Data Model - Persona App Database Architecture

Core Entity Relationships

Primary Entities

- **Users → Personas → Platform Accounts → Content**
- **Proxy Assignments → Sessions → Activity Logs**
- **Content Templates → Scheduled Posts → Engagement Metrics**

Database Schema Design

Users Table

```
CREATE TABLE users (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
  email VARCHAR(255) UNIQUE NOT NULL,
  password_hash VARCHAR(255) NOT NULL,
  subscription_tier VARCHAR(50) DEFAULT 'basic', -- basic,
pro, enterprise
  max_personas INTEGER DEFAULT 5,
  created_at TIMESTAMP DEFAULT NOW(),
  updated_at TIMESTAMP DEFAULT NOW(),
  last_login TIMESTAMP,
  is_active BOOLEAN DEFAULT true,
  two_factor_enabled BOOLEAN DEFAULT false,
  two_factor_secret VARCHAR(255)
);
```

Personas Table

```
CREATE TABLE personas (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
  user_id UUID REFERENCES users(id) ON DELETE CASCADE,
  name VARCHAR(100) NOT NULL,
  status VARCHAR(20) DEFAULT 'inactive', -- active,
inactive, suspended

  -- Core Identity
```

```sql
  demographics JSONB NOT NULL, -- age, gender, location,
occupation
  personality JSONB NOT NULL, -- interests, values,
communication_style
  backstory TEXT,

  -- Geographic Profile
  primary_location VARCHAR(100) NOT NULL, -- Manila, Cebu,
etc.
  timezone VARCHAR(50) NOT NULL,
  language_preferences JSONB DEFAULT '["en", "fil"]',

  -- Behavioral Patterns
  activity_schedule JSONB NOT NULL, -- daily posting times,
frequency
  content_themes JSONB NOT NULL, -- topics, hashtags, style
preferences
  engagement_style JSONB NOT NULL, -- comment frequency,
interaction patterns

  -- Proxy Assignment
  proxy_id VARCHAR(100), -- Proxy-Cheap static IP
identifier
  proxy_ip VARCHAR(45), -- IPv4/IPv6 address
  proxy_location VARCHAR(100), -- Manila, Cebu
  proxy_status VARCHAR(20) DEFAULT 'unassigned', --
assigned, active, error

  -- Metadata
  created_at TIMESTAMP DEFAULT NOW(),
  updated_at TIMESTAMP DEFAULT NOW(),
  last_active TIMESTAMP,
  total_posts INTEGER DEFAULT 0,
  risk_score DECIMAL(3,2) DEFAULT 0.00 -- 0.00-1.00
);

-- Indexes for performance
CREATE INDEX idx_personas_user_id ON personas(user_id);
CREATE INDEX idx_personas_status ON personas(status);
CREATE INDEX idx_personas_proxy_id ON personas(proxy_id);
```

Platform Accounts Table

```sql
CREATE TABLE platform_accounts (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
  persona_id UUID REFERENCES personas(id) ON DELETE
CASCADE,
  platform_type VARCHAR(50) NOT NULL, -- twitter,
instagram, tiktok, linkedin

  -- Account Details
  username VARCHAR(100) NOT NULL,
  display_name VARCHAR(100),
  bio TEXT,
  profile_image_url TEXT,

  -- Authentication (Encrypted)
  credentials_encrypted TEXT NOT NULL, -- AES-256 encrypted
credentials
  auth_tokens_encrypted TEXT, -- OAuth tokens, encrypted

  -- Account Status
  account_status VARCHAR(20) DEFAULT 'pending', -- pending,
verified, suspended, banned
  verification_level VARCHAR(20) DEFAULT 'basic', -- basic,
verified, business
  follower_count INTEGER DEFAULT 0,
  following_count INTEGER DEFAULT 0,

  -- Platform-Specific Settings
  platform_settings JSONB NOT NULL, -- posting limits,
hashtag preferences
  posting_schedule JSONB NOT NULL, -- platform-specific
timing

  -- Risk Management
  daily_post_limit INTEGER DEFAULT 10,
  daily_posts_count INTEGER DEFAULT 0,
  last_post_at TIMESTAMP,
  cooldown_until TIMESTAMP,
  warning_count INTEGER DEFAULT 0,
```

```
  -- Metadata
  created_at TIMESTAMP DEFAULT NOW(),
  updated_at TIMESTAMP DEFAULT NOW(),
  last_login TIMESTAMP,
  is_active BOOLEAN DEFAULT true
);

-- Composite indexes
CREATE INDEX idx_platform_accounts_persona_platform ON
platform_accounts(persona_id, platform_type);
CREATE INDEX idx_platform_accounts_status ON
platform_accounts(account_status);
```

