

# UNIX<sup>™</sup>/Linux Overview



## Unix/IP Preparation Course

# UNIX / Linux and Windows

## Why does \*NOGs use UNIX / Linux?

Majority of core services on the Internet provided by UNIX / Linux

Much of Enterprise class computing built around UNIX / Linux

Open Source network monitoring and management solutions

- Widely used
- Generally not available for Windows

Router OSes are command-line and some, even, Linux

## We assume

End users are on Windows (some places Macs, too)

Don't expect end-users to use UNIX or Linux

We do expect that you are likely to use Linux or UNIX

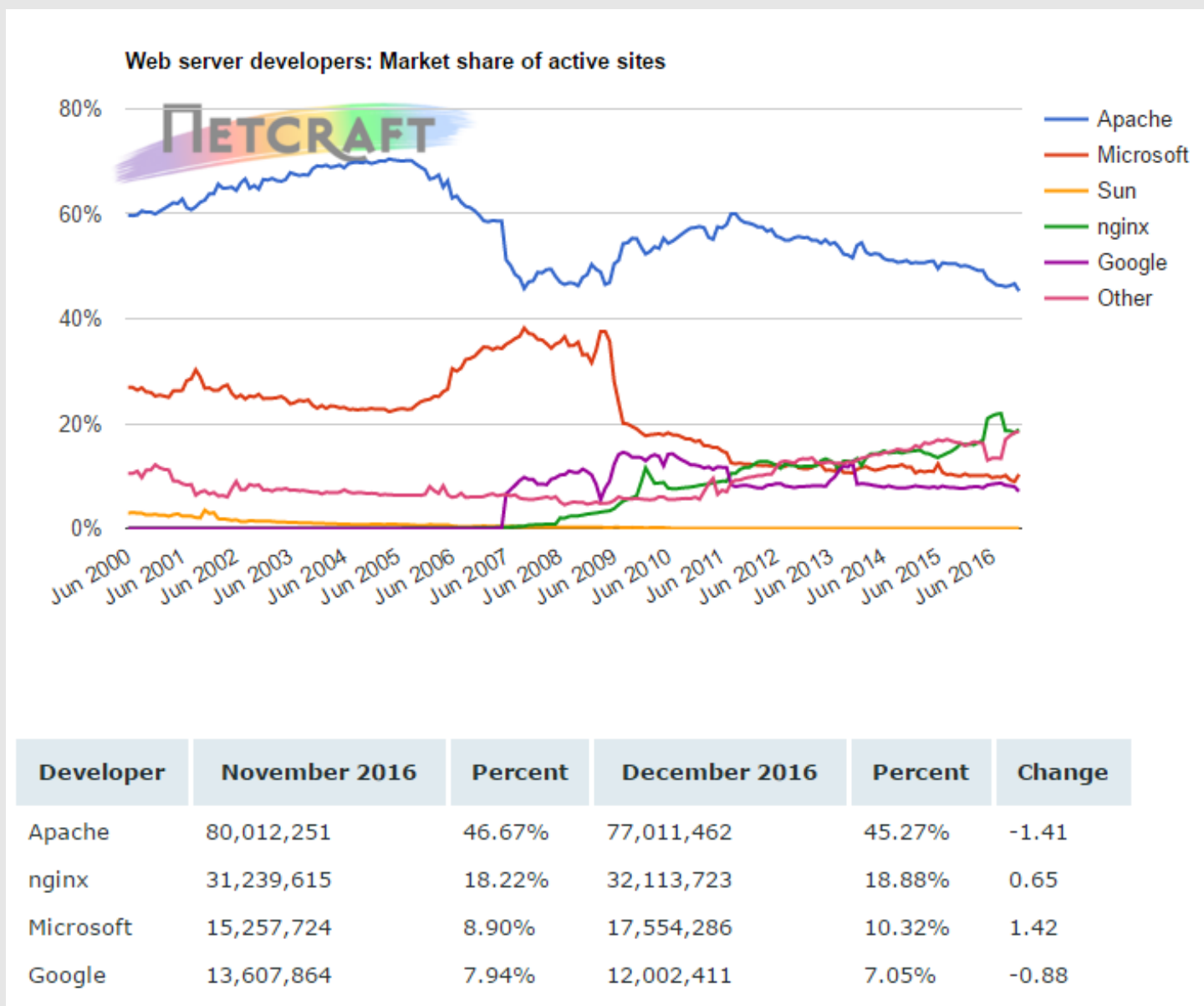
## Licensing

Windows products and license schemes cost \$\$

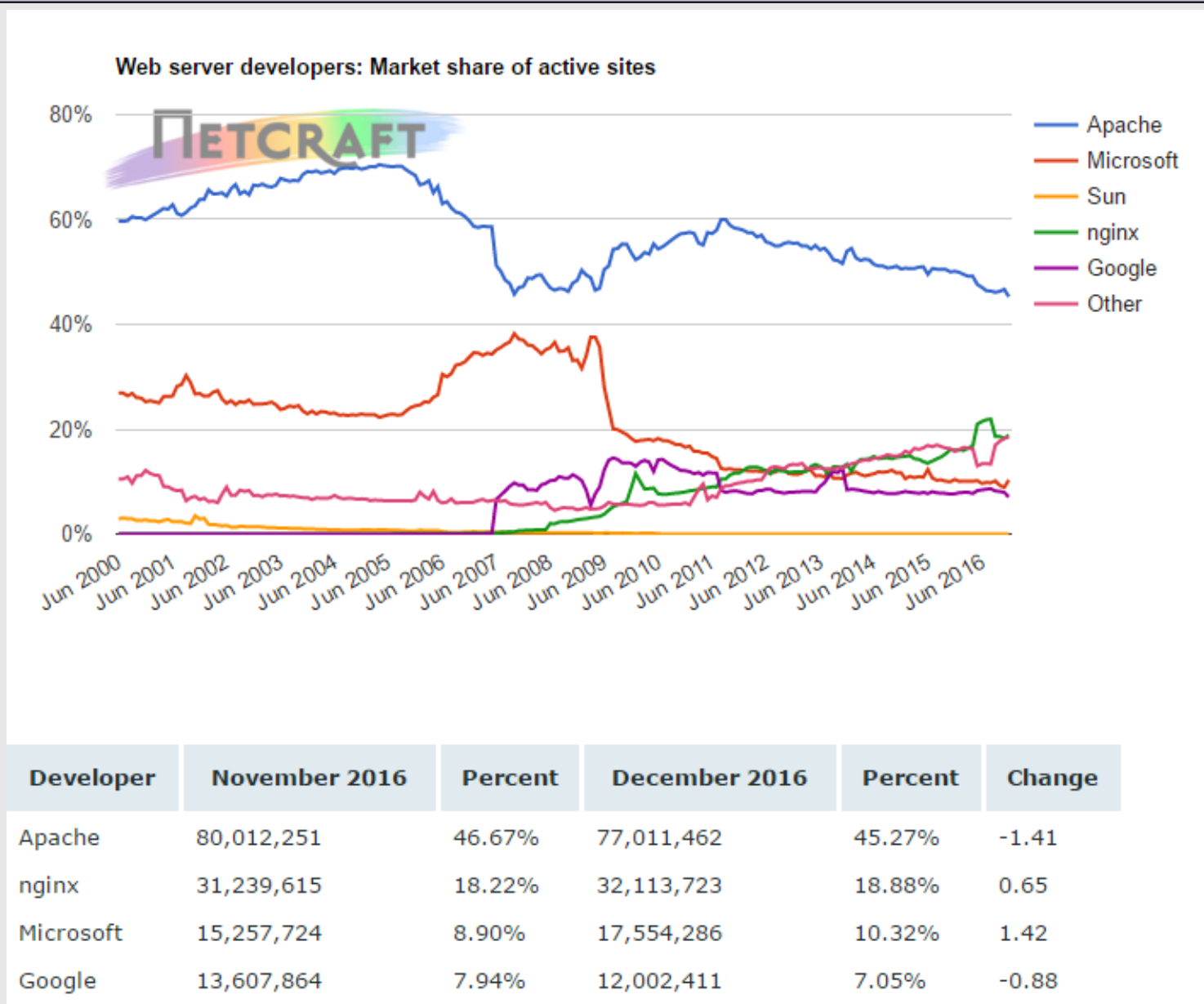
Open Source software is “free” (as in beer)

