İhsan Doğramacı Bilkent University

Department of Computer Engineering

CS319 Object Oriented Software Engineering

ProCheck

Design Report Iteration 2

Group 1E

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1. Introduction

1.1. Purpose of the system

This application will allow instructors to easily manage the courses that include projects as a task. Also, students will be able to work in groups and manage their work easily thanks to ProCheck (our application name). Furthermore, the main goal will be to provide enough feedback to the project groups so that they can improve their work. By giving users opportunities to both facilitate the management process and develop the projects according to the feedback that was received, one can benefit from this system fully.

1.2. Design goals

Usability

Our program must be user-friendly since it will be used by many students whose first precedence is simplicity. In order to do this, we made our user interface very simple and easy to use. Moreover, it will be comprehensible for users who want to easily find what they need. Our interfaces will be interchangeable. For instance, instructors and students have different interfaces with little changes but it will not affect the simplicity of interfaces. On the other hand, our interfaces will be detailed which is mostly about the process of students' projects.

Reliability

In order to make our program reliable, we tried to handle exceptions and errors so they won't result in a fatal error which results in a breakdown in the program or data loss. Besides, in every error situation, the user is informed about the problem by proper messages and warnings that explain the problem.

Portability

Since our application will be a web-based application, we need to make sure that it works in every web browser. Users of this application can use different browsers such as Safari on macOS version 14.0.3, Chrome version 90.0.4430.72, Firefox version 87.0, and also Chrome on Android version 90.0.4430.66 and Safari on iOS version 14.0, therefore, it is important that the user can open this application smoothly and perform his/her actions.

Maintainability

Since the application will be using the basis of Object-Oriented Programming (OOP), adding new features is going to be simple for any developer by using interfaces or inheritance. Moreover, OOP enables us to implement hierarchy easily by using its features such as polymorphism or inheritance.

Performance

The application would have a decent response time to not waste the teacher's or students' time, even though performance is not a main concern in the application. It will have a response time under 5 seconds and will display the changes such as uploading homework or sending a message in less than 5 seconds.

2. High-level Software Architecture

2.1. Subsystem Decomposition

Our goal is to ensure that further enhancements will be implemented in an easy manner without touching existing functionalities. So, we have decided to use a 3-layer architectural style which are UserInterface Layer, Management Layer, and Data Layer. Our main focus is to maximize the coherence in between components while minimizing the coupling in between the components.

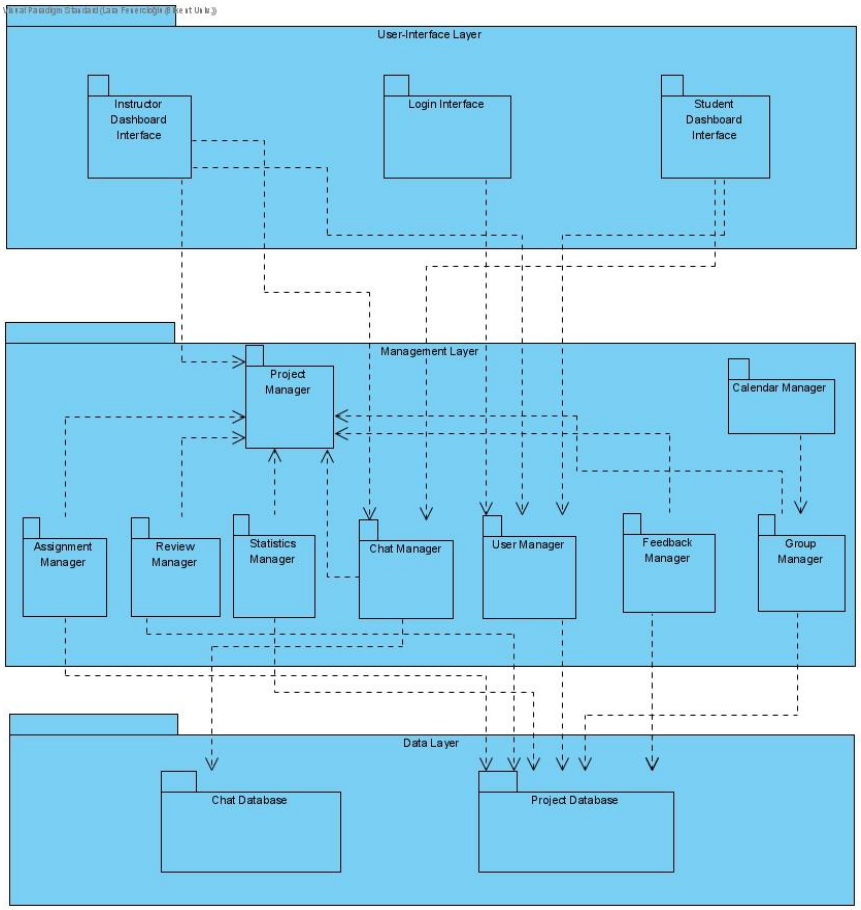


Figure 1 https://imgur.com/B5gRKj0

2.1.1. User Interface Layer

This layer is responsible for connecting users to the system with simple interfaces. It helps to visualize the system with UI components. This layer is connected to the Management Layer to modify the system or data. It has no access to data or functions directly.

Login Interface: It is the first interface which the users will see and enter their email - password to login into the system.

Instructor Dashboard Interface: After the user entered, according to the role of s/he a dashboard interface will appear. If the user is an instructor or TA this dashboard interface will be used.

Student Dashboard Interface: If the user is a student this interface will appear and will be used. There are small differences between instructor and student dashboards. Thus, we decided to use two different interface components.

2.1.2. Management Layer

This layer is responsible for doing calculations according to the user's actions, unseen by the user. The layer does the calculations according to user inputs and data according to the task.

Project Manager: Project information, fundamental functionalities of a project will be kept here.

Statistics Manager: Statistics about the course will be accessed through this package.

Calendar Manager: Functionalities related to calendar will be accessed from this package such as add event or edit calendar.

User Manager: User related activities such as chat will be kept here for further access.

Assignment Manager: It is the Manager which will handle the assignment submissions from students to the assignments created by the instructor. It will send assignments to the database.

Review Manager: It is the manager which will handle the Peer and artifact reviews submitted by students. It will be stored in a database.

Chat Manager: The manager who manages the chat messages from students and instructors.

Feedback Manager: This is the manager which will handle the feedback given by the instructor, store them in the database.

Group Manager: Is the manager which will handle the group creation, join requests, invitations and will store the information of the groups into database.

2.1.3. Data Layer

This layer will be responsible for hiding the data from the other layers and saving it. All of the information will be stored in a database.

Chat Database: Messages between users will be kept in this database. Managing the communication will be carried out here.

Project Database: All things related to the project will be saved in this database.

