Vaisala IceCast
Traffic Safety
Solutions

VAISALA

Your Local Partner Worldwide

Your Local
Partner Worldwide

Vaisala is the World's leading supplier of meteorological instruments and services to transport professionals responsible for Winter Service and Traffic Weather. The company operates globally and serves customers in more than 100 countries.

Winter Service

IceCast Traffic Safety Solutions comprise a range of systems and services tailored to provide weather hazard warning, monitoring and prediction information in support of timely Winter Service decision-making. Such information enables customers to optimise the safety of the road user at the most economic cost.

World Leaders

Active Research and Development driven by close cooperation with customers is the basis for Vaisala's portfolio of class-leading products and services. Vaisala is recognised as the benchmark for quality and innovation with several distinctions to its credit:

- Thermal Mapping of more than 1,000,000 km in 25 countries

- Over 3,000 weather stations installed Worldwide

- The World's only pavement sensor to detect Black Ice & Water Film Thickness

- The World's only Ice Prediction System linked to Time Step Thermal Maps

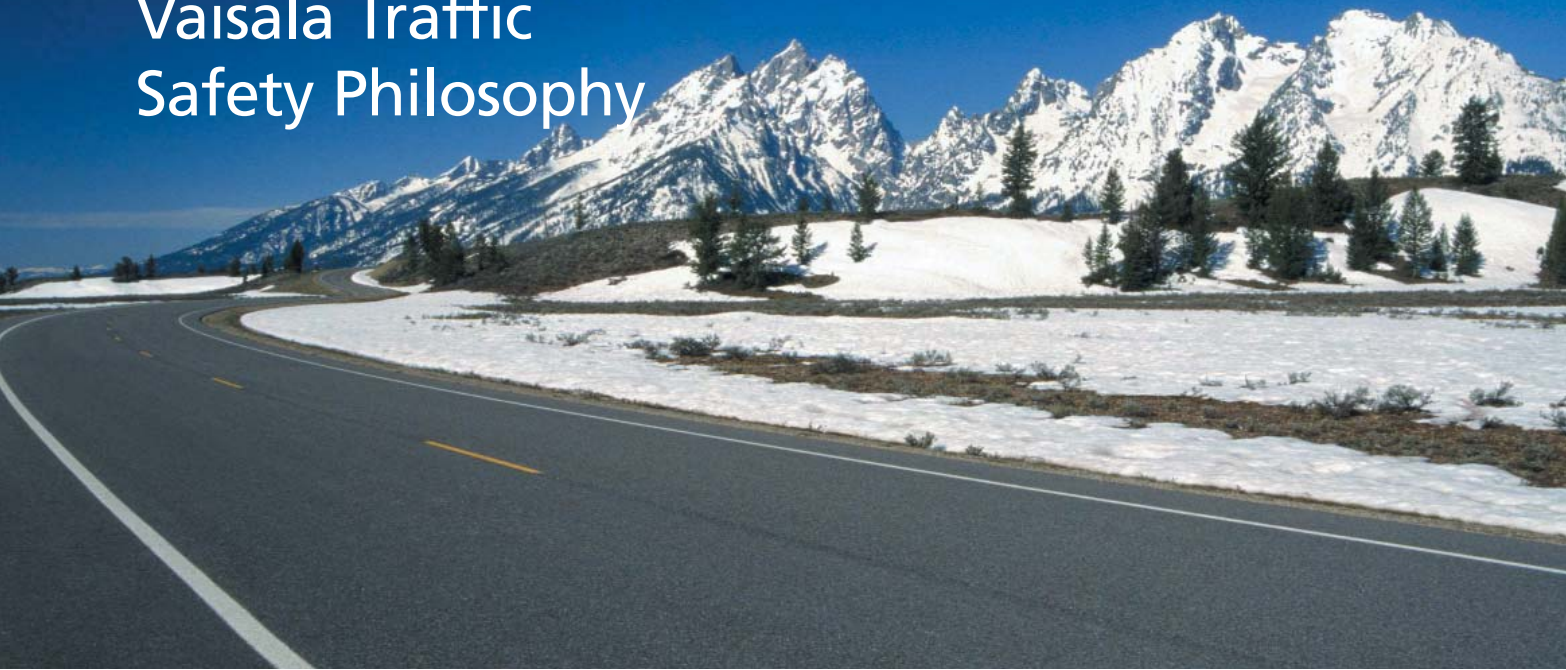- Global Service – data management, support, maintenance and 24/7 back-up

Continuous investment guarantees that Vaisala delivers technical excellence and ensures that customers are always provided with reliable and accurate system solutions. Our proven track record is unsurpassed.

