INTEGRATED TRAFFIC MANAGEMENT SYSTEM (ITMS)

Project Introduction

Integrated Traffic Management System (ITMS) is being implemented in the City of Hyderabad by IBI for Hyderabad City Police to enhance the road user service levels through the usage of advanced technologies. ITMS provides a common smart platform for inter-agency collaboration with over 15 agencies such as Municipal Corporation, Metro Rail Authority, Metropolitan Development Authority, Police, Emergency services etc. The System integrates with field sensors for getting real time data for managing traffic and associated incidents and events enabling efficient decision making in real-time and KPI based performance tracking.

ITMS Architecture

As a part of the project, several field devices & applications are integrated together with the central ITMS Application. The Variable Message Signs and Public announcements Systems help broadcast real time travel information to road users. The Automatic Traffic Counting and Classification Sensors collect traffic data at critical junctions in real-time and integrate with the Signaling System to optimize traffic signal timing and reduce congestion on the road. Automatic Number Plate Recognition cameras detect violations and hot-listed vehicles in real time to improve traffic discipline.
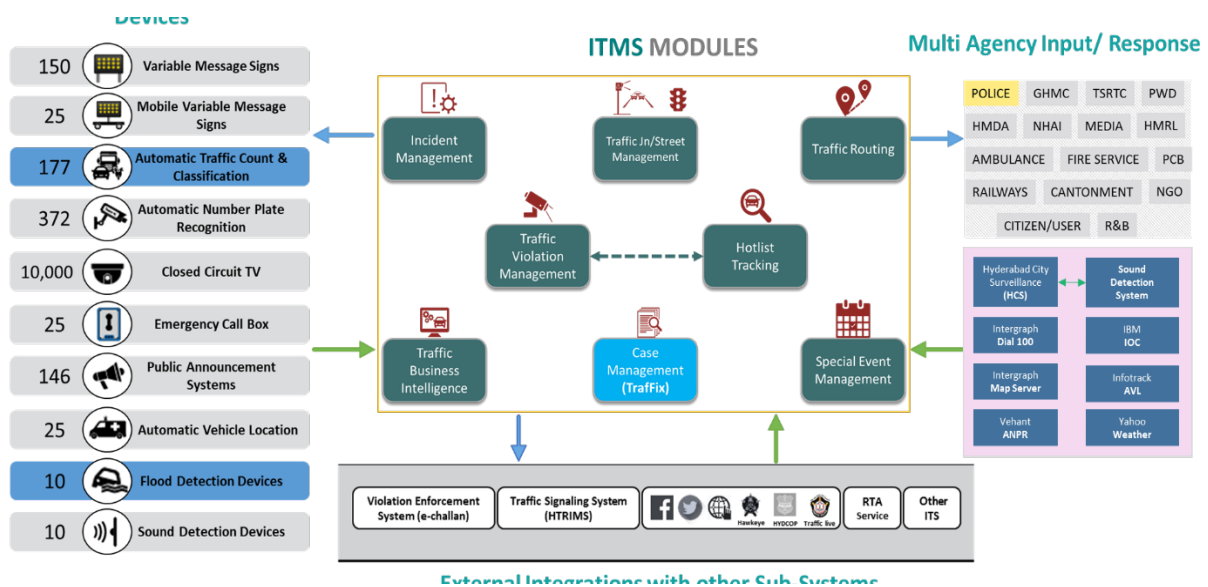

Figure 1: Functional Architecture of ITMS

Some Benefits Realized by the City of Hyderabad

a. Enhanced Travel Speeds

During peak hours some corridors in the city experience speeds as low as 10-12 Kmph. ITMS is helping the city in over-coming this issue and increasing the travel speeds, described in this section. The legacy traffic signaling system operates on manual, fixed time and vehicle actuated modes. The ITMS system provides vehicular counts from ATCC Systems which are installed at various junctions which count and classify actual vehicles approaching the signalized junction using Artificial Intelligence techniques. The ATCC System is able to