2.2. Hardware/Software Mapping

Our application does not require any specific hardware component to run. Since the application will not have complicated interactions between objects, it certainly does not require any high-end hardware. However, the user will need a keyboard, touchpad, or a mouse to interact with the application if the user uses a computer. Additionally, this application will be implemented by using Java, Javascript programming languages and HTML, CSS markup languages.We are planning to use Java Spring Framework for the back-end development. Since Spring is very popular and used in web development, we can easily implement it and find much more resources than other frameworks. Thymeleaf template engine will be used in order to create a connection between frontend and java. Also we will use MongoDB which is a NoSQL database in order to store the data. Since it will be web-application, the user doesn't need to install anything, the user only needs to load the website. But the versions of the browsers are important and they are Safari on macOS version 14.0.3, Chrome version 90.0.4430.72, Firefox version 87.0, and also Chrome on Android version 90.0.4430.66 and Safari on iOS version 14.0.

2.3. Persistent Data Management

The database will hold usernames and passwords in order to login the system. Groups, group members will be held to form project groups. The invitations and requests sent by the groups and students will also be held in the database. Project information, class statistics such as grades, averages will be held to be used in a graph which will show the average of the class. Artifact submissions, reviews about them and feedback about them, instructor announcements will be held to inform both students and instructor/TA. Participants and channels will be held for the chatting feature of the application. Also messages from participants will be stored as well. Since the calendar will be used in the dashboard, event related information such as dates and event topic will be stored.

2.4. Access Control and Security

In our application, no user can access other user's private information such as their password. All the information about users will be held on a database. No user can reach these data that are in the database, so they cannot manipulate the data directly. The database will keep every user's data including their project papers and chat logs. The application will not have a user authentication system. Meaning that, if a user shares their user information with someone, they will be able to reach their account. This situation results in weakness on the security side. Additionally, some functionalities can be only done by instructors, for instance announcing,

changing project settings, grading, and editing assignment operations. On the other hand, forming groups, peer reviewing, artifact reviewing, and submitting assignments are special to each student.

2.5. Boundary Conditions

2.5.1. Initialization

Our game will not require any installation process in order to enter. For initialization, the users should have an internet connection and load the page successfully. Then users must be registered to the system in order to log in. After that, the users can enter the system and focus on their projects, group formations, etc.

2.5.2. Termination

When the user wants to exit the program, s/he can log out or simply close the application window. If the user closes the window, the program will automatically log out from the user's account in order to prevent the user's account to remain logged in public computers after closing the program.

2.5.3. Failure

Loss of network connection can lead to some major problems. If the user loses the internet connection while uploading something, sending a message, reviewing an artifact, and other similar actions, the data may not be saved.

If the user attempts to log out or close the window while using any function of the application, data will not be saved since the action is not finished yet.

3. Low-level Design

3.1. Object Design Trade-offs

Usability vs Functionality:

Usability is one of our biggest concerns since this program will be mostly used by students that are mostly impatient and want to easily find what they want. Also our program must be clear and simple since it focuses on a specific purpose. Therefore, we focus on more usable programs whereas we make a sacrifice from functionality. Our program is about projects and thus, limited but enhanced functions will be enough for students and instructors to develop a project and assess it.

Efficiency vs Portability:

Since it will be a web based application portability is not a concern and it can be used by either a computer, Android, or iOS phone through different browsers such as Chrome, Firefox, Safari, etc. . The efficiency may decrease due to portability of the application because it will not be designed specifically to the platforms such as phone browsers.

Performance vs Security:

Security is not the one of the main concerns of this project. Although we want our application to be secure, we did not want to compromise on performance. Since our application is going to be used on a very large variety of devices, and the application has different kinds of tasks, we prioritize performance over security; because we wanted to facilitate users' experience.

Reliability vs Cost:

Our program will handle most of the exceptions and errors without any damage and notify users with warnings and messages, therefore, reliability is one of the aspects that we will focus on. In order to achieve this we will spend many hours and try various test programs to detect errors and handle them in a proper way which means its cost will increase.

Maintainability vs Cost:

We are planning to develop a maintainable program since our product can be used by different courses for different assignments and different purposes. Therefore we have to spend more time to add changes easily which will increase the cost of our project.

3.2. Final Object Design

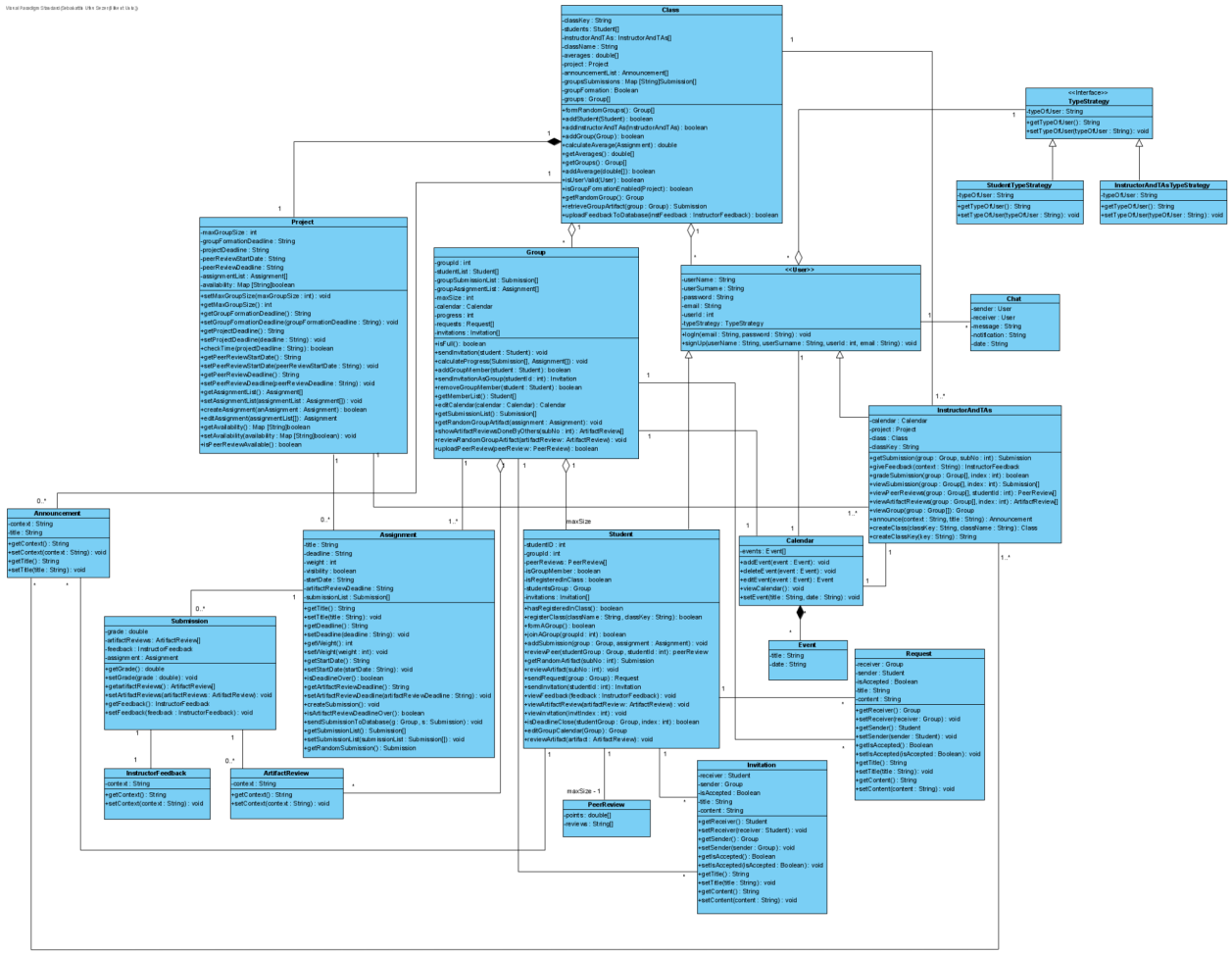


Figure 2 https://imgur.com/iY7Ip3a

3.3. Packages

We will be using external packages which are introduced by external libraries such as javax. By using these we will be able to easily use classes that we need.

