Team 4

CMSC 495

February 4 2017

Design

Software Design Components

The broad overview of the Hygieia system allows users to interface with the program through a third party browsers like Internet Explorer, or Mozilla Firefox over port 80 (HTTP). Once the browser starts the TCP/IP handshake process the browser gets connected to an Apache Server. This server then connects to the Apache Tomcat server over port 8009 which then pulls up the JSP pages. These JSP pages then call to the Servlet which then call to the SQL database over port 3306 which stores all of the data for the system. Once the data is retrieved the process is completely reversed heading back to the Servlet over port 3306 back to the JSP which goes back to the Apache server over port 8009 and finally reaches back to the user over port 80. See figure 1.1 for a visual representation of the state approach. The next items will break down into each page the design plan that goes behind it.

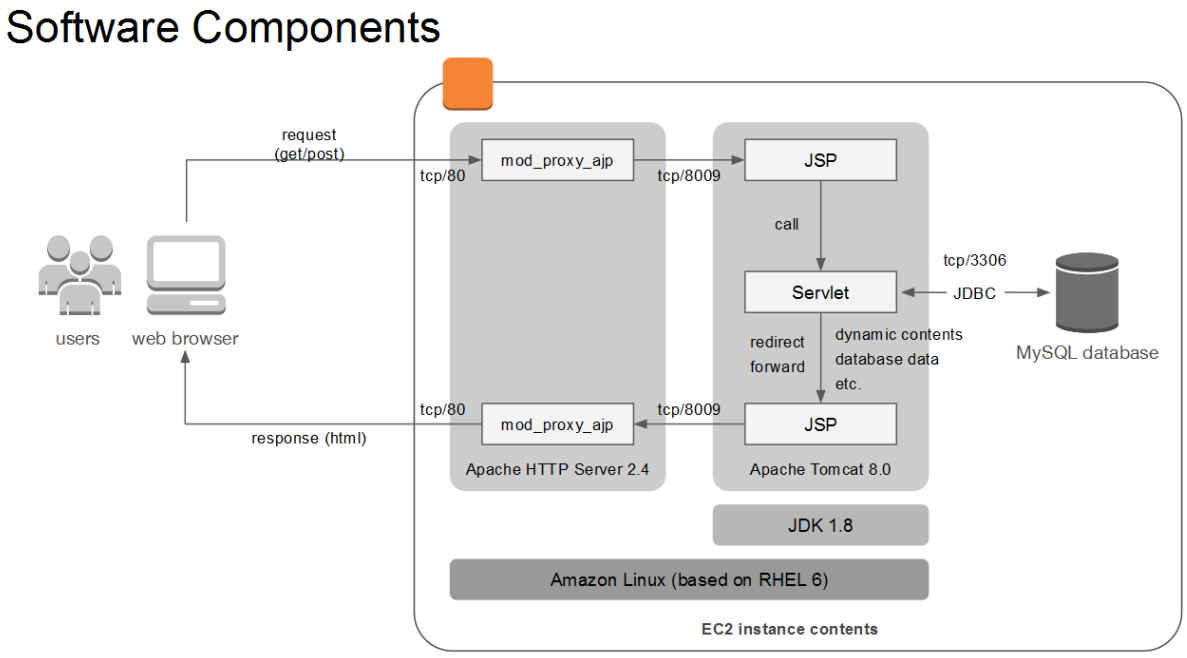

Figure 1.1

Login Page Design

The login page displays the logo for our system, a username field and a password field. This login page contains two labels that are “Login Name:” and “Password:” which are used to identify the text fields next to them, and tells the users where to put their information. Additionally, there are two buttons at the bottom called “login” and “reset”. When the “login” button is clicked the program looks to see if the login name or password field is empty. If it is then the program throws an internal error which then redirects the user back to the login page. If the login name and password fields are not empty then the system captures those two fields and sends the information to the backend database

using the sql query “SELECT id FROM users WHERE login_name = ? AND password = ?”. The backend database will then try to find that information. If the authentication failed then the program with send the user back to the login page. If the user succeeds the program will send the user to the NewPatient page. In figure 1.2 there is a representation of the login page.

