LifeOS: Complete System Specification

Version: 1.0
Last Updated: October 27, 2025
Architecture: Event-Driven Productivity Gamification + SBS Automation Engine

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Executive Overview

What is LifeOS?

LifeOS merges a **gamified productivity application** with the **System for Building Systems (SBS)** automation engine into a unified platform where:

- **Users** create characters, complete habits/quests, and earn XP/coins
- **Systems** automate recurring workflows through a 5-stage lifecycle (Define → Design → Build → Automate → Review)
- **Events** drive real-time reactions using PostgreSQL `pg_notify`
- **AI** generates personalized missions and prestige messages
- **Telegram Bot** provides conversational check-ins and system management

Core Principles

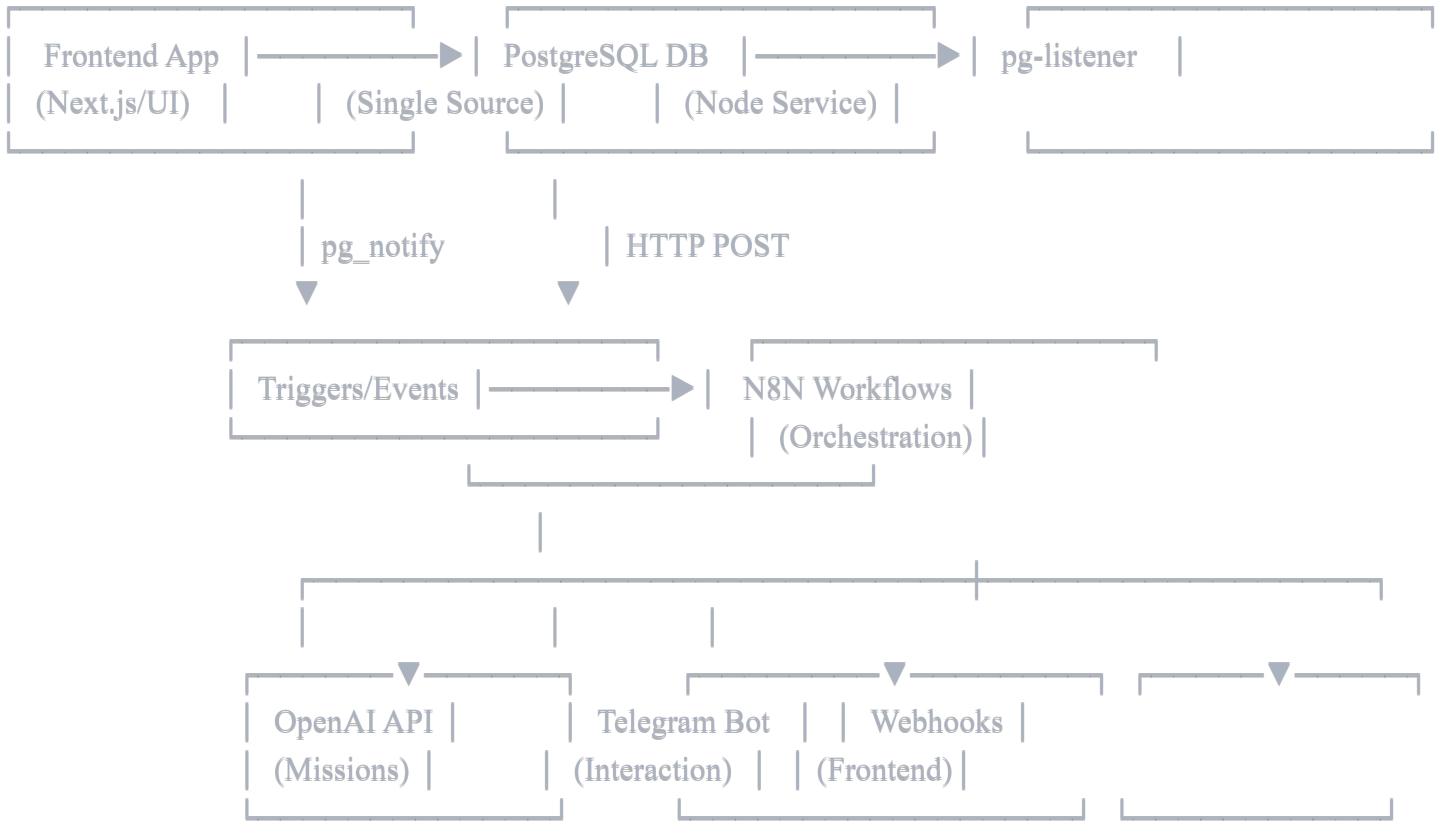
1. **Single Source of Truth:** One PostgreSQL database
2. **Event-Driven:** All changes trigger `pg_notify` events consumed by n8n
3. **Modular Workflows:** Reusable n8n sub-workflows for common operations
4. **Unified Logging:** All actions logged to `unified_logs` and `system_logs`
5. **Polymorphic Ownership:** Systems can belong to users, characters, or guilds

Key Statistics

- **10 Core Game Workflows:** User setup, habits, quests, damage, prestige, etc.
- **5 SBS Workflows:** System spawner, orchestrator, routine engine, event listener, Telegram bot
- **30+ Database Tables:** Characters, habits, projects, systems, routines, inventory, etc.
- **2 Notification Channels:** `system_update`, `unified_event`

System Architecture

High-Level Architecture



Component Responsibilities

Component	Purpose	Technology
PostgreSQL	Data storage, event generation via triggers	PostgreSQL 15+
pg-listener	Listens to pg_notify, forwards to n8n webhooks	Node.js
N8N	Workflow orchestration, API calls, business logic	n8n (Docker)
Frontend	User interface, authentication, API calls	Next.js
OpenAI	AI mission generation, prestige messages	GPT-4
Telegram	Bot notifications, conversational commands	Telegram Bot API

Event Flow Example

1. User marks habit complete (Frontend → API)
2. Habit record updated in DB
3. PostgreSQL trigger fires: pg_notify('unified_event', habit_data)
4. pg-listener receives notification
5. pg-listener POSTs to n8n webhook: /webhook/pg-notify
6. N8N HABIT_CHECKIN workflow executes:
   - Calculate rewards (XP, coins, streak)
   - Update character stats
   - Update skill XP
   - Log to events table
   - Log to systems_log
   - Return success response
7. Frontend receives success, updates UI

Database Schema

Core Tables Overview

Category	Tables	Purpose
Authentication	users	User accounts, credentials, settings
Game Entities	characters, skills, habits, projects, tasks, areas	Core gameplay mechanics
Economy	items, inventory, transactions	Shop, items, coins
Social	guilds, guild_members	Multiplayer features
SBS Automation	systems, system_steps, routines, system_templates, system_logs	Lifecycle automation
Logging	unified_logs, events, ai_logs	Audit trail, analytics
Content	rng_events, achievements, journal	Dynamic content, progression

