

Introduction à la programmation système

Georges-André Silber, CRI

Mines Paris - PSL — janvier 2024

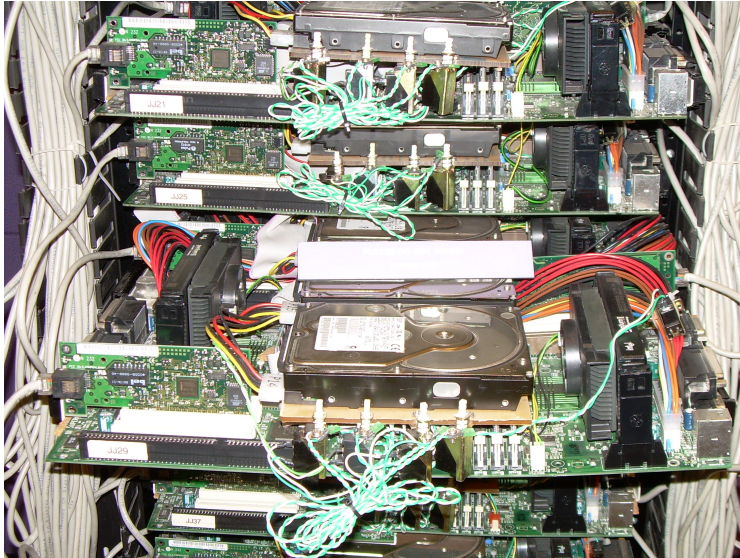


- Programmation à bas niveau, proche du matériel
- Systèmes d'exploitation, pilotes de périphériques
- Émulateurs et virtualiseurs
- Création de distributions (OS complets)
- Utilisation de langages "proches de la machine"
- Assembleur, C, C++, Rust, Zig

low-level language *A primitive programming language in which each line of code needs, but never gets, 20 lines of comment.*

