TEAM4OIES

Software Requirements Specification (SRS)

# of Actors: ***5***

# of UCs: ***12***

# of Functional Requirements: ***9***

# of Non Functional Requirements: ***7***

Version *2.0*

Approvals Signature Block

COSC 4351	Name	Signature	Date
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The document in this file is adapted from the IEEE standards for Software Project Requirements Specifications, 830-1998, which conforms to the requirements of ISO standard 12207 Software Life Cycle Processes. Tailor as appropriate.

Items that are intended to stay in as part of your document are in **bold**; *blue italic text is used for explanatory information that should be removed when the template is used.*

Table of Contents

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1. INTRODUCTION

Software Requirements Specification document will contain a complete understanding of what the software with contain and everything that will be required for the software. This document should allow everyone to understand the requirements for the software.

1.1 PURPOSE

The SRS is a self-sufficient contract between the Customer and the Software Development Team. This document will serve as a contract. This is the only document that will need to be signed by the Customer to ensure that there is an understanding between the Customer and the Software Development Team.

1.2 SCOPE

The software product that will be produced will be a uploading and downloading system to help with the analysis of EVAR data. This will allow doctors to view patient CT scans, and allow for the downloading of non-specific data only pertaining to the measurements and statistics of the CT scan. Confidential patient data will not be allowed to be downloaded, stored, or viewed by anyone.

1.3 DEFINITIONS, ACRONYMS, AND ABBREVIATIONS

Term or Acronym	Definition
UC	Use Case which is how users will perform tasks.
SRS	Software Requirements Specification, this document

Table 1. Definitions and Acronyms

1.4 REFERENCES.

Documents Referenced:

- SE Team Project with Line Numbers for UML USE CASE DIAGRAM
- UML Class Diagram
- Input Forms and Output Reports
- Database Requirement Specifications

1.5 OVERVIEW

Through this document it will be understood what the interfaces are and their descriptions. The constraints of this software and any special adaptations that are needed will be mentioned. Functionality of the software will be described through this document. The second section of this document will cover a brief explanation of the previously described parts of the program. The third section of this document covers more specific areas branching from the second section.

2. Overall Description

This product will be a database and data manipulation software that will aid in the EVAR study that the customer is performing. The customer will be able to interface with the data in the database via a website.

2.1 Product Perspective

This product will serve as a database and data manipulation software for the customer's medical study. Our product will serve as a tool to allow surgeons, hospital technicians, and computational scientists involved in the EVAR project to upload and download patient information. Specifically, this software will store CT scans and slice data for each CT scan. This will allow hospital staff to evaluate the data and what it means for that patient and the overall medical study.

2.1.1 System Interfaces

Our website will be hosted on a server from the Computer Science department at the University of Houston. We will be utilizing MySQL as a database management system, to create a database that will store all data in this system. The DBAs of our team are tasked with maintaining this database.

The website will be designed and implemented using C#, ASP .NET, and HTML languages. Visual Studio will function as an integrated development environment in aiding us with the development of the front end and website.

2.1.2 User Interfaces

The website will act as our user interface. It will present a simplistic design while fulfilling the requirements stated in the SE Team Project with Line Numbers document. The site will feature a home page, an "About Us" page, a testimonials page, and a contact page. These pages will each be simple to navigate to in a clear manner that follows the "three click" rule. A chat box will be implemented onto the website, as a floating box on the right-hand side of the window of each page. That is, during a visitor's navigation of our site, the chat box will remain present on the screen and will remain uninterrupted during browsing. There will be a search bar on the testimonials page, so that visitors can browse testimonials about the EVAR study by searching for keywords.

2.1.3 Hardware Interfaces

The website will be hosted on a shared Linux server, with HTTP and HTTPS as the main types of protocols of communication. We aim to support most of the browsers, especially Mozilla Firefox, Google Chrome, Internet Explorer, and Safari. The website will be fully tested in sandbox before being released to the customer. All files for our software will be created locally on personal computers and then uploaded to the server using FTP.

