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ESSEN

CASE STUDY

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Birla Public School
Doha, Qatar

International school in Qatar pilot project for a RFID-based STUDENT TRACKING SYSTEM

Automated school bus and student tracking for multiple buses and bus routes

Live route tracking and data transmission through GPRS

Safe and secure transportation of children

Authentication and SMS alerts to parents

INSIDE:

TECHNOLOGY

Solution:
EPC Gen2 compliant
personnel tracking solution
GPS based remote vehicle tracking

Tag Type:
Personna™ UHF Passive

Reader/Antenna:
Xtenna Hybrid™
Xtenna Proximity™
Strada™

Method:
Multiple Tracking via Integrated Reader/Antenna modules
Vehicle Tracking via On-board Tracking device

Integration Platform:
RFID Middleware:
Xtenna™ WebToolkit
Xtenna™ Studio
Application: Essen RFID's Student Tracking 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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Xtenna™ Integrated RFID Antenna/Reader

CASE STUDY

KEY REQUIREMENTS:

Birla Public School in Doha, Qatar is an prestigious school fulfilling the educational needs of the children of expatriates and of other international students in Qatar. It conducts schooling for around 6,000 students from kindergarten to school-leaving age. Its facilities include a fleet of 120 school buses that transport these children from their homes to the school and back. The school's endeavor has always been to provide the best facilities including the adoption of the latest technologies for the benefit and safety of its students.

Since most parents are unable to pickup and drop-off their children to and from school, the school found it necessary to have a system in place that gave the school authorities as well as parents live information about whether their children had reached school safely, were within the school premises and whether they had returned home safely. This was especially important since the school had a fleet of 120 buses and a technological solution was needed that would prevent students from boarding the wrong bus and could automate and manage the entire process without difficulty.

Main challenges:

- Identifying children boarding school buses and verifying the boarding time and place of each student into the bus.
- Locating and verifying the disembarking point and time for each student.
- Sending information alerts to parents that their children have safely reached school or home.
- Alerting the bus driver if any student tries to board the wrong school bus.
- Alerting the bus driver if any student is left behind in the bus.
- Monitoring the live location and path of each school bus on its daily trips.

SOLUTION:

Essen RFID suggested RFID technology for tracking students entering or exiting the school bus and confirming their entry into the school premises. Along with this, a GPS based vehicle tracking solution was proposed that allowed remote tracking of current location of school buses by the school authorities.

IMPLEMENTATION:

Xtenna Hybrid™ antenna-readers configured to be remotely programmable through Wi-Fi are mounted at the door of each school bus. Each student is issued a PERSONNA™ RFID tag as an identity card. Tags are registered using a Xtenna Proximity™ reader. Controller devices are installed in each bus, which interface with the mounted RFID reader. A Strada™ vehicle tracking device is fitted inside each school bus, which communicates with the central server

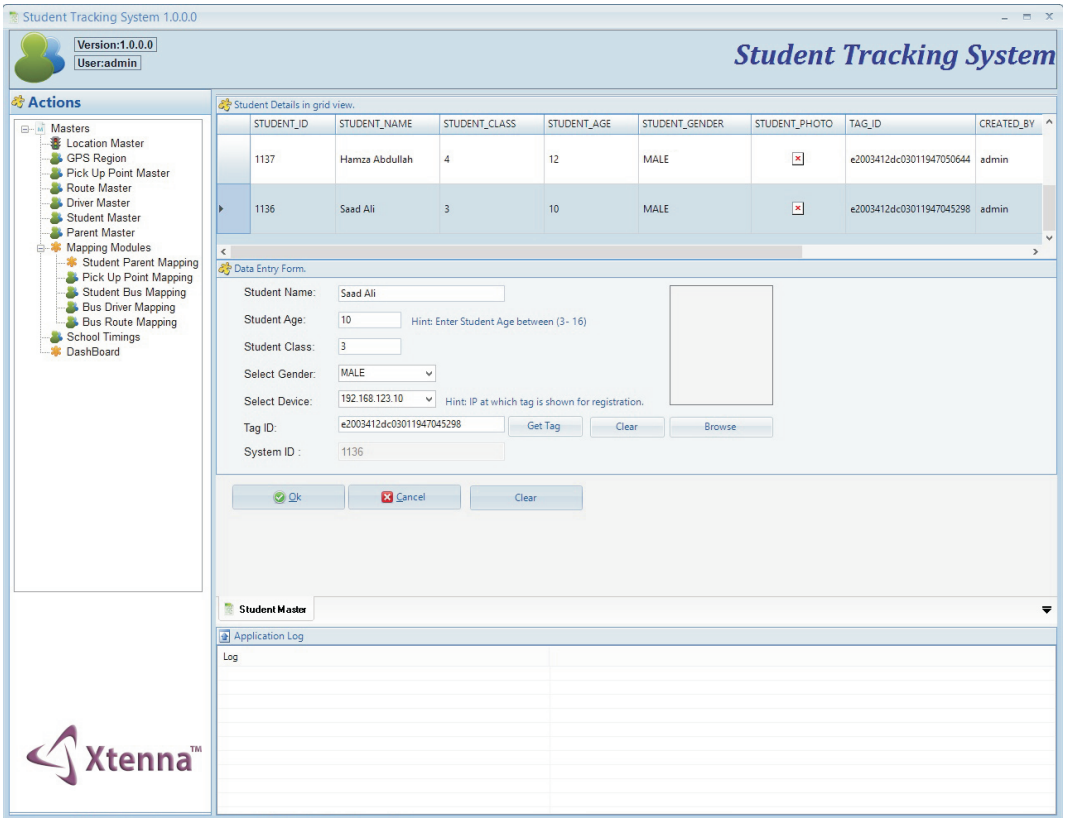
CASE STUDY

located in the school. The system uses SQL Server as a back-end database with .NET software as a front-end interface.

