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CASE STUDY

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Large petroleum refinery adopts RFID-enabled VEHICLE ACCESS CONTROL SYSTEM

Real-time vehicle tracking system for security, parking and access control for employees, visitors and trucks

Automated entry and exit logging at multiple gates

Accurate identification, messages and alerts

Management of further location-wise access restrictions

INSIDE:

TECHNOLOGY

Solution:
EPC Gen2 compliant vehicle tracking solution

Tag Type:
Parka™ UHF Passive

Reader/Antenna:
Xtenna™
Xtenna Proximity™

Method:
Multiple Tracking via Integrated Reader/Antenna modules

Integration Platform:
RFID Middleware:
Xtenna™ WebToolkit
Xtenna™ Studio
Application: Essen RFID's Vehicle Access Control System
Database: SQL Server 2005 Exp. ed.

Tag Manufacturer/Supplier:
Essen RFID, with US based chip inlay

Reader/Antenna Manufacturer:
Essen RFID, with US based module

Systems Integrator:
Essen RFID

Xtenna™ Integrated RFID Antenna/Reader

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KEY REQUIREMENTS:

Mangalore Refinery and Petrochemicals Ltd. (MRPL) is a state-of-the-art oil refinery and a subsidiary of ONGC. The infrastructure complex consists of several plant units spread over a large area. Numerous vehicles enter, exit and traverse within this area on a daily basis. Due to the nature of plant operations including the presence of highly restricted areas, security is of prime concern to the managing authorities.

Vehicles entering the premises consist of employee vehicles, visitor vehicles and trucks. The company was previously deploying manual procedures and records for managing entry/exit at the gates and was unable to keep track of vehicles once they were inside the premises. There was also difficulty in recording complete details of trucks and drivers. The company therefore needed an automated solution that would overcome these shortcomings, keep efficient track of vehicles and enhance security.

Main challenges in implementation:

- Tracking the movement of each vehicle.
- Have automated information regarding each vehicle/driver entering and exiting the premises.
- Allow entry at specific locations only to those vehicles that are authorized to enter at those locations.
- Generate alerts if unauthorized vehicle entry is attempted.
- Managing details of visitors and tracking their vehicles within the premises.
- Tracking the movement of trucks within the area and at entry/exit.
- Automated operation of boom barrier at the gates.
- Maintaining track records and entry/exit logs of all vehicles in the premises.

SOLUTION:

Essen RFID provided a comprehensive solution for intelligently tracking vehicles entering and exiting the refinery complex through its RFID-based Vehicle Access Control System.

IMPLEMENTATION:

Xtenna™ RFID Antenna-Readers are installed, one each for each of the 'Entry' and 'Exit' gates of the facility. A PARKA™ Tag is issued to each vehicle and affixed to its windshield. For visitors' vehicles, the tags are temporarily affixed with a clip-holder. All tags are registered using an Xtenna Proximity™ Antenna-Reader. The tracking system incorporates a boom barrier installed at each gate that is operated through a trigger switch and RFID controller that automates operations for vehicle entry/exit. SQL Server is used as the back-end database to store the system's tracking data.

WORKING:

Process Flow:

1. All relevant vehicle owner (employee) details are obtained for the system database.
2. Details of each vehicle are also entered into the system database.
3. A permanent RFID tag is assigned to each vehicle. Essen RFID's PARKA™ Tag is used for this purpose. The tag is read by the Xtenna Proximity™ Antenna-Reader and is registered in the database as assigned to the particular vehicle. The tag is affixed on the vehicle's windshield.
4. When a vehicle enters the facility, its tag is detected at the 'Entry' gate by the Xtenna™ Antenna-Reader that has been mounted at the gate. Xtenna™ reads the tag, and verifies that it is a registered tag that has been assigned to an authorized vehicle. It then logs the entry time and transmits this data back to the server.
5. The server then triggers the switch controlling the boom barrier, which opens and the vehicle is allowed inside. Once the vehicle has passed through the detection area and its tag detection has ceased, the boom barrier closes till it has detected another registered tag.
6. As the vehicle's tag gets read at the Entry gate its time log gets stored in the database. Similarly, the Xtenna™ mounted at the Exit gate detects the tag of the exiting vehicle and its departing time gets logged in the server database.

Operational Flow:

The Vehicle Access Control System consists of:

Windows application for operations such as vehicle registration and vehicle de-registration, tag assigning, etc.

Web application for administration functions such as user management, dashboard reports, etc.

