Faculty of Engineering and Technology

Computer Science Department

COMP433 – Group Assignment phase 1

Project name: DentalTech

Students Name	Student Number
Yazan shadid	1191522
Ahmad Sayyad	1190855
Sondos Shahin	1200166
Baian wahdan	1192401

Introduction

- **Proposal for a Comprehensive Digital Enhancement at Ramallah Dental Inc.**

Your clinic stands not just as a dental service provider, but as a symbol of healthcare excellence and patient dedication. Recognizing the evolving needs of our community, we are poised to embark on a transformative journey with a groundbreaking digital upgrade: a bespoke application designed to streamline every facet of our operations.

Your clinic's pulse will be regulated by a smart scheduling system, a cornerstone of our digital strategy. This intuitive feature promises to elegantly orchestrate the complex dance of appointments, aligning the schedules of our dedicated team of dentists and nurses with the needs of our patients. The ability for patients to manage their appointments with ease – booking, adjusting, or canceling at their convenience – marks a new era of patient empowerment and flexibility.

The digital transformation extends to our reporting capabilities. With the dynamic reporting dashboard, we're not just collecting data; we're harnessing it. Real-time analytics will offer us a window into the heart of our operations, revealing patient preferences, identifying peak times, and unearthing hidden trends. This level of insight will empower us to make decisions that are not just timely but also deeply informed by the needs and behaviors of our patients.

In our pursuit of operational excellence, the patient record system will undergo a complete digital metamorphosis. The days of cumbersome paper records will be replaced by a sleek, secure, and sophisticated digital repository. Each patient's history, treatments, and interactions with our clinic will be meticulously cataloged and easily retrievable, ensuring a continuity of care that is both personalized and precise.

But what about the financial aspect? Our integrated payment system within the app will redefine the way we handle transactions. It's about bringing clarity, speed, and simplicity to the billing process, benefiting both our patients and our administrative team. And when

it comes to inventory management, our app will ensure that we are always equipped, always prepared, making shortages a thing of the past.

As we navigate this digital shift, we are acutely aware of the challenges that accompany such a change. This is why we are committed to providing robust IT support, ensuring a seamless and confident transition for our team. Training sessions, ongoing support, and a responsive IT helpdesk will form the backbone of our adaptation process.

This digital revolution is more than an upgrade; it's a redefinition of how we operate, interact, and care for our patients. It's about setting a new standard in dental healthcare, about being a leader in technological integration, and about ensuring that every interaction with Ramallah Dental Inc. is as smooth, efficient, and patient-focused as possible.

In embracing this digital future, we're not just keeping up with the times; we're creating a legacy of innovation and excellence that will resonate within the walls of our clinic and beyond, into the community we so proudly serve.

System Features

- **An Extensive Look at Our Goals for Ramallah Dental Inc.**

A digital revolution in dental care is about to occur. Comprehending the distinct ecology of Ramallah Dental Inc., our suggested solution is painstakingly designed to improve patient care, optimize workflow, and establish novel benchmarks for the industry.

1. **Combined Patient App**

The Problem: Inefficiencies in managing patient records and staff schedules due to a fragmented and manual system.

Our Response: This digital solution will store and manage individual profiles, including treatment plans, payment information, dental history, and appointment dates. The development of a comprehensive app that not only centralizes patient information but also aids the staff. For doctors and nurses, this app will provide an organized view of their work schedules, reducing the chances of missed or overlapping appointments. This will improve time management and operational efficiency.

The Future Vision: Integrating AI, the app could provide personalized dental care advice, timely check-up reminders, and even dietary recommendations based on each user's specific dental health needs, thus enhancing patient engagement and care.

2. **Tracking Patients record**

The Problem: Current patient data management is fragmented, making it difficult to keep up with important information efficiently and making it more difficult to deliver individualized treatment.

Our Response: A database system or specific Electronic Health Record (EHR) software may be used to store and manage all the information related to a patient's care. From medical history and diagnosis to prescription medications and follow-up plans, our system carefully collects and arranges all relevant information. This involves designing tables for patients, sections, and details, and linking them using unique identifiers. this can get and change particular data by running a query against the Details Table depending on the patient or section ID. Addition of timestamps or version control systems can be used to monitor modifications. Data security is ensured by regular backups, encryption of data, and access control mechanisms. By that a comprehensive perspective that goes beyond individual visits is made possible by careful documentation of each patient's journey.

The Future Vision: Our Comprehensive Patient Records System will develop to provide individualized health insights. Integrating seamlessly will promote proactive and easily available healthcare. The system's flexibility guarantees that it stays at the forefront of cutting-edge innovations, influencing how Ramallah Dental Inc. will provide patient-centered treatment going forward.

3. **Smart Scheduling Algorithm**

The Problem: Manual scheduling that results in inefficiencies, mishandled time slots, and overlapping appointments.

Our Response: The subtleties of the clinic's operations, such as peak patient periods, preferred doctor availabilities, and even room occupancy, are taken into account by our AI-driven scheduler. It assigns spaces wisely, guaranteeing a steady stream of patients.

The Future Vision: By using predictive analytics to identify periods of high demand, the clinic will be able to optimize resource utilization and patient care by adjusting staffing levels or providing unique slots.

4. **Dynamic Reporting Dashboard**

The Problem: The current system's poor analytical capabilities prevent it from supporting strategic decision-making.

Our Response: Introducing a dynamic reporting dashboard with an extensive number of features that provide quick access to relevant data. Nowadays, data-driven decision making is no longer a luxury but a necessity. It is essential to make decisions based on accurate and up-to-date information. This advanced dashboard gives you the capacity to make well-informed decisions, whether it's tracking monthly patient intake, examining treatment patterns, or effectively managing inventory levels.

The Future Vision: Future dental predictions are something that Ramallah Dental Inc. will be doing in addition to treating teeth. Our vision extends beyond conventional reporting. Imagine harnessing patient feedback to drive ongoing improvements or correlating weather patterns with appointment cancellations. Integration with cutting-edge analytical tools opens avenues for macro insights that go beyond the routine, providing a holistic understanding of clinic operations.

5. **Inventory Management System**

The Problem: Manual tracking is laborious and prone to error, which increases the possibility of shortages or overstocking.

Our Solution: A real-time dental supply monitoring system that tracks inventory, notifies suppliers when supplies are running short, and even creates orders for suppliers automatically based on historical usage patterns.

Future Prospects: By forecasting when maintenance is necessary or replacements are required, integration with IoT devices could monitor the health of the equipment and prevent unplanned downtime.

6. **Making appointments:**

The problem: Patients have to call the receptionists to make an appointment. And when they arrive for the first time, they have to manually fill a hard copy registration form. Also, there is no other way to remind the patients of their follow ups unless by calling the patient.

Our solution: Our application allows a patient who wants to start having services at the clinic to register for the first time online, and creating an account that will have all their future services and payment record. The application will also allow the patient to reserve an appointment online, without having to call the clinic. Moreover, the patients will be reminded of their appointments and follow ups through a message generated by the system from their record information, instead of a call from the receptionists

7. **Payment System**

Problem**:** Patients need a secure, versatile payment method for dental services that accommodates different financial situations.

Our Response: The app integrates with PayPal for secure transactions, offering full payments or installments for flexibility. Discounts and loyalty rewards are applied automatically, enhancing affordability. All payment activities are recorded, ensuring transparency and accurate financial history. A user-friendly payment experience that's secure, flexible, and clear, improving patient satisfaction and streamlining clinic operations

8. **System Maintenance & IT Support**

Problem: The clinic's digital infrastructure faces challenges in maintaining uninterrupted operations and addressing technical issues efficiently. Without regular updates and effective IT support, system downtime and unaddressed technical glitches could impede clinic operations and patient care.

OurResponse: To tackle these challenges, we've implemented a strategic approach. Regular system updates are scheduled during off-peak hours, ensuring minimal impact on clinic operations. A dedicated IT support team, equipped with a robust ticketing system, will promptly address technical issues and provide comprehensive staff training. This ensures that the clinic's digital infrastructure remains reliable and staff are well-equipped to handle the technology, leading to uninterrupted patient care and operational excellence.

9. **Secure Cloud Integration**

Our goal**:** Think of the cloud as a high-tech safety deposit box in the sky. By moving your data there, we're not just keeping it safe from prying eyes with top-notch encryption, but we're also making sure your dedicated team can reach it anytime, from anywhere. No more being tied down to a single computer or device – your patient records will be just a click away, whether you're in the clinic or on the move.

Future Prospects**:** You've probably heard buzzwords like 'blockchain' thrown around. Well, we're looking into harnessing its power. Imagine a system where once something's added, it can't be changed without leaving a clear trace. That's the kind of next-level security we're aiming for, ensuring your patient records aren't just secure, but set in digital stone.

- **Crucial Non-Functional Requirements**

  Growing with Us: As your clinic blossoms, welcoming more smiling faces and expanding your fantastic team, you need a system that grows with you. Whether we're adding new treatments or bringing more hands-on deck, our system will adapt seamlessly.

  Always On, Always Ready: We've all had those moments of frustration when technology decides to take a nap. With our top-tier setup, those moments will be few and far between. We're aiming for a system that's there when we need it, every single time.

  Easy as Pie: No one wants to spend days trying to figure out a new system. That's why we've put a premium on making things straightforward and intuitive. your team will feel right at home with it, getting the hang of things in no time.

