CEBU INSTITUTE OF TECHNOLOGY
UNIVERSITY

IT342-G4
System Integration and Architecture

System Design Document (SDD)

Project Title: Knock Knock

Prepared By: Villadarez, Niña Nicole S.

Version: 0.1

Date: February 18, 2026
Status: Draft

REVISION HISTORY TABLE

Version	Date	Author	Changes Made	Status
0.1	02/18/26	Villadarez, Niña	Initial draft	Draft
0.2	[Date]	[Your Name]	Added API specifications	Review
0.3	[Date]	[Your Name]	Updated database design	Review
0.4	[Date]	[Your Name]	Added UI/UX designs	Review
0.5	[Date]	[Your Name]	Incorporated feedback	Revised
0.6	[Date]	[Your Name]	Final review and corrections	Final
1	[Date]	[Your Name]	Baseline version for development	Approved

TABLE OF CONTENTS

Contents

EXECUTIVE SUMMARY

1.1 Project Overview

Knock Knock is a digital visitor management system for condominiums. It replaces manual visitor logbooks by providing real-time visitor tracking, secure entry logging, and an administrative dashboard. The system includes:

- Spring Boot backend API
- React web application for security and admin users
- Android mobile app for all users

1.2 Objectives

1. Implement secure user authentication and role-based access
2. Manage visitor entries with CRUD functionality
3. Enable file uploads (ID scans, photos)
4. Integrate with Google OAuth for login
5. Provide optional real-time updates via WebSockets
6. Send system emails (welcome, notification, receipt)

1.3 Scope

Included Features:

- User registration and authentication (email/password + OAuth)
- Visitor check-in/check-out management
- Resident and security role-based dashboards
- File uploads for visitor verification
- PostgreSQL database with normalized schema

Excluded Features:

- Push notifications
- Advanced analytics dashboard
- Multi-language support

1.0 INTRODUCTION

1.1 Purpose

This document provides the comprehensive design specification for the Knock Knock visitor management system, detailing system requirements, architecture, API

contracts, database design, UI/UX, and implementation roadmap. It serves as a guide to ensure secure, maintainable, and scalable development.

2.0 FUNCTIONAL REQUIREMENTS SPECIFICATION

2.1 Project Overview

Project Name: Knock Knock
Domain: Residential Security / Visitor Management
Primary Users: Security Personnel, Admins, Residents, Visitors

Problem Statement: Manual visitor logs are inefficient, error-prone, and insecure.

Solution: A digital system that tracks visitors in real-time, manages role-based access, integrates file uploads, and provides notifications.

2.2 Core User Journeys

Journey 1: Visitor Check-In

1. Security or admin logs in (web or Android)
2. Registers visitor info (name, contact, ID, photo)
3. Links visitor to a resident unit
4. Checks in visitor
5. Optional payment for parking
6. Sends notification email to resident

Journey 2: Visitor Check-Out

1. Security logs out visitor
2. Records check-out time
3. Sends optional receipt email

Journey 3: Resident Access

1. Resident logs in via Android app
2. Views visitors linked to their unit
3. Receives notifications on visitor check-in/out

Journey 4: Admin Management

1. Admin logs in via web or Android
2. Manages users and roles
3. Views visitor logs and reports
4. Approves, edits, or deletes visitor entries

2.3 Feature List (MoSCoW)

MUST HAVE

1. User authentication (JWT + OAuth)
2. Visitor entry and exit
3. File uploads
4. Checkout process (shipping, order placement)
5. Admin panel (product CRUD, order view)

SHOULD HAVE

1. Product categories and filtering
2. Order history for users
3. Basic input validation feedback
4. Responsive design for all screen sizes

COULD HAVE

1. Product wishlist
2. Basic sales dashboard
3. Order status tracking

WON'T HAVE

1. Real payment processing
2. Email notifications
3. Social login
4. Advanced analytics
5. Multi-language support

2.4 Detailed Feature Specifications

Feature: User Authentication

- **Screens:** Registration, Login, Forgot Password
- **Fields:** Email, Password, Confirm Password
- **Validation:** Email format, password strength, uniqueness

- **API Endpoints:** POST /auth/register, POST /auth/login, POST /auth/logout
- **Security:** JWT tokens, password hashing with bcrypt

Feature: Product Catalog

- **Screens:** Product Listing, Product Detail
- **Display:** Grid layout, product images, names, prices
- **Search:** By product name
- **API Endpoints:** GET /products, GET /products/{id}, GET /products/search
- **Admin Functions:** POST /products, PUT /products/{id}, DELETE /products/{id}