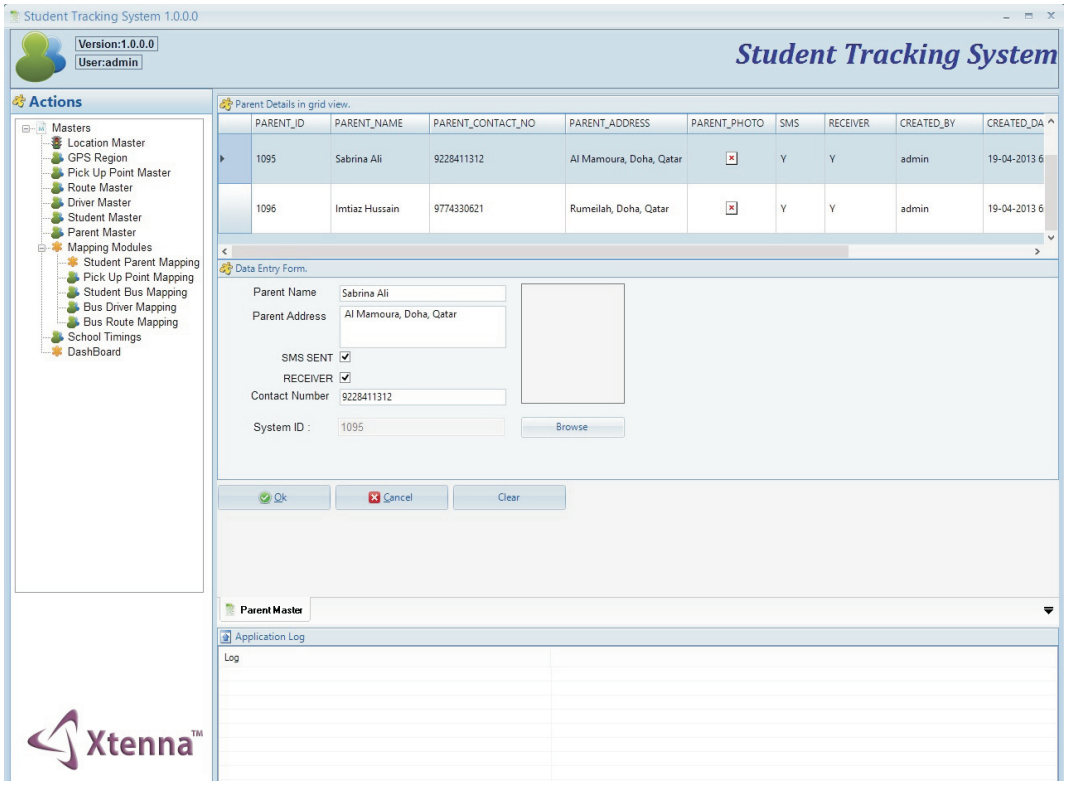
WORKING:

Essen RFID's Student Tracking system was developed for tracking students as they entered and exited the school bus, along with an integrated school bus remote monitoring system. The main modules are as follows:

Student Master:
Information required of each student is entered into the database and in the master record of the school. This consists of data such as student's address, age, class year, parents' details, etc, along with photograph. Similarly, data of new students is collected and entered into the school master and database, as and when a new student takes admission in the school. Each individual student data is associated with a PERSONNA™ tag issued to the student.

