Central Point of Coordination (CPC)

Port of Tacoma, Tacoma Washington

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Submitted July 25, 2003

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Port Description

The Port of Tacoma (POT) is strategically located in Pierce County on Commencement Bay, a natural deep-water harbor in southern Puget Sound and enjoys strong international trade ties with nations on the Pacific Rim and around the world. The Port currently ranks as the sixth-largest container port in North America with four container terminals covering nearly 400 acres. Outstanding intermodal operations, facilitated by three dockside intermodal rail yards, connections to two transcontinental railroads and easy access to Interstate 5 make the Port an ideal location for warehouse and distribution activities with more than 70 percent of the Port's international container cargo coming from, or bound for, the central and eastern regions of North America. A fourth intermodal yard now being built will come on line by January 2005.

Four of the world's top container shipping lines call in Tacoma--Evergreen Line, Hyundai, "K" Line, and Maersk Sealand. These and other shipping lines have been attracted to Tacoma because of its highly productive longshore labor force, available land for expansion, and excellent intermodal rail facilities and highway connections.

The Port handles more than $22 billion of international trade each year. The Port's leading trading partners are Japan, China, South Korea and Hong Kong. Based on container volumes, China is now the Port's largest trading partner. In addition, it serves as the "Gateway to Alaska," handling more than $3 billion, or about 80 percent, of trade to that state with both Horizon Lines and Totem Ocean Trailer Express shipping lines. The Port's Foreign Trade Zone gives importers and exporters a flexible way to ship, store, manipulate and add value to goods while delaying or even eliminating U.S. Customs duties.

Major Port imports include: electrical machinery, sound/TV equipment, vehicles, machinery, toys and sporting goods, and footwear. Major exports through Tacoma include: machinery, meat, vehicles, plastics, grain, paper/paper board, and prepared and frozen vegetables.

The Port is a combination landlord Port and operating Port. The Port's maritime marketing efforts are focused both on getting additional shipping lines to call in Tacoma, as well as getting additional charter shipments and project cargoes to move through Port-operated terminals. The Port also has a major focus on industrial development and real estate, working to attract major manufacturing and warehouse/distribution centers to the Port area.

The Port covers 2,400 acres, of which over 700 acres are still available for development. Port properties include marine terminals and warehouse/industrial sites, and two major areas for industrial development--The Port Commerce Center, 120 acres of Port land being developed in partnership with a private developer, and Frederickson, where the Port has more than 250 acres available for sale for industrial use.

While the Port only has 210 employees, its activities have a tremendous economic impact on Pierce County and Washington State. The Port is often referred to as the "Economic Engine" for Pierce County, with an estimated 28,000 jobs in the County being related to the Port's activities. At the State level, nearly 102,000 jobs are tied to the Port's activities.

The Port of Tacoma operates as an independent municipal corporation under laws passed by the state legislature in 1911. Although it is a separate entity from the City of Tacoma, Pierce County, and Washington State, the Port works closely with all of these entities on a variety of projects that are in their mutual benefit.

The Port of Tacoma’s vision is “to be a global magnet for commerce that creates success for our customers, enthusiasm for our employees, and vitality for our community.”

Introduction – Paper Highlights

The Port of Tacoma has been involved in on-dock intermodal rail operations since the early 1980's and our volume has grown steadily over the years. The total number of lifts for all three yards for the 2002 calendar year was 362,344, representing a 37% increase over 2001. With the ever-increasing volumes of containers moving via rail through the Port of Tacoma, and with the realization that there is a limit to the amount of rail infrastructure that can be built, it became obvious that better methods of planning the traffic flow over the existing rail infrastructure were needed to maximize use of the existing facilities.

This paper will describe the project to provide automated rail planning and data dissemination tools to the Port Operations personnel and Port customers. The project was accomplished in three separate phases:

- Web-based automation of Eastbound Rail Planning Tool
- Implementation of a rail infrastructure utilization program
- Web-based rail infrastructure and train status display and inquiry

Goals and Objectives / Business Problem

The goals and objectives of the Central Point of Coordination (CPC) system were to reduce the time and effort necessary for planning the usage and movement of rail traffic within the Tacoma Tideflats. These goals would be met by developing a system designed to provide the following functionality:

- Maintain planned, revised and actual train activities
- Provide data on train composition and schedules
- Provide notification of changes in status to authorized participants
- Provide on-line access via the Internet
- Provide reporting capabilities

The business problem(s) which needed to be addressed by implementing an automated rail planning system were:

- The difficulty of coordinating meetings between several companies located in areas ranging from Tacoma to Seattle
- The need to reduce the amount of labor necessary to collect data, resolve conflicts, assemble and disseminate a final weekly planning document for rail operations

Discussion

A. Background

Due to problems encountered with conflicts in the movement of Intermodal rail cars by various entities in the Tacoma Tideflats, a comprehensive method of planning the efficient usage and movement of traffic was needed. The Central Point of Coordination (CPC) was created in 2001 and consisted of the following stakeholders: the Port of Tacoma, Tacoma Rail, Burlington Northern Santa Fe (BNSF) and Union Pacific (UP).

After stakeholder team members had identified preliminary requirements for the following week, the CPC held two face-to-face meetings each week with the various entities associated with Intermodal transport, e.g. Rail, Shipping Lines, and Rail handling companies. The first meeting on the Thursday consisted of jointly defining a work plan for departing trains for the coming week and incorporating the details into an Excel spreadsheet. At the conclusion of the meeting, each member of the CPC was given a printed copy of the document. After that meeting, each member of the CPC would make whatever changes they deemed necessary to their copy of the plan, sometimes communicating by telephone conference calls when necessary to coordinate details among the team. A final meeting was held on Friday to coordinate and reconcile all changes to the plan into a “finalized” plan.

Due to the number of people involved, their location, and the technology available, an ever-increasing amount of time was required to schedule and coordinate the activities of the CPC.

B. Objectives and Methodology

To alleviate the challenges associated with the time necessary to plan and coordinate the movement of rail traffic within the Port of Tacoma Tideflats it was decided to apply technology to optimize the planning process and to facilitate the dissemination of information to all stakeholders in near real-time. The project was accomplished in three phases over a period of 18 months.

Phase one of the CPC project was to automate the creation and updating of the rail planning document and to host the document on the Internet, thus providing instant access to all parties for review and modification. The objectives of phase one were:

- Track train locations and capacities
- Maintain planned, revised planned, and actual train activities
- Provide status change notification to selected participants
- Provide Internet based real-time access and update capabilities
- Provide reporting capabilities

The design and programming for phase one was accomplished using in-house resources and the project was officially begun in July of 2001. A dynamic web site for the collection and modification of rail planning data was designed using templates for the web pages and a relational database to store the data. After a user logs in and is authenticated, they are authorized to perform one of the following functions:

Add new trains

- Update planned or actual train movement times
- Change train car counts or type of cars in a train
- Change the length an/or the weight of a train
- Change the number of wells in a train.
- Archive a train

Port of Tacoma personnel enter the initial rail plan template for each week into the system. Once the basic data has been entered, any CPC member may add to or modify portions of the data, depending on their level of access. For example, only authorized POT operations personnel can archive a train, which removes it from the active database and stores the data into a history database. Examples of data that would typically change are the train ID, information about the content of the trains and planned or actual arrival or departure times.

When a user modifies any data in the plan, the database is updated with the new data. The next time a web page is requested by any user, the latest information is displayed. Any user may also send notifications via email to any or all of users to notify them of the change, or any problems with a train.

NOTE: Initially, the "actual" times for equipment arrival, availability and departures were recorded manually. Following the implementation of Phase Two (described below), these times were recorded using automated AEI data collected and processed by the Phase Two application.