Feature: Shopping Cart

- **Screens:** Cart View
- **Functions:** Add product, remove product, update quantity
- **Persistence:** Database storage per user
- **API Endpoints:** GET /cart, POST /cart/items, PUT /cart/items/{id}, DELETE /cart/items/{id}

Feature: Checkout Process

- **Screens:** Checkout Form, Order Confirmation
- **Data Collected:** Shipping address (name, address, city, zip)
- **Process:** Validate input, create order, clear cart
- **API Endpoints:** POST /orders, GET /orders/{id}

Feature: Admin Panel

- **Screens:** Product Management, Order List
- **Functions:** Add/edit/delete products, view orders
- **Access Control:** Admin role required
- **API Endpoints:** Admin-prefixed endpoints with role validation

2.5 Acceptance Criteria

AC-1: Successful User Registration

Given I am a new user

When I enter valid email and strong password

And confirm password matches

And click "Create Account"

Then my account should be created

And I should be automatically logged in

And redirected to the homepage

AC-2: Product Purchase Flow

Given I am logged in as a customer

When I add a product to my cart

And proceed to checkout

And enter valid shipping information

And place the order

Then I should see order confirmation

And my cart should be empty

And the order should appear in admin panel

AC-3: Admin Product Management

Given I am logged in as an administrator

When I add a new product with valid details

And save the product

Then the product should appear in customer product listing

And be available for purchase

3.0 NON-FUNCTIONAL REQUIREMENTS

3.1 Performance Requirements

- API response time: ≤ 2 seconds for 95% of requests
- Web page load time: ≤ 3 seconds on broadband

- Mobile app cold start: ≤ 3 seconds
- Support 100 concurrent users
- Database queries complete within 500ms

3.2 Security Requirements

- HTTPS for all communications
- JWT token authentication
- Password hashing with bcrypt (salt rounds = 12)
- SQL injection prevention
- XSS protection
- Rate limiting: 100 requests/minute per IP
- Admin endpoints require role verification

3.3 Compatibility Requirements

- **Web Browsers:** Chrome, Firefox, Safari, Edge (latest 2 versions)
- **Android:** API Level 24+ (Android 7.0+)
- **Screen Sizes:** Mobile (360px+), Tablet (768px+), Desktop (1024px+)
- **Operating Systems:** Windows 10+, macOS 10.15+, Linux Ubuntu 20.04+

