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Geographic information — Rights expression language for geographic information — GeoREL

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A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

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Geographic information — Rights expression language for geographic information — GeoREL

Information géographique — Langue sur l'expression des droits pour l'utilisation de l'information géographique — GeoREL

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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.

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 19149 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics.* A base document was supplied by the Open Geospatial Consortium, Inc.

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Introduction

The use of ubiquitous computing in geographic information is often obstructed by legal concerns about the rights of the holders and owners of data and other intellectual property resources. It can be the case that once data or other resource is released into any unconstrained and unprotected environment, the value of the holding is decreased because the underlying data theoretically becomes available from other sources. The multimedia industry has taken the lead in solving this problem by creating a general model for digital rights protection, in which a language was developed in order that instances of those rights might be documented, a rights expression language, specifically in ISO/IEC 21000-5, the ISO REL. This language, used in conjunction with Digital Rights Management (DRM) systems, can protect the value of data and still allow it to be distributed subject to a system of licensing, trust and enforcement.

This International Standard extends the ISO REL to encompass the concerns of holders of geographic data and service resources to equally ensure their protection. This allows the geographic information market to operate with minimal constraints derived from the need for the protection of intellectual property.

There are two major sources for foundational material for this work.

— The first source is ISO/IEC 21000, a multiple part standard that defines digital rights management in general. There is no need to extend this basic foundation for expressing and enforcing rights for resources except in those cases where the special requirements of geographic information and services make it necessary.

— The second source is ISO 19153 (originally an Open Geospatial Abstract Specification volume), which enumerates these special cases for geographic information as well as providing an overall reference model using common geographic information terms that ties the work of the ISO/IEC 21000 work into this spatial standard.

Given these two foundations, the purpose of this International Standard is to extend the ISO REL, consistent with the requirements for such extensions given in ISO/IEC 21000-5, to cover the special cases enumerated in ISO 19153.

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INTERNATIONAL STANDARD ISO 19149:2011(E)

Geographic information — Rights expression language for geographic information — GeoREL

1 Scope

This International Standard defines an XML-based vocabulary or language to express rights for geographic information in order that digital licenses can be created for such information and related services. This language, GeoREL, is an extension of the rights expression language in ISO/IEC 21000-5 and is to be used to compose digital licenses. Each digital license will unambiguously express those particular rights that the owners (or their agent) of a digital geographic resource extend to the holders of that license. The digital rights management system in which these licenses are used can then offer *ex ante* (before the fact) protection for all such resources.

NOTE The proper use of a GeoREL includes the preservation of rights access by formula expressed in usage licenses. Thus, data in the public or private domain, when protected, remain in their respective domains if the usage rights granted so state.

These “rights” are not always covered by copyright law, and are often the result of contracts between individuals that specify the proper and allowed uses of resources, as opposed to the threat of copyright litigations which is an *ex post facto* (after the fact) remediation measure, not an *ex ante* protection measure. This International Standard is not a reflection of, or extension of, copyright law.

Mechanisms for the enforcement and preservation of those contract rights are specified in ISO/IEC 21000, and it is not the intention of this International Standard to replace nor redefine those mechanisms, but to use them as previously standardized.

2 Conformance

The license language vocabulary is expressed as an XML schema extending the ISO/IEC 21000-5 REL. A conformant license expression is a well-formed and complete XML document (or its equivalent) that expresses the semantics described in the standard and that is properly protected from modification by the mechanisms described and specified in ISO/IEC 21000.

A license compliant to this International Standard will be consistent with the XML schema for ISO/IEC 21000-5 and the XML schema associated with this International Standard (see requirements in Clause 6).

A software system compliant to this International Standard shall interpret any compliant license in a manner consistent with the semantics expressed in ISO/IEC 21000 and the abstract test suite given in Annex A.

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3 Normative references

The following referenced standards are indispensable for the application of this International Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced standard (including any amendments) applies.

ISO 19153[1)], *Geospatial Digital Rights Management Reference Model (GeoDRM RM)*

ISO/IEC 21000 (all parts), *Information technology — Multimedia framework (MPEG-21)*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 21000 apply[2)].

The terms “constraint” and “condition” are used interchangeably, and no distinction is meant in terms of the license based on which term is used. This differs from other cases where constraints are expressed as the contrapositive of conditions.

Following the precedent set in ISO/IEC 21000, the alternative English (Oxford English Dictionary) spelling of the word license has been used in all instances, except when used in proper names. This is in contradiction to the ISO 19153, and the preferred English usage, where the word “license” is usually a verb and the word “licence” is a noun. Both US and UK English dictionaries accept the “s” spellings for the noun, and so this is not in variance with any current dictionary in either dialect. The basic reason for this is to not confuse the spelling of the XML elements (which use the ISO/IEC 21000 spellings) with the spellings in the text. No semantic difference is meant by this typographic convention.

