

# **Request For Information**

# **Next generation Road Weather Information System** (RWIS) for Sweden

Company name:

Name of contact person:

Email:

Phone number:

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#### 1 Introduction

#### 1.1 Presentation of Trafikverket

Trafikverket is responsible for the activities of the former national road and railway administrations, the national traffic and shipping board, as well as long-term planning for the Swedish Maritime Administration and the Swedish Transport Agency. Even some of the earlier SIKA (Swedish Institute for transport and communications analysis) are currently within Trafikverket. Trafikverket has approximately 6,500 employees. The headquarters are located in Borlänge, and the regional offices in Luleå, Gävle, Stockholm, Eskilstuna, Gothenburg and Kristianstad.

Trafikverket is responsible for the long-term planning of the transport system for road, rail, sea and air transport as well as for the construction, operation and maintenance of state roads and railways. capitalize the government agencies mentioned (for consistency): National Traffic and Shipping Board and promotes accessibility in the public transport, including the award of contracts.

#### 1.2 Background and need of a new RWIS

Trafikverket has since the mid-1980s established a road weather information system (RWIS) in order to assist with winter roads maintenance that is also responsible for performing the right action at the right time, and for informing road users about the weather situation. The RWIS is based on approximately 775 weather stations at strategic locations across the country.





RWIS data is collected every 10 minutes and consists of:

- Road surface temperature
- Humidity
- Air temperature
- Precipitation type and quantity (mm/30 minutes where snow is measured in solid form)
- Wind speed and direction
- Photos of road conditions

Some weather stations have non-contact sensors to detect road conditions (wet, dry, ice, etc.), as well as to determine friction values; other weather stations have non-contact sensors for measuring road surface temperature.

The control system calculates dew point temperature on the basis of the current air temperature and humidity and the information is displayed along with forecasts and radar images. Information forms the basis for the decision and follow-up actions.

Trafikverket has relied on several generations of measuring station computers beginning with MS1, and today it is ending operation of the third generation (MS4).

Developments in this area have progressed rapidly, as hardware capacity has increased while costs have decreased. Advances in communications present new opportunities: fiber and 4G/5G have

bandwidth, response times etc. that manage information with higher capacity than previously possible and at lower cost.

At the same time, demand for additional input data (such as real time streaming video, traffic data and environmental data) has risen, both internally and externally.



A feasibility study (Indra 2020) was carried out from May to December 2016. The aim of the study was to investigate the potential for a next-generation RWIS.

The study included the following main activities: a study of the current situation, an analysis, an investigation and reporting of user needs, and an assessment of the internal and external interface functionality of the next generation RWIS. The Steering Committee decided to initiate a process to implement the procurement and implementation of next-generation RWIS based on the proposed guidance.

Besides weather stations to collect measurement data, the RWIS includes administrative data systems, data storage, and processing of data to supply data through various interfaces to present road weather information.

The MS4 needs to be replaced because it is becoming more difficult to replace electronic components on its board, and because an aging solution imposes technical limitations to handle future needs (this is in fact, a driving factor in this request). The plan is for all the approximate 775 stations and other necessary parts of the system to be replaced by 2021.

#### Trafikverket needs are as follows:

- Information from any new sensors should be managed in a way that result are comparable to the data from the existing sensors (e.g. precipitation).
- Weather data should be quality assured from the source to the output, and the information can be delivered to standardized API and nodes, as Datex2.
- The system has secure accessibility requirements, a description of the safety requirements that can be meet both at the measurement station level and for the central system will be needed
- The vendor should be able to manage information security requirements.
- Identify a solution that will be optimal in the long-term with respect to everything from purchase and installation, as well as future service both in the field and in the workshop..

#### 1.3 Purpose of this request

The purpose of this RFI is to provide Trafikverket with a better understanding of the market's ability to deliver RWIS solutions, gather information about available delivery models and obtain an estimated cost. Based on this information, Trafikverket wants to develop the optimal specification for the next-generation RWIS.

#### The document aims to:

- Prepare a future procurement of RWIS by identifying market offerings (products and services).
- Understand the market's interest to supply the entire future RWIS or parts of it.
- Understand the cost structure and cost drivers for delivery of the RWIS, and obtain initial cost estimates.

