Proactive Price Intervention Communication with BOs - PRD

Pain-point:

BOs need visibility into how frequently and effectively the system intervenes in pricing, so they can build trust, confidence, and feel that their services are actively being managed.

Objective:

The system determines pricing actions and their impact, while COE/BD teams control when, how often, and to whom notifications are sent.

Key Stakeholders and system:

User/system	Role
Business Operator(BO)	Receives concise pricing interventions and wins
COE Team	Configuration tool that can be used to make changes specific to BOs
Algorithmic AI system	Generates insights highlighting the wins

Constraints & Guardrails

- **DBD Eligibility:** Notifications are sent **only** for services within **DBD 0 (today)** or **DBD 1 (tomorrow)**; all other services are excluded from notification evaluation.
- **Daily Notification Cap:** A maximum of **5 notifications per Business Operator (BO) per day** is enforced across all eligible services to prevent fatigue.
- **Minimum Time Gap:** There must be a **minimum interval of 2 hours** between any two notifications sent to the same Business Owner.
- **Delivery Channels:** Notifications are delivered exclusively via **Telegram (group or personal chat)** and **Email**, ensuring reliable and auditable communication.

Steps involved:

Step 1: Pricing Intervention Detection

System ingests pricing data from the database and computes hourly price changes, treating any price increase or decrease as an intervention and capping the intervention count to a maximum of **2 per hour with diff >=50 Rs** to avoid overstating activity.

Step 2: Outcome Evaluation Window Selection

The system evaluates seat gain over a configurable analysis window (manual or auto), and if no meaningful highlight is found, it progressively expands the window to a longer duration to capture delayed impact.

Step 3: Trigger Qualification

A notification is triggered only if computed outcomes cross predefined thresholds (for example, **≥2 net seats sold** within the selected window), ensuring that only materially relevant updates are communicated.

Step 4: Communication & Aggregation

Once qualified, an LLM generates a concise performance update highlighting pricing interventions and gains, which can be sent at either an individual service level or an aggregated level across multiple services via Telegram or email.

Step 5: Notification Eligibility & Rate Control

Before sending, the system checks notification eligibility rules such as DBD (0/1 only), maximum notifications per day, and minimum time gap between alerts to prevent BO fatigue.

Step 6: Sanity & Guardrail Validation

The system performs final sanity checks to ensure reported seat gains align with occupancy movement, intervention counts are valid, and no future or inconsistent data is included, blocking the notification if any check fails.

Example:

Step 1: Capture raw within-hour event data

Hour H1 (10:00–11:00)

Time	Self Price
10:02	1600
10:10	1550
10:25	1600
10:40	1500
10:55	1450

Comp data

Time	Comp Price avg	Comp Occ avg
10:05	1520	0.60
10:20	1500	0.61
10:45	1480	0.63

Step 2: Compute event-to-event price changes (within the hour)

`1600 → 1550  = -50` ✅

`1550 → 1600  = +50` ✅

`1600 → 1500  = -100` ✅

`1500 → 1450  = -50` ✅

Raw meaningful changes = **4**

IF competitor occupancy increased

THEN competitive pressure exists

So for this hour:

- Competitor price intervention → No
- Competitor occupancy gain → Yes

Step 3: Apply ₹50 threshold

All four changes qualify as meaningful (≥ ₹50).

At this stage (before capping):

- Decreases = 3
- Increases = 1
- Total = 4

Final Metrics — With Sample Row

Metric Name	What it Represents	How it is Computed (Brief)	Sample Value (Example)
Analysis Window (hrs)	Final time span considered	Auto: first qualifying of 3 / 5 / 7 hrs	**3 hours**
Total Price Interventions	Meaningful pricing actions taken	Sum of hourly price changes ≥ ₹50, capped at 2/hr	**2**

Price Increase / Decrease Split	Direction of interventions	Count of increases vs decreases	**1 increase / 1 decrease**
Net Seats Sold	Actual outcome achieved	(End occ − Start occ) × 32 seats, guardrailed	**2 seats**
Competitive Context	Market pressure indicator	Comp occ gain in any hour ⇒ pressure	**Competitive pressure observed**
Revenue Impact Band	Business impact summary	Derived from seats sold	**Medium**

Similar metrics need to be generated across services selected. And then using the prompt, we to communicate proactively.

