API Gateway | Authentication Service | Rate Limiting Engine

Insurance API

Communication API

JPJ API

Payment Gateways

User Data

Insurance Provider Database

Vehicle Database

Pattern Recognition Database

Pattern Recognition

Recommendation Engine

Correction Engine

AI/ML Layer

Error Detection Engine

Payment & Policy Service

Notification Service

User Management Service

Insurance Comparison Service

Vehicle Validation Service

Frontend

**1. API Gateway**

**Core Components**

* **Authentication Service**: JWT token validation and user authentication
* **Rate Limiting Engine**: Controls API request frequency per user
* **Request Router**: Directs requests to appropriate microservices
* **Load Balancer**: Distributes traffic across service instances
* **API Versioning Manager**: Handles backward compatibility
* **Request/Response Logger**: Captures all API interactions
* **Circuit Breaker**: Prevents cascading failures during service outages

**Security Features**

* **OAuth 2.0 Provider**: Token-based authentication
* **API Key Management**: Generation and validation of API keys
* **Request Validation**: Schema validation for incoming requests
* **Encryption Service**: Data encryption for sensitive information
* **DDoS Protection**: Mitigation against denial-of-service attacks
* **IP Whitelisting**: Restricts access to authorized IPs

**2. Core Services**

**Vehicle Validation Service**

* **Plate Validator**: Checks and corrects license plate formats
* **Brand Validator**: Detects and corrects brand name typos
* **Model Validator**: Validates car models within brand context
* **Year Validator**: Ensures valid manufacturing years
* **Confidence Scorer**: Calculates confidence levels for corrections
* **Batch Processor**: Handles bulk validation requests
* **Validation History Logger**: Records all validation attempts

**Insurance Comparison Service**

* **Quote Aggregator**: Collects quotes from multiple insurers
* **Coverage Analyzer**: Compares coverage details across policies
* **Premium Calculator**: Computes total costs including add-ons
* **Recommendation Engine**: Ranks options based on user preferences
* **Discount Finder**: Identifies applicable discounts and promotions
* **Coverage Gap Detector**: Identifies missing or inadequate coverage
* **Renewal Reminder**: Tracks policy expiration dates

**User Management Service**

* **Profile Manager**: Handles user account creation and updates
* **Preference Engine**: Stores user preferences and history
* **Vehicle Registry**: Manages user's saved vehicles
* **Document Vault**: Stores user documents and policies
* **Consent Manager**: Handles user permissions and data consent
* **Activity Tracker**: Logs user interactions and behavior
* **Segmentation Engine**: Categorizes users for targeted offers

**Payment & Policy Service**

* **Payment Processor**: Handles payment transactions
* **Policy Generator**: Creates insurance policy documents
* **Road Tax Calculator**: Computes road tax fees
* **Document Signer**: Manages digital signatures
* **Refund Manager**: Handles premium refunds and cancellations
* **Installment Planner**: Manages payment plans and schedules
* **Compliance Checker**: Ensures regulatory compliance

**Notification Service**

* **Email Dispatcher**: Sends transactional and marketing emails
* **SMS Gateway**: Delivers text messages and alerts
* **Push Notification Engine**: Sends mobile app notifications
* **In-App Messenger**: Manages in-app communication
* **Template Manager**: Handles notification templates
* **Delivery Tracker**: Monitors notification delivery status
* **Preference Handler**: Manages user notification preferences

**3. AI/ML Layer**

**Error Detection Engine**

* **Typo Detector**: Identifies character-level errors in text input
* **Format Validator**: Checks structural correctness of input data
* **Context Analyzer**: Understands relationships between data fields
* **Anomaly Detector**: Flags unusual or suspicious inputs
* **Pattern Matcher**: Recognizes common error patterns
* **Confidence Estimator**: Calculates certainty of error detection
* **Multi-Error Handler**: Processes multiple simultaneous errors

**Correction Engine**

* **Auto-Correction Algorithm**: Automatically fixes high-confidence errors
* **Suggestion Generator**: Provides multiple correction options
* **Contextual Corrector**: Applies corrections based on vehicle context
* **Historical Learner**: Improves corrections using past data
* **User Feedback Integrator**: Incorporates user acceptance/rejection data
* **Confidence Scorer**: Rates correction reliability
* **Priority Sorter**: Orders corrections by importance and confidence

