nsMHS

Rock solid, crystal clear

The NetSys premier Message Handling System

NetSys

charting the future...

Introduction

nsMHS is the **NetSys** premier weather-data management offering in accordance with the WMO store-and-forward architecture standards.

It presents users in the meteorological community with a rich set of tools covering all aspects of the WMO World Weather Watch. It also excels in providing all the requisite features to integrate seamlessly into the aviation enterprise environment.

The system has been battle hardened and kept abreast of developments during more than 30 years of impeccable service in the field, a fact attested to by some of our installations outliving four hardware generations from a single license procurement.

It also explains why it has been chosen as the core of the ICAO SADIS OPMET gateway. But perhaps most of all, it illustrates our true and honest commitment to providing the best customer service in the industry whilst still keeping abreast of developments.

Whether your requirements are basic or you require an enterprise class solution, please join us in perusing the following brief sections for an introduction to this workhorse that is proven to provide cost effective solutions.

Overview

The Message Handling System is responsible for the ingestion, validation, storage, dissemination and delivery of messages. The System provides an integrated approach to meeting the requirements of:

- Routine collection and storage of observed data;
- Automatic dissemination of scheduled products, both real- and non-real-time;
- Ad-hoc non-routine applications (e.g. requests for non-routine data and products).

This system is:

- Reliable;
- Cost effective and affordable for a wide range of users;
- Technologically sustainable and appropriate to local expertise;
- Modular and scale-able;
- Flexible, able to adjust to changing requirements and allow dissemination of products from diverse data sources.

The system also supports:

- Different user groups and access policies;
- Integration of diverse data sets;
- Data as well as network security;
- Ad hoc as well as routine requests for data and products ("pull" as well as "push")

Industry Standards

Because our customers require us to remain abreast of important developments within the industry, we ensure that the system is fully compliant to the WMO Manuals on the GTS 386, Codes 306 and Data Processing 485 as well as ICAO Annex 3 and remains up to date as Amendments are made. ICAO EUR Doc 18 for OPMET, WMO Quantity Monitoring and EUR AMHS Manual for P3 and ICAO Doc 10003 for IWXXM

TDCF / TAC / IWXXM

The **nsMHS** development team has done a great job of extending the system with the capability to translate to and from TAC, IWXXM and BUFR. As is evident from the proceedings of MEETINGS OF EXPERT TEAMS ON DATA REPRESENTATION AND CODES, numerous recommendations and corrections as proposed by NetSys have been taken to heart over the years and helped to define the current version of code forms. As such, existing and new customers can rest assure that they have access to the highest quality BUFR and IWXXM support enabling them to participate in the exchange of data in these code forms. This development work in the product has also given rise to a facility dubbed 'transmuter' which allows message translations to non-standard targets e.g. bespoke XML or SQL.

Store and Forward

The core principles of a GTS switching system remains:

A message is stored in a real-time database upon reception and is retained for as long as the specific message lifetime allows. During its lifetime it can be sent and resent to multiple destinations by means of a classical queuing system with the accompanying acknowledgment protocols to ensure one and only one delivery even in the event of temporary circuit failure. Detailed input and output journalling is available per queue for auditing.

Message Routing

Powerful routing features based on WMO header masks are provided as well as timed routing whereby messages are released at specific times as needed by MOTNE.

Soft wiring of input queues to multiple output queues and vice versa is standard and messages containing detected errors can be routed to error queues for user intervention. Alternate routing allows for the rerouting of output messages in the event of primary circuit failure.

Input and output queues support 3,4 and 5 digit sequence numbering.

Bulletin Creation

The bulletin creation module and the realtime as well as non-realtime monitors form a combined task force to ensure the timely, efficient and accurate composition and management of weather reports that comply with the WMO regulations on composite, retarded, amended and corrected bulletins.

Bulletins can be created from stations (either WMO or ICAO identifier) or messages routed to some queue. Missing stations can be indicated and cumulative bulletins at the end of a series can be issued.