Proxy Management Table

```
CREATE TABLE proxy_assignments (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),

  -- Proxy Details (Proxy-Cheap)
  proxy_id VARCHAR(100) UNIQUE NOT NULL, -- Proxy-Cheap
identifier
  proxy_ip VARCHAR(45) NOT NULL,
  proxy_port INTEGER NOT NULL,
  proxy_username VARCHAR(100) NOT NULL,
  proxy_password_encrypted TEXT NOT NULL, -- AES-256
encrypted

  -- Geographic Details
  country_code VARCHAR(2) DEFAULT 'PH',
  city VARCHAR(100) NOT NULL, -- Manila, Cebu
  isp_name VARCHAR(100),

  -- Assignment Status
  assignment_status VARCHAR(20) DEFAULT 'available', --
available, assigned, maintenance
  assigned_persona_id UUID REFERENCES personas(id),
  assigned_at TIMESTAMP,

  -- Health Monitoring
  last_health_check TIMESTAMP DEFAULT NOW(),
```

```
  health_status VARCHAR(20) DEFAULT 'unknown', -- healthy,
degraded, failed
  response_time_ms INTEGER,
  uptime_percentage DECIMAL(5,2) DEFAULT 100.00,

  -- Usage Tracking
  monthly_bandwidth_gb DECIMAL(10,2) DEFAULT 0.00,
  monthly_requests INTEGER DEFAULT 0,
  monthly_cost_usd DECIMAL(8,2) DEFAULT 1.27, -- $1.27/
month per IP

  -- Metadata
  created_at TIMESTAMP DEFAULT NOW(),
  updated_at TIMESTAMP DEFAULT NOW()
);

-- Unique constraint for one proxy per persona
CREATE UNIQUE INDEX idx_proxy_assignments_persona ON
proxy_assignments(assigned_persona_id)
WHERE assigned_persona_id IS NOT NULL;
```

Sessions Table

```
CREATE TABLE persona_sessions (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
  persona_id UUID REFERENCES personas(id) ON DELETE
CASCADE,

  -- Session Details
  session_status VARCHAR(20) DEFAULT 'starting', --
starting, active, idle, ended, error
  browser_instance_id VARCHAR(100), -- Puppeteer/Playwright
instance ID

  -- Proxy Connection
  proxy_id UUID REFERENCES proxy_assignments(id),
  proxy_connected_at TIMESTAMP,
  proxy_disconnected_at TIMESTAMP,

  -- Platform Connections
```

```sql
  active_platforms JSONB DEFAULT '[]', -- Currently logged
in platforms
  platform_sessions JSONB DEFAULT '{}', -- Session details
per platform

  -- Activity Tracking
  actions_performed INTEGER DEFAULT 0,
  content_posted INTEGER DEFAULT 0,
  errors_encountered INTEGER DEFAULT 0,

  -- Session Lifecycle
  started_at TIMESTAMP DEFAULT NOW(),
  ended_at TIMESTAMP,
  duration_minutes INTEGER,

  -- Risk Monitoring
  suspicious_activity_detected BOOLEAN DEFAULT false,
  risk_events JSONB DEFAULT '[]'
);

CREATE INDEX idx_persona_sessions_persona_id ON
persona_sessions(persona_id);
CREATE INDEX idx_persona_sessions_status ON
persona_sessions(session_status);
```