2.1.4 Software Interfaces

Microsoft Visual Studio 2010 will be used to fill an IDE requirement. Some text editors, such as notepad or Notepad++, will be used to create some C# or HTML files. We plan on using MySQL to create and maintain the database of this product.

2.1.5 Communications Interfaces

The various communications interfaces that we can expect our product to utilize include HTTP, HTTPS, TCP, UDP, IP, and FTP.

2.1.6 Memory Constraints

There is a constraint on the available space for which we can upload data into our database. The database for this project will be hosted on a shared high-traffic server, so each product team is allowed only a few gigabytes of memory to use. Because the CT scan files that our users wish to upload are so large, this constraint greatly affects the robustness of our product.

2.1.7 Operations

Different types of users will have different available operations. For example, the surgeon and computational scientist will be able to upload and download data, while the medical technician can only upload data. Database administrators will be able to create and monitor user accounts. General users, who will simply be visiting the website, will only have browsing, and chat capabilities. Backup and recovery operations will be handled by the team DBAs when needed

2.1.8 Site Adaptation Requirements

In order to fit the requirements, testimonials should be able to be added to the site. They need to remain searchable. All pages must be allowed to be edited at customer's discretion. The data that is being uploaded onto the site will need to remain available only through the database.

2.2 Product Functions

The primary function of this product is the storage of CT scan files and the categorization of those scans based on the patient they refer to. The product will allow users, including computational scientists, technicians, surgeons, and website visitors to create an account. It will provide hospital technicians with a database to upload CT scan data and slice data for each CT scan. This will then allow surgeons or other users allowed access to the slice data the ability to view and download the anonymized patient data made available on the EVAR database. The product will include a front-end website for users and involved hospital staff to interface with to upload data, download data, and inquire about the EVAR study. The website will include a chat box for any user, primarily the generic website-visitor, to ask questions to support staff live about the research and the EVAR study. There will also be pages on the website including a contact page, testimonials, and "about us".

2.3 User Characteristics

The intended users of this product will generally include any hospital staff helping with this EVAR study. These will include: surgeons working on the research project, hospital technicians, and computational scientists that are working to evaluate the data. There are also generic users that will be able to interact with the system on the website, but these users will not be able to upload or download any data.

2.4 Constraints

There will be a necessary anonymizing requirement for any data added to this database. As such, there is a limit to the amount of personal information of each patient file. This requires that no names will be included in each patient file, but rather each patient will be distinguished by an ID number. There is a constraint on how much data we will be able to put onto our database, as it will be on a high-traffic shared server. This data constraint translates directly to a constraint of patient CT files we will be able to store.

2.5 Assumptions and Dependencies

One assumption that is being made is that the users will be able to interact with our interface well enough to upload data onto this database. Another assumption is that we will eventually have enough space available to store large amounts of CT scan files, as these files are each very large. These assumptions may affect the requirements stated in the SRS.

2.6 Apportioning of Requirements

It is possible that requirements related to making this database more large-scale and eventually an international system will have to be delayed until future versions of the system. Our team does not have the resources, namely in terms of memory, to allow this database system to be that large.

3. Specific Requirements

The software product TEAM4OIES requires many inputs from surgeons and facilities in order for it to work as intended. CT SCANS, patient data, and doctor analysis should compose this requirements that will facilitate the use of the product and a better faster diagnosis that a surgeon would perform. The base of the software project will lie within a server that is big enough to be able to store large DICCOM files as well as being able to process requests as fast as possible. It should also be able to handle multiple requests and be able to process them in real time.

