

Finnra's Digitraffic Service Quality Manual for User

Sisältö

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1 Description of Manual

This document is made to share out more knowledge of issues reflecting to the quality of Digitraffic service data. Digitraffic is multi source system to deliver data of its sub systems. Thus the level of quality of data available related to different sub systems differs from one another, because the quality of each sub system is depending on the factors reflecting to data.

2 Service and background

Digitraffic is a real-time traffic database service to collect, analyse, store and deliver (to service providers) traffic related real-time information. Digitraffic is including, in addition to interfaces, a set of functionalities (incl. graphic user interface) to analyse and report traffic situation. These functionalities are only available for Finnra's administrators (and consultants working for Finnra).

In the future Digitraffic is the only interface for real time traffic and road weather data from Finnra to the service providers.

Finnish Road Administration (later Finnra) is strongly improving the quality of real-time traffic information in Finland. Finnra provides real-time traffic data free of charge to its partners, but it does not participate in the development of actual end user services or value added services. Finnra's contribution to development is made through a private-public partnership (PPP) as a provider of information.

In 2005 Finnra started a project for developing a travel time information system. This system is based on two parts: 1) detection of real-time travel times, and 2) real-time traffic database called Digitraffic. Finnra has made five years long contracts with two service providers to implement the system. NeVia Ltd. is the supplier of the real-time travel time data and Infotripla Ltd. – Gofore Ltd. consortium provides the Digitraffic-service. Both systems are owned by each service provider, Finnra has only the access to the data. The system has been operating since June 2008 and data via interfaces is available for service providers from the beginning of 2009.

Also the system, already used since 1998 in the Helsinki Metropolitan area (PKS) is included to travel time system.

3 Up to date situation

Digitraffic data has been delivered via web service interface since October 2008. Identified issues related to the use of the data and in status of pending are

- **Number of Observations** (nobs); the element for nobs already exists in the data , but the actual values for nobs are not yet available. At the moment, value is "-1".
- **Site names in Static data of TT**; the site names are supposed to be given in Finnish, Swedish and English. Finnish site names are already available. Swedish and English site names are not available, but are about to be included as soon as available.

Any changes in status of these pending issues will be informed to Digitraffic customers by the customer service. Also this document will be updated.

4 Quality of Digitraffic

4.1.1 Description

Digitraffic collects the data available from its subsystems. At the moment Digitraffic is collecting data from following subsystems:

- Travel time system (TT) (including older PKS system and new national wide system)
- Automatic traffic count system (ATC)

When any new subsystem is available via Digitraffic the customer service will inform data users and this document will be updated by the information related to new subsystem. Also any major changes of Digitraffic itself will be informed and updated to this document.

If there is a need to contact customer service, please look at up to date details to contact in www.tiehallinto.fi/digitraffic.

4.1.2 Data analysing and delivering methods

The process of delivering data to data users is planned to be kept as quick as possible to avoid any delays and to keep the information real time.

The data collected from subsystems is stored into database immediately after collection.

Stored data is available at the Digitraffic web service interface in 15 seconds from the reception from subsystems. Some of rarely updated data are processed and updated once a day.

4.1.3 Factors reflecting to quality of data

Data retrieval

Subsystem retrieval methods are:

- **TT:** data is delivered every minute after available from TT subsystems. Data is transferred over the internet in XML format.
- **ATC:** data is delivered every minute after available from ATC subsystem. Data is transferred over the internet as CSV files.

Data storing

Data is stored into Digitraffic database without any content modifications. Data is taken from database without any content modifications.

Data processing as a whole

Data process - from retrieval from subsystems to delivering as a web service - is made in less than 15 seconds. Delays are not expected, but utilisers are advised to check the data transfer and rerun the query if needed.

Travel times delivered

Travel times delivered in via web service interface are raw data measurements from TT links, i.e. travel time for the link is the travel time median of the set of travel times from the link in last 5 minute period and ending during the minute counting period. Thus it is not exactly the actual travel time since it is based on the travel times of link ending at the time (car is out of the link). The time stamp of travel times is the ending time stamp.

Free flow speed values

Free flow speed of the traffic is based on speed limit information of Finnra's road registry. At the moment possible updates to road registry are not updated immediately to Digitraffic-service, because tracking the changes from Finnra's road registry is quite time consuming. Free flow speed information is updated at least once in a year or in case of major speed limit changes.

