

# SeedCore Edge Guardian

A Cognitive Coordination Layer for Autonomous Smart Hotels

**Hackathon Track:** Tuya × AWS

**Hardware:** Tuya T5 AI Dev Board

**Cloud Stack:** AWS (EKS, IoT Core, DynamoDB, Ray)

**Scenario Focus:** Smart Hotel Operations

**Core Innovation:** Unified State + Energy-Guided Intelligence

## 1. Inspiration

Modern hotels are rapidly becoming **autonomous environments**. A single hotel now operates with:

- Hundreds of smart locks, cameras, lights, and HVAC units
- Service robots and automated cleaning systems
- AI concierges and cloud-based management software
- Guests, staff, vendors, and delivery services—all with time-bound access

The challenge is no longer connecting devices; it is **coordinating behavior across many entities**—often with minimal human supervision.

Today's hotel automation is still rule-based and device-centric:

- Each system reacts independently
- Context is fragmented across vendors
- False alerts disrupt guests and staff
- Privacy and accountability are hard to manage

**SeedCore Edge Guardian** was built to solve this **coordination problem at the system level**.

## 2. What SeedCore Does (Uniquely)

SeedCore Edge Guardian is **not a traditional security system** and **not a rule engine**. It is a **cognitive coordination layer** that:

- Consolidates signals from hotel devices into a **Unified State**
- Reasons across guests, staff, robots, rooms, and zones
- Uses an **Energy Function** to decide *how much intelligence is needed*
- Produces **explainable, system-level decisions**, not raw alerts

Instead of asking, “Did a sensor trigger?” SeedCore asks, “What is happening in the hotel right now, and how should the system respond?”

### 3. Core SeedCore Concepts (Hotel-Relevant)

#### Unified State (SeedCore-Specific)

SeedCore maintains a **hotel-wide state** combining:

- Guest check-in / check-out status
- Staff roles and shift schedules
- Robot assignments and locations
- Room states and zone permissions
- Time, mode, and recent activity

This allows decisions to be made **at the hotel level**, not per device.

#### Energy-Guided Intelligence

SeedCore computes an internal **energy score** based on:

- Novelty (is this unusual for this zone and role?)
- Uncertainty
- Cost and latency sensitivity

Low-energy situations stay on the **fast execution path**. High-energy situations escalate to **deeper cloud reasoning**. This keeps the system:

- Responsive

- Cost-controlled
- Privacy-aware

## Task Graphs & Organ Graphs

- **Task-level graphs:** model workflows like “entry handling” or “room access”
- **Organ-level graphs:** represent persistent responsibilities (lobby monitoring, corridor access, housekeeping coordination)

This makes the system extensible without rewriting logic.

## 4. Flagship Demo Scenario — Smart Hotel Night Shift

### Scenario: “Is This Activity Normal?”

#### Environment

- Tuya T5 devices in the lobby and corridor
- Smart door locks
- Lighting and notification systems
- Cloud-based hotel management system

#### Step 1: Edge Detection (Tuya T5)

At 23:40, a Tuya T5 camera detects a person entering a staff-only corridor. The edge device:

- Performs lightweight inference (“person detected”)
- Generates a structured event with an anomaly score
- Does **not** make a decision

```
{
  "event_type": "person_detected",
  "zone": "staff_corridor",
  "timestamp": "23:40",
  "anomaly_score": 0.81
}
```

## **Step 2: Unified State Reasoning (AWS Cloud Cortex)**

SeedCore evaluates the event using hotel-wide context:

- Time: late night
- Zone: staff-only
- Staff schedule: one cleaner on duty
- Robot activity: cleaning robot active on the same floor
- Guest status: no guest access allowed

The **Control Plane** computes high novelty → escalates reasoning.

## **Step 3: Explainable Decision**

SeedCore produces an explanation:

“Unrecognized person detected in staff-only corridor outside scheduled access. No matching staff role or robot assignment found.” This explanation is logged and visible to operators.

## **Step 4: Coordinated Action (Tuya DP Updates)**

SeedCore issues coordinated actions:

- Turn on corridor lights
- Lock adjacent service doors
- Notify night staff quietly via the dashboard

**No alarms. No guest disturbance. Just coordinated intelligence.**

# **5. Why Tuya + AWS Is Essential**

## **Tuya**

- Real-world edge hardware (T5) suitable for hotels
- Fast integration with locks, lighting, HVAC
- DP-based control for coordinated actions

## AWS

- Kubernetes (EKS) for scalable coordination
- Ray for distributed tasks and reasoning
- IoT Core for secure messaging
- DynamoDB for unified state and audit trails

Tuya provides **perception and actuation**. AWS provides **system-level cognition**.

## 6. Why This Is Different (Judge Summary)

## 7. Hackathon Roadmap

**Phase 1:** Cloud simulation with unified state and explanations

**Phase 2:** Tuya T5 live hotel corridor demo

**Phase 3:** Energy routing + operator dashboard

Each phase is independently demoable.

## 8. Market & Future Expansion

The same coordination layer extends naturally to:

- Smart apartments
- Autonomous hotels
- Mixed-use buildings
- Smart campuses

Hotels are the **ideal starting point** because they expose the full coordination problem.

## 9. Closing Statement

SeedCore Edge Guardian demonstrates how **Tuya edge intelligence and AWS cloud scalability** can work together to enable **autonomous hotels that understand situations, not just sensors**. **SeedCore doesn't add more rules. It adds coordinated intelligence.**