

WPI

Intelligent Building Management System

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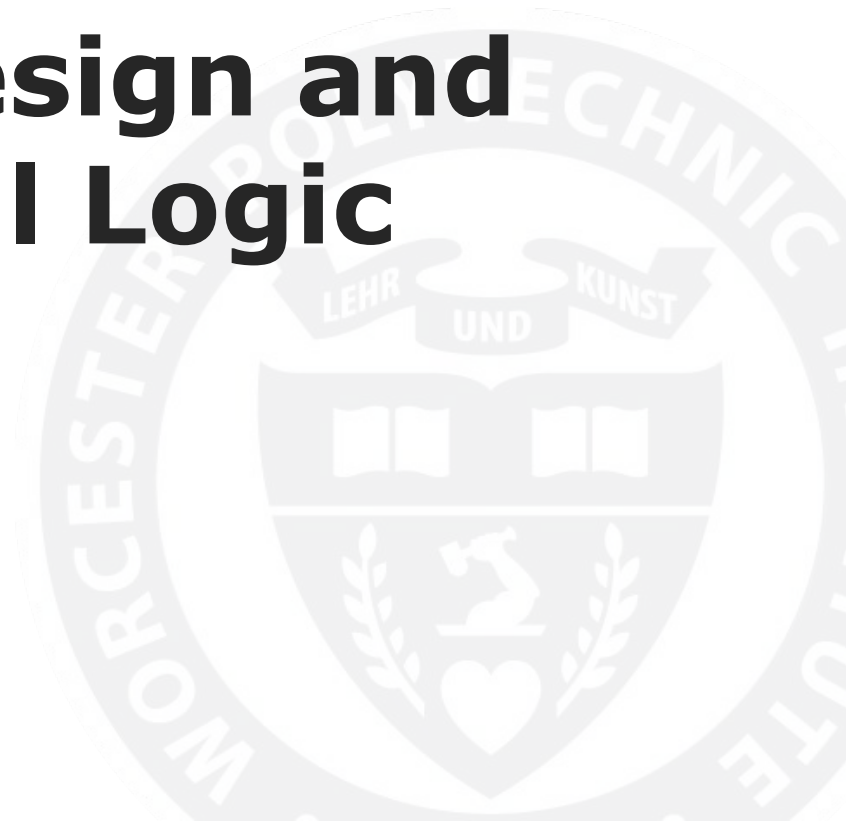
Business Problem



