Pier Point Shipping Inc Project Pitch

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Our Understanding

- Mr. Keogh wants a software to minimize the time taken for:
  - Unloading/loading cargo ships
  - Balancing cargo ships
- Mr. Keogh wants simple graphs to show how each container will be moved
- Mr. Keogh wants step by step moving process(sequence 1 of 17 moves)
- There is only one crane
- If the containers have the same name, then treat them as the same object
- No exceed loading is allowed
- Program should log every atomic event, can also be noted by the operator
- Logging only has to be precise to minutes
- Our program has 15 minutes to calculated for the optimal moves
- Send out an edited manifest as a signal of ending process.

Our Understanding

- Only one log file is used per year, for example, KeoghsPort2025.txt
- Resume from the very end of the log file if in the same year
- Only one person can sign in at a time, if the second person signs in then sign out the first person
- The legal definition of balance must be followed if possible
  - Legal definition: Total mass of the port side and the total mass of starboard side are within ten percent of each other
  - If not possible, obtain a pseudo-balance with the SIFT operation
- An easy and user-friendly interface will be developed to allow operators to easily navigate the system and access necessary information quickly.
- The program will provide real-time updates on cargo status and movement to enhance operational awareness.
- The software will include mechanisms for detecting and alerting operators to potential errors in the unloading/loading process.

Our Understanding

- Each container will be tracked individually, allowing for better accountability and management of cargo throughout the process.
- The time cost is calculated by the Manhattan distance, each cell cost 1 minute
- The time consumed to move the container between the ship and the buffer is 4 minutes
- The software will be designed to scale easily, accommodating future expansions in operations or additional cranes.

Stakeholders

- Ship Staff
- Crane Operators
- Truck Drivers
- Head Office
- Delivery Supply Chain
- Customers
- Insurance company
- Regulatory Agencies: Government agencies who make sure oversee goods satisfy regulations
- Workers Unions: IUOE, International Union for Operating Engineers

Assumptions

- Crane tower always has an employee manning it
- Crane is operated manually with joystick controls
- Crane operators are able-bodied
- Crane operators can speak/read basic English [a]
- Operator will sent the manifest to the captain
- Operator will have no access to the log file
- Operator will manually log inconsistencies
- The software assumes that all ships serviced will be of similar types, allowing for standardized loading and unloading processes.

Assumptions

- The software will have access to real-time data
- It is assumed that there will be no security incidents affecting operations, allowing for smooth handling of cargo.
- Ship does not have a weight limit
- All manifests are formatted the same
- The manifest is perfect, no errors
- Crane tower computer runs continuously for the year
- Only interruptions are unexpected power cuts

Assumptions

- All containers will be of a consistent size and shape
- The Crane is operated under good weather conditions
- All operators will receive adequate training on both the software and crane operation to ensure safety and efficiency.
- It is assumed that staffing levels will remain stable throughout the year, ensuring adequate coverage for crane operations.
- It is assumed that all operations will adhere to relevant labor laws and regulations governing working hours and conditions.

Inputs

- Manifest
  - Emailed from incoming ship
  - Highly structured text file
  - 8 x 12 grid of everything on the ship
  - Operator feeds manifest to software
- Option to Balance or Load/Unload containers from Ship
- Containers selected by the user to load/unload

Outputs

- Edited manifest
  - Software outputs edited manifest for the operator
  - Manifest rename by adding the term “OUTBOUND”
    - (ex. BigBoat.txt ⟶ BigBoatOUTBOUND.txt)
  - 8 x 12 grid of everything on the ship (after our operations)
  - Email to currently docked ship (ship’s ticket to leave)
    - Ask operator to confirm they did this
- Log file
  - Only Mr. Keogh will access
  - Records every atomic event with minute specific timestamps
  - Operators can manually add logs through the software

Outputs

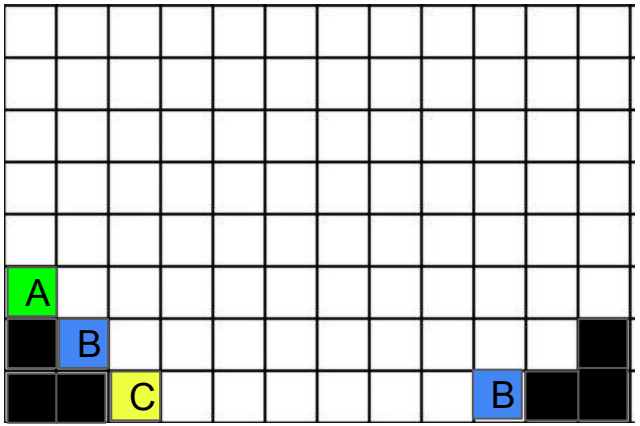
- Estimated Time Remaining
- Estimated Time of Current Move
- Information of current container that is being moved
    - Name of container
    - Original location of container
    - New location desired

