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BSI Standards Publication

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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National foreword

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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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Foreword

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*, in cooperation with the Traveller Information Services Association (TISA), TPEG Applications Working Group through Category A Liaison status.

ISO/TS 21219 consists of the following parts, under the general title *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2):*

— *Part 1: Introduction, numbering and versions*

— *Part 2: UML modelling rules*

— *Part 3: UML to binary conversion rules*

— *Part 4: UML to XML conversion rules*

— *Part 5: Service framework*

— *Part 6: Message management container*

— *Part 9: Service and network information*

— *Part 10: Conditional access information*

— *Part 14: Parking information application*

— *Part 18: Traffic flow and prediction application*

— *Part 19: Weather information*

The following parts are under preparation:

— *Part 15: Traffic event compact*

— *Part 16: Fuel price information application*

The following parts are planned:

— *Part 7: Location referencing container*

— *Part 11: Universal location reference*

— *Part 21: Geographic location referencing*

— *Part 22: OpenLR location referencing*

— *Part 23: Road and multimodal routes application*

— *Part 24: Light encryption*

— *Part 25: Electromobility charging infrastructure*

Introduction

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 may 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/WG 4, in conjunction with ISO/TC 204/WG 10, 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, 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, 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, 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 parts of the ISO/TS 18234 series to provide location referencing.

The ISO/TS 18234 series has become known as TPEG, generation 1.

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 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/TS 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 is embodied in the ISO/TS 21219 series and it comprises many parts that cover 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 Parts 2, 3, 4 and the conversion to two current physical formats: binary and XML; others could 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, that forms the Annex for each physical format.

TPEG2 has a three container conceptual structure: Message Management (ISO/TS 21219-6), Application (many ISO/TS 21219 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:

Toolkit parts:	TPEG2-INV (ISO/TS 21219-1), TPEG2-UML (ISO/TS 21219-2), TPEG2-UBCR (ISO/TS 21219-3), TPEG2-UXCR (ISO/TS 21219-4), TPEG2-SFW (ISO/TS 21219-5), TPEG2-MMC (ISO/TS 21219-6), TPEG2-LRC (ISO/TS 21219-7);
Special applications:	TPEG2-SNI (ISO/TS 21219-9), TPEG2-CAI (ISO/TS 21219-10);
Location referencing:	TPEG2-ULR (ISO/TS 21219-11), TPEG2-GLR (ISO/TS 21219-21), TPEG2-OLR (ISO/TS 21219-22);
Applications:	TPEG2-PKI (ISO/TS 21219-14), TPEG2-TEC (ISO/TS 21219-15), TPEG2-FPI (ISO/TS 21219-16), TPEG2-TFP (ISO/TS 21219-18), TPEG2-WEA (ISO/TS 21219-19), TPEG2-RMR (ISO/TS 21219-23).

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 having both long-term, unchanging content and highly dynamic content, such as Parking Information.

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

SP13002/1.1/001

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

Part 19:
Weather information (TPEG2-WEA)

1 Scope

This part of ISO/TS 21219 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.

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 of the specific HMI of the receiving device. This part of ISO/TS 21219, therefore, does not define any prerequisites for the HMI of the device.

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/TS 21219-5, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 5: Service framework*

ISO/TS 21219-6, *Intelligent transport systems — Traffic and travel information via transport protocol experts group, generation 2(TPEG2) — Part 6: Message management container*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
service
collection of different information streams (applications) logically bound together and delivered from a service provider to the end user

3.2
service component
information stream (application) that is part of a *service* (3.1)

Note 1 to entry: A TPEG stream is logically divided into parts known as service components. Each service component carries an application instance. A service component is effectively a "channel" within the multiplex of a TPEG stream. Each stream comprises a number of these "channels" which are identified by the component identifier in TPEG2-SFW and linked to the COID and AID in the TPEG2-SNI application.

3.3
message management container
concept applied to the grouping of all message elements including message management information of a TPEG-Message together in one place

3.4
location referencing
means to provide information that allows a system to accurately identify a location

Note 1 to entry: The content of a location reference allows the location to be presented in a graphical or textual manner to the end-user (e.g. coloured network graphs), as well as to be used for navigational systems purposes.

3.5
location referencing container
concept applied to the grouping of all the *location referencing* (3.4) elements, of a TPEG-Message, together in one place

4 Abbreviated terms

ACID	Application and Content Identifier
ADC	Application Data Container
CEN	Comité Européen de Normalization
EBU	European Broadcasting Union
LRC	Location Reference Container
MMC	Message Management Container
n.a.	Not available
OSI	Open Systems Interconnection
SFW	TPEG Service Framework: Modelling and Conversion Rules
TISA	Traveller Information Services Association
TPEG	Transport Protocol Expert Group
TTI	Traffic and Traveller Information
UML	Unified Modelling Language
TEC	Traffic Event Compact
WEA	TPEG Weather
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 IDentification (AID). An AID is defined whenever a new application is developed and these are all listed in TPEG2-MMC (ISO/TS 21219-6).

The application identification number is used within the TPEG2-SNI (ISO/TS 21219-9) application to indicate how to process TPEG content and 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 may have an impact on client devices.

The version numbering principle is defined in TPEG2-INV.

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	1

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 **Message Management Container**. 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 **Application Data Container** component(s) which includes the application-specific information.

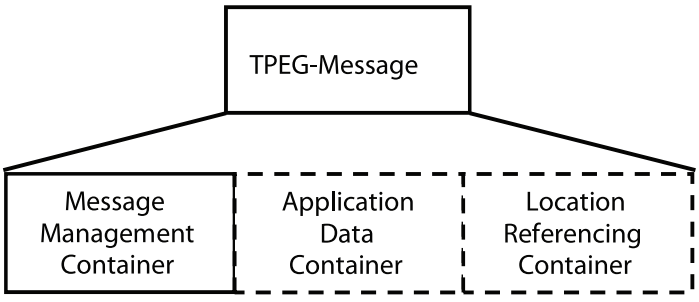


Figure 1 — Composition of TPEG messages

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 (ISO/TS 21219-5).