The Windows application has various operational modules, such as:

Masters:
- Location Master
- Template Master
- Employee Master
- Visitor Master
- Truck Master

Transactions:
- End Trip
- Dashboard

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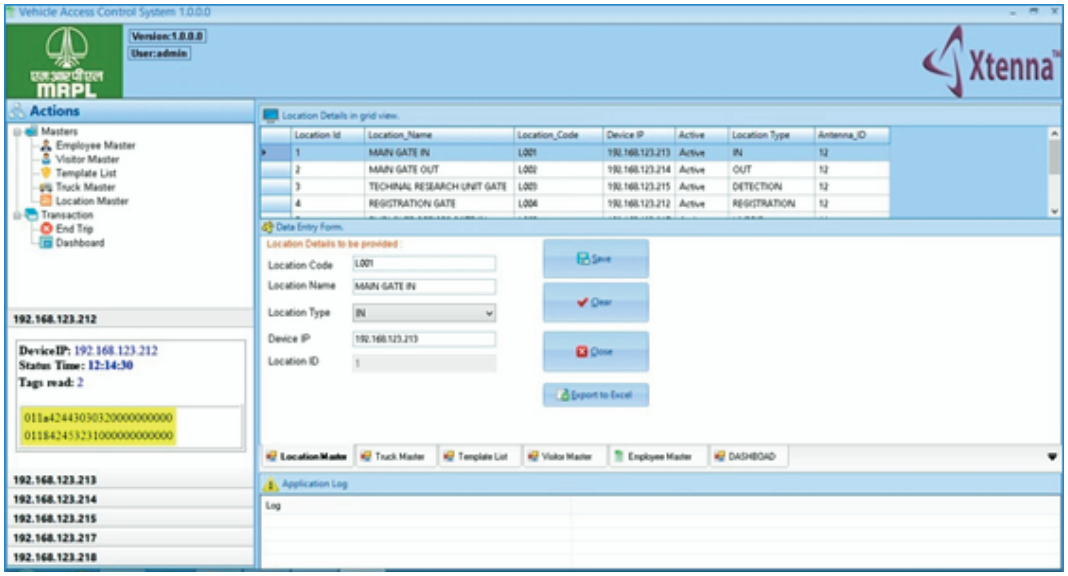
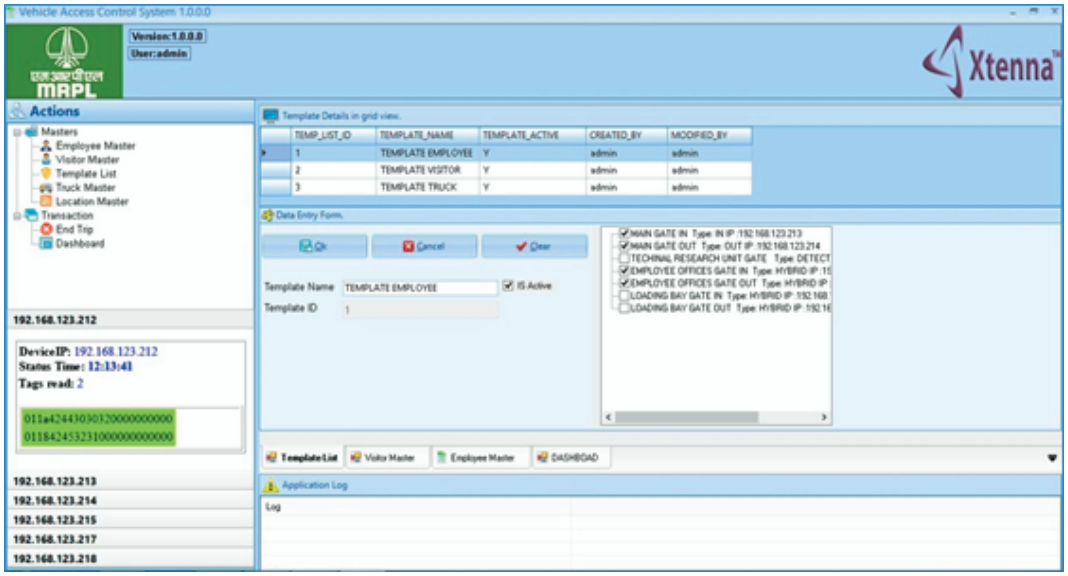
Location Master: This module contains information about the various RFID-enabled locations within the facility where RFID devices have been installed. The settings consist of Location Name, Location Code, RFID Reader IP Address, etc. The Location Master provides a clear indication of total RFID locations in the refinery complex along with their IP address details.



Template Master: This module is used to assign a group of locations into a single template. Once the template is created with a name and selected location, it is used to map the employees or visitors or trucks.

For instance, a template named as “Employee Template” for employees contains Location-1 and Location-2. During employee registration the user then assigns a template to that employee. If the employee is found elsewhere other than Location-1 and Location-2, the system will generate and send an alert for unauthorized access.



