Welcome to LKCAMP!

A Linux kernel study group

LKCAMP - Round 3 - Mar 26, 2019

Index 1

What a kernel does?

The kernel is an abstraction layer that manages your hardware resources and provide security for your system.

What does a kernel manage?

Memory, process, threads, scheduler, file system, networking, power consumption, keyboard, usb, screen, graphics card, media, boot, storage, gpios, spi, i2c, audio, microphone, camera, virtual machines, ...

Kernel examples

Windows kernel

Linux

FreeBSD kernel

OpenBSD kernel

XNU (MacOS kernel)

...

Why an abstraction layer is required?

Each hardware has its specificities. The kernel provides an API that abstracts the hw specific things.

Avoid concurrency between processes

Which kind of security does it provide?

Programs are selfish: they think they are the only software running in the system.

- It can consume all available resources.
- It can use all available memory and CPU.

Programs shouldn’t interfere with others.

The kernel provides process isolation.

How does it provide security?

- Operates in special mode from the processor (privileged mode)
- It can access memories, page table, execute instructions and access registers that are only available in privileged mode.

Processor modes are hardware specific.

Index 2

History

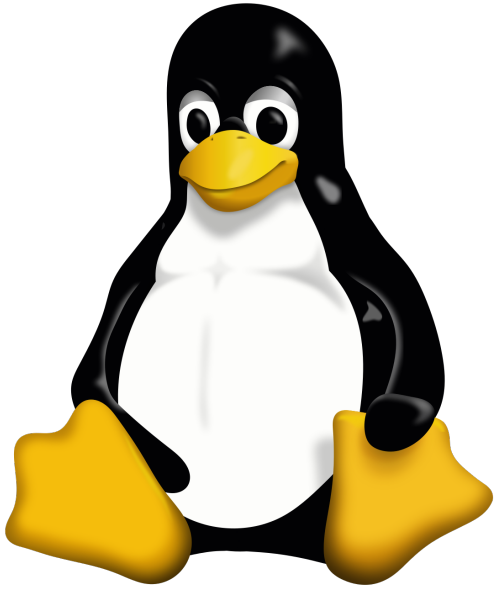
Created by Linus Torvalds in 1991

Free Software - GPLv2

Monolithic kernel

It is just a part of the Operating System

Richard Stallman - GNU project



But what is a Free Software?

The freedom to:

- 0) Run (for any purpose)
- 1) Study and change it (source code required)
- 2) Redistribute copies
- 3) Redistribute copies of your modified version (source code required)

Where we can find it?

Servers

Public clouds

GNU/Linux OSes (Ubuntu / Debian / Fedora / Arch Linux / Gentoo / SteamOS / ...)