- **Why Ramallah Dental Inc. Will Stand Out:**

Let's face it, the dental care market is quite competitive. The issue is that, with our new approach, we're not just levelling the playing field; rather, we're putting down the guidelines. We've taken the time to comprehend the issues, created effective remedies, and layered on some cutting-edge features. This is about more than just picking up a flashy new tool; it's about collaborating to build a better, more productive future. When we collaborate, we want to redefine quality in patient care, not just extend it.

Software development process

For this system, an incremental delivery approach would be followed, in which a set of functional parts would be released in each iteration. In the first increment, the most critical features of the system will be implemented so that the system becomes usable by your staff. And after every released iteration, a meeting will occur to take your feedback and notes on the delivered work for improvements and updates, in addition to any suggestions for the upcoming increment. This would help both sides to stay in touch and avoid errors due to misunderstanding from any party.

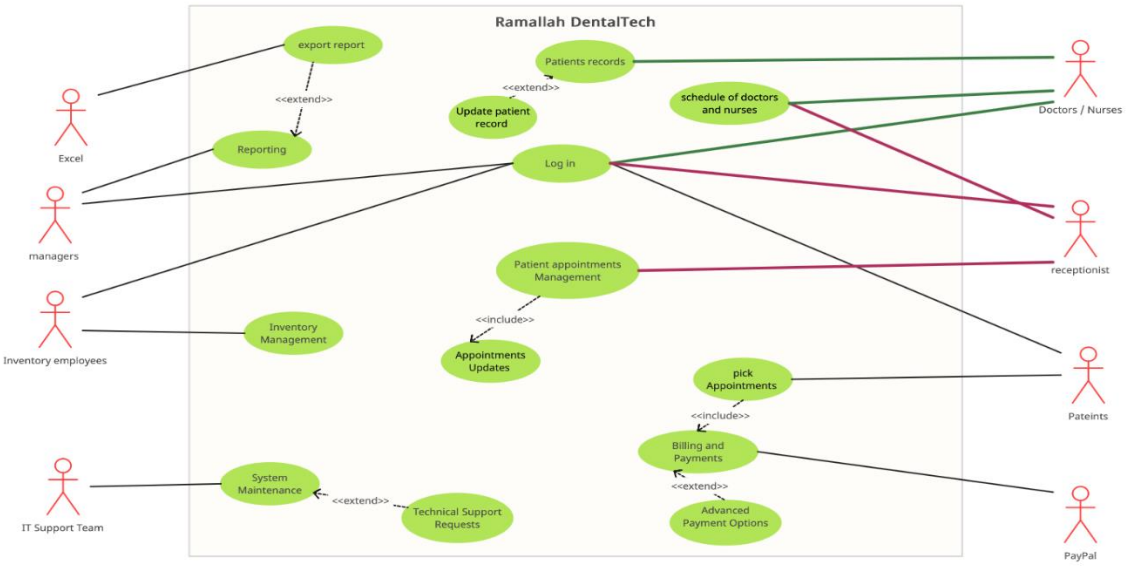
This approach of delivering your system will start with a meeting with us for you to identify your main objectives and requests for the system, then deciding your most crucial features to start with in the first increment. In that way you can start using the system early after the first iteration is released, while we continue to work on the other less crucial features. This also give you the chance to see every step of the work, and your requests for changes and updates would be easier to accomplish.

After hearing your requirements, our team will evaluate the time needed to accomplish them, and by that the releasing time of the iterations will be decided. But don’t worry, an iteration time will not be more than 4 weeks, and you will see the progress and benefit from every release.

By the end of the last iteration, you will have a high-quality system with high efficiency and functionality that meets your desired goals.

Analysis and Modelling:

- **Use-Case diagram**



- Aactors Analytics

1) **Doctors/Nurses**: They can view and adjust their schedules through the app and also access comprehensive 'Patient Records' for informed treatment planning, ensuring they deliver care that's both efficient and tailored to each patient.
2) **Receptionist**: Entrusted with 'Patient Appointment Management' and the intricate 'Scheduling of Doctors and Nurses,' the receptionist ensures seamless clinic operation, expertly balancing patient needs with staff availability.
3) **Patients**: Engage with 'pick Appointments' to select and manage their visits, and 'Billing and Payments' to handle financial transactions, providing them with control over their healthcare experience.
4) **Managers**: They utilize 'Reporting' to generate insightful data, aiding strategic decisions, and oversee 'Inventory Management' to maintain clinic efficiency and supply levels.
5) **Inventory Employees**: Interact with 'Inventory Management' to track supplies, ensuring that the clinic is well-stocked and that inventory levels are adequately maintained.
6) **IT Support Team**: Responsible for 'System Maintenance' and addressing 'Technical Support Requests', they ensure the app runs smoothly and any issues are promptly resolved.
7) **Excel (User)**: Likely a managerial role that uses 'Reporting' to export data into Excel for further analysis, facilitating a deep dive into clinic metrics and performance.
8) **PayPal (User)**: As part of 'Billing and Payments', this indicates how patients can use PayPal within the app for secure and convenient financial transactions.

- Use-case Analytics

Use Case	Description
Log in	Users securely log in to access their personalized areas of the app. This feature safeguards patient confidentiality and maintains data integrity, while also providing audit trails for security monitoring.
Patient Records	Essential for informed dental care, this feature allows practitioners to access full dental histories. It's crucial for continuity of care and ensuring that all treatment decisions are based on comprehensive information.
Update Patient Records	After every appointment, healthcare professionals update patient records. This ongoing documentation ensures that every record reflects the most current health status, aiding in future treatment planning.
Export Report	This function allows for the extraction of complex data sets into manageable reports, which can be analyzed to improve clinic operations and patient care strategies.
Reporting	Managers utilize this feature to generate detailed reports that offer insights into clinic operations, financial health, and patient demographics. These reports guide strategic planning and resource allocation.
Inventory Management	This vital operational feature ensures that the clinic is always equipped with necessary dental supplies, which is essential for the uninterrupted delivery of dental services.
Appointment Updates	Staff can use this to reschedule, cancel, or update appointments, ensuring a flexible and responsive service to patients' changing needs.
Patient Appointment Management	A comprehensive scheduling system that allows for the efficient booking and management of patient appointments, optimizing clinic workflow and resource utilization.
Schedule of Doctors and Nurses	A dynamic scheduling system for staff that balances workloads and manages personal schedules in harmony with patient appointment times.
Pick Appointments	Patients are empowered to choose and book their appointments based on real-time availability, which enhances their experience and satisfaction with the clinic's services.
Billing and Payments	The app provides a streamlined and secure payment process, incorporating billing and payment collection, which is fundamental for the clinic's revenue cycle management.
Advanced Payment Options	Patients benefit from flexible payment options such as payment plans or promotional discounts, improving access to dental services.
System Maintenance	Regular maintenance ensures the app remains functional, secure, and up to date, which is essential for the reliability of the entire system.
Technical Support Requests	A dedicated channel for reporting and resolving technical issues, ensuring minimal disruption to clinic operations and maintaining high user satisfaction.

list of user functional and non-functional requirements

2. tracking Patients records

Author: Ahmed Sayyad 1190855

this application is Intended to completely transform patient data management. at Ramallah Dental Inc. focusing on easily keeping track of and storing all important facts.

And its user & System Requirements are:

2.1) The user should be able to search and filter patients

2.2) The user should be able to view the patient record and to track treatment progress

2.3) The system should store all patient data secure and centralized database.

2.4) The application should prevent anyone except of the whom that are giving the access to be able to view, modify, or delete sensitive information

2.5) The user interface should be easy to navigate and understand for users with varying levels of technical expertise.

2.6) The system should provide quick response times for reporting features, data changes, and access.

2.7) The system should protect patient data from illegal access and loss.

2.8) The system should regularly back up data and having a disaster recovery plan.

2.9) The user should be able to add and update patient information

4. Dynamic Reporting Dashboard

This application should introduce a specialized Dynamic Reporting Dashboard designed specifically for Ramallah Dental Inc., with the main objective being to support managerial decision-making.

And its user & System Requirements are:

4.1) The user should be able to access and view the real-time dashboard

4.2) The user should be able to generate and export reports

4.3) The user should be able to Set and receive alerts

4.4) the system should interface with current lab equipment, X-ray systems, and dental software to process relevant data.

4.5) The system should protect patient data from illegal access and loss.

4.6) The dashboard should provide easy interface to deal with

4.7) The dashboard should load data and react fast to user input

4.8) The User access should be controlled based on roles and permission

Author: Sondos Shahin 1200166

6. making appointment

User requirement: the patient shall be able to reserve or cancel an appointment online through the application, and shall receive a confirmation message of the reservation or cancellation of the appointment.

System requirements:

6.1 a patient shall log in to the system in order to reserve or cancel an appointment. if a patient is having a service for the first time in the clinic, a registration form must be filled in order for an account to be created for the patient, and all the patient's information and medical record shall be saved to this account.

6.2 For the first time registration, a patient should add their complete information, including their full name and their phone number.

6.3 If the entered personal information were not complete, an error message will be shown to the patient, and the patient will be asked to complete the registration in order to have an account and be able to start reserving appointments.

6.4 After logging in to the application, if *add an appointment* option was chosen, a patient shall be able to choose the required type of service, which are: treatment of tooth loss, tooth repairs, tooth implants, dental cosmetics, X-ray as well as delta emergency services.

