



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:

Key Requirements
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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

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CASE STUDY

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.



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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

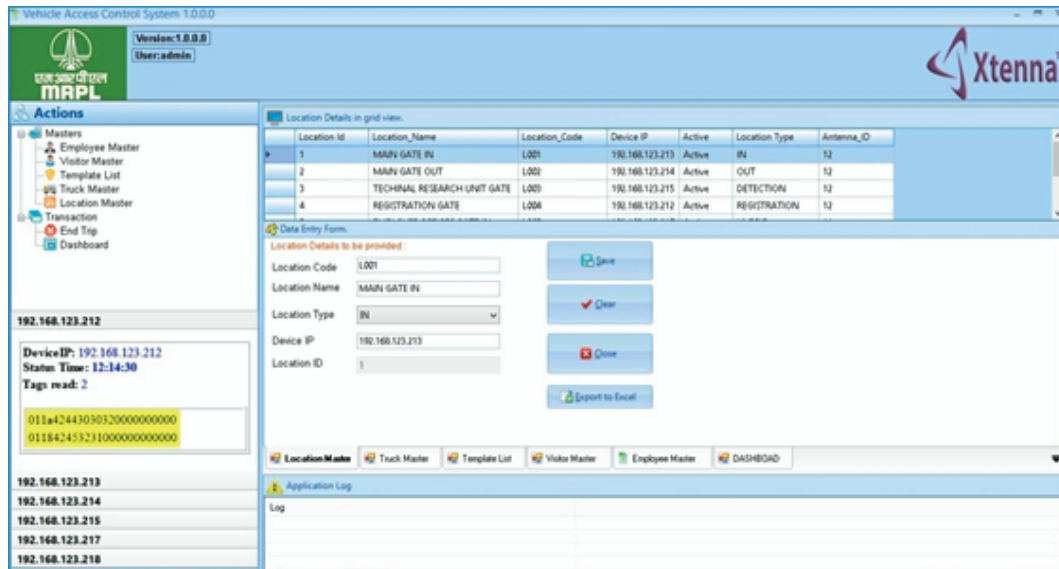
Transactions:

- End Trip
- Dashboard



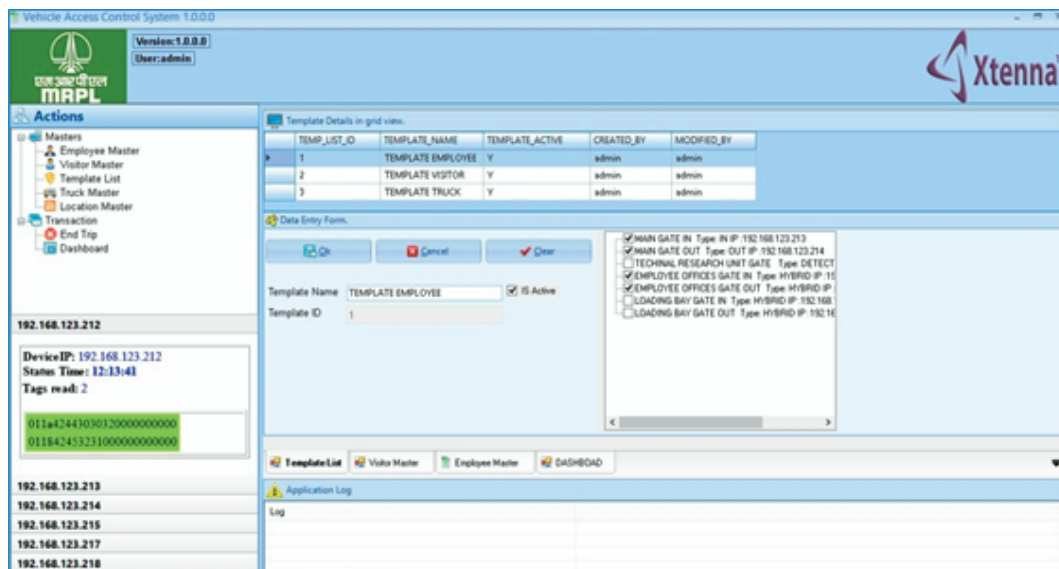
CASE STUDY

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.

