alphecca systems

*Environmental data acquisition for the global network*

ARTEMeS
A Real Time Environmental Measurement System

ARTEMeS is a global, web-based, real time measurement and display system for environmental data. Designed with the twin aims of enabling true world-wide data acquisition and display of results, with the ability to handle measurements of almost any type, ARTEMeS allows environmental data to be viewed remotely using highly interactive displays.

Data such as meteorological and oceanographic parameters are acquired directly from instrumentation and sent to an ARTEMeS server using any number of transport mechanisms on the Internet such as FTP and HTTP, the mobile GPRS network or Iridium satellite. A typical acquisition module utilises a small micro-controller or intelligent GSM modem, and the absence of conventional computer hardware ensures that security issues such as hacking and tampering are minimised.

ARTEMeS allows complete flexibility in the type of data to be acquired; a single measurement may comprise a simple value, such as temperature or pressure; or it may be much more complex, such as a photograph or binary data block from an intelligent instrument. Measurement sets may comprise any combination of measurement types, and additional data types may be added without compromise.

ARTEMeS displays are interactive, allowing a user to easily change scales, read the values of data points and access metadata.
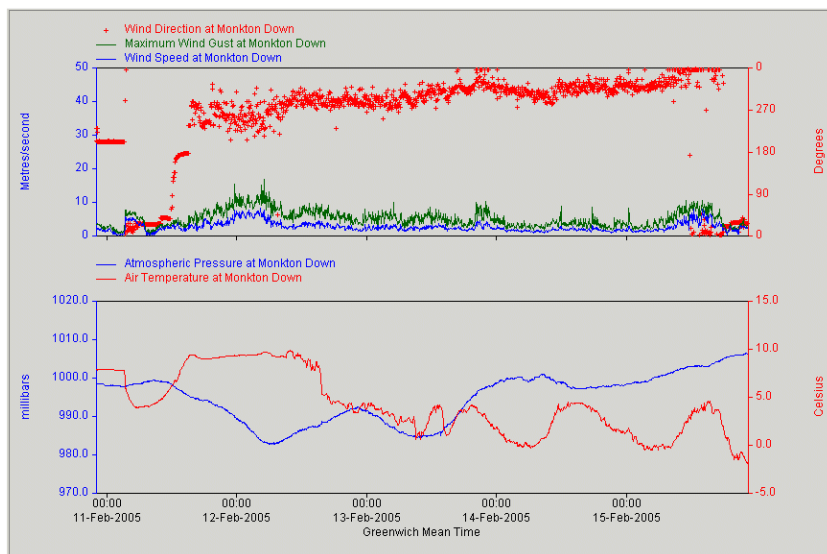
A series of frontal systems measured by an Aanderaa Met Station (left)

ARTEMeS is backed by a comprehensive relational database which holds both acquisition information and important metadata, as well as user-specific credentials which include authorisation details and permissions along with configurable user preferences.

All measurement data within ARTEMeS are inseparably linked to vital metadata that fully describe the measurements.

These contain details such as measurement location, time zone, instruments, sensors and units as well as others such as calibration dates and alternative units.
A subset of this information is available on every display.

*Subset of metadata available from every display (left)*

ARTEMeS is a multi-project, multi-user system that has been designed from the outset for true global operation. This has been achieved by providing support for non-western character sets throughout the entire structure, so it is possible for web pages and the interactive graphics to be presented in Russian, for example.
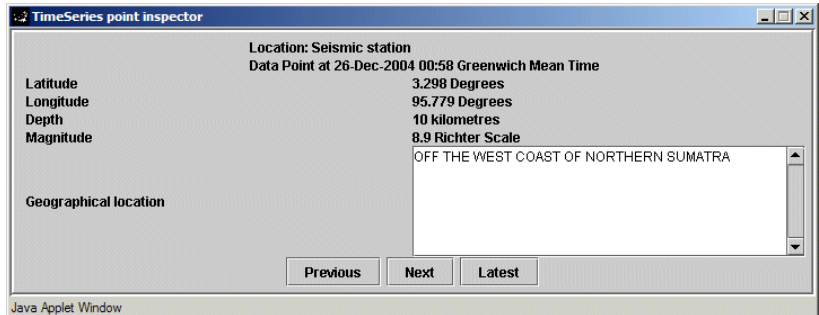
Access to each web page and each item of data is controlled using a hierarchy of users and user groups, with individuals identified by username and password. Data may only be accessed by authorised users.

ARTEMeS displays have been carefully designed to be both intuitive and use strong mathematical and scientific principles. A time series of location data, for example, may be plotted on a globe that can be rotated using the users' mouse.
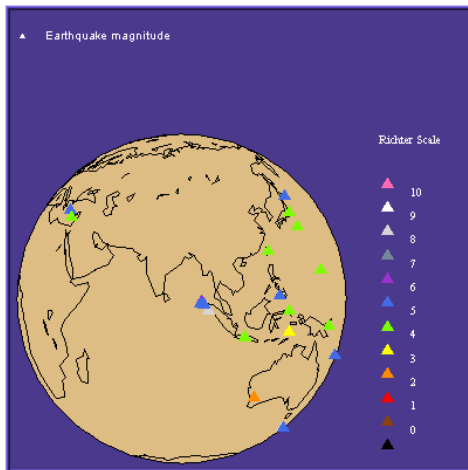

Seismic events world-wide are shown in this plot (left)
The earthquake that generated the Asian tsunami of 26 December 2004 can be seen near the centre of the globe.

Individual points of any time series may be inspected by a mouse click on the point, which launches a TimeSeries Inspector. The Inspector allows a user to scroll back and forth through a plotted time series, reading the exact values of each point. This contrasts dramatically with other systems which merely provide a static image of a plot and offer neither interactivity nor intelligence.