Train Schedule Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Media

Address https://www.portoftacoma.com/cpc/railcpc.cfm

View Ship Schedule | Add A Train

Print Out Schedule | Send E mail Alert

Edit YOUR Login/Password Data | Edit CPC Members Data | View Documentation - Helpful Terms

MainLine Train ID	MainLine Train Day	Local Train Number	Move Count	Well Count	5W	4W	3W	SW	5SP	3SP	CV		Gross Cont. (Tons)	Train Weight (Tons)	Train Length (Feet)	Plan Cars Avail-able	Actual Cars Avail-able	Plan Cars On Spot	Actual Cars On Spot	Plan Off Ship	Actual Off Ship	Plan Re-lease	Actual Re-lease	Plan Pull	Actual Pull	Plan Meet	Actual Meet	Air	Loca-tion	Direc-tion	Plan ML Connect	Actual ML Connect	Plan Depart	Actual Depart	Operatio Commer
STACCHI313	Sat, 06/14/03	HANJIN EAST	217	98	12	2	8	4	1	0	0		0	5,900	6,353				Sat 04:00	Fri 12:00	Fri 12:00	Sat 17:00	Sat 17:00	Sat 17:00	Sat 18:55	Sat 19:00		Y	BF	N			Sat 21:00	Sat 21:04	
STACCHI115	Sat, 06/14/03	TRAIN 12 WAE/CPN	242	105	12	0	11	4	2	0	3		0	6,425	7,013				Sat 04:00			Sat 17:00	Sat 16:15	Sat 21:00	Sat 21:00	Sat 23:00	Sat 23:00	Y	BF	N			Sun 01:00	Sun 01:42	
STCBCHI115	Sun, 06/15/03	HIM #1	220	110	22	0	0	0	0	0	0		0	6,050	6,600									Sun 17:00		Sun 19:00		Y	BF	N			Sun 21:00	Sun 20:20	
STCBCHI116	Sun, 06/15/03	HIM #2	220	110	22	0	0	0	0	0	0		0	6,050	6,600									Sun 19:00		Sun 21:00		Y	BF	N			Sun 23:00	Sun 22:54	
PTACKCM117	Mon, 06/16/03	DAILY SE	220	110	22	0	0	0	0	0	0		0	6,050	6,600									Mon 16:00	Mon 14:28			N	BL	N			Tue 02:00	Tue 08:21	
STACBPA114	Mon, 06/16/03	WAE #1	262	103	14	1	9	2	0	0	0		4,513	6,735	6,494				Sun 16:00	Mon 15:00			Mon 15:40	Mon 16:00	Mon 18:36	Mon 18:00	Mon 17:20	Y	BF	S			Mon 20:00	Mon 20:08	
STACCHI117	Mon, 06/16/03	DAILY EAST/SIM #2	220	110	22	0	0	0	0	0	0		0	6,050	6,600									Mon 16:00	Mon 18:06		Mon 18:56	N	BL	N			Tue 01:00	Tue 01:35	
STACCNI115	Mon, 06/16/03	SIM #1	220	110	22	0	0	0	0	0	0		0	6,050	6,600									Mon 21:00	Mon 21:38			Y	BF	S			Mon 23:00	Tue 03:44	
STACBPA115	Mon, 06/16/03	WAE #2/3	250	110	15	0	11	2	0	0	0		0	6,475	6,954				Mon 15:30			Tue 03:00	Tue 01:25	Tue 03:00	Tue 03:36	Tue 05:00	Tue 03:30	Y	BF	S			Tue 07:00	Tue 12:08	
STACCHC416	Tue, 06/17/03	WAE #4/3	270	95	11	0	11	7	0	0	0		0	5,750	6,114				Mon 19:00				Tue 06:25	Tue 10:00	Tue 12:15	Tue 12:00	Tue 12:48	Y	BF	N			Tue 14:00	Tue 18:54	
PTACKCM118	Tue, 06/17/03	DAILY SE	220	110	22	0	0	0	0	0	0		0	6,050	6,600									Tue 16:00	Tue 13:29			N	BL	N			Wed 02:00	Wed 11:50	
STACCHI118	Tue, 06/17/03	DAILY EAST	220	110	22	0	0	0	0	0	0		0	6,050	6,600									Tue 16:00	Tue 17:10		Tue 21:19	N	BL	N			Wed 01:00	Wed 12:10	
PTACKCM216	Tue, 06/17/03	WAE #5	204	75	15	0	0	0	0	0	0		0	4,125	4,500				Tue 10:00				Tue 12:20	Tue 19:00	Tue 18:50	Tue 21:00	Tue 19:45	Y	BF	N			Tue 23:00	Wed 08:30	P/U AT SEATTLE
STACCHC419	Wed, 06/18/03	WAE #12	232	106	14	0	11	3	0	0	0		0	6,275	6,726				Sun 00:25	Mon 22:00			Wed 14:00	Wed 14:00	Wed 17:09	Wed 16:00	Wed 16:55	Y	BF	N			Wed 18:00	Wed 18:55	

Internet

Start | Inbox - Microsoft Outlook | IT_Award.doc - Microsoft... | IAPH IT Award 2003final.... | OutlineCPC.doc (Read-O... | Train Schedule Page - ... | 3:53 PM

Figure 1 – Screen shot of a portion of the web-based Rail Planning Document

Phase two was the collection and collation of all Electronic Data Interchange (EDI) and Automated Equipment Identification (AEI) information on rail traffic into, within and out of the Tacoma Tideflats and to make that data available graphically to Port Operations personnel on the Port network. The objectives of phase two were:

- Integrate all AEI and EDI rail movement data within the Tacoma Tideflats
- Provide actual train departure and arrival data
- Provide advanced data for trains destined for Tacoma with current ETAs
- Provide detailed data on containers destined for Tacoma
- Automated E-Mail notification to customers of railcar/container arrival in Tacoma
- Provide accurate railcar attributes such as container capacity and maximum weight per platform, using the Universal Machine Language Register (UMLER) file
- Provide real-time status of all intermodal rail equipment in the Tideflats
- Provide rail infrastructure capacity utilization by rail yard

Once the requirements for phase two were finalized, the IT department needed to make a "build or buy" decision and a search for existing applications that would meet our requirements was begun. During this process, a Windows-based application was found that provides a graphical display of cars and tracks in rail yards that could be modified and enhanced to meet our requirements. Signal Computer Consultants, located in Pittsburgh, developed the application called the AEI Rail/Container Manager.

Port of Tacoma IT and Intermodal personnel reviewed the capabilities of the software and held discussions with the vendor regarding program customizations and costs that would be necessary to meet port requirements. Once these were identified a formal quote for the software was requested and received. The cost of the AEI Rail/Container Manager software, including customizations, proved to be much less costly, both in time and expense, than building a similar capability using in-house resources.

The Port worked closely with Signal in the customization of the application so that AEI site data could be incorporated and merged with EDI train consist data. The resulting customized

application was delivered to the Port for beta testing three months after contract award and was in production a month later.

The AEI Rail/Container Manager is an automated tool for maintaining railcar and container inventory in areas such as a small yard or industrial terminal area, a group of separate yards or terminals or a short line railroad.

The main feature of the system is the graphical representation of the location of railcars on a yard or terminal diagram. The system includes software that allows users to easily create and maintain yard or terminal diagrams of their facilities, which can then be incorporated into the system. Railcars can be manually moved on the yard or terminal diagram by simply dragging the railcar with the mouse to its new location. The system also has the capability to automatically track railcar and container movements according to information received from AEI readers.

The Terminal display graphically shows the location of each railcar in the terminal on a diagram of the user's facility (Figure 2).

