DevLink.cn
帮助开发者持续成长

macOS 内核结构简介

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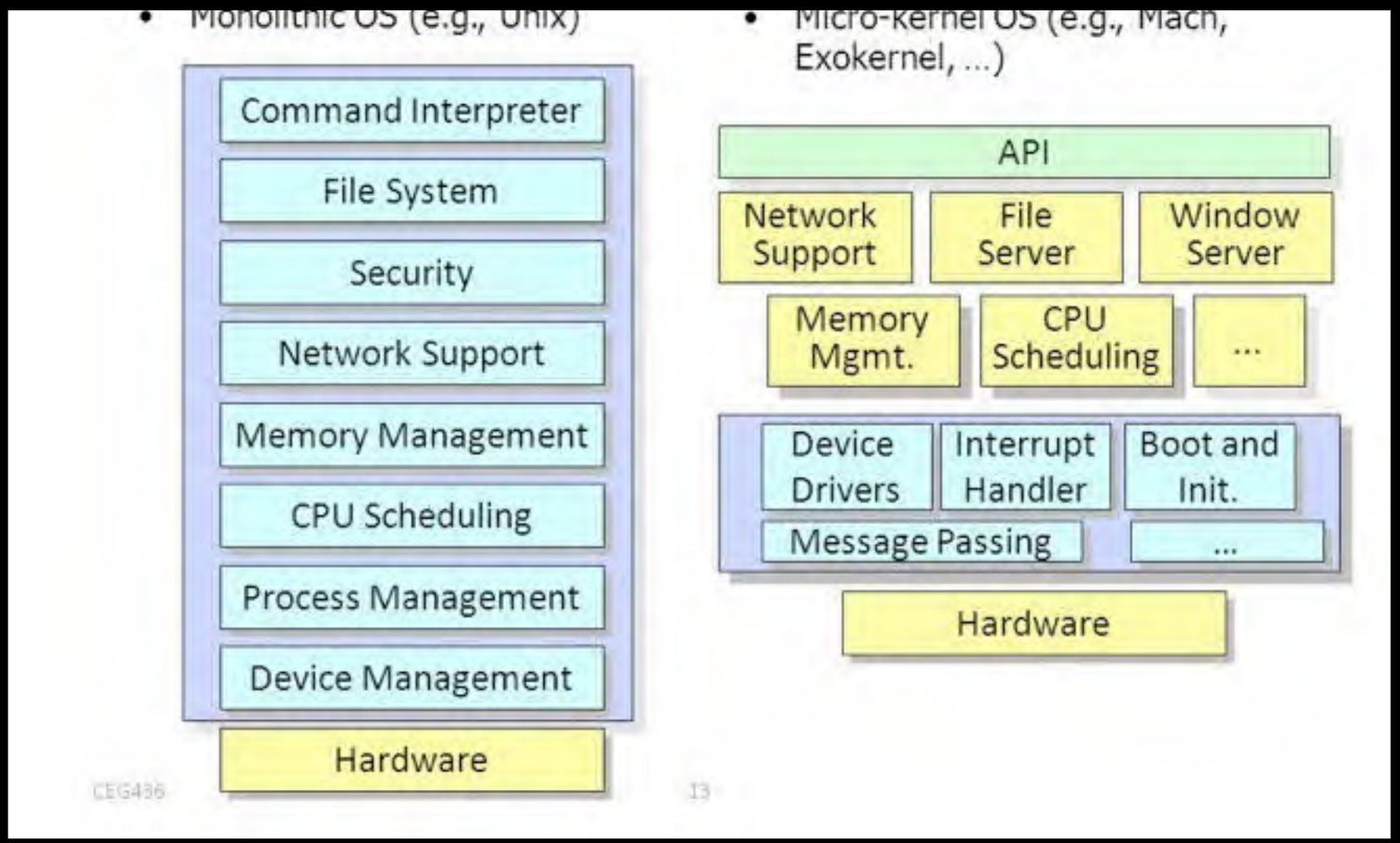
当我们谈论操作系统时，我们在谈论什么

