Tearing open packages

What is a package?

A package is an archive of files and directories.

The archive contains information about location, kind, owner, group, and mode of each file and directory.

The archive contains information about location, kind, owner, group, and mode of each file and directory.

A package may also
optionally run some scripts.

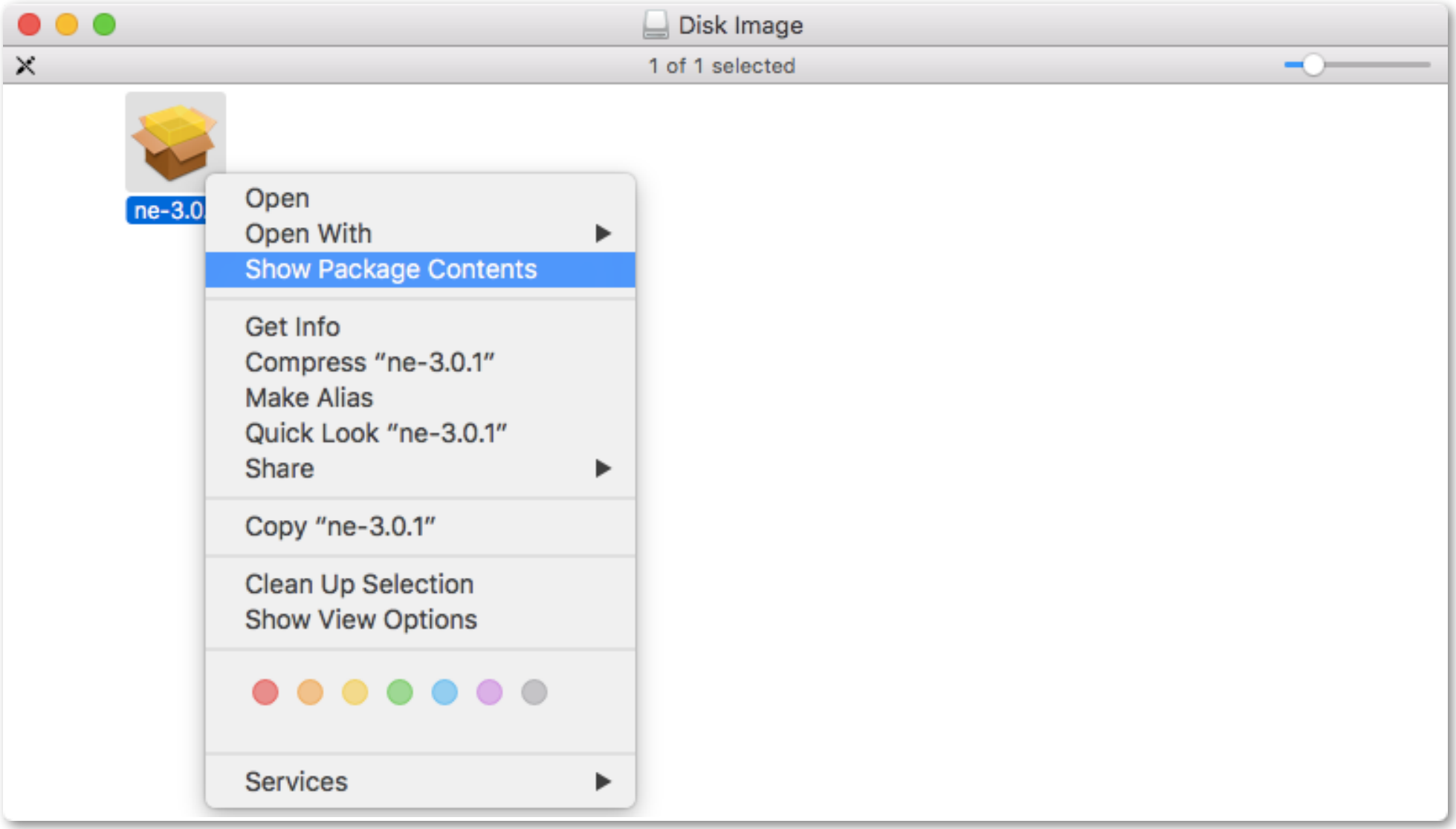
A package may also
optionally run some scripts.

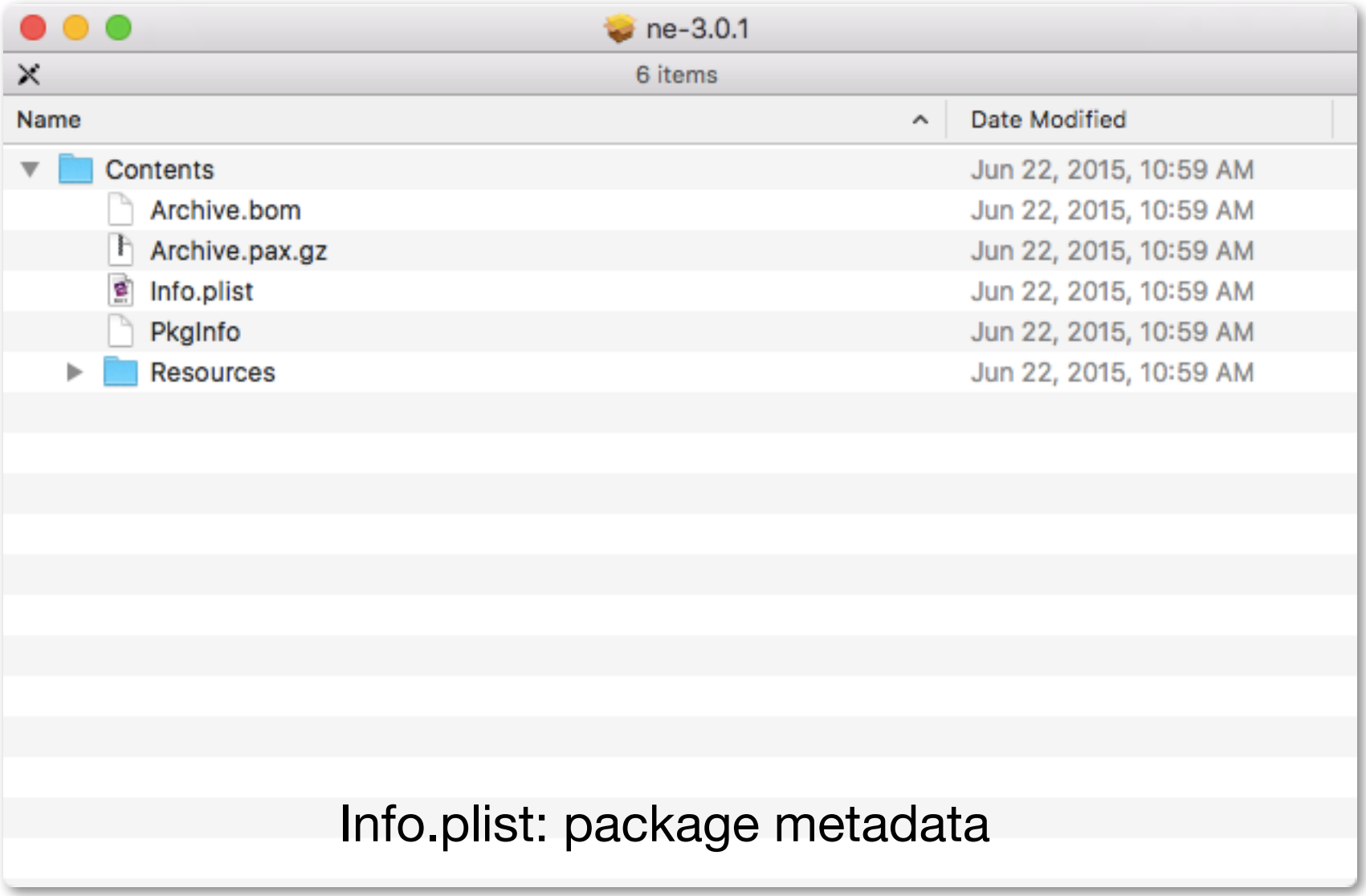
Package Types

- Bundle
- Flat

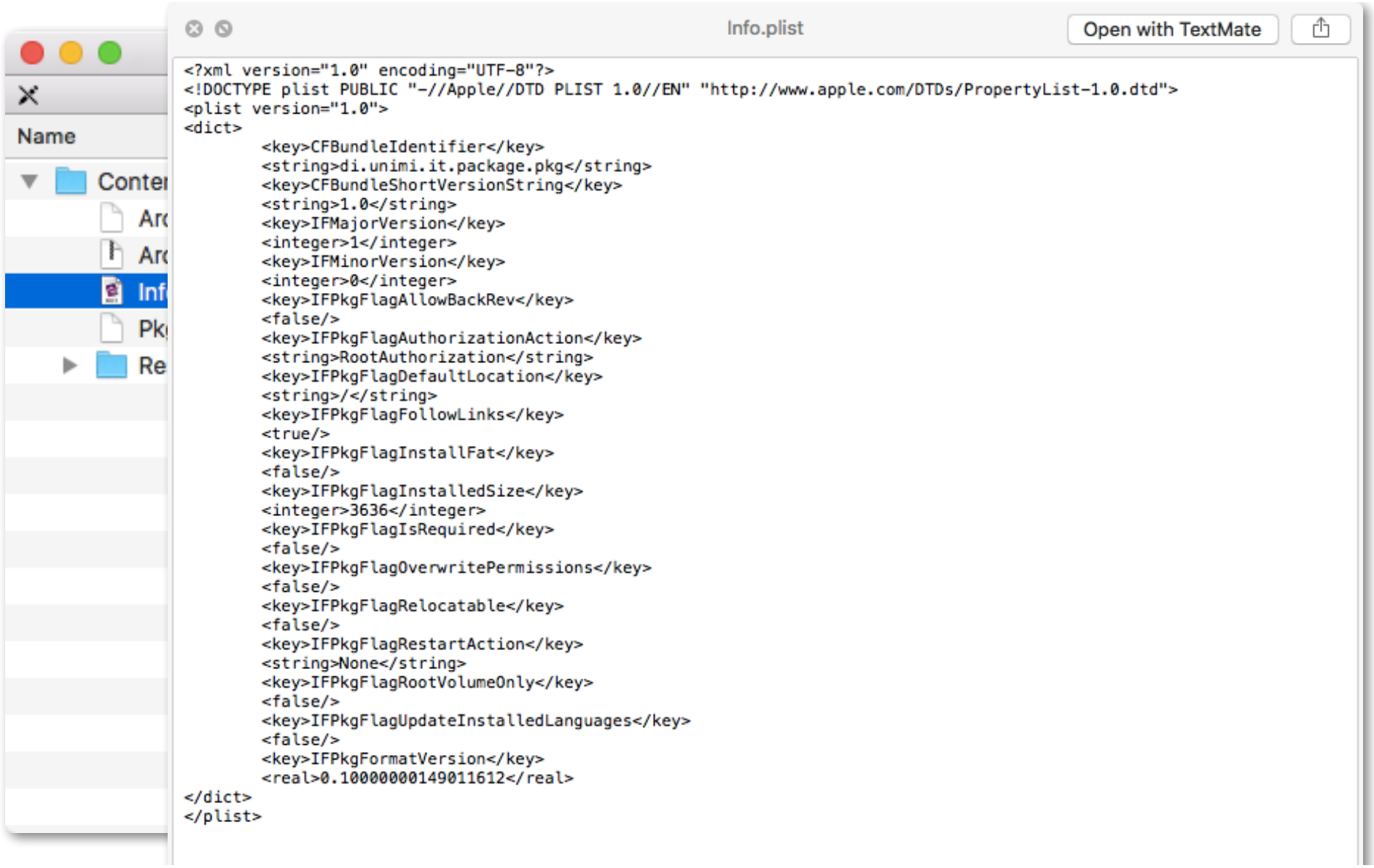
Bundle packages

- Like other OS X bundles (apps, preference panes, etc): a special type of directory


Disk Image
1 of 1 selected
ne-3.0
Open
Open With
Show Package Contents
Get Info
Compress “ne-3.0.1”
Make Alias
Quick Look “ne-3.0.1”
Share
Copy “ne-3.0.1”
Clean Up Selection
Show View Options
Services



Info.plist: package metadata

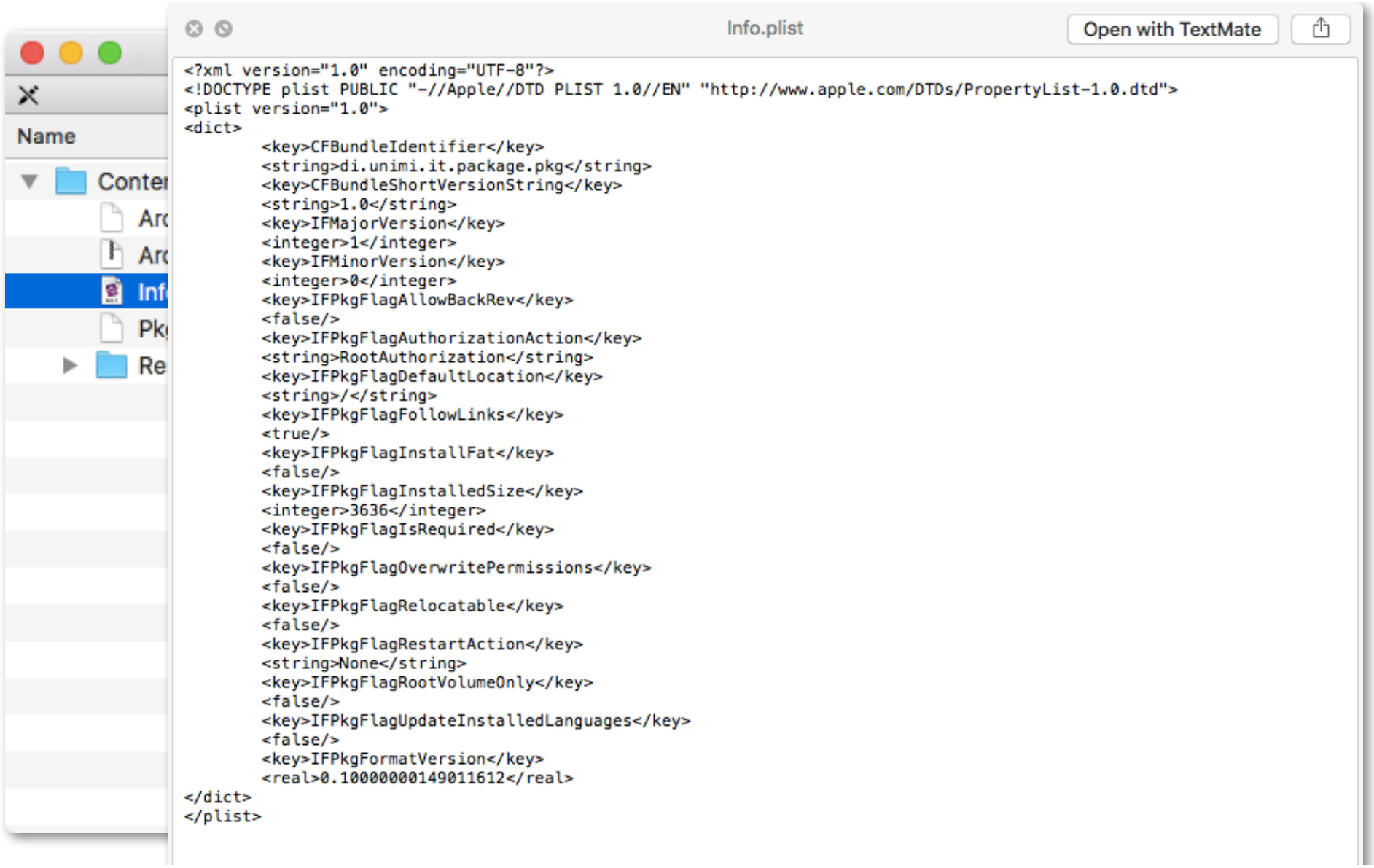

Info.plist
Open with TextMate
Name
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple//DTD PLIST 1.0//EN" "http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
<dict>
<key>CFBundleIdentifier</key>
<string>di.unimi.it.package.pkg</string>
<key>CFBundleShortVersionString</key>
<string>1.0</string>
<key>IFMajorVersion</key>
<integer>1</integer>
<key>IFMinorVersion</key>
<integer>0</integer>
<key>IFPkgFlagAllowBackRev</key>
<false/>
<key>IFPkgFlagAuthorizationAction</key>
<string>RootAuthorization</string>
<key>IFPkgFlagDefaultLocation</key>
<string>/</string>
<key>IFPkgFlagFollowLinks</key>
<true/>
<key>IFPkgFlagInstallFat</key>
<false/>
<key>IFPkgFlagInstalledSize</key>
<integer>3636</integer>
<key>IFPkgFlagIsRequired</key>
<false/>
<key>IFPkgFlagOverwritePermissions</key>
<false/>
<key>IFPkgFlagRelocatable</key>
<false/>
<key>IFPkgFlagRestartAction</key>
<string>None</string>
<key>IFPkgFlagRootVolumeOnly</key>
<false/>
<key>IFPkgFlagUpdateInstalledLanguages</key>
<false/>
<key>IFPkgFormatVersion</key>
<real>0.10000000149011612</real>
</dict>
</plist>

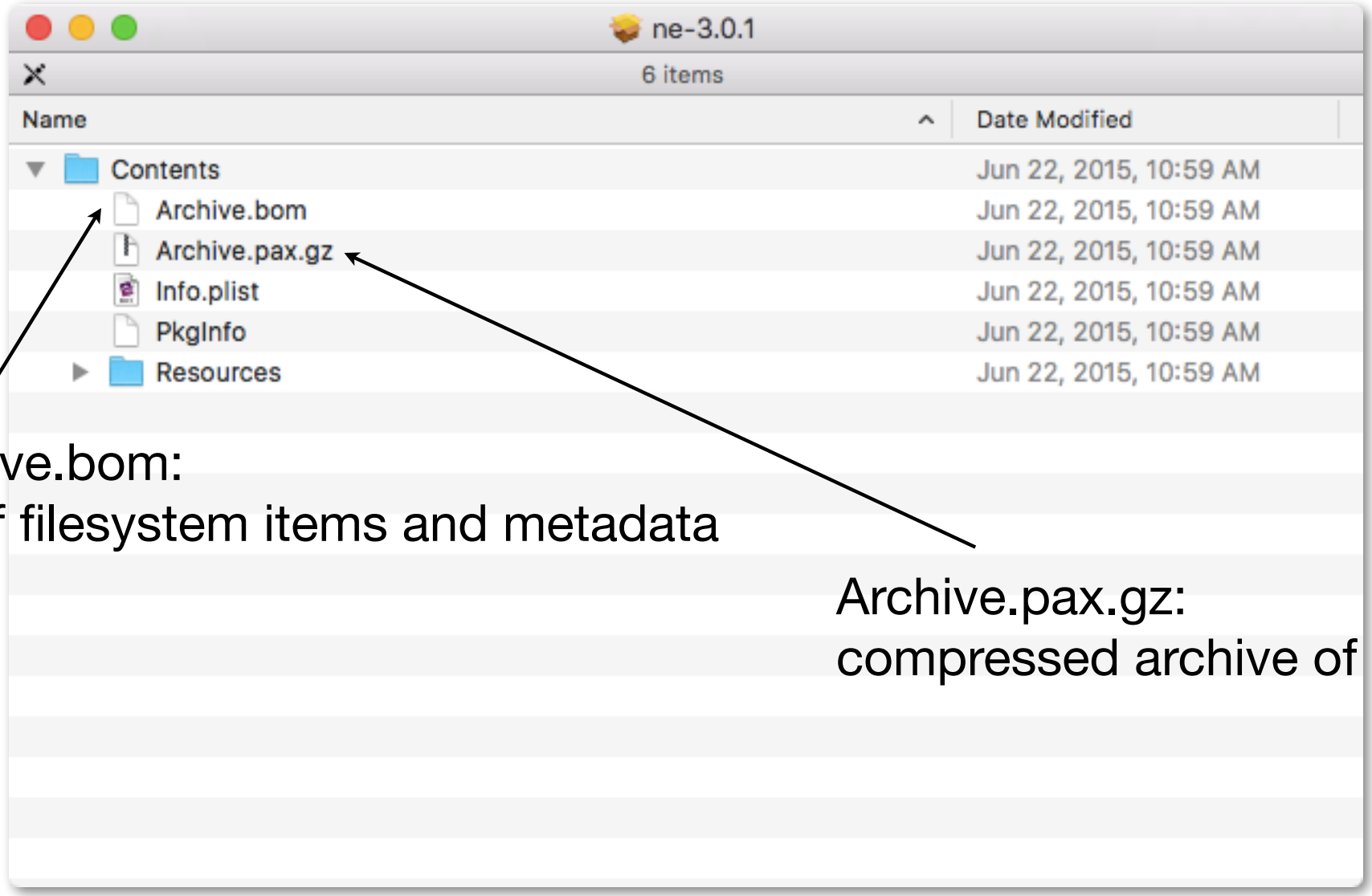
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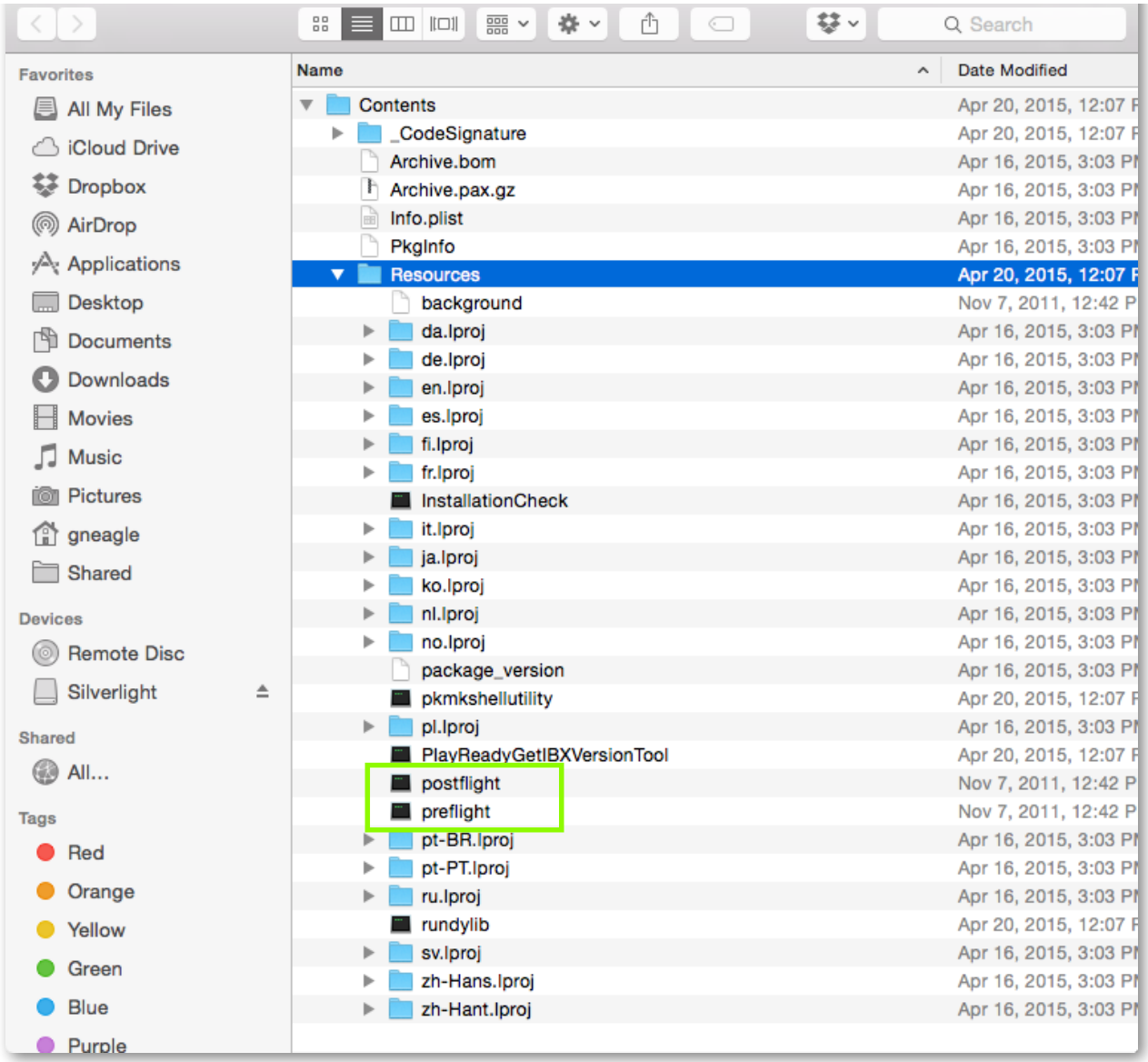
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        <string>1.0</string>
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        <integer>0</integer>
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        <false/>
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        <string>RootAuthorization</string>
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        <false/>
        <key>IFPkgFlagInstalledSize</key>
        <integer>3636</integer>
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        <false/>
        <key>IFPkgFlagOverwritePermissions</key>
        <false/>
        <key>IFPkgFlagRelocatable</key>
        <false/>
        <key>IFPkgFlagRestartAction</key>
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        <real>0.10000000149011612</real>
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<key>IFPkgFlagInstalledSize</key>
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<key>IFPkgFlagRelocatable</key>
<false/>
<key>IFPkgFlagRestartAction</key>
<string>None</string>
<key>IFPkgFlagRootVolumeOnly</key>
<false/>
<key>IFPkgFlagUpdateInstalledLanguages</key>
<false/>
<key>IFPkgFormatVersion</key>
<real>0.10000000149011612</real>
</dict>
</plist>