6.5 If the emergency service was chosen, the system shall generate the closest available appointment and reserve it for the patient.

6.6 If a different service was chosen, the patient shall be able to choose the wanted date and time for an appointment, in addition to the preferred doctor/ specialist (optional).

6.7 then the system shall search the medical staff's schedules to find if the chosen date and time, in addition to a suitable room for the service are available, and reserve it for the patient, if not, a list of available times and their doctor will be shown for the patient, and the patient should be able to reserve an appointment from these options.

6.8 If a patient reserved an appointment, a confirmation message will be sent to their phone number with the appointment specifications, such as the date, time and room of the appointment.

6.9 The patient should be able to cancel a reservation online through the application, without needing to call the clinic, by choosing the *cancel an appointment* option.

6.10 If a patient chose the *cancel an appointment* option, a list of the patient's appointments will appear to the patient, and the patient shall be able to cancel a reserved appointment from the list.

6.11 If a patient cancelled an appointment, the patient shall receive a message confirming the cancellation of the appointment.

6.12 If any modifications happened to the appointment information from the clinic's side, a message shall be sent to notify the patient of the change. And the patient should be able to confirm the new appointment, or cancel it.

6.13One day before the appointment, a reminder message of the appointment information will be sent for the patient.

6.14 After an appointment, a patient should be able to choose whether to pay fully for the service, or put it on installment debt.

6.15 After an appointment, the patient record should be modified by the doctor/ nurse if needed.

3. Smart Scheduling Algorithm

User requirement: smart and efficient scheduling algorithm for medical staff's schedules.

System requirements:

3.1 System shall be able to make schedules for doctors, nurses and X-ray specialists, specifying the date, time and room number, where rooms' occupancy is taken into consideration, since a room cannot have more than one patient's appointment at a time.

3.2 System shall be able to make schedules for each doctor, X-ray specialist and nurse (medical staff), where not one of them can have more than one appointment at a time.

3.3 A medical staff should be able to choose a break time, where no appointments are assigned in that slot.

3.4 Medical staff shall be able to view their schedules. Seeing their reserved appointments with all related information, such as date, time, room number, in addition to the patient's information and medical record.

3.5 A medical staff should be able to cancel an appointment, and the system shall reschedule the appointment to another time, or another available medical staff. The system shall also notify both the patient and the new medical staff of the change.

3.6 A medical staff should be able to change an appointment's information, and the system shall update the schedule. The system shall also notify the patient of the change.

3.7 Receptionists shall be able to view and make changes to medical staffs' schedules. They can update, add or delete appointment, and the system shall notify both the medical staff and the patient of the change.

3.8 If a receptionist wanted to add an appointment for a medical staff's schedule, the system shall make sure that the new appointment does not contradict with another appointment's time or room. If the new wanted appointment contradict with another reserved one, an error message shall be shown to the receptionist to alert them, and new appointment information will be needed to complete the operation.

Author: Baian Wahdan 1192401

5.Inventory management dental

supplies involves keeping track of what's in stock, placing orders when necessary, and making sure the items are available for treatments.

And its System Requirements are: -

5.1The application must provide the ability to log in securely, where inventory managers can have full control over inventory management. As for doctors, the ability to request inventory for treatments.

5.2 The application must provide the ability to add, update and delete items from the inventory, as the application must contain the ability to classify the inventory according to type, name, category, description, expiration date.

5.3 App must show live, up-to-date inventory information for all items, display inventory details, update instantly with any changes, and include item names, quantities, categories.

5.4 The application must provide assist inventory managers with reviewing and approving/rejecting orders.

5.5 The application must provide the ability to create reports that display current stock levels and usage trends.

5.6 The application must provide the ability to connect inventory usage to specific patient treatments and procedures.

5.7 The application must provide an easy and clear design for easy browsing with details and also easy reference.

5.8 The application must provide inventory record keeping in terms of date and expiration of inventory.

5.9 The application must provide an alert feature through notifications to remind you of running out or low inventory.

9. Secure cloud integration

Secure cloud integration integrates the data and services of a dental clinic with a secure internet platform, enabling high-level security procedures while enabling safe information access, exchange, and management. .

And its System Requirements are: -

9.1 The application must contain strong protocols to protect patient data while moving within the cloud.

9.2 Access restrictions must be implemented by the application through certain user authentication techniques, ensuring that only authorized individuals are able to access secret information.

9.3 The application must provide proactive recall to prevent robust data recovery and recovery in case any problem occurs

9.4The application should provide regular updates and active monitoring necessary to constantly identify and fix security vulnerabilities, ensuring continuous protection of clinic data stored and accessible in the cloud

Author: Yazan shadid 1191522

8. System Maintenance & IT Support

The System Maintenance & IT Support at Ramallah Dental Inc. ensures operational excellence with scheduled off-hour software updates, a responsive IT helpdesk, and comprehensive training for staff. These measures, coupled with proactive performance monitoring and high system availability, guarantee a reliable and user-friendly experience, reflecting the clinic's commitment to continuous improvement and top-tier patient care.

8.1 Scheduled Software Updates: Regular updates during off-peak hours ensure the system's smooth operation, much like a routine health check for our digital environment.

8.2 Update Logging: Each update is meticulously recorded, creating a valuable historical database for tracking and future analysis.

8.3 Responsive IT Support: A user-friendly, approachable IT helpdesk, complete with an efficient ticketing system, ensures swift issue resolution, much like a reliable digital mechanic.

8.4 Resolution Timeframes: Clear service level agreements (SLAs) provide assurance that all issues will be addressed promptly, ensuring minimal disruption.

8.5 Training on New Updates: Regular, engaging training sessions keep staff up-to-date, fostering a confident and tech-savvy clinic environment.

8.6 Accessible Support Documentation: Easy-to-understand guides and documentation are readily available, serving as a valuable resource for staff.

8.7 Proactive Issue Detection: Advanced monitoring tools preemptively identify potential issues, maintaining system health and reliability.

8.8 Regular System Audits: Periodic audits ensure continuous system improvement and optimization, reflecting a commitment to excellence.

8.9 User Feedback for IT Support: Regular collection of user feedback helps refine and enhance the IT support experience, aligning it with user needs.

8.10 High System Uptime: The system aims for near-perfect availability, with contingency plans for unexpected downtimes.

8.11 Performance Monitoring: Continuous performance monitoring ensures the system operates at peak efficiency and within established benchmarks.

8.12 User-Centric Support: IT support is not just about fixing problems; it's about understanding and catering to user needs, ensuring a seamless experience.

7.Payment System Requirements

The Payment System at Ramallah Dental Inc. is designed for security, efficiency, and user convenience. It features seamless PayPal integration, flexible payment options including installments, and ensures data protection with robust encryption. This system enhances the patient experience by simplifying financial transactions.

7.1 Secure PayPal Integration: Integrating PayPal ensures secure transactions. This integration is pivotal, not just for security but for user trust and convenience in financial dealings.

7.2 Immediate Transaction Feedback: Users will receive instant confirmation for transactions, enhancing the transparency and reliability of the payment process.

7.3 Installment Payment Options: The system will clearly articulate installment plans, providing flexibility and clarity for patients managing larger bills.

7.4 Discounts and Promotions: Seamlessly applying discounts or promotional codes, the system automatically adjusts billing amounts, enhancing user satisfaction and loyalty.

7.5 Accessible Transaction History: Users can easily track their payment history, fostering a sense of control and transparency over their financial interactions with the clinic.

7.6 Data Security and Encryption: Robust encryption of payment data safeguards user privacy, reinforcing the system's integrity and user confidence.

7.7 User-Friendly Interface: The interface will be designed with simplicity and clarity, ensuring that it's intuitive for users of all technological proficiencies.

7.8 Compliance with Accessibility Standards: Adhering to accessibility guidelines, the system will cater to users with diverse abilities, emphasizing inclusivity.

7.9 Efficient Transaction Processing: Quick processing of payments to avoid delays, enhancing the user experience and operational efficiency.