3.3.1. External Packages

java.util: Data structures will be used from this package and also java.util.random will be used in order to give a random class key while opening a class[3].

com.google.api.services.calendar.Calendar: This package is used to manipulate events on a calendar. A template of a calendar will be used[5].

javax.websocket: This package is used for creating lifecycle endpoint classes to implement the chat in the web application[2].

org.springframework.boot: Since we will use Spring Framework, we will be using this package[6].

javax.servlet: This package includes classes and interfaces that describes and introduces servlet classes and the runtime environment[4].

3.4. Design Patterns

3.4.1. Strategy Design Pattern

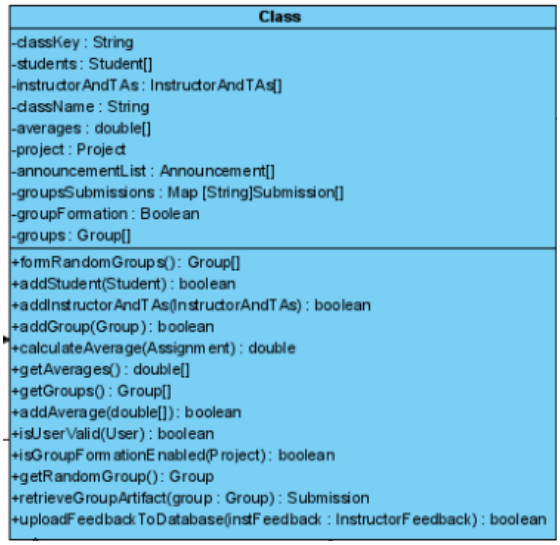
In this project we are using the Strategy design pattern because there are different types of users in our system and they have to be encapsulated so we created a TypeStrategy interface to differentiate between them because they will have different

functionalities and this will let us isolate between their different algorithms for the user object during runtime.

3.4.2. Singleton Design Pattern

We are also going to use the Singleton design pattern in order to create an object while making sure that only one object gets created. These classes will provide a way to access its only object which can be accessed without needing to instantiate the object of the class. For instance Class class' and Project class' object is going to be created only once in our system so singleton will be helpful in that sense.

3.5. Class Interfaces



3.5.1. Class

This is the class which contains attributes and operations related to Class.

Attributes:

- **private String classKey:**

  Holds the key of the class to register the course

- **private Students[] students:**

  Contains the students in the class.

- **private InstructorAndTAs instructorAndTAs:**

  Holds instructor and TAs of the class.

- **private Group[] groups:**

  Contains the groups that are formed in the class.

- **private String className:**

  Holds the name of the course.

- **private double[] averages:**

  Holds the averages of assignments.

- **private Project project:**

  Class will have a project instance.

- **private Announcement announcementList:**

  Class will hold all the announcements made by the instructor.

- **private Map[String]Submission[] groupSubmissions:**

  Class has a map type that will hold each assignment's submission list made by the groups.

- **private Boolean groupFormation:**

  This attribute will tell whether the groupFormation action started or not.

Operations:

- **public boolean formRandomGroups():**

  A method which creates random groups if there are still students without any group.

- **public boolean addStudent(Student):**

  Adds a new student to class.

- **public boolean addInstructorAndTAs(InstructorAndTAs):**

  Adds instructor and TAs to class.

- **public boolean addGroup(Group):**

  Adds a new group to class.

- **public double calculateAverage(Assignment):**

  Calculates average of an assignment.

- **public double getAverages():**

  Returns average of an assignment.

- **public Group[] getGroups():**

  Returns all the formed groups.

- **public boolean addAverage(double[]):**

  This method will add an average score of an assignment to the attribute averages list. If successful, returns true, else returns false.

- **public boolean isUserValid(User):**

  Returns true if the user is in the system.

- **public boolean isGroupFormationEnabled(Project):**

Returns true if the group formation is enabled and it will check this by looking to the project attribute.

- **public Group getRandomGroup():**

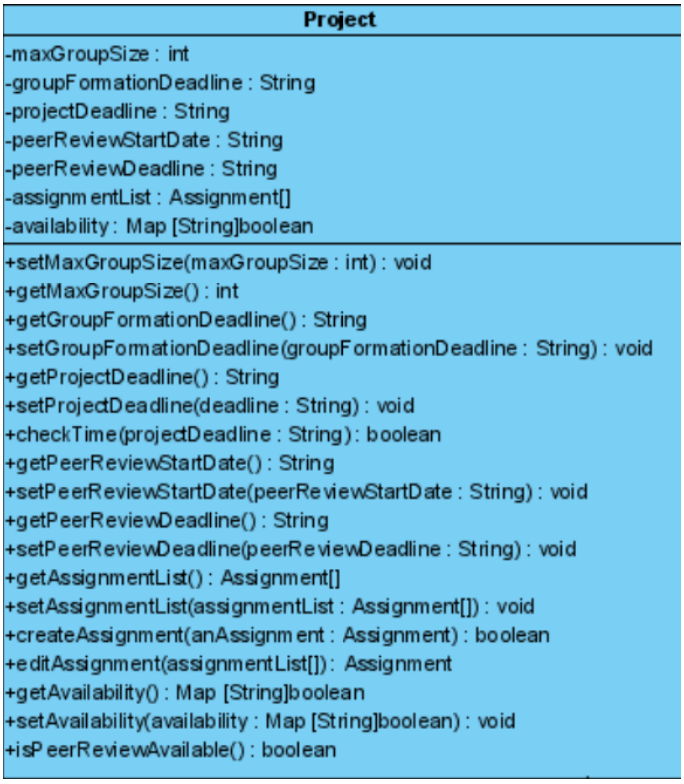
  Returns a random group in the class.

- **public Submission retriveGroupArtifact(Group):**

  Before making an artifact review, this method will be called and will return the specified group's artifact.

- **public boolean uploadFeedbackToDatabase(InstructorFeedback):**

  After the instructor makes a feedback, it will be uploaded to the database.



3.5.2. Project

It is used for projects that will be done by students.

Attributes:

- **private Map[String]boolean availability:**

  Decides which submission is visible.

- **private int maxGroupSize:**

  Holds the maximum group size which will be determined by the instructor.

- **private String groupFormationDeadline:**

  Holds the final date to form the groups.

- **private String projectDeadline:**

  Holds the deadline of the project.

- **private String peerReviewStartDate:**

  Holds the start date to review group members.

- **private String peerReviewDeadline:**

  Holds the final date to review group members.

- **private Assignment[] assignmentList:**

  Project will hold every assignment in a list.