Scenario I: Part 1 of 12

- Adam Smith is a crane operator at Mr. Keogh's Long Beach port
- He is working the 12am to 8am shift
- It is now 7:00 am on January 5th, 2024
- There are no ships in the queue at the moment so he works on his crossword puzzle

Scenario I: Part 2 of 12

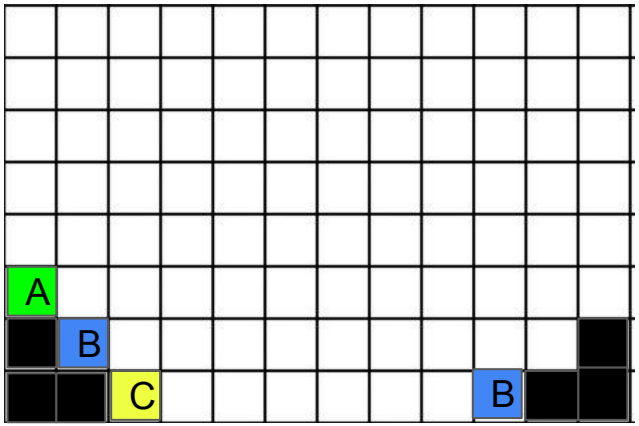
- Adam Smith gets an email with the manifest “SSFreiger.txt” for a ship that is coming in
- Adam first clicks the “BALANCE” button on the program
- The program instantly prompts Adam for the manifest
- Adam gives the manifest “SSFreiger.txt” to the program and it reads the manifest



Scenario I: Part 3 of 12

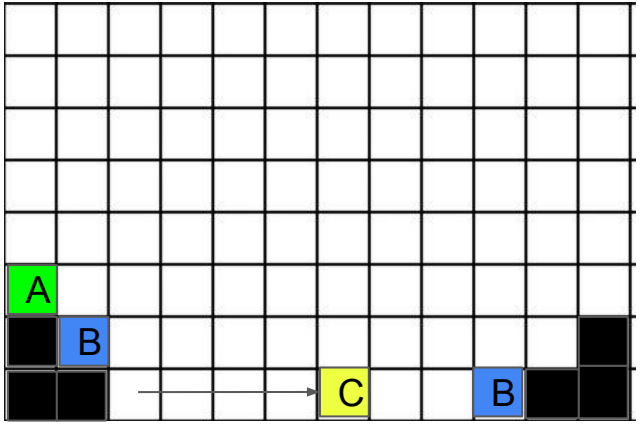
- The message “2024-01-05 7:32 Manifest SSFreiger.txt is opened, there are 4 containers on the ship”
- The program now knows every single detail about the manifest/ship
- Since Adam chose the “BALANCE” option, the program takes a few seconds to calculate the optimal moves and time needed to balance the ship
- There will not be any load or unload

moves given



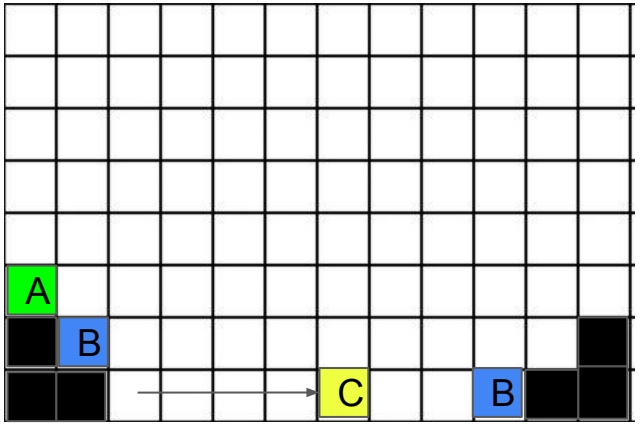
Scenario I: Part 4 of 12

- After the program finishes calculations, the program displays the “Estimated Time Remaining” of 8 minutes as well as the “Estimated Time of Current Move” which is 4 minutes
- The first move tells Adam that he needs to move container C from [1,3] to [1,7]
- Moving container C from [1,3] to [1,7] will cost 4 minutes



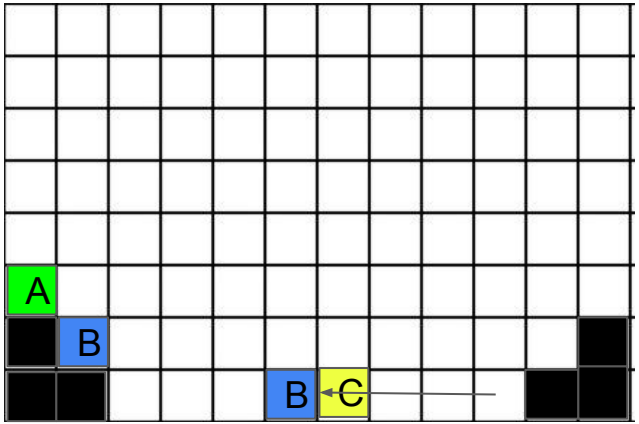
Scenario I: Part 5 of 12

- While moving container C from [1,3] to [1,7], Adam accidentally clicks the program's close button.
- Adam is prompted with a pop-up asking him "Are you sure you want to quit?"
  - His two options are two buttons: "Confirm" and "Cancel"
- Startled, Adam clicks the "Cancel" button
- If the program does quit unexpectedly (power outage), the program will start from where he left off.



