⚔️ SJF vs. Max-Min vs. Mixed Strategy – The Ultimate Battle!

🔥 The Battle Begins!

We pit **Shortest Job First (SJF)**, **Maximum-Minimum (Max-Min)**, and a **Mixed Strategy** against each other in a **CPU scheduling showdown!**

- **SJF** ⏳ : Prioritizes **small jobs first**, perfect for quickly clearing short tasks — but **big jobs might starve**.
- **Max-Min** 💪 : Gives **priority to big jobs**, ensuring heavy processes don't wait — but **small jobs can get delayed**.
- **Mixed Strategy** ⚖️ : Aims for **balance**, preventing both **small and large jobs** from starving, but adds **complexity**.

🔗 Jump to Battle Scenarios!

🚀 Scenario 1: SJF vs. Max-Min: The Ultimate Restaurant Serve 🍔 🔥

👨‍🍳 **Welcome to CPU Diner – Where Scheduling Can Make or Break Your Hunger!**

At **CPU Diner**, three customers arrive **simultaneously (AT = 0)** and order different meals. Let's see how our two chefs handle their orders!

🍟 The Customers Arrive

Customer 🧍	Order Type	Burst Time (BT) ⏳	Arrival Time (AT) ⏰
Alex 😋	Fries 🍟	2 mins	0
Bob 😛	Burger 🍔	5 mins	0
Charlie 😑	Pizza 🍕	10 mins	0

🔍 Chef SJF's Strategy (Shortest Job First)

⏩ **SJF Says:** "Yo, let's get the fastest orders done first!"

Execution Order in SJF:

1️⃣ **Fries** (2 mins)
2️⃣ **Burger** (5 mins)
3️⃣ **Pizza** (10 mins)

Customer 🧍	Order 🍔	BT ⏳	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⏳	Waiting Time (WT = TAT - BT) ⏳
Alex 😋	Fries 🍟	2	0	2	2 - 0 = **2**	2 - 2 = **0**
Bob 😛	Burger 🍔	5	2	7	7 - 0 = **7**	7 - 5 = **2**
Charlie 😑	Pizza 🍕	10	7	17	17 - 0 = **17**	17 - 10 = **7**

Total Values for SJF:

✅ **Total Finish Time (TFT) = 17 mins**
✅ **Total Waiting Time (TWT) = 0 + 2 + 7 = 9 mins**
✅ **Total Turnaround Time (TAT) = 2 + 7 + 17 = 26 mins**

Execution Order:
1️⃣ Fries 🍟 (2 mins) → **(Done! Alex is happy 😍)**
2️⃣ Burger 🍔 (5 mins) → **(Done! Bob is satisfied 😌)**
3️⃣ Pizza 🍕 (10 mins) → **(Finally! Charlie eats 😐)**

🔥 Chef Max-Min's Strategy (Longest Job First)

🐢 **Max-Min Says:** "Naaaah, let's tackle the **BIGGEST** meal first. Let's make 'em wait! 😈"

Execution Order in Max-Min:

1️⃣ **Pizza** (10 mins)
2️⃣ **Burger** (5 mins)
3️⃣ **Fries** (2 mins)

Customer 🧍	Order 🍩	BT ⌛	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⌛	Waiting Time (WT = TAT - BT) ⌛
Charlie 😑	Pizza 🍕	10	0	10	10 - 0 = **10**	10 - 10 = **0**
Bob 😅	Burger 🍔	5	10	15	15 - 0 = **15**	15 - 5 = **10**
Alex 😋	Fries 🍟	2	15	17	17 - 0 = **17**	17 - 2 = **15**

Total Values for Max-Min:

❌ **Total Finish Time (TFT) = 17 mins** *(same as SJF, but less efficient!)*

❌ **Total Waiting Time (TWT) = 0 + 10 + 15 = 25 mins** *(WAY higher than SJF!* 🔥 🔥 🔥 *)*

❌ **Total Turnaround Time (TAT) = 10 + 15 + 17 = 42 mins** *(MUCH worse!* 💀 *)*

Execution Order:

1️⃣ Pizza 🍕 (10 mins) → **(Charlie is happy, but Alex & Bob are starving!** 😵 *)*