3.1 External Interfaces

Name of Item	DICCOM FILE
Description of purpose	All medical data for a specific patient that a surgeon would upload into the database
Source of input or destination of output	Input: DICCOM file stored somewhere in the user's computer
Valid range, accuracy, and/or tolerance	Any DICCOM file
Units of measure	N/A
Timing	Whenever the doctor decides to upload the file
Relationships to other inputs/outputs	It has to be uploaded so the software product can extract it and manipulate it at the surgeons request
Screen formats/organization	small "browse" button
Data Formats	DICCOM type
Commands formats	N/A
End messages	If file is uploaded successfully: "DICCOM file uploaded successfully" Else "file could not be uploaded

Name of Item	Login
Description of purpose	Users logging into the software system
Source of input or destination of output	Input keyboard
Valid range, accuracy, and/or tolerance	Tolerated characters for the password field. Username can be any ASCII characters
Units of measure	N/A
Timing	Immediate
Relationships to other inputs/outputs	Must be found in the database, so user must be registered prior to logging in
Screen formats/organization	Small area for login and password fields
Data Formats	strings
Commands formats	N/A
End messages	If login is successful display "log in successful" else "wrong username and password"

Name of Item	Chat system
Description of purpose	Connects a user and a representative for any user questions
Source of input or destination of output	Input keyboard
Valid range, accuracy, and/or tolerance	Any character
Units of measure	N/A
Timing	Should be as soon as possible and whenever a message is sent it should be

	displayed on both ends for immediate response
Relationships to other inputs/outputs	N/A
Screen formats/organization	Small area concentrated towards one side of the page
Data Formats	strings
Commands formats	N/A
End messages	"chat is closed"

3.2 FUNCTIONS

ID	Detail	Type	Priority	Line Numbers	Use Case Name
R1	The TEAM4OIES shall authenticate given credentials are available.	Authentication Non Functional	MustHave	287-288	UC1
R2	The TEAM4OIES shall notify the user if account was successfully created or not	Modify Functional	MustHave	287-288	UC1
R3	The TEAM4OIES shall authenticate given credentials	Authentication Non Functional	MustHave	288-289	UC2
R4	The TEAM4OIES shall notify user slice data was uploaded successfully	Modify Functional	MustHave	46-47	UC3
R5	The TEAM4OIES shall notify user meta data was uploaded successfully	Modify Functional	MustHave	48	UC4
R6	The TEAM4OIES shall display EVAR CT data	User Interface Functional	MustHave	49-50	UC5
R7	The TEAM4OIES shall Display .vtu data	User Interface Functional	MustHave	85	UC6
R8	The TEAM4OIES shall search database by a given parameter	Queries Functional	MustHave	223	UC7
R9	The TEAM4OIES shall Search database for a specific patient	Queries Functional	MustHave	60	UC8
R10	The TEAM4OIES shall return the given patient	Download data Non Functional	MustHave	60	UC8

	EVAR CT data for download				
R11	The TEAM4OIES shall Search database for a specific patient	Queries Functional	MustHave	77	UC9
R12	The TEAM4OIES shall return the given patient Meta Data for download	Download data Non Functional	MustHave	77	UC9
R13	The TEAM4OIES shall produce an excel document available to download	Download data Non Functional	MustHave	59	UC10
R14	The TEAM4OIES shall display a real time chat support dialog	Availability Non Functional	MustHave	22	UC11
R15	The TEAM4OIES shall extract anatomical data from EVAR CT data	Extraction Non Functional	MustHave	63	UC12
R16	The TEAM4OIES shall upload extracted anatomical data to database	Modify Functional	MustHave	63	UC12

3.3 Performance Requirements

Performance requirements for TEAM4OIES will consist of any medical facility that is interested in participating in the study. Number of terminals will be dependent on how many computers each facility will use in the system. Anyone with the necessary credentials will be able to register and login to the system. Any number of users will be supported by the system due to the nature of TEAM4OIES. The software product will only upload and download data from the server, all of the analysis will be done by the user using the interpretations the software product may produce which would be handled locally. EVAR CT data, Meta data, patient information, and user information will be the only type of information transmitted through the use of the software product. 95% of server requests shall be processed within 1s. 95% of uploads shall be completed within 5s.

3.4 Logical Database Requirements

DRS? in SRS?

