Enhancing Course Management and CMS to modernization

Introduction

▶ In this presentation we will be discussing in length about how we can improve not just the quality of the CMS but also the experience and satisfaction it can offer to students and lecturers alike.

Modular Architecture

- When dealing with project designs that require Scalability, flexibility and efficient intergration with other systems we'd want it to be small and simple.

- In terms of CMS we break components down to smaller parts that we can independently interact or change.

- Using Modular Architecture, this way allows you to make decisions with ease, such as easy to handle maintenance, updating and upgrading CMS to your desired vision.

- We would be able to develop a model of the CMS that suits our specifications, test if that model works to our liking and we can deploy the model for public review.

Data Model Design

- Making a data model is very useful when needing an accurate description of the model a company could deal with.

- For the CMS it is very important to keep accurate data which can boil down to details of the course, how many students are enrolled, faculty schedules, grades and feedback to the students and to the lecturers.
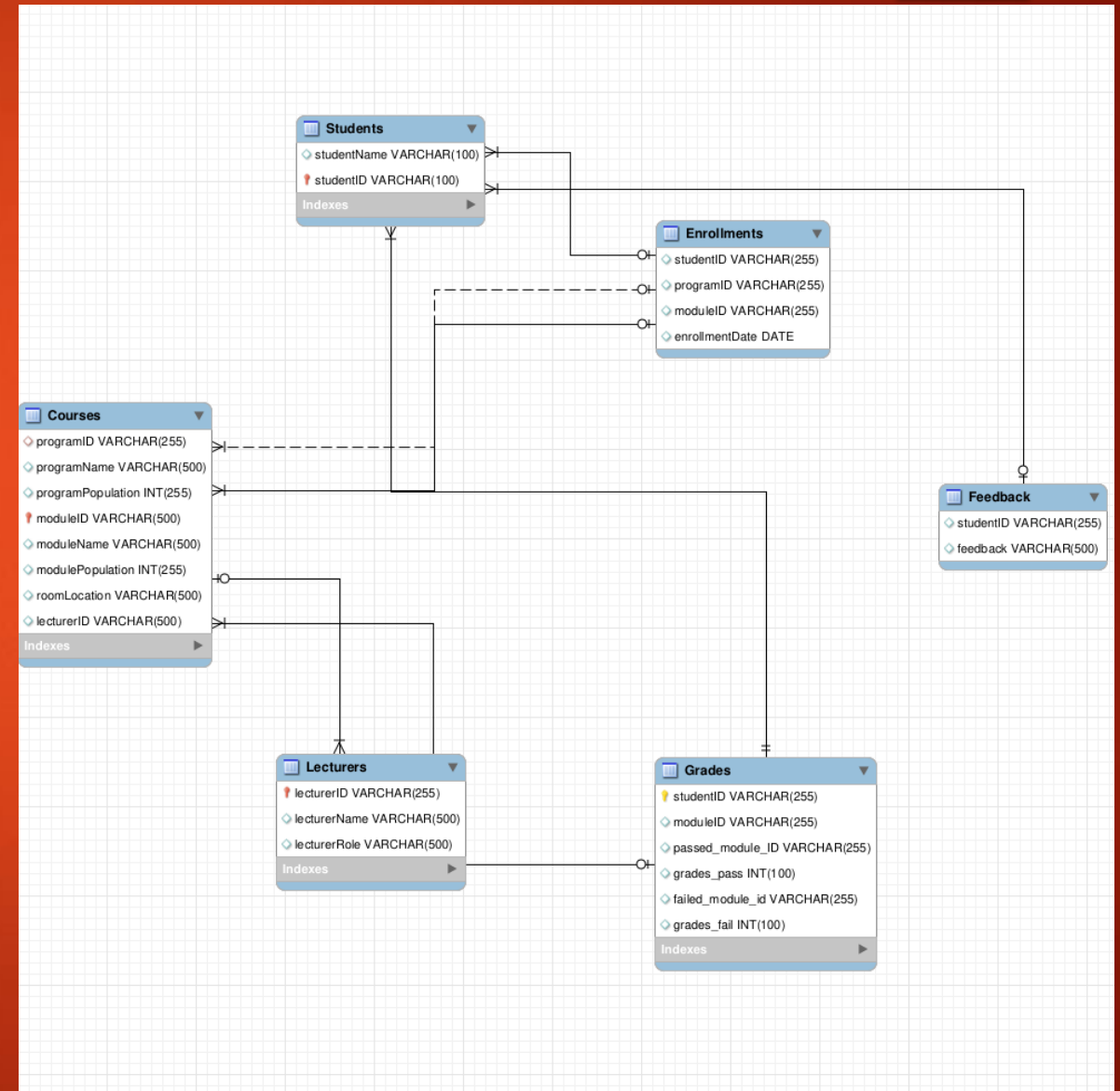
Integration