Fluency classes

Fluency classes are based on Finnra's specification. Classes are related to the free flow speed of the road section and to the measured median speed of the traffic. Classes used and relationship of each fluency class to free flow speed are presented as follows:

Fluency Class	Description
Class 1 (red) <ul style="list-style-type: none"> Stationary traffic 	Median speed is less than 10% of the free flow speed. Traffic flow keeps stopping and moving is very slow.
Class 2 (orange) <ul style="list-style-type: none"> Queuing traffic 	Median speed is between 10 and 25% of the free flow speed. The velocity of the traffic flow is significantly lower than the speed limit.
Class 3 (yellow) <ul style="list-style-type: none"> Slow traffic 	Median speed is between 25 and 75% of the free flow speed. The capacity of the street has decreased due to high traffic flow or some incident. Moving is getting more difficult.
Class 4 (blue) <ul style="list-style-type: none"> Heavy traffic 	Median speed is between 75 and 90% of the free flow speed. Traffic is flowing quite freely, but overtaking is difficult on a two lane road.
Class 5 (green) <ul style="list-style-type: none"> Traffic flowing freely 	Median speed is more than 90% of the free flow speed. Traffic is flowing freely.

Data delivering

Data is delivered to users by web service interface. Interface is documented in up to date information web pages of Digitraffic (look at: www.tiehallinto.fi/digitraffic). Any changes and improvement of interface will be informed to data users by email.

Internet connections

Data is delivered over the internet which might cause sometimes unexpected connection problems (i.e. force majeure).

Static data of subsystems

Static information of any subsystem is available for data users to describe the system. Static information is available as a part of interface details in www.tiehallinto.fi/digitraffic . Any changes in static information are expressed automatically to data users as a specific "Last Static Update" tag in the data.

Abnormal situation in road infrastructure

Sometimes some abnormal situations (e.g. close down of road or alternative routing of traffic caused by accidents, road maintenance etc.) in road network will cause a lack of data from sub systems. Up to date incident information of Finnra is available in <http://alk.tiehallinto.fi/alk/> .

5 Quality of Sub Systems

The service includes following sub systems:

- Travel time system, consisting of:
 - PKS travel time system (PKS-TT), chapter 5.1
 - National travel time system (NTT), chapter 5.2
- Automatic traffic count system (ATC), chapter 5.3

Subsystems are described in following chapters in order to give more detailed information how the data is produced and what are the subjects to have an effect on data quality.

Any other sub system to be connected to service in future will be presented in following chapters as those existing ones.

5.1 PKS travel time system (PKS-TT)

5.1.1 Description

The PKS-TT began in 1998 as a pilot study by the Tielaitos (now the Tiehallinto) to assess the use of automatic number plate reading (ANPR or ALPR) to measure vehicle travel times in the Helsinki Metropolitan area (PKS). It now consists of about 150 cameras at about 40 sites (outstations) on most of the major roads in the PKS, together with an instation in the Uudenmaan tiepiiri liikennekeskus.

PKS-TT links are with link numbers less than 1000.

5.1.2 Method of data production

Vehicles passing the roadside cameras are identified by their registration marks, and this information is sent (over the Internet) to the instation, where travel times between camera locations are calculated, typically within 15 seconds of the vehicle passing the second camera. Outstation clocks are typically kept within 20 milliseconds of UTC. The

travel time information is made available from the instation through a variety of interfaces to authorised third parties.

5.1.3 Factors affecting data quality

Weather

Weather conditions can affect the reading of vehicle registration marks. Falling snow may cover the number plate. When the road temperature is close to zero, the mixture of partially melted snow, salt and dirt on the road may also obscure number plates so that registration marks cannot be read.

Technical problems

Loss of mains power, or equipment failure, at an outstation will cause data loss.

Communication failures

Communications failures will delay the transmission of data to the instation, and may reduce the timing accuracy.

5.2 National travel time system (NTT)

5.2.1 Description

NTT determines accurate realized travel times by monitoring the transition of individual vehicles at selected locations in the road network. The monitoring is performed with infra-red video technology, high frequency digitization and license plate recognition (LPR).

The core functionality of NTT is the time-stamped monitoring of individual driving vehicles at a single specific road-side location. On the basis of this core function, realized travel times of individual vehicles between two of such locations can be accurately determined.

NTT links are with link numbers more than 100000.

5.2.2 Method of data production

The two main components of the NTT are the central data processing system and the TripStar and camera unit that monitor the traffic. The data from the TripStars is registered in the NTT database, in anticipation of further processing.

Vehicle transitions at each TripStar location are compared by the matching module and yield unique vehicle road-section travel times. The travel times for individual vehicles and road sections are statistically

processed to provide median travel times per 5 minutes and at the quality level required by the client.