— *The Devil's Dp Dictionary*

Premier serveur de production de Google

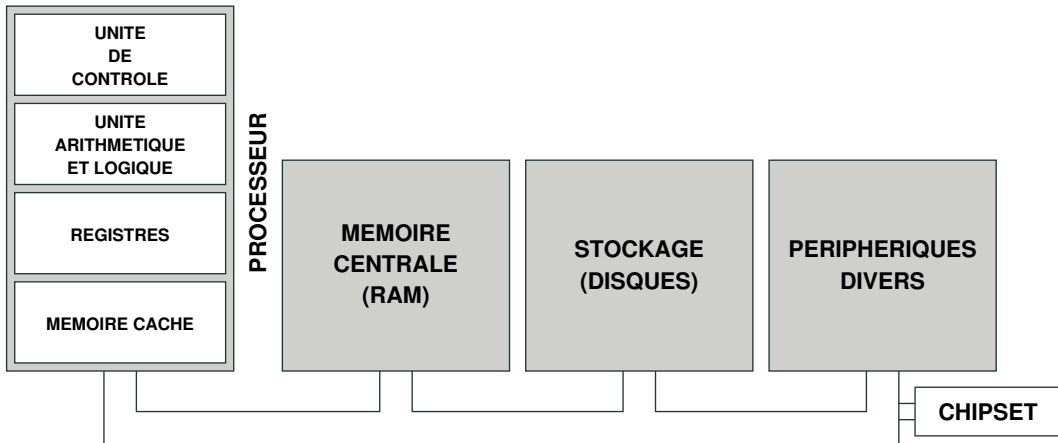


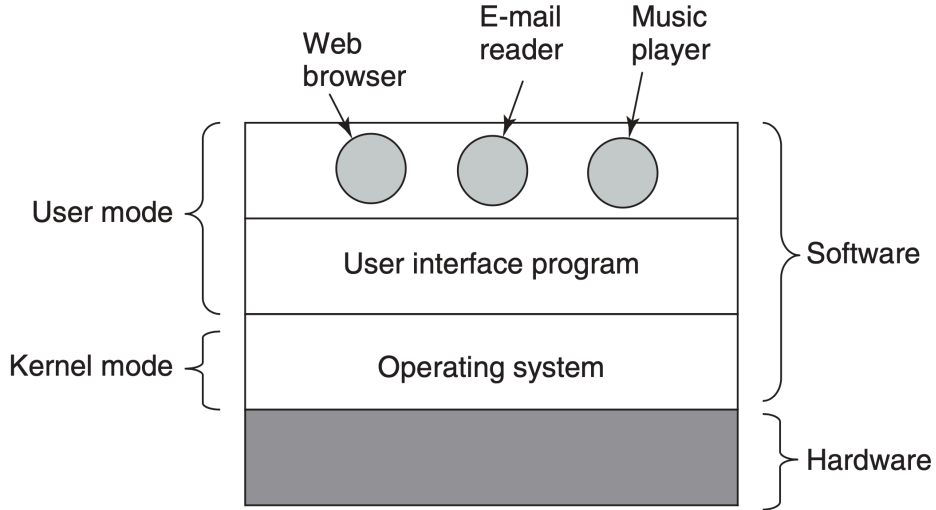


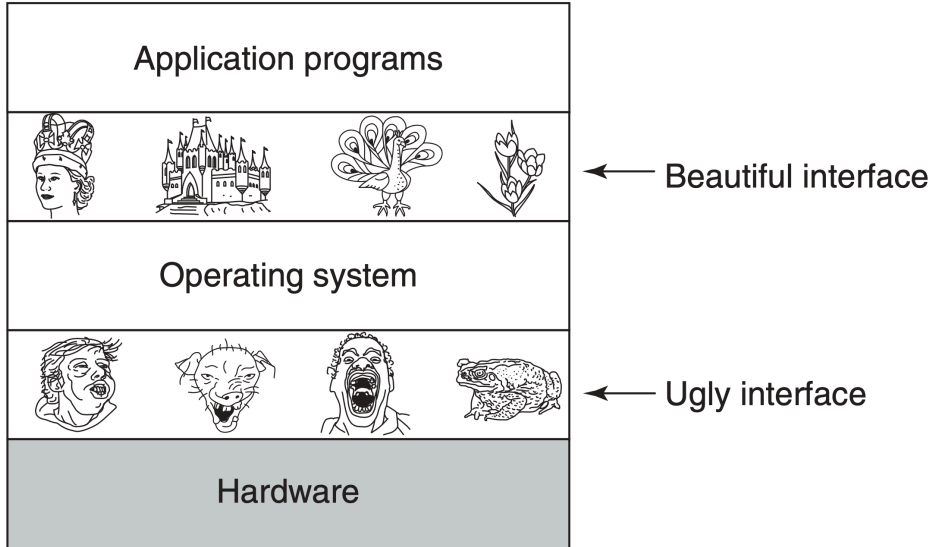
Paul Allen and Bill Gates surrounded by personal computers on October 19, 1981, shortly after signing a contract with IBM to write software for the IBM PC.
Photo courtesy of Sarah Hinman, Microsoft Museum