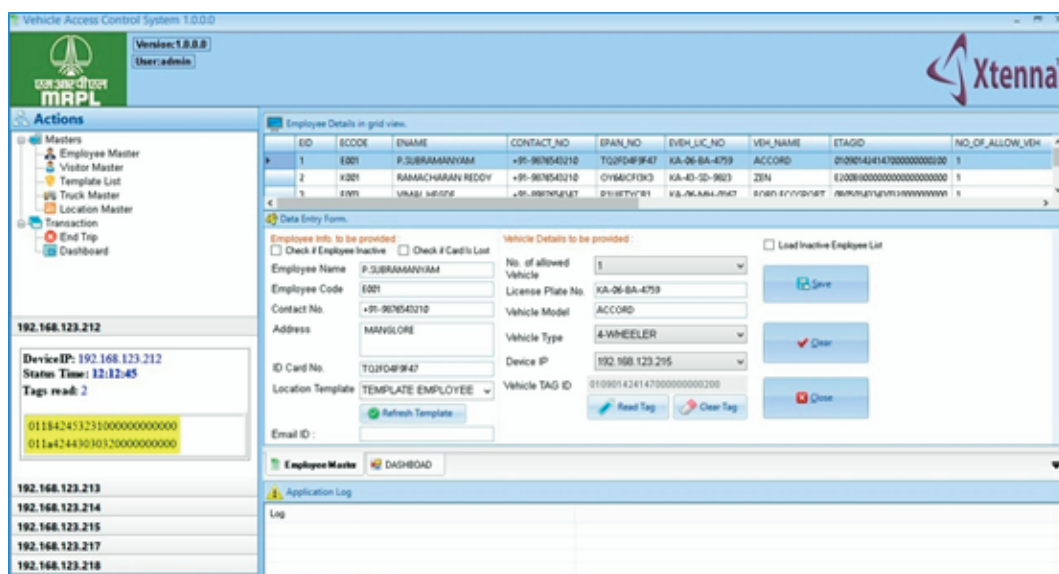




CASE STUDY

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.



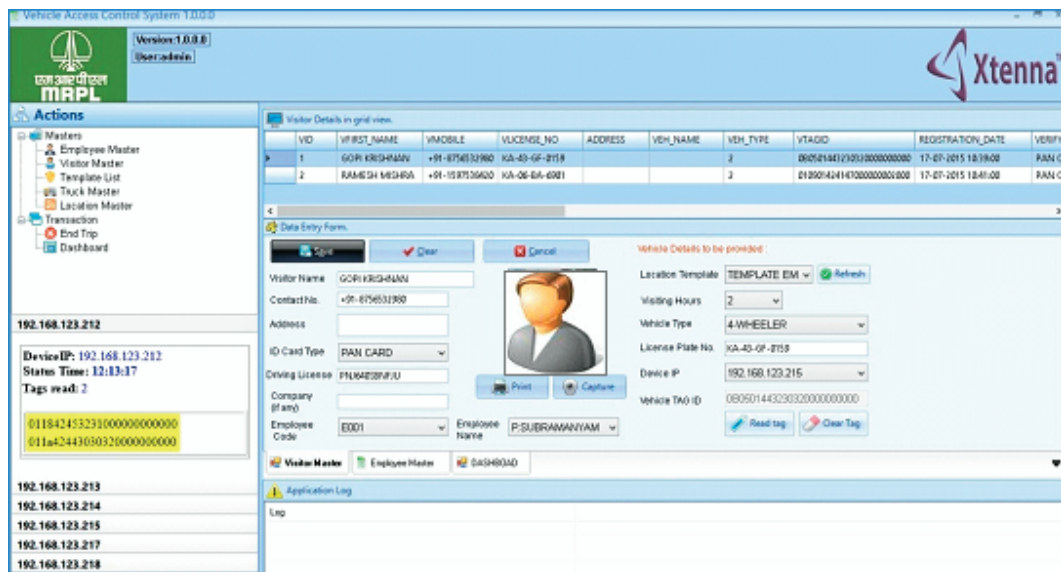
Visitor Master: This module is used to register visitors' vehicles. The information entered here includes the visitor's name, address, contact, vehicle type, vehicle license plate number, etc. A template can also be assigned to the visitor, limiting the locations within the facility that he can enter.