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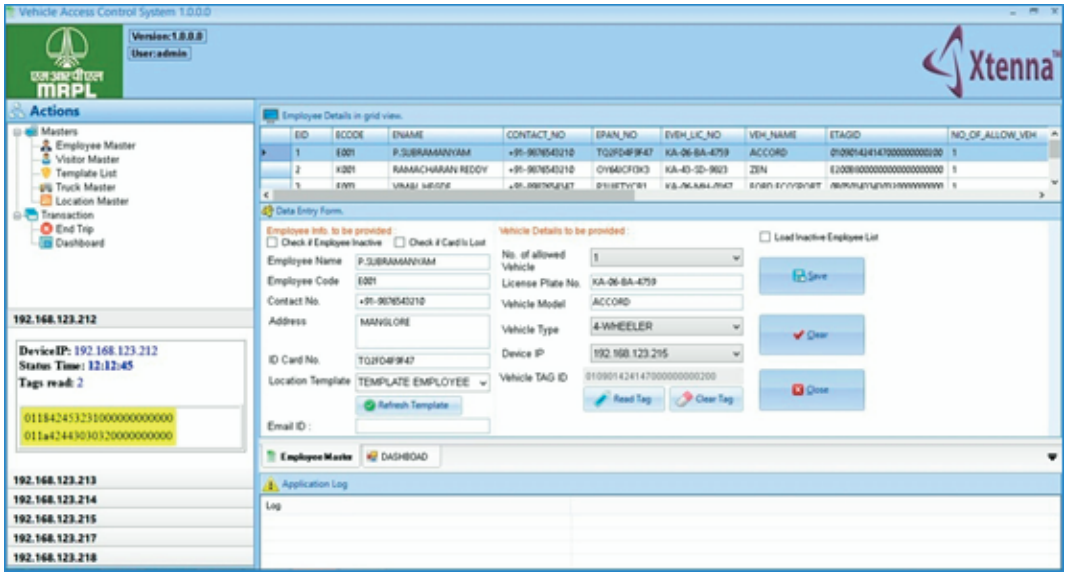
Employee Master: This module is used to register employees' vehicles. The information entered here includes employee name, employee code, contact, address, vehicle type, vehicle license plate number, etc. While registering the employee, a template is assigned for that employee. If the template is not available, the operator can create template by selecting the "Add New Template" option in the list.

If an employee has more than one vehicle, a new window opens allowing the operator to register multiple vehicles for that employee.



Visitor Master: This module is used to register visitors' vehicles. The information entered here includes the visitor's name, address, contact, vehicle type, vehicle license plate number, etc. A template can also be assigned to the visitor, limiting the locations within the facility that he can enter.

The operator can capture a photo of the visitor using a webcam and upload it into the system. During registration, the visitor is required to provide the employee's details to whom he intends to meet. An email and message will be sent to the registered mobile and email of the employee about the visitor's details.

The operator can also select the maximum number of visiting hours for a visitor. If the allowed hours are exceeded then the system will send an alert to the authorities.

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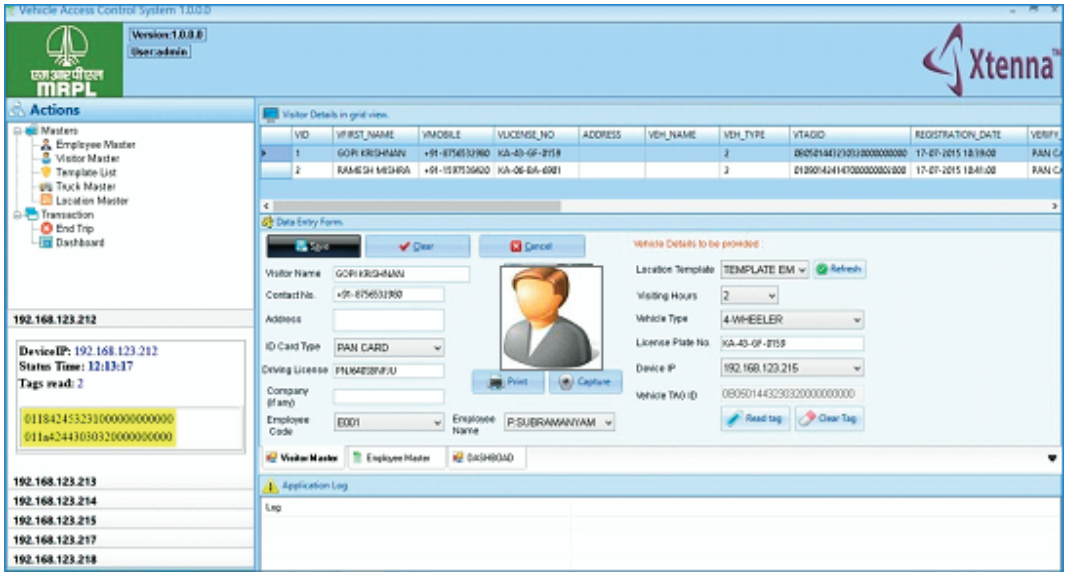
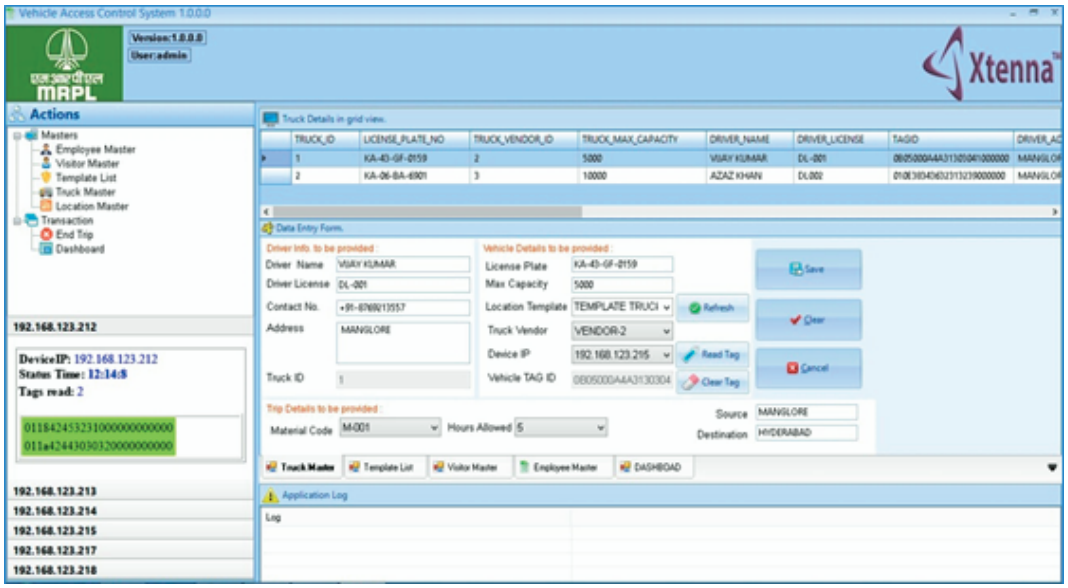