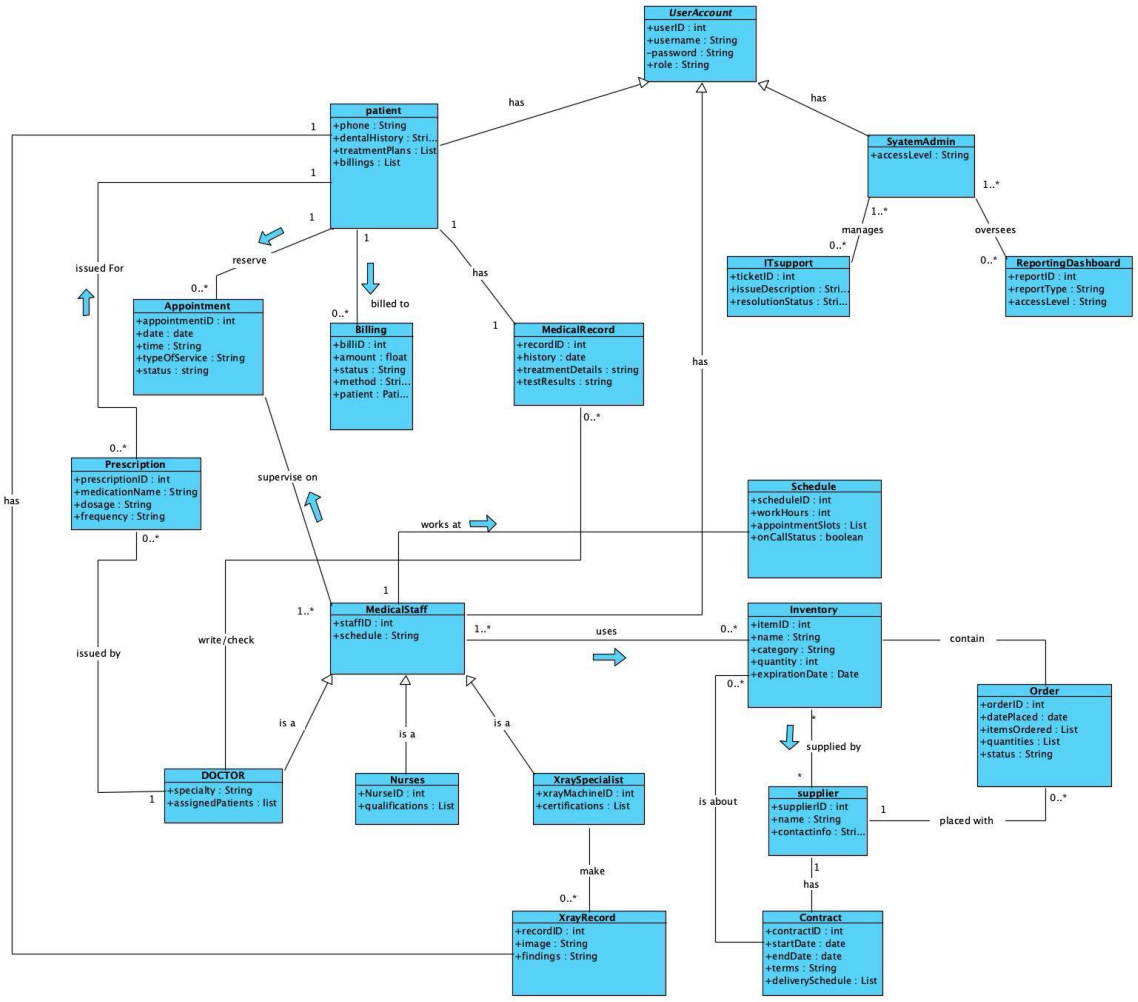
7.10 High Volume Transaction Handling: The system's capability to handle high transaction volumes during peak periods ensures operational resilience and reliability.

Non-Functional Requirements:

7.11 System Reliability: Reliability is key, with the system designed to minimize downtime and ensure consistent availability, crucial for maintaining uninterrupted clinic operations.

7.12 Performance Monitoring: Ongoing monitoring of the system's performance guarantees that it consistently meets the high standards set, with adjustments made as needed for continuous improvement.

Class diagram



Use Case Specification and Activity Diagrams

tracking Patients records

Ahmed Sayyad 1190855

1.Brief Description:

This use case enables users to track and manage patient records efficiently within the Ramallah Dental Inc. system. It encompasses various functionalities such as searching, viewing, updating, and securing patient data.

2.Flow of Events:

2.1 Basic Flow – View Patient Record and Track Treatment Progress:

1. User selects the "View Patient Record" option from the main menu.
2. The system presents the patient record interface.
3. User searches (e.g., patient name, ID, date of birth) for and selects the desired patient record.
4. The system displays comprehensive patient information including treatment history, progress notes, and appointments.
5. User tracks the treatment progress, updates relevant information if necessary, and saves changes.
6. The use case ends.

2.2Alternative Flows:

2.2.1 Alternative Flow – Search and Filter Patients:

1. User initiates the "Search and Filter Patients" function.
2. The system presents a search interface allowing the user to input search criteria.
3. User enters search parameters (e.g., patient name, ID, date of birth) and submits the search request.
4. The system filters patient records based on the provided criteria and displays the results to the user.
5. User reviews the filtered patient list and selects a specific patient for further actions.
6. The use case ends.

2.2.2 Alternative Flow – Add and Update Patient Information:

1. User accesses the "Add and Update Patient Information" feature.
2. The system provides a form to input patient details such as name, contact information, medical history, etc.
3. User enters or updates patient information and submits the form.
4. The system validates the input data and updates the patient record accordingly.
5. A confirmation message is displayed to the user upon successful update.
6. The use case ends.

2.2.3 Alternative Flow – Access Control:

If a user attempts to access sensitive information without proper authorization, the system denies access and logs the unauthorized attempt.

3.Special Requirements:

1. The system must ensure data security and privacy in compliance with relevant regulations
2. Response times for accessing, updating, and securing patient data should not exceed predefined thresholds.
3. Regular backups of patient data must be performed according to the specified backup schedule.
4. The user interface must be intuitive and user-friendly to accommodate users with varying levels of technical expertise.

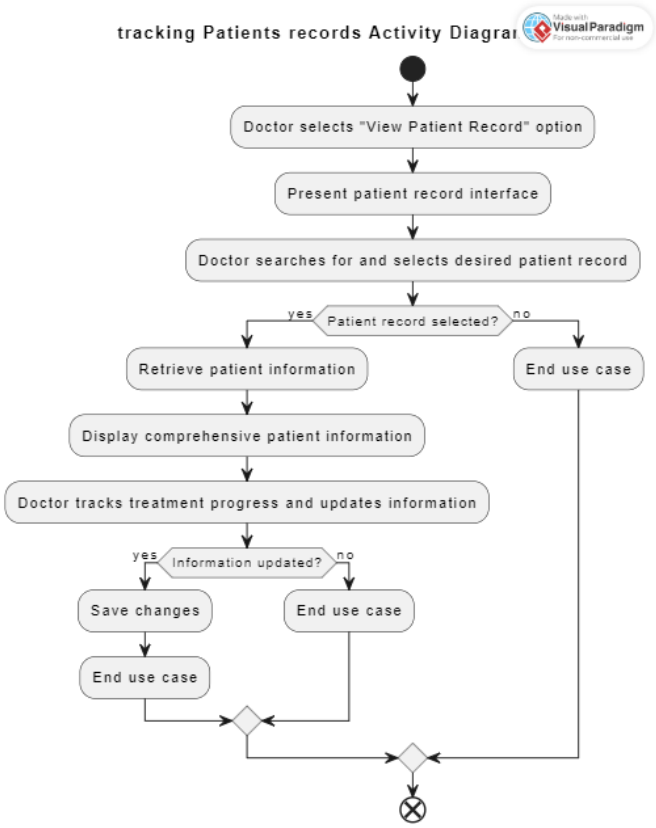
4.Entry Conditions:

User must be authenticated and logged into the system to access patient records and perform related actions.

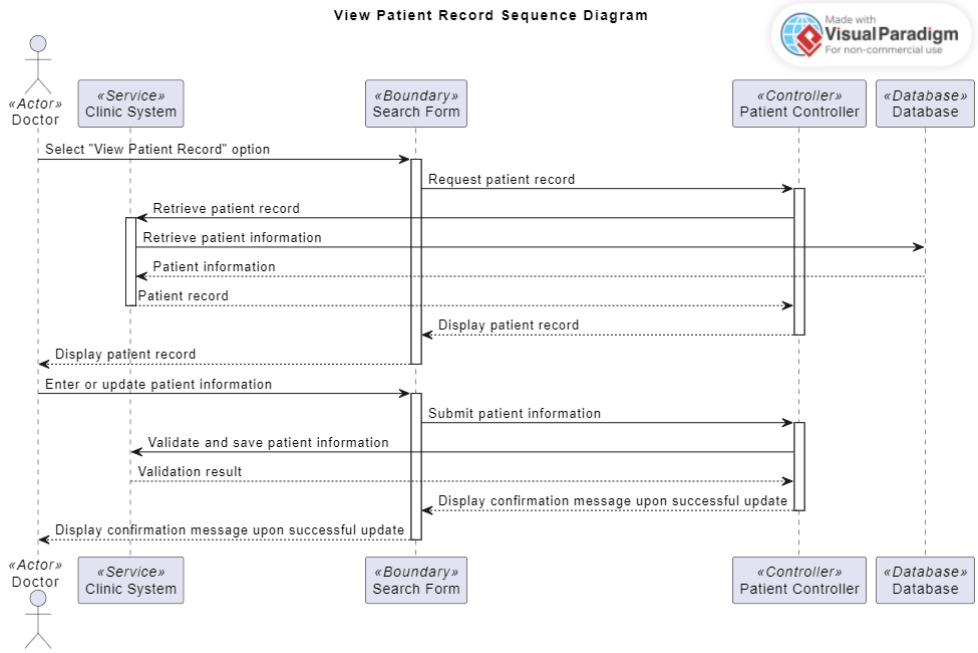
5.Exit Conditions:

Upon completing the desired actions (e.g., searching, viewing, updating patient records), the system provides confirmation messages and returns to the main menu or previous interface.

Activity diagram



Sequence diagram



Use Case Name: Handling Online Payments

Author : Yazan shadid 1191522

1. Brief Description:

Ramallah Dental Inc. offers an advanced electronic payment system that ensures a smooth and convenient process for patients to manage their treatment payments. The system supports various payment options including PayPal, cash, and structured payment plans, all underpinned by robust security measures. Patients are empowered to pay, modify, and track their payments with ease.