2️⃣ Burger 🍔 (5 mins) → **(Bob FINALLY eats... but he's annoyed** 😡 *)*

3️⃣ Fries 🍟 (2 mins) → **(Alex could've eaten long ago... now he's fuming!** 😡 🔥 *)*

📊 **SJF vs. Max-Min: The Ultimate Scoreboard**

Metric 📊	SJF 🔍 (Fastest First)	Max-Min 🔥 (Slowest First)	🏆 Winner
Execution Time (TET)	**Same** (Depends on BT)	**Same** (Depends on BT)	🤝 Tie
Waiting Time (TWT)	✅ 9 mins	❌ 25 mins	🏆 SJF
Turnaround Time (TAT)	✅ 26 mins	❌ 42 mins	🏆 SJF
Finish Time (TFT)	✅ 17 mins	❌ 17 mins	🏆 SJF

🔥 **FINAL VERDICT: SJF WINS!** 🎉

- **SJF serves food quickly & keeps customers happy.** 🍟 🍔
- **Max-Min leaves people STARVING!** 😡 🔥
- **Short jobs should NEVER have to wait behind long jobs!**

🥇 **Who Wins?**

✅ **Winner: SJF!** 🎉

- **SJF keeps everyone happy** because orders are served in a balanced way.
- **Max-Min is a disaster** for small orders—short tasks suffer!

🚀 **Lesson:** In CPU scheduling (or in real life), **serving small tasks first speeds up the whole system!**

💡 **Moral of the Story:**

"If you want efficiency, always serve short tasks first. Don't make people wait for no reason!" 🚀

🏁 Scenario 2: The CPU Olympics – A High-Priority Race! 🏃 🕛

💡 **Scenario Setup:**
Imagine a **coding competition** where **three teams** submit programs for execution. The judge (CPU) schedules them **based on execution time**.
But this time, **longer tasks are more important** (e.g., AI training, simulations).

⏳ **The Competitors & Their Programs**

Team 🎭	Program Name 💻	Burst Time (BT) ⏳	Arrival Time (AT) ⏰
Fast Coders ⚡	Simple Calculator 🧮	2 mins	0
Code Lords 🏆	Machine Learning Model 🤖	8 mins	0
Lazy Devs 💤	Data Processing 📊	4 mins	0

🔍 Chef SJF's Strategy (Shortest Job First)

⏩ **SJF Says:** "Let's finish small programs first, THEN handle the big guys!"

Execution Order in SJF:

1️⃣ **Simple Calculator (2 mins)**
2️⃣ **Data Processing (4 mins)**
3️⃣ **Machine Learning Model (8 mins)**

Team 🎭	Program 💻	BT ⏳	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⏳	Waiting Time (WT = TAT - BT) ⏳
Fast Coders ⚡	Simple Calculator 🧮	2	0	2	2 - 0 = 2	2 - 2 = 0

Team 🎭	Program 💻	BT ⏳	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⏳	Waiting Time (WT = TAT - BT) ⏳
Lazy Devs 💤	Data Processing 📊	4	2	6	6 - 0 = 6	6 - 4 = 2
Code Lords 🏆	ML Model 🤖	8	6	14	14 - 0 = 14	14 - 8 = 6

Total Values for SJF:

❌ **Total Finish Time (TFT) = 14 mins** *(Big task delayed! 🙀)*
❌ **Total Waiting Time (TWT) = 0 + 2 + 6 = 8 mins**
❌ **Total Turnaround Time (TAT) = 2 + 6 + 14 = 22 mins**

🔥 Chef Max-Min's Strategy (Longest Job First)

🐢 **Max-Min Says:** "Screw the tiny tasks, let's start with the BIG BOYS! 💪"

Execution Order in Max-Min:

1️⃣ **Machine Learning Model (8 mins)**
2️⃣ **Data Processing (4 mins)**
3️⃣ **Simple Calculator (2 mins)**

Team 🎭	Program 💻	BT ⏳	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⏳	Waiting Time (WT = TAT - BT) ⏳
Code Lords 🏆	ML Model 🤖	8	0	8	8 - 0 = 8	8 - 8 = 0
Lazy Devs 💤	Data Processing 📊	4	8	12	12 - 0 = 12	12 - 4 = 8
Fast Coders ⚡	Simple Calculator 🧾	2	12	14	14 - 0 = 14	14 - 2 = 12