- 核心
- 基本用户程序
- GUI
- 开发者: syscall, loader. executable format, …

内核结构的类型

- 微内核: Mach
- 一体化内核: Linux
- 混合式: Mac OS X, Windows

微内核 vs 一体化内核


Monolithic OS (e.g., Unix)
Command Interpreter
File System
Security
Network Support
Memory Management
CPU Scheduling
Process Management
Device Management
Hardware
Micro-kernel OS (e.g., Mach, Exokernel, ...)
API
Network Support
File Server
Window Server
Memory Mgmt.
CPU Scheduling
...
Device Drivers
Interrupt Handler
Boot and Init.
Message Passing
...
Hardware
CEG436
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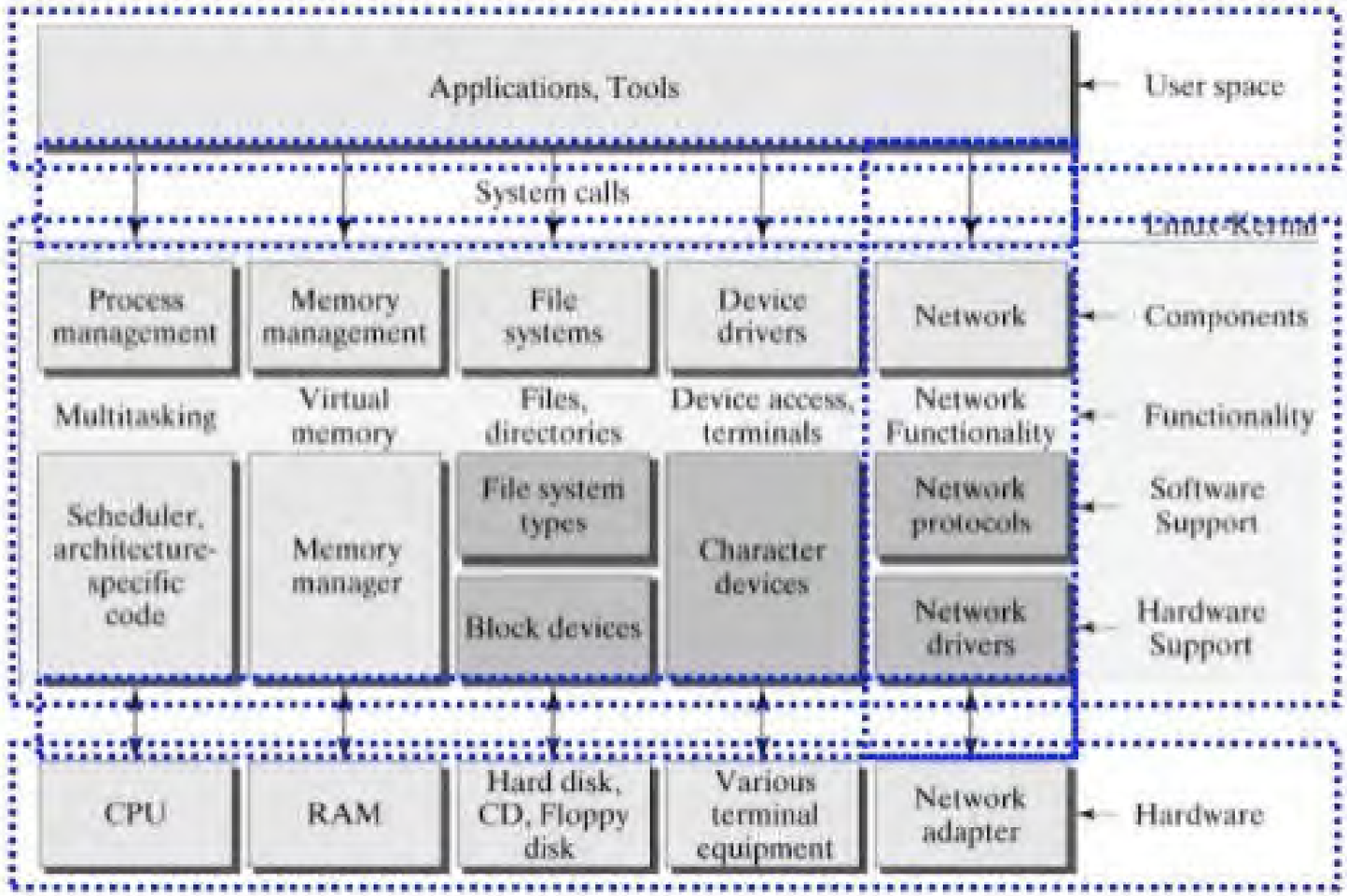
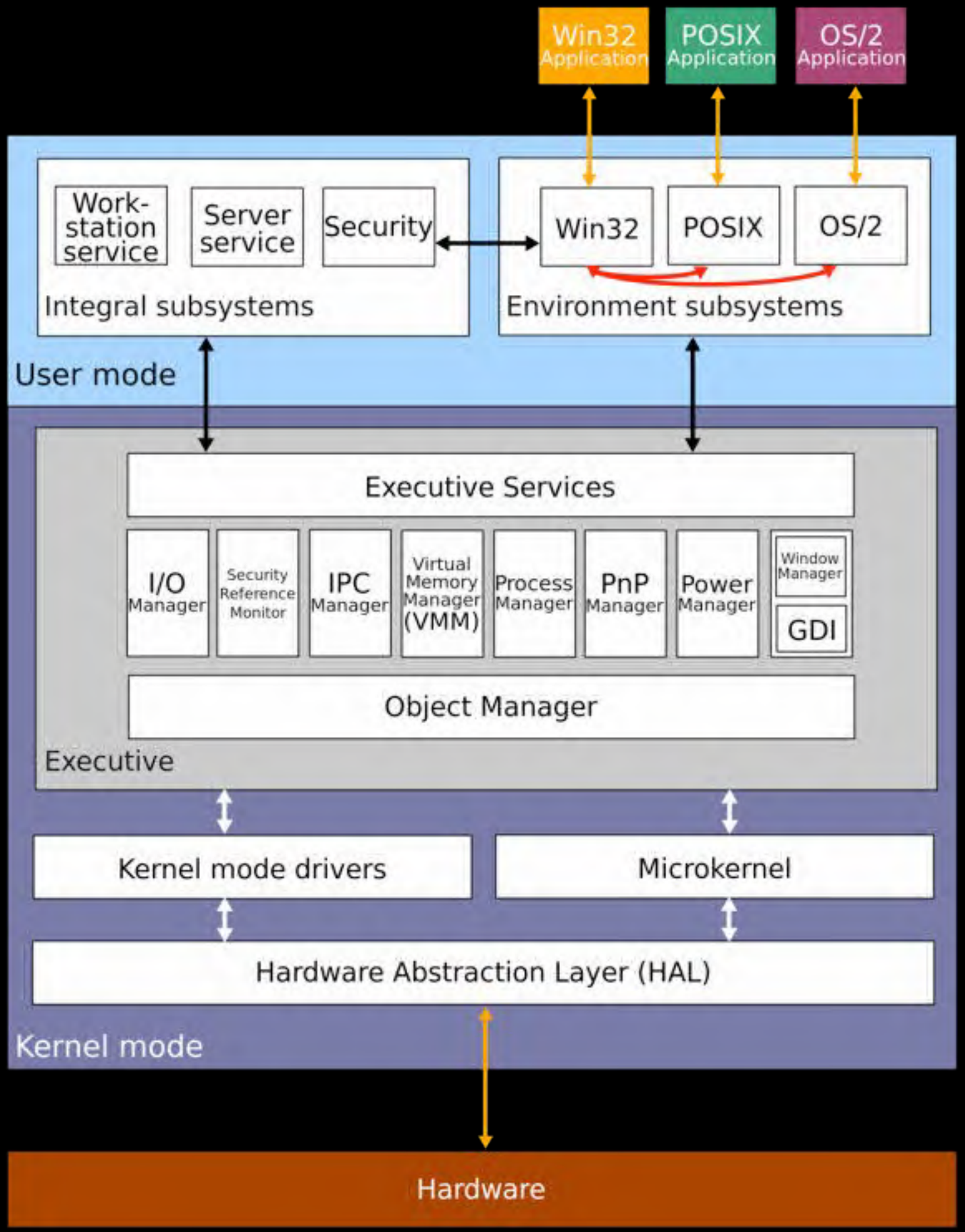
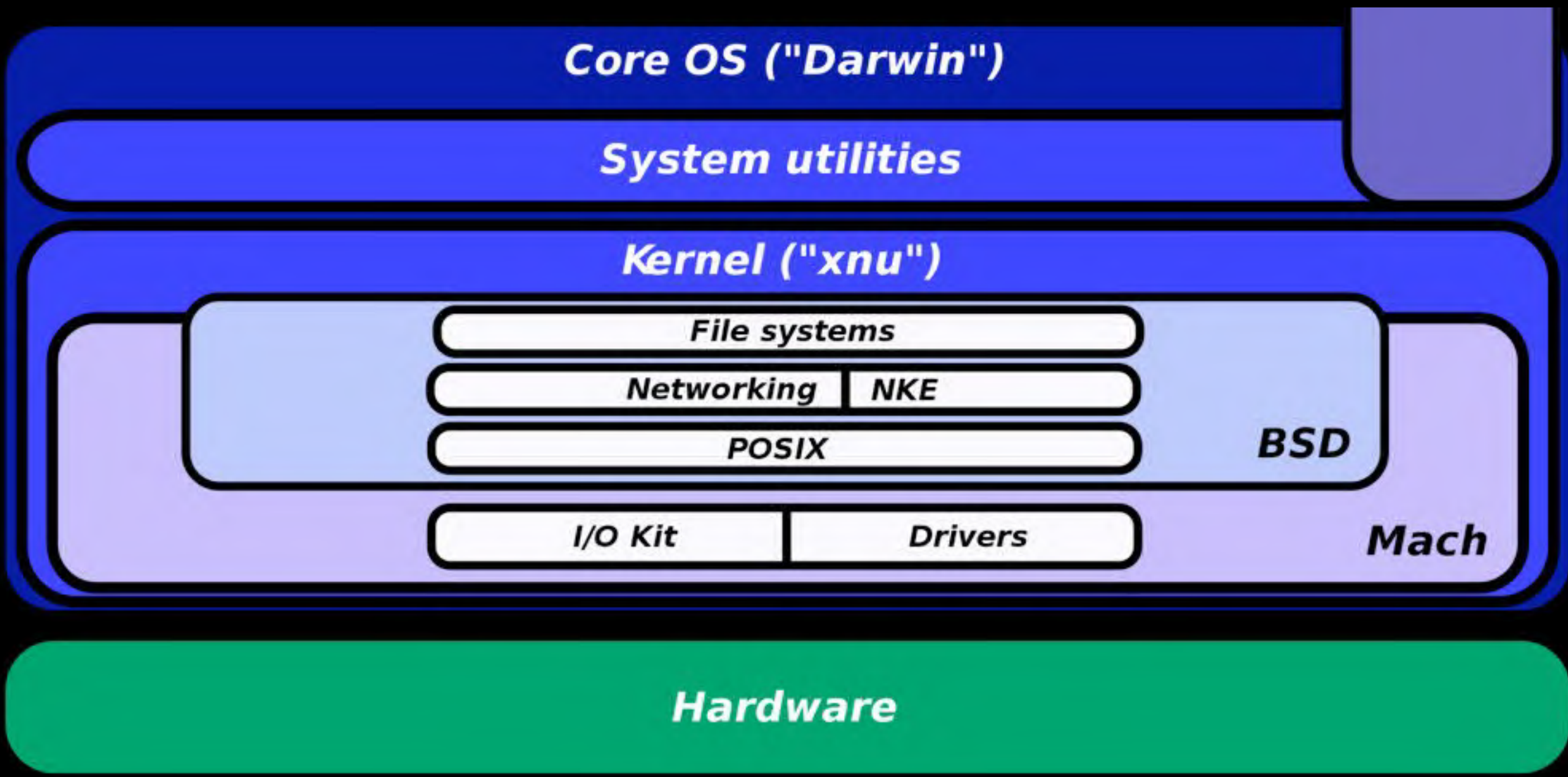
一体化内核: Linux