5 Symbols and abbreviated terms

5.1 Abbreviated terms

The following symbols and abbreviated terms are used in this document.

DRM Digital Rights Management

GeoREL Rights Expression Language for Geographic Information (including the ISO REL and the extension defined in this International Standard)

GeoDRM Digital Rights Management for Geographic Information

ISO REL Rights Expression Language from ISO/IEC 21000-5 (see Annex C for notes on ISO REL)

LBS Location Based Service

REL Rights Expression Language

UDDI Universal Description, Discovery and Integration

URI Uniform Resource Identifier

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1) To be published.

2) This International Standard does not include an abstract model. It depends on the models in ISO/IEC 21000 and ISO 19153.

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WFS Web Feature Service (ISO 19142)

WSDL Web Services Definition Language

XML Extensible Markup Language

5.2 Symbols used for common XML namespaces

The following namespace prefixes are used in the in-text XML and XML Schema fragments:

`grm` Namespace prefix for the geoRel.xsd license extensions

`xsd` Namespace prefix for the XML Schema basic types, used in defining schema elements

`r` Namespace prefix for rel-r.xsd in ISO/IEC 21000, representing the namespace urn:mpeg:mpeg21:2003:01-REL-R-NS

`sx` Namespace prefix for rel-sx.xsd in ISO/IEC 21000, representing the namespace urn:mpeg:mpeg21:2003:01-REL-SX-NS

`mx` Namespace prefix for rel-mx.xsd in ISO/IEC 21000, representing the namespace urn:mpeg:mpeg21:2003:01-REL-MX-NS

Examples in this International Standard are given as informative illustrations of ideas, and are not valid licenses, since they lack the appropriate signature values that would allow them to be recognized by a qualified security system as well-formed. Other than the absence of signature keys, the fragments are valid, in the sense that within a properly signed license document, they would be valid and correctly parsed and interpreted if correctly placed in the larger context of a license. They do conform to the XML schemas using the above namespace prefixes, unless abbreviated elements are used, and in those cases, the abbreviations are noted in the text, or in the use of ellipsis marks (…) between opening and closing element tags.

To make the requirements expressed in this International Standard easier to find, normative statements specifying either requirements or recommendations have been presented in a **bold font**.

6 Digital rights management systems

This International Standard is written within the model defined in ISO 19153 and within the model defined in ISO/IEC 21000, including all of its parts. The license structure is defined in ISO/IEC 21000-5 and this International Standard only addresses the extension of that license format for the purpose of creating a licensing vocabulary for geographic resources, both data and services, using as much of the existing ISO/IEC 21000-defined framework as possible. An informative description of the entire MPEG-21 systems as defined in ISO/IEC 21000 is given in *The MPEG-21 Book* [6] cited in the Bibliography.

For this purpose, this International Standard defines extensions only to license parts appearing in grants as defined by ISO/IEC 21000-5 and whose semantics are described in ISO 19153. All security, principal identity, and generic resource descriptions and identity descriptions remain as defined in ISO/IEC 21000.

In all cases, licenses valid under this International Standard shall be consistent with the schema given in Annex B and those schemas imported by it, and shall carry a valid digital signature of the resource owner or of one of the owner's recognized agents.

A software system compliant to this International Standard shall interpret any compliant license in a manner consistent with the semantics expressed in ISO/IEC 21000 and this International Standard.

These dependencies on ISO/IEC 21000 and ISO 19153 provide the context for this International Standard. ISO/IEC 21000 provides a general system description for digital rights management, license construction and interpretation, and covers the security techniques that make such systems feasible. ISO 19153 provides a

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reference model including those items in the realm of geographic information that require the protection of a licensing system. The extension to the ISO REL as presented in this International Standard is where these two dependencies interact. ISO/IEC 21000 gives requirements for the mechanism for extending the ISO REL and ISO 19153 provides the semantics for those same extensions.

7 Requirements for the expression of digital licenses for geographic resources

A license in a rights expression language has as its major component a sequence of grants which specifies which individuals (represented by principals) may commit which acts (represented by rights) against which items (represented as resources) under which circumstances (represented by conditions). Within an ISO REL grant (XML element r:grant; see Figure 1), these four types of items are specified in the following order, including:

1) Principal – the parties to whom the licensed right is granted, the licensee;
2) Rights – the act or actions covered by the rights licensed by this grant;
3) Resources – the items to be licensed, and hence to which rights are granted;
4) Conditions – conditions on any parts specific to this grant.