Total Values for Max-Min:

☑️ **Total Finish Time (TFT) = 14 mins** *(Same, but ML model finished EARLIER! 🚀)*

☑️ **Total Waiting Time (TWT) = 0 + 8 + 12 = 20 mins** *(More waiting, but worth it! 🥴)*

☑️ **Total Turnaround Time (TAT) = 8 + 12 + 14 = 34 mins** *(Worse for small tasks, but ML finishes FIRST!)*

📊 SJF vs. Max-Min: The Ultimate Scoreboard

Metric 📊	SJF 🔍 (Fastest First)	Max-Min 🔥 (Slowest First)	🏆 Winner
Execution Time (TET)	Same	Same	🤝 Tie
Waiting Time (TWT)	☑️ 8 mins	❌ 20 mins	🏆 SJF
Turnaround Time (TAT)	☑️ 22 mins	❌ 34 mins	🏆 SJF
Finish Time (TFT)	☑️ 14 mins	☑️ 14 mins	🤝 Tie
Priority (Big Tasks Finish Early)	❌ ML Model takes too long!	☑️ ML Model Done Faster!	🏆 Max-Min

🔥 FINAL VERDICT: MAX-MIN WINS! 🎉 (For Priority Tasks)

- If your goal is to finish BIGGER, more important tasks EARLIER, Max-Min is the KING! 👑
- If you just want the smallest tasks done fast, go for SJF.

💡 **Moral of the Story:**

- ◆ SJF is better for getting everything done faster. 🏎️
- ◆ Max-Min is better when HIGH-priority tasks MUST finish first. 🔥

📌 Scenario 3: The Grand Hotel CPU 🏨

Imagine a **hotel with a single elevator** that serves **VIP guests (big jobs) and regular guests (small jobs)**.

- **VIP guests (long burst time)** pay more 💰, so they need priority.
- **Regular guests (short burst time)** just want to reach their rooms quickly.
- Some guests arrive later than others (different arrival times).

🔢 Guest List (Processes)

Guest 🏨	Task 🏗️	Burst Time (BT) ⏳	Arrival Time (AT) ⏰
🏎️ Speedy Coder	Debugging Small Script	3 mins	0
🤖 AI Researcher	Training Large Model	10 mins	2
📊 Data Analyst	Processing Reports	4 mins	1
🎮 Gamer	Running Heavy Graphics	6 mins	3

🥩 Case 1: SJF – Small First, Chaos Ensues!

🧑‍🍳 **SJF Says:** "Short jobs first, always!"

Execution Order:

1️⃣ **Speedy Coder (3 mins)**
2️⃣ **Data Analyst (4 mins)**
3️⃣ **Gamer (6 mins)**
4️⃣ **AI Researcher (10 mins)**

Guest 🏨	Task 🏗️	BT ⏳	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⏳	Waiting Time (WT = TAT - BT) ⏳
🏎️ Speedy Coder	Debugging	3	0	3	3 - 0 = **3**	3 - 3 = **0**
📊 Data Analyst	Reports	4	3	7	7 - 1 = **6**	6 - 4 = **2**
🎮 Gamer	Graphics	6	7	13	13 - 3 = **10**	10 - 6 = **4**
🤖 AI Researcher	ML Training	10	13	23	23 - 2 = **21**	21 - 10 = **11**

Total Values for SJF:

✅ **Total Finish Time (TFT) = 23 mins** *(Not bad! 😎)*
✅ **Total Waiting Time (TWT) = 0 + 2 + 4 + 11 = 17 mins**
✅ **Total Turnaround Time (TAT) = 3 + 6 + 10 + 21 = 40 mins**

😱 **BUT WAIT...** The **VIP AI Researcher waited 11 mins** before even starting!! **BAD for priority jobs.** 😬

🔥 Case 2: Max-Min – Big First, Everyone Waits!

💪 **Max-Min Says:** "BIG jobs get priority, sorry small fries!"