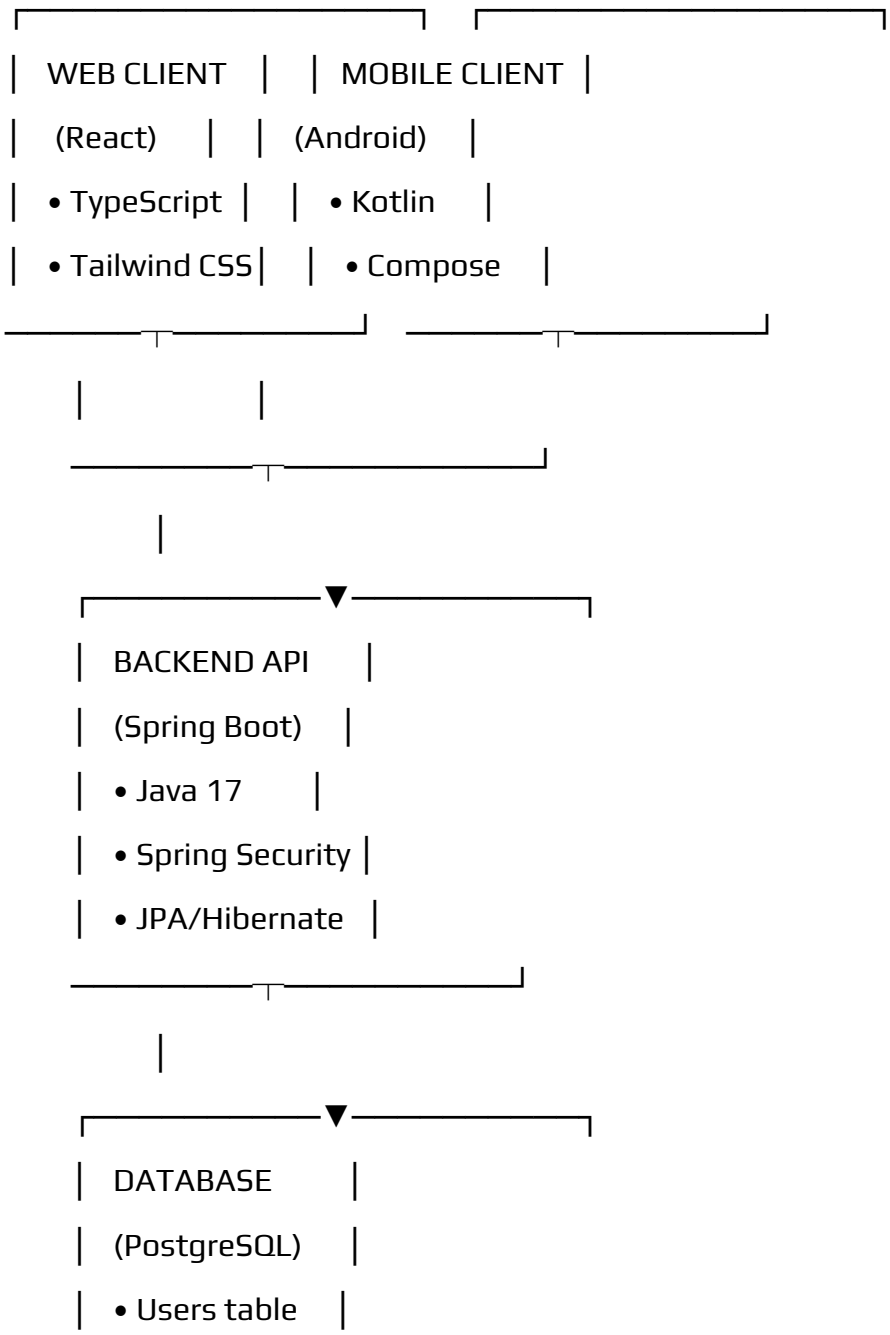
3.4 Usability Requirements

- Complete first purchase within 5 minutes for new users
- WCAG 2.1 Level AA compliance for web
- Consistent navigation across all pages
- Clear error messages with recovery options
- Touch targets minimum 44x44px on mobile
- Keyboard navigation support

4.0 SYSTEM ARCHITECTURE

4.1 Component Diagram

Note: This should be a component diagram



```
│ • Products table │
│ • Orders table │
│ • Cart items table│
└──────────────────────────┘
```

Technology Stack:

- **Backend:** Java 17, Spring Boot 3.x, Spring Security, Spring Data JPA
- **Database:** PostgreSQL 14+
- **Web Frontend:** React 18, TypeScript, Tailwind CSS, Axios
- **Mobile:** Kotlin, Jetpack Compose, Retrofit, Room
- **Build Tools:** Maven (Backend), npm/yarn (Web), Gradle (Android)
- **Deployment:** Railway/Heroku (Backend), Vercel/Netlify (Web), APK (Mobile)

5.0 API CONTRACT & COMMUNICATION

5.1 API Standards

- **Base URL:** https://api.marketplace.com/api/v1
- **Format:** JSON for all requests/responses
- **Authentication:** Bearer token (JWT) in Authorization header
- **Response Structure:**

```
json
{
  "success": boolean,
  "data": object|null,
  "error": {
    "code": string,
    "message": string,
    "details": object|null
  },
```

"timestamp": string

}

5.2 Endpoint Specifications

Authentication Endpoints

POST /auth/register

Body: {email, password, confirmPassword, fullName?}

Response: {user: {id, email, name}, token, refreshToken}

POST /auth/login

Body: {email, password}

Response: {user: {id, email, name, role}, token, refreshToken}

POST /auth/logout

Headers: Authorization: Bearer {token}

Response: {message: "Logged out successfully"}

Product Endpoints

GET /products

Query: ?page=1&limit=20&search=keyword&category=electronics

Response: {products: [...], pagination: {page, limit, total, pages}}

GET /products/{id}

Response: {product: {id, name, description, price, stock, imageUrl, category}}

POST /products (Admin only)

Body: {name, description, price, stock, imageUrl, category}

Response: {product: {...}}

PUT /products/{id} (Admin only)

Body: {name?, description?, price?, stock?, imageUrl?, category?}

Response: {product: {...}}

Cart Endpoints

GET /cart (Authenticated)