6 WEA structure

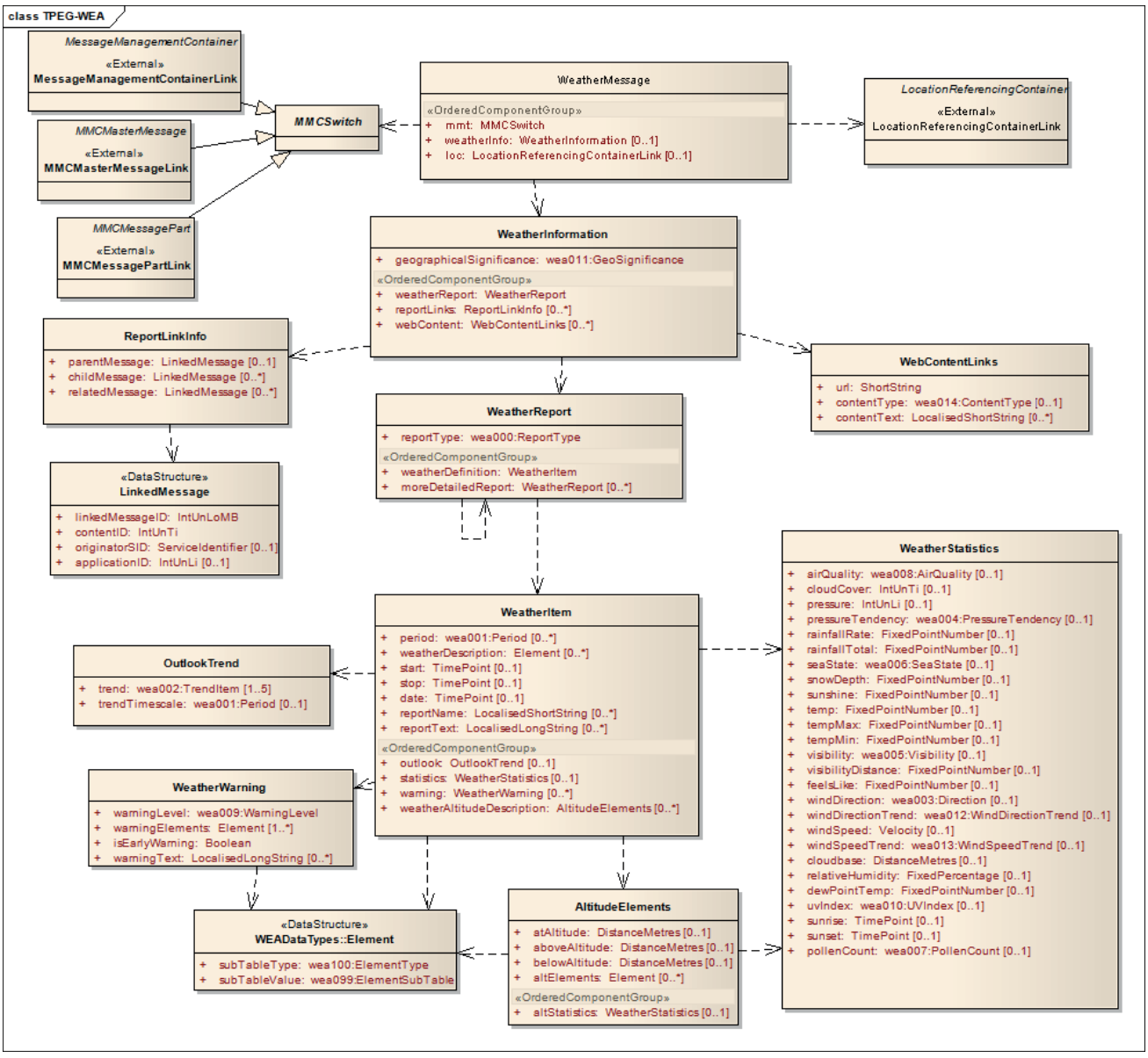


Figure 2 — WEA message structure

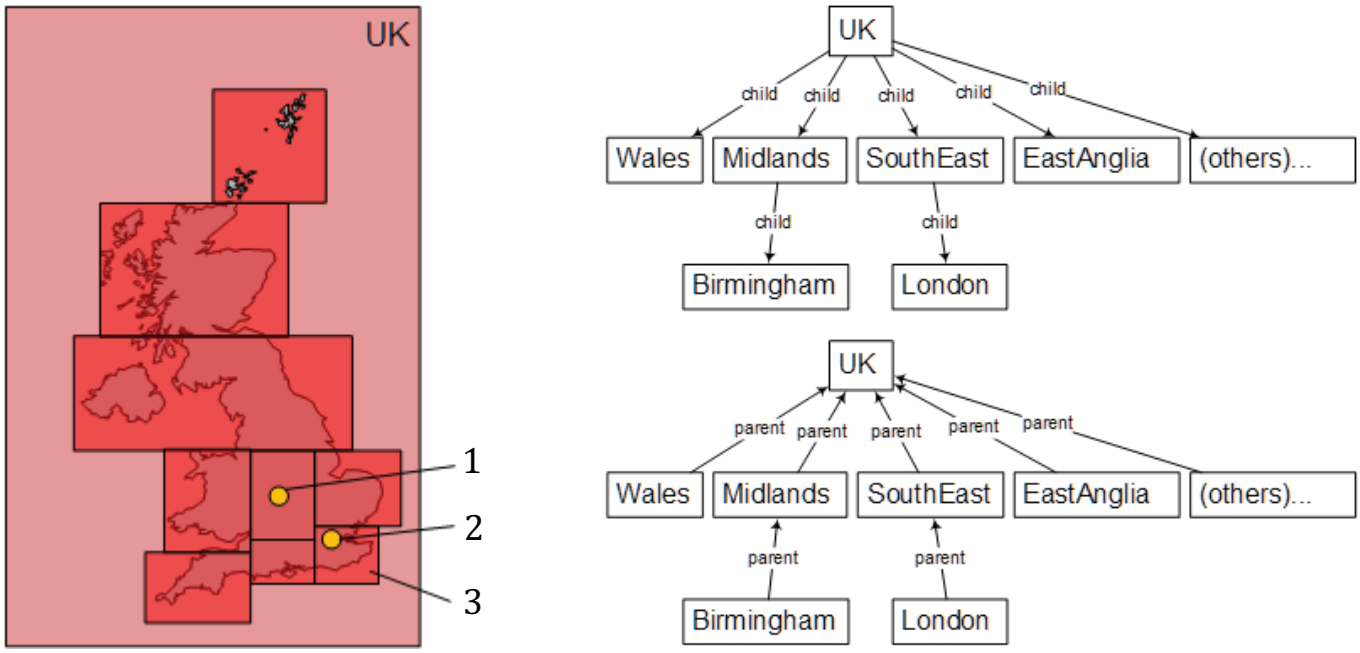
7 WEA message components

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 may be exploited by receivers to help users find the messages they need.

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

Individual messages are linked by child and parent message IDs, as shown in Figure 3.



