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16. ABSTRACT

This project was started to develop a user friendly database to house the data from the statewide system of Weigh in Motion sites. The project was ended early when a decision was made to put this data into the Caltrans Performance Management System Database (PeMS).

17. KEY WORDS Weigh in Motion, Truck Data, Warehouse	18. DISTRIBUTION STATEMENT	
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Final Report

Truck Data Warehouse
Caltrans Project
(7/12/2006 - 6/30/2007)

MOU 76 (Fnd Acct 511821)
Ref# : 43A0068.76

Final Report

on

Caltrans Project: “Truck Data Warehouse”

1. INTRODUCTION

The primary objectives for the Caltrans project: “Truck Data Warehouse” (TDW) include the following:

- Produce a feasibility study report for the effort in automating the process of storing, retrieving, analyzing and generating reports based on the Caltrans Weight-in-Motion (WIM) truck data.
- Develop an expandable prototype database system for truck data collected at Caltrans WIM stations throughout the state of California.
- Develop a set of user tools to generate various reports for different stakeholders. The tools will be accessible through web interfaces.

We have accomplished all of the aforementioned objectives. Beyond these requirements, the CSUS team developed a Google Earth based geographic information interface to enhance WIM data accessibility to certain stakeholders of the system.

The infrastructure for the TDW system is a Pentium dual core workstation running a Linux operating system (SUSE 9) [4]. The computer is connected to the College of Engineering and Computer Science network and is protected behind the firewall. The database system used to support the applications is Oracle 10g [3]. The user tools are developed using JSP technology [1]. All the technologies utilized in developing the TDW system are in compliance with the Caltrans IT policies.

This final report intends to provide a panoramic view of the functionality of the TDW system from the user’s perspective. The remainder of the report is organized as follows. Section 2 describes the top level interfaces for the TDW system. Section 3 discusses the Oracle Discoverer Viewer interface and the types of graphic reports it supports. Section 4 focuses on the web page interface for generating various reports. Section 5 deals with the Google Earth based geographic information interface. Finally, Section 6 concludes the report.

2. TOP LEVEL VIEWS

The TDW system utilizes the user-name/password authentication in the login page, which is captured in a screen shot in Figure 1. The login page is located at the URL below:

http://eagle.ecs.csus.edu:7781/new_wim/wimlogin.jsp

Once a user logs in, the top level views of the system consist of the following (Figure 2):

- Web page interface.
- Oracle Discoverer Viewer interface.
- Geographic information interface.

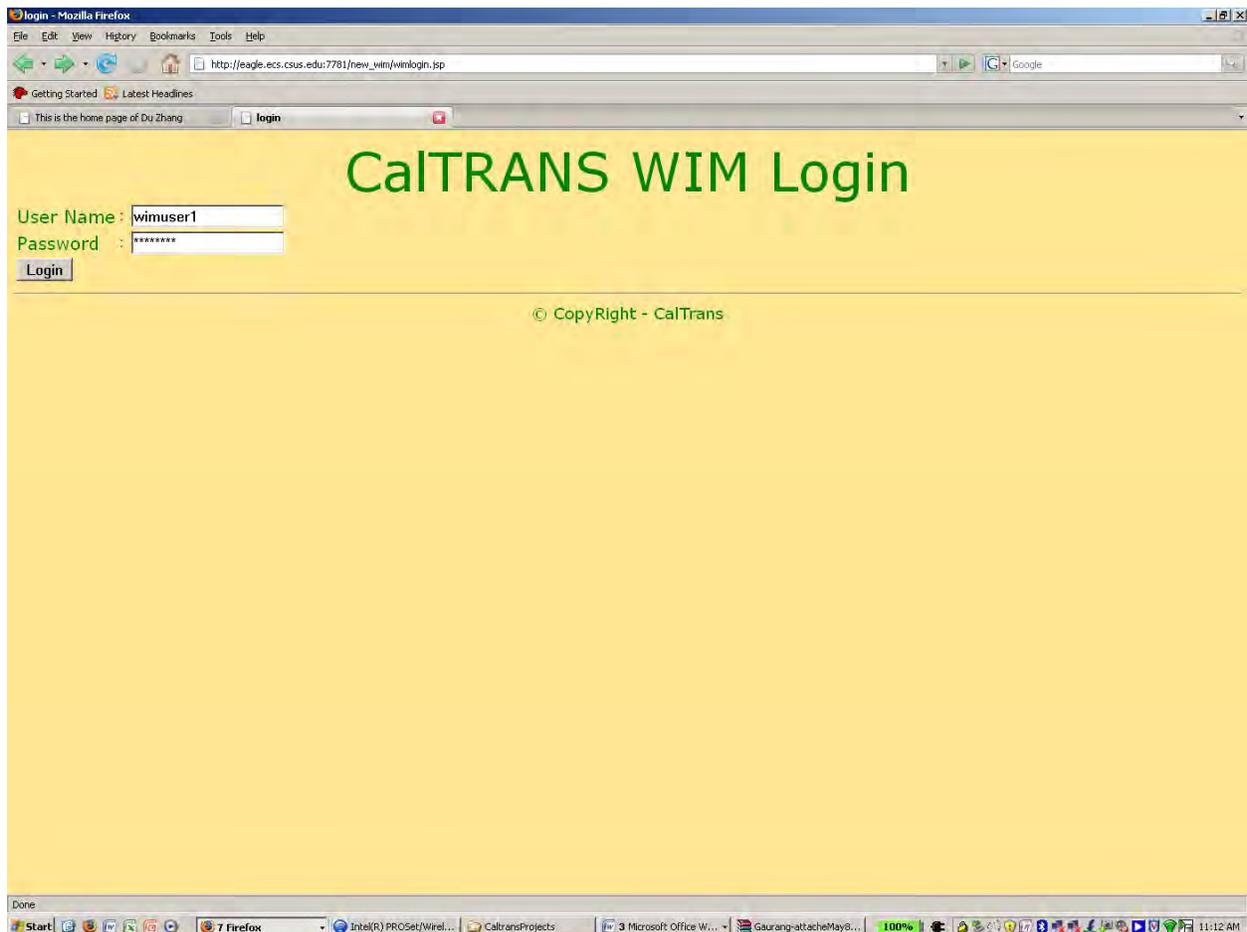


Figure 1. Login page.

There is a URL for each of the first two interfaces. By clicking a link, a user chooses to pursue the report generating process using the selected interface. For the geographic information interface, it is essentially embodied in the state of California map, where each red dot signifies a different WIM station in the state. By clicking a red dot, the summary information will be

displayed. If a user would like to drill down to the details pertaining to that particular station, she/he can just follow the link in the summary pane.

The map in the geographic information interface has several different view formats (satellite, hybrid, plain map). It can be zoomed in and out.

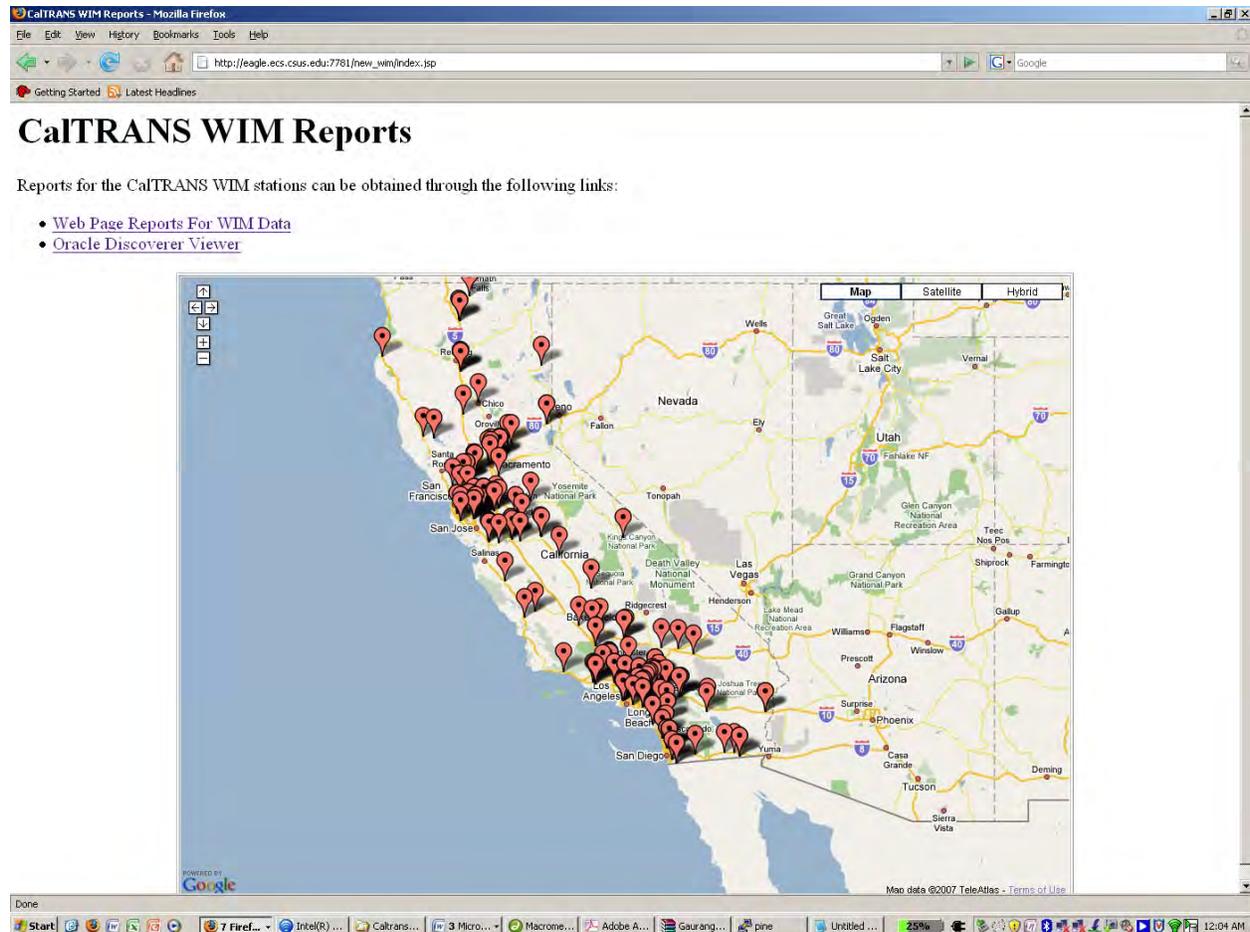


Figure 2. Top level views.

3. ORACLE DISCOVERER VIEWER INTERFACE

One of the major benefits using Oracle Discoverer Viewer (ODV) is that it can generate reports in many different graphic formats, providing easy-to-comprehend visual effects [2]. This is helpful in many different circumstances such as showing trending information or qualitative

description of data. By following the right link in Figure 2, a user is led to ODV page, as shown in Figure 3.

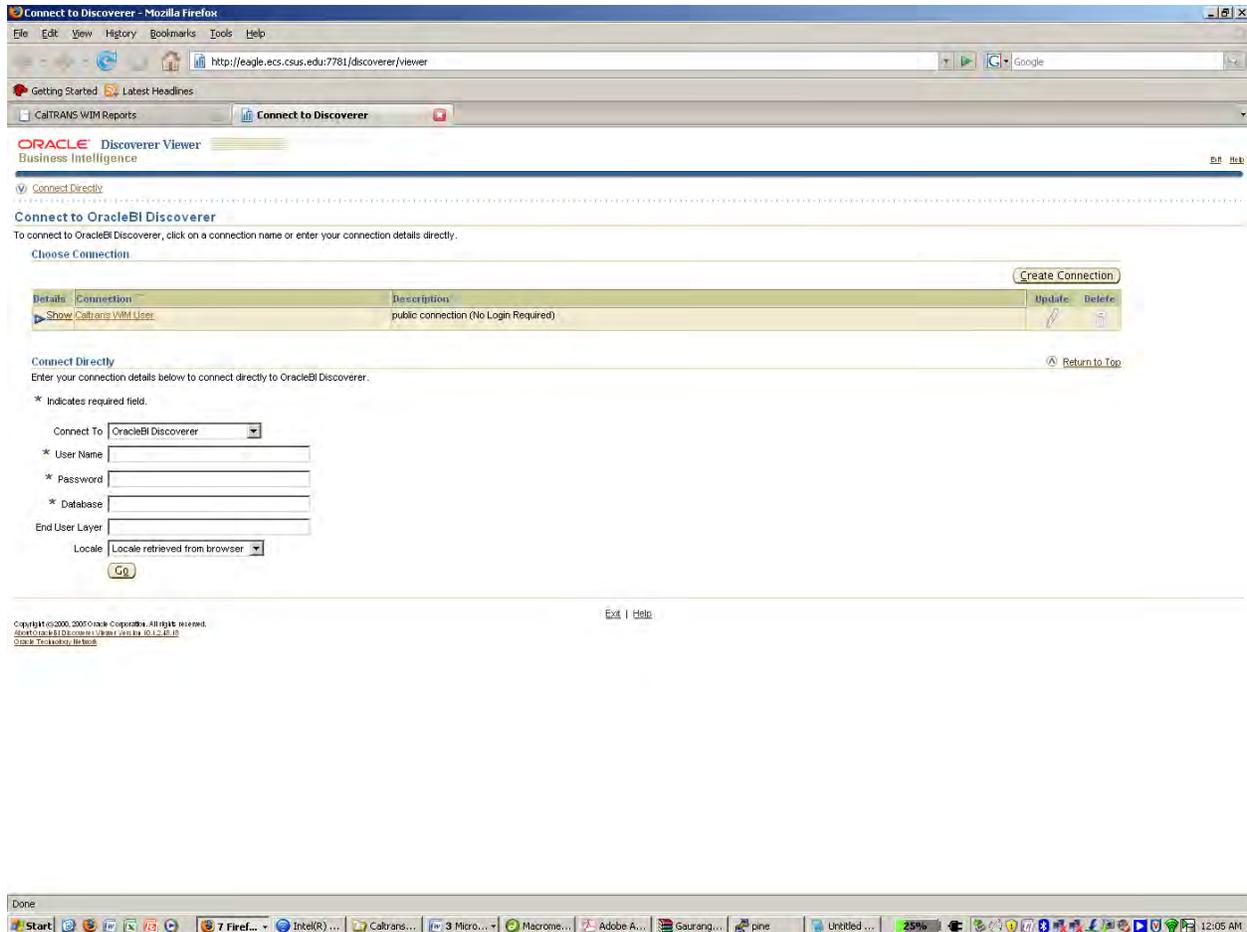


Figure 3. Oracle Discoverer Viewer.

As can be seen in Figure 3, ODV has its own user authentication. A subset of reports has been developed in the ODV for demonstration purpose. Figure 4 lists the report categories in the ODV:

- Avg_Volumes.
- Exceptionally_Heavy_Vehicles.
- Loaded_Empty_Report.
- Station_Information.

- Truck_Volume_per_Station.
- Truck_Volume_per_Year.
- Violations.
- Volume_st_name_date.

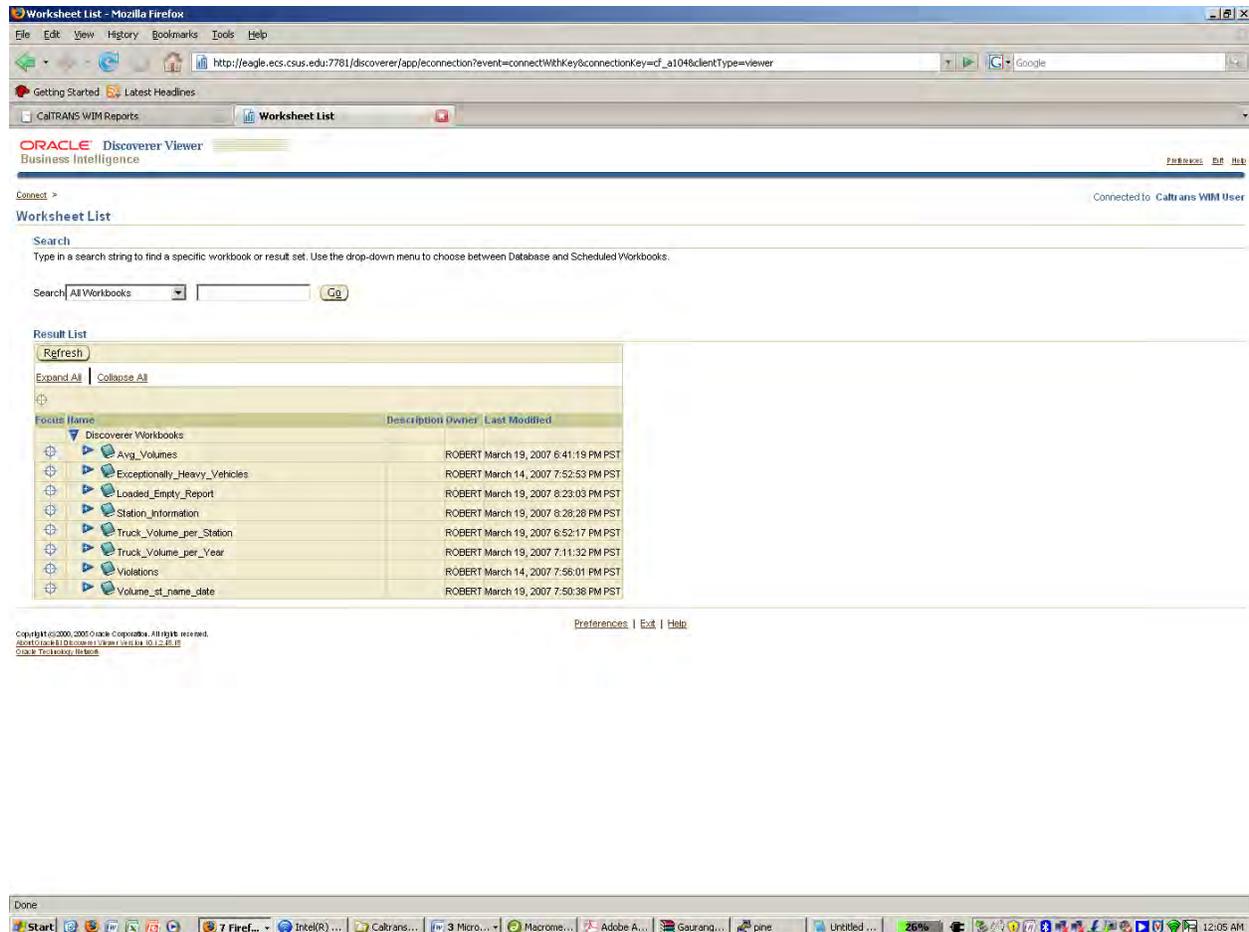


Figure 4. Report categories in Oracle Discoverer Viewer.

