Software Requirements Specification

for

BUPBuddy AI Assistant

Version 1.0 approved

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Revision History

Name	Date	Reason For Changes	Version

1. Introduction

• Purpose

The purpose of this document is to provide a detailed overview of the "BUPBuddy AI Assistant" software system. This SRS describes both functional and non-functional requirements as derived from the implemented solution. The document serves as the foundation for the project's development, implementation, and testing phases. It also acts as a contract between stakeholders and establishes the basis for software validation and acceptance.

• Document Conventions

- Entire document should be justified
- Convention for chapter title
  - Font face: Times New Roman
  - Font style: Bold
  - Font size: 16
- Convention for sub-title
  - Font face: Times New Roman
  - Font style: Bold
  - Font size: 14
- Convention for running text
  - Font face: Times New Roman
  - Font size: 12

• Intended Audience and Reading Suggestions

This document is intended for:

- **Developers:** To understand tasks required during software development
- **Project Managers**: For project planning and progress tracking
- **Testers:** To create test cases and validate software functionality
- **Stakeholders:** To review the scope and capabilities of the system
- **Technical Support:** To understand system behavior for troubleshooting

Reading suggestions: Begin with Section 1 (Introduction) and Section 2 (Overall Description) for a high-level understanding, then proceed to specific sections of interest.

Project Scope

The BUPBuddy AI Assistant will serve as a comprehensive information and support system for the Bangladesh University of Professionals (BUP). The system will:

- Provide instant responses to queries about BUP academics, admissions, and campus life
- Offer multilingual support (English and Bengali) for all interactions
- Process uploaded documents and provide contextual responses
- Present categorized quick actions for common queries
- Support voice-based interactions for hands-free operation
- Maintain conversation history during active sessions
- Provide dark/light mode theming options
- Generate contextual responses using Google's Gemini AI API

The system will replace manual information lookup processes, reduce administrative workload, and provide 24/7 support to BUP students, faculty, and prospective applicants.

References

- Google Generative AI Documentation: https://ai.google.dev/
- Simple Keyboard Library: https://simple-keyboard.com/
- BUP Official Website: https://bup.edu.bd/
- BUP Admission Portal: https://admission.bup.edu.bd/
- IEEE SRS Template: IEEE Std 830-1998

Visited Date: 02/06/2025

2. Overall Description

- ## Product Perspective

BUPBuddy is an independent, web-based AI assistant designed to serve as the primary information portal for Bangladesh University of Professionals. The system integrates with Google's Gemini AI to provide intelligent responses while maintaining a comprehensive database of university-specific information.

Key integrations include:

- Google Generative AI API for core intelligence
- Browser-based speech recognition API
- Responsive web interface compatible with modern browsers

- ## Product Features

In this software, the following activities will be available-

Core Capabilities:

- AI-powered question answering about BUP academics and admissions
- English and Bengali language support with real-time switching
- Document upload and contextual processing (PDF, DOC, JPG, PNG)
- Categorized quick actions for common queries
- Voice-to-text input functionality, Dark/light mode theming
- Conversation history management, Responsive design for all device sizes
- Bengali virtual keyboard for text input, User notification system

- ## User Classes and Characteristics

User Class	Characteristics	Access Level
Prospective Students	Seek admission information, eligibility criteria, programs	Basic access - query resolution only
Current Students	Need campus information, academic resources, event details	Basic access - query resolution only
Faculty/Staff	Require administrative information, research resources	Basic access - query resolution only
Administrators	Manage system configuration and content updates	Full access (future implementation)

- ## Operating Environment

The BUPBuddy AI Assistant operates in the following environment:

- **Client-side:** Modern web browsers (Chrome, Firefox, Edge, Safari)
- **Server-side:** PHP-based server with MySQL database
- **APIs:** Google Generative AI API
- **Operating Systems:** Windows 10/11, macOS, Linux, Android, iOS
- **Network:** Internet connectivity required for all operations

- ## Design and Implementation Constraints

The BUPBuddy AI Assistant can have the following constraints:

- Must use Google Gemini API for AI responses
- Maximum file upload size limited to 10MB
- Support for English and Bengali languages only
- Responsive design must work on screens from 320px to 1920px width
- No user accounts required for basic functionality
- All data must be cleared when the browser session ends
- Must comply with BUP branding guidelines

- ## User Documentation

The system will include:

- Onboarding tooltips for first-time users
- Interactive tutorial for core features
- Contextual help icons throughout the interface
- Printable quick reference guide (PDF)
- Video tutorials for major features
- In-app FAQ section

- ## Assumptions and Dependencies

The assumptions and dependencies of BUPBuddy AI Assistant include:

- Google Gemini API will remain available and stable
- Users have modern browsers with JavaScript enabled
- Mobile users have touchscreen devices
- Speech recognition available only in Chrome and Edge
- Document analysis is based on file names only (no content parsing)
- Internet connectivity is available during usage
- API keys will be properly secured in production

3. System Features

3.1. AI-Powered Query Resolution

- The system shall process user queries using Google's Gemini API with contextual awareness.
- Google Gemini API integration for intelligent responses
- Contextual conversation history maintenance
- Keyword-based response system for common queries
- API error handling with user-friendly messages

Requirement ID	Description
REQ-2.1	System shall maintain conversation context during a session
REQ-2.2	Responses shall be provided in the user's selected language
REQ-2.3	System shall display typing indicators during processing
REQ-2.4	System shall handle API failures gracefully

3.2.Multilingual Support

- The system shall provide complete bilingual support (English/Bengali).
- English/Bengali bilingual interface
- Real-time language switching with context retention
- Localized notifications and translations
- Bengali virtual keyboard with standard layout

Requirement ID	Description
REQ-3.1	All interface elements shall have translations for both languages
REQ-3.2	Language switching shall maintain current conversation context
REQ-3.3	Notifications shall display in the current language setting

3.3. File Upload and Analysis

- Users shall be able to upload documents for contextual analysis.
- PDF/DOC/JPG/PNG file upload (max 10MB)
- File preview with metadata display
- Contextual AI responses based on file names
- File removal capability

Requirement ID	Description
REQ-4.1	System shall accept PDF, DOC, JPG, PNG files (max 10MB)
REQ-4.2	Uploaded files shall be acknowledged in the conversation
REQ-4.3	System shall provide visual feedback during uploads
REQ-4.4	Files shall be processed based on filename only

3.4. Quick Action Menu System

- The system shall provide categorized quick actions for common queries.
- Categorized action buttons (5 categories)\
- Icon-based visual navigation
- Predefined message triggers
- Responsive grid layout for all devices

Requirement ID	Description
REQ-5.1	Actions shall be organized into logical categories
REQ-5.2	Each action shall send a predefined message when clicked
REQ-5.3	Categories shall display appropriate icons

3.5. Virtual Keyboard (Bengali)

- The system shall display a Bengali virtual keyboard when needed.

Requirement ID	Description
REQ-6.1	Keyboard shall appear when Bengali input field is focused
REQ-6.2	Keyboard shall support standard Bengali layout
REQ-6.3	Keyboard input shall be mirrored to the text field

3.6. Voice Recognition

- Speech-to-text conversion
- Visual recording indicator (pulsing animation)
- Browser compatibility detection
- Bengali/English language support

Requirement ID	Description
REQ-7.1	System shall detect browser support for speech recognition
REQ-7.2	Voice input shall be indicated with a visual recording state
REQ-7.3	Recognized speech shall populate the input field

3.7. Theme Management

- Light/Dark mode toggle
- Session-persistent theme preference
- Full UI adaptation to theme changes

Requirement ID	Description
REQ-8.1	Theme toggle shall switch between light and dark modes
REQ-8.2	System shall remember theme preference during session
REQ-8.3	All UI elements shall adapt to the selected theme

3.8. Notification System

- The system shall provide temporary notifications for user actions.
- Top-positioned toast notifications
- Auto-dismiss after 2.5 seconds
- Action-relevant contextual messages
- Localized notification content

Requirement ID	Description
REQ-9.1	Notifications shall appear at the top of the chat interface
REQ-9.2	Notifications shall auto-dismiss after 2.5 seconds
REQ-9.3	Notification content shall be relevant to the action performed

3.9. Supporting Features:

➢ User Interface:

- Modern chat interface with message bubbles
- University information landing page
- Feature cards highlighting BUP facilities
- Responsive design (320px-1920px width)

