Requirements & Design

CSE308: Software Engineering
Section 1
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This document contains the requirements analysis, use case diagram, all use cases, system architecture (component diagrams), object model (class diagrams), GUI specifications, technology outline, and dynamic diagrams for the CRISYS Electronic Health Records system. This Document was completed February - March 2009 at Stony Brook University

Contents

1. OVERVIEW

The transition from paper-based health records to electronic health records (EHR) is underway. There are many systems marketed to medical providers, and some systems oriented towards consumers, such as Google Health (www.google.com/health) and Microsoft HealthVault(www.healthvault.com).

A comprehensive EHR system would provide interfaces for many kinds of organizations (doctor's offices, hospitals, pharmacies, insurance companies, auditors, regulatory agencies, etc.) and many categories of users within each organization. In this project, we limit the scope to patients and their agents (e.g., spouse or parents) and clinicians (e.g.,doctors and nurses). Also, the information maintained by the system is limited primarily to EHRs and information needed to control access to EHRs. Work schedules, appointments, billing, insurance, etc., are omitted.

2. HEALTH RECORDS INFORMATION

An EHR is a set of items.

2.1. ITEM INFORMATION
The attributes of every item include:

- Item type: Legal values include quantitative observation, qualitative observation, diagnosis, treatment, and comment.
- Author: Author of the item. the author must be a user with an account in the EHR system.
- Creation time: Date and time when the item was created
- Medical areas: Relevant areas of medicine, e.g., general, oncology, podiatry

2.2. QUANTITATIVE OBSERVATION ITEM INFORMATION
Additional attributes of a quantitative observation item include:

- Observer: The user who made the observation (usually but not always the author of the item)
- Observation time: Date and time when the observation was made
- Observed quantity: e.g., blood pressure or temperature.
- Value: A number, e.g., 37.0
- Unit: e.g., "degrees Celsius".

2.3. QUALITATIVE OBSERVATION ITEM INFORMATION
Additional attributes of a qualitative observation item include:

- Observer: Same as for a quantitative observation.
- Observation Time: Same as for a quantitative observation.
- Description: A string, e.g., "small red spots on left arm"

2.4. DIAGNOSIS ITEM INFORMATION
Additional attributes of a diagnosis item include:

- Description: A string, which may contain a diagnosis code (e.g., "1030F") or an actual description (e.g., "influenza").

2.5. TREATMENT ITEM INFORMATION
Additional attributes of a treatment item include:

- Start date: Date that treatment should start
- End date: Date that treatment should end
- Description: A string, e.g., "physical therapy once per week to strengthen left knee" or "100 mg aspirin, twice a day".

2.6. COMMENT ITEM INFORMATION
additional attributes of a comment item include:

- Description: A string

- Commented item: If this item is a comment on another item, then this attribute identifies that item. for example, if an initial diagnosis turns out to be incorrect, a doctor would create a comment item linked to the original diagnosis item, indicating that the original diagnosis is incorrect, and would also create a new diagnosis item containing the correct diagnosis.

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3. INFORMATION ABOUT USERS

3.1. USER INFORMATION
The system stores the username, password, name, and ID# of every user. For simplicity, the system does not need to maintain other general information about users (street address, phone number, date of birth, etc.)

Thus, the attributes of every user include:

- Username: Unique username so the user can log into the system
- Password: Secret string for user login
- Name: First and Last Name of the user
- ID#: Unique integer that identifies the user in the system
- Roles: The system tracks every user's roles. Roles include patient, agent, clinician, and administrator. A user may have multiple roles. It is acceptable to require that, when a user logs in, the user chooses a single role to be used for the duration of that session.

3.2. PATIENT INFORMATION
Additional attributes of a patient include:

- Appointed Agents: A patient can appoint users as his/her agents.
- Treating Clinicians: A list of clinicians that patients have consented to be treated by.

3.3. AGENT INFORMATION
No additional attributes of an agent.

3.4. CLINICIAN INFORMATION
Additional attributes of a clinician include:

- Areas of Medicine: For clinicians, the system keeps track of their areas of medicine (e.g., general, oncology, podiatry). a clinician may specialize in multiple areas.

3.5. ADMINISTRATOR INFORMATION
No additional attributes of an administrator.

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4. FUNCTIONALITY FOR PATIENTS

- Browse items in his/her own EHR.
- Search for items in his/her own EHR. For simplicity, it is sufficient for your system to support one or two representative search options, e.g., search for items by medical area or by words appearing in the description.
- Add comment item in his/her own EHR.
- Appoint agent. A patient can appoint a user as his/her agent with one of the following access levels:
    - Read: Permission to browse and search the patient's HER
    - Read-and-Comment: Permission to browse, search, and add comment items to the patient's EHR.
    - Full: Same permissions as the patient himself/herself.
- Revoke Agent. A patient can revoke an appointment of a user as his/her agent, regardless of who appointed the agent.
- Appoint a doctor as his/her primary doctor.
- Revoke a doctor as his/her primary doctor.
- Grant consent to treatment by a clinician. In other words, this means "consent to being under the care of the clinician". The effect of this within the EHR system is to grant the clinician access to the patient's EHR.
- Withdraw consent to treatment by a clinician.

- Conceal an item in his/her own EHR from a specified user. For example, a patient might want to conceal EHR items about a past medical condition from a clinician treating a current, unrelated medical condition. An item cannot be concealed from its author.
- Cancel the concealment of an item in his/her own EHR.
- Cancel a referral. Note: referrals are created by clinicians, as described below.

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5. FUNCTIONALITY FOR AGENTS

A patient's agent can perform the functions described above, depending on the agent's access level.

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6. FUNCTIONALITY FOR CLINICIANS

Definition: a clinician C is a treating clinician of patient P (equivalently, "P is a patient of C") if (1) P consented to treatment by C, or (2) a treating clinician of P referred P to C.

- Browse items in EHRs of his/her patients. An item is visible to a clinician if the patient has not concealed it from the clinician, and one of the medical areas of the item equals one of the medical areas of the clinician. In addition, a clinician can always read items that he or she authored.
- Search items in EHRs of his/her patients. Visibility of items described above.
- Add items in EHRs of his/her patients. Visibility of items described above.
- Appoint agent. A patient's primary doctor can appoint an agent for the patient. Normally, the primary doctor would do this only when the patient is unable to appoint an agent himself/herself.
- Revoke agent. a patient's primary doctor can revoke an agent appointment that he/she created.
- Create a referral. A treating clinician of a patient can refer the patient to another clinician. Note: the patient does not need to consent to referrals, but the patient can cancel referrals.
- Cancel a referral. A clinician can cancel a referral that he/she created.

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7. FUNCTIONALITY FOR ADMINISTRATORS

- Add a user.

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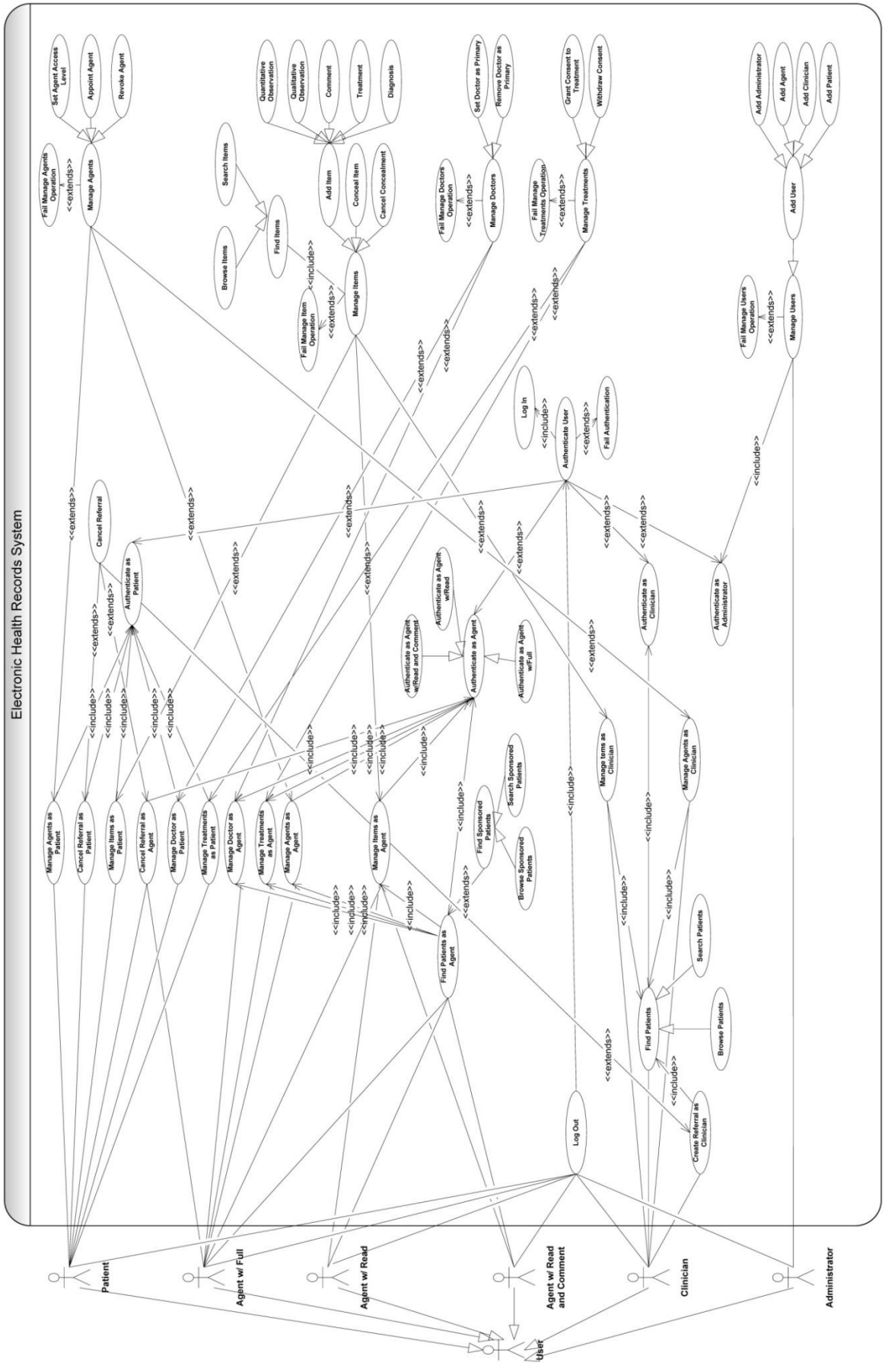
8. OTHER REQUIREMENTS

