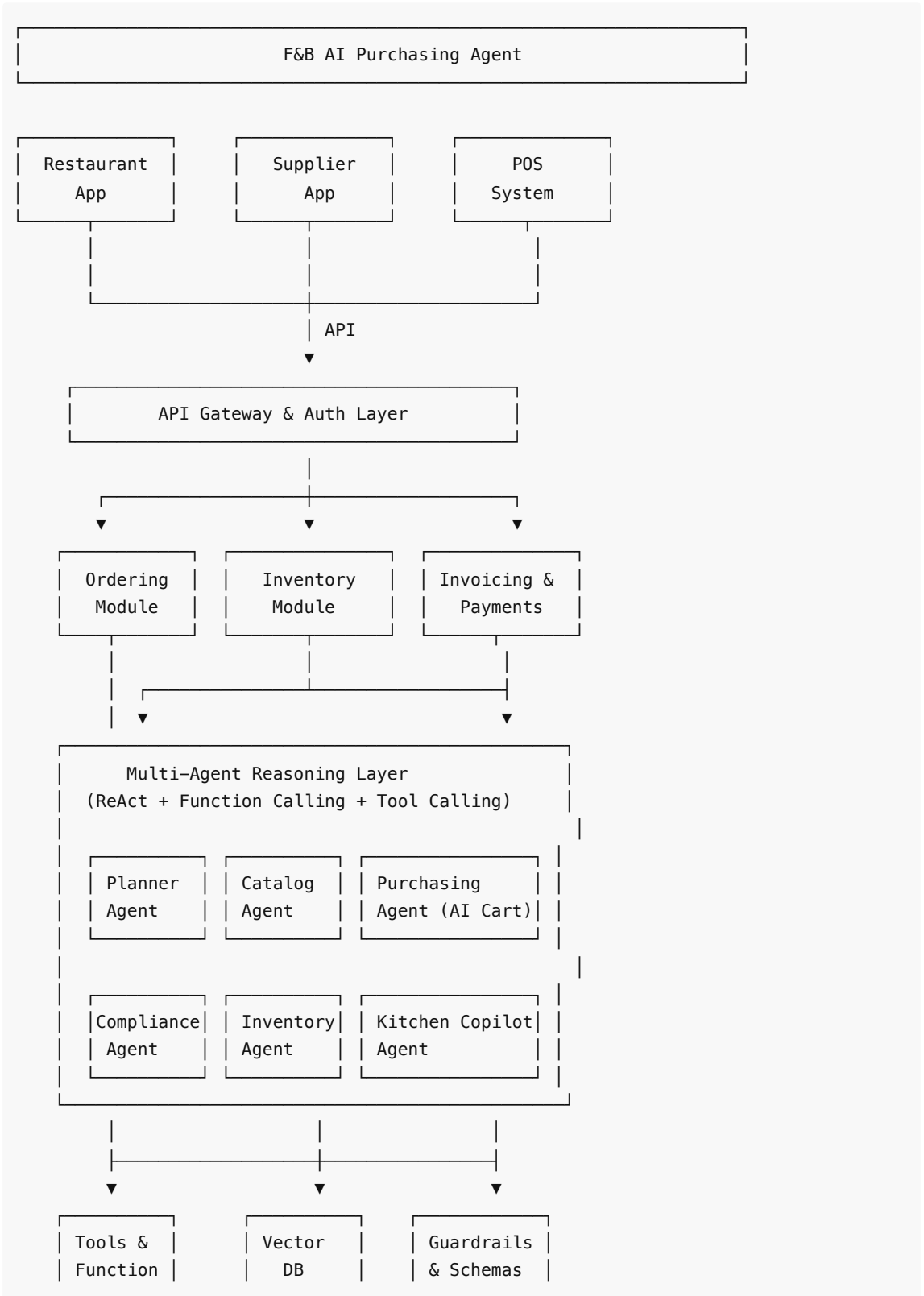
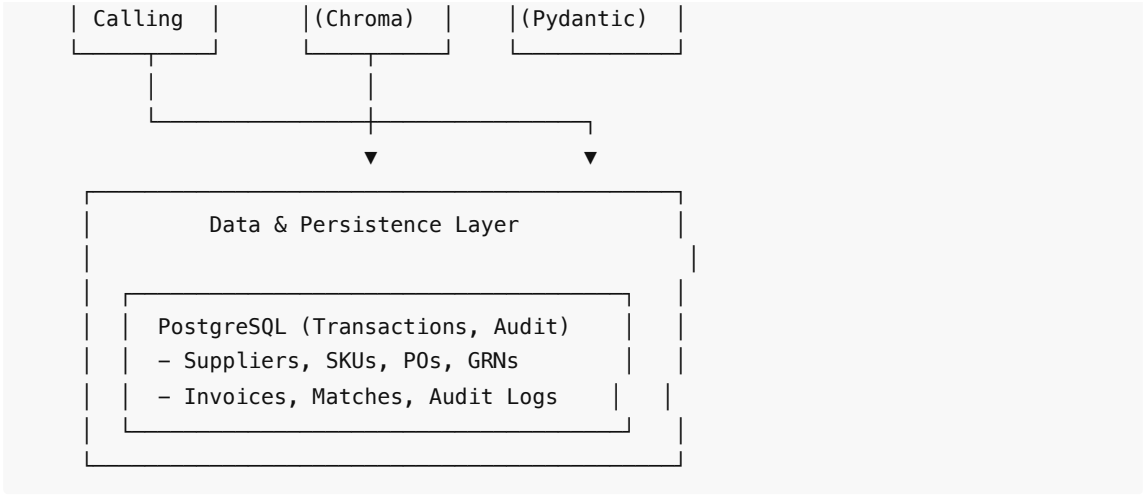
