



bitcarrier<sup>w</sup>  
WORLDSENSING

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## TRAFFIC FLOW MANAGEMENT SYSTEM

SOFTWARE SUITE



SENSORS





WORLDSENSING

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## THE REAL-TIME TRAFFIC FLOW MANAGEMENT SYSTEM

### TRACKING THE WAY THE WORLD MOVES

**Bitcarrier** is a system for real-time traffic and road monitoring. Vehicle movements are captured with a network of smart sensors, which are placed at strategic locations in city streets, on roads and on highways.

City and road operators wirelessly collect traffic information and can visualize and analyze results to better manage traffic flow.

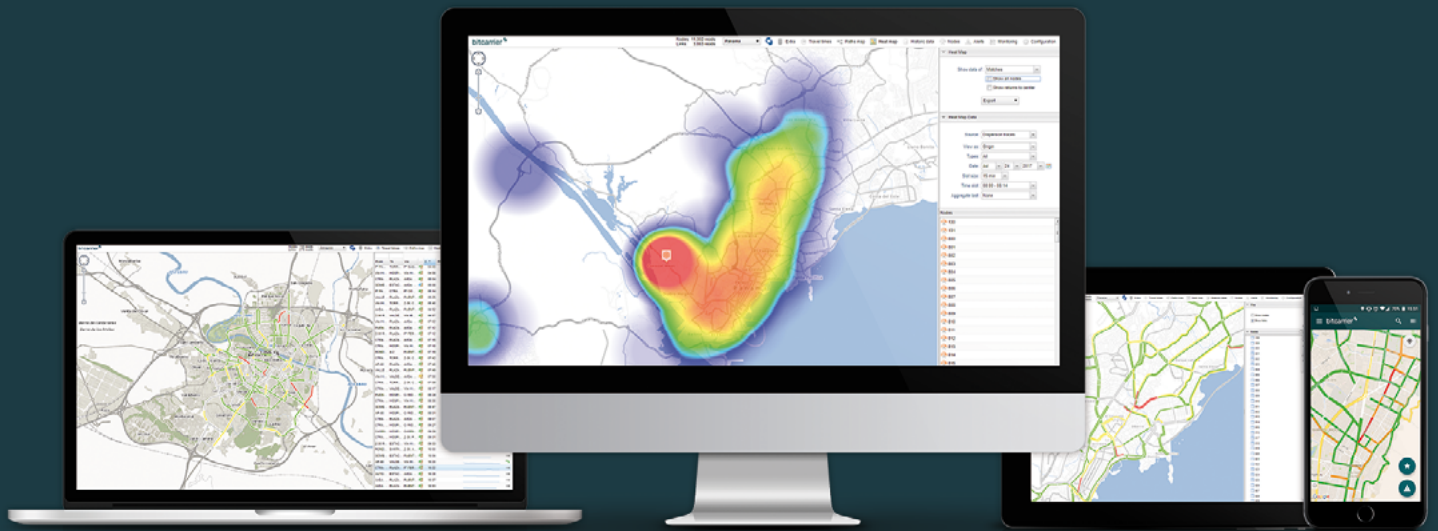
While drivers obtain instant updates about journey times and incidents, road operators receive all the data they need to develop agile mobility policies.

#### FEATURES

- Cloud-based or on-premise software suite
- Data analytics tools
- Real-time traffic maps
- Key traffic metrics:
  - Traffic intensity, vehicle speed, congestion level & travel times
- Mobility profiling: origin and destination matrices
- Incident alert system: accidents, roadblocks, among others
- Historical and real-time traffic data statistics
- Third Party Data Input APIs
- Flexible integration with third party data feeds

#### BENEFITS

- Improve mobility strategy
- Manage and optimize traffic in real time
- Make faster decisions based on 24/7 information
- Easily add sensors to extend measurement range
- Save resources through fast implementation
- Decrease costs through easy maintenance
- Integrate with TMCs and information dissemination
- Manage congestion and reduce pollution
- Provide citizens and drivers with valuable updates
- Leverage system without privacy issues
- Improve your mobility strategy