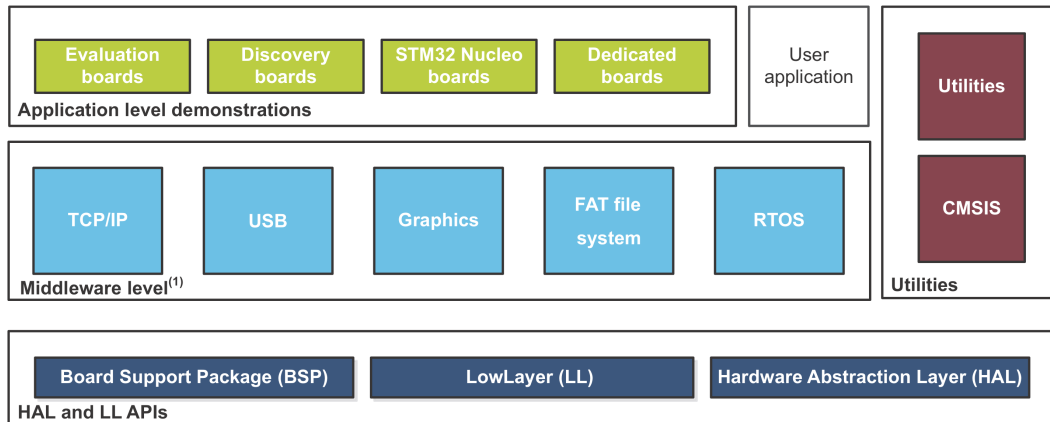
BACK

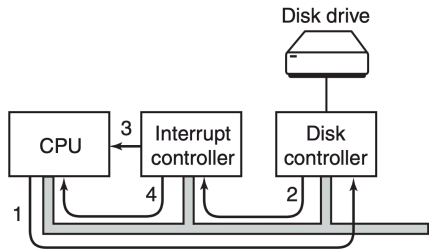




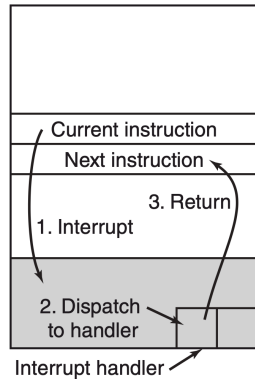


Abstractions sans OS : exemple du STM32



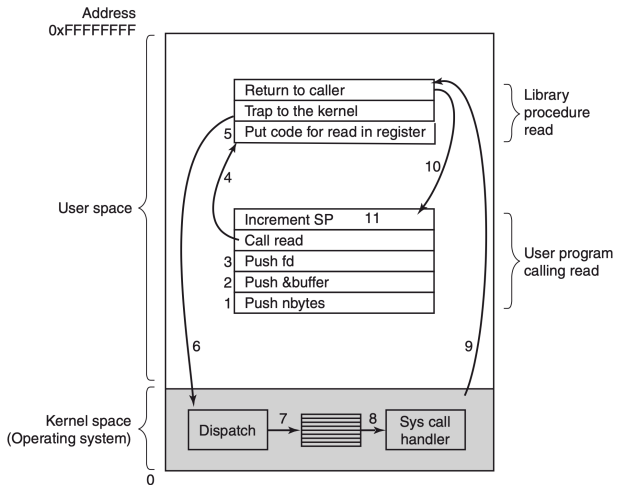


(a)

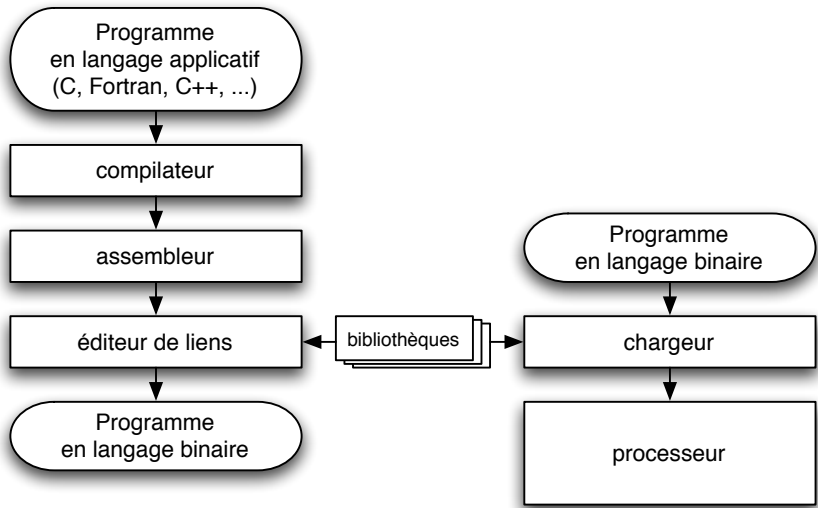


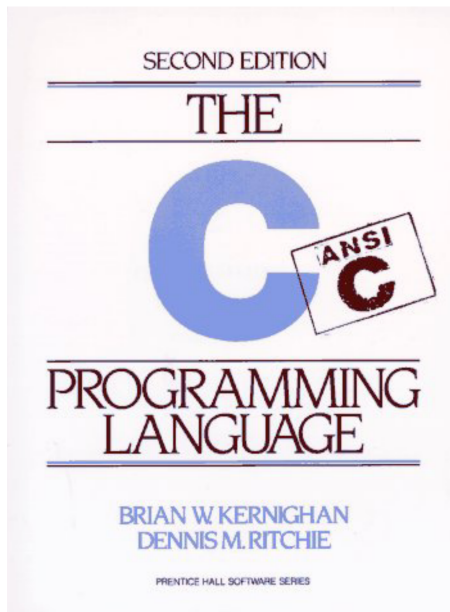
(b)

