

**KGiSL INSTITUTE OF TECHNOLOGY**

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**DEPARTMENT OF**

**ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

**NAAN MUDHALVAN - INTERNET OF THINGS**

**PUBLIC TRANSPORT OPTIMIZATION**

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**Phase 4: Development Part 2**

**DESIGN THE PLATFORM TO RECEIVE AND DISPLAY REAL-TIME LOCATION, RIDERSHIP AND ARRIVAL TIME DATA FROM IoT SENSORS.**

**Problem Statement:**

Our challenge is to create a smart public transport automation system using IoT technology. We aim to monitor real-time vehicle availability, offer dynamic route guidance to users, and seamlessly integrate these features into a mobile app. The ultimate goal is to enhance the efficiency and convenience of public transportation services, alleviating the common difficulties of finding available vehicles and navigating public transit in urban areas.

**PROCEDURE:**

**Designing a platform to receive and display real-time location, ridership, and arrival time data from IoT sensors requires a multi-faceted approach. Below is a high-level outline of the architecture and components you might need for such a system:**

**1. \*\*IoT Sensors\*\*:**

- Deploy IoT sensors on public transportation vehicles (buses, trains, trams) to collect data. These sensors could include GPS for location, passenger counters for ridership, and vehicle telematics for performance data.

- Ensure that these sensors are capable of transmitting data in real-time to a central server.

**2. \*\*Communication Infrastructure\*\*:**

**-** Establish a reliable communication infrastructure to connect the sensors to the central server. This can be done through cellular networks, Wi-Fi, or other suitable connectivity options.

- Implement data security protocols to protect the data transmitted from sensors to the server.

**3. \*\*Central Server\*\*:**

- Set up a central server or cloud-based platform to receive and process data from the IoT sensors.

- Use scalable and reliable cloud services to handle the potential data load in real-time.

**4. \*\*Data Ingestion\*\*:**

- Develop data ingestion pipelines to receive data from sensors and store it in a database.

- Use IoT protocols (MQTT, CoAP, HTTP) for data transmission and ensure data validation and cleansing.

**5. \*\*Data Storage\*\*:**

- Utilize a robust database system (e.g., NoSQL or SQL) to store the incoming sensor data.

- Ensure data redundancy and backups to prevent data loss.

**6. \*\*Data Processing\*\*:**

- Implement real-time data processing and analytics to process the incoming data.

- Use stream processing frameworks like Apache Kafka or Apache Flink to handle data in motion.

**7. \*\*Data Analysis and Insights\*\*:**

- Apply analytics and machine learning algorithms to the data to derive useful insights.

- Generate arrival time predictions, route optimization, and ridership statistics.

**8. \*\*APIs and Integration\*\*:**

- Create APIs to allow external applications (e.g., mobile apps, websites) to access real-time data and predictions.

- Implement data integration with existing transit systems and apps.

**9. \*\*User Interface\*\*:**

- Develop user-friendly web or mobile applications for passengers to access real-time data.

- Create dashboards for transportation authorities to monitor the system.

**10. \*\*Security\*\*:**

- Implement robust security measures to protect the data, the platform, and the privacy of passengers.

- Use encryption, access control, and threat detection systems.

**11. \*\*Alerts and Notifications\*\*:**

- Provide a mechanism for sending real-time alerts and notifications to passengers regarding delays, route changes, or other relevant information.

**12. \*\*Scalability and Redundancy\*\*:**

- Design the system to be scalable to handle increasing numbers of sensors and passengers.

- Implement redundancy and failover mechanisms to ensure system availability.

**13. \*\*Data Visualization\*\*:**

- Create interactive data visualization tools for transportation authorities to monitor the system's performance and make data-driven decisions.

**14. \*\*Maintenance and Monitoring\*\*:**

- Set up a system for ongoing maintenance, monitoring, and performance optimization.

**15. \*\*Compliance and Regulations\*\*:**

**- Ensure compliance with data privacy regulations and transportation industry standards.**

**16. \*\*User Training and Support\*\*:**

- Provide training for operators and support for passengers using the system.

This design represents a comprehensive approach to building a platform for real-time location, ridership, and arrival time data from IoT sensors. It combines hardware, software, data management, analytics, and userinterfaces to deliver a valuable service for public transportation. Keep in mind that specific technologies and platforms may evolve over time, so it's essential to stay up to date with the latest developments in IoT and data processing.