Operations:

- **public void setAvailability():**

  Sets the availability of the submission.

- **public void setMaxGroupSize():**

  Sets the maximum size of the groups.

- **public boolean getAvailability():**

  Gets the availability of the submission.

- **public int getMaxGroupSize():**

  Gets the maximum size of the groups.

- **public String getGroupFormationDeadline():**

  Gets the deadline to form groups.

- **public void setGroupFormationDeadline(String groupFormationDeadline):**

  Sets the deadline to form groups.

- **public String getProjectDeadline():**

  Gets the deadline of the projects.

- **public void setProjectDeadline(String deadline):**

  Sets the deadline of the projects.

- **public boolean checkTime():**

  Checks the remaining time to complete the project.

- **public String getPeerReviewStartDate():**

  Gets the start date of the peer review.

- **public void setPeerReviewStartDate(String peerReviewStartDate):**

  Sets the start date of the peer review.

- **public void getPeerReviewDeadline():**

Gets the deadline of the peer review.

- **public void getPeerReviewDeadline(String peerReviewDeadline):**

  Gets the deadline of the peer review.

- **public boolean createAssignment(Assignment):**

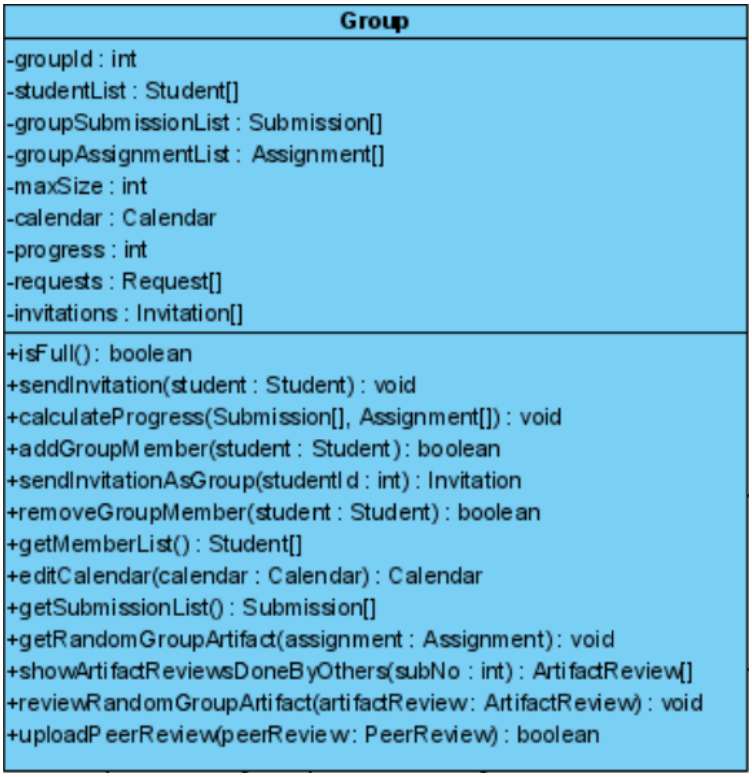
  Project will hold all the assignments and this method will be used to create an assignment.

- **public Assignment editAssignment(Assignment[]):**

  Assignment details can be edited through this method.

- **public boolean isPeerReviewAvailable():**

  Returns true if the peer review is available, false if not.



3.5.3. Group

The group class which will hold the group's data.

Attributes:

- **private int groupId:**

  Each group will have a unique Id.

- **private Student[] studentsList:**

  The list of members of the groups.

- **private Submission[] groupSubmissionList:**

  The list of all submissions done by the group

- **private Assignment[] groupAssignmentList:**

  The list of assignments given to group

- **private int maxSize:**

  Size of the group.

- **private Calendar calendar:**

  The calendar object of the group which will content the events.

- **private int progress:**

  Percentage of progress of work done by the group based on total workload.

- **private Requests[] requests:**

  Join requests the group receives from students.

- **private Invitations[] invitations:**

  Invitations that the group has sent to students.

Operations:

- **public boolean isFull():**

  Checks if maximum group size is reached.

- **public boolean sendInvitation(Student):**

  Method for sending an invitation to a student.

- **public double calculateProgress(Submission[], Assignment[]):**

  Method for calculating overall progress of the project.

- **public boolean addGroupMember(Student):**

  Adds a student to the group as a member.

- **public boolean sendInvitationAsGroup(int studentId):**

  Sends invitation to a student according to student ID.

- **public boolean removeGroupMember(Student):**

  Removes a student from the group and returns true if successful false if not successful.

- **public Student[] getMemberList():**

  Return the list of members of the group.

- **public Calendar editCalendar(Calendar):**

  Edits the calendar for the all group members.

- **public Submission[] getSubmissionList():**

  Returns all the submissions done by the group.

- **public void getRandomGroupArtifact(Assignment):**

  Returns a random submission for a specified assignment object, done by another group.

- **public ArtifactReview[] showArtifactReviewsDoneByOthers(int subNo):**

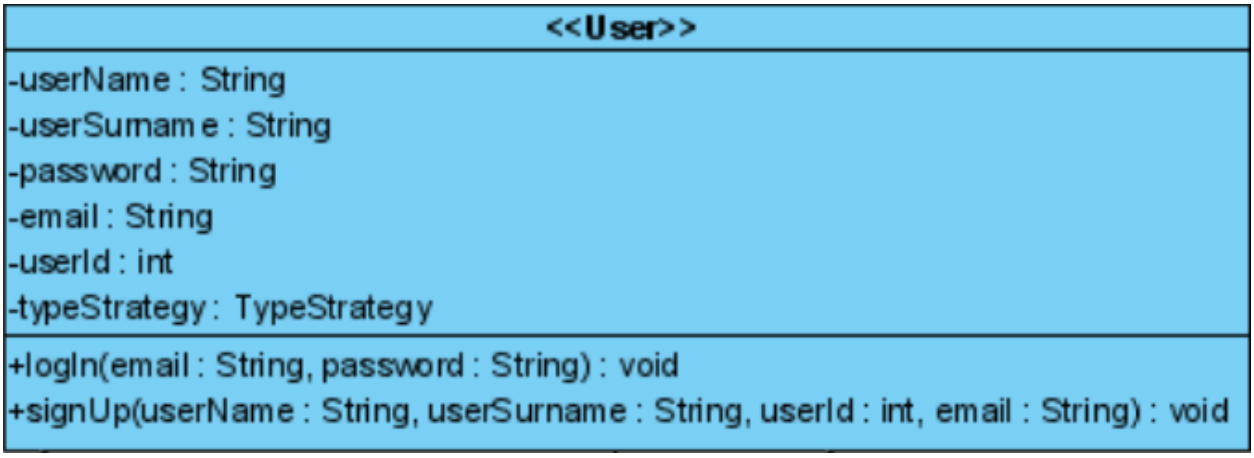
  Returns the artifact reviews done by other groups to that group.

- **public void reviewRandomGroupArtifact(ArtifactReview):**

  There will be an empty ArtifactReview object for each assignment. This function will provide the functionality for the Student to do the ArtifactReview for the group.

- **Public boolean uploadPeerReview(PeerReview):**

  This function will provide the functionality to send the PeerReview done by the student to the database.