Student Information Systems

To have integration in a CMS we need to consider how best can we manage information flow especially in students.

SIS or Student Information System is where all the information that the student needs or any education facility needs is stored.

Learning management Systems

LMS or Learning Management System in integration is primarily used for e-learning.

Reason for this is because it involves only two operations which are the server that has base functionality and a user interface that students and lecturers can use.

It allows the lecturer to make and provide content online such as homework or educational material.

Protocols to use

SIS and LMS are flows of information and we need to have a steady stream flow of information so that we are able to properly comprehend the information.

In this case we need to encourage data interoperability, but what is data interoperability?

Data interoperability is an exchange of data that can be used together so we would be able to use both information from SIS and LMS.

User Authentication

- Implementing a user authentication system allows for users only listed in the college system to access the educational material in college.

- We can implement an SSO which stands for single sign on, this gives the user a more pleasant experience when signing in or logging in on a existing college account.

- Role based access control basically means that certain users are defined and given special permissions, lecturers for example can show or hide parts of learning material.

- This also locks any users to the information they are privy to so lecturers cannot access information that a dean has, so users are stuck to the information that are relevant to their assigned roles.

Interface design for user experience

- For user interface design in a CMS it would have to be simple and clear in terms of navigation around the college website so a user should be able to navigate to a course registration for example and should be indicated clearly and concise.

- The same goes for work submission, viewing grades and methods of communication to the lecturers, students should be able to see clearly where they're going when navigating.

Real time communication and collaborations amongst students and lecturers

Forums

The CMS could have a discussion forum for students to ask questions about their class schedules, assignments and their grade results.

This can allows lecturers to interact with students in a more open and free environment which engages the students and lecturers more outside of classes.

Private messaging

Private messaging allows for students who wish to ask a lecturer for help or advice more personally.

This also helps on reviewing the grades students earn, as it can be difficult to discern who is happy with their grades and who isn't.