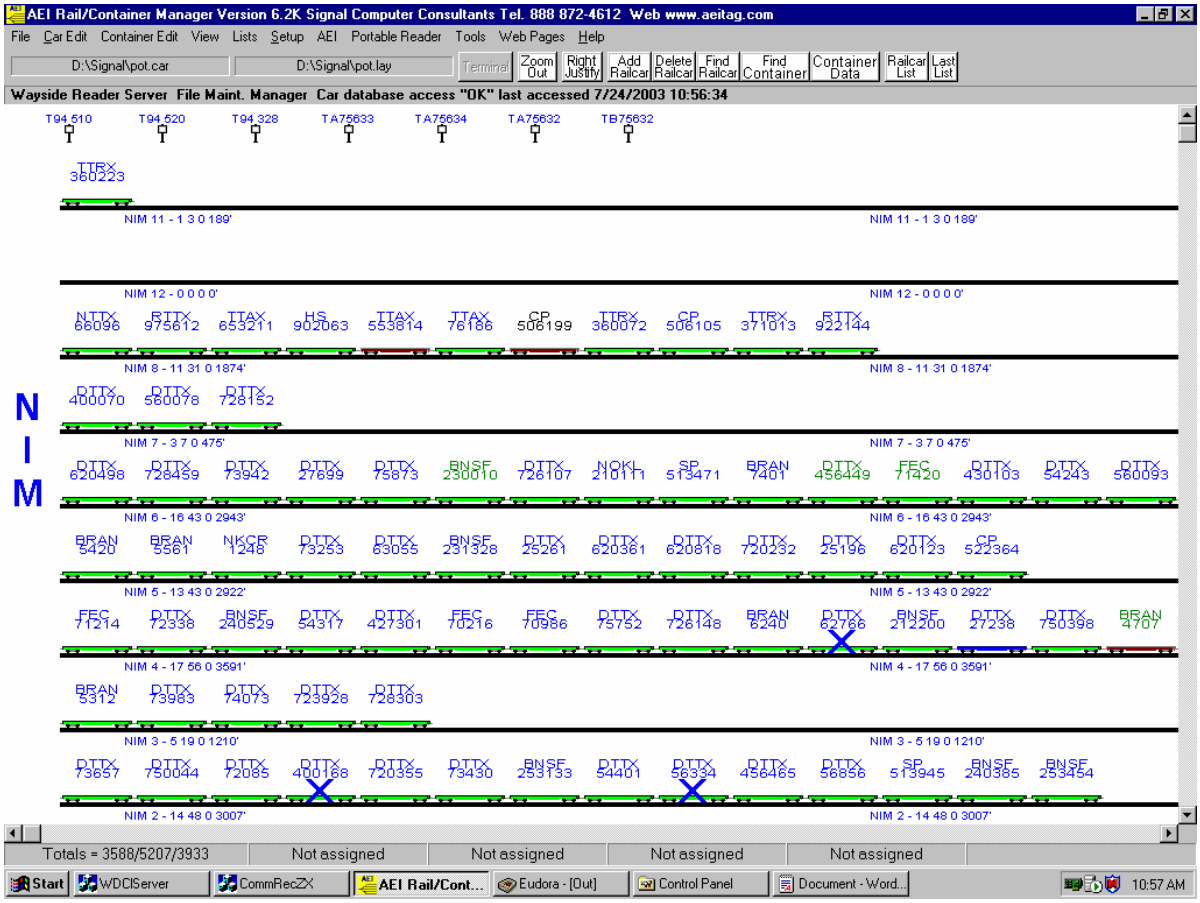

Figure 2 – Terminal Display

The AEI Rail/Container Manager program is designed to handle multiple facilities or allow multiple users to view information at a single facility. From a central location users can monitor railcar information at several facilities, or several users at the same facility can obtain up-to-date information on railcar locations and status. The system also has password protection, which prevents unauthorized users from viewing or updating information. Any change to a railcar's position or data is recorded in a transaction file with the name of the user who made the change. Users can specify the types of records they want to maintain on a railcar. They can easily search the railcar database to find railcars with particular attributes, e.g. all railcars that have been in the facility for over 8 days. Users can also specify that the

colors of railcars on the terminal diagram be based on information contained in their respective data records. For example, all railcars that are bad order could be displayed in blue. Records are archived for railcars leaving (deleted from) the facility. This information is used to reconstruct records for railcars returning to the facility. Fields to be automatically restored may be specified by the user.

There are several ways to obtain information about a railcar from the Terminal display. The simplest is to place the cursor on the railcar. This causes the status line located below the tool bar at the top of the screen to display information about the railcar (Figure 3).

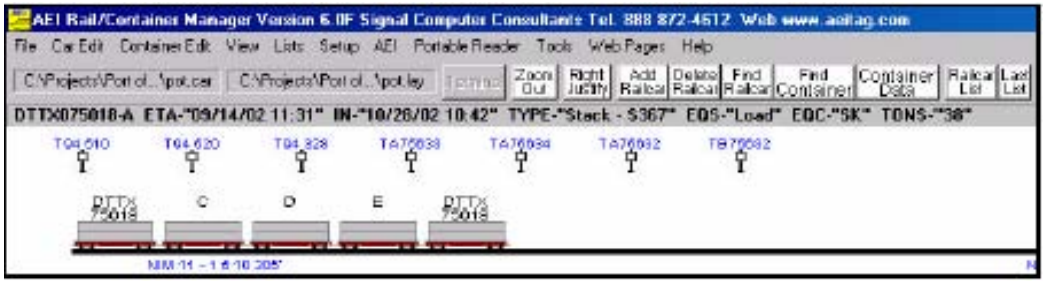

Figure 3 – Rail Car Information Status Line

The user can also export the railcar database by creating a delimited text file. A delimited text file can then be accessed by other applications. This capability would be used later in phase three to present data via the Internet. The transaction and retained archive files are delimited text files. The system has the capability to search, display and print these files.

Railcar movements can be reported by an EDI418 message, an AEI reader site or a person by manually moving the railcar on the Terminal display. A history of Railcar movements within the Tacoma Tideflats is maintained by the system and can displayed. (Figure 4)

