Open Geospatial Consortium

OGC Indexed 3d Scene Layer (I3S) and Scene Layer Package Format Specification Version 1.1 Release Notes

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Warning

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Contents

Preface

This document provides the set of revision notes for OGC I3S Community Standard [OGC 17-014r5] and does not modify that standard.

This document provides the details of edits, deficiency corrections, and enhancements of the above-referenced standard. It also documents those items that have been deprecated. Finally, this document provides implementations details related to issues of backwards compatibility.

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Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

Keywords

ogcdoc, i3s

Introduction

A single I3S data set, referred to as a Scene Layer, is a container for arbitrarily large amounts of heterogeneously distributed 3D geographic data. Scene Layers are designed to be used in mobile, desktop, and server-based workflows and can be accessed over the web or as local files.

These release notes describe in detail the changes and enhancements to the original OGC I3S Community Standard. This is a 1.1 revision. This I3S revision including al the changes and enhancements are backwards compatible with the version 1.0 (17-14r5)

Scope

The completed Work Item changes to the OGC I3S Community Standard include:

- Point Cloud Scene Layer type.
- For existing layer types, the addition of: -- Oriented Bounding Boxes -- Attribute Domain Rules -- Service Update Timestamp -- Index hash table for improved performance.
- Numerous editorial updates/corrections to improve readability.

In relation to the last work item, the following changes were applied to all tables in the I3S Community Standard:

1. For all the class tables, in the previous version mandatory properties were identified with an "*". In version 1.1, mandatory properties are highlighted using a bold type font.
2. In all property tables, the type designation "Float" is changed to "Number".
3. In all property tables, the type designation "Integer" is changed to "Number".
4. In all property tables, the type designation "Date" is changed to "String"
5. Added examples to most classes.

None of these global changes affect backwards compatibility.

Document contributor contact points

All questions regarding this document should be directed to the contacts provided below or the referenced standard editor(s).

Table 1. Contacts

Name	Organization
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References

There are no normative documents that are new or updated references in the version of the I3S standard to which these Release Notes apply.

Terms and definitions

This document uses the terms defined in Sub-clause 5.3 of [OGC 06-121r8], which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word "shall" (not "must") is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

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

Administrative change

An administrative change is a change that does not alter the conformance abstract tests for any requirements. It includes typographical errors, changes in wording to improve clarity or consistency, and perfunctory changes such as changes in version numbers.

Critical Change

A critical change is a change that alters requirements in a way that is known to cause reverse compatibility issues.

Substantive change

A substantive change is a change that alters requirements in a way that is not deemed to have a high risk for causing reverse compatibility issues.

Abbreviated terms

There are no new abbreviations or terms and definitions in this I3S revision.

Change Log

Notes on the "meaning" of column headings.

- Source - Source of the change. In the case of the I3S Community Standard, the value is always "Other" indicating that the changes were submitted from an external source.
- Identifier - As the changes to the I3S Community Standards were submitted by the Esri I3S community, there are no Change Request or GitHub issue identifiers. Hence the value used in this document is N.A. for Not Applicable.
- Type - Type of change. Always "A" for administrative.
- Section - The section number modified in the updated document.
- Description - Brief text describing the change.
- Purpose - the reason for the change. Suggested reasons are:
  - Clarity
  - Consistency
  - Interoperability
  - Perfunctory
  - Readability
  - Usability

A word on "deprecated". For the purposes of this I3S revision, deprecated properties or classes do not impact backwards compatibility. Deprecated properties in version 1.1 were optional in version 1.0. Further, these deprecated classes/properties will remain in the OGC I3S Community Standard until such time as Version 2 of this Community Standard is approved. At that time, this deprecated class will be removed from the standard. This will allow adequate time for any I3S implementations to remove deprecated elements from their product and applications.

