APRIL 29, 2025

TIMELINEXPRESS SYSTEM DESIGN DOCUMENT

DRAFT 0.6 FOR REVIEW

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TABLE OF CONTENTS

INTRODUCTION

Description of the Application

The Timeline app is a user-friendly, interactive application designed to help people explore historical events in an engaging and accessible way. The app lets users view, compare, and interact with historical timelines, offering a visual and customizable approach to learning about the past.

Events are stored in an integrated database, allowing users to search for key historical moments, create and manage entries, and explore timelines based on themes, periods, or event types.

Purpose of This Design Document

The purpose of this document is to define the design details~~,~~ and functionality, of the Timeline app. It serves as a shared reference point for the development team, designers, and stakeholders through the implementation phase of the project.

By outlining the app's core features, technical components, and performance expectations, this document ensures that everyone involved in the project has a mutual understanding of what the application will do, and how it will work.

What This Document Contains

This design document includes the following sections:

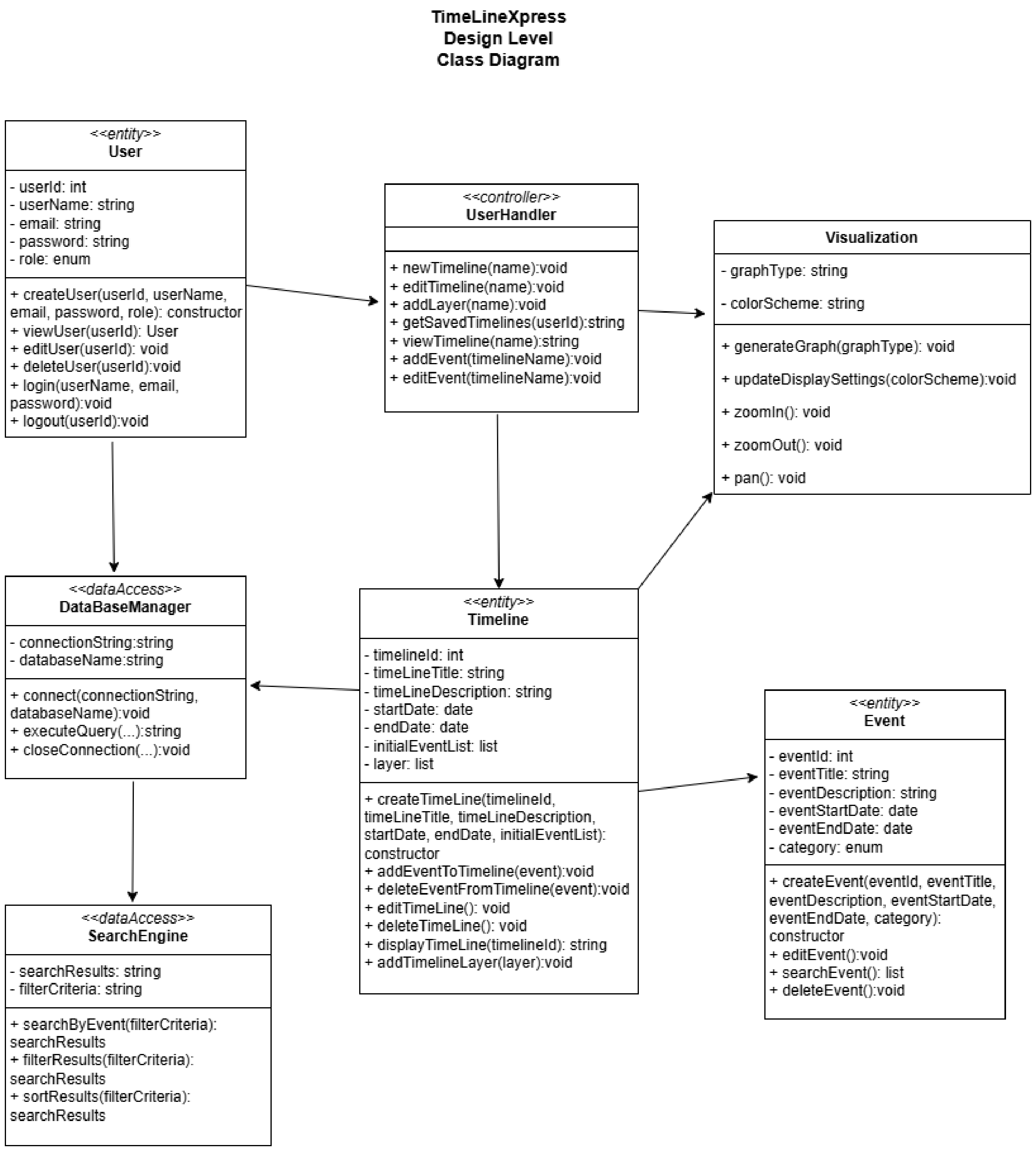
- Introduction, including a high-level overview of the Timeline app.
- A design level class diagram, including pseudocode for each class.
- Statechart diagrams for each class
- Design level sequence diagrams for each use case identified in the System Requirements Document

Reference Documents

TimelineXpress Project Plan, February 17, 2025.

TimelineXpress System Requirements Document, March 26, 2025

DESIGN LEVEL CLASS DIAGRAM


TimeLineXpress
Design Level
Class Diagram
<<entity>>
User
- userId: int
- userName: string
- email: string
- password: string
- role: enum
+ createUser(userId, userName, email, password, role): constructor
+ viewUser(userId): User
+ editUser(userId): void
+ deleteUser(userId):void
+ login(userName, email, password):void
+ logout(userId):void
<<controller>>
UserHandler
+ newTimeline(name):void
+ editTimeline(name):void
+ addLayer(name):void
+ getSavedTimelines(userId):string
+ viewTimeline(name):string
+ addEvent(timelineName):void
+ editEvent(timelineName):void
Visualization
- graphType: string
- colorScheme: string
+ generateGraph(graphType): void
+ updateDisplaySettings(colorScheme):void
+ zoomIn(): void
+ zoomOut(): void
+ pan(): void
<<dataAccess>>
DataBaseManager
- connectionString:string
- databaseName:string
+ connect(connectionString, databaseName):void
+ executeQuery(...):string
+ closeConnection(...):void
<<entity>>
Timeline
- timelineId: int
- timeLineTitle: string
- timeLineDescription: string
- startDate: date
- endDate: date
- initialEventList: list
- layer: list
+ createTimeLine(timelineId, timeLineTitle, timeLineDescription, startDate, endDate, initialEventList): constructor
+ addEventToTimeline(event):void
+ deleteEventFromTimeline(event):void
+ editTimeLine(): void
+ deleteTimeLine(): void
+ displayTimeLine(timelineId): string
+ addTimelineLayer(layer):void
<<entity>>
Event
- eventId: int
- eventTitle: string
- eventDescription: string
- eventStartDate: date
- eventEndDate: date
- category: enum
+ createEvent(eventId, eventTitle, eventDescription, eventStartDate, eventEndDate, category): constructor
+ editEvent():void
+ searchEvent(): list
+ deleteEvent():void
<<dataAccess>>
SearchEngine
- searchResults: string
- filterCriteria: string
+ searchByEvent(filterCriteria): searchResults
+ filterResults(filterCriteria): searchResults
+ sortResults(filterCriteria): searchResults

PSEUDOCODE FOR EVENT CLASS

```
class Event:

  attributes:
    eventID: int
    eventTitle: string
    eventDescription: string
    eventStartDate: date
    eventEndDate: date
    category: string


methods:

    # Constructor to create a new event
    createEvent(eventID: int, eventTitle: string, eventDescription: string, eventStartDate: date,
eventEndDate: date, category: string):
      this.eventID = eventID
      this.eventTitle = eventTitle
      this.eventDescription = eventDescription
      this.eventStartDate = eventStartDate
      this.eventEndDate = eventEndDate
      this.category = category
      print("Event created successfully.")


    # Edit an event based on eventID
    editEvent(eventID: int):
      if this.eventID == eventID:
        input("Enter new eventTitle: ") -> this.eventTitle
        input("Enter new eventDescription: ") -> this.eventDescription
        input("Enter new eventStartDate: ") -> this.eventStartDate
        input("Enter new eventEndDate: ") -> this.eventEndDate
        input("Enter new category: ") -> this.category
        print("Event updated successfully.")
      else:
        print("Event ID not found.")
    # Search for an event based on eventID
    **searchEvent**(eventID: int) -> list:
      if this.eventID == eventID:
        return [this.eventID, this.eventTitle, this.eventDescription, this.eventStartDate,
this.eventEndDate, this.category]
      else:
        print("Event ID not found.")
        return []

    # Delete an event based on eventID
    **deleteEvent**(eventID: int):
      if this.eventID == eventID:
        this.eventID = null
        this.eventTitle = null
        this.eventDescription = null
        this.eventStartDate = null
        this.eventEndDate = null
        this.category = null
        print("Event deleted successfully.")
      else:
        print("Event ID not found.")
```

Explanation of the Methods:

- createEvent: Initializes a new event with all the attributes provided.
- editEvent: Allows modification of an event's details if the eventID matches.
- searchEvent: Searches for an event using eventID and returns the details in a list format.
- deleteEvent: Clears all the attributes of the event if the eventID matches.