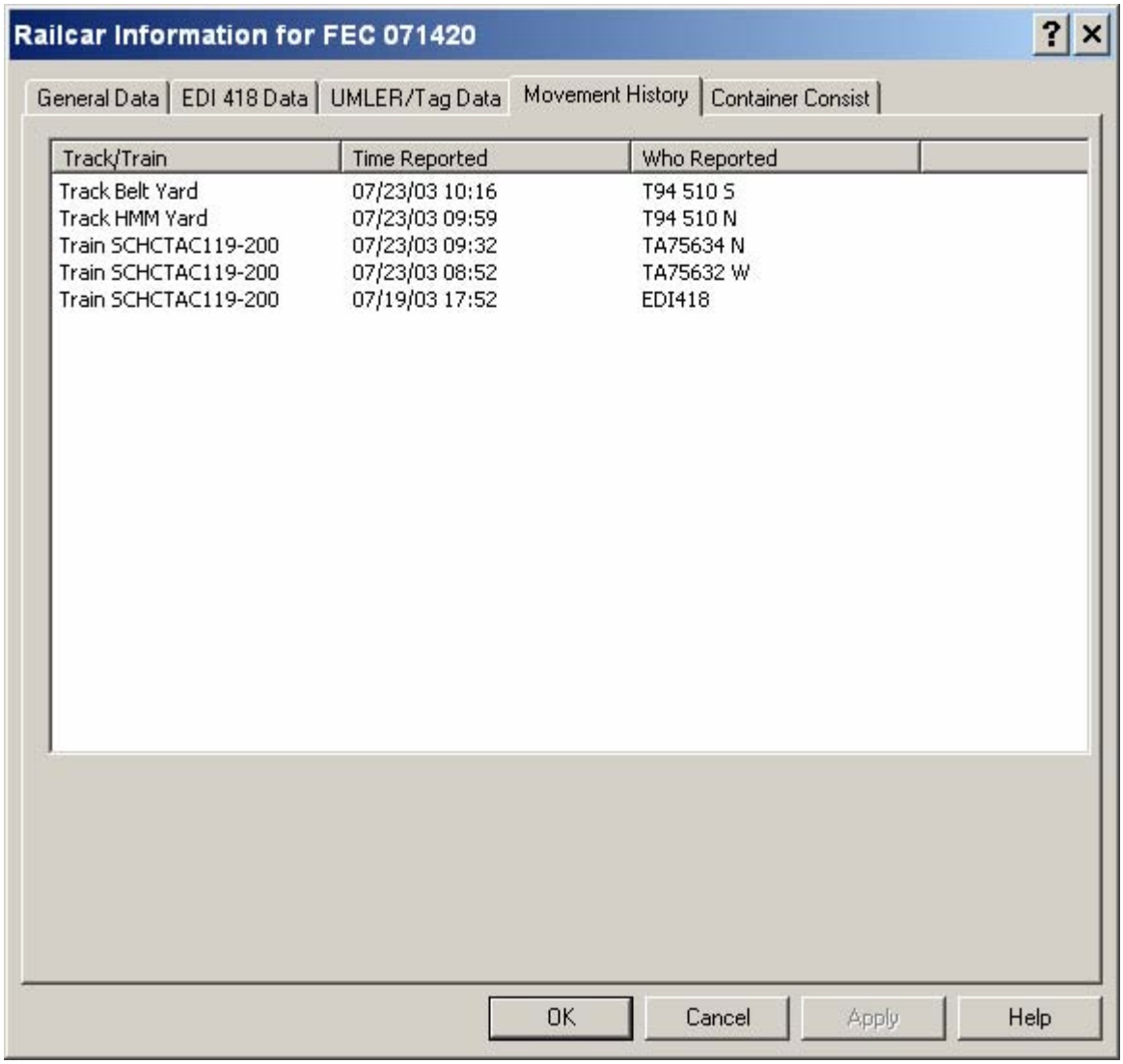

Figure 4 - Car movement history reported by EDI and tracked by AEI stations

Figure 5 shows a typical display of the data the system receives about a railcar from an EDI418 message. These fields are continuously updated as new EDI 418 messages are received about the railcar. The user can modify the information in these fields, but any new EDI 418 will overwrite user-entered information.

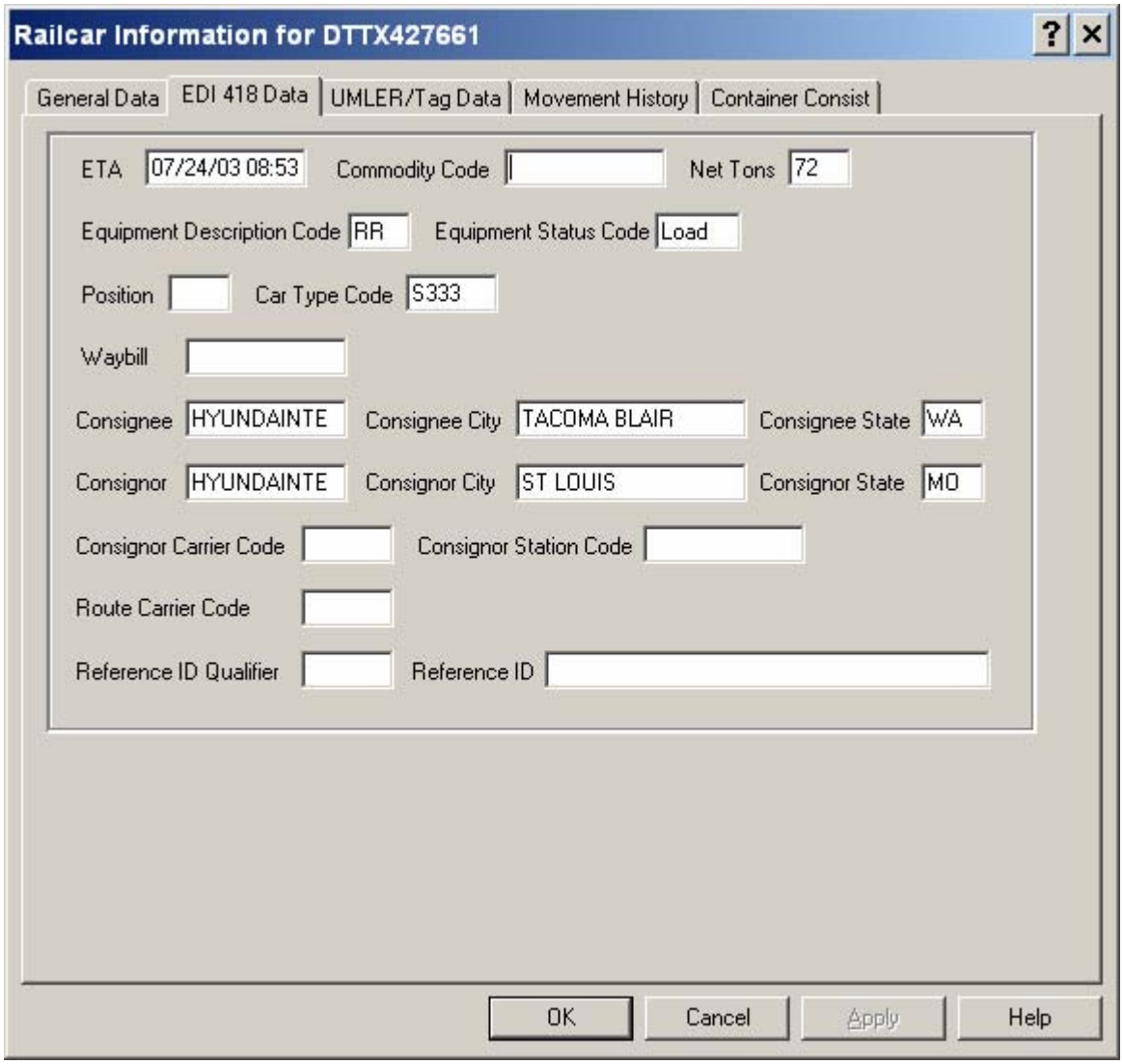

Figure 5 – EDI 418 Data Display

Figure 6 shows the display of UMLER and AEI tag data for a railcar.

