Traditional traffic measurement solutions do very little to advance a more comprehensive understanding of the traffic system.

**BETTER UNDERSTANDING OF THE TRAFFIC FLOWS**

The solution developed by Nodeon focuses particularly on the diverse analysis of traffic flows. This is achieved by a solution where traditional license plate recognition technology (ANPR) is combined with public authorities’ data (national license plate registration data).

Nodeon has developed a cost-effective solution for innovative traffic flow analysis, even without any investment in hardware. The solution includes roadside cameras, Nodeon distributed field-level intelligence for solving license plates from camera feed, field unit remote diagnostics, and a secured data transfer to the Nodeon Valhalla cloud system. The cloud system includes all data analysis for the customer as a service.

**SET OF TRAFFIC FLOW ANALYSIS**

The One cross-section measurement (one camera, one direction, two lanes) solution offers the following set of traffic flow analysis:

✅ Amount of recognized vehicles
✅ Classification of vehicles (over 20 classes)
✅ Vehicle speeds
✅ Origin area analysis (regions, cities/municipalities, postal code areas)
✅ Traffic recurrence analysis
✅ Emission analysis (CO2)
✅ Motive power analysis (diesel/petrol/hybrid/electric)
✅ Age analysis
✅ Breakdown of vehicle make/model/colors

**APPLICATIONS**

- Initial data for the traffic system design
- Before-and-after measurements (which areas show changes in behavior)
- Monitoring of long-term changes over time (for example, emissions and motive power changes)
- “Hotspot” measurements of interesting transportation hubs (employment areas, commercial districts, park-and-ride parking areas, airports, harbors, etc.)

**MEASUREMENT ALTERNATIVES**

**Fixed measurements**

A continuous traffic flow analysis over a longer period of time. The right solution for tracking long-term changes over time and differences between seasons (yearly, holiday seasons, crowd events, etc.).

**Short-term measurements as a service**

No need to invest in hardware. Carried out with productized Nodeon measurement units, which are entirely self-sufficient in terms of energy and telecommunication. The right solution for getting a snap-shot analysis of the traffic flow.

Energy self-sufficient off-grid measuring unit.
MEASUREMENT STATION SPECS

Short-term measurement unit

- Typical installation location street-side (lamppost, street portal or Nodeon movable installation post), no need to intervene in the traffic flow
- Quick installation (30-60 minutes per station)
- One measuring station includes one license plate recognition camera with IR night-vision, max one-directional 2 lanes recognition (recognition rate varies relating environmental conditions)
- Energy provided by batteries which are recharged by methanol fuel-cells (10-liter fuel cartridge)
- Fuel-cells from German leading off-grid energy provider SFC Energy AG, more than 40 000 fuel-cells sold, certificates:
  - Field unit operations remotely monitored
  - Max measuring time 3 weeks (could be extended by re-fueling the station)
  - Measuring station includes Nodeon Field Intel software for local intelligence, remote diagnostics, data cache and secured data sending
  - Recognition events sent every 5 minutes to Nodeon Valhalla Smart City cloud, programmable

MEASUREMENT AS A SERVICE

No need to dig cables or invest in measuring units, data storages, or situational awareness systems. All packed under one fee. Short-term measurement includes the following services:

- Site-survey for measuring planning
- Measuring planning (attachment, measuring directions and angles)
- Street-work permits
- Measuring stations rent
- System installation
- Energy
- Data communication costs
- Disassembly of the measuring stations
- Data storage costs
- Vehicle registration database usage fees
- Nodeon Valhalla Smart City cloud usage

VALHALLA SMART CITY CLOUD SERVICES

A centralized place for customers to manage all traffic flow analysis and data.

- Highly secured Microsoft Azure based cloud platform (EU area)
- Interface for national vehicle registration data
- Traffic Now! Real-time view of traffic flow
- Automatic generation of traffic flow key figures for each analysis
- Monitoring of key figures over time (long-term changes)
- Reporting and filtering tools
- Raw data export (*.CSV)

Nodeon Valhalla cloud emission report example.

PERSONAL DATA PRIVACY AND DATA SECURITY

Data security and personal data privacy are the key elements of the service.

- Data privacy/security relating usage of vehicle registration database is defined on security agreement between Nodeon and state authorities (Trafi/Fin, Transportstyrelsen/Swe)
- Transfer of vehicle registration numbers from field to Nodeon cloud is always secured
- Nodeon does not store any personal information relating to recognition events
- Nodeon analysis or raw data does not provide customers any personal information relating to recognition events (person names, street addresses, vehicle registration numbers)
- Nodeon Valhalla cloud is located in EU area, in highly secured Microsoft Azure data center
Combination of two Traffic Flow Measurement and Analysis station provides an efficient way for deep analyzing passing-through traffic.

**DETECT AND UNDERSTAND BETTER PASSING-THROUGH TRAFFIC**

The Nodeon solution does not only provide customers with the amount of passing-through traffic between two measurement points. Nodeon solutions also provides a versatile analysis of passing-through traffic, like the origin of the passing-through traffic, and breaks it down into different vehicle classes, motive powers, and CO2 values.

Passing-through traffic analyses between two measuring points are based on a minimum of two license plate camera detection points described in the previous pages (Traffic Flow Measurement and Analysis).

**SET OF PASSING-THROUGH TRAFFIC ANALYSIS**

*With the two cross-section measurement* (in each, one camera, one direction, two lanes) solution, in addition to the two normal cross-section traffic flow measurements and analysis, the following set of passing-through traffic analysis between two measurement points are offered:

- Amount of passing-through traffic
- Following information is provided relating passing-through traffic:
  - Classification of vehicles
  - Origin area analysis
  - Emission analysis (CO2)
  - Motive power analysis (diesel/petrol/hybrid/electric)
  - Age analysis
  - Breakdown of vehicle make/model

**APPLICATIONS**

- **Background material** for the traffic system design
- **Precise profiling** of passing-through traffic in terms of origin areas and vehicular breakdown
- Monitoring long-term changes over time (for example, emissions and motive power changes)

**HOW TO MEASURE?**

Passing-through traffic could be measured with the very same fixed and short-term measurement alternatives, like Traffic Flow Measurement and Analysis.

**TECHNICAL IMPLEMENTATION**

The same technical and data privacy specifications apply to the Passing-through Traffic Analysis as to the Traffic Flow Measurement and Analysis (described in this document).