PSEUDOCODE FOR TIMELINE CLASS

```
class TimeLine:

  attributes:
    timelineId: int
    timeLineTitle: string
    timeLineDescription: string
    startDate: date
    endDate: date
    initialEventList: list  # List of events in some type of data structure
    layer: list    # Additional timeline layers in some type of data structure


  methods:

    # Constructor to create a new timeline
    createTimeLine(timelineId: int, timeLineTitle: string, timeLineDescription: string, startDate:
date, endDate: date, initialEventList: list):
      this.timelineId = timelineId
      this.timeLineTitle = timeLineTitle
      this.timeLineDescription = timeLineDescription
      this.startDate = startDate
      this.endDate = endDate
      this.initialEventList = initialEventList
      this.layer = []
      print("Timeline created successfully.")


    # Add an event to the timeline
    addEventToTimeline(event: Event):
      this.initialEventList.append(event)
      print("Event added to timeline.")


    # Delete an event from the timeline
    deleteEventFromTimeline(event: Event):
      if event in this.initialEventList:
        this.initialEventList.remove(event)
        print("Event deleted from timeline.")
      else:
        print("Event not found in timeline.")


    # Edit a timeline's details
    editTimeLine(timelineId: int):
      if this.timelineId == timelineId:
        input("Enter new timeLineTitle: ") -> this.timeLineTitle
        input("Enter new timeLineDescription: ") -> this.timeLineDescription
        input("Enter new startDate: ") -> this.startDate
        input("Enter new endDate: ") -> this.endDate
        print("Timeline updated successfully.")
    else:
        print("Timeline ID not found.")


  # Delete a timeline
  deleteTimeLine(timelineId: int):
    if this.timelineId == timelineId:
        this.timelineId = null
        this.timeLineTitle = null
        this.timeLineDescription = null
        this.startDate = null
        this.endDate = null
        this.initialEventList = null
        this.layer = null
        print("Timeline deleted successfully.")
    else:
        print("Timeline ID not found.")


  # Display timeline details
  displayTimeLine(timelineId: int) -> string:
    if this.timelineId == timelineId:
        return f"Timeline: {this.timeLineTitle}\nDescription: {this.timeLineDescription}\nStart Date:
{this.startDate}\nEnd Date: {this.endDate}\nEvents: {len(this.initialEventList)}\nLayers:
{len(this.layer)}"
    else:
        print("Timeline ID not found.")
        return ""


  # Add a layer to the timeline
  addTimelinelayer(layer: string):
    this.layer.append(layer)
    print("Layer added to timeline.")
```

Explanation of the Methods:

- createTimeLine: Initializes a timeline with attributes like ID, title, description, and event list.
- addEventToTimeline: Appends a new event to the initialEventList.
- deleteEventFromTimeline: Removes an event from the list if it exists.

- editTimeLine: Updates timeline details such as title, description, and dates.
- deleteTimeLine: Deletes a timeline by clearing all its attributes.
- displayTimeLine: Returns a string with timeline details, including the number of events and layers.
- addTimelinelayer: Appends a new layer to the timeline's layer list.

PSEUDOCODE FOR USER CLASS

```
class User:

  attributes:
    userId: int
    userName: string
    email: string
    password: string
    role: enum  # Example values: Admin, Regular, Guest


  methods:
    # Create a new user
    createUser(userId: int, userName: string, email: string, password: string, role: enum):
      this.userId = userId
      this.userName = userName
      this.email = email
      this.password = password
      this.role = role
      print("User created successfully.")


    # View user details
    viewUser(userId: int) -> string:
      if this.userId == userId:
        return f"User ID: {this.userId}\nName: {this.userName}\nEmail: {this.email}\nRole:
{this.role}"
      else:
        print("User ID not found.")
        return ""


    # Edit user details
```

```
editUser(userId: int):
  if this.userId == userId:
    input("Enter new userName: ") -> this.userName
    input("Enter new email: ") -> this.email
    input("Enter new password: ") -> this.password
    input("Enter new role: ") -> this.role
    print("User details updated successfully.")
  else:
    print("User ID not found.")


# Delete a user
deleteUser(userId: int):
  if this.userId == userId:
    this.userId = null
    this.userName = null
    this.email = null
    this.password = null
    this.role = null
    print("User deleted successfully.")
  else:
    print("User ID not found.")


# Log in a user
login(userName: string, email: string, password: string):
  if this.userName == userName and this.email == email and this.password == password:
    print(f"Login successful for user: {this.userName}")
  else:
    print("Invalid credentials.")


# Log out a user
logout(userId: int):
  if this.userId == userId:
    print(f"User {this.userName} logged out successfully.")
  else:
    print("User ID not found.")
```

Explanation of the Methods:

- createUser: Initializes a new user by setting all the attributes.
- viewUser: Returns a formatted string with user details if the userId matches.
- editUser: Updates user information such as name, email, password, and role when the userId matches.
- deleteUser: Clears the attributes of a user if the userId matches.
- login: Authenticates the user based on their username, email, and password.
- logout: Logs the user out by validating the userId.

PSEUDOCODE FOR DATABASEMANAGER CLASS

```
class DataBaseManager:

  attributes:
    connectionString: string
    databaseName: string
    isConnected: boolean  # To track the connection status (optional)


  methods:

    # Connect to the database using connectionString and databaseName
    connect(connectionString: string, databaseName: string):
      this.connectionString = connectionString
      this.databaseName = databaseName
      print(f"Connecting to database: {this.databaseName} using {this.connectionString}...")
      # Simulate successful connection
      this.isConnected = true
      print("Connection successful.")


    # Execute a query on the connected database
    executeQuery() -> string:
      if this.isConnected:
        print("Executing query on the database...")
        # Simulate query execution
        return "Query executed successfully."
      else:
        print("No active database connection.")
        return "Query execution failed."


    # Close the database connection
    closeConnection():
      if this.isConnected:
        print(f"Closing connection to database: {this.databaseName}...")
        this.isConnected = false
        print("Connection closed.")
      else:
        print("No active connection to close.")
```

Explanation of the Methods:

- connect: Initializes the database connection using connectionString and databaseName and updates the connection status to isConnected to be true.
- executeQuery: Executes a database query if the connection is active (isConnected is true). Returns a success message if the query is executed or a failure message if the connection is not active.
- closeConnection: Closes the database connection by setting isConnected to false and ensures resources are released.

