



## TECHNOLOGY TRENDS FOR ROAD USER SAFETY IN PUBLIC SECTOR

### Abstract

Owing to the high number of traffic accidents caused by commercial trucks, ensuring road safety is a major concern for governments. Minimizing these incidents will require implementing robust systems that monitor vehicle performance and driver actions. Such systems should also connect stakeholders such as vehicle operators, drivers, traffic departments, field officers, etc., to ensure transparency and quick response times.

This thought paper explores an approach to improve road safety by leveraging digital, IoT and big data technologies. It also examines the key elements of implementing a real-time monitoring approach for active commercial vehicles. The analysis presented here is based on our recent experience working for a provincial Ministry of Transportation in North America.



## Introduction

Several initiatives in the public sector have been geared to increasing public accountability and enhancing citizens' experiences with government services. One such area is road safety. A recent article in the International Journal of Injury Control and Safety Prevention states that commercial trucks comprise 8% of US highway traffic and are involved in 11% of fatal road accidents. These trucks are responsible for 4,500 deaths per year in the US alone. Thus, improving road safety is a top priority.

With the emergence of disruptive technologies, public sector organizations are looking for ways to gain visibility into driver and vehicle performance through timely alerts of incidents so they can take immediate action.



## Problem Statement

As commercial trucks account for a large portion of road traffic, minimizing accidents involving these trucks is a top priority for governments. While many governments may want to enable continuous monitoring and auditing of vehicle fleets, this requires real-time views and live tracking of each vehicle. Ageing legacy IT systems that reside in silos do not offer consolidated views of vehicle performance. Further, traffic officers do not have real-time visibility into past or current road violations. Such ineffective monitoring of active vehicles and lack of visibility results in unsafe highways.

## Business Solution

Many government agencies are looking for ways to accurately measure the performance of commercial vehicles. Monitoring on-road performance and auditing off-road performance are two key ways to achieve this, as discussed below:

### 1. Monitoring real-time on-road performance

Commercial vehicle operators can be monitored during a preset time-frame according to local laws to measure the potential risk to road safety. Risk is expressed as a 'safety score' of each commercial truck and is calculated based on several factors that include:

- Business information such as fleet size, odometer readings, commodities being transported, etc.
- Civil and criminal convictions against operators and drivers
- Number of collisions
- Outcomes of road-side safety inspections of drivers and their vehicles
- History of previous interventions like letters, interviews, audits, and sanctions

To evaluate commercial truck safety, governments need to first assess the on-road performance using three indicators that measure the following violations:

- Total operator collision points accumulated during a pre-determined period, known as the collision violation rate
- Total operator conviction points accumulated during a pre-determined period, known as the conviction violation rate
- Total vehicle inspection points accumulated during a pre-determined period

For each indicator, the total points are compared to threshold values to calculate the threshold percentage, which provides the violation rate. Violations rates across

all three categories are then combined to give an overall score. While the inspection points are taken as-is, collisions and convictions are weighted as double when calculating the overall score. This is because these two indicators have been shown to be better predictors of future collisions as compared to out-of-service defects.

The overall score determines the safety score by comparing it against pre-determined thresholds. For example, a leading public sector organization uses the following safety rating measures to assess on-road performance:

Performance	Score
Excellent	Overall violation rate of 15% or less of overall threshold
Satisfactory	Overall violation rate of 70% or less of overall threshold and the operator has been audited
Satisfactory - unaudited	Overall violation rate of 70% or less of overall threshold but the operator has not undergone an audit
Conditional	Overall violation rate greater than 70% of overall threshold
Unsatisfactory	Overall violation rate greater than 100% of overall threshold

Such a process eliminates subjectivity, value judgments and human error while ensuring

accurate and complete monitoring of a large number of commercial vehicles.



## 2. Auditing operations or monitoring off-road performance

Poor vehicle conditions and driver incompetence are leading causes of commercial vehicle collisions. Thus, off-road audits of truck operations are useful to measure truck performance and mitigate risk. The key steps here are:

### Step 1: Identify the operators to be audited

Using information from on-road monitoring, identify trucks that have crossed the prescribed threshold limit. These trucks should undergo an offline audit. The threshold values can be decided by the local legislature.

### Step 2: Conduct the audit

Conduct the audit for trucks and drivers using the following key performance indicators (KPIs):

#### • For trucks:

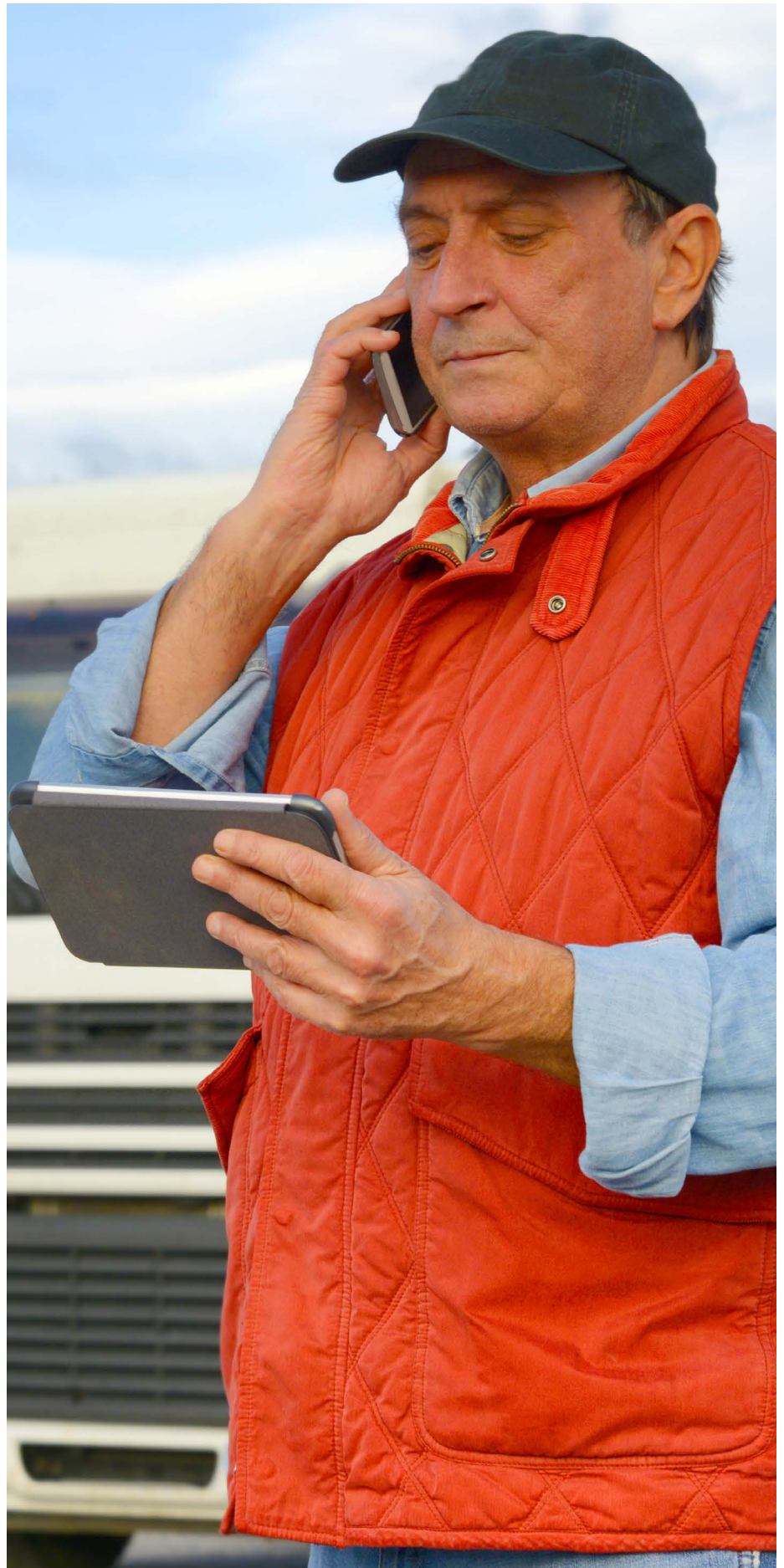
- Preventive and reactive maintenance history of the vehicle
- Compliance with preventive maintenance and annual inspection programs
- Records of adherence to the local laws like periodic inspections
- Accident/collision history

#### • For drivers:

- Driver qualifications like valid driving license, proper class, endorsements, and appropriate certifications
- Accident/collision/conviction history
- Verification of driver responsibilities to detect any violations such as greater or lesser hours clocked each day

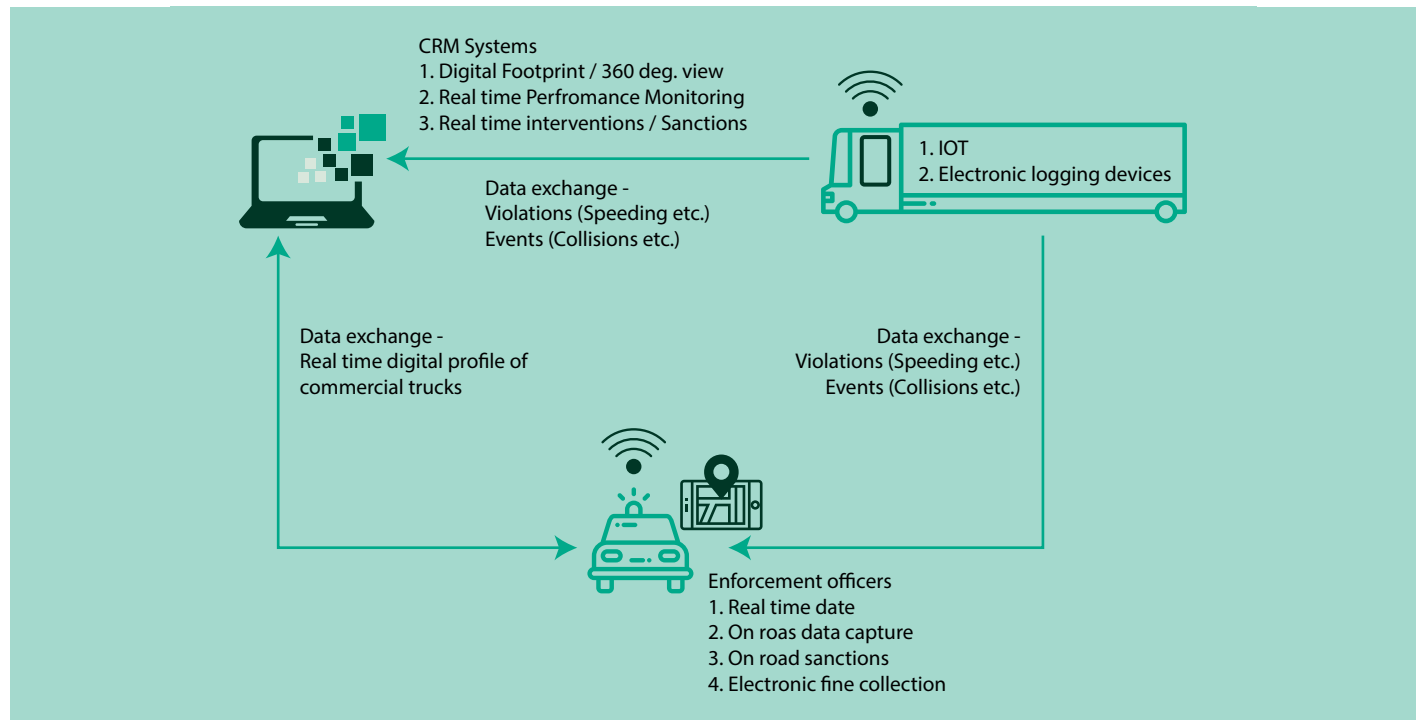
### Step 3: Compute the results

Points are awarded across all auditing KPIs according to local legislation to determine the final audit score. If the audit score does not meet the required threshold, sanctions and/or corrective action plans are imposed. A low score can result in suspended operations. Until the corrective action plan is implemented and executed, the operator remains under surveillance or his license is revoked.





## Technology Solutions – Conceptual Model And Architecture



The above diagram illustrates how an effective commercial vehicle monitoring IT system operates. All the key players must be digitally connected to facilitate the flow of real-time information. The key sub-systems in this model are:

### 1. Data capture systems that integrate with a centralized CRM system

Centralized customer relationship management (CRM) systems contain the digital profiles of commercial vehicles with real-time data feeds on operational performance parameters like speeding tickets, collisions, inspections, etc. Real-time data feeds can track and measure operational performance on-the-go. If violations occur, real-time sanctions can be electronically generated and conveyed to the affected parties. Insurance agencies can also use real-time data to calculate the insurance costs that need to be levied during renewals.

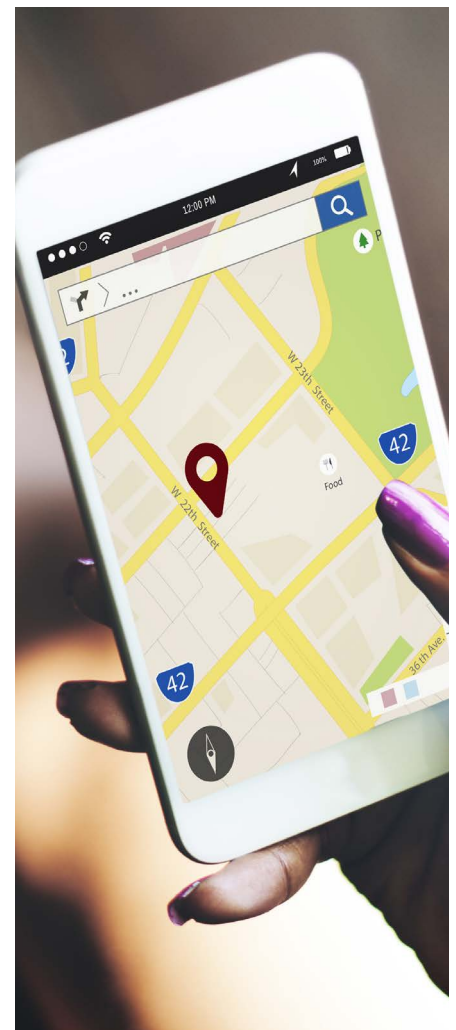
### 2. On-vehicle sensors and electronic logging devices

Internet-of-Things (IoT) sensors can be installed in vehicles to capture real-time data that can be fed into CRM systems

either electronically or manually by the drivers. This data is helpful in providing information on preventive maintenance, thereby minimizing on-road failures. However, data feeds from IoT-enabled devices can be unstructured and voluminous. It is worthwhile to implement a big data processing engine to ingest data and convert it into meaningful insights before it is sent to the CRM system.

### 3. Road-side data capture systems

Traffic officers need access to real-time alerts while monitoring on-road vehicles so that they can instantly impose sanctions or collect fines digitally. Further, if any event occurs on the road, it must be logged electronically and transmitted instantly to the CRM systems. Equipping traffic enforcement officers with handheld devices that are connected to centralized CRM systems can offer real-time visibility into road incidents for swift remedial action.



## Top 5 Technology Trends

Achieving this vision of enforcing road safety through connected and digital systems is possible by leveraging the following technology trends:

### Modernize IT systems



Sharing data among all stakeholders and consolidating IT systems into an ERP/CRM stack can deliver significant benefits to public sector organizations. However, IT systems must first be digitally connected so that real-time information is instantly available for effective governance. Next-gen technology solutions can help government agencies modernize disparate systems and implement digital capabilities so they can quickly detect road violations and take immediate action, thereby improving road safety.

### Implement IoT devices



IoT-enabled sensors can be installed in trucks to instantly capture and transmit real-time information about the vehicle. This information can then be evaluated using business logic and visualized through dashboards on handheld devices belonging to enforcement officers. For example, if a vehicle is over-speeding on a highway, IoT sensors will capture this information and alert traffic officers on their handheld devices. To achieve such insights, governments must make it mandatory for vehicle operators to install IoT sensors across their fleet.

### Leverage electronic logging devices



Recording and maintaining reports of truck driver duty measures such as hours of service is still a paper-based task. Auditing these reports is done manually, and so violations are flagged much later. Further, owing to manually-intensive auditing processes, some violations may be omitted by mistake. Electronic logging devices can be installed on trucks to accurately record various on-duty measures. This information can be transmitted instantly over networks to agencies to monitor driver performance in real-time. When violations occur, they are recorded in the driver's profile on CRM systems and alerts can be triggered to enforcement agencies so they can take appropriate action.

### Connect road-side data capture applications with CRM systems



CRM applications on handheld devices give enforcement agents information about events such as collisions, convictions and inspections. This direct data capture reduces manual errors as the system enforces the requisite checks and balances. It also reduces cost by eliminating data entry operations and minimizes delay between the event and response. As event information is fed in real-time, it alerts enforcement agents who then decide what corrective actions to take.

### Enable big data analytics



Big data is crucial to uncovering causation patterns. When it comes to road safety, big data aggregates inputs from numerous sources such as on-road and off-road monitoring to provide immediate insights, thereby improving the effectiveness of any road safety program. IoT sensor data, odometer data, fleet size, driver medical history, violation history, and even weather patterns can all be integrated using big data tools. These inputs can then be fed into predictive models to identify commercial vehicle operators that require tight enforcement supervision.

## Benefits

### 1. Real-time information improves road safety

Getting real-time information as soon as events occur helps relevant agencies recognize and respond to violations early and prevent potential accidents.

### 2. Digitized vehicles enhance performance visibility

Connected vehicles offer a holistic view and digital records of vehicle and driver performance, thereby enabling paperless and automated processing. It also simplifies detection of violations and fraud as all the captured information is linked to CRM systems.

### 3. IoT-driven surveillance ensures better adherence to traffic laws

When drivers are aware that their movements are being monitored through IoT and electronic devices, there is reduced risk of violations, resulting in safer highways.

### 4. Accurate data optimizes insurance costing

Insurance companies can instantly issue quotes based on accurate data from digital driving records, accident reports, etc. Further, a connected on-road performance model reduces the risk of fraud, leading to accurate insurance quotes. Safe driving also reduces insurance overheads during renewal, thereby saving cost for vehicle owners.

### 5. Stringent monitoring plugs revenue loss

Interconnected systems for on-road and off-road monitoring of commercial vehicle operators provide enforcement agencies with a holistic view of operations, affiliation to other carriers, vehicle ownership, and financial and ownership information. Such transparency not only minimizes the risk of fraud but also ensures that fines are collected on-time, thereby reducing revenue leakage.



## Conclusion

Many public sector organizations are adopting CRM technologies like Siebel CRM and Microsoft Dynamics to replace ageing mainframes and modernize their processes for better governance. When it comes to road safety, an approach that leverages connected CRM systems, IoT devices and big data processing can help radically change how organizations monitor commercial vehicles. Real-time operational data helps vehicle owners monitor vehicle and driver performance and conduct preventive maintenance to promote safe driving. Further, instant alerts allow traffic enforcement officers to be aware of all violations, respond to incidents instantly, collect the proper fines, and automate the processing of digital reports. With such capabilities, public sector organizations as well as vehicle owners can benefit from safer roads, lower cost, accurate insurance quotes, and more efficient operations.



## About the Authors



**Subodh Rane**  
Lead Consultant, Infosys

Subodh has 13+ years of diverse industry experience in CRM space and has played key roles in CRM Package & ERP Implementation projects.



**Kaustav Datta**  
Principal Consultant, Infosys

Kaustav has 15+ years of experience in CRM domain across different industry verticals and has played lead roles in business transformation projects.

For more information, contact [askus@infosys.com](mailto:askus@infosys.com)

**Infosys**<sup>®</sup>  
Navigate your next

© 2018 Infosys Limited, Bengaluru, India. All Rights Reserved. Infosys believes the information in this document is accurate as of its publication date; such information is subject to change without notice. Infosys acknowledges the proprietary rights of other companies to the trademarks, product names and such other intellectual property rights mentioned in this document. Except as expressly permitted, neither this documentation nor any part of it may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, printing, photocopying, recording or otherwise, without the prior permission of Infosys Limited and/ or any named intellectual property rights holders under this document.