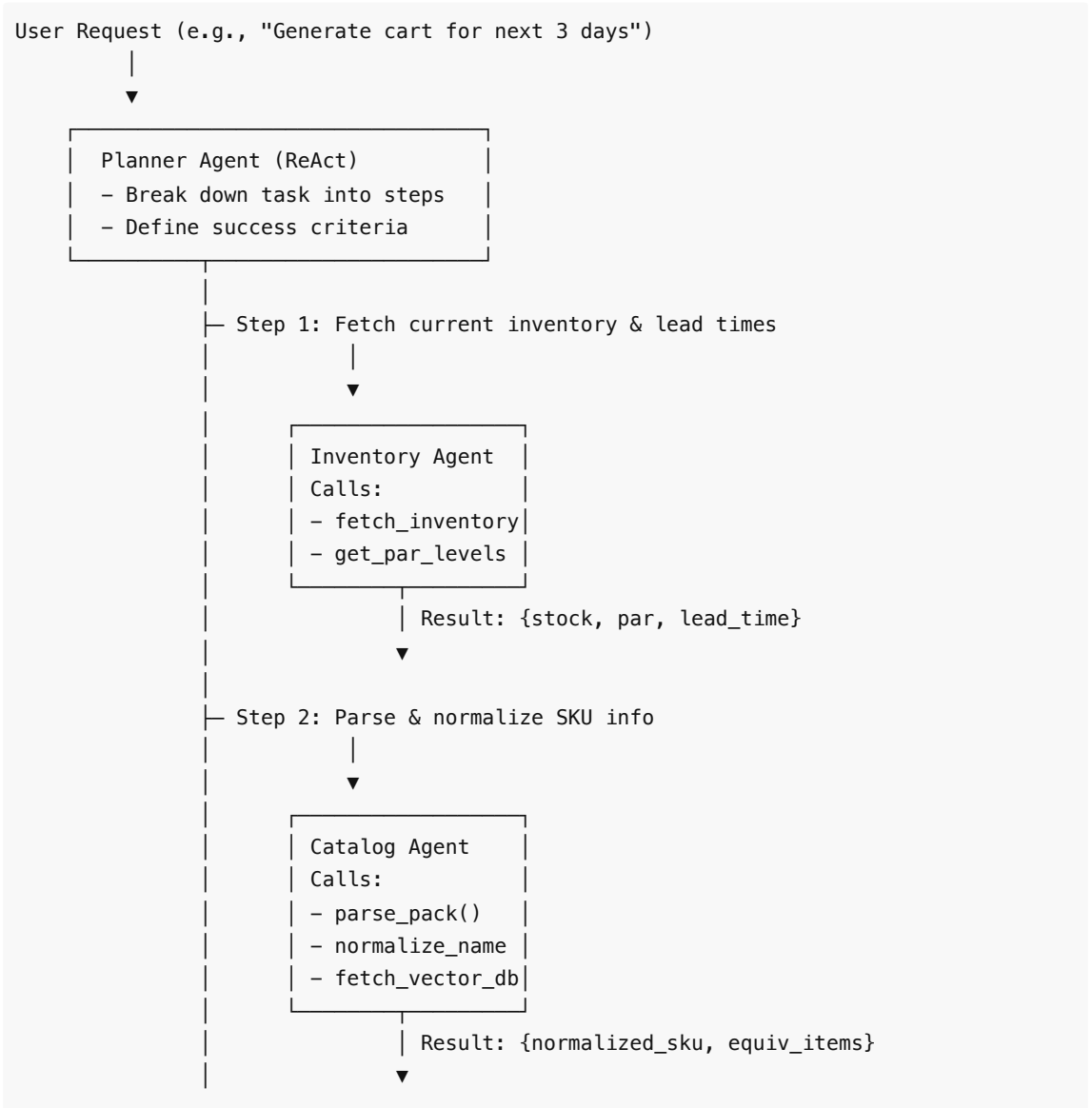
System Architecture & Flows