- Authentication. Each user must login with a username and password before using the system.
- Concurrency. Multiple users may use the system concurrently.
- No arbitrary limits. The system should not impose arbitrarily limits on EHR data. For example, it should not limit the numbers of agents, referrals, medical areas, etc., associated with a user.
- Network security. For simplicity, your system does not need to use secure communication.
- Permanence. No user can modify or delete EHR items. For simplicity, your system does not need to support transfer of old items to archival storage.
- Declarative access-control policy. The access-control policy should be stored in database table (or tables), not hardwired in the code. "access-control policy" here means which operations are available to each role. here are some examples of policy changes that should be possible without changes to the code:
    - allow a patient to create an observation item in his/her own HER
    - eliminate the ability of clinicians to appoint agents for patients
    - allow a patient's primary doctor to conceal an item in the patient's EHR

  Note: this requirement implies that menus should be generated, not hardwired. You should start investigating how to do this, if you don't know already. For simplicity, you do not need to implement a GUI for updating the table containing the access-control policy. You can update it using the DBMS's command-line client or GUI client.

Use Case Diagram



PATIENT

Browse Items
Description: A patient browses items in his/her record
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Flow of Events:
1. User selects “Browse Items”
2. System displays a list of all items related to the user will be displayed
3. User selects an item
4. All attributes related to the selected item will be displayed (e.g. item type, author, creation time, etc.)

Search Items
Description: A patient searches for items in his/her record
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Flow of Events:
1. User enters a keyword or phrase in the search bar and clicks "Search"
2. System searches the database for all items containing the specified keyword or phrase
3. System will filter out any items that cannot be viewed by the current user
4. System will display the search results for the user
5. User selects a specific item
6. System displays the item
Alternate Flow: The search returns no results
4. System displays message informing the user that there were no items found

Add Comment
Description: A patient adds a comment to his/her record
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Post-condition: A comment is added to the user's EHR
Flow of Events:
1. User selects “Add Comment” from a navigation menu
2. System displays a form for the user to add a comment
3. User enters a comment into a text box
4. User submits the comment by clicking on “submit”
5. System displays a confirmation message to make sure the user wants to add the comment
6. User confirms
7. System adds the comment to the user's EHR
8. System displays a confirmation message
Alternate Flow: User comments on an item
1. Include "Browse Items"
2. Go to step 1
Alternative Flow: User does not confirm the action
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while adding the comment
8. System displays an appropriate error message and instructs the user to try again.

Appoint Agent
Description: A patient appoints a user as his/her agent
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient. The appointed user needs to be an existing user in the system database.
Post-condition: An agent is added to the user's EHR
Flow of Events:
1. User selects “Add Agent” from a navigation menu
2. User enters the name (or partial name) of the agent whom he or she wants to appoint
3. System searches for the name in the database
4. The System displays, alphabetically (last name, first name), a list of users whose name matches the user’s entry along with their personal information
5. User selects someone from the result list
6. User selects the access level for the agent
7. User confirms his/her selection by clicking on “Confirm”
8. System adds the agent to the user's EHR
9. System displays a confirmation message
Alternate Flow: The system returns no result
4. System displays message informing the user that there were no items found.
5. User either selects “Search again” or “Cancel”
Alternative Flow: An error occurs while appointing the agent
9. System displays an appropriate error message and instructs the user to try again.

Revoke Agent
Description: A patient revokes his/her (appointed) agent

Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Post-condition: An agent is removed from the user's EHR
Flow of Events:
1. User selects “Revoke Agent” from a navigation menu
2. System displays the list of his/her appointed agents
3. User selects the agent he/she wants to revoke
4. System displays a confirmation message to make sure the user wants to revoke the selected agent
5. User confirms
6. System removes the agent from the user's EHR
7. System displays a confirmation message
Alternate Flow: User has no appointed agent
2. User will be informed that he/she has no appointed agent
Alternative Flow: User does not confirm the action
6. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while revoking the agent
7. System displays an appropriate error message and instructs the user to try again.

Set Doctor As Primary
Description: User makes a doctor his primary doctor
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient, clinician is an existing user in system
Post-condition: A primary doctor is added to the user's EHR
Flow of Events:
1. User selects "Appoint Primary Doctor" from a navigation menu
2. User enters the name (or partial name) of the doctor whom he or she wants to appoint
3. System searches for the name in the database
4. The System displays, alphabetically (last name, first name), a list of users whose name matches the user’s entry
5. User selects someone from the result list
6. User confirms his/her selection by clicking on “Confirm”
7. System adds the agent to the user's EHR
8. System displays a confirmation message
Alternate Flow: User already has a primary doctor
2. System displays message informing the user that they already have a primary doctor and if they wish to change it, they must first revoke their current primary doctor
Alternate Flow: The system returns no result
4. System displays message informing the user that there were no items found.
5. User either selects “Search again” or “Cancel”
Alternative Flow: An error occurs while appointing the agent
8. System displays an appropriate error message and instructs the user to try again.

Revoke Doctor As Primary
Description: A patient revokes his/her current primary doctor
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Post-condition: A primary doctor is removed from the user's EHR
Flow of Events:
1. User selects “Revoke Primary Doctor” from a navigation menu
2. System displays the name of the user's current primary doctor
3. User selects "Revoke"
4. System displays a confirmation message to make sure the user wants to revoke their current primary doctor
5. User confirms
6. System removes the primary doctor from the user's EHR and sets it to null
7. System displays a confirmation message
Alternate Flow: User has no primary doctor
2. User will be informed that he/she has no primary doctor
Alternative Flow: User does not confirm the action
6. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while revoking the doctor
7. System displays an appropriate error message and instructs the user to try again.

Grant Consent To Treatment
Description: User grants a clinician access to his/her EHR
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient, clinician is an existing user in system
Post-condition: A clinician is granted consent in the user's EHR
Flow of Events:
1. User selects “Consent A Clinician” from a navigation menu
2. System displays a list of clinicians that are available to the user
3. User selects a clinician
4. Information regarding the selected clinician will be displayed
5. User clicks on the name of his/her selection
6. System displays a confirmation message to make sure the user wants to give consent to the selected clinician
7. User confirms
8. System gives consent to the selected clinician

9. System displays a confirmation message
Alternate Flow: No clinician is available
2. User will be asked to check back at a later time
Alternative Flow: User does not confirm the action
8. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while giving the clinician consent
9. System displays an appropriate error message and instructs the user to try again.

Withdraw Consent
Description: A patient withdraws consent to a clinician
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Post-condition: Consent is withdrawn from a doctor on the user's EHR
Flow of Events:
1. User selects “Withdraw Consent” from a navigation menu
2. System displays a list of consented clinician(s) for the current user
3. User selects the clinician he wants to withdraw consent from
4. System displays a confirmation message to make sure the user wants to withdraw consent from the selected clinician
5. User confirms
6. System withdraws consent from the selected clinician
7. System displays a confirmation message
Alternate Flow: No clinician has been consented
2. System displays a message informing the user that he/she has no consented clinicians
Alternative Flow: User does not confirm the action
6. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while withdrawing consent
9. System displays an appropriate error message and instructs the user to try again.