TABLE 1: Data Requirements

ID	Detail	Entity Set/Relationship Set Name	Accessed by Actor(s)	Accessed type (r,w, query)	Line #
D1	**Patient, 8 attributes:** A1: **id** A2: originalID A3: firstName A4: lastName A5: birthdate A6: sex A7:age A8:entryDate	**E1: Patient**	**Surgeon, Auditor**	 r, query r, w, query r, w, query r, w, query r, w, query r, w, query r, w, query r, w, query	 225 226 228 230 232 234 235 236
D2	**CTScan, 10 attributes:** A1: **id** A2: dateOfSurgery A3: brand A4: diameter A5: length A6: unilateralLegDiameter A7: unilateralLegLength A8:controlaterLegDiameter A9: controlaterLegLenght A10: entryPoint	**E2: CTScan**	**Surgeon, Auditor**	 r, query r, query r, query r, query r, query r, query r, query r, query r, query r, query	 238 239 240 241 242 243 244 245 246 247
D3	**Study, 10 attributes:** A1: **id** A2: originalID A3: description A4: modality A5: date A6: time A7: referringPhysician A8: institution A9: additionalPatientHistory A10: entryDate	**E3: Study**	**Surgeon, Auditor**	 r, query r, query r, query r, query r, query r, query r, query r, query r, query r, query	 249 250 252 254 255 257 259 262 264 267
D4	**Series, 4 attributes:** A1:**id** A2: originalSeriesId A3: description	**E4: Series**	**Surgeon, Auditor**	 r, query r, query r, query	 269 270 272

	A4: entryDate			r, query	274
D5	**Slice, 12 attributes:** A1: **id** A2: inOrder A3: filename A4: title A5: width A6: height A7: resolution A8: coordinateOrigin A9: bitsPerPixel A10: displayRange A11: fullMetaData A12: entryDate	**E5: Slice**	**Surgeon, Auditor**	 r, query r, query r, query r, query r, query r, query r, query r, query r, query r, query r, query	 276 277 278 279 280 281 282 283 284 285 286 286
D6	**User, 9 attributes:** A1: userType A2: firstName A3: lastName A4: **username** A5: password A6: email A7: institution A8: active A9: online	**E6: User**	**Auditor, Surgeon, CFD Scientist, Computational Scientist**	 r, query r, w, query r, w, query r, query r, w, query r, w, query r, w, query r, w, query r, w, query	 289 308 309 310 311 312 313 315 316
D7	**AnatomicalData, 7 attributes:** A1: lumenVolume A2: partialLumenVolume A3: skeletalCoordinates A4: skeletalCurvature A5: bifurcationAngles A6: neckAngle A7: sacArea A8: **idStudy**	**E7: AnatomicalData**	**Computational Scientist, Surgeon**	 r, query r, query r, query r, query r, query r, query r, query r, query	 65 66 67 68 69 70 71 63
D8	**Testimonial, 3 attributes:** A1: **TestimonialID** A2: content A3: tDate	**E8: Testimonial**	**Surgeon CFD Scientist**	 r, query r, w, query r , query	 **27** **27** **27**
D9	**Has, 0 attributes**	**R1: Has**		**Patient & Studies**	
D10	**Has, 0 attributes**	**R2: Has**		**Study & Series**	

D11	Has, 0 attributes	R3: Has		Series & Slices	
D12	Has, 0 attributes	R4: Has		Patient & CTScan	
D13	Analysis, 0 attributes	R5: Analysis		User & Anatomical Data	
D14	Is, 0 attributes	R6: Is		CTScan & Study	
D15	Provide, 0 attributes	R7: Provide		User & Testimonial	

TABLE 2: Constraints

ID	Detail	Entry Set PK or Views or Triggers	Constraints
D1	A1: **id**	E1: Patient	PK
C2	A1: **id**	E2: CTScan	PK
C3	A1: **id**	E3: Study	PK
C4	A1:**id**	E4: Series	PK
C5	A1: **id**	E5: Slice	PK
C6	A4: **username**	E6: User	PK
C7	A8: idStudy	E7: AnatomicalData	FK
C8	A1: TestimonialID	E8: Testimonial	PK
C9	E3: Study E4: Series E5: Slices	V1: EVARCTData	Input: E1: Patient Output: E3: Study E4: Series E5: Slices
C10	T1	T1: email	Event E7: Anatomical Data on update to surgeon

3.5 Design Constraints

Having a large server to hold all the information considering that DICCOM files are approximately 1.5GB each.

