

## ABLATION STUDY RESULTS

### Executive summary — ablation outcome :

I performed an ablation study with four variants:

- (A) Linux-like baseline,
- (B) AI scheduler with only **scheduler assignment** (classifier decides FIFO/RR/CFS),
- (C) AI scheduler with only **quantum/vruntime adjustments** (score-based scaling of vruntime and RR/CFS quantum), and
- (D) **combined** (assignment + quantum + vruntime).

For all tested workloads, the classifier-based assignment produced the majority of improvements. The quantum/vruntime-only variant produced little benefit with the chosen scaling parameters and did not significantly change throughput or fairness.

## MIXED (Realistic) WORKLOAD

Metric	Linux-like Baseline Scheduler	AI-augmented Linux- like Scheduler (combined)	AI (RR Quantum + CFS Quantum + Vruntime Only)	AI (Scheduling Assignment Only)
Simulated Ticks	20,579	20,575	20,579	20,579
Average Turnaround Time	10,412.89	6,640.26	10,412.96	6,640.17
Median Turnaround Time	10,858.00	2,051.00	10,858.00	2,051.00
Average Response Time	10,384.11	6,610.78	10,384.14	6,610.74
95th Percentile Response	17,107.60	17,110.60	17,107.60	17,110.60
Fairness (Jain Index)	0.043008	0.043008	0.043008	0.043008
CPU Utilization (%)	91.06	91.08	91.08	91.08
Context Switches	64,943	64,084	64,833	64,193
Tasks Total	929	929	929	929
Tasks Completed	929	929	929	929
Throughput (tasks/unit time)	0.045141	0.045150	0.045141	0.045141

## STRESS WORKLOAD

Metric	Linux-like Baseline Scheduler	AI-augmented Linux- like Scheduler (combined)	AI (RR Quantum + CFS Quantum + Vruntime Only)	AI (Scheduling Assignment Only)
Simulated ticks	584621	584621	584621	584621
Average Turnaround Time	254771.7587	186110.7579	254773.5940	186108.9383
Median Turnaround Time	41083.0	12711.0	41083.0	12711.0
Average Response Time	252713.1857	184041.6511	252706.1880	184048.6632
95th Percentile Response	577634.65	577634.65	577634.65	577634.65
Fairness (Jain Index)	0.0387167805	0.0387167805	0.0387167805	0.0387167805
CPU Utilization (%)	99.365145	99.365145	99.365145	99.365145
Context Switches	2306423	2303467	2306419	2303472
Tasks Total	1330	1330	1330	1330
Tasks Completed	1330	1330	1330	1330
Throughput (tasks/unit time)	0.002275	0.002275	0.002275	0.002275

## CPU WORKLOAD

Metric	Linux-like Baseline Scheduler	AI-augmented Linux-like Scheduler (combined)	AI (CFS Quantum + RR Quantum + Vruntime)	AI (Scheduling Assignment Only)
Simulated Ticks	29,586	29,585	29,586	29,586
Average Turnaround Time	11,044.21	9,069.18	11,044.18	9,069.22
Median Turnaround Time	7,826.00	7,763.50	7,826.00	7,763.50
Average Response Time	11,002.10	9,027.00	11,002.14	9,026.96
95th Percentile Response	24,999.90	24,999.00	24,999.90	24,999.95
Fairness (Jain Index)	0.018506	0.018506	0.018506	0.018506
CPU Utilization (%)	99.93	99.93	99.93	99.93
Context Switches	105,635	105,325	105,628	105,333
Tasks Total	942	942	942	942
Tasks Completed	942	942	942	942
Throughput (tasks/unit time)	0.031838	0.031839	0.031838	0.031838

## IO WORKLOAD

Metric	Linux-like Baseline Scheduler	AI-augmented Linux- like Scheduler (combined)	AI (CFS Quantum + RR Quantum + Vruntime)	AI (Scheduling Assignment Only)
Simulated Ticks	625,244	625,244	625,244	625,244
Average Turnaround Time	235,751.33	197,340.84	235,751.35	197,340.81
Median Turnaround Time	28,047.00	22,427.00	28,047.00	22,427.00
Average Response Time	235,288.61	196,877.98	235,288.67	196,877.93
95th Percentile Response	620,834.60	620,822.20	620,834.60	620,822.20
Fairness (Jain Index)	0.008850	0.008850	0.008850	0.008850
CPU Utilization (%)	99.85	99.85	99.85	99.85
Context Switches	2,480,065	2,479,682	2,480,060	2,479,687
Tasks Total	1,383	1,383	1,383	1,383
Tasks Completed	1,383	1,383	1,383	1,383
Throughput (tasks/unit time)	0.002212	0.002212	0.002212	0.002212

## BATCH WORKLOAD

Metric	Linux-like Baseline Scheduler	AI-augmented Linux-like Scheduler (combined)	AI (CFS Quantum + RR Quantum + Vruntime)	AI (Scheduling Assignment Only)
Simulated Ticks	199,847	199,845	199,847	199,847
Average Turnaround Time	71,601.53	50,828.56	71,603.25	50,826.88
Median Turnaround Time	26,421.50	12,007.00	26,421.50	12,007.00
Average Response Time	71,114.42	50,335.50	71,111.29	50,338.67
95th Percentile Response	194,569.00	194,570.00	194,569.00	194,570.00
Fairness (Jain Index)	0.059495	0.059495	0.059495	0.059495
CPU Utilization (%)	98.48	98.49	98.48	98.49
Context Switches	774,460	772,893	774,456	772,897
Tasks Total	972	972	972	972
Tasks Completed	972	972	972	972
Throughput (tasks/unit time)	0.004864	0.004864	0.004864	0.004864