Figure 2: Counting and Classification of Vehicles using thermal ATCC sensors

achieve more than 90% of accuracy under conditions such as heterogeneous traffic & poor adherence to lane discipline.
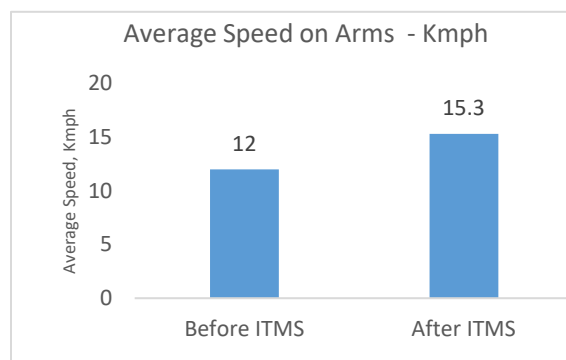

Figure 3: Comparison of junction arm speeds before and after ITMS

The traffic signal control system using this ATCC data is now being utilized for optimizing the signal timings. A pre and post assessment of the speeds on a same corridor demonstrated that the travel speeds on the same corridor increased by around 30% through signal timing optimization with ITMS.

b. Reduction in Response Times

The Level of Service (LoS) of the road network is continuously monitored using the traffic sensors and using in-built predictive algorithms, the ITMS System can generate automated alerts

Figure 4: A snapshot of Traffic Analytics of from ITMS

regarding traffic congestion at any junction crossing a certain threshold limit. Such congestion alerts are pushed to various stakeholders automatically as SMS's and e-mail alerts to act and fix the congestion as soon as possible by cutting the response times to less than 1/4th compared to what was existing before the ITMS was in place.
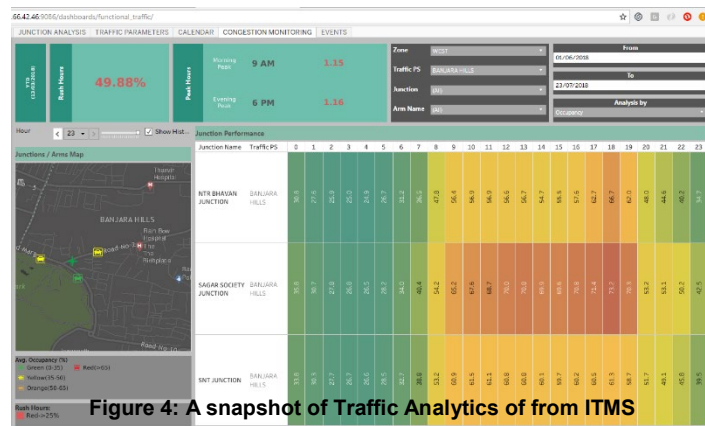
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c. Better Information Availability to Citizens

Real-time information regarding accidents, incidents, congestion hot-spots and accident prone locations etc. are shared with road users using Variable Message Signs , Social media pages (Facebook & Twitter). The information not only provides pre-alerts of a probable condition but also suggests the road users about the real time traffic conditions so that they can plan their trip or take alternative routes for their respective destinations. Without the presence of ITMS the