3.5.1 Standards Compliance.

Report formats should be Microsoft Excel Friendly.
Data naming should follow C# and Microsoft ASP.net standards

3.6 Software System Attributes

The system will be fully compatible with any windows machine

3.6.1 Reliability

Every team member is to finish their respective parts on time, and the required server is up and connected to the software product.

3.6.2 Availability

Due to the nature of the system, checkpoints within the software product will not be stored while the user is in session. However, a log will be generated for anytime a user queries or interacts with the server.

3.6.3 Security

The MySQL server backend will keep patient data, user data, and medical data safe. A login system will be implemented and passwords will be encrypted for extra security. Logs will be generated and kept, and roles will ensure sensible information is not viewed or stored by anyone who isn't supposed to.

3.6.4 Maintainability

The system will be developed with high cohesion among the classes and low coupling. Page will only refresh by frames rather than generating a whole new page every time a request is made.

3.6.5 Portability

We will use C Sharp which is Microsoft friendly with .ASP which will generate HTML code. All of which is very environment friendly with the most recent and popular operating systems. Installation and portability will not be an issue to any facility that wishes to use the software product.

ID	Characteristic	Rank
1	Correctness	HIGH
2	Efficiency	HIGH
3	Flexibility	HIGH
4	Integrity/Security	MED
5	Interoperability	LOW
6	Maintainability	HIGH
7	Portability	HIGH
8	Reliability	HIGH

9	Reusability	MED
10	Testability	LOW
11	Usability	LOW
12	Availability	HIGH

3.7 Organizing the Specific Requirements

Specific requirements are gathered based on what the client needs. We have found 12 Use cases which explain in detail what each does and are based on what the client requires for the software product.

3.7.1 System Mode

Only one normal mode will be used.

3.7.2 User Class

See Appendix A.1 Table 1

3.7.3 Objects

See Appendix A.1 Table 2

3.7.4 Use Cases

See Appendix A.1 Table 3

3.7.5 Feature

Chat will be implemented into the system which would allow users to talk to a representative for any help or questions. The user will be notified whenever a representative is available, then the user should ask whatever he/she wants to about the system.

3.7.6 Stimulus

N/A

3.7.7 Response

Response functions include UCAccessSupport UCSearchDatabase

3.7.8 Functional Hierarchy

Visitor actor will be inherited by all other actors. Surgeon will have access to all CFD and computational Scientist functions