**Recommendation Engine**

* **Collaborative Filter**: Recommends based on similar users
* **Content-Based Filter**: Suggests based on vehicle characteristics
* **Hybrid Recommender**: Combines multiple recommendation approaches
* **Personalization Engine**: Tailors suggestions to individual users
* **Seasonality Adjuster**: Considers time-based factors
* **Promotion Integrator**: Highlights relevant special offers
* **Explainability Module**: Provides reasons for recommendations

**Pattern Recognition**

* **Frequency Analyzer**: Identifies common input patterns
* **Trend Detector**: Recognizes emerging error trends
* **Clustering Engine**: Groups similar errors and corrections
* **Sequence Analyzer**: Understands multi-step error patterns
* **Geographic Pattern Detector**: Identifies regional variations
* **Temporal Pattern Analyzer**: Recognizes time-based patterns
* **Predictive Model**: Forecasts potential future errors

**4. Data Layer**

**Vehicle Database**

* **Make Registry**: Stores all vehicle manufacturers
* **Model Registry**: Contains vehicle models by manufacturer
* **Year Range Table**: Valid production years for each model
* **Specification Database**: Vehicle specifications and features
* **Variant Information**: Model variants and options
* **Discontinued Models**: Tracks older vehicle models
* **Vehicle Classification**: Categories and types of vehicles

**Insurance Provider DB**

* **Insurer Profiles**: Information about insurance companies
* **Product Catalog**: Insurance products and coverages
* **Pricing Tables**: Premium rates and calculations
* **Coverage Details**: Specifics of what each policy covers
* **Exclusion Lists**: What is not covered by policies
* **Discount Rules**: Eligibility criteria for discounts
* **Commission Structures**: Agent and partner commissions

**User Data**

* **User Profiles**: Personal information and contact details
* **Vehicle History**: Previously insured vehicles
* **Policy Records**: Current and past insurance policies
* **Claim History**: Insurance claims and outcomes
* **Payment History**: Transaction records and payment methods
* **Interaction Logs**: User engagement and behavior data
* **Preference Data**: User settings and customization choices

**Error Patterns DB**

* **Error Taxonomy**: Classification of error types
* **Pattern Library**: Common error patterns and corrections
* **Frequency Metrics**: How often each error occurs
* **Correction Success Rates**: Effectiveness of corrections
* **Geographic Distribution**: Regional error variations
* **Temporal Data**: When errors most frequently occur
* **User Demographics**: Error patterns by user segments

**5. External Integrations**

**Insurance APIs**

* **Quote Retrieval APIs**: Fetch real-time insurance quotes
* **Policy Binding APIs**: Activate insurance policies
* **Claim Submission APIs**: File insurance claims
* **Endorsement APIs**: Modify existing policies
* **Renewal APIs**: Process policy renewals
* **Cancellation APIs**: Cancel policies and process refunds
* **Document Generation APIs**: Create policy documents

**Payment Gateways**

* **Credit Card Processors**: Handle credit and debit card payments
* **E-Wallet Integrations**: Connect with digital wallet services
* **Online Banking**: Direct bank transfer capabilities
* **Installment Providers**: Manage payment plans
* **Fraud Detection Services**: Identify and prevent fraudulent transactions
* **Currency Conversion**: Handle multi-currency transactions
* **Recurring Payment Manager**: Manage subscription payments

**JPJ API**

* **Vehicle Registration Verification**: Validate vehicle ownership
* **Road Tax Calculation**: Compute official road tax fees
* **Vehicle Details Retrieval**: Get official vehicle specifications
* **Owner Information**: Verify vehicle owner details
* **Road Tax Status**: Check current road tax validity
* **Offence History**: Access vehicle traffic violation records
* **Digital Road Tax**: Issue electronic road tax certificates

**Communication APIs**

* **Email Service Providers**: Send transactional and marketing emails
* **SMS Gateways**: Deliver text messages and alerts
* **Push Notification Services**: Send mobile app notifications
* **Chat Platforms**: Integrate with messaging apps
* **Voice Call Services**: Make automated voice calls