Change Table

Table 1. Change Log

Source	Identifier	Type	Section	Description	Purpose
Other	N.A.	A	Introduction	1. Added additional informative text to the first and second paragraph. 2. Add Point Clouds to the bullet list.	New informative content
Other	N.A.	A	3.0 Terms and Definitions	1. Added an additional informative sentence to Term 4.11 Oriented Bounding Box. 2. In support of the new Point Clouds Layer type, added terms	New informative content

Source	Identifier	Type	Section	Description	Purpose
				and definitions for LiDAR, Near Infrared, and Point Clouds	
Other	N.A.	A	Section 6.1	Reworded all the design principals.	Readability and Clarity
Other	N.A.	A	Section 6.2	1. Reworded the Overview to enhance "readability" 2. Added Point Clouds to the bullet list and to Table 1.	Readability and Clarity
Other	N.A.	A	Section 7.1 Coordinate Reference Systems	Added a new introductory informative paragraph for clarification and to reduce complexity in the text	Clarity
Other	N.A.	A	Section 7.1.2 CRS use and requirements in I3S	Add the clarifying sentence: "Note that all I3S profiles support writing 3D content in two modes: global and local. In global mode, only the geographic CRS WGS84 (EPSG 4326) is supported for both index and vertex positions."	Clarity
Other	N.A.	A	Section 7.3.1 I3S - Indexing Model and Tree Structure	A number of grammatical changes to improve flow and "readability".	Readability
Other	N.A.	A	Section 7.3.2 Geometry Model and Storage	A number of grammatical changes to improve document flow and "readability".	Clarity and readability.
Other	N.A.	A	Section 7.3.3 Textures	A few edits that improve document flow and "readability" were applied.	Readability
Other	N.A.	A	7.3.4 Attribute Model and Storage	A few edits that improve document flow and "readability" were applied. Links to related attribute classes were added.	Interoperability and Readability
Other	N.A.	A	7.5 Level of Detail	A few edits that improve document flow and "readability" were applied.	Readability
Other	N.A.	A	7.5.1 Discrete LoDs	A few edits that improve document flow and "readability" were applied.	Readability
Other	N.A.	A	7.5.2 Representation of input data	A few edits that improve document flow and "readability" were applied.	Readability
Other	N.A.	A	Section 7.5.3.1 Node Switching	Added the following informative paragraph clarifying what node switching is: Node switching lets clients focus on the display of a node	Clarity

Source	Identifier	Type	Section	Description	Purpose
				as a whole. A node switch occurs when the content from a node's children is used to replace the content of an existing node. This can include features, geometry, attributes and textures. Node switching can be helpful when the user needs to see more detailed information.	
Other	N.A.	A	Section 7.5.4 Levels of Detail Generation	Reformatted Table 2 to be consistent and to include Point Cloud Layers and (planned) Building Scene Layers.	Interoperability
Other	N.A.	A	Section 7.5.4.7 (now 7.6.4.7) Class IndexScheme	This class has been deprecated in the version 1.1 of the OGC I3S Community Standard. However, this class remains in the standard for backwards compatibility. Developers should not implement this class. This class will be removed in a future I3S version. See additional note below table.	Deprecated
Other	N.A.	A	Section 7.5.5 LoD Selection Metrics	- Corrected an error in the example. - Added definitions for maxScreenThresholdSQ, maxScreenThresholdSQ, screenSpaceRelative, distanceRangeFromDefaultCamera, effectiveDensity. The latter two definitions are new in version 1.1 of the OGC document. They were added in support of Point Clouds. - Added a new table to better summarize available properties.	Clarity and Enhancement. See Substabtive Changes for more information
Other	N.A.	A	7.6.3.1 Class SceneServiceInfo	A few edits that improve document flow and "readability" were applied.	Readability
Other	N.A.	A	7.6.4.1 Class 3dSceneLayerInfo	Added a sentence to clarify the relationship between this class and sub-class drawingInfo.	Clarity. See also Substantive Changes for more information.

Source	Identifier	Type	Section	Description	Purpose
Other	N.A.	A	7.6.4.2 Class Store	• Added more informative text for the resourcePattern property. Old description was limited and confusing. • Added more informative text for the normalReferenceFrame property. Old description was limited and confusing. • Added more informative text for the lodType property. Old description was limited and confusing. • Added more informative text for lodType value descriptions (MeshPryamid, AutoThinning, Clustering, and Generalizing)	Clarity
Other	N.A.	A	7.6.4.2 Class Store	The property *indexScheme* was deprecated. This was an optional property	Deprecated
Other	N.A.	A	7.6.4.3 GeometryStore	• Renamed as this class was incorrectly labeled in version 1.0. The class name should have been defaultGeometrySchema. • Added more informative text for the topology property. Old description was limited and confusing	Clarity and Interoperability
Other	N.A.	A	7.6.5.1 3dNodeIndexDocument	• Updated table of properties to include property "obb", which is new for this revision. • Corrected an error in the clause title. In version 1.0, the title stated, "Node". This should have been 3dNodeIndexDocument. All examples and other references were correct in version 1.0.	Clarity and Interoperability
Other	N.A.	A	7.6.5.2 nodeReference	Updated table of properties to include property "obb", which is new for this	Interoperability

