IMS4 UDCS

Unified Data Collection System

Meteorological, hydrological, radiological, and other environmental data can be useful only after they reach the end-users. Information and communication technologies have never been more important in the world of hydrological monitoring. IMS4 UDCS is a data collection and switching system built on the field-proven IMS4 platform for meteorological, hydrological, radiation, and environmental data acquisition, and remote system maintenance.

Scalability

Fault tolerance

High availability

Supports wide choice of protocol

WMO Message Collection and Switching Capabilities

The IMS4 UDCS supports wide choice of protocols defined by the WMO No. 386 Manual on the GTS or other industry standards:

- FTP file transfer (FTP, SFTP, SCP, SMB, different formats)
- TCP/IP sockets as defined by the Attachment II/15 of the WMO Manual on the GTS
- E-mail
- SADIS FTP, ISCS
- Global or local NWP models (NOAA GFS, ECMWF, DWD, ALADIN, etc.) – deterministic as well as ensemble model output
- AFTN/AMHS interface (AFTN ITA-2, IA-5, AMHS P3, P7 protocols)
- Radar, satellite receivers
- Web service interface (SWIM)
- Legacy support: PSTN, asynchronous
- Optional linking to the 3rd party database systems

The full-duplex mode of operation allows not only collection of the data from stations, but also distribution and switching of messages between/to the stations. The system fully supports creating and processing of the standard WMO TAC and TDFC codes SYNOP, SHIP, PILOT, TEMP, METAR/SPECI, CLIMAT, TAF, AIREP, BUFR, CREX, GRIB/GRIB2, etc., the compilation and decompilation of message bulletins, and is open for the support of proprietary national codes. The conversions among formats (TAC/TDCF/ IWXXM, WMO TAC to BUFR, BUFR/GRIB/GRIB2 to text, ASCII – CSV – XML) are supported. The optional WMO/OASIS CAP (v1.2) warning editor with pre-defined templates allows creating the CAP warnings, which are disseminated to the pre-defined users through the UDCS channels.

Binary Data, OGC Formats, Image and Non-WMO Data Processing

The UDCS supports numerous proprietary protocols and formats for communication with automatic weather, hydrological and environmental stations and data loggers, as well as for data distribution and exchange:

- OGC WaterML, NetCDF, OpenMI
- Text log-files (user configurable formats)
- National and/or international formats (EURDEP, ANSI N42.42)

- NWP model outputs
- Radar, satellite data
- JPEG/PNG/other image formats, MPEG videos (camera images)

Supported Interfaces

The data collection is performed using various protocols and technologies:

- Web services
- LAN/WAN/VPN, Ethernet, GSM/GPRS/3G/4G/5G
- File based data transfer (local, FTP, sFTP, scp)
- MODBUS
- E-mail
- SMS
- Vendor specific protocols: MicroStep-MIS, Vaisala, Campbell-Scientific PAKBUS, Lufft UMB, etc.
- Asynchronous leased lines
- and dial-up lines with dial-in, dial-out options (both periodical and manual)

The supported formats include, but are not limited to text / ASCII, binary, CSV, XML, JSON, BUFR, SYNOP, etc. The time intervals of data collection are user-configurable for each station from minutes (or even seconds) to days. In case of communication line failure the robust data collection mechanism allows automatic retrieval of missing data as soon as the connection to particular station is reestablished.