PSEUDOCODE FOR SEARCHENGINE CLASS

```
class SearchEngine:

  attributes:
    searchResults: string  # Stores the results of the search as a string (can be modified for a list in real implementation)
    filterCriteria: string  # Stores the criteria to filter or sort results


  methods:

    # Search for events based on filter criteria
    **searchByEvent**(filterCriteria: string) -> string:
      this.filterCriteria = filterCriteria
      print(f"Searching for events using criteria: {this.filterCriteria}...")
      # Simulate search logic
      this.searchResults = f"Results found for criteria: {this.filterCriteria}"
      return this.searchResults


    # Filter the search results based on additional criteria
    **filterResults**(filterCriteria: string) -> string:
      this.filterCriteria = filterCriteria
      print(f"Filtering results using criteria: {this.filterCriteria}...")
      # Simulate filtering logic
      this.searchResults = f"Filtered results for criteria: {this.filterCriteria}"
      return this.searchResults


    # Sort the search results based on specified criteria
    **sortResults**(filterCriteria: string) -> string:
      this.filterCriteria = filterCriteria
      print(f"Sorting results using criteria: {this.filterCriteria}...")
      # Simulate sorting logic
      this.searchResults = f"Sorted results by criteria: {this.filterCriteria}"
      return this.searchResults
```

Explanation of the Methods:

- searchByEvent: Accepts a filterCriteria as input. Simulates a database search using the provided criteria and updates searchResults with matching entries.
- filterResults: Applies additional filtering on the current searchResults based on new filterCriteria. Updates searchResults to reflect the filtered data.
- sortResults: Sorts the current searchResults based on the specified filterCriteria. Updates searchResults to reflect the sorted data.

Usage Flow: The user would typically invoke searchByEvent to get a list of results based on initial criteria. The results can then be further refined using filterResults. Finally, the results can be sorted as needed using sortResults.

PSEUDOCODE FOR CLASS VISUALIZATION:

```
Class Visualization:

 attributes:
   graphType: string  # Type of graph to represent the timeline (e.g., Bar, Gantt, Line)
   colorScheme: string  # Color scheme for the display (e.g., Light, Dark, Custom)


  methods:

   # Set the type of graph for visualization
   generateGraphType(graphType: string):
     this.graphType = graphType
     print(f"Graph type set to: {this.graphType}")
     # Simulate generating the graph
     print(f"Generating a {this.graphType} graph...")


   # Update the display settings with a specific color scheme
   updateDisplaySettings(colorScheme: string):
     this.colorScheme = colorScheme
     print(f"Color scheme updated to: {this.colorScheme}")
     # Simulate applying the color scheme
     print(f"Applying {this.colorScheme} color scheme to the visualization.")


   # Zoom into the timeline view
   zoomIn():
     print("Zooming in on the timeline...")
     # Simulate the zoom-in effect
     print("Timeline zoomed in.")

   # Zoom out of the timeline view
   zoomOut():
     print("Zooming out from the timeline...")
     # Simulate the zoom-out effect
     print("Timeline zoomed out.")

   # Pan across the timeline
   pan():
     print("Panning across the timeline...")
     # Simulate the panning effect
     print("Timeline panned.")
```

Explanation of the Methods:

- generateGraphType: Sets the type of graph for timeline visualization and simulates the process of generating it. The graph types could include bar charts, Gantt charts, line graphs, etc.
- updateDisplaySettings: Updates the color scheme used for the timeline display (e.g., light mode, dark mode) and applies the new settings.
- zoomIn: Simulates zooming into the timeline to provide a closer view of events or layers.
- zoomOut: Simulates zooming out to show a broader view of the timeline and its events.
- pan: Allows the user to move across the timeline horizontally, providing navigation functionality.

PSEUDOCODE FOR USERHANDLER CLASS

```
class UserHandler:

 methods:
  # Create a new timeline with a given name
  newTimeline(name: string):
    print(f"Creating a new timeline: {name}")
    # creating a new timeline
    timeline = TimeLine(name)
    print(f"Timeline '{name}' created successfully.")
```

```
# Edit an existing timeline by name
editTimeline(name: string):
   print(f"Editing timeline: {name}")
   # Simulate editing timeline logic
   input("Enter new title for timeline: ") -> newTitle
   timeline = getTimelineByName(name)  # function to retrieve the timeline
   if timeline:
      timeline.timeLineTitle = newTitle
      print(f"Timeline '{name}' updated to '{newTitle}'.")
   else:
      print("Timeline not found.")


# Add a layer to a timeline by name
addLayer(name: string):
   print(f"Adding a layer to timeline: {name}")
   timeline = getTimelineByName(name)  # function to retrieve the timeline
   if timeline:
      input("Enter layer name: ") -> layerName
      timeline.addTimelinelayer(layerName)
      print(f"Layer '{layerName}' added to timeline '{name}'.")
   else:
      print("Timeline not found.")


# Retrieve saved timelines for a specific user
getSavedTimelines(userId: int) -> string:
   print(f"Retrieving saved timelines for user ID: {userId}")
   # retrieval of timelines
   timelines = getTimelinesByUserId(userId)
   if timelines:
      return f"Saved Timelines for User {userId}: {timelines}"
   else:
      return "No saved timelines found."


# View the details of a timeline by name
viewTimeline(name: string) -> string:
   print(f"Viewing timeline: {name}")
   timeline = getTimelineByName(name)  # function to retrieve the timeline
   if timeline:
      return f"Timeline Details: {timeline.displayTimeLine(timeline.timelineId)}"
   else:
      return "Timeline not found."
```

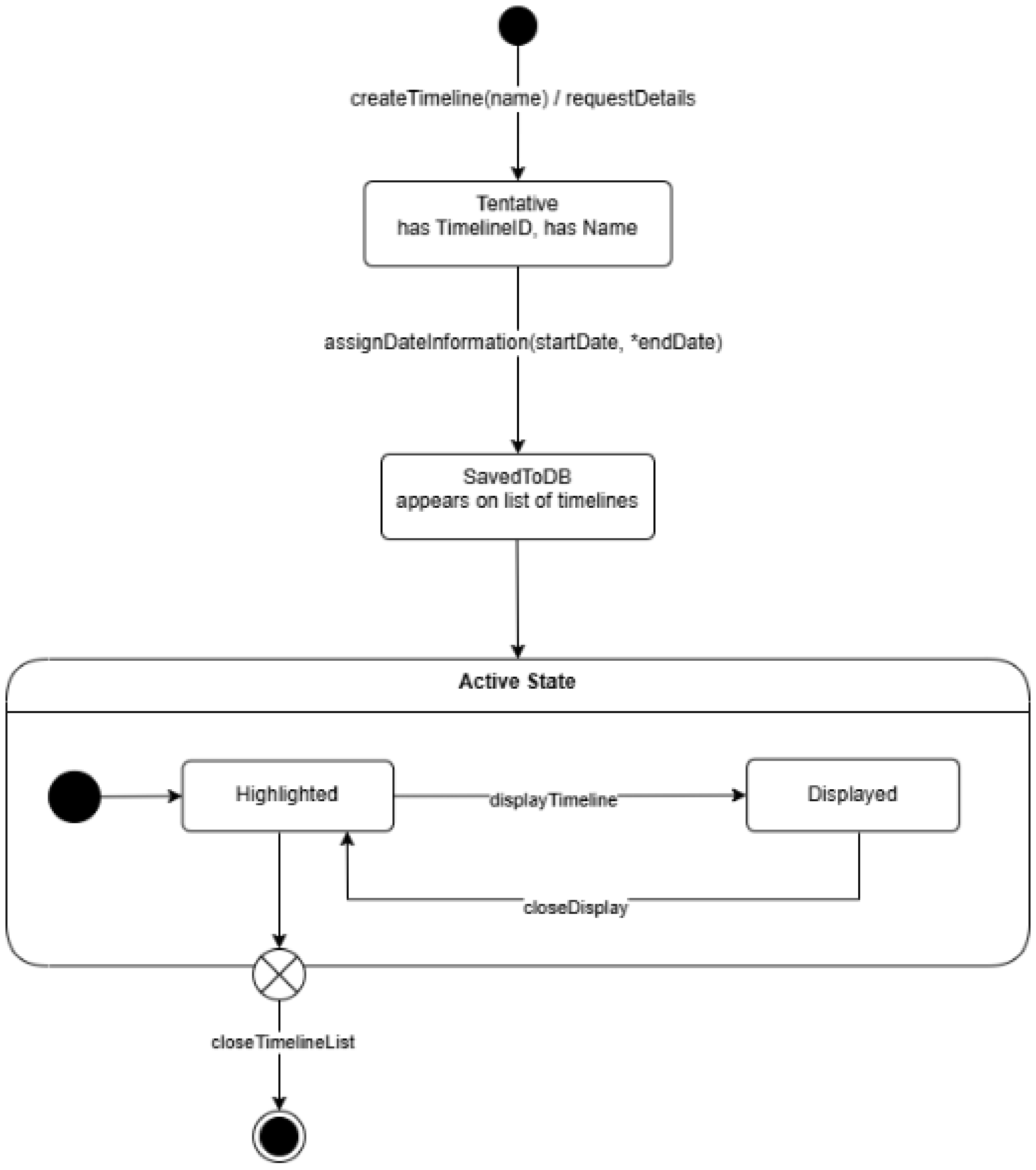
```
  # Add an event to a specific timeline by name
  addEvent(timelineName: string):
    print(f"Adding an event to timeline: {timelineName}")
    timeline = getTimelineByName(timelineName)  # function to retrieve the timeline
    if timeline:
      input("Enter event details (ID, title, description, startDate, endDate, category): ") ->
eventDetails
      newEvent = Event(eventDetails)  # event creation
      timeline.addEventToTimeline(newEvent)
      print(f"Event added to timeline '{timelineName}'.")
    else:
      print("Timeline not found.")


  # Edit an event within a specific timeline by name
  editEvent(timelineName: string):
    print(f"Editing an event in timeline: {timelineName}")
    timeline = getTimelineByName(timelineName)  # function to retrieve the timeline
    if timeline:
      input("Enter event ID to edit: ") -> eventId
      event = getEventById(timeline, eventId)  # function to retrieve the event
      if event:
        event.editEvent(event.eventID)
        print(f"Event with ID {eventId} in timeline '{timelineName}' updated.")
      else:
        print("Event not found in the timeline.")
    else:
      print("Timeline not found.")
```