Contents

Vaisala Traffic Safety Philosophy

Transport authorities across the world are tasked with resolving diverse traffic weather problems, including ice, snow, flooding, fog and strong winds. Regardless of the cause, the goal for any transport authority is usually the same, to ensure safe passage across the network. Delivering the appropriate action depends on having the knowledge of the current, and possibly future, conditions, and the likely effect they will have on the network.

In order to ease the stress of managing traffic weather problems Vaisala supply a variety of systems appropriate to the need. Such systems range from relatively simple traffic management to more complex winter service systems. Every system is modular in design, to enable development in line with the network which it is designed to serve.

Any Vaisala system is designed to meet requirements across the entire operations spectrum. In its simplest form the Vaisala system facilitates traffic management, identifying hazardous conditions, such as fog and surface water. In its more extensive format, the Vaisala system offers a comprehensive Winter Service system, incorporating prediction of adverse weather conditions.

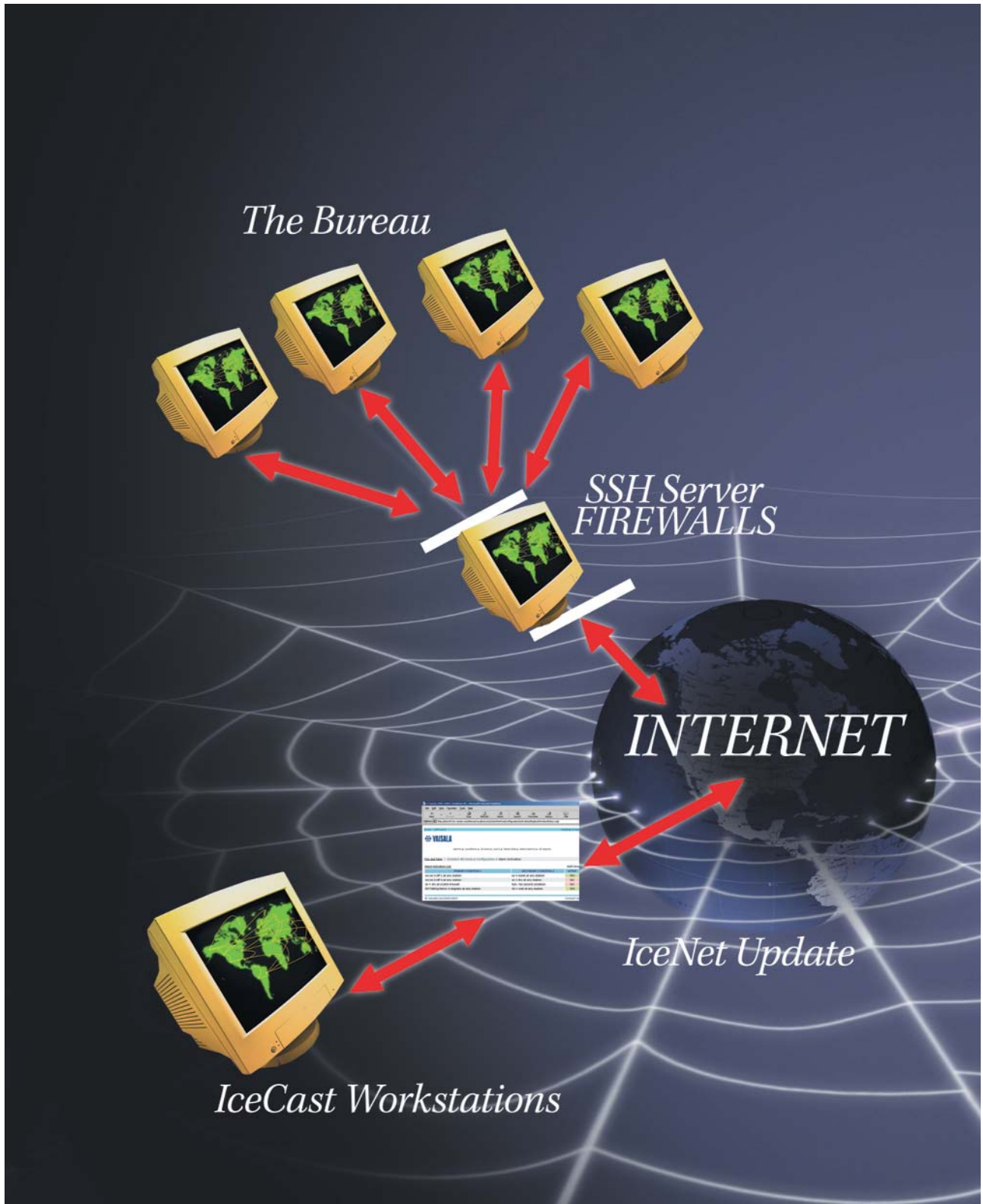**Turn-Key Solutions**
Central to the ethos of the Vaisala system provision, is robustness through unity. Vaisala manufactures, supplies, installs and offers comprehensive 24/7 management, maintenance and service of its systems solutions.