Complete Schema

sql

```sql
-- ==================================================================
-- CORE SCHEMA: LifeOS Database
-- PostgreSQL 15+ Required
-- Extensions: uuid-ossp, pgcrypto
-- ==================================================================

CREATE EXTENSION IF NOT EXISTS "uuid-ossp";
CREATE EXTENSION IF NOT EXISTS pgcrypto;

-- ==================================================================
-- AUTHENTICATION & USERS
-- ==================================================================

CREATE TABLE IF NOT EXISTS users (
    id SERIAL PRIMARY KEY,
    email VARCHAR(255) UNIQUE NOT NULL,
    username VARCHAR(80) UNIQUE NOT NULL,
    avatar VARCHAR(255),
    join_date TIMESTAMP WITH TIME ZONE DEFAULT now(),
    password_hash VARCHAR(255) NULL,
    theme VARCHAR(40) DEFAULT 'default',
    cloud_sync_token VARCHAR(128) NULL,
    total_prestiges INTEGER DEFAULT 0,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now(),
    updated_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

-- ==================================================================
-- GAME ENTITIES
-- ==================================================================

CREATE TABLE IF NOT EXISTS characters (
    id SERIAL PRIMARY KEY,
    user_id INTEGER REFERENCES users(id) ON DELETE CASCADE,
    class VARCHAR(32),
    bio TEXT,
    goals TEXT,
    level INTEGER DEFAULT 1,
    xp BIGINT DEFAULT 0,
    total_xp BIGINT DEFAULT 0,
    hp INTEGER DEFAULT 100,
```

```sql
    max_hp INTEGER DEFAULT 100,
    coins INTEGER DEFAULT 100,
    prestige_level INTEGER DEFAULT 0,
    xp_multiplier DECIMAL(3,2) DEFAULT 1.00,
    title VARCHAR(120),
    last_login TIMESTAMP WITH TIME ZONE,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now(),
    updated_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS skills (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id) ON DELETE CASCADE,
    name VARCHAR(64) NOT NULL,
    xp BIGINT DEFAULT 0,
    level INTEGER DEFAULT 1,
    unlocked BOOLEAN DEFAULT FALSE,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS habit_templates (
    id SERIAL PRIMARY KEY,
    name VARCHAR(80),
    skill_name VARCHAR(64),
    description TEXT
);

CREATE TABLE IF NOT EXISTS habits (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id) ON DELETE CASCADE,
    skill_id INTEGER REFERENCES skills(id) ON DELETE SET NULL,
    name VARCHAR(100),
    type VARCHAR(10) CHECK (type IN ('good','bad')),
    xp_value INTEGER DEFAULT 0,
    hp_value INTEGER DEFAULT 0,
    streak INTEGER DEFAULT 0,
    last_completed DATE,
    template_id INTEGER REFERENCES habit_templates(id) ON DELETE SET NULL,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now(),
    updated_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);
```

```sql
CREATE TABLE IF NOT EXISTS areas (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id),
    name VARCHAR(50),
    description TEXT
);

CREATE TABLE IF NOT EXISTS projects (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id) ON DELETE CASCADE,
    area_id INTEGER REFERENCES areas(id),
    title VARCHAR(120),
    description TEXT,
    total_xp INTEGER DEFAULT 0,
    coin_reward INTEGER DEFAULT 0,
    difficulty VARCHAR(32),
    deadline DATE,
    completed BOOLEAN DEFAULT FALSE,
    system_template_id INTEGER REFERENCES system_templates(id) ON DELETE SET NULL,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS tasks (
    id SERIAL PRIMARY KEY,
    project_id INTEGER REFERENCES projects(id) ON DELETE CASCADE,
    title VARCHAR(120),
    completed BOOLEAN DEFAULT FALSE,
    xp INTEGER DEFAULT 0,
    coins INTEGER DEFAULT 0,
    difficulty VARCHAR(32),
    deadline DATE,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

-- ==============================================================
-- ECONOMY
-- ==============================================================

CREATE TABLE IF NOT EXISTS items (
    id SERIAL PRIMARY KEY,
    name VARCHAR(64),
    item_type VARCHAR(32),
```

```sql
    rarity VARCHAR(32),
    description TEXT,
    effect TEXT,
    cost INTEGER DEFAULT 0
);

CREATE TABLE IF NOT EXISTS inventory (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id),
    item_id INTEGER REFERENCES items(id),
    quantity INTEGER DEFAULT 1,
    acquired TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS transactions (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id),
    type VARCHAR(32),
    amount INTEGER,
    item_id INTEGER REFERENCES items(id),
    description TEXT,
    trans_date TIMESTAMP WITH TIME ZONE DEFAULT now()
);

-- ==============================================================
-- SOCIAL
-- ==============================================================

CREATE TABLE IF NOT EXISTS guilds (
    id SERIAL PRIMARY KEY,
    name VARCHAR(100) UNIQUE,
    description TEXT,
    leader_id INTEGER REFERENCES users(id),
    xp_pool INTEGER DEFAULT 0,
    created TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS guild_members (
    guild_id INTEGER REFERENCES guilds(id),
    user_id INTEGER REFERENCES users(id),
    joined TIMESTAMP WITH TIME ZONE DEFAULT now(),
    is_admin BOOLEAN DEFAULT FALSE,
```

```sql
    PRIMARY KEY(guild_id, user_id)
);

-- ==================================================================
-- SBS (SYSTEM FOR BUILDING SYSTEMS)
-- ==================================================================

CREATE TABLE IF NOT EXISTS system_templates (
    id SERIAL PRIMARY KEY,
    name TEXT NOT NULL,
    category TEXT,
    description TEXT,
    default_inputs JSONB,
    default_outputs JSONB,
    schema_ref TEXT,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS systems (
    id SERIAL PRIMARY KEY,
    name TEXT NOT NULL,
    category TEXT,
    purpose TEXT,
    inputs TEXT,
    outputs TEXT,
    update_frequency TEXT,
    current_stage TEXT DEFAULT 'define',
    metadata JSONB DEFAULT '{}'::jsonb,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now(),
    updated_at TIMESTAMP WITH TIME ZONE DEFAULT now(),
    owner_type TEXT CHECK (owner_type IN ('user', 'character', 'guild')) DEFAULT 'user',
    owner_id INTEGER
);

CREATE TABLE IF NOT EXISTS system_steps (
    id SERIAL PRIMARY KEY,
    system_id INT REFERENCES systems(id) ON DELETE CASCADE,
    step TEXT NOT NULL CHECK (step IN ('define', 'design', 'build', 'automate', 'review')),
    status TEXT DEFAULT 'pending' CHECK (status IN ('pending', 'complete', 'blocked')),
    notes TEXT,
    metadata JSONB DEFAULT '{}'::jsonb,
    updated_at TIMESTAMP WITH TIME ZONE DEFAULT now()
```

```sql
);

CREATE TABLE IF NOT EXISTS routines (
    id SERIAL PRIMARY KEY,
    name TEXT NOT NULL,
    system_id INT REFERENCES systems(id) ON DELETE CASCADE,
    day_of_week TEXT,
    description TEXT,
    status TEXT DEFAULT 'active' CHECK (status IN ('active', 'paused', 'archived')),
    metadata JSONB DEFAULT '{}'::jsonb,
    habit_id INTEGER REFERENCES habits(id) ON DELETE SET NULL,
    trigger_type TEXT DEFAULT 'scheduled' CHECK (trigger_type IN ('manual', 'scheduled', 'event')),
    active BOOLEAN DEFAULT TRUE,
    guild_id INTEGER REFERENCES guilds(id) ON DELETE SET NULL,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS system_logs (
    id SERIAL PRIMARY KEY,
    system_id INT REFERENCES systems(id) ON DELETE CASCADE,
    event TEXT NOT NULL,
    details JSONB,
    created_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

-- ==============================================================
-- LOGGING & AUDIT
-- ==============================================================

CREATE TABLE IF NOT EXISTS unified_logs (
    id SERIAL PRIMARY KEY,
    timestamp TIMESTAMP WITH TIME ZONE DEFAULT now(),
    source TEXT,
    system_id INT REFERENCES systems(id) ON DELETE SET NULL,
    character_id INT REFERENCES characters(id) ON DELETE SET NULL,
    user_id INT REFERENCES users(id) ON DELETE SET NULL,
    action TEXT,
    detail JSONB,
    outcome TEXT,
    severity TEXT DEFAULT 'info'
);
```

```sql
CREATE TABLE IF NOT EXISTS events (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id),
    event_type VARCHAR(50),
    xp_change INTEGER DEFAULT 0,
    hp_change INTEGER DEFAULT 0,
    coins_change INTEGER DEFAULT 0,
    description TEXT,
    event_date TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS ai_logs (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id),
    message TEXT,
    insight_type VARCHAR(32),
    timestamp TIMESTAMP WITH TIME ZONE DEFAULT now()
);

-- ==============================================================
-- CONTENT & PROGRESSION
-- ==============================================================

CREATE TABLE IF NOT EXISTS rng_events (
    id SERIAL PRIMARY KEY,
    description TEXT,
    effect TEXT,
    rarity VARCHAR(32),
    available BOOLEAN DEFAULT TRUE,
    last_issued DATE
);

CREATE TABLE IF NOT EXISTS achievements (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id),
    title VARCHAR(100),
    description TEXT,
    reward_type VARCHAR(32),
    bonus_value INTEGER,
    unlocked_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);
```

```sql
CREATE TABLE IF NOT EXISTS journal (
    id SERIAL PRIMARY KEY,
    character_id INTEGER REFERENCES characters(id),
    entry TEXT,
    wisdom_xp INTEGER DEFAULT 0,
    entry_date TIMESTAMP WITH TIME ZONE DEFAULT now()
);

CREATE TABLE IF NOT EXISTS settings (
    user_id INTEGER PRIMARY KEY REFERENCES users(id),
    level_xp_formula TEXT,
    overdraft_rule TEXT,
    notification_times TEXT,
    theme VARCHAR(32),
    updated_at TIMESTAMP WITH TIME ZONE DEFAULT now()
);

-- ==============================================================
-- TRIGGERS FOR EVENT-DRIVEN ARCHITECTURE
-- ==============================================================

-- System Update Trigger
CREATE OR REPLACE FUNCTION notify_system_update()
RETURNS trigger AS $$
BEGIN
    PERFORM pg_notify('system_update', row_to_json(NEW)::text);
    RETURN NEW;
END;
$$ LANGUAGE plpgsql;

DROP TRIGGER IF EXISTS systems_notify_trigger ON systems;
CREATE TRIGGER systems_notify_trigger
AFTER INSERT OR UPDATE ON systems
FOR EACH ROW EXECUTE FUNCTION notify_system_update();

-- Unified Event Trigger
CREATE OR REPLACE FUNCTION notify_unified_event()
RETURNS trigger AS $$
DECLARE
    payload json;
BEGIN
    payload := row_to_json(NEW);
```

```
    PERFORM pg_notify('unified_event', payload::text);
    RETURN NEW;
END;
$$ LANGUAGE plpgsql;

DROP TRIGGER IF EXISTS habits_notify_trigger ON habits;
CREATE TRIGGER habits_notify_trigger
AFTER INSERT OR UPDATE ON habits
FOR EACH ROW EXECUTE FUNCTION notify_unified_event();

DROP TRIGGER IF EXISTS tasks_notify_trigger ON tasks;
CREATE TRIGGER tasks_notify_trigger
AFTER INSERT OR UPDATE ON tasks
FOR EACH ROW EXECUTE FUNCTION notify_unified_event();

-- ==============================================================
-- INDEXES FOR PERFORMANCE
-- ==============================================================

CREATE INDEX IF NOT EXISTS idx_systems_owner ON systems(owner_type, owner_id);
CREATE INDEX IF NOT EXISTS idx_system_steps_system_id ON system_steps(system_id);
CREATE INDEX IF NOT EXISTS idx_routines_system_id ON routines(system_id);
CREATE INDEX IF NOT EXISTS idx_routines_habit_id ON routines(habit_id);
CREATE INDEX IF NOT EXISTS idx_projects_character_id ON projects(character_id);
CREATE INDEX IF NOT EXISTS idx_unified_logs_timestamp ON unified_logs(timestamp);
CREATE INDEX IF NOT EXISTS idx_characters_user_id ON characters(user_id);
CREATE INDEX IF NOT EXISTS idx_skills_character_id ON skills(character_id);
CREATE INDEX IF NOT EXISTS idx_habits_character_id ON habits(character_id);
CREATE INDEX IF NOT EXISTS idx_events_character_id ON events(character_id);
```

