MARINE SYSTEMS
INTEGRATED MET-OCEAN MONITORING AND FORECASTING SYSTEM

MARINE MODELING
- Tide Modeling
- Tsunami Modeling
- Oil Spill Modeling
- Current Modeling
- Wind Wave Modeling

PORT OFFICE
- Central System
- Forecasting Workstation
- Marine Observer

MARINE FORECAST OFFICE
- Forecasting Workstation
- Marine Observer

Satellite Ground Station (Thuraya, Iridium, etc.)

CONTROL TOWER
- Met-ocean Displays

Multidirectional Antenna

All sensor’s data to media converter

Met-ocean Displays
Maritime industries such as shipping, dredging, fishing, offshore oil and gas continue to grow in response to rising incomes and population growth. Newer sectors such as offshore deep-water oil and gas, renewable energy, mariculture and seabed mining have begun to play a major role in the economy. The growth of a sustainable global economy will be constrained unless we develop integrated systems for marine environment monitoring supporting efficient management of marine resources.

Marine environment monitoring systems have to withstand complex and harsh operating conditions. Gathering data from marine environment is both complex and expensive operation. Our portfolio in this area consists of development of marine and harbour systems, marine surveys, software and hardware development, database and collection systems, modeling and forecasting, early warning systems. As a certified research organization we participate in various research projects results of which assist our continuous product development.

Our core customer groups include, but are not limited to, marine operators, coastal management authorities, environmental agencies, meteorological departments and offices of civil protection. To be able to respond better to the specific requirements and local conditions in each region, we have established several offices worldwide, including our Dubai office, MicroStep-MIS FZCO, specializing in marine monitoring systems and solutions.
MEASUREMENT AND MONITORING DEVICES

AMS 111 IV is the fourth generation of MicroStep-MIS data loggers. Now it is designed on modular platform which supports different main systems. Basic version is based on 32-bit CPU. AMS 111 IV mainboard includes ultra-low-power 32-bit CPU which allows connection to more peripherals to optimize power consumption even with Linux based systems.

User can decide to configure the slave processor independently and to make not only measurement and communication with intelligent sensors, but also mathematical and statistical calculation independent on the state of the main processor or system. This enables the design of systems with very low power or very high CPU capacity in one data logger.

THIRD PARTY SENSORS INTEGRATED IN OUR SYSTEMS

Marine sensors can be divided into three main categories in terms of measurement: sea level and tide, wave and current, and last but not least, the water quality. The sensors use variety of approaches from non-contact to immersed, acoustic wave and current profilers suitable for stable as well as the most adverse weather conditions.

Water Level and Tide Measurement

We integrate several types of water level and tide sensors. Submersible pressure transmitter is intended for very accurate measurement of water level and tide. Non-invasive radar level sensor represents a highly stable system for waves and sea level measurement. The downward looking non-contact sensor uses a microwave radar to measure distance to the sea surface and represents a perfect medium for the extreme demands of the harsh offshore environment. Acoustic water level sensor calculates the true average level and can be configured via its communication ports for virtually any site-unique conditions.

Wave and Currents Measurement

MicroStep-MIS also integrates several types of acoustic current Doppler profilers (bottom mounting or buoy-based ADCP), single point current meters and inertial sensors to measure water currents and wave in estuaries shallow and deep sea water. The measurements from various wave and currents sensors have minimal error due to buoy movement, therefore the integration of motion reference unit for correcting the measurements is possible.

Water Quality Monitoring

The challenge to have accurate water quality data is the biofouling, therefore, we integrate probes with different biofouling control technology, such as mechanical wipers, copper mesh, and ultraviolet light to prevent marine growth.

The multi-parameter instrument allows for the changing of the instrument’s sensor load, in-the-field and on-demand. It can accommodate many sensor heads on the end-cap allowing to configure the focus of the research on an application by application basis.

