

Midterm Report

I PRO 307: Advanced Shipping Container Transportation System Solutions
Spring 2007

Advisors:

Laurence Rohter, *IIT* • Peter Mirabella, *Mi-Jack Products*
Doug Daun, *CSX Intermodal Manager*

Team:

Maria Aguirre • Zachary Borschuk • Michael Grilley • Jonathan Kohler
Axita Patel • Nathaniel Roth • Joanna Ruiz • Benjamin Russo • Mary Sisay
Cesar Sotelo • Josie Truong • Yousef Zaatar

1.0. Revised Objectives

The main objective of the IPRO 307 team in the Spring 2007 semester is to completely design a modern intermodal yard for the city of Gary, Indiana. It will be capable of handling the forecasted increase in container movement over the next decade while decreasing the demand placed on existing intermodal facilities in Chicago and northwest Indiana. Several intermediate goals must be met in order to accomplish this objective, which include:

- Selecting the site and planning the physical layout of the Gary yard which maximizes efficiency and minimizes any negative effects on the surrounding areas,
- Making recommendations concerning the appropriate number, size, and type of cranes capable of handling the predicted capacity, and
- Developing a demonstration of software capable of tracking containers and trucks both within the yard and regionally.

These objectives have not changed since the project plan was submitted, however several intermediate goals were added to the list:

- Design to accommodate the planned Gary airport expansion, and make sure the structures in the yard comply with FAA height regulations.
- Account for the proposed Greenlinks Bicycle path and the natural preserves located near the proposed site.

- Design entry and exit pathways that will not impede traffic; such as running the railway underneath a bridge, thus allowing vehicle traffic to move unimpeded.

2.0. Results to Date

Demo Program

- A. The Gary Wide Area Network (GWAN) program is being tested and finalized and is ready for demonstration.
- B. Program runs smoothly and testing has helped to remove problems in using the program.
- C. GWAN could be adapted to be used with Radio Frequency (RF) technology to further increase the ease of container location and updateability.
- D. GWAN will help to reduce errors in the facility as well as keep a better record of the status of containers.
- E. Currently the program works and provides basic functioning, and is nearly finished and ready for presentation as a prototype for future programs similar to it.
- F. The current results address the basic problem and with further development has great potential in eliminating the problem entirely.
- G. The current state of the program will be used as a basis to monitor containers within Gary Indiana for the new train yard being built.

GIS

- A. The first part of the objective has already been completed. All of our information has been consolidated and incorporated into Google Earth.
- B. The purpose for incorporating our data into Google Earth is so we can be able to share our information with our employer through the internet. .
- C. IPRO 307 was able to accomplish this by dividing the work into three sectors: 1)layout,2)buildings,3)compile everything.

Design Team

The design team's major goal outlined in the project plan was to design the physical layout of the proposed advanced intermodal yard in Gary, Indiana. The team visited the CSX intermodal facility in Bedford Park, Illinois. This intermodal yard is one of the largest and advanced facilities of its kind in the United States. The Gary, Indiana site was to be modeled after this intermodal facility. The site in Gary was found to contain sufficient space for an advanced intermodal facility. The site also contains an existing railroad storage yard, and a parking lot for the steel mill north of the proposed

site. The design team was able to include the following necessary attributes into the proposed site in Gary:

- Trackside, 109 acres (entrance to site, unloading and loading space for trains)
- Container on chassis, 100 acres (space for container on chassis storage)
- Chassis yard, 15 acres (space for chassis storage)
- Empty container yard, 15 acres (space for empty container storage)
- Gates, repairs, administration 15 acres (Space for entry and exit gates, repair and maintenance buildings, and administration buildings)

These attributes are necessary for the proposed intermodal site, and total to 250 acres. Also completed by the design team, was the moving of the existing railroad storage yard, and the parking lot on the proposed site. Both of these areas are equivalent to what is on the current proposed site. The proposed site is in and will be presented in Google Earth. The site is also going to contain a tower used for controlling the activity in the intermodal facility. The design has yet to be finalized. A bike path proposed by the City of Gary also runs near the west end of the proposed intermodal facility. A bridge next to the intermodal site for this bike path is also a task yet to be completed.

Mechanical Team

The mechanical team has been responsible for making recommendations as to the number of equipment the yard will require. This team has also been researching the mechanical operation of common types of cranes, different methods of powering them, as well as emissions information. Evaluating the environmental impact on the region and surrounding areas by introducing an Intermodal train yard in Gary is another task of the mechanical team.

3.0. Revised Task / Event Schedule

Schedule of Events

ID	Task Name	Duration	Start	Finish
1	Initialize	18 days	Tue 1/16/07	Thu 2/8/07
2	Define the problem	14 hrs	Tue 1/16/07	Wed 1/24/07
3	Structure Groups	2 hrs	Thu 1/25/07	Thu 1/25/07
4	Project Plan	6 hrs	Tue 2/6/07	Thu 2/8/07
5				
6	Research	15 days	Tue 1/23/07	Mon 2/12/07
7	Define Client Needs	30 hrs	Tue 1/23/07	Mon 2/12/07
8	Bedford Park Site Visit	1 day	Thu 1/25/07	Thu 1/25/07
9	Equipment Needed	10 hrs	Tue 1/30/07	Mon 2/5/07
10	Define Demo Program	10 hrs	Tue 1/30/07	Mon 2/5/07
11	Gary Demographics	10 hrs	Tue 2/6/07	Mon 2/12/07
12	Familiarization with Project Software	8 hrs	Tue 1/30/07	Fri 2/2/07
13	Effects of Yard on Gary	10 hrs	Tue 2/6/07	Mon 2/12/07
14				
15	Design	20 days	Thu 1/25/07	Wed 2/21/07
16	Site Plan	40 hrs	Thu 1/25/07	Wed 2/21/07
17	Coding Demo Program	20 hrs	Thu 2/8/07	Wed 2/21/07
18	Yard Requirements	10 hrs	Tue 2/6/07	Mon 2/12/07
19	Construction of Model	20 hrs	Wed 2/7/07	Wed 2/21/07
20				
21	IPRO Deliverables	27.5 days	Tue 3/20/07	Fri 4/27/07
22	Midterm Report	5 hrs	Tue 3/20/07	Fri 3/23/07
23	Abstract	3 hrs	Wed 4/18/07	Fri 4/20/07
24	Poster	8 hrs	Mon 4/16/07	Fri 4/20/07
25	Presentation	10 hrs	Wed 4/18/07	Wed 4/25/07
26	Information CD	2 hrs	Thu 4/26/07	Fri 4/27/07