N8N Workflow Specifications

Workflow Catalog

Game Workflows

ID	Name	Trigger	Purpose
1	INIT_USER_SETUP	Webhook (user signup)	Create character, skills, tutorial quest
2	HABIT_CHECKIN	Webhook (habit complete)	Award XP, coins, update streaks
3	DAMAGE_CALC	Webhook (bad habit)	Calculate HP damage with defense modifiers
4	QUEST_ENGINE	Webhook (task complete)	Grant rewards, check project completion
5	SHOP_CHECK	Webhook (purchase)	Validate coins, deduct, add to inventory
6	CRON_MANAGER	Schedule (daily)	Apply HP penalties, generate daily events
7	AI_MISSIONS	Schedule (daily 6am)	Generate personalized missions via AI
8	ACHIEVEMENT_UNLOCK	Webhook (milestone)	Check thresholds, grant achievements
9	EVENT_SEEDER	Schedule (monthly)	Generate new random events via AI
10	PRESTIGE_CALC	DB Trigger (level max)	Reset stats, add permanent bonuses

SBS Workflows

ID	Name	Trigger	Purpose
11	SBS_SYSTEM_SPAWNER	Webhook (system created)	Initialize lifecycle steps, routines
12	SBS_SYSTEM_ORCHESTRATOR	Webhook (system update)	Route to step handlers (define/design/build/automate/review)
13	SBS_ROUTINE_ENGINE	Schedule (daily 9am)	Execute due routines, send reminders
14	SBS_PG_LISTENER	Webhook (pg_notify)	Forward DB events to appropriate workflows
15	SBS_TELEGRAM_BOT	Telegram (message)	Handle commands (/complete, /skip, /status, /help)

Reusable Modules

All workflows leverage these shared modules:

Module	Used By	Purpose
Reward Calculation	HABIT_CHECKIN, QUEST_ENGINE, PRESTIGE_CALC	Calculate XP, coins, streak multipliers
Event Logging	All workflows	Write to events and unified_logs
HP/XP Modifier	DAMAGE_CALC, CRON_MANAGER, PRESTIGE_CALC	Adjust character stats with validation
Skill Update	HABIT_CHECKIN, QUEST_ENGINE, PRESTIGE_CALC	Increment skill XP, recalculate level
Task Creation	INIT_USER_SETUP, AI_MISSIONS	Generate projects and tasks

