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Intelligent transport systems — Traffic and Travel Information (TTI) via transport protocol experts group, generation 1 (TPEG1) binary data format —

Part 11: Location Referencing Container (TPEG1-LRC)

Systèmes intelligents de transport — Informations sur le trafic et le tourisme via les données de format binaire du groupe d'experts du protocole de transport, génération 1 (TPEG1) —

Partie 11: Conteneur de référencement d'emplacement

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 18234-11 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Road transport and traffic telematics*, in collaboration with ISO Technical Committee TC 204, *Intelligent transport systems* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO/TS 18234 consists of the following parts, under the general title *Intelligent transport systems — Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams*:

— *Part 1: Introduction, numbering and versions (TPEG1-INV)*

— *Part 2: Syntax, Semantics and Framing Structure (SSF)*

— *Part 3: Service and network information (TPEG1-SNI)*

— *Part 4: Road Traffic Message (RTM) application*

— *Part 5: Public Transport Information (PTI) application*

— *Part 6: Location referencing applications*

— *Part 7: Parking Information (TPEG-PKI)*[1]

— *Part 8: Congestion and travel-time application (TPEC1-CTT)*[2]

— *Part 9: Traffic event compact (TPEG1-TEC)*[3]

— *Part 10: Conditional access information (TPEG1-CAI)*[4]

— *Part 11: Location Referencing Container (TPEG1-LRC)*

[1] To be published.

[2] To be published.

[3] To be published.

[4] To be published.

Introduction

TPEG technology uses a byte-oriented data stream format, which may be carried on almost any digital bearer with an appropriate adaptation layer. TPEG messages are delivered from service providers to end-users and used to transfer information from the database of a service provider to an end-user's equipment.

The brief history of TPEG technology development dates back to the European Broadcasting Union (EBU) Broadcast Management Committee establishing the B/TPEG project group in autumn 1997 with the mandate 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 are 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.

One year later in December 1998, the B/TPEG group produced its first EBU specifications. Two documents were released. Part 2 (TPEG1-SSF, which became ISO/TS 18234-2) described the Syntax, Semantics and Framing structure, which is used for all TPEG applications. Part 4 (TPEG1-RTM, which became ISO/TS 18234-4 described the first application, for Road Traffic Messages.

Subsequently, CEN/TC 278/WG 4, in conjunction with ISO/TC 204/WG 10, established a project group comprising the members of B/TPEG and they continued the work concurrently since March 1999. Since then two further parts were developed to make the initial complete set of four parts, enabling the implementation of a consistent service. Part 3 (TPEG1-SNI, ISO/TS 18234-3) describes the Service and Network Information Application, which should be used by all service implementations to ensure appropriate referencing from one service source to another. Part 1 (TPEG1-INV, ISO/TS 18234-1), completes the series, by describing the other parts and their relationship; it also contains the application IDs used within the other parts. Additionally, Part 5, the Public Transport Information Application (TPEG1-PTI, ISO/TS 18234-5) and TPEG1-LRC, ISO/TS 18234-6), were developed.

This Technical Specification adds a powerful mechanism for the ISO/TS 18234 series, allowing detailed road event information to be encoded and transmitted to the user; it was developed specifically to satisfy the need for a number of location referencing methods for Navigation Systems for worldwide markets. This Technical Specification includes new datatypes as specified in Annex A.

TPEG applications are now developed using UML modelling and a software tool is used to automatically select content which then populates this Technical Specification. Diagrammatic extracts from the model are used to show the capability of the binary coding in place of lengthy text descriptions; the diagrams do not necessarily include all relevant content possible.

During the development of the TPEG technology a number of versions have been documented and various trials implemented using various versions of the specifications. At the time of the publication of this Technical Specification, the original parts are fully inter-workable and no specific dependencies exist. Now, however, at least for TPEG1-TEC, profiles are used to define which Applications should be used together. For example TPEG1-TEC is used only with TPEG1-LRC containing DLR1 and never with TPEG1-LOC.