Applications, Tools
User space
System calls
Linux Kernel
Process management
Memory management
File systems
Device drivers
Network
Components
Multitasking
Virtual memory
Files, directories
Device access, terminals
Network Functionality
Functionality
Scheduler, architecture-specific code
Memory manager
File system types
Block devices
Character devices
Network protocols
Network drivers
Software Support
Hardware Support
CPU
RAM
Hard disk, CD, Floppy disk
Various terminal equipment
Network adapter
Hardware

混合内核: Windows

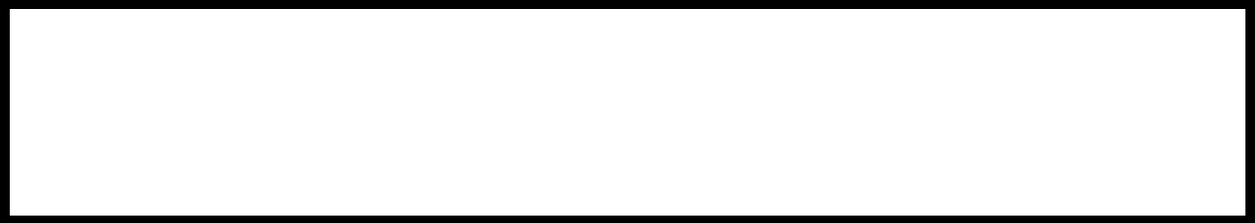


OS X 内核结构图


Core OS ("Darwin")
System utilities
Kernel ("xnu")
File systems
Networking
NKE
POSIX
BSD
I/O Kit
Drivers
Mach
Hardware

