MS-CO-14325-MIS

09 September 2019

Market Survey Request for Information

Meteorological Information System

NCI Agency Ref: MS-CO-14325-MIS

NCI Agency is seeking information from Nations and their Industry regarding the availability of meteorological software solutions for NATO.

NCI Agency Senior Contracting Officer: Mr Graham Hindle

E-mail: graham.hindle@ncia.nato.int

To: See Distribution List

Subject: **NCI Agency Market Survey Request - Meteorological Information System (MIS)**

1. NCI Agency requests the assistance of the Nations and their Industry to identify potential COTS products available to meet the requirement for Meteorological Information System (MIS) solution. This Market Survey is being issued to identify potential solutions and possible suppliers.

2. The broadest possible dissemination by Nations of this Market Survey Request to their qualified and interested industrial base is requested.

3. A summary of this emerging requirement is set forth in the Annex B attached hereto. Respondents are requested to reply via the questionnaire at Annex C. Other supporting information and documentation (technical data sheets, marketing brochures, catalogue price lists, descriptions of existing installations, etc.) are also desired.

4. The NCI Agency reference for this Market Survey Request is MS-CO-14325-MIS, and all correspondence and submissions concerning this matter should reference this number.

5. Responses may be issued to NCI Agency directly from Nations or from their Industry. Respondents are invited to carefully review the requirements in Annex B.

6. Responses shall in all cases include the name of the firm, telephone number, e-mail address, designated Point of Contact, and a NATO UNCLASSIFIED description of the capability available and its functionalities. This shall include any restrictions (e.g. export

controls) for direct procurement of the various capabilities by NCI Agency. Non-binding product pricing information is also requested as called out in Annex C.

7. Details of forecasted future METOC requirements are included at Annex D for situational awareness, however please note that the Market Survey will be evaluated ONLY on the responses to questions in Annex C – Market Survey Questionnaire.

8. Responses are due back to NCI Agency no later than **close of business 11/Oct/2019**.

9. Please send all responses, via email, using MS-CO-14325-MIS in the title of the Email to following NCI Agency contact:

For Attention Of:	Mr. Graham Hindle Senior Contracting Officer – DACQ/ASG Email: graham.hindle@ncia.nato.int

10. Product demonstrations or face-to-face briefings/meetings with industry are not foreseen during this initial stage. Respondents are requested to await further instructions after their submissions and are requested not to contact any NCI Agency staff directly other than the POC identified above in Para 8.

11. Any response to this request shall be provided on a voluntary basis. Negative responses shall not prejudice or cause the exclusion of companies from any future procurement that may arise from this Market Survey. Responses to this request, and any information provided within the context of this survey, including but not limited to pricing, quantities, capabilities, functionalities and requirements will be considered as indicative and informational only and will not be construed as binding on NATO for any future acquisition.

12. The NCI Agency is not liable for any expenses incurred by firms in conjunction with their responses to this Market Survey and this Survey shall not be regarded as a commitment of any kind concerning future procurement of the items described.

13. Your assistance in this Market Survey request is greatly appreciated.

For the Director of Acquisition

Graham Hindle
Senior Contracting Officer

Annex B – MARKET SURVEY REQUIREMENTS FOR NATO METEOROLOGICAL INFORMATION SYSTEM (MIS)

1. Scope

NCI Agency is performing a market survey in order to identify available Meteorological Information System solutions on the market that fulfil the requirements presented below. At this stage, NCI Agency is willing to evaluate all the available systems on the market which can provide technological, robust, capable and cost effective solution to NATO.

The NCI Agency hosts the NATO Automated Meteorological Information System (NAMIS) to provide direct weather support to NATO-led operations by providing coherent, comprehensive, and harmonized weather information and products throughout the NATO Command Structure (NCS). There are three main apps in NAMIS Application Service:

- NAMIS X (Main app for production and visualization of MetOc data)
- Moving Weather (Meteorological Data Transmission and Routing System – out of scope of this paper) – responsible for feeding NAMIS X with data.
- NMD-Web (NATO Meteorological Data Web Viewer – out of scope of this paper) - visualization tool for Meteorological products.

Moving Weather and NMD-Web are out of scope of this survey. These products will be given to the Customer as Purchaser Furnished Items (PFIs) if NCI Agency would decide to replace the current system with the possible candidate after this survey.

2. Definitions, Acronyms, and Abbreviations

This subsection provides the definitions of all terms, acronyms, and abbreviations required to properly interpret the Market Survey Questionnaire.

ACO	Allied Command Operations
C2	Command & Control
COTS	Commercial off the Shelf
FAS	Functional Area Service
GUI	Graphical User Interface
MIS	Meteorological Information System
MW	Moving Weather
NAMIS	NATO Automated Meteorological Information System
NAMIS XB, XP, XW	NAMIS X Basic, X Premium, X Web

NCIA	NATO Communication and Information Agency
NU	NATO Unclassified
NS	NATO Secret
OGC	Open Geospatial Consortium
OW	Online Weather
RDP	Remote Desktop Protocol
WMS	Web Map Service

3. Current System Architecture/Description

This section of the Market Survey presents the system architecture that is currently used to provide the NATO MIS capability.