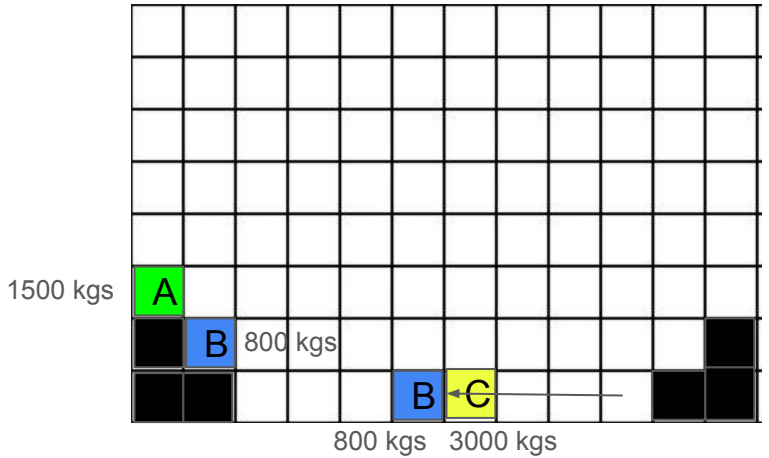
Scenario I: Part 6 of 12

- After the crane is finished moving container C from [1,3] to [1,7], Adam presses the “NEXT” button
- The next move now prompts Adam to move container B from [1,10] to [1,6]
- The “Estimated Time Remaining” changes to 4 minutes and the “Estimated Time of Current Move” changes to 4 minutes as well



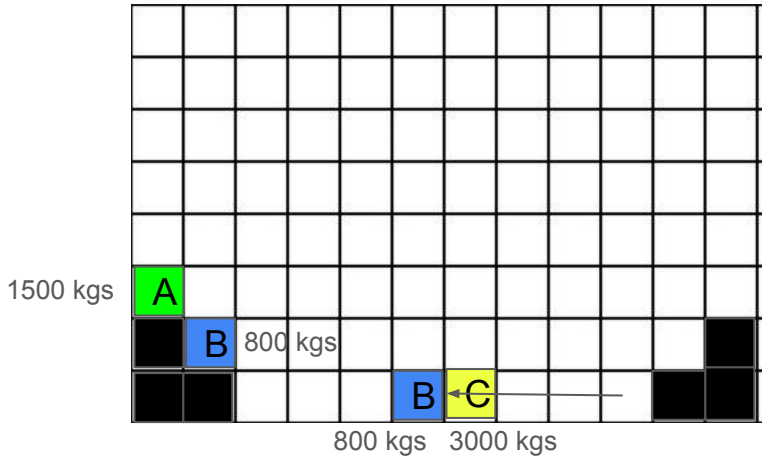
Scenario I: Part 7 of 12

- Container A's weight is 1500 kgs, Container B's weight is 800 kgs, and Container C's weight is 3000 kgs
- Container C is the heaviest container on the ship and all of the other containers weights add up to weigh less than container C



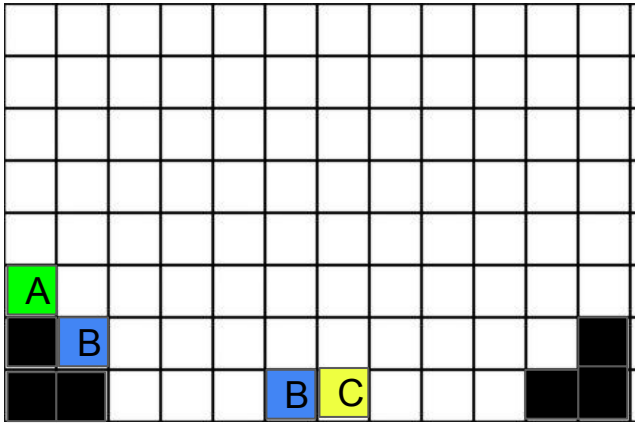
Scenario I: Part 8 of 12

- The left hand side of the ship adds up to 1500 kgs + 800 kgs + 800 kgs = 3100 kgs
- The right hand side of the ship adds up to 3000 kgs
- Therefore, this balance state is optimal



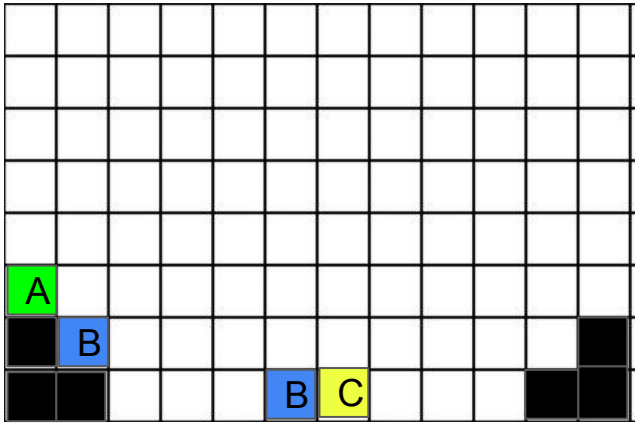
Scenario I: Part 9 of 12

- Adam notices Container C's weight reading on the crane's scale is 5 kgs more than what is stated on the manifest.
- Adam then writes in the comment box of the program, "I noticed that container C's weight reading is 5 kgs higher from the manifest. However, the balance should still be good so I am continuing with the cycle."