3.8 Additional Comments

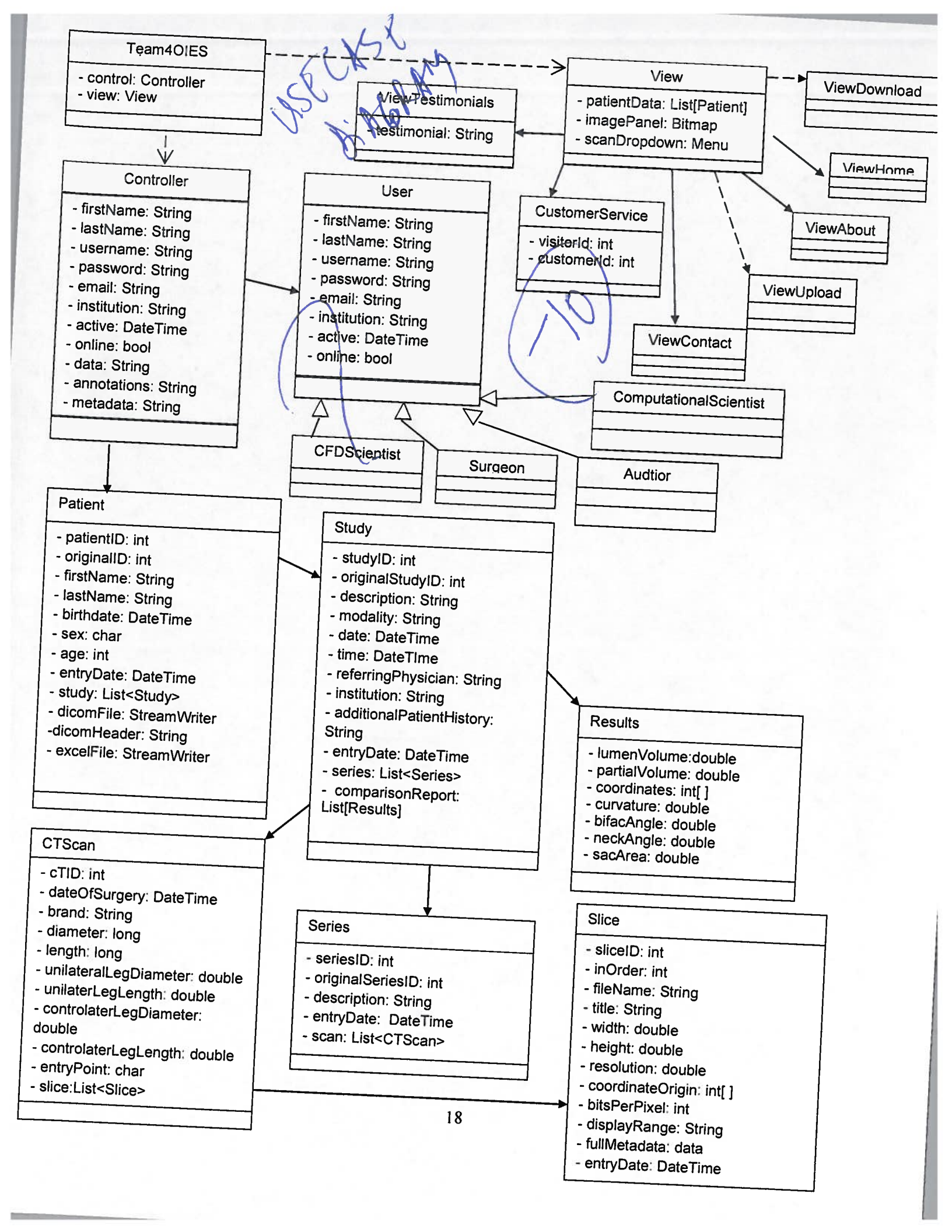
4. SUPPORTING INFORMATION.

APPENDICES

A.1 Table 1

User #	User Name	Brief Semantics
User1	Surgeon	Upload download data from the server, view patient data, make diagnosis based on data
User2	CFD Scientist	Functional features extraction
User3	Visitor	Allowed to browse the website, view testimonies, chat support for questions
User4	Computational Scientist	Anatomical features extraction
User5	Auditor	Audit the database