Response: {cart: {id, items: [...], total, itemCount}}

POST /cart/items

Body: {productId, quantity}

Response: {message: "Added to cart", cartItem: {...}}

PUT /cart/items/{itemId}

Body: {quantity}

Response: {message: "Cart updated", cartItem: {...}}

DELETE /cart/items/{itemId}

Response: {message: "Removed from cart"}

Order Endpoints

POST /orders

Body: {shippingAddress: {fullName, address, city, zipCode, country}}

Response: {order: {id, orderNumber, total, status, items: [...], createdAt}}

GET /orders

Response: {orders: [...]}

GET /orders/{id}

Response: {order: {...}}

5.3 Error Handling

HTTP Status Codes

- 200 OK - Successful request
- 201 Created - Resource created
- 400 Bad Request - Invalid input
- 401 Unauthorized - Authentication required/failed
- 403 Forbidden - Insufficient permissions
- 404 Not Found - Resource doesn't exist
- 409 Conflict - Duplicate resource
- 500 Internal Server Error - Server error

Error Code Examples

json

```
{
  "success": false,
  "data": null,
  "error": {
    "code": "AUTH-001",
    "message": "Invalid credentials",
    "details": "Email or password is incorrect"
  },
  "timestamp": "2024-01-28T10:30:00Z"
}
```

```
{
  "success": false,
  "data": null,
  "error": {
    "code": "VALID-001",
    "message": "Validation failed",
    "details": {
      "email": "Email is required",
      "password": "Must be at least 8 characters"
    }
  },
  "timestamp": "2024-01-28T10:30:00Z"
}
```


Common Error Codes

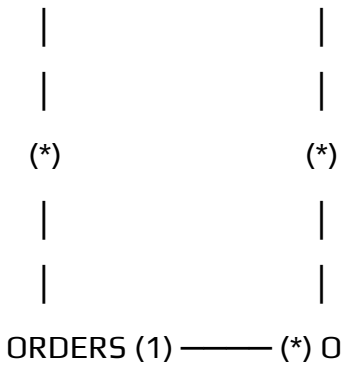
- AUTH-001: Invalid credentials
- AUTH-002: Token expired
- AUTH-003: Insufficient permissions
- VALID-001: Validation failed
- DB-001: Resource not found
- DB-002: Duplicate entry
- BUSINESS-001: Insufficient stock
- SYSTEM-001: Internal server error

6.0 DATABASE DESIGN

6.1 Entity Relationship Diagram

Note: This should be an ERD

USERS (1) ——— (1) CARTS (1) ——— (*) CART_ITEMS (*) ——— (1) PRODUCTS



Detailed Relationships:

- **One-to-One:** User ↔ Cart (Each user has exactly one cart)
- **One-to-Many:** User → Orders (User can have multiple orders)
- **One-to-Many:** Cart → CartItems (Cart contains multiple items)
- **One-to-Many:** Order → OrderItems (Order contains multiple items)
- **Many-to-One:** CartItems → Product (Items reference products)
- **Many-to-One:** OrderItems → Product (Items reference products)

Key Tables:

1. **users** - User accounts and authentication
2. **products** - Product catalog information
3. **carts** - Shopping cart per user
4. **cart_items** - Items in shopping cart
5. **orders** - Customer orders
6. **order_items** - Items in each order
7. **refresh_tokens** - JWT refresh tokens

Table Structure Summary:

- **users:** id, email, password_hash, full_name, role, created_at
- **products:** id, name, description, price, stock, image_url, category
- **carts:** id, user_id, created_at
- **cart_items:** id, cart_id, product_id, quantity
- **orders:** id, order_number, user_id, total, status, shipping_address

- **order_items:** id, order_id, product_id, product_name, quantity, price

7.0 UI/UX DESIGN

7.1 Web Application Wireframes

Note: This should be wireframes from Figma

Homepage (Product Listing)

Header: [Logo] [Search Bar] [Cart Icon] [User Menu]

Content: Product Grid (3 columns desktop)

Each Product Card: Image, Name, Price, "Add to Cart" button

Footer: Links, Copyright

Product Detail Page

Back Button

Product Image (large)

Product Name and Price

Description

Quantity Selector (1-10)

"Add to Cart" and "Buy Now" buttons

Product Specifications

Shopping Cart Page

Cart Title

List of Cart Items (Image, Name, Quantity, Price, Remove)

Order Summary: Subtotal, Shipping, Tax, Total

"Continue Shopping" and "Proceed to Checkout" buttons

Checkout Page

Shipping Address Form

Order Review (Items, Prices, Totals)

