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Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) —

Part 19: Weather information (TPEG2-WEA)

Systèmes intelligents de transport — Informations sur le trafic et le tourisme via le groupe expert du protocole de transport, génération 2 (TPEG2) —

Partie 19: Renseignements météorologiques (TPEG2-WEA)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

This first edition cancels and replaces the first edition (ISO/TS 21219-19:2016), which has been technically revised.

The main changes are as follows:

— the document has been changed from a Technical Specification to an International Standard;

— a NOTE and one new WeatherStatistics value have been added in Table 6.

A list of all parts in the ISO 21219 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

0.1 History

TPEG technology was originally proposed by the European Broadcasting Union (EBU) Broadcast Management Committee, who established the B/TPEG project group in the autumn of 1997 with a brief to develop, as soon as possible, a new protocol for broadcasting traffic and travel-related information in the multimedia environment. TPEG technology, its applications and service features were designed to enable travel-related messages to be coded, decoded, filtered and understood by humans (visually and/or audibly in the user's language) and by agent systems. Originally, a byte-oriented data stream format, which can be carried on almost any digital bearer with an appropriate adaptation layer, was developed. Hierarchically structured TPEG messages from service providers to end-users were designed to transfer information from the service provider database to an end-user's equipment.

One year later, in December 1998, the B/TPEG group produced its first EBU specifications. Two documents were released. Part 2 (TPEG-SSF, which became ISO/TS 18234-2) described the syntax, semantics and framing structure which was used for all TPEG applications. Meanwhile, Part 4 (TPEG-RTM, which became ISO/TS 18234-4) described the first application for road traffic messages.

Subsequently, in March 1999, CEN/TC 278, in conjunction with ISO/TC 204, established a group comprising members of the former EBU B/TPEG and this working group continued development work. Further parts were developed to make the initial set of four parts, enabling the implementation of a consistent service. Part 3 (TPEG-SNI, later ISO/TS 18234-3) described the service and network information application used by all service implementations to ensure appropriate referencing from one service source to another.

Part 1 (TPEG-INV, later ISO/TS 18234-1) completed the series by describing the other parts and their relationship; it also contained the application IDs used within the other parts. Additionally, Part 5, the public transport information application (TPEG-PTI, later ISO/TS 18234-5), was developed. The so-called TPEG-LOC location referencing method, which enabled both map-based TPEG-decoders and non-map-based ones to deliver either map-based location referencing or human-readable text information, was issued as ISO/TS 18234-6 to be used in association with the other applications of parts of the ISO 18234 series to provide location referencing.

The ISO 18234 series has become known as TPEG Generation 1.

0.2 TPEG generation 2

When the Traveller Information Services Association (TISA), derived from former forums, was inaugurated in December 2007, TPEG development was taken over by TISA and continued in the TPEG applications working group.

It was about this time that the (then) new Unified Modelling Language (UML) was seen as having major advantages for the development of new TPEG applications in communities who would not necessarily have the binary physical format skills required to extend the original TPEG TS work. It was also realized that the XML format for TPEG described within the ISO 24530 series (now superseded) had a greater significance than previously foreseen, especially in the content-generation segment, and that keeping two physical formats in synchronism, in different standards series, would be rather difficult.

As a result, TISA set about the development of a new TPEG structure that would be UML-based. This has subsequently become known as TPEG Generation 2 (TPEG2).

TPEG2 is embodied in the ISO 21219 series and it comprises many parts that cover an introduction, rules, toolkit and application components. TPEG2 is built around UML modelling and has a core of rules that contain the modelling strategy covered in ISO 21219-2, ISO 21219-3 and ISO 21219-4 and the conversion to two current physical formats: binary (see Annex A) and XML (see Annex B); others can be added in the future. TISA uses an automated tool to convert from the agreed UML model XMI file directly into an MS Word document file, to minimize drafting errors; this file forms the annex for each physical format.

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TPEG2 has a three-container conceptual structure: message management (ISO 21219-6), application (several parts) and location referencing (ISO/TS 21219-7). This structure has flexible capability and can accommodate many differing use cases that have been proposed within the TTI sector and wider for hierarchical message content.

TPEG2 also has many location referencing options as required by the service provider community, any of which may be delivered by vectoring data included in the location referencing container.

The following classification provides a helpful grouping of the different TPEG2 parts according to their intended purpose. Note that the list below is potentially incomplete, as there is the possibility that new TPEG2 parts will be introduced after the publication of this document.

— Toolkit parts: TPEG2-INV (ISO 21219-1), TPEG2-UML (ISO 21219-2), TPEG2-UBCR (ISO 21219-3), TPEG2-UXCR (ISO 21219-4), TPEG2-SFW (ISO 21219-5), TPEG2-MMC (ISO 21219-6), TPEG2-LRC (ISO/TS 21219-7).

— Special applications: TPEG2-SNI (ISO 21219-9), TPEG2-CAI (ISO 21219-10), TPEG2-LTE (ISO/TS 21219-24).

— Location referencing: TPEG2-OLR (ISO/TS 21219-22), TPEG2-GLR (ISO/TS 21219-21), TPEG2-TLR (ISO 17572-2), TPEG2-DLR (ISO 17572-3).

— Applications: TPEG2-PKI (ISO 21219-14), TPEG2-TEC (ISO 21219-15), TPEG2-FPI (ISO 21219-16), TPEG2-SPI (ISO 21219-17), TPEG2-TFP (ISO 21219-18), TPEG2-WEA (ISO 21219-19 - this document), TPEG2-RMR (ISO/TS 21219-23), TPEG2-EMI (ISO/TS 21219-25), TPEG2-VLI (ISO/TS 21219-26).

TPEG2 has been developed to be broadly (but not totally) backward compatible with TPEG1 to assist in transitions from earlier implementations, while not hindering the TPEG2 innovative approach and being able to support many new features, such as dealing with applications with both long-term, unchanging content and highly dynamic content, such as parking information.

This document is based on the TISA specification technical/editorial version reference:

SP20014/1.2/001.

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Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) —

Part 19: Weather information (TPEG2-WEA)

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1 Scope

This document defines the TPEG Weather (WEA) application for reporting weather information for travellers. It provides general weather-related information to all travellers and is not limited to a specific mode of transportation.

This application does not provide specific weather-related safety warnings to drivers; these are provided as safety related messages as part of the TPEG2-TEC application (ISO 21219-15).

The WEA application provides weather-related forecasts and status information over multiple time periods and for multiple, possibly linked, geographical areas.

NOTE The presentation of the information is dependent on the specific human-machine interface (HMI) of the receiving device. Therefore, this document does not define any prerequisites for the HMI of the device.

This document contains examples to help explain how some typical weather reports can be signalled (see Annex C) and suggested translations between WEA table codes and WMO SYNOP weather observation codes (see Annex D).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 21219-1, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 1: Introduction, numbering and versions (TPEG2-INV)*

ISO 21219-9, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 9: Service and network information (TPEG2-SNI)*

ISO 21219-14, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 14: Parking information (TPEG2-PKI)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21219-9 and ISO 21219-14 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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4 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO 21219-1, ISO 21219-9, ISO 21219-14 and the following apply.

AQI air quality index

HMI human-machine interface

RF radio frequency

SYNOP surface synoptic observations

UV ultraviolet

UVI UV Index

WHO World Health Organization

WMO World Meteorological Organization

5 Application specific constraints

5.1 Application identification

The word “application” is used in the TPEG specifications to describe specific subsets of the TPEG structure. An application defines a limited vocabulary for a certain type of messages, for example, parking information or road traffic information. Each TPEG application is assigned a unique number, called the application identity (AID). An AID number is defined in ISO 21219-1 whenever a new application is developed.

The AID number is used within the TPEG2-SNI application (ISO 21219-9) to indicate how to process TPEG content. It facilitates the routing of information to the appropriate application decoder.

5.2 Version number signalling

Version numbering is used to track the separate versions of an application through its development and deployment. The differences between these versions can have an impact on client devices.

The version numbering principle is defined in ISO 21219-1.

Table 1 shows the current version numbers for signalling WEA within the SNI application.

Table 1 — Current version numbers for signalling of WEA

Major version number	1
Minor version number	2

5.3 Ordered components

TPEG2-WEA requires a fixed order of TPEG components. The order for the WEA message component is shown in Figure 1. The first component shall be the MMC. This shall be the only component if the message is a cancellation message. Otherwise, the MMC component shall be followed by the one or more ADC component(s) which includes the application-specific information.

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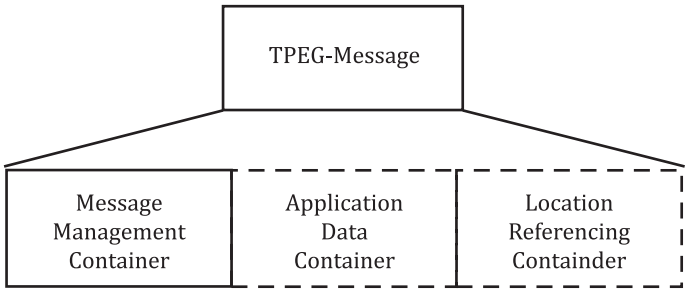

Figure 1 — Composition of TPEG messages

5.4 Extendibility

The requirement of a fixed component order does not affect the extension of WEA. Future application extensions may insert new components or may replace existing components by new ones without losing backward compatibility. That means a WEA decoder shall be able to detect and skip unknown components.

5.5 TPEG service component frame

WEA makes use of the "service component frame with dataCRC and messageCount" according to TPEG2-SFW specified by ISO 21219-5.

6 WEA structure

WEA message structure is shown in Figure 2. The binary format and XML format of the TPEG2-WEA application for use in transmission shall be in accordance with Annexes A and B, respectively.

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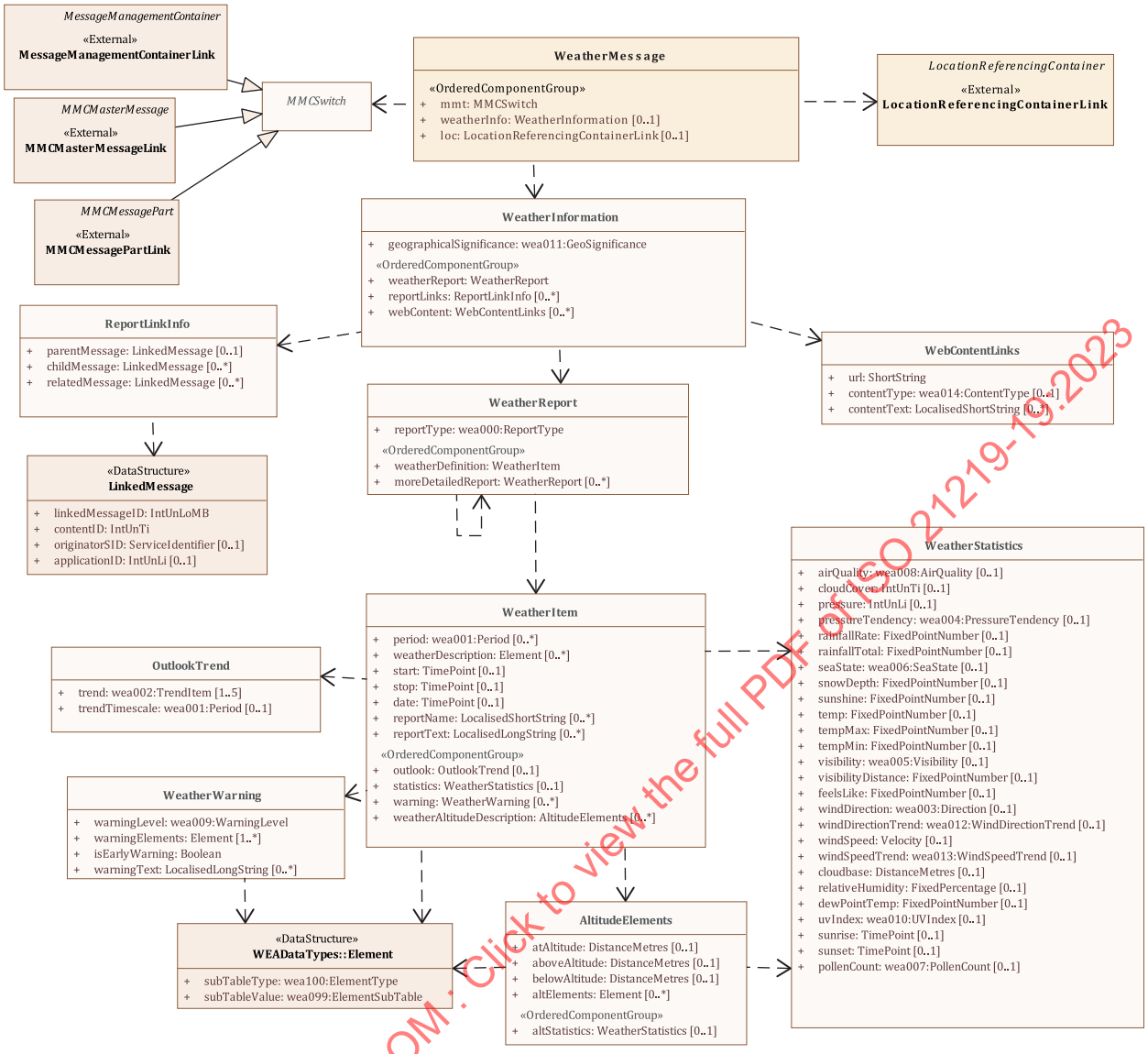

Figure 2 — WEA message structure

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7 WEA message components

7.1 General

The WEA application provides a flexible message interface for distribution of weather information.