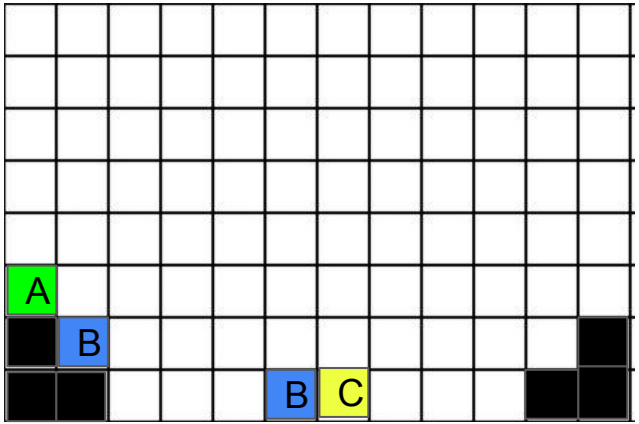
Scenario I: Part 10 of 12

- Adam presses the “NEXT” button and since there are no more moves left, a reminder pop-up is displayed to Adam to notify him that balancing is complete.
- The message “2024-01-05 7:40 Finished a Cycle. Manifest SSFreigerOUTBOUND.txt was written to desktop, and a reminder pop-up to operator to send file was displayed.” is written to the log.



Scenario I: Part 11 of 12

- Adam presses the “X” button on the pop-up, which immediately takes him back to the selection menu.
- The updated manifest gets automatically downloaded to the PC, and Adam sends the updated manifest to the ship captain.



Scenario I: Part 12 of 12

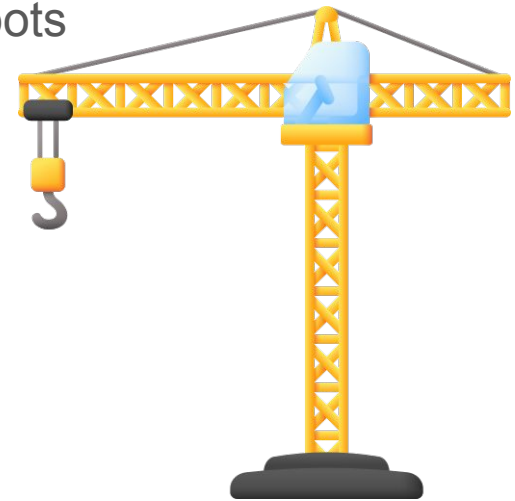
- Adam then continues with his crossword puzzle
- It is now 8:02 am and the next crane operator James Park comes up to Adam, taps on his shoulder to signal his shift is over
- James Park signs in to the program
- The program writes to the log:
  “2024-01-05 8:02 James Park signs in”

Scenario 2: Part 1 of 11

- Bob Johnson is a crane operator at Mr. Keogh’s Long Beach port
- He is working the 8:00 to 16:00 shift
- It is currently 15:00 on January 7th, 2024
- There are no ships in the queue when he starts his shift so he works on his sudoku puzzle

Scenario 2: Part 2 of 11

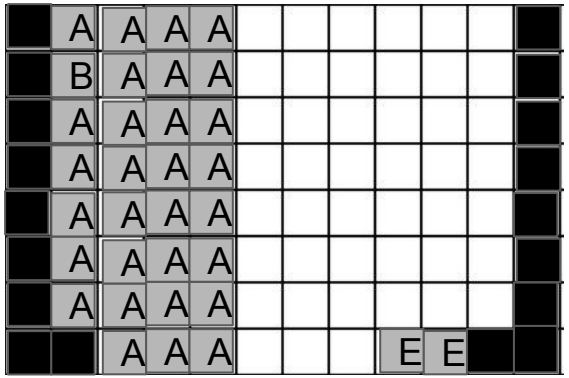
- Bob gets an email with the manifest for a ship that is coming in: “SSEverwinter.txt”
- Bob also gets a transfer list at the same time
- He makes sure that all the trucks are in the correct spots



Scenario 2: Part 3 of 11

- Bob first clicks the “LOAD/UNLOAD” button on the program
- The program will instantly prompt Bob for the manifest
- Bob gives the manifest (“SSEverwinter.txt”) to the program and it reads the manifest