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The TimeSeries inspector allows the individual points of a time series to be inspected. (right)

Type-specific displays are available to view complex data types. A time series of photographs, from a cloud camera or orbiting satellite, for example, may be viewed singly or as an animation using the photograph display. When viewed as an animation the images draw smoothly, giving the impression of video.
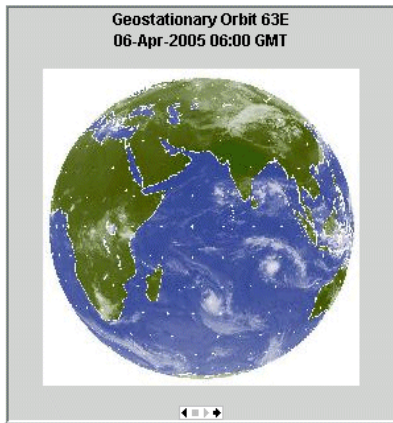
Infra-red satellite images from Meteosat 5 are shown in this display. The sequence of images may be viewed as a movie using the animation buttons. (left).

Other complex data types that can be rendered include oceanographic current profilers, text fields and raw data blocks, while others may be easily added.
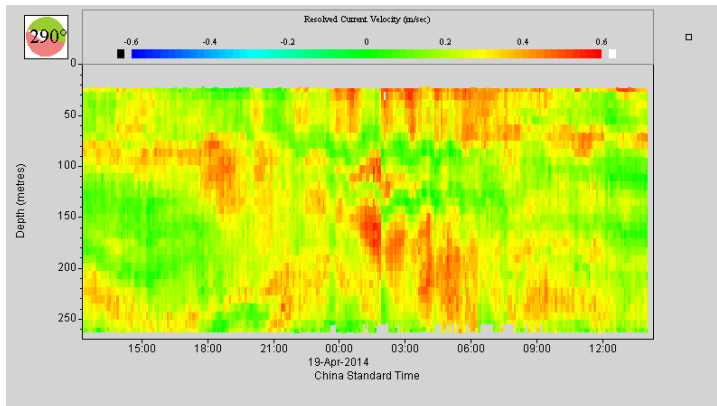
Current profile (left) shows the velocity resolved along a direction as a colour slice. A degenerated soliton can be seen between 00:00 and 06:00.

ARTEMeS is not restricted to the acquisition and display of environmental data using the Internet, but offers additional benefits:

Automatic tasks can be run at regular intervals to provide data management, export or reporting functions. For example, a fax or e-mail containing a data summary may be sent automatically to an interested party, or data may be exported to another computer for further processing. Automatic tasks are defined and held on the central ARTEMeS server, but are executed on a separate machine that can be located anywhere with network access. This means there is almost no restriction on the functionality that can be provided by this means.

One civil-engineering application provides automatic quality control tests that are carried out at five-minute intervals on data obtained from a network of moored water quality buoys. Multiple tests are performed that monitor system parameters such as battery status, buoy location, and time of last measurement, as well as a number of water quality measurements. Emails and SMS messages are automatically sent in the event of a test failure.

ARTEMeS servers may be chained together, so that data are acquired from one server by another. This can be used to provide a degree of redundancy and local autonomy in the event of network failure, with any missed data being automatically infilled when the fault is corrected.

Web pages customised for modern smart PDAs, so that values of selected measurements are available to authorised users anywhere, anytime (subject to suitable mobile phone coverage). This facility can provide valuable information to personnel in the field.

ARTEMeS provides a web-launched application that allows a user to download his data directly from the ARTEMeS server for post processing.
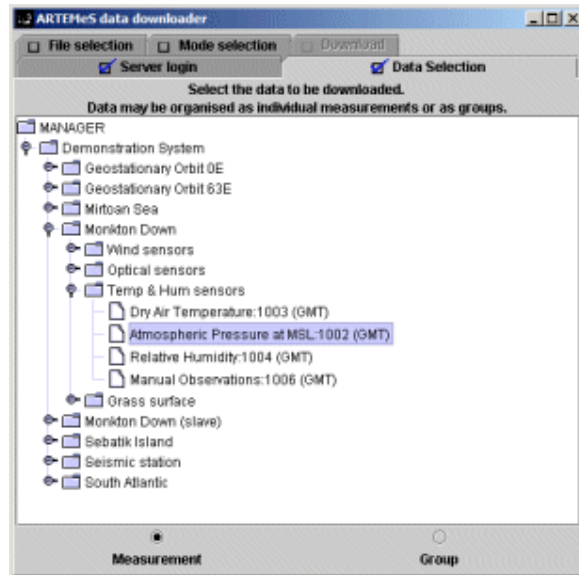
Data Downloader program allows a user to download his data to files (right).

After entering his login details, the program provides the user with a choice of data to which he is authorised, before downloading to a local text file. More complex data, such as images, are downloaded to separate files referenced by a text file.

The Downloader provides a scripted facility to enable regular data downloads to be performed easily.

Data may be entered into ARTEMeS manually, using a web-based form, enabling measurements to be acquired even from un-instrumented sites. Once acquired, data are handled in exactly the same manner as those from automatic instruments. Manually-entered data may be measured values or text, allowing visual observations or comments to be acquired and accessed.

Since 2004, ARTEMeS has been used by different clients including the oil and gas and civil engineering companies, with projects located in diverse locations including UK, France, Nigeria, Turkmenistan, Yemen, Saudi Arabia, China, Indonesia and Malaysia.

For more information about ARTEMeS, contact Stephen André of Alphecca Systems.

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