Decoders

Apart from validating messages, decoders can also extract values from TAC messages to facilitate easy packing into relational databases. The output format is a new text message containing either key=value pairs or XML documents structured according to the message type.

NetSys can also supply a customizable program to populate an array of different relational database systems such as mySQL, PostgreSQL and Oracle to form OPMET or Climat data banks.

To this effect, the following decoders are available:

- intermediate/main/hourly SYNOP/SHIP
- MOBILE SHIP
- METAR/SPECI
- TAF FC/FT
- TEMP/PILOT
- AIREP/AMDAR
- SIGMET

This module can also be obtained separately to integrate into existing switching infrastructure by means of TCP/IP GTSSOC.

Extended Validation

The validation subsystem has the ability to perform numerous kinds of validation ranging from WMO code form checks to content validation for SYNOP, METAR and TAF. The automatic fixing of numerous commonly occurring errors is possible reducing the need for manual intervention. GRIB and BUFR are validated for correct section and octet counts. The message sequence numbers are monitored for gaps to optionally invoke automatic re-transmission requests. XSD schema validation and schematron validation is performed for IWXXM.

Networking Expertise

Even though NetSys now make use of COTS communications equipment as supplied by CISCO, 3COM, DIGI and others, we have our roots in manufacturing communications hardware for military and government institutions preceding the days these names became household items.

This brings depth of knowledge and levels of experience few can match. During site commissioning NetSys applies networking skills ranging from integration into modern MPLS and OSPF networks to setting up firewalls and routing.

HA Cluster

Single server configurations are supported of course but for sites requiring mission critical service levels a High Availability cluster is the preferred choice. Such a system advertises the servers in the cluster to the outside world by a single IP address and transparently handles assignment of the address to the elected live Ethernet interface by means of a HA heartbeat process. This makes configuration and interaction of any 3rd parties with the cluster much simpler and less error prone. All transactions happening on the live server are replicated to the standby server to ensure both are in step at all times should a live server breakdown warranting a hot/standby swap

TCP/IP   X.25   GSM   PSTN   VSAT...

AMHS   AFTN

HA CLUSTER

COTS Hardware

NetSys elects to use Commercially Off The Shelf hardware only, with a preference for Dell or HP server and workstation equipment providing hot swappable components running the Linux operating system. The system is however also widely deployed on virtualization infrastructure such as VMWare.

AFTN/AMHS Integration

The system is deployed at numerous locations requiring seamless integration into aviation networks. For AFTN interaction the system supports all the required features such as sending and receiving from multiple channels, handling service messages, performing ICAO and BBB segmentation and converting AFTN input to WMO output by stripping of the AFTN envelope and adding a WMO header if not present. The user interface supports filtering on the content of AFTN headers to locate specific messages with ease. It also offers facilities to compose messages destined for the AFTN network and as such serves as a modern AFTN terminal. For interaction with an AMHS, the system implements the P3 protocol thus placing it at the leading edge of developments in the aviation industry.

Communications Standards

The solution offers support for the wide range of communications standards that is encountered within the domain of meteorological and aviation weather data exchange. These range from the most arcane legacy 50 baud telex to the most modern TCP/IP based protocols:

• TCP/IP GTS SOC and FTP
• SSL Secure Sockets and VPN
• X.25 PVC and SVC input and output
• SADIS and ISCS FTP/HTTPS
• PSTN/ISDN dialup terminal input and output or PPP
• Telex and TP
• ASCII Printers
• Fax input and output
• e-Mail input and output
• Satellite and Radar Imagery (EUMETCast /NOAAPort/Himawaricast)
• GSM SMS input and output (alerts delivery) and BulkSMS.com
• AMHSX.400 P3 DUA
• AMQP for SWIM

AFTN Streams
aftn

AFTN Stations

Message Priority
5

AFTN Priority
GG

FAPR
RCTPYNYX

Performance Figures

The system allows for the connection of hundreds of circuits with the number of messages only limited by hardware storage constraints. Switching time is immediate and performance metrics taken on a Dell PowerEdge T310 in LAB conditions shows the number of OPMET messages switched to be more than 1000 messages per second. Real world results from some of our larger deployments demonstrate switching volumes counted in Gigabytes per day with peak per minute volumes exceeding hundreds of Megabytes. A High Availability cluster configuration exhibits near 100% up-time for demanding deployments.