**CODE:**

function install\_app() {

var baseURL = location.href.substring(0, location.href.lastIndexOf("/"));

var canInstall = !!(navigator.mozApps && navigator.mozApps.install);

if (canInstall) {

var req = navigator.mozApps.install(baseURL + '/manifest.webapp');

req.onsuccess = function() {

$("#toastModal .modal-body").text("Installation complete.");

$("#toastModal").modal('show');

};

req.onerror = function() {

$("#toastModal .modal-body").text("Installation failed: "+this.error.name);

$("#toastModal").modal('show');

};

} else {

$("#toastModal .modal-body").text("Open web apps are not supported on this platform. Try FirefoxOS devices from Mozilla.");

$("#toastModal").modal('show');

}

return false;

}

add\_onclick("install\_app", install\_app);

function maybe\_show\_install\_app() {

var baseURL = location.href.substring(0, location.href.lastIndexOf("/"));

var canCheckInstall = !!(navigator.mozApps && navigator.mozApps.checkInstalled);

var installCheck, appSelf;

if (canCheckInstall) {

installCheck = navigator.mozApps.checkInstalled(baseURL + '/manifest.webapp');

installCheck.onsuccess = function() {

if (installCheck.result == null) {

appSelf = navigator.mozApps.getSelf();

appSelf.onsuccess = function() {

if (appSelf.result == null) {

$(".install-btn").removeClass("hidden", installCheck.result);

}

};

};

};

}

}

function set\_line\_station(obj, station, route) {

set\_line(obj, route);

set\_station(obj, station, route);

}

function load\_times(data) {

var index = 0;

var station\_template, line\_template;

line\_template = prepare\_template(

$(".table-times thead"),

$(".table-times thead .template"));

add\_new\_row(line\_template, set\_line\_station, data.stops[0], data.route);

station\_template = prepare\_template(

$(".table-times tbody"),

$(".table-times tbody .template"));

for (index = 1; index < data.stops.length; index++) {

add\_new\_row(station\_template, set\_station, data.stops[index], data.route);

}

$(".loading-spinner").addClass("hidden");

$(".table-times").removeClass("hidden");

$(".actions-times").removeClass("hidden");

update\_station\_times();

}

function line\_row\_onclick(route\_id) {

start\_loading();

$(".actions-times").removeClass("hidden");

get\_route\_times(route\_id, load\_times);

}

add\_onclick("line\_row\_onclick", line\_row\_onclick);

function setup\_control() {

load\_favorites();

setup\_onclick();

maybe\_show\_install\_app();

}

$(setup\_control);

<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="utf-8">

<meta http-equiv="X-UA-Compatible" content="IE=edge">

<meta name="viewport" content="width=device-width, initial-scale=1, user-scalable=no">

<title>Timisoara public transport</title>

<!-- Bootstrap -->

<link href="css/bootstrap.min.css" rel="stylesheet">

<link href="css/bs-theme.css" rel="stylesheet">

<script src="https://oss.maxcdn.com/libs/html5shiv/3.7.0/html5shiv.js"></script>

<script src="https://oss.maxcdn.com/libs/respond.js/1.4.2/respond.min.js"></script>

<![endif]-->

</head>

<body>

<div class="container theme-page" role="main">

<!-- Fixed navbar -->

<div class="navbar navbar-inverse navbar-fixed-top" role="navigation">

<div class="container">

<div class="navbar-header">

<button type="button" class="navbar-toggle" data-toggle="collapse" data-target=".navbar-collapse">

<span class="sr-only">Toggle navigation</span>

<span class="icon-bar"></span>

<span class="icon-bar"></span>

<span class="icon-bar"></span>

</button>

<a class="navbar-back-icon navbar-action-icon hidden" data-onclick="load\_favorites" href="#"></a>

<a class="navbar-brand-icon navbar-action-icon" data-onclick="load\_favorites" href="#"></a>

<a class="navbar-brand" data-onclick="load\_favorites">Public transport<br>Timisoara</a>

</div>

<div class="navbar-collapse collapse">

<ul class="nav navbar-nav">

<li><a class="view-app-btn" href="index.html">View App</a></li>

<li><a href="#about" data-toggle="modal" data-target="#aboutModal">About</a></li>