Virtual lectures

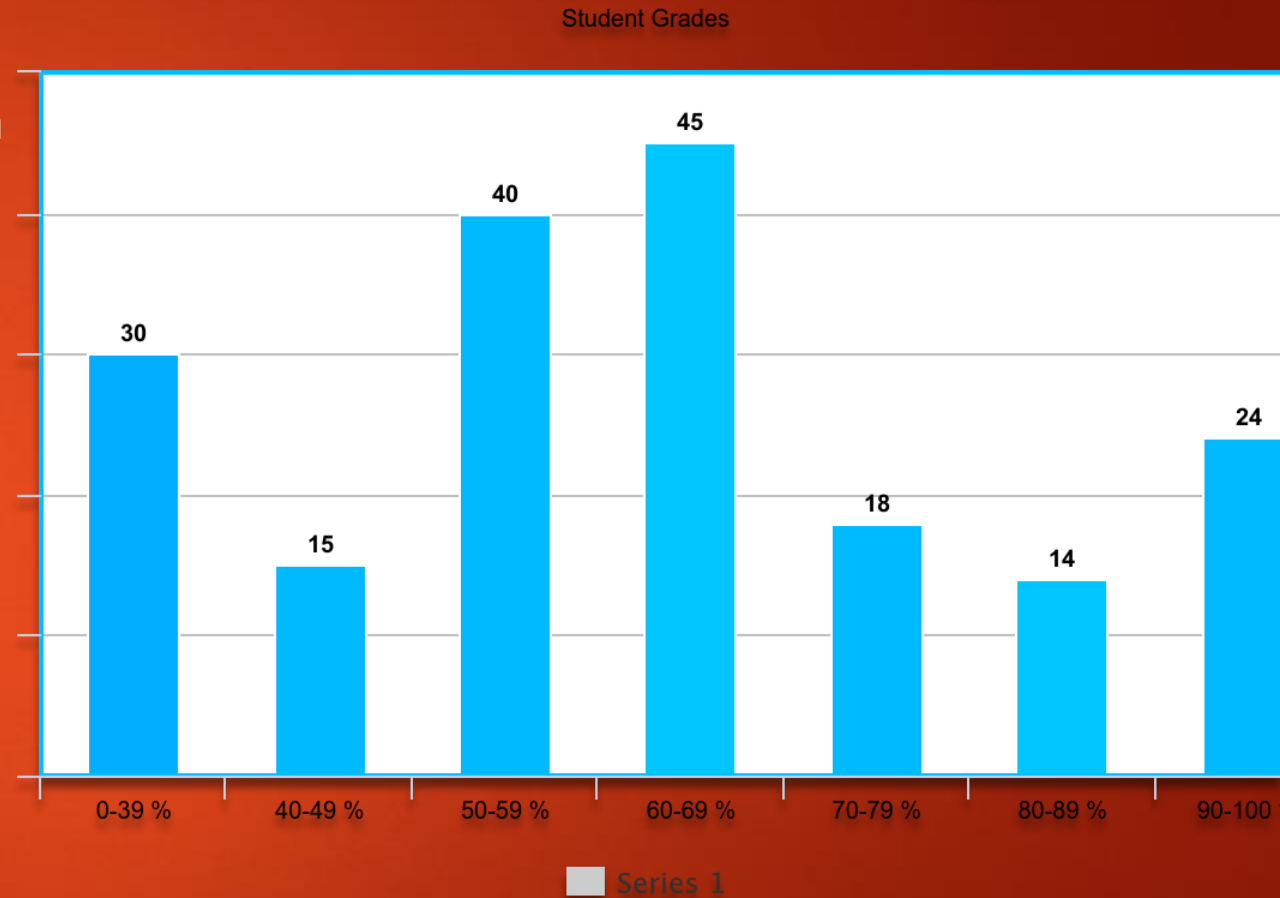Virtual classrooms are a very important factor in communication.

Teaching material virtually will not only reach out to local students, students in different cities in the same country but also to students who are abroad in different countries.

Teaching virtual lectures still communicates the material to the student and can be recorded anywhere.

Analytics

- Students for example can sometimes improve on their learning and how they absorb the material and lecturers how they absorb and communicate that material.

- In more graph related ways you can implement a usage of bar charts, column charts, line charts to check how students are doing in regards to completing assignments or passing exams.

Student Grades

45

40

30

24

18

15

14

0-39 % | 40-49 % | 50-59 % | 60-69 % | 70-79 % | 80-89 % | 90-100

Series 1

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Performance and Scalability of a CMS

Horizontal scaling

Having to make room for student information and lecturer information to the CMS is a very difficult task as the system cannot take on this information all at once.

Horizontal scaling helps decrease or increase workload that the system can do this leads to more important operational workload to be active and the less important workload that can be done afterwards.

Load balancing

You must be prepared to take in a lot of students, a lot of students means more network usage for the CMS and it has to process each and every single one of the students.

Load balancing evens the network traffic by equally distributing resources where it is needed between the college server and the users.

Caching

Students that use CMS, we should make certain that their information is saved whenever they use the CMS same goes for lecturers.

Caching helps in storing this data by locally saving it when the student or lecturer login to the CMS to look at the contents of their files or assignment submissions.

Security and privacy

Encryption

For security concerns within the college outside of college we need to utilize tools that provide security to the students, lecturers and any college personnel.

Encrypting personal and sensitive information about the student, lecturer or college personnel helps keep their information safe from malicious misuse.

Masking

Data masking is a replication of non-authenticated information which has no use but act as a test data in place of using real data.

