

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

Open Geospatial Consortium

Submission Date: 2021-xx-xx

Approval Date: 2021-xx-xx

Publication Date: 2021-xx-xx

External identifier of this OGC® document: <http://www.opengis.net/doc/NOTE/I3S-notes/1.2>

Internal reference number of this OGC® document: 21-xxx

Version: 1.2

Category: OGC® Release Notes

Editor: Carl Reed, PhD

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Document type: OGC® Release notes

Document subtype:

Document stage: Approved

Document language: English

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Preface

This document provides the set of revision notes for version 1.2 of the OGC I3S Community Standard [OGC <document number>] and does not modify that standard.

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

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Keywords

ogcdoc, geopackage, tiled gridded coverage, tiles, coverage, release notes

Chapter 1. Introduction

1.1. Scope

This Release Notes document provides information on changes to Version 1.2 of the OGC I3S Community Standard.

1.2. 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
Carl Reed	Carl Reed & Associates
Tamrat Belayneh	Esri

Chapter 2. References

The following normative documents are new or updated references in the standard to which these Release Notes apply.

NOTE	Need to update link to document!!
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OGC: [OGC Indexed 3d Scene Layer \(I3S\) and Scene Layer Package Format Specification Version 1.2](#)

Chapter 3. 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.

3.1. 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.

3.2. critical Change

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

3.3. substantive change

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

3.4. Abbreviated terms

Chapter 4. Change Log

4.1. KEY

- Source:
 - CR - Formal Change Request
 - (Ed)itor - The Editor for the standard
 - (Is)sue - GitHub Issue
 - OGC-NA - OGC Naming Authority review
 - (Pu)blic - Public Comment period
 - (Su)bmission team - From the source specification as submitted by the Submission Team, usually for a Community Standard.
 - SWG - Approved decision by the Standards Working group (SWG)
 - User - The standard's User Community
 - Other
- Identifier: Change Request number or issue number and pull request/commit in GitHub
- Type:
 - A=Administrative
 - S=Substantive
 - C=Critical

See [Description of Critical Changes](#) for more information on critical changes and [Description of Substantive Changes](#) for more information on substantive changes.

- Section: Section number in the updated document
- Description: Brief text describing the change
- Purpose: the reason for the change:
 - Clarity
 - Consistency
 - Enhancement
 - Interoperability
 - Perfunctory
 - Readability
 - Usability
 - Change Request

NOTE

All of the new classes identified below are optional! Further, new properties added to existing classes are also optional. All of the 1.1 classes, properties, and capabilities are included in version 1.2. This is for backwards compatibility. The majority of the new (optional) classes must be implemented to support the new major enhancements as identified in the Substantive Changes section of this document.

4.2. Change Table

Table 2. Change Log

Source	Identifier	Type	Section	Description	Purpose
Editor	NA	A	All sections	Change cover page to reflect Version 1.2	Consistency
Editor	NA	A	Various	Move source code etc from Esri Git repo into GPKG repo and OGC I3S 1.1 Word document	Consistency
Editor	NA	A	Intro materials	Add Future Work sub-clause	Information
Su	NA	S	3DSceneLayer	Enhanced to specify three new optional parameters (materialDefinitions, textureSetDefinition, geometryDefinition) in support of PBR materials and Draco compression.	Enhancement
Su	NA	S	attributeCompression	New class: supports compressing the geometryBuffer of Integrated Mesh and 3D Object Layers using Draco compression	Enhancement
Su	NA	S	features	New class: Declaration of the attributes per feature in the geometry, such as feature ID or face range.	Enhancement
Su	NA	S	geometryBuffer	New class: Better organize information for geometry buffer and to support Draco compression. Note: All 1.1 Geometry capabilities are still supported.	Enhancement
Su	NA	S	geometryColor	New class: In support of using PBR materials definition and Draco compression.	Enhancement