Truck Master: This module is used to register the trucks entering the refinery complex. The operator inputs necessary information regarding the truck as well the driver, along with vendor and material information.

Each truck is assigned a location template. The vendor and material are selected from a list when the truck arrives for loading, along with the maximum number of hours allowed inside the facility. The source and destination of the truck can also be entered here.



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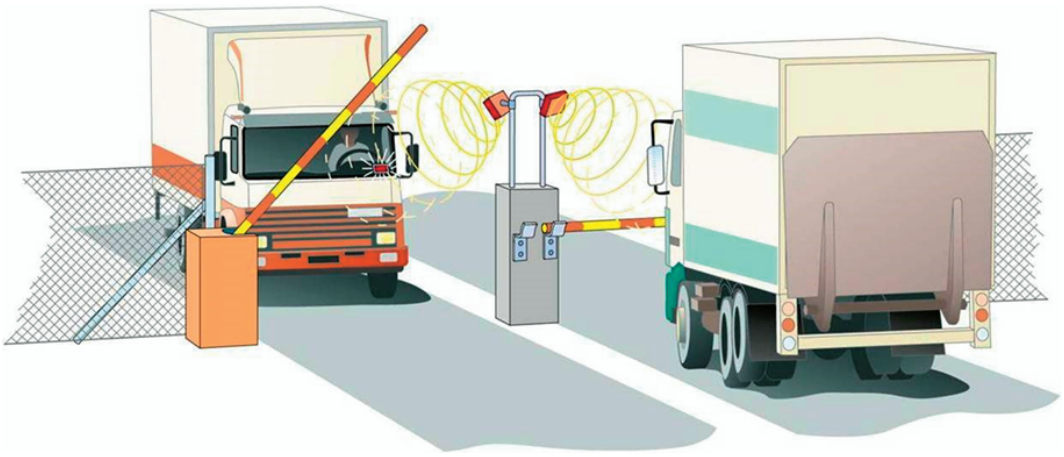
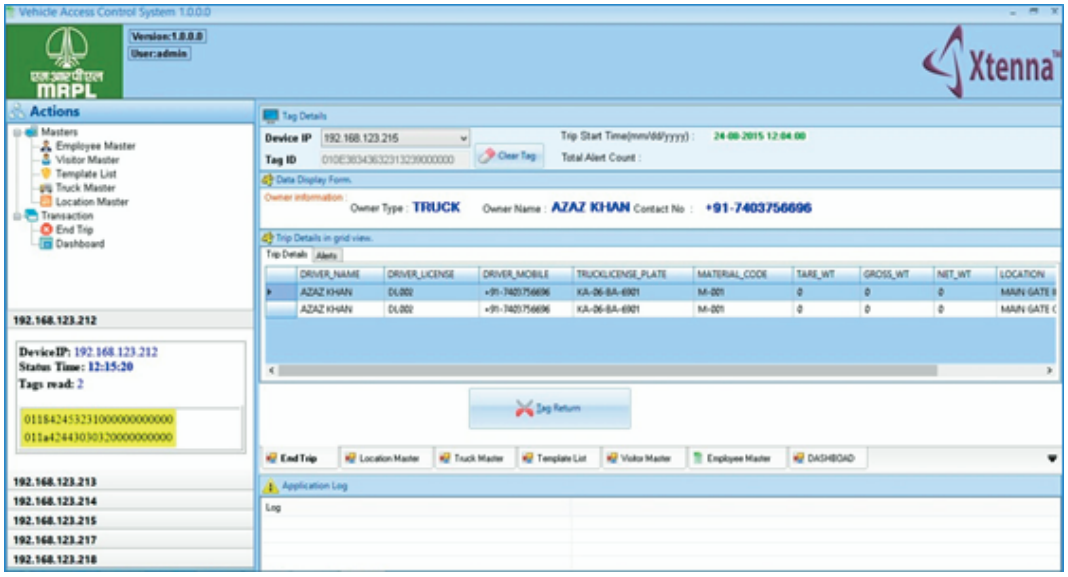


End Trip: This module is used to end the current trip of visitors as well as trucks. Once a visitor or truck exits the 'Out' gate after completion of the trip, the security person will take the RFID tag back from the driver/visitor, keep the tag on the Reader and select the Reader IP from the list provided on the module. Once the IP is selected it will display the details of the trip along with all alerts (if any) generated for that vehicle. Clicking on "Tag Return" will end the trip. Once the trip has ended for this vehicle, the same tag can be assigned to another vehicle or trip.