This section refers to the NAMIS X (or NAMIS 10) application for MetOc data production and visualization. The current NAMIS X version from NATO Approved Product Field List is NAMIS X v.3.6.16. NAMIS X employs two software types and several types of licenses.

From the point of view of the software types there are two types of NAMIS X: Server and Client.

The main difference between the two is the following:

- NAMIS X Server – has his own local DB and runs several services such as:
  - ICOP – for access to the DB, licensing server and Doc Storage
  - WMS services
  - Web server for WMS and Online Weather (NAMIS thin/web client)
- NAMIS X Client has no local DB and relies on ICOP (acting as ICOP client) to access the database. Also this service is used for Licensing and Doc Storage access.

In a typical architecture a NAMIS System must have at least a server with/without clients. Clients are configured to use the server as authority.

From the functionality point of view the NAMIS X server has the same features as NAMIS X Client included and some specific ones associated with the server functionalities.

- Examples of the common features:
  - Map Editor
  - Message Viewer
  - Task Manager
  - Forecaster
  - Message Editor
  - Report monitoring
- Examples of the common functional features:

  - Process Manager
  - Configuration
- Examples of the Server specific features:
  - Data Base manager
  - Operator Console

The NAMIS X features are highly dependent on the license types. Therefore based on this dependency some feature may be available or not.

Types of NAMIS X licenses:

- NAMIS X Basic (or NAMIS XB) – contain a basic subset of features
- NAMIS X Premium (or NAMIS XP) – contain the extended features set
- NAMIS X Web (or NAMIS XW) – contain the XP extended feature set plus the web services as WMS and iwebservice to run Online Weather.
- NAMIS X Premium or Web with RDP5 – contain the respective XP or XW feature set plus the possibility to run NAMIS in a Microsoft RDS (Remote Desktop Services) allowing up to 5 concurrent RDP connections. This connections are usually done by using RemoteApp services as part of Microsoft RDS.

Online Weather is a thin (web) client that work in conjunction with a NAMIS XW Server is a lightweight web app that offer access to NAMIS products and features offered through WMS.

Online Weather (OW) is doing WMS request to the local WMS services to receive maps that are published in advance on the NAMIS XW server.

Another service application Moving Weather (MW) serves have a supporting role for NAMIS X and it is located at the centre of the Data Distribution. The Moving Weather Message and File Switching System is a software application designed to serve as a general purpose device for reception, distribution, compilation and transmission of meteorological data. MW Servers are placed in a chain from the data entry point up to the classified networks. They provide data to NAMIS X to all network levels and they retransmit the automatic productions of NAMIS X to other systems (FAS's). MW servers can serve other systems independent of NAMIS X but they main role is supplying NAMIS with MetOc data.

There are four major parts within the software system dealing with the switching functions:

- Input processing - performing identification and checking of input messages
- Database - serving as a database for messages, reports and files
- Output processing - ensuring the distribution of messages in correct formats
- Utilities for message switching - including the system handling by the operator, the compilation processing, monitoring functions and the data request service.

As a summary, in NAMIS current architecture, there are different Moving weather servers to process and route the data to the related users on different networks. And

there is no intention to replace MW within the scope of this Market Survey, this item will be provided as PFI.

Currently, NAMIS versions are available to the users in different networks and classification levels. The networks are separated between them by Firewalls and Data Diodes. Data transmission is done by the Moving Weather servers which are present as NAMIS on each network and classification level. From the point of view of data transmission, NAMIS X act as a client of Moving Weather. Moving Weather feeds data to NAMIS X but also handles the files from the NAMIS X automatic production, send it further to other systems.

Selected Lead Nations performs collection of the meteorological data for NATO. The national atmospheric, meteorological and oceanographic centres supply satellite images, forecasts, observations and numerical model outputs to NATO for analysis and forecasts of METOC conditions. The data is collected at the NATO Metoc Data Hub located in the Bundeswehr Geoinformation Centre and further transmitted to NATO and NATO nations. The content of the data transmitted through the hub is managed by the Allied Command Operations (ACO) with the advisory of ACO Meteorological and Oceanographic Information Exchange working group. If requested by the ACO, the Lead Nations may change the set of products being sent. However, there are limitations on the capacity of the available bandwidth on different NATO networks.

The following figure depict the current architecture on the NATO networks.