Vandalism and Tracking System

AMS 111 IV could be integrated with camera, siren, and PIR sensor in order to detect and possibly prevent unwelcomed interventions. For tracking and monitoring the marine platform the integrated GPS provides alerts in case of buoy drifting from specific area.

DATA LOGGER

METEOROLOGICAL DATA
- Atmosphere Pressure
- Solar Radiation
- Wind Speed and Direction
- Humidity and Temperature
- Visibility

MARINE DATA
- Water Level and Tide
- Water Quality
- Wave and Currents
- Water Temperature

ANTIVANDALISM SYSTEM
- Camera
- Siren
- Motion Detection

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IMS4 HELIDECK MONITORING SYSTEM

Built on modular and field proven IMS4 AWOS platform, IMS4 Helideck is optimized to provide real-time weather conditions and monitoring of the helideck motion, thus ensuring the flight and passenger safety.

The monitored weather parameters include wind speed and direction, air and sea temperature, relative humidity, barometric pressure, visibility and present weather, cloud height and wave height. In addition, the IMS4 Helideck monitors the helideck’s heave, heave velocity, roll, pitch and inclination in real-time. The automatically generated helideck reports can be disseminated through various communication channels or optionally broadcast to pilots via VHF transceiver.
INTEGRATED MARINE MONITORING SYSTEM

IMS4 Marine is an innovative open architecture platform developed to access, monitor and manage met-marine data at a very high resolution. The system has been in constant development since 2000 and it is designed for 24/7 unattended operation. We have more than 100 installations in various countries of Middle East and Asia. The system is compliant with applicable regulations and recommendations and open for adjustment for compatibility with any national practices.

MEASUREMENT AND DATA COLLECTION

IMS4 Marine provides real-time data collection and archiving with displays customized as per client requirements.

IMS4 UNIFIED DATA COLLECTION SYSTEM

MicroStep-MIS provides comprehensive solution for marine weather data measurement, processing, storage, presentation and communication to marine observers, port control offices, pilots and other users in form of real time screens, graphs, WMO codes, alarms and reports.

IMS4 Marine provides real-time data collection and archiving with displays customized as per client requirements.

Measured data can be visualized in the form of text, tables and graphs such as time series, statistics, or wave spectrum. Automatic or manual creation of standard WMD codes (Buoy, Synop etc.) as well as national proprietary code forms with data verification is performed by the system too.

The data acquisition module provides connection with the stations and downloads the data. The acquisition can be configured to be either on-line (near real-time) or on hourly, daily or weekly basis depending on the capabilities of the station.

The communication is carried out via telemetry links. In case of failure, the Unified Data Collection System (UDCS) is able to connect to a station and retrieve any missed data, once the communication is established back.

The UDCS is open for further extensions and supports wide range of available types of communication channels, protocols and data formats. The system is extendible to dual hot failover system.

COMMUNICATION

RADIO MODEM, GPRS, SATELLITE (IRIDIUM, THURAGA)

MODELING

TIDE MODELING
TSUNAMI MODELING
OIL SPILL MODELING
CURRENT MODELING
WIND WAVE MODELING

LOCAL NETWORK

PC WORKSTATIONS | REAL TIME DISPLAYS

INTERNET

UOCS, CLDB

DEPARTMENT

PUBLIC CLIENT

WEB BROWSER
MOBILE APP
IMS4 INTEGRATED ENVIRONMENTAL DATABASE

The main utilization of IMS4 EnvIDB is the storage of all collected met-marine data in one unified structure to avoid data inconsistencies and discrepancies and to enable standard and comfortable data access for all users and other software systems.

The guarantee of data storage quality is the industry-proven Oracle® Database Server, the world leader in database technologies. Great alternative for smaller and medium systems is based on solution offered by PosgreSQL. The database provides its users with long-term archiving and reporting, the data serve as input parameters for the current and tidal modeling software.