3.5.4. User

This class will be used to define users of the system who have to be registered.

Attributes:

- **private String userName:**

  Holds the name of the user.

- **private String userSurname:**

  Holds the surname of the user.

- **private String password:**

  Holds the password of the user.

- **private String email:**

  Holds the email of the user.

- **private int userId:**

  Holds the ID of the user.

- **private TypeStrategy typeStrategy:**

  Holds the users type.

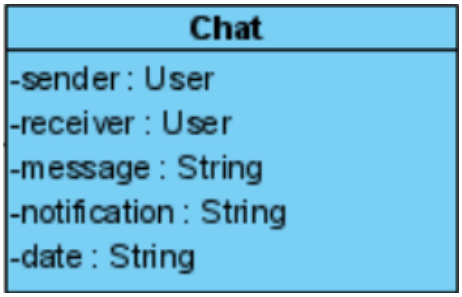
  Operations:

- **public void logIn(String email, String password):**

  Method for logging in to the program.

- **public void signUp(String userName, String userSurname, int userId, String email):**

  Method for creating a new account.



3.5.5. Chat

This class will be used in order to store chat related information.

Attributes:

- **private User sender:**

  Holds the sender of a message

- **private User receiver:**

  Holds the receiver of a message

- **private String message:**

  Holds the message as a String

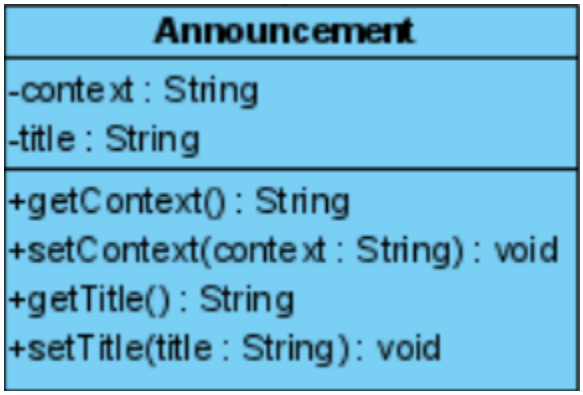
- **private String notification:**

  Holds the chat notification as a String

- **private String date:**

  Holds the date of a message

Operations: -



3.5.6. Announcement

This class will be used in order to show an announcement.

Attributes:

- **private String context:**

  Attribute will store the text related to the announcement.

- **private String title:**

  Attribute will store a name which is about an announcement or feedback's topic.

Operations:

- **public String getContext():**

  Getting the context of an announcement.

- **public void setContext(context:String):**

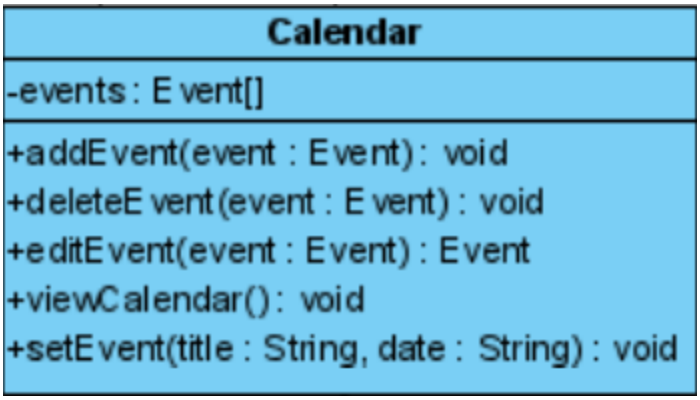
  Setting the context.

- **public String getTitle():**

  Getting the title of an announcement.

- **public void setTitle(title:String):**

  Setting the title.



3.5.7. Calendar

This class will be used for the calendar.

Attributes:

- **private Event [] events:**

  Calendar holds events as an array

Operations:

- **public void addEvent(Event):**

  This method is used to add an event to a calendar.

- **public void deleteEvent(Event):**

  This method is used to delete an event.

- **public Event editEvent(Event):**

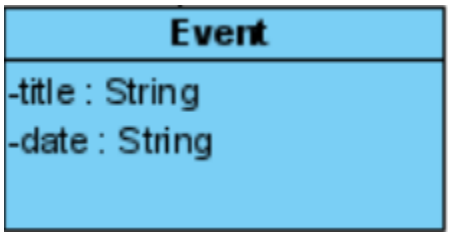
  This method is used to edit a calendar.

- **public void viewCalendar():**

  This method will show the calendar in a bigger version.

- **public void setEvent(String title, String date):**

  This method will set an event with its title and its date.



3.5.8. Event

This class will be used for events that will be displayed in the calendar.

Attributes:

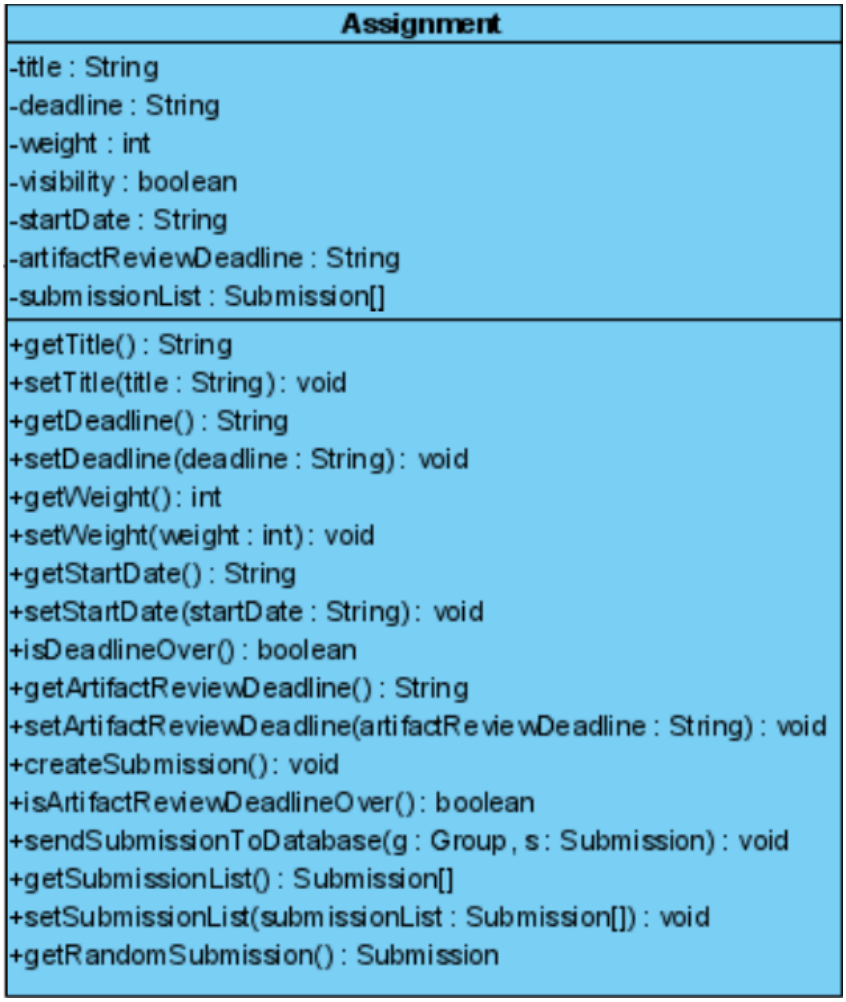
- **private String title:**

  Holds the title of the event which is announced by instructor or TA.