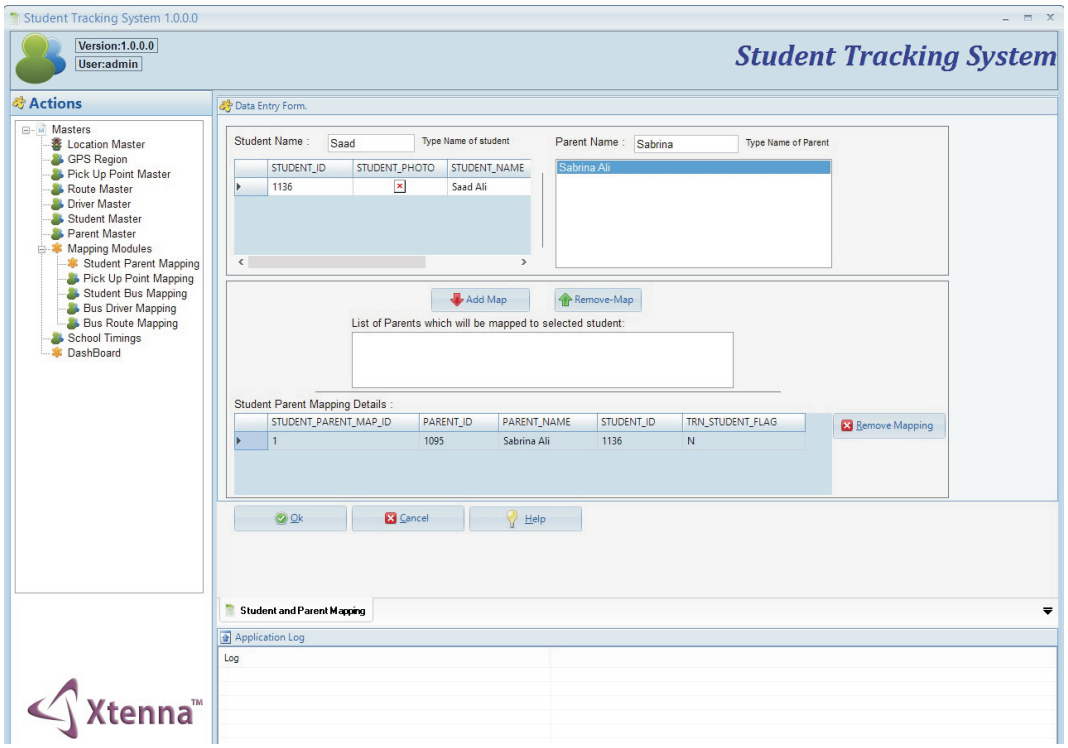


Parent Master:
This includes information regarding parents, including their own contact details and mobile phone numbers. This is necessary for the parent to receive a confirmation SMS from the system regarding their children's safe arrival in school.



Student - Parent Mapping:

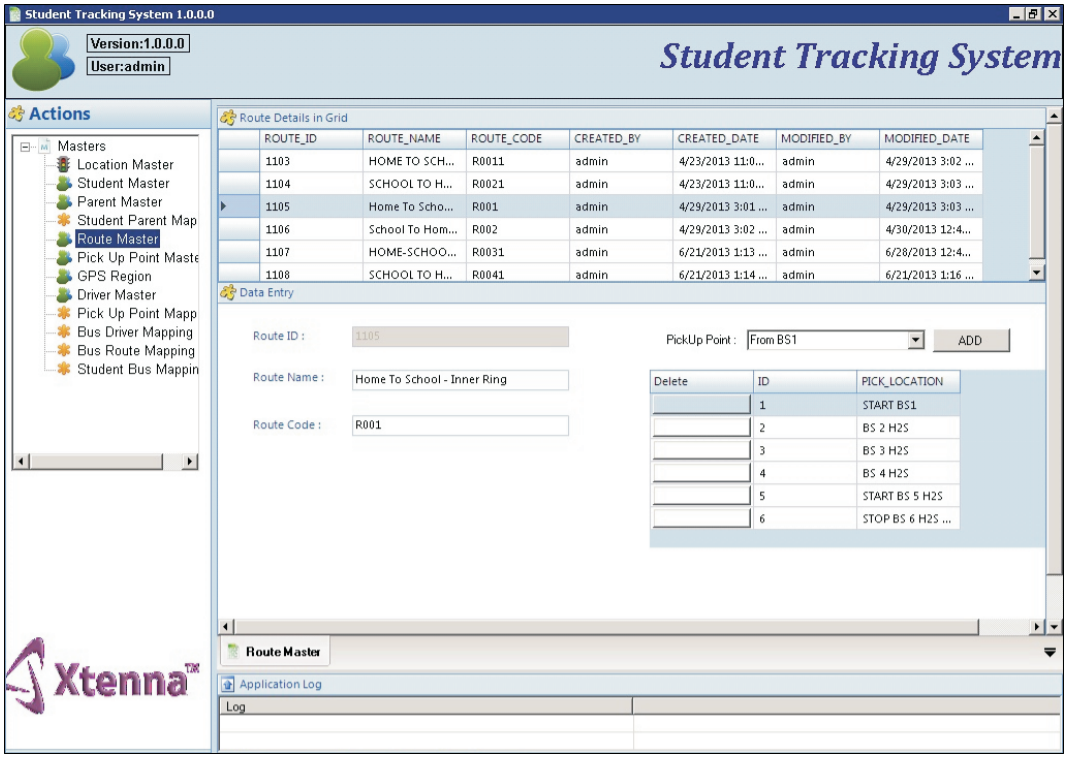
Each student is mapped with the parents or guardians that will receive confirmation SMS regarding pickup, drop-off and other necessary information that may be sent from time to time.



CASE STUDY

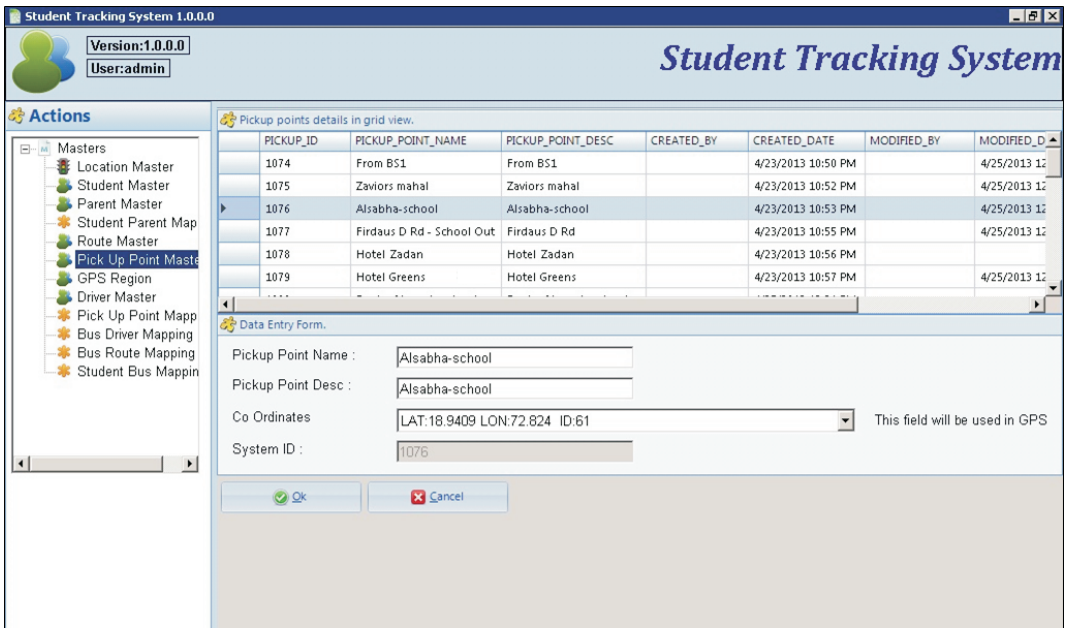
Route Master:

All bus routes are created and maintained in the Route Master. Pick-up and drop-off points along the route are first created here.