24/7
24/7 after-sales support ensures a guaranteed, single point of contact.

The Bureau

SSH Server
FIREWALLS

INTERNET

IceNet Update

IceCast Workstations

Traffic Weather

Weather hazards can present themselves to the road user at any time of year. Vaisala's comprehensive range of measurement technology has a leading part to play in any Intelligent Transport solution including:

- Fog detection and automated alarming
- Traffic Weather cameras
- Water layer measurement for aqua-planing risk assessment and vehicle speed restriction

Vaisala's IceCast system presents a range of modular and highly configurable options for the collection, management and display of measured and forecast road weather data.
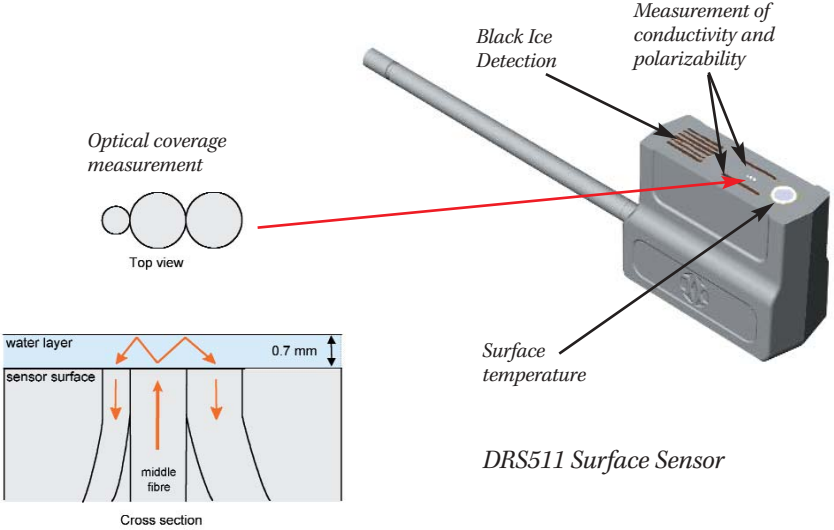
Standard System Features

- Open System Architecture including: industry standard protocols & formats e.g. NTCIP, DGT, TR2020, BUFR & industry standard relational databases

- Accurate measurement of primary factors determining hazardous surface: ice, snow, frost, wet, water layer thickness

- Accurate measurement of anti-icing chemical

- User-configurable, Windows™ compatible turn-key software package

- Media independent communications: dial-up, leased line, radio, GSM, GPRS, X25, LAN, WAN, NMT, TCP/IP and microwave connections

- Flexible architecture allows a readily expandable system to be constructed, ranging from a single weather station to a network of hundreds

- Graphical and textual display with user configurable options for parameters, colours, line styles and personalised choice of views

- Full data archiving

- Mains, battery, wind and solar power

Traffic Weather

Optical coverage measurement

Black Ice Detection

Measurement of conductivity and polarizability

Top view

water layer | 0.7 mm
sensor surface
middle fibre

Cross section

Surface temperature

DRS511 Surface Sensor

Optional Sensors Include:
- Wind speed and direction sensors
- Visibility sensor
- Present Weather Sensor, reporting visibility and precipitation type
- Additional ground temperature sensor
- Atmospheric pressure sensor
- Snow depth sensor
- Solar radiation sensor
- Traffic Weather Cameras

Weather Stations

The ROSA weather station provides real-time weather and pavement data to inform decision-makers of hazardous conditions such as ice, snow or low visibility.

The ROSA weather station is compact and modular, allowing easy expansion of the number of sensors attached. The standard installation will report:

- Surface conditions
- Black ice
- Surface and ground temperature
- Water layer thickness; (important for advanced warning of aqua-planing and freezing point measurement)
- Air temperature, humidity, dewpoint and precipitation

The patented sensor technology allows accurate surface measurements because there is no heating or cooling of the sensor itself.

Based on these measurements, ROSA determines the anti-icing chemical concentration, freezing point temperature and the surface state (dry, moist, moist & chemical, wet, wet & chemical, frosty, snowy or icy). ROSA also generates alarms and warnings for rain, frost and ice.

Camera view damp road

Camera view dry road

Traffic Weather

Data Collection and Management Options:

IceCast Server

The system hub provides a robust, multi-tasking environment. It runs a series of processes, simultaneously managing the collection and handling of observational weather station data. This includes storage, display, alarms and distribution to remote or network PCs.

IceCast is extremely configurable serving single and complex multi PC systems using industry standard open architecture.

