Software Requirements Specification

for the Digital Medical Assistant

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Change Log
- *Version 1.0 (02-26-2010): Document created.*

1. Introduction

1.1 Purpose

This Software Requirements Specification is intended to document the requirements for the Digital Medical Assistant (DMA). The requirements were gathered through consulation with Professor Rabah and the other students in the Mobile Application Design and Development class.

1.2 Context (or scope)

The Digital Medical Assistant serves as an aid to a healthcare provider needing to keep patient information organized and available from a wide variety of mobile devices (iPhone/iPod Touch, Android, and BlackBerry). The Digital Medical Assistant will offer an intuitive interface that effectively aggregates patient information in a task-oriented way. The information is presented in the context of a personal calendar and scheduler, which is likely to be an essential tool for all healthcare providers in the performance of their duties during each day. Patient information will be included with patient appointments that would be overlayed on the provider's personal calendar. The healthcare provider will have the option to write and store electronic notes and other media depending upon the capabilities of the device. All of this data will also be available offline so that a mobile device without network connectivity can still gain access to this information. If the calendar entry includes location information such as where the appointment is, then the application will interface with the mapping application on the mobile device if one is available and offer directions.

The benefits of the Digital Medical Assistant will be far-reaching. The value of electronic health records is well documented as a part of eHealth initiatives and it is surely going to become even more important as it becomes necessary to further automate and streamline workflow in healthcare along with the benefits that come from making communication between pharmacies, clinics, etc. easier. With the popularity of smartphones such as the iPhone, BlackBerry, etc, and the increasing capability of these devices, an opportunity exists to extend these kinds of capabilities beyond client PCs to smartphones. A healthcare provider no longer needs to locate a workstation in order to access patient information among other things. He or she can instead access this data from anywhere at anytime with a mobile device interface.

1.3 Definitions, Acronyms, and Abbreviations

Acronyms and Abbreviations:
a. DMA: Digital Medical Assistant: the software application that is being discussed in this requirements specification.
b. SRS: Software Requirements Specification: this document

c. eHealth: a term used to refer to healthcare practice that is supported by electronic processes and communication.

d. mHealth: a term used to refer to an extension of eHealth concepts whereby electronic healthcare processes and communication are supported by mobile devices.

e. EHR: Electronic Health Record: a collection of electronic health information about individual patients that's in digital form and can be shared amongst different healthcare providers. In the context of this document, EHR and Google Health record are used interchangeably.

f. HIPAA: Health Insurance Portability and Accountability Act: an act enacted by Congress that dictates national standards for electronic health care privacy among other things.

g. GUI: Graphical User Interface: a graphical interface to a software application, as opposed to a text-based interface, offers graphical elements to represent the information and actions available to an end-user.

h. WWW: World Wide Web: a collection of hyper text documents accessed via the Internet.

i. JEE: Java Enterprise Edition: a widely used platform for server programming in the Java programming language.

j. JME: Java Mobile Edition: a Java platform for mobile devices.

Definitions:

a. iPhone: refers to a line of smartphones made by Apple that are both Internet and multimedia-enabled. The smartphone incorporates a multi-touch screen with a virtual on-screen keyboard, camera phone, media player, and Internet client.

b. BlackBerry: refers to a line of wireless devices made by Research in Motion. Capabilities vary amongst the line of devices, and they are known for being the most popular smartphone among business users. In this context, the class of BlackBerry device being referred to is the smartphone.

c. Android: refers to any wireless device that uses the Android operating system that was developed by Google. Android mobile phones differ greatly in capability. In this context, the class of Android device being referred to is the smartphone.

d. Java: a system for developing cross-platform application software.

e. Objective-C: an object-oriented programming language primarily used on Apple's Mac OS X operating system and the iPhone operating system.

1.4 References

None at this time

1.5 Overview

This document is designed to provide information to both the client and the technical designers and developers of the DMA. Section 1 provides a brief overview of the product,

including definition, acronyms, and references. The definitions and acronyms section is meant to clarify the terms used through this requirements specification. Section 2 provides a general description of the product requirements from the end-user's perspective. It includes some general constraints while making the software, assumptions, and functional and data requirements. Section 3 provides detailed product requirements from the technical developer/designer's perspective. These are the requirements that the product is expected to deliver with functional requirements being communicated with various use cases. Section 4 discusses the Change Management Process that will be used to manage changes to this document as the project scope and/or requirements change. Section 5 includes supporting information in the form of Appendices.