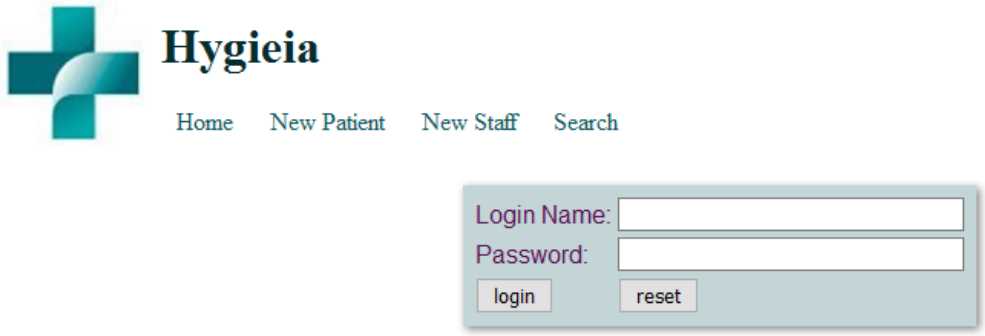

Figure 1.2

New Patient Page

The new patient page is used for hospital employees to put new patients into their system and get down basic information that can be used during their entire visit and future visits. The form has twelve different fields that allow users to specify specific items. The first section is for the patients name and is broken down into three separate fields. There are three labels that read “First Name:”, “Middle Name: “, and “Last Name:”, and next to those are three text fields to input the specified user name. In these fields we have allowed all alphabetical characters to be inputted; however, we do not allow any numbers or “;” or “ ’ ” as these can lead to SQL injections on the back end. Additionally the name fields check for how long the name is as each field can only hold 30 characters, and it checks to see if the

name fields are left black (except the middle name). If any one of these events happen the program will notified the user when the forms is trying to be submitted. The next label is “SSN” which is looking for a person’s social security number. This should be a nine digit number with no dashes, and the program auto generates an example for the user to follow. If the field is left blank, does not each nine characters, or contains anything besides numbers an error will be thrown alerting the user that the format is incorrect. The next field is labeled “Admitted date:” which is used by doctors and billing staff. This field must be field out as MM/DD/YYYY or it will throw and error. Additionally, if it is left black it will also throw and error and let the user know that the field has the incorrect format. Then the next section is used for assigning a doctor to the primary care. These fields are labeled “Doctor First Name:” and “Doctor Last Name:” These two fields are drop down boxes that have pulled the doctors names from the database allowing the user to select which doctor will be the patients primary care provider. Then comes a radio button group which contains two radio buttons labeled “Inpatient” and “Outpatient”. This field is used mainly for billing, and is automatically selected to be “Inpatient” so an employee will have to manually select the “Outpatient”. The next field is labeled “Address:” where a patient’s address will go. The system checks to see if the text field is over 100 characters and if it is then it will throw an error telling the users that the address has too many characters. Then comes the “Insurance” field which checks for the same thing as the address field and will perform the same error message as the address field. Then there is the “Password” fields that allow the user to create a complex password that has one uppercase, one lowercase one number, one special character, and is at least 12 characters long. The password will be used by the patient’s to gain access to the system to review their medical files only. Finally, is two buttons located on the bottom left corner which are labeled “Submit” and “Logout”. The “Submit” button will check for all the things stated above and then output any error messages. If no errors are found then is will submit the information on the form to the backend database. The “Logout” button will close out the webpage and bring the user back to the login screen. In figure 1.3 a rough draft

of what the page will look like is displayed. Figure 1.4 shows an example of error messages being displayed.