Source	Identifier	Type	Section	Description	Purpose
				revision.	
Other	N.A.	A	7.6.5.4 Class Feature	This class is deprecated in version 1.1. FeatureData contains the properties originally in class Feature.	Deprecated
Other	N.A.	A	7.6.5.5 Class LodSelection	The maxValue, avgValue, and minValue properties have been deprecated in version 1.1. These were optional properties. See additional note below table.	Deprecated
Other	N.A.	A	7.6.6 FeatureData	Added reference to Point Clouds	See Substantive Changes for more information.
Other	N.A.	A	7.6.6.5 Class GeometryReferenceParams	Added a new optional property called "type". The type denotes whether the following geometry is defined by using array buffer views (ArrayBufferView), as an internal reference (GeometryReference), as a reference to a shared Resource (SharedResourceReference) or embedded (Embedded).	Interoperability
Other	N.A.	A	7.7.1.2 Class Texture	Added the 'image' property and reference to the 'image class' as this was missing from the table of properties in version 1.0 of the Community Standard.	Interoperability
Other	N.A.	A	7.7.1.4 Class Renderer	Added informative text to better define UniqueValue and ClassBreaks	Clarity.
Other	N.A.	A	8.1 Textures and all subsections	A number of minor grammatical edits for clarity and additions to the informative content are incorporated.	Clarity and Readability
Other	N.A.	A	8.3 Attributes including 8.3.1 and related sub-clauses	A number of minor grammatical edits for clarity and additions to the informative content are incorporated.	Clarity and Readability
Other	N.A.	A	8.3.2 REST API for Accessing Attribute Resources	Minor grammatical edits were made.	Readability
Other	N.A.	A	8.3.3 A typical usage pattern of the attributes	Minor grammatical edits were made. Also, the attributeStorageInfo	Clarity and Readability

Source	Identifier	Type	Section	Description	Purpose
			REST API	properties originally listed as bullets are now organized into a table for clarity and are available in clause 7.6.4.6.	
Other	N.A.	A	8.3.4 Attribute Resources: Details	Minor grammatical edits were made.	Readability
Other	N.A.	A	9.0 New chapter that provides details on the I3S Layer Structures	A variety of information on the various layer structures, such as Point Scene Layers, were scattered through the document and in the annexes. Further, there were no examples. Version 1.1 now provides details and implementation examples for each of the supported layer types. More information is provided below.	Clarity, Readability, Interoperability
Other	N.A.	A	10.1 (Was 9.1) Flexibility	Minor grammatical edits were made for clarity.	Clarity
Other	N.A.	A	10.2 (Was 9.2) Summary of I3S Defining Characteristics	Minor grammatical edits were made for clarity.	Clarity
Other	N.A.	A	11 (Was 10.0) Persistence	Minor grammatical edits were made for clarity.	Clarity

Additional Note on deprecated properties in Class LodSelection

The maxValue, avgValue, and minValue properties in Class LodSelection are deprecated. The LodSelection object provides information on a given metric determined during the cooking process of an I3S store. This metric can be used by the client to determine whether a representation is of the right quality level for rendering or whether a different representation is needed.

Publishers (aka "cookers") can add as many LodSelection objects as desired but must provide one so the layer's lodType is not null.

Additional Note on IndexScheme

The IndexScheme class has been deprecated as the class was useful only for informational reasons. Furthermore, it made it onerous for content generators to explicitly document the data partitioning scheme used to generate I3S content. As an I3S client's data discovery and traversal

is purely driven by the node index document, information supplied by the IndexScheme class is not necessary for traversal or for efficient loading of content. As a result, this class is deprecated.

Description of Critical Changes

There are no critical changes in version 1.1 of the I3S Community Standard.

