App for Medical Transcription

Introduction:

We developed an innovative healthcare solution that streamlines the medical transcription process through a comprehensive mobile and web-based platform. The application revolutionizes how healthcare providers capture and manage patient visit documentation; by combining state-of-the-art voice-to-text technology with AI inferencing capabilities. This dual-interface system enables healthcare providers to dictate patient visits on mobile devices while allowing transcriptionists to review and approve content through a web portal.

Targeted Customers

Our platform specifically serves healthcare providers and medical transcriptionists by offering:

- Healthcare providers with an efficient mobile dictation system.
- Transcriptionists with a streamlined web-based review interface.
- Healthcare organizations with reduced transcription costs and improved efficiency.

Client Details:

Name: Confidential | **Industry:** Healthcare | **Location:** USA

Technologies:

- ReactJS
- Flutter
- Java
- Spring
- AWS
- Stanford NLP
- Google Speech to Text

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Project Description:

The mobile app was developed using the Flutter framework, while the web application was built with ReactJS, Java and Spring.

Our mobile application enables a healthcare provider to dictate the entire patient visit on their device of choice, including tablets and mobile phones. The Web portal enables the transcriptionist to review the dictation and approve it.

The state-of-the-art natural language voice-to-text and AI inference engine captures relevant data and populates the provider's EMR of choice with little or no manual transcription required. Healthcare organizations using this solution stand to witness an increase in profits by reducing time spent on transcription and data entry.

Mobile Application (Flutter)

- Enables healthcare providers to dictate patient visits on tablets and mobile phones.
- Supports real-time voice capture and processing.
- Integrates with EMR systems for seamless data population.
- Includes vital signs monitoring and medical diagnostic tracking.
- Features patient profile management and visit history.

Web Portal (ReactJS, Java, Spring)

- Provides transcriptionists with a comprehensive review interface.
- Supports document management and approval workflows.
- Features user role management and access control.
- Includes quality assurance tools and verification processes.
- Offers an administrative dashboard for monitoring and reporting.

AI and Natural Language Processing

- Implements advanced voice-to-text conversion.
- Features automated data extraction and categorization.
- Provides intelligent EMR field population.
- Supports medical terminology recognition.
- Includes error detection and correction capabilities.

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Administrative Features

- Comprehensive user management system.
- Robust security and access controls.
- Detailed activity monitoring and logging.
- Custom template management.
- Performance analytics and reporting.

User Roles

- Super Admin
- Admin
- Doctors
- Transcriptionist
- Reviewer

Architecture:

The application utilizes modern microservices architecture with:

- Mobile app was built using the Flutter framework
- Web application was built using ReactJS frontend
- Backend services were powered by Java Spring
- Data persistence through Hibernate
- Cloud infrastructure on AWS
- Secure authentication and authorization
- Real-time data synchronization
- EMR system integration capabilities