Explanation of the Methods:

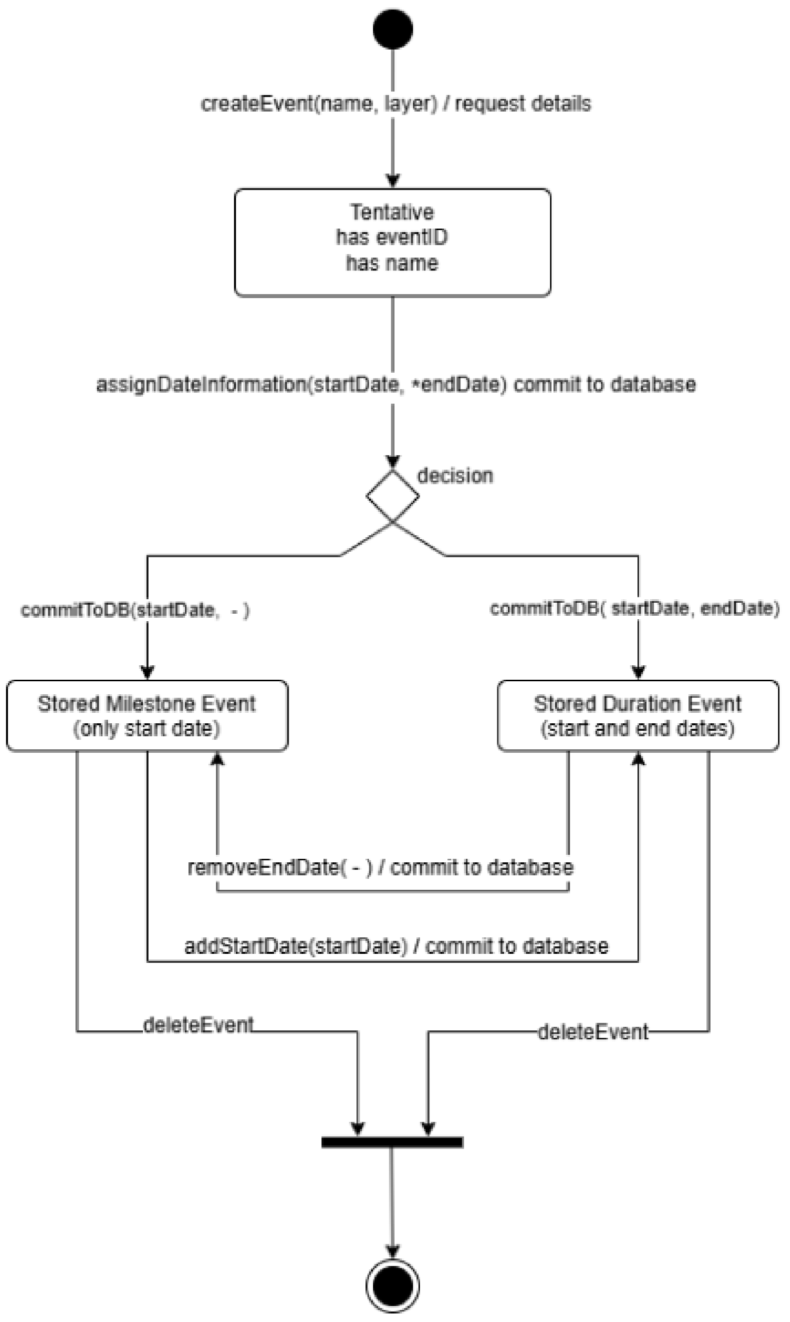
- newTimeline: Creates a new TimeLine instance with the provided name.
- editTimeline: Updates the details of an existing timeline.
- addLayer: Adds a new layer to an existing timeline.
- getSavedTimelines: Fetches all saved timelines for a specific user based on their userId.
- viewTimeline: Displays the details of a specific timeline.
- addEvent: Creates and adds a new event to a timeline.
- editEvent: Edits an event within a specified timeline by event ID.