Description of Substantive Changes

Point Cloud Scene Layers

The ability to code, stream, and store point cloud scene layers is a key update and extension of the I3S Community Standard. The addition of point cloud scene layers resulted in the addition of a number of new classes and profiles and profiles with extensions of the existing classes as defined in version 1.0 of the I3S Community Standard.

The addition of the Point Cloud Scene Layer capability to I3S resulted in a number of additions to the Community Standard

- New optional properties added to Class 3dSceneLayerInfo (see below)
- New optional properties added to Class LoD Selection Metrics (see below)
- The addition of a new optional class elevationInfo (see below)
- A new major section: 9.4 Point Cloud Scene Layer that provides informative background and a structure example.
- The addition of a new Annex: Annex I I3S Point Cloud Scene Layer Profile. This Annex provides the majority of the information on how to implement a I3S Point Cloud Scene Layer. This Annex defines profiles of a number of the core I3S classes: 3dSceneLayerInfo, attributeInfo, Store, Index, defaultGeometrySchema, vertexAttributes.
- A new Class *Node* specifically for Point Cloud Scene Layers.
- A new Class *Stats* specifically for Point Cloud Scene Layers. This class contains statistics about each attribute. Statistics are useful to estimate attribute distribution and range.
- A new Class *Labels* specifically for Point Cloud Scene Layers. The statistics document may contain labeling information for the attribute values.

Clause 7.4 Bounding Volume Hierarchy - New Optional Class Defined

This is a new optional class that describes the I3S bounding volume hierarchy. This class references two other classes. See obb below.

Clause 7.5.5 LoD Selection Metrics - Correction Warning

In version 1.0, the property maxError was considered as a mandatory element in all of the examples and in the text. However, in the class property table this property was not highlighted as mandatory. This was an error in the version 1.0 document. This is corrected in version 1.1.

Clause 7.6.4.1 Class 3dSceneLayerInfo

1. spatialReference now has its own clause with greater detail. There is a cross reference from the table to the new clause.
2. heightModelInfo now has its own clause with greater detail. There is a cross reference from the table to the new clause. This includes an enumeration of the allowed height units.

3. New optional properties added to this class. These properties were added based on implementation experience or in support of the new Point Cloud capability.
   a. ZFactor: Define conversion factor for elevation unit. This was added in support of point cloud scene layers.
   b. elevationInfo - An object containing elevation drawing information. If absent, any content of the scene layer is drawn at its z coordinate. This was added in support of point cloud scene layers.
   c. popupinfo: PopupInfo of the scene layer.
   d. disablePopup: Indicates if client application will show the popup information.
   e. statisticsInfo: Contains the statistical information for a layer.

These are all new optional elements either added in support of Point Cloud or requested by the implementation community. They do not affect backwards compatability.

Clause 7.6.4.5 Field property Domain - New Optional Property Defined

A new property domain has been added to the class Field. Attribute domains are rules that describe the legal values of a field type, providing a method for enforcing data integrity. Attribute domains are used to constrain the values allowed in a particular attribute. They can be thought of as filters. The addition of domain property requires the addition of two new classes to the I3S Community Standard: domain and domainCodedValues. These are new clauses 7.6.5.4.1 and 7.6.5.4.2.

7.6.4.11 elevationInfo - New Class

This is a new class added in support of point cloud scene layers. *elevationInfo* defines how content in a scene layer is aligned to the ground.

Clause 7.6.4.13 ServiceUpdateTimeStamp - New class

ServiceUpdateTimeStamp is a new optional class in this revision. This object provides a time stamp about when the I3S service or the source of the service was created or updated.

Clause 7.6.5.6 obb - New Optional Class Defined

This is an optional class that defines the properties for an oriented bounding box. 'obb' was in version 1.0 but its properties were not clearly defined in one location in the document. The new class provides a single table with all properties defined in one location.

7.6.6.7 Class SingleComponentParams - Much greater detail and completed

This class was expanded and enhanced to enable the ability to specify more than one material or one texture. In version 1.0, only one texture and/or one material was allowed to be specified for a given scene layer.

Clause 9.5 SLPK Hash Table - New Clause:

Scanning an SLPK (ZIP store) containing millions of documents is usually inefficient and slow. To improve first load and file scanning performances, a hash table file may be added to the SLPK.