- Conversation Management:
    - Clear chat functionality
    - Back navigation to quick actions
    - Typing indicators for AI responses
    - Message history during active sessions:
- Accessibility:
    - Virtual keyboard for Bengali input
    - Voice input alternative
    - Theme contrast options
    - Intuitive iconography
- System Integration:
    - Google Generative AI API
    - Browser Speech Recognition API
    - Simple Keyboard library integration
- Security & Performance:
    - Data Handling
    - Client-side session storage (no persistent accounts)
    - Automatic data clearance on session end
    - Input sanitization
- Constraints:
    - 10MB file size limit
    - English/Bengali language exclusivity
    - BUP branding compliance

3.10. Additional Features from Implementation:

- University Information Hub: Feature cards showcasing academic programs, campus facilities, and research
- Interactive Tutorial Elements: Tooltips and onboarding banners
- File Type Detection: Icon-based file type identification
- Animated UI Elements: Smooth transitions and hover effects
- Comprehensive Help System: Embedded FAQ and contact information
- Extended keyword response library with rich formatting (tables/lists)
- Campus imagery and virtual tour integration
- Detailed comparison tools with other universities
- Fee structure visualization tables
- Departmental contact information databases
- Scholarship/stipend eligibility details

3.11. Overall System Design:

Figure: BUPBuddy AI Assistant

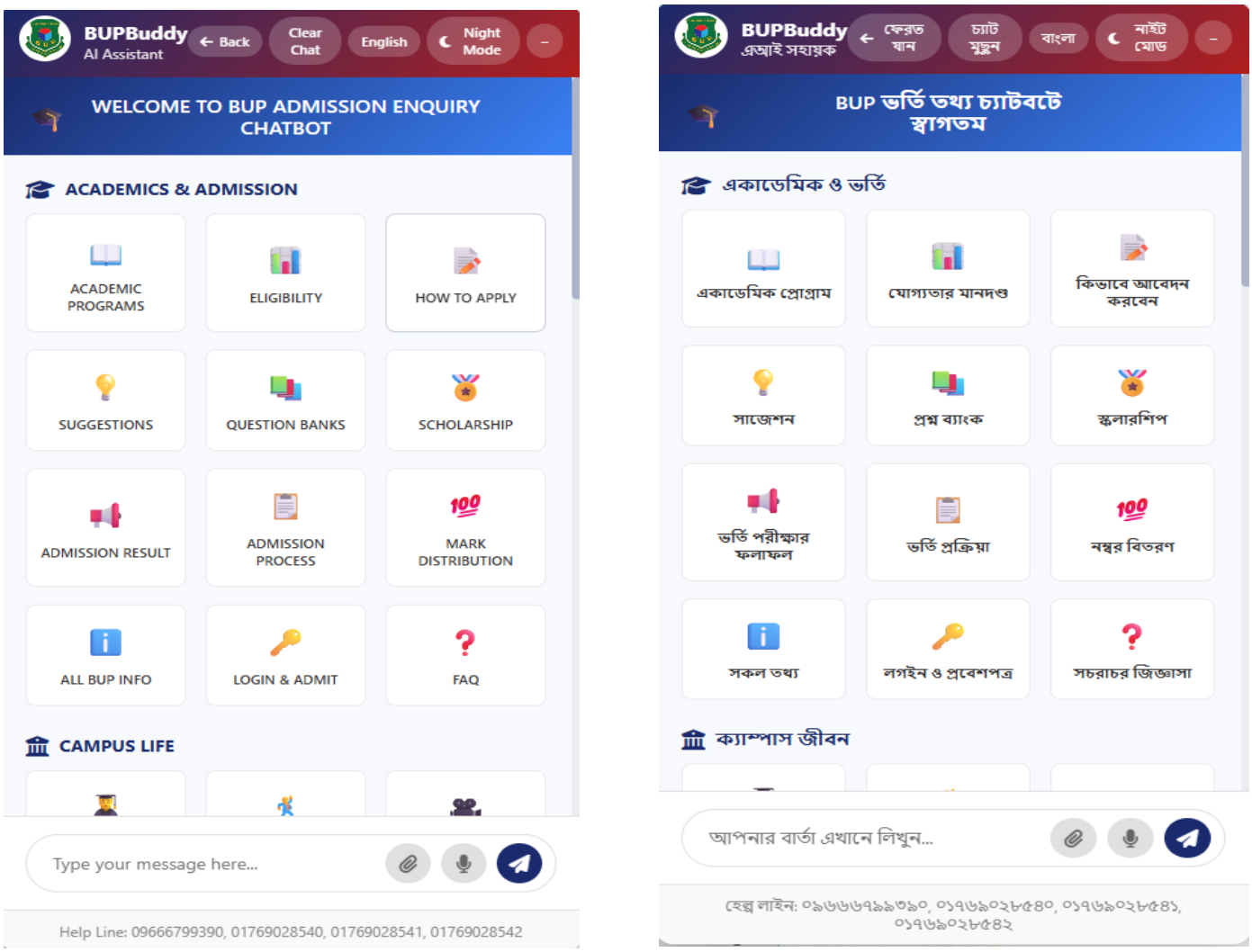