Actual costs to implement vary widely

# Netcraft Survey: Approx 1.7 Billion Hosts



# Netcraft Survey: Approx 1.7 Billion Hosts



# Security Space Survey: March 2017

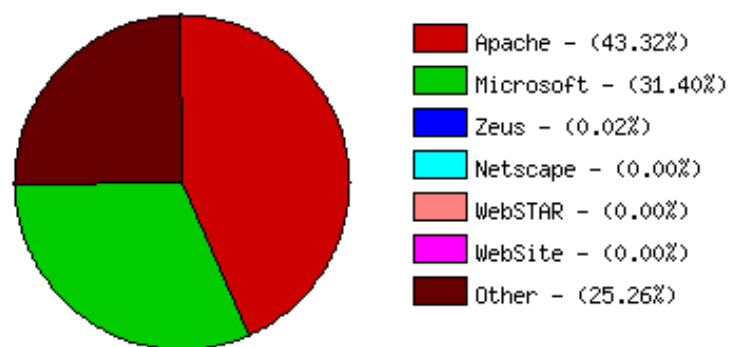
## Across All Domains

Market Share Change (Total servers: 76,829,923)

Server <sup>1</sup>	February Count	February %	January Count	January %	Change
Apache	33,285,312	43.32%	32,647,479	44.46%	-1.14%
Microsoft	24,125,486	31.40%	22,100,932	30.09%	+1.31%
Zeus	13,082	0.02%	14,376	0.02%	+0.00%
Netscape	1,054	0.00%	1,048	0.00%	+0.00%
WebSTAR	683	0.00%	670	0.00%	+0.00%
WebSite	514	0.00%	501	0.00%	+0.00%
Other	19,403,792	25.26%	18,674,221	25.43%	-0.17%

<sup>1</sup>Servers are ordered according to their global market share.

## Market Share for February 2017 - Across All Domains



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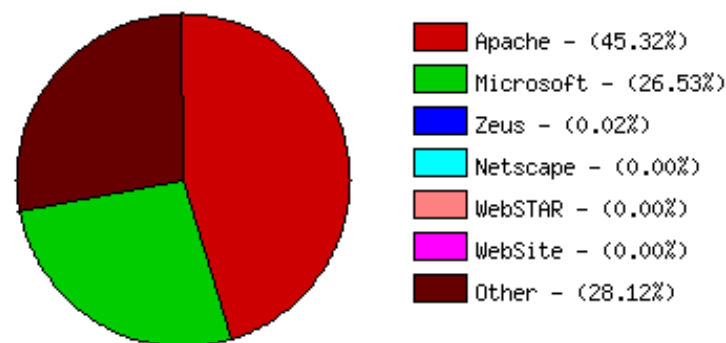
## Domain .com (Commercial)

Market Share Change (Total servers: 27,947,308)

Server <sup>1</sup>	February Count	February %	January Count	January %	Change
Apache	12,665,818	45.32%	12,386,508	45.48%	-0.16%
Microsoft	7,415,721	26.53%	7,113,450	26.12%	+0.41%
Zeus	4,677	0.02%	5,535	0.02%	+0.00%
Netscape	450	0.00%	447	0.00%	+0.00%
WebSTAR	330	0.00%	329	0.00%	+0.00%
WebSite	251	0.00%	242	0.00%	+0.00%
Other	7,860,061	28.12%	7,727,864	28.38%	-0.26%

