Operating System Architecture

1000 meters view…

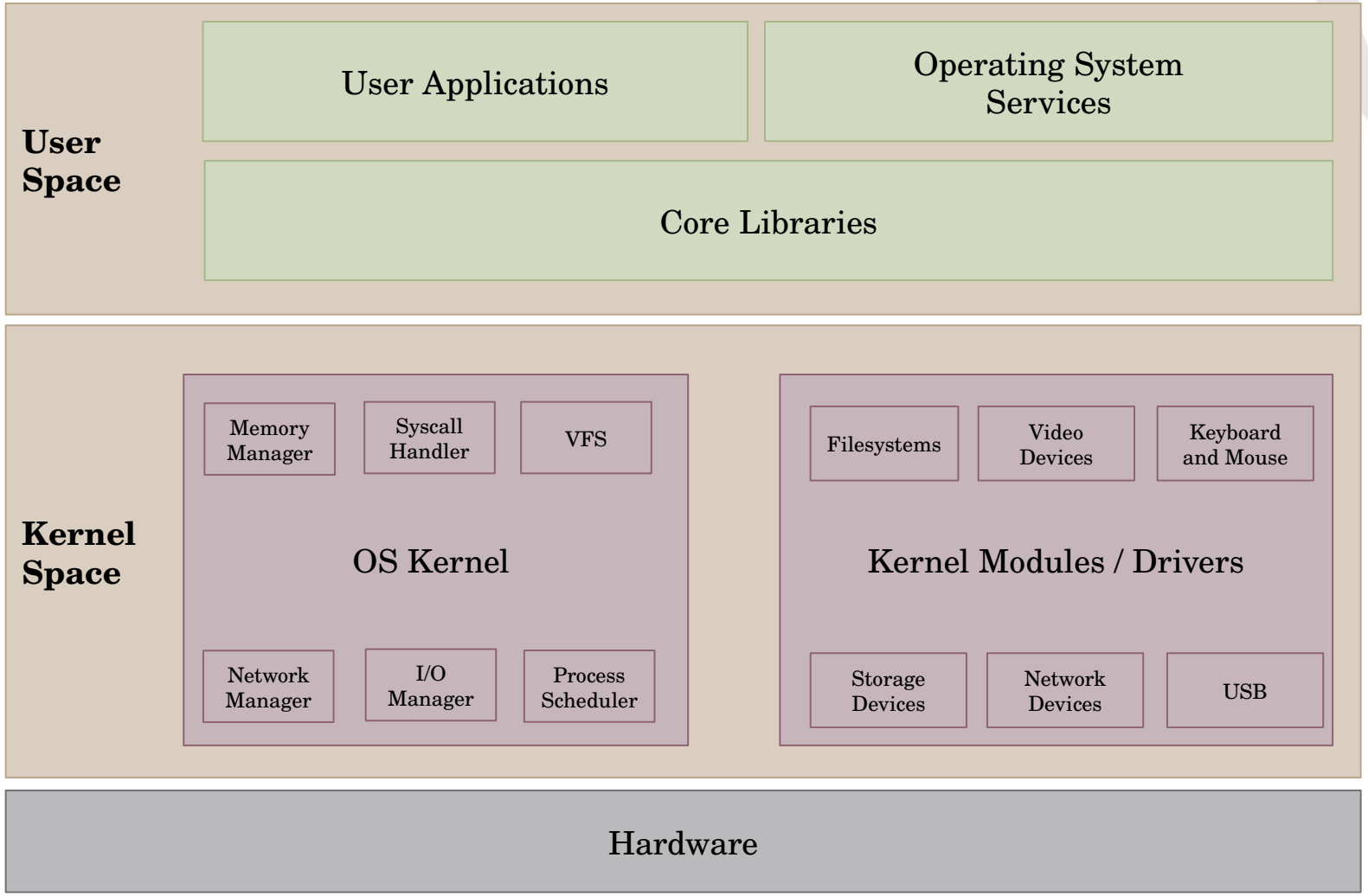
Operating System

- Controls hardware resources
  - CPU
  - Memory
  - Network
  - Storage
  - More…
- Developer point of view
  - Provides application programming interfaces
  - Provides common services
- User point of view
  - Operating system is there to execute programs