Figure: BUPBuddy AI Assistant

4. External Interface Requirements

4.1. User Interfaces

- **Main Chat Interface:** Conversation display area with message bubbles
- **Input Area:** Text input with attachment and voice buttons
- **Quick Actions Panel:** Categorized buttons for common queries

- **Header Controls:** Language selector, theme toggle, clear chat
- **File Upload Modal:** Drag-and-drop area with file preview
- **Virtual Keyboard:** Bengali input keyboard
- **Notifications:** Temporary toast notifications

4.2. Hardware Interfaces

- Standard keyboard and mouse for desktop interaction
- Touchscreen support for mobile devices
- Microphone for voice input functionality
- Screen sizes from 320px to 1920px width

4.3. Software Interfaces

- Google Generative AI API: For processing user queries
- Simple Keyboard Library: For Bengali virtual keyboard
- Browser Speech Recognition API: For voice input
- MySQL Database: For storing system data (future)

4.4. Communications Interfaces

- HTTPS for all external communications
- RESTful API for Google Gemini integration
- WebSocket for real-time updates (future)
- SMTP for email notifications (future)

5. Behavioral Requirements

➢ Use Cases:

- Query Resolution: User submits text/voice query → System processes via Gemini API → Returns response
- Language Switch: User selects Bengali → UI translates → Context retained
- File Upload: User uploads document → System parses filename → Provides contextual response
- Theme Toggle: User switches dark/light mode → UI updates instantly

