Project Plan Presentation
#BIKES4ERP Tracking

The Capstone Experience

Team Evolutio

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Project Sponsor Overview

• Consulting company based in Chicago.
• Helps with building and scaling an enterprise application.
• Part of the Group Elephant non-profit organization.
Project Functional Specifications

• High rate of theft/loss of bikes in South Africa.
• Use GPS to track bikes for children in South Africa.
• Show tracked bikes on web page.
• This allows for lost or stolen bikes to be recovered rather than replaced, lowering costs.
Project Design Specifications

• Interactive map on web page to show the location of the bikes.
• Users are able to mark bikes as lost/stolen.
• Users with a higher role can mark a bike as found.
• Automated message is sent when a bike is reported.
• Bikes are assigned to users by admins.
• Various statistics such as distance traveled and speed are shown in addition to location.
Screen Mockup: Home Screen
Screen Mockup: Bike Status Screen

![Bike Status Screen Mockup]
Screen Mockup: Systems Screen
Screen Mockup: Alerts Screen

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Bike ID</th>
<th>Alert</th>
<th>Time of Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sam Kisel</td>
<td>47</td>
<td>Bike 47 has been marked stolen</td>
<td>Today, 10:59am</td>
</tr>
<tr>
<td>Dorton Smalley</td>
<td>48</td>
<td>Bike 48 has been marked offline for more than 24 hours. It will soon be marked stolen.</td>
<td>1/20/2023</td>
</tr>
<tr>
<td>Nick Fileman</td>
<td>104</td>
<td>Bike 104 seems to be travelling at a rate above 20mph. It will soon be marked stolen.</td>
<td>1/13/2023</td>
</tr>
</tbody>
</table>
Screen Mockup: About Screen

Elephants | Rhinos | People

Elephants, Rhinos & People (ERP) was founded to preserve and protect Southern Africa’s wild elephants and rhinos through a strategy that is based on rural poverty alleviation. In order to accomplish its mission, ERP carefully selects projects based on their potential to create economic engines for impoverished rural communities in areas adjacent to threatened elephant and rhino populations. Armed with an Ashoka-accredited poverty alleviation model, and by having a multifaceted team positioned to tackle poverty, ERP is able to address the welfare of elephants and rhinos in an unusual but effective manner. ERP brings over 20 years of experience in community relations, poverty alleviation, and impact investment in infrastructure, so as to achieve sustainable, non-lethal wildlife conservation.

Learn more at https://www.erp.ngo/

#BIKES4ERP

#BIKES4ERP is an ERP initiative to distribute bicycles to children in rural South Africa. Without a bike, these children would have to walk their very long and difficult commute to school everyday, which often results in absenteeism or dropping out altogether. The bikes alleviate their commute and allows them to get to school in a more timely manner -- giving them a better chance at completing their education.

Learn more at https://www.erp.ngo/bikes
Screen Mockup: Focused Tracking Screen
Screen Mockup: Mobile Alerts Screen
Project Technical Specifications

• Raspberry Pi 3B
• Raspberry Pi GPS Module
• AWS Cloud Platform
• Harness
• Postman
• React
• Google Maps API
Project System Architecture

Frontend
- Public subnet
- Certificate Manager
- S3 Bucket
- Cache to global edge locations
- Route 53
- DNS resolution
- HTTPS CA
- Cloudfront
- React static website files
- CI/CD Process
  Compile and Deploy to S3
- React
- Google Map API
- Harness

End User
- Raspberry Pi
- Simulate bike signals
- Bikes
- Update location
- Pull data
- React single page app
- Users

Backend
- Public subnet
- API Gateway
- Cognito
- RBAC
- Test API
- SNS
- Lambda
- Lambda
- Lambda
- RDS with MySQL engine
- DB Token
- Read & Write
- Secrets Manager
- WRITE
- DB Token
- POSTMAN
- If get any problem
- Send email/text message notifications
Project System Components

• Hardware Platforms
  ▪ Raspberry Pi 3B.
  ▪ Beitian BN-880 GPS Module.

• Software Platforms / Technologies
  ▪ Python for Raspberry Pi application.
  ▪ React for web application.
  ▪ AWS for backend and database operations.
  ▪ Harness for CI/CD of React app.
  ▪ Google Maps API for tracking map.
  ▪ Postman in order to test API.
Project Risks

• Tracker Connection
  ▪ How to get GPS and other data points from the Raspberry Pi to the database.
  ▪ Client has stated that the Raspberry Pi is a prototype/proof of concept and has said the use of only Wi-Fi and mobile hot spots are fine.

• Theft Classification
  ▪ What are the metrics for determining if a bike is stolen.
  ▪ Start by basing the metrics on speed or missed pings, adding more as progress is made.

• Database Scalability
  ▪ Client is requesting large amounts of data to be stored for extended periods of time, drastically increasing costs.
  ▪ Test various rates of data upload and possible averaging.

• API Utilization
  ▪ Depending on how often the tracking map is updated the cost associated could quickly rise.
  ▪ Limit the map updates to occurring only once during a period of time and on page reload.
Questions?