Each report category can be expanded to display all the specific reports in the category. Figure 5 offers a snapshot where all eight categories are expanded to include specific reports in each and every category. Currently, the following is what has been developed for demonstration purpose.

- For Avg_Volumes category, there are three reports: weekday volume, weekend volume, and average day volume.

- For Exceptionally_Heavy_Vehicles category, there is one report thus far: exceptionally heavy vehicles.
- For Loaded_Empty_Report category, there are four reports: empty loaded trucks, empty loaded trucks by hour, empty loaded trucks by weekdays, empty loaded trucks by weekends.
- For Station_Information category, there is just one report so far: station information.
- For Truck_Volume_per_Station category, one report: truck volume by stationname.
- For Truck_Volume_per_Year category, one report: truck volume per year.
- For Violations category, one report: total violations.
- For Volume_st_name_date category, there are five reports: truck volume classification, truck volume by lane and class, speeds by hour, truck volume per hour and class, and speeds by class.

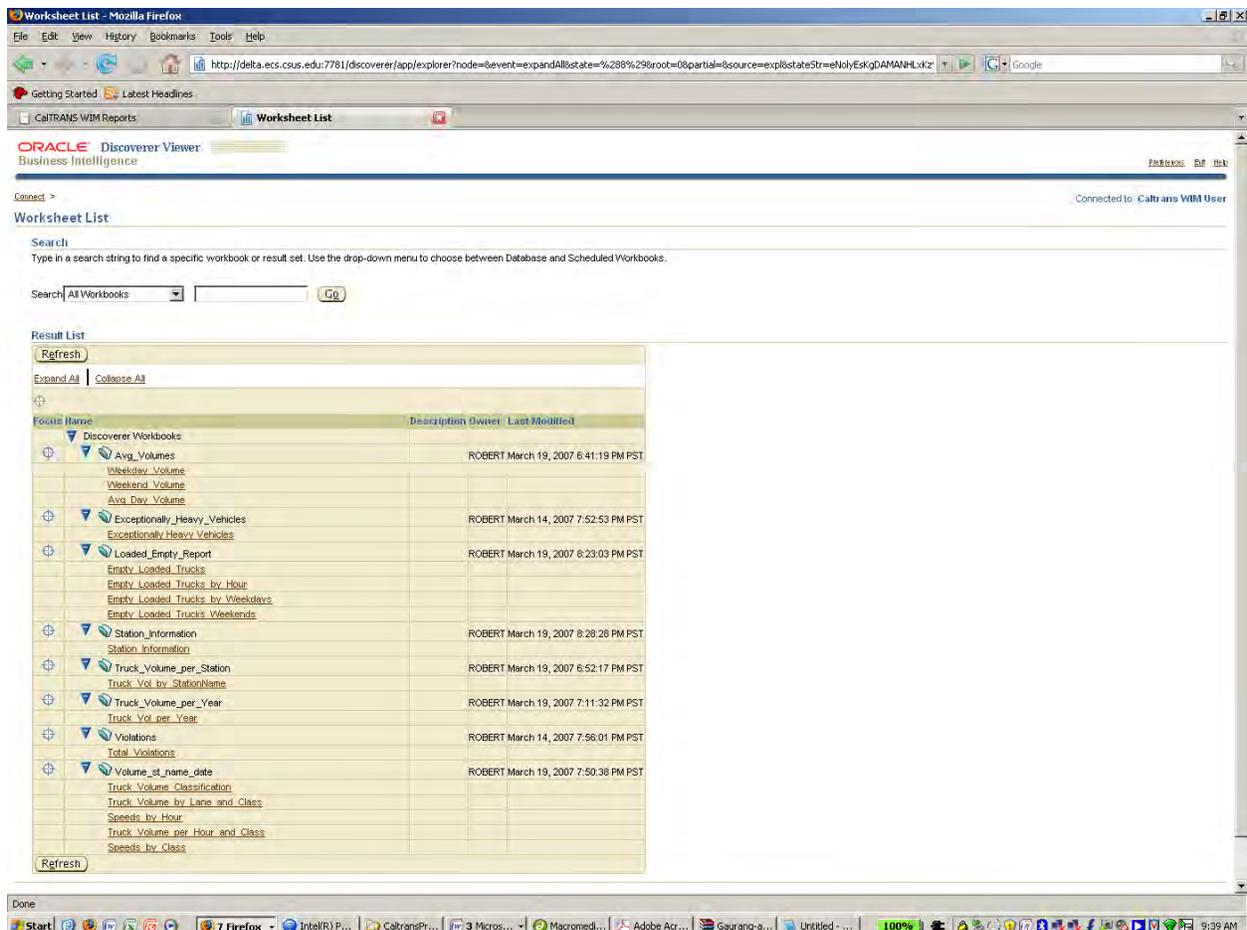


Figure 5. Specific reports in a particular category in Oracle Discoverer Viewer.

After selecting a particular report to pursue, a user may need to provide necessary input parameters to a query. For instance, for Weekday_Volume report in the Avg_Volumes category, a user needs to enter start and end date information, and the station name for which information is sought. Figure 6 depicts the query input page for the above report.

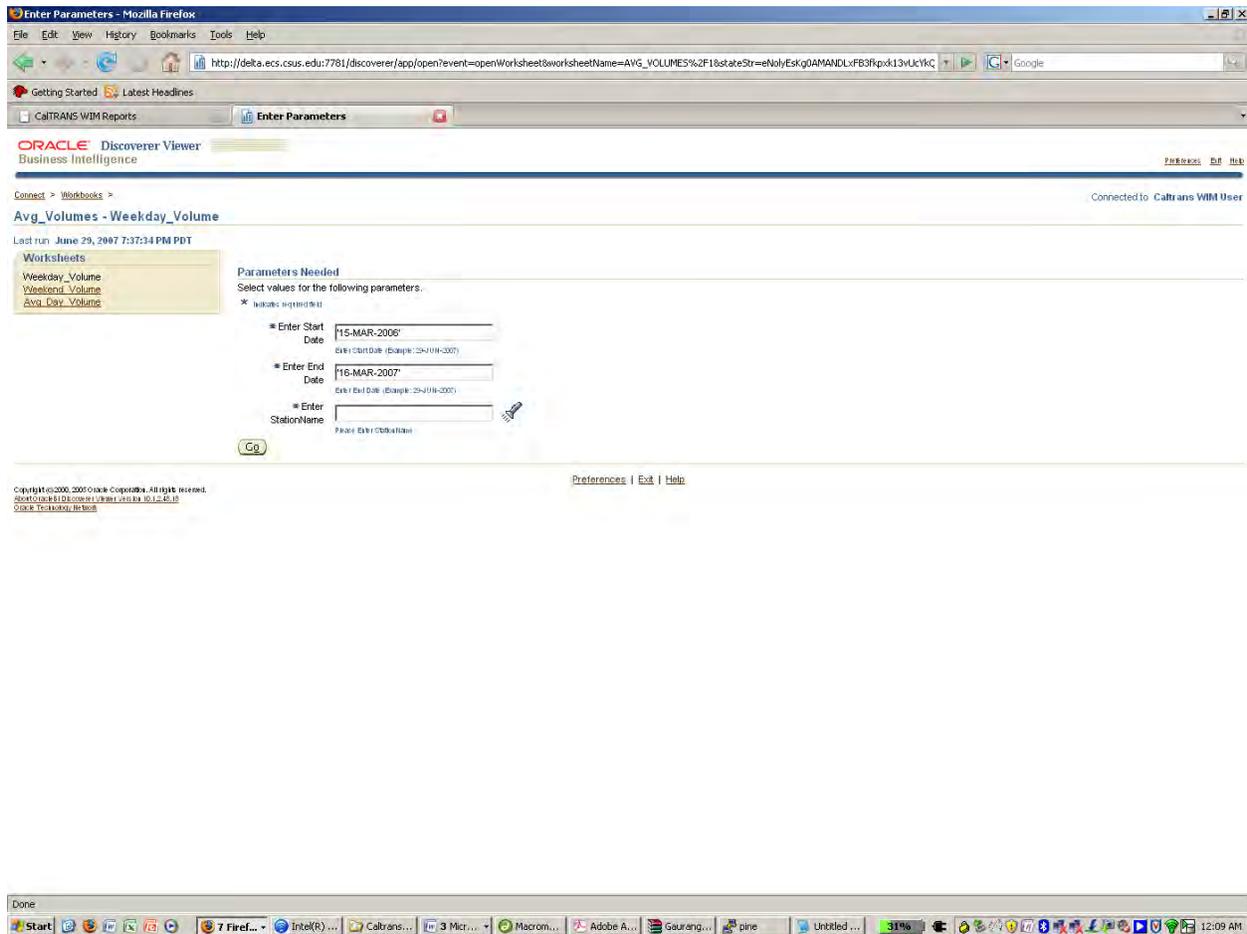


Figure 6. Input to query before report generating in Oracle Discoverer Viewer.

Figure 7 captures an example query seeking information for one of the stations in LA (LA 710 (NB)) for the duration from April 10 to April 16, 2006.

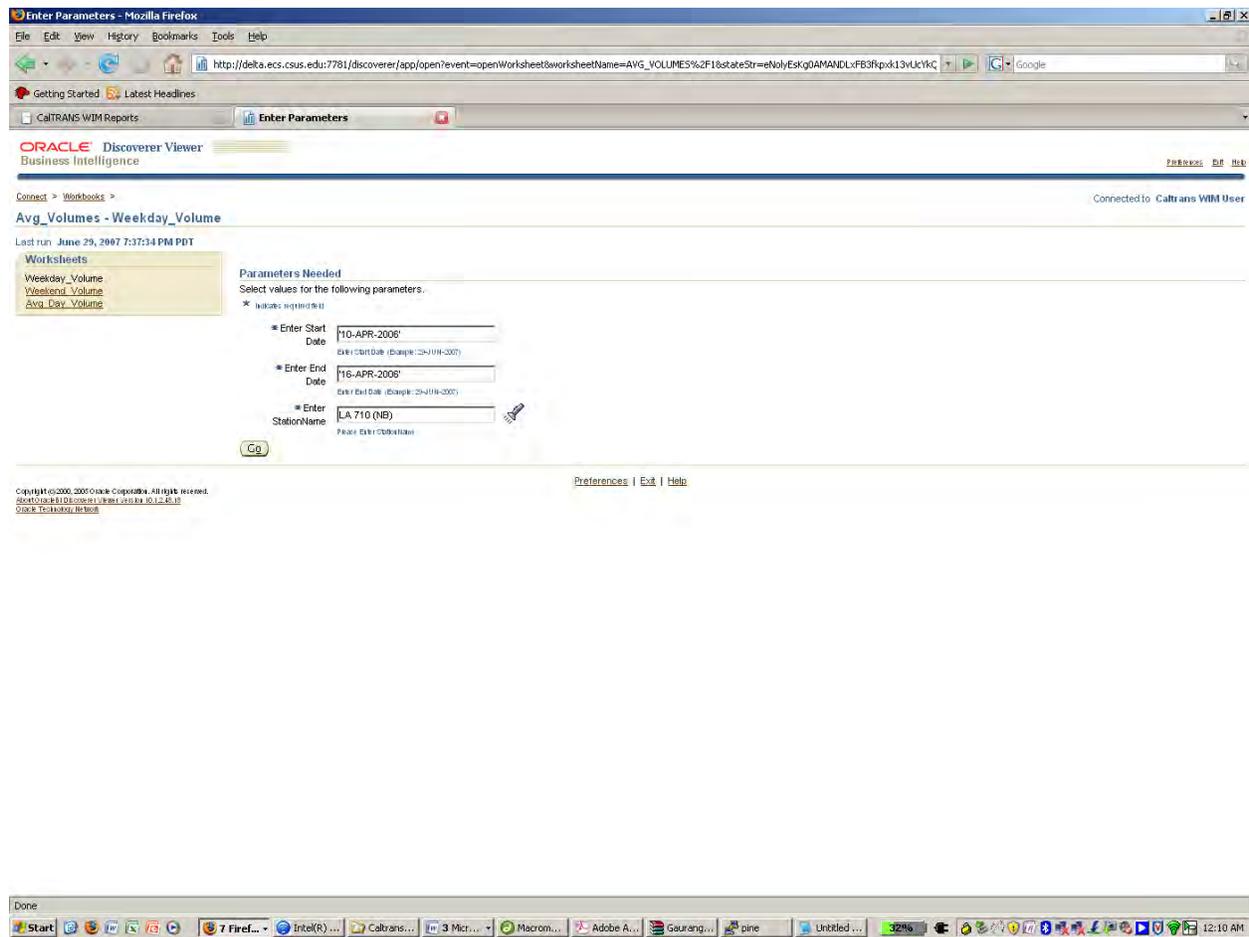


Figure 7. Entering station name in Oracle Discoverer Viewer.

ODV provides a rich set of different graphic charts that can be used to present different perspective in the query results. These include:

- Vertical bar chart.
- Horizontal bar chart.
- Pie chart.
- Line chart.
- Area chart.
- Combination.
- Scatter plot.
- Stock.

- Circular charts.
- Pareto chart.
- 3D chart.

Figures 8 through 18 illustrate various types of charts ODV supports for query result presentations.

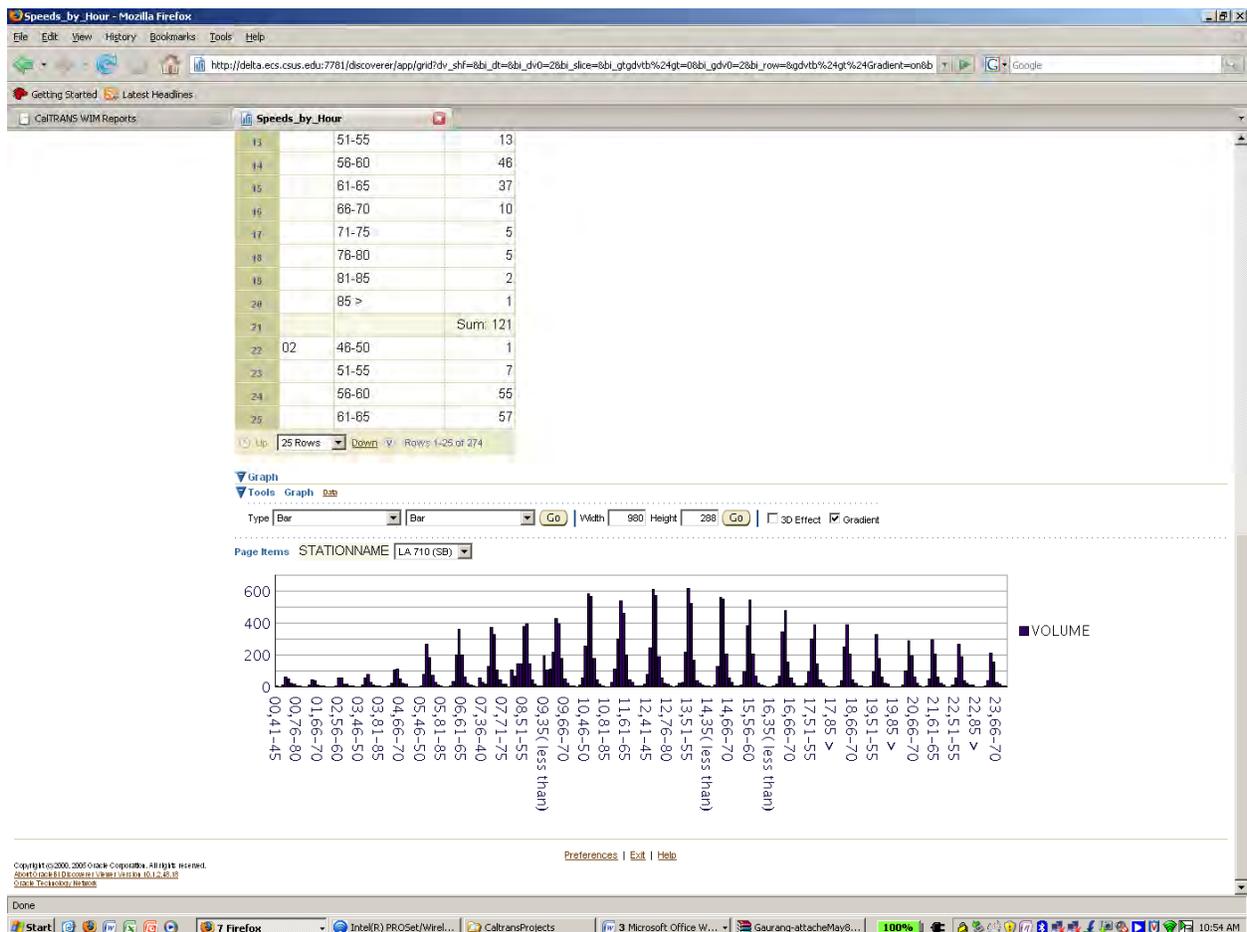


Figure 8. Vertical bar chart in Oracle Discoverer Viewer.