Android devices

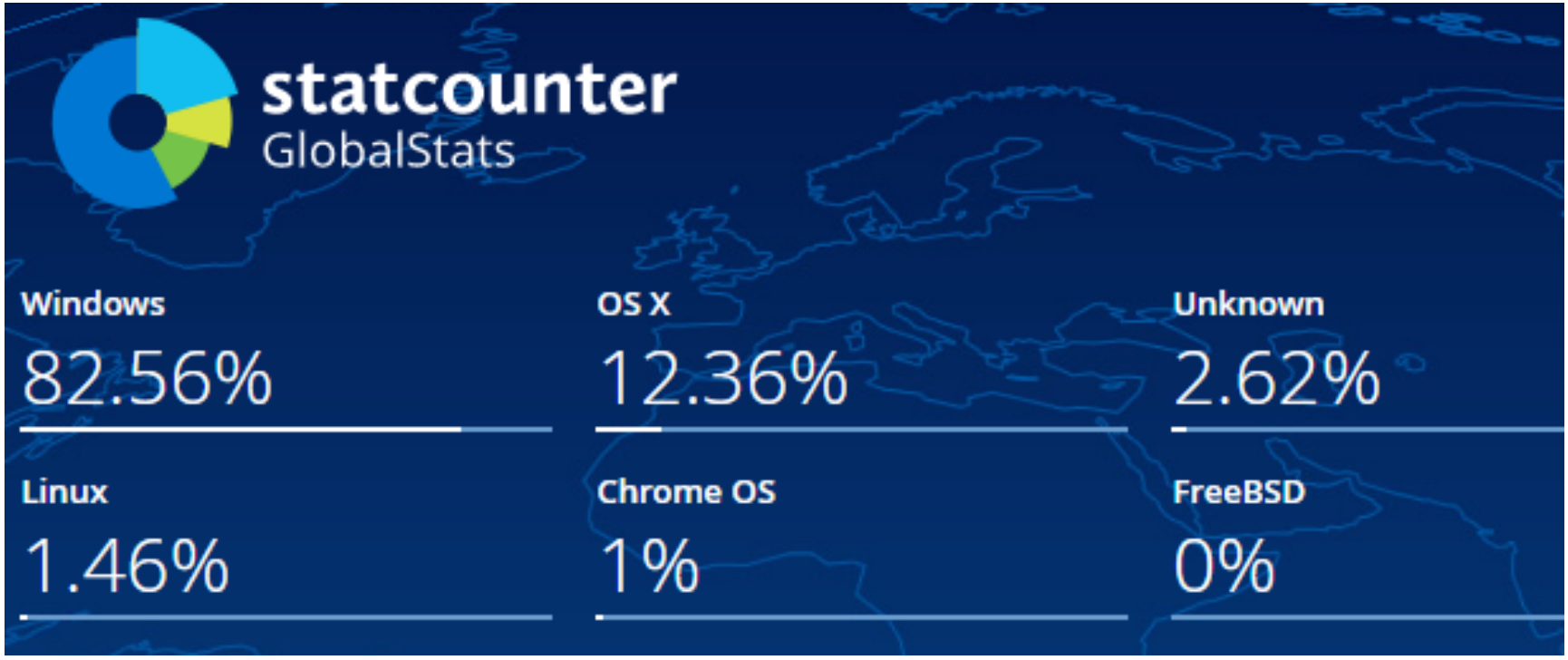
Chromebooks

Amazon kindles

Tesla cars

Embedded systems: SmartTVs, setup-boxes, steam box, drones, e-readers ...

Market share - Desktops and Laptops



source: https://www.makeuseof.com/tag/linux-market-share/ (Mar 2018)

Linux market share - Other areas

Web Servers - 96.5%

Public clouds - 92%

Smartphones and tablets - 70% (Android)

- Estimated 2.5 billion smartphones in the world
- roughly 1.75 billion handsets are Android
- for comparison: Windows is running on an estimated 1.5 billion home computers.

source: https://www.makeuseof.com/tag/linux-market-share/(Mar2018)

Development statistics

https://lwn.net/Articles/780271/

Index 3

LKCAMP - Linux kernel study group

Group created to teach and learn about Linux kernel development.

Schedule

M1 - Compile and boot the kernel from source code

M2 - Learn how the kernel development cycle works and send your first patch

M3 - Device drivers - how to write a module from scratch

M4 - Boot process and project assignments

M5 - System calls - API between userspace and kernelspace

M6 - Presentations

Pre-requirements

C programming language

Notions of GNU/Linux command line

Notions of operating systems

Notions of data structure

Git versioning tool

What if I don’t have the requirements?

It’s going to be a bit harder, but we are here to help! :)

Git-game: a Git course a bit different

This Thursday! Mars 28, 2019 - Room 303 - 19h20

Welcome to the git-game!!

This is a terminal game designed to test your knowledge of git commands. Each level in the game is a task to perform on this repo. Once you perform that task, you will be given your next task. There are a total of ten levels, each one harder than last!

Let's get this journey started!!

Clone this repository by running:

```
$ git clone https://github.com/hgarc014/git-game.git
```

Don't know a lot about git??

Then you should check these files for assistance:

https://github.com/mikelzbicki/ucr-cs100/blob/2015winter/textbook/cheatsheets/git-cheatsheet.md

https://github.com/mikelzbicki/ucr-cs100/tree/2015winter/textbook/tools/git/advanced-git

Otherwise, you are free to continue...

You can win a badge for completing this game!

learn more about badges here: https://openbadgefactory.com/faq

You should always check the README.md file for your next clue!