To enable multiple levels of detail to be signalled, WEA provides two different hierarchal structures to allow messages to cover multiple geographical areas and also to cover different time periods. Messages may be linked to each other to provide a geographical hierarchy of the weather reports which can be exploited by receivers to help users find the messages they need.

EXAMPLE A UK service can provide a national overview, with regional reports and individual city reports.

Individual messages are linked by child and parent message IDs by linking individual messages in a child/parent relationship. A message can only have 1 parent but can have multiple child messages, as shown in Figure 3.

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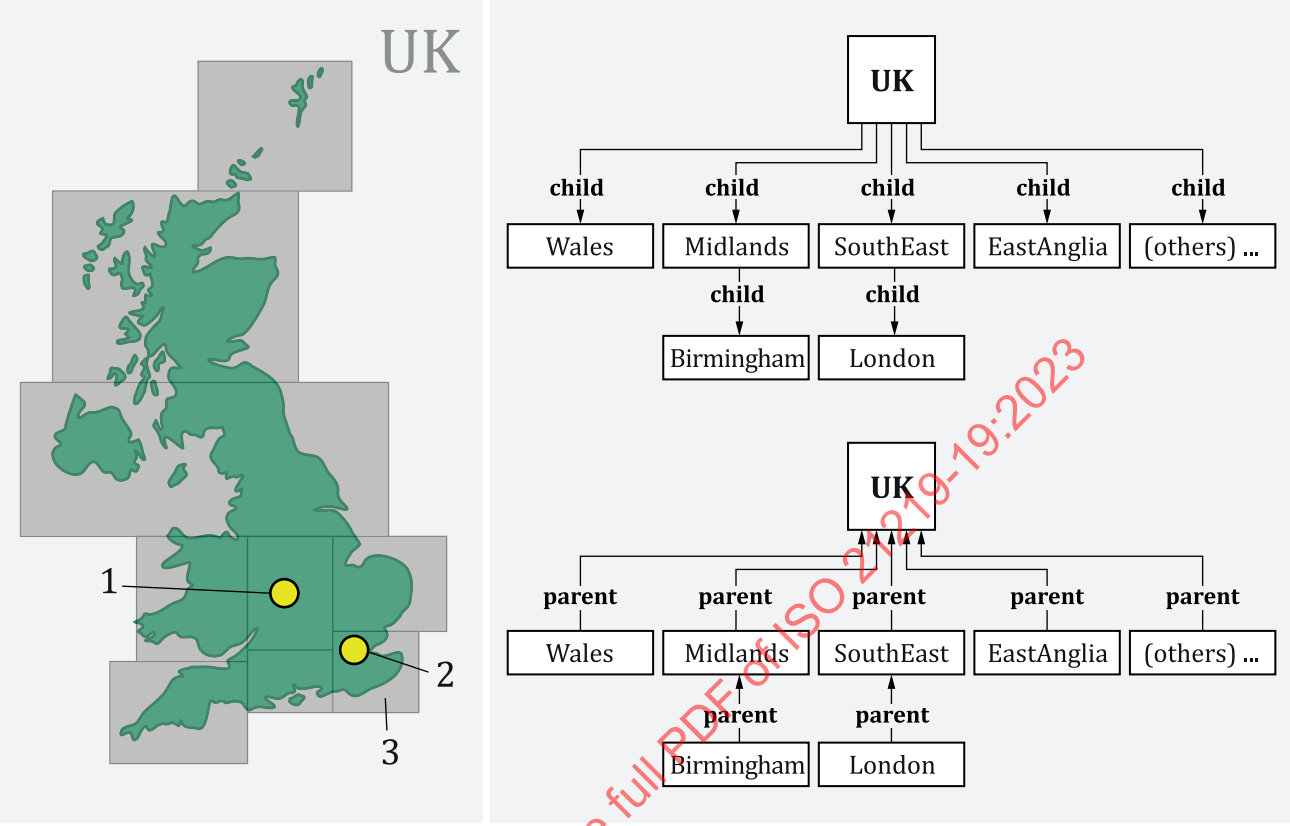

Key

1 Birmingham
2 London
3 South East England

Figure 3 — Location hierarchy

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7.2 WeatherMessage

Each WEA message is associated with a single location and contains one or more weather reports (excluding the case of a cancellation). The structure of a WeatherMessage is presented in Figure 4, and the encoding of a WeatherMessage is shown in Table 2.

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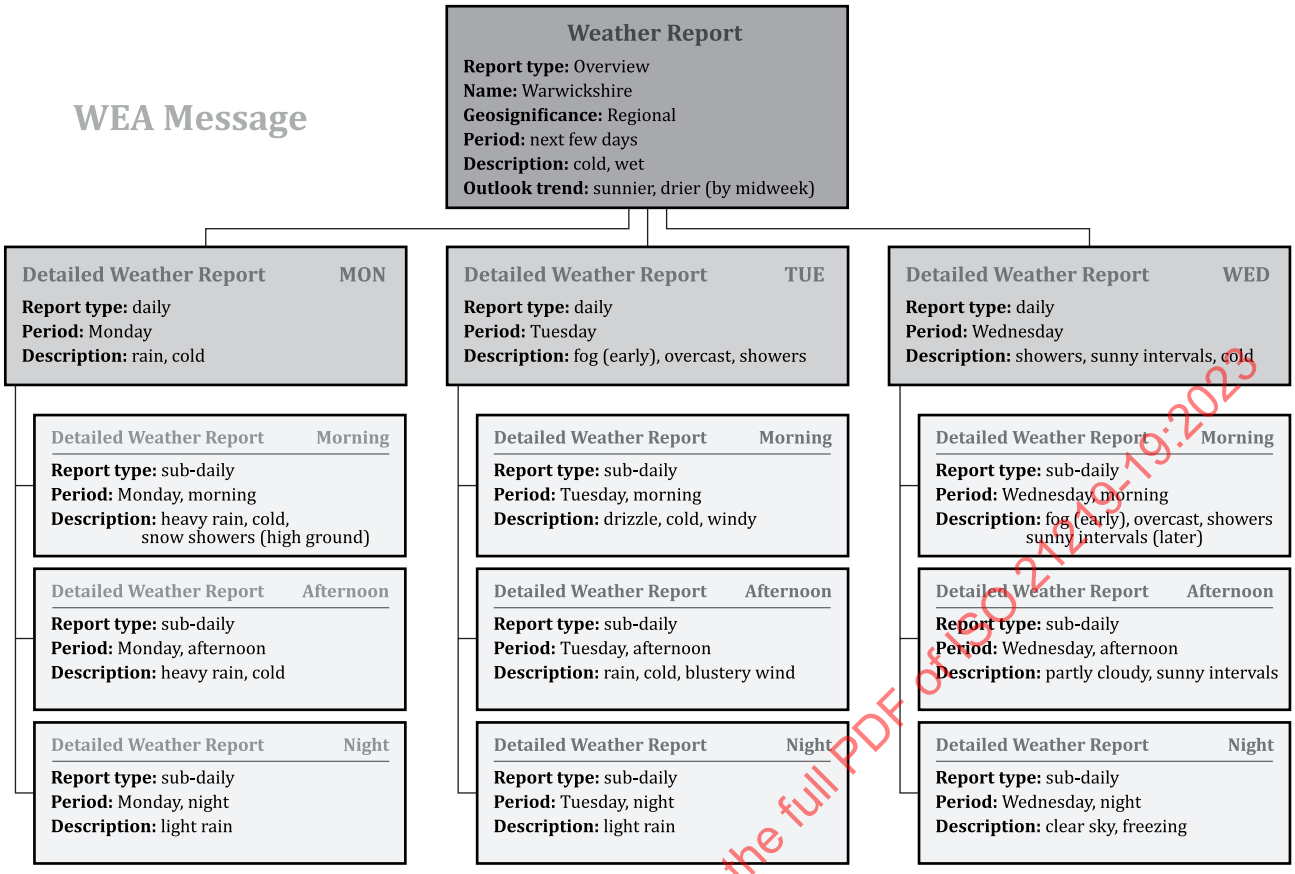

Figure 4 — Sample WEA message with different timescales covered

Table 2 — WeatherMessage

Name	Type	Multiplicity	Description
Ordered components			
mmt	MMCSwitch	1	MMC
weatherInfo	WeatherInformation	0..1	Weather information (always included except for cancellation of a message).
loc	LocationReferencingContainerLink	0..1	LRC (always included except for cancellation of a message).

7.3 WeatherInformation

A weather report can be either a simple single level report or can be made into a hierarchy of reports associated to increasingly smaller time periods. The encoding of WeatherInformation is shown in Table 3.

Table 3 — WeatherInformation

Name	Type	Multiplicity	Description
geographicalSignificance	wea011:GeoSignificance	1	Defines the geographical significance or "spatial extent" of the report.
Ordered components			

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Table 3 *(continued)*

Name	Type	Multiplicity	Description
weatherReport	WeatherReport	1	Contains the report data, defines what type of period it covers and gives additional, more detailed reports for smaller time periods if required.
reportLinks	ReportLinkInfo	0..*	Links to related WEA reports or other TPEG messages.
webContent	WebContentLinks	0..*	Allows linkage to web-based content.

7.4 WeatherReport

The WeatherReport component provides the top level WeatherItem of the report and allows subsequent lower levels to be defined. A multiple level hierarchy of time periods may be defined. Different timescales are covered within a specific message by use of the different levels of Report (using the reportType). The encoding of a WeatherReport is shown in Table 4.

Table 4 — WeatherReport

Name	Type	Multiplicity	Description
reportType	wea000:ReportType	1	Defines the time "extent" of a report.
Ordered components			
weatherDefinition	WeatherItem	1	Main details of weather report.
moreDetailedReport	WeatherReport	0..*	Optional next-level report.

7.5 WeatherItem

The WeatherItem component defines the main content for the weatherReport, including descriptive and statistical parts. The encoding of a WeatherItem is shown in Table 5.

Table 5 — WeatherItem

Name	Type	Multiplicity	Description
period	wea001:Period	0..*	This provides an optional period for the report.
weatherDescription	Element	0..*	Weather description provides a qualitative description for the weather report. Any number of elements can be selected from the element tables.
start	TimePoint	0..1	Start defines the specific time of day at which the period of this weather report item begins. Typically, hours and minutes. If Stop is not defined, then Start is used to define a nominal time of the report. For example: 2 pm sunny; 4 pm rain; 6 pm showers, sunny intervals.
stop	TimePoint	0..1	Stop defines the explicit end time of the period for the weather item.
date	TimePoint	0..1	This provides the ability to report the main date for a report (suitable for a daily forecast). Typically, date or date and month.