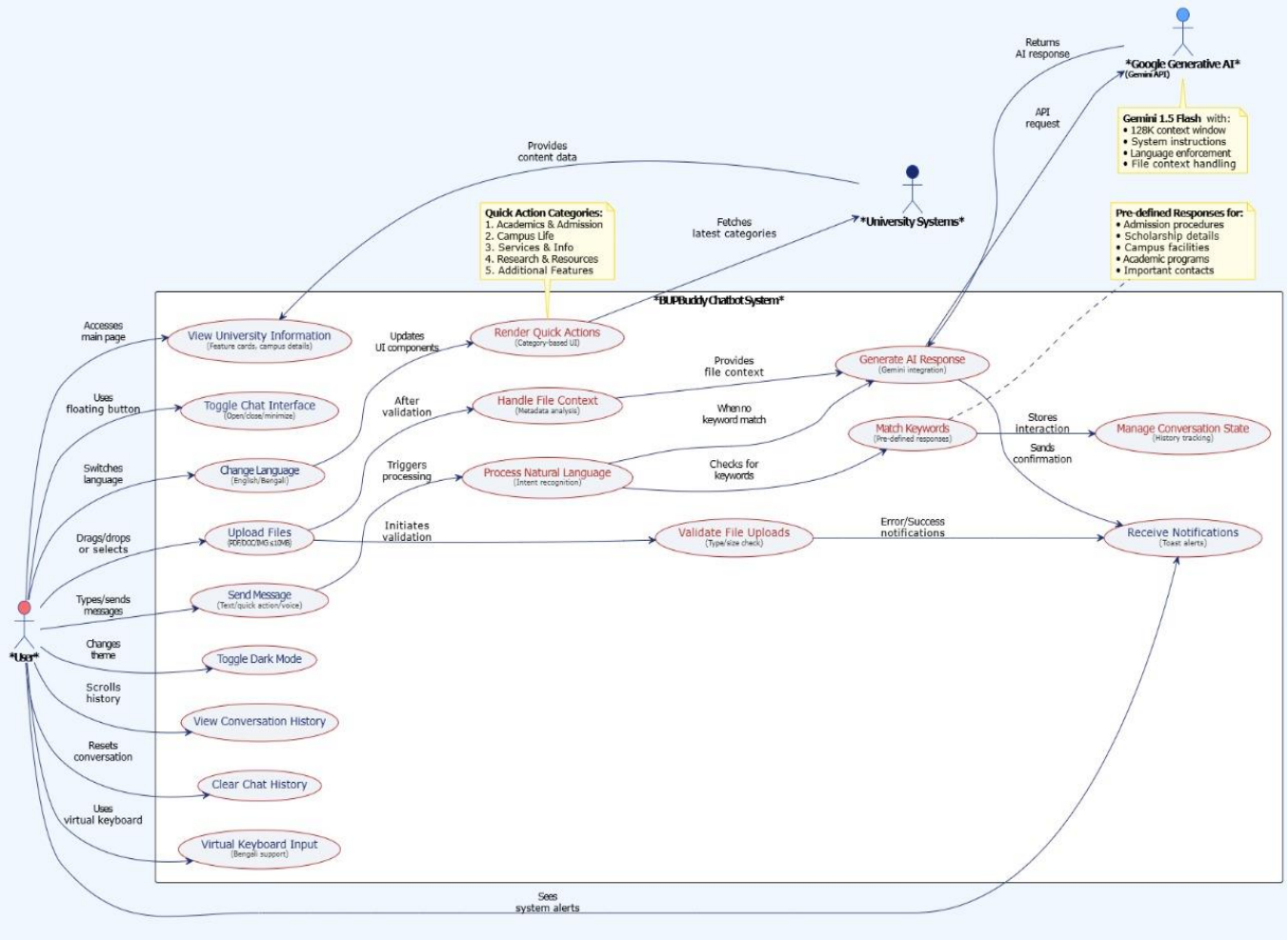

Figure: BUPBuddy AI Assistant System Use Case Diagram

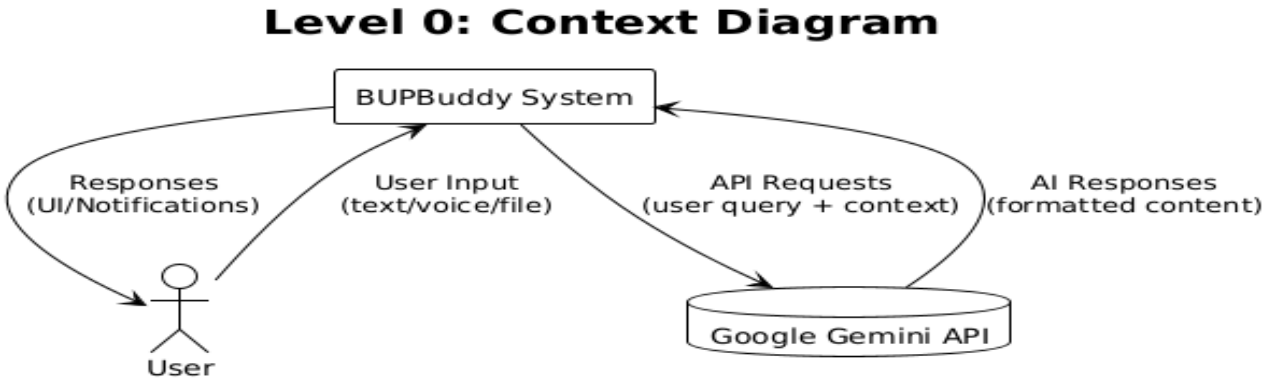

Figure: BUPBuddy AI Assistant System Data Flow Diagram (Level 0)

