Project Plan

IPRO 307: Advanced Shipping Container Transportation System Solutions
Spring 2007

Advisors:

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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. 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.

2.0. Background

With 19 intermodal yards covering more than 2,200 acres, Chicago is the third largest intermodal port in the world. Despite the already staggering number of containers passing through Chicago each year, the number is expected to double over the next decade. For this reason, Chicago and its surrounding areas require modern, efficient yards in order to maximize capacity.

Many facilities in the area are already attempting to address this problem. In a recent visit to the Bedford Park, Illinois, facility, we saw how RF technology is making an impact in the industry by allowing train and container movement to be tracked in real-time. The system notifies the company that their container has arrived and tells the trucker exactly where in the yard to pick it up. RF technology has drastically cut the amount of time trucks and containers sit in the yard, clearing space for additional trucks and containers.

Over several semesters, IPRO 307 has analyzed many possible solutions to Chicago's capacity problem. Mi-Jack Products, a manufacturer of intermodal equipment such as cranes and side loaders, has sponsored the team in this endeavor. The first proposed solution was the Grid-Rail (GRail) system. Essentially, an elevated grid was spread across the entire yard and devices capable of lifting and transporting containers, called shuttles, were attached below. The fully automated shuttles could access any point on the grid, transporting containers and loading or unloading trains along the way.

This idea evolved into Mi-Jack's Thru-Port system. This was a system of cranes with two double-grapplers, allowing up to four containers to be loaded or unloaded simultaneously. The system was designed to quickly and efficiently organize containers based on their destinations and shuffle them to the correct train.

The focus has now shifted to Gary, Indiana, where the Chamber of Commerce desires an intermodal yard to create jobs and spur economic growth. A high density of freight travels through the city each year, large amounts of land are available from old steel mills, and several major highways are easily accessible, making Gary an ideal location for intermodal operations.

3.0. Methodology

The problem IPRO 307 faces is that the capacity for intermodal operations in the Chicagoland area is not keeping up with the demand. In order to meet the expected demand over the next decade, current facilities must be reworked to increase efficiency or new yards must be built.

The first step in addressing this problem was visiting an existing intermodal yard located in Bedford Park, Illinois. The team met with a manager who gave an in depth explanation concerning how the yard operated. This was followed by a tour of offices and then a ride around the entire facility. The visit provided the team with a first-hand idea of the layout and large amount of land needed for these types of facilities, as well as the substantial amount of work required to keep it running smoothly.

Keeping what they learned from the Bedford Park facility in mind, the team will design a new intermodal yard, recommend equipment that would best suit the site, and create a demonstration program that illustrates how RF technology can be expanded to cover an entire region. This requires research into all aspects of container movement.

It is important for the team to learn about GIS, or geographic information systems, which displays geographically-referenced information in the form of data layers on a map. Team members must familiarize themselves with GIS software so that they can create and display data layers necessary for their tasks.

Research into zoning must also be carried out, including the general types of zones common in many municipalities and also those specific to Gary, Indiana. Additionally, it will be necessary to determine land ownership of the potential site.

Finally, types of equipment needed for intermodal operations must be researched. The team needs to study how cranes operate mechanically as well as methods of powering them. This information is needed to make recommendations as to the number and type of equipment required in the yard.

Once the research, design, and recommendations have been completed, the team will analyze the solution. The proposed intermodal yard should be capable of handling a predetermined number of lifts annually, meet all standards set by Gary’s zoning ordinances, and minimize pollution and any other negative effects on the surrounding area. Once it is determined that the solution has satisfied all requirements work can begin on the deliverables outlined in Section 4.0.

IPRO deliverables, however, will be generated as the semester progresses. It will be a collaborative effort, with each group reporting any relevant information to the individual responsible for a particular deliverable. This individual will be responsible for organizing the given information in a logical order and ensuring that the style is consistent throughout.

4.0. Expected Results

By the time IPRO 307's work is complete this semester, we expect to have accomplished the following:

- Designed an intermodal yard for a selected site in Gary, Indiana, that is capable of handling the predicted increase in container movement through the area,
- Developed a demonstration of software that is capable of giving and receiving real-time information about container movement both locally within the yard as well as regionally, and
- Made recommendations as to how many and which type of equipment is required to handle the expected demand.

In terms of deliverables expected in this project, we intend to place a 3D model of our proposed intermodal yard in its exact location using Google Earth. Gary's twin city and county buildings, as well as the elevated toll road supported by columns, will be included as landmarks to provide a sense of where in the city our yard is located. Mi-Jack cranes will be shown in the model and the facility will be surrounded by models of industrial buildings in order to illustrate the economic benefits and job growth an intermodal yard will provide.