Intelligent transport systems — Traffic and Travel Information (TTI) via transport protocol experts group, generation 1 (TPEG1) binary data format —

Part 11: Location Referencing Container (TPEG1-LRC)

1 Scope

This Technical Specification establishes the method of signalling the specific location referencing used by all TPEG1 applications that require detailed location information to be delivered to client devices such as TPEG1-RTM, TPEG1-PTI, TPEG1-TEC or TPEG1-PKI. The TPEG1-Location Referencing Container (TPEG1-LRC) is described, as well as how it is used to signal which specific location referencing method is in use for a particular TPEG Message. It is able to handle Location Referencing methods that are external to ISO/TS 18234 (all parts) and the internal location referencing method (TPEG1-LOC) defined in ISO/TS 18234-6.

2 Normative references

The following referenced documents are indispensable for the application 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 639-1:2002, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

ISO 3166-1:2006, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

ISO 4217:2008, *Codes for the representation of currencies and funds*

ISO 17572-2:2008, *Intelligent transport systems (ITS) — Location referencing for geographic databases — Part 2: Pre-coded location references (pre-coded profile)*

ISO 17572-3:2008, *Intelligent transport systems (ITS) — Location referencing for geographic databases — Part 3: Dynamic location references (dynamic profile)*

ISO/TS 18234-2:2006, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 2: Syntax, Semantics and Framing Structure (SSF)*

ISO/TS 18234-3:2006, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 3: Service and Network Information (SNI) application*

ISO/TS 18234-6:2006, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 6: Location referencing applications*

IEC 60559:1989, *Binary floating-point arithmetic for microprocessor systems*

3 Terms and definitions

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

NOTE Digital map-based systems, either on the message generation side or the client (end-user) side tend to be based upon road mapping rather than, for example, rail track mapping. Therefore, throughout ISO/TS 18234 (all parts) there is a tendency to use roads as examples. However, roads are not necessarily implied, so the use and context of an element must be clarified.

3.1
dynamic location reference
location reference generated on the fly based on geographic properties in a digital map database

3.2
location referencing
means to provide information that allows a system to identify a location accurately

Note 1 to entry: The content of a location reference allows the location to be presented in a plain-language manner directly to the end-user (i.e. text, speech or icons) or to be used for navigational purposes, for example, for map-based systems.

3.3
location referencing container
concept applied to the grouping of all the location referencing elements of a TPEG Message together in one place

Note 1 to entry: Many TPEG applications are designed to deliver TPEG messages, which consist of three high level containers, each with one or more elements. These containers are for message management, event information and location referencing information. Note that some special application messages do NOT include a location referencing container, such as a cancellation message. It should also be noted that each container does not necessarily have all possible lower level elements included.

Figure 1 shows the “container view” structure used, for example, when a TPEG1-RTM (See ISO/TS 18234-4) application message is generated to describe a road event and location references need to be given to the end-user.

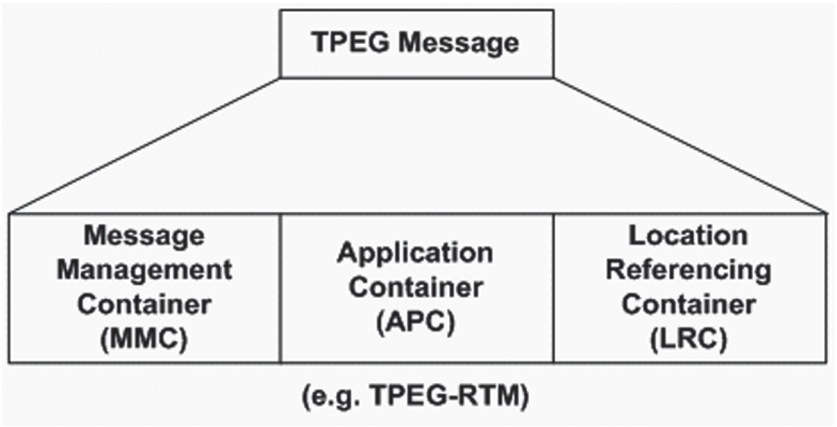

Figure 1 — The “container view” of a TPEG Message

The main purpose of the location referencing container is to provide both human understandable and machine-readable elements to appropriate client decoders. It may be delivered to a “thin client”, which for example is only able to convey limited location referencing information to the end-user, or it may be delivered to a “thick client” using a considerable number of elements and using considerable processing power to filter the information for a comprehensive display to an end-user.