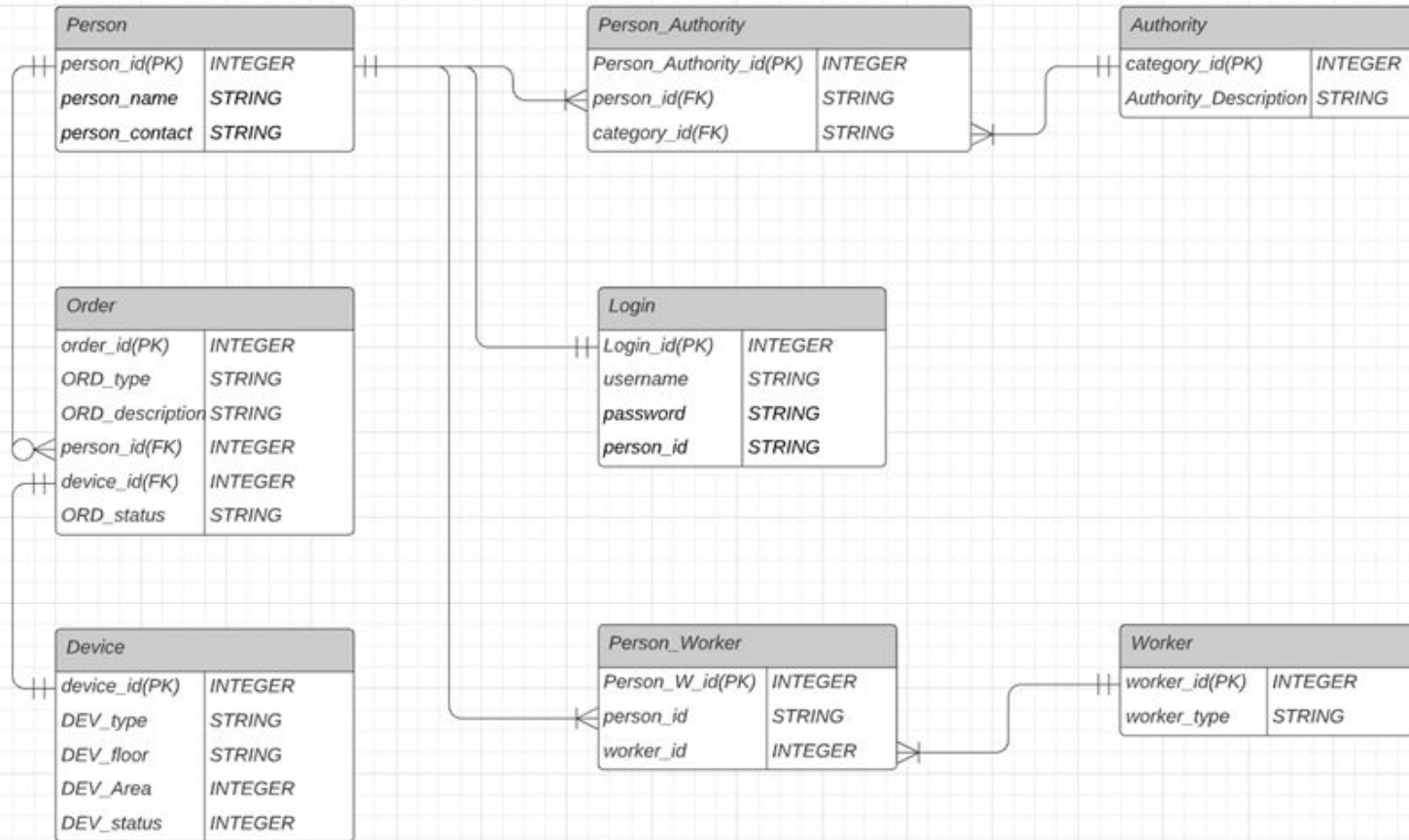
Business Problem

- The building industry is in need of a management system to keep track of maintenance work orders
- The Intelligent Building Management System (IBMS) is an integrated DBMS system to support pre-construction, post-operation, and maintenance issues
- A shopping mall is used as our building model for business analysis
- IBMS has increased functionality for managers to:
 - check and assign all work orders
 - view equipment details
 - conduct performance evaluations based on work completed