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Table 5 *(continued)*

Name	Type	Multiplicity	Description
reportName	LocalisedShort-String	0..*	Title for the WEA report e.g. “Warwickshire Forecast”, “UK Weather” Multiplicity allows multiple languages to be carried.
reportText	LocalisedLongString	0..*	Additional text for weather related information. Can be advice or description of major weather problem or can be specific information related to weather at a specific function/event. (For example: for the London Marathon, “Due to high temperatures, ensure you drink plenty of liquids if you are running today.”) Multiplicity allows multiple languages to be carried.
Ordered components			
outlook	OutlookTrend	0..1	Outlook trend provides a description of how the weather is expected to develop over a following period.
statistics	WeatherStatistics	0..1	Weather statistics are provided as required to provide quantitative details for the weather report.
warning	WeatherWarning	0..*	Warnings for specific weather.
weatherAltitudeDescription	AltitudeElements	0..*	Weather description provides a qualitative description for the weather report. Any number of elements may be selected from the element tables.

7.6 WeatherStatistics

Statistics are provided to give a quantitative description of the weather status or forecast. The encoding of the WeatherStatistics is shown in Table 6.

Table 6 — WeatherStatistics

Name	Type	Multiplicity	Description
airQuality	wea008:AirQuality	0..1	Air quality.
cloudCover	IntUnTi	0..1	Cloud cover. An okta is a measurement used to describe cloud cover. Sky conditions are estimated in terms of how many eighths of the sky are obscured by cloud, ranging from completely clear, 0 oktas, through to completely overcast, 8 oktas. Valid range: 0 to 8.
pressure	IntUnLi	0..1	Barometric pressure is hPascal (this is nominally equivalent to mBar, which is still the preferred unit in practice for weather forecast, although not actually an SI unit).
pressureTendency	wea004:PressureTendency	0..1	How pressure will (or has) change(d).
rainfallRate	FixedPointNumber	0..1	Rate of rainfall in mm/h.
rainfallTotal	FixedPointNumber	0..1	Total rainfall for defined period in mm.
seaState	wea006:SeaState	0..1	Description of the size of the waves.
snowDepth	FixedPointNumber	0..1	Depth of fallen snow (mm).

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Table 6 *(continued)*

Name	Type	Multiplicity	Description
sunshine	FixedPointNumber	0..1	Hours of sunshine for defined period (either recorded in past or expected in future).
temp	FixedPointNumber	0..1	General temperature in degrees Celsius (to define current or expected temperature). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
tempMax	FixedPointNumber	0..1	Maximum temperature (degrees Celsius) expected over a defined period (for daily report type, this is typically maximum temperature expected during daytime.). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
tempMin	FixedPointNumber	0..1	Minimum temperature (degrees Celsius) expected over a defined period (for daily report type this is typically the minimum temperature expected during nighttime). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
visibility	wea005:Visibility	0..1	Subjective visibility description.
visibilityDistance	FixedPointNumber	0..1	Nominal visibility in km.
feelsLike	FixedPointNumber	0..1	"Feels like" defines what the temperature will be perceived as to a person, due to wind chill or humidity; temperature “that it feels like” on exposed skin, due to wind/humidity (Celsius). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
windDirection	wea003:Direction	0..1	Wind direction based on cardinal, ordinal and sub-ordinal directions of the compass.
windDirectionTrend	wea012:WindDirectionTrend	0..1	How the direction of the wind is changing.
windSpeed	Velocity	0..1	Wind speed (m/s).
windSpeedTrend	wea013:WindSpeedTrend	0..1	Defines how wind speed is changing.
cloudbase	DistanceMetres	0..1	Height of base of lowest clouds above the ground.
relativeHumidity	FixedPercentage	0..1	Relative humidity; amount of water vapour in the air.
dewPointTemp	FixedPointNumber	0..1	The temperature to which a given body of air must be cooled for it to condense (linked to relative humidity); in degrees Celsius. NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
uvIndex	wea010:UVIndex	0..1	WHO measure of ultraviolet radiation.
sunrise	TimePoint	0..1	Time of sunrise.
sunset	TimePoint	0..1	Time of sunset.
pollenCount	wea007:PollenCount	0..1	Pollen count.

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7.7 WeatherWarning

The WeatherWarning provides highlighted warning about specific types of weather. The encoding of a WeatherWarning is shown in Table 7.

EXAMPLE "Warning strong wind".

Table 7 — WeatherWarning

Name	Type	Multiplicity	Description
warningLevel	wea009:WarningLevel	1	Warning level.
warningElements	Element	1..*	Item taken from element tables for which a warning is provided.
isEarlyWarning	Boolean	1	If true, the warning is provided more than 24 h before expected bad weather period. If false, the warning is related to time within 24 h of the report period. This allows "today's" report to include a warning about "tomorrow's" weather, allowing users to prepare if needed.
warningText	LocalisedLongString	0..*	Additional information for warnings.

7.8 AltitudeElements

AltitudeElements allow an altitude to be assigned to an element or set of elements and or statistics. This allows reporting of altitude-specific weather, such as snow above a certain altitude or temperature at altitude. The encoding of AltitudeElements is shown in Table 8.

Table 8 — AltitudeElements

Name	Type	Multiplicity	Description
atAltitude	DistanceMetres	0..1	Defines that the reported weather elements are found at this altitude (not to be combined with aboveAltitude or belowAltitude attributes).
aboveAltitude	DistanceMetres	0..1	Defines that the reported weather elements are found above this altitude (e.g. snow above 3 000 m).
belowAltitude	DistanceMetres	0..1	Defines that the reported weather elements are found below this altitude (e.g. humid below 1 000 m).
altElements	Element	0..*	Weather elements associated with the defined altitude.
Ordered components			
altStatistics	WeatherStatistics	0..1	Statistical information associated with the defined altitude.

7.9 OutlookTrend

This component provides an indication of how the weather will change over a given period. The encoding of the OutlookTrend is shown in Table 9.

EXAMPLE 1 "Becoming wetter (by midweek)".

EXAMPLE 2 "Becoming warmer (by later today)".

EXAMPLE 3 "Becoming cooler (by Thursday)".

EXAMPLE 4 "Becoming more humid (by this afternoon)".

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Table 9 — OutlookTrend

Name	Type	Multiplicity	Description
trend	wea002:TrendItem	1..5	How the weather is expected to progress.
trendTimescale	wea001:Period	0..1	Over what period the trend is defined.

7.10 ReportLinkInfo

Linked messages provide a method of referencing other WEA messages. This is used to provide a hierarchy of WEA messages based on child or parent locations. The encoding of a ReportLinkInfo is shown in Table 10.

EXAMPLE A message can have a location representing a region such as "The Midlands", its parent can be the "UK", and several child messages can reference "Warwickshire", "West Midlands", "Staffordshire", etc. See Figure 3.

Table 10 — ReportLinkInfo

Name	Type	Multiplicity	Description
parentMessage	LinkedMessage	0..1	Link to parent message.
childMessage	LinkedMessage	0..*	Link to child message.
relatedMessage	LinkedMessage	0..*	Link to message related to this weather report, another WEA report or a completely different TPEG application; for example, reference to TEC message detailing a bridge closure due to high winds or flooding.

7.11 WebContentLinks

The WebContentLinks allow linkage to web-based content, such as weather maps, plots, rain radar, cloud or temperature maps. The type of data may be defined by ContentType. Additional title descriptions may be signalled using text. The encoding of WebContentLinks is shown in Table 11.

Table 11 — WebContentLinks

Name	Type	Multiplicity	Description
url	ShortString	1	URL of online data content.
contentType	wea014:ContentType	0..1	Type of content; may be used to set icon in HMI for link.
contentText	LocalisedShortString	0..*	Used to add additional information relating to the link if required. Also, if ContentType is not appropriate then this can be used to send another short description of data type.

7.12 MMCSwitch

The MMCSwitch is a switch construct for MMC messages.

7.13 MMCMessagePartLink

The MMCMessagePartLink component is a placeholder for the MMCMessagePart component as specified in TPEG2-MMC (ISO 21219-6). It assigns the traffic event compact (TEC) application specific local component ID for the MMC container. All component IDs within the MMC container are local to the MMC toolkit. The MMC contains all and only information related to message management.

Message generation systems shall ensure that the information given in the MMC allows unambiguous interpretation over the whole time a message is valid. It is particularly important to recognize that

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client devices are likely to suffer from non-continuous transmission channels as typically encountered in broadcast systems suffering intermittent RF performance.

7.14 MMCMasterMessageLink

The MMCMasterMessageLink component is a placeholder for the MMCMasterMessage container as specified in TPEG2-MMC (ISO 21219-6). It assigns the TEC application specific local component ID for the MMC container. All component IDs within the MMC container are local to the MMC toolkit. The MMC contains all and only information related to message management.

Message generation systems shall ensure that the information given in the MMC allows unambiguous interpretation over the whole time a message is valid. It is particularly important to recognize that client devices are likely to suffer from non-continuous transmission channels as typically encountered in broadcast systems suffering intermittent RF performance.

7.15 MessageManagementContainerLink

The MessageManagement component is a placeholder for the MessageManagementContainer as specified in TPEG2-MMC (ISO 21219-6). It assigns the TEC application specific local component ID for the MMC container. All component IDs within the MMC container are local to the MMC toolkit. The MMC contains all and only information related to message management.

Message generation systems shall ensure that the information given in the MMC allows unambiguous interpretation over the whole time a message is valid. It is particularly important to recognize that client devices are likely to suffer from non-continuous transmission channels as typically encountered in broadcast systems suffering intermittent RF performance.

7.16 LocationReferencingContainerLink

The LocationReferencingContainer component is a placeholder for the LRC as described in the TPEG2-LRC toolkit specified by ISO/TS 21219-7. It assigns the WEA application specific local component ID for the LRC container. All component IDs within the LRC container are local to the LRC toolkit.

8 WEA datatypes

8.1 LinkedMessage

The LinkedMessage provides link information for child and parent messages and is implemented using the messageID. For linking to other applications, the related message includes COID and SID. The encoding of a LinkedMessage is shown in Table 12.

Table 12 — LinkedMessage

Name	Type	Multiplicity	Description
linkedMessageID	IntUnLoMB	1	The related messageID.
contentID	IntUnTi	1	ContentID of the TPEG service component defined for the linked message.
originatorSID	ServiceIdentifier	0..1	The TPEG service ID related to the linked message (this may be originatorSID or carrierSID). This may be excluded if linked message is in same service.
applicationID	IntUnLi	0..1	Application ID of target message (if in other application); default is = 5 (TEC) so this may be omitted if the linked message is of this application type.

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8.2 Element

Elements are selected from the element tables, to provide the qualitative description of the weather report or warning type. The encoding of an Element is shown in Table 13.

Table 13 — Element

Name	Type	Multiplicity	Description
subTableType	wea100:ElementType	1	Table number.
subTableValue	wea099:ElementSubTable	1	Entry from table.

9 WEA tables

9.1 wea000:ReportType

The encoding of a ReportType is shown in Table 14.

Table 14 — ReportType

Code	Reference-English "word"	Comment
0	Undefined	Specific report type not defined.
1	Overview	Any report for more than a day.
2	Daily	Report is for a specific day.
3	Sub-daily	Report is for part of a day.
4	Timed	Report is for a small part of a day defined by specified time intervals.
5	Historical	Report is for providing weather data in the past.

9.2 wea001:Period

The Period provides a textual definition of the validity period. It is more descriptive than an explicit time definition and therefore preferred for the HMI display to the user. The encoding of a Period is shown in Table 15.

EXAMPLE If a report is valid from 6:00 to 12:00, it can be chosen to display "tomorrow morning".