Source	Identifier	Type	Section	Description	Purpose
Su	NA	S	geometryDefinition	New class: Better organize information for geometry buffer and to support Draco compression. Note: All 1.1 Geometry capabilities are still supported.	Enhancement
Su	NA	S	geometryFaceRange	New class: faceRange is an inclusive range of faces in this geometry that belongs to this feature. Aspect of compressing the geometryBuffer of Integrated Mesh and 3D Object Layers using Draco compression	Enhancement
Su	NA	S	geometryFeatureID	New class: FeatureID attribute helps to identify a part of a mesh belonging to a particular GIS feature. Support for enhanced Mesh encoding. Note: All 1.1 Geometry capabilities are still supported.	Enhancement
Su	NA	S	geometryNormals	New class: Better organize information for geometry buffers and to support Draco compression. Note: All 1.1 Geometry capabilities are still supported.	Enhancement
Su	NA	S	geometryPosition	New class: Position vertex attribute relative to the center of oriented-bounded box of the node. Better organize information for geometry buffers and to support Draco compression. Note: All 1.1 Geometry capabilities are still supported.	Enhancement
Su	NA	S	geometryUV	New class: Defines the texture coordinates of the geometry. In support of using PBR materials definition.	Enhancement
Su	NA	S	geometryUVRegion	New class: UV regions are required to properly wrap UV coordinates of repeated-texture in texture atlases. In support of using PBR materials definition.	Enhancement

Source	Identifier	Type	Section	Description	Purpose
Su	NA	S	materialDefinition	New class: Describes how a feature or a set of features is to be rendered, including shading and color. In support of using PBR materials definition. Part of the sharedResource class that is deprecated with OGC Version 1.2.	Enhancement
Su	NA	S	materialDefinitionInfo	New class: Describes how a feature or a set of features is to be rendered, including shading and color. In support of using PBR materials definition.	Enhancement
Su	NA	S	materialDefinitions	New class: Specifies all of the necessary properties to be feature compatible with glTF PBR materials. In support of using PBR materials definition.	Enhancement
Su	NA	S	materialParams	New class: Specifies Parameters describing the material. In support of using PBR materials definition.	Enhancement
Su	NA	S	materialTexture	New class: Specifies the material texture definition. In support of using PBR materials definition.	Enhancement
Su	NA	S	mesh	New object specifying mesh geometry for a node. Note: All 1.1 Mesh, node storage, and indexing capabilities are still supported.	Enhancement
Su	NA	S	meshAttributes	New object specifying mesh attributes for a node. Note: All 1.1 Mesh, node storage, and indexing capabilities are still supported.	Enhancement
Su	NA	S	meshGeometry	New object specifying mesh geometry for a node. Note: All 1.1 Mesh, node storage, and indexing capabilities are still supported.	Enhancement
Su	NA	S	meshMaterial	New object specifying mesh material for a node. Note: All 1.1 Mesh, node storage, and indexing capabilities are still supported.	Enhancement

Source	Identifier	Type	Section	Description	Purpose
Su	NA	S	node	New object specifying the node object and how Nodes are stored contiguously in what can be considered a flat array of nodes. Note: All 1.1 Node storage and indexing capabilities are still supported.	Enhancement
Su	NA	S	nodePage	New class: The node page object representing the tree as a flat array of nodes where internal nodes reference their children by their array indices. Note: All 1.1 Node storage and indexing capabilities are still supported.	Enhancement
Su	NA	S	nodePageDefinition	New class: Specify how Nodes are stored contiguously in what can be considered a flat array of nodes. Note: All 1.1 Node storage and indexing capabilities are still supported.	Enhancement
Su	NA	S	pbrMetallicRoughness	New class: Feature-compatible with glTF material. With the exception of emissive texture.. In support of using PBR materials definition.	Enhancement
Su	NA	S	resource	Deprecated properties: All properties except <i>hrdf</i> have been deprecated. Superseded by enhancements for new node indexing, Draco compression, and materials. However, still included in version 1.2 for backwards compatibility.	Interoperability
Su	NA	S	sharedResource	Deprecated class: Superseded by enhancements for new node indexing, Draco compression, and materials. However, still included in version 1.2 for backwards compatibility.	Interoperability
Su	NA	S	store.pcs1	New class: Further support for Point Cloud Scene layers in version 1.2.	Enhancement

Source	Identifier	Type	Section	Description	Purpose
Su	NA	S	textureSetDefinition	New class: In support of enhanced texture capabilities related to using PBR materials definition. Specifies the set of available textures.	Enhancement
Su	NA	S	textureSetDefinitionFormat	New class: In support of enhanced texture capabilities related to using PBR materials definition. Describes the formats available for a texture set.	Enhancement

Chapter 5. Description of Critical Changes

There are no critical changes in this release.

