In-House Packing Engine for MARSHALLTOWN

MEET THE TEAM

Evelyn Smith - Project Lead
Computer Science Major
with a Mathematic Minor

Carey Lawrence - Team Member
Computer Science Major
with a Mathematic Minor

Akhila Parvathaneni - Team Member
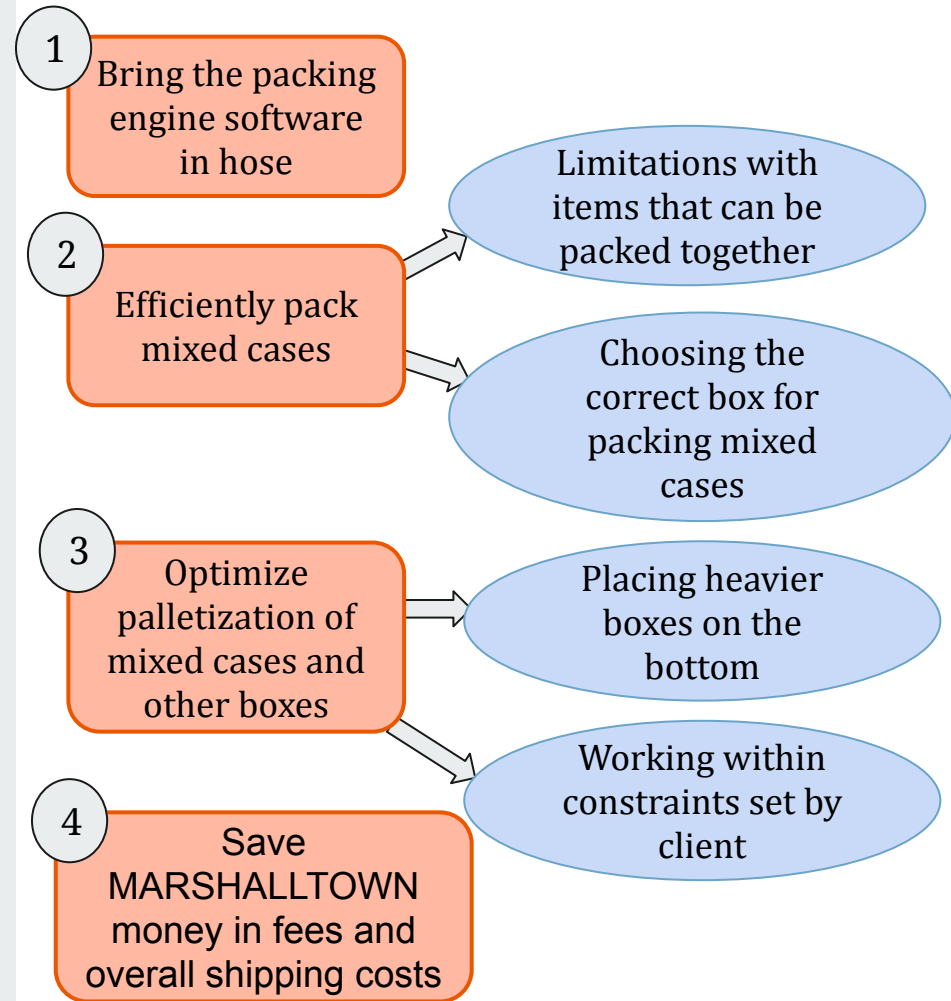Computer Science Major
with a Bachelor's in Biology

Problem

Choosing and packing mixed case boxes

Palletizing boxes efficiently

Objectives

1. Bring the packing engine software in hose

2. Efficiently pack mixed cases
   - Limitations with items that can be packed together
   - Choosing the correct box for packing mixed cases

3. Optimize palletization of mixed cases and other boxes
   - Placing heavier boxes on the bottom
   - Working within constraints set by client

4. Save MARSHALLTOWN money in fees and overall shipping costs

Background

Preexisting Code:

Current packing engine

Starter project-- EB-AFIT algorithm

- C#
    - Blazor client side
        - .NET Core
    - C# Server side
        - .NET Standard
            - Algorithm
            - Linq2Db
- SQL Database
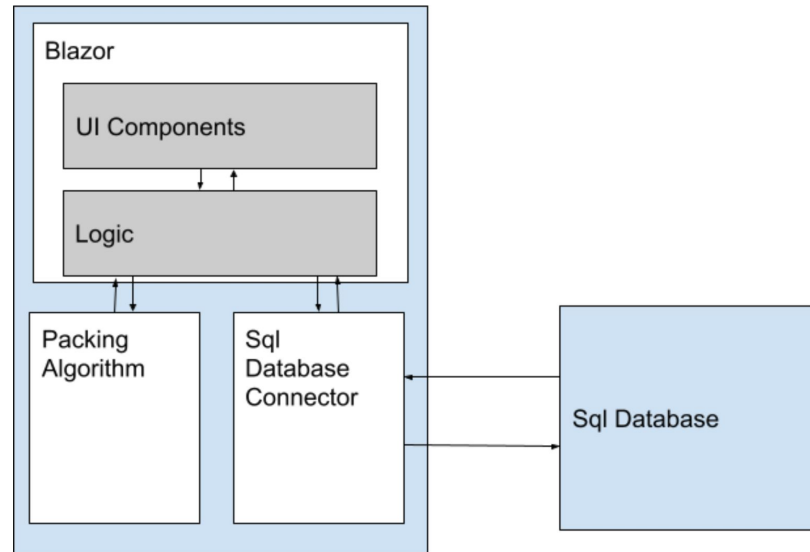   - Stored Procedures
    - Box information

Design

Requirements

- ❖ For Mixed cases…
  - ➢ Most cost efficient box size, weight, and quantity of boxes for a given list of items to be packed
- ❖ For pallets…
  - ➢ Prioritize heaviest items at the bottom
  - ➢ Certain items cannot be reoriented
  - ➢ Abnormal items pose large issues during packing
  - ➢ Working with client constraints
- ❖ Overall…
  - ➢ Maximize cost savings for MARSHALLTOWN shipments

Design

Architecture

Tasks

1. Determine and create script for SQL Database creation
2. Learning new software and frameworks
3. Testing current project and determining any additional shortcomings
4. Algorithm return model determination/updating
5. **Adjusting the algorithm for heaviest at the bottom**
6. **Adjusting the algorithm to work with items that cannot be reoriented**
7. **Adjusting the algorithm to work with abnormally shaped items**
8. **Adjusting algorithm to determine most efficient box size for given list**
9. **Adjusting algorithm to determine most efficient box weight for given list**
10. **Adjusting algorithm to determine most efficient box quantity for given list**
11. **Making packing algorithm work for both pallet packing, and box packing...**
12. UI and visualization rework
13. Unit testing application
14. Edge case testing application

Key Personnel

- Craig Wall:
    - Director of Arkansas branch IT

- Jeff Schneider:
    - Director of MARSHALLTOWN IT across all branches

- Steve Smith
    - Main source at MARSHALLTOWN for any SQL scripts and database management

Facilities and Equipment

- C# pallet packing
  - Blazor
  - SQL Database connector
  - Packing algorithm
  - Unit testing
- SQL scripts