#### The document does not aim to:

- Either qualify or disqualify suppliers for a future procurement.
- Produce a final cost estimate or scope for the procurement.

This document is not part of a contract, and does not represent a commitment from Trafikverket to undertake a procurement after the RFI is conducted. Trafikverket has no obligation to compensate participants for any costs associated with responding to this request and related work.

#### 1.4 Preliminary time plan

The following schedule is tentative and subject to change.

Activity	Time
RFI goes public	13 june 2017
Expected answers on RFI	31 august 2017
Analyze of RFI and requirement work	30 november 2017
Procurement	2018

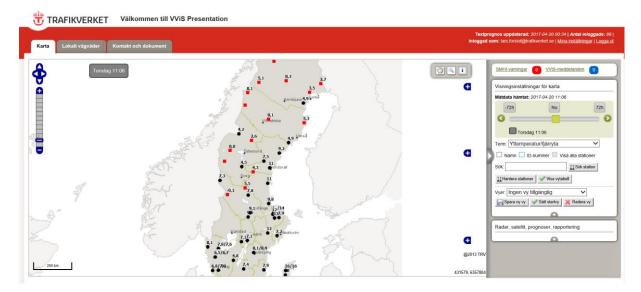
If necessary, Trafikverket will contact any vendors for additional questions.

#### 1.5 Current situation

Trafikverket currently operates its MS4 units, a purpose-built hardware (measuring station computer) mounted in a protective cabinet. The system is in operation 24/7/365 and it stores the data every 10 minutes. As mentioned, the MS4 have a product life of almost 20 years and has technically reached their end-of-life.

- In addition to data from a number of sensors attached to the MS4, the system gathers images separately from a weather camera.
- The weather sensors used were sourced from various manufacturers and standard cameras were sourced separately by Trafikverket.
- Data and images are collected and processed by Trafikverket in a centralized manner.

Trafikverket also has a proprietary format of measurement data provided to the contractors that perform winter maintenance. This includes presentation of weather forecasts from an external party. A future possibility would be to add alternative services for presentation and decision support.



Trafikverket also manages its own operations to manage metadata about sensors and measuring stations, and to assign user rights. Today, this is done with a system called GENI, and in the long run, the plan is to transition to a system called ANDA.

Historical data from the RWIS is stored on an annual basis in SQL databases but should in the future be included in a standardized solution for historical data within Trafikverket.

The measurement stations are installed and serviced in the field in accordance with contracts for other roadside technologies (such as lighting and traffic signals) in 5 different areas in Sweden. Workshop service carried out requires a close coordination with field service.

This document does not provide a detailed breakdown of how today's RWIS works, and neither does it define detailed requirements of how a future RWIS should operate.

The rationale for this RFI is to identify available solutions, and to identify what different vendors are interested in offering.

#### 1.6 Driving forces and changes needed

In selecting the future RWIS, Trafikverket will take into account a number of key drivers and needed changes. As mentioned, one driving need is to replace today's MS4; at the same time, Trafikverket needs new cabinets installed.

At a minimum, a response to this RFI - and in a future procurement – should include the delivery of a new measuring computer and a new cabinet.

Although Trafikverket wishes to conduct a "big picture" review and find what is available for the collection of measurement data and other components in today's RWIS (pictures shown on the next pages), Trafikverket would also like to see how both field and workshop service may be provided in a future.

The drivers Trafikverket currently considers as particularly important in selecting a future RWIS are summarized below:

#### 1. Flexibility

Trafikverket is seeking flexible and standardized solutions. This means that we want to avoid purpose-built solutions that are difficult to adapt/develop in the future (e.g., connection of new sensors/sensor types). As mentioned earlier, sensor types from different manufacturers need to be interoperable with the weather station.

The cabinet should be able to house more than just one measurement computer to collect weather and weather data. For example, devices for an extra camera or other sensor systems should be included in the cabinet. The Cabinet should have a standardized and scalable solution with power and data/telecommunications. While those requirements cannot be specified precisely, Trafikverket expects to be given basic suggestions to solve the challenge.