As each task was completed, the closer the group came to a complete model of the intermodal yard. The more complete the model, the more fine tuning could be done to the design. Each task builds off the ones before it: a site was chosen, a layout was proposed, quantity and cost of materials could then be estimated to be able to delivery a cost estimate to Mi-Jack.

4.0. Updated Task Assignments and Designation of Roles

Generally, the team filled the subgroups based on each individual's academic major. This ensures that team members can usually work in areas in which they are interested and the most knowledgeable. This approach has proven to be very reliable as each of the assigned teams has performed their duties admirably and no reorganization

has been necessary. A complete list of team members, their majors, and their responsibilities can be found below.

Responsibilities	Name	Major
Design Team	Jonathan Kohler Nathaniel Roth Benjamin Russo Mary Sisay Yousef Zaatar	Civil Engineering
Mechanical Team	Michael Grilley Axita Patel Josie Truong	Mechanical Engineering
Zoning	Maria Aguirre Joanna Ruiz	Architecture
GIS	Cesar Sotelo	Architecture
Demo Program	Zachary Borschuk	Computer Science

- Design Team: The design team is responsible for the physical layout of the proposed intermodal yard. They will improve upon what they saw at existing facilities and apply it to the site in Gary, Indiana.
- Mechanical Team: The mechanical team will make recommendations as to the number and types of equipment the yard will require. They will research the mechanical operation of common types of cranes, different methods of powering them, as well as emissions information. They are also responsible for calculating the environmental impact on the region due to an intermodal yard in Gary.

- Zoning: The team must research Gary's zoning ordinances and determine if the current zoning of potential sites allows an intermodal yard. They must also determine land ownership for the site of the proposed yard.
- GIS: Accurate maps and data for the site and its surroundings are essential. Those working with GIS will have to learn to use the necessary software and combine several data layers, such as municipal boundaries, national parks, and rail densities, onto one map.
- Demo Program: The Bedford Park facility illustrated how computers and RF technology can greatly increase efficiency and accuracy for intermodal operations. The demo program will show how this idea can be expanded to cover an entire region rather than being bound by the confines of the yard

5.0. Barriers and Obstacles

Demo Program

- A. One of the obstacles that needed to be overcome was how to store the container data. Another obstacle was how to password protect the administrator side of the program.
- B. It was decided that an array of classes would be best suited for storing the data. It was decided that for the password protection, simply comparing the entered string to a predetermined string was sufficient.
- C. A barrier that remains is incorporating RF technology with the program. This can be resolved with access to RF technology and research into how it interacts with the machine.

GIS

- A. The only obstacles the group encounter were technical, as we able to work together in an effective way.
- B. Upon further research we were able to resolve our technical issues.
- C. Our only remaining barriers that need to be addressed before the team can successfully complete the planned work is to come to decision on how the IPRO day presentation should look.
- D. Those barriers will be dealt with as we finalize our individual group assignments

Design Team

The design team faced a few barriers and obstacles that slowed the beginning of the design process. Finding the site for the intermodal facility was the first obstacle. The original site designated by the instructor was found to be a park reserve. All the design that had been done was discarded. There was some time where no site had been designated, and this slowed the design process. Without a site, dimensions of the intermodal facility could not be established. Also, at the onset of the project, the design team was unclear of each member's rolls. Once objectives were established throughout the design process, rolls became clearer. There is a possibility of more barriers and obstacles occurring in the rest of our design process. The majority of the design team's tasks have been accomplished, and our focus will be shifting to the final presentation and IPRO day soon. There are no notable future barriers and obstacles at the time of this report.

Mechanical Team

Complications are a part of any project and it is more that likely that there will be several. In this case, the obstacle that arose was finding the information pertinent to our research. There is a lot of information out there. However, the more that is out there the harder it is to determine what is relevant and what is not. Another barrier that was faced was the wall that we hit when relevant information was found. When pertinent information was found there was limited background of the information presented. For example, the attainment information was not hard to find but what attainment referred to and what the different categories of attainment represented was difficult to discern and further explore. These types of research obstacles are not uncommon and usually expected but leads to the other major barrier of time. Research takes time especially clear, concise fully developed research on an unfamiliar area and subject.

These obstacles were overcome by delegating a broad area of research into the most applicable research between team members. Even with overlapping areas of research there was plenty to go around. Each mechanical team member took a part of the subject that need to be explored and produced an analysis of that subject shown previously in the results to date section.

Remaining barriers include determining the number and type of equipment that is needed for the size and capacity of an Intermodal yard that is being designed for Gary.

Our most useful resource is the example of an existing Intermodal yard, Bedford Park. Based on this example we hope to develop a realistic model of necessary equipment and a corresponding cost analysis.