The real-time as well as historical data and early warnings are present everywhere and everytime they are needed, thus helping decision makers to control and plan marine transport, industrial operations and environmental protection activities.

We develop integrated systems for measurement of meteorological, oceanographic and water quality parameters such as conductivity, salinity, water temperature, turbidity, pH, blue-green algae, chlorophyll, dissolved oxygen. Our ship-board Automatic Marine Stations have interface capability to ship navigation system for calculation of true wind speed and direction. MicroStep-MIS provides the turnkey solution and integration for the measurement, data acquisition and processing, as well as reporting of marine parameters.

IMS4 Marine is capable to measure, calculate and process oceanographic data such as water current, tide and wave data. It is scalable for measuring and processing of other meteorological or water quality data as well.
The real-time displays are collection of screens installed in the central office. Their main purpose is to display real-time data acquired from in-field Automatic Marine Stations and visualize the outputs which shall be used by marine operators, support decision making processes and generate early warnings in cases of emergency. All screens are accessible via any web browser.

Graphical display for all parameters measured at a single station or view of one parameter from multiple stations can be configured as per customer’s requirements. Differences in weather evolution between various stations as well as evolution of one parameter, while other values still in sight, are available on a right side, with quick links to other functions.

The system is designed to allow integration of satellite data with a map of updated real time data from the stations where each station is denoted with an icon. The color of station and measured values are changed automatically to reflect the current station status.

If communication bandwidth allows, the near real-time camera images could be displayed too. Online camera view as well as multiple camera pictures from all stations can be visualized in one comprehensive screen. Display of modeling and forecasting data such as areas endangered by fog or general weather forecast map enable the user to browse through different forecasts, parameters, playing weather movies, etc.
For studying and modeling water motion, IMS4 Marine could be integrated with 2D and 3D marine models, outputs of which can be viewed or saved in a unified data platform for further analysis and data QA/QC.

Front-end displays and tools are specifically developed and customized for interacting with the marine models. This includes obtaining data from the model (such as water level or current at a particular position) as well as, extracting time series data with an option to draw a transection to visualize profile graphs for the surface current. Animation of marine parameters such as velocity, surface elevation changes over time could be prepared and presented with user friendly displays. Forecast assessment is included in the system.

Customized Tidal Analysis and Prediction

IMS4 ATTide is a custom-built software for tidal analysis and prediction. The software is built to run on any 64-bit Windows OS and is simple to load and run. It provides full DA/QC of tide gauge data, with spike removal, interpolation over allowable gaps, removal of "flatlines", date shifts, and time (clock) shifts. The software also generates full record of changes.

The software can choose harmonics automatically, or user can input pre-chosen list. It comes with 112 “built-in” harmonics, based on the UKHO/IHO set; there is no limit to a number that can be added to meet local requirements. IMS4 ATTide automatically senses if input time series is water level (scalar) or current (vector) time series and operates accordingly. The software generates automatic graphical output of user-selectable time interval. The data is saved as csv file for easy import into a wide variety of graphics software packages. High and low tides are automatically generated for the prediction.

Wind-wave Models

Wave forecasts are extremely important for commercial interests on the high seas, mainly for the shipping industry. Therefore IMS4 Marine could be integrated with wind-wave models to simulate wave heights, periods, and propagation directions for regional seas or global oceans. Wind-wave models describe the effort to characterize the sea state and predict the evolution of the wind waves energy using numerical techniques.

Early warning system assists meteorologists and decision makers in forecasting hazardous and severe weather phenomena such as sea storms or tsunami.

3D Modeling for Flushing and Sediment Transport Studies

Integration with 3D marine models enables simulation of pertinent coastal processes such as flushing and sedimentation to perform coastal specialized studies for supporting the design activities and performing the environmental studies. These models can be also used to determine the impacts of new coastal developments on water circulation, flushing, as well as the impacts of the sediment transports on coastal structures and artificial islands.