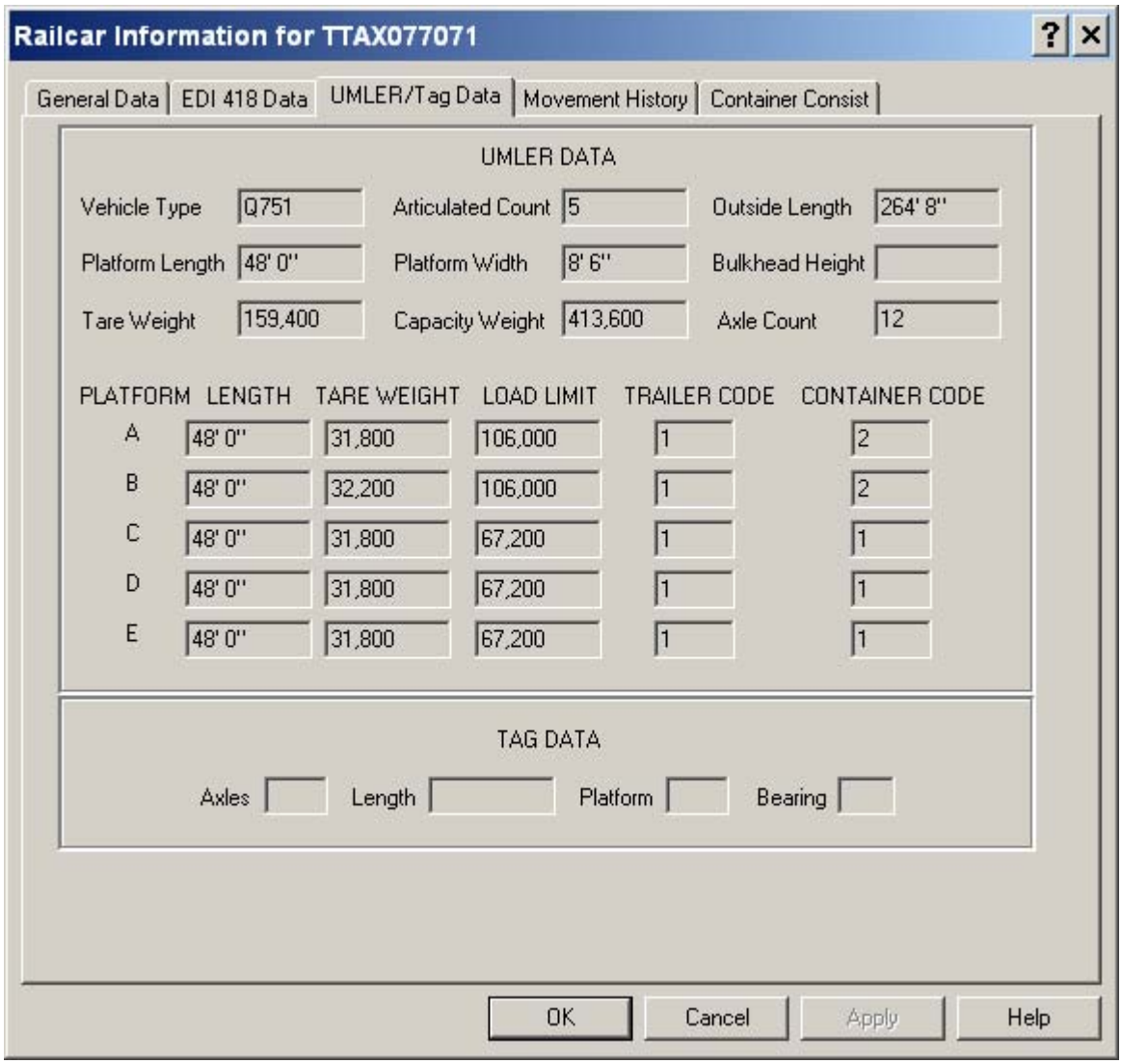

Figure 6 – UMLER/TAG Data Display

The system maintains two separate UMLER databases. One database is for intermodal railcars, which contains all the platform dimensions. The second database is for non-intermodal cars and contains only the following fields:

- Railcar Type
- Outside Length
- Axle Count

If a railcar is not found in one of the UMLER databases, all UMLER fields will be blank. The user cannot modify these fields. Any AEI tag data received from the AEI reader system will appear in the fields at the bottom of the display.

There are times when it is necessary to modify or augment the data supplied by EDI and AEI sources. The Signal application also provides the following functions:

- Add a railcar
- Delete a railcar
- Modify a railcar's data
- Find a railcar
- Assign a rail car to a departing train

Phase three was designed to extract the collated data from the phase two and make it available to Port customers through the Port of Tacoma web site via a secure login and password. The objectives of phase three were:

- Display the data via a web-based Graphical Information System (GIS)
- Retrieve and store tabular data from the Signal application
- Provide a query capability for railcar and container data
- Display AEI reader and track locations on a Tideflats map and provide summary information of track assets

Phase three disseminates the collated data from the phase two for the purposes of decision support visualization and data display, as well as management, planning, and facilitating operational analysis. The Port contracted with Integral GIS to develop a secure web-based Rail Management System (RMS) application which provides a gateway to the rail car and container information being displayed and analyzed by the Signal application via the Internet to the different entities within the POT as well as different entities outside of the POT, such as the Tacoma Rail and Burlington Northern Santa Fe. This secured portion of the Port's website is password protected and has four levels of access depending on one's security clearance. The data presented on the site is real-time, being constantly updated from the electronic input received and processed by the Signal application and transmitted to the web page(s). In addition to providing a means of sharing information between different organizations in a near real-time environment, the Web RMS Map is a web-based GIS that allows for visualization of integrated real-time tabular rail and yard info and existing spatial infrastructure data layers.

The CPC RMS is comprised of the following components:

1. System Security
2. Rail Car & Container Inquiry
3. Rail Traffic / Car Location Tables
4. Map Details and Pictures of Port Layout

System Security: The first component of the CPC Web RMS is the security login page. This function is very important to the overall project because the CPC Web RMS contains very sensitive information that should only be viewed by authorized users. The multi-tier security login page established for the CPC in phase one was incorporated into the CPC RMS by passing session variables from the phase one ColdFusion MX environment to an ASP.NET environment. Figure 7 is a flow diagram that outlines the different levels of security and access to components of the CPC Web RMS.

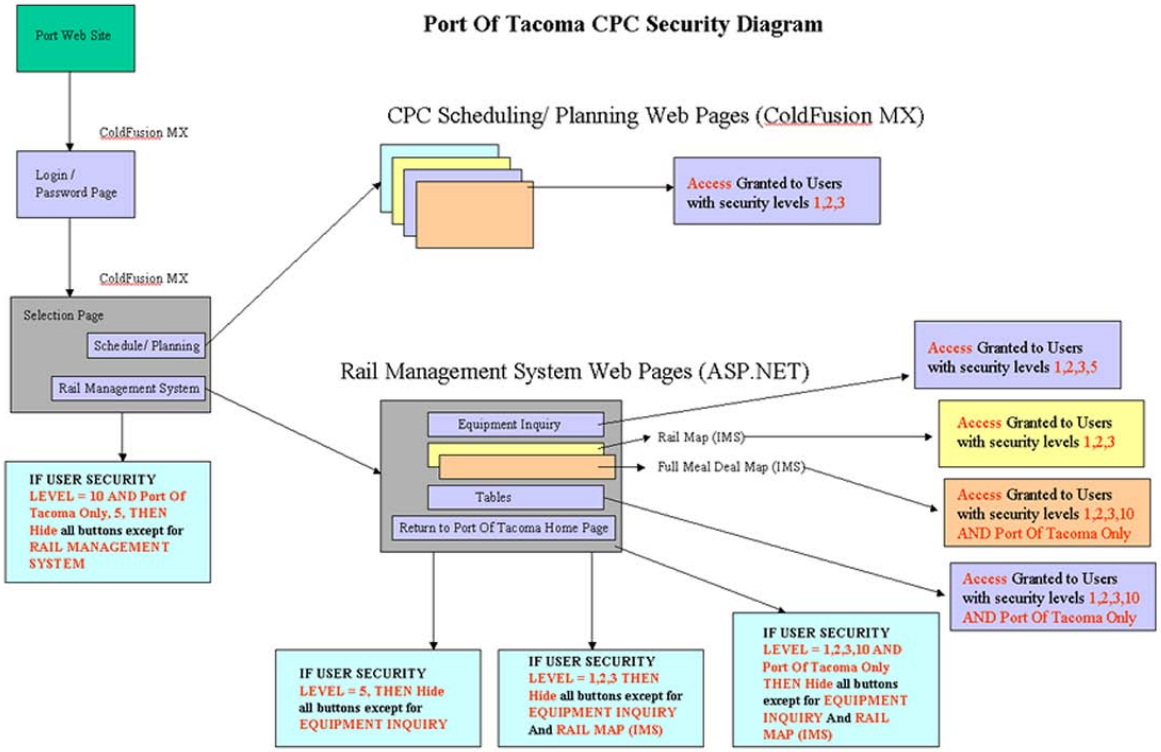

Figure 7 – Security CPC Security Flow Diagram

Rail Car & Container Inquiry: Port employees and customers use the equipment inquiry function to inquire about the status of a rail car or container. In the past if customers wanted to make an inquiry, they would have to call the POT or the mainline railroad. However, this can be very inaccurate because, the mainline railroad computer tracking system may not be in sync with the Port Of Tacoma computer tracking system. Thus, incorrect information could be communicated to the customer resulting poor customer service and poor customer accountability. However, with the new equipment inquiry capability (Figures 8, 9) of the

CPC RMS, customers are able to make inquiries via the Internet by selecting either a rail car or container radio button, and then entering an appropriate tracking number. The equipment inquiry function opens a direct connection to the Signal software and passes the rail car or container tracking number ID entered by the user. If the rail car or container information entered by the user is valid, the Signal software will return the results of the user inquiry to the equipment inquiry web page. Some of the information being displayed includes the rail movement history within the Tacoma Tideflats of a rail car or container, current rail car or container location within the Port rail yards, and ETA if the rail car or container has not yet arrived. This equipment inquiry function not only increases customer service satisfaction and accountability, but helps make the POT more efficient in its future operations by tracking actual performance to facilitate future planning.