3.4
message
collection of coherent information sent through the information channel describing an event, a collection of related events, or status information and including message management information

3.5
pre-coded location reference
location reference using a unique identifier that is agreed upon in both sender and receiver systems to select a location from a set of pre-coded locations

3.6
TPEG-LOC
TPEG Location
native TPEG location referencing method focused on providing location references for various TPEG applications, which are designed for delivering messages to end-users

Note 1 to entry: Since TPEG-LOC is designed for delivering messages to end-users, some definitions have a meaning which is different from that found in other location referencing systems.

Note 2 to entry: An important aspect of the TPEG-LOC referencing method is that a location description may be created on-the-fly by the service provider when needed. It may then be interpreted and used by the TPEG-decoder, and then discarded. The pre-creation of codes and the use of a database and code maintenance is entirely avoided.

4 Abbreviations

For the purposes of this document, the following abbreviations apply.

CEN Comité Européen de Normalisation

EBU European Broadcasting Union

ETL Extended TMC Location Reference

GLR Geographical Location Reference

ISO International Organization for Standardization

OSI Open Systems Interconnection

RTM Road Traffic Message

SSF Syntax, Semantics and Framing Structures

TISA Traveller Information Services Association

TPEG Transport Protocol Experts Group

TTI Traffic and Travel Information

VICS Vehicle Information and Communication System

NOTE Real-time road traffic information system providing congestion and regulation information developed and deployed by Japan.

5 Location Referencing Container

5.1 TPEG-LRC Introduction

TPEG applications are described by the TPEG specifications in this Technial Specification series and are placed at the highest layers of the OSI protocol stack, ISO/IEC 7498-1:1994. Each TPEG application (e.g. TPEG1-RTM) is assigned a unique Application IDentification (AID) number. In this respect, the TPEG1-LRC is not an application, but it is an essential constituent part of <u>all</u> TPEG Messages requiring location referencing. To satisfy the principles of the TPEG technology, location referencing requires the transmission of data that will allow a client to present such details to a human, directly as text, speech, graphics or a combination of these, to recreate a comprehensible representation of a real-world place.

Generally, location referencing comes in three distinct types:

— pre-coded, where a number of locations are fixed in a list and the same list must be used by the service provider as well as by the client device decoder;

— dynamic, where locations are encoded on-the-fly and decoded by the client device with no specific prior knowledge;

— hybrid, a mixture of the two.

The key concept of the TPEG1-LRC design is that it allows any location referencing method presently identified to be specified in this Technical Specification (and allows for future extension methods to be identified and agreed), to be used within any TPEG Message. Indeed a service provider may implement the use of any one or more location references per TPEG Message. The choice will depend upon market driven factors and thus there is full service provision choice for both transitional and long-term location referencing requirements.

To date, seven location referencing methods have been identified as suitable for use within TPEG1-LRC. In alphabetical order they are: DLR1, Korean Node Link Location, Extended TMC Location Reference, Geographic Location Reference, TMC Location, TPEG-Location and VICS Link Location. These are further described in 6.2. These location referencing methods are detailed in other specifications (see Clause 2, Normative references) and they may be used by inserting the location data, encoded according to their specification, into the TPEG1-LRC. The LRC ensures a stable way to identify the method in use and thus allows client decoder(s) to choose what location method(s) are present in the message for their use.