Data masking in CMS Is used to mask personal data so in place of real personal data it creates a replica example of the personal data without exposing any leakages in the actual data.

Audits

Audits help run systems through a criteria check list of whether your data is secure through several hurdles: Physical components, apps and software, vulnerabilities in your network and the overall security strategies in place.

Audits in CMS in this case will check for example if it has proper login system and role access control.

Maintenance and monitoring

- Technology is ever evolving in our world, we always have to keep up with more recent and newer upgrades.

- In CMS there need to be constant updates as technology is evolving so do the requirements that follow.

- The software components must be updated regularly and running performance tuning.

- User feedback must also be adhered to as students or lecturers may have some insight as to how the CMS should perform or look.

- Feedback should always be used for inspiration or improvement in areas of the CMS that need it.

Journey to release to the public

- This Section will go into brief detail about the following topics:
- Software engineering principles
- Software development cycle
- Agile development methodologies
- Analysis, diagrams, design and testing

Software Engineering Principles

Abstraction

Abstraction involves hiding the more complicated parts of the project from the user and leaving the easy to comprehend details to the user.

In CMS all the students should see is where to go to their classes, what time the classes are scheduled, who will be teaching the class, what is the subject and module for the class.

Encapsulation

Encapsulations purpose is to hide the internal parts of a system, this helps with security of the data of a system.

In CMS you would use encapsulation to hide student details, lecturer details and other sensitive information.

Reusability

Reusability is often used when a user logs into a website and they wish to log out and log back in the next day, this process is repeated constantly.

There are two types of reusable methods: Internal and External.

In the case of CMS internal reusability should be used as when a student or lecturer log into the CMS to access material.

Software engineering principles (Continued)

- Documentation is used for describing a product or application and how it came to be.

- In CMS documentation should be used to describe how the CMS runs and what are the different functionalities and how it was designed and developed.

- There are many documentations that can be made in CMS: Software Requirements Specifications, Software design description, Source code documentation, UX design documentation etc.

- Version control reverts a current version of a project back to the previous version, this means that if the new version breaks you could always revert back to the old working version.

- In CMS a lot can go wrong, the log in system could break or students cannot enroll because of a malfunction in the registration so in version control it is possible to revert the changes.

Software Development Cycle

▶ Going through the SDLC is where we begin gathering resources for the development of the CMS, and this goes through several stages: planning, analysis, design, implementation, testing and integration and maintenance.

▶ First step would be requirements gathering (in SDLC this is the planning stage), this means talking to the stakeholders which are course administrators, lecturers and students.

▶ Next is translating (which is analysis in SDLC) those requirements into a design per the specifications of the stakeholders they wish to see on the CMS, this will focus on user authentication, architectural design of the CMS, access control, and integration with other systems.
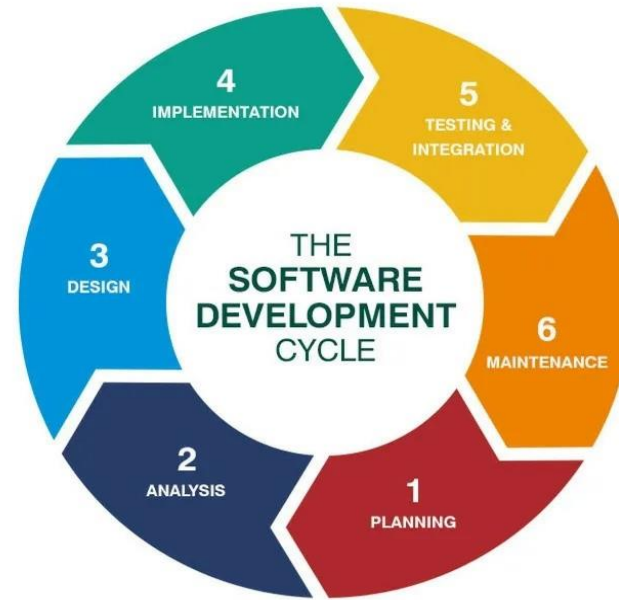
Software Development Cycle (Continued)

- Testing the CMS(which would be the testing and integration stage of SDLC) to make sure the described functionality operates as it was designed helps the developers to isolate errors that may occur within the CMS.