#### 2. Safety

Trafikverket is a government agency, and RWIS is a strategic infrastructure that carries a number of safety requirements. The cabinet should be secure both physically and also in terms of IT security. For example, a third party should not be able to reach the central system even if a station is broken into.

Trafikverket expects to be given a basic description of how you manage the security of your solutions, including any certifications to specific standards, and specific security policies in use.

Finally, a description of how you cope with product vulnerability is needed.

#### 3. Long Term Governance

It is understood that Trafikverket will operate the solution provided for a long time. A description of how you can ensure the system's survival over time is needed. Please describe how the measurement computer and its components can be managed, and also how the replacement of components like modems and sensors can be addressed in the future.

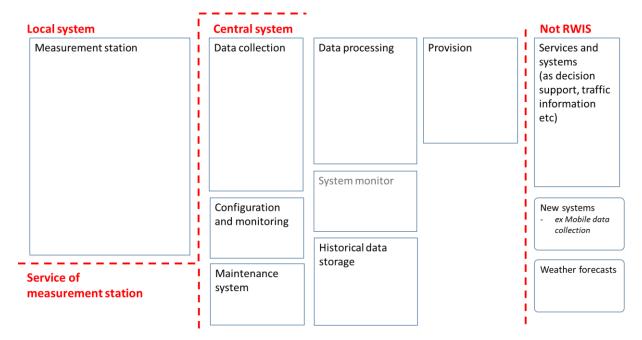
#### 4. Serviceability

Describe how:

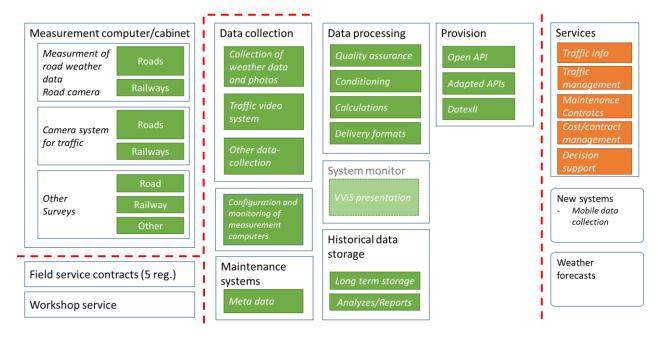
- The contractors can perform field service and be given the knowledge and training to perform their work
- How the workshop service will be performed, including possible solutions for spare parts, maintenance, cleaning, calibration, etc.

### 2 Delivery scenarios for future RWIS

In the procurement of next-generation RWIS, Trafikverket has identified two main alternative scenarios for deliveries. The components we identified at the global level are shown below:



The chart below shows the components for each area. Note that these charts are neither an exact description of what the system looks like today, nor are they an exact description of what they should look like in the future..



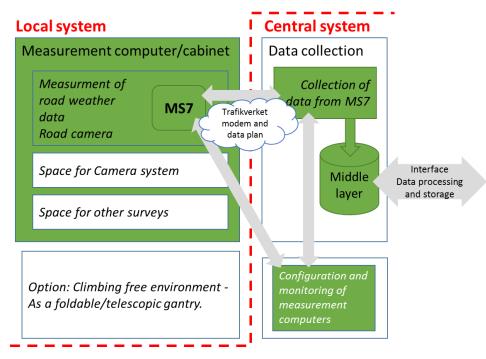
Based on the basic charts above, there are two possible scenarios for a future procurement.

A general requirement is that the computer communication in RWIS takes place within the Trafikverket process network (TRV02/Red grid). This should include everything from the local system to the data collection, and data processing and provision. Trafikverket will provide a standard modem (https://faltcom.com/sv) and a plan for communication with the weather station/measuring computer.

# 2.1 Scenario 1: Procurement of the measuring computer, data collection and maintenance system

A possible first scenario is that Trafikverket limits the procurement to only the most necessary requirements. Under this scenario, a new measuring computer is referred to as MS7.

This scenario envisions relatively few changes to other existing structures, such as central systems for data processing. Trafikverket wants to compare this scenario with a solution that adds data processing and provision. Scenario 2 describes such a solution (below).