Operating System Categories

- Desktop
  - Windows
  - Linux
  - MacOS
  - More…
- Server
  - Linux
  - Windows
  - Unix – BSD, AIX, HPUX..
  - More…
- Mobile
  - Android
  - IOS
  - More…
- Embedded
  - Windows CE
  - Minix
  - Linux
  - More…
- Real-time (RTOS)
  - QNX
  - RTLinux
  - Windows CE
  - More…
- More…

Modern OS High Level Design



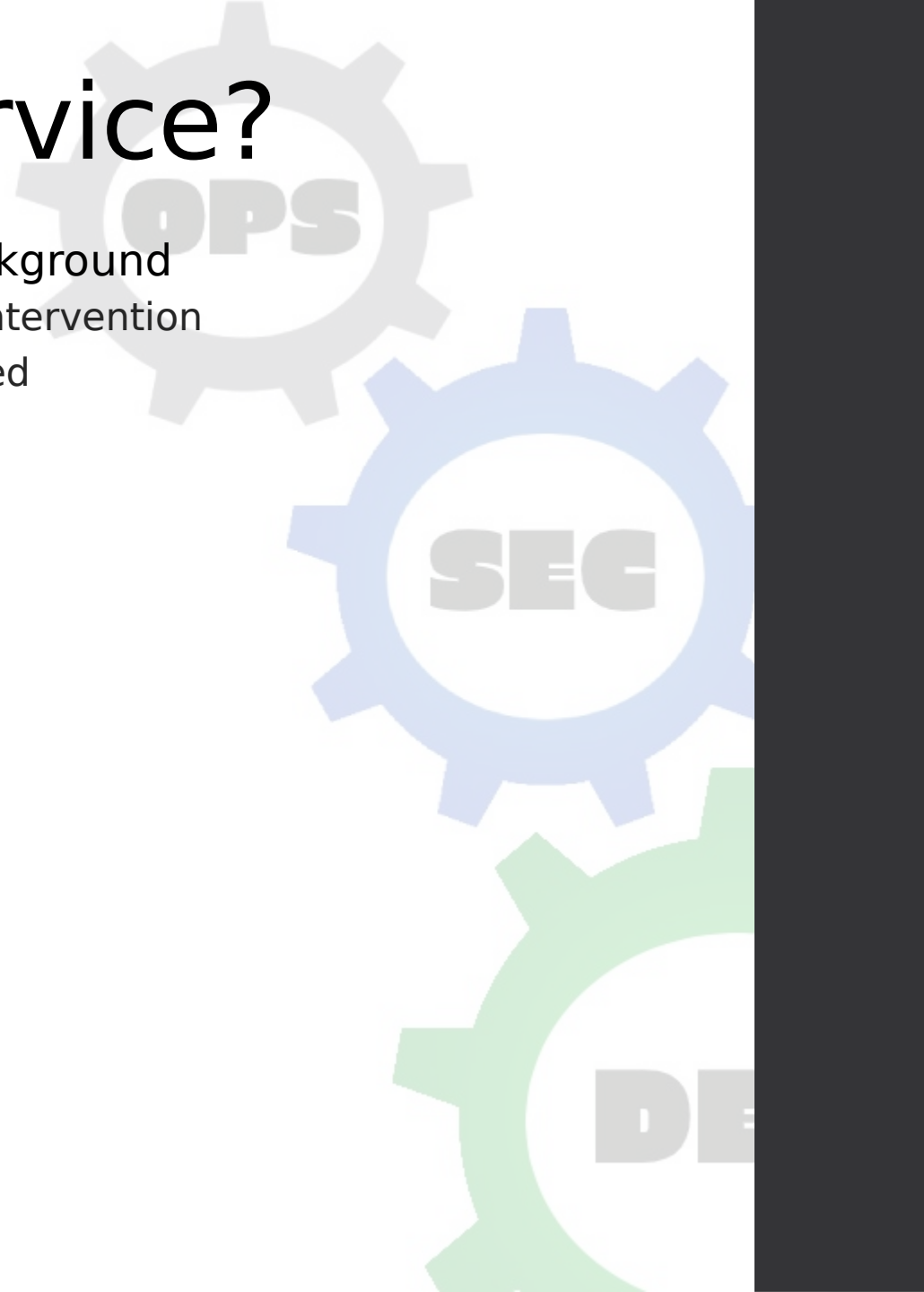
What is a Process

- Represents an instance of a running program
- OS create a process to run a program
- Starting an application creates a process

What is a Deamon or Service?