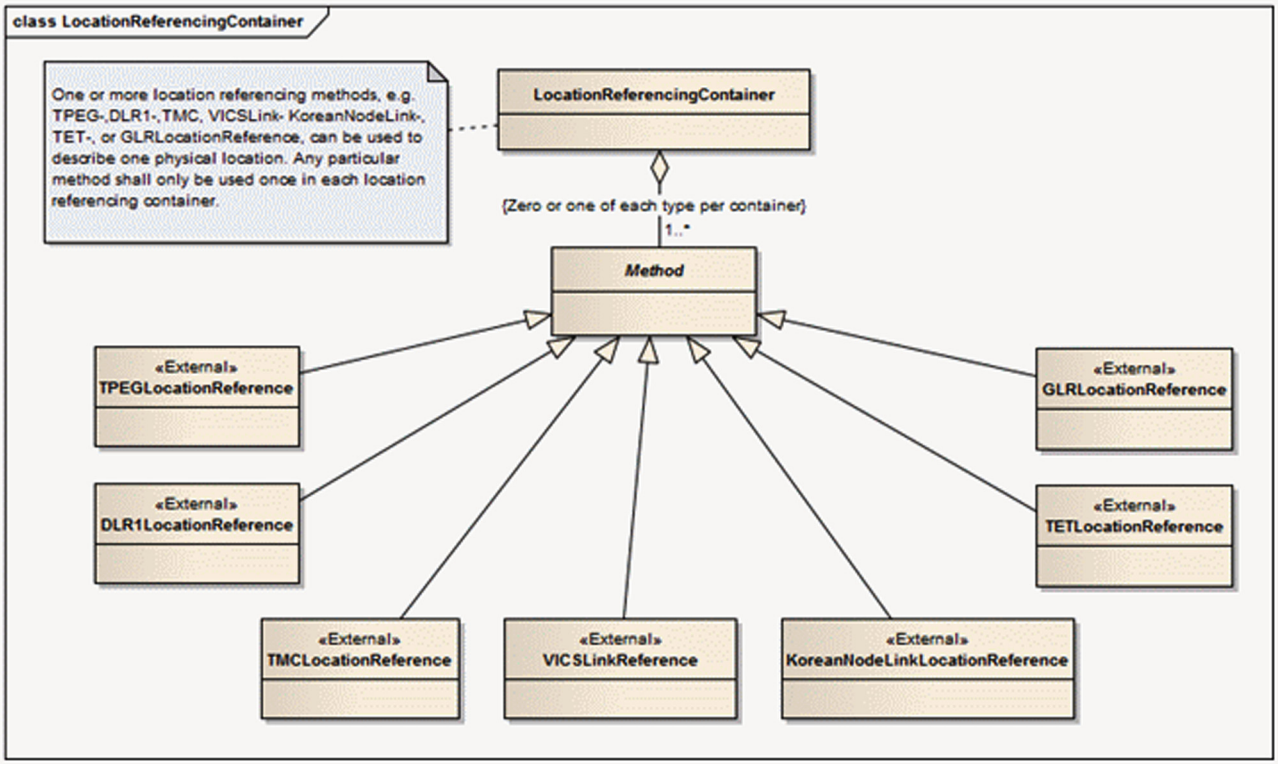

Figure 2 — Location Referencing Container construct

5.2 TPEG-LRC Methods

The following TPEG-LRC methods are currently approved for use within the LRC:

5.2.1 DLR1 Location

The DLR1 location referencing method is a dynamic location referencing method developed by ISO/TC 204. The method is designed to provide compact location references that allow accurate location referencing for 100 % of the road network. DLR1 location references are machine readable and are primarily aimed at dynamic route guidance navigation systems. The DLR1 method is specified in ISO 17572-3.

5.2.2 Korean Node Link Location

Korean Node Link Location is a pre-coded location referencing method designed for the South Korean road network. The Korean Node Link Location reference method is further described in the ISO 17572 series.