2. The Overall Description

2.1 Product Perspective

The Digital Medical Assistant is independent and not a component of a larger system.

2.1.1 Software Interfaces

The Digital Medical Assistant will be made available in the form of a server application and client application with client builds for each supported device platform. The server application will run within a JEE Application Server, which is a prerequisite for the Digital Medical Assistant, such as Tomcat or the SpringSource dm Server. The client will support the iPhone, BlackBerry, and Android platforms and will be made available in the form of an executable for each platform. The external libraries/platforms required are described below.

(1) *Java Standard Edition Development Kit or Java Standard Edition Runtime Environment 6*
(2) *JDK 6 or JRE 6*
(3) *Version 1.6*
(4) *Sun Microsystems (http://java.sun.com/javase/downloads/index.jsp)*
(5) *Development of the server-side/client-side DMA application will require a Java Development Kit*

(1) *SpringSource dm Server v2.0*
(2) *SDS v2.0*
(3) *Version 2.0*
(4) *SpringSource (http://www.springsource.com/products/dmserver)*
(5) *The DMA consists of a JEE-based server application based on the Spring Web MVC framework that will execute within the SpringSource dm Server (JEE Application Server)*

(1) *GoogleData Application Programming Interface Eclipse Plugin v1.0*

(2) Google GData API Plugin v1.0

(3) Version 1.0

(4) Google Code (http://code.google.com/p/gdata-java-client-eclipse-plugin/)

(5) The DMA leverages the Google Calendar service and the Google Health service, both of which provide an API for consuming service functionality. The Google GData API Plugin offers a development environment for building applications that leverage the GData APIs.

(1) BlackBerry Java Development Environment Plugin for Eclipse v1.0

(2) BlackBerry JDE v1.0

(3) Version 1.0

(4) BlackBerry Developer Zone (http://na.blackberry.com/eng/developers/javaappdev/devtools.jsp)

(5) The DMA consists of a BlackBerry client, the development of which requires an Integrated Development Environment. The BlackBerry JDE v1.0 offers such a development environment that also includes BlackBerry device simulators to test BlackBerry applications being developed

(1) Android Development Tools Plugin for Eclipse v0.9.5

(2) ADT Plugin v0.9.5

(3) Version 0.9.5

(4) Android (http://developer.android.com/sdk/eclipse-adt.html)

(5) The DMA consists of an Android client, the development of which requires an Integrated Development Environment. The ADT Plugin v0.9.5 offers such a development environment that also includes Android device simulators to test Android applications being developed.

(1) iPhone Software Development Kit v3.1.3

(2) iPhone SDK v3.1.3

(3) Version 3.1.3

(4) Apple Developer Connection (http://developer.apple.com/iphone/index.action)

(5) The DMA consists of an iPhone client, the development of which requires an Integrated Development Environment. The iPhone SDK v3.1.3 offers such a development environment that also includes iPhone device simulators to test iPhone applications being developed.

2.1.2 User Interfaces

All interaction with the end-user shall be via the DMA GUI on either an iPhone, BlackBerry, or Android device. The interface provided will be graphical. The interface will offer either a monthly, weekly, or daily view of the user's personal calendar with calendar events showing as appropriate. The interface will allow the user to create calendar events corresponding to patient appointments, for instance. The interface will allow for the viewing of calendar event details and will also combine event detail with the patient's EHR if the event involves a patient with an EHR. The interface will offer

driving directions from where the user is to where the user needs to be for a particular calendar event if the event includes location information. This mapping functionality will only be available if the mobile device includes GPS hardware and a mapping application such as BlackBerry Maps is available on the device. The interface will allow the healthcare provider to also annotate the patient's EHR as appropriate by adding any electronic notes.

2.1.3 Memory Constraints

No memory constraints exist other than the resource limitations of each mobile device that is supported.