## BITCARRIER TECHNOLOGY

### COMPLETE SOFTWARE SUITE

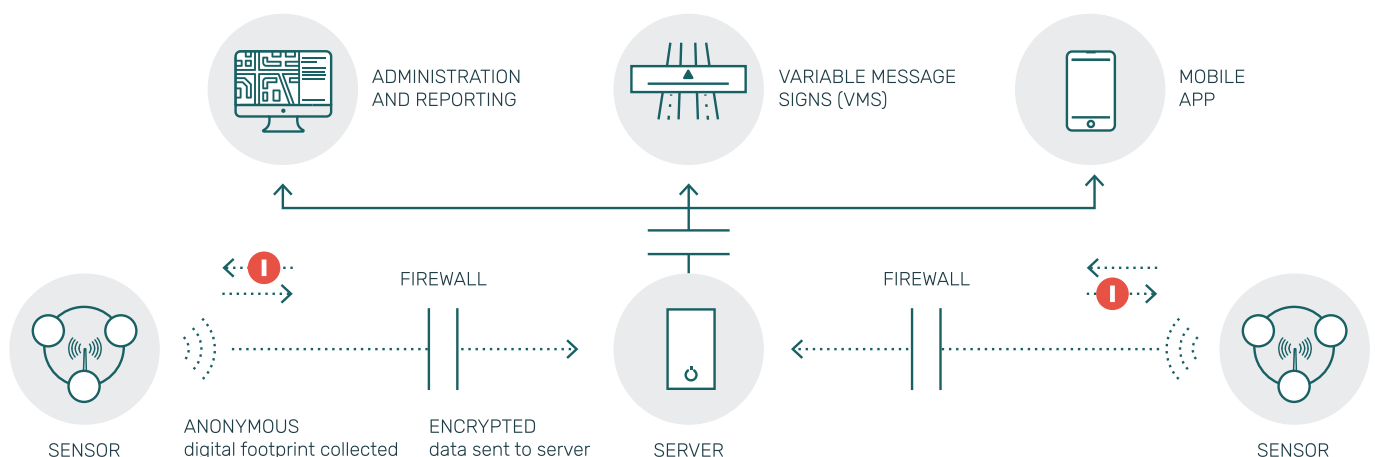
The wireless, intelligent Bitcarrier traffic flow management system is a combination of Worldsensing proprietary hardware and software. The Bitcarrier Software Suite enables cities and transport operators to collect real-time traffic information. The software suite includes two individual tools for analyzing and archiving data in real time: the Bitcarrier Configuration and Visualization Tool.

Bitcarrier can complement other existing traffic information systems enabling operators to use multiple sources of information and allows to integrate data quickly and easily.

### ADVANCED SENSOR

Bitcarrier works in three steps: data collection, information processing and data visualization. It uses a 2.4GHz frequency band and scans Bluetooth and Wi-Fi signals emitted by mobile devices such as cell phones, GPS navigators, and hands-free kits. The system uses anonymous data from captured signals in order to provide information related to traffic flow in various environments, thus allowing to analyze and manage traffic more efficiently.

### HOW IT WORKS



Operational Intelligence  
for Cities and Transport Operators

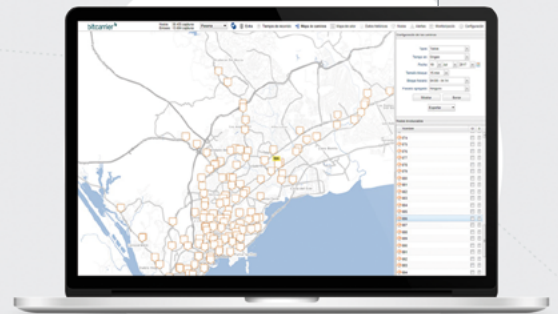
Worldsensing is not only among the leading providers for wireless data capturing, we also know how to extract intelligence from collected data to transform traffic management operations.



#### CONFIGURATION TOOL

The Bitcarrier Configuration Tool allows users to easily configure their installation as well as all Bitcarrier sensors, parameters, and variables.

**VISUALIZATION TOOL**  
The Bitcarrier Visualization Tool provides insights into a city's mobility by showing real-time results on a map.