Database Design and Conceptual Logic



Entity-Relationship Diagram



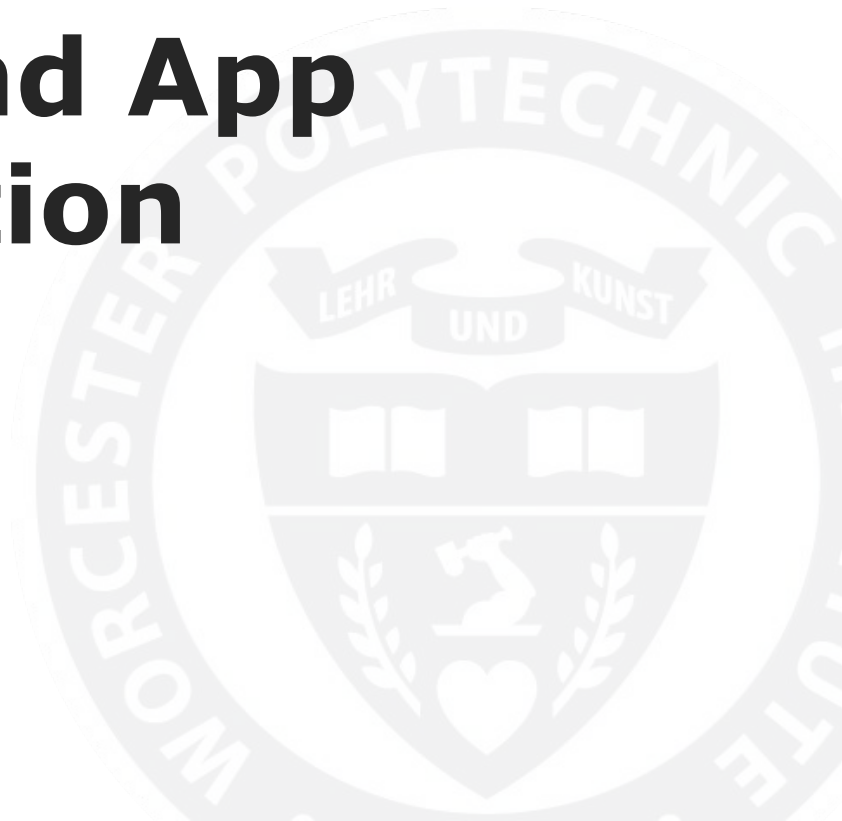
Bachmann Diagram

- Person (person_id, person_name, person_contact)
- Order (order_id, ORD_type, ORD_description, ORD_status, *person_id*, *device_id*)
- Device (device_id, DEV_type, DEV_floor, DEV_Area, DEV_status)
- Login (Login_id, username, password, *person_id*)
- Worker (worker_id, worker_type)
- Authority (category_id, Authority_Description)
- Person_Authority (Person_Authority_id, *person_id*, *category_id*)
- Person_Worker (Person_W_id, *person_id*, *person_id*, *worker_id*)

Data Dictionary

Column Data Field	Description	Data Type
person_id	Self-incrementing ID for employee identification	INTEGER
person_name	Last, first, and middle name of employee in a 40-character text string.	NVARCHAR(40)
person_contact	Ten-digit Mobile phone number of each employee	CHAR(10)
Person_Authority_id	Self-incrementing ID for employee_authority identification	INTEGER
category_id	Self-incrementing ID for authority type identification	INTEGER
Authority_Description	Authority description stored as a 40-character text string.	NVARCHAR(40)
order_id	Self-incrementing ID for order identification	INTEGER
ORD_type	Order type stored as a 20-character text string.	NVARCHAR(20)
ORD_description	Order description stored as a 50-character text string.	NVARCHAR(50)
ORD_status	Order status(In progress, closed stc.) stored as a 10-character text string.	NVARCHAR(10)
device_id(PK)	Self-incrementing ID for device identification	INTEGER
DEV_type	Device type stored as a 30-character text string.	NVARCHAR(30)
DEV_floor	The floor of the mall where the device is located stored as a 5-character text string	NVARCHAR(5)
DEV_Area	The area of the mall floor where the device is located(A,B,C etc.) stored as a 1-character text string	NVARCHAR(1)
DEV_status	Device status stored as a 15-character text string.	NVARCHAR(15)
worker_id(PK)	Self-incrementing ID for worker identification	INTEGER
worker_type	Description of the categories of building subsystems involved by employees (power, lighting, fire, etc.)	NVARCHAR(10)
Person_W_id(PK)	Self-incrementing ID for Person_Worker identification	INTEGER
Login_id(PK)	Self-incrementing ID for Login user identification	INTEGER
username	The user name used by the employee to log in to the system stored as 10-character text string	NVARCHAR(10)
password	The password used by the employee to log in to the system stored as 10-character text string	NVARCHAR(10)

Queries and App Navigation



List of Queries

- Device Status Query
- Work order status query (Based on Authority)
- Personnel Information Query
- Create Work Order
- Join between Login and Person to get number of logins for each employee
- Query to show count of devices of each type from Device
- Query to show the overall order status of all orders as an overview from Order by ORD_status
- Query to show count of each order status for every device type (Join between Orders and Device)
- Query to aggregate information based on Device Area(DEV_Area). Get count of orders, count of people, etc. grouped by Device Area
- Query to use regex and check for weak passwords used by employees. Returns login_id of employees using weak passwords