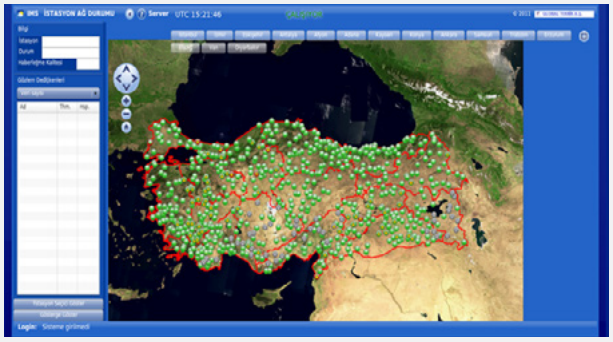
UDCS as a Center of the Large-Scale Heterogenous Network of Automatic Stations

The UDCS provides all functionality necessary to operate and maintain large networks of automatic as well as manned stations, MicroStep-MIS ones or from other producers (Vaisala, Campbell Scientific, Lufft, Aanderaa, etc.). The 3rd party stations are interfaced either directly, or through the data collection system from the particular vendor. Both the data as well as status information are being communicated and processed. The station, sensor and observation metadata are used to keep the track of the data, identification of the missing data and automatic / manual download of them and the data collection mechanisms ensures the automatic recovery of data transfer after the station outage. The number of stations which can be interfaced by a single UDCS is limited only by the used communication infrastructure.

The real-time data monitoring is performed at the level of the reports / data messages as well as at the level of the parameter values (missing data, ratio of missing / rejected by QC data The comprehensive station management is supported:

- WMDR (WIGOS Metadata Representation) compliant management of the station metadata, including the station maintenance log book (user comments), photo and document management
- Export of metadata (to OSCAR, etc.)
- Sensor metadata, calibration information management
- Remote terminal access to the automatic stations
- Station configuration management (MicroStep-MIS AWS Setup, Vaisala Lizard, Campbell Scientific etc., files)
- Remote configuration, firmware update
- Reports of station / sensor metadata, export of log books

Public map view



Network management status screen

Metadata management (stations, instruments)

- Creating and maintenance of the groups of stations either on geographical principle (regions) or using other criteria
- Archive of history of metadata
- Station transmission history, statistics
- Optional warehouse management (registering the components/sensors, information on material taken in/out)

Data Validation and Export

The UDCS data validation and export options include:

- Data processing of WMO and various proprietary text and binary formats
- Quality control of collected data (limits, internal consistency)
- Data export in various text and binary formats
- Data export to relational database (Climatological Database of MicroStep-MIS or 3rd party one)

Monitoring and Confirmation

The status of the station network is visualized by status screens displaying the status of stations and / or communication channels and data flow in the tabuler view or on the GIS map or can be exported in the form of the reports. All communication events are archived in the UDCS logs. The user-friendly interface allows easy configuration of the network and station parameters.

Scalability, Fault Tolerance and High Availability

The IMS4 UDCS is vertically scalable, running on standard PC, or fault tolerant server with redundant components or even a high availability cluster of two servers running in a hot failover mode, providing more and more safety for your data. The selected configurations support full horizontal scalability.

Multi-platform product, industry proven technologies

- The server and client can run on Microsoft Windows® and Linux®
- PostgreSQL or ORACLE database
- Web interface: Mozilla, Chrome, Edge – all modern browsers supported without installation of additional plugins
- Mobile applications: Android, iOS

Application programming interface for the 3rd party applications

- REST API
- Web service SOAP API
- TLS/SSL, HMAC authentication (optional)
- Client side: Python, Jav

Compliance with Standards

- WMO Technical Regulations (WMO-No. 49)
- WMO Manual on Codes (WMO-No. 306)
- WMO Manual on the Global Telecommunication System (WMO-No.386)
- WMO Manual on Global Data Processing System (WMO-No.485)
- WMO Guide to the Global Observing System (WMO-No. 488)
- Manual on the Global Observing System (WMO-No. 544)
- WMO Manual on WIGOS (WMO-No.1160)
- WMO Guide to WMO Information System (WIS) (WMO-No.1061)
- WMO/OASIS Common Alerting Protocol
- WIGOS Metadata Standard (WMO-No.1192)
- ICAO Annex 3 Meteorological Service for International Air Navigation
- ICAO Annex 10 Aeronautical Telecommunications
- SADIS workstation requirements (SADISOPSG/19 from May 2014)