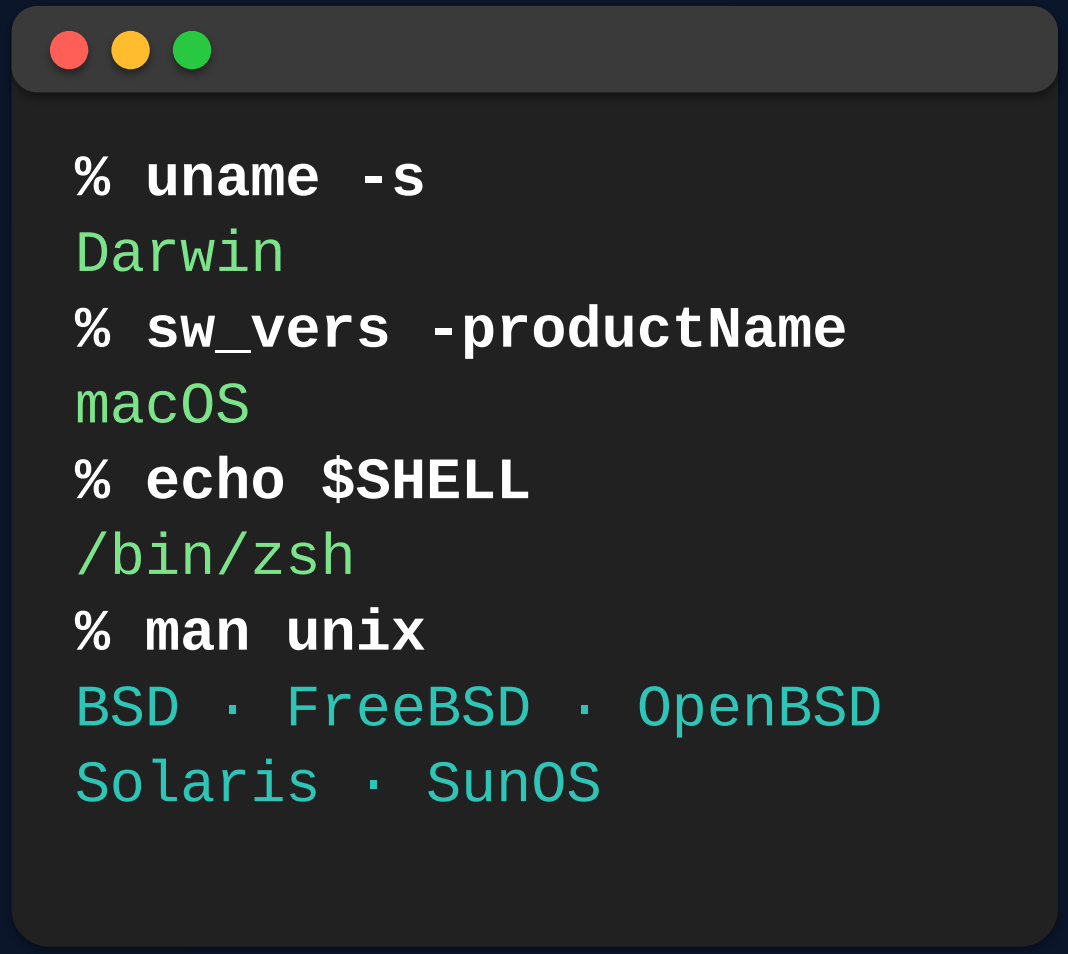


LESSON 5 OF 12

macOS UNIX

Darwin & BSD

Package Management: Homebrew, MacPorts, pkg & App Store

Full Course · macOS 27 Golden Gate

What You Will Learn in Lesson 5

- The ways software arrives on a Mac
- Install Homebrew and learn its vocabulary
- Install, upgrade, clean up, and run services with brew
- Brewfiles: rebuild a whole machine with one command
- GNU tools side by side with BSD tools
- MacPorts, .pkg installers with pkgutil, and the App Store CLI
- pkg on FreeBSD, pkg_add on OpenBSD, and IPS on Solaris

How Software Arrives on a Mac

Method	Where it installs	Best for
App Store	/Applications	Sandboxed desktop apps; automatic updates
.dmg (drag and drop)	/Applications	Desktop apps from a developer's website
.pkg installer	Anywhere (needs admin)	Drivers, system tools, enterprise software
Homebrew formula / cask	/opt/homebrew · /Applications	UNIX tools and developer apps
MacPorts	/opt/local	UNIX tools, built in a BSD ports style
Source (./configure && make)	/usr/local	Learning, or software with no package

Install Homebrew

```
# 1. Run the official installer (from brew.sh):
% /bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"
#    It installs the Xcode Command Line Tools if they are missing.

# 2. Add brew to your PATH (Apple silicon):
% echo 'eval "$(/opt/homebrew/bin/brew shellenv)"' >> ~/.zprofile
% eval "$(/opt/homebrew/bin/brew shellenv)"

% brew --version;  brew doctor     # "Your system is ready to brew."
```

Always copy the install command from brew.sh. A .pkg installer is also offered there.