Conceal Item
Description: A patient conceals an item in his/her own EHR from a specified user
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Post-condition: An item or items are concealed from specified users
Flow of Events:
1. User selects “Conceal Items” from a navigation menu
2. System displays a list of all items pertaining to the user
3. User selects all items they want to conceal using check boxes
4. User submits his/her selection
5. User inputs names of people to prohibit access from
6. User submits his/her selection
7. System displays users input for confirmation
8. User clicks "Submit"
9. System makes items concealed to specified users
10. System displays a confirmation message
Alternate Flow: No existing items
2. System displays a message informing the user that they have no items
Alternate Flow: User attempts to block an author
7. System notifies user of the invalid choice
8. Go to step 5
Alternate Flow: An error occurs while processing
10. System displays an appropriate error message and instructs the user to try again.

Cancel Concealment
Description: A patient cancels the concealment of an item in his/her own EHR
Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Post-condition: Concealments in the user's EHR are cancelled
Flow of Events:
1. User selects “Cancel Concealment” from a navigation menu
2. System displays a list of all items that the user previously concealed
3. User selects items that he/she wants to cancel the concealment by selecting check boxes
4. User submits his/her selection
5. System displays a confirmation message to make sure the user wants to cancel the concealments
6. User confirms
7. System withdraws consent from the selected clinician
8. System displays a confirmation message
Alternate Flow: No existing concealments
2. System notifies user
Alternative Flow: User does not confirm the action
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while canceling the concealments
8. System displays an appropriate error message and instructs the user to try again.

Cancel Referral
Description: A patient cancels a referral(s) that a clinician made

Primary Actor: Patient
Pre-condition: User logged in successfully as a patient
Post-condition: A referral in the user's EHR is cancelled
Flow of Events:
1. User selects "Cancel referral" from a navigation menu
2. System displays a list of referrals that were created for him/her
3. User selects the referral they want to cancel
4. System displays a confirmation regarding the user's selection
5. User confirms
6. System cancels the referral
7. System displays a confirmation message
Alternative Flow: The current user has no referrals
2. System inform the user that he/she has no referrals
Alternative Flow: User does not confirm the action
5. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while canceling the referral
7. System displays an appropriate error message and instructs the user to try again.

AGENT

Browse Patients
Description: An agent can browse the list of patients that he/she is appointed to, and can view their information
Primary Actor: Agent (any level)
Pre-condition: User logged in successfully as an agent.
Flow of Events:
1. User selects "List Sponsored Patients" from a navigation menu
2. System displays a list of sponsored patients alphabetically (last name, first name)
3. User selects a patient
4. System displays patient information
Alternate Flow: User has no sponsored patients
2. User will be informed that he/she has sponsored patients

Browse Items
Description: An agent browses items in a sponsered patient's EHR
Primary Actor: Agent (any level)
Pre-condition: User logged in successfully as an agent.
Flow of Events:
1. Include "Browse Patients"
2. User selects "Browse Items" from a navigation menu
3. A list of all items of the patient will be displayed (except the concealed items)
4. User selects an item
5. All attributes related to selected item will be displayed (e.g. item type, author, creation time, etc.)

Search Items
Description: An agent searches for items in the patient's EHR
Primary Actor: Agent (any level)
Pre-condition: User logged in successfully as an agent.
Flow of Events:
1. Include "Browse Patients"
2. User enters a keyword or phrase in the search bar and clicks "Search"
3. System searches the database for all items (for the current patient) containing the specified keyword or phrase
4. System will filter out any items that cannot be viewed by the current user
5. System will display the search results for the user
6. User selects a specific item
7. System displays the item
Alternate Flow: The search returns no results
5. System displays message informing the user that there were no items found

Add Comment
Description: An agent adds a comment to the patient's EHR
Primary Actor: Read-and-comment agent, full-permission agent
Pre-condition: User logged in successfully as an agent with proper access.
Post-condition: A comment is added to the patient's EHR
Flow of Events:
1. Include "Browse Patients"
2. User selects "Add Comment" from a navigation menu
3. System displays a form for the user to add a comment
4. User enters a comment into a text box
5. User submits the comment by clicking on "submit"
6. System displays a confirmation message to make sure the user wants to add the comment
7. User confirms
8. System adds the comment to the patient's EHR

9. System displays a confirmation message
Alternate Flow: User comments on an item
1. Include BROWSE PATIENTS
2. Include BROWSE ITEM
3. Go to step 2
Alternative Flow: User does not confirm the action
8. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while adding the comment
9. System displays an appropriate error message and instructs the user to try again.

READ ONLY LEVEL AGENTS

Browse
Description: An agent browses items in the patient's EHR
Primary Actor: Read-only agent
Pre-condition: User logged in successfully as a read-only level agent.
Flow of Events:
1. Include "Browse Items"

Search
Description: An agent searches for items in the patient's EHR
Primary Actor: Read-only agent
Pre-condition: User logged in successfully as a read-only level agent.
Flow of Events:
1. Include "Search Items"

READ AND COMMENT LEVEL AGENT

Browse
Description: An agent browses items in the patient's EHR
Primary Actor: Read-and-comment agent
Pre-condition: User logged in successfully as a Read-and-comment level agent.
Flow of Events:
1. Include "Browse Items"

Search
Description: An agent searches for items in the patient's EHR
Primary Actor: Read-and-comment agent
Pre-condition: User logged in successfully as a Read-and-comment level agent. The user has selected a patient.
Flow of Events:
1. Include "Search Items"

Add Comment
Description: An agent adds comment items to the patient's EHR
Primary Actor: Read-and-comment agent
Pre-condition: User logged in successfully as a Read-and-comment level agent. The user has selected a patient.
Flow of Events:
1. Include "Add Comment"

FULL PERMISSION LEVEL AGENT

Browse
Description: An agent browses items in the patient's EHR
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Browse Items"

Search
Description: An agent search for items in the patient's EHR
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Search Items"

Add Comment
Description: An agent add comment items to in the patient's EHR
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Add Comment"

Appoint Agent
Description: An agent appoints a user as the patient's agent
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent. The user has selected a patient. The appointed user needs to be an existing user in the system.
Post-condition: An agent is appointed to a patient
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Appoint Agent"

Revoke Agent
Description: An agent revokes the patient's agent(s)
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent. The user has selected a patient.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Revoke Agent"

Set Doctor As Primary
Description: An agent appoints a primary doctor for the sponsored patient
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Set Doctor As Primary"

Revoke Doctor As Primary
Description: An agent revokes a primary doctor for the sponsored patient
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Revoke Doctor As Primary"

Grant Consent To Treatment
Description: An agent grants a clinician access to the patient's EHR
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent. The user has selected a patient.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Grant Consent To Treatment"

Withdraw Consent
Description: An agent withdraws the patient's consent to a clinician
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Withdraw Consent"

Conceal Item
Description: An agent conceals an item in the patient's EHR from a specified user
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Conceal Item"

Cancel Concealment
Description: An agent cancels the concealment of an item in the patient's EHR
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Cancel Concealment"

Cancel Referral
Description: An agent cancels a referral/referrals that the patient was previously referred by a clinician
Primary Actor: Full permission agent
Pre-condition: User logged in successfully as a full permission level agent.
Flow of Events:
1. Include "Browse Patients"
2. Include "Patient -> Cancel Referral"

CLINICIAN

Browse Items
Description: An item is visible to a clinician if the patient has not concealed it from the clinician, and one of the medical areas of the item equals one of the medical areas of the clinician. In addition, a clinician can always read items that he or she authored. This function will allow a clinician to browse these items in an organized manor.
Primary Actor: Clinician
Pre-condition: User logged in successfully as a clinician
Flow of Events:
1. User selects "Browse Items" option from a navigation menu
2. System displays all of the current user's patients in alphabetical order (last name, first name)
3. User selects a specific patient
4. System displays all items that are viewable for the current user
5. User may select any item to view it

Search Items
Description: An item is visible to a clinician if the patient has not concealed it from the clinician, and one of the medical areas of the item equals one of the medical areas of the clinician. In addition, a clinician can always read items that he or she authored. This function will allow a clinician to search these items with a specific keyword or phrase.
Primary Actor: Clinician
Pre-condition: User logged in successfully as a clinician
Flow of Events:
1. User enters text in the search bar located in a navigation menu
2. System searches the database for all items that contain the specified keyword or phrase
3. System will filter out any items that cannot be viewed by the current user
4. System will display the search results for the user
5. User selects a specific item
6. System displays the item
Alternate Flow: The search returns no results
4. System displays message informing the user that there were no items found

Add Items
Description: An item is visible to a clinician if the patient has not concealed it from the clinician, and one of the medical areas of the item equals one of the medical areas of the clinician. In addition, a clinician can always read items that he or she authored. This function will allow a clinician to add an item to one of his or her patients.
Primary Actor: Clinician
Pre-condition: User logged in successfully as a clinician
Post-condition: An item is added to a selected patient's EHR
Flow of Events:
1. Include "Browse Patients"
2. User selects "Add An Item" option from a navigation menu
3. System displays a form for the user to enter an item (marking any required fields)
4. User fills out the appropriate form and clicks submit
5. System will ask the user to verify the input
6. User verifies that their input is correct
7. System adds the item to the patients EHR
8. System displays a confirmation message
Alternative Flow: User does not accept their input as correct
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while adding the item to the patients EHR
8. System displays an appropriate error message and instructs the user to try again.