Dashboard: This displays the overall view of the application and is the default view after login to the windows application. It shows the total number of vehicles inside the refinery complex, and their category such as employee, visitor and trucks, along with the alerts generated by the system for each vehicle.

When the operator clicks on any tab shown on the dashboard it will display a list of vehicles under that category in the grid just below the tab.

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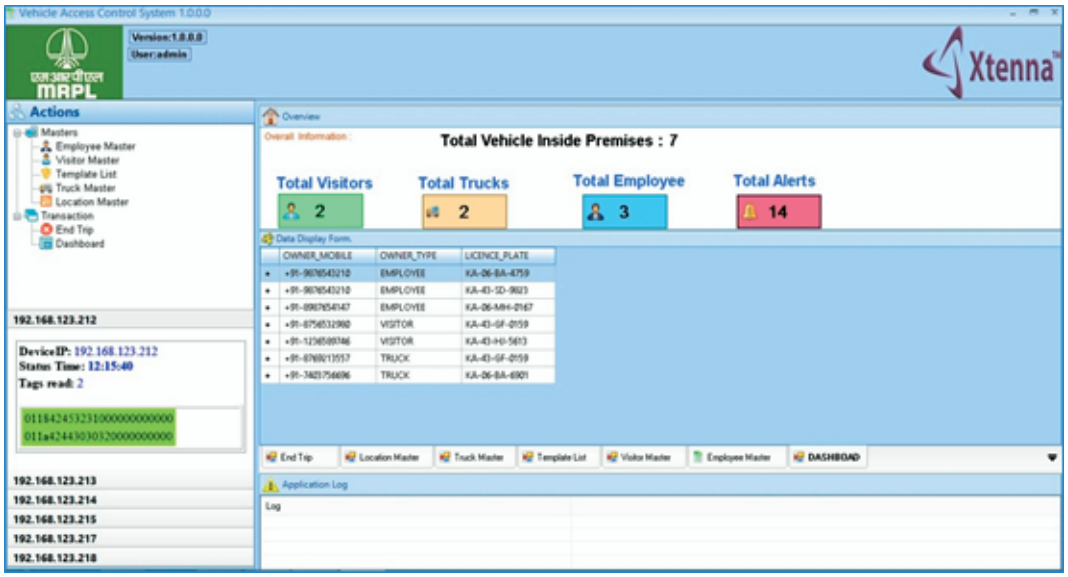
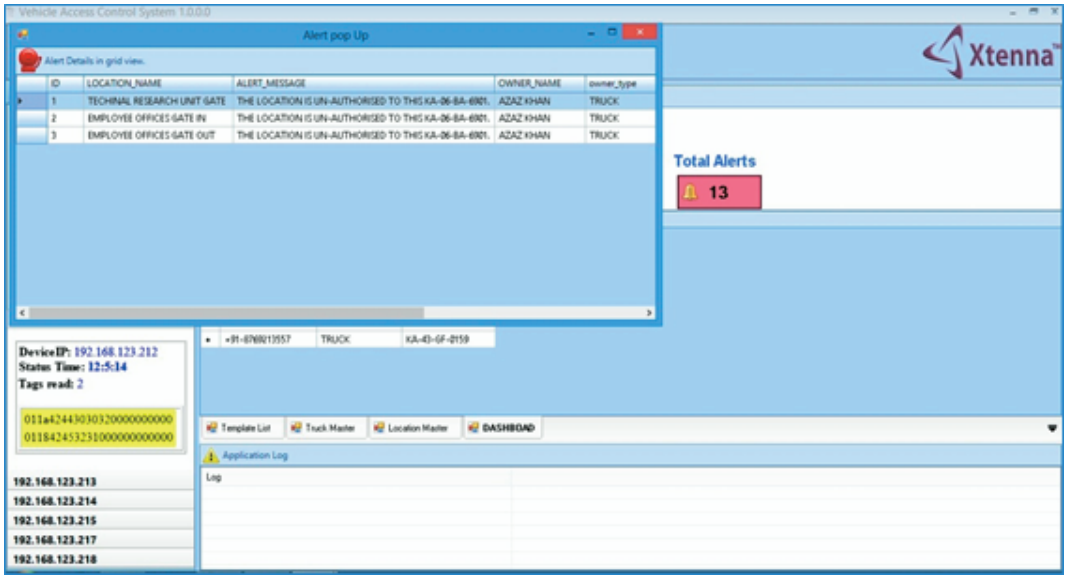
Within the list, clicking on the "+" will further display the details related to that vehicle. For instance, clicking on the "Employee" tab, a list of all employee vehicles will be displayed on the grid below the tab section. Further clicking the "+" next to a particular employee it will display a list of locations where the employee has passed through.