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.



CASE STUDY



Vehicle Access Control System 1.0.0.0

Version: 1.0.0.0
User: admin

Actions

- Masters
 - Employee Master
 - Visitor Master
 - Template List
 - Truck Master
 - Location Master
- Transaction
- End Trip
- Dashboard

192.168.123.212

Device IP: 192.168.123.212
Status Time: 12:13:17
Tags read: 2

011842453231000000000000
011a42441030320000000000

192.168.123.213
192.168.123.214
192.168.123.215
192.168.123.217
192.168.123.218

Visitor Details in grid view:

VID	VFIRST_NAME	VMOBILE	VLICENSE_NO	ADDRESS	VEH_NAME	VEH_TYPE	VTAGID	REGISTRATION_DATE	VERIFY
1	GOPI KRISHNAN	+91-8756531980	KA-43-GF-2119			2	060621841210120000000000	17-07-2015 18:19:00	PAN CA
2	RAMESH MISHRA	+91-1587136600	KA-06-BA-6001			2	01280142414702000000000000	17-07-2015 18:41:00	PAN CA

Data Entry Form:

Visitor Name: GOPIKRISHNAN
Contact No.: +91-8756531980
Address:
ID Card Type: PAN CARD
Driving License: P1164E2P1F1U
Company (if any):
Employee Code: E001
Employee Name: P.SUBRAMANYAM

Vehicle Details to be provided:

Location Template: TEMPLATE EM
Visiting Hours: 2
Vehicle Type: 4-WHEELER
License Plate No: KA-43-GF-2119
Device IP: 192.168.123.215
Vehicle TAG ID: 080501443230320000000000

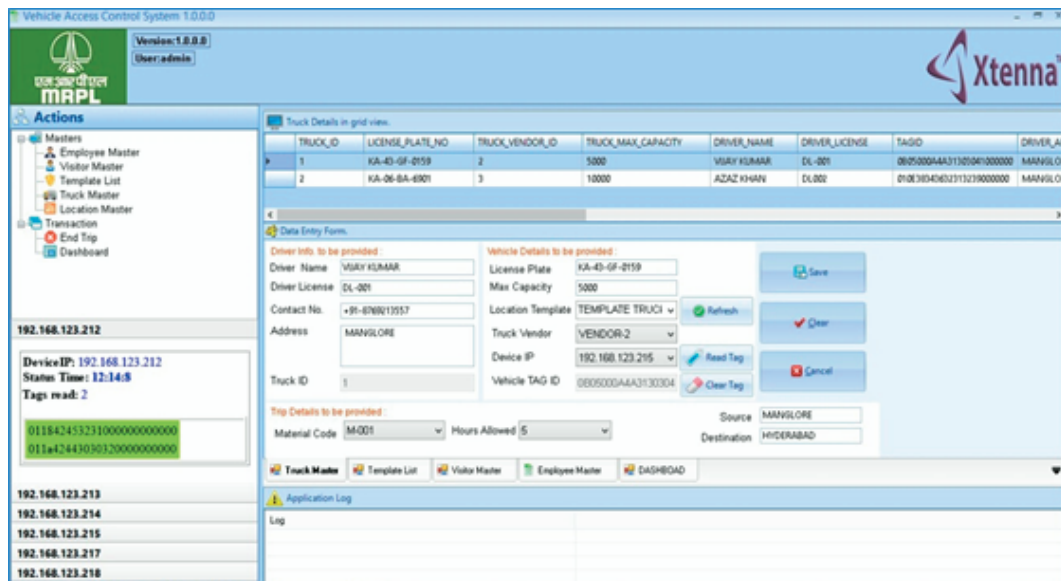
Buttons: Save, Clear, Cancel, Refresh, Read Tag, Clear Tag

Application Log

Log

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.