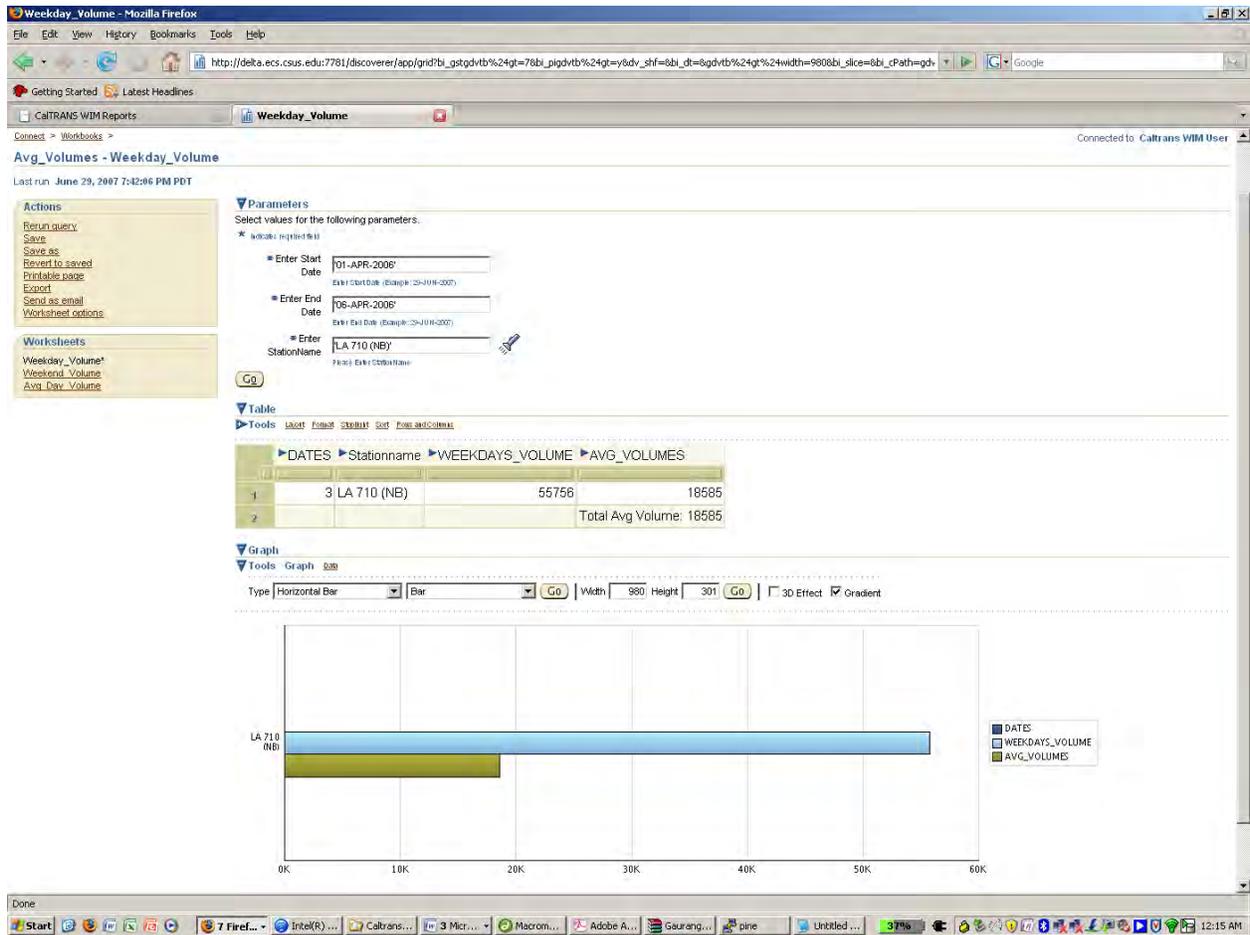


Figure 9. Horizontal bar chart in Oracle Discoverer Viewer.

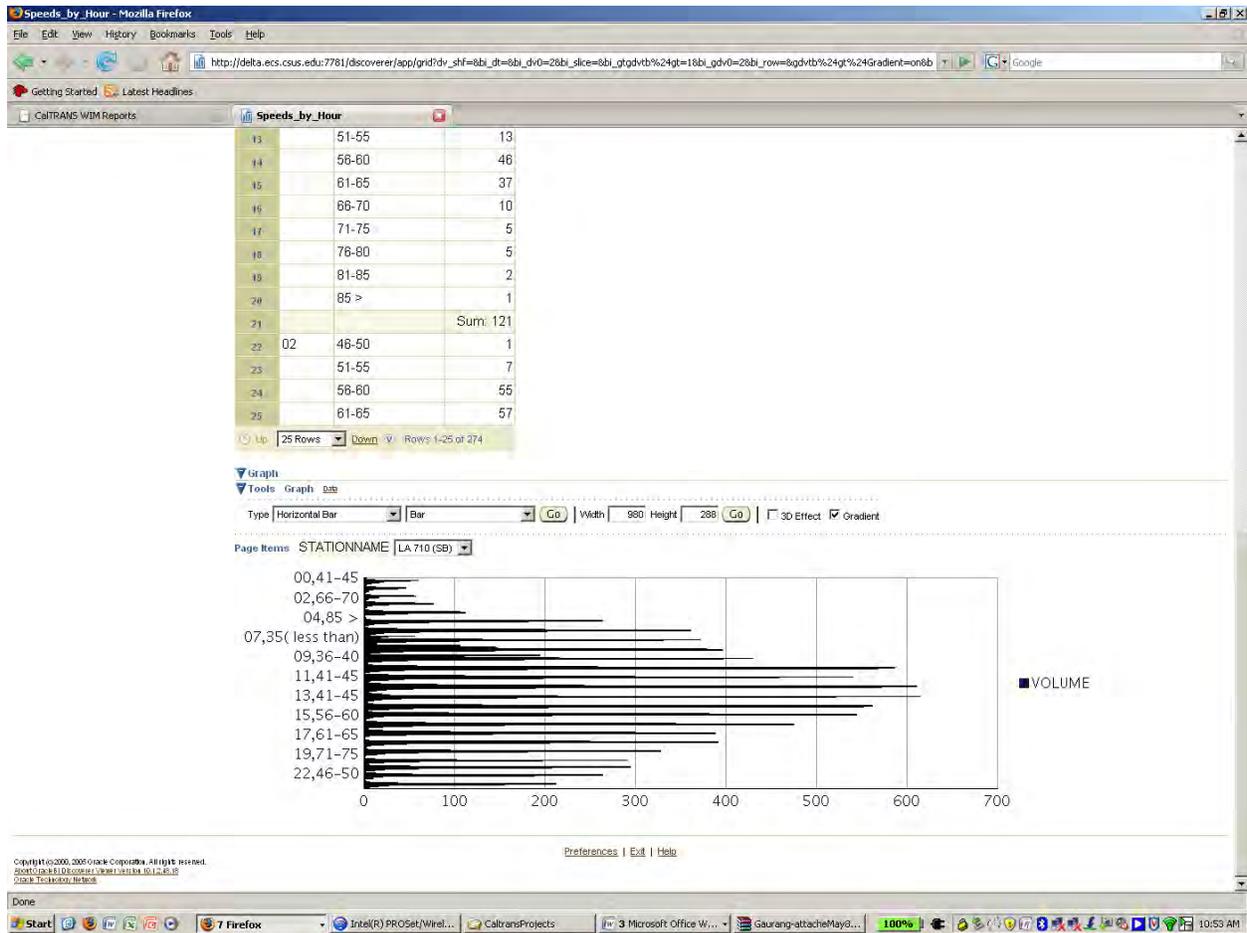


Figure 10. Another horizontal bar chart example in Oracle Discoverer Viewer.

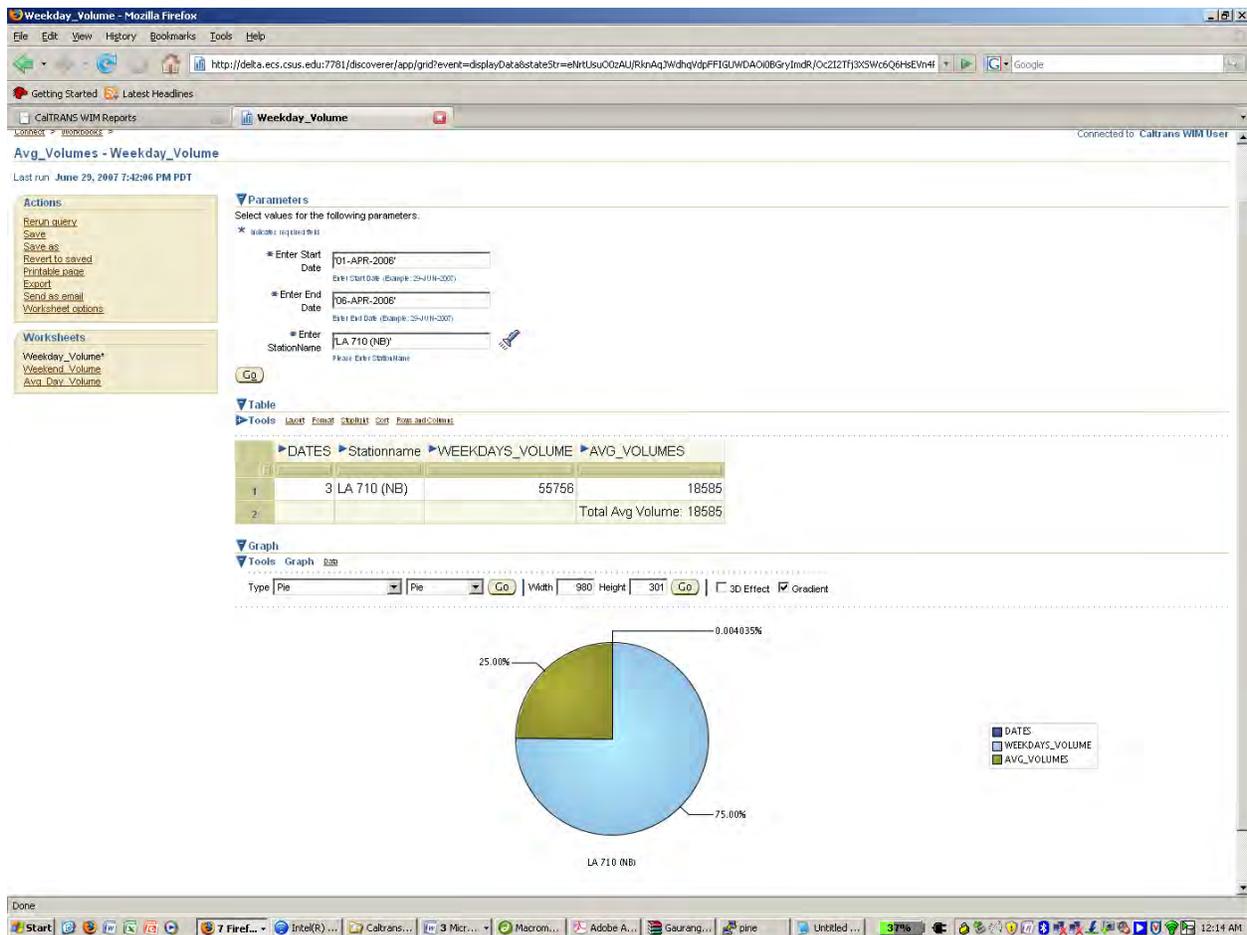


Figure 11. Pie chart in Oracle Discoverer Viewer.

ODV offers a number of options with regard to the query results (see Actions box in Figure 11). A user can

- Rerun query.
- Save.
- Save as.
- Revert to saved.
- Convert results to a printable page.
- Export.
- Send as email.
- Choose other worksheet options.

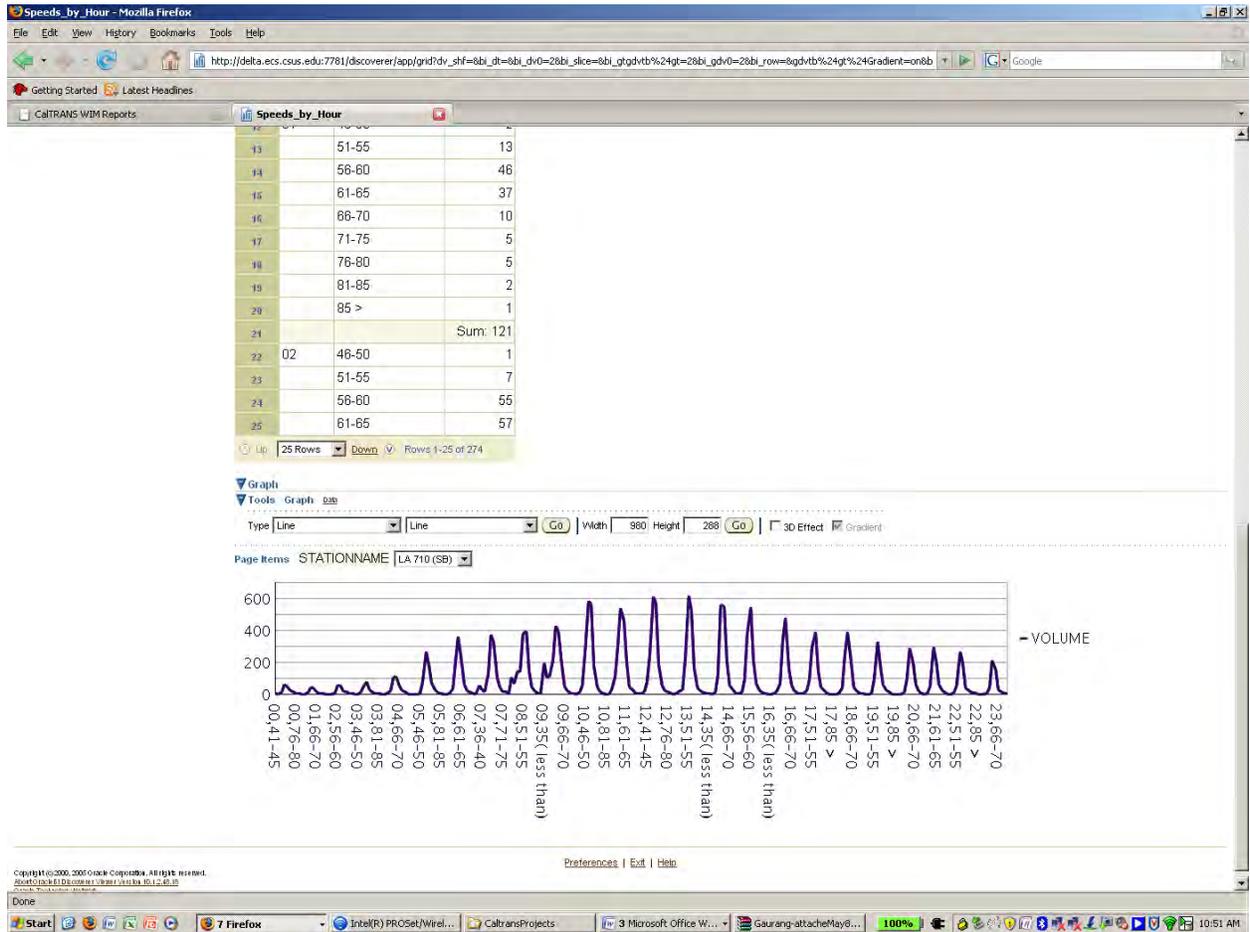


Figure 12. Line chart in Oracle Discoverer Viewer.

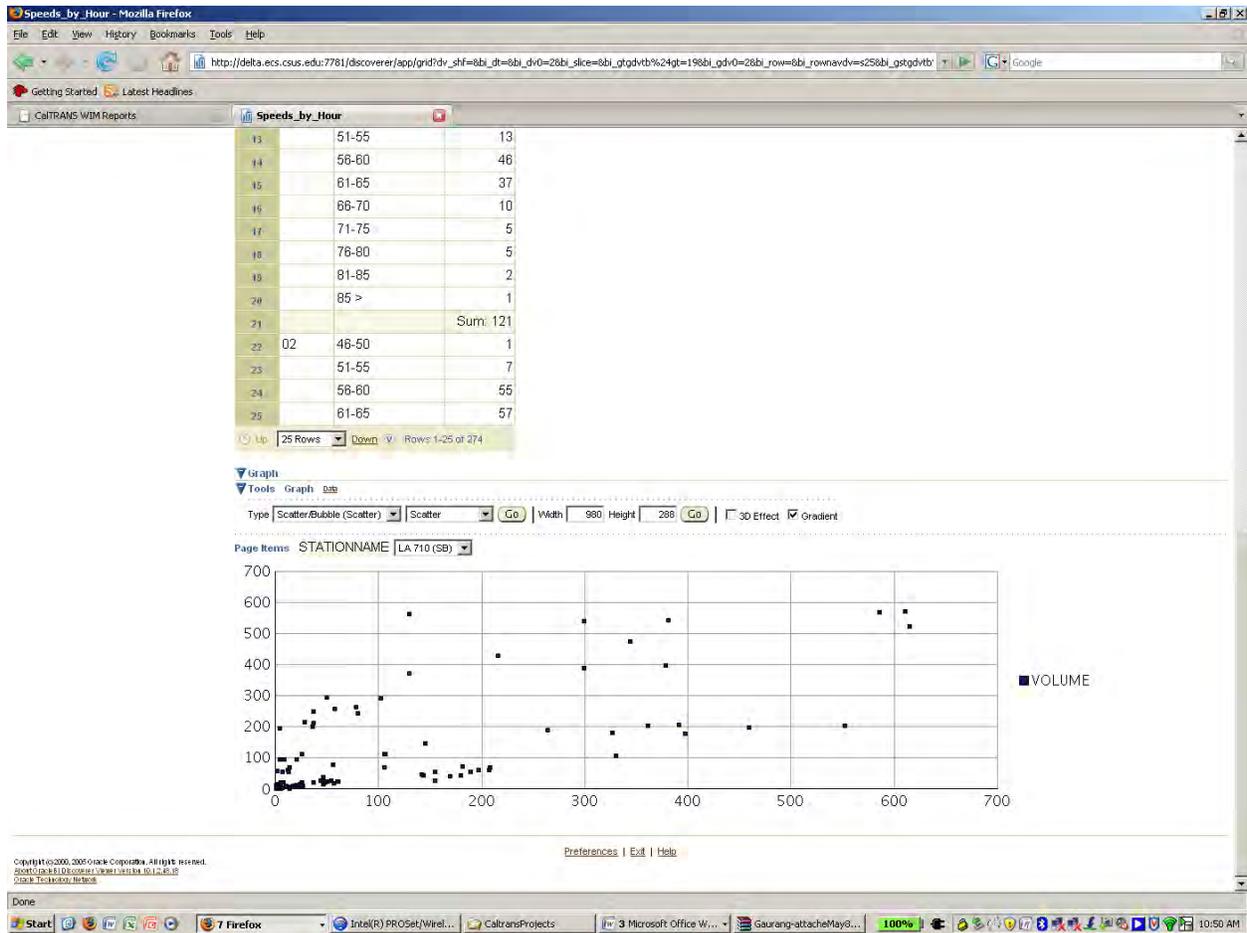


Figure 13. Scatter plot in Oracle Discoverer Viewer.