This final product will not be a movie, rather, it will be an interactive model completely viewable within Google Earth. This will be easily transferable to future IPRO teams or sponsors who will be able to see the exact solution we proposed as long as they have the free program and the files.

These results should address the concerns of Mi-Jack Products and the Gary Chamber of Commerce. They will have designs for a new, modern intermodal yard as well as a demonstration of a potential software solution which will help run things efficiently. All of our work will be easily transferable and accessible because we will take advantage of widely-used computer programs such as Google Earth.

The highlight of our IPRO Day exhibit will be a 42-inch or greater LCD television on which people can view the 3D model in Google Earth that was described earlier. There will also be a map of Gary laid out on a table which shows our proposal in two dimensions. The "Gary-Wide Area Network", or GWAN, demo program will run on a PC and will be displayed on a 19-inch monitor. Our certificate of compliance will be available, and we will have a brochure, accompanied by a minidisk containing the Google Earth files of our solution, to hand out to visitors.

5.0. Project Budget

Item	Cost
1.) Google Earth Plus Subscription	$20.00
2.) CommunityVIZ Training	$400.00

TOTAL COST	$420.00

6.0. Schedule of Tasks and Milestone Events

In order to accomplish the objectives set forth in previous sections, a schedule of tasks and their deadlines was created. Each team member must make an effort to adhere to this schedule so subsequent tasks can be performed without delay.

In order to assist in these efforts, a Gantt chart was created for the team to reference, which is included at the end of this report. It specifies several milestones for the design process, the first of which is the site plan. The team must determine locations for the gates to the yard as well as divide the site into color-coded zones for container and chassis storage, loading and unloading trains, and others. The number of lifts the facility will be expected to handle annually must also be determined. This information will address the yard requirements, allowing the team to calculate how many pieces of equipment are needed as well as the amount of pollution that might be generated.

The design process included in the Gantt chart also specifies the coding of the demo program and the construction of the model. Descriptions of what will be required to accomplish these activities can be found in Section 4.0.

Although the Gantt chart illustrates the timeline of task well, there are no clear milestones besides those listed in the Gantt chart.

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7.0. Individual Team Member Assignments

The team decided to use a design process similar to a charrette. A charrette is an intense design process in which the main group is divided into subgroups that meet for several sessions. The subgroups then combine and present their part of the solution, which can be refined by the main group and integrated into the overall plan. Basically, a charrette is a way of quickly designing a solution to a problem that requires knowledge on a number of different subjects.

After gaining an understanding of the charrette process, the team identified the subgroups that would be necessary to address the main problem.

- 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.

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. 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

8.0. Designation of Roles

At the beginning of each meeting, one team member shall volunteer to act as the Secretary for that session. The Secretary will take note of task assignments, decisions made by the group, and anything that needs to be discussed during the next meeting. Soon after the meeting has concluded, the minutes should be uploaded to iGroups so that all team members may review them before the next session.

The Meeting Leader shall be the individual who acted as Secretary in the previous meeting. Among the responsibilities of the Meeting Leader are setting the meeting's agenda, allowing group discussion and decision on important items, and making sure everything that needed to be accomplished during that session is completed.

In order to track what each team member has done and is currently working on, each individual will submit a "5-15" to iGroups on a weekly basis. This is a bulleted list of five completed, ongoing, or to-do activities, and should take no more than fifteen minutes to complete.

iGROUPS coordination is not assigned.

Each team member has the responsibility of making sure iGroups stays organized. Any files uploaded to the site must be placed in either an existing related folder or one created for the file if it addresses a new subject. The instructor will make the final determination on whether or not the files on iGroups are properly organized. These steps will ensure that files are arranged in a logical manner so that team members can quickly find any materials necessary.

Comment [ACP1]: Your team should choose someone to enforce these weekly reports. Also, there is no one designated to prepare a weekly task list.