Table 15 — Period

Code	Reference-English "word"	Comment
0	Now	Report is describing current conditions.
1	This morning	Report is describing conditions for morning of the current day.
2	This afternoon	Report is describing conditions for afternoon of the current day.
3	This evening	Report is describing conditions for evening of the current day.
4	Tonight	Report is describing conditions for nighttime of the current day.
5	Today	Report is describing conditions for the current day.
6	Tomorrow	Report is describing conditions for the following day.
7	Tomorrow morning	Report is describing conditions for the following morning.
8	Tomorrow afternoon	Report is describing conditions for the following afternoon.
9	Tomorrow evening	Report is describing conditions for the following evening.

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Table 15 *(continued)*

Code	Reference-English "word"	Comment
10	Tomorrow night	Report is describing conditions for nighttime of the following day.
11	Next few days	Report is describing conditions for the following 2 d to 3 d; recommended to be clarified with start or stop times or with sub-reports detailing the days.
12	Monday to Friday	Report is describing conditions for following weekday period.
13	Beginning of the week	Report is describing conditions for the beginning of the weekday period; recommended to be clarified with start or stop times or with sub-reports detailing the days.
14	Midweek	Report is describing conditions for the middle day(s) of the week; recommended to be clarified with start or stop times or with sub-reports detailing the days. Typically, Tuesday, Wednesday, Thursday.
15	End of the week	Report is describing conditions for the last few days of the week; recommended to be clarified with start or stop times or with sub-reports detailing the days. Typically, Thursday and Friday and maybe even Saturday/Sunday.
16	Weekend	Report is describing conditions for the weekend. This can be clarified with start or stop times or with sub-reports detailing the days. Typically, just Saturday and Sunday, but can include Friday as this helps users plan their "weekend".
17	Before dawn	Early morning, before daylight.
18	Dawn	Describing conditions at sunrise.
19	Dusk	Describing conditions at around sunset
20	Morning	Describing conditions in morning of a specific day. Day defined in other Period. Multiple Periods can be used in one Report, to allow "Sunday evening", "Monday morning" "Monday afternoon".
21	Early morning	Describing conditions during smaller parts of the day.
22	Mid morning	Describing conditions during smaller parts of the day.
23	Late morning	Describing conditions during smaller parts of the day.
24	Afternoon	Describing conditions in the afternoon of a specific day. Day defined in other "period", multiple Periods can be used in one Report, to allow "Sunday evening", "Monday morning" "Monday afternoon"
25	Early afternoon	Describing conditions during smaller parts of the day.
26	Mid afternoon	Describing conditions during smaller parts of the day.
27	Late afternoon	Describing conditions during smaller parts of the day.
28	Evening	Describing conditions in the evening of a specific day. Day defined in other "period", multiple Periods can be used in one Report, to allow "Sunday evening", "Monday morning", "Monday afternoon".
29	Early evening	Describing conditions during smaller parts of the day.
30	Mid evening	Describing conditions during smaller parts of the day.
31	Late evening	Describing conditions during smaller parts of the day.
32	Night	Describing conditions at night for a specific day. Day defined in other Period. Multiple Periods may be used in one Report to allow "Sunday evening", "Monday morning", "Monday afternoon", "Tuesday night".
33	Late night	Describing conditions during smaller parts of the day.

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Table 15 *(continued)*

Code	Reference-English "word"	Comment
34	Overnight	Describing conditions typically covering evening + night + early morning.
35	This week	Describing conditions for the current week.
36	Next week	Describing conditions for next week.
37	During next hour	Describing conditions for very near short-term period; can be related to fast-changing or hazardous weather.
38	During next couple of hours	Describing conditions for upcoming short-term period.
39	During next few hours	Describing conditions over the next 3 h to 4 h.
40	Later	Describing conditions "later" as opposed to "now". Can also be used with other periods: "later Tuesday".
41	Later today	Latter half of the day.
42	Later tonight	Later in the nighttime.
43	Later tomorrow	Latter half of tomorrow.
44	Monday	Specific day.
45	Tuesday	Specific day.
46	Wednesday	Specific day.
47	Thursday	Specific day.
48	Friday	Specific day.
49	Saturday	Specific day.
50	Sunday	Specific day.

9.3 wea002:TrendItem

The TrendItem provides a description of how the weather will generally progress/develop in the near future. The encoding of a TrendItem is shown in Table 16.

Table 16 — TrendItem

Code	Reference-English "word"	Comment
0	Cloudier	Amount of cloud expected to increase.
1	Clearer	Clearer weather (e.g. less cloud or fog or rain); clearer skies.
2	Warmer	Temperature expected to increase slightly.
3	Cooler	Temperature expected to decrease slightly.
4	Hotter	Temperature expected to increase.
5	Colder	Temperature expected to decrease.
6	Wetter	Amount of precipitation expected to increase.
7	Drier	Amount of precipitation expected to decrease.
8	Windier	Wind expected to increase.
9	Calmer	Wind expected to decrease.
10	Stormier	Weather expected to become more likely to create storms, increased wind, rain, etc.
11	Fresher	Weather expected to be colder, maybe with more wind.
12	More humid	Humidity expected to increase.
13	Less humid	Humidity expected to decrease.
14	Sunnier	Amount of sunshine expected to increase.

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Table 16 *(continued)*

Code	Reference-English "word"	Comment
15	More unsettled	Weather expected to become changeable, maybe with showers then sun, then rain or wind. No similar pattern over the Period; different each day/part of day.
16	Milder	Expected to be less cold, less windy; generally more pleasant.

9.4 wea003:Direction

The Direction reports from which direction the weather element comes. It is normally used for wind. The encoding of a Direction is shown in Table 17.

EXAMPLE A northerly wind (N) blows from the north to the south; but can also indicate from where other elements approach, e.g. "Snow from SE".

Table 17 — Direction

Code	Reference-English "word"	Comment
0	Variable	No specific direction prevails. Usually when winds are light, direction can change quickly.
1	N	North.
2	NNE	North-Northeast.
3	NE	Northeast.
4	ENE	East-Northeast.
5	E	East.
6	ESE	East-Southeast.
7	SE	Southeast.
8	SSE	South-Southeast.
9	S	South.
10	SSW	South-Southwest.
11	SW	Southwest.
12	WSW	West-Southwest.
13	W	West.
14	WNW	West-Northwest.
15	NW	Northwest.
16	NNW	North-Northwest.

9.5 wea004:PressureTendency

The PressureTendency describes how the pressure changes over a period. The encoding of a PressureTendency is shown in Table 18.

Table 18 — PressureTendency

Code	Reference-English "word"	Comment
0	Static	No change.
1	Rising slowly	Pressure increasing slowly.
2	Rising	Pressure increasing.
3	Falling	Pressure reducing.
4	Falling slowly	Pressure reducing slowly.

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Table 18 *(continued)*

Code	Reference-English "word"	Comment
5	Blocking high pressure	High pressure weather system blocking usual changes to weather.
6	Blocking low pressure	Low pressure weather system blocking usual changes to weather.

9.6 wea005:Visibility

The Visibility provides a subjective visibility description. The encoding of a Visibility is shown in Table 19.

Table 19 — Visibility

Code	Reference-English "word"	Comment
0	Good	Visibility of more than 8 km.
1	Moderate	Visibility between 3 km and 8 km.
2	Poor	Visibility between 1 km and 3 km.
3	Very poor	Visibility less than 1 000 m.
4	Zero	Nominal zero visibility, generally anything less than 100 m.

9.7 wea006:SeaState

The SeaState defines how rough or calm the sea is, related to the wave height. It follows the definition from the UK Meteorological Office website. The encoding of a SeaState is shown in Table 20.

Table 20 — SeaState

Code	Reference-English "word"	Comment
0	Smooth	Wave height less than 0,5 m.
1	Slight	Wave height of 0,5 m to 1,25 m.
2	Moderate	Wave height of 1,25 m to 2,5 m.
3	Rough	Wave height of 2,5 m to 4,0 m.
4	Very rough	Wave height of 4,0 m to 6,0 m.
5	High	Wave height of 6,0 m to 9,0 m.
6	Very high	Wave height of 9,0 m to 14,0 m.
7	Phenomenal	Wave height more than 14,0 m.

9.8 wea007:PollenCount

PollenCount is the measurement of the number of grains of pollen in a cubic metre of air. The higher the number, the more people will suffer if they are allergic to pollen. Ranges are taken from the UK Meteorological Office. The encoding of PollenCount is shown in Table 21.

Table 21 — PollenCount

Code	Reference-English "word"	Comment
0	Low	Less than 30 pollen grains per cubic metre of air.
1	Moderate	30 to 49 pollen grains per cubic metre of air.
2	High	50 to 149 pollen grains per cubic metre of air.
3	Very high	150 or more pollen grains per cubic metre of air.

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9.9 wea008:AirQuality

AirQuality is defined as a measure of the condition of air relative to the requirements of one or more biotic species and/or to any human need or purpose. AQIs are usually numbers used by government agencies to characterize the quality of the air at a given location. As the AQI increases, an increasingly large percentage of the population is likely to experience increasingly severe adverse health effects. AQI values are divided into ranges, and each range is assigned a descriptor and a colour code. Standardized public health advisories are associated with each AQI range. An agency can also encourage members of the public to take public transportation or work from home when AQI levels are high. No IS exists on this subject; therefore, this is an amalgamation of several systems. The encoding of AirQuality is shown in Table 22.

Table 22 — AirQuality

Code	Reference-English "word"	Comment
0	Good	No health impacts.
1	Moderately good	Mild effects, unlikely to require action, can be noticed amongst sensitive individuals.
2	Unhealthy for sensitive groups	Can have harmful impacts on patients and members of sensitive groups.
3	Unhealthy	Can cause the general public some minor irritation/ unpleasant feelings.
4	Very unhealthy	Can have a serious impact on patients and members of sensitive groups in case of acute exposure. Widespread symptoms of irritation in the healthy population.
5	Hazardous	Generally healthy individuals will notice some discomfort.
6	Very hazardous	Serious health risks for general public. Can require emergency action or evacuation.

9.10 wea009:WarningLevel

The WarningLevel provides specific weather warnings, ranging from mild disruptions to more serious, potentially damaging and dangerous weather situations. The encoding of a WarningLevel is shown in Table 23.

Table 23 — WarningLevel

Code	Reference-English "word"	Comment
0	No warnings	No specific warnings issued.
1	Inclement weather	The weather is not expected to have any noticeable impact on travel infrastructure or travel plans, but outdoor events can be affected due to generally poor weather (raining/windy).
2	Bad weather	Mild disruption to travel plans can be caused (some high bridges closed due to strong wind or slow traffic due to poor visibility from fog, for example). Travellers should be aware of this and ensure that they access the latest weather forecast for up-to-date weather information. Some delays should be expected due to slower traffic. Outdoor events can be disrupted or cancelled.
3	Severe weather	Travellers should take precautionary action and remain extra vigilant, and follow orders and any advice given by authorities under all circumstances. Travellers should ensure that they access the latest weather forecast before travelling. Some public transport can be affected/cancelled. Expect significant disruption to daily routines. Travellers should avoid all non-essential journeys, but if a journey is imperative, they should carry emergency food/clothing/blankets, etc.

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Table 23 *(continued)*

Code	Reference-English "word"	Comment
4	Destructive weather	Do not travel unless required to do so by authorities. Evacuation can be required. Expect damage to buildings. Residents should seek appropriate shelter.

9.11 wea010:UVIndex

The UVIndex as defined by the World Health Organization (WHO). The UVI is a measure of the level of UV radiation. The values of the index range from zero upward — the higher the UVI, the greater the potential for damage to the skin and eyes, and the less time it takes for harm to occur. The UVI is an important vehicle for alerting people about the need to use sun protection. The encoding of a UVIndex is shown in Table 24.