Archive.bom:
list of filesystem items and metadata

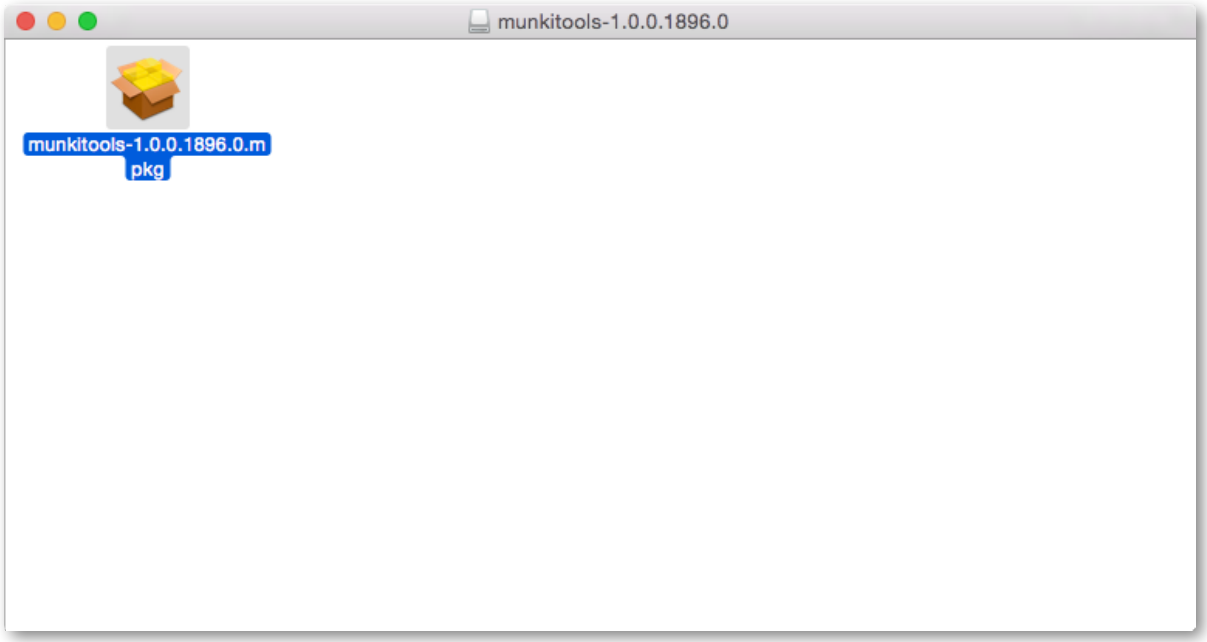
Archive.pax.gz:
compressed archive of files

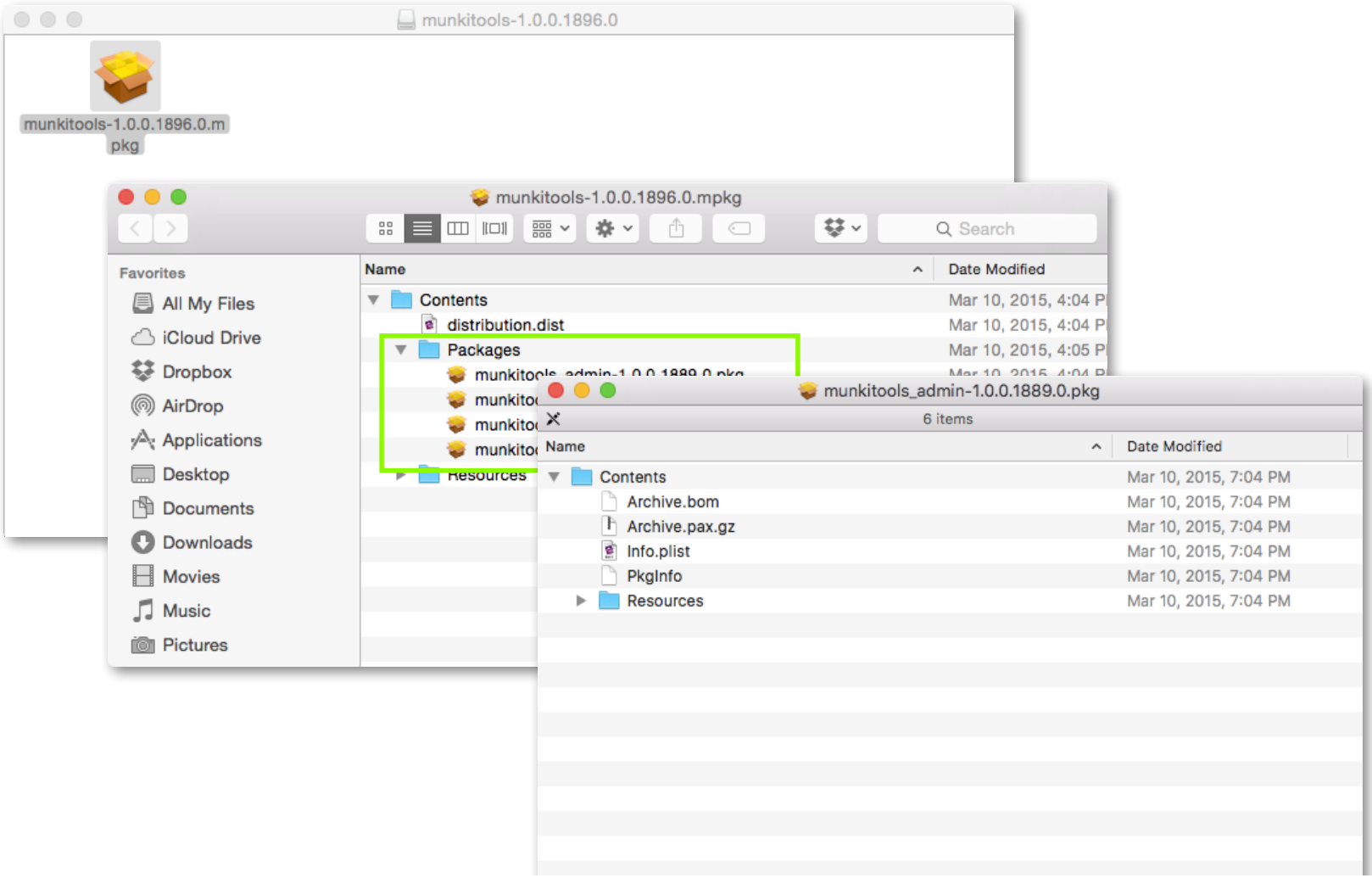

Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
gneagle
Shared
Devices
Remote Disc
Silverlight
Shared
All...
Tags
Red
Orange
Yellow
Green
Blue
Purple
Name
Date Modified
Contents
_CodeSignature
Archive.bom
Archive.pax.gz
Info.plist
PkgInfo
Resources
background
da.lproj
de.lproj
en.lproj
es.lproj
fi.lproj
fr.lproj
InstallationCheck
it.lproj
ja.lproj
ko.lproj
nl.lproj
no.lproj
package_version
pkmkshellutility
pl.lproj
PlayReadyGetIBXVersionTool
postflight
preflight
pt-BR.lproj
pt-PT.lproj
ru.lproj
rundylib
sv.lproj
zh-Hans.lproj
zh-Hant.lproj

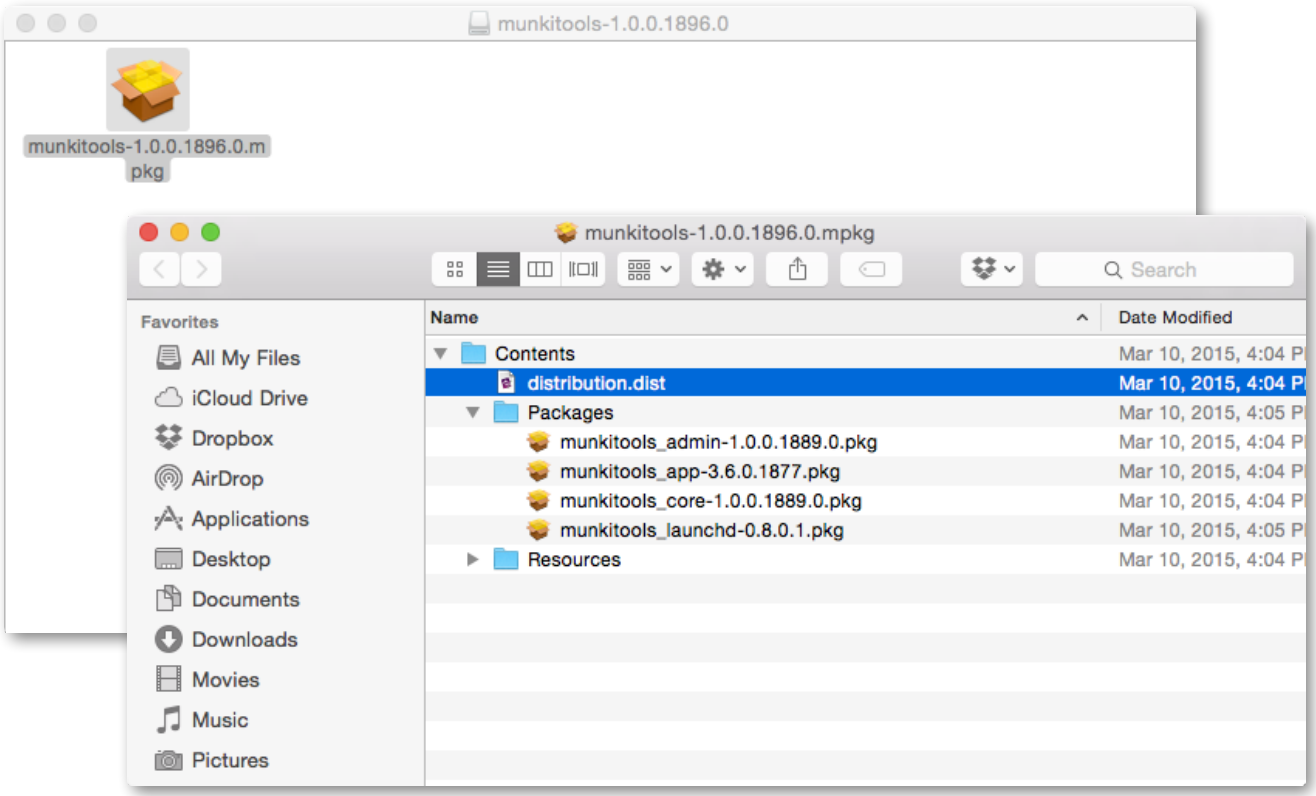
Bundle pkg scripts

- preflight
- preinstall
- preupgrade
- postupgrade
- postinstall
- postflight

Bundle metapackage and distribution pkgs


munkitools-1.0.0.1896.0
munkitools-1.0.0.1896.0.m
pkg


munkitools-1.0.0.1896.0
munkitools-1.0.0.1896.0.mpkg
munkitools-1.0.0.1896.0.mpkg
Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
Name
Date Modified
Contents
Mar 10, 2015, 4:04 P
distribution.dist
Mar 10, 2015, 4:04 P
Packages
Mar 10, 2015, 4:05 P
munkitools_admin-1.0.0.1889.0.pkg
6 items
Name
Date Modified
Contents
Mar 10, 2015, 7:04 PM
Archive.bom
Mar 10, 2015, 7:04 PM
Archive.pax.gz
Mar 10, 2015, 7:04 PM
Info.plist
Mar 10, 2015, 7:04 PM
PkgInfo
Mar 10, 2015, 7:04 PM
Resources
Mar 10, 2015, 7:04 PM


munkitools-1.0.0.1896.0
munkitools-1.0.0.1896.0.mpkg
munkitools-1.0.0.1896.0.mpkg
Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
Name
Date Modified
Contents
Mar 10, 2015, 4:04 P
distribution.dist
Mar 10, 2015, 4:04 P
Packages
Mar 10, 2015, 4:05 P
munkitools_admin-1.0.0.1889.0.pkg
Mar 10, 2015, 4:04 P
munkitools_app-3.6.0.1877.pkg
Mar 10, 2015, 4:04 P
munkitools_core-1.0.0.1889.0.pkg
Mar 10, 2015, 4:04 P
munkitools_launchd-0.8.0.1.pkg
Mar 10, 2015, 4:05 P
Resources
Mar 10, 2015, 4:04 P

```
<?xml version="1.0" encoding="utf-8"?>
<installer-script minSpecVersion="1.000000" authoringTool="com.apple.PackageMaker"
authoringToolVersion="3.0.4" authoringToolBuild="179">
    <title>Munki - Managed software installation for OS X</title>
    <options customize="allow" allow-external-scripts="no"/>
    <domains enable_anywhere="true"/>
    <choices-outline>
        <line choice="core"/>
        <line choice="admin"/>
        <line choice="app"/>
        <line choice="launchd"/>
    </choices-outline>
    <choice id="core" title="Munki core tools" description="Core command-line tools used by
munki.">
        <pkg-ref id="com.googlecode.munki.core"/>
    </choice>
    <choice id="admin" title="Munki admin tools" description="Command-line munki admin tools.">
        <pkg-ref id="com.googlecode.munki.admin"/>
    </choice>
    <choice id="app" title="Managed Software Update" description="Managed Software Update
application.">
        <pkg-ref id="com.googlecode.munki.app"/>
    </choice>
    <choice id="launchd" title="Munki launchd agents" description="Munki launch daemons and launch
agents.">
        <pkg-ref id="com.googlecode.munki.launchd"/>
    </choice>

    <pkg-ref id="com.googlecode.munki.core" installKBytes="588" version="1.0.0.1889.0"
auth="Root">file:./Contents/Packages/munkitools_core-1.0.0.1889.0.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.admin" installKBytes="132" version="1.0.0.1889.0"
```

```
    <choice id="app" title="Managed Software Update" description="Managed Software Update
application.">
        <pkg-ref id="com.googlecode.munki.app"/>
    </choice>
    <choice id="launchd" title="Munki launchd agents" description="Munki launch daemons and launch
agents.">
        <pkg-ref id="com.googlecode.munki.launchd"/>
    </choice>

    <pkg-ref id="com.googlecode.munki.core" installKBytes="588" version="1.0.0.1889.0"
auth="Root">file:./Contents/Packages/munkitools_core-1.0.0.1889.0.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.admin" installKBytes="132" version="1.0.0.1889.0"
auth="Root">file:./Contents/Packages/munkitools_admin-1.0.0.1889.0.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.app" installKBytes="1520" version="3.6.0.1877"
auth="Root">file:./Contents/Packages/munkitools_app-3.6.0.1877.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.launchd" installKBytes="32" version="1.0.0.1889.0"
auth="Root" onConclusion="RequireRestart">file:./Contents/Packages/munkitools_launchd-0.8.0.1.pkg</
pkg-ref>

</installer-script>
```

```
    <choice id="app" title="Managed Software Update" description="Managed Software Update
application.">
        <pkg-ref id="com.googlecode.munki.app"/>
    </choice>
    <choice id="launchd" title="Munki launchd agents" description="Munki launch daemons and launch
agents.">
        <pkg-ref id="com.googlecode.munki.launchd"/>
    </choice>

    <pkg-ref id="com.googlecode.munki.core" installKBytes="588" version="1.0.0.1889.0"
auth="Root">file:./Contents/Packages/munkitools_core-1.0.0.1889.0.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.admin" installKBytes="132" version="1.0.0.1889.0"
auth="Root">file:./Contents/Packages/munkitools_admin-1.0.0.1889.0.pkg</pkg-ref>
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auth="Root">file:./Contents/Packages/munkitools_app-3.6.0.1877.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.launchd" installKBytes="32" version="1.0.0.1889.0"
auth="Root" onConclusion="RequireRestart">file:./Contents/Packages/munkitools_launchd-0.8.0.1.pkg</
pkg-ref>

</installer-script>
```

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    <choice id="app" title="Managed Software Update" description="Managed Software Update
application.">
        <pkg-ref id="com.googlecode.munki.app"/>
    </choice>
    <choice id="launchd" title="Munki launchd agents" description="Munki launch daemons and launch
agents.">
        <pkg-ref id="com.googlecode.munki.launchd"/>
    </choice>