Mach in General

- Mach. 面向对象的设计思路. 尽可能小的核心, 外国 一堆 server 提供需要的外国功能. 利用消息进行功 能的请求与完成.
  - 纯粹的 Mach. 在以用户空间进程的形式来实现备个 Server. 消息即 IPC.
  - IPC 导致的性能问题. Context switch, memory mapping, cache missing, etc.



- 演变. 从严格的到不那么严格的.
- Mach 部分成为了提供最核心的, 必须的操作系统服务的部分.
  - thread Object, task Object, scheduler, clock object, VMM, processor object, synchronization object.
  - IPC: mach messages/ports. 依然是很重要的部分. 大量用于用户进程良 kernel 之间的通信, 用户进程之间的通信, 以及内核代码中需要访问另一进程的资源时.

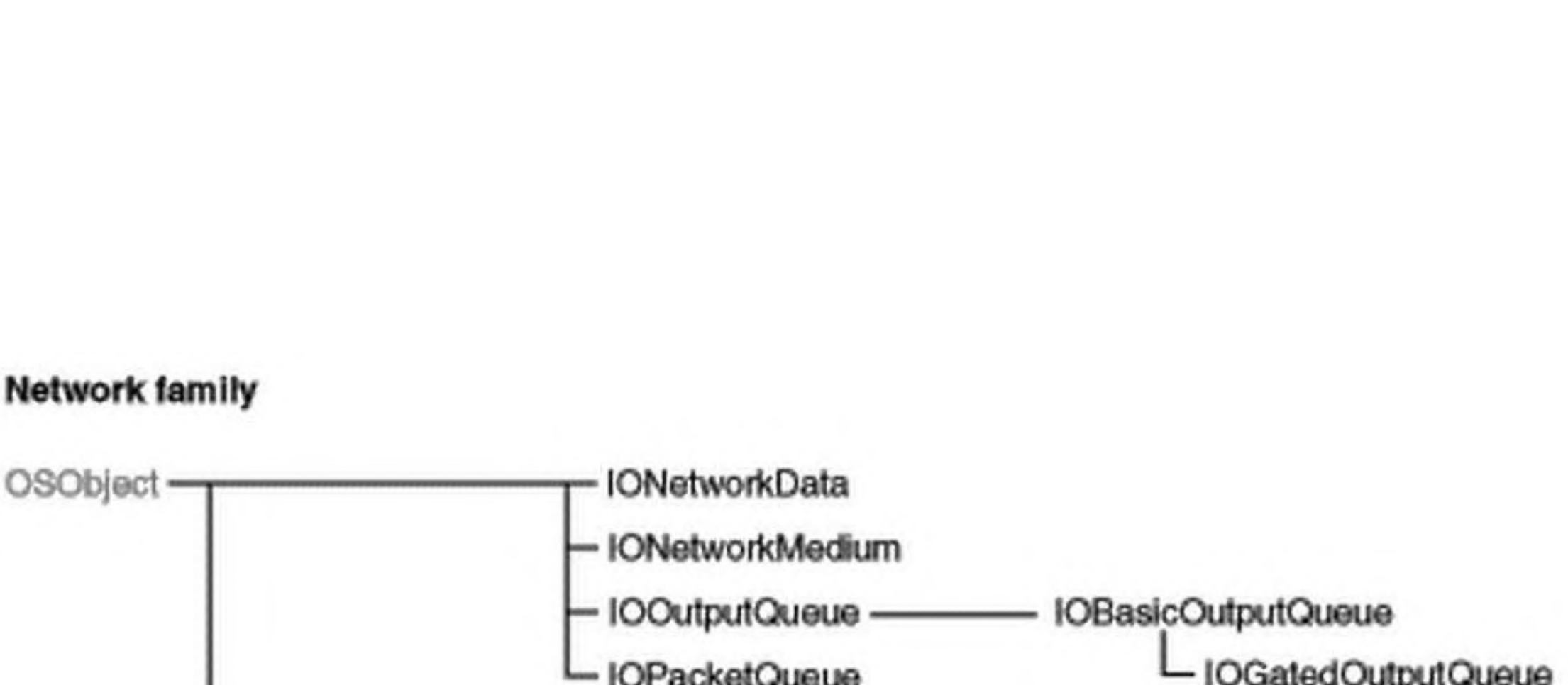
- 与机器本身相关的: host object, processor object, processor set object, clock object.
- 调度相关的: task, thread, exception handling.
- 同步相关: mutex, spinlock, semaphore, rwlock.
- 内存管理.

