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Univie: An App for Managing Digital Health Data of Refugees

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Abstract. The refugee crisis has reached historic proportions, with more than 82 million people on the run. Access to healthcare is often difficult for them due to a lack of medical records and language barriers. This paper examines a digital medical documentation system for refugees that captures, stores, and translates records. International data protection standards are considered. The contribution consists of designing a system that manages and translates medical data across borders and integrates a prediction model for epidemics in refugee camps.

Keywords. eHealth, digital health, innovation, refugees, health data, mobile app

1. Introduction

By the middle of 2022, the global count of forcibly displaced individuals had soared to 110 million, attributed to persecution, conflict, violence, human rights violations, or events severely disrupting public order[2]. Providing comprehensive and quality healthcare services to refugees and migrants facing various challenges such as language barriers, uncertain legal status, and economic difficulties is an urgent task. To address this need, a mobile health app called Univie is currently being developed. Univie allows users to store and retrieve personalized medical information in their native language and share it with healthcare professionals in different languages. The name "Univie" is made up of the words "universal" and "vie" (French for "life") and emphasizes the vision of saving lives. The objective of the paper is to address the following research questions pertaining to the creation of a health app for refugees.

- **RQ1:** What are the technical challenges and implications of developing an app for the cross-border storage and processing of medical data?
- **RQ2:** What eHealth systems and solutions are currently available for managing and sorting medical data for refugee populations?
- **RQ3:** What is the system design approach for developing a scalable cloud-based electronic health records model?

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[2] https://www.unhcr.org/refugee-statistics/

2. Methods

In this work, the scientific method of literature research is applied to analyze the existing solutions and identify the technical challenges. Additionally, interviews were conducted to gather stakeholder requirements for this system. Requirements analysis involves documenting stakeholder needs, continuously reviewed throughout the system's lifecycle. Stakeholders identified for the Univie-App include system administrators, refugees or patients, medical professionals or doctors, and non-profit healthcare organizations. The following functional requirements are defined for the Univie-App.

- **FR1**: The app must allow refugees to enter their medical information (metadata, illnesses, medications, etc.).
- **FR2**: The app must allow refugees to scan their medical documents (reports, therapies, X-rays, ultrasound images, etc.).
- **FR3**: The app must allow refugees to edit and delete their medical documents.
- **FR4**: The app must be capable of translating medical documents of refugees into different languages.
- **FR5**: The app must allow refugees to selectively share personal information or medical documents with medical professionals using generated QR codes or email in selected languages.
- **FR6**: The app must allow medical professionals to view shared medical documents from refugees in selected languages.
- **FR7**: The app must allow medical professionals to upload new medical documents or information to refugee accounts via a one-time QR code.
- **FR8**: The app must allow refugees to find registered medical professionals within the Univie or find non-registered medical professionals nearby via maps.
- **FR9**: The app must allow refugees to create reminders for their medication and doctor appointments.

The following NFRs are defined: **Connectivity:** Univie is expected to continue working with or without an internet connection. **Data protection:** Univie should be GDPR-compliant. **Usability:** Univie should be available in different languages and be easy to use. **Security:** The Univie-App must allow users to log in using multiple methods and provide secure storage in the cloud to protect against loss, accessible emergency profile, detailed medical profile only with patient consent. **Scalability:** Univie should be designed to scale up with increasing requests. **Availability:** Univie should be highly available and the data should be stored on several servers, as the app should be always accessible and usable for refugees at all times.

3. Results

The technical challenges of developing an app for cross-border storage and processing of medical data include ensuring data protection and security, compliance with international data protection standards [1,2], and user acceptance. The proposed microservices architecture in Figure 1 can address these challenges by ensuring scalability, availability, offline functionality, GDPR compliance, multi-method login (biometrics, passcode, secure 2FA authentication) [3]. The Univie-App represents a

promising solution to the challenges refugees face in accessing healthcare due to language barriers, lack of consistent medical records and long-term sustainability.

Figure 1 shows the proposed architecture. To ensure the non-functional requirements a Microservices architecture [4] is used. The system consists of various services including **Proxy-service**, **EHR-service**, **Share-service**, **Email-service**, **Translation-service**, and **Cloud-Storage-service**. The Proxy service acts as a gateway and checks the token before forwarding requests to the appropriate service. The EHR service manages information about refugees and their medical documents, while the Medical service allows refugees to search for medical professionals. The Notification service sends push notifications, and the Document service manages medical documents with the help of the Translation service. The Share service enables sharing of information and documents via QR code or email, which is sent using the Email service. The Translation service uses a cloud provider's service to translate documents, and the Cloud Storage is used to store documents.

After completing the system design and requirements analysis, a prototype of the Univie-App was developed as shown in Figure 2, showcasing the feasibility of the concept. Key functionalities (FR1 to FR5) have been successfully implemented, while FR6 to FR9 are pending and scheduled for the second release phase.