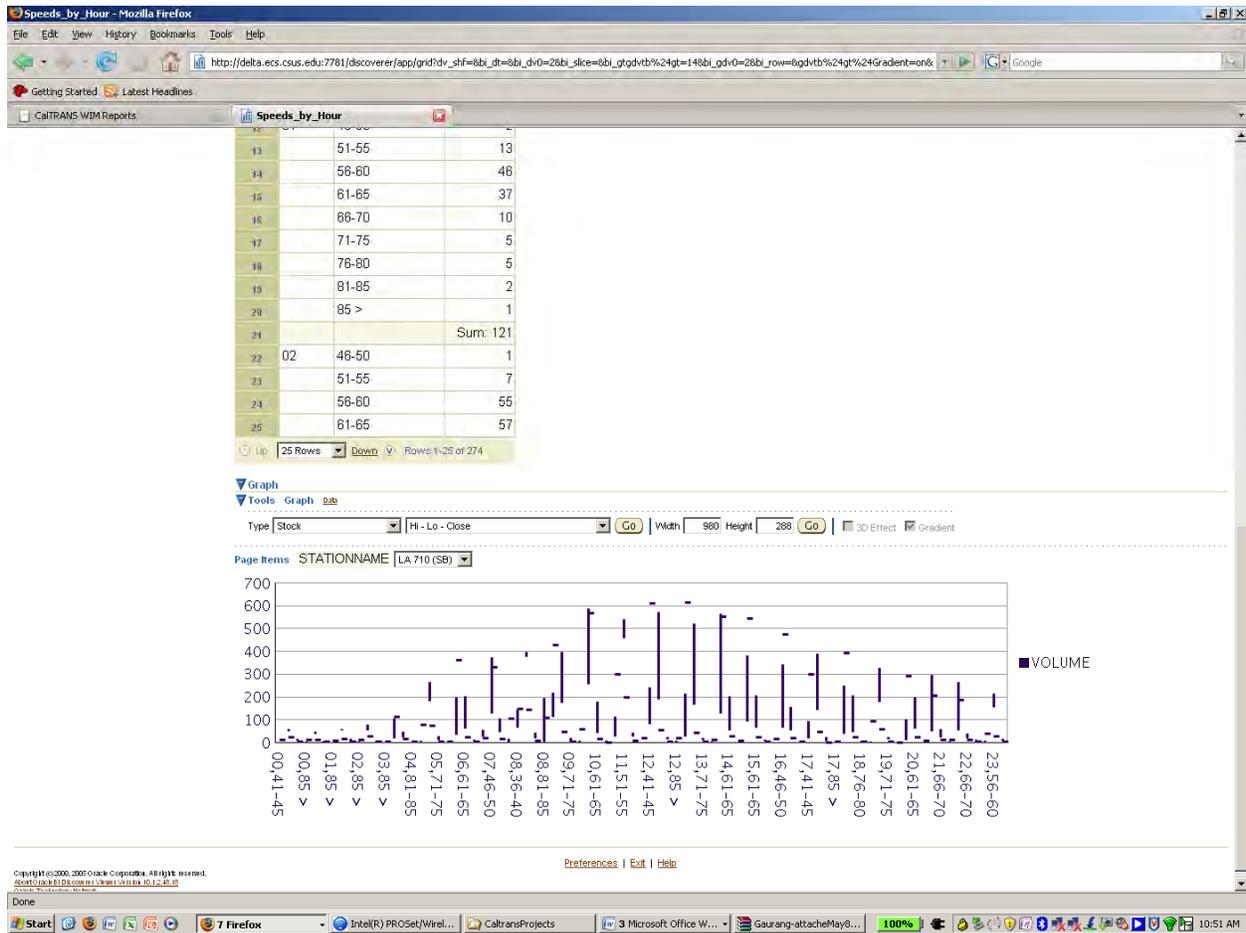


Figure 14. Stock chart in Oracle Discoverer Viewer.

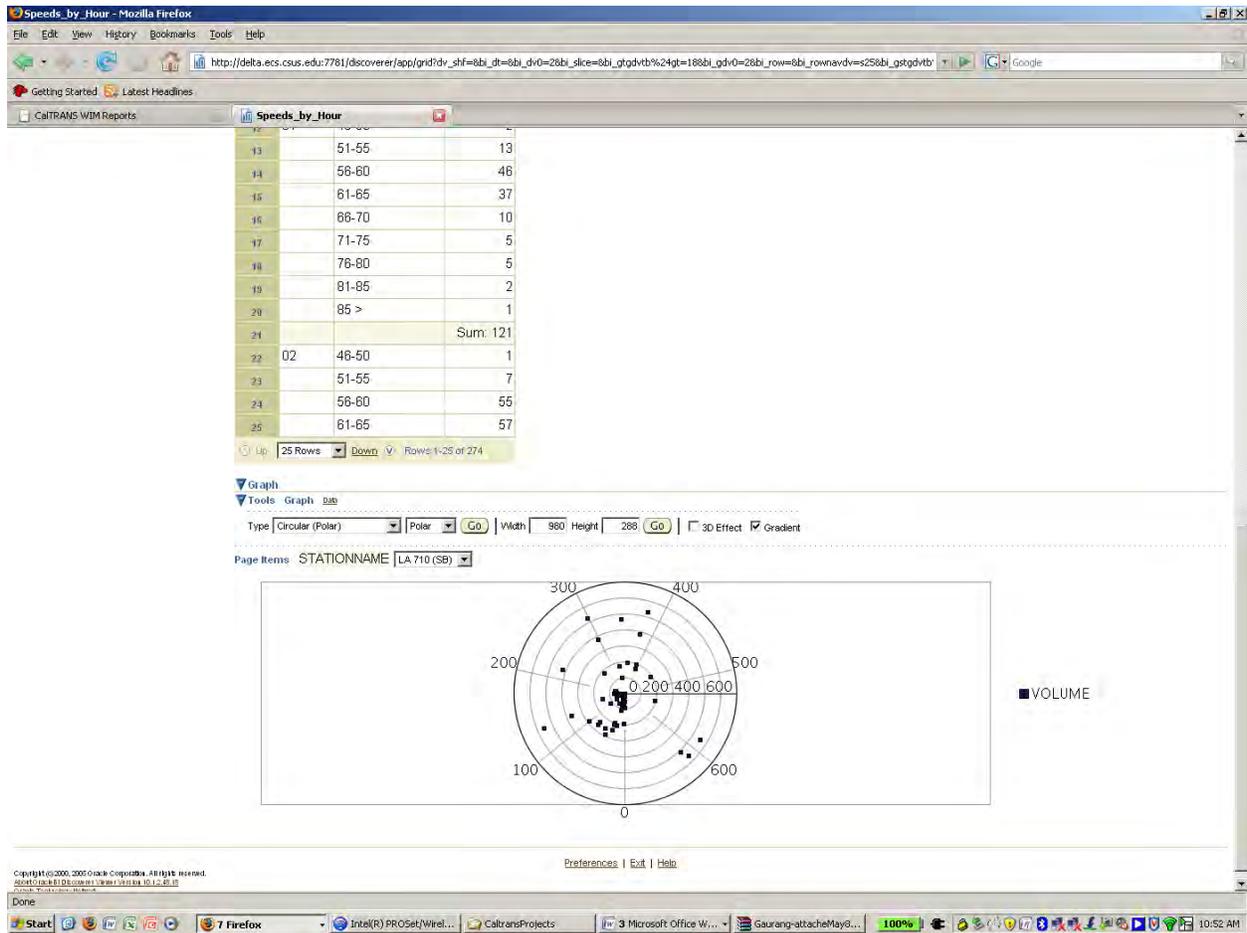


Figure 15. Circular chart in Oracle Discoverer Viewer.

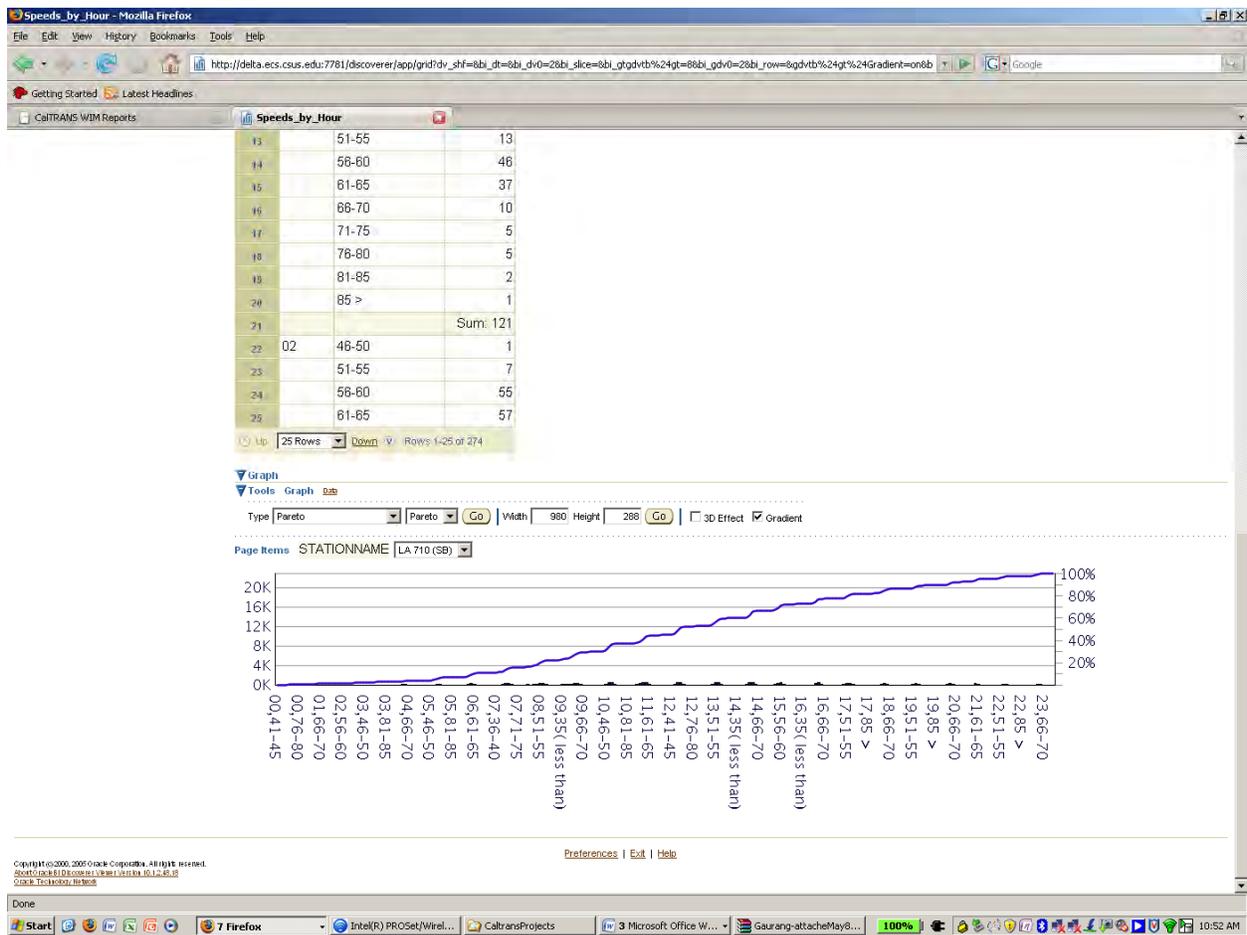


Figure 16. Pareto chart in Oracle Discoverer Viewer.

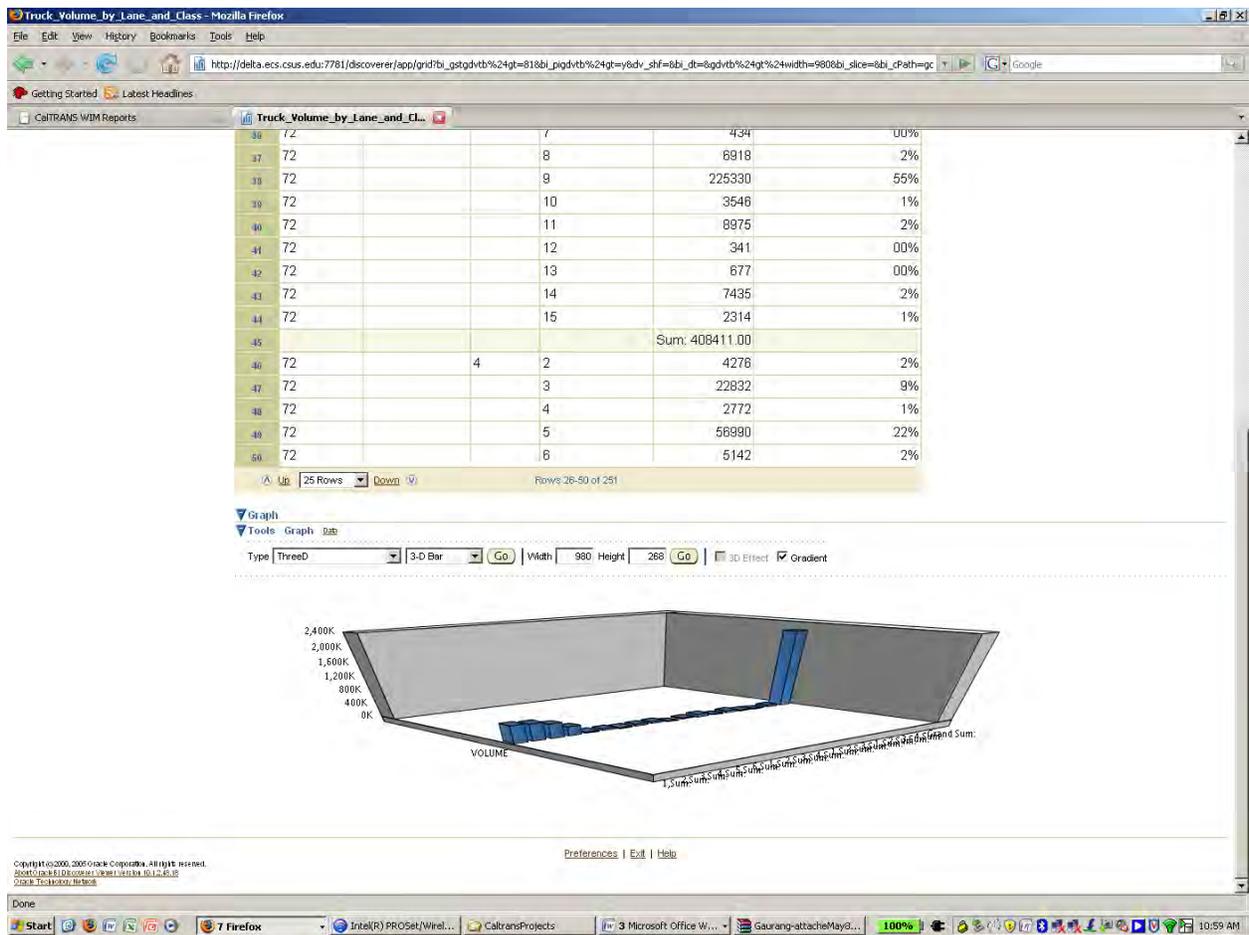


Figure 17. 3D bar chart in Oracle Discoverer Viewer.

The screenshot displays the Oracle Discoverer Viewer interface. A search dialog titled "Search and Select: StationName" is open, allowing the user to filter station names. The search criteria are set to "Contains" with the text "LA 710 (NB)". The dialog shows two panes: "Available" and "Selected". The "Available" pane lists "BOWMAN", "LA 710 (SB)", and "LODI". The "Selected" pane lists "LA 710 (NB)".

Below the search dialog, a 3D bar chart is visible. The vertical axis is labeled "AVG_VOLUMES" and ranges from 0K to 60K. The horizontal axes are labeled "DATES" and "LA 710 (NB)". The chart shows a single blue bar for "LA 710 (NB)" with a value of approximately 30K. The "DATES" axis has a label "3 LA 710 (NB)".

Station Name	Avg Volume
LA 710 (NB)	30K

Figure 18. Selection of multiple stations in Oracle Discoverer Viewer.

4. WEB PAGE REPORT INTERFACE

Web page interface offers a full list of reports that are categorized into seven groups (see Figure 19). The reports have been developed based on the revised stakeholders' requirements. The web page reports have been shown to provide fast response to user queries and the performance for report generating has been satisfactory.