Vehicle Access Control System 1.0.0.0

Version: 1.0.0.0
User: admin

Actions

- Masters
 - Employee Master
 - Visitor Master
 - Template List
 - Truck Master
 - Location Master
- Transaction
- End Trip
- Dashboard

192.168.123.212

Device IP: 192.168.123.212
Status Time: 12:14:08
Tags read: 2

011842453231000000000000
011a42441030320000000000

192.168.123.213
192.168.123.214
192.168.123.215
192.168.123.217
192.168.123.218

Truck Details in grid view:

TRUCK_ID	LICENSE_PLATE_NO	TRUCK_VENDOR_ID	TRUCK_MAX_CAPACITY	DRIVER_NAME	DRIVER_LICENSE	TAGID	DRIVER_LAC
1	KA-43-GF-2119	2	5000	VIJAY KUMAR	DL-001	080500044312000402000000	MANVILOR
2	KA-06-BA-6001	3	10000	AZAZ KHAN	DL-002	01083046602713131900000000	MANVILOR

Data Entry Form:

Driver Info to be provided:

Driver Name: VIJAY KUMAR
Driver License: DL-001
Contact No.: +91-8769213557
Address: MANGLORE

Vehicle Details to be provided:

License Plate: KA-43-GF-2119
Max Capacity: 5000
Location Template: TEMPLATE TRUCI
Truck Vendor: VENDOR-2
Device IP: 192.168.123.215
Vehicle TAG ID: 0805000443130004

Buttons: Save, Clear, Cancel, Refresh, Read Tag, Clear Tag

Truck Details to be provided:

Truck ID: 1
Material Code: M001
Hours Allowed: 5
Source: MANGLORE
Destination: HIDERABAD

Buttons: Save, Clear, Cancel

Application Log

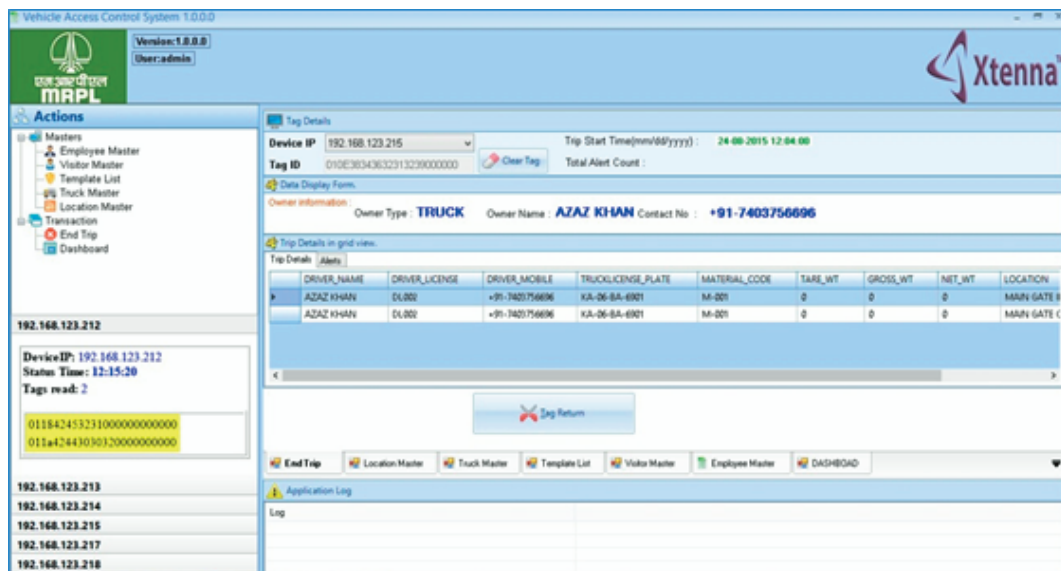
Log



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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.