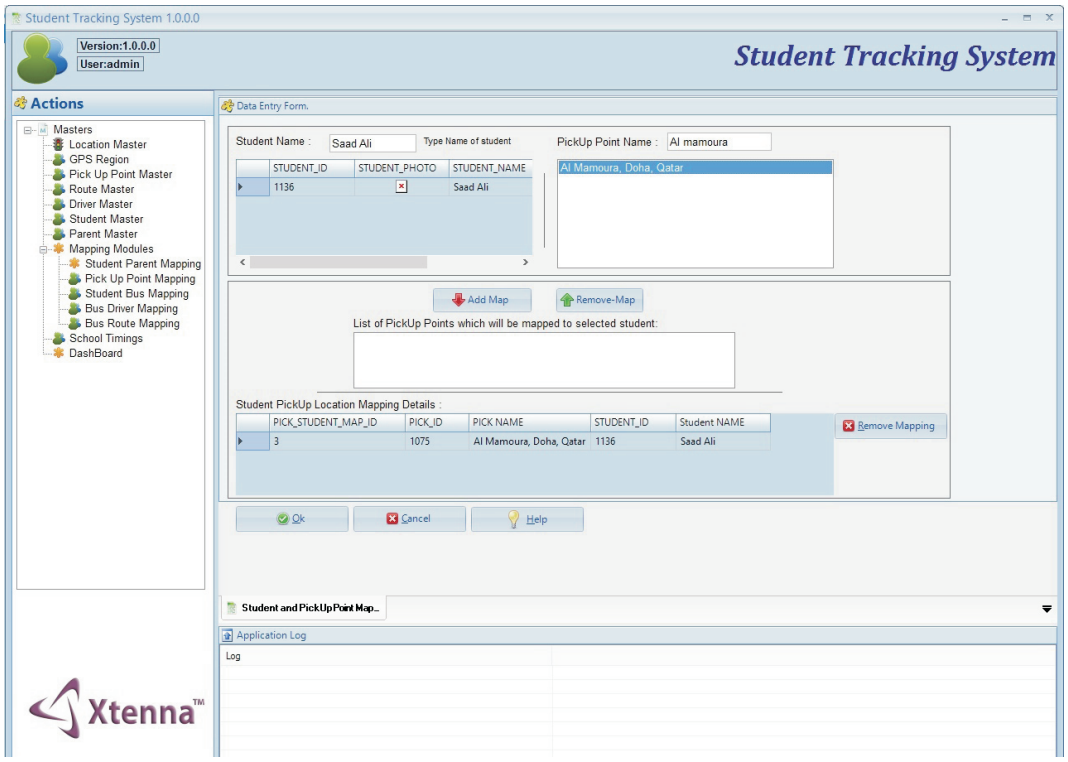
Pickup and Drop-off Points:

Here the precise GPS co-ordinates of pickup and drop-off points are entered in the screen. This enables the system to monitor the movement of the bus and its halts along its designated route using the on-board Strada™ tracker.



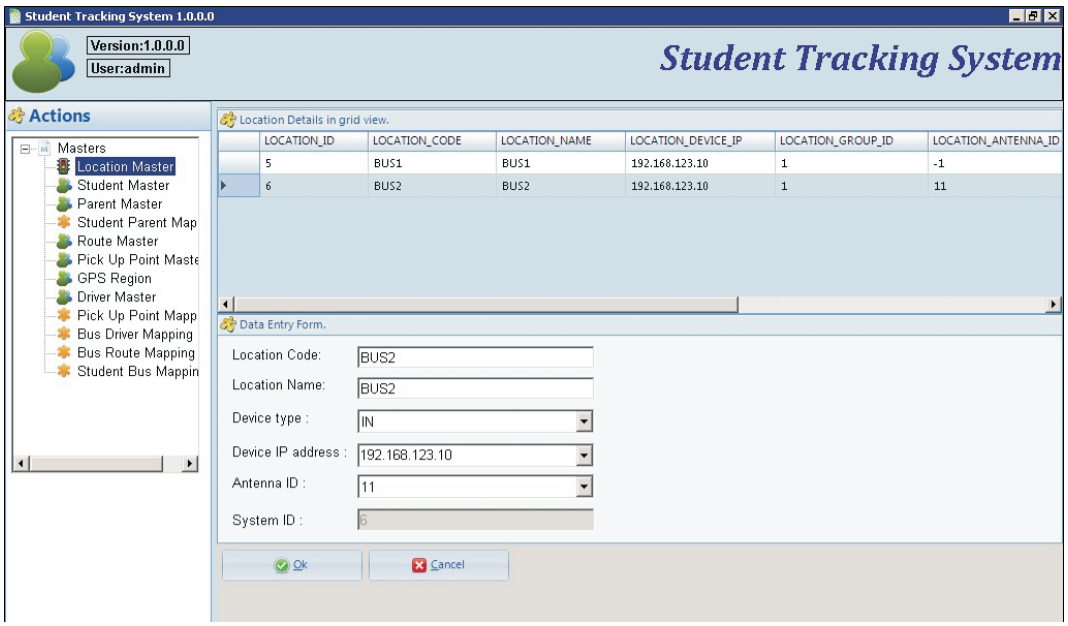
Student - Pickup/Drop-off Point Mapping:

In this module, each student is mapped with the pickup and drop-off point from where he/she will board and disembark from the school bus.