Table 24 — UVIndex

Code	Reference-English "word"	Comment
1	1-Low	WHO Colour code: GREEN
2	2-Low	WHO Colour code: GREEN
3	3-Moderate	WHO Colour code: YELLOW
4	4-Moderate	WHO Colour code: YELLOW
5	5-Moderate	WHO Colour code: YELLOW
6	6-High	WHO Colour code: ORANGE
7	7-High	WHO Colour code: ORANGE
8	8-Very High	WHO Colour code: RED
9	9-Very High	WHO Colour code: RED
10	10-Very High	WHO Colour code: RED
11	11-Extreme	WHO Colour code: PURPLE

9.12 wea011:GeoSignificance

The geographic significance of the report, indicating the applicable scope for the report. The encoding of a GeoSignificance is shown in Table 25.

Table 25 — GeoSignificance

Code	Reference-English "word"	Comment
0	Undefined	Not defined type
1	Continental	Report covers a whole continent or major part of a continental landmass.
2	International	Report covers multiple countries.
3	National	Report covers the whole or major part of a single country.
4	Area	Report covers a large part of a country (e.g. northern, southern, central).
5	Regional	Report covers a specific part of a country defined by specific boundaries (East Midlands, Black Forest).
6	City	Report for specific city and surrounding area.
7	Local	Report for small area (e.g. north part of a city)
8	Ultra local	Specific forecast related to small local area; typically, area of 5 km^2 to 10 km^2.
9	Event	Report is intended for a specific event.

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9.13 wea012:WindDirectionTrend

The WindDirectionTrend indicates how wind direction is changing. The encoding of a WindDirectionTrend is shown in Table 26.

Table 26 — WindDirectionTrend

Code	Reference-English "word"	Comment
0	Not changing	No change in direction.
1	Veering	Veering; a change in wind direction in a clockwise sense (e.g. east to southeast to south); the opposite of backing.
2	Backing	Backing; a change in wind direction in a counterclockwise sense (e.g. south to southeast to east); the opposite of veering.

9.14 wea013:WindSpeedTrend

The WindSpeedTrend indicates how wind speed is changing. The encoding of a WindSpeedTrend is shown in Table 27.

Table 27 — WindSpeedTrend

Code	Reference-English "word"	Comment
0	Constant	Wind strength expected to remain the same throughout the Period.
1	Increasing	Wind speed increasing.
2	Increasing quickly	Wind speed increasing quickly.
3	Decreasing	Wind speed decreasing.
4	Decreasing quickly	Wind speed decreasing quickly.

9.15 wea014:ContentType

A high-level categorization used to indicate the type of graphical element included in a web link. The encoding of a ContentType is shown in Table 28.

Table 28 — ContentType

Code	Reference-English "word"	Comment
0	Undefined	Content type not specified, or of type not defined in available types default value, if attribute not included.
1	General situation	Used to provide link to general weather map picture/ content.
2	Cloud	For use when linking to cloud coverage pictures.
3	Temperature	Used when linking to temperature maps.
4	Pressure	Used when linking to pressure maps.
5	Wind	Used when linking to wind maps.
6	Rain	Used when linking to rainfall maps.

9.16 wea099:ElementSubTable

The ElementSubTable is an abstracted table for element sub-types used in the element data structure The encoding of ElementSubTable is shown in Table 29. Therefore, it is intentionally empty.

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Table 29 — ElementSubTable

Code	Reference-English "word"	Comment

9.17 wea100:ElementType

The ElementType (part of element data structure) defines from which table the element is taken. It is grouped with other similar elements. The encoding of an ElementType is shown in Table 30.

Table 30 — ElementType

Code	Reference-English "word"	Comment
1	wea101_RainElements	
2	wea102_SnowElements	
3	wea103_SleetHailElements	
4	wea104_WindElements	
5	wea105_StormElements	
6	wea106_FogElements	
7	wea107_FrostElements	
8	wea108_Sunshine-Cloud	
9	wea109_TemperatureElements	
10	wea110_Hazards	
20	wea200_ElementQualifier	
21	wea201_ElementQualifierProbability	

9.18 wea101:RainElements

The RainElements provides a selection of different types of precipitation. The encoding of RainElements is shown in Table 31.

Table 31 — RainElements

Code	Reference-English "word"	Comment
0	Rain	
1	Wet	
2	Light rain	
3	Drizzle	
4	Light drizzle	
5	Heavy rain	
6	Showers	
7	Blustery showers	
8	Intermittent showers	
9	Thundery showers	
10	Thundery rain	
11	Freezing rain	Rain that freezes on impact (sometimes called "ice rain").
12	Damp	

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9.19 wea102:SnowElements

The SnowElements provide a selection of winter weather elements. The encoding of SnowElements is shown in Table 32.

Table 32 — SnowElement

Code	Reference-English "word"	Comment
0	Snow	
1	Light snow	
2	Light snow showers	
3	Snow showers	
4	Heavy snow showers	
5	Drifting snow	
6	Low drifting snow	
7	Blowing snow	
9	Light blowing snow	
10	Localized snow showers	
11	Blizzard	
12	Diamond dust	
13	Snow grains	
14	Snow crystals	

9.20 wea103:SleetHailElements

The encoding of SleetHailElements is shown in Table 33.

Table 33 — SleetHailElements

Code	Reference-English "word"	Comment
0	Sleet or hail	
1	Sleet	
2	Light sleet	
3	Sleet showers	
4	Heavy sleet showers	
5	Hail	
6	Light hail	
7	Hail showers	
8	Heavy hail showers	
9	Damaging hail	
10	Large hail	

9.21 wea104:WindElements

WindElements Wind related elements, including Beaufort scale definition. The encoding of WindElements is shown in Table 34.

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Table 34 — WindElements

Code	Reference-English "word"	Comment
0	Calm	Beaufort scale 0: wind < 1 km/h.
1	Light air	Beaufort scale 1: wind up to 5,5 km/h.
2	Light breeze	Beaufort scale 2: wind up to 11 km/h.
3	Gentle breeze	Beaufort scale 3: wind up to 19 km/h.
4	Moderate breeze	Beaufort scale 4: wind up to 28 km/h.
5	Fresh breeze	Beaufort scale 5: wind up to 38 km/h.
6	Strong breeze	Beaufort scale 6: wind up to 49 km/h.
7	Moderate gale	Beaufort scale 7: wind up to 61 km/h.
8	Gale	Beaufort scale 8: wind up to 74 km/h.
9	Strong gale	Beaufort scale 9: wind up to 88 km/h.
10	Storm	Beaufort scale 10: wind up to 102 km/h.
11	Violent storm	Beaufort scale 11: wind up to 117 km/h.
12	Hurricane	Beaufort scale 12: wind up to > 117 km/h
13	Windy	
14	Strong wind	
15	Moderate wind	
16	Very strong wind	
17	Blustery wind	
18	Variable wind	
19	Light and variable wind	
20	Northerly	
21	Easterly	
22	Southerly	
23	Westerly	
24	North-easterly	
25	South-easterly	
26	South-westerly	
27	North-westerly	

9.22 wea105:StormElements

StormElements are describing different types of storms. The encoding of StormElements is shown in Table 35.

Table 35 — StormElements

Code	Reference-English "word"	Comment
0	Storm	
1	Ice storm	When surface temperatures are below freezing, with a thick layer of above freezing air remains above ground level, rain can fall into a freezing layer and freeze on impact into a "glaze" known as freezing rain (sometimes called "ice rain").
2	Thunderstorm	A storm with thunder and lightning normally accompanied by heavy rain.

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Table 35 *(continued)*

Code	Reference-English "word"	Comment
3	Derecho	A derecho (from Spanish, meaning "straight") is a widespread and long-lived, violent, convectively-induced, straight-line windstorm that is associated with a fast-moving band of severe thunderstorms.
4	Firestorm	A fire that attains such intensity that it creates and maintains its own wind system. Large bush fires often create a firestorm.
5	Squall	Sudden onset of large wind increase.
7	Tropical cyclone	Storm formed as a closed circulation round a centre of low pressure.
8	Hailstorm	Storm that precipitates chunks of ice.
9	Tornado	A violent, destructive wind storm occurring on land.
10	Hurricane	Same as tropical cyclone.
11	Dust storm	Storm where dust is picked up and carried into the air; common in arid and semi-arid regions.
12	Sand storm	Storm where sand is picked up and carried into the air. Common in desert areas. Similar to dust storm.

9.23 wea106:FogElements

FogElements indicate types of fog or mist. The encoding of FogElements is shown in Table 36.

Table 36 — FogElements

Code	Reference-English "word"	Comment
0	Fog	
1	Patchy fog	Fog in small areas across defined area.
2	Localized fog	Fog in larger patches in some areas (generally larger continuous patches than "patchy fog").
3	Low lying fog	Fog in low-lying areas, typically in valleys near rivers.
4	Shallow fog	Fog that is of thin layer and close to ground level, typically 1,8 m (6 ft) thick, such that it does not obstruct general horizontal visibility except close to ground level. Often causes driving difficulties due to drivers' visibility being reduced, but vertically, sky looks clear.
5	Dense fog	Thick fog causing low visibility throughout the area.
6	Freezing fog	The term "freezing fog" refers to fog where water vapour is super-cooled, filling the air with small ice crystals similar to very light snow. It seems to make the fog "tangible".
7	Dense freezing fog	
8	Mist	Light fog.
9	Patchy mist	Light patchy fog.
10	Sea mist	Sometimes called sea smoke, warm air passing over warmer water causes a mist/fog to occur.
11	Thinning	Allows description of how fog is changing over the period; fog thinning or dense fog thickening.
12	Thickening	Allows description of how fog is changing over the period; fog thinning or dense fog thickening.
13	Developing	Allows description of how fog is changing over the period; fog thinning or dense fog developing.

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9.24 wea107:FrostElements

FrostElements provide a selection of frost or ice weather elements. The encoding of FrostElements is shown in Table 37.

Table 37 — FrostElements

Code	Reference-English "word"	Comment
0	Frost	
1	Light frost	
2	Ground frost	
3	Heavy frost	
4	Severe frost	
5	Ice	

9.25 wea108:SunshineCloudElements

SunshineCloudElements provide a selection of elements related to sunshine and cloud. The encoding of SunshineCloudElements is shown in Table 38.

Table 38 — SunshineCloudElements

Code	Reference-English "word"	Comment
0	Clear sky	Used usually at nighttime instead of "blue sky".
1	Blue sky	
2	Fair	
3	Sunny	
4	Sunny intervals	
5	A few clouds	
6	Partly cloudy	
7	Cloudy	
8	Very cloudy	
9	Overcast	
10	Dull	
11	Hazy	
12	Clouds developing	
13	Clouds dissolving	

9.26 wea109:TemperatureElements

TemperatureElements are subjectively describing the temperature. The encoding of TemperatureElements is shown in Table 39.

Table 39 — TemperatureElements

Code	Reference-English "word"	Comment
0	Chilly	
1	Cold	
2	Freezing	
3	Hot	
4	Mild	

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Table 39 *(continued)*

Code	Reference-English "word"	Comment
5	Scorching	
6	Warm	
7	Humid	
8	Heat-wave	
9	Hotter than normal	
10	Colder than normal	
11	Extremely cold	
12	Extremely hot	

9.27 wea110:HazardElements

HazardElements describe specific hazard-causing elements. The encoding of HazardElements is shown in Table 40.

Table 40 — HazardElements

Code	Reference-English "word"	Comment
0	Black ice	
1	Flooding	
2	Localized flooding	
3	Risk of flash floods	
4	Storm surge	
5	Landslides	
6	Mudflows	
7	Smoke	
8	Smog	
9	Ash cloud	
10	Dust	
11	Sand	
12	Dust whirls	Sometimes called "dust devils".
13	Avalanche risk	

9.28 wea200:ElementQualifier

ElementQualifiers relate to the immediately preceding element. Hence, the ElementQualifier shall not be set as the first element in weather description. The encoding of an ElementQualifier is shown in Table 41.

EXAMPLE "Flooding (low lying areas)", "windy (in exposed areas)", "fog (early), rain (later)".