## SOFTWARE SUITE

### CONFIGURATION TOOL

The Bitcarrier Configuration Tool helps users to easily configure their installation and allows setting up all Bitcarrier sensors, parameters and variables that are displayed in the Bitcarrier Visualization Tool.

#### FEATURES

- Set location of each device (longitude and latitude)
- Create links, metalinks, routes and travel times
- Use colored lines to create graphical links on the map
- Define thresholds of e.g. service levels, congestion, and speed publications
- Special configurations for speed, time and service levels
- Get alerts from different components

### VISUALIZATION TOOL

The Bitcarrier Visualization Tool is an online map showing results in real time. It can be accessed by multiple control center agents.

Traffic operators can

- Monitor traffic flow in detail, identify critical points just before congestions arise, optimize routes, and divert traffic
- Identify vehicle flows, congestion patterns, travel times, and critical problems in order to inform commuters
- Predict real-time traffic based on the day of the week, hour and location
- Access historical data by day and time by viewing graphics which are linked to various parameters

#### FEATURES

- Real-time maps and congestion levels
- Travel times and average speeds
- Dispersion traces
- Origin-Destination matrices
- Traffic prediction
- Number and type of tracked devices
- Monitoring of Bitcarrier sensors (e.g. availability, uptime, position)
- Historical data
- Allows exporting data in CSV, Excel or JSON

## ALGORITHMS

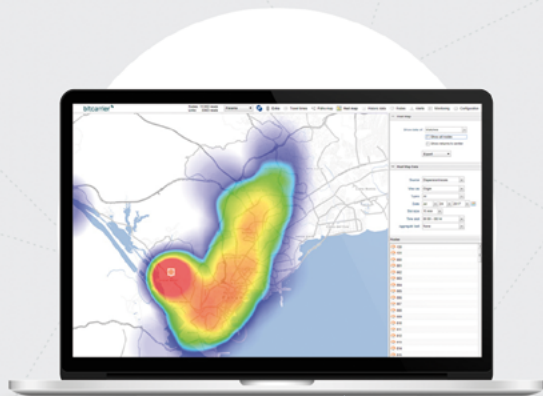
The Bitcarrier system uses proprietary algorithms to filter and process data sent by all sensors. People or vehicles circulating at lower speeds can be omitted.

#### COMPONENTS

- Node: data audited on one spot (one or more sensors)
- Vector (or Links): speed and travel times between 2 points
- MetaVector (or MetaLinks): combination of several vectors in a unique list
- Route: combination of vectors and metavectors

#### PRIVACY

- All Bluetooth and Wi-Fi identifiers audited by the sensors are anonymized using a hash algorithm, so that the physical address of a device is not traceable
- The communication between the client and the server is done using a proprietary protocol resulting in a very low GPRS data consumption
- In the server, all raw data (hashes) have a life time of 3 to 8 hours. The time depends on the environment and on the speed at which vectors between sensors are created



#### HEAT MAPS

Visualize traffic flows in real time to optimize routes or divert traffic to secondary routes.

**TRAVEL TIMES**  
Analyze travel times and average speeds to identify critical points just before congestions arise.



## SOFTWARE SUITE

### TECHNICAL SPECIFICATIONS

Bitcarrier runs on a hybrid database that combines the advantages of relational databases and the flexibility and speed of NoSQL storage systems.

Bitcarrier runs on a cluster of 2 servers to ensure performance and resilience. Depending on the size of the deployment the servers can be increased to 6.

The Bitcarrier system offers secure web-based REST API services to connect to 3rd party software solutions and provides a connection to a raw database where all detections are aggregated and stored.

#### FEATURES

- JVM module (Java Virtual Machine) for data gathering
- JVM Software for origin destination matrix calculation
- JVM Software for data aggregation and for statistical analysis
- NOSQL3 database based on CASSANDRA
- SQL database based on MYSQL
- Secure REST API in JSON format or standard XML formats
- The platform allows integrating and displaying geolocation data using external Keyhole Markup Language (KMLs)

### HISTORICAL DATA

#### FEATURES

The tool allows to:

- Access historical data per day or time
- Predict real-time traffic based on the day of the week, hour or location
- Secure REST API

Bitcarrier can be integrated into Mobility, the City Operational Intelligence solution for city control centers.