The screenshot shows the 'Vehicle Access Control System 1.0.0.0' dashboard. The top right corner features the 'Xtenna' logo. The main dashboard area displays 'Total Vehicle Inside Premises : 7' and four summary cards: 'Total Visitors : 2', 'Total Trucks : 2', 'Total Employee : 3', and 'Total Alerts : 14'. Below these is a 'Data Display Form' table with columns for 'OWNER_MOBILE', 'OWNER_TYPE', and 'LICENCE_PLATE'. The table lists several entries, including employees and visitors. On the left, there is a sidebar with 'Actions' and 'Masters' sections, and a 'Device IP: 192.168.123.212' section showing 'Status Time: 12:15:40' and 'Tags read: 2'. At the bottom, there is an 'Application Log' section.

OWNER_MOBILE	OWNER_TYPE	LICENCE_PLATE
+91-9678543210	EMPLOYEE	KA-06-BA-4759
+91-9678543210	EMPLOYEE	KA-03-SD-9823
+91-8987654321	EMPLOYEE	KA-06-MH-0167
+91-875632980	VISITOR	KA-03-0F-0159
+91-123456789	VISITOR	KA-03-0F-5613
+91-876543210	TRUCK	KA-03-0F-0159
+91-3421756896	TRUCK	KA-06-BA-6901

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

The screenshot shows the same dashboard as above, but with an 'Alert pop Up' window overlaid. The window title is 'Alert pop Up' and it contains a table with columns 'ID', 'LOCATION_NAME', 'ALERT_MESSAGE', 'OWNER_NAME', and 'owner_type'. The table lists three alerts related to unauthorized access at 'TECHNICAL RESEARCH UNIT GATE', 'EMPLOYEE OFFICES GATE IN', and 'EMPLOYEE OFFICES GATE OUT'. The 'Total Alerts' card in the background now shows '13'. The 'Device IP' and 'Tags read' information remains the same.

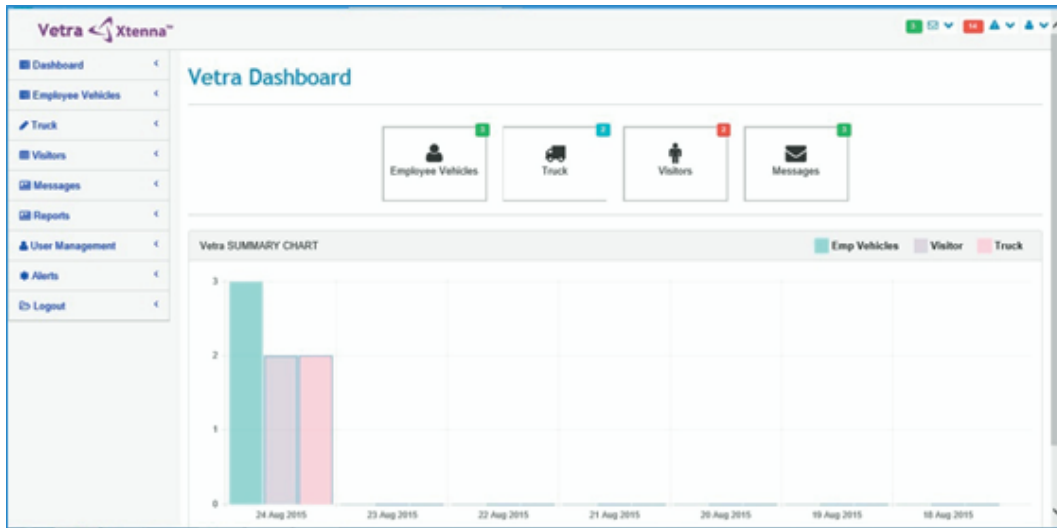
ID	LOCATION_NAME	ALERT_MESSAGE	OWNER_NAME	owner_type
1	TECHNICAL RESEARCH UNIT GATE	THE LOCATION IS UN-AUTHORISED TO THIS KA-06-BA-6901.	AZAZ KHAN	TRUCK
2	EMPLOYEE OFFICES GATE IN	THE LOCATION IS UN-AUTHORISED TO THIS KA-06-BA-6901.	AZAZ KHAN	TRUCK
3	EMPLOYEE OFFICES GATE OUT	THE LOCATION IS UN-AUTHORISED TO THIS KA-06-BA-6901.	AZAZ KHAN	TRUCK



CASE STUDY

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.