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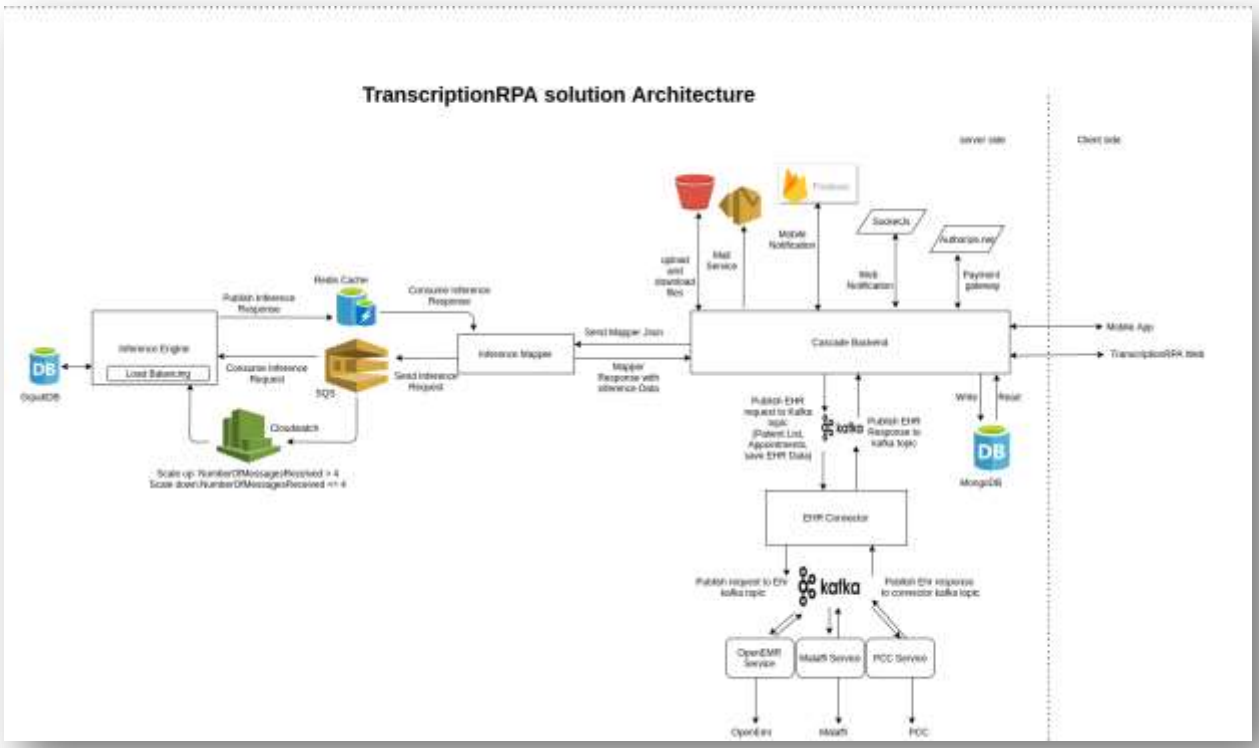
Technical Architecture:



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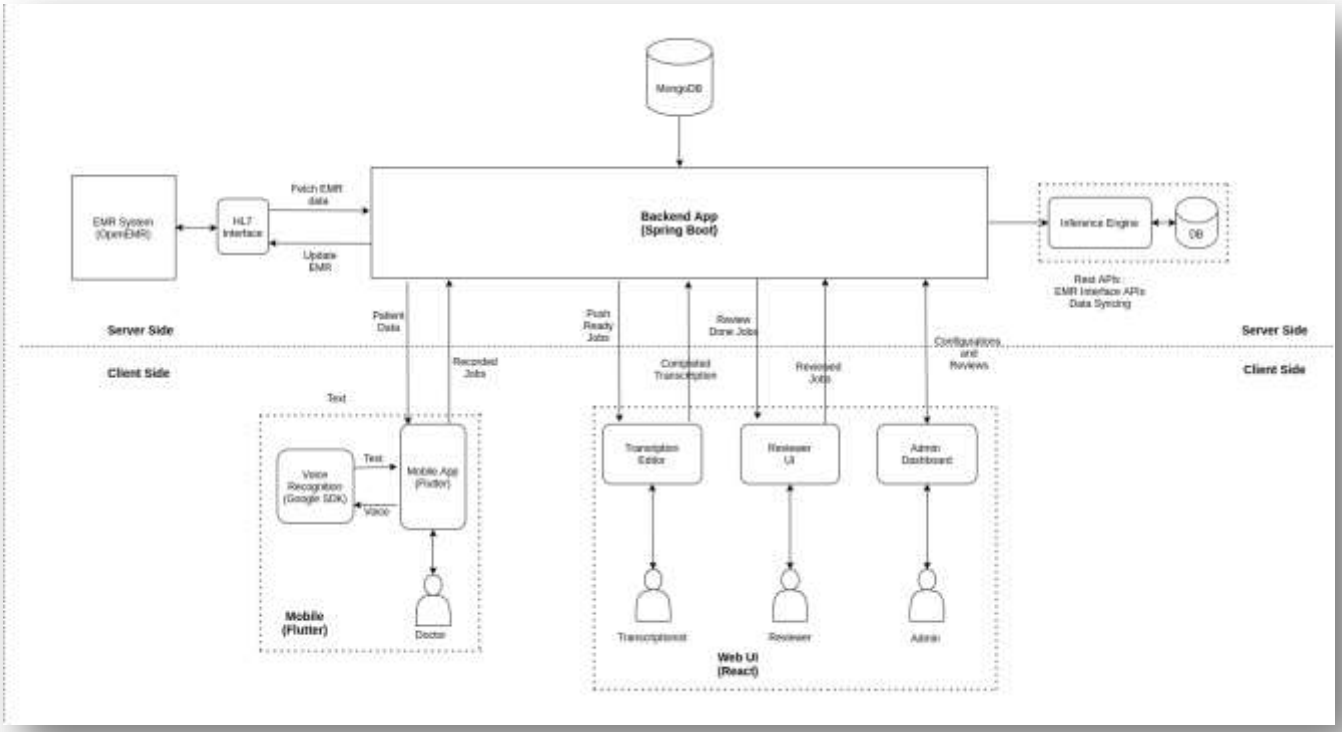
Scalability:

- The architecture design features make the application a highly scalable and low-latency product.
- The most CPU-intensive work is done by the inference engine, which gets horizontally scaled up based on the number of jobs in the queue (SQS).
- The inference engine results are written back to Redis, which opens up a stateless architecture and enables the possibility of horizontally scaling each of these microservices.
- A plug-and-play architecture design for EMR integration brings in separation of concern. Individual EMR systems can be load-balanced or enable us to write custom-made rules in the EMR communication.



Security:

- Transcription RPA is secured with spring boot security features.
- JWT (JSON Web Token) is used for authentication.
- Proper user-based authorization is implemented for every API.
- Made use of an SSL certificate for secure online communications.

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- Provide protection against CSRF and xss attacks.
- Databases and microservices EC2 instances are carefully IP whitelisted to internal services. No external IP can communicate with these instances.

Monitoring:

- Prometheus alert manager is configured to send automated email alerts if any of the microservices instances are down.
- AWS EC2 memory usage, CPU usage, etc. can be viewed through the AWS console, and custom CloudWatch metrics can be added as needed.

Logging:

- Detailed logs are written to files by every microservice application which helps in monitoring services.

Stability:

- Proper load testing is done on the most CPU-intensive microservice - inference engine and it gives reasonable results.
- The architecture design allows us to scale or load balance any of the instances when required.

Disaster Recovery:

- Production Database dump is taken regularly and stored in the file storage (S3).
- A cron job is scheduled to run every 5 minutes to restart if some of the instances fail or shut down (including GraphDB, inference engine, etc.).
- Proper exception handling is done at the code level to handle the unexpected exceptions gracefully.

HIPAA Compliance:

- The Health Insurance Portability and Accountability Act (HIPAA) sets the standard for sensitive patient data protection. Transcription RPA also takes data privacy into account, has taken the following steps for the same:
- Data Separation: Proper separation of patient identity data and their encounter data is taken care of. These data are separated into different databases on different servers. Fetching data from a single point will not provide any sensitive information about the individuals.

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Security:

- HTTPS: Online data transfers are secured through the HTTPS protocol.
- JWT: A JWT-based authentication mechanism is used for authentication.
- Session Timeouts: User inactivity of 30 minutes logs the user out of the application.
- IP Whitelisting: The database instances are IP whitelisted and can be used only by the application instances.
- Role-based access control: Proper role-based authorization techniques are employed.
- Data Encryption: Proper data encryption techniques are in place. Every HL7 message and dictation texts are encrypted and securely stored in the Filestore for later retrieval by customers.
- Audits: Proper audit logs are stored in the database whenever any additions/updates, transcription activity, reviews, etc. occur.
- Periodical data backup: A scheduler job takes a backup of the production database to AWS S3 every day so that no information is lost.
- Data anonymization: Transcription RPA has a strong machine learning component, which we named Inference Engine. It has been trained over a large number of encounter data. All these training data were completely anonymized, and the training