2. Flow of Events:

2.1 Basic Flow – Make Payment:

1. The patient securely logs in to the system and selects "Make Payment."
2. The system displays the payment form, where the patient can choose the payment method:
    - PayPal: For a secure and expedited digital payment process.
    - Cash: For patients who opt for a traditional payment method.
    - Payment Plans: For patients requiring staggered payment options.
3. The patient enters all necessary details for the payment process, such as their name, patient number, treatment date, and payment amount, then submits the information.
4. The system checks the accuracy of the details provided and, if correct, processes the payment.
5. Upon successful payment processing, the system updates the patient's account and displays a message confirming the payment completion.
6. The patient is given the option to view their payment history to verify the recent transaction.
7. The patient repeats these steps for each new payment they need to make.

2.2 Alternative Flows:

2.2.1 Modify Payment:

1. The patient selects "Modify Payment" to change details of a prior payment.
2. The system provides a list of past and current payments for selection.
3. The patient adjusts the payment details as needed and submits the changes.
4. The system validates the new information and, if verified, updates the payment record.
5. A confirmation of the successful modification is displayed to the patient.
6. The patient can check the updated details in their payment history.
7. The patient may repeat the modification process for any other payments.

2.2.2 Delete Payment:

1. The patient chooses "Delete Payment."
2. The system prompts the patient to select which payment to delete.
3. Once the payment is selected, the system confirms the validity of the deletion request.
4. The patient confirms the deletion, and the system then removes the payment and updates the account.
5. A notification of the successful deletion is provided to the patient.
6. The payment history is updated accordingly.
7. This deletion process is available for any payment the patient wishes to remove.

2.2.3 Payment Not Found:

if a search for payment details yields no results, the system notifies the patient with an error message and provides the options to either re-enter the details or cancel the operation.

2.2.4 Viewing Payment History:

Patients have the ability to access their payment history at any time, allowing them to review and track their past and recent payments for better financial management.

2.2.5 Special Requirements

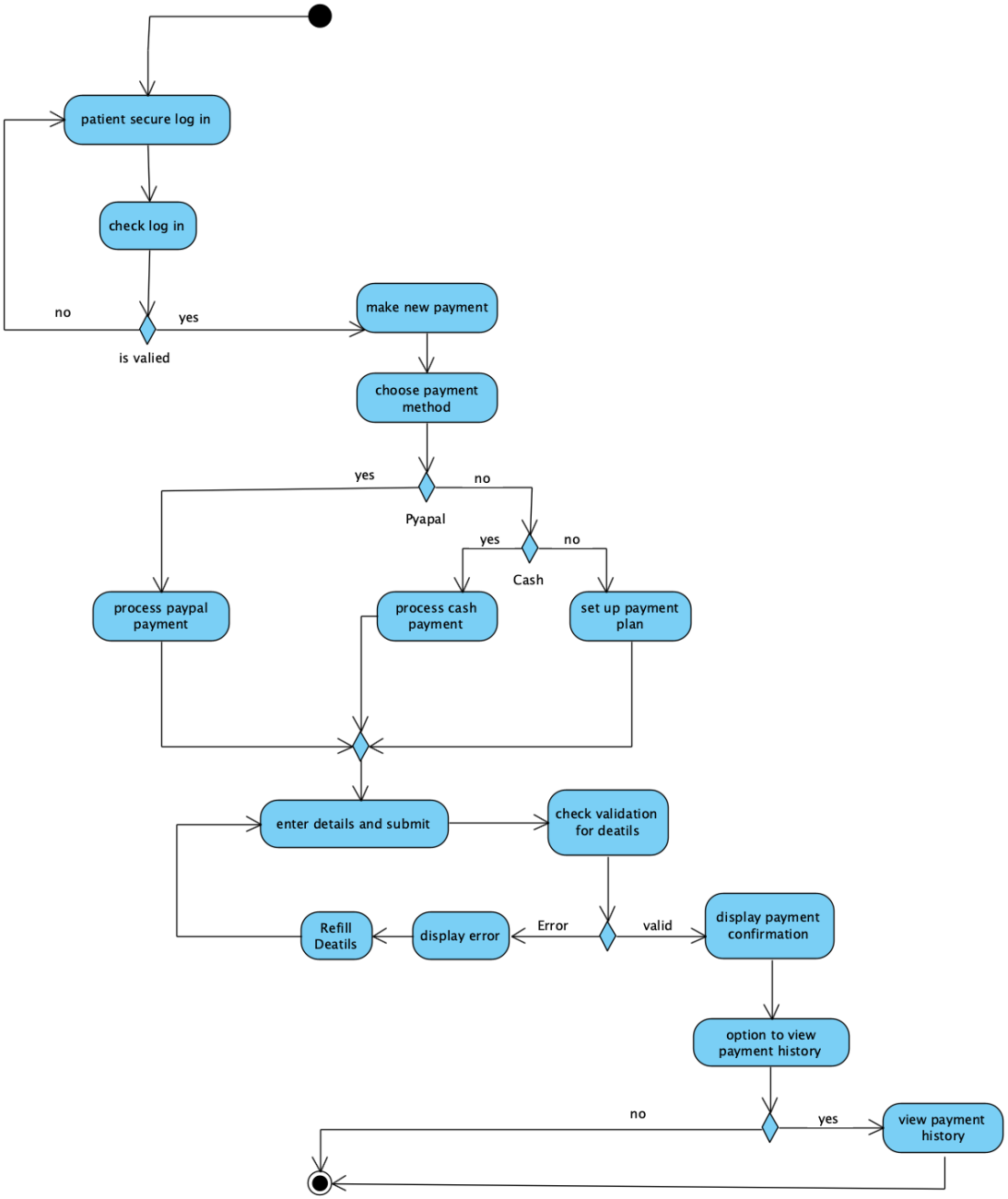
The system must ensure secure encryption for all financial transactions.

When searching for payments to modify or delete, the system's response time should not exceed 3 seconds.

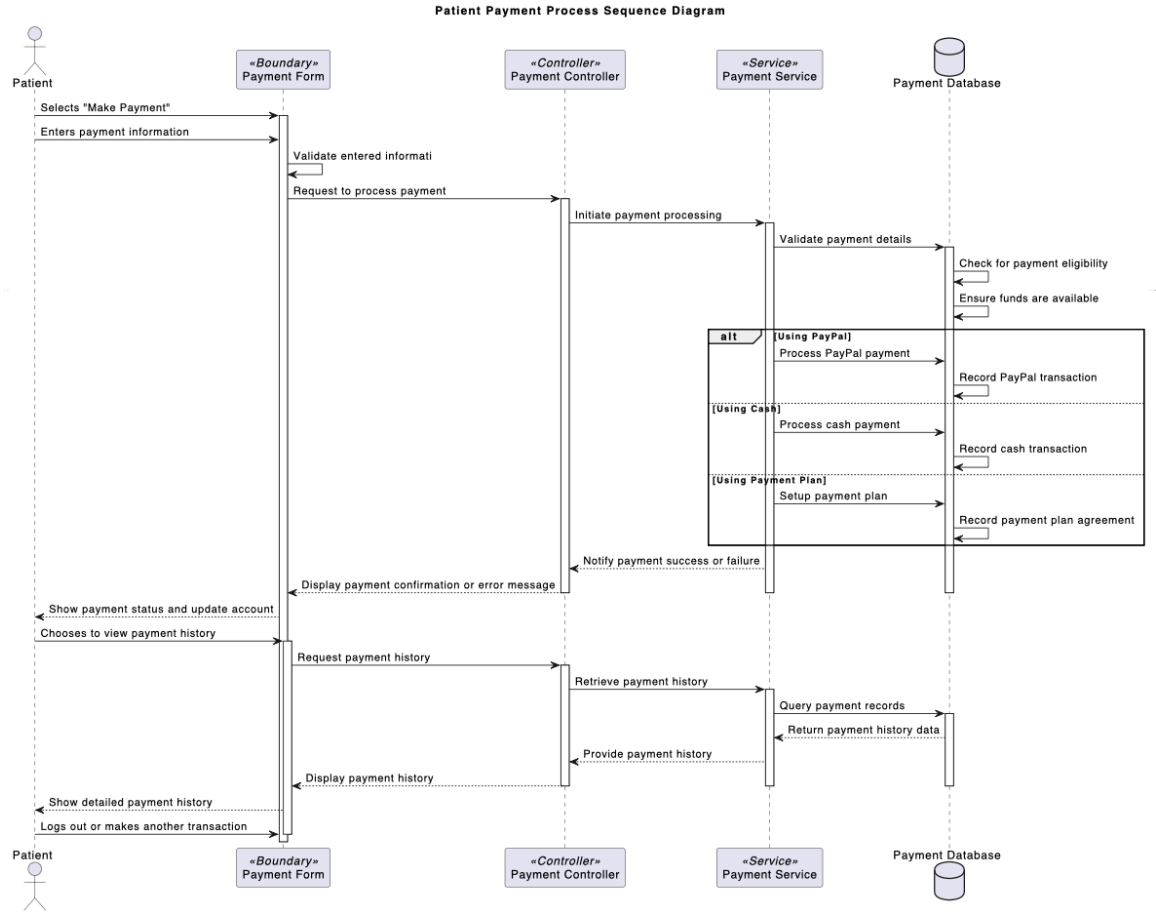
2.2.6 Entry Conditions:

1. Patients must have an active account and be logged in to utilize the payment functionalities.
2. An appointment must be scheduled prior to initiating the payment process.
   5. Exit Conditions: After completing the payment operations, the patient receives a transaction completion notification and a confirmation email, ensuring a secure and transparent conclusion to the payment experience.