---

API Contracts & Webhooks

N8N Webhook Endpoints

All webhooks follow the pattern: `https://your-n8n-domain.com/webhook/{endpoint}`

Endpoint	Method	Purpose	Payload
/webhook/user-signup	POST	Initialize new user	{user_id, username, email, class, goals}
/webhook/habit-checkin	POST	Mark habit complete	{habit_id, character_id}
/webhook/bad-habit-battle	POST	Apply damage	{habit_id, character_id}
/webhook/complete-task	POST	Complete quest task	{task_id, character_id}
/webhook/shop/purchase	POST	Purchase item	{character_id, item_id, quantity}
/webhook/check-achievements	POST	Check for unlocks	{character_id}
/webhook/pg-notify	POST	Receive DB events	{channel, payload}
/webhook/sbs-system-created	POST	Initialize system	{system_id, name, category, purpose}
/webhook/sbs-system-update	POST	Advance system stage	{system_id, current_stage, name}

Response Formats

Success Response (Standard)

```json
{
  "success": true,
  "data": { /* relevant data */ },
  "message": "Operation completed successfully"
}
```

Error Response (Standard)

```json
{
  "success": false,
  "error": "Error description",
  "code": "ERROR_CODE",
  "details": { /* optional additional context */ }
}
```

Example Payloads

Habit Check-in Request

```json
{
  "habit_id": 42,
  "character_id": 13
}
```

Habit Check-in Success Response

```json
{
  "success": true,
  "xpEarned": 30,
  "coinsEarned": 15,
  "newStreak": 7,
  "streakBonus": 1.5,
  "message": "Great work! Keep the momentum going!"
}
```

Shop Purchase Request

```json
{
  "character_id": 13,
  "item_id": 5,
  "quantity": 2
}
```

Shop Purchase Error Response

```json
{
  "success": false,
  "error": "Insufficient coins",
  "required": 500,
  "available": 320,
  "shortfall": 180
}
```

Deployment Guide

Prerequisites

- Docker & Docker Compose
- PostgreSQL 15+
- Node.js 18+ (for pg-listener)
- N8N account or self-hosted instance
- OpenAI API key
- Telegram Bot token (optional)

Docker Compose Configuration

yaml

```yaml
version: '3.8'

services:
  postgres:
    image: postgres:15
    restart: always
    environment:
      POSTGRES_USER: lifeos_app
      POSTGRES_PASSWORD: ${DB_PASSWORD}
      POSTGRES_DB: lifeos_db
    volumes:
      - pgdata:/var/lib/postgresql/data
      - ./schema.sql:/docker-entrypoint-initdb.d/schema.sql
    ports:
      - "5432:5432"
    healthcheck:
      test: ["CMD-SHELL", "pg_isready -U lifeos_app"]
      interval: 10s
      timeout: 5s
      retries: 5

  n8n:
    image: n8nio/n8n:latest
    restart: always
    environment:
      - DB_TYPE=postgresdb
      - DB_POSTGRESDB_HOST=postgres
      - DB_POSTGRESDB_PORT=5432
      - DB_POSTGRESDB_DATABASE=lifeos_db
      - DB_POSTGRESDB_USER=lifeos_app
      - DB_POSTGRESDB_PASSWORD=${DB_PASSWORD}
      - N8N_HOST=0.0.0.0
      - N8N_PORT=5678
      - N8N_PROTOCOL=https
      - WEBHOOK_URL=${N8N_WEBHOOK_BASE_URL}
      - GENERIC_TIMEZONE=America/Denver
      - EXECUTIONS_PROCESS=main
      - OPENAI_API_KEY=${OPENAI_API_KEY}
      - TELEGRAM_BOT_TOKEN=${TELEGRAM_BOT_TOKEN}
    ports:
      - "5678:5678"
```

```yaml
    depends_on:
      postgres:
        condition: service_healthy
    volumes:
      - n8n_data:/home/node/.n8n

  pg-listener:
    build: ./pg-listener
    restart: always
    environment:
      - DB_HOST=postgres
      - DB_PORT=5432
      - DB_USER=lifeos_app
      - DB_PASSWORD=${DB_PASSWORD}
      - DB_NAME=lifeos_db
      - N8N_WEBHOOK_BASE_URL=${N8N_WEBHOOK_BASE_URL}
    depends_on:
      postgres:
        condition: service_healthy
      n8n:
        condition: service_started

  adminer:
    image: adminer
    restart: always
    ports:
      - "8080:8080"
    depends_on:
      - postgres

volumes:
  pgdata:
  n8n_data:
```

Environment Variables (.env)

bash

```
# Database
DB_PASSWORD=your_secure_password_here

# N8N
N8N_WEBHOOK_BASE_URL=https://your-n8n-domain.com

# OpenAI
OPENAI_API_KEY=sk-your-openai-key-here

# Telegram (Optional)
TELEGRAM_BOT_TOKEN=123456:ABC-DEF...
TELEGRAM_CHAT_ID=your_chat_id
```

pg-listener Service

Create `pg-listener/listener.js`:

javascript

```
const { Client } = require('pg');
const fetch = require('node-fetch');

const client = new Client({
  host: process.env.DB_HOST,
  port: process.env.DB_PORT,
  user: process.env.DB_USER,
  password: process.env.DB_PASSWORD,
  database: process.env.DB_NAME
});

async function main() {
  await client.connect();
  console.log('✅ Connected to PostgreSQL');

  client.on('notification', async (msg) => {
    const channel = msg.channel;
    const payload = JSON.parse(msg.payload);

    console.log(`📢 Notification received: ${channel}`);

    try {
      const response = await fetch(`${process.env.N8N_WEBHOOK_BASE_URL}/webhook/pg-notify`, {
        method: 'POST',
        headers: { 'Content-Type': 'application/json' },
        body: JSON.stringify({ channel, payload })
      });

      if (response.ok) {
        console.log(`✅ Forwarded to n8n: ${channel}`);
      } else {
        console.error(`❌ Failed to forward: ${response.statusText}`);
      }
    } catch (error) {
      console.error(`❌ Error forwarding notification:`, error);
    }
  });

  await client.query('LISTEN system_update');
  await client.query('LISTEN unified_event');
```

```
  console.log('👂 Listening to: system_update, unified_event');
}

main().catch(console.error);
```

Create `pg-listener/Dockerfile`:

dockerfile

```
FROM node:18-alpine
WORKDIR /app
COPY package*.json ./
RUN npm install
COPY . .
CMD ["node", "listener.js"]
```

Create `pg-listener/package.json`:

json

```
{
  "name": "lifeos-pg-listener",
  "version": "1.0.0",
  "dependencies": {
    "pg": "^8.11.0",
    "node-fetch": "^2.6.9"
  }
}
```

Deployment Steps

1. **Clone repository and configure**

bash

```bash
git clone your-repo
cd lifeos
cp .env.example .env
# Edit .env with your credentials
```

2. **Start services**

bash

```bash
docker-compose up -d
```

3. **Initialize database**

bash

```bash
docker-compose exec postgres psql -U lifeos_app -d lifeos_db -f /docker-entrypoint-initdb.d/schema.sql
```