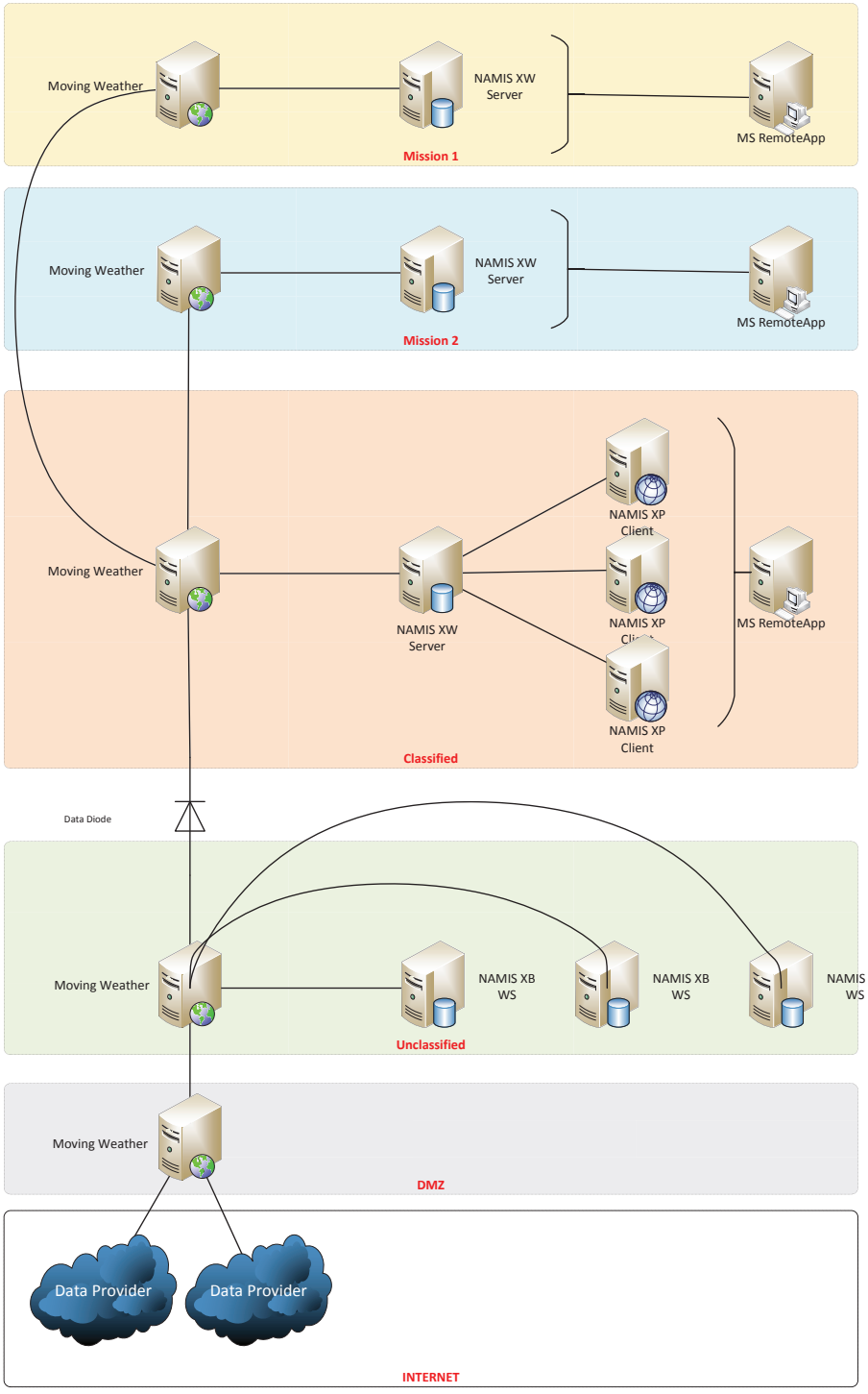

Figure 1. NAMIS Architecture

All NAMIS types (server or client) have (more or less) the same Graphical User Interface (GUI). This GUI is published and made available to the users through Microsoft RemoteApp. NAMIS X Server and NAMIS X Clients are published in separate collections in order to differentiate them. RemoteApp acts as a graphic interface between NAMIS and users, allowing them to connect to servers using RDP protocol without having access to the whole desktop. Domain user groups are used to set up access to the NAMIS X server or clients depending on their needs.

Three level of access are set for users in NAMIS X in three groups and is implemented at RemoteApp level:

- NAMIS Super Users – Have access to NAMIS XW Server, NAMIS XP Clients and Online Weather
- NAMIS Forecasters – have access to NAMIS XP Clients and Online Weather
- NAMIS OW Users – have access only to OW web app.

The role of NAMIS Super Users group is to produce maps and publish them as WMS services for OW or other Functional Area Services (FAS) such as NCOP, iGeoSit and CoreGIS. In addition, the Super Users can manage the OW app and set up automatic productions.

The Role of Forecasters – as the Super Users can produce maps, setup automatic productions and use all other NAMIS features except WMS publishing and OW maintenance.

The Online Weather users are limited on using OW for visualization of the pre-defined meteorological products (shown as layers in OW).

In other words the Super Users and partial the Forecasters are responsible for setting up the tools for OW users.

There are some limited NAMIS capabilities present on unclassified network for NATO included missions. These are local WSs running XB licenses of NAMIS X. They are fed by a MW server placed at this network level.

This current architecture is capable to process data in the order of 60-70 GB per day without any degradation. The Contractor shall also specify that how much/size data can be processed by the proposed system.

The current system supports min 50 concurrent users at a time; the contractor shall offer the necessary number of licenses to maintain this capacity.

4. NAMIS Interface Requirements

NAMIS features native interfaces to multiple public standards (e.g. OGC, SFTP) and data sources has either a service consumer to NAMIS Server or provider to NAMIS client or other FASs. The following table lists the interfaces supported by NAMIS.