Figure 5: ITMS auto generated SMS showing congestion alert at a junction

citizens would have suffered heavy traffic jams and loss of time in navigating through congested roads but with ITMS the problem is addressed to an extent. The ITMS System also simultaneously tracks the condition for any subsequent changes in the network.
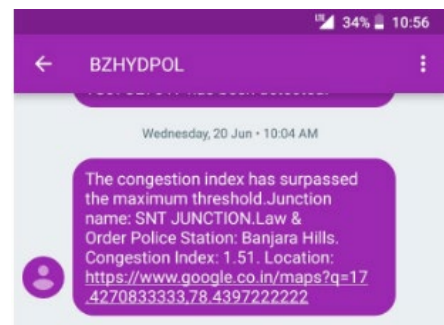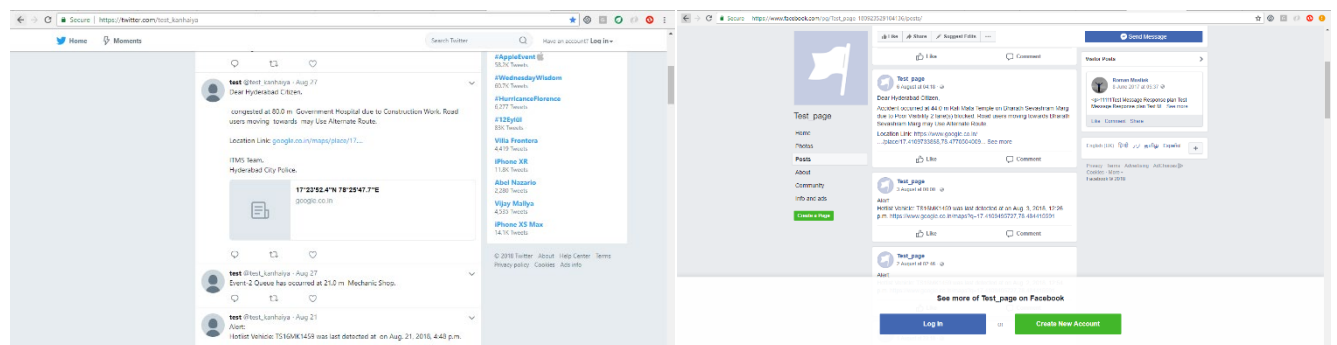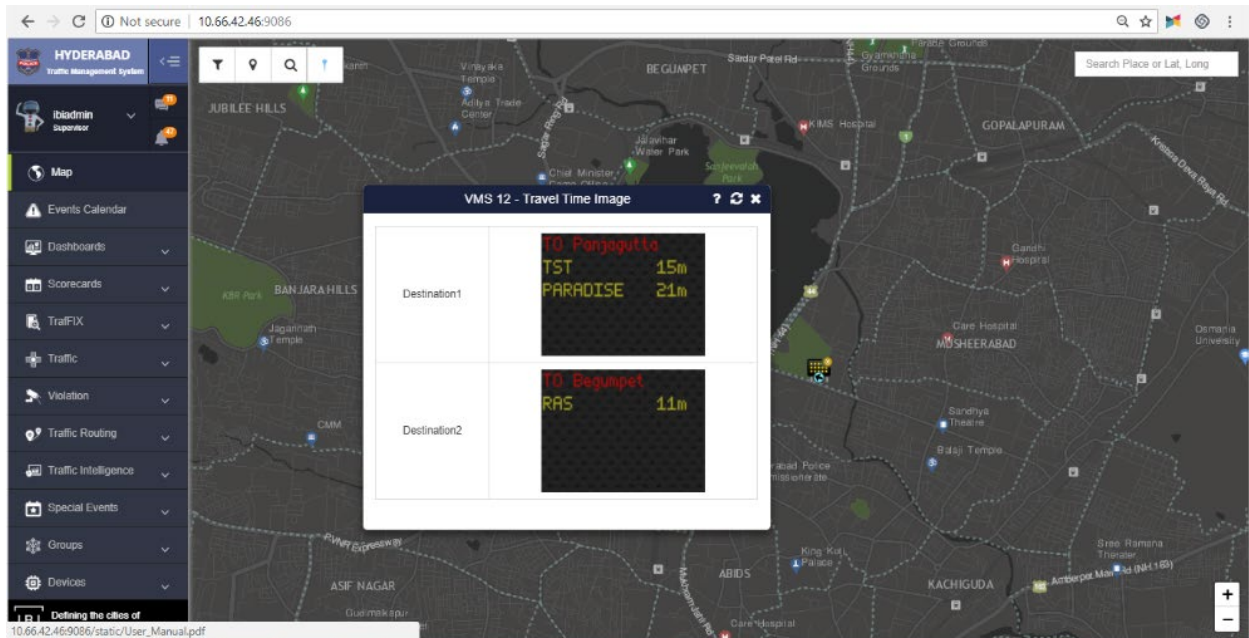
d. Better Usage of Road Infrastructure