Key

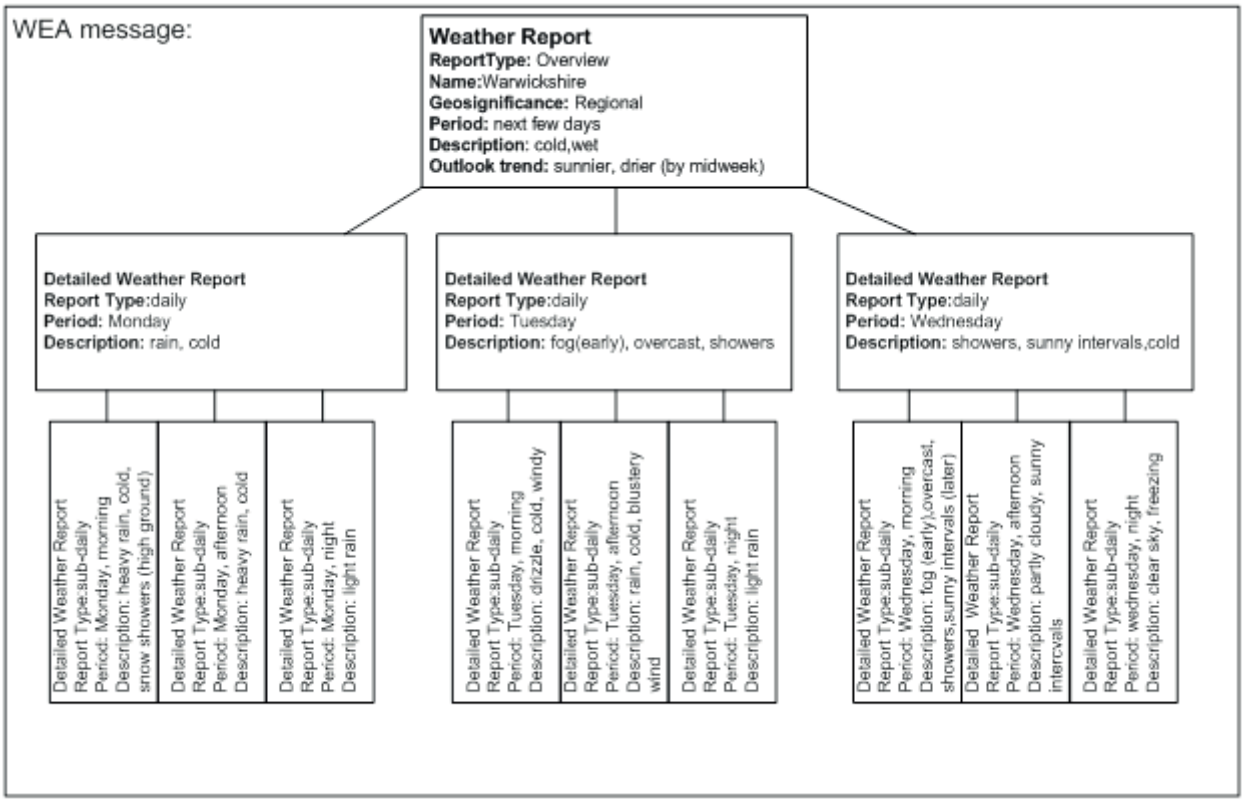
1 Birmingham

2 London

3 SouthEast

NOTE This is provided by linking individual messages in a child/parent relationship. A message may have 1 parent, but may have multiple child messages.

Figure 3 — Location hierarchy



NOTE Different timescales are covered within a specific message by use of the different levels of Report (using the reportType).

Figure 4 — Sample WEA message with different timescales covered

7.1 WeatherMessage

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

Table 2 — WeatherMessage

Name	Type	Multiplicity	Description
Ordered components			
mmt	MMCSwitch	1	Message Management Container
weatherInfo	WeatherInformation	0..1	Weather Information (always included except for cancellation of a message)
Loc	LocationReferencingContainerLink	0..1	Location Referencing Container (always included except for cancellation of a message)

7.2 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			
weatherReport	WeatherReport	1	Contains the report data, defines what type of period it covers and 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

7.3 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 can be defined. 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

7.4 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 may be selected from the element tables.
start	TimePoint	0..1	Start defines the specific time of day 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 ability to report the main date for a report (suitable for a daily forecast). Typically date or date and month.
reportName	LocalizedShortString	0..*	Title for the WEA report e.g. "Warwickshire Forecast", "UK Weather" Multiplicity allows multiple languages to be carried.

Table 5 *(continued)*

Name	Type	Multiplicity	Description
reportText	LocalizedLongString	0..*	Additional text for weather related information. Maybe advice or description of major weather problem or maybe specific information related to weather at specific function/event. (For 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 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.

7.5 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	AirQuality
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 preferred unit in practice for weather forecast, although not actually SI units).
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 how big the waves are
snowDepth	FixedPointNumber	0..1	Depth of fallen snow (mm)
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)

Table 6 *(continued)*

Name	Type	Multiplicity	Description
tempMax	FixedPointNumber	0..1	Maximum temperature (degrees Celsius) expected over defined period (For daily report type, this is typically maximum temperature expected during daytime.)
tempMin	FixedPointNumber	0..1	Minimum temperature (degrees Celsius) expected over defined period (for daily report type this is typically minimum temperature expected during night time)
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).
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.
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

7.6 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, 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 people to prepare if needed.
warningText	LocalizedLongString	0..*	Additional information for warnings

7.7 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

7.8 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)”.

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

7.9 ReportLinkInfo

Linked Messages provide a method to reference 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 may have a location representing a region such as “The Midlands”, its parent may be the “UK”, and several child messages may reference “Warwickshire”, “West Midlands”, “Staffordshire”, etc.

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, maybe either another WEA report or a different TPEG APP completely; for example, reference to TEC message detailing a bridge closure due to high winds or flooding

7.10 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	LocalizedShortString	0..*	Used to add additional information relating to the link if required. Also, if ContentType not appropriate then this can be used to send other short description of data type.

7.11 MMCSwitch

The MMCSwitch is a switch construct for MMC messages.

7.12 MMCMessagePartLink

The MMCMessagePartLink component is a placeholder for the MMCMessagePart component as specified in TPEG2-MMC. 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 client devices are likely to suffer from non-continuous transmission channels as typically encountered in broadcast systems suffering intermittent RF performance.

7.13 MMCMasterMessageLink

The MMCMasterMessageLink component is a placeholder for the MMCMasterMessage container as specified in TPEG2-MMC. 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 client devices are likely to suffer from non-continuous transmission channels as typically encountered in broadcast systems suffering intermittent RF performance.

7.14 MessageManagementContainerLink

The MessageManagement component is a placeholder for the MessageManagementContainer as specified in TPEG2-MMC. 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 client devices are likely to suffer from non-continuous transmission channels as typically encountered in broadcast systems suffering intermittent RF performance.

7.15 LocationReferencingContainerLink

The LocationReferencingContainer component is a placeholder for the LocationReferencingContainer (LRC) as described in the TPEG2-LRC toolkit specification. 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.

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

EXAMPLE If a report is valid from 6:00 to 12:00, one might want 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 night time 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.
10	Tomorrow night	Report is describing conditions for night time 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 stop time or with sub reports detailing the days.
14	Midweek	Report is describing conditions for the middle day(s) of the week; should be clarified with start stop time or with sub reports detailing the days. Typically Tuesday, Wednesday, Thursday.

Table 15 *(continued)*

Code	Reference English "word"	Comment
15	End of the week	Report is describing conditions for last few days of the week; should be clarified with start stop time 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 may be clarified with start stop time or with sub reports detailing the days. Typically just Saturday and Sunday but may include Friday as this helps people plan their "weekend" get-away.
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 may be used in 1 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 afternoon of a specific day. Day defined in other "period", multiple Periods may be used in 1 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 evening of a specific day. Day defined in other "period", multiple Periods may be used in 1 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 1 Report to allow "Sunday evening", "Monday morning", "Monday afternoon", "Tuesday night"
33	Late night	Describing conditions during smaller parts of the day
34	Overnight	Describing conditions typically covering evening + night + early morning
35	This week	Describing conditions for current week
36	Next week	Describing conditions for next week
37	During next hour	Describing conditions for very near short-term period; maybe related to fast-changing or hazardous weather
38	During next couple of hours	Describing conditions for near 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", also can be used with other periods; "later Tuesday"
41	Later today	Later half of the day
42	Later tonight	Later in the night time
43	Later tomorrow	Later half of tomorrow

Table 15 *(continued)*

Code	Reference English "word"	Comment
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 over 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
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 from. 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 where other elements approach from "Snow from SE".