5.2.3 TMC Location

The RDS-TMC protocol (i.e. ALERT-C protocol) is specified in ISO 14819-1. This protocol is designed to provide pre-coded information messages using pre-coded location references to end-users on inter-urban road networks. Both messages and locations are required to be stored in all client devices. The TMC system, developed for FM transmission in the RDS sub-channel, is limited to a code-base of <64000 locations per location table. The TMC location reference method for embedding ALERT-C location references in the TPEG-LRC is described in ISO 17572-2.

5.2.4 TPEG Location

TPEG Location is the native dynamic location referencing method designed for use with TPEG applications that require location information. It is the native TPEG location referencing method and is described fully in ISO/TS 18234-6. It is designed to enable a service provider to give an impression or image to the human end-user of where an event has taken place (this cannot be done easily because the human end-user may or may not be familiar with the location.) The TPEG1-LOC method has the added challenge of attempting to be as language independent as possible, while at the same time providing location data in a machine readable form that allows great freedom of client device design. For example, clients offering text display only, text-to-speech output or map matched icons are all possible.

Location references encoded according to TPEG1-LOC are client device-type agnostic in terms of how locations are presented. As a minimum, it seeks to allow even the most basic client to present useful location information to end-users.

5.2.5 VICS Link Location

VICS Link Location is a pre-coded location referencing method designed for the Japanese road network. The VICS Link Location reference method is further described in ISO 17572-2.

5.2.6 ETL Location

The RDS-TMC protocol (i.e. ALERT-C protocol) is specified in ISO 14819-1. That protocol is designed to provide pre-coded information messages using pre-coded location references to end-users on inter-urban road networks. Both messages and locations are required to be stored in all client devices. The TMC system, developed for FM transmission in the RDS sub-channel, is limited to a code-base of <64000 locations per location table. Some Events in the RDS-TMC protocol address only the exit and entries of the point location defined by the location code. Complete addressing of exits and entries requires additional information to be used with a location code and has to be supplied in the location container. The **E**xtended **T**MC **L**ocation Reference extends the TMC Location referencing defined in ISO 17572-2 to allow, additionally, specifying exit and entry roads of a defined TMC-Point location. The ETL Location Reference method for embedding ALERT-C location references in TPEG-LRC is described in TISA SP10037.

5.2.7 GLR Location

The GLR location referencing method is a simple geographic location referencing method developed by TISA. The method is designed to provide compact, dynamic location references for geographic features, e.g. geographic point, line and area locations. GLR location references are machine readable. The GLR method is primarily aimed at geo-oriented (i.e. non-road network related) applications such as weather reports, safety alerts and emergency warnings. The GLR method is specified in TISA SP10038.

6 Message components

6.1 List of Generic Component IDs

Name	Id
TPEGLocationReference	0
DLR1LocationReference	1
TMCLocationReference	2
VICSLinkReference	3
KoreanNodeLinkLocationReference	4
ETLLocationReference	5
GLRLocationReference	6

6.2 LocationReferencingContainer

The generic LocationReferencingContainer can contain a pre-coded or a dynamic location reference.

One or more location referencing methods, e.g. TPEG Location, DLR1 Location, ETL Location, GLR LocationTMC Location, VICS Link Location or Korean Node Link Location, can be used to describe one physical location. Any particular method shall be used only once in any LocationReferencingContainer.

<**LocationReferencingContainer**(x)<**Component**(x)>>:=	
<**IntUnTi**>(x),	: Identifier, is defined by the instance
<**IntUnLoMB**>(lengthComp),	: Length of component in bytes, excluding the id and length indicator
<**IntUnLoMB**>(lengthAttr),	: Length of attributes, always 0 since this component has no attributes
unordered {	
t * <**TPEGLocationReference**>(tpegLoc)[0..1],	: t represents the number of occurrences between 0 and 1
d * <**DLR1LocationReference**>(dlr1Loc)[0..1],	: d represents the number of occurrences between 0 and 1
m * <**TMCLocationReference**>(tmcLoc)[0..1],	: m represents the number of occurrences between 0 and 1
v * <**VICSLinkReference**>(vicsLoc)[0..1],	: v represents the number of occurrences between 0 and 1
k * <**KoreanNodeLinkLocationReference**>(klrLoc)[0..1],	: k represents the number of occurrences between 0 and 1
e * <**ETLLocationReference**>(tetLoc)[0..1],	: e represents the number of occurrences between 0 and 1
g * <**GLRLocationReference**>(vicsLoc)[0..1],	: g represents the number of occurrences between 0 and 1
};	