Appoint Agent
Description: A patient's primary doctor can appoint an agent for the patient. Normally, the primary doctor would do this only when the patient is unable to appoint an agent himself/herself. This function will allow a doctor to appoint an agent for one of his or her patients.
Primary Actor: Clinician (doctor)
Pre-condition: User logged in successfully as a clinician and is a doctor
Post-condition: An agent is appointed to a selected patient
Flow of Events:
1. Include "Browse patients"
2. User selects "Appoint Agent To This Patient" from a functions menu
3. System displays a list of available agents and instructs the user to select the agent they want to appoint
4. User selects the desired agent
5. System displays a confirmation to make sure that the user wants to appoint the selected agent to the current patient
6. User confirms
7. System appoints the agent to the patient
8. System displays a confirmation message
Alternative Flow: User does not confirm the action
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while appointing the agent
8. System displays an appropriate error message and instructs the user to try again.

Revoke Agent
Description: A patient's primary doctor can revoke an agent appointment that he/she created.
Primary Actor: Clinician (doctor)
Pre-condition: User logged in successfully as a clinician and is a doctor
Post-condition: An agent is revoked from a selected patient
Flow of Events:
1. Include "Browse patients"
2. User selects "Revoke An Agent" from a functions menu
3. System displays a list of agents that were appointed by the current user and instructs them to select the agent they want to revoke
4. User selects the agent they want to revoke
5. System displays a confirmation message to make sure the user wants to revoke the selected agent from the current patient
6. User confirms
7. System revokes the agent from the patient
8. System displays a confirmation message
Alternative Flow: The current user has no agents that they are able to revoke
3. System displays a message informing the user that there are no agents to revoke for the current patient
Alternative Flow: User does not confirm the action
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while revoking the agent
8. System displays an appropriate error message and instructs the user to try again.

Create Referral
Description: A treating clinician of a patient can refer the patient to another clinician. This function allows the current user to create a referral for one of their patients.
Primary Actor: Clinician
Pre-condition: User logged in successfully as a clinician
Post-condition: A referral is created for a patient
Flow of Events:
1. Include "Browse patients"
2. User selects "Create A Referral" from a functions menu
3. System displays a list of all clinicians that the patient can be referred to (including the clinians information, such as specialties), and instructs the user to select a clinician to make a referral to
4. User selects a clinician
5. System displays a confirmation message to make sure the user wants to create a referral to the selected clinician for the current patient
6. User confirms
7. System creates a referral
8. System displays a confirmation message
Alternative Flow: User does not confirm
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while creating the referral
8. System displays an appropriate error message and instructs the user to try again.

Cancel Referral
Description: A clinician can cancel a referral that he/she created.
Primary Actor: Clinician
Pre-condition: User logged in successfully as a clinician
Post-condition: A selected referral is cancelled
Flow of Events:
1. Include "Browse patients"
2. User selects "Cancel A Referral" from a functions menu
3. System displays a list of referrals that were created by the current user and instructs them to select the referral they want to cancel
4. User selects the referral they want to cancel
5. System displays a confirmation message to make sure the user wants to cancel the selected referral for the current patient
6. User confirms
7. System cancels the referral for the patient
8. System displays a confirmation message
Alternative Flow: The current user has no referrals that they are able to cancel
3. System displays a message informing the user that there are no referrals to cancel for the current patient
Alternative Flow: User does not confirm the action
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while canceling the referral
8. System displays an appropriate error message and instructs the user to try again.

Browse Patients
Description: This function allows a clinician to view an organized list of all their patients. The user may select any of the patients to display the details and functions related to that patient.
Primary Actor: Clinician
Pre-condition: User logged in successfully as a clinician
Flow of Events:
1. User selects "View All Patients" option from a navigation menu
2. System displays all that clinicians patients in alphabetical order (last name, first name)
3. User selects a specific patient
4. System displays all items that are viewable for the user logged in
5. User selects the desired patient
6. System displays the information for the selected patient

Search Patients
Description: This function allows a clinician to search for any one of their patients. The user may select any of the patients to display the details and functions related to that patient.
Primary Actor: Clinician
Pre-condition: User logged in successfully as a clinician
Flow of Events:
1. User enters text in the search bar located in a navigation menu
2. System searches the database for all patients that contain the specified name or names
3. System will filter out any items that cannot be viewed by the current user
4. System will display the search results for the user
5. User selects a specific patient
6. System displays the information for the selected patient
Alternate Flow: The search returns no results
4. System displays message informing the user that there were no patients found

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ADMINISTRATOR

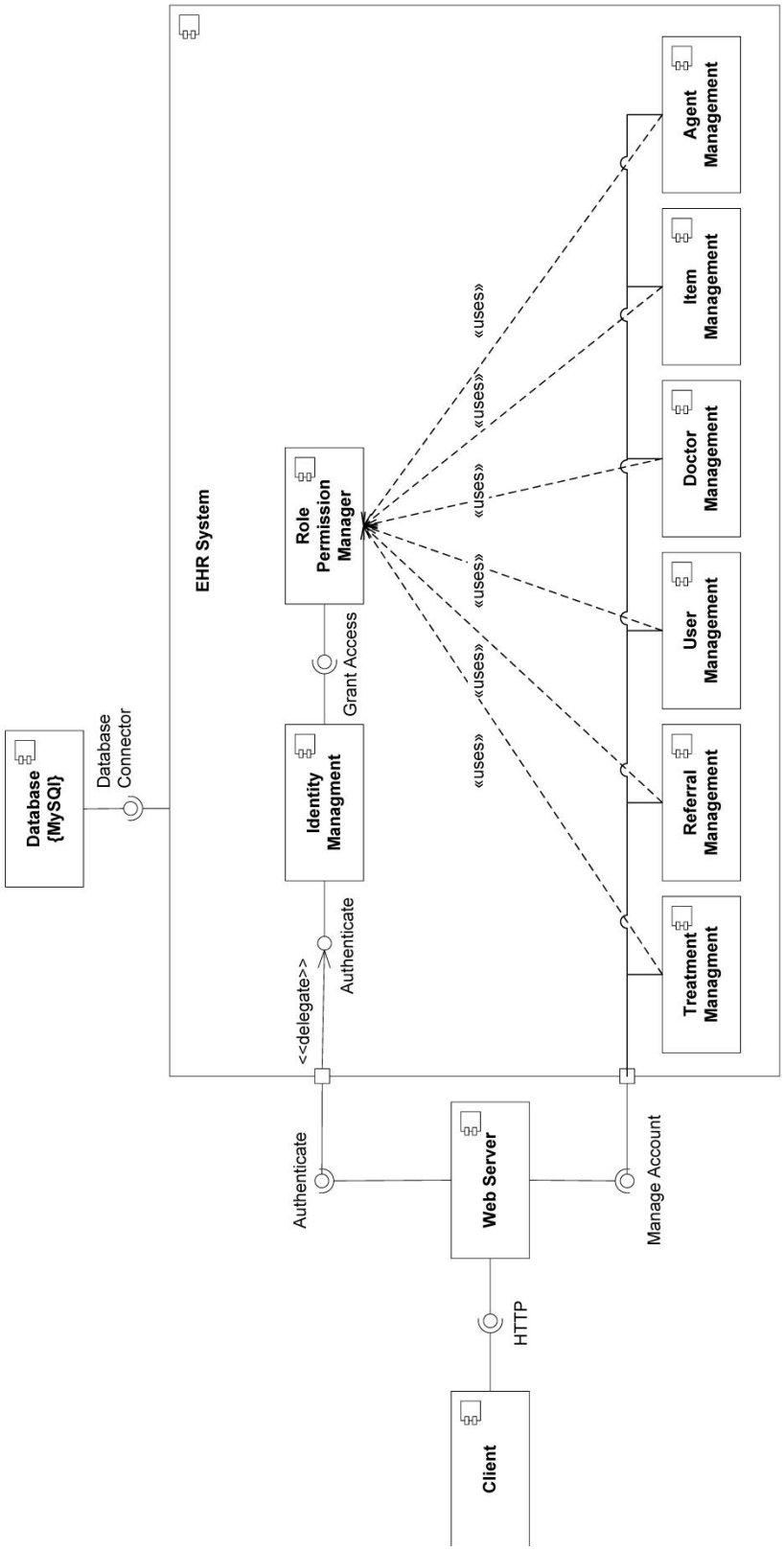
Add a user
Description: This function allows a system administrator to add a user to the system**.**
Primary Actor: Administrator
Pre-condition: User logged in successfully as an administrator
Post-condition: A new user will be added to the system
Flow of Events:
1. User selects "Add A User" from their navigation menu
2. System asks the user to select the type of user they want to add to the system (patient, agent, clinician or administrator)
3. User selects type
4. System displays an appropriate form for the user to enter the information for the new user (marking any required fields)
5. User fills out the appropriate form and clicks submit
6. System will ask the user to verify the input
7. User verifies that their input is correct
8. System adds the user
9. System displays a confirmation message
Alternative Flow: User does not accept their input as correct
7. System displays the previous page so that the user may edit their input and try again
Alternative Flow: An error occurs while adding the user to the system
9. System displays an appropriate error message and instructs the user to try again.