Content Management

```sql
CREATE TABLE content_templates (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
  user_id UUID REFERENCES users(id) ON DELETE CASCADE,

  -- Template Details
  template_name VARCHAR(100) NOT NULL,
  content_type VARCHAR(50) NOT NULL, -- text, image, video,
carousel
  template_text TEXT,

  -- Media Assets
  media_urls JSONB DEFAULT '[]',
  media_metadata JSONB DEFAULT '{}', -- dimensions, file
sizes, alt text
```

```
  -- Targeting
  target_platforms JSONB NOT NULL, -- which platforms this
works for
  target_personas JSONB DEFAULT '[]', -- which personas can
use this

  -- Customization Rules
  personalization_rules JSONB DEFAULT '{}', -- how to adapt
per persona
  hashtag_strategy JSONB DEFAULT '{}', -- hashtag rules per
platform
  timing_rules JSONB DEFAULT '{}', -- optimal posting times

  -- Performance
  usage_count INTEGER DEFAULT 0,
  success_rate DECIMAL(5,2) DEFAULT 0.00,

  created_at TIMESTAMP DEFAULT NOW(),
  updated_at TIMESTAMP DEFAULT NOW(),
  is_active BOOLEAN DEFAULT true
);
```

Manual Content Workflow

```
CREATE TABLE manual_posts (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
  persona_id UUID REFERENCES personas(id) ON DELETE
CASCADE,
  platform_account_id UUID REFERENCES platform_accounts(id)
ON DELETE CASCADE,
  content_template_id UUID REFERENCES
content_templates(id),
  session_id UUID REFERENCES persona_sessions(id),

  -- Manual Creation Process
  creation_started_at TIMESTAMP NOT NULL,
  creation_completed_at TIMESTAMP,
  creation_time_minutes INTEGER,

  -- Content Details (Final Manual Version)
```

```sql
    final_content TEXT NOT NULL,
    final_hashtags JSONB DEFAULT '[]',
    final_media_urls JSONB DEFAULT '[]',
    content_edits_from_template JSONB DEFAULT '{}', -- what
was changed manually

    -- Manual Publishing
    published_manually_at TIMESTAMP,
    platform_post_id VARCHAR(255), -- Platform's ID for the
post
    publishing_method VARCHAR(20) DEFAULT 'manual', --
manual, scheduled_manual

    -- Manual Performance Tracking
    immediate_engagement JSONB DEFAULT '{}', -- likes/
comments within first hour
    daily_engagement JSONB DEFAULT '{}', -- performance after
24 hours
    weekly_engagement JSONB DEFAULT '{}', -- performance
after 7 days

    -- Quality Assessment
    authenticity_rating DECIMAL(3,2) DEFAULT 1.00, -- higher
for manual posts
    user_satisfaction INTEGER, -- 1-5 rating of how satisfied
with post
    improvement_notes TEXT, -- manual notes for future
improvement

    -- Template Performance
    template_effectiveness DECIMAL(5,2), -- how well template
worked
    manual_customization_level VARCHAR(20) DEFAULT 'high', --
low, medium, high

    created_at TIMESTAMP DEFAULT NOW(),
    updated_at TIMESTAMP DEFAULT NOW()
);
```

```
CREATE INDEX idx_manual_posts_persona_platform ON
manual_posts(persona_id, platform_account_id);
CREATE INDEX idx_manual_posts_published_at ON
manual_posts(published_manually_at);
CREATE INDEX idx_manual_posts_session ON
manual_posts(session_id);
CREATE INDEX idx_manual_posts_template_performance ON
manual_posts(content_template_id, template_effectiveness);
```

Activity Logging

```
CREATE TABLE activity_logs (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),

  -- Context
  user_id UUID REFERENCES users(id),
  persona_id UUID REFERENCES personas(id),
  session_id UUID REFERENCES persona_sessions(id),

  -- Activity Details
  activity_type VARCHAR(50) NOT NULL, -- login, post,
comment, like, follow, etc.
  platform_type VARCHAR(50), -- twitter, instagram, etc.
  activity_data JSONB NOT NULL, -- detailed activity
information

  -- IP and Location
  ip_address VARCHAR(45),
  user_agent TEXT,
  location_data JSONB, -- city, country from IP

  -- Risk Assessment
  risk_level VARCHAR(20) DEFAULT 'low', -- low, medium,
high, critical
  anomaly_score DECIMAL(5,4) DEFAULT 0.0000,

  -- Compliance
  gdpr_category VARCHAR(50), -- performance, functional,
targeting
  retention_until DATE, -- when to delete this log
```

```
  created_at TIMESTAMP DEFAULT NOW()
);

-- Partitioning by month for performance
CREATE INDEX idx_activity_logs_created_at ON
activity_logs(created_at);
CREATE INDEX idx_activity_logs_persona_type ON
activity_logs(persona_id, activity_type);
```