Chapter 6. Description of Substantive Changes

There are substantive changes incorporated into Version 1.2 of the I3S Community Standard. These changes do not impact backwards compatibility. These changes are now described.

6.1. Summary of substantive changes

The substantive revisions for I3S version 1.2 include:

- Introduction of paged node access pattern – which significantly reduces the client-server traffic by bundling individual node metadata resources into compact pages of nodes.
- Introduction of a more compact geometry layout for 3D Object and Integrated Mesh layers binary geometry payloads – using a well-known quantization encoding (Draco).
- Introduction of an advanced material definitions property such as physically based materials.
- More optimal selection strategy – standardizes on Oriented Bounding Boxes (OBBs) based node selection criterion.

Each is now described in more detail.

6.2. Node Paging

A major improvement is node paging. Previously, clients received one node per request. In the new version, the nodes are grouped into pages. Clients can determine which node pages are needed and request only the necessary pages. This significantly reduces server-client traffic and improves performance.

Specifically, in earlier versions, each node was stored individually as a `3DNodeIndexDocument`, causing the tree traversal performance to be negatively impacted due to the large number of small resource requests required. For version 1.2 many nodes are packed into a single resource called a node page. These node pages are created by representing the tree as a flat array of nodes where internal nodes reference their children by their array indices.

I3S creators are free to use any ordering (e.g. breadth first, depth first) of the nodes into a flat array of nodes. The ID for a node is an integer that represents the index of the node within this flattened array.

Due to the addition of node pages, the I3S shared resources class has been deprecated. The primarily components of the shared resource class, which are texture and material information, are now available in the 3D Scene Layer Resource. However, since the proposed I3S 1.2 Community Standard is backwards compatible, the shared resource component of a node is still included in the standard, even though it is not utilized by newer client application accessing the proposed CS. The presence of the shared resource class in I3S 1.2 guarantees that older client application based on OGC I3S Version 1.1 will still be able to consume the same I3S resource.

6.3. Geometry compression

The next major enhancement is support for [Draco](#) geometry compression. Draco is an open-source library for compressing and decompressing 3D geometric meshes and point clouds. Using Draco is intended to improve the storage and transmission of 3D graphics. In I3S, Draco supports compressing geometry attributes creating more compact nodes, which in turn provides a smaller payload, increasing performance. More specifically, Draco is a library for compressing and decompressing 3D geometric meshes and point clouds. It is intended to improve the storage and transmission of 3D graphics. The Draco encoder and decoder APIs are now available in C++ and Javascript and are provided as an open source solution by Google under an Apache 2.0 license.

By using Draco compression, OGC I3S version 1.2 community standard enables deploying I3S instances that have a geometry payload that is ~85% smaller compared to those encoded based on the OGC I3S 1.1 CS. Such a reduction in the geometry payloads is attained by using Draco compression that gets decoded on the client side at runtime. This approach enables I3S 1.2 services to stream content across the wire more efficiently compared to previous versions.

6.4. Advanced Materials Definition

Another key enhancement for I3S version 1.2 is support for advanced materials. The material definition is now feature compatible with glTF materials. glTF defines materials using a common set of parameters that are based on widely used material representations from [Physically-Based Rendering](#) (PBR). Specifically, glTF uses the metallic-roughness material model. Using this declarative representation of materials enables a glTF file to be rendered consistently across platforms.

The materialDefinitions object are feature-compatible with glTF material with the following exceptions. I3S material colors properties (baseColorFactor, emissiveFactor etc.) are assumed to be in the same color space as the textures, most commonly sRGB while in glTF they are interpreted as linear. glTF has separate definitions for properties like strength for occlusionTextureInfo and scale for normalTextureInfo. Further I3S has only one texture definition with factor that replaces strength and scale.

Below is an example of a rendering of I3S encoded content using PBR materials definitions.



NOTE

[glTF](#) is Khronos' royalty-free format for widespread, efficient transmission and loading of 3D scenes and models.

Chapter 7. Future Work

Annex A: Revision History

Date	Release	Editor	Primary clauses modified	Description
2021-04-02	1.2	C. Reed	all	initial version for 1.2