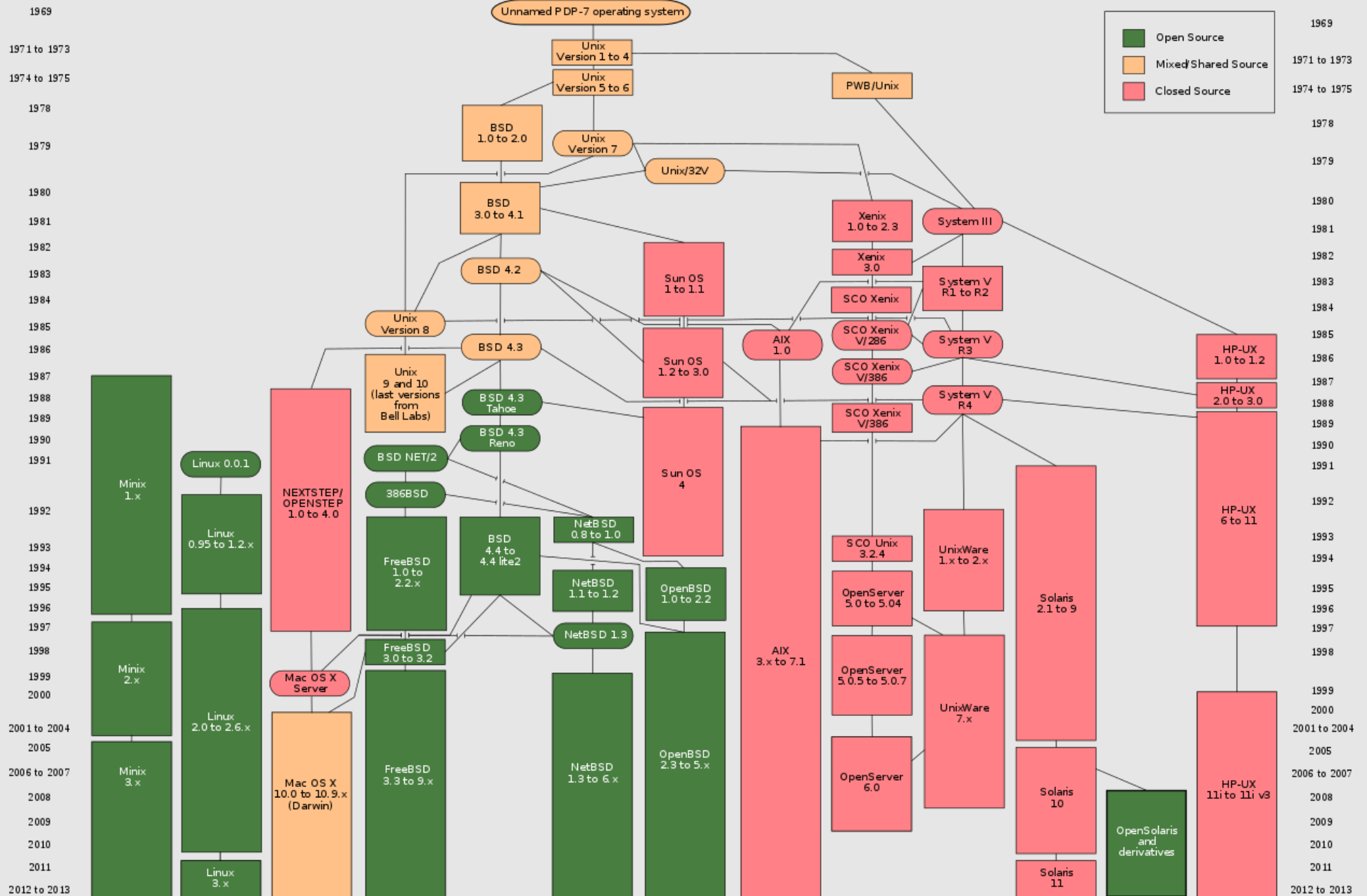
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## Market Share for February 2017 - Domain .com (Commercial)