NTT provides travel time data to Digitraffic via TCP/IP. The scheme for the XML-packages and parameters is agreed with Tiehallinto.

5.2.3 Factors affecting data quality

Rain

Custom made large camera casings are being deployed for locations where this problem might raise. Tests have shown that these camera casings eliminate this problem in most cases.

Snow

Snow affects the license plate recognition system in many ways. During snowfall, snow will pile up on the license plates, in many cases totally covering the characters. As actual snowfall is much rarer than dirt, it is advised to monitor the front side of vehicles. This causes however a drop in the recognition rate during the snowfall.

License plates

License plates are legally required to be of a specific retroreflective nature and to be well readable. However, not all license plates have this characteristic, which affects the quality of the license plate readings.

Data communication

Data communication is performed by means of 3G mobile Internet. In case of unavailability of the UMTS network the data transfer will be buffered and transferred when the connection becomes available again. The occurrence of connection problems is not very high.

Amount of observations

The number of observations is reflecting to the quality of data. Number of observations will be delivered to the data users as soon as it is available. Meanwhile the element for the number of observations is included in the data sets, but the values are not yet available.

5.3 Automatic traffic count system (ATC)

5.3.1 Description

Automatic traffic count (ATC) system collects traffic measurement data from road side equipments (including induction loops in road surface) via Finnra's road weather system.

ATC is producing traffic related cross-section information from more than 400 ATC points. About 150 of those are in real time collection process.

5.3.2 Method of data production

Data from ATC stations is collected by Finnra's road weather system. Every region of Finnra has own data collecting system, e.g. the data collection system of Uusimaa region could collect data by 60 modems at the moment.

Data is collected by modem call or continuous connection (ADSL etc.). Data is collected normally every 10 minutes, but the interval is configurable. If connected by modem the interval has an effect on costs.

Data collection is configurable by Finnra's system users using following parameters:

- stations collected
- collection period in day (e.g. working days 6.00 - 21.00, weekends XX-YY)
- collecting interval

Data, available after previous collection period, is usually collected every 15 minutes from ATC stations. The data file size is max. 30 kb and collection of data will take less than 1 minute.

After collecting data from stations data will be analysed and categorised, e.g. to produce average vehicle speed in 5 minutes. The categorised data is then collected to road weather database.

Data stored into database is available for analysing by Web- and Win-Tiesää -user interfaces. In addition to that, collected data is delivered to Finnra's ftp server to be collected by Digitraffic or any other customer system.

5.3.3 Factors affecting data quality

No filtering

ATC system is "as it is", i.e. no filtering is made to avoid incorrect data to be delivered. Any incorrect data is possible due to several factors reflecting to data.

Broken loop

ATC is based on road surface loops which might lead to broken loops e.g. in case of road maintenance or renewal of pavement.

Data communication

Data communication is based on either modem call or continuous connection (ADSL etc.). Sometimes lack of connections might cause lack of information.

Deviation in collecting timing

Collecting timing varies a lot because different collecting methods. This causes deviation in real-time values.

6 Digitraffic customer service and contact information

Contact information for Digitraffic service:

Service center

Infotripla Ltd
Tel. +358 10 6662 666
Fax +358 3 2238 911

Finnish Road Administration

Finnish Road Administration / Kaakkois-Suomi region
Pasi Halttunen
Tel. +358 204 22 11 *
Fax +358 204 22 6215

The valid contact details including email addresses are always available in Digitraffic web page – www.tiehallinto.fi/digitraffic.

7 Frequently Asked Questions - FAQ

Frequently asked questions (FAQ) are invented and answered as follows:

Question 1: How are the fluency classes calculated?

- **Answer:** Fluency classes are based on Finnra's specification. Classes are related to the free flow speed of the road section and to the measured median speed of the traffic. Please look at more information in quality manual of users.

Question 2: Is the travel time the time actually in link?

- **Answer:** The travel times delivered via web service interface are the data measured on TT links. The value is the median of the individual travel times measured during last 5 minute period. In other words, the travel time is the measured travel time for cars leaving the link (road section) and does not necessarily equal to the travel time of those cars entering the link. The forecasted travel time for cars entering the link may

be estimated based on measured travel time and historical data.

Question 3: Travel time between the vehicles and how this will have an effect on the travel time output?

- Answer: The median of travel times per period is used to avoid misleading travel time data.

Question 4: How have the privacy issues been taken into account?

- Answer: The licence plate data is not saved as it is. Right after detection the license plate information is encrypted. After encryption the data is only processed in encrypted format.

FAQ content is also about to be available in service web pages – www.tiehallinto.fi/digitraffic.