ANKARA BİLİM ÜNİVERSİTESİ

SENG 244 - Object Oriented Software Engineering

NGO Aid Operations Management System : NGO-AOMSYS
AidFlow

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SOFTWARE DESIGN DOCUMENT

Software Design Document (SDD) describes design goals set by the project, subsystem decomposition (with UML class diagrams), hardware/software mapping (with UML deployment diagrams), data management, access control, control flow mechanisms, and boundary conditions. The SDD is used to define interfaces between teams of developers and serve as a reference when architecture-level decisions need to be revisited.

It also describes object design trade-offs made by developers, guidelines they followed for subsystem interfaces, the decomposition of subsystems into packages and classes, and the class interfaces. The SDD is used to exchange interface information among teams and as a reference during testing.

Audience

The audience for the SDD includes the project management, the system architects (i.e., the developers who participate in the system design), the developers who design and implement each subsystem and testers.

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Introduction

1.1 Purpose of the System

The purpose of NGO-AOMSYS is to address the challenges faced by Non-Governmental Organizations (NGOs) in managing the allocation and distribution of aid provisions to households in need. With households dispersed across various geographical locations, NGOs often struggle with efficiently managing and distributing aid resources, whether in-kind or in cash. NGO-AOMSYS aims to streamline this process and ensure that aid is allocated effectively to those who need it most.

1.2 Design Goals

The design goals of NGO-AOMSYS revolve around creating a comprehensive and user-friendly system tailored to the specific needs of NGOs operating within national boundaries. These goals include:

Developing a centralized platform for aid management that facilitates efficient allocation and distribution processes.

Ensuring transparency and accountability in aid allocation and distribution to enhance trust among stakeholders.

Implementing features for tracking aid utilization and assessing impact to improve decision-making and resource allocation strategies.

Enhancing communication and collaboration among NGOs, government agencies, and other stakeholders involved in aid provision.

1.3 Definitions, Acronyms, and Abbreviations

NGO-AOMSYS: Non-Governmental Organization Aid Management System

NGO: Non-Governmental Organization

Aid provisions: Resources provided by NGOs, including food, shelter, medical supplies, financial assistance, etc., to households in need.

1.4 Overview

NGO-AOMSYS is a comprehensive aid management system designed to address the challenges faced by NGOs in managing the allocation and distribution of aid resources. By providing a centralized platform for aid management, enhancing transparency and accountability, and facilitating communication among stakeholders, NGO-AOMSYS aims to optimize the impact of aid provisions and improve the lives of those in need.

2) Current Software Architecture:

Similar to NGO-AOMSYS, the donations management systems have been produced in charity donations and conflicts management in NGOs, in volunteer management, and in humanitarian aid. There are some examples below:There are some examples below:

2.1) Non-Profit Management Systems:

- Salesforce Nonprofit Success Pack (NPSP): NPSP is a complex CRM solution that has been tailored specifically to the non-profit organizations. It’s donor management, fundraising, tracking volunteers, and program management features including.

- Blackbaud Raiser's Edge: Raiser's Edge is an all-purpose fundraising and donor-management software which is very popular in the sector of nonprofits. It helps non-profits to focus on resources by facilitating donor relations management, streamlining the fundraising processes , and tracking donations.

2.2) Volunteer Management Platforms:

- VolunteerMatch: The VolunteerMatch website is an online place where volunteers can find non-profits with which they can join. This enables the volunteers to access opportunities tailored on location, interest or skills; while the organizations can post the opportunities and manage volunteers across the system.

- Better Impact: Besides this, Better Impact has a special volunteer management software that connects nonprofits and volunteers by means of providing leadership within the organization to improve the management process and team performance. It encompasses a wide range of functions including registering of volunteers, scheduling, organizing communication, and reporting.

2.3) Humanitarian Aid Management Systems:3. Humanitarian Aid Management Systems:

- UNHCR's ProGres: ProGres (PRiNO – PRofile, Registration and Operations online) is a software system implemented both by the UN High Commissioner for Human Rights (Rnik) and the IDPers to facilitate registration, managements and assistance delivery for refugees and IDPs.

- Red Cross Aid Management Platform: The Red Cross has created many assistance management platforms, which make the coordination of disasters possible, tracking of donations and provision of volunteering to take place whenever need occurs.

Usually such initiatives are accompanied by common functionality for the user registration as well as the donation management, volunteer coordination system, aid distribution and an administrative control. Hence, they adopt tools to develop stable and protecting products such as web applications frameworks, databases, and cloud services. Furthermore, they may adapt such services as mailing, SMS, mapping, and capturing for the extra features.

3- Proposed Software Architecture:

Overview:

* The architecture aims to create a robust and efficient system.

* It facilitates donation management, volunteer coordination, aid request processing, and operational scheduling.

* Designed to be modular, scalable, and secure for easy maintenance and future enhancements.

Subsystem Decomposition:

1-User Management Subsystem:

* Registration: Allows users (donors, volunteers, administrators) to create accounts.

* Authentication: Verifies user identity during login.

* Authorization: Determines access rights based on user roles (e.g., donor, volunteer, admin)

2-Donation Management Subsystem:

* Donation Entry: Enables donors to submit details about their contributions (e.g., monetary donations, supplies).

* Donation History Management: Tracks and maintains a history of all donations.

* Reporting: Generates reports on donation trends, donor activity, and impact.

3-Volunteer Management Subsystem:

* Volunteer Application: Allows individuals to express interest in volunteering.

* Profile Management: Volunteers can update their profiles, skills, and availability.

* Availability Tracking: Helps coordinate volunteer schedules for aid operations.

4-Aid Request Management Subsystem:

* Application Form Management: Provides a way for indigent people to request aid (e.g., food, medical supplies).