AUTHENTICATION

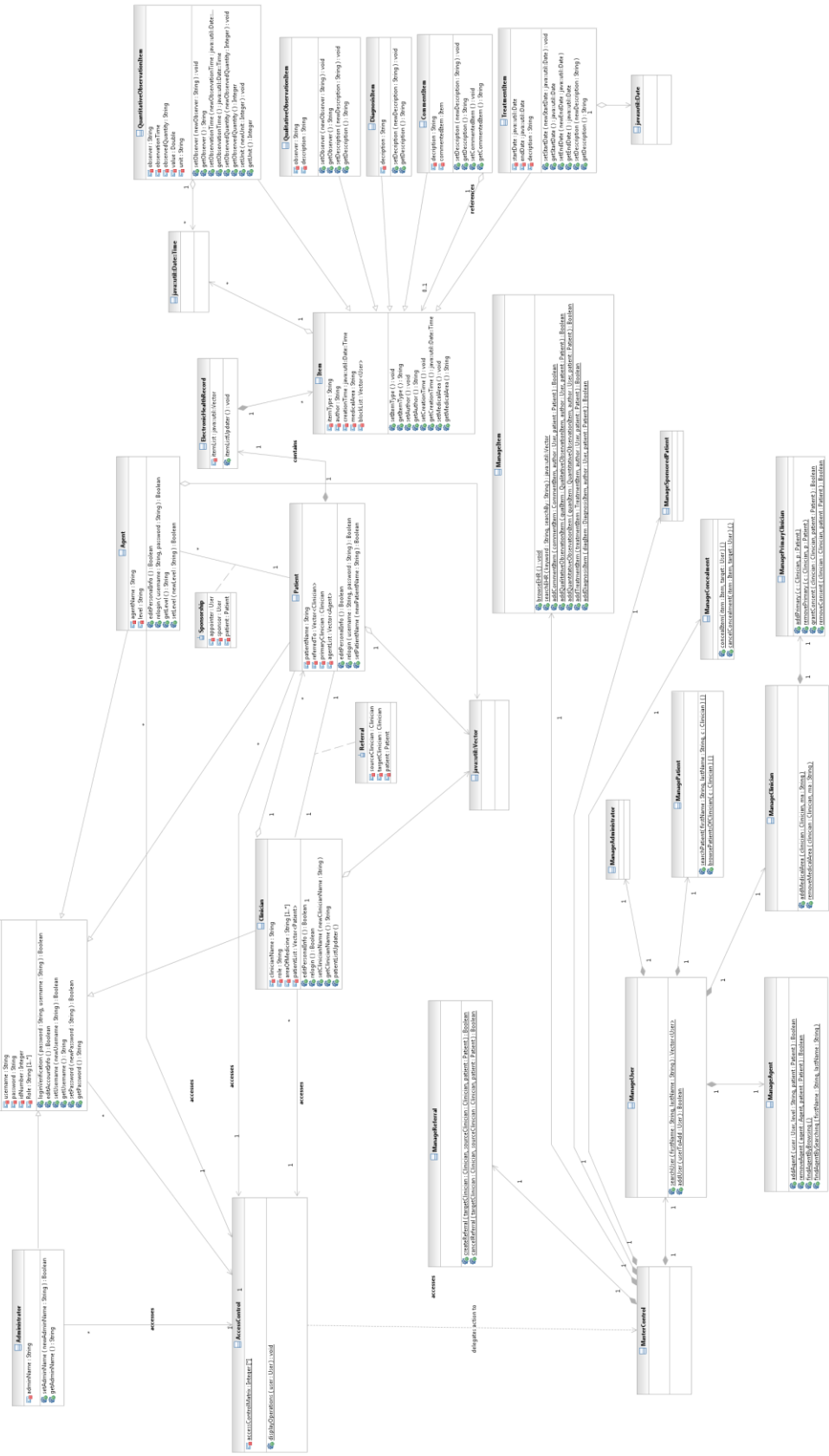
Login
Description: User submits account information
Primary Actor: Any user
Flow of Events:
1. User submits username and password

Authentication
Description: User attempts to gain access to system’s resources
Primary Actor: any user
Flow of Events:
1. Include "login"
2. System looks up submitted information in database
3. Check for validity passes
4. User gains access with proper permission level
Alternate Flow: failed authentication
3. Submitted information fails verification
4. User notified of failure
5. User redirected to login page

EHR Component Diagram



Object Model



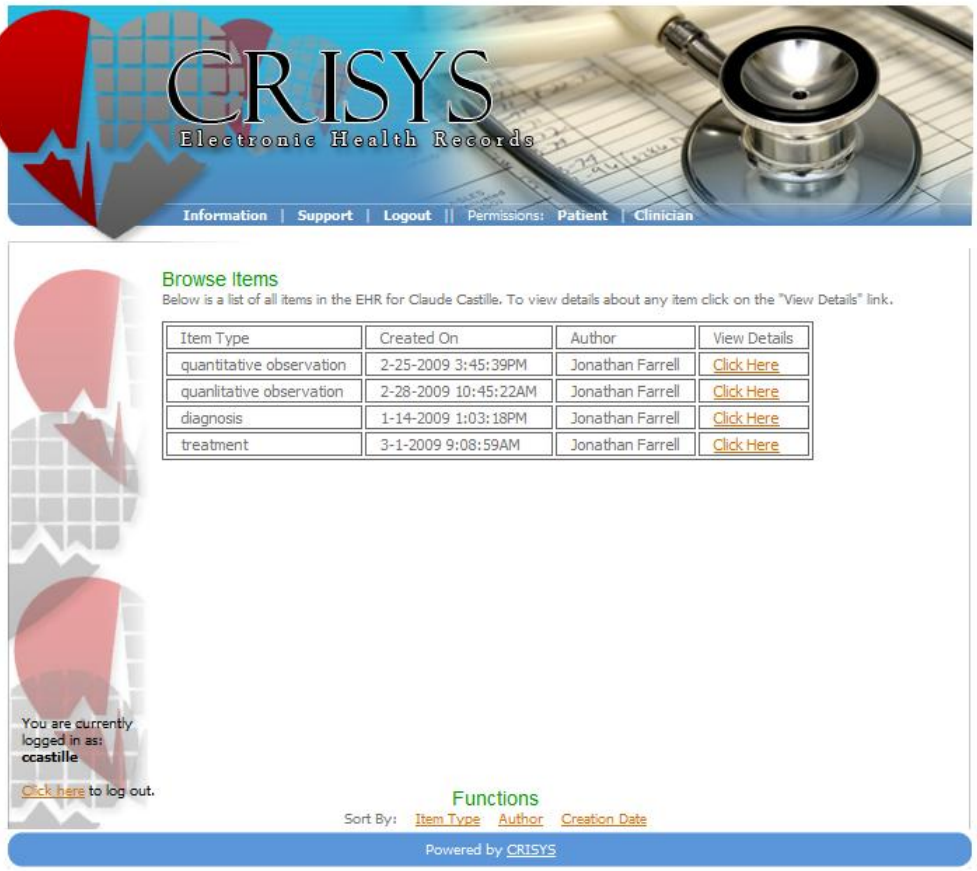
Design

We took a traditional approach in creating our class diagrams. We plan to implement our project using php and mysql. We are currently looking into the use of object oriented php to find the advantages/disadvantages of such implementation. We will use our class diagrams to translate over to our database system, scripting and perhaps objects if we decide to take an object oriented approach with the php.

Graphical User Interface

Description:
We plan to implement our EHR system using a web based system. We will use php scripting with MySql database queries to produce pages on the fly and process information into the database as it is requested by the user.

Demo pages:
index.html: This page demonstrates the main page and log in screen presented to a user who visits the site.
demo1.html: This page demonstrates the home page for a clinician. This page will be the first page displayed when a user logs in. Its content will depend on the user's status in the system.
demo2.html: This page demonstrates what a clinician will see while viewing one of his patient's information.
demo3.html: This page demonstrates what a patient will see while browsing their items.
demo4.html: This page demonstrates what a patient will see when appointing an agent.