If the specific LocationReferencing-Method top level container does not include the standard component length (IntUnLoMB) and attributeLength (IntUnLoMB) (see A.2.3.3.1), these need to be added to the container, while the id and native length indicators of the external top level container are replaced with the ones specified in this Technical Specification. However all further content of the top level container is not modified, which implies that child components may have different (non-standard) component headers.

6.3 TPEGLocationReference

This element is defined by ISO/TS 18234-6.

The content of this component is defined in another specification. The purpose of this class definition is to assign a unique identifier to the component.

<**TPEGLocationReference**<**Component**(0)>>:=	
external <**TPEGLocationReference**(0)>;	: Defined in ISO/TS 18234-6

The TPEGLocationReference as defined in ISO/TS 18234-6 does not include the standard component length (IntUnLoMB) and attributeLength (IntUnLoMB) (see A.2.3.3.1). Hence, these need to be added to the container, while the id and native length indicators of the external top level container are replaced with the ones specified in this document as follows.

<TPEGLocationReference<Component(0)>>:=	
<IntUnTi>(0),	: Identifier = 0, TPEG-Loc
<IntUnLoMB>(lengthComp),	:Length of component in bytes, excluding id and length indicator
<IntUnLoMB>(lengthAttr),	Length of attributes of this component in bytes
……..	:TPEG-Loc content as defined in ISO/TS 18234-6, but without id and intunli length indicator

6.4 DLR1LocationReference

This element is defined by ISO 17572-3.

The content of this component is defined in another specification. The purpose of this class definition is to assign a unique identifier to the component.

<**DLR1LocationReference**<**Component**(1)>>:=	
external <**DLR1LocationReference**(1)>;	: Defined in ISO 17572-3

6.5 TMCLocationReference

This element is defined by ISO 17572-2.

The content of this component is defined in another specification. The purpose of this class definition is to assign a unique identifier to the component.

<**TMCLocationReference**<**Component**(2)>>:=	
external <**TMCLocationReference**(2)>;	: Defined in ISO 17572-2:2008, Annex A

6.6 KoreanNodeLinkLocationReference

This element is defined by ISO 17572-2.

The content of this component is defined in another specification. The purpose of this class definition is to assign a unique identifier to the component.

<**KoreanNodeLinkLocationReference**<**Component**(3)>>:=	
external <**KoreanNodeLinkLocationReference**(3)>;	: Defined in ISO 17572-2

6.7 VICSLinkReference

This element is defined by ISO 17572-2.

The content of this component is defined in another specification. The purpose of this class definition is to assign a unique identifier to the component.

<**VICSLinkReference**<**Component**(4)>>:=	
external <**VICSLinkReference**(4)>;	: Defined in ISO 17572-2:2008, Annex A (logical format only)

6.8 ETLLocationReference

This element is defined by TISA SP10037.

The content of this component is defined in another specification. The purpose of this class definition is to assign a unique identifier to the component.

<**ETLLocationReference**<**Component**(5)>>:=	
external <**ETLLocationReference**(5)>;	: Defined in TISA SP10037

6.9 GLRLocationReference

This element is defined by TISA SP10038.

The content of this component is defined in another specification. The purpose of this class definition is to assign a unique identifier to the component.

<**GLRLocationReference**<**Component**(6)>>:=	
external <**GLRLocationReference**(6)>;	: Defined in TISA SP10038