## BITCARRIER SENSOR

The Bitcarrier sensor is designed for both urban and interurban environments. While Bitcarrier enables cities and transport operators to better manage traffic flow, drivers receive real-time updates to plan their journeys.

### KEY COMPONENTS

BLUETOOTH AND WIFI SENSORS

WIRELESS COMMUNICATION SYSTEM

DATA MANAGEMENT AND ANALYTICS SOFTWARE

ELECTRONIC VARIABLE MESSAGE SIGNS (VMS)

STANDARDIZED API

MOBILE APP

### SYSTEM ARCHITECTURE

Sensor network capturing Bluetooth and Wi-Fi signals emitted by mobile devices

Network server hosts databases

Online web client displays all results

Secure web-based REST API to easily integrate results in 3rd party platforms or VMS

### DATA CAPTURING

Bitcarrier sensors capture up to 500 unique devices per minute which travel at speeds ranging from 5 km/h to 160 Km/h

The number of lanes is 6 for each direction

Simultaneous Bluetooth and Wi-Fi detection technology

### DEPLOYMENT AND MAINTENANCE

Sensors run on DC/AC/ PoE power and GSM 3G coverage

No need to close roads to deploy sensors

Plug-in ready to immediately start collecting data

Can be easily integrated into existing infrastructures

### DATA PROTECTION

Anonymous data collection

Doesn't collect personal data

Each captured signal corresponds to a unique identifier

Anonymized identifiers prior to sending to server

Deletion of original data after transmission



# BITCARRIER SENSOR

## MAIN SPECIFICATIONS

### PROCESSOR

Ultra low-power processor specifically designed for outdoor installations. Because of its ultra low TDP no fan is needed. This also minimizes the risk of failure due to moving parts

### COMMUNICATION

#### Ethernet:

Passive POE (Power over Ethernet) sends both data and power to the device with the same cable. When Ethernet is available, power and connectivity are provided using the same cable. If a traffic light has an Ethernet socket, a POE connector can be installed to connect the device with the Ethernet cable

#### Modem GSM:

Modem with 4 bands able to transmit GPRS, EDGE and HSDPA data

### LOCATION

GPS receiver able to process GPS and WAAS satellite signals

### STORAGE

- Non-volatile memory data storage
- Storage is activated only when the sensor is offline. When connectivity is recovered, all data in storage are submitted

### DETECTION SCANNING

#### Bluetooth:

- BT 2.1 EDR (2.4 Ghz)  
All versions are detected if Bluetooth is switched on (visible mode)
- Gain: 15.5 dBi (directional)
- Maximum range: 150m

#### Wi-Fi

- 2.4 Ghz
- Gain: 1 dBi
- Maximum range: 50 m

### POWER

- Two input options: VDC/ Passive PoE
- Power consumption: 4 W

### REMOTE MANAGEMENT

- Remote checking and maintenance of the nodes
- Remote detection of connectivity, coverage and system
- Remote updating

## MECHANICAL

### ANTENNA

Box with adjustable clamp for pole installation

### SIZE

276 x 272 x 96.5 mm (HxLxW)

### WEIGHT

2 kg

### CASING MATERIAL

ABS (UV RESISTANT)

### OPERATING TEMPERATURE

-35°C to +80°C <sup>1</sup>

### STORAGE TEMPERATURE

-35°C to +80°C <sup>1</sup>

### HUMIDITY

10 to 95%

### IP67

Compliant – Resistant to all weather conditions

### MTBF

10 years or 90000 hours

## STANDARDS COMPLIANCE

RoHS compliant

### REGIONS

CE, FCC, IC and NEMA compliant

## BENEFITS

### → SOFTWARE SUITE

Monitor and manage traffic 24/7 in real-time with intuitive software. Instantly obtain information on speed and travel times.

### → AFFORDABILITY

The cost of the Bitcarrier solution is significantly lower than other competing traffic information technologies.

### → THIRD PARTY INTEGRATION

Complement other traffic information systems such as cameras to provide your traffic control center with multiple sources of information.