A.1 Table 2


Team4OIES
- control: Controller
- view: View
View
- patientData: List[Patient]
- imagePanel: Bitmap
- scanDropdown: Menu
ViewTestimonials
- testimonial: String
ViewDownload
ViewHome
ViewAbout
ViewUpload
ViewContact
Controller
- firstName: String
- lastName: String
- username: String
- password: String
- email: String
- institution: String
- active: DateTime
- online: bool
- data: String
- annotations: String
- metadata: String
User
- firstName: String
- lastName: String
- username: String
- password: String
- email: String
- institution: String
- active: DateTime
- online: bool
CustomerService
- visitorId: int
- customerId: int
ComputationalScientist
CFDScientist
Surgeon
Audtior
Patient
- patientID: int
- originalID: int
- firstName: String
- lastName: String
- birthdate: DateTime
- sex: char
- age: int
- entryDate: DateTime
- study: List<Study>
- dicomFile: StreamWriter
-dicomHeader: String
- excelFile: StreamWriter
Study
- studyID: int
- originalStudyID: int
- description: String
- modality: String
- date: DateTime
- time: DateTIme
- referringPhysician: String
- institution: String
- additionalPatientHistory: String
- entryDate: DateTime
- series: List<Series>
- comparisonReport: List[Results]
Results
- lumenVolume:double
- partialVolume: double
- coordinates: int[ ]
- curvature: double
- bifacAngle: double
- neckAngle: double
- sacArea: double
CTScan
- cTID: int
- dateOfSurgery: DateTime
- brand: String
- diameter: long
- length: long
- unilateralLegDiameter: double
- unilaterLegLength: double
- controlaterLegDiameter: double
- controlaterLegLength: double
- entryPoint: char
- slice:List<Slice>
Series
- seriesID: int
- originalSeriesID: int
- description: String
- entryDate: DateTime
- scan: List<CTScan>
Slice
- sliceID: int
- inOrder: int
- fileName: String
- title: String
- width: double
- height: double
- resolution: double
- coordinateOrigin: int[ ]
- bitsPerPixel: int
- displayRange: String
- fullMetadata: data
- entryDate: DateTime

A.1 Table 3

Use case Number	Use case name	Breif Semantics	Line Numbers
UC1	UCregisterAccount	Used to create an account	287-288
UC2	UCloginAccount	Used to log in into the system	288-289
UC3	UCuploadSliceData	Used to upload Slice Data into the server	46-47
UC4	UCuploadMetaData	Used to upload Meta Data into the server	48
UC5	UCviewSliceData	Used to view Slice data in the system	49-50
UC6	UCviewVTU	Used to view VTU data in the system	85
UC7	UCsearchDatabase	Used to search the Database for a specific object	223
UC8	UCdownloadEVARData	Allows the user to download EVAR data from the server	60
UC9	UCdownloadMetadata	Allows the user to download Meta Data from the server	60
UC10	UCproduceExcel	Used to make an excel document out of a specified sample of data	77
UC11	UCaccessSupport	Used to be able to access live online support chat	77
UC12	UCuploadAnatomicalData	Used to upload Anatomical data into the server	59

DOCUMENT CONTROL

CHANGE HISTORY

Table 1: TLs entries (assigned work and due dates) before releasing to the team (all SQAs)

Revision	Name	Due Date	Description
1.A	TM Steven Pate	03/06/2015	Complete XXX
1.B	TM Daniel Gonzalez	03/06/2015	Complete YYY
1.C	TM Sarah Moore	03/06/2015	
1.D	TM Janaye Maggart	03/06/2015	
1.X	SQA Linh Tong	03/08/2015	Review Document
1.Y	SQA Paul Miller	03/08/2015	Review Document

Table 2: Entries when work completed (SVN Commit Comment matches Description)

Revision	Name	**Completed Date**	Description
1.A	TM Steven Pate	03/06/2015	Helped with Section 3
1.B	TM Daniel Gonzalez	03/06/2015	I completed Section 3
1.C	TM Sarah Moore	03/06/2015	I completed Section 1
1.D	TM Janaye Maggart	03/06/2015	I completed Section 2
1.X	SQA Linh Tong	03/08/2015	I reviewed Document
1.Y	SQA Paul Miller	03/08/2015	I reviewed Document

Table 3: TL entry for RED DELIVERABLES (SVN Commit Comment matches Description)

Revision	Name	Due Date	Description
2.0	TL Javier Rivera	03/09/2015	I changed Version to 2.0

DOCUMENT STORAGE

This file is stored in SVN at https://svn.cs.u.edu/svn/cosc4351/team4/TEAM PROJECT DELIVERABLES/Software Requirements Specification.doc.