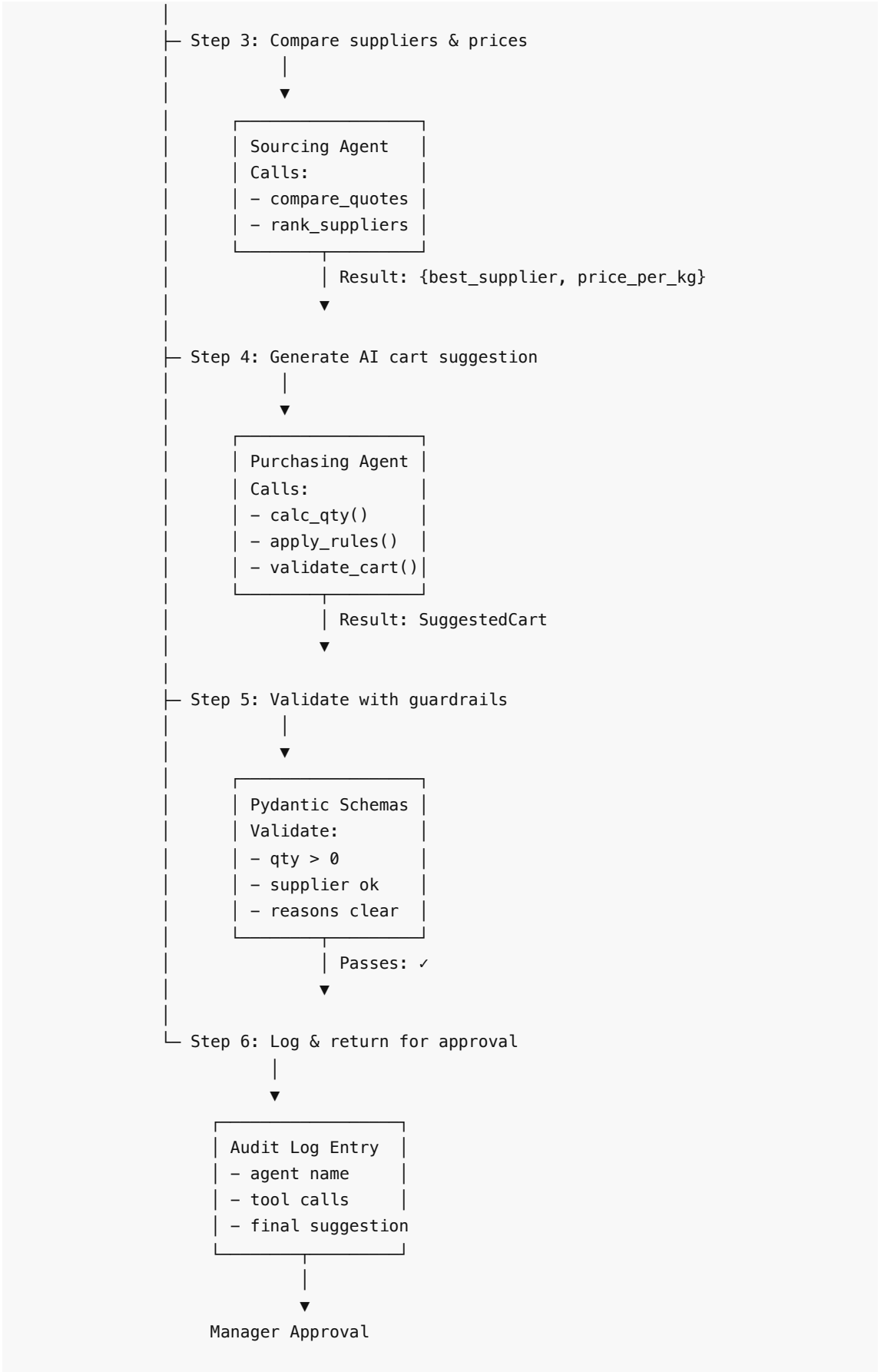
High-Level System Architecture





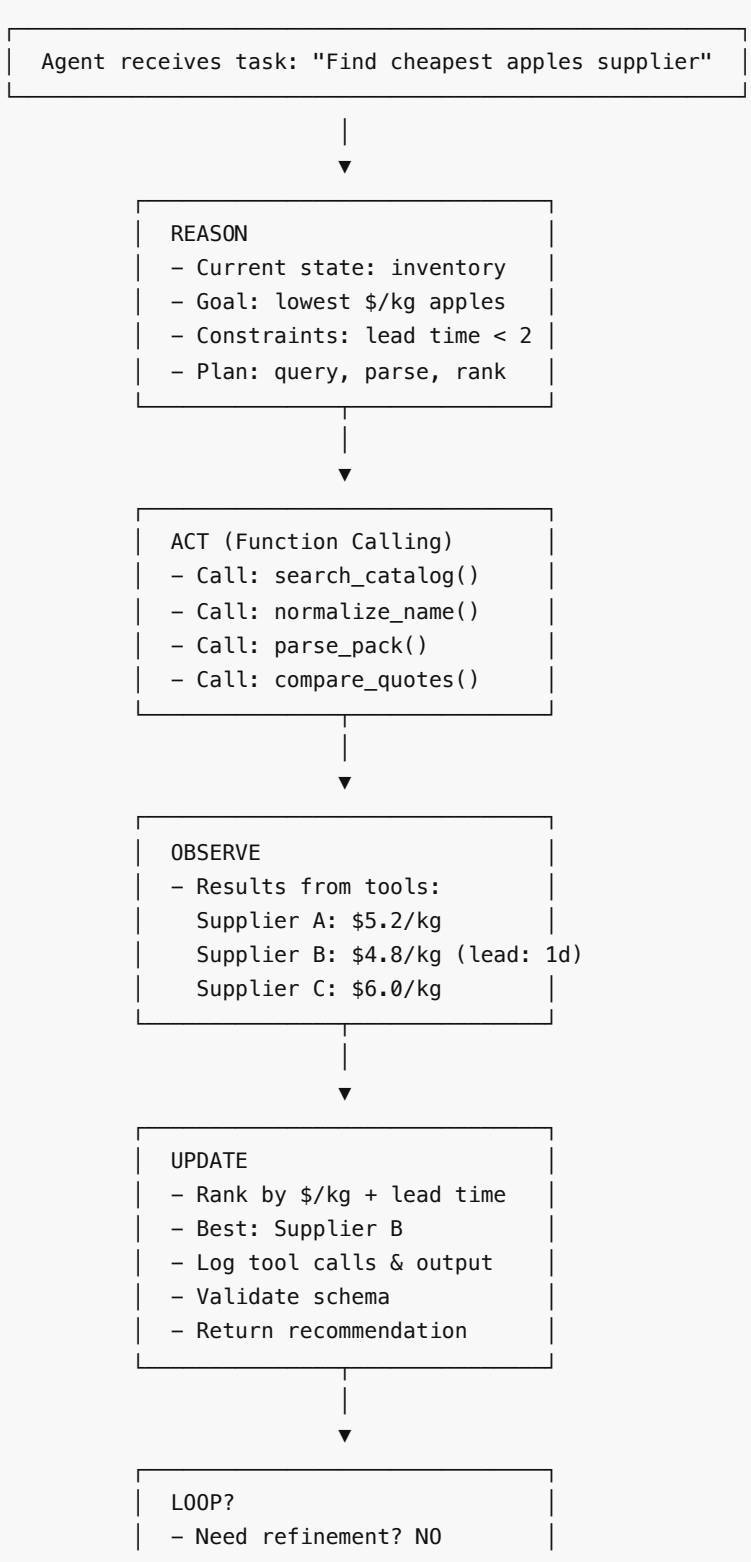
Multi-Agent Workflow (End-to-End Procurement)




Step 3: Compare suppliers & prices
Sourcing Agent
Calls:
- compare_quotes
- rank_suppliers
Result: {best_supplier, price_per_kg}
Step 4: Generate AI cart suggestion
Purchasing Agent
Calls:
- calc_qty()
- apply_rules()