STATECHART DIAGRAMS

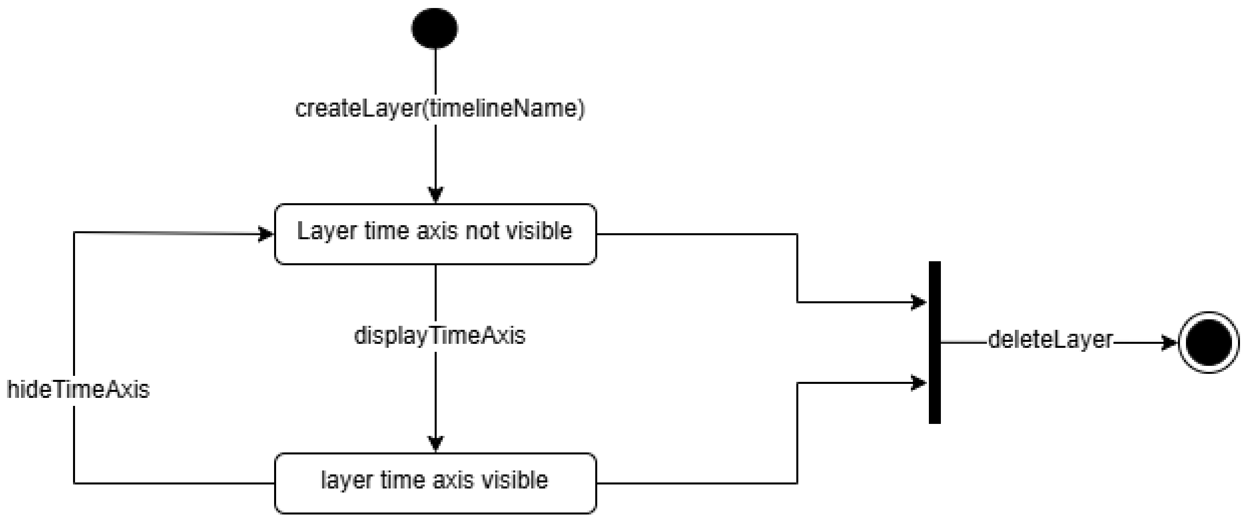
TIMELINE CLASS



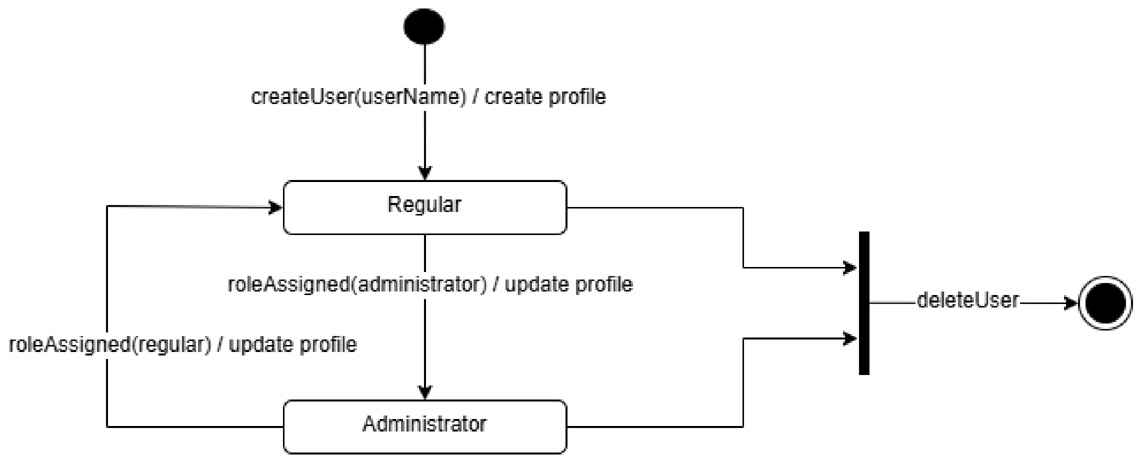
EVENT CLASS


createEvent(name, layer) / request details
Tentative
has eventID
has name
assignDateInformation(startDate, *endDate) commit to database
decision
commitToDB(startDate, -)
commitToDB(startDate, endDate)
Stored Milestone Event
(only start date)
Stored Duration Event
(start and end dates)
removeEndDate(-) / commit to database
addStartDate(startDate) / commit to database
deleteEvent
deleteEvent

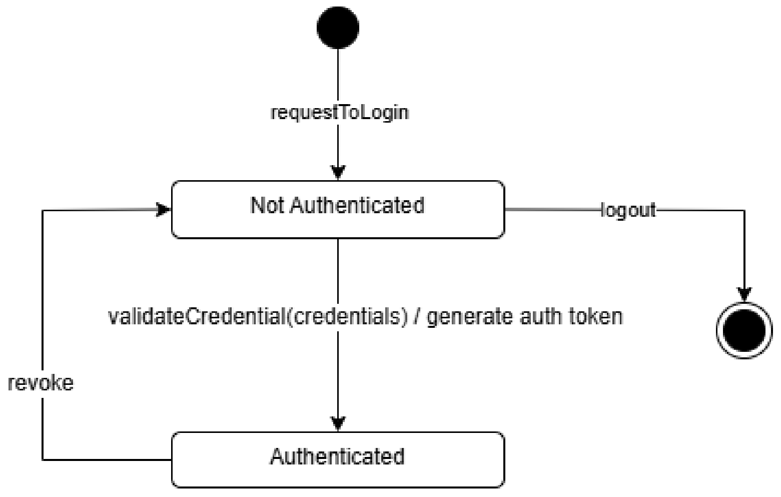
VISUALIZATION CLASS



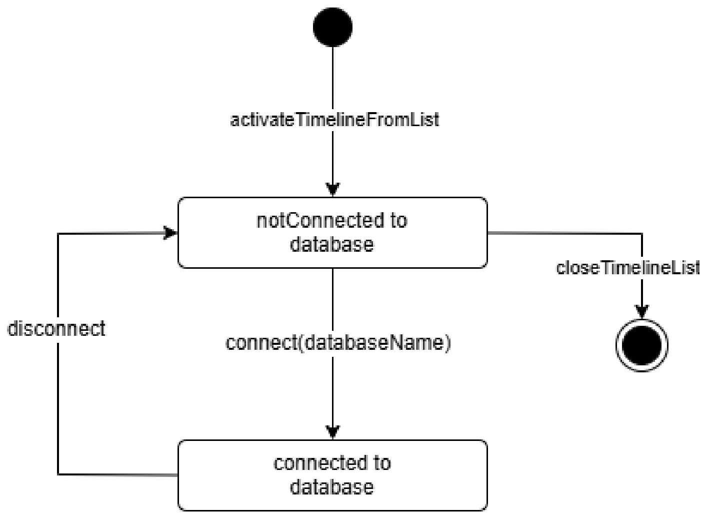
USER CLASS


createUser(userName) / create profile
Regular
roleAssigned(administrator) / update profile
roleAssigned(regular) / update profile
Administrator
deleteUser