2.2 Product Functions

The functionality of the DMA was discussed earlier to some extent. In this section, use cases will be presented for the one class of user that the DMA will have. The requirements were gathered by researching the concept of electronic health records, thinking about the advantage of mobility solutions in such an area, and discussion with the professor and students in the class.
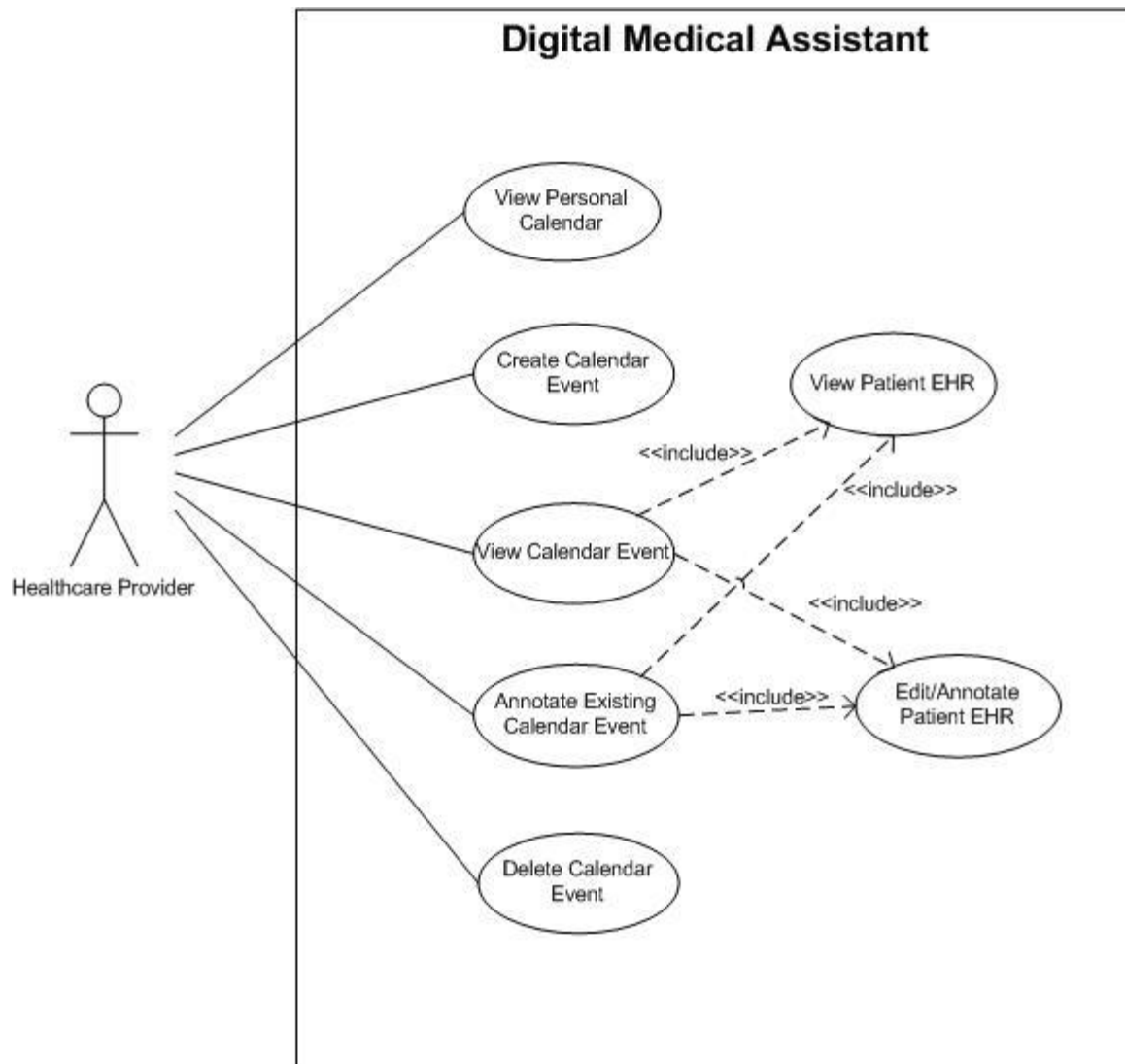
Figure 1.1: DMA User Use Case Diagram

Use Case descriptions:

- **View Personal Calendar:** Upon launching the DMA, the user will be challenged for credentials that will authenticate the mobile user to both the Calendar and Scheduling service (Google Calendar) and the Electronic Health Records service (Google Health). The user will then be shown their personal calendar with calendar events overlayed. The user can choose to view their calendar in a daily, weekly, or monthly view.
- **Create Calendar Event:** The healthcare provider using the DMA can create a calendar event to represent a patient appointment, for instance. The form will include input fields for things like the "what", "when", "where", and description for the calendar event along with a unique identifier associated with the patient if the calendar event is for a patient. That patient identifier will be used to later

query Google Health for an EHR for the patient if one is available and the healthcare provider has access to it.