- **private String date:**

  Holds the date of the event.

Operations: -



3.5.9. Assignment

This class will be used for assignments.

Attributes:

- **private String title:**

  Title of the assignment.

- **private String deadline:**

  Deadline of the assignment.

- **private String startDate:**

Start date of the assignment.

- **private int weight:**

  Weight of the assignment.

- **private boolean visibility:**

  Is true if it is visible, false if not visible.

- **private String artifactReviewDeadline:**

  Holds the artifact review deadline.

- **private Submission[] submissionList:**

  Each assignment holds the submissions that are made by groups in a list.

Operations:

- **public String getTitle():**

  Returns the title of the assignment.

- **public void setTitle(String title):**

  Sets the title of an assignment with the given title.

- **public String getDeadline():**

  Returns the deadline of the assignment.

- **public void setDeadline(String deadline):**

  Sets the deadline of the submission.

- **public int getWeight():**

  Returns the weight of the assignment in the project.

- **public void setWeight(int weight):**

Sets the weight of the assignment in the project.

- **public String getStartDate():**

  Returns the start date that the assignment will be visible to students.

- **public void setStartDate(String startDate):**

  Sets the start date that the assignment will be visible to the students.

- **public boolean isDeadlineOver():**

  Returns true if the deadline for the assignment is over, false if it is not over.

- **public String getArtifactReviewDeadline():**

  Returns the artifact review deadline for the assignment.

- **public void setArtifactReviewDeadline(String artifactReviewDeadline):**

  Sets the artifact review deadline for the assignment.

- **public void createSubmission():**

  Creates a new submission object and adds it to the submissionList.

- **public boolean isArtifactReviewDeadlineOver():**

  Returns True if artifact review deadline is over, False if is not over.

- **public Submission getRandomSubmission():**

  Returns a random submission from the submission list.

- **public void setSubmissionList(Submission[] submissonList):**

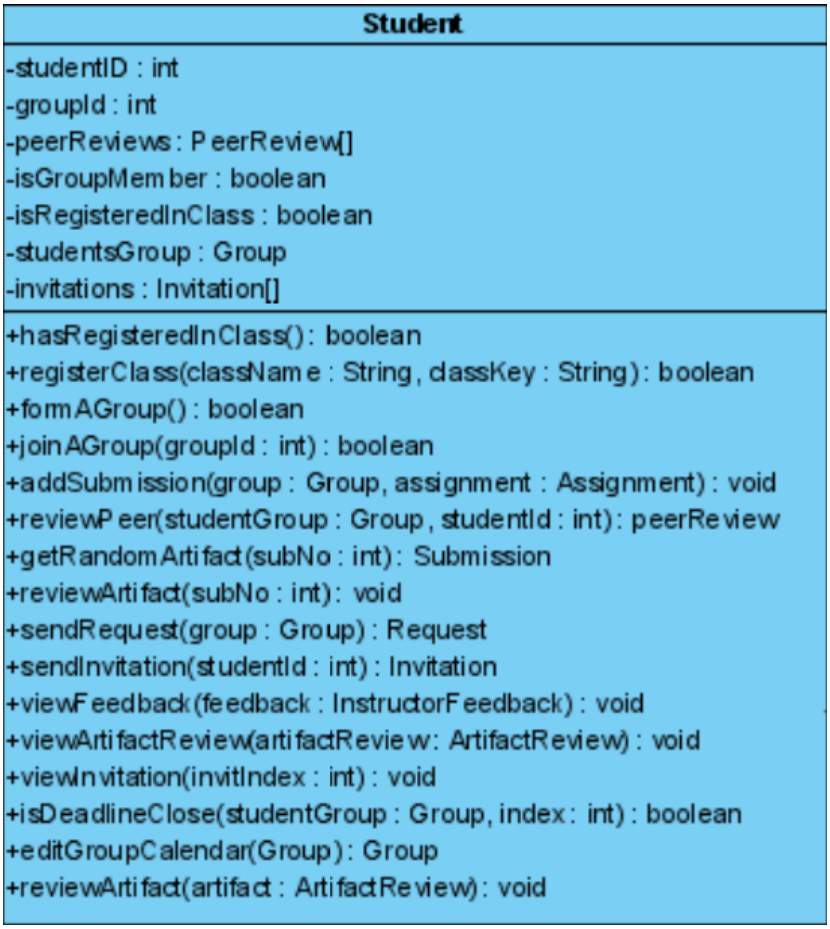
  Sets the submission list object of the assignment.

- **public Submission[] getSubmissionList():**

  Returns the submissions done by each group as a list.

- **public void sendSubmssion(Group g, Submission s):**

  Provide the functionality to send the Submission done by the group to the database.



3.5.10. Student

This class is used to define students.

Attributes:

- **private int groupId:**

  This will store the group id of the student's belonging group.

- **private int studentId:**

  Stores student's own unique id.

- **private PeerReview[] peerReviews:**

  Since each student will have a peer review made by the group members, their reviews will be stored in this PeerReview array, this array will be made of PeerReview objects.

- **private Boolean isGroupMember:**

  His attribute will be used in order to specify which students have a group or not.

- **private Boolean isRegisteredInClass:**

  In order to connect a student to a class, s/he has to register into a class since registering a class will enable the student to perform specific actions, so we need to check whether the student belongs to a class or not.

- **private Group studentsGroup:**

  In order to access a student's belonging group, there has to be a Group object so that the student can reach detailed information such as to his/her own group member list.

- **private Invitation[] invitations:**

  Students will have invitations come from groups and will store these in an array.

Operations:

- **public boolean hasRegisteredInClass():**

  This operation will check whether the student has registered in a class.

- **public boolean registerClass(String className, String classKey):**

  Since a student must register a class, s/he has to register the class by using this operation. It will basically get the class key and enter that key in order to register a specific class.

- **public boolean formAGroup():**

  Students will form groups, so each student has the right to form a group with initially no participants. Afterwards, a student without a group can join this newly created group.

- **public boolean joinAGroup(int groupId):**

  If a student has no group and wants to join a group then this operation will be used. Students will be able to already create groups and then will call joinAGroup(). Afterwards, this operation will send a notification to that group to notify the members. These members will then decide to accept this invitation.

- **public void addSubmission(Group group, Assignment assignment):**

  This method is for students to upload artifact submissions.