Table 17 — Direction

Code	Reference English "word"	Comment
0	Variable	No specific direction prevails. Usually when winds are light, direction may change quickly.
1	N	North
2	NNE	NorthNorthEast
3	NE	NorthEast
4	ENE	EastNorthEast
5	E	East
6	ESE	EastSouthEast
7	SE	SouthEast
8	SSE	SouthSouthEast
9	S	South
10	SSW	SouthSouthWest
11	SW	SouthWest
12	WSW	WestSouthWest
13	W	West
14	WNW	WestNorthWest
15	NW	NorthWest
16	NNW	NorthNorthWest

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
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 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 taken from the UK Meteorological Office website. 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

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. Air quality indices (AQI) 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. Air quality index 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 might also encourage members of the public to take public transportation or work from home when AQI levels are high. No International Standard exists; 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, may be noticed amongst sensitive individuals
2	Unhealthy for sensitive groups	May have harmful impacts on patients and members of sensitive groups
3	Unhealthy	May cause the general public some minor irritation/ unpleasant feelings
4	Very unhealthy	May 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. May 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 may be affected due to generally poor weather. (Raining/windy)
2	Bad weather	Mild disruption to travel plans may be caused (may be some high bridges closed due to strong wind or slow traffic due to poor visibility from fog). Travellers should be aware and ensure they access the latest weather forecast for up-to-date weather information. Some delays should be expected due to slower traffic. Outdoor events may be disrupted or cancelled.
3	Severe weather	Travellers should take precautionary action and remain extra vigilant. Follow orders and any advice given by authorities under all circumstances. Travellers should ensure they access the latest weather forecast before travelling. Some public transport may be affected/cancelled. Expect significant disruption to daily routines. Travellers should avoid all non-essential journeys; but if they must make a journey, they should carry emergency food/clothing/blankets, etc.
4	Destructive weather	Do not travel unless required to do so by authorities. Evacuation may 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 eye, and the less time it takes for harm to occur. The UVI is an important vehicle to alert 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 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 Forrest).
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.

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

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.

Table 29 — ElementSubTable

Code	Reference English "word"	Comment

9.17 wea100:ElementType

The ElementType (part of element data structure) defines from what table the element is taken. 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	

Table 30 *(continued)*

Code	Reference English "word"	Comment
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	

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	

Table 32 *(continued)*

Code	Reference English "word"	Comment
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.

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

Table 34 *(continued)*

Code	Reference English "word"	Comment
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 freezing layer and freeze on impact into a "glaze" known as freezing rain.
2	Thunderstorm	A storm with thunder and lightning normally accompanied by heavy rain
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 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", as if one could "grab a handful".
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

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 night time 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	
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 Element Qualifier shall not be set as 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 may not be present everywhere, just in some places
1	Low lying areas	Items like fog may be more likely in valleys and low ground near rivers.
2	High ground	Elements like frost and snow may be likely more in high areas.
3	Urban areas	Urban areas sometimes have their own micro climate so sometimes warmer in urban areas or maybe smog may be an issue.
4	Rural areas	Outside city areas snow may be more of a problem in rural areas where drifting snow may be an issue.
5	Coastal areas	Coastal areas are prone to higher winds and sometimes colder temperatures.
6	In land	In land areas may have more sheltered weather, or less windy, or warmer.
7	Exposed area	Allows reference to open areas (moors, hills, etc.)
8	Sheltered areas	Valleys or urban areas might 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

Table 41 *(continued)*

Code	Reference English "word"	Comment
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 sub areas within a general 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, some element may be likely at an earlier time of the period (Frost early, sunny with showers later)
19	Later	Within a report, some element may be likely at a later time of the period (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)

9.29 wea201:ElementQualifierProbability

ElementQualifierProbability provides a qualifier defining the probability of the preceding element occurring. Hence, the ElementQualifierProbability shall not be set as first element in 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 %	

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),	: Message Management Container
n * <WeatherInformation> (weatherInfo)[0..1],	: Weather information (always included except for cancellation of a message)
n * <LocationReferencingContainerLink>(loc)[0..1]	: Location Referencing Container (always included except for cancellation of a message)
};	

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.

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 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 * <LocalizedShortString>(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 * <LocalizedLongString>(reportText),	: Additional text for weather related information. Maybe advice or description of major weather problem or maybe specific information related to weather at 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.

Table A.5 *(continued)*

n * <WeatherWarning>(warning),	: Warnings for specific weather
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),	: AirQuality
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 preferred unit in practice for weather forecast, although not actually SI units).
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 how big the waves are
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)
if (bit 10 of selector is set)	

Table A.6 *(continued)*

<FixedPointNumber>(tempMax),	: Maximum temperature (degrees Celsius) expected over defined period (for daily report type, this is typically maximum temperature expected during daytime)
if (bit 11 of selector is set)	
<FixedPointNumber>(tempMin),	: Minimum temperature (degrees Celsius) expected over defined period (for daily report type, this is typically minimum temperature expected during night time)
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).
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 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.
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
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, 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 people to prepare if needed.
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalizedLongString>(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)
if (bit 3 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <Element>(altElements),	: Weather elements associated with the defined altitude

Table A.8 *(continued)*

}	
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),	
n * <LinkedMessage>(relatedMessage)	: Link to message related to this weather report, maybe either another WEA report or a different TPEG APP completely. 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 not appropriate then this can be used to send other short description of 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.

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

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:LocalizedShortString" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="reportText" type="tdt:LocalizedLongString" 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>
```

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:LocalizedLongString" 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>
```

```
</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:LocalizedShortString" 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 -->
```

```
<xs:schema xmlns="http://www.tisa.org/TPEG/WEA_1_1"
  targetNamespace="http://www.tisa.org/TPEG/WEA_1_1"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:tsf="http://www.tisa.org/TPEG/SFW_1_1"
  xmlns:tdt="http://www.tisa.org/TPEG/TPEGDataTypes_2_0"
  xmlns:mmc="http://www.tisa.org/TPEG/MMC_1_1"
  xmlns:lrc="http://www.tisa.org/TPEG/LRC_2_0"
  elementFormDefault="qualified"
  attributeFormDefault="qualified">
  <xs:import namespace=http://www.tisa.org/TPEG/SFW_1_1 schemaLocation="SFW_1_1.xsd"/>
  <xs:import namespace=http://www.tisa.org/TPEG/TPEGDataTypes_2_0 schemaLocation="TDT_2_0.
xsd"/>
  <xs:import namespace=http://www.tisa.org/TPEG/MMC_1_1 schemaLocation="MMC_1_1.xsd"/>
  <xs:import namespace=http://www.tisa.org/TPEG/LRC_2_0 schemaLocation="LRC_2_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:LocalizedShortString" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="reportText" type="tdt:LocalizedLongString" 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"/>
```

```
      <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:LocalizedLongString" 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>
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    <xs:sequence>
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      <xs:element name="contentType" type="wea014_ContentType" minOccurs="0"/>
      <xs:element name="contentText" type="tdt:LocalizedShortString" minOccurs="0"
maxOccurs="unbounded"/>
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        <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>
  <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>
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    <xs:sequence>
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      <xs:element name="subTableValue" type="wea099_ElementSubTable"/>
    </xs:sequence>
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    <xs:attribute name="code" use="required">
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          <xs:maxInclusive value="5"/>
        </xs:restriction>
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  </xs:complexType>
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  </xs:complexType>
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  </xs:complexType>
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  </xs:complexType>
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use="required"/>
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```

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        </xs:restriction>
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  </xs:complexType>
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    <xs:attribute name="code" use="required">
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        </xs:restriction>
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    </xs:attribute>
  </xs:complexType>
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use="required"/>
    <xs:attribute name="code" use="required">
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        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
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    <xs:attribute name="code" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="1"/>
          <xs:maxInclusive value="11"/>
        </xs:restriction>
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    </xs:attribute>
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use="required"/>
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          <xs:maxInclusive value="9"/>
        </xs:restriction>
      </xs:simpleType>
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  </xs:complexType>
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use="required"/>
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        </xs:restriction>
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  </xs:complexType>
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use="required"/>
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    </xs:attribute>
  </xs:complexType>
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          <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>
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  </xs:complexType>
  <xs:complexType name="wea100_ElementType">
    <xs:attribute name="table" type="xs:string" fixed="wea100_ElementType" use="required"/>
```

