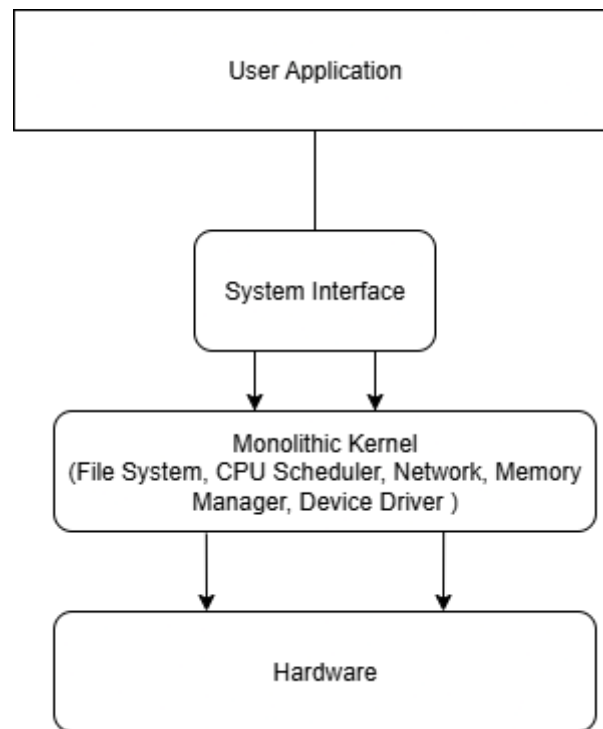


Nama : Ibnu Hakim Nurlan

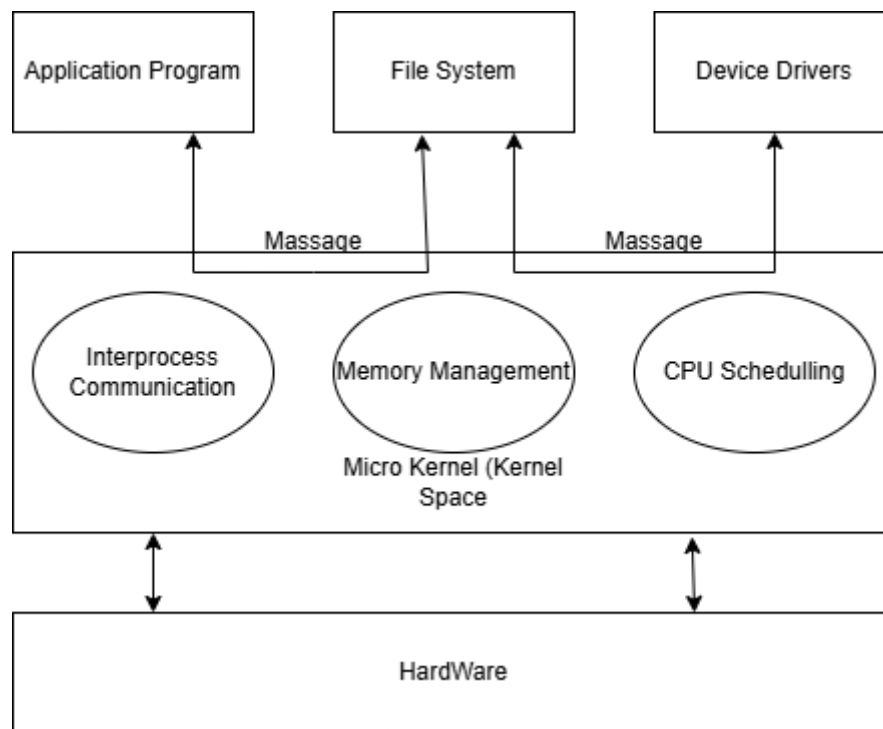
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Operating System Concept (TakeHome – UTS)