Figure 1.3

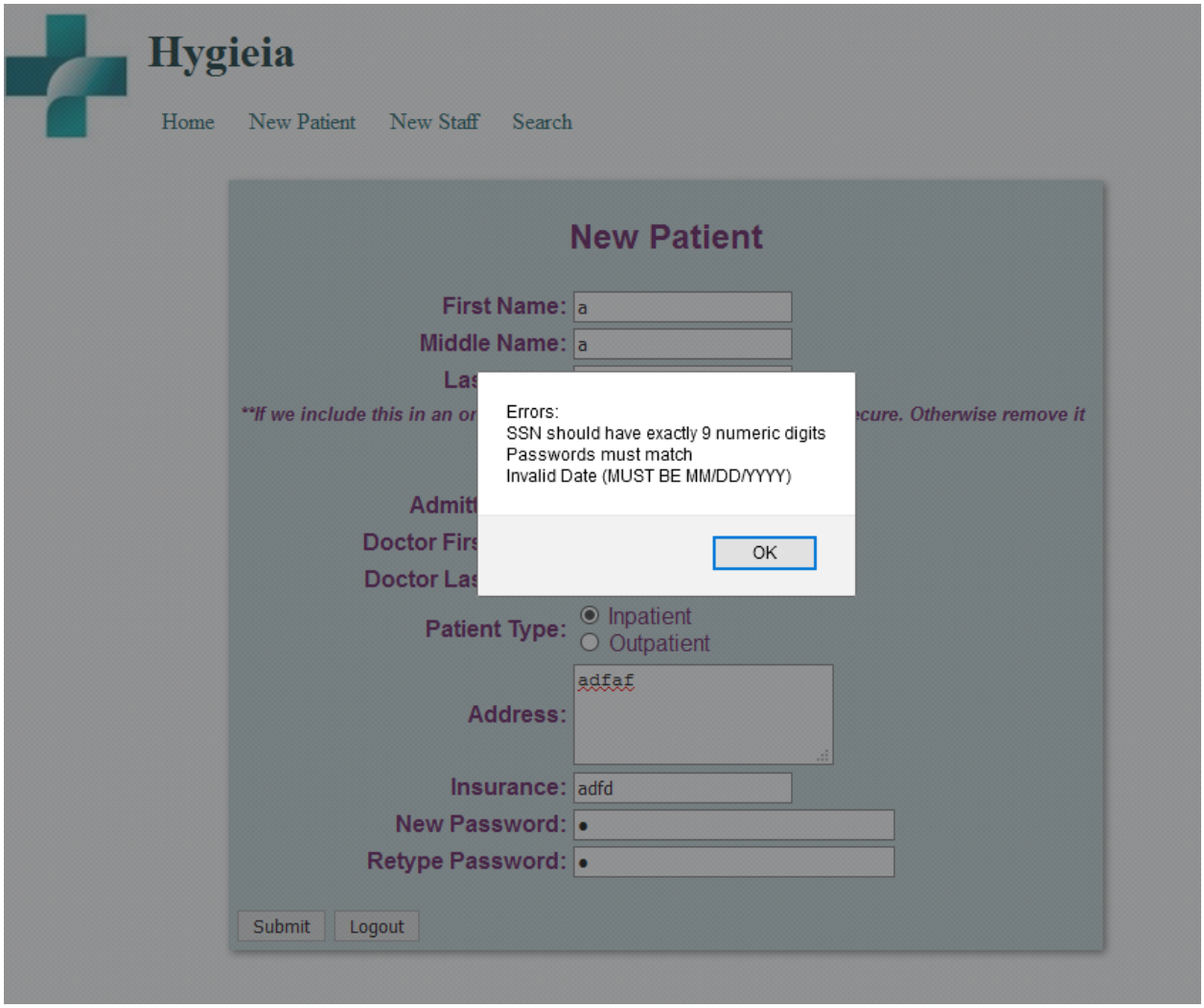

Figure 1.4

Medical Files Page

The medical files page is used both by patients and the medical staff. The patients only have read access to their files, but the medical staff are allowed to change and modify fields in this form. The first field is labeled “Date of Visit” which is used to document the initial day the patient came into the hospital for this particular symptom. The format of this field needs to be MM/DD/YYYY and any other format will give an error. The next fields are labeled “Doctor’s First Name” and “Doctor’s Last Name”