- In this stage this is where CMS is tested, this means that test cases will be run to ensure that the CMS is ran without performance loss and plans to ensure security of the CMS are followed correctly.

- Quality assurance in the CMS is ensured by integration testing, determining whether the CMS is capable of running on other systems for example if the CMS is able to run on Google Chrome.

- Once the CMS is properly integrated it undergoes what is called System testing which evaluates the requirements that were provided by the stakeholders.

Software Development Cycle (Continued)

- The last stage of this CMS would be the deployment phase where the functionality and design choices are finalized.

- The CMS at this stage is now ready for release to the public.

- Once the CMS is released it is worth noting that feedback should be considered after the stakeholders and other users have tried the CMS.

- When there are complications in a product that was released into a live environment, it leaves a very unpleasant experience for the users or a group of people the product targeted.

- The process then should be reverted back to maintenance according to the SDLC to improve on the CMS should that situation occur.

- Which is where version control and other tools at your disposal come in to revert changes to either make or add changes.
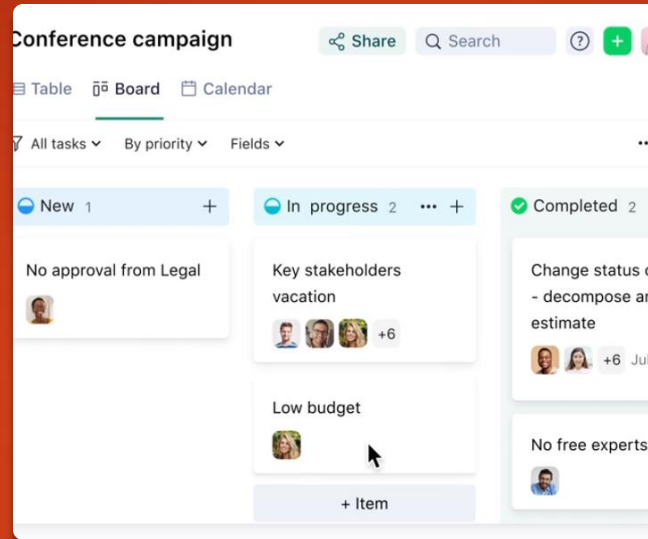
Agile Methodologies

Going through developing a product it's best to do it efficiently and on time.

Iterative Development breaks huge work loads into manageable small chunks that are easy to handle.

The Kanban methodology is a popular method of organizing workload and a team when working with a huge project or product.

The Kanban methodology will be a perfect Agile Method to use for the CMS development.

Scrum is an Agile Method that focuses on the team working towards a common goal, it focuses on these qualities in a successful project: transparency, reflection and adaptation.

Scrum focuses heavily on teamwork and team members are expected to exercise these traits: commitment, asking hard questions, focusing on their tasks, open minds, and respecting their peers as well as each other.

Kanban Methodology: Advantages and Disadvantages

- Advantages

- Kanban has better visibility when it comes to progression in workload, a project has a backlog of tasks that others are able to see and determine how the project is progressing.

- Kanban has Improved efficiency, as it highlights where an issue in the project is most occurring which gives a team more time to act on how to solve the issue.

- You gain a strong collaboration with your team members, any opinion a member might have is respected and taken into consideration which increases the overall morale of your team.

- Disadvantages

- Oversimplification in tasks is always a risk as it breaks down components into smaller pieces which increases chances of overlooking a major detail in a project.

- Information overload can be expected especially when breaking down huge projects into smaller tasks which makes it difficult to organize tasks to individual team members.

- Lack of strategic planning for projects in Kanban is a downside when dealing with large projects, as the team can face their attention on more immediate tasks which discards long term planning for the project.