Activity diagram for Handling Online Payments



Sequence diagram



Managing appointments

Sondos Shahin 1200166

1. Brief Description

This use case allows the patient to manage their appointments. This includes reserving and cancelling appointments from the system.

The actor for this use case is the patient.

2. Flow of Events

The use case begins when the patient selects the "manage appointment" activity from the Main Form.

2.1 Basic Flow – Add appointment

1. The patient selects "reserve appointment".
2. The system displays a blank appointment form.
3. The patient enters the following information for the appointment: name, date of desired appointment, time of desired appointment, preferred doctor, type of service. then selects “reserve” option.
4. The system validates the data to ensure that the selected doctor has a slot time for reserving at the specified time, and there is an empty room appropriate to the type of service at the time of the appointment. If the data validates, the appointment is reserved, and a message is sent to the patient to confirm that the reservation is done.
5. If the selected doctor does not have empty slots for reservation, the system will display the available slots for other doctors, at the time desired by the patient. And the patient can choose one of them to reserve or can choose not to reserve an appointment.
6. If there are no empty time slots at all, or there are no empty rooms at the specified time, the system will display a list of available times for reservation. And the patient can choose one of these times to reserve or can choose not to reserve an appointment.
7. When the patient is finished the use case ends.

2.2 Alternative Flows

2.2.1 cancel appointment

1. The patient selects "cancel appointment".
2. The system displays a list of all the patient’s reserved appointments.
3. The patient chooses the appointment they want to cancel.

4. The system will display the appointment's information, and a "delete" option will display to the patient.
5. If the patient chooses the "delete" option, The system displays a delete verification dialog confirming the deletion.
6. If the patient selects "yes", the appointment will be cancelled, and a confirmation message will be sent to the patient.
7. The patient can choose not to delete any appointment, by selecting the "exit" option instead of "delete". When edits are complete, the use case ends.

2.2.2 appointment is modified

1. If the appointment's information is modified from the clinic's side, the system will send the patient a message to inform them of the change.
2. When the patient opens the system to see the changes, the system will display the new appointment information, with 2 potions: "keep the appointment" and "delete the appointment".
3. If the patient selects "keep the appointment", an appointment with the new information will be reserved for the patient.
4. If the patient selects "delete the appointment", the appointment will not be reserved for the patient.

3. Special Requirements

when reserving or deleting an appointment, the system shall take no more than 5 seconds.

4. Entry Conditions

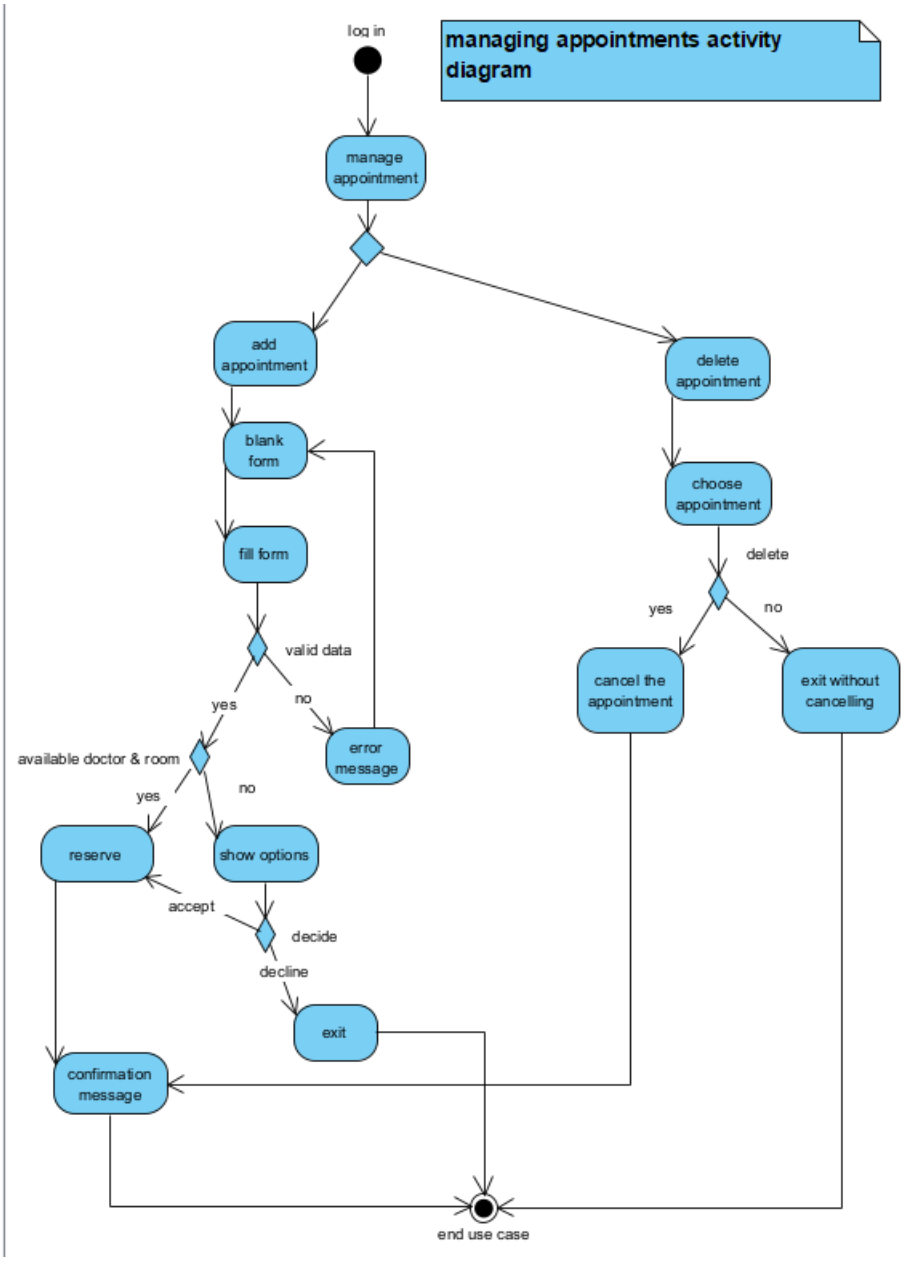
4.1 Log In

Before this use case begins the patient has logged onto the system.

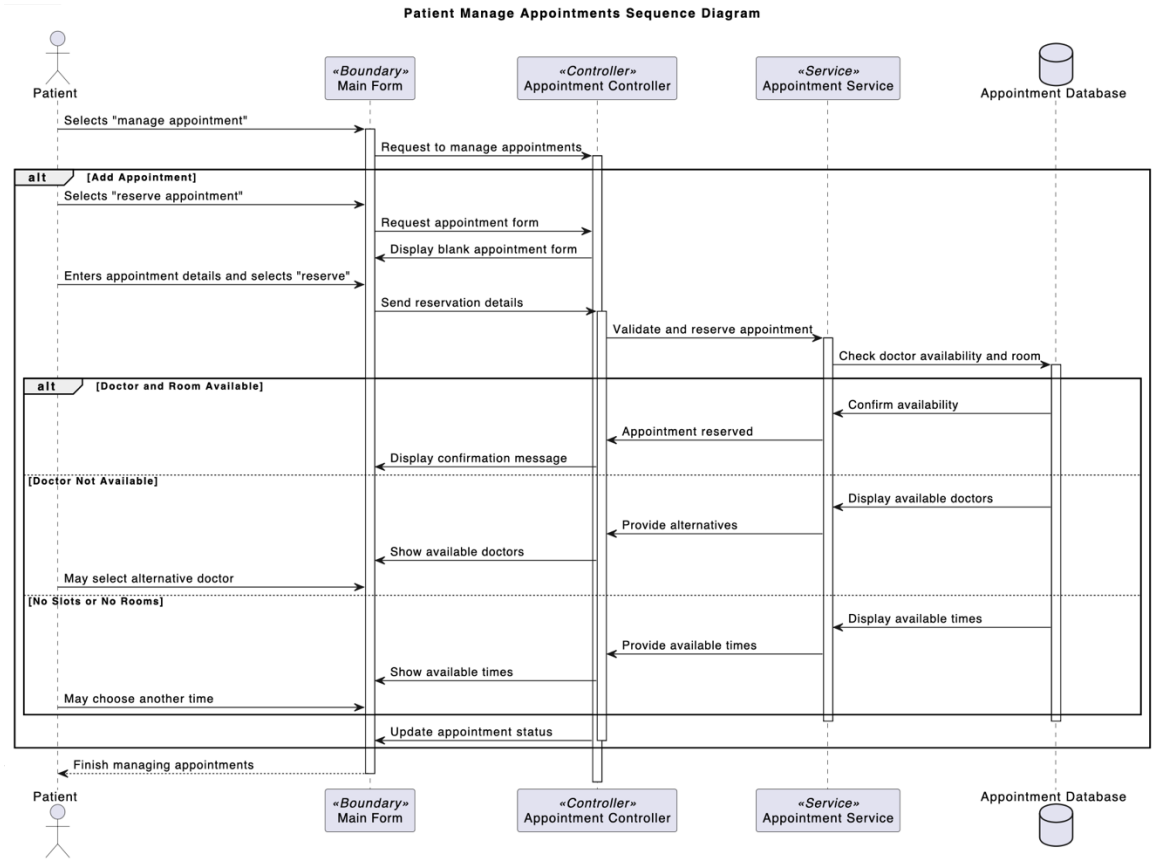
5. Exit Conditions

Before the use case ends, a message of the done actions will be sent to the patient.