- validate_cart()
Result: SuggestedCart
Step 5: Validate with guardrails
Pydantic Schemas
Validate:
- qty > 0
- supplier ok
- reasons clear
Passes: ✓
Step 6: Log & return for approval
Audit Log Entry
- agent name
- tool calls
- final suggestion
Manager Approval

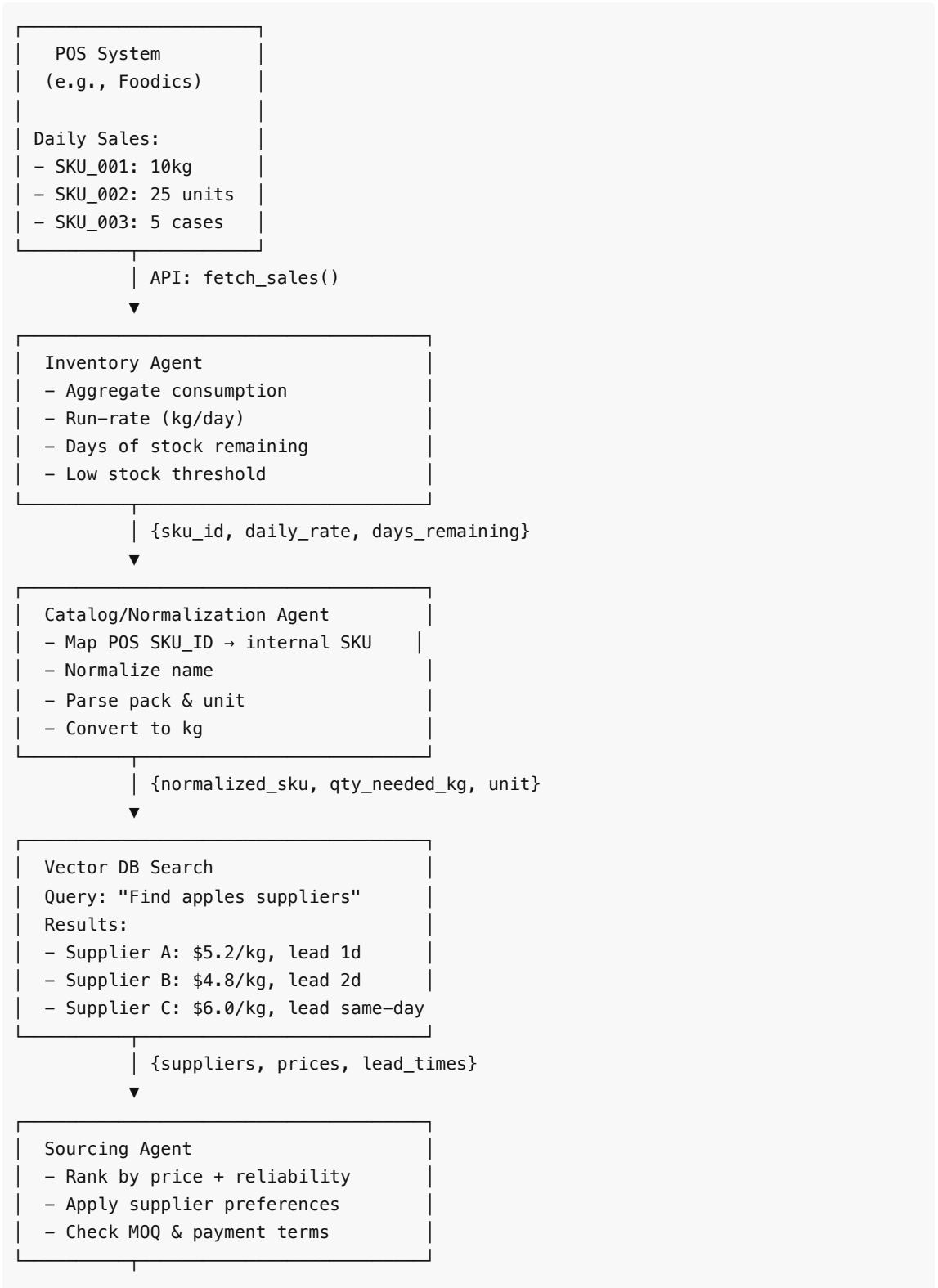
```
                    ✓ Approve → PO Created
                    ✗ Reject  → Return for edit
```