"Place Order" button

Terms and Conditions note

Admin Dashboard

Sidebar Navigation: Dashboard, Products, Orders, Users

Product Management: Add New button, Product list with Edit/Delete

Order Management: Order list with status filters

7.2 Mobile Application Wireframes

Note: This should be wireframes from Figma

Bottom Navigation

[🏠 Home] [🔍 Search] [🛒 Cart] [👤 Profile]

Home Screen

Search Bar

Product Grid (2 columns)

Swipe gestures for quick actions

Pull to refresh

Product Detail Screen

Back arrow

Product image (swipeable gallery)

Product info

Quantity selector

"Add to Cart" fixed bottom button

Cart Screen

Edit mode for quantity updates

Swipe to remove items

Order summary sticky bottom

Checkout button

Checkout Flow

Step indicator: Cart → Shipping → Payment → Confirm

Address form (auto-complete)

Order summary

Place order button

Mobile-Specific Features:

- Touch-optimized buttons (min 44x44px)
- Gesture support (swipe, pull-to-refresh)
- Offline caching for product images
- Bottom navigation for main actions
- Simplified forms for mobile input

Design System:

- **Colors:** Primary (#2563EB), Secondary (#7C3AED), Success (#10B981), Error (#EF4444)
- **Typography:** Inter font family, responsive sizing
- **Spacing:** 8px grid system
- **Components:** Consistent buttons, inputs, cards, modals
- **Responsive:** Mobile-first approach, breakpoints at 640px, 768px, 1024px

8.0 PLAN

8.1 Project Timeline

Phase 1: Planning & Design (Week 1-2)

Week 1: Requirements & Architecture

Day 1-2: Project setup and documentation

Day 3-4: Complete FRS and NFR

Day 5-7: System architecture design

Week 2: Detailed Design

Day 1-2: API specification

Day 3-4: Database design

Day 5-6: UI/UX wireframes

Day 7: Implementation plan finalization

Phase 2: Backend Development (Week 3-4)

Week 3: Foundation

Day 1: Spring Boot setup with dependencies

Day 2: Database configuration and entities

Day 3: JWT authentication implementation

Day 4: User management endpoints

Day 5: Product CRUD operations

Week 4: Core Features

Day 1: Cart functionality

Day 2: Order management

Day 3: Search and filtering

Day 4: Error handling and validation

Day 5: API documentation and testing

Phase 3: Web Application (Week 5-6)

Week 5: Frontend Foundation

Day 1: React setup with TypeScript

Day 2: Authentication pages (login, register)

Day 3: Product listing page

Day 4: Product detail page

Day 5: Shopping cart implementation

Week 6: Complete Web Features

Day 1: Checkout flow

Day 2: Order history and confirmation

Day 3: Admin dashboard

Day 4: Responsive design polish

Day 5: API integration and testing

Phase 4: Mobile Application (Week 7-8)

Week 7: Android Foundation

Day 1: Android Studio setup and project structure

Day 2: Authentication screens

Day 3: Product browsing

Day 4: Shopping cart

Day 5: API service layer

Week 8: Complete Mobile App

Day 1: Checkout flow

Day 2: Order management

Day 3: UI polish and animations

Day 4: Testing on emulator/device

Day 5: APK generation and documentation

Phase 5: Integration & Deployment (Week 9-10)

Week 9: Integration Testing

Day 1: End-to-end testing across platforms

Day 2: Bug fixes and optimization

Day 3: Security review

Day 4: Performance testing

Day 5: Documentation updates

Week 10: Deployment

Day 1: Backend deployment (Railway/Heroku)

Day 2: Web app deployment (Vercel/Netlify)

Day 3: Mobile APK distribution

Day 4: Final testing

Day 5: Project submission

Milestones:

- **M1 (End Week 2):** All design documents complete
- **M2 (End Week 4):** Backend API fully functional
- **M3 (End Week 6):** Web application complete
- **M4 (End Week 8):** Mobile application complete
- **M5 (End Week 10):** Full system deployed and integrated

Critical Path:

1. Authentication system (Week 3)
2. Product catalog API (Week 3-4)
3. Shopping cart functionality (Week 4)

4. Checkout process (Week 6)
5. Cross-platform testing (Week 9)

Risk Mitigation:

- Start with simplest working version of each feature
- Test integration points early and often
- Keep backup of working versions
- Focus on core functionality before enhancements