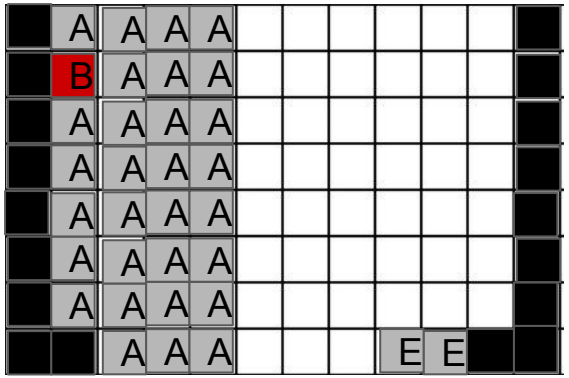
Transfer List
Load: C, D
Unload: B



Scenario 2: Part 4 of 11

- The message “2024-01-07 15:02 Manifest SSEverwinter.txt is opened, there are 33 containers on the ship”
- Program knows everything about the manifest
- Depending on the transfer list:
  - Bob will select the containers on the ship to unload
  - Bob will select the positions to load incoming containers
- Program takes less than 15 minutes to determine the optimal sequence of moves

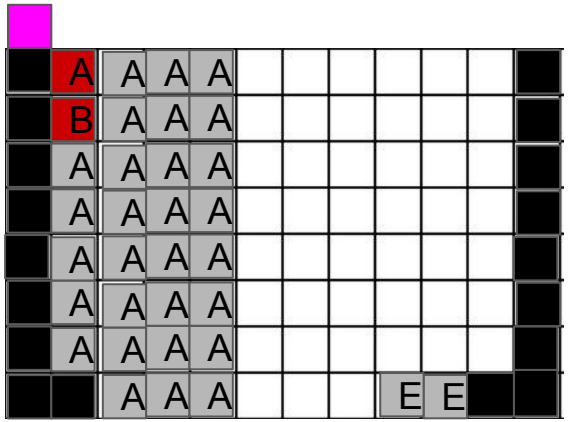
Transfer List
Load: C, D
Unload: B



Scenario 2: Part 5 of 11

- Program shows the moves for Bob to execute
- Program displays the following times:
  - Estimated time for the sequence of optimal moves (45 minutes for this case)
  - Estimated time for the current move which will be 10 minutes (shown in next slide)
- Program wants Bob to start by moving container A to the buffer to access container B
  - [8, 2] to [9, 1] to take it off the ship

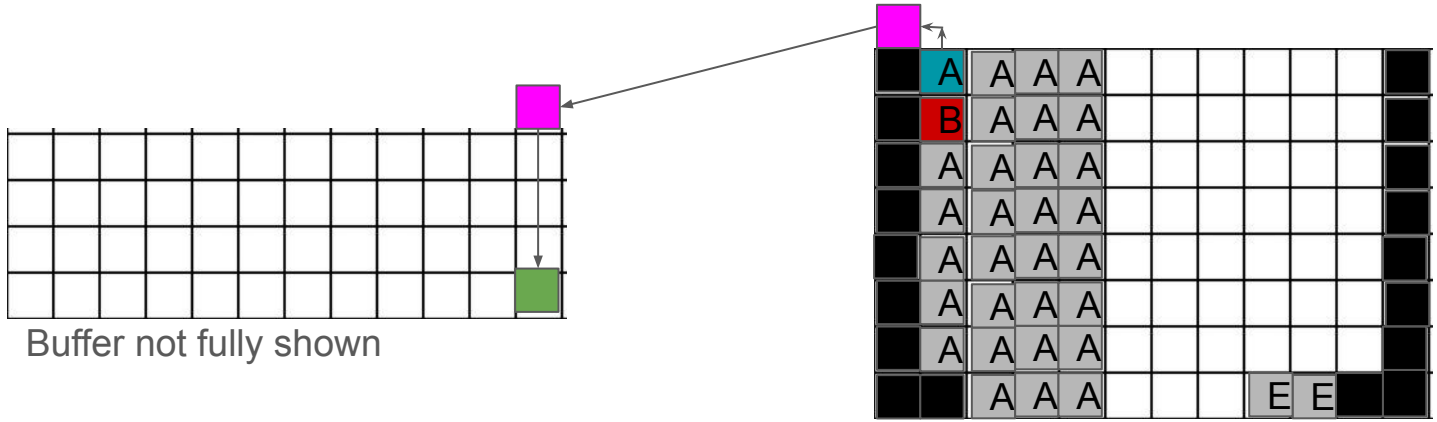
Transfer List
Load: C, D
Unload: B



Scenario 2: Part 6 of 11

- At the same time, Bob is prompted to move container A off of the ship (10 minutes)
  - This will take 2 minutes (to the pink square)
  - 4 more minutes to the buffer
  - 4 more minutes within the buffer
- Crane's weight reading aligns with the manifest's. Bob notes nothing
- Bob presses the "NEXT" button after finishing this move to see the next move