Activity diagram



Sequence diagram



Inventory Management

Baian Wahdan 1192401

1. Brief Description

This use case allows the Inventory Manager can efficiently manage and track the inventory within the clinic. The activities include adding, modifying, and deleting inventory items.

The actor for this use case is the Inventory Manager.

2. Flow of Events:

The use case begins when the Inventory Manager selects the “maintain inventory” activity from the Main Form.

2.1.Basic Flow – Add Inventory Item:

1. Initiate: Inventory Manager selects "add inventory item."
2. Display Form: System presents a blank inventory form.
3. Enter Information: Manager fills in item name, quantity, category, price, and clicks "save."
4. Validate and Create: System checks data, ensures no duplicates, assigns a unique ID, and creates the new item record.
5. Repeat: Steps 2-4 can be repeated for multiple items.
6. End: Use case concludes when manager finishes adding items.

2.2.Alternative Flows:

2.2.1. Modify an Inventory Item:

1. Initiate: The Inventory Manager selects “modify inventory item.”
2. Item Selection:
   -The system displays a list of existing inventory items or allows searching for a specific item.
   -The system retrieves the item information and displays it.
3. Display Edit Form: The system displays the selected item's details in a pre-populated edit form. The system validates data, updates the inventory information.
4. Edit Information: The manager can modify any or all of the existing item details on the form, such as: Item name, Quantity, Category and Price.
5. Validate and Update: The system validates the modified data for accuracy and ensures no duplicates exist with the updated name, if valid the system updates the existing item record with the changed information.
6. End: The Manager chooses to return to the main menu or finish modifying all desired items.

2.2.2. Delete an Inventory Item:

1. Initiate: The Inventory Manager select "delete inventory item" within the system.
2. Item Selection:
   -The system displays a list of existing items or allows searching for a specific one.
   -The Manager selects the item they wish to delete.
3. Confirmation: The system displays a confirmation message asking the Manager to confirm they want to delete the selected item. This message might include details like the item name and quantity.
4. Deletion: The Inventory Manager selects "delete." Then the item is deleted from the system.
5. End: The Manager chooses to return to the main menu or finish deleting all desired items.

2.2.3. Item Already Exists:

- If during the "Add an Inventory Item" sub-flow, the system finds an existing item with the same name, an error message is displayed: "Item Already Exists." The Inventory Manager can change the name, create a new item with the same name, or cancel the operation, at which point the use case ends.

2.2.4. Item Not Found:

- If during the "Modify an Inventory Item" or "Delete an Inventory Item" sub-flows, the item name is not located, the system displays an error message: "Item Not Found." The Inventory Manager can then type in a different name or cancel the operation, at which point the use case ends.

3. Special Requirements:

- When searching for an inventory item, the system shall retrieve the item record in no more than 3 seconds.

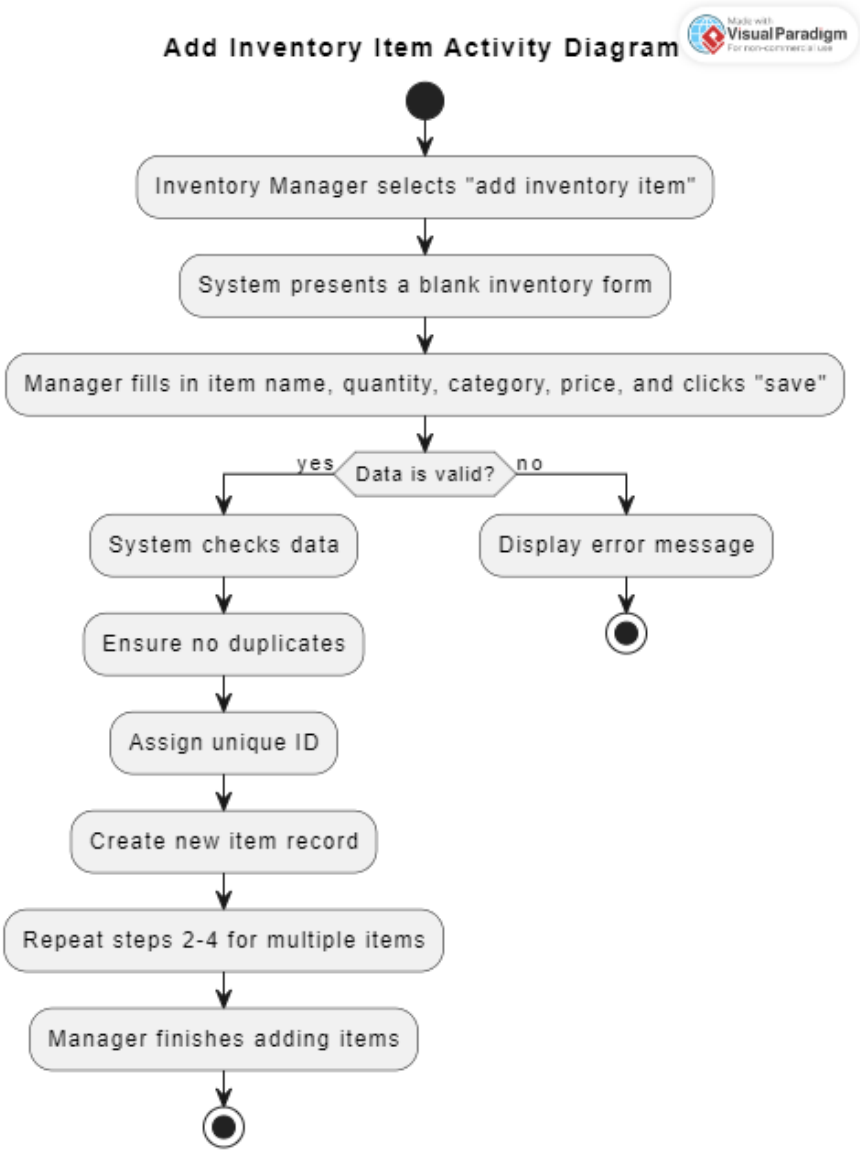
4. Entry Conditions:

4.1.Log In: Inventory Manager must log in before starting.

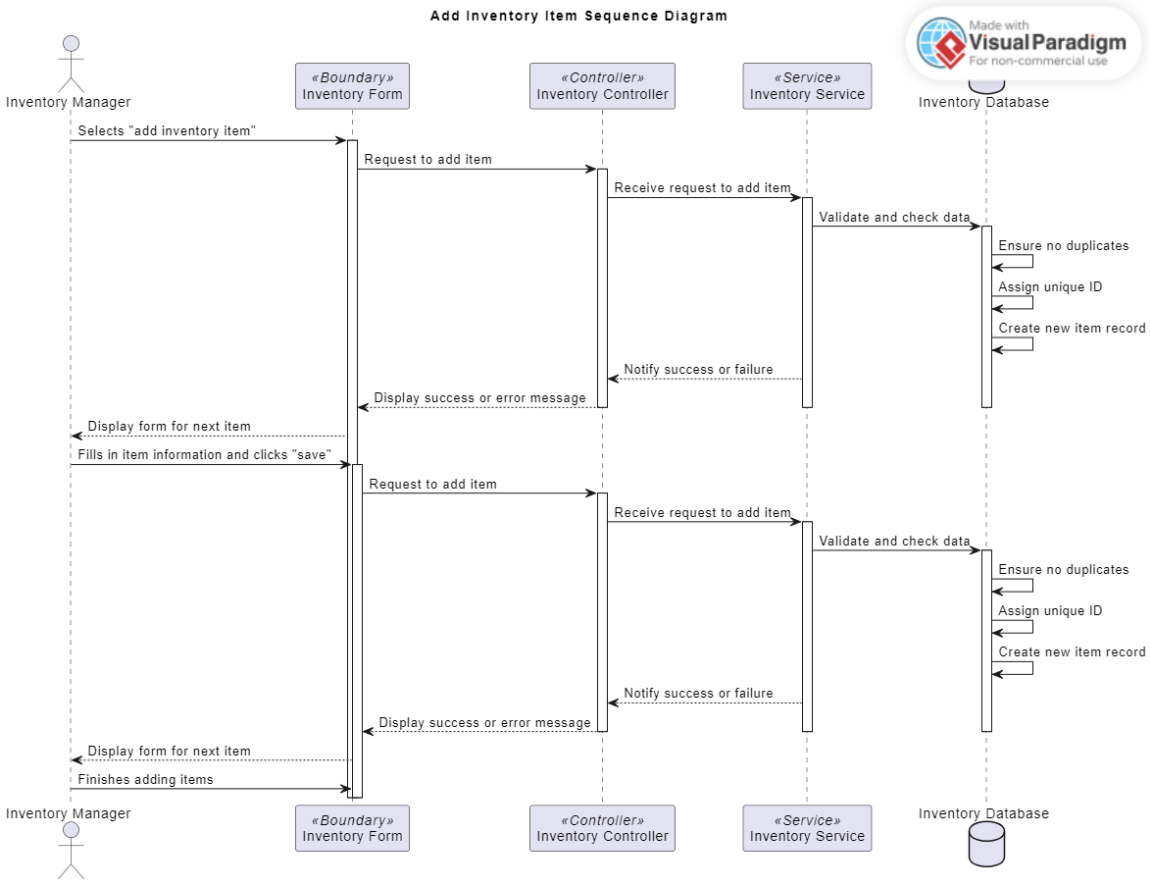
5. Exit Conditions:

- No specific post-conditions associated with this use case.

