

2014



# ON-BOARD TRACKING AND WEIGHING SYSTEM

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## VIZION® - Overview

**VIZION®** is an integral solution based on geolocation technology through the use of GPS devices combined with communication capabilities and multiple input peripherals that supports business management converting data obtained in real time into information relevant for decision-making processes.

**VIZION®** has been developed by **GLOBALIS S.A.**, a company devoted to the provision of technology solutions and outsourcing services with a vast experience in the software development market. It offers its clients technological knowledge and innovation applicable to the development of reliable and useful computing tools.

**VIZION®** includes:

- **Web Platform:** Monitoring, tracking, and control software developed by Globalis S.A. The platform includes a configuration back-end and a front-end for clients and/or final users with security configuration determined by access profiles that provides the platform with great flexibility.
- **Communication Drivers:** Set of applications designed to manage not only TCP/UDP traffic but also traffic from satellite links. These drivers can handle large volumes of data using asynchronous processes.
- **Specific Hardware:** Globalis S.A.'s know-how enables to add hardware and/or complementary developments to the platform if required.

Information managed in the **VIZION®** platform is sent to the company's management systems by importing and exporting data from and into them thereby integrating every business activity.

## VIZION® On-Board Weighing System

The **VIZION®** on-board weighing system provides an integral solution for truck weighing. It offers total control over the fleet of vehicles. **VIZION®** on-board weighing systems increase productivity, streamline the logistic flow, and control loads transported, activities that could never be performed using traditional weighing systems.

The **VIZION®** on-board weighing system has a module designed for the real-time tracking of fleets that controls the position of units with great accuracy to have information on the route followed permanently. The tracking module is supplemented with the on-board weighing system that enables to know the weight of the load transported by the vehicle in real time.

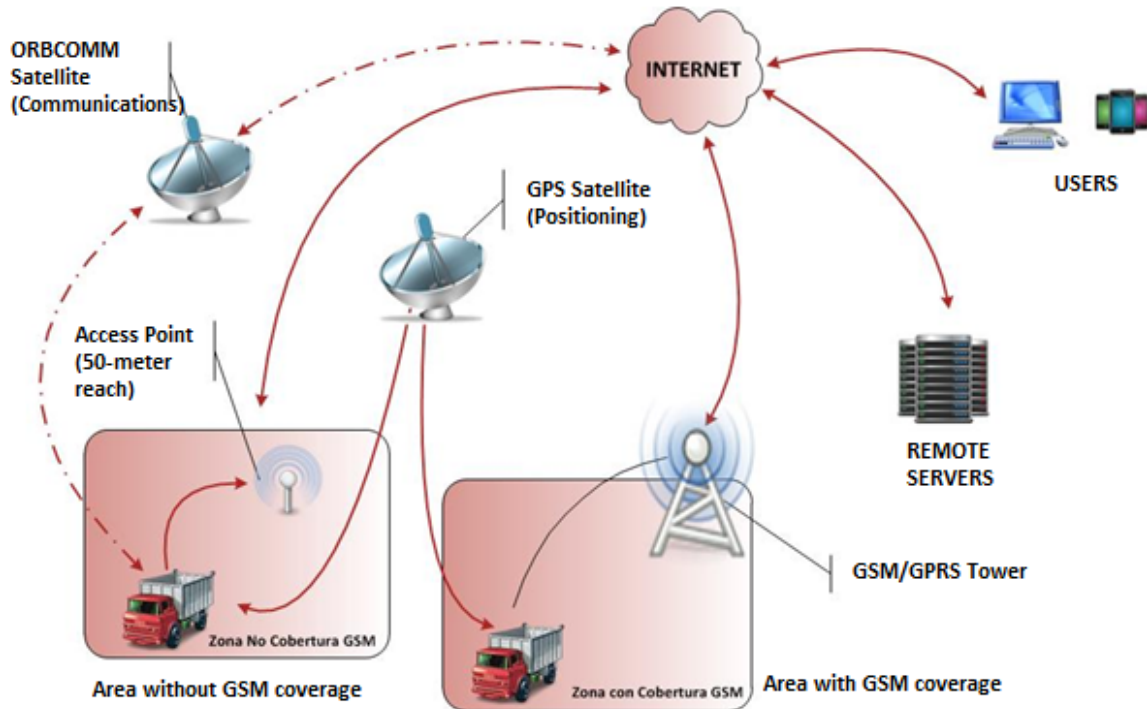
In consequence, accurate data associated with the following factors can be accessed:

- ✓ Distance traveled by the vehicle.
- ✓ Weight of the load transported.
- ✓ Distance through which the load was transported.
- ✓ Uploading place.
- ✓ Downloading place.
- ✓ Route traveled by the vehicle.