4. **Import n8n workflows**
    - Access n8n at `http://localhost:5678`
    - Go to Workflows → Import
    - Upload each JSON workflow from `/n8n-workflows/` directory
5. **Configure n8n credentials**
    - PostgreSQL: `lifeos_app` user
    - OpenAI API: Your API key
    - Telegram Bot: Your bot token
6. **Activate workflows**
    - Enable all imported workflows
    - Test with a simple webhook call
7. **Verify pg-listener**

bash

```bash
docker-compose logs -f pg-listener
# Should show: "Listening to: system_update, unified_event"
```

Testing & Validation

Unit Tests

Test 1: User Initialization

bash

```bash
curl -X POST http://localhost:5678/webhook/user-signup \
  -H "Content-Type: application/json" \
  -d '{
    "user_id": 1,
    "username": "alice",
    "email": "alice@example.com",
    "class": "Starter",
    "goals": "Get fit and learn new skills"
  }'
```

Expected Result:

- Character created with ID
- 7 skills initialized (3 unlocked, 4 locked)
- Tutorial quest created with 3 tasks
- Default settings created
- Starter items added to inventory
- Events logged

Test 2: Habit Check-in

bash

```bash
curl -X POST http://localhost:5678/webhook/habit-checkin \
  -H "Content-Type: application/json" \
  -d '{
    "habit_id": 1,
    "character_id": 1
  }'
```

Expected Result:

- XP earned (base + streak multiplier)
- Coins earned

- Streak incremented
- Skill XP updated
- Character stats updated
- Event logged

Test 3: Quest Completion

bash

```bash
curl -X POST http://localhost:5678/webhook/complete-task \
  -H "Content-Type: application/json" \
  -d '{
    "task_id": 1,
    "character_id": 1
  }'
```

Expected Result:

- Task marked complete
- XP and coins awarded
- Related skill updated
- If all tasks done: project archived

Test 4: System Creation (SBS)

sql

```sql
INSERT INTO systems (name, category, purpose, owner_type, owner_id)
VALUES ('Morning Routine', 'Habits', 'Automate morning habits', 'character', 1);
```

Expected Result:

- pg_notify fired
- pg-listener forwards to n8n
- 5 system_steps created (define complete, others pending)
- 2 default routines created (Monday, Friday)
- System stage advanced to 'design'
- Telegram notification sent

Integration Tests

Test 5: Complete User Journey

javascript

```
// 1. Create user
POST /webhook/user-signup
// 2. Create habit
INSERT INTO habits (character_id, name, type, xp_value, skill_id)
// 3. Check in habit 7 days in a row
POST /webhook/habit-checkin (x7)
// 4. Verify streak bonus applied
GET character stats -> streak should be 7, multiplier 1.5x
// 5. Check achievement unlock
POST /webhook/check-achievements
// 6. Verify "Week Warrior" achievement granted
```

Test 6: Shop Transaction Flow

javascript

```
// 1. Check initial coins
GET character -> coins = 100
// 2. Attempt purchase beyond budget
POST /webhook/shop/purchase {item_id: 1, quantity: 10}
// Expected: 400 error, insufficient coins
// 3. Valid purchase
POST /webhook/shop/purchase {item_id: 1, quantity: 1}
// Expected: 200, inventory updated, coins deducted
// 4. Verify transaction logged
SELECT * FROM transactions WHERE character_id = 1
```

Test 7: SBS Lifecycle Progression

javascript

```
// 1. Create system
INSERT INTO systems (name, category, purpose, owner_type, owner_id)
// 2. Verify spawner ran
SELECT * FROM system_steps WHERE system_id = NEW.id
// 3. Manually trigger orchestrator
POST /webhook/sbs-system-update {system_id: 1, current_stage: 'design'}
// 4. Verify design handler executed
SELECT * FROM system_logs WHERE event = 'design_canvas_generated'
// 5. Advance through all stages
POST /webhook/sbs-system-update (x4)
// 6. Verify completion
SELECT current_stage FROM systems WHERE id = 1
// Expected: 'complete'
```

Acceptance Criteria Checklist

- [ ] User can sign up and character is created with default skills
- [ ] Habits can be checked in and rewards are calculated correctly
- [ ] Bad habits apply damage with defense modifiers
- [ ] Quests award XP and coins on task completion
- [ ] Shop validates coins and updates inventory
- [ ] Daily cron applies HP penalties for overdue habits
- [ ] AI generates personalized daily missions
- [ ] Achievements unlock at correct thresholds
- [ ] Prestige resets stats and applies permanent bonuses
- [ ] Systems progress through 5-stage lifecycle
- [ ] Routines execute on schedule and send reminders
- [ ] Telegram bot responds to commands correctly
- [ ] All events are logged to unified_logs
- [ ] pg_notify triggers are reliable

N8N Workflow JSON Files

Directory Structure

```
n8n-workflows/
├── game/
│   ├── 01_INIT_USER_SETUP.json
│   ├── 02_HABIT_CHECKIN.json
│   ├── 03_DAMAGE_CALC.json
│   ├── 04_QUEST_ENGINE.json
│   ├── 05_SHOP_CHECK.json
│   ├── 06_CRON_MANAGER.json
│   ├── 07_AI_MISSIONS.json
│   ├── 08_ACHIEVEMENT_UNLOCK.json
│   ├── 09_EVENT_SEEDER.json
│   └── 10_PRESTIGE_CALC.json
├── sbs/
│   ├── 11_SBS_SYSTEM_SPAWNER.json
│   ├── 12_SBS_SYSTEM_ORCHESTRATOR.json
│   ├── 13_SBS_ROUTINE_ENGINE.json
│   ├── 14_SBS_PG_LISTENER.json
│   └── 15_SBS_TELEGRAM_BOT.json
└── README.md
```

Import Instructions

1. **Access n8n Interface**
   - Navigate to `https://your-n8n-domain.com`
   - Login with credentials
2. **Import Workflows**
   - Click "Workflows" in left sidebar
   - Click "Import from File"
   - Select each JSON file from the appropriate directory
   - Repeat for all 15 workflows
3. **Configure Credentials**
   - Go to "Credentials" in left sidebar
   - Add PostgreSQL connection: `lifeos_app`
   - Add OpenAI API: Your API key
   - Add Telegram Bot API: Your bot token
4. **Update Environment Variables**
   - Edit each workflow
   - Update `N8N_WEBHOOK_BASE_URL` references
   - Update `TELEGRAM_CHAT_ID` references
5. **Activate Workflows**
   - Toggle each workflow to "Active"
   - Monitor execution logs for errors

Detailed Workflow Specifications

1. INIT_USER_SETUP

Trigger: Webhook POST `/webhook/user-signup`

Input Payload:

```
json

{
  "user_id": 1,
  "username": "alice",
  "email": "alice@example.com",
  "class": "Starter",
  "goals": "Get fit and learn new skills"
}
```

Node Flow:

1. **Webhook Trigger** → Receive signup data
2. **Create Character** → Insert into `characters` table
3. **Prepare Default Skills** → Define 7 skills array
4. **Split Skills** → Loop through each skill
5. **Insert Skills** → Create skill records
6. **Create Tutorial Quest** → Insert welcome project
7. **Prepare Tutorial Tasks** → Define 3 starter tasks
8. **Split Tasks** → Loop through each task
9. **Insert Tasks** → Create task records
10. **Create Settings** → Initialize user settings
11. **Prepare Starter Items** → Define inventory items
12. **Insert Items** → Add to inventory
13. **Log Events** → Write to events and unified_logs
14. **Respond** → Return success with character_id