IceNet Bureau

For customers who would prefer a data management service rather than owning their own system, Vaisala offers IceNet Bureau. IceNet Bureau is a Vaisala managed service offering 24/7 data and forecast provision directly to the customer PC. The service provision is tailored to the customer requirement and can include:

- Web delivery of data from customer owned weather stations
- Weather station lease
- Complete weather station maintenance service including spare parts provision

Data Access and Display Options:

IceView Application Software

IceView software displays the data collected from the ROSA weather stations in a user-friendly, Windows™ compatible environment. Graphs, maps and tabular displays of current, historic and forecast data are available. IceView is highly configurable, allowing the user to choose:
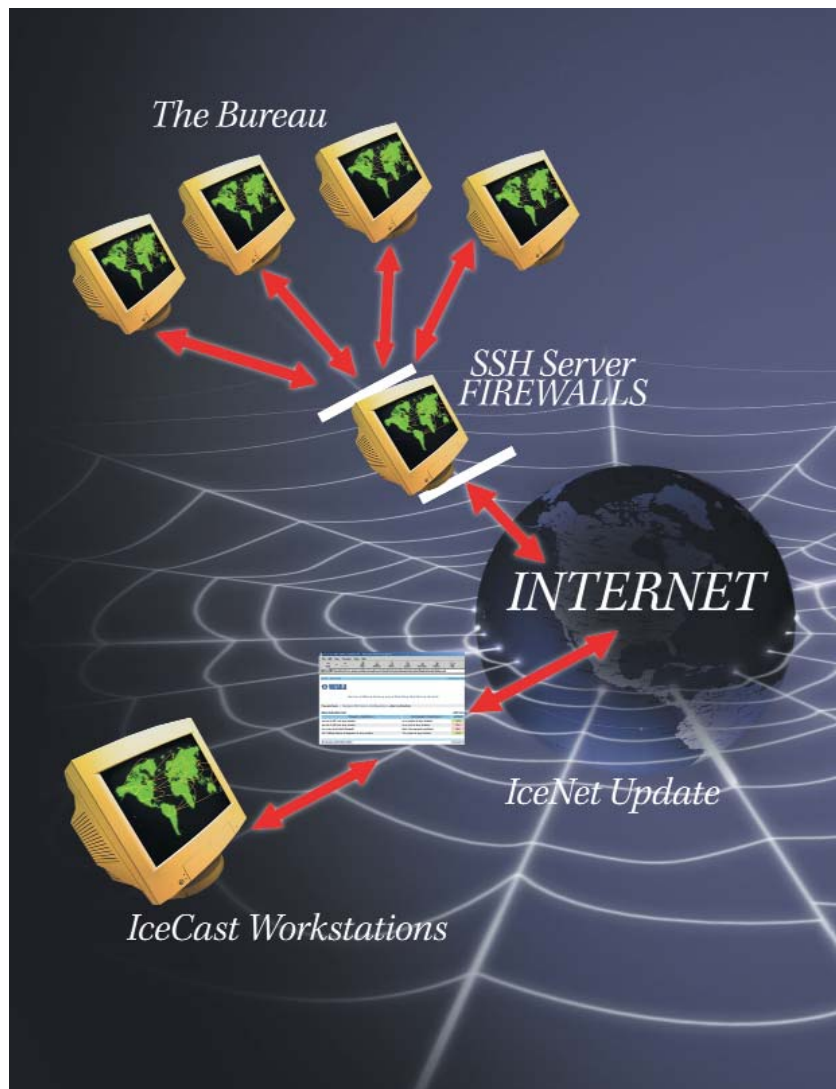
Sample Vaisala IceCast System Architecture

- Language
- Measurement units
- Archive options
- Display parameters
- Display styles

IceView is communications media independent and will operate over LAN/WAN, Internet or dial-up.

IceWeb

IceWeb is an Iceview based server application which creates html images from IceView style views. Images are accessed via standard web browsers over an Intranet or Internet connection and are password protected to ensure data security. In addition to supporting the full range of graphs, maps and text found in Iceview, IceWeb also provides support for the display of camera images from ROSA stations.

Optional Modules:

IceNet Alarm

IceNet Alarm's simple and intuitive web pages allow users to log on and create alarms based on one or more conditions - which can be set against one or many stations.

Alarm notification is delivered to users via their e-mail address to a mobile phone, a PDA or indeed any other device that supports e-mail. Differing levels of access can be created to control who can set up alarms, e-mail addresses and perform other administrative tasks.

IceNet Update

IceNet Update is a Vaisala utility which allows the user to take advantage of the Internet to transfer data between the IceCast Server and IceView application software. The utility allows the user to realise all the benefits of IceView such as configurability and TimeStep map forecasts while taking advantage of the low communication costs offered by the Internet. Security for IceNet Update is provided by Secure Shell (SSH), secure tunnelling and multiple firewalls.

IcePager

IcePager allows paging of alarms generated by IceAlarm via SMS to a GSM phone.