Bus Master:

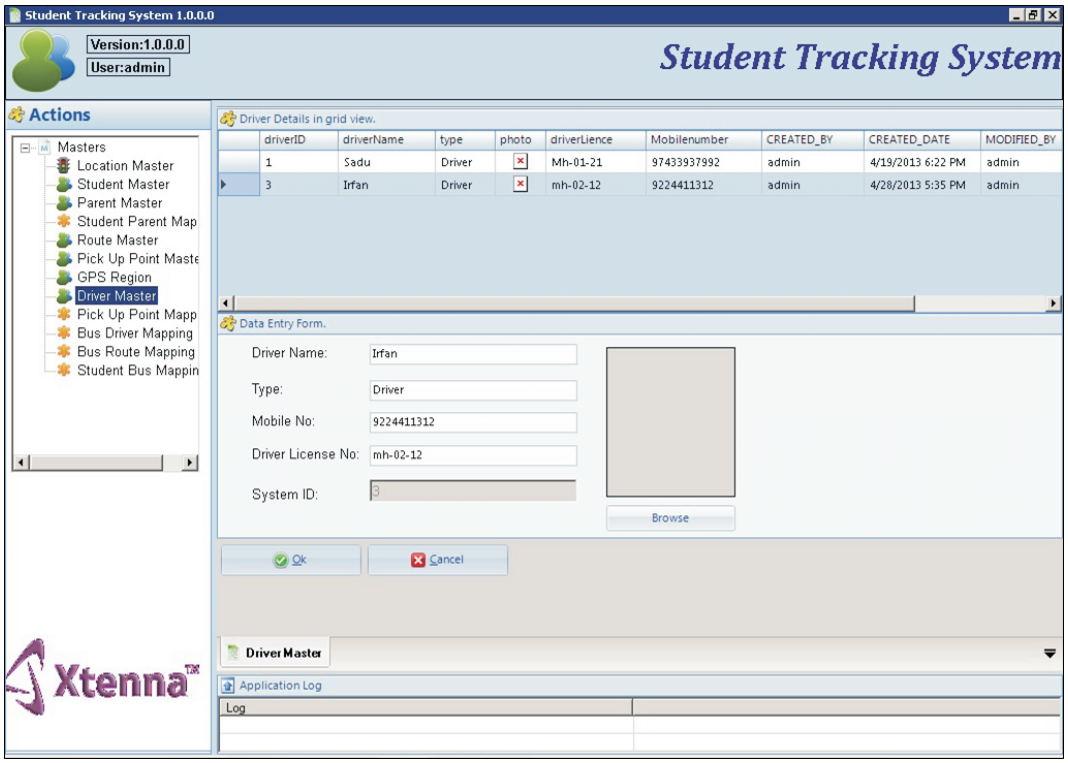
Here the details regarding each school bus are entered, such as its licence plate registration number, etc. Also entered here is the device IP of the Xtenna Hybrid™ reader-antenna device mounted on that particular bus. Each bus is thus uniquely identified with the antenna device fitted on to it.



CASE STUDY

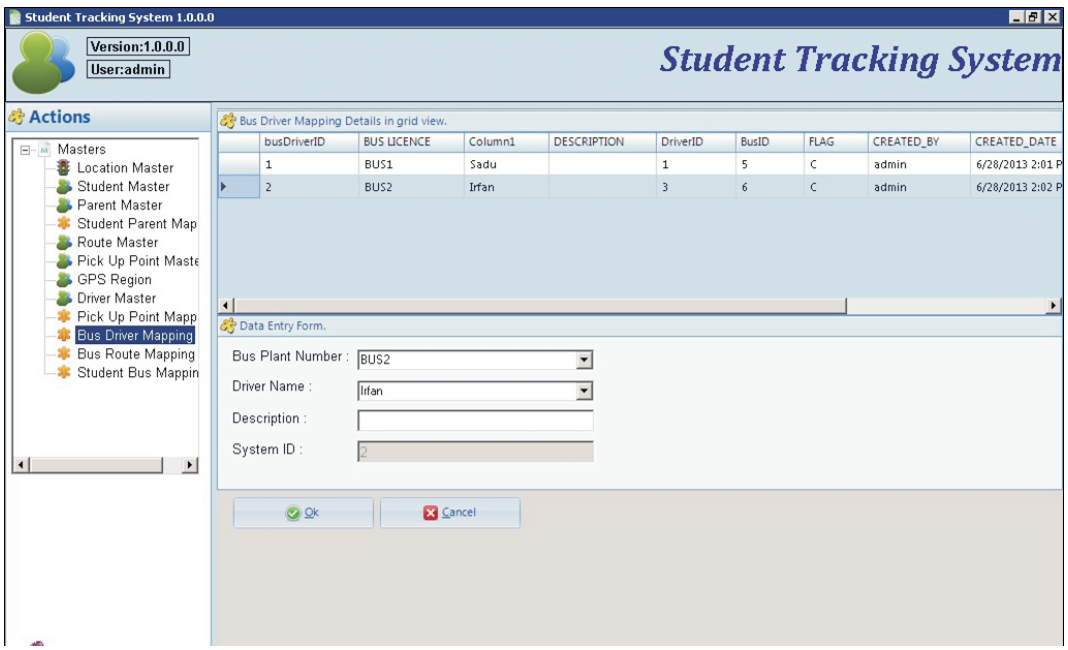
Driver Master:

Information regarding bus drivers with their contact details and driving licence number are entered here along with their photograph.