which again are drop down boxes that pull their information from the backend database. The doctor that is chosen in this case will be the one providing the medical examination and not necessarily the primary care provider. The next two fields go hand in hand with the each other as both are needed to figure out current status of equipment in the hospital and how much does the hospital bill the person. They are labeled “Start Bed Date” and “End Bed Date”. Both of these fields will need to be formatted the same way as all other dates MM/DD/YYYY. If they are marked any other way than an error will be displayed telling the user the format is incorrect. The next field is labeled “Bed Name” which is another drop down menu that list all the beds the hospital has. Once a bed is selected it then gets disabled and cannot be selected by another medical team which ensure that the same bed is not registered to two different patients. Additionally, once a bed is selected the next field labeled “Room Number” is automatically filled out based on how the database has linked beds and rooms. The next field is labeled “Disease Name:” which is used for the medical name of the disease name. This field accepts alpha/numeric characters and can hold up to 200 characters. If this field contains more than 200 characters and/or contains special characters it will send an error and alert the user that the format is wrong. The next field is labeled “Treatment” that is a text field where the medical team can put in the treatments they have done so far to help the patient. This text field can handle up to 1000 alpha/numeric characters and will only send out an error if one of these conditions is broken. The next field is a radio button group with has two buttons labeled “Yes” or “No”. This field automatically has the “Yes” button selected as a safety feature. The next field is labeled “Medicine Name” which is a text field that can handle up to 200 alpha/numeric characters. If there are special characters inputted here the system will send out an error message to the user letting them know that there are illegal characters in this field. Additionally, this filled will alert the user it needs to be filled out if the “Medical Given” field was selected “Yes”. The next field is labeled “Medical Notes” which can be used for all sort of information that needs to be noted like symptoms, descriptions of pain, or discolorations. This field can

hold up to 1000 alpha/numeric characters, and if this limit is reached an error message will appear. The next field is labeled “Ambulance Service” which is a radio button group that has two options “Yes” or “No”. This field is primarily used for billing, and other statistical information. It is automatically selected to “No”. The final field that requires user typed input is labeled “Billing Amount” which is used to put the total bill for a patient’s care. The required format is a string of numbers with two decimals after the decimal point. The max length of the bill is set to 11 which includes the tenths, and hundreds places. If any input besides numeric and the decimal point is inputted then the system will send out an error message. Finally, there are three buttons on the bottom of the screen labeled “Submit”, “Modify”, and “Logout”. The “Submit” button checks the information for all the rules stated above and produces any error messages. If no errors are found then the data is passed to the database. The “Modify” button unlocks the fields and is only available to the medical team. This allows them to added data to the medical file. Once the new information is added the medical will have to click the “Submit” button to send the data to the database. The “Logout” button performs the same action as above where it send the user back to the login screen without saving any data.

Employee Records Page

The employee records page is used to add/modify/review the employees at the hospital. The first field is a group of radio buttons labeled “Status” which has two radio buttons called “Staff” and “Doctor”. These fields are used to determine where this information is going to be saved in the database. The next fields are labeled “Staff/Doctor First Name:”, “Staff/Doctors Middle Name:”, and “Staff/Doctor’s Last Name:”. These fields accept up to 30 alphabetical characters per field, and must have something in the fields except for the middle name. If one of these conditions is not met then the program will throw an error and display that to the user. The next field is labeled “Staff Address:” which acts the same way as the “Patient Address:” in the new patient page, and has the same errors as well. The next field is labeled “Staff SSN:” which again act the same way with the same errors as the “SSN:”

field in the new patient page. Next is a field labeled “Qualifications:” which allows for alpha/numeric characters up to 500 characters long. This field is used for describing education level achievements and certifications. If there are any special characters or the character limit is reached an error will display letting the user know that the format is incorrect. The next section is labeled “Certifications Expirations:” which is used to keep track of employees’ certifications and when they expire. In this section there are six fields. Three of which are text fields used to give the professional name of the certification and the other to give the date of expiration. The date must be in the format MM/DD/YYYY and only contain numbers, while the certification must only contain up to 50 alpha/numeric characters in each field. If one of these conditions is not met then an error is displayed to the user that the format is incorrect. The next field is labeled “Cell Number:” which is used for emergency calls or other professional business. This number must be inputted using the format DDDDDDDDDD with no space, dashes, or parenthesis. If the data inputted is not all numbers and does not equal the ten digit requirement then an error is generated displaying how to properly input the information in this field. The next field is labeled “Email:” which is used as another avenue to contact staff members and let them know important information. This filed allows all characters except “ ‘ “ and “ = “. This field also requires a “@” symbol and a “.com/.edu/.net/.gov” be at the end of the field. It is also limited to 50 characters. If any condition is not met then there error message displays to the user. The next field is labeled “Payroll:” and has the same limitations as “Billing Amount:” from the medical files page. The next field is a drop down labeled “Shifts:” that has three choices “0600-1400”, “1400-2200”, and “2200-0600”. This field identifies what shift that employee will be working. The next field is labeled “Personnel Notes:” which is used to list out anything the employer should know like disabilities. This field can only accept alpha/numeric characters up to 200 characters long. Finally, this page has the same buttons as the medical files page at the very bottom, with the same functionality.