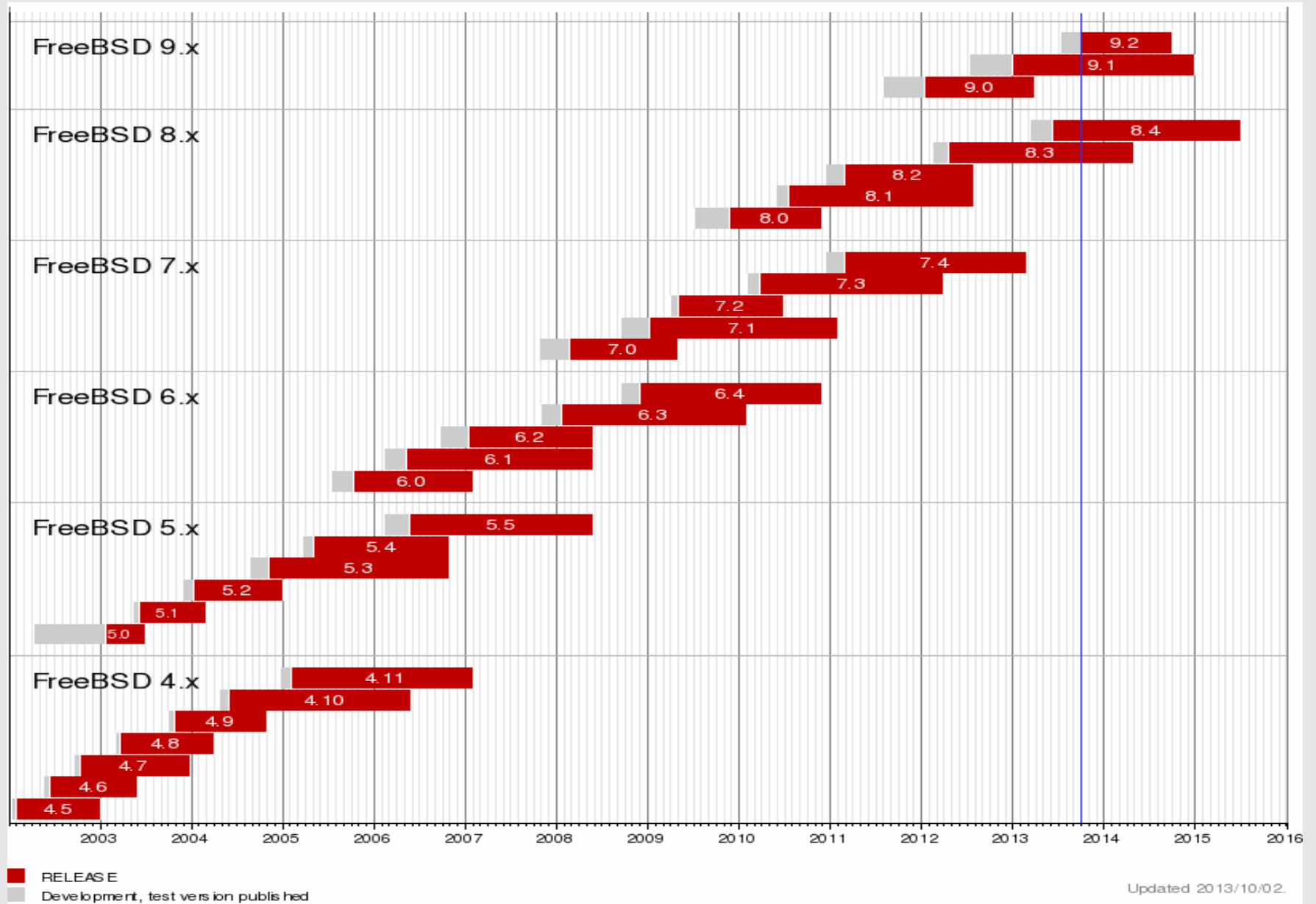


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# UNIX History

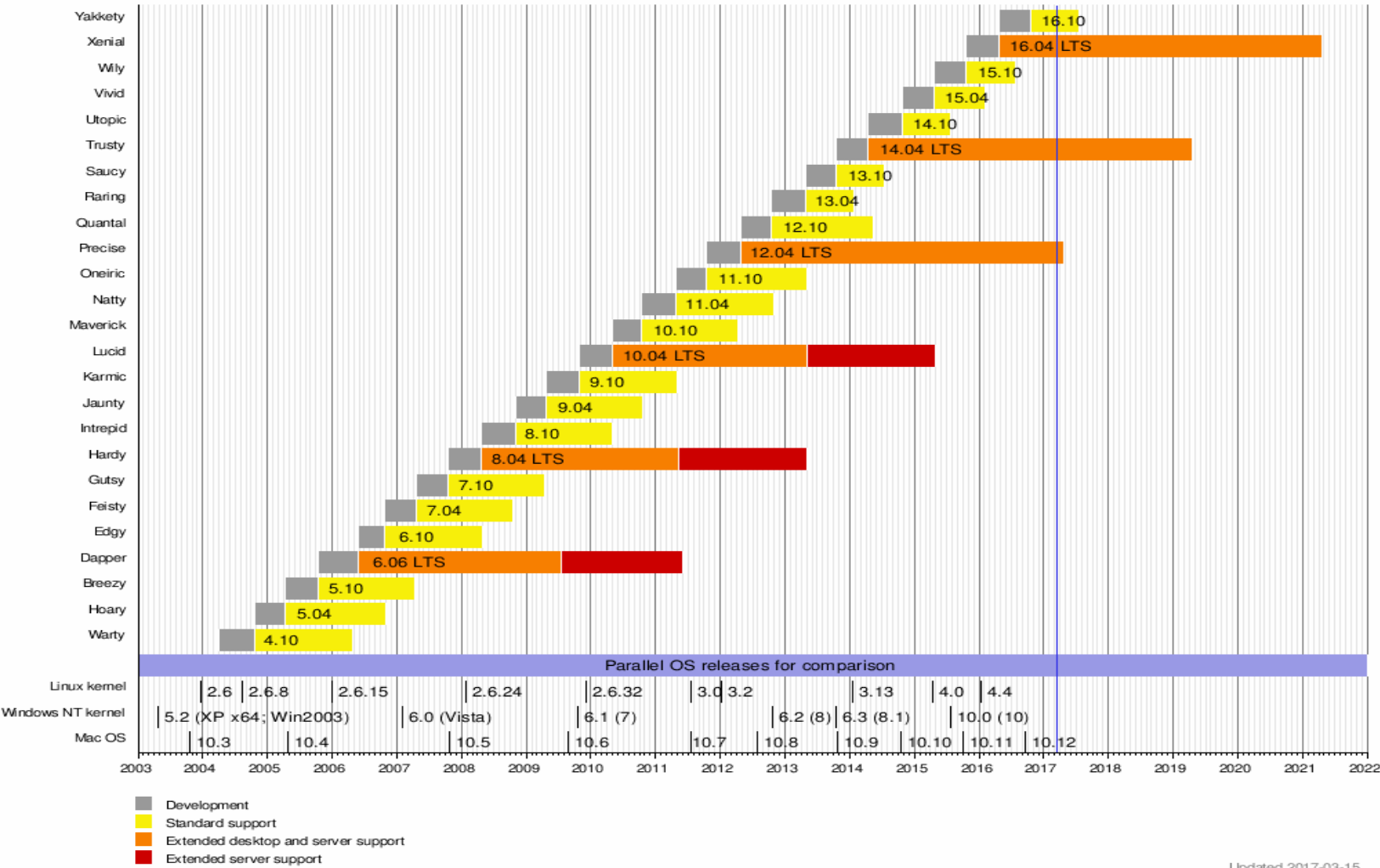


# FreeBSD Timeline



# Ubuntu Timeline

Ubuntu release timeline



Note the length of support for the **LTS (Long Term Support)** versions of Ubuntu.



# Unix vs. Linux

## Are they the same?

Yes, at least in terms of operating system interfaces  
Linux was developed independently from Unix  
Unix is much older (1969 vs. 1991)

## Scalability and reliability

Both scale very well and work well under heavy load  
(this is an understatement 😊)