Execution Order:

1️⃣ **AI Researcher (10 mins)**
2️⃣ **Gamer (6 mins)**
3️⃣ **Data Analyst (4 mins)**
4️⃣ **Speedy Coder (3 mins)**

Guest 🏨	Task 🏗️	BT ⏳	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⏳	Waiting Time (WT = TAT - BT) ⏳
🤖 AI Researcher	ML Training	10	0	10	10 - 2 = **8**	8 - 10 = **-2** (???)
🎮 Gamer	Graphics	6	10	16	16 - 3 = **13**	13 - 6 = **7**
📊 Data Analyst	Reports	4	16	20	20 - 1 = **19**	19 - 4 = **15**
🏎️ Speedy Coder	Debugging	3	20	23	23 - 0 = **23**	23 - 3 = **20**

Total Values for Max-Min:

❌ **Total Finish Time (TFT) = 23 mins** *(Same, but worse TAT!)*
❌ **Total Waiting Time (TWT) = -2 + 7 + 15 + 20 = 40 mins** *(WHAT!?* 🥴*)*
❌ **Total Turnaround Time (TAT) = 8 + 13 + 19 + 23 = 63 mins** *(Yikes!)*

😬 **BAD NEWS: Speedy Coder waited FOREVER.** AI Researcher finished early, but **short jobs suffered HARD.**

🔥 🔥 Case 3: MIXED STRATEGY – Balance Both!

🧠 **New Rule:**

- **Biggest job shouldn't starve.**
- **Shortest jobs should get quick wins.**
- **Medium jobs? Let's balance!**

Execution Order:

1️⃣ **Speedy Coder (3 mins)** ✅ *(Quick win!)*
2️⃣ **AI Researcher (10 mins)** ✅ *(Gets priority!)*
3️⃣ **Data Analyst (4 mins)** ✅
4️⃣ **Gamer (6 mins)** ✅

Guest 🏨	Task 🛠️	BT ⏳	Start Time ⏰	Completion Time (CT) 🏁	Turnaround Time (TAT = CT - AT) ⏳	Waiting Time (WT = TAT - BT) ⏳
🏎️ Speedy Coder	Debugging	3	0	3	3 - 0 = **3**	3 - 3 = **0**
🤖 AI Researcher	ML Training	10	3	13	13 - 2 = **11**	11 - 10 = **1**
📊 Data Analyst	Reports	4	13	17	17 - 1 = **16**	16 - 4 = **12**
🎮 Gamer	Graphics	6	17	23	23 - 3 = **20**	20 - 6 = **14**

Total Values for Mixed Strategy:

✅ **Total Finish Time (TFT) = 23 mins** *(Same! But better balance!)*
✅ **Total Waiting Time (TWT) = 0 + 1 + 12 + 14 = 27 mins** *(WAY better!)*
✅ **Total Turnaround Time (TAT) = 3 + 11 + 16 + 20 = 50 mins** *(Better than Max-Min!)*

🎉 **BEST OF BOTH WORLDS!**

- AI Researcher doesn't wait forever.
- Speedy Coder gets fast service.
- Medium jobs don't get bullied.

📊 **FINAL SHOWDOWN: The Scoreboard**

Metric 📊	SJF 🔍	Max-Min 🔥	Mixed Strategy ⚖️	🏆 Winner
Execution Time (TET)	✅ Same	✅ Same	✅ Same	🤝 Tie
Waiting Time (TWT)	✅ 17 mins	❌ 40 mins	✅ 27 mins	🏆 SJF

Metric 📊	SJF 🔍	Max-Min 🔥	Mixed Strategy ⚖️	🏆 Winner
Turnaround Time (TAT)	✅ 40 mins	❌ 63 mins	✅ 50 mins	🏆 SJF & Mixed
Big Jobs Finish Early?	❌ No	✅ Yes	✅ Yes	🏆 Max-Min & Mixed

🏆 FINAL VERDICT: MIXED STRATEGY WINS!

- Best balance for ALL tasks.
- VIP jobs get priority without starving small tasks.
- Still maintains a good finish time.

👑 FINAL WORDS:

🚀 "Sometimes, life isn't all about the smallest or biggest… it's about BALANCE!"
🔥 SJF wins for small jobs, Max-Min wins for big jobs, but Mixed Strategy wins for EVERYTHING!

📌 Conclusion:

🔥 For small & quick tasks → Use SJF!
💪 For high-priority long tasks → Use Max-Min!
⚖️ For an all-round solution → Mixed Strategy WINS!