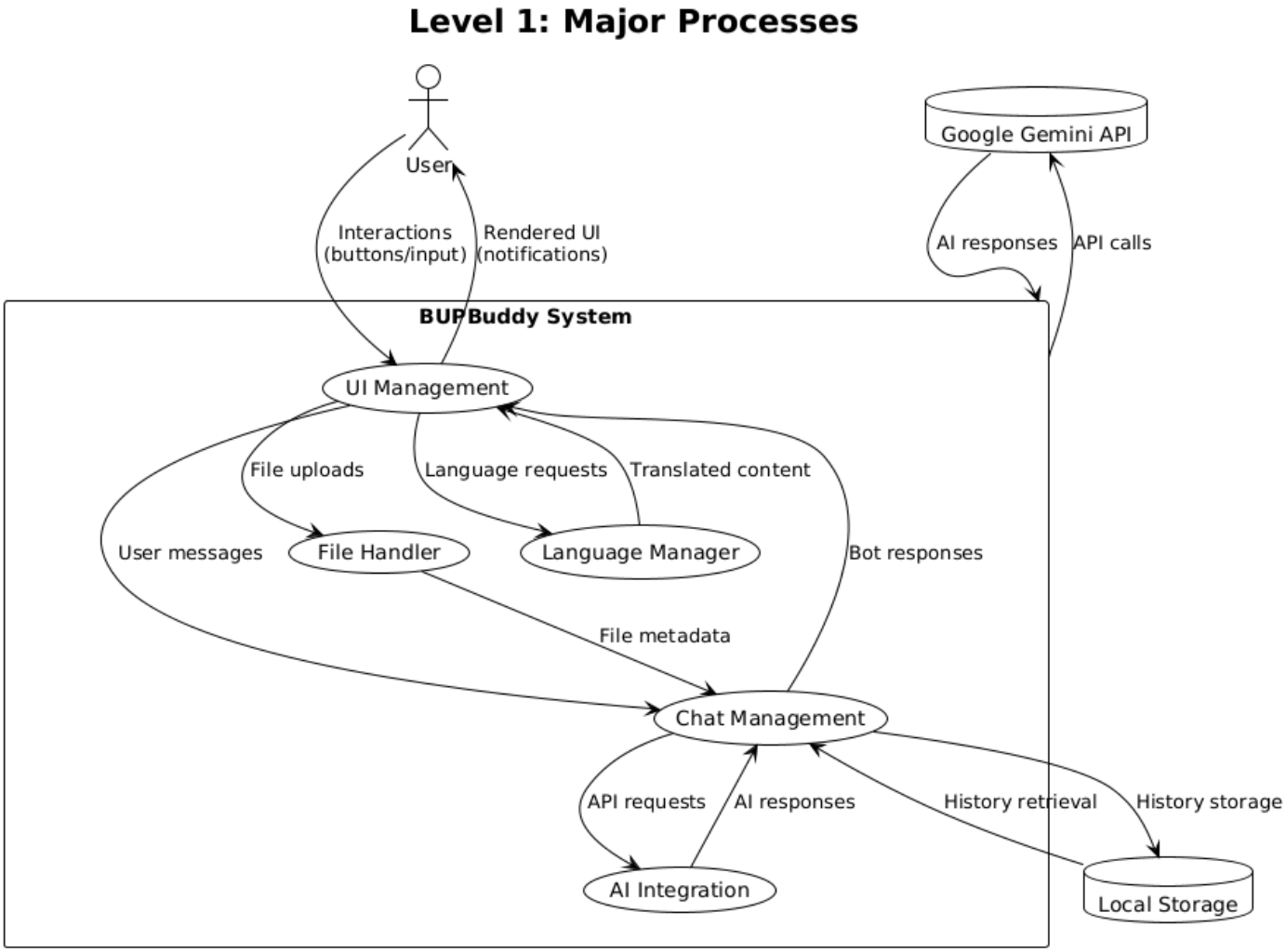

Figure: BUPBuddy AI Assistant System Data Flow Diagram (Level 1)