Search Page

The search page is used to search the system for existing documentation on certain people/files. The first field is labeled “ID Type:” which has a drop down box with the following options in it, “SSN:”, “First Name:”, “Last Name:”, and “Address:”. The next field is labeled “Searchable Text:” which allows for alpha/numeric characters up to 200 characters in length. If these conditions are not met then an error message is displayed. Finally at the button is two buttons “Submit” and “Logout”. The “Submit” button checks to for the fields stated above and if no errors are found it submits the request. The program then looks into the database and pulls the proper files linked with the requested information. It redirects the web page to one of the three previous pages which can then allow for the user to modify/review the data stored.

Home Page

The home page is used to display announcements to the users and only has one field of a label which is set by the site administrator.

Overall Page Functions

Each page has tabs at the top labeled “Home”, “New Patient”, “Medical Files”, “New Staff”, and “Search”. Clicking on one of these tabs redirects the system to the desired webpage.

Database Design

The database is linked in a multitude of ways that makes it flexible yet efficient. It boost a time and data stamp protocol that changes every time an element is modify The first table is called “Users” which holds username, passwords, roles, first/middle/last names, SSN, and address. The table is then linked to the “Staff” table which contains the qualifications, certification expirations, cell phone number, email address, payroll, personnel details, and a Boolean of is doctor. Thus the “Doctor” table is connected to this table as well as the “Shift” table which has clock in time, clock out time and status. The

“Patient” table is connected to the “Doctor” table and has the type of patient (in or out) and the type of insurance. The “Bed_Usage” table is then connect to the “Patients” table and describes the state date, end date and status. This table is then connected to the “Beds” table which has the name of the bed listed which is then connected to the “Rooms” table. This table has the name of the room and the floor number. Finally the “Patient_Records” table has the initial visit day, disease name, treatment, medicine given (yes or no), medicine name, medical notes, ambulance services (yes or no) and the billing amount. It is connected to the “Beds” table and the “Patients” table. For a more graphical view see figure 1.5.


USERS
ID :INT (U)
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
LOGIN_NAME :CHAR(30) (U)
PASSWORD :CHAR(50)
ROLE :TINYINT
FIRST_NAME :CHAR(30)
MIDDLE_NAME :CHAR(30)
LAST_NAME :CHAR(30)
SOCIAL_SECURITY_NUMBER :CHAR(15) (U)
ADDRESS :CHAR(100)
STAFF
ID :INT (U)
USER_ID :INT
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
QUALIFICATION :CHAR(50)
CERTIFICATION_EXPIRATIONS :DATE
CELL_PHONE_NUMBER :CHAR(20)
EMAIL_ADDRESS :CHAR(50)
PAYROLL :CHAR(30)
PERSONAL_DETAILS :VARCHAR(500)
IS_DOCTOR :BOOLEAN
DOCTORS
ID :INT (U)
STAFF_ID :INT
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
PATIENTS
ID :INT (U)
USER_ID :INT
DOCTOR_ID :INT
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
TYPE :TINYINT
INSURANCE :CHAR(100)
PATIENT_RECORDS
ID :INT (U)
PATIENT_ID :INT
BED_ID :INT
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
VISIT_DATE :DATE
DISEASE_NAME :VARCHAR(500)
TREATMENT :VARCHAR(1000)
MEDICINE_GIVEN :BOOLEAN
MEDICINE_NAME :VARCHAR(500)
MEDICAL_NOTES :VARCHAR(1000)
AMBULANCE_SERVICE_USED :BOOLEAN
BILLING_AMOUNT :CHAR(30)
BED_USAGE
ID :INT (U)
BED_ID :INT
PATIENT_ID :INT
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
START_DATE :DATE
END_DATE :DATE
STATUS :TINYINT
SHIFTS
ID :INT (U)
STAFF_ID :INT
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
CLOCK_IN_TIME :TIME
CLOCK_OUT_TIME :TIME
STATUS :TINYINT
BEDS
ID :INT (U)
ROOM_ID :INT
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
NAME :CHAR(30)
ROOMS
ID :INT (U)
CREATED_AT :DATETIME
UPDATED_AT :DATETIME
NAME :CHAR(30)
FLOOR :TINYINT

Figure 1.5