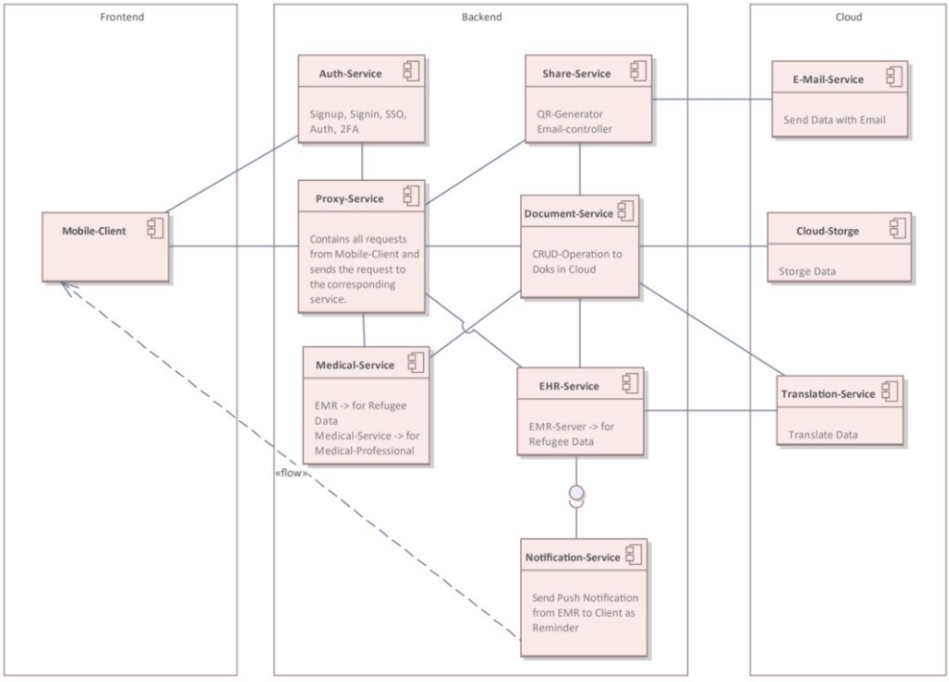

Figure 1. System component diagram for Univie.

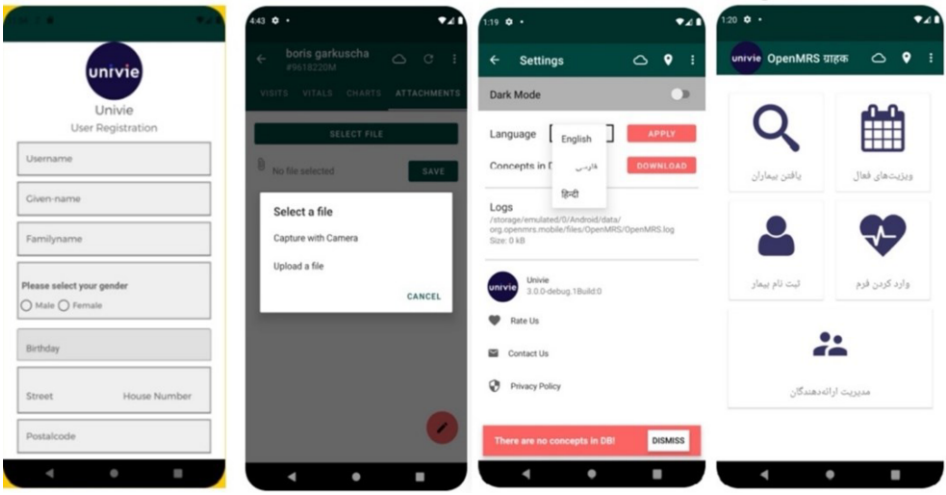

Figure 2. Prototype of the Univie mobile app.

4. Discussion

In this paper, the authors propose a digital medical documentation system for refugees, called Univie-App. The app captures, stores, and translates medical records and is designed to simplify interaction and workflows between different users, from data entry staff and administrators to end users such as healthcare providers and refugees. The paper addresses the technical challenges and implications of developing an app for cross-border storage and processing of medical data, and presents a system design approach for developing a scalable cloud-based electronic health records model. The authors also define functional and non-functional requirements for the Univie-App and present a prototype of the mobile app as a starting point for further development and implementation. Overall, the Univie-App represents a promising solution to the challenges refugees face in accessing healthcare due to language barriers and lack of consistent medical records [5]. However, data security and user acceptance remain critical challenges that need to be addressed [6]. The paper highlights the need for future research to focus on the implementation, user behavior, and acceptance of the app in different cultural and legal contexts, as well as scalability and long-term sustainability. The Univie-App has the potential to improve the quality and accessibility of healthcare for vulnerable populations, and this paper provides a valuable contribution to the field of eHealth and mobile apps for managing digital health.

In contrast to other approaches that address similar problems, such as Re-Health2[3], UNRWA e-Health [7] for Palestinians, and Sijilli [8] for Syrian refugees in Lebanon, Univie is not restricted to certain regions or languages. The proposed Univie-App shows distinct advantages when compared to these approaches. Unlike the Sijilli project, which relies on USB drives to store health records, Univie employs a robust cloud-based infrastructure, thus mitigating risks associated with physical media such as loss or

[3] https://eea.iom.int/re-health2

damage [9,8]. This is a critical improvement over systems like Sijilli that face operational challenges in crises or conflict zones where physical devices are particularly vulnerable.

5. Conclusions

In conclusion, the Univie-App provides a promising solution to the challenges refugees face in accessing healthcare due to language barriers and lack of consistent medical records. The app allows for cross-border storage and processing of medical data, enabling rapid integration of health data into existing systems. However, data security and user acceptance remain critical challenges that need to be addressed. Future research should focus on the implementation, user behavior, and acceptance of the app in different cultural and legal contexts, as well as scalability and long-term sustainability. Overall, the Univie-App represents a significant step forward in digital healthcare for refugees and has the potential to improve the quality and accessibility of healthcare for vulnerable populations.

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