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        </xs:restriction>
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use="required"/>
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      <xs:simpleType>
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          <xs:minInclusive value="0"/>
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        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea102_SnowElements">
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use="required"/>
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      <xs:simpleType>
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        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea103_SleetHailElements">
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use="required"/>
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      <xs:simpleType>
        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="10"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
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use="required"/>
    <xs:attribute name="code" use="required">
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        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea105_StormElements">
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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>
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    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea106_FogElements">
    <xs:attribute name="table" type="xs:string" fixed="wea106_FogElements" use="required"/>
```

```
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        </xs:restriction>
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    </xs:attribute>
  </xs:complexType>
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use="required"/>
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        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
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use="required"/>
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          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="13"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
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use="required"/>
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        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="12"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
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use="required"/>
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        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="13"/>
        </xs:restriction>
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    </xs:attribute>
  </xs:complexType>
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use="required"/>
    <xs:attribute name="code" use="required">
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        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
  <xs:complexType name="wea201_ElementQualifierProbability">
    <xs:attribute name="table" type="xs:string" fixed="wea201_ElementQualifierProbability"
```

```
use="required"/>
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        <xs:restriction base="xs:unsignedByte">
          <xs:minInclusive value="0"/>
          <xs:maxInclusive value="10"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:schema>
```

Annex C
(informative)

Worked examples

C.1 General

The following examples are provided to help explain how some typical weather reports may be signalled:

a) single weather message with single report;

b) multi-level reports showing several levels of report — overview, daily, hourly;

c) multiple messages with child/parent message relationship to show geographical hierarchy;

d) multiple messages and multiple time periods.

C.2 Example 1

This example shows in Figure C.1 a single message with a single report detailing the weather for the UK National situation. The rendering of this data in the HMI display is suggested in the picture below.