Prompt:
prompt = f"""
Generate a Business Owner update using ONLY these facts.

Facts:
- Analysis window: past {analysis_hours} hours
- Strategic price interventions executed: {total_interventions}
- Price increases: {num_increases}
- Price decreases: {num_decreases}
- Net incremental seats sold: {net_seat_gain}
- Revenue impact band: {revenue_band}
- Confidence: {confidence_flag}
- Pricing actions aligned to market conditions
- Competitive context: {comp_context}

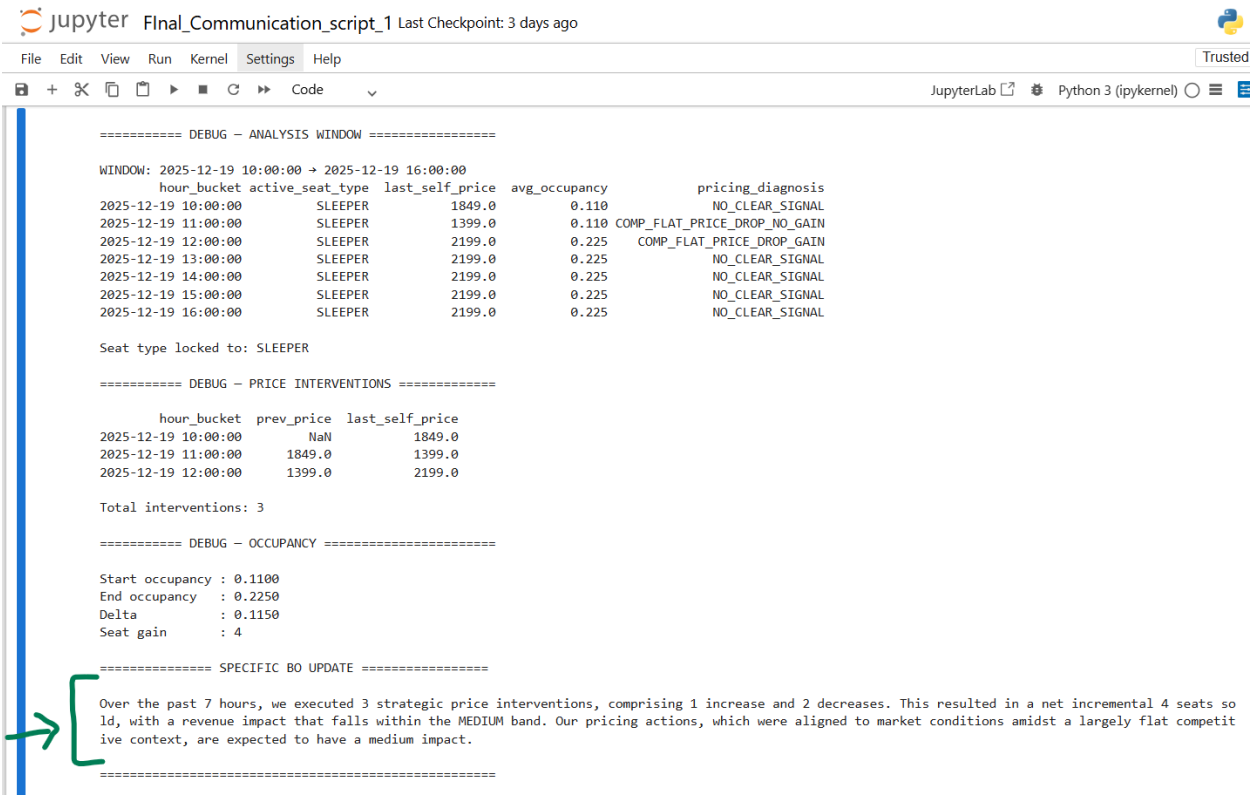
Rules:
- Always say "strategic price interventions"
- Always mention increase and decrease counts
- Do NOT mention prices or timestamps
- State exact seats sold as a number
- Revenue impact must be qualitative
- 2–3 sentences only
- Calm, professional BO-facing tone
- Mention the analysis window
"""

========== SPECIFIC BO UPDATE ==========

Over the past 7 hours, we executed 3 strategic price interventions, comprising 1 increase and 2 decreases. This resulted in a net incremental 4 seats sold, with a revenue impact that falls within the MEDIUM band. Our pricing actions, which were aligned to market conditions amidst a largely flat competitive context, are expected to have a medium impact.