Key Benefits:

- Reduced transcription time and costs
- Improved accuracy in medical documentation
- Enhanced workflow efficiency
- Seamless integration with existing EMR systems
- Real-time access to patient documentation
- Secure and HIPAA-compliant data handling
- Customizable templates and workflows
- Comprehensive audit trail and reporting

Future Enhancements:

- Enhanced AI capabilities for medical terminology
- Additional EMR system integrations
- Advanced analytics and reporting features
- Expanded mobile platform capabilities
- Improved collaboration tools
- Enhanced quality assurance features

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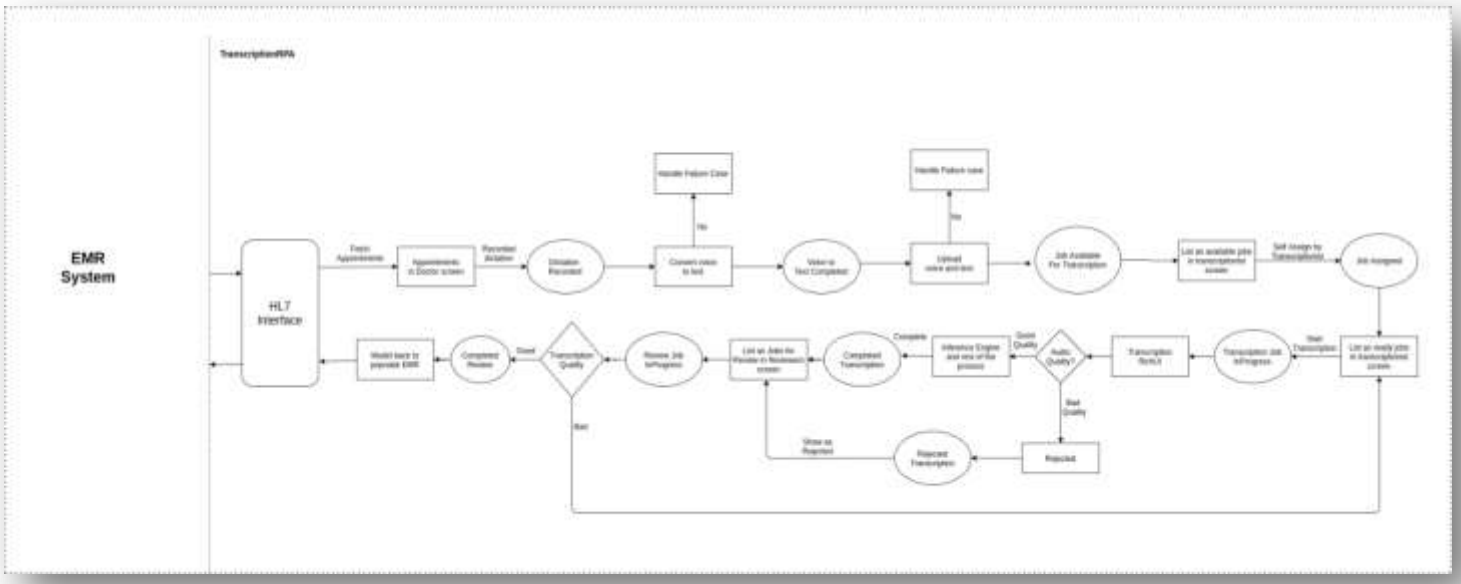
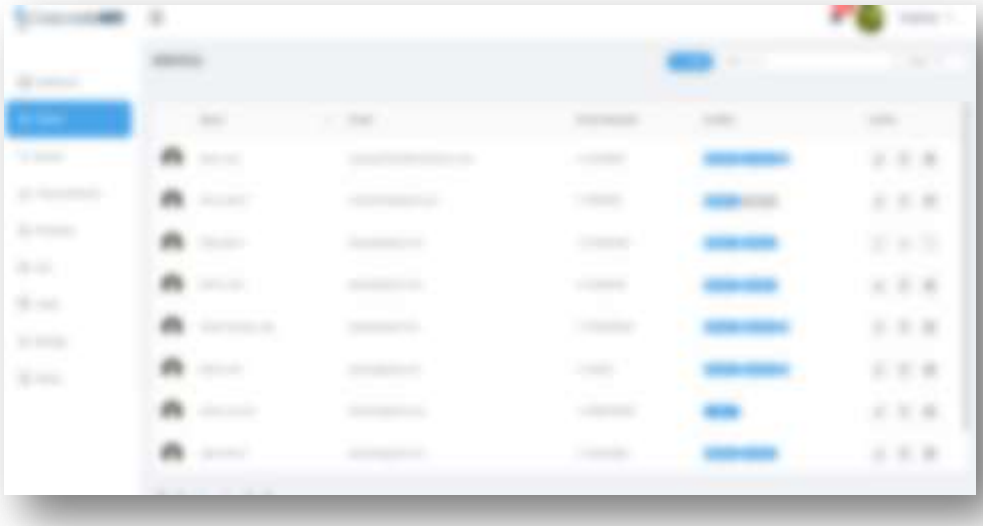
Job Workflow:



Screenshots:

Web View



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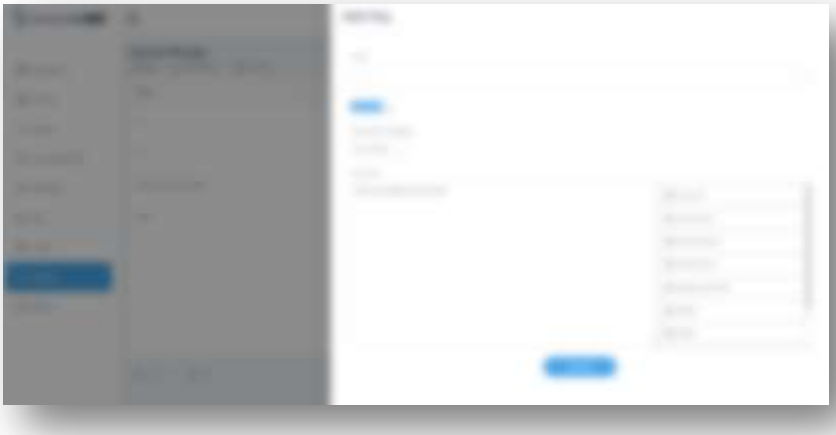

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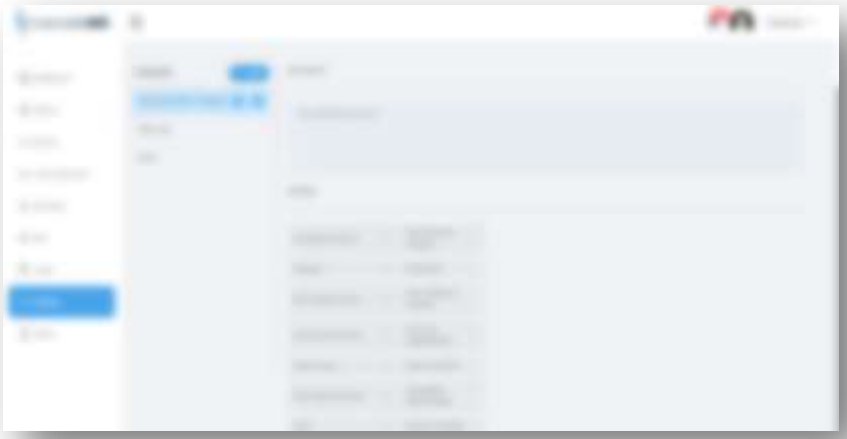

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Mobile View