- **View Calendar Event:** The user can click on a specific calendar event and see the event details. If the calendar event involves a patient and a patient's EHR is available, the EHR will be linked to the calendar event and available for viewing as is documented in the shared use case "View Patient EHR."
- **View Patient EHR:** A duplicated activity that refers to viewing a patient's EHR that has been linked into a particular calendar event being viewed.
- **Edit/Annotate Patient EHR:** A duplicated activity that refers to editing or annotating a patient's EHR that has been linked into a particular calendar event being viewed.
- **Annotate Existing Calendar Event:** The user may edit an existing calendar event by changing event attributes like the location, description, etc. or can add electronic notes or other media depending on the capabilities of the mobile device.
- **Delete Calendar Event:** The user can delete a calendar event if desired.

2.3 User Characteristics

The target clients for the DMA are healthcare providers with either an iPhone, BlackBerry, or Android smartphone that have a need for a mobile C&S application that can also interface with an EHR service (Google Health). The user is expected to have basic proficiency with a PC and a specific supported smartphone that will enable him or her to use the DMA in the performance of their day-to-day job.

2.4 Constraints

No constraints have been identified.

2.5 Assumptions and Dependencies

No assumption or dependancies identified.

2.6 Apportioning of Requirements.

Some ideas for future versions of the DMA follow. This application offers a mobile interface to capabilities that build on what Google Calendar and Google Health offer. Google Calendar and Google Health certainly aren't the only services of their kind. Future support could be provided for Windows Live Calendar (http://calendar.live.com/calendar) and Microsoft HealthVault (http://www.healthvault.com/Industry/index.html) as alternatives. This application supports the iPhone, Android, and BlackBerry smartphones. Support could be added for additional platforms like the Palm. In order to support linking in and adding richer

content to calendar events and EHRs, this application could use the capabilities of Google Documents.

3. Specific Requirements

3.1 External Actor Descriptions

3.1.1 Human Actors

Healthcare Provider   The healthcare provider employs the DMA as a tool in the performance of his or her day-to-day job. It is a both a mobile C&S and EHR management application. The characteristics of this user were described in section 2.3. The healthcare provider is the only entity that is external to the DMA and interacts with the DMA.

3.1.2 Hardware Actors

No Hardware Actors exist for the DMA.

3.1.3 Software System Actors

No Software System Actors exist for the DMA.

3.2 Use Case Descriptions

Please refer to Figure 1.1 in section 2.2 for the Use Case Diagram. Each use case in that diagram is further discussed below.

3.2.1 View Personal Calendar

a. Introduction: The DMA shall allow the user to access his or her personal Google Calendar.
b. Inputs: The user will have authenticated to the DMA server and also, by extension, Google Calendar so that's the extent of the user's input required for this use case.
c. Processing: No processing is performed.
d. Outputs: The only visible output will be the user's personal Google Calendar displayed on his or her mobile device.

3.2.2 Create Calendar Event

a. Introduction: The DMA shall allow the user work with his or her Google Calendar. An appropriate form will be presented to the user so that he or she can create a calendar event.

b. Inputs: The DMA will present a form where the user may enter the attributes for the calendar event such as the "what", "when", "where", description, etc. The DMA data model will be detailed in the DMA Design specification.

c. Processing: Once the user directs the DMA to save his or her calendar event, the DMA will ensure that data has been provided for all required fields, and then save the calendar event.

d. Outputs: Only visible output on the screen would be a confirmation message that the calendar event has been saved if the user directed the DMA to save his or her calendar event. The DMA would save and add the calendar event to his or her Google Calendar

3.2.3 View Calendar Event

a. Introduction: <u>The DMA shall</u> allow the user to view calendar event details. The user may view details of the calendar event and/or view the patient's EHR as described in the shared use case "View Patient EHR."

b. Inputs: No user input is required other than the selection of the calendar event on the calendar to view with standard input methods for the mobile device.

c. Processing: No processing is performed.

d. Outputs: Visible output on the screen will consist of the details of the calendar event selected along with any additional information available such as the patient's EHR as described in the shared use case "View Patient EHR."