<li><a href="https://github.com/MihaiBalint/TimisoaraPublicTransport" target="\_blank">Developer</a></li>

</ul>

</div><!--/.nav-collapse -->

</div>

</div>

<!-- Fixed navbar -->

<div class="navbar navbar-inverse navbar-fixed-bottom" role="navigation">

<div class="container">

<div class="navbar-header">

<div class="actions-container actions-lines">

<a class="navbar-action-icon tram-kinds" data-onclick="load\_trams" href="#"></a>

<a class="navbar-action-icon trolleybus-kinds" data-onclick="load\_trolleybuses" href="#"></a>

<a class="navbar-action-icon bus-kinds" data-onclick="load\_busses" href="#"></a>

</div>

<div class="actions-container actions-times hidden">

<a class="navbar-action-icon update-times" data-onclick="update\_station\_times" href="#"></a>

</div>

</div>

</div>

</div>

</div>

<div class="loading-spinner">

Loading...

</div>

<table class="table table-striped table-lines hidden">

<tbody>

<tr class="template" data-onclick="line\_row\_onclick">

<td class="vehicle-col">

<div><a href="#" class="vehicle-name">E33</a></div>

<div class="vehicle-type">autobuz</div>

</td>

<td class="departure-col">

<span class="departure-label">Catedrala</span>

</td>

<td class="dir-arrow-col">

<div class="icon-arrow-to"></div>

</td>

<td class="destination-col">

<span class="destination-label">Sagului</span>

</td>

</tr>

</tbody>

</table>

<table class="table table-striped table-times hidden">

<thead>

<tr class="template">

<th class="vehicle-col">

<div class="vehicle-name">E33</div>

<div class="vehicle-type">autobuz</div>

</th>

<th class="route-col">

<todo />

</th>

<th class="departure-col">

<div class="departure-label">Catedrala</div>

<div class="station-time">7 min</div>

</th>

<th class="dir-arrow-col">

<div class="icon-arrow-to"></div>

</th>

<th class="destination-col">

<span class="destination-label">Sagului</span>

</th>

</tr>

</thead>

<tbody>

<tr class="template">

<td class="vehicle-col"></td>

<td class="route-col">

<todo />

</td>

<td class="station-col" colspan="3">

<div class="station-label">Catedrala</div>

<div class="station-time">7 min</div>

</td>

</tr>

</tbody>

</table>

<!-- About Modal -->

<div class="modal fade" id="aboutModal" tabindex="-1" role="dialog" aria-labelledby="aboutModalLabel" aria-hidden="true">

<div class="modal-dialog">

<div class="modal-content">

<div class="modal-header">

<button type="button" class="close" data-dismiss="modal" aria-hidden="true">&times;</button>

<h4 class="modal-title" id="aboutModalLabel">About app</h4>

</div>

<div class="modal-body">

</div>

<div class="modal-footer">

<button type="button" class="btn btn-default btn-primary" data-dismiss="modal">Ok</button>

</div>

</div>

</div>

</div>

<!-- Toaster Modal -->

<div class="modal fade" id="toastModal" tabindex="-1" role="dialog" aria-labelledby="toastModalLabel" aria-hidden="true">

<div class="modal-dialog">

<div class="modal-content">

<div class="modal-header">

<button type="button" class="close" data-dismiss="modal" aria-hidden="true">&times;</button>

<h4 class="modal-title" id="toastModalLabel">Message</h4>

</div>

<div class="modal-body">

Everything ok!

</div>

<div class="modal-footer">

<button type="button" class="btn btn-default btn-primary" data-dismiss="modal">Ok</button>

</div>

</div>

</div>

</div>

<!-- jQuery (necessary for Bootstrap's JavaScript plugins) -->

<script src="https://code.jquery.com/jquery.js"></script>

<script src="js/bootstrap.min.js"></script>

<script src="js/live\_data.js"></script>

<script src="js/common.js"></script>

<script src="js/editor.js"></script>

</body>

</html>

**CONCLUSION:**

This project involves creating an IoT-driven public transportation optimization system by deploying sensors in vehicles to capture real-time location and ridership data. This data is sent to a central platform via a Python script for real-time monitoring, route optimization, and data analysis, enhancing public transportation efficiency and service quality.