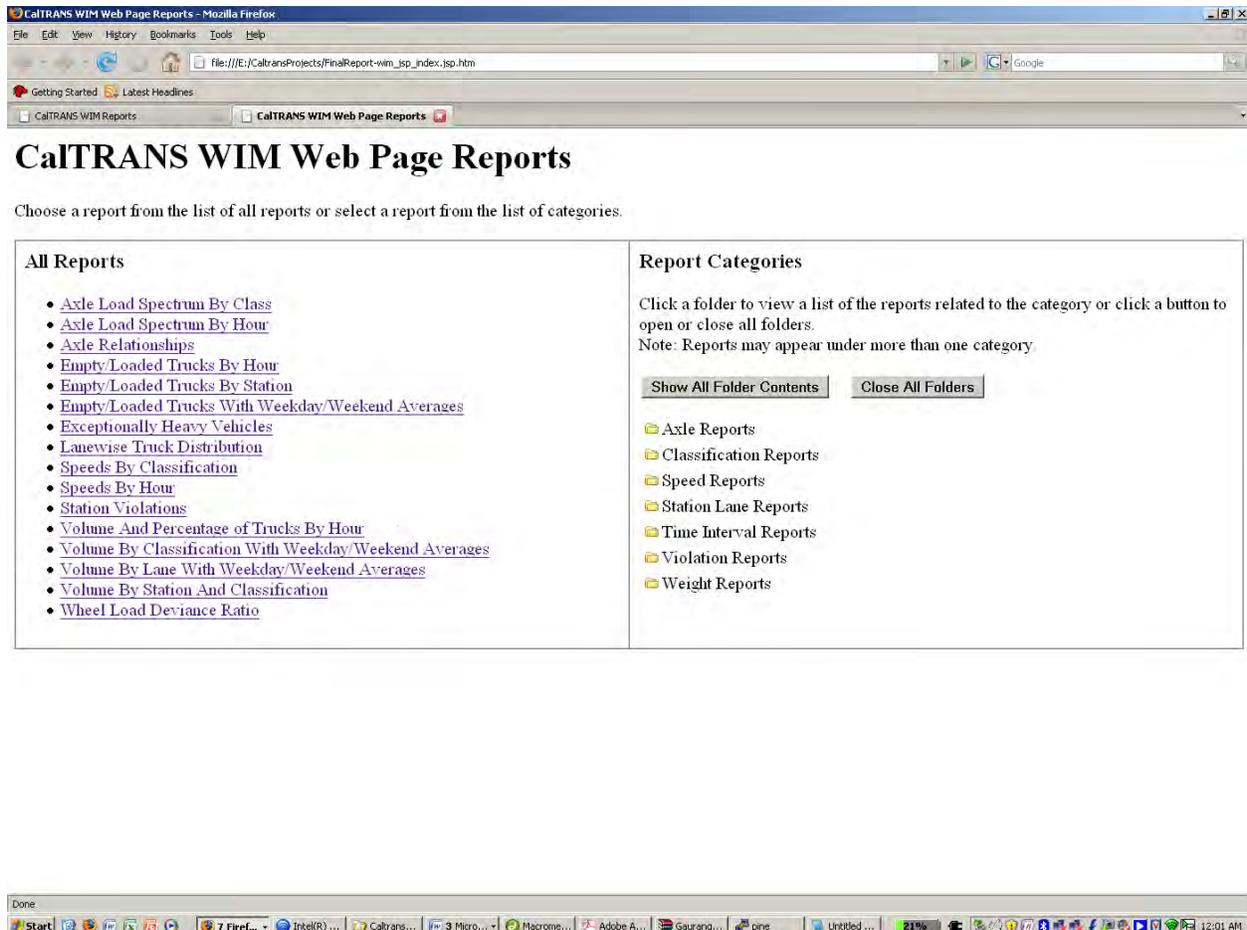


Figure 19. Web page interface.

The report categories can be expanded and collapsed easily to help users focus their attention (see an expanded view in Figure 20).

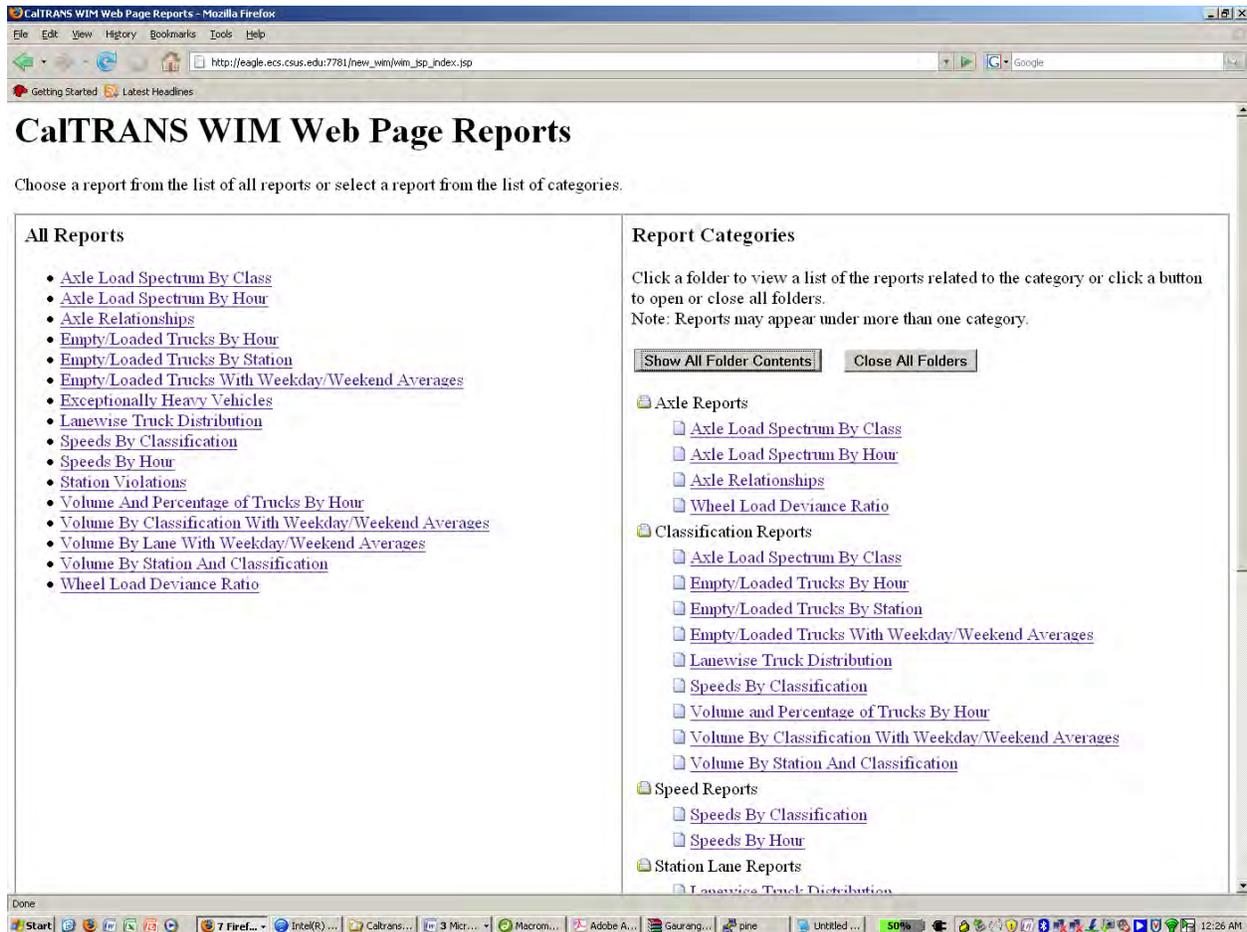


Figure 20. Expanded view in web page interface.

For each report, a user can submit a query via an input page. Figure 21 describes the input page for the report on Axle Load Spectrum By Class. As can be seen, the input page is very straightforward. All user needs to provide is the following:

- Information on time period.
- Station name.

The input page allows a user to select the option to show daily data, a feature the Caltrans stakeholders consider very important, and to choose multiple stations. The 134 WIM stations throughout the state have station names, and Caltrans district and county information.

CalTRANS WIM Web Page Reports

[Home Page](#) | [Report List](#)

Axle Load Spectrum By Class

To generate a report, please specify the following information:

Time period

Start Date and Time

Month Day Year Time (24 hour clock) :

End Date and Time

Month Day Year Time (24 hour clock) :

Show Daily Data

Stations

To choose multiple stations, hold "Control" while selecting from the list.

Station [District, County]

- ANTELOPE (EB) [3, SAC]
- ANTELOPE (WB) [3, SAC]
- ARCO (SB) [3, SAC]
- ARTESIA (EB) [7, LA]

Figure 21. Report on “Axle Load Spectrum By Class”.

Once the input to the query is entered, a user can submit the request by clicking “Generate Report” button (Figure 22). Usually, the query results are returned instantaneously.

Axle Load Spectrum By Class

To generate a report, please specify the following information:

Time period

Start Date and Time

Month Day Year Time (24 hour clock) :

End Date and Time

Month Day Year Time (24 hour clock) :

Show Daily Data

Stations

To choose multiple stations, hold "Control" while selecting from the list.

Station [District, County]

- JEFFREY [11, IMP]
- KEYES [10, STA]
- LA 710 (NB) [7, LA]**
- LA 710 (SB) [7, LA]
- LAKEPORT [1, LAK]
- LEUCADIA (NB) [11, SD]
- LEUCADIA (SB) [11, SD]
- LODI [10, S.J]
- LOLETA [1, HUM]
- LOS BANOS [10, MER]

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Figure 22. Selections on dates and station name.

For the query in Figure 22, the results are shown in Figures 23, 24, and 25. The results are presented as two parts: data and calculations, and related statistics. The results can be saved as a spreadsheet file (via “Generate Excel” button in Figure 25).

Report - Axle Load Spectrum By Class

Time Period:
4-1-6 0:0:00 to 4-10-6 23:59:59
April 1, 2006 00:00:00 - April 10, 2006 23:59:59

Stations:
LA 710 (NB)

Table of Contents

- [1. Data and Calculations](#)
- [2. Related Statistics](#)

Data and Calculations

Axle Load by Class

Class	Axle Load Ranges (In 1000 Pounds)										Total	
	0-9.9	10.0-19.9	20.0-29.9	30.0-39.9	40.0-49.9	50.0-59.9	60.0-69.9	70.0-79.9	80.0-89.9	90.0-99.9		> 100
4	0	205	546	341	69	5	0	0	0	0	0	1166
5	5757	10373	2519	247	4	0	0	0	0	0	0	18900
6	0	11224	1832	633	482	95	18	2	0	0	0	14286
7	0	20	72	11	28	139	28	0	0	0	0	298
8	0	12	706	784	473	132	23	13	0	0	0	2143
9	0	653	6681	14810	13333	13350	11070	11279	2636	249	122	74183
10	0	2	83	340	29	59	153	280	106	8	8	1068

Figure 23. Generated report.

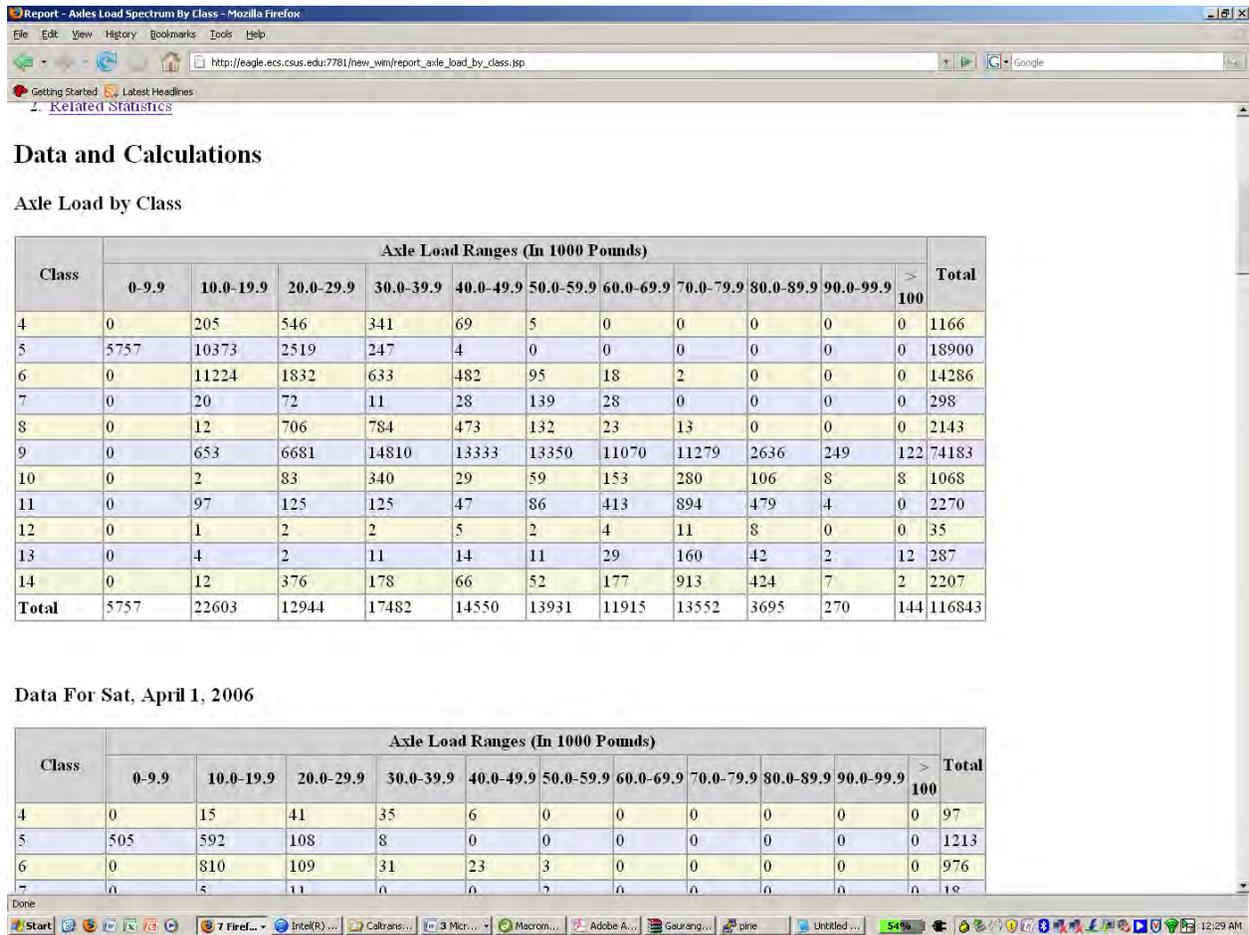


Figure 24. Generated report (continued).

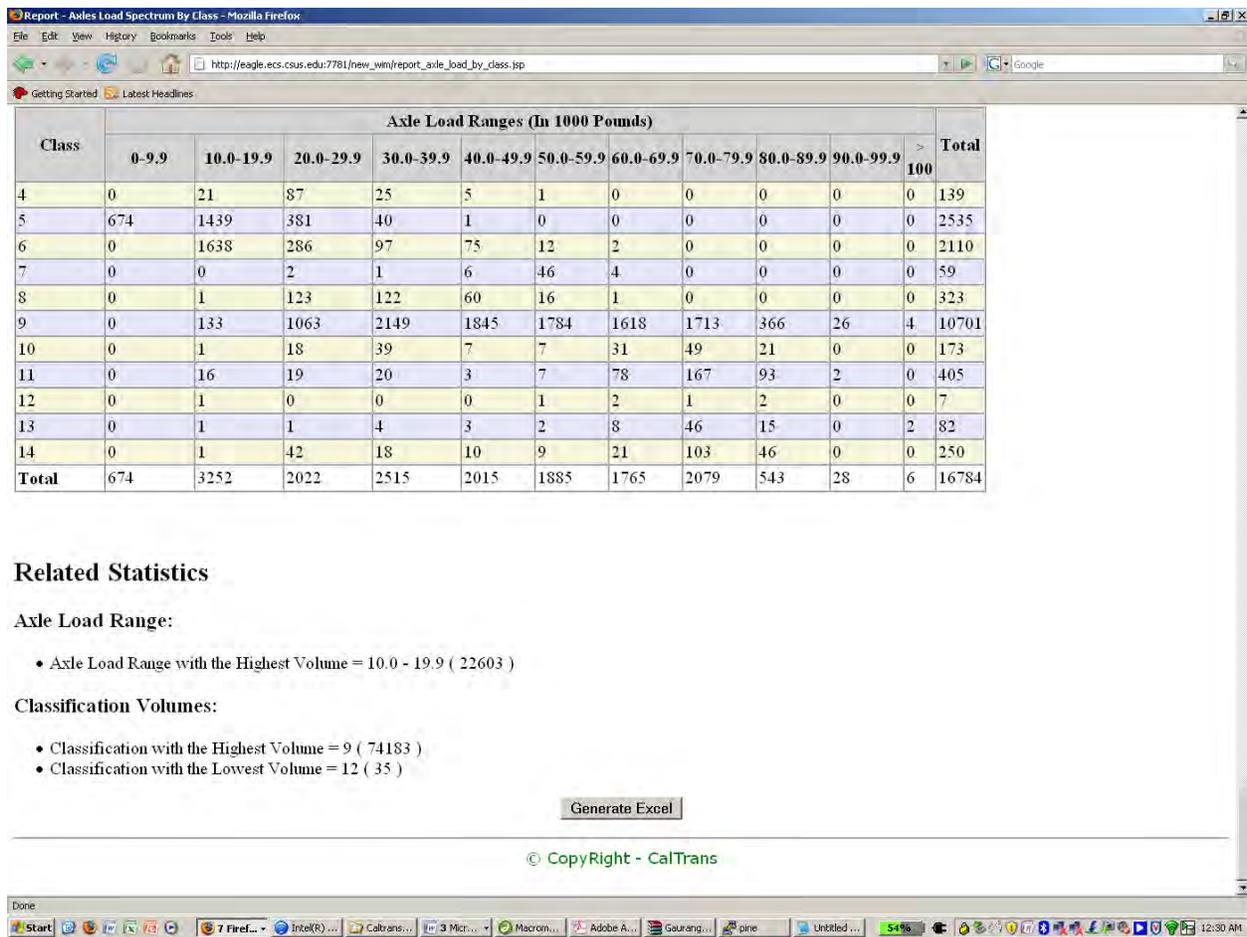


Figure 25. End of the generated report.

All the other query types can be organized and submitted in a similar manner under the web page report interface.

5. GEOGRAPHIC INFORMATION INTERFACE

Geographic information interface is a functionality that was not in the original scope of work. However, during the requirements elicitation process, the CSUS development team decided to include this feature after consultation with the project manager from Caltrans so as to provide a unique and useful visual interface for potential stakeholders. Figure 26 depicts a summary information pane after a red dot in the map is clicked. The summary contains a link that allows a user to pursue in-depth queries if she/he so chooses.

The screenshot shows a web browser window titled "CalTRANS WIM Reports - Mozilla Firefox". The address bar shows the URL "http://eagle.ecs.csus.edu:7781/new_wim/index.jsp". The page content includes the heading "CalTRANS WIM Reports" and a sub-heading "Reports for the CalTRANS WIM stations can be obtained through the following links:". Below this are two links: "Web Page Reports For WIM Data" and "Oracle Discoverer Viewer".