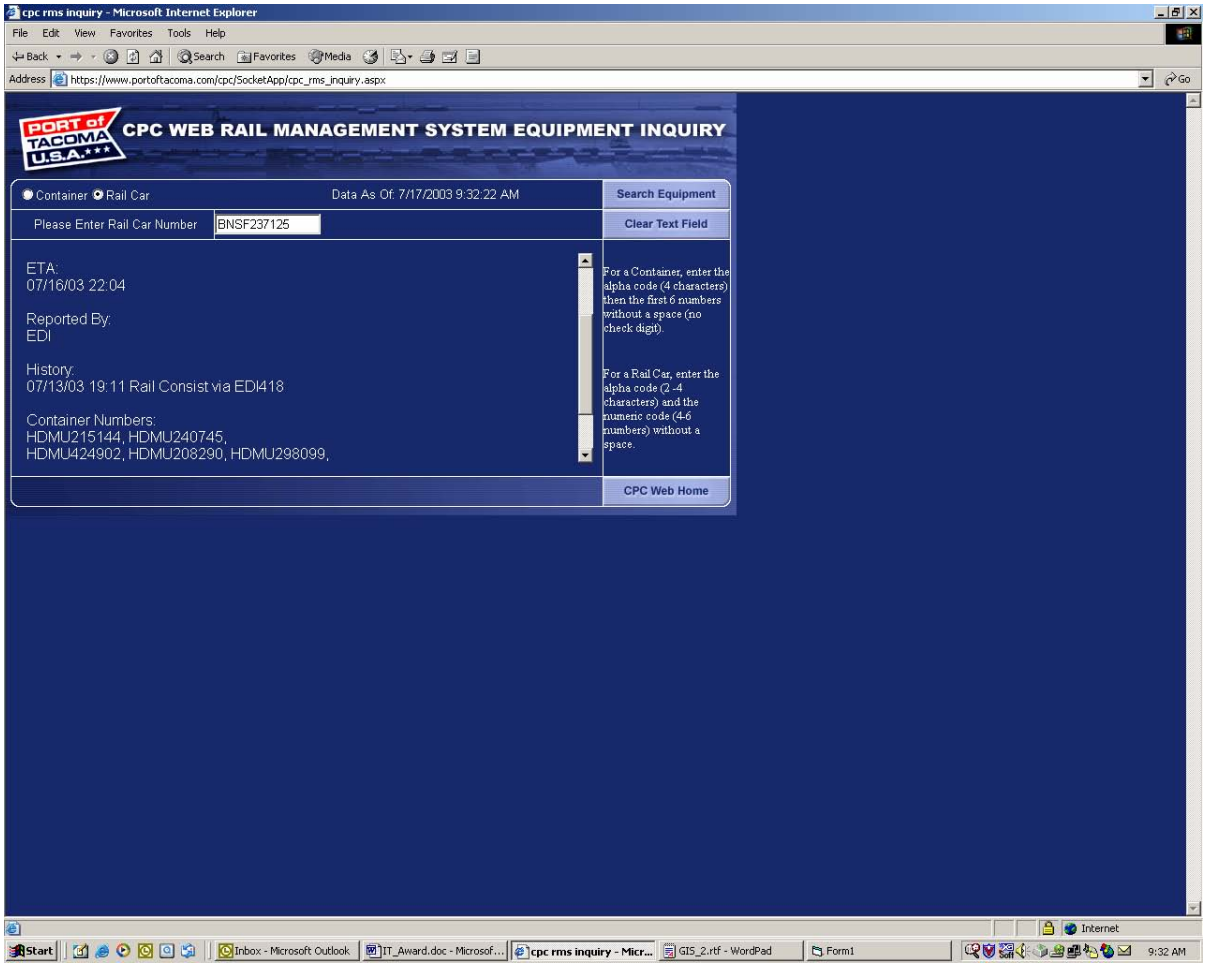

Figure 8 – Equipment Inquiry Screen, Rail Car Data

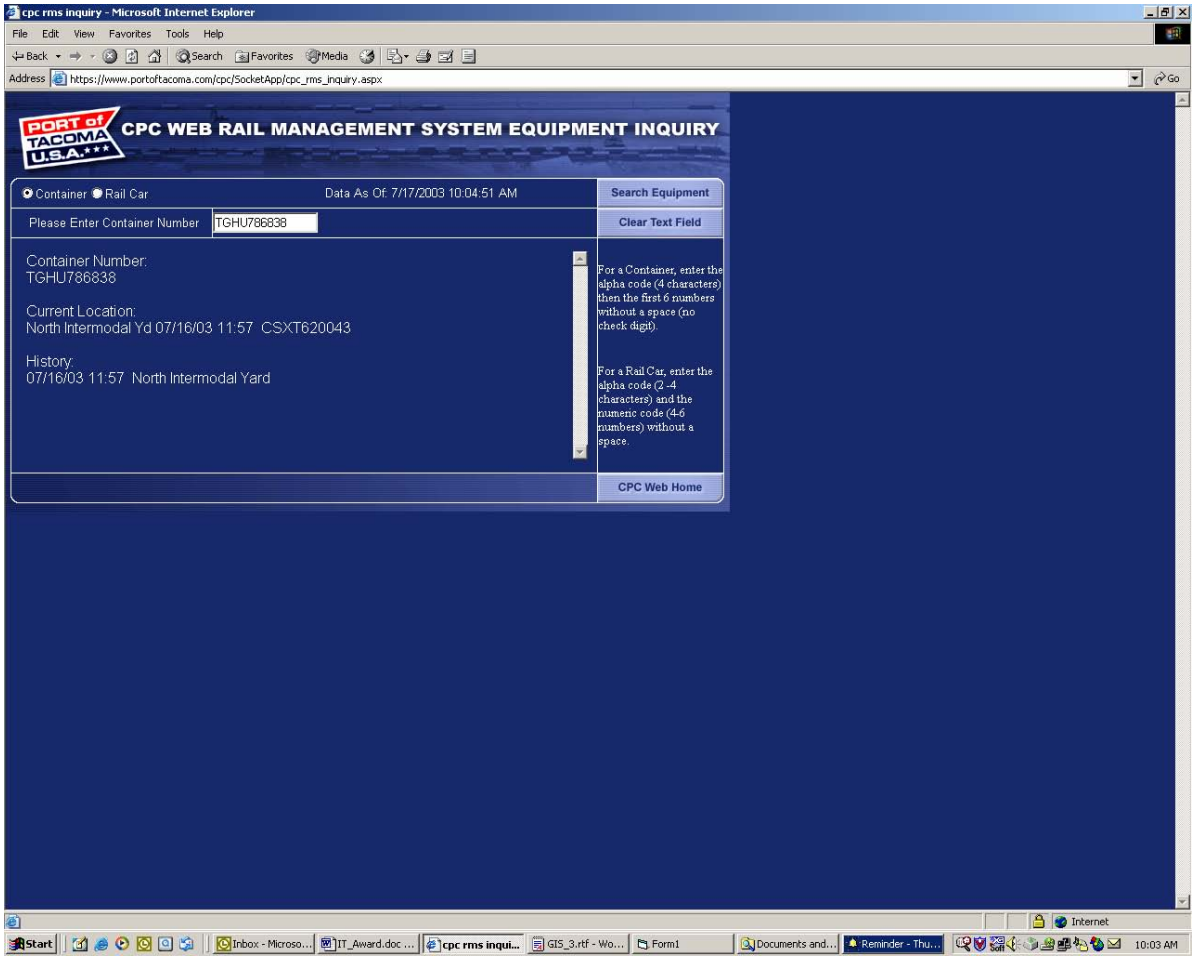

Figure 9 – Equipment Inquiry Screen, Container Data

<u>Rail Traffic / Car Location Tables</u>: The third component of the Web RMS consists of a component to organize and display the AEI rail car and container data produced by the Signal application in a meaningful tabular format in CPC Web RMS tables. Like other components of the CPC Web RMS, this component is restricted to certain users based on his/ her level of security. This component received the attention and support from not only the POT, but from other rail entities like Burlington Northern Santa Fe and Union Pacific because it helped solve some current inefficiencies. For instance, before this system was in place, a BNSF employee would have to manually create these tables, taking up to six hours and using some data collected by inspection. However, with this component in place, the system can create dynamic tables immediately from current data only minutes old. (Figure 10)