Table 41 — ElementQualifier

Code	Reference-English "word"	Comment
0	In some areas	In the overall area being referenced, the element is not necessarily present everywhere, just in some places.
1	Low-lying areas	Items like fog can be more likely in valleys and low ground near rivers.
2	High ground	Elements like frost and snow can be more likely in high areas.

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Table 41 *(continued)*

Code	Reference-English "word"	Comment
3	Urban areas	Urban areas sometimes have their own microclimate, so it can sometimes be warmer in urban areas. Alternatively, smog can be an issue.
4	Rural areas	Outside city areas (i.e. in rural areas) snow can be more of a problem, e.g. drifting snow can be an issue.
5	Coastal areas	Coastal areas are prone to higher winds and sometimes colder temperatures.
6	Inland	Inland areas can have more sheltered weather, or be less windy, or warmer.
7	Exposed area	Allows reference to open areas (moors, hills, etc.)
8	Sheltered areas	Valleys or urban areas can be protected from harsher weather (warm in sheltered areas).
9	Northern parts	Allows reference to smaller areas within a larger report area.
10	Northeast parts	Allows reference to smaller areas within a larger report area.
11	Eastern parts	Allows reference to smaller areas within a larger report area.
12	Southeast parts	Allows reference to smaller areas within a larger report area.
13	Southern parts	Allows reference to smaller areas within a larger report area.
14	Southwest parts	Allows reference to smaller areas within a larger report area.
15	Western parts	Allows reference to smaller areas within a larger report area.
16	Northwest parts	Allows reference to smaller areas within a larger report area.
17	Central parts	Allows reference to smaller areas within a larger report area.
18	Early	Within a report, certain elements can be likely at an earlier time of the Period (e.g. Frost early, sunny with showers later).
19	Later	Within a report, certain elements can be likely at a later time of the period (e.g. Frost early, sunny with showers later).
20	Slight	Allows variation to elements in strength.
21	Moderate	Allows variation to elements in strength.
22	Severe	Allows variation to elements in strength.
23	Intermittent	Allows adjustment to how element is persisting (snow showers — intermittent).
24	Periodic	Allows adjustment to how element is persisting (rain showers — periodic).
25	Continuous	Allows adjustment to how element is persisting (heavy rain — continuous).

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9.29 wea201:ElementQualifierProbability

ElementQualifierProbability provides a qualifier defining the probability of the preceding element occurring. Hence, the ElementQualifierProbability shall not be set as the first element in a weather description. The encoding of ElementQualifierProbability is shown in Table 42.

EXAMPLE Cold, snow (30 %), windy.

Table 42 — ElementQualifierProbability

Code	Reference-English "word"	Comment
0	0 %	
1	10 %	
2	20 %	
3	30 %	
4	40 %	
5	50 %	
6	60 %	
7	70 %	
8	80 %	
9	90 %	
10	100 %	

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Annex A
(normative)

TPEG application, TPEG-binary representation

A.1 Message components

A.1.1 List of generic component IDs

The encoding of component IDs is shown in Table A.1.

Table A.1 — Component IDs

Name	ID
WeatherMessage	0
MessageManagementContainerLink	1
MMCMasterMessageLink	2
MMCMessagePartLink	3
LocationReferencingContainerLink	4
WeatherInformation	5
WeatherReport	6
WeatherItem	7
WeatherStatistics	8
AltitudeElements	9
OutlookTrend	10
WeatherWarning	11
ReportLinkInfo	12
WebContentLinks	13

A.1.2 WeatherMessage

The encoding of a WeatherMessage is shown in Table A.2.

Table A.2 — WeatherMessage

<WeatherMessage(0)>:=	
<IntUnTi>(0),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
ordered {	
<MMCSwitch>(mmt),	MMC
n * <WeatherInformation> (weatherInfo)[0..1],	Weather information (always included except for cancellation of a message).
n * <LocationReferencingContainerLink>(loc)[0..1]	LRC (always included except for cancellation of a message).
};	

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A.1.3 WeatherInformation

The encoding of a WeatherInformation is shown in Table A.3.

Table A.3 — WeatherInformation

<WeatherInformation(5)>:=	
<IntUnTi>(5),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
<wea011:GeoSignificance>(geographicalSignificance),	Defines the geographical significance or "spatial extent" of the report.
ordered {	
<WeatherReport>(weatherReport),	Contains the report data, defines what type of period it covers and additional more detailed reports for smaller time periods if required.
n * <ReportLinkInfo>(reportLinks),	Links to related WEA reports or other TPEG Messages.
n * <WebContentLinks>(webContent)	Allows linkage to web-based content.
};	

A.1.4 WeatherReport

The encoding of a WeatherReport is shown in Table A.4.

Table A.4 — WeatherReport

<WeatherReport(6)>:=	
<IntUnTi>(6),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
<wea000:ReportType>(reportType),	Defines the time "extent" of a report.
ordered {	
<WeatherItem>(weatherDefinition),	Main details of weather report.
n * <WeatherReport>(moreDetailedReport)	Optional next level report.
};	

A.1.5 WeatherItem

The encoding of a WeatherItem is shown in Table A.5.

Table A.5 — WeatherItem

<WeatherItem(7)>:=	
<IntUnTi>(7),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
BitArray(selector),	
if (bit 0 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <wea001:Period>(period),	This provides an optional period for the report.

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Table A.5 *(continued)*

}	
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <Element>(weatherDescription),	Weather description provides a qualitative description for the weather report. Any number of elements may be selected from the element tables.
}	
if (bit 2 of selector is set)	
<TimePoint>(start),	Start defines the specific time of day at which the period of this weather report item begins. Typically, hours and minutes. If Stop is not defined, then Start is used to define a nominal time of the report. EXAMPLE 2 pm sunny; 4 pm rain; 6 pm showers, sunny intervals.
if (bit 3 of selector is set)	
<TimePoint>(stop),	Stop defines the explicit end time of the period for the WeatherItem.
if (bit 4 of selector is set)	
<TimePoint>(date),	This provides ability to report the main date for a report (suitable for a daily forecast). Typically, date or date and month.
if (bit 5 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(reportName),	Title for the WEA report. EXAMPLE “Warwickshire Forecast”, “UK Weather” Multiplicity allows multiple languages to be carried.
}	
if (bit 6 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedLongString>(reportText),	Additional text for weather-related information. Can be advice or description of a major weather problem or can be specific information related to weather at a specific function/event. EXAMPLE For the London Marathon: “Due to high temperatures, ensure you drink plenty of liquid if you are running today”). Multiplicity allows multiple languages to be carried.
}	
ordered {	
n * <OutlookTrend>(outlook)[0..1],	Outlook trend provides a description of how the weather is expected to develop over a following period.
n * <WeatherStatistics>(statistics)[0..1],	Weather statistics are provided as required to provide quantitative details for the weather report.
n * <WeatherWarning>(warning),	Warnings for specific weather.

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Table A.5 *(continued)*

n * <AltitudeElements>(weatherAltitudeDescription)	Weather description provides a qualitative description for the weather report. Any number of elements may be selected from the element tables.
};	

A.1.6 WeatherStatistics

The encoding of the WeatherStatistics is shown in Table A.6.

Table A.6 — WeatherStatistics

<WeatherStatistics(8)>:=	
<IntUnTi>(8),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
BitArray(selector),	
if (bit 0 of selector is set)	
<wea008:AirQuality>(airQuality),	Air Quality
if (bit 1 of selector is set)	
<IntUnTi>(cloudCover),	Cloud cover. An okta is a measurement used to describe cloud cover. Sky conditions are estimated in terms of how many eighths of the sky are obscured by cloud, ranging from completely clear, 0 oktas, through to completely overcast, 8 oktas. Valid range: 0 to 8.
if (bit 2 of selector is set)	
<IntUnLi>(pressure),	Barometric pressure is hPascal (this is nominally equivalent to mbar, which is still the preferred unit in practice for weather forecasts, although not actually an SI unit).
if (bit 3 of selector is set)	
<wea004:PressureTendency>(pressureTendency),	How pressure will (or has) changed.
if (bit 4 of selector is set)	
<FixedPointNumber>(rainfallRate),	Rate of rainfall in mm/h.
if (bit 5 of selector is set)	
<FixedPointNumber>(rainfallTotal),	Total rainfall for defined period in mm.
if (bit 6 of selector is set)	
<wea006:SeaState>(seaState),	Description of the size of waves.
if (bit 7 of selector is set)	
<FixedPointNumber>(snowDepth),	Depth of fallen snow (mm).
if (bit 8 of selector is set)	
<FixedPointNumber>(sunshine),	Hours of sunshine for defined period (either recorded in past or expected in future).
if (bit 9 of selector is set)	
<FixedPointNumber>(temp),	General temperature in degrees Celsius (to define current or expected temperature). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].

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Table A.6 *(continued)*

if (bit 10 of selector is set)	
<FixedPointNumber>(tempMax),	Maximum temperature (degrees Celsius) expected over a defined Period (for daily report type, this is typically the maximum temperature expected during daytime). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
if (bit 11 of selector is set)	
<FixedPointNumber>(tempMin),	Minimum temperature (degrees Celsius) expected over a defined Period (for daily report type, this is typically the minimum temperature expected during nighttime). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
if (bit 12 of selector is set)	
<wea005:Visibility>(visibility),	Subjective visibility description.
if (bit 13 of selector is set)	
<FixedPointNumber>(visibilityDistance),	Nominal visibility in km.
if (bit 14 of selector is set)	
<FixedPointNumber>(feelsLike),	"Feels like" defines what the temperature will be perceived as to a person, due to wind chill or humidity; Temperature “that it feels like” on exposed skin, due to wind/humidity (Celsius). NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
if (bit 15 of selector is set)	
<wea003:Direction>(windDirection),	Wind direction based on cardinal, ordinal and sub-ordinal directions of the compass.
if (bit 16 of selector is set)	
<wea012:WindDirectionTrend>(windDirectionTrend),	How the direction of the wind is changing.
if (bit 17 of selector is set)	
<Velocity>(windSpeed),	Wind speed (m/s).
if (bit 18 of selector is set)	
<wea013:WindSpeedTrend>(windSpeedTrend),	Defines how the wind speed is changing.
if (bit 19 of selector is set)	
<DistanceMetres>(cloudbase),	Height of base of lowest clouds above the ground.
if (bit 20 of selector is set)	
<FixedPercentage>(relativeHumidity),	Relative humidity; amount of water vapour in the air.
if (bit 21 of selector is set)	
<FixedPointNumber>(dewPointTemp),	The temperature to which a given body of air must be cooled for it to condense (linked to relative humidity). In degrees Celsius. NOTE The FixedPointNumber binary format does not cover the range of values in the interval [-0,99, -0,01].
if (bit 22 of selector is set)	
<wea010:UVIndex>(uvIndex),	WHO measure of ultraviolet radiation.
if (bit 23 of selector is set)	
<TimePoint>(sunrise),	Time of sunrise.
if (bit 24 of selector is set)	
<TimePoint>(sunset);	Time of sunset.

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Table A.6 *(continued)*

if (bit 25 of selector is set)	
<wea007:PollenCount>(pollenCount);	Pollen count.

A.1.7 WeatherWarning

The encoding of a WeatherWarning is shown in Table A.7.

Table A.7 — WeatherWarning

<WeatherWarning(11)>:=	
<IntUnTi>(11),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
<wea009:WarningLevel>(warningLevel),	Warning level.
<IntUnLoMB>(n),	
n * <Element>(warningElements),	Item taken from element tables for which a warning is provided.
BitArray(selector),	
if (bit 0 of selector is set)	
<Boolean>(isEarlyWarning),	If true, the warning is provided more than 24 h before expected bad weather period. If false, the warning is related to a time within 24 h of the report period. This allows “today's” report to include a warning about “tomorrow's” weather, enabling people to prepare if needed.
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedLongString>(warningText)	Additional information for warnings.
};	

A.1.8 AltitudeElements

The encoding of AltitudeElements is shown in Table A.8.