The main part of the interface is a map of California and the surrounding region, populated with numerous red location pins. A pop-up window titled "WIM-GIS Station Information" is displayed over the map, containing the following data:

WIM-GIS Station Information	
StationId	109
StationName	INYO
District	9
County	INYO
Route	395
Postmile	96.4
	Click Here for Station Reports

The browser's taskbar at the bottom shows several open applications, including "7 Fire...", "Intel(R)...", "Caltrans...", "3 Micr...", "Macrom...", "Adobe A...", "Gaurang...", "pine", and "Unbitted...". The system tray shows the time as 12:21 AM.

Figure 26. Summary information pane in GIS interface.

Since the geographic information interface is built on Google Earth, a user can zoom in on the map (Figure 27, Figure 31), choose a satellite view (Figure 28), a hybrid view (Figure 29), or zoom out (Figure 30).

CalTRANS WIM Reports

Reports for the CalTRANS WIM stations can be obtained through the following links:

- [Web Page Reports For WIM Data](#)
- [Oracle Discoverer Viewer](#)

WIM-GIS Station Information

StationId	826
StationName	Cordelia EB Plate
District	4
County	SOL
Route	80
Postmile	14
	Click Here for Station Reports

Figure 27. Zoom-in effect on the map.

CalTRANS WIM Reports - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://eagle.ecs.csus.edu:7781/new_wim/index.jsp

Getting Started Latest Headlines

CalTRANS WIM Reports

Reports for the CalTRANS WIM stations can be obtained through the following links:

- [Web Page Reports For WIM Data](#)
- [Oracle Discoverer Viewer](#)



Station Summary

WIM-GIS Station Information

StationId	826
StationName	Cordelia EB Plate
District	4
County	SOL
Route	80
Postmile	14

[Click Here for Station Reports](#)

Map Satellite Hybrid

Done

Start 7 Firef... Intel(R)... Caltrans... 3 Micr... Macrom... Adobe A... Gaurang... pine Unklted... 47% 12:23 AM

Figure 28. Satellite view on the map.

CalTRANS WIM Reports - Mozilla Firefox

File Edit View History Bookmarks Tools Help

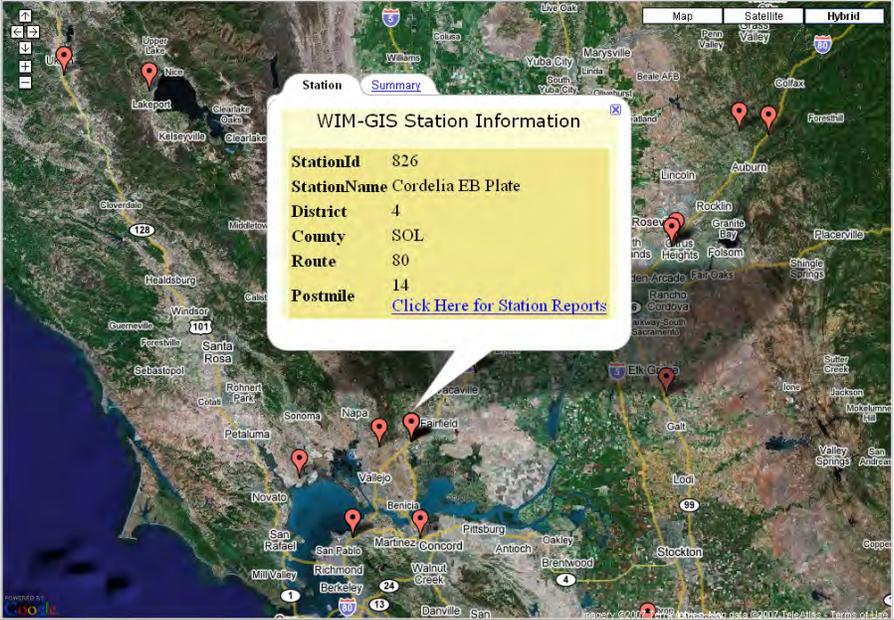
http://eagle.ecs.csus.edu:7781/new_wim/index.jsp

Getting Started Latest Headlines

CalTRANS WIM Reports

Reports for the CalTRANS WIM stations can be obtained through the following links:

- [Web Page Reports For WIM Data](#)
- [Oracle Discoverer Viewer](#)



Station Summary

WIM-GIS Station Information

StationId	826
StationName	Cordelia EB Plate
District	4
County	SOL
Route	80
Postmile	14
	Click Here for Station Reports

Done

Start 7 Fire... Intel(R)... Caltrans... 3 Micr... Macrom... Adobe A... Gaurang... pine Unklibd... 47% 12:24 AM

Figure 29. Hybrid view on the map.

CalTRANS WIM Reports - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://eagle.ecs.csus.edu:7781/new_wim/index.jsp

Getting Started Latest Headlines

CalTRANS WIM Reports

Reports for the CalTRANS WIM stations can be obtained through the following links:

- [Web Page Reports For WIM Data](#)
- [Oracle Discoverer Viewer](#)

Station Summary

WIM-GIS Station Information

StationId	826
StationName	Cordelia EB Plate
District	4
County	SOL
Route	80
Postmile	14

[Click Here for Station Reports](#)

Done

Start Intel(R) Caltrans... 3 Micr... Macrom... Adobe A... Gaurang... pine Unklted... 49% 12:25 AM

Figure 30. Zoom-out hybrid view on the map.

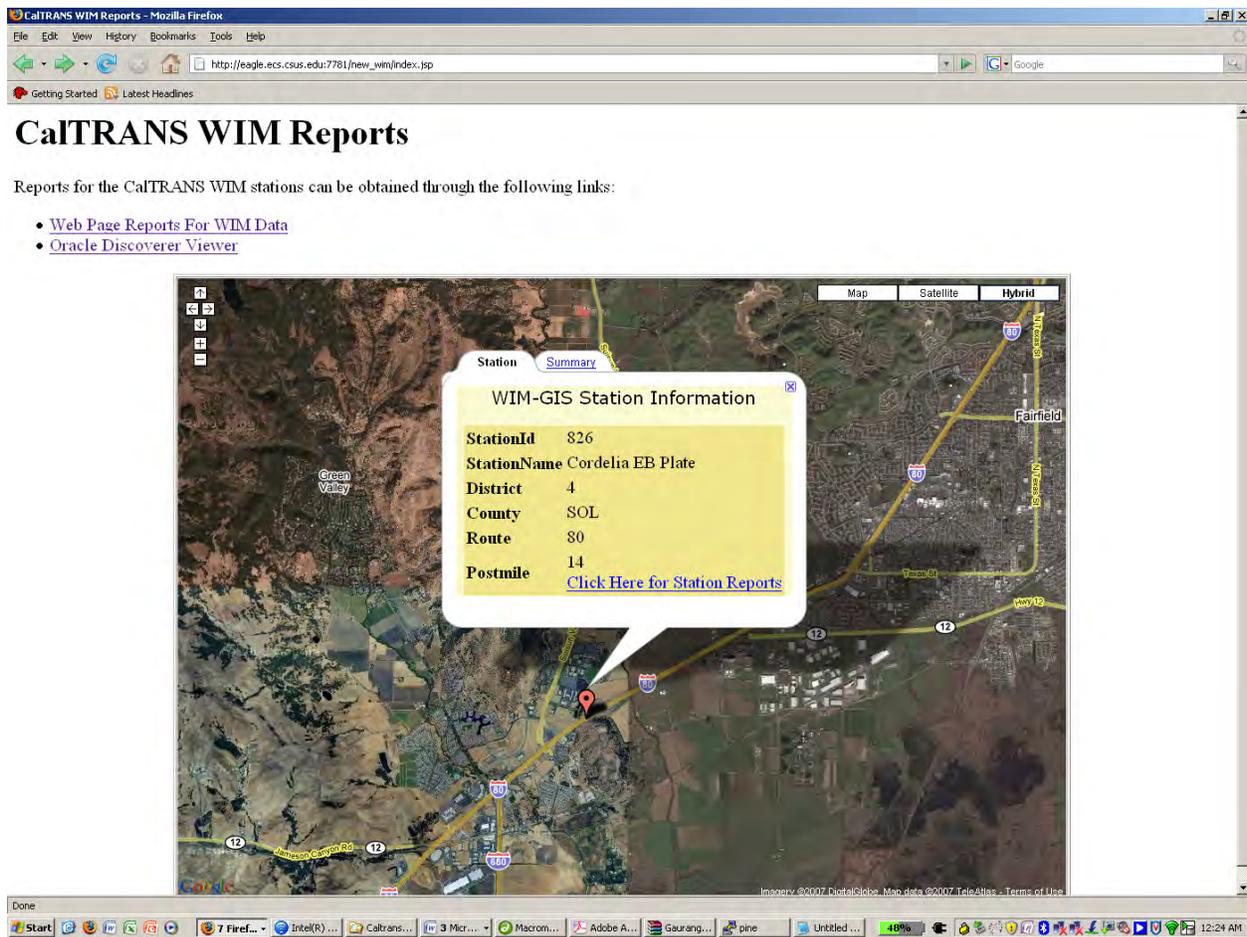


Figure 31. Zoom-in hybrid view on the map.

6. CONCLUSION

This report describes the functionality of the TDW system from the user standpoint. It discusses the query submission processes from three different interfaces (ODV, web pages, and geographic map), and explains the query results presentations. Though the CSUS development team has only been provided with approximately a year's worth of data for only four WIM stations by Caltrans, the preliminary results have indicated that the overall performance of the TDW system meets Caltrans requirements. As a successful first step toward a final and fully automated system for WIM data storage, retrieval, processing and analysis, the results obtained from this project lay a solid foundation for future development.

REFERENCES

1. JavaServer Pages Technology: <http://java.sun.com/products/jsp/>
2. Oracle Business Intelligence Discoverer:
<http://www.oracle.com/technology/products/discoverer/index.html>
3. Oracle Database 10g: <http://www.oracle.com/database/index.html>
4. SUSE Linux Enterprise: <http://www.novell.com/linux/>

Report on Database System

Truck Data Warehouse
Caltrans Project
(7/12/2006 – 6/30/2007)

MOU 76 (Fnd Acct 511821)
Ref# : 43A0068.76

Report on the Database System in Caltrans Project: “Truck Data Warehouse”

1. INTRODUCTION

This report focuses on the database component in the Caltrans project: “Truck Data Warehouse” (TDW). The database system is used to store truck data collected at Caltrans Weight-in-Motion (WIM) stations throughout the state of California, and to provide support to access and analysis of the WIM data. Thus it plays a pivotal role in the TDW project. We use WIM-DB as an abbreviation to refer to the database.

The infrastructure for the TDW system is a Pentium dual core workstation running a Linux operating system (SUSE Linux 9) [5]. The computer is connected to the College of Engineering and Computer Science network and is protected behind the firewall. Oracle 10g [4] is used to create the WIM-DB and Oracle Application Server [2] is deployed to support web applications of the WIM-DB. The user tools are developed using JSP technology [1] and Oracle Business Intelligence Discoverer [3]¹. All the technologies utilized in developing the database component in the project are in compliance with the Caltrans IT policies.

This report is organized as follows. Section 2 describes the data model for the WIM-DB. Section 3 discusses how to create WIM-DB in Oracle 10g environment. Section 4 explains Oracle Application Server related issues. Finally Section 5 concludes the report.

2. DATA MODEL

The data model for WIM-DB consists of three entity sets and two relationships as exhibited in Figure 1. The entity set of “Truck” contains all instances of trucks going through the WIM stations. Each truck has a set of attributes describing its characteristics. The second set of entities is “WeightStation”. Each station has its own ID and a set of attributes. The third set of entities is “Lane”. A lane has a lane number and direction.

Since many trucks can pass the same station, and a truck can pass several stations, there is many-to-many relationship between “Truck” and “WeightStation”, which is referred to as “WimInstance”.

¹ The discussion on Oracle Business Intelligence Discoverer will be included in a separate report (the Final Report on the TDW project).

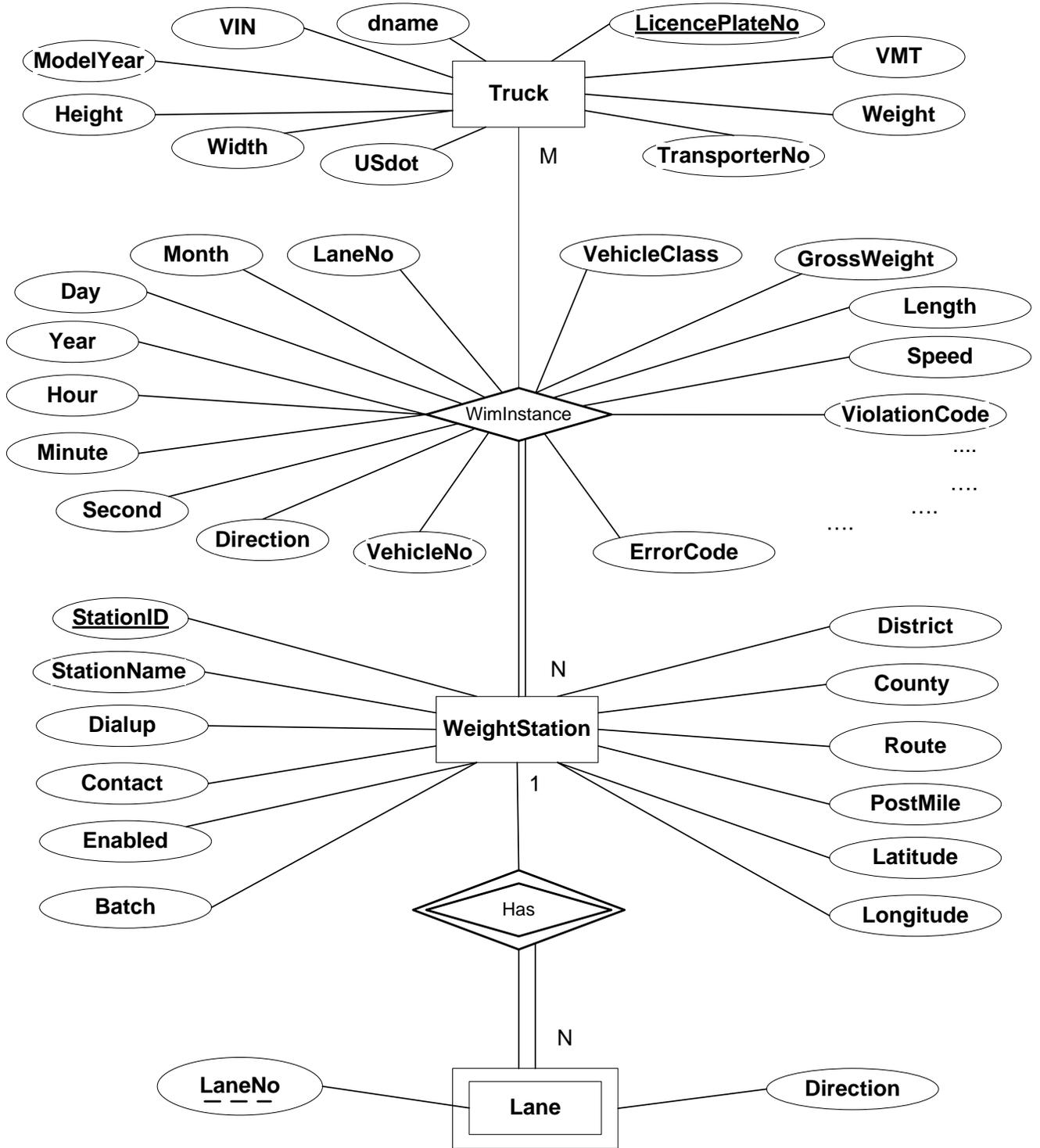


Figure 1. E-R diagram for the WIM-DB.

A weight station may have several lanes, thus there exists a one-to-many relationship between “WeightStation” and “Lane”.

3. WIM-DB CREATION

In this section, we describe how the WIM-DB is actually created in the Oracle 10g environment. We will explain the database generation process, database table creation process, and the process of loading ASCII data into the Oracle 10g tables.

3.1. Database Creation

There is a sequence of steps to follow when creating a database in Oracle 10g environment.

- Specifying Instance ID (SID).
- Creating an Oracle Service.
- Creating the initialization parameter file.
- Starting the instance.
- Creating the database.
- Creating table spaces for WIM database.
- Run Scripts “catalog.sql”, catproc.sql and others.
- Setting up database to using java.
- Creating spfile.ora.
- Errors while creating database.
- Create users for WIM database.

Before you start creating the WIM database, make sure that Oracle 10g system is up and running. You listener must be running and able to listen request on 1521 port.

To check:

```
Type : sqlplus // from any directory.
or
Cd $ORACLE_HOME/bin/sqlplus // if first command is not
// running then try this.
```

The above command will ask you to enter Username and Password to log in to Oracle Database SQLPLUS command line utility.

If the system is running and allows you to log into database, then exit from SQLPLUS and follow steps below.

Prompt:>exit

Step 1: Specifying Instance ID (SID)

- Open terminal.
- There can be more than one Oracle instance on a single machine. In order to be able to distinguish these instances, Oracle uses a SID (System Identifier) which is a string.
- The SID can be set through the ORACLE_SID variable using the following command

```
Prompt:> set ORACLE_SID = imw           // or any other SID you want
                                     // to set for WIM database
```

Step 2: Creating an Oracle Service

- On Windows, each instance requires a Windows service. This service must first be created with “oradim”.
- It can be verified that a Windows service was created by typing “services.msc” into the console.
- A service named OracleServiceimw (imw = %ORACLE_SID%) will be found. Also, the startup type is *manual* as was requested by “-startmode M.”
- Type the following command with appropriate sid (Oracle_SID), password and pfile location.

Remember: We have not yet start SQLPLUS yet. This must be done from the command prompt.

```
oradim -new -sid imw -intpwd gaurang -startmode a -pfile d:\wim\initimw.ora
```

Note: If you want to know more options for oradim utility, press enter after typing “oradim”. Do not specify any parameter with it. It will display all available options of oradim.