Marine Forecasting Solutions

We have implemented many local as well as national level marine monitoring and forecasting solutions. Our solutions include developing customized systems for marine data collection, management forecasting and early warning application for hazardous phenomena such as storm surges and waves.

IMS4 uses numerical models to forecast marine parameters. The models generate alerts and warning notifications based on predicted values and according to the pre-set threshold values of marine parameters. We have experience in development of SMS and Email services for warning and notifications.

Tsunami Early Warning

Tsunami monitoring and early warning system could primarily incorporate two definite monitoring systems: one for real-time monitoring of seismic or other trigger events and the other for monitoring of the tidal waves.

Integration of the tsunami model provides an improved understanding of the water level and current response in the coastal waters to an earthquake-generated tsunami originating in the regional seas, gulfs or global oceans. The key parameters of interest include water level, current, and arrival time, for different sites within specific waters area, and for earthquakes of varying magnitude and location.
MARINE SURVEYING AND HABITAT MAPPING

Hydrographic / Bathymetric Surveys

IMS4 Marine could be integrated with bathymetry survey data and generation of Digital Terrain Model (DTM). Integrating with the local bathymetry enables fine tuning of the marine models for better representation of the model domain. Integration of the bathymetry allows development of localized operational models for applications such as oil spills, search and rescue, flushing scenarios and sediment transport studies.

The DTM data is available as GIS layers for viewing and sharing with other applications. The DTMs are available for browsing, viewing as well as input for marine modules and models. IMS4 Marine supports development of customized marine models based on local bathymetry and shoreline data. With this feature it is possible to extend IMS4 Marine to build marine models with very high resolution model domain with user selectable grid size.

Biodiversity Surveys

Biodiversity surveys are undertaken to find out what organisms exist in a given area and this research tool helps to define areas and species of most conservation value and need, moreover, it provides data to allow effective monitoring and evaluation of implemented conservation measures. The data gathered from these surveys is used for numerous purposes such as monitoring endangered populations, evaluating conservation priorities of an area or bioprospecting.

Marine Geophysical Surveys

We conduct marine geophysical surveys to identify existing subsurface structural features, geological layers, buried wrecks, and infrastructure. The surveys can help project stakeholders to identify subsurface conditions that might otherwise remain hidden to traditional bathymetric survey techniques and underwater investigations by divers.

Marine Habitat Surveys

Habitat surveys are conducted using multi-beam sonars, echo sounders, and remotely operated vehicles. With these surveys, scientists map, explore and document the physical, chemical, and biological systems. The data are collated with other habitat and bathymetry data and integrated in IMS4 Marine to model and map the distribution of the marine habitats. IMS4 Marine maps can be used to quantify the spatial area of the marine habitats and to monitor whether the distribution changes over time.

Marine Cartographic Solutions

We produce navigational charts for navigation purposes and entering channels and ports, in addition to show coastline configurations and the bathymetry of coastal waters. Moreover, accurate charts are essential for proper planning in support of multiple usage of maritime resources within national waters. Collection and analysis of field data, and the transposing of this data on to charts becomes an essential navigational tool for the maritime industry.

Environmental Studies

Environmental studies are performed to explore how physical and biological processes maintain life, and how humans affect nature. We conduct many environmental studies, for example but not limited to, measuring the turbidity parameter near new port under construction to learn about the effects of dredging and constructing on the marine life and environment, in addition measure water quality parameter and study the fish kill phenomena, harmful algal blooms, and oil spills.
Coastal zones all along the world are witnessing one of the most significant urban and industrial expansion in human history. The planning and implementation of land and marine data collection with an efficient management of the database is of a great importance for coastal development and sustainability. Sorting and integration of land and marine spatial data is a complex procedure which requires interaction with different data sources and testing QA/QC procedures, prior to importing into a unified database server.