	Print	Close			NIM		BLAIR		Summary			
Train I.D.	Date	Time	Feet	Units	Feet	Units	Feet	Units	Total Feet	Total Units	Date	Time
LNWE708119	7/20/2003	1:10	0	0	0	0	0	0	0	0	7/20/2003	1:10
VSPOTAC819	7/20/2003	10:05	0	0	94	3	291	12	385	15	7/20/2003	10:05
ZCHCSSE817	7/20/2003	11:09	0	0	0	0	0	0	0	0	7/20/2003	11:09
SBPATAC117	7/20/2003	13:21	0	0	2,904	89	0	0	2,904	89	7/20/2003	13:21
SCHCTAC116	7/20/2003	15:12	0	0	0	0	557	22	557	22	7/20/2003	15:12
ZCHCSSE118	7/20/2003	19:47	0	0	0	0	0	0	0	0	7/20/2003	19:47
Subtotal	**7/20/2003**		**0**	**0**	**2,998**	**92**	**848**	**34**	**3,846**	**126**	**7/20/2003**	
LNWE708121	7/22/2003	2:28	0	0	265	8	0	0	265	8	7/22/2003	2:28
SBPATAC118	7/22/2003	3:21	0	0	2,542	76	0	0	2,542	76	7/22/2003	3:21
SCHCTAC218	7/22/2003	4:00	71	2	668	25	681	23	1,420	50	7/22/2003	4:00
MLYDINB122	7/22/2003	8:12	0	0	0	0	0	0	0	0	7/22/2003	8:12
BN 02 18	7/22/2003	10:00	0	0	189	0	0	0	189	0	7/22/2003	10:00
VCHCTAC819	7/22/2003	10:14	0	0	1,688	52	0	0	1,688	52	7/22/2003	10:14
SCHCTAC119	7/22/2003	13:55	0	0	76	3	0	0	76	3	7/22/2003	13:55
Subtotal	**7/22/2003**		**71**	**2**	**8,471**	**267**	**884**	**27**	**9,426**	**296**	**7/22/2003**	
VKCMPTL820	7/23/2003	1:04	0	0	0	0	0	0	0	0	7/23/2003	1:04
LNWE708122	7/23/2003	2:20	0	0	300	9	94	2	394	11	7/23/2003	2:20
ZSPOSSE122	7/23/2003	8:59	0	0	0	0	0	0	0	0	7/23/2003	8:59
SCHCTAC319	7/23/2003	12:14	0	0	3,489	119	2,448	81	5,937	200	7/23/2003	12:14
SBPATAC119	7/23/2003	12:46	0	0	6,070	206	0	0	6,070	206	7/23/2003	12:46
MDENLAU122	7/23/2003	16:03	0	0	0	0	0	0	0	0	7/23/2003	16:03
Subtotal	**7/23/2003**		**4,060**	**116**	**19,280**	**614**	**3,818**	**116**	**27,158**	**846**	**7/23/2003**	
Subtotal	**7/28/2003**		**1,052**	**30**	**4,045**	**129**	**770**	**22**	**5,867**	**181**	**7/28/2003**	
Grand Total			**21,247**	**534**	**72,623**	**2251**	**18,476**	**561**	**112,346**	**3346**		

Figure 10 – Westbound Flow Table

A particularly useful table shown on the Train Summary Page (Figure 11) displays a list summary of inbound trains and a summary of the various rail yards around the POT. If a user clicks on a TRAIN_ID number, a detailed train summary page appears with information displayed in a tabular format. As a result, users will be able to see information such as the train's ETA date, ETA time, car length and more. Similarly, if a user clicks on the detail button within the rail yard header, a brief summary on that particular rail yard appears in tabular format. Furthermore, the ability to produce two additional tables in near real-time, 'Tacoma Intermodal Equipment Flow' and 'Tacoma Westbound Plan' was a great benefit to the POT and other rail entities like Burlington Northern Santa Fe and Union Pacific.

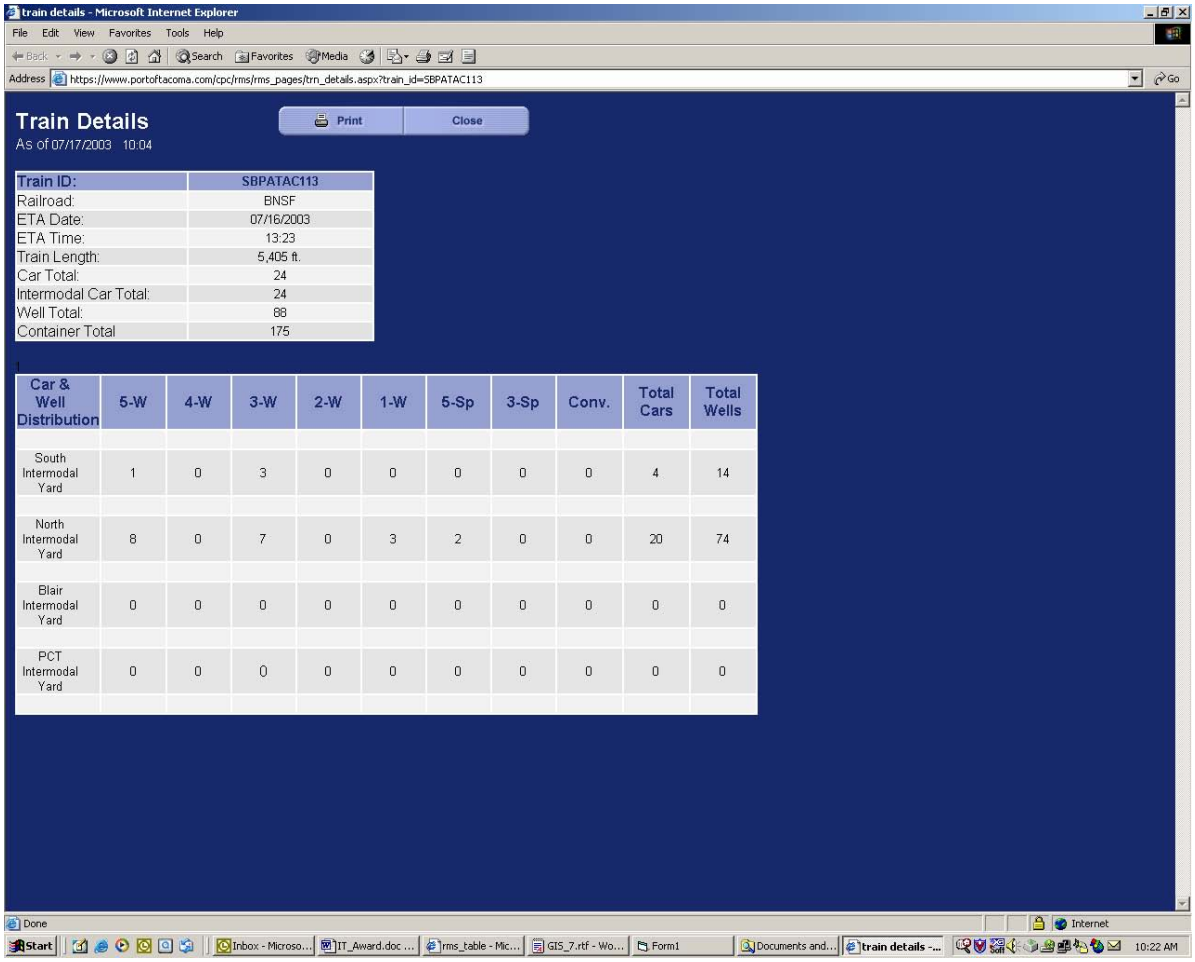

Figure 11 – Train Summary Page

Map Details and Pictures of Port Layout: While organization of tabular data into a meaningful format was an important result in the creation of the web-based RMS, another underlying goal was to enable the POT and associated entities to see the tabular data organized around in a spatial framework.