Step 3: Creating the initialization parameter file

- When an Oracle instance starts up, it requires either an initialization parameter file (init.ora) or an SPFILE.
- SPFILES have binary content and must be created from init.ora files. Therefore, the init.ora file (which is an ordinary text file) is created first.
- Here's a minimal init.ora (under \$ORACLE_HOME/dbs if the operating system is Unix, or %ORACLE_HOME%\database, if it is Windows) just to demonstrate how the control files are found.

The pfile must have a file extension of “.ora”. Since the instance name is imw for WIM-DB, the file name is therefore “initimw.ora”.

Note: Below is the location of the pfile after completing the creation of WIM-DB.

Path name: /u01/app/oracle/product/10_2/oracleas1/pfile/initimw.ora

Step 4: Starting the instance

- Here we need to start SQLPLUS, so type the command to start SQLPLUS.
- *Prompt:> sqlplus /nolog // Nolog is not to generate the log on
// what you are doing right now.*
- After the above command, sqlplus prompt asks for username and password to login. Type the following command for Username
*Username:sys as sysdba // Sys is username and sysdba is
//privilege.*
Password: “given during oracle installation”

The above command is useful when you are specifically asked for username and password. But if you have SQL prompt and you want to change the schema and want to log in as another user, try using following command.

*SQL prompt:> conn sys as sysdba // or any other username
SQL prompt:> “pass”*

After the above command, SQL*Plus indicates that the user is “Connected to an Idle instance”. Remember: you must have set ORACLE_SID using the same terminal window you are in right now.

- That means that it is not yet started. So, let's start the instance.
- We have to start the instance without mounting (nomount) as there is no database that we could mount at this moment.
- Type the following command to start the database in “NOMOUNT” mode as we do not have a database yet.

SQL:>startup nomount pfile=location of pfile without quotation;

This will result in the following:

```
SQL> startup nomount pfile=d:/wim/initimw.ora
ORACLE instance started.
```

Total System Global Area	113246208 bytes
Fixed Size	787708 bytes
Variable Size	61864708 bytes
Database Buffers	50331648 bytes
Redo Buffers	262144 bytes

This creates the SGA (System Global Area) and the background processes.

Step 5: Creating the database

- We're now ready to finally create the database.
- Before typing the command we must have to create the “create_database.sql” script, which will create database for us.
- Now you also need to create some folder with exact same name which is used in create_wimdatabase.sql file at appropriate location.
- Example: Redo logs, system_tbs, indx_tbs etc.
- Type following command:

SQLprompt:>@"full pathname of create_wimdatabase.sql file";

- If something goes wrong with the creation, Oracle will write an error into the “**alert.log**” The alert log is normally found in the directory that is specified with the “bdump”.
- If this parameter was not specified (as is the case in our minimal init.ora), the alert.log will be written into %ORACLE_HOME%/RDMBS/trace.
- If an “ORA-01031: insufficient privileges” is returned, that means most likely, that the current user is not in the dba group (on Unix), or the ORA_DBA (Windows).
- If the init.ora file is not at its default location or has not been found with the **pfile** attribute, an **ORA-01078: failure in processing system parameters** and an **LRM-00109: could not open parameter file** `'/appl/oracle/product/9.2.0.2/dbs/initadpdb.ora'` error is issued.
- The `create database` command also executes a file whose name is determined by the (hidden) init parameter “init_sql_file” (which seems to default to sql.bsq).
- After successful execution, make sure some files must have been created under the newly created directories.

Database is not Created Error:

- If you find errors stating that database is not created, please remove all files which are created, in particular directories which were created before executing “create_wimdatabase.sql” except pfile.
- Remove all those things which were created by an unsuccessful “create_wimdatabase.sql” script.

Syntax Related Errors:

- If there are syntactic errors, try to remove extra spacing among lines of “create_wimdatabase.sql” files.
- Remove any extra character after the end of sql command other than “;”.

Other Errors that Start with “ORA-”:

- If you find any other errors which start with “ORA” keyword, do not worry simply copy and paste that error in Google and search more about that error.
- After the creation of the database, it can be mounted and opened for use.

Step: 6 Creating table spaces for WIM-DB

- For data as well as for indexing purposes, table space must be created for better performance. Otherwise Oracle puts everything in SYSTEM table space, which will increase overhead on database operations.
- For WIM-DB, two table spaces need to be created, one for WIM data – “imwdata” and another for indexing purpose – “imwindx”.
- “imwdata”- table space is used to hold all WIM data including ASCII and other data.
- “imwindx” – table space is used to hold indexes.
- Details can be found in the “create_tbs.sql” script.
- Copy and paste the “create_tbs.sql” file at appropriate location and type the following command at the SQL prompt.

SQL:>@”full path name of create_tbs.sql”

Errors:

- Check for any white spaces between lines.
- Please append “;” at the end of every create statement otherwise it will give you an error.

Check:

- Use the following commands to verify that the above scripts succeeded and that we are working with the correct oracle_sid (“imw”). Make sure that it retrieves the correct names which we have created earlier.

(a) */* Query to find table space which is not used as temporary or for undo information*/*

*select tablespace_name from dba_tablespaces
where contents not in('TEMPORARY','UNDO')
and tablespace_name not in (select tablespace_name from
dba_rollback_segs) and tablespace_name not like 'sys%'*

(b) */*find temporary table spaces....*/*

*select tablespace_name from dba_tablespaces
where contents = 'TEMPORARY'*

(b) */*find available spaces in MB */*

*select file_name,tablespace_name, bytes/(1024*1024) from dba_data_files*

Step 7: Run Scripts “catalog.sql”, catproc.sql and others.

Remember: You must be a “sys” user and must be logged in with “sysdba” privilege in order to run the following scripts (these scripts must be run for the following reasons).

- Catalog.sql : creates data-dictionaries for WIM-DB.
- Catproc.sql : creates all structures required for PL/sql.
- catalog.sql calls, for example, catexp.sql which is a requirement for exp, or dbmsstdx.sql which is a requirement to create triggers.

Type following commands to run those scripts:

```
SQL> @$ORACLE_HOME/rdbms/admin/catalog.sql
SQL> @$ORACLE_HOME/rdbms/admin/catproc.sql
```

Note: you are able to find the ORACLE_HOME location by echoing \$ORACLE_HOME in another terminal.

Prompt: echo \$ORACLE_HOME.

- You can also see Oracle Installation steps for it.

To run “**pupbld.sql**” script:

- Type at sql prompt the following command to log in as “system” user.
- pupbld.sql creates a table that allows to block someone from using sql plus.
-

```
SQL> connect system/manager
SQL> @$ORACLE_HOME/sqlplus/admin/pupbld.sql
```

Step 8: Setting up database to use java

- Also call @\$ORACLE_HOME/javavm/install/initjvm if you want to enable the JServer option.

Step 9: Creating spfile.ora

- /*Oracle recommends that you create a server parameter file as a dynamic means of maintaining initialization parameters.*/

create spfile='path where we want to create spfile/**spfileimw.ora**' from pfile='pathname of the pfile which we have used before for creating wim database/**initimw.ora**';

Step 10: Errors while creating database

- If you find any kind of errors while performing any of the above steps please refer to “alert.log” file which is in bdump folder.
- If you find any errors starting with “ORA-”, Google them.

Remember:

- If you find errors stating that the database is not created, please remove all files which are created in particular directories before executing “create_wimdatabase.sql” except pfile.
- Basically, you have to remove all those things which were created by an unsuccessful “create_wimdatabase.sql” script.

Step 11: Create users for WIM database

- Create users using following command.
- **SQL:> conn sys as sysdba** // Log in using “sys as sysdba”
// username
- Password: “yourpass”
- **SQL:> @full pathname of “create_users.sql”**

Grant the following roles to newly created users using the following command as a SYS user.

SQL:> Grant connect, resource to “username”;

Connect: Includes the following system privileges: ALTER SESSION, CREATE CLUSTER, CREATE DATABASE LINK, CREATE SEQUENCE, CREATE SESSION, CREATE SYNONYM, CREATE TABLE, CREATE VIEW.

Resource: Includes the following system privileges: CREATE CLUSTER, CREATE INDEXTYPE, CREATE OPERATOR, CREATE PROCEDURE, CREATE SEQUENCE, CREATE TABLE, CREATE TRIGGER, CREATE TYPE.

Here is an SQL query to find out how many privileges are granted by the grantor to a particular user.

***select count(*), grantee from dba_sys_privs
where grantee in ('GAURANG','SYS','ROBERT') group by grantee;***

You can use “desc “tablename” ” to get the available columns of that table.

3.2. Generating Database Tables

The aforementioned ten steps allow us to create the WIM-DB with “imw” as its oracle_sid”. Now we are ready to connect using the username and to create all WIM-DB tables. The following two steps are the continuation from the previous database creation phase.

Step 12: Connecting to Oracle

At the SQL prompt, simply type the following SQL commands to connect:

***SQL:>conn “username”
SQL:>password “yourpass”***

Step 13: Getting create_table scripts

- Get the “create_table_weightstation.sql”, “create_table_wiminstance.sql”, “create_table_weight_station_lane.sql” and “create_table_trucks.sql” scripts and copy them at the particular directory location.
- You can create tables in any order without worrying about the constraints as there is no data in those tables yet.
- Use the following command to run each of the above scripts.

SQL:>@”full path/name of the script”

- Do the same thing for the rest of tables.

Errors:

- Remove any extra blank lines from create table syntax command.
- Check semicolon at the end of create table syntax.
- Remove “.” Dot if it exists from the syntax.
- For “ORA” specific error, search it on Google.

3.3. Loading Data into Tables

Step 13 resulted in tables being created. Though there are tables, there is no data in those tables yet. The following steps allow us to load the data in “wim” tables.

Note: please load data in the following order.

weightstation → weight_station_lane → wiminstance → Trucks

Step 14: Load data in “weightstation” table

- Open another window by keeping the SQL window active.
- We are loading data of each table using “sqlldr” utility. So please check whether that “sqlldr” is working properly or not, by simply typing “sqlldr” at the command prompt.

Prompt:>sqlldr

- If it is not running and gives any kind of errors, make sure that Oracle installed that utility properly.
- If it is running correctly then it will display the available options to you.
- To load the data into “weightstation” table, you must have the following two files with you.
 - (a) *weightstation_sample.txt* // contains data in CSV format.
 - (b) *weightstation_ctl.ctl* // control file used to load CSV data.
- Badfile is the file which contains any unloaded data which is not inserted due to error in loading.
- Change the above to locations accordingly.

After the setup above, use the following command at the command prompt.

Prompt:> *sqlldr username/pass control="location path"/weightstation_ctl.ctl data="location path"/weightstation_sample.txt log="location path"/weightstation_log*

- Username is the name of the user who created these tables.

Errors:

- Please check "weightstation_log" file for particular reason.
- For errors like:

Oracle is not available

ORA-27101: shared memory realm does not exist

The solution is as follows:

- Verify the sid of the currently running database with which you want to connect.
- Shutdown the currently running database if it is running.
- Set oracle_sid = "new Sid"
- Sqlplus
- Conn sys as sysdba
- Pass : "yourpass"
- Startup pfile = "path of the pfile of the database which you want to start for"
- So in short, you have to restart the database with appropriate ORACLE SID for this problem.

Step 15: Load data in "weight_station_lane" table

- To load the data into "weight_station_lane" table, you must have following two files.
- (a) *weight_station_lane_sample.txt* // contains data in CSV format.
- (b) *weight_station_lane_ctl.ctl* // control file used to load CSV data.
- Badfile is the file which contains any unloaded data which is not inserted due to error in loading.

Use the following command to load data.

Prompt:> *sqlldr username/pass control="location path"/weight_station_lane_ctl.ctl data="location path"/weight_station__lane_sample.txt log="location path"/weight_station__lane_log*

- Username is the name of the user who created these tables.

Errors:

- Please check “weight_station_lane_log” file for particular reason.
- For error like:

Oracle is not available

ORA-27101: shared memory realm does not exist

The solution is similar to that of Step 14.

Step 16: Load data in “wiminstance” table

- To load the data into “wiminstance” table, you must have following two files.
- (a) *wiminstance_sample.txt* // contains data in CSV format.
- (b) *wiminstance_ctl.ctl* // control file used to load CSV data.

Use following command to load data.

*Prompt:> sqlldr username/pass control="location path"/wiminstance_ctl.ctl
data="location path"/wiminstance_sample.txt log="location
path"/wiminstance_log*

- Username is the name of the user who created these tables.

Errors:

- Please check “wiminstance_log” file for particular reason.
- For error like:

Oracle is not available

ORA-27101: shared memory realm does not exist

The solution is similar to that of Step 14.

Remember: If you are doing any transaction with Oracle while loading data using sqlldr, it will take longer time as the sqlldr utility will not begin if there are any dependants transactions going on in the Oracle environment. Use “commit” command at sql prompt if you have this kind of issue.

Step 17: Load data in “trucks” table

- To load the data into “trucks” table, you must have following two files.
- (a) *trucks_sample.txt* // contains data in CSV format.
- (b) *trucks_ctl.ctl* // control file used to load CSV data.

Use following command to load data.

**Prompt:> sqlldr username/pass control="location path"/trucks_ctl.ctl
data="location path"/trucks_sample.txt log="location path"/trucks_log**

- Username is the name of the user who created these tables.

Errors:

- Please check "trucks_log" file for particular reason.
- For error like:

Oracle is not available

ORA-27101: shared memory realm does not exist

The solution is similar to that of Step 14.

After loading the data into tables, if you want to connect with the Oracle WIM-DB as a sys user, try the following command

- ***Unix Prompt:> set oracle_sid=imw***
- ***UNIX Prompt:> Sqlplus***
- ***SQL:> Conn sys as sysdba***
- ***SQL:>Pass : "yourpass"***

or

SQLPLus:>conn sys/password@imw as sysdba

- ***SQLPLus:>Startup pfile = "path of the pfile of the database which
you want to start for"***
- If you want to connect as another user rather than "sys", then you have to do the above steps to start the database using "imw" sid and it will remain running till you shutdown the computer or restart the computer.
- So if you want to exit the terminal just type "exit" at sql prompt.
- Now after exiting and starting "imw" database, if you want to connect as any other user, type the following command.

UnixPrompt:>sqlplus

Sqlplus:>conn user/pass@imw

4. ORACLE APPLICATION SERVER

Oracle Application Server, a key component of Oracle Fusion Middleware [2], offers a solution to developing, integrating, and deploying an enterprise's applications, portals, and web services. In this project, we rely on the Oracle Application Server to deploy the web services for the TDW users.

In this section, we will briefly go over the SUSE Linux issues. We then explain how the Oracle Application Server gets installed in the SUSE Linux environment.

4.1. SUSE Linux 9

The TDW system runs in a SUSE Linux 9 environment. The first step is to successfully install SUSE Linux 9 (Service Pack-3).

If a machine has previously run Windows system, then simply format the existing disk drive after making backup data. Make sure that CD drive has the first priority to boot the system. When booting the system, start with the first CD in SUSE Linux 9 Service Pack-3. The process is automatic. When prompted for disk partitions, don't accept the default partitions skim. Instead, select custom partitions. Here you will see the hard drives available in the machine. Specify the partition skim according to the table below.

Table 1. Disk partitions.

File system	Mount point	Size	
Primary: /dev/hda1 /dev/hda2 /dev/hda3	/boot /swap /	100Mb 2Gb 5Gb	Note: file system is ext3 '/' and /boot mount point. Otherwise keep as "Reiser" (default in suse)
Extended: /dev/hda4		Rest of the space available on HD	You can specify your own size too for different mount point.
Logical: /dev/hda5 /dev/hda6 /dev/hda7 /dev/hda8 /dev/hda9 /dev/hda10 /dev/hda11	/home /usr /var /opt /tmp /u01 (oracle software) /u02 (oracle database)	5Gb 4Gb 1.5Gb 6Gb 500Mb 8Gb Rest of the space left	

4.2. Installing Oracle Application Server 10g

Before installing Oracle Application Server 10g, we need to check system resources. The minimum system requirements are given in Table 2.

Table 2. Minimum system requirements for Oracle Application Server.

	Oracle Infrastructure
Memory	1GB
Disk Space	3.7 GB
Temp	400MB
Swap Space	1.5GB

To verify for the requirements, login as root using the command

Prompt> su root

Once you logged in as root.

- Check physical RAM size

```
#grep MemTotal /proc/meminfo
```
- Check amount of disk space

```
#df -k dirname
```

// where dirname is the name of the directory where you want to install oracleas.
- Check Swap space

```
# grep SwapTotal /proc/meminfo
```
- Check size of /tmp directory

```
# df -k /tmp
```
- Check the directory size in which you want to keep your database files

```
#df -k /u02
```

In addition, we need to check for software requirements as well. We need to complete the following steps before installing Oracle Application Server on SUSE Linux 9 system (root status is needed):

Check that SUSE Linux Enterprise Server 9 is installed:

```
# cat /etc/issue
Welcome to SUSE Linux 9.0 (i686) - Kernel \r (\l).
```

Check that Linux kernel version kernel-bigsmpt-2.6.5-7.97, kernel-default-2.6.5-7.97 or kernel-smp-2.6.5-7.97 is installed, using the following command:

```
# uname -r  
kernel-bigsm-2.6.5-7.97
```

Check that the following software packages, or higher versions, are installed

```
glibc-2.3.3-98.28  
gcc-3.3.3-43.24  
gcc-c++-3.3.3-43.24  
libstdc++-3.3.3-43.24  
libstdc++-devel-3.3.3-43.24  
openmotif21-libs-2.1.30MLI4-119.1  
pdksh-5.2.14-780.1  
make-3.80-184.1  
gnome-libs-1.4.1.7-671.1  
gnome-libs-devel-1.4.1.7-671.1  
sysstat-5.0.1-35.1  
binutils-2.15.90.0.1.1-32.5  
db1-1.85-85.1  
compat-2004.7.1-1.2
```

(1) Using Terminal window

Check to see if a package is installed or not:

```
# rpm -q package name
```

When installing a package, make sure you are using the correct architecture and optimization rpm file. To check the architecture of an rpm file, run the following command:

```
# rpm -q package_name --queryformat "%{arch}\n"
```

To install the package if it is not installed;

Download the package from internet and type the following command

```
#rpm -i packagename
```

(2) Using YAST of SUSE 9

To install packages from YAST do the following:

- Go to the start button at the very left-bottom corner of suse window.
- Open YAST.
- If you logged in as root you will not be prompted for the password. If you did not log in as root then it will ask for root password. So enter root password when prompted.