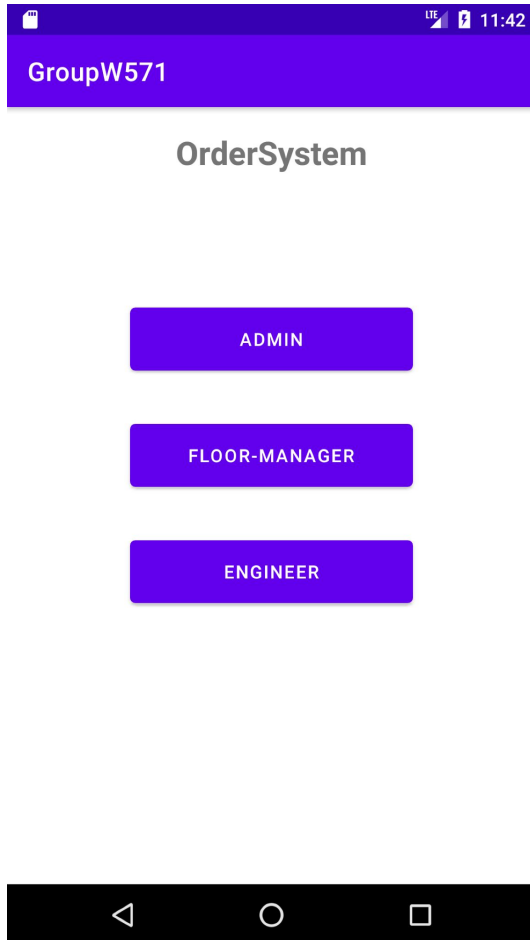
Screen Designs

- Login screen
- Work Order Query Screen
- Device Status Query Screen
- Personnel Information Query Screen
- Insert, Update, Delete Employee Screen
- Insert, Update, Delete Work Order Screen
- Insert, Update, Delete Device Screen
- Query picker screen to show outputs of some queries desired by the user

Demonstration



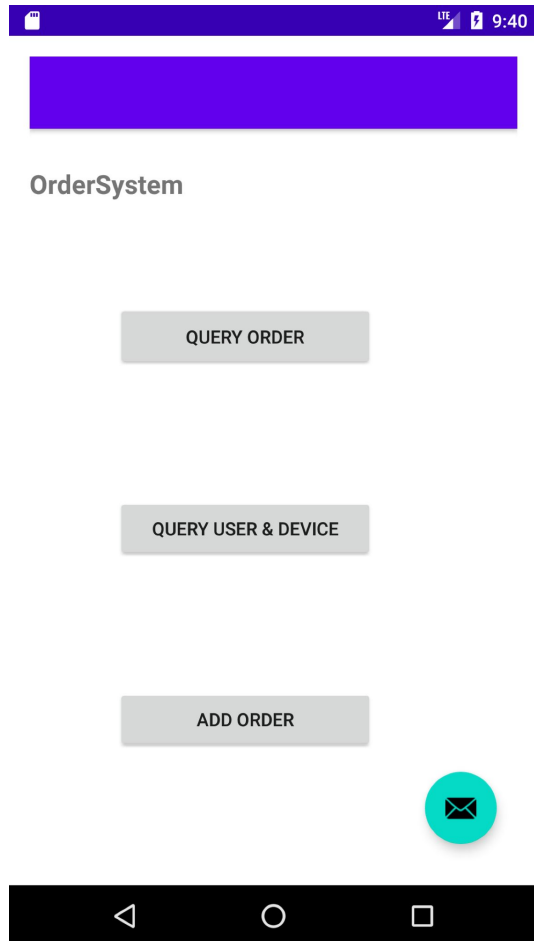
Demo - Main Screen



Main Screen of the Application

- User can choose between 3 roles:
 - Admin
 - Manager
 - Engineer
- Admin and Manager roles are similar, except
 - Admin can add new orders
 - Manager can update order statuses
- The Engineer role can only update order status