3.2.4 Annotate Existing Calendar Event

a. Introduction: <u>The DMA shall</u> allow the user to edit/annotate a selected calendar event. Details of the event may be edited along with being able to add electronic notes and other media based on the capabilities of the mobile device.

b. Inputs: The user must provide the information that he or she wants to edit or add to the calendar event and then save the updates.

c. Processing: Once the user directs the DMA to save his or her calendar event, the DMA will ensure that the data is valid and then save the calendar event.

d. Outputs: Only visible output on the screen would be a confirmation message that the updated calendar event has been saved. The DMA would save the updated calendar event to his or her Google Calendar.

3.2.5 Delete Calendar Event

a. Introduction: <u>The DMA shall</u> allow the user to delete a selected calendar event. Deleting a calendar event will delete the information stored with the calendar event including all attachments except a patient's EHR if that's been linked in.

b. Inputs: No user input is required other than the selection of the calendar event on the calendar to delete with standard input methods for the mobile device.

c. Processing: Once the user directs the DMA to delete his or her calendar event, the calendar event will be deleted from the Google Calendar.
d. Outputs: Only visible output on the screen would be a confirmation message that the calendar event has been deleted. The DMA would delete the calendar event from the Google Calendar.

3.2.6 View Patient EHR

a. Introduction: The CVDS shall allow the user to access a patient's EHR from the relevant calendar event if the calendar event has a patient associated with it. This EHR is accessed from Google Health as a Google Health record.
b. Inputs: The user must select the calendar event and then select the action to display the patient's EHR using standard input methods for the mobile device.
c. Processing: No processing is performed.
d. Outputs: The Google Health record for the patient will be presented on the mobile device's screen.

3.2.7 Edit/Annotate Patient EHR

a. Introduction: The DMA shall allow the user to edit/annotate the patient's EHR provided that the user is authorized to perform such actions on the Google Health record. Access control is handled by the patient and access must be explicitly granted to the DMA user.
b. Inputs: The user must provide the information that he or she wants to edit or add to the patient EHR and then save the updates.
c. Processing: Once the user directs the DMA to save updates to the patient EHR, the DMA will ensure that the data is valid and then save the updated EHR.
d. Outputs: Only visible output on the screen would be a confirmation message that the patient's EHR has been saved. The DMA would save the updated EHR back to Google Health.

3.3 Performance Requirements

There are no specific performance characteristics for the DMA that have been uncovered during requirements gathering.

3.4 Logical Data Requirements

The data model for this application follows from the data model for Google Calendar and Google Health. Both data models will be studied in depth and a combined data model for DMA will be detailed in the design specification and a series of User screens will follow from that data model specification.

3.5 Software System Attributes

3.5.1 Reliability

Other than as a result of an operating system error, the DMA shall never crash or hang.

3.5.2 Availability

There are no specific availability requirements for the DMA.

3.5.3 Security

The specific security and privacy requirements are usually dictated by HIPAA for applications of this kind. However, due to the infancy of eHealth/mHealth/EHR and the capabilities of the services utilized under the covers (Google Health and Google Calendar), the degree to which the DMA will be HIPAA compliant is directly related to how HIPAA compliant Google Health is. Basic security mechanisms will be employed such as authentication, authorization, channel encryption, etc. Device level security will prevent access to the DMA by unauthorized persons and access to Google Health and Google Calendar require Google authentication.

3.5.4 Maintainability

All code shall be fully documented and the code shall be modular to permit future modifications.

3.5.5 Portability

The DMA will be made available for use with the iPhone, BlackBerry, and Android platforms. Other devices aren't supported. The DMA for the BlackBerry and Android platforms is Java-based, but won't be developed as a cross-device application due to the non-standard J2ME/Device APIs available for device programming on those devices. The DMA for the iPhone will be written as an Objective-C application.

3.5.6 Other quality characteristics

There are no additional quality characteristics for the DMA that have been uncovered during requirements gathering.

4. Change Management Process

This will be a living document and so a Change Log will be created and maintained with this document. Each change requested by the client must be discussed by all of the project stakeholders and accepted only after careful analysis of the risk involved with introducing the change. Communication with the client will happen on an on-going basis and so changes to requirements would likely be brought up during one of these meetings. The client may then submit via email a description of the change requested and why the change is being requested.

5. Supporting Information

No additional supporting information at this time.