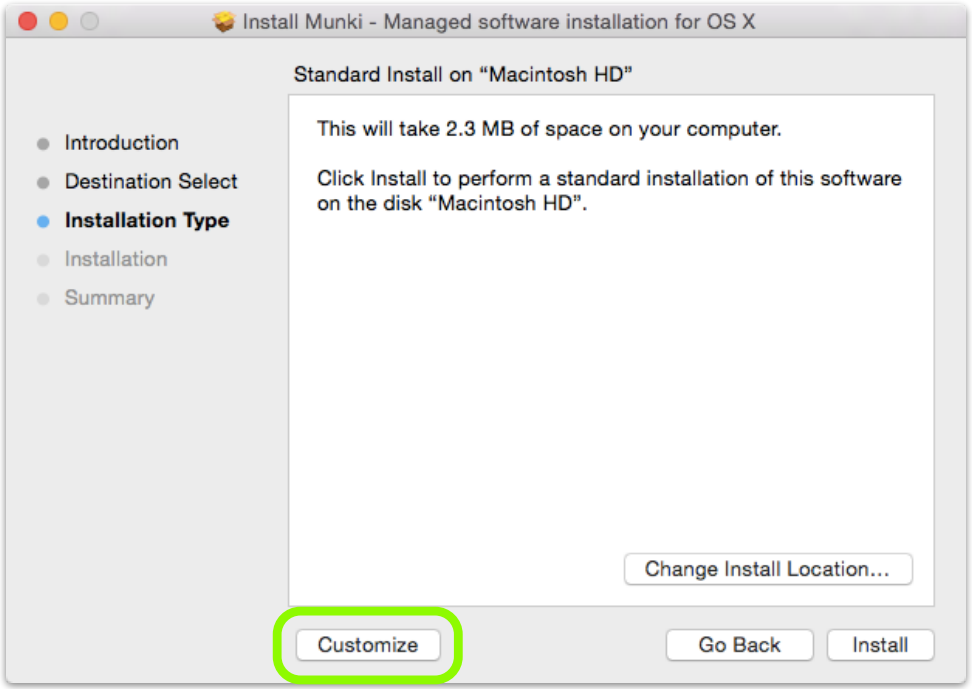
    <pkg-ref id="com.googlecode.munki.core" installKBytes="588" version="1.0.0.1889.0"
auth="Root">file:./Contents/Packages/munkitools_core-1.0.0.1889.0.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.admin" installKBytes="132" version="1.0.0.1889.0"
auth="Root">file:./Contents/Packages/munkitools_admin-1.0.0.1889.0.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.app" installKBytes="1520" version="3.6.0.1877"
auth="Root">file:./Contents/Packages/munkitools_app-3.6.0.1877.pkg</pkg-ref>
    <pkg-ref id="com.googlecode.munki.launchd" installKBytes="32" version="1.0.0.1889.0"
auth="Root" onConclusion="RequireRestart">file:./Contents/Packages/munkitools_launchd-0.8.0.1.pkg</
pkg-ref>

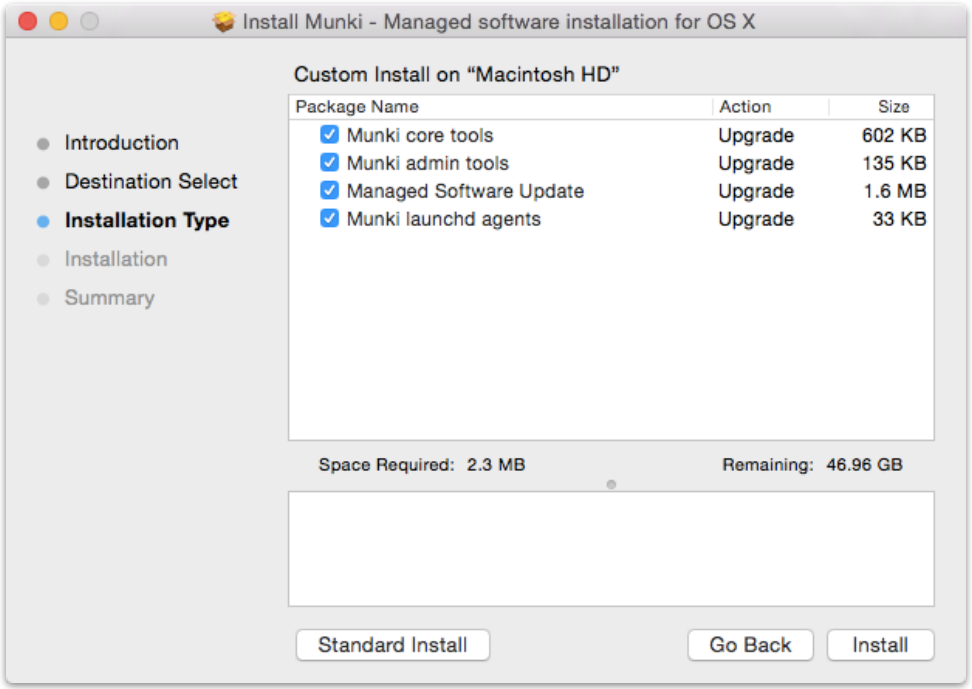
</installer-script>
```

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    <choice id="app" title="Managed Software Update" description="Managed Software Update
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        <pkg-ref id="com.googlecode.munki.app"/>
    </choice>
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        <pkg-ref id="com.googlecode.munki.launchd"/>
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    <pkg-ref id="com.googlecode.munki.launchd" installKBytes="32" version="1.0.0.1889.0"
auth="Root" onConclusion="RequireRestart">file:./Contents/Packages/munkitools_launchd-0.8.0.1.pkg</
pkg-ref>

</installer-script>
```


Install Munki - Managed software installation for OS X
Standard Install on “Macintosh HD”
Introduction
Destination Select
Installation Type
Installation
Summary
This will take 2.3 MB of space on your computer.
Click Install to perform a standard installation of this software on the disk “Macintosh HD”.
Change Install Location…
Customize
Go Back
Install


Install Munki - Managed software installation for OS X
Introduction
Destination Select
Installation Type
Installation
Summary
Custom Install on "Macintosh HD"
Package Name
Action
Size
Munki core tools
Upgrade
602 KB
Munki admin tools
Upgrade
135 KB
Managed Software Update
Upgrade
1.6 MB
Munki launchd agents
Upgrade
33 KB
Space Required: 2.3 MB
Remaining: 46.96 GB
Standard Install
Go Back
Install

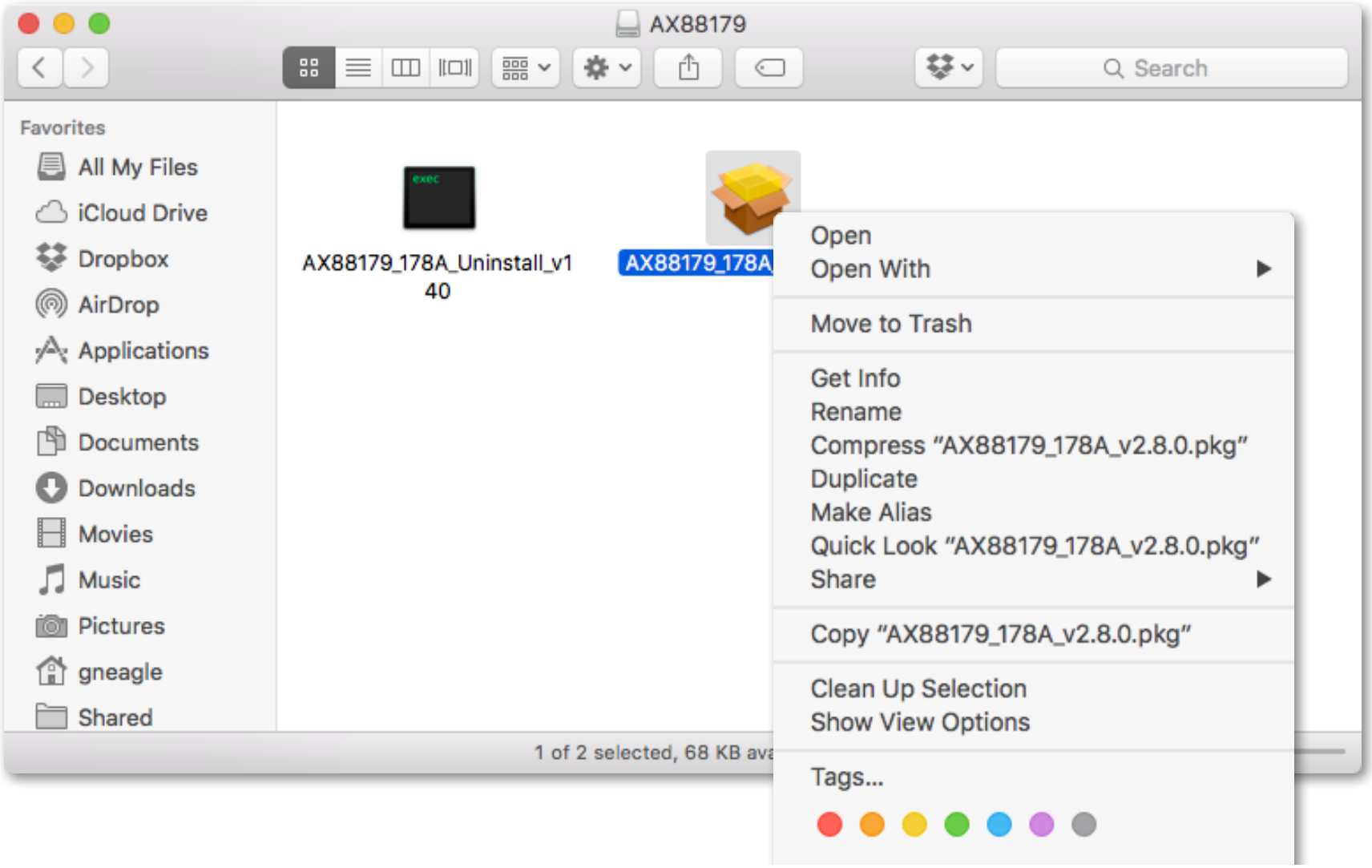
Flat packages

Flat packages

- Introduced in Mac OS X 10.5 Leopard
- "Flat" because they are a single file

Flat packages

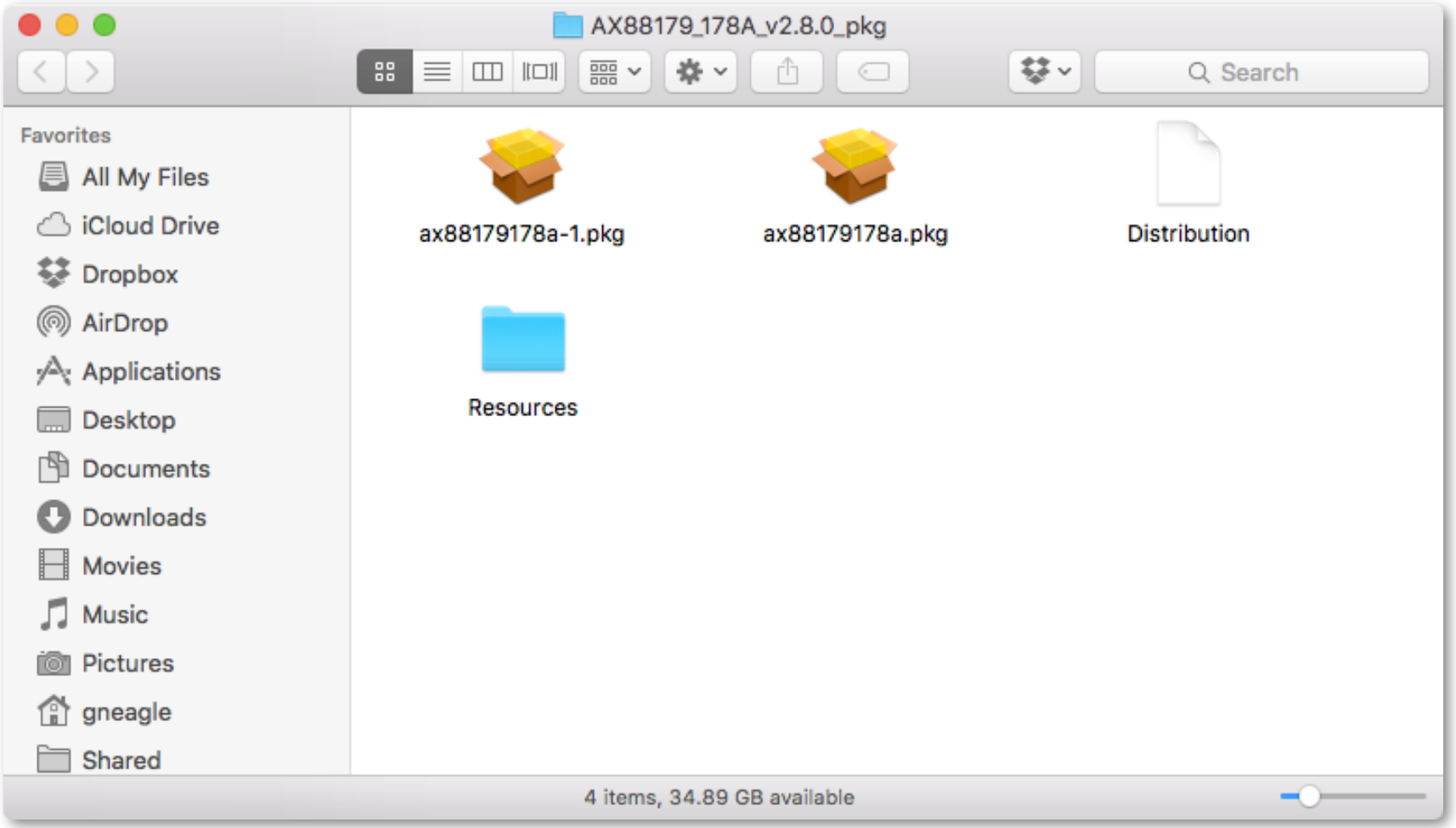
- Component pkgs
- Distribution pkgs


AX88179
Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
gneagle
Shared
exec
AX88179_178A_Uninstall_v140
AX88179_178A
Open
Open With
Move to Trash
Get Info
Rename
Compress "AX88179_178A_v2.8.0.pkg"
Duplicate
Make Alias
Quick Look "AX88179_178A_v2.8.0.pkg"
Share
Copy "AX88179_178A_v2.8.0.pkg"
Clean Up Selection
Show View Options
Tags...
1 of 2 selected, 68 KB ava

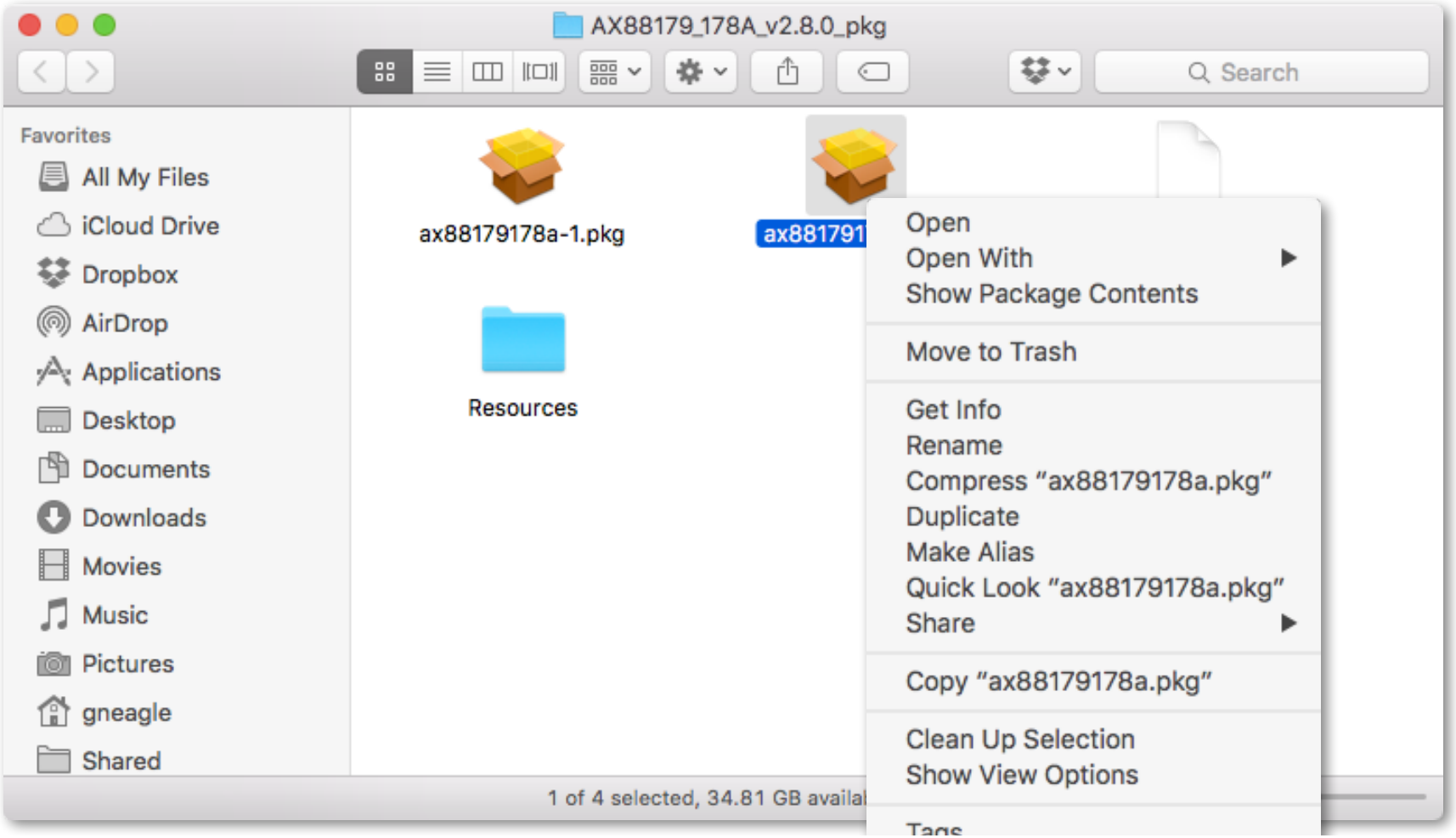
pkgutil --expand

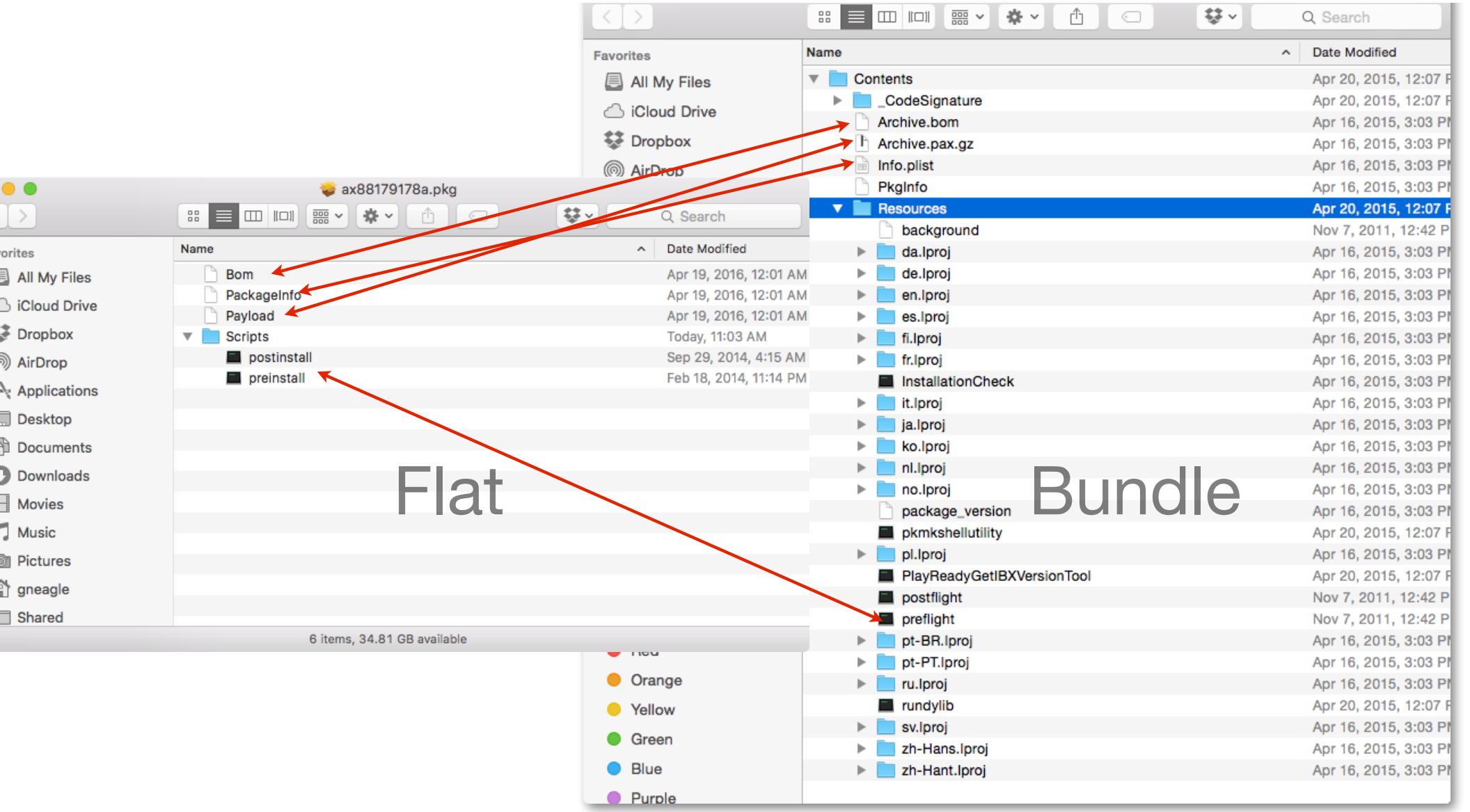
```
% pkgutil --expand /Volumes/AX88179/AX88179_178A_v2.8.0.pkg /tmp/AX88179_178A_v2.8.0_pkg
% open /tmp/AX88179_178A_v2.8.0_pkg
```

Flat distribution package



Flat distribution package




ax88179178a.pkg
Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
gneagle
Shared
Name
Date Modified
Bom
PackageInfo
Payload
Scripts
postinstall
preinstall
Apr 19, 2016, 12:01 AM
Today, 11:03 AM
Sep 29, 2014, 4:15 AM
Feb 18, 2014, 11:14 PM
6 items, 34.81 GB available
Flat
Contents
_CodeSignature
Archive.bom
Archive.pax.gz
Info.plist
PkgInfo
Resources
background
da.lproj
de.lproj
en.lproj
es.lproj
fi.lproj
fr.lproj
InstallationCheck
it.lproj
ja.lproj
ko.lproj
nl.lproj
no.lproj
package_version
pkmkshellutility
pl.lproj
PlayReadyGetIBXVersionTool
postflight
preflight
pt-BR.lproj
pt-PT.lproj
ru.lproj
rundylib
sv.lproj
zh-Hans.lproj
zh-Hant.lproj
Apr 20, 2015, 12:07 PM
Apr 16, 2015, 3:03 PM
Nov 7, 2011, 12:42 PM
Apr 20, 2015, 12:07 PM
Bundle
Orange
Yellow
Green
Blue
Purple