Transfer List
Load: C, D
Unload: B

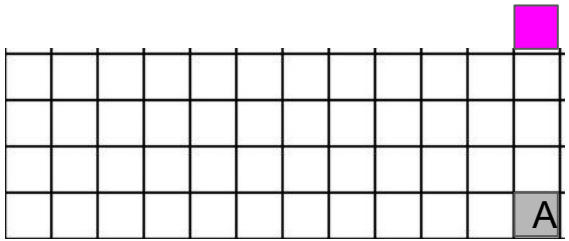


Buffer not fully shown

Scenario 2: Part 7 of 11

- Bob is prompted to move container B to the truck and the truck leaves (5 minutes)
  - Moving container B off the ship takes 3 minutes ([7,2] to [9,1])
  - Moving container B to the truck takes 2 minutes
- Bob presses the “NEXT” button after finishing this move to see the next move

Transfer List
Load: C, D
Unload: B



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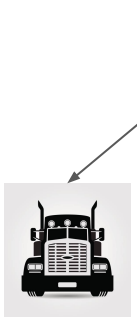
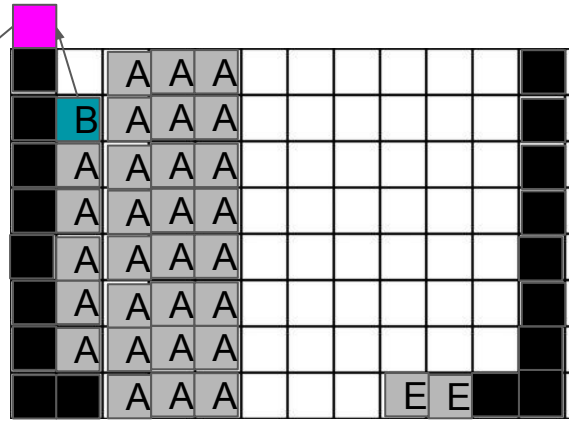
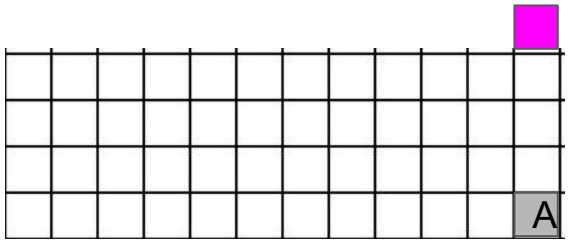




Scenario 2: Part 8 of 11

- Bob calls up the truck with container C
- Bob grabs container C and loads it (5 minutes)
  - Truck leaves after unloading
  - 2 minutes to get on the ship
  - 3 minutes to the desired position ([9,1] to [7,2])
- Bob presses the “NEXT” button after finishing this move to see the next move

Transfer List
Load: C, D
Unload: B



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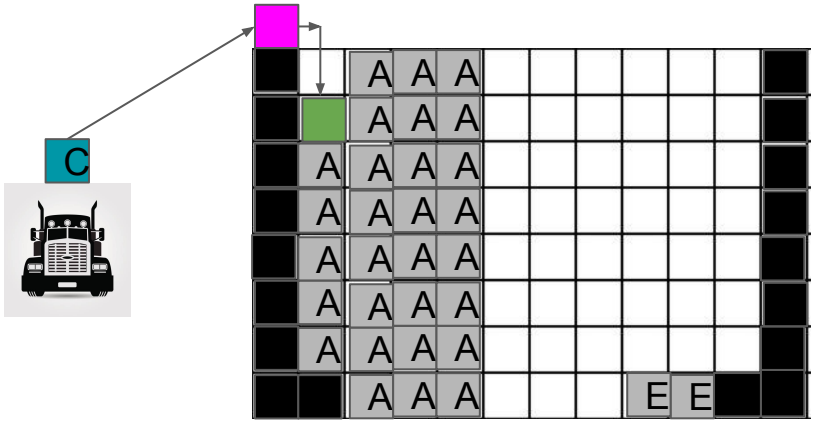
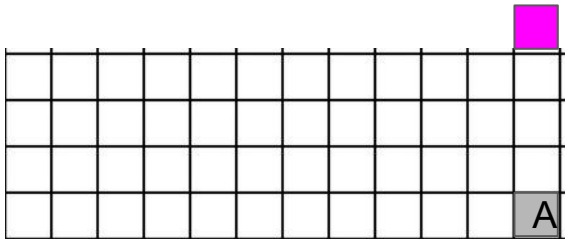