AUTHENTICATION CLASS



DATABASEMANAGER CLASS

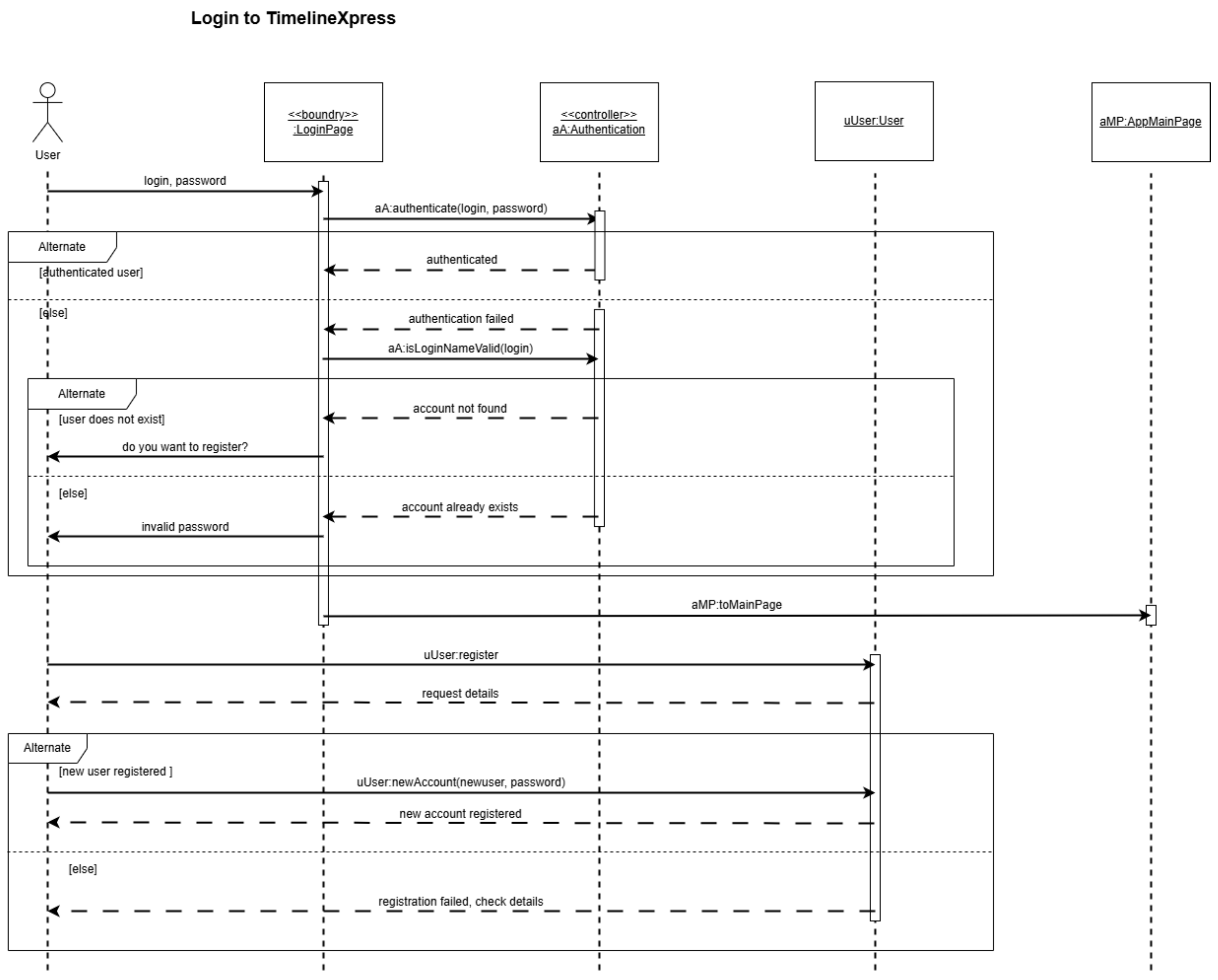


SEARCHENGINE CLASS

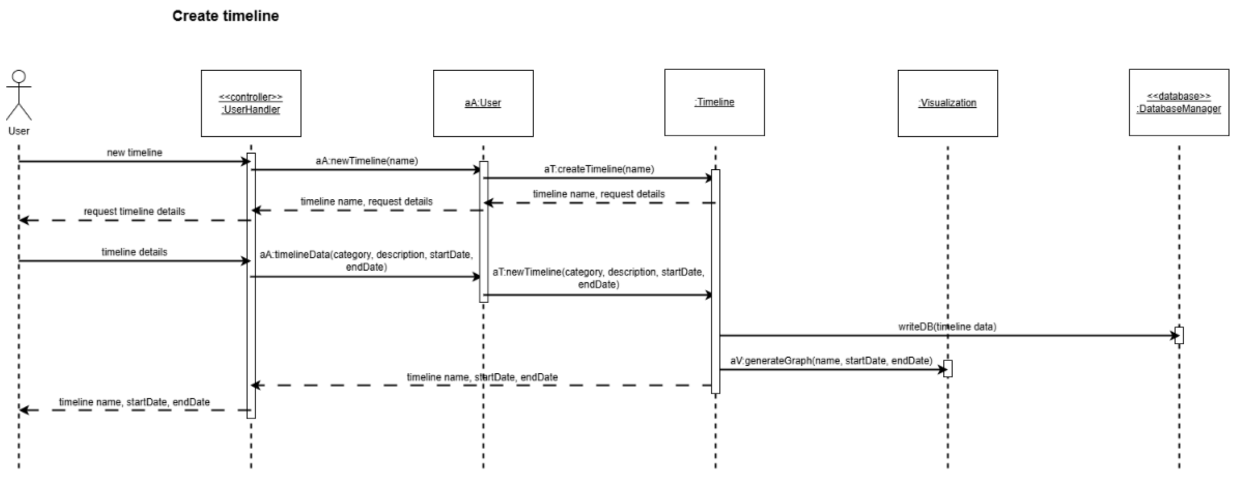
The SearchEngine class provides only services, and thus does not have a state machine diagram.

SEQUENCE DIAGRAMS

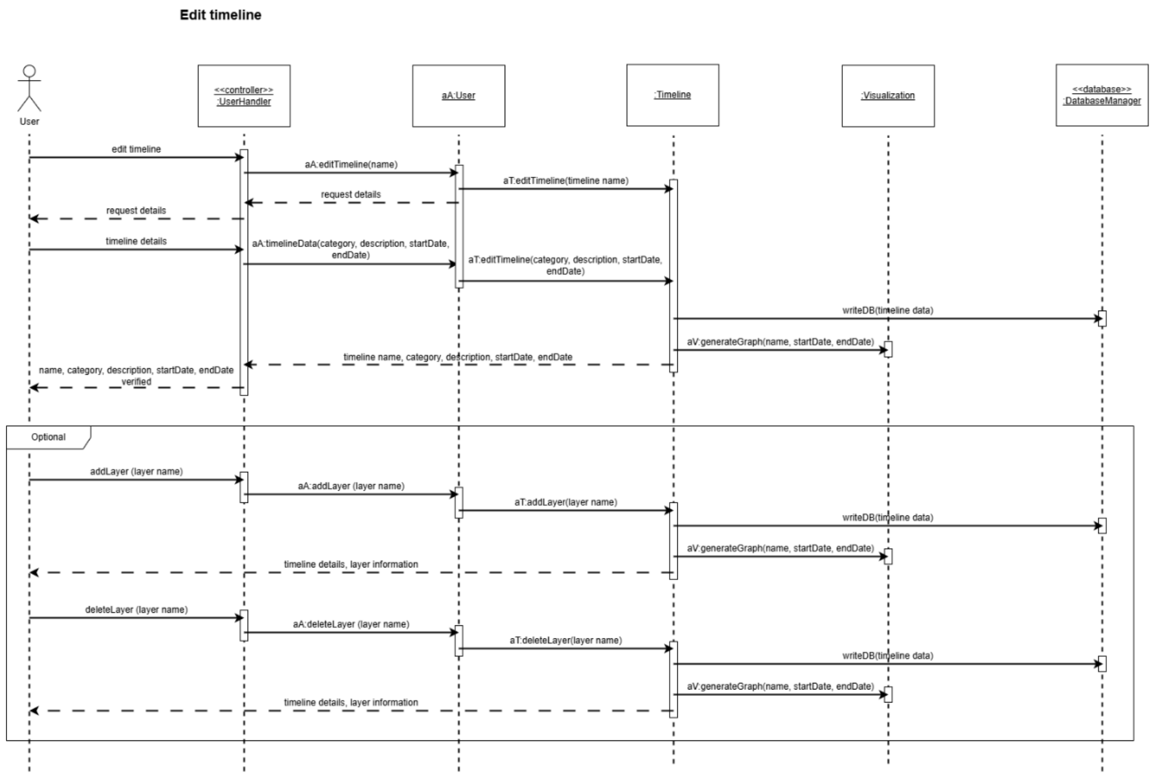
USE CASE 1: LOGIN TO TIMELINEXPRESS



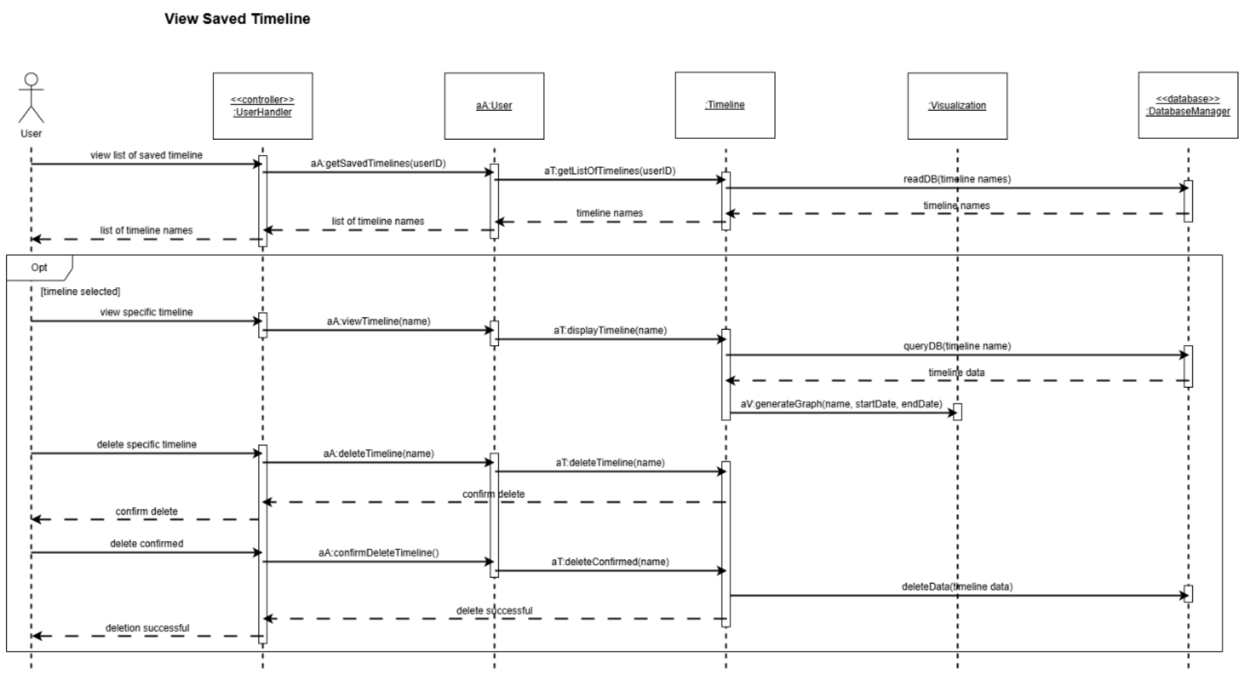
USE CASE 2: CREATE TIMELINE


Create timeline
User
<<controller>> :UserHandler
aA:User
:Timeline
:Visualization
<<database>> :DatabaseManager
new timeline
aA:newTimeline(name)
aT:createTimeline(name)
timeline name, request details
timeline name, request details
request timeline details
timeline details
aA:timelineData(category, description, startDate, endDate)
aT:newTimeline(category, description, startDate, endDate)
writeDB(timeline data)
aV:generateGraph(name, startDate, endDate)
timeline name, startDate, endDate
timeline name, startDate, endDate