In a version of this scenario the offeror provides only a new weather station (i.e., only a new measuring computer and a new cabinet), and a system to configure and monitor the measurement station. This means that Trafikverket will retain the current solution for retrieving data from MS7.

Trafikverket has also raised the possibility of only replacing the measurement computer (from the MS4 to MS7), retaining the same cabinet and system for data collection and configuration. However, Trafikverket has not seen it worthwhile to describe this alterative in more detail.

#### 2.1.1 Measurement computer

The new measuring computer will be called MS7, and it should be able to:

- Manage today's sensors and future sensors, as new precipitation and road conditions sensors
- Connecting sensors from different manufacturers (i.e., not just a specific manufacturer)
- Manage a frost depth gauge a rod with 20-40 sensors for temperature readings at different soil depths

Scenario 1 includes the delivery of a solution that can manage a fixed camera taking pictures of the road and an infrared illumination for night time. As an option (not required) MS7 would handle the camera, or it could be connected separately to the data collection system.

A standard camera will be provided by Trafikverket that will capture still images of the road. Images should be delivered in conjunction with other measurement data in a similar time lapse as today (every 10 minutes).

This RFI does not include the offer of any sensors.

The Cabinet to be offered shall be weather safe and burglarproof. Standards used should be included in the proposal.

The Cabinet should be able to accommodate MS7, but also a camera system and space for other measurements with standardized connectors. We cannot specify the functionality more precisely.

The response should also suggest a thoughtful way for access to and key management of the Cabinet.

**Space for a camera system** means the possibility to connect a camera and a communication device. Such a camera can perhaps be used for traffic management and thus it would have additional requirements than a weather camera (for example a need to stream video with pan and zoom). Such a system should have its own data-connection suitable for high bandwidth for a limited period, rather than sending small pictures every 10 minutes.

**Space for other measurements** refers, for example, to the ability to collect data to assess road wear or related to railway issues, or collection by other authorities. There may be room for another measuring computer, PLC or similar. We cannot further specify the requirements for such a solution, but expect to obtain suitable suggestions and good ideas.

As an option to the weather station we would like to see suggestions for a solution that enables a climbing-free environment. An example would be a folding/telescoping pole or folding arms for the sensors that are higher up the mast and may need service

#### 2.1.2 Data collection

Trafikverket would like you to propose a system or method to collect weather and road conditions and weather data from the images of MS7.

The operation of data collection should be able to communicate with MS7 and retrieve the weather data (including road conditions photos). Today, data is gathered every 10 minutes, 24 hours a day/all year round.

Proposals should show how you collect/buffer data in both the weather station and by some form of interim storage at the data collection, for further delivery into what is mentioned as data processing and storage of historical data.

#### 2.1.3 System to configure and monitor the weather station

This includes a system to monitor and configure the measurement stations. For example, it may be able to add and remove certain sensors, configuring weather cameras, update software in the measuring computer, etc.

The system should contain a system monitor that shows the station placements on a background map, including their status, and view details of their configuration.

The system should focus only on the measurement of weather and weather data and not on the handling of a traffic management camera or other measurements.

# 2.2 Scenario 2: Procurement of Scenario 1 + Data Processing and Provision of Information

Under this scenario, the vendor would take greater responsibility and also deliver the features that are referred to as data processing and provision (of information).

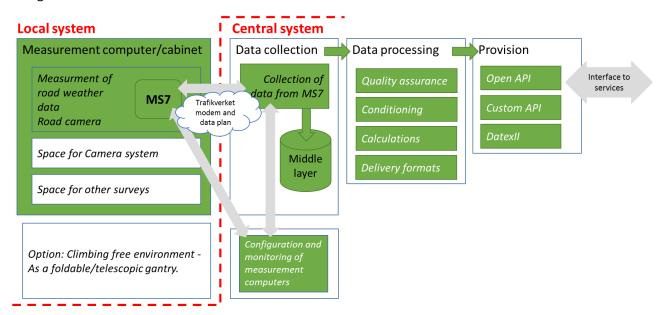
In terms of data processing, some calculations would include:

- Calculation of raw data from precipitation sensor
- Dew point calculations, on the basis of the air humidity or air temperature
- Quality checks and conditioning of measurement data

There is a need for an in-depth dialogue on how it can be done. In the data processing, there are adjustments made to the data to export to different interfaces. This scenario gives the vendor a greater responsibility to supply the whole system, and provide data via API directly to various services.

