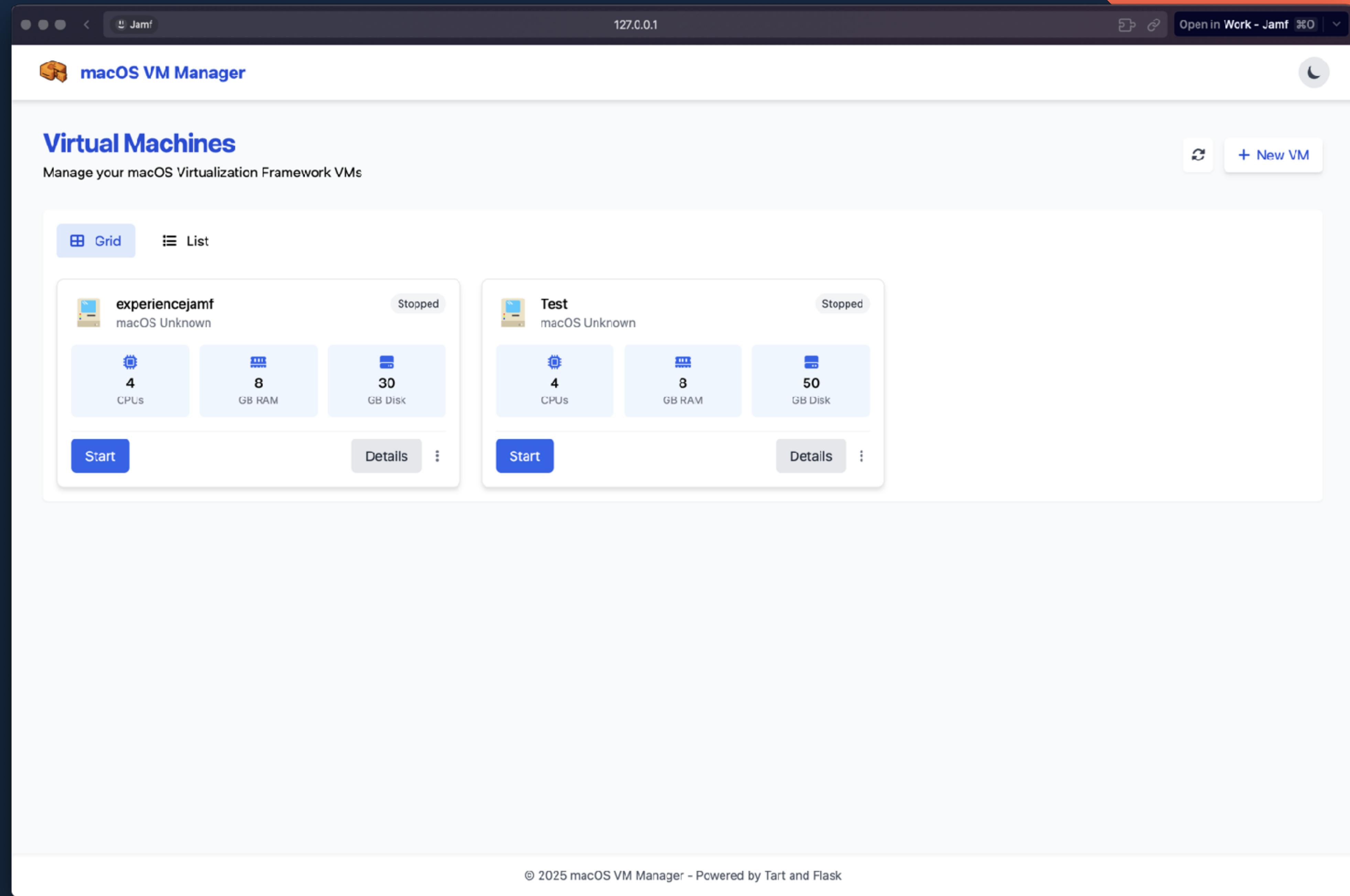




jamf



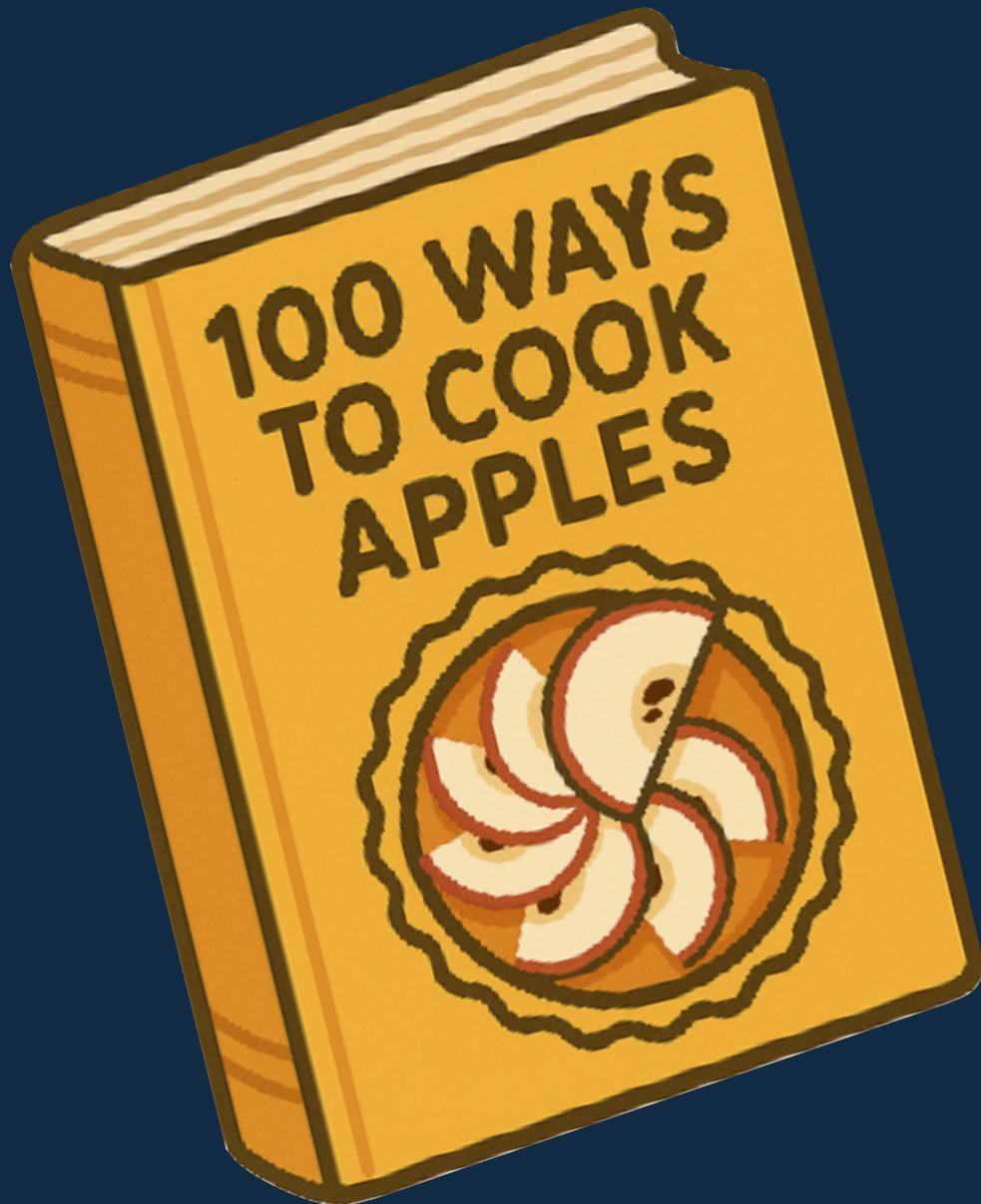




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# Leftovers You'll Love: Blog Preview & Handy Resources

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



# Q&A



# Thank You