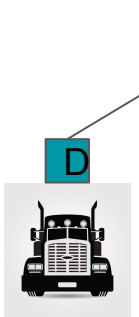
Scenario 2: Part 9 of 11

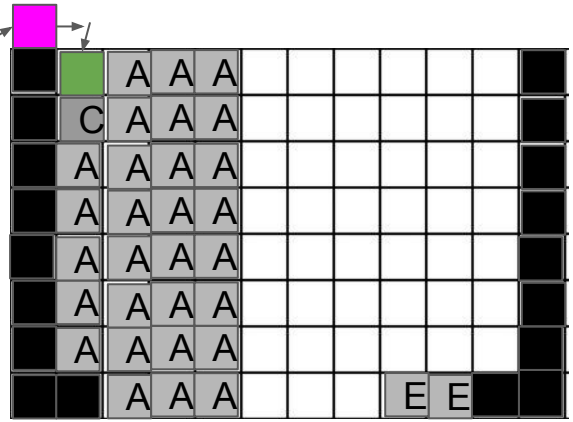
- Bob calls up the truck with container D
- Bob grabs container D and loads it (4 minutes)
  - Truck leaves after unloading
  - 2 minutes to get on the ship
  - 2 minutes to the desired position ([9,1] to [8,2])
- Bob presses the “NEXT” button after finishing this move to see the next move

Transfer List
Load: C, D
Unload: B



Buffer not fully shown

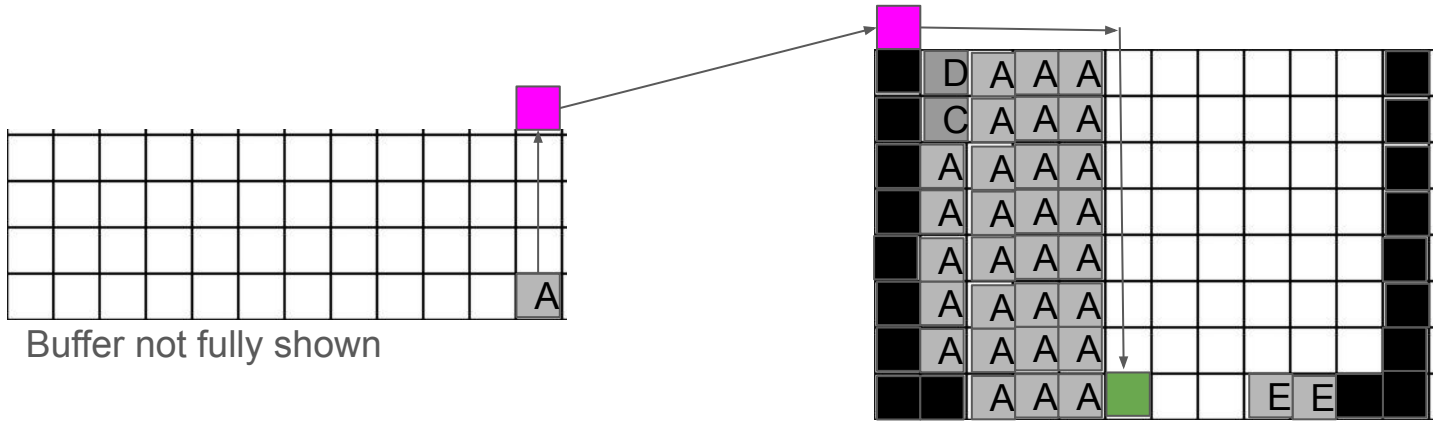




Scenario 2: Part 10 of 11

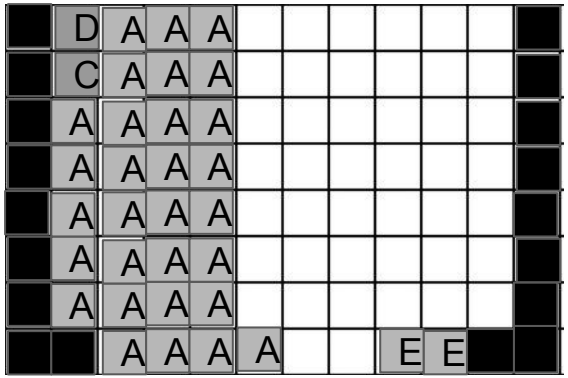
- Bob moves one of the container A back from the buffer back to the ship (21 minutes)
  - 4 minutes out of the buffer
  - 4 minutes back to the ship
  - 13 minutes within the ship ([9,1] to [1,6])
- Bob presses the “NEXT” button but there are none left

Transfer List
Load: C, D
Unload: B



Scenario 2: Part 11 of 11

- Bob completed the transfer
- Reminder pop-up reminds Bob that the transfer is completed
- Program outputs edited manifest and a pop-up reminds Bob to send it to the docked ship
- “2024-01-07 15:47 Finished a Cycle. Manifest SSEverwinterOUTBOUND.txt was written to desktop, and a reminder pop-up to operator to send file was displayed.” is written to the log
- Bob emails the edited manifest to the ship
    - Ship leaves when it receives the edited manifest



Maintenance Plan (1 of 2)

While we cannot anticipate future occurrences, we recognize that the following (although unlikely) may require us to update our software:

- If there is a large reduction in downtime (15 minutes), we will need to **optimize** our software to run within the new defined time limit
- If there are changes in operation times (moving a container), we will need to update our software with the new times

We will make changes to handle the above issues, for free, within the next 5 years.