IceLog

IceLog displays and archives a single page summary of actual (and where applicable forecast) surface conditions over the previous 24-hours. IceLog also includes an operator's diary facility.

IceLog provides the facility to e-mail either the complete summary page including measured data, forecast data and diary page or just the diary page itself.

The software provides the capability to inform interested parties of specific actions. When using e-mail, the recipient does not need access to the IceLog software.

The key features of IceLog are:

· 24-hour summary of key surface parameters for each weather station; time and state at point of freezing, time and surface state at minimum temperature

· Free text diary with user-defined templates

· Archiving of summary data and diary page

· Easy access to archived data

· E-mail option for data transfer

· Printer support

Winter Service

Winter weather presents additional traffic hazards such as ice and snow on the road pavement. Detecting such hazards is important but even more important is accurate prediction. Prediction allows more time for planning and the proactive use of resources, minimising the use of de-icing chemicals while maintaining traffic safety.

Prediction enables proactive anti-icing operations which can prove to be more effective than more reactive maintenance practices. Vaisala offers two ice prediction modules to enhance ice detection systems:

- Automated 3-hour forecasting of surface state and temperature which are weather station specific.
- Automated 24-hour forecasting of surface state and temperature which are specific to a weather station and use wide area forecast inputs.

Maximum benefit is derived from the complementary use of both 3-hour and 24-hour forecasts.

3-hour Forecasts

3-hour forecasts are automatically generated using a specially developed version of Vaisala's IceBreak model. Real-time measurements from the weather station are used in the prediction process. Users of the predictions are able to closely monitor potential weather hazards and mobilise resources in sufficient time to initiate preventative treatment.

24-hour Forecasts

Vaisala's IceBreak heat-balance model is the industry standard and is used on a global scale. IceBreak utilises forecast inputs of atmospheric weather parameters to produce weather station specific forecasts of road pavement temperature and state. The usual forecast period is 24 hours ahead, with a resolution of 20 minutes which can be extended to 72 hours ahead as required.

TimeStep Forecast for 00.00 midnight & 03.00

TimeStep Thermal Map

For the winter service highway engineer, Thermal Mapping is an integral part of the Ice Prediction System.

TimeStep Thermal Map software is designed to further enhance the use of Thermal Map data.

Forecast TimeStep expands on traditional Thermal Maps to display at what time individual roads will reach a critical state. TimeStep enables the user, to step through the forecast for the forthcoming night to observe the development of the road surface temperature profile map across the entire network, climatic domain, and salting route.

The individual TimeStep Thermal Maps clearly identify sections of the network which are likely to experience falling temperatures, and at what time they are likely to cross zero.

By knowing which sections of the network are forecast to cross zero first, the opportunity to further optimise treatment schedules arises. Those roads forecast to become dangerous to road users, may be treated as a priority.

Real-Time Thermal Map

Complementing the Forecast TimeStep Thermal Map, Real-Time Thermal Maps display observational data as it is received into the IceCast System. Given a situation where the forecast and observed data deviate from one another, the decision-maker can easily identify those areas of the network that may require treatment ahead of the original schedule. Real-Time TimeStep Thermal Maps may also be used for retrospective analysis of the season's forecast and treatment procedures.

An up-to-date and comprehensive Thermal Map database will ensure that the maximum benefit is realised from TimeStep Thermal Map.

Thermal Mapping Service

On a typical winter night the differences in temperature across a road or runway network can easily be 10°C/18°F Consequently, some sections will be freezing while others will not. Vaisala's Thermal Mapping service is the only proven objective method to establish the road temperatures that are likely to occur across an entire network.

Key Benefits of Thermal Mapping

- Identifies dangerous sections that are not apparent when using only weather stations

- Enables selective anti-icing strategies that avoid the unnecessary treatment of warmer network sections

- Identifies the optimum location and number of weather stations

- Provides quantitative reference data

- Extends ice prediction from weather station locations to an entire road network

What is Thermal Mapping?

Thermal Mapping identifies the pattern of temperature variation across roads under different weather conditions. The pattern of warm and cold sections is dictated by local environmental factors and prevailing weather conditions. The occurrence of frost or ice is determined by the balance of energy a surface receives and loses in conjunction with the amount of available moisture. This is determined by factors, such as altitude, sky view factor (exposure); construction; traffic, and weather conditions.

Ground based surveys are carried out involving the collection of surface temperature data over a series of winter nights, using specially equipped survey vehicles.

Thermal Map Displays

The power of Thermal Mapping as a decision-making tool is maximised when integrated into the IceCast ice prediction system. Site-Specific Forecast data for a weather station can be extended to all roads within a network using Thermal Mapping. As an integral part of an ice-prediction system Thermal Mapping provides forecast minimum temperature maps for an entire network. Thermal Mapping is also invaluable when considering the siting of weather stations. If weather stations are only located in the coldest sections of a network this may lead to a pessimistic strategy being undertaken which can cause unnecessary treatment operations and expense.