Similarly clicking on the "Alerts" tab on the dashboard it will display a list of vehicles for which alerts have been generated. Further clicking the "+" next to a vehicle will display all the alerts generated for the selected vehicle.



If the system generates an alert while the application is running, a pop-up alert will be displayed for immediate action.



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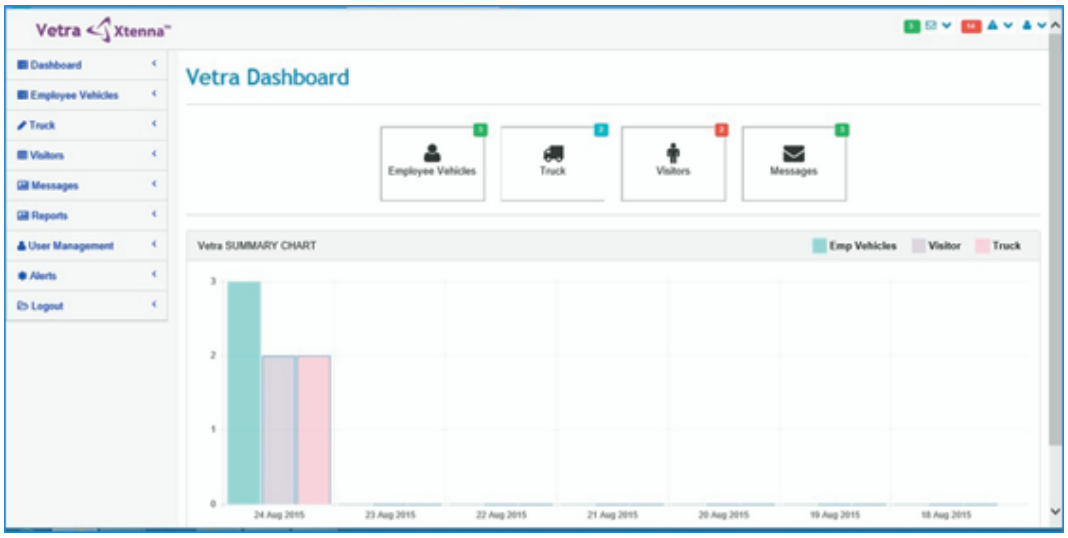
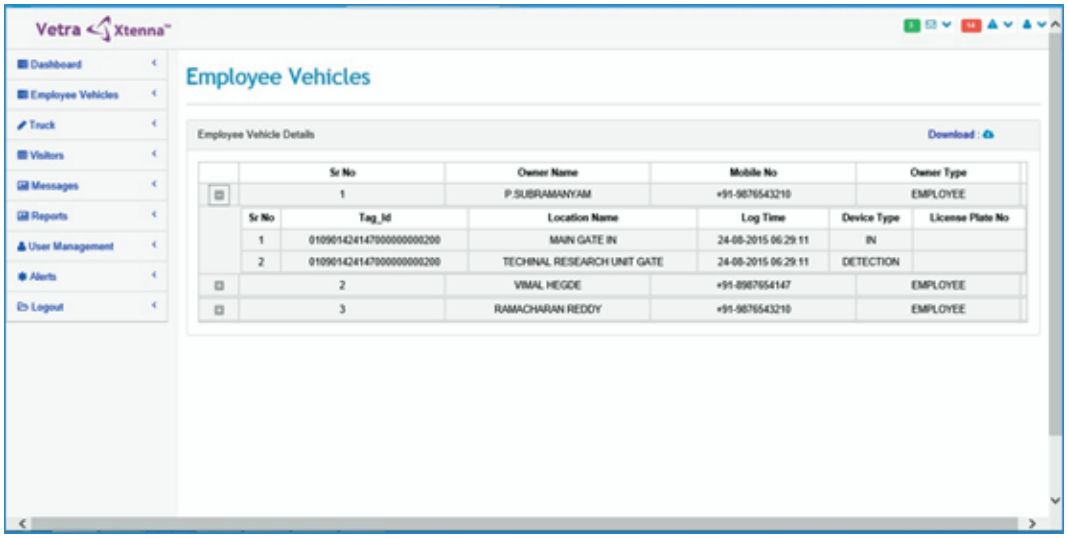
The admin web application gives an overall view of the system to the administrator. Since it is web-based, it can be viewed from any computer after valid login. It consists of the following:

Dashboard: This provides a summary view of the application for viewing employee, visitor and truck transaction events.



Employee Vehicles: This is used to track employees' vehicles inside the refinery complex. When the admin user clicks on any particular vehicle for information, a new list displays full details of that vehicle's movement across the facility premises along with timing details. The screen also has a download option to export the details to an Excel file.