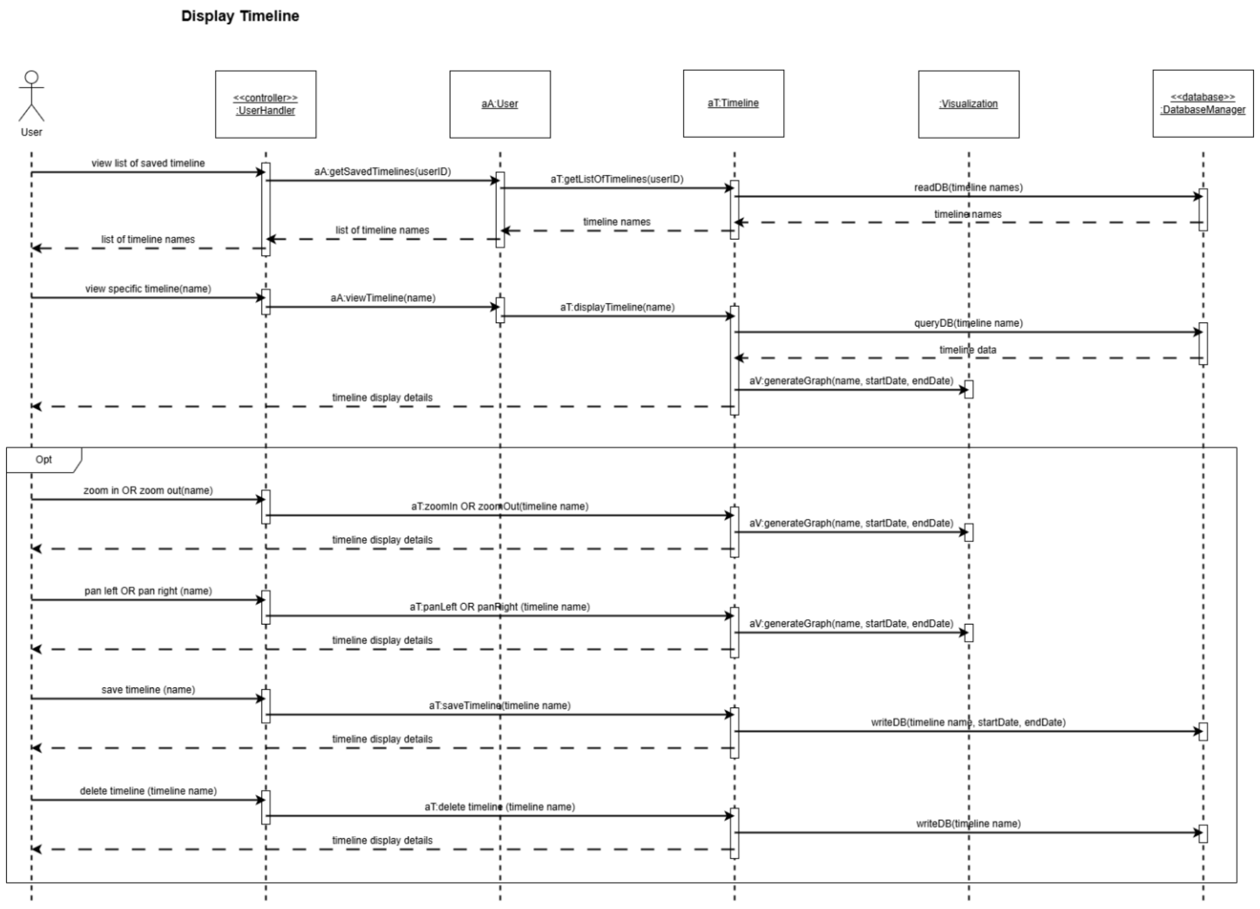
USE CASE 3: EDIT TIMELINE


Edit timeline
User
<<controller>> :UserHandler
aA:User
:Timeline
:Visualization
<<database>> :DatabaseManager
edit timeline
aA:editTimeline(name)
aT:editTimeline(timeline name)
request details
request details
timeline details
aA:timelineData(category, description, startDate, endDate)
aT:editTimeline(category, description, startDate, endDate)
writeDB(timeline data)
aV:generateGraph(name, startDate, endDate)
timeline name, category, description, startDate, endDate
name, category, description, startDate, endDate verified
Optional
addLayer (layer name)
aA:addLayer (layer name)
aT:addLayer(layer name)
writeDB(timeline data)
aV:generateGraph(name, startDate, endDate)
timeline details, layer information
deleteLayer (layer name)
aA:deleteLayer (layer name)
aT:deleteLayer(layer name)
writeDB(timeline data)
aV:generateGraph(name, startDate, endDate)
timeline details, layer information