We understand that it is difficult to assess what it will demand/cost to do what is done today in terms of data processing. The RFI is not meant to get pricing on this, but to get your view of the opportunities or constraints that can be identified for this option.

You may currently deliver similar solutions to other operators and they likely use similar systems, so it may be possible to learn from these to develop the procurement. Currently, Trafikverket has its own development and management of data processing and provision of information, but this can be changed in the future.



Proposals can offer only scenario 1, or only scenario 2, or both scenarios.

The same need for space camera systems, different measurements and option for a climbing-free environment applie to scenario 2.

#### 2.3 In field service

Trafikverket would like proposals to describe how a supplier of RWIS will transfer the knowledge that Trafikverket's private sector service providers will need for future field service (preventive and corrective maintenance that is needed out in the field, at the measuring station).

#### 2.4 Workshop service

Trafikverket would like proposals to describe how a supplier of RWIS will offer the workshop service needed in the future. Examples of workshop service include repair, calibration of sensors, and a supply of an inventory of components to the measuring station. Another example is the technical support to field service.

#### 2.5 Other suggestions

Proposals may also offer other solutions that we have not addressed in paragraphs 2.1 to 2.4. We may not be aware of possible solutions you may have. You may want to offer only a new measuring station - or a full service – or other. Trafikverket welcomes such suggestions, but would like you to respond to 2.1-2.4 also.

#### 2.6 Consulting services

Consulting services include expert support related to installation, configuration and operation of the system, but it can extend to development and modification of systems. Consulting services, will be ordered on an ongoing basis, as needed, and billed on an hourly basis.

## 3 Vendor Responses

Trafikverket would like to understand the vendor's ability to deliver a new RWIS-solution based on the background and the requirements described in section 1-2. Trafikverket wants the provider to answer the questions below and refer to other material where it might be described in more detail..

#### 3.1 Administrative instructions

- Trafikverket will accept responses to this RFI no later than 31st August 2017
- Replies must be submitted via email to erik.stalnert@trafikverket.se
- Questions can be asked within the period up to July 7 and after August 14, 2017 and must be submitted via email to erik.stalnert@trafikverket.se
- The provider must provide one or more custom response documents, and these documents are referenced in section 3.2-3.4
- Responses can be delivered in Swedish or English
- Vendors are also asked to enter the contact person for the submitted responses, in case
   Trafikverket needs to contact them for any follow-up questions.

#### 3.2 Provider organization

Trafikverket requires a short description of the vendor's organization, history, market promotion, size and geographic presence.

4.2.1 Provider organization	Reference to the annex and/or section where the vendor's responses are found
a) Briefly describe the vendor's organization and history	
b) Describe your organization's size and revenue (number of employees, turnover)	
c) Describe the overall vendor's total service offerings	
d) Please describe the supplier's geographical presence and delivery capabilities	

#### 3.3 About proposed RWIS solutions

Trafikverket would like to understand the vendor delivery performance and offer for RWIS. The questions below are based on a number of standard questions that Trafikverket uses in other contexts. We ask for your patience and understanding if any of the questions do not fit into your offer (you do not have to respond to all questions).

3.3.1 Provider's offer - Overall	Reference to the annex and/or section where the vendor's responses are found
a) Does the vendor provide Scenario 1 as an alternative? What are the advantages or disadvantages you see with Scenario 1?	
b) Does the vendor provide just the measurement station and a system to set up the station (and Trafikverket will retain the existing solution to collect data) as an alternative? What are the advantages/disadvantages you see with this variation on the scenario 1?	
c) Does the vendor provide Scenario 2 as an alternative? What are the advantages or disadvantages you see with Scenario 2?	
d) Describe your vendor's solution for Scenario 1, preferably related to the current situation and needs of Trafikverket described in sections 1-2.	
e) Describe your vendor's solution for the variant of Scenario 1, where you deliver only a new measuring station as well as a system to set up the station and Trafikverket will retain the existing solution for collecting data.	
f) Describe your vendor's solution for Scenario 2, preferably related to the current situation and needs of Trafikverket described in sections 1-2.	
g) The vendor is encouraged to link his reply with any comments or suggestions for improvement to the described scenarios.	
h) If the vendor also offers what in the system overview, called "services", it can be listed here. It can be decision support for winter roads, monitoring tools or systems for road user information. Describe the principles and link to more information.	