All these factors enable to control not only the fleet but also the movement operation.

## VIZION® On-Board Weighing System - Components

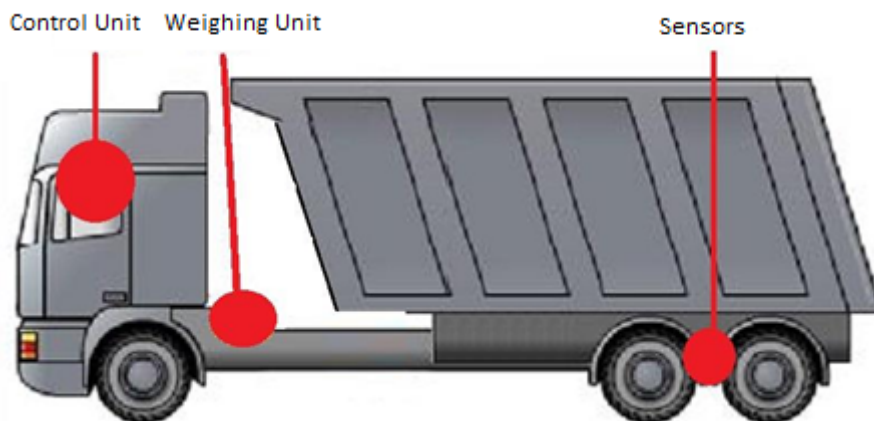
The **VIZION®** on-board weighing system includes the following elements and technologies:



**Global Positioning Technology (GPS):** Global positioning technology enables to determine the position of vehicles accurately in the entire world.

**GSM Communication Technology:** Data collected by a control unit located in the vehicle cabin can be sent to remote servers using mobile telephony technology.

**Vehicle:** The following devices are installed inside the vehicle:



**Control Unit:** The control unit is equipped with GSM connectivity and GPS positioning technology. It is included into the weighing unit installed inside the vehicle. The control unit receives the load weight collected by the weighing unit. It also determines the position of the place where loading and unloading activities are performed and calculates the distance through which the load is transported by the vehicle. Finally, it sends information collected to the servers where the **VIZION®** web platform is installed.

**Weighing Unit:** The weighing unit reads data provided by the sensors installed inside the unit and calculates the weight of the load to be transported.

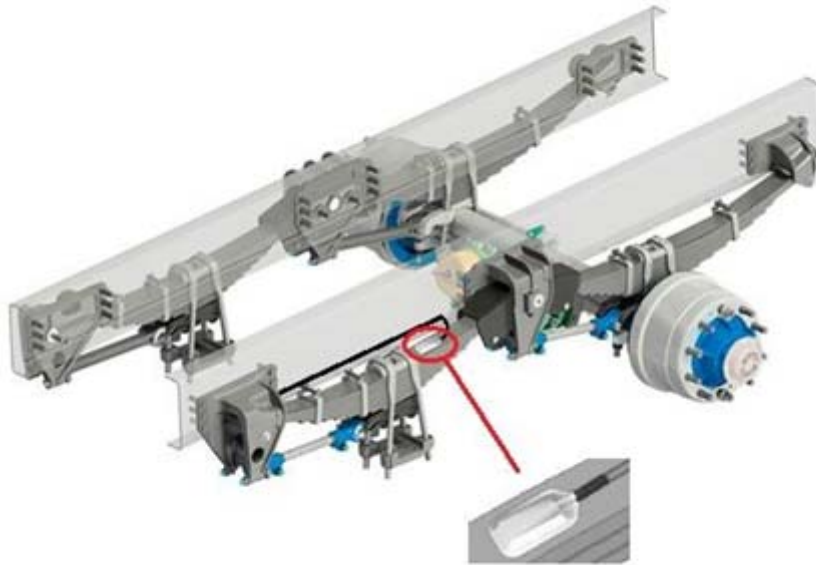
Load weight is calculated measuring the pressure exerted by such load on the vehicle suspension system.

**Sensors:** Sensor selection depends on the type of suspension of the vehicle.

- ✓ **Air Suspension:** Units with this type of suspension use a pressure-measuring device that must be installed at the air inlet of pneumatic bellows. This sensor measures air pressure in the suspension system, which is proportional to the load transported by the vehicle.



- ✓ **Mechanical Suspension:** Vehicles with mechanical suspension use spring sensors. These sensors detect the curvature caused by the load on the vehicle spring. In this way, the weight transported by trucks is calculated indirectly.



Spring Sensor

## On-Board Weighing System - Prototype

A prototype of the on-board weighing system proposed by **VIZION**<sup>®</sup> was developed with the aim of proving its efficiency. It was installed in a Ford dump truck owned by Conevial.



### Installation

The equipment installed to prove the performance of the system includes a tracking module with capacity to locate the vehicle in real time since it has the **VIZION**<sup>®</sup> tracking solution integrated to the on-board weighing module.

The truck has mechanic suspension in the three axles. Hence, three spring sensors were required for weighing purposes.

The following figures show the installation of sensors inside the dump truck.





The sensors are installed in the swingers of the rear suspension and in the axle of the front suspension. There are bonded to the metal using a powerful industrial glue.

Sensors include a metal casing to withstand heavy operating conditions. This casing protects sensors against objects that can hit them. Additionally, the metal casing is filled with a rubber-type industrial resin that protects sensors against external factors, including moisture, dust, water, mud, etc.

Once the system is installed, the truck must remain motionless during 24 hours so that the glue and resins used in sensors dry properly. This casing also provides protection against potential sabotage.

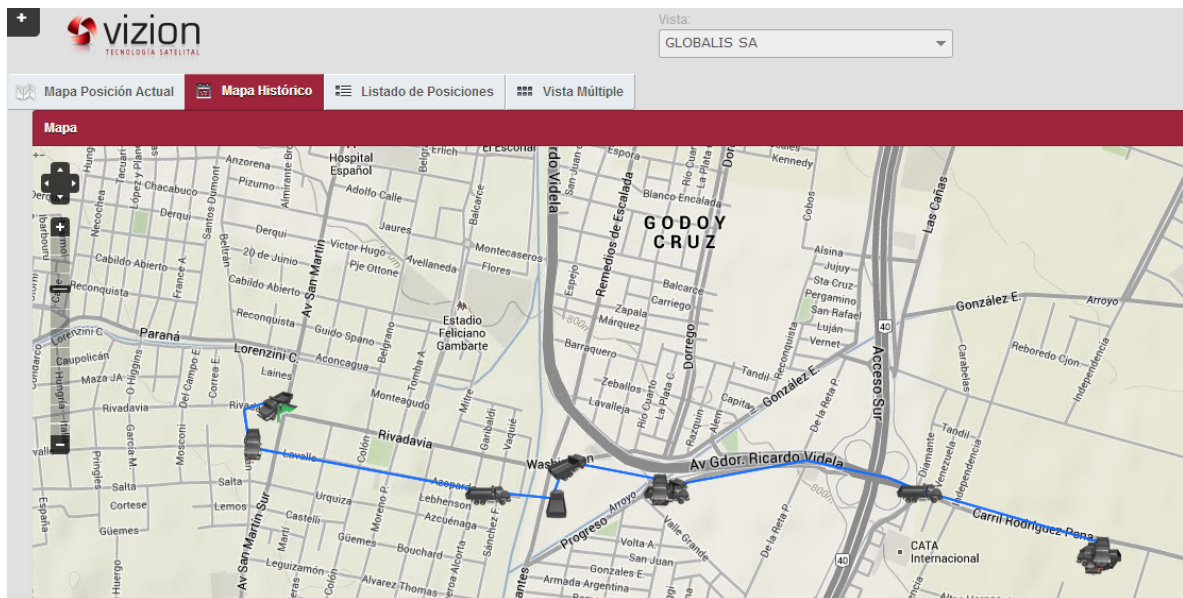
For proper operation, the system must be calibrated using a scale for data comparison. Calibration is achieved weighing the truck empty and with full load. Values collected by the scale are manually entered into the weighing system. When the calibration process is complete, the truck is under suitable conditions to be used.

## VIZION® Web Platform

The following information about the weighing system can be visualized online:

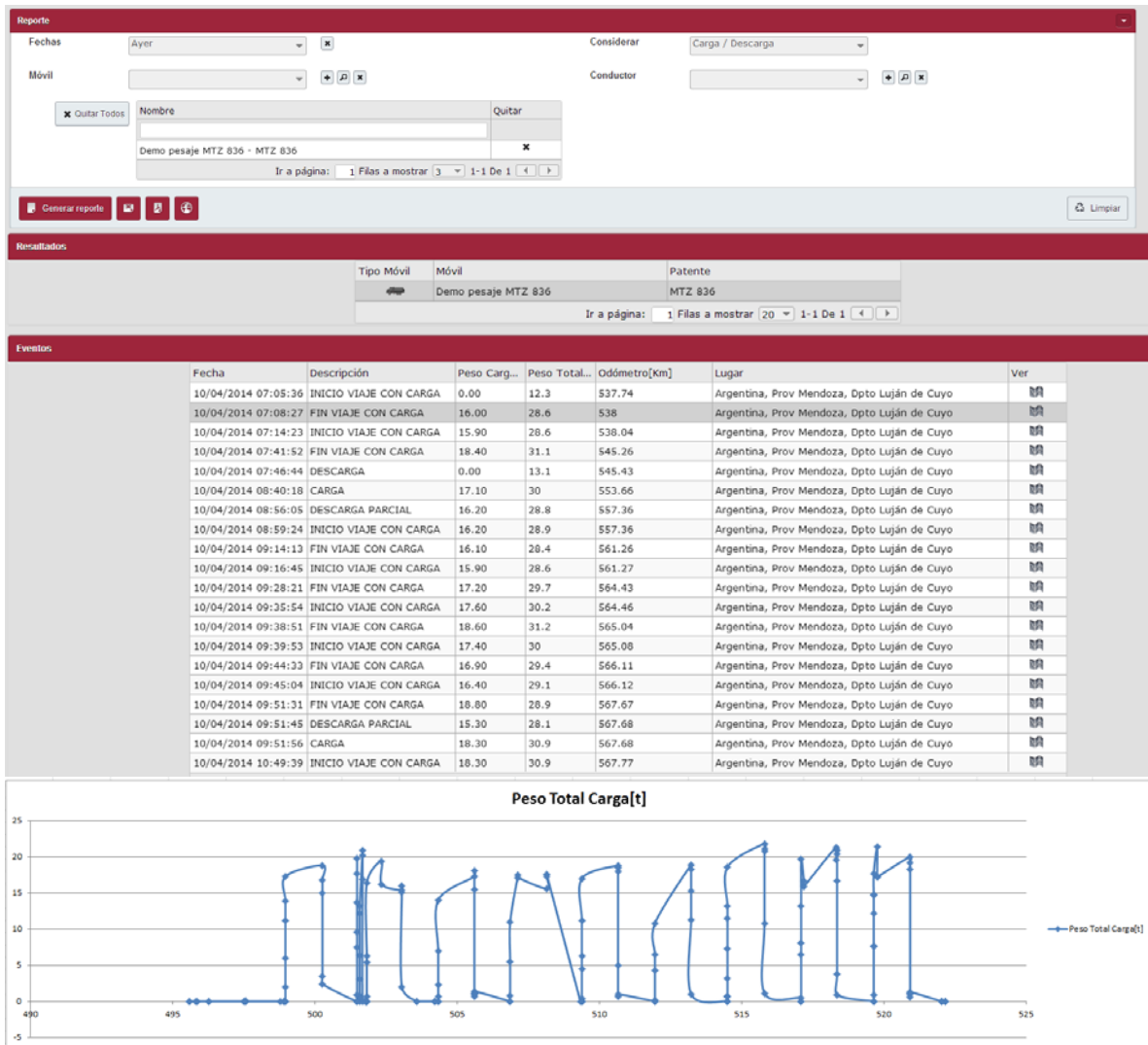
### Real-Time Tracking

VIZION® provides continuous monitoring viewing the vehicle through the web platform and accessing different data in real time, including speed, direction, route, zones accessed by the truck, stops, etc.



## On-Board Weighing System

**VIZION**® provides continuous monitoring of the truck load viewing the weight transported (in tons) in real time through the web platform. **VIZION**® identifies loading and unloading times making it possible to prepare a detailed report with this information, including distance through which the load is transported.



The system also enables to create and export Excel® tables and graphs to analyze the information.

## System Checking

The system is checked comparing measurements made by the scale (performed by YPF) and the measurements collected by the **VIZION®** on-board weighing system.

The following figure shows a screenshot with measurements of load gross and net weight made by the system and the slip sent by YPF.

**Reporte**

Fechas: Personalizado  
Desde: 06/05/2014 23:32:53 Hasta: 06/05/2014 08:32:53 - Dias: TODOS

Móvil: Demo pesaje MTZ 836 - MTZ 836

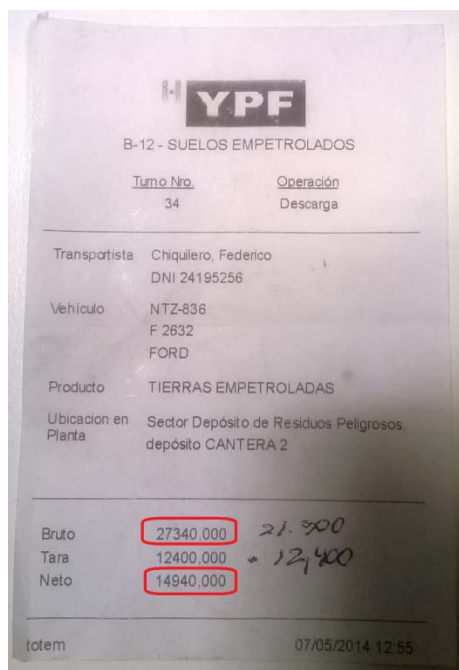
Peso Carga...	Peso Total...
15.20	27.8

**Resultados**

Tipo Móvil	Móvil	Patente	Ver Gráfico
	Demo pesaje MTZ 836	MTZ 836	

**Eventos**

Fecha	Descripción	Velocidad	Peso Carga...	Peso Total...	Odómetro(Km)	Lugar	Ver
07/05/2014 12:25:10	CARGA	0.00	15.20	27.8	2442.87	Argentina, Prov Mendoza, Dpto Luján de Cuyo	
07/05/2014 12:50:51	DESCARGA	0.00	0.30	13	2443.01	Argentina, Prov Mendoza, Dpto Luján de Cuyo	
07/05/2014 17:46:34	CARGA	0.00	18.20	30.6	2470.85	Argentina, Prov Mendoza, Dpto Luján de Cuyo	
07/05/2014 17:48:55	DESCARGA PARCIAL	0.00	13.80	26.1	2470.86	Argentina, Prov Mendoza, Dpto Luján de Cuyo	
07/05/2014 17:49:58	CARGA	0.00	18.60	30.9	2470.86	Argentina, Prov Mendoza, Dpto Luján de Cuyo	
07/05/2014 17:52:35	DESCARGA	0.00	0.00	12.1	2470.86	Argentina, Prov Mendoza, Dpto Luján de Cuyo	



As it can be observed, the error of the measurement accounts for 1.6%, approximately. This percentage matches the expected error margin of the system (maximum error accounts to 5%). The time difference occurs because the system makes the measurement when the

loading of the material is finished, and not when the measurement is made using the scale.  
The information is listed below:

- In the web: 15.20 tons
- In the slip: 14.94 tons

## Conclusion

The information provided by the system shows proper operation. The system has proven to have the robustness required to withstand the heavy operating conditions to which it has been subjected. The checking system verified that the measurements made comply with the accuracy required by the client.

It can be concluded that the weighing system installed meets the specifications requested by the client.