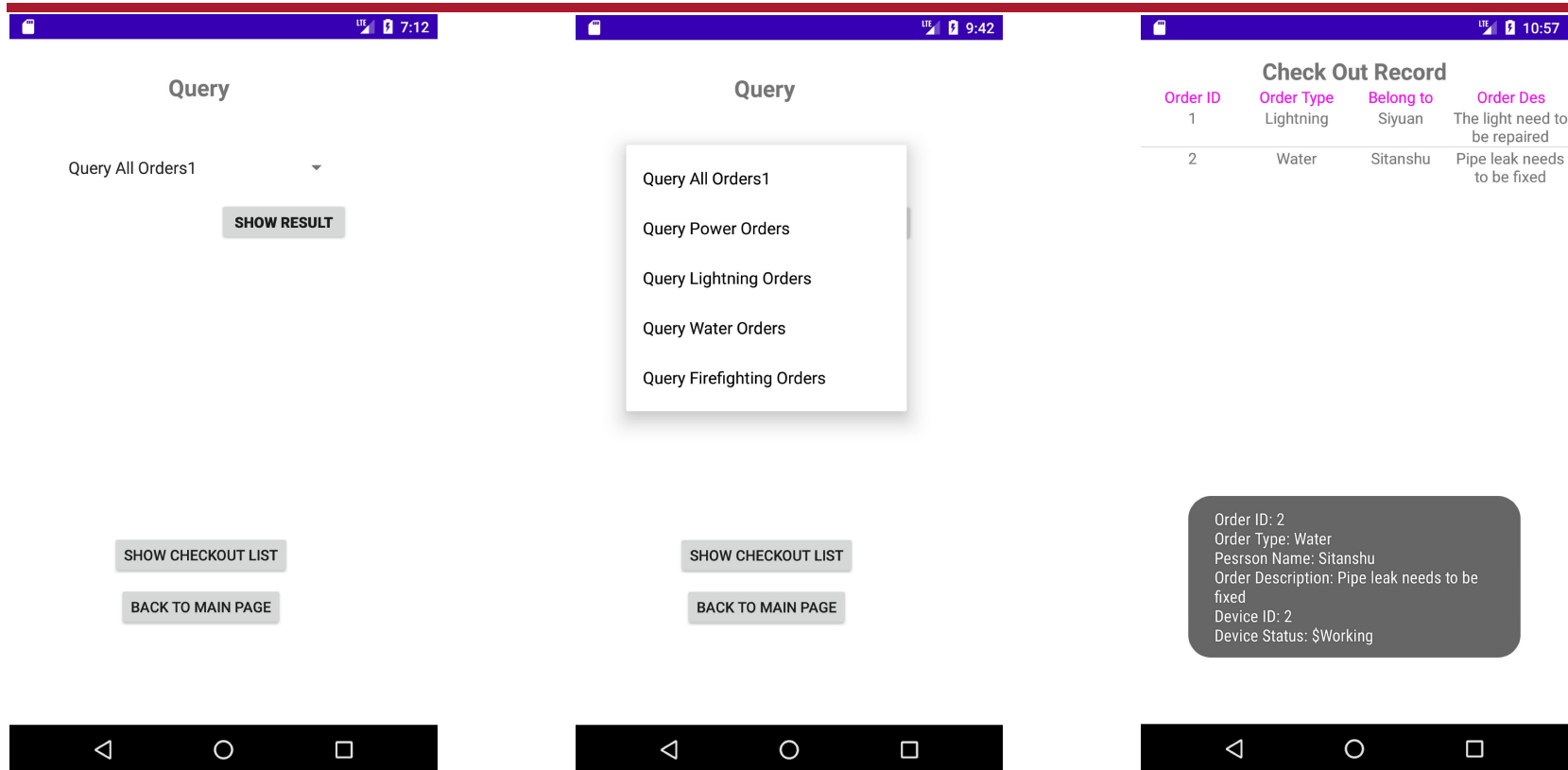
Demo - Admin Page



Admin Page

- This page is dedicated for Admin level roles only
- This page has 3 main functionalities
- Query Orders
- Query Users and Devices
- Add Order
- Only Admin level roles can add orders