Monitoring

The GUI contains a module for monitoring and reporting most important aspects of system operation. Inactivity alarms can be configured on queues to draw attention to queues with no activity for a preset time period. A display of recent messages received and transmitted allows the user to monitor message headers as they enter/exit the system. Browsing forward and backward through various system log files of user selectable periods (default is one month) is possible and filters can be used to focus on specific logs only. The server hardware and communications equipment are monitored by means of SNMP for which the GUI provides built-in support. Reception and transmission statistics are also available on a per queue basis.
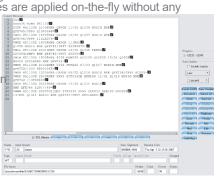
User Interfaces

A client-server implementation for the Graphical User Interface provides administrative, operational and monitoring modules that cover the entire spectrum of functions from a desktop.

Context sensitive help is provided on each and every aspect of the interface. All functionality is access controlled with a fine grain of control as regards what functions are available to which users. Multiple users can be connected to the system at once with the integrity of concurrent operations intact.

A web interface allows for submission of observations and access to the message database from standard web browsers. Configuration changes are applied on-the-fly without any downtime required and take immediate effect upon saving with a rollback facility allowing restoration of a prior configuration also provided. Alert messages interrupt all logged in users and has to be acknowledged prior to the user proceeding.

Programming Interface

An open design allows independent development of add-on applications. All functionality of the system is exported in the form of a XML-RPC interface. This allows for the creation of surrounding applications in any of the major programming languages supporting this on-the-wire protocol..
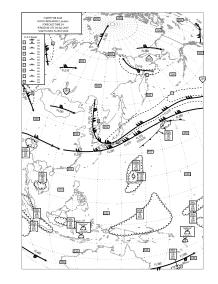
Standard Features

A summary of other prominent features includes:
• Addressed messages
• Message entry templates
• Query filter favorites
• RQM and abbreviated //RT, RS, RQ, RD commands
• File Switching based on file path mask
• Real-time and non-Real-time monitors
• Text to fax conversion
• Generation of WMO Routing Catalogs and Statistics
• SCP, RCP, SFTP, FTP, Microsoft Networks
• Viewing of graphical images in the database

Cutting Edge Developments

The **nsMHS** is one of **NetSys**' leading products which we endeavor to constantly extend, improve and enrich so as to keep it abreast of the latest developments and trends in the weather and ICT fields.

The **nsMHS** has recently been enhanced with a WMO **WIS** compliant meta-data editor. This ensures that any investment made into the product by customers will be safely carried forward into the new era of WMO data exchange and management.

The communications module contains an **AMQP** interfacing endpoint to integrate with **SWIM**.

The **OHS** (object-handling system) component alongside MHS allows for geographical routing of individual reports from **IWXXM** based on geographical intersections.

The latest version of **IWXXM** is supported by allowing for the creation of collections similar to TAC bulletins, schema and schematron validation and translation from TAC to **IWXXM**.

The **nsMHS** system functions as a **AMHS** P3 user agent and is capable of exchanging large volumes of data with the ATN using either the basic or extended service.

Conclusion

The nsMHS is a complete, powerful and user-friendly product that deserves consideration in terms of functionality, affordability, performance and flexibility. This flexibility stems from the team at NetSys who is willing and able to customize the product to integrate into any environment seamlessly which in the end is sure to reduce the total cost of ownership through stability and effectiveness. NetSys is an ISO9001:2015 certified organization that have a Quality Management System in place to ensure your experience of our systems and customer service remains predictable and professional at all times.