## Flexibility

Both emphasize small, interchangeable components

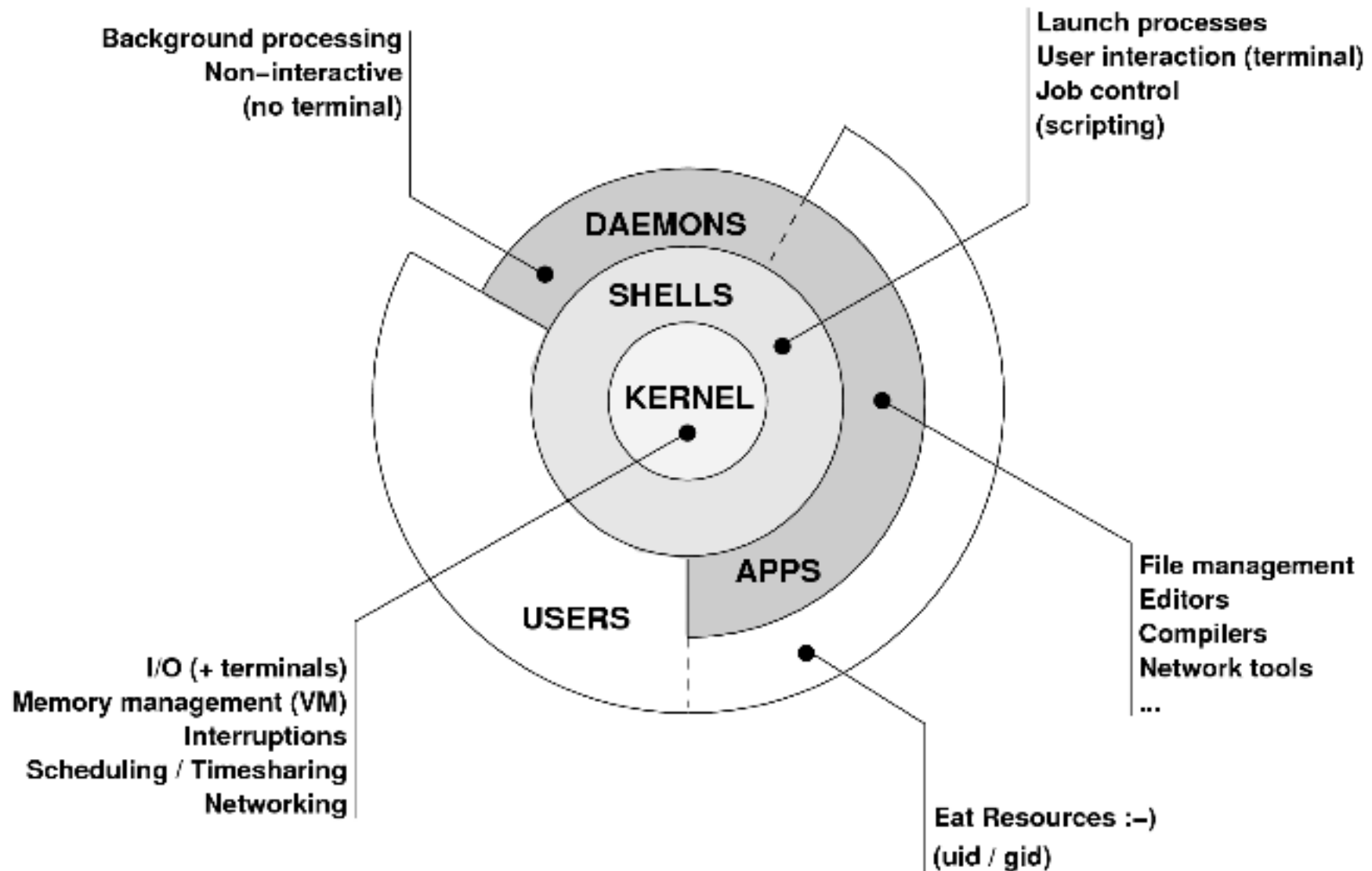
## Manageability

Remote logins rather than GUI  
Scripting is integral

## Security

Due to modular design has a reasonable security model  
Linux and its applications are not without blame

# The Unix System



# Kernel

The "core" of the operating system

Device drivers

communicate with your hardware

block devices, character devices, network devices, pseudo devices

Filesystems

organise block devices into files and directories

Memory management

Timeslicing (multitasking)

Networking stacks - esp. TCP/IP

Enforces security model

# Shells

## Command line interface for executing programs

- Windows equivalent: `command.com` or `command.exe`

## Also programming languages for scripting

- DOS/Windows equiv.: batch files, WSH, VBScript, PowerShell
- Linux/Unix: Perl, shell, php, python, C, etc.

## Choice of similar but slightly different shells

- **bash**: the "Bourne-Again Shell". Combines POSIX standard with command history.
- **sh**: the "Bourne Shell". Standardised in POSIX
- Others: **ksh**, **tcsh**, **zsh**, **cs**

# User processes

The programs that you choose to run

Frequently-used programs tend to have short cryptic names (why?)

"**ls**" = list files

"**cp**" = copy file

"**rm**" = remove (delete) file

Lots of stuff included in most base systems

Editors, compilers, system admin tools

Lots more stuff available to install as well

Thousands and thousands of packages

# Services, Processes Daemons

Programs that run in the background; called daemons on FreeBSD →



“sparky”

Examples:

**apache:** The Apache Web server

**cron:** Executes programs at certain times of day

**syslogd:** Takes log messages and writes them to files

**sshd:** Accepts incoming logins

**sendmail** (other MTA daemons like Exim, Postifx):  
accepts incoming mail (smtp)

# Security model

## Numeric IDs

user id (uid 0 = "*root*", the superuser)

group id

supplementary groups

## Mapped to names

/etc/passwd, /etc/group (plain text files)

## Suitable security rules enforced

e.g. you cannot kill a process running as a different user, unless  
you are "*root*"

# Any questions?

?



# Core directory refresher

/	<i>(/boot, /bin, /sbin, /etc, maybe /tmp)</i>
/var	<i>(Log files, spool, maybe user mail)</i>
/usr	<i>(Installed software packages)</i>
/tmp	<i>(May reside under "/")</i>

Don't confuse the the “root account” (/root) with the “root” (“/”) partition.

# ‘Auto Defaults’ Partition

During FreeBSD installation you can choose this option. It creates the following:

- “/” Small Root partition
  - this will contain everything not in another partition  
/bin, /sbin, /usr etc.
- A *swap partition* for virtual memory
- /var for “variable” files, such as logs, mail spools, etc.
- /tmp
  - Where temporary files are located
- /usr
  - /usr/home contains user directories. This is the largest partition created.

# Partitioning Issues

**/var** may not be big enough

**/usr** contains OS utilities, third-party software

**/usr/home** contains your own important data

If you reinstall from scratch and erase /home, you will lose your own data

- Everything in “/” is now more common due to RAID. Why? Valid?
- /tmp?
- Others?
- How much *swap* should you define?

# Note...

Partitioning is just a logical division

If your hard drive dies, most likely *everything* will be lost.

If you want data security, then you need to set up mirroring with a separate drive.

Another reason to keep your data on a separate partition, e.g. /u  
Remember, “`rm -rf`” on a mirror works *very* well.

Or, as always “Data Security”  $\Leftrightarrow$  Backup

# Software Installation Linux

Two major packaging systems:

- Redhat Package Manager → RPM
- Debian Packages → DPKG

Both have wrapper tools to make them easier to use:

- rpm wrapped with “yum”
- dpkg wrapped with “apt” and “aptitude”

Both use repositories.

Linux has the other usual suspects as well:

- Install from source
- Install from binary

# System Startup Linux

## Startup scripts

In /etc/init.d/ (System V)

In /etc/init/ (Ubuntu 12.04 LTS and Upstart)

**NOTE!** Upon install services run!

## Controlling services

Stop/Start/Restart/Reload/Status Services

```
# service <Service> <Action>
```

or, “old school”

```
# /etc/init.d/<service> <action>
```

# Administration

- The use of the *root* account is discouraged. The *sudo* program is used instead.
- You can do a “*buildworld*” to move between major and minor releases (FreeBSD).
- You can use *apt* and/or *yum* to move between many major and minor Linux releases.
- Ubuntu does `do-release-upgrade` to move to a new version.

# Important Reads

- `man builtin`
- `man hier`
- `man man`
- `man ports`
- `man rc.conf`

And, “`man any_unknown_command`” when you are in doubt.



# There's More

## The FreeBSD Handbook

<http://www.freebsd.org/handbook/>

## Some Web Resources

<http://www.freebsd.org>

<http://forums.freebsd.org>

<http://distrowatch.com/table.php?distribution=freebsd>

<http://www.freshports.org/>

<http://wiki.freebsd.org>

<http://en.wikipedia.org/wiki/FreeBSD>

*GIYF (Google Is Your Friend)*

# Connect to your Virtual Linux Machine

Now you will use ssh to log in on your own virtual Linux machine as userid ***ubuntu***

1. Windows users download putty.exe from:

<https://nsrc.org/workshops/2018/afnog-bootcamp/software/putty.exe>

2. Save putty.exe to your desktop and double-click the icon
3. Connect to 100.64.0.**N** as user “***ubuntu***”

We'll do this now and instructors will help

Mac / Linux users open a terminal window and do

```
$ sshubuntu@100.64.0.N
```

**You specific VM and password will be given in class**