Key Logic:

```
javascript
```

```javascript
// Default Skills
const defaultSkills = [
  {name: 'Health & Fitness', xp: 0, level: 1, unlocked: true},
  {name: 'Career & Work', xp: 0, level: 1, unlocked: true},
  {name: 'Finance & Wealth', xp: 0, level: 1, unlocked: true},
  {name: 'Social & Relationships', xp: 0, level: 1, unlocked: false},
  {name: 'Learning & Knowledge', xp: 0, level: 1, unlocked: false},
  {name: 'Creativity & Arts', xp: 0, level: 1, unlocked: false},
  {name: 'Mindfulness & Wisdom', xp: 0, level: 1, unlocked: false}
];
```

---

2. HABIT_CHECKIN

Trigger: Webhook POST `/webhook/habit-checkin`

Input Payload:

```json
{
  "habit_id": 42,
  "character_id": 13
}
```

Node Flow:

1. **Webhook Trigger** → Receive check-in request
2. **Fetch Habit Data** → Join habits, skills, characters
3. **Calculate Rewards** → Apply streak multipliers
4. **Check Already Completed** → Prevent double check-in
5. **Update Habit Streak** → Increment streak, set last_completed
6. **Update Skill XP** → Add skill XP (40% of habit XP)
7. **Update Character** → Add XP, coins, recalculate level
8. **Log Event** → Write to events table
9. **Log System** → Write to unified_logs
10. **Respond** → Return rewards earned

Reward Calculation Logic:

```javascript
```

```javascript
const baseXP = habitData.xp_value || 10;
const baseCoins = Math.floor(baseXP * 0.5);
const currentStreak = habitData.streak || 0;

let newStreak = currentStreak + 1;
let streakMultiplier = 1.0;

if (newStreak >= 7) streakMultiplier = 1.5;
else if (newStreak >= 30) streakMultiplier = 2.0;
else if (newStreak >= 90) streakMultiplier = 3.0;

const finalXP = Math.floor(baseXP * streakMultiplier);
const finalCoins = Math.floor(baseCoins * streakMultiplier);
const skillXP = Math.floor(finalXP * 0.4);
```

Level Calculation Formula:

javascript

```javascript
// Character Level = FLOOR(POWER(total_xp / 100, 0.66)) + 1
// Skill Level = FLOOR(POWER(skill_xp / 100, 0.5)) + 1
```

---

3. DAMAGE_CALC

Trigger: Webhook POST `/webhook/bad-habit-battle`

Input Payload:

json

```json
{
  "habit_id": 15,
  "character_id": 13
}
```

Node Flow:

1. **Webhook Trigger** → Receive battle request
2. **Fetch Data** → Join habit, character, skill data
3. **Calculate Damage** → Apply defense modifiers

4. **Update HP** → Reduce character HP (min 0)
5. **Update Timestamp** → Mark habit last_completed
6. **Log Battle** → Write to events table
7. **Log System** → Write to unified_logs
8. **Respond** → Return damage dealt, narrative

Damage Calculation Logic:

javascript

```javascript
const baseDamage = Math.abs(habitData.hp_value) || 15;
const skillLevel = habitData.skill_level || 1;

// Higher skill = better defense
const defenseModifier = Math.max(0.5, 1 - (skillLevel * 0.05));
const finalDamage = Math.floor(baseDamage * defenseModifier);
const newHP = Math.max(0, currentHP - finalDamage);

const isDefeated = newHP === 0;

let battleNarrative = `You faced the ${habitData.name} and took ${finalDamage} damage!`;
if (isDefeated) {
  battleNarrative += " You've been defeated and must recover at the Hotel.";
} else if (newHP < 30) {
  battleNarrative += " Your HP is critically low!";
}
```

---

4. QUEST_ENGINE

Trigger: Webhook POST `/webhook/complete-task`

Input Payload:

json

```json
{
  "task_id": 7,
  "character_id": 13
}
```

Node Flow:

1. **Webhook Trigger** → Receive task completion
2. **Fetch Task Data** → Join task, project, character, area
3. **Calculate Rewards** → Apply difficulty multipliers
4. **Mark Complete** → Set task.completed = true
5. **Find Related Skill** → Lookup skill by area
6. **Update Skill XP** → Add skill experience
7. **Update Character** → Add XP and coins
8. **Check Project** → Count remaining tasks
9. **If Complete** → Mark project done, archive
10. **Log Event** → Write to events
11. **Log System** → Write to unified_logs
12. **Respond** → Return rewards and completion status

Difficulty Multipliers:

javascript

```javascript
const difficultyMultipliers = {
  'easy': 1.0,
  'tutorial': 1.0,
  'medium': 1.5,
  'hard': 2.0,
  'epic': 3.0,
  'legendary': 5.0
};

const multiplier = difficultyMultipliers[difficulty] || 1.5;
const finalXP = Math.floor(baseXP * multiplier);

// Time bonus: 20% extra for on-time completion
if (completedBeforeDeadline) {
  timeBonus = Math.floor(finalXP * 0.2);
}
```

---

5. SHOP_CHECK

Trigger: Webhook POST `/webhook/shop/purchase`

Input Payload:

json

```
{
  "character_id": 13,
  "item_id": 5,
  "quantity": 2
}
```

Node Flow:

1. **Webhook Trigger** → Receive purchase request
2. **Parse Request** → Extract parameters
3. **Fetch Item** → Get item details and cost
4. **Fetch Character** → Get current coins
5. **Validate Purchase** → Calculate total cost, check affordability
6. **If Affordable:**
   - Deduct coins from character
   - Add item to inventory (or increment quantity)
   - Log transaction
   - Log event
   - Log system
   - Return success
7. **If Not Affordable:**
   - Log failure
   - Return error with shortfall

Transaction Logging:

javascript

```javascript
// transactions table
{
  character_id: 13,
  type: 'spend',
  amount: totalCost,
  item_id: 5,
  description: 'Purchased 2x Health Potion',
  trans_date: NOW()
}
```

---

6. CRON_MANAGER

Trigger: Schedule (Daily at midnight)

Node Flow:

1. **Schedule Trigger** → Cron: `0 0 * * *`

2. **Fetch Active Characters** → Last login within 30 days
3. **Check Overdue Habits** → Good habits not completed in 2+ days
4. **Check Overdue Tasks** → Tasks past deadline
5. **Calculate Penalties** → HP deductions based on overdue items
6. **Update Character HP** → Apply penalties or bonuses
7. **Log Events** → Write daily maintenance events
8. **Fetch Available Events** → Get RNG events not issued recently
9. **Generate Daily Events** → Randomly assign 1-3 events per character
10. **Insert Events** → Write to events table, update last_issued
11. **Reset Broken Streaks** → Set streak = 0 for habits >2 days old
12. **Log Streak Breaks** → Write streak break events
13. **Log System** → Summary of daily run