Descriptive terms associated with resources, rights and principals because of their geographic nature are needed in the license extension defined by this International Standard. These terms are given in geoCondition elements, using references to the described Principal, Right or Resource using standard ISO/IEC 21000-5 mechanisms. The most obvious requirements deal with geographic constraints within a database resource. Less obvious, but just as important, is the description of geographic processing resources or services that may be associated in particular or in kind to other resources.

These descriptions can link across multiple licenses to create behaviours of the licensing system as required.

EXAMPLE

— A license can be given to each emergency management professional for a given area as proof of his status.

— A license can be associated with each data or service resource that gives emergency management professionals access to use the resource but triggers a side effect that records that access.

— In an emergency, the emergency management professional can use his “proof of status” license to gain access to the resources in the group above.

This is a simple implementation strategy for a “break the glass” use of normally restricted data by authorized personnel.

Since the actions against these types of resources cannot be defined completely within the purview of multimedia, the rights associated with geographic data and processing resources require further description within a geo-license than they would in a baseline ISO/IEC 21000 license.

With new actions (rights) and geographic resources, the conditions placed on grants require more description to fully meet the need of the geographic information and processing communities. Conditions describe how the license part is constrained, using the property or Boolean expression that needs to be matched by that part.

The other parts of a license, including the security specifications and identification, are not affected by the association of geographic properties to the licensed resources, rights, conditions and principals involved in the community. In many cases, useful licenses for geographic resources may confine themselves to the dialect of an ISO/IEC 21000-5 compliant license. These other parts include the identity of the license issuer, also a principal, who shall be an agent (through a “chain of agency”, see ISO 19153) of the owner of the resource. The additional information associated with the issuer is verification information that “digitally signs” the license as an XML document, which proves the identity of the issuer as the signatory, and the license document's “unmodified” state from the time of the signature. The mechanism is defined in ISO/IEC 21000-5 and uses “Digital Signatures” for XML documents.

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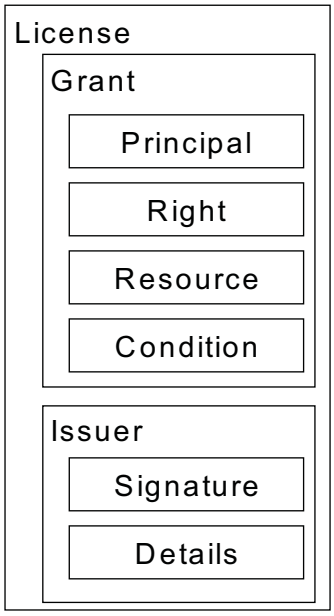

Figure 1 — Structure of a license from ISO/IEC 21000-5

8 Geographic rights expression language extensions — GeoREL

8.1 Technical approach

The licenses produced by the MPEG 21/ISO/IEC 21000 REL are designed to work within a security system that can enforce to the extent legally and feasibly possible the conditions of a legal contract, the legal version of the license between supplier and user. It is not the intent of this International Standard to supplant this system, but to extend the parts that describe the granting of license rights to include geographic data and processing resources to take advantage of those same security features.

Further, the license structure is constrained by the semantics of its interpretation as given in the description of authorization presented in ISO/IEC 21000-5. This interpretation is not always “obvious” to the uninformed reader of the license. A digital license, even when written in an unencrypted XML format, would not be expected to be interpretable by anyone unless they are conversant with the authorization algorithms and element semantics described in ISO/IEC 21000.

The public users should never be encouraged to read an XML license in order to understand their contract. Licenses published in unencrypted form should carry a caveat that expresses this concern, and refers the user back to the legally binding contract, or other “plain text” explanation of the meaning of the license.

The general approach is to extend the principal, right, resource and conditions of the ISO REL to include geometric properties. To ensure that the baseline functions of the ISO REL are preserved, these extensions have been made by using conditions within the license to describe, and thereby restrict, these entities.

The patterns used in the following clauses follow one of the following abstract structures:

```
GeoResource implements Resource
        Sequence
            (
        Resource
            )

GeoCondition implements Condition
        Sequence
            (
            License Part   — usually by reference or variable
            Service        — service to calculate the conditions if needed
            Boolean statement or condition to match by the License Part
            )
```

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In each specific property to be used in conditions defined below, and in specifications using this International Standard as a base, care should be taken to completely define and understand the semantics of the property so that there is no ambiguity in license processing by the GateKeeper as defined in ISO 19153. The validity of actions with respect to a license is defined in ISO/IEC 21000-5 (with the geographic interpretation of conditions supplied by ISO 19153).

When properly interpreted by conformant "gatekeeper" software, a valid license shall always allow actions valid under the license, and shall always disallow actions not valid under the license.