- **public peerReview reviewPeer(Group studentGroup, int studentId):**

  Each student has to do a peer review at the end of the project. Each student will review the members of the group.
- **public Submission getRandomArtifact(int subNo):**

  Returns a random artifact.
- **public void reviewArtifact(int subNo):**

  Students will be able to review the artifacts of different groups. These artifact reviews will be distributed to each group randomly after each artifact submission.
- **public Request sendRequest(Group group):**

  Sends the request to join a group.
- **public Invitation sendInvitation(int studentId):**

  Sends an invitation to another student without a group.
- **public void viewFeedback(InstructorFeedback feedback):**

  Method for viewing feedback.
- **public void viewArtifactReview(ArtifactReview artifact):**

  It is used to view the artifact review which is done by other groups.
- **public void viewInvitation(int invitIndex):**

  Method to view invitations sent by a group**.**
- **public boolean isDeadlineClose():**

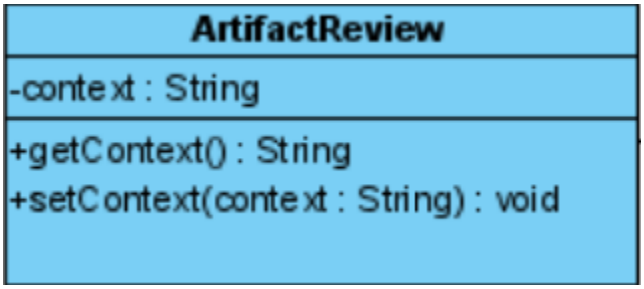
  Is true if the deadline is close and false if it is not, will be used to show higher priority assignments in a different way.

- **public void editGroupCalendar(Group g):**

  Each student can edit the calendar and add new events.

- **public void reviewArtifact(ArtifactReview ar):**

  Overridden function to do the reviewArtifact.



3.5.11. ArtifactReview

This class is used for the peer review part.

Attributes:

- **private context:**

  This will store a short explanation of what the artifact review is about.

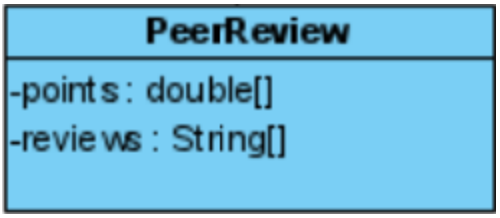
Operations:

- **public String getContext():**

  Returns the context of the artifact review.

- **public void setContext(String context):**

  Sets the artifact review's context.



3.5.12. PeerReview

This class is used for the peer review part.

Attributes:

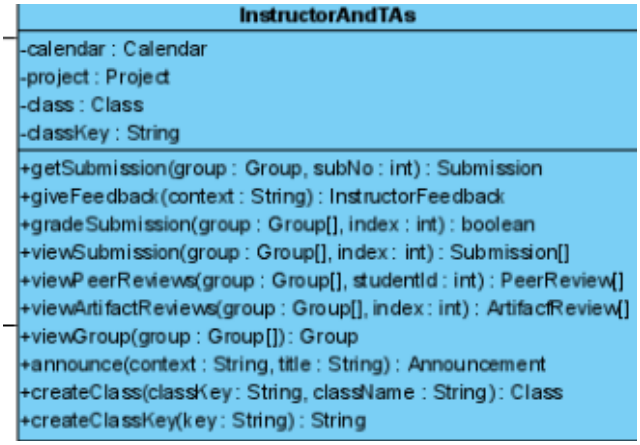
- **private double[] points:**

  This will store the scores, points related to a single peer review.

- **private String[] reviews:**

  It will store the textual reviews about a single peer review.

Operations: -



3.5.13. InstructorAndTAs

This is the class which contains attributes and operations related to Instructor or TA's.

Attributes:

- **private Calendar calendar:**

  It is the Calendar object specialized to each group. Will contain events of the group.

- **private Project project:**

  Instructors can do any edits by accessing the project.

- **private Class class:**

  The class object will contain everything and will be created by the instructor.

- **private String classKey:**

  The access key generated for the students to join the class.

Operations:

- **public InstructorFeedback giveFeedback(String feedback):**

  The teacher will give feedback to the group's submission.

- **public boolean gradeSubmission(Group[] g, int index):**

  The teacher will submit the grade for groups' submission.

- **public Submission[] viewSubmission(Group[] g, int index):**

  The teacher will view the submissions for every group.

- **public PeerReview[] viewPeerReviews(Group[] g, int index):**

  Teachers will be able to view peer reviews.
- **public ArtifactReview[] viewArtifactReviews(Group[] g, int index):**

  The teacher will view the artifact review of groups.
- **public Announcement announce(String context, String title):**

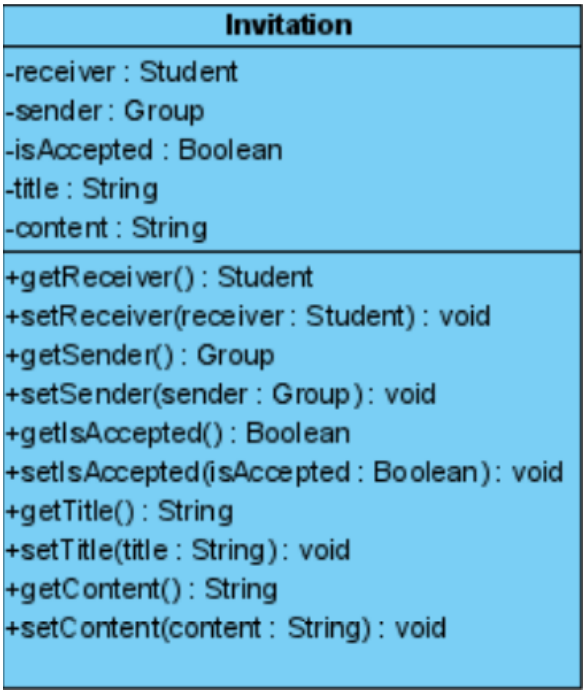
  The teacher will make announcements to the class.
- **public boolean createClass(String classKey, String className):**

  The teacher will create a new class at the beginning of the semester.
- **public boolean createClassKey(String key):**

  Will create an access key by the teacher to provide to the students.
- **public Submission getSubmission(Group g, int subNo):**

  Returns the selected submission done by the specific group.
- **public Group viewGroup(Group[] groupList):**

  Shows the group from the list of groups.



3.5.14. Invitation

The invitation object is the object which will be created when a student from a group wants to invite a student with no group. It will contain the related information such as sender,receiver,title, and the content (message) of the invitation.

Attributes:

- **private Student receiver:**

  Is the Student who receives the invitation.

- **private Group sender:**

  Is the group which sends the invitation.

- **private boolean isAccepted:**

  The current status of the Invitation.

- **private String title:**

  Title of the invitation.

- **private String content:**

  The content or the message of the invitation.

Operations:

- **public Student getReceiver():**

  Returns the student who receives the invitation.

- **public void setReceiver(receiver: Student):**

  Sets the receiver of the invitation.

- **public Group getSender():**

  Returns the sender Group of the invitation.

- **public void setSender(sender: Group):**

  Sets the sender Group of the invitation.

- **public Boolean getIsAccepted():**

  Gets the status of the invitation, whether it is accepted or not.

- **public void setIsAccepted(isAccepted: Boolean):**

  Sets the status of the invitation, whether it is accepted or not.

- **public String getTitle():**

  Returns the title of the invitation.