Thermal Mapping Service

At the Forefront of Technology

With over 20 years of experience in Thermal Mapping, Vaisala remains at the forefront of technology. Testimony to Vaisala's expertise is an international client base of more than 1000 users. Vaisala has conducted over 1,000,000 km of Thermal Mapping in very different winter climates:

- United States
- Western Europe
- Japan
- Eastern Europe
- Scandinavia
- Australia
- New Zealand

Proven Reliability

Under an on-going programme of research and development, Vaisala continues to advance the Thermal Mapping process. A key part of this is the regular testing and examination of the accuracy and repeatability of Thermal Mapping, the results of which are routinely endorsed in international scientific journals. This has lead to the establishment of a statistical procedure to validate data quality, which quantifies the similarity between temperature patterns collected during different Thermal Mapping surveys. This process continually demonstrates that Vaisala's

Thermal Mapping process is reliable and that the pattern of temperature variation along a road can always be reproduced under similar weather conditions.

Best Practice

Thermal Mapping is now established Best Practice for many authorities.

With ever increasing litigation, can you afford to ignore this proven scientific decision-making tool? Anti-icing strategies without Vaisala's Thermal Mapping are at best costly and at worst dangerous.

© Crown Copyright MC 100031344; Aberdeen Council thermal map Thermal Mapping Service
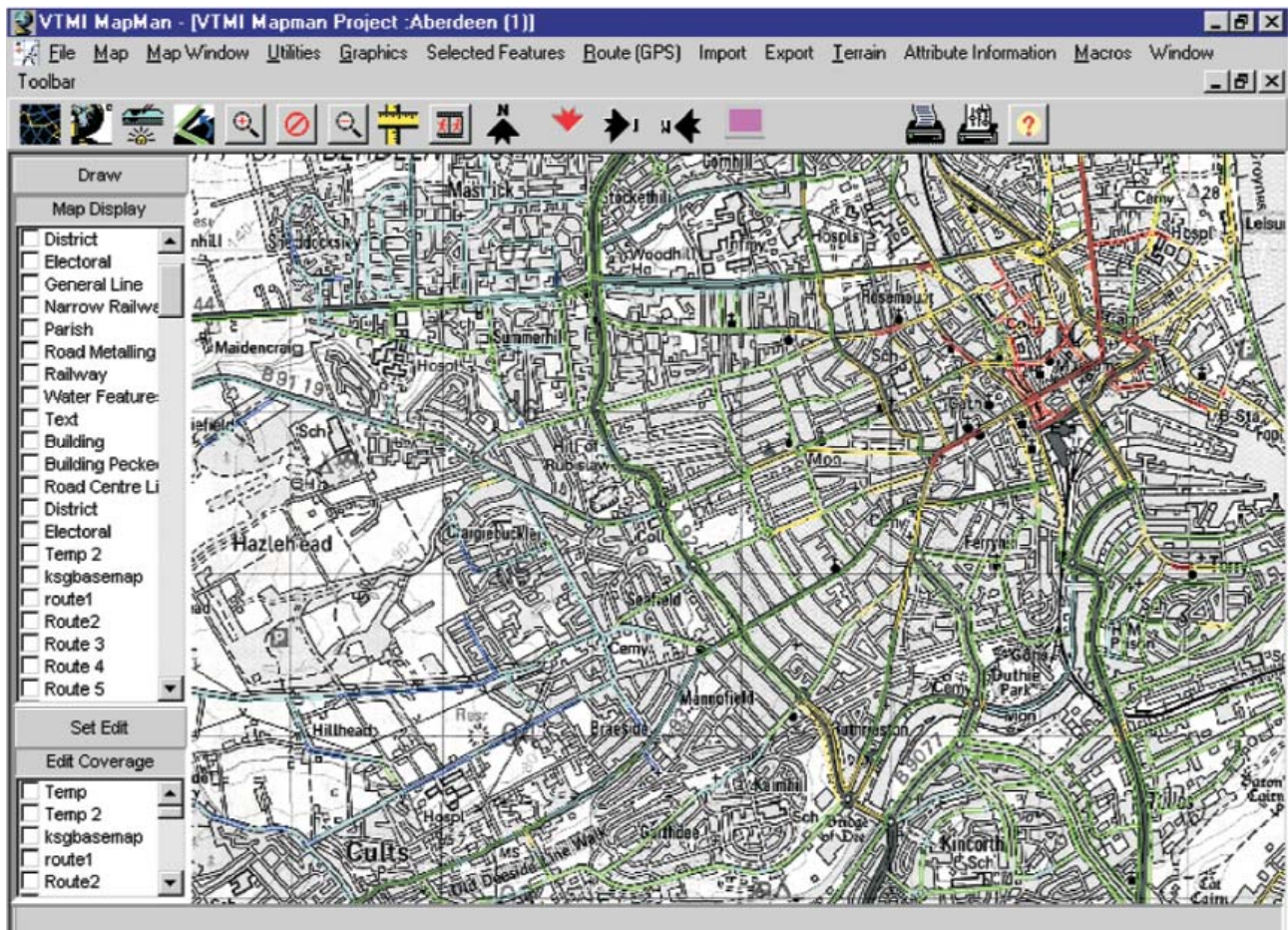
Route Optimization Service