`Level 1`

Your first task is to checkout the commit whose commit message is the answer to this question:

> When a programmer is born, what is the first thing he/she learns to say?

source: `https://github.com/git-game/git-game`

Advanced topics

DMA mapping

Types of memory allocation

Device trees

KVM virtual machine API

Scheduling

Kernel data structures (lists, kobjects)

Graphics stack API / Media stack API

Makefile

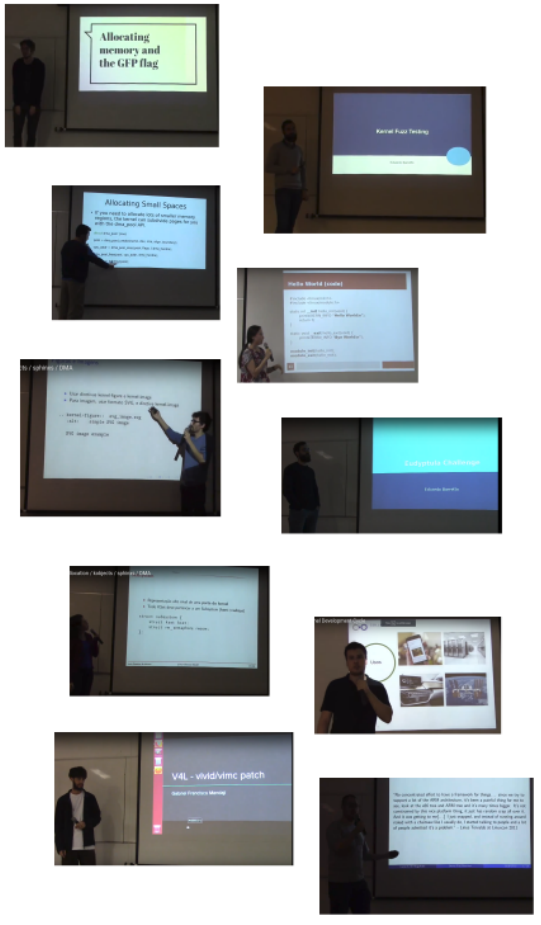
Kernel memory leak detection

Security modules (Seccomp / eBPF)

How a program get to run

Semaphores, mutex, spinlocks

Fuzzy testing



LKCAMP start time

19h - advanced topics and/or hacking (come if you can!)

19h30 - meeting begins.

Volunteers call

We are all volunteers!

Become a member and contribute back too!

Join our group: `https://gitlab.com/lkcamp`

Index 4

What is GSoC and how it works

GSoC - Google Summer of Code

3 months paid internship in a free software project.

Several organizations are participating, including Linux.

What is GSoC and how it works [2]

Mentors: experienced people in the free software community.

Interns are more likely to get a job with free software due to:

- technical knowledge acquired.
- skills to interact with the communities.

GSoC Practical information

Only for students.

Coding period: May 27 - August 19 2019

Application deadline: April 9, 2019

Brazil 3600 USD (R$13.800,00 today)

Application process values previous contributions.

https://summerofcode.withgoogle.com

Outreachy - Diversity in Tech

Similar to GSoC

Focused to under-represented people in tech (women (both cis and trans), trans men, and genderqueer)

You don’t need to be a student.

Outreachy Practical information

Extended deadline April 2, 2019.

Internship period: May 20, 2019 to Aug. 20, 2019

$5,500 USD (R$21.000,00 today) + $500 travel stipend

Application process requires:

- Previous contributions.
- Task list specified by the project you are applying.

`https://www.outreachy.org/apply/project-selection/`

Conferences and Bursaries

500USD is not much to go to international conferences. But...

- Several organizations can provide more funding.
- E.g. Linux Foundation, DebConf, ...
- Active contributors, GSoC and Outreachy interns and alumnis are more likely to get more funding.

Why should you go? Meeting your mentors and great developers and active members of the community face to face is very motivating and builds a network.

Index 5

Our volunteers

Who we are ...

Mentorship

Today requires bash skills

take a quick look:

https://lkcamp.gitlab.io/lkcamp_docs/intro_course/lab01/

Who is a newcomer?

Volunteers for mentors?

Getting started

Start with https://lkcamp.gitlab.io/lkcamp_docs/intro_course/lab01/

- Use virtme to test the kernel.
- if everything goes well, go back to https://lkcamp.gitlab.io/lkcamp_docs/unicamp_group/boot/
- try to boot own machine with your custom kernel.

IC computers - Room 303

Wi-fi: facebook account

Communication:

- Mailing list: lkcamp@lists.libreplanetbr.org
- IRC Channel: #lkcamp @ Freenode
- Telegram (IRC bridge): https://t.me/lkcamp