

## The Internet of Things (IoT): Connecting Drivers, Vehicles and the Back Office

More efficient and sustainable waste collection is now considered a fundamental service for future-oriented Smart Cities. IoT can be applied to optimize waste collection for connected data sharing between the back office, trucks and drivers to enable route optimization, full management of container assets, safety and more efficient, sustainable operations.

■ By Martin Demers

A greater focus on energy savings and safety in waste fleet operations means managers must minimize operations costs while adhering to ever-strengthening safety regulations. Key aspects of fleet management such as fuel consumption, route management, driver performance and vehicle maintenance are all fundamental to improving fleet operations.

Enter the wireless Internet of Things (IoT)—the next wave of capabilities that take advantage of robust, mobile connectivity to deliver the data and services that make fleet operations safer, greener and more cost-effective.

IoT is all about connecting and managing many aspects of our life with the help of the Internet. IoT is built on cloud computing and networks of data-gathering sensors to deliver a mobile, virtual and immediate connection. And it has the power to make everything “smart”.

### IoT Connects Drivers, Trash, Vehicles and Customers

The waste sector is increasingly taking advantage of IoT to

substantially evolve its operations. We see this with the use of smart technologies like RFID sensors for cart/container management, camera-based systems for real-time monitoring, and route management solutions for ramped up productivity and tracking. Waste management organizations globally are now progressively deploying industrial IoT systems to monitor trash, vehicles, drivers and customers to maximize many elements of the essential services offered. IoT has brought greater efficiencies and improvement to how waste management organizations manage their fleets.

### Complete Visibility

Fleet managers who have limited or no visibility into their fleet and driver activity, cannot address or mitigate the issues, and cannot deal effectively with at-risk drivers. This lack of visibility directly impacts their risk factors, safety records and operating costs. They need to have a complete view of all fleet, equipment and driver activity. IoT-connected smart displays with fleet management

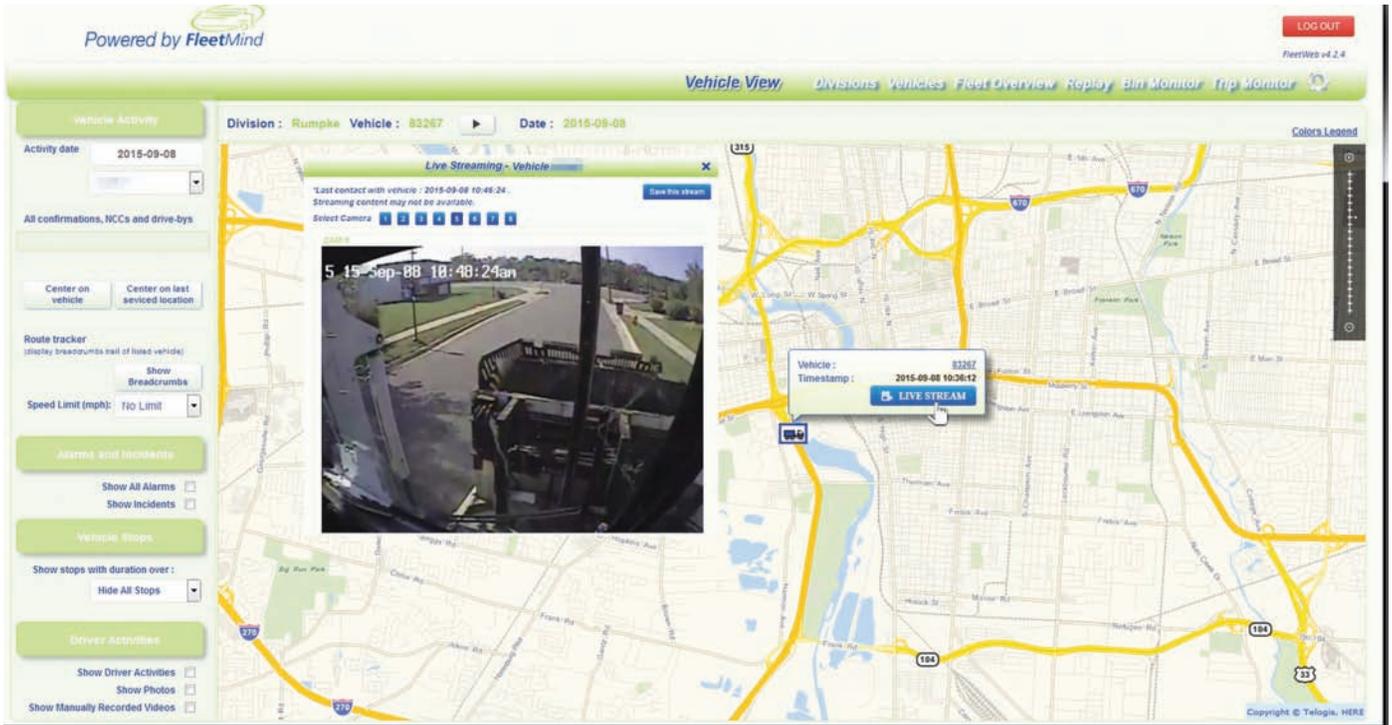
IoT-enabled lift sensors control the range of motion of a hydraulic actuator to ensure smoother mechanical operation and greater visibility into vehicle operation.

IoT-connected RFID tags and sensors track each garbage can or cart as is associated to a specific customer address.

Backing maneuvers can be dangerous for employees, pedestrians and the trucks. New smart trucks now come with rear-mounted cameras ensuring full IoT-powered visibility.

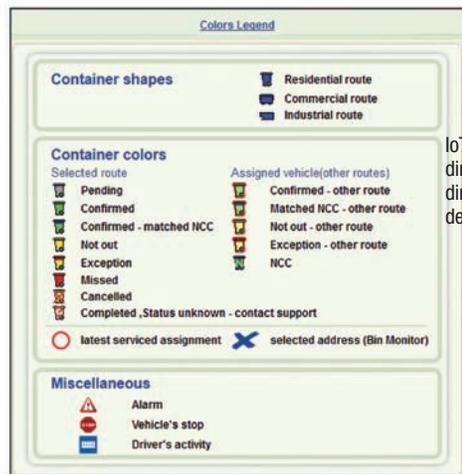


Images courtesy of Fleetmind.



Top: IoT-powered smart displays and mobile DVR devices capture real-time video footage to improve operations by tracking bins, monitoring the lift's safe use and recording any contamination status.

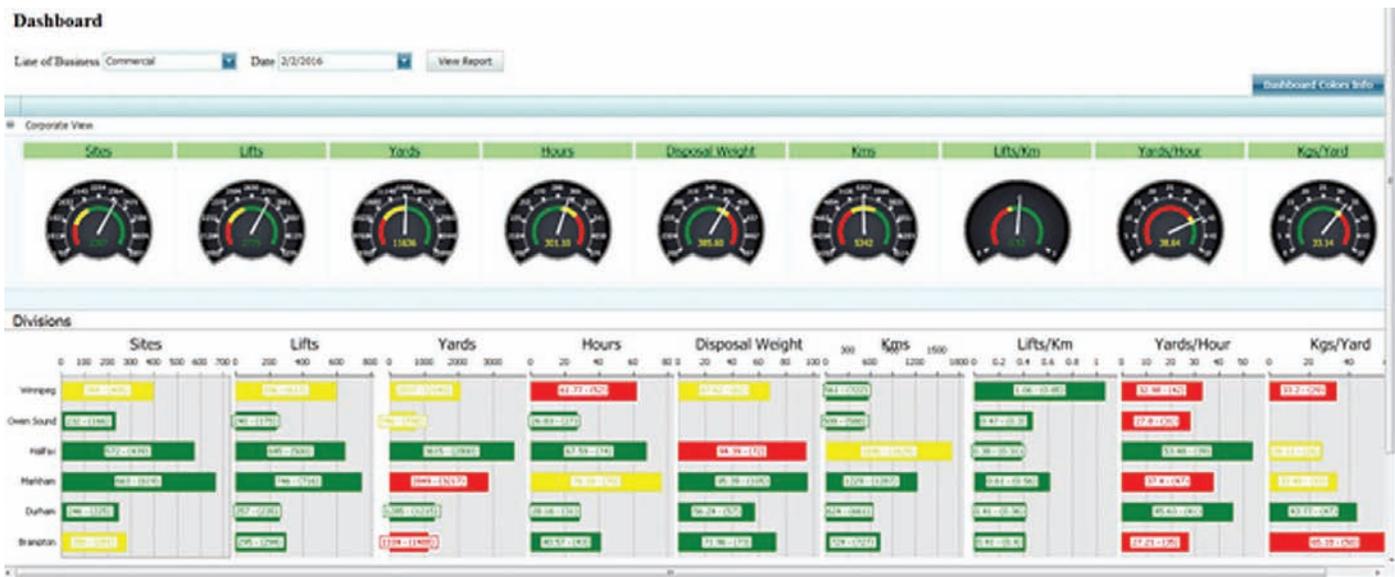
software will ensure complete visibility into driver and truck activity. These smart displays provide a single point of interface between the driver, truck, back office and all communications. They further integrate multiple video and audio feeds in real-time, and ensure flexible and easy interfaces with the vehicle's control system. It is like having a supervisor in every truck.



IoT-driven automatic driver direction tools provide directions to a driver's designated next stop.

### Less Driver Distractions

Reducing driver distractions is essential for both waste fleet safety and productivity. IoT-driven connectivity makes bilateral communications between drivers and the back office easy and intuitive. Connected smart displays typically provide a single point of interface for the driver, truck, back office and all communications. A touchscreen display allows for real-time video and audio functionality, and flexible interfaces ensure easy interaction with the control system. These onboard systems typically provide real-time feedback to drivers on any performance thresholds (speeding, idling, hard-braking, etc.) so that they can modify their behavior before alerts are sent to the back office. This takes the guesswork out of driving. When accidents do occur, onboard computing systems will typically capture key data and photographic evidence to support both drivers and related insurance claims.



IoT enables enhanced levels of operations and performance statistics tracking for key productivity indicators.

### More Eco-friendly Operations

Green fleets are focused on reducing fuel consumption, mileage and exhaust emissions, and on driving more safely. IoT-connected onboard computing systems with driver direction capabilities let managers optimize each truck's routes to reduce time spent on the road and the number of engine hours per day. They further help reduce the amount of fuel burned by the engine as it is being used by using alarms to monitor and reduce idling, identify aggressive driving patterns and identify vehicle maintenance problems so that engines can be repaired before problems escalate.

### Improved Preventative Maintenance

IoT-connected onboard systems further flag vehicle issues to ensure that the vehicle is properly maintained and running. Both drivers and fleet managers are assured of immediate Engine Control Module (ECM)-related alarms to flag any issues for repair and maintenance. Drivers are safer and vehicles perform better.

### Enhanced Data Collection

Every day waste fleets generate masses of information regarding driver activity, driver performance and scoring, fuel consumption, fleet performance, vehicle alarms, fuel tax, vehicle usage and more. Before IoT, much of this data was collected manually, which left many information gaps and incidences of human error. Often, there was detrimental lag time between issues and awareness of these, which prevented timely resolutions. IoT now enables enhanced levels of operations and performance statistics tracking for key productivity indicators. This provides unprecedented and total visibility into all information at a macro company level right down to the individual driver level. The result is the ability to identify and solve problems faster, improve operational efficiency,

make better informed decisions, know a vehicle's status and anticipate maintenance, spot costly and unsafe driver maneuvers, and spot service anomalies over time. Fleet managers can not only collect, analyze and understand all the data from their fleet, but also act on it in near real-time timeframes.

### Route Optimization

Route management takes the theory of optimizing route efficiencies and combines that with the real-time IoT-driven fleet tracking and turn-by-turn driver directions to ensure that vehicles actually use those routes that minimize the distance, the amount of fuel used or the amount of time required to fulfill their duties. Route management also includes the monitoring of driver behavior and truck activity to ensure safe driving practices.

### IoT Benefits Specifically for Drivers

In a nutshell, IoT-connected vehicles will help drivers do their jobs better, faster and safer.

### Sensors to Manage Lifts

For increased efficiencies, many waste collection fleets now use automated loaders to lift garbage containers and dump the garbage into the vehicle. These automated loaders can service a much higher number of customers as compared to manual lifting, which significantly reduces both collection time and costs. However, due to the speed and force of automatic lifts, they need to be controlled to avoid stresses within mechanical components that can lead to breakage, failure or accelerated wear of components. To mitigate these risks, IoT-enabled lift sensors can control the range of motion of a hydraulic actuator by signaling that the actuator is near a specified range of motion.

This ensures smoother mechanical operation and greater visibility into vehicle operation.

### ***RFID Sensors for Cart/Container Management***

New cart and container management systems provide waste and recycling firms with advanced solutions for automated garbage collection and the management of carts and customers. Using IoT-connected RFID tags and sensors, each garbage can or cart can be associated with a specific customer address. Drivers can quickly verify cart specifics by scanning these with handheld or other devices. Individual customer information—from damaged carts to insufficient cart capacity—is easily captured into a centralized database. This further ensures immediate and accurate information for billing processes.

### ***Connected Camera Systems***

Smart fleet management systems now come with multiple cameras for unprecedented insights into and all around a vehicle. Typically integrated with in-cab IoT-powered smart displays and mobile DVR devices, these cameras take pictures and capture real-time video footage to improve operations by tracking bins, monitoring the lift's safe use and recording any contamination status.

Backing maneuvers are potentially dangerous for employees, pedestrians, surrounding goods and the trucks themselves. New smart trucks now come with the ability to capture snapshots, video snippets and continuously record from up to eight truck-mounted cameras. These provide complete IoT-connected visibility to both drivers and back office personnel for optimal safety.

### ***Sensors for Weight Management***

Smart trucks can now come with calibrated mobile scales that record the weight of each cart/container lifted. These vehicles are equipped with load cells, which include corresponding scale sensors to record precise weights. These can easily be integrated with order processing systems, and IoT-powered onboard computing systems for route management, bin identification, tracking and navigation. Benefits include less cost-intensive weighing processes, real-time weight data collection, accurate billing and zero manual intervention requirements.



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### ***Driver Direction***

IoT-driven automatic driver direction tools provide directions to a driver's designated next stop and can also automatically recalculate routes when a driver deviates from the route or makes an out-of-sequence manual stop. Subsequent locations do not need to be entered by the driver. Ongoing route locations and directions are based on the driver's schedule and are provided audibly and automatically.

### ***Optimizing Waste Collection***

More efficient and sustainable waste collection is now considered a fundamental service for future-oriented Smart Cities. IoT can be applied to optimize waste collection for connected data sharing between the back office, trucks and drivers to enable route optimization, full management of container assets, safety and more efficient, sustainable operations. | **WA**

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