- Go to YAST software management tool. // double check
- Click on install software or packages. // double check
- In the search bar type the name of the package or just the part of the name which you want to install. It will show you the list of packages related to it.
- Select all check boxes which you want to install and then click on finish.
- Insert SUSE 9 CDs when it is prompted.
- Repeat these steps for each package.

(3) Create the following symbolic link for the Perl executable if it does not already exist:

```
prompt> ln -sf /usr/bin/perl /usr/local/bin/perl
```

(4) Create the following symbolic link for the fuser executable if it does not already exist:

```
prompt> ln -sf /bin/fuser /sbin/fuser
```

(5) Check to see if orarun package is installed or not. Do not worry about the version number of that package

```
Prompt>rpm -q orarun
```

- If it is there it will display the package available in the machine and skip the following step.
- If it is not installed, install it the same way as explained above with package name “orarun”. Remember you might require SUSE 9 CDs with you every time you are installing packages and you must be logged in as a root user.

(6) If the orarun package was installed, complete the following steps to reset the environment:

Enter the following commands as the root user :

```
prompt> cd /etc/profile.d  
prompt> cp oracle.csh oracle.csh.bak  
prompt> cp oracle.sh oracle.sh.bak  
prompt> cp alljava.sh alljava.sh.bak  
prompt> cp alljava.csh alljava.csh.bak
```

(7) Check the /etc/services file to make sure that the following port ranges are available:

- Ports 3060-3129 required for Oracle Internet Directory
- Ports 3130-3199 required for Oracle Internet Directory (SSL)
- Ports 1812-1829 required for Oracle Enterprise Manager (console)
- Ports 1830-1849 required for Oracle Enterprise Manager (agent)

- Ports 1850-1869 required for Oracle Enterprise Manager (RMI)

Note: If necessary, remove entries from the /etc/services file and reboot the system. To remove the entries, you can use the Perl script included in the utils/3167528/ directory of CD-ROM disk 1 and the DVD-ROM. Run the script as the root user. This script is also available as patch 3167528. This patch is available from: <http://metalink.oracle.com>

If these ports are not available, the associated configuration assistants will fail during the installation.

Remark: When you copy and try to install Oracle Application Server from CDs or DVDs, you will find a directory in Disk1 named /utils. This directory contains 3167528 and one other directory which has an integer name (4015045 – Usage of this file is described below). Both of these directories will have one perl script and one readme.txt file. Read the readme.txt file and run the script as described in readme.txt file.

(8) If you use Network Information Service (NIS):

Make sure that the following line exists in the /etc/yp.conf file:

hostname.domainname broadcast

Make sure that the following line exists in the /etc/nsswitch.conf file:

hosts: files nis dns

(9) Make sure that the local host entry in the /etc/hosts file is an IPv4 entry. If the IP entry for local host is IPv6 format, installation cannot succeed. The following example shows an IPv6 entry:

```
# special IPv6 addresses
::1 local host ipv6-localhost
```

To correct this example /etc/hosts file, comment the local host entry as follows. (Here ‘#’ sign is not a prompt, it is a comment indicator):

```
# special IPv6 addresses
# ::1 local host ipv6-localhost
```

During our installation the following entry was not in the hosts file. So add the following lines in hosts file along with the above lines.

```
ipv6-loopback
::1 ipv6-localhost ipv6-loopback
```

Note: To comment the entries, you can use the perl script included in the `utils/4015045/` directory of CD-ROM Disk 1 and in the `application_server/utils/4015045/` directory on the DVD-ROM. Run the script as the root user. This script is also available as patch 4015045.

This patch is available from: <http://metalink.oracle.com>

Check Kernel Parameters Required by Oracle AS Web Cache

This step is necessary if you are installing Oracle AS Web Cache:

If you are installing the J2EE and Web Cache middle tier, the Oracle AS Web Cache component is optional.

If you are installing the Portal and Wireless or Business Intelligence and Forms middle tier, the Oracle AS Web Cache component is always installed.

Obtain root status first and then run the following command to check that the `rlim_fd_max` kernel parameter is set to at least 65536:

```
prompt> ulimit -Hn
```

Run the following command to check that the `nofile` kernel parameter is set to at least 65536:

```
prompt> ulimit -Hn
```

If the command returns a value less than 65536, add this line to the `/etc/security/limits.conf` file (use a text editor to edit the file):

```
*      hard      nofile      65536
```

Note: During our installation we have added the following lines in `/etc/security/limits.conf` file, assuming that the sid for our installation is **oracle**. See the documentation of this particular file in itself for the meaning of each column of below two lines.

```
oracle  soft      nofile    4096
oracle  hard      nofile    65536
```

Reboot the computer for the new value to take effect.

Check Kernel Parameters Required by Oracle AS Metadata Repository

This section applies only if you are installing the Oracle AS Infrastructure. Verify that the kernel parameters shown in the following table are set either to the formula shown, or to values greater than or equal to the recommended value shown. The procedures following the table describe how to verify and set the values.

We have checked all these values. If the values in our machines are higher, then the values defined below do not change, otherwise change them to at least the default one.

Table 3. Kernel parameters.

Parameter	Value	File
semmsl	256	/proc/sys/kernel/sem
semmns	32000	
semopm	100	
semmni	142	
shmall	2097152	/proc/sys/kernel/shmall
shmmax	2147483648	/proc/sys/kernel/shmmax
shmmni	4096	/proc/sys/kernel/shmmni
msgmax	8192	/proc/sys/kernel/msgmax
msgmnb	65535	/proc/sys/kernel/msgmnb
msgmni	2878	/proc/sys/kernel/msgmni
file-max	131072	/proc/sys/fs/file-max
ip_local_port_range	10000 - 65000	/proc/sys/net/ipv4/ip_local_port_range

Enter the following commands on terminal as a root user to see the values of above parameters. You can also see the values of these parameters by opening the particular file. In this case it is a 'sysctl.conf' file in '/sbin' directory.

Table 4. Commands for inspecting kernel parameters.

Parameter	Command
semmsl, semmns, semopm, and semmni	# /sbin/sysctl -a grep sem This command displays the value of the semaphore parameters in the order listed.
shmall, shmmax, and semmni	# /sbin/sysctl -a grep shm
msgmax, msgmnb, and msgmni	# /sbin/sysctl -a grep msg
file-max	# /sbin/sysctl -a grep file-max
ip_local_port_range	# /sbin/sysctl -a grep ip_local_port_range This command displays a range of port numbers.

If the value of any kernel parameter is different from the recommended value, complete the following steps:

- a. Using any text editor, create or edit the `/etc/sysctl.conf` file and add or edit lines similar to the following:

```
kernel.shmall = 2097152
kernel.shmmax = 2147483648
kernel.shmmni = 4096
# semaphores: semmsl, semmns, semopm, semmni
kernel.sem = 256 32000 100 142
fs.file-max = 131072
net.ipv4.ip_local_port_range = 10000 65000
kernel.msgmni = 2878
kernel.msgmax = 8192
kernel.msgmnb = 65535
```

Note: Include lines only for the kernel parameter values that you want to change. For the semaphore parameters (`kernel.sem`), you must specify all four values. However, if any of the current values is larger than the recommended value, specify the larger value. During our installation we didn't change the following values as these values are above the default values.

By specifying the values in the `/etc/sysctl.conf` file, they persist when you reboot the system. So reboot the system after you done.

- b. Enter the following command to change the current values of the kernel parameters.

```
# /sbin/sysctl -p
```

Review the output from this command to verify that the values are correct. If the values are incorrect, edit the `/etc/sysctl.conf` file, then enter this command again.

- c. On SUSE Linux Enterprise Server systems only, enter the following command to make the system read the `/etc/sysctl.conf` file when it reboots:

```
# chkconfig boot.sysctl on
```

Set Shell Limits for the oracle User

To improve the performance of the software on Linux systems, you must increase the following shell limits for the oracle user, depending on the user's default shell:

The default shell for the oracle user is bash. So type 'bash' on the terminal for BASH if it is not set.

Bourne or Bash Shell Limit	Korn Shell Limit	C or tcsh Shell Limit	Hard Limit
nofile	nofile	descriptors	16384
noproc	processes	maxproc	16384

To increase the shell limits:

Add the following lines to `/etc/security/limits.conf` file:

```
*      soft      nproc      2047
*      hard      nproc      16384
*      soft      nofile     2048
*      hard      nofile     65536
```

Add the following line to the `/etc/pam.d/login` file, if it does not already exist:

session required /lib/security/pam_limits.so

Depending on the oracle user's default shell, make the following changes to the default shell start-up file:

For the Bourne, Bash, or Korn shell, add the following lines to the `/etc/profile` file: As the default shell in our installation is 'bash', check what is the the file for BASH in '`/bin`' directory, it should be 'bash'.

```
if [ $USER = "oracle" ]; then
    if [ $SHELL = "/bin/bash" ]; then
        ulimit -p 16384
        ulimit -n 65536
    else
        ulimit -u 16384 -n 65536
    fi
fi
```

Create an Operating System Group for the Inventory Directory

If this is the first Oracle product to be installed on the computer, create an operating system group for the "**inventory**" directory. The installer creates files in the inventory directory to keep track of the Oracle products that are installed on the computer. The default group name for this is '**oinstall**'.

By having a separate group for the inventory directory, you allow different users to install Oracle products on the computer. Users need write permission for the inventory directory. They can achieve this by belonging to the **oinstall** group. The default name of the inventory directory is **oraInventory**.

If you are unsure if there is already an inventory directory on the computer, look in the **/etc/oraInst.loc** file. This file lists the location of the inventory directory and the group who owns it. If the file does not exist, the computer does not have Oracle products installed on it. So it means when you start installation of oracle application server, you will be prompted by "oracleAS" installation process to specify the path as well as to run one script related with "orainventory" as a root user.

So do not worry if you can not find "**/etc/oraInst.loc**" file before installation of oracleAS.

How to Create a Group

To create the oinstall group, enter the following as the root user:

```
# /usr/sbin/groupadd oinstall
```

By default, this group is already available in SUSE 9. So you do not need to create it. To check whether this group is available or not follow these steps.

- Login is as root.
- Open YAST. If you are not logged in as root then it will ask for root password.
- Go to the Add user or group option available in YAST. Click on Group.
- Click on filter and select system.
- Here you will see oinstall, dba, disk and other groups available in SUSE9.
- You can also create this group if they are not available in that list. Use “create” button to do so.

Create an Operating System Group for Database Administration

Using the same steps as in the previous section, create an operating system group called "dba". When you create an operating system user in the next step, you will set this dba group to be the user's secondary group.

Create an Operating System User

Create an operating system user to install and upgrade Oracle products. This guide refers to this user as the oracle user.

How to Create a User

To create the oracle operating system user as part of the oinstall group, enter the following command as the root user:

```
# /usr/sbin/useradd -g oinstall oracle // here "oinstall" is the primary  
// groupname of oracle user.
```

By default, the user named “oracle” is already created in SUSE9. So you do not need to create it. To check whether this user is available or not follow these steps

- Login is as root.
- Open YAST. If you are not logged in as root then it will ask for root password.
- Go to the Add user or group option available in YAST. Click on Users.
- Click on filter and select system.
- Here you will see oracle and other system users available in SUSE9.
- You can also create this user or any other user if they are not available in that list by clicking “create” button.
- If oracle user is already there then select oracle user.
- Assign password for oracle and then click on “Detail” button for more information. Try following option also to change the password of oracle just for safer side.

```
Prompt:> cd /usr/bin  
Prompt:> passwd "username" // where username = oracle in our case
```

- Click on Edit button, to set properties of oracle user.
- Change the default shell from “/bin/false” to “/bin/bash” if it is not default to “bash”. Do not change the home directory of oracle user here. Keep it as it is.

- Make sure the default group for oracle is “oinstall”. If it is not then set it to “oinstall”.

Check Environment Variables

Here you have to specify the oracle home directory, oracle base directory and other environment variables for the oracle. So keep those variables handy in this step.

Here are the values of oracle environment variables for our project:

```
- $ORACLE_BASE = /u01/app/oracle'
- $ORACLE_HOME = $ORACLE_BASE/product/10_2/oracleas1'
- $ORACLE_SID = 'orcl' // this sid is for default database which will be
// installed automatically when you finished with
// "oracleAS"
```

In our project, we are changing the default locations of oracle software and for database files. Here we are putting oracle software files in “/u01” file system and all database files (.dbf) in “/u02” file system. So we need to create those directories as a root user and have to change mode as well as ownership of those directories and have to assign to the “oracle” user.

Check for the directories like, app, oracle, product, 10_2, oracleas1, are already created in “/u01” file system or not. If they are not created, do the following,

- Create directories

```
#mkdir -P /u01/app // Do the same this for other directories
// in /u01 file system
```

In file system “/u02”, create following directory for database files. During the installation of oracleAS, it will ask for database files locations to user, at that time specify this directory.

```
#mkdir -P /u02/oradata
```

- Change the mode, ownership and assign those to “oracle”

```
#chown -R oracle:oinstall/u01
#chown -R oracle:oinstall/u02/oradata

#chmod -R 775 /u01
#chmod -R 775 /u02/oradata
```

If they are already created then change the ownership of those directories. If they are not assigned to oracle user then perform (b) as explained above.

Now after setting oracle environments for our database, set it into the “oracle.csh” and “oracle.sh” files.

Do the following steps for that:

- a. Go to “/etc/profile.d” directories:

```
# cd /etc/profile.d
# vi oracle.sh // You must be a root user to change this file.
```

- b. Add or Edit the oracle environment variables which we have set for our database in “Check Environment Variables” step.
- c. Check PATH variable and make sure the following entry is also listed as one of its values to run sqlplus.

```
“/u01/app/oracle/product/10_2/oracleas1/bin”
```

- d. Make sure to export the above environments to make them global.
- e. Perform the above steps for “**oracle.csh**” files too.
- f. To make them effective run the following script and ignore any errors if it pops up.

```
#cd /usr/sbin
#!/rcoracle start
```

Note: Used to start cluster file system, cluster management, oracle GSD and listener. It also starts database, apache, Application Server, Application Server console, oracle agent, enterprise manager, iSQLplus, oracle internet file system, oracle internet directory etc.

- g. Exit root session and login as “**oracle**”.

Environment Variable Tips: there are things to look out for when setting environment variables:

a. If you set environment variables in the .profile file, they might not be read. To ensure environment variables are set to the correct values, check their values in the shell where you will be running the installer.

b. To check the value of environment variables, use the env command. This displays all the currently defined environment variables and their values.

```
Prompt> env
```

c. If you use the su command to switch users (for example, switching from the root user to the oracle user), check the environment variables when you are the new user because the environment variables might not be passed to the new user. This can happen even if you run su with the - parameter (su - user). # /* root user */

```
# su - oracle
# env
```

Check If Port 1521 Is in Use

This section is applicable only if you are installing the Oracle AS Infrastructure. The Oracle AS Infrastructure installs an Oracle database, which uses port 1521 by default. To check if port 1521 is in use:

```
prompt> netstat -an | grep 1521
```

If port 1521 is in use by a third-party application, you need to configure the application to use a different port. If port 1521 is in use by an existing Oracle database listener, you need to stop the listener before installing the Oracle AS Infrastructure.

Note: In our project we haven't find that port 1521 is running. So you will see nothing if it is not being used. If it is then the output will give you which process is using that port. Here you are almost done with the configuration of SUSE 9 for oracle application server at least for oracle database part. So logout if you logged in as root and log in as an oracle user.

Starting up the Installer (Installing Oracle Application Server)

- (1) After you logged in as an oracle user insert oracle CD - 1 into CD drive and copy it into desktop or in any other directory which has enough space to accommodate oracle software.
- (2) After you are done copying of all 4 oracle CDs open terminal and type following:

```
Prompt>cd /pathname //pathname where you just put your oracle
//software.
```

- (3) If the oracle software in “.gz” format try following the unzip it.

```
Prompt>gunzip filename_cpio.gz
```

- (4) After the above step your file is in “cpio” format.

```
Prompt>cpio -id < filename_cpio
```

This command will unzip the oracle software and put the content into Disk1 directory at the same location.

- (5) Now open Disk1 directory and make sure there are oracle files in it.
- (6) Do the first 5 steps to unzip rest of oracle CDs.
- (7) Open terminal if you have closed it.
- (8) Go to the directory Disk1 using “cd” command.

(9) Inside Disk1 you will see “runInstaller” file. Run that file using following command only.

Prompt>./runInstaller

This will start the oracle installation process.

(10) Specify oracle home directory which you have defined in step - 3.9, a full path name not in terms of ORACLE_BASE.

(11) Specify the starter database name, global database name and SID (from Check Environment Variables step) and password for different oracle accounts. Please remember all these things. However even as this is for the default database not for WIM database, even if you forget it, do not worry. Click next after you are done.

(12) Specify inventory directory and credentials in this step. Click next, if you get message window to execute “/opt/oracle/oraInventory/orainstRoot.sh” do the following:

- Open terminal
- type: “su root”
- give password for root.
- got to “/opt/oracle/orainventory” directory
- type: sh oraInventory.sh.

(13) After you execute “oraInventory.sh” file click “ok” to the window which you have got in step 12 and click next.

(14) Keep clicking next till you will be asked to specify the path name for database files. At that time, specify the database file pathname from step 3.9. You may be asked to run “root.sh” at the later steps of this process.

(15) This is almost done with the oracle application server installation at least from the database point of view. You might need to install other portals of component for complete installation of oracle application server.

(16) Restart the machine and logged in as oracle user.

(17) Use sqlplus command to start oracle. Use following command to connect oracle.

Conn sys as sysdba
Password //Give the same password

(18) If it says “connected to an idle instance”, try “startup” command to start the database.

(19) This is the end of oracle application server on the machine.

5. CONCLUSION

This report summarizes the database related issues in the TDW project. The success of the TDW project hinges critically on the implementation of WIM-DB in Oracle 10g and on the web services provided through Oracle Application Server. The results have indicated that the overall performance of the database component in the TDW system meets the Caltrans requirements.

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