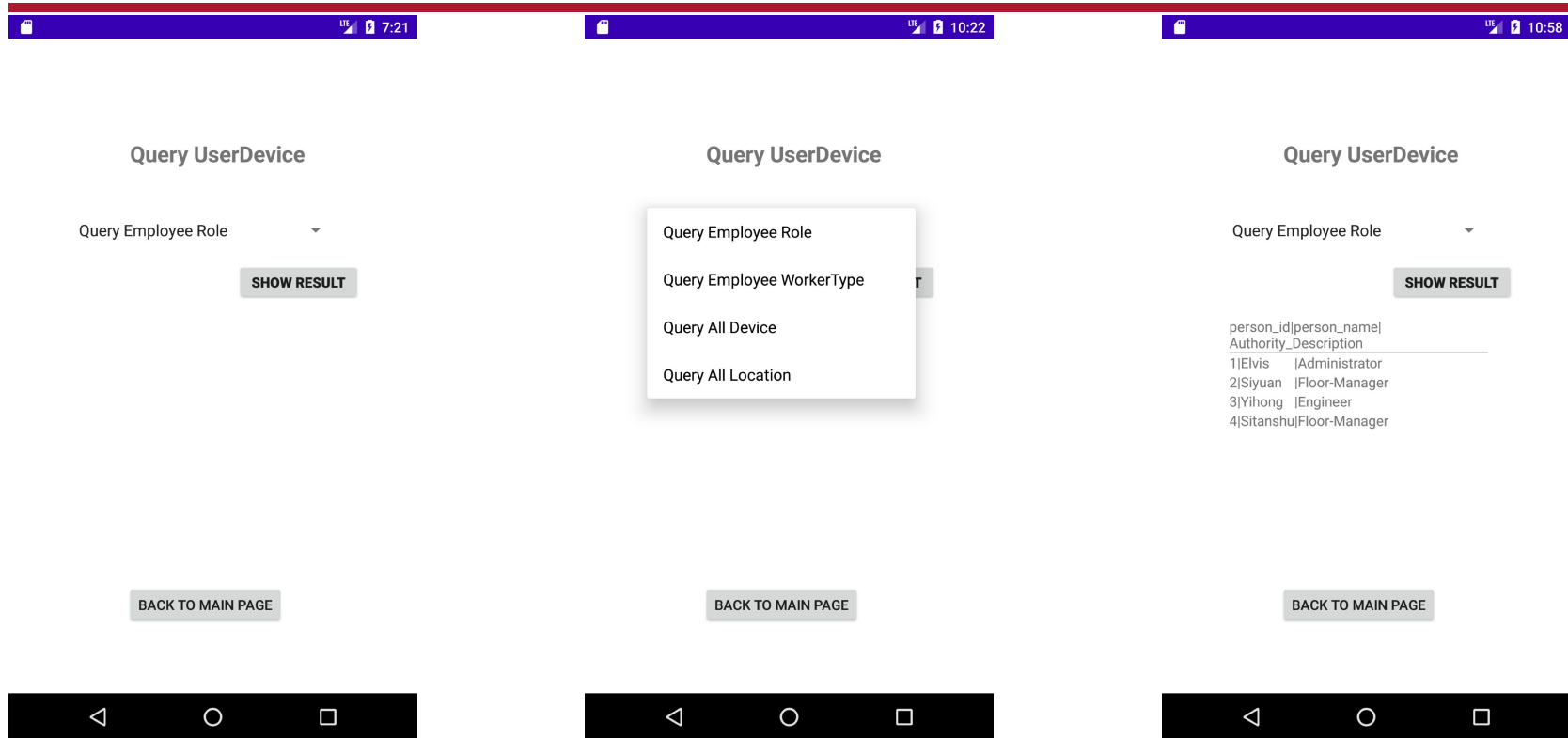
Demo - Admin Query Order Page



Admin - Query Order Page

- Contains a Query picker to choose from
- List of queries regarding orders can be chosen from here
- The show checkout list button takes the user to a order summary page with Toast functionality to showcase more information on touch
- Contains a back to main menu button to go back to the Admin page