For continuity of the narrative, the semantics of terms from the references are often included in the text of this International Standard. **If this semantics text is different from the ISO 19153 text or the ISO/IEC 21000 text, the base standard text takes precedence and should be considered the primary source of the normative semantics of the terms used.**

8.2 Spatial entities used in conditions

A common entity used in conditions is a geographic place specified by geometry, name or other text, such as an address or telephone number that can be associated with a place. Most of these names would be included in an ISO-compliant gazetteer or similar data store available to the license GateKeeper.

Geometry to express geographic location requires information on coordinate system and mechanisms for interpretation. A geoPlace element uses GML geometry elements, defined in ISO 19136, to properly describe such geometry as needed. GeoPlace is essentially a data-type that can be used to realize SI_LocationInstance from ISO 19112 or AD_AbstractAddress from ISO 19133. Schema 1 gives an XML Schema description of these elements. This and all other schema examples in this International Standard are combined in a full XML schema document (geoRel.xsd) given in Annex B.

Schema 1: GeoPlace

```
<xsd:complexType name="GeoPlace" mixed="false">
<xsd:annotation>
   <xsd:documentation>
      GeoPlace is a named place, described elsewhere in some gazetteer. This
      allows the license to avoid large coordinate strings, and makes the
      license more readable
   </xsd:documentation>
</xsd:annotation>
<xsd:choice minOccurs="0">
   <xsd:element ref="gml:_Geometry"/>
   <xsd:element name="location">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="country" type="xsd:QName" minOccurs="0"/>
            <xsd:element name="region" type="xsd:QName" minOccurs="0"/>
            <xsd:element name="state" type="xsd:string" minOccurs="0"/>
            <xsd:element name="city" type="xsd:string" minOccurs="0"/>
            <xsd:element name="postalCode" type="xsd:string"
                minOccurs="0"/>
            <xsd:element name="street" type="xsd:string" minOccurs="0"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
</xsd:choice>
<xsd:attribute name="placeName" type="xsd:string" use="optional"/>
<xsd:attribute name="gazetteer" type="xsd:anyURI" use="optional"/>
</xsd:complexType>

<xsd:element name="geoPlace" type="grm:GeoPlace"/>
```


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The place may be presented as either an element value of geometry or as a “placeName” attribute value, usually either well-known or linked to some sort of gazetteer where its limits may be found. Further, an Address structure can be used. The pattern for address is taken from ISO/IEC 21000-5 and parallels the similar structure in ISO 19133. It can be extended for local use in the same manner as done in r:territory in the ISO REL.

NOTE Other text used as place names, such as telephone numbers, would be included as a placeName attribute value, and a gazetteer describing their semantics would be included.

In cases where geometry is included, the placeName and gazetteer may be ignored. **The local geometry description should take precedent over the implied extent of the place name from the gazetteer service (ISO 19112). These redundant location expressions should be consistent with the location expressed in the geometry.**

In general, properties and parameters are used in conditions to restrict license parts based on conditions. The only difference between a parameter and a property is that a parameter shall have a name, usually referring to a name used in a properly formatted service request, but potentially using a WSDL (or similar) offset such as “wsdl-4” which would be the 4th parameter in the description of a WSDL structure as specified in the **parameterOrder** attribute of the **operation** element (2.4.6 Parameter Order within an Operation http://www.w3.org/TR/wsdl#_parameter) in the WSDL description – see References [9], [10], [11] and [12] in the Bibliography. The use of WSDL offsets is consistent with the expression of service calls in conditions as expressed in ISO/IEC 21000 licenses for such items as “tracking” services (defined in ISO 19133). Schema 2 gives the basic structure of properties and parameters to be used in expressing geoCondition elements.

Schema 2: Property and parameter schema

```
<xsd:complexType name="Property" mixed="true">
   <xsd:annotation>
      <xsd:documentation>
         Properties are descriptions of any item in a licence. The only
         current restriction is that they shall have a name, a description
         and a value from this namespace.
      </xsd:documentation>
   </xsd:annotation>
   <xsd:attribute name="name" type="xsd:string" use="optional"/>
   <xsd:attribute name="definition" type="xsd:anyURI" use="optional"
      default="urn:ogc:geodrm:properties"/>
</xsd:complexType>

<xsd:complexType name="Parameter" mixed="true">
   <xsd:complexContent mixed="true">
      <xsd:extension base="grm:Property">
         <xsd:sequence>
            <xsd:element ref="grm:property"/>
         </xsd:sequence>
      </xsd:extension>
   </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="ParameterList">
   <xsd:sequence>
      <xsd:element ref="grm:parameter" maxOccurs="unbounded"/>
   </xsd:sequence>
</xsd:complexType>

<xsd:element name="property" type="grm:Property"/>

<xsd:element name="parameter" type="grm:Parameter"
    substitutionGroup="grm:property"/>

<xsd:element name="parameters" type="grm:ParameterList"/>
```

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