Table A.8 — AltitudeElements

<AltitudeElements(9)>:=	
<IntUnTi>(9),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
BitArray(selector),	
if (bit 0 of selector is set)	
<DistanceMetres>(atAltitude),	Defines that the reported weather elements are found at this altitude. (Not to be combined with aboveAltitude or belowAltitude attributes).
if (bit 1 of selector is set)	
<DistanceMetres>(aboveAltitude),	Defines that the reported weather elements are found above this altitude (e.g. snow above 3 000 m).
if (bit 2 of selector is set)	
<DistanceMetres>(belowAltitude),	Defines that the reported weather elements are found below this altitude (e.g. humid below 1 000 m).

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Table A.8 *(continued)*

if (bit 3 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <Element>(altElements),	Weather elements associated with the defined altitude.
}	
ordered {	
n * <WeatherStatistics>(altStatistics)[0..1]	Statistical information associated with the defined altitude.
};	

A.1.9 OutlookTrend

The encoding of an OutlookTrend is shown in Table A.9.

Table A.9 — OutlookTrend

<OutlookTrend(10)>:=	
<IntUnTi>(10),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
<IntUnLoMB>(n),	{1 ≤ *n* ≤ 5}
n * <wea002:TrendItem>(trend),	How the weather is expected to progress.
BitArray(selector),	
if (bit 0 of selector is set)	
<wea001:Period>(trendTimescale);	Over what period the trend is defined.

A.1.10 ReportLinkInfo

The encoding of a ReportLinkInfo is shown in Table A.10.

Table A.10 — ReportLinkInfo

<ReportLinkInfo(12)>:=	
<IntUnTi>(12),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
BitArray(selector),	
if (bit 0 of selector is set)	
<LinkedMessage>(parentMessage),	Link to parent message.
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LinkedMessage>(childMessage),	Link to child message.
}	
if (bit 2 of selector is set)	
{	
<IntUnLoMB>(n),	

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Table A.10 *(continued)*

n * <LinkedMessage>(relatedMessage)	Link to message related to this weather report, another WEA report or completely a different TPEG application. EXAMPLE Reference to TEC message detailing a bridge closure due to high winds or flooding.
};	

A.1.11 WebContentLinks

The encoding of a WebContentLink is shown in Table A.11.

Table A.11 — WebContentLinks

<WebContentLinks(13)>:=	
<IntUnTi>(13),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr),	number of bytes in attributes.
<ShortString>(url),	URL of online data content.
BitArray(selector),	
if (bit 0 of selector is set)	
<wea014:ContentType>(contentType),	Type of content, may be used to set icon in HMI for link.
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalizedShortString>(contentText)	Used to add additional info relating to the link if required. Also, if ContentType is not appropriate, then this can be used to send another short description of the data type.
};	

A.1.12 MMCSwitch

The encoding of MMCSwitch is shown in Table A.12.

Table A.12 — MMCSwitch

<MMCSwitch(x)>:=	
<IntUnTi>(x),	id of this component.
<IntUnLoMB>(lengthComp),	number of bytes in component.
<IntUnLoMB>(lengthAttr);	number of bytes in attributes.

A.1.13 MMCMessagePartLink

The encoding of MMCMessagePartLink is shown in Table A.13.

Table A.13 — MMCMessagePartLink

<MMCMessagePartLink(3)<MMCSwitch()>>:=	
External <MMCMessagePart(3)>;	See MMCMessagePart specification.

A.1.14 MMCMasterMessageLink

The encoding of MMCMasterMessageLink is shown in Table A.14.

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Table A.14 — MMCMasterMessageLink

<MMCMasterMessageLink(2)<MMCSwitch()>>:=	
External <MMCMasterMessage(2)>;	See MMCMasterMessage specification.

A.1.15 MessageManagementContainerLink

The encoding of a MessageManagementContainerLink is shown in Table A.15.

Table A.15 — MessageManagementContainerLink

<MessageManagementContainerLink(1)<MMCSwitch()>>:=	
External <MessageManagementContainer(1)>;	See MessageManagementContainer specification.

A.1.16 LocationReferencingContainerLink

The encoding of a LocationReferencingContainerLink is shown in Table A.16.

Table A.16 — LocationReferencingContainerLink

<LocationReferencingContainerLink(4)>:=	
External <LocationReferencingContainer(4)>;	See LocationReferencingContainer specification.

A.2 WEA datatypes

A.2.1 LinkedMessage

The encoding of a LinkedMessage is shown in Table A.17.

Table A.17 — LinkedMessage

<LinkedMessage>:=	
<IntUnLoMB>(linkedMessageID),	The related messageID.
<IntUnTi>(contentID),	ContentID of the TPEG service component defined for the linked message.
BitArray(selector),	
if (bit 0 of selector is set)	
<ServiceIdentifier>(originatorSID),	The TPEG service ID related to the linked message; (this may be originatorSID or carrierSID). This may be excluded if linked message is in same service.
if (bit 1 of selector is set)	
<IntUnLi>(applicationID);	Application ID of target message (if in other application); default is = 5 (TEC) so this may be omitted if the linked message is of this application type.

A.2.2 Element

The encoding of an Element is shown in Table A.18.

Table A.18 — Element

<Element>:=	
<wea100:ElementType>(subTableType),	Table number.
<wea099:ElementSubTable>(subTableValue);	Entry from table.

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Annex B
(normative)

TPEG application, TPEG-ML representation

B.1 Message components

B.1.1 WeatherMessage

```
<xs:element name="WeatherMessage" type="WeatherMessage"/>
<xs:complexType name="WeatherMessage">
<xs:complexContent>
<xs:extension base="tsf:ApplicationRootMessageML">
<xs:sequence>
<xs:element name="mmt" type="MMCSwitch"/>
<xs:element name="weatherInfo" type="WeatherInformation" minOccurs="0"/>
<xs:element name="loc" type="lrc:LocationReferencingContainer" minOccurs="0"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
```

B.1.2 WeatherInformation

```
<xs:complexType name="WeatherInformation">
<xs:sequence>
<xs:element name="geographicalSignificance" type="wea011_GeoSignificance"/>
<xs:element name="weatherReport" type="WeatherReport"/>
<xs:element name="reportLinks" type="ReportLinkInfo" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="webContent" type="WebContentLinks" minOccurs="0" maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
```

B.1.3 WeatherReport

```
<xs:complexType name="WeatherReport">
<xs:sequence>
<xs:element name="reportType" type="wea000_ReportType"/>
<xs:element name="weatherDefinition" type="WeatherItem"/>
<xs:element name="moreDetailedReport" type="WeatherReport" minOccurs="0"
maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
```

B.1.4 WeatherItem

```
<xs:complexType name="WeatherItem">
<xs:sequence>
<xs:element name="period" type="wea001_Period" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="weatherDescription"" type="Element" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="start" type="tdt:TimePoint" minOccurs="0"/>
<xs:element name="stop" type="tdt:TimePoint" minOccurs="0"/>
<xs:element name="date" type="tdt:TimePoint" minOccurs="0"/>
<xs:element name="reportName" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="reportText" type="tdt:LocalisedLongString" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="outlook" type="OutlookTrend" minOccurs="0"/>
<xs:element name="statistics" type="WeatherStatistics" minOccurs="0"/>
<xs:element name="warning" type="WeatherWarning" minOccurs="0" maxOccurs="unbounded"/>
```

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```
<xs:element name="weatherAltitudeDescription" type="AltitudeElements" minOccurs="0"
maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
```

B.1.5 WeatherStatistics

```
<xs:complexType name="WeatherStatistics">
<xs:sequence>
<xs:element name="airQuality" type="wea008_AirQuality" minOccurs="0"/>
<xs:element name="cloudCover" type="tdt:IntUnTi" minOccurs="0"/>
<xs:element name="pressure" type="tdt:IntUnLi" minOccurs="0"/>
<xs:element name="pressureTendency" type="wea004_PressureTendency" minOccurs="0"/>
<xs:element name="rainfallRate" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="rainfallTotal" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="seaState" type="wea006_SeaState" minOccurs="0"/>
<xs:element name="snowDepth" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="sunshine" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="temp" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="tempMax" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="tempMin" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="visibility" type="wea005_Visibility" minOccurs="0"/>
<xs:element name="visibilityDistance" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="feelsLike" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="windDirection" type="wea003_Direction" minOccurs="0"/>
<xs:element name="windDirectionTrend" type="wea012_WindDirectionTrend" minOccurs="0"/>
<xs:element name="windSpeed" type="tdt:Velocity" minOccurs="0"/>
<xs:element name="windSpeedTrend" type="wea013_WindSpeedTrend" minOccurs="0"/>
<xs:element name="cloudbase" type="tdt:DistanceMetres" minOccurs="0"/>
<xs:element name="relativeHumidity" type="tdt:FixedPercentage" minOccurs="0"/>
<xs:element name="dewPointTemp" type="tdt:FixedPointNumber" minOccurs="0"/>
<xs:element name="uvIndex" type="wea010_UVIndex" minOccurs="0"/>
<xs:element name="sunrise" type="tdt:TimePoint" minOccurs="0"/>
<xs:element name="sunset" type="tdt:TimePoint" minOccurs="0"/>
<xs:element name="pollenCount" type="wea007_PollenCount" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
```

B.1.6 WeatherWarning

```
<xs:complexType name="WeatherWarning">
<xs:sequence>
<xs:element name="warningLevel" type="wea009_WarningLevel"/>
<xs:element name="warningElements" type="Element" maxOccurs="unbounded"/>
<xs:element name="isEarlyWarning" type="tdt:Boolean"/>
<xs:element name="warningText" type="tdt:LocalisedLongString" minOccurs="0"
maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
```

B.1.7 AltitudeElements

```
<xs:complexType name="AltitudeElements">
<xs:sequence>
<xs:element name="atAltitude" type="tdt:DistanceMetres" minOccurs="0"/>
<xs:element name="aboveAltitude" type="tdt:DistanceMetres" minOccurs="0"/>
<xs:element name="belowAltitude" type="tdt:DistanceMetres" minOccurs="0"/>
<xs:element name="altElements" type="Element" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="altStatistics" type="WeatherStatistics" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
```

B.1.8 OutlookTrend

```
<xs:complexType name="OutlookTrend">
<xs:sequence>
<xs:element name="trend" type="wea002_TrendItem" maxOccurs="5"/>
<xs:element name="trendTimescale" type="wea001_Period" minOccurs="0"/>
</xs:sequence>
```

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```
</xs:complexType>
```

B.1.9 ReportLinkInfo

```
<xs:complexType name="ReportLinkInfo">
<xs:sequence>
<xs:element name="parentMessage" type="LinkedMessage" minOccurs="0"/>
<xs:element name="childMessage" type="LinkedMessage" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="relatedMessage" type="LinkedMessage" minOccurs="0"
maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
```

B.1.10 WebContentLinks

```
<xs:complexType name="WebContentLinks">
<xs:sequence>
<xs:element name="url" type="tdt:ShortString"/>
<xs:element name="contentType" type="wea014_ContentType" minOccurs="0"/>
<xs:element name="contentText" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
```

B.1.11 MMCSwitch

```
<xs:complexType name="MMCSwitch">
<xs:sequence>
<xs:choice minOccurs="1" maxOccurs="1">
<xs:element name="optionMMCMessagePartLink" type="mmc:MMCMessagePart" minOccurs="1"
maxOccurs="1"/>
<xs:element name="optionMMCMasterMessageLink" type="mmc:MMCMasterMessage" minOccurs="1"
maxOccurs="1"/>
<xs:element name="optionMessageManagementContainerLink"
type="mmc:MessageManagementContainer" minOccurs="1" maxOccurs="1"/>
</xs:choice>
</xs:sequence>
</xs:complexType>
```

B.2 Datatypes

B.2.1 LinkedMessage

```
<xs:complexType name="LinkedMessage">
<xs:sequence>
<xs:element name="linkedMessageID" type="tdt:IntUnLoMB"/>
<xs:element name="contentID" type="tdt:IntUnTi"/>
<xs:element name="originatorSID" type="tdt:ServiceIdentifier" minOccurs="0"/>
<xs:element name="applicationID" type="tdt:IntUnLi" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
```