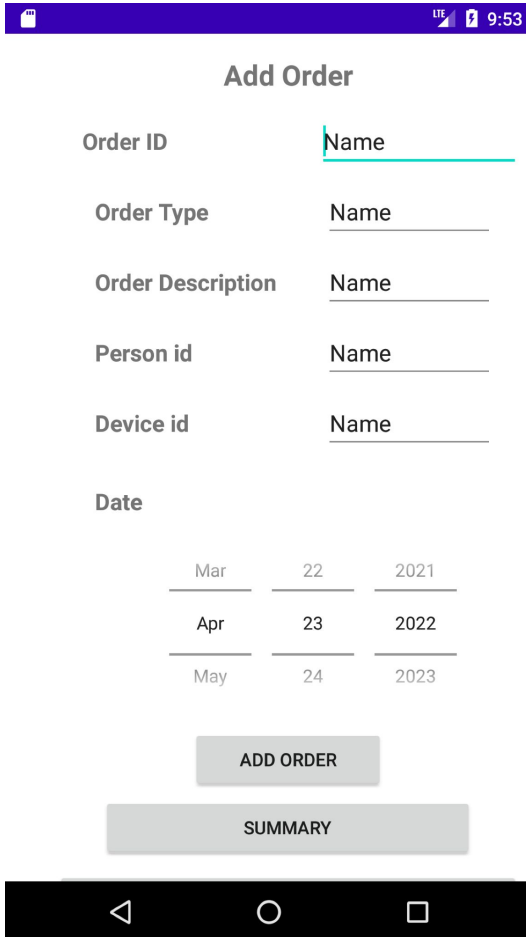
Demo - Admin Query User/Device



Admin - Query User/Device Page

- This page contains queries regarding Users and Devices in the database
- This page is also available in the Manager role

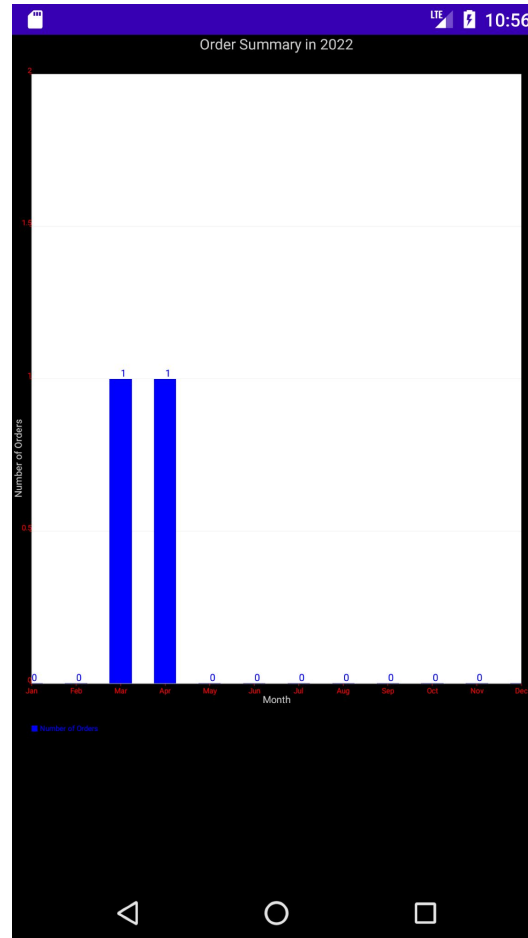
Demo - Admin Add Order Page



The screenshot shows the 'Add Order' form on a mobile device. The form has a purple header bar with a status bar at the top showing 'LTE' and '9:53'. The form fields are as follows:

Field	Value
Order ID	Name
Order Type	Name
Order Description	Name
Person id	Name
Device id	Name
Date	Mar 22 2021 Apr 23 2022 May 24 2023