Driver - Bus Mapping:

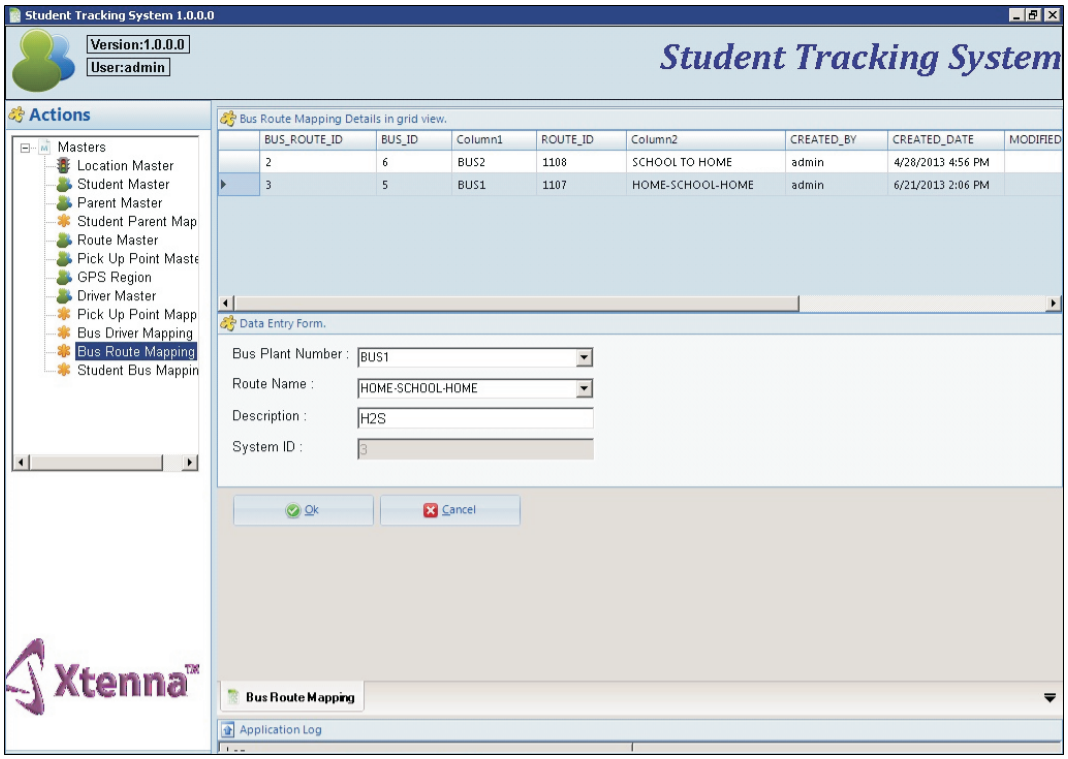
In this module, the drivers that were registered in the previous module are assigned to each school bus. This enables each individual school bus to have a designated driver for its trips. The driver can be changed only through the system.



CASE STUDY

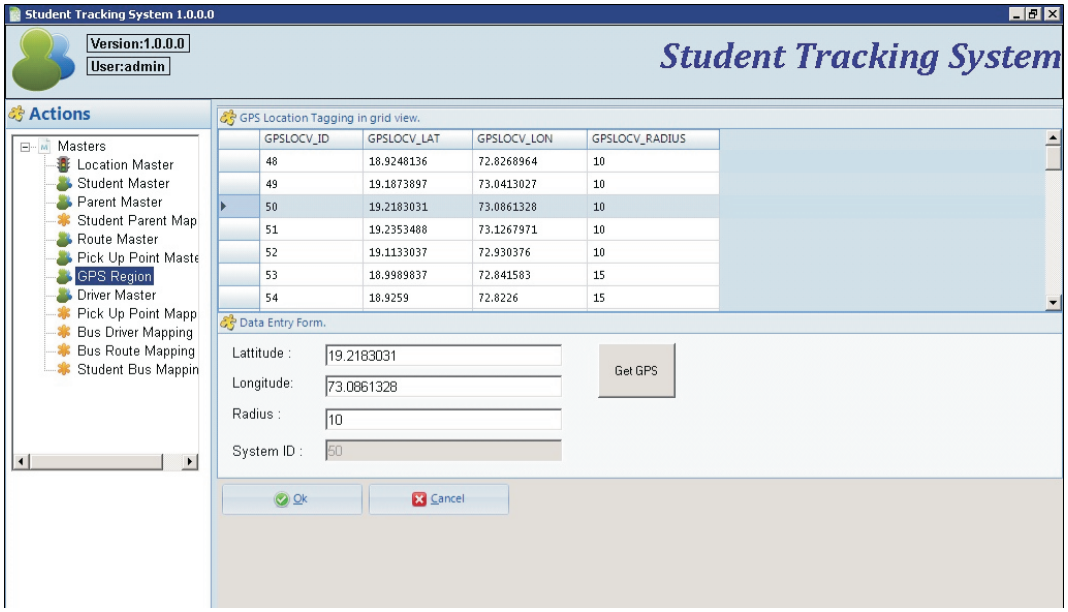
Bus - Route Mapping:

Here routes that were created earlier in the Route Master are assigned to the school buses. Each bus is assigned a particular route leading to the school. If the route assigned to a bus has to be changed, it is also done here.