As the ITMS System monitors the entire road network, the imbalance in the road network infrastructure utilization is easily measured and the system also presents the data based on the time of the day in a visual manner. The intelligent Routing algorithm in the ITMS System can then be used to plan detours and traffic diversion plans for Emergency Vehicle movements and also for general public.
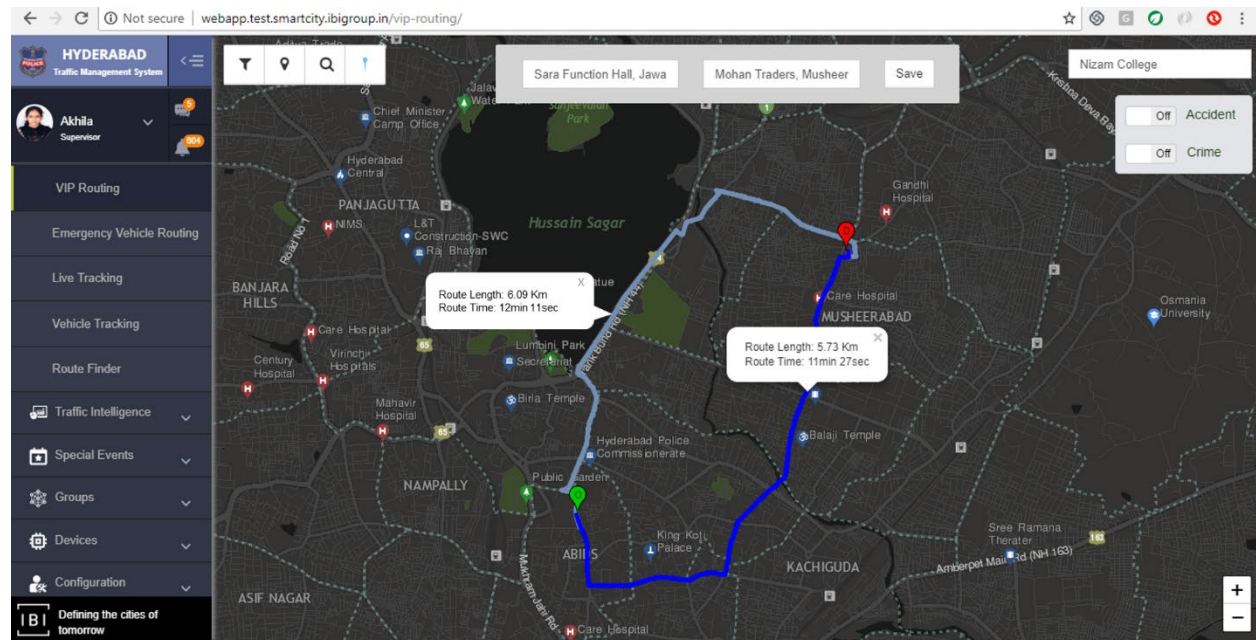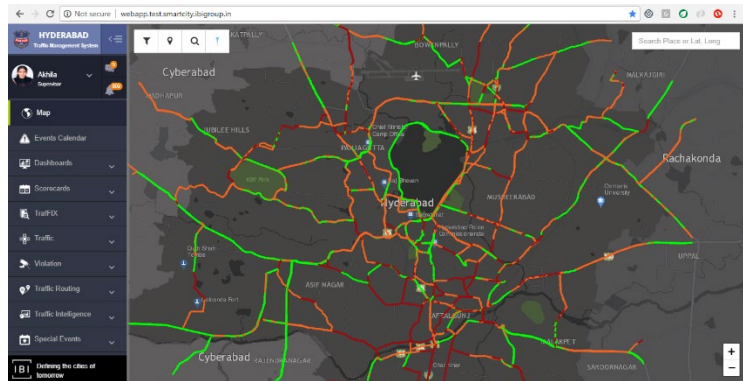
e. Special Event Management using Scientific Methods & Simulation Tools

The way planned special events for festivals such as Ganesh Nimajjan, Bonalu, etc. are managed has improved a lot with the usage of ITMS System. The Special Event Management Module in ITMS is integrated with traffic simulation tool for evaluating several alternative traffic management plans for the special event. These alternatives can be tested prior to ground implementation to choose the best alternative which maximizes the road network utility. Several KPI's can be defined in the process for the various alternatives to arrive at a practical alternative to reduce the impact to the road users caused due to a surge and change in trend of the traffic demand generated due to the special event. The methodology has been applied recently to one of the biggest events that happen in Hyderabad, "Bonalu Festival" which yielded positive outcome & benefitted in optimizing
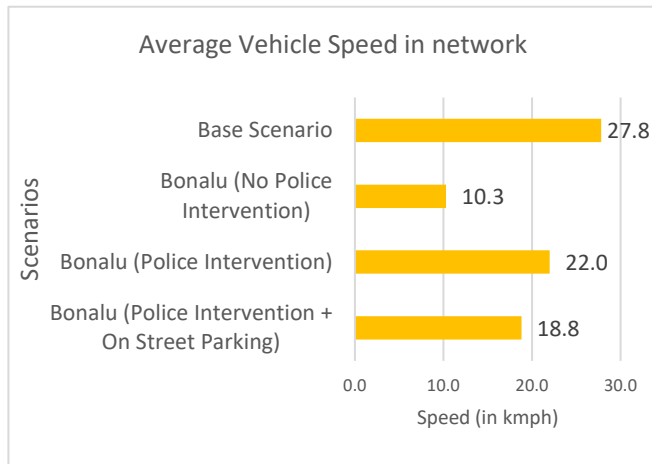
the traffic management plan for the special event. Different traffic management scenarios were analyzed on the road network for the influence zone before a practical plan was zeroed down using ITMS. It has been observed that there is at least a 20% improvement in the network speeds by choosing the optimal traffic management plan evaluated and selected from ITMS platform.

## f. *Increase in the Detection of Traffic Violations*

Before ITMS was in place, the traffic police personnel who are responsible for traffic management used to be deployed on the ground for violation detections such as Red Light Violation Detections etc. The Police also used to manage priority vehicle movement in the city using manual means and through wireless communications. Due to the limited number of personnel deployed on the field, even though there were several violations that used to happen, it was not possible to practically record all the violations and this has become a road safety threat in the city. With ITMS being implemented, through the ANPR System several of these uncaught violations are getting detected and traffic tickets are generated in real-time. The traffic ticket information is also sent to the violator's mobile phone as an SMS based on the vehicle registration data of the vehicle available due to the integration with Road Transport Authority database.

The violation detection cameras identify the vehicle numbers whenever the vehicle violates the rules like over speeding, red light crossing, and wrong side driving and illegal parking. The ITMS system is able to capture around 2400 red light jumping violations per day by covering around 50 junctions in the city, this number previously was under 100. The efficiency in capturing violations increased by over 4800%. Such kind of enforcement is bringing discipline in road users and the ITMS is helping by reducing the accidents caused due to violations.

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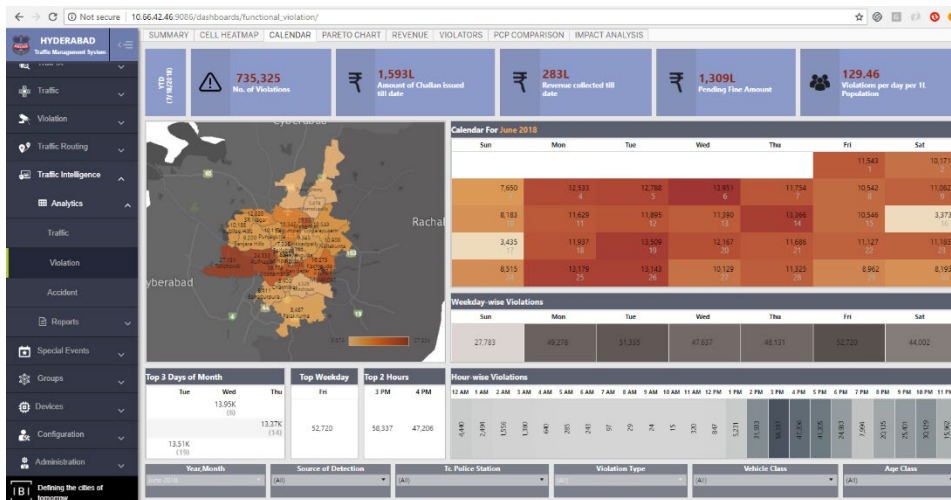
g. *Hot-list Vehicle Detection & Tracking*

This module of ITMS System is used to track any vehicle in the city and is used to generally track the movement of stolen and suspicious vehicles. Once the vehicle is tracked using ITMS, an automated alert is sent to the mobile phones of the nearest police officer to take further action. There are about 25,000 hotlist vehicles in the ITMS application which are tracked in real-time. The Police also uses this module to keep a track of persons using vehicles with criminal history to ensure safety in the city.
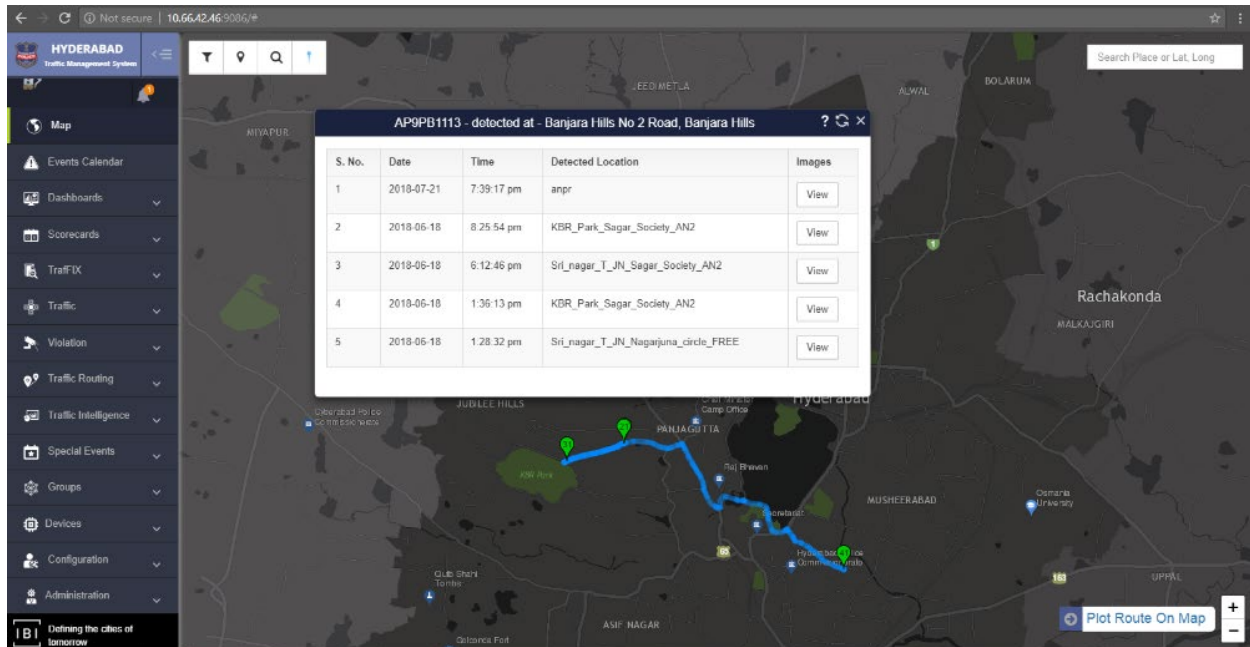

h. *Reduction in Accidents/ Fatalities*

More than 2,000 accidents happened in the year 2017 out of which 311 people are killed in the city of Hyderabad. There are several minor accidents which are not detected. ITMS helps to reduce these accidents and fatalities in three ways.

a. The first one is through proactive measures by advising the officers and stakeholders in identifying the root causes and prioritizing action plans to curtails accidents using the traffic business intelligence module. ITMS sends alerts to all the respective stakeholders to act on accidents/fatalities increasing above threshold. For example, the top 3 police stations will be alerted for action by giving them insights on major cause of accidents.

b. As most of the accidents happen because of traffic violations, the second way is by decreasing the number of violations with more efficient enforecement mechanisms using automatic violation management system.

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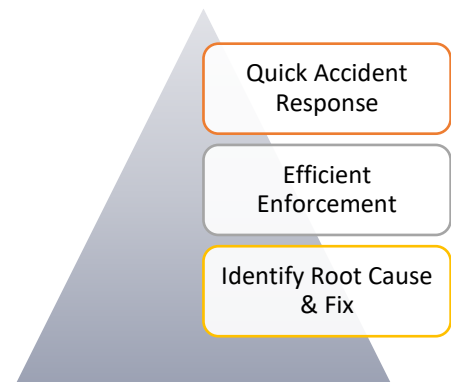
c. The third way is using automatic incident management through which the response plan is generated as soon as an accident is detected. For example, if an accident occurred on a road, then the system helps in responding to the accident by sending the automatic response plan to ambulance, towing vehicle to clear the site and approaching road users are informed to take alternative routes to avoid accident location. Thuse helps in saving lives of accident victims.
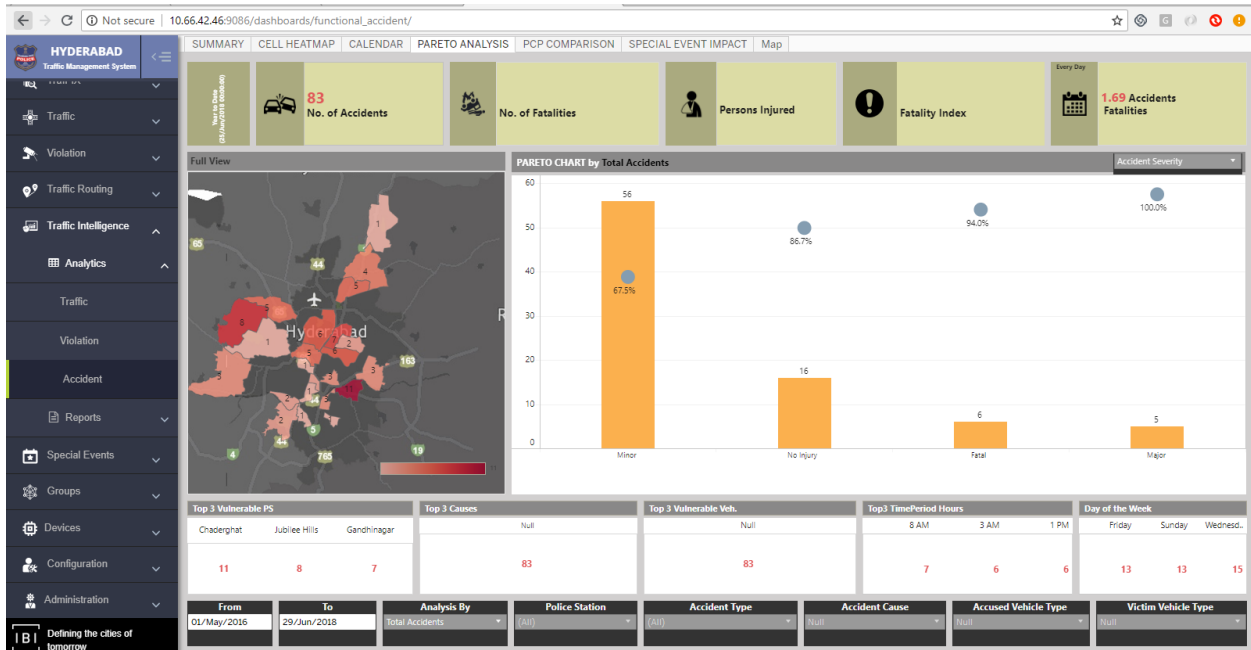
Leadership Team Structure for ITMS Product