3.3.2 Provider's offer - Central System	Reference to the annex and/or section where the vendor's responses are found
a) See Appendix with specific questions about the IT environment in Chapter 6. The questions will help Trafikverket to form the requirements of a procurement coming.	
b) What kind of support and maintenance is included in the provider's central RWIS-solution? Trafikverket wants a clear delineation of what is included in such agreements and which services are not included, but can be purchased through additional order.	
c) If software is to be installed in Trafikverket's hardware, we like the vendor to describe the requirements for the software and hardware for client and server installations.	
d) Please describe any accessibility or performance requirements you can account for.	
e) Describe if your central systems have open source or require specific licensed software.	
f) Describe how algorithms and calculations can defined and changed by Trafikverket in your central system.	

#### 3.3.3 Provider's offer - Measuring Station

Reference to the annex and/or section where the vendor's responses are found

- a) Describe if your measuring station uses open source software or requires specific licensed software.
- b) Trafikverket uses overall high standards of information security. Please describe how you will ensure information security of your measuring station throughout its lifetime. Take into account in particular the following:
- Management and dissemination of information about the detected vulnerabilities.
- Management of information security in development and support.
- -How your solution relates to standardization in the field (e.g., IEC 62443, ISO 27000).
- c) Please describe if and how you can solve an eventual need for a battery and solar panel solution for the measuring station.
- d) Please describe if/how your measuring station can manage controlling other components in addition to collecting measurement data.
- e) Please describe any accessibility or performance requirements your measuring station can account for.
- f) Please describe if/how you handle a requirement to be able to use your measuring station/cabinets on existing gantries.
- g) Option mentioned, please describe if/how you can deliver a solution for a climbing-free environment .
- h) Provided that the procurement of a new system is finished by the first half of 2018, do you have the capacity to deliver the following:

2018: 5 measuring stations (tests winter 18-19)

2019: 100 measuring stations 2020: 400 measuring stations 2021: 300 measuring stations

3.3.4 Provider's offer - General Information	Reference to the annex and/or section where the vendor's responses are found
a) Describe your process to ensure the quality of supplies and your testing procedures.	
b) Please describe any mobile RWIS solutions you are working with. A basic description of how data is collected and how it is handled at the central level is desired.	
c) Describe other ideas, information, innovation or possible solutions that you deem relevant to this area.	
d) Do you have any other recommendations for Trafikverket to procure the next generation RWIS? If so, elaborate.	
e) Describe how you can allow transparency between a new system and existing sensors/ measuring stations. For example, if there is something you have done before and how you solved it.	
f) Describe where (geographically) you can deliver RWIS (installation, operation, maintenance, support). Please describe available options.	
g) On which geographical locations do you offer consulting services and how many consultants are available at each respective location?	
h) Describe your opinion of a project in which Trafikverket's existing solution will be transferred to the vendor's proposed solution. Trafikverket is particularly interested in what will be expected from Trafikverket's side in such a project.	

# 3.4 Vendor's Price Model

Trafikverket wants to understand vendor price models for software products and services offered.

4.4 Vendor's price model	Reference to the annex and/or section where the vendor's answers are found
a) Describe the pricing model and the cost drivers as you see for Scenario 1. It is optional to specify price information.	
b) Describe the pricing model and the cost drivers as you evaluate Scenario 1, in which you deliver only a new measuring station and a system to set up the station. Trafikverket will retain the existing solution for collecting data. It is optional to specify price information.	
c) Describe the pricing model and the cost drivers as you see for Scenario 2. It is optional to specify price information.	
d) Describe the pricing model and cost drivers for the transfer of knowledge to the field service organization.	
e) Describe the pricing model and cost drivers on how to solve the workshop service.	