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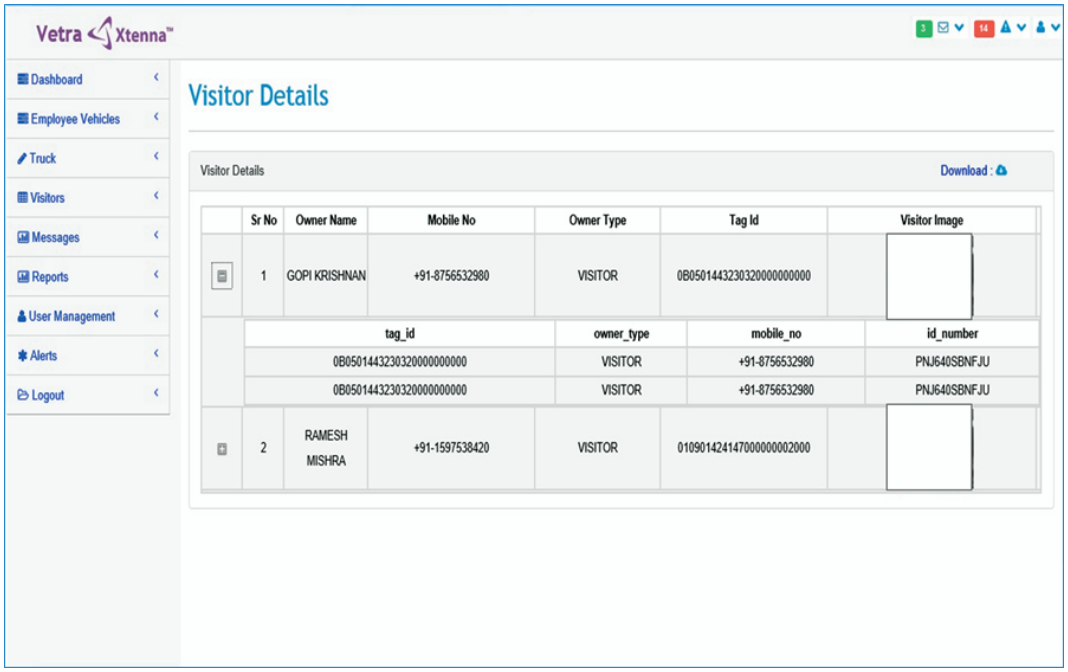
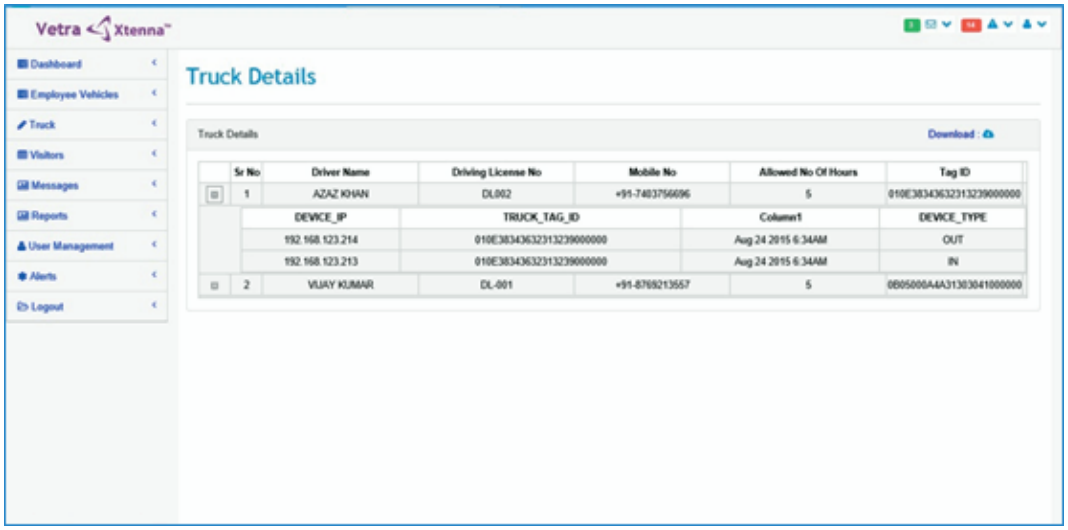
Visitor Vehicles: This is used to track visitors' vehicles inside the refinery complex. The admin user can view details of those vehicles whose trip has not been ended by the operator in the 'End Trip' module, i.e. only those vehicles that are currently within the premises. The screen also has a download option to export the details to an Excel file.



Truck Details: This is used to track active trucks currently inside the refinery complex and displays both truck and driver details. When the admin user clicks on any particular truck for information, a new list displays full details of that truck's movement across the facility premises along with timing details. Once the operator has ended the truck's trip in the database, then the particular truck trip becomes inactive and will not be displayed in detail view. The screen also has a download option to export the truck details to an Excel file.



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Messages: This module is used to broadcast messages from the admin to all operators using the Windows application.