The key term in Vaisala's unique Route Optimization Service is Efficiency.

Vaisala's impartial and comprehensive consultancy and route design service provides efficient route sets that meet a range of targets, including:

Cost Reduction
Design the minimum number of routes required to cover a given network within a set time period. – This is a typical cost saving exercise with routes designed for minimum plant and man-power. We regularly achieve a massive 30% reduction in total route number.

Improved Service Provision 1
The extension of an existing network enables optimization of the available plant and man-power. – This is a typical service improvement project. The maintenance organisation provides an improved service at minimal extra cost.

Improved Service Provision 2
Minimise the time taken to cover the current network using the existing plant and man-power. – Again the maintenance organisation provides an improved faster service response.

Selective Treatment Plans
Climatic and Thermal route design. – Invariably one of the projects above includes route design to reflect the local climatology and, if available, Thermal Mapping data. The routes offer maximised cost savings with only selected routes requiring treatment on a night, depending on minimum temperatures and weather patterns.

Resource Allocation
Part of our consultancy may include investigating the optimum number and location of depots and plant.

Cost-Effective
Vaisala undertakes an initial review of its Client's current operation and (based on over 10 years experience) provides a best estimate of the project out-come. In this way Clients can determine whether a route optimization project is of value.

Project Size
All projects are catered for. To date the smallest has been 100 km and the largest 9000 km.

Does it work?
The routes are designed in close liaison with the Client. This guarantees the final routes will be both logistically feasible and operationally acceptable.

Route Optimization Service


Thermal Routeing

This involves the design of anti-icing routes using thermal characteristics. On a typical winter night the difference in road surface temperature across a network can easily be 10ºC/18ºF.

Using Thermal Mapping data and local climatology routes are designed to provide efficient anti-icing strategies which maximise the potential for road safety at minimum cost.

IceCast & Route Optimization

Optimized routes can be integrated into the IceCast system to provide dynamic Forecast Thermal Route displays.

When combined with Time-Step Thermal Maps the decision-maker can quickly determine IF and AT WHAT TIME each route should commence.
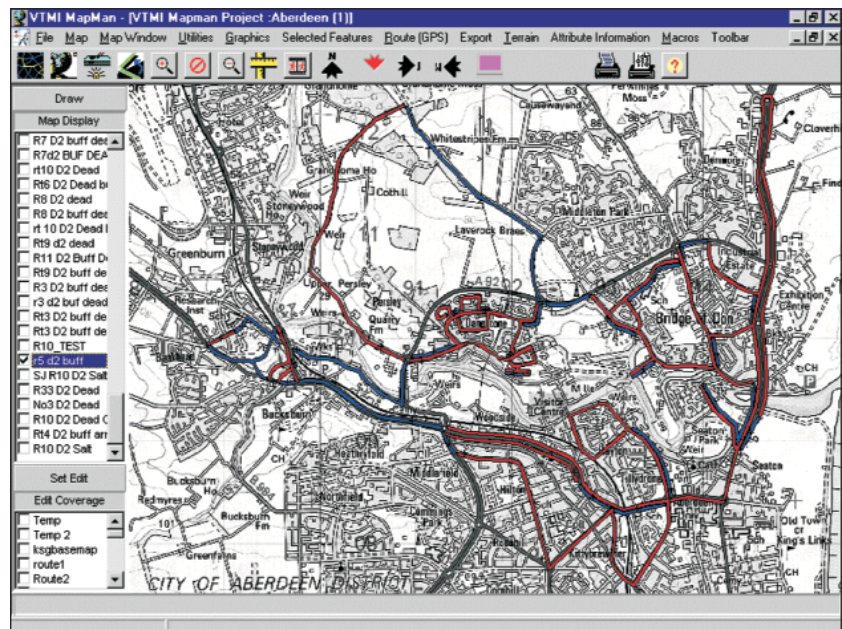
© Crown Copyright MC 100031344; Aberdeen Council thermal map

Road Applications

Vaisala provide system solutions for the road operator's unique requirements. Specialist road weather data and forecasting help keep roads safe and free-flowing, reducing costs and protecting the environment.

