Final Interface Requirements Specification: 4DWxCube – MET-GATE

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Abstract

The 4DWxCube is designed to integrate MET information into ATM systems. The key objective is to take advantage of enhanced MET capabilities to better support ATM operational needs and decision making. The MET-GATE is the one enterprise level information system that exposes MET services to ATM consumers via a SWIM compliant interface. While Consolidation and Translation FBs generate pan-European consistent MET products, MET-GATE represents the one-stop-shop to access and custom-tailor this information for the individual needs of ATM consumers.

The 4DWxCube Interface Requirements Specification provides the description of the external interfaces of the 4DWxCube. The IRS is derived from MET requirements expressed in SWP 11.02.01-D23 (OSED), -D24 (SPR) and mostly -D25 (INTEROP).

This is the final version of the document and includes the verification status of the requirements developed in SESAR 1 Programme.

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This deliverable consists of SJU foreground and EUMETNET Consortium background. The NWP models and meteorological information used to support the described 11.02 prototypes and validation/demonstration exercises belong to the respective National Meteorological Service.

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Executive summary

This document describes the interface specifications of the MET domain system referred to as the 4DWxCube DS.

The 4DWxCube is designed to integrate MET information into ATM systems. The key objective here is to take advantage of enhanced MET capabilities to better support ATM operational needs and decision making. The MET-GATE is the one enterprise level information system that exposes MET services to ATM consumers via a SWIM compliant interface. While Consolidation and Translation FBs generate pan-European consistent MET ATM products, MET-GATE represents the one-stop-shop to access and tailor this information for the individual needs of ATM consumers.

The 4DWxCube Interface Requirements Specification (IRS) provides the description of the external interfaces of the 4DWxCube with the MET Service Provider side and the 4DWxCube Management functional block and in detail the interface between the MET-GATE and the ATM consumer systems.

Both external interface groups are covered in this document, with an emphasis on the ATM consumers' side that is governed by interoperability with the SWIM network, provided by WP8. External constraints on the MET Service Provider side interfaces are more relaxed but also more heterogeneous due to practical needs introduced through the intrinsic heterogeneity of MET information, products and services.

The IRS is derived from MET requirements expressed in SWP 11.02.01-D23 (OSED), D24 (SPR) and D25 (INTEROP).

Note that in previous versions of the WP11.02 documentation the MET-GATE was called MISC and 4DWxCube referred to the functional block, not the whole domain system. In order to clarify the distinction between the technical system and the domain system, WP11.02 renamed the technical system with an interface to the ATM consumers MET-GATE and the system handling the input information 4DWxCube Management which are both part of the domain system 4DWxCube.

1 Introduction

1.1 Purpose of the document

The purpose of this document is to describe the interface specification of the MET domain system 4DWxCube. 4DWxCube technical specification which focusses on 4DWxCube Management and MET Information Services: Generation, ATM Tailoring and Exchange (MET-GATE) functional blocks (FBs) is covered in the 4DWxCube technical specification 11.02.02-D41 [13] while the Consolidation and Translation FBs, provided by T11.02.02.01, are described in the three MET-TS documents 11.02.02-D38 [10] for local, -D39 [11] for sub-regional and –D40 [12] for network operational user environments (OUE)

The 4DWxCube Interface Requirements Specification (IRS) focusses on the description of the external machine-to-machine interfaces between METSPs and the 4DWxCube Management FB and especially the interface between MET-GATE FB and the ATM consumer systems. The internal interfaces between the functional blocks of the 4DWxCube, namely between 4DWxCube Management and Consolidation, Translation" and MET-GATE FBs which are not specified as they are internal to the MET community but described in a functional perspective in P11.02.01-D33 Section 2.1.1.2 [6].

Both external interface groups are covered in this document, with an emphasis on the ATM consumers' side that is governed by interoperability with the SWIM network, provided by WP8. External constraints on the MET Service Provider side interfaces are more relaxed but also more heterogeneous due to practical needs introduced through the intrinsic heterogeneity of MET information, products and services.

It is crucial for the ATM consumer interfaces to specify and coordinate requirements and technical standards with the SWIM network, in order to ensure interoperability between provided MET Services and ATM consumers. The challenge here is to provide fit-for-purpose services that fulfil current and future requirements of the ATM consumer community.
The MET Service Provider (METSP) interface tackles the issue of high complexity proprietary formats used in the MET community today hide this complexity from the user without imposing harmful dependencies between National Meteorological Services (NMSs) and other METSPs.

This IRS document provides a requirement list of the criteria that the 4DWxCube shall fulfil in terms of interface operations, functionalities, performance and services. It is based on MET requirements expressed in P 11.02.01-D23 (OSED) [7], D24 (SPR) [8] and D25 (INTEROP) [9].

Figure 1 presents the IRS within the hierarchy of the SESAR concept documents, together with the SESAR Projects responsible for their production and maintenance.

Figure 2 shows the interim technical proposal of the SESAR Industrial Support (IS) to allow efficient progress in WP11.02 while OPS WPs and OFAs are progressively clarifying their MET requirements. Therefore some of the specifications are traced back to requirements expressed in the MET deliverables only.

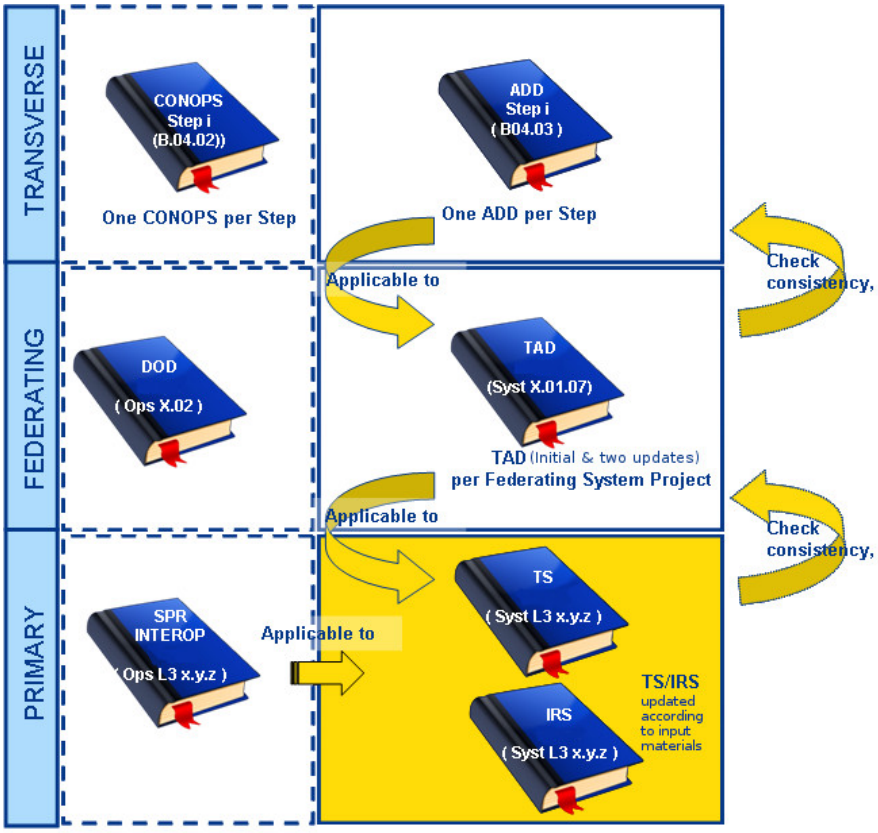

Figure 1: IRS document and dependencies to other SESAR documents

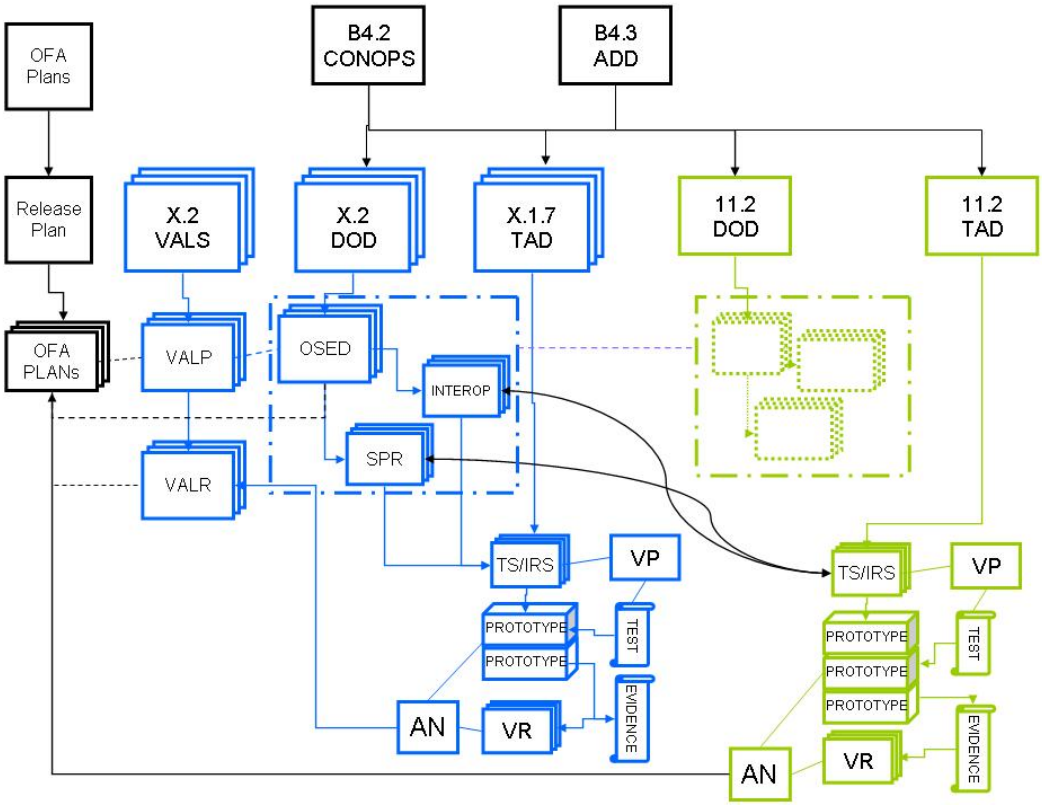

Figure 2: The technical IS proposal

1.2 Intended readership

The intended readership of this document is members of WP11.2 projects who propose the overall architecture of the 4DWxCube and define technical details that allow for the implementation of a proof-of-concept prototype and support its validation. Members of P11.02.01 are vital stakeholders as they represent the MET provider side through specifying MET requirements. The ATM consumers are represented through WP08 members, as the MET-GATE utilizes SWIM compliant interfaces to them, making the MET-GATE a SWIM node.

Therefore beyond WP11.02, projects of WP8 are considered as readership because their activity encompasses modelling MET information and developing MET and airport and airspace ATM Business Information Services, which will be based on MET information exchange requirements & services. From the technical side, WP14 projects will be interested to enable the seamless data exchange of MET data via SWIM to ATM stakeholders as well as other system work packages (WP9, 10, 12, 13, 15) who are interested in interface specification to ensure interoperability with their systems.

Furthermore, it is expected that all Operational Focus Areas (OFAs) and related technical projects which need MET Information Services in support of their operational concepts, have an interest in the interface specifications described in this document, to ensure interoperability with their own information systems.

At a higher level WPB, in particular WP B.04.03, is expected to have an interest in this document in view of the identified MET related Processes & Services. WP B.04.03 projects and relevant ATM System projects will use this document to ensure consistency on MET information usage across the ATM system domains (including Airspace Users). WP16, in particular P16.01, is expected to have an interest in view of the development of any safety related requirements.

1.3 Inputs from other projects

The inputs for the 4DWxCube Interface Requirements Specification are 11.02.01-D23 (OSED), D24 (SPR), D25 (INTEROP) and D33 (TAD) as well as inputs from 11.02.02 – D38 (TS–Local), – D39 (TS–Sub-regional), – D40 (TS–Network) and D41 4DWxC TS (references from [6] to [13]).

1.4 Document Overview

The document is structured as follows:

- Chapter 1 introduces the document as well as each functional block and provides short introductory information including a glossary of terms and a list of acronyms.
- Chapter 2 provides a detailed description of each interface and the involved functional blocks.
- Chapter 3 structures the requirements associated to the 4DWxCube which are traced to INTEROP and SPR requirements of the Operational Projects and OFAs.
- Other requirements associated to the 4DWxCube interfaces are listed in Chapter 4.
- Chapter 5 consists of the references.

The purpose of the IRS is to specify interface requirements to be met by the participating functional blocks. It includes a summarised description of the functional blocks, defines the message structure and protocols which govern the interchange of data, and identifies the communication paths along which the data is expected to flow.

1.5 Requirements Definitions – General Guidance

The requirements are written according to the SESAR requirements and V&V Guidelines [2] and SESAR Template Toolbox [1] that means they comply with the following properties: necessary, complete, clear and concise, consistent, verifiable, traceable and feasible. They have a unique identifier and an explicit title. The compliance with the standardized layout will enable the import of the requirements into the SESAR System Engineering (SE) Tools and Repository.

The requirements are categorized into two interfaces between the 4DWxCube with either the ATM consumer side or the METSP side. These interfaces are described in detail in section 2.

1.6 Functional block Identification

The 4DWxCube DS, its technical architecture is shown in Figure 3, collects MET Information from three categories of METSPs: (i) Meteorological Services with their already existing observation infrastructure and numerical weather prediction capacities, (“General MET Infrastructure” via Port 1), (ii) the local MET providers operating a dedicated MET observation infrastructure at the airport (“ATM-dedicated Aerodrome MET Infrastructure” via Port 2), and (iii) the “Aircraft” (via Port 4) downlinking information to the ground that can further be processed to derive MET observations along the trajectory. This information is handled by the 4DWxCube Management FB.

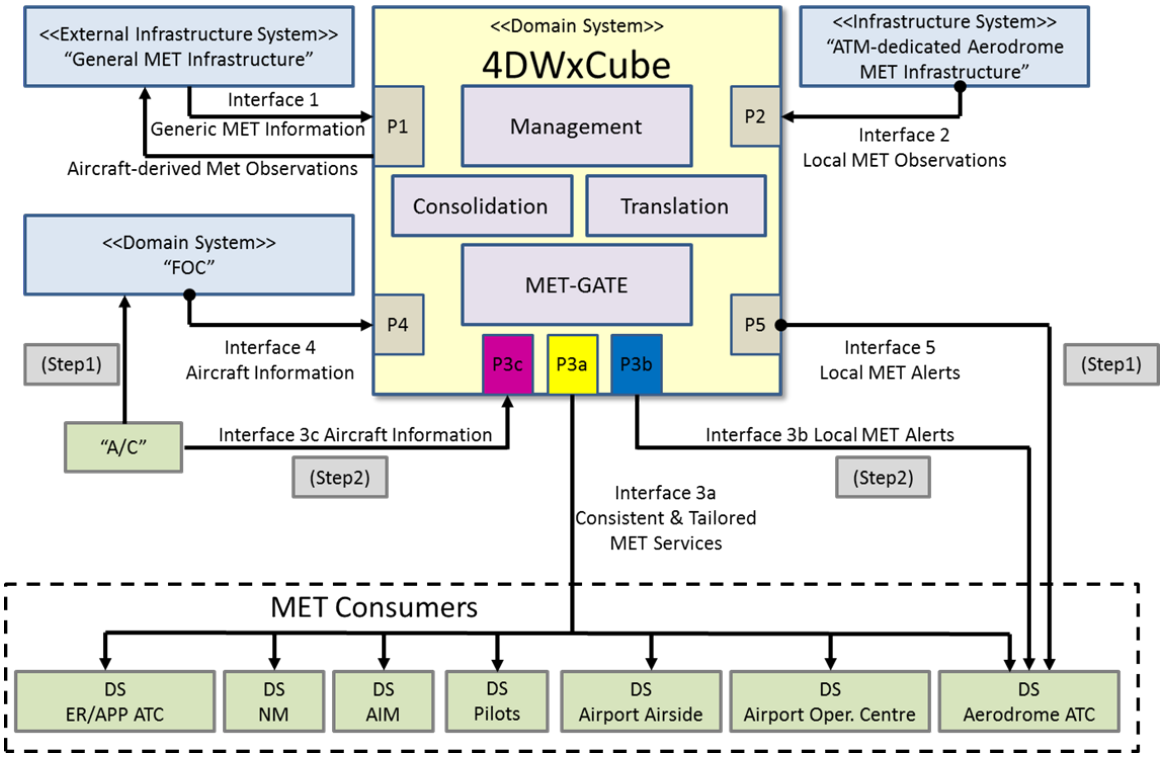

Figure 3: Overview of the 4DWxCube Domain System

Within the 4DWxCube DS, the first step is to manage the receipt of data, to store and to transfer them to Consolidation, Translation or directly to the MET-GATE. The information collected from a distributed infrastructure is consolidated to provide aviation end users with information that is consistent in space over the regional domain and in time from execution to the longest lead time for planning. This will be ensured within a set of functional blocks that are collectively named Consolidation FBs. Consolidated but still generic MET Information shall then be translated to end user requirements.

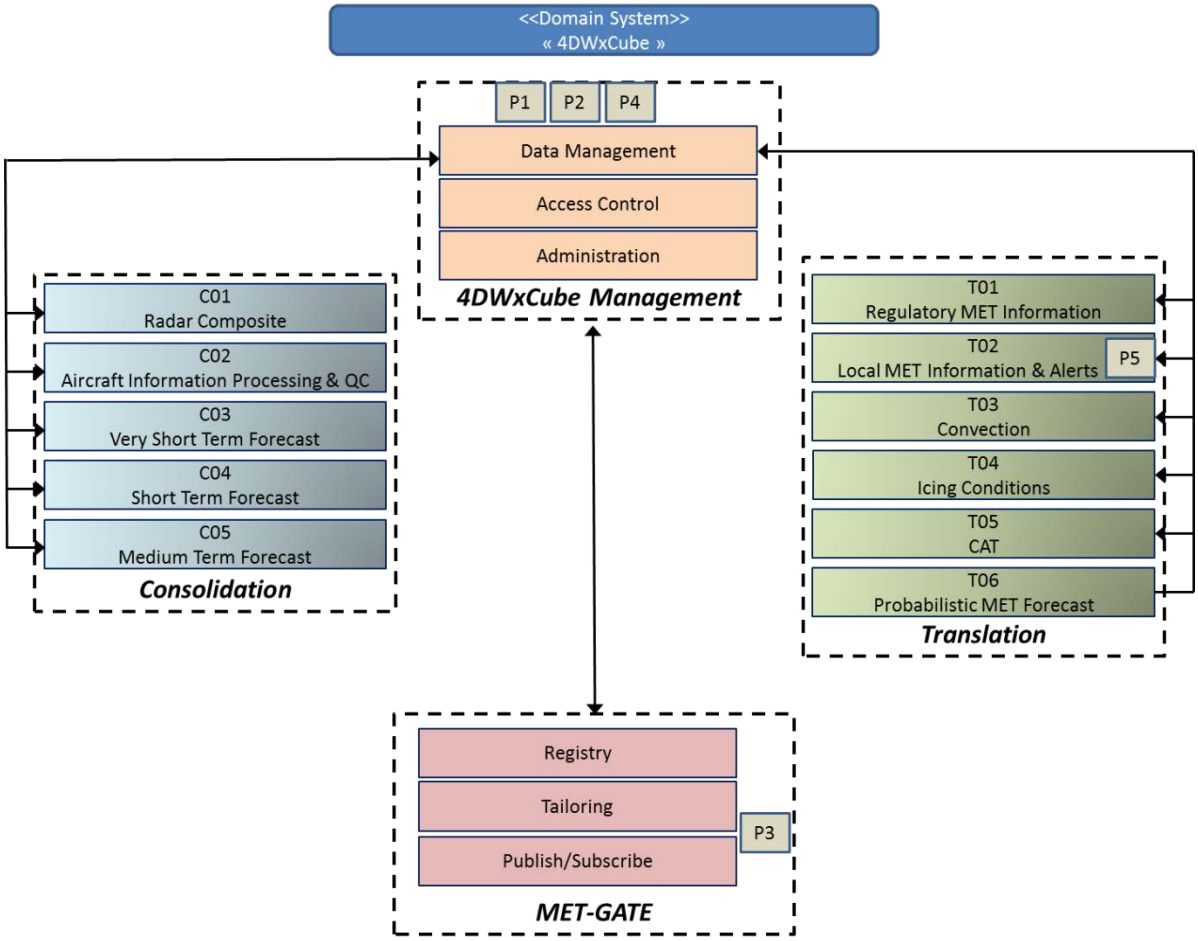

Figure 4: 4DWxCube DS functional block breakdown

A collection of six FBs, named Translation FBs (

Figure *4*) aims to provide specific ATM-MET information. Consolidated and Translated MET Products are send back to the Management FB for further processing and send on to the MET-GATE which distributes MET product Services to aviation end users via Port 3. While ATM users use either the Yellow SWIM profile (P3a) for request/reply and publish/subscribe modes, the Blue SWIM profile (P3b) is used for short latency subscribed warnings or the Purple (P3c) SWIM profile for an uplink to the cockpit.

A direct link (Port 5) is also provisioned for Local MET warnings derived from the “ATM-dedicated Aerodrome MET Infrastructure” observations for the warnings to offer the opportunity of a fast transfer without undue delays to Local end users (e.g. TWR) if requested.

The 4DWxCube IRS specifies two categories of interfaces (Figure 5). Port 3 and 5 are interfaces between the external ATM consumers and the MET-GATE and called “MET service exchange interface”. Port 5 is dedicated to provide MET services to Aerodrome ATC. It is dependent on local infrastructures and technical constraints. Therefore, this interface is not specified in this document, and the MET service exchange interface specifications focus on Port 3. The interface between the 4DWxCube and the METSP outside of the domain system delivering the input via Port 1, Port 2 and Port 4 are considered as a single interface called “MET information service provision interface”. Given

the heterogeneous nature of the data and communications mechanisms some interface specification requirements may only apply to a specific METSP which will then be indicated specifically.

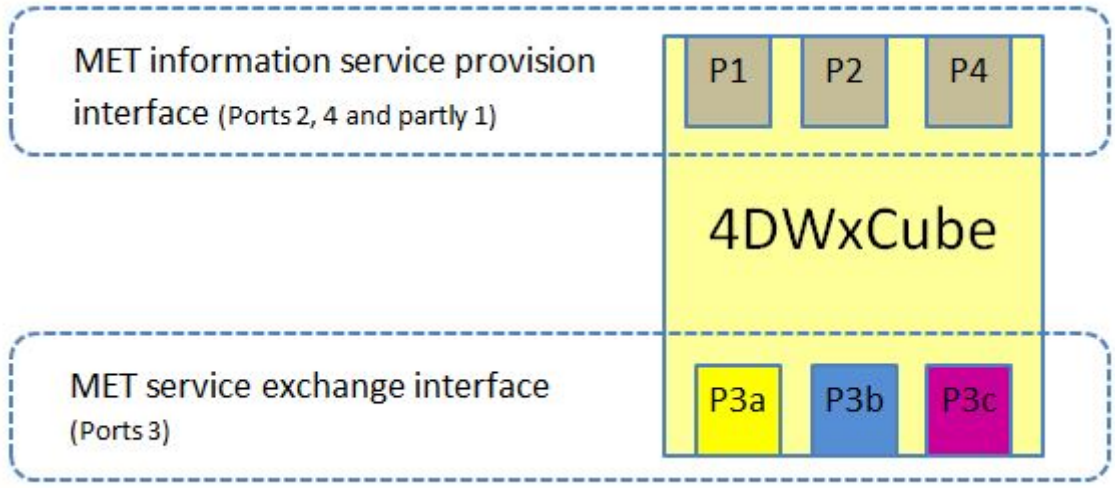

Figure 5: Interfaces described in the IRS

1.6.1 4DWxCube Management FB

The Management FB collects diverse types of “Generic MET Information”, “Local MET Information” and “Aircraft Information” and dispatches the data to the Consolidation or Translation FBs. It also manages the exchange of Consolidated and Translated MET Information between these FBs, as well as the provision of “Aircraft-derived MET Information” produced by “Aircraft Information Processing and QC” FB to the “General MET Infrastructure” via Port1 which is bidirectional to enhance the “Generic MET Observation and Forecast” system. Finally this FB manages the provision of MET Information to the MET-GATE for producing the MET Services.

In general the main role of the Management FB is to perform the data management actions on the provided MET information from multiple distributed MET sources, managing the MET products (e.g. checking validity, distributing to other FBs, storing MET products), access control of all user types (administrator, provider, consumer) and administrative functionalities (e.g. managing metadata and MET product definitions and descriptions, monitoring system behavior, purging deprecated data and services).

The Technical Specifications are described in detail in 11.02.02-D41 [13].

1.6.2 4DWxCube MET-GATE FB

The MET-GATE is a FB serving tailored MET products to ATM systems through the SWIM. Tailoring includes extraction of MET information over a specified geographical domain or flight corridor and suite of observation and forecast products covering the specified planning horizon of the end user. It is fed by consolidated and Translated MET Products send on by Management FB. The MET-GATE’s major functionalities are tailoring by Open Geospatial Consortium (OGC) Web services, handling subscribe/publish services of MET Product retrieval and keeping the registry up to date which are necessary to fulfil the MET-related SWIM Information services. It will enable ATM consumers to subscribe to generic MET-ATM SWIM services, offering access to tailored high-level, user-oriented operational MET services without having to manage specific interaction with the individual METSPs

involved in the provision of MET information. The Technical Specifications of the MET-GATE FB are described in detail in 11.02.02-D41 [13].

1.6.3 MET Service Provider systems

The information input interface combines several FBs which are used either by regional MET Service centres as the WAFC, VAAC, TCAC, the National Meteorological Services (NMSs) (represented in the SESAR programme by EUMETNET members of WP11.02), ATM-dedicated Aerodrome MET Infrastructure (P15.4.9.c) and Flight Observation Centres who provide Aircraft derived information. The 4DWxCube Management FB collects and receives the provided information. The MET information produced by the METSP are e.g. raw radar data, numerical weather prediction forecast, deterministic or ensemble data, for various time ranges, aircraft measurements and on-board observations as well as aerodrome dedicated MET observations and measurements. The METSPs can receive consolidated MET information e.g. aircraft derived MET observations from the 4DWxCube which are used to enhance the MET forecast information. The interface (Port1) has been described as a two way interface (TAD, [6]) but has not been specified yet as it is suggested to use Port 3c only to retrieve MET products from the 4DWxCube by any consumer.

Besides NMSs, commercial METSPs or local MET information providers may implement the MET information service provision interface to provide MET information including Aerodrome related MET information to the 4DWxCube. Furthermore, Airline Operators belong to the group of METSPs to provide on-board measurements and need to implement the interface. However, it is envisaged these aircraft observations and measurements may be provided via the SWIM interface (Port 3c).

1.6.4 ATM consumer systems

ATM consumer systems are developed by the ATM consumers and are specific to a type of activities. An ATM consumer system uses data supplied by the MET-GATE operating machine-to-machine; there is no Human Machine Interface (HMI). All ATM consumer systems can be considered to support SWIM standard protocols, decoupling implementation details between MET-GATE and ATM consumer system.

The list below presents typical ATM consumer systems as assumed will be using the 4DWxCube and therefore implement the interface:

a) Applications for Airlines:
   - Client Systems:
     - FOC/AOC: Flight Operation Centre - Airline Operation Control systems
     - FOC-HCC: Flight Operation Centre - Hub Control Centre systems
     - Aircraft FMS: Flight Management systems
   - Expected transaction volume: support for up to 30.000 flights/day

b) Applications for ANSPs (En-route, Approach)
   - Client Systems:
     - ATC-ER: En-route Air Traffic Control systems
     - ATC-LFTM: Local Traffic Flow Management systems
     - ATC-APP: Approach Air Traffic Control systems
   - Expected transaction volume: support for up to 670 sectors in total (approach or en-route)

c) Applications for Airports (Tower, airport)
   - Client Systems:
     - ATC-TWR: Tower Air Traffic Control systems
     - AOP: Airport Operations Plan systems
   - Expected transaction volume : support for up to 430 Aerodromes

d) Applications for Network
   - Client Systems:
     - NM: European Network Management systems
   - Expected transaction volume: support for up to 1 subscriber

1.7 Glossary of terms

Note: the source column references the source of any formal terms. Where the source column is blank, this indicates that the terms has been agreed informally amongst the 4DWxCube design sub-group.

Table 1: List of terms

Term	Definition	Source
Catalogue	Set of all the MET Product Descriptions accessible for ATM consumers	
Consolidated MET Product	MET Information (from one or more sources) that has undergone consolidation to produce a consistent, common harmonized and seamless meteorological view at the European scale.	
Data item	Statement of observed and/or forecast meteorological conditions related to a specific time (or period) and location.	
Discovery	Action to search within the catalogue to find out what MET product is available and what are characteristics of each MET product.	
Domain System	Element of the technical architecture	
Functional Block	Element which equals to or is part of a domain system.	
Metadata	Information which describes a data item. Some metadata are mandatory for all products, e.g unique identifier, common name; others are natural to a product, e.g geographical region for a forecast map.	

Term	Definition	Source
MET-GATE	A functional component of the 4DWxCube serving tailored MET Information and services to ATM systems through SWIM compliant webservices.	
MET services	Those facilities and services that furnish aviation with meteorological forecasts, briefings and observations as well as SIGMET information, VOLMET broadcasting material and any other meteorological data provided by states for aeronautical use. *Note: in order to have a definition in line with SESAR terminology, the following new definition is suggested by P11.02.01: MET Service = Operational, application or information service in relation to the provision or use of MET information*	ICAO Doc 9713 New Proposed by P11.02.01
Meteorological information	Meteorological report, analysis, forecast, and any other statement relating to existing or expected meteorological conditions. *Note: It is suggested by P11.02.01 to add 'data' in this definition*	ICAO Annex 3 ICAO Doc 9713 WMO, No. 182
MET product	MET Information provided to the 4DWxCube which is specified by its metadata; therefore it contains metadata and data items.	
MET Product Definition	Static metadata associated with a specific MET Product that MET Service Providers deliver to the 4DWxCube. This acts as a template for the generated Product Description.	
MET Product Description	List of attributed product properties associated to a MET Product that ATM consumers shall use to access the MET Products. Each product property shall be attributed with values reflecting the content of the particular product item.	
MET Product Specification	Description of a specific MET Product properties to inform users of what the product delivers, its requirements and constraints. Within the 4DWxCube it should also describe the key elements of the data and metadata that must be provided.	

Term	Definition	Source
Meteorological Service Provider	The institution or organisation that provides MET services (see above the following the SESAR terminology definition proposed by P11.02.01)	
Polling	Operation to regularly check the status of another system. In the context of this document, the term polling applies to ATM consumers who check periodically if new data is available in the 4DWxCube.	
Query	(Full-text) Heuristic search in a catalogue, filtering a set resulting in a smaller set	
Request	request for a particular data item using a unique identifier	
Retrieval	A query or request resulting into receiving a suitable reply, i.e. a product, a metadata file, or a data item.	
Significant weather conditions	Degraded weather conditions, which have a significant negative impact on operations unless an appropriate response is organized. This would be e.g. deep convective clouds, thunderstorms, turbulence or icing.	Proposed by P11.02.01
Tailored MET Product	MET Information (from one or more sources) that has undergone consolidated, translated and subsequently tailored to the need of ATM Users by the 4DWxCube. Tailored MET Products are specified by their metadata, therefore contain metadata and data items.	
Translated MET Product	MET Information (from one or more sources) that has undergone translation to produce an ATM specific view of meteorological phenomena.	
Tropical Cyclone Advisory Centre (TCAC)	A meteorological centre designated by regional and international air navigation agreement to provide advisory information to meteorological watch offices, area control centres, flight information centres, world area forecast centres and international OPMET databanks regarding the intensity, position and movement of tropical cyclones.	ICAO Annex 3

Term	Definition	Source
Update cycle	Time interval between publication of updates; for products that are updated on a regular basis (e.g. hourly refresh rate of observations or forecasts)	
Update interval	time interval between updates of the MET product delivery: at periodic intervals (with specified update rate), as soon as the data is available or as soon as the data is available and a condition is satisfied (with specified criteria)	
Volcanic Ash Advisory Centre (VAAC)	A Meteorological centre designated by regional air navigation agreement to provide advisory information to meteorological watch offices, area control centres, flight information centres, world area forecast centres and international OPMET databanks regarding the lateral and vertical extent and forecast movement of volcanic ash in the atmosphere following volcanic eruptions.	ICAO Annex 3

1.8 Acronyms and Terminology

Table 2: List of acronyms

Term	Definition
4DWxCube	Four-dimensional weather cube, the domain system representing MET in SESAR
AIRM	ATM Information Reference Model
AIRMET	AIRman's METeorological Information
ANSP	Air Navigation Service Provider
AOC	Airline Operation Centre
AOP	Airport Operation Plan
API	Application Programming Interface
APP	(Air Traffic Control) Approach
ATC	Air Traffic Control
ATM	Air Traffic Management
CAT	Clear Air Turbulence
CTR	ConTRol zone (control area between the ground and a given altitude around an aerodrome)
DOD	Detailed Operational Description
DS	Domain System
FB	Functional Block
FIR	Flight Information Region
FMS	Flight Management System
FOC	Flight Operation Centre
GUID	Globally Unique Identifier, a 32-character alphanumeric code used for unambiguous identification purposes.
HCC	Hub Control Centre

Term	Definition
HMI	Human Machine Interface
HR	High Resolution
ICAO	International Civil Aviation Organisation
INTEROP	Interoperability
IRS	Interface Requirements Specification
IS	Industrial Support
ISRM	Information Service Reference Model
iWXXM	ICAO Weather Exchange Model
LFTM	Local Traffic Flow Management
LA	Limited Area
LNM	Local Network Manager/Management
MET	Meteorology/Meteorological
METAR	Meteorological Aerodrome Report
MET-GATE	MET Information Services: Generation, ATM Tailoring and Exchange
MISC	MET Information Service Composition (deprecated name, see MET-GATE)
MR	Medium Resolution
MT	Medium Term
NM	Network Manager/Management
NOP	Network Operation Plan
OCC	Operational Control Centre
OFA	Operational Focus Area
OGC	Open Geospatial Consortium
OSED	Operational Service and Environment Definition
OUE	Operational User Environment

Term	Definition
QC	Quality Control
QoS	Quality of service
RNM	Regional Network Manager/Management
SE	System Engineering
SESAR	Single European Sky ATM Research
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU
SHA	Secure Hash Algorithm
SIGMET	SIGnificant METerological information
SIGWX	SIGnificant Weather Chart
SJU	SESAR Joint Undertaking
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking
SOA	Service Oriented Architecture
SPR	Safety and Performance Requirements
ST	Short term
SWIM	System Wide Information Management
SWP	Sub work package
TAD	Technical Architecture Description
TAF	Terminal Aerodrome Forecast
TCA	Tropical Cyclone Advisory
TMA	Terminal Manoeuvring Area
TREND	Trend forecast in METAR message
TS	Technical Specification
TWR	(Air Traffic Control) Tower

Term	Definition
UC	Use Case
VAA	Volcanic Ashes Advisory
VST	Very Short Term
WMO	World Meteorological Organisation
WP	Work Package
Wx	Weather
WXXM	Weather Exchange Model

2 Functional block(s) and Interface(s)

2.1 Functional block Overview

The 4DWxCube consists of a number of FBs, out of which the majority are internal to the 4DWxCube, while others are exposed to MET service providers and MET-ATM service clients.
Interfaces between Consolidation, Translation and Management FBs are internal to WP11.2, implementation dependent and, hence, do not need to be further specified for the needs of this document (functional view is provided in 11.02.01-D33 [6]).
This document focusses on the boundary interfaces. On the one hand there is the MET information service provision interface, on the other hand the MET service exchange interface (Figure 5).

The main purpose of the MET information service provision interfaces is to allow NMSs, MET Organisations, Local MET information providers and Aircraft, summarised as METSPs, to provide information to the 4DWxCube for further consolidation, translation, tailoring and dissemination to consumers.
ATM consumer use the MET service exchange interfaces which is responsible for delivering the resources (both data and services) published by registry. There are likely to be a significant number of individual services for the provision of the MET information. The IRS states that where possible the client interfaces should use OGC standards.

If a METSP has a requirement to extract information from the 4DWxCube, they can receive that information via Port 1 or utilise the various consumer interfaces.

General requirements that are assumed for 4DWxCube's boundary interfaces:

- use of standard secure internet protocols (https, ftp over tls, ssl …),
- provide SWIM compliant services to the ATM consumers,
- use of OGC standards for data transfer, exceptions need to be duly justified,
- implement authentication of MET service providers, ATM consumers using certificates,
- use of standard technology for metadata encoded (most likely) in XML
- metadata are bundled with data items building a MET product.

The overall architecture follows the service oriented architecture (SOA) paradigm in order to minimize dependencies between METSP and MET-ATM consumers, and to support the self-description of services and product offerings. The SWIM compliance requirement, including the use of OGC standards, is mandatory for the client side interfaces.

The Service view of the 4DWxCube has already been introduced in the Technical Specifications of the 4DWxCube document [13] which describes in detail how these services are embedded in the 4DWxCube architecture.

2.2 Interface: MET information service provision

The MET information service provision interface is utilized to deliver MET information to the 4DWxCube. This interface also provides a two-way communication between the METSP and 4DWxCube. MET products, as far as they can be pre-computed, are published to the 4DWxCube on a regular basis. On the other hand processed MET information in the 4DWxCube, like Consolidated MET Products, are provided to the METSP to enhance the forecast capabilities by using aircraft

derived MET observations. This interface, since it is internal to WP11.2 is not strictly bound to using OGC standards, even though exceptions must be duly justified and documented properly.

The update interval of MET products depends on properties of the MET products provided. Properties include MET product inherent properties like regularly computed forecasts, significant weather warnings on event or browsing historical data, and technical properties like e.g. amount of data transfer in comparison to network band-width, number of requests per MET product and the like.

2.2.1 MET Product Definition

A MET Product Definition is static metadata associated with a specific MET Product that a METSP delivers to the 4DWxCube. This acts as a template for the generated MET Product Description provided in the MET service exchange interface.

A MET Product Definition contains metadata provided by a METSP or created by the Consolidation / Translation process which is approved by the 4DWxCube Governance Board. All MET products need to be suitably defined so that they provide metadata; including:

- unique identifier of the METSP (originating centre)
- identification of the product
- description of the product
- extent of the product
- format of the product
- usage constraints
- observed/forecast parameters
- update regime
- lifespan
- associated MET Product Specification

A MET Product Definition may relate to a specific product from an individual METSP or relate to a regulated product type, e.g. TAF or METAR that can be delivered by multiple METSPs. Note that the 4DWxCube itself is considered as a special type of METSP as it is responsible for the generation of Consolidated and Translated Products which also require a MET Product Definition.

The originating centre is a unique identifier of the responsible centre or organisation that created the product. A fixed set of identifiers shall be defined and documented to allow for automated use.
This information shall be held on the originator CI_ResponsibleParty and refer to a controlled vocabulary. Possibly use the WMO Common Code Table C-11 as the list of acceptable originating centres.

Further specific details are declared directly in the requirements to provide information on the proposed standards to be used.

2.2.2 METSP Registration Service

A METSP has the opportunity to register for being an authenticated MET information service provider of the 4DWxCube. The 4DWxCube Governance Board approves on the proposed registration. As soon as it has been approved the METSP receives access rights.

2.2.3 METSP Product Management Services

The METSP Product Management Services provides a METSP with the ability to register, manage and unregister product definitions with the 4DWxCube once the MET Product Definition has been approved by the 4DWxCube Governance Board. It also allows the METSP to review the usage of the products that it supplies.

2.2.3.1 Register MET product

A METSP adds a new MET Product Definition to the catalogue/registry. A new MET product definition is proposed and agreed with the 4DWxCube Governance Board. The METSP provides details of the update cycle for the associated MET product.

2.2.3.2 Recall MET product / Send alert

A METSP sends a message for MET products that were uploaded but should not be provided to ATM consumers because of e.g. defective data items. The METSP recalls the MET product by marking them as invalid. This mechanism can be used to, maybe temporarily, prevent products from being issued to clients, without necessarily deleting the actual data items. In case where the check of the data items indicates that the data items are correct, the recall status can be deleted and the data items delivered to the end users without uploading them again to the 4DWxCube.

2.2.3.3 De-register MET product

The MET product management service offers the opportunity to delete a MET product provision e.g. when it cannot be produced anymore or it is not necessary anymore because of a replacement of a higher quality product.

2.2.3.4 Request MET Product Usage Log

A METSP queries subscriptions and requests for MET products that it supplies. This may include the current subscriptions for statistical and development purposes (number of subscribers, area, time, resolution, update rate of interest if available) or a log of MET products delivered through the MET service exchange interface.

2.2.4 METSP Observation Retrieval Service

The Observation Retrieval Service provides a mechanism for a METSP to retrieve MET Observation information from the 4DWxCube. This interface allows the METSPs to retrieve the Consolidated MET Products generated by CO2 Aircraft Information Processing & QC (outgoing information flow to the Generic MET infrastructure via Port 1). Each request shall provide

- The unique Identifier for the METSP. This is the identifier provided by the 4DWxCube Administrator when the METSP is registered with the system.
- The unique identifier for the MET Product Definition that describes the MET information to be retrieved.
- Geographical extent information

The Observation Retrieval Service does not have to be SWIM compliant.

2.2.5 Upload MET product

A METSP uploads MET products as delivery service of MET information and associated meta data to the 4DWxCube. That means the following information have to be provided for a successful upload:

- the unique identifier for the METSP
- the unique identifier for the MET product definition
- a unique identifier for the MET information provided
- the MET information
- metadata (included in the MET information or as separate item)

2.3 Interface: MET service exchange interface

The MET service exchange interface provides SWIM compliant functionality through which ATM consumers connect and access MET information. In this way MET products are delivered to the user community. This interface allows for two-way communication in order to answer interactive requests as well as scheduled delivery or the reception of aircraft observations as shown in Figure 3. The MET-GATE supports SWIM compliant publication/subscription pattern services, i.e. it accepts configurable subscriptions and publishes the configured responses. Configuration options are product specific and include time interval and triggered on event. For other use cases it is also possible to interact with MET-GATE using a request/reply protocol.

Configuration parameters for subscriptions, e.g. time interval, can depend on properties of the MET products provided. Configuration parameters include a MET product's intrinsic properties, like forecast interval for regularly computed forecasts, or event type for significant weather warnings. Technical parameters like availability of a service are part of service metadata. All data access functionality is based on OGC standards.

Services defined in the MET service exchange interface allow data discovery, product specification and product retrieval based on request/reply and publication/subscription type communication patterns.

2.3.1 MET Product Description

The associated MET Product Metadata, the MET Product Definition and the METSP description, are combined to produce a MET Product Description that fully describes the instance of the MET Product that has been uploaded and processed. The MET Product Description provides a reference to the location of the stored data item. It is published to the 4DWxCube Registry where it can be accessed by other processes in the 4DWxCube. The 4DWxCube Registry entry provides a summary of the MET Product Description to support fast Discovery of products and allows access to the full MET Product Description containing all metadata information. Metadata should comply with the WMO Core Metadata profile.

In general, the set of properties that constitutes a MET Product Description depends on the MET product itself. Nevertheless, some generic properties shall be supported by all MET products handled by the MET-GATE. These metadata are summarized in Table **3**.

Table 3: MET Product Description: mandatory metadata

Unique identifier	surrogate key (e.g. a GUID) that identifies a product description, not a specific file or a data item; the machine identification of a product description
Creation time	date and time of creation of a specific product
Common name	human-readable name that identifies the product (for human readers, only)
Data format	type of file or access method
Description	plain text information describing the data item for human readers.
Update regime	update frequency
Lifespan	how long the MET product is valid for
Unique identifier of the	identifier of the responsible centre or organisation that created the product.

METSP	
Usage constraints	any constraints that the consumer need to know for usage of the MET information
Associated MET Product Specifications	parameters that may be used to influence the content of a product which are mandatory like contained observed or forecast MET parameter, extent of the product
Optional properties	any information that are necessary to descript the MET Product but not applicable for any MET Product

Furthermore, there are associated metadata elements that are necessary to be specified, but they are not applicable for every MET product and therefore optional. Some examples are listed in Table 4.

Table 4: MET Product Description: natural, product dependent metadata

observation time/interval	point in time or time interval in which meteorological observations have been carried out that were used in the computation of the product
validity time/interval	point in time or time interval described by a MET product (e.g. a weather forecast that is valid from 12 to 13 o'clock)
update interval	time interval between regular updates of a MET product (e.g. a weather forecast that is updated every hour)
geography	geographical location, area or volume (e.g. polygon or shape) that specifies the outer bounds covered by a MET product; geography must specify coordinate system, geodetic datum, grid parameters and the like, exhaustively (i.e. to specify a location on earth and the horizontal and vertical coverage unambiguously)
resolution	adequate measure of level of detail, depending on the product

2.3.2 MET Service Description

Services can either deliver MET products provided by a METSP or Consolidated and Translated MET Products directly or send a tailored version of those MET Products if designed to do so. Each service is associated to a Service Description that have been defined and agreed between the 4DWxCube Governance board, the Provider(s) and the Consumer(s). The Service Description includes

- organisation information (author, publisher of the service)
- details on the MET Product Definitions that it operates on
- details of the MET Product Specifications that it delivers
- collection of service operation information
    - endpoint address (The end point must be accessible from the 4DWxCube)
    - binding information
        - input parameters
        - input constraints
    - output formats

The Service Description information is entered into the 4DWxCube either by providing a correctly formatted XML document (ISO 19119 definition of a Service) or by entering the information through a form based interface. Each Service should be able to provide some form of capabilities document to describe its parameters.

2.3.3 Discovery Service

An ATM consumer uses this service to discover what MET products are available through the MET-GATE. The Discovery service queries the registry using standard parameter(s) and returning MET Product Descriptions and associated Services for delivery, or Service Descriptions and the associated MET products with the related MET Product unique identifiers.

MET Service Descriptions provide details on how to access the service and what parameters can be provided when requesting tailored MET products. It is only possible to access tailored MET products through their associated services.

The Discovery Service responds to a user request providing one or more criteria for filtering the information returned. The filtering criteria can include

- object type – product type or service type
- one or more keywords
- partial strings which may be contained in the name or description of the object
- a geographical area by name or by explicit lat/lon coordinates.
- a time horizon
- MET Product Specifications

2.3.4 Request/Reply Service

This service type fulfils the ATM consumers' need of performing an ad-hoc request. There may be a number of services that satisfy this requirement. This service consists of the supply of "Tailored MET-ATM" products, selected according to a set of parameters - which in general shall have been defined according to the outcomes of an interrogation of the discovery service.

An ATM consumer requests a MET Service to receive a single or a collection of MET products according to the outcomes of an interrogation of the MET Discovery service or according to the information found on the SWIM registry. According to its needs, the ATM consumer requests MET products identified by its unique identifier and specified by its properties defined in the MET Product Description. The MET Product Description includes product specific properties that can be used to formulate a data request.

The MET-GATE sends back the requested data item or collection of data items. It collects data items of each MET product included in the request, compiles them into one message and pushes it to the ATM consumer immediately.
If the MET product requested by the ATM system is not available, the MET-GATE will notify the ATM consumer.

2.3.5 Subscription Service

This service consists of the configuration of a subscription to a Service on the MET-GATE. The parameters needed by the ATM consumer to use this service shall in general have been defined

according to the outcomes of an interrogation of the discovery service. There may be a number of services that satisfy this requirement.

The subscription service is used by ATM consumers to request MET products at a specific time, periodically or on event. In contrast to the “ad hoc data request” of the Request/Reply Service, the time and update interval of the product delivery needs to be specified in the subscription. Therefore, delivery time and update interval of data delivery belongs to the mandatory parameters of a subscription.

The subscription service combines several sub-services which allow the ATM consumer to create, issue and modify its subscription.

The ATM Consumer needs to provide:

- user identifier
- return specifications to which to return the information to (e.g. URL). This “location” must be accessible from the 4DWxCube. It is further called URL as an example.
- details of the event on which to return the information (e.g. periodic 30 minutes, on update)
- publishing criteria (always, source changed, updates only)
- publication mode (polling, notification)
- start time for the subscription (optional)
- end time of the subscription (optional)
- termination time for the subscription (optional)
- MET product’s unique identifier with its description
- service specific parameters

The service specific parameters have been described in the associated Service Description.

The ATM Consumer can issue an unsubscribe request to a specified service to terminate a pre-existing subscription. Therefore the subscription identifier needs to be provided by the ATM consumer.

2.3.6 Publication Service

This service provides automatic supply of Tailored MET Products following the creation of a subscription. That requires that the ATM consumer has previously subscribed to the service and chosen a list of MET products associated to a subset (time, area, MET elements) and defined the update interval. Two types of publication are distinguished.

2.3.6.1 Periodic update

This case consists of a periodic publication of a collection of Tailored MET Products. The user defines the update rate.

The ATM consumer has created the subscription with the mandatory properties which are necessary in the Subscription Service. Periodically, the MET-GATE collects the specified MET products and performs the requested Tailoring processes, compiles them into one message and pushes it to the ATM consumer URL configured in the subscription.

The periodic Publication Service provides two modes of supply called polling and notification, selectable by the ATM consumer and dependent on the type of connection used. Notification means that each time MET products are available for an ATM consumer the MET-GATE will either send him a notification or directly the subscribed MET products. Polling means that the ATM consumer will periodically send a request to the MET-GATE to check if MET products are available.

The periodic Publication Service provides push and pull supply modes. Push mean either pushing a data item to a specific place specified in the subscription or the MET-GATE sends a notification (push) and the user then pulls the service content (pull after notification). Pull could mean the MET-GATE prepares the information for download and the ATM consumer pulls it from the accessible platform.

2.3.6.2 On event update

This case consists of the publication of a Tailored MET Product as soon as it is available. The Subscription Service delivers the Tailored MET Product, as defined by the original subscription, when any of the associated Consolidated or Translated MET Products have been updated or due to a specific criterion like a threshold reached when the Translated MET Product has been produced.

The update on event publication of a subscribed MET product is performed as soon as it is available or when a criterion is satisfied.

The ATM consumer has created the subscription with the mandatory properties which are necessary in the Subscription Service. The subscription service configuration specifies whether a product must be sent either each time it is available (updated) or only when specified criteria are fulfilled. Every MET product sent through this service must be associated with the date at which it was produced, its validity period and the date at which it should be updated.

The Update on event Publication Service is performed like the Periodic Publication Service but the reply/delivery is based on product specific events (where applicable, e.g. occurrence of severe weather for a severe weather warning) not on regular time intervals.

2.3.7 European ATM MET Services

WP 08 has defined as number of specific MET Services that have to be provided by the 4DWxCube. These services are described in the series of European ATM Service Description documents in the WP_08 section of the SJU extranet [15].

The following sections provide a brief description of each of the services. More detail can be found in the associated links.

2.3.7.1 European ATM Service Description for AirportMETForecast Service

The service covers the dissemination of customized airport meteorological forecasts over SWIM. Service design has been performed in the context of Service Activity SVA003 entailing Airport Meteorological and Surface Contamination services [16].

2.3.7.2 European ATM Service Description for the AirportMETInducedCapacityReduction Service

The Airport MET Induced Capacity Reduction Service provides an indication of the maximum airport capacity achievable considering only the current and near term weather conditions, and thus providing useful input to the overall capacity computation made by DCB at the airport. This service is

consumed by the airport operations centre. The supplier of the service is the Airport MET Provider [17].

2.3.7.3 European ATM Service Description for AirportMETNowcast Service

The AirportMETNowcast Service provides a Meteorological prediction of the weather at the airport concerned, at a small interval in the future. This service is consumed by a number of different actors with the airport. The supplier of the service is currently the IWIS (Improved Weather Information System) [18].

2.3.7.4 European ATM Service Description for the AirportMETObservation Service

The AirportMETObservation Service covers the dissemination of customized airport meteorological observations over SWIM. Service design has been performed in the context of Service Activity SVA003 entailing Airport Meteorological and Surface Contamination services [19].

2.3.7.5 European ATM Service Description for METAR Service

The METAR service covers the dissemination of standard ICAO METAR bulletins over SWIM. Service design has been performed in the context of Service Activity SVA003 entailing Airport Meteorological and Surface Contamination services [20].

2.3.7.6 European ATM Service Description for the SNOWTAM Service

The SNOWTAM service covers the dissemination of standard ICAO SNOWTAM over SWIM. Service design has been performed in the context of Service Activity SVA003 entailing Airport Meteorological and Surface Contamination services [21].

2.3.7.7 European ATM Service Description for the TAF Service

The TAF service covers the dissemination of standard ICAO TAF bulletins over SWIM. Service design has been performed in the context of Service Activity SVA003 entailing Airport Meteorological and Surface Contamination services [22].

2.3.7.8 European ATM Service Description for the METHazardEnrouteForecast Service

The METHazardEnrouteForecast service defines an information service for exchanging Forecasts and Nowcasts of significant weather phenomena. The service is realised in the publish/subscribe

message exchange pattern and to this end defines subscribe, unsubscribe and publish operations. The subscription mechanism additionally allows for fine-grained filtering [23].

2.3.7.9 European ATM Service Description for the METHazardEnrouteObservation Service

The METHazardEnrouteObservation service defines an information service for information exchanges for Observations of significant weather phenomena. The service is realised in the publish/subscribe message exchange pattern and to this end defines subscribe, unsubscribe and publish operations. The subscription mechanism additionally allows for fine-grained filtering [24].

2.3.7.10 European ATM Service Description for the METGriddedForecast Service

The METGriddedForecast service defines an information service for information exchanges for Forecasts of meteorological parameters (such as wind, temperature or relative humidity). Output of this service is a 4D grid. The service is realised in the publish/subscribe message exchange pattern and to this end defines subscribe, unsubscribe and publish operations. The subscription mechanism additionally allows for fine-grained filtering [25].

3 Detailed Interface Requirements

In the following sections, the IRS requirement identifiers are developed as follows:

MET IRS document: REQ-11.02.02-IRS-ABCD.XYZZ:

- ABCD = 4DWC as acronym for the main functional block this document describes
- XYZZ = number unique for each ABCD combination with:
  - X indicating if the requirement is of general nature, applicable for any interface with the 4DWxCube (0), MET information service provision (1) and MET service exchange (2) interface
  - YZZ = consecutive numbering

The requirements should be traced back to the requirements of the Operational Work packages and Projects and therefore their INTEROP, SPR and OSED documents.

There are no requirements specified for the MET information service provision interface

Often, the needs of the ATM consumer systems are not expressed properly in formal requirements. In these cases the identified needs are specified in the MET-INTEROP and MET-SPR requirements which will act as IRS requirement traces. There are further requirements which cannot be traced at all. However, those are also included in this chapter as well because they are evaluated as crucial and necessary though mostly very general. The interface requirement specifications do not include any technical implementation details.

At the end of the SESAR 1 Programme the requirement status is selected to be either ‘validated’, ‘deleted’ or ‘in progress’. System requirements have not been validated as operational requirements have been. Nevertheless, the status is named ‘validated’ if the system requirements have been verified successfully. The status of a requirement has been set on deleted for any requirement that has not been verified successfully due to the unavailability of input from the outside or other stakeholders. Requirements that have been partially verified successfully are marked as ‘in progress’ because some effort (e.g. implementation of functionalities in the prototypes) is needed to complete the verification process. Details of the verification results are reported in [14].

‘Deleted’ does not include ‘not valid anymore’, all requirements are evaluated as necessary and important.

The offered services also belong to the functionalities of the 4DWxCube. Therefore some interface specifications are similar in content to those requirements expressed in 11.02.02-D41 [13].

3.1 General Requirements

The functional blocks have been introduced in section 1.6 and the 4DWxCube FBs are described and specified in detail in 11.02.02-D41 [13]. The external functional blocks are very diverse. There are various METSP systems as well as multiple ATM consumer systems. The MET community already exchanges MET data among themselves in meteorological networks. The interface to the ATM consumer systems follows the developed SWIM network standards.
[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.0007
Requirement	The 4DWxCube shall communicate with external entities primarily through machine-to-machine interfaces.
Title	<Communication – machine to machine

Status	<In Progress>
Rationale	<Necessity to ensure interoperability>
Category	<Interoperability>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.0001
Requirement	All communication between the 4DWxCube and all users shall use standard Internet protocols, if applicable based on IP v4 and v6.
Title	<Communication - standard internet protocols>
Status	<Validated>
Rationale	<Necessity to ensure interoperability>
Category	<Interoperability>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.0002
Requirement	All communication between the MET-GATE and all users shall use secure standard Internet protocols (https, ftp over tls or ssl).
Title	Communication - secure internet protocols
Status	<Validated>
Rationale	Necessity to ensure secure communication.
Category	<Security>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.0003
Requirement	Any user shall be authenticated using the registration certificate before allowing communication with the MET-GATE.
Title	Communication - authentication of all partners
Status	<In Progress>
Rationale	On the provider-side only authorities and authorised partners are entitled to publish information. It is crucial that products can be traced to their

	originating centres.
Category	<Interoperability><Security>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.0004
Requirement	The communications between the MET-GATE and any user shall be encrypted except when duly justified.
Title	Communication - encrypted protocols
Status	<In Progress>
Rationale	Crucial to ensure data integrity and prevent data manipulation.
Category	<Interoperability><Security>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.0005
Requirement	Users shall be able to retrieve their own access permissions.
Title	Communication - access permissions
Status	<In Progress>
Rationale	A met provider, authorised met service provider, and a client should be able to query the permissions granted to them.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	TBD	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.0006
Requirement	Any user shall be able to apply for registration.
Title	First contact - ask for registration
Status	<In Progress>
Rationale	MET service providers and ATM users need to do the first contact before MET-GATE can register and allow or reject communication.
Category	<Functional><HMI>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.1 Interface MET information service provision Requirements

The following interface requirements specify the communication and connection between the METSPs systems and the 4DWxCube Management FB which has been described in section 2.2.

3.1.1.1 Operations

The 4DWxCube Management FB offers services to the METSP to register/de-register and to manage their MET products. The METSPs connect to the 4DWxCube via this interface to upload its agreed MET products.

The operations performed are service oriented and therefore described in the Service Interface subsection.

3.1.1.2 Functional Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1000
Requirement	The METSP Registration Service shall enable METSP to register/de-register as providers for the 4DWxCube.
Title	MET service provider - registration as data provider
Status	<In Progress>
Rationale	Flexible way to manage authorised data providers.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1001
Requirement	The METSP Product Management Service shall enable METSP to register/de-register/modify a MET product definition.
Title	MET service provider - registration of MET products
Status	<In Progress>
Rationale	Allows data providers to announce publication of a specific product.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1002
Requirement	A MET product provided to the 4DWxCube shall consist of metadata called MET product definition bundled with data items.
Title	MET product - metadata + data item
Status	<In Progress>
Rationale	Metadata and data shall never be stored separately, since data typically useless without metadata.
Category	<Functional>
Validation Method	
Verification Method	<Review of Design, Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1003
Requirement	The METSP Product Management Service shall allow a METSP to upload a MET product.
Title	MET service provider – publication of MET products
Status	<In Progress>
Rationale	Allows data providers to announce publication of a specific product.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1004
Requirement	The METSP Product Management Service shall allow a METSP to recall a MET product.
Title	MET service provider – recall of MET products
Status	<In Progress>
Rationale	Allows data providers to invalidate a formerly published specific product.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1005
Requirement	The Request Log Service shall provide METSPs information about active subscriptions or requests for their MET products.
Title	MET service provider – query active subscriptions
Status	<In Progress>
Rationale	Provides feedback for data providers about usage of a specific product. Allows for optimization of the portfolio.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1006
Requirement	The Request Log Service shall allow a METSP to access retrieval statistics for a MET product description.
Title	MET service provider – query retrieval statistics
Status	<In Progress>
Rationale	Provides feedback for data providers about usage of a specific product. Allows for optimization of the portfolio.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1007
Requirement	The METSP Observation Retrieval Service enables the METSP to retrieve aircraft-derived MET information products generated by the 4DWxCube MET capabilities.
Title	METSP – Observation Retrieval
Status	<In Progress>
Rationale	Aircraft-derived MET observations are useful to enhance observation and forecast MET products.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1008
Requirement	The MET Product definition shall contain geography metadata which describe unambiguously locations, shapes or volumes on earth. WMO requires a bounding box to be provided. /MD_Metadata/identificationInfo/MD_DataIdentification/extent/EX_Extent/geographicElement/EX_BoundingPolygon Multiple extents can be provided to refine the geographic information presented. /MD_Metadata/identificationInfo/MD_DataIdentification/extent/EX_Extent/geographicElement/EX_GeographicDescription Vertical extents can be described through the use of EX_VerticalExtent/MD_Metadata/identificationInfo/MD_DataIdentification/extent/EX_Extent/geographicElement/EX_GeographicBoundingBox /MD_Metadata/identificationInfo/MD_DataIdentification/extent/EX_Extent/verticalElement/EX_VerticalExtent
Title	MET product – geographical metadata
Status	<Validated>
Rationale	Coordinates are useless without information about a reference system.
Category	<Interoperability><Reliability>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1009
Requirement	Mandatory MET product definition shall include a measure for level of detail (i.e. resolution), if applicable.
Title	MET product – mandatory metadata – resolution
Status	<In Progress>
Rationale	Allows for filtering and reduction of transferred data.
Category	<Functional>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.1.3 Performance Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1010
Requirement	The 4DWxCube shall support a simple product insertion rate of 2000 Report type products per minute (e.g. TAF. METAR)

Title	Upload frequency – simple products
Status	<In Progress>
Rationale	Expected performance
Category	<Performance>
Validation Method	
Verification Method	<Analysis>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1011
Requirement	The Upload Service shall support ingest of large Gridded MET Products within 5 minutes per upload request.
Title	Upload – frequency – large products
Status	<In Progress>
Rationale	Expected performance
Category	<Performance>
Validation Method	
Verification Method	<Analysis>

3.1.1.4 Security and Integrity Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1012
Requirement	The 4DWxCube Management shall verify a data item's integrity using the MET product definition. Implies the need for automated validation against a known profile and additional rules (to be defined later)
Title	MET product – mandatory metadata – data item's integrity
Status	<In Progress>
Rationale	Crucial to prevent manipulation of a data items.
Category	<Security><Reliability>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.1.5 Physical requirements

N/A

3.1.1.6 Data Transfer

N/A

3.1.1.7 Transactions

N/A

3.1.1.8 Service Interface Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1030
Requirement	A MET Product Definition shall include a set of (natural) parameters, if applicable. MD_ContentInformation provides a mechanism for describing the content of the datasets (feature, coverage, imagery) Note that ISO-19115-2 provides extensions for imagery and gridded data that may be applicable in this area. MD_Metadata/contentInfo/MD_CoverageDescription MD_Metdata/contentInfo/MD_FeatureCatalogueDescription MD_Metadata/contentInfo/MD_ImageDescription This entry should make use of the O&M observed properties element.
Title	MET product – metadata – optional
Status	<In Progress>
Rationale	Crucial for search and filtering by product dependent properties.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1025
Requirement	Mandatory MET product definition shall include a list of MET parameters for the MET product.
Title	MET product – mandatory metadata – MET elements
Status	<In Progress>
Rationale	Inherent property of almost any met product.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1026
Requirement	Mandatory MET product definition shall include a list of available data formats which should be based on the WMO Codes http://www.wmo.int/pages/prog/www/WMOCodes.html /MD_Metadata/distributionInfo/MD_Distribution/distributionFormat
Title	MET product – mandatory metadata – data format
Status	<In Progress>

Rationale	Inherent property of almost any met product.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.1.8.1 MET Product Definition

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1013
Requirement	MET product definition of each product shall include a mandatory set of (technical) parameters.
Title	MET product – metadata - mandatory
Status	<In Progress>
Rationale	Crucial to establish a generic view of the notion of "product". Necessary for all kind of standard processing.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1014
Requirement	Mandatory MET product definition shall include a product unique identifier of type WMO MD_Metadata/fileIdentifier
Title	MET product – mandatory metadata – product identifier
Status	<In Progress>
Rationale	Necessity for traceability.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1015
Requirement	Mandatory MET product definition and metadata shall include creation timestamps. /MD_Metadata/identificationInfo/MD_DataIdentification/citation/CI_Citation/date

	/MD_Metadata/identificationInfo/citation/date/dateType="creation" /MD_Metadata/dateStamp
Title	MET product – mandatory metadata – timestamp
Status	<In Progress>
Rationale	Crucial for error tracing.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1016
Requirement	Mandatory MET product definition shall include a common name describing the product defined between METSP and 4DWxCube Governance Board. A new code-list needs to be developed and maintained to ensure controlled vocabulary. Authority shall be WMO "codes.wmo.int" MD_Metadata/identificationInfo/MD_Identification/descriptiveKeywords
Title	MET product – mandatory metadata – common name
Status	<In Progress>
Rationale	Eases human communication.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1017
Requirement	Mandatory MET product definition shall include a data format descriptor. Should be based on the http://www.wmo.int/pages/prog/www/WMOCodes.html /MD_Metadata/distributionInfo/MD_Distribution/distributionFormat
Title	MET product – mandatory metadata – data format descriptor
Status	<In Progress>
Rationale	Allows for automatic interpretation.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1018
Requirement	Mandatory MET product definition shall include a list of mandatory parameters, compliant with WMO metadata profile requirements.
Title	MET product – mandatory metadata – list mandatory
Status	<In Progress>
Rationale	Allows for automatic refinement of filtering and the like.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1019
Requirement	Mandatory MET product definition shall include a list of optional parameters, possibly empty. Any elements that can be supported by MD_Metadata can be considered as possible candidates.
Title	MET product – mandatory metadata – list optional
Status	<In Progress>
Rationale	Allows for automatic refinement of filtering and the like.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1020
Requirement	Mandatory MET product definition shall include an originating centre descriptor which is a unique identifier of the responsible METSP or organisation that created the product. A fixed set of identifiers shall be defined and documented to allow for automated use.
Title	MET product – mandatory metadata – origin
Status	<In Progress>
Rationale	The responsible for a product.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1021
Requirement	Mandatory MET product definition shall include a product original name given by the MET provider. ISO 19115-1 adds a new section called resourceLineage which may be more appropriate. MD_Metadata/dataQualityInfo/DQ_DataQuality/lineage/LI_Lineage/statement
Title	MET product – mandatory metadata – origin name
Status	<In Progress>
Rationale	Eases human communication.
Category	<Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1022
Requirement	Mandatory MET product definition shall include an observation time/interval, if applicable. The dataQualityInfo provides a location to describe when and where observations were carried out. /MD_Metadata/dataQualityInfo/DQ_DataQuality/scope/DQ_Scope/extent /MD_Metadata/dataQualityInfo/DQ_DataQuality/scope/DQ_Scope/level /MD_Metadata/dataQualityInfo/DQ_DataQuality/scope/DQ_Scope/levelDescription In the case of a forecast this should relate to the temporal extent that the forecast covers. /MD_Metadata/identificationInfo/MD_DataIdentification/extent/EX_Extent/temporalElement/EX_Temporal
Title	MET product – mandatory metadata – time
Status	<In Progress>
Rationale	Inherent property of almost any met product.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1023
Requirement	Mandatory MET product definition shall include a list of keywords. The resourceConstraints or metadataConstraints may be the best place for

	this. (See Jeremy Tandy Guidelines for WMO MD) /MD_Metadata/resourceConstraint/MD_LegalConstraints/useLimitation /MD_Metadata/resourceConstraint/MD_LegalConstraints/useConstraints /MD_Metadata/resourceConstraint/MD_LegalConstraints/otherConstraints /MD_Metadata/identificationInfo/MD_DataIdentification/descriptiveKeywords
Title	MET product – mandatory metadata – keywords
Status	<In Progress>
Rationale	Inherent property of almost any met product.
Category	<Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1024
Requirement	Mandatory MET product definition shall include a list of available Quality of Services - defined by the maintenanceAndUpdateFrequency /MD_Metadata/identificationInfo/MD_DataIdentification/resourecMaintenance/MD_MaintenanceInformation/maintenanceAndUpdateFrequency MD_Metadata/identificationInfo/SV_ServiceIdentification/
Title	MET product – mandatory metadata – QoS
Status	<In Progress>
Rationale	Inherent property of almost any met product.
Category	<Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1027
Requirement	Mandatory MET product definition shall include a time validity domain. The resourceConstraints or metadataConstraints may be the best place for this. (See Jeremy Tandy Guidelines for WMO MD) /MD_Metadata/resourceConstraint/MD_LegalConstraints/useLimitation /MD_Metadata/resourceConstraint/MD_LegalConstraints/useConstraints /MD_Metadata/resourceConstraint/MD_LegalConstraints/otherConstraints ISO 19115 MD_Resolution allows the definition of resolution. For gridded data using the distance to define the grid size may be more appropriate than equivalentScale temporal resolution of the dataset can be defined by the temporalResolution element /MD_Metadata/identificationInfo/MD_DataIdentification/temporalResolution

Title	MET product – mandatory metadata – validity time
Status	<In Progress>
Rationale	Inherent property of almost any met product.
Category	<Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SL01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG03.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG04.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0002	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1028
Requirement	Mandatory MET product definition shall include an update interval, if applicable, defined by the maintenanceAndUpdateFrequency /MD_Metadata/identificationInfo/MD_DataIdentification/resourecMaintenance/MD_MaintenanceInformation/maintenanceAndUpdateFrequency
Title	MET product – mandatory metadata – update interval
Status	<In Progress>
Rationale	Inherent property of almost any met product.
Category	<Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR02.0002	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SL01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG03.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG04.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL01.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL02.0002	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0002	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.1029
Requirement	Mandatory MET product definition shall include a geographical validity domain.
Title	MET product – mandatory metadata – geography
Status	<In Progress>
Rationale	Inherent property of almost any met product.
Category	<Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2 Interface MET service exchange Requirements

The interface MET service exchange is the interface between the MET-GATE FB of the 4DWxCube and the external consumers. In the first place ATM consumers are addressed but in a second step the Generic MET infrastructure may retrieve Consolidated MET Products via this interface.

The MET-GATE FB offers MET Services to provide and supply consolidated, translated and tailored MET products following ATM consumers' requests.

The ATM consumers receive or retrieve the requested MET information following their requests. Both interactions are machine-to-machine.

3.1.2.1 Operations

N/A

3.1.2.2 Functional Requirements

The MET-GATE FB supplies MET products to the ATM consumer systems via MET ATM Services. The MET products and their properties are specified in the following requirements as well as the functionalities provided for METSP services.

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2001
Requirement	The MET-GATE shall deliver information to ATM Users only through defined MET Services.
Title	MET-ATM Services
Status	<Validated>
Rationale	SWIM compliance
Category	<Functional>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2002
Requirement	The 4DWxCube shall advertise its Services through the SWIM Registry.
Title	Service – SWIM Registry
Status	<Validated>
Rationale	SWIM compliance
Category	<Functional>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2003
Requirement	ATM Users shall only be able to access MET Products through the Services advertised through the SWIM Registry.
Title	ATM-MET Services via SWIM Registry

Status	<Validated>
Rationale	SWIM compliance
Category	<Functional>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2004
Requirement	The 4DWxCube shall provide access to MET Products through very simple services with minimum tailoring capabilities for the provision of regulatory products.
Title	MET ATM Services – simple
Status	<Validated>
Rationale	User friendly
Category	<Functional>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2005
Requirement	The 4DWxCube shall provide access to tailored MET Products through sophisticated services that provide flexibility in how they deliver the information to the end user.
Title	MET ATM Services – sophisticated
Status	<Validated>
Rationale	User tailored
Category	<Functional>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2006
Requirement	The ATM User shall query the SWIM Registry to obtain a description of the MET Service, how to access the MET Service and what types of MET Products the MET Service can provide.
Title	SWIM discovery
Status	<In Progress>
Rationale	Discover MET Services for enhanced MET capabilities
Category	<Functional>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.2.1 ICAO MET products

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2007
Requirement	The MET-GATE shall provide access to ICAO Annex 3 regulatory MET products like - METAR - TREND - MET Report / SPECI - TAF - Aerodrome Warnings and Alerts - SIGMET - AIRMET - GAMET - Advisories from VAAC - Advisories from TCAC - Information on radioactive material release produced by the Regulatory MET information system in accordance with the definitions and properties in ICAO Annex 3 (Edition valid at time of supply).
Title	Provision of ICAO regulatory MET products
Status	<Validated>
Rationale	Stakeholders need ICAO products in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	IER-11.02.01-INTEROP-REQ.MT-0001	<Partial>
<SATISFIES>	<ATMS Requirement>	IER-11.02.01-INTEROP-REQ.ST-0001	<Partial>
<SATISFIES>	<ATMS Requirement>	IER-11.02.01-INTEROP-REQ.EX-0001	<Partial>
<SATISFIES>	<ATMS Requirement>	IER-11.02.01-INTEROP-REQ.MT-0002	<Partial>
<SATISFIES>	<ATMS Requirement>	IER-11.02.01-INTEROP-REQ.ST-0002	<Partial>
<SATISFIES>	<ATMS Requirement>	IER-11.02.01-INTEROP-REQ.MT-0005	<Partial>
<SATISFIES>	<ATMS Requirement>	IER-11.02.01-INTEROP-REQ.ST-0005	<Partial>

3.1.2.2.2 Nominal MET products

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2008
Requirement	The MET-GATE shall provide MET products for - surface wind speed - surface wind direction - surface wind gusts - headwind of a given runway at an airport - crosswind of a given runway at an airport

	- runway surface temperature - visibility - RVR - vertical visibility - ceiling - cloud base height - cloud amount - precipitation - air pressure (QNH, QFE) - air temperature - dew point temperature - air density - obscuration by present weather - upper air wind forecasts - upper air temperature forecasts - upper air relative humidity forecasts - tropopause height forecasts - geopotential altitude of flight levels produced by the Nominal MET information system and tailored according to the consumer's request.
Title	Provision of Nominal MET products
Status	<Validated>
Rationale	Stakeholders need Nominal MET information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.2.3 Significant MET products

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2009
Requirement	The MET-GATE shall provide the following MET products for - icing conditions - turbulence - wind shear - jet stream - mountain waves - convective activity - lightning - low visibility conditions - temperature inversion - dust storm - sand storm - widespread snow

	- widespread precipitation produced by the Significant MET information system and tailored according to the consumer's request.
Title	Provision of Significant MET products
Status	<Validated>
Rationale	Stakeholders need I Significant MET information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.2.4 MET products properties

3.1.2.2.4.1 Unit

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2010
Requirement	The MET products accessible through the MET-GATE shall be assigned to a specific geographical location and time expressed in latitude/longitude coordinates, if applicable vertical level, and time of occurrence besides the specific parameter dimension.
Title	General information – unit
Status	<In Progress>
Rationale	Stakeholders need detailed information about time and place of MET information.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2011
Requirement	The MET products accessible through the MET-GATE shall be expressed in accordance with ICAO Annex 3.
Title	Provision of MET products according to ICAO Annex 3 regulations - unit
Status	<In Progress>
Rationale	Stakeholders need clearly defined MET products.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2012
Requirement	Wind speed including gusts information accessible through the MET-GATE shall be expressed in - metre per second - knots selectable by the ATM consumer.
Title	Provision of wind speed – unit
Status	<In Progress>
Rationale	Stakeholders need wind information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2013
Requirement	Wind direction information accessible through the MET-GATE shall be expressed in degree.
Title	Provision of wind direction – unit
Status	<In Progress>
Rationale	Stakeholders need wind direction in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2014
Requirement	Temperature including dew point information accessible through the MET-GATE shall be expressed in in degree Celsius.
Title	Provision of temperatures – unit
Status	<In Progress>
Rationale	Stakeholders need temperature information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2015
Requirement	Humidity information accessible through the MET-GATE shall be expressed as relative humidity in per cent.
Title	Provision of air humidity – unit
Status	<In Progress>
Rationale	Stakeholders need relative humidity information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2016
Requirement	Upper troposphere height information (e.g. tropopause, jet stream) accessible through the MET-GATE shall be expressed in flight level.
Title	Provision of upper troposphere heights - unit
Status	<Validated>
Rationale	Stakeholders need tropopause height in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2017
Requirement	Height information (e.g. cloud base vertical, visibility, ceiling) accessible through the MET-GATE shall be expressed in - metre - feet selectable by the ATM consumer.
Title	Provision of heights – unit
Status	<In Progress>
Rationale	Stakeholders need height information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2018
Requirement	Geopotential altitude of flight levels accessible through the MET-GATE shall be expressed in metre.
Title	Provision of geopotential altitude of flight levels - unit
Status	<In Progress>
Rationale	Stakeholders need ICAO products in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2019
Requirement	Visibility information including RVR accessible through MET-GATE shall be expressed in metre or kilometre.
Title	Provision of Aerodrome parameters - visibility - unit
Status	<In Progress>
Rationale	Stakeholders need visibility information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2020
Requirement	The cloud amount at airports accessible through MET-GATE shall be expressed in oktas.
Title	Provision of cloud amount – unit
Status	<In Progress>
Rationale	Stakeholders need cloud amount information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2021
Requirement	The air pressure including QNH and QFE accessible through MET-GATE shall be expressed in hectopascal.
Title	Provision of air pressure – unit
Status	<In Progress>
Rationale	Stakeholders need air pressure information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2022
Requirement	The air density accessible through the MET-GATE shall be expressed in kilogram per cubic metre.
Title	Provision of air density – unit
Status	<In Progress>
Rationale	Stakeholders need air density information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2023
Requirement	Significant weather conditions like icing, turbulence, low visibility accessible through the MET-GATE shall be expressed in severity classes.
Title	Provision of significant weather – severity classes
Status	<In Progress>
Rationale	Stakeholders need significant weather information in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2024
Requirement	Precipitation accessible through the MET-GATE shall be expressed in - millimetre per time - litre per square metre and hour - cm per time (for solid precipitation) selectable by the ATM consumer.
Title	Provision of precipitation – unit
Status	<In Progress>
Rationale	Stakeholders need Airport MET parameters in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.2.4.2 Coverage

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2025
Requirement	The MET-GATE shall supply MET products covering the - airport - selected routes - selected sub-regional area - ECAC area - world depending on the requested resolution and MET product.
Title	MET products – area of interest
Status	<Validated>
Rationale	Observed and forecast values need to be representative for the area of interest of the ATM stakeholders.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-07.06.01-1020.0020	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-07.06.01-1020.0030	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-07.06.01-1020.0080	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.05.05-OSED-MET1.0030	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-06.05.05-OSED-MET1.0031	<Partial>

3.1.2.2.4.3 Forecast horizon

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2026
Requirement	The MET-GATE shall supply observation and forecast MET products with a time horizon between - statistical information up to 3 months ahead - 12hours - 7 days for Medium Term planning - 1hour - 24 hours for Short Term planning - 0h - 2 hours for Execution and Very Short Term planning - 0h - 20 minutes warning products for Execution depending on the requested MET product.
Title	MET products - forecast horizon
Status	<In Progress>
Rationale	Stakeholders require MET forecast information in support of their Medium Term planning operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.2.4.4 Temporal resolution

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2027
Requirement	The time resolution (granularity) of the forecast MET products accessible through the MET-GATE shall be at least the time resolution in ICAO Annex 3, with a higher resolution up to 3 days ahead.
Title	Forecast MET products – general time resolution
Status	<Validated>
Rationale	The time resolution of the forecast MET information needs to be sufficiently high to support the operational processes.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2028
Requirement	The default time resolution (granularity) of the forecast MET products accessible through the MET-GATE shall be - 5 minutes between T+0 and T+20min - 15 minutes between T+0 and T+2hr - 1 hour between T+2 and T+24hr - 3 hours between T+24 and T+48hr

	- 6 or 12 hours between T+48 and T+168hr depending on the requested MET product.
Title	MET forecast products –time resolution
Status	<Validated>
Rationale	The time resolution of the forecast MET information needs to be sufficiently high to support the operational processes.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.2.4.5 Spatial resolution

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2029
Requirement	MET products accessible through the MET-GATE shall be supplied in a higher resolution than specified in ICAO Annex 3, if available depending on the selected MET parameter.
Title	Provision of MET products - higher resolution than ICAO
Status	<Validated>
Rationale	Stakeholders need MET products of sufficient spatial resolution in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2030
Requirement	The Airport MET products accessible through the MET-GATE shall be supplied with a vertical resolution of - at least 500ft up to 2000ft - at least 1000ft up to 5000ft - 0.5 nautical miles for the slant resolution depending on the selected MET parameter.
Title	MET information – vertical resolution
Status	<Validated>
Rationale	Stakeholders need MET products of sufficient spatial resolution in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2031
Requirement	The MET-GATE shall provide MET products with a horizontal resolution of - 35km for Medium Term Planning (probabilistic forecast) - 25km for Medium Term planning (deterministic forecast) - 10km for Short Term planning (European-wide) - 2km for Short Term planning (sub-regional, det. + prob.) - 1km for Very Short Term planning - 250m for Execution (Airport) on specific vertical levels depending on the selected MET elements.
Title	Provision of MET products - spatial resolution
Status	<Validated>
Rationale	Stakeholders need MET products of sufficient spatial resolution in support of their operations.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.3 Performance Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2032
Requirement	MET data items shall be delivered to ATM consumers with a maximum miss rate of 1 per week per user.
Title	ATM consumers - miss rate
Status	<In Progress>
Rationale	Performance criteria are necessary for the users to know to ensure safe operations.
Category	<Performance>
Validation Method	
Verification Method	<Review of Design><Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0005	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SL01.0005	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG03.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG04.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0005	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2033
Requirement	MET data items shall be delivered to ATM consumers within a maximum delivery time - of 10 to 30 minutes for Medium Term Planning purposes - of 3 to 15 minutes for Short Term Planning purposes - of 30 seconds to 5 minutes for Execution purposes - of 15 seconds to 1 minute for alerts depending on the MET products.
Title	ATM consumers - maximum delivery time
Status	<In Progress>
Rationale	Performance criteria are necessary for the users to know to ensure safe operations.
Category	<Performance>
Validation Method	
Verification Method	<Review of Design><Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS01.0005	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SL01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG03.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG04.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER01.0005	<Partial>

<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES01.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES02.0005	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL02.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0005	<Partial>

3.1.2.4 Security and Integrity Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2034
Requirement	Any ATM consumer shall be registered and provided with a certificate having a given validity period, before enabling any communication with the 4DWxCube.
Title	ATM consumer - authentication before communication
Status	<In Progress>
Rationale	Flexible way to manage clients with different capabilities.
Category	<Functional><Maintainability><Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.5 Physical requirements

N/A

3.1.2.6 Data Transfer

3.1.2.6.1 Data format Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2035
Requirement	The ICAO Annex 3 regulatory MET products accessible through the MET-GATE shall be delivered in XML formats following iWXXM standards in accordance to ICAO regulations.
Title	Provision of ICAO message products -format
Status	<Validated>
Rationale	Stakeholders need MET products in standard data formats to ensure interoperability with their systems.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2036
Requirement	The MET-GATE shall supply gridded MET products as gridded N-D data fields in GRIB2 and NetCDFvia an OGC WCS, if applicable depending on requested MET product.
Title	Provision of MET products - format - gridded
Status	<Validated>
Rationale	Stakeholders need MET products in standard data formats to ensure interoperability with their systems.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2037
Requirement	The MET-GATE shall supply MET products in contours/isolines/polygons in XML compliant with SWIM data format via an OGC WFS, if applicable depending on requested MET product.
Title	Provision of MET products - format - polygons
Status	<Validated>
Rationale	Stakeholders need MET products in standard data formats to ensure interoperability with their systems.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2038
Requirement	The MET-GATE shall supply MET products, especially e.g. meteorological satellite and ground-based weather radar images, information in graphical format (jpeg, png, pdf) via an OGC WMS, if applicable depending on requested MET product.
Title	Provision of MET products – graphical format
Status	<Validated>
Rationale	Stakeholders need MET products in standard data formats to ensure interoperability with their systems.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2039
Requirement	The MET-GATE shall supply MET products in textual format (ASCII) if applicable depending on requested MET product.
Title	Provision of MET products – textual format
Status	<Validated>
Rationale	Stakeholders need MET products in standard data formats to ensure interoperability with their systems.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.7 Transactions

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2040
Requirement	The communications and data supplies between the MET-GATE and ATM users shall use standard OGC web services, except when duly justified.
Title	ATM consumers - data - OGC standard
Status	<Validated>
Rationale	Necessity to ensure interoperability and profit from current standards for storage and GUI.
Category	<Interoperability>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2041
Requirement	The communication between the MET-GATE and ATM consumers shall use the SWIM "Yellow", “Blue” or “Purple” profile except when duly justified by the required Quality of Service.
Title	ATM consumers - connection via SWIM
Status	<In Progress>
Rationale	Separation of concerns between product providers and distributers. Less complex interfaces.

Category	<Interoperability>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.8 Service Interface Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2042
Requirement	The services supporting exchanges between the MET-GATE and ATM consumers shall be compliant with the latest releases of SESAR AIRM and ISRM except when duly justified.
Title	ATM consumers - SWIM compliance
Status	<In Progress>
Rationale	mandatory to ensure interoperability with SWIM
Category	<Interoperability>
Validation Method	
Verification Method	<Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.8.1 Discovery Service Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2043
Requirement	The Discovery service shall enable ATM consumers to access a catalogue of descriptions of MET products available through the MET-GATE.
Title	Discovery service - Catalogue of MET products
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Interoperability><Security>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG02.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR02.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0003	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2044
Requirement	The Discovery service shall enable ATM consumers to access the MET product description associated to a specific MET product, identified by a MET product unique identifier.
Title	ATM consumers - metadata - access
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Interoperability>
Validation Method	
Verification Method	<Review of Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG02.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR02.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0003	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2045
Requirement	The Discovery service shall provide the ATM consumers with an API enabling to define a set of selection criteria for the MET products to be accessed through the MET-GATE.
Title	ATM consumers - metadata - keywords
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Interoperability>
Validation Method	
Verification Method	<Review of Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG02.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2046
Requirement	In response to a given query, the Discovery service shall indicate to the ATM consumer if any MET products are available through the MET-GATE in compliance to the requested criteria.
Title	ATM consumers - available data
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR02.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2047
Requirement	The response delivered by the Discovery service shall contain the list of available MET-ATM products compliant with the MET product descriptions, associated with their metadata, including the available QoSs and formats.
Title	ATM consumers - available data – list
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SL01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2048
Requirement	If no MET product is compliant with the requested criteria, the Discovery service shall contain the indication that no MET product matches with the request.
Title	ATM consumers - no available data
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2049
Requirement	The Discovery service shall provide the ATM consumers with an API enabling to query the registry/catalogue by a MET product unique identifier.
Title	ATM consumer - metadata - product unique identifier
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ER02.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2050
Requirement	The Discovery service shall provide the ATM consumers with an API enabling to query the catalogue by one or several keywords.
Title	ATM consumers - metadata - keywords
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2051
Requirement	The API of the Discovery service shall support the selection of a number of keywords from a finite list of available keywords.
Title	ATM consumers - metadata - list of keywords
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2052

Requirement	The Discovery service shall provide the ATM consumers with an API enabling to query the catalogue by a geographical area of interest.
Title	ATM consumers - metadata - geographical area
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2053
Requirement	The API of the Discovery service shall support the query of the catalogue by a geographical area determined by a lat/long polygon.
Title	ATM consumers - metadata - selection of geographical area - polygon
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MR02.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG03.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2054
Requirement	The API of the Discovery service shall support the query of the catalogue by a geographical area determined by a point (lat/lon).
Title	ATM consumers - metadata - selection of geographical area - point
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2055
Requirement	The API of the Discovery service shall support the query of the catalogue by a geographical area determined by a Lat/Long/ FL_{min}-FL_{max} volume.
Title	ATM consumers - metadata - selection of geographical area - volume
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2056
Requirement	The API of the MET Discovery service shall support the query of the catalogue by a geographical area or volume determined by a 4D-Trajectory corridor.
Title	ATM consumers - metadata - selection of geographical area - corridor
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.

Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2057
Requirement	The Discovery service shall provide the ATM consumers with an API enabling to query the registry/catalogue by a time horizon of interest.
Title	ATM consumers - metadata - time horizon
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2058
Requirement	The API of the Discovery service shall support the query of the catalogue by a time horizon of interest determined by a T_{min} and T_{max}, whereby T_{max} shall be equal or larger than T_{min}.
Title	ATM consumers - metadata - definition of time horizon
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0003	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2059
Requirement	The Discovery service shall provide the ATM consumers with an API enabling to query the catalogue by one or several MET elements.
Title	ATM consumers - metadata - MET element
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2060
Requirement	The Discovery service shall provide the ATM consumers with an API enabling to query the catalogue by Quality of Services (QoS).
Title	ATM consumers - metadata - QoS
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2061
Requirement	The Discovery service shall provide the ATM consumers with an API enabling to query the catalogue.
Title	ATM consumers - metadata - data format
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2062
Requirement	The API of the Discovery service shall support the query of the catalogue by data formats determined by a list of available data formats of MET products available in the MET-GATE.
Title	ATM consumers - metadata - list of available data format
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2063
Requirement	The API of the Discovery service shall support the multiple selections of criteria to query the catalogue.
Title	ATM consumers - metadata –multiple criteria
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.8.2 Products Request/Reply Service Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2064
Requirement	A Request/Reply service shall enable ATM consumers to interactively access MET products available through the MET-GATE.
Title	Request/Reply – general
Status	<Validated>
Rationale	Basis for HMI/GUI applications being input to ATM consumer systems
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0002	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EG04.0002	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2065
Requirement	In response to a given query, the Request/Reply Service shall deliver to the ATM consumer the data items available through the MET-GATE, in compliance to the requested criteria specified by MET product description and identified by a MET product unique identifier.
Title	Request/Reply - data delivery
Status	<Validated>
Rationale	Basis for HMI/GUI applications being input to ATM consumer systems
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR02.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2066
Requirement	If no MET data is compliant with the requested criteria, the Request/Reply

	Service shall respond that no MET product matches with the request.
Title	Request/Reply - data delivery - not possible
Status	<Validated>
Rationale	Basis for HMI/GUI applications being input to ATM consumer systems
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2067
Requirement	The Request Service shall provide ATM consumers with an API enabling to specify the request of MET products found in the MET Discovery service.
Title	Request/Reply - specification of request - API
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2068
Requirement	The API of the Request Service shall support specifying the request by indicating the MET product description with the possible range for the considered MET product which is identified by the MET product unique identifier received from the MET Discovery Service.
Title	Request/Reply - specify metadata by given range
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2069

Requirement	The API of the Request Service shall support the selection of a geographical area determined by a point (Lat/Long).
Title	Request/Reply - geographical area - point
Status	<Validated>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ML01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SL01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2070
Requirement	The API of the Request Service shall support the selection of a geographical area determined by a Lat/Long polygon.
Title	Request/Reply - geographical area - polygon
Status	<Validated>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2071
Requirement	The API of the Request Service shall support the selection of a geographical volume determined by a Lat/Long/ FL_{min}-FL_{max} volume.
Title	Request/Reply - geographical area - volume
Status	<Validated>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2072
Requirement	The API of the Request Service shall support the selection of a geographical area or volume determined by a 4D-Trajectory corridor.
Title	Request/Reply - geographical area - trajectory corridor
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2073
Requirement	The API of the Request Service shall support the selection of a time horizon determined by a T_{min} and T_{max} whereby T_{max} shall be equal or larger than T_{min}.
Title	Request/Reply - time horizon
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.

Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2074
Requirement	The API of the Request Service shall support the selection of one or several MET elements among the list of available MET elements of the considered MET product.
Title	Request/Reply - MET elements
Status	<Validated>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2075
Requirement	The API of the Request Service shall support the selection of a given QoS among the available QoSs for the considered MET-ATM product.
Title	Request/Reply - QoS specifications

Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2076
Requirement	The API of the Request Service shall support the selection of a given format among the available formats for the considered MET product.
Title	Request/Reply - data format
Status	<Validated>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2077
Requirement	The Reply Service shall collect and compile all data items of each requested MET product in a message and push it to the ATM consumer.
Title	Request/Reply - immediate data delivery
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request and reply system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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3.1.2.8.3 Subscription Service Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2078
Requirement	The Subscription service shall enable ATM consumers to be automatically served with data items from the MET products available through the MET-GATE, according to a specified subscription profile.
Title	Subscription service – general
Status	<Validated>
Rationale	Basis for routine machine-to-machine type applications like regularly updated forecasts.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2079
Requirement	A subscription shall be configured as periodical or event triggered request depending on the properties of the MET product.
Title	Subscription - update of data item delivery
Status	<In Progress>
Rationale	Basis for routine inherently event triggered applications like severe weather warning.
Category	<Functional>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2080
Requirement	The Subscription service shall provide ATM consumers with an API enabling to define the profile of the subscription.
Title	MET Subscription – defining subscription
Status	<In Progress>
Rationale	Functional requirement for subscriptions -definition
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2081
Requirement	Mandatory subscription metadata shall include a subscriber's unique identifier to ensure the requested data items are delivered to the correct ATM consumer.
Title	Mandatory subscription metadata - identifier of Subscriber/ATM consumer
Status	<Validated>
Rationale	Inherent property of a subscription may be needed for accounting.

Category	<Functional><Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2082
Requirement	The API of the Subscription service shall support the definition of a start date and an end date of the subscription, expressed in UTC.
Title	Mandatory subscription metadata - start and end date
Status	<Validated>
Rationale	Inherent property of a subscription.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2083
Requirement	The API of the Subscription service shall support the definition of the publication mode, either automated polling by the client or notification by the MET-GATE.
Title	Mandatory subscription metadata - update
Status	<In Progress>

Rationale	Inherent property of a subscription.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2084
Requirement	The API of the Subscription service shall support the definition of all mandatory metadata of the MET product description.
Title	Subscription - mandatory MET product metadata
Status	<Validated>
Rationale	Inherent property of a subscription, in order to specify the product to be provided.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2085
Requirement	The API of the Subscription service shall support the definition of all optional metadata of the MET product description, if any applicable.
Title	Subscription - optional MET product metadata
Status	<Validated>
Rationale	Inherent property of a subscription may assist filtering and tailoring of the product to be provided.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Review of Design><Inspection>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-ES01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0003	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2086
Requirement	The API of the Subscription service shall enable the ATM consumers to retrieve/configure/delete their own subscriptions.
Title	ATM consumers - handling subscriptions
Status	<Validated>
Rationale	Flexible way for clients to manage their product subscriptions.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2087
Requirement	In response to a request for subscription, the Subscription service shall return to ATM consumers, if the subscription is valid and compatible with the contents of the MET-GATE, an acknowledgement that the subscription will be operated from its start date.
Title	ATM consumers - subscription - validity - yes
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2088
Requirement	In response to a request for subscription, the Subscription service shall return to ATM consumers, if the subscription is not valid or not compatible with the contents of the MET-GATE, an indication that the subscription is not valid and will not be operated.
Title	ATM consumers - subscription - validity - no
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2089
Requirement	The Subscription service shall provide ATM consumers with an API enabling to specify a repetitive request of MET products found in the MET Discovery service.
Title	Subscription - specification of subscription - API
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request/reply system for subscriptions
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2090
Requirement	The API of the Subscription service shall support the ATM consumers to define the subscription by indicating the subscription metadata and their possible range for the considered MET product which has already been specified by the MET Request/Reply Service.
Title	Subscription - specify metadata by given range
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request/reply system for subscriptions
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2091
Requirement	The API of the Subscription service shall support the chosen request specifications found by using the API of the MET Request/Reply Service.
Title	Subscription - request specifications by Request/Reply service
Status	<In Progress>
Rationale	Basic functional requirement for client/server type metadata/data request/reply system for subscriptions
Category	<Functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2092
Requirement	The API of the Subscription service shall support the selection of thresholding criteria if relevant.
Title	Subscription – thresholding
Status	<In Progress>
Rationale	Functional requirement for subscriptions - thresholding
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2093
Requirement	The API of the Subscription service shall support the definition of a "thresholding" logical expression to be applied on a given parameter in a given MET product, with the effect to keep the MET element if the parameter is above/below the threshold, and to set at NULL the value of the MET element if the parameter is below/above the threshold, in a gridded (N-D) data item.
Title	Subscription - thresholding - gridded dataset
Status	<In Progress>
Rationale	Functional requirement for subscriptions - thresholding
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2094
Requirement	The API of the Subscription service shall support the definition of a "thresholding" logical expression to be applied on a given parameter in a given MET-ATM product, with the effect to determine the 2D geographical contour of the domain where the parameter is above/below a threshold, in a gridded (N-D) data item.
Title	Subscription - thresholding - contours

Status	<In Progress>
Rationale	Functional requirement for subscriptions - thresholding
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2095
Requirement	The API of the Subscription service shall support the definition of a "thresholding" logical expression to be applied on a given parameter in a given MET-ATM product, with the effect to keep the MET element if parameter above/below a threshold, and discard the MET element if the parameter is below/above a threshold, in a 1-D data item.
Title	Subscription - thresholding - 1D dataset
Status	<In Progress>
Rationale	Functional requirement for subscriptions - thresholding
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2096
Requirement	The API of the Subscription service shall support the definition of a "thresholding" logical expression to be applied on a given parameter in a given MET-ATM product, with the effect to send out a warning if parameter is above/below a threshold, and no effect if the parameter is below/above a threshold for single points.
Title	Subscription - thresholding - point
Status	<In Progress>
Rationale	Functional requirement for subscriptions - thresholding
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

3.1.2.8.4 Publication Service Requirements

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2097
Requirement	In execution of a valid subscription, the MET-GATE shall deliver to ATM consumers the data items from the MET products in compliance to their specified subscriptions.
Title	ATM consumer - data - publication
Status	<Validated>
Rationale	Basic functional requirement for client/server type metadata/data retrieval system.
Category	<Functional><Metadata>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-MG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SG01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR01.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SR02.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-SS01.0003	<Partial>
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<SATISFIES>	<ATMS Requirement>	REQ-11.02.01-INTEROP-EL03.0003	<Partial>

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2098
Requirement	In case some of the MET products to be published as per a valid subscription are not available, the MET-GATE shall deliver a warning message to the subscriber.
Title	ATM consumer - publication - failed - warning message
Status	<In Progress>
Rationale	Basic functional requirement for highlighting errors.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

[REQ]

Identifier	REQ-11.02.02-IRS-4DWC.2099
Requirement	In case some of the MET products to be published as per a valid subscription are not available, the MET-GATE shall fill-in the corresponding data items with an error field.
Title	ATM consumer - publication - failed - error field
Status	<In Progress>
Rationale	Basic functional requirement for highlighting errors.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

4 Assumptions

N/A

5 References

5.1 Applicable Documents

[1] Template Toolbox 03.00.00
https://extranet.sesarju.eu/Programme%20Library/SESAR%20Template%20Toolbox.dot

[2] Requirements and V&V Guidelines 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Requirements%20and%20VV%20Guidelines.doc

[3] Templates and Toolbox User Manual 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Templates%20and%20Toolbox%20User%20Manual.doc

[4] EUROCONTROL ATM Lexicon
https://extranet.eurocontrol.int/http://atmlexicon.eurocontrol.int/en/index.php/SESAR

5.2 Reference Documents

[5] ICAO Annex 3

[6] “MET Technical Architecture Description (TAD)”, 11.02.01-D33, Ed 00.02.00, June 2016

[7] “MET Operational Service and Environment Definition (MET-OSED)” 11.02.01-D23 - MET-OSED Ed 00.01.00

[8] “MET Safety and Performance Requirements” (MET-SPR), 11.02.01-D24 - Ed 00.01.00

[9] “MET Interoperability Requirements" (MET-INTEROP), 11.02.01-D25 - Ed 00.01.00, September 2015

[10] Final Technical Specification, MET prototypes - Local P11.02.02-D38

[11] Final Technical Specification, MET prototypes – Sub-regional P11.02.02-D39

[12] Final Technical Specification, MET prototypes - Network P11.02.02-D40

[13] Final Technical Specification, 4DwxCube P11.02.02-D41

[14] “Final System Specifications”, 15.04.09.c. D08, Ed 00.01.00

5.3 Web links

[15] https://extranet.sesarju.eu/WP_08/Project_08.03.10

[16] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_AirportMETForecast_Service.doc

[17] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_AirportMETInducedCapacityReduction_Service.doc

[18] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_AirportMETNowcast_Service.doc

[19] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_AirportMETObservation_Service.doc

[20] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_METAR_Service.doc

[21] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_SNOWTAM_Service.doc

[22] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_TAF_Service.doc

[23] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_METHazardEnrouteForecast_Service.doc

[24] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_METHazardEnrouteObservation_Service.doc

[25] https://extranet.sesarju.eu/WP_08/Project_08.03.10/Project%20Plan/ISRM%202.0/DEL_08.03.10_D65_European_ATM_Service_Description_for_METGriddedForecast_Service.doc

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