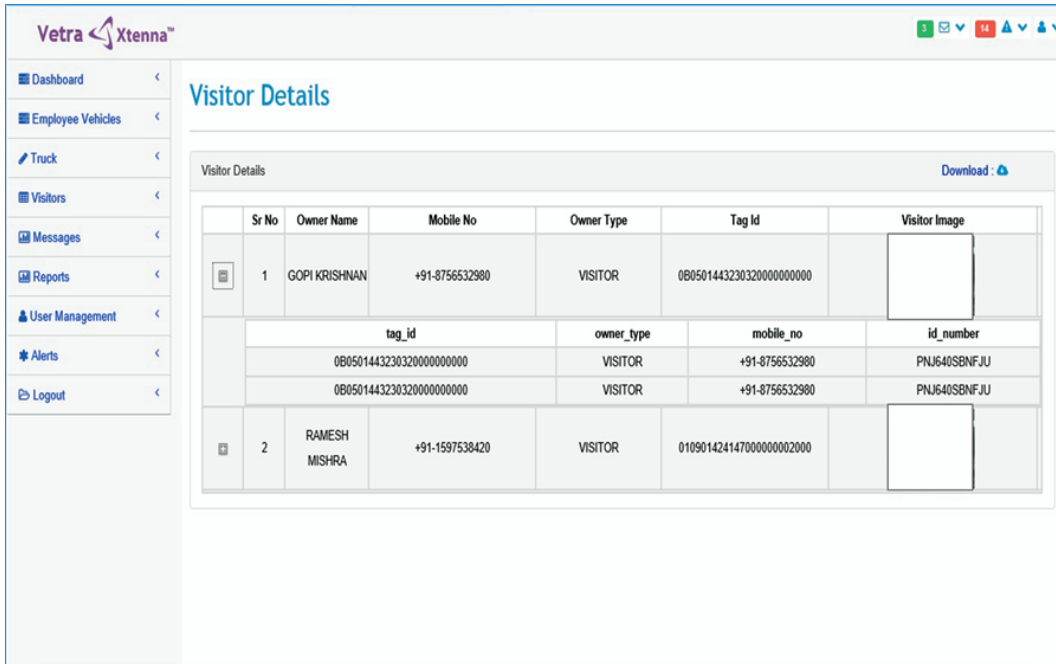
The screenshot shows the 'Employee Vehicles' page with a 'Download' button. The table below contains the following data:

Sr No	Owner Name	Mobile No	Owner Type		
1	P.SUBRAMANYAM	+91-9876543210	EMPLOYEE		
Sr No	Tag_Id	Location Name	Log Time	Device Type	License Plate No
1	010901424147000000000200	MAIN GATE IN	24-08-2015 06:29:11	IN	
2	010901424147000000000200	TECHNICAL RESEARCH UNIT GATE	24-08-2015 06:29:11	DETECTION	
2	VIMAL HEGDE	+91-8967654147			EMPLOYEE
3	RAMACHARAN REDDY	+91-9876543210			EMPLOYEE