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/PackageInfo

<pkg-info format-version="2" identifier="com.asix.pkg.ax88179-178a-10.9"
version="2.8.0" install-location="/Library/Extensions" auth="root" postinstall-
action="restart">
    <payload installKBytes="104" numberOfFiles="11"/>
    <scripts>
        <preinstall file="./preinstall"/>
        <postinstall file="./postinstall"/>
    </scripts>
    <bundle id="com.asix.driver.ax88179-178a"
CFBundleIdentifier="com.asix.driver.ax88179-178a" path="./AX88179_178A.kext"
CFBundleVersion="1.8.0"/>
    <bundle-version>
        <bundle id="com.asix.driver.ax88179-178a"/>
    </bundle-version>
</pkg-info>
```

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/PackageInfo

<pkg-info format-version="2" identifier="com.asix.pkg.ax88179-178a-10.9"
version="2.8.0" install-location="/Library/Extensions" auth="root" postinstall-
action="restart">
    <payload installKBytes="104" numberOfFiles="11"/>
    <scripts>
        <preinstall file="./preinstall"/>
        <postinstall file="./postinstall"/>
    </scripts>
    <bundle id="com.asix.driver.ax88179-178a"
CFBundleIdentifier="com.asix.driver.ax88179-178a" path="./AX88179_178A.kext"
CFBundleVersion="1.8.0"/>
    <bundle-version>
        <bundle id="com.asix.driver.ax88179-178a"/>
    </bundle-version>
</pkg-info>
```

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/PackageInfo

<pkg-info format-version="2" identifier="com.asix.pkg.ax88179-178a-10.9"
version="2.8.0" install-location="/Library/Extensions" auth="root" postinstall-
action="restart">
    <payload installKBytes="104" numberOfFiles="11"/>
    <scripts>
        <preinstall file="./preinstall"/>
        <postinstall file="./postinstall"/>
    </scripts>
    <bundle id="com.asix.driver.ax88179-178a"
CFBundleIdentifier="com.asix.driver.ax88179-178a" path="./AX88179_178A.kext"
CFBundleVersion="1.8.0"/>
    <bundle-version>
        <bundle id="com.asix.driver.ax88179-178a"/>
    </bundle-version>
</pkg-info>
```

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/PackageInfo

<pkg-info format-version="2" identifier="com.asix.pkg.ax88179-178a-10.9"
version="2.8.0" install-location="/Library/Extensions" auth="root" postinstall-
action="restart">
    <payload installKBytes="104" numberOfFiles="11"/>
    <scripts>
        <preinstall file="./preinstall"/>
        <postinstall file="./postinstall"/>
    </scripts>
    <bundle id="com.asix.driver.ax88179-178a"
CFBundleIdentifier="com.asix.driver.ax88179-178a" path="./AX88179_178A.kext"
CFBundleVersion="1.8.0"/>
    <bundle-version>
        <bundle id="com.asix.driver.ax88179-178a"/>
    </bundle-version>
</pkg-info>
```

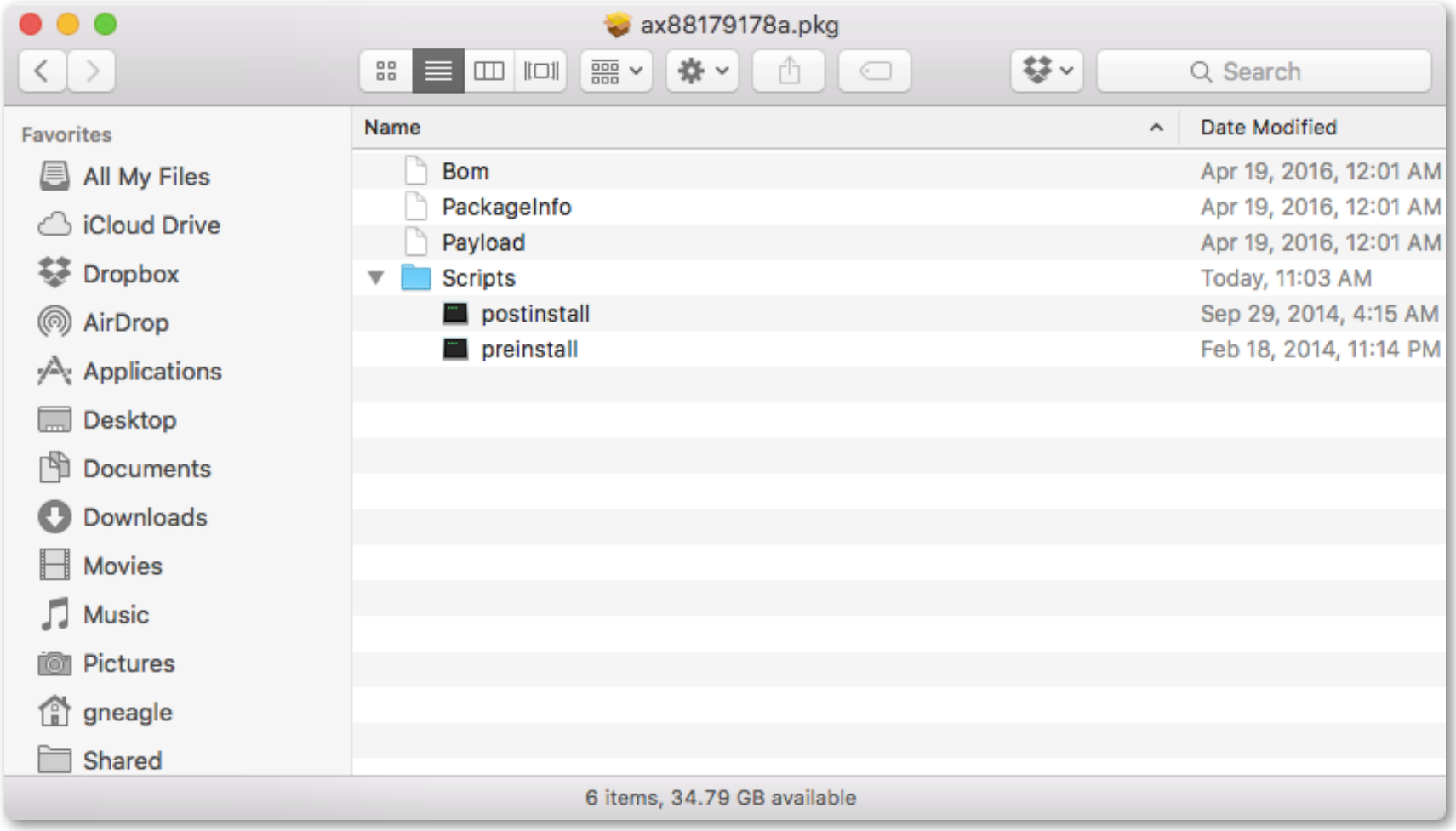
```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/PackageInfo

<pkg-info format-version="2" identifier="com.asix.pkg.ax88179-178a-10.9"
version="2.8.0" install-location="/Library/Extensions" auth="root" postinstall-
action="restart">
    <payload installKBytes="104" numberOfFiles="11"/>
    <scripts>
        <preinstall file="./preinstall"/>
        <postinstall file="./postinstall"/>
    </scripts>
    <bundle id="com.asix.driver.ax88179-178a"
CFBundleIdentifier="com.asix.driver.ax88179-178a" path="./AX88179_178A.kext"
CFBundleVersion="1.8.0"/>
    <bundle-version>
        <bundle id="com.asix.driver.ax88179-178a"/>
    </bundle-version>
</pkg-info>
```

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/PackageInfo

<pkg-info format-version="2" identifier="com.asix.pkg.ax88179-178a-10.9"
version="2.8.0" install-location="/Library/Extensions" auth="root" postinstall-
action="restart">
    <payload installKBytes="104" numberOfFiles="11"/>
    <scripts>
        <preinstall file="./preinstall"/>
        <postinstall file="./postinstall"/>
    </scripts>
    <bundle id="com.asix.driver.ax88179-178a"
CFBundleIdentifier="com.asix.driver.ax88179-178a" path="./AX88179_178A.kext"
CFBundleVersion="1.8.0"/>
    <bundle-version>
        <bundle id="com.asix.driver.ax88179-178a"/>
    </bundle-version>
</pkg-info>
```

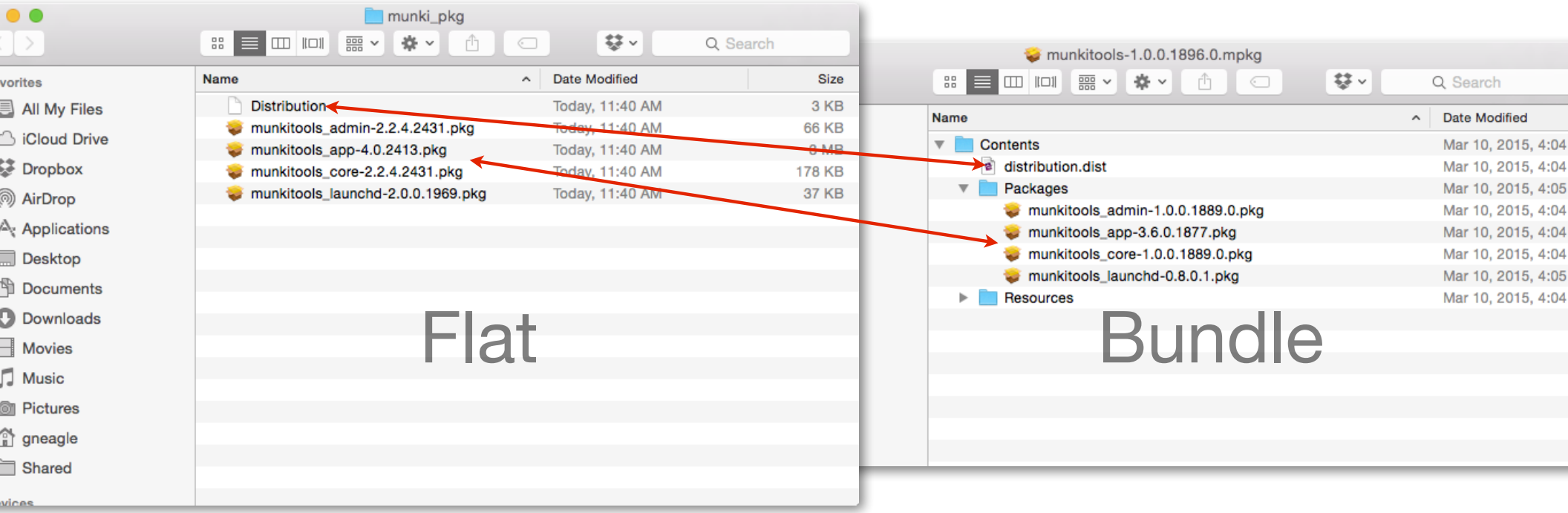
Flat component package



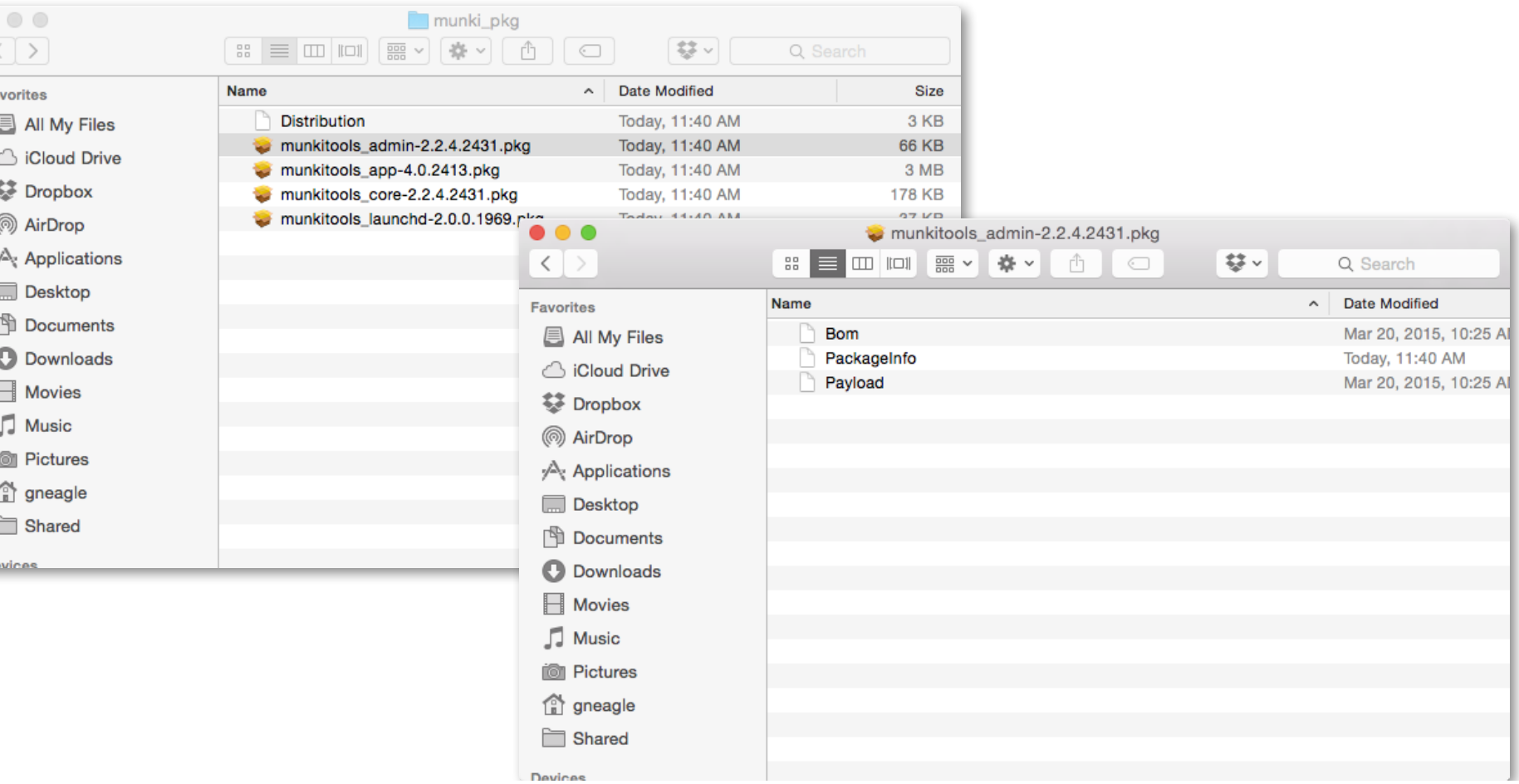
Flat pkg scripts

- ~~preflight~~
- preinstall
- ~~preupgrade~~
- ~~postupgrade~~
- postinstall
- ~~postflight~~

Distribution packages

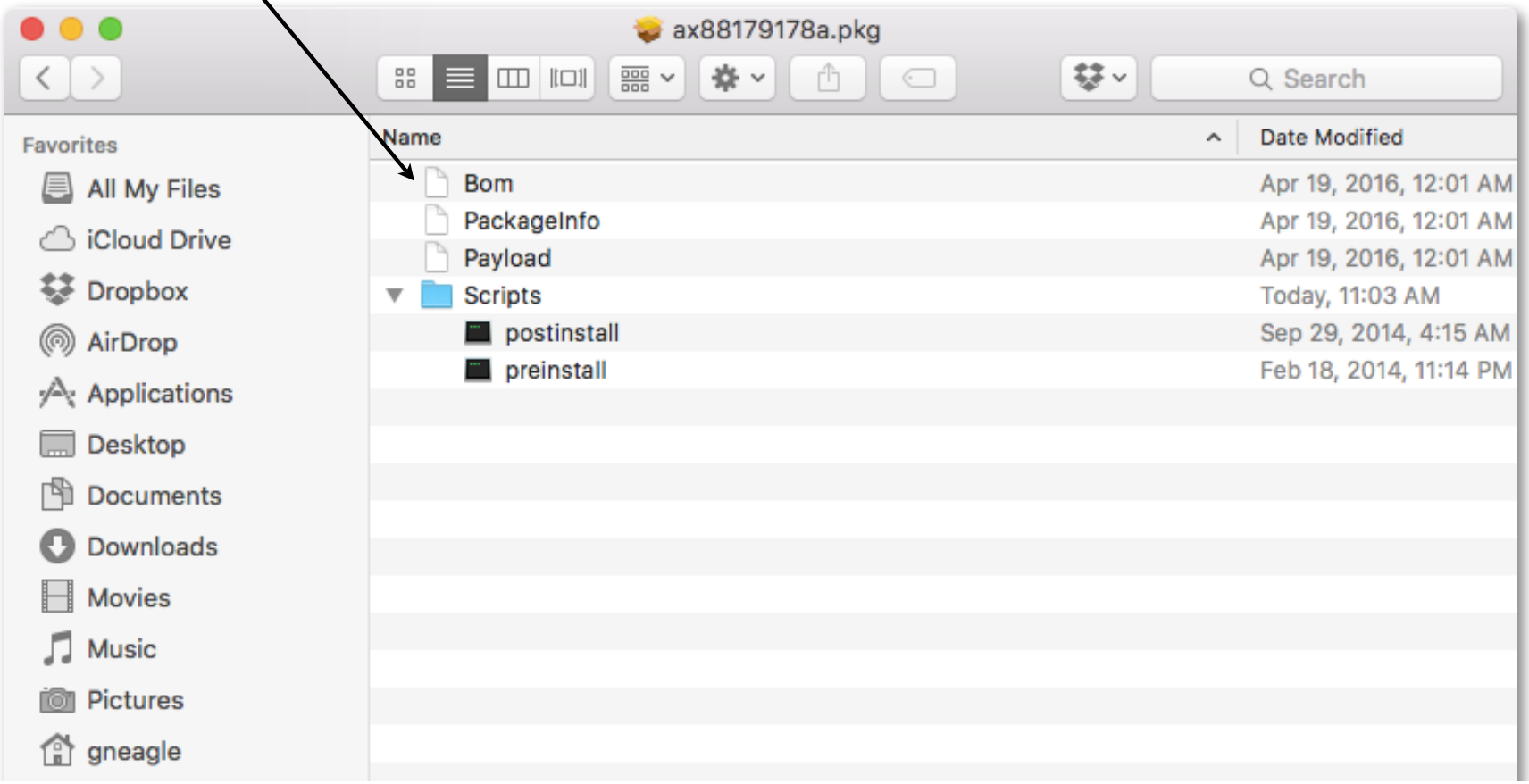


Distribution packages



Examining a pkg archive

Bom/Archive.bom:
list of filesystem items and metadata



lsbom

The archive contains information about location, kind, owner, group, and mode of each file and directory.

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

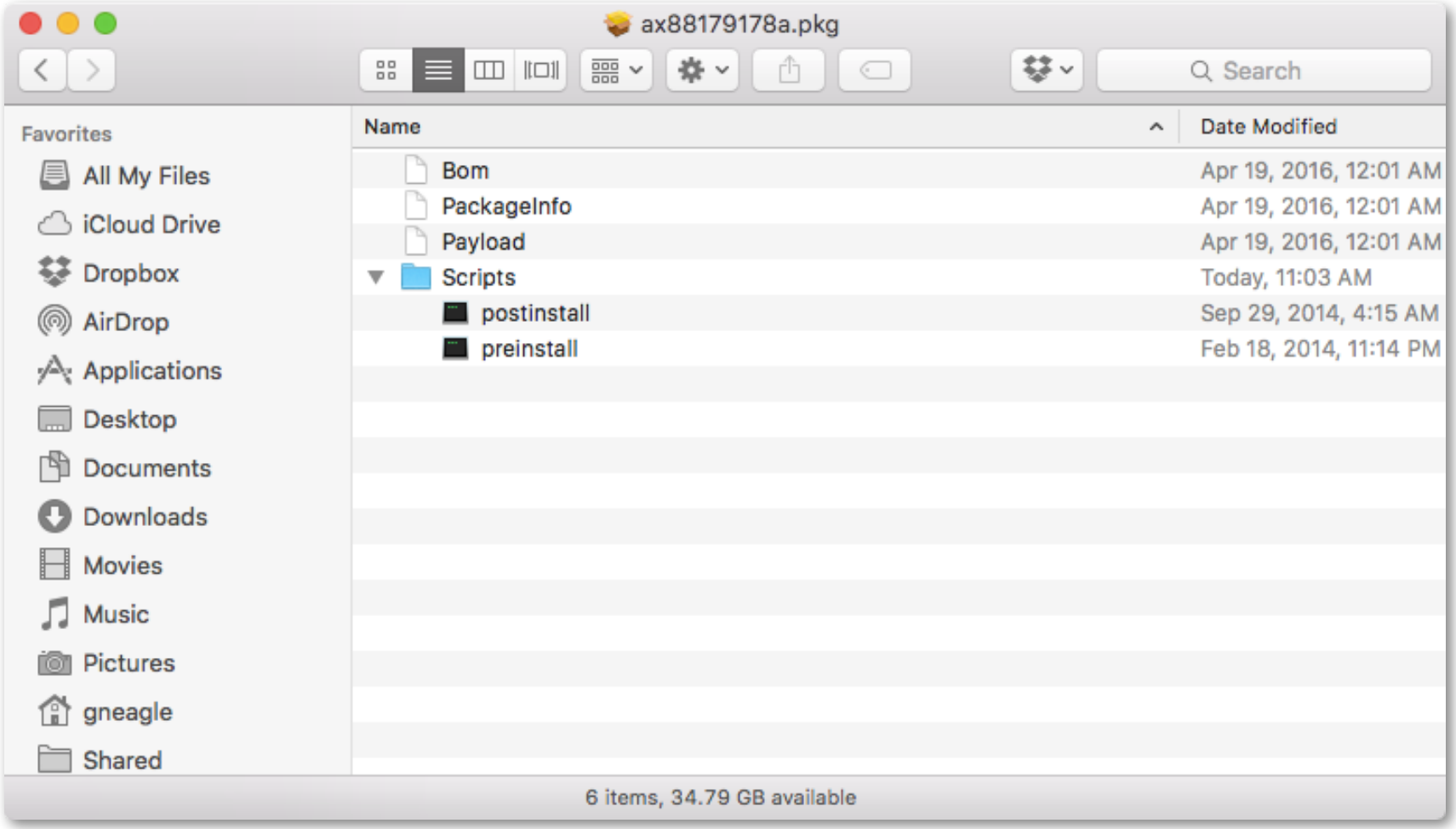
```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/PackageInfo