Penalty Calculation:

javascript

```javascript
// Penalty for overdue habits: 2 HP per habit (max 20)
const habitPenalty = Math.min(overdueHabits * 2, 20);

// Penalty for overdue tasks: 5 HP per task (max 25)
const taskPenalty = Math.min(overdueTasks * 5, 25);

// Penalty for negative coins (overdraft): 10% of debt (max 15)
const overdraftPenalty = Math.min(Math.abs(coins) * 0.1, 15);

// Daily wellness bonus for active high-level players
if (level >= 10 && hpPenalty === 0) {
  hpBonus = 5;
}

const netHpChange = hpBonus - (habitPenalty + taskPenalty + overdraftPenalty);
```

---

7. AI_MISSIONS

Trigger: Schedule (Daily at 6 AM)

Node Flow:

1. **Schedule Trigger** → Cron: `0 6 * * *`
2. **Fetch Active Users** → Last login within 7 days
3. **For Each User:**
   - Fetch top 3 skills
   - Fetch recent activity (last 7 days)
   - Fetch habit streaks
   - Fetch active projects
4. **Prepare AI Context** → Combine all user data

5. **Generate Missions (AI)** → Call OpenAI GPT-4
6. **Parse Response** → Extract JSON missions array
7. **Find/Create Missions Area** → Ensure "Daily Missions" area exists
8. **Create Mission Projects** → Insert projects with 1-day deadline
9. **Create Mission Tasks** → Insert corresponding tasks
10. **Log AI Generation** → Write to ai_logs
11. **Log Events** → Write mission creation events
12. **Log System** → Record AI run summary

AI Prompt Template:

```
You are a wise AI companion for {username} in their personal growth journey.

Player Profile:
- Class: {class}
- Level: {level}
- Goals: {goals}

Top Skills:
- Health: Level 5 (500 XP)
- Work: Level 3 (250 XP)

Recent Activity (Last 7 Days):
- habit_completed: 5 times (75 XP earned)
- task_completed: 3 times (120 XP earned)

Generate 3 personalized daily missions. Each mission should:
1. Be specific and actionable
2. Align with their goals
3. Challenge them appropriately for their level
4. Include XP reward (10-50)
5. Include coin reward (5-25)
6. Relate to one of their top skills

Respond ONLY with JSON array:
[
  {
    "title": "Morning Meditation Session",
    "description": "Practice mindfulness for 10 minutes",
    "xp": 25,
    "coins": 10,
    "difficulty": "medium",
    "skill_name": "Mindfulness"
  }
]
```

---

8. ACHIEVEMENT_UNLOCK

Trigger: Webhook POST `/webhook/check-achievements`

Input Payload:

```json
{
  "character_id": 13
}
```

Node Flow:

1. **Webhook Trigger** → Receive check request
2. **Fetch Character Stats** → Aggregate habits, projects, level, XP
3. **Fetch Skill Stats** → Max level, level 5+ skills, level 10+ skills
4. **Fetch Habit Stats** → Max streak, 30-day streaks, 90-day streaks
5. **Fetch Wealth Stats** → Total coins earned
6. **Fetch Existing Achievements** → Already unlocked titles
7. **Check Criteria** → Evaluate 30+ achievement definitions
8. **If New Achievements:**
    - Insert achievement records
    - Apply rewards (XP or coins)
    - Log events
    - Log system
    - Aggregate results
    - Return achievements list
9. **If No New:**
    - Return empty list

Achievement Definitions (Sample):

```javascript
```

```
const achievements = [
  // Level Milestones
  {
    title: 'Novice Adventurer',
    condition: level >= 5,
    reward_type: 'xp',
    bonus_value: 100,
    description: 'Reached Level 5'
  },
  {
    title: 'Legendary Hero',
    condition: level >= 50,
    reward_type: 'coins',
    bonus_value: 5000,
    description: 'Reached Level 50'
  },

  // Streak Achievements
  {
    title: 'Week Warrior',
    condition: maxStreak >= 7,
    reward_type: 'xp',
    bonus_value: 75,
    description: 'Maintained a 7-day streak'
  },
  {
    title: 'Year of Discipline',
    condition: maxStreak >= 365,
    reward_type: 'coins',
    bonus_value: 10000,
    description: 'Maintained a 365-day streak'
  },

  // Skill Mastery
  {
    title: 'Renaissance Soul',
    condition: level5Skills >= 3,
    reward_type: 'coins',
    bonus_value: 300,
    description: 'Have 3 skills at level 5+'
```

```
  }
];
```

---

9. EVENT_SEEDER

Trigger: Schedule (Monthly on 1st)

Node Flow:

1. **Schedule Trigger** → Cron: `0 0 1 * *`
2. **Check Event Pool** → Count total and available events
3. **Generate Events (AI)** → Call OpenAI for 20 new events
4. **Parse and Validate** → Extract JSON, validate structure
5. **Insert Events** → Add to rng_events table
6. **Retire Old Events** → Mark events not used in 60 days as unavailable
7. **Generate Seasonal Events** → Create month-specific events
8. **Insert Seasonal** → Add seasonal events
9. **Cleanup Old Seasonal** → Remove past seasonal events
10. **Analyze Distribution** → Count events by rarity
11. **Create Summary** → Aggregate statistics
12. **Log System** → Record seeder run
13. **Notify Users** → Send "new events available" notification

AI Prompt:

Generate 20 diverse random events for a life-gamification app.

Event Pool Status:
- Total events: 150
- Currently available: 120

Create events that are:
1. Diverse (positive, negative, neutral, mysterious)
2. Varied in rarity (common, uncommon, rare, legendary)
3. Thematic (personal growth, productivity)
4. Fun and engaging
5. Include specific effects (HP, XP, coins, bonuses)

Categories:
- Fortune (lucky finds, bonus rewards)
- Misfortune (setbacks, penalties)
- Mystery (random outcomes)
- Wisdom (reflective, philosophical)
- Social (community interactions)
- Seasonal (time of year)

Respond with JSON array:
```
[
  {
    "description": "Found a lucky coin while cleaning!",
    "effect": "+15 coins",
    "rarity": "common"
  }
]
```

Seasonal Event Generation:

```javascript
```

```javascript
const month = new Date().getMonth() + 1;
const seasons = {
  1: {name: 'New Year', theme: 'fresh starts and resolutions'},
  3: {name: 'Spring', theme: 'renewal and growth'},
  6: {name: 'Summer', theme: 'outdoor adventures'},
  9: {name: 'Autumn', theme: 'harvest and preparation'},
  12: {name: 'Winter Holiday', theme: 'celebration and reflection'}
};

const currentSeason = seasons[month];
// Generate 3 season-specific events
```

---

10. PRESTIGE_CALC

Trigger: Database Trigger (Level reaches max_level)

Input: Triggered automatically when `characters.level >= max_level`

Node Flow:

1. **Trigger** → PostgreSQL trigger on characters UPDATE
2. **Fetch Character & User** → Join characters and users tables
3. **Fetch Current Skills** → Get all skills with XP
4. **Calculate Prestige Bonus** → Determine rewards based on prestige level
5. **Generate AI Message** → Create epic celebration message and title
6. **Parse AI Response** → Extract title, message, quote
7. **Reset Character Stats** → Level = 1, XP = 0, HP increased, multiplier increased
8. **Update User** → Increment total_prestiges, add coin bonus
9. **Reset Skills** → Keep 10% of skill XP, reset to level 1
10. **Grant Achievement** → Add prestige achievement with AI title
11. **Add Token** → Insert prestige token to inventory
12. **Log Event** → Write prestige unlock event
13. **Notify Frontend** → Trigger celebration animation
14. **Output Summary** → Return prestige details