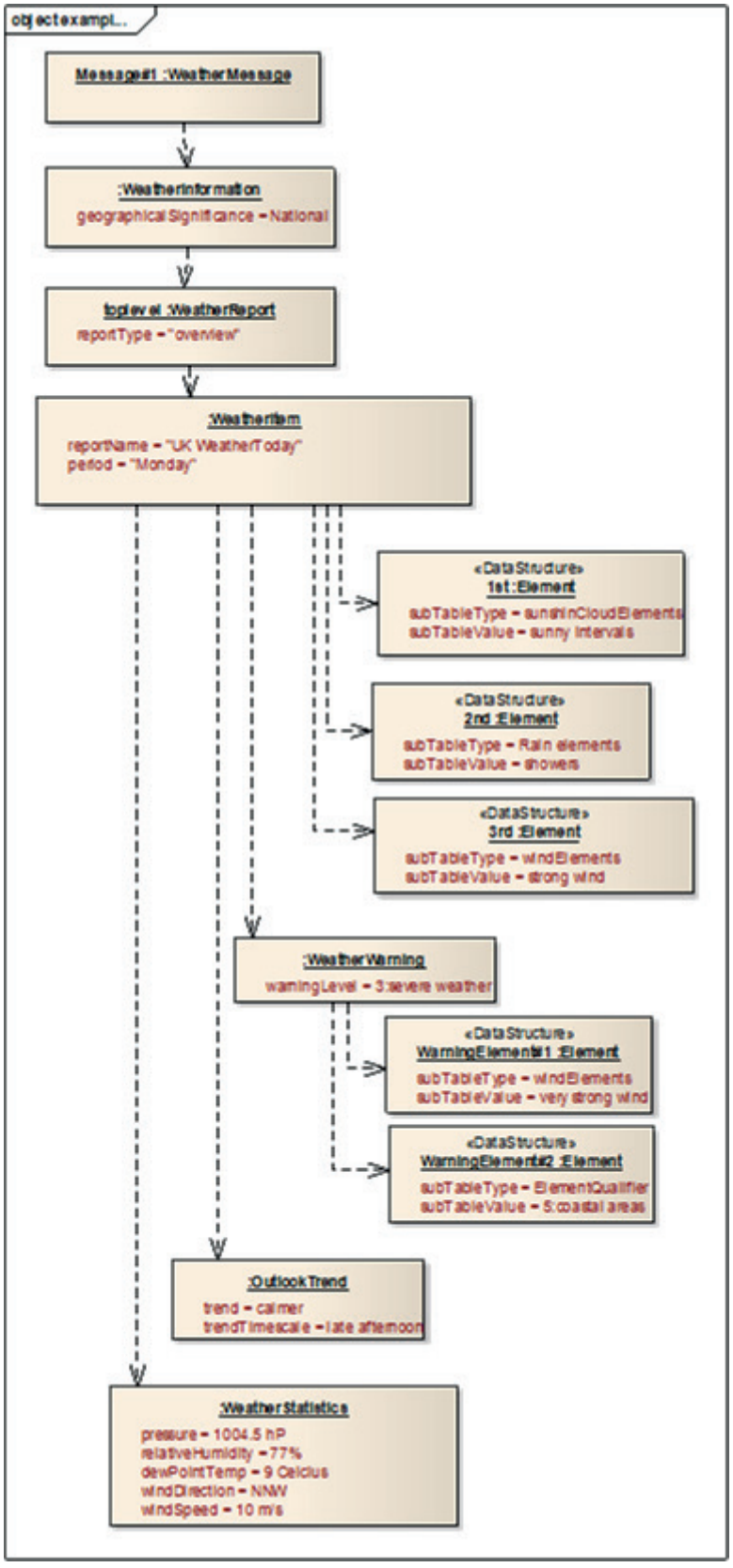

Figure C.1 — Example data

C.3 Example 2

This example shows in Figure C.2, Figure C.3 and Figure C.4 a single message with a summary overview of a few days followed by more detail for each day.

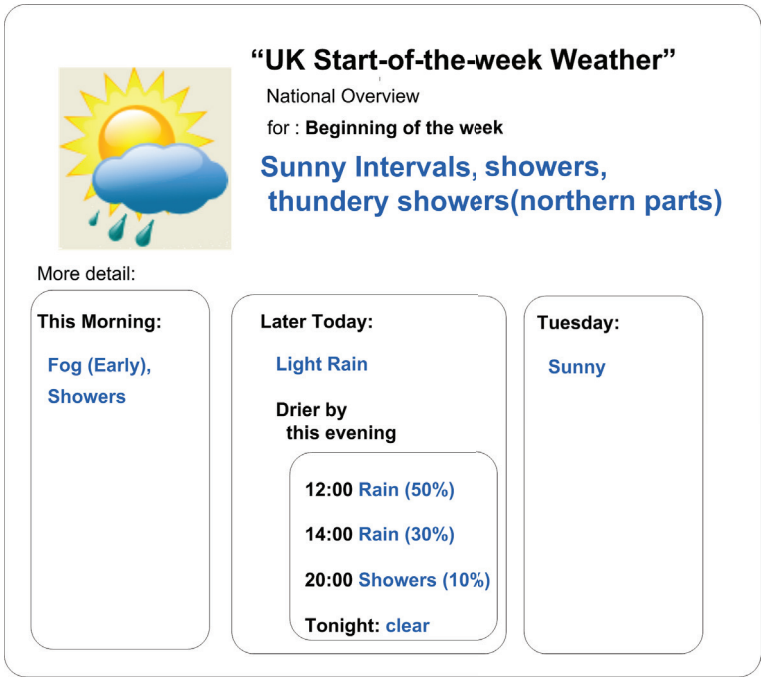

Figure C.2 — HMI rendering of example 2

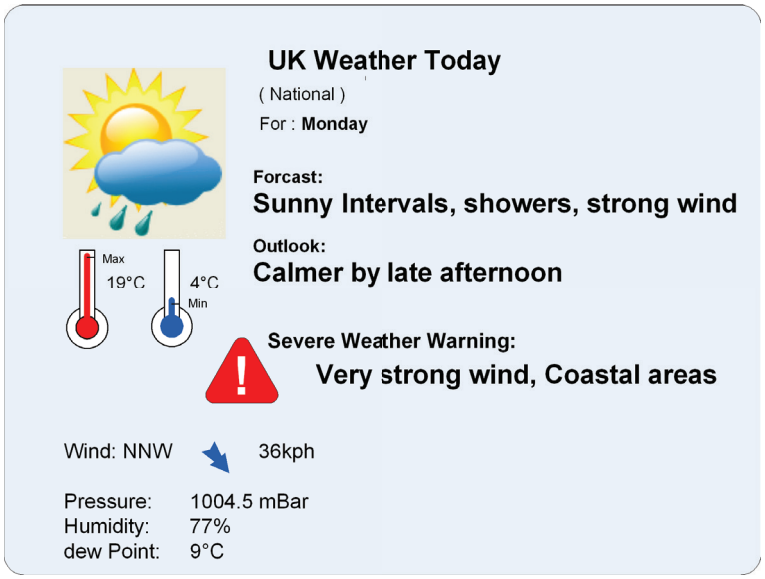

Figure C.3 — HMI rendering of data

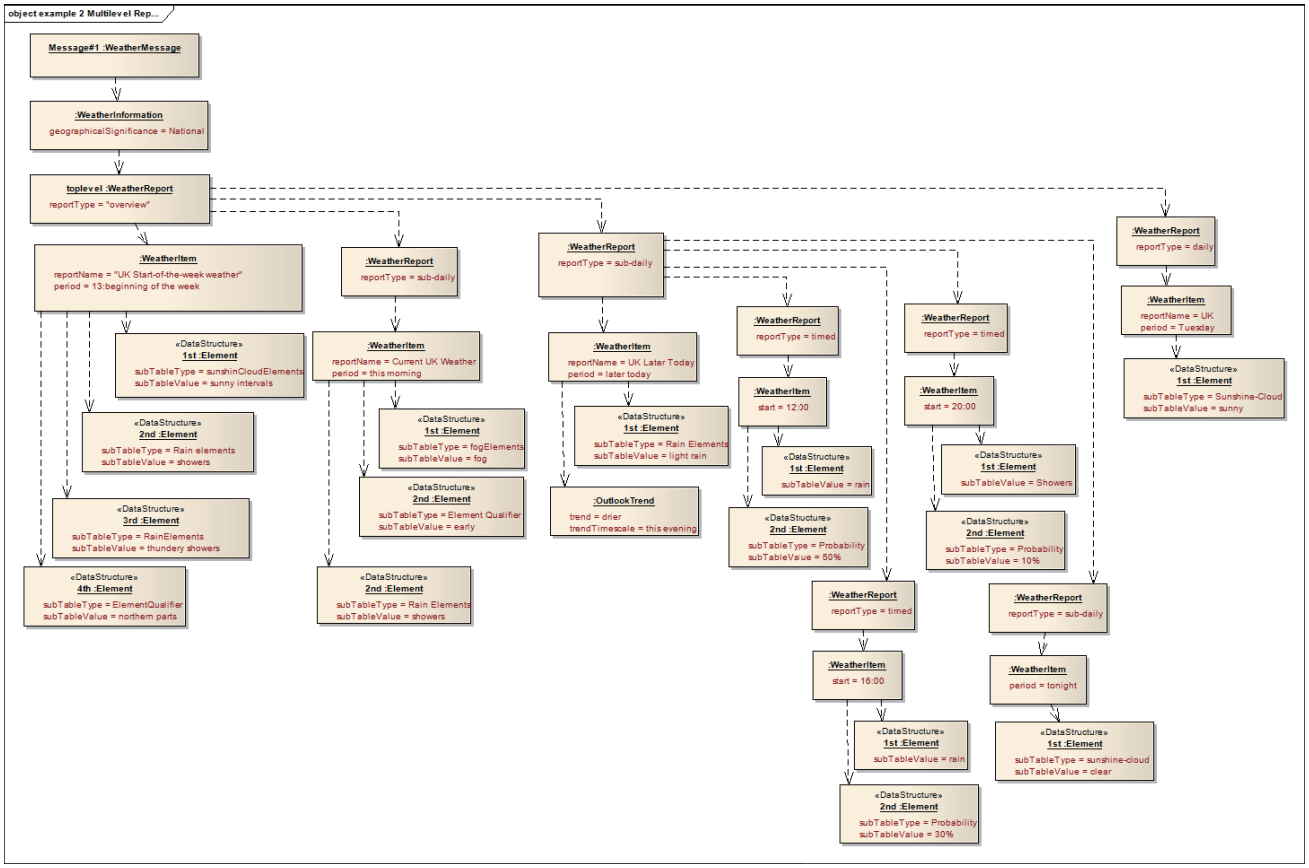

Figure C.4 — Multi-level report data

C.4 Example 3

Hierarchy of messages using Linked Weather Messages is shown in Figure C.5 and Figure C.6.

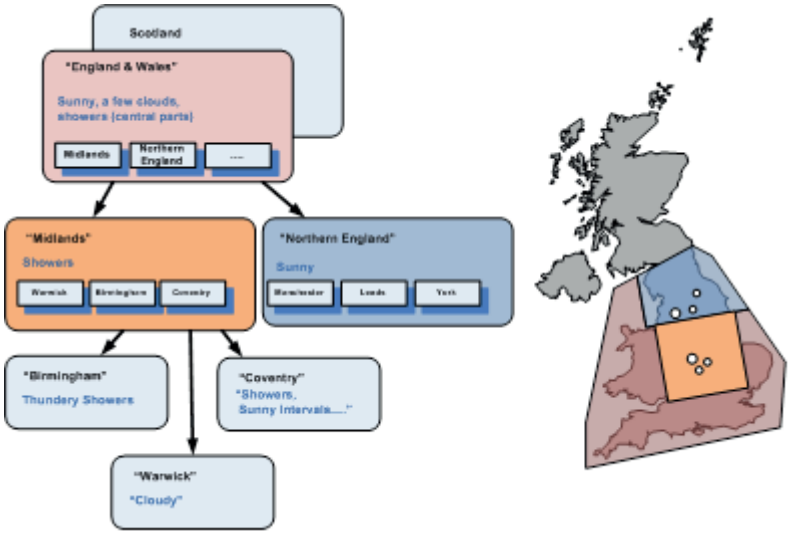

Figure C.5 — Geo-hierarchy using linked message

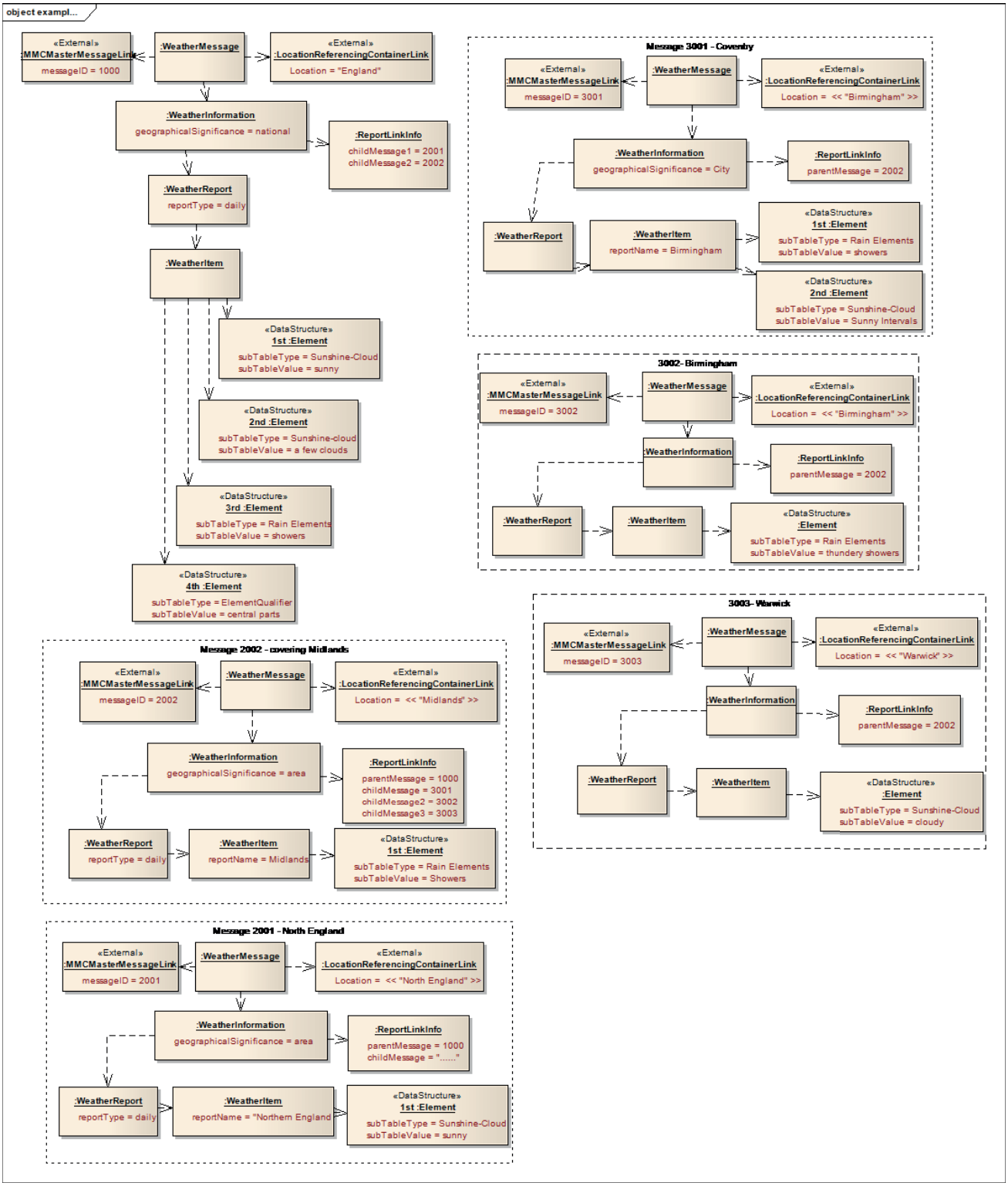

Figure C.6 — Linked message example data

Annex D
(informative)

Suggested translation between WEA table codes and WMO SYNOP weather observation codes

During development of this part of ISO/TS 21219, references were made to the SYNOP code system.

SYNOP (**surface synoptic observations**) is a numerical code (called FM-12 by WMO) used for reporting weather observations made by manned and automated weather stations. A report consists of groups of numbers describing general weather information, such as the temperature, barometric pressure and visibility at a weather station.

TISA recognizes that this is an existing method of reporting weather data but views it as being defined for raw observation data and not suited for the specific application of transferring processed forecast information to users for display on an HMI device relating primarily to traffic and travel information. However, it may be useful to be able to convert the standard codes relating to present and forecast conditions defined by SYNOP into appropriate WEA table values. This is presented in Table D.1.

Table D.1 — Translation between WEA table codes and WMO SYNOP weather observation codes

SYNOP code	Element type code	Wea100:Element-Type	Element code	Element code description	Comment
00 — clear skies	8	wea108_Sunshine-Cloud	0	Clear sky	
01 — clouds dissolving	8	wea108_Sunshine-Cloud	13	Clouds dissolving	
02 — state of sky unchanged					N/A
03 — clouds developing	8	wea108_Sunshine-Cloud	12	Clouds developing	
04 — visibility reduced by smoke	10	wea110:HazardElements	7	Smoke	
05 — haze	8	wea108_Sunshine-Cloud	11	Hazy	
06 — widespread dust in suspension not raised by wind	10	wea110:HazardElements	10	Dust	
07 — dust or sand raised by wind	10	wea110:HazardElements	10 or 11	Dust or sand	
08 — well developed dust or sand whirls	10	wea110:HazardElements	12	Dust whirls	
09 — dust or sand storm within sight but not at station	5	wea105:StormElements	10 or 11	Dust or sand	
10 — mist	6	wea106:FogElements	8	Mist	
11 — patches of shallow fog	6	wea106:FogElements	4	Shallow fog	Use with element quantifier code 0
12 — continuous shallow fog	6	wea106:FogElements	4	Shallow fog	
13 — lightning visible, no thunder heard	5	wea105:StormElements	2	Thunderstorm	

Table D.1 *(continued)*

SYNOP code	Element type code	Wea100:Element-Type	Element code	Element code description	Comment
14 — precipitation within sight but not hitting ground	1	wea101:RainElements	0	Rain	
15 — distant precipitation but not falling at station	1	wea101:RainElements	0	Rain	
16 — nearby precipitation but not falling at station	1	wea101:RainElements	0	Rain	
17 — thunderstorm but no precipitation falling at station	5	wea105:StormElements	2	Thunderstorm	
18 — squalls within sight but no precipitation falling at station	5	wea105:StormElements	5	Squall	
19 — funnel clouds within sight					N/A
20 — drizzle	1	wea101:RainElements	3	Drizzle	
21 — rain	1	wea101:RainElements	0	Rain	
22 — snow	2	wea102:SnowElements	0	Snow	
23 — rain and snow	1	wea101:RainElements	0	Rain	AND
	2	wea102:SnowElements	0	Snow	
24 — freezing rain	1	wea101:RainElements	11	Freezing rain	