Maintenance Plan (2 of 2)

While we cannot anticipate future occurrences, we recognize that the following (although unlikely) may require us to update our software:

- If more ships are loading/unloading simultaneously, we will need to optimize the sequencing and coordination of loading/unloading tasks between ships
- If more cranes are added to the port, we will need to improve our software to fully utilize the additional cranes without delays or bottlenecks

We will make changes to handle the above issues, for a nominal fee, not exceeding 20% of our original budget.

Training and Documentation

The training session will be provided as the following formats:

- PDF documentation
  - Operation procedure
  - Usage of the software
  - Safety protocol
  - Emergency procedures
- The documentation is designed to be read under **10 minutes**

Regulations - Environmental Standards (1 of 4)

International Maritime Organization (IMO) - Ship Operational Efficiency Regulations

- Our software supports compliance with IMO standards by improving operational efficiency and cargo handling, helping clients **reduce fuel use and emissions** during loading/unloading phases.

ISO 14001 - Environmental Management Systems

- Through optimizing loading/unloading paths, our software enables clients to streamline port operations, supporting **ISO 14001's goals of minimizing environmental impact** and promoting resource efficiency in maritime activities.

Green Marine Certification Program

- By providing tools to optimize loading/unloading and improve ship balance, our software assists clients in meeting standards set by Green Marine—a North American certification focused on improving port **sustainability and reducing environmental** impacts in ship operations

Regulations - Safety Standards (2 of 4)

International Safety Management (ISM) Code - Safe Operating Procedures

- Our software enhances compliance with the ISM Code by improving cargo handling efficiency and loading/unloading path planning, which **minimizes risks** associated with poor weight distribution and operational delays

North American Maritime Safety Association (NAMSA) Guidelines

- Through optimized load balancing and efficient cargo movement paths, our software assists clients in meeting NAMSA's recommended practices, which **prioritize safety and risk management** during dockside operations.

Regulations - Worker Health & Safety (3 of 4)

International Labour Organization (ILO) Guidelines

- By providing tools that facilitate safer cargo handling and minimize movement, our software supports adherence to ILO guidelines aimed at **protecting dock workers' health and ensuring safe** work environments.

Occupational Safety and Health Administration (OSHA) Standards

- Our software enhances compliance with OSHA regulations by optimizing loading/unloading paths, which **reduces the risk of worker injuries** related to manual handling and improves overall operational efficiency.
- Our software helps clients implement safe practices during loading and unloading operations, aligning with Cal/OSHA regulations to reduce workplace accidents and maintain a safe working environment for all personnel.

Regulations - Port-Specific Regulations (4 of 4)

Environmental Protection Agency (EPA) Port Compliance Regulations

- By streamlining cargo handling processes, our software supports clients in adhering to EPA regulations **regarding emissions and pollution control** during loading and unloading, fostering environmentally responsible operations.

Local Harbor Safety Committees (HSC) Guidelines

- Our software provides data-driven insights that help clients meet the safety and operational recommendations set forth by Local Harbor Safety Committees, promoting best practices in **cargo handling and vessel movement** within the port

Port Authority Operational Guidelines

- Our software aids compliance with local Port Authority regulations by optimizing loading/unloading routes, ensuring adherence to operational protocols that **enhance safety and efficiency** within the port environment.

Acceptance Testing

We have the final deliverable date of ***December 6th, 2024***

We propose the following tests:

- Two weeks before testing, please provide send us with **five sample manifests and five corresponding transfer lists**, and we will test them live
- The following are metrics of success:
  - The path optimization algorithm takes **no more than 15 minutes** to run when the **total amount of containers** being moved is **less than 10**
  - The provided solution is the fastest and a faster solution cannot be found
  - The ship is **balanced** according to maritime law
  - A user can **understand** and follow the animations
  - Outbound manifest matches the changes recommended by the software
  - All atomic events are **logged** within an operation

Contract

- We propose to create software to solve your problem
- We will have our final deliverable ready on or before ***December 6th, 2024*** (no more than 7 days after acceptance testing)
- We may require up to **ten hours** of your time to answer any additional questions. Questions should be answered within **two business days**
- We will not honor “feature creep” requests at our current budget and delivery date

Signature:_____ Date:_____

References

a) Mr. Keogh's Problem Overview
b) Elicitation Interview with Mr. Keogh
c) Video Demonstration by Team Momo Engineering
d) Video Demonstration by Team Cranium
e) The International Safety Management (ISM) Code-https://www.imo.org/en/ourwork/humanelement/pages/ISMCode.aspx
f) North American Maritime Safety Association (NAMSA)-https://nmsa.us/
g) ISO 14001-https://www.iso.org/standard/60857.html
h) Green Marine Certification Program-https://green-marine.org/certification/

References

i) International Labour Organization (ILO)-https://www.ilo.org/

j) Occupational Safety and Health Administration (OSHA)-https://www.osha.gov/

k) Environmental Protection Agency (EPA)-https://www.epa.gov/

l) Local Harbor Safety Committees (HSC)-https://mxsocal.org/hsc/

m) Port Authority-https://www.portauthorityclothing.com/