Table 1. NAMIS Interfaces

Interface categories	Interface	Description
Web Services	OGC WMS 1.1.1/1.3.0	Web Map Service used for exposing the stored data to clients and for retrieving of geospatial data as static images (PNG, JPEG, GIF, GeoTIFF, SVG, etc.).
	OGC WCS 1.0/2.0	Web Coverage Service (WCS), used for retrieval of geospatial as data with its original semantics (GRIB1, GRIB2, GeoTIFF, KML, JSON, etc.) which can be interpreted or extrapolated.

	OGC WFS 1.0.0	Web Feature Service (WFS), used for retrieval of discrete geospatial features; WS server returns the data values from its native meteorological database for the requested point.
	file	Service for exposing files stored in a specified directory.
	python	Service for integrating a Python script.
	jmbl	Services based on Joint METOC Broker Language. Used mainly in USA, administered by US Air Force.
Data Transmission Services	HTTP/HTTPS	Services used for transmitting and receiving of files and messages over the network.
	FTP/SFTP	
	TCP Socket	
	ICOP	Service allows NAMIS Client(s) to retrieve DB, Doc Storage, license information etc. from NAMIS Server.
	SMTP	Service allows NAMIS Server to send generated files.

The file formats supported in NAMIS are given as;

- WMO Standard Format 00
- WMO Standard Format 00 (with zero tail)
- WMO Standard Format 01
- WMO Standard Format 01 (with zero tail)
- One Message One File
- One Message One File - Body Only
- One Message One File - Heading + Body
- ASCII - SOH/ETX
- ASCII - ZCZC/NNNN
- Heading Separated
- 4 Bytes - Mark First
- 4 Bytes - High Order
- 4 Bytes - Low Order
- VAX Standard
- VAX Standard Segmented
- LFPW Standard (old)
- LFPW 8 byte
- GRIB/BUFR
- EumetCast LRIT - MDD
- MSS Standard
- KKCI (NWS/NCEP/NOAA)

Finally in the following table the supported message formats in the system are given.

Message Format	Description
GRIB	Satellite data, e.g. HDF-EOS2 from MODIS satellite or HDF-5 from NPOESS satellite encoded in GRIB format
OPERA BUFR	Single surface (2D) data, usually radar, encoded in BUFR/OPERA format
OPERA BUFR Volumetric	Volumetric radar data encoded in OPERA BUFR format
ODIM BUFR Polar	Polar volumetric radar data encoded in OPERA Data Information Model in BUFR
PIF	Satellite data encoded in PIF format (used by VCS - SpaceCom receivers)
XPIF	Satellite data products encoded into XPIF (a later version of Picture Image Format).
HMIS SRD-2	Satellite data encoded in HMIS SRD-2 format (used by Met Office Slovenia)
MEOS HDF	Satellite data encoded in MEOS HDF5 format (used by Kongsberg Spacetec receivers)
NWCSAF	Now-casting data, encoded in NWCSAF format
AutoSat	Special satellite format used by UK Met Office
McIDAS area	Special format used by BoM Australia
BoM ROWLF Radar	Special radar format used by BoM Australia
Picture	Image files ingested to system
EDGE NetCDF Polar	Polar radar data in NetCDF format produced by EEC's EDGE 5.0
ODIM HDF5 Grid	2D Cartesian radar data encoded in Hierarchical Data Format version 5 (HDF5)
ODIM HDF5 Polar	Polar volumetric radar data encoded in Hierarchical Data Format version 5 (HDF5)
MDV Grid	Grid radar data in MDV (Meteorological Data Volume) format
MDV Polar	Polar radar data in MDV (Meteorological Data Volume) format
NIMROD	Rainfall radars used by UK Met Office
CF NetCDF Polar	Radar derived data for rainfall intensity (Rainfields) in NetCDF format, used by BOM Australia
Land SAF HDF	Geostationary and polar orbit satellite data for land pixels produced by the LSA-SAF in HDF5 format

5. Critical Requirements/Functionalities

This section includes high-level critical requirements or functionalities, which are available on the current system. The below table illustrates the expected functionality and provides known constraints for the meteorological expert support capability.

The NATO MIS shall provide a meteorological expert user support tool for NATO, fully integrated with the other components of the MIS.

At the time of the release of this survey the meteorological support (production, visualisation, distribution, accessing etc.) is being provided by the NATO Automated Meteorological Information System (NAMIS), based on the Visual Weather software (by IBL and UK Met Office).

