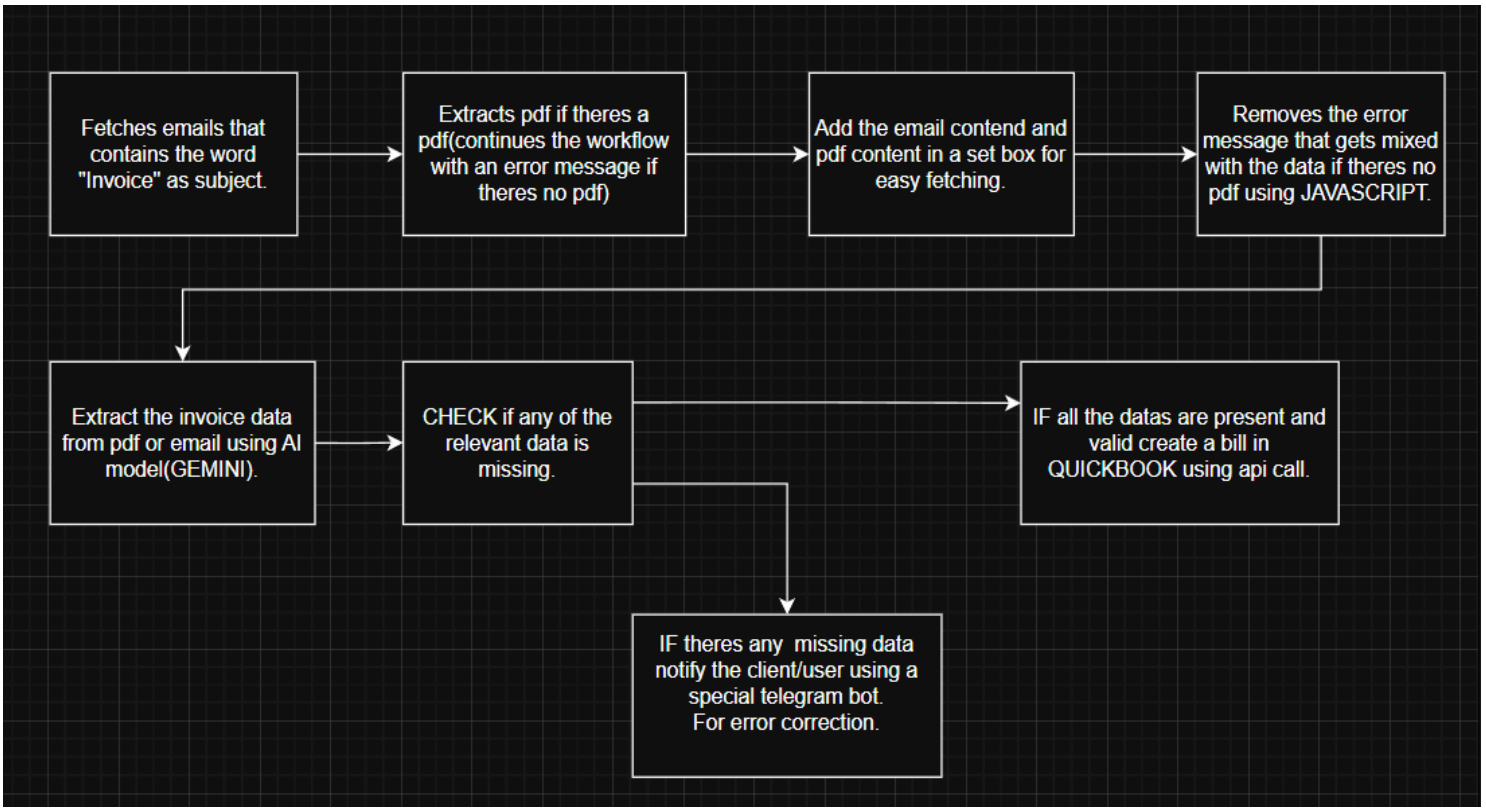
TECHNICAL ARCHITECTURE



The proposed architecture automates invoice processing by combining email integration, AI-powered data extraction, and seamless accounting synchronization. Incoming invoices are captured directly from Gmail, with attachments processed through PDF text extraction or, if unavailable, plain email parsing. A lightweight code layer cleans redundant outputs before the invoice text is sent to the Google Gemini model, which structures unformatted data into key invoice fields. The system validates completeness through a missing-data check: complete invoices are automatically

synchronized with QuickBooks via its secure API, while incomplete ones trigger a Telegram notification for human review. This modular design ensures scalability, reduces manual effort, and upholds compliance with secure OAuth2 authentication, encrypted data handling, and human-in-the-loop error management

Tech Stack

- Email Integration → *Gmail API* (secure, reliable invoice ingestion)
- Document Parsing → *n8n Extract from PDF node* (text layer extraction), fallback to *email body parser*
- Data Cleaning → *Custom Code Node* (JavaScript/Python for error suppression + preprocessing)
- AI Extraction → *Google Gemini Chat Model* (LLM-based structured field extraction from unstructured invoices)
- Validation → *n8n Conditional Logic* (missing-data checks, fallback routing)

- Error Handling (Human-in-the-loop) →*Telegram Bot API* (real-time alerts + manual intervention)

- Accounting Sync → *QuickBooks Online API* (OAuth2 secured, bill creation endpoint)

- Workflow Orchestration → *n8n Automation Platform* (modular, scalable, open-source)

- Security & Compliance → *TLS encryption, OAuth2 tokens, n8n credential vault, GDPR-compliant data retention*