POC results (Till LLM response):

A PoC on realtime data was done and below is the attached screenshot for the same. ***POC Code shall be shared with the devs during/after the handover***



Endpoints used for POC:

1. POST /priceChangeLog
2. GET /api/v1/Cassandra/get_cge_parameters/{vendor_id}/{service_id}/{doj}/{route_id}
3. GET /getDemandPercentile
4. Groq for LLM llama-3.3-70b-versatile

Flow:

PriceChangeLog API
↓
Hourly Timeline + Occupancy
↓
CGE Parameters API
↓
Seat Type + Competitive Context
↓
Demand Percentile API
↓
Market Qualification
↓
Algorithmic Metrics (Seats, Revenue, Confidence)
↓
LLM API (Message Only)

COE configuration Tool:

1. Selection of BO (Multi-select / CSV upload),
2. Selection of services (Multi-select / CSV upload)
3. Selection of channels (Telegram group, personal, email)
4. Master Turn on or off
5. Option to add telegram ids/email
6. COE selection (to identify who initiated. Can be taken from login)
7. Selection of Manual/Automatic (Manual atleast 2 hours duration. If automatic best 3/5/7 hours window)
8. # of notifications to be sent for DBD0 and for DBD1 (Let's say DBD1→ 2 then DBD0→3. Total<=5 max)
9. Between time hours the notification to be sent (btw 9 am -6 pm)

Success Metrics

- % notifications sent via config (vs manual)
- Configuration reuse rate

Future Enhancements

- WhatsApp integration
- Enhancements basis feedbacks

Appendix:

Algorithm:

Step 1: Select services and decide the time window

- The system starts with the services that have been configured for monitoring.
- If a service is in **automatic mode**, the system can evaluate activity for up to **7 hours maximum**.
- If a service is in **manual mode**, the system evaluates only the **exact window configured**.

Step 2: Begin with the most recent hours

- For automatic services, the system first checks the **last 3 hours**.
- This allows early identification of strong signals without waiting longer.
- Manual services skip this step and use the configured window directly.

Step 3: Track price changes at an hourly level

- For each hour, the system compares the price with the previous hour.
- A price change is counted only if it is **₹50 or more**, up or down.
- Smaller changes are ignored to avoid noise.

Step 4: Limit price interventions

- The system counts meaningful price changes within the window.
- A maximum of **2 price interventions** are considered.
- This keeps the focus on deliberate pricing actions.

Step 5: Measure seat gains

- The system compares occupancy at the **start and end** of the window.
- The change in occupancy is converted into **number of seats sold**.
- This reflects the actual business outcome.

Step 6: Qualify based on seat sales

- If **fewer than 2 seats** were sold, the service does not qualify.
- If **2 or more seats** were sold, the service qualifies to be highlighted.

- This ensures only meaningful impact is communicated.

Step 7: Evaluate competitor behaviour

- If any hour shows signs that competitors were gaining while price drops did not help, the system assumes competitive pressure.
- If competitors appear mostly unchanged in any hour, the system treats the market as stable.
- If neither situation is seen, the system assumes there was no meaningful competitive activity.
- Overall: If the gains for competition>=2 seats and >=2 incr/decr within the window then competitive pressure. Otherwise a stable market.

Step 8: Apply automatic guardrails

- For automatic services, the system checks if criteria are met in **3 hours**.
- If not, it expands to **5 hours**, and then to **7 hours** if needed.
- If criteria are never met, no update is sent.

Step 9: Make the final decision

- If all conditions are satisfied, the service is selected for highlighting.
- If conditions are not met, the system remains silent.
- This avoids unnecessary or weak updates.

Step 10: Generate a business-friendly update

- The system prepares a short summary of actions and outcomes.
- It mentions interventions, seat gains, and competitive context.
- No raw prices or timestamps are included.