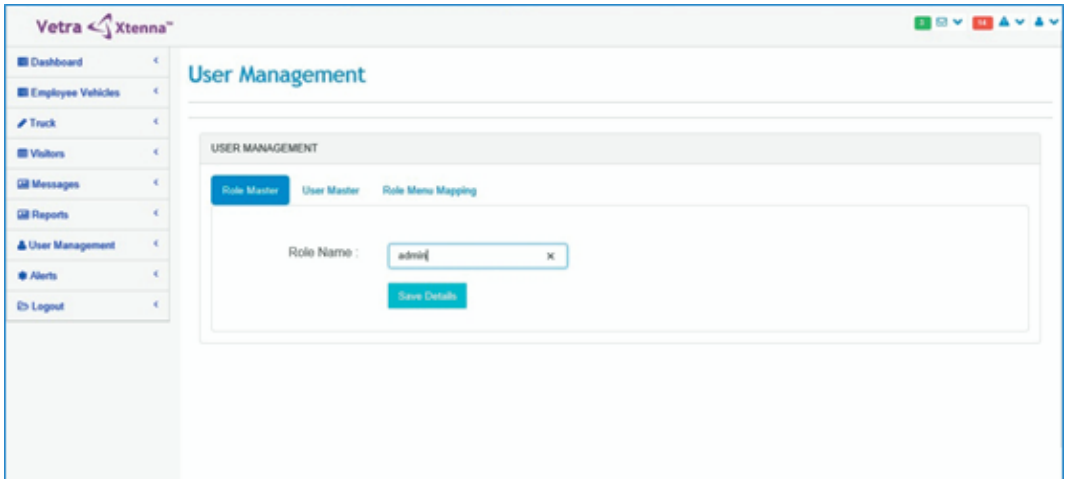
Reports: This module allows the admin user to view the employee vehicle, visitor vehicle and truck details. The admin can also view the daily vehicle transactions and export the report data into Excel and PDF format.

User Management: This module allows the administrator to maintain the data integrity and security of the system. The module has three sections as follows:

Role Master: This is used to define a new role to the application. Details such as Role Name, Description, etc. are entered and saved into the system.

User Master: This is used to create the users who can access the application. When creating a User, his role has to be selected from the list which will help to maintain data security and integrity.

Role Mapping: This is used to map the existing role in the system to the various available modules of the application. For instance, the role of admin is mapped to all the modules, whereas the role of operator will only be allowed limited access to the application and not modify any crucial data.



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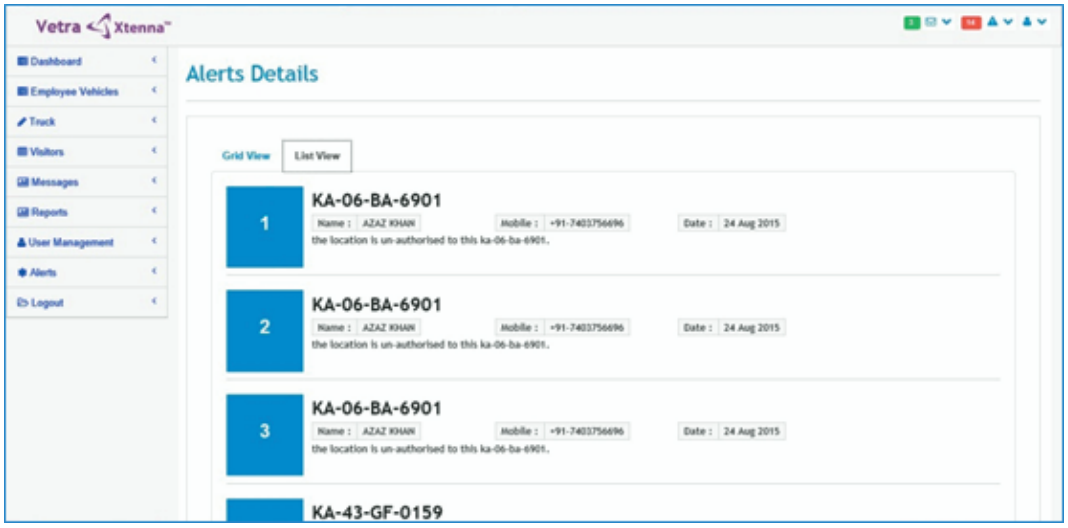
Alerts: This module will allow the admin user to view all the generated alerts in the system, in order to initiate corrective measures.



BENEFITS:

- Accurate identification and access for authorized vehicles.
- Real-time tracking of all vehicles entering and exiting the gates.
- Efficient tracking of employees' vehicles throughout the premises.
- Efficient management of visitors' details and tracking of their vehicles.
- Efficient management of truck and driver details.
- Efficient tracking across multiple entry/exit gates.
- Automated boom barrier operations at the gates through trigger switch, requiring no manual operator for lifting the barriers.
- Default 'no entry' for unregistered vehicles.
- Automated entry and exit logging into server.
- Quick verification with employee via automated email when visitor's vehicle is at the gate.
- Efficient location-wise restrictions for different vehicles within the facility.
- Broadcast of messages to client machines.
- Vehicle/owner mapping in database provides instant search function.
- Automated alerts to authorized persons.
- Automated report generation enables ready record reference.
- Live status reports for vehicles.
- Easy administration functionality resulting in improved system management.
- Improved security at entry/exit points and overall security within premises.

LINKS:

Hardware:

Xtenna™

Xtenna Proximity™

Tags:

PARKA™

Software:

Xtenna WebToolkit™

Xtenna Studio™

Reference Example:

http://www.essenrfid.com/Mailer/accessparking-flash-demo.pdf