In accordance with the current architecture, the system consists of Data Hub, security data diodes, desktop and web applications. The user accesses the NAMIS application

by Remote Desktop connection and according to the definition of user group they can access the related application (Online-Weather, NAMIS). Online Weather provides OGC WMS interface to/from other services/systems. NAMIS provides the following functionalities:

Overview of High Level NAMIS Functionality

General Functions	Availability on NAMIS
Visualisation core, data ingestion, storage, basic display and animation	√
Map customisation	√
NWP GRIB edition 1 data	√
NWP GRIB edition 2 data	√
EPS Ensemble Prediction System	√
Satellite image processing	√
Radar Image processing	√
SIG WX visualization, in particular the system must be fully compliant with the following items: • WAFS GRIB decoder and compliant display package • WAFS SWH and SWM BUFR decoder and compliant display package).	√
Significant Weather or general weather chart (e.g. LAF) editing	√
Lightning processing and display	√
Radar ducting	√
Python Development API – to allow local development of the system	√
On-screen interactive Objective Analysis of observations and NWP data	√
NWP Field Modification (MetMorph – meteorologically consistent manipulation)	√
TAF monitoring and verification	√
Chart batch production capabilities e.g. generation of images NOT full production system	√
Meteogram and cross section generation	√
Thermodiagram tools	√
Thermodiagram roaming profiler	√
METOC calculator tools (Message TDA calculators)	√
Product Delivery Service	√
Background batch scheduling including - task scheduler	√
OLE2 Map linking – insertion of dynamic charts into Office documents in MS Windows	√
Meteo Chart – tabular spreadsheet calculations	√

Weather monitoring (alerts)	√
Local data integration services (regional radar, AWS, NWP ...)	√
OGC/JMBL Web services	√
TDAs in standalone mode	√
TDAs in network mode	√
TDAs generated as web services	√
OGC Compliant Service Creation (CSC) (by Online Weather)	√
Bi-Directional OGC CSC Use	√
Supporting other services (NCOP, CoreGIS, iGeoSIT)	√

6. Life Cycle information

The system design should minimise total system life cycle costs, including its future Operations and Maintenance (O&M).

The software and hardware environment in NATO are in the process of being upgraded by the IT Modernisation project based on a modern data centre approach. However, note that the majority of the NATO systems run on Microsoft/LINUX operating systems and must be capable of running in a virtual environment.

ANNEX C
Questionnaire

Organisation name:

Contact Name & Détails and Position within organisation:

Notes

- Please **DO NOT** alter the formatting. If you need additional space to complete your text then please use the 'Continuation Sheet' at the end of this Annex and reference the question to which the text relates to.
- Please feel free to make assumptions, *HOWEVER* you must list your assumptions in the spaces provided.
- Please **DO NOT** enter any company marketing or sales material as part of your answers within this market survey. But please submit such material as enclosures with the appropriate references within your replies. If you need additional space, please use a continuation sheet and clearly refer to the question being answered
- Please **DO** try and answer the relevant questions as comprehensively as possible.
- All questions within this document should be answered in conjunction with the summary of requirements in Annex B.
- All questions apply to Commercial or Government respondees as appropriate to their Commercial off the Shelf (COTS) or Government off the Shelf (GOTS) products.
- Cost details required in the questions refer to Rough Order of Magnitude (ROM) Procurement & Life Cycle cost, including all assumptions the estimate is based upon:

General Questions

a. Do you have an, in service, currently deployed METEOROLOGICAL INFORMATION SYSTEM that currently meets the current NAMIS requirements as detailed in Annex B;

b. Provide details of where it is used and deployed and number of users;

c. Is it deployed in the military environment, if so where? ;

d. Is it currently operating in classified domain;

e. If not how can it be adapted, to enable this;

f. If adaptation is required, what is the adaptation schedule;

g. How long has the system been in operation;

h. What is the current in service support package;

i. What is the current training available.

Detailed questions

1. COTS Solution

Please indicate the requirements from Annex B that your proposed system/technology is compliant with (entirely or partially). For each of these, provide details how the requirement is fulfilled. Add as many lines as needed to the table below:

Req. no	Compliant (Partial/Full)	Details/Observations

Is your proposed system/technology currently in active service as a COTS solution? If so, where and what types of support does your organisation currently provide for such a capability?

Please provide us license fees, support figures for your current COTS solution?

Please provide the following information regarding current and previous uses of your available COTS solution:

i. Names of customers/users and contact details of their POC's.
ii. UNCLASSIFIED details on the specific program your COTS solution supported.
iii. Overview of any modifications to the COTS solution necessary to support these customers and the licensing terms applicable to modifications of the COTS product, stating also whether those will be assigned to the NCI Agency (Foreground/Background IPR).
iv. Estimated cost to the purchaser for modifications.

Please provide us with any additional capabilities of your COTS solution that go above and beyond those included in Annex B. Also, include the following:

- A Rough Order of Magnitude (ROM) Procurement & Life Cycle costs including all assumptions the estimate is based upon,
- Advantages & disadvantages of your product/solution/organisation,

- Any other supporting information you may deem necessary including any assumptions relied upon.

Commercial Aspects

i. Are there any restrictions on the use and deployment of the Meteorological Information System (MIS) solution within: NATO ;NATO nations or NATO Deployed operations

ii. Are any supplementary agreements or export control requirements ie TAA,OGL required

ROM price data

i. Please Rough Order of Magnitude pricing data for all components of the proposed system,
ii. separate pricing for the Life Cycle aspects of the proposed solution

2. Previous NATO or Equivalent National Defence Experience

a) Does your company have experience in achieving Security Certification and Accreditation through the NATO or equivalent national defence process? Please list applicable past projects where such certifications were achieved.

b) Does your company have experience in achieving approval through the NATO Request for Change (RFC) or an equivalent national defence process? Please list applicable past projects.