25 — rain showers	1	wea101:RainElements	6	Showers	
26 — snow showers	2	wea102:SnowElements	3	Snow showers	
27 — hail showers	3	wea103:SleetHailElements	7	Hail showers	
28 — fog	6	wea106:FogElements	0	Fog	
29 — thunderstorms	5	wea105:StormElements	2	Thunderstorm	
30 — slight to moderate dust storm, decreasing in intensity	5	wea105:StormElements	11	Dust storm	
31 — slight to moderate duststorm, no change	5	wea105:StormElements	11	Dust storm	
32 — slight to moderate duststorm, increasing in intensity	5	wea105:StormElements	11	Dust storm	
33 — severe duststorm, decreasing in intensity	5	wea105:StormElements	11	Dust storm	
34 — severe duststorm, no change	5	wea105:StormElements	11	Dust storm	
35 — severe duststorm, increasing in intensity	5	wea105:StormElements	11	Dust storm	

Table D.1 *(continued)*

SYNOP code	Element type code	Wea100:Element-Type	Element code	Element code description	Comment
36 — slight to moderate drifting snow, below eye level	2	wea102:SnowElements	5	Drifting snow	Element quantifier moderate
37 — heavy drifting snow, below eye level	2	wea102:SnowElements	5	Drifting snow	
38 — slight to moderate drifting snow, above eye level	2	wea102:SnowElements	5	Drifting snow	
39 — heavy drifting snow, above eye level	2	wea102:SnowElements	5	Drifting snow	
40 — Fog at a distance	6	wea106:FogElements	0	Fog	
41 — patches of fog	6	wea106:FogElements	1	Patchy fog	
42 — fog, sky visible, thinning	6	wea106:FogElements	0	Fog	Addition of element code 11, 12 (thinning, thickening)
43 — fog, sky not visible, thinning	6	wea106:FogElements	0	Fog	
44 — fog, sky visible, no change	6	wea106:FogElements	0	Fog	
45 — fog, sky not visible, no change	6	wea106:FogElements	0	Fog	
46 — fog, sky visible, becoming thicker	6	wea106:FogElements	0	Fog	
47 — fog, sky not visible, becoming thicker	6	wea106:FogElements	0	Fog	
48 — fog, depositing rime, sky visible	6	wea106:FogElements	0	Fog	
49 — fog, depositing rime, sky not visible	6	wea106:FogElements	0	Fog	
50 — intermittent light drizzle	1	wea101:RainElements	3	Drizzle	Addition of element qualifier code 23 (intermittent)
51 — continuous light drizzle	1	wea101:RainElements	4	Light drizzle	Addition of element qualifier code 25 (continuous)
52 — intermittent moderate drizzle	1	wea101:RainElements	3	Drizzle	Addition of element qualifier code 23, 21 (intermittent, moderate)
53 — continuous moderate drizzle	1	wea101:RainElements	3	Drizzle	Addition of element qualifier code 23, 21 (continuous, moderate)

Table D.1 *(continued)*

SYNOP code	Element type code	Wea100:Element-Type	Element code	Element code description	Comment
54 — intermittent heavy drizzle	1	wea101:RainElements	0	Rain	Addition of element qualifier code 23 (intermittent)
55 — continuous heavy drizzle	1	wea101:RainElements	0	Rain	addition of element qualifier code 25 (continuous)
56 — light freezing drizzle	1	wea101:RainElements	11	Freezing rain	
57 — moderate to heavy freezing drizzle	1	wea101:RainElements	11	Freezing rain	
58 — light drizzle and rain	1	wea101:RainElements	2	Light rain	
59 — moderate to heavy drizzle and rain	1	wea101:RainElements	0	Rain	
60 — intermittent light rain	1	wea101:RainElements	2	Light rain	Addition of element qualifier code 23 (intermittent)
61 — continuous light rain	1	wea101:RainElements	2	Light rain	Addition of element qualifier code 25 (continuous)
62 — intermittent moderate rain	1	wea101:RainElements	2	Light rain	addition of element qualifier code 23, 21 (intermittent, moderate)
63 — continuous moderate rain	1	wea101:RainElements	2	Light rain	Addition of element qualifier code 23, 21 (continuous, moderate)
64 — intermittent heavy rain	1	wea101:RainElements	5	Heavy rain	Addition of element qualifier code 23 (intermittent)
65 — continuous heavy rain	1	wea101:RainElements	2	Light rain	Addition of element qualifier code 25 (continuous)
66 — light freezing rain	1	wea101:RainElements	11	Freezing rain	
67 — moderate to heavy freezing rain	1	wea101:RainElements	2	Light rain	