Analysis, Communication, Testing and Design
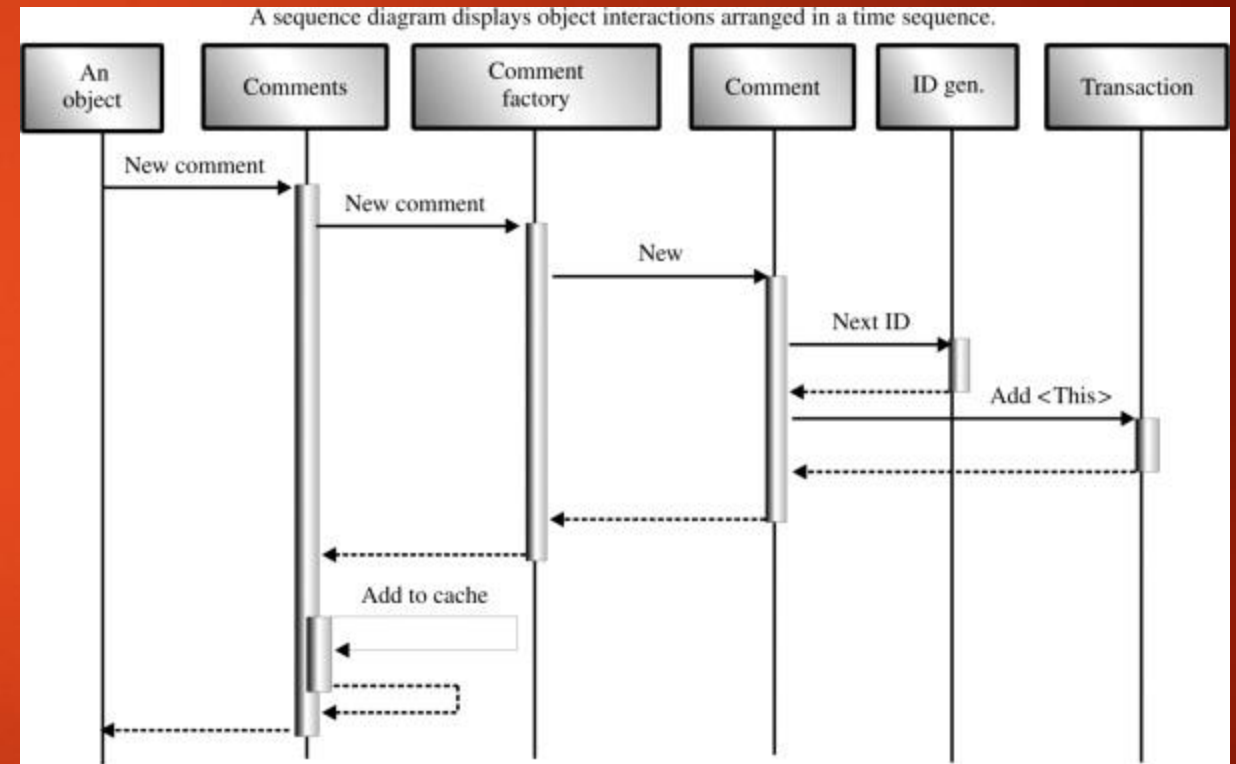
- Analysis

- Analysis involves organizing interviews, surveys and workshops to understand what requirements are wanted to be seen in a product.

- In a CMS an interview is organized with a stake holder to describe and identify what they would want the CMS to be and how it should function.

- Surveys could be posted out to social media or given to students or lecturers to find out what the requirements should be in a college CMS.

- Testing

- Testing consists of creating test cases and validating a functionality in a product.

- This gives an increase in usability and a boost in performance when testing CMS through test cases.

- During testing we may also utilize more automated frameworks to run test cases allowing more coverage for the tests and early error warnings.

# Analysis, Communication, Testing and Design (Continued)

- Communication displays how a system interacts.

- These are displayed through three diagrams: Use case diagrams, sequence diagrams and activity diagrams.

- This gives a better idea of how a CMS will interact with its internal components, functionality and users.

Example of a sequence diagram

Analysis, Communication, Testing and Design (Continued)

- The design of the CMS must follow core principles: Scalability, Modularity, using design tools and optimization of performance.

- We will use UML diagrams as an example .

- These three diagrams describe the structure of a system and how it operates: Deployment Diagram, Component Diagram and Class Diagram.