Activity diagram



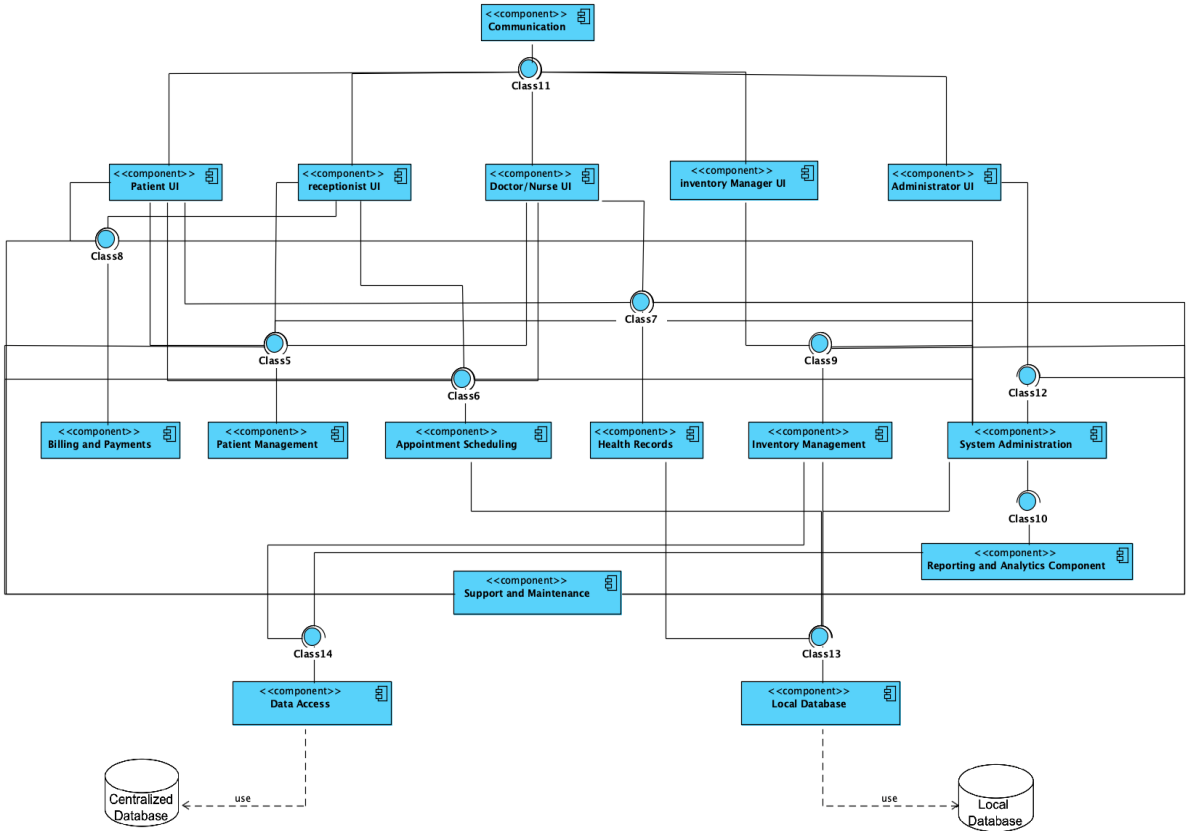
Sequence diagram



Software architecture design goals:

1. **Security:** our system deals with payment, so related sensitive information such as the credit card information of patients are required. Therefore, a high level of security is needed to keep such data safe. So, a secure cloud integration is one of our top goals.
2. **User friendliness:** since our system is designed for a medical clinic, it would have a huge platform of users, including elderly people. So, user friendly interfaces that can be used easily by all types of users are another one of our design goals.
3. **Maintainability and reliability:** medical systems should be error-free. So, a maintainable system will make regular maintenance easier, and therefore, would increase the reliability of the system.

UML Component Diagram



UI Components:

1. Patient UI: Provides an interface for patients to register, manage their profiles, book and cancel appointments, view their health records, and handle payment transactions.

2. Receptionist UI: Used by clinic receptionists to schedule and manage appointments, handle patient check-ins, and perform other administrative tasks.

3. Doctor/Nurse UI: Allows medical staff to access patient health records, manage their appointment schedules, document treatment details, and make notes on patient visits.

4. Inventory Manager UI: Enables inventory managers to monitor stock levels, track and order dental supplies, and manage inventory logistics.

5. Administrator UI: Provides administrators with tools to manage user accounts, configure system settings, and oversee the security and integrity of the entire system.

Functional Components:

6. Billing and Payments: Handles the financial transactions of the clinic, including patient billing, processing of payments, and integration with external payment systems.

7. Patient Management: Manages all aspects of patient data, such as registration, contact information, insurance details, and other pertinent personal data.

8. Appointment Scheduling: Responsible for the coordination and management of all patient appointments, optimizing time slots based on provider availability and patient preferences.

9. Health Records (EHR): Maintains a secure and comprehensive electronic record of patients' medical history, diagnoses, treatments, and any other health-related information.

10. Inventory Management: Ensures that the clinic has the necessary supplies and equipment on hand, managing inventory levels, and facilitating the ordering process when stock is low.

11. System Administration: Oversees the configuration and maintenance of system settings, user permissions, and ensures that all components are functioning correctly.

12. Reporting and Analytics: Gathers data from various sources to provide insightful reports and analytics, which aid in strategic planning and clinic management decisions.

13. Support and Maintenance: Provides ongoing technical support, system updates, and maintenance to ensure the clinic's systems operate smoothly without interruption.

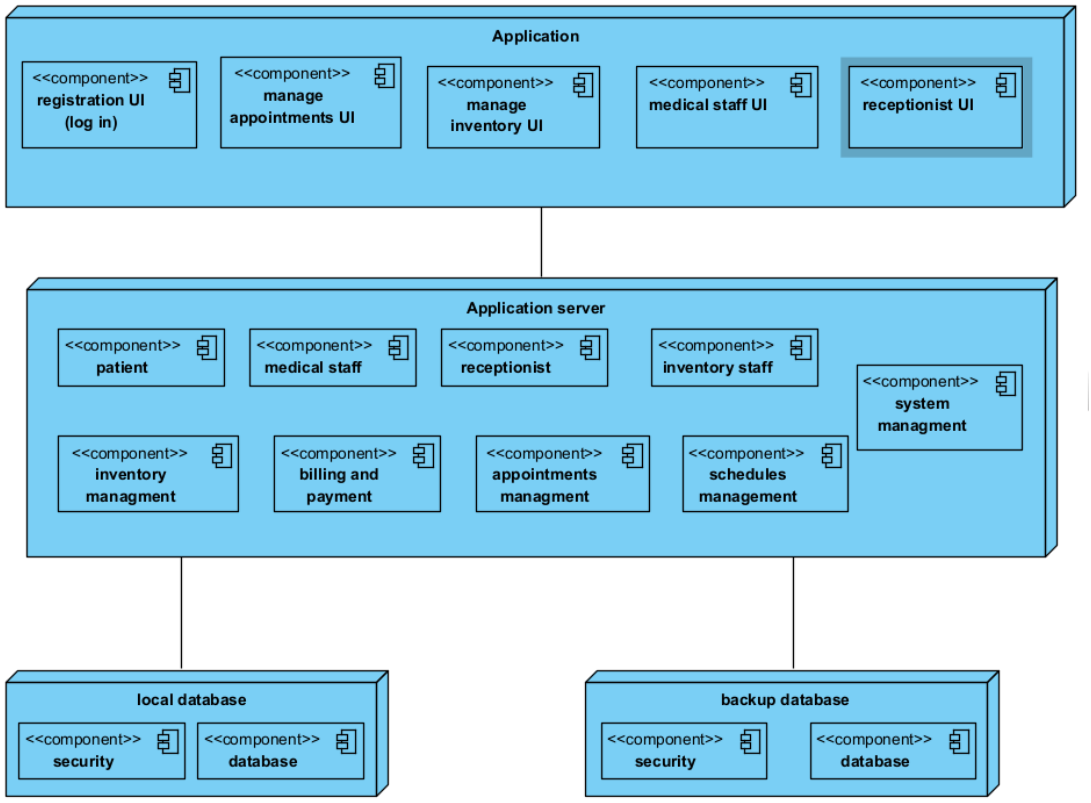
14. Data Access: Acts as a liaison between the user interfaces and databases, facilitating the retrieval and storage of data, ensuring efficient data operations.

Databases:

15. Local Database: A repository for storing operational data on a local server, providing the clinic with fast access to necessary information for daily activities.

16. Centralized Database: A repository for consolidating data from various sources, typically hosted on cloud services, which is used for advanced data analysis, reporting, and as a backup for disaster recovery scenarios.

UML Deployment Diagram



Specified UML Deployment Diagram