<pkg-info format-version="2" identifier="com.asix.pkg.ax88179-178a-10.9"
version="2.8.0" install-location="/Library/Extensions" auth="root" postinstall-
action="restart">
    <payload installKBytes="104" numberOfFiles="11"/>
    <scripts>
        <preinstall file="./preinstall"/>
        <postinstall file="./postinstall"/>
    </scripts>
    <bundle id="com.asix.driver.ax88179-178a"
CFBundleIdentifier="com.asix.driver.ax88179-178a" path="./AX88179_178A.kext"
CFBundleVersion="1.8.0"/>
    <bundle-version>
        <bundle id="com.asix.driver.ax88179-178a"/>
    </bundle-version>
</pkg-info>
```

```
% ls -al /Library/Extensions/AX88179_178A.kext
total 0
drwxr-xr-x   3 root  wheel  102 Dec 25  2015 .
drwxr-xr-x  16 root  wheel  544 Jun  3 14:48 ..
drwxr-xr-x   6 root  wheel  204 Dec 25  2015 Contents
```

```
% lsbom /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Bom
. 40700 501/0
./AX88179_178A.kext 40755 501/20
./AX88179_178A.kext/Contents 40755 501/20
./AX88179_178A.kext/Contents/Info.plist 100644 501/20 4882 2338734375
./AX88179_178A.kext/Contents/MacOS 40755 501/20
./AX88179_178A.kext/Contents/MacOS/AX88179_178A 100755 501/20 88528 1035438097
./AX88179_178A.kext/Contents/Resources 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj 40755 501/20
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings 100644 501/20 152 221771084
./AX88179_178A.kext/Contents/_CodeSignature 40755 501/20
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources 100644 501/20 2370 1632215908
```

A package may also
optionally run some scripts.


ax88179178a.pkg
Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
gneagle
Shared
Name
Date Modified
Bom
Apr 19, 2016, 12:01 AM
PackageInfo
Apr 19, 2016, 12:01 AM
Payload
Apr 19, 2016, 12:01 AM
Scripts
Today, 11:03 AM
postinstall
Sep 29, 2014, 4:15 AM
preinstall
Feb 18, 2014, 11:14 PM
6 items, 34.79 GB available

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Scripts/postinstall
#!/bin/sh
#filename:autopack.sh

if [ -d  /System/Library/Extensions/IONetworkingFamily.kext/Contents/PlugIns/
AX88179_178A.kext ]; then
sudo chown -R root:wheel /System/Library/Extensions/IONetworkingFamily.kext/Contents/PlugIns/
AX88179_178A.kext
sudo chmod 755 /System/Library/Extensions/IONetworkingFamily.kext/Contents/PlugIns/
AX88179_178A.kext/Contents/MacOS/AX88179_178A
fi

if [ -d  /Library/Extensions/AX88179_178A.kext ]; then
sudo chown -R root:wheel /Library/Extensions/AX88179_178A.kext
sudo chmod 755 /Library/Extensions/AX88179_178A.kext/Contents/MacOS/AX88179_178A
fi

sudo touch /System/Library/Extensions
```

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/ax88179178a.pkg/Scripts/postinstall
#!/bin/sh
#filename:autopack.sh

if [ -d  /System/Library/Extensions/IONetworkingFamily.kext/Contents/PlugIns/
AX88179_178A.kext ]; then
sudo chown -R root:wheel /System/Library/Extensions/IONetworkingFamily.kext/Contents/PlugIns/
AX88179_178A.kext
sudo chmod 755 /System/Library/Extensions/IONetworkingFamily.kext/Contents/PlugIns/
AX88179_178A.kext/Contents/MacOS/AX88179_178A
fi

if [ -d  /Library/Extensions/AX88179_178A.kext ]; then
sudo chown -R root:wheel /Library/Extensions/AX88179_178A.kext
sudo chmod 755 /Library/Extensions/AX88179_178A.kext/Contents/MacOS/AX88179_178A
fi

sudo touch /System/Library/Extensions
```

The archive contains information about location, kind, owner, group, and mode of each file and directory.

More info

```
% pkgutil --payload-files /Volumes/AX88179/AX88179_178A_v2.8.0.pkg
.
./AX88179_178A.kext
./AX88179_178A.kext/Contents
./AX88179_178A.kext/Contents/_CodeSignature
./AX88179_178A.kext/Contents/_CodeSignature/CodeResources
./AX88179_178A.kext/Contents/Info.plist
./AX88179_178A.kext/Contents/MacOS
./AX88179_178A.kext/Contents/MacOS/AX88179_178A
./AX88179_178A.kext/Contents/Resources
./AX88179_178A.kext/Contents/Resources/en.lproj
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings
.
./AX88179_178A.kext
./AX88179_178A.kext/Contents
./AX88179_178A.kext/Contents/Info.plist
./AX88179_178A.kext/Contents/MacOS
./AX88179_178A.kext/Contents/MacOS/AX88179_178A
./AX88179_178A.kext/Contents/Resources
./AX88179_178A.kext/Contents/Resources/en.lproj
./AX88179_178A.kext/Contents/Resources/en.lproj/InfoPlist.strings
```

```
% cat /tmp/AX88179_178A_v2.8.0_pkg/Distribution
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<installer-script minSpecVersion="1.000000" authoringTool="com.apple.PackageMaker"
authoringToolVersion="3.0.6" authoringToolBuild="201">
    <title>AX88179/178A USB3.0/2.0 Gigabit Ethernet Adapter Driver</title>
    <options customize="allow" allow-external-scripts="no"/>
    <domains enable_localSystem="true"/>
    <script>
function pm_choice3_selected() {
  result = true;
  result = result &amp;&amp; (/* &gt;= */
system.compareVersions(system.version.ProductVersion, '10.9.0') &gt;= 0);
  return result;
}


function pm_choice3_enabled() {
  result = true;
  result = result &amp;&amp; (/* &gt;= */
system.compareVersions(system.version.ProductVersion, '10.9.0') &gt;= 0);
  return result;
}
```

```
}</script>
    <choices-outline>
        <line choice="choice3"/>
        <line choice="choice58"/>
    </choices-outline>
    <choice id="choice3" title="OS X 10.9 to 10.11 driver " description="AX88179/178A
Macintosh 10.9 to 10.11 Driver v1.8.0" start_enabled="false" selected="pm_choice3_selected()"
enabled="pm_choice3_enabled()">
        <pkg-ref id="com.asix.pkg.ax88179-178a-10.9"/>
    </choice>
    <choice id="choice58" title="OS X 10.6 to 10.8 driver" description="AX88179/178A Macintosh
10.6 to 10.8 Driver v1.11.0" start_enabled="false" selected="pm_choice58_selected()"
enabled="pm_choice58_enabled()">
        <pkg-ref id="com.asix.pkg.ax88179-178a-10.8"/>
    </choice>
    <pkg-ref id="com.asix.pkg.ax88179-178a-10.9" installKBytes="104" version="2.8.0"
auth="Root" onConclusion="RequireRestart">#ax88179178a.pkg</pkg-ref>
    <pkg-ref id="com.asix.pkg.ax88179-178a-10.8" installKBytes="176" version="2.8.0"
auth="Root" onConclusion="RequireRestart">#ax88179178a-1.pkg</pkg-ref>
</installer-script>
```

```
}</script>
    <choices-outline>
        <line choice="choice3"/>
        <line choice="choice58"/>
    </choices-outline>
    <choice id="choice3" title="OS X 10.9 to 10.11 driver " description="AX88179/178A
Macintosh 10.9 to 10.11 Driver v1.8.0" start_enabled="false" selected="pm_choice3_selected()"
enabled="pm_choice3_enabled()">
        <pkg-ref id="com.asix.pkg.ax88179-178a-10.9"/>
    </choice>
    <choice id="choice58" title="OS X 10.6 to 10.8 driver" description="AX88179/178A Macintosh
10.6 to 10.8 Driver v1.11.0" start_enabled="false" selected="pm_choice58_selected()"
enabled="pm_choice58_enabled()">
        <pkg-ref id="com.asix.pkg.ax88179-178a-10.8"/>
    </choice>
    <pkg-ref id="com.asix.pkg.ax88179-178a-10.9" installKBytes="104" version="2.8.0"
auth="Root" onConclusion="RequireRestart">#ax88179178a.pkg</pkg-ref>
    <pkg-ref id="com.asix.pkg.ax88179-178a-10.8" installKBytes="176" version="2.8.0"
auth="Root" onConclusion="RequireRestart">#ax88179178a-1.pkg</pkg-ref>
</installer-script>
```

Package audit exercise

Examine the contents of the Adobe Reader DC package* and answer these questions:

- What are the component packages inside the distribution package?
- Which component packages include scripts?
- What are the install-locations for the component packages?

*AcroRdrDC_1501620039_MUI.pkg, in the AcroRdrDC_1501620039_MUI.dmg

Examine the contents of the Adobe Reader DC package and answer these questions:

- What are the component packages inside the distribution package?

```
% pkgutil --expand /Volumes/AcroRdrDC_1501620039_MUI/AcroRdrDC_1501620039_MUI.pkg /tmp/AdobeReader_pkg
% ls /tmp/AdobeReader_pkg
Distribution            Resources               armagent.pkg            support.pkg
RdrServicesUpdater.pkg  application.pkg         browser.pkg
```

```
% ls /tmp/AdobeReader_pkg | grep .pkg
RdrServicesUpdater.pkg
application.pkg
armagent.pkg
browser.pkg
support.pkg
```

Examine the contents of the Adobe Reader DC package and answer these questions:

- Which component packages include scripts?

```
% ls /tmp/AdobeReader_pkg/RdrServicesUpdater.pkg
Bom         PackageInfo Payload     Scripts
% ls /tmp/AdobeReader_pkg/application.pkg
Bom         PackageInfo Payload     Scripts
% ls /tmp/AdobeReader_pkg/armagent.pkg
Bom         PackageInfo Payload     Scripts
% ls /tmp/AdobeReader_pkg/browser.pkg
Bom         PackageInfo Payload     Scripts
% ls /tmp/AdobeReader_pkg/support.pkg
Bom         PackageInfo Payload
```

Examine the contents of the Adobe Reader DC package and answer these questions:

- What are the install-locations for the component packages?

```
% cat /tmp/AdobeReader_pkg/RdrServicesUpdater.pkg/PackageInfo
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<pkg-info overwrite-permissions="true" relocatable="false"
identifier="com.adobe.RdrServicesUpdater" postinstall-action="none" version="0" format-version="2"
generator-version="InstallCmds-554 (15C50)" install-location="/tmp/webinstaller" auth="root">
    <payload numberOfFiles="10" installKBytes="11601"/>
    <bundle id="com.adobe.AdobeRNAWebInstaller" CFBundleVersion="15.016.20039" path="./
RdrServicesUpdater.app"/>
    <bundle-version/>
    <upgrade-bundle>
        <bundle id="com.adobe.AdobeRNAWebInstaller"/>
    </upgrade-bundle>
    <update-bundle/>
    <atomic-update-bundle/>
    <strict-identifier>
        <bundle id="com.adobe.AdobeRNAWebInstaller"/>
```

Examine the contents of the Adobe Reader package and answer these questions:

- What are the install-locations for the component packages?

```
RdrServicesUpdater.pkg: /tmp/webinstaller
application.pkg:        /Applications
armagent.pkg:           /tmp/com.adobe.AcrobatRefreshManager
browser.pkg:            /Library/Internet Plug-Ins
support.pkg:            /Library/Application Support
```

Apple packaging tools

pkgutil

Query and manipulate OS X Installer packages and receipts.

pkgutil

Receipt database commands:

--pkgs

--pkg-info

--files

--file-info

--forget

pkgutil --pkgs

```
% pkgutil --pkgs
adobe.adobeShockwavePlayer.shockwave11.pkg
adobe.adobeShockwavePlayer.shockwave12.pkg
com.adobe.pkg.AIR
com.adobe.pkg.FlashPlayer
com.alias.pkg.AliasUninstaller1.0
com.alinofsoftware.alinoftimer
com.amazon.Kindle
com.apple.pkg.AdditionalEssentials
com.apple.pkg.AdditionalSpeechVoices
com.apple.pkg.AirPortUtility
com.apple.pkg.Aperture_AppStore
com.apple.pkg.AppleConfigurator
com.apple.pkg.AsianLanguagesSupport
com.apple.pkg.BaseSystemBinaries
com.apple.pkg.BaseSystemResources
```

pkgutil --pkgs

```
% pkgutil --pkgs | grep -i flash
com.adobe.pkg.FlashPlayer
com.googlecode.munki.disableflash10autoupdate
```

pkgutil --pkg-info

```
% pkgutil --pkg-info com.googlecode.munki.disableflash10autoupdate
package-id: com.googlecode.munki.disableflash10autoupdate
version: 1.0
volume: /
location:
install-time: 1375297642
```

```
% date -r 1375297642
Wed Jul 31 12:07:22 PDT 2013
```

pkgutil --files

```
% pkgutil --files com.googlecode.munki.disableflash10autoupdate
Library
Library/Application Support
Library/Application Support/Macromedia
Library/Application Support/Macromedia/mms.cfg
```

pkgutil --file-info

```
% pkgutil --file-info /Library/Application\ Support/Macromedia/mms.cfg
volume: /
path: /Library/Application Support/Macromedia/mms.cfg

pkgid: com.googlecode.munki.disableflash10autoupdate
pkg-version: 1.0
install-time: 1375297642
uid: 0
gid: 80
mode: 664
```

pkgutil --forget

```
% pkgutil --forget com.adobe.pkg.FlashPlayer
```

pkgutil

Flat package commands:

--expand

--flatten

--bom

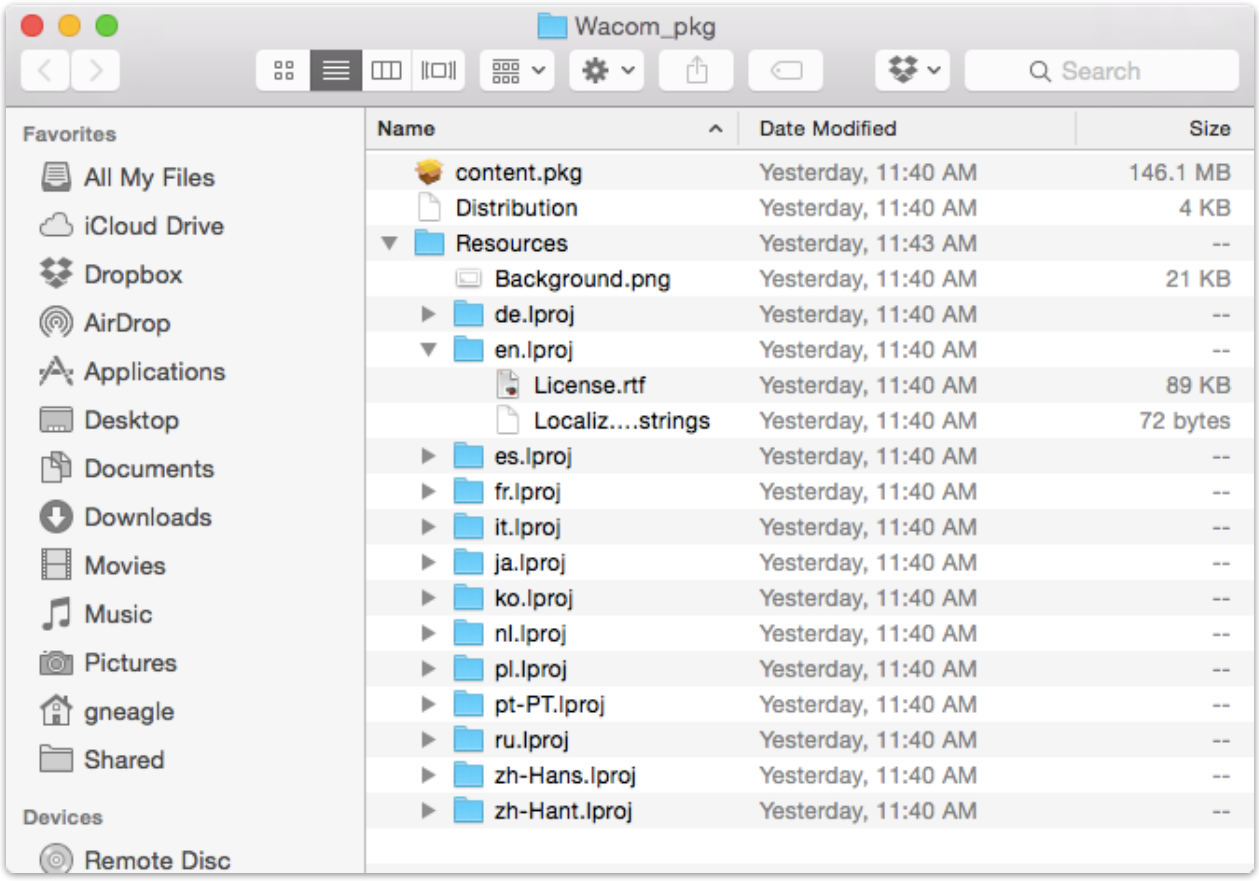
--payload-files

--check-signature

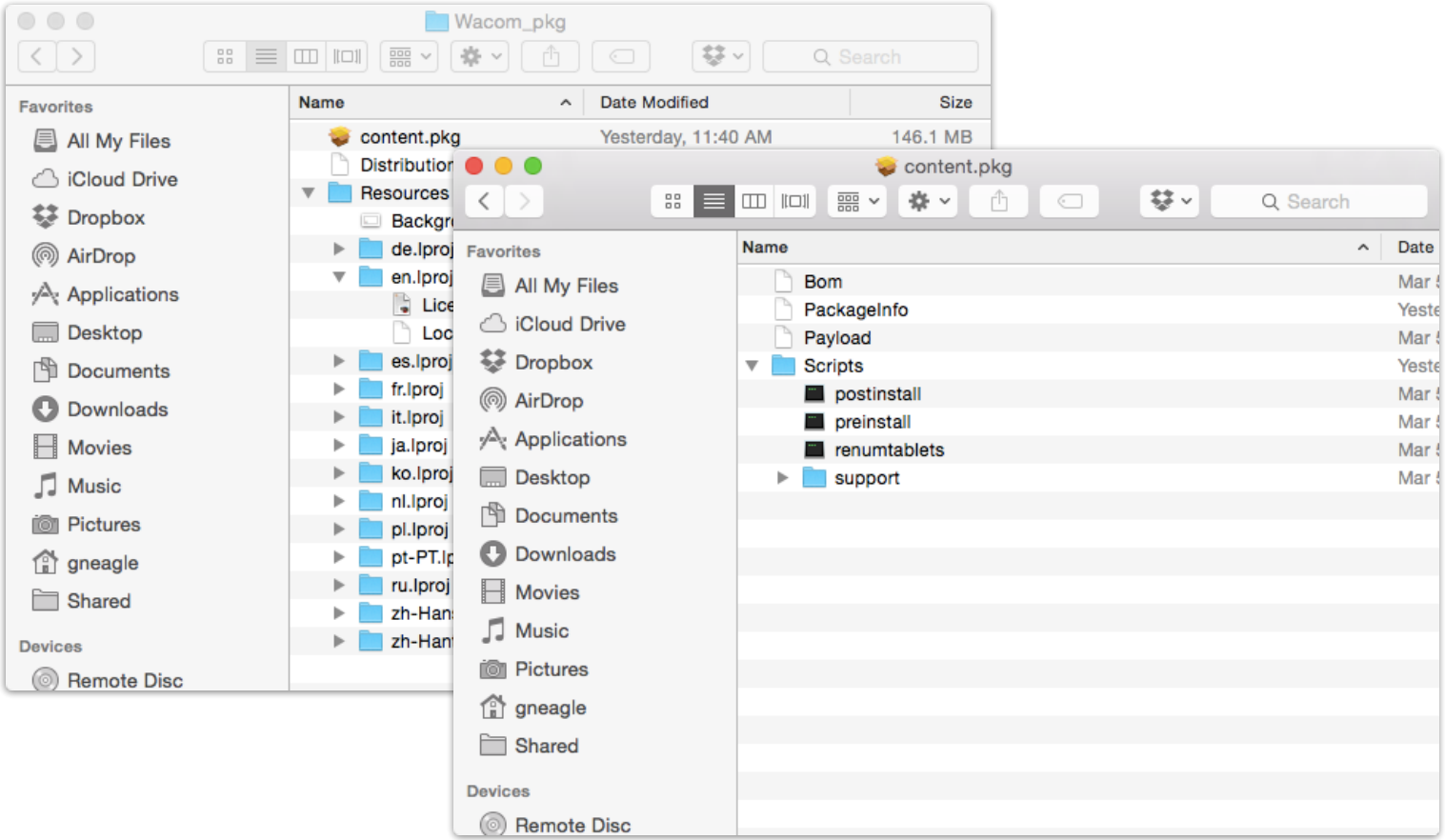
pkgutil --expand