Appels au noyau (syscalls)



- Appels système Linux
- <https://filippo.io/linux-syscall-table/>
- man syscall
- man syscalls
- man 2 intro

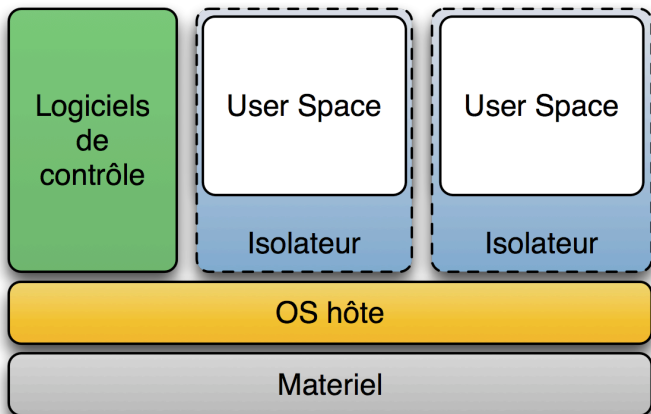




- Dennis Ritchie
- Brian Kernighan
- 1972 → C23 (2024?)
- <https://godbolt.org>

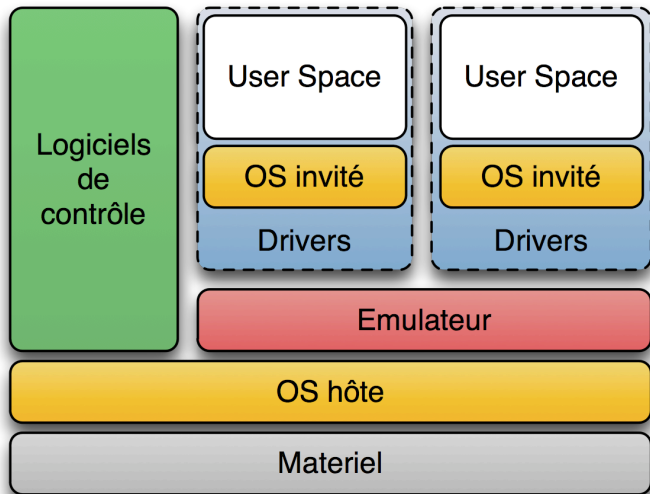


- chroot, Jails de FreeBSD
- *cgroups* et *namespaces* de Linux : LXC, LXD, Docker



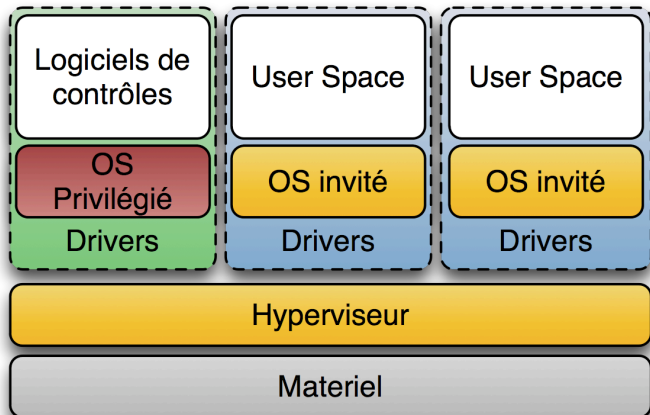


- VirtualBox, QEMU





- Xen, KVM





- Firmware en mémoire Flash
- Accès bas niveau à un périphérique
- Lecture du MBR (512 octets)
- Bootloader + partition disque
- Chargement bootloader niveau 2
- Chargement binaire plus compliqué
- etc...