B.2.2 Element

```
<xs:complexType name="Element">
<xs:sequence>
<xs:element name="subTableType" type="wea100_ElementType"/>
<xs:element name="subTableValue" type="wea099_ElementSubTable"/>
</xs:sequence>
</xs:complexType>
```

B.3 Full WEA schema definition

```
<?xml version="1.0" encoding="UTF-8"?>
<!—This XML schema is generated with tpegUMLconverter V2.3 -->
```

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```
<xs:schema xmlns="https://www.tisa.org/TPEG/WEA_1_2"
  targetNamespace="https://www.tisa.org/TPEG/WEA_1_2"
  xmlns:xs="https://www.w3.org/2001/XMLSchema"
  xmlns:tsf="https://www.tisa.org/TPEG/SFW_1_1"
  xmlns:tdt="https://www.tisa.org/TPEG/TPEGDataTypes_2_1"
  xmlns:mmc="https://www.tisa.org/TPEG/MMC_1_1"
  xmlns:lrc="https://www.tisa.org/TPEG/LRC_3_0"
  elementFormDefault="qualified"
  attributeFormDefault="qualified">
  <xs:import namespace=https://www.tisa.org/TPEG/SFW_1_1 schemaLocation="SFW_1_1.xsd"/>
  <xs:import namespace=https://www.tisa.org/TPEG/TPEGDataTypes_2_1
schemaLocation="TDT_2_1.xsd"/>
  <xs:import namespace=https://www.tisa.org/TPEG/MMC_1_1 schemaLocation="MMC_1_1.xsd"/>
  <xs:import namespace=https://www.tisa.org/TPEG/LRC_3_0 schemaLocation="LRC_3_0.xsd"/>
  <xs:element name="WeatherMessage" type="WeatherMessage"/>
  <xs:complexType name="WeatherMessage">
    <xs:complexContent>
      <xs:extension base="tsf:ApplicationRootMessageML">
        <xs:sequence>
          <xs:element name="mmt" type="MMCSwitch"/>
          <xs:element name="weatherInfo" type="WeatherInformation" minOccurs="0"/>
          <xs:element name="loc" type="lrc:LocationReferencingContainer" minOccurs="0"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="WeatherInformation">
    <xs:sequence>
      <xs:element name="geographicalSignificance" type="wea011_GeoSignificance"/>
      <xs:element name="weatherReport" type="WeatherReport"/>
      <xs:element name="reportLinks" type="ReportLinkInfo" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="webContent" type="WebContentLinks" minOccurs="0"
maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="WeatherReport">
    <xs:sequence>
      <xs:element name="reportType" type="wea000_ReportType"/>
      <xs:element name="weatherDefinition" type="WeatherItem"/>
      <xs:element name="moreDetailedReport" type="WeatherReport" minOccurs="0"
maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="WeatherItem">
    <xs:sequence>
      <xs:element name="period" type="wea001_Period" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="weatherDescription" type="Element" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="start" type="tdt:TimePoint" minOccurs="0"/>
      <xs:element name="stop" type="tdt:TimePoint" minOccurs="0"/>
      <xs:element name="date" type="tdt:TimePoint"" minOccurs=""0"/>
      <xs:element name="reportName" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="reportText" type="tdt:LocalisedLongString" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="outlook" type="OutlookTrend" minOccurs="0"/>
      <xs:element name="statistics" type="WeatherStatistics" minOccurs="0"/>
      <xs:element name="warning" type="WeatherWarning" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="weatherAltitudeDescription" type="AltitudeElements" minOccurs="0"
maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="WeatherStatistics">
    <xs:sequence>
      <xs:element name="airQuality" type="wea008_AirQuality" minOccurs="0"/>
      <xs:element name="cloudCover" type="tdt:IntUnTi" minOccurs="0"/>
      <xs:element name="pressure" type="tdt:IntUnLi" minOccurs="0"/>
      <xs:element name="pressureTendency" type="wea004_PressureTendency" minOccurs="0"/>
      <xs:element name="rainfallRate" type="tdt:FixedPointNumber" minOccurs="0"/>
```

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```
      <xs:element name="rainfallTotal" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="seaState" type="wea006_SeaState" minOccurs="0"/>
      <xs:element name="snowDepth" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="sunshine" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="temp" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="tempMax" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="tempMin" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="visibility" type="wea005_Visibility" minOccurs="0"/>
      <xs:element name="visibilityDistance" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="feelsLike" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="windDirection" type="wea003_Direction" minOccurs="0"/>
      <xs:element name="windDirectionTrend" type="wea012_WindDirectionTrend"
minOccurs="0"/>
      <xs:element name="windSpeed" type="tdt:Velocity" minOccurs="0"/>
      <xs:element name="windSpeedTrend" type="wea013_WindSpeedTrend" minOccurs="0"/>
      <xs:element name="cloudbase" type="tdt:DistanceMetres" minOccurs="0"/>
      <xs:element name="relativeHumidity" type="tdt:FixedPercentage" minOccurs="0"/>
      <xs:element name="dewPointTemp" type="tdt:FixedPointNumber" minOccurs="0"/>
      <xs:element name="uvIndex" type="wea010_UVIndex" minOccurs="0"/>
      <xs:element name="sunrise" type="tdt:TimePoint" minOccurs="0"/>
      <xs:element name="sunset" type="tdt:TimePoint" minOccurs="0"/>
      <xs:element name="pollenCount" type="wea007_PollenCount" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="WeatherWarning">
    <xs:sequence>
      <xs:element name="warningLevel" type="wea009_WarningLevel"/>
      <xs:element name="warningElements" type="Element" maxOccurs="unbounded"/>
      <xs:element name="isEarlyWarning" type="tdt:Boolean"/>
      <xs:element name="warningText" type="tdt:LocalisedLongString" minOccurs="0"
maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="AltitudeElements">
    <xs:sequence>
      <xs:element name="atAltitude" type="tdt:DistanceMetres" minOccurs="0"/>
      <xs:element name="aboveAltitude" type="tdt:DistanceMetres" minOccurs="0"/>
      <xs:element name="belowAltitude" type="tdt:DistanceMetres" minOccurs="0"/>
      <xs:element name="altElements" type="Element" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="altStatistics" type="WeatherStatistics" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="OutlookTrend">
    <xs:sequence>
      <xs:element name="trend" type="wea002_TrendItem" maxOccurs="5"/>
      <xs:element name="trendTimescale" type="wea001_Period" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ReportLinkInfo">
    <xs:sequence>
      <xs:element name="parentMessage" type="LinkedMessage" minOccurs="0"/>
      <xs:element name="childMessage" type="LinkedMessage" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="relatedMessage" type="LinkedMessage" minOccurs="0"
maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="WebContentLinks">
    <xs:sequence>
      <xs:element name="url" type="tdt:ShortString"/>
      <xs:element name="contentType" type="wea014_ContentType" minOccurs="0"/>
      <xs:element name="contentText" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="MMCSwitch">
    <xs:sequence>
      <xs:choice minOccurs="1" maxOccurs="1">
        <xs:element name="optionMMCMessagePartLink" type="mmc:MMCMessagePart"
minOccurs="1" maxOccurs="1"/>
        <xs:element name="optionMMCMasterMessageLink" type="mmc:MMCMasterMessage"
```

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```
minOccurs="1" maxOccurs="1"/>
        <xs:element name="optionMessageManagementContainerLink"
type="mmc:MessageManagementContainer" minOccurs="1" maxOccurs="1"/>
      </xs:choice>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="LinkedMessage">
    <xs:sequence>
      <xs:element name="linkedMessageID" type="tdt:IntUnLoMB"/>
      <xs:element name="contentID" type="tdt:IntUnTi"/>
      <xs:element name="originatorSID" type="tdt:ServiceIdentifier" minOccurs="0"/>
      <xs:element name="applicationID" type="tdt:IntUnLi" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Element">
    <xs:sequence>
      <xs:element name="subTableType" type="wea100_ElementType"/>
      <xs:element name="subTableValue" type="wea099_ElementSubTable"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="wea000_ReportType">
    <xs:attribute name="table" type="xs:string" fixed="wea000_ReportType" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="5"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea001_Period">
    <xs:attribute name="table" type="xs:string" fixed="wea001_Period" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="50"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea002_TrendItem">
    <xs:attribute name="table" type="xs:string" fixed="wea002_TrendItem" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="16"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea003_Direction">
    <xs:attribute name="table" type="xs:string" fixed="wea003_Direction" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="16"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea004_PressureTendency">
    <xs:attribute name="table" type="xs:string" fixed="wea004_PressureTendency"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
```

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```
          <xs:maxInclusive value="6"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea005_Visibility">
    <xs:attribute name="table" type="xs:string" fixed="wea005_Visibility" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="4"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea006_SeaState">
    <xs:attribute name="table" type="xs:string" fixed="wea006_SeaState" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="7"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea007_PollenCount">
    <xs:attribute name="table" type="xs:string" fixed="wea007_PollenCount"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="3"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea008_AirQuality">
    <xs:attribute name="table" type="xs:string" fixed="wea008_AirQuality" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="6"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea009_WarningLevel">
    <xs:attribute name="table" type="xs:string" fixed="wea009_WarningLevel"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="4"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea010_UVIndex">
    <xs:attribute name="table" type="xs:string" fixed="wea010_UVIndex" use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="1"/>
          <xs:maxInclusive value="11"/>
        </xs:restriction>
      </xs:simpleType>
```

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```
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea011_GeoSignificance">
    <xs:attribute name="table" type="xs:string" fixed="wea011_GeoSignificance"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="9"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea012_WindDirectionTrend">
    <xs:attribute name="table" type="xs:string" fixed="wea012_WindDirectionTrend"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="2"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea013_WindSpeedTrend">
    <xs:attribute name="table" type="xs:string" fixed="wea013_WindSpeedTrend"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="4"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea014_ContentType">
    <xs:attribute name="table" type="xs:string" fixed="wea014_ContentType"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="6"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea099_ElementSubTable">
    <xs:attribute name="table" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="wea101_RainElements"/>
          <xs:enumeration value="wea102_SnowElements"/>
          <xs:enumeration value="wea103_SleetHailElements"/>
          <xs:enumeration value="wea104_WindElements"/>
          <xs:enumeration value="wea105_StormElements"/>
          <xs:enumeration value="wea106_FogElements"/>
          <xs:enumeration value="wea107_FrostElements"/>
          <xs:enumeration value="wea108_SunshineCloudElements"/>
          <xs:enumeration value="wea109_TemperatureElements"/>
          <xs:enumeration value="wea110_HazardElements"/>
          <xs:enumeration value="wea200_ElementQualifier"/>
          <xs:enumeration value="wea201_ElementQualifierProbability"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="code" type="xs:unsignedByte" use="required"/>
  </xs:complexType>
```

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```
  <xs:complexType name="wea100_ElementType">
    <xs:attribute name="table" type="xs:string" fixed="wea100_ElementType"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="1"/>
          <xs:maxInclusive value="21"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea101_RainElements">
    <xs:attribute name="table" type="xs:string" fixed="wea101_RainElements"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="12"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea102_SnowElements">
    <xs:attribute name="table" type="xs:string" fixed="wea102_SnowElements"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="14"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea103_SleetHailElements">
    <xs:attribute name="table" type="xs:string" fixed="wea103_SleetHailElements"
use="required"/>
    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
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  </xs:complexType>
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use="required"/>
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          <xs:minInclusive value="0"/>
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        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
```

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  </xs:complexType>
  <xs:complexType name="wea106_FogElements">
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use="required"/>
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  </xs:complexType>
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use="required"/>
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  </xs:complexType>
  <xs:complexType name="wea109_TemperatureElements">
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  </xs:complexType>
  <xs:complexType name="wea110_HazardElements">
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    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea200_ElementQualifier">
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use="required"/>
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    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea201_ElementQualifierProbability">
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      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:schema>
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