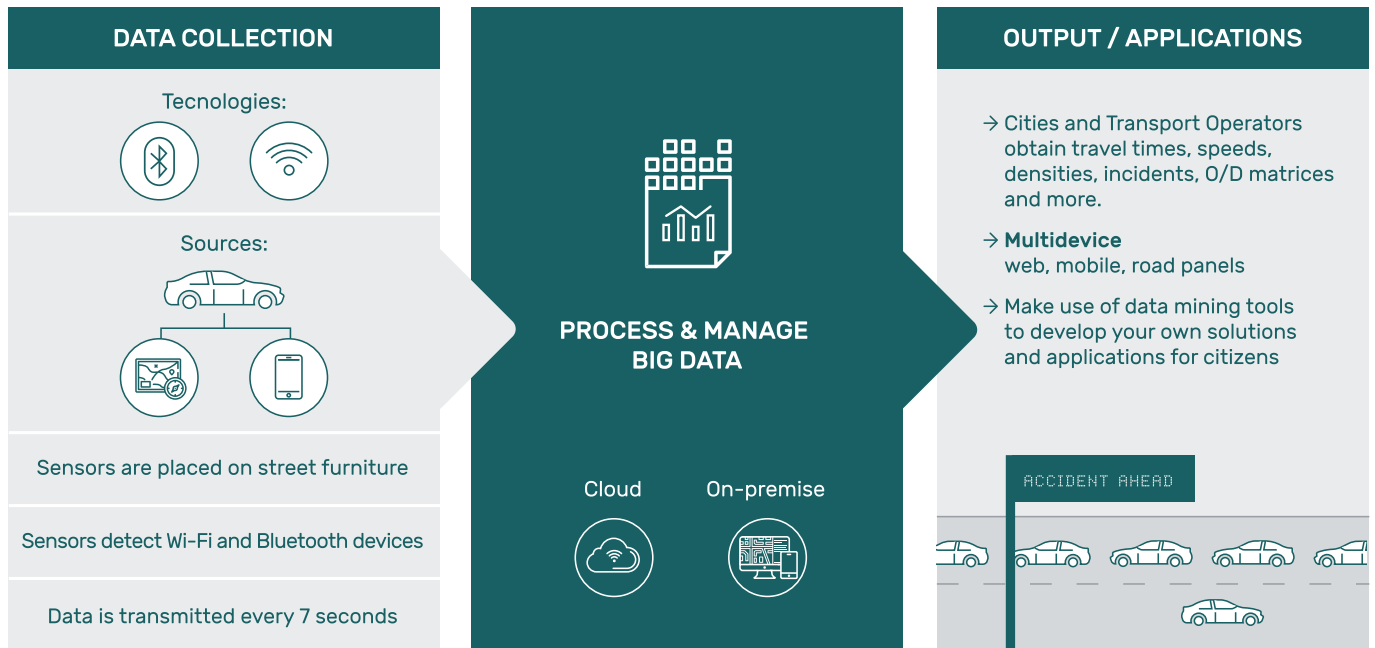
### → WIRELESS SENSOR SYSTEM

Deploy wireless sensors quickly and easily and save money on cabling and costly installation. Once installed, they are easy to maintain.

### → 24/7

Bitcarrier offers round-the-clock remote monitoring with real-time data and alerts.

<sup>1</sup> Depending on configuration



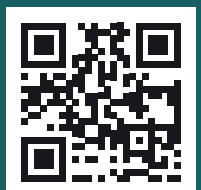
## TRAFFIC APP

Keep drivers up to date in real time by analyzing vehicle flows, congestion patterns, and travel times.

All Bitcarrier information can be integrated in a mobile App or published on a public website for citizens to check traffic information and plan trips accordingly.

- Drivers receive real-time updates on available routes and traffic conditions
- They can then avoid traffic jams
- And save time by getting to destinations faster

Available for:



### BARCELONA

Viriat 47, Edificio Numancia 1, 10th floor,  
08014 Barcelona, Spain  
(+34) 93 418 05 85

### LONDON

9-10 Carlos Place, Mayfair  
London W1K 3AT, UK  
(+44) 203 807 2495

### LOS ANGELES

1900 Avenue of the Stars, Suite 2430  
90067 Los Angeles, CA, USA  
(+1) 323 395 5120

sales@worldsensing.com  
[www.worldsensing.com](http://www.worldsensing.com)