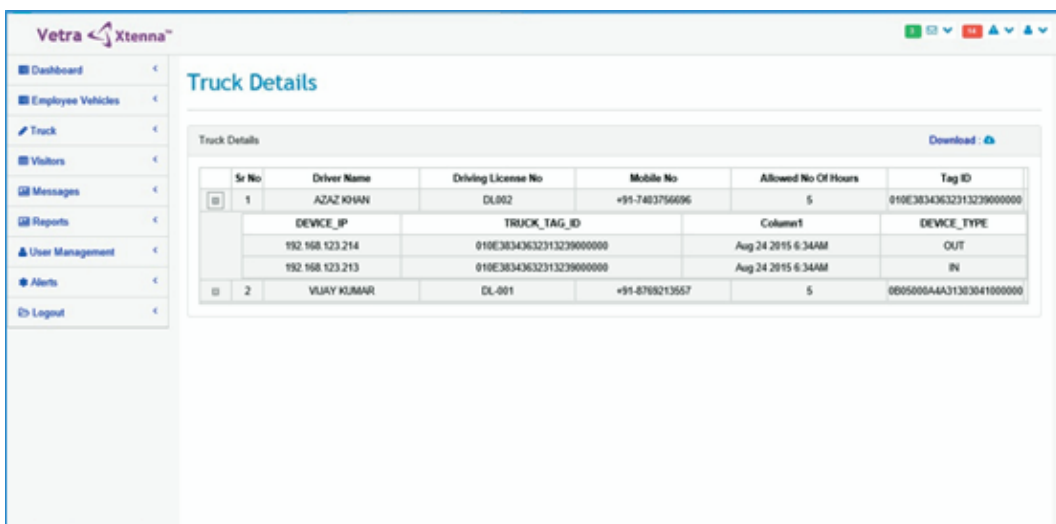
CASE STUDY

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.



Sr No	Owner Name	Mobile No	Owner Type	Tag Id	Visitor Image				
1	GOPI KRISHNAN	+91-8756532980	VISITOR	0B0501443230320000000000					
						tag_id	owner_type	mobile_no	id_number
						0B0501443230320000000000	VISITOR	+91-8756532980	PNJ640SBNFJU
		0B0501443230320000000000	VISITOR	+91-8756532980	PNJ640SBNFJU				
2	RAMESH MISHRA	+91-1597538420	VISITOR	01090142414700000002000					

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.

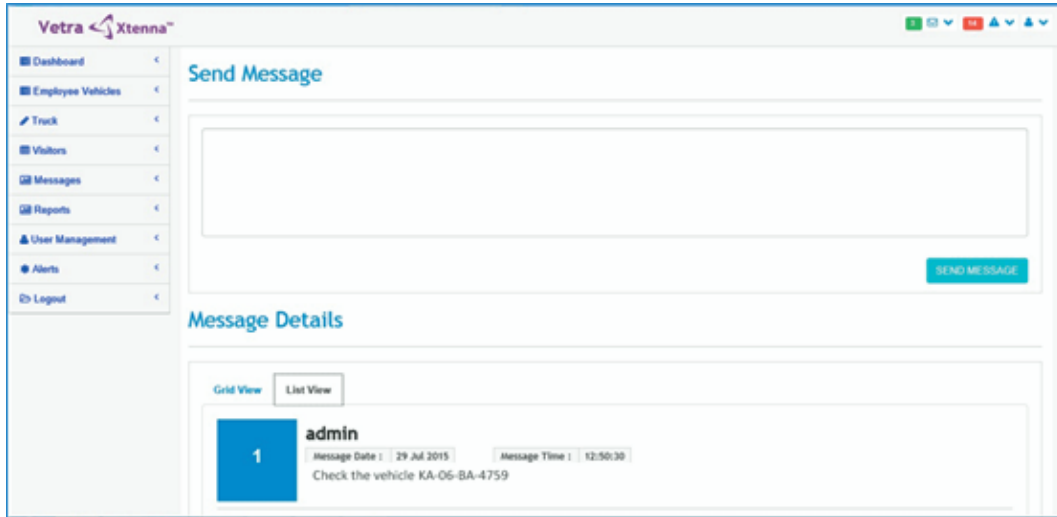


Sr No	Driver Name	Driving License No	Mobile No	Allowed No Of Hours	Tag ID				
1	AZAZ KHAN	DL02	+91-7403756696	5	010E38343632313239000000				
						DEVICE_IP	TRUCK_TAG_ID	Column1	DEVICE_TYPE
						192.168.123.214	010E38343632313239000000	Aug 24 2015 6:34AM	OUT
					192.168.123.213	010E38343632313239000000	Aug 24 2015 6:34AM	IN	
2	VJAY KUMAR	DL-001	+91-8789213557	5	0B05000AAA31383041000000				