* Request Validation: Validates aid requests based on predefined criteria (e.g., urgency, eligibility).

* Aid Distribution: Ensures fair and efficient distribution of aid to those in need.

5-Operation Coordination Subsystem:

* Operation Scheduling: Coordinates aid activities (e.g., packing, delivery) based on available resources (donations, volunteers).

* Logistics Management: Handles transportation, storage, and distribution logistics.

* Stakeholder Communication: Keeps donors, volunteers, and aid recipients informed.

6-Algorithmic Analysis Subsystem:

* Data Analysis: Analyzes historical data (donations, requests, volunteer availability) to optimize resource allocation.

* Resource Allocation Algorithms: Determines how to best allocate resources (e.g., volunteers, supplies) for maximum impact.

* Scheduling Optimization: Optimizes aid operation schedules to minimize delays and maximize efficiency.

Hardware/Software Mapping :

* The system will be deployed on a cloud-based infrastructure to ensure scalability and availability.

* It will utilize a relational database management system (RDBMS) for persistent data storage.

* The application will be developed using a modern web development framework, ensuring compatibility with various devices and browsers

Persistent Data Management :

* Data related to users, donations, volunteers, aid requests, and operational activities will be stored in a relational database.

* The database design will prioritize data integrity, consistency, and security.

* Regular backups will be performed to prevent data loss

Access Control and Security :

* Access to the system will be controlled through user authentication and authorization mechanisms.

* Password hashing and encryption will secure sensitive user information.

* Role-based access control (RBAC) will restrict access to certain functionalities based on user roles.

* The system will employ HTTPS protocol for secure communication over the internet

Boundary Conditions :

* The system will be accessible via a web interface, allowing users to interact with it from any device with internet connectivity.

* It will support multiple languages and provide a user-friendly interface for ease of use.

* Integration with external services (such as payment gateways, email providers, and SMS gateways) will ensure seamless communication and transaction processing

Subsystem Services Glossary :

User Management Services:

* Registration, authentication, and authorization.

Donation Management Services:

* Donation entry, donation history management, and reporting.

Volunteer Management Services:

* Volunteer application, profile management, and availability tracking.

Aid Request Management Services:

* Application form management, request validation, and aid distribution.

Operation Coordination Services:

* Operation scheduling, logistics management, and stakeholder communication.

Algorithmic Analysis Services:

* Data analysis, resource allocation, and scheduling optimization

4- Object Design

Object-Oriented Design Principles for Healthcare Donors: Streamlining Efficiency and Impact

Healthcare donors play a critical role in supporting medical research, program development, and access to care for vulnerable populations. However, managing complex data sets, diverse funding requests, and evolving program structures can create operational challenges. Here's where object-oriented design (OOD) principles can make a significant impact.

What are OOD principles, and how can they benefit healthcare donors?

OOD is a software development approach that focuses on creating reusable and modular components called "objects." These objects encapsulate data (attributes) and functionality (methods) related to a specific entity within the system. For healthcare donors, OOD offers several advantages:

Reduced Complexity: Donor organizations juggle data on programs, funding streams, grant applications, beneficiaries, and partner institutions. OOD principles encourage the creation of distinct objects for each entity, with specialized data fields and functions. This simplifies data management, improves organization, and simplifies queries for program evaluation or impact analysis.

Enhanced Maintainability: Traditional, monolithic code structures can become unwieldy and prone to errors as functionalities expand. OOD promotes modularity, where changes to one object's code have minimal impact on others. This reduces debugging time, simplifies future updates, and lowers long-term maintenance costs.

Improved Scalability and Reusability: As donor organizations scale their operations or introduce new program areas, OOD's focus on reusable components proves invaluable. Existing object functionalities can be adapted or inherited by new objects, accelerating system development and reducing redundancy in code. This empowers healthcare donors to adapt to evolving needs and deploy new initiatives more efficiently.

Concrete OOD Applications for Healthcare Donors:

Let's delve into specific examples of how OOD principles can be implemented in donor management systems:

Donor Object: Attributes like name, contact information, giving history, and preferred areas of support would reside within this object. Methods could include generating donation receipts, tracking communication history, and assessing eligibility for specific funding streams.

Grant Application Object: This object would capture details like program description, budget breakdown, target beneficiaries, and evaluation metrics. Methods might include calculating funding eligibility based on pre-defined criteria, routing applications for review, and generating reports on application status.

Program Object: This object would encapsulate data on program goals, timelines, budget allocation, partner institutions, and impact metrics. Methods could include generating reports on program performance, tracking resource utilization, and monitoring progress towards established goals.

Exception Handling and Data Validation: Utilizing exception handling mechanisms within OOD ensures data integrity and system robustness. For instance, attempting to submit a grant application with incomplete data triggers an exception, notifying the user and preventing invalid data entry.

Beyond the Basics: Advanced OOD Considerations for Healthcare Donors

While the examples above provide a starting point, healthcare donors can leverage more advanced OOD concepts to further optimize their systems:

Inheritance: Create a base "Funding Opportunity" object with common attributes and methods like application deadlines and eligibility criteria. Grant programs can then inherit these functionalities and add specific details.

Polymorphism: Develop a "Report Generation" method within the Program object that can be customized to generate reports on various aspects like budget allocation or beneficiary demographics.

Object-Relational Mapping (ORM): Utilize ORMs to seamlessly map OOD objects to a relational database, simplifying data persistence and retrieval for further analysis or reporting.

Conclusion: Empowering Healthcare Donors with OOD

By embracing OOD principles, healthcare donors can build robust, efficient, and scalable software systems that streamline their operations. With a focus on modularity, reusability, and data integrity, OOD empowers healthcare donors to manage complex workflows effectively, maximize their impact, and ultimately contribute more significantly to improved health outcomes.