Spatial Database Solutions

MicroStep-MIS provides a spatial database server capable of storing all data in one database repository and using a unique Feature Object Identifier (FOID) for each spatial geometry from vector maps and nautical charts. MicroStep-MIS spatial database imports and seamlessly integrates all geometric attributes by assigning a single FOID to each entity.

Integrated Environmental & Survey Database

We specialize in the development and promotion of Integrated Environmental and Survey Data Platforms combining various environmental sciences and surveying aspects with advanced information and communication technology. Application domains include air quality, meteorology, hydrology, coastal and offshore environmental data. Our integrated platforms support various applications including emission control and energy efficiency, climate change impacts, adaptation, mitigation, sustainable urban and regional development.

IMS4 Maps

IMS4 Maps is a tool for processing, editing and sharing of the geospatial data on the web, both static data sets (topography) as well as current, historical or forecast, meteorological and oceanographic data. Integrating the best of the IT as well as environmental science worlds, the IMS4 Maps process as well as produce the data in numerous formats such as KML, GML, Shapefile, GeoRSS, GeoJSON, PDF, JPEG, GIF, PNG, SVG and more formats of output. The 2D data sets can be displayed in the forms of colored fields, isolines, wind barbs. In addition, the data could be edited via the WFS transactional profile (WFS-T).

Although IMS4 Maps comes with the integrated web client for previewing data layers, thanks to compliance with the OGC standards any OGC web service enabled client software can access the IMS4 Maps server. The IMS4 Maps web client provides users with an easy-to-use interface to access, browse and animate various data layers which include but are not limited to:

- Overlay, switch on/off, reordering of the layers
- Setting layer transparency
- Applying custom filtering and styles to layers for enhanced visualization
- Zoom in/zoom out, pan, rotate functionality
- Browsing the model data through model runs, forecast times, vertical coordinates
- Smart tooltips showing the actual values, trends or additional information
- Time dimension animation over multiple layers simultaneously
- Measurement of distances, areas etc. with option to select the specific unit.

Marine Navigation Modules

Customized marine navigation modules are developed based on local bathymetry data and environmental conditions for coastal as well as inland waterways applications. The modules are based on open NEMA 0183 and serial protocols with user friendly interfaces and allow the usage of AIS signals, currents, tides and Internet access to acquire additional information from specific feature objects included in the ENC S57 catalogue.

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MicroStep-MIS offers a turnkey solution for establishing complete monitoring systems from initial consultation, design, supply and on-site installation, commissioning, trials and training. Our experienced team participates or supports the whole process until the final handover of the system to client.

On-site support for installation of marine stations includes services like site clearance surveys, reconnaissance surveys, offshore engineering and mooring design, site preparation, anchor and mooring positioning, diving support, cable laying and subsea installation works.

The marine systems are customized according to client requirements. MicroStep-MIS team of specialists provides the professional know-how for efficient installation, commissioning and trials. Our personnel have many years of experience and accumulated knowledge with marine systems allowing it to get the marine monitoring systems on-line and in operating condition as per client’s needs.

Our maintenance services provide a comprehensive support to clients to ensure continuous and trouble-free operation of the marine monitoring systems. These services include support to clients on the diagnostics, analysis and reporting of marine data.

We ensure effective and efficient support on the marine stations through a planned maintenance program to preemptively avoid any disruptions to the operations of the marine stations. In addition to the preventive maintenance, our services include on-call attendance for any maintenance issues reported by client. Service reports are provided for every service attendance both routine as well as on-call maintenance visit.

You can join the representatives of our company at various expos and conferences which is the great opportunity to consult the business. One of such events is Oceanology International (London), the world’s largest ocean technology exhibition and conference.
MicroStep-MIS Support Centre is responsible for real-time monitoring of all customer systems worldwide, so we can detect and fix all the possible issues immediately. In order to achieve this objective, we have to build a comprehensive monitoring system. Furthermore, our support team is receiving all important issues from logs and the current server condition by email on a daily basis.
100+
integrated marine stations

www.microstep-mis.com