Table D.1 *(continued)*

SYNOP code	Element type code	Wea100:Element-Type	Element code	Element code description	Comment
68 — light rain and snow	1	wea101:RainElements	2	Light rain	AND
	2	wea102:SnowElements	0	Snow	
69 — moderate to heavy rain and snow	1	wea101:RainElements	5	Heavy rain	AND
70 — intermittent light snow	2	wea102:SnowElements	1	Light snow	Addition of element qualifier code 23 (intermittent)
71 — continuous light snow	2	wea102:SnowElements	1	Light snow	Addition of element qualifier code 25 (continuous)
72 — intermittent moderate snow	2	wea102:SnowElements	0	Snow	addition of element qualifier code 23, 21 (intermittent, moderate)
73 — continuous moderate snow	2	wea102:SnowElements	0	Snow	Addition of element qualifier code 23, 21 (continuous, moderate)
74 — intermittent heavy snow	2	wea102:SnowElements	4	Heavy snow showers	Addition of element qualifier code 23 (intermittent)
75 — continuous heavy snow	2	wea102:SnowElements	4	Heavy snow showers	Addition of element qualifier code 25 (continuous)
76 — diamond dust	2	wea102:SnowElements	12	Diamond dust	
77 — snow grains	2	wea102:SnowElements	13	Snow grains	
78 — snow crystals	2	wea102:SnowElements	14	Snow crystals	
79 — ice pellets	3	wea103:SleetHailElements	5	Hail	
80 — light rain showers	1	wea101:RainElements	2 and/or 6	Light rain/ showers	
81 — moderate to heavy rain showers	1	wea101:RainElements	5	Heavy rain	Addition of element qualifier code 23 (intermittent)
82 — violent rain showers	1	wea101:RainElements	5 or 10	Heavy rain or thundery rain	

Table D.1 *(continued)*

SYNOP code	Element type code	Wea100:Element-Type	Element code	Element code description	Comment
83 — light rain and snow showers	1	wea101:RainElements	2	Light rain	AND
	2	wea102:SnowElements	3	Snow showers	
84 — moderate to heavy rain and snow showers	1	wea101:RainElements	5	Heavy rain	AND
	2	wea102:SnowElements	4	Heavy snow showers	
85 — light snow showers	2	wea102:SnowElements	3	Snow showers	
86 — moderate to heavy snow showers	2	wea102:SnowElements	4	Heavy snow showers	
87 — light snow/ice pellet showers	2	wea102:SnowElements	1	Light snow	AND
	3	wea103:SleetHailElements	7	Hail showers	
88 — moderate to heavy snow/ice pellet showers	2	wea102:SnowElements	4	Heavy snow showers	AND
	3	wea103:SleetHailElements	7	Hail showers	
89 — light hail showers	3	wea103:SleetHailElements	6	Light hail	Addition of element qualifier code 23 (intermittent)
90 — moderate to heavy hail showers	3	wea103:SleetHailElements	8	Heavy hail showers	
91 — thunderstorm in past hour, currently only light rain	5	wea105:StormElements	2	Thunderstorm	AND
	1	wea101:RainElements	2	Light rain	
92 — thunderstorm in past hour, currently only moderate to heavy rain	5	wea105:StormElements	2	Thunderstorm	AND
	1	wea101:RainElements	5	Heavy rain	
93 — thunderstorm in past hour, currently only light snow or rain/snow mix	5	wea105:StormElements	2	Thunderstorm	AND
	3	wea103:SleetHailElements	8	Sleet showers	
	2	wea102:SnowElements	1	Light snow	
94 — thunderstorm in past hour, currently only moderate to heavy snow or rain/snow mix	5	wea105:StormElements	2	Thunderstorm	AND
	2	wea102:SnowElements	4	Heavy snow showers	
	3	wea103:SleetHailElements	8	Sleet showers	

Table D.1 *(continued)*

SYNOP code	Element type code	Wea100:Element-Type	Element code	Element code description	Comment
95 — light to moderate thunderstorm	5	wea105:StormElements	2	Thunderstorm	Addition of element qualifier code 21 (moderate)
96 — light to moderate thunderstorm with hail	5	wea105:StormElements	2	Thunderstorm	AND
	3	wea103:SleetHailElements	5	Hail	
97 — heavy thunderstorm	5	wea105:StormElements	2	Thunderstorm	Addition of element qualifier code 22 (severe)
98 — heavy thunderstorm with dust storm	5	wea105:StormElements	2	Thunderstorm	AND
	5	wea105:StormElements	2	Dust storm	
99 — heavy thunderstorm with hail	5	wea105:StormElements	2	Thunderstorm	AND
	3	wea103:SleetHailElements	5	Hail	

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