```
% pkgutil --expand Install\ Wacom\ Tablet.pkg /tmp/Wacom_pkg
```

pkgutil --expand



pkgutil --expand



pkgutil --flatten

```
% pkgutil --flatten /tmp/Wacom_pkg ~/Desktop/CustomWacom.pkg
```

pkgutil --bom

```
% pkgutil --bom Install\ Wacom\ Tablet.pkg
/tmp/Install Wacom Tablet.pkg.boms.ye2sPU/content.pkg/Bom

% lsbom "/tmp/Install Wacom Tablet.pkg.boms.ye2sPU/content.pkg/Bom"
.  407550/0
./Applications 407750/0
./Applications/Wacom Tablet.localized  40775  0/0
./Applications/Wacom Tablet.localized/.localized 40775  0/0
./Applications/Wacom Tablet.localized/.localized/de.strings  100664 0/072 2630072004
./Applications/Wacom Tablet.localized/.localized/en.strings  100664 0/070 2525589374
./Applications/Wacom Tablet.localized/.localized/es.strings  100664 0/072 3567506170
./Applications/Wacom Tablet.localized/.localized/fr.strings  100664 0/074 3315303271
./Applications/Wacom Tablet.localized/.localized/it.strings  100664 0/076 3843434223
./Applications/Wacom Tablet.localized/.localized/ja.strings  100664 0/064 3782196401
./Applications/Wacom Tablet.localized/.localized/ko.strings  100664 0/058 981171454
./Applications/Wacom Tablet.localized/.localized/nl.strings  100664 0/070 3200743802
./Applications/Wacom Tablet.localized/.localized/pl.strings  100664 0/070 2340425475
./Applications/Wacom Tablet.localized/.localized/pt.strings  100664 0/082 1558099759
./Applications/Wacom Tablet.localized/.localized/ru.strings  100664 0/072 3166065194
./Applications/Wacom Tablet.localized/.localized/zh_CN.strings  100664 0/064 3933362247
./Applications/Wacom Tablet.localized/.localized/zh_TW.strings  100664 0/064 3696104737
./Applications/Wacom Tablet.localized/Wacom Desktop Center.app  40775  0/0
```

pkgutil --payload-files

```
% pkgutil --payload-files /Install\ Wacom\ Tablet.pkg
.
./Applications
./Applications/Wacom Tablet.localized
./Applications/Wacom Tablet.localized/.localized
./Applications/Wacom Tablet.localized/.localized/de.strings
./Applications/Wacom Tablet.localized/.localized/en.strings
./Applications/Wacom Tablet.localized/.localized/es.strings
./Applications/Wacom Tablet.localized/.localized/fr.strings
./Applications/Wacom Tablet.localized/.localized/it.strings
./Applications/Wacom Tablet.localized/.localized/ja.strings
./Applications/Wacom Tablet.localized/.localized/ko.strings
./Applications/Wacom Tablet.localized/.localized/nl.strings
./Applications/Wacom Tablet.localized/.localized/pl.strings
./Applications/Wacom Tablet.localized/.localized/pt.strings
./Applications/Wacom Tablet.localized/.localized/ru.strings
./Applications/Wacom Tablet.localized/.localized/zh_CN.strings
./Applications/Wacom Tablet.localized/.localized/zh_TW.strings
./Applications/Wacom Tablet.localized/aft.tar
./Applications/Wacom Tablet.localized/Wacom Desktop Center.app
```

pkgutil --check-signature

```
% pkgutil --check-signature Install\ Wacom\ Tablet.pkg
Package "Install Wacom Tablet.pkg":
   Status: signed by a certificate trusted by Mac OS X
   Certificate Chain:
    1. Developer ID Installer: Wacom Technology Corp.
       SHA1 fingerprint: 62 F5 E7 EC B3 21 8F B7 CE 63 70 4B E7 B9 8A 0B 3B 03 0D 8D
       ------------------------------------------------------------------------
    2. Developer ID Certification Authority
       SHA1 fingerprint: 3B 16 6C 3B 7D C4 B7 51 C9 FE 2A FA B9 13 56 41 E3 88 E1 86
       ------------------------------------------------------------------------
    3. Apple Root CA
       SHA1 fingerprint: 61 1E 5B 66 2C 59 3A 08 FF 58 D1 4A E2 24 52 D1 98 DF 6C 60
```

pkgutil exercise

pkgutil review tasks

- How many packages are installed on your machine?
- What pkgs are responsible for the current contents of these files?
  - /Applications/Chess.app/Contents/MacOS/Chess
  - /Applications/Safari.app/Contents/MacOS/Safari
- What files do the XProtectPlistConfigData packages manage?

pkgutil review tasks

- How many packages are installed on your machine?

```
% pkgutil --pkgs | wc -l
```

pkgutil review tasks

- How many packages are installed on your machine?

```
% pkgutil --pkgs | wc -l
```

- Bonus: How many Microsoft packages are installed on your machine?

```
% pkgutil --pkgs | grep -i microsoft | wc -l
```

pkgutil review tasks

- What pkgs are responsible for the current contents of these files?
  - /Applications/Chess.app/Contents/MacOS/Chess
  - /Applications/Safari.app/Contents/MacOS/Safari

```
% pkgutil --file-info /Applications/Chess.app/Contents/MacOS/Chess
% pkgutil --file-info /Applications/Safari.app/Contents/MacOS/Safari
```

pkgutil review tasks

- What files do the XProtectPlistConfigData packages manage?

```
% pkgutil --pkgs | grep XProtect
com.apple.pkg.XProtectPlistConfigData.14U4036
com.apple.pkg.XProtectPlistConfigData.14U4037
com.apple.pkg.XProtectPlistConfigData.14U4041
com.apple.pkg.XProtectPlistConfigData.14U4042
com.apple.pkg.XProtectPlistConfigData.14U4043
com.apple.pkg.XProtectPlistConfigData.14U4046
% pkgutil --files com.apple.pkg.XProtectPlistConfigData.14U4046
System
System/Library
System/Library/CoreServices
System/Library/CoreServices/XProtect.bundle
System/Library/CoreServices/XProtect.bundle/Contents
System/Library/CoreServices/XProtect.bundle/Contents/Info.plist
System/Library/CoreServices/XProtect.bundle/Contents/Resources
```

pkgutil review tasks

- What files do the XProtectPlistConfigData packages manage?

```
% pkgutil --files com.apple.pkg.XProtectPlistConfigData.14U4046
System
System/Library
System/Library/CoreServices
System/Library/CoreServices/XProtect.bundle
System/Library/CoreServices/XProtect.bundle/Contents
System/Library/CoreServices/XProtect.bundle/Contents/Info.plist
System/Library/CoreServices/XProtect.bundle/Contents/Resources
System/Library/CoreServices/XProtect.bundle/Contents/Resources/XProtect.meta.plist
System/Library/CoreServices/XProtect.bundle/Contents/Resources/XProtect.plist
System/Library/CoreServices/XProtect.bundle/Contents/_CodeSignature
System/Library/CoreServices/XProtect.bundle/Contents/_CodeSignature/CodeDirectory
System/Library/CoreServices/XProtect.bundle/Contents/_CodeSignature/CodeRequirements
System/Library/CoreServices/XProtect.bundle/Contents/_CodeSignature/CodeResources
System/Library/CoreServices/XProtect.bundle/Contents/_CodeSignature/CodeSignature
System/Library/CoreServices/XProtect.bundle/Contents/version.plist
```

pkgbuild

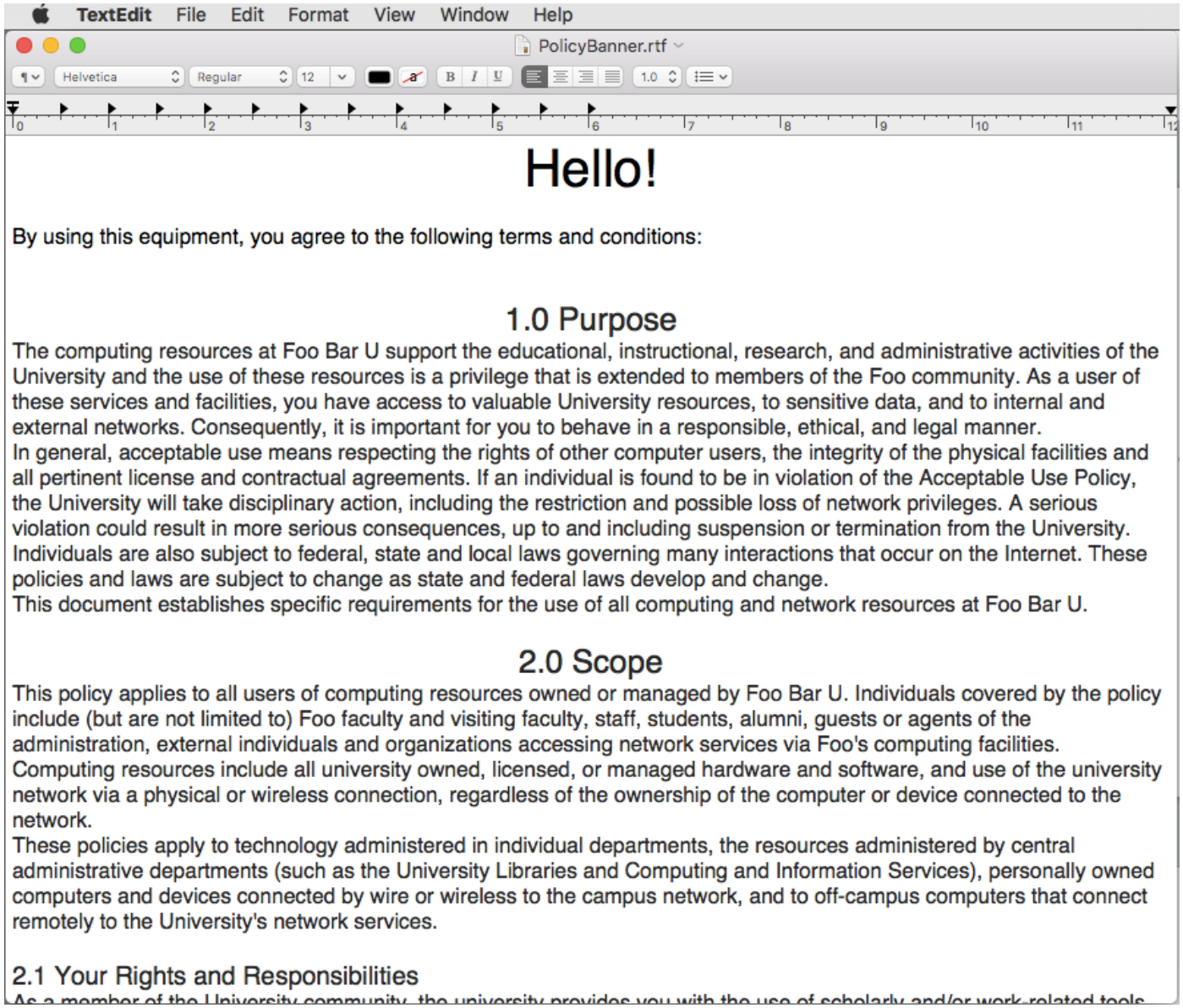
Build an OS X Installer component package from on-disk files

pkgbuild

We're going to build a simple package to cause a policy banner to display over the loginwindow.

One file needs to be placed:

- /Library/Security/PolicyBanner.rtf


TextEdit File Edit Format View Window Help
PolicyBanner.rtf
Helvetica
Regular
12
1.0
Hello!
By using this equipment, you agree to the following terms and conditions:
1.0 Purpose
The computing resources at Foo Bar U support the educational, instructional, research, and administrative activities of the University and the use of these resources is a privilege that is extended to members of the Foo community. As a user of these services and facilities, you have access to valuable University resources, to sensitive data, and to internal and external networks. Consequently, it is important for you to behave in a responsible, ethical, and legal manner.
In general, acceptable use means respecting the rights of other computer users, the integrity of the physical facilities and all pertinent license and contractual agreements. If an individual is found to be in violation of the Acceptable Use Policy, the University will take disciplinary action, including the restriction and possible loss of network privileges. A serious violation could result in more serious consequences, up to and including suspension or termination from the University. Individuals are also subject to federal, state and local laws governing many interactions that occur on the Internet. These policies and laws are subject to change as state and federal laws develop and change.
This document establishes specific requirements for the use of all computing and network resources at Foo Bar U.
2.0 Scope
This policy applies to all users of computing resources owned or managed by Foo Bar U. Individuals covered by the policy include (but are not limited to) Foo faculty and visiting faculty, staff, students, alumni, guests or agents of the administration, external individuals and organizations accessing network services via Foo's computing facilities.
Computing resources include all university owned, licensed, or managed hardware and software, and use of the university network via a physical or wireless connection, regardless of the ownership of the computer or device connected to the network.
These policies apply to technology administered in individual departments, the resources administered by central administrative departments (such as the University Libraries and Computing and Information Services), personally owned computers and devices connected by wire or wireless to the campus network, and to off-campus computers that connect remotely to the University's network services.
2.1 Your Rights and Responsibilities

pkgbuild

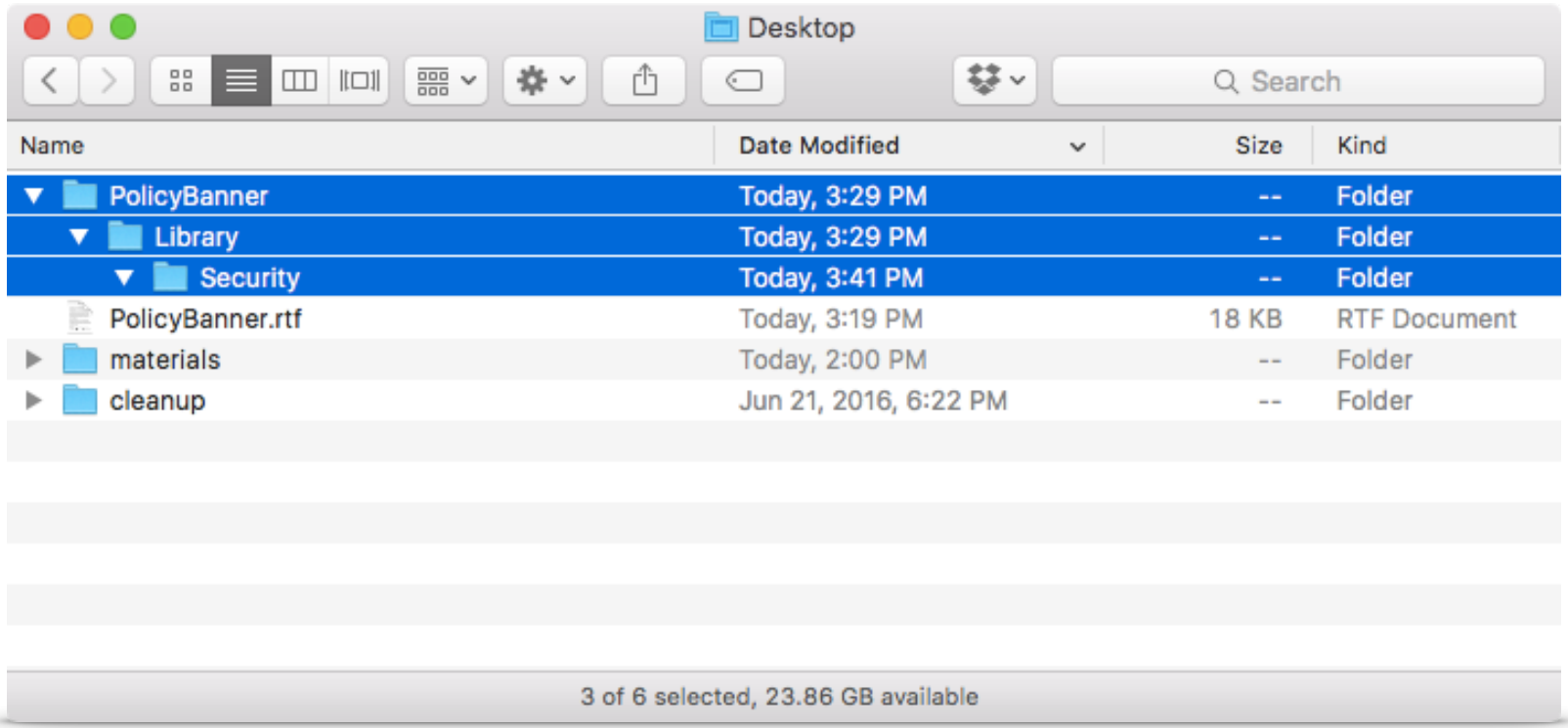
```
# need some working space
% cd ~/Desktop
```

pkgbuild

```
# make a root directory for our files
% mkdir PolicyBanner
```

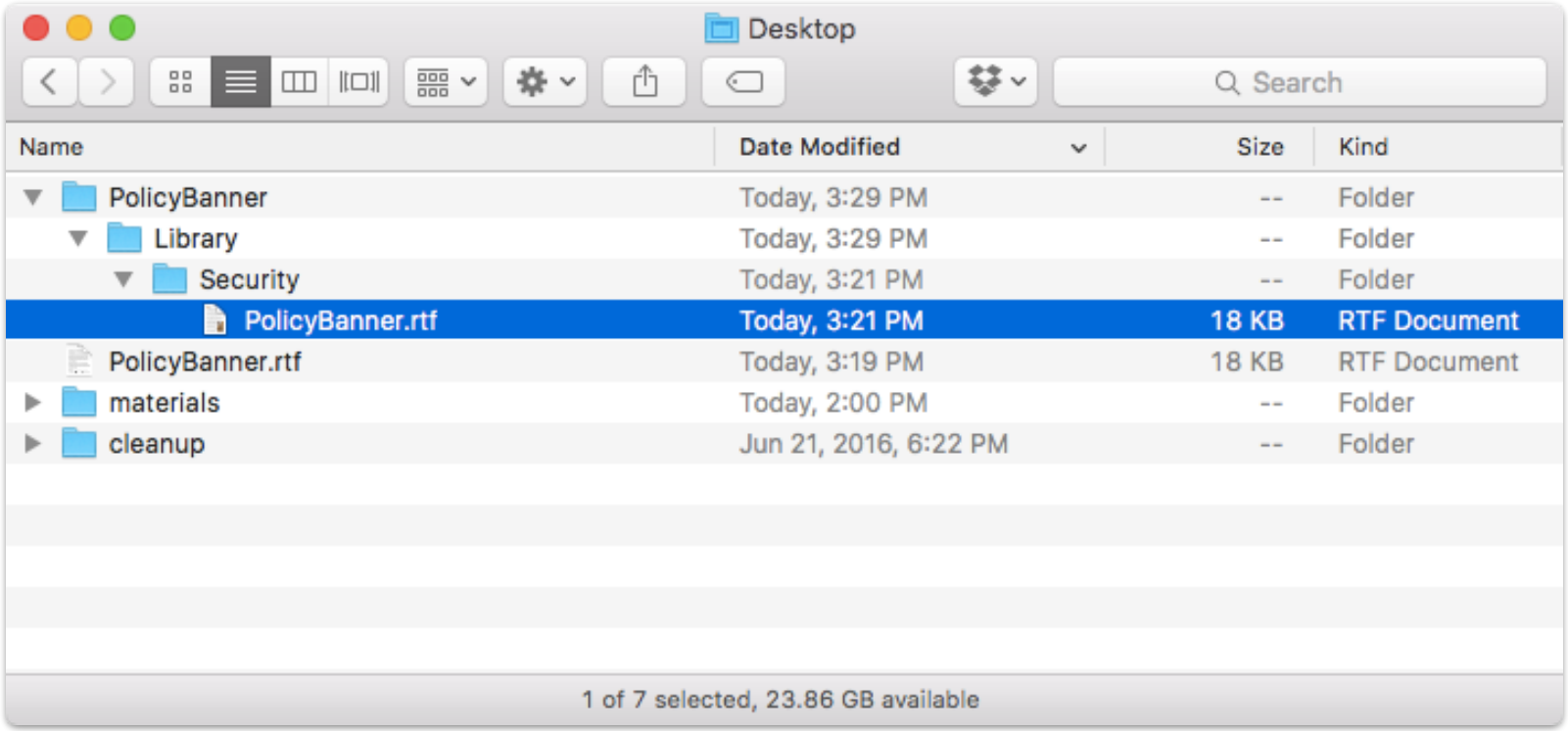
pkgbuild