- **public void setTitle(title: String):**

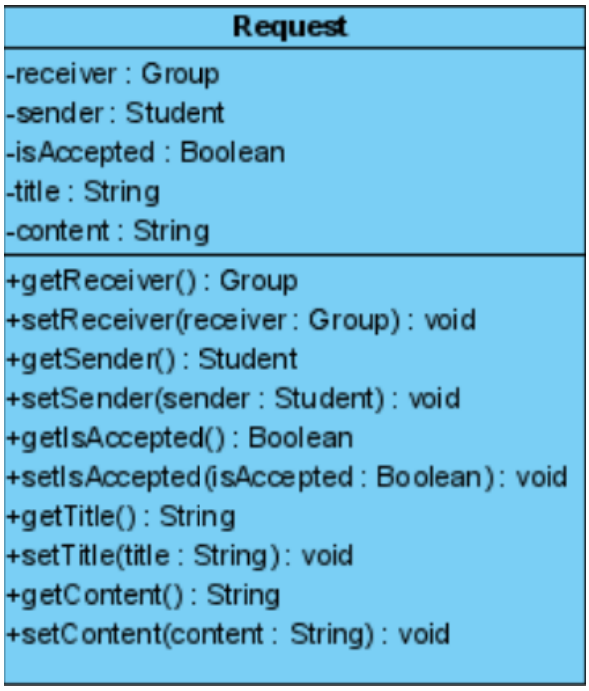
  Sets the title of the invitation.

- **public String getContent():**

Returns the content of the invitation.

- **public void setContent(content: String):**

  Sets the content of the invitation.



3.5.15. Request

The Request object is the object which will be created when a student with no group wants to join a group. It will contain the related information such as sender,receiver,title, and the content(message) of the Request.

Attributes:

- **private Group receiver:**

  The receiver group of the request.

- **private Student sender:**

  The sender student of the request.

- **private boolean isAccepted:**

  The current status of the Request.

- **private String title:**

  Title of the Request.

- **private String content:**

  The content or the message of the Request.

Operations:

- **public Group getReceiver():**

  Gets the receiver group of the request.

- **public void setReceiver(receiver: Group):**

  Sets the Receiver Group the Request.

- **public Student getSender():**

  Returns the sender Student of the Request.

- **public void setSender(sender: Student):**

  Sets the sender Student of the Request.

- **public Boolean getIsAccepted():**

  Gets the status of the Request, whether it is accepted or not.

- **public void setIsAccepted(isAccepted: Boolean):**

  Sets the status of the Request, whether it is accepted or not.

- **public String getTitle():**

Returns the title of the Request.

- **public void setTitle(title: String):**

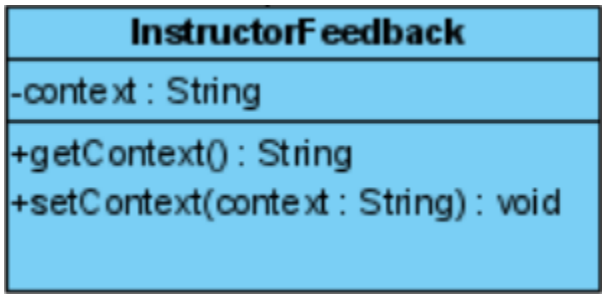
  Sets the title of the Request.

- **public String getContent():**

  Returns the content of the Request.

- **public void setContent(content: String):**

  Sets the content of the Request.



3.5.16. InstructorFeedback

This class holds the instructor's feedback.

Attributes:

- **private String context:**

  The context of the Instructor feedback.

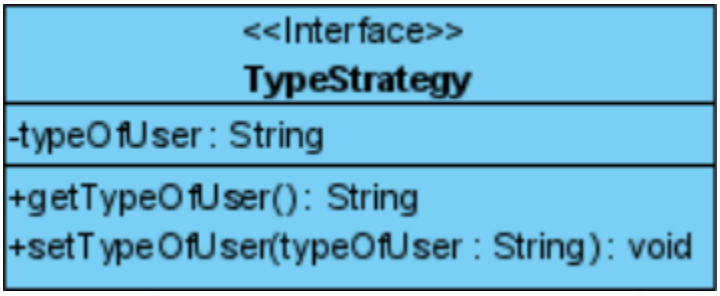
Operations:

- **public String getContext():**

  Returns the content of the feedback.

- **public void setContext(context: String):**

  Sets the content of the feedback.



3.5.17. TypeStrategy

It's an interface which will be used to decide the type of the users. Since it is used in Strategy Design Pattern, it will be implemented by other concrete classes.

Attributes:

- **private String typeOfUser:**

  Stored the type of the user, student or instructor.

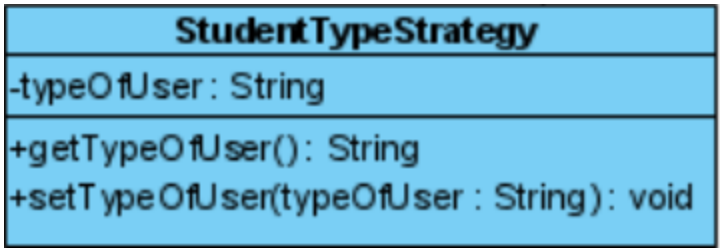
Operations:

- **public String getTypeOfUser():**

  Returns the user type in the string format.

- **public void setTypeOfUser(typeOfUser: string):**

  Sets the user type in the string format.



3.5.18. StudentTypeStrategy

Users can have a student type so this strategy class will be used by students.

Attributes:

- **private String typeOfUser:**

  Stores the type of user, student or instructor.

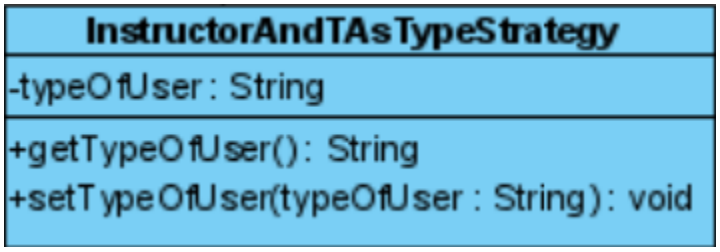
Operations:

- **public String getTypeOfUser():**

  Returns the user type in the string format.

- **public void setTypeOfUser(typeOfUser: string):**

  Sets the user type in the string format.



3.5.19. InstructorAndTAsTypeStrategy

Users can have InstructorAndTAs type, so this strategy will be used by instructors.

Attributes:

- **private String typeOfUser:**

  Stores the type of user, student or instructor.

Operations:

- **public String getTypeOfUser():**

  Returns the user type in the string format.
- **public void setTypeOfUser(typeOfUser: string):**

  Sets the user type in the string format.

4. Improvement Summary

In the second iteration we have changed the subsystem decomposition diagram because the dependencies between packages were the opposite. Also, we have created four more packages which are Calendar Manager, Project Manager, Statistics Manager and User Manager. We have also added the versions of the apps that the application will work with. Moreover, we have changed the class diagram. We have added the missing multiplicities and also missing relations between classes. We have created new associations with the new classes

as well because we thought more thoroughly this time and found out that the classes Request and Invitation were missing. Submission class was added as well because we thought that assignments and each group's submission should be different from each other. We also have added new operations and attributes to the classes which we forgot in the first place. Lastly, we have introduced the design patterns which will be helpful in the implementation part of the project and we decided to use Strategy and Singleton design patterns.

5. Glossary & References

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