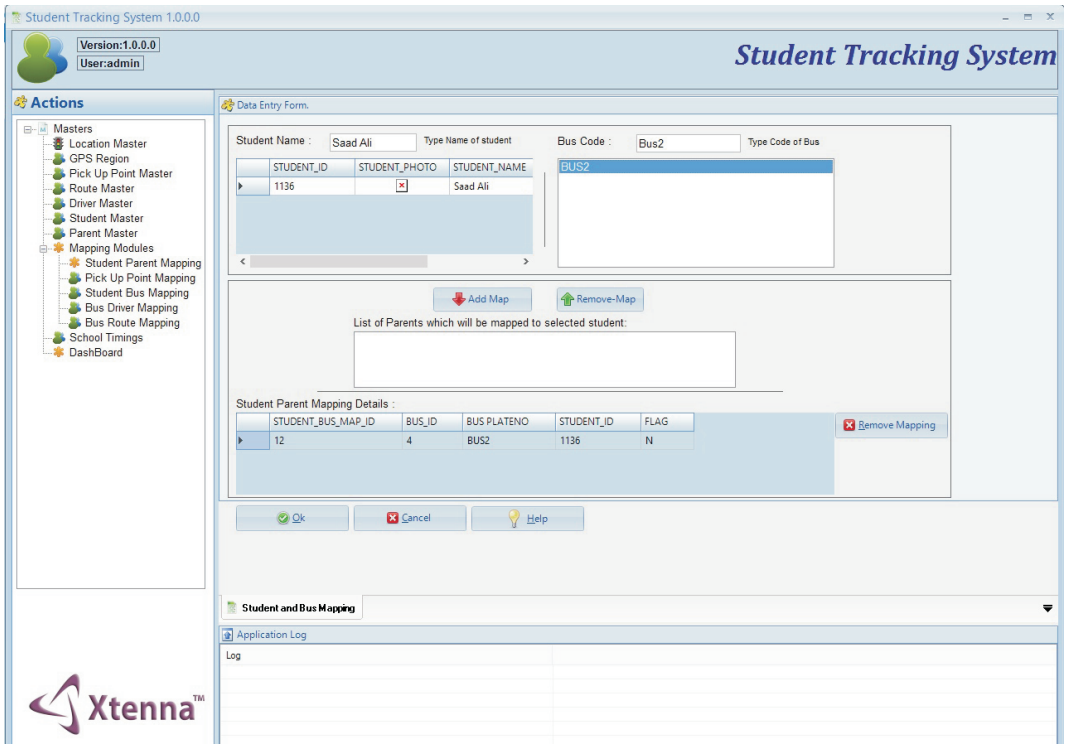
Tracker Master:

The Strada™ tracker fitted on each school bus enables real time GPS tracking of that bus along its route along with halt (pickup/drop-off) monitoring. In this module, the Strada™ location settings for each device are entered.



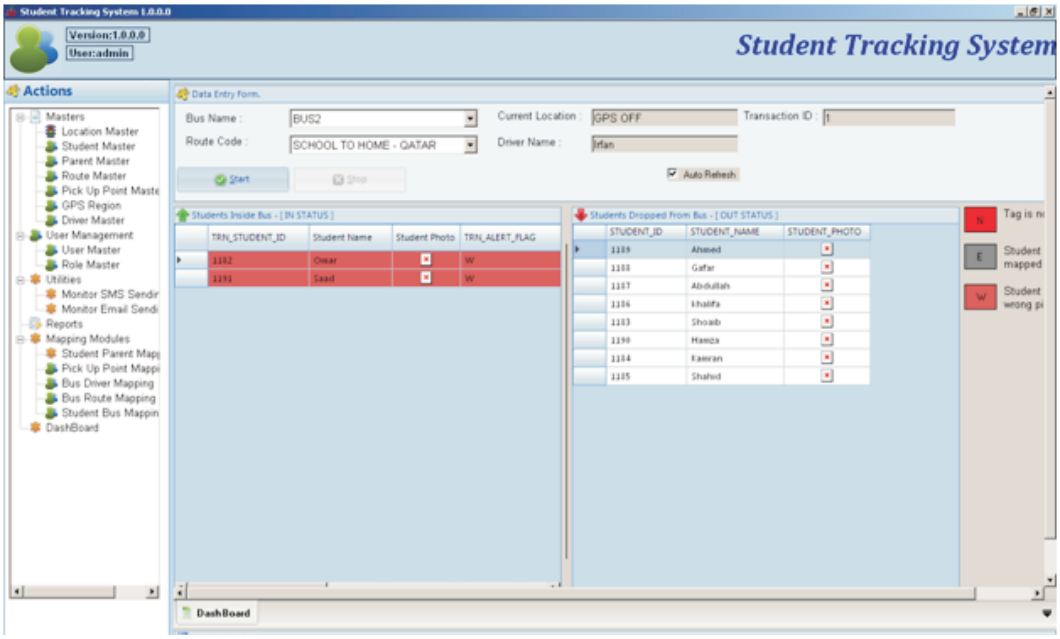
Assigning School Bus to Student:

Finally each student is assigned to a particular school bus based on his/her pickup and drop-off point and the route taken by a particular school bus.