The reliable detection and prediction of hazardous conditions allows confident decision-making, maximising the benefit of anti-icing operations.

While customers may choose to join the IceCast system with any of the products, in any order, customers typically progress as follows:

1. Thermal Mapping of the road network to identify the location and number of weather stations required.

2. Install the IceCast system with surface sensors and ROSA weather stations using the locations recommended by the Thermal Mapping.

3. Add forecasts for selected weather stations generated by local forecaster's and/or Vaisala's NowCasting. Thermal Mapping extrapolates these Site-Specific Forecasts across the network.

4. Route Optimization of the network to increase operating efficiency and reduce costs, by decreasing the number of routes required and providing the potential to select individual routes for treatment.

Optional Features

- Fog system: The Vaisala Present Weather Sensor family provides both roadside visibility measurement and precipitation classification (frozen/non- frozen). Sensors can be installed either stand-alone (for example to trigger variable message panels) or as part of an integrated system.
- Wind system: Stand-alone or integrated systems can be provided to measure and display wind parameters (average, gust, speed and direction), which can be used to raise visual and/or audible alarms and to activate variable message panels.
- Aqua-planing system: Stand alone or integrated systems using the DRS511 fibre-optic water film thickness sensor.
- Traffic Weather Cameras: Including digital camera images of road surface condition and traffic level verification.

Bridge Applications

Vaisala delivers a package of products and services to help bridge operators manage hazardous weather conditions in the bridge environment where, compared to the general road environment, the hazards of ice, wind and low visibility are compounded.

Dealing with weather related hazards is a major concern for bridge operators. To enable them to handle these unique conditions, Vaisala offers a combination of integrated products including:

1. Specially designed bridge deck sensors, report bridge surface state, temperature and depression of freezing point.

2. Wind measurement systems process standard parameters (average, gust, direction, speed) and trigger alarms. Specialised wind displays are also available.

3. The Vaisala Present Weather Sensor provides both roadside visibility measurement and precipitation classification (frozen/non-frozen). It can be installed either stand-alone (for example to trigger variable message panels) or as part of an integrated system.

Wind Display

4. The IceCast system monitors critical data in real-time. All data are archived for future reference.

Options
- Vaisala's Thermal Mapping identifies the optimum location for the position of a limited number of sensor points.
- NowCasting offers a fully automated, bridge specific, short-term (3-hour) forecast of surface conditions (temperature and state). NowCasting enables proactive response to icing hazards.
- 24-hour Forecasting: the IceCast system supports input and display of 24-hour forecasts received from an external forecasting agency.

24/7 Customer Support

Central to the Vaisala system is the provision of a comprehensive customer support service.

The service includes:

- 24-hour, 7-day helpdesk
- Sensor monitoring
- System maintenance
- Customer training
- Consultancy

24hr Helpdesk
Fully trained, front-line staff are available by telephone and e-mail, 24 hours a day, 7 days each week, throughout the winter period. Typically, problems will be resolved immediately. In cases where additional assistance is required, specialist on-call personnel will provide the necessary assistance to expedite the completion of enquiries.

Sensor Monitoring
Incorporated within the Vaisala Service is an automated sensor monitoring facility.

The sensor monitoring software automatically checks for data quality and station faults every 90 seconds. On any occasion when a reading falls beyond the predefined thresholds, it is flagged and presented to Customer Support personnel to initiate the appropriate action, in the shortest possible timescale.

Total Customer Care

Customer Training

A diverse number of training courses are offered. Level 1 training, IceView User, ensures that decision-makers are equipped with the skills to operate the system effectively in order to make the appropriate decision.

For more experienced users, Scenario Training, simulates various challenging situations, including marginal night with road temperatures close to freezing and a cold front clearing early. The course offers guidance and encourages user discussion to build confident decision-making.

Thermal Map User training equips the decision-maker with the necessary skills to interpret the data presented on Thermal Maps. It offers guidance on best practice for incorporating this information into the decision-making process.

System Maintenance

Vaisala provides comprehensive maintenance for weather stations and client workstations. In addition to the routine weather station preseason maintenance and mid season meteorological checks, the maintenance contract makes provision for call-out engineers. Efficient response to weather station problems ensures that downtime is minimised.

Consultancy

In the knowledge that Best Practice is becoming an increasingly significant requirement in Winter Service, Vaisala draws on its vast experience to assist its clients. Consultancy services range from providing bespoke analytical reports on current and best practice, to guidance for weather station location.

Vaisala employ a broad range of personnel, with varying degrees of specialism. In working together with our customers we aim to provide cost effective, environmentally friendly, efficient, Winter Service systems.

Vaisala IceCast Traffic Safety Solutions

Reliable.

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All specifications subject to change without notice.