```
# create needed subdirectories
% mkdir PolicyBanner/Library
% mkdir PolicyBanner/Library/Security
```


Desktop
Search
Name
Date Modified
Size
Kind
PolicyBanner
Today, 3:29 PM
--
Folder
Library
Today, 3:29 PM
--
Folder
Security
Today, 3:41 PM
--
Folder
PolicyBanner.rtf
Today, 3:19 PM
18 KB
RTF Document
materials
Today, 2:00 PM
--
Folder
cleanup
Jun 21, 2016, 6:22 PM
--
Folder
3 of 6 selected, 23.86 GB available

pkgbuild

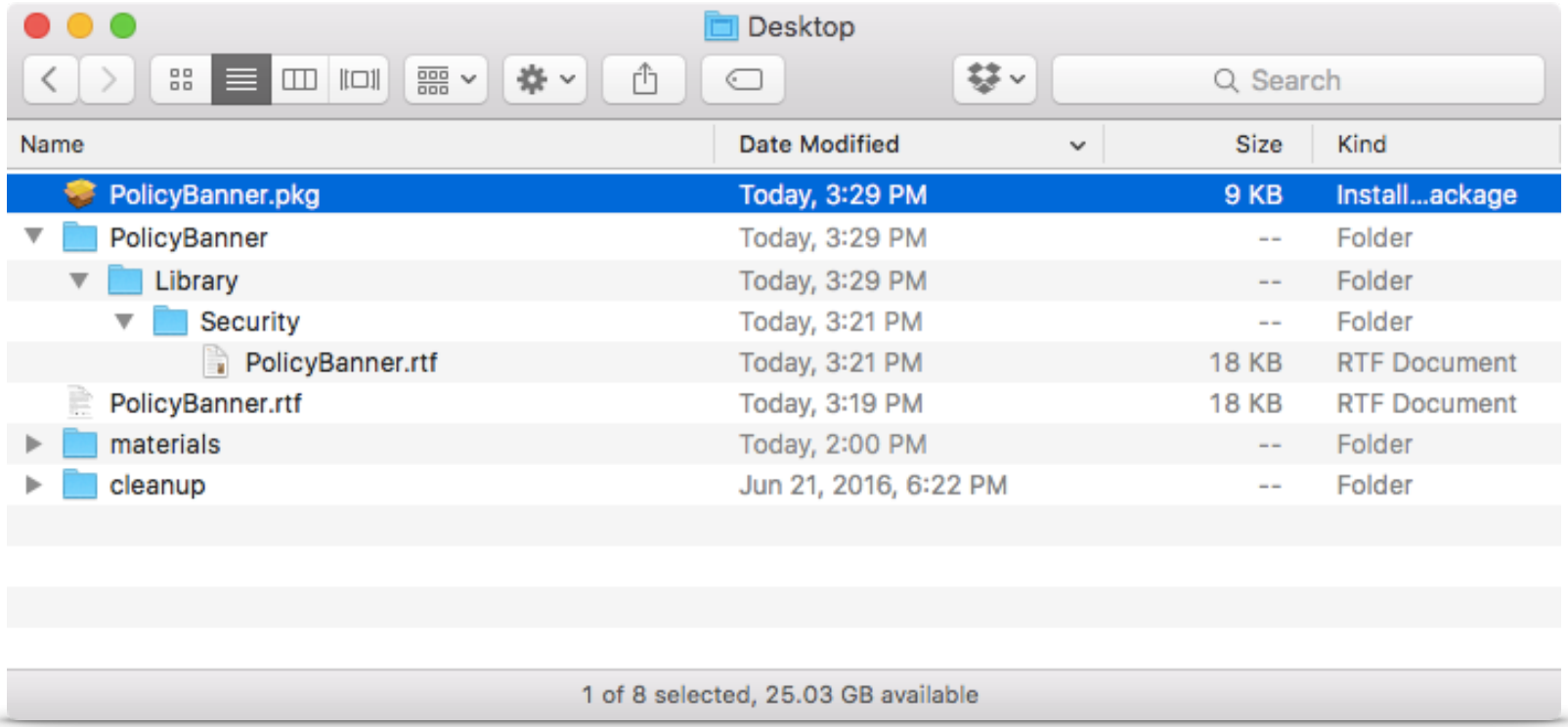
```
# copy our PolicyBanner into the correct subdirectory
% cp PolicyBanner.rtf PolicyBanner/Library/Security/
```


Desktop
Search
Name
Date Modified
Size
Kind
PolicyBanner
Today, 3:29 PM
--
Folder
Library
Today, 3:29 PM
--
Folder
Security
Today, 3:21 PM
--
Folder
PolicyBanner.rtf
Today, 3:21 PM
18 KB
RTF Document
PolicyBanner.rtf
Today, 3:19 PM
18 KB
RTF Document
materials
Today, 2:00 PM
--
Folder
cleanup
Jun 21, 2016, 6:22 PM
--
Folder
1 of 7 selected, 23.86 GB available

pkgbuild

```
# build the pkg
% pkgbuild --root PolicyBanner \
           --identifier edu.psumac.demo.PolicyBanner \
           --version 1.0 \
           PolicyBanner.pkg
pkgbuild: Inferring bundle components from contents of PolicyBanner
pkgbuild: Wrote package to PolicyBanner.pkg
```

pkgbuild

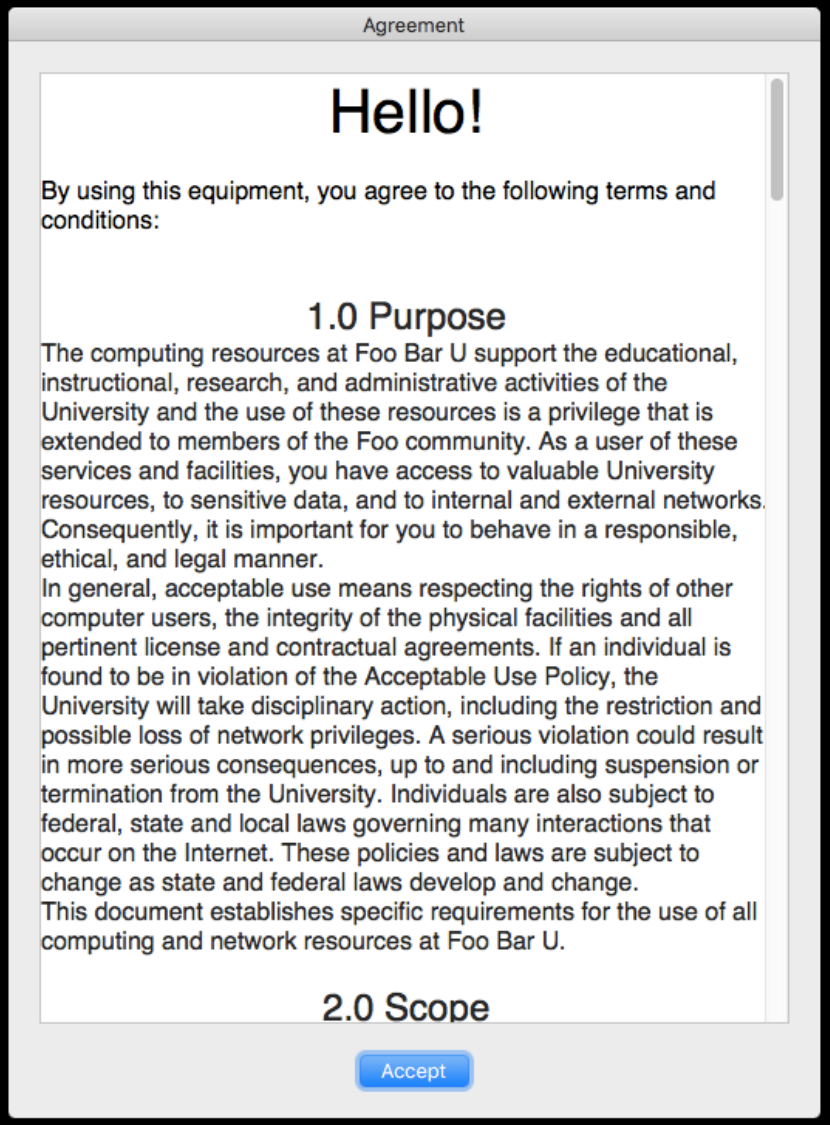

Desktop
Search
Name
Date Modified
Size
Kind
PolicyBanner.pkg
Today, 3:29 PM
9 KB
Install...ackage
PolicyBanner
Today, 3:29 PM
--
Folder
Library
Today, 3:29 PM
--
Folder
Security
Today, 3:21 PM
--
Folder
PolicyBanner.rtf
Today, 3:21 PM
18 KB
RTF Document
PolicyBanner.rtf
Today, 3:19 PM
18 KB
RTF Document
materials
Today, 2:00 PM
--
Folder
cleanup
Jun 21, 2016, 6:22 PM
--
Folder
1 of 8 selected, 25.03 GB available

Let’s check our work…

```
% pkgutil --payload-files PolicyBanner.pkg
.
./Library
./Library/Security
./Library/Security/PolicyBanner.rtf
```

Or fancier…

```
% lsbom `pkgutil --bom PolicyBanner.pkg`
. 40775 0/0
./Library 40775 0/0
./Library/Security 40775 0/0
./Library/Security/PolicyBanner.rtf  100664  0/0 17721 4185183220
```


Agreement
Hello!
By using this equipment, you agree to the following terms and conditions:
1.0 Purpose
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In general, acceptable use means respecting the rights of other computer users, the integrity of the physical facilities and all pertinent license and contractual agreements. If an individual is found to be in violation of the Acceptable Use Policy, the University will take disciplinary action, including the restriction and possible loss of network privileges. A serious violation could result in more serious consequences, up to and including suspension or termination from the University. Individuals are also subject to federal, state and local laws governing many interactions that occur on the Internet. These policies and laws are subject to change as state and federal laws develop and change.
This document establishes specific requirements for the use of all computing and network resources at Foo Bar U.
2.0 Scope
Accept

pkgbuild

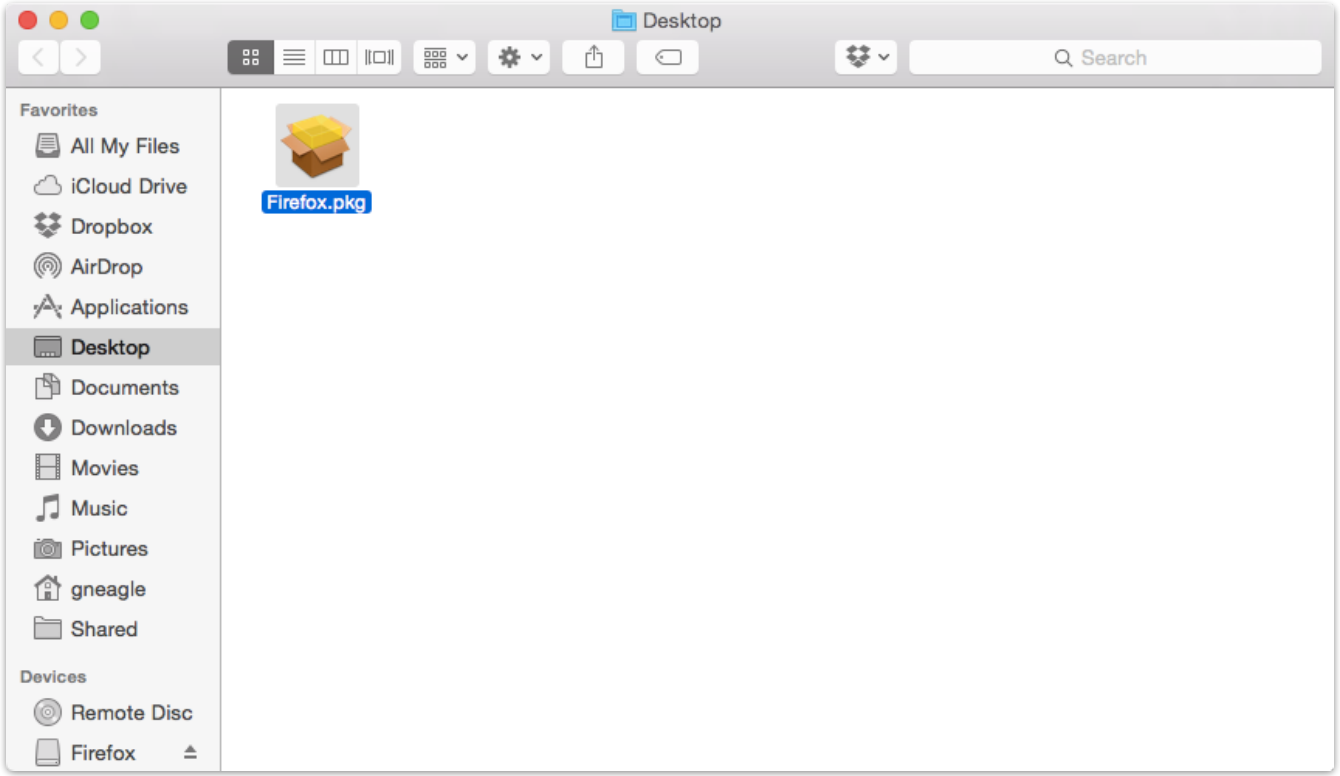
Package from application



pkgbuild

```
% pkgbuild --component /Volumes/Firefox/Firefox.app \
          --install-location /Applications \
          Firefox.pkg
pkgbuild: Adding component at /Volumes/Firefox/Firefox.app
pkgbuild: Wrote package to Firefox.pkg
```

pkgbuild


Desktop
Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
gneagle
Shared
Devices
Remote Disc
Firefox
Firefox.pkg

Let’s check our work…

```
% pkgutil --payload-files Firefox.pkg
.
./Firefox.app
./Firefox.app/Contents
./Firefox.app/Contents/_CodeSignature
./Firefox.app/Contents/_CodeSignature/CodeResources
./Firefox.app/Contents/_CodeSignature/._CodeResources
./Firefox.app/Contents/.__CodeSignature
./Firefox.app/Contents/Info.plist
./Firefox.app/Contents/._Info.plist
./Firefox.app/Contents/MacOS
./Firefox.app/Contents/MacOS/crashreporter.app
./Firefox.app/Contents/MacOS/crashreporter.app/Contents
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/_CodeSignature
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/_CodeSignature/CodeResources
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/_CodeSignature/._CodeResources
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/.__CodeSignature
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/Info.plist
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/._Info.plist
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/MacOS
./Firefox.app/Contents/MacOS/crashreporter.app/Contents/MacOS/crashreporter
```

Let’s check our work…

```
% pkgutil --expand Firefox.pkg Firefox_pkg
% cat Firefox_pkg/PackageInfo
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<pkg-info overwrite-permissions="true" relocatable="false" identifier="org.mozilla.firefox"
postinstall-action="none" version="47.0.0" format-version="2" generator-version="InstallCmds-554
(15F34)" install-location="/Applications" auth="root">
    <payload numberOfFiles="149" installKBytes="201018"/>
    <bundle path="./Firefox.app" id="org.mozilla.firefox" CFBundleShortVersionString="47.0"
CFBundleVersion="4716.6.4"/>
    <bundle-version>
        <bundle id="org.mozilla.firefox"/>
    </bundle-version>
    <upgrade-bundle>
        <bundle id="org.mozilla.firefox"/>
    </upgrade-bundle>
    <update-bundle/>
    <atomic-update-bundle/>
    <strict-identifier>
        <bundle id="org.mozilla.firefox"/>
    </strict-identifier>
    <relocate>
        <bundle id="org.mozilla.firefox"/>
    </relocate>
</pkg-info>
```

Let’s check our work…

```
% pkgutil --expand Firefox.pkg Firefox_pkg
% cat Firefox_pkg/PackageInfo
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<pkg-info overwrite-permissions="true" relocatable="false" identifier="org.mozilla.firefox"
postinstall-action="none" version="47.0.0" format-version="2" generator-version="InstallCmds-554
(15F34)" install-location="/Applications" auth="root">
    <payload numberOfFiles="149" installKBytes="201018"/>
    <bundle path="./Firefox.app" id="org.mozilla.firefox" CFBundleShortVersionString="47.0"
CFBundleVersion="4716.6.4"/>
    <bundle-version>
        <bundle id="org.mozilla.firefox"/>
    </bundle-version>
    <upgrade-bundle>
        <bundle id="org.mozilla.firefox"/>
    </upgrade-bundle>
    <update-bundle/>
    <atomic-update-bundle/>
    <strict-identifier>
        <bundle id="org.mozilla.firefox"/>
    </strict-identifier>
    <relocate>
        <bundle id="org.mozilla.firefox"/>
    </relocate>
</pkg-info>
```

Let’s check our work…

```
% pkgutil --expand Firefox.pkg Firefox_pkg
% cat Firefox_pkg/PackageInfo
<?xml version="1.0" encoding="utf-8" standalone="no"?>
<pkg-info overwrite-permissions="true" relocatable="false" identifier="org.mozilla.firefox"
postinstall-action="none" version="47.0.0" format-version="2" generator-version="InstallCmds-554
(15F34)" install-location="/Applications" auth="root">
    <payload numberOfFiles="149" installKBytes="201018"/>
    <bundle path="./Firefox.app" id="org.mozilla.firefox" CFBundleShortVersionString="47.0"
CFBundleVersion="4716.6.4"/>
    <bundle-version>
        <bundle id="org.mozilla.firefox"/>
    </bundle-version>
    <upgrade-bundle>
        <bundle id="org.mozilla.firefox"/>
    </upgrade-bundle>
    <update-bundle/>
    <atomic-update-bundle/>
    <strict-identifier>
        <bundle id="org.mozilla.firefox"/>
    </strict-identifier>
    <relocate>
        <bundle id="org.mozilla.firefox"/>
    </relocate>
</pkg-info>
```

A word about owner, group and mode

The archive contains information about location, kind, owner, group, and mode of each file and directory.

```
--ownership (recommended | preserve | preserve-other)
```

`--ownership recommended`

- Default
- `pkgbuild` applies Apple's recommended owner and group to files in the payload
- Generally, this is `root:wheel`

`--ownership preserve`

- `pkgbuild` uses the owner and group from the actual on-disk source files
- It's *your* responsibility to set these before building the package

`--ownership preserve-other`

- `pkgbuild` will apply the recommended UID and GID to those files that are owned by the user running `pkgbuild`, but leave other files unchanged.

But what about mode?

- Mode (read/write/execute) is always copied from on-disk files.
- It's *your* responsibility to set these to the right values *before* building the package
- If a package fixes user, group or mode in a postinstall script, it is doing it wrong.

pkgbuild exercise

pkgbuild review task

- Build a package that installs some application that is normally distributed via “drag-n-drop” disk image — like Google Chrome.

pkgbuild review task

- Build a package that installs some application that is normally distributed via “drag-n-drop” disk image.

```
% pkgbuild --component /Volumes/Google\ Chrome/Google\ Chrome.app --install-location /Applications ~/Desktop/GoogleChrome.pkg

% pkgbuild --component /Applications/Skype.app ~/Desktop/Skype.pkg
```

productbuild

Build a product archive for the OS X Installer or the Mac App Store

(Builds “distribution”-style packages)

productbuild

Convert a component pkg to a distribution pkg:

```
% cd ~/Desktop
% productbuild --package Firefox.pkg Firefox-Dist.pkg
productbuild: Wrote product to Firefox-Dist.pkg
```

productbuild

Check our work:

```
% pkgutil --expand Firefox-Dist.pkg Firefox_dist_expanded
% ls -1 Firefox_dist_expanded
Distribution
Firefox.pkg
```

productbuild

Create a distribution pkg from multiple component pkgs

```
productbuild --package Firefox.pkg \
             --package PolicyBanner.pkg \
             Combo.pkg
```

productbuild

Check our work!