ReAct (Reason + Act + Observe + Update) Loop

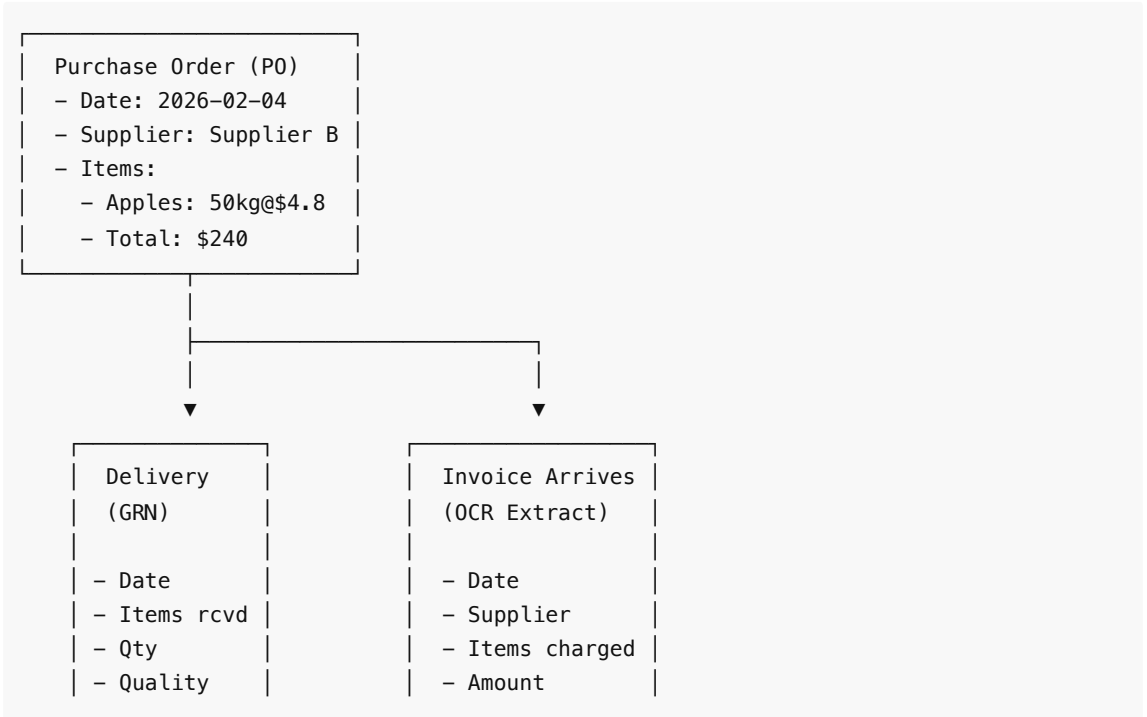


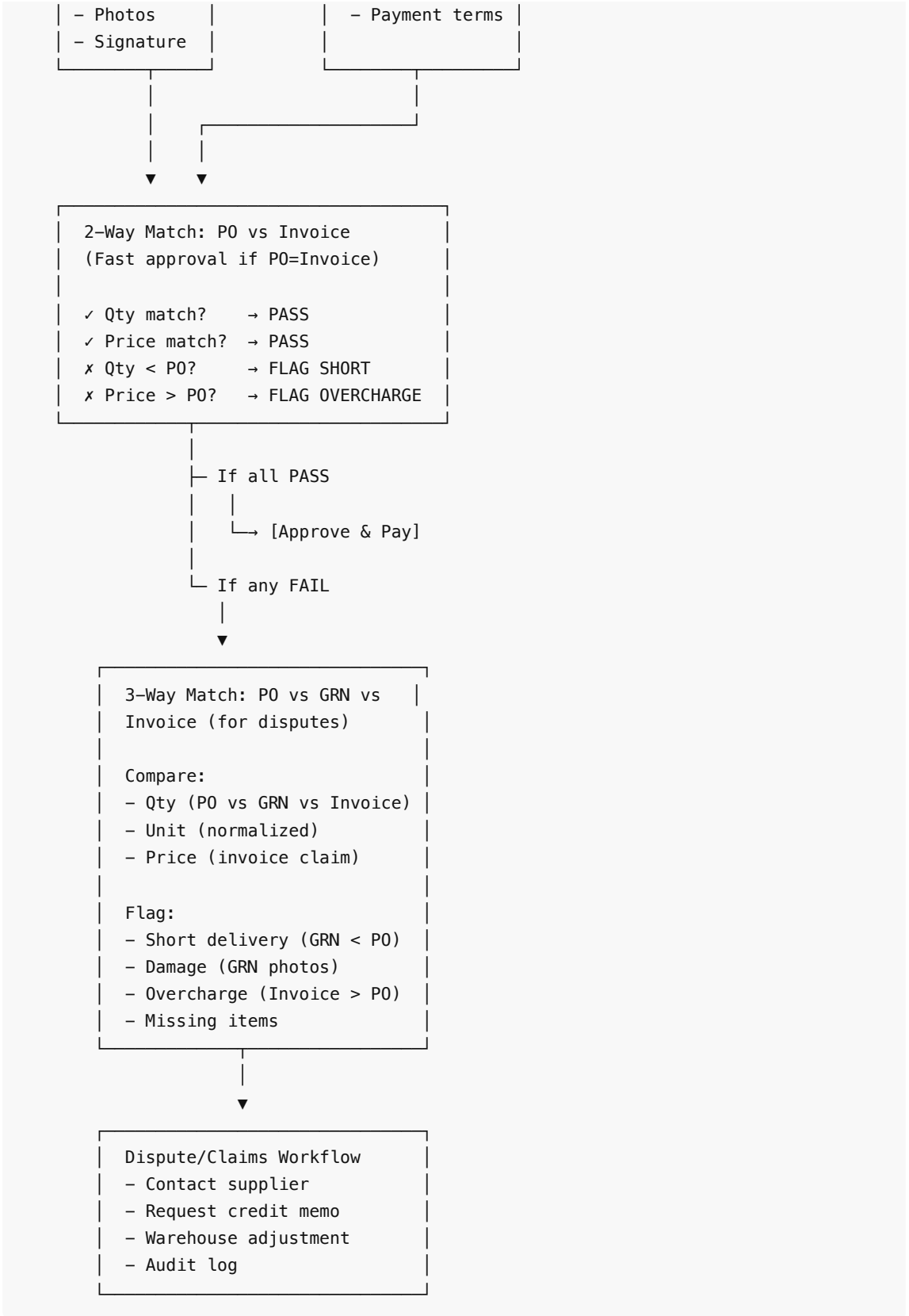
```
          │  - Return final suggestion    │
          └──────────────────────────────┘
```