CRISYS
Electronic Health Records
Information | Support | Logout || Permissions: Patient | Clinician
Browse Items
Below is a list of all items in the EHR for Claude Castille. To view details about any item click on the "View Details" link.
Item Type | Created On | Author | View Details
quantitative observation | 2-25-2009 3:45:39PM | Jonathan Farrell | Click Here
quanlitative observation | 2-28-2009 10:45:22AM | Jonathan Farrell | Click Here
diagnosis | 1-14-2009 1:03:18PM | Jonathan Farrell | Click Here
treatment | 3-1-2009 9:08:59AM | Jonathan Farrell | Click Here
You are currently logged in as: ccastille
Click here to log out.
Functions
Sort By: Item Type Author Creation Date
Powered by CRISYS

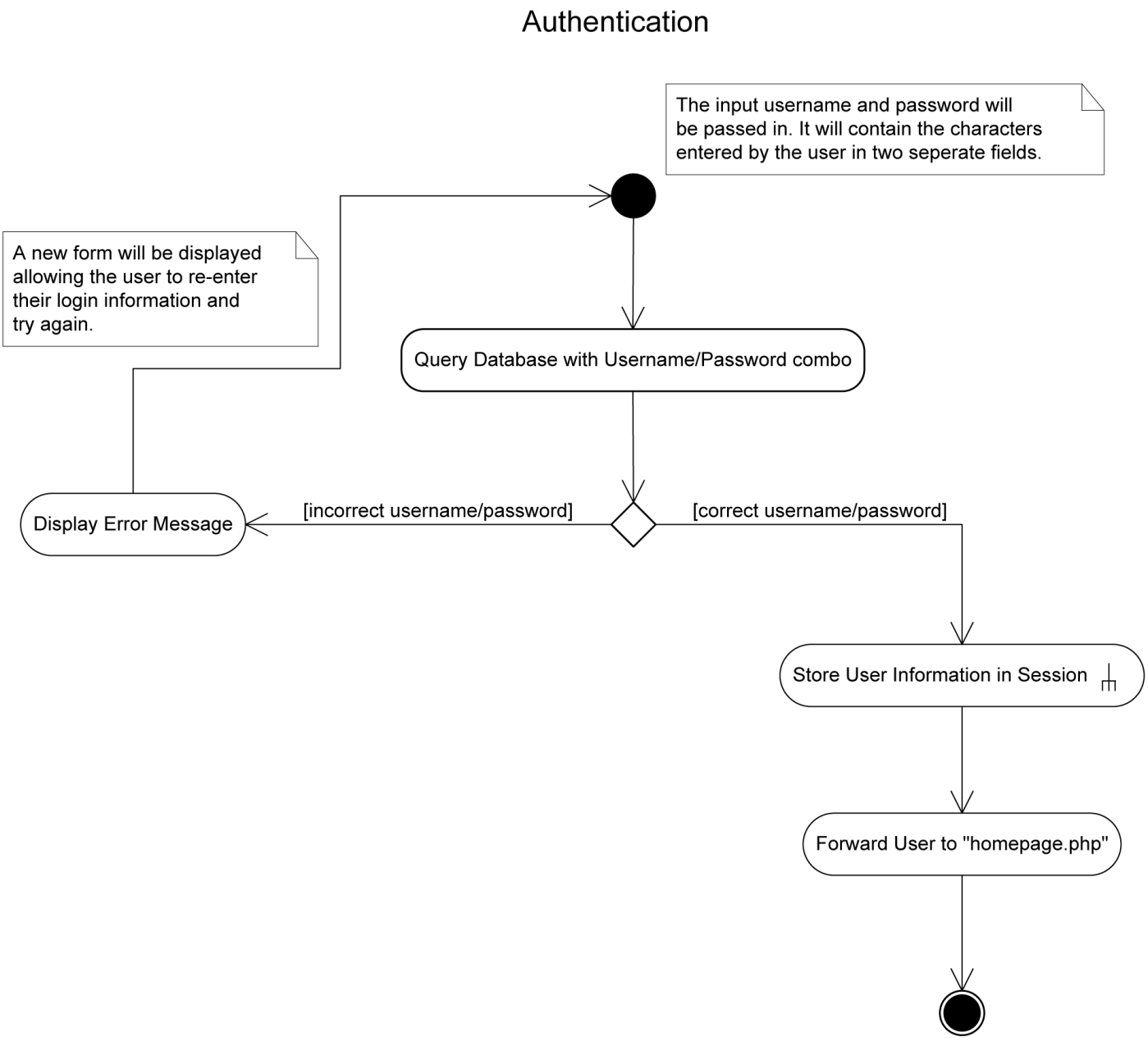

CRISYS
Electronic Health Records
Information | Support | Logout || Permissions: Patient | Clinician
Homepage
Browse My Items
Search My Items
Appoint An Agent
Revoke An Agent
Primary Physician Details
View My Consents
View My Referrals
Browse Items
Item Type | Created On | View Details
quantitative observation | 2-25-2009 3:45:39PM | Click Here
quanlitative observation | 2-28-2009 10:45:22AM | Click Here
diagnosis | 1-14-2009 1:03:18PM | Jonathan Farrell | Click Here
treatment | 3-1-2009 9:08:59AM | Jonathan Farrell | Click Here
You are currently logged in as: ccastille
Click here to log out.
Functions
Sort By: Item Type Author Creation Date
Powered by CRISYS

These pages can all be viewed online at:
http://www.corpusvile.com/crisys/build/index.html
http://www.corpusvile.com/crisys/build/demo1.html
http://www.corpusvile.com/crisys/build/demo2.html

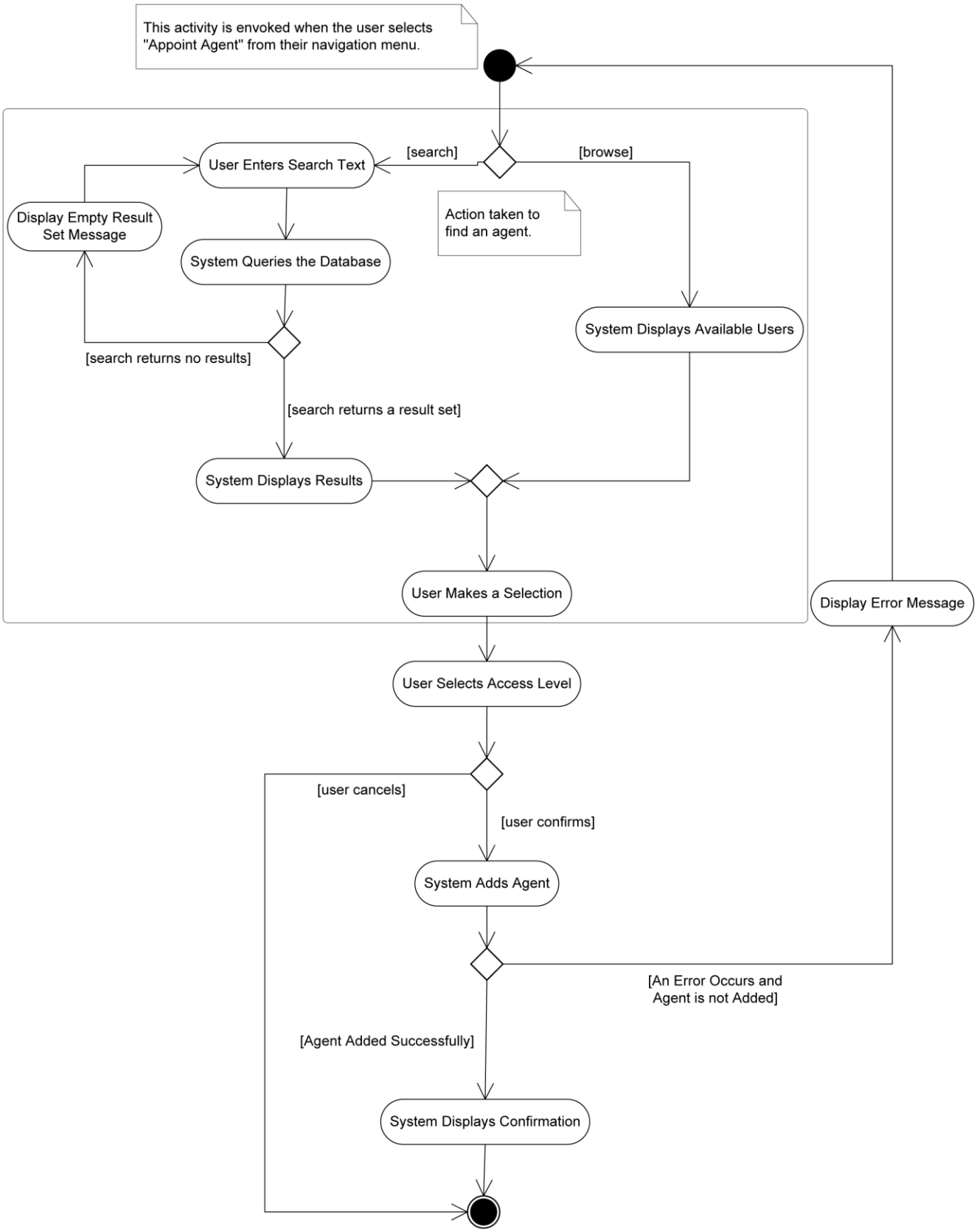
Languages/Technologies:
-html
-css
-javascript
-php
-ajax
-mysql