Security & Audit

```
CREATE TABLE security_events (
  id UUID PRIMARY KEY DEFAULT gen_random_uuid(),

  -- Event Classification
  event_type VARCHAR(50) NOT NULL, -- login_failure,
suspicious_activity, rate_limit_hit
  severity VARCHAR(20) NOT NULL, -- info, warning, error,
critical

  -- Context
  user_id UUID REFERENCES users(id),
  persona_id UUID REFERENCES personas(id),
  platform_account_id UUID REFERENCES
platform_accounts(id),

  -- Event Details
  event_description TEXT NOT NULL,
  event_data JSONB NOT NULL,

  -- Network Information
  source_ip VARCHAR(45),
  proxy_ip VARCHAR(45),
  user_agent TEXT,

  -- Response Actions
  actions_taken JSONB DEFAULT '[]', -- account_locked,
persona_suspended, etc.
  resolved BOOLEAN DEFAULT false,
  resolved_at TIMESTAMP,
  resolved_by UUID REFERENCES users(id),
```

```
  created_at TIMESTAMP DEFAULT NOW()
);

CREATE INDEX idx_security_events_severity ON
security_events(severity);
CREATE INDEX idx_security_events_type ON
security_events(event_type);
CREATE INDEX idx_security_events_created_at ON
security_events(created_at);
```

Data Encryption Strategy

Sensitive Data Fields

- **Credentials**: AES-256-GCM encryption
- **OAuth Tokens**: AES-256-GCM encryption
- **Proxy Passwords**: AES-256-GCM encryption
- **Personal Information**: Field-level encryption for PII

Encryption Implementation

```
interface EncryptedField {
  algorithm: 'AES-256-GCM';
  iv: string; // Initialization vector
  data: string; // Encrypted data
  tag: string; // Authentication tag
}

// Example encrypted credential storage
const encryptedCredentials: EncryptedField = {
  algorithm: 'AES-256-GCM',
  iv: 'base64-encoded-iv',
  data: 'base64-encoded-encrypted-data',
  tag: 'base64-encoded-auth-tag'
};
```

Data Retention Policies

Retention Periods

- **Activity Logs**: 90 days (rolling deletion)
- **Security Events**: 1 year (compliance requirement)

- **Session Data**: 30 days (performance analysis)
- **Content Templates**: Until user deletion
- **Persona Data**: Until user deletion

GDPR Compliance

- **Right to Access**: API endpoints for data export
- **Right to Deletion**: Cascade delete on user removal
- **Right to Portability**: JSON export functionality
- **Data Minimization**: Store only necessary fields

Performance Optimizations

Personal App Performance

- **Single user optimization**: No multi-tenant complexity
- **Simplified queries**: Direct persona access without user filtering
- **Focused indexing**: Performance for 5 personas maximum
- **Local caching**: Redis for active persona sessions only

Development Simplification

- **No user management**: Single admin authentication
- **Direct database access**: No complex permission layers
- **Streamlined APIs**: Personal use endpoints only
- **Simple deployment**: Single-user application architecture

Data Migration Strategy

Version Control

- **Drizzle ORM**: Schema migrations with rollback capability
- **Semantic Versioning**: Database schema version tracking
- **Backup Strategy**: Full backup before major migrations
- **Testing**: Migration testing on staging environment

Deployment Process

1. **Backup Production**: Full database backup
2. **Run Migration**: Execute Drizzle migration scripts
3. **Validate Schema**: Verify data integrity
4. **Application Deployment**: Deploy compatible application version
5. **Monitor Performance**: Track query performance post-migration