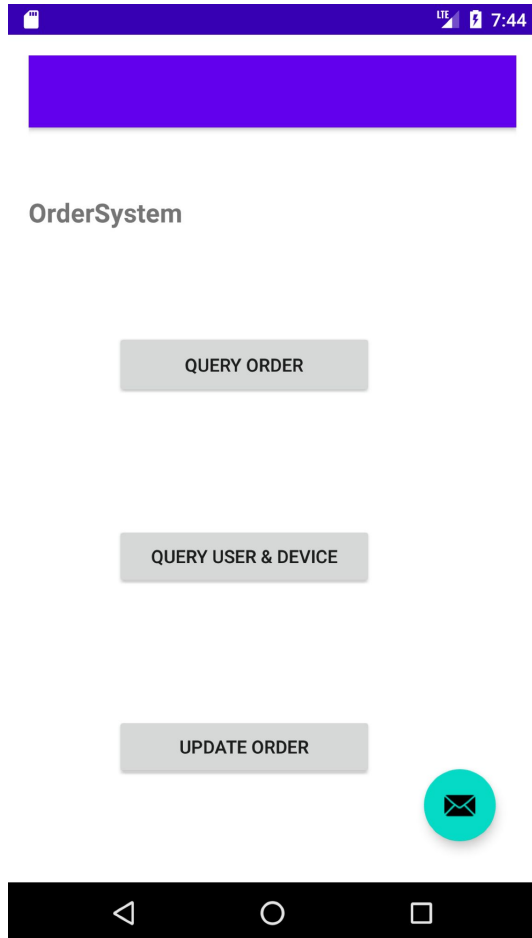
At the bottom of the form are two buttons: 'ADD ORDER' and 'SUMMARY'.



Admin Add Order Page

- Only the Admin level user can access this page
- User can create new orders
- User can also assign the new order to a particular engineer
- A date picker to choose the order creation date
- The summary page shows a macro level chart of orders created month-on-month

Demo - Manager Page



Manager Page

- This page is dedicated for Manager level roles only
- This page also has 3 main functionalities
- Query Orders
- Query Users and Devices
- Update Order
- The Manager page has similar functionalities as the Admin page except the Update Order page

Demo - Manager Update Order



Update Order

Order ID	<input type="text" value="Name"/>
Order Status	<input type="text" value="Name"/>
Person id	<input type="text" value="Name"/>

UPDATE ORDER

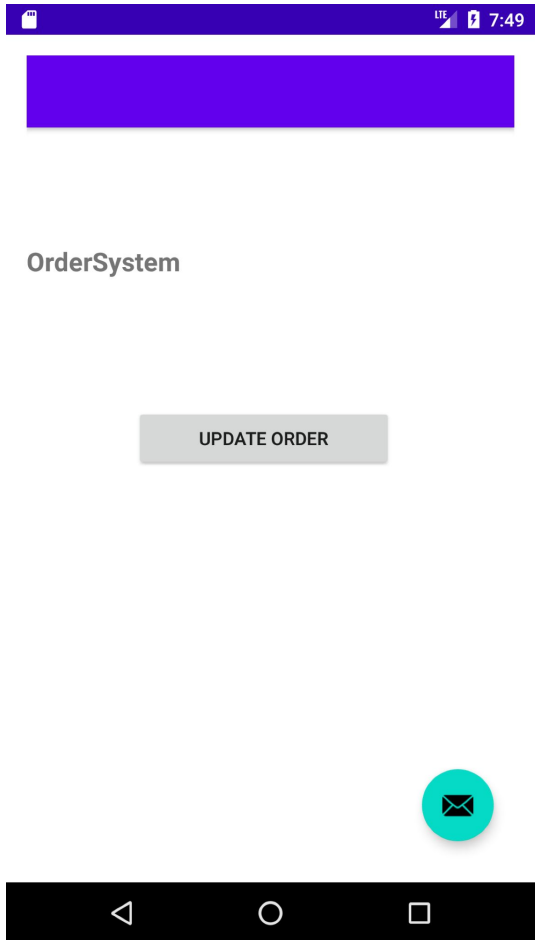
BACK TO MAIN PAGE

Manager Update Order Page

- This functionality is common between the Engineer and Manager roles
- Allows the Engineer role user to update order status after working on it
- Allows the Manager to allocate the order to a new Engineer or to change an existing allocation



Demo - Engineer Page



Engineer Page

- The Engineer page only has one role, the Update Order Role
- This functionality is common between the Engineer and Manager roles



Thank You!