- Deployment Diagram view the physical components of a system where ever the software is deployed.

- Component diagram explains the different wiring and organization between physical components within a system.

- Class diagram is usually used to represent a visual relationship between the classes and the system itself.
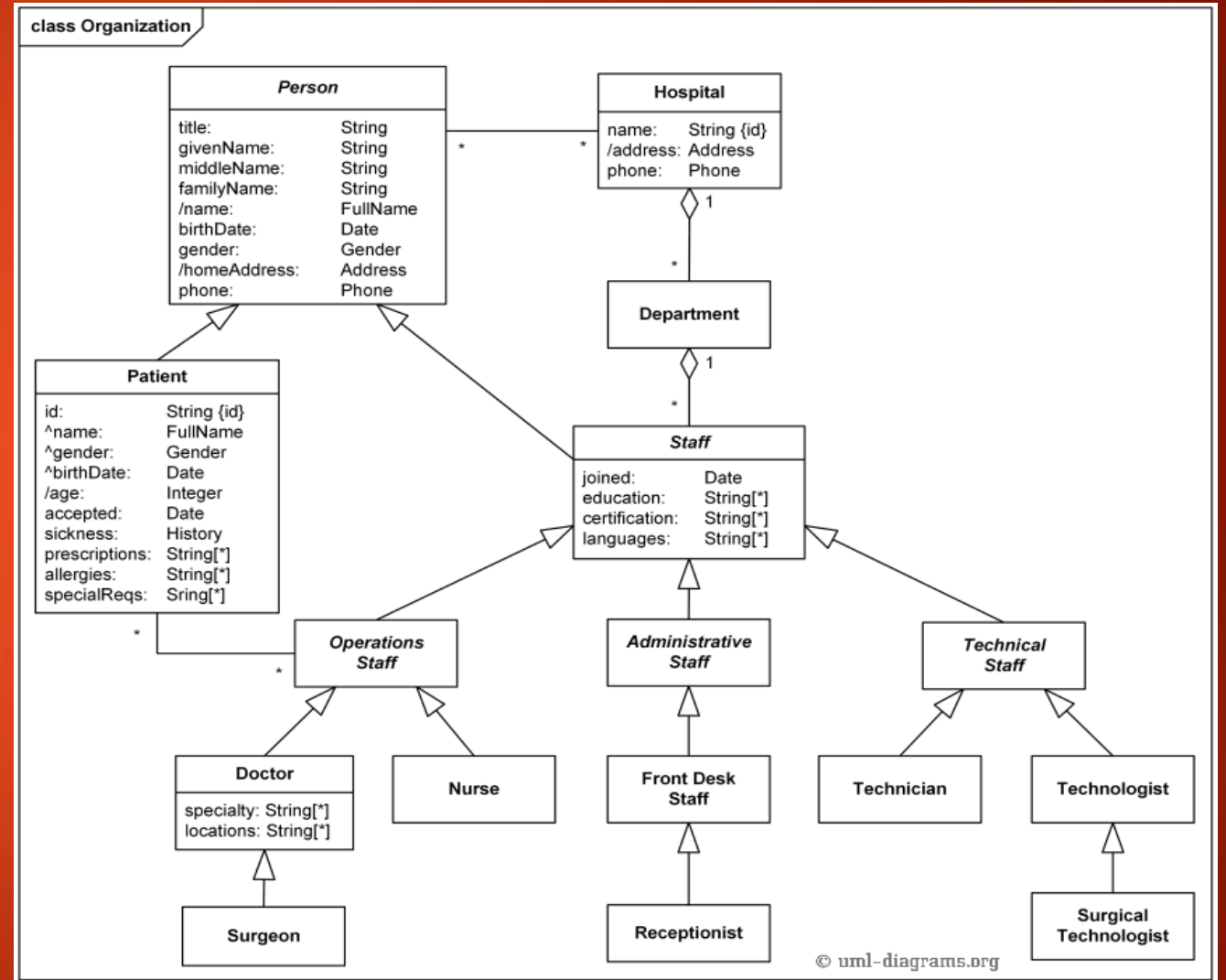
Example of a class diagram

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