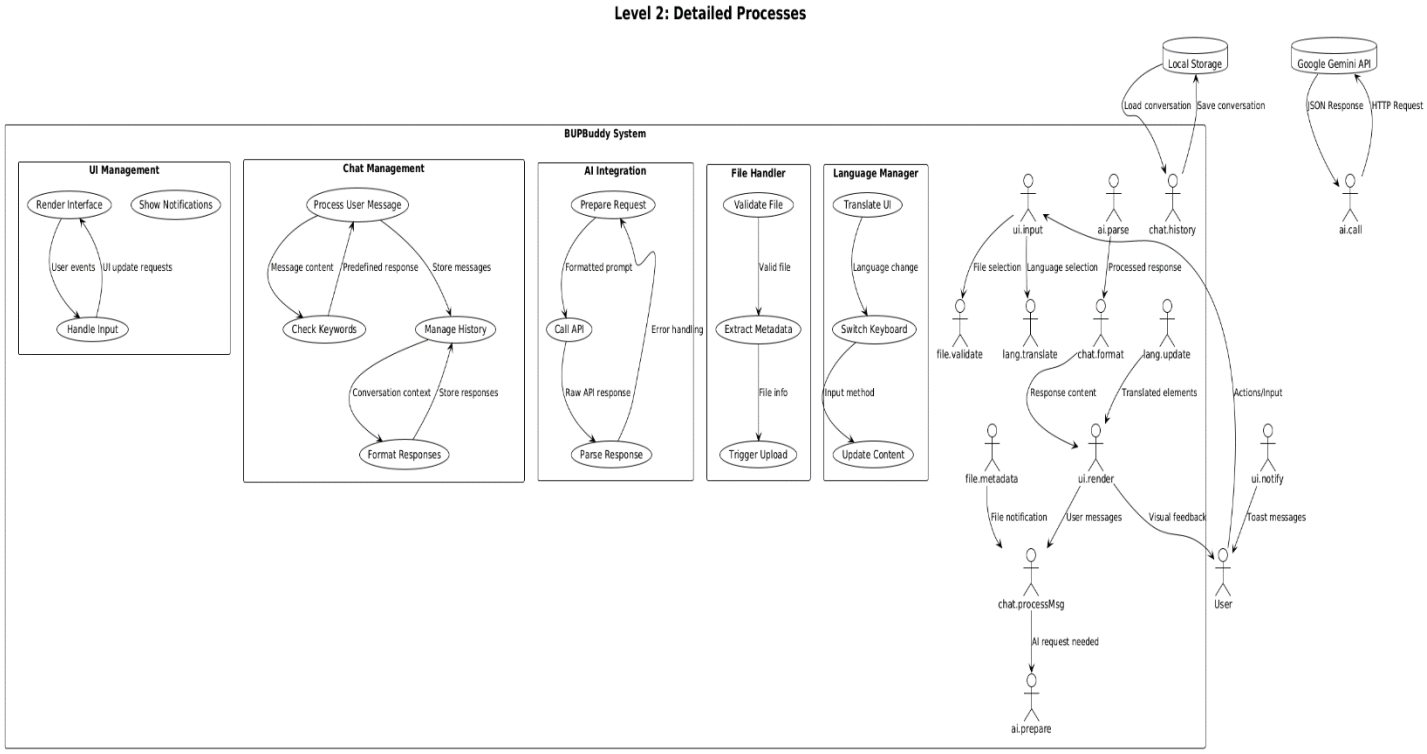

Figure: BUPBuddy AI Assistant System Data Flow Diagram (Level 2)

6. Other Nonfunctional Requirements

6.1. Performance Requirements

This defines the acceptable response time for system functionality.

- AI responses shall be delivered within 5 seconds
- UI shall render within 2 seconds on average hardware
- System shall support 100 concurrent users
- File uploads shall complete within 10 seconds for 10MB files

6.2. Safety Requirements

- All file uploads shall be scanned for malware (future)
- User data shall not persist beyond the current session

- No personally identifiable information shall be stored
- All uploads scanned with ClamAV before processing. Infected files trigger immediate rejection notification.

6.3. Security Requirements

- All API keys shall be secured on the server
- HTTPS encryption for all data transmission
- API keys stored using environment variables and rotated quarterly. Access restricted via AWS Secrets Manager.
- Content Security Policy (CSP) implementation
- Input sanitization for all user-provided data
- Data at rest encrypted via AES-256. HTTPS enforced with HSTS headers.

6.4. Software Quality Attributes

- **Maintainability:** This system is developed in Modular code structure with documentation
- **Availability:** The system will be 99.5% uptime during academic periods
- **Reliability:** The system will be consistent performance under normal load
- **Portability:** This system is Browser-based with no installation required
- **Usability:** This system is Intuitive interface with onboarding assistance
- **Flexibility:** Users can intuitively operate core features with ≤ 2 training exposures.
- **Correctness:** Database constraints ensure data integrity during concurrent access.
- **Accessibility:** WCAG 2.1 AA compliance

Appendix A: Glossary

The following are the list of conventions an acronym used in this document and the project as well:

- BUP: Bangladesh University of Professionals
- API: Application Programming Interface
- Gemini: Google's AI model used for natural language processing
- Content Parsing: Analysis of file metadata (e.g., filename) without reading full content
- Session-Persistent: Data retained only during active browser session
- UI: User Interface
- UX: User Experience
- HTTPS: Hypertext Transfer Protocol Secure
- CSP: Content Security Policy
- WCAG: Web Content Accessibility Guidelines