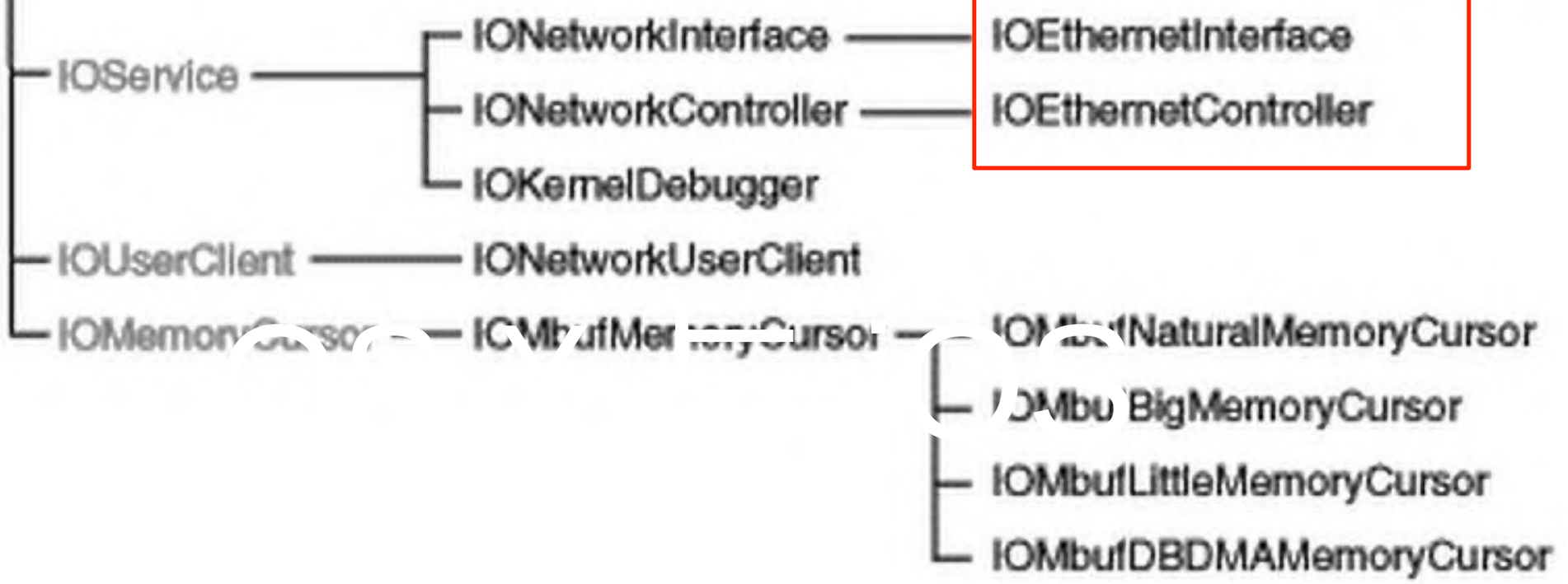
kernel_task	3.0	2:44:24.39	139	1,417	0	root
launchd	0.0	29:55.66	4	2	1	root
Firefox	11.6	5:17:26.74	63	401	10720	lee

```
struct task { void * bsd_info; } <-> struct proc { void * task; }
```

```
struct thread { void * uthread; }
                                <->
struct uthread { struct vfs_thread { thread_t vc_thread; } * uu_context;
                                }
```

Network family




IOService
IONetworkInterface
IOEthernetInterface
IONetworkController
IOEthernetController
IOKernelDebugger
IOUserClient
IONetworkUserClient
IOMemoryCursor
IOMbufNaturalMemoryCursor
IOMbufBigMemoryCursor
IOMbufLittleMemoryCursor
IOMbufDBDMAMemoryCursor

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