```
% pkgutil --expand Combo.pkg Combo_expanded
% ls -1 Combo_expanded
ClearRegistration.pkg
Distribution
Firefox.pkg
```

productbuild exercise

- Using `pkgbuild` and `productbuild`, build a distribution package that installs both Firefox and Google Chrome (or any two apps of your choice)

- Using `pkgbuild` and `productbuild`, build a distribution package that installs both Firefox and Google Chrome (or any two apps of your choice)
- A solution:

```
% pkgbuild --component /Volumes/Firefox/Firefox.app --install-location /Applications Firefox.pkg
pkgbuild: Adding component at /Volumes/Firefox/Firefox.app
pkgbuild: Wrote package to Firefox.pkg

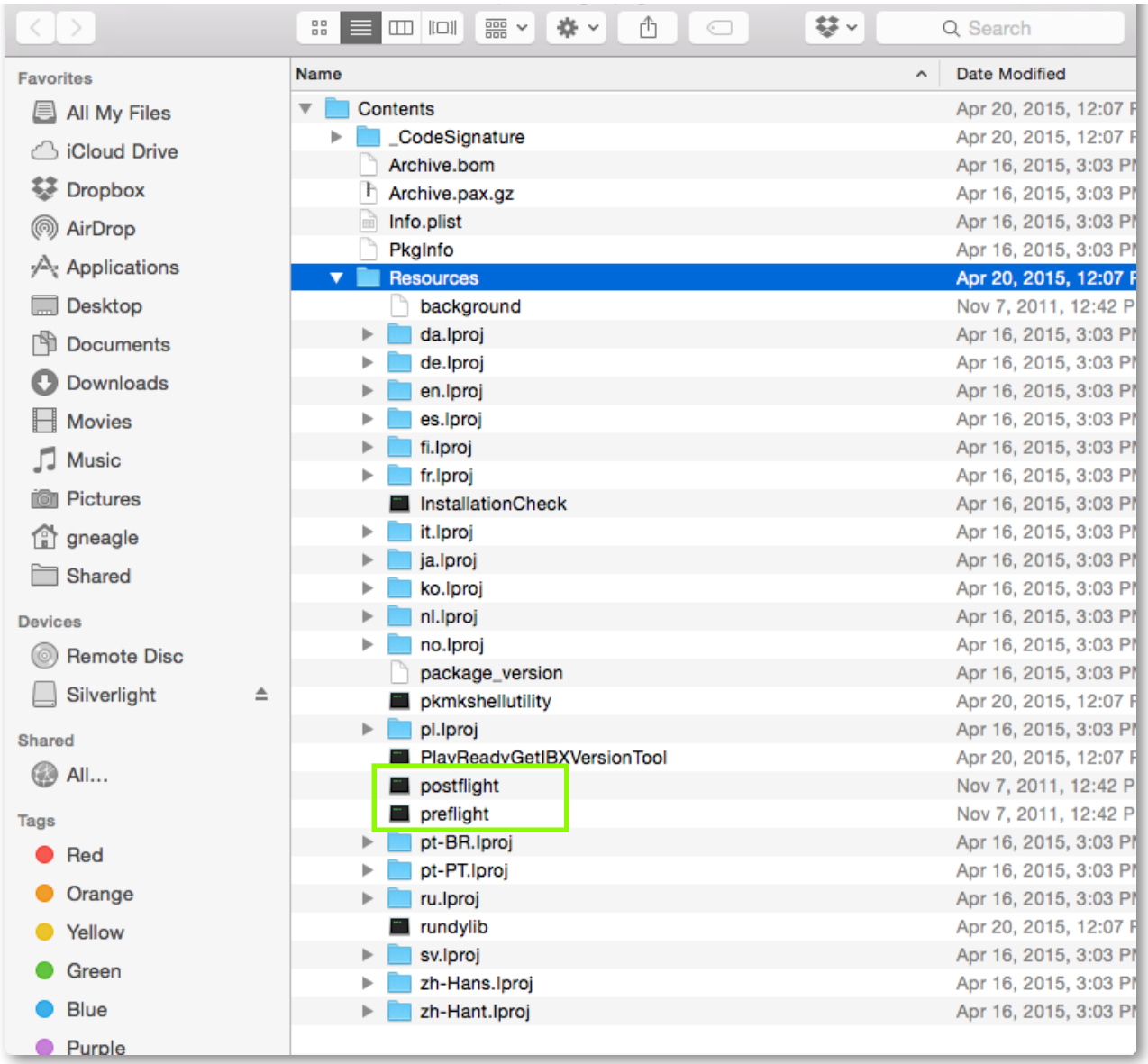
% pkgbuild --component /Volumes/Google\ Chrome/Google\ Chrome.app \
           --install-location /Applications GoogleChrome.pkg
pkgbuild: Adding component at /Volumes/Google Chrome/Google Chrome.app
pkgbuild: Wrote package to GoogleChrome.pkg

% productbuild --package Firefox.pkg --package GoogleChrome.pkg FreeBrowsers.pkg
productbuild: Wrote product to FreeBrowsers.pkg
```

Package Scripting

A package is an archive of files and directories.

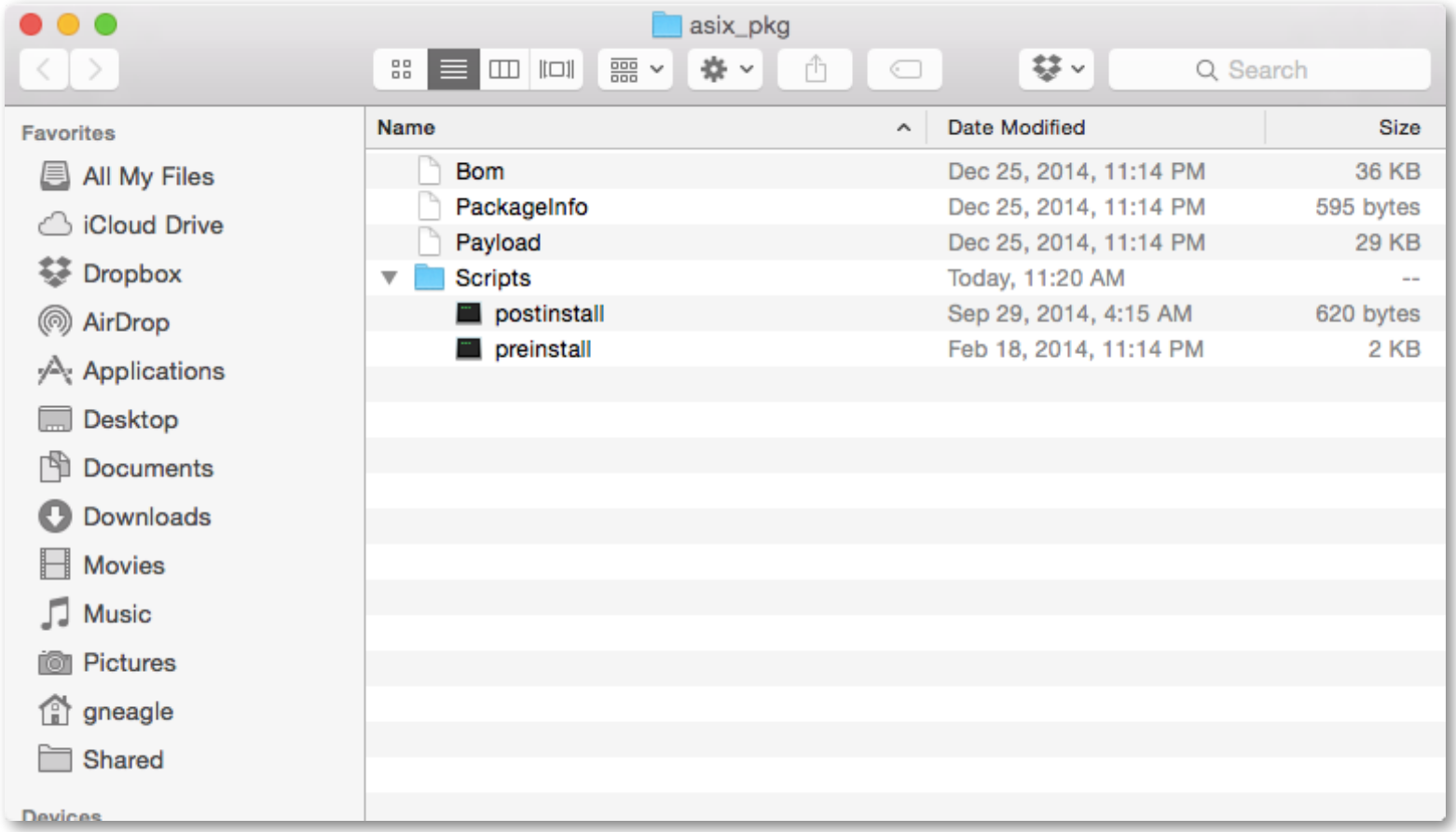
A package may also
optionally run some scripts.


Search
Favorites
All My Files
iCloud Drive
Dropbox
AirDrop
Applications
Desktop
Documents
Downloads
Movies
Music
Pictures
gneagle
Shared
Devices
Remote Disc
Silverlight
Shared
All...
Tags
Red
Orange
Yellow
Green
Blue
Purple
Name
Date Modified
Contents
_CodeSignature
Archive.bom
Archive.pax.gz
Info.plist
PkgInfo
Resources
background
da.lproj
de.lproj
en.lproj
es.lproj
fi.lproj
fr.lproj
InstallationCheck
it.lproj
ja.lproj
ko.lproj
nl.lproj
no.lproj
package_version
pkmkshellutility
pl.lproj
PlayReadyGetIBXVersionTool
postflight
preflight
pt-BR.lproj
pt-PT.lproj
ru.lproj
rundylib
sv.lproj
zh-Hans.lproj
zh-Hant.lproj

Bundle pkg scripts

- preflight
- preinstall
- preupgrade
- postupgrade
- postinstall
- postflight

Flat component package



Flat pkg scripts

- ~~preflight~~
- preinstall
- ~~preupgrade~~
- ~~postupgrade~~
- postinstall
- ~~postflight~~

Script arguments

$1	The full path to the installation package.
$2	The full path to the installation destination.
$3	The mountpoint of the destination volume.
$4	The root directory for the current System folder

Environment vars

$PACKAGE_PATH	Same as the $1 argument.
$SCRIPT_NAME	The name of the file being executed.
$COMMAND_LINE_INSTALL	Set when installing via /usr/sbin/installer

postflight script

```
#!/bin/sh

touch /private/var/db/.AppleSetupDone
touch /Library/Receipts/.SetupRegComplete
```

postflight script

```
#!/bin/sh

touch $3/private/var/db/.AppleSetupDone
touch $3/Library/Receipts/.SetupRegComplete
```

postflight script

```
#!/bin/sh

touch “$3/private/var/db/.AppleSetupDone”
touch “$3/Library/Receipts/.SetupRegComplete”
```

postflight script

```
#!/bin/sh

touch "$3/private/var/db/.AppleSetupDone"
touch "$3/Library/Receipts/.SetupRegComplete"
```

postflight script

```
#!/bin/sh

/usr/bin/touch "$3/private/var/db/.AppleSetupDone"
/usr/bin/touch "$3/Library/Receipts/.SetupRegComplete"
```

A package is an archive of files and directories.

A package may also optionally run some scripts.

Pro Tip:
Don’t use a script when a payload will work.

```
% pkgutil --payload-files SuppressSetupAssistant.pkg
.
./Library
./Library/Receipts
./Library/Receipts/.SetupRegComplete
./private
./private/var
./private/var/db
./private/var/db/.AppleSetupDone
```

Common scripting errors

#1: Forgetting to refer to the target volume

```
#! /bin/bash
sudo rm -rf /Library/Application\ Support/Adobe/Shockwave\ 11
```

```
#!/bin/sh

# Script to delete old versions
# Copyright (c) 2006 Microsoft Corporation

#####################################################
# Remove WPFe
rm -rf /Library/Internet\ Plug-Ins/WPFe.plugin/
rm -rf /Library/Internet\ Plug-Ins/Silverlight.plugin/

rm -rf /Library/Receipts/Silverlight.pkg/
rm -rf /Library/Receipts/Silverlight_W2.pkg/
rm -rf /Library/Receipts/Silverlight_W2_MIX.pkg/
```

#2: Interacting with the Finder or Dock

```
osascript -e "tell application \"Finder\" to make new alias at \"$aliaspath\"
to file \"$filepath\""
```

#3: Assuming there is a GUI user

```
#!/bin/bash
#get the user and group
thisuser="$SUDO_USER"
if [ -z "$thisuser" ]; then
        thisuser="$USER"
        group=$(id -gn "$thisuser")
else
        sudo_user_name="$SUDO_USER"
        group=$(id -gn "$sudo_user_name")
fi

#set proper permissions on the prefpane
sudo chmod -R 555 "/Library/PreferencePanes/utcore-prefpane.prefPane"
#set ownership of the prefpane
sudo chown -R "$thisuser":"$group" "/Library/PreferencePanes/utcore-prefpane.prefPane"

#adding the UTCore login item
sudo su "$thisuser" -c "defaults write loginwindow AutoLaunchedApplicationDictionary -
array-add '<dict><key>Hide</key><true/><key>Path</key><string>/Library/PreferencePanes/
utcore-prefpane.prefPane/Contents/Resources/UTCoreHelper.app</string></dict>'"
```

#4: Other assumptions about the environment

```
#!/bin/bash

function MoveReaderToTrash {

    newReaderApp=$readerApp
    while [ 1 ]
    do
        if [ -e ~/.Trash/"$newReaderApp" ]
        then
            echo "$newReaderApp exists in Trash. Retrying with a new name."
            sleep 1
            time_to_be_attached=`date "+%k-%M-%S"`
            newReaderApp="Adobe Reader""$time_to_be_attached"".app"
        else
            echo "Moving existing $readerApp to Trash as $newReaderApp"
            mv "$installation_path/$readerApp" ~/.Trash/"$newReaderApp"
            if [ $? -ne 0 ]
            then
                echo "ERROR: Could not move existing $readerApp to Trash."
                exit -1
            else
                exit 0
            fi
        fi
    done
}
```

Concrete example!

```
#!/bin/sh

# turn off Bluetooth
BLUETOOTHPREFS="/Library/Preferences/com.apple.Bluetooth"
defaults write "$BLUETOOTHPREFS" ControllerPowerState -int 0

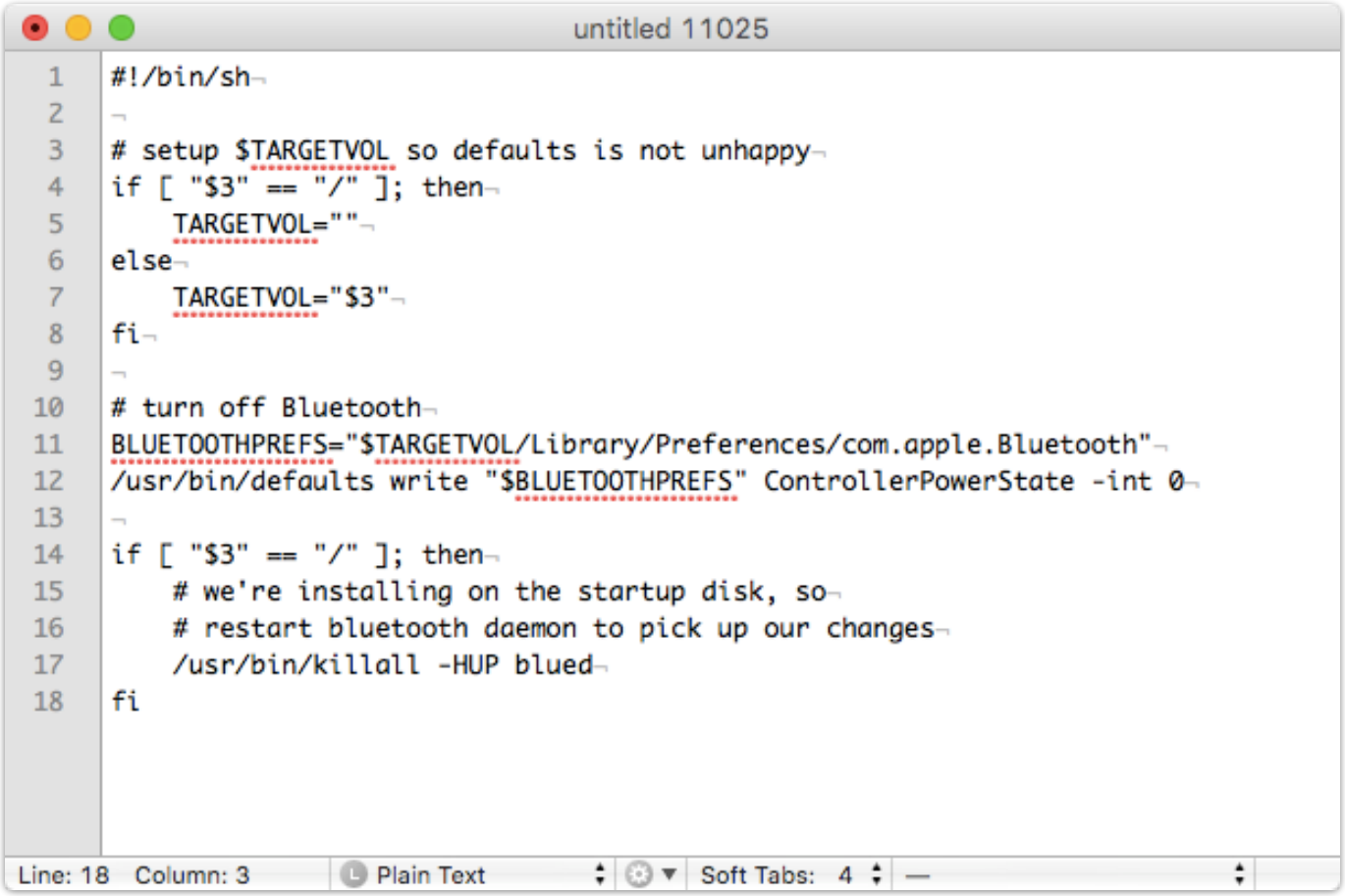
# restart bluetooth daemon to pick up our changes
killall -HUP blued
```

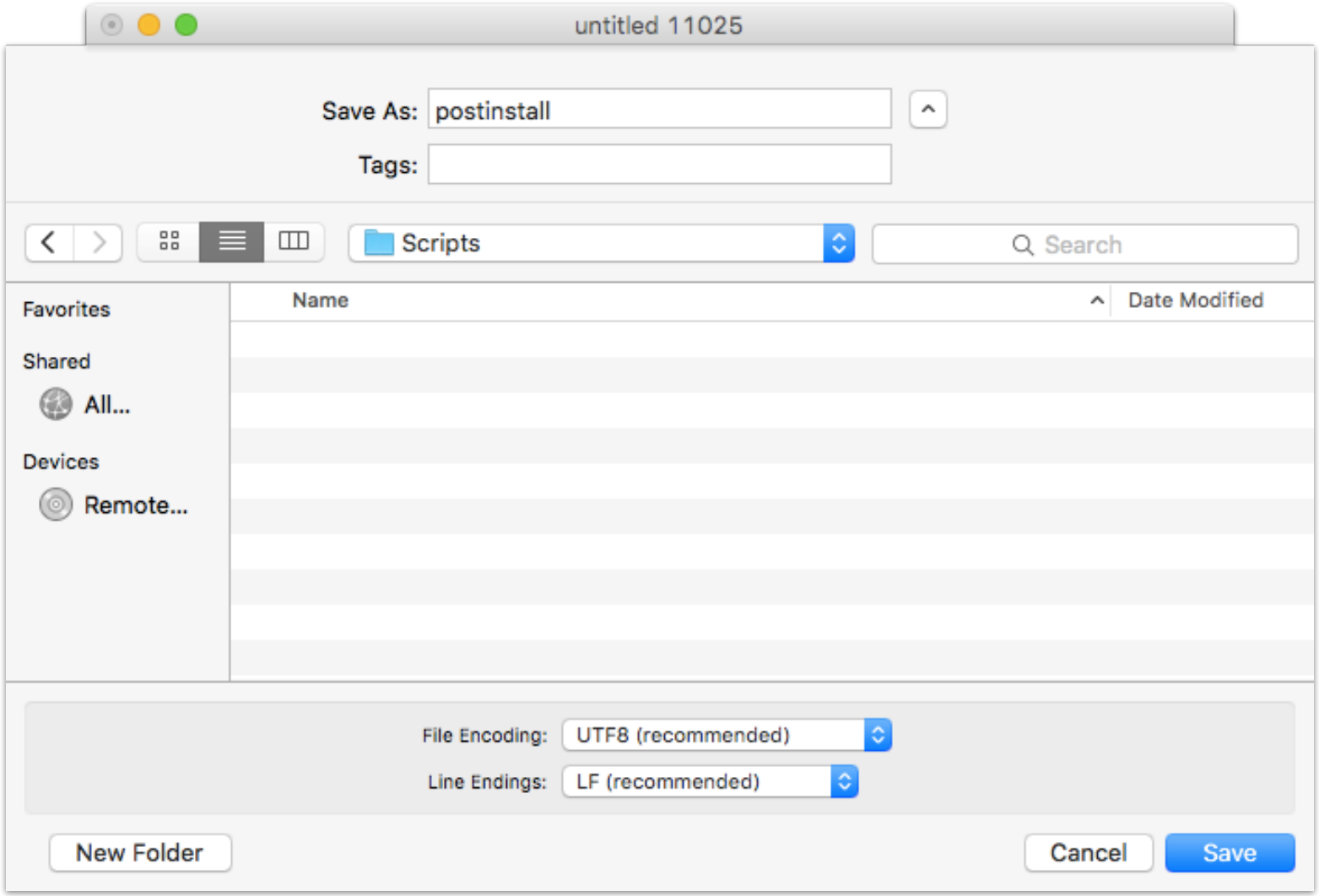
```
#!/bin/sh

# setup $TARGETVOL so defaults is not unhappy
if [ "$3" == "/" ]; then
    TARGETVOL=""
else
    TARGETVOL="$3"
fi

# turn off Bluetooth
BLUETOOTHPREFS="$TARGETVOL/Library/Preferences/com.apple.Bluetooth"
/usr/bin/defaults write "$BLUETOOTHPREFS" ControllerPowerState -int 0

if [ "$3" == "/" ]; then
    # we're installing on the startup disk, so
    # restart bluetooth daemon to pick up our changes
    /usr/bin/killall -HUP blued
fi
```


untitled 11025
#!/bin/sh
# setup $TARGETVOL so defaults is not unhappy
if ["$3" == "/"]; then
TARGETVOL=""
else
TARGETVOL="$3"
fi
# turn off Bluetooth
BLUETOOTHPREFS="$TARGETVOL/Library/Preferences/com.apple.Bluetooth"
/usr/bin/defaults write "$BLUETOOTHPREFS" ControllerPowerState -int 0
if ["$3" == "/"]; then
# we're installing on the startup disk, so
# restart bluetooth daemon to pick up our changes
/usr/bin/killall -HUP blued
fi
Line: 18 Column: 3
Plain Text
Soft Tabs: 4


untitled 11025
Save As: postinstall
Tags:
Scripts
Search
Favorites
Shared
All...
Devices
Remote...
Name
Date Modified
File Encoding: UTF8 (recommended)
Line Endings: LF (recommended)
New Folder
Cancel
Save

```
% chmod a+x Scripts/postinstall
```

```
% pkgbuild --nopayload \
          --scripts Scripts \
          --identifier "org.psumac.demo.bluetoothconfig" \
          --version 1.0 TurnBluetoothOff.pkg
pkgbuild: Wrote package to TurnBluetoothOff.pkg
```

Scripting recommendations

#1: Avoid scripts.

#2: Don’t use a script to fix payload mistakes

#3: Use $3 to target files on the target volume

#4: Don’t forget that target volume name might have spaces

#5: Test via CLI

#6: Test installing to a volume other than the current startup volume

#7: Test installing at the loginwindow