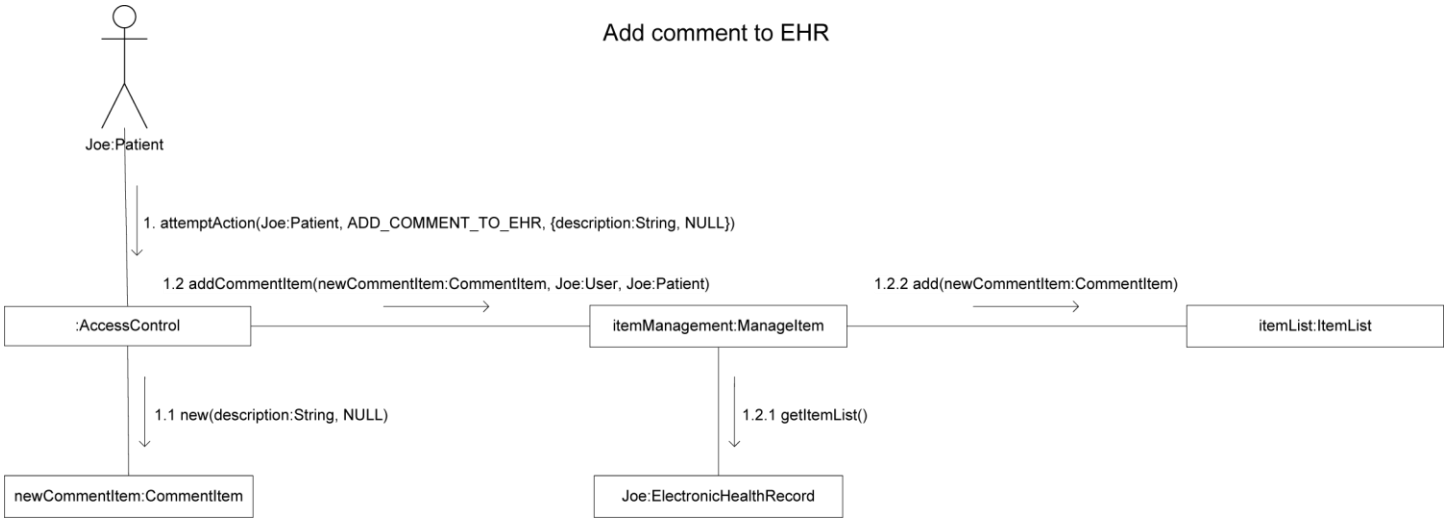
-CakePHP will be used as a framework.

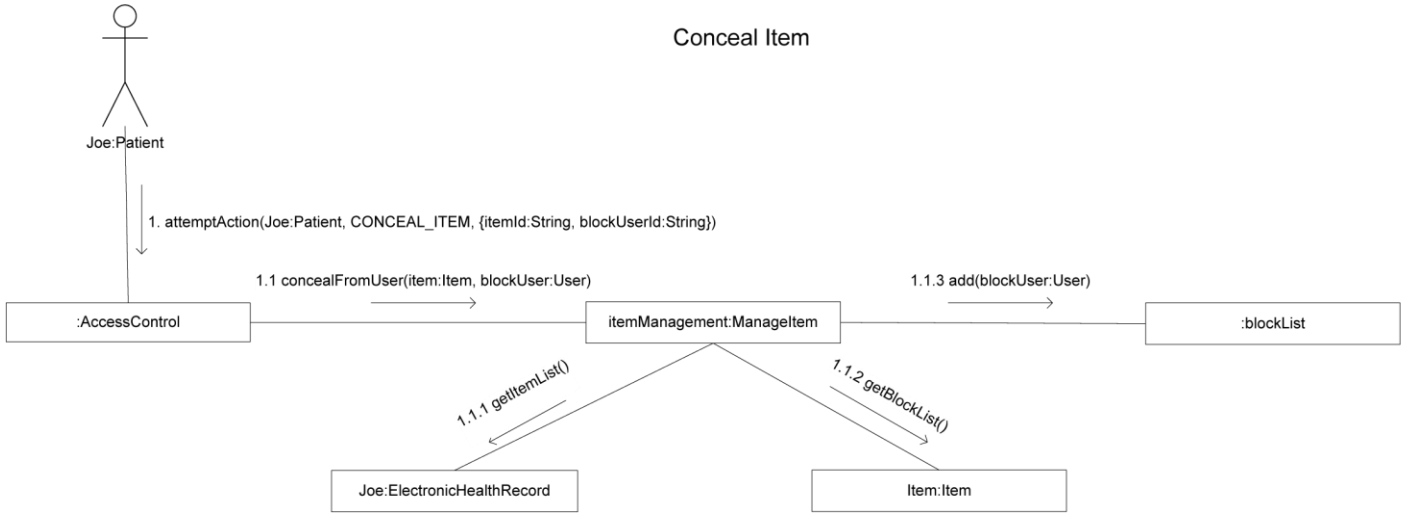
Team Knowledge:
The entire team is fluent in all technologies except php. Team manager, Jonathan Farrell, has experience with php and will help lead the team in learning and applying the language. The other three team members do have minor experience with php and will complete tutorials from the w3schools website.

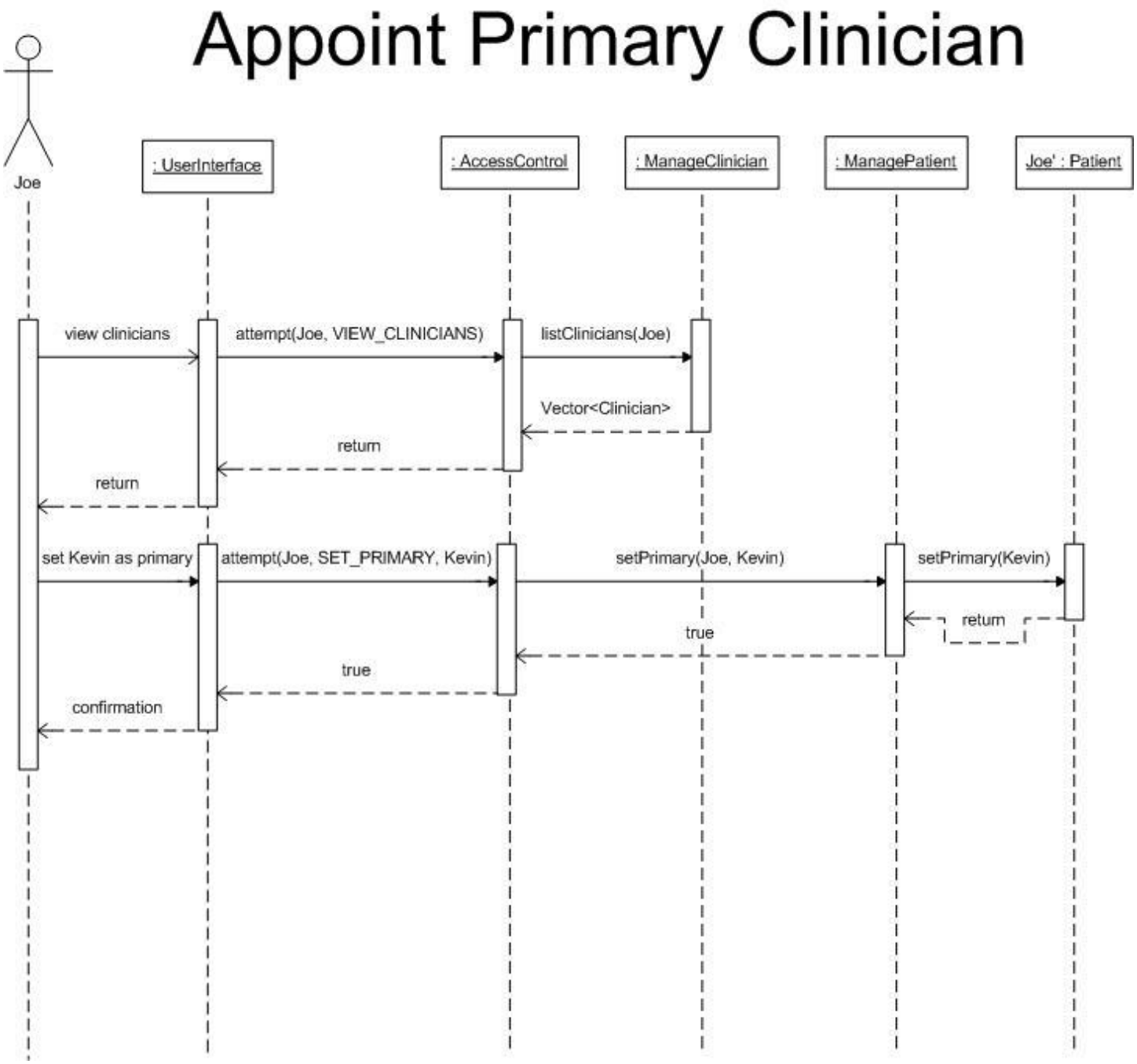

Authentication
The input username and password will be passed in. It will contain the characters entered by the user in two seperate fields.
A new form will be displayed allowing the user to re-enter their login information and try again.
Query Database with Username/Password combo
Display Error Message
[incorrect username/password]
[correct username/password]
Store User Information in Session
Forward User to "homepage.php"