- A Deamon is a long running process that operates in background
  - Provides specific function that is designed to require no user intervention
  - Can be configured to start when the operating system is started
  - Also known as Service in Windows

- Example of deamons:
  - Web Server (Apache, Nginx, IIS)
  - Database Server (MySql, MongoDB, MSSQL)
  - More...

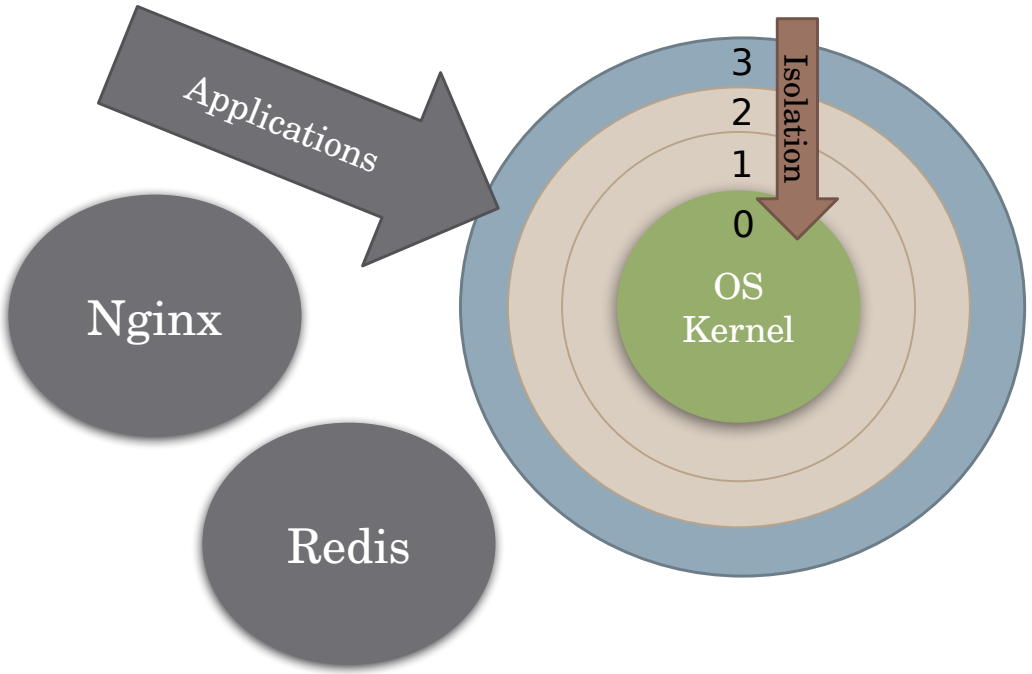


Multitasking

- CPU Core == Single Task
  - Only one process can be executing at any one time on a single CPU core
- What is Multitasking
  - Allow multiple processes to share same CPU and other system resources
- Multitasking operating system
  - OS switches between processes to give the appearance of many processes executing simultaneously
- Cooperative vs Preemptive
  - cooperative multitasking
    - processes decide for how long it keeps the CPU
  - preemptive multitasking
    - processes are not in control for how long they are going to use the CPU

Protection Rings (a.k.a. Isolation Rings)

- Protects data and functionality from faults
- Hardware-enforced by CPU
- CPU microcode



What is a Module or Driver?

- Device
  - A device is a unit of hardware that performs a special function and is attached to a computer.

- Kernel module or Device Driver
  - A device driver is a small software program that operates or controls a particular type of device that is attached to a computer.

How does the OS know which driver to use?

- Device identification string
  - The computer devices have a set of registers that identify the vendor and the device model
  - The OS uses those IDs to identify the attached devices and to select the suitable drivers for them
- Example of device identification string:
  - PCI VEN_10E8&DEV_4750