Data Flow: POS → Normalization → Comparison → AI Cart

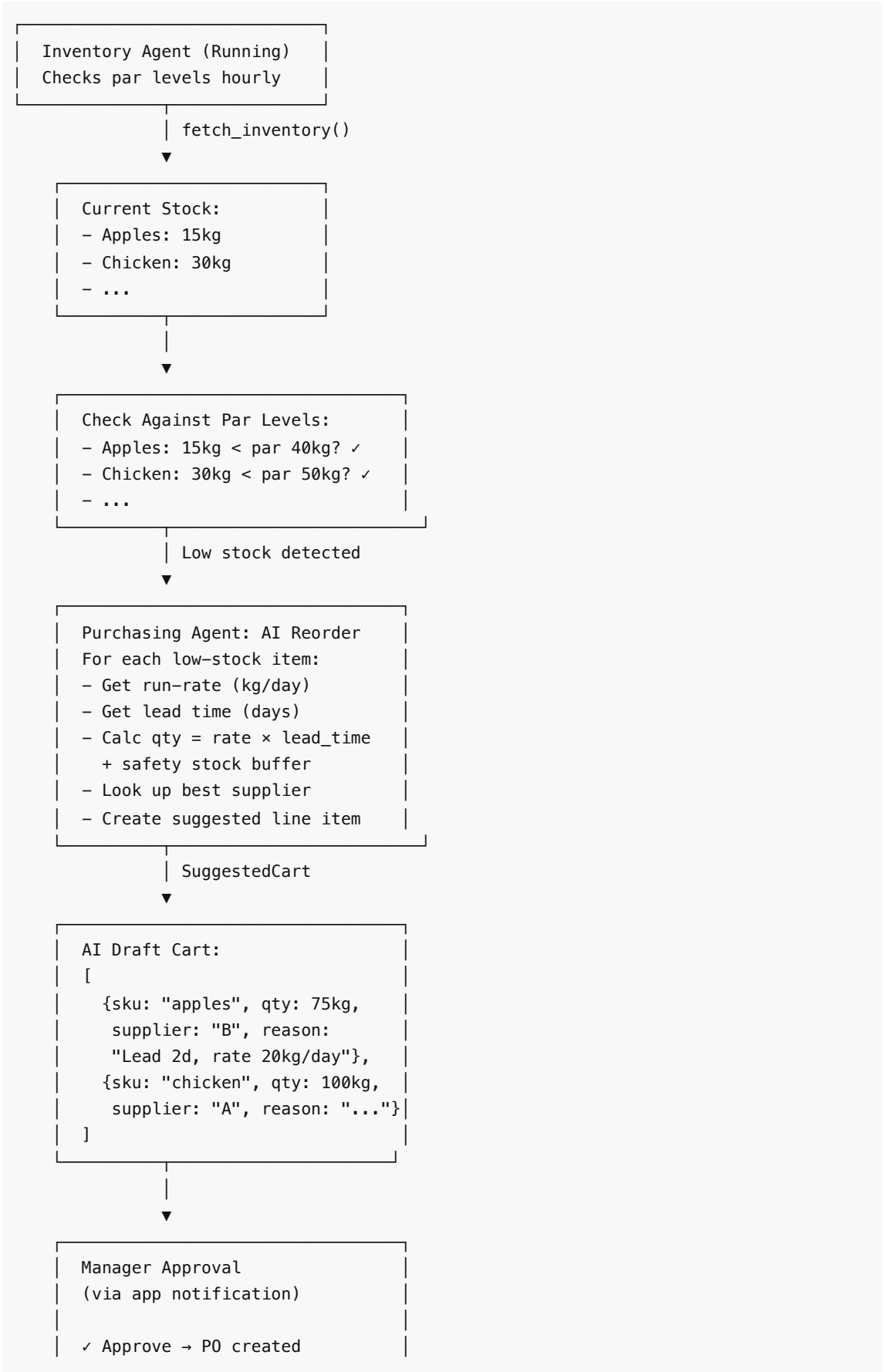


Invoice & GRN Reconciliation Flow (2-way / 3-way Match)





Low Stock → Reorder Trigger Flow


Inventory Agent (Running)
Checks par levels hourly
fetch_inventory()
Current Stock:
- Apples: 15kg
- Chicken: 30kg
- ...
Check Against Par Levels:
- Apples: 15kg < par 40kg? ✓
- Chicken: 30kg < par 50kg? ✓
- ...
Low stock detected
Purchasing Agent: AI Reorder
For each low-stock item:
- Get run-rate (kg/day)
- Get lead time (days)
- Calc qty = rate × lead_time
+ safety stock buffer
- Look up best supplier
- Create suggested line item
SuggestedCart
AI Draft Cart:
[