Homebrew Vocabulary

Word	Meaning	Example
Formula	A command-line package, built from a recipe	brew install wget
Cask	A desktop app (.app) or binary installer	brew install --cask firefox
Bottle	A pre-built binary of a formula (fast install)	Downloaded automatically
Tap	An extra repository of formulas and casks	brew tap <user>/<repo>
Cellar	Where installed versions live	/opt/homebrew/Cellar
Keg	One installed version inside the Cellar	/opt/homebrew/Cellar/wget/1.x

brew: The Daily Commands

```
% brew search nginx            # find packages
% brew info wget               # version, dependencies, caveats
% brew install wget tree htop  # install formulas
% brew install --cask visual-studio-code
% brew list;  brew leaves      # everything · only what YOU asked for
% brew outdated                # what has a newer version
% brew upgrade                 # upgrade everything (or: brew upgrade wget)
% brew uninstall htop;  brew autoremove   # remove + unused dependencies
% brew cleanup                 # delete old versions and downloads
```

Services and Brewfiles

```
% brew install postgresql@17
% brew services start postgresql@17   # starts now AND at login (launchd)
% brew services list                  # name, status, user, plist file
% brew services stop postgresql@17

% brew bundle dump --file=~/Brewfile  # save everything installed
% cat ~/Brewfile
brew "wget"
cask "visual-studio-code"
% brew bundle install --file=~/Brewfile   # rebuild on a new Mac
```

PostgreSQL version is an example: use brew search postgresql for current ones.

GNU Tools Side by Side

```
% brew install coreutils gnu-sed grep findutils gawk bash

% gls --color=auto                # GNU ls   (BSD ls stays as ls)
% gsed -i 's/old/new/' file.txt   # GNU sed  (no '' needed)
% gdate -d yesterday              # GNU date
% ggrep -P '\d+' file.txt         # GNU grep with Perl regex
% $(brew --prefix)/bin/bash --version   # modern bash 5.x
```

MacPorts: The BSD Ports Style

```
# Install the MacPorts .pkg for your macOS version from macports.org
% sudo port selfupdate                  # update the ports tree
% port search nmap
% sudo port install nmap
% port installed
% sudo port upgrade outdated
% sudo port uninstall nmap
# Everything lives under /opt/local (add /opt/local/bin to PATH)
```

.pkg Installers: installer and pkgutil

```
% pkgutil --check-signature MyTool.pkg     # who signed it?
% pkgutil --expand-full MyTool.pkg /tmp/x  # look inside before installing
% sudo installer -pkg MyTool.pkg -target / # install from Terminal

% pkgutil --pkgs | grep -v com.apple       # installed (non-Apple) packages
% pkgutil --pkg-info com.example.mytool
% pkgutil --files com.example.mytool       # every file it installed
% sudo pkgutil --forget com.example.mytool # remove the receipt only
```

The App Store From Terminal: mas

```
% brew install mas
% mas list                          # App Store apps installed (with IDs)
% mas outdated                      # apps with updates
% mas upgrade                       # update them all
% mas search Xcode
% mas install <app-id>              # needs you signed in to the App Store

# In a Brewfile:   mas "Xcode", id: <app-id>
```

mas is a community tool, not made by Apple.

Uninstalling Cleanly

- App Store or .dmg apps: drag to Trash (or delete in Launchpad/Apps)
- Leftovers: ~/Library/Application Support, Preferences, Caches, Containers
- Homebrew: brew uninstall <name> (casks: --zap removes settings too)
- MacPorts: sudo port uninstall <name>
- .pkg: pkgutil --files <id> → remove files → pkgutil --forget <id>
- Check for login items, LaunchAgents and LaunchDaemons it added

Package Tools on Other UNIX Systems

Task	FreeBSD	OpenBSD	Solaris 11.4
Search	pkg search nginx	pkg_info -Q nginx	pkg search nginx
Install	pkg install nginx	pkg_add nginx	pkg install nginx
List installed	pkg info	pkg_info	pkg list
Upgrade all	pkg upgrade	pkg_add -u	pkg update
Remove	pkg delete nginx	pkg_delete nginx	pkg uninstall nginx
Build from source	/usr/ports: make install clean	/usr/ports: make install	(source builds are rare)

Which Tool Should You Use?

- Desktop apps: App Store first, then the developer's .dmg, or brew --cask
- UNIX and developer tools: Homebrew (most popular, fastest)
- Need BSD-ports-style builds: MacPorts
- Enterprise or driver software: the vendor's .pkg
- Pick ONE of Homebrew or MacPorts as your main tool
- Write it down: a Brewfile is your machine's recipe

Lab: Build Your Toolbox

```
% /bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"
% eval "$(/opt/homebrew/bin/brew shellenv)"
% brew doctor
% brew install wget tree htop coreutils mas
% tree -L 1 /opt/homebrew;  brew leaves
% gls --color=auto;  htop     # q to quit htop
% brew bundle dump --file=~/Brewfile && cat ~/Brewfile
% pkgutil --pkgs | grep -v com.apple
```

Summary & Homework

- App Store, .dmg, .pkg, Homebrew, MacPorts, source
- brew install / upgrade / leaves / autoremove / cleanup / services
- brew bundle dump + install: rebuild a Mac from a Brewfile
- pkgutil inspects .pkg files and their receipts; mas manages App Store apps
- Homework: do the lab; uninstall one cask cleanly with --zap
- Next: Lesson 6 — Compilers & Interpreters

Thank You! 🙏

Free videos & PDFs: www.MyWebUniversity.com

Slides for this lesson: MyWebUniversity.com/presentations

YouTube: @MyWebUniversity · @MyWebUniversity-Dari

Wahidullah Lutfy — Founder and Director of IT of MyWebUniversity, and CS teacher

Book: The Direct Path to Linux Ubuntu (Amazon · Barnes & Noble)

Learn it, then pass it on.