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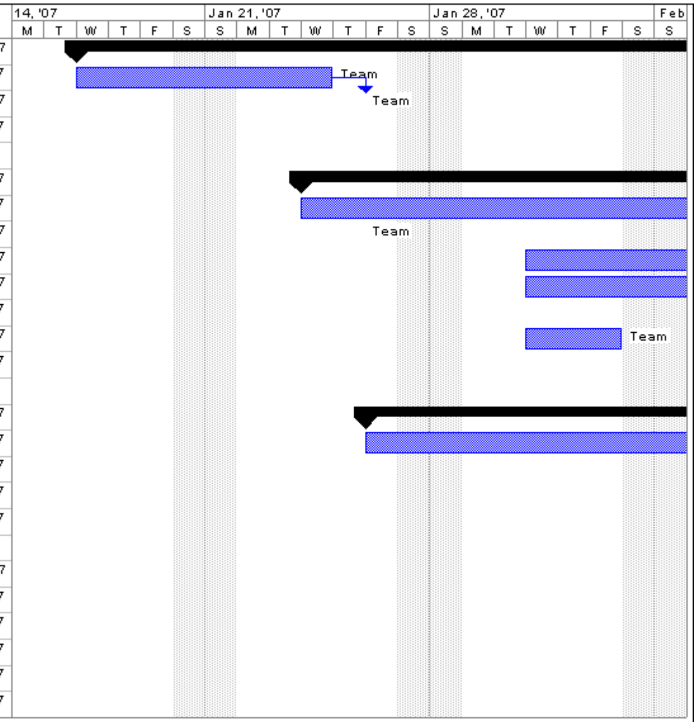
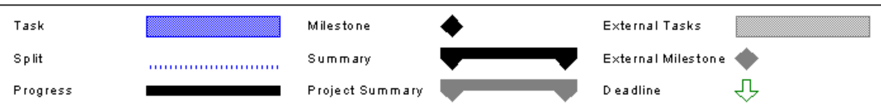
Gantt Chart