{sku: "apples", qty: 75kg,
supplier: "B", reason:
"Lead 2d, rate 20kg/day"},
{sku: "chicken", qty: 100kg,
supplier: "A", reason: "..."}
]
Manager Approval
(via app notification)
✓ Approve → PO created

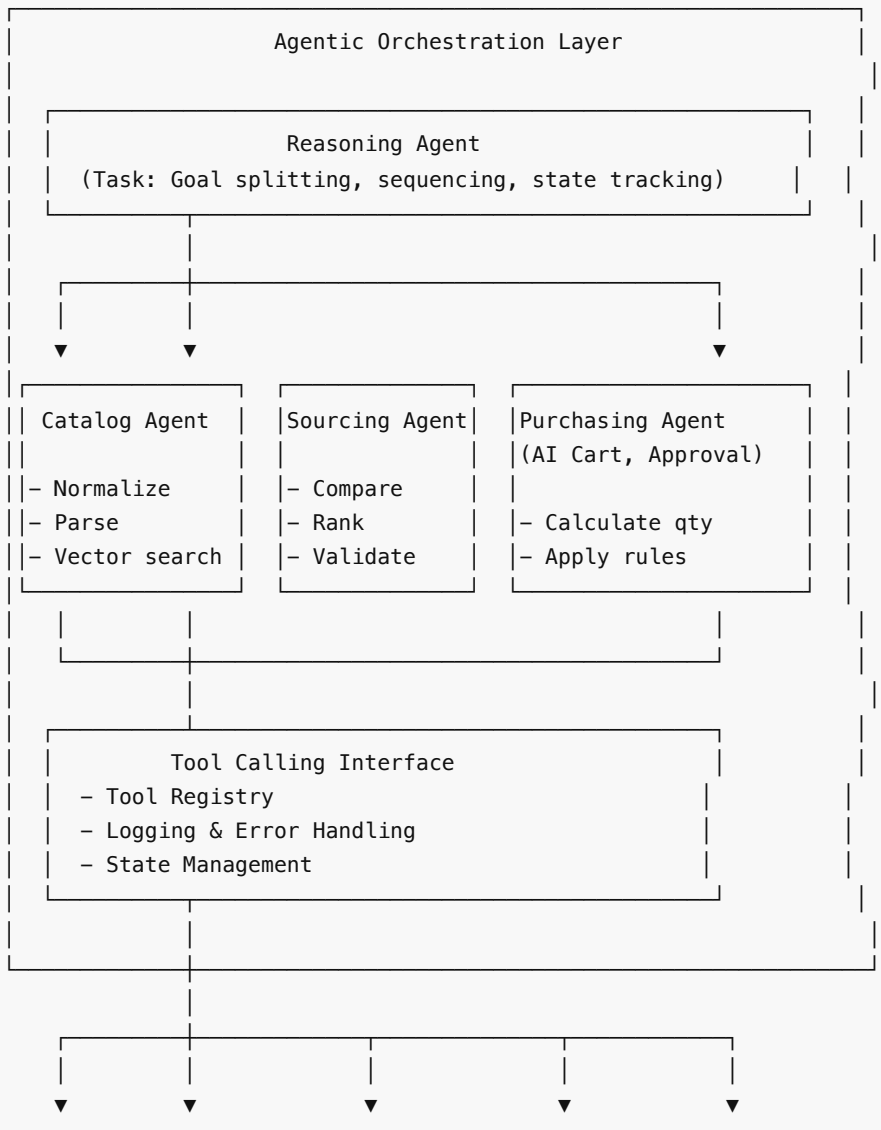
```
    │  ✗ Edit qty → Resubmit           │
    │  ✗ Change supplier → Resubmit    │
    │  ✗ Reject → Manual reorder later │
    └──────────────┬───────────────────┘
                   │
                   ▼
    ┌──────────────────────────────────┐
    │  PO Created & Sent to Supplier   │
    │  - Logged in audit trail         │
    │  - Tracked in order status       │
    └──────────────────────────────────┘
```

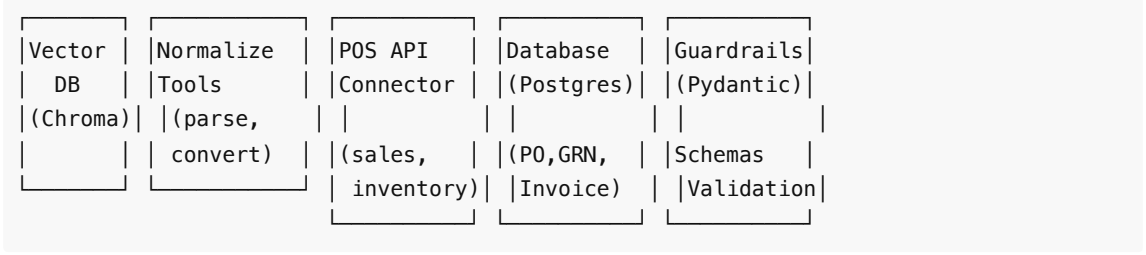
Approval Workflow (Human-in-the-Loop)

```
AI Agent Recommendation
         │
         ▼
    ┌──────────────────────────────────┐
    │  Notification to Manager         │
    │  - App push                      │
    │  - Email                         │
    │  - SMS (optional)                │
    └──────────────────────────────────┘
         │
         ▼
    ┌──────────────────────────────────┐
    │  Approval Screen:                │
    │  ┌────────────────────────┐      │
    │  │ Suggested Cart         │      │
    │  │ Item 1: Apples 75kg    │      │
    │  │ Item 2: Chicken 100kg  │      │
    │  │ Item 3: ...            │      │
    │  └────────────────────────┘      │
    │  ┌────────────────────────┐      │
    │  │ AI Reasoning:          │      │
    │  │ "Apples: 2-day lead,   │      │
    │  │  20kg/day run-rate,    │      │
    │  │  1kg safety buffer     │      │
    │  │  → 75kg suggested"     │      │
    │  └────────────────────────┘      │
    │  ┌────────────────────────┐      │
    │  │ Best Supplier:         │      │
    │  │ Supplier B: $4.8/kg    │      │
    │  │ (vs A: $5.2, C: $6.0)  │      │
    │  └────────────────────────┘      │
    └──────────────────────────────────┘
         │
         ├─ ✓ Approve
         ├─ ✗ Edit & resubmit
         └─ ✗ Reject
```

```
        │
        ├──→ [Action: Approve]
        │    ├─ Log edit feedback
        │    ├─ Create PO
        │    └─ Send to supplier
        │
        ├──→ [Action: Edit]
        │    ├─ Change qty, supplier
        │    ├─ Revalidate
        │    └─ Resubmit
        │
        └──→ [Action: Reject]
             ├─ Log rejection reason
             └─ Alert for manual reorder
```

Component Interaction Diagram





Key Decision Points & Guard Rails

```
Before AI creates any suggestion:
│
├─ Is supplier in approved list?
│  └─ NO → Flag exception, use fallback
│
├─ Is calculated qty > 0 and reasonable?
│  └─ NO → Reject, log error
│
├─ Is lead time compatible with par level?
│  └─ NO → Warn, offer manual alternatives
│
├─ Does total cost exceed monthly budget?
│  └─ NO (maybe) → Flag for CFO review
│
├─ Are there active quality issues with supplier?
│  └─ YES → Suggest alternative, log reason
│
└─ Is this a repeat order (no new variations)?
   └─ NO → Verify human before auto-PO
```

These diagrams provide a visual blueprint for understanding the multi-agent system, data flows, and approval workflows.