CASE STUDY

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



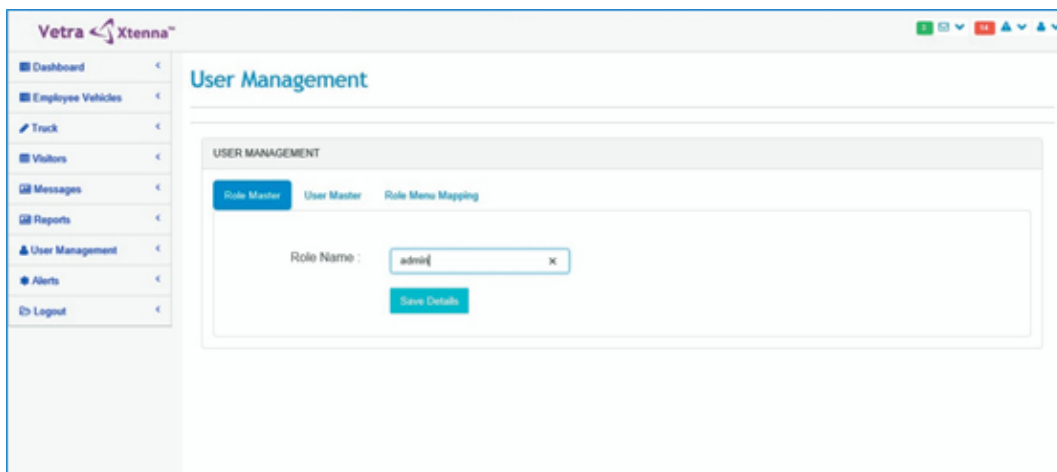
Reports: This module allows the admin user to view the employee vehicle, visitor vehicle and truck details. The admin can also view the daily vehicle transactions and export the report data into Excel and PDF format.

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.

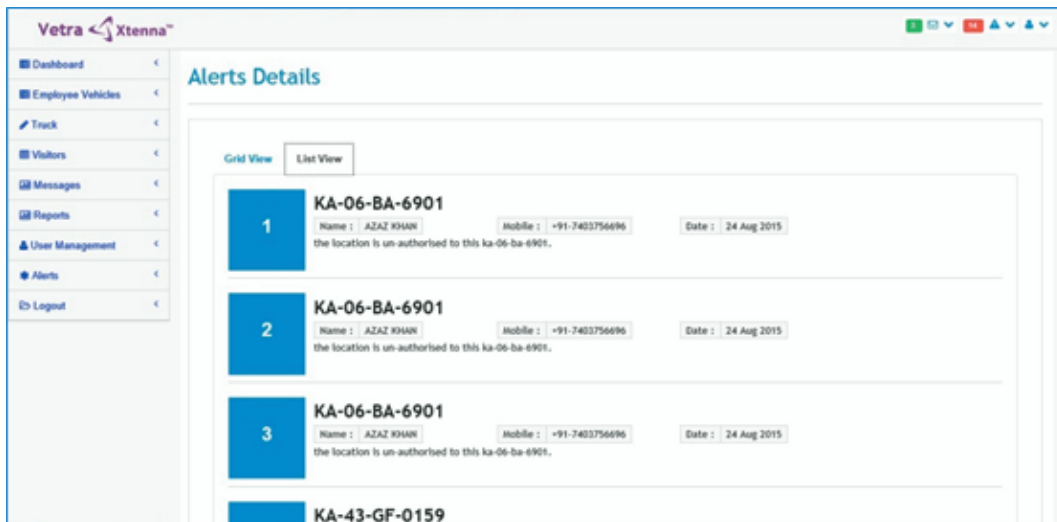
Role Mapping: This is used to map the existing role in the system to the various available modules of the application. For instance, the role of admin is mapped to all the modules, whereas the role of operator will only be allowed limited access to the application and not modify any crucial data.





CASE STUDY

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.



CASE STUDY

LINKS:

Hardware:



Tags:



Software:



Reference Example:

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