Admin View:

The system administrator/supervisor can view the total number of students and individual student details of those picked up or dropped off by each school bus on its route, along with alerts.



CASE STUDY

Working Process:

1. Tracking the student entering/exiting the bus:
   Each student wears a RFID-enabled ID card containing a PERSONNA™ tag. When a student's tag ID is read by the twin antennas of Xtenna Hybrid™, if the tag is detected first by antenna A and then by antenna B, this indicates that the student has entered the bus. If the tag is detected first by antenna B and then by antenna A, then the student is exiting from the bus.

2. Child picked up by school bus:
   Xtenna Hybrid™ on the bus entrance checks if the student is registered for that particular bus route. If the tag ID is not found then a pop up alert is displayed, whereas if the registered ID is found then the system is updated along with co-ordinates from the Strada™ vehicle tracking device. This confirmation of pick-up with location name, date and time is also sent via SMS to the parent. If a child registered for pick-up is not found then the parent gets a message that the child has missed the stop.

3. Child reaching school:
   When the bus reaches school, its GPS is mapped to the school location and the entrance time is registered. The Xtenna Hybrid™ on the bus registers the child leaving the bus by detecting his tag first by antenna B and then by antenna A, and a corresponding entry is made into the system. A confirmation SMS is sent to the parent indicating that the child has reached school.

4. Child boarding the wrong bus when leaving school:
   If a student tries to board the wrong bus when leaving school for home, then the Xtenna Hybrid™ on the bus detects the tag ID and pops up an alert on the screen. This alerts the driver who prevents the child from getting into the wrong bus.

5. Child dropped off from school at destination:
   The student is dropped off at his destination mapped with the exact GPS co-ordinates obtained by the on-board Strada™ and registered in the database. A confirmation SMS is sent to parent with location name, date and time.

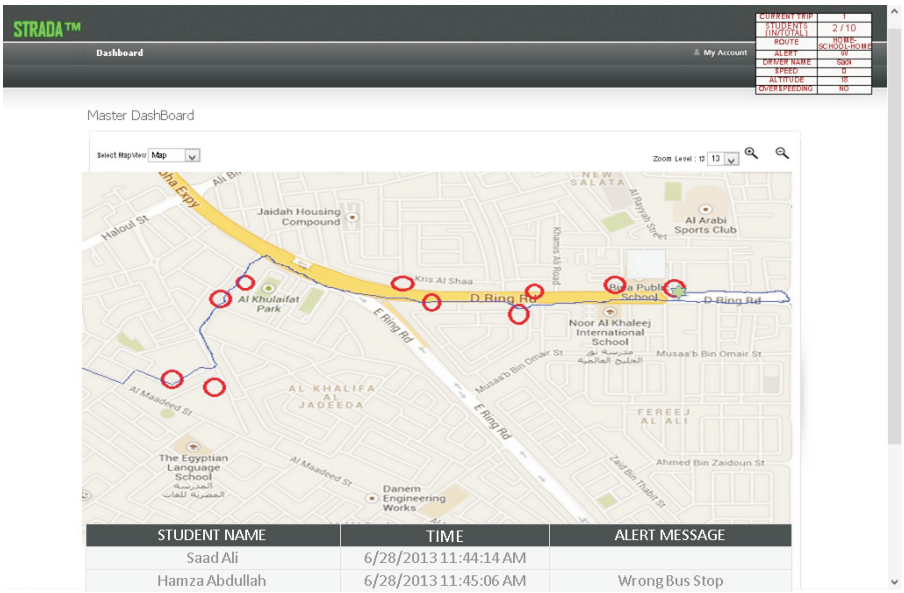
6. Child dropped off at different location:
   In case a student is to be dropped off at a different location for some reason, then the Strada™ device on the bus sends these co-ordinates to the server and this location name, date and time is alerted by SMS to the parents.

7. Child remains in bus:
   If a child is not dropped off and is still in the school bus, then the driver gets an alert that the student is still remaining in the bus.

8. **Bus has not reached in time (Bus Tracking):**
   The Strada™ vehicle tracking device continuously sends GPS co-ordinates to the central server database. The system administrator can select each bus for tracking and viewing its current position on the route in real time. This enables strict monitoring of the school bus as to its schedule and whether it is having any stoppage or breakdown or is running late. The driver can then be contacted over his mobile phone for the reason. SMS updates or alerts can also be sent to parents if there is any change in timings.

Web-based School Bus Tracking:

Real time route location of any particular bus can be viewed by the system administrator / supervisor on the software dashboard screen. Each bus screen will also display information such as Bus Route, Driver Name, Number of Students in the bus, Speed of bus, etc., along with alerts.



BENEFITS:

- Effective live monitoring of multiple school buses.
- Monitoring of each individual student from home to school and back.
- Data transmission in real-time through GPS technology.
- Administrator control and overview of school bus operations, with alerts.
- Safe and secure transportation of the child.
- Parent authentication when child is dropped off at destination.
- No child is left unattended on the school bus.
- Eliminates chances of student getting on the wrong bus, getting off at the wrong stop or being left behind after the route has been completed.
- Ensures that the child is not left behind sleeping in the bus.
- SMS alerts to parents when children arrive at school or are dropped off.
- Live tracking of school bus location along its route.

CASE STUDY

LINKS:

Hardware:

Xtenna Proximity™

Xtenna Hybrid™

STRADA™

Tags:

PERSONNA™

Software:

Xtenna WebToolkit™

Xtenna Studio™

Reference Example:

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