## 4 Publicity and Privacy

The responses provided in accordance with this RFI will be treated as public documents by Trafikverket.

Public documents are made public and can, upon request, be disclosed to third parties, unless there are legal grounds to classify the requested information. Information received by Trafikverket under this RFI may be covered by the obligation of professional secrecy if it can be assumed that Trafikverket, regarding the future of any contract, may suffer damage if the information is disclosed.

If the vendor is of the opinion that certain information should be kept confidential with respect to the respondent's business or operational conditions, as well as to the special reason to assume that the respondent may suffer damage if the information is divulged, the respondent should submit a written request for privacy. Such a request should include a specification of the specific data referred to and the damage that the respondent would suffer if the data is divulged.

Please note that Trafikverket cannot guarantee that the received data will be covered by the obligation of professional secrecy.

Trafikverket is obligated to make a particular examination, in each case, when someone requests access to a public document. Respondents to this RFI should be aware that Trafikverket may need to disclose information to potential persons requesting this information.

## 5 Appendix – Specific Questions About the IT Environment

Below is a table which Trafikverket IT personnel developed for optional additional information by respondents.

Respondents that do provide the information requested below, may (in doing so) assist Trafikverket to formulate the requirements of the coming procurement. As an example, we might not include requirements that are not critical, but that are difficult to fulfill.

Answer each question with Yes or No in the columns for measuring station or central system, respectively. We ask for your understanding if a question is not directly applicable; questions that are not possible to answer should be left blank.

No	Title	Measuring	Central	Comments
	Construction that are a first facilities	station	system	
	Can processes that are not required for the			
1	operation of the product be turned off or uninstalled.			
	Can XML be used in according to agreed			
2	schedules integration.			
3	Is it possible to maintain the software remotely.			
3	Can the system use Trafikverket national IP			
4	network for all IP-based communication.			
_	The product can function as a full IP-host in a			
5	routed IP network.			
6	Does the product support both IPv4 and IPv6.			
	Can the product be supplemented with additional			
	physical separate network interfaces to meet the			
	changing needs of different/for connection of			
7	network.			
	The product can be integrated with client's IT			
8	solution according to OPC UA specifications.			
	Can JSON structures be used in accordance with			
9	agreed integration.			
	Http or https can be used as transmission			
10	protocols for integration.			
	Can the product be supplemented to manage (by			
	market accepted) transmission protocol for			
11	integration?			
	Can the product be supplemented to handle (by			
12	market-accepted) message format for			
12	integration?			
13	Can time and date be synchronized over the Network Time Protocol (NTP)?			
13	Can the product send all logged data			
14	immediately?			
	Does the product have a filtering function to			
	send, by the customer, selected events during			
15	integration?			
	Can the product send ("push") data during			
16	integration?			

	Can the product deliver data during download		
17	(pull) according to defined search parameters?		
	Can the product manage another party when		
	interaction is temporarily unavailable, and does it		
	have the ability to resend data (retry) until it is		
	ensured that the information is received by the		
18	other party?		
	Can the product store logged data for all input		
	devices for at least 14 days in a non-volatile		
19	memory?		
	Can the product manage "overflow" in connection		
	with the storage of information in accordance		
20	with the principle FIFO (First In First Out)?		
	Can the product store data that are of interest to		
	the client in an open file format, and is it able to		
21	be handled by a standard PC?		
	Has the product a built-in firewall to allow only		
22	business traffic to and from the product?		
	Does the product have protection against		
	Does the product have protection against		
23	malware?		
23	,		
23	malware?		
	malware?  Are functions of IP forwarding in the operating		
24	malware?  Are functions of IP forwarding in the operating system and the software turned off?		
24	malware?  Are functions of IP forwarding in the operating system and the software turned off?  Can the product send logs according to Syslog?		
24	malware?  Are functions of IP forwarding in the operating system and the software turned off?  Can the product send logs according to Syslog?  Does the product have support for SNMP (version		
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