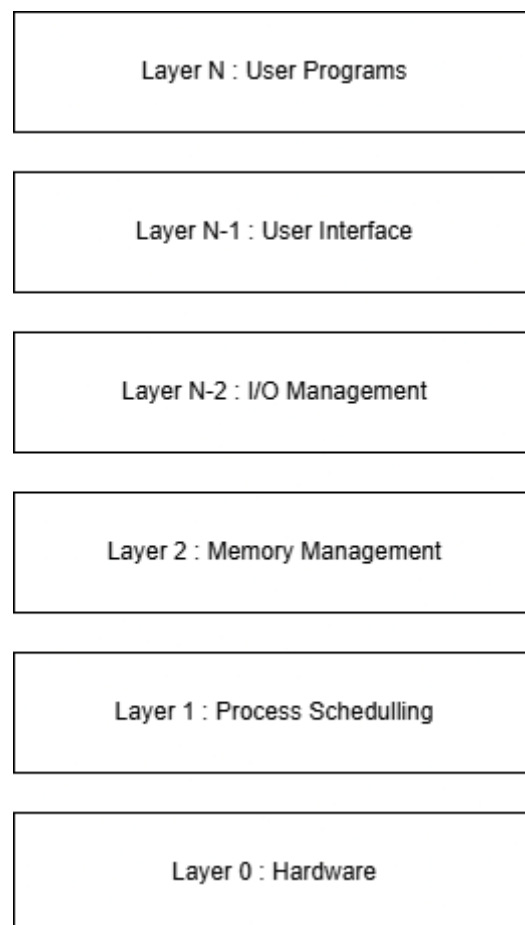
1. A. Diagram



Gambar 1.1 Monolithic Kernel



Gambar 1.2 Diagram Micro Kernel



Gambar 1.3 Merupakan Diagram Layered

B. Comparison Table

Aspek	Monolithic	Layered	Micro Kernel	Modular
Core Concept	Monolithic Kernel (Tunggal) yang besar yang juga menjalankan sistem OS	Fungsi-fungsi OS disusun secara berlapis dengan ketentuan (Hierarchical)	Kernel yang berukuran minimalis + user space server	Kernel dibagi jadi modul-modul terpisah yang bisa di-load/unload secara dinamis
Component in Kernel	Drivers, File System, Networking, IPC, Memory dan Scheduling	Semua Komponen yang ada di masing-masing layer	IPC, Basic Scheduling, Basic Memory Management	drivers, filesystem, protokol jaringan
Performance (Latency)	Very High	Low	Medium	high
Reliability & Isolation	Low	Medium	High	Medium
Security	Low	Medium	High	Medium – Bisa dikelola secara terpisah yang berjalan di kernel
Maintainability	Difficult – Karena kode saling terikat	Medium – Depedensi antar layer buat perubahan	Bagus – Arsitektur server yang modular	Sangat Bagus – Bisa dikembangkan dan update secara terpisah
Extensibility	Difficult	Medium	Excellent	Excellent
IPC Overhead	None – Direct Function	Low – Internal Function	High – Frequent message passing	Very Low
Example OS	Linux, Unix, MS-Dos	THE OS, early Multics	Minix, L4, QNX, Mach	Linux Modern, Solaris, macOS
Suitable for	Sistem General Purpose dan aplikasi yang butuh performa tinggi	Keperluan edukasi dan sistem dengan hierarki yang jelas	Aplikasi yang butuh realibilitas tinggi	Sistem yang butuh fleksibilitas tinggi dengan performa bagus

2. CPU SCHEDULLER

Process	Arival time	Burst Time	Priority
P1	0 ms	8 ms	3
P2	1ms	4 ms	1
P3	2ms	9 ms	4
P4	3ms	5 ms	2

RR Quantum : 3ms

a. FCFS (First Come First Served)

Proces	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
P1																										
P2																										
P3																										
P4																										

Average Waiting time :

$$(0 + 7 + 10 + 18) / 4 = 8.75\text{ms}$$

Average Turn Around Time :

$$(8 + 11 + 19 + 23) / 4 = 15.25 \text{ ms}$$

$$\text{Average Response Time : } (0 + 7 + 10 + 18) / 4 = 8.75 \text{ ms}$$

b. Shortest Job First

Proces	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
P1																										
P2																										
P4																										
P3																										

$$\text{Average Waiting Time : } (0 + 7 + 9 + 15) / 4 = 7.75 \text{ ms}$$

$$\text{Average Turn Around Time : } (8 + 11 + 14 + 24) / 4 = 14.25 \text{ ms}$$

$$\text{Average Response Time : } (0 + 7 + 9 + 15) / 4 = 7.75 \text{ ms}$$

c. Shortest Remaining Time First (SRTF)

Proces	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
P1																										
P2																										
P3																										
P4																										

$$\text{Average Waiting Time : } (9 + 0 + 15 + 2) / 4 = 6.5 \text{ ms}$$

$$\text{Average TurnAround Time : } (17 + 4 + 24 + 7) / 4 = 13.0 \text{ ms}$$

$$\text{Average Response Time : } (0 + 0 + 15 + 2) / 4 = 4.25 \text{ ms}$$

d. Priority Scheduling

Proces	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
P1																										
P2																										
P4																										
P3																										

$$\text{Average waiting time : } (0 + 7 + 9 + 15) / 4 = 7.75 \text{ ms}$$

$$\text{Average Turnaround time : } (8 + 11 + 14 + 24) / 4 = 14.25 \text{ ms}$$

Average Response time : $ART = (0 + 7 + 9 + 15) / 4 = 7.75 \text{ ms}$

e. Round Robin

Proces	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
P1																										
P2																										
P3																										
P4																										

Average Waiting Time : $(15+11+15+13)/4 = 13.50\text{ms}$

Average Turnaround Time : $(23+15+24+18)/4 = 20\text{ms}$

Average Response Time : $(0+2+4+6)/4 = 3\text{ms}$