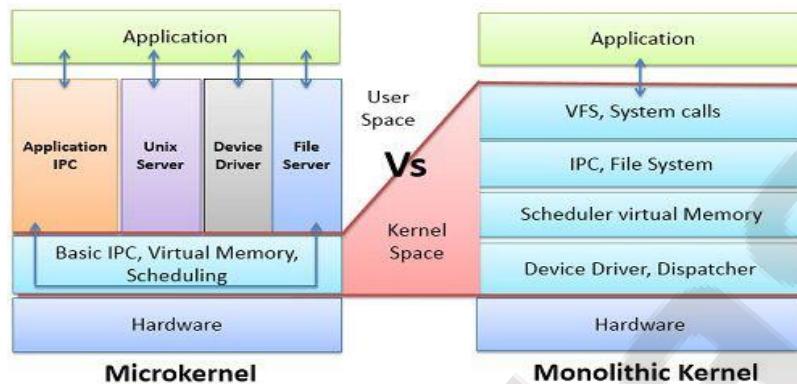


Difference Between Microkernel and Monolithic Kernel

Kernel is the core part of an operating system; it manages the system resources. Kernel is like a bridge between application and hardware of the computer. The Kernel can be classified further into two categories, Microkernel and Monolithic Kernel. Microkernel is the one in which user services and kernel services are kept in separate address space. However, in Monolithic kernel user services and kernel services both are kept in the same address space. Let us discuss some more differences between Microkernel and Monolithic kernel with the help of comparison chart shown below.



Comparison Chart

BASIS FOR COMPARISON	MICROKERNEL	MONOLITHIC KERNEL
Basic	In microkernel user services and kernel, services are kept in separate address space.	In monolithic kernel, both user services and kernel services are kept in the same address space.
Size	Microkernel are smaller in size.	Monolithic kernel is larger than microkernel.
Execution	Slow execution.	Fast execution.
Extendible	The microkernel is easily extendible.	The monolithic kernel is hard to extend.
Security	If a service crashes, it does effect on working of microkernel.	If a service crashes, the whole system crashes in monolithic kernel.
Code	To write a microkernel, more code is required.	To write a monolithic kernel, less code is required.
Example	QNX, Symbian, L4Linux, Singularity, K42, Mac OS X, Integrity, PikeOS, HURD, Minix, and Coyotos.	Linux, BSDs (FreeBSD, OpenBSD, NetBSD), Microsoft Windows (95,98,Me), Solaris, OS-9, AIX, HP-UX, DOS, OpenVMS, XTS-400 etc.

Key Differences Between Microkernel and Monolithic Kernel

1. The basic point on which microkernel and monolithic kernel is distinguished is that **microkernel** implement user services and kernel services in **different address spaces** and **monolithic kernel** implement both user services and kernel services under **same address space**.
2. The size of microkernel is **small** as only kernel services reside in the kernel address space. However, the size of monolithic kernel is comparatively **larger** than microkernel because both kernel services and user services reside in the same address space.
3. The execution of monolithic kernel is **faster** as the communication between application and hardware is established using the **system call**. On the other hands, the execution of microkernel is **slow** as the communication between application and hardware of the system is established through **message passing**.
4. It is easy to extend microkernel because new service is to be added in user address space that is isolated from kernel space, so the kernel does not require to be modified. Opposite is the case with monolithic kernel if a new service is to be added in monolithic kernel then entire kernel needs to be modified.
5. Microkernel is more **secure** than monolithic kernel as if a service fails in microkernel the operating system remain unaffected. On the other hands, if a service fails in monolithic kernel entire system fails.
6. Monolithic kernel designing requires **less code**, which further leads to fewer bugs. On the other hands, microkernel designing needs more code which furher leads to more bugs.