3. System Components

ID	Questions	Answer/Comments
SC.1	Which OGC web services does your SW provide or consume? (provide an example for each)	
SC.2	Which OGC web services is your SW compliant with (certified or implementing)? Provide references to OGC website implementation pages where applicable.	
SC.3	Explain implementation of temporal and vertical (altitude/height) aspects of information in your web services. Does your SW employ TIME, ELEVATION or any other custom WMS dimensions?	

SC.4	Are there any well-known web services implementation guidelines and/or conventions your SW complies with?	
SC.5	What other web services does your system provide? What types of information are provided by these services?	
SC.6	What other recognised protocols does your system use for interfacing with external systems?	

The following questions will be answered by the Contractor to emphasize their system capabilities based on the information given in Annex B.

4. Data Formats

ID	Questions	Answer/Comments
DD.1	Is your system capable to handle all WMO data formats?	
DD.2	What data formats should be added to NMDH in order to extend meteorological support? Are these formats in used by your system?	
DD.3	How can climatological be distributed? What method is being used by your system?	

5. MET functionalities

ID	Questions	Answer/Comments
MET. 1	Can your system provide functionality equivalent to NAMIS?	
MET. 2	How can your system replace MW (if it is requested) or be integrated with MW? What NAMIS components could be reused? Which would need to be replaced?	
MET. 3	Does your system provide the requested meteorological functionality?	
MET. 4	Can your system implement additional TDAs?	
MET. 5	Which TDAs related with meteorology does your system implement?	

6. COTS

ID	Questions	Answer/Comments

COTS. 1	Can your solution be virtualised? What virtual environment can be used?	
COTS. 2	Is your solution hardware independent, i.e. can run on servers/workstations of different brands?	
COTS. 3	Are there any specific hardware components necessary to run the software?	
COTS. 4	What COTS components are necessary to run the described software?	
COTS. 5	What operating systems are required to run the software?	
COTS. 6	What core services (e.g. Active Directory) can the system use? Which of them are necessary for system's operation?	
COTS. 7	What standard system monitoring and control tools can be used to manage the system (e.g. System Center Configuration Manager - SCCM)?	

7. Security

The NATO MIS will be deployed on NATO Secret (NS) and Mission Secret (MS) networks. Therefore, it must obtain the NATO security accreditation required for the approval to operate. This process involves demanding security and penetration tests conducted by NATO. The systems will have to operate with the restrictions of the NATO security settings applied both on servers and workstations. Systems that have been designed to work only on the internet generally cannot meet these security constraints without significant re-work.

Questions-Security

ID	Questions	Answer/Comments
SEC.1	Do your personnel have NATO security clearance or a national equivalent?	
SEC.2	Was your system deployed in a NS environment or a national equivalent?	
SEC.3	Has the system received any security accreditation approval?	
SEC.4	What security precautions can be implemented within your system?	

8. Product Life Cycle

To minimise disruption and to maximise the re-use of existing components integration with the hardware and COTS elements already deployed in the NATO environment as described in Annex A Please address the following:

Questions-Product Life Cycle

ID	Questions	Answer/Comments
PLC.1	What level of resources will be required from NATO to support transition, please provide this information in the draft transition plan to be used for the transition from NAMIS to the proposed new system ?	
PLC .2	The following test will be applied to ensure the quality criteria; User Acceptance Test (Scenario based testi`ng, focused on validating the system as per user needs), what will be the scope and duration of this test? Any previous test reports with other customer is available?	
PLC.3	The security test will ensure the security criteria are met NATO Cyber Security Teams will conduct these tests, the Contractor shall be responsible to support the tests and take the remedial actions after the tests conductions. Any specific experience or test applied on the proposed system?	
PLC.4	Which documents will be provided with the system the following document set shall be considered as minimum; User Manual(s), Administrative Guidance(s) and Installation Manual(s) ?	
PLC.4	Which training will be given to the Agency within the scope of the transition the following shall be considered as minimum: System Administrative Training, User Training	

Annex D, METOC Future Requirements - Main Requirements.

IT-Service	IT-Service-Functionalities	Description
Meteorological Information Service	Provide Meteorological Assessment	Provide visualisation of forecasts, visualisation of observations, visualisation of value added products such as satellite images, management of information on meteorological stations.
Meteorological Information Service	Provide Meteorological Assessment	Automated / manually added value production to visualise internationally recognised data formats (grib1/2, netcdf, hdf, IWXXM,etc.)
Meteorological Information Service	Provide Meteorological Briefs	Deliver Meteorological briefs in support of operations.
Meteorological Information Service	Provide Meteorological Messages	Provide meteorological messages to other services.
Meteorological Information Service	Support Density Altitude Calculation	Support the verification of conditions for use of air assets on the specific areas.
	flight weather survey	Obs related functionalities (METAR, TAF, SYNOP display / automatic generation, monitoring, etc.)
Meteorological Information Service	Provide METOC Data Distribution	Provide the only first-in and sustained NATO Meteorological and Oceanographic (METOC) data source for the NATO Command and Force Structure.
Meteorological Information Service	Provide Ballistic Wind Messages	Provide ballistic wind messages.
Meteorological Information Service	Provide METWATCH	Deliver colour state and forecast trend for selected airfields (METWATCH).
Meteorological Information Service	Support Graphical Depiction of Human Exposure	Graphical depiction of "Human Exposure" supports Temperature-Humidity index (Heat Stress), Wind-Chill, Cold-Water Survival and Night Illumination.
Meteorological Information Service	Support Parachute Operations	Support parachute operations MEDW (Mean Effective Dropping Wind) and SFG (Surface Wind and Gusts).
Meteorological Information Service	Support Theatre Crosswind Monitor	Support the monitoring of selected airfield for crosswind threshold.

IT-Service	IT-Service-Functionalities	Description
Environmental Service	Forecast Space Weather	The Space Weather Services shall provide forecasts on space weather conditions such as: Flare forecast, Magnetic forecast and Proton forecast.
Environmental Service	Manage Space Weather Alerts	The Space Weather Services shall provide alerts for near-real-time emergency space weather conditions and forecasts such as: X-ray alerts, Radio Emission and burst alerts, Geomagnetic Sudden Impulse alerts, Geomagnetic Storm alerts, Electron Integral Flux alerts and Proton Integral Flux alerts.
Environmental Service	Provide Geographical Information	The Geographical Services provide access to high-level spatial and temporal value-added information, and related computation functions required by geographers.
Environmental Service	Provide Hydrographical Information	The Hydrography Services provide access to high-level and value-added information, and related computational functions required by hydrographers.
Environmental Service	Provide Meteorological Information	The Meteorology Services provide the means to access to atmospheric information and weather forecasting algorithms.
Environmental Service	Provide Oceanographic Information	The Oceanography Services provide access to high-level value-added information, and related computational functions required by oceanographers.
Environmental Service	Provide Recognized Environmental Picture	- The Environmental Service provides the means produce, manage and disseminate the Recognized Environmental Picture. - The Environmental Service provides the means produce a de-conflicted and agreed picture of the geospatial, oceanographic, hydrographic and meteorological environment through the combination, aggregation, correlation and fusion of data from multiple sources.
Environmental Service	Provide Viewer	The Environmental Service provides the ability to display geospatial information. Furthermore it shall provide following functionality: - Selecting coordinates (UTMREF, UTM, WGS84 (decimal), WGS84 (degree, min., sec.), lat. / lon.) - Searching coordinates - Calculating buffer - Distance measurement - Area measurement
Environmental Service	Allow the auto production of	Based on received raw data, allow the auto production of meteorological products

IT-Service	IT-Service-Functionalities	Description
	meteorological products	
Environmental Service	Editing formulae	Gives the possibility to edit the calculation formulae

New Utilities:

IT-Service	IT-Service-Function	Description
METOC Service Bw	Provides objective analysis	Computation of grid-field info out of observed point/station data
METOC Service Bw	Provides on-screen analysis (OSA)	Objective analysis for human assisted analysis and batch OSA
METOC Service Bw	Provides satellite image processing	Display sat data on maps, overlaying them with other METOC data, re-projection, creates animations and spectral compositions, able to use various data formats
METOC Service Bw	Provides RADAR image processing	Display RADAR data on maps, overlaying them with other METOC data, re-projection, creates animations and spectral compositions, able to use various data formats
METOC Service Bw	Provides Volumetric 3D RADAR processing and vertical profiler module	Processing of RADAR volumetric multi-elevation polar data, interactive vertical profile cross-section, ad-hoc PPI/CAPPI/MAX computation for various input file formats
METOC Service Bw	Provides satellite application facility products (SAF) processing	SAF products decoding and visualization from all SAF applications for various input formats (such as HDF5, BUFFR, etc.)
METOC Service Bw	Provides lightning information processing	Displays, re-projects and animates lightening data from various formats and enables overlays with other METOC data/products
METOC Service Bw	Provides SIGWX processing	Displays significant weather charts generated from BUFFR and overlays with other METOC info over selected areas
METOC Service Bw	Provide Weather charts and SIGWX editing	Visual on-screen editing of maps incl. drawing of METOC relevant information using predefined symbols and providing a corresponding symbol editor

IT-Service	IT-Service-Function	Description
METOC Service Bw	Provides Alert editor	Graphical editor for area-based METOC hazard warnings with alert output generation according to the Common Alert Protocol incl. a web-based alert map for monitoring
METOC Service Bw	Provide upper air profile and thermodynamic diagrams	Upper-air profiler, interactive mouse roaming profiles, calculation and tabulated display of thermodynamic indices, on-screen editing of thermodynamic parameter lines
METOC Service Bw	Provides ocean profiler	Ocean observation and predicted model data profiler, interactive mouse roaming profiles, display of tabulated and graphical diagnostics.
METOC Service Bw	Provides Wind profiler data processing	Processing and display of Doppler wind profiler information for various input data formats
METOC Service Bw	Provides RADAR Ducting	Sounding profile diagnostic module for the analysis of atmospheric refraction effects on RADAR systems over land and sea.
METOC Service Bw	Provide meteograms and cross sections	Generates meteograms and cross sections from observations and numerical weather and ocean prediction (NWOP) model data
METOC Service Bw	Provide trajectory and feature tracking	Tools for particle and feature tracking according to NWOP model data together with manual tools for the analysis of weather feature movement in 4D.
METOC Service Bw	Provides derived NWOP field diagnostics	Grib (and differently formatted model data) field post-processing tool for automated generation of derived parameter fields.
METOC Service Bw	Provides NWOP filed cutter / extractor	Batch job automated sub-setting and resampling of NWOP fields for further dissemination in various formats to support other systems.
METOC Service Bw	Provides on-screen field modification – METMORPH	Allows METOC consistent modification of NWOP fields.
METOC Service Bw	Provides OLE2 map linking	Place maps in other office applications with automated updates.
METOC Service Bw	Provide tabular product generation – METOC and spot chart, resp.	Tabular product generation from observations and NWOP both automated and on mouse click for the position of the pointer.
METOC Service Bw	Provide form based production frameworks	Provide a message editor, office module, take-off aerodrome forecast, monitoring and verification possibility, marine forecast production, etc.

IT-Service	IT-Service-Function	Description
METOC Service Bw	Provide automated weather alerts	Threshold-based monitoring of observations, NWOP, satellite and RADAR data for multiple locations and areas integrated into a dashboard.
METOC Service Bw	Provides a verification module	Automated verification of forecasted NWOP parameters based on atmospheric and oceanographic observations.
METOC Service Bw	Provides TAF monitoring and verifications	Real-time evaluation and statistical verification of TAF forecasts.
METOC Service Bw	Provides background batch processing	Scheduler and task editor for automated execution of map generation, printing, message generation, data extraction and sending, system housekeeping, etc.
METOC Service Bw	Provides a product delivery service	Pipeline oriented product post-processing and delivery mechanism with comprehensive logging and monitoring capabilities, data format changing, file format changing, mail delivery service, and secure delivery services (sftp, ssh, https)
METOC Service Bw	Provides an automatic file relay module	Relaying of arbitrary files using various protocols with management and queueing capabilities.
METOC Service Bw	Provide GIS-compatible web services	Provide powerful and customizable web map service, web coverage service, web feature service to export all types of generated METOC products.
METOC Service Bw	Provide Test-Environment for GIS Products	Use of CoreGIS (independent) for quality Management
METOC Service Bw	Ensure interoperability with other systems	Ensure interoperability with MCOP, COREGIS and any other NATO's systems.
METOC Service Bw	Platform Service	The Platform Service Bw provides user-related services, like E-Mail, Collaboration, Portal and Document Handling and cross-functional services for the integration of COI services.
METOC service Bw	Platform Mgmt Service	The Platform Management Service Bw provides required administration functions and capabilities for the operation management.
METOC Service Bw	Client Service	The Client Service Bw includes the provision of client hardware (C3CT user equipment e. g. desktop computer, notebooks) in different specifications e. g. for specific applications or user groups, as well as a standardized software packages.
METOC Service Bw	Infrastructure Service	The Infrastructure Service Bw provides infrastructure as computing power, storage space, IT network and WAN connectivity. The service offers the complete virtualization of the hardware inclusive necessary components for management and operation of hardware

IT-Service	IT-Service-Function	Description
		and software of the infrastructure layer. It is the basis for implementation of additional services like Platform Service Bw.
METOC Service Bw	Infrastructure Mgmt Service	The Infrastructure Management Service Bw provides the operation of the infrastructure and necessary administration functionality.

IT-Service/ IT-Service Modul/ IT-Service Package	Enthaltener IT-Service/ IT-Service Modul	Aufgaben (genutzte Utility)
METOC Service Bw	Platform Service	The Platform Service Bw provides user-related services, like E-Mail, Collaboration, Portal and Document Handling and cross-functional services for the integration of COI services.
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METOC Service Bw	Infrastructure Service	The Infrastructure Service Bw provides infrastructure as computing power, storage space, IT network and WAN connectivity. The service offers the complete virtualization of the hardware inclusive necessary components for management and operation of hardware and software of the infrastructure layer. It is the basis for implementation of additional services like Platform Service Bw.
METOC Service Bw	Infrastructure Mgmt Service	The Infrastructure Management Service Bw provides the operation of the infrastructure and necessary administration functionality.
METOC Service Bw	Meteorological Information Service	The Meteorological Information Service provides a NATO Meteorological and Oceanographic (METOC) data source for the NATO Command and Force Structure. It also provides METOC capability to NATO deployed combined operations. The service is used to provide direct weather support to NATO-led operations by providing coherent, comprehensive, and harmonized weather information and products throughout ACO activities. It provides professional tools for e. g. tactical specialists in operational context.

IT-Service/ IT-Service Modul/ IT-Service Package	Enthaltener IT-Service/ IT-Service Modul	Aufgaben (genutzte Utility)
METOC Service Bw	Environmental Service	The Environmental Service provides mission- and spatial-related analysis, forecasts and spatial evaluations of geographical and environmental conditions. The basic data sets contain GeoInfo-Data and data from the ESRI Data Appliance, which may vary in terms of resolution and coverage. This data should only be used as basic information (no basis for target analysis).

Remark: All lists mentioned here above are non exhaustive.