Appoint Agent

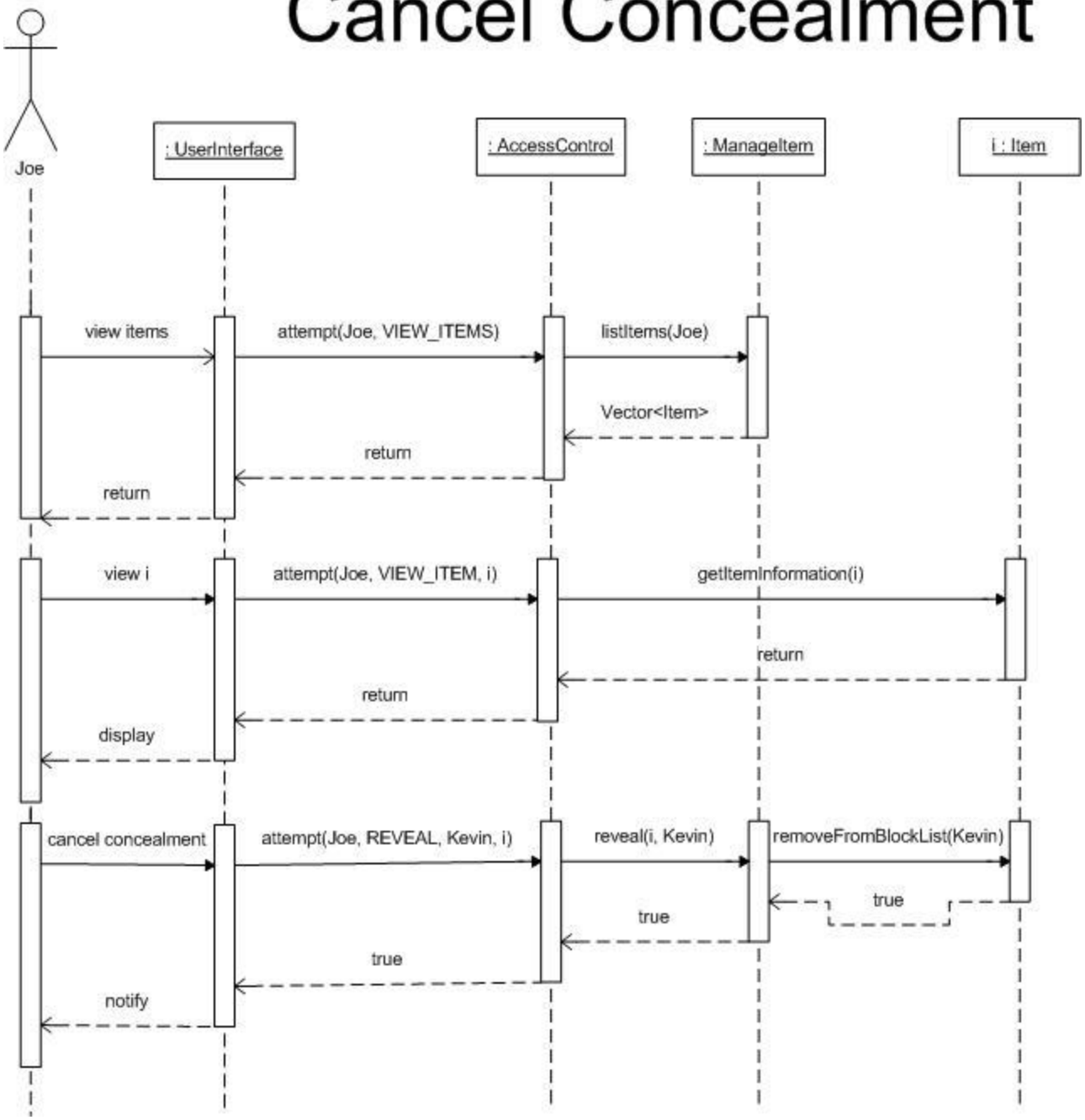



Add comment to EHR
Joe:Patient
1. attemptAction(Joe:Patient, ADD_COMMENT_TO_EHR, {description:String, NULL})
1.2 addCommentItem(newCommentItem:CommentItem, Joe:User, Joe:Patient)
1.2.2 add(newCommentItem:CommentItem)
:AccessControl
itemManagement:ManageItem
itemList:ItemList
1.1 new(description:String, NULL)
1.2.1 getItemList()
newCommentItem:CommentItem
Joe:ElectronicHealthRecord

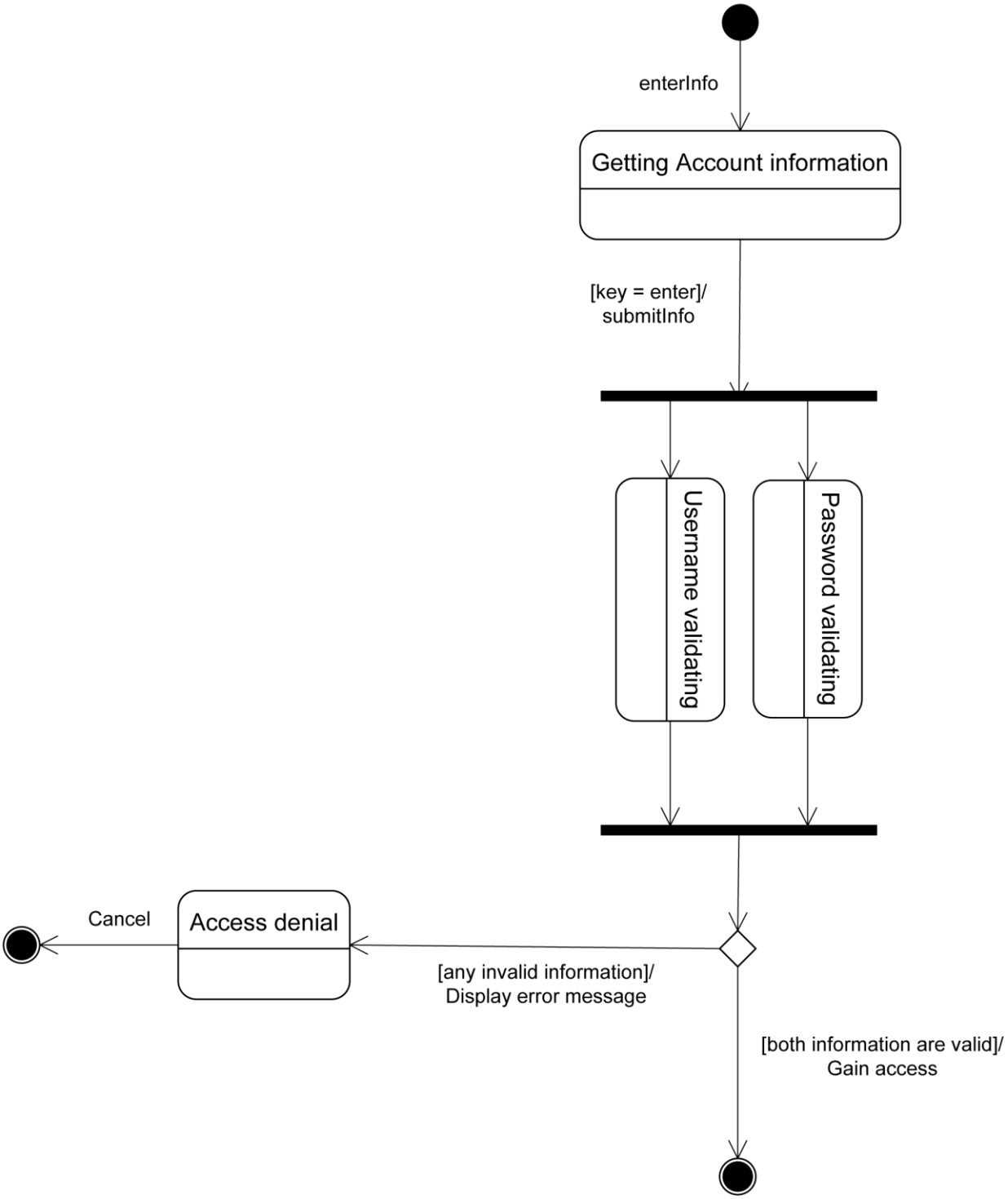

Conceal Item
Joe:Patient
1. attemptAction(Joe:Patient, CONCEAL_ITEM, {itemId:String, blockUserId:String})
1.1 concealFromUser(item:Item, blockUser:User)
1.1.3 add(blockUser:User)
:AccessControl
itemManagement:ManageItem
:blockList
1.1.1 getItemList()
1.1.2 getBlockList()
Joe:ElectronicHealthRecord
Item:Item


Appoint Primary Clinician
Joe
: UserInterface
: AccessControl
: ManageClinician
: ManagePatient
Joe' : Patient
view clinicians
attempt(Joe, VIEW_CLINICIANS)
listClinicians(Joe)
Vector<Clinician>
return
return
set Kevin as primary
attempt(Joe, SET_PRIMARY, Kevin)
setPrimary(Joe, Kevin)
setPrimary(Kevin)
return
true
true
confirmation

Cancel Concealment



State diagram for Log-in controller



State diagram for Registration Handler