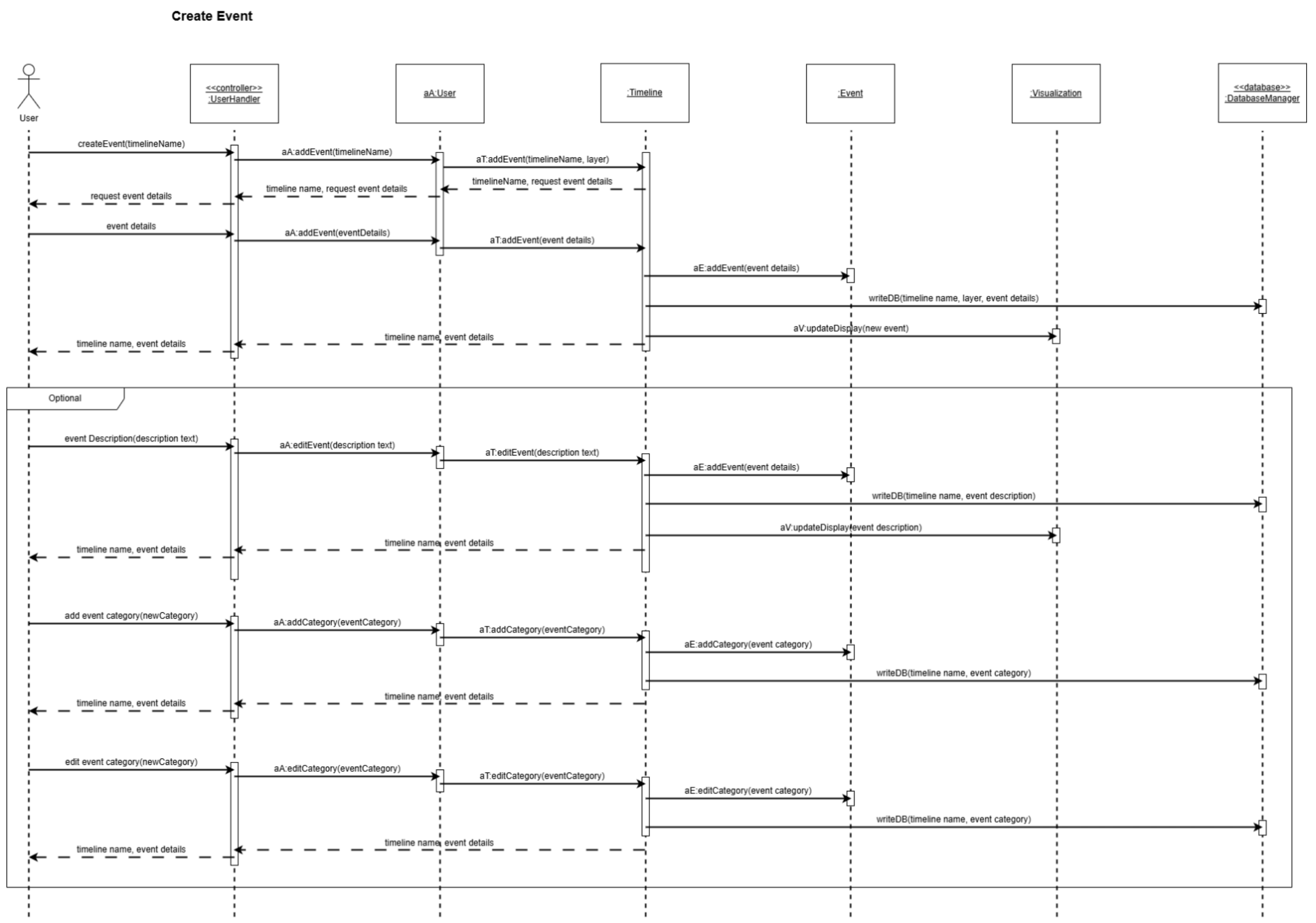
USE CASE 4: VIEW ALL SAVED TIMELINES



USE CASE 5: DISPLAY A TIMELINE

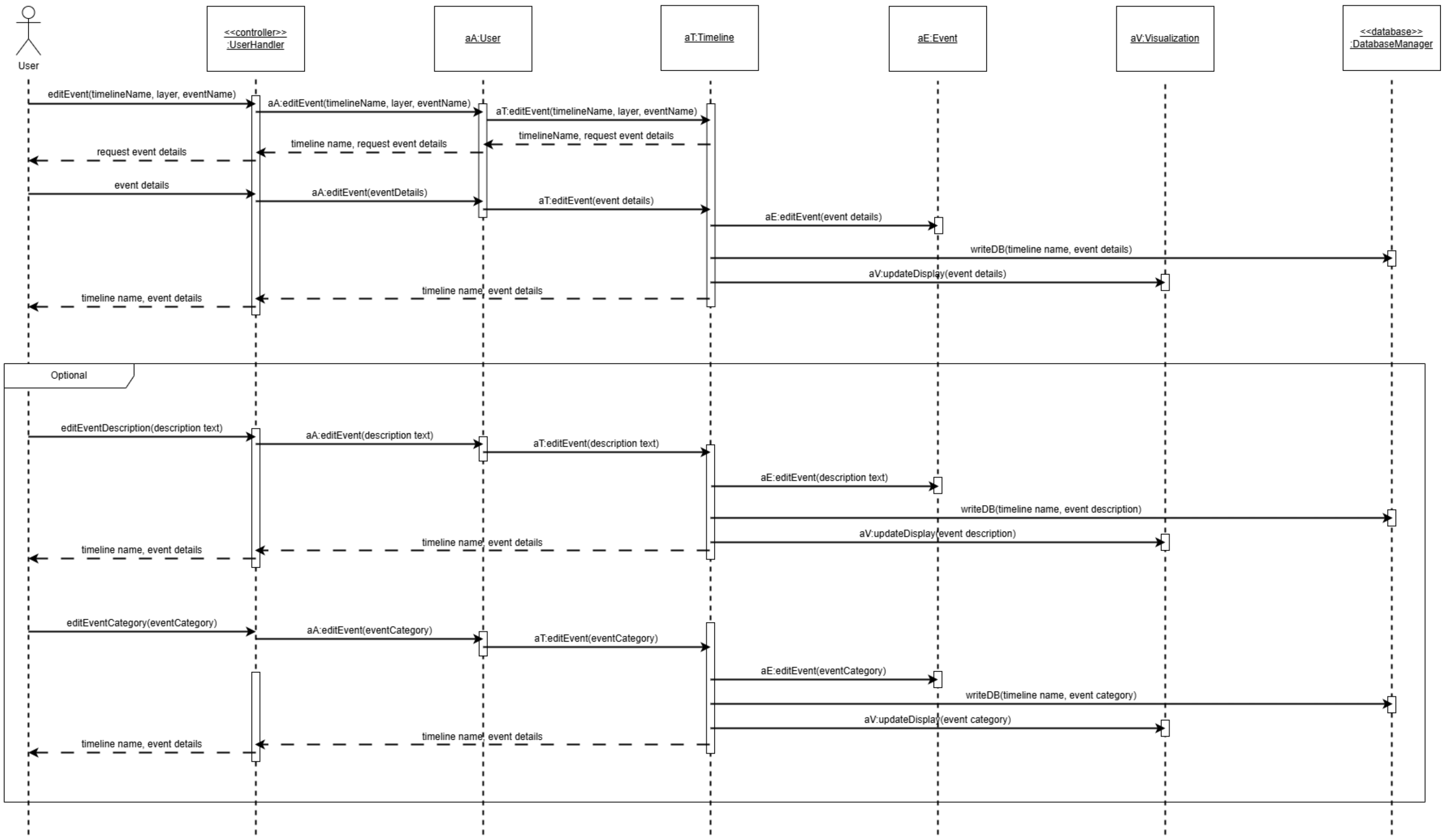

Display Timeline
User
<<controller>> :UserHandler
aA:User
aT:Timeline
:Visualization
<<database>> :DatabaseManager
view list of saved timeline
aA:getSavedTimelines(userID)
aT:getListOfTimelines(userID)
readDB(timeline names)
timeline names
timeline names
list of timeline names
list of timeline names
view specific timeline(name)
aA:viewTimeline(name)
aT:displayTimeline(name)
queryDB(timeline name)
timeline data
aV:generateGraph(name, startDate, endDate)
timeline display details
Opt
zoom in OR zoom out(name)
aT:zoomIn OR zoomOut(timeline name)
aV:generateGraph(name, startDate, endDate)
timeline display details
pan left OR pan right (name)
aT:panLeft OR panRight (timeline name)
aV:generateGraph(name, startDate, endDate)
timeline display details
save timeline (name)
aT:saveTimeline(timeline name)
writeDB(timeline name, startDate, endDate)
timeline display details
delete timeline (timeline name)
aT:delete timeline (timeline name)
writeDB(timeline name)
timeline display details

USE CASE 6: CREATE EVENT


Create Event
User
<<controller>> :UserHandler
aA:User
:Timeline
:Event
:Visualization
<<database>> :DatabaseManager
createEvent(timelineName)
aA:addEvent(timelineName)
aT:addEvent(timelineName, layer)
timelineName, request event details
timeline name, request event details
request event details
event details
aA:addEvent(eventDetails)
aT:addEvent(event details)
aE:addEvent(event details)
writeDB(timeline name, layer, event details)
aV:updateDisplay(new event)
timeline name, event details
timeline name, event details
Optional
event Description(description text)
aA:editEvent(description text)
aT:editEvent(description text)
aE:addEvent(event details)
writeDB(timeline name, event description)
aV:updateDisplay(event description)
timeline name, event details
timeline name, event details
add event category(newCategory)
aA:addCategory(eventCategory)
aT:addCategory(eventCategory)
aE:addCategory(event category)
writeDB(timeline name, event category)
timeline name, event details
timeline name, event details
edit event category(newCategory)
aA:editCategory(eventCategory)
aT:editCategory(eventCategory)
aE:editCategory(event category)
writeDB(timeline name, event category)
timeline name, event details
timeline name, event details

USE CASE 7: EDIT EVENT

Edit Event


User
<<controller>> :UserHandler
aA:User
aT:Timeline
aE:Event
aV:Visualization
<<database>> :DatabaseManager
editEvent(timelineName, layer, eventName)
aA:editEvent(timelineName, layer, eventName)
aT:editEvent(timelineName, layer, eventName)
timelineName, request event details
timeline name, request event details
request event details
event details
aA:editEvent(eventDetails)
aT:editEvent(event details)
aE:editEvent(event details)
writeDB(timeline name, event details)
aV:updateDisplay(event details)
timeline name, event details
timeline name, event details
Optional
editEventDescription(description text)
aA:editEvent(description text)
aT:editEvent(description text)
aE:editEvent(description text)
writeDB(timeline name, event description)
aV:updateDisplay(event description)
timeline name, event details
timeline name, event details
editEventCategory(eventCategory)
aA:editEvent(eventCategory)
aT:editEvent(eventCategory)
aE:editEvent(eventCategory)
writeDB(timeline name, event category)
aV:updateDisplay(event category)
timeline name, event details
timeline name, event details