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



Project: 307 Project Plan
Date: Wed 2/14/07



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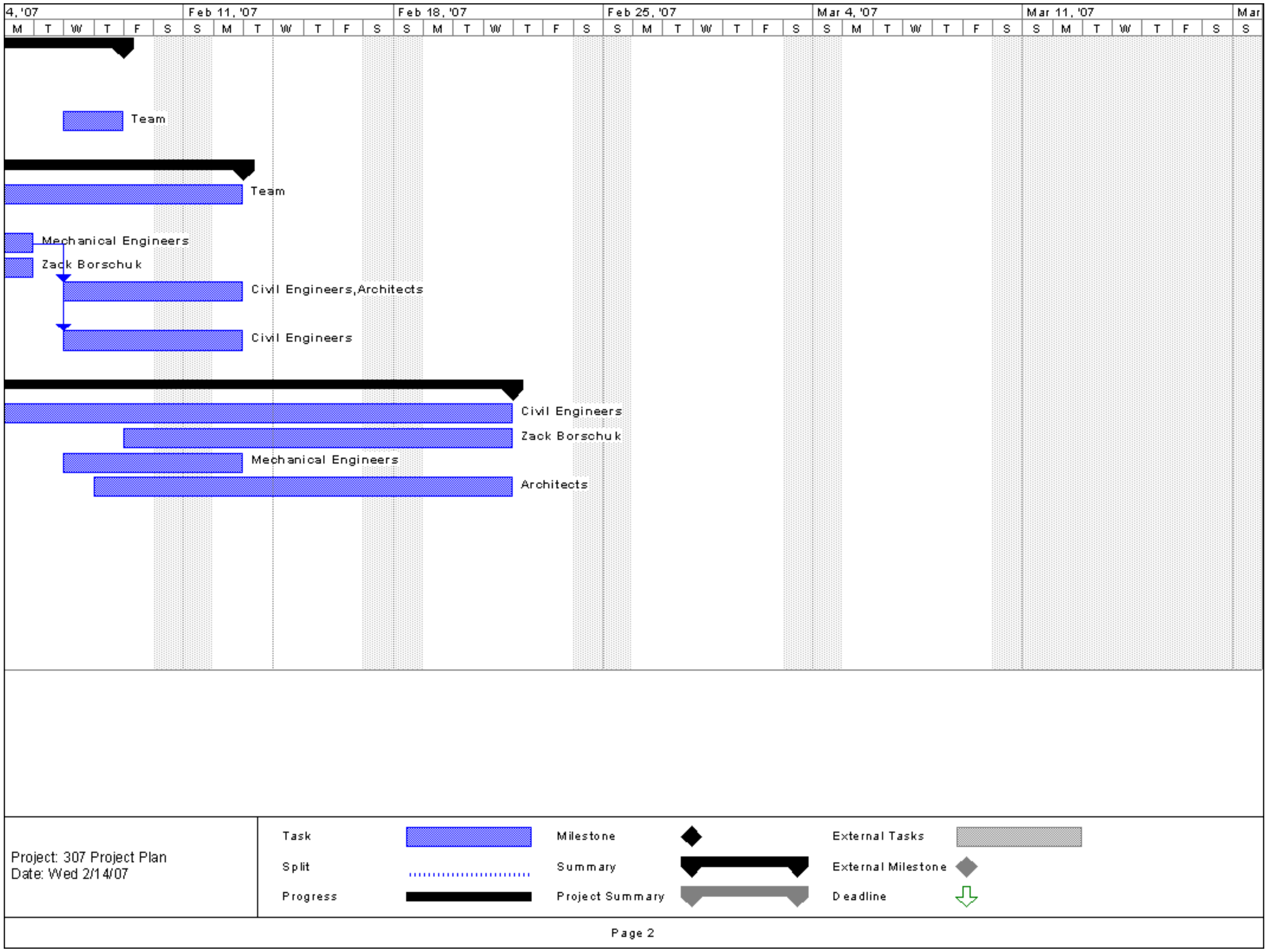
Gantt Chart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Mar 11, '07
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Team
Team
Mechanical Engineers
Zack Borschuk
Civil Engineers,Architects
Civil Engineers
Civil Engineers
Zack Borschuk
Mechanical Engineers
Architects
Project: 307 Project Plan
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Summary
Project Summary
External Tasks
External Milestone
Deadline
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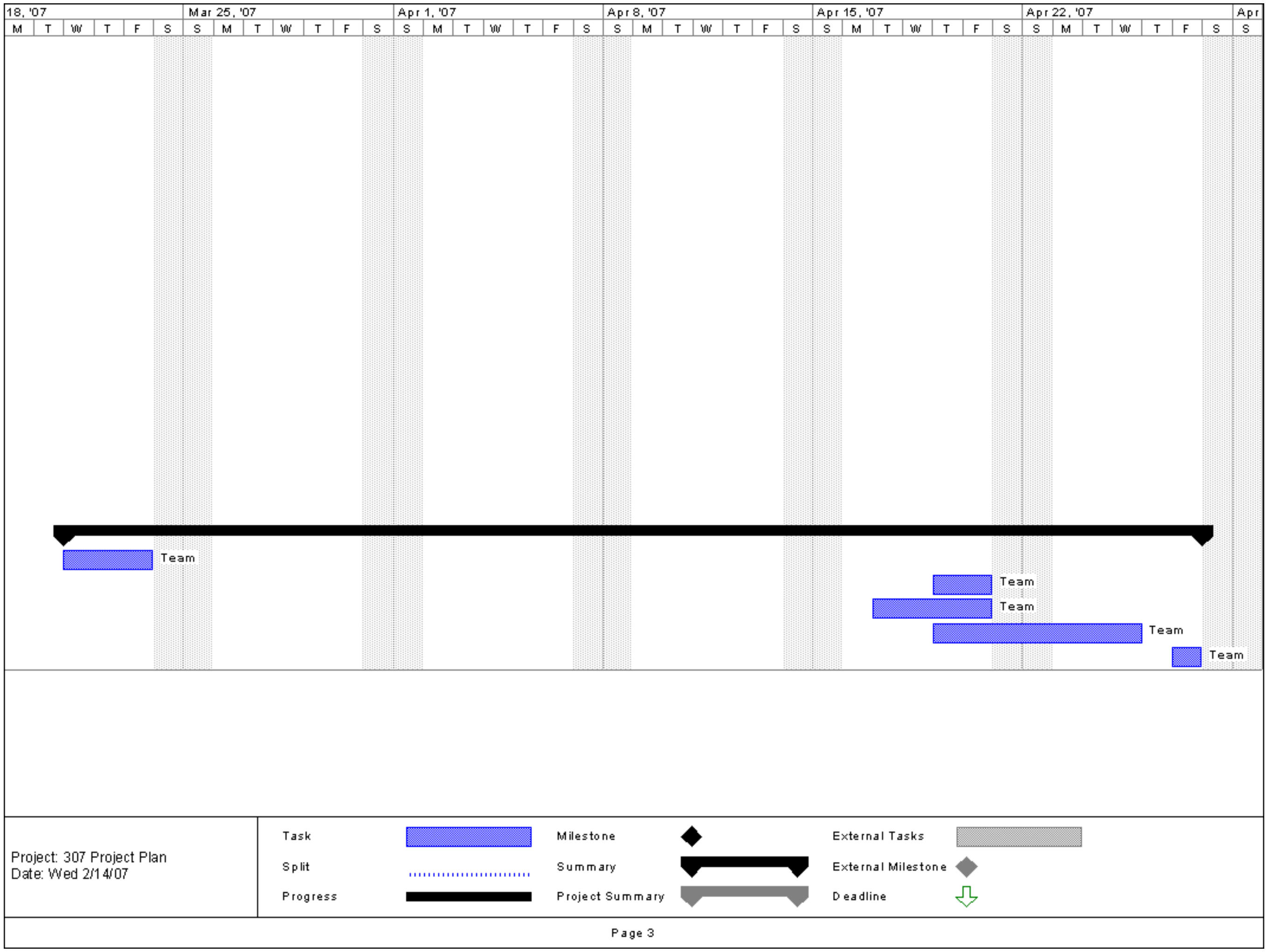
Gantt Chart



18, '07
Mar 25, '07
Apr 1, '07
Apr 8, '07
Apr 15, '07
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