System Design
Child Sponsorship and Analytics for AMG Guatemala

To be submitted to the Department of Mathematics and Computer Science
Gordon College
in partial fulfillment of the requirements for the degree of
Bachelor of Science in Computer Science

by

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1. Introduction

1.1 Purpose of the system

The purpose of this system is to provide local Guatemalan donors the opportunity to support children in their own country and to help AMG Guatemala better focus their aid efforts through computed analytics on the data they will be storing. Although it is still unknown if there will be time at the end of the core functionality development for additional work done with analytics, the system will be designed with this option available by further development teams.

1.2 Design goals

The primary objective of this system is to provide child sponsorship functionality to AMG International's website and provide local Guatemalan donors the opportunity to support children in their own country.

1.3 Definitions, acronyms, and abbreviations

AMG Guatemala - division of AMG International which focuses specifically on missions in Guatemala.

AMG International - parent non-profit of AMG Guatemala encompassing all of the countries that AMG supports.

Banco G&T - Bank supporting AMG Guatemala's finances

Banco Rendimento - Online financial transaction service AMG Guatemala would like to leverage for managing online donor payments

GoDaddy - DNS registry that AMG Guatemala currently uses for managing their web infrastructure

MongoDB - NoSQL document database that will be used for storing child and sponsor information

Node.js - an open source, cross platform runtime environment for developing server side web applications

Woord en Daad - Dutch, Christian, non-profit organization both sponsoring children and providing databases that AMG Guatemala uses currently to store child, school, and donor information

1.4 References

Brian Dennett - President of AMG Guatemala, project sponsor

Carlos Rios - Web Developer located in Guatemala who developed AMG Guatemala's Spanish website

Alex Orellana - Technical Director for AMG Guatemala

Russ Tuck - School Advisor and Consulting Professor.

1.5 Overview

With the 2011 - 2015 five year plan complete, Advancing the Ministries of the Gospel (AMG) Guatemala, a Christian non-profit based in the country of Guatemala, begins a new five year marathon focusing on utilizing local resources. Among the many ideas for leveraging Guatemalan resources, none is more ready for implementation than providing child sponsorship through AMG Guatemala instead of through the larger group, AMG International. Right now, child sponsorship is only available to English speaking, domestic donors through AMG Guatemala's parent group, AMG International. This will allow native Guatemalans to support children in their own country, instead of having the rely solely on international donors.

2. Current software architecture

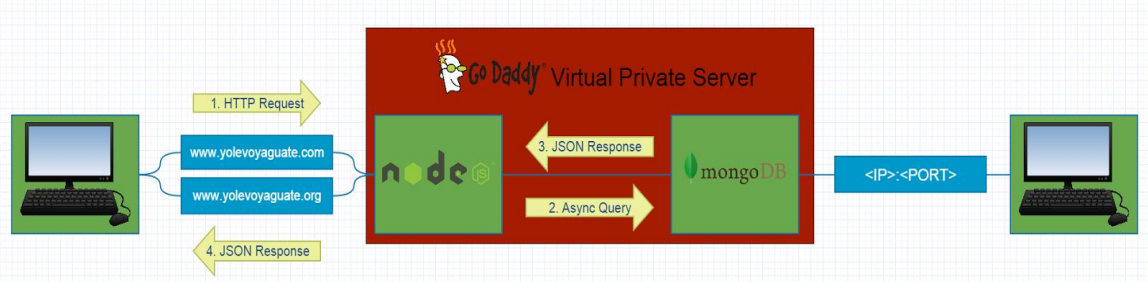
Currently there are three databases used by AMG International located in the Netherlands, Canada, and the United States. Data is stored across these three databases and is not duplicated across different databases. Information stored in these databases is maintained by AMG International and the data is stored in English. As of right now, donations are collected and dispersed by AMG International which makes it difficult for AMG Guatemala who operates in the Guatemalan currency.

3. Proposed software architecture

3.1 Overview

As previously stated, our system will be providing child sponsorship functionality to AMG Guatemala. The server will be running a version of Node.js to be determined later. The choice in using Node.js was made for it's single-threaded speed and lightweight capability. Node.js is an industry standard when dynamically creating pages for a website that are driven by a backing database that have both the front and back end hosted on the same server. Below is a diagram that explains the structure of our system.The system we will be designing and creating will be hosted on a virtual private server on GoDaddy where AMG Guatemala is already hosting their Spanish website. The MongoDB database that we will create will contain information on all newly added unsponsored Guatemalan children as well as a randomly selected subset of the unsponsored children from each of the three databases currently used. These databases are provided by AMG International, Woord en Daad, and a Canadian vendor. These unsponsored children will be selected randomly from AMG Internationals databases and will be removed from AMG Internationals databases once they are migrated to our database.

3.2 Subsystem decomposition



Node.js - a JavaScript framework for client/server interaction. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient.

MongoDB - a performance centered document database with extensive Node.js integration. Because the documents stored in MongoDB are JSON documents, Node.js is a natural fit because the data can be easily converted into a JavaScript object.

Mongo-Express - a web UI for managing MongoDB. Both computer and mobile support.

GoDaddy - GoDaddy is a domain registry and hosting service provider. Our client has been using their services for several years and would like to stay with them.

Banco Rendimento - the service provider we will be leveraging for managing financial transactions within our system, will provide an interface and an API for automated transactions.

3.3 Hardware/software mapping

All parts of our system will be hosted on a GoDaddy virtual private server. The system we will create will potentially need automated communication with databases located in the Netherlands, Canada, and the United States. The need for this though is still in the process of being evaluated.

3.4 Persistent data management

We will be storing the data for all newly added Guatemalan children as well as half of the unsponsored children from each of the three databases currently in use in a MongoDB instance we will be creating. Data backups will be saved either in another virtual private server hosted by GoDaddy, or on premise at AMG Guatemala's site in

Guatemala City. Donor personal financial information will not be stored by our system, but will only be transferred through to Banco Rendimento.

3.5 Access control and security

As the Virtual Private Server with the MongoDB instance will be publicly accessible, SCRAM-SHA-1 will be used to provide authentication. AMG Guatemala employees will have to login to access the database using a username and password through a socket on the GoDaddy VPS.

3.6 Global software control

Our system will have to take half of the unsponsored children from the three databases currently in operation and store them in our MongoDB system. Our client has expressed interest in using this as their main data warehouse, however this would require automated mirroring across four warehouses. As previously stated above, the need for this automation is still in being evaluated.

3.7 Boundary conditions

Any read/write errors with MongoDB will be handled by the service itself. There are however a potential few boundary cases with user's attempting to sponsor the same child. There is the case where a donor sponsors a child while another donor is attempting to sponsor the same child. In order to solve this issue once a donor lands on the page to enter their financial information, the child or children they have selected will be locked by the database. We will have a default timeout period of 30 minutes before the child documents are unlocked and the donor will have to re-enter their information. The child documents will stay locked until the donor has submitted their sponsorship information or the timeout period is reached.

4. Subsystem services

N/A