Based on the user's level of security one of two maps will be displayed, a basic map, which displays rail assets within the POT and an enhanced map, which displays both rail assets as well as other assets that are associated with the POT. (Figure 12) Each map has its own purpose, and thus conveys a different story. For example, a primary function in the Web RMS is to assist POT Rail Operators as well as various rail entities like BNSF and UP by integrating rail car and container data exported by Signal CC software with the existing POT GIS. With the RMS Map, users will be presented with a wide selection of interactive tools, like "zoom in," "examine yard," and "yard utilization." With these tools, users will be able to interrogate this interactive map. For example, by selecting the "Examine Yard" tool, the user will be able to interrogate a particular yard. As a result, this application will return a summary of the yard's utilization. Likewise, by selecting the track utilization tool, the user will be able to interrogate a particular track. As a result, this application will return a summary of the tracks utilization.

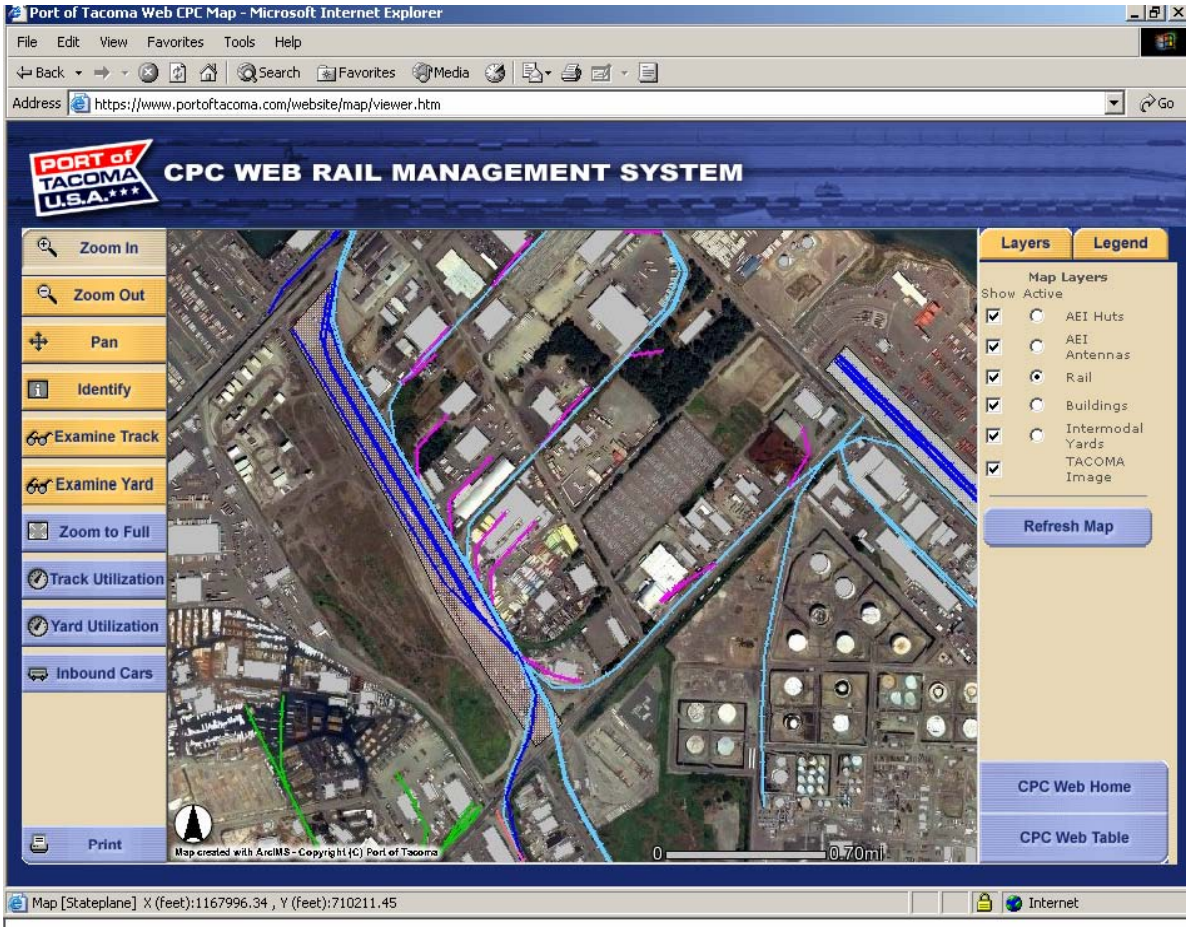

Figure 12 –

During the design requirements phase of the CPC RMS Map component, the POT realized that a similar component to the Web RMS Map could be used for the purpose of asset management. As a result, the 'Port Wide Department Map' was developed and integrated into the CPC RMS. (Figure 13)

Figure 13 – Port Wide Department Map

The primary purpose for 'Port Wide Department Map' is to assist decision support personnel, such as maintenance, real estate, and engineering. On "Port Wide Department Map', users will be able to display various data layers such as utility lines, sewer lines, parcels of property, and land ownership. Similar to 'Web RMS Map', users will be presented with a selection of interactive tools, which will allow him/her to drill down and interrogate different aspects of the map. For example, if the POT was doing some renovations to the North Intermodal Yard, the maintenance department can immediately locate all the gas lines, water lines, power lines, and fire lines thus minimizing construction mistakes.

C. Hardware and Software Used

Software Used:

The following CPC software components run under the Windows NT operating system:

- Phase One. Database: Microsoft SQL, Web Application: Cold Fusion
- Phase Two: Database: Proprietary, Server Application: C++
- Phase Three: Database: Microsoft SQL, Web Application: ASP.NET

Hardware used:

All software runs on Dell Servers:

- Intel 5oo Mhz chips
- 512 Megabytes RAM
- Two Hard Disks, 8 Gigabytes and 46 Gigabytes

D. Project Cost

Phase One:	Approximately 6 man-months internal labor only. No hardware cost.	
Phase Two:	Signal application:	$121,000
Phase Three:	CPC RMS:	$ 50,000

E. Performance Measures

Labor expended for weekly eastbound rail planning

Accuracy of data

Age (timeliness) of data

Accessibility of data

F. How the Project Fulfills the Award Criteria

The Central Point of Control Project completely satisfies all five award criteria.

The system provides measurement tools and data for decision-making that were not available prior to its implementation. It is now used daily in the train planning loading and unloading processes as well as in determining labor requirements needed for the next day's projected activity in the Intermodal yards and the related switching services.

Each phase of the project incorporates separate and unique technologies that were successfully integrated into a robust, functional and highly valuable tool for the Port of Tacoma and its customers.

The system provides highly reliable data in an automated and timely fashion and has saved significant labor in the rail planning and tracking for Port of Tacoma staff, mainline railroads, and Tacoma Rail. The marrying of electronic data available through the implementation of AEI and EDI technologies represent a unique and creative approach to meeting the initial requirements.

With carefully planned customization, an off the shelf application was integrated into the system, demonstrating creativity and greatly reducing development costs. In addition to greatly reducing the labor involved in rail planning, Port customers now have instant access to more data and in greater detail about equipment and container status in near real time.

The transferability of the technology applied in the project is evident by the expansion of the CPC RMS Map component to include asset management. The resulting Port Wide Department Map demonstrates the adaptability of the system to meet a variety of decision support requirements.

Conclusion

The CPC RMS system has impressed users with its ability to instantly provide information that formerly required up to six person-hours per day of manual data manipulation to accomplish. The system allows constantly changing data streams to be managed automatically on a real time basis. The system itself is totally automatic. There are no required keystrokes. Customized reports can be produced from the program upon request. Since all input data are date and time stamped, reports can be accessed that measure switching performance, provide historical data on rail car or container arrivals and departures as well as current car or container location. Rail car capacities and availability can be instantly accessed for load-out planning. Rail infrastructure utilization is constantly displayed. Container ownership based on rail billing data is available as well as the data specific to each container (size, booking number, etc.). Access to all of this data has increased the efficiency of the port and its customers.