Prestige Bonus Formula:

javascript

```
const prestigeLevel = currentPrestigeCount + 1;

const prestigeBonus = {
  hp_bonus: 10 * prestigeLevel,          // +10 HP per prestige
  xp_multiplier: 1 + (0.05 * prestigeLevel), // +5% XP per prestige
  coin_bonus: 100 * prestigeLevel,        // +100 coins per prestige
  prestige_level: prestigeLevel,
  permanent_perk: `prestige_${prestigeLevel}`
};

// Skill Retention: Keep 10% of XP
const retainedXP = Math.floor(currentSkillXP * 0.1);
```

AI Prestige Message Prompt:

```
Generate a prestige celebration message and title for {username} who has reached Prestige Level {level}.

Pre-prestige stats:
- Level {level}
- {total_xp} total XP
- {skills_count} skills mastered

Make it epic and motivational.

Return JSON:
{
  "title": "Eternal Ascendant",
  "message": "You have transcended mortal limits...",
  "quote": "Every end is a new beginning"
}
```

SBS (System for Building Systems) Workflows

11. SBS_SYSTEM_SPAWNER

Trigger: Webhook POST `/webhook/sbs-system-created`

Input Payload:

```json
{
  "system_id": 42,
  "name": "Morning Routine System",
  "category": "Habits",
  "purpose": "Automate morning habits"
}
```

Node Flow:

1. **Webhook Trigger** → Receive system creation event
2. **Validate Input** → Ensure system_id exists
3. **Insert Lifecycle Steps** → Create 5 steps (define, design, build, automate, review)
4. **Create Default Routines** → Insert 2 routines (Monday, Friday)
5. **Advance Stage** → Update systems.current_stage to 'design'
6. **Log Event** → Write system_spawned to system_logs
7. **Send Notification** → Telegram message with system details
8. **Respond** → Return success with next_stage

Lifecycle Steps Created:

```sql
INSERT INTO system_steps (system_id, step, status, notes) VALUES
(42, 'define', 'complete', 'System creation completed'),
(42, 'design', 'pending', 'Design system architecture'),
(42, 'build', 'pending', 'Build working components'),
(42, 'automate', 'pending', 'Add triggers and schedules'),
(42, 'review', 'pending', 'Schedule review cycle');
```

Default Routines:

```sql
INSERT INTO routines (name, system_id, day_of_week, description, status)
VALUES
('Morning Routine System - Monday', 42, 'Monday', 'Auto-generated routine', 'active'),
('Morning Routine System - Friday', 42, 'Friday', 'Auto-generated routine', 'active');
```

---

12. SBS_SYSTEM_ORCHESTRATOR

Trigger: Webhook POST `/webhook/sbs-system-update`

Input Payload:


json

```
{
  "system_id": 42,
  "current_stage": "design",
  "name": "Morning Routine System"
}
```

Node Flow:

1. **Webhook Trigger** → Receive system update
2. **Get Current Step** → Fetch next pending step from system_steps
3. **Route by Step:**
   - **Design** → Generate design canvas, store in system_logs
   - **Build** → Send Telegram notification, create infrastructure
   - **Automate** → Configure triggers, add to system_logs
   - **Review** → Schedule review cycle, log next review date
4. **Mark Step Complete** → Update system_steps.status = 'complete'
5. **Update System Stage** → Advance to next pending step
6. **Respond** → Return success with new stage

Step Handlers:

Design Handler


javascript

```
// Generate design canvas markdown
INSERT INTO system_logs (system_id, event, details)
VALUES (42, 'design_canvas_generated', {
  name: 'Morning Routine System',
  timestamp: NOW(),
  canvas_template: 'markdown'
});
```

Build Handler

javascript

```javascript
// Send Telegram notification
POST https://api.telegram.org/bot{token}/sendMessage
{
  chat_id: "{CHAT_ID}",
  text: "🔧 *Build Phase Started*\n\nSystem: *Morning Routine System*\n\n📁 Creating folders and database schemas..."
}
```

Automate Handler

javascript

```javascript
// Log automation configuration
INSERT INTO system_logs (system_id, event, details)
VALUES (42, 'automation_configured', {
  triggers_added: true,
  schedules_created: true,
  timestamp: NOW()
});
```

Review Handler

javascript

```javascript
// Schedule next review
INSERT INTO system_logs (system_id, event, details)
VALUES (42, 'review_scheduled', {
  next_review: NOW() + INTERVAL '30 days',
  review_frequency: 'monthly',
  timestamp: NOW()
});
```

---

13. SBS_ROUTINE_ENGINE

Trigger: Schedule (Daily at 9 AM)

Node Flow:

1. **Schedule Trigger** → Cron: `0 9 * * *`
2. **Get System Stats** → Count active systems, categories, stages
3. **Send Daily Summary** → Telegram overview message
4. **Get Today's Routines** → Fetch routines matching current day_of_week
5. **Check Routines Exist** → Branch: yes/no
6. **If Routines Exist:**
   - Split into individual items
   - For each routine:
     - Send Telegram reminder with routine details
     - Log reminder sent to system_logs
   - Aggregate results
   - Send summary message
7. **If No Routines:**
   - Send "no routines today" message

Daily Summary Message:

📊 *SBS System Summary*

🔧 Active Systems: 5
📁 Categories: 3
⚙️ Stages in Progress: design, build, automate

Daily routine check initiated...

Routine Reminder Message:

📅 *Daily Routine Reminder*

System: Morning Routine System
Category: Habits
Routine: Morning Page

📝 Write 3 pages of stream-of-consciousness

Current Stage: automate

✅ Reply with `/complete 15` when done
⏭️ Reply with `/skip 15` to skip today

---

14. SBS_PG_LISTENER

Trigger: Webhook POST `/webhook/pg-notify`

Input Payload:

📋 ✓
json


```
{
 "channel": "system_update",
 "payload": {
  "id": 42,
  "name": "Morning Routine System",
  "current_stage": "define",
  "owner_type": "character",
  "owner_id": 13,
  "created_at": "2025-10-27T13:12:00Z"
 }
}
```


Node Flow:

1. **Webhook Trigger** → Receive pg_notify forwarded from pg-listener
2. **Parse Payload** → Extract and parse JSON
3. **Check Stage:**
   - **If 'define'** → Trigger System Spawner
   - **If 'complete'** → Notify completion, log
   - **Otherwise** → Trigger System Orchestrator
4. **Respond** → Acknowledge receipt

pg-listener Service Logic:

javascript

```javascript
// This runs as a separate Node.js service
client.on('notification', async (msg) => {
  const channel = msg.channel;  // 'system_update' or 'unified_event'
  const payload = JSON.parse(msg.payload);

  // Forward to n8n
  await fetch(`${N8N_WEBHOOK_BASE_URL}/webhook/pg-notify`, {
    method: 'POST',
    headers: {'Content-Type